Report Number: PB-V000-00-6899

Republic of South Africa
Department of Water Affairs and Forestry

Thukela Water Project Feasibility Study

Volume 6: Baseline Studies

A) Natural Resource Utilisation Baseline Study
B) eco-cultural Tourism Baseline Study
C) Visual and Aesthetic Baseline Study

June 2000

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THUKELA WATER PROJECT FEASIBILITY STUDY

NATURAL RESOURCE UTILISATION BASELINE STUDY

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

SUMMARY

The purpose of this study was to identify the impacts of the proposed Thukela Water Project (TWP) on natural resource utilisation. This study was undertaken in two sections:

- assessment of use and dependence on natural resources at a subsistence level by the Mziyonke community located to the north of the proposed Jana Dam
- assessment of commercial resource utilisation through game farming

The subsistence utilisation and game farming assessments were undertaken primarily using:

- a survey of quantities and uses of natural resources
- assessment of trends in these levels of utilisation
- scenario development of levels of use in ten years
- workshops with experts to predict impacts of TWP on resource use

(i) Subsistence utilisation of natural resources

Current resource use practices significantly support the households in the Mziyonke area. Utilisation includes:

- firewood collection to meet household energy requirements
- collection of house building and fencing materials in the form of poles and thatch
- collection of medicinal plants for household consumption and sale
- collection of craftwork resources (*incema*) for household use and sale
- grazing for livestock production (cattle and goats)

The value of these resources to each household from the area to be flooded by the Jana Dam is estimated at R11 000 per household per year. Current levels of utilisation of firewood, medicinal plants and building materials is believed to be unsustainable. However, depletion of the resources will not occur in the short to medium term, and significant quantities of these resources would still be available to the community in ten years time. Utilisation of these resources is not only meeting local consumption needs. Sale of the medicinal plants, and craft resources in particular, is meeting a regional need.

Positive impacts from the TWP on resource utilisation by the Mziyonke community include:

- creation of fishing opportunities as a new resource for subsistence utilisation
- development of new services such as electricity

A number of negative impacts were identified that would significantly affect resource utilisation and the livelihoods of the Mziyonke community:

- loss of economic opportunities for local harvesting and sale of resources for craft production by flooding the resources
- loss of a substantial percentage of firewood and thus household energy supplies through flooding of the valley
- loss of medicinal plant resources for both household consumption and income generation by flooding
- increased rates of resource depletion resulting from construction activities, as well as increased numbers of people (construction personnel) with access to the resources
- escalating degradation of remaining resources due to increased pressure on these resources following flooding of the valley

Mitigations for the negative impacts could include:

- careful location of the construction village and infrastructure to minimise impact on the resources
- salvage and relocate resources to areas outside of flooded boundaries
- provide alternative energy resources through electrification of the Mziyonke area
- establishment of alternative economically viable income-generation opportunities
- promote commercial propagation of high value plants to reduce pressure on remaining populations and assist in meeting regional and national demand
- empowerment of community to enforce local resource rights

(ii) Game farming industry

There is a strong trend to shift resources into the game industry within this region. In the past five years, the total area for game farming has grown by 45%, with an average annual growth rate of 9%. This game farming industry generally relies on income receipts from tourism and hunting. The game farming and associated hunting and tourism opportunities are considerable given the suitability of this region to support the 'Big Five' game species. Current trends and influences indicate that the game farming industry will continue to grow over the next five to ten years. These growth trends may be further boosted if the Drakensberg is declared a World Heritage Site.

Positive impacts of the TWP on the game farming industry included:

- the dams are likely to increase regional diversity of wildlife with creation of new wildlife habitats suitable for hippo, crocodile and a range of waterbirds
- increased opportunity for the development of attractive lodges and hunting facilities on the banks of the dams

A number of significant negative impacts were identified for game farming:

- visual and noise pollution arising from construction would destroy the opportunity for high value hunting in the affected areas, thereby compromising the enterprises through loss of revenue
- reduced viability of game farms divided by a canal as a result of a barrier restricting movement of game and reduced hunting and tourism marketability
- the canal would form a game barrier limiting the westward expansion of the game farming enterprises towards Colenso and Winterton, and limiting options for farmers in these areas to enter the game farming industry and join the Thukela Biophere Reserve
- game farms on the aqueduct route and bordering the dam sites will not be able to function during the construction phase due to noise and visual pollution, and disturbance to game
- elephants may destroy canal fences allowing other animals to fall into the canal and drown
- increased road traffic and people in the area could result in higher crime levels and significant increases in the incidents of poaching

Mitigations for negative impacts include:

- positioning of construction villages and workshops with the least visual impact
- co-ordinate construction and hunting/tourist activities to avoid disruptive action during peak tourist periods
- compensation for opportunity costs and lost business due to lost hunting and tourism opportunities
- promote habitat rehabilitation following construction
- development of pipeline aqueduct option rather than the canal
- expropriate farms divided by the canal, offering divisions for sale to neighbouring farms
- use of electric fencing to make canal fence resistant to breakage by the ‘Big Five’ game species

1 PURPOSE AND TERMS OF REFERENCE

The purpose of this Baseline Study is to determine the impact of the proposed Thukela Water Project (TWP) on natural resource utilisation (Figure 1.1). The rationale for this study is that the TWP is located in an area where the livelihood of adjacent communities and landowners is dependent on the utilisation of a variety of natural resources. The objective of this component is to determine the extent and significance of the dependence on these resources and the impact the TWP may have on the livelihoods of the affected communities. This Baseline Study will have the following objectives:

1.1 Describe and document the natural resource use context of the TWP area by identifying:

- the resources currently being utilised
- resource use patterns
- the supply and demand of resources
- the condition of these resources
- active enterprises associated with natural products.

1.2 In order to assess the impact of the TWP this Baseline Study will develop and document four scenarios for natural resource use and supply, namely the:

- current situation
- future without the TWP
- future with the TWP
- TWP during the construction phase.

1.3 Using the four scenarios describe and evaluate the impacts of the proposed TWP on natural resource use and livelihoods based on natural resource utilisation. This assessment should assess impacts according to the criteria and terminology as indicated in Table 1.1. Special reference should be made to the impact on:

- resource supply and future consumption of basic goods
- game carry capacity and game hunting enterprises
- micro-enterprises associated with natural products
- options for future use.

1.4 Identify mitigatory actions that would reduce the impact on natural resource based livelihoods and also outline actions that can be taken to enhance any potential benefits for natural resource based livelihoods.

1.5 Specific attention should be given to the identification of requirements for further investigation.

Table 1.1: Conventions for definitions and terminology used in the description, evaluation and assessment of environmental impacts

Category	Description or Definition
Type	A brief written statement, conveying what environmental aspect is impacted by a particular project activity or action, or policy or statutory provision.
Magnitude and Intensity	The severity of the impact
· very high	- Complete disruption of process; death of all affected organisms; total demographic disruption
· high	- Substantial process disruption, death of many affected organisms; substantial social disruption
· moderate	- Real, measurable impact, which does not alter process or demography
· low	- Small change, often only just measurable
· no effect	- No measurable or observable effect
· unknown	- Insufficient information available on which to base a judgement
Extent / Spatial Scales	The geographical extent or area over which the direct effects of the impact are discernable, i.e. the area within which natural systems or humans directly endure the effects of the impact.
· international	- Southern Africa
· national	- South Africa
· regional	- KwaZulu-Natal and the Thukela catchment, the UThukela Region
· local	- dam basin, conveyance servitude, river reach, specific site locality
Duration	The term or time period over which the impact is expressed, **not** the time until the impact is expressed. Where necessary the latter must be specified separately.
· short term	- up to 5 years (or construction phase only)
· medium term	- 5 to 15 years 9 (or early commissioning and operational phases)
· long term	- > 15 years (or operational life)
Sign	Denotes the perceived effect of the impact on the affected area
· positive (+)	beneficial impacts
· negative (-)	impacts which are deleterious
Certainty	A measure of how sure, in the professional judgement of the assessor, that the impact will occur or that mitigatory activity will be effective
· improbable	- low likelihood of the impact actually occurring
· probable	- distinct possibility that the impact may occur
· definite	- impact will occur regardless of prevention measures
Significance	An integration (i.e. opinion) of the type, magnitude, scale and duration of the impact. Judgements as to what constitutes a significant impact require consideration of both context and intensity. It is the assessor's best judgement of whether the impact is important or not within the broad context in which its direct effects are felt. (see Fuggle R.F. & Rabie M.A. 1992. *Environmental Management in South Africa*. Cape Town: Juta & Co. 823)
· high	- Could (or should) block the project/policy; totally irreversible (-ve impact) or provides substantial and sustained benefits (+ve impact)
· medium	- Impact requires detailed analysis and assessment, and often needs substantial mitigatory
· low	actions. - Impact is real but not sufficient to alter the approach used. Probably no mitigation action necessary.

Some Explanations and Definitions

1 Environmental impact - An environmental change caused by some human act. (DEA 1992. *The Integrated Environmental Procedure*. Vol 5).

2 Environmental impact - Degree of change in an environment resulting from the effect of an activity on the environment whether discernable or undesirable. Impacts may be the direct consequence of an organisation's activities or may be indirectly caused by them. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

3 Affected environment - Those parts of the socio-economic and bio-physical environment impacted on by the development. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

4 Environmental issue - A concern felt by one or more parties about some existing, potential or perceived environmental impact. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

5 Environment - means the surroundings within which humans exist and that are made up of:
- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part or combination of (i) and (ii) and the interrelationships among and between them;
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being. (National Environmental Management Act No 107 of 1998).

6 Significance - (See Fuggle R.F. & Rabie M.A. 1992. *Environmental Management in South Africa*. Cape Town: Juta & Co. 823. Also in, DEA 1992. *The Integrated Environmental Procedure*. Vol 4).

7 Significance - "The definition of significance with regard to environmental effects is a key issue in EIA. It may relate *inter alia* to scale of the development. To sensitivity of location and to the nature of adverse effects." (Glasson, J. Therival, R. and Chaduuick, A. 1995. *Introduction to Environmental Impact Assessments. Principles and Procedures, Process, Practise and Prospects*. London: UCL Press. 13).

8 Significance - "Once impacts have been predicted, there is a need to assess their relative significance. Criteria for significance include the magnitude and likelihood of the impact and its spatial and temporal extent, the likely degree of recovery of the affected environment, the value of the affected environment, the level of public concern, and political repercussions." (Glasson, J. Therival, R. and Chaduuick, A. 1995. *Introduction to Environmental Impact Assessments. Principles and Procedures, Process, Practise and Prospects*. London: UCL Press. 124).

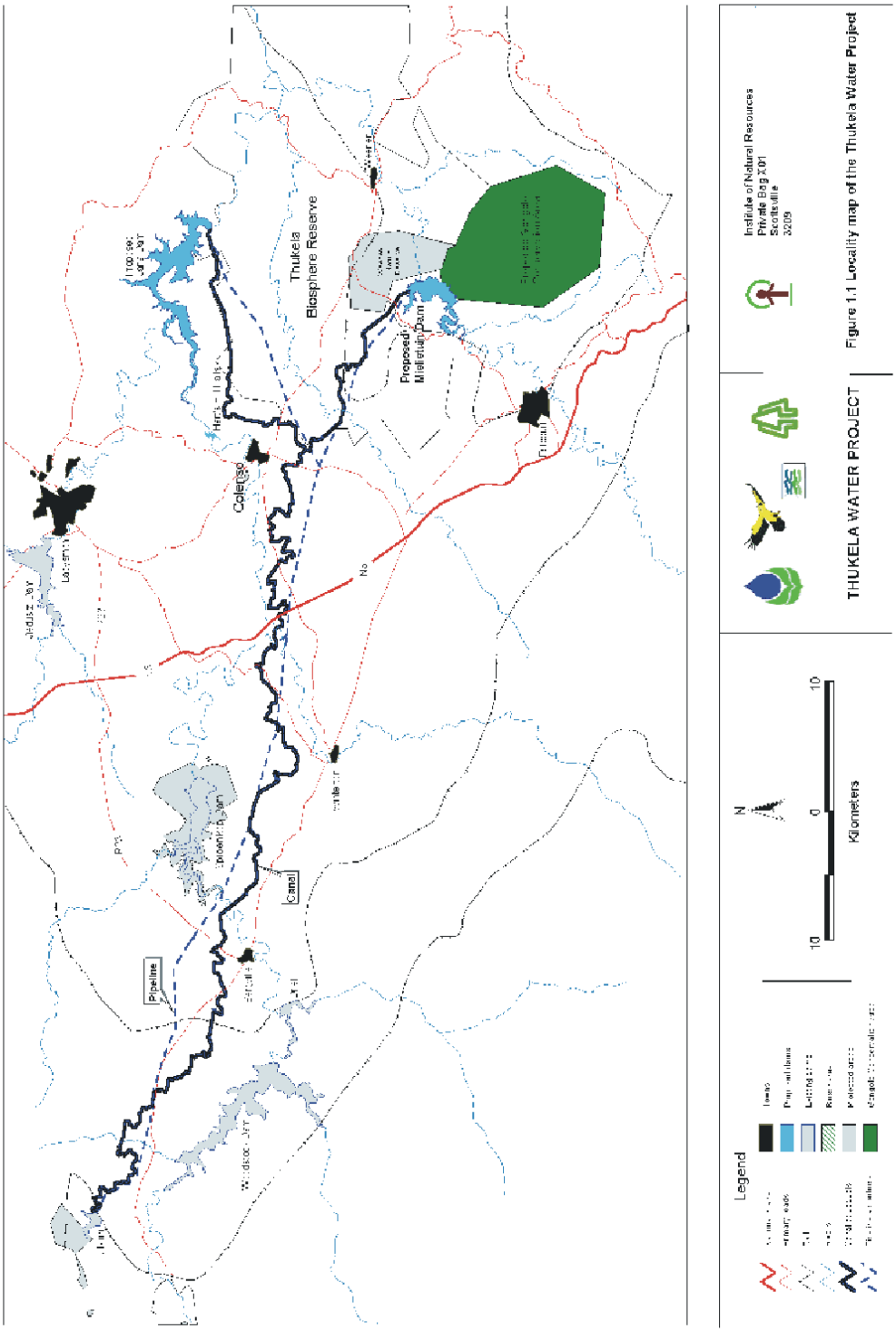
9 Significance -" The question of significance of anthropogenic perturbations in the natural environment constitutes the very heart of environmental impact assessment. From any perspective - technical, conceptual or philosophical - the focus of impact assessment at some point narrows down to a judgement whether the predicted impacts are significant." (Beanlands, G. 1983. *An ecological Framework for Environmental Impact Assessments in Canada*. Institute for Resource and Environmental studies. Dalhausie University. Sections 7: 43).

10 Environment - Surroundings in which an organisation operates, including air, water, natural resources, flora, fauna, humans and their interrelation. (ISO 14001. 1996).
Note - Surroundings in this context extend from within an organisation to the global system.

11 Environmental aspect - Element of an organisation's activities, products or services that can interact with the environment. (ISO 14001. 1996).
Note - A significant environmental aspect is an environmental aspect that has a or can have a significant environmental impact.

12 Environmental impact - Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services. (ISO 14001. 1996).

Figure 1.1: Locality map of the Thukela Water Project



2 METHODOLOGY

2.1 Methods

Due to the diversity of issues covered within this Baseline Study, it was undertaken in two sections:

- An assessment of the use and dependence on natural resources at subsistence level under common property tenure.
- An assessment of resource utilisation at a commercial game farming enterprise level, under private ownership.

2.1.1 Subsistence resource utilisation

- A field visit was undertaken to develop a general impression of the key resource utilisation issues.
- A survey of quantity and types of resources used in the Mziyonke area was undertaken through interviews with resource users.
- Data was analysed to estimate quantities of resource utilisation inside and outside of flooded area, economic value of these resources, availability of alternatives.
- A workshop was held with specialist team members to develop scenarios of resource utilisation for the present, as well for the next ten years. This future scenario was then used to predict the condition of the resource base in ten years time, and to identify the potential impact of the loss of these resources through the development of the Jana Dam.

2.1.2 Commercial game farming

- A field visit was undertaken to develop a general impression of the key resource utilisation issues, and identify role players in the local game farming industry.
- An assessment was made of the number and location of game farms affected by the two dam sites, as well as by the aqueduct route.
- An assessment was made of trends in this industry both in terms of economic growth, as well as expansion of land invested in game farming.
- A workshop was held with specialist team members to develop a scenario of resource utilisation for the present, as well for the next ten years. This future scenario was then used to predict the extent of the game farming industry, and the impact of the TWP on this industry on a local, sub-regional and regional scale.

A number of issues influenced the general approach to both studies:

- Flooding of the basin may take place in ten years time at the earliest.

- The changes to the resource base and demand patterns within the next ten years needs to be considered.
- The future scenario for resource use in the area in the next ten years needs to be developed.
- Based on this future scenario the impacts of the TWP on the resource base, and how this influences livelihoods and resource use enterprises, can be assessed.

2.2 Assumptions

Assumptions specific to each section are listed in the relevant sections.

2.3 Constraints

- The time and budgets allocated to the Baseline Study limited the range and depth at which issues could be addressed. This Baseline Study, however, forms part of a feasibility study and not an impact assessment which mitigates the scope of the study.
- It was not possible to assess each location and enterprise, and as a result the application of the expertise base gained from previous experience in other areas had to be applied during this study. However, while the data may be incomplete, it has enabled the development of a general overview of the situation.
- Accuracy of future scenarios is unknown. However, they provide general instruments for making predictions for future resource use levels and patterns. Importantly, experts have been used to generate the most plausible future scenario, upon which the predictions of impacts were based.
- Uncertainty and lack of information regarding certain key issues, for example location of construction villages, development of new infrastructure, height of dam wall, have limited the ability to assess impacts.

3 SUBSISTENCE USE OF RESOURCES

3.1 The context of resource utilisation - harvesting of indigenous plants

3.1.1 The location of intensive plant use

Plant use in the project area is characterised by two distinct patterns of use. There is intensive harvesting of indigenous plant resources in association with communally owned land by relatively large numbers of tribally based communities, and then there is low intensity plant use by dispersed settlements of farm labourers on commercial farms.

The Mielietuin Dam Basin and the aqueducts are located on commercial farms where plant use is spatially dispersed and harvested in small quantities by relatively small numbers of farm labourers. The intensity of plant use per square kilometre on commercial farms is low with alternative plant resources easily accessible. Consequently it is unnecessary for this study to focus on the Mielietuin Basin and the aqueduct from a plant harvesting point of view. On the other hand, the northern half of the Jana Basin is communally owned and plant use by the local tribal communities is spatially concentrated around their homesteads and includes the Jana Dam Basin (both the north and southern sides of the basin although the southern side is commercially owned). The assessment consequently focusses on indigenous plant use in the Jana Basin by the Mziyonke community which live immediately north of the proposed Jana Dam.

3.1.2 The role of plants in rural economies

Plant use by communities on tribal land in remote areas plays a critical role in local economies by providing:

- Trade items which only require an investment in labour for harvesting and retailing, and do not require cash resources to establish a trading enterprise.
- Household consumer goods (building material, food, beverages, medicines) which can be obtained without cash resources.
- Agricultural inputs without the need for cash.

In summary, indigenous plant resources provide trade and consumption opportunities without the need for cash, thereby representing an important cost savings mechanism to rural households. The plant resources also provide an important additional economic role - an option for future use. For example, should a family member lose their job, they are able to return to the rural homestead and enter into the trade of some local plant products. This option value is a vital safety net which ensures/guarantees that the local households will always have some economic resource with which to generate an income.

3.1.3 Current plant use in the Jana Basin

There are currently 170 households in the Mziyonke community adjacent to the Jana Basin and these households make intensive use of the local indigenous vegetation. There is also occasional plant use in the Jana Basin by more distant communities but these are in low quantities. The estimates that are made for plant use by the Mziyonke community are relatively coarse and quantities used by other communities in the area would probably not make a significant difference to estimates.

The local households currently use indigenous vegetation in the Jana Basin to supply:

- fuelwood
- grazing and the associated stock products (milk, ploughing, fertilizer, meat, cash from trading animals, etc.)
- house building materials
- medicinal plants
- craft materials
- fencing materials.

These plants and the associated products can be either consumed within the households or they can be traded to generate incomes. The plant use survey of households revealed a large dependence on the local plant resources. Table 3.1 summarizes the survey results and shows the extent of plant utilisation and the economic value to local households. The table indicates the numbers of people in the community who reported their use of particular plant products, and importantly, those households which targeted plant resources in the Jana Basin.

Table 3.1: Community utilisation of resources inside Jana Dam Basin (based on a survey in the area and a survey (Beukman *et al.*, 1998) conducted in the area around Jameson's Drift)

Resource used	Households using resource (%)	Households using basin resource (%)	Number of households using basin resource	Quantity used per household per year	Total quantity used by community per year	Value per households per year	Total value to community per year for basin resources
Firewood	100	57	97	12 520kg	1214440kg	R2 795	R271 115
Grazing: Cattle Goats	9898	7373	122122	9.70 9.01	1204# 1118*	R2 438 R522	R297 388 R63 726
Muthi	40	88	60		46 tonnes	R6 630	R397 800
Craftwork	76	96	124		◆	R3384	R419 616
Housing	100	87	148		◆	R411	R60397
Fencing: Kraals Fences	6262	7373	7777		5775 poles★ 10626poles▲	R98 R319	R7546 R24 563

\# Average herd size of 9,7 cattle per household valued at R245/cow/year
* Average herd size of 9,01 goats per household valued at R57/goat/year
★ Replacement of kraal pole every 10 years
▲ Replacement of fence poles every 3,3 years
◆ Only values were estimated

The survey indicates that all households in the area rely on local vegetation in some way, and on average 78% of the Mziyonke households depend on the vegetation from within the Jana Basin. The lowest percentage of use in the basin is 57% for fuelwood. This low percentage is probably a factor of the intensive effort required to remove a low value high volume product from the incised valley and more easily accessible wood for households far away from the valley. In contrast, 96% of households harvesting *incema* or *Juncus effusus* (a sedge used extensively in the production of *icansi* - traditional sleeping mats), harvested from the Jana Basin. These plants are confined to permanently wet areas adjacent to the river bed and are not found in any substantial quantities outside of the valley.

The survey has also identified *incema*, either as raw material or as a woven mat (*icansi*), and medicinal plants, as being important trade items. Both products are traded extensively in Ladysmith, Durban and Johannesburg. Apart from craftwork and medicinal plants being important local trade items, they are important regional resources for the wider community. The limited distribution and availability of these plants make the Jana Basin an important regional asset supplying consumers in the KwaZulu-Natal (KZN) interior and to more distant locations such as Johannesburg and Durban.

Several of the households reported that they were trading and using large volumes of medicinal

plants. These volumes are substantially higher than other estimates in South Africa and should be considered with caution. However, if this region is a major resource for Ladysmith and other areas, then the estimates are not unrealistic. For example, Durban traded an estimated 1 200 tonnes in 1996 and the Mziyonke amount would, therefore, amount to 4% of the Durban trade or equivalent to100 000 consumers and there could be that many consumers in the region. Further work is required on the medicinal plants before accurate estimates can be made in this regard.

The total value of goods and services supplied by plant resources in the Jana Basin to the surrounding community could amount to R1.5 million per annum, or R11 000 per household per annum. These estimates are some 30% higher than estimates done for other woodlands in KZN, and could be attributed to the active trade in high value medicinal and craftwork products.

Food plants usually play an important role in household economies in rural areas. The survey was not able to make estimates of the wild foods used and this would also need further investigation.

In summary, the plant resources in the Jana Basin play a critical role in local livelihoods, ensuring that households are able to make a living. The question is, how much of these resources are likely to remain in the area in ten years.

3.2 The future scenario for plant use in ten years

In developing a scenario to provide an indication of what the resource base and associated plant harvesting may be like in ten years time, a number of key assumptions were adopted based on current trends. These assumptions are:

- The area will remain rural and will not develop into a peri-urban centre.
- Natural population growth will be limited by trends of urban migration, and AIDS mortalities, resulting in a population growth rate of 2.2%.
- The population growth is likely to result in a growth in the local population. In 1999 there are 170 households with 1 400 people (8.2/household), and in 2009 with a 2.2% growth there will be 211 households with 1 738 people.
- No major infrastructural development will occur preceding the dam development. Therefore, the population will remain stable with no decrease in current levels of resource consumption.
- Ladysmith will be a large and growing market for the trade in traditional products (traditional medicine and craftwork).
- There will be an active trade in high value low volume traditional products to regional and national locations.
- Low value high volume trade of resources will occur at a local level only (e.g. firewood).

- Plant resources will continue to offer an option value, providing a safety net against unemployment.
- The current national trends in increasing plant consumption and an associated decline in the high value plant resource base will continue, resulting in an increasing demand for Jana plant resources, particularly *muthi* and craft fibres.
- The probability of drought occurring within the next ten years is high. This would increase dependency on natural resources (especially food), and decrease the supply of grazing and herbaceous species.
- Current resource management institutions and community power relations remain stable.
- The current management approach to resource utilisation will continue.
- There will be a reduction in high value housing timbers on neighbouring commercial farms as a result of increased levels of harvesting by community due to local shortages.
- Stocking rate is currently at a maximum and will continue.
- The demand for local *muthi* and craft resources is likely to mirror urban growth trends.

3.2.1 The woodfuel asset in ten years

Using the assumptions identified above and the current trends in woodland products used by local households, it was possible to make estimates of the future resource base. Fuelwood plays a key role in determining the size of the future woodland resource. As large quantities of trees are harvested for fuel, the entire woodland is affected. The current demand for fuelwood from the Jana Basin is estimated to be 1 214 tonnes per annum and is likely to be harvested from 823ha (the woodland area which the Mziyonke community current has easy access to). The current biomass estimated to be 15 tonnes per ha with a sustainable yield of 1.7%. This suggests that the sustainable yield is 210 tonnes per annum from this woodland and only meets 17% of current consumption. Consequently, as annual demand exceeds supply by approximately 1 000 tonnes, it is likely that in ten years only 46% of the current standing stock will be available. This will, however, still constitute an important resource to the community.

3.2.2 The medicinal plant asset in ten years

As the area is dominated by woodland, it is likely that the tree products constitute about 70% of the plants harvested. Therefore, of the estimated 46,8 tonnes harvested, 32 tonnes could be from trees. Using an estimate of 8kg dry mass harvested per tree, this would result in 4 095 trees having their bark stripped per year (frequently a fatal impact when undertaken intensively). In addition, bark harvesting would be targeted at high value trees. With a dam basin of between 4000ha and 2000ha, this would translate to the equivalent of 1 to 2 trees harvested per ha per year. In terms of the 823ha that the Mziyonke community have access to, this would translate to 4 trees per ha per year. While the densities of high value plants are not known, experience from other woodland areas in South Africa would indicate that the above harvesting levels are not

sustainable. The active harvesting of high value trees on the southern slopes of the Jana Basin attests to the unsustainability of current harvesting. This implies that in ten years, the high value medicinal trees are likely to have been depleted, while low value species are likely to still be available.

3.2.3 The craftwork assets in ten years

The production of *Juncus effusus* in the Thukela could be between 2 to 6 tonnes per ha per year. The current demand for *Juncus* is estimated to be 7.6 tonnes based on the survey undertaken. This implies that 2.5ha of *Juncus* are required to meet demand or 12.5km of river bank with a 2m wide strip of *Juncus*. The implication of this is that it is likely that all the easily accessible *incema* is already harvested by the local community, and any increase in demand is likely to require harvesting further up and down the river. It is likely that all the *incema* beds in the Jana Basin would be a focus of harvesting in the future.

3.2.4 The house building material in ten years

The unsustainable harvesting of wood fuel resources in the basin is likely to have removed most of the high value housebuilding material in ten years. Laths are likely to remain in large quantities and thatch is also likely to be available.

3.2.5 The grazing asset in ten years

Current stocking rates are 1.5ha/LSU while the recommended rate is 6ha/LSU. This implies the grazing is already being utilised in excess of recommended rates, and consequently there is unlikely to be a significant increase in stock numbers as forage is already a limitation. The quantity of forage is likely to be the same in ten years, but the quality may be poorer given the intensive pressure already being placed on palatable species.

In summary, there is likely to be intensive use of the plant resources in the Jana Basin in ten years time. While the quantity of woodland trees (or biomass) is likely to be half the present quantity, the quality of the resource will be much reduced. High value species will probably be scarce. The grassland and wetland species in the wider area are likely to be fully exploited.

4 THE POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT ON SUSTAINABLE USE OF RESOURCES

The proposed development will have an impact on the supply and demand for indigenous plants in the project area. In order to derive the potential impacts that may arise, the development of the dam is considered in terms of how the dam will affect the supply of plants and what demand may be generated by the additional activities introduced by the dam, and how these activities may impact on the demand which may already exist at the time of development.

4.1 The construction phase

The construction of the dam will lead to physical land-use changes and result in a reduction in the quantities of vegetation available for utilisation. Furthermore, construction will lead to large numbers of additional people entering the area and will alter vegetation use patterns. The significance of these users to resource use is tabled below (Table 4.1) and is based on observations made by the project team in other developing areas. The contract workers in the area are likely to harvest medicinal plants and to a lesser degree they will also harvest firewood. Outsiders or camp followers will focus on a wide range of plant resources with emphasis on trade products such as firewood and medicine. External entrepreneurs travelling through the area are likely to focus on firewood, filling up empty vehicles travelling back to urban centres. Local entrepreneurs from the community are likely to focus on high value trade items such as medicine, craft and firewood.

Table 4.1: The significance of new users impacting on the supply for plant resources during the construction phase

Resource	Contract Workers	Camp Followers	External Entrepreneurs	Local Entrepreneurs
Firewood	1	1 or 2	2	1
Grazing	0	0	0	1
Muthi	2	2	0	2
Craft materials	0	1	0	2
Housing materials	0	1	0	0
Fencing materials	0	1	0	0

Key: Scored against existing levels of demand
0 = no impact
1 = impact
2 = significant impact

The impacts of additional people and the destruction of vegetation is likely to produce the following impacts:

- The total area of woodland and grassland cover on both the north and south banks will be reduced through the establishment of accommodation, administration, transport and construction infrastructure. This is likely to be a relatively small area.
- Craftwork plants, especially *Juncus* populations, will be destroyed at the construction site and may be flooded through coffer dams. The loss of plant resources (*Juncus*) could amount to 7.6 tonnes with an annual value of R76 000 in raw material and up to R420 000 in processed products (in 1999 prices) (this processed value also includes other craftwork but is insignificant).
- The addition of more people in the area for several years will lead to a greater demand for woodfuel, even with staff villages being electrified, and consequently result in an accelerated reduction in the available woodfuel. The loss of woodfuel is likely to result in increased effort being expended to collect wood from further into the valley, with subsequent costs to agricultural and other home enterprise productivity.
- Additional people may settle in the area resulting in a reduction in the available grazing land as open space is settled and farmed.
- Additional people in the areas will result in increased levels of medicinal plant harvesting for either self-medication or for trade in and out of the area. High value plants will become scarce at an accelerated rate, reducing the trade opportunities for the current traders. Home consumption will also be impacted as high value products become increasingly inaccessible.
- Additional people in the area will result in increased harvesting of craftwork plants. As the entire plant stock in the area is likely to be exploited in the future, additional harvesters will reduce the individual quantities harvested and reduce enterprise incomes.
- Additional people in the area will result in a reduction of housing and fencing material. The establishment of new settlements will use additional plant resources. However, high value products such as poles are likely to be scarce in five years time and the impact will, therefore, be small.

4.2 The post-construction phase

After construction of the dam, it is unlikely that large numbers of people will remain in the area. The construction workers and external entrepreneurs that would have been in the area are likely to relocate. On the other hand, the local community is likely to have more people as people who returned home to seek work or to become local traders will remain. It is also likely that some outsiders who moved into the area to look for piecemeal work would remain in the area. These numbers are not considered significant in terms of changing the demand for woodland resources. The flooding of the dam basin will, however, impact on the resource base by flooding woodland,

grassland and wetland plant communities.

- Communities will suffer an economic loss with the loss of plant resources. Table 3.1 indicates what the current value of benefits are from harvesting plant resources. The total value of goods and services supplied by plant resources in the Jana Basin to the surrounding community could amount to R1.5 million per annum, or R11 000 per household per annum (140 households). The medicinal and house building plants are likely to be severely depleted when flooding occurs, while the other products are more robust populations and are likely to be accessible in similar quantities. This implies that value of lost plant resources is more likely to be around R1 million per annum or R6 000 per household (for 170 households - the probable number in ten years).
- There is likely to be increased competition between community members for the harvesting of the remaining plant resources that will not be flooded.
- The community will suffer an economic loss as the remaining resources outside of the flood basin have to be shared. The whole community is then impacted and not just those community members who may have been using the basin resources.
- The resource use levels outside of the flood basin are likely to be unsustainable resulting in a running down of the resource asset with an associated loss of economic benefits. Households will be forced to enter the cash economy and need to locate in the order of R6 000 to R11 000 in cash to replace the lost resources, the amount depending on the degree of resources loss.
- The flooded river basin will generate an enlarged and new habitat for fish and these may become a resource for the community.
- Regional pressure of medicinal and craftwork plant resources may increase as the loss of the basin resources shifts and increases harvesting pressure on alternative stocks.
- Regional consumer welfare may diminish as cultural and medicinal products are no longer available or as product prices may rise as demand exceeds supply in the region. Scarce medicinal plants are between 4 to 20 times more expensive than readily available plants.
- Increased outsider utilisation of the remaining resources will result from more easy access and this may lead to accelerate rates of product reduction.
- The option value of the resource will be eliminated for the Jana Basin, foreclosing future options which resident households may wish to exercise.
- An increase in the supply of electricity, water and housing as a result of the construction activities may result in less pressure being placed on plant resources.
- There may be an increased demand for craftwork products as the local tourism sector increases in response to the dam, with increased opportunities for enterprises to develop.
- A growth in local tourism may result in the local community increasing the environmental management of the area in a response to tourist demand for higher quality environments.

4.3 The quantification of impacts

Negative impacts that are assessed as being high in magnitude, confidence and significance are highlighted through grey shading (Table 4.2). These impacts could severely affect subsistence resource use and associated enterprises in the study area, as well as regionally. They could have crucial socio-economic impacts on the regional population and would require substantial mitigation.

Table 4.2: Description and evaluation of impacts on resource utilisation

Impacts	Magnitude/ Intensity	Extent/ Scale	Duration	Sign	Certainty	Significance
Pre-construction						
Resource loss due to less cautious harvesting strategy	medium	local	short term	negative	probable	medium
Possibility of compensation for loss of remaining resource resulting in increased management of standing stock	low	local	short term	positive	probable	moderate
Construction phase						
Grass and woodland loss resulting from village and infrastructure development on north bank	low	local	long term	negative	definite	medium
Grass and woodland loss resulting from village and infrastructure development on south bank	low	local	long term	negative	definite	medium
Loss of craft materials (*incema* and reeds) at site of dam construction	high	local	indefinite	negative	definite	medium
Loss of upstream craft resources due to flooding of basin	high	local	indefinite	negative	definite	medium
Loss of firewood due to increased number of people associated with construction (Table 3.1)	high	local	indefinite	negative	definite	medium
Loss of grazing due to increased number of people due to construction	low	local	medium term	negative	probable	low

Impacts	Magnitude/ Intensity	Extent/ Scale	Duration	Sign	Certainty	Significance
Loss of *muthi* due to increased number of people associated with construction	high	local	long term	negative	definite	medium
Loss of craft materials due to increased number of people associated with construction	moderate	local	medium term	negative	probable	medium
Loss of housing materials due to increased number of people associated with construction	low	local	medium term	negative	probable	low
Loss of fencing materials due to increased number of people associated with construction	low	local	medium term	negative	probable	low
Dam phase						
Economic loss to Mzinyonke community through loss of resources resulting from flooding of basin	very high	local	indefinite	negative	definite	medium
Increased competition for use of remaining resources resulting in accelerated depletion	high	regional	indefinite	negative	definite	medium
Economic loss resulting from reduced share of resources	high	regional	indefinite	negative	definite	medium
Continuous degradation of resource base and associated economic benefits	high	local	indefinite	negative	probable	medium
Creation of a new potential resource - fish	low	local	indefinite	positive	definite	low
Loss of in-basin resources resulting in additional harvesting pressures on medicinal and craftwork species in the region	low	regional	indefinite	negative	definite	medium
Regional consumer welfare impacted on through the loss of local and cheaper traditional products	low	regional	indefinite	negative	probable	low
Improved transport infrastructure and access to local resources resulting in increased utilisation of resources	low	local	long term	negative	improbable	low

Impacts	Magnitude/ Intensity	Extent/ Scale	Duration	Sign	Certainty	Significance
More housing, electricity, and water provision	low	local	indefinite	positive	probable	medium
Development of local tourism sector requiring non-degraded landscape, resulting in improved land management	low	local	indefinite	positive	improbable	medium
Aqueduct : canal - not applicable to pipeline						
Increased effort to harvest resources due to barriers	low	regional	indefinite	negative	definite	medium

4.4 The mitigation of potential impacts

Table 4.3: Mitigation

Impact	Mitigation
Resource loss due to less cautious harvesting strategy	• Community environmental awareness campaigns
Grass and woodland loss resulting from village and infrastructure development on north bank or south bank	• Careful location of village and infrastructure to minimize loss of high quantity and quality of resources • Provide alternative land nearby • Locate village away from dam site (in neighbouring town) and bus labour in
Loss of craft materials (*incema* and reeds) at site of dam construction, as well as upstream flooding	• Salvage and relocate the resources to an area outside of the immediate flooding boundaries • Establish paddy fields for intensive cultivation of *Juncus* in environmentally suitable locations
Loss of firewood due to increased number of people associated with construction (Table 3.1)	• Provide alternative energy sources (e.g. electricity, paraffin) • Supply firewood from off site, e.g. from wattle plantations • Appoint local conservation officers to police harvesting of the resource
Loss of grazing due to increased number of people due to construction	• Provide access to alternative grazing lands • Promote effective cattle marketing
Loss of *muthi* due to increased number of people associated with construction	• Establishment of commercial production of *muthi* plants in community and individual plots
Loss of craft materials due to increased number of people associated with construction	• Establishment of commercial production of craft plants
Loss of housing materials due to increased number of people associated with construction	• As above

Impact	Mitigation
Loss of fencing materials due to increased number of people associated with construction	• Provision of access to affordable alternative fencing materials
Economic loss through loss of resources resulting from flooding of basin	• Establishment of alternative economically viable income- generation opportunities • Provide alternative services • Provide compensation for losses that cannot be mitigated
Increased competition for use of remaining resources resulting in accelerated depletion	• Support the commercial production of high value resources locally to reduce pressure on remaining resources • Provide alternative services • Provide compensation for losses that cannot be mitigated
Economic loss resulting from reduced share of resources	• Establishment of alternative economically viable income-generation opportunities • Provide alternative services
Continuous degradation of resource base and associated economic benefits	• Commercial production of demanded resources locally to reduce pressure on remaining resources • Establishment of alternative economically viable income- generation opportunities • Provide alternative services
Creation of a new potential resource - fish	• Awareness creation of benefits and opportunities of this resource • Skills and tools development for harvesting and management of fish resource
Loss of in-basin resources resulting in additional harvesting pressures on medicinal and craftwork species in the region	• Promote commercial production of high values plants locally and regionally to reduce pressure on remaining resources
Regional consumer welfare impacted on through the loss of local and cheaper traditional products	• Promotion of the commercial propagation and cultivation of relevant species
Improved transport infrastructure and access to local resources resulting in increased utilisation	• Empowerment of local community to enforce local resource rights and exclusion of outsiders
More housing, electricity, and water provision	• Ensure that the installation design is adaptable for future community access
Development of local tourism sector resulting in craft market and associated increased demand for craft materials	• Commercial production of demanded resources locally and regionally to reduce pressure on remaining resources • Promote skills development in high value craftwork
Development of local tourism sector requiring non-degraded landscape, resulting in improved land management	• Awareness and education programmes on environmental management and tourism
Increased effort to harvest resources due to barriers	• Development of mechanisms to facilitate the crossing of barriers, e.g. walkways

5 COMMERCIAL USE OF GAME RESOURCES

5.1 The context of resource use - commercial harvesting of game

5.1.1 The local industry

There are several major game farming clusters located in the proposed development area with approximately 100 000ha already committed to game farming and another 44 000ha with both cattle and game (Table 5.1). For comparison, the Hluhluwe-Umfolozi Park is also approximately 100 000ha in extent.

Table 5.1: Land committed to game and cattle

Game Farm Cluster	Number of Landowners	Area (Ha)
Thukela Biosphere Reserve (Game farming only)	14	56 000
Gongolo Game Reserve	12	25 000
Weenen Nature Reserve	1	10 000
Independent farmers	3	8 000
Total area with game only		**99 000**
Cluster with cattle and game		
Thukela Biosphere Reserve (Game and cattle)	?	44 000

The topography is attractive, undulating country with deeply incised rivers and numerous perched plateaus. The landscape is scenically attractive with few large scale man-made structures, a microwave tower being the only built infrastructure which is visible in many locations. The vegetation is relatively undisturbed, consisting of closed and open woodland in the valleys, thickets on the hill slopes and sour grasslands on the plateaus. The valleys provide excellent game habitat with a combination of sweet grazing and abundant browse, while the higher altitude grasslands provide summer grazing for game and all year grazing for highveld antelope. The following animal species are already established in the area:

Aardwolf	Aardvark	Baboon	Black-backed Jackal
Black Rhino	Blesbuck	Blue Wildebeest	Brown Hyaena
Buffalo	Bushbuck	Bushpig	Common Reedbuck
Crocodile	Eland	Elephant	Giraffe
Grey Duiker	Impala	Klipspringer	Kudu
Leopard	Lynx	Mountain Reedbuck	Nyala
Oribi	Ostrich	Red Hartebeest	Serval
Spotted Hyaena	Springbok	Vaal Rhebok	Vervet Monkey
Warthog	Waterbuck	White Rhino	Zebra

In addition, the region's habitat is also suited to African wild dogs, black wildebeest, cheetah, hippo and lion. The area, thus, already has four of the 'Big Five'. However, the buffalo and rhino are currently only found within the KwaZulu-Natal Nature Conservation Service area (Weenen Nature Reserve).

There is active movement of game between the various properties within various zones which have been established, for example, the elephants within a number of farms in one area or zone. The movement of large herbivores, such as elephant, is critical to sustaining the ecological functions in the region by maintaining the habitat diversity which supports a wide range of other game animals. As most of the properties are too small to contain these large herbivores, the corridors between properties are critical for the effective farming of game animals in the long term. Furthermore, all the major game farm clusters are neighbours in some way, which promotes more functional ecosystems, that in turn provide better conditions for game. In keeping with the approach to joint management of resources, the current trend is for farms to function cooperatively, reducing the barriers to game movement between the properties, and to purchase game animals jointly.

There is a strong trend to shift resources into the game industry within this region. The economic and management challenges which are facing the local cattle farming industry and the attractiveness of game farming as an economic enterprise, is leading farmers to shift to game farming. In the last five years, the total area for game farming has grown by 45%, with an annual average growth rate of 9%. This trend is also occurring at a national level where there are now some 9 000 commercial game farms established. In addition, the international demand for South African game hunting has increased with a shift in demand from eastern Africa to South Africa. In the last five years there has been a 60% (or 12% per annum) increase in the number of foreign hunters in South Africa. Another indicator of growth is the large numbers of professional hunters being trained per year. In 1998, approximately 250 professional hunters were trained in South Africa.

The game farming industry generally relies on income receipts from hunting and eco-tourism. The hunting industry is strongly seasonal with most hunts taking place from May to October and earns relatively high returns. For example, in 1998 the average foreign hunter to South Africa spent R17 000 on accommodation fees (9 days) and hunted six animals worth R24 000, with a total value of R41 000 spent per package (Paula McGee, Professional Hunters Association of South Africa, *pers. comm.* 1999). The incomes earned are generally divided between the professional hunter and the game owner. During the summer season, the farmers usually service the eco-tourism industry. The game farms in the project area each have between one to three lodges or bush camps which serve both hunting and eco-tourism clients. The combination of high value

hunting and lower value eco-tourism ensures that the game farm enterprises are sustainable economic units.

The game farming and associated eco-tourism potential of this area is considerable given the suitability of this region for the 'Big Five' and its easily accessible location close to Gauteng and Durban. The wide range of game animals available for hunting in this area makes the region an attractive international hunting destination.

5.1.2 The game farming assets

The game farming assets in the region are:

- A large area (100 000ha) of land dedicated to game farming (see Table 5.1).
- Farm infrastructure that services the industry.
- Established accommodation on the farms.
- A wide diversity of wildlife habitats providing a diverse hunting package.
- Four of the 'Big Five' game species are already resident in the region.
- A big game area without tropical diseases, particularly malaria.
- Established markets for hunting and associated eco-tourism.
- Relatively low game stocking densities at present.
- Cooperative associations to promote joint management of game.
- Large clusters of farms promoting effective ecological functions with the movement of large herbivores between farms.

5.1.3 Market trends and future development

The major trends in the game industry are:

- A significant growth in the local industry of some 9% per annum over the last five years.
- A 12% annual growth in foreign hunters in South Africa (SA) in the last five years.
- An increasing demand for a greater diversity of game animals in hunt packages.
- An increasing demand for high quality natural environments in which to hunt.
- A local shift in farming from cattle to game, replicating the national trend.
- An increase in cooperative farming with joint management of game and allowing large herbivores to move between properties.
- Increasing optimisation of market opportunities by combining game farming with eco-tourism.

There are a number of developments which can influence the future of the local game industry and which can determine what the industry may look like in five to ten years. In view of these developments and the current trends, the following assumptions are made.

- There will continue to be a growth of farming cooperation in the area.

- There will be mixed institutional support from various levels of government, with most support for the industry coming from tourism.
- There will continue to be an increase in foreign hunters arriving in SA as east African hunting becomes more problematic.
- The stock farming industry will continue to decline in SA as international competition and security issues impact on enterprises.
- International tourism will continue to increase in SA.
- The region may experience a boom in international tourism after the Drakensberg becomes a World Heritage Site (conservation officials participating in a recent assessment of the Drakensberg-Maloti Region as a World Heritage Site have indicated that it is highly likely that the area will achieve one of the highest possible status of World Heritage Sites).
- An increase in national demand for wildlife and hunting opportunities.

5.2 A future scenario for the game farming industry

The future game farming industry within the proposed development area has been visualised by combining the current situation together with the assumptions made above to generate a plausible scenario of what the industry may look like. A ten year period has been used as this is the likely time span that will be required to construct the proposed dams and aqueducts.

The future game farm industry may have the following characteristics towards the end of the next decade.

- An expanded private game farming area of 170 000ha (89 000ha * 1.9 = 170kha) (1.9 is an average of 4.5% growth over 10 years).
- The expansion is likely to be largely in valley bushveld which implies a westward and southeasterly expansion of the game farms.
- A large and growing demand for hunting and viewing game animals as other game resources in Africa diminish.
- An increase in foreign clients as foreign demand increases and outbids local demand for hunting.
- The Thukela Region will increase in popularity as a hunting destination due to the wide range of game animals it is able to offer the market in a single locality.
- Four of the 'Big Five' game species are likely to be available for hunting in the region, with lion being a questionable possibility.
- There will be double the number of accommodation establishments on farms in the region catering for the hunting industry.

- The quality of the regional outdoor experience will improve as more land use changes to game farming and fewer conflicting activities occur.
- There will be active movement of large herbivores, particularly elephant and buffalo, between properties.
- The secondary service industry is likely to grow considerably to support a large game industry (for example, game capture, veterinary services, taxidermy, catering, transport, off-site accommodation, etc).
- A large game farming industry and associated tourism industry will become the major economic driver in the region, especially if global trade negatively impacts on the local agricultural industry.
- The addition of major provincial tourist destinations, such as St Lucia and the Drakensberg-Maloti Transfrontier Park, will boost local economic growth.
- An additional Big Five tourist destination in association with the historical/cultural and adventure tourism assets and the Drakensberg could create an international tourist and hunting destination.

6 POTENTIAL IMPACTS OF THE TWP ON THE COMMERCIAL GAME FARMING INDUSTRY

6.1 The construction phase

The construction period for the project is likely to be eight years, with extensive transport/movement of material, spoil and people. At the dam construction sites, the aqueduct route and transport corridors there is likely to be visual pollution, dust, noise, new roads, habitat destruction and staff villages. The following impacts are likely to emerge:

- There will be a loss of the current wild 'sense of place' with the disturbance of natural habitats and establishment of large artificial structures. The African bush experience will be changed.
- The aesthetic value to visitors will be reduced within a radius or strip of 5km to the dams construction sites, aqueduct and roads where the noise and visual intrusion will be present. This may be closer or further depending on topography. The installation of powerlines to supply the pump houses along the aqueduct could create visual pollution for extensive distances.
- Game and other wildlife will move away from the disturbed area.
- Natural habitats will be destroyed during construction, with riverine vegetation being lost by the dam construction. This vegetation is important to the local game farms as it provides a source of high quality browse in the dry season.
- Increased movement of vehicles and additional transport corridors is likely to result in illegal game hunting, accidental road kills and will become a barrier to game and other wildlife movement.
- Increased road traffic and people movement in the area may promote higher crime levels in the region, negatively impacting on tourists/hunters perceptions of the area as a destination. Security is an important prerequisite for recreational visitors.
- Visual and noise pollution will stop high value hunting taking place in locations where it can be perceived. Game farms which are exposed to visual and noise pollution will be severely impacted for the duration of the construction period.
- The loss of high quality hunting environments reduces the marketability of affected game farm enterprises and may lead to the termination of high earning and financially critical business components.
- Game farm enterprises will not be able to function on farms immediately adjacent to the dams, and along transport corridors due to disturbance generated during construction.
- A canal is likely to generate a continuous linear disturbance to wildlife and hunters/tourists.

- Canal construction will create a barrier to the movement of game animals within and between farms.
- The more central the canal to the farm unit the more severe the impact on game production.
- Individual farm units may lose all high value hunting opportunities for the duration of the canal construction.
- Game hunting enterprises may close down for the construction period of a canal.
- A pipeline is likely to create a spatially limited and temporary limited barrier to game movement on and between farms.
- Lodges and bush camps adjacent to the aqueduct and powerlines will not be suitable for hunters and eco-tourists for the duration of the construction period.

6.2 The post-construction period

6.2.1 Potential impacts arising from Jana and Mielietuin Dams

- Flooding the dam basin will result in the loss of thickets on the steeply sloping land, woodland/ grassland on the valley bottoms and riverine vegetation on the river banks. The loss of vegetation will result in a reduction of habitat for game animals. The loss of valley bottom and riverine vegetation is significant for the Mielietuin Dam.
- Bushveld scenery in the valley bottoms will be changed to water surface.
- Riverine vegetation is likely to become re-established in the long term along the dam water line.
- The Jana Basin is likely to have greater quantities of riverine vegetation with a dam.
- Mielietuin Dam is likely to increase waterfowl habitat in the region with potential opportunities for eco-tourism and game bird hunting.
- The dams are likely to provide more attractive locations for the development of bush camps and lodges.
- Mielietuin Dam is likely to increase the regional diversity in wildlife habitat for hippo and waterfowl in particular.
- The exposed mudbanks could provide attractive grazing areas for game animals.
- The Jana Dam could become a barrier to any illegal game harvesting activities from north of the Thukela.

6.2.2 The aqueducts - potential impacts arising from a canal

- A canal would create a permanent barrier to the movement of game animals.
- Elephants are likely to destroy canal fencing, with the result that wildlife may fall into the canal and drown.

- A game barrier may limit the western expansion of the game farming enterprises towards Colenso and Winterton, limiting options for farmers in these areas to enter the game farming industry.
- The Gongolo and Weenen private reserves may be limited in their expansion.
- The natural 'sense of place' would be diminished with the presence of a canal, pump stations, and powerlines.
- A road network and traffic associated with the canal may encourage poaching.
- A canal (especially canals located centrally on properties) may result in game farming becoming unviable as a result of lower stocking rates required for smaller properties.
- Canals and unsightly pump stations are likely to be unacceptable to hunters, resulting in lost market opportunities.
- The combination of less game availability and poor marketability of a farm with a canal may generate significant income losses.

6.2.3 The aqueducts - potential impacts arising from a pipeline

- Pipelines crossing river bottoms would detract from the 'sense of place' if exposed.
- Pump stations and associated powerlines are likely to detract from the natural 'sense of place'.
- Game farms with powerlines could lose their attractiveness as a destination and consequently create economic losses for the enterprise.

6.2.4 Farms likely to be impacted by the development

Person's Name:	***M Winter***
Establishments Name:	*Mtontwane Game Ranches*
Name of Facility:	*Thorton Bush Lodge*
Type of Facility:	*Bushcamp*
Name of Facility:	*Magubane Camp*
Type of Facility:	*Tented Camp & Camping*
Number of Ha:	*3 500*

The property forms part of AC block within the Thukela Biosphere Reserve and is ring fenced with Umsuluzi Game Park. The common boundary with Umsuluzi Game Park is not fenced and game is known to move freely between the two properties.

The property will be affected by the aqueduct and, to a lesser degree by the pipeline. The open canal would, however, effectively cut this game farm in two, thus drastically restricting the movement of game. It is possible that the canal route would pass very close to the one visitor facility thus necessitating the closure of the camp.

Game currently on the property:

Aardvark	Blesbuck	Blue Wildebeest	Bushbuck
Bushpig	Common Reedbuck	Giraffe	Grey Duiker
Impala	Nyala	Black-backed Jackal	Kudu
Leopard	Lynx	Oribi	Mountain Reedbuck
Ostrich	Red Hartebeest	Serval	Spotted Hyaena
Steenbok	Vaal Rhebok	Warthog	Zebra

Person's Name:	***M Meyer***
Establishments Name:	*Umsuluzi Game Park*
Type of Facility:	*Self Catering Cottages & Lodge*
Name of Facility:	*Bushwillow Camp*
Type of Facility:	*Tented Bushcamp*
Number of Ha:	*4 000*

The property forms part of AC block within the Thukela Biosphere Reserve and is ring fenced with Mtontwane Game Ranch. The common boundary with Mtontwane Game Ranch is not fenced and game is known to move freely between the two properties.

The property will be affected by the aqueduct, to a lesser degree by the pipeline than the open canal. The open canal would, however, effectively cut this game farm in two, drastically restricting the movement of game. It does seem apparent that the canal system would effectively pass right through the middle of one of the camps, thus resulting in the establishment having to be closed down.

Game currently on the property:

Aardwolf	Aardvark	Blesbuck	Blue Wildebeest
Bushbuck	Bushpig	Common Reedbuck	Crocodile
Eland	Giraffe	Grey Duiker	Impala
Nyala	Black-backed Jackal	Kudu	Leopard
Lynx	Oribi	Ostrich	Red Hartebeest
Serval	Spotted Hyaena	Steenbok	Mountain Reedbuck
Warthog	Waterbuck	Zebra	

Person's Name:	***B Mackey***
Establishments Name:	*Selbourne*
Name of Facility:	*Mkhamba Cottage*
Type of Facility:	*Self Catering Cottage*
Number of Ha:	*3 100*

The property is not entirely ring fenced as it forms part of the Gongola Game Reserve. Game

fencing exists on the northern boundary and the game on the property moves freely onto neighbouring farms within Gongola Game Reserve.

The property will be affected by the Mielietuin Dam. The dam would substantially reduce the overall size of the property. The movement of game will most definitely be restricted to the one side of the dam.

Game currently on the property:

Aardvark	Baboon	Blesbuck	Bushbuck
Bushpig	Common Reedbuck	Grey Duiker	Impala
Nyala	Black-backed Jackal	Klipspringer	Kudu
Leopard	Lynx	Oribi	Mountain Reedbuck
Red Hartebeest	Serval	Spotted Hyaena	Steenbok
Vaal Rhebok	Vervet Monkey	Warthog	Zebra

Person's Name: ***W Erasmus***
Establishments Name: *Glen Ann*

The property is not game fenced. However, the farm is within the boundary of Gongola Game Reserve and, therefore, would not require a game fence. Game currently on the property moves freely over the whole of Gongola Game Reserve and to some extent onto Mr Dorfling's property.

The property will be affected by the Mielietuin Dam. The dam would substantially reduce the overall size of his property and could result in any future wildlife enterprises on this property being non-viable. The movement of game will most definitely be restricted to the one side of the dam.

Game currently on the property:

Aardvark	Bushbuck	Bushpig	Grey Duiker
Impala	Black-backed Jackal	Kudu	Leopard
Lynx	Red Hartebeest	Serval	Mountain Reedbuck
Spotted Hyaena	Steenbok	Vaal Rhebok	

Person's Name: ***B Schlanders***
Establishments Name: *Groote Mielie Tuin*

The property is game fenced on the tar road between Estcourt and Weenen, between Mr Dorfling and Weenen Game Reserve. Game can, however, move freely between Gongola Game Reserve and Mr B. Schlanders as no fence divides the properties.

The property will be affected by both the Mielietuin Dam and the section of the pipeline or canal that would need to pass over this property. The dam would substantially reduce the overall size of the property and could result in any future wildlife enterprises on this property being unviable. The movement of game will most definitely be restricted to the one side of the dam and then be further divided by any canal system.

Game currently on the property:

Aardvark	Bushbuck	Common Reedbuck	Grey Duiker
Impala	Nyala	Black-backed Jackal	Klipspringer
Kudu	Leopard	Lynx	Mountain Reedbuck
Oribi	Serval	Spotted Hyaena	Steenbok
Vaal Rhebok			

Person's Name: ***N Dorfling***
Establishments Name: *Unkonka Bushcamp*
Name of Facility: *Unkonka Bushcamp*
Type of Facility: *Bushcamp*
Number of Ha: *1 100*

The entire boundary of Mr N. Dorfling's farm is game fenced, bar the section butting onto the Gongola Game Reserve which allows the free flow of game between the two properties.

The property will be affected by both the Mielietuin Dam and a section of the pipeline or canal that may pass over his property. The dam would substantially reduce the overall size of his property and will result in the current wildlife enterprises on his property having to close down entirely. The movement of game will most definitely be restricted to the one side of the dam and then be further divided by any canal system.

Game currently on the property:

Aardvark	Baboon	Blesbuck	Bushbuck
Bushpig	Common Reedbuck	Grey Duiker	Impala
Nyala	Black-backed Jackal	Kudu	Leopard
Lynx	Red Hartebeest	Serval	Mountain Reedbuck
Spotted Hyaena	Springbok	Steenbok	Vaal Rhebok
Vervet Monkey	Warthog	Waterbuck	Zebra

Person's Name:	***H Bosse***
Establishments Name:	*Tugela Game Ranch*
Name of Facility:	*Tugela Game Ranch Bushcamp*
Type of Facility:	*Bushcamp*
Number of Ha:	*2 100*

The property will be affected by both the Jana Dam and the section of canal that would need to pass over his property. It seems that the pipeline would bypass this property. The dam would reduce the overall size of his property and could restrict the current wildlife enterprises on his property. The movement of game will most definitely be restricted to the one side of the dam and then be further divided by any canal system.

Game currently on the property:

Aardvark	Baboon	Blesbuck	Blue Wildebeest
Bushbuck	Bushpig	Common Reedbuck	Crocodile
Grey Duiker	Impala	Nyala	Black-backed Jackal
Kudu	Leopard	Lynx	Mountain Reedbuck
Red Hartebeest	Serval	Spotted Hyaena	Steenbok
Vervet Monkey	Warthog	Waterbuck	Zebra

Person's Name:	***Dr C Miller***
Establishments Name:	*Thukela Wildlife*
Name of Facility:	*Emoweni*
Type of Facility:	*Lodge*
Name of Facility:	*Brakfontein*
Type of Facility:	*Camp*
Number of Ha:	*2 833*

The property will be affected by both the Jana Dam and the section of canal or pipeline that would need to pass over this property. The dam would reduce the overall size of this property and may restrict the current wildlife enterprises on the property. The movement of game will most

definitely be restricted to the one side of the dam and then be further divided by any canal system.

Game currently on the property:

Aardwolf	Aardvark	Baboon	Blesbuck
Blue Wildebeest	Bushbuck	Bushpig	Common Reedbuck
Crocodile	Eland	Giraffe	Grey Duiker
Impala	Nyala	Black-backed Jackal	Kudu
Leopard	Lynx	Ostrich	Brown Hyaena
Mountain Reedbuck	Red Hartebeest	Serval	Spotted Hyaena
Vervet Monkey	Warthog	Waterbuck	Zebra

6.3 The quantification of impacts

Negative impacts that are assessed as being high in magnitude, confidence and significance are highlighted through grey shading (Table 6.1). These impacts could severely affect game farming enterprises in the study area, as well as regionally. They could have crucial socio-economic impacts on the regional population and would require substantial mitigation.

Table 6.1: Description and evaluation of impacts on resource utilisation

Impacts	Magnitude/ Intensity	Extent/ Scale	Duration	Sign	Certainty	Significance
Construction phase						
A loss of the African bushveld 'sense of place' and reduction in aesthetic value to hunters and tourists	moderate	regional	medium term	negative	definite	high
Wildlife will move away from the disturbed area	low	local	medium term	negative	definite	medium
Riverine vegetation as wildlife habitat will be destroyed	moderate	local	long term	negative	definite	medium
Vehicle traffic on transport corridors will result in disturbance and fatalities of wildlife	moderate	regional	medium term	negative	definite	low
High value hunting may not be possible in affected areas due to visual and noise pollution and businesses may be compromised by loss of hunting revenue	high	local	long term	negative	definite	medium

Impacts	Magnitude/ Intensity	Extent/ Scale	Duration	Sign	Certainty	Significance
The construction of the canal will be a barrier to wildlife movement and prevention of effective game production	high	regional	medium term	negative	definite	medium
Pipeline construction may create a temporary barrier to game movement	moderate	local	short term	negative	definite	medium
Lodges near the aqueduct may close down for the construction period, will reduce the viability of the game farm enterprises	high	local	long term	negative	definite	medium
The closure of hunting operations may result in long term loss of market share for farmers	very high	local	medium term	negative	probable	medium
Post-construction phase						
Impacts arising from the Jana and Mielietuin Dams						
Complete loss of highly productive riverine vegetation will reduce game productivity	moderate	local	long term	negative	definite	medium
Partial loss of valley thicket as wildlife habitat	moderate	local	indefinite	negative	definite	medium
Bushveld scenery will change to water surface in the basins providing an additional environment for hunters and tourists	moderate	local	indefinite	positive	definite	medium
Riverine vegetation will become re-established at the water line in the long term, re-establishing highly productive wildlife habitat	high	local	indefinite	positive	definite	medium
Waterfowl habitat and associated enterprises will be enhanced particularly at Mielietuin	high	local	indefinite	positive	definite	medium
Additional lodge sites will be available near the dams	high	local	indefinite	positive	definite	medium

Impacts	Magnitude/ Intensity	Extent/ Scale	Duration	Sign	Certainty	Significance
Increased habitat for hippos, especially at Mielietuin, would increase the attractiveness of the game farm industry	moderate	regional	indefinite	positive	probable	low
Exposed dam mudbanks would provide good grazing and promote game productivity	low	local	indefinite	positive	probable	low
Impacts arising from the aqueducts - a canal, pump station and powerlines						
The canal will be a barrier to wildlife movement and prevention of effective game production	moderate	regional	indefinite	negative	definite	medium
Elephants may destroy canal fences allowing other animals to fall into the canal and drown	high	regional	indefinite	negative	definite	medium
Westward expansion of the game farming area would be limited by the canal	high	regional	indefinite	negative	probable	medium
Colenso farmers options for linking to existing game farms to the east could be foreclosed as a result of the canal barrier	moderate	regional	indefinite	negative	probable	medium
Visual pollution would reduce the opportunities for hunting and game viewing enterprises	high	local	indefinite	negative	definite	medium
Poaching opportunities could be increased by easy access into the area	moderate	local	indefinite	negative	probable	medium
Game farm enterprises could become unviable if bisected by a canal	high	local	indefinite	negative	definite	medium
Game farmers could incur income loss with poor marketability and poor game production	high	local	indefinite	negative	definite	medium
Potential impacts arising from a pipeline						

Impacts	Magnitude/ Intensity	Extent/ Scale	Duration	Sign	Certainty	Significance
Visual pollution (pump stations and powerlines) would reduce the opportunities for hunting and game viewing enterprises	moderate	local	indefinite	negative	probable	medium

6.4 The mitigation of potential impacts

Table 6.2: Mitigation

Impact	Mitigation
The construction phase	
A loss of the African bushveld 'sense of place', and reduction in aesthetic value to hunters and tourists	• Limit the use of lights at night • Position the staff villages and workshops in locations with the least visual impact • Minimise noise production • Coordinate hunting and construction activities, e.g. avoid disruptive action in peak tourism periods
Wildlife movement away from disturbed area	• No mitigation possible
Riverine vegetation will be destroyed	• No mitigation possible
Vehicle traffic on transport corridors will result in disruption and fatalities in wildlife	• Training drivers • Set speed limits in the area • Institute traffic calming measures • Provide access to the Jana Dam from the north bank of the Thukela • Police the area to control unacceptable and illegal behaviour
High value hunting may not be possible in affected areas due to visual and noise pollution, and business may be compromised by loss of hunting revenue	• Minimise construction period • Compensation for opportunity costs • Business arrangement for supplying staff accommodation
The construction of a canal will be a barrier to wildlife movement and prevention of effective game production	• Use a pipeline • Electric fencing may be necessary to prevent elephant damage to canal infrastructure and game drownings • Affected farmers may require compensation for opportunity costs
Pipelines construction may create a temporary barrier to game movement	• Minimise the disturbance by keeping the pipeline construction area compact
Lodges near the aqueduct may close down during construction period, which will reduce the overall viability of the game farm enterprise	• Business arrangement for supplying staff accommodation to maintain occupancy rates, and compensate for opportunity cost of lost business
Loss of market share due to closed hunting enterprise	• Finance the costs of marketing to achieve previous business levels • Compensation for opportunity costs of lost business
Post-construction phase	
Riverine vegetation will be lost to game species in the dam basin	• Promote the rehabilitation of riverine habitat on dam banks
Partial loss of valley thicket as wildlife habitat	• No mitigation

Impact	Mitigation
Canal will be a barrier to wildlife movement	• Provide sections of pipeline to offer natural bridges for movement of game
Elephants may destroy fences along canal resulting in animals falling into canal and drowning	• Make canal fence resistant to big five game species with the use of cable and electric fencing
Westward expansion of game farming areas would be limited by the canal	• Use pipeline option • No mitigation for the canal
Colenso farmers options for linking with existing game farms development to the east would be foreclosed by the canal barrier	• Use pipeline option • No mitigation for the canal
Visual pollution by canal and pump stations would reduce opportunity for high value hunting and game viewing opportunities and enterprises	• Use pipeline option and landscaping with local plants • Camouflage pump stations with suitable painting and plant screens
Poaching opportunities would be increased through easy access by means of the access servitude	• Effective policing and management of access
Game farm enterprises could become unviable if bisected by canal	• Expropriate divided farms, offering divisions for purchase to neighbouring farms
Game farmers could incur income loss as a result poor marketability and poor game production	• Expropriate divided farms, offering divisions for purchase to neighbouring farms
Visual pollution resulting from pump stations, powerlines and access servitudes associated with pipeline would reduce opportunities for hunting and game viewing enterprises	• Financial compensation
Game farms could suffer economic loss as a result of decreased attractiveness and African bushveld experience as a result of pipeline and associated infrastructure	• Financial compensation

7 REFERENCES

Beukman, R., N. Rivers-Moore, M. Mander, M. de Wit, and R. Hassan. 1998. *Economic valuation of KwaZulu-Natal woodlands based on household use : An input-output (I-O) framework*. Council for Scientific and Industrial Research.

McGee, P. 1999. *Pers. comm.* Professional Hunters Association of South Africa.

REVIEW

Thukela Water Project Feasibility Study:
Natural Resource Utilisation Baseline Study

Review of Project Report

I found this report to be generally satisfactory. The terms of reference call for a study of a factual situation, and a study of a factual situation has been provided. The project team has thus complied with the terms of reference.

What is not particularly clear from the terms of reference, however, is whether the project team is required, or indeed even encouraged, to form and state a subjective opinion on the factual situation it has discovered from the perspective of the Thukela Water Project as a whole. To give an example. The project report indicates (page 12) that the value of plant resources in the Jana basin which will be lost if the basin is flooded will be around R1 million per annum. The significance of this negative impact is described as medium. However, mitigation of and compensation for this negative impact is relatively straightforward, and R1 million a year is a trifling sum in the context of the total Thukela Water Project. Therefore, *in perspective*, this impact seems insignificant, at least to this reviewer, and it would be useful if the project team were to say so.

In similar vein, some eight farms will suffer negative impacts if the Jana and Mielietuin dams are built. From the locality map provided in the report, however, it seems as if this would have very little effect on game farming in the region as a whole. Moreover, one must assume that at some time the market for game farming must reach a point of saturation. So the reader must conclude that this impact too is insignificant from the perspective of the Thukela Project overall. By contrast, it appears that the impact of a canal could be serious. Again, it would be preferable for the project team rather than the reader to draw these conclusions.

In saying this, I realise that I may be expecting the project team to go beyond its terms of reference. I also realise that this Baseline Study was undertaken at a relatively early stage in the complete Thukela study, and is not intended to meet the standards of an environmental impact assessment. However, if the project team does not express opinions about the significance, in context, of what it has investigated, who is to do so? In a planning exercise as large as the Thukela Water Project, eventually this task may well fall by default on the shoulders of some consultant, or some committee, without the same degree of local knowledge as the present project team. In short, valuable understanding may be lost if the consultants on even purely factual studies are not encouraged to express at least provisional opinions as to the significance of their findings within the broader context of the Thukela study overall.

I recommend that the project team be asked to add a short section along the lines indicated above to the report. This is the only change that I believe to be necessary.

I was asked when reviewing the report to answer ten specific questions. The questions and my responses to them are as follows.

1. Has the specialist concerned complied with the terms of reference (TOR) that were set for the study? *Yes.*

2. Do you believe that the report is balanced, impartial/unbiased and comprehensive enough, within the framework provided by the TOR, and that it will meet the purpose for which it was commissioned? *Yes.*

3. Does the report in your opinion contain sufficient information that may be used in the decision making process that marks the culmination of the TWP Feasibility Study? *Yes, if the change I have suggested above is made.*

4. In reading the report is there a logical train of thought throughout, clarity in setting out and explaining the assessment process that was followed, the results that were obtained and the conclusions drawn? *Yes.*

5. Have complex issues received adequate attention and appropriate treatment in the report? *Yes, if the change I have suggested above is made.*

6. Does the report adequately address the issues and alternatives that were formulated as the framework for the environmental feasibility assessment process? *Yes.*

7. Has the specialist used appropriate assessment methods and techniques and have these been adequately described in the report? *Yes.*

8. Are there any major deficiencies in terms of results obtained and conclusions drawn in the assessment. *No.*

9. Will these deficiencies, if any, affect the ability of the proponent to make an informed decision on proceeding to the next stage of the TWP? *Not applicable.*

10. If so, what remedial action would you recommend to correct the deficiencies and how must it be carried out? *Not applicable.*

Dr RI Mirrilees

INSTITUTE OF NATURAL RESOURCES

Association incorporated under Section 21 96/00355/08

Promoting the wise and sustainable use of natural resources
through the integration of conservation and development

28th April 2000

Ms J Mander
IEM Task Leader
Institute of Natural Resources
Scotsville

Dear Jenny

Thukela Water Project Feasibility Study : Review of the Natural Resource Utilisation Baseline Study

The reviewer's single concern was that the report did not comment on the implications of the potential impacts of changes to natural resource use patterns - to the overall feasibility of the Thukela Water Project. In my opinion this can only be assessed once all the impacts and associated costs/benefits of each component of the project are considered. The reviewer's recommendation that this should be addressed therefore falls outside the terms of reference of the specialist study.

Please contact me should you have any queries.

Yours sincerely

Myles Mander

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An Associate Institute of the University of Natal

THUKELA WATER PROJECT FEASIBILITY STUDY

ECO-CULTURAL TOURISM AND RECREATION BASELINE STUDY

Prepared by

M. MANDER, INSTITUTE OF NATURAL RESOURCES
FONDA LEWIS, INSTITUTE OF NATURAL RESOURCES
GRAEME ADDISON
INGRID WEIDENBRUCK, RMS COLLIERS

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

SUMMARY

The primary purpose of this study was to identify the impact of the proposed Thukela Water Project (TWP) on eco-cultural tourism and recreation. The study was primarily undertaken using:

- a survey of tourism operations in the study area
- a literature review of printed and electronic publications
- workshops with experts in the field of tourism

The workshops were used to interpret information and identify local, national and even global tourism trends. These trends were used to develop broad future scenarios for tourism in the region. Using these future scenarios, the potential impacts of the TWP on tourism operations and development in the Thukela Region were predicted. The scenarios are based on a number of fundamental assumptions including:

- growth rates in tourism
- regional trends in crime and health (e.g. HIV/AIDS)
- infrastructural development in the region
- continuation of current tourism policy

Trends indicate that the tourism industry is growing, with increases in numbers of both foreign and domestic tourists to the region. Current tourist activities in the region focus on wildlife and nature, adventure activities, and historical tours and activities.

Future scenarios for tourism include:

- growth in tourist numbers to the region
- growth in the ecotourism and historical sector in the region
- growth in the accommodation and catering enterprises and facilities
- growth in the arts and curio sectors
- continued development of a 'small town' atmosphere in many of the towns
- continued heritage restoration with the rehabilitation and development of battlefields and monuments

The tourism operators in the study area generally view the TWP as a positive influence on tourism development in the region. A number of positive impacts were identified:

- development of new tourism assets in the form of the Jana and Mielietuin Dams
- creation of opportunity for new tourist activities and enterprises associated with the dams, particularly in the ecotourism and adventure tourism sectors

- boost to local tourist industry resulting from increased demand with influx of construction personnel
- increased infrastructural development in the region could positively affect tourism

Negative impacts were also identified, particularly during the construction phase:

- visual and noise pollution arising from construction could also detract from the wilderness and bushveld experience that is an important tourism attraction to this region, resulting in a decrease in tourist demand in the region
- disturbance to the game farming and wildlife industry, which forms a cornerstone of the tourism economy, could reduce opportunities for ecotourism in the region
- flow disruptions in the river would negatively affect the whitewater and canoeing enterprises and activities in the Thukela and Bushman's Rivers, both in the vicinity of the dams as well as downstream
- flooding of the rivers would result in the loss of national and international level whitewater competition courses
- flooding of certain features and habitats such as the Thukela Canyon will change the local 'sense of place' and could affect future attraction of tourists to the area
- increased levels of use of existing infrastructure could reduce quality of local infrastructure and reduce quality of the tourism experience

Mitigations proposed include:

- economic compensation for decreased viability of tourism enterprises, particularly during construction phase
- protection of tourist sites of historical and archaeological value
- development of supplementary infrastructure, particularly roads, to reduce congestion and maintain road safety for tourists
- assist with marketing initiatives to regain market share lost during construction of the TWP
- Rehabilitation of all disturbed sites to restore wilderness aesthetics of the region

1 TERMS OF REFERENCE

The purpose of this Baseline Study is to determine the impact of the proposed Thukela Water Project (TWP) on eco-cultural tourism and recreation (Figure 1.1). The rationale for this study is that the TWP is located in an area characterised by a growing tourism industry based on both the historical wealth of the area and the numerous developing game farms and reserves, as well as enterprises based directly on the utilisation of the river, such as canoeing and whitewater rafting. This Baseline Study will have the following objectives:

1.1 Describe the tourism context by identifying market trends relevant to the TWP in both the local and international arena, destination selection criteria and the social, economic and political drivers of tourism.

1.2 Document the tourism asset base of the TWP area with special reference to :

- natural resources that provide opportunities for tourism and recreation
- cultural and historical resources that provide opportunities for tourism and recreation
- infrastructure in place that supports tourism and recreation
- key stakeholder groups associated with tourism and recreation
- active enterprises associated with tourism and recreation.

1.3 In order to assess the impact of the TWP this Baseline Study will develop and document four tourism scenarios, namely:

- the current situation
- future tourism without the TWP
- future tourism with the TWP
- the TWP during the construction phase.

1.4 Using the four scenarios, describe and evaluate the impacts and issues of concern of the proposed TWP on eco-cultural tourism and recreation. This assessment should assess impacts according to the criteria and terminology as indicated in Table 1.1.

1.5 Recommend mitigation measures to reduce the impact on tourism activities and also outline actions that can be taken to enhance the potential benefits for tourism.

1.6 Specific attention should be given to the identification of requirements for further investigation.

Table 1.1: Conventions for definitions and terminology used in the description, evaluation and assessment of environmental impacts

Category	Description or Definition
Type	A brief written statement, conveying what environmental aspect is impacted by a particular project activity or action, or policy or statutory provision.
Magnitude and Intensity	The severity of the impact
· very high	- Complete disruption of process; death of all affected organisms; total demographic disruption
· high	- Substantial process disruption, death of many affected organisms; substantial social disruption
· moderate	- Real, measurable impact, which does not alter process or demography
· low	- Small change, often only just measurable
· no effect	- No measurable or observable effect
· unknown	- Insufficient information available on which to base a judgement
Extent / Spatial Scales	The geographical extent or area over which the direct effects of the impact are discernable, i.e. the area within which natural systems or humans directly endure the effects of the impact.
· international	- Southern Africa
· national	- South Africa
· regional	- KwaZulu-Natal and the Thukela catchment, the UThukela Region
· local	- dam basin, conveyance servitude, river reach, specific site locality
Duration	The term or time period over which the impact is expressed, **not** the time until the impact is expressed. Where necessary the latter must be specified separately.
· short term	- up to 5 years (or construction phase only)
· medium term	- 5 to 15 years 9 (or early commissioning and operational phases)
· long term	- > 15 years (or operational life)
Sign	Denotes the perceived effect of the impact on the affected area
· positive (+)	beneficial impacts
· negative (-)	impacts which are deleterious
Certainty	A measure of how sure, in the professional judgement of the assessor, that the impact will occur or that mitigatory activity will be effective
· improbable	- low likelihood of the impact actually occurring
· probable	- distinct possibility that the impact may occur
· definite	- impact will occur regardless of prevention measures
Significance	An integration (i.e. opinion) of the type, magnitude, scale and duration of the impact. Judgements as to what constitutes a significant impact require consideration of both context and intensity. It is the assessor's best judgement of whether the impact is important or not within the broad context in which its direct effects are felt. (see Fuggle R.F. & Rabie M.A. 1992. *Environmental Management in South Africa*. Cape Town: Juta & Co. 823)
· high	- Could (or should) block the project/policy; totally irreversible (-ve impact) or provides substantial and sustained benefits (+ve impact)
· medium	- Impact requires detailed analysis and assessment, and often needs substantial mitigatory actions.
· low	- Impact is real but not sufficient to alter the approach used. Probably no mitigation action necessary.

Some Explanations and Definitions

1 Environmental impact - An environmental change caused by some human act. (DEA 1992. *The Integrated Environmental Procedure*. Vol 5).

2 Environmental impact - Degree of change in an environment resulting from the effect of an activity on the environment whether discernable or undesirable. Impacts may be the direct consequence of an organisation's activities or may be indirectly caused by them. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

3 Affected environment - Those parts of the socio-economic and bio-physical environment impacted on by the development. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

4 Environmental issue - A concern felt by one or more parties about some existing, potential or perceived environmental impact. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

5 Environment - means the surroundings within which humans exist and that are made up of:
- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part or combination of (i) and (ii) and the interrelationships among and between them;
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being. (National Environmental Management Act No 107 of 1998).

6 Significance - (See Fuggle R.F. & Rabie M.A. 1992. *Environmental Management in South Africa*. Cape Town: Juta & Co. 823. Also in, DEA 1992. *The Integrated Environmental Procedure*. Vol 4).

7 Significance - "The definition of significance with regard to environmental effects is a key issue in EIA. It may relate *inter alia* to scale of the development. To sensitivity of location and to the nature of adverse effects." (Glasson, J. Therival, R. and Chaduuick, A. 1995. *Introduction to Environmental Impact Assessments. Principles and Procedures, Process, Practise and Prospects*. London: UCL Press. 13).

8 Significance - "Once impacts have been predicted, there is a need to assess their relative significance. Criteria for significance include the magnitude and likelihood of the impact and its spatial and temporal extent, the likely degree of recovery of the affected environment, the value of the affected environment, the level of public concern, and political repercussions." (Glasson, J. Therival, R. and Chaduuick, A. 1995. *Introduction to Environmental Impact Assessments. Principles and Procedures, Process, Practise and Prospects*. London: UCL Press. 124).

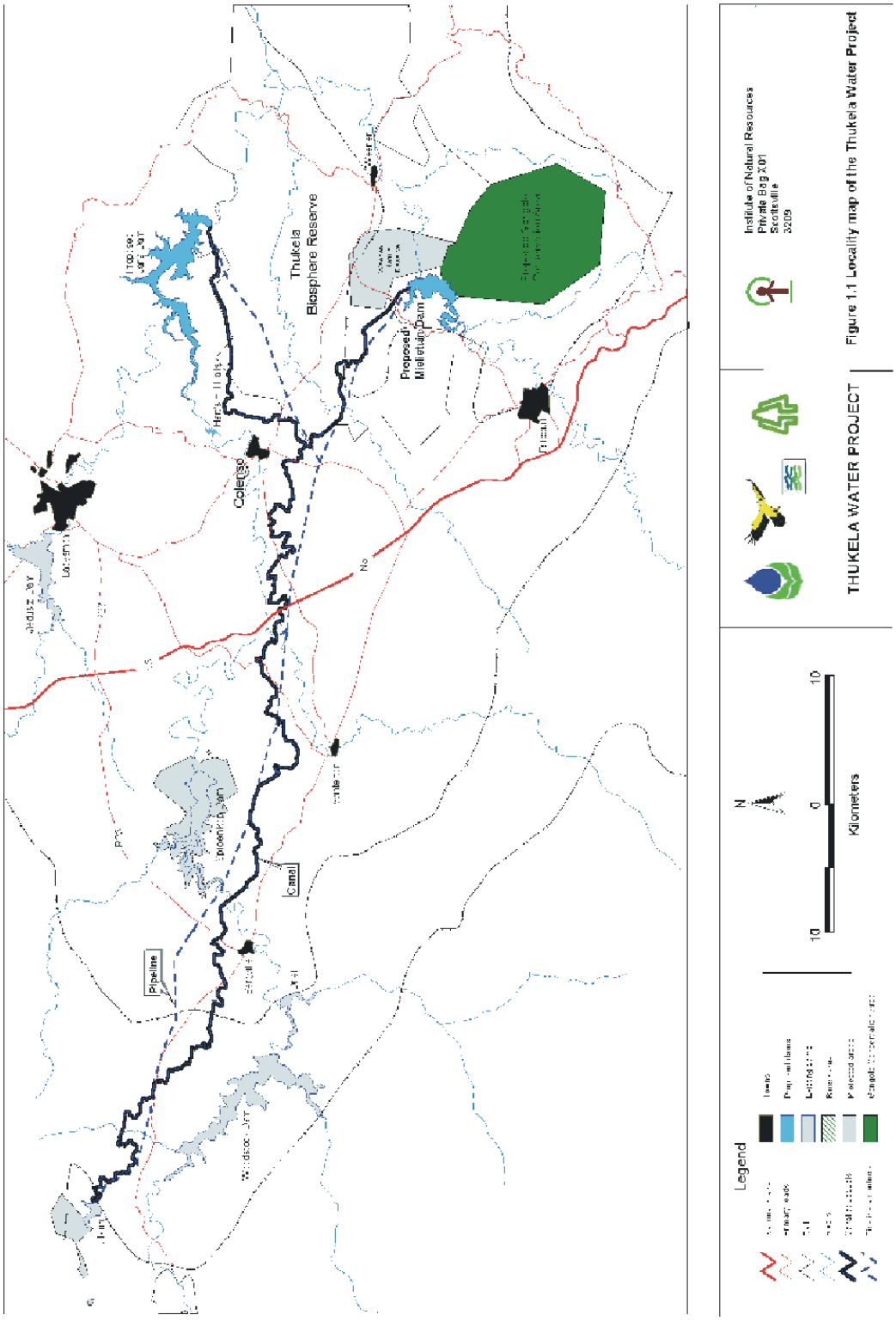
9 Significance -" The question of significance of anthropogenic perturbations in the natural environment constitutes the very heart of environmental impact assessment. From any perspective - technical, conceptual or philosophical - the focus of impact assessment at some point narrows down to a judgement whether the predicted impacts are significant." (Beanlands, G. 1983. *An ecological Framework for Environmental Impact Assessments in Canada*. Institute for Resource and Environmental studies. Dalhausie University. Sections 7: 43).

10 Environment - Surroundings in which an organisation operates, including air, water, natural resources, flora, fauna, humans and their interrelation. (ISO 14001. 1996). Note - Surroundings in this context extend from within an organisation to the global system.

11 Environmental aspect - Element of an organisation's activities, products or services that can interact with the environment. (ISO 14001. 1996). Note - A significant environmental aspect is an environmental aspect that has a or can have a significant environmental impact.

12 Environmental impact - Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services. (ISO 14001. 1996).

Figure 1.1: Locality map of the Thukela Water Project



2 METHODS USED

2.1 Methods

In order to assess the potential impacts of the TWP on tourism activities in the Thukela Region, it was necessary to develop a future scenario of tourism in the region onto which the influence will be exerted. The future scenario was developed to reflect the current trends of tourism, rather than to reflect optimistic growth or a low road scenario. In order to develop this scenario data from the most reliable and widely acknowledged information sources were used to develop an idea of the status quo and trends. These information sources included SATOUR, KwaZulu-Natal Tourism Authority, as well as a number of local tourism operators in the Thukela Region. This information was used to establish tourism trends that were then projected to develop a future scenario of tourism in the region.

A number of actions were undertaken in the course of this study:

- The study team undertook a field visit to orientate themselves to the study area, and to identify key issues. The field trip was concluded with a workshop to discuss key issues around which the study would be focussed, and to draw up an action plan.
- A questionnaire survey (Appendix 1) was conducted among local tourism authorities and tourism enterprises. The survey was conducted by interviews, and was used to gauge both scale and extent of tourism enterprises and activities in the area. The survey was also used to assess the attitudes towards the TWP and the tourism practitioners assessment of the impacts of the TWP on local tourism. This information was used to develop the future scenario for tourism, as well as to identify impacts and mitigations. Appendix 2 provides a list of all survey participants.
- A survey was undertaken to assess the tourism ambitions of the Mziyonke and Mankandane communities. This survey was undertaken using an open-ended focus group interview and provided information of community-held views of the future for tourism in the Mziyonke area, with and without the Jana Dam. This information was used to develop the future scenario for tourism, as well as to identify impacts and mitigations.
- A workshop, including the specialist study team members and a representative from the Regional Development Module, was held to develop current and future tourism scenarios, and to identify and discuss impacts and mitigations.
- A literature review of printed, as well as Internet references, was used to generate an understanding of global and national tourism trends. This information was vital for the generation of the future scenario of tourism in the study area.
- Scenario generation was key to predicting the future of tourism in the study area. Impacts of the TWP were then assessed on the basis of impacts on this future scenario.

2.2 Assumptions

A number of key assumptions have been made during this study, particularly in the scenario development for the future of tourism. The key assumptions upon which the study were based can be summarised as:

- The tourism scenarios are a simplification. However, they provide a platform from which to identify and evaluate impacts.
- Current tensions between national and provincial tourism authorities will continue.
- Continuation of current socio-political trends in South Africa, resulting in the continuation of current influences.
- Current national and international growth trends in tourism will be maintained.
- Current infrastructure in the study area remains the same, with no major additions or reduction in quantity or quality.
- Current globalisation trends will continue.

Based on these assumptions, a number of issues were identified as the key drivers of change in the tourism arena:

- Security influences on tourism, in terms of crime and health (HIV/AIDS) will remain constant.
- Trends in increased demand for multi-activities vacation packages will be maintained.
- Current trends in consumer preferences (social and economic) will remain dominant.
- Marketing patterns and trends will remain constant.
- Funding and investment in local tourism enterprises and assets will not increase or decline relative to current trends.
- Infrastructure changes, e.g. airports and road access will not be significantly altered.
- Tourism policy will follow current policy trends.
- Tourist asset base will not be dramatically altered.

2.3 Constraints

- The time and budgets allocated to the Baseline Study were restricted to the range and depth at which issues could be addressed. Considering that this Baseline Study forms part of a feasibility study and not an impact assessment, it provides appropriate mitigation for the depth and scope of the study.
- It was not possible to assess each location and enterprise, and as a result the application of the expertise base gained from previous experience in other areas had to be applied during this study. However, while the accuracy of the data may not be high, it has enabled the development of a general overview of the situation.
- Accuracy of future scenarios is unknown. However, they provide general instruments for making predictions for future resource use levels and patterns. It is also important that experts have been used where possible to generate the most plausible future scenarios,

upon which the predictions of impacts were based.

- Uncertainty and lack of information regarding certain key issues, for example location of construction villages, development of new infrastructure, height of dam wall, have reduced the ability to both assess impacts and develop future scenarios.
- The lack of information on tourism numbers and trends, particularly specific to the Thukela Region, have made the prediction of growth and trends in the tourism industry, as well as impacts and their mitigation, difficult. The report is based on information available at the time of writing - September 1999.

3 DESCRIPTION OF TOURISM ENVIRONMENT

3.1 International tourism trends

To place the discussion of tourism and the TWP in context, it is useful to look at the policies and underlying concepts that currently shape tourism in South Africa. Much has been said since the democratic elections of 1994 to suggest that tourism is South Africa's "new gold". Since the peaceful elections in 1994, South Africa's overseas visitor arrivals increased significantly, being ranked 26th in the world destinations in 1996. South Africa received 3.7 million mainland Africa visitors and 1.2 million overseas visitors during 1997. Between 1995 and 1997, the average annual growth rate for overseas visitors was 7% and this is expected to increase to 10% until 2001. Thereafter, it is expected to decrease to between 5 and 10% until 2010. Arrivals from mainland Africa are expected to show a growth rate of 7.5% until 2001 and then 3% until 2010. Tourism generates foreign exchange and creates jobs while other industries are cutting back. It is widely recognised that tourism potential is under-utilised in this country. The World Travel and Tourism Council estimated that tourism contributed R80.6 billion or 8.2% to South African GDP, which is lower than the 11.6% that tourism contributes to the world economy (World Tourism Organisation (WTO), 1998). Research Director of the SA Foundation, Professor Philip Black, says the figures demonstrate the catch-up potential for tourism growth in South Africa (WTO, 1998). This leads to the general belief that the tourism sector is still to experience growth.

Government tourism policy has recognised that visitor satisfaction is closely connected with the conservation of South Africa's social and physical diversity. On the one hand, government recognises that the asset base of the country, comprising its cultures, game parks, scenery and infrastructure of tourism services, must be conserved in order to be marketed. On the other hand, government policy is very specific about empowering the previously disadvantaged who need training and resources to enter tourism and so make the best of what the country has to offer. The 1996 *White Paper on Tourism* issued by the Department of Environmental Affairs and Tourism (DEAT, 1996) sets out the key objectives of policy at some length, which may be paraphrased as:

- Generating economic growth, specifically *job creation* and opportunities for *small entrepreneurs*
- Ensuring that the tourism industry is *sustainable* and, in particular, that it aids *rural communities*
- Making tourism a *national priority* and encouraging a *tourism investment* climate
- Encouraging tourism "*with dignity*", meaning both *responsible tourism* and *participation* in capacity-building programmes

- Developing *ecotourism* with a focus on *cultural tourism* as a means of creating national identity which is both dignified and marketable.

The White Paper (1996) highlighted the qualitative nature of supply and demand factors in tourism. The quality of visitor experience is a key element in the exchange that takes place between the service provider and the consumer. South Africa's major accommodation chains have paid too little attention to changes in tourist orientation, which are now reflected in ecotourism. The White Paper's strictures on the private sector were made in the light of the sluggishness of hotel groups to take up the challenge of cultural, historical, nature-based and adventure-based tourism. For lack of a better word, the term "ecotourism" has generally been used as a catch-all to describe this range of tourism products. Recently, the term "Afrikatourism"[1] has been proposed as an indigenous label for ecotourism. According to its proponents, Afrikatourism encompasses ecotourism in that it refers to a form of sustainable tourism with community participation and conservation as cornerstones. It goes beyond ecotourism in the sense that it embraces all that is African, not just the natural resources but also the social and cultural, thus engendering a sense of ownership and pride. From a branding point of view, Afrikatourism is sold as something unique to this continent that cannot be experienced anywhere else, unlike ecotourism which is marketed everywhere. The term could well be applied in KwaZulu-Natal.

The tourism market worldwide is growing more diversified by the day as the highly differentiated needs of tourists are increasingly catered for. Variety and choice are the watchwords, but so are intensity of experience in holidays of shorter duration. According to the WTO, the "trendiest" destinations for holiday makers at the start of the next millennium will be the remoter places, "The tops of the highest mountains, the depths of the oceans and the ends of the earth". The WTO makes a distinction between those who want traditional leisure-based holidays in hotels, casinos and Disneyland-style theme parks, and the others who seek activity or exposure to challengingly different experiences.

Conclusions of the WTO's study of the first two decades of the 21st Century, in a report titled *Tourism: 2020 Vision* (WTO, 1998), outlines five broad areas where tourist products are expected to emerge:

- *Adventure tourism*, in the form of organised treks to hitherto "untouched" areas
- *Cruises*, in vessels built to accommodate the 9 million and more travellers expected by the Year 2000

[1] Afrikatourism is a concept promoted by the Open Africa Foundation and the University of Pretoria's School of Tourism

- *Ecotourism*, trips containing a nature component that provide an economic incentive to conservation
- *Cultural tourism*, which is growing strongly in Europe and the Middle East and is beginning to attract the mass market to cultural sites; and
- *Themes*, trips to parks and other forms of special interest holiday such as golfing vacations.

While the number of people travelling internationally is expected to rise from around 612 million in 1997 to more than one billion by 2010 and 1.6 billion by 2020, the WTO predicts that "the amount of leisure time that people can spend travelling for pleasure will decrease". Travellers in the 21st Century will be "poor in time and rich in money", and as a result, will look for products that offer maximum thrills in minimum time (WTO, 1998). Short-break and weekend trips will be enjoyed more frequently, while the main vacation of the year is likely to get shorter for many people. For others, the need for release from increasing job pressures will create the desire for complete relaxation without decisions or taxing activities, a trend that bodes well for further growth of all-inclusive resorts according to (a WTO) study (WTO, 1998). Thus, the gap between pure leisure and recreation through raw experience will continue into the future.

A study of travel trends by the Travel Industry Association (TIA) of the United Sates of America (USA), completed in 1997, provides statistics on the travel tastes of Americans, and is used in this report as a general indicator of the travel habits of North American and Western European travellers[2]. Of particular interest in the study were findings that:

- Adventure travel is far higher than was thought, with half of USA adults, or 98 million people, having undertaken an adventure trip in the past five years.
- Sports and travel go together, with two out of five USA adults, that is 75.3 million (38%), having attended an organised sports event in the past five years.
- Cultural and historic tourism is one of the more popular sectors of the tourism industry, with more than a quarter of the USA adult population, or 53.6 million people, saying they visited a museum or historical site and 33 million, or one-sixth, having attended a cultural festival.
- National Parks in America attracted nearly 30 million USA adults, with a large share participating in outdoor activities, of which hiking and camping were the most popular.
- Festivals, garden tours, golf and tennis, kids' and seniors' programmes, religious and school tours, and "romantic" travel are important trends.

[2] Refer to web site: http://www.tia.org

- Weekend trips by Americans jumped by a dramatic 70% between 1986 and 1996 and now account for more than half of USA travel. By comparison, non-weekend travel increased by only 15% during the same period.
- Internet information and online travel booking have grown rapidly. In 1996 Internet users booked $276 million in travel online, while by 1997 the figure had tripled to $827 million. It was projected to top $9 billion by the year 2002[3].

The trends shown by these figures have a bearing on the future of KwaZulu-Natal and may be interpreted as follows.

- Worldwide, ecotourism (comprising nature, culture, and activities) is growing much faster than other forms of tourism. The pattern can be expected to repeat itself in KwaZulu-Natal amongst foreign visitors, while domestic travellers sharing relatively affluent socio-economic lifestyles will probably follow suit.
- Cultural, historical, and natural assets form the basis of this growth and need to be conserved. Elsewhere, it is pointed out that much tourism development has bypassed the Thukela Basin, which remains an underdeveloped area with enormous potential for future tourism growth.
- Special events and attractions that help to boost tourism, such as festivals and major sports events, are of great importance. The experience of KwaZulu-Natal with the Comrades Marathon, Midmar Mile and the Duzi Canoe Marathon are local cases in point. Events in the Thukela Basin are more low-key and could be marketed more effectively.
- Weekending and shorter breaks are a feature of American tourism, as they are worldwide. South Africa and other long-haul destinations may suffer adverse effects from this if more international travellers stay in their home countries and take shorter vacations closer to home. Domestically, however, the Thukela Basin is close enough to both Gauteng and Durban/Pietermaritzburg to be an attractive weekender destination.
- The Internet is a growing factor that could work to the advantage of smaller businesses in remote areas, provided that the telecommunications framework is upgraded to make contact possible. Telkom is working on fast optical communications around Africa and a network of low earth orbit satellites, due to be in operation in the first years of the 21st Century (Telkom, 1998).

The TIA figures indicate a surprisingly high involvement in adventure and outdoor activity tourism. There was a fivefold increase in the numbers of US adventure travellers in a decade from the mid-eighties, and a third of adventurers engaged in “hard” activities. Clearly, KwaZulu-Natal stands to gain from this trend amongst foreign visitors. Although the number of American visitors

[3] Refer to web site: http://www.tia.org/fastfacts8.stm

to Southern Africa is relatively small, they are often the standard-bearers for new forms of tourism, particularly adventure travel. Americans, for example, were the pioneers who virtually established the worldwide markets for rafting and mountain biking. If world trends are followed by domestic travellers in the same socio-economic range of lifestyles, a growth of adventure travel will occur here soon (the growing market in adventure tourism operators is a clear indication that SA is following US trends in this regard). Unfortunately, there is little information on the numbers on domestic adventure travellers in southern Africa. However, there are figures available for adventure tourism in the field of whitewater rafting and canoe tours. Figures from the Southern African Rivers Association (SARA) indicate that in 1998, some 250 000 client days were serviced by SARA Operators on rivers from the Cape to the Zambezi. In January 1999, the turnover of the industry from client fees was estimated at R50 million per annum (SARA, 1998a). This form of tourism has grown from nil in 1982 when the first commercial operator was launched (SARA, 1999b). Operators also supported a thriving equipment industry for river boats and accessories, including a company specialising in whitewater rescue and safety equipment, Xtreme Equipment, based at Weenen and employing eight seamstresses full time, and up to 12 at peak times (Nicol, *pers. comm.* 1999[4]). The commercial river tour operators also employed local people at river camps and lodges, including those at Zingela and Mfongosi. Comparisons between the TIA figures and those collected by the KwaZulu-Natal Tourism Authority in 1998 support the trends spotlighted by the WTO .

3.2 Types of tourists and tourism

In KwaZulu-Natal, current and future trends in tourism will reflect broader developments in tourism. Although the "industry" may be seen as comprising hard assets such as natural attractions and tourism infrastructure, there are many intangible factors to consider when making predictions about tourism. Competition between countries and regions is not solely based on what they have to offer in terms of scenery and accommodation. Increasingly, the value of culture, education and history, the thrill of sports and adventure, and the special fulfilment of travelling with people who share one's own religious or personal interests, are what prompts many people to become tourists. KwaZulu-Natal's traditional offering of beaches, mountains, game parks and pleasure resorts is undergoing change as new types of tourists enter the marketplace, with new attitudes and expectations.

Environmental changes brought by dams or other major projects will affect different groups of tourists differently. To simplify at the outset, it is argued that there are basically three types of tourist for which KwaZulu-Natal and South Africa as a whole need to prepare (Table 3.1).

- The *traditional tourist*, relatively well-off people of all ages, seeking pure leisure, personal

[4] Mr Wayne Nicol, Director Xtreme Equipment, Weenen.

comfort and entertainment or amenities, whether at urban casinos or game parks, and who are content to enjoy relaxation away-from-it-all. These tourists have disposable income and are middle to upper class, and they spend their money on fully catered holidays. They are concerned about aesthetics and tend to shun mass tourist traps.

- The *New Age tourist*, mainly affluent people between the age of 25-45, seeking self-realisation through original experience, whether this be by meeting new cultures, in the outdoors, or through relationships that give them a sense of affinity with like-minded others, and who actively pursue recreation. These tourists not only have disposable income but they tend to spend it on expensive toys like 4x4 vehicles and kayaks which allow them to undertake independent travel.
- The *emergent tourist*, coming from a lower socio-economic base and entering the market for the first time and who, in the first generation, seek fun and comfort in conventional holiday making ways but, in the second generation, will become more discerning. These tourists form the emergent "mass" tourism market, and are generally in the middle income class, although some are already relatively wealthy but lack tourism experience. They spend their money mainly on urban hotels and resorts, as well as entertainments.

Table 3.1: Main tourism trends of tourist types

	Responses		
Macro Trends	**Traditional Tourism**	**New Age Tourism**	**Emergent Tourism**
Overall tourism growth to continue worldwide	Hotels, casinos, cruises	Search for remoter destinations	Discovering traditional destinations for first time
Shorter breaks likely	Weekend hotels and guest houses	Getaway outdoors and some urban adventures	Low cost breaks, family and friends
More intensive holidays	Better value for money with more variety and amenities	Development of ever more challenging outdoor activities	Partying and having fun to make the best of it
Affinity groups	Religious travel, Rotary, golfing holidays, trout fishing	Gay, lesbian, alternative lifestyle or subcultures	Choir groups, students, business colleagues
Accommodation	Comfortable and fully catered	Roughing it and loving it	The best they can afford
Travel	Standard arrangements	Very independent, usually in own vehicle	Groups or families
Nature-based tourism	Game viewing and also hunting	Wilderness trails	Beaches
Cultural tourism	Museums and art	Ethnic crossovers and village experiences	Life is a multicultural experience

	Responses		
Macro Trends	**Traditional Tourism**	**New Age Tourism**	**Emergent Tourism**
Adventure tourism	Some hiking, fishing and other mild activities	The whole gamut of hiking, biking, flying, caving, diving, rafting	Theme parks, beachfront
Historical and educative tourism	A lot, including battlefield, birdwatching, antique collecting, etc.	More exotic pastimes such as archaeology and science trips	In school groups or on sponsored trips

There is some mixing of these types on certain kinds of holidays, specifically corporate team-building and conferencing, where the purpose is to bring people of different backgrounds together. Team-building challenges them as individuals while conferencing has organisational goals, but both afford the participants the chance to mix socially. The first two of the three types are apparently present amongst foreign visitors but not the third, except perhaps for a small group from Africa itself. This is only to be expected, as mass tourism focussing on urban entertainments is more a feature of domestic rather than international travel in any country. Thus, the conclusion that can be drawn is that foreign visitors to KwaZulu-Natal would either be seeking resorts for relaxation, or activity and cultural outlets for recreation/experiences.

An important social trend in South Africa will influence domestic tourism now and in the future. Black empowerment and rise of black elites and middle class will almost certainly change the character of traditional tourism and, in due course, have an impact on the interests and activities of more adventurous tourists. These tourists will be coming from a background in mass tourism and rising in socio-economic levels from middle to upper income categories. Another factor to consider is the impact of foreign black tourism on southern Africa, involving wealthy travellers from the USA and other Western nations, as well as from Africa itself. In the domestic market, government policy and corporate change are increasing the number of upper income blacks, with a resulting change in their lifestyles and their entering the tourism market.

There appears to be little research into black tourism *per se*, and this is a topic that needs to be pursued. However, some tentative conclusions may be drawn. Recognition of the black tourism market was accorded, for example, at a workshop run by Timeless Africa (the marketing initiative of five KwaZulu-Natal Regional Councils). A workshop in April 1999 outlined the initial results of its 1999/2000 marketing strategy workshop. It was suggested that in the “first generation”, affluent emergent black tourists would exhibit fairly traditional tastes - for holidays in hotels, at the beach and resorts offering the luxury of pure leisure. With the scrapping of apartheid, new elites of executives, government officials, traders, entertainment and media personalities has climbed the economic ladder. The level of personal wealth has steadily increased amongst the

black urban segment in the 1990s, and with it has come lifestyle changes for "buppies" (black upwardly mobile professionals). If the black professionals conform with other tourist patterns, visits to game farms and the prizing of natural and cultural heritage will also become characteristic. Their numbers are still small but growing and could form an important part of the future domestic tourist market. The "second generation", and subsequent generations of black tourists, are far more likely to embrace alternative forms of tourism, including some New Age activities, although many will remain set in the traditional mould mass tourism that has so far been concentrated on the beaches of KwaZulu-Natal rather than the hinterland.

3.3 Tourism trends in South Africa

3.3.1 International tourism trends

Since the 1950s, tourist activity has risen on average by 7.2% per annum. This is illustrated by the fact that there were 25 million visitors worldwide in 1950 and 476 million in 1994. Africa's share of this global market is, however, not very significant but it is managing to maintain its share of the world tourism arrivals market. It received 19.593 million tourists in 1996, which was 548 000 more than in 1995. This reflects a growth rate of 2.9%. The World Tourism Organisation expects tourism arrival figures for Africa to grow at a faster rate in the future, at 5.5% per annum to the year 2000 and thereafter at 4% per annum until 2010. Although the forecast for future travel is better than currently, the recession has significantly influenced travellers worldwide. Visitors are thus seeking a more value-for-money product. Several shorter holidays are also now more popular than a single prolonged stay. This growth trend in tourism is expected to continue in South Africa but at a somewhat slower rate. The World Tourism Organisation projects a sustainable growth rate of 5% from the turn of the century.

The two main attractions for foreign visitors to South Africa are the scenery and the wildlife (Figure 3.1). Most overseas visitors (59%), therefore, travel to a nature or wildlife reserve. A fairly high percentage (38%) of visitors enjoy visiting historical sites and a much smaller percentage (15%) of visitors participate in adventure based[5] activities. The annual growth rate for adventure travellers is small, being 1% between 1997 and 1998. Approximately 35% of the adventure visitors are young people and 30% stay for longer than a month. It is, therefore, possible that 168 000 overseas visitors came to South Africa in 1997 for adventure-related activities. This group is important because it has the potential to be targeted by all adventure-based destinations in South Africa, including the two TWP proposed dams: Jana and Mielietuin.

[5] Mr Wayne Nicol, Director Xtreme Equipment. Weenen.

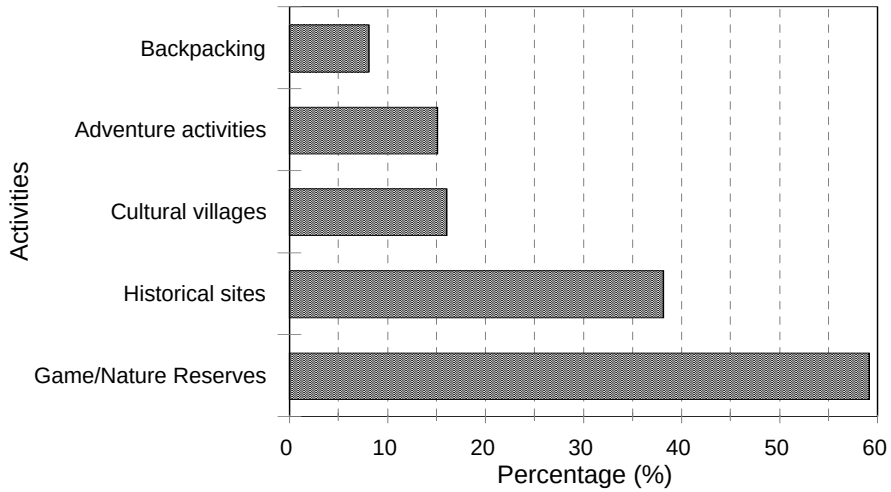


Figure 3.1: Main activities undertaken by foreign visitors

3.3.2 Domestic tourism trends

SATOUR's 1996 survey indicates that 63% of South Africans take at least one trip a year, resulting in 16 million visitors. Growth in this sector will most likely take place in tandem with the economy, which is expected to be between 2-3% until 2010.

KwaZulu-Natal is still the most popular leisure destination for domestic visitors in South Africa, followed by Gauteng and the Western Cape. The Western Cape has recently, however, been most successful in attracting the wealthy tourists. Whereas the beach used to be a popular holiday place for all the race groups, white visitors now prefer to visit a game or nature reserve in South Africa.

3.3.3 KwaZulu-Natal tourism trends

(i) Foreign tourism trends in KwaZulu-Natal

The KwaZulu-Natal Tourism Authority's 1998 survey revealed that an average of 497 532 overseas and mainland Africa visitors spend time in KwaZulu-Natal per annum. According to SATOUR, the average annual growth rate for KwaZulu-Natal between 1995 and 1997 was 8%. KwaZulu-Natal is the third most popular destination for foreign visitors, after the Western Cape and Gauteng, and it is visited mainly by holiday-makers in the winter months. The vast majority of foreign visitors go to Durban. Approximately 134 333 tourists visit the Drakensberg, 119 407 visit Pietermaritzburg/Midlands and 69 654 people tour the battlefields per annum. Attractions such as the Howick Falls are more popular in summer, but on average 9% go there per annum, which is equivalent to 44 777 visitors.

A large number (74 630 visitors in 1998) of foreign tourists are attracted to KwaZulu-Natal by the wildlife and scenery-related opportunities. On average, 10% of all foreign tourists visiting the province participate in water sports. Many more people are interested in undertaking certain activities but are currently unable to as a result of the lack of information and infrastructure. There is on average a 200% annual difference between those who actually participate in water sports and those who want to but don't. This amounts to an additional 99 506 visitors and illustrates the potential for water sports and, therefore, dams, if properly marketed and accessible.

(ii) Domestic tourists to KwaZulu-Natal

According to the SATOUR survey of 1996, KwaZulu-Natal receives 30% of all leisure trip visitors in the country. The 1998 survey undertaken by the KwaZulu-Natal Tourism Authority (KZNTA) of the domestic tourism market suggests that 5.81 million domestic tourists are visiting the province annually. The province attracts 56% more visitors in summer than in winter. More than half of the visitors come from within KwaZulu-Natal and they spend an average of 6 days on holiday. The most popular destination in KwaZulu-Natal is Durban and the beachfront is the key destination. The most important activities which domestic tourists engage in whilst in this province are water-related.

The Pietermaritzburg/Midlands Region receives on average 13.6% of the domestic tourists to the province per annum. Midmar Dam is the third most popular destination after the Durban beachfront and a township tour. According to the KZNTA 1998 survey, on average 5% of domestic tourists in KwaZulu-Natal visit Midmar Dam. The battlefields receive on average 10.3% of the domestic tourists to the province per annum (approximately 652 130 visitors). The Drakensberg receives on average 4% of domestic tourists annually (approximately 233 400 visitors). Other popular destinations and activities include visits to a nature reserve which attract 14% of the domestic tourist (Figure 3.2), hiking (12%) and taking part in water sports (7%). Most water-related activities occur in the summer months. On average, 29% of the people want to participate in water sports and are unable to. This represents a potential 1.23 million additional people (just over 300% more than actually do participate in water sports) and shows the vast potential for this category in terms of new and existing dams, if appropriately targeted.

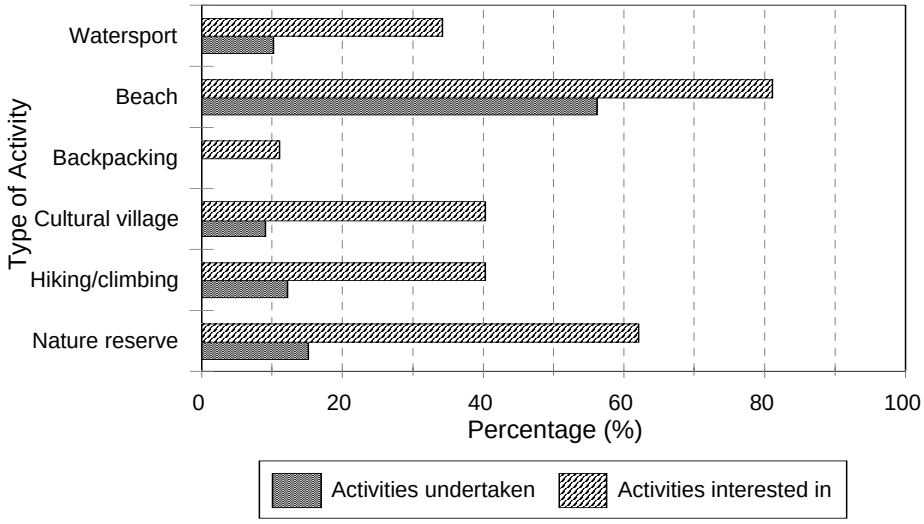


Figure 3.2: Activities undertaken by domestic tourists to KwaZulu-Natal

4 TOURISM IN THE THUKELA REGION AND ASSOCIATED WITH THE THUKELA RIVER - THE CURRENT SITUATION

4.1 Tourism trends in the Thukela Region

There is currently very little information on the nature and extent of the tourism market in the various regions in KwaZulu-Natal, for example, the Thukela Region. Consequently, a survey of local tourism activities was conducted for the purposes of this TWP Baseline Study. The survey reviewed the tourism organisations and accommodation establishments between Kilburn Dam, Colenso and Estcourt (Figure 4.1).

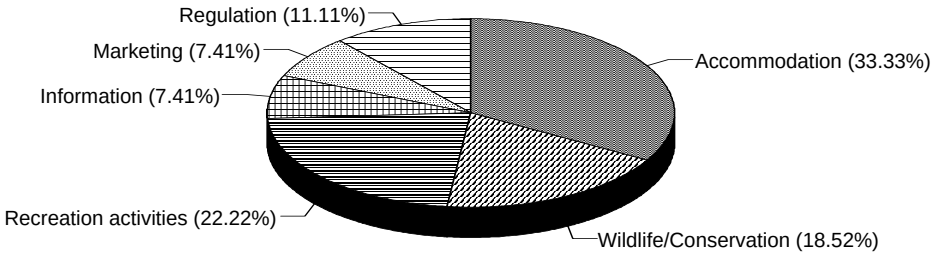


Figure 4.1: Nature of operations surveyed by this study

The Thukela Biosphere Reserve is considered one the main catalysts for new growth in the Thukela Region as it could be marketed as a "must see" attraction for KwaZulu-Natal. It is envisaged that this biosphere will eventually be linked to the Spioenkop Game Reserve, in order to create a 'Big Five' game reserve in this region. The Drakenberg is likely to be designated as a World Heritage Site and this has proved to be a major catalyst for tourism in other countries. The associated attractions in the area are; the Zulu and San culture, historical sites, hiking, pony trekking, game viewing, mountain climbing, mountain biking, paragliding, whitewater canoeing, fishing and birding. Other catalysts of growth in the Thukela Region could be a cableway and hotel planned for the Mnweni Valley in the northern Drakensberg. Together with the world-renowned Anglo-Boer battlefields, the Thukela Region, therefore, has vast potential for growth.

There were no statistics available on the number of tourists (foreign and domestic) who spend time or travel through the Thukela Region. However, statistics for the Drakensberg Region indicate that an average of 367 733 (134 333 foreign and 233 400 domestic) visitors visit the Drakensberg per annum. An average of 721 784 (69 654 foreign and 652 130 domestic) visitors

tour the battlefields in KwaZulu-Natal per annum. Of these, approximately 50% use the Estcourt/Colenso route, which is equivalent to 360 892 visitors per annum. Therefore, a possible total of 606 047 visitors travel through the Thukela Region per annum for the purpose of visiting the Drakensberg and battlefields alone. These tourists are, in addition, potential visitors to all accommodation establishments, tourist attractions and activities in the Thukela Region because visitors today are demanding a more diversified holiday experience, offering a multitude of activities.

Estcourt is the gateway to most of the tourism areas which lie in the north-western areas of KwaZulu-Natal, for example, the Anglo-Boer battlefields and the Drakensberg. The tourist office in Estcourt reported receiving 8 000 visitors per annum, and anticipate receiving 30 000 visitors per annum in five years time. This translates to a 375% increase over a five year period. Winterton and Bergville are relatively new tourist destinations in the Drakensberg Region. Visitors pass through Winterton and Bergville *en route* to the central and northern Drakensberg. The Winterton tourist office reports receiving approximately 1 700 visitors per annum and expect this number to increase to about 3 000 visitors per annum in five years time, which translates to a 76% increase over this period. As tourism in these areas is promoted, it is anticipated that hotels will increase their occupancy but there will be little growth in terms of new developments, unless a new unique attraction stimulates demand. Five years ago, there were 21 accommodation establishments in this region and today there are 22, with Alpine Heath added. The Spioenkop battlefield is one of the main attractions close to Bergville. It attracts, on average, 558 additional visitors every year. This is at an average annual growth rate of 14.8%. Based on the current trend it is, therefore, anticipated that the battlefield might receive 23 531 visitors by the year 2009.

One of the main attractions to the Weenen area is reported to be the Weenen Nature Reserve. Weenen Nature Reserve has experienced an average annual growth rate in visitor numbers of 20,8% since 1991/92. Statistics indicate that, particularly foreign tourists, are travelling in small, specialised tour groups, visiting a combination of Weenen Nature Reserve (with a number of big game species), the Battlefields and the Drakenberg. Many local people living in Weenen and the neighbouring towns, as well as tourists, support the local catering facilities, such as the Owl and Elephant restaurant. Five years ago approximately 2 600 people visited the restaurant, while current figures are reported as 5 000 visitors per annum.

Tourists to Colenso mainly visit the battlefields in the area, and are generally overnight or day visitors. A number of tourists also pass through Colenso *en route* to the Thukela River for whitewater rafting. It is reported that five years ago, 1 100 visitors came to the Zingela Safari and River Company camp per annum. Today this figure has risen to about 2 150. This translates to a 95% increase in visitors to the area over a five year period. This trend is predicted to continue,

particularly among foreign visitors, as more of them want to experience "wild" South Africa. Over the past five years, there have been three whitewater rafting operators on the Thukela River and trends indicate that this number could increase to about seven in five years time because of the increasing demand by tourists for this experience. A range of other people are attracted to the Thukela and Bushman's Rivers on an annual basis. People are attracted to the area to participate in annual events, such as the Tugela Canoe Marathon, primarily due to the rugged nature of the Thukela River and the resultant challenge in the race. Five years ago there were 60 canoeists in the race while in 1999 there were 180 competitors.

The local tourism industry is primarily based on the provision of accommodation facilities (Figure 4.2). Associated with the accommodation and catering services are a range of activities, the most popular of which are wildlife related activities. These include game viewing and hunting on private game farms and conservation areas. Adventure-related activities, primarily whitewater rafting, kayaking and canoeing are also popular activities in this area and form a cornerstone to the local tourism industry, particularly in the Weenen area. Historical tours are also important to the local tourism industry, with the focus mainly on the Colenso area.

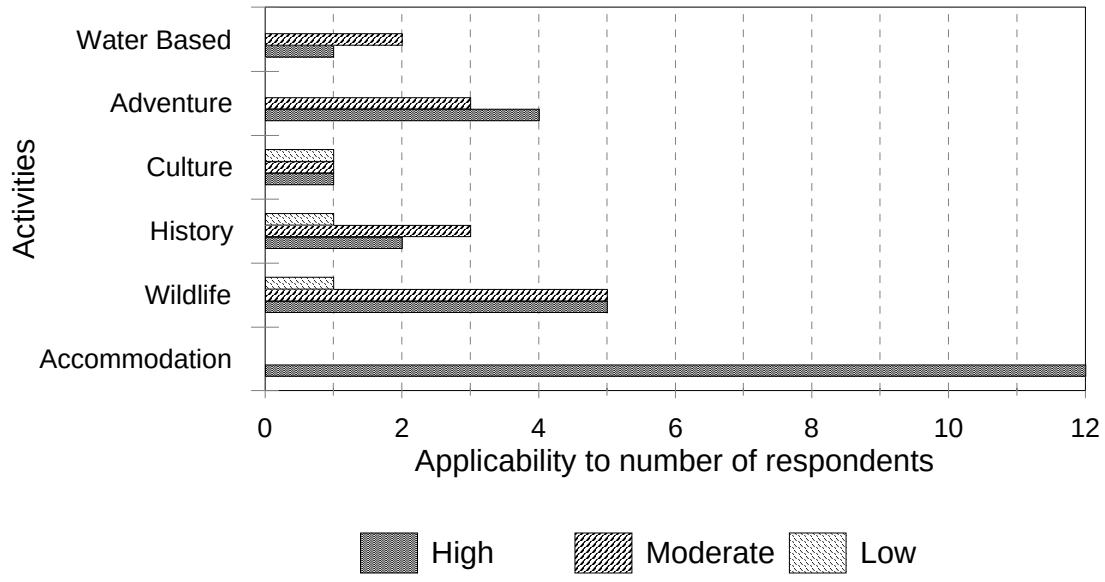


Figure 4.2: Primary tourism operation activities reported during survey

4.2 Water-based tourism associated with the Thukela River

4.2.1 Dam-based recreation

The KwaZulu-Natal Nature Conservation Services (KZNNCS) and Msinsi Holdings control most of the dams in KwaZulu-Natal. Table 3.2 illustrates an increasing interest by visitors to go to dams in KwaZulu-Natal (Scott Wilson, 1999).

The average annual growth rate is 15.2%, which means an additional 1 306 people per annum visit each dam in the province. Although Midmar Dam historically had high increases in visitor numbers, it has reached its peak and showed a minimal growth rate of 2% between 1994 and 1997. Midmar Dam is, however, still the most popular dam and this can be attributed to four key factors. Firstly, it is located close to Pietermaritzburg (20 minutes drive away), secondly, the N3 passes directly alongside the dam, thirdly, the surroundings currently offer a wide range of recreational activities and finally, there is a wide range of accommodation on offer at the dam.

Spioenkop Dam, close to the project area, has shown a steady increase in visitor numbers, with the average growth rate of 13%. This is very close to the average annual growth rate for all the dams (15%) and suggests that new dams in this area could also achieve the same rate, if not more, if properly managed and marketed. Wagendrift Dam shows a smaller growth rate. The difference in visitor numbers to the Spioenkop and Wagendrift Dams could be attributed to the nearby attractions and accommodation facilities available at the dams. Spioenkop has a self-catered bush camp, caravan and camping sites, picnicking facilities, a game reserve and a battlefield, whilst Wagendrift Dam only has camping facilities and dormitory style accommodation for 80 scholars.

The two dams are used largely for water skiing, picnicking, boating, yachting, windsurfing, jet skiing, canoeing, nature walks and fishing. Spioenkop is not particularly well suited for wind-based activities due to the erratic nature of the winds in the area. Fishing is relatively poor with only carp and barbel being targeted. Popular sport fish such as bass and trout are unable to flourish in the dam due to sediment which remains suspended and inhibits the survival of fish which feed by sight. Consequently, Spioenkop tends to used only for social fishing.

Spioenkop provides a service which combines water-based recreation and land-based recreation. For example, the bushcamps provide a range of wildlife/historical activities that are combined with the use of boats to get to the remote sites. There are also opportunities that cater for a wide range of visitor demands, allowing families greater flexibility/choice in their recreation activities. Throughout the year Spioenkop is visited for land-based experiences (wildlife, horse riding and history) while in the summer the dam is visited for both water sports and land-based

experiences. The diversity of opportunities at Spioenkop probably contributes to the relatively high growth rate in visitor numbers.

Visitor numbers to dams fluctuate for a number of reasons. Visits are highly dependent on good weather, especially day visitors. If it is overcast or raining, visitor numbers are likely to reflect a substantial decrease. Visits are also determined by the dam water height. If the water is too low, people will most likely stay away (Scott Wilson, 1999).

Table 4.1: Current and projected visitor numbers to dams in KwaZulu-Natal

Dam	Visitor numbers per year				Average growth rate (1994 - 1997)	Average annual change in visitor numbers	Projection of visitors in 2009
	1994	1995	1996	1997			
Midmar	131 118	161 154	157 329	132 167	0.02	661	140 097
Hazelmere	42 276	40 986	30 000	55 549	0.18	3 414	96 522
Spioenkop	23 634	29 628	30 743	33 873	0.13	1 479	51 622
Shongweni			27 048	32 766	0.21	2 309	60 473
Wagendrift	18 651	22 594	22 842	24 297	0.1	773	33 569
Inanda				13 535			
Nagle			5 352	6 195	0.16	325	10 098
Coleford	1 668	3 744	3 946	2 036	0.27	184	4 247
Jozini	No statistics						
Total	217 347	258 106	27 7323	300 418	(Avg) 0.15	(Avg) 1306	396 628

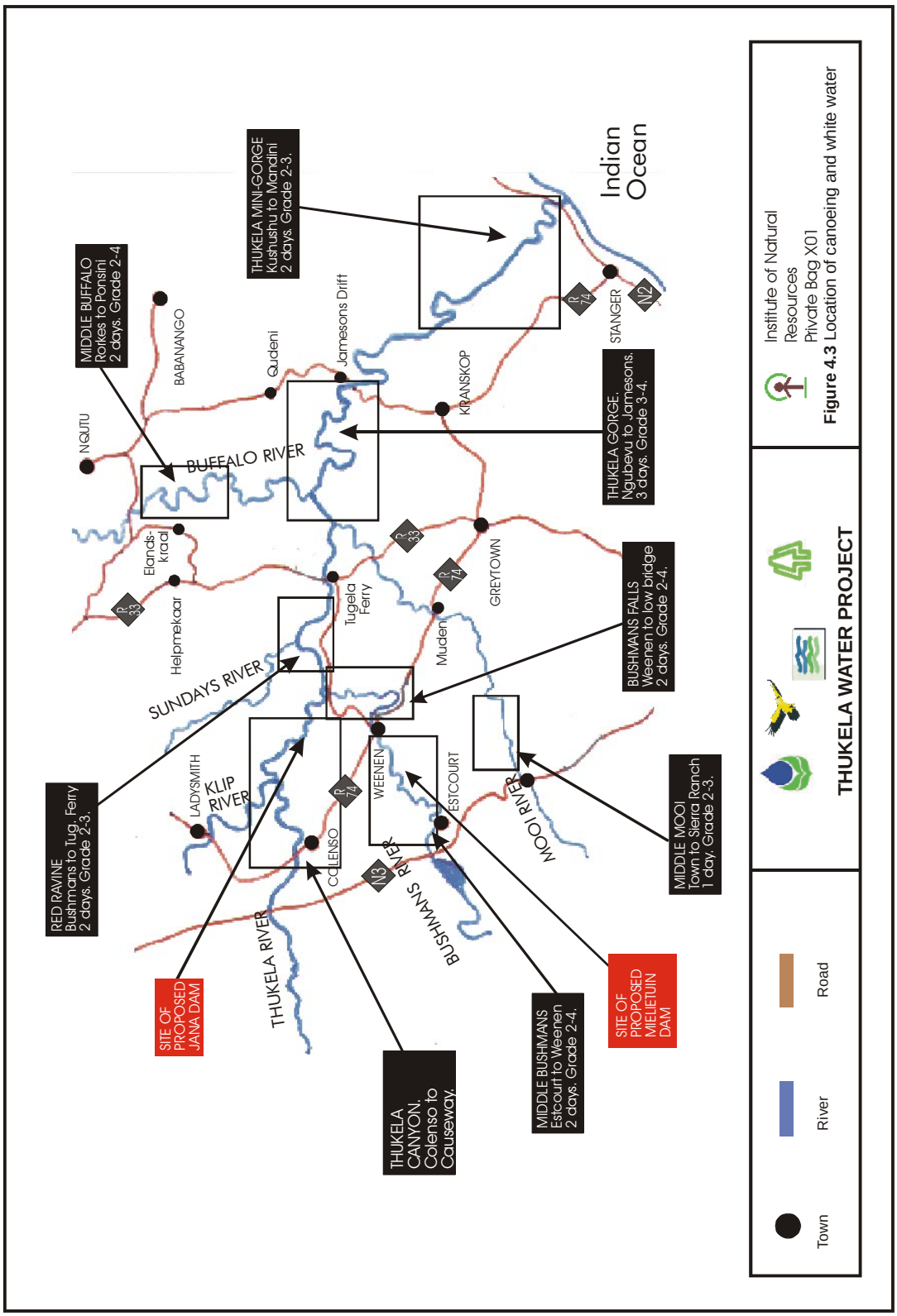
4.2.2 River-running in Thukela and linked rivers

Among the river users likely to be most directly affected by damming of the Thukela and Bushman's Rivers are the canoeists, kayakers, whitewater rafters and tubers (floating on inner tubes). They are collectively known as river-runners. Two river basins will be directly affected by the Thukela Water Project: the Thukela Basin itself, and the Vaal Basin. In the Thukela Basin, existing canoe races, training, commercial whitewater rafting and private tripping will be altered by damming. Water transfers are already taking place from the Sterkfontein/ Woodstock Dam system, and from the Lesotho Highlands Water Project. Along the rivers leading into the Vaal Dam and on the Vaal River itself, river-running and other water-related activities are on the increase and the trend is likely to be accentuated by the supply of more water.

Thukela Basin

KwaZulu-Natal is well known for its whitewater sport. The races and activities on the Thukela and Bushman's Rivers attract fewer participants than other rivers in the province, such as the Duzi Marathon on the Umsunduzi River. However, numerous river-running enterprises are active in a variety of locations on these rivers (Figure 4.3). Table 4.2 sets out the current estimated usage based on figures supplied by the relevant associations. Canoeing South Africa (CSA) represents amateurs, and the Southern African Rivers Association (SARA) represents professional river tour operators and river guides. Table 4.2 also includes an estimate of "private tripping" involving people who may not be members of the associations but go river-running all the same.

Figure 4.3: Location of canoeing and whitewater activities and enterprises in the Thukela Basin



The main localities and activities in the Thukela Basin are as follows:

Thukela River

- Thukela River - Upstream of Colenso (below Spioenkop Dam).
  A flat and relatively rocky stretch of river with good road access. River rafting activities:
  - Annual CSA race (September)
  - No commercial tour operators
  - Private kayaking and tubing

- Thukela Canyon - downstream of Colenso (to Causeway, below Weenen).
  This is a wild, waterfall-strewn stretch of the river, with road access at very few points. This section is known by river-runners as the "Thukela Canyon". It was on this stretch in 1999 that the South African Wildwater Rafting Championships were held to select the SA team for the World Championships later in the year. This section of the river would be flooded to the foot of the Colenso Falls. No canoe races occur on this stretch of the river. However, river rafting activities include:
  - CSA affiliated clubs such as the Johannesburg Canoe Club run annual down river kayaking trips in the Canyon.
  - Commercial river rafting by Zingela Safaris and Sunwa Ventures, both commercial tour operators.
  - River guide training by Xtreme Equipment and Wildwater Training, both SARA-affiliated training bodies.
  - Unknown number of private trippers, usually experienced kayakers rather than leisure groups.

- Red Ravine - downstream of Causeway (below Weenen to Tugela Ferry).
  This stretch of river is varied rapids and good scenery. Road access is good at the top and end, and possible at some points along the way. Unfortunately, thefts from vehicles and rock-throwing at rafting parties has stopped many of the trips that ran in the 1980s-early 1990s. The Blaaukranz and Bushman's Rivers are tributaries, increasing the Thukela's flow in this stretch. Activities along this stretch include:
  - Limited private rafting, but this is affected by crime in the area.

- Thukela Gorge - downstream of Tugela Ferry (Tugela Ferry to Jameson's Drift).
  This stretch of the Thukela is scenic with a number of rapids. At Mfongosi there is a large commercial river rafting camp run by River Tours & Safaris. Several tour operators have used the Gorge since the 1980s. Its setting in rural KwaZulu-Natal and its inaccessibility make it very special and suitable for global marketing as an African wildwater experience. Activities in the area include:

- Commercial SARA rafting by River Tours & Safaris and occasionally by other operators.
- SARA training by Xtreme Equipment and Wildwater Training.
- Extensive private tripping by experienced rafters and kayakers.

- Thukela Mini-Gorge - downstream of Jameson's Drift (Jameson's Drift to estuary).
  This is a popular canoeing stretch, scenically attractive and accessible by road most of the way. The hot springs on an island in the middle of the Thukela at Kushushu are little-known but popular with visitors who know where to find them, and could become a cultural attraction if local people saw the potential. The paper mill at Mandini pollutes the air with smells and discharges effluent into the river above the estuary, spoiling the opportunity for canoeing below Mandini. Activities along this section include:
  - Annual CSA two-day marathon canoe race from Middeldrift to Mandini.
  - Tubing and "anything-that-floats" annual raft race held near the estuary, attracting a substantial crowd.

On the whole, the Thukela is an under-utilised river-running resource by world standards. Whitewater tourism is a major component of the world adventure travel sector. Similar basins in America, Europe and Australasia provide work for dozens of rafting operators. South Africa's isolation from the world tourist market, until recently, limited the development of this resource. Uncertainty surrounding the future of the Thukela watercourse, and crime, are probably inhibiting further whitewater tourism development and marketing.

Bushman's River

- Bushman's River - Around Estcourt (Wagendrift Dam to Weenen).
  This is a very accessible and well-known stretch of the Bushman's River. A steady but small outflow from Wagendrift Dam provides just enough water for canoe races, training, slalom, kayaking and public whitewater recreation. Slalom is an Olympic sport. The route through the little gorge through Weenen Nature Reserve is popular with paddlers, and several annual recreational trips take place here. Activities include:
  - Annual CSA race (October) from Wagendrift to Estcourt
  - Annual CSA race (New Year) from Estcourt to above Weenen Nature Reserve
  - South Africa's only permanent slalom kayaking course is on the Bushman's River at Estcourt and is maintained by CSA.
  - Regular SARA river training courses are held in the Bushman's Gorge between Weenen Nature Reserve and Weenen
  - A lot of whitewater kayak training and public tripping takes place on the stretch below Estcourt.

- Below Weenen (Weenen to Thukela confluence).
  This is a scenic stretch encompassing the Bushman's Falls. A remote, private caravan park/campsite at Darkest Africa is popular with recreational rafters and kayakers, and is used as a SARA training camp several times a year. Activities include:
  - SARA itself runs training for river guides at Darkest Africa
  - Some private tripping by experienced rafters and kayakers.

Overall, the comments made about the unrealised potential of the Thukela River Basin apply to the Bushman's River as well, as it is close to main roads and national highways. Usage has steadily increased over the years as river-running has grown more popular. Commercial rafting has been inhibited by the relatively low flow of the river at most times, for while the rapids are good after rains, the Wagendrift Dam releases provide too little water for exciting recreation.

Table 4.2: Canoeing, kayaking and rafting on Thukela and Bushman's Rivers

Organisation	National Members	KwaZulu-Natal	Activities in Thukela Basin	No. of particip.	Days	Person /days*
Canoeing South Africa amateur*	3500 individuals	2200 individuals	· Upper Thukela, to Colenso	200	1	200
			· Thukela Marathon, from Middledrift.	100	2	200
			· Bushman's race, Wagendrift-Estcourt.	300	1	300
			· Bushman's whitewater, Estcourt-above Weenen	100	1	100
			· Slalom practice and champs, 6mths, Estcourt.	10	48	480
			· Clinics and local training, 6mths, Estcourt	75	48	3600
Subtotal : Amateurs				785		4880
Southern African Rivers Association professional*	52 tour operators 200 river guides 5 corporates	7 tour operators 20 river guides 1 corporate	· Zingela Safaris, Canyon, 5 months x weeknds	30	40	1200
			· Sunwa Ventures, Canyon, 3 months x various	15	12	180
			· River Tours & Safaris, Gorge, 5 mths x 3 days	40	60	2400
			· Xtreme Equipment various training	20	10	200
			· Whitewater Training, Gorge courses	20	4	80
			· SARA training on Bushman's	45	5	225
Subtotal : Professionals				170		4285
Private groups	No estimate of total	Private trippers p.a.	· Pmburg canoeists, Estcourt-Weenen	40	2	80
			· Other known annual trips	70	3	210
			· General kayaking and rafting by private trippers	200	2	400
			· Lower Tugela tubing and social rafting (est)	250	1	250
Subtotal : Private				460		940
Total number of person/days on affected rivers				2075		10105

* A person/day is 1 person for one day on the river. A two-day race for one individual is thus 2 person-days. A five-day training course for 20 individuals is 100 person-days.

The figures indicate that there is steady usage during the summer by river-runners of the channels to be affected by damming. A steady increase in these numbers has been noted over the years, particularly with the rise of commercial rafting and training since the SA Rivers Association was founded in 1989. The trend looks set to continue.

Vaal Basin - a linked location to the Thukela by water transfer

The Vaal River and its environs are popular water sport assets for the people of Gauteng and the Free State. The Vaal area, comprising Vaal Dam, Loch Vaal above the Barrage, and the area around Parys and further downstream, has become a popular weekend resort for water sport enthusiasts (Table 4.3). Augmentation of the water supply from the various water transfer schemes has made the downstream flow of the river below Vaal Dam reasonably reliable. It seldom drops below $7m^3/s$ (cubic metres per second) and in summer it often reaches $15\text{-}30m^3/s$. When water is being sent downstream to Bloemhof Dam, the flow may increase to $100\text{-}300m^3/s$ for periods of a week or more. Water quality is maintained at a reasonable-to-good standard by Rand Water and this, together with the reliable flow, creates ideal conditions for water-based tourism and adventure activities. Further augmentation of this water system is unlikely to be noticed by water-based activity users but it will reinforce existing trends.

The main localities and activities are as follows:

- Vaal River - above and below the Vaal Dam (from Grootdraai Dam to Parys).
  There are a few rapids below the Vaal Dam. Road access is only possible at bridges. Activities along this stretch of river include:
  - CSA races including the annual 2-day Vaal River Marathon, a single 1-day below Grootdraai, Vaal Dam race, and 5 other races below Vaal Dam wall.
  - SARA river guide training occasionally
  - A range of public canoeing, kayaking, rafting and tubing

- Vaal below Parys (Parys to Bloemhof Dam).
  A scenic stretch of river with access, without difficulty, from bridges and campsites. There are rapids and long sections of open water flanked by trees and reeds, with little urban development. It is popular with river-runners. The river later passes by unattractive mining areas, and recreation declines. Activities:
  - CSA races with one time-trial below Parys
  - Major SARA companies operating here are Sunwa, Hadeda, Dimalachite, Zambezi Spectacular. The first three have permanent lodge camps on the banks.
  - River training by SARA operator, Wildwater Training, and by others
  - A range of public canoeing, kayaking, rafting and tubing

Overall, the Vaal River is well used by river-runners but there is more capacity for trips and races. Vaal numbers overall are higher than for the Thukela Basin, mainly due to the high turnover of commercial river tour operators who work most of the year. Table 4.3 provides an outline of whitewater canoeing, kayaking and rafting on the Vaal river around Parys in order to make a comparison with the activities described for KwaZulu-Natal.

Table 4.3: Canoeing, kayaking and rafting on Vaal River Basin

Organisation	National Members	Gauteng/ Free State Members	Activities in Vaal Basin	No. of particip.	Days	Person /days*
Canoeing South Africa amateur*	3500 individuals	800 individuals	· Vaal River Marathon · Other canoe races · Various development events & training	400 150 50	2 6 4	800 900 200
Subtotal : Amateurs				700		1900
Southern African Rivers Association professional*	52 tour operators 200 river guides 5 corporates	5-8 tour operators 35 river guides 2 corporate	· Hadeda Creek rafting, virtually all year many days · Sunwa Ventures, 6-7 months many days · Dimalachite, 5 months weekends · Other Vaal operators · Whitewater Training courses, 5 months (figures show average number in camp or on course)	20 20 10 10 15	300 200 100 100 40	6000 4000 1000 1000 600
Subtotal : Professionals				75		12600
Private groups	No estimate of total	Private trippers p.a.	· Private river courses · General canoeing, kayaking, rafting (estimated)	15 1000	30 2	450 2000
Subtotal : Private				1015		2450
Total number of person/days on affected rivers						17650

* A person/day is 1 person for one day on the river. A two-day race for one individual is thus 2 person-days. A five-day training course for 20 individuals is 100 person-days.

New linked rivers

A recent development associated with water transfers is that minor riverbeds have become major water-carriers. The water flow in these rivers resulting from the water transfer offers the opportunity for expanded river-running activities in the Free State above Vaal Dam. These rivers include the Nuwejaars River, into which water transfer is made from the Sterkfontein Dam (and ultimately the Thukela River), and the Ash River/Liebenbergsvlei River, into which water is being transferred from the Katse Dam (part of the Lesotho Highlands Water Project).

In other parts of the world, successful income-generating "artificial rivers" have become the site of Olympic slalom events, international team training, local whitewater rafting operations, and "river rodeo" which is a spectacular TV-sport. Such sites have been established at Augsburg in Germany, Nottingham in England, Penrith in Australia, and Ocoee in Tennessee. During the northern hemisphere winter, international teams could be expected to come to southern hemisphere training facilities. These types of facilities could, for example, be developed on the Wilge River should the TWP be developed. A related point to note, however, is that the heavy

instream flow in the old, smaller riverbeds is causing banks to collapse and leading to bad siltation of the water. Trees are falling into the river, making for extremely dangerous paddling. Stabilisation of the riverbeds would have the dual effect of limiting siltation and making water sport and associated tourism activities safer.

4.3 Tourism assets of the Thukela Region

The tourism industry in the TWP study area is based on a range of assets which support a diverse range of activities and enterprises. These activities and enterprises are based on the natural environment, as well as cultural and historical assets in the region. In addition, a range of infrastructural assets, together with associated services, support the local tourism industry.

4.3.1 Natural assets

Natural assets are:

- Rivers and valleys of both the Thukela and Bushman's Rivers
- Drakensberg Mountains
- Wildlife resources (four of the 'Big Five'), both on private land and provincial conservation land
- Canyons along river valleys
- Mild climate throughout the year
- Large tracts of natural, relatively undisturbed landscapes

4.3.2 Cultural assets

Cultural assets in the area are:

- Indigenous Zulu culture of the region
- "Natal Midlands" farming culture
- Arts and crafts industry which has developed
- Small town culture of local towns such as Colenso, Winterton and Bergville

4.3.3 Historical assets

Historical assets of the region reflect the history of most of the cultures of the area, including Anglo, Zulu and Boer. These assets are of interest to both domestic and international tourists. Historical assets in the Thukela Region are:

- Battlefields and memorials from the Anglo-Boer South African War, Anglo-Zulu War and Boer-Zulu conflicts
- Voortrekker monuments
- Bushman paintings in the Drakensberg
- Archaeological sites, particularly iron age sites

4.3.4 Infrastructure

The infrastructural development in the Thukela Region is an important asset for the functioning of the tourism industry. Existing infrastructure that is important for the local tourism industry includes:

- Dams and impoundments of existing water schemes
- Hydro-electric scheme
- Roads, rail and airfield networks
- Communication networks
- Hospitality industry including a range of accommodation and catering facilities

4.3.5 Hospitality services

A range of tourism services in the Thukela Region are supported by the above asset base.

(i) Accommodation

- Bed and breakfast facilities
- Hotels
- Game lodges and bush camps
- Camping and caravanning facilities
- Self-catering resorts

(ii) Catering

- Restaurants and bars in towns
- Shops and supermarkets
- Catering facilities at private accommodation facilities

(iii) Activities

- Adventure activities including rafting, canoeing, kayaking, tubing, abseiling and hiking
- Cultural tours
- Historical tours
- Nature tours
- Hunting and fishing
- Game and bird viewing
- Educational activities including conferences, team-building and school groups
- Annual spectacles such as festivals and canoe events
- Water sports including skiing, sailing and boating

The assets upon which tourism activities and enterprises in the study area are currently primary based were most frequently reported to be based on wildlife and scenery, historical assets such as the battlefields, and cultural assets such as local Zulu culture (Figure 4.4).

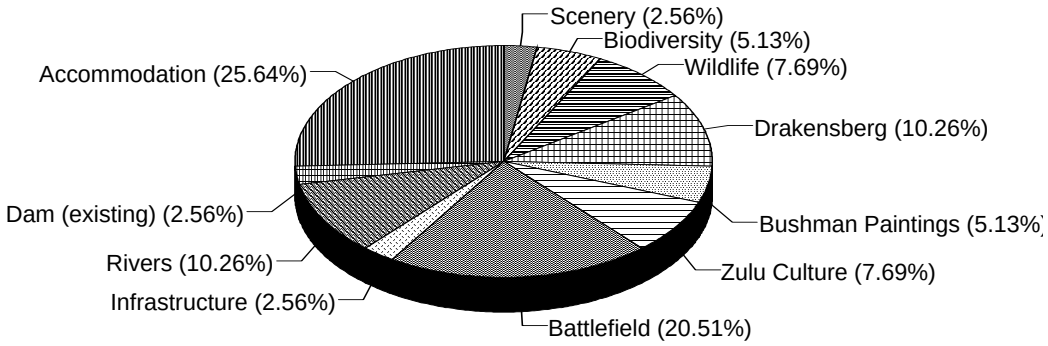


Figure 4.4: Tourism assets identified by tourism operators in the Thukela Region

5 A FUTURE SCENARIO FOR TOURISM IN THE THUKELA REGION - WITHOUT THE TWP DEVELOPMENT

Based on the current tourism activities and trends, a likely future scenario for tourism in the region has been developed for 5 to 10 years time.

5.1 Changes to the local tourism asset base in a five to ten year time horizon

Future developments in the tourism industry in the study area will both cause and be brought about by changes to the asset base. A number of changes have been anticipated:

5.1.1 Natural assets

- Rivers
  - Rivers and valleys will contain less water as a result of increasing water demand by local populations
  - Water quality of rivers could decline as a result of increased population and industrial growth
- Wildlife assets
  - There will be a 45% increase in wildlife and game farms in the next five years. Private game farm areas could, therefore, increase from the current area of 89 000ha to 170 000ha in the next 10 years
- Vegetation
  - There will be less indigenous woody vegetation resources in tribal areas as a result of continued unsustainable harvesting, if current trends are maintained
  - The increase in the local game farming industry could result in the conservation of extensive tracts of indigenous vegetation, with a reduction in the conversion of indigenous vegetation to commercial farming lands
- Climate
  - There could be a gradual increase in temperatures if trends in global warming persist
- Wilderness area
  - Protected areas will maintain their attractiveness
  - On commercial farms there will be limited increase in human pressures and man-made influences
- World Heritage Status for the Drakensberg
  - The Maloti-Drakensberg Transfrontier Park may be a proclaimed World Heritage Site
  - The current numbers of people visiting the Thukela Region (606 047 per annum) would be expected to increase at a rate of 20% per annum if this occurs. This

could mean that 1.2 million people per annum would be visiting the area in five years time.

5.1.2 Cultural assets

- Indigenous Zulu culture
  - There could be an increase in the trend towards the restoration of Zulu culture tourism activities
- "Natal Midlands" farming culture
  - There will be a decline in the current 'Midlands' farming culture as a result of ongoing conversion of current farming activities to more economically viable activities, such as game farming
- Arts and crafts
  - There will be increasing commercialisation of these activities resulting from growing demand
- Small town culture
  - There will be an increase in small town culture as a result of increasing tourist demand
  - Revitalising of small towns such as Colenso, Winterton and Weenen

5.1.3 Historical assets

- Battlefields and memorials
  - There will be a steadily increasing demand for this aspect of tourism, but the asset base will not change
- Bushman paintings
  - Continued growth in demand for this form of tourism
  - The rock art paintings will decline in time
- Archaeological sites
  - The increasing demand for historical tourism will likely result in an increased demand for access to archaeological sites

5.1.4 Infrastructure

- Hydro-electric scheme (Drakensberg Pumped Storage Scheme)
  - There is unlikely to be any increase in this type of infrastructure
- Roads, rail and airfields
  - Major roads will probably be upgraded
  - The De Beers pass toll road is likely to be constructed
  - There will probably be a decrease in the quality of secondary roads

- Communication network
  - There will be an increase in communication infrastructure including cellular and microwave networks

5.2 Future scenario for tourism services

Changes to tourism assets, as well as global and local tourism trends will result in the transformation of local tourism services. The probable proclamation of the Drakensberg as a World Heritage Site will have a significant impact on tourism growth in the region. Changes in the next five to ten years at local level may include:

Accommodation

- Bed and breakfast (B&Bs)
  - The number of B&Bs may double. Increase in numbers could mirror growth in tourism industry
- Hotels
  - No new hotels are likely be developed close to the project area but occupancy of existing hotels will increase
  - In the Winterton area, only one new hotel has been developed in the last five years
  - Additional hotels in the Drakensberg may be developed
- Game lodges
  - Based on current growth trends, in the next five and ten years the number of game lodges in the region could increase to 64 and 96 respectively
- Camping and caravanning
  - No new sites are likely to be developed but occupancy of existing sites will increase
- Self-catering resorts
  - Backpacker lodge sector will be developed

Catering

- Restaurants and bars
  - These facilities will increase with the projected increase in the number of conferences and team-building events in the area
  - There will be an increase in the number of coffee shops, in line with the increase in the demand for a small town culture

Activities

- Adventure tourism activities
  - The increase in demand for whitewater rafting on the Thukela River is resulting in a growth rate of 19% per annum for the industry in the area. In ten years time,

6 235 people could be engaging in this activity on the Thukela River.

- Cultural activities
  - There will be growth of indigenous cultural tours
  - Growth in this sector will also be self-driven with the discovery of new opportunities
  - Currently, 909 567 foreign and local tourists visit the Pietermaritzburg/Natal Midlands area per annum. SATOUR predicts a 4% annual growth rate in tourism in KwaZulu-Natal. Based on this trend, 1 273 393 people could be visiting the area in 10 years time, with an interest in cultural activities. This may spill over into the project area.
- Historical activities
  - There will be a gradual increase after the well-publicised battlefield centenary promotion of 1999
  - It is estimated that 721 784 people currently visit battlefields and memorial sites in the region per annum. Based on the predicted tourism growth rate of 4% per annum, 1 010 497 people may be visiting these sites per year in ten years time.
  - The estimated numbers of people visiting the Drakensberg (who may view the bushman paintings) is currently 367 733 per annum. This number may increase to 514 826 in the next ten years based on a 4% per annum growth rate. If the Drakensberg is proclaimed a World Heritage Site, this number of visitors may be as high as 1.2 million per annum.
- Hunting and fishing activities
  - There will be continued growth in keeping with current trends, mirroring increasing opportunities resulting from growth of the game farming sector
  - In the last five years there has been a 60% increase in the number of foreign hunters in SA.
  - Trout fishing may increase in higher altitude areas
- Game and bird viewing
  - Growth in this sector will mirror international and national trends in ecotourism
  - It is estimated that 74 630 foreign tourists and 813 400 local tourists visit nature reserves in KwaZulu-Natal per annum. The projected tourism growth rate for the province is 4%, which could indicate that 1.2 million people will be visiting nature reserves in the province per annum in ten years time. The current high occupancy rates for 'in-season' are likely to result in more private game reserves being patronised by domestic tourists.

- Education, conferences and team building
  - There will be growth in this sector in line with increasing popularity of these activities nationally
- Annual spectacles (festivals and canoe events)
  - These activities will experience growth if current trends are maintained
  - Over the last five years, competitor numbers in the Tugela Canoe Marathon have tripled. This could indicate that competitor numbers in this event will be as high as 540 in ten years time.

6 IMPACT IDENTIFICATION, DESCRIPTION AND ASSESSMENT

6.1 Description of impacts

The impacts of the TWP project will arise from its three main components, the Jana Dam, the Mielietuin Dam, and the aqueduct and associated infrastructure.

6.1.1 Pre-construction phase

Uncertainty about the future of the TWP could reduce investment confidence in tourism infrastructure in the region. The chance that certain areas could be flooded by the dams or disturbed by the aqueducts could reduce the rate of growth in the local tourism sector. This could result in a reduction in the harnessing in market opportunity and reduced growth in the regional tourism sector.

Increased media coverage and publicity arising from the TWP could increase awareness about this region and the tourism opportunities available. This increased awareness could result in increased demand for tourism activities, increasing occupancy rates for accommodation and enterprises in the region.

The chance that popular whitewater rafting and canoeing opportunities on the Thukela and Bushman's Rivers could be lost through the development of the TWP may increase demand for rafting and canoeing activities while the opportunity still exists. Increased demand for these activities may precede the construction phase.

6.1.2 Impacts on future tourism during the construction phase

Loss of habitats and disturbance due to construction could alter the wilderness atmosphere of the sub-region. This would negatively impact on the tourism experience, especially for the ecotourists attracted to the wildlife and scenic assets in the region. The impact on the tourism industry would be a reduction in the demand by the ecotourism sector but could be limited by a demand for tourism services by the construction sector.

Increased media coverage and publicity associated with the construction of the dams in particular could create a tourism attraction and draw tourists to the area. Examples of this include the Lesotho Highlands Water Project where a sustained tourist and media interest spanned the construction phase.

The disruption of the local game farming industry through noise and visual pollution from construction, as well as the possible impact on farms divided by the aqueduct, could reduce the supply of game/wildlife opportunities for the ecotourists to the region. The closure or non-

viability of game farms affected by construction could reduce the asset base for ecotourism on the sub-region. Again this may be offset to some degree by the construction sector's need for accommodation in various locations near the proposed dams and conveyance route.

Flow disruptions to the rivers through the development of coffer dams would negatively impact on the opportunities for canoeing and whitewater river rafting in the region. The loss in the regional supply of these activities would reduce the opportunities for specialist enterprises and services in the region. Flooding would also result in the loss of a national level competition whitewater slalom course (Bushman's River between Wagendrift Dam and Weenen). The tourism sector focussed on river based activities would be limited by construction activities, water impoundment and a reduction in water quality.

Potential disfigurement or disturbance at or close to places of historical importance (e.g. battlefields or the Spioenkop monument) through construction would reduce the quality of the experience for tourists, particularly if the visual activities are accompanied by noise. Tourists and tour guides are likely to limit their visits to such sites, decreasing the viability of enterprises associated with historical assets in the region.

The increase in numbers of people to the area through construction personnel could have a positive impact on the sub-regional tourism industry through the increase in demand for a range of services. This includes increased demand for accommodation, that would result in increased occupancy rates at B&Bs, hotels, caravan parks and lodges. There would also be increased demand for a range of other services such as catering and bars, transport, and entertainment. This could result in a significant increase in enterprise opportunities in the service industry associated with tourism.

The increase in numbers of people in the area through construction personnel could also increase the market demand for locally produced arts and crafts, associated with the tourism industry. This increase in market demand could result in increased opportunity for enterprises in this tourism sector.

A boost in the tourist industry through increased demand by the influx of construction personnel to the sub-region could encourage the development of the 'small town culture' atmosphere and associated tourism activities, particularly in Colenso, Winterton and Weenen.

Increased infrastructure developed during the construction phase could increase accessibility to remote areas which have been inaccessible to tourists. Increased accessibility could also result in increased opportunities for enterprises and increased demand by tourists.

While certain new infrastructure may be developed, there will also be an increase in levels of use on existing infrastructure, particularly roads. Increased use of roads could not only cause congestion and decreased road safety but heavy vehicles could accelerate breaking up of roads, and decrease quality of road surfaces.

Overall there is likely to be little growth or a reduction in the growth in demand for tourism services by people interested in ecotourism activities during construction. This will, however, be offset by some growth in demand for services by construction personnel and any tourism associated with the construction. The growth in tourism associated with the construction sector is, however, likely to be limited due to a relatively fixed number of personnel involved in construction. The adventure and wildlife sectors in the industry which are located in or close to the dam basins are likely to be the most significantly negatively impacted.

6.1.3 Impacts on future tourism with the dams and aqueducts

The changes and disruption to the natural assets of the region could have a number of positive and negative impacts on tourism in the region. These impacts on future tourism are discussed below and assessed in the following chapter.

Disruptions to downstream water flow could decrease the viability of water-based activities in these areas. A number of river features, including rapids and waterfalls (the Little Niagra), would be flooded. The loss of these features would impact significantly on a number of activities and enterprises operating in the dam basin area, as well as up and downstream of the proposed dams. These activities include a whitewater and slalom course of national level, and a number of recreational water courses. Two sites in particular, i.e. immediately above and below the proposed Jana Dam wall on the Thukela River, and on the Bushmen's River below Estcourt are also being investigated for international level whitewater competition venues. These competition and recreation activities could be relocated downstream. However, water release schedules and quantities of water released (as part of the IFR and Ecological Reserve) would ultimately influence the future viability of these enterprises.

The partial flooding of natural assets such as the Thukela Canyon and rapids will change the local character and 'sense of place' of the area. This could reduce the quality of the tourist experiences, particularly ecotourists, and effect the adventure tourism industry in the area.

Potential closure of game farms along aqueduct routes and loss of activities and accommodation facilities associated with these enterprises could affect the viability of farm enterprises in the affected area.

The construction and flooding of the dam basins will result in the loss of certain natural habitats and associated species. The range of both plant and animal species may change, both in composition and distribution. The changes in these assets could change the location and demand in certain ecotourism activities, such as bird and game viewing, with an associated change in the supply of services. One may see a shift in the location of ecotourism services, away from disturbed areas to other more or attractive pristine locations, with some farm enterprises either moving into or out of ecotourism. In other words, one could see a redistribution of ecotourism opportunities.

The creation of new habitats, i.e. a large water body, resulting from the development of the dams could create the opportunity for the introduction of new plant and animal species, thereby increasing the diversity of species in the region. This increased species diversity (particularly for birds and large wildlife) could significantly increase the attractiveness of the Mielietuin Basin for ecotourism and create opportunities for new tourism enterprises. In terms of fishing, the opportunities would be limited due to the relatively high altitude (cool temperatures) and the high levels of suspended particles in the water, limiting fishing to barbel, carp and tilapia.

The development of the dams would result in the creation of new tourism assets in the form of large water bodies. These dams would create the opportunity for a wide range of new recreation activities and enterprises in the area. These new enterprises could increase tourist numbers in the area as a greater number of potential activities makes the region more attractive as a destination. It is likely that Mielietuin Dam could see large resort/holiday housing estates around it edges and Jana Dam could see the development of houseboats and bushcamps along its edges to accommodate tourists in the area. Apart from accommodation, the two dams are likely to provide additional opportunities for water sports, such as sailing, boating, canoeing, skiing, and jet skiing, and for land-based activities such as picnicking, mountain biking, walking, game and bird watching. These activities would obviously need to be integrated in some way to reduce conflicts between themselves and land-based activities.

The dam walls, particularly at Jana, are also likely to become a tourist attraction, and could also be used for adventure activities like abseiling and wall running.

Income-generating opportunities could be developed around the Wilge River based on the increased instream flow resulting from the transfer scheme. These enterprises could be similar to activities in other parts of the world where "artificial rivers" have become the site of Olympic slalom events, international team training, local whitewater rafting operations, and "river rodeo" which is a spectacular TV-sport.

Infrastructure, particularly roads, remaining from the construction phase would no longer be carrying the heavy traffic as during the construction phase. The infrastructure would become a new asset to the region resulting in increased accessibility to certain areas, as well as increased communication and services to tourism enterprises in general.

6.2 Quantification and assessment of impacts

Negative impacts that are assessed as being severe in magnitude, confidence and significance are highlighted through grey shading (Table 6.1). These impacts could severely affect tourism in the study area, as well as regionally and even nationally. They will have significant socio-economic impacts on the regional population and will require significant mitigation.

Table 6.1: Quantification and assessment of impacts

Impacts	Magnitude/ Intensity	Extent/ Scale	Duration	Sign	Certainty	Significance
Pre-construction						
Reduction in development of new facilities due to uncertainty about dam	moderate	local	short term	negative	medium	medium
Increased tourism demand resulting from media coverage	low	regional	short term	positive	probable	medium
Increased demand for whitewater rafting activities	low	regional	short term	positive	probable	low
Construction phase						
Reduced ecotourism demand as a result of loss of 'sense of place' and wilderness experience	high	regional	medium term	negative	definite	medium
Decreased viability of associated ecotourism enterprises as a result of loss of 'sense of place'	very high	local	long term	negative	definite	high
Reduced ecotourism opportunities as a result of disruption to local game farming activities	high	regional	medium term	negative	probable	medium

Impacts	Magnitude/ Intensity	Extent/ Scale	Duration	Sign	Certainty	Significance
Loss of whitewater rafting national and potential international competition opportunities through development of coffer dams, and disruptions to water flow	moderate	national	medium term	negative	definite	medium
Decrease in demand for historical tourism enterprises and activities as a result of disfigurement of historical or archaeological sites	unknown	regional	long term	negative	probable	medium
Increased demand for tourism accommodation facilities and associated enterprises as a result of construction personnel and construction tourists in the region	moderate	regional	medium term	positive	definite	medium
Increased demand for local arts and crafts with the influx of construction personnel	low	regional	medium term	positive	possible	low
Increase in development of small town culture as a result of development of market opportunities with influx of construction personnel	low	regional	medium term	positive	definite	low
Increase accessibility and activity opportunities in certain areas, resulting from new infrastructural development	low	local	long term	positive	definite	low
Increased pressure on existing infrastructure, particularly roads, reducing road safety and quality of tourism experience	high	regional	medium term	negative	definite	high
Operational phase						

Impacts	Magnitude/ Intensity	Extent/ Scale	Duration	Sign	Certainty	Significance
Disruption to downstream water flow resulting in decreased viability of water-based activities	high	national	long term	negative	definite	medium
Flooding of the Thukela canyon results in the loss of a regional tourism asset, and a change to the local 'sense of place'	very high	national	indefinite	negative	definite	high
Reduction in general ecotourism attraction to the region as a result of the potential closure of game farms and accommodation facilities along the canal route	moderate	regional	long term	negative	probable	medium
Loss or changes in location and demand for certain ecotourism activities and enterprises as a result of the loss of certain wildlife habitats	low	regional	long term	negative	probable	medium
New recreation opportunities developed with the creation of a new tourism asset and wildlife habitats	high	regional	long term	positive	definite	high
Increased tourist demand resulting from increased diversity of activities and habitats in the region	moderate	national	long term	positive	probable	medium
Increased opportunities for new tourism enterprises in the area due to increased tourism demand	moderate	local	long term	positive	probable	medium
Increased diversity and expansion of local tourism industry and increased tourist numbers could act as catalyst for expansion in tourism industry in the region	moderate	regional	long term	positive	probable	medium

Impacts	Magnitude/ Intensity	Extent/ Scale	Duration	Sign	Certainty	Significance
Increased water-based tourism opportunities along the Wilge River due to increased instream flow	low	local	long term	positive	probable	low
Infrastructure remaining from the construction phase would provide new tourism assets	low	regional	long term	positive	probable	medium

6.3 Summary of impacts

The development of the Thukela Water Project could change the face of tourism in the Thukela Region, from a predominantly ecotourism industry founded on the wilderness 'sense of place' of the region, to a more water-based recreation industry. The loss of a number of key natural features such as the Thukela Canyon, well-known rapids in the section of the river to be flooded, and the closure of a number of game farms will result in the reduction in many of the existing ecotourism-related opportunities. Conversely, the creation of a new tourism asset in the form of two large water bodies (the Jana and Mielietuin Dams) will stimulate a range of new tourism opportunities primarily focussing on water-based activities. This change in focus would translate to the attraction of a new sector of tourists, whilst reducing the opportunities for ecotourists, particularly during the construction phase. While ecotourism would not disappear from the region, there would be the opportunity to diversify tourism activities and opportunities resulting in the closure of some existing operations and the creation of new opportunities.

The region may experience a temporary slump in the tourism industry during the construction phase of the TWP. During this time, the greatest disruption to the tourism activities in the region would be experienced, with the closure of a number of enterprises directly impacted on through construction, and prior to the establishment of the new opportunities. This slump may be partly compensated for by the influx of construction personnel and 'construction tourists' who may be attracted to the area to observe the construction of large dams.

A number of actions could be taken to minimise or mitigate the negative impacts of the TWP on eco-cultural tourism and recreation in the region, particularly during the construction phase. These mitigations could range from strategic actions to compensation pay-outs to affected parties and enterprises that are no longer viable.

7 MITIGATION RECOMMENDATIONS

Table 7.1: Recommended mitigations for impacts

Impact	Mitigation
Pre-construction phase	
Reduced investment and development of tourism facilities as a result of dam uncertainty	• Encourage public participation and information exchange
Construction phase	
Reduced tourism demand as a result of change in 'sense of place' and wilderness experience, resulting in decreased viability of tourism enterprises	• No mitigation
Reduced ecotourism opportunities as a result of disruption to local game farming industry	• No mitigation
Loss of whitewater rafting opportunities through development of coffer dams and disruptions to river flow	• No mitigation
Decrease in demand for historical tourism activities as a result of disfigurement of historical or archaeological sites	• Protection of sites of historical and archaeological value
Increased pressure on existing infrastructure, particularly roads, reducing road safety and quality of tourist experience	• Development of sufficient supplementary infrastructure • Keep construction traffic, particularly heavy vehicles, off main tourist routes
Post-construction phase	
Disruption of downstream water flow resulting in decreased viability of water-based activities	• Regulate IFR and Ecological Reserve water releases from dams to complement water-based activities downstream
Flooding of Thukela Canyon resulting in the loss of a regional tourism asset, and change to local 'sense of place'	• No mitigation
Reduced regional ecotourism attraction resulting from potential closure of game farms and accommodation facilities along canal route	• Implement pipeline option • Assist with new marketing initiatives to regain market share
Loss or changes in location of certain ecotourism activities and enterprises as a result of loss of certain wildlife habitats	

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APPENDICES

APPENDIX 1: ISSUES AND IMPACTS QUESTIONNAIRE

APPENDIX 2: RESPONDENTS: ISSUES AND IMPACTS QUESTIONNAIRE

APPENDIX 1

ISSUES AND IMPACTS QUESTIONNAIRE

STUDY OF THE ECO-CULTURAL TOURISM AND RECREATION IMPACTS OF THE PROPOSED THUKELA WATER PROJECT

Issues And Impacts Questionnaire

SECTION A: DESCRIPTIVE

Interviewer Details

Full name of person filling in questionnaire: .....

Place: ..... Date: .....

Contact telephone numbers: .....

Was an interpreter used? Yes / No

If Yes, Name: .... Designation: .....

Interviewer Comments: .....

.....**R**

espondent Details

Full Name: .....

Organization or group (if applicable): .....

Position: .....

Telephone (code& number): ..... Facsimile: .....

Other contact numbers: .....

Email address: ..... WWWaddress: .....

Postal address: .....

..... Code: .....

Name and contact details of alternative contact person: .....

.....

1. Identify the Respondent

Rank and detail descriptions applicable to respondent (1 = most applicable; 3 = least applicable):

- Practitioner Rank:..... Description: .....
- Marketer Rank:..... Description: .....
- Association / Research Rank:..... Description: .....
- Local Authority Rank:..... Description: .....
- Civics and Clubs Rank:..... Description: .....
- Other Rank:..... Description: .....

2. Nature of Activity

Rank and describe the activity most applicable to the respondent:

1 = highly relevant; 3 = slightly relevant

- Tour Industry Activity Rank:..... Description: .....
- Private Activity Rank:..... Description: .....
- Organizational Rank:..... Description: .....
- Regulatory Rank:..... Description: .....
- Other Rank:..... Description: .....

3. Category (Ranked range)

Rank activities around which this tourism development operates:

1 = highly relevant; 3 = slightly relevant

- Accommodation (B&B; Resort) Rank:.....
- Wildlife Rank:.....
- History Rank:.....
- Culture Rank:.....
- Adventure Rank:.....
- Water based (non-adventure) Rank:.....
- Other Rank:..... Description: .....

4. Organizational

What kind of organizational function best describes this tourism related operation?

1 = highly relevant; 3 = slightly relevant

- Financial gain Rank:.....
- Publicity Rank:.....
- Study Rank:.....
- Training Rank:.....
- Regulatory Rank:.....
- Media Rank:.....
- Development Rank:.....
- Consulting Rank:.....
- Marketing Rank:.....
- Reservations Rank:.....
- Transport Rank:.....
- Other Rank:..... Description: .....

5. Describe the nature of the function undertaken by this operation: .....

.....

.....

.....

6. Referring to the Map, mark the nodes or routes where your tourism activities most frequently take place.

Red - frequent use

Green - moderate use

Yellow - seldom used

SECTION B:ASSETS AND RETURNS

Tourism Assets and Resources

7. Inventory and how operation makes use of:

- Natural Assets: .....
  Use: .....
- Cultural Assets: .....
  Use: .....
- Historical Assets: .....
  Use: .....
- Man made Assets: .....
  Use: .....

8. Mark these assets on the map provided.

Blue - assets used

Statistics

9. Facilities

What facilities have been developed for the operation of the tourism operation?

- Accommodation .....
  Number .....
  Cost .....

- Other (describe) .....
  Number .....
  Cost .....

- Other (describe) .....
  Number .....
  Cost .....

Supply Side Benefits

10. Nett Annual income generated by the operation (tick applicable block)

< R12 000	R12 000 - R60 000	R60 001 - R120 000	R120 001 - R240 000	>R 240 000

11.

Jobs	In Season	Out Season	Non-Seasonal
(1) Number skilled	.....	.....	.....
- professional	.....	.....	.....
- managerial	.....	.....	.....
Payroll	.....	.....	.....
(2) Number unskilled	.....	.....	.....
Payroll	.....	.....	.....

12. Roughly how many members or participants does your operation involve on a monthly basis?

Category	In Season	Out Season	Non-Seasonal
0 - 5	☐	☐	☐
6 - 15	☐	☐	☐
16 - 25	☐	☐	☐
26 - 50	☐	☐	☐
51 - 100	☐	☐	☐
101 - 200	☐	☐	☐
201 - 500	☐	☐	☐
501 - 1000	☐	☐	☐
More than 1000	☐	☐	☐

Benefits produced by the activity

13. What major benefits do you regard as resulting from the tourism activity for the PARTICIPANTS. Rank and scale the benefits

1 = Greatest benefits; 3 = seldom benefited

	Rank	Scale
Physical fitness	☐	☐
Excitement	☐	☐
Social contact	☐	☐
Knowledge and education	☐	☐
Scenic interest	☐	☐
Wildlife interest	☐	☐
Cultural interest	☐	☐
Spiritual interest	☐	☐
Other	☐	☐

Describe: .....

Demand side Benefits

14. Rank the most common source of client base

1 = most common; 3 = seldom

- Corporate Rank: .....
- Individual/ families Rank: .....
- Clubs Rank: .....
- Other Rank: ..... Description: .....

15. ~~Tourist spending (tick~~ appropriate block)

☐ ~~<R 50 pp/day~~

☐ ~~R50 - R100 pp/day~~

☐ ~~R101 - R300 pp/day~~

☐ ~~R301 - 600 pp/day~~

☐ ~~R601 - R1000 pp/day~~

☐ >R1000 pp/day

16. List additional activities tourism or other, apart from this operation that tourists undertake while visiting this operation :

1. .....
2. .....
3. .....
4. .....

Access

17. How do guests access the facilities (rank):

1 = most often; 3 = seldom

- private motor car .....
- hire car .....
- 4 x 4 .....
- tour bus .....
- air .....

SECTION C: DRIVERS OF CHANGE

18. What support/complementing structures and assets make this development work: (eg infrastructure; marketing; funding; wildlife)

.....

.....

.....

19. What are the primary influences that will shape the future development of this tourist operation? (Eg infrastructure dev.; advertising; exchange rate; financing)

.....

.....

.....

20. What indicators are used in this operation to demonstrate growth / trends in tourism?

Examples	3 - 5 years ago
Number of tourists	.....
Number of competing developments	.....
Number of complementing activities	.....
Number of service industries	.....
Other	.....
Other	.....
Other	.....

21. What trends do you predict in these trends

Examples	5 years time
Number of tourists	.....

Motivation: .....

Number of competing developments .....

Motivation: .....

Number of complementing activities .....

Motivation: .....

Examples	5 years time
Number of service industries	.....

Motivation: .....

Other ....

Motivation: .....

Other ....

Motivation: .....

SECTION D: SCENARIOS

22. Which dam will influence this development or operation?

Jana	Mielietuin

How will the scenarios change the service you provide?

23. During Construction of Dam

How do you anticipate the construction phase will impact on:

Tourism Asset: .....

.....

.....

Service provided .....

.....

.....

Quality and Quantity: .....

.....

.....

Other .....

.....

24. Future with Dam

How do you anticipate the existence of the dams will impact on:

Tourism Asset: .....

.....

.....

Service provided .....

.....

.....

Quality and Quantity: .....

.....

.....

Other.....

25. Future Without Dam

What do you anticipate future tourism trends will be if no dams are built in this region?

Tourism Asset: .....

.....

.....

Service provided .....

.....

.....

Quality and Quantity: .....

.....

.....

Other .....

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26. What comments would you like to make regarding this proposed development

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27. From what you know about the proposed Thukela Water Project, do you think this will significantly affect your current tourism activity or function?

Affect significantly for the BETTER

Motivation: .....

.....

.....

Affect significantly for the WORSE

Motivation: .....

.....

.....

UNCERTAIN of effects

Motivation: .....

.....

APPENDIX 2

RESPONDENTS: ISSUES AND IMPACTS QUESTIONNAIRE

RESPONDENTS : ISSUES AND IMPACTS QUESTIONNAIRE

FULL NAME	ORGANIZATION OR GROUP
Gordon Smith	KZNNCS - Spionkop Nature Reserve
Lyn Conway	Settlement Hotel
Mziyonke and Makadane community Representatives	Thukela Committee (Workshop 1)
Mziyonke and Makadane community Representatives	Thukela Committee (Workshop 2)
Catherine Todd	Hunters Rest
John Lewellyn	KZNNCS - Weenen Nature Reserve
Graeme McIntosh	Congolo Game Reserve
Isabel Schiever	Bushmans River B & B
Mark Calverley	Zingela Safari & River Company
Anthony Jones	Tugela Canoe Marathon
Mrs Betty Laatz	Weenen TLC
Charl Fouche	Uthukela Reg. Council
Janet Wawler	Colenso TLC
Taffy Heske	Owl & Elephant
Andrew van der Watt	Drakensville Holiday Resort
Denise Eyssell	Drakensberg Tourism
Peter Scott	Sandford Park Lodge
Julita van Zuydan	Winterton Info. Office
Angela André	Bushmans River Tourism Assoc.

REVIEW

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Review: Thukela Water Project Feasibility Study:
Eco-cultural Tourism and Recreation Baseline Study

This review consists of two sections. The first sections deals with answers to the ten questions set in the letter dated 8 March 2000. The second section deals with other specific issues identified during a study of the document under review. The document itself also includes suggested changes, additions and corrections and these are noted in the text of the returned document.

Section 1:

1. On the whole the Terms of Reference (ToR) have been complied with. However, it appears that the four tourism scenarios which were requested to be developed in section 2.3 of the ToR have not been adequately outlined. The current situation as regards tourism has, to a large extent, been elaborated upon, as has the future of tourism without the TWP. However, the future of tourism with the TWP and the state of tourism during the construction phase need further amplification and clarification. It may just be a case of clarifying the location of these sections in the text, but there needs to be a clearer outline of each scenario (or the latter three at least) in terms of potential activities, facilities, tourism numbers and the like.

Also, the most up to date information should be used. Some of the data are from 1996 but there is more recent data available.

2. Overall the report seems to provide a balanced and comprehensive overview of the work requested. With the clarification of the various scenarios, it should provide a strong basis for future decision-making in terms of the development of the TWP for this region.

3. See question 2 above. With the suggested changes, this report should provide adequate material for decision-making.

4. Yes, the report follows logical arguments throughout, and logical developmental steps through the stages of the report.

5. There does not seem to have been sufficient attention paid to the differences between the development of tourism with the building of the proposed dams and canals, and without the dams. With tourism increasing in numbers but decreasing in terms of length of stay, a fuller exploration of the different future scenarios is of strategic importance.

There was very little attention paid to the effects of the development - or otherwise - on landowners. Mention needs to be made of compensation, for example, to those whose land needs to be appropriated to accommodate the dams, the pipeline or the canals. Tourism development, in some instances, is critically dependant upon the support of such landowners and lack of such support could threaten not only tourism development in the area but also the Thukela Water Project overall. This could perhaps form part of the mitigation possibilities.

6. The report certainly addresses the main tourism issues adequately. However, a more detailed study could have been provided as regards alternative uses of the area. Such a study would have proved useful for the purposes of informed decision-making.

Furthermore, some means of weighting of alternative land uses needs to be provided for this purpose.

7. The reports has made use of appropriate methodologies. However, the description of these is very broad. For example, copies of the questionnaires should have been included as appendices at the end of the report so that the reader could ascertain the kinds of questions asked, the level of investigation undertaken and the like. If the list of I&AP's at the end of the report constitutes those to whom the questionnaire was administered, it should be stated. It is very difficult to ascertain whether or not an important organisation or even individual has been left out of the questionnaire survey without such information.

The methods of questionnaire administration were not described, and this needs to be included. For example, were field workers used, was the questionnaire self administered, posted, or completed in face to face interview situations? Also, were there any refusals or any rejection of the questionnares? How were they received by the respondents and what was the return / rejection rate?

Were the two surveys mentioned based on the same or on different questionnaires?

The report states that 'scenario generation was key to predicting the future of tourism in the study area' and that 'Impacts of the TWP were assessed on the basis of impacts on this future scenario' (pg 3). However, the scenarios were not clearly outlined and some further work needs to be done in this regard.

Finally, what was the pattern or time outline of the actions, or, what was done when? The assessment of methodologies is hampered by the lack of full description of both

the methodologies and their applications, particularly when a multi-faceted methodology has been used.

8. There does not to seem to be much in the way of outlining of new tourism opportunities, experiences or facilities which could be developed with the construction of the dams and other facets of the project and this would seem to be most important. If tourism development is to play an important role in the area, such opportunities need to be spelled out, particularly in the light of the growing importance of tourism worldwide. The section dealing with the status quo of tourism in the area is dealt with fairly comprehensively, but the future scenarios need more 'meat'.

9. Yes. Only when as full and clear a picture of future developments as possible is provided can informed decisions be made. Again, the four tourism scenarios need to be clearly identified and outlined.

10. Sections 1.3 and 1.4, as outlined on pg 1 of the report, need to be clearly outlined and completed.

A full description of the methodologies used as well as of their application needs to be included, as do the questionnaires.

Section 2:

- There should be a clear outline of the existing tourism industry or status quo before any outline of the potential states.

- All references should be included in the bibliography (or References) at the end of the report including internet references.

- A page of definitions at the beginning of the report would prove useful to the readers. Terms which should be included are tourism, eco-cultural tourism, Afrikatourism, affinity tourism and others which would ensure all readers have at least similar concepts in mind.

- A page of acronyms would be similarly useful.

- Be wary of equating the trends and behaviours of US and South African tourists too closely. Their environments, experiences, histories, economies among other things, are vastly different and frequently give rise to very different patterns of behaviour (see report pg 7 onwards).

- The river-running aspects of the report were fully covered but the dam based recreational activities need to be more fully covered. For example, fishing, particularly fly fishing, boating, water skiing and the like need to be considered, both in the status quo section and in the future development of the area, with and without the construction of new dams.

I hope this review proves useful in improving what is already a substantial report.

INSTITUTE OF NATURAL RESOURCES

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Promoting the wise and sustainable use of natural resources
through the integration of conservation and development

Friday, 28 April 2000

Ms J Mander
IEM Task Leader
Institute of Natural Resources
Scotsville

Dear Jenny

Thukela Water Project Feasibility Study : Review of the Eco-cultural Tourism and Recreation Baseline Study

The reviewers recommendations were assessed and most of the recommended changes made to the document. Apart from recommendations made in the review report, the recommended editorial changes in the tourism study itself have been attended to.

The primary change made in line with the reviewer's comments was to adapt the text to outline the scenarios in a more clear way. However, the reviewer requested that the future scenarios for tourism with the construction and the dam be developed in more detail. We feel that it is inappropriate to generate more detailed scenarios as we will then be making projections on projections with very little basis for accuracy. We feel it is safer to rather provide a broad indication of potential impacts that may result from the development. Any further detail is likely to be entirely speculative with little value for decision making.

Furthermore, the reviewer has requested that more up-to-date information be used in the report. At the time of the research been undertaken the scenarios developed used the information available at that time – September 1999. Subsequently more recent information has become available. In assessing some of this information, the differences from the data used in September compared to the data now available, make little impact on the projections made in September 1999. We therefore do not consider that the additional costs that would be incurred in doing additional research and making further changes to the document to be economically justified.

Please contact me should you have any queries.

Yours sincerely

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THUKELA WATER PROJECT FEASIBILITY STUDY

VISUAL AND AESTHETIC BASELINE STUDY

Prepared by

CAVE KLAPWIJK AND ASSOCIATES

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

SUMMARY

1 INTRODUCTION

1.1 Background and brief

The Department of Water Affairs and Forestry (DWAF) as the responsible institution for the management of South Africa's water resources, has commissioned the Thukela Water Project Feasibility Study (TWPFS) with a view to further augmenting water supply to the Vaal River System from the Thukela River catchment.

The proposed scheme, a bulk water inter-basin transfer scheme, comprises two large dams, the Jana Dam on the Thukela River and the Mielietuin Dam on the Bushman's River, with linking aqueducts comprising either open canals and/or pipelines from the proposed dams to the existing Drakensberg Pumped Storage Scheme.

This visual assessment is a baseline study to determine the visual effects of the proposed Thukela Water Project on the surrounding environment and forms part of the overall EIA study to assess the environmental impact.

In order to address the aesthetic concerns, Cave Klapwijk and Associates were requested by Ms Jenny Mander of the Institute of Natural Resources to undertake a Visual Impact Assessment (VIA) of the main components of the Thukela Water Project on the surrounding existing environment.

The project components consist of the Jana and Mielietuin Dams, the canal route alternative, the pipeline route alternative, or a combination of both routes.

The purpose of this Baseline Study is to determine the impact of the proposed Thukela Water Project (TWP) on the visual and aesthetic character of the dam basin areas and aqueduct routes. The rationale for this Study is that the construction of large impoundments and the associated aqueduct routes may fundamentally alter the landscape character and 'sense of place' of the local environment. The primary objective of this Baseline Study is therefore to quantify the potential impact of these structures on the visual character and 'sense of place' of the area. This Baseline Study has the following objectives:

- Describe the visual character of:
  - Jana Dam;
  - Mielietuin Dam; and the
  - Aqueduct routes (as provided)

  evaluating components such as topography and current land use activities.

- Identify elements of particular visual quality that could be affected by the TWP.

- Describe and evaluate the visual impacts of the individual components of the proposed TWP from critical areas and view fields. This assessment should assess impacts according to the criteria and terminology as indicated in Section 1, Table 1.1.

- Recommend mitigation measures to reduce the potential visual impacts generated by the components of the TWP.

- Specific consideration should be given to the identification of requirements for further investigation.

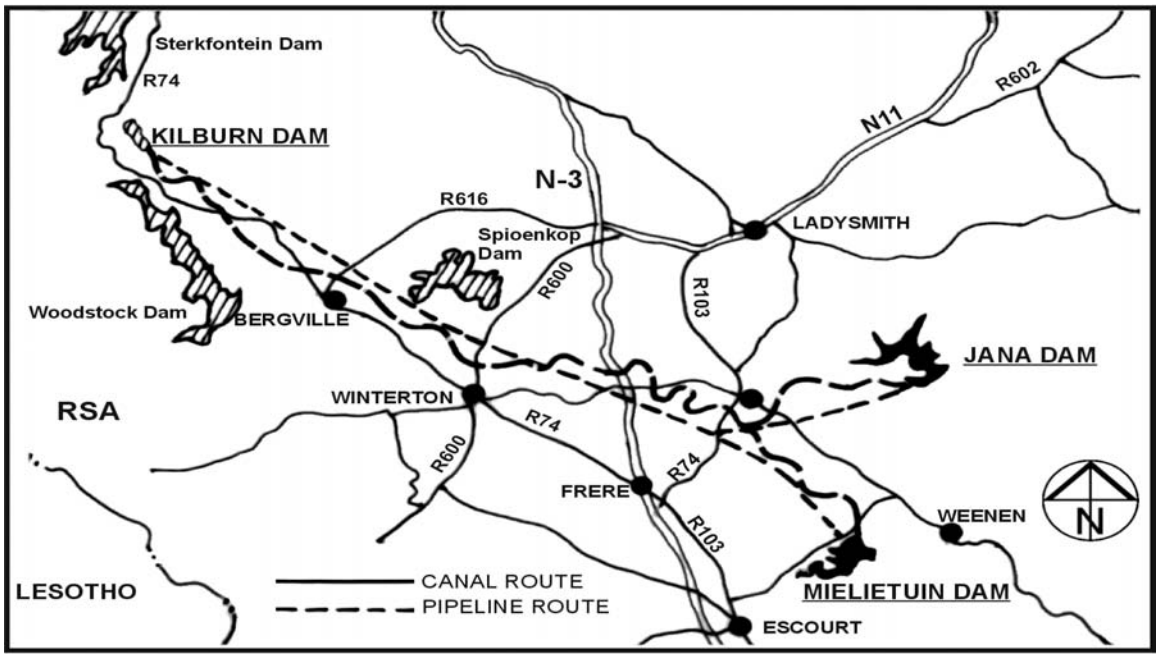


Figure 1: Regional locality plan

1.2 Study area

The study area traverses the western KwaZulu-Natal province from approximately 20km east of Colenso in a northwesterly direction to the Kilburn Dam at the foot of the Oliviershoek Pass approximately 35km northwest of Bergville (Figure 1).

The Jana Dam is located a few kilometres downstream of the Thukela and Klip Rivers confluence. The Mielietuin Dam is located on the Bushman's River immediately upstream of the Weenen Game Reserve, north east of Estcourt.

The canal route is approximately 183km long while the pipeline route is 121km long.

2 STUDY APPROACH

In order to address the objectives of the study the following methodology has been used:

- A site visit to determine the setting, visual character and land uses of the areas;
- Discussions and meetings with the specialist consultant team to identify specific aspects of the construction and development which would affect the visual quality of a setting;
- The preparation of plans based on 1:50 000 topographical data, which would identify the visual characteristics of the environment, important views, viewsheds, and existing land uses. A definition of the visual environment affected by the project components and an assessment of the visual impacts;
- The determination of the visibility of project components using a viewshed analysis.

The visual impact assessment statements in this report are based on the expert opinion of the authors and attitudes that are generally accepted worldwide.

The assessment is based on preliminary aqueduct alignment proposals, together with preferred dam elevation heights.

3 IDENTIFICATION OF RISK SOURCES

Various risk sources for the visual impact have been identified for the construction and operation phases and can be classified as both negative and positive.

3.1 Construction phase

It is anticipated that the major risk source during construction would be:

3.1.1 Negative risk sources

- cut and fill slopes become highly visible if not re-vegetated and shaped to blend in with the existing topography;
- excessive cleaning and stripping of topsoil for site offices, servitudes and temporary access road;
- the relatively random and disorganised lay down of building materials, vehicles and offices;
- the extent and intensity of the security and construction lighting at night;
- dust from construction activities;
- open and unrehabilitated landscape scarring;
- uncontrolled exploitation of borrow pits and quarries without compliance to environmental controls related to aesthetic rehabilitation;
- high seed bank of black wattle (*Acacia mearnsii)* in the topsoil can lead to the uncontrolled spread of this exotic invader plant species along the edges of the aqueducts. This could create a treed edge that is visually contrary to the low grasslands; and
- location and layout of construction workers village if located in proximity of the works area.

3.1.2 Positive risk sources

- image of construction activity could lead to a perceived view of progress and benefit to the community.

3.2 Operational phase

3.2.1 Negative risk sources

- site engineering, such as cuts and fills, could remain aesthetically incompatible with surrounding landscape. Edges may not blend in with the landscape or cut slopes may be too steep to be adequately re-vegetated;

- night lighting of components such as dam walls and pump stations could create a beacon in an unlit rural setting; and
- areas and / or specific sites of high aesthetic value may be disfigured by the introduction of a project component within the viewshed resulting in a permanent change to the existing visual quality of visually sensitive areas.

3.2.2 Positive risk sources

- new routes could present and promote existing high quality visual attributes of an area not normally exposed to the general public;
- the presentation of a large water body such as the Mielietuin Dam in a very scenic landscape to the road users. This scenic experience may attract visitors or tourists to an area not normally travelled for the purpose of the experience;
- the visual image of a large water body within a scenic area may attract allied ecotourism activities to the area;
- the Thukela Water Project could be the visual affirmation of progress and prosperity for the region.

4 THE VISUAL ANALYSIS

This section describes the aspects that have been considered in order to determine the intensity of the visual impact on the area. The criteria includes the area from which the project can be seen (the viewshed), the viewing distance, the capacity of the landscape to visually absorb structures and forms placed upon it (the visual absorption capacity), and the appearance of the project from important or critical viewpoints within established and existing planned land uses.

The focus of this study is specifically on the main project components such as the dams and aqueducts and not on the ancillary infrastructure.

5 THE VISUAL IMPACT

The visual impacts of the TWP in the landscape are a function of many criteria. Some are measurable while others are purely subjective. Each visual assessment criteria was rated according to a high, medium or low scale. These ratings were defined and used to evaluate one site's visual attributes against those of the other site.

In order to follow the assessment procedure, the impact of each project component was explained together with the overall impact description of the construction and operation project phases. Visual impact mitigation and management recommendations are presented in

Section 7 of the main document. Summary tables for each element are set out for both the construction and operational phase; each without mitigation (Tables 1 to 6).

Table 1: Visual impacts: Jana Dam wall and related infrastructure without management / mitigation actions

Stage in Project Lifecycle	Extent / Spatial Scales	Duration	Magnitude and Intensity	Certainty	Significance	Sign
Construction	Local	Short term	High	Probable	High	Negative
Operation	Local	Long term	Moderate	Probable	Medium - low	Negative

Table 2: Visual impacts: Jana Dam reservoir without management / mitigation actions

Stage in Project Lifecycle	Extent / Spatial Scales	Duration	Magnitude and Intensity	Certainty	Significance	Sign
Construction	Local	Short term	Moderate	Probable	Medium	Negative
Operation	Local	Long term	Moderate	Probable	Low	Positive

Table 3: Visual impacts: Mielietuin Dam wall and related intrastructure without management / mitigation actions

Stage in Project Lifecycle	Extent / Spatial Scales	Duration	Magnitude and Intensity	Certainty	Significance	Sign
Construction	Local	Short term	Moderate	Probable	Medium	Negative
Operation	Local	Long term	Low	Probable	Medium - low	Negative

Table 4: Visual impacts: Mielietuin Dam reservoir without management / mitigation actions

Stage in Project Lifecycle	Extent / Spatial Scales	Duration	Magnitude and Intensity	Certainty	Significance	Sign
Construction	Local	Short term	Moderate	Probable	Medium -low	Negative
Operation	Local	Long term	Moderate	Probable	Low	Positive

Table 5: Visual impacts: Pipeline aqueduct without management / mitigation actions

Stage in Project Lifecycle	Extent / Spatial Scales	Duration	Magnitude and Intensity	Certainty	Significance	Sign
Construction	Regional	Short term	High	Probable	Medium	Negative
Operation	Regional	Short term	Low	Probable	Low	Negative

Table 6: Visual impacts: Canal aqueduct without management / mitigation actions

Stage in Project Lifecycle	Extent / Spatial Scales	Duration	Magnitude and Intensity	Certainty	Significance	Sign
Construction	Regional	Short term	High	Probable	High	Negative
Operation	Regional	Long term	Moderate	Probable	Medium	Negative

6 DISCUSSION

This study evaluated the visual impact of the Thukela Water Project on the affected environment with a view to assessing its severity based on the author's experience, expert opinion and accepted techniques.

6.1 Jana Dam

Dam Wall and Infrastructure

The Jana Dam wall and the associated structures will exert a negative impact on the visual environment. This is largely due to:

- the large scale of the dam located within a wilderness;
- the moderate absorption capacity of the setting which is attributable to:
  - the moderate vegetation height (one to five metres);
  - the position of the wall in the landscape which permits extended views from the east and south-east;
  - uniform visual pattern; and
  - steep slopes.
- the contrast of human intrusion within a wilderness setting;
- the visual quality of the area has a high aesthetic value due to the unspoilt extended views of ridges, mountains and valleys which impact a wilderness quality;
- the night image of the dam wall area being brightly lit by security and safety lighting. The visual impact of the night image may well be greater than that during the day;
- the need to cut into the existing landforms to accommodate infrastructure and the spillway;
- the overall significance of the visual impact during construction is regarded as medium negative and during operation as medium to low negative due to the visual impact that cannot be readily mitigated. Amelioration measures will only reduce the impacts to a limited extent.

Reservoir

The Jana Dam Reservoir will exert a positive visual impact on the visual environment. This is due to:

- the form of the water body fits well with the existing contours of the landscape;
- the water body has an intrinsic positive aesthetic appeal.

6.2 Mielietuin Dam

Dam Wall and Infrastructure

The Mielietuin Dam wall and its associated structures will exert a negative impact on the visual environment. This is largely due to:

- the scale of the dam wall located within a rural setting;
- the moderate absorption capacity of the setting which is attributable to:
  - the moderate vegetation height (one to five metres); and
  - the uniform visual pattern.
- the visual quality of the dam basin / reservoir environs has a high aesthetic value created by the mountains, valleys, rolling topography and the distinct rural and visually attractive character of the area;
- the need to cut into the existing landforms to accommodate the dam wall infrastructure;
- the night image of the dam wall and infrastructure being brightly lit by security and safety lighting. The visual impact due to night image may well be greater than that during the day;
- the overall significance of the visual impact is regarded as medium to low due to:
  - the existing land uses which have modified the landscape already exert, to a limited extent, a negative impact;
  - relatively few viewers will be exposed to the dam wall;
  - the visual impact can be reduced to some extent by implementing the recommended mitigation and management measures.

Reservoir

The Mielietuin Dam reservoir will exert a positive visual impact on the visual environment. This is due to:

- the form of the water body fits well with the existing contours of the landscape;
- the water body has an intrinsic positive aesthetic appeal.

6.3 Aqueducts

The pipeline and canal aqueducts will exert a negative influence on the visual environment. This is largely due to:

- high visibility of construction activity within a zone of uniform visual pattern;
- the low visual absorption capacity of the setting which is attributable to:
  - relatively flat topography;
  - the low vegetation height (less than one metre); and
  - the lack of visual diversity.
- the length of the route will expose it to many viewers;
- the need to cut into the existing landform to accommodate especially the canal; and
- project infrastructure could be dominant in the landscape such as reservoirs and surge towers if mitigation is not built into the design process;
- the significance of the visual impact of both the pipeline and the canals during construction is regarded as medium.

Pipeline

The overall significance of the visual impact of the pipeline during operation is regarded as low negative rather than medium due to:

- the existing land uses, which have already modified the landscape, exert, to a limited extent, a negative impact;
- the visual impact can be reduced significantly by implementing the recommended mitigation and management measures;
- once full rehabilitation of the pipeline servitude is completed the impact can be regarded as neutral.

Canals

The overall significance of the visual impact of the canal route during operation is regarded as medium negative rather than high due to:

- the existing land uses, which have already modified the landscape, exert, to a limited extent, a negative impact;
- the visual impact can be reduced to a limited extent by implementing the recommended mitigation and management measures. However, the canal will always remain visible in the landscape since it cannot be successfully screened from view. Tunnel portals could also remain as a visual intrusion in the landscape.

1 INTRODUCTION

1.1 Background

The Department of Water Affairs and Forestry (DWAF), as the responsible institution for the management of South Africa's water resources, has commissioned the Thukela Water Project Feasibility Study (TWPFS) with a view to further augmenting water supply to the Vaal River System from the Thukela River catchment.

The proposed scheme comprises two large dams, the Jana Dam on the Thukela River and the Mielietuin Dam on the Bushman's River, with linking aqueducts comprising either open canals and/or pipelines from the proposed dams to the existing Drakensberg Pump Storage Scheme.

The Thukela Water Project (TWP) is a proposed bulk water inter-basin transfer scheme from the Thukela to Vaal River catchments. Initiated in early 1994, Reconnaissance and Pre-feasibility Studies were undertaken through to the end of 1996. From the outset it was recognised that, whatever the final scheme configuration, long aqueducts would be required to convey raw water from storage units to the transfer point, either the existing Drakensberg Pumped Storage Scheme or the proposed Braamhoek Scheme.

The Institute of Natural Resources (INR) has been tasked by the DWAF Directorate: Project Planning with the co-ordination and management of the Integrated Environmental Management (IEM) process to determine, at feasibility level, the potential impact of the project on the environment.

Although planning is still at an early stage, it was seen as important to begin an Environmental Impact Assessment (EIA) to determine the possible impacts of the development and to identify methods to mitigate these impacts. The first stage in the EIA process is the preparation of a Scoping Report, which provides the mechanism to involve interested and affected parties (I&AP's) to voice their opinion on the proposed development and to identify possible issues and concerns.

The second stage in the EIA process is to undertake baseline studies to address the issues and concerns raised during the scoping stage.

This visual assessment is a baseline study to determine the visual effects of the proposed Thukela Water Project on the surrounding environment and forms part of the overall study to assess the environmental impact.

1.2 Study area

The study area traverses the western KwaZulu-Natal province from approximately 20km east of Colenso in a north-westerly direction to the Kilburn Dam at the foot of the Oliviershoek Pass, approximately 35km north-west of Bergville (Figure 1.1).

The Jana Dam is located a few kilometres downstream of the confluence of the Thukela and Klip Rivers. The Mielietuin Dam is located on the Bushman's River immediately upstream of the Weenen Game Reserve, north-east of Estcourt.

The canal route is approximately 183km long while the pipeline route is 121km long.

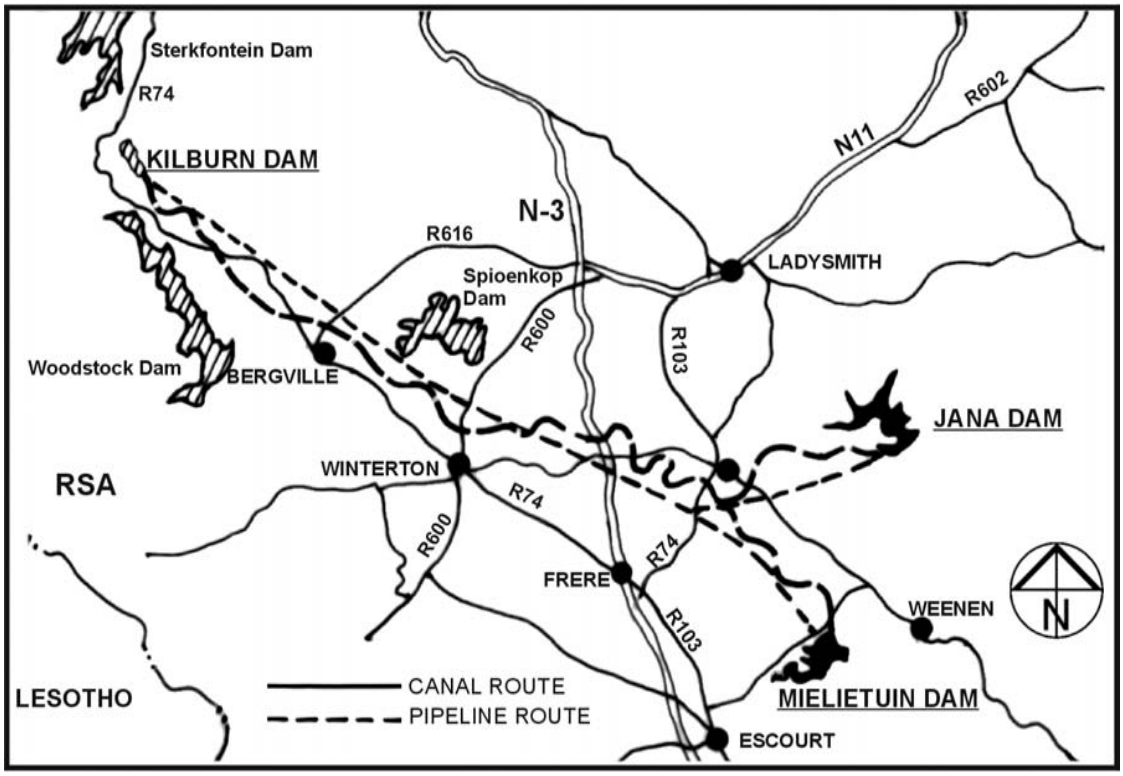


Figure 1.1: Regional locality plan

1.3 Brief

In order to address the aesthetic concerns, Cave Klapwijk and Associates were requested by Ms Jenny Mander of the Institute of Natural Resources to undertake a Visual Impact Assessment (VIA) of the main components of the Thukela Water Project on the surrounding existing environment.

The project components will consist of the Jana and Mielietuin Dams, the canal route alternative, the pipeline route alternative, or a combination of both routes.

1.3.1 Terms of reference

The purpose of this Baseline Study is to determine the impact of the proposed Thukela Water Project (TWP) on the visual and aesthetic character of the dam basin areas and aqueduct routes. The rationale for this Study is that the construction of large impoundments and the associated aqueduct routes may fundamentally alter the landscape character and 'sense of place' of the local environment. The primary objective of this Baseline Study is therefore to describe the potential impact of these structures on the visual character and 'sense of place' of the area. This Baseline Study will have the following objectives:

- Describe the visual character of:
  - Jana Dam;
  - Mielietuin Dam; and the
  - Aqueduct routes (as provided)

  evaluating components such as topography and current land use activities.

- Identify elements of particular visual quality that could be affected by the TWP.

- Describe and evaluate the visual impacts of the individual components of the proposed TWP from critical areas and view fields. This assessment should assess impacts according to the criteria and terminology as indicated in Table 1.1.

- Recommend mitigation measures to reduce the potential visual impacts generated by the components of the TWP.

- Specific consideration should be given to the identification of requirements for further investigation.

1.3.2 Method

In order to address the objectives of the study the following method is proposed:

- Define the visual characteristics of the components;
- Determine the setting, visual character and land use of the area surrounding the sites, and the Genius Loci (sense of place);
- Identify important viewing points;

- Prepare plans which would identify the visual characteristics of the environment, important views and viewsheds;
- Define the extent of the affected visual environment, the viewing distance and critical views;
- Determine and map the visual absorption capacity (VAC) of the site (the ability of the site to accept change); and
- Describe and assess the visual impacts.

Table 1.1: Conventions for definitions and used in the description, evaluation and assessments of environmental impact

Category	Description or Definition
Type	A brief written statement, conveying what environmental aspect is impacted by a particular project activity or action, or policy or statutory provision.
Magnitude and Intensity	The severity of the impact
very high	- Complete disruption of process; death of all affected organisms; total demographic disruption
high	- Substantial process disruption, death of many affected organisms; substantial social disruption
moderate	- Real, measurable impact, which does not alter process or demography
low	- Small change, often only just measurable
no effect	- No measurable or observable effect
unknown	- Insufficient information available on which to base a judgement
Extent / Spatial Scales	The geographical extent or area over which the direct effects of the impact are discernible, i.e. the area within which natural systems or humans directly endure the effects of the impact.
international	- Southern Africa
national	- South Africa
regional	- KwaZulu-Natal and the Thukela catchment, the uThukela region
local	- dam basin, conveyance servitude, river reach, specific site locality
Duration	The term or time period over which the impact is expressed, **not** the time until the impact is expressed. Where necessary the latter must be specified separately.
short term	- up to 5 years (or construction phase only)
medium term	- 5 to 15 years (or early commissioning and operational phases)
long term	- > 15 years (or operational life)
Sign	Denotes the perceived effect of the impact on the affected area
positive (+)	beneficial impacts
negative (-)	impacts which are deleterious
Certainty	A measure of how sure, in the professional judgement of the assessor, that the impact will occur or that mitigatory activity will be effective
improbable	- low likelihood of the impact actually occurring
probable	- distinct possibility that the impact may occur
definite	- impact will occur regardless of prevention measures

Category	Description or Definition
Significance	An integration (i.e. opinion) of the type, magnitude, scale and duration of the impact. Judgements as to what constitutes a significant impact require consideration of both context and intensity. It is the assessor's best judgement of whether the impact is important or not within the broad context in which its direct effects are felt. (see Fuggle R.F. & Rabie M.A. 1992. *Environmental Management in South Africa*. Cape Town: Juta & Co. 823)
high	- Could (or should) block the project/policy; totally irreversible (-ve impact) or provides substantial and sustained benefits (+ve impact)
medium	- Impact requires detailed analysis and assessment, and often needs substantial mitigatory actions.
low	- Impact is real but not sufficient to alter the approach used. Probably no mitigation action necessary.

Some Explanations and Definitions

1 Environmental impact - An environmental change caused by some human act. (DEA 1992. *The Integrated Environmental Procedure*. Vol 5)

2 Environmental impact - Degree of change in an environment resulting from the effect of an activity on the environment whether discernable or undesirable. Impacts may be the direct consequence of an organisation's activities or may be indirectly caused by them. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

3 Affected environment - Those parts of the socio-economic and bio-physical environment impacted on by the development. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

4 Environmental issue - A concern felt by one or more parties about some existing, potential or perceived environmental impact. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

5 Environment - means the surroundings within which humans exist and that are made up of:
- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part or combination of (i) and (ii) and the interrelationships among and between them;
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being National Environmental Management Act No 107 of 1998).

6 Significance - (See Fuggle R.F. & Rabie M.A. 1992. *Environmental Management in South Africa*. Cape Town: Juta & Co. 823. Also in, DEA 1992. *The Integrated Environmental Procedure*. Vol 4)

7 Significance - "The definition of significance with regard to environmental effects is a key issue in EIA. It may relate *inter alia* to scale of the development. To sensitivity of location and to the nature of adverse effects." (Glasson, J. Therival, R. and Chaduuick, A. 1995. *Introduction to Environmental Impact Assessments. Principles and Procedures, Process, Practise and Prospects*. London: UCL Press. 13).

8 Significance - "Once impacts have been predicted, there is a need to assess their relative significance. Criteria for significance include the magnitude and likelihood of the impact and its spatial and temporal extent, the likely degree of recovery of the affected environment, the value of the affected environment, the level of public concern, and political repercussions." (Glasson, J. Therival, R. and Chaduuick, A. 1995. *Introduction to Environmental Impact Assessments. Principles and Procedures, Process, Practise and Prospects*. London: UCL Press. 124).

9 Significance -" The question of significance of anthropogenic perturbations in the natural environment constitutes the very heart of environmental impact assessment. From any perspective - technical, conceptual or philosophical - the focus of impact assessment at some point narrows down to a judgement whether the predicted impacts are significant." (Beanlands, G. 1983. *An ecological Framework for Environmental Impact Assessments in Canada*. Institute for Resource and Environmental studies. Dalhausie University. Sections 7: 43)

10 Environment - Surroundings in which an organisation operates, including air, water, natural resources, flora, fauna, humans and their interrelation. (ISO 14001. 1996). Note - Surroundings in this context extend from within an organisation to the global system.

11 Environmental aspect - Element of an organisation's activities, products or services that can interact with the environment. (ISO 14001. 1996). Note - A significant environmental aspect is an environmental aspect that has a or can have a significant environmental impact.

12 Environmental impact - Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services. (ISO 14001. 1996).

2 STUDY APPROACH

In order to address the objectives of the study the following methodology has been used:

- A site visit to determine the setting, visual character and land uses of the areas;

- Discussions and meetings with the specialist consultant team to identify specific aspects of the construction and development which would affect the visual quality of a setting;

- The preparation of plans based on 1:50 000 topographical data, which would identify the visual characteristics of the environment, important views, viewsheds, and existing land uses. A definition of the visual environment affected by the project components and an assessment of the visual impacts;

- The determination of the visibility of project components using a viewshed analysis.

The visual impact assessment statements in this report are based on the expert opinion of the authors and attitudes that are generally accepted worldwide.

The assessment is based on preliminary aqueduct alignment proposals, together with preferred dam elevation heights.

3 LIMITATIONS, CONSTRAINTS AND ASSUMPTIONS

The following assumptions and limitations are applicable to this study:

- The basis for this assessment is that scenic wilderness areas form the core of ecotourism due to the high positive aesthetic appeal.

- A range of dam heights have been provided. These are:

  Jana Dam – FSL 835m - 890m with a preferred height of 860m.
  Mielietuin Dam – FSL 1 015m - 1 033m with a preferred height of 1 025m.

  This report has evaluated only the preferred heights. Should further phases of the study examine any other dam height in more detail then the visual impact would need to be re-examined.

- The assessment does not consider the ancillary project infrastructure and components such as roads, borrow pits, spoil dumps, etc. These components will be assessed in detail during the design phase, should the project be implemented.

- The assessment is based on assumed demographic data. No detailed study was done to determine accurate data on potential viewers of the project components. If necessary, these studies could be undertaken during the design phase of the project.

- The location and extent of the construction and labour campsites, as well as material lay-down areas, will only be determined during the design and construction phases. These are, however, of a relatively temporary nature and can effectively be controlled through the Environmental Management Plan.

- Determining a visual resource in absolute terms is not achievable. Evaluating a landscape's visual quality is both complex and problematic. Various approaches have been developed but they all have one problem in common: unlike noise or air pollution, which can be measured in a relatively simple way, for the visual landscape mainly qualitative standards apply. Therefore, subjectivity cannot be excluded in the assessment procedure (Lange, 1994). Individually there is a great variation in the evaluation of the visual landscape based on different experiences, social level and cultural background. Exacerbating the situation is the inherent variability in natural features. Climate, season, atmospheric conditions, region, and sub-region all affect the

attributes that comprise the landscape. What is considered scenic to one person may not be to another (NLA, 1997).

Localised visual perceptions of the economically depressed communities of the population have not been tested as these may be influenced rather by the economic and job opportunities that will exist than the direct visual perception of the project.

If the study, however, determined that the negative visual impact is of such a magnitude and significance that it will seriously influence the decision on whether or not to build, it will then be necessary to test and determine the visual perceptions of neighbouring communities. Such a study is involved, costly and time-consuming.

4 DESCRIPTION OF THE AFFECTED ENVIRONMENT

4.1 Description of the works and associated elements

The proposed Thukela Water Project, as presently configured for feasibility purposes, is comprised of the following development components:

- Two large storage dams:
  - Jana Dam in the Thukela River (Figure 4.1) approximately 15km downstream of the confluence of the Thukela and Klip Rivers;
  - Mielietuin Dam in the Bushman's River (Figure 4.2) immediately upstream of the western boundary of the Weenen Nature Reserve.

- Aqueducts linking the proposed dams and the existing Kilburn Dam from which water will be transferred to the Vaal River System (six provinces) via the existing Drakensberg Pumped Storage Scheme. At present, three aqueduct options are under investigation:

  - Open canals (including limited pipelines and siphons, Figures 4.3 and 4.4);
  - A pipeline ranging in size from 1.6 to 2.7m in diameter (Figure 4.3);
  - A combination of open canals and a pipeline.

- Appurtenant infrastructure including pump stations, access roads and bulk electricity supply.

The Thukela Water Project is presently being planned to deliver $15m^3/s$ to Kilburn Dam for transfer to the Vaal River System.

Figure 4.1: Locality of Jana Dam

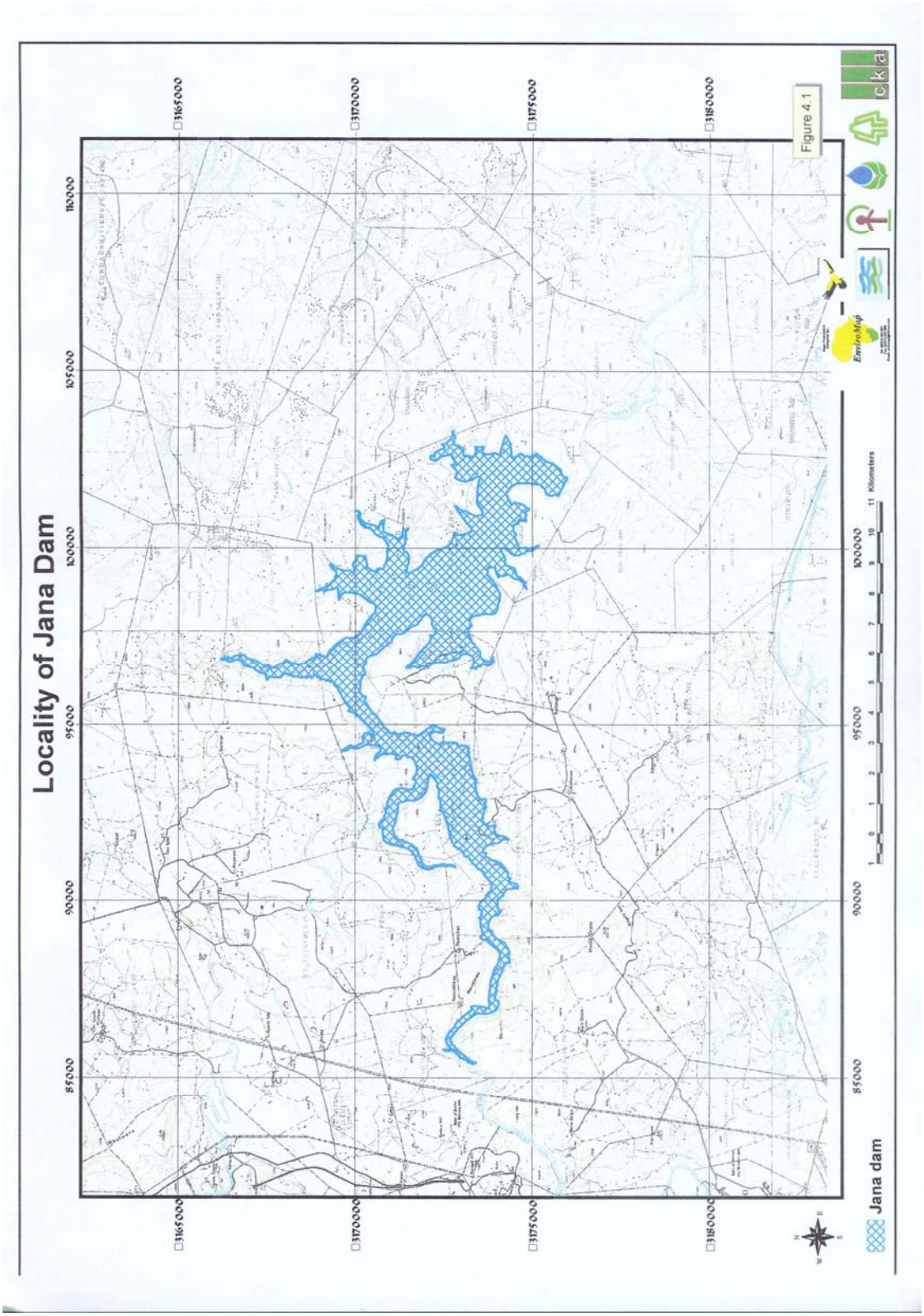


Figure 4.2: Locality of Mielietuin Dam

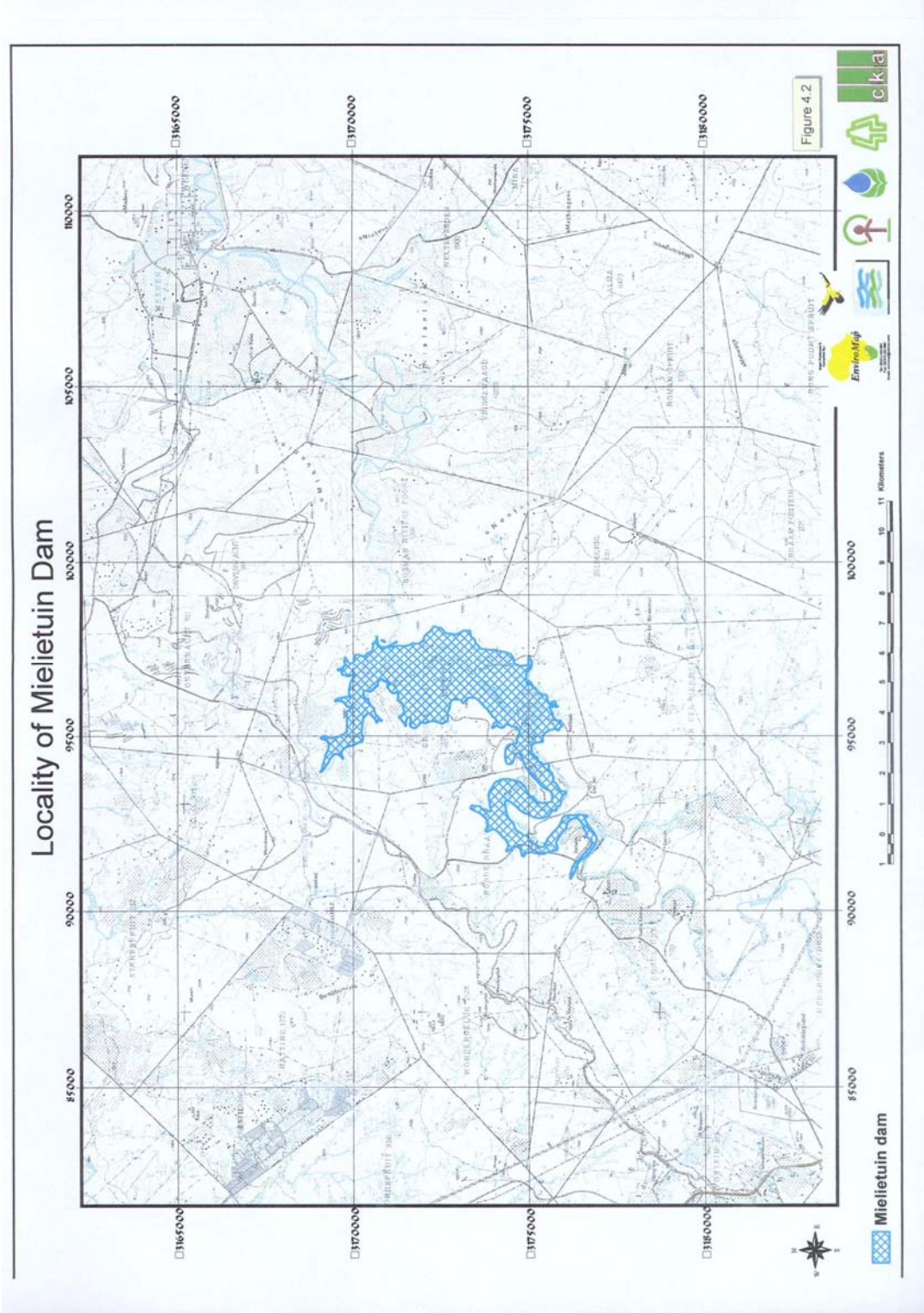


Figure 4.3: Section through aqueducts

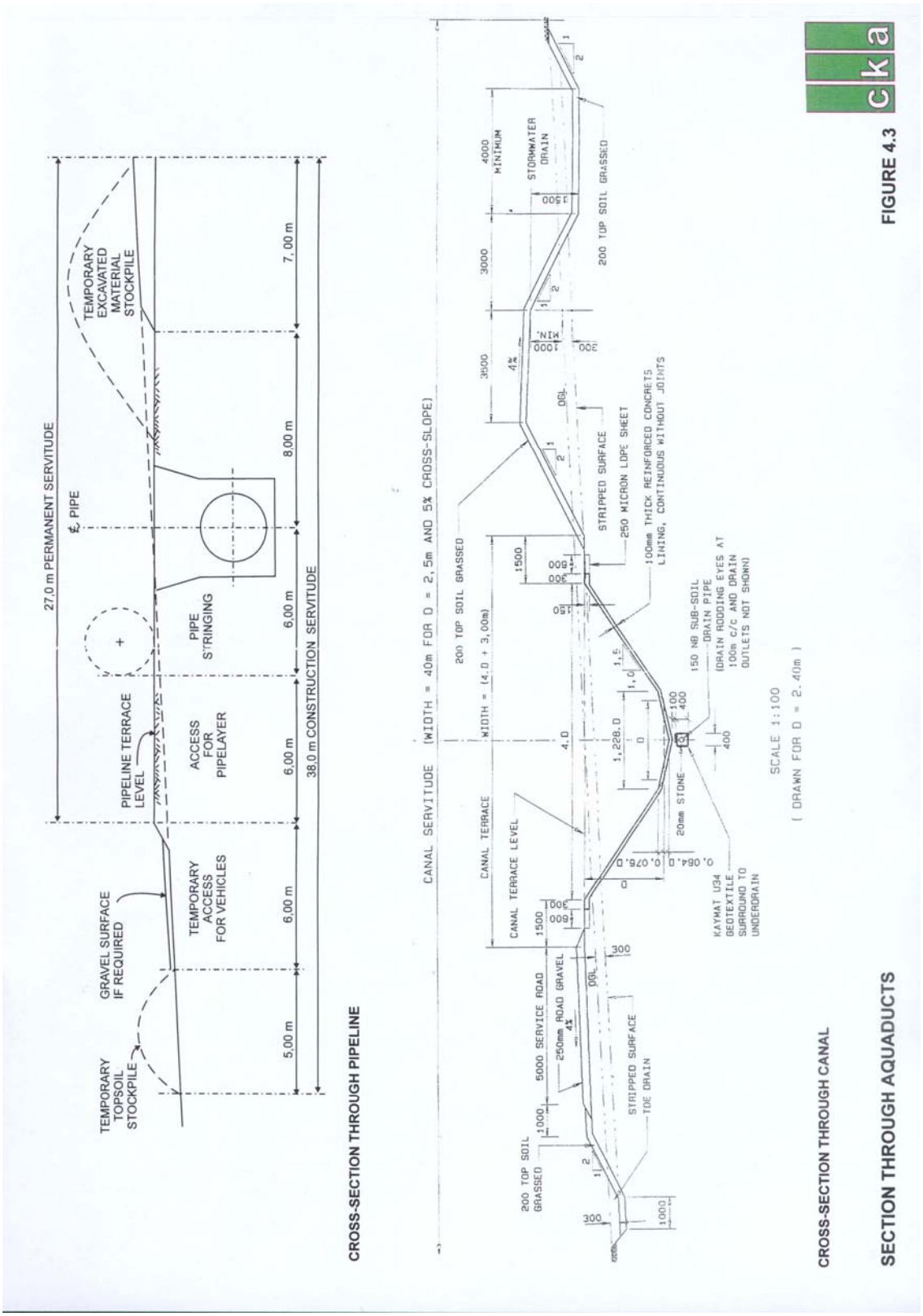
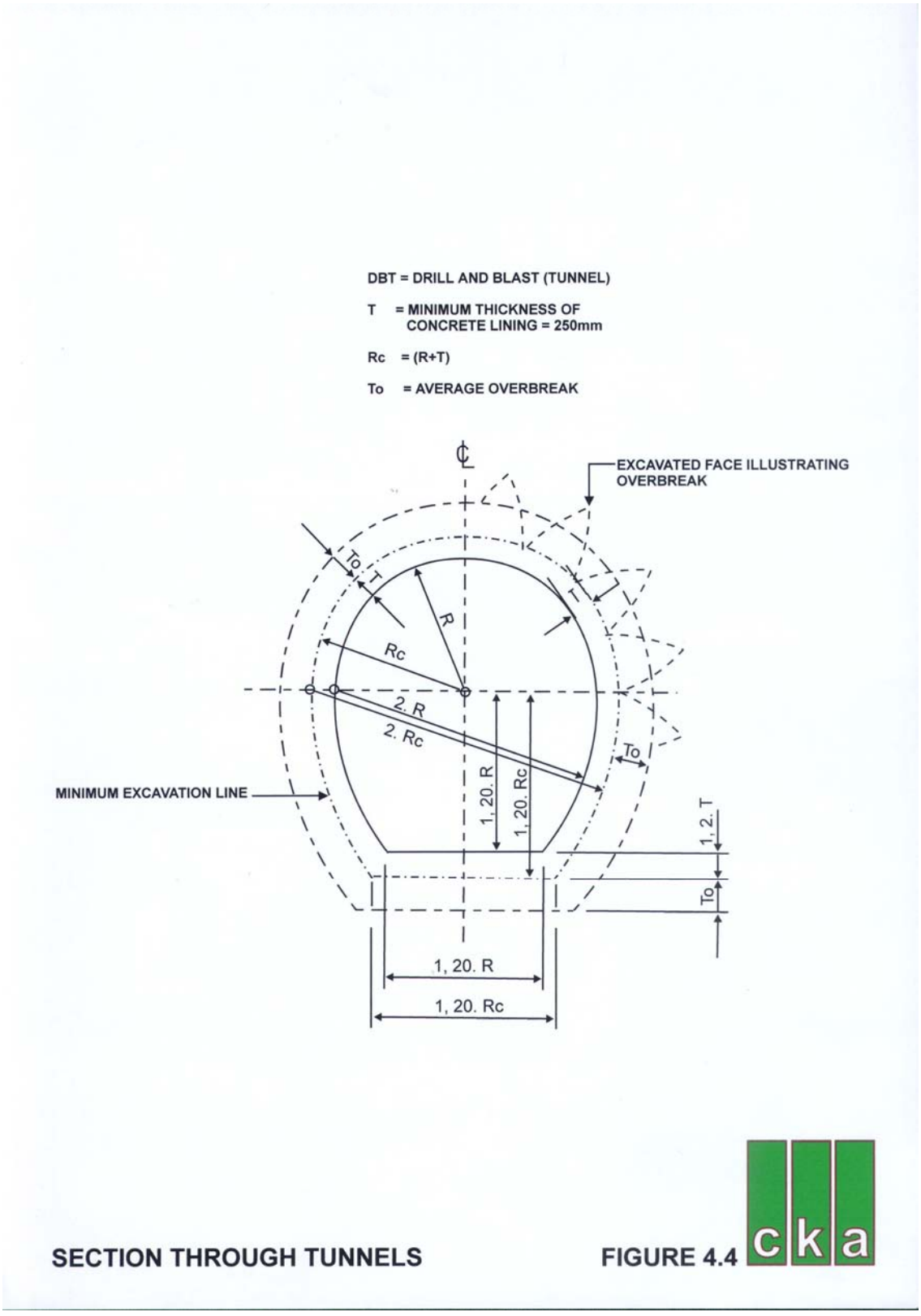


Figure 4.4: Section through tunnels



4.1.1 General description of the dams

- Jana Dam

A range of dam heights of between 135 and 190m (FSL RL 835 - 890m) is currently being investigated for the Jana Dam site. The preferred height is 860m. The dam type will be either a curved RCC gravity structure, with a main spillway over the dam wall and an auxiliary spillway down the left flank, or a concrete faced rockfill embankment, with the spillway over a shoulder on the left flank. In the latter case, spillway flows will be returned into the river course almost 1.5km downstream of the dam toe. In the case of an RCC dam to FSL RL 860m, the total concrete volume is in the order of 2.8 million m^3.

In the case of a rockfill dam to the same storage, 11.5 million m^3 of rock would be required. A total of 8 million m^3 of material would have to be excavated for the left shoulder spillway and plunge pool for a dam to FSL 860m. High capacity outlets will be included on the dam to allow releases of up to 330m^3/s, of which up to 80m^3/s can be abstracted from a selected level, with the balance being routed straight through a bottom outlet.

- Mielietuin Dam

A range of dam heights of between 80 and 103m (FSL RL 1010 - 1020m) is currently being investigated for the Mielietuin Dam site with a preferred height of 1 025m. The dam types being considered include an RCC arch structure, with the spillway uncontrolled and discharging over the dam wall into a plunge pool created by a tailpond dam and a concrete faced rockfill embankment, with an uncontrolled spillway chute down the right abutment.

Construction of the RCC arch would require approximately 2.2 million m^3 of fill. Outlets will be included on the dam to allow releases of up to 100m^3/s, of which up to 25m^3/s can be abstracted from a selected level, with the balance being routed straight through a bottom outlet. At this site, the RCC arch is showing a clear advantage on the basis of engineering aspects and construction cost.

4.1.2 General description of the aqueducts

- Canal-type aqueduct route

Table 4.1 provides a breakdown of the sections of the canal-type aqueduct route (183.55km). The route begins at the two dams, Jana and Mielietuin, and runs in a westerly direction via three intermediate pump stations, before terminating via a chute into Kilburn Dam.

A trapezoidal canal geometry has been adopted with side slopes of 1v:1,5h. The overall depth of lined canal, D, equals the canal bed width and this varies depending on the design flow and the longitudinal grade of the canal. It allows for 0.3m freeboard.

The design flows adopted for the Intermediate Level Study are 15.5m^3/s, with contributions of 11m^3/s from the Jana Dam aqueduct leg and 4.5m^3/s from the Mielietuin Dam aqueduct leg.

The longitudinal canal grades vary from 1:2000 to 1:6000.

A 100mm thick continuous reinforced concrete lining has been adopted for the canal, together with a central sub-soil drain. A 1.50m wide berm will be provided on each side of the crest of the canal lining and this will incorporate a 1.20m wide x 250 micron thick polyethylene sheet 150mm below the grassed surface of the berm.

On the downhill side of the canal, a 5.0m wide gravel service road and toe drain will be provided. On the uphill side of the canal, stormwater banks and drains are to be provided. The stormwater drains will transport stormwater alongside the canal to stormwater cross-drainage structures such as culverts and stormwater superpassages.

Where canals are found in cut, the stormwater drains will be provided above the edge of the cut and along intermediate level berms in order to prevent runoff from the cut face entering the canal. Where the canals are found in embankment, a culvert will be incorporated, allowing stormwater from the uphill side of the canal to drain into the culvert forebay.

Other ancillary structures include longweirs, reject spillways and road bridges. Longweirs retain water below the canal crest during times of low or no flow, while in times of increased flow, reject spillways are designed to discharge excess water. Road bridges will be provided at locations agreed with the land owners/users.

Siphons, tunnels and box canals will also be incorporated in the canal-type aqueduct route. Siphons are inverted siphon pipes that will be located along the canal route where there are river or stream valleys; while tunnels will be located along the canal route where there are ridges. Box canals are located along the canal route where steep ground cross-slopes exceed 1v:3h.

The servitude width for the canal varies from 44m to 56m depending on the ground cross-slope and the canal depth D. Note, however, that this can increase at canal bends or where the canal is found in cut or embankment.

Each of the intermediate pump stations includes a 135x135x4.0m deep reservoir which lies in-line with the canal route and just upstream of the intermediate pump station.

Table 4.1: Breakdown of canal-type aqueduct route

Canal-Type Aqueduct Route Section	Intermediate Flows (m^3/s)	Depth D (m)	Length (km)
Jana Dam to Aqueduct Junction	11,0	2,1	32,2
Mielietuin Dam to Aqueduct Junction	4,5	1,8	24,1
Aqueduct Junction to Shelly Pump Station	15,5	2,7	36,6
Shelly Pump Station to Rietfontein Pump Station	15,5	2,5	21,4
Rietfontein Pump Station to Woodford Pump Station	15,5	2,5	31,2
Woodford Pump Station to Kilburn Dam	15,5	2,5	38,2
TOTAL			183,5

- Pipeline-type aqueduct

A breakdown of the pipeline-type aqueduct route sections at Intermediate Level Study is provided in Table 4.2 below. The pipeline route also begins at the two dams and runs in a westerly direction. This time, however, via only two intermediate pump stations, before terminating via a chute into Kilburn Dam.

For the pipeline-type aqueduct route, the design flows adopted for the Intermediate Level Study are $15m^3/s$, with contributions of $11m^3/s$ from the Jana Dam aqueduct leg and $4m^3/s$ from the Mielietuin Dam aqueduct leg.

The pipes are laid in trenches of widths 1200mm wider than the pipe diameter, providing for 600mm side allowance either side of the pipe. There is to be a minimum cover of 1800mm above the crown of the pipe and trench depths are to allow for 300mm bedding below the pipe. The pipes themselves will be butt-welded steel pipe sections coated internally and externally for corrosion protection.

Ancillary structures include ventilated flowmeter chambers, ventilated valve chambers and concrete route marker beacons. Valve chambers will be spaced at intervals of 500m to 750m.

The permanent servitude width of the pipeline-type aqueduct route is 27m. During construction temporary access roads will be provided and, thus, the construction servitude width is 38m, although it is noted that this construction servitude width could be 10m greater.

Each of the intermediate pump stations include a 100x100x8.1m deep reservoir which lies in-line with the pipeline route and just upstream of the intermediate pump station.

Table 4.2: Breakdown of pipeline-type aqueduct route

Pipeline-Type Aqueduct Route Section	Intermediate Flows (m3/s)	Diameter D (m)	Length (km)
Jana Dam to Aqueduct Junction	11,0	2,4	25,6
Mielietuin Dam to Aqueduct Junction	4,0	1,8	19,7
Aqueduct Junction to Rustenburg Pump Station	15,0	3,0	23,8
Rustenburg Pump Station to Bethany Pump Station	15,0	3,0	22,1
Bethany Pump Station to Kilburn Dam	15,0	3,0	30,0
TOTAL			121,3

4.2 Description of the natural physical elements

4.2.1 Jana Dam

- Landform

The Jana Dam site is located in the Thukela River within a steep sided, relatively narrow, gorge (Appendix 1, Figures 1 & 2 and Appendix 2, Figures 5, 6, 7 and 8). The dam basin opens up on the north-western side into a flatter shallow plain emphasising a highly diverse topographical landscape.

The landform is dramatic with steep-sided kranses and steeply rolling topography, both to the north and south of the Thukela River.

- Vegetation

The vegetation of the Thukela Valley has been classified by Low and Rebelo (1996) as Valley Thicket of the Thicket Biome (Appendix 1, Figure 1 and Appendix 2, Figures 5, 6, 7 and 8). The flora has transitional Tongoland-Pondoland and Afromontane affinities.

The upper slopes and the crests of the hills (Appendix 2, Figures 9, 10 and 11) form a transition into the Natal Central Bushveld of the Savanna Biome which occupies a large portion of the KwaZulu-Natal Midlands.

The vegetation is open savanna with scattered trees of several *Acacia* species. The herbaceous layer is quite variable.

- Views / Visibility

The elevated landform provides for dramatic and panoramic views across the dam basin to the extended distant hills (Appendix 1, Figures 1 & 2, and Appendix 2, Figures 5 & 6). Views from within the dam basin are limited by the rising and surrounding landforms (Figure 4.5).

Extended views are possible, especially from the southern hills surrounding the gorge. These views are relatively undisturbed with little evidence of human intrusion.

Critical viewpoints are limited to elevated positions occupied by game and cattle farmers (e.g. Emaweni Game Ranch) (Appendix 1, Figure 1 and Appendix 2, Figure 6) many of whom provide hunting and ecotourism facilities.

The dam wall and the adjacent ancillary works will be visible and intrusive due to the considerable height of the dam wall and the elevated viewing points surrounding the dam wall area. Any physical change to the surface of the landscape slopes would be highly visible due to the elevated position of the works and the viewer. Night lighting of project components below the elevated viewpoints will be highly visible.

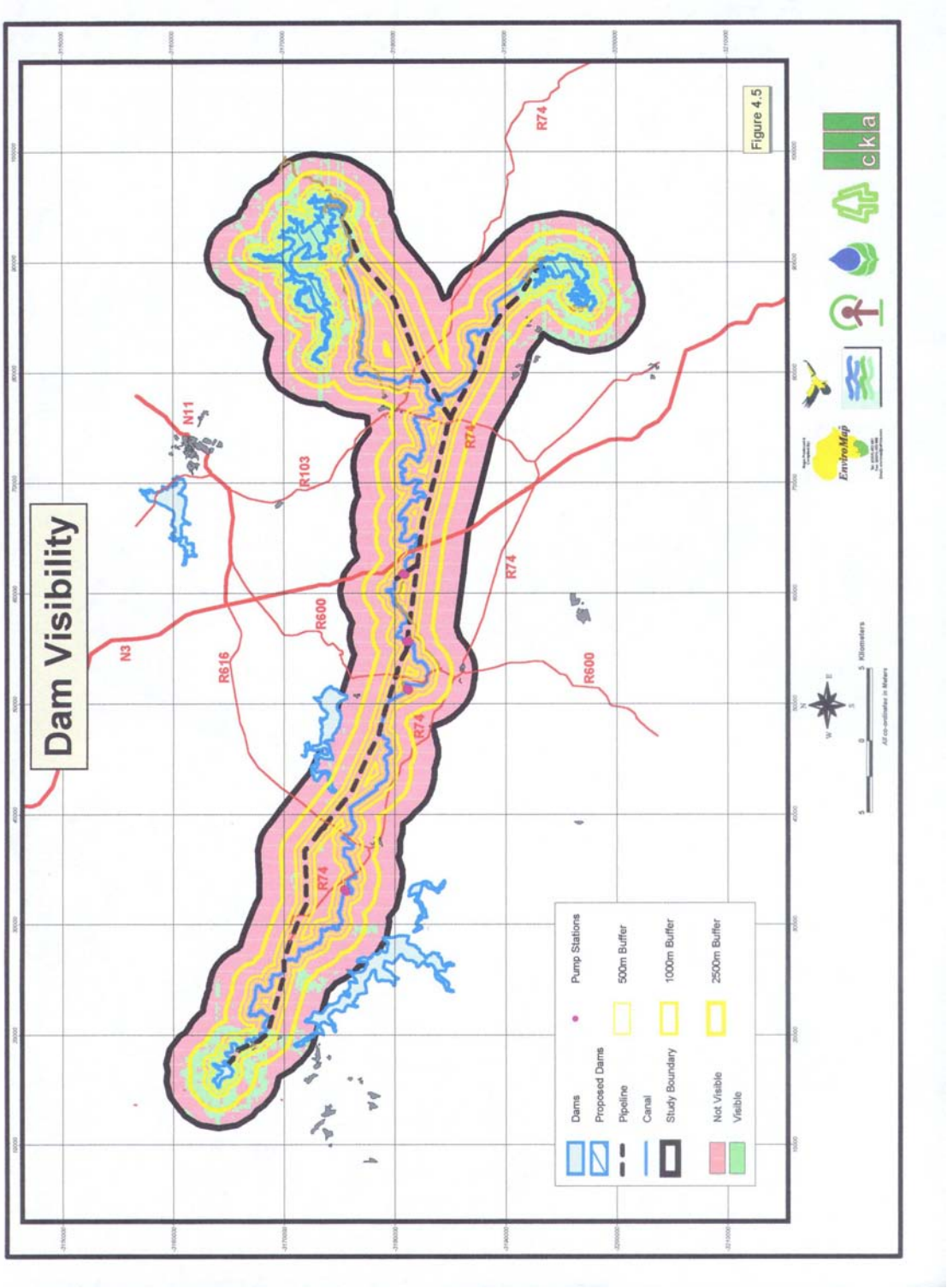
Views of the dam wall, spillways and ancillary works contrast with the existing wilderness quality (Appendix 2, Figure 6) of the surrounding landscape as the forms of the structures are not compatible with the landscape.

Views of the water body away from the dam wall and works area are more compatible and sympathetic with the landscape as the edges follow the contours of the landscape. Views towards and across the water body could be pleasing and could enhance the ecotourism potential within this viewshed and along the shoreline.

- Genius loci

The spirit of place is provided by the dramatic and protective background of rising hills and associated distant views; the evident lack of surrounding human habitation to the north-east, east and south; the limited infrastructure and the seemingly rural bushveld / grassveld vegetation (Appendix 2, Figure 6).

Figure 4.5: Dam visibility



These aspects impart a distinct rural and visually attractive character to the area. This character reinforces a timeless ambience of a rural / wilderness setting.

- Visual quality and character

The visual quality of the Jana Dam basin and surrounds could be considered high due to the interplay of interesting landscape elements such as the massive scale of the slopes, the open and enclosed nature of the gorge and the unspoilt extended views (Appendix 1, Figure 1 and Appendix 2, Figures 5 & 6). The quality of this visual environment is comparable to some of the most scenic landscapes within the 'bushveld' regions of KwaZulu-Natal. This natural landscape helps to unify the viewed setting resulting in an intact and vivid impression.

The visual quality to the north-west can be regarded as moderate due to the open plain, subsistence farming and human habitation.

- Land uses

The area is surrounded on the south and east by predominantly cattle and game farmers (Appendix 2, Figure 12). This activity has retained the "bushveld" ambience, which promotes the wilderness quality.

The area situated to the north and north-west has been modified by subsistence farming and rural settlement.

- Scale of the landscape

The vertical scale of the Thukela Valley is large due to the prominent vertical definition of the hills and gorges. When viewed from the surrounding hills, relatively tall structures or moderate changes to landform can be readily accommodated due to the presence of the backdrop of the surrounding landscape.

The massive scale of the dam wall and spillway will create a major alteration to the landscape which will contrast greatly with the surrounding landscape and be contrary to the wilderness quality and ambience, irrespective of the moderate inherent visual absorption capacity of the landscape.

4.2.2 Mielietuin Dam

- Landform

The Mielietuin Dam is located in the Bushman's River with the dam wall situated across the upper end of the narrow Bushman's River Poort, which is flanked to the north by the uMthunzini Mountains and to the south by the uNanthethe Mountains.

The landform, west of the river, is rolling topography (Appendix 1, Figure 3). East and south of the river the landform rises steeply to the relatively flat uNanthethe Plateau (Appendix 2, Figure 14). The tailend of the dam narrows to the west where the landform becomes rapidly steeper (Appendix 1, Figure 4).

- Vegetation

The vegetation of the Bushman's River Valley, as for the Thukela Valley, has been classified by Low and Rebelo (1996) as Valley Thicket of the Thicket Biome. The flora has transitional Tongoland-Pondoland and Afromontane affinities.

Much of the low-lying vegetation has been disturbed by grazing and agriculture (Appendix 1, Figures 3 & 4). This has led to open grasslands on the lower lying areas and irrigated lands in the floodplain.

The upper slopes and the crests of the hills form a transition into the Natal Central Bushveld of the Savanna Biome.

- Views / Visibility

The views of the dam basin from the eastern plateau (Appendix 2, Figure 14) are dominant, uninterrupted and extensive (Figure 4.5). Large expanses of the water body will be visible from the plateau, as will any scarring or muddy edges, should rapid drawdowns of water level occur. Any physical change within the viewshed would be highly visible due to the elevated position. Night lighting of project components below would be highly visible from the higher vantage points.

Views from the west of the dam basin would be limited due to the relative flatness of the rolling terrain (Appendix 1, Figure 3) with only portions of the water body visible at any one time.

Critical viewpoints are considered those from the road (Appendix 1, Figures 3 & 4), linking the R74 and R103, which will skirt the western shoreline before rising to the elevated regions of the plateau from where elevated views of the tailend of the dam basin will be possible.

Views of the dam wall will be restricted to only the elevated views from either side of the Bushman's River Poort, which limits the visibility to a relatively narrow strip.

- Genius Loci

The genius loci of the dam basin area can be described as rural agriculture (Appendix 1, Figures 3 & 4 and Appendix 2, Figure 14). This 'spirit of place' is provided by the flat to rolling, open and extensive landscape utilised for grazing and crop production, the seemingly rural bushveld / grassveld vegetation, the scattered farmsteads and outbuildings and the lack of industrial images.

These aspects impart a distinct rural and visually attractive character to the area. This character reinforces an ambience of a rural / agricultural setting.

- Visual quality and character

The visual quality of the Mielietuin Dam basin can be regarded as moderate due to the mix of agriculture, bushveld, farmsteads and tarred roads. The setting is intact and unified by the surrounding topography which, together with the open grasslands, scattered trees and agriculture, provide vividness to the viewed setting.

- Land uses

The area borders on the Weenen Nature Reserve which lies to the north of the dam. The dam basin floodplain is utilised for irrigated farming lands (Appendix 1, Figure 4) while the surrounding area is mainly that of stock grazing. It is anticipated that with the dam in place land uses may change in favour of ecotourism related land uses.

- Scale of the landscape

The vertical and horizontal scale, when viewed from the road, can be regarded as broad, extensive and horizontal due to the gently sloping topography covered by grazing lands and shrub / scattered trees and grasslands. The horizontal scale is truncated in the east, north and south by the rising hills and escarpment.

The capacity of the landscape to absorb the form of changes is regarded as low to moderate.

Project structures or changes to landform which are elevated will become highly visible from viewpoints nearby because of the possibility of project features breaking the skyline through silhouette or the visual contrast caused by the removal of existing vegetation. These objects and changes in landform would, however, blend with the landform at greater distances or

from higher elevations because the relief is diverse and colours, textures and shadows assist in obscuring these changes.

4.2.3 Aqueducts

- Landform

The section of the aqueduct routes east of the Colenso / Estcourt divide consists of a relatively diverse landscape with rolling topography, well-defined valleys created by the Thukela, Bushman's and Bloukrans Rivers, rising escarpments and narrow gorges (Appendix 2, Figures 9, 10, 11, 12, 13 and 15).

The landform west of the Colenso / Estcourt divide consists predominantly of a low undulating and featureless landscape interrupted only by minor drainage ways and rounded hills (Appendix 2, Figures 16-21).

The landform west and south of Bergville is dramatic due to the steep Drakensberg escarpment which is situated on the visual periphery.

- Vegetation

The vegetation through which the aqueducts are aligned is classified as Natal Central Bushveld of the Savanna Biome by Low and Rebelo (1996), terminating on the edge of the north-eastern mountain grassland of the Grassland Biome.

The vegetation is predominantly open savanna with scattered trees. Much of the area has been modified by cattle farming and agriculture resulting in fairly open grassland and exotic plantations and windbreaks (Appendix 2, Figures 16-21).

- Views / Visibility

The relatively flat landscape (Appendix 2, Figures 16-21) creates an uninterrupted viewshed that extends often beyond a distance of five kilometres (Figures 4.6 and 4.7). Any vertical object within this viewshed is readily visible, depending on its size and distance from the viewer (Figure 4.8).

The views are restricted by the flat topography due to the lack of elevated viewpoints.

Figure 4.6: Pipeline visibility

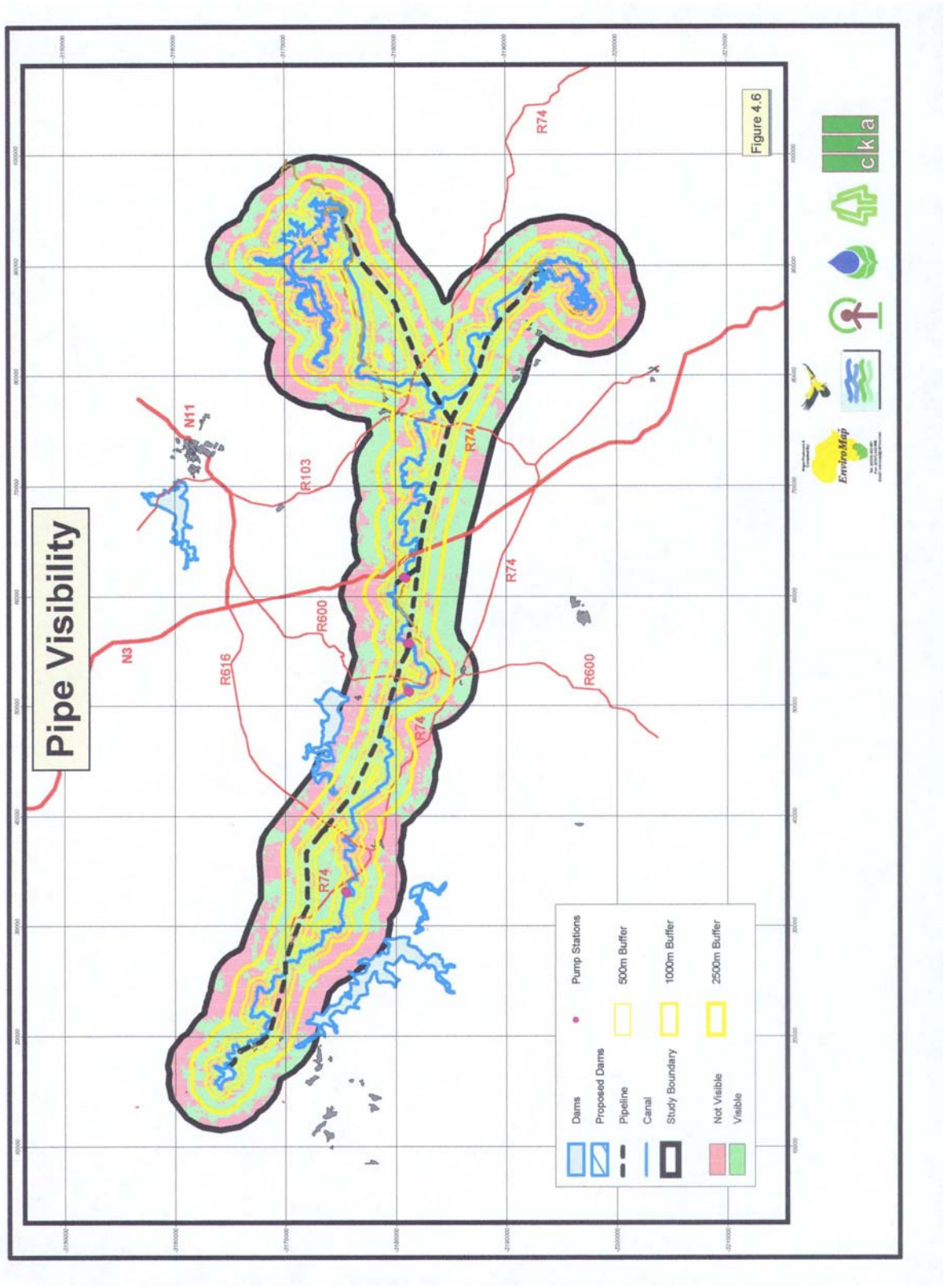


Figure 4.7: Canal visibility

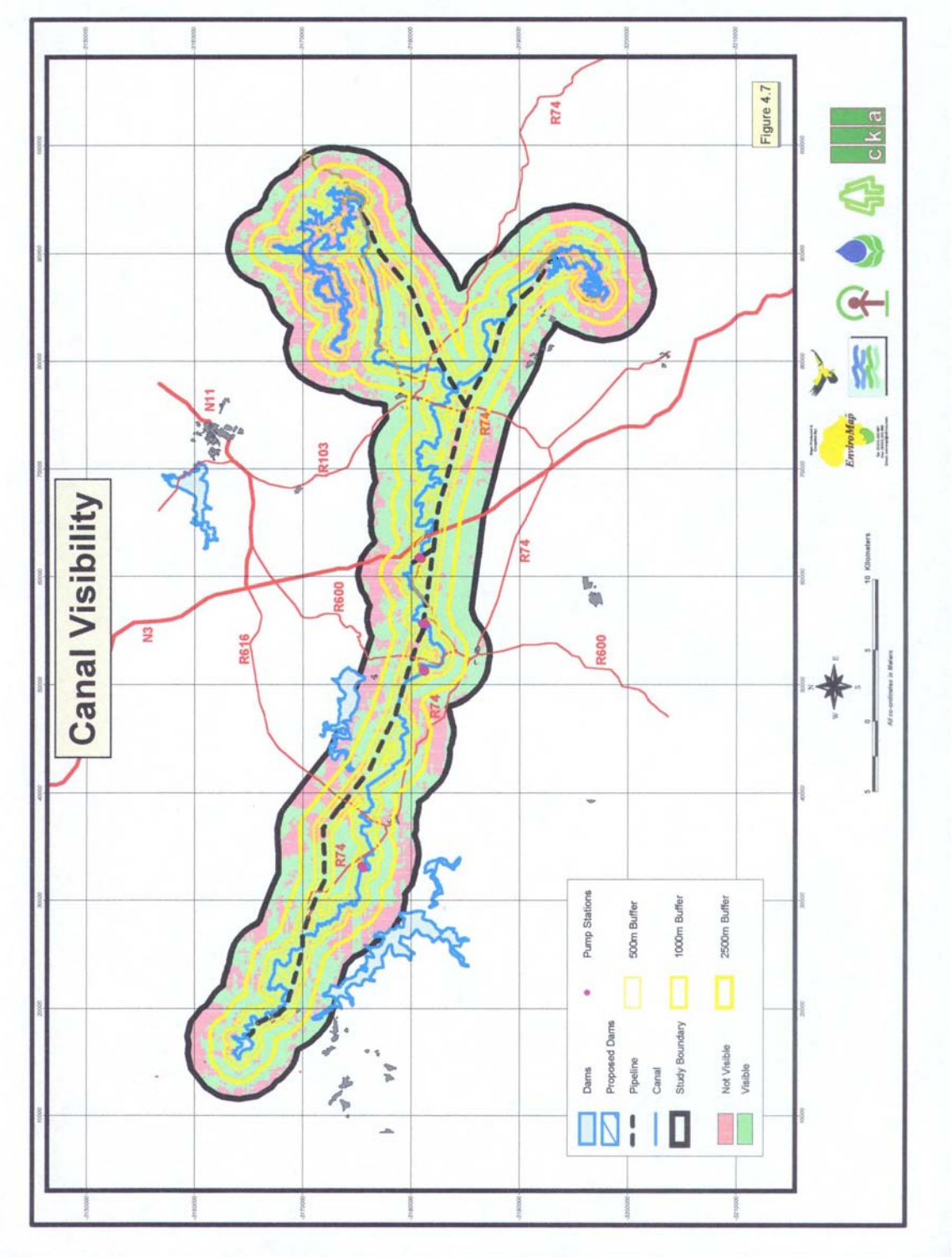
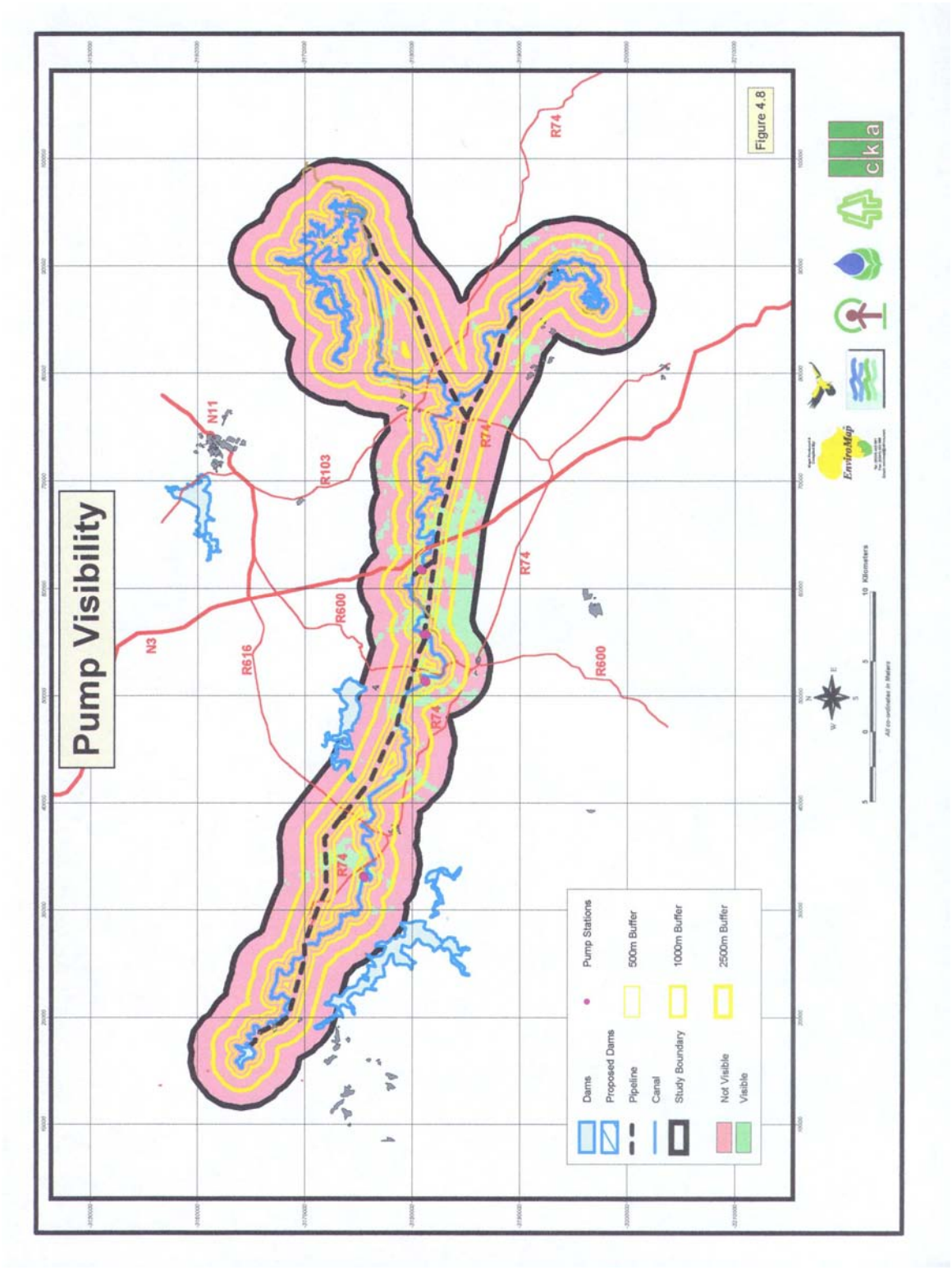


Figure 4.8: Pump station visibility



Linear developments such as canals, roads and pipelines, when aligned along the contour, do not significantly contrast with the landscape as these do not readily break the skyline where they could be viewed in silhouette.

- Genius loci

The genius loci of the routes and surrounding area can be described as rural agricultural (Appendix 2, Figures 16-21). The 'spirit of place' is provided by the flat, undulating, open and extensive landscape utilised for grazing and agricultural production, the small communities such as Winterton, Bergville and Frere, the lack of major industrial images and the scattered farmsteads. This is reinforced by the dominating Drakensberg which surrounds and encompasses the image.

These aspects impart a rural and visually attractive character to the surrounding landscape. This character reinforces an ambience of a rural / agricultural setting.

- Visual quality and character

The visual quality is the visual significance given to landscape determined by cultural values and the landscape's intrinsic physical properties (Smardon *et al.*, 1986). While many factors contribute to a landscape's visual quality, they can ultimately be grouped under three headings: vividness, intactness and unity.

The visual quality between Colenso and Bergville is considered to be low to moderate because there is little of visual interest within the relatively featureless landscape. The scene is not vivid nor does it have elements that unify the view. Further west the Drakensberg forms a dramatic backdrop which raises the visual quality considerably.

The visual character of an area has different elements that provide an overall perceived ambience. In the consideration of the visual character of the site it is important to include not only the internal land use but that of the surrounding land as well.

The visual character of the routes is a mixture of pastoral and arable agriculture, and small-holding residential. This is characterised by the surrounding open lands, the scattered farmsteads and the small rural communities.

- Land use

The aqueduct routes are situated within a landscape utilised predominantly for stock grazing and arable agriculture (Appendix 2, Figures 18 & 19). Other land uses include wood lots, shelter breaks and rural residential.

The routes follow the general direction of the R74 from Estcourt to Killburn Dam via Bergville, passing local towns and settlements such as Colenso, Frere and Winterton.

- Scale of the landscape

Visual scale is the apparent size relationships between landscape components or features and their surroundings (Smardon *et al.*, 1986).

The broad, extensive and horizontal scale of the landscape with little vertical definition is due, primarily, to the gently sloping topography covered with grazing and agricultural lands and shrub and grassland. Because of this flatness, a tall structure would be visible for an extended distance. Low structures such as canals, pipelines, single-storey buildings, roads, borrow pits, etc. would not be readily visible due to the lack of elevated viewpoints.

The vertical scale of the Midlands is large due to the definition of the rolling hills. The horizontal scale of the landscape is truncated on the visual periphery by the hills and valleys. Tall structures or changes to the landform, which are elevated or viewed from above will become highly visible from critical viewpoints. This is due to the possibility of the silhouette breaking the skyline or the visual contrast caused by the removal of vegetation. These objects and changes in landform would, however, blend with the landform at greater distances due to the colours, textures and shadows assisting in obscuring and blurring these changes.

The horizontal and vertical scale of the landscape west and south of Bergville is reduced by the massive scale of the existing Drakensberg mountains which will assist to reduce the visual intrusion of any tall structure in the area.

5 IDENTIFICATION OF RISK SOURCES

Various risk sources for the visual impact have been identified for the construction and operation phases and can be classified as both negative and positive.

5.1 Construction phase

It is anticipated that the major risk source during construction would be:

5.1.1 Negative risk sources

- cut and fill slopes become highly visible if not re-vegetated and shaped to blend in with the existing topography;
- excessive cleaning and stripping of topsoil for site offices, servitudes and temporary access road;
- the relatively random and disorganised lay down of building materials, vehicles and offices;
- the extent and intensity of the security and construction lighting at night;
- dust from construction activities;
- open and unrehabilitated landscape scarring;
- uncontrolled exploitation of borrow pits and quarries without compliance to environmental controls related to aesthetic rehabilitation;
- high seed bank of black wattle (*Acacia mearnsii*) in the topsoil can lead to the uncontrolled spread of this exotic invader plant species along the edges of the aqueducts. This could create a treed edge that is visually contrary to the low grasslands; and
- location and layout of construction workers village if located in proximity of works area.

5.1.2 Positive risk sources

- image of construction activity could lead to a perceived view of progress and benefit to the community.

5.2 Operational phase

5.2.1 Negative risk sources

- site engineering, such as cuts and fills, could remain aesthetically incompatible with surrounding landscape. Edges may not blend in with the landscape or cut slopes may be too steep to be adequately re-vegetated;

- night lighting of components such as dam walls and pump stations could create a beacon in an unlit rural setting; and
- areas and/or specific sites of high aesthetic value may be disfigured by the introduction of a project component within the viewshed resulting in a permanent change to the existing visual quality of visually sensitive areas.

5.2.2 Positive risk sources

- new routes could present and promote existing high quality visual attributes of an area not normally exposed to the general public;
- the presentation of a large water body such as the Mielietuin Dam in a very scenic landscape to the road users. This scenic experience may attract visitors or tourists to an area not normally travelled for the purpose of the experience;
- the visual image of a large water body within a scenic area may attract allied ecotourism activities to the area;
- the Thukela Water Project could be the visual affirmation of progress and prosperity for the region.

6 IMPACT DESCRIPTION AND ASSESSMENT

6.1 The visual analysis

This section describes the aspects which have been considered in order to determine the intensity of the visual impact on the area. The criteria includes the area from which the project can be seen (the viewshed), the viewing distance, the capacity of the landscape to visually absorb structures and forms placed upon it (the visual absorption capacity), and the appearance of the project from important or critical viewpoints within established and existing planned land uses.

The focus of this study is specifically on the main project components such as the dams and aqueducts and not on the ancillary infrastructure.

6.1.1 The viewshed

The viewshed is a topographically defined area which includes all possible observation sites from which the project will be visible. The boundary of the viewshed, which connects high points in the landscape, is the boundary of possible visual impact (Alonso *et al.*, 1986). Local variations in topography and man-made structures would cause local obstruction of views (Figures 4.5 to 4.8).

6.1.2 The viewing distance

Visual distance zones have been defined by distances of 500, 1 000, 2 500 and 5 000m from the project components (Figures 4.5 to 4.8).

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988).

Thus, the visual impact at 1 000m would be approximately a quarter of the impact as viewed from 500m. Consequently, at 2 000m, it would be one sixteenth of the impact at 500m. The view of the project components would appear so small from a distance of 5 000m or more that the visual impact at this distance is insignificant. On the other hand, the visual impact of the project components from a distance of 500m or less would be at its maximum.

6.1.3 Critical views

Sections from critical viewpoints to selected components have been plotted with the vertical scale being exaggerated twenty times in order to illustrate the change in topography. The line of sight drawn towards the components from the observer indicates the extent to which the

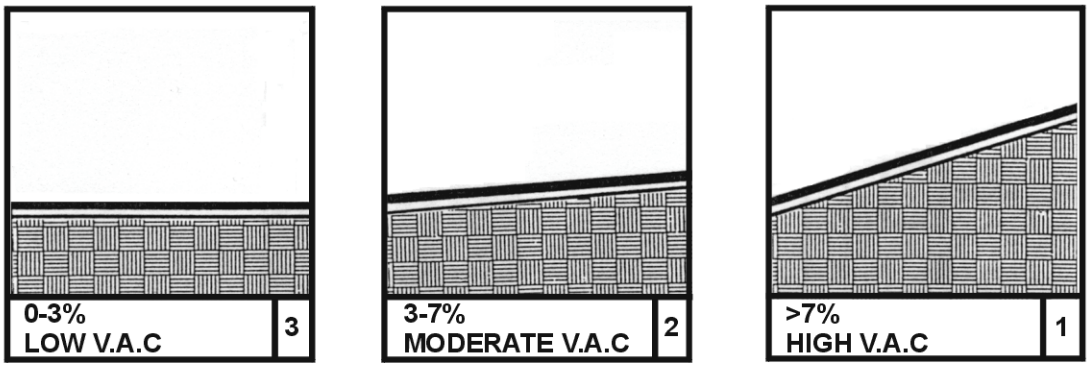
most prominent elements are not screened by intervening landforms or structures (Figures 6.7 and 6.8).

6.1.4 The visual absorption capacity (VAC)

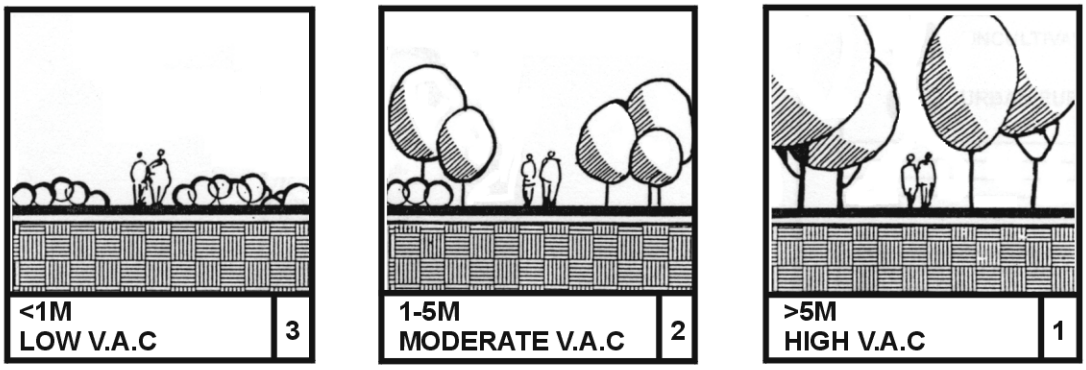
The visual absorption capacity is a measure of the landscape's ability to visually accept / accommodate or embrace a development. Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely, areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them. In this case, the VAC has been defined as a function of three factors (Figure 6.1).

- Slope (Figure 6.2)
- Visual pattern (landscape texture) with regard to vegetation and structures (Figure 6.3)
- Vegetation height (Figure 6.4)

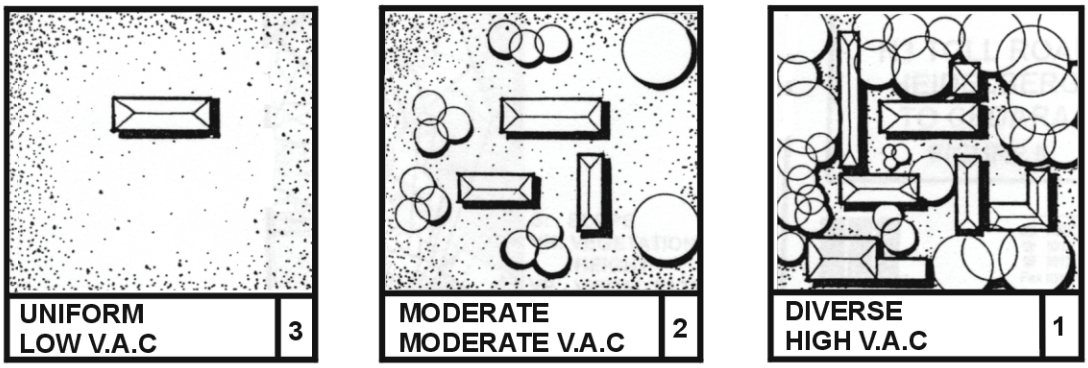
Three ranked categories are defined within each factor and each category has been assigned a numerical value to enable an arithmetic calculation of the VAC of different zones. The VAC factors, categories and their values are shown in Table 6.1.



V.A.C FACTOR: SLOPE



V.A.C FACTOR: VEGETATION HEIGHT



V.A.C FACTOR: VISUAL PATTERN

Figure 6.1: Visual absorption capacity criteria

Figure 4.5: Dam visibility

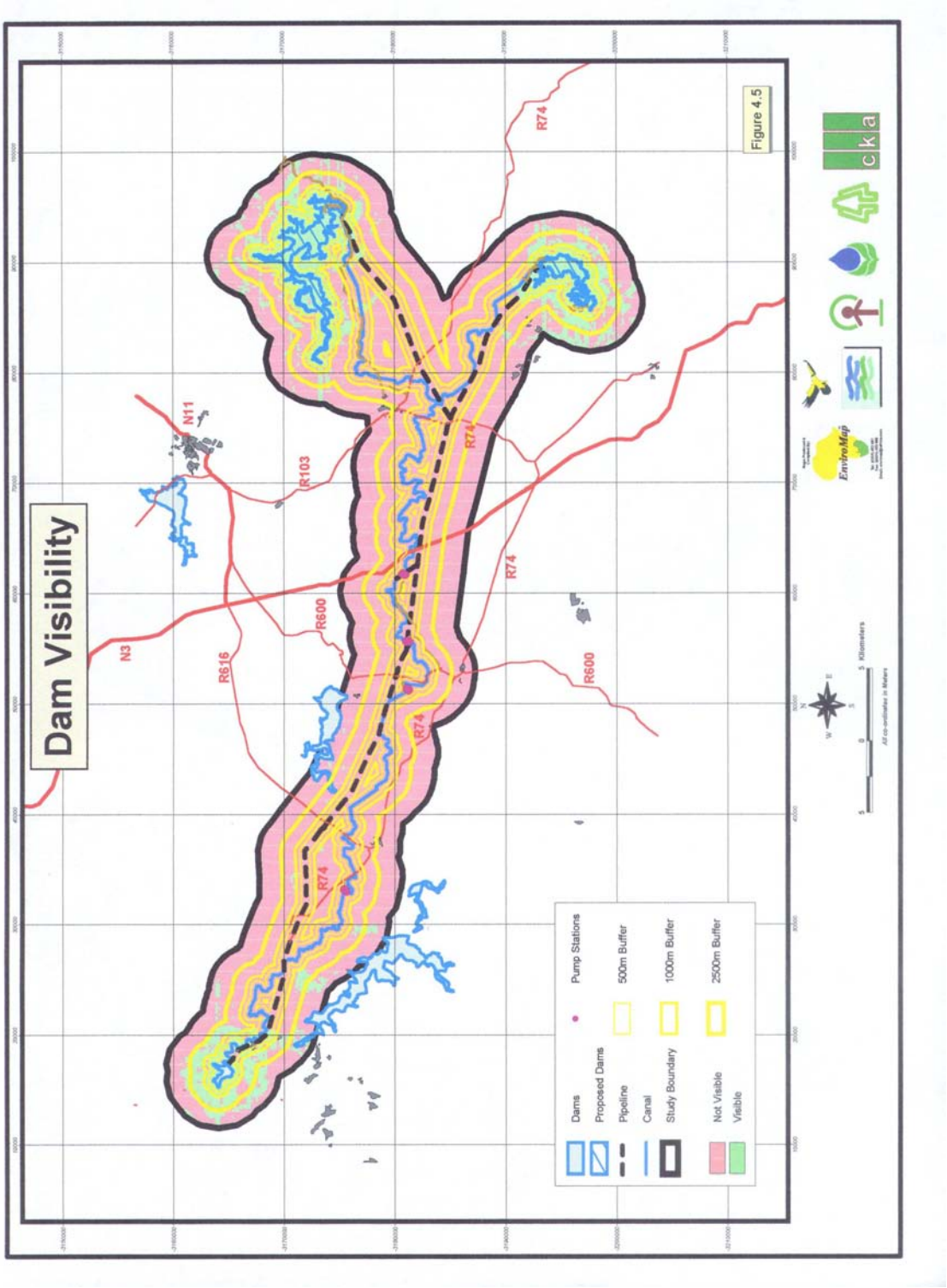


Figure 6.2: Slope

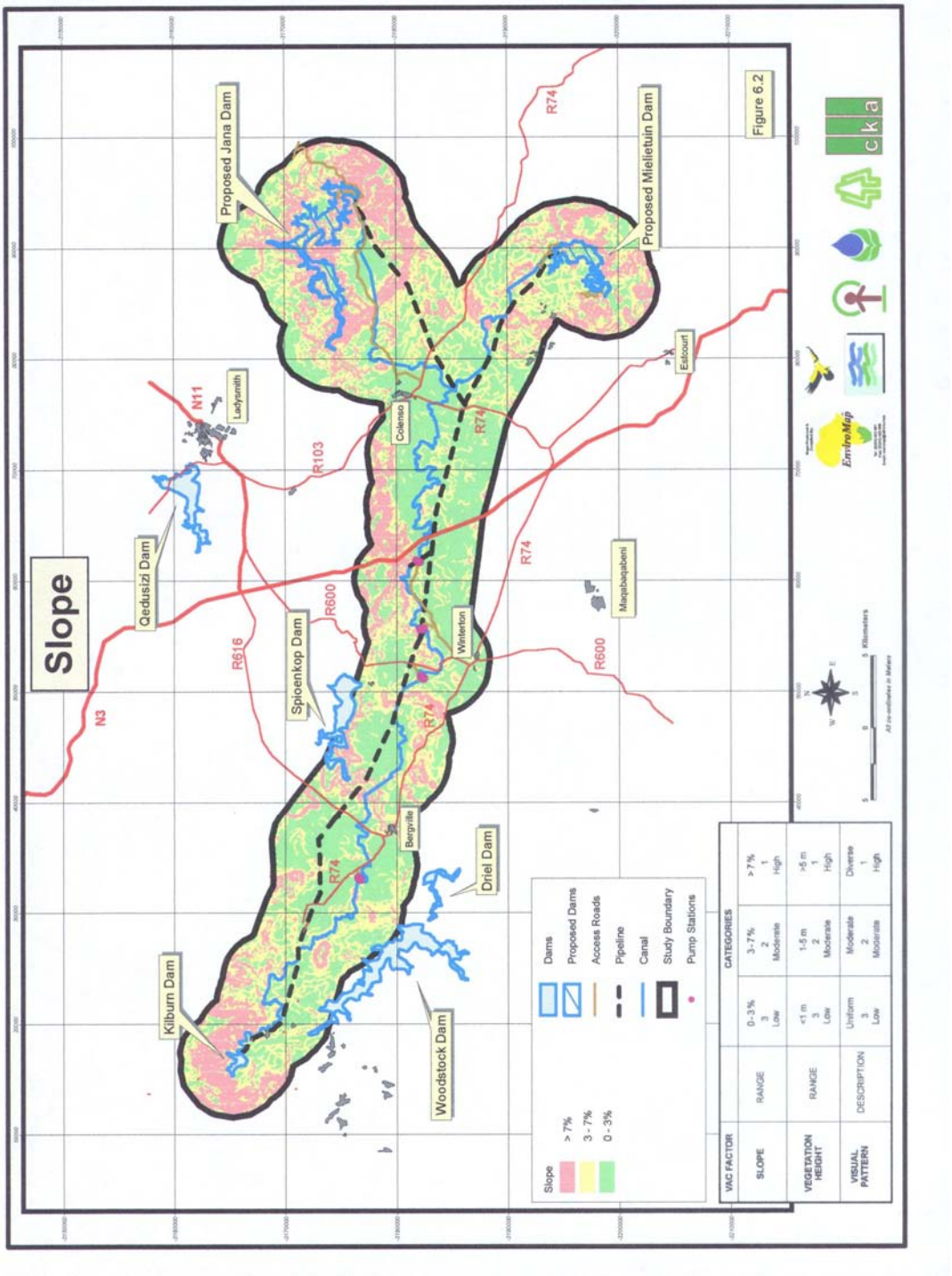


Figure 6.3: Visual pattern

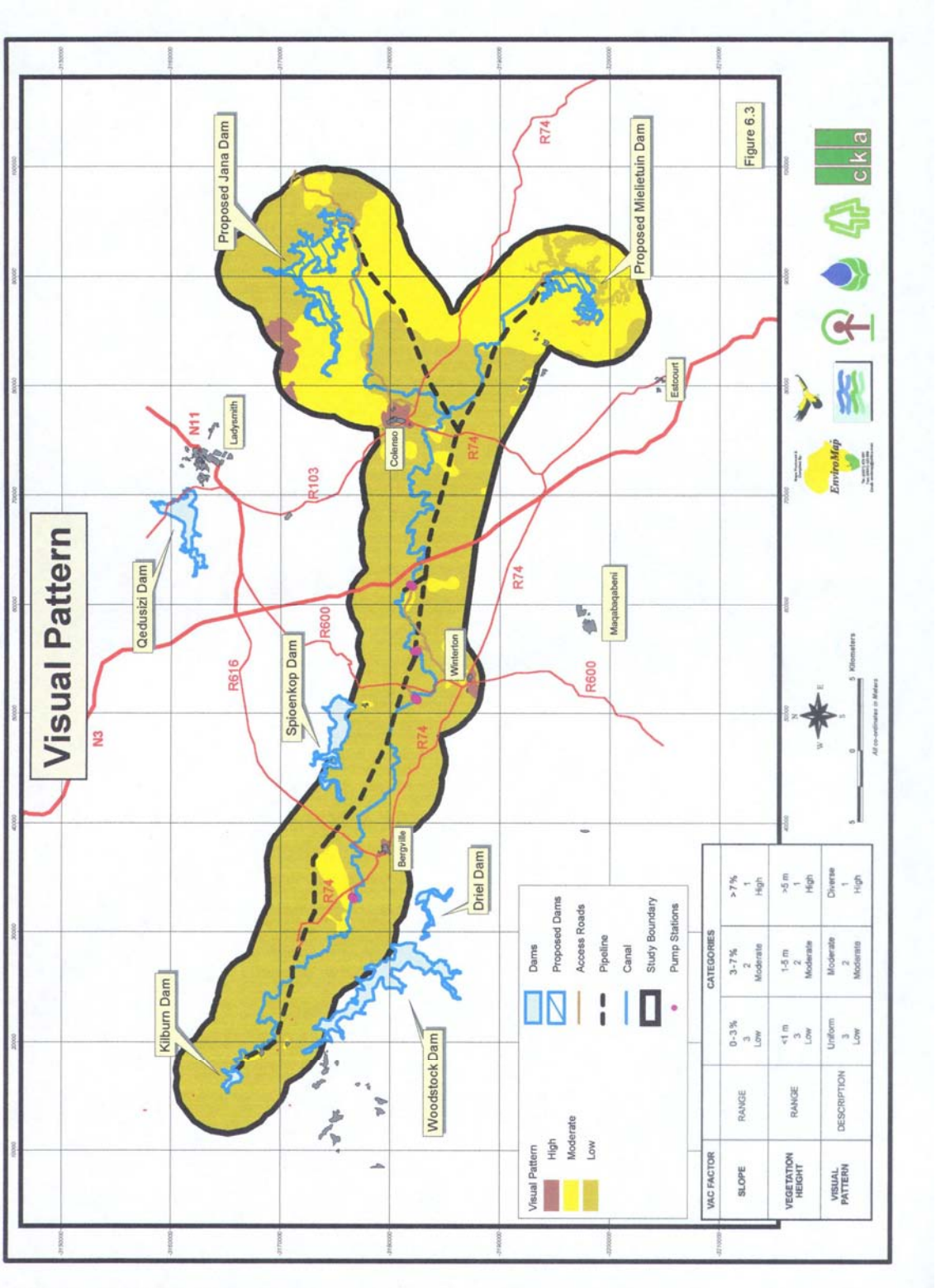
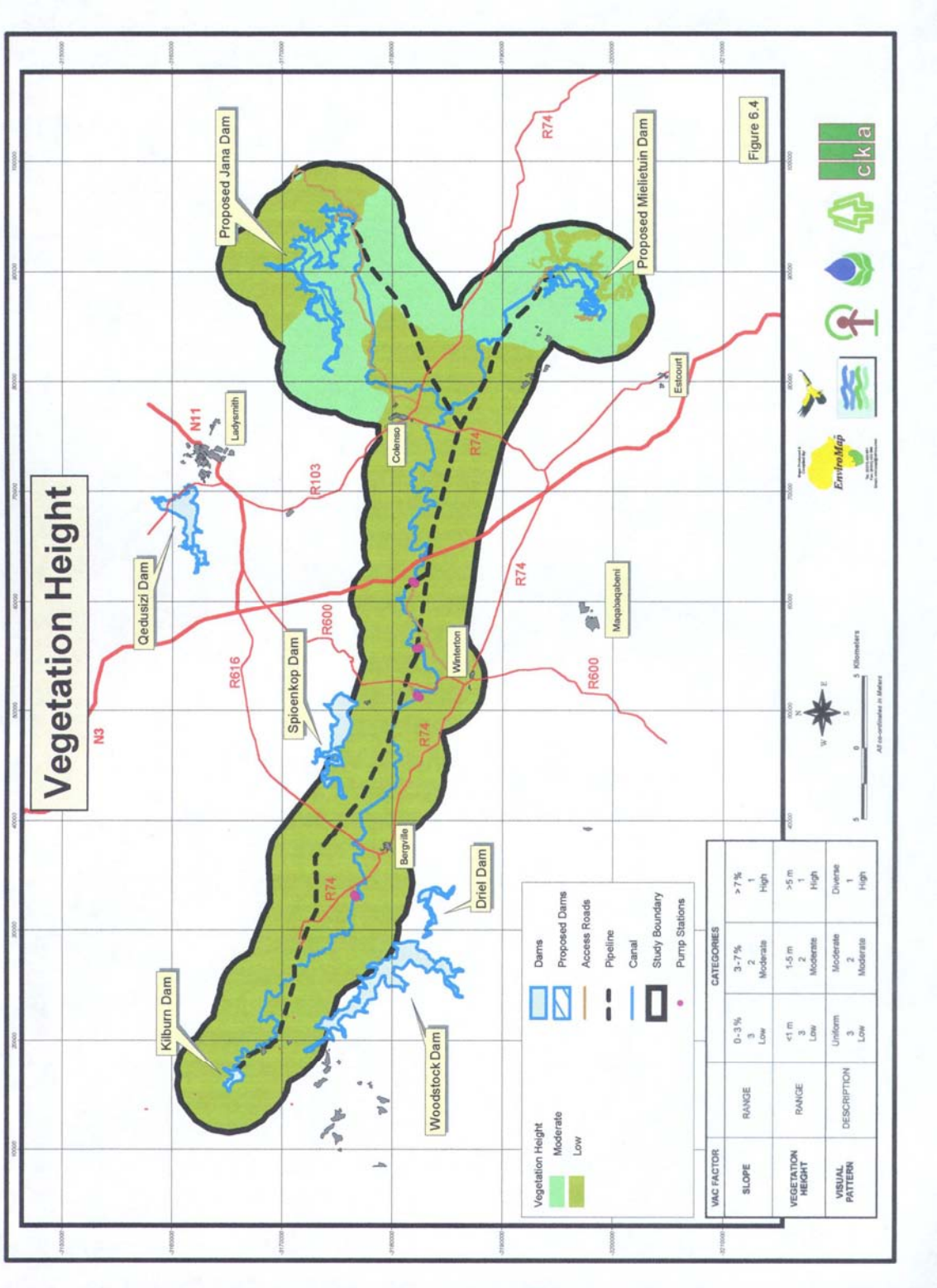


Figure 6.4: Vegetation height



The slope, vegetation and visual pattern were mapped and overlaid to define facets (areas) of particular visual quality (Figure 6.5). Numerical values (Table 6.1) of the three VAC factors were added (Figure 6.6) to give an overall value to each landscape facet (Figure 6.5).

Table 6.1: VAC factors and their numerical values

VAC Factor		Categories		
Slope	Range	0-3 %	3-7 %	> 7 %
	Numerical Value	3	2	1
	VAC	Low	Moderate	High
Vegetation Height	Range	< 1 m	1-5 m	5 m
	Numerical Value	3	2	1
	VAC	Low	Moderate	High
Visual Pattern	Description	Uniform	Moderate	Diverse
	Numerical Value	3	2	1
	VAC	Low	Moderate	High

- Jana Dam

The VAC of the landscape in which the Jana Dam is located, is considered moderate (Figure 6.5) due to moderate ratings for vegetation height and visual pattern and a high rating for slope.

- Mielietuin Dam

The VAC of the landscape in which the Mielietuin Dam is located, is considered moderate (Figure 6.5).

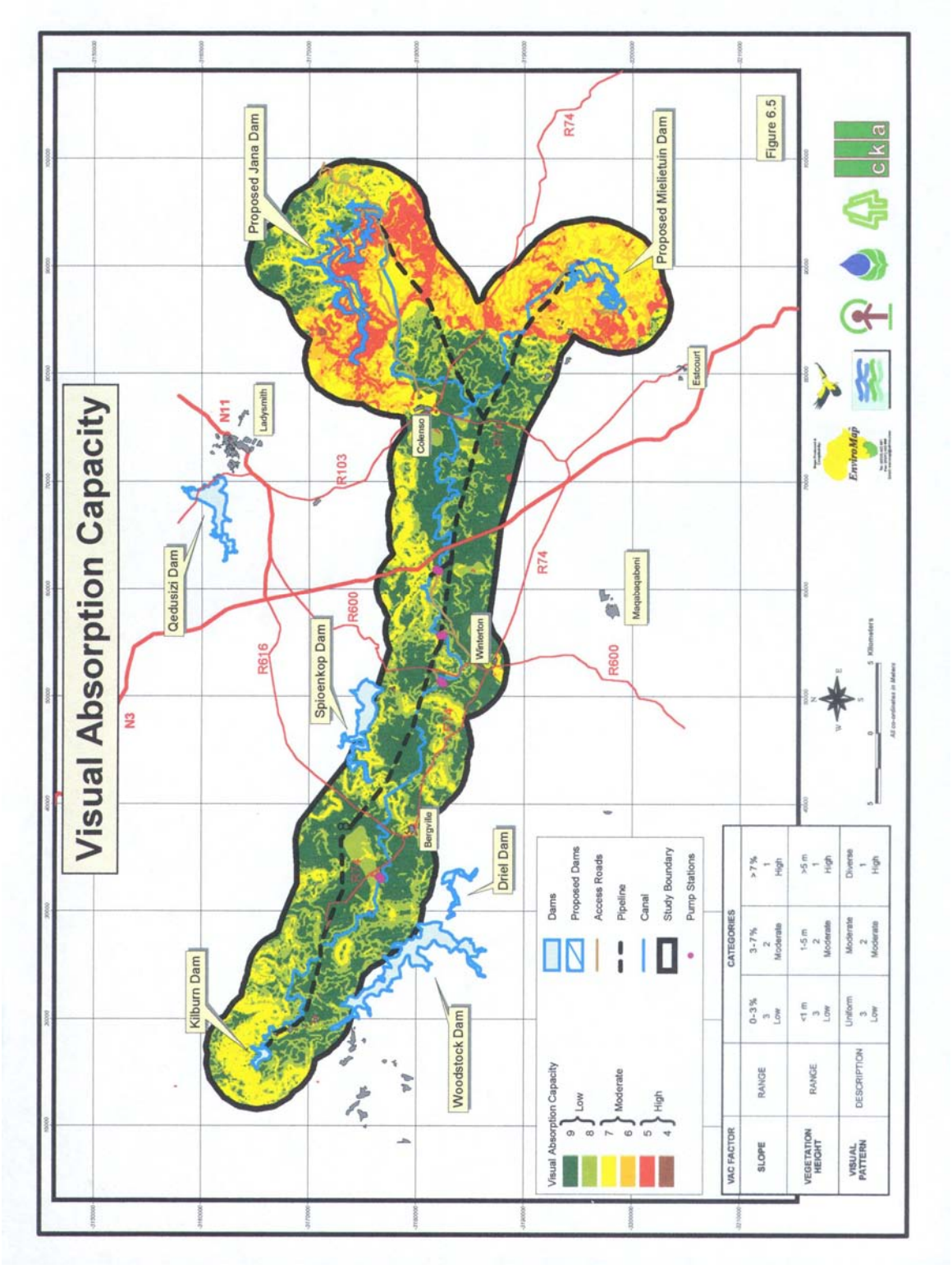
- Aqueducts

The visual absorption capacity of the landscape east of the Colenso-Estcourt divide is considered moderate while that west of the divide is classified as low (Figure. 6.5).

6.2 The visual impact

The visual impact of the project and associated structures in the landscape is a function of many factors (Table 6.5). Some of the factors are measurable such as viewing distance, the visual absorption capacity of the surrounding landscape and the scale of the surrounding environment and landform. Other factors are subjective viewpoints, which are extremely difficult to consistently categorise the opinion of the community. Studies in the U.S.A. have shown that professionals and environmental groups view modification of the natural landscape more negatively than other groups (McCool *et al.*, 1986).

Figure 6.5: Visual absorption capacity



The critical appraisal of the visual impact of the project and associated works on the landscape is presented from the viewpoint of the informed citizen and professional. To the community surrounding the proposed project, it may well be that they do not, or will not, object to the visual intrusion in their immediate environment.

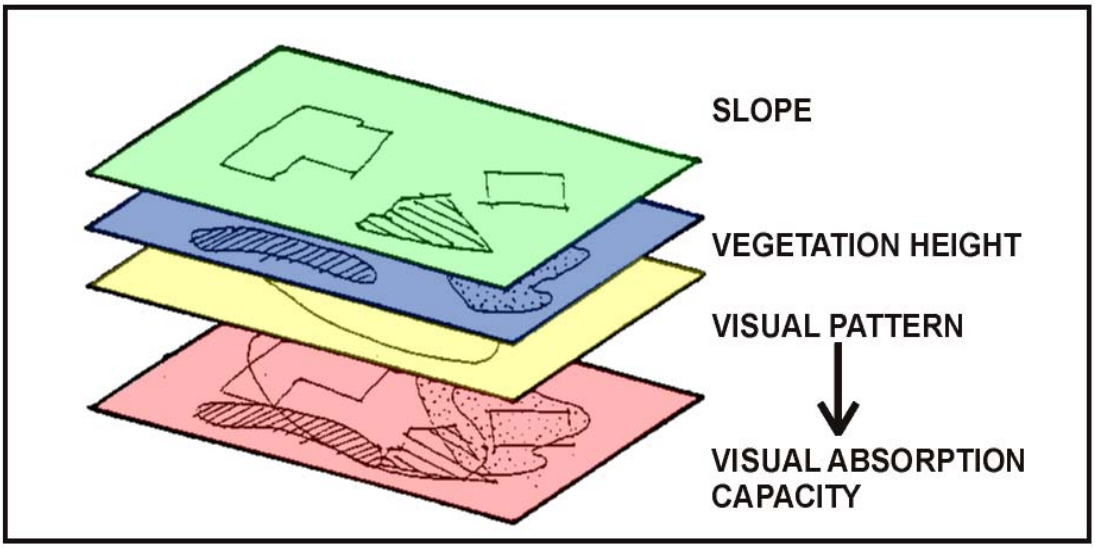


Figure 6.6: Overlay methodology to define landscape facets

It may be that they welcome it since they could perceive it as a symbol of prosperity and personal advancement opportunity.

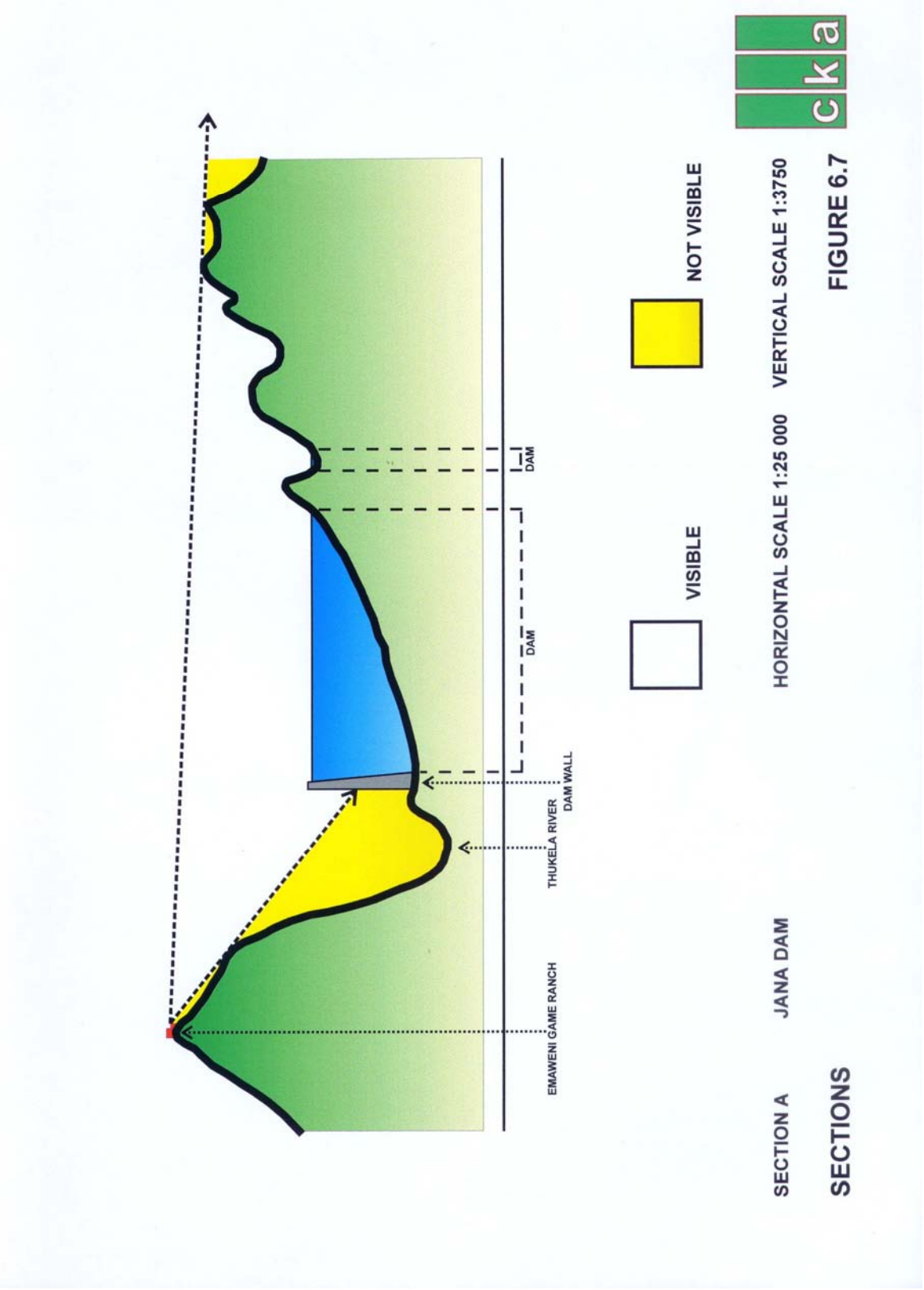
6.2.1 The view distance

The visual impact of the project and associated structures will reduce exponentially as the viewer moves further away from the proposed structures (Hull and Bishop, 1988).

- Jana Dam
  - Wall and Infrastructure

    Because of the size and scale of the dam wall (preferred height FSL 860m), both the dam wall and spillway will be considerably visible from the elevated viewpoints to the south-east and east (Figures 4.5 and 6.3, Section A). Views to the north, west and south-west will be screened by the topography.

Figure 6.7: Section A - Jana Dam



The visual impact within the 500m zone will be significant as the wall and spillway will visually dominate the area. This image will still remain dominant within the 1 000m to 2 500m distance zone due to views from elevated positions. These views are limited to a few views which are uninterrupted by topography.

At night, the dam infrastructure, when viewed from the elevated positions, could be readily seen and noticed because of the glare of the on-site lighting within the enclosed landscape. It would form an intrusive beacon in a relatively unlit landscape.

- Reservoir

The water body can be viewed intermittently from various elevated viewpoints. Due to the steep terrain, the viewing distance will generally be limited to close views within the 500m buffer zone, extending into the 1 000m - 2 500m zone. There are few views which extend into the 2 100m - 5 000m zone.

- Mielietuin Dam and Reservoir
  - Wall and Infrastructure

The Mielietuin Dam wall will exert a significant visual impact on the surrounding landscape within the 500m distance zone.

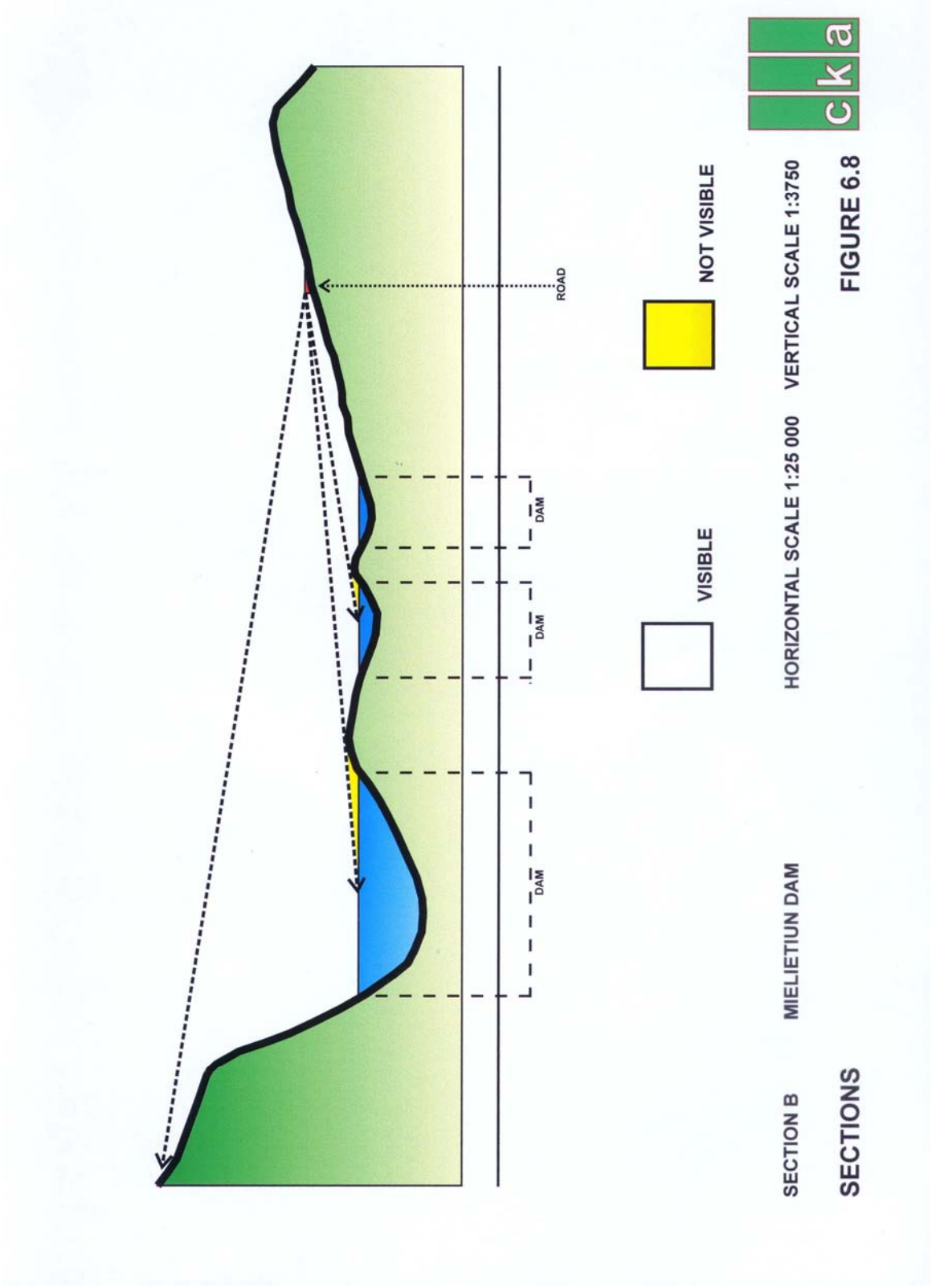
The dam wall area is visually contained within the Bushman's River gorge to no further than the 2 500m distance zone.

- Reservoir

The Mielietuin Dam reservoir will exert a significant visual impact on the surrounding landscape, especially on viewers using the road to the west of the dam, which is within the 500m distance zone. The views are generally uninterrupted from the road, although with only a portion of the water visible at any one time.

The view from the elevated section of the road to the west of the reservoir, although from a raised position, is less significant due to the extended viewing distance (Figure 6.4, Section B).

Figure 6.8: Section B - Mielietuin Dam



The elevated views down onto the reservoir from the uNanthethe Plateau are uninterrupted and highly visible. These views extend beyond the 5 000m distance zone.

- Aqueducts

The canal and pipeline will, in the short term, exert a high visual impact within the 500m and 1 000m zone.

The pipeline will be visible, due to the fact that the route does not follow the contour but follows a route that cuts across the landform. This creates a visible intrusion that lies in contrast with the landform until total rehabilitation is complete.

The scar that is formed, especially where the vegetation is diverse, will be visible for an extended distance beyond the 5 000m zone.

However, minor variations in topography and relief will help screen many of the short distance views as the pipeline route is at ground level with only the ancillary structures such as valve chambers and reservoirs being elevated. It is estimated that the larger structures such as reservoirs, pump stations and pressure release towers will be visible from distances greater than 2 500m.

The canals will be visible at times for extended distances when viewed from elevated positions beyond the 5 000m zone. The canals will have a high visual impact due to the fact that they will be permanently exposed and, although following the contour, will have exposed cut and fill slopes including an access road alongside it. These hard edges are highly visible due to the contrast created within the landscape.

6.2.2 Critical viewpoints

Due to the linear nature of the aqueducts and the fact that most viewers of these components would be road users, specific viewpoints for the aqueducts were not selected. However, areas with high recreation and tourism potential, such as the Thukela Valley and the undeveloped rural areas of high scenic value, were regarded as critical view zones against which the visual impact would be evaluated.

Sections from critical view zones have been plotted with the vertical scale being exaggerated twenty times in order to illustrate the landform relief. Figure 6.5 illustrates the elevation of the study area. The line of sight drawn from the observer indicates the extent to which the

most prominent elements are not screened by intervening landforms (Figures 6.7 and 6.8, Sections A and B).

6.2.3 Extent / spatial scale

- Jana Dam
  - Dam Wall and Infrastructure

  The visual impact for both the construction and operation phases will occur on a local scale as the visual boundary is limited to the immediate areas surrounding the dam basin defined by the viewshed.

  The fact that the majority of viewers are mainly ecotourists, utilising the surrounding hunting and ecotourism facilities, and local inhabitants surrounding the dam basin implies that numerically few viewers will be affected. However, many of the viewers are from beyond the regional boundaries and will carry the visual impact effect with them beyond the physical visible confines.

  The lack of effective screening in the form of existing landform and trees, as well as the semi-enclosed amphitheatre / bowl nature of the surrounding topography does not assist in limiting the extent of the impact from the existing ecotourism facilities.

  - Reservoir

  The impact of the Jana Dam reservoir can be regarded as local as it is largely confined to the dam basin.

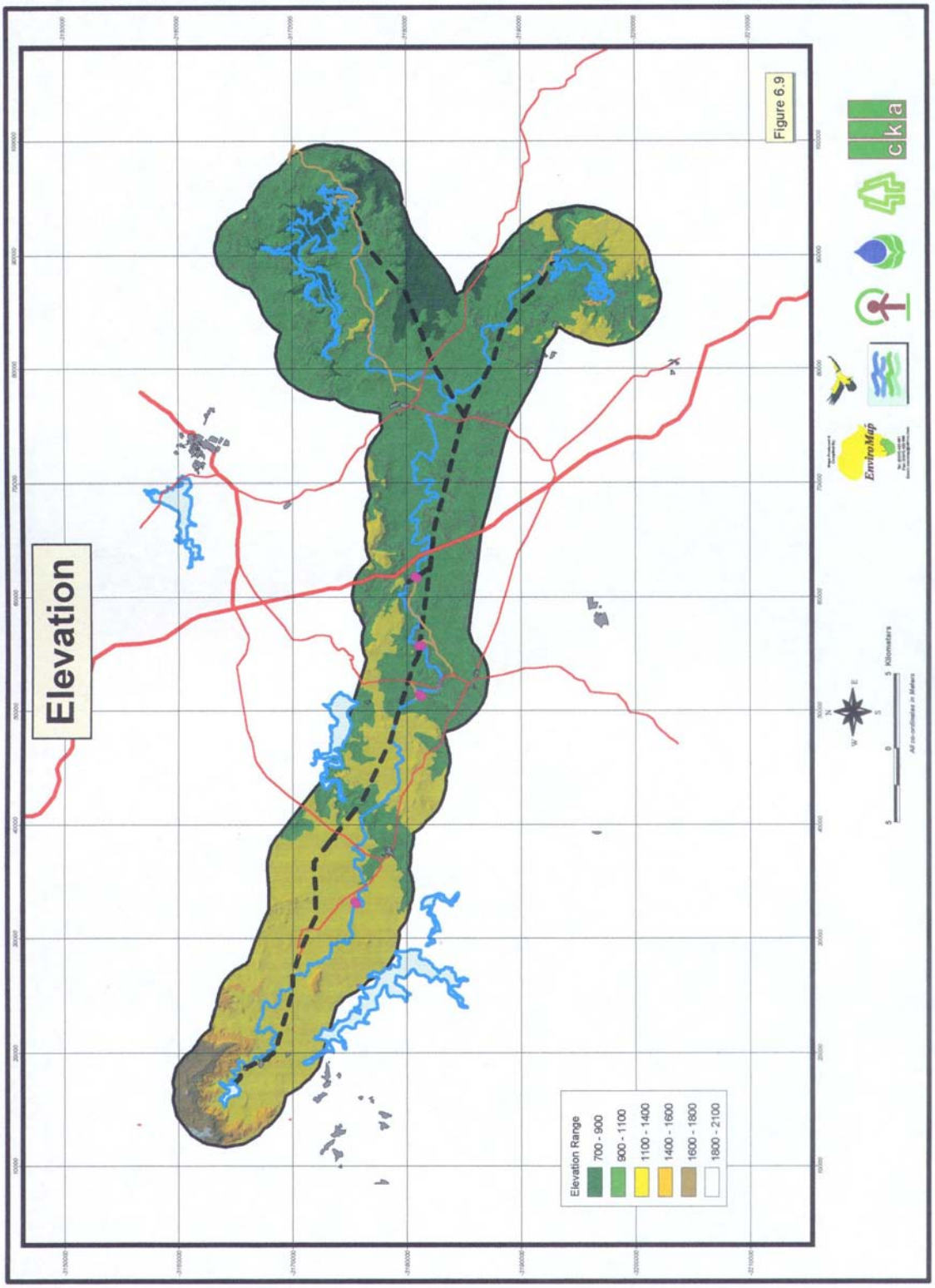
- Mielietuin Dam
  - Dam Wall and Infrastructure

  The visual impact for both the construction and operation phase will occur on a local scale, which extends to the edge of the viewshed. The dam wall is particularly screened by intervening topography or reduced in scale by the viewing distance.

  - Reservoir

  The impact of the reservoir can be regarded as local. The views are predominately from the road which links the Weenen area with that of Estcourt. The views are intermittent and mainly of the water body.

Figure 6.9: Elevation



The fact that the majority of the viewers, many of whom are tourists, are in transit and are not viewing from a static or stationary viewpoint, implies that the viewer carries the visual impact effect, be it positive or negative, with them beyond the physical visible confines.

- Aqueducts

The impact of the aqueducts can be regarded as regional due to the considerable length of servitude and the extent of the viewshed.

The visual impact extends beyond the 5 000m zone for a considerable proportion of the route (Figures 4.6 and 4.7). This is especially so for the section from midway between Colenso and Weenen to Winterton.

The section between Winterton-Bergville-Kilburn Dam will be visually affected for up to 2 500-5 000m; seldom much beyond this distance. Extended views are possible from the western and northern higher lying slopes to surrounding the Kilburn Dam.

6.2.4 Duration

- Jana Dam

The duration of the impact during construction will be short term due to the relatively short duration of this period.

The duration of the impact during the operational phase will be long term to indefinite, in other words greater than 15 years.

- Mielietuin Dam

The duration of the impact during construction will be short term due to the relatively short duration of this period.

The duration of the impact during the operational phase will be long term to indefinite, in other words greater than 15 years.

- Aqueducts

The duration of the impact during construction for the pipeline will be short term due to the relatively short duration (0-5 years) of this period.

The duration of the impact during the operational phase will be medium term due to the fact that the pipeline will be underground and the disturbed surface can be rehabilitated. Only the access roads and ancillary infrastructure will remain visible.

The duration of the impact during the construction phase for the canal will be short term due to the short duration (0-5 years) of this period.

The duration of the impact during the operational phase will be long term to indefinite (greater than 15 years) with the impact terminating only after a possible decommissioning of the canal.

6.2.5 Magnitude and intensity

- Jana Dam
  - Dam Wall and Infrastructure

  The intensity of the visual impact during construction will be high within the 500-1 000m zone surrounding the dam wall due to the fact that there are ecotourist facilities within this zone that will be exposed to the impacts.

  During the operational phase the intensity of the visual impact can be regarded as moderate, as although the construction vehicles, camps, and temporary infrastructure, etc. will have been removed from site, the large scale of dam wall and spillway, the permanent housing and the night lighting will remain dominant in the view.

  It is not possible to screen the dam wall and infrastructure from the viewers, such as the ecotourists.

  The visual impact intensity is moderate for the operation phase due to the fact that the dam is located within a landscape of high scenic value. The introduction of the dam will contrast greatly with the existing rural features.

  The fact that many viewers could be high-spend tourists utilising the relatively unspoilt natural resources of the area, implies that the extent of impact needs to be minimised as far as possible to limit the impact on the tourism industry of the area.

  - Reservoir

  The visual impact magnitude and intensity of the water body is considered to be moderate as the water can contribute to the scenic amenity of the area, on condition that the fluctuating level will not leave unsightly bare and muddy edges to the shoreline. It is anticipated that the exposed edges will be limited due to the steep

profile of the topography and the low rate of drawdown (Figure 6.10). The moderate magnitude and intensity is a response to the dramatic change from an open valley to a large water body. One must bear in mind that the magnitude and intensity does not carry a positive or negative status.

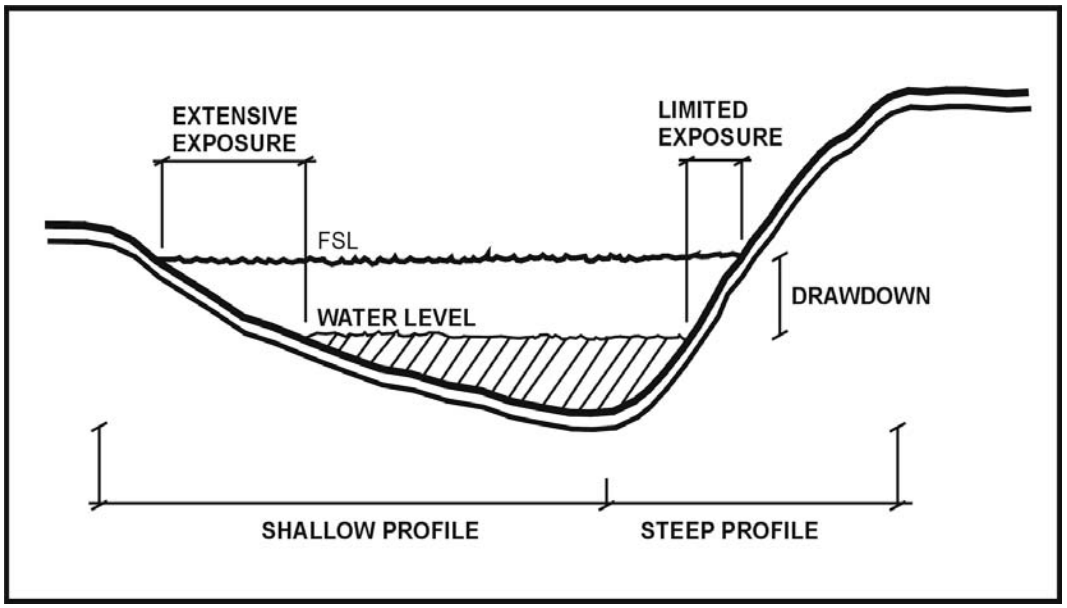


Figure 6.10: Extent of shoreline exposure due to water level drawdown

- Mielietuin Dam
  - Dam Wall and Infrastructure

The intensity of the visual impact during construction will be moderate within the 500m zone due to the fact that, although the majority of viewers will be exposed to the dam impoundment within the zone, the area of disturbance, namely the dam wall area, is hidden from view by the surrounding landscape.

During the operational phase the visual impact in the vicinity of the dam wall can be regarded as low although the construction vehicles, camps, temporary signage, etc. will have been removed from site, the permanent operation and staff housing, including the intrusion of security lighting at night, will remain.

- Reservoir

The magnitude and intensity of the visual impact of the Mielietuin Dam reservoir is considered to be low due to the fact that the valley is altered from a low, flat valley to a low, flat water body.

It is not possible, nor desirable, to screen the dam impoundment area from the majority of the viewers, namely the road users, as the view of the dam could contribute to the positive visual amenities of the area.

- Aqueducts

The intensity of the visual impact of the pipeline and canal during construction will be high within the 500m zone due to the fact that the majority of viewers will be exposed at times to the impacts within this zone (Figures 4.6 and 4.7).

During the operational phase the visual impact for the pipeline can be regarded as low as the construction vehicles, camps, stockpiles, pipes, temporary signage, etc. will have been removed from site, the pipeline buried and the surface rehabilitated. All that will remain will be the access road and surface infrastructure such as valve chambers, pump stations and reservoirs.

The intensity of the visual impact for the canal during the operational phase can be regarded as moderate to high as the viewers will at times be exposed to the permanently highly visible hard edges of the canal within the 500m zone.

It is not practical to screen the aqueducts from the majority of the viewers.

6.2.6 Certainty

- Jana Dam

The impacts described, specifically for the zone around the dam wall, is probable. It will be difficult to ameliorate the impact due to the scale and magnitude of the facility. Alterations to the wall area design could reduce the impact to a limited extent.

- Mielietuin Dam

The impacts described is probable. As the impact on the viewers along the road is limited and could be positive, little amelioration will be necessary. The impacts associated with the dam wall area will be more difficult to ameliorate.

- Aqueducts

The impact described is probable.

6.2.7 Significance

- Jana Dam
  - Dam Wall and Infrastructure

  It is considered that the construction of the Jana Dam is of high significance (based on significance classification in Table 1.1) in that the visual impact will have a high influence on the environment, specifically around the area of the dam wall and gorge. Noise, dust, the stripping of soil, etc. will create a disturbance to the aesthetic setting. The impacts can be ameliorated to a limited extent by a modification in the project design and by the implementation of effective mitigation measures.

  Once the dam is in operation and the mitigation measures are implemented, the impacts can be regarded as having a medium to low significance, especially as the impacts will be experienced by relatively few viewers.

  - Reservoir

  The significance of the impacts of the reservoir is low due to the fact that the impacts will impinge on relatively few viewers and that the view of the water body is considered to impart a positive aesthetic appeal.

- Mielietuin Dam
  - Dam Wall and Infrastructure

  It is considered that the construction of the Mielietuin Dam is of medium significance (based on significance classification in Table 1.1) in that the visual impact will have a moderate influence on the environment. The significance of the impact during operation on the majority of viewers is medium to low. The impacts within the area around the dam wall can be ameliorated to a certain extent by a modification in the project design and by the implementation of effective mitigation measures.

  - Reservoir

  The significance of the impacts of the Mielietuin reservoir is considered as low due to the fact that views are intermittent and generally of a positive aesthetic nature.

- Aqueducts

The significance of impact of the construction phase of the aqueducts is considered medium due to the fact that it is of a short, but intense, duration. The extent, in terms of length, will be considerable in view of the width of the working servitude and the disturbance to the landscape.

The significance of the operation phase of the pipeline will be low due to the fact that once the route is rehabilitated, it will become relatively unobtrusive in the landscape – no more so that much of the existing modifications that have occurred within the landscape. The implementation of mitigation measures would substantially reduce the visual intrusion.

The significance of the operational phase of the canal is considered medium as the canal will remain a visual intrusion for the duration of the operational phase. The implementation of mitigation measures will not reduce the negative impacts substantially.

6.2.8 Sign

- Jana Dam
  - Wall and Infrastructure

  The impact status is regarded as negative because of the dominating form and scale of the dam wall in the landscape and the loss of the very scenic Thukela Gorge.

  The view of the wall and infrastructure contrast does not complement the existing landscape and is thus regarded as having a negative impact.

  - Reservoir

  The dam basin, when full of water, complements the existing landscape and could provide an aesthetic amenity for ecotourism activities and recreation in the area. The impact of the water body is considered to be positive.

- Mielietuin Dam
  - Dam Wall and Infrastructure

  The impact of the dam wall and infrastructure is regarded as negative.

  - Reservoir

  The impact of the water body, especially when viewed from the western road, is considered as positive.

- Aqueducts

The impact status of the pipeline is considered negative during the construction phase and neutral during the operational phase. The impact status of the canal is considered negative for the construction and operational phases.

6.2.9 The visual impact summary

Table 6.2: Visual impacts: Jana Dam wall and related infrastructure without management / mitigation actions

Stage in Project Lifecycle	Extent / Spatial Scales	Duration	Magnitude and Intensity	Certainty	Significance	Sign
Construction	Local	Short term	High	Probable	High	Negative
Operation	Local	Long term	Moderate	Probable	Medium – low	Negative

Table 6.3: Visual impacts: Jana Dam reservoir without management / mitigation actions

Stage in Project Lifecycle	Extent / Spatial Scales	Duration	Magnitude and Intensity	Certainty	Significance	Sign
Construction	Local	Short term	Moderate	Probable	Medium	Negative
Operation	Local	Long term	Moderate	Probable	Low	Positive

Table 6.4: Visual impacts: Mielietuin Dam wall and related infrastructure without management / mitigation actions

Stage in Project Lifecycle	Extent / Spatial Scales	Duration	Magnitude and Intensity	Certainty	Significance	Sign
Construction	Local	Short term	Moderate	Probable	Medium	Negative
Operation	Local	Long term	Low	Probable	Medium – low	Negative

Table 6.5: Visual impacts: Mielietuin Dam reservoir without management / mitigation actions

Stage in Project Lifecycle	Extent / Spatial Scales	Duration	Magnitude and Intensity	Certainty	Significance	Sign
Construction	Local	Short term	Moderate	Probable	Medium –low	Negative
Operation	Local	Long term	Moderate	Probable	Low	Positive

Table 6.6: Visual impacts: Pipeline aqueduct without management / mitigation actions

Stage in Project Lifecycle	Extent / Spatial Scales	Duration	Magnitude and Intensity	Certainty	Significance	Sign
Construction	Regional	Short term	High	Probable	Medium	Negative
Operation	Regional	Short term	Low	Probable	Low	Negative

Table 6.7: Visual impacts: Canal aqueduct without management / mitigation actions

Stage in Project Lifecycle	Extent / Spatial Scales	Duration	Magnitude and Intensity	Certainty	Significance	Sign
Construction	Regional	Short term	High	Probable	High	Negative
Operation	Regional	Long term	Moderate	Probable	Medium	Negative

7 RECOMMENDED MANAGEMENT / MITIGATION ACTIONS

7.1 Earthworks

7.1.1 Landscape shaping

Sculpturing or shaping the cut and fill slopes to angles and forms that are reflected in the adjacent landscape can reduce the visual impact. By blending the edges with the existing landforms the visual impression made, is that the project component has followed a natural route provided by the landscape and has not been 'engineered' through the landscape.

For access / service roads, power lines, firebreaks and servitudes avoid straight edges and corridors. These lines should complement the landscape through which they pass (Litton, 1980).

Special attention should be focussed on the width of servitude actually required for the construction and operational phases. There is a tendency to make these servitudes wider than necessary and access roads built to a higher engineering specification than required for a single lane 4x4 maintenance vehicle track.

Vegetation stripping should be done in a manner where the edges are organic (non-geometric) or curvilinear rather than straight or sharp edged as viewers tend to form positive visual impressions such as "gentleness" and "delicacy" and tend to object to negative visual impressions such as "rough", "rugged" or "violent" (Ribe, 1989). When disturbances in the landscape are viewed from a distance, those with irregular lines, rather than straight lines appear to blend in with the natural configuration and lines in the landscape (Schaefer, 1967).

7.1.2 Landscaping

It is essential that all cut and fill slopes, as well as all areas disturbed by construction activity, are suitably topsoiled and vegetated as soon as is possible after final shaping. The progressive rehabilitation measures will allow the maximum growth period before the completion of the project.

All areas affected by the construction works will need to be rehabilitated and re-vegetated. This includes the areas beyond the works area such as temporary access roads, construction camp sites, workers camp sites, borrow pits, laydown areas, quarries, etc.

Critical viewpoints such as major road crossings (e.g. N3) and vantage points that look out towards components of the TWP will need to be analysed in detail to determine the need to screen and to determine the most effective placement of screen planting and/or berming.

The special conditions of contract must include the stripping and stockpiling of topsoil from the construction areas for later re-use. Topsoil is considered to be at least the top 300mm of the natural soil surface and includes grass, roots and organic matter. The areas to be cleared of topsoil should be all areas that will be covered by paving, structures, streets and roads, and construction camps. The topsoil stockpiles will be used in developing the screening berms. The presence of degraded and disused roads and areas left over after development that are not rehabilitated, could present a high perceptual visual impact. These areas should be topsoiled and re-vegetated.

All existing large trees which fall outside the earthworks area must be retained. These will assist in softening the forms of the structures and obscure views to them.

The use of informal tree planting where aqueducts pass through landscapes in which scattered groups of trees are present, will lessen the linear impact of the servitude. This is especially applicable in frequently viewed areas.

7.1.3 Dust suppression

Dust generated by construction activity and the haulage of materials and equipment will need to be suppressed. This could either be by regular wetting or the use of soil bonding agents. It is recommended, however, that the main link roads are paved. The colour of the paving material must be of a neutral earth colour which will blend in with the landscape.

The importance of suppressing the visual aspects of dust cannot be over-stressed since the visibility will generate the impression of a polluting industry.

7.2 Building works

7.2.1 Building colour

To reduce the visual intrusion and scale of the support buildings within this relatively natural landscape, colour variations on the buildings must be considered (Figure 7.1). It is recommended that the colour selected for roofing and walls be of a nature which will help to visually break up the surfaces of the buildings, and that they be matt, not glossy, so as to reduce reflection and glare from the surfaces. This is important when considering the night scene and reflected light. It is important that the colour choices and patterns should be timeless in that they should not become dated or fashionable for a short period. These colours should be complementary to the colours in the surrounding landscape, such as olive green or grey-green with buff trim of natural tones such as variations of tan. This is recommended due to the fact that the buildings will often be viewed from an elevated surrounding position and thus be read together with the landscape rather than in silhouette.

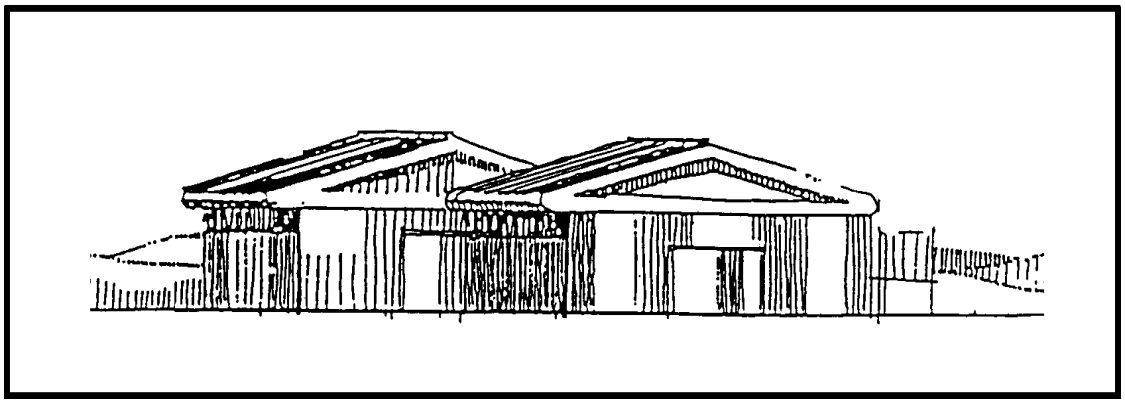


Figure 7.1: Paint patterns to reduce visual scale of buildings

7.2.2 Building form and positioning

The building forms should be broken by roof overhangs and steps in the façade (Figure 7.2). This will create shadow lines which, in turn, assist in the mottling or breaking up of the visible form.

In order to reduce the visual impact of proposed structures, it is important that the roof line of the structures does not extent beyond or break the skyline. The ridge lines and watersheds internal and external to the viewshed should be protected from any development.

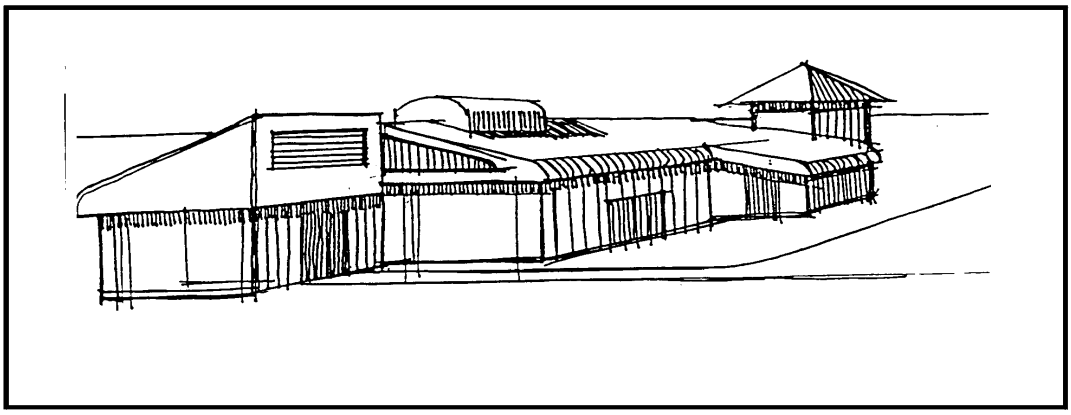


Figure 7.2: Variation of building form

7.2.3 Lighting

As night lighting is one of the more objectionable forms of visual intrusion, it is important that selective and sensitive location and design of the lighting requirements for the project components are developed. For instance, reduce the height from which floodlights are fixed and identify zones of high and low lighting requirements with the focus of the lights being inward, rather than outward. Avoid uplighting of structures or directing the light towards where the light would be most readily experienced (Figure 7.3).

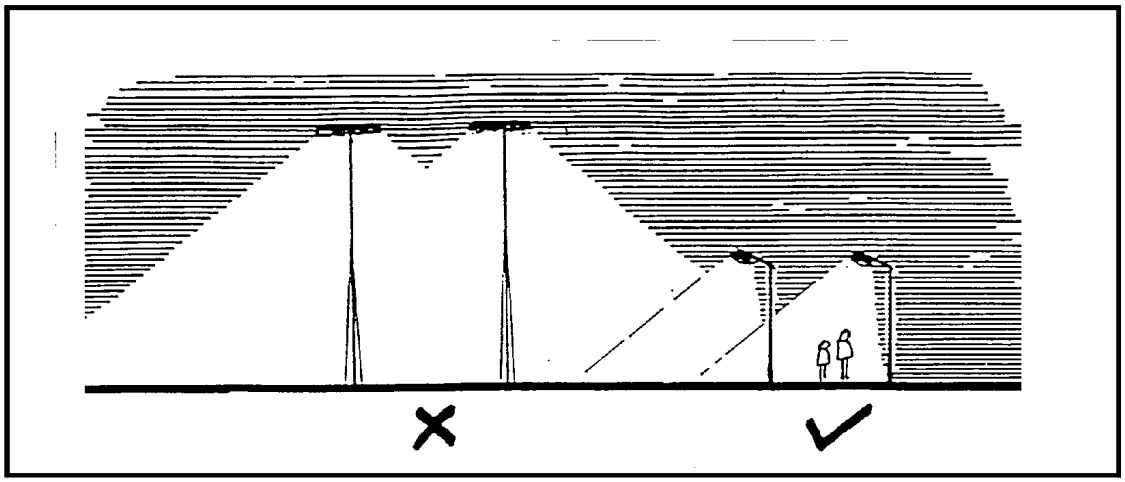


Figure 7.3: Reduced height of floodlights

7.3 Project components

7.3.1 Dams

Much of the proposed mitigation for the dams is covered elsewhere in Section 7. Due to the scale and magnitude there is little that can be done to reduce or minimise the visual impact. Minor actions, such as those which pertain to minimising area of disturbance, landscape rehabilitation, buildings works, lighting and dust control.

Certain changes to the project design could also reduce the visual impact. These include combining the spillway and the dam wall, placing project components such as access roads, spoil dumps, support buildings, pump stations, and power supply out of the line of view from critical viewpoints.

7.3.2 Aqueducts

The visual impact during construction will be significant and little can be done about reducing the effect since excavations, machinery and haulage etc. cannot be screened.

The mitigation measures for the aqueducts during operation will need to focus on effective rehabilitation of the construction corridor and work sites. These specifications must be explicit and detailed and included in the contract documentation so that the tasks can be costed and monitored for compliance and result.

Visible infrastructure such as reservoirs, pump stations, valve chambers and booster stations, depending on their location, will require individual relevant treatment by way of colouring and berming to minimise visual contrast with the surroundings.
It is recommended that:

- all visible infrastructures, such as pump stations and reservoirs, be located where they will not be visually prominent or where they are constantly viewed against the skyline in silhouette;

- as many trees within the working servitude as possible be retained to break the visually linear scar, especially on the slopes;

- excavations take place as close as possible to the edge of access roads so as to minimise the adjacent landscape scarring;

- all stream crossings be treated in such a way as to minimise the visual disturbance to the river banks. The excavation crossing the river should be limited to as narrow a strip as possible;

- all newly exposed rock that contrasts with the existing landscape be oxidised-stained to age / weather the surface;

- the Contractor be contained within the servitude working width to minimise disturbance to the surrounding landscape;

- the edges to cleared servitudes should not follow a 'knife-edge' line but follow a random line that could blend in with the existing visual pattern;

- all visible infrastructure such as reservoirs, pump stations and valve chambers should blend in with the surrounding landscape through berming, painting and staining;

- no natural feature may be defaced through painting or any other form of permanent marking;

- branches and tree stumps removed during clearing and excavations should be placed or spread on the backfilled trench to promote vegetation growth; and

- the routes through natural vegetation be grass seeded as soon as possible to reduce the visual scarring.

7.4 Miscellaneous

7.4.1 Tourism amenities

Attention must be given to provide the viewers the opportunity to optimise the visual attributes of the scenic landscape. This can be achieved by opening up vistas where cuttings may have blocked the views (Figure 7.4) and by providing stopover points for travellers to appreciate and experience the views or landscape features.

7.4.2 Signage

All signage should be co-ordinated and unified. This includes the various forms of signage such as directional, informational, warning, and advertisement signage. Signage such as billboards should be avoided at all costs as these form some of the worst forms of visual intrusion.

7.4.3 Service / utilities

It is recommended that all services and utilities such as telephone and electricity lines be placed underground. If this is not possible, it is important that any overhead services should be placed lower down in the landform, placed internally to the viewshed and kept off all ridge lines in order that the skyline is not punctuated by these elements.

7.4.4 Waste dumps

Experience gained on similar projects has shown that large volumes of construction waste will be generated. Providing the materials are non-toxic or not hazardous they can be dumped on site. This can result in considerable cost savings. Where it is not possible to recycle waste material, this product should be placed and formed in its final position in organic, non-geometric forms. The side slopes should have a maximum gradient of 1:2,5 which should be vegetated by seeding with indigenous grasses over an adequate topsoil layer.

The arrangement of the waste dumping procedure should be such that it allows a face of the waste dump to be vegetated progressively so that in time these forms would be able to be

softened by vegetation. It must not be allowed that the waste dumps be rehabilitated only after their forms have been completed.

Consultation, therefore, between the landscape planners and the design engineers need to take place early in the design process of the dumps and during the determination of the methods of waste placement. This will ensure that the dumps can be rehabilitated successfully.

7.4.5 Monitoring and review programme

The rehabilitation and stabilisation of vegetation of all disturbed areas and new landforms must be done as soon as the forms are complete. The monitoring and management of the vegetation programme is important to ensure that problems (erosion, die back, lack of grass cover) are identified early so that corrective measures can be taken.

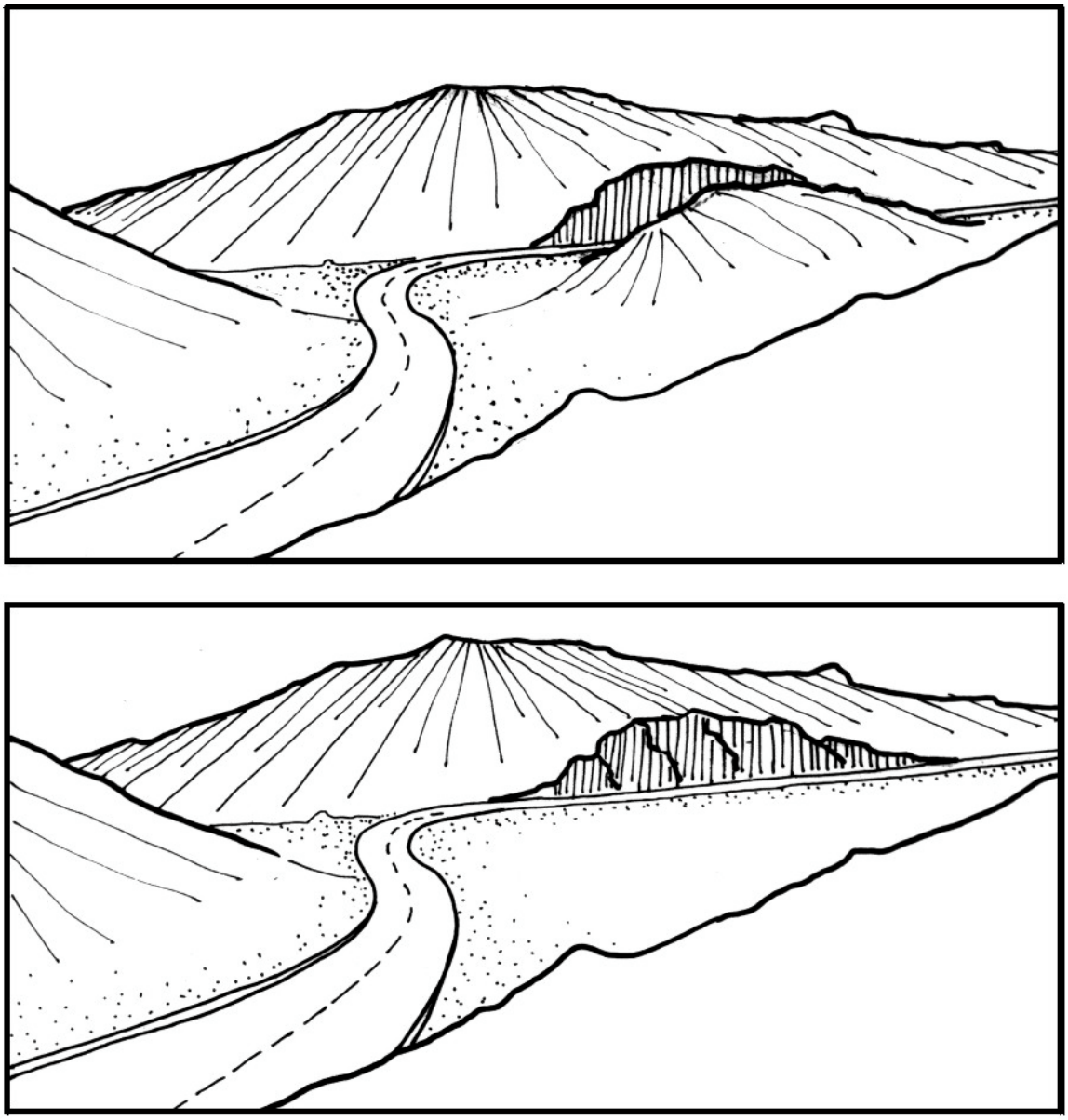


Figure 7.4: Avoid ‘left over’ cuts and blend in with existing landforms

8 DISCUSSION

This study evaluated the visual impact of the Thukela Water Project on the affected environment with a view to assessing its severity based on the author's experience, expert opinion and accepted techniques.

8.1 Evaluation of the Thukela Water Project

Table 8.1, Visual Assessment Criteria Ratings, rates each criteria from high, medium to low according to the specific characteristics of that criteria. Tables 8.2, 8.3 and 8.4, Site Evaluation, list for each project component the visual criteria rating and the visual impact of the component on these areas. It is important to note, however, that no direct comparison can be made between dams and aqueducts.

Table 8.1: Visual assessment criteria ratings

	Criteria	High	Medium	Low
1	Visibility	Very visible from many places beyond 1000m zone.	Visible from within the 1000m zone but partially obscured by intervening objects.	Only partly visible within the 1000m zone and beyond due to screening by intervening objects.
2	Genius Loci	A particularly definite place with an almost tangible dominant ambience or theme.	A place which projects a loosely defined theme or ambience.	A place having little or no ambience with which it can be associated.
3	Visual Quality	A very attractive setting with great variation and interest but no clutter.	A setting which has some aesthetic and visual merit.	A setting which has little aesthetic value.
4	Visible Social Structures	Housing and/or other structures as a dominant visual element.	Housing and/or other structures as a partial visual element.	Housing and/or other structures as a minor visual element.
5	Surrounding Landscape Compatibility	Ideally suits or matches the proposed development.	Can accommodate the proposed development without appearing totally out of place.	Cannot accommodate proposed development without it appearing totally out of place visually.
6	Character	The site or surrounding area exhibits a definite character.	The site or surrounding area exhibits some character.	The site or surrounding area exhibits little or no character.
7	Scale	A landscape which has horizontal and vertical elements in high contrast to the human scale.	A landscape with some horizontal and vertical elements in some contrast to the human scale.	Where vertical variation is limited and most elements are related to the human and horizontal scale.

	Criteria	High	Medium	Low
8	Visual Absorption Capacity (VAC)	The ability of the landscape to easily accept visually a particular development because of its diverse landform, vegetation and texture.	The ability of the landscape to less easily accept visually a particular development because of a less diverse landform, texture and vegetation.	The ability of the landscape not to visually accept a proposed development because of a uniform texture, flat slope and limited vegetation cover.
9	View Distance	If uninterrupted view distances to the site are > than 5km.	If uninterrupted view distances are < 5km but > 1km.	If uninterrupted view distances are >500 m and < 1000m.
10	Critical Views	Views of the project are to be seen by many people passing on routes and from prominent areas i.e. farms, guest farms / lodges, hiking routes.	Some views of the project from surrounding routes and farms / lodges.	Limited views to the project from roads and farms / lodges.

Table 8.2: Site evaluation: Reservoirs

	Characteristics	Jana Dam		Mielietuin Dam	
		Visual criteria rating	Visual impact	Visual criteria rating	Visual impact
1	Visibility	High	Low	High	Low
2	Genius Loci	High	Medium	Medium	Low
3	Visual Quality	High	Low	Medium	Low
4	Social	Low	Medium	Medium	Medium
5	Surrounding Landscape Compatibility	Medium	Low	Medium	Low
6	Character	Medium	High	Medium	High
7	Scale	High	Medium	Medium	Low
8	VAC	Medium	Medium	Medium	Medium
9	View Distance	Medium	Medium	High	Low
10	Critical Views	Medium	Low	High	Medium

Table 8.3: Site evaluation: Dam wall and related infrastructure

Characteristics		Jana Dam		Mielietuin Dam	
		Visual criteria rating	Visual impact	Visual criteria rating	Visual impact
1	Visibility	Medium	Medium	Medium	Medium
2	Genius Loci	High	High	High	Medium
3	Visual Quality	High	High	High	Medium
4	Social	Low	Low	Low	Low
5	Surrounding Landscape Compatibility	Low	Medium	Medium	Medium
6	Character	High	High	High	High
7	Scale	High	Medium	High	Medium
8	VAC	Medium	Medium	Medium	Medium
9	View Distance	Medium	Medium	Medium	Low
10	Critical Views	Medium	Low	Low	Low

Table 8.4: Site evaluation: Aqueducts

Characteristics		Pipeline		Canal	
		Visual criteria rating	Visual impact	Visual criteria rating	Visual impact
1	Visibility	High	Low	High	Medium
2	Genius Loci	Medium	Low	Medium	Medium
3	Visual Quality	Low	Medium	Low	Medium
4	Social	Medium	Low	Medium	Low
5	Surrounding Landscape Compatibility	Medium	Low	Medium	Medium
6	Character	High	Low	High	Medium
7	Scale	Medium	Low	Medium	Medium
8	VAC	Low	Medium	Low	High
9	View Distance	High	Low	High	Medium
10	Critical Views	Medium	Low	Medium	Medium

8.2 Jana Dam

Dam Wall and Infrastructure

The Jana Dam wall and the associated structures will exert a negative impact on the visual environment. This is largely due to:

- the large scale of the dam located within a wilderness;
- the moderate absorption capacity of the setting which is attributable to:

  - the moderate vegetation height (one to five metres);
  - the position of the wall in the landscape which permits extended views from the east and south-east;
  - uniform visual pattern; and
  - steep slopes.
- the contrast of human intrusion within a wilderness setting;
- the visual quality of the area has a high aesthetic value due to the unspoilt extended views of ridges, mountains and valleys which impact a wilderness quality;
- the night image of the dam wall area being brightly lit by security and safety lighting. The visual impact of the night image may well be greater than that during the day;
- the need to cut into the existing landforms to accommodate infrastructure and the spillway;
- the overall significance of the visual impact during construction is regarded as medium negative and during operation as medium to low negative due to the visual impact that cannot be readily mitigated. Amelioration measures will only reduce the impacts to a limited extent.

Reservoir

The Jana Dam reservoir will exert a positive visual impact on the visual environment. This is due to:

- the form of the water body fits well with the existing contours of the landscape;
- the water body has an intrinsic aesthetic appeal.

8.3 Mielietuin Dam

Dam Wall and Infrastructure

The Mielietuin Dam wall and its associated structures will exert a negative impact on the visual environment. This is largely due to:

- the scale of the dam wall located within a rural setting;
- the moderate absorption capacity of the setting which is attributable to:
  - the moderate vegetation height (one to five metres); and
  - the uniform visual pattern.
- the visual quality of the dam basin / reservoir environs has a high aesthetic value created by the mountains, valleys, rolling topography and the distinct rural and visually attractive character of the area;
- the need to cut into the existing landforms to accommodate the dam wall infrastructure;

- the night image of the dam wall and infrastructure being brightly lit by security and safety lighting. The visual impact due to night image may well be greater than that during the day;
- the overall significance of the visual impact is regarded as medium to low due to:
  - the existing land uses which have modified the landscape already exert, to a limited extent, a negative impact;
  - relatively few viewers will be exposed to the dam wall;
  - the visual impact can be reduced to some extent by implementing the recommended mitigation and management measures.

Reservoir

The Mielietuin Dam reservoir will exert a positive visual impact on the visual environment. This is due to:

- the form of the water body fits well with the existing contours of the landscape;
- the water body has an intrinsic aesthetic appeal.

8.4 Aqueducts

The pipeline and canal aqueducts will exert a negative influence on the visual environment. This is largely due to:

- high visibility of construction activity within a zone of uniform visual pattern;
- the low visual absorption capacity of the setting which is attributable to:
  - relatively flat topography;
  - the low vegetation height (less than one metre); and
  - the lack of visual diversity.
- the length of the route will expose it to many viewers;
- the need to cut into the existing landform to accommodate especially the canal; and
- project infrastructure could be dominant in the landscape such as reservoirs and surge towers if mitigation is not built into the design process.
- The significance of the visual impact of both the pipeline and the canals during construction is regarded as medium.

Pipeline

The overall significance of the visual impact of the pipeline during operation is regarded as low negative rather than medium due to:

- the existing land uses, which have already modified the landscape, exert, to a limited extent, a negative impact;

- the visual impact can be reduced significantly by implementing the recommended mitigation and management measures.
- Once full rehabilitation of the pipeline servitude is completed the impact can be regarded as neutral.

Canals

The overall significance of the visual impact of the canal route during operation is regarded as medium negative rather than high due to:

- the existing land uses, which have already modified the landscape exert, to a limited extent, a negative impact;
- the visual impact can be reduced to a limited extent by implementing the recommended mitigation and management measures. However, the canal will always remain visible in the landscape which cannot be successfully screened from view. Tunnel portals could also remain as a visual intrusion in the landscape.

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APPENDICES

APPENDIX 1: VISUAL SIMULATIONS

APPENDIX 2: PHOTO SURVEY

APPENDIX 1

VISUAL SIMULATIONS

FIGURE 1a JANA DAM
PROPOSED POSITION OF DAM WALL VIEWED FROM EMAWENI GAME RANCH

FIGURE 1b JANA DAM
SIMULATION OF DAM WALL

FIGURE 2a JANA DAM
PROPOSED DAM BASIN

FIGURE 2b JANA DAM
SIMULATION OF WATER BODY

FIGURE 3a MIELIETUIN DAM
PROPOSED DAM BASIN VIEWED FROM ROAD

FIGURE 3b MIELIETUIN DAM
SIMULATION OF WATER BODY

FIGURE 4a MIELIETUIN DAM
PROPOSED DAM BASIN VIEWED FROM ROAD

FIGURE 4b MIELIETUIN DAM
SIMULATION OF DAM BASIN

APPENDIX 2

PHOTO SURVEY

Figure 5: View north across Jana Dam basin

Figure 6: View north of Wilderness area from Emaweni Game Ranch

Figure 7: Thukela Valley Gorge to be inundated by Jana Dam

Figure 8: Thukela valley upstream of Gorge to be inundated by Jana Dam

Figure 9: Typical landscape near Jana Dam through which pipeline passes

Figure 10: Canal route through landscape west of Colenso

Figure 11: Canal portal on route to Jana Dam

Figure 12: Point where canal crosses road to Jana Dam

Figure 13: Point where canal crosses R74 east of Colenso

Figure 14: View east from Road towards Bushman's River Gorge and Mielietuin Dam

Figure 15: Typical scarring caused by installation of a pipeline

Figure 16: Point at which canal (via underground syphon) crosses Thukela River east of Bergville

Figure 17: Position of pipeline (between two hills) where it crosses Thukela River near Spioenkop Dam

Figure 18: Canal route skirts the lower slopes of the hill in the background near Bergville

Figure 19: Point at which pipeline crosses R616

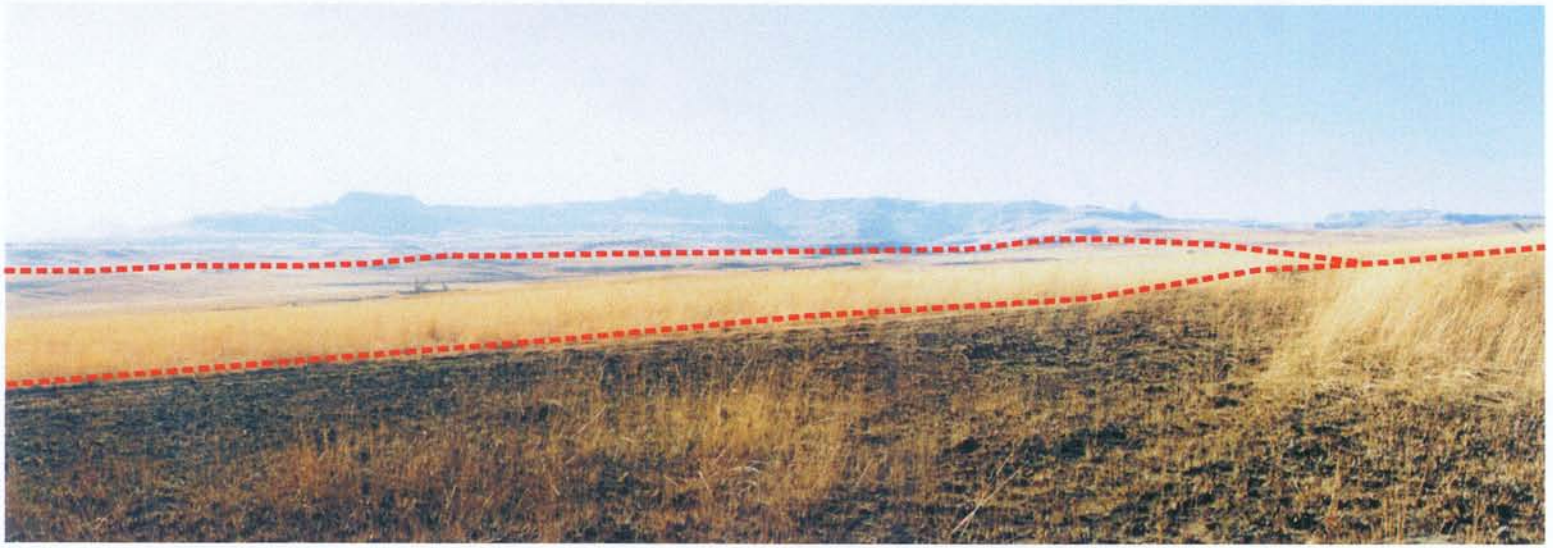


Figure 20: Pipeline route in foreground with canal route following the contour in the background ±8 km east of Kilburn Dam

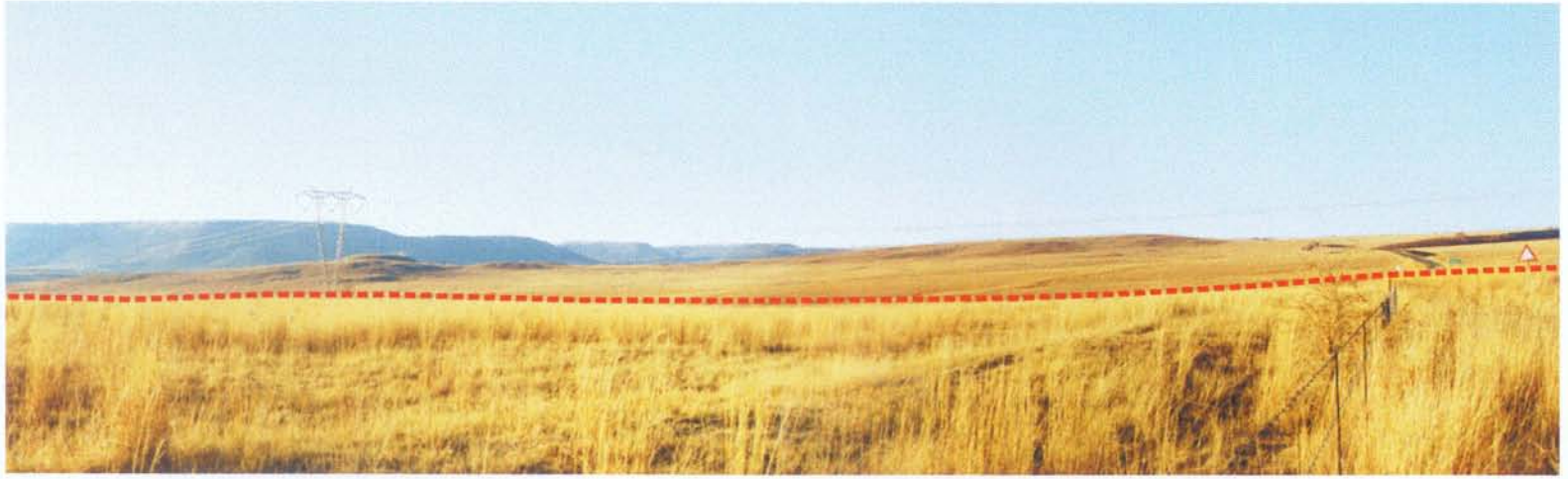


Figure 21: Pipeline route (foreground) at canal route (background) 1 km of N3 crossing

REVIEW

THUKELA WATER PROJECT

FEASIBILITY STUDY

PEER REVIEW OF THE VISUAL AND AESTHETIC BASELINE STUDY.

PREPARED FOR : INSTITUTE OF NATURAL RESOURCES

PREPARED BY: COOPER DRUMMOND ENVIRONMENTAL CONSULTANTS

APRIL 2000.

THUKELA WATER PROJECT
FEASIBILITY STUDY
PEER REVIEW OF THE
VISUAL AND AESTHETIC BASELINE STUDY

EXECUTIVE SUMMARY

The contents of the specialist study to assess the visual and aesthetic impacts of the major components of the proposed Thukela Water Project are reviewed in this report.
The findings can be summarised in terms of the peer reviewer's terms of reference as follows:-

1.0 The specialist has complied with their terms of reference .The question of identification of requirements for further investigation is implied under the assumptions ,and limitations discussions, it could have been further elaborated upon, but is not critical to the issues at hand.

2.0 The report is balanced, factual, unbiased and comprehensive enough to be used for its purpose.

3.0 Sufficient information exists in the report for decision making for this stage of the process.

4.0 The report process is clear, and the results can be defended on the basis of the process followed.

5.0 Within the limitations of the brief, we feel that complex issues have received adequate attention.

6.0 We believe that the report does adequately address issues formulated within this specialist environmental study for the feasibility assessment process.

7.0 The specialist has used accepted methods and techniques, in carrying out the study.

8.0 We do not believe that there are serious deficiencies in terms of results obtained and conclusions drawn in the report.

PEER REVIEW REPORT: VISUAL AND AESTHETIC BASELINE STUDY OF THE PROPOSED THUKELA WATER PROJECT.

1.0 INTRODUCTION.

1.1 Background and Brief

The Thukela Water Project Feasibility Study, was commissioned by the Department of Water Affairs and Forestry (DWAF) to investigate the feasibility of inter-basin transfer of bulk water supply to the Vaal River system from the Thukela River system in order to augment future supplies to that high growth area..

A specialist study was commissioned by the Institute of Natural Resources in Pietermaritzburg to assess the visual and aesthetic concerns of the proposed project. This study was prepared by Cave Klapwijk and Associates at the feasibility level and completed by the beginning of March 2000.

Cooper Drummond Environmental Consultants have subsequently been commissioned to review this visual report as part of the IEM process and is the purpose of this report.

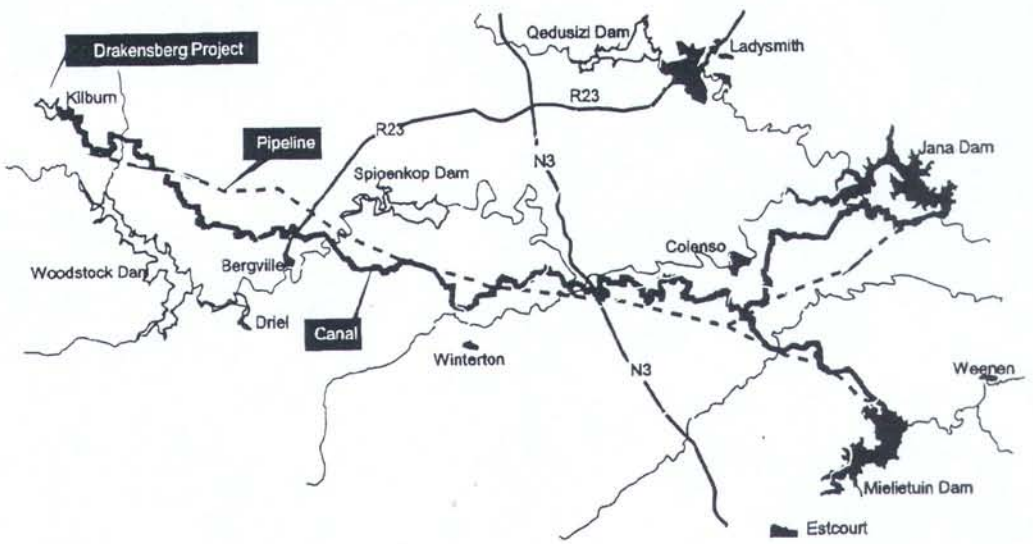


Figure 3.1 Proposed layout of the Thukela Water Project

!.2 Terms of Reference of the Peer Reviewer.

In reviewing the visual and aesthetic baseline study report, the following criteria were to be considered :-

- Has the specialist consultant complied with their terms of reference?
- Is the report balanced, impartial/unbiased and comprehensive enough within the TOR set for the study?
- Does the study contain sufficient information to be used in the decision making process , as this feasibility phase of the TWP project reaches culmination ?
- Does the report follow a logical and clear thought process, explaining the methodology followed, results obtained and conclusions drawn?
- Has the treatment of complex issues received adequate attention and appropriate treatment in this report?
- Does the report adequately address the issues and alternatives that were formulated as the framework for the environmental feasibility assessment process?
- Have appropriate assessment methods and techniques been employed and explained by the specialist.
- Are there any deficiencies in terms of results obtained and conclusions drawn?
- If there are deficiencies in the report, will they have a material effect on the proponent's ability to make an informed decision on proceeding to the next stage of the TWP ?
- Make recommendations as to possible remedial action to correct any deficiencies and how they should be carried out.

2.0 TERMS OF REFERENCE OF THE SPECIALIST CONSULTANT.

The underlying rationale for the visual and aesthetic study is to assess the potential impact that the key components of the Thukela Water Project, viz. the Jana Dam on the Thukela River, Mielietuin Dam on the Bushman's River and their respective aqueducts converging into a single aqueduct, (underground pipeline or open canal alternative, or elements of both) across some 121-183 km. to Kilburn Dam and the existing Pumped-Storage Scheme to Sterkfontein Dam.
The concern is that the project proposals may fundamentally alter the character and sense of place of the local environment in a negative manner, making the project a less attractive option at the national level

To this end Cave Klapwijk and Associates as specialist consultants were given the following terms of reference:-

a) Describe the visual character of :
   - Jana Dam.
   - Mielietuin Dam
   - The aqueduct routes (as provided).

Evaluating components such as topography and current land use activities.

b) Identify elements of particular visual quality that could be affected by the TWP.
c) Describe and evaluate the visual impacts of the individual components of the proposed TWP from critical areas and view fields. This assessment should assess impacts according to the criteria and terminology as indicated in the report.
d) Recommend mitigation measures to reduce the potential visual impacts generated by the components of the TWP.
e) Specific consideration should be given to the identification of requirements for further investigation.

2.1 COMMENTS ON THE SPECIALIST CONSULTANTS TERMS OF REFERENCE.

The terms of reference for the study are acceptable for this level of investigation. Possible additions to the above could include some early investigation into the visual impact of providing the material required for say, the rock fill core of a concrete faced rock fill embankment wall option.(11,5 million m3) This impact could be compared to the possible impact of a curved RCC gravity structure in terms of its material and sourcing requirements. This matter will no doubt receive attention during the next project phase. The potential impact of quarrying this volume of material is however of significant visual concern and perhaps should be considered fairly earlier in the decision making process.

3.0 SPECIALIST CONSULTANTS REPORT.

3.1 Methodology and Data employed.

The methodology employed to assess the visual impact of the project proposals , using a mapping system of view sheds , distances, important viewing corridors and points is internationally employed and acceptable .
Studies by the US Forest Service have shown that tourists, and eco-tourists in particular, are more sensitive to landscape quality than local residents , who may have either a different priority, or due to an extended duration, tend to become "accustomed" to their local aesthetic.
It would however be useful to the consultant have some basic data on the numbers concerned, for example, how many hunters ,hikers or river-rafters and other eco-tourists will view Jana Dam from downstream of the wall ? (the most negative view) How will this effect their experience or desire for unspoilt or wilderness areas, in which to recreate?
One comment as an "outsider " to understanding the project, is that the report could be more effective in transferring the image of the various components , if more use were made of photos or sketches showing diagrams or examples of similar structures. A typical section/perspective of say the canal aqueduct option , would make visualisation much easier for the reader.
I also felt a little frustration at perhaps, not seeing more details of the immediate impoundment area (perhaps an enlargement of key areas of the maps.)

3.2 Limitations Constraints and Assumptions.

The specialist consultants have stated the limitations to their study, and one has to concur that the study is of necessity going to be somewhat limited at this feasibility stage.
Special note needs to be taken of the exclusion of the so-called "ancillary project components" i.e. the question of what materials will be quarried from where, and how great a visual impact will this have on the project. My concern is that these secondary facets of the proposal could be more significant than some of the major components, for example, a large quarrying operation close to site could have as much impact as a pipeline servitude itself.

3.3 Description of the Affected Environment.

3.3.1 Description of the Works and Associated Elements

This aspect is adequately covered in the report, but could have been more animated for ease of understanding and visualisation.

3.3.2. Description of the Natural Physical Elements.

This aspect of the report is well covered. It would however be helpful to have the relevant photos of the affected areas included in this section for ease of reference.
Some indication of the *relative quality* of the affected environment on a broader scale may also be helpful in assessing visual disturbance. By this is meant, how does the affected area rate in terms of scenic beauty within the region? Are we proposing to alter the character of the most scenic gorge in the whole of Western KwaZulu-Natal?
Again perhaps, some indication of the numbers of viewers from critical viewpoints would be helpful (if available.)

3.4 Identification of Risk Sources.

The identification of risk sources for visual disturbance, both during construction and operational phases of the project is adequately considered in the report.
One should consider the proposed dam walls themselves as potentially the biggest visual intrusion in especially , a scenic gorge, viewed by eco-tourists. The scale, form, texture and colour of these elements can make them visually very intrusive. The simulation photos are very helpful in this regard. A useful addition would be a view of say Jana Dam wall, from a downstream elevated plateau position.
On the positive side, the addition of water to a landscape scene is often positive , especially in more monotonous or featureless scenes , and certainly in the case of Mielietuin Dam.

4.0 Impact Description and Assessment.

The methods and techniques used here are well documented and widely used, viz. an overlay system of VAC factors, together with mapping of view sheds , distance

6.7 The specialist has used accepted methods and techniques, in carrying out the study.

6.8 We do not believe that there are serious deficiencies in terms of results obtained and conclusions drawn in the report.

6.9 Any deficiencies of the study would not materially effect the proponent in proceeding to the next stage of the TWP in terms of informed decision making.

6.10 We do not believe that remedial action is required. There are a few issues raised in this review, but these can be adequately dealt with during the next level of investigation or design.

THUKELA WATER PROJECT FEASIBILITY STUDY

Response Document to the Peer Review of the Visual and Aesthetic Baseline Study

1. INTRODUCTION

Comment by Mr J Drummond of Drummond Environmental Consulting CC was forwarded by the Institute of Natural Resources.

The comment was used to make amendments to the draft report.

2. RESPONSE

The comment was generally favourable in that the peer review was of the opinion that the terms of reference had been met and that the report was balanced, factual, unbiased and comprehensive.

2.1 Comment: It would have been useful to have basic numbers on how many hunters, hikers, river rafters and other eco-tourist would be affected.

Response: We were not aware of any eco-tourist data that could have been used at the time of the study and therefore had to base the findings on assumptions. Such a study can be undertaken during the environmental impact study.

2.2 Comment: The report would be more effective if images of the various components in the form of photos or diagrams were included.

Response: Additional sections of the components were included in the final report.

2.3 Comment: More detail of the immediate impoundment area would have assisted in describing the project.

Response: Detailed maps of the impoundment areas were included in the final report.

2.4 Comment: Ancillary project components such as quarries were excluded from the study. These secondary facets could be more significant than some of the major components.

Response: A proposal was made to the Client to investigate the visual impact of these components. The Client was made aware of the need for such impact assessments.

Report Number: PB-V000-00-6999

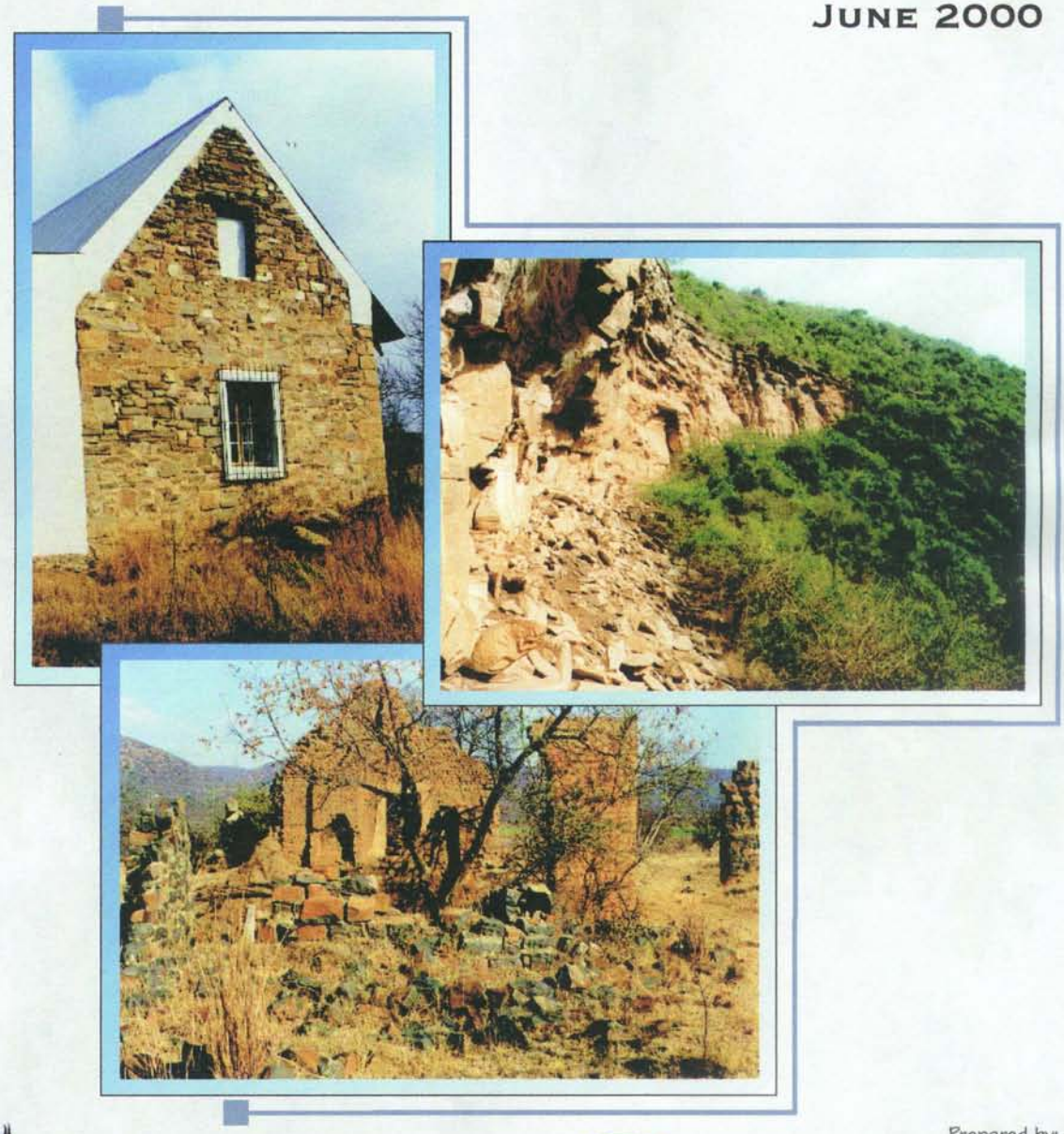
Republic of South Africa
Department of Water Affairs and Forestry

THUKELA WATER PROJECT FEASIBILITY STUDY

VOLUME 7: BASELINE STUDIES

A) HISTORICAL AND CULTURAL BASELINE STUDY
B) ARCHAEOLOGICAL BASELINE STUDY

JUNE 2000



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A) Historical and Cultural Baseline Study

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THUKELA WATER PROJECT FEASIBILITY STUDY

HISTORICAL AND CULTURAL BASELINE STUDY

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TABLE OF CONTENTS

LIST OF TABLES, MAPS AND FIGURES

1 SUMMARY

1.1 Mielietuin Dam area

1.1.1 This survey sets out to identify the historical and cultural events and sites of significance in the Bushman's (Mtshezi) River valley which are likely to be affected by the construction and filling of the Mielietuin Dam. The survey outlines the early habitation of the valley, followed by the arrival of the trekkers (Voortrekkers) in the 19th century and the contact between the trekkers and inhabitants of the valley. An endeavour has been made to establish the accuracy of the trekkers' assertion that this area was unoccupied when they arrived. Attention has been paid to the trekker and Zulu conflicts with particular reference to this area. Aspects of the 19th century agricultural history have been dealt with. Of note are the remains of several extensive water furrows which lead off the Bushman's River. These developments are a feature in the context of farming with irrigation in the 19th century in this province. Attention has also been paid to the remains of homes and farm buildings.

1.1.2 Efforts were made to locate more recent local community historical and cultural sites.

1.1.3 Most of the sites of significance that have been located will be inundated in the event of the dam being built and filling to a level of 1033m (34 sites). However, slightly fewer will be flooded in the event of the dam filling to a level of 1015m (20 sites).

1.1.4 It is proposed that (i) the maze of furrows should be accurately mapped, (ii) the buildings and building remains be meticulously documented, (iii) selected archaeological test excavations be carried out at some of the homestead sites, and (iv) more detailed historical research be carried out to obtain a fuller and more detailed picture of the 19th century occupation of the affected area before it is inundated. This should include further research at the KwaZulu-Natal Archives, at the Voortrekker Monument archives and among people who may have had information passed down to them about previous landowners of the relevant farms.

1.1.5 All the resulting information and material recovered should be deposited with the Fort Durnford Museum, Estcourt, with the proviso that should this museum be closed at a future date that the material be passed on to another appropriate museum or archive. In the event of Fort Durnford Museum's future being in doubt when the material is being deposited, then it should be left with the nearest suitable, viable museum.

1.2 Jana Dam area

1.2.1 This survey sets out to identify the historical and cultural events and sites of significance in the Thukela River valley which are likely to be affected by the construction and filling of the Jana Dam. The survey outlines the early habitation of the valley, followed by the arrival of the colonial settlers. Attention is paid to the Thukela River as a boundary and a frontier area with all the attendant conflict.

1.2.2 Attention has also been paid to more recent local community historical and cultural sites.

1.2.3 All the sites of significance that have been located will be inundated in the event of the dam filling to a level of 890m (30 sites) and most of these sites will be inundated in the event of the dam being filled to a level of 835m (29 sites).

1.2.4 It is proposed that negotiations are entered into with the Mankandane, Mzinyonke, Mcitsheni and Qinisa communities to mitigate the loss of their cultural and historical sites.

1.3 Aqueduct routes

1.3.1 This survey sets out to identify the historical and cultural events and sites of significance along the aqueduct routes which are likely to be affected by the construction of either the canals or pipelines. The survey outlines the early habitation of the area, arrival of new inhabitants in the nineteenth century and identifies certain trekker routes and Second Anglo-Boer War sites.

1.3.2 It is proposed that note be taken of the trekker routes and Second Anglo-Boer War sites and particular care be taken in the way in which the developments are levelled off. No stone and soil should be left higher above ground level than prior to the commencement of the development.

2 TERMS OF REFERENCE FOR BASELINE STUDY

2.1 Introduction and background

The Department of Water Affairs and Forestry (DWAF), as the responsible institution for the management of South Africa's water resources, has commissioned the Thukela Water Project Feasibility Study with a view to further augmenting water supply to the Vaal River System from the Thukela River catchment.

The proposed scheme comprises two large dams, the Jana Dam on the Thukela River and the Mielietuin Dam on the Bushman's River, with linking aqueducts comprising either an open canal and/or a pipeline from the proposed dams to the existing Drakensberg Scheme.

2.2 Terms of reference

The purpose of this baseline study is to determine the impact of the proposed Thukela Water Project (TWP) on the historical and cultural heritage resources. The rationale for this study is that the construction of large impoundments and the associated aqueduct routes is likely to impact on cultural heritage resources of importance. The primary objective of this baseline study is therefore to investigate and assess culturally significant places, cultural events and important persons as well as historical buildings and places likely to be affected by the dam basin areas and aqueduct routes. This baseline study will have the following objectives:

(i) Describe the historical and cultural heritage context of the area to be affected by;

- Jana Dam
- Mielietuin Dam
- Aqueduct routes (as provided)

(ii) Document the historical and cultural heritage resources that could be affected by the TWP by providing a description and location of sites, features and events with special reference to:

- Black settlers
- Colonial settlers
- Voortrekker period
- Anglo-Boer War 1899-1900 period
- Settlement sites
- Architectural structures and remains (older than 60 years)
- Significant events or people
- Cultural sites

by making use of a review of the literature, contact and interviews with interested and affected parties, and a field survey to identify sites.

(iii) Describe and evaluate the impacts on historical and cultural heritage resources. This evaluation should assess impacts on sites, features and events according to the criteria and terminology as indicated in Table 2.1.

(iv) Recommend mitigation measures to reduce the impacts on sites of historical and cultural heritage.

(v) Specific consideration should be given to the identification of requirements for further investigation.

Table 2.1: Conventions for definitions and terminology used in the description, evaluation and assessment of environmental impacts

Category	Description or Definition
Type	A brief written statement, conveying what environmental aspect is impacted by a particular project activity or action, or policy or statutory provision.
Magnitude and Intensity	The severity of the impact
· very high	- Complete disruption of process; death of all affected organisms; total demographic disruption
· high	- Substantial process disruption, death of many affected organisms; substantial social disruption
· moderate	- Real, measurable impact, which does not alter process or demography
· low	- Small change, often only just measurable
· no effect	- No measurable or observable effect
· unknown	- Insufficient information available on which to base a judgement
Extent / Spatial Scales	The geographical extent or area over which the direct effects of the impact are discernable, i.e. the area within which natural systems or humans directly endure the effects of the impact.
· international	- Southern Africa
· national	- South Africa
· regional	- KwaZulu-Natal and the Thukela catchment, the uThukela region
· local	- dam basin, conveyance servitude, river reach, specific site locality
Duration	The term or time period over which the impact is expressed, **not** the time until the impact is expressed. Where necessary the latter must be specified separately.
· short term	- up to 5 years (or construction phase only)
· medium term	- 5 to 15 years 9 (or early commissioning and operational phases)
· long term	- > 15 years (or operational life)
Sign	Denotes the perceived effect of the impact on the affected area
· positive (+)	beneficial impacts
· negative (-)	impacts which are deleterious
Certainty	A measure of how sure, in the professional judgement of the assessor, that the impact will occur or that mitigatory activity will be effective
· improbable	- low likelihood of the impact actually occurring
· probable	- distinct possibility that the impact may occur
· definite	- impact will occur regardless of prevention measures
Significance	An integration (i.e. opinion) of the type, magnitude, scale and duration of the impact. Judgements as to what constitutes a significant impact require consideration of both context and intensity. It is the assessor's best judgement of whether the impact is important or not within the broad context in which its direct effects are felt. (see Fuggle R.F. & Rabie M.A. 1992. *Environmental Management in South Africa*. Cape Town: Juta & Co. 823)
· high	- Could (or should) block the project/policy; totally irreversible (-ve impact) or provides substantial and sustained benefits (+ve impact)
· medium	- Impact requires detailed analysis and assessment, and often needs substantial mitigatory actions.
· low	- Impact is real but not sufficient to alter the approach used. Probably no mitigation action necessary.

Some Explanations and Definitions

1 Environmental impact - An environmental change caused by some human act. (DEA 1992. *The Integrated Environmental Procedure*. Vol 5).

2 Environmental impact - Degree of change in an environment resulting from the effect of an activity on the environment whether discernable or undesirable. Impacts may be the direct consequence of an organisation's activities or may be indirectly caused by them. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

3 Affected environment - Those parts of the socio-economic and bio-physical environment impacted on by the development. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

4 Environmental issue - A concern felt by one or more parties about some existing, potential or perceived environmental impact. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

5 Environment - means the surroundings within which humans exist and that are made up of:
- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part or combination of (i) and (ii) and the interrelationships among and between them;
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being. (National Environmental Management Act No 107 of 1998).

6 Significance - (See Fuggle R.F. & Rabie M.A. 1992. *Environmental Management in South Africa*. Cape Town: Juta & Co. 823. Also in, DEA 1992. *The Integrated Environmental Procedure*. Vol 4).

7 Significance - "The definition of significance with regard to environmental effects is a key issue in EIA. It may relate *inter alia* to scale of the development. To sensitivity of location and to the nature of adverse effects." (Glasson, J. Therival, R. and Chaduuick, A. 1995. *Introduction to Environmental Impact Assessments. Principles and Procedures, Process, Practise and Prospects*. London: UCL Press. 13).

8 Significance - "Once impacts have been predicted, there is a need to assess their relative significance. Criteria for significance include the magnitude and likelihood of the impact and its spatial and temporal extent, the likely degree of recovery of the affected environment, the value of the affected environment, the level of public concern, and political repercussions." (Glasson, J. Therival, R. and Chaduuick, A. 1995. *Introduction to Environmental Impact Assessments. Principles and Procedures, Process, Practise and Prospects*. London: UCL Press. 124).

9 Significance -" The question of significance of anthropogenic perturbations in the natural environment constitutes the very heart of environmental impact assessment. From any perspective - technical, conceptual or philosophical - the focus of impact assessment at some point narrows down to a judgement whether the predicted impacts are significant." (Beanlands, G. 1983. *An ecological Framework for Environmental Impact Assessments in Canada*. Institute for Resource and Environmental studies. Dalhausie University. Sections 7: 43).

10 Environment - Surroundings in which an organisation operates, including air, water, natural resources, flora, fauna, humans and their interrelation. (ISO 14001. 1996). Note - Surroundings in this context extend from within an organisation to the global system.

11 Environmental aspect - Element of an organisation's activities, products or services that can interact with the environment. (ISO 14001. 1996). Note - A significant environmental aspect is an environmental aspect that has a or can have a significant environmental impact.

12 Environmental impact - Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services. (ISO 14001. 1996).

3 METHODOLOGY

3.1 A variety of methods have been employed in this survey. Interviews were conducted with affected and interested parties of the Mielietuin and Jana Dam areas and the aqueduct routes in July and August 1998, and March, August and September 1999. Efforts were made to meet with every landowner/manager who would be affected in the Jana and Mielietuin Dam areas and along the aqueduct route areas. Contacts were made with community representatives in the Jana Dam area (Mzinyonke/Mankandane Development Committee, Qinisa Development Committee and Mcitsheni Development Committee). Where appropriate, land tenants were also contacted. Organisations such as farmers' associations, women's institutes, historical societies and museums, as well as people with a particular interest or knowledge, were invited to an open briefing meeting in Ladysmith (Appendix 1: Attendance Register). Interviews with individuals with specialist knowledge have been conducted, namely Mr George Chadwick (retired Inspector of History for Schools), Mr David Green (Farmer, Bushman's River valley), Mr Frans Prins (Anthropologist, Natal Museum), Mr Steve Watt (retired Natal Education Department official) and Professor John Wright (University of Natal).

3.2 A physical survey of the terrain was made, with sites being pointed out by local residents. At the same time a visual search was made for additional visible remains.

3.3 Historical literature and documents with data relating to the Thukela and Bushman's Rivers valleys, the aqueduct routes area and relevant events was surveyed.

3.4 The archaeological record and archaeologists have also been consulted about early habitation of the Mielietuin and Jana Dam sites and aqueduct routes area. The Archaeological Baseline Report deals in detail with the prehistoric period.

3.5 The sources are relatively scarce and not particularly precise in terms of exactly where people were settled. An additional complicating factor is that the aqueduct routes run across somewhat featureless countryside. This further exacerbates the lack of precision in the descriptions provided in the sources.

3.6 The indiscriminate use of some of the sources has to be guarded against. Into this category in particular falls A.T. Bryant's *Olden Times in Zululand and Natal.* It has been severely criticised by several historians, who include S. Marks (1969), C. Hamilton (1985), J.B. Wright (1990) and J. Cobbing (1990). Nonetheless, Hamilton and Wright (1989) (Duminy and Guest, 1989, 57) do acknowledge that Bryant's works remain indispensable to the historian.

4 HISTORICAL AND CULTURAL EVENTS

4.1 An effort has been made to compile a fairly comprehensive history of noteworthy events of the region, some of which stretch beyond the specific dam sites and aqueduct routes area. This history does not claim to be an exhaustive thesis of the area.

4.2 The Mielietuin Dam area has a relatively flat terrain in the valley floor, covered in several areas by rich soils. Rising from the valley floor are slopes varying in steepness. Large portions of the valley floor lend themselves to cultivation, while the slopes are not suitable for intensive agricultural activities and habitation. The Jana Dam terrain is rugged, with a deep, steep sided valley. The terrain is rocky, soils generally poor and shallow with few areas suitable for cultivation. There are some small, flattish areas in the valley which are suitable for cultivation. The rainfall is approximately only 700mm per annum, further militating against cultivation. The aqueduct routes cross generally flat and open terrain, intersected by a few hilly areas. Most of this area lends itself to agriculture of one kind or another, with large portions having in the past been covered by high quality grazing grass.

4.3 The presence of quality natural resources in terms of soils, vegetation and an abundance of water in certain areas, has resulted in human occupation and utilisation of this area, stretching back over a long time.

4.4 The archaeological record indicates that the area has been utilised for thousands of years, dating back to the Stone and Iron Ages. In more recent times, during the 18th and early 19th centuries, it is difficult from sources such as Stuart (1976 to 1986) and Bryant (1929), to establish who was living in the area under investigation. Further complicating factors in trying to establish who lived in the area and where, are that social structures and entities were small and groupings, identities and position relatively fluid (Bryant,1929 and Wright,1989). Bryant in his map, "Zululand and Natal - The Native Clans as located in the Pre-Shakan Times", suggests that the area under consideration was settled by one of the Dlamini chiefdoms in the east and the amaZizi people in the west.

Wright maintains that "the stereotyped view that in the 1810s and early 1820s the Zulu state was the only significant agency of change in the Thukela - Mzimkhulu region, and that the Zulu had the power to intervene more or less at will in the region's affairs, completely fails to capture the complexity of the region's history in this period. So too does the notion that this history was mainly one of violence and destruction."

"There is no doubt that these years saw a great political, social and economic upheaval taking place south of the Thukela as migrant groups from the north pushed their way into it and disrupted established patterns of existence ... (and) these groups used force not so much to wipe out populations as to seize resources and, at times, to destroy the political organisation of communities which stood in their way." (Wright in Hamilton,1995, 174-175). Precisely how these events affected those living in the area under consideration is impossible to determine due to a lack of precise detail. What is known is that in the late 1810s the Ngwane under Chief Matiwane ka Masumpa moved into the amaZizi area, driving out some and incorporating others under his control. Matiwane established himself near a hill called Ntenjwa, near where the aqueduct routes cross the Thukela River. From here Matiwane extended his authority to the Biggarsberg in the north, the upper Mtshezi and beyond it in the south. Bryant maintains that the Ngwane were expelled from this area in 1822 and it, according to Wright, probably remained vacant for a while.

4.5 Furthermore, according to Bryant, the Thembus under the chief Nodada settled in the Bushman's River valley in 1839. No sooner had they settled than the trekkers ejected them from this valley and settled there themselves.

4.6 The trekkers had begun to cross the Drakensberg into Natal in 1837. Their routes periodically cross the proposed aqueduct routes (Map 4.1, p.14). In a trekker diary it is reported that on one day 100 wagon loads of produce were collected from lands and gardens of blacks living around the trekker laager at Doornkop and that another 100 wagon loads could have been collected. This clearly indicates that the region was reasonably densely occupied before the arrival of the trekkers. There is no indication of the distribution of these early inhabitants.

4.7 The arrival of the trekkers introduced a new element into the region and this initially led to conflict with the Zulu nation. A Zulu force attacked the trekker community on the night of 16/17 February 1838 at the Mlazi (Little Moordspruit), Qubanga (Groot Moordspruit), Msuluzi (Bloukrans), Little Bushman's River, Mtshezi (Bushman's River) and Rensburgspruit (Figure 4.1). The Zulu force that attacked the families along the Rensburgspruit, according to Chadwick, crossed the Bushman's River in the region where the Rensburgspruit enters it.

4.8 When conditions began to calm down in Natal, the trekkers settled along the Bushman's River valley, which includes areas which are to be inundated by the proposed dam. They also settled in several other areas. Between 1839 and at the latest 1842 the farms Groote

Milie Tuin, Roode Draay, Ronde Dray and Van der Merwe's Kraal had been occupied, and almost immediately built on. In keeping with trekker farming practice they established extensive furrows on all farms where there was access to a regular water supply. From the water furrows they irrigated their crops. The remains of these furrows are a feature of this valley, attesting to extensive agricultural endeavour, which continues to this day, with the Bushman's River still playing a significant role, but now through modernised irrigation systems. The farm Groote Milie Tuin was purchased by the prominent trekker leader, Andries Pretorius, in 1839. He personally only settled there in 1847 and left again in 1848. The water wheel that was erected on Groote Milie Tuin was dismantled in the 1980s and erected in Weenen as a tourist attraction. There is documentary evidence that each of the four farms had buildings on them by 1848. (It is not possible at this stage to state with certainty which of the existing building remains, and even the water furrows, are of Voortrekker origin, be it based on oral or documentary evidence. However, in the absence of any other remains, and from the brief description of trekker farms dating to the 1840s, it is almost certain that several of the sites in this valley, listed in Section 5, date to trekker endeavours.)

4.9 During the 19th century the Thukela River was at times used to demarcate the boundary between different authorities.

When the trekkers arrived in what is today known as KwaZulu-Natal, they entered into a treaty with Inkosi Mpande on 27 October 1839 in terms of which he handed over to them that territory bounded by the Thukela and Mzimvubu Rivers, the Drakensberg and Indian Ocean. This territory became known as the Republic of Natalia. However, on 15 February 1840 Chief Commandant A.W.J. Pretorius announced to Inkosi Mpande and his izinduna that the trekkers were extending their territory from the Thukela River to the Black Mfolozi, the Drakensberg and Indian Ocean. The British government was concerned by the instability in Natal and also believed that proper control should be exerted over the trekkers. They therefore took the necessary military action and after initial setbacks drove the trekkers back from Durban and annexed Natal as an autonomous district of the Cape Colony. It was only on 15 July 1856 that Natal was annexed as a separate colony of Great Britain. The British authorities had by then already presented a new land division document to Mpande, in which Zululand's southern boundary was the Thukela River from the sea to its junction with the Mzinyathi (Buffalo) River and then north along that river to the foot of the Drakensberg. The document was agreed to on 5 October 1843. This cancelled the annexation by Pretorius of the territory between the Thukela and Black Mfolozi Rivers.

4.10 The majority of the trekkers who had left the Cape Colony to escape British rule left Natal when it was annexed by Britain. However, some of those remaining in the triangle of land between the Thukela, Mzinyathi Rivers and the Drakensberg, neither wished to leave or live under British rule. Andries Spies "bought" this land from Mpande in January 1847 in perpetual ownership for a mere seventy five pounds - which was never paid. This agreement seriously strained Anglo-Zulu relations. The British brought pressure to bear on Mpande over this land deal, resulting in him repudiating the sale in January 1848. The Thukela River in the Jana Dam site has never again been used to demarcate a national boundary.

4.11 The Thukela River in the Jana Dam site region was in the 19th century effectively a frontier district, far from a controlling authority. The turmoil over the boundaries and landownership lent itself to civil unrest. It was in this context that it was reported to the Executive Council in Natal that the trekkers in that region, although the most warlike in the district, were alarmed at the rumours of disaffection among the blacks and that they were on the point of leaving their farms. Furthermore, the trekkers were enforcing compulsory labour on the blacks in the vicinity of the Klip River and separated husbands and wives in the process. Also there were constant aggressions and assaults perpetrated on the blacks and their cattle seized.

In December 1846 B.G. Oosthuyse, who lived at the Thukela River (possibly in the Jana Dam area) and had met with Andries Spies, who lived at the Klip River, stated that they had met three of Mpande's men who claimed that their Inkosi had long since wished to send out a force against those Zulus who lived along the Thukela River who had deserted from Zululand. They also stated that many of Mpande's men had firearms and that they would soon make war on the whites again, but had hitherto only been prevented from doing so by the Inkosi himself and one of his old izinduna. Oosthuyse also stated that blacks living along the Thukela and Klip Rivers were obtaining firearms from Pietermaritzburg and Durban. All this made the whites very uneasy and Oosthuyse maintained that many had left the district and others were on the point of doing so, "as we feel quite certain that in the event of a disturbance with the natives, and in particular the Zulas (sic), they will easily succeed in carrying off our cattle, without a prospect on our part of ever recovering the same, or any part thereof" (South African Archival Records Natal No 6 Document 102).

4.12 Theophilus Shepstone reported that on 1 September 1849 a force consisting of Natal Native Police Corps, supported by members of Job's, Madoda's and Phakade's people, entered the more distant corner of the Klip River Division (probably the south-eastern

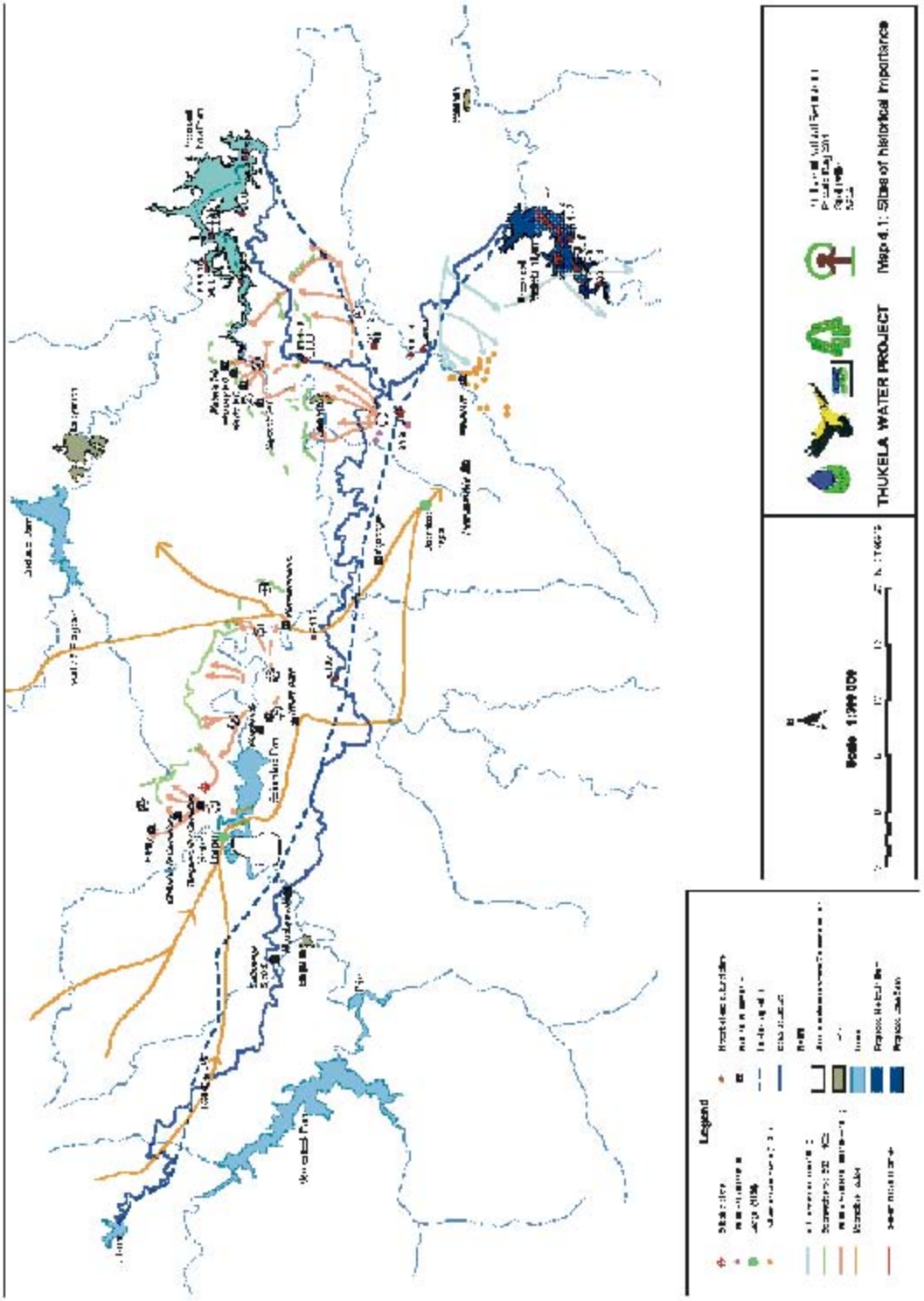
corner at the junction of the Klip and Thukela Rivers). Their intention was to enforce the Location system, also known as the Shepstone system. Parts of Natal had been divided into locations where blacks who were not working for white colonists were to reside. The remainder of Natal was designated for use by whites or was Crown land. Where blacks were on "white" land and were not in the employ of whites they were to be moved off. The force in the Klip River Division set about to remove all blacks not employed by whites, to burn their imizi (homesteads) and confiscate their cattle from them. This action began from the confluence of the Klip and Thukela Rivers to the former's headwaters in the Drakensberg.

4.13 In 1879 the last remaining group of Bushmen (San) still in Natal, living in the Estcourt - Weenen district, departed from there during the Anglo-Zulu conflict. They moved northwards, possibly passing through terrain to be affected by the proposed Jana Dam, to eLenge (Jobe's Kop) and then on to Lake Chrissie. Descendants of these people still live there.

4.14 It was at the end of the nineteenth century that further dramatic events unfolded in some of the areas of the aqueduct routes. In 1899 the Anglo-Boer War broke out and the Boers of the Zuid-Afrikaansche Republiek and Oranje Vrystaat besieged Ladysmith. In an effort to prevent the British from relieving Ladysmith, the Boers established a defence line along the Thukela River in the Colenso area. A British force attacked them there on 15 December 1899 and were repulsed, suffering significant losses (Map 4.1, No. 1). In January and February 1900 the British made further efforts to break through to Ladysmith to relieve it but were again repulsed, this time on the upper Thukela near Winterton (Map 4.1, No. 2, 2A, 2B,3, 3A 3B and 3C).

4.15 The British force then returned to the Colenso area and made another major effort to relieve Ladysmith. After two weeks of almost continuous fighting the British broke through the Boer defence line and relieved Ladysmith. The events had repercussions around the world. (Map 4.1, No. 4)

Map 4.1: Sites of historical importance



5 DESCRIPTION, IMPACT AND ASSESSMENT

Notes: For the purposes of this report it is assumed that the aqueducts will pass through all the relevant sites identified along their routes.

Site/Criterion: Each site is unique in itself and non-renewable. Despite this, some of the sites are not of major historical value. The Voortrekker sites taken as a whole are a valuable record of part of an event that had a considerable impact on the region's history at one time.

Extent and spatial scales criterion: This criterion refers, in broad terms, to whether a site is of local significance, e.g. history of local community, ritual site; regional significance, e.g. buildings constructed by colonial farmers who were not Voortrekkers; national significance, e.g. Voortrekker sites; international significance, e.g. Anglo-Boer War sites. It needs to be stressed that if a site is of local significance to relatively few people, it may nonetheless be of major importance to that community and special mitigatory action may have to be taken.

Certainty with respect to mitigation: The criterion that is selected for each site relates primarily to the necessary mitigation that CAN and MUST be taken under the given circumstances.

MIELIETUIN DAM AREA

The first trekker to own the farm Groote Milie Tuin was Ockert Olivier. It was acquired from him by the prominent trekker leader, Andries Pretorius, on 29 June 1839. He allowed his son-in-law, Hendrik Stephanus Pretorius, and Jurie Potgieter to farm it. By 1843 it was reported that this farm had buildings on it and an extensive water furrow. Andries Pretorius moved to the farm in 1847 but left it again in 1848. What contributions he made in that time is unknown. There are remains of several buildings on this farm, in varying stages of collapse and decay, dating to different eras. Most of these buildings probably date to the 19th century, and from documentary evidence it is certain that some were built by the earliest trekkers in the area.

Read the text in this section in conjunction with the photographs and Map 5.1.

5.1 Woodlands farm is a portion of the original Groote Milie Tuin farm

5.1.1 This is a red brick, mud mortar building, under corrugated iron and was referred to as a cook house. It is quite black inside from soot. It is presently used for storage. It was used by a Mr Masson in the early part of the 20th century. It appears to date to the 19th century. No information could be obtained as to who built it and when. The building is in sound repair. (Figures MT 1 A (i) and (ii))
GPS S 28 54 46 ; E 29 58 54

Map 5.1: Sites of historical importance in the proposed Mielietuin Dam area

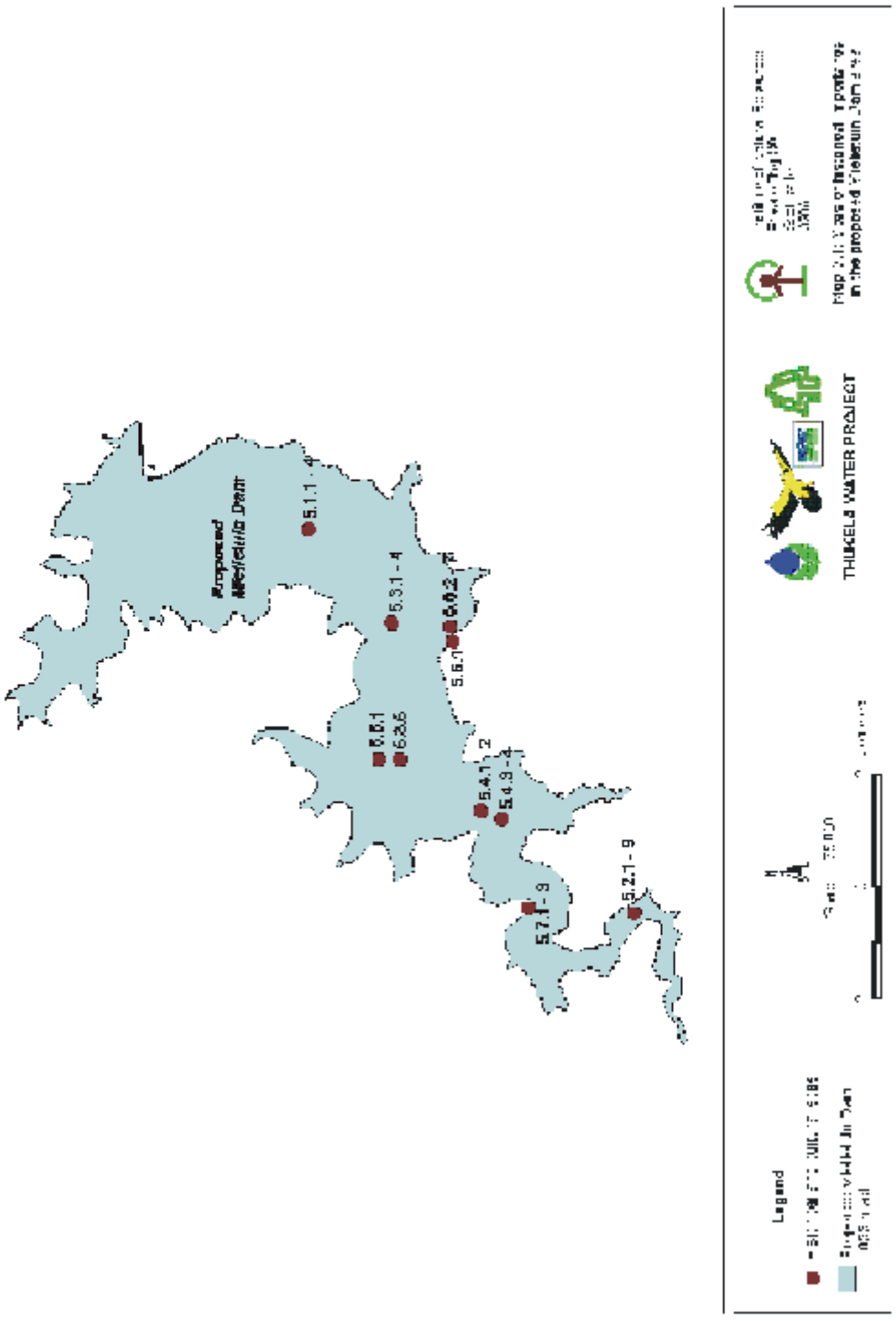


Figure MT 1 A (i)

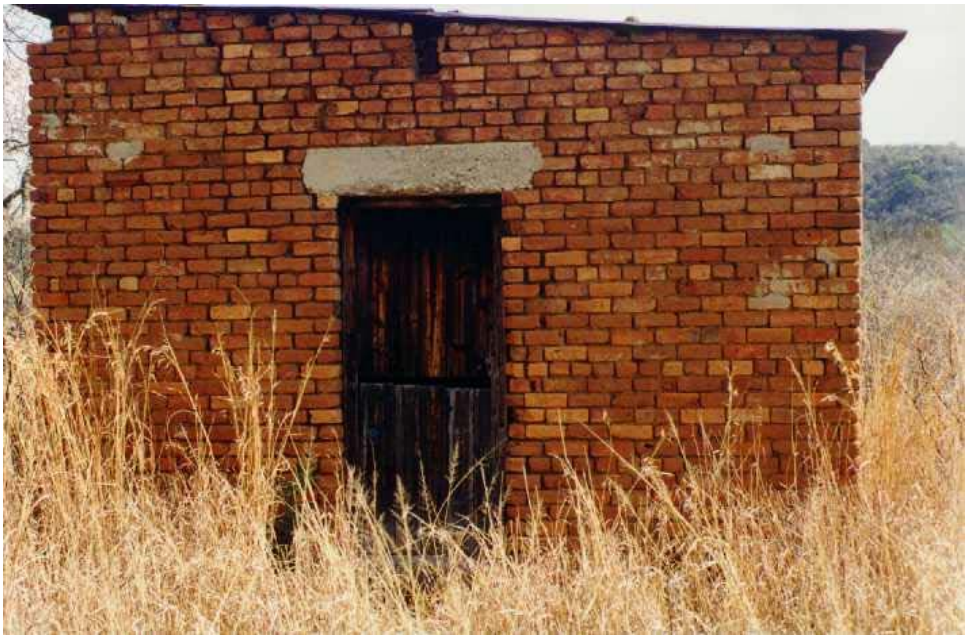


Figure MT 1 A (ii)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.1.1 (Figs. MT1A(i) & (ii))	Very high	Regional	Long term	Negative	Medium	Definite

5.1.2 The remains of a shed built of red brick and corrugated iron. The building has been altered over time. The original portion was probably built in the 19th century. No information is available on who or when it was built. The building is in poor repair. (Figure MT 1 B)
GPS S 28 54 46 ; E 29 58 54

Figure MT 1 B

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.1.2 (Fig. MT1B)	Very high	Regional	Long term	Negative	Medium	Definite

5.1.3 The remains of an old baler worked by two oxen and five labourers. It was used to bale lucerne. It was installed by Mr Masson in the early part of the 20th century. It remained operational until approximately the 1970s. (Figure MT 1 C)
GPS S 28 54 46 ; E 29 58 54

Figure MT 1 C

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.1.3 (Fig. MT1C)	Very high	Regional	Long term	Negative	Medium	Definite

5.1.4 The remains of a disused water furrow from which water was drawn to irrigate the lands between it and the Bushman's River. It is possible that the furrow dates to the early trekker period. (Figure MT 1 D)
GPS S 28 54 46 ; E 29 58 54

Figure MT 1 D

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.1.4 (Fig. MT1D)	Very high	National	Long term	Negative	Medium	Definite

5.2 Groot Mielietuin farm is a portion of the original Groote Milie Tuin farm

5.2.1 This structure of sundried and fired brick appears as though it is the remains of the main dwelling, what was Groote Milie Tuin. On the outer side the building is built of fired bricks. Figure MT 2 (iii) - note the depression on the left which is the remains of a water furrow. (Figures MT 2 A (i) - (iii))

GPS S 28 58 58 ; E 29 54 22

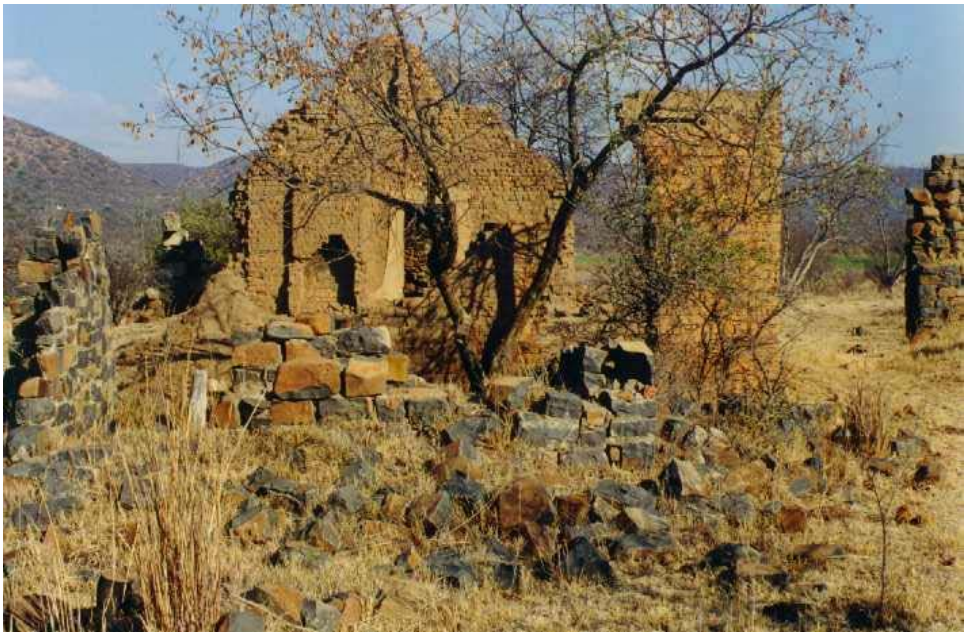


Figure MT 2 A (i)

Figure MT 2 A (ii)

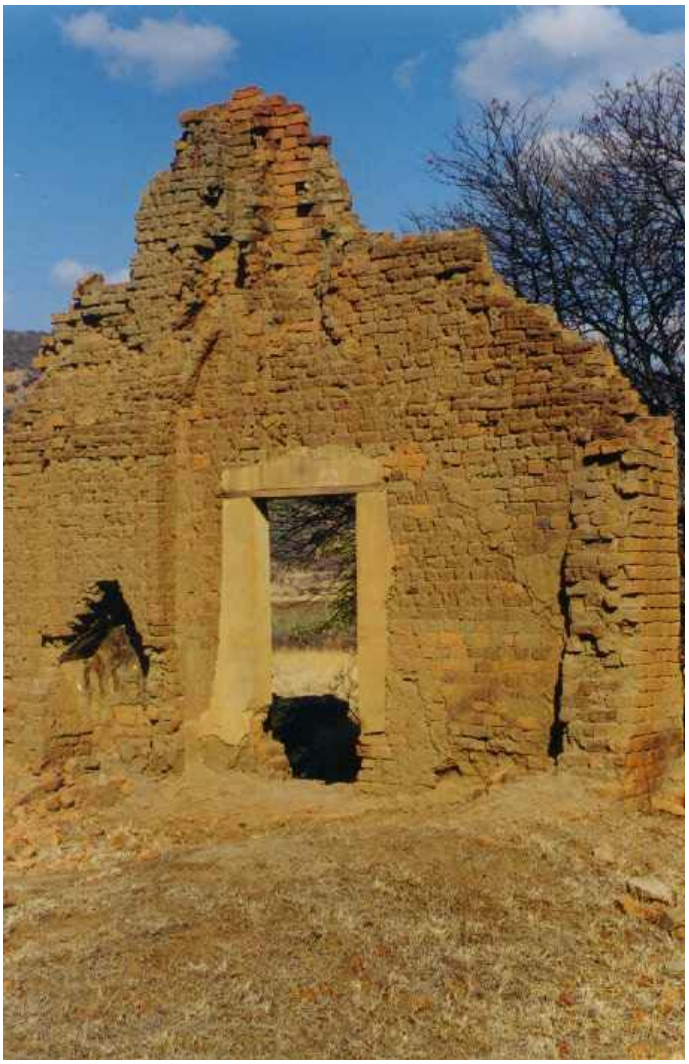


Figure MT 2 A (iii)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.2.1 (Figs. MT2A (i), (ii) & (iii))	Very high	National	Long term	Negative	Medium	Definite

5.2.2 At a later stage additions were made to this building, built with various types of stone, cement and mud plastering, evident in the corner of MT 2 A (v). (Figures MT 2 A (iv) and (v))
GPS S 28 58 58 ; E 29 54 22

Figure MT 2 A (iv)

Figure MT 2 A (v)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.2.2 (Figs. MT2A (iv) & (v))	Very high	National	Long term	Negative	Medium	Definite

5.2.3 The remains of a structure built only of sundried brick. (Figure MT 2 B)
GPS S 28 58 58 ; E 29 54 22

Figure MT 2 B

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.2.3 (Fig. MT2B)	Very high	National	Long term	Negative	Medium	Definite

5.2.4 The remains of a structure built of fired bricks, on a shale foundation. It appears as though this may have been a shed. (Figure MT 2 C)
GPS S 28 58 58 ; E 29 54 22

Figure MT 2 C

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.2.4 (Fig. MT2C)	Very high	National	Long term	Negative	Medium	Definite

5.2.5 The remains of a structure built mainly of sundried brick on the inner wall, and fired brick on the outside. It appears as though this may have been a shed. (Figure MT 2 D) GPS S 28 58 58 ; E 29 54 22

Figure MT 2 D

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.2.5 (Fig. MT2D)	Very high	National	Long term	Negative	Medium	Definite

5.2.6 The remains of a structure built of dolerite and cement. It is probably of later construction than those described above. It appears that it may have been a dwelling. (Figure MT 2 E)
GPS S 28 58 58 ; E 29 54 22

Figure MT 2 E

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.2.6 (Fig. MT2E)	Very high	Regional, rather than National, assuming that site is post-Voortrekker period.	Long term	Negative	Medium	Definite

5.2.7 The remains of a rondavel built of dolerite and cement. Its uses are unknown. (Figure MT 2 F)
GPS S 28 58 58 ; E 29 54 22

Figure MT 2 F

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.2.7 (Fig. MT2F)	Very high	Regional, rather than National, assuming that site is post-Voortrekker period.	Long term	Negative	Medium	Definite

5.2.8 It is from this point that water was released from the water furrow to operate a waterwheel which was housed near the pile of stones visible on the right. The waterwheel has been dismantled and re-erected in Weenen as an exhibit for tourists. (Figure MT 2 G)

GPS S 28 58 58 ; E 29 54 22

Figure MT 2 G

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.2.8 (Fig. MT2 G)	Very high	National	Long term	Negative	Medium	Definite

5.2.9 The remains of the water furrow which was already in existence in 1843 and is approximately 1.3km long. Parts of the water furrow sides are clad with stone (see MT 2 H ii). There is evidence that a shutter slide was in place here which allowed water to be diverted, probably to irrigate cultivated lands. (Figures MT 2 H (i) - (iii))
GPS S 28 58 58 ; E 29 54 22

Figure MT 2 H (i)

Figure MT 2 H (ii)

Figure MT 2 H (iii)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.2.9 (Figs. MT2H (i), (ii) & (iii))	Very high	National	Long term	Negative	Medium	Definite

5.3 Riversdale farm is a portion of the original Groote Milie Tuin farm

There is no evidence of remains of a major dwelling on this farm in the valley floor.

5.3.1 This wall built of shale and mud is all that remains of a shed that was twelve metres long, four metres wide and five metres high. The wall is still perfectly straight and upright. There is no detail available as to who built this structure. The style and workmanship have similarities to other buildings in the valley dating to the 19th century. (Figures MT 3 A (i) and (ii))
GPS S 28 55 23 ; E 29 58 07

Figure MT 3 A (i)

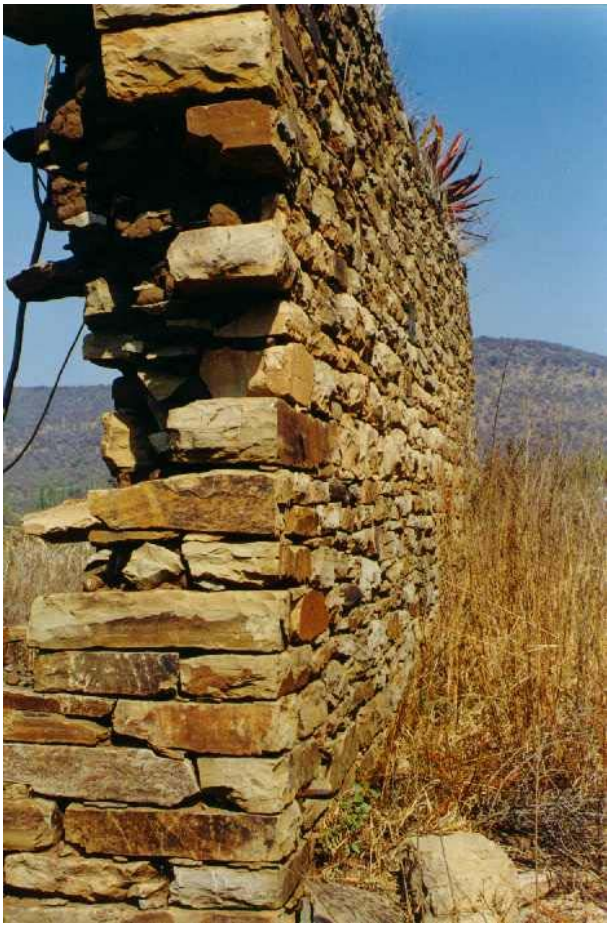


Figure MT 3 A (ii)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.3.1 (Figs. MT3A (i) & (ii))	Very high	National	Long term	Negative	Medium	Definite

5.3.2 This structure is built of sandstone and mud. All that remains is a corner and the foundations. The foundations are approximately four metres by five metres. It is unknown when it was built and by whom. No cultural remains were found. It appears as though the remainder of the stone was removed, and possibly incorporated into nearby dry stonewall cattle pens of more recent construction. (Figures MT 3 B (i) and (ii))
GPS S 28 55 23 ; E 29 58 07

Figure MT 3 B (i)

Figure MT 3 B (ii)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.3.2 (Figs. MT3B (i) & (ii))	Very high	National	Long term	Negative	Medium	Definite

5.3.3 A little distance away slightly to the west is a dipping tank. It is built of dressed sandstone and cement. There is a furrow just above it which probably supplied the water. It does not appear to have been in recent use. It is unknown who built this and when. The first dipping tank in Natal was built at Baynesfield in 1902. (Figure MT 3 C)
GPS S 28 55 23 ; E 29 58 07

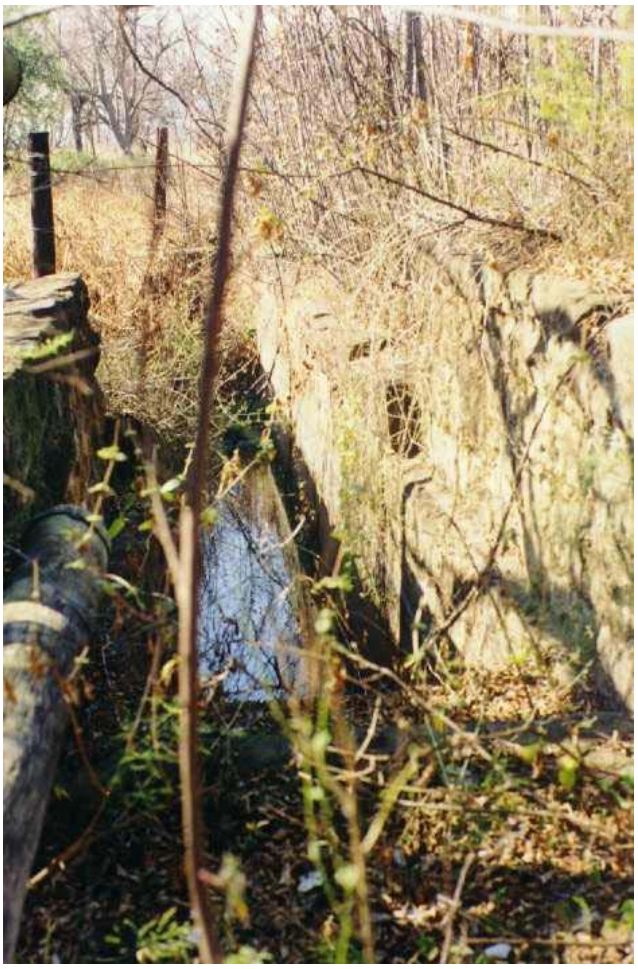


Figure MT 3 C

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.3.3 (Fig. MT3C)	Very high	Regional	Long term	Negative	Medium	Definite

5.3.4 There is an extensive irrigation water furrow which is approximately two kilometres long. It is no longer in use.
GPS S 28 55 23 ; E 29 58 07

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.3.4	Very high	National	Long term	Negative	Medium	Definite

5.3.5 The remains of a large shed built of sunbaked and fired bricks. Date and person who built the shed are unknown. It would appear that it dates to after the Voortrekker period. It is possible that the water acquired from the furrow described in 5.5.1 may have been used to irrigate lands near the shed.
GPS S 28 56 58 ; E 29 55 27

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.3.5	Very high	Regional	Long term	Negative	Medium	Definite

5.4 Oatlands farm is part of the original Roode Draay farm

Roode Draay farm was originally granted to Hendrik Klopper which he occupied from at least 1840 by which time there were also buildings on it and it was being cultivated.

5.4.1 The oldest remaining building on Oatlands is still being occupied. From building styles and design it appears to date to the 19th century. It is built of sandstone. It has been added onto, the interior, according to a report has been modified and the pointing redone with cement. Much of the old exterior remains unchanged. (Figures MT 4 A (i) and (ii))
GPS S 28 56 03 ; E 29 56 32

Figure MT 4 A (i)

Figure MT 4 A (ii)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.4.1 (Figs. MT4A (i) & (ii))	Very high (at 1033m - it will be on the waterline) Moderate (at 1015m)	National	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) No effect (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.4.2 An unmarked grave next to the oldest building on Oatlands farm. (Figure MT 4 B)
GPS S 28 56 03 ; E 29 56 32

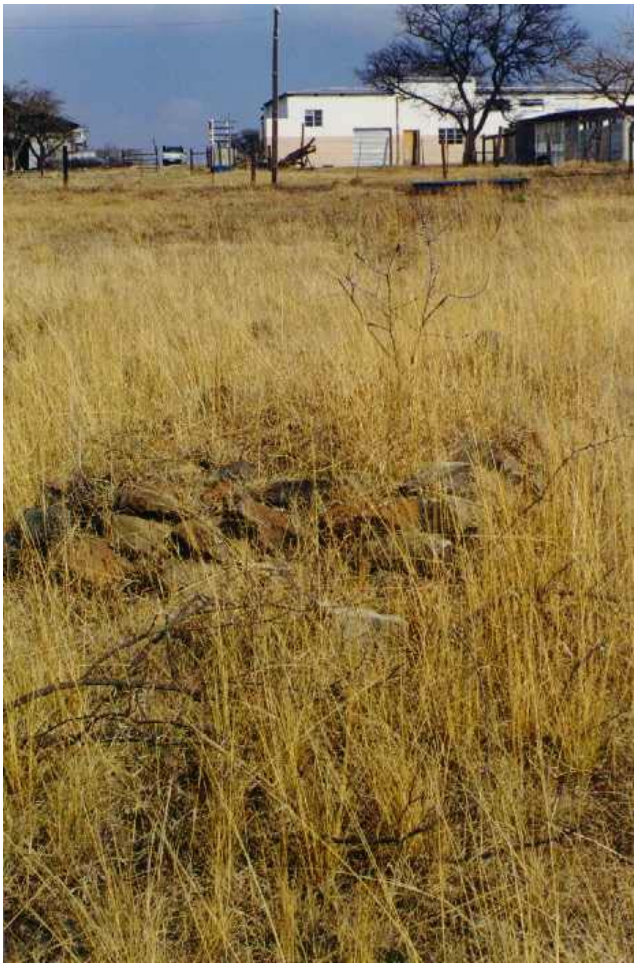


Figure MT 4 B

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.4.2 (Fig. MT4B)	Very high (at 1033m) Moderate (at 1015m)	Local - if post-Voortrekker period; National - if Voortrekker period	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) No effect (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.4.3 The remains of an unused irrigation furrow on the farm which was probably used for agricultural irrigation. It is approximately one kilometre long. It is unknown who built it and when. An 1843 report mentions land being cultivated on Roode Draay. It falls within the pattern of other similar documented farming activities in the area.
(Figure MT 4 C)
GPS S 28 56 13 ; E 29 56 28

Figure MT 4 C

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.4.3 (Fig. MT4C)	Very high (at 1033m) Moderate (at 1015m)	National	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) No effect (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.4.4 The graves of Anna Susanna de Beer and M? C.J.S. Bester who died on 31 August 1843 and 8 August 1848 respectively. (Figures MT 4 D (i) - (iii))
GPS S 28 56 13 ; E 29 56 28

Figure MT 4 D (i)

Figure MT 4 D (ii)

Figure MT 4 D (iii)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.4.4 (Figs. MT4D (i), (ii) & (iii))	Very high (at 1033m) Moderate (at 1015m)	National	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) No effect (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.5 Glen Ann farm is a portion of the original farm Roode Dray

5.5.1 A disused water furrow which is approximately 3.5km long. It appears that water may have been led across the river from a certain point to irrigate fields on the other side at a lower elevation. It is unknown who built it and when. The cemented intake suggests a more recent improvement. It also appears that water may have been led across the river to fields on the north bank. It is unknown who built the canal and when.
(Figures MT 6 A and B)
GPS S 28 56 0 ; E 29 57 0

Figure MT 6 A

Figure MT 6 B

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.5.1 (Figs. MT6 A & B)	Very high	National	Long term	Negative	Medium	Definite

5.6 Ambleside farm is a portion of the original farm Groote Milie Tuin

5.6.1 This is part of a terraced site on which are the remains of a rondavel built from a variety of types of stone. Close by is a very collapsed rectangular structure built of loose stone. On site were pieces of glass and bits of metal: plough shares and part of a spring. There is an unmarked grave, grindstone and fired bricks. This site was probably occupied in the early part of the 20th century. (Figure MT 7 A)
GPS S 28 55 50 ; E 29 57 58

Figure MT 7 A

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.6.1 (Fig. MT7 A)	Moderate	Regional	Not at all	Neutral	Low	Improbable

5.6.2 The remains of a shed built of dolerite. This shed either partially collapsed or was dismantled on one side and converted into a stock enclosure. (Figure MT 7 B (i))
GPS S 28 55 49 ; E 29 58 05

Figure MT 7 B (i)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.6.2 (Fig. MT7B (i))	Very high (at 1033m) Moderate (at 1015m)	Regional, assuming from building features that it is post-Voortrekker period.	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) Low (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.6.3 A small shale built structure, four metres by two and a half metres, which is very collapsed. The use of this structure is unknown. The date and person who built it are unknown. (Figure MT 7 B (ii))
GPS S 28 55 49 ; E 29 58 05

Figure MT 7 B (ii)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.6.3 (Fig. MT7B (ii))	Very high (at 1033m) Moderate (at 1015m)	Regional, assuming from building features that it is post-Voortrekker period.	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) Low (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.6.4 A shale structure which is fairly collapsed, but was originally neatly built. Fired bricks are also lying around. The purpose of the building is unknown. Date and person who built it are unknown. (It is possible that it was a shed for domestic use.)
(Figure MT 7 B (iii))
GPS S 28 55 49 ; E 29 58 05

Figure MT 7 B (iii)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.6.4 (Fig. MT7B (iii))	Very high (at 1033m) Moderate (at 1015m)	Regional, assuming from building features that it is post-Voortrekker period.	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) Low (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.6.5 A totally collapsed/ dismantled structure, with a dolerite foundation and fired bricks on top. The foundations of this structure are quite elevated from the surrounding terrain. It is probable that this was a home. (Figure MT 7 B (iv))
GPS S 28 55 49 ; E 29 58 05

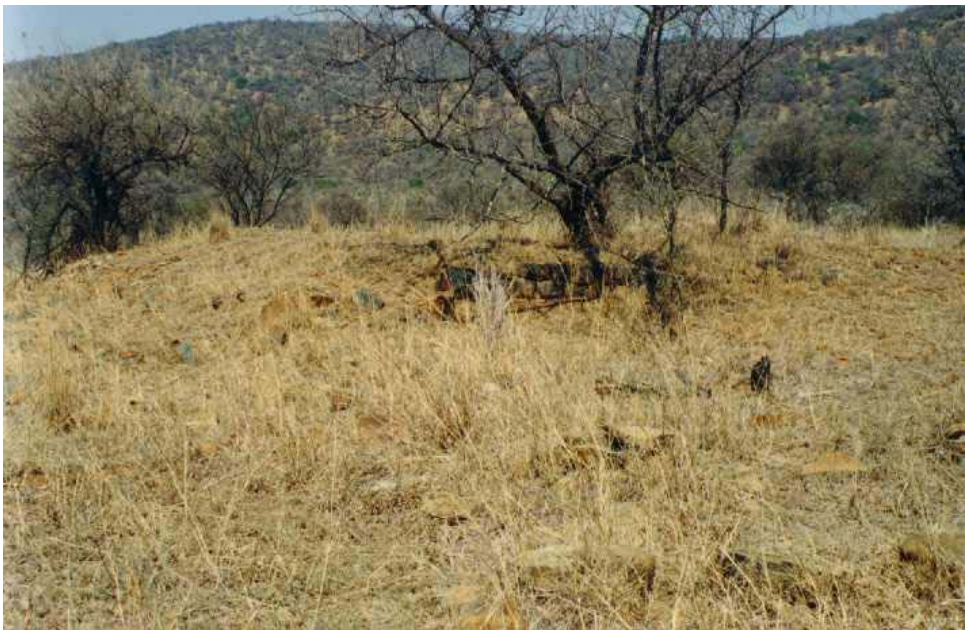


Figure MT 7 B (iv)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.6.5 (Fig. MT7B (iv))	Very high (at 1033m) Moderate (at 1015m)	Regional, assuming from building features that it is post-Voortrekker period.	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) Low (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.6.6 A partially collapsed three metre shale wall is all that remains of a small building - it is possible that it may have been a toilet. (Figure MT 7 B (v))
GPS S 28 55 49 ; E 29 58 05

Figure MT 7 B (v)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.6.6 (Fig. MT7B (v))	Very high (at 1033m) Moderate (at 1015m)	Regional, assuming from building features that it is post-Voortrekker period.	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) Low (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.6.4, 5.6.5 and 5.6.6 are all within the confines of a stone wall approximately sixty metres long and forty metres across, built either to demarcate a particular area, for protection or to keep animals out. From the accumulation of soil against the wall on the upper slope it is evident that it has been in existence for some time. Not much remains of the wall.

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.6.4, 5.6.5, 5.6.6	Very high (at 1033m) Moderate (at 1015m)	Regional, assuming from building features that it is post-Voortrekker period.	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) Low (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.6.7 A loosely built stone kraal - possibly for pigs. This enclosure is not particularly old, built sometime in the 20th century. (Figure MT 7 C)
GPS S 28 55 49 ; E 29 58 05

Figure MT 7 C

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.6.7 (Fig. MT7C)	Very high (at 1033m) Moderate (at 1015m)	Local	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) Low (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.7 Rondedraai farm forms part of the original farm Ronde Draay

It was originally purchased by Z. de Beer, on which he erected buildings, built a water furrow and carried out extensive cultivation.

5.7.1 This appears to be the oldest structure on the farm, built of dressed sandstone. A section has been added onto this structure. The original building is very sturdy and appears to have been a dwelling. This structure appears to have been built more recently than some of the others in the valley. It is unknown who built them and when.
(Figure MT 5 A)
GPS S 28 56 25 ; E 29 55 43

Figure MT 5 A

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.7.1 (Fig. MT5 A)	Very high (at 1033m) Moderate (at 1015m)	Regional, assuming from building features that it is post-Voortrekker period.	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) No effect (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.7 .2 A sturdily built shed made of sandstone and cement. The interior walls are not plastered. It is unknown who built this shed and when. (Figure MT 5 B)
GPS S 28 56 25 ; E 29 55 43

Figure MT 5 B

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.7.2 (Fig. MT5B)	Very high (at 1033m) Moderate (at 1015m)	Regional, assuming from building features that it is post-Voortrekker period.	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) No effect (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

5.7.3 A rondavel built of dolerite and cement and appears to have been more recently constructed than the sandstone buildings. It is unknown when and by whom it was built. (Figure MT 5 C)
GPS S 28 56 25 ; E 29 55 43

Figure MT 5 C

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.7.3 (Fig. MT5C)	Very high (at 1033m) Moderate (at 1015m)	Regional	Long term (at 1033m) Not at all (at 1015m)	Negative (at 1033m) Neutral (at 1015m)	Medium (at 1033m) No effect (at 1015m)	Definite (at 1033m) Improbable (at 1015m)

JANA DAM AREA

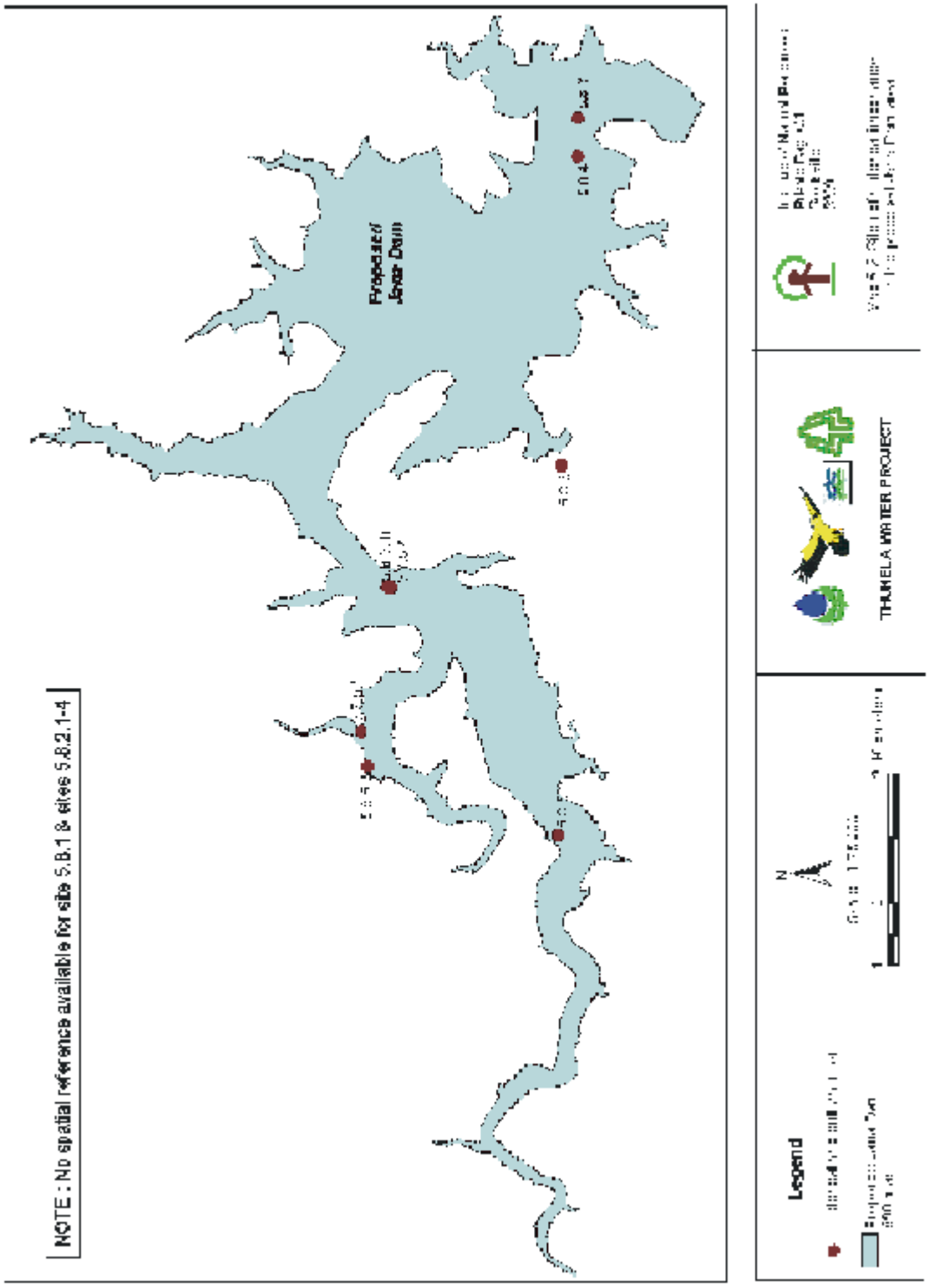
Read this section in conjunction with the photographs and Map 5.2.

5.8.1 The Mankandane community has indicated that the Mtholo tree was used by the amabutho (military force) as a campsite and rest place when they were proceeding to visit the local Inkosi. Some members of the community are displeased at the possible loss of this site stating that it is part of their cultural/historical heritage. (Figure J A)
No GPS reading.

Figure J A

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.8.1 (Fig. JA)	Very high	Local	Long term	Negative	Medium	Definite

Map 5.2: Sites of historical importance in the proposed Jana Dam area



5.8.2 Mziyonke community

5.8.2.1 This communty will have the sites inundated where the founding members settled and had their maize fields. The names of the founding families are: Zwane, Ntusi, Thabede, Mnchunu, Manyisa and Ngcobo. Although nothing remains at the original settlement sites people still have memories of where these families lived and farmed. (Figure J B(i) to (iii))

No GPS reading.

Figure J B (i)

Figure J B (ii)

Figure J B (iii)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.8.2.1 (Figs. JB (i), (ii) & (iii))	Very high	Local	Long term	Negative	Medium	Definite

5.8.2.2 It is at the Nginjani pool that participants in the "Nomkhumbulwane" (type of fertility ceremony held at Tshayeyakhe) cleanse themselves and throw their "msenge" leaves into the water. They regard this as a sacred site. (Figure J C)
No GPS reading.

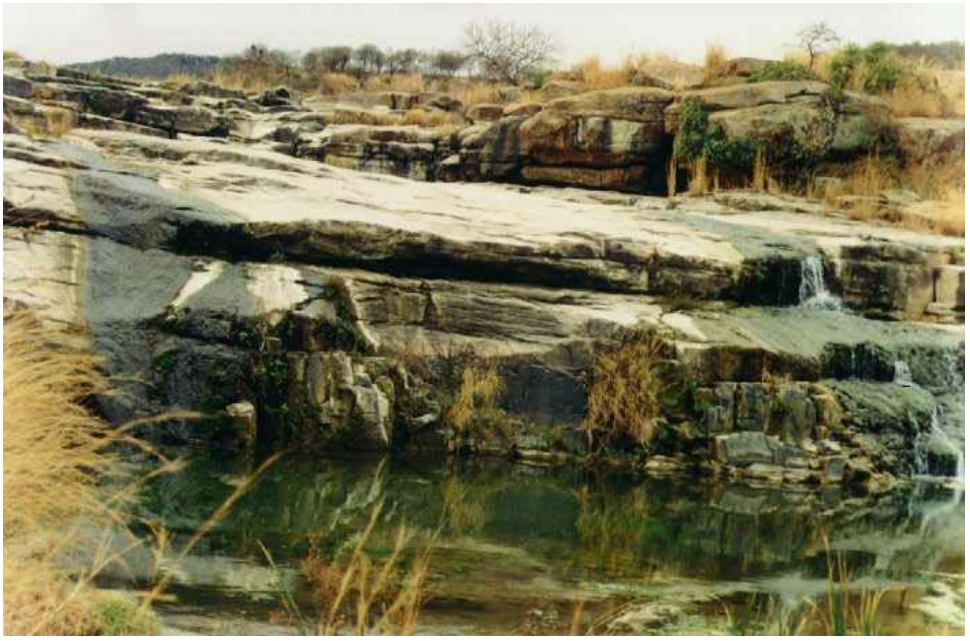


Figure J C

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.8.2.2 (Fig. JC)	Very high	Local	Long term	Negative	Medium This site may require special negotiations with the community to attempt to achieve a suitable compromise solution.	Definite

5.8.2.3 Nsindwane pool was named after a man said to have been a founding member of the people at Mziyonke. It is said that he bathed in the pool a few metres from his home. It is also said that in the pool stayed an animal which resembled a bull. (Figure J D)
No GPS reading.

Figure J D

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.8.2.3 (Fig. JD)	Very high	Local	Long term	Negative	Medium	Definite

5.8.2.4 There is a cave named after Qhebe Khanyile who used it as a home. He was renowned for blowing a horn from a rock nearby for many hours at a time. (Figure J E)
No GPS reading.

Figure J E

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.8.2.4 (Fig. JE)	Very high	Local	Long term	Negative	Medium	Definite

5.8.3 There are two abandoned circular stone structures with mud mortar, in the valley floor. They are well constructed. From the vegetation growing in them it is evident that they have not been in use for a long time. Extensive sections of the walls are still intact standing approximately two metres high and six metres in diameter. A terrace with a stone retaining wall approximately sixty metres long is immediately below the circular structures. Below the terrace wall some potsherds, glass and metal fragments and a broken grinding stone were found. There is no consensus as to who built these structures and when. (There is evidence that Voortrekkers built rondavels of stone in the Eastern Cape where they moved from.) (Figure J F)
GPS S 28 40 51 ; E 30 02 30

Figure J F

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.8.3 (Fig. JF)	Very high	National - if dating to Voortrekker period. Regional - if post-Voortrekker period.	Long term	Negative	Medium	Definite

5.8.4 On "Gannahoek" farm there is a dipping tank of stone said to have been built by Sir Duncan McKenzie, an earlier owner of the farm. An informant who was approximately 58 years old and has lived in the area all his life, stated that the dipping tank has been in existence for as long as he can remember.
GPS S 28 40 51 ; E 30 02 08

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.8.4	Very high	Regional	Long term	Negative	Medium	Definite

5.8.5 Mcitsheni community

5.8.5.1 This community pointed out the Mvutshini and Mpopoma pools, stating they believed that there were snakes in them. (Figures 5.8.5.1(i) and (ii) respectively)
GPS S 28 39 17 & S 28 39 04 ; E 29 58 00 & E 29 56 38

Figure 5.8.5.1 (i)

Figure 5.8.5.1 (ii)

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.8.5.1	Very high	Local	Long term	Negative	Medium	Definite

5.8.5.2 Bozo Drift. This drift was named after a man called Bozo, who had his homestead next to it.

GPS S 28 40 44 ; E 29 55 39

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.8.5.2	Very high	Local	Long term	Negative	Medium	Definite

5.8.5.3 There is a disused coal mine said to have been used by Joseph Ndaba. He is said to have extracted coal from it which he used for iron smelting. (Figure 5.8.5.3)
GPS S 28 39 08 ; E 29 56 18

Figure 5.8.5.3

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.8.5.3	Very high (at 890m) Moderate (at 835m)	Local	Long term (at 890m) Not at all (at 835m)	Negative (at 890m) Neutral (at 835m)	Medium (at 890m) No effect (at 835m)	Definite (at 890m) Improbable (at 835m)

5.8.5.4 In 1991 there was a conflict between the Qinisa and Mcitsheni people over alleged cattle theft. In the conflict two Qinisa and three Mcitsheni people were killed. Family members of the deceased regard the conflict site as “graves”, where they carry out the traditional “umbuyiso” ceremony to honour the dead. (Figure 5.8.5.4)
GPS S 28 39 19 ; E 29 58 00

Figure 5.8.5.4

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.8.5.4	Very high	Local	Long term	Negative	Medium. This site may require special negotiations with the community to attempt to achieve a suitable compromise solution.	Definite

5.8.6 There are five isivivane near the Thukela River. These are piles of small stones, which are built up over time. Passersby will throw a stone onto them as it is believed that in doing so it will bring good luck to them as they continue their journey.
GPS S 28 40 44 ; E 29 59 11

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.8.6	No effect	Regional	Not at all	Neutral	No effect	Improbable

AQUEDUCT ROUTES : PIPELINE OPTION

5.9.1 Umsuluzi Game Park

5.9.1.1 On a rocky outcrop are a number of small stone enclosures. At the base of the ridge is a straight stone wall, with larger stones on the outside and smaller ones packed in the middle. Beyond the outcrop are larger upright stones and some circular stone enclosures. There is also an 18m square enclosure with double walls packed with smaller stones. The Natal Branch of the Archaeological Society suggests this site merits conservation/ salvaging. The inhabitants and dates of occupation are unknown. (Natal Museum Site 67)

GPS S 28 46 52 ; E 29 52 20

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.9.1.1	Very high	Regional	Long term	Negative	Medium	Definite

5.9.1.2 This site is on top of a small hill. There are Late Iron Age and historical remains on the same site. At the westem extremity is a modern built circular stone structure with various pieces of quite recent debris lying about. There are several stone demarcated rectangular areas - vegetable garden? (Natal Museum Site 64)

GPS S 28 46 49-58 ; E 29 52 20

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.9.1.2	Very high	Regional	Long term	Negative	Medium	Definite

5.9.1.3 A rock near the Bloukrans River has been used to polish something and also has some grooves in it. It appears to be a spear sharpening and/or shaping activity. (Natal Museum Site 87)

GPS S 28 49 07 ; E 29 52 09

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.9.1.3	Very high	Regional	Long term	Negative	Medium	Definite

5.9.1.4 This site was settled by whites in the 19th century according to details from graves. There are remains of stone, brick/concrete buildings. This site, according to the Natal Branch of the Archaeological Society, merits some conservation/salvaging. (Site 87)
GPS S 28 48 30 ; E 29 51 54

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.9.1.4	Very high	Regional	Long term	Negative	Medium	Definite

5.9.2 The remains of what appear to be two trenches running from west to east on the farm Hillgrove. One lies between the railway line and farm track and the other just east of the track and slightly further north. The former is 18m long and the latter 35m. These probably date to the Anglo-Boer War.
GPS S 28 48 07 ; E 29 48 43

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.9.2	Very high	International	Long term	Negative	Medium	Definite

5.9.3 A cattle enclosure which is rectangular, 11x18m in extent and approximately 1m high. It is built of rough stone. It is unknown when and by whom it was built. (Figure 5.9.3)
GPS S 28 48 07 ; E 29 48 43 (Approximate)

Figure 5.9.3

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.9.3	Very high	Regional	Long term	Negative	Medium	Definite

5.9.4 For Voortrekker routes see map (Map 4.1, p.14).

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.9.4	Moderate	National	Long term	Negative	Low	Definite

5.9.5 For Anglo-Boer War Boer positions and British advance routes see map (Map 4.1, p.14).

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.9.5	Moderate	International	Long term	Negative	Low	Definite

AQUEDUCT ROUTES : CANAL OPTIONS

5.10.1 A circle of stones facing towards Colenso, south-westwards. Size approximately four metres wide and one metre at highest point. It was probably built at the time of the Anglo-Boer War (1899-1900) by the Boers while they occupied Nhlangwini from December 1899 to February 1900. This would have been a forward lookout post. No artefactual remains were located. (Figure 5.10.1)
GPS S 28 43 41 ; E 29 51 32

Figure 5.10.1

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.10.1	Very high	International - if this is an Anglo-Boer War site	Long term	Negative	Medium	Definite

5.10.2 The remains of a wagon road crossing over low koppies from east to west heading towards the Thukela River. Stones have been moved to the sides and the road is partially eroded. (Figure 5.10.2)
GPS S 28 43 42 ; E 29 51 34

Figure 5.10.2

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.10.2	Moderate	Regional	Long term	Negative	Low	Definite

5.10.3 A low stone fortification probably built by the Boers during the Anglo-Boer War while they held Nhlangwini from December 1899 to February 1900. This may well have been part of an extended line of fortifications from Nhlangwini, to Green Hill and Cingolo. It would have been a forward post facing eastwards. It extends for 7m and is about 500mm high.
GPS S 28 43 42 ; E 29 51 34

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.10.3	Very high	International	Long term	Negative	Medium	Definite

5.10.4 A round stone structure approximately six metres in diameter. This is either a stock enclosure or Boer built Anglo-Boer War fortification. It faces eastwards. (Figure 5.10.4) GPS S 28 43 42 ; E 29 51 34

Figure 5.10.4

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.10.4	Very high	Regional - if a stock enclosure; International - if an Anglo-Boer War site.	Long term	Negative	Medium	Definite

5.10.5 A deserted but very well built rondavel of expertly dressed dolerite stone. The wall is approximately 1.8m high. There are two window apertures, the interior diameter is five metres. It is placed on a terrace which has a low retaining wall to the east and south of the rondavel. No artefactual remains were located. It is unknown by whom and when this was built. (Figure 5.10.5)
GPS S 28 43 39 ; E 29 51 34

Figure 5.10.5

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.10.5	Very high	Regional	Long term	Negative	Medium	Definite

5.10.6 The grave of Mirema Sibeko with a headstone.
GPS S 28 44 09 ; E 29 37 00

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.10.6	Very high	Local	Long term	Negative	Medium	Definite

5.10.7 On the farm Vermaakskraal 1030 is headstone to C.J. Labuschagne, who allegedly died in 1836 according to inscription. However, the trekkers moved to this region in 1837 to settle. There is a whole cluster of old graves where this one is. They are fenced off. (Figure AR 1 A)

GPS S 28 45 10 ; E 29 34 55 (Approximate)

Figure AR 1 A

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.10.7 (Fig. AR1A)	Very high	National and local	Long term	Negative	Medium	Definite

5.10.8 There is an old shed built of sundried and fired bricks, which is alleged to have been built by Andries Pretorius. This is unlikely. Once he settled in Natal he lived just outside Pietermaritzburg or at Groote Milie Tuin. It is possible that the shed may have been built by a trekker family in the mid-nineteenth century. The large farm house, which the occupant could not provide any details about, appears to have been built in the late 19th or early 20th century. (Figure AR 1 B)
GPS S 28 45 10 ; E 29 34 55 (Approximate)

Figure AR 1 B

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.10.8 (Fig. AR B)	Very high	National and regional	Long term	Negative	Medium	Definite

5.10.9 Part of Sandford Park Lodge was built in the 1850s and was used as a staging post.
GPS S 28 43 15 ; E 29 20 05

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.10.9	Low	Regional	Not at all	Neutral	Low	Improbable

5.10.10 For Voortrekker routes see Map 4.1, p.14. View of terrain over which a Voortrekker route passes and through which an aqueduct route will pass. It was in this vicinity that the Doornkop Lager (Map 4.1) was established. (Figure 5.10.10)

Figure 5.10.10

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.10.10	Moderate	National	Long term	Negative	Low	Definite

5.10.11 For Anglo-Boer War Boer positions and British advance routes see Map 4.1, p.14. A view over the Colenso battlefield, from south to north, seen from the Clouston Garden of Remembrance, where the British had their headquarters. One of the aqueduct routes passes through this terrain. (Figure 5.10.11)

Figure 5.10.11

Site / Criterion	Magnitude & Intensity	Extent / Spacial scales	Duration	Sign	Significance	Certainty with respect to loss
5.10.11	Moderate	International	Long term	Negative	Low	Definite

6 MITIGATION MEASURES

(i) This report will have made it evident that there are several historical/cultural sites and areas where historical events took place which will be affected by the construction of the Jana and Mielietuin Dams and the aqueduct routes. These historical and cultural sites and events vary in significance, stretching from local to international importance. None of the historical structures are of such great historical significance that they should be erected elsewhere should the dams and aqueduct routes be built. However, mitigating steps will have to be taken to lessen the impact of the development on the historical and cultural heritage that is to be affected in the region.

It is important that the trekker sites in the Bushman's River valley be seen as a whole of a community living in the valley and in surrounding areas and not be taken individually.

It should be noted that at this time some of the historical sites dealt with in this report, are barely being utilised for research, cultural or tourism purposes, but this may change. The way society views, interacts with and interprets its heritage is always changing. In this context it is significant to note that the Zulu-Voortrekker site at Ncome/Blood River has in recent times been accorded greater prominence. Also the Anglo-Zulu War sites have increased significantly in terms of interest and attention paid to them since that war's centenary. It is presently the Anglo-Boer War centenary.

(ii) In order to possibly gain more information as to who occupied and had settled the area of study in the nineteenth century, it is suggested that the Ladysmith, Estcourt, Bergville and Weenen magistrates reports be examined, as well as relevant documents under the Secretary for Native Affairs, Natal Colonial Publications and Government House papers housed at the Archives depot in Pietermaritzburg.

(iii) Some historical sites are not going to be that significantly impacted upon and require little or no mitigating actions. Included among these are those described in Sections 4.4, 4.5, 4.6, 4.7, 4.10, 4.11, 4.12 and 4.13.

(iv) From a historical/cultural perspective there is little to choose between whether the pipeline or canal option will have greater impact. In each case the sites are small or of such a nature that appropriate action will make it possible to either prevent impacts altogether, or reduce them to a minimum.

6.1 Mielietuin Dam area

6.1.1 The primary historical evidence that will be affected in the event of the dam being built and filling to a level of 1015m or 1033m relates mainly to settlement and agricultural endeavour from approximately 1840 AD onwards, much of it carried out by the Voortrekker people. All sites described will be completely inundated if the dam is constructed to a level of 1033m, while several will be affected if the dam fills to a level of 1015m. Some of those not inundated will have their context impacted upon.

6.1.2 If the dam is built to either 1015 or 1033m and the sites are inundated or have their context affected then:
All the sites should be fully documented by an architect and site plans drawn (this would include the buildings, building remains and water furrow remains). This report needs to include a full photographic record. A copy of the complete report should be lodged with the Fort Durnford Museum, Estcourt.

6.1.3 An archaeologist should be employed to put in test trenches on Groot Mielietuin, Riversdale and Rondedraai Farms to establish more complete details about the lifestyles of 19th century inhabitants. The sites be agreed upon between the archaeologist and the compiler of this report.

6.1.4 The headstones of the two graves described in 5.4.4 above should be relocated to a suitable site negotiated with affected and interested parties, and any concerned authorities. (One local resident has proposed that the headstones be moved to the Weenen town cemetery.) A suitably inscribed plaque should be erected with the headstones to indicate where they originated from and to provide a brief historical context. The developer should negotiate with the farm owner and local interest groups such as family relatives (if they can be traced), Afrikaner cultural organisations, historical societies, and Amafa akwaZulu-Natali, over the possible reburial or other treatment of human remains as may be requested.

6.1.5 At a public viewing site along the Mielietuin Dam a robust plaque should be erected to depict the Zulu attack on the Voortrekker communities, and in particular where the Zulu force crossed the Bushman's River to advance along the Rensburgspruit on the night of 16/17 February 1838.

6.1.6 All the artefacts that are excavated by the archaeologist should, at the completion of the survey, be deposited with the Fort Durnford Museum, with a full report.

6.1.7 The archaeological and architectural surveys should be carried out under the supervision of a competent historian.

6.2 Jana Dam area

6.2.1 If the dam is built and the sites are inundated then:
All the sites that have been described under 5.8.1, 5.8.2.1 to 5.8.2.4, 5.8.5.1 to 5.8.5.4 and 5.8.6, and would be lost, should be discussed with the relevant local communities by a person with an understanding and appreciation of such communities, sites and history; and mitigating actions agreed to. Whatever the outcome of these negotiations, a full photographic and written report should be made and a copy of that record lodged with the Ladysmith Museum.

The sites described under 5.8.3 and 5.8.4 should be photographically recorded and accompanied by a written report. A copy of this should be lodged with the Ladysmith Museum.

6.3 Aqueduct routes area

6.3.1 Where the aqueduct routes cross or pass close to Anglo-Boer War sites the pipeline or canals should be finished off in such a manner that no excavated soil or stone is left lying around in the area to have an adverse visual impact.

6.3.2 Where the aqueduct route passes through or in any way affects a historical site, that site should be fully documented by a competent person and the resultant report lodged with either the Ladysmith, Fort Durnford, Estcourt or Winterton Museums - whichever one is closest to the particular site concerned.

6.3.3 Should the canal route pass through the cemetery at GPS S 28 45 10, E 29 34 55 (approximately), that headstones should be relocated to a suitable location negotiated with interested and affected parties such as family relatives (if they can be traced), Afrikaner cultural organisations, historical societies and Amafa aKwaZulu-Natali.

7 SOURCES

7.1 Secondary sources

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7.2 Archival sources

(i) Natal Archives Depot

(ii) Surveyor General's Office (SGO)
1/3
1/4
II/2
II/4
III/5/14
III/12/9

(iii) Maps
2/134
3/50

7.3 Informants

A Abrahamse, V Albers, G Atkinson, A Braithwaite, GA Chadwick, T Clouston, Mr de Villiers, M Dladla, NJ Dorfling, F Duma, M Duma, AH Furniss, Mrs Goosen, D Green, G Green, GP Horner, J Jackson, Mrs Jordaan, Mr Kern, J Khan, V Khumalo, JP Lange, Mr Llewellyn, F Mabaso, J Mabaso, M Mayer, H Mbatha, M Mbele, A Mchunu, P Mchunu, T Mdlolo, I Milne, D Miya, D Muller, K Ndaba, D Ndlovu, S Nel, NR Nkabinde, D Njoko, F Prins, N Ralfe, M Schriever, D Sclanders, P Scott, R Seele, V Sithole, G Smith, B Trodd, JJ van Reenen, M Velase, F Vickers, I Vilakazi, A Watling, SA Watt, M Winter, J Wright, B Zwane, Mr Zwane

APPENDICES

APPENDIX 1: ATTENDANCE REGISTER

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Name	Organisation	Address	Telephone	Facsimile
C. de Villiers	Ladysmith Museum	PO Box 29 Ladysmith	0361-22992	0361-22992
A.J.B. le Roux	Weenen Boerevereniging	Posbus 50 Weenen	0363-41945	
V. Albers	Thukela Wildlife	PO Box 213 Colenso	0363-41760	0363-41760
G.P. Smythe	KwaZulu Monuments Council	PO Box 1461 Dundee	0341-82375	0341-82375
Sheila Henderson	KZN Museums Board	P/Bag X70141 Wasbank 2920	034-6511706	034-6511352
A.C. Watling	Farmer	PO Box 127 Colenso 3360	036-4222413	036-4222413
R.S. Heron	Battlefields Route Association	PO Box 20 Ladysmith 3370	0825730225 0361-311350	
G.R. Green	Winterton Farmers' Association	PO Box 311 Winterton 3340	036-4881264	036-4881264

REVIEW

Peer Review: Thukela Water Project Feasibility Study - Historical And Cultural Baseline Study

I offer the following comments on the *Historical And Cultural Baseline Study* in response to the specific questions posed in the explanatory letter which accompanied my copy of that *Study*:

1. Has the specialist concerned complied with the terms of reference (TOR) that were set for the study?

1.1 The stipulated terms of reference have been respected, though the attention given to 'pre-colonial' settlements in the area under consideration is brief. (See *Item 2.5*, below and Terms of Reference *2.2*)

1.2 The 'identification of requirements for further investigation' could be more fully explored (See Terms of Reference *2.5*, and *Historical And Cultural Baseline Study* p 60-62 Mitigation Measures.)

2. Do you believe that the report is balanced, impartial/unbiased and comprehensive enough, within the framework provided by the TOR, and that it will meet the purpose for which it was commissioned?

2.1 The Report will meet the purpose for which it was commissioned in that it is balanced, impartial and fairly comprehensive, though in the latter respect there are some reservations.

2.2 More information with regard to the occupation and settlement of the area of study in the nineteenth century might have been gleaned from an examination of the relevant magistrates' reports in the Pietermaritzburg government archive depot (See Report p 65, 7.2 Archival Sources.)

2.3 With reference to 'Cultural sites' (Terms of Reference 2.2) more attention could have been given to the possible impact upon, and future potential of cultural tourism in the study area. (See Report p 60, 6.1 Mitigation Measures.)

2.4 The cultural/heritage significance of the Mvutshini and Mpopoma pools is not clearly indicated (See Report p 52, 5.8.5.1 Mcitsheni community.)

2.5 More seriously, while the Report is quite thorough with regard to nineteenth and twentieth century settlements in the affected area it provides only limited information pertaining to earlier archaeological remains (See Report p 53, 5.9.1.1 and p 54, 5.9.1.2/3) The Report does propose that an archaeologist should be commissioned to dig test trenches on stipulated sites (See Report p 61, 6.1.3) but it does appear that the area under investigation has already been fairly thoroughly surveyed, even if not exhaustively excavated. (See, for example, A. Duminy and B. Guest (eds) *Natal and Zululand From Earliest Times to 1910 : A New History*, Pietermaritzburg 1989, Maps 1-5, pages 4, 8, 10, 30, 36) Mr Gavin Whitelaw, Archaeology Department, Natal Museum, Pietermaritzburg, should be consulted for further information pertaining to the extent of archaeological work already undertaken and information currently available concerning the study area. Ms. Anne Solomon, also of the Natal Museum, should be consulted in connection with any known rock art sites in that area. (Report p 7, 3.4 is very vague.)

2.6 It is important that the Mitigation Measures proposed in the *Historical and Cultural Baseline Study* should not convey the impression that there was no human habitation of the area prior to the nineteenth century, or that settlement has remained unchanged and involved the same communities, without any migratory movement, for centuries. The cultural/historical heritage of those communities currently resident in the area may not be the only one at risk of inundation as far as the archaeological record is concerned. (See the Report's own comment at p 8, 4.4.)

3. Does the report in your opinion contain sufficient information that may be used in the decision making process that marks the culmination of the TWP Feasibility Study?

3.1 The Report provides adequate information for use in the decision-making involved in the culmination of the TWP Feasibility Study, except for the reservations expressed under *Item 2, above* and with particular reference to possible archaeological and rock art remains which need to be considered (*Items 2.5, 2.6*, above.)

3.2 It would assist the decision making process if the 'concerned' and 'relevant authorities', the 'affected and interested parties', and the 'local interest groups' referred to in the Report were identified (See Report p 61, 6.1.4 and p 62, 6.3.3.)

4. In reading the report is there a logical train of thought throughout, clarity in setting out and explaining the assessment process that was followed, the results that were obtained and the conclusions drawn?

4.1 The Report is logically developed, the assessment process followed is clearly explained, and the outcomes reached and conclusions made are clearly set out.

4.2 The photographs used to illustrate the text are of good quality, though these are strangely lacking from page 52 to 56 of the Report.

4.3 Where the reader is referred to the Map on page 12 for the locality of certain cultural/historical sites these could be more clearly indicated.

4.4 The overall clarity of the Report would be greatly improved by further proofreading, especially with regard to the Summary pages 1-3, Methodology pages 7-11, and Mitigation Measures pages 60-62. Instead of submitting a ponderous list of suggested corrections, I return my copy of the Report with its pencilled marginal comments for assistance in this process.

5. Have complex issues received adequate attention and appropriate treatment in the report?

5.1 The Report reflects an awareness of the historical and cultural complexities contained within the study area, except for the following:

5.1.1 Pre-colonial (pre-nineteenth century) archaeological remains (See *Items 2.5 and 2.6 above* of this Peer Review)

5.1.2 With reference to the Mziyonke community (See Report p 46, 5.8.2.1 and p 48, 5.8.2.2) it is not clear whether there are any gravesites, or spiritual/religious implications attached to the sites identified for likely inundation. (See, by way of example, Report p 53, 5.8.5.4)

5.2 The Report is not concerned specifically with socio-economic impacts but it would be useful if some indication could be given as to the numerical size of the communities currently resident in the affected areas.

6. Does the report adequately address the issues and alternatives that were formulated as the framework for the environmental feasibility assessment process?

6.1 The Report takes adequate cognizance of the issues that provide the contextual framework for the environmental feasibility assessment process.

6.2 The relevant alternative implications of inundation at the site specific level are tabulated, where appropriate, for each historical/cultural item identified with regard to the Mielietuin and Jana dam areas (See Report, p 32-45, 52.)

6.3 The implications in relation to dam size and also canal/pipeline routes are also addressed under Mitigation Measures (See Report p 60-62.)

7. Has the specialist used appropriate assessment methods and techniques and have these been adequately described in the report?

7.1 Appropriate assessment methods and techniques have been deployed in this study, and these have been adequately described in the ensuing Report, but with the following reservations:

7.1.1 Reference is made to a public meeting held in Ladysmith and to an attendance list provided under Appendix 1 (See Report p 7, 3.1) This Appendix is missing from my copy of the Report.

7.1.2 Reference is made to interviews 'conducted with affected and interested parties' in the study area (See Report p 7, 3.1) It would be helpful for the decision-making process if the assurance could be given that this process was thoroughly undertaken and that *all* the appropriate communities were consulted.

7.1.3 The reference to the 'archaeological record and archaeologists' is vague (see Report p 7, 3.4) and needs to be elaborated upon and/or investigated further (See *Items 2.5, 2.6 above.*)

7.1.4 Battle sites identified in the Report (See Report p 11, 4.14) are marked on the Map (See Report 12, Figure 4.1) but are not clearly labelled for ready identification, as promised at p 11, 4.14.

8. Are there any major deficiencies in terms of results obtained and conclusions drawn in the assessment?

8.1 There are no major deficiencies evident in the Report with respect to its results and concluding observations, with the possible exception of the following:

8.1.1 The need to ensure that no archaeological and rock art sites have been overlooked in the area at risk of inundation. (See *Items 2.5 and 2.6, above.*)

8.1.2 The need to identify the 'concerned' and 'relevant authorities', the 'affected and interested parties', and the 'local interest groups' referred to in the Report under Mitigation Measures (See Report p 61, 6.1.4, and p 62, 6.3.3) (See *Item 3.2, above.*)

9. Will these deficiencies, if any, affect the ability of the proponent to make an informed decision on proceeding to the next stage of the TWP?

9.1 Possible future recriminations and adverse publicity for the TWP will be avoided if the issue of archaeological and rock art sites in the affected area and appropriate action in that regard is cleared with the local experts in the Natal Museum. The possible loss of such material is particularly sensitive at a recently proclaimed time of 'African Renaissance' in South Africa.

9.2 The clear identification of the 'authorities', 'parties' and 'interest groups' referred to in the Report will obviously facilitate the decision-making process, unless this information is already available from other sources.

10. If so, what remedial action would you recommend to correct the deficiencies and how must it be carried out?

10.1 As previously indicated, the matter of possibly endangered archaeological and rock art sites in the affected area should be clarified by referring to the appropriate local experts, Mr. Gavin Whitelaw and Ms. Anne Solomon of the Natal Museum in Pietermaritzburg.

10.2 If required, the specialist who compiled the *Historical and Cultural Baseline Study* should be competent to identify the relevant 'authorities', 'parties' and 'groups' in the study area with which he is so closely acquainted.

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School of Human and Social Studies
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29 March 2000.

Thukela Water Project: Historical and Cultural Baseline Study - Response to Peer Review Report

1.1 There is a separate report dealing with the archaeological period (see *Archaeological Baseline Study*), which will cover most of the pre-colonial period. (This comment is also applicable to comments made under 2.5, 2.6, 3.1, 5.1.1, 8.1.1, 9.1 and 10.1 in the Peer Review report).

1.2 Details regarding "further investigation" are discussed under *6. Mitigation Measures*.

2.2 In order to possibly gain more information as to who occupied and had settled the area of study in the nineteenth century it is suggested that the Ladysmith, Estcourt, Bergville and Weenen magistrates' reports been examined, as well as relevant documents under the Secretary for Native Affairs, Natal Colonial Publications and Government House papers housed at the Archives depot in Pietermaritzburg. This response has also been included into the mitigation measures section.

2.3 The impact on each individual site is dealt with under the heading of "Certainty with respect to loss" in each table. As regards the "future potential of cultural tourism" attention is drawn to the general principle made under 6 (i) paragraph three. It is not possible at this stage to be more specific than that. Reference should also be made to the Thukela Water Project's *Tourism Baseline Study*.

3.2 See the response to 7.1.2 below, for details to this comment.

4.2 The majority of these sites have been photographed.

4.3 Additional maps will be included showing the two dam areas and all the individual sites. More details will be included on the present map of individual sites.

4.4 All the changes which were suggested have been agreed to and the pages have been proof read once more.

5.1.2 It has already been stated that the site mentioned under 5.8.2.2 is regarded as being sacred. All "black" graves have been dealt with under the *Social Impact Report.*

5.2 According to the *Social Impact Report* three homesteads will be inundated at the 1040m level in the Mielietuin dam basin. No homesteads will be inundated in the Jana dam basin. For further social and econmic impacts on people living near the Mielietuin and Jana dam basins refer to the *Social Impact Report.*

7.1.1 This list has now been included.

7.1.2 Efforts were made to meet with every landowner/manager who will be affected in the Jana and Mielietuin dam basin areas and along the aqueduct route areas. Contacts were made with community representatives in the Jana dam area (Mziyonke/Mankandane Development Committee, Qinisa Development Committee and Mcitsheni Development Committee). Where appropriate land tenants were also contacted. Organisations such as farmers' associations,

women's institutes, historical societies and museums, as well as people with a particular interest or knowledge were invited to an open meeting in Ladysmith.

7.1.3 This reference is deliberately brief, in the knowledge that an independent archaeological report has been compiled. The reference is made merely to acknowledge that the historical period has a context and links to the archaeological period.

7.1.4 The battle sites have been marked on the map as indicated in the report at 4.14.

8.1.2 See the comment under 7.1.2.

9.2 and 10.2 The "authorities", "parties", "interest groups" referred are: the individual landowners of the property to be affected by the proposed developments, the land tenants, formally established community contact groups in the Jana dam area (Mziyonke/Mankandane Development Committee, Qinisa Development Committee and Mcitsheni Development Committee), Amafa akwaZulu-Natali, farmers' associations, historical societies, museums, women's institutes and individuals with a particular interest or knowledge of the areas.

Gilbert Torlage
Historical and Cultural Baseline Study
12 April 2000

a:peerrev.twp

THUKELA WATER PROJECT FEASIBILITY STUDY

ARCHAEOLOGICAL BASELINE STUDY

Prepared by

L.O. VAN SCHALKWYK
G. ANDERSON
W. FISH

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

SUMMARY

Five archaeological sites of varying significance were located within a 100m range of the highest full supply level under consideration for the proposed Mielietuin Dam Basin, and mitigation measures have been proposed. These measures range from surface collection and mapping through to more intensive excavation of threatened deposits.

Forty-seven archaeological sites of varying significance were located within a 100m range of the highest full supply level under consideration for the proposed Jana Dam Basin, and mitigation measures have been proposed. These measures range from surface collection and mapping through to more intensive excavation of threatened deposits.

Forty archaeological sites were located along the path of the proposed canal route, as opposed to twenty-eight found along the proposed pipeline. Although one archaeological site of high significance is found on the pipeline route, medium and medium-high sites found along the canal route far outnumber those found along the pipeline route. It is suggested that the proposed pipeline will have a less negative impact on archaeological resources. However, a full Phase 2 archaeological survey will have to be undertaken on whichever aqueduct route is eventually selected.

Mgoduyanuka archaeological site (Maggs, 1982) is a Heritage Landmark located in the path of the proposed pipeline. Amafa aKwaZulu-Natali, the provincial heritage agency, should be contacted in the event of the pipeline being chosen above the canal as the preferred aqueduct route. Given the significance of the site, re-routing past the declared Heritage Landmark with no impact to the site will have to be considered. No other sites recorded on the Natal Museum database, or identified by aerial photographs, or foot survey along both the aqueduct routes or in the Mielietuin Dam Basin, are of sufficient significance to warrant preservation at all costs, although mitigation will be required on most sites. Further, surveying activities, construction of access roads, bush clearing, construction camp sites, quarries, etc. will need to be assessed in order to ascertain whether or not any archaeological deposits or features could be impacted upon.

1 TERMS OF REFERENCE

1.1 Introduction and background

The Department of Water Affairs and Forestry (DWAF), as the responsible institution for the management of South Africa's water resources, has commissioned the Thukela Water Project Feasibility Study with a view to further augmenting water supply to the Vaal River System from the Thukela River catchment.

The proposed scheme comprises two large dams, the Jana Dam on the Thukela River and the Mielietuin Dam on the Bushman's River, with linking aqueducts comprising either an open canal and/or a pipeline from the proposed dams to the existing Drakensberg Scheme. A briefing document describing the project in more detail is attached.

1.2 Terms of reference for baseline study

The purpose of this baseline study is to determine the impact of the proposed Thukela Water Project (TWP) on archaeological resources. The rationale for this study is that the construction of large impoundments and the associated aqueduct routes is likely to impact on archaeological resources of significance. The primary objective of this baseline study is therefore to investigate and assess the archeological sites likely to be affected by the dam basin areas and aqueduct routes. This baseline study will have the following objectives:

- Describe the archaeological context of the area to be affected by;
  - Jana Dam
  - Mielietuin Dam
  - Aqueduct routes (as provided).

- Document the archaeological resources that could be affected by the TWP by providing a description and location of sites, features and events with special reference to:
  - Surface scatters of Stone Age material (ESA, MSA, and LSA)
  - Iron Age settlement
  - Pre-colonial contact stone-walled agriculturalist settlements
  - Rock shelters containing Bushman paintings and possible archeological deposits and stone-engravings executed by either Bushmen or African farming communities,

  by making use of a review of the literature and a field survey to identify sites.

- Describe and evaluate the impacts to the archaeological resources. This evaluation should assess impacts to sites, features and events according to the criteria and terminology as indicated in Table 1.1.

- Recommend mitigation measures for the respective archaeological sites and provide an estimate of the likely costs of mitigation.

- Specific consideration should be given to the identification of requirements for further investigation.

Table 1.1: Conventions for definitions and terminology used in the description, evaluation and assessment of environmental impacts

CATEGORY	DESCRIPTION OR DEFINITION
TYPE	A brief written statement, conveying what environmental aspect is impacted by a particular project activity or action, or policy or statutory provision.
MAGNITUDE AND INTENSITY	The severity of the impact
· very high	- Complete disruption of process; death of all affected organisms; total demographic disruption
· high	- Substantial process disruption, death of many affected organisms; substantial social disruption
· moderate	- Real, measurable impact, which does not alter process or demography
· low	- Small change, often only just measurable
· no effect	- No measurable or observable effect
· unknown	- Insufficient information available on which to base a judgement
EXTENT / SPATIAL SCALES	The geographical extent or area over which the direct effects of the impact are discernable, i.e. the area within which natural systems or humans directly endure the effects of the impact.
· international	- Southern Africa
· national	- South Africa
· regional	- KwaZulu-Natal and the Thukela catchment, the uThukela region
· local	- dam basin, conveyance servitude, river reach, specific site locality
DURATION	The term or time period over which the impact is expressed, **not** the time until the impact is expressed. Where necessary the latter must be specified separately.
· short term	- up to 5 years (or construction phase only)
· medium term	- 5 to 15 years 9 (or early commissioning and operational phases)
· long term	- > 15 years (or operational life)
SIGN	Denotes the perceived effect of the impact on the affected area
· positive (+)	beneficial impacts
· negative (-)	impacts which are deleterious
CERTAINTY	A measure of how sure, in the professional judgement of the assessor, that the impact will occur or that mitigatory activity will be effective
· improbable	- low likelihood of the impact actually occurring
· probable	- distinct possibility that the impact may occur
· definite	- impact will occur regardless of prevention measures
SIGNIFICANCE	An integration (i.e. opinion) of the type, magnitude, scale and duration of the impact. Judgements as to what constitutes a significant impact require consideration of both context and intensity. It is the assessor's best judgement of whether the impact is important or not within the broad context in which its direct effects are felt. (see Fuggle R.F. & Rabie M.A. 1992. *Environmental Management in South Africa*. Cape Town: Juta & Co. 823)
· high	- Could (or should) block the project/policy; totally irreversible (-ve impact) or provides substantial and sustained benefits (+ve impact)
· medium	- Impact requires detailed analysis and assessment, and often needs substantial mitigatory actions.
· low	- Impact is real but not sufficient to alter the approach used. Probably no mitigation action necessary.

Some Explanations and Definitions

1 Environmental impact - An environmental change caused by some human act. (DEA 1992. *The Integrated Environmental Procedure*. Vol 5).

2 Environmental impact - Degree of change in an environment resulting from the effect of an activity on the environment whether discernable or undesirable. Impacts may be the direct consequence of an organisation's activities or may be indirectly caused by them. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

3 Affected environment - Those parts of the socio-economic and bio-physical environment impacted on by the development. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

4 Environmental issue - A concern felt by one or more parties about some existing, potential or perceived environmental impact. (Department of Environment Affairs & Tourism, 1998. *Guideline Document: EIA Regulations Implementation of Sections 21 22 and 26 of the Environment Conservation Act, April 1998*).

5 Environment - means the surroundings within which humans exist and that are made up of:
- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part or combination of (i) and (ii) and the interrelationships among and between them;
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being. (National Environmental Management Act No 107 of 1998).

6 Significance - (See Fuggle R.F. & Rabie M.A. 1992. *Environmental Management in South Africa*. Cape Town: Juta & Co. 823. Also in, DEA 1992. *The Integrated Environmental Procedure*. Vol 4).

7 Significance - "The definition of significance with regard to environmental effects is a key issue in EIA. It may relate *inter alia* to scale of the development. To sensitivity of location and to the nature of adverse effects." (Glasson, J. Therival, R. and Chaduuick, A. 1995. *Introduction to Environmental Impact Assessments. Principles and Procedures, Process, Practise and Prospects*. London: UCL Press. 13).

8 Significance - "Once impacts have been predicted, there is a need to assess their relative significance. Criteria for significance include the magnitude and likelihood of the impact and its spatial and temporal extent, the likely degree of recovery of the affected environment, the value of the affected environment, the level of public concern, and political repercussions." (Glasson, J. Therival, R. and Chaduuick, A. 1995. *Introduction to Environmental Impact Assessments. Principles and Procedures, Process, Practise and Prospects*. London: UCL Press. 124).

9 Significance -" The question of significance of anthropogenic perturbations in the natural environment constitutes the very heart of environmental impact assessment. From any perspective - technical, conceptual or philosophical - the focus of impact assessment at some point narrows down to a judgement whether the predicted impacts are significant." (Beanlands, G. 1983. *An ecological Framework for Environmental Impact Assessments in Canada*. Institute for Resource and Environmental studies. Dalhausie University. Sections 7: 43).

10 Environment - Surroundings in which an organisation operates, including air, water, natural resources, flora, fauna, humans and their interrelation. (ISO 14001. 1996). Note - Surroundings in this context extend from within an organisation to the global system.

11 Environmental aspect - Element of an organisation's activities, products or services that can interact with the environment. (ISO 14001. 1996). Note - A significant environmental aspect is an environmental aspect that has a or can have a significant environmental impact.

12 Environmental impact - Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services. (ISO 14001. 1996).

2 ARCHAEOLOGICAL SITE ASSESSMENT

2.1 Summary

The original terms of reference for the specialist analysis of archaeological resources that would potentially be impacted by the proposed Thukela Water Scheme required an assessment of three potential dam basins, the Klip and Jana Dam Basins on the Thukela River, and the Mielietuin Basin on the Bushman's River. Two potential aqueduct routes were also to be investigated. Subsequent to embarking on the field-work the proposed Klip Dam was excluded from further investigation by the DWAF. A Cultural Resource Management Assessment of the proposed Klip Dam Basin is available under separate cover (Anderson, 1999).

The Jana Dam was surveyed to the 860 and 890m contour lines and the Mielietuin Dam to the 1040m contour. Consequently, any changes to the levels of the proposed dam walls would require further assessment and survey. As the location of quarries and the routing of servitudes were not disclosed, the potential impact of these could not be ascertained and would require further investigation if the scheme were to be commissioned.

The archaeological survey located fifty-two sites in the respective dam basins dating from the Middle Stone Age to the Historical Period. In the event of dam construction, most of these sites would require some form of mitigation, as detailed below. Forty archaeological sites were located along the path of the proposed canal route, as opposed to twenty-eight found along the proposed pipeline.

2.2 Methodology

Both a desktop analysis and a foot survey were undertaken as part of this project. The desktop analysis took place at the Natal Museum, since this Museum is the provincial repository for all known archaeological sites. The desktop analysis is primarily a method of determining the probability of archaeological sites occurring in a given area. This is achieved by analysing existing records of archaeological sites in the area, as well as noting the geology, topography, soil types and water sources (Wahl, 1995). This method of site "detection" is fairly accurate when dealing with agriculturist sites since ecology and farming are interrelated.

The foot survey entailed walking the study area where much of the vegetation had been recently burnt, and/or died for the winter. In addition to these physical features, previous experience of Iron and Stone Age settlement patterns, as well as local topography, informed us of potential site locations.

2.3 Defining significance

Archaeological sites vary in significance and in order to establish a general significance rating the following criteria have been applied to the sites identified in this study (after Anderson, 1999):

(i) State of preservation of:

- Organic remains:
  - Faunal
  - Botanical
- Stone walling
- Presence of a cultural deposit
- Features:
  - Ash features
  - Graves
  - Middens
  - Cattle byres
  - Bedding and ash complexes

(ii) Spatial arrangements:

- Internal housing arrangements
- Intra-site settlement patterns
- Inter-site settlement patterns

(iii) Features of the site:

- Are there any unusual, unique or rare artefacts or images at the site?
- Is it a type site?
- Does the site represent a good example of a specific time period or does it contain representative features, or artefacts?

(iv) Research:

- Providing information on current research projects
- Salvaging information for potential future research designs

(v) Inter- and intra-site variability:

- Can the particular site yield information regarding intra-site variability, i.e. spatial relationships between various features and artefacts?
- Can the particular site yield information about a community's social relationships within itself, or between other communities?

(vi) Educational:

- Does the site have the potential to be used as an educational instrument? *
- Does the site have the potential to become a tourist attraction?

* The educational value of a site can only be fully determined after initial test-pit excavations and/or full excavation.

The higher a site scores when the above criteria are applied, the greater the significance it can be accorded. Test-pit excavations are used to test for a fuller potential of an archaeological deposit. Such test-pit excavations may indicate that further excavation is required if the initial exploratory work reveals a potential high significance. Sites may also be mapped and/or have artefacts sampled as a form of mitigation. Sampling is normally undertaken when the artefacts present may be good examples of their type, but are not in a primary archaeological context, or when they can supplement previously collected samples from known primary contexts. Mapping records both inter-site spatial relationships and intra-site relationships between features and artefacts.

3 DESCRIPTION OF ARCHAEOLOGICAL SITES

The recorders' site number prefixes JN and MD refer to the Jana and Mielietuin Dams respectively. The prefix CON refers to sites identified along the proposed canal and pipeline routes. A summarised list of sites and their proposed mitigation are tabled following the individual site descriptions (Table 3.1-3.8 and Figure 3.1).

3.1 Jana Dam

JN2

This site consists of a stone-walled settlement and an iron working area, intersected by an existing dirt track. The settlement consists of two 40m long and 6m wide walled terraces. Upper and lower grindstones and a mortar were observed. Below the terrace further grindstones and various worked stone implements and three ephemeral stone circles occur outside the terrace. A cultural deposit may exist in the terrace.

An iron working area is located on the opposite side of the dirt track. There is a stone-walled feature in which tuyeres (clay bellows pipes) and pieces of slag occur. At least three oval furnaces, with associated tuyeres occur outside the stone-walled feature. These furnaces are fairly well preserved. Many ceramic vessel fragments are scattered in this area. These sherds are orange-red in colour. A midden deposit appears to be present on this section of the site. The site probably dates to the last century (Maggs, 1982). The site is of high archaeological significance and further mitigation would be necessary in the form of test-pit excavations and archaeological mapping.

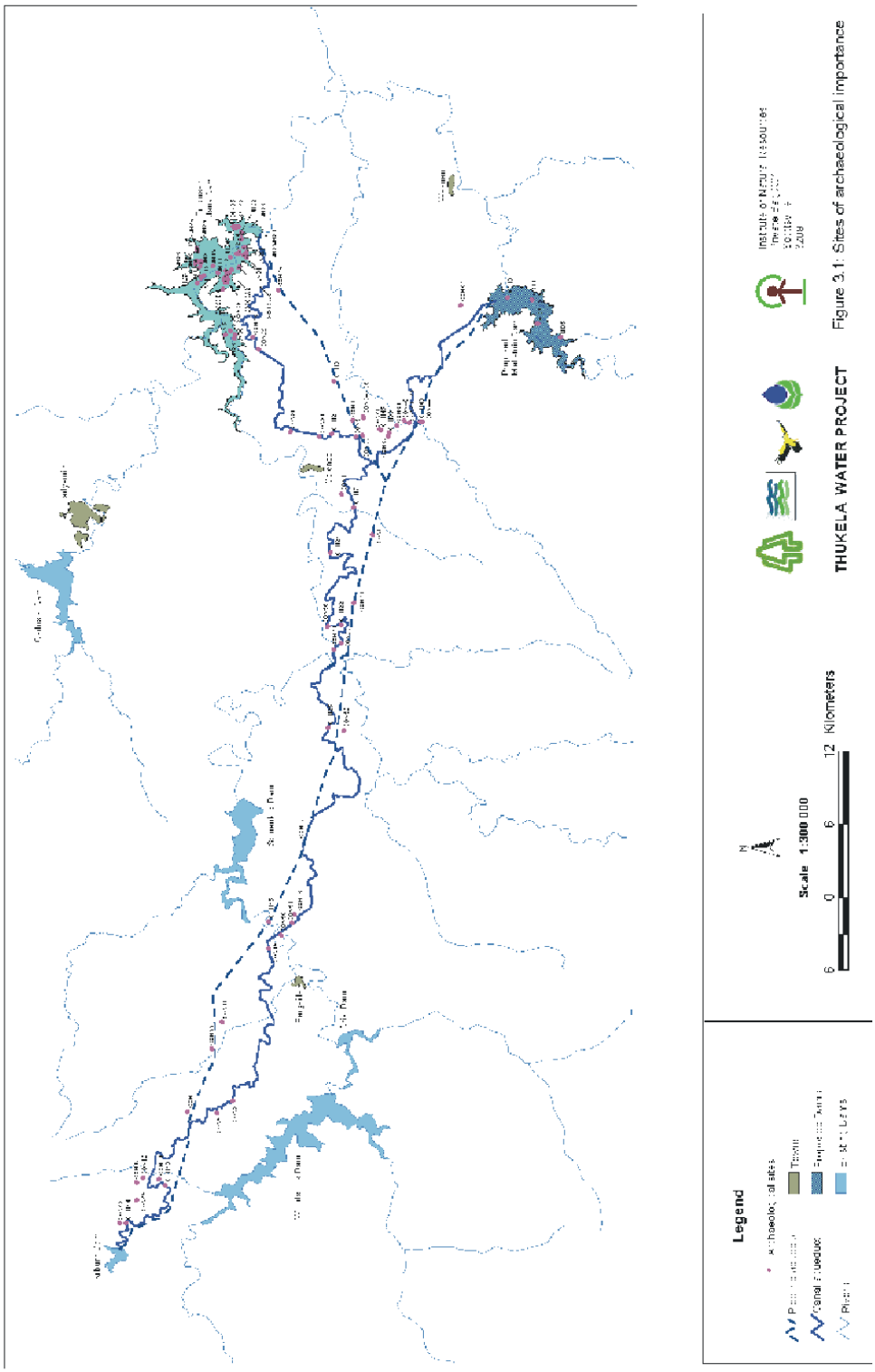
JN3

The site is a scatter of adiagnostic sherds, worked/smoothed stone, slag, iron-ore and haematite. It appears as if the dirt track has damaged the site. Three Middle Stone Age (MSA) flakes occur. The site is of low archaeological significance and no further mitigation is required.

JN4

This site consisted of two sets of very faded white rock art images. One image may be an antelope, while the other set may be a group of humans. A single piece of pottery was found in this shelter. The site is of low archaeological significance and no further mitigation is required.

Figure 3.1: Sites of archaeological importance



JN5

This site consists of stone-walled features and terracing. Two stone-walled features are bilobial cattle byres and are located behind the main stone-wall feature. The entrances to the cattle byres face downhill. The main stone-walled feature is made of large stone blocks at the base, with flat slabs placed above it. To the right of this feature is a series of stone-walled features. These form two rectangular areas with a semi-circular wall attached to the lower rectangle. The nature of preservation suggests that a midden deposit may be present. The site dates to the Historical Period, is of medium archaeological significance and requires further mitigation in the form of archaeological test-pit excavations and mapping.

JN6

The site consists of a stone-walled cattle byre with two secondary enclosures attached to it. A smaller circular stone-walled feature is located some 45m from the main feature. A lower grindstone is associated with the site. No cultural deposit was visible at the site. This site dates to the Historical Period, is of medium-low archaeological significance and will require archaeological mapping.

JN7

The site is a scatter of slag, haematite, iron-ore and pottery and dates to the Historical Period. It is of low archaeological significance and no further mitigation is required.

JN8

The site is a large settlement with stone-walling, graves, terracing and iron working areas, and is bisected by a road. The stone-walling consists of a circular feature on a terrace and a bilobial stone-walled feature and ephemeral stone-walling behind the terrace. Four graves, in an east-west direction, are situated in the vicinity of the stone-walling. Between the graves and the bilobial stone-walled feature is a row of two paired furnaces in a relatively well preserved condition. Slag and tuyere fragments are associated with the furnaces. The pottery sherds tend to be thicker than those from other sites, but are of similar colour and temper.

On the opposite side of the road is another iron working area. Two furnaces are in a relatively well preserved condition while two others are fragmented. Slag and tuyere fragments are associated with this area. A cultural deposit probably exists at the site. This site dates to the early Historical Period. An iron-ore source occurs on the hillslope above the site.

The site is of high archaeological significance and further mitigation is required. Mitigation should take the form of archaeological excavation and mapping.

JN9

The site is a large multi-component site with stone-walled features, graves, furnaces and a cultural deposit. The settlement consists of ephemeral walling and terraces, with a large stone-walled cattle byre in the front. Two possible graves occur on each side of the byre. The settlement has two daga floors, each with the remains of short wooden poles. This may suggest that the daga features (or house remains) may be older than 50 years, since the wooden poles tend to last for several years before they are eaten by termites. This is confirmed by the graves that do not have headstones. A characteristic feature of more recent graves is usually the presence of some form of headstone. The settlement thus appears to be more recent than the iron working features.

The furnaces are stratigraphically older than the settlement. There are two sets of four furnaces in a well preserved condition. One set is located near one of the daga floors while the other is on the left hand side of the main cattle byre. Tuyeres and slag are associated with the furnaces.

Upper and lower grindstones, grooved stones, orange-red sherds and a few metal fragments are associated with the site. The site has a cultural deposit and dates to the early Historical Period. It is of high archaeological significance and further mitigation is required in the form of archaeological excavations and mapping.

JN10

The site is a settlement with a cultural deposit and scatter of artefacts. Several upper and lower grindstones occur on the surface, as well as diagnostic pot sherds and a few bone fragments. Some of the pottery has an orange-red or red burnished of which some have a flat rim and lip with a slight external emphasis. A single European ceramic fragment is associated with the site. Approximately 50m away from the main artefact scatter is a daga floor with red burnished pottery.

This site dates to the Historical Period, is of medium archaeological significance and further mitigation is required in the form of archaeological test-pit excavations and mapping.

JN11

The site is a large concentration of slag with some furnace fragments and probably relates to the daga floor of JN10. There is a high concentration of slag and ore in one part of the site. However, the rest of the site appears to have been eroded. The dense concentration of slag appears to be mostly in a primary context, and may contain furnaces. This site dates to the early Historical Period.

Many MSA stone tools were observed on the surface. One bifacial point and other retouched and

utilised flakes were recorded.

The site is of medium archaeological significance and further mitigation would be required in the form of test-pit excavation around the slag concentration. Some of the MSA tools should be sampled.

JN12

The site consists of three furnaces in a row. The furnaces are in a medium-low state of preservation. This site dates to the early Historical Period.

Several Late Stone Age (LSA) fragments occur on the surface.

The site is of low-medium significance and further mitigation is required in the form of archaeological mapping.

JN13

The site is a series of settlements dating from the early Historical Period and to the more recent past. A relative date seriation will only be possible by excavation.

The more recent part of the site consists several daga floors and stone walling. In front of these is a large stone-walled cattle byre and two smaller stone-walled features that are surrounded by a lower stone wall. The latter may not necessarily be associated with the daga floors. Stone-walled features occur behind the settlement and an ash feature at the entrance of one of these suggests that it that it may be a cattle byre. Recent *Acacia* spp. tree fences occur throughout the site. This site differs in its settlement layout in comparison to others seen in the valley. On the upslope side of the stone-walled byre is a bilobial stone-walled feature and wattle-and-daub houses in circular and rectangular shapes. The sherds associated with these, and the previous features, are orange-red or red in colour.

Downslope from the main site are several upper and lower grindstones, pottery sherds, slag and tuyere fragments, furnaces and graves. The graves appear to be related to the settlements further upslope and have headstones. The furnaces are in a relatively well preserved condition.

Downslope towards the river are further furnace and slag fragments.

The site is of medium archaeological significance and requires further mitigation in the form of archaeological test-pits and mapping.

JN14

The site is an engraving site of a traditional Zulu game board, called *mahlabahlaba*. The engraving appears to be recent. The site is of low archaeological significance and no further mitigation is required.

JN15

The site consists of two stone-walled rectangles beside a more recent cattle byre made from aloes. The site is of low archaeological significance and no further mitigation is required.

JN16

The site is a multi-component site consisting of MSA, LSA, and at least two Late Iron Age phases of occupation.

The MSA and LSA include some formally retouched pieces, but are mostly utilised flakes and cores.

The Late Iron Age phases of the site can be divided into:

(i) iron working activity areas, and

(ii) stone-walled features.

The iron working activity area consists of a group of fourteen furnaces in a double row. These furnaces are in a fairly well preserved condition. Large pieces of furnace fragments and slag are associated with these furnaces.

Approximately 100m uphill is a concentration of stone-walled features. One feature has a terrace and a stone wall, while another has a rectangular wall. There are four possible graves downslope from these latter features. Alternatively, they may be collapsed stone-walled circles.

About 200m downstream of the Thukela River, at a small tributary junction, are several more stone-walled features and stone terracing. It appears that there is a long term occupation of this area through time.

The site is of medium archaeological significance and further mitigation is required in the form of archaeological test-pit excavations and mapping.

JN17

The site has two long, stone walls 50m apart. Between these walls are various stone-walled features. These features vary from ephemeral walling to circular features with cultural deposits. One feature includes four stone-walled circles besides each other.

This site dates to the Historical Period, is of medium archaeological significance and requires further mitigation in the form of archaeological test-pit excavations and mapping.

JN18

The site is a settlement probably dating to the recent past, i.e. between 30 to 70 years ago. There is a large blue gum and *Acacia* sp. tree on the site. The site consists of a stone-walled cattle byre, possible four graves, six rectangular to square houses, and a bilobial stone-walled feature on the right. The site is of low archaeological significance and no further mitigation is required.

JN19

The site is a scatter of MSA and LSA stone tools, in a open scatter near the edge of the river bank. The MSA component consists of unifacial and bifacial points, flakes and cores. The LSA component consists of scrapers, adzes, blades, utilised flakes and cores. The site is of low-medium significance and further mitigation is required in the form of sampling a representative collection of the stone tools.

JN20

The site is a rock shelter 25m long, 3m deep and 10m high and dates to the LSA. It contains both rock art and a cultural deposit. The rock art consists of six faded red images. There is one eland and five indeterminate antelope. The cultural deposit is 50cm deep. Near the surface is an ashy feature with burnt bone. In the drip line, stone tools, grindstones and pottery sherds were observed. Artefacts also occur on the talus slope in front of the cave.

The site is of high archaeological significance and further mitigation is required in the form of an archaeological excavation of the LSA component of the cave.

JN21

The site consists of two stone-walled features. One feature is a cattle byre, while the other is a low rectangular feature, possibly a house.

This site dates to the Historical Period, is of low archaeological significance, and no further mitigation is required.

JN22

These sites are in a flat area near the Thukela River floodplain. There are several stone-walled features, terraces, graves, furnaces, tuyere and slag fragments, grindstones and shale plinths.

At least four settlements occur in this area each having several graves, stone-walled features and terraces. Each settlement has a cultural deposit. The southern area has a higher concentration of occupation than the northern areas. In addition, it appears that areas closer to the base of the hill have domestic occupation while those areas closer to the river appear to be non-domestic areas.

In particular, three settlements stand out as being of high significance. The first is on a raised terrace. The walling on the terrace has supportive stone slabs, and these may have doubled as the support for an old road. The terrace is 40m long and 10m wide. Two large stone-walled circular houses are built on the terrace. The base of each house has large dressed blocks, and above this are horizontally placed shale slabs. Two windows occur in each house. To the left of the houses were smaller activity areas. The talus slope in front of the terrace includes orange-red Nguni ceramics, glass from historical bottles, metal pieces from iron pots, and upper and lower grindstones. The preservation of this site is very good and the architectural style is clearly unique to the area.

To the left and right of this settlement are two more settlements. Each settlement has at least three graves, several large shale plinths, stone-walling and potential cultural deposits. The furnaces and other artefacts from further downslope are probably associated with these sites.

This site dates to the Historical Period, is of high archaeological significance, and consequently further mitigation is required in the form of archaeological excavations and mapping. The mitigation should occur for the whole of the site area.

JN24A/B

This site consists of stone-walled features, terracing and agricultural fields. There are two main settlements separated by a small stream. Each site consists of a stone terrace, with potential deposit, a stone-walled cattle byre, and ephemeral stone walling, and stone circles. One terrace has a daga floor. The site is of medium archaeological significance and further mitigation will be required in the form of archaeological test-pit excavations and mapping.

JN25

The site consists of an extensive scatter of mostly LSA and fewer MSA stone tools in an open area. The LSA tools include scrapers, adzes and a drill, as well as many utilised flakes. In

comparison, only a few MSA standard flakes were observed. The tools are made on local dolerite, cryptocrystalline silicates and/or sandstone. One orange-red pottery sherd was observed.

It initially appears that this may be the remains of an open site, of which few have been recorded in KwaZulu-Natal. While organic materials may not be preserved, a spatial component of the site may still exist.

The site is of high-medium status and further mitigation is required. Mitigation will be in the form of test-pit excavations to determine if a spatial component exists at the site and the degree of preservation of organic remains.

JN26

The site consists of three pairs of furnaces in a relatively well preserved condition. These will not be affected by the dam, but may be affected by potential servitudes. The site is of medium archaeological significance and mitigation will be required if they are to be affected.

JN27

The site consists of a large stone-walled feature and an engraving. The whole site was not properly analysed since the local community was not in favour of the team being in the area. The stone-walling was different to that noted elsewhere in the study area in that there was a main primary enclosure with many secondary enclosures inside, attached to the primary enclosure. Additional stone-walling occurred inside the primary enclosure. An Iron Age engraving was situated near the entrance of the site. The engraving consisted of several small pecked circles around a central circle. The site is of medium-high significance and requires further mitigation in the form of archaeological test-pit excavations and mapping.

JN28

The site consists of six large stone circles 10m in diameter, and some terracing on the hill. A possible midden deposit may occur within the stone-walled features. The site is not identified by the local community as belonging to them, suggesting that it is relatively old. It dates to the Historical Period, is of medium archaeological significance and further mitigation will be required in the form of archaeological test-pit excavations and mapping.

JN29

The site consists of an old mine shaft, probably relating to the iron smelting activities in the study area. It has been subsequently covered by the land owner. The mine shaft is said to be approximately 1m wide and was a source of iron-ore. The shaft was deep and formed an L-shape. While the site is of medium-high archaeological significance, it has been damaged and no further

mitigation is required.

JN30

The site consists of four furnaces in a relatively well preserved condition. Tuyeres, slag and a few pieces of iron-ore are concentrated near the furnace. The furnaces do not appear to have been used as much as other furnaces. The ceramics are undecorated and orange-red in colour. An upper grindstone and some hammerstones are present. A cultural deposit may exist at the site. This site dates to the Historical Period, is of medium archaeological significance and further mitigation is required in the form archaeological test-pit excavations and mapping.

JN31

The site consists of ephemeral stone-walling, a blue glass bead, several upper grindstones, shale plinths and a branding iron. Oral history dates this site to beyond sixty years in age. While the site will not be affected by the dam, the pipeline may impact on the site. No further mitigation will be required if the pipeline route bypasses the site.

JN33

The site consists of settlement probably dating to this century. There are four raised stone circles forming the platform of houses. Old rectangular glass bottle fragments and a single grave are associated with the site, as well as a possible cultural deposit. The site dates to the Historical Period, is of medium archaeological significance, and further mitigation is required in the form archaeological test-pit excavations and mapping.

JN34

The site consists of several stone-walled terraces, circular features and furnaces. One of the terraces contains two circular features that may have a cultural deposit. Four furnaces occur to the right of the terrace and some are still complete. Other furnaces occur in the vicinity of the site but due to the thick nature of the vegetation could not be fully assessed. Slag, silica, large tuyere fragments, upper grindstones, lower grindstones, hammerstones and iron-ore are associated with these features. The site is of medium archaeological significance and further mitigation will be required in the form of archaeological test-pit excavations and mapping.

JN35

The site is a multicomponent site of possibly two occupations. It consists of terracing, stone walling and cultural deposits. The occupations are as follows:

(i) A terrace with an agricultural field below. Artefacts include fragments of metal and pottery sherds. This part of the site may be recent.

(ii) Two large stone-walled circles 50m apart with the entrances possibly facing uphill.

Upslope from the stone-walling area are several iron working areas as evidenced by slag, tuyeres, furnace remains and ephemeral stone-walled features. Several upper grindstones, lower grindstones and grooved stones were observed. Another concentration of slag occurs some 15m further upslope which appears to be associated with a midden deposit.

The site is of medium archaeological significance and further mitigation is required in the form archaeological test-pit excavations and mapping.

JN36

This site is located in an eroded area near the Thukela River. The site consists of tuyeres, slag, iron-ore, quarried basalt, and small square stone features some 1m x 1m in extent. The site is of low archaeological significance and no further mitigation is required.

JN37

The site consists of two stone-walled circles, two terraces and an artefact concentration. One stone-walled circle has an entrance facing uphill. The pottery sherds are orange-red and brown in colour. A midden deposit appears to exist at the site. This site dates to the Historical Period, is of medium archaeological significance and further mitigation will be required in the form of archaeological test-pit excavations and mapping.

JN38

The site consists of a small stone-walled enclosure, 2m x 1m in size. Two sides of the feature are packed with flat stone with a rubble infill. The entrance appears to face downhill. The feature appears to be similar to the mine excavated by Maggs (1982). This site dates to the Historical Period, is of medium archaeological significance and further mitigation will be required. Mitigation will be in the form of archaeological test-pit excavations and mapping.

JN39

The site consists of stone-walled features and a large open scatter of artefacts of which some may be in a primary context. The artefacts include orange-red pottery, slag, upper grindstones, lower grindstones, hammerstones, fire-cracked spalls, furnace fragments, iron-ore and calcrete. Further upslope is a large stone-walled feature (8m x 3m). The wall is constructed of flat shale slabs, with smaller stones as an infill. The smaller stone-walled features may be graves. Ephemeral stone-walled features exist. The site may have a cultural deposit. The pottery sherds are orange-red in colour and some have a round lip with flat rim.

This site dates to the early Historical Period, is of medium archaeological significance and further mitigation will be required in the form of archaeological test-pit excavations and mapping.

JN40

The site consists of three stone-walled features with ephemeral terracing. Scatters of slag occur below the walling along together with numerous furnace fragments. The vegetation is dense and appears to conceal further features and artefacts. This site dates to the Historical Period, is of medium archaeological significance and further mitigation will be required in the form of archaeological test-pit excavations and mapping.

JN41

The site consists of two stone-walled features 15m long, 2m wide and 8m apart. The walls are constructed from shale slabs with a rubble infill. The site may be an extension of JN40. The site is of medium-low archaeological significance and further mitigation will be required in the form of archaeological mapping.

JN42

The site consists of a bilobial stone-walled feature with the entrance facing uphill. Another secondary enclosure is attached to the primary enclosure. Further upslope is an ephemeral stone-walled terrace with circular features. A cultural deposit appears to exist within the site. The site dates to the Historical Period, is of medium archaeological significance and further mitigation will be required in the form of archaeological test-pit excavations and mapping.

JN43

The site consists of ephemeral stone-walled features and contains three possible graves. The features date to the Historical Period and the site is of medium-low archaeological significance. Further mitigation will be required in the form of archaeological test-pit excavations and mapping.

JN44

The site consists of stone-walled features and possible graves. A cultural deposit exists on the site. A terrace surrounds four hut floors and some ephemeral walling. Another settlement appears to exist above the site. However, the vegetation was too dense for more accurate observation. The site dates to the Historical Period, is of medium archaeological significance and further mitigation will be required in the form of archaeological test-pit excavations and mapping.

JN45

The site consists of a terrace with ephemeral stone-walled features.

This site dates to the Historical Period, is of low archaeological significance and no further mitigation will be required.

JN46

The site consists of a stone-walled feature and a daga floor. The stone walling occurs slightly upslope from the daga floor and extends downslope to the left. The site is unlikely to be affected by the dam and no further mitigation is required.

2829DB4 *

This site comprises stone walling and furnaces and has an archaeological deposit. It is of high archaeological significance and further mitigation will be required in the form of archaeological test-pit excavations and mapping.

2829DB12 *

This site consists of stone-walled features, graves, slag, furnaces and tuyeres. The site is of high archaeological significance and further mitigation will be required in the form of archaeological test-pit excavations and mapping.

2830CA2 *

This site consists of a stone enclosure, stone-walled features, furnaces and a mine/quarry. The site is of high archaeological significance and further mitigation will be required in the form of archaeological test-pit excavations and mapping.

2830CA3 *

The site consists of stone-walled features and furnaces that have been surveyed and excavated by Maggs (1982). No further mitigation is required.

* Refers to sites recorded on the Provincial Archaeological Database (Natal Museum - Pietermaritzburg).

3.1.1 Significance rating of archaeological sites located in the proposed Jana Dam Basin

Mitigation for the Jana Dam would take a total of 114 days to attend to the 47 sites listed. This is projected to cost about R230 000 at current costings. There are no sites of sufficient significance to oppose the construction of the dam. However, in terms of mitigation, the impact of the dam is high-positive, if the proposed mitigation can be realised (Tables 3.1 and 3.2).

Table 3.1: List of sites and significance in the Jana Dam Basin

Site No.	Period	Significance	Effecting Dam
JN2	LIA	High	Jana Dam
JN3	MSA/LIA	Low	Jana Dam
JN4	LSA/HP	Low	Jana Dam
JN5	HP	Medium	Jana Dam
JN6	HP	Medium-low	Jana Dam
JN7	HP	Low	Jana Dam
JN8	LSA/LIA	High	Jana Dam
JN9	MSA/LIA	High	Jana Dam
JN10	HP	Medium	Jana Dam
JN11	MSA/LIA	Medium	Jana Dam
JN12	LSA/LIA	Medium-low	Jana Dam
JN13	LIA	Medium	Jana Dam
JN14	HP	Low	Jana Dam
JN15	HP	Low	Jana Dam
JN16	MSA/LSA/LIA	High	Jana Dam
JN17	HP	Medium	Jana Dam
JN18	HP	Low	Jana Dam
JN19	MSA/LSA	Medium-low	Jana Dam
JN20	LSA	High	Jana Dam
JN21	HP	Low	Jana Dam
JN22	LIA	High	Jana Dam
JN24	HP	Medium	Jana Dam
JN25	MSA/LSA/	Medium-high	Jana Dam
JN26	HP	Medium	Jana Dam
JN27	HP	Medium-high	Jana Dam
JN28	HP	Medium	Jana Dam
JN29	LIA	Low	Jana Dam
JN30	LIA	Medium-high	Jana Dam
JN31	HP	Low	Jana Dam
JN33	HP	Medium	Jana Dam
JN34	LIA	Medium	Jana Dam
JN35	LIA	Medium	Jana Dam
JN36	LIA	Low	Jana Dam
JN37	HP	Medium	Jana Dam

Site No.	Period	Significance	Effecting Dam
JN38	HP	Medium	Jana Dam
JN39	LIA	Medium	Jana Dam
JN40	LIA	Medium-low	Jana Dam
JN41	HP	Medium-low	Jana Dam
JN42	HP	Medium	Jana Dam
JN43	HP	Medium-low	Jana Dam
JN44	HP	Medium	Jana Dam
JN45	HP	Low	Jana Dam
JN46	HP	Medium	Jana Dam
2830CA2	LIA	High	Jana Dam
2830CA3	LIA	High	Jana Dam
2829DB4	LIA	High	Jana Dam
2829DB12	LIA	High	Jana Dam

Table 3.2: Sites requiring mitigation for Jana Dam

Site No.	Mitigation Required	No. of days	Approx. Cost
JN2	Excavations and mapping	3	R6 000
JN3	Surface collection and mapping	2	R4 000
JN4	Surface collection and mapping	2	R4 000
JN5	Test-pit excavations and mapping	3	R6 000
JN6	Surface collection and mapping	1	R2 000
JN7	Surface collection and mapping	1	R2 000
JN8	Excavations and mapping	6	R12 000
JN9	Excavations and mapping	3	R6 000
JN10	Test-pit excavations and mapping	3	R6 000
JN11	Test-pit excavations and mappings	3	R6 000
JN12	Surface collection and mapping	1	R2 000
JN13	Test-pit excavations and mapping	3	R6 000
JN14	Surface collection and mapping	2	R4 000
JN15	Surface collection and mapping	2	R4 000
JN16	Test-pit excavations and mapping	3	R2 000
JN17	Surface collection and mapping	2	R4 000
JN18	Surface collection and mapping	1	R2 000

Site No.	Mitigation Required	No. of days	Approx. Cost
JN19	Surface collection and mapping	1	R2 000
JN20	Excavation	14	R28 000
JN21	Surface collection and mapping	1	R2 000
JN22	Excavations and mapping	6	R18 000
JN24	Test-pit excavations and mapping	1	R2000
JN25	Test-pit excavations and mapping	3	R6000
JN26	Not affected	-	-
JN27	Test-pit excavations and mapping	3	R6000
JN28	Test-pit excavations and mapping	3	R6000
JN29	Not affected	-	-
JN30	Test-pit excavations and mapping	3	R6000
JN31	Not affected	-	-
JN33	Test-pit excavations and mapping	2	R4000
JN34	Test-pit excavations and mapping	3	R6 000
JN35	Test-pit excavations and mapping	3	R6 000
JN36	Surface collection and mapping	1	R2 000
JN37	Test-pit excavations and mapping	3	R6 000
JN38	Test-pit excavations and mapping	3	R6 000
JN39	Test-pit excavations and mapping	3	R6 000
JN40	Surface collection and mapping	1	R2 000
JN41	Surface collection and mapping	1	R2 000
JN42	Test-pit excavations and mapping	3	R6 000
JN43	Surface collection and mapping	1	R2 000
JN44	Test-pit excavations and mapping	3	R6 000
JN45	Surface collection and mapping	1	R2 000
JN46	Surface collection and mapping	1	R2 000
2830CA2	Excavations and mapping	3	R6 000
2830CA3	No	-	-
2829DB4	Excavations and mapping	3	R6 000
2829DB12	Excavations and mapping	3	R6 000
Totals	47 sites	114 days	R230 000

3.2 Mielietuin Dam

MD5
Early Iron Age (?). Circular stone platforms (grainbin foundations [?]) as well as thick buff-coloured ceramics. No decorated ceramics were found but the position and layout of the site seem to indicate that it belongs to the Early Iron Age.

MD7
Late Iron Age/Historic. One circular stone enclosure. Very little cultural material present on the surface.

MD8
Late Iron Age/Historic. At least three circular stone enclosures. This site is probably a multi-component site, probably built by Late Iron Age people and later re-used by people in the Historic Period. Historic material in the form of ploughshares, metal fencing, amongst others, is present.

Stone-walling in the largest enclosure has been robbed and re-used, forming a division within the main enclosure. This division is a straight stone wall. Lower grindstones have also been used in the construction of this wall. The entrance to the main enclosure has been changed, and wooden posts and wire have been erected.

The re-use of this Late Iron Age site may be linked to the nearby Historic homestead.

MD13
Late Stone Age/Middle Stone Age. Lithic scatter.

MD14
Early Iron Age. Msuluzi Phase ceramics, hut floors, grindstones.

3.2.1 Significance rating of archaeological sites located in the proposed Mielietuin Dam Basin

Table 3.3: List of sites and significance in the Mielietuin Basin

Site	Significance Rating	Mitigation
MD5	Medium-high	Excavation and mapping
MD7	Medium-low	Test pit excavations and mapping
MD8	Medium	Test pit excavations and mapping
MD13	Medium-low	Surface collection and mapping
MD14	Medium-high	Excavation and mapping

Mitigation for the Mielietuin Dam would take a total of 34 days to attend to the 5 sites listed. This is projected to cost about R68 000 at current costings. There are no sites of sufficient significance to oppose the construction of the dam.

Table 3.4: Sites requiring mitigation for Mielietuin Dam

Site	Mitigation Required	No. of Days	Approx. Cost
MD5	Excavation and mapping	14	R28 000
MD7	Test pit excavations and mapping	3	R6 000
MD8	Test pit excavations and mapping	5	R10 000
MD13	Surface collection and mapping	2	R4 000
MD14	Excavation and mapping	10	R20 000
Total	5 sites	34	R68 000

3.3 Aqueduct route: Canal

CON1
Late Iron Age. Circular stone enclosures.

CON2
Late Iron Age. Circular stone enclosures.

CON5
Late Iron Age. Circular stone enclosures.

CON7
Late Iron Age. Circular stone enclosures.

CON8
Late Iron Age. At least ten circular stone enclosures. At least two middens.

CON9
Late Iron Age. At least three circular stone enclosures. At least two middens.

CON10
Late Iron Age. At least eight circular stone enclosures. At least three middens.

CON12
Late Iron Age. At least one circular stone enclosure.

CON13
This area should be thoroughly checked for rock art.

CON14
This area should be thoroughly checked for rock art.

CON17
Late Iron Age. At least five circular stone enclosures. At least three middens. Middle Stone Age flakes are also present.

CON18
Late Iron Age. At least two circular stone enclosures.

CON19
Late Iron Age. At least two circular stone enclosures.

CON21
Late Iron Age. At least two circular stone enclosures.

CON22
Late Iron Age. At least four circular stone enclosures. At least two middens.

CON23
Late Iron Age. At least four circular stone enclosures. At least one midden.

CON24
Late Iron Age/Historic. At least two circular stone enclosures. Some stone-walling at right angles.

CON25
Late Iron Age. At least one circular stone enclosure.

CON28
Late Iron Age. This is a large area with a high concentration of circular stone enclosures.

CON29
Late Iron Age. This is a large area with a high concentration of circular stone enclosures.

CON30
Late Iron Age/Historic/Anglo-Boer War. At least five circular stone enclosures. Hut platforms and foundations. At least two middens. The site has been re-used in historic times - metal artefacts and stone walls built at right angles. Anglo-Boer War defensive walling (Torlage *pers. com*.).

CON31
Late Iron Age. At least three circular stone enclosures. At least one midden.

CON32
Late Stone Age. Lithic scatter.

CON33
Late Iron Age/Historic. Several circular stone enclosures. At least one midden, ceramics, metal artefacts, grave.

CON34
Late Iron Age. At least four circular stone enclosures. Broken grindstones. At least one midden.

CON35
Late Iron Age/Historic. At least five circular stone enclosures. Rectangular stone walls.

CON36
Late Iron Age. At least three circular stone enclosures. Hut floors.

CON37
Late Iron Age/Historic. At least two circular stone enclosures. Dugout area to one side (possibly Historic).

CON38
Late Iron Age. High concentration of circular stone enclosures. Grave. Walls have been robbed.

CON39
Historic. Colonial settlers and graves.

CON40
Late Iron Age. At least two circular stone enclosures. At least one midden.

CON41
Middle Stone Age. Lithic scatter.

CON42
Late Iron Age/Historic. Rock with three polishing surfaces and small grooves, probably for spear sharpening.

CON43
Late Iron Age. Numerous circular stone enclosures. Graves.

CON44
Historic. Circular and rectangular stone walling. Graves.

CON45
Middle Stone Age. Lithic scatter.

CON46
Middle Stone Age. Lithic scatter.

CON47
Late Stone Age. Lithic scatter.

CON48
Late Iron Age. At least five circular stone enclosures. At least three middens.

CON49
Late Stone Age. Lithic scatters and rock art.

Table 3.5: Summary of impacts of the canal

Indet.	Low	Medium-Low	Medium	Medium-High	High	Total
2	1	4	26	7	0	40

Table 3.6: List of sites along the canal aqueduct route and recommended mitigation

Site	Significance Rating	Mitigation
CON1	Medium	Test pit excavations and mapping
CON2	Medium	Test pit excavations and mapping
CON5	Medium	Test pit excavations and mapping
CON7	Medium	Test pit excavations and mapping
CON8	Medium-high	Excavation and mapping
CON9	Medium	Test pit excavations and mapping
CON10	Medium-high	Excavation and mapping
CON12	Medium	Test pit excavations and mapping
CON13	?	Area checked for rock art
CON14	?	Area checked for rock art
CON17	Medium-high	Excavation and mapping
CON18	Medium	Test pit excavations and mapping
CON19	Medium	Test pit excavations and mapping

Site	Significance Rating	Mitigation
CON21	Medium	Test pit excavations and mapping
CON22	Medium	Test pit excavations and mapping
CON23	Medium	Test pit excavations and mapping
CON24	Medium	Test pit excavations and mapping
CON25	Medium	Test pit excavations and mapping
CON28	Medium-high	Excavation and mapping
CON29	Medium	Test pit excavations and mapping
CON30	Medium	Test pit excavations and mapping
CON31	Medium	Test pit excavations and mapping
CON32	Medium-low	Surface collection
CON33	Medium	Test pit excavations and mapping. Graves need further examination.
CON34	Medium	Test pit excavations and mapping
CON35	Medium	Test pit excavations and mapping
CON36	Medium	Test pit excavations and mapping
CON37	Medium	Test pit excavations and mapping
CON38	Medium-high	Excavation and mapping. Graves need further examination.
CON39	Medium	Test pit excavations and mapping. Graves need further examination.
CON40	Medium	Test pit excavations and mapping
CON41	Medium-low	Surface collection
CON42	Low	Photograph and document
CON43	Medium-high	Excavation and mapping. Graves need further examination.
CON44	Medium	Test pit excavations and mapping. Graves need further examination.
CON45	Medium-low	Surface collection
CON46	Medium-low	Surface collection
CON47	Medium-low	Surface collection
CON48	Medium-high	Excavation and mapping
CON49	Medium	Surface collection. Rock art documentation. Excavation if deposit present.

3.4 Aqueduct route: Pipeline

CON3
Late Iron Age. At least two circular stone enclosures. This area should be thoroughly checked for rock art.

CON4
Late Iron Age. At least four circular stone enclosures. At least one midden.

CON6
Late Iron Age. At least two circular stone enclosures and a midden.

CON10
Late Iron Age. At least eight circular stone enclosures. At least three middens.

CON11
Late Iron Age/Historic. At least one circular stone enclosure and Historic-type walling.

CON15
Late Iron Age. Large area with at least twenty circular stone enclosures.

CON16
Late Iron Age. Identified by aerial photographs but site probably destroyed by subsequent expansion of informal settlement.

CON20
Late Iron Age. Large area with at least twenty circular stone enclosures.

CON26
Late Iron Age. At least three circular stone enclosures.

CON33
Late Iron Age/Historic. Several circular stone enclosures. At least one midden, ceramics, metal artefacts, grave.

CON34
Late Iron Age. At least four circular stone enclosures. Broken grindstones. At least one midden.

CON35
Late Iron Age/Historic. At least five circular stone enclosures. Rectangular stone walls.

CON36
Late Iron Age. At least three circular stone enclosures. Hut floors.

CON37
Late Iron Age/Historic. At least two circular stone enclosures. Dugout area to one side (possibly Historic).

CON38
Late Iron Age. High concentration of circular stone enclosures. Grave. Walls have been robbed.

CON39
Historic. Colonial settlers and graves.

CON40
Late Iron Age. At least two circular stone enclosures. At least one midden.

CON41
Middle Stone Age. Lithic scatter.

CON42
Late Iron Age/Historic. Rock with three polishing surfaces and small grooves, probably for spear sharpening.

CON43
Late Iron Age. Numerous circular stone enclosures. Graves.

CON44
Historic. Circular and rectangular stone walling. Graves.

CON45
Middle Stone Age. Lithic scatter.

CON46
Middle Stone Age. Lithic scatter.

CON50
Late Iron Age. Mgoduyanuka, National Monument.

CON51
Late Iron Age. Ceramic scatter and pipe bowl (accessioned and curated at Natal Museum).

CON52
Late Iron Age. At least one circular stone enclosure. Sixteen assegaai heads ploughed up in nearby land.

CON55
Middle Stone Age/Late Stone Age. Lithic scatter.

CON56
Late Iron Age. Four engravings (accessioned and curated at Natal Museum).

Table 3.7: Summary of impacts of the pipeline

Indet.	Low	Low-Medium	Medium	Medium-High	High	Total
0	2	5	16	4	1	28

Table 3.8: List of sites along the pipeline aqueduct route and recommended mitigation

Site	Significance Rating	Mitigation
CON3	Medium	Test pit excavations and mapping
CON4	Medium	Test pit excavations and mapping
CON6	Medium	Test pit excavations and mapping
CON10	Medium-high	Excavation and mapping
CON11	Medium	Test pit excavations and mapping
CON15	Medium-high	Excavation and mapping
CON16	Medium	Test pit excavations and mapping
CON20	Medium	Test pit excavations and mapping
CON26	Medium	Test pit excavations and mapping
CON33	Medium	Test pit excavations and mapping. Graves need further examination.
CON34	Medium	Test pit excavations and mapping
CON35	Medium	Test pit excavations and mapping

Site	Significance Rating	Mitigation
CON36	Medium	Test pit excavations and mapping
CON37	Medium	Test pit excavations and mapping
CON38	Medium	Excavation and mapping. Graves need further examination.
CON39	Medium	Excavations and mapping.
CON40	Medium	Test pit excavations and mapping
CON41	Medium-low	Surface collection
CON42	Low	Photograph and document
CON43	Medium-high	Excavation and mapping. Graves need further examination.
CON44	Medium	Test pit excavations and mapping. Graves need further examination.
CON45	Medium-low	Surface collection
CON46	Medium-low	Surface collection
CON50	High	Mgoduyanuka National Monument. Permit needed from Amafa.
CON51	Medium-low	Surface collection
CON52	Medium	Test pit excavations and mapping
CON55	Medium-low	Surface collection
CON56	Low	Collected by Natal Museum

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5 GLOSSARY OF TERMS

(**BP** - Before Present)

500 000 BP	Appearance of early *H. sapiens*.
150 000 BP	Modern *H. sapiens sapiens* in southern Africa
80 000 BP	Modern *H. sapiens sapiens* in Africa and the Near East.
1.5m-200 000 BP	Early Stone Age (**ESA**).
150 000-20 000 BP	Middle Stone Age (**MSA**).
20 000 BP- c. AD 1850	Late Stone Age (**LSA**).
AD 300-1100	Early Iron Age farming communities colonise southern Africa.
AD 1100-1300	Earliest east coast trade and rise of complex chiefdoms.
AD 1300-1500	Gradual Iron Age expansion to interior grasslands.
AD 1600-1900	Further expansion and settlement by major Iron Age groups.

THE STONE AGE

The Early Stone Age (before 1 500 000 to c. 200 000 years ago)

Early Stone Age tool assemblages consist of hand axes, cleavers and choppers and are characteristically robust. The distribution of these assemblages suggests that these people did not occupy rock shelters or caves but lived in the open. Generally these settlements were located in the close vicinity of water sources. Apart from easy access to water, these locations gave Early Stone Age people access to large river pebbles which could be used in the manufacture of tools. These stone artefacts are virtually all that has remained from the Early Stone Age and it is thus extremely difficult to reconstruct the behaviour of these people. There is evidence for the use of fire but no evidence, to date, of personal adornment or burial practices.

The Middle Stone Age (150 000 to 30 000 years ago)

Middle Stone Age tool assemblages are made up of a wider variety of raw materials and consist of a greater number of tool types than the Early Stone Age. These artefacts are smaller and more

specialised than those of the Earlier Stone Age. The Middle Stone Age saw a gradual shift in living sites from the open veld to caves and rock shelters. Thick layers of refuse (middens) found in some caves contain rich evidence concerning diet and lifestyle during the Middle Stone Age.

The Late Stone Age (from 30 000 years ago)

This period is better understood than previous periods in the Stone Age as:

- archaeological deposits are younger, organic materials and food remains are better preserved.
- the Late Stone Age falls within the range of radiocarbon dating (± 50 000 years) and it is therefore possible to accurately date sites.
- the Late Stone Age can be linked directly with the San (Bushmen) and Khoikhoin so it is possible to use them as ethnographic analogues for the reconstruction of life during the Late Stone Age.

Late Stone Age tool assemblages are characterised by microlithic tools which could be hafted as arrowheads or mounted onto handles to be utilised as knives. Bone was also used in the manufacture of awls and arrowheads. Ostrich eggshell beads were manufactured and whole ostrich eggshells used as water containers.

Most rock paintings in southern Africa are attributed to these people.

THE IRON AGE

The Early Iron Age

Radiocarbon dates from the Early Iron Age of South Africa generally fall between AD 300 and 1100 and these groups represent the first Bantu-speaking people to migrate into southern Africa.

Early Iron Age people were mixed farmers and brought with them a variety of domestic grain in the form of sorghum and millet. Maize did not form part of their dietary package and was introduced into southern Africa much later, at roughly AD 1550. Domestic stock were also kept, in the form of cattle, sheep and goats. Hunting formed an important dietary component, and these people possessed the ability to smelt and work metal. Domestic dogs and chickens are also recorded.

Early Iron Age people lived in a spatial layout called the Central Cattle Pattern which consisted of a cattle byre as the central focus of the settlement. Huts and living areas would form a roughly circular configuration around the cattle byre. Structures were thatched and generally built of wattle-and-daub, or *dagha*.

It seems as if Early Iron Age people were not restricted in their settlement by demographic pressures. It is thus reasonable to assume that their choice of settlement sites was fairly open. Bearing in mind that they were mixed farmers, it would make sense for them to inhabit arable land. This was indeed the case, and Early Iron Age sites are generally located on land that is, or was, conducive to cultivation.

Early Iron Age settlements are general located below the 1 000m contour and in areas with more than 300mm of rainfall per annum. Settlements occur in major river valleys, close to rivers and around coastal lakes. These settlements can be up to 5ha in extent.

The Late Iron Age

The Late Iron Age in KwaZulu-Natal dates from about AD 1100 - AD 1800. Major differences between these sites and those of the Early Iron Age are found in pottery styles and settlement patterns. Late Iron Age settlements are located in savannah and grassland areas and often on the upper slopes of hills. The introduction of maize led to a change in the form of several artefacts, such as grindstones. There is also an introduction of foreign, or exotic artefacts, such as ceramics and glass beads imported from the Middle and Far East and Europe. The introduction of European foundry iron saw the rapid demise of indigenous iron smelting practices as goods and labour were traded for this more easily obtainable resource.

THE HISTORICAL PERIOD

The Historical Period in KwaZulu-Natal dates from AD 1829 and marks the arrival of European colonists in the region. These sites include those associated with black and white agriculturists, European colonists and Colonial and Territorial armies.

APPENDICES

APPENDIX 1: CO-ORDINATES FOR SITES OF ARCHAEOLOGICAL SIGNIFICANCE

APPENDIX 1

CO-ORDINATES FOR SITES OF ARCHAEOLOGICAL SIGNIFICANCE

Table 1. Co-ordinates for Jana Dam sites of archaeological significance

Site	South			East		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
Sites affected by full supply level of 860m (preferred level)						
JN2	28	40	45	30	1	21
JN3	28	40	40	30	1	22
JN4	28	41	8	30	1	24
JN5	28	40	8	29	56	50
JN6	28	40	26	30	0	27
JN7	28	40	12	30	0	11
JN8	28	40	11	30	0	5
JN9	28	40	5	29	59	57
JN10	28	40	7	29	59	45
JN11	28	40	11	29	59	46
JN12	28	40	13	29	59	55
JN13	28	40	7	30	0	22
JN14	28	39	44	30	0	16
JN15	28	39	30	30	0	38
JN16	28	39	4	30	0	6
JN17	28	38	55	30	0	1
JN18	28	28	55	29	59	58
JN19	28	38	46	29	59	43
JN20	28	40	51	30	2	8
JN21	28	38	54	30	0	54
JN22	28	40	51	30	2	30
JN24	28	40	20	30	1	8
JN25	28	41	1	30	1	41
JN27	28	38	55	30	0	49
JN28	28	38	41	30	0	56
JN30	28	40	36	29	56	52
JN31	28	41	8	30	1	8
JN33	28	40	34	29	56	38
JN34	28	40	30	30	2	46
JN35	28	40	38	30	2	44
JN36	28	40	21	29	57	4
JN37	28	40	28	30	2	48
JN38	28	40	54	30	2	26
JN39	28	40	44	30	2	50
JN40	28	40	38	30	2	51
JN41	28	40	34	30	2	51
JN42	28	40	28	30	2	48
JN43	28	38	50	30	0	49
JN44	28	38	52	30	0	35
JN45	28	38	39	30	0	45
JN46	28	38	43	30	1	37
2830CA2	28	40	18	30	0	15
2830CA3	28	40	45	30	0	35

Site	South			East		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
2829DB12	28	40	5	29	59	50
Additional sites affected by full supply level of 890m						
JN26	28	38	44	30	1	26
JN29	28	40	59	30	1	15
2829DB4	28	40	0	29	59	20

Table 2. Co-ordinates for Mielietuin Dam sites of archaeological significance

Site	South			East		
	Degrees	minutes	seconds	Degrees	minutes	seconds
Affected at a full supply level of 1025m (preferred level)						
MD7	28	55	19	29	57	35
MD8	28	55	17	29	57	36
MD13	28	59	49	29	59	4
MD14	28	55	0	29	58	55
Additional sites affected at a full supply level of 1033m						
MD5	28	56	25	29	56	12

Table 3. Co-ordinates for Aqueduct route sites of archaeological significance

Site	South			East		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
CON1	28	45	50	29	48	4
CON2	28	45	20	29	51	25
CON3	28	45	25	29	54	20
CON4	28	46	20	29	52	10
CON5	28	46	30	29	51	15
CON6	28	47	20	29	45	50
CON7	28	46	25	29	47	20
CON8	28	40	40	29	14	30
CON9	28	39	55	29	13	50
CON10	28	37	5	29	10	10
CON11	28	38	30	29	13	55
CON12	28	36	20	29	10	15
CON13	28	37	25	29	9	50
CON14	28	35	30	29	7	45
CON15	28	42	25	29	24	25
CON16	28	40	10	29	18	50
CON17	28	43	52	29	28	50
CON18	28	43	40	29	24	50
CON19	28	42	25	29	22	55
CON20	28	46	28	29	42	5
CON21	28	45	18	29	44	50
CON22	28	45	50	29	40	50
CON23	28	45	50	29	39	50
CON24	28	45	30	29	39	30
CON25	28	45	15	29	35	10
CON26	28	42	40	29	59	20
CON28	28	41	28	29	56	45
CON29	28	41	45	29	56	5
CON30	28	43	20	29	51	30
CON31	28	44	45	29	51	15
CON32	28	51	32	29	58	35
CON33	28	46	50	29	51	20
CON34	28	46	52	29	51	39
CON35	28	46	52	29	52	20
CON36	28	46	52	29	52	23
CON37	28	48	4	29	51	18
CON38	28	48	7	29	51	30
CON39	28	48	30	29	51	54
CON40	28	48	52	29	52	9
CON41	28	49	6	29	52	4
CON42	28	49	6	29	52	4
CON43	28	49	38	29	52	9
CON44	28	49	44	29	52	9
CON45	28	47	44	29	51	39

Site	South			East		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
CON46	28	47	40	29	51	41
CON47	28	36		29	10	
CON48	28	35	10	29	7	45
CON49	28	36		29	9	
CON50	28	43	0	29	23	40
CON51	28	43	32	29	24	20
CON52	28	46		29	35	
CON55	28	39	36	29	17	25
CON56	28	45	12	29	40	45

REVIEW

REVIEW OF THE ARCHAEOLOGICAL BASELINE STUDY: THUKELA WATER PROJECT FEASIBILITY STUDY for the Institute of Natural Resources

Gavin Whitelaw
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Private Bag 9070
Pietermaritzburg
3200

11 April 2000

REVIEW OF THE ARCHAEOLOGICAL BASELINE STUDY: THUKELA WATER PROJECT FEASIBILITY STUDY

Ms J. Mander of the Institute of Natural Resources requested that I review the report on the archaeological baseline study undertaken for the Thukela Water Project Feasibility Study. My terms of reference were laid out in a letter written by Ms J. Mander, dated 16 March 2000. A copy of the letter is attached to this document. For the most part, the archaeological baseline study report is an adequate draft. However, I do recommend modifications in several areas. I list these below.

The report does not comply adequately with its terms of reference, as these are presented in the report (note, not the terms of reference supplied to me as an independent document by the INR). The terms of reference in the report require that the study examine the impact of the Thukela Water Project (TWP) on 'cultural heritage sites as defined in the KwaZulu-Natal Heritage Act (Act No. 10 of 1997) and the South African Heritage Resources Act (Act No. 25 of 1999)'. The term 'cultural heritage sites' in these two pieces of legislation has a far wider definition than sites of a solely archaeological nature (acknowledged in the report on p1-2). Yet, the report deals only with sites of an archaeological (material cultural) nature. It could be argued that the phrase 'with special reference to' (2.2 of the terms of reference, p2) restricts the study to cultural heritage sites of an archaeological nature, but this is debatable. Either the terms of reference within the report need to restrict the study to sites of an archaeological nature (as do the terms of reference supplied separately to me) or further work needs to be done to deal with non-archaeological cultural heritage sites.

I believe it is unwise to state that the 'impact of the dam is high-positive' (p1 & 19). I do recognise what the authors are trying to achieve with this statement, but suggest that it may result in an inaccurate understanding of the impact of the development. The impact of the TWP on archaeological sites is high-negative. This should be stated and not confused with the possible results from a mitigation project, which are unknowable. Furthermore, there is no description of the impact of the TWP on the archaeological sites in the affected areas. Admittedly, there is little need to devote much space to this – sites in the basin will be flooded and therefore arguably unavailable to future generations[1]. However, there is a need to state this in the report. The situation may be more complex along the aqueduct and other conveyance corridors where sites will be affected to a greater or lesser degree by construction, depending upon their exact position within or adjacent to corridors.

[1] One could argue that sites flooded by a dam might become available to future researchers should the dam be drained. This argument would need to consider the preservation of archaeological material underwater. In general, archaeological material lasts longer in anaerobic conditions such as might be found at dam bottoms than in conditions present on many open-air archaeological sites. The argument would also need to consider the likelihood of the sites becoming available to future generations, ie. the likelihood of the dam being drained.

The section of the report devoted to assessment methodology is very brief. The report should provide details of the number of people in the fieldwork teams, the survey strategies adopted, the number of days in the field (there is nothing in the report on these) and details of the desktop analyses (limited information is present, but no conclusions or expectations derived from the desktop analyses are provided).

No detailed maps of site locations are provided, though the report does list the co-ordinates of the sites. A map is essential, however, and it should ideally include an indication of walkpaths and areas searched.

The key issue of site significance assessment is given only limited attention. The criteria presented in 3.3 (p6) are standard. The authors note that sites that 'score' higher in terms of these criteria are of higher significance. However, no scores are provided in the report. If the sites identified actually received a score, then this should be provided. If not, then more detailed discussion of each site's significance rating is required. This is necessary because site significance is a complex issue that determines the level and type of future actions. The descriptions of sites in the Jana Dam provide some direction for the modification of this report. In many cases, it is clear from the Jana Dam descriptions why sites received a particular significance rating. By contrast, the descriptions of the Mielietuin Dam and aqueduct sites are too limited to provide any indication of their significance to an independent reviewer. Significance ratings are presented in Tables 4.3 and 4.7 without any explanation of how or why they were reached. I therefore recommend that the Mielietuin Dam and aqueduct site descriptions are expanded and that the authors explicitly discuss their assessment of site significance in the case of each site in all three surveyed areas (that is, Jana and Mielietuin dams and the aqueduct corridors).

The impact of the TWP on sites in the Jana and Mielietuin dam basins is summarised in tabular form in the report (Tables 4.1 and 4.3). No similar tables are provided for sites on the aqueduct routes. There are aspects of these tables that are unclear. I concur with the entries in most columns, but consider the "extent/spatial scale" of the impact to be **local** rather than **national**. This is because the archaeological material within the affected areas is not linked in any systemic way with archaeological material outside the affected areas. Note that the definition of "extent/spatial scale" on p3 of the report refers to the area within which the affected environment will directly endure the impact.

The issue of the significance of the impact, as presented in Tables 4.1, 4.3 and 4.7, requires further consideration. The significance of an impact is dependent upon the impact's magnitude, scale, duration and, importantly, on the significance of the affected environment (various definitions on p4). Therefore it is nonsensical to state that the significance of an impact will be **medium** if that impact results in the total loss of a site of **high** archaeological significance. It is true that mitigation may be possible on many, even most archaeological sites, but the sites will be irreversibly

affected by the TWP. Further, total mitigation is impossible, while development mitigation is a less than ideal context in which to perform archaeological work.

The report does not adequately address the one alternative that was available to the specialists, the aqueduct route. The reports provides very brief descriptions of the sites identified along the aqueduct routes and a summary of these and (presumably – it does not say) their significance ratings in Tables 4.5 and 4.6. The authors conclude that the pipeline route will have a lower impact on archaeological resources. No reasoning is given, other than noting that the number of sites affected on the pipeline route is lower. However, impact has little to do with numbers, but rather more to do the significance of the sites suffering the impact. Tables 4.5 and 4.6 are presumably meant to provide a comparison of the significance of the impact, but they are insufficient. Discussion on the relative significance of the archaeological resources on the two routes is required.

I would like to comment on the possible threat to the Mgoduyanuka national monument. The site is a representative of what are perhaps the only Iron Age earthworks south of the Zambezi. As such, it represents a significant precolonial architectural innovation in southern Africa. The site is well preserved, well researched and has considerable potential for tourism and education. The baseline study allows for a scenario in which no re-alignment of the pipeline around the national monument may be possible (p32). It is my strong opinion that the TWP should not in any way threaten the integrity of Mgoduyanuka. If the pipeline is chosen, then the developers must find a way around the site.

There are some minor details that should be taken care of in producing the final report. These include ironing out any grammatical errors and sloppy sentence construction in the descriptions of the Jana Dam sites. I make the following suggestions and corrections. All concern the Jana Dam sites, but the brevity of the rest of the site descriptions precludes similar problems elsewhere.

1. Most sites with iron smelting debris are classified in the report as Historical. I would prefer to see these reclassified as Late Iron Age (LIA). The one date available from an iron-production site in the Jana Dam area falls in the early eighteenth century AD. It seems likely that others in this area also date to and around this period. Furthermore, indigenous iron smelting in the region died out fairly soon after the colonial (Historical) period began in 1824.
2. The report should note that the Jana Dam area was clearly of considerable significance in precolonial times from the point of view of iron production. In this sense, the Jana Dam survey confirmed what was already suspected on the basis of earlier research.
3. JN2: the site is of high significance, yet the mitigation recommended involves 'test-pit excavations'. I doubt that this will sufficient for a site of high significance. See also sites 2829DB 4, 12, 2830CA 2, 3. If test-pit excavations are recommended in terms of a phased approach, this should be stated.

4. Several sites of low significance occur in the Jana Dam basin. No mitigation is recommended, but the authors should consider low-level mitigation such as surface collection of ores, slag (both for sourcing work), decorated and rimmed ceramics, photography and paint sampling.
5. Several JN sites appear from the descriptions to be multicomponent sites. This is not always stated.
6. Sherds are not diagnostic (JN10) unless they recognisably belong to a named ceramic entity.
7. The Stone Age sites on which the authors recommend mitigation, should be *systematically* sampled (cf. JN11, JN19).
8. The engraving at JN27 should be traced.
9. Maggs did not excavate the iron mine mentioned in JN8. Shaft mining for iron ore was very unusual in southern Africa and each of the shaft mines located is of considerable significance.
10. JN25: areal excavation would be preferable to test-pit excavation to determine spatial layout.
11. JN35: mentions three occupations, but details only two.
12. JN16: the description of the site suggests to me that the site is of high rather than medium significance.
13. I believe the words 'plinths' and 'silica' on p16 are used incorrectly.
14. The database referred to in the footnote on p18 is the provincial, not the national database.

Finally

The terms of reference of the report require modification. The report is impartial, unbiased and for the most part clear and logical. It will need modification to facilitate the decision-making process in the TWP feasibility study. Specifically in this regard, it requires work on the aqueduct alternatives to allow for an informed choice of aqueduct route. For the rest of the development, it is clear that there must be allowance for considerable archaeological mitigation. More detail is needed in the report on the assessment process and the reasons for the conclusions reached. With the modifications outlined above, the report should allow the proponent to make an informed decision on moving forward to the next stage of the TWP.

P.O.Box 2685
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3200
20 July 2000

Jenny Mander
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Dear Ms Mander

With reference to the review of the archaeological baseline study for the Thukela Water Project, undertaken by Mr Gavin Whitelaw, my response is as follows:

1. *Terms of Reference*
   The report has been modified to indicate that the baseline study deals solely with archaeological sites and that other cultural heritage sites are dealt with in other parts of the feasibility study.

2. *Impact of the dam*
   Whilst the reviewer is critical of the term 'high-positive' I believe we have addressed the justification of the use of this term adequately in the text (pg 20, section 3.1.1.).

3. *Assessment methodology*
   The fieldwork team comprised only the authors of the report and their field methodology has been described in section 2.2. (page 5).

4. *Site significance assessment*
   No numeric scores were applied to the assessment of site significance. The criteria presented (section 2.3. page 6) were used by the respective authors to assess the sites in terms of archaeological significance as currently perceived. It is the authors' best judgement of the archaeological significance and the impact of the TWP in terms of prevailing archaeological research designs.

5. *Aqueduct route*
   The report addresses the shortcomings of the aqueduct route options as provided to the assessors. The significance of sites and the potential impact of either aqueduct option will only be able to be ascertained when the precises routes are flagged.

6. *Mgoduyamuka Heritage Site*
   The report has categorically stated that no impact to this site should be permitted, without reference to Amafa-aKwaZulu Natali. The significance of the site is recognised and all realignment options will have to considered around the site.

The following concerns raised by the reviewer have been addressed in the report:

- A map of the respective survey areas has been provided.

- A table of site significance has been provided for the aqueduct routes.
- It is agreed that the significance of the sites are at the local rather than the national level.
- Sites with iron smelting debris have now been classified as Iron Age.
- Cognisance was taken of the minor details listed at the conclusion of the assessment report and incorporated into the final draft of the archaeological baseline study.

We gratefully acknowledge the positive critique and constructive criticism provided by Mr Gavin Whitelaw.

Yours sincerely

Len van Schalkwyk