

**A framework for effective Urban Stream Corridor  
management :**

**A case study of Pietermaritzburg**

**Component A**

by

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## Abstract

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Not only does urbanisation have a negative impact on the establishment of natural open space areas but also has serious implications for urban stream corridors (USCs), the focus of this study. For the purpose of this study USCs are defined as the aquatic, the riparian and the terrestrial zone. The principle objective of this study is to develop a set of policies, based on international and local experiences (Pietermaritzburg Metropolitan Open Space System) to guide municipalities in implementing effective USC management practices.

The literature review lead to the identification of both the value of USCs and the threats thereto. The value of USCs includes habitat and biodiversity, purification, amenity, cultural, recreational and educational values as well as flood attenuation value. Conversely, threats to USCs include the impacts of urbanisation on stream hydrology, erosion, decline in water quality, loss of natural open space (NOS), alien infestation, littering and unnatural fence barriers. Urban stream corridor management is subject to specific legislation, municipal capacity and importantly, public involvement, which were also evaluated.

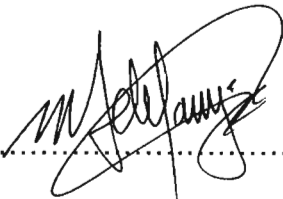
This process lead to the establishment of a conceptual framework containing the critical considerations associated with USC management such as the value of USCs for nature and man, the need for public involvement, effective implementation structures supported by implementation policies and the integration of USC management in urban planning. Key to the success of USC management is public involvement.

As a consequence, the methodology included a survey to be undertaken with 40 urban riparian households along two streams in Pietermaritzburg to establish their opinion regarding natural open spaces (NOSs) and USC management. A reconnaissance survey of two streams was undertaken to inform the questionnaire and later debate on the issue. The results from this exercise together with the findings of the interviews with stakeholders in the USC management process will form the basis for the establishment of an USC management policy, which will be contained in a separate report (Component B).

## Preface

The work described herein was undertaken in the Centre for Environment and Development, University of Natal, Pietermaritzburg, under the supervision of Dr. N. W. Quinn of the Centre of Environment and Development, Pietermaritzburg.

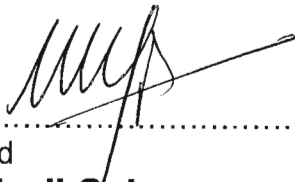
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Signed

**Marthinus Arnoldus de Lange**

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28 NOVEMBER 2003  
Date



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Signed

**Dr. Nevil Quinn**

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## LIST OF ABBREVIATIONS

<b>CMAs</b>	Catchment management agencies
<b>CMIs</b>	Catchment management institutions
<b>D'MOSS</b>	Durban metropolitan open space system
<b>IDPs</b>	Integrated development plans
<b>MOSS</b>	Metropolitan open space system
<b>NOS</b>	Natural open space
<b>POS</b>	Public open space
<b>USCs</b>	Urban stream corridors

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# CHAPTER 1: INTRODUCTION TO THE STUDY

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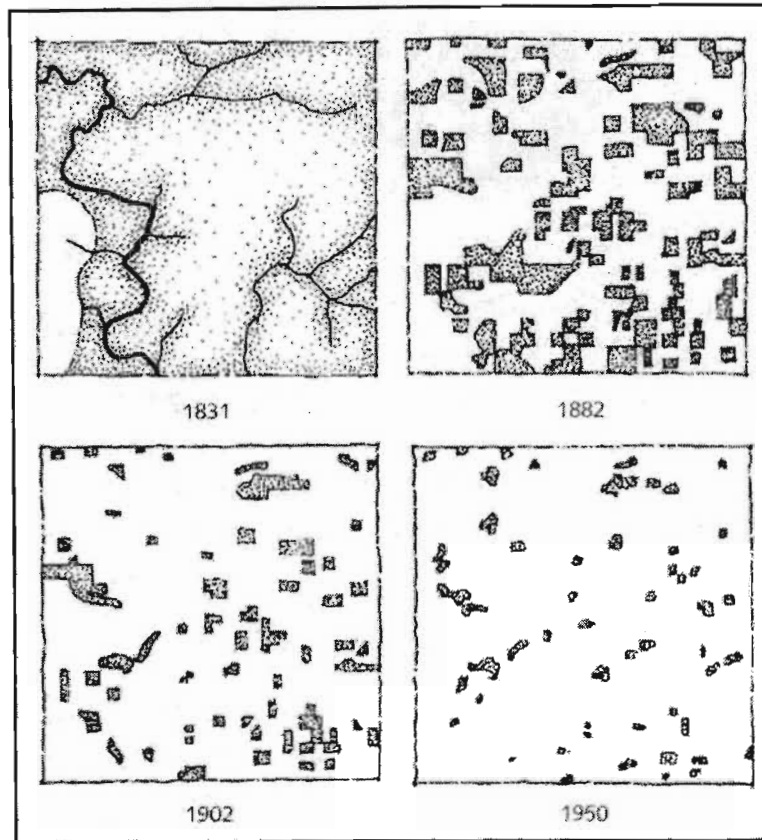
## 1.1 INTRODUCTION

Public open spaces have always had an important role to play with regard to cities and urban areas, representing a means of bringing nature back to the city. In fact, due to the functions they fulfil for humankind and nature, these areas are often referred to as the lungs of the city (Scheer 2001; Francis, Cashdan and Paxson 1984). Various forms of public open spaces (POSs) fulfil an important role with regard to the urban dweller. A landscaped park or natural area containing a tranquil stream provides an oasis where city residents can again experience a part of nature, finding the peace and harmony of nature, escaping the sometimes claustrophobic character and pressures of the city (Taylor and Coalter 2001; Integrated Planning Services 1997).

Open space systems consist of two main types. Firstly there are human-made open spaces, such as parks, sport-fields and infrastructural servitudes, for example, electricity transmission lines. The second type of open space refers to relatively undisturbed and undeveloped areas in the form of grasslands, natural forests and wetlands. This study focuses on the protection and maintenance of the latter, especially natural areas along urban stream corridors (USCs) as well as the protection of the associated riverine areas.

The need for public open spaces, together with associated natural open spaces (NOSs) which include rivers is well recognised (Petts, Heathcote and Martin 2002; Durban Metropolitan Council 1999; Wade, Large and De Waal 1998; Council for the Environment 1989; Nicolson 1987; Cooper and Antoni 1983). Over the past few decades the increasing negative impact of urbanisation and the associated increasing impact on the urban open space landscape has led to a realisation that POS needs to be protected and managed (Durban Metropolitan Council 1999; Mhlanga 1994; Smith and Hellmund 1993; Council for the Environment 1989; Anderson 1983; Cooper and Antoni 1983). In the United States of America, for instance, the total area of urban and other developed areas increased by twenty-two million acres between 1959 and 1982, representing an increase of 45 percent (Heimlich and Anderson 1987, in Smith and Hellmund 1993).

A striking example of the effects of urbanisation is found in the loss of forested areas in Cadiz, Wisconsin during the period 1831 to 1950 (Figure 1.1) (Smith and Hellmund 1993).



**Figure 1.1:** Loss and fragmentation of forested areas in Cadiz, Wisconsin, 1831-1950. The township is 6 by 6 miles. The shaded areas represent the remaining forest cover following urbanization (Smith and Hellmund 1993: 3).

The South African context is effectively summarised by the Council for Environment:

*“South Africa is entering a new era of even more rapid urbanisation than in the first stage of urban growth following the Second World War....The Council for the Environment recognised the importance of the timely provision of adequate natural open space as a vital element within the built environment. Without the provision and protection of adequate natural areas the environmental and living quality of our cities will rapidly deteriorate. The Council therefore considers the timely planning and provision of open space as a key element in the urban environment and a major responsibility of local and all other bodies, persons or professions concerned with urban planning and administration.”* (Council for Environment 1989:1)

The rapid population growth and associated urbanisation together with prioritisation of basic human needs such as food, water and housing has led to POS development taking a disadvantaged position relative to basic needs. This is especially the case in developing countries of the world where meeting basic human needs is the priority of the governments of the day (Integrated Planning Services 1997; Roberts 1994; Roberts 1990). Markewicz, English and Associates *et al.* (1998) substantiate the above, citing the pressure on natural indigenous vegetation as just one consequence of rapid urban expansion in respect of Durban. A survey undertaken by Integrated Planning Services (1997) of eight Municipalities (then Transitional Local Councils) confirmed a similar situation in KwaZulu-Natal due to competing land use demands, and especially the provision of housing. This is of particular importance as South Africa has one of the highest urbanisation rates in the world (Braune and Wood 1999).

The degradation caused by increased urbanisation is, however, not only restricted to our public and natural open spaces. Wade *et al.* (1998) suggest that mankind has also had a negative effect on river corridors through alteration, over-engineering, pollution and unsympathetic management. The Kissimmee river in Florida, for instance, has been transformed from a 103 mile meandering channel to 56 mile channel which is wide and deep and lost its use as a biological system (Karr 1988, in Smith and Hellmund 1993). In support of the above, Petts *et al.* (2002: 69, 104) observe that “...*the urban process has led to the degradation of urban watercourses and their rehabilitation is central to the regeneration of the urban environment*”.

It has been Government's intention to construct one million houses in South Africa between 1999 and 2004. It is estimated that this will cover a total area of 60 000 ha (Braune and Wood 1999). This will have a definite effect on previously natural areas which will have to be cleared for housing, as well as increased runoff associated with an increase in impervious areas, which in turn have further negative impacts such as increased risk of flooding and streambank erosion (United States Environmental Protection Agency 1993; Schueler 1987). The urbanisation problem thus has a marked effect on urban rivers and the adjacent terrestrial area.

Integrated Planning Services (1997) argue that people have a deep-seated need for access to open spaces which is described as 'the desire to get back to nature'. Roberts (1990), reflects on the negative effects of urbanisation and lack of urban open spaces, whilst contrasting the positive effects of open spaces in relieving tension and stress. Similar advances are made by Ruther (1987) and Shaw and Supplee (1987), both in Mauz, Lambert and Groessl (1999) regarding the protection of the natural environment and open spaces and the associated positive relationship with improved quality of life. It is therefore implied that humankind attaches an intrinsic value to open space, but as already indicated above, such values are affected by and are subordinate to basic human needs such as the provision of water and shelter.

From the above, it would appear that the values attached to natural open spaces are diminishing (Integrated Planning Services 1997). Not only are NOSs and USCs facing this challenge, but they are further negatively affected by the maintenance and administration costs of such areas, perceived security risks and lack of municipal capacity (Bartholomew 2001, *pers comm*; Anderson 1983). The value of a NOS area is therefore, to a large extent, dependant on the need of the community. This aspect is well recognised by Günther-Diringer (2001), Durban Metropolitan Council (1999), Integrated Planning Services (1997) and Roberts (1994), citing the need for public consultation to determine their needs with regard to open space planning. Integrated Planning Services (1997), in their evaluation of POS management in the United States consider community participation as essential to the success of open space planning programs. Natural open space planning and maintenance is thus dependant on the value placed thereon and the need expressed in respect thereof, by communities. The funding and resource allocation to NOS and USC protection and management is in turn related to the expressed need of the community. The community therefore has an essential role to play in ensuring the appropriate municipal level of priority with regard to NOS planning.

## **1.2 PROBLEM STATEMENT**

Thus far consideration has been given to the impacts on NOS and USCs associated with urbanisation, the value attached to NOSs by communities, the management thereof, the perceived security risks as well as administrative capacity of municipal

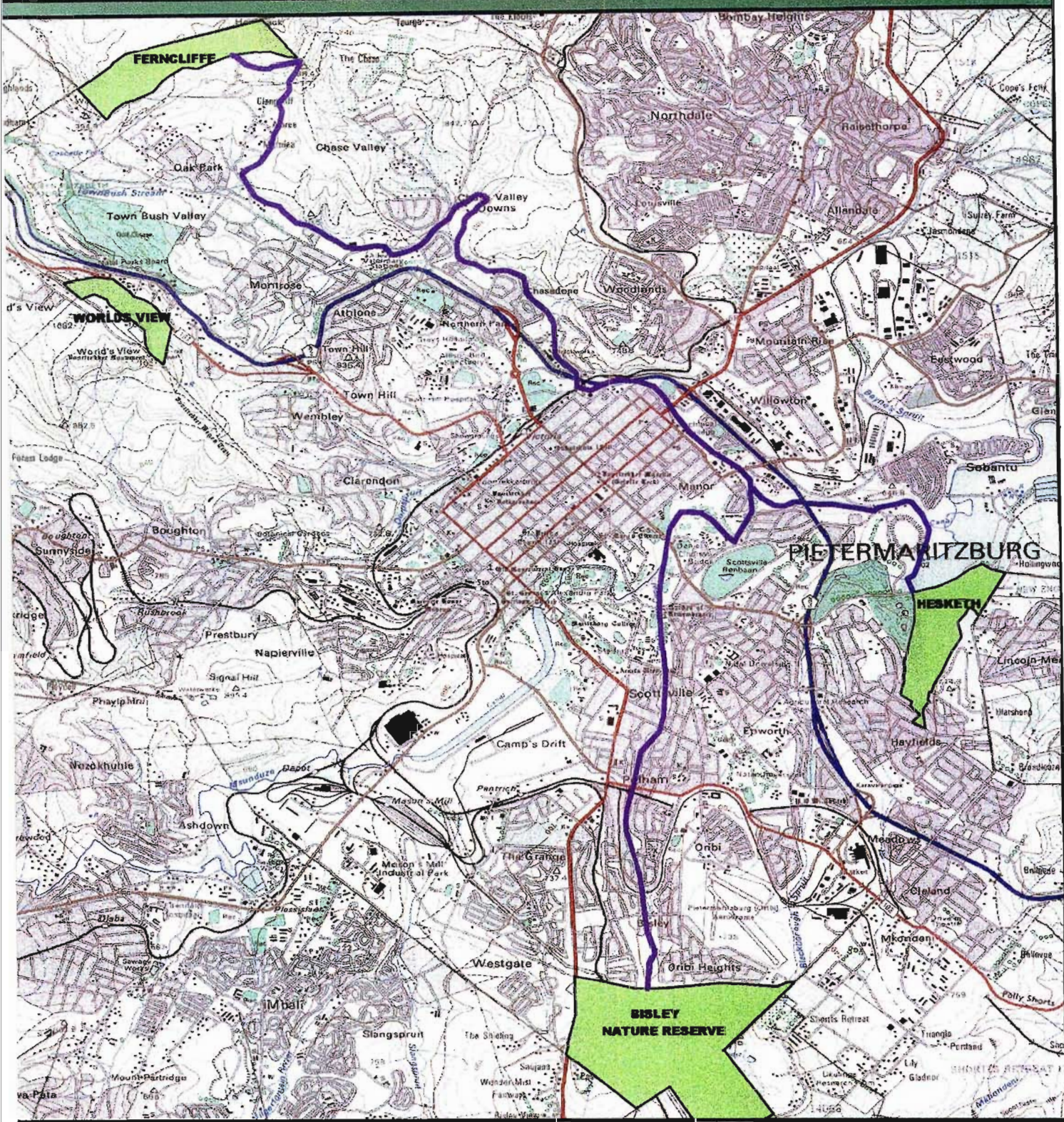
authorities (Geocities 2002; Bartholomew 2001, *pers. comm*; Anderson 1983). These impacts are however not the only impacts which NOSs and more particularly urban stream corridors face. All streams, due to the hydrological cycle and natural properties of streams, will erode their banks and flood from time to time. Urbanisation together with the associated increase in impervious surfaces increases the erosion capacity and flooding potential whilst decreasing groundwater supplies (Schueler 1987; Hall 1984). To protect and mitigate USCs from the above negative influences it is essential that a proper management programme is developed and implemented.

During the 1990s, the Msunduzi Municipality drafted a concept plan to create a natural open space system by linking existing NOSs through a river corridor system (Bartholomew 2001, *pers comm.*). The intention was to link the Bisley Nature Reserve in the south west of Pietermaritzburg with the Ferncliffe Nature Reserve via the Foxhill Spruit and the Town Bush Spruit. It was also the intention to establish hiking trails along these river corridors as described in Figure 1.2.

Initially when one considers this concept plan, it creates the vision of a colourful and quick escape to nature along an urban stream. However, when one walks down these streams, the reality proves to be considerably different with unnatural boundary fences, residential development which extends virtually to the edge of the river and invasion by alien plant species and very few or no pathways being provided. The intention of this report is therefore to consider the problems associated with the creation and maintenance of USC systems as a subsystem of NOSs development, and the consideration of methods to overcome the problems being experienced.

The document addresses three issues, namely:

1. What are the problems which effect USC management and what alternative methods can be considered to overcome these problems?
2. What are the perceptions of urban riparian households regarding NOS and USC management?
3. What principles, policies and procedures should inform the development of a USC management programme?



SCALE: 1: 70 000



Kilometres

SOURCE: Bartholomew (2001, pers. comm)

LEGEND

- Proposed sixam trail linking Bisley Nature Reserve, Hesketh & Ferncliffe
- Existing conservancy areas (Bisley Nature Reserve, Hesketh, World's View & Ferncliffe)



Figure 1.2 :Reconstructed map of original open space system in respect of Pietermaritzburg

At the outset of this study it was established that, for several years, the Msunduzi Municipality have been attempting to establish a POS system which would include urban streams as an integral part thereof. However, endeavours thus far have failed (Bartholomew 2001, *pers.comm.*). A policy for the protection of urban streams, although having been placed on the Msunduzi Catchment Management Forum agenda for some two years has failed to materialise (Bartholomew 2002, *pers.comm.*). The study will therefore consider and evaluate the Msunduzi POS endeavours as a case study to seek for answers to the questions posed above.

### **1.3 AIMS AND OBJECTIVES OF THE STUDY**

This study will consider local perceptions and legislative frameworks, against the background of international trends, with the intention of providing recommendations for USC policy and management. The main objectives of the dissertation are:

- (i) To review the development and application of international and domestic approaches to NOS/ USC management.
- (ii) To review and research the status of local USC management from the perspective of resources, institutional capacity and statutory requirements.
- (iii) To document local perceptions of urban rivers and attitudes towards USC management.
- (iv) To develop a policy for the protection and management of USCs in respect of the Msunduzi Municipality .
- (v) Provide recommendations to address some of the locally identified issues which are impacting on the implementation of an effective USC system in respect of Pietermaritzburg.

### **1.4 OVERVIEW OF METHODOLOGY**

To establish a framework for USC management, a literature review of domestic and international experiences will be undertaken to identify issues which influence USCs as well as related problems. This will be followed by the consideration of the local situation through the case study of two local streams. The issues raised through this process will form the basis for further investigation through interviews with prominent roleplayers. As mentioned in the introductory section, knowing public opinion and expressed need is vital to NOS and thus USC management. Accordingly this will be the subject of a semi-structured questionnaire and a series of in-depth interviews. The findings of the above investigations together with a brief reference to the state

of the environment, will form the basis for the determination of a policy for the protection and management of the Pietermaritzburg streams and associated natural open spaces. A detailed description of the methodology is provided in Chapter 3.

## **1.5 STRUCTURE OF STUDY**

This document consists of four chapters and comprises Component A of the research report. The introductory chapter has focused on a brief background of the study topic followed by a description of the problem under consideration. In Chapter 2 consideration is given to both domestic and international literature with regard to issues relating to NOS and USCs with specific reference to the value of USCs, the current problems as well as the *status quo* of USCs in Pietermaritzburg. The main issues identified in Chapter 2, in turn form the basis for an USC management framework and the methodology employed in this study to meet the objectives, which is discussed in Chapter 3. Chapter 4, the final Section of this component is devoted to a brief reconnaissance survey of the subject area. The above forms the basis and departure point for an academic paper, to follow, in which the findings of this research together with recommendations will be considered (Component B).

## **CHAPTER 2: LITERATURE REVIEW**

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### **2.1 INTRODUCTION**

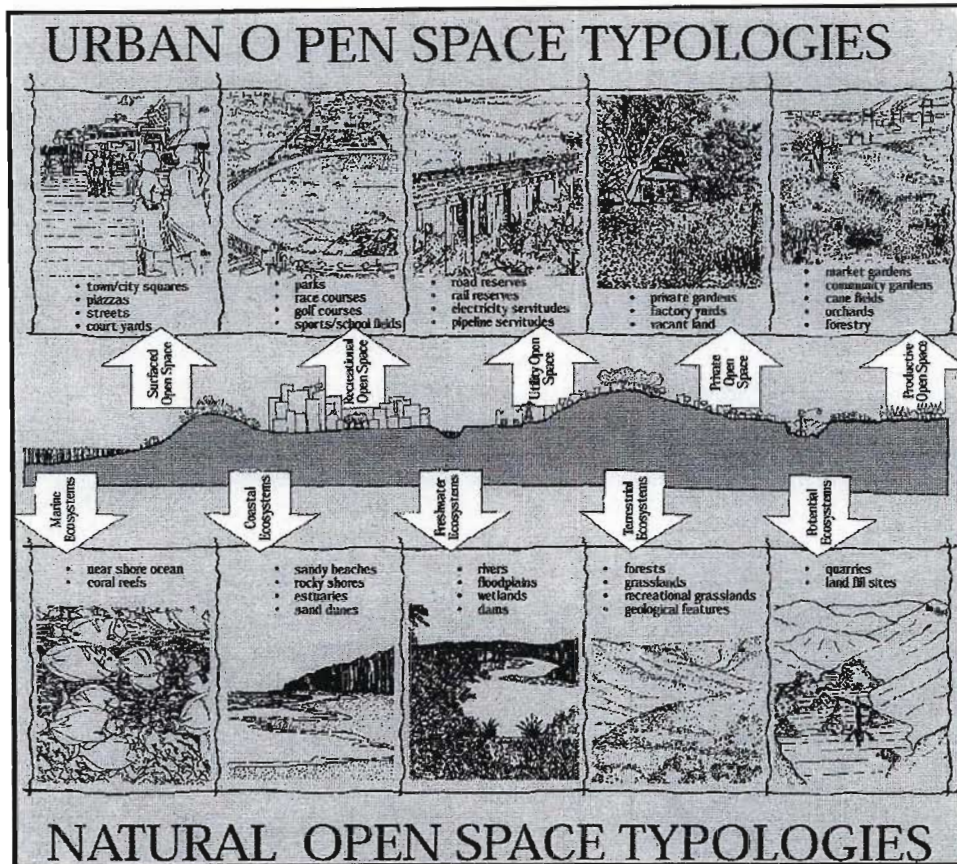
Chapter 1 provided the background to this study, highlighting the need for this research. The purpose of this chapter is to consider local and international developments with regard to urban stream corridor protection. Initially consideration is given to the definition of the various open space concepts, namely, metropolitan open space system (MOSS), public open space (POS) and natural open space (NOS), highlighting the relationships between these land uses, with a final focus on urban stream corridors (USCs). Attention is also given to the importance of USCs from a value and amenity point of view, followed by the threats to USCs and a discussion of the current South African legal and institutional framework for urban stream management. Having provided the above background, consideration will be given to the key principles of USC management and the status of USC management in Pietermaritzburg.

### **2.2 DEFINING OPEN SPACES AND THE FOCUS OF THIS STUDY**

Open space management can be considered at various levels. At a macro-level, consideration is given to open space issues such as biological conservation, trail systems, recreation, education, visual amenity and river protection. At a micro-level consideration may be given to more specific issues such as habitat protection of particular species of fish or bird within a defined reach of stream or corridor, and giving attention to specific issues such as threshold numbers. The Durban MOSS is an example of a macro-level strategy. It represents a holistic policy in respect of public open spaces for a geographic region, to establish the necessary linkages and biodiversity balances to form a system of public open spaces. Durban Metropolitan Council (1999) describes an open space system as the physical connection of various ecological systems or typologies. In this regard they identify ten typologies ranging from open spaces to potential ecosystems, shown in Figure 2.1.

As mentioned in Section 1.1, urban open spaces can be further categorised as 'active open spaces' which represent man-made open spaces such as sports stadia,

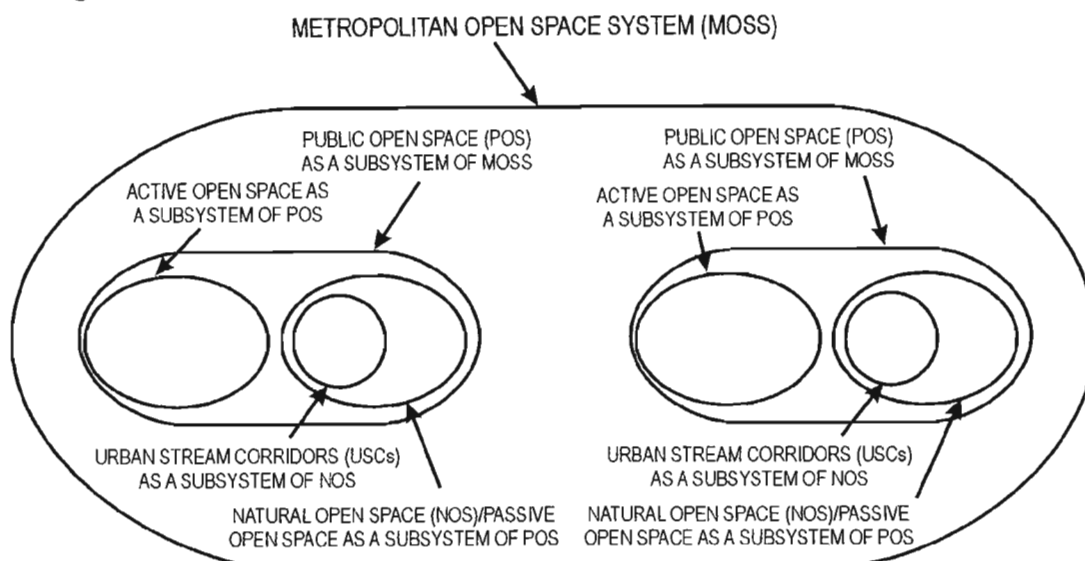
playing fields and electric power line servitudes or alternatively 'passive open spaces' or 'natural open spaces' such as conservation areas, river reserves and natural areas.



**Figure 2.1:** Relationship between urban and natural open spaces in Durban (Durban Metropolitan Council 1999: 4).

This study is concerned with the conservation of urban stream corridors (USCs), a sub-component of natural open spaces. It is important to incorporate urban stream restoration within development planning as advocated by both Petts *et al.* (2002) and Wade *et al.* (1998) and thus this endeavour to recognise and integrate USCs as part of current land use definitions, "environmental management or services" (Kahn, Von Riesen and Jewel (2001)), which is aimed at the protection of important environmental services such as proclaimed parks and areas of bio-diversity. Figure 2.2 shows the conceptual relationship between the types of open spaces as described above, recognising that POS is a sub-system of MOSS, with 'passive or natural open space' and 'active open space' being sub-systems of POS, whilst USCs

in turn are important components of NOSs. A MOSS thus consists of multiple POSs which together form an integrated set of open spaces described as a MOSS.



**Figure 2.2:** The conceptual relationship between metropolitan open space systems (MOSS), public open space (POS), active open space, natural open space (NOS), and urban stream corridors (USCs); as defined in this study.

All municipalities in South Africa have been tasked to prepare integrated development plans (IDPs). In KwaZulu-Natal, the Department of Traditional and Local Government Affairs have also required each municipality to compile a land use management system (LUMS) to convert and replace current town planning schemes. Kahn, Von Riesen and Jewel (2001), the authors of the KwaZulu-Natal land use management system guideline manual observe that planners, in relation to NOSs, have been focusing on amenity rather than recognising the important services provided by NOSs which facilitates sustaining development. As a consequence, the KwaZulu-Natal LUMS provides appropriate zonation as well as management overlays in support the recognition and protection of NOSs. In contrast to the zonation of specific portions of land for a specific land use, management plans represent a broad statement of intent, applicable to a larger area. In designing a LUMS consideration will for example have to be given as to whether a NOS or an USC is to be zoned as an Environmental Planning Area or whether it would be dealt with as a management overlay. The decision to either impose a zonation or a

management overlay will be dependent on the size and environmental importance of the area. It therefore would be more appropriate to create a zoning for a large or environmentally significant NOS area, with the management overlay reserved for smaller, less significant areas.

As indicated earlier, this study will address urban streams (aquatic environment), their riparian or transitional zone and the terrestrial zone, as defined in Figure 2.1 above, specifically considering urban stream corridors and their surrounding natural vegetation. An example of such a system is the Hesketh Conservancy in Pietermaritzburg. It effectively encapsulates the above typologies, containing urban streams, their riparian and terrestrial zones, together forming a NOS system in the form of green belts along the streams as well as public open space in form of a golf course, as represented in Figure 2.3.

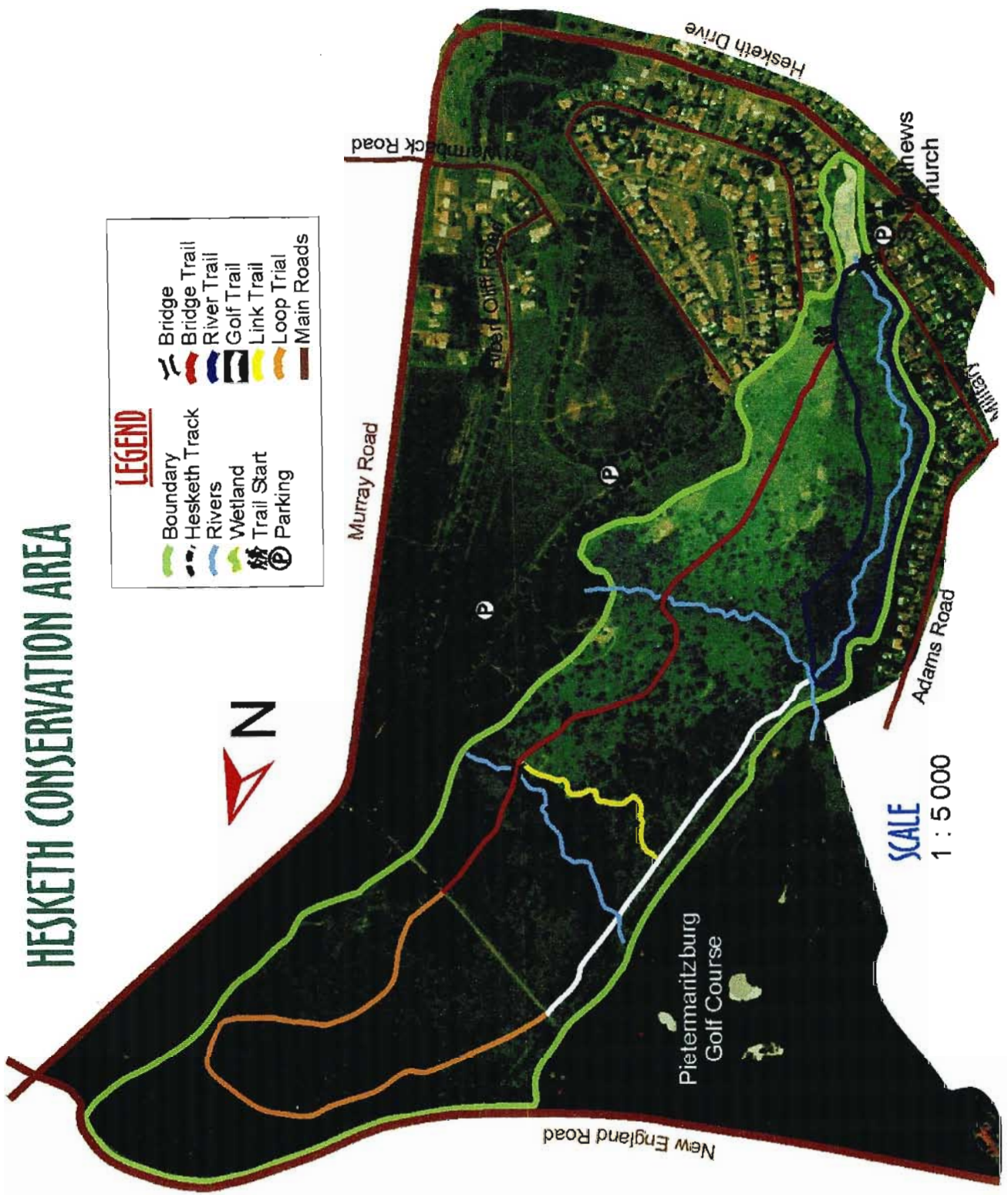
### **2.3 IMPORTANCE AND VALUE OF URBAN STREAM CORRIDORS**

The value of urban stream corridors is well recognised (Mauz, Lambert and Groessl 1999; De Waal *et al.* 1998; Riley 1998; Adams 1994 a; Nicolson 1987). The following sections will illustrate the importance of urban stream corridors.

#### **2.3.1 Importance of urban stream corridors with regard to metropolitan open space systems**

The value of urban stream corridors in respect of metropolitan open space systems is evidenced by the fact that in both Durban MOSS and the proposed Msunduzi MOSS, urban streams form the backbone of the open space systems (Durban Metropolitan Council 1999; McCormack, Hlongwa and Associates 1999; Nicolson 1987).

The value of 'corridor type' natural open space is also highlighted by Adams (1994a), Roberts (1994) and Lyle and Quinn (1991) in Mauz, Lambert and Groessl (1999), pointing to the specific needs for effective dispersal corridors between core conservation areas, which thus fulfill an important role with respect to maintaining connectivity between ecological islands. In Australia, for instance, the Queensland



**Figure 2.3:** Hesketh conservancy map showing the integration of trails with the retention of the USC natural area (Bartholomew 2001, unpublished).

Environment Protection Agency and Montgomery Watson have been appointed to develop guidelines for protecting Australian waterways recognising the ecological values of their streams (Bennett *et al.* 2001).

### **2.3.2 The value of urban stream corridors**

Challen (2001) points out that many of today's landscapes are divided into island-like habitats as a consequence of human impacts. He adds that "*(t)hese activities have centered on manipulating riparian areas and adjacent systems*", which has had severe consequences for stream and riparian ecosystems. These island-like habitats are referred to as patches (FISRWG 1998).

Corridors are linear features which may link one or more patches (FISRWG 1998; Soule and Gilpin, in Saunders and Hobbs 1991). The function of corridors therefore are to promote and provide pathways along which energy, matter and animals can flow (Durban Metropolitan Council 1999, Smith and Hellmund 1993). The landscape benefits derived from corridors include maintenance of genetic variation, dispersal, colonisation and the provision of habitat. According to Bradby (1991) corridors are responsible for achieving these benefits by maintaining and connecting indigenous species and systems. The effectiveness of corridors in promoting ecological integrity and biological biodiversity is illustrated in an experiment in Great Britain which studied the diversity of animal species occurring in roadside vegetation (Way 1977). This study revealed that the vegetation acted as a breeding habitat for 20 of the 50 resident species of mammals, 40 of the 200 bird species and all six the reptiles. Despite the relative small width of the roadside vegetation and its associated limited functional influence, this study illustrates the value that corridors can have.

Natural open spaces, which include USCs, perform a variety other environmental and utility functions. The Durban Metropolitan Council (1999) identifies 17 open space services in the Durban Metropolitan area (Figure 2.4). Jensen (1998), in discussing the functions of rivers and floodplains recognises values such as breeding and feeding habitat for aquatic biota, food storage and retention, nutrient filtration, sediment and toxin retention, water supply and interaction with the riparian zone.

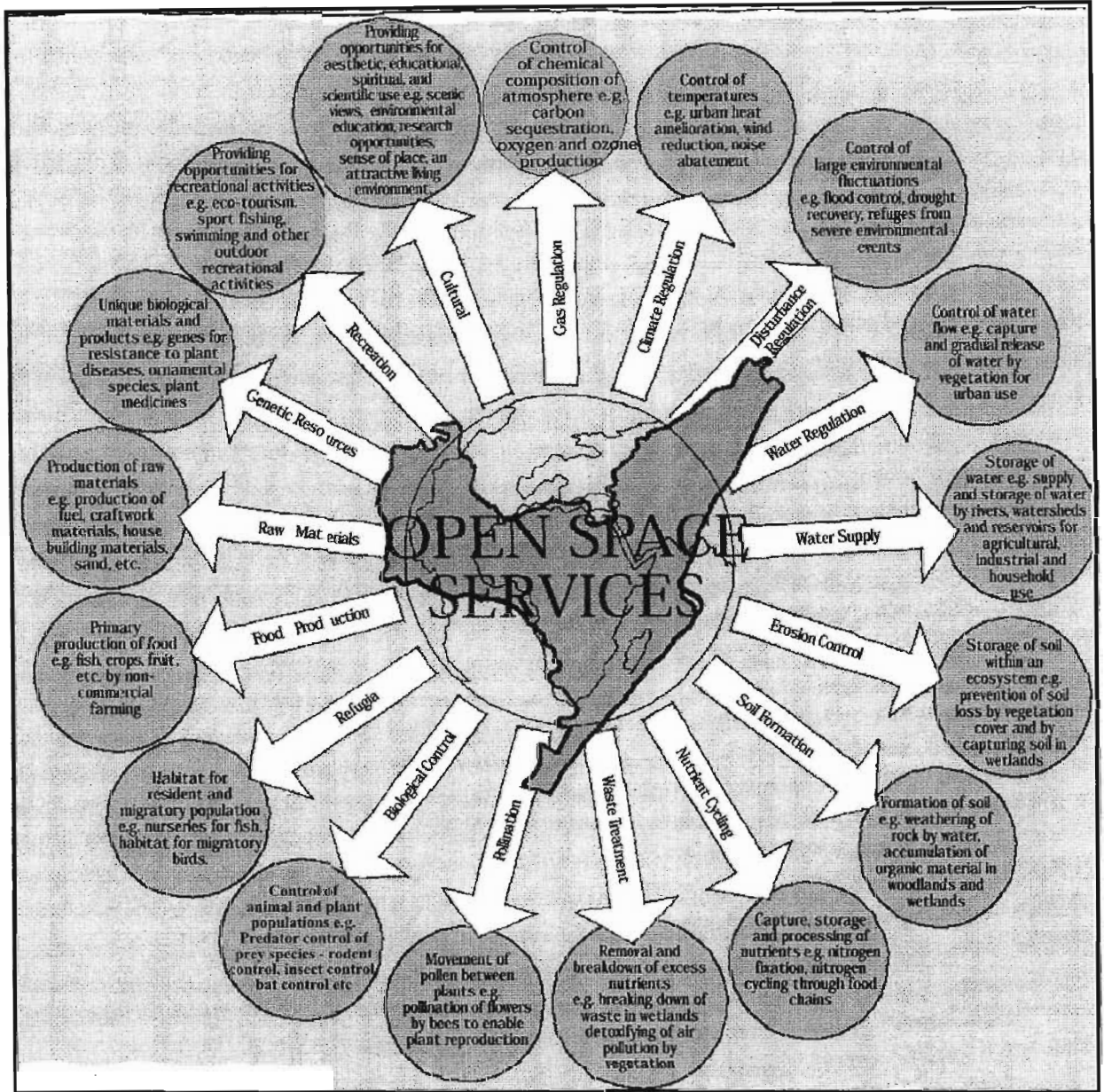


Figure 2.4: Open space services (Durban Metropolitan Council 1999: 4)

Similarly, Shelton *et al.* (2001) recognise ecological services such as maintenance of the atmosphere and climate, filtration, purification and soil provision as well as goods such as cultural, spiritual and intellectual values.

Based on the above, consideration will be given to the habitat and biological, purification, amenity, cultural, recreational and educational values associated with USCs.

#### 2.3.2.1 *Habitat and biodiversity value*

Urban stream corridors (USCs) provide multiple habitats for various plant and animals species to co-exist (FISRWG 1998; Raven, Jose and Drury 1995; Lyle and Quinn 1991 in Mauz, Lambert and Groessl 1999; Johnson 1988). For the purposes of this study, three main habitats are identified, namely the stream channel or aquatic zone, the riparian or transitional zone consisting of the streambanks and adjacent area, and the terrestrial zone, which represents the surrounding natural open space area.

The aquatic and riparian zones are habitat for various fish species, amphibians, invertebrates, micro-organisms, and insects, whilst the adjacent terrestrial zone provides habitat for organisms such as frogs and crabs, rodents and reptiles such as snakes, lizards and leguane and various bird species.

With the flow of energy and material through corridors, they act as conduits. The conduit functions of corridors are important for creation and preservation of stream habitat as the transfer of material impacts on the hydrology, habitat and structure of the streams and associated terrestrial habitat. The conduit function of stream corridors is responsible for the modification of heat and energy from sunlight, the creation of favourable micro-climates and the regulation of temperature changes (FISRWG 1998).

Smith and Hellmund (1993) and FISRWG (1998) draw attention to the inter-relationship between streamside vegetation and aquatic life. Fallen trees, branches

and root masses create pools and waterfalls which gives rise to greater diversity of aquatic organisms. This debris also provides a diversity of cover which forms habitat for aquatic insects. Healthy and diverse riparian vegetation therefore provides a dependable supply of food (Smith and Hellmund 1993). The inter-relationship between the aquatic zone, the riparian and terrestrial zone requires careful attention as the excessive alteration of either of these habitats will affect the remaining zones. This view is supported by the FISRWG (1998: 2-75), suggesting that “(t)he stream corridor must be viewed as a single unit or ecosystem with numerous connections and interactions between components”.

Thomas *et al.* (1979), in FISRWG (1998: 2-56), points out that “...stream corridors are used by wildlife more than any other habitat type”. This, for example, is substantiated by Ohmart and Anderson (1986), in FISRWG (1998), confirming that 60% of Arizona’s wildlife species depend on riparian areas for their survival.

Similar advances are made regarding reptiles and amphibians. Most amphibians (frogs, toads and salamanders) are dependant on aquatic habitats for reproduction and over-wintering. For example, 36 of the 63 reptiles and amphibian species found in West-central Arizona were found to use riparian zones (FISRWG 1998). According to FISRWG (1998), birds are the most commonly observed terrestrial species found in riparian corridors.

The importance of USC habitat value is highlighted by the Federal Interagency Stream Restoration Working Group (1998), referring to a stream biota inventory undertaken of an undisturbed stream, the Breitenbach (Germany) where 1,300 species were identified in a 1.2 mile reach.

Another important aspect of stream protection relates to bank stability. Bank stability plays an important role with regard to sediment load and thus the health of a stream. A good example in this regard is found in the report on the Townbush Spruit, in Pietermaritzburg (Biggs *et al.* 2001), which demonstrates the negative impacts associated with stream bank collapse in respect of river health, highlighting the

negative effects of increased sedimentation loading.

Due to the importance of the terrestrial vegetation and its affect on adjacent streams, the process of succession also requires attention. Succession or biotic change refers to the change in vegetational growth over time Adams (1994 b). For example, Adams explains that in south eastern United States, during the first year or two following the abandonment of a farm field, one would find annual natural plant species such as ragweed, horseweed and crab grass covering the fields. This will also coincide with associated bird life. Later on this will be replaced by 'grass-shrub-pine-seedling' communities. Humankind, in terms of urbanisation, however, influences this process by mowing grass, applying fertilisers and pesticides and introducing exotic tree and other species. Therefore what is required is a balance in human influence of nature so as to not disturb the natural succession unnecessarily.

In their evaluation of open spaces, the Durban Metropolitan Council further emphasise the biological value of open spaces and corridors, referring to habitat provision for resident and migratory populations of nurseries of fish and migratory birds. Reference is also made to the nutrient cycling properties of these systems through the capture, storage and processing of nutrients such as nitrogen through food chain cycling. The role of USCs are further emphasised through the recognition of ecosystem functioning at various levels. In summary, these corridors enable and facilitate the flow of energy, water, nutrients, genetic material and plants as well as animals and thus have a very important biological role (Durban Metropolitan Council 1999).

USCs, when protected and managed properly have the potential to be a significant component of urban biodiversity. Integrated Planning Services (1997), address the importance of NOSs from the point of view of the conservation of biologically important areas, citing the need to identify highly productive areas, high biodiversity areas, threatened areas as well as wildlife corridors, which need to be evaluated collectively in order to maximise the biological value of such corridors. Mauz, Lambert and Groessl (1999: 11), highlight another very important biological purpose

of corridors. They point out that “...*biological corridor conservation prevents the fragmentation of habitat and allows the movement of populations of wildlife to different locations. Such movement allows for genetic intermingling between populations and reduces the possibility of ill-effects due to in-breeding.*” This point is strongly supported by Johnson (1988: 8), in his discussion of open spaces and their role in respect of bird species, emphasising that, “...*of all natural features in suburbia rivers and streams are the most important since they can never be developed, and they form vital corridors joining otherwise isolated refuges into a single unit.*” Bourne (2001) submits that urban waterways are generally the only ‘natural’ features that have been retained in our urbanised environment. He further adds that biological diversity and ecological integrity are essential for the survival of humankind. According to him, urban streams provide the most suitable vehicle to conserve these values in urban areas.

#### 2.3.2.2 *Purification value*

Vegetation, during the day, through the process of photosynthesis absorbs carbon and thus has an important role to play as a pollution control mechanism. Similarly, natural streams and wetlands function as natural carbon sinks breaking down pollutants as highlighted by the Durban Metropolitan Council (1999). Wetlands have a very important function in detoxifying water and reducing urban water pollution as argued by Kotze (2000: 1):

*“ Wetlands are natural filters, helping to improve the quality of runoff water from urban and agricultural lands by trapping pollutants.”*

Mitsch and Gosselink (1986), debate whether wetlands are nutrient sources, sinks or transformers. It is pointed out that wetlands are considered to be sinks if the input of a specific chemical exceeds the output, whilst it is considered as a nutrient source if the opposite occurs. A wetland acts as a transformer where the input/ output ratio remains the same, but where the chemical composition is altered from entering to exiting the wetland. Mitsch and Gosselink (1986), conclude that although there is no consensus as to whether wetlands act as sources, sinks or transformers, the results of a study involving 26 wetlands confirmed that many wetlands act as sinks for

specific nutrients and that many wetlands acted as sources of organic material to downstream systems. This is of particular importance with regard to the Townbush Spruit which has functioning wetlands (Biggs *et al.* 2001).

#### 2.3.2.3 *Amenity value*

Amenity, as defined by the Oxford Dictionary, refers to a pleasant or useful feature or facility. Amenity therefore should be considered from a visual and utility perspective. Although not evaluating USCs specifically, the amenity value of NOSs is well recognised by Petts *et al.* (2002); Mauz, Lambert and Groessl (1999); Cooper (1988); Nicolson (1987) and Anderson (1983). Amenity, according to Anderson (1983: 13) includes, "...*breaking the suburban monotony, softening the hard outline of brick and concrete and preserving an attractive view.*" Amenity values will however only be achieved if USCs are properly managed and conserved.

At a macro scale USCs create a series of 'green belts' within an open space system to break the urbanisation patterns. At a local level however, USCs could provide natural indigenous areas within their floodplains, rocky outcrops closer to the source of streams or well functioning wetlands providing grass and reed types endemic to such areas, thereby creating a specific character. In this regard, Petts *et al.* (2002) and the Scottish Environmental Protection Agency (2000), refer to the neglect of urban streams and rivers and historic manipulation of urban rivers, including the construction of concrete and steel channels, artificial straightening of channels as well as the pollution of rivers through human waste. This is contrasted with the drive to enhance urban rivers and streams through soft engineering, and in so doing provide opportunities for nature, people and the built environment to be promoted. The Cape Town City Council (1993) support the above by stating that open spaces often form the focal points within urban environments.

#### 2.3.2.4 *Cultural, recreational and educational value*

In addition to the human benefits derived from USCs in the form of visual amenity and open space services, open spaces in general and USCs specifically, will have to perform an even more important role to provide relief from the pressures of urban life,

with increasing densification of urban areas (Durban Metropolitan Council 1999; Roberts 1990). The Durban Metropolitan Council (1999), as mentioned in Section 2.3.2, highlights a variety of open space values, which are also applicable to USCs as a subsection of open spaces. Three of these aspects, namely cultural, recreational and educational values will be discussed.

Cultural aspects associated with USCs include the potential to contribute to the aesthetic value of an area, enabling environmental education opportunities, establishing scenic views and creating an attractive living environment. Natural open spaces also provide opportunity for recreational activities such as walking, swimming and eco-tourism. The cultural and recreational value of streams is echoed by Petts *et al.* (2002), with clean rivers being a prerequisite. Rivers and streams also have an important spiritual value in South Africa. Tham (2002) demonstrates this through his study of the Salem Community in the Mlazi River catchment. This study identified various ceremonies such as the reed dance, blessing of harvests, weddings and cleansing of the dead which involve streams and rivers and are still practiced. Urban stream corridors have the potential to provide the above services to humans, however, this is dependant on the successful management of such open space areas, as well as the desire from affected communities to use such open spaces responsibly.

Recreational value, for instance in Pietermaritzburg, can be enhanced through the creation of proper USC trails, as suggested by Cooper (1988) and Latham (1988). However, increased benefits are subject to positive human input in establishing and responsibly managing such trails in a sustainable fashion.

USCs also have a role to play in respect of education. USCs, although only a subsection of NOSs, provide opportunities for education of people on plant species, ecosystem functioning, a point well recognised by Cooper (1988). Nicolson (1987) emphasises a broader role of education in that it could cultivate a better understanding, knowledge and awareness of the environment and its needs. Petts *et al.* (2002) accentuate the need for a co-ordinated strategy with rivers forming an

integral part of urban development. In this regard he quotes the success in Leicester (United Kingdom), which is attributed to extensive community involvement and education programs.

#### 2.3.2.5 *Flood attenuation value*

The importance of flood attenuation by riparian areas is well recognised by Blankley *et al.* (2001); Durban Metropolitan Council (1999) and Slade (1999). In this regard the Water Act of 1956 (Juta Statutes 1999) and the National Water Act of 1998 (Department of Water Affairs and Forestry 1998) require the determination of flood lines depending on the catchment area, however the enforcement of this has been reliant on town bylaws and town planning scheme clauses (Parker 2002, *pers. comm.*).

Roberts (1994: 21) explains that “*(t)he open space system is seen as a way to employ natural areas in an efficient control of storm water runoff.*” Luger (1998: 63) makes the following important statement, “*(t)o retain a river in its natural state, the flood plain must be accepted as part of the river. This may sterilise large areas of land from urban development.*” This must be read in conjunction with Section 144 of the National Water Act (Act of 1998), which requires that the 1:100 year flood line must be identified when developing land. The value of open space areas in terms of flood attenuation is also recognised by the Durban Metropolitan Council (1999) and Zalewski and Frankiewics (1998). The Engineers Department of the Msunduzi Municipality have confirmed that the 1: 50 year floodline determination, as provided for in the Water Act of 1956 was only rigorously applied from the late 1970s and early 1980s. The successor of the above Act, the National Water Act of 1998 requires the determination of the 1: 100 year floodline. Although developers are requested to show the 1:100 floodline on their layouts, the 1: 50 year floodline is still applied to determine the building lines in respect of urban development along water courses. In fact, developers may build within the 1:50 year floodline, provided that the floor level is above the 1:50 year floodline or alternatively, if the dwelling is built on stilts (Harrison and Kedge, 2002 *pers. comm.*).

## 2.4 THREATS TO URBAN STREAM CORRIDORS (USCs)

One of the aims central to this document is to consider the obstacles encountered in the creation and maintenance of USCs. Having considered the positive impacts associated with USCs, the focus in this section is on the problems which are encountered with regard to effective USC management.

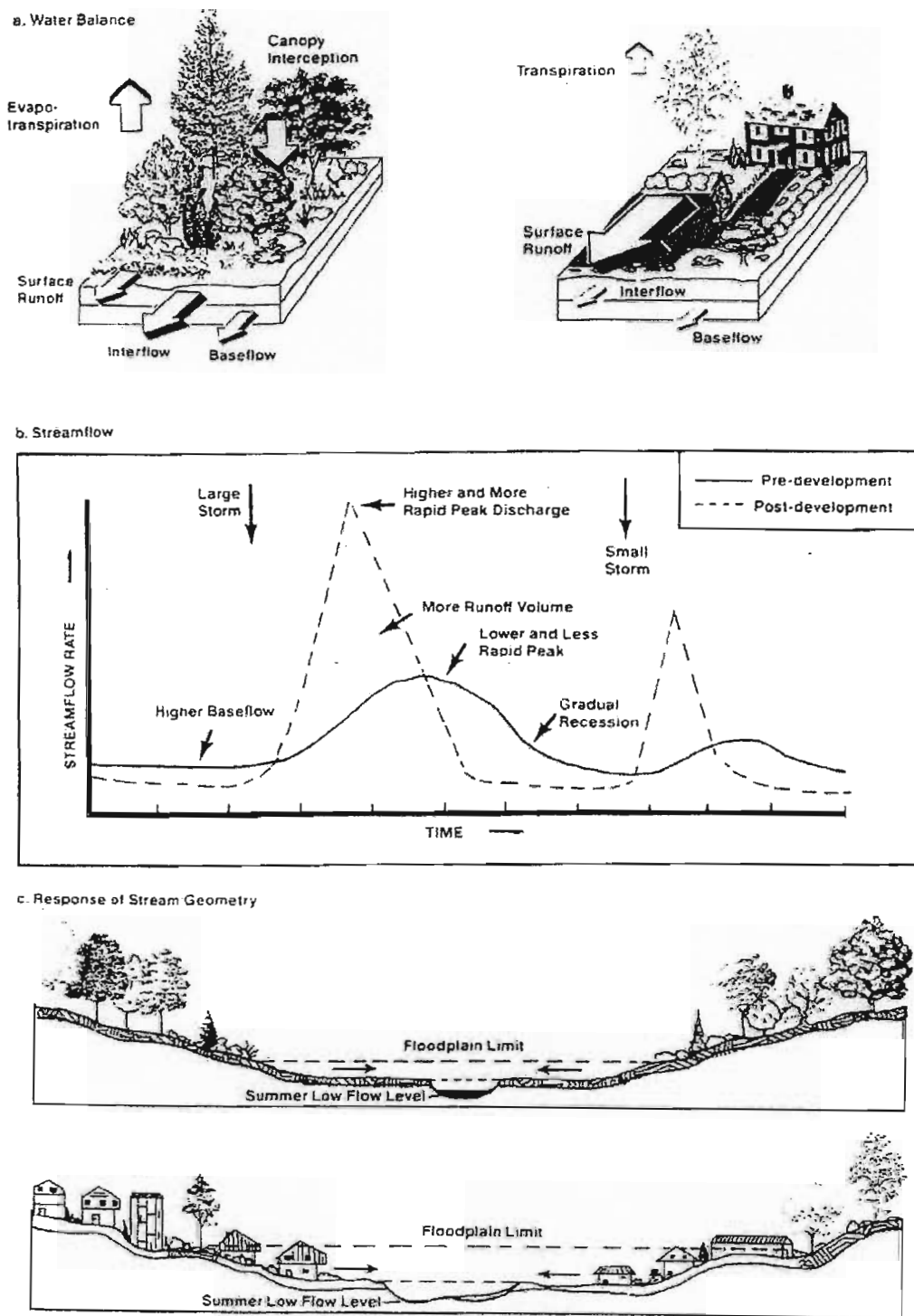
### 2.4.1 Urbanisation and impacts to urban stream corridors

The effects of urbanisation on urban streams are extensive. Firstly, urbanisation leads to increases in hardened and impervious surfaces which leads to increased run-off and streamflow, which in turn leads to increased sediment load, turbidity and flooding potential detailed in table Table 2.1 (Schueler 1987; Leopold 1971). The effects of urbanisation on urban streams are shown in Figure 2.5.

The nett effect of the above is that the stream geometry, as a consequence of increased volumes, peak flows and sediment loading is altered through flooding and erosion giving effect to channel widening, streambed alteration and habitat loss (Schueler 1987; United States Environment Protection Agency 1993).

**Table 2.1:** Impacts from increases in impervious surfaces (after United States Environmental Protection Agency 2001; 2).

Increased imperviousness leads to :	Resulting impacts				
	Flooding	Habitat loss (e.g., inadequate substrate, loss of riparian areas, etc.)	Erosion	Channel widening	Streambed alteration
Increased volume	✓	✓	✓	✓	✓
Increased peak flow	✓	✓	✓	✓	✓
Increased peak flow duration	✓	✓	✓	✓	✓
Increased stream temperature		✓			
Decreased baseflow		✓			
Changes in sediment loading	✓	✓	✓	✓	✓



**Figure 2.5:** Changes in watershed hydrology as a result of urbanisation (Schueler 1987).

One of the main threats associated with urbanisation is the pressure that is being exerted on NOSs within urban areas due to population growth and increased human needs (Anderson 1983). This is substantiated by Integrated Planning Services (1997:1) who state that *"(t)he spread of un-serviced informal settlements and the demand for land which is capable of being developed for housing and other competing land uses is placing considerable pressure on available land areas, specifically Public Open Spaces (POS), both natural and developed."* Urbanisation therefore leads to the loss of NOS and the associated habitat and biodiversity to urban development. Key impacts are revealed in the sections below. These impacts are illustrated through reference to the Foxhill Spruit in Pietermaritzburg, a focus of this study.

Trees which previously intercepted rainfall are removed to make place for dwellings (Figure 2.5a), whilst natural depressions, previously functioning as natural detention ponds are leveled in favour of uniform slopes leading to the destruction of the natural storage capacity (Schueler 1987). The effects of urbanisation are further manifested after construction is completed. *"Rooftops, roads, parking lots, sidewalks and driveways make much of the site impervious to rainfall. Unable to percolate into the soil, rainfall is almost completely converted into runoff"* (Duncan 2002, 6). Increased impervious surfaces therefore increase runoff which leads to greater flooding potential (Schueler 1987). The effect of rooftops and hardened surfaces are that water moves more readily and rapidly down roofs, pathways and roads into gutters and stormwater drains, where it is channeled directly to streams.

As a consequence of adjusted watershed hydrology (Figure 2.5b), the peak flow discharge is increased both in intensity and time as compared with pre-urbanisation, leading to increased flooding potential (United States Environmental Protection Agency 2001; Schueler 1987).

#### 2.4.1.1 *Stream bank erosion and channel incision*

As a consequence of the increased volume and flow velocity as a result of hardened surfaces, the stream responds by eroding its river channel including its banks in an

endeavour to achieve a new equilibrium (United States Environmental Protection Agency 2001; Scottish Environment Protection Agency 1999; Luger 1998; Schueler 1987). The above is exacerbated by the fact that urban streams are treated as stormwater channels (Bartholomew, 2001 *pers. comm.*). As Purseglove (1988: 1) highlights;

*“The engineer explained his problem. All he was attempting to do was to prevent the river from flooding these ungrateful people’s houses. For this, however, many trees would have to be removed, and the river would have to deepened and straitened. It would cease to be recognizable as the river which the local people enjoyed, but it would become a very efficient drain...”*

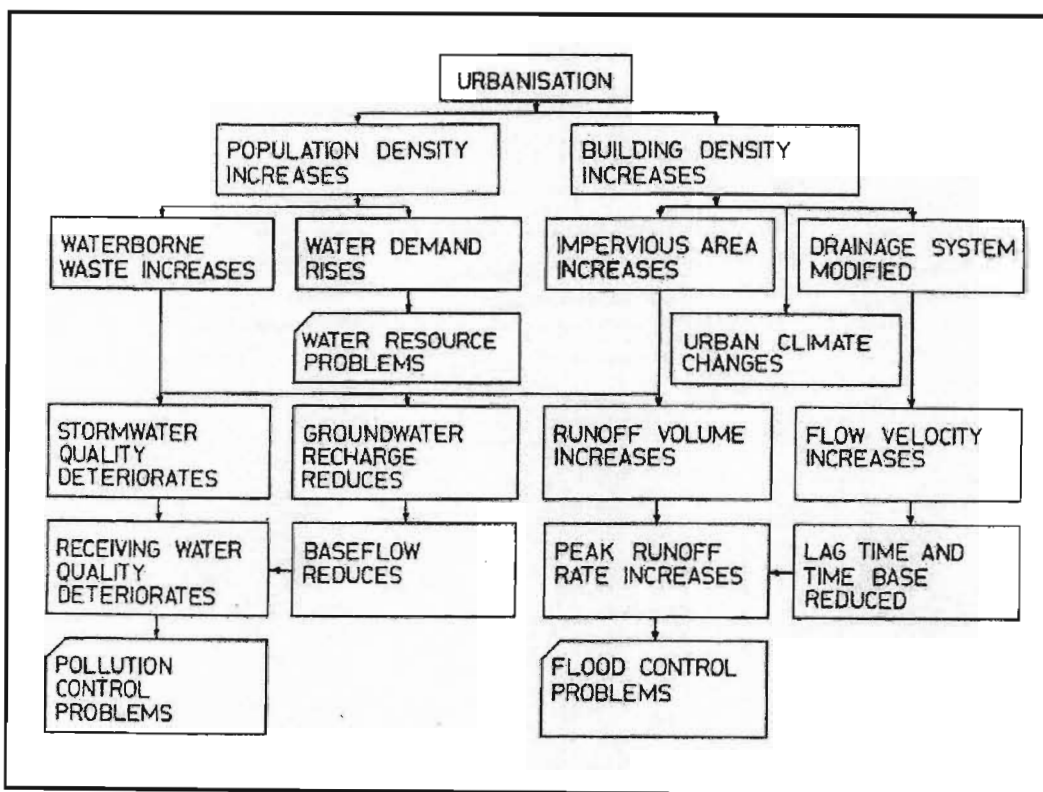
Anderson (1983) in his discussion of the objectives of the then proposed Durban MOSS, points out that one of the objectives of the MOSS would be conservation of water courses, wetlands and related riparian areas so as to reduce erosion. Evidence of erosion, in the form of undercutting, is evident along several sections of the Foxhill Spruit, one of which is shown in Figure 2.6. Slade (1999) supports the above observation, referring to the fact that many of the streams and water courses in Pietermaritzburg have eroded banks, which he attributes to high intensity rainfall events compounded by increased run-off from urbanised areas.



**Figure 2.6:** Evidence of undercutting on the banks of the Foxhill Spruit, January 2002.

### 2.4.1.2 Water quality

Urbanisation with its inherent population growth and increase in impervious surfaces has a negative effect on stormwater quality and therefore water quality in general. Pollutants rapidly collect on impervious surfaces, and are easily washed away into storm water drains and streams (Livingston 1989, in United States Environmental Protection Agency 1993; Schueler 1987; Hall 1984). This problem is exacerbated in South Africa due to the number of large informal settlement which are often unserviced (Braune and Wood 1999). The effects of urbanisation on water quality are demonstrated in Figure 2.7. With the increase in impervious surfaces, less water is likely to percolate into any aquifers underlying the urban settlements negatively influencing the groundwater recharge and the baseflow volumes (Hall 1984). The poor quality of streams in Pietermaritzburg are noted by the Water Research Commission (2002) and confirmed by Slade (1999: 4), who states that *“(t)he polluted and degraded nature of the water courses through Pietermaritzburg make them no longer functional ecosystems for indigenous biodiversity of aquatic organisms, riverine vegetation, animals, birds and insects”*



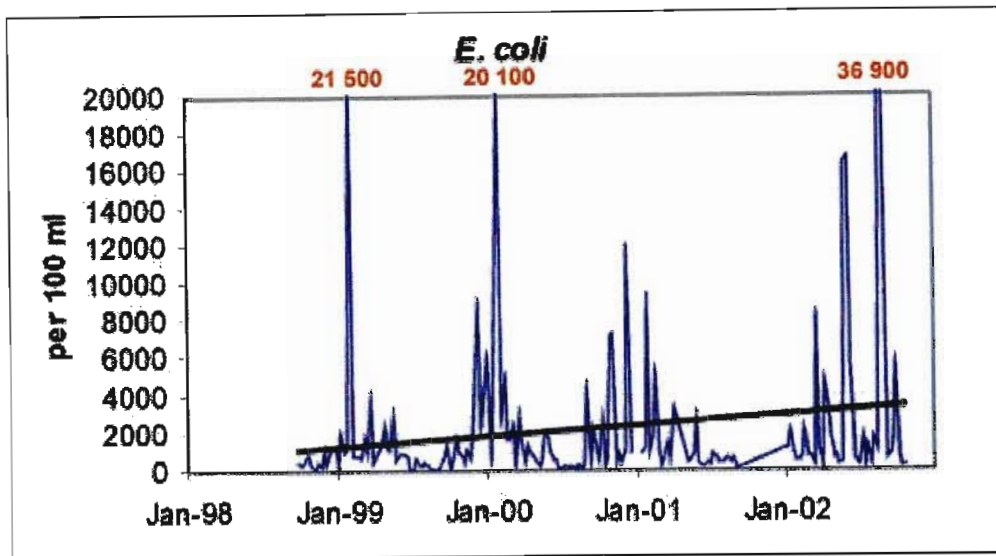
**Figure 2.7:** The effects of urbanisation on water quality (Hall 1984)

This statement is substantiated by the biotic index and habitat quality figures, provided by Umgeni Water, confirming medium to poor quality. The water of the Pietermaritzburg rivers is considered to be of a poor quality. The water sampling undertaken by Umgeni Water to determine quality and suitability of water for recreational use has also highlighted serious concerns with *E.coli.* count levels being excessive, rendering the water unhygienic and unsuitable for recreation due to risks of infectious disease transmission (Slade 1999). In fact the Baynespruit and Slangspruit were found to have *E. coli* counts in excess of 610 00 and 670 000 per 100ml (Bishop 2002), in comparison to the acceptable level of 5 to 130 counts per 100ml as prescribed for domestic and recreational purposes respectively (Department of Water Affairs and Forestry 1996).

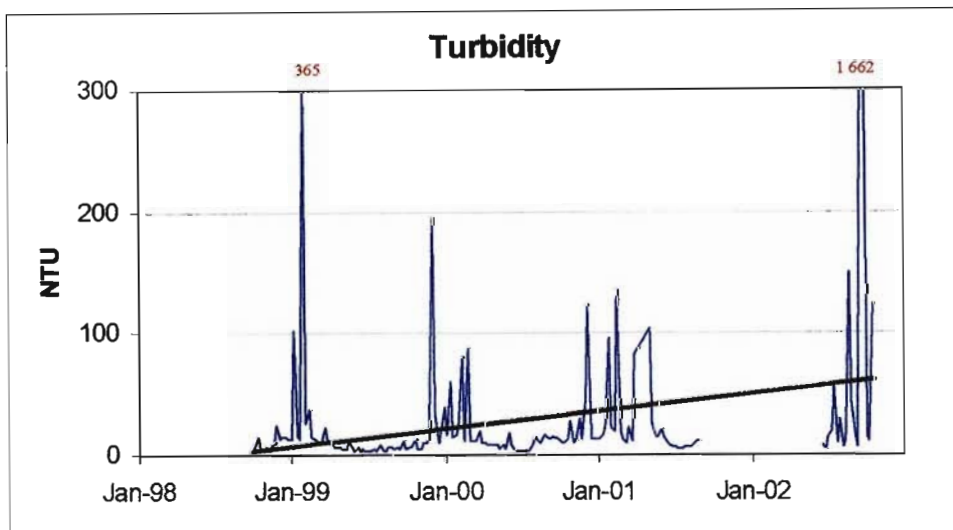
It is interesting to note that the Msunduzi Municipality IDP contains the following goal, however without specific funding being allocated to achieve this objective (Msunduzi Councillors and Officials 2002: 117):

*“The Municipality should clean up and highlight its many streams and watercourses, instead of allowing them to be neglected and (as it were) hidden away.”*

Umgeni Water, the responsible authority for water provision and water quality for the City of Pietermaritzburg was approached to determine the water quality with regard to the Foxhill and Townbush Spruits, specifically to consider data over a period of time to establish a trend. Only the Townbush Spruit is monitored by Umgeni Water and therefore only data for one stream could be provided. In discussion with Mrs Kim Hodgson (2003, *pers. comm.*), two general indicators of river health were considered, namely *E.coli.* count levels and turbidity of water. The data for these two indicators recorded over a three year period at the Polocross field, are shown graphically in Figure 2.8(a) and (b) below. According to Hodgson (2003, *pers. comm.*), although there are seasonal spikes, there is a general trend of increasing turbidity and *E. coli.* and thus a degradation of the stream.



**Figure 2.8(a):** *E. coli*. Count for the Townbush Spruit, January 1999 to January 2002.



**Figure 2.8(b):** Turbidity in respect of the Townbush Spruit, January 1999 to January 2002.

The turbidity problem experienced in the Townbush Spruit is mainly attributed to a collapsed slope on the Monzali Estate in close to the source of the stream (Duncan 2002; Joubert 2002; Biggs *et al.* 2001). Figures 2.9 and 2.10 show high turbidity runoff shortly after rainfall events.



**Figure 2.9:** Tributary to the Town Bush stream flowing from the Queen Elizabeth golf course. The high level of sedimentation is evident (Duncan 2002:101).



**Figure 2.10:** Main channel of the Town Bush stream with high levels of sedimentation noticeable (Duncan 2002:101).

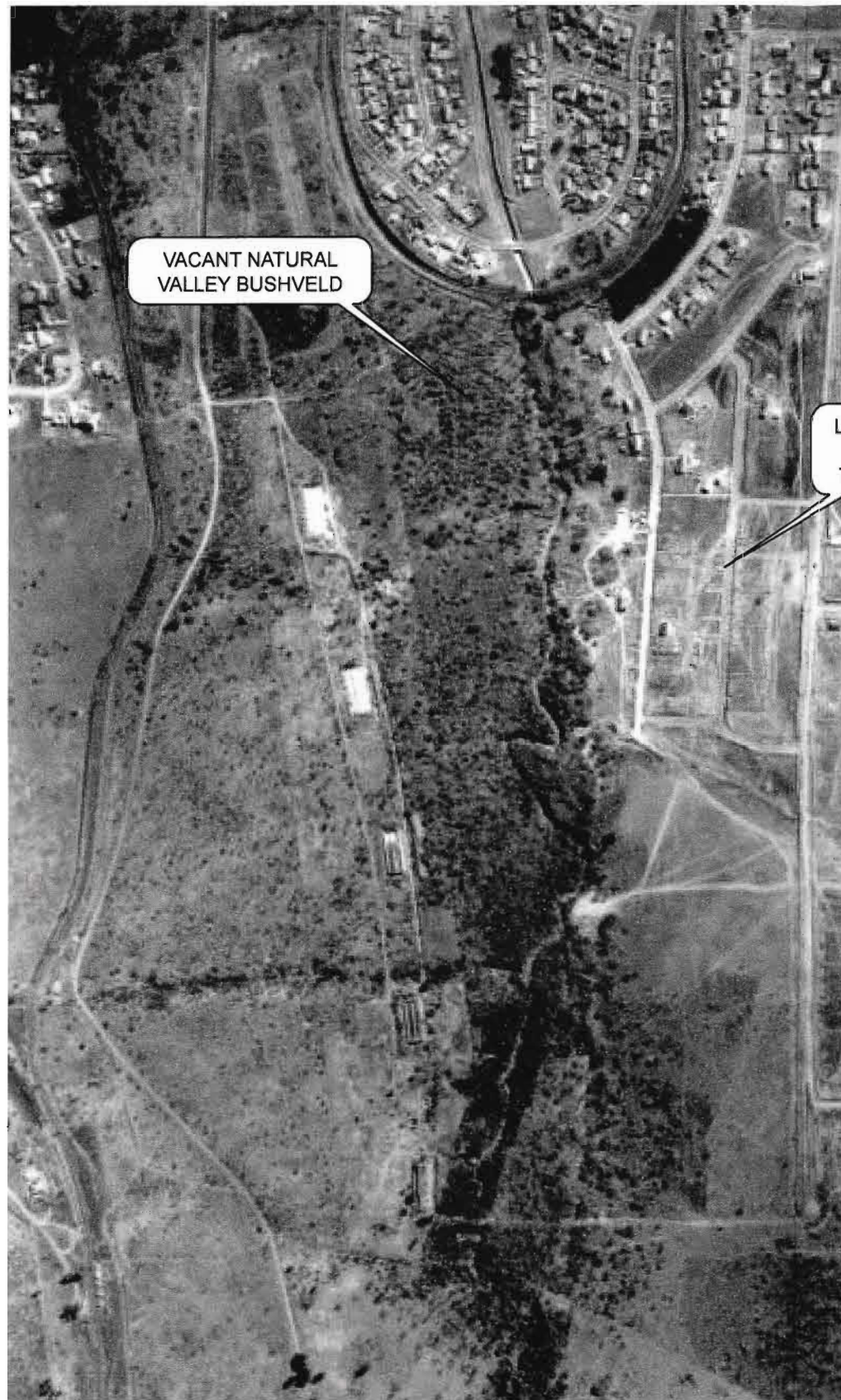
#### 2.4.1.3 Loss of NOS and associated habitat

As alluded to above, the loss of NOS and associated habitat is a serious negative impact of urbanisation. To illustrate this point a comparison will be made between pre and post urbanisation scenarios of the same valley (Figure 2.11a and b). The first frame (Figure 2.11a) depicts the Foxhill Spruit Valley in 1974, with minimal new development. As seen from the aerial photograph, the valley is well vegetated with Valley Thornveld. In comparison, the 2000 aerial photograph (Figure 2.11b) shows that the landscape has been altered significantly. Much of the vegetation has been removed to make space for housing, roads and bridges as can be seen from in the centre part of the photograph in Figure 2.11b. Not only has NOS been lost, but more importantly, previously natural environments and ecosystems have been modified or destroyed. This is a worldwide phenomena as confirmed by Machado and Alves (in Nijland and Cals 2001: 277), describing the effects of urbanisation on the Jamor River, situated near Lisbon, a small tributary of the Tagus River :

*"In the last two decades, urban development has been increased in the watershed. The destruction of natural vegetation and the changing of land use have modified the watershed drainage conditions and augmented flood hazards. On the other hand the construction of houses and roads on the riverbanks, the loss of riparian trees, damage to the riverbank structure, presence of bridges with narrow sections, erosion, and sedimentation on the river bed and along the river bank have affected channel morphology and reduced the floodwater discharge capacity."*

The same observations are made in respect of the Don river in Canada (Meek and McIntyre 1995).

This process of channel adjustment is often accompanied by high concentrations of suspended sediment which may cause adverse conditions such as increased turbidity, reduced light penetration, which sight feeding predators require, as well as clogging the gills of fish and aquatic invertebrates. This threat is most definitely prevalent in the Town Bush stream.



Frame 2.11(a): Aerial Photograph: Foxhill Spruit - 1974



Frame 2.11(b): Aerial Photograph: Foxhill Spruit - 2000

Figure 2.11(a) and (b): Comparison of two aerial photographs reflecting the development of the Foxhill Spruit, between Andries Pretorius and Murray Roads

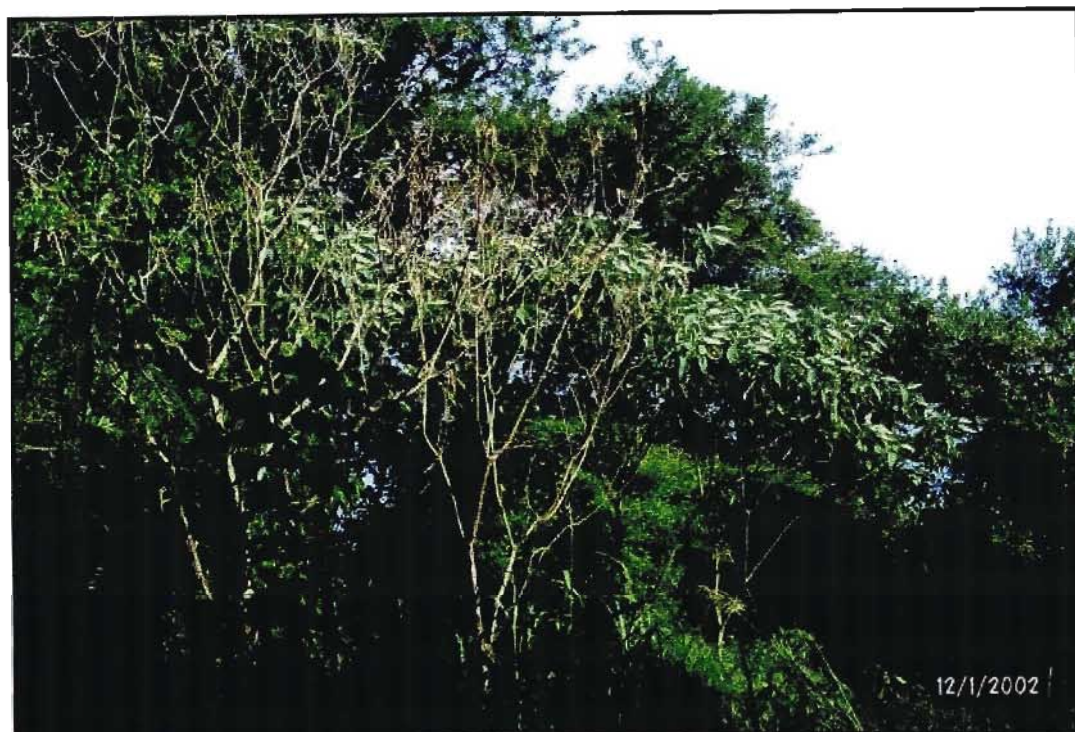
Duncan (2002; 100) confirms that, “(w)ater quality samples taken by Mr Mark Graham of Umgeni Water in respect of the Town Bush stream on 31 May 2001 found no visible algae, limited primary biota and all rocks covered in thick sediment. He thus concluded that severe damage had been caused to the riparian habitat.”

#### 2.4.1.4 Alien weed infestation

A principal threat to biodiversity and habitat in USCs is the encroachment of alien invasive vegetation, which out-competes natural species, particularly in watercourses. This has been recognized as a serious concern in Pietermaritzburg USCs (Slade 1999).

To protect the biological value of USCs, it is essential that alien weed control is undertaken. Johnstone (1988) points to the fact that alien weed infestation is a common problem to Pietermaritzburg open spaces, with differing degrees of intensity of infestation. He adds that these weeds will spread at the expense of the indigenous vegetation if left unattended. This point is substantiated by Slade (1999) and an article by Dr Jason Londt (2002) in the Natal Witness, headed ‘City the alien capital of South Africa’, citing various examples of alien weed infestation in Pietermaritzburg. Despite the promulgation of Regulation 15 to the Conservation of Agricultural Resources Act No. 43 of 1983 which requires the eradication of alien invasive plant species by land owners, this has not as yet had the desired affect (Londt 2002). Figure 2.12 shows *Solanum mauritianum* (Bugweed) which is abundant in the Foxhill Spruit. Johnstone (1988) makes the very important statement noting that whole catchments should be cleared, failing which, re-infestation is highly likely. This problem is not only a localised problem as is confirmed by Petts *et al.* (2002) in their consideration of the alien invasion in the United Kingdom. In addition to displacing native plants, he refers to the negative effect this has on the food supply and the fact that the invasives are deciduous, dying down in winter, and if they are situated in, or on river banks, leaving banks exposed leading to accelerated erosion in the absence of vegetation to stabilise the riverbank soil.

The Msunduzi Municipality IDP acknowledges the need to attend to this environmental requirement and has allocated a R 1 000 000 per annum for this medium term goal (Msunduzi Councillors and officials 2002).



**Figure 2.12:** Shrub-like trees in the middle foreground represent invasion of *Solanum mauritianum* (bugweed) - Foxhill Spruit, January 2002.

#### 2.4.1.5 Littering

One of the most critical issues with regard to visual amenity is littering. Harris (1988) expresses concern regarding the increasing problem associated with litter and the negative effect this has on the natural state of the forests in and around Pietermaritzburg. Littering is also evident in the two streams under consideration. The urban streams in Pietermaritzburg are plagued by pollution depicted in Figure 2.13. Litter is a globally widespread problem as highlighted for example, by Petts *et al.* (2002) referring to the clean-up campaign in the Mersey Basin in the United Kingdom, Riley (1998) who refers to the clean-up of the Hang Man's Creek, whilst Montaigne (2002: 21) discusses the litter and pollution problems experienced in Matamoros, Mexico. Not only does litter have an effect on visual amenity, but plastic

bags, tins and other litter also negatively effect the habitat of micro organisms, amphibian species and fish.

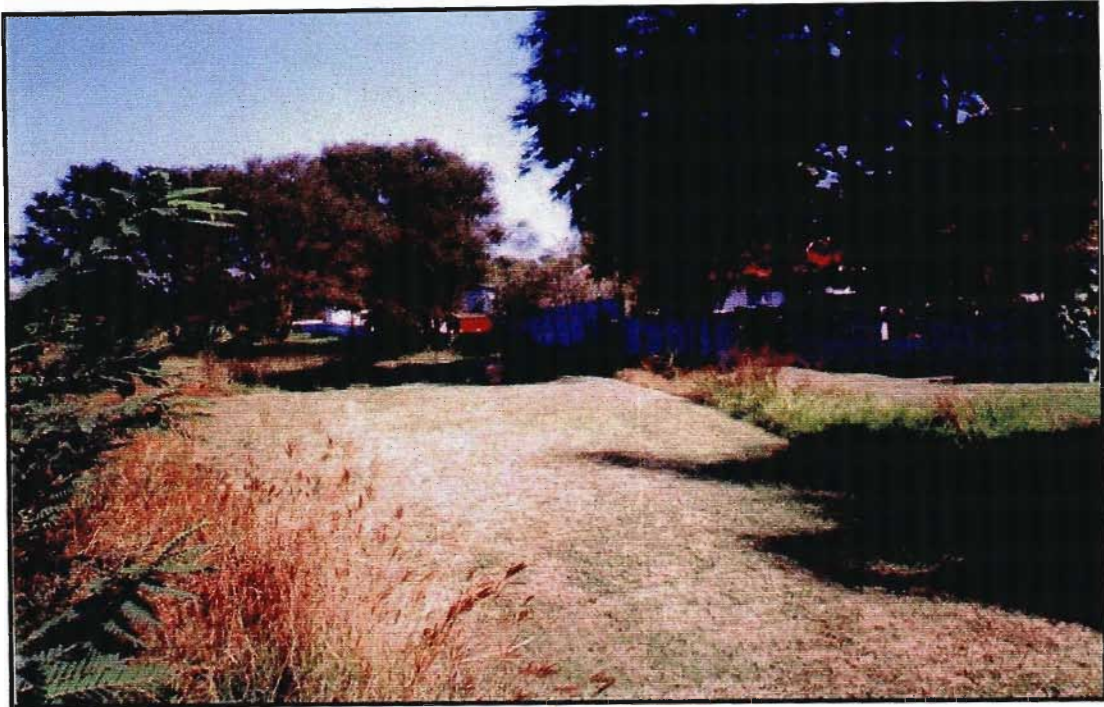


**Figure 2.13:** Evidence of littering in urban streams in Pietermaritzburg (Bishop 2002).

#### 2.4.1.6 *Fences, barriers and property boundaries*

Passino (2000), in considering the limitations of river corridor restoration, cites institutional and legal aspects of land ownership and water use as some of the general constraints associated with river rehabilitation.

The erection of fences along these boundaries has various effects on USCs. This study is specifically interested in the visual effects and habitat alteration associated with urbanisation. In terms of visual effects, high concrete fences along urban stream banks stand in stark contrast to the riparian vegetation and detract from the amenity of the USC. This is evident in Figures 2.14 (a) and (b).



**Figure 2.14 (a):** Negative effect of concrete fences on visual amenity - Foxhill Spruit, June 2001.



**Figure 2.14 (b):** Negative effect of fences on visual amenity - Townbush Spruit, February 2002.

Additionally, fences create barriers which influence the previous unhindered migration of *fauna*, disrupting functioning ecosystems. This observation is supported

by FISRWG (1998) and Soule and Gilpin, in Saunders and Hobbs (1991) in evaluating edges associated with corridors. It is suggested that abrupt edges, usually as a consequence of disturbances, tend to discourage movement between ecosystems, whilst gradual edges normally encourage movement between ecosystems. A further threat relates to the boundaries of properties on river banks. Where property boundaries are either situated in the middle of a stream or across a stream, the possible establishment of conservation and amenity areas are affected, and would be subject to the willingness and co-operation of land owners to actively join such a venture. Slade (1999) acknowledges this problem and the associated negative affect on the establishment of hiking trails.

The two streams chosen as case studies, depicted in Figure 2.15a and b respectively, are affected by properties which extend across the respective streams. Due to the possible interpretation errors associated with scale, data resolution and geo-referencing, the municipal cadastral information was superimposed on the orthographic photo series for the subject area to determine the land parcels affected. Whilst this portion of the Foxhill Spruit only had two affected portions, the Townbush Spruit have several such examples, in the form of sectional title developments, depicted in Figure 2.15.

## **2.5. POLICY, LEGISLATIVE AND INSTITUTIONAL FRAMEWORK**

Having established the need for USCs and their associated threats, what are the policy, legal and institutional frameworks in place locally to support the conservation and maintenance of USCs? Firstly, consideration will be given to the supporting institutional structures, followed by the policy and legislative framework which informs USC management.

### **2.5.1 Institutional framework**

The Durban Metropolitan Council (1999), based on the experience of the Durban Metropolitan Open Space System, identified two main role players, namely the Municipality and interested parties and stakeholder groups, with a catchment management forum forming part of the interest and stakeholder group.

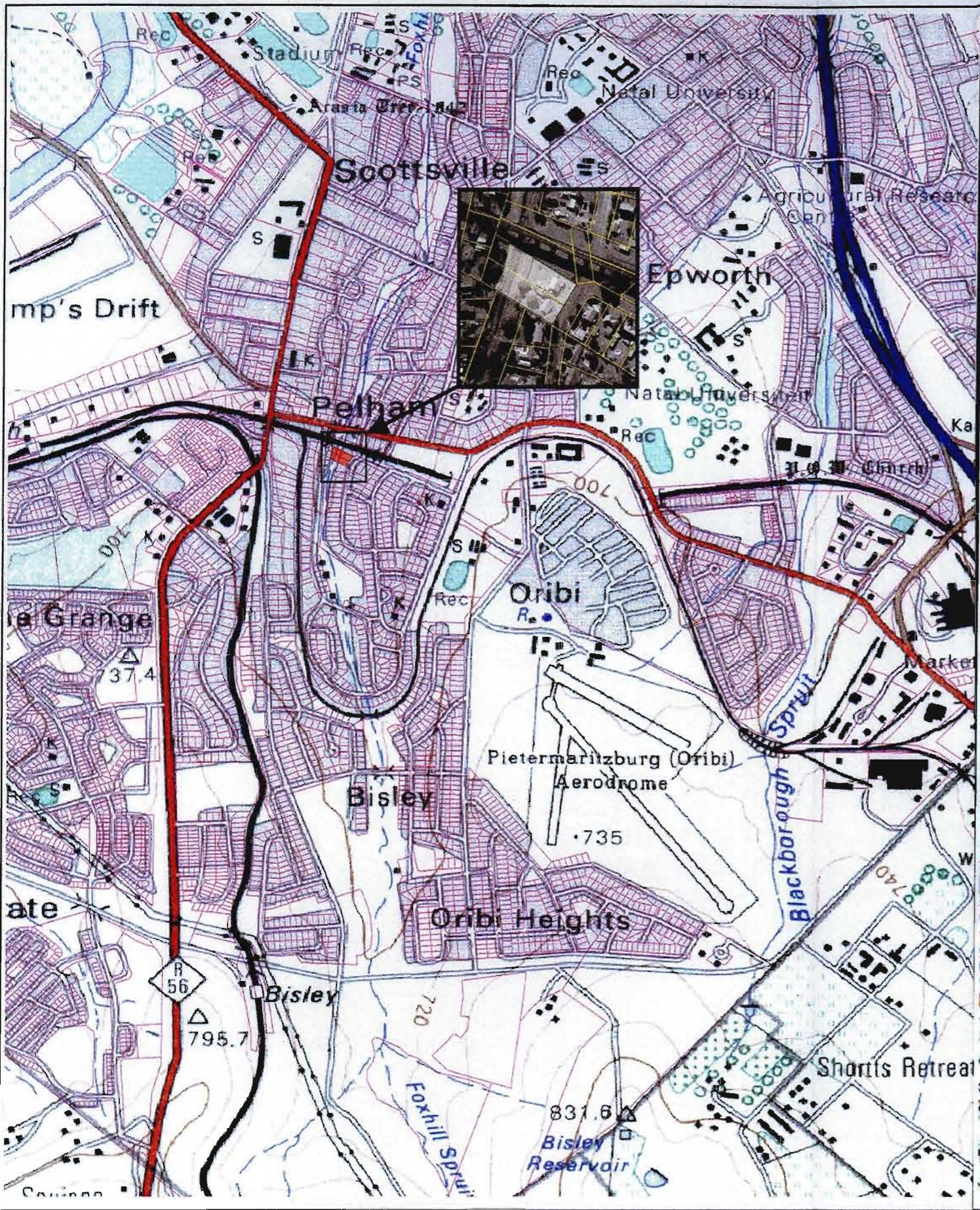


Figure 2.15(a): Foxhill Spruit

Scale: 1:20000  
 0.2 0 0.2 0.4  
 Kilometers



LEGEND  
 Land Parcels  
 Land Parcels which extend across urban streams

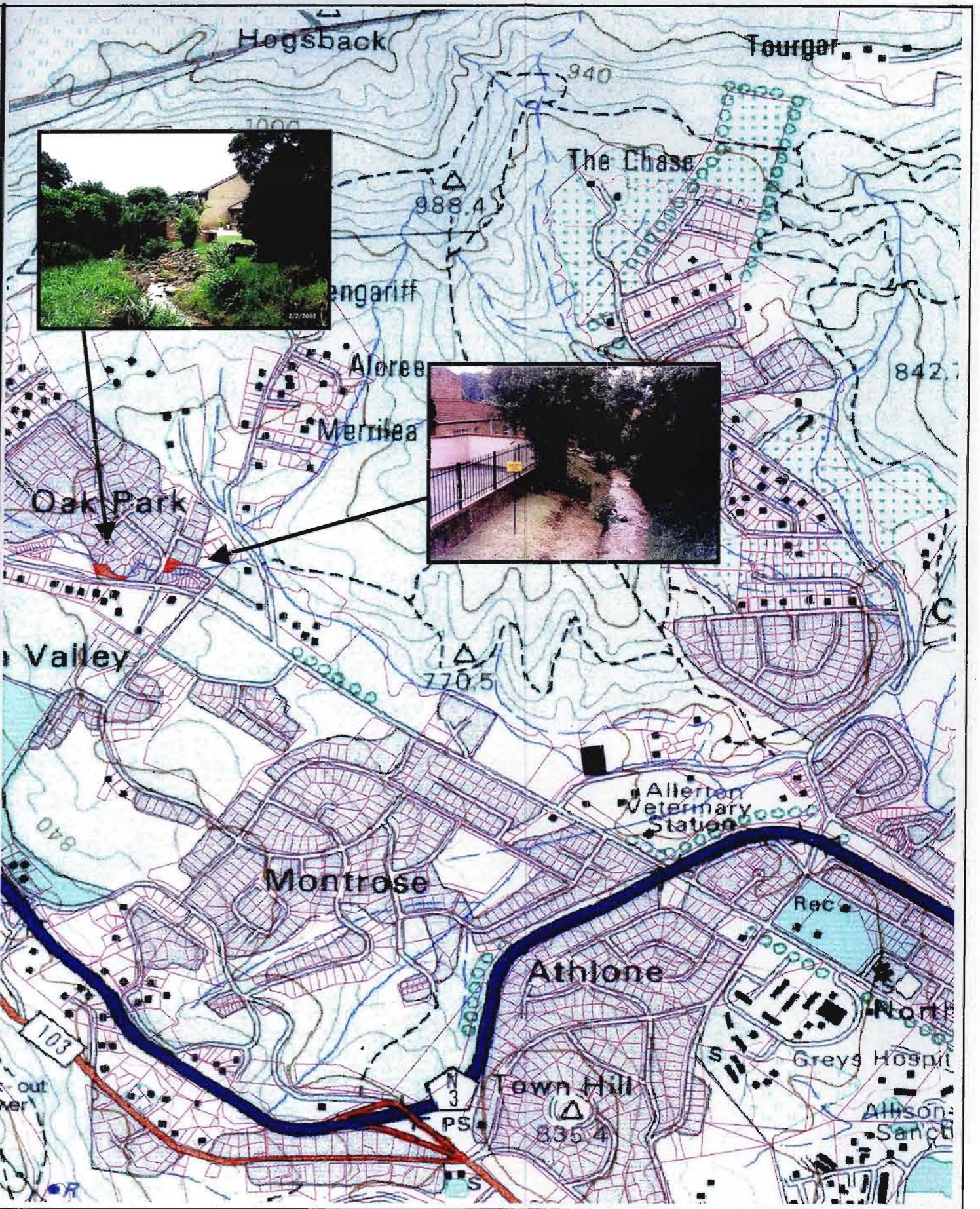


Figure 2.15(b): Town Bush Spruit

Figure 2.15(a) and (b): Cadastral Boundary Map of the Foxhill and Town Bush Spruit

This differs slightly from the Nicolson (1987) model which proposed representation from the Municipality, various institutions such as the University of Natal and the then Natal Parks Board together with other interested and affected parties including the public.

#### 2.5.1.1 *Municipality*

Slade (1999), in his consideration of the environmental management capacity of the Msunduzi Municipality, identifies various shortcomings of the current Parks and Recreation Division, which is responsible for open space management in the municipality. The shortcomings included inadequate human capacity to attend to environmentally related matters as well as the need for an appropriately qualified person to consider environmental issues. One of the findings of his report included the extension of the division to provide more human capacity to attend to environmental management. Human capacity can however not be considered in isolation, but should be linked to financial resources dealt with further-on in this Section. Slade (1999) further refers to an initiative funded by the Development Bank to review the capacity of the Municipality to implement environmental policy, which it was hoped would provide valuable guidelines for the possible restructuring and more effective integration in respect of environmental management, which was found lacking during his review of the Msunduzi Municipality.

Before proceeding further it would be naïve not to recognise the political element associated with municipal council officials and the decisions taken by these officials (Roberts 2002, *pers comm.*; Staras 2000; Roberts 1990). This is particularly important in South Africa, a country where a shift in power has taken place from the affluent minority to an previously oppressed majority, who have various social needs which may not include the protection of USCs, and which are rather focused on primary existence needs such as safe drinking water, sanitation and housing (Roberts 1990). The erstwhile Durban Metropolitan Council (now eThekweni Municipality) over the past few years have reduced the funding allocation for the D'MOSS initiative due to the pressure for more essential services for the previously oppressed. There has however, been a significant breakthrough, through the

realisation of the value of an open space system, with the allocation of 2,5 million rand for this purpose (Roberts 2002, *pers. comm.*).

One of the main advancements associated with contemporary planning in South Africa is recognition of the need for Integrated Development Plans (IDPs). The intention of these IDPs is their use as a mechanism to co-ordinate development within a municipal demarcated area. This will ensure that municipal services and activities are co-ordinated based on public participation, thus creating a common vision and strategies for the direction of the municipality. Very importantly, such strategies need to be linked to a budget to enable their implementation. Integrated Planning Services (1997) recognise the same value associated with IDPs. A further important point associated with IDPs is the use of sectoral plans which include a land use management plan. These plans which include current and proposed future land uses will be important mechanisms to protect land through proper zoning, and prohibition of certain land uses (also see Section 2.2). Wade *et al.* (1998) make a very important statement in their evaluation of the rehabilitation of rivers in that the rehabilitation of rivers needs to be built into the urban development and planning process and should not be dealt with as a separate issue. Drawing on the United Kingdom experience, Petts *et al.* (2002) substantiate the above, confirming that since the 1990s there has been a shift to using the planning system as a tool to realise sustainable development including urban rivers. In Pietermaritzburg, Bartholomew (2002, *pers. comm.*) points out that passive recreation, which includes the maintenance and development of USCs is of a low priority, with no funding for this land use.

The maintenance of NOSs is costly. Roberts (1994) discusses the costs associated with the development of formal parks as opposed to developing more natural areas, comparing the costs of R 23 000 per ha associated with formal parks whilst natural areas can be created at R 4 300 per ha. She further also considers the maintenance costs of these areas which amount to R 3 000 per ha. and R 2 000 per ha. respectively. The budget allocation to the Msunduzi Municipality Parks and Recreation Division, specifically to the conservation of townlands increased from

R3,6 million to R3,65 million for the 1998/1999 to 1999/2000 financial years. Bearing in mind the inflation rate, this in fact represents a reduction in allocation in real terms. It should further be mentioned that some 79% of this amount is used for salaries, thus leaving very little for effective conservation. Funding for the conservation of natural areas within urban areas has been a matter of contention for some years. Keith Cooper, the former conservation director of the Wildlife Society, in 1995 encouraged public contributions towards the conservation and protection of urban open spaces, pointing out that "...*the lack of money available in the future for urban conservation means it is vital that the public become involved*" (Natal Witness 1995).

The need to consider funding allocation is also highlighted by Slade (1999). This must be seen against the bigger picture of service provision by municipalities, specifically acknowledging the needs of large numbers of low income families. Integrated Planning Services (1997: 48) summarise this well:

*"In the face of life and death priorities it is clear why the TLC Parks Department is at the bottom of the pecking order when dividing up the pie."*

In considering limitations to river corridor restoration, Passino (2001) recognises that restoration is expensive and that it is essential to secure public and private funding. Passino goes on to cite institutional and legal aspects associated with land ownership and water use as further limitations.

The lack of financial resources requires of local government to come up with alternative financial and other means to address this problem. The need to involve the public in NOS management to is acknowledged by the Durban Metropolitan Council (1999), who encourages public participation.

#### 2.5.1.2 *Catchment Management Institutions*

The Durban Metropolitan Council (1999) emphasises the role that catchments and thus catchment management institutions have to play in open space management. They highlight the all-important role catchments fulfill in physically connecting terrestrial, fresh water and marine ecosystems. As a consequence, the Durban Metropolitan Council, as mentioned in Section 2.5.1, recognise the catchment forum

as one of the main role players in the open space institutional framework. Although not as clearly articulated as the case of the Durban Metropolitan Council, the Cape Metropolitan Council (1993) echoes the above view recognising the need for water catchment integration. Acknowledging that management of a catchment area is often subject to jurisdiction and control by various organizations, Abernethy and Wansbrough (2001) emphasize the importance of a 'whole catchment' approach when considering river rehabilitation, a view also supported by Common Ground Consulting (1998) arguing that catchments stretch across administrative boundaries and thus it is suggested that open space management should be linked to catchments rather than administrative areas.

#### 2.5.1.3 *Private land owners and interest groups*

The third leg of the institutional framework consists of the private land owners along urban streams and specific interest groups involved in the maintenance, management and protection of urban stream corridors. Both the Durban Metropolitan Council (1999) and Nicolson (1987) identify the public as an important role player. Spies and de Waal (1994) emphasise the importance of public participation in open space management, submitting a model providing for a local open space management forum which in turn reports to a regional open space management forum which has the responsibility to interact with regional government and advise central government. The need for public participation is also well entrenched in the legislation which influences NOS management (e.g., Section 4(f) of the National Environmental Management Act, Act 107 of 1998, Section 9(g) the National Water Act, Act 108 of 1998). Beyond this expressed view that the public should be part of open space management forums, it is considered that persons living along urban stream corridors should have a strong interest in the corridor health as it influences them directly. Their actions also have a direct influence on the stream through illegal dumping, unnecessary clearing of streams to avoid flooding potential or pollution through pool chemical discharge into streams. The need for the involvement of the public in USC protection is thus a prerequisite for effective open space planning. Through active participation in projects the public take ownership and develop real commitment to projects (Petts *et al.* 2002; Outhet *et al.* 1999; Shephard *et al.*

1999). Both the Durban Metropolitan Council (1999) and Nicolson (1987), as previously mentioned, refer to a broader spectrum of the public. Again, it is considered that this should be narrowed to rather refer to those public groups which have a positive, definite interest such as school groups, conservancies and specific private companies who have taken a positive interest in the protection of urban NOSs and USCs (Roberts 2002, *pers comm.*). The lack of public funds to give effect to environmental protection is not only restricted to developing countries. Flowers and Searns (1996) discuss the successes that have been achieved in respect of the South Platte River in the Denver area (United States of America), through public-private partnerships.

In summary, it is submitted that municipalities, catchment management institutions and private land owners have a combined responsibility regarding the maintenance of USCs. What is however lacking, is an effective recognised framework for these role-players to function in tandem to achieve effective USC management. A final point relates to the financial resources and the need for political support to ensure financial support. The effective involvement of the public, interest groups and schools will reduce the dependency of funding and is thus of importance.

### **2.5.2 Policy and legislative framework**

Municipalities, and the functions they perform are subject to and often informed by legislation. It is therefore essential to consider the policy and legislative framework in terms of which they operate. In addition to the above many authors have raised the need for legislation in support of river protection (Petts *et al.* 2002; Wade *et al.* 1998; Scottish Environment Protection Agency 1999). Nowlan (1996), in support of the need for legislation, discusses the successful use of legislation to protect urban streams in Canada. She goes on to demonstrate the legal provisions contained in legislation which have been used with positive results. Outhet *et al.* (1999) cites the need to be able to change legislation in order to effectively adapt to changing technology and the means to counter new illegal activities. The local institutional framework, discussed in Section 2.5.1 identified municipalities, catchment management institutions and land owners bordering the terrestrial zone together with

interest groups as the three components charged with USC management. The legislative and policy framework will thus be evaluated by specifically identifying the policies and legislation which inform natural open space/urban stream corridor protection, with specific reference to the above three components. Table 2.2 presents the legislation and policies applicable to USC management in Pietermaritzburg.

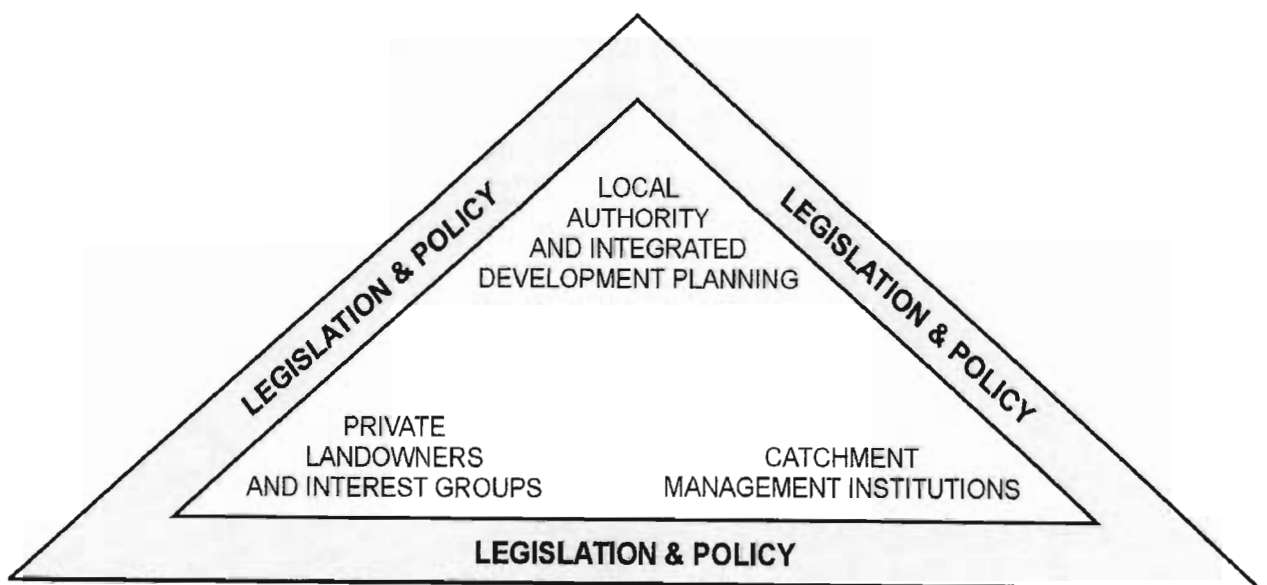
**Table 2.2: Legislation and policies applicable to USC management**

Policy / Legislation	Responsibility allocation		
	Local Authority	Private land owners and interest groups	Catchment Management Institutions (CMIs)
<b>Policy</b>	<p>There currently is no overarching policy which informs the implementation of USC management in Pietermaritzburg.</p> <p>The Municipality is however in the process of devising a framework and work ethic which must be environmentally based.</p>	<p>No policy or plan relating to the involvement of private land owners or interest groups. In fact current conservancies are operated on a voluntary basis and are dependant on donations for their functioning. In principle there should be public participation in catchment management institutions as required in terms of Section 80(e) of the National Water Act 36 of 1998.</p>	<p>As already mentioned, there is no overarching policy to inform the implementation of USC management in Pietermaritzburg. There however is representation from the Msunduzi Catchment Management Forum on the Local Agenda 21 Forum.</p>
<b>Legislation</b> 1. Constitution of South Africa, Act 108 of 1996	<p>Section 24 of the Constitution mandates the protection of the environment for present and future generations, which places responsibility on Municipalities to manage the environment for which they are responsible. This together with Section 156, read in conjunction with Part B of Schedule 5, which determines that the management of, <i>inter alia</i>, public places and parks and recreation induces responsibility on municipalities to protect the environment.</p>	<p>Section 24 of the Constitution of South Africa places an obligation on all citizens of this country to act responsibly with regard to the environment, which will thus include private persons.</p>	<p>The Constitution is the supreme Law of a country. It therefore follows that all actions taken are to be subject to such law. It is therefore submitted that Catchment Management Agencies in the consideration of catchment areas will have to take cognisance of the environmental requirements as set out in this legislation.</p>

Policy / Legislation	Responsibility allocation		
	Local Authority	Private land owners and interest groups	Catchment Management Institutions (CMIs)
2. National Environmental Management Act 107 of 1998.	<p>1. Section 28 of the National Environmental Management Act, Act 107 of 1996 (NEMA), imposes responsibility on the owner of the land or the person who has use of the land to avoid or remediate any activity which may cause significant pollution or degradation of the environment. This therefore places a responsibility on all land owners which includes the Municipality as land owner.</p> <p>2. See paragraph 2 alongside.</p>	<p>1. Private land owners are directly responsible for land under their control as per Section 28 of NEMA.</p> <p>2. Section 4 (f) of NEMA requires the participation of all interested and affected parties in environmental governance. Similarly, Section 4 (o) advocates the beneficial use of environmental resources to serve public interest and the protection thereof as the peoples common heritage. It is considered that this places a responsibility on municipalities, private land owners and CMAs to protect the environment.</p>	<p>1. Section 11 of NEMA requires each National Department to prepare an environmental plan for their area of responsibility. Although an indirect linkage, CMAs and other related institutions will have consult the plans prepared by Department of Agriculture and Environmental Affairs as well as the Water plan prepared by the Department and Water Affairs and Forestry.</p>
3. The Conservation of Agricultural Resources Act, Act 43 of 1983. (CARA).	<p>1. Although many of the regulations such as 2 to 6 and 9 to 14 to CARA have an agricultural slant, regulation 7 and 8 could also be applicable to urban areas, requiring the removal of vegetation in floodplains, prohibiting the unauthorised drainage of wetlands and the diversion of run-off. This places a responsibility on both the Municipality as land owners as well as private land owners to manage their land. Similarly, Section 15 and 16 respectively deals with alien vegetation and bush encroachment, placing the responsibility of removing and managing alien plant species on all land owners, including Municipalities. This point is well recognised by Ashpole and Crawford, both in (Ashpole undated).</p>	<p>1. As already mentioned alongside, regulations 7, 8, 15 and 16 have a direct effect on private land owners.</p>	<p>1. CMAs have at their foundations the protection rivers and riparian vegetation. The strict adherence regulations 7, 8, 15 and 16 would be necessitated in order to perform an effective service as a CMA. This point is also laboured by Ashpole in Ashpole (undated).</p>
4. The National Water Act 36 of 1998 (NWA).	<p>The NWA establishes various objectives with regard to water quality, conservation and reserve requirements which municipalities as service providers need to enforce and adhere to. They have an important role to play in the co-implementation of the requirements of the NWA together with CMIs.</p>	<p>Various new responsibilities are placed on the private individual in terms of the NWA. This includes the need for water use licenses as required by Chapter 4, as well as the declaration of stream flow reduction activities, such as forestry. A very important new development is the introduction of penalties for water related offences</p>	<p>Chapter 7 of the NWA establishes Catchment Management Agencies with specific responsibilities including water resource strategies and catchment management in general. One of the key functions is ensuring community participation (Section 80(e)).</p>

Policy / Legislation	Responsibility allocation		
	Local Authority	Private land owners and interest groups	Catchment Management Institutions (CMIs)
5. Local Government Municipal Systems Act No. 32 of 2000 (MSA)	Section 25 of the MSA requires that each Municipality adopts an Integrated Development Plan (IDP). The purpose of this IDP is to integrate and co-ordinate plans and proposals for the development of the Municipality and should contain the priorities and objectives for the Municipality. As part of the IDP process the Municipality is required to consult with the local community, stakeholders and organs of state (Section 29) in compiling its IDP.	The community has a definite responsibility in the compilation of IDPs as confirmed by Section 29 of the MSA. Their vision for the Municipality in terms of this process could thus direct the IDP. The importance of public participation in this process is evident in the fact that a whole chapter was devoted to this.	The nature of IDPs requires full integration of sector plans as provided by the different organs of state. Section 29(b)(iii) of the MSA supports this integration and linkage between Municipalities and organs of state.

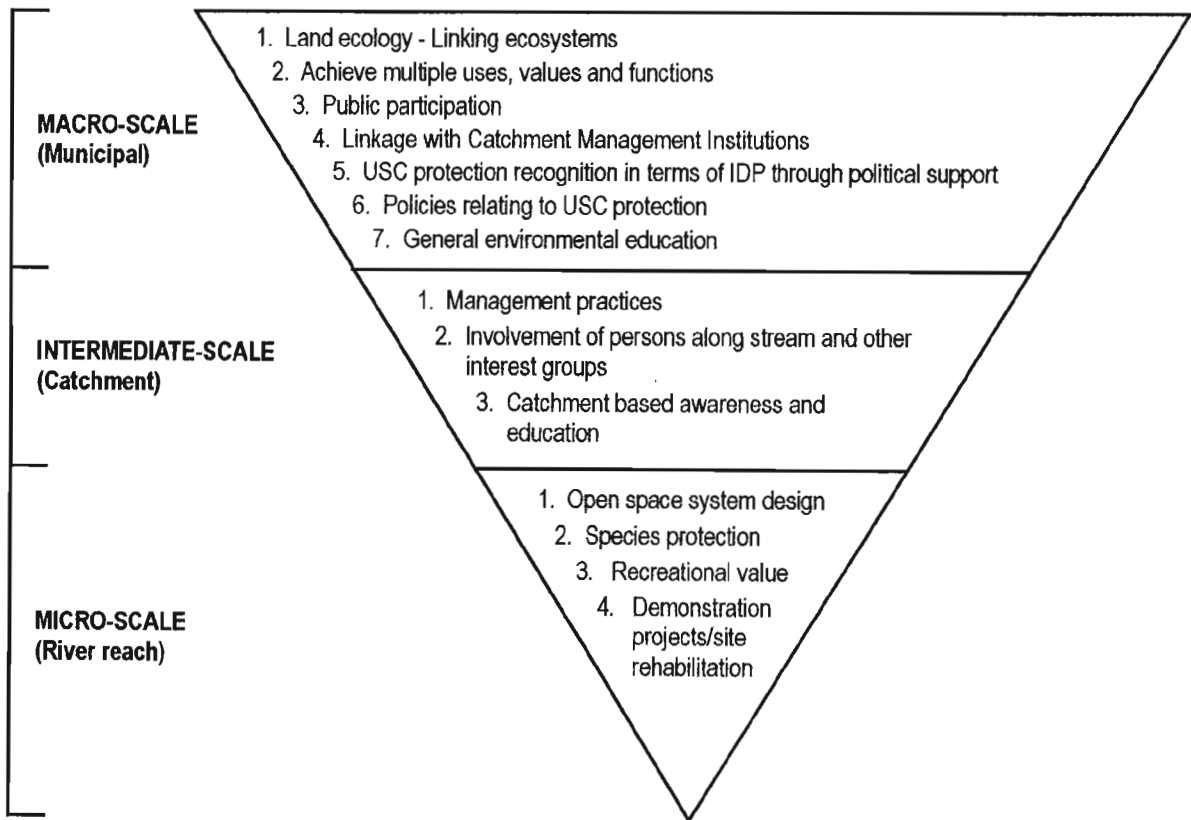
In the preceding discussion, it has been suggested that there are three different, but specific institutions which make up the institutional framework with regard to NOS and thus USC management, namely the municipality, private land owners and interest groups and thirdly, catchment management institutions, who in turn are directed by legislative provisions. This relationship is conceptually represented in Figure 2.16.



**Figure 2.16** Integration of policy, legislation and institutional framework relating to USC management.

## 2.6 KEY PRINCIPLES FOR USC MANAGEMENT

Consideration has been given to the value and importance of USCs, the threats they face, as well as the policy and legislative requirements. This has formed the basis for the formulation of key principles for USC management, which are presented in Figure 2.17 in relation to their scale of application. Macro-scale refers to the scale of the whole municipality whereas intermediate scale represents individual catchments within the municipality and micro-scale, river reaches within catchments.



**Figure 2.17:** Key principles of USC management

The above framework suggests that macro-scale issues should be addressed first, such as, recognition of USCs in IDPs, followed by a more focused look at management practices, whilst the specific design of an area would form part of the detailed planning, or micro-scale. These principles will now be examined briefly.

## **2.6.1 Principles at macro-scale**

### **2.6.1.1 *Land ecology - linking ecosystems***

In Section 2.3.1 the important role of urban stream corridors in linking island ecosystems and the biological role of such links was highlighted. This must therefore be one of the cornerstones of use management, and should thus form part of the macro considerations.

### **2.6.1.2 *Achieve multiple uses, values and functions***

USCs perform two key functions. The first relates to their natural function as collection points for natural run off, although surface runoff is substantially increased in urban areas. The other function relates to the natural health of the aquatic, riparian and terrestrial zones which thus includes both the health of the water, its inhabitants as well as the stream corridor. Bartholomew (2002, *pers.comm*) indicated that this is one of the areas of weakness in respect of the Pietermaritzburg USC system, as attention currently is only given to the stream to ensure its capacity to contain urban flood water, with the removal of excess growth and rocks and other obstacles from the streams, to ensure maximum capacity. This however is not an isolated local practice. Newbury *et al.* (undated: 3-1) in their consideration of Midwestern North America also remark that urbanisation and the development of cultivated land has "...often included the alteration of natural channel networks to provide flood control and to improve land drainage." The second function, relating to river health and riparian protection is given very little attention.

### **2.6.1.3 *Public participation***

Public participation is an important element of effective open space management (Boune 2001; Staras 2001; Scottish Environmental Protection Agency 2000; Durban Metropolitan Council 1999; Integrated Planning Services 1997; Spies and de Waal 1994; Roberts 1990). This together with the public involvement required to achieve effective IDPs, makes this an essential principle to include at the macro-level of USC management. In fact, Wade *et al.* (2000: 6) also emphasize the importance of public participation and effective communication stating that "*(t)his is perhaps one of the*

*greatest challenges facing river workers as we approach the 21<sup>st</sup> century.*" Staras (2001) gives further support to public participation referring to the value of public awareness and stakeholder participation, which if not attended to properly could lead to a project either slowing down, or even obstructing projects as was the case with the Danube Delta where lack of stakeholder participation was one of the issues that had a negative influence on the project.

#### 2.6.1.4 *Linkage with CMIs*

The need for the linkage of USC protection and catchment management institutions has been discussed in Section 2.5.1.2. In support of this notion, Braune and Wood (1999: 117) state, *"(t)he need exists to manage urban stormwater on an integrated catchment basis, thereby reducing the negative impact of urbanisation on the environment and quality of life."* A further point raised by the Scottish Environmental Protection Agency (2000) relates to the protection of a catchment area. For this study, it would be important to take cognisance of the above, linking catchment areas with natural open spaces where possible, as the study seeks to protect both urban streams and their natural areas.

#### 2.6.1.5 *USC protection recognition in IDP through polical support*

One of the main criteria of IDPs is that projects have to be aligned with a specific budget (Bartholomew 2002, *pers.comm.*). For an initiative or project to be taken forward, it has to be recognised as worthwhile through the public participation process inherent in integrated development planning, together with the allocation of a budget to ensure the realisation of the project. Without these requirements being satisfied, a project cannot commence.

#### 2.6.1.6 *Policies relating to USC protection*

In order to have effective USC management and protection there must be relevant legislation and policies (Scottish Environmental Protection Agency 2000; Integrated Planning Services 1999). National and provincial policy and legislation creates the broad framework, whilst local policies and strategies guide the more detailed implementation of action. The legislative and policy framework, discussed in Section

2.5.2 revealed various pieces of legislation, but showed the lack of explicit local policies and strategies.

#### *2.6.1.7 General environmental education*

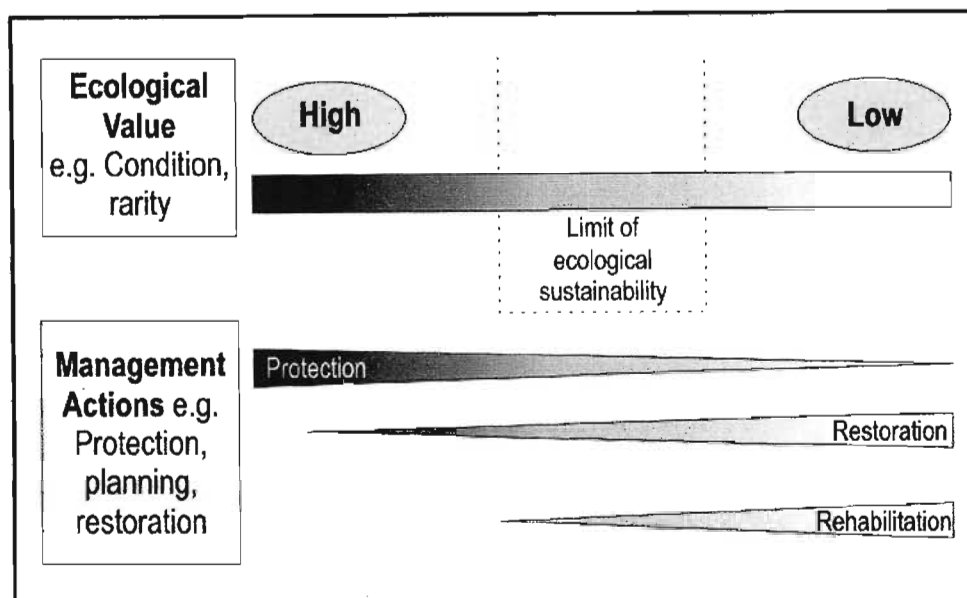
The value of environmental education is well recognised (Slade 1999; Integrated Planning Services 1997; Wallace, in Saunders and Hobbs 1991). It is considered that education of people regarding the environment will create an awareness of the need for environmental conservation (Elements of Smart Watershed Program 2002; Roberts 1994). According to Roberts (1994), open space systems provide easy access to educational opportunities, as evidenced through visitation patterns to reserves within the D'MOSS area. She further points out that this could be done at two levels, namely informal education through trails and more formalised education in training centres within the open space setting. The value of open space systems in environmental education, especially regarding ecosystem functioning is supported by Cooper (1988), who emphasises the value of open spaces close to schools. Although the above general environmental education is seen as important, Slade (1999) and Integrated Planning Services (1997) draw attention to a very important and more specific need for environmental education, identifying the needs of decision makers at municipal and other decision making levels.

### **2.6.2 Principles at an intermediate level**

#### *2.6.2.1 Management practices*

As previously mentioned (Section 2.3.2.1), Adams (1994 b), discusses the consequences of succession and biotic change associated with man's influence on natural open space areas. This is an important aspect associated with USCs. Practices such as the cutting of grass in appropriate seasons to not influence the habitat or breeding of USC species needs to be recognised. Similarly, any burning programs need to be sensitive to the above requirements. The management of USCs is a task which needs to be undertaken with due consideration and care, and includes other activities such as the use of herbicides, grazing and the need to work around trees (Ward, Holmes and Jose 1995). Caution is also required regarding the cutting of weeds which increases flow capacity, which may have a negative effect on

fish spawning and hatching (Raven *et al.* 1995). Management practices should therefore be sensitive to the above to be effective. Bennett *et al.* (2001) makes an important observation regarding the biological value and management, and that there should be a positive correlation between ecological value and protection through management (Figure 2.18).



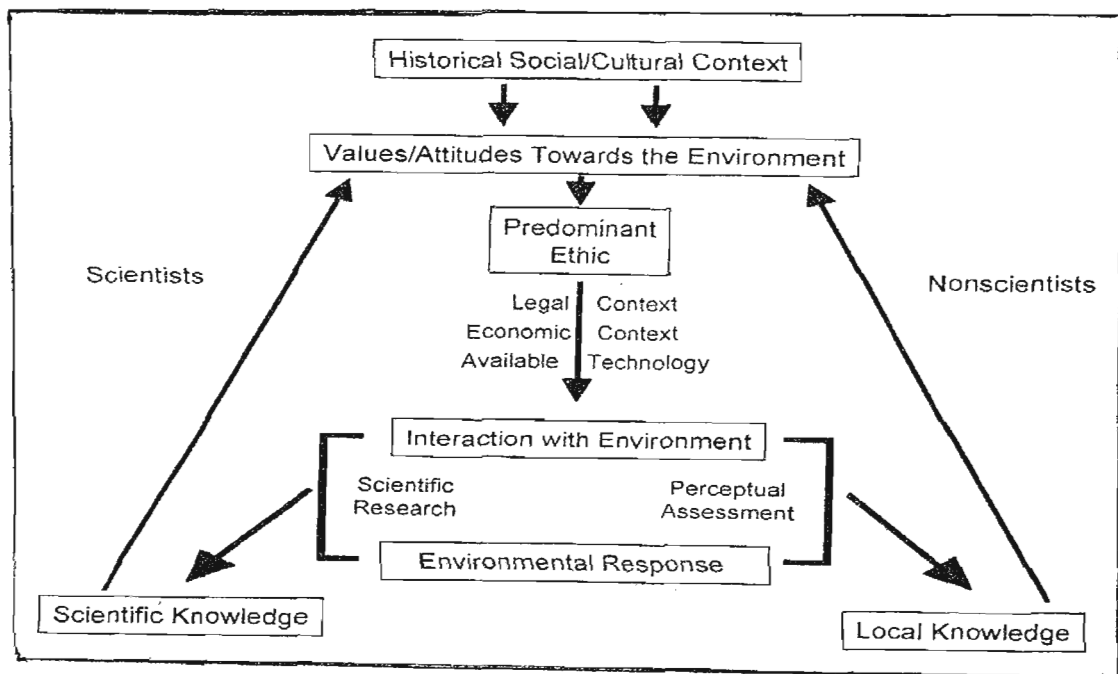
**Figure 2.18:** Relationship between ecological value, sustainability and management (Bennett *et al.* 2001: 37).

#### 2.6.2.2 *Involvement of interest groups and persons along streams*

Section 2.6.1.3 referred to the need for public participation in the municipal planning process. At the level of individual catchments, it is considered that specific interest groups and people along urban streams have an important role to fulfill in the protection and management of USCs. As mentioned earlier, many authors on the subject of Open Space Management identify the importance of public involvement (Staras 2001; Durban Metropolitan Council 1999; Integrated Planning Services 1997; Roberts 1994; Nicholson 1987; Anderson 1983). In fact, Staras warns that experience has shown that issues such as public awareness and stakeholder participation, if not appropriately dealt with can either slow down or hamper stream restoration projects. It is considered that persons along urban streams have a direct interest in the health and protection of streams. One of the key principles of the

intermediate level would therefore include the encouragement of these groups' participation in USC management.

Given the emphasis on community-based approaches relating to environmental decision making, Wilson, Urban and Herricks (1999) draw attention to the need for scientists to appreciate, understand, respect and immerse themselves within the local social context (Figure 2.19). Only through this interaction, mutual information sharing and trust will an effective process and relationship be born which effectively integrates local knowledge and science. In support of this model, reference is made to the value-laden conceptions of nature, environmental quality and sustainability which cannot be dealt with by scientific inquiry only (Gale and Cordray 1994; Greider and Garovich 1994; Simmons 1994; von Maltzahn 1994, in Wilson, Urban and Herricks 1999).



**Figure 2.19:** Conceptual model of interaction between scientists and non-scientists in community based watershed management in the agricultural Midwest (Wilson, Urban and Herricks 1999).

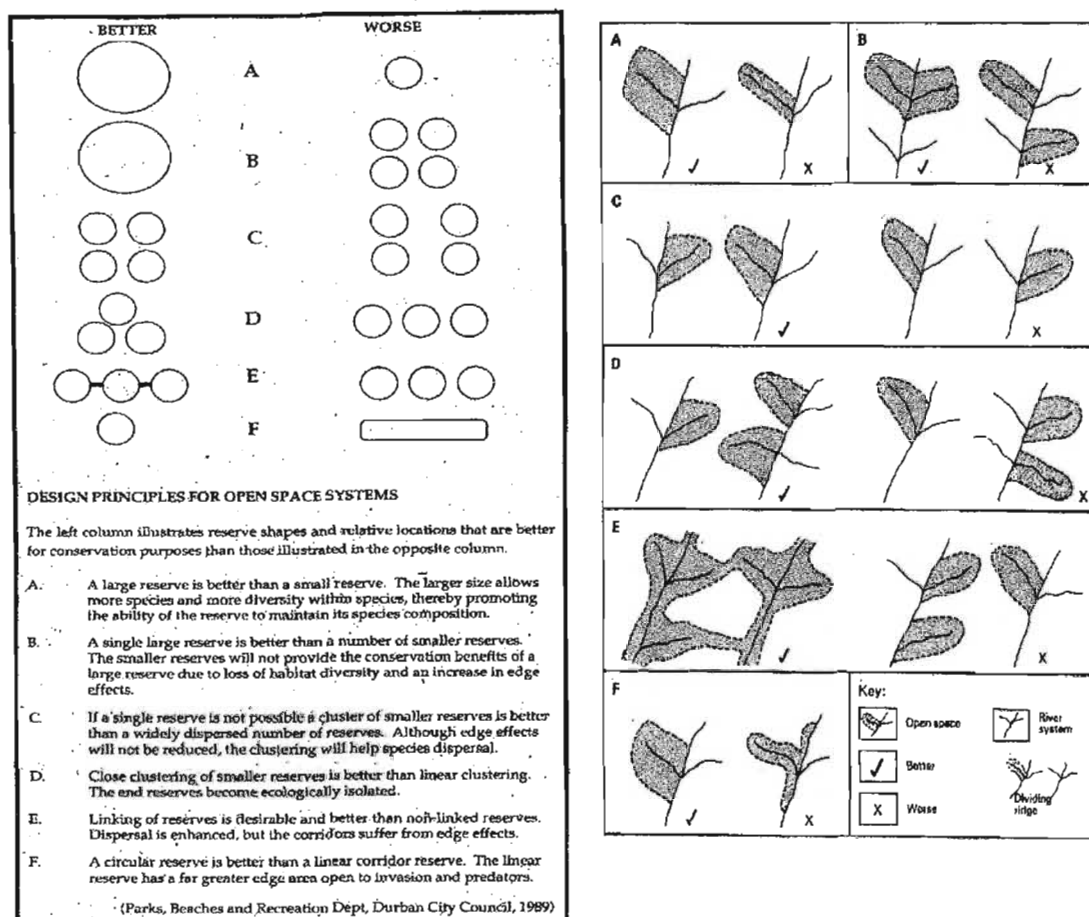
### 2.6.2.3 *Catchment based awareness education*

Earlier, in Section 2.6.1.7 consideration was given to environmental education at a general level. In terms of the provisions of the National Water Act 36 of 1998 (Section 80 (a) and (e)), catchment management agencies are required to investigate and advise interested persons on various water management related issues as well as promote public participation. It is argued that effective participation would only be possible if associated with appropriate education.

## **2.6.3 Micro-principles**

### 2.6.3.1 *Open space system design/ configuration*

The design of a natural open space area or urban stream corridor is subject to local influences and landscape morphology and would form part of the micro scale principles. In considering a design, one has to take cognisance of physical barriers, accessibility, affordability from a maintenance point of view, and very importantly, the creation of the best suited environment for the fauna and flora contained in the natural open space system. Both the Durban and Cape Metropolitan areas have considered open space designs in the establishment of the metropolitan open space system (Cape Metropolitan Council 1993; Nicloson 1983). These concepts are fairly simplistic and are based on practical management principles and from a biodiversity point of view (Figure 2.20). For example, it is more advantageous to consider a closely connected clump of open space areas, as opposed to widely dispersed areas.

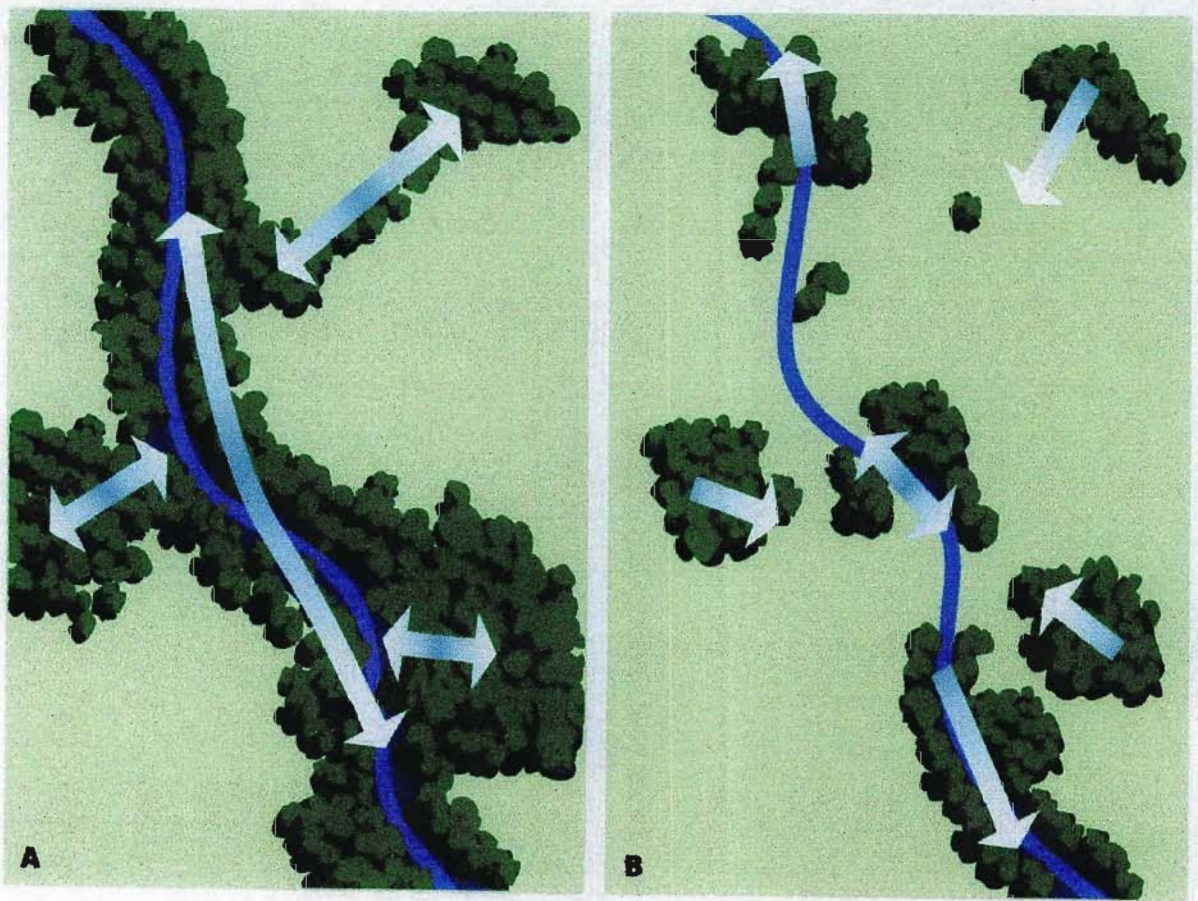


**Figure 2.20:** Open space design options and preferences (Cape Metropolitan Council 1993; Nicolson 1983)

The ideal configuration is represented by option E in both models, representing the linking of islands or patches, encouraging ecological integration. Adams points out that in Columbia much of the open space is located along streams, which provide buffers to the streams in respect of development and is also used as a corridor for wildlife movement. At the 1988 seminar regarding the envisaged Pietermaritzburg Metropolitan Open Space System, Dr Johnson, in discussing the role of urban streams in linking MOSS to natural areas stated that :

*“Linking these habitats is a series of watercourses. Of all natural features in suburbia, rivers and streams are the most important since they can never be developed and they form vital corridors joining otherwise isolated refuges in a single unit (Johnson 1998: 8).”*

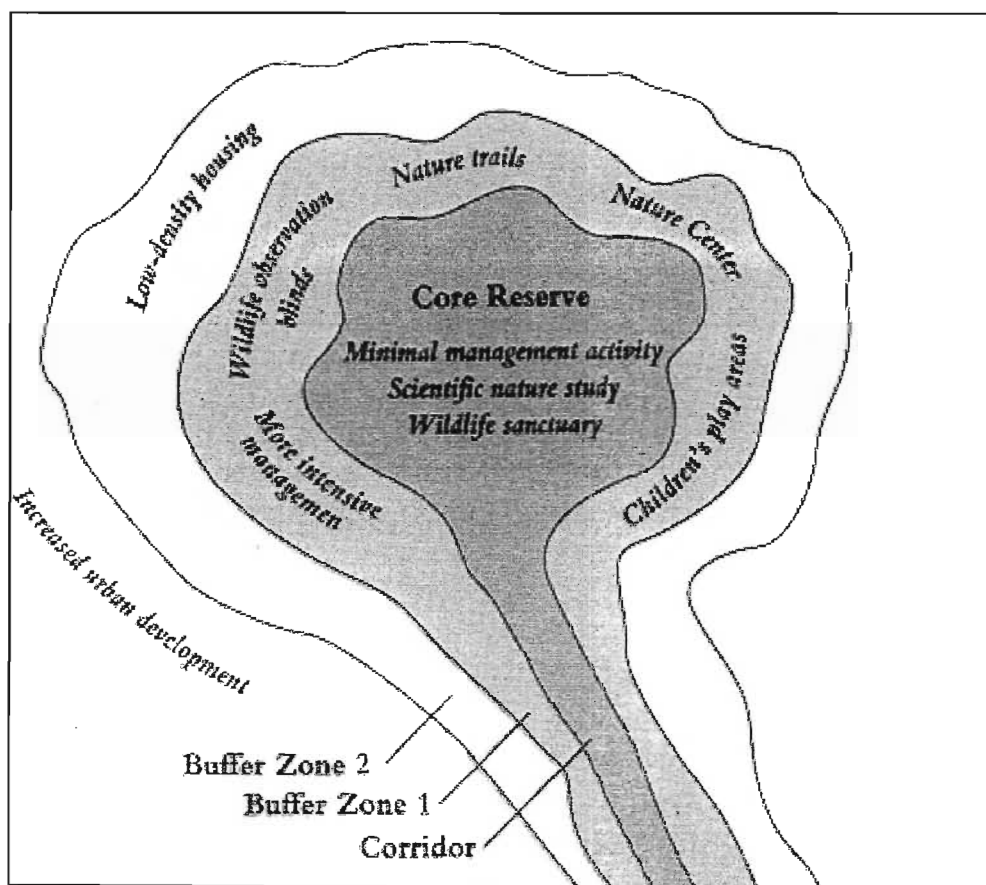
The above observations relate to the importance of connectivity. Connectivity is a measure of how spatially continuous a corridor or matrix of landscapes are. Stream corridors with a high degree of connectivity among its natural communities promotes ecological integrity. Differing degrees of connectivity are depicted in Figure 2.21. It is important to note that corridors have an important role to play in connecting patch populations, in so doing avoiding the extinction of isolated patch populations. Recolonisation of fragmented landscapes can occur when such fragmented landscapes are connected through corridors (Bradby 1991).



**Figure 2.21:** Landscape A represents a high degree of connectivity whilst landscape B represents a lower degree of connectivity. A high level of connectivity is normally associated with higher levels of functions as opposed to fragmented landscapes.

Although the value of the above designs are recognised, Adams (1994 b) makes a further important contribution, citing the need for buffer zones which provide for transition between core reserves and urban development as detailed in Figure 2.21.

Roberts (1994) and Common Ground Consulting (1998) suggest a similar model involving core areas, which normally contain a particular indigenous flora, corridors which link core areas, and finally buffer zones which should be part of development of the urban landscape to protect the core areas (Figure 2.22).



**Figure 2.22:** Buffer zones providing a transition between a core reserve corridor and surrounding urban development (Adams 1994 b: 79).

#### 2.6.3.2 Species protection

One of the intentions of corridor design as provided in Figure 2.21 above, is to identify and protect the habitats of important species. The intent is to provide for the

protection of the natural environment, whilst still providing for human recreation through nature trails within such areas. Cooper (1988), recognises the importance of biodiversity and species protection through NOSs and corridors. Johnson (1988) specifically highlights the value of stream corridors, citing the value of the Ferndcliffe area and the Bisley Valley for their rich bird diversity and the need to protect certain species such as the crowned eagle nests in the Chase Valley area.

What Adams (1994b) and Johnson (1988) are suggesting is that a species audit should be undertaken which in turn should form the basis for specific management practices to protect specific species.

#### 2.6.3.3 *Recreational value*

Open spaces provide for both active and passive recreational activities (Roberts 1994). This study is specifically interested in the creation and use of USCs for passive recreation, through the provision of trails. Use of trails along river corridors is becoming a popular activity associated with urban streams or greenbelts in the United States of America (Riley 1998). The creation of hiking trails, as a part of USCs, is also supported by Nicolson (1987), Latham (1988) and Cooper and Antoni (1993). Hiking trails, although not a primary goal of USC management, are however recognised for the role they play in creating an awareness of the urban natural environment (Nicolson 1987).

#### 2.6.3.4 *Demonstration projects*

The focus, at micro-level, has now shifted to specific river reaches. The United States Environmental Protection Agency (2000) refers to the need to focus on rehabilitation projects, which are feasible. Attention is also drawn to the importance and value of previously restored sites, which could be used as models for restoration projects. Although projects will not necessarily be able to be merely duplicated, due to the unique circumstances associated with each site, it will provide useful guidelines. It is suggested that exposure of the public at this level could encourage involvement through the observation of improved environments.

#### **2.6.4 USC management plan**

Having key principles for USC management is not enough to ensure the sustainable management of urban stream corridors. What is required is a multi-year management plan, supported by legislation and policies, a dedicated budget, linked to the allocation of responsibilities in order to give effect to the above key principles with the main goal of achieving the protection and management of USCs. In Sections 2.5.1.1 and 2.5.1.2 respectively, consideration was given to Municipal IDPs and CMAs with their own catchment management strategies. For an USC management plan to be effective there have to be linkages and support between the above different management “tools”, including linkages between USC management, CMAs and USCs and environmental management plans contained in IDPs. This ideology is supported by Brierly and Fryirs (2001) calling for a catchment framed vision for river rehabilitation.

#### **2.7 DOES PIETERMARITZBURG HAVE AN USC MANAGEMENT PLAN?**

Various documents have been published over the past 10 years, discussing the need for the establishment of a public open space management system in respect of Pietermaritzburg which would include the protection of river corridors (McCormack and Hlongwa 1999; Slade 1999; Town and Regional Planning Commission 1988).

These documents, amongst others, give consideration to issues such as the need to establish an open space system, the requirements of an open space system, and the benefits and maintenance requirements of the system including the protection of rivers. There is, however, no documented chronological history of this public open space management system for Pietermaritzburg. Mr R Bartholomew, the Manager of the Msunduzi Parks and Recreation Department for the past 15 years, was interviewed regarding the history and development of open space policy, and more particularly, USC management plans. He confirmed that the Pietermaritzburg Metropolitan Open Space System had been initiated in 1987, by the then Town and Regional Planning Commission, following their involvement in the Durban Metropolitan Open Space System. Upon a directive from Provincial Government, a Committee was established to develop and implement a system for Pietermaritzburg.

This initiative was never widely supported by the public and in addition had no committed funding. Late in the 1990s, Professor Abbott took the chairmanship of the ailing committee, which saw a renewal under his leadership. One of the more important tangible results was a map linking all the conservancy areas using river corridors (Figure 1.2). It illustrated the intention to create a trail system along the river corridors. In 1997 when Professor Abbott passed away, it was decided to disband this committee and rather have a Conservancy Association. This did not function effectively, leading to the establishment of individual conservancies, which although functioning are unable to achieve the objective of an open space system for Pietermaritzburg. Pietermaritzburg, has neither an operational open space system, nor an urban stream corridor management plan (Bartholomew, 2002, *pers. comm.*). This is confirmed through the IDP for the Msunduzi Municipality which is currently under review. Although R1 000 000 has been budgeted for the eradication of invasive and alien plant species, the budget for “Greening, Beautification and Open Spaces” and the “Prevention of Soil Erosion”, has been left “unattended” at present (Msunduzi Councillors and officials 2002).

In contrast, the Durban Metropolitan Council initiated a metropolitan open space system (D'MOSS) which was supported by the Wildlife Society in the late 1970s to early 1980's with the intention of conserving isolated conservation islands with the development of an open space system possibly a secondary thought only. Under the leadership of Dr. D. C. Roberts this underwent a conceptual change in the mid 1980s, now rather considering a system of ecological viability and sustainability, leading to the D'MOSS report of 1989. This also saw the purchase of land for conservation purposes and the active conservation of the D'MOSS (Roberts, 2002 *pers. comm.*). In addition, an environmental report (Common Ground Consulting 1998) and maps were generated (Durban Metropolitan Council 1999; Nicolson 1987) highlighting and designating those areas of environmental importance. According to Dr. Roberts, the current Director of Environmental Management, Ethekeweni Municipality, one of the main contributions to the success of the D'MOSS is the ability of the administrators, and the system to change to circumstances. She referred to the political changes which have occurred in South Africa in the mid 1990s and the

effect this had on revised political and municipal priorities, with a new emphasis on service provision. Greenhalgh and Worpole (1996: 3, in Taylor and Coalter 2001) suggest that the status of urban parks has declined and that the funding for this purpose has been reduced, stating that, "*(i)n the Victorian era, parks were at the forefront of urban development: today they are often an after-thought, at the bottom of the political agenda.*"

The successful continuation of the D'MOSS was based on the fact the managers of the D'MOSS were able to adapt to these changes, recognising the need to adjust their priorities. At the same time, the managers recognised the need to find new ways to familiarise councillors and decision makers of the environmental value of open space services (see Figure 2.4). Through this process they were successful in again rekindling the need to protect the natural environment. The past few years have also seen an ideological shift, reflected in the recognition and environmental protection of key areas, the control of development through environmental appeals and the securing of additional funding for environmental protection (Roberts, 2002 *pers. comm.*).

## **CHAPTER 3: CONCEPTUAL FRAMEWORK AND METHODOLOGY**

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### **3.1. INTRODUCTION**

The purpose of the conceptual framework presented in this chapter is to describe the issues relating to USC management and their interactions or interrelationships.

### **3.2. ANALYSIS OF LITERATURE REVIEW**

The literature review identified issues such as the habitat and biodiversity value of USCs, amenity value, cultural, recreational and educational value and flood attenuation value. Consideration was also given to issues associated with USC management, highlighting the threat to NOS and associated habitat loss, streambank erosion, the influence of cadastral boundaries, alien weed infestation, littering and water quality. However, these concerns can not be considered in isolation from issues such as policy, legislation and the institutions mandated to consider USC management and protection. Consequently municipalities, CMIs and people living along urban streams are identified as the main institutions associated with USC management. Other key principles identified include the need for public participation, the importance of recognition of USC management in IDPs, design principles, recreational value and finally, political support.

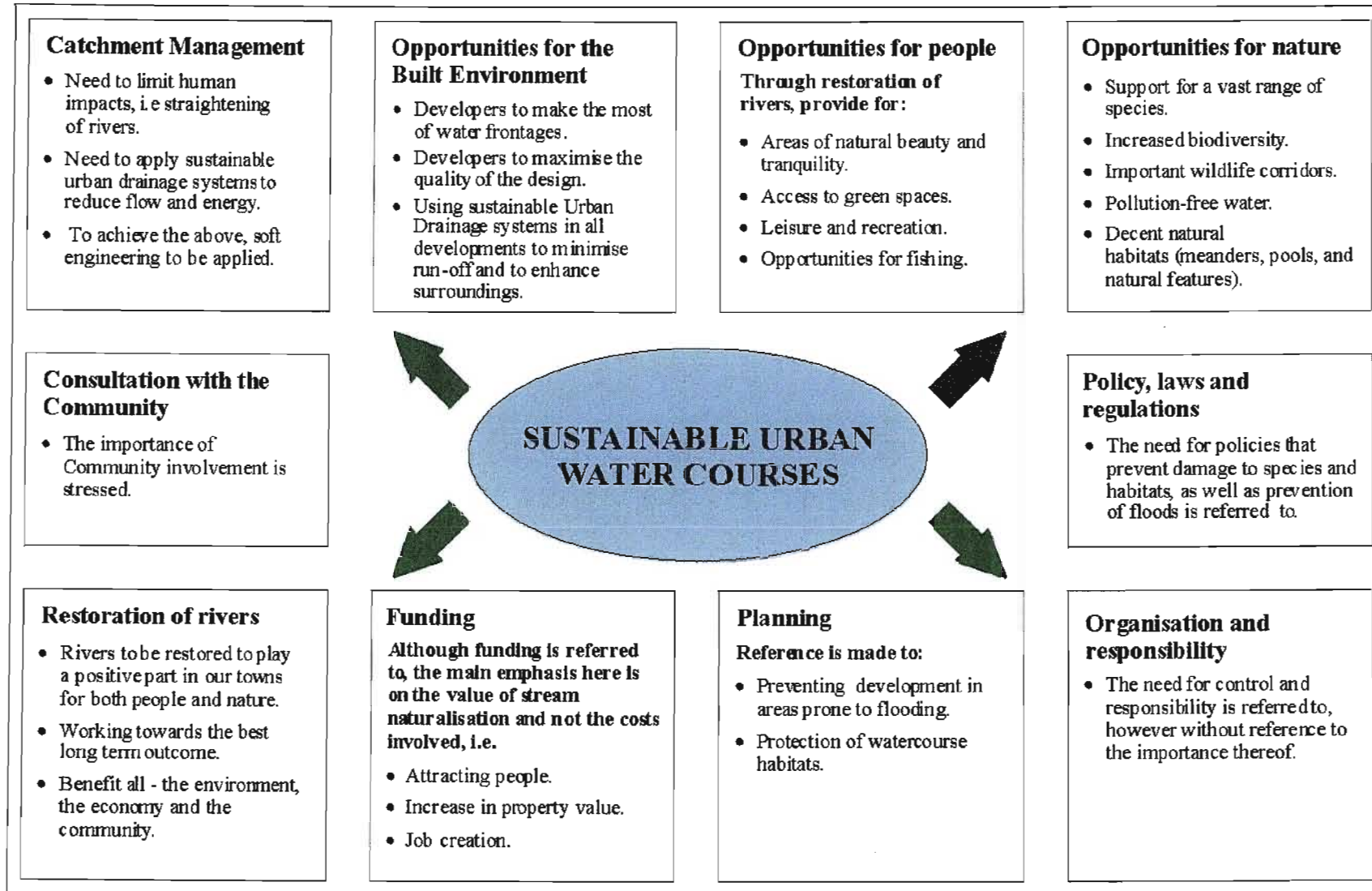
Before ordering the above factors into a conceptual framework they were evaluated against the key issues identified by various authors on this subject to ensure that the resultant conceptual framework is comprehensive and sound. For this purpose, the work of Nicolson (1987), Anderson (1983), Blankley, Fox, Savageau *et al.* (2001) and the Scottish Environmental Protection Agency (2000) were considered. The main issues identified by these authors are recorded in Table 3.1 below.

**Table 3.1:** Identification of the key issues identified by various authors on the subject of open space protection/ management and stream rehabilitation.

Authors				
Issues identified	Nicolson (1987)	Anderson (1983)	Blankley, Fox, Savageau <i>et al.</i> (2001)	Scottish Environment Protection Agency (2000)
	<ol style="list-style-type: none"> <li>1. Biological conservation</li> <li>2. Trail system</li> <li>3. Recreation</li> <li>4. Education</li> <li>5. Visual amenity</li> <li>6. River protection</li> </ol>	<ol style="list-style-type: none"> <li>1. Conservation</li> <li>2. Physical exercise</li> <li>3. Social interchange</li> <li>4. Visual amenity</li> <li>5. Environmental protection</li> <li>6. Finance</li> <li>7. Maintenance</li> <li>8. Security</li> <li>9. Administration</li> </ol>	<ol style="list-style-type: none"> <li>1. Aesthetic enhancement/ quality of life</li> <li>2. Recreational opportunity</li> <li>3. Acquisition of land for use as POS</li> <li>4. Conservation organisations</li> <li>5. Regulation</li> <li>6. Education</li> <li>7. Tax incentives</li> </ol>	<ol style="list-style-type: none"> <li>1. Catchment management</li> <li>2. Opportunities for the built environment</li> <li>3. Opportunities for people</li> <li>4. Opportunities for nature</li> <li>5. Policy, laws and regulation</li> <li>6. Organisation and responsibility</li> <li>7. Planning policies in support of USC management</li> <li>8. Funding</li> <li>9. Restoration of rivers</li> <li>10. Consultation with the community</li> </ol>

The Scottish Environmental Protection Agency (2000) has adopted a holistic approach in their river rehabilitation and protection programme. Although all three of the other studies under discussion recognised the need to balance the requirements of society with those of nature to achieve sustainable NOS and USC maintenance and protection, the Scottish Environmental Protection Agency also integrates USC management with catchment management to achieve a more holistic approach. They also realise the importance of supporting planning policies which will ensure that town planning approaches will recognise and support USC management. They further recognise the need for river rehabilitation and protection to be entrenched in policy, law and regulation if it is to be successful, whilst aspects such as funding, organisation and responsibility as well as consultation are all drawn together in their model, creating a well integrated and comprehensive urban river management framework. Due to the comprehensive nature of the Scottish Environmental Protection Agency (2000) framework plan, a simplified framework based on their work, detailing the main points addressed above has been included in Figure 3.1.

**Figure 3.1 : Scottish Environment Protection Agency framework in respect of sustainable urban water courses after the Scottish Environment Protection Agency 2000 v)**



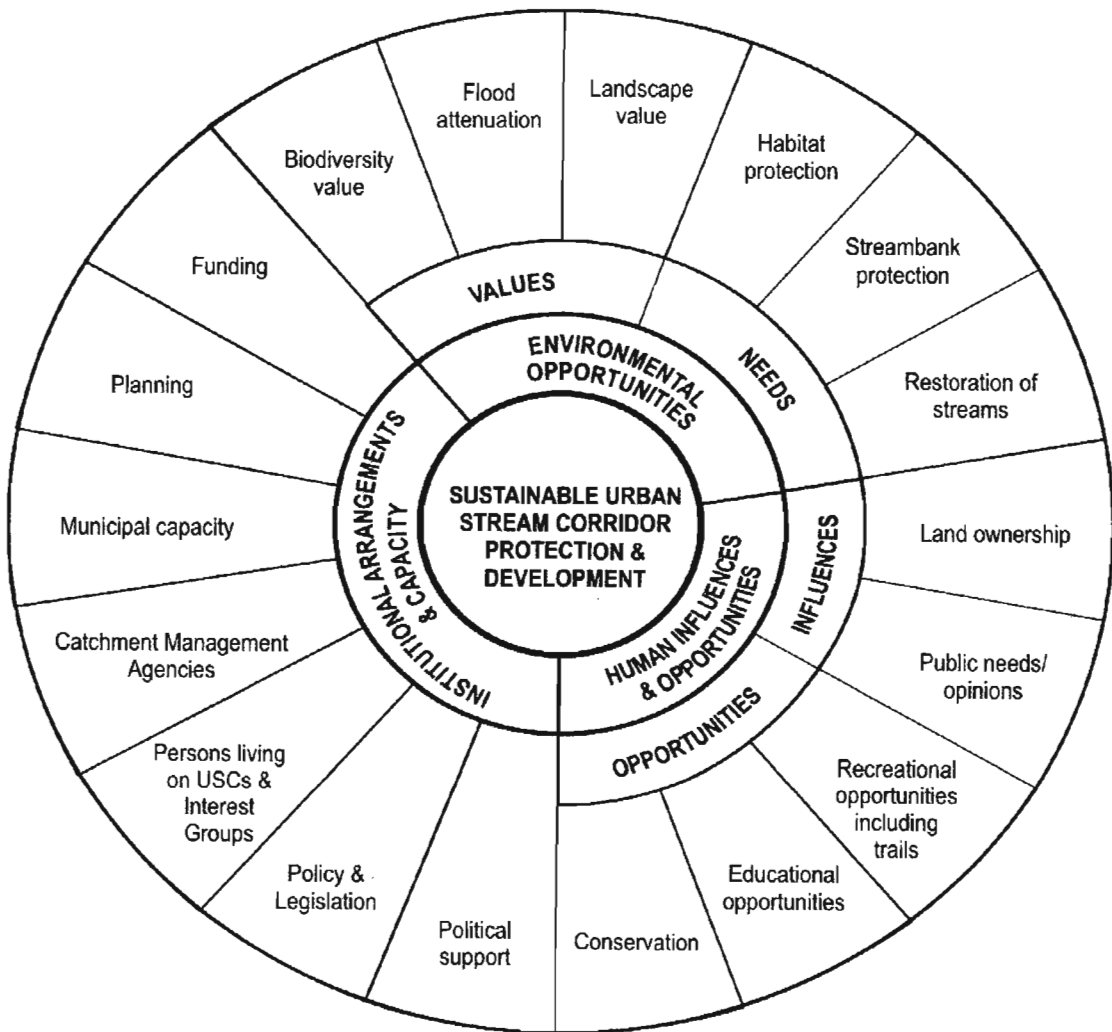
Returning to Table 3.1, there is agreement between Nicolson (1987) and Anderson (1983) on issues such as conservation, recreation and visual amenity, whilst the former refers to river protection and the latter to environmental protection respectively. There is also alignment between Blankley, Fox, Savageau *et al.* (2001) and the previous two authors with reference to the need for conservation and structures to support aesthetic enhancement and recreational opportunities. A new concept raised by the latter authors is that of regulation. This point is also supported by the Scottish Environment Protection Agency (2000) which recognise the need for policy, laws and regulation. The Scottish Environment Protection Agency augments the above list of important considerations citing issues such as catchment management, the need to consider the opportunities for people, planning and nature, as well as the need for funding and public participation. In addition to the above, the present study also acknowledges the need to consider issues such as political support and the need for river protection and rehabilitation being part of the planning process.

### **3.3. CONCEPTUAL FRAMEWORK**

Figure 3.2 represents a combination of the concepts contained in Section 3.2, establishing a holistic conceptual framework for sustainable urban stream corridor protection and development. This is shown as a circle consisting of three segments, representing the three main components, namely the environment represented by environmental opportunities, human influences and opportunities and finally institutional arrangements and capacity. The design of a segmented circle was a deliberate choice to signify equal importance of each of these components in the establishment of sustainable USCs.

The environmental component is further partitioned into two segments, one containing values consisting of biodiversity value, flood attenuation and landscape value, whilst the needs identified relate to habitat protection, streambank protection and restoration of streams. Human influences and opportunities, as the title indicates

is also divided into two sections, with land ownership and public needs/ opinions identified as influences whilst conservation, educational opportunities and recreational opportunities, which include trails are identified as opportunities for society. The final segment consists of legislation and policy, persons living on USC boundaries and interest groups, catchment management agencies, municipal capacity, planning and funding.



**Figure 3.2:** Conceptual framework detailing the issues that need to be considered to achieve sustainable urban stream corridor protection and development.

In conclusion, sustainable urban stream corridor protection and management is subject to the interaction of the three core components of this framework consisting of the environment, humankind and the institutions mandated by legislation to undertake environmental protection, which are in turn affected by the sub-components identified above.

### **3.4. IDENTIFICATION OF FURTHER RESEARCH**

The literature review has highlighted specific areas which are critical to the success of USC management and river rehabilitation. One of the main issues raised was the apparent decline in the interest to manage and protect NOS and their associated USCs. In this regard, it would be critical to test the public interest and use. As indicated in Section 2.5.1.3, people living along urban streams will be the subject of a survey due to their close linkage and the direct influence on USCs and *visa versa*.

This survey will serve multiple functions. The survey seeks to determine public need which is also linked to current use of USCs/NOS, which in turn is an important factor in the IDP determination which is largely based on expressed public need, funding and the overall priorities of a municipality.

A further issue which will be tested is the view point of respondents regarding the issue of funding. It is intended to elicit their views regarding the need to pay for the provision and protection of NOS and USCs, whether they are prepared to pay for this, and if not, who's responsibility is it considered to be. As an alternative, it will also be asked if respondents would be prepared to assist with the protection and maintenance of USCs through 'sweat' equity.

Interest in a particular problem or issue is often a result of knowledge or awareness of the problem. The literature review identified various threats to USCs. The survey will test respondents knowledge of both the positive and negative aspects associated with the USC, which will also be assessed to determine whether there is more of an

interest in the protection of USCs where respondents have a better awareness of environmental matters.

The allocation of resources for the protection and maintenance of USCs is the responsibility of the local municipality. This study will endeavour to assess the allocation of resources for the protection of USCs and the consequential inclusion of USC management in the IDP for Pietermaritzburg. Another emphasis of this study which will require further attention through informal interviews with the Municipality, is the availability of policies to focus and mandate the protection of USCs.

The above forms the core of the further research to be undertaken by means of questionnaires and interviews with residents living along urban streams, specific interest groups and specific specialists in institutions mandated to attend to USC management.

### **3.5 METHODOLOGY**

The previous Section highlighted aspects associated with USC management and protection which are intended for further investigation. Included amongst others was the testing of the community's interest in protecting NOSs and USCs and the interviewing of municipal officials and other stakeholders. The municipal policies and current practices will also be verified through a consideration of the current conditions of the Foxhill and Townbush Spruits. This section also considers the methods of analyses and synthesis, and concludes with the assumptions and ethics employed in the study and a brief description of the limitations of the research approach.

As this study represents a review of existing information relating to the protection and management of urban stream corridors with the intent to generate a policy for the management of urban streams, it is considered expository research (Melville and Goddard 1996).

### 3.5.1 Research approach

The research approach is made-up of six steps. The process commenced with a literature review focussed on the value, threats and framework in which USCs are managed. This was followed by a reconnaissance survey of the two subject streams to establish a better understanding of the streams and to form the basis for the compilation of a survey questionnaire, the third step of the process. This will be followed by the survey of riparian households and the interview of persons in institutions mandated with urban stream management as steps four and five respectively. The final product, will be the drafting of policy guidelines based on the findings of the above processes (Figure 3.3).

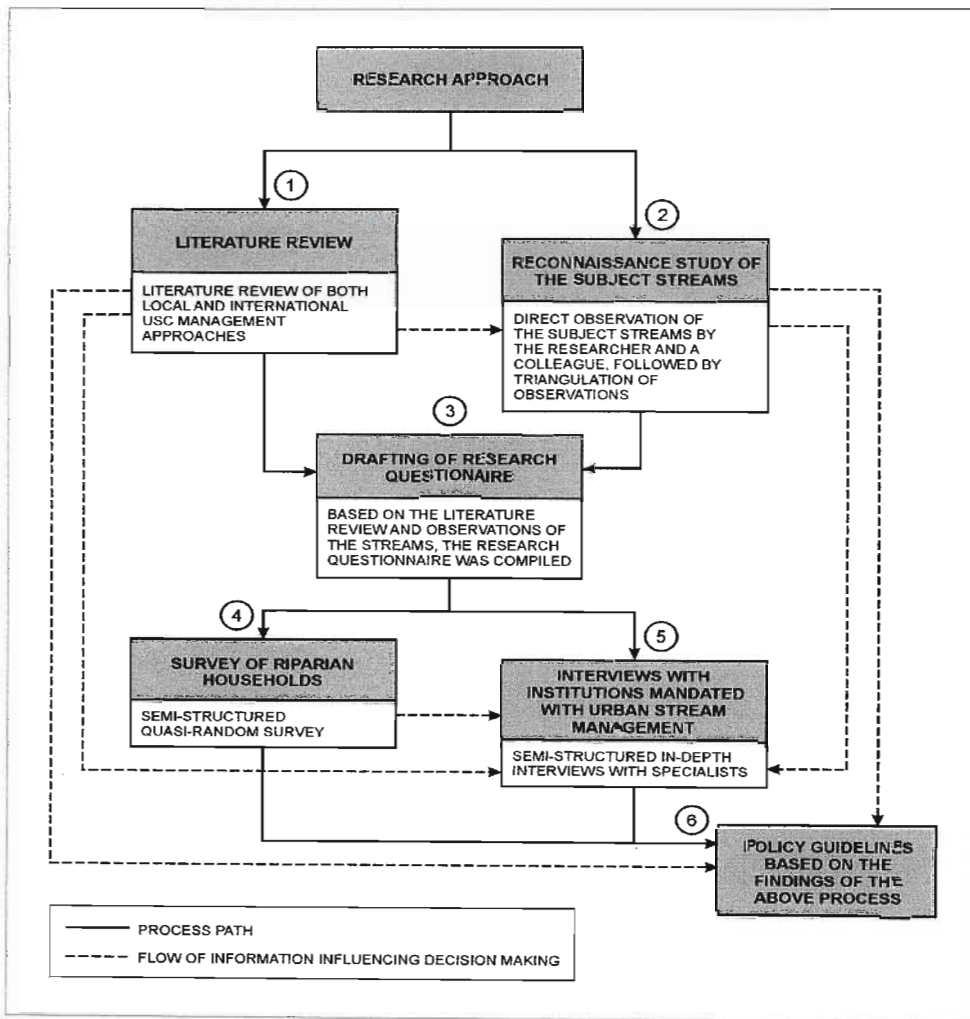


Figure 3.3: Overview of research approach, methods and process.

In addition to the sequential process discussed above, it should be noted that there is a matrix of information flows as detailed in Figure 3.3. For example, the information gathered through the literature review, although contributing directly to the drafting of the questionnaire, will also influence the interviews with persons in institutions mandated with USC management, the reconnaissance study, as well as the final policy guidelines.

### **3.5.2 Methods of observation and data collection**

The successful management and protection of USCs is subject to the actions of humans, which for this research are categorised into two groups, namely those people living along urban stream corridors, and secondly the institutions which are mandated by legislation to manage and protect water resources and other interest groups. To determine the status of streams in the city, the two pilot study streams which are considered as representative of streams in the city will be assessed at a reconnaissance level to establish what the current state of USCs are, as well as issues and concerns. This will give an indication of the municipal management currently being exercised. There will thus be three *foci* of research, which will be subject to different techniques of research as detailed in Figure 3.3.

The survey component for this project will be restricted to people along urban stream corridors to establish their views in respect of urban stream management and protection. For this purpose, two case study areas were chosen, namely the Foxhill Spruit in the southwest, and the Townbush Spruit in the north of Pietermaritzburg. This decision was based on several factors. Firstly, these streams formed part of the initial open space plan of Pietermaritzburg (Figure 1.2.), which intended for these two streams corridors to form the linkage between the Bisley Nature Reserve and the Ferncliff Nature Reserve, which form part of the catchment areas for the respective streams. In addition to the above these two streams drain through two different bio-resource groups, namely Southern Tall Grassland (Foxhill Spruit) and Ngongoni Veld (Townbush Spruit) respectively with differing precipitation and vegetation (Slade

1999). The streams drain through different socio-economic areas manifested in larger erven in the more affluent Ferncliff area and smaller erven in the Bisley area. The influence of these factors on peoples perceptions and needs would thus be included as part of this assessment.

The direct observation of these streams will be undertaken by the researcher and a colleague in order to facilitate triangulation of the observations, a technique recommended by Neuman (1999). This method requires the separate recording of results by different observers of the same phenomena with a subsequent comparison of results. Similarly, the researcher and a colleague will undertake the interviewing of people residing on the banks of the two case study streams.

The interviewing of specialists in institutions involved with USC management and interest groups will be undertaken by the researcher and will be based on the knowledge and current interaction with these specialists as part of the researcher's daily work routine. This study, due to its nature, will be restricted to qualitative techniques described below:

#### *3.5.2.1 Reconnaissance level assessment*

The case study streams will be evaluated by the researcher and a colleague to determine the status of these with regard to:

- the quality of the water and number of aquatic species observed,
- streambank conditions,
- the location of boundaries in relation to the streams,
- consideration of vegetation, including alien invasives,
- recording of reptile, animal and birdlife in these corridors, and
- maintenance of the streams and their associated corridors in general.

The purpose of this reconnaissance survey is to inform the design of the questionnaire and provide the required background to enable discussion with the stakeholders. It is also the intention to correlate the above observations when selected staff of the Msunduzi Municipality are interviewed.

### 3.5.2.2 *Semi-structured interviews with riparian households*

A quasi-random sample survey will be undertaken with persons residing on the edge of the stream corridors of the Foxhill- and Townbush Spruits by the researcher and a colleague, as discussed in Neuman (1999), using the Braby's directory as it groups names by street. It is intended to interview 20 households associated with each stream. For this purpose 20 names will be selected from the streets which border on the streams. The representivity of the research project may be questioned due to the relatively small sample, however it should be noted that other interest groups will also form part of this research in an attempt to counter this.

These interviews will be based on the questionnaire in **Appendix 1**, consisting both of open and closed questions following a semi-structured approach in order to explore areas of specific interest to the respondent in greater depth (Arksey & Knight 1999). In addition to the above, the open-ended questions will be based on the Likert scale to allow respondents a more realistic choice as opposed to a yes/no answer (Neuman 1999). The questionnaire will be used to test the main areas of interest listed below.

- Use and involvement with natural open spaces and conservancies
- Perceptions regarding open spaces in Pietermaritzburg
- Perceptions on the adequacy of open spaces
- Management of natural open spaces
- Ownership and property information
- Community involvement
- Environmental knowledge

Other pertinent questions were modeled around the determination of the responsibility of USC management. Questions relating to community involvement and environmental knowledge were included to the correlation between personal characteristics and involvement in USC protection and management.

#### *3.5.2.3 Semi-structured in-depth interviews with other stakeholders*

The researcher formulated specific questions regarding resource capacity, including financial, human and environmental capacity together with policy related questions. However, it is anticipated that many of the answers to the above questions will lead to new questions and hence the decision to use an semi-structured interview process (Arksey & Knight 1999). A similar process will be followed during the interviewing of interest groups who may well also raise certain questions that the researcher had not considered. The key questions are attached at [Appendix 2](#).

### **3.6 SYNTHESIS AND ANALYSIS OF DATA**

The direct observation of the two case study streams will be directly recorded during the survey of the streams followed by a triangulation exercise after the survey when the observations of the researcher and a colleague will be compared. The data collected during the semi-structured interviews will be synthesized immediately.

The data collected through the semi-structured questionnaire will be more complex. The responses will have to be categorised and tabularised to determine the range of responses, based on the Likert scale. This refined data will be analysed to determine the expressed needs of the sample population and to identify specific correlations. This will include whether there is a positive correlation between those people who belong to civic organisations and those persons who, through the survey have shown a positive interest in USC protection. Responses will also be compared between the two stream corridors to ascertain whether socio-economic factors have an influence on USC support.

## **3.7 ASSUMPTIONS, ETHICS AND ANTICIPATED PROBLEMS AND LIMITATIONS**

### **3.7.1 Assumptions**

This dissertation has two principal assumptions. The first relates to the streams chosen. The Foxhill and Townbush streams are two of many streams in Pietermaritzburg. As explained in Section 3.5.2 these two specific streams were chosen due to the fact that they formed part of the concept open space plan, they drain through two different bio-resource groups and socio-economic constituencies. These two streams are thus considered representative of streams in Pietermaritzburg. Associated with this, is the second assumption which relies on the fact that respondents to be interviewed along these streams are representative of the broader stream dwelling population of Pietermaritzburg.

### **3.7.2 Research ethics**

Respondents will be given the assurance that their views will be kept anonymous. In addition respondents will be advised that this is only a research project and that their specific requirements in respect of USC's may not be implemented as a consequence of this study.

### **3.7.3 Anticipated problems and limitations**

#### *3.7.3.1 Interviewing of people along the pilot streams*

Due to the estimated time-span of the survey (45 minutes), the fact that there is no financial gain for the respondents and as the researcher will, due to daily work commitments, only be able to undertake the survey after hours, it is anticipated that there may well be resistance to the administering of the survey.

#### *3.7.3.2 Bias because of knowledge of the area*

The researcher has been resident in Pietermaritzburg all of his life. Although the decision has been taken to randomly sample residents along the two stream banks,

he may well know some of these persons which may influence their responses. To limit this problem, the researcher employed the services of two other persons to assist him in the undertaking of the survey. This in itself brings its own problem, for example, whether the other interviewers have an adequate background and understanding of the subject of study? To limit this problem, the researcher chose two persons who have a geography background (geography honours degrees) and he spent some time with each of them to familiarise them with the background and intention of the study.

#### 3.7.3.3 *Sample size*

This study only involves the interviewing of 40 respondents along two urban streams. Ideally, based on the population of Pietermaritzburg, this sample should have been larger and should have included a broader spectrum of the population to ensure a more representative sample. This however falls beyond the scope of this project. Despite the above limitations it is still considered that this dissertation will provide a useful guide for municipalities relating to USC management.

## **CHAPTER 4: PRELIMINARY FINDINGS OF THE RECONNAISSANCE SURVEY**

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### **4.1 INTRODUCTION**

The research of this subject, as referred to in Chapter 3, includes the direct observation of the two streams. As the purpose of the reconnaissance assessment was to inform the development of the questionnaire, findings of the study are presented briefly in this chapter. In addition to helping inform and conceptualise the questionnaire, the reconnaissance assessment also helped create a context for consequent discussion with stakeholders.

The researcher accompanied by a colleague walked the length of the two streams recording their findings regarding the status of the water, the condition of the stream channel, visible amphibian life, alien plant species, insects, bird and animal life observed. The information below represents their finding after triangulation of their observations.

### **4.2 DIRECT OBSERVATION OF THE FOXHILL AND TOWNBUSH STREAMS**

The direct observation of the Foxhill and Townbush spruit corridors were undertaken with a dual purpose namely, to observe the status of these streams including Municipal intervention. Figure 4.1 contains two maps of the streams and findings presented visually. The findings are briefly recorded under the broad categories of stream channel and the terrestrial zone.

#### **4.2.1 Stream channel**

##### **4.2.1.1 *Foxhill Spruit***

The stream channel of the Foxhill spruit was characterised by a slow-flowing shallow stream, on average 2 to 3 meters wide and a flow depth of 15 to 25 centimeters. The water quality, with the exception of one pond (Figure 4.2), appeared to be good with frogs, tadpoles, crabs (Figure 4.3), and various other aquatic invertebrates noted fairly frequently in a clear and odourless stream. From a habitat point of view it therefore appeared to be fairly healthy. Whilst various stretches of the stream revealed erosion, two distinct occurrences of bank erosion were identified as referred to in Figure 4.1(a) and shown in Figure 2.6 (Chapter 2) and Figure 4.4. Physical intrusion on the stream channel was

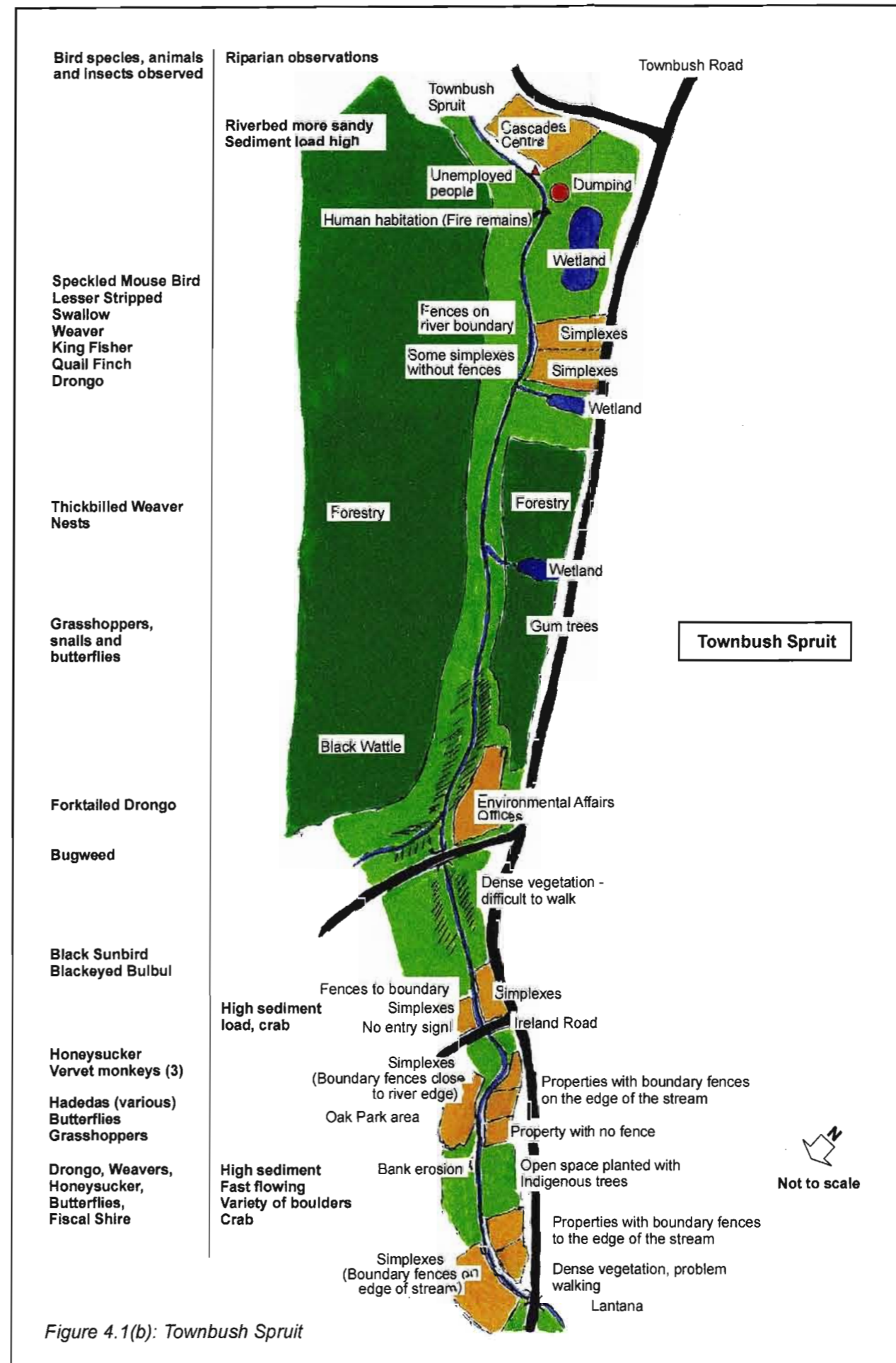
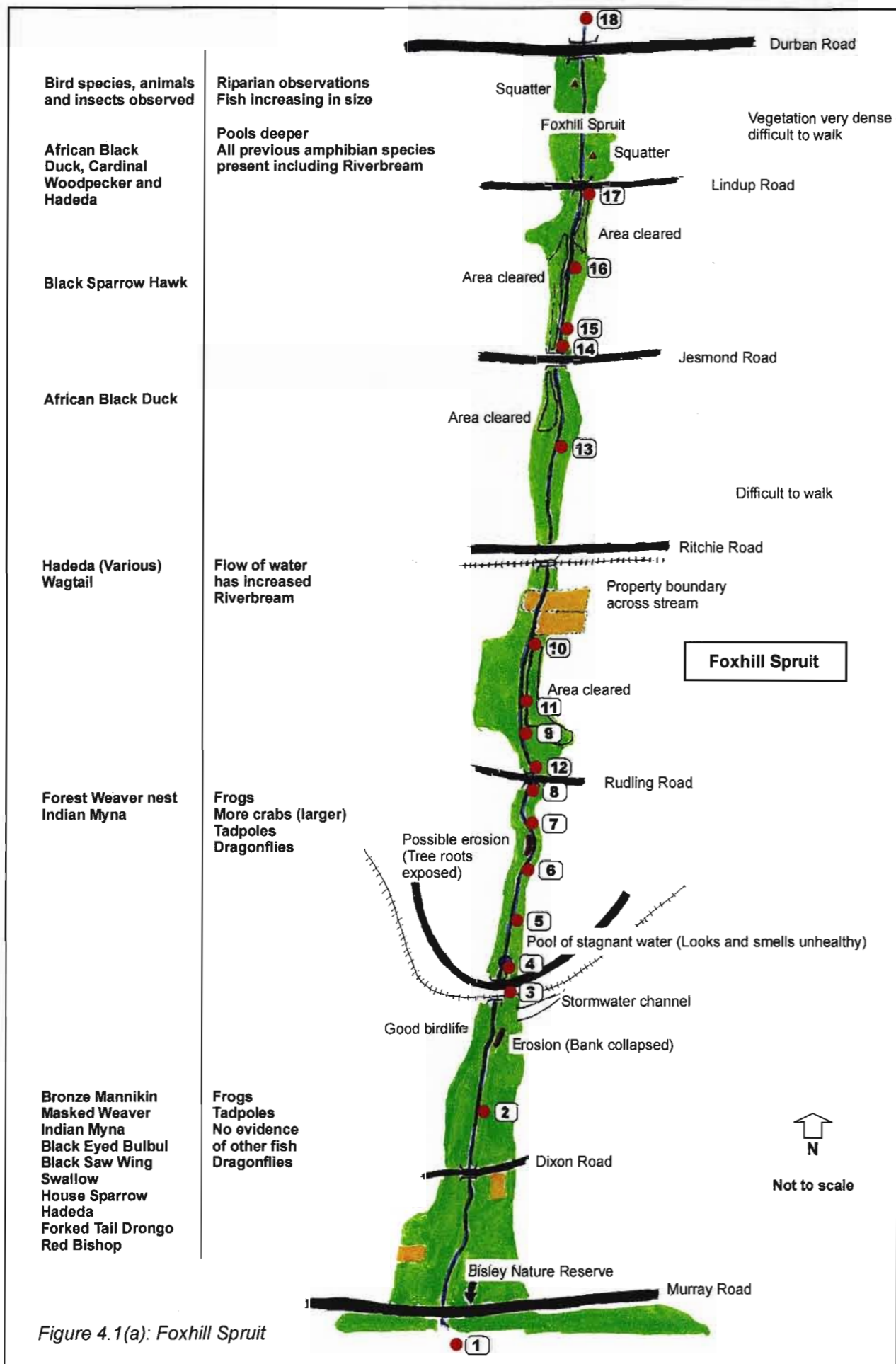


Figure 4.1(a) and (b): Schematic representation of observations during reconnaissance survey of the Foxhill and Townbush streams

limited to four properties which had boundary fences which extended to the stream channel.



**Figure 4.2:** Evidence of eutrophication as shown as masses of green algae - Foxhill Spruit, January 2002.



**Figure 4.3:** Two crabs hunting a frog - Foxhill Spruit, January 2002.

In support of the above observations, and in an effort to correlate same consideration was given to the findings of Schoeman (2001) who also studied the Foxhill Spruit, however from a riparian bank rehabilitation point of view. He considered 18 sites along the stream, the findings of which relate to this study are summarised in Table 4.1.



**Figure 4.4:** Channel incision and undercutting of outer bank with root system exposed. Foxhill Spruit, January 2002.

**Table 4.1:** Summary of the streambank condition and presence of alien vegetation. Foxhill Spruit (after Schoeman 2001).

Site number	Site description	Streambank condition	Presence of alien vegetation
1	Stretch of river source to the Dixon Road bridge	Stream banks are stable with structural elements of vegetation in tact.	Very little invasion by exotic species.
2	River stretch between Dixon Road bridge and service railway bridge	The stream banks are steep but stable.	This area has high exotic invasion in excess of 80%.
3	Area between the railway bridge and Andries Pretorius Road bridge.	Site is structurally sound with no signs of degradation. Plant growth on the upper banks are between 40% to 20% cover.	Alien vegetation has invaded this site.
4	Area directly below Andries Pretorius bridge.	It is believed that the structural instability is being caused by increased flow velocity as a result of the bridge concrete lining. Low presence of vegetation.	Some exotics noted.
5	Stretch between Andries Pretorius bridge and Rudling Road bridge.	There has been a clearing of vegetation which could lead to bank instability. This is exacerbated by the steepness and height of the banks.	A significant presence of alien vegetation reported.
6	Area, approximately 100 metres below the Andries Pretorius Road bridge.	This stretch is about 50 metres long and situated on an outside meander. There has been large scale degradation of this site.	A significant presence of alien vegetation reported.
7	Between the Andries Pretorius Road bridge and Rudling Road bridge, approximately 50 metres above the Rudling Road bridge.	This site is situated at a parallel flow and seems to have been channelised artificially. Evidence of large scale slumping due to undercutting observed. Both sides of the stream are actively eroding.	Extreme invasion by exotic species.
8	Site directly below Rudling Road bridge.	The integrity of the bank is supported by stone gabions.	No reference to aliens.
9	This site is 200 metres below the Rudling Road bridge.	The banks are stable due to summer growth. Streambanks will however be exposed to erosion in winter when summer growth dies back.	There is evidence of invasion by exotic vegetation species.
10	(Not noted).	Evidence of bank instability.	Alien species present.
11	Below Rudling road.	Although this is an outer meander and thus subject to high energy, the vegetation appears to be protecting the bank stability. Other pressures include a culvert.	Invasion of alien species.
12	Rudling Road bridge area.	Scour giving rise to bank retreat. Lack of deep rooted plants.	Young alien juveniles present.
13	This site is below Ritchie Road.	Two areas on an outside bank have been scoured out and undercut resulting in mass failure	There is a high infiltration on the left bank.
14	Area directly below Jesmond Road bridge.	The additional velocity as a consequence of the concrete lining of the bridge has severely affected the integrity of the bank. The scour has lead to undercutting and mass failure of the bank.	Pressures on the bank include alien invasives.
15	River stretch between Dixon Road bridge and service railway bridge	The stream banks are steep but stable.	This area has high exotic invasion in excess of 80%.
16	Stretch between the Jesmond and Lindup Road bridges	This represents a relatively high energy environment due to straight channelised waterway. Evidence of rill and sheet erosion observed.	In addition to a lack of vegetation, all the over storey vegetation consisted of alien invasives.
17	Lindup Road bridge.	Site serves as an access point for humans who seek shelter under the bridge. Ground is therefore bare and susceptible to erosion.	Invasion by alien species.
18	Area below the Durban Road bridge.	Concrete lining leading to high energy. This is leading to undermining of banks through scour.	Vegetation mostly alien.

These points are identified on Figure 4.1(a) for ease of reference. The number of observations of erosion and alien plant invasion support the observations of the researcher.

#### 4.2.1.2 Townbush Spruit

The Townbush spruit in comparison to the above had a totally different stream morphology. This stream on average 2 meters wide, was much deeper flow (50 centimeters and deeper) and high flow velocities. Turbidity levels in this stream made it very difficult to observe any stream life although a crab was noticed (Figure 4.5). This observation is also echoed by Duncan (2002) and Biggs *et al.* (2001) who ascribed this high levels of turbidity to bank collapse near the source of this stream.



Figure 4.5: Crab found in the Townbush stream. Note the high turbidity of the stream in the background.

This high levels of turbidity have a negative affect on light penetration, combinely leading to clogging of gills of fish and aquatic invertebrates and reduced juvenile fish survival and reduced prey visability for sight feeding predators (Biggs *et al.* 2001, Dallas, Day and Reynolds 1994). Evidence of bank erosion was noted in various stretches of the stream, mostly confined to high energy outer meanders. One particular visual incident of bank erosion, as detailed in Figure 4.6 was observed in this stretch of stream. This stream was plagued by boundary fences which extend to the boundary of the stream.

It was evident form the above observations that the Municipality was either not attending to streambank rehabilitation.



**Figure 4.6:** Scour of outer meander - Townbush Spruit, February 2002.

## **4.2.2 Riparian and terrestrial zone**

### **4.2.2.1 Foxhill Spruit**

The Foxhill spruit terrestrial zone is characterised by a fairly narrow corridor flanked and virtually choked by residential development. No trails are evident in the corridor. In fact the natural growth was so thick and unruly in two places as indicated in Figure 4.1(a) that walking was practically impossible without a panga to slash some of the 1,8 meter high grass and alien vegetation. Some stretches of the stream were plagued by alien species such as Lantana (*Lantana camara*), Mauritius thorn (*Caesalpinia decapetala*), Wild Yam (*Dioscorea sylvatica*) and Bugweed (*Solanum mauritianum*) highlighting the need for an alien eradication plan. The area is however home to a variety of bird species as indicated in Figure 4.1(a). One resident in the area, a keen bird watcher also provided a list containing 42 bird species observed in the stretch of the stream.

Whilst the corridor edge from Murray Road to the Andries Pretorius Road bridge was gradual with residential development being a substantial way from the stream channel and

fairly natural, the corridor edge from here-on becomes much more abrupt with residential development in close proximity discouraging movement between ecosystems as mentioned in Section 2.4.1.6 (FISRWG 1998).

The only evidence municipal involvement in these areas was restricted to the clearing and maintenance of some parts of the stream corridor, basically between the Andries Pretorius Road bridge and Lindup Road.

#### 4.2.2.2 Townbush Spruit

The Townbush stream corridor is more irregular in design. In places it is narrow, only 25 meters wide flanked by residential development, whilst in other places the corridor is a few hundred meters wide and appears to stretch even further as it is flanked by commercial forestry which seems to be a natural extension of the corridor. Besides an abundance in grasshoppers (Figure 4.7) and butterflies (Figure 4.8), this area also contained a variety of bird species as per Figure 4.1(b). This portion of the stream is also home to four wetlands which lend themselves to use by a variety of bird species as reflected in Figure 4.1(b). There is also a long stretch of this stream which is densely vegetated restricting any possibility of walking, specifically the area between Ireland Road and Department of Environmental Affairs.



**Figure 4.7:** Grasshoppers on *Solanum Mauritianum* (bugweed) - Townbush Spruit, February 2002.



**Figure 4.8:** Example of butterflies in the terrestrial zone.

The Townbush Stream corridor edge also represents a mixture of gradual and abrupt edges. Many of the townhouse simplex developments have been built on the stream edge and thus create an abrupt edge whilst other portions of the stream are flanked by natural open spaces and forestry, creating gradual edges encouraging the movement between ecosystems as shown in Figure 4.1(b). Even though many of the simplex developments are built on the stream bank and thus create an abrupt edge, it must be noted that many of these complexes are not fenced, which does soften the impact. Evidence of municipal involvement in the stream was restricted to a natural open space area one hectare in size between two complexes (Figure 4.9).



**Figure 4.9:** Evidence of municipal maintenance of natural open space area - Townbush Spruit, February 2002.

In summary, the above observations suggest that minimal maintenance of USCs are being undertaken by the municipality, whilst the current status of the two USCs revealed high turbidity levels in the Townbush Stream and evidence of alien vegetation invasion in the Foxhill Spruit.

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# APPENDIX 1

**RESEARCH QUESTIONNAIRE**  
**Pietermaritzburg Natural Open Space System**

Martin de Lange  
Telephone number : 033 - 355 6164  
E-mail : delangem@tlga.kzntl.gov.za

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**Details regarding respondent**

- (1). Name : \_\_\_\_\_
- (2). Title: Mr.  Mrs.  Dr.  Other, please state \_\_\_\_\_
- (3). Address :  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone number : \_\_\_\_\_

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This questionnaire consists of various questions. Some questions require a simple "Yes" or "No" answer whilst others may be in the form of a statement which needs your evaluation of such statement.

**1. Use and involvement with natural open spaces and conservancies**

1.1 How long have you lived here ?

[ ] Years.

1.2 Do you and your family make use of the natural open spaces in your neighbourhood and in Pietermaritzburg?

Yes  No .

(If **yes**, please go to question **1.3**.)

(If **no**. go to question **1.4**.)



1.4 What, in your opinion would increase the use of Natural Open Spaces in Pietermaritzburg ?

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1.5 What amount of money do you allocate to outdoor recreational activities on an annual basis ?

Less than R 250  R 251- R 500  R 501-R 1 000   
 More than R 1 001 .

Breakdown of costs	
Item	Approximate costs
Travel costs	
Donations	
Equipment	
Accommodation	
Other	
<b>Total</b>	

(ii) Which are your favourite destinations ?

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**2. Perceptions regarding open spaces in Pietermaritzburg**

2.1 It is submitted that there is a **general need** for natural open spaces **from a Society perspective**. Do you, in your opinion,

Strongly agree  Moderately agree  Neutral  Moderately disagree   
 Strongly disagree .

Please provide reasons for your answer above.

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- 2.2 Natural Open Spaces in Pietermaritzburg are marketed effectively. Do you, in your opinion, Strongly agree  Moderately agree  Neutral  Moderately disagree  Strongly disagree .

Please provide reasons for your answer above.

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- 2.3 (i) Do you have children ?  
Yes  No ,
- (ii) How often do your children play in the natural open spaces ?  
Very often  Often  Seldom  Very seldom  Never .

- (iii) It is argued that Natural Open Spaces have a role to play in the education and upbringing of our children. Do you, Strongly agree  Moderately agree  Neutral  Moderately disagree  Strongly disagree .

Please provide reasons for your answer above.

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- 2.4 It is considered that Natural Open Spaces in Pietermaritzburg are acceptable from a safety point of view. Do you, Strongly agree  Moderately agree  Neutral  Moderately disagree  Strongly disagree .

Please provide reasons for your answer above.

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**3. Question on the adequacy of open spaces**

3.1 Is it the duty of the Municipality to ensure that there are natural open spaces? Do you,

Strongly agree [ ] Moderately agree [ ] Neutral [ ] Moderately disagree [ ]  
Strongly disagree [ ].

3.2 It is submitted that the provision of open spaces in Pietermaritzburg satisfy Community requirements. Do you, in your opinion,  
Strongly agree [ ] Moderately agree [ ] Neutral [ ] Moderately disagree [ ]  
Strongly disagree [ ].

Please provide reasons for your answer above.

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3.3 (i) What, do you believe are the problems associated with open space planning in Pietermaritzburg?  
Please list the **top three reasons** in your opinion.

Suggestion	Reason

(ii) What effect do the following issues have on your use of natural open spaces in Pietermaritzburg ?

Pre-determined issue	Response	
	Positive effect	Negative effect
Security/personal safety (ie theft, mugging, snakes, animals, other dangers)		
Lack of publicity		
Lack of municipal resource allocation		
Ineffective maintenance of areas		
Lack of political support		
Water quality		
Flooding		
Illegal dumping		
Other :specify		

**4 Management of natural open spaces**

4.1 All citizens in Pietermaritzburg have a right to have a say in the management of natural open spaces in Pietermaritzburg. Do you, in your opinion,

Strongly agree  Moderately agree  Neutral  Moderately disagree  Strongly disagree .

Please provide reasons for your answer above.

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4.2 What can the local community do to support the Municipality with regard to Natural Open Space protection and management ?

Proposal	Response	
	Yes	No
Financial support		
Establishment of Environmental Committees		
Voluntary work		
Other		

4.3 Should there be a cost for using natural open spaces, which can be used for the maintenance thereof ?

Yes  No .

Please provide reasons for your answer above.

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4.4 Who should be responsible to pay for the maintenance of riverine areas?

(Tick the most suitable option)

Municipality	Land owners	Businesses	Combination of the previous 3 (Specify)	Other (Specify)
Reasons				

4.5 Should private land owners on properties along rivers be responsible for maintaining the riverine areas ?

Yes  No .

Please provide reasons for your answer above.

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4.6 Should the controlled harvesting of medicinal plants be permitted?

Yes  No .

Please provide reasons for your answer above.

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4.7 Would you use hiking trails along the riverine areas should this initiative be successful?

Most definitely  Definitely  Likely  Unlikely  No .

Please provide reasons for your answer above.

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4.8 Do you believe that the Municipality should carry the sole responsibility for managing natural open spaces in Pietermaritzburg?

Yes  No .

Please provide reasons for your answer above.

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4.9 Do you have any ideas to improve the use and maintenance of Natural Open Spaces in Pietermaritzburg ?

Area of concern	Suggested improvement
Maintenance	
Safety	
Biodiversity	
Water quality	

4.10 Would you support the proposal for the establishment of "Car guards" for the natural open spaces ?

Yes  No.

Please provide reasons for your answer above.

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## 5. Ownership and property information

5.1 Are you the owner of the property or is it rented / leased ?

Tenure	Tick applicable box
Owner	
Renting/ leasing	

5.2 Where is the property boundary in relation to the river ?  
(Only in respect of those persons who live along river boundaries).

Boundary description	Tick applicable box
Some distance away from the river	
On the river bank	
The middle of the river	
Across the river	
Do not know	

5.3 What type of fence do you have in relation to the natural open space area?

Type of fence	Tick applicable box
Concrete	
Wire	
Wood	
Hedge	
Other	

5.4 Do you have a gate from your property to the natural open space area ?

Yes  No .

5.5 What problems do you experience due to your position in respect of the natural open space area / river ?

Problem	Tick applicable box
Mosquitos	
Bank erosion	
Weeds	
Flooding	
Dumping	
Vagrants	
Litter in the stream	
Other ( Specify)	

## 6. Community involvement

6.1 Do you belong to any other civic/ environmental organisation ?

Yes  No .

If yes, please provide details :

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6.2 Do you :-

(i) Know who your Local City Councillor is ?

Yes  No .

(ii) Have you ever communicated with him/ her ?

Yes  No .

6.4 (i) Have you heard of the Msunduzi Catchment Management Forum (MCMF) ?

Yes  No .

(ii) Would you like to be involved ?

Yes  No .

**7. Environmental knowledge**

7.1 (i) Are you aware of the alien plant control legislation ?  
Yes  No .

(ii) Do you have any alien plants on your land ?  
Yes  No  Do not know .

If so, which type and would you clear them ?

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(iii) Do you have any alien plants in the riverine area near you ?  
Yes  No  Do not know .

If so, which type and would you clear them ?

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7.2 What are your perceptions of the water quality in the streams in your natural open space system ?

Good  Moderate  Poor  Bad  Do not know .

7.3 Have you noticed any changes to the river in this time ?

Yes  No .

If so, what changes ?

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7.4 (i) Are you familiar with the bird species in your area ?

Very familiar  Moderately familiar  Unsure  Unfamiliar   
Totally unfamiliar .

(ii) Please name some bird species observed in your area.

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7.5 (i) Are you familiar with the fish species in the streams in your area ?

Very familiar [ ] Moderately familiar [ ] Unsure [ ] Unfamiliar [ ]  
 Totally unfamiliar [ ].

(ii) Please name some fish species observed in the streams in your area.

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**8. General**

8.1 Do you enjoy gardening ?

Yes [ ] No [ ].

8.2 Would you like your garden to enter into the river (if security was not an issue) ?

Yes [ ] No [ ].

8.3 Do you have any photographs of the river ?

Yes [ ] No [ ]  
 ( Number of photographs [ ] ).

Photograph (Of what )	Approximate date of photograph

# **APPENDIX 2**

## Appendix 2: Summary of questions to be posed to stakeholders

Institution	Questions posed
Chief Town and Regional Planner- Msunduzi Municipality	<ol style="list-style-type: none"> <li>1. Does the Msunduzi Municipality have any land use controls in support of the protection of urban stream corridors?</li> <li>2. Will the new Integrated Development Plan provide better protection for urban streams?</li> <li>3. How is the Planning Directorate dealing with the issue of cadastral boundaries which extend to the centre line or across streams?</li> <li>4. Does the Municipality have any policies to protect urban stream corridors in the absence of zoning controls?</li> <li>5. Are there any environmentally related policies supporting urban stream management?</li> <li>6. Are floodlines taken into account during the planning of new land development?</li> </ol>
Chief Stormwater Engineer and his Deputy- Msunduzi Municipality	<ol style="list-style-type: none"> <li>1. What policies are in place to protect urban stream corridors?</li> <li>2. What floodline requirements do the Municipality apply and what are the consequences for development along the streams?</li> <li>3. Who maintains urban stream corridors?</li> <li>4. What is the purpose of this maintenance?</li> <li>5. Is there political support for urban stream corridor management?</li> <li>6. Is the maintenance of the streams environmentally sensitive?</li> <li>7. Is there good co-operation and support between Department of Water Affairs and Forestry, the Msunduzi Catchment Management Forum and the Municipality relating to urban stream corridor management?</li> <li>8. What erosion control measures are in place?</li> <li>9. Is there funding being set aside for urban stream corridor management?</li> </ol>
Director Environmental Management Ethekweni Municipality	<ol style="list-style-type: none"> <li>1. Overview of the Durban Metropolitan Open Space System (D'MOSS).</li> <li>2. Financial allocation supporting D'MOSS.</li> <li>3. From driving to Durban along the old main road it would appear that the "Adopt a spot campaign" in Durban is a success. To what is this attributed?</li> </ol>
Manager Keep Pietermaritzburg Clean Association	<ol style="list-style-type: none"> <li>1. What projects do you/your organisation get involved in?</li> <li>2. Do you have projects relating to the management of urban stream corridors?</li> <li>3. Which areas are targeted for the "adopt a spot" campaign?</li> <li>4. What sources of funding do you have? Has this increased over recent years?</li> <li>5. Is there linkages between yourself and the Parks and Recreation Department?</li> <li>6. Do you have any views on the role of businesses in the protection of our open spaces and urban stream corridors?</li> <li>7. What are your priorities?</li> <li>8. Are there any linkages with the D'MOSS and their advances in open space management?</li> <li>9. Are there any ideas how to achieve proper USC management and increase use of open spaces?</li> <li>10. How does KPCA achieve public involvement? What methods are used to ensure involvement?</li> </ol>
Deputy Director, Parks and Recreation Department, Pietermaritzburg Municipality	<ol style="list-style-type: none"> <li>1. What legislation or policies dictate the functioning of the Parks Department?</li> <li>2. Is there an alien weed eradication plan and is this linked to USC management?</li> <li>3. What is the Parks Department doing to protect urban water courses?</li> <li>4. Is there a specific urban stream corridor implementation policy?</li> <li>5. Does the Parks Department's maintenance programme include urban stream corridors?</li> <li>6. Are there any plans to initiate the trails as contained the original 1990 Pietermaritzburg Metropolitan Open Space System?</li> <li>7. What are the costs of stream maintenance?</li> <li>8. Mr Bartholomew was requested to provide a brief history of the Pietermaritzburg open space plan.</li> </ol>

Institution	Questions posed
Msunduzi Catchment Management Forum	<ol style="list-style-type: none"> <li>1. Mandate of the Msunduzi Catchment Management Forum (MCMF).</li> <li>2. Role of the MCMF with regard to USC management.</li> <li>3. Programmes adopted in support of USC management.</li> <li>4. Financial support for USC management including erosion control and rehabilitation work.</li> <li>5. Integration of functions with other Catchment stakeholders.</li> <li>6. Progress with the involvement of the public.</li> <li>7. Future plans of the MCMF?</li> <li>8. How can the role of the forum be strengthened?</li> </ol>
Private sector Conservancies	<ol style="list-style-type: none"> <li>1. Programmes supporting USC management.</li> <li>2. Financial allocation supporting USC management.</li> <li>3. Obstacles in the way of effective USC management.</li> <li>4. Suggestions in support of more effective USC management.</li> <li>5. Public involvement.</li> </ol>

## **Component B**

**Towards effective urban stream corridor  
management: A case study of Pietermaritzburg**

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### **ABSTRACT**

***"The care of the river is not a question of the river but of the human heart"* – Tanaka Shoza, in Federal Interagency Stream Restoration Working Group (1998, 1-ii)**

Not only does urbanisation have a negative impact on the availability of natural open space areas but also has significant consequences for urban stream corridors (USCs), through erosion, littering, habitat loss, loss of amenity and negative effects on biodiversity. The principle objective of this paper is to, through qualitative research, develop policy guidelines to guide municipalities in implementing effective USC management practices.

Firstly the critical issues influencing USC protection and management are identified through the consideration of the value, threats and organisational structures in support of USC management. This process leads to the establishment of a conceptual framework containing the critical considerations associated with USC management such as the value of USCs for nature and society, the need for public involvement, effective implementation of policy, structures supported by implementation policies and the integration of USC management in urban planning. Key to the success of USC management is public involvement. As a consequence a survey was undertaken with 40 urban riparian households along two streams in Pietermaritzburg to establish their opinion regarding natural open spaces (NOSs) and USC management. Interviews were also undertaken with key stakeholders in the USC process including municipal officials, the chairpersons of the Msunduzi Catchment Management Forum and the Cleland/Mkondeni Conservancy.

Respondents expressed a definite need for open spaces and associated USCs. The important role of open spaces and USCs in the education of children featured highly on the priorities of respondents. Whilst municipalities have an instrumental responsibility and role in the success of USCs, the role that the public have to play was also acknowledged. Respondents acknowledged the need for joint responsibility.

The conceptual framework together with the views of respondents and functionaries at a municipal level formed the basis for the policy guideline which identifies specific prerequisites which need to be adhered to in order to achieve effective USCs. It is submitted that USC management should form part of a holistic open space programme which includes stream management and incorporates concepts such as effective implementation policies, the integration of USC management in urban planning and catchment management, the prioritisation of areas to be protected and public participation. Despite the limitations of this survey it is considered that these policy guidelines will benefit USC management programmes and should form an integral part of the current zonation of land in terms of the land use management component of recently initiated Integrated Development Plans (IDPs).

## **Introduction**

Public open spaces have always had an important role to play with regard to cities and urban areas, representing a means of bringing nature back to the city and allowing people to escape the sometimes claustrophobic nature of the city (Taylor and Coalter, 2001; Integrated Planning Services, 1997). In fact, due to the functions they fulfil for society and nature, these areas are often referred to as the lungs of the city (Scheer, 2001; Francis, Cashdan and Paxson, 1984). The importance of open spaces is also acknowledged in the Pietermaritzburg Integrated Development Plan (IDP), recognising that the city needs a Metropolitan Open Space System (MOSS) (Msunduzi Councillors and Officials, 2002).

This study is concerned with the conservation of urban stream corridors (USCs), consisting of the in-stream or aquatic zone, the riparian or transitional zone comprising the stream and its associated banks, and the adjacent terrestrial zone which represents the surrounding natural open space area which is thus a sub-component of natural open space

(NOS). Figure 1 shows the conceptual relationship between the different types of open spaces, recognising urban stream corridors (USCs) as important components of NOSs.

Integrated Planning Services (1997) point out that open space planning has often been undertaken on an *ad hoc* basis creating fragmented open spaces, failing to achieve ecological, visual and spatial continuity. The importance of incorporating urban stream restoration within development planning is advanced by Petts, Heathcote and Martin (2002). Wade, Large and De Waal (1998) also advocate a holistic approach and hence this endeavour to recognise and integrate USCs as part of the current land use definition, 'environmental management or services' (Kahn, Von Riesen and Jewel, 2001), which is aimed at the protection of important environmental services such as proclaimed parks and areas of bio-diversity, and is discussed further below.

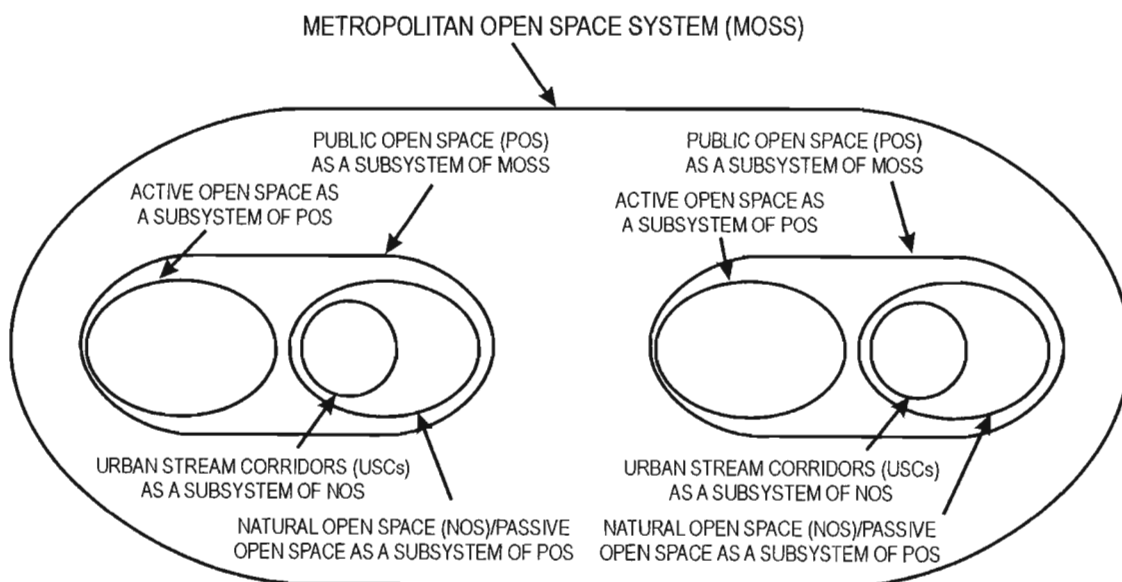


FIGURE 1: Conceptual relationship between metropolitan open space systems (MOSS), public open space (POS), active open space (e.g. constructed open spaces such as sports stadia, playing fields and electric power line servitudes), natural open space (e.g. conservation areas, river reserves and natural areas), and urban stream corridors (USCs).

All municipalities in South Africa have been tasked to prepare integrated development plans (IDPs). In KwaZulu-Natal, the Department of Traditional and Local Government Affairs have also required each municipality to compile a land use management system (LUMS) to convert and replace current town planning schemes. Kahn, Von Riesen and

Jewel (2001), the authors of the KwaZulu-Natal land use management system guideline manual observe that planners, in relation to NOSs, have been focussing on amenity rather than recognising the important services provided by NOSs which facilitates sustaining development. As a consequence, the KwaZulu-Natal LUMS provides appropriate zonation as well as management overlays in support of the recognition and protection of NOSs. In contrast to the zonation of specific portions of land for a specific land use, management plans represent a broad statement of intent, applicable to a larger area.

Over the past few decades, the increasing negative impact of urbanisation and increasing impact on the urban open space landscape has led to a realisation that POS needs to be protected and managed (Durban Metropolitan Council, 1999; Integrated Planning Services, 1997; Mhlanga, 1994; Roberts, 1994; Smith and Hellmund, 1993; Council for the Environment, 1989; Cooper and Antoni, 1983; Anderson, 1983). The United States of America, for example, between 1959 and 1982, experienced an increase of twenty-two million acres or 45% in urban and other developed land uses (Heimlich and Anderson 1987, in Smith and Hellmund, 1993).

Degradation of natural fauna and flora, caused by increased urbanisation, is however not only restricted to our public and natural open spaces. Wade *et al.* (1998) acknowledges that society has also had a negative effect on river corridors through alteration, over-engineering, pollution and unsympathetic management. Petts *et al.* (2002, p.104) observe that *"(t)he urban process has led to the degradation of urban watercourses and their rehabilitation is central to the regeneration of the urban environment."*

Due to the hydrological cycle and natural properties of streams, most streams will erode their banks and flood from time to time. Urbanisation, together with the associated increase in impervious surfaces, increases the erosion and flooding potential whilst decreasing recharge to groundwater (Schueler, 1987; Hall, 1984) leading to problems such as flooding, habitat loss, channel widening through bank erosion and channel incision through streambed erosion (United States Environmental Protection Agency, 2001). Channel incision, one of the effects of urbanisation, can clearly be seen in Figure 2(a) and (b). To protect and mitigate USCs from the above negative influences it is essential that a proper management programme, supported by the appropriate policy, is developed and implemented.

Integrated Planning Services (1997) suggest that people have a deep-seated need for access to open spaces described as 'the desire to get back to nature'. Roberts (1990) reflects on the negative effects of urbanisation and lack of urban open spaces, whilst contrasting the positive effects of open spaces in relieving tension and stress. Open spaces therefore have an intrinsic value to society, but this value is all too often seen as being subordinate to basic human needs such as the provision of water and shelter, especially in developing countries (Integrated Planning Services, 1997). Based on the abovementioned mismanagement and increased pressure on open spaces it would therefore appear that the intrinsic values attached to NOSs are diminishing (Integrated Planning Services, 1997).



FIGURE 2: Figure 2(a) shows bank scour downstream of a bridge on the Foxhill Spruit, while 2(b) shows the incised channel form, typical of many urban streams.

In the 1990s, the Msunduzi Municipality (Municipality for Pietermaritzburg) drafted a concept plan to create a Natural Open Space System through the linkage of NOSs,

through a river corridor system (Bartholomew, pers. com., 2001). The establishment of a metropolitan open space system has however not been effective (Msunduzi Councillors and Officials, 2002). The intention of this paper therefore is to also consider the problems associated with the maintenance of USC systems as a subsystem of NOSs development, based on the experience of the Msunduzi Municipality.

NOS planning and maintenance is dependant on how they are perceived and valued by communities, who therefore have an essential role to play in ensuring the appropriate municipal level of priority with regard to NOS planning. A survey of 40 riparian households in the KwaZulu-Natal city of Pietermaritzburg was therefore undertaken to establish the opinion of these households regarding NOS and USC management.

## **Methods**

This paper will therefore identify the problems which affect USC management and alternative methods which could be considered to overcome these problems, with the ultimate purpose of producing policy guidelines which could be adopted as a basis for an effective USC management programme. For this purpose a literature review together with a reconnaissance survey of two streams formed the basis of identifying the context and problems. Based on the importance of public interest, a quasi-random sample of 40 urban riparian households were interviewed on the basis of a semi-structured questionnaire (Appendix 1). Twenty households were each selected along the Townbush and Foxhill streams selecting surnames from a Braby's directory. Respondents were selected to cover the whole reach of the stream under consideration. In the case of simplex developments, the final selection was done on the ground in order to select those individuals on the stream banks. The primary purpose of the questionnaire was to determine public need and interest in USCs whilst also considering their perceptions of the maintenance and protection practices of the municipality. Other pertinent questions were modelled around the determination of the responsibility for USC management.

Based on the current South African legislative framework key roleplayers, as identified in Table 1 were also identified. In-depth, open-ended interviews were consequently undertaken with senior representatives of the Msunduzi Municipality, the local Catchment Management Forum and other specific interest groups.

TABLE 1: Sectors approached regarding urban stream management

Sectors approached	Whom approached	Questions posed	Methodology
Persons living along urban stream corridors	Quasi-random selected families living along the Foxhill and Townbush streams (n = 40)	<p><b>1. Use of NOSs and USCs</b></p> <p>1.1. Use and involvement with NOSs and conservancies.</p> <p>1.2. What would increase use of NOSs?</p> <p><b>2. Perceptions regarding open spaces: Determining of views relating to:</b></p> <p>2.1. Need for NOS.</p> <p>2.2. Efficient marketing.</p> <p>2.3. Safety.</p> <p><b>3. Adequacy of open spaces</b></p> <p>3.1. Adequacy of open spaces in Pietermaritzburg.</p> <p>3.2. Perceived problems.</p> <p><b>4. Management of NOSs</b></p> <p>4.1. Should Municipalities have sole responsibility for management of NOSs?</p> <p>4.2. What can the community contribute?</p> <p>4.3. Should there be payment for use of NOSs?</p> <p>4.4. Use of proposed hiking trails.</p> <p><b>5. Environmental awareness</b></p> <p>5.1. Testing of environmental knowledge.</p> <p>5.2. Catchment management knowledge.</p>	Semi-structured questionnaire
Public sector Municipality <input type="checkbox"/> Parks and Recreation Department	The Deputy Director	<p>1. What legislation or policies dictate the functioning of the Parks Department?</p> <p>2. Is there an alien weed eradication plan and is this linked to USC management?</p> <p>3. What is the Parks Department doing to protect urban water courses?</p> <p>4. Is there a specific urban stream corridor implementation policy?</p> <p>5. Does the Parks Department's maintenance programme include urban stream corridors?</p> <p>6. Are there any plans to initiate the trails as contained the original 1990 Pietermaritzburg Metropolitan Open Space System?</p> <p>7. What are the costs of stream maintenance?</p> <p>8. Mr Bartholomew was requested to provide a brief history of the Pietermaritzburg open space plan.</p>	In-depth semi-structured interview
<input type="checkbox"/> Engineering Department	The Chief Engineer and his Deputy	<p>1. What policies are in place to protect urban stream corridors?</p> <p>2. What floodline requirements do the Municipality apply and what are the consequences for development along the streams?</p> <p>3. Who maintains urban stream corridors?</p> <p>4. What is the purpose of this maintenance?</p> <p>5. Is there political support for urban stream corridor management?</p> <p>6. Is the maintenance of the streams environmentally sensitive?</p> <p>7. Is there good co-operation and support between Department of Water Affairs and Forestry, the Msunduzi Catchment Management Forum and the Municipality relating to urban stream corridor management?</p> <p>8. What erosion control measures are in place?</p> <p>9. Is there funding being set aside for urban stream corridor management?</p>	In-depth semi-structured interview
<input type="checkbox"/> Planning Department	The Chief Town and Regional Planner	<p>1. Does the Msunduzi Municipality have any land use controls in support of the protection of urban stream corridors?</p> <p>2. Will the new Integrated Development Plan provide better protection for urban streams?</p> <p>3. How is the Planning Directorate dealing with the issue of cadastral boundaries which extend to the centre line or across streams?</p> <p>4. Does the Municipality have any policies to protect urban stream corridors in the absence of zoning controls?</p> <p>5. Are there any environmentally related policies supporting urban stream management?</p> <p>6. Are floodlines taken into account during the planning of new land development?</p>	In-depth semi-structured interview
<input type="checkbox"/> Keep Pietermaritzburg Clean Association	The Manager	<p>1. What projects do you/your organisation get involved in?</p> <p>2. Do you have projects relating to the management of urban stream corridors?</p> <p>3. Which areas are targeted for the "adopt a spot" campaign?</p> <p>4. What sources of funding do you have? Has this increased over recent years?</p> <p>5. Is there linkages between yourself and the Parks and Recreation Department?</p> <p>6. Do you have any views on the role of businesses in the protection of our open spaces and urban stream corridors?</p> <p>7. What are your priorities?</p> <p>8. Are there any linkages with the D'MOSS and their advances in open space management?</p> <p>9. Are there any ideas how to achieve proper USC management and increase use of open spaces?</p> <p>10. How does KPCA achieve public involvement? What methods are used to ensure involvement?</p>	In-depth semi-structured interview
<input type="checkbox"/> eThekweni Municipality: Environmental Department	The Director: Environmental Department	<p>1. Overview of the Durban Metropolitan Open Space System (D'MOSS).</p> <p>2. Financial allocation supporting D'MOSS.</p> <p>3. From driving to Durban along the old main road it would appear that the "Adopt a spot campaign" in Durban is a success. To what is this attributed?</p>	Semi-structured interview
Msunduzi Catchment Management Forum	The Chairperson	<p>1. Mandate of the Msunduzi Catchment Management Forum (MCMF).</p> <p>2. Role of the MCMF with regard to USC management.</p> <p>3. Programmes adopted in support of USC management.</p> <p>4. Financial support for USC management including erosion control and rehabilitation work.</p> <p>5. Integration of functions with other Catchment stakeholders.</p> <p>6. Progress with the involvement of the public.</p> <p>7. Future plans of the MCMF?</p> <p>8. How can the role of the forum be strengthened?</p>	In-depth semi-structured interview
Private sector Conservancies	The Chair Person of the Cleland/ Mkondeni Conservancy	<p>1. Programmes supporting USC management.</p> <p>2. Financial allocation supporting USC management.</p> <p>3. Obstacles in the way of effective USC management.</p> <p>4. Suggestions in support of more effective USC management.</p> <p>5. Public involvement.</p>	In-depth semi-structured interview

## Conceptualisation of urban stream corridor management

Consideration of the range of issues identified in the literature review lead to the development of a conceptual framework for urban stream corridor management. The framework (Figure 3) is shown as a circle consisting of three segments, representing the three main components, namely the environmental opportunities, human influences and opportunities and thirdly, institutional arrangements and capacity. The design of a segmented circle was a deliberate choice to signify equal importance of each of these components in the establishment of sustainable USCs.

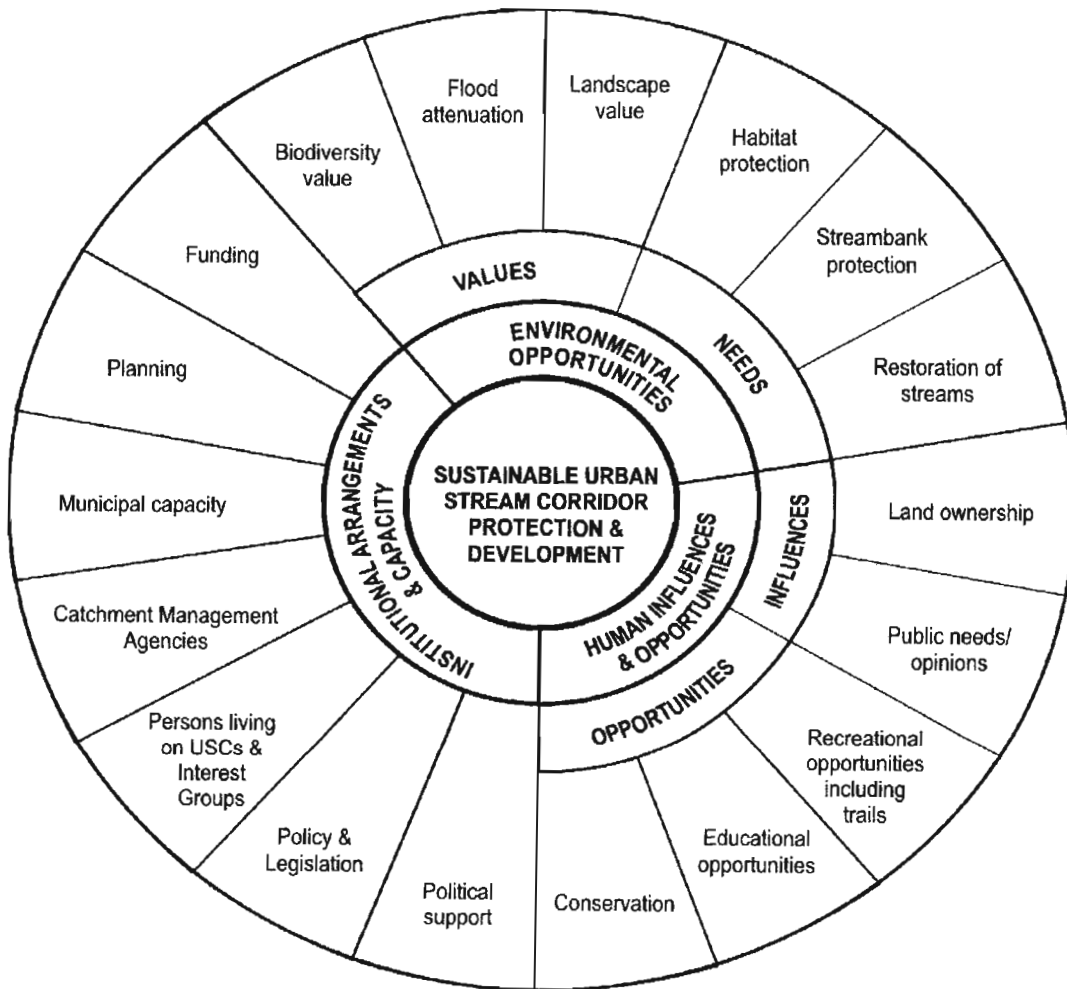


FIGURE 3: Conceptual framework detailing the issues that need to be considered to achieve sustainable urban stream corridor protection and development.

In addition to fulfilling open space services such as water supply, water pollution control through wetlands, recreational and amenity value (Durban Metropolitan Council, 1999),

USCs also provide multiple habitats for various plant and animal species to co-exist (Lyle and Quinn, 1991, in Mauz, Lambert and Groessl, 1999; Raven *et al.*, 1995; Johnson, 1988). Mauz, Lambert and Groessl (1999, p.11), point out that “...*biological corridor conservation prevents the fragmentation of habitat and allows the movement of populations of wildlife to different locations.*” This important connectivity value of USCs is recognised by Federal Interagency Stream Restoration Working Group (1998) and Way (1977). Wetlands and streams also function as natural carbon sinks breaking down pollutants as highlighted by the Durban Metropolitan Council (1999), whilst the flood attenuation value of USCs is recognised by Roberts (1994, p. 21) who explains that “(t)he open space system is seen as a way to employ natural areas in an efficient control of storm water runoff.” Due to their vulnerability to human influences, USCs require protection of habitats, streambanks and rehabilitation of damaged environments. The environmental component of the framework is accordingly partitioned into two segments, one containing values consisting of biodiversity value, flood attenuation and landscape value, whilst the needs identified relate to habitat protection, streambank protection and restoration of streams.

Human influences and needs represent the second component of this conceptual approach. Although society has a positive influence through conservation initiatives and the protection of certain areas, there are many negative aspects such as habitat loss due to increased development (Smith and Hellmund, 1993), litter (Petts *et al.*, 2002; Riley, 1998), alien weed infestation (Londt, 2002; Petts *et al.*, 2002; Slade, 1999) and fences and barriers and land ownership (Passino, 2000).

Whilst considering human influences, it is important to give attention to public participation. The need for public participation in the management of open space is well recognised locally (Durban Metropolitan Council, 1990; Nicolson, 1987). This need is also entrenched in the legislation, for example:

Section 2(4)(f) of the National Environmental Management Act No. 107 of 1998 – “*The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding...*”, and Section 9(g) the National Water Act No. 108 of 1998 - “*enable the public to participate in managing the water resources within its water management area*”.

Beyond the general expectation that the public should be part of open space management, persons living along urban stream corridors in particular should have a direct interest in the health of the corridor as this may have a direct influence on them. Their actions also may have a direct influence on the stream through illegal dumping, unnecessary clearing of streams to avoid flooding potential or pollution through pool chemical discharge into streams. Through active participation in projects, the public takes ownership and develops real commitment to projects (Petts *et al.*, 2002; Outhet *et al.*, 1999; Shephard *et al.*, 1999). In fact, the newly adopted integrated development planning approach places much more emphasis on public involvement as required by Section 29 of the Local Government Municipal Systems Act No. 32 of 2000. Municipal NOS planning and maintenance is dependant on community value and the need expressed in respect thereof through the IDP participatory and service prioritising process. The public participation process can also enter the political arena as has been demonstrated in the recent public debate on the intention of the Msunduzi Municipality to allow the development of a Service Station in Alexandra Park, a public open space in Pietermaritzburg (Vanderhaeghen, 2003).

This component of the framework is accordingly categorised into influences and opportunities. Land ownership and public needs/ opinions are identified as influences whilst conservation, educational opportunities and recreational opportunities, which include trails are identified as opportunities for society.

The final segment consists of legislation and policy, persons living on USC boundaries and interest groups, catchment management institutions, municipal capacity, planning and funding. Important institutional considerations include implementation policies, political support, funding and capacity. Negative aspects associated with institutions in terms of this study include maintenance costs, the administration of such areas, perceived security risks and municipal capacity (Bartholomew, 2001, pers. com.; Anderson, 1983).

The actions of municipalities, catchment management institutions and other stakeholders are informed by legislation such as the Constitution of South Africa (Act No. 108 of 1996), the Environmental Conservation Act No.107 of 1998, the Conservation of Agricultural Land Act No. 43 of 1983 as well as various municipal by-laws and therefore have an important role to play in guiding their actions. The importance of the legislative operational framework, which also determines responsibilities, is demonstrated in Table 2 below.

TABLE 2: Legislation and policies applicable to USC management within the Msunduzi municipal area.

Policy / Legislation	Responsibility allocation		
	Local Authority	Private land owners and interest groups	Catchment Management Institutions (CMIs)
<b>Policy</b>	<p>There currently is no overarching policy which informs the implementation of USC management in Pietermaritzburg.</p> <p>The Municipality is however in the process of devising a framework and work ethic which must be environmentally based.</p>	<p>No policy or plan relating to the involvement of private land owners or interest groups. In fact current conservancies are operated on a voluntary basis and are dependant on donations for their functioning. In principle there should be public participation in catchment management institutions as required in terms of Section 80(e) of the National Water Act 36 of 1998.</p>	<p>As already mentioned, there is no overarching policy to inform the implementation of USC management in Pietermaritzburg. There however is representation from the Msunduzi Catchment Management Forum on the Local Agenda 21 Forum.</p>
<b>Legislation</b> 1. Constitution of South Africa, Act 108 of 1996	<p>Section 24 of the Constitution mandates the protection of the environment for present and future generations, which places responsibility on municipalities to manage the environment for which they are responsible. This together with Section 156, read in conjunction with Part B of Schedule 5, which determines that the management of, inter alia, public places and parks and recreation induces responsibility on municipalities to protect the environment.</p>	<p>Section 24 of the Constitution of South Africa places an obligation on all citizens of this country to act responsibly with regard to the environment, which will thus include private persons.</p>	<p>The Constitution is the supreme law of a country. It therefore follows that all actions taken are to be subject to such law. It is therefore submitted that Catchment Management Institutions (CMIs) in the consideration of catchment areas will have to take cognisance of the environmental requirements as set out in this legislation.</p>
3. National Environmental Management Act 107 of 1998.	<p>1. Section 28 of the National Environmental Management Act, Act 107 of 1996 (NEMA) imposes responsibility on the owner of the land or the person who has use of the land to avoid or remediate any activity which may cause significant pollution or degradation of the environment. This therefore places a responsibility on all land owners which includes the municipality as land owner.</p> <p>2. See paragraph 2 alongside.</p>	<p>1. Private land owners are directly responsible for land under their control as per Section 28 of NEMA.</p> <p>Section 4 (f) of NEMA requires the participation of all interested and affected parties in environmental governance. Similarly, Section 4 (o) advocates the beneficial use of environmental resources to serve public interest and the protection thereof as the peoples common heritage. This places a responsibility on municipalities, private land owners and CMAs to protect the environment.</p>	<p>1. Section 11 of NEMA requires each National Department to prepare an environmental plan for their area of responsibility. Although an indirect linkage, Catchment Management Agencies (CMAs) and other related institutions will have consult the plans prepared by Department of Agriculture and Environmental Affairs as well as the Water plan prepared by the Department and Water Affairs and Forestry.</p>
The Conservation of Agricultural Resources Act, Act 43 of 1983. (CARA).	<p>1. Although many of the regulations such as 2 to 6 and 9 to 14 to CARA have an agricultural slant, regulation 7 and 8 could also be applicable to urban areas, requiring the removal of vegetation in floodplains, prohibiting the unauthorised drainage of wetlands and the diversion of run-off. This places a responsibility on both the municipality as land owners as well as private land owners to manage their land. Similarly, Section 15 and 16 respectively deals with alien vegetation and bush encroachment, placing the responsibility of removing and managing alien plant species on all land owners, including municipalities. This point is well recognised by Ashpole and Crawford, both in (Ashpole undated).</p>	<p>1. As already mentioned alongside, regulations 7, 8, 15 and 16 have a direct effect on private land owners.</p>	<p>1. CMIs have at their foundations the protection rivers and riparian vegetation. The strict adherence regulations 7, 8, 15 and 16 would be necessitated in order to perform an effective service as a CMA. This point is also laboured by Ashpole in Ashpole (undated).</p>

Policy / Legislation	Responsibility allocation		
	Local Authority	Private land owners and interest groups	Catchment Management Institutions (CMIs)
The National Water Act 36 of 1998 (NWA).	The NWA establishes various objectives with regard to water quality, conservation and reserve requirements which municipalities as service providers need to enforce and adhere to. They have an important role to play in the co-implementation of the requirements of the NWA together with CMIs.	Various new responsibilities are placed on the private individual in terms of the NWA. This includes the need for water use licenses as required by Chapter 4, as well as the declaration of stream flow reduction activities, such as forestry. A very important new development is the introduction of penalties for water related offences	Chapter 7 of the NWA establishes Catchment Management Agencies with specific responsibilities including water resource strategies and catchment management in general. One of the key functions is ensuring community participation (Section 80(e)).
Local Government Municipal Systems Act No. 32 of 2000 (MSA)	Section 25 of the MSA requires that each Municipality adopts an Integrated Development Plan (IDP). The purpose of this IDP is to integrate and co-ordinate plans and proposals for the development of the municipality and should contain the priorities and objectives for the Municipality. As part of the IDP process the Municipality is required to consult with the local community, stakeholders and organs of state (Section 29) in compiling its IDP.	The community has a definite responsibility in the compilation of IDPs as confirmed by Section 29 of the MSA. Their vision for the municipality in terms of this process could thus direct the IDP. The importance of public participation in this process is evident in the fact that a whole chapter was devoted to this.	The nature of IDPs requires full integration of sector plans as provided by the different organs of state. Section 29(b)(iii) of the MSA supports this integration and linkage between municipalities and organs of state.

The institutional framework therefore consists of municipalities, catchment management institutions and private landowners together with interest groups who function within a legislative framework. In summary, sustainable urban stream corridor protection and management is subject to the interaction of the three core components of this framework, namely the environment, society and the institutions mandated to undertake environmental protection.

**Results and discussion**

This section will present the findings associated with the interviewing of respondents along the two urban streams (Summary of findings attached at Appendix 2). The findings of the remaining in-depth interviews will be integrated in the next section.

**Use of NOSs and USCs**

*(1) Use and involvement in NOSs and conservancies*

Seventy percent (70%) of the residents bordering the Foxhill Spruit use the POSs in Pietermaritzburg, with Queen Elizabeth Park, Worlds View, Bisley Nature Reserve, Alexandra Park, Camps Drift and the Botanical Gardens being the more frequent destinations. The Foxhill Spruit also ranked high with 8 families or 40% of the respondents visiting this USC on a regular basis. In comparison, 90% of the respondents in the Townbush Spruit survey indicated that they use POSs. Their favourite destinations include Ferncliffe Nature Reserve, Queen Elizabeth Park, Worlds View, Alexandra Park, Botanical Gardens, and Wylie Park. A similar proportion of the respondents (40%) also used the

Townbush Spruit on a regular basis. The continued need for open spaces is therefore clearly reflected in the above statistics.

(2) *Increased use of NOSs*

Security in NOSs was considered to be lacking with this problem being identified by 60% of the respondents as the main area which needs attention. This included one suggestion that there should be patrols by mounted police for visible security. This was followed by the need for improved maintenance of NOSs and USCs, attracting the attention of 15 respondents (37.5%). Other responses worthy of further consideration include the suggestion of mini-parks along the USCs with picnic facilities, the need for events in the USCs which will act as a focal point for environmental education and the need for a NOS/ USC vision by the municipality to guide activities.

## Perceptions regarding open spaces

(1) *Need for natural open spaces*

Eighty five percent of the respondents in the Foxhill Spruit indicated that they agree strongly with the statement that there is a general societal need for NOS. In contrast, only 60% of the persons living along the Townbush Spruit expressed the same view. It is suggested that this variance can partly be ascribed to the fact that lot sizes in the Townbush area are larger than those in the Foxhill area, thus giving effect to a different perception and a subsequent diminished need for open spaces. In support of this observation one of the respondents in the Townbush survey alluded to this, suggesting that the need for open spaces is determined by the size of ones property. The most important reasons for open spaces and USCs relate to their importance to children with 10 respondents (25%) identifying this need, followed by the importance to the natural environment, with 7.5% of the respondents noting the need for '*lungs of the city*'. Other inputs related to the value of open spaces in releasing stress (5%), the relaxing effect of these areas and associated mental health value.

(2) *Effective marketing*

Based on the statement that marketing of open spaces and USCs in Pietermaritzburg is effective, 40% of respondents strongly disagreed, referring to the lack of marketing, particularly citing the need to highlight the value of these areas. This was followed by a further 22.5% of respondents who moderately disagreed. Two persons, although

acknowledging that marketing is inadequate, wanted the *status quo* to remain as it was considered that a further increase in visitor numbers would effect these areas negatively. Twenty-two and a half percent of the respondents moderately agreed that marketing was effective.

### (3) Safety

In response to a statement that safety in respect of Pietermaritzburg open spaces was satisfactory, 67.5% of the respondents strongly or moderately disagreed with this statement, whilst 22.5% moderately agreed. Although none of the respondents identified recent factual cases to support this point of view there was a general feeling that some of the open spaces were not safe and most definitely not for young children or women on their own. Areas considered as reasonably safe were Queen Elizabeth Park and the Botanical Gardens. Other areas such as Ferncliffe and Alexandra Park are considered to be less safe and would definitely not be visited after dark.

## Adequacy of natural open spaces in Pietermaritzburg

### (1) *Adequacy of open spaces in Pietermaritzburg*

In response to the statement that NOSs in Pietermaritzburg are adequate for public needs, 15% of the respondents strongly disagreed with a further 22.5% or 9 persons moderately disagreeing. Eight persons (20%) remained neutral as they did not believe that they had the necessary information or qualifications to make a useful judgement in this regard. The largest support came from those persons who moderately agreed (32.5%). In this category seven respondents (17.5%) were of the view that affluent neighbourhoods probably had sufficient natural open spaces, whilst the more densely populated, and previously disadvantaged areas in all likelihood are lacking.

### (2) *Perceived problems*

The lack of maintenance was identified as the main problem by 25% of the respondents. This was followed by 20% of the respondents identifying the lack of financial support for urban open spaces, whilst security was identified by 7 or 17.5% of the respondents as core problems. Allied to these observations, 10% of the respondents believed that the municipality, as the main responsible authority for the protection of NOSs and USCs, was lacking a '*future vision*' and that based on the recent debate on the development of a Service Station on part of Alexandra Park, that planning decisions are based on economic

principles rather than holistic integrated assessments. One respondent questioned political will, pointing out that NOS protection as currently practiced by the Msunduzi Municipality is 'lip service' rather than a priority. This perception is further substantiated through a subsequent debate regarding a similar proposal to develop a commercial development on a public open space opposite the Northway Mall (Barbeau, 2003).

## Management of NOSs

### (1) *Municipal responsibility in respect of NOS management*

The response to the statement that municipalities should be responsible for NOS management was divided. Forty-two and a half percent of the respondents were of the opinion that management was the sole responsibility of the municipality, citing the payment of rates and taxes and unnecessary expenditure by the municipality as the core reason why the municipality should carry this responsibility. The remaining 57.5% of the respondents held the view that this was not the sole responsibility of the municipality with 20% of the respondents supporting a joint initiative. An important observation made was that involvement breeds commitment, and hence it is felt that joint responsibilities will lead to more interest in the protection of NOSs and USCs. Comparatively, Foxhill Spruit residents were slightly more in favour of a joint responsibility with 65% of respondents favouring this option whilst Townbush Spruit respondents were evenly poised at 50%.

### (2) *Local community involvement in NOS management*

Respondents were required to express their views on financial support, the establishment of environmental committees and voluntary work in support of NOS management. Table 3 below reflects the results.

TABLE 3: Responses to community financial support and involvement with regard to NOS management

Financial support for management and maintenance of NOSs and USCs		Support for the establishment of Environmental Committees to assist the municipality with NOS and USC management	Voluntary work as a method of support through environmental committees or other localised projects
Yes	No		
40%	60%	77.5%	80%

The notion of financial support was only viewed positively by 40% of the respondents. In contrast, 77.5% of the respondents pledged their support for the establishment of environmental committees, with 80% of the respondents indicating their support through voluntary work to these committees. The establishment of environmental committees and

the possibility of attracting voluntary assistance based on the above, appears to be more feasible than levying an NOS management fee.

(3) *Who should be responsible for the payment in respect of maintenance of riverine areas?*

Respondents were given a choice consisting of the municipality, landowners, businesses or a combination of all three. The results were as follows:

TABLE 4: Responsibility identification for riverine area maintenance based on respondent views

Municipality to undertake sole responsibility for USC maintenance	Households who directly border onto urban streams should have a joint responsibility with the municipality for the maintenance of the portion of USC which adjoins their property.	Businesses in Pietermaritzburg need to contribute to the maintenance of streams	This option represents a combination of all three the previous options. Respondents viewed NOS and USC as a common good for all citizens. It would therefore be appropriate to have a holistic shared approach to USC management.
67.5%	15%	2.5%	32.5%

The majority of respondents (67.5%) elected the municipality as the responsible authority for riverine maintenance based on annual rates and tax contributions. Fifteen percent of the respondents, all along the Townbush Spruit were of the opinion that they could be jointly responsible for riverine maintenance with the municipality, whilst 32.5% of respondents favoured the concept of a combination of all three choices as a shared resource. The joint responsibility option was however subject to the *proviso* that the municipality should take the leading role. The greater support for landowner responsibility in the Townbush area is attributed to the fact that eight of the respondents interviewed already have gardens which form part of the stream environment and the affluence of this community in comparison to the Foxhill Spruit. It is interesting that the response to this question is slightly different to the previous question relating to responsibilities. Under the heading 'Municipal responsibility in respect of NOS management', which dealt with management responsibility for NOSs in general, respondents in the Foxhill and Townbush Spruits supported the notion of a joint responsibility. However, now that it has been narrowed down to specific properties, only residents along the Townbush Spruit were in support of a joint responsibility. It is suggested that this relates to the fact that many of the respondents along the Townbush Spruit were already undertaking their own maintenance

of the riparian zone. This in turn could be linked to the absence of boundary fences and financial affluence along this USC as opposed to the Foxhill Spruit where all properties were fenced (mostly concrete) and a less affluent community.

**(4) Payment for the use of urban open spaces and stream corridors**

Thirty-two and half percent of the respondents supported the payment of a fee for the use of NOSs with 67.5% opposed to it. The majority of respondents felt that NOSs are a public good which should be there for the enjoyment of all. Ten percent of the respondents were of the view that a fee or levy of any nature, even if it is used for maintenance, will be directly in conflict with the intention of public open space. The concern was also expressed that the levying of a fee could restrict use leading to further disinterest.

**(5) Use of hiking trails**

The suggestion of hiking trails along the streams was welcomed by all with the exception of one respondent who questioned the feasibility thereof. The results of the question are detailed in Figure 4 below.

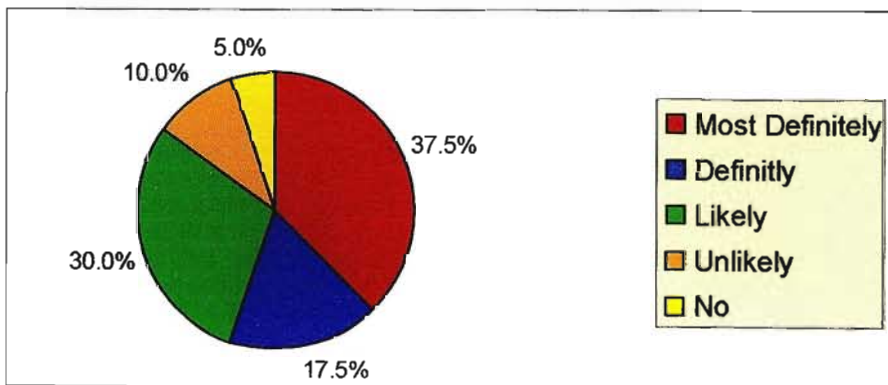


FIGURE 4: Anticipated use of urban stream hiking trails if provided

**Environmental and catchment management awareness**

A variety of questions were included in the survey to test the dissemination of environmental and catchment management related information and to determine public awareness of this. Eighty-two and half percent of respondents were aware of alien weed legislation. However, only 57.5% percent of respondents have removed alien invasives from their properties and were prepared to remove alien invasive species from the USCs, whilst 37.5% were unsure of the exact species and whether they would remove same. In

contrast, only 20% of the respondents had heard of the Msunduzi Catchment Management Forum (MCMF).

## **Challenges facing USC management**

In Section 2 attention was drawn to some of the problems which USC management is facing in Kwazulu-Natal, with specific reference to maintenance costs, security, funding, litter, alien weed infestation, stream morphology changes and habitat losses as a consequence of urbanisation and problems associated with unnatural boundaries. The responses (see Appendix 3 for a summary of the interviews with key stakeholders) to pertinent questions raised with the various sectors in addressing the above will form the basis of this discussion.

### **Lack of policies**

The Constitution of South Africa, supported by national and provincial legislation such as the Conservation of Agricultural Resources Act and supported by out-dated by-laws (currently under review) informs and mandates the execution of municipal environmental related functions. Despite the legislative framework it was confirmed that there was no overarching policy framework guiding the implementation of NOS management or its protection (Bartholomew, 2002, pers. com.; Harrison and Kedge, 2002, pers. com.; Parker, 2002, pers. com.). The lack of policies appear to substantiate the earlier perception that the municipality lacks vision for the NOSs as expressed by some of the respondents.

The Parks and Recreation Department advised that although the issue of a policy for the protection of urban streams has been on the agenda for some years now, such a policy has not been forthcoming. In the absence of a policy, the two main areas of focus have been the eradication of alien invasives and the maintenance of watercourses.

The Engineering Department indicated that a catchment management process had been initiated to consider the status of streams and associated priorities. This however has been shelved due to lack of funding. In the absence of a guiding policy USC management from an engineering point of view, is focussed on hydraulic efficiency.

The Planning Department, in the absence of specific policies to guide the effective management and protection of USCs from a planning point of view has adopted the broad

guidelines of Local Agenda 21 for general environmental and urban stream protection. Municipal officials, in the absence of rigid environmental policy to limit development in sensitive areas such as unprotected USCs, have adopted an environmental management checklist which larger developments and rezoning applications are subjected to.

### Lack of stakeholder strategy co-ordination

The interview with Mr Vorwerk, the chairperson of the Cleland/ Mkondeni Conservancy, revealed that there is hardly any interaction between the Municipality and the Conservancy regarding environmental issues. The limited communication is based on unofficial interaction. Similarly, it was evident from the interview with the chairperson of the MCMF that although there is effective co-operation between stakeholders on isolated specific projects, individual USC stakeholder strategies are not co-ordinated.

### Stream maintenance: Environmental value vs. hydraulic efficiency

Both the Engineering Department and the Parks and Recreation Department are of the view that the focus of stream maintenance is hydraulic efficiency. Clearance of rocks and vegetation from stream channels is undertaken to achieve hydraulic efficiency, with little or no consideration of environmental consequences or amenity. In some cases this involves excavations of accumulated sediment (Figure 5). This practice is also recognised in the United Kingdom (Purseglove, 1988, p.1)

*"The engineer explained his problem. All he is attempting to do was to prevent the river from flooding these ungrateful people's houses. For this, however, many trees would have to be removed, and the river would have to be deepened and straitened. It would cease to be recognizable as the river which the local people enjoyed, but it would become a very efficient drain..."*

In fact, the maintenance of stream corridors is shared between the Parks and Recreation and the Engineering Departments with Engineering being responsible for the channel and two meters on either side, whilst the Parks Department is responsible for the maintenance of the remaining NOS area. This leads to tension as the Parks personnel have more environmental knowledge and are able to maintain the channel area from an environmental point of view. Despite the emphasis on hydraulic efficiency, it was however confirmed that the maintenance and removal of vegetation of USCs is properly programmed and sensitive to bird breeding periods.

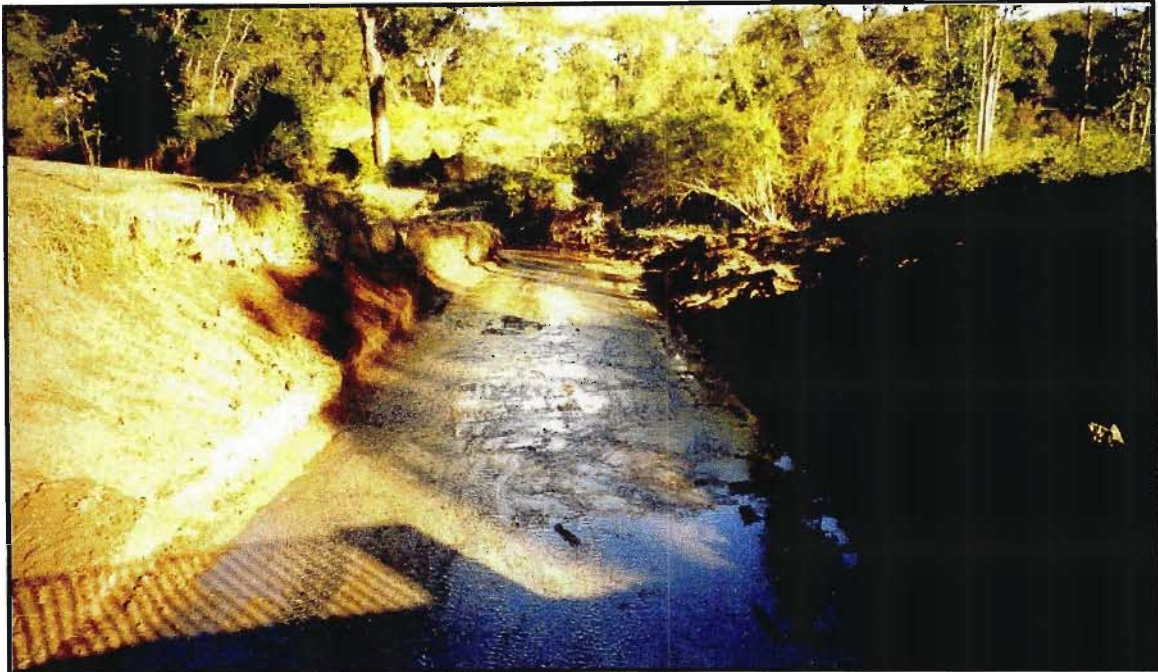


FIGURE 5: Figure 5 shows a portion of the Townbush Spruit between the Cascades Centre and the Sheraton residential development where the channel has been graded to accommodate flood highflows.

This represents a very narrow approach to USC management. The ecological value of urban streams (Petts *et al.*, 2002; Sheldon *et al.*, 2001; Durban Metropolitan Council, 1999; Jensen, 1998) must be recognised by those authorities charged with USC management to ensure effective management. A further matter which needs attention is the regular maintenance of USC vegetation as expressed by the residents along the subject streams. Caution is however to be exercised with the removal of flora so as not to unnecessarily disturb the natural succession or biotic change in vegetational growth over time (Adams, 1994).

### Streambank erosion control

Erosion control is only undertaken by the Msunduzi Municipality when municipal service provision is affected by such erosion. Such maintenance is reactive in nature and is only permitted on Council owned land or where municipal infrastructure (e.g. sewer lines) is threatened.

## Property boundaries

Municipal maintenance is only permissible on Council owned land. This approach is of concern when one considers the extent of private properties where the centre of the stream forms the boundary of the property (Harrison and Kedge, 2002, pers. com.). One of the respondents resident in Kathleen Place (Townbush Spruit) identified the erosion of the streambank as a concern. Negotiations with the municipality to have the two areas repaired has revealed that the municipality is not able to attend to this as this is on her private property as the property boundary is the middle of the stream. They have, as a concession, proposed that they will be willing to pay 50% of the costs of installing two reno mattresses to curb the erosion. This situation is unacceptable and needs urgent attention as also identified by the Engineers Department (Harrison and Kedge, 2002, pers. com.). Ideally the municipality should purchase all this land which will provide them access. This however will be expensive and not practical at this stage. A possible solution would be the registration of servitudes in favour of the municipality over these properties. Such servitudes could form the basis of river reserves through a management overlay in terms of the LUMS. Although this is a possible solution, this will only be temporarily as further development up-stream will alter floodlines over time which will alter the reserve dimensions.

The establishment of stream trails forms an important component of NOS exposure and use. The use of private land as opposed to municipal owned land will be more challenging. Acquiring the land or a servitude right will also have the benefit of allowing the use of the land for this purpose.

## Alien plant control

Alien weed infestation is a problem in Pietermaritzburg (Londt, 2002; Slade, 1999; Johnstone, 1988). Funding and other resources have been made available through the Department of Environmental Affairs and the Department of Water Affairs and Forestry "Working for Water" program. A business plan and committed funding, prioritising the clearing of existing conservation areas and riparian areas have been accepted and implemented by the Msunduzi Municipality. Bearing in mind that the rationale for water-course maintenance is focused on stormwater control rather than environmental criteria (Bartholomew, 2002, pers. com.), it was questioned whether the removal of alien invasives in riparian areas will be successful.

## **Political support**

One of the main contributions to the success of the D'MOSS (Roberts, 2002, pers. com.) is the ability of the managers and the system to adapt to changed circumstances. Reference was made to the political changes which have occurred in South Africa since the mid 1990s and the effect this has had on revised political and municipal priorities, with a new emphasis on service provision. The successful continuation of D'MOSS is based on the fact the managers of D'MOSS are able to adapt to these changes, recognising the need to adjust their priorities. The managers recognised the need to find new ways to familiarise councillors and decision-makers with the environmental value of open space services. Through this process decision-makers acknowledged the need to protect the natural environment. This is evidenced in the recognition and environmental protection of key areas, the control of development through environmental appeals and the securing of additional funding for environmental protection (Roberts, 2002, pers. com.). The importance of political acceptance of the need to have a balance between the needs of humankind and the environment is further strengthened by Vanderhaeghen (2003) referring to the political support for petrol filling stations in a bid for economic advancement opposed to the public lobby for the protection of public spaces in Pietermaritzburg.

## **Funding and recognition of public need**

The lack of funding was generally cited as a problem by all the organisations approached. In the case of the Keep Pietermaritzburg Clean Association their annual budget has remained static for the past two years. So too the MCMF is dependant on limited research funding and human resources from the other associated stakeholders. On the question of the provision of pathways to facilitate walks, authorities indicated that this represented a passive use and that funding resources are allocated to higher order community needs and that passive uses at this stage are still unfunded. Similarly, conservancies are dependent on grant funding and donations in order to fulfil their functions (Vorwerk, 2003, pers. com.)

It is however important to acknowledge the significance of expressed public need and funding allocation as provided for in the newly adopted IDPs. Theoretically, the allocation of municipal funding is dependent on the priorities identified by the municipality and its community. The amount of funding allocated to a service is thus dependent on the public need expressed for this. What is however concerning is that the Msunduzi IDP, although recognising the need for a MOSS, eradication of alien invasive plants and the need to

clean up its streams, have only allocated funding for the eradication of alien invasive species as per Table 5.

TABLE 5: Extract of the Msunduzi IDP reflecting proposed environmental projects (Msunduzi Municipality, 2002, p.281).

Project	Funding allocation	Funding source	Project duration
Environmental management plan	R250 000	DET DAEA DBSA Msunduzi	Short term
Awareness and education (including Legislation)	R150 000	DET DAEA Msunduzi	Short and ongoing
Built environment improvement and marketing	To be announced		
Environment component in all development	R300 000	DBSA	Current
Community involvement in environmental matters	Nil	Msunduzi	Ongoing
LA 21	To be announced		
Invasive and alien plant eradication	R1 000 000	DET, Msunduzi	Medium term
Greening, beautification and open space	To be announced		
Prevention of soil erosion	To be announced		

## Stormwater detention

The Parks and Recreation Department's medium term intention was to establish an urban stream protection policy. Despite the absence of such a policy, progress has been made in giving more attention to the environment through environmentally orientated engineering designs such as the flood detention pond established at the Waltdorf development on the banks of the Townbush stream to dissipate water energy and reduce flood peaks (Bartholomew, 2002, pers. com.; Duncan, 2002), as well as use of reno mattresses to dissipate water energy from a stormwater outlet alongside the St Matthews Church along Hesketh Drive, re-creating a wetland which had been disturbed through increased water energy associated with increased urbanisation (Bartholomew, 2002, pers. com.).

## Integration of USC protection and urban planning

Conservation areas such as Ferncliffe nature reserve are appropriately zoned in terms the current Msunduzi Town Planning Scheme and are thus protected under the scheme provisions. Although passive open spaces such as USCs are protected under current land use controls, these areas are not given the same attention as active open spaces due to limited use in comparison to active open spaces. Kahn, Von Riesen and Jewell (2001, p.17) point out that planners have focussed on amenities and that it is "...widely recognised that planner should focus on ensuring the ability of the environment to provide the necessary services to sustain development." The LUMS provisions provide the regulating mechanisms through appropriate zonations and management overlays to achieve the

required NOS protection. However, the interview with the Planning Department of the Municipality revealed that there is no clear statement of intent to give effect to the better protection of USCs through this land use control mechanism during the current translation of town planning schemes to LUMS.

## **Recommendations**

The following key actions emerge from this study as priorities for effective USC management.

### **(1) Adopting a common vision for co-ordinated USC management**

Respondents, based on the recent public debate on the decision of the Pietermaritzburg Council to permit the establishment of a filling station in Alexandra Park questioned whether the Msunduzi Council had a vision for the protection of open spaces in Pietermaritzburg. Rutherford, Jerie and March (2000) emphasize the importance of developing a vision and associated goals. Integrated Planning Services (1997, p.84) suggest that, "*(w)ithout an open space 'vision' nor institutions and interest groups to use, manage and secure land set aside for POS, it is likely that such land areas will be lost through sustained pressure*". People need to know what they are working towards to direct their actions and energy. An accepted common vision of all stakeholders is thus essential for success and cohesion and needs to be undertaken from the outset.

### **(2) Integration of urban stream corridor management stakeholders and programmes**

A critical issue identified for successful stream restoration was the need to integrate USC management with development planning as advocated by Petts *et al.* (2002) and Wade *et al.* (1998). This should include catchment management institutions as acknowledged by the Durban Metropolitan Council (1999) and Abemethy and Wansbrough (2001). An example of the value of such integration is seen in the work of the Msunduzi Catchment Management Forum who have demonstrated the success which can be achieved through effective integration of stakeholder actions in addressing problems such as the prosecution of point-source pollution in the Bayne's Spruit and the current actions relating to streambank erosion in the upper Townbush Spruit (Quinn, 2003, pers. com.). The above concept of integration should be extended to include private institutions such as conservancies. It is thus essential to have a holistic approach which integrates planning, catchments and private initiatives.

### **(3) Establishing a municipal integrated NOS implementation team**

Interviews with municipal officials, the chairperson of the MCMF and the chairperson of the Cleland/ Mkondeni Conservancy revealed that the maintenance and management of streams is not effectively integrated or co-ordinated amongst stakeholders.

Municipal IDPs are used to identify municipal priorities and to achieve co-ordination of services. To facilitate the co-ordination of USC management, the integration of key USC stakeholders could be nestled within the IDP. It is believed that this would also assist in forging better links within the Municipality and would thus lead to better co-ordination between the Parks and Recreation and the Engineering Departments with regard to USC maintenance. It is apparent that there is a need for strong linkages between the key stakeholders and that the use of a sector plan to facilitate the integration with the IDP is an important step to successful integration. It is suggested that such integration could be achieved through the adoption of a municipally chaired catchment sector forum where the above organisations can have representation under the auspices of the municipality.

### **(4) Identifying priority stream corridor areas which either need protection or rehabilitation**

Municipalities have extensive responsibilities and limited resources to attend to such responsibilities. To attend to all these responsibilities simultaneously with their limited resources would be impractical. Consequently, a maintenance system needs to be implemented which is based on a long-term needs as well as specific shorter term priorities. Such priorities are to be determined based on the analysis of the assets and problems associated with a specific catchment area, again highlighting the need for an integrated approach which should acknowledge the importance of the role that catchment management institutions could fulfil. Rutherford, Jerie and Marsh (2000) suggest that assets, degraded assets and problems be identified. To identify priority cases they suggest that priority be given to river reaches where assets are being threatened or areas of high value or rarity are negatively affected. This rationale is already being applied by the Msunduzi Municipality through its alien plant eradication programme where resources will initially be focussed on pristine areas and the densely invaded areas (Bartholomew, 2002, pers. com.). Rutherford, Jerie and Marsh (2000) include a further useful priority decision matrix, shown in Table 6.

TABLE 6: Priority decision matrix (after Rutherford, Jerie and Marsh, 2000)

Rehabilitating Australia's streams
Save reaches that support valuable organisms or communities (rare or endangered) before you turn to less valuable reaches that support common organisms and communities.
Protect the streams that are in the best general condition before trying to improve those that are in a poor condition.
Stop streams deteriorating, rather than waiting for them to stabilise and then trying to accelerate recovery.
Improve the condition of reaches that are damaged, beginning with those that are easy to fix.
While there are still reaches that need protecting or improving, don't bother trying to fix reaches that are already extremely degraded.
Identify the most important problems. Raw banks and erosion may seem obvious problems, but the real problem could be water pollution in storm run-off.

To achieve successful USC management, assessment criteria have to be developed to differentiate between essential, important and less important projects. The forum will thus need to adopt a set of prioritising criteria.

#### **(5) Setting achievable objectives linked to limited resources**

It was apparent from the interviews with key stakeholders such as the Msunduzi Municipality, the MCMF and the Cleland/ Mkondeni Conservancy that limited funding or in some cases such as the MCMF, no funding was being provided for USC management. The allocation of limited resources is therefore key to the effective functioning of the proposed integrated committee of stakeholders. Although it is hoped that the intended integration of the catchment sector forum with the Msunduzi IDP will result in more funding being channeled to USC management, it would still be necessary to set achievable objectives within budgetary constraints.

This forum will need to, based on priorities identified, budgetary and other resource constraints develop achievable and tangible objectives, which when achieved will encourage further growth and development.

#### **(6) Determination of public need for a specific land use**

This is a very important point. The survey revealed that 37.5% of the respondents believed that Pietermaritzburg has sufficient open spaces and needed to rather consider existing quality as opposed to the need for additional areas. In addition, an important point which was raised and which needs further attention is whether sufficient attention is being given to open spaces and USCs in the previously disadvantaged areas.

The use of NOSs is dependent on expressed public needs. Public need in turn determines the municipal resource allocation to a specific service. For any MOSS to be successful it is essential that a comprehensive survey is undertaken of community needs and current use patterns which needs to be correlated with counts of users, where practically possible. Through a thorough investigation current demand can be compared with present facilities, with a secondary benefit of also identifying the priority areas.

**(7) Use of legislative provisions to protect stream corridors**

Urban stream corridors and NOSs are categorised as passive open spaces, which as a consequence of less use in comparison to public open spaces, have less resources allocated thereto. From a sustainable development perspective, the value of the natural areas have been neglected (Kahn, 2003; Kahn, Von Riesen and Jewell, 2001). Through appropriate zoning or the use of management overlays, as provided in the KwaZulu-Natal LUMS, the value of these areas can be recognised and protected. As mentioned in the introduction, the use of either a zonation or management overlay will be dependent on the size and environmental significance of an area. The LUMS also incorporates land use templates that can be manipulated to suit the most effective management of an area. Table 8 below provides an example of how a management overlay template can be designed to ensure environmental protection. This system may be used in a more prescriptive manner through the use of activity matrixes in combination with the other control measures as demonstrated below.

TABLE 7: Land use template (after Kahn, Von Riesen and Jewel, 2001).

Planning scheme			
E.g. Medium impact residential district (Residential and office conversion district)			
Zone	Residential	Height	Not applicable
District	Medium Impact Residential	Coverage	Not applicable
Lot size (Where appropriate)	Not applicable	Intensity	Not applicable
Parking	Not applicable	Setbacks: F S R	Not applicable Not applicable Not applicable
Management area (if applicable)	Environmental Management Area No. 1	Environmental controls	Subject to 1:50 year Flood line Open Space policy applicable
Old Town Planning Scheme	Not zoned previously	Building form	Development applications subject to successful EIA
Additional controls: Only limited activities permitted according to activity matrix			

To provide effective management of NOSs and USCs it is essential to provide proper land use controls as provided in the KwaZulu-Natal LUMS.

#### **(8) Public involvement in planning, maintaining and protecting NOSs**

Public involvement in USC is vital for effective open space management (Staras, 2001; Durban Metropolitan Council, 1999; Integrated Planning Services, 1997; Roberts, 1994; Nicholson, 1987; Anderson, 1983). Rutherford, Jerie and March (2000, p.77), recognise the importance of public involvement, stating that, "*(m)ost stream rehabilitation projects are at least as much about people as they are about science and construction*". In fact Staras (2001) warns that experience has shown that issues such as public awareness and stakeholder participation, if not appropriately dealt with can either slow down or hamper restoration projects.

Wilson *et al.* (1999) draws attention to the need for scientists to appreciate, understand, respect and immerse themselves within the local social context. Only through this interaction, mutual information sharing and trust will an effective process and relationship be born which effectively integrates local knowledge and science. Public involvement is a prerequisite for effective open space management. To avoid unnecessary costs it is suggested that existing communication mechanisms are used. This may however need to be enhanced in certain instances. In Pietermaritzburg, for instance, the Keep Pietermaritzburg Clean Association has a regular column in the Mirror community newspaper. This could be used to communicate ideas and strategies of the integrated stakeholder committee (paragraph 2 above), whilst conservancies could relay the thoughts and responses from their community. Not only could ideas flow through this process but it should also be used to co-ordinate actual activities on the ground.

#### **(9) Municipal vs. private ownership of stream corridor land**

Where private property boundaries either extend to the centre-line of a stream or extend beyond the stream, this has negative influences on both the maintenance and the passive use thereof. This prohibits maintenance of the stream by the municipality who are unable to affect any work on private property without compensation and similarly the use of such land for passive open space becomes problematic due to private ownership. This method of subdivision should be avoided. This recommendation needs to address both the existing situation and future development. With reference to existing cases, it is suggested that a

servitude be registered over such properties to provide access to both the municipality and passive use. New residential developments should be required to retain USCs up to the 1:100 year floodline as a river reserve which in turn should be controlled through the LUMS. It is acknowledged that this could effect property developers negatively due to a reduction in the disposable developable land, however the value for the public in general may out-weigh this. A further suggestion which may be considered is the transfer of portions of NOS to conservancies to be held in Trust for the general public but transferring the maintenance responsibility to such an organisation. The allocation of tracts of land to private organisations which can then be locally managed according to an agreed upon framework would reduce the dependency of municipalities and limited resources.

#### **(10) Promoting public use of natural open spaces**

The survey of riparian households revealed that NOSs and their associated USCs are not marketed. The view was expressed that a general interest in these areas which could also include the protection and management of these areas could be initiated through the effective marketing of these natural areas which could include social events, whether it be markets, picnic, mountain-biking or other events. This will also encourage public participation in NOS management.

#### **(11) Efficient stormwater management recognising the needs on nature and hydraulic efficiency**

In Section 4 attention was drawn to fact that urban stream management in Pietermaritzburg was focussed on hydraulic efficiency rather than a balanced approach which would have as its basis the protection of the environment. The consequences of this are illustrated in Figure 4 showing a portion of the Townbush Spruit which had been graded and widened to achieve effective stormwater management. This however has destroyed the ecosystem functioning of the stream through the alteration of the flow volume, velocity and the removal of the natural habitat. A more environmentally sustainable alternative would be through the creation of low-flow channels (Fischenich, 2002; Rahman 2001). This provides for minimal alteration to the channel slope, creating a terraced profile which will allow for the continuation of the natural stream characteristics whilst also providing for highflow events.

Effective control of stormwater should not be restricted to channel considerations only. This should form part of a holistic approach which should give attention to on-site attenuation of

stormwater through rainwater tanks, porous parking lot designs and environmentally orientated stream channel maintenance. Stormwater management therefore begs a holistic policy balancing the needs of the environment with that of the stormwater engineer.

### **(12) Adoption of riparian habitat protection and rehabilitation programmes**

Riparian habitat protection in Pietermaritzburg is restricted to severely polluted streams and is re-active as opposed to pro-active in nature. The severely polluted Baynespruit for instance was cleaned on 29 November 2001 (Pole, 2002). This however was as a consequence of a demonstration and plea from the community and interested parties as opposed to having a pro-active, on-going programme to attend to pollution. Similarly it has already been mentioned that erosion control is only undertaken where municipal services are threatened, again revealing a re-active approach (Harrison and Kedge, 2002, pers. com.). What is thus required is an integrated urban stream management program which includes river rehabilitation, riparian protection and erosion control. Such a program should further be pro-active in nature, concentrating on those priority areas identified through a prioritising process.

### **(13) Environmental education for the public and officials**

The education of people regarding the need to protect the environment is essential for the effective interaction of the public in an USC management program. Low, in Saunders and Hobbs (1991) indicates that effective education programmes must form part of urban corridor management. In addition to the above, Wallace, in Saunders and Hobbs (1991) reflects on the usefulness of corridors as a medium for environmental education through first-hand experience. Saunders and Hobbs (1991) also recognise the potential use of corridors in educating people about conservation. Education programs which are to be linked to the marketing of USC management could play a useful role in this regard. Important NOS environmental issues can therefore be captured in the media, possibly by either the Municipal Parks Department or alternatively the Keep Pietermaritzburg Clean Association.

Whilst it is important to educate the public, the education of municipal officials and councillors who have to take decisions on resource allocation is just as critical. One of the reasons for the success of the D'MOSS is the fact that councillors were made aware and

accepted the need for more support for the protection of NOS. The education programme should thus have a dual approach.

#### **(14) Adjustment of policies and programmes through regular evaluation**

Policies and implementation plans are not static, but rather evolving due to continuous changes associated with the various variables. In order for a USC management program to be successful is therefore a requirement that results are continuously subjected to evaluation and that visions, priorities and implementation plans are adjusted to achieve effective results. Evaluation is also important to ensure the effective allocation of resources and to improve on work undertaken (Rutherford, Jerie and Marsh, 2000).

#### **(15) Improving security of urban NOSs**

The survey of riparian households revealed a sense of a lack of security which in turn has a negative effect on their visitation patterns. It is suggested that this could be dealt with through a combination of strategies. Firstly, proper marketing could counter unsupported fears. Whilst there was general concern regarding security, it is considered that the efficient maintenance of NOSs and associated USCs would to large extent alleviate fears expressed regarding a lack of visibility. Other fairly inexpensive strategies could include the provision of lighting, pathways and ideally more facilities in the form of benches. The increase in user numbers due following the introduction of the above facilities will in itself create a safer environment through the presence of more people. A further strategy, although more costly, could include the introduction of two to three "river guards" to be deployed at strategic NOSs, an idea well supported during the riparian household survey. These persons could possibly be employed by the municipality on a retainer only, with contributions from those people using these areas.

### **A process framework for implementing USC management**

This paper supports the adoption and implementation of a co-ordinated urban stream corridor management framework. Figure 6 below, based on the work of Rutherford, Jerie and Marsh (2000), represents an implementation framework which links the above requirements in an interactive process framework.

This process framework represents a holistic approach consisting of four phases. The planning phase commences with the development and adoption of a common vision

supported by all the role players. This is followed by the establishment of an integrated implementation strategy and a multi-sectoral implementation and monitoring team. This stage is followed by the analysis phase, commencing with the assessment of the subject area, followed by the setting of priorities based on measurable objectives. The third stage relates to implementation, giving consideration to the allocation of tasks together with maintenance. The final stage relates to the evaluation of implementation and the adjustment of the original vision based on the evaluation. The importance of public participation and education, well recognised in this study, is also represented in this process, forming the basis of the process, represented by the outer circle.

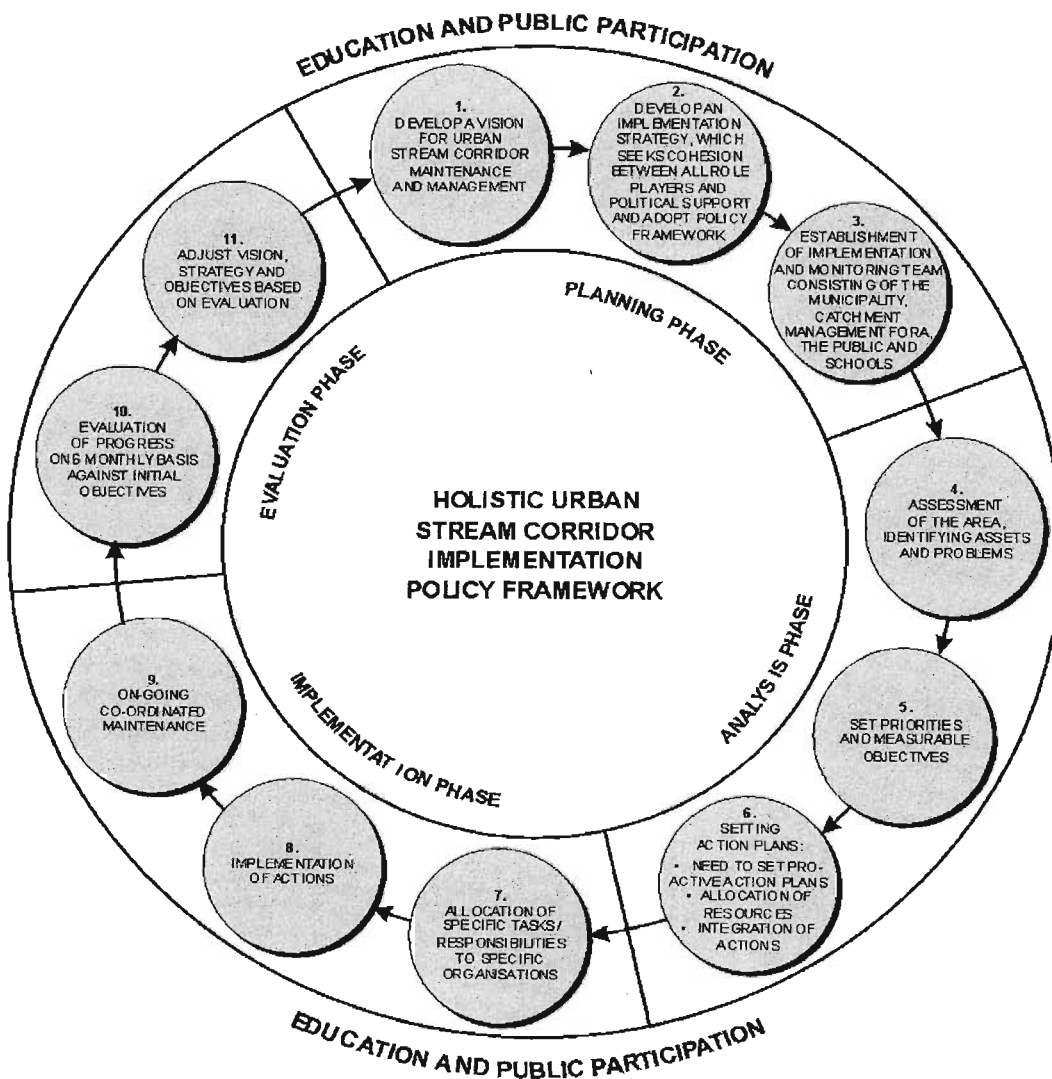


FIGURE 6: Urban stream corridor implementation process framework

It is important to create a direct link between this process and the IDP. This process represents a river management sector plan, in this instance focussed on USCs and NOSs. What is essential through this linkage is that the priorities determined through this process need to feed directly into the Municipal IDP to ensure appropriate resource allocation and political support.

## **Conclusion**

The intention of this study was to identify the obstacles which affect USC management in order to develop policy guidelines for USC management. The literature review revealed a variety of problematic issues. This information together with a reconnaissance study of two streams in Pietermaritzburg formed the basis for further evaluation of USC management through interviews with riparian households and other primary stakeholders in the process, including the Municipality and the chairman of the Cleland/ Mkondeni Conservancy. This led to the establishment of an integrated policy framework for USC management. Although primary needs such as housing, water and sanitation appear to have higher political support, it is suggested that the adoption of the above policy, integrated with community education and involvement as well as environmental orientated management practices by the municipality, could lead to the more effective management of USCs.

One of the more important issues identified as part of the USC management guideline is the importance of public involvement. Based on the interviews with riparian households and the Cleland/ Mkondeni Conservancy chairman, it is considered that the value and standing of conservancies and associated public has not been institutionalised in South Africa and needs further attention through research.

It is suggested that such further research should also give attention to financial support to such organisations in order that they may fulfil a more effective role in the USC management process.

Up to now, the protection of NOSs in terms of conventional Town Planning Schemes were mostly reserved for formal conservation areas. The need to extend planning controls to include natural areas such as USCs has been acknowledged in the new LUMS, now being established. It is hoped that this paper will serve as a catalyst, on the eve of the conversion

of Town Planning Schemes to LUMS, to remind municipalities of the importance to conserve USCs.

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# APPENDIX 1

**RESEARCH QUESTIONNAIRE**  
**Pietermaritzburg Natural Open Space System**

Martin de Lange

Telephone number : 033 - 355 6164

E-mail : delangem@tlga.kzntl.gov.za

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**Details regarding respondent**

(1). **Name :** \_\_\_\_\_

(2). **Title:** Mr.  Mrs.  Dr.  Other, please state \_\_\_\_\_

(3). **Address :**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone number : \_\_\_\_\_

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This questionnaire consists of various questions. Some questions require a simple "Yes" or "No" answer whilst others may be in the form of a statement which needs your evaluation of such statement.

**1. Use and involvement with natural open spaces and conservancies**

1.1 How long have you lived here ?

[ ] Years.

1.2 Do you and your family make use of the natural open spaces in your neighbourhood and in Pietermaritzburg?

Yes  No .

(If **yes**, please go to question **1.3**.)

(If **no**, go to question **1.4**.)



1.4 What, in your opinion would increase the use of Natural Open Spaces in Pietermaritzburg ?

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1.5 What amount of money do you allocate to outdoor recreational activities on an annual basis ?

Less than R 250  R 251- R 500  R 501-R 1 000   
 More than R 1 001 .

Breakdown of costs	
Item	Approximate costs
Travel costs	
Donations	
Equipment	
Accommodation	
Other	
<b>Total</b>	

(ii) Which are your favourite destinations ?

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**2. Perceptions regarding open spaces in Pietermaritzburg**

2.1 It is submitted that there is a **general need** for natural open spaces from a **Society perspective**. Do you, in your opinion,

Strongly agree  Moderately agree  Neutral  Moderately disagree   
 Strongly disagree .

Please provide reasons for your answer above.

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- 2.2 Natural Open Spaces in Pietermaritzburg are marketed effectively. Do you, in your opinion, Strongly agree  Moderately agree  Neutral  Moderately disagree  Strongly disagree .

Please provide reasons for your answer above.

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- 2.3 (i) Do you have children ?  
Yes  No ,
- (ii) How often do your children play in the natural open spaces ?  
Very often  Often  Seldom  Very seldom  Never .
- (iii) It is argued that Natural Open Spaces have a role to play in the education and upbringing of our children. Do you, Strongly agree  Moderately agree  Neutral  Moderately disagree  Strongly disagree .

Please provide reasons for your answer above.

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- 2.4 It is considered that Natural Open Spaces in Pietermaritzburg are acceptable from a safety point of view. Do you, Strongly agree  Moderately agree  Neutral  Moderately disagree  Strongly disagree .

Please provide reasons for your answer above.

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**3. Question on the adequacy of open spaces**

3.1 Is it the duty of the Municipality to ensure that there are natural open spaces? Do you,

Strongly agree [ ] Moderately agree [ ] Neutral [ ] Moderately disagree [ ]  
Strongly disagree [ ].

3.2 It is submitted that the provision of open spaces in Pietermaritzburg satisfy Community requirements. Do you, in your opinion,  
Strongly agree [ ] Moderately agree [ ] Neutral [ ] Moderately disagree [ ]  
Strongly disagree [ ].

Please provide reasons for your answer above.

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3.3 (i) What, do you believe are the problems associated with open space planning in Pietermaritzburg?  
Please list the **top three reasons** in your opinion.

Suggestion	Reason

(ii) What effect do the following issues have on your use of natural open spaces in Pietermaritzburg ?

Pre-determined issue	Response	
	Positive effect	Negative effect
Security/personal safety (ie theft, mugging, snakes, animals, other dangers)		
Lack of publicity		
Lack of municipal resource allocation		
Ineffective maintenance of areas		
Lack of political support		
Water quality		
Flooding		
Illegal dumping		
Other :specify		

**4 Management of natural open spaces**

4.1 All citizens in Pietermaritzburg have a right to have a say in the management of natural open spaces in Pietermaritzburg. Do you, in your opinion,

Strongly agree [ ] Moderately agree [ ] Neutral [ ] Moderately disagree [ ]  
Strongly disagree [ ].

Please provide reasons for your answer above.

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4.2 What can the local community do to support the Municipality with regard to Natural Open Space protection and management ?

Proposal	Response	
	Yes	No
Financial support		
Establishment of Environmental Committees		
Voluntary work		
Other		

4.3 Should there be a cost for using natural open spaces, which can be used for the maintenance thereof ?

Yes [ ] No [ ].

Please provide reasons for your answer above.

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4.4 Who should be responsible to pay for the maintenance of riverine areas?

(Tick the most suitable option)

Municipality	Land owners	Businesses	Combination of the previous 3 (Specify)	Other (Specify)
Reasons				

4.5 Should private land owners on properties along rivers be responsible for maintaining the riverine areas ?

Yes  No .

Please provide reasons for your answer above.

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4.6 Should the controlled harvesting of medicinal plants be permitted?

Yes  No .

Please provide reasons for your answer above.

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4.7 Would you use hiking trails along the riverine areas should this initiative be successful?

Most definitely  Definitely  Likely  Unlikely  No .

Please provide reasons for your answer above.

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4.8 Do you believe that the Municipality should carry the sole responsibility for managing natural open spaces in Pietermaritzburg?

Yes  No .

Please provide reasons for your answer above.

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4.9 Do you have any ideas to improve the use and maintenance of Natural Open Spaces in Pietermaritzburg ?

Area of concern	Suggested improvement
Maintenance	
Safety	
Biodiversity	
Water quality	

4.10 Would you support the proposal for the establishment of "Car guards" for the natural open spaces ?

Yes  No.

Please provide reasons for your answer above.

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## 5. Ownership and property information

5.1 Are you the owner of the property or is it rented / leased ?

Tenure	Tick applicable box
Owner	
Renting/ leasing	

5.2 Where is the property boundary in relation to the river ?  
(Only in respect of those persons who live along river boundaries).

Boundary description	Tick applicable box
Some distance away from the river	
On the river bank	
The middle of the river	
Across the river	
Do not know	

5.3 What type of fence do you have in relation to the natural open space area?

Type of fence	Tick applicable box
Concrete	
Wire	
Wood	
Hedge	
Other	

5.4 Do you have a gate from your property to the natural open space area ?

Yes  No .

5.5 What problems do you experience due to your position in respect of the natural open space area / river ?

Problem	Tick applicable box
Mosquitos	
Bank erosion	
Weeds	
Flooding	
Dumping	
Vagrants	
Litter in the stream	
Other ( Specify)	

## 6. Community involvement

6.1 Do you belong to any other civic/ environmental organisation ?

Yes  No .

If yes, please provide details :

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6.2 Do you :-

(i) Know who your Local City Councillor is ?

Yes  No .

(ii) Have you ever communicated with him/ her ?

Yes  No .

6.4 (i) Have you heard of the Msunduzi Catchment Management Forum (MCMF) ?

Yes  No .

(ii) Would you like to be involved ?

Yes  No .

**7. Environmental knowledge**

7.1 (i) Are you aware of the alien plant control legislation ?

Yes  No .

(ii) Do you have any alien plants on your land ?

Yes  No  Do not know .

If so, which type and would you clear them ?

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(iii) Do you have any alien plants in the riverine area near you ?

Yes  No  Do not know .

If so, which type and would you clear them ?

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7.2 What are your perceptions of the water quality in the streams in your natural open space system ?

Good  Moderate  Poor  Bad  Do not know .

7.3 Have you noticed any changes to the river in this time ?

Yes  No .

If so, what changes ?

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7.4 (i) Are you familiar with the bird species in your area ?

Very familiar  Moderately familiar  Unsure  Unfamiliar

Totally unfamiliar .

(ii) Please name some bird species observed in your area.

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7.5 (i) Are you familiar with the fish species in the streams in your area ?

Very familiar [ ] Moderately familiar [ ] Unsure [ ] Unfamiliar [ ]  
 Totally unfamiliar [ ].

(ii) Please name some fish species observed in the streams in your area.

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**8. General**

8.1 Do you enjoy gardening ?

Yes [ ] No [ ].

8.2 Would you like your garden to enter into the river (if security was not an issue) ?

Yes [ ] No [ ].

8.3 Do you have any photographs of the river ?

Yes [ ] No [ ]  
 ( Number of photographs [ ] ).

Photograph (Of what )	Approximate date of photograph

# **APPENDIX 2**

### Summary of responses by Foxhill stream respondents regarding open space use patterns

Facility	Knowledge of area		Frequency of visitation (Number of visits per annum)					Purpose of visit (Conservation [C], recreation [R], picnic [P], fishing [F], walking the dog/s [W/d], holiday [H], other - specify)						
	Yes	No	Never	1 - 3	4 - 7	8 - 10	Other	C	R	P	F	W/d	H	Other
<b>Conservation areas</b>														
Ferncliffe	14	6	-	3	-	-	-	-	3	-	-	-	-	Bird watching (1)
Queen Elizabeth Park	16	4	-	6	2	-	-	1	6	1	-	-	-	Bird watching (1)
Bisley Valley	17	3	-	4	3	2	-	1	8	-	-	-	-	Bird watching (1)
Hesketh Conservancy	13	7	-	-	1	-	-	-	1	-	-	-	-	
Bird Sanctuary	10	10	-	-	2	-	-	-	1	-	-	-	-	Bird watching (1)
World's View	18	2	-	7	-	-	-	-	6	1	-	-	-	
<b>Parks</b>														
Alexandra Park	18	2	-	6	3	1	1	-	9	2	-	-	-	
Botanical Gardens	17	3	-	3	2	2	2	1	6	2	-	-	-	
Wylie Park	14	6	-	2	2	-	-	-	4	-	-	-	-	
Chase Valley (Hatcheries)	10	10	20	-	-	-	-	-	-	-	-	-	-	
<b>Natural Open Space</b>														
Campsdrift	17	3	-	4	2	2	-	-	5	1	1	1	-	
Foxhill Spruit	20	0	-	1	1	2	4	-	2	6	-	2	-	
Dorp Spruit	14	6	-	1	-	1	-	-	2	-	-	-	-	Visit garden Centre
Townbush Spruit	14	6	-	1	-	-	-	-	1	-	-	-	-	Bird watching (1)
Other														
<b>Non Local Areas</b>														

### Summary of responses by Townbush stream respondents regarding open space use patterns

Facility	Knowledge of area		Frequency of visitation (Number of visits per annum)					Purpose of visit (Conservation [C], recreation [R], picnic [P], fishing [F], walking the dog/s [W/d], holiday [H], other - specify)						
	Yes	No	Never	1 - 3	4 - 7	8 - 10	Other	C	R	P	F	W/d	H	Other
<b>Conservation areas</b>														
Ferncliffe	19	1	-	6	3	2	3	3	10	1	-	3	-	
Queen Elizabeth Park	20	-	-	10	2	2	2	2	9	6	1	1	-	Walking
Bisley Valley	12	8	-	3	-	-	-	-	3	-	-	-	-	
Hesketh Conservancy	11	9	-	1	-	-	-	-	1	-	-	-	-	
Bird Sanctuary	15	5	-	1	1	-	-	-	2	-	-	-	-	
World's View	20	-	-	8	4	1	-	-	9	4	-	-	-	Bicycle racing
<b>Parks</b>														
Alexandra Park	16	4	-	4	1	3	-	-	7	-	-	1	-	
Botanical Gardens	20	-	-	10	6	1	-	-	10	7	-	-	-	
Wylie Park	18	2	-	7	4	1	-	-	7	5	-	-	-	
Chase Valley (Hatcheries)	15	5	-	3	-	-	-	-	3	-	-	-	-	
<b>Natural Open Space</b>														
Campsdrift	18	2	-	2	2	-	1	-	5	-	-	-	-	
Foxhill Spruit	15	5	No	-	-	-	-	-	-	-	-	-	-	
Dorp Spruit	16	4	-	1	-	-	-	-	-	-	-	1	-	
Townbush Spruit	15	5	-	1	-	4	3	-	5	-	-	2	-	Walking (1)
Other														
<b>Non Local Areas</b>														

**Summary of questionnaire results: Natural open space survey  
(Where more than one respondent had a similar idea, this is noted by the number in brackets)**

FOXHILL SPRUIT	TOWNBUSH SPRUIT
<p><u>1. What in your opinion would lead to the better use of natural open spaces in Pietermaritzburg</u></p>	
<ul style="list-style-type: none"> <li>➤ Better maintenance (4)</li> <li>➤ Cutting grass (5)</li> <li>➤ Need to improve security (6)</li> <li>➤ Improved publicity (2)</li> <li>➤ Provision of pathways (3)</li> <li>➤ Open space rehabilitation programmes</li> <li>➤ Provision of picnic facilities (2)</li> <li>➤ Provision of ablution facilities (2)</li> <li>➤ Provision of braai areas</li> <li>➤ Provision of playing facilities for children</li> <li>➤ Patrols by mounted police (visible security)</li> <li>➤ Education on bird species</li> <li>➤ Removal of litter (3)</li> <li>➤ Creation of mini parks in USCs</li> <li>➤ Undertaking nature education events in these areas (2)</li> <li>➤ Use of USCs for recreational events (2)</li> <li>➤ Improving neglected areas (2)</li> </ul>	<ul style="list-style-type: none"> <li>➤ Improved security (15)</li> <li>➤ Improved maintenance (6)</li> <li>➤ Improved cleanliness of NOSs (3)</li> <li>➤ Improved publicity (2)</li> <li>➤ Improved facilities (1)</li> <li>➤ Provision of ablution facilities</li> <li>➤ Providing facilities for children</li> <li>➤ Proper management of NOSs (2)</li> <li>➤ One respondents was opposed to the idea that NOSs need to be increased</li> <li>➤ NOSs need to have draw cards such as hosting Flea markets</li> </ul>

FOXHILL SPRUIT	TOWNBUSH SPRUIT								
<p><u>2. It is submitted that there is a general need for natural open spaces from a society perspective. Please also provide reasons for your answers</u></p>									
<ul style="list-style-type: none"> <li>➤ Provide open spaces for children</li> <li>➤ Important for children (3)</li> <li>➤ Need to be exposed to nature (2)</li> <li>➤ Provides opportunities for the establishment of hiking trails</li> <li>➤ NOSs provide opportunities for cheap outings.</li> <li>➤ Important space for people living in flats/townhouses</li> <li>➤ Need for city dwellers to relax in peaceful environment whilst learning to appreciate and conserve natural surroundings</li> <li>➤ Children can experience nature through NOSs (4)</li> <li>➤ USCs function as the lungs of the city</li> <li>➤ Provides space for the release of stress (2)</li> <li>➤ Represents a pleasant environment</li> <li>➤ Provides recreational opportunities</li> <li>➤ Extensive use of Alexandra Park has been observed</li> <li>➤ Has potential to increase tourism</li> <li>➤ Ethical responsibility for humans not to use the whole environment for themselves</li> <li>➤ Use of these areas provides a healing experience</li> </ul>	<ul style="list-style-type: none"> <li>➤ Although a nice-to-have vs. essential, if maintained properly, could be an attraction</li> <li>➤ The need for space is determined by your property size</li> <li>➤ People spending too much time indoors. Therefore has an important role</li> <li>➤ Allows one to get away from the home environment and enjoy freedom of the open space</li> <li>➤ NOSs /USCs has the potential to improve health through fresh air, exercise and relaxation</li> <li>➤ Important medium for recreation</li> <li>➤ Important for relaxation</li> <li>➤ Important for mental health</li> <li>➤ Required for urban health as lungs of the city (2)</li> <li>➤ Open spaces must however not be created at the cost of other society needs</li> <li>➤ USCs/ NOSs represents and opportunity to feed our souls</li> <li>➤ Feel 'in touch' with nature</li> <li>➤ Stress free environment</li> <li>➤ Important for children (2)</li> </ul>								
85%	5%	5%	5%	0	60%	25%	15%	0	0
17	1	1	1	0	12	5	3	0	0
Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree	Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>									
72.5%		15%			10%		2.5%		0
29		6			4		1		0
Strongly Agree		Moderately Agree			Neutral		Moderately Disagree		Strongly Disagree

FOXHILL SPRUIT					TOWNBUSH SPRUIT				
<p><u>3. Natural open spaces in Pietermaritzburg are marketed effectively. Please provide reasons for your answer.</u></p> <ul style="list-style-type: none"> <li>➤ Limited marketing (5)</li> <li>➤ No marketing being undertaken</li> <li>➤ No sign-posting of paths</li> <li>➤ Have seen some brochures</li> <li>➤ Marketing of Bisley Big 5</li> <li>➤ In comparison with Midlands Meander, local open spaces not well marketed</li> <li>➤ No adverts in local papers (2)</li> <li>➤ Need more involvement of schools</li> </ul>					<ul style="list-style-type: none"> <li>➤ Marketing lacking compared to flea markets etc (3)</li> <li>➤ Have never seen any marketing (5)</li> <li>➤ If you are really interested, information is available</li> <li>➤ No active advertising or highlighting importance of areas.</li> <li>➤ Need to retain <i>status quo</i>. Further use will lead to disturbance of areas (2)</li> <li>➤ There should be a greater involvement of schools and KPC</li> <li>➤ Signage adequate</li> <li>➤ No advertising</li> <li>➤ Are there in fact areas to be marketed</li> <li>➤ Marketing not done effectively</li> </ul>				
0	20%	10%	25%	45%	10%	25%	10%	20%	35%
0	4	2	5	9	2	5	2	4	7
Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree	Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>									
5%		22.5%			10%		22.5%		40%
2		9			4		9		16
Strongly Agree		Moderately Agree			Neutral		Moderately Disagree		Strongly Disagree

FOXHILL SPRUIT					TOWNBUSH SPRUIT				
<p><u>4. It is considered that natural open spaces in Pietermaritzburg are acceptable from a safety point of view. Please provide reasons for your answer.</u></p> <ul style="list-style-type: none"> <li>➤ Inadequate policing</li> <li>➤ High crime rate</li> <li>➤ Always feel unsafe</li> <li>➤ Tendency for vagrants to occupy these areas</li> <li>➤ Unsafe feeling</li> <li>➤ Just a feeling of insecurity in these areas</li> <li>➤ Children have been raped in Alex Park.</li> <li>➤ Certain open spaces such as the Botanical Gardens and Queen Elizabeth Park considered safe</li> <li>➤ Reported muggings in these areas</li> <li>➤ One respondent has been bothered whilst bird-watching</li> <li>➤ Grass too tall</li> <li>➤ Presence of snakes</li> </ul>					<ul style="list-style-type: none"> <li>➤ Do not feel safe walking in some areas</li> <li>➤ Children not safe (2)</li> <li>➤ Fairly safe (during the day on known paths)</li> <li>➤ Will not go into areas alone (2)</li> <li>➤ Have been some muggings in NOS areas</li> <li>➤ Fairly safe, however, squatters could lead to problems</li> <li>➤ Crime (2)</li> <li>➤ Overgrowth (2)</li> <li>➤ Criminal activity occurs in all open spaces.</li> <li>➤ Common knowledge that these areas are prone to crime</li> <li>➤ Although some areas are safe, others are considered unsafe, e.g. Wylie park and the Hatcheries (2)</li> <li>➤ Don't feel safe</li> <li>➤ Areas are acceptable from safety point of view</li> </ul>				
5%	30%	10%	15%	40%	0	15%	5%	35%	45%
1	6	2	3	8	0	3	1	7	9
Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree	Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>									
2.5%		22.5%			7.5%		25%		42.5%
1		9			3		10		17
Strongly Agree		Moderately Agree			Neutral		Moderately Disagree		Strongly Disagree

FOXHILL SPRUIT					TOWNBUSH SPRUIT				
<p>5. It is argued that natural open spaces have a role to play in the education and upbringing of our children. Please provide reasons for your answer.</p> <ul style="list-style-type: none"> <li>➤ Agreed, has education value (3)</li> <li>➤ Children learn to appreciate and conserve natural surroundings (3)</li> <li>➤ Teaches children to respect nature (5)</li> <li>➤ Need space for children living in flats or with small gardens</li> <li>➤ Prepares them to preserve nature</li> <li>➤ Need to be exposed to nature (4)</li> <li>➤ Encourages family activities (3)</li> <li>➤ Natural ecosystem education</li> </ul>					<ul style="list-style-type: none"> <li>➤ Could be of value for education</li> <li>➤ People need to know about nature</li> <li>➤ Allows a child to enjoy and appreciate nature</li> <li>➤ Decreases stress</li> <li>➤ Value in studying nature and natural sciences</li> <li>➤ Important for children to be exposed to nature</li> <li>➤ Healthy mind in healthy body</li> <li>➤ Importance – conservation, interaction with nature, including wildlife.</li> <li>➤ Learn about nature (4)</li> <li>➤ Provides a 'fresh air' experience</li> <li>➤ NOSs have no costs</li> <li>➤ Value experience – sets tone for rest of life (3)</li> <li>➤ One respondent was neutral - no children</li> <li>➤ Need to be in touch with nature</li> <li>➤ Need a good base for life ahead</li> <li>➤ Children need to be exposed to nature</li> </ul>				
85%	15%	0	0	0	75%	15%	10%	0	0
17	3	0	0	0	15	3	2	0	0
Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree	Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>									
80%		15%			2%		0		0
32		6			2		0		0
Strongly Agree		Moderately Agree			Neutral		Moderately Disagree		Strongly Disagree

Foxhill Spruit					Townbush Spruit				
<p>6. It is submitted that the provision of open spaces in Pietermaritzburg satisfy community needs. Please provide reasons for your answer.</p> <ul style="list-style-type: none"> <li>➤ Quantity acceptable, quality needs attention i.e. Clean up and marketing (2)</li> <li>➤ Quality needs to be improved (2)</li> <li>➤ More active management of these spaces with a curator on duty may improve the situation</li> <li>➤ Could include mountain bike tracks</li> <li>➤ Need for open spaces in our previously disadvantaged areas (2)</li> <li>➤ Not enough NOSs to satisfy community needs (4)</li> <li>➤ Affordability a problem where entrance fees are charged</li> <li>➤ Facilities lacking</li> </ul>					<ul style="list-style-type: none"> <li>➤ Some children may no have place to play, important for them</li> <li>➤ Not sure of adequacy</li> <li>➤ Areas being overcrowded</li> <li>➤ Should provide braai facilities</li> <li>➤ Unsure (2)</li> <li>➤ Some affluent areas have sufficient open spaces, more densely populated areas neglected, e.g. Shenstone/ Ambleton. NOS protection must however have community by-in (4)</li> <li>➤ There probably is a need for open spaces in previously disadvantaged areas.</li> <li>➤ Enough open space – not used effectively</li> </ul>				
10%	15%	10%	40%	25%	10%	50%	30%	5%	5%
2	3	2	8	5	2	10	6	1	1
Strongly agree	Moderately agree	Neutral	Moderately disagree	Strongly disagree	Strongly agree	Moderately agree	Neutral	Moderately disagree	Strongly disagree
<b>Combined evaluation of the above Foxhill Spruit and Townbush Spruit</b>									
10%		32.5%			20%		22.5%		15%
4		13			8		9		6
Strongly agree		Moderately agree			Neutral		Moderately disagree		Strongly disagree

FOXHILL SPRUIT					TOWNBUSH SPRUIT				
7. Is it the duty of the Municipality to ensure that there are natural open spaces?									
70%	25%	5%	0	0	95%	0	5%	0	0
14	5	1	0	0	19	0	1	0	0
Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree	Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>									
82.2%		12.5%			5		0		0
33		5			2		0		0
Strongly Agree		Moderately Agree			Neutral		Moderately Disagree		Strongly Disagree

FOXHILL SPRUIT		TOWNBUSH SPRUIT	
8. Should municipalities carry the sole responsibility for managing open spaces?			
<ul style="list-style-type: none"> <li>➤ Community as a whole needs to participate but the municipality should play a leading role</li> <li>➤ NOS management should be a combined responsibility (3)</li> <li>➤ NOS management is a Municipal responsibility. They should curb unnecessary spending which will lead to more funding for services such as NOS protection</li> <li>➤ No, volunteers, ratepayers and commerce all have a role to play</li> <li>➤ No, should be a joint venture</li> <li>➤ No, schools should also be involvement</li> <li>➤ No. Greater participation by community will lead to better awareness</li> <li>➤ Yes, already paying rates.</li> <li>➤ No, people should also take ownership.</li> <li>➤ Yes, Municipal responsibility.</li> </ul>		<ul style="list-style-type: none"> <li>➤ Not maintained at present – concerned about overgrowth, safety and snakes</li> <li>➤ No, environmental groups and conservancies to assist</li> <li>➤ Yes, NOS management should be municipal responsibility</li> <li>➤ No. If persons (residents) are involved, they will utilize the open spaces</li> <li>➤ No, NOS management should be a joint responsibility (5)</li> <li>➤ Yes, already paying rates</li> <li>➤ No, NOS management could be dealt with through environmental committees</li> <li>➤ No. Partnerships important</li> </ul>	
35%	65%	50%	50%
7	13	10	10
Yes	No	Yes	No
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>			
42.5%		57.5%	
17		23	
Yes.		No.	

FOXHILL SPRUIT					TOWNBUSH SPRUIT				
<p><u>9. All citizens in Pietermaritzburg have a right to have a say in the management of NOSs</u></p> <ul style="list-style-type: none"> <li>➤ Ratepayers should have a say. Final decisions should however be in the hands of experts</li> <li>➤ Ratepayers should have a say (3)</li> <li>➤ Yes there is a need take local knowledge into consideration</li> <li>➤ Yes, this could lead to more awareness which could lead to more support</li> <li>➤ Yes, people need to feel part of projects</li> <li>➤ Yes, ratepayers should have a role. This is probably rather idealistic</li> <li>➤ Yes, ratepayers and neighbours to NOS</li> <li>➤ Yes, citizens need to have a say in future developments</li> <li>➤ Yes, consultation will lead to contribution</li> <li>➤ Yes, shared responsibility will leads to transparency</li> <li>➤ Yes, it is considered a constitutional right</li> <li>➤ Yes, involvement will lead to ownership</li> <li>➤ Yes, because it is for their benefit</li> <li>➤ Open spaces are there for community use, and thus all people should have a right to express their views in this regard</li> </ul>					<ul style="list-style-type: none"> <li>➤ Yes, as a ratepayer you should have a say (5)</li> <li>➤ Yes, all people need to contribute</li> <li>➤ Yes, each community recognizes it's own needs which need to be communicated</li> <li>➤ No, it will not be practical</li> <li>➤ Yes, it is a democratic right</li> <li>➤ Yes, however people's rights must be localized to their wards. (2)</li> <li>➤ Yes, NOSs are a public resource therefore all people should have a say.</li> <li>➤ Yes it is a community right</li> <li>➤ Yes. Views should however be localized</li> <li>➤ Yes, this is supported. Although one acknowledges expert views, one should allow public input</li> </ul>				
60%	35%	0	5%	0	60%	30%	0	5%	5%
12	7	0	1	0	12	6	0	1	1
Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree	Strongly Agree	Moderately Agree	Neutral	Moderately Disagree	Strongly Disagree
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>									
60%		32.5%			0		5%		2.5%
24		13			0		2		1
Strongly Agree		Moderately Agree			Neutral		Moderately Disagree		Strongly Disagree

FOXHILL SPRUIT					TOWNBUSH SPRUIT				
<p><u>10. What do you believe are the problems associated with open space planning in Pietermaritzburg .</u></p> <ul style="list-style-type: none"> <li>➤ Finance (7)</li> <li>➤ Security (6)</li> <li>➤ Maintenance lacking (4)</li> <li>➤ Marketing lacking (3)</li> <li>➤ Municipal capacity (2)</li> <li>➤ In terms of past planning practices only superfluous land was set aside for NOSs. This limits use/conservation value</li> <li>➤ Lack of facilities</li> <li>➤ Lack of interest by residents</li> <li>➤ Maintenance ineffective - bird nests destroyed</li> <li>➤ Lack of conviction by residents and residents</li> <li>➤ Lack in respect of vision/ NOS plan for Pietermaritzburg (2)</li> <li>➤ River water dirty (high sedimentation)</li> <li>➤ Lack ablution facilities, litter drums and benches (2)</li> <li>➤ Consultation with public lacking</li> <li>➤ Political will lacking. Rather a statement vs. priority</li> <li>➤ Open spaces should be 'free'</li> <li>➤ Need NOS for education purposes</li> </ul>					<ul style="list-style-type: none"> <li>➤ Keep bushy areas to a minimum</li> <li>➤ Maintenance (4)</li> <li>➤ Allocation of certain areas to specific residential areas only – ownership</li> <li>➤ Lack of interest</li> <li>➤ Growth of residential areas – encroaching on NOSs</li> <li>➤ Security non-existent (1)</li> <li>➤ Ablution facilities lacking</li> <li>➤ Increases in development densities</li> <li>➤ Inadequate financial support for NOSs</li> <li>➤ Over-development of riverine areas</li> <li>➤ Education of council required (2)</li> <li>➤ Future NOS vision lacking (4)</li> <li>➤ Safety lacking</li> <li>➤ Planning motivated by economics rather than environmental value e.g. the Alexandra filling station development (3)</li> <li>➤ Municipality satisfying NOS for development</li> <li>➤ Need natural lungs in city</li> <li>➤ NOS expensive to maintain</li> </ul>				

FOXHILL SPRUIT				TOWNBUSH SPRUIT			
<p>11. What can the local community do to support the municipality with regard to natural open space protection and management (e.g. financial support, establishment of environmental committees)? What additional ideas do you have?</p> <ul style="list-style-type: none"> <li>➤ Extention of the 'Adopt-a-spot' idea (3)</li> <li>➤ Persons to extend their gardens to include portion of the NOS in order to protect areas</li> <li>➤ Owners of land along streams could volunteer to clear aliens once a month.</li> </ul>				<ul style="list-style-type: none"> <li>➤ Already paying rates and taxes, therefore don't believe that further assistance should be provided</li> <li>➤ Residents could assist by reporting on dumping/squatters</li> <li>➤ School children to assist in clean-up campaigns</li> <li>➤ Involvement brings understanding</li> <li>➤ If NOSs are used frequently, it could encourage involvement</li> <li>➤ If right structures are in place, community assistance could be effectively integrated</li> </ul>			
35%	65%	75%	85%	45%	55%	80%	75%
7	13	15	17	9	11	16	15
Yes	No	Establishment Of environmental committees	Moderately Disagree Strongly Disagree	Yes	No	Establishment Of environmental committees	Moderately Disagree Strongly Disagree
Financial support							
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>							
40%		60%		75%		80%	
16		24		31		32	
Yes		No		Establishment of environmental committees		Moderately Disagree Strongly Disagree	
Financial support							

FOXHILL SPRUIT		TOWNBUSH SPRUIT	
<p>12. Should there be a cost for using natural open spaces which can be used for maintenance thereof?</p> <ul style="list-style-type: none"> <li>➤ Some areas should be 'pay areas' and others not. Pay areas could subsidize the maintenance of 'free areas'</li> <li>➤ No, already paying rates (7)</li> <li>➤ Normal maintenance must be paid through rates/central government funding. Specific projects, such as rehabilitation, could be initiated through additional donations</li> <li>➤ Yes, there should be cost, linked to safety</li> <li>➤ No, use of NOSs a right</li> <li>➤ No, levying a cost will affect use</li> <li>➤ Contributions will assist in making areas self sufficient (5)</li> <li>➤ Yes, but costs should be reasonable</li> <li>➤ Costs make it unaffordable to the poor</li> </ul>		<ul style="list-style-type: none"> <li>➤ Already paying rates and taxes (2)</li> <li>➤ Gate fees will be a disincentive to the poor</li> <li>➤ Fees could be levied as long as costs are realistic and restricted to certain areas only</li> <li>➤ Will prevent misuse of open spaces</li> <li>➤ Yes, on condition that is used for maintenance of that area</li> <li>➤ Should consider those who cannot afford NOS use</li> <li>➤ Yes, it could facilitate control</li> <li>➤ No, NOS should be available to all</li> <li>➤ Concept of 'open space' will be killed by entrance fees (4)</li> <li>➤ No. Municipal funding should rather be properly managed</li> </ul>	
45%	55%	30%	70%
9	11	6	14
Yes	No	Yes	No
Costs for using NOSs		Costs for using NOSs	
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>			
37.5%		62.5%	
15		25	
Yes.		No.	

FOXHILL SPRUIT				TOWNBUSH SPRUIT			
<b>13. Who should be responsible for payment in respect of maintenance of riverine areas (Municipality, land owners, businesses or a combination of all three)?</b> <ul style="list-style-type: none"> <li>➤ Combination of all.</li> <li>➤ Municipality – It is a municipal mandate and responsibility as the responsible authority (3)</li> <li>➤ All have a responsibility - All landowners have 'ownership' of NOSs. Rivers a national resource. Riverine land owners through their actions have a direct impact on the stream and downstream users</li> <li>➤ Landowners should have limited involvement with leading role by municipality and business.</li> <li>➤ Rates and taxes paid to municipality. It is therefore their responsibility (4)</li> <li>➤ Whole society has use of the area, and should therefore contribute to same, including businesses.</li> <li>➤ Riparian land owners should have a contribution</li> <li>➤ Should be joint responsibility</li> <li>➤ Responsibility of all (4)</li> </ul>				<ul style="list-style-type: none"> <li>➤ Already pay rates and taxes therefore a municipal responsibility (3)</li> <li>➤ Municipality should attend to maintenance; landowners should attend to curbing of dumping, business should provide financial support</li> <li>➤ Municipal responsibility</li> <li>➤ More involvement by business, public will result in more effectiveness.</li> <li>➤ Municipal responsibility (3)</li> <li>➤ Should be a joint venture (2)</li> <li>➤ There should be joint responsibility between the municipality and landowners, but the main responsibility should rest with the municipality</li> <li>➤ Everyone has a role to play</li> <li>➤ Municipality should curb corrupt practices. This will ensure sufficient funding for its responsibilities</li> </ul>			
52.4%	4.8%	4.8%	38.1%	53.3%	23.3%	3.3%	20%
11	1	1	8	16	7	1	6
Municipality	Land owners	Business's	Combination of all three	Municipality	Land owners	Business's	Combination of all three
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>							
53%		15.7%		4%		27.5%	
27		8		2		14	
Municipality		Land owners		Business's		Combination of all three	

FOXHILL SPRUIT		TOWNBUSH SPRUIT	
<b>14. Should private landowners on properties along streams be responsible for maintaining the riverine areas?</b> <ul style="list-style-type: none"> <li>➤ NOS areas/USCs are public areas should be paid through rates and taxes (2)</li> <li>➤ Yes, shared responsibility in terms of maintenance</li> <li>➤ No, already paying rates and taxes (4)</li> <li>➤ Yes, riparian land owners have a direct interest in the maintenance of USCs</li> <li>➤ Increased involvement could lead to a better understanding and assistance in curbing problems</li> <li>➤ Already responsible for payment of rates and maintenance of verges (2)</li> <li>➤ No, but could assist though.</li> <li>➤ No, municipal responsibility (4)</li> <li>➤ Will consider joint responsibility if rates and taxes are proportionately reduced.</li> </ul>		<ul style="list-style-type: none"> <li>➤ Yes, landowners can be requested to contribute to maintenance, but with a rebate in rates and taxes</li> <li>➤ Yes riparian land owners benefit from proper management (2)</li> <li>➤ Yes, where boundaries are the center of stream</li> <li>➤ Once USCs are in a good state, this could be considered</li> <li>➤ Will increase effectivity of maintenance.</li> <li>➤ Yes, wanted to lease land but was not permitted</li> <li>➤ Yes, partnerships could assist in controlling pollution</li> <li>➤ Yes, land owners could have a role. This could improve aesthetics and conservation quality of USCs through more resources and understanding</li> <li>➤ Yes, already own land up to middle of stream</li> <li>➤ Yes, however municipalities should acquire riverine areas as a servitude to allow them access for maintenance (2)</li> </ul>	
20%	80%	60%	40%
4	16	12	8
Yes	No	Yes	No
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>			
40%		60%	
16		24	
Yes.		No.	

FOXHILL SPRUIT					TOWNBUSH SPRUIT				
<p>15. Would you use hiking trails along the riverine areas should these be provided?</p> <ul style="list-style-type: none"> <li>➤ Yes, would be good from recreational point of view</li> <li>➤ Not provided at present. Would make these areas more accessible and will improve safety</li> <li>➤ Yes, subject to improved security (2)</li> <li>➤ Yes, will increase exposure to nature</li> <li>➤ Trails will increase use of USCs</li> <li>➤ Yes, use releases stress</li> <li>➤ Yes, will provide opportunities for adventure, outing</li> <li>➤ Yes, will expose children to natural environment</li> </ul>					<ul style="list-style-type: none"> <li>➤ Yes, enjoy hiking trails (2)</li> <li>➤ Good for recreation and education</li> <li>➤ Proper maintenance of trails will improve safety</li> <li>➤ Will be a good initiative</li> <li>➤ Yes, if security is improved</li> <li>➤ Will encourage use and environmental education (2)</li> <li>➤ No, not supported in an urban area</li> </ul>				
55%	15%	20%	0	5%	20%	20%	40%	15%	5%
11	3	4	0	1	4	4	8	3	1
Most definitely	Definitely	Likely	Unlikely	No	Most definitely	Definitely	Likely	Unlikely	No
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>									
37.5%		17.5%			30%		10%		5%
15		7			12		4		2
Most definitely		Definitely			Likely		Unlikely		No

FOXHILL SPRUIT		TOWNBUSH SPRUIT	
<p>16. Would you support the establishment of enviro (river) guards?</p> <ul style="list-style-type: none"> <li>➤ Could improve security (9)</li> <li>➤ No, this is a municipal responsibility</li> <li>➤ Yes, improves vigilance</li> <li>➤ No, financial viability question</li> <li>➤ No, not considered necessary</li> <li>➤ Will improve security, hopefully prevent dumping</li> </ul>		<ul style="list-style-type: none"> <li>➤ Will allow people peace of mind while enjoying nature</li> <li>➤ Will improve security</li> <li>➤ Will allow people to be more relaxed when using USCs</li> <li>➤ Questioned. They will have no power to protect</li> <li>➤ Yes, will provide employment</li> <li>➤ Yes, could deter crime</li> </ul>	
80%		20%	
16		4	
Yes		No	
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>			
72.5%		27.5%	
29		11	
Yes.		No.	

FOXHILL SPRUIT		TOWNBUSH SPRUIT	
17. Do you have any knowledge of the Msunduzi Catchment Management Forum?			
15%	85%	35%	65%
3	17	7	13
Yes, have knowledge	No, does not have knowledge	Yes, have knowledge	No, does not have knowledge
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>			
25%		75%	
10		30	
Yes, have knowledge		No, does not have knowledge	

FOXHILL SPRUIT		TOWNBUSH SPRUIT			
18. Environmental knowledge tested based on respondents knowledge of the requirements relating to alien plants in respect of Conservation of Agricultural Resources Act					
70%	30%	95%	5%		
14	6	19	1		
Yes, have environmental knowledge	No, do not have environmental knowledge	Yes, have environmental knowledge	No, do not have environmental knowledge		
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>					
82,5%		17,5%			
33		7			
Yes, have environmental knowledge		No, do not have environmental knowledge			
Will respondents remove invasive aliens?		Will respondents remove invasive aliens?			
30%	5%	65%	85%	5%	10%
6	1	13	17	1	2
Yes	No	Not sure	Yes	No	Not sure
<b>Combined Evaluation of the above Foxhill Spruit and Townbush Spruit</b>					
57,5%		5%		37,5%	
23		2		15	
Yes		No		Not sure	

# APPENDIX 3

## **Summary of interviews with interested and affected parties other than riparian residents**

**Interview with Mr Ian Parker: Chief Town and Regional Planner- Msunduzi Municipality  
30 September 2002**

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**Question 1: Does the Msunduzi Municipality have any land use controls in support of the protection of urban stream corridors?**

Mr Parker explained that the current town planning scheme makes provision for three categories of open space, namely active open spaces such as Alexandra Park, conservation reserves such as the Ferncliff conservancy and finally passive open spaces which include urban stream corridors. He explained that only active open spaces and conservation areas are protected through effective scheme zonations together with effective maintenance plans. Passive open spaces, because of their limited use, enjoy less protection under the provisions of the town planning scheme. He acknowledged that this situation was not ideal.

**Question 2: Will the new Integrated Development Plan provide better protection for urban streams?**

It was confirmed that the new Integrated Development Plan process is more environmentally orientated. The new Integrated Development Plan was consulted during the interview. Although it acknowledged the importance and need to protect the water courses, eg. that *“(t)he Municipality should clean up and highlight its many streams and watercourses, instead of allowing them to be neglected and(as it were) hidden away”* (Msunduzi Municipality 2002, 117), no funding was allocated to this activity (Ibid 281). It was further confirmed that no new specific plans have been commissioned to attend to the protection of watercourses in terms of the provisions of the Integrated Development Plan.

**Question 3: How is the Planning Directorate dealing with the issue of cadastral boundaries which extend to the centre line or across streams?**

Mr Parker explained that many of the problems relating to property boundaries extending either to the centre of streams or traversing same dates back to the mid 1950's prior to the introduction of the current town planning scheme. In terms of Section 67 *oct* of the Town Planning Ordinance No. 27 of 1949 municipalities had ten years as from 1983 to purchase land previously reserved for public purposes. This however proved to be too costly and thus

the problems such as these prevail. Mr Parker confirmed that this resulted in a problem relating to the maintenance of streams as the Municipality was not permitted to effect any work on privately owned land at their costs.

**Question 4: Does the Municipality have any policies to protect urban stream corridors in the absence of zoning controls?**

Mr Parker explained that there was no official policy to protect urban stream corridors. He did however advise that Council, to protect open spaces in general including urban stream corridors, require persons who want to use open space for any other use, to apply for special consent.

**Question 5: Are there any environmentally related policies supporting urban stream management?**

He explained that Local Agenda 21 under the chairmanship of Councilor Gardener was responsible for macro environmental policies but that no specific policy existed to protect urban stream corridors. He did however point to the fact that officials in the absence of such specific policies have designed an environmental checklist which developers have to comply with to assist in identifying environmental issues which should be dealt with. This is particularly applied to the rezoning of land which includes any passive open space to another use and larger developments. Reference was made to the Liberty Mall development along the Townbush spruit which was subjected to this requirement.

**Question 6: Are floodlines taken into account during the planning of new land development?**

It was confirmed that this is a function performed by the Engineers Department. They however rely on the provisions of the National Water Act No. 36 of 1998. No specific or additional requirements are applied.

# **Interview with Mr Gavin Harrison and Mr Ian Kedge: Chief Stormwater Engineer and his deputy - Msunduzi Municipality**

**30 September 2002**

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## **Question 1: What policies are in place to protect urban stream corridors?**

Mr Harrison confirmed that there were no specific policies in place to protect urban stream corridors. He advised that they rather opted for narrow policies, in this case hydraulic efficiency. The emphasis of stream management was thus on the efficiency of streams to contain storm water runoff as opposed to a balance between stormwater efficiency and environmental protection and value.

He did however indicate that some 2-3 years ago the Municipality wanted to initiate a catchment management agency process to identify the problems and needs of the streams in Pietermaritzburg. The intention was to determine the status and needs of each of the urban streams leading to policies to attend to stream management and rehabilitation, ideally over a 5 year implementation programme. This project however was shelved due to a lack of funding.

## **Question 2: What floodline requirements do the Municipality apply and what are the consequences for development along the streams?**

Although the Engineers Department was aware and complied with Section 144 of the National Water Act, No. 36 of 1998 that is to show the 1: 100 year flood line with regard to development, it was still applying the 1: 50 year flood line in terms of the Town Planning Scheme. Thus developments may occur within the 1:100 year floodline but above the 1: 50 year flood line. It was further mentioned that building could take place below the 1: 50 year flood line if the final floor level was in fact above the 1: 50 year flood line.

## **Question 3: Who maintains urban stream corridors?**

It was confirmed that the stream channel as well as the area two meters on either side of the channel is a responsibility of the Engineering Department. The open space area beyond that was the responsibility of the Parks and Recreation Department. Some discussion ensued regarding the practicalities of this arrangement. It was acknowledged that it may be

environmentally more effective to have the Parks Department to tend to all the maintenance due to their environmental knowledge.

**Question 4: What is the purpose of this maintenance?**

As mentioned earlier the main purpose was hydraulic efficiency. Whilst this at face value may appear to be a narrow approach, Mr Kedge however indicated that although the maintenance plan does not have the environment as its focus, officials within the Municipality have taken it upon themselves to implement this programme bearing in mind the needs of the environment. They for instance only undertake clearing and bushwhacking of urban stream channels outside breeding seasons of various bird species.

**Question 5: Is there political support for urban stream corridor management?**

In response to this question it was pointed out that urban stream management is subject to community needs. It was also added that the use of urban streams for recreation is considered to be a passive open space use and due to the small numbers of people that use these natural facilities no natural funding other than stream maintenance is available for this purpose.

**Question 6: Is the maintenance of the streams environmentally sensitive?**

Mr Kedge pointed out that despite the lack of environmental policies environmental issues are taken into account and certain aliens are cut down when stream clearance is undertaken. They however lack the technical and environmental knowledge to know exactly which alien trees to be removed and how to treat the remaining stumps. This links in with the previous dilemma where the Engineers Department is only responsible for the channel and 2 meters on either side thereof whilst the Parks and Recreation component who has the environmental knowledge is responsible for the remaining open space areas. It was also confirmed that the cutting of alien vegetation was done without proper consideration of the long term eradication.

He also referred to the fact that they from time to time do stream clean up projects such as a recent example when the Baynespruit was cleared. It was further confirmed that such maintenance actions are re-active in nature.

**Question 7: Is there good co-operation and support between Department of Water Affairs and Forestry, the Msunduzi Catchment Management Forum and the Municipality relating to urban stream corridor management?**

Mr Harrison confirmed that the Msunduzi Catchment Management Forum is used for this purpose. Although various role players are able to meet at this forum and consider issues such as water quality control, specific water related problems and alien vegetation eradication, the effective implementation of resolutions are still lacking due to financial and other capacity constraints.

**Question 8: What erosion control measures are in place?**

Mr Kedge advised that only isolated erosion control is undertaken. Erosion control is only undertaken where there is a threat to Municipal services. For instance gabion walls were recently placed in the Townbush stream as a consequence of the effect on the municipal sewer. It was also confirmed that erosion control was reactive in nature and that there was no specific programme to consider all streams and deal with erosion control on a proactive basis.

In this regard specific attention was also drawn to the fact that maintenance and erosion control can only take place on public open space and municipal owned land. Where the centre line of the stream is the boundary of a private property, the Municipality as a consequence of by-laws is not able to perform any work. Recognising the number of erven where the stream is the boundary of private properties it was admitted that this was a contentious problem especially in times of flooding where maintenance work is required as a consequence thereof.

It was suggested that consideration be given to the creation of river reserves which will alleviate this problem. It was however acknowledged that this would be a costly exercise in terms of existing development but that this most definitely must be borne in mind in the establishment of new developments.

**Question 9: Is there funding being set aside for urban stream corridor management?**

Mr Harrison explained that the focus is currently on hydraulic efficiency and that budget allocations are aligned to this cause as indicated in the Integrated Development Plan.

**Telephonic interview with Dr Debra Roberts: Director Environmental Management  
Ethekeweni Municipality**

**10 October 2002**

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**Question 1: Overview of the Durban Metropolitan Open Space System (D'MOSS)**

The Durban Metropolitan Council initiated a metropolitan open space system (MOSS) which was supported by the Wildlife Society in the late 1970's to early 1980's with the intention of conserving isolated conservation islands with the development of an open space system rather as a secondary consideration. Under the leadership of Mrs D. C. Roberts this approach underwent a conceptual change in the mid 1980's, now rather considering a system of ecological viability and sustainability, leading to the D'MOSS report of 1989. This also saw the purchase of land for conservation purposes and the active conservation of the D'MOSS. In addition, an environmental report and maps were generated by Nicolson in 1987 followed by a further report by the then Durban Metropolitan Council in 1999 highlighting and designating those areas of environmental importance.

According to Dr. Roberts one of the main contributions to the success of the D'MOSS is the ability of the administrators, and the system to change to circumstances. She referred to the political changes which have occurred in South Africa in the mid 1990's and the effect this had on revised political and municipal priorities, with a new emphasis on service provision. The successful continuation of the D'MOSS was based on the fact the administrators of the D'MOSS was able to adapt to these changes, recognising the need to adjust their priorities. At the same time, the administrators recognised the need to find new ways to familiarise councillors and decision makers of the environmental value of open space services. Through this process they were successful in again rekindling the need to protect the natural environment.

The past few years have also seen an ideological shift, reflected in the recognition and environmental protection of key areas, the control of development through environmental appeals and the securing of additional funding for environmental protection. In this regard specific reference was made to the fact that various appeals opposing certain developments on environment grounds have been upheld. This ideology shift was further strengthened

through a R2, 5 million increase in the funding allocated to the Environmental Department of the Ethekeweni Municipality.

**Question 2: From driving to Durban along the old main road it would appear that the “Adopt a spot campaign” in Durban is a success. To what is this attributed?**

Dr. Roberts indicated that this project was as a consequence of the efforts of the erstwhile Natal Parks Board. Various companies were approached to ‘adopt’ natural areas and corridors for which they would take the responsibility to maintain same. Under the championship of Mr Gregg Bosch this project has been very successful. Dr Roberts was further of the opinion that the success was due to his dedication and personal commitment to this cause. With his passing on, the momentum of the project has been lost. KZN Wildlife, the successors in title to Natal Parks Board have not continued with this project.

## Interview with Mrs C Pascoe: Manager Keep Pietermaritzburg Clean Association

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### **Question 1: What projects do you/your organisation get involved in?**

The focus of this association is on waste management education, community projects and school education. Mrs Pascoe confirmed that Keep Pietermaritzburg Clean Association (KPCA) has in consultation with KZN Wildlife and Umgeni Water produced a brochure which is used at primary school level for the education of children with regard to waste management and the environment in general. Thus far they have some 80 schools in Pietermaritzburg at primary level which are involved in their programme, which was implemented in 1997.

### **Question 2: Do you have projects relating to the management of urban stream corridors?**

In this regard Mrs Pascoe indicated that they do have the “adopt a spot” programme. In terms of this programme schools or organisations can indicate their willingness and commitment to take over the maintenance of a portion of open space or stream. She further indicated that although this programme has been running for some years the outcome has not always been positive.

Although monitoring of streams with regard to water quality was done fairly effectively the maintenance of streams was neglected. Basically the streams were used for scientific water sampling only.

### **Question 3: Which areas are targeted for the “adopt a spot” campaign?**

Mrs Pascoe referred to various areas which have been adopted. A few examples are detailed in the schedule below.

Prestbury Conservancy	Portions of the Dorpspruit
Scottsville Primary School	Blackburrow Spruit
Pelham Primary School	Pelham Park wetland
Voortrekker School	Portion of the Dorpspruit

She also went on to give feedback on the positive results achieved by certain schools in the Pietermaritzburg area. Here she mentioned specifically Scottsville School who received their Annual Award for their work done on the Blackburrow stream. They successfully eradicated aliens, cleaned up the stream and planted indigenous vegetation. It had been confirmed that some of the natural rodents had returned to the stream as a consequence of this outstanding environmental project.

Similarly Pelham School who took responsibility for the Pelham park wetland has achieved similar results.

She further included that this programme is focused on primary schools as experience has shown that there is commitment at primary level however, high schools have failed to achieve their objectives.

**Question 4: What sources of funding do you have? Has this increased over recent years?**

Mrs Pascoe confirmed that they get a grant-in-aid of R205 000-00 per year which is the operational budget for the organisation including the salaries for two staff. This has remained unchanged for the past 2 years. She further confirmed that the National Development Aid agency has this year agreed to provide funding for the education of communities which will include the employment of a community development officer. There are also small donations from organisations supporting this cause.

**Question 5: Is there linkages between yourself and the Parks and Recreation Department?**

Although there is no official linkages, it was confirmed that the local Agenda 21 forum is attended by both organisations where ideas of common interest are exchanged.

**Question 6: Do you have any views on the role of businesses in the protection of our open spaces and urban stream corridors?**

Mrs Pascoe felt that businesses do have a role to play in the protection of urban stream corridors through funding and other capacity. Having said this she advised that various industries along the Baynespruit had been approached some time ago regarding their role and

responsibility in the protection of this stream. The survey revealed that many of them believed that they were already paying substantial rates and were not prepared to contribute more to this.

**Question 7: What are your priorities?**

It was confirmed that waste management education both at Primary school level and at Community level were the priorities of KPCA.

**Question 8: Are there any linkages with the DMOSS and their advances in open space management?**

There are no links in this regard.

**Question 9: Are there any ideas how to achieve proper USC management and increase use of open spaces?**

Mrs Pascoe felt that education was an important issue and that exposure to the environment is important in creating awareness and interest. She specifically highlighted the new Liberty Mall development on the old Corrobrick site which will include a hiking trail which is intended for use by schools. It was intended that this trail would have a positive effect through increased awareness of the environment and the current needs of the area.

**Question 10: How does KPCA achieve public involvement? What methods are used to ensure involvement?**

The KPCA does not actively canvas persons and organisations to join their cause and were thus unable to give much guidance with regard to the second part of the question. She did however indicate that there was a partnership with the Witness/Echo through which she on a regular basis draws attention to the work and success of the KPCA. In this regard she indicated that there has been positive feedback since this publicity campaign and that there was a definite positive relationship between good publicity and positive feedback.

She further indicated that they do use meetings which they attend to publicize their work and seek support for their Association.

Finally she indicated that a few years ago there was a web site which also contained photograph and other information regarding the KPCA. This however has discontinued as a consequence of funding and staff incapacity. It was felt that this initiative together with a link with a GIS map detailing the “adopt a spot” areas as well as successes achieved could be very good publicity and lead to further active support of the initiatives by outside organisations.

**Interview with Mr Rodney Bartholomew, Deputy Director, Parks and Recreation  
Department, Pietermaritzburg Municipality  
15 August 2002**

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**Question 1: What legislation or policies dictate the functioning of the Parks Department?**

Mr Bartholomew advised that the functions of the Parks Department are based on a legal framework consisting of the Constitution, National and Provincial legislation such as the Conservation of Agricultural Resources Act as well as outdated by-laws. He added that the by-laws are currently under review.

With regard to the legislative framework a distinction is drawn between Councils obligations. The first obligation would be current contractual obligations whilst the other relates to the legal requirements as set by the various pieces of legislation. He also added that there is a linkage with the integrated development plan. Functions are therefor informed by legislation and the Msundunzi Municipality integrated development plan.

**Question 2: Is there an alien weed eradication plan and is this linked to USC management?**

In relation to the first part of the question Mr Bartholomew provided a background to the responsibility of alien vegetation eradication. He referred to the Conservation of Agricultural Resources Act which is the responsibility of the National Department of Agriculture and the fact that a satellite office has been opened in Pietermaritzburg headed by Messrs. Kobus and Peter Botha.

As part of the eradication programme Council is required to design and compile a programme which would deal with Council owned land only. In order to ensure a holistic approach this programme would have to be co-ordinated with adjacent private land owners in order to ensure effective implementation of this programme. He indicated that R106 000-00 grant funding had been made available early that year to survey alien plants on Council land. He confirmed that this would be a three phase programme of which the first phase being a desk top exercise as well as broad scale mapping had been completed. This revealed that 2200 hectares of the 647 square kilometer Msunduzi Municipal area has been alien infested.

Phase two of this plan, based on an annual programme, would be considering the clearing and maintenance of aliens, using the norms of the "Working for Water programme". Phase three would consist of a business plan as well as proposals and recommendations to secure further funding for medium and long term eradication and maintenance.

Thus far R1 million per year has been committed for this programme. This however is not sufficient and hence the need for phase three to access more National funding. It was likely that this would receive political support as it projected 100 jobs for the next five to ten years.

In conclusion in this regard he added that it would be necessary to prioritise specific areas which at this stage would be the existing conservation areas and riparian areas. There is therefore a link between the alien eradication programme and riparian areas, however with the *proviso* that sufficient funding is secured to ensure medium and long term sustainable eradication.

**Question 3: What is the Parks Department doing to protect urban water courses?**

Mr Bartholomew referred to the provisions of the new Water Act and Environmental Legislation such as the National Environmental Management Act. He cited the involvement of other provincial departments and organisations such as Umgeni in the protection and management of the urban water courses.

He pointed to the requirements of Schedule 1 of the Environmental Conservation Act and the consequences for developers in respect of listed activities. He specifically referred to the new development in the Bird Sanctuary area which required developers to comply with provisions of the legislation. In addition to this he also referred to the bank collapse, in the Monzalli's Castle area on the Townbush Spruit, where various departments have now come together to find a solution to this problem.

**Question 4: Is there a specific urban stream corridor implementation policy?**

Mr Bartholomew replied that there was no specific policy at the moment. The intention was to design a specific policy for the management and rehabilitation of urban streams, however this has never materialised.

It was further confirmed that the maintenance of urban streams in Pietermaritzburg was currently geared to storm water control rather than with an environmental emphasis. He further added that any management plan would have to look at both storm water control and the environment. At this stage the urban streams are in a poor condition and most of the streams are beyond their carrying capacity. In this regard he suggested that we give consideration to European examples of storm water attenuation which requires that storm water control be addressed on site through better use in garden, different road design and parking area designs to retain storm water and dissipate energy.

He referred to the design of the McDonalds Parking area explaining the Engineering considerations that were implemented to ensure on site energy dissipation. He contrasted this with the burms built along the Msunduzi river by schools to protect their playing fields from flooding. Although this may have reduced the risk of flooding at these schools the flooding potential now increased for residential and other areas down stream from these schools. Other examples referred to include the Waltdof development in Non-such Road where a flood attenuation dam was constructed to deal with stormwater run-off from this development.

Mr Bartholomew also referred to the low cost housing developments in the Shenstone/Ambleton area explaining that these streams in these areas are already stressed and that the increased run-off due to increased impervious surfaces will lead to further stressing of the streams.

A final point that he made in this regard was the need to consider the dissipation of stormwater at stormwater outlets. In this regard reference was made to the flood attenuation facilitated at the St Joseph's Church in Hayfields where a wetland was created at the stormwater outlet, which fulfils a dual function of providing a wetland and also dissipating stormwater.

**Question 5: Does the Parks Department's maintenance programme include urban stream corridors?**

Mr Bartholomew indicated that the Parks Department is jointly responsible with the Engineering Department for the maintenance of urban stream corridors. The Engineering

Department is responsible for the clearance of the stream channel and two meters on either side of the channel whilst they are responsible for the remaining areas. He further added that the emphasis was on stormwater control rather than a combination of stormwater management and environmental management. Despite not having an explicit policy which requires environmental consideration as part of urban stream corridor management, many officials have taken a personal interest in the environment and have thus planned their maintenance work to accommodate the environment as far as possible. Clearing and cutting is thus, as far as possible done outside the breeding season for birds to reduce impacts.

Other suggestions that came out of this session included the need for training and possible manuals for staff with regard to issues such as when to do clearance, what to clear, why it is done and other relevant information. The need for education and guidance with regard to rehabilitation programmes together with information relating to which appropriate species to plant and in conjunction with alien eradication was also cited.

**Question 6: Are there any plans to initiate the trails as contained in the original 1990 Pietermaritzburg Metropolitan Open Space System?**

Mr Bartholomew indicated that this was not a priority and that no budget had been allocated for this. He went on to explain that trails represented a passive recreational use. Due to the limited use of USCs, this is considered as passive open spaces. The cost implications of providing a trail in a low use area was thus not warranted bearing in mind the many other higher priority needs. Although it was acknowledged that trails could lead to an increased awareness of USCs and the associated needs, funding is not available for passive open space uses at this stage.

**Question 7: What are the costs of stream maintenance?**

As this function is mostly performed by the Engineering Department, it was suggested that I take this up with Mr Harrison of that Department.

**Question 8: Mr Bartholomew was requested to provide a brief history of the Pietermaritzburg open space plan.**

He explained that the Pietermaritzburg open space system had been initiated in 1987, by the then Town and Regional Planning Commission, following their involvement in the Durban metropolitan open space system. Upon a directive from Provincial Government, a Committee was established to develop and implement a system for Pietermaritzburg. This initiative was never widely supported by the public and in addition had no committed funding. Late in the 1990's, Professor Abbott took the chairmanship of the ailing committee, which saw a renewal under his leadership. One of the more important tangible results was a map linking all the conservancy areas using river corridors (Figure 1.2 of dissertation). He also added that they fulfilled more of a watchdog as opposed to effective implementation. It illustrated the intention to create a trail system along the river corridors. In 1997 when Professor Abbott passed away, it was decided to disband this committee and rather have a Conservancy Association. This did not function effectively, leading to the establishment of individual conservancies, which although functioning are unable to achieve the objective of an open space system for Pietermaritzburg. He made mention of the following functional conservancies:

Cleland/Mkondeni

Femcliffe

Greater Edendale Environmental Network

Sobantu Environmental Desk.

Pietermaritzburg, has neither an operational open space system, nor an urban stream corridor management. This is confirmed through the IDP for the Msunduzi Municipality which is currently under review. Although R1 000 000 has been budgeted for the eradication of invasive and alien plant species, the budget for "*Greening, Beautification and Open Spaces*" and the "*Prevention of Soil Erosion*", has been left "*unattended*" at present (Msunduzi Councillors and officials 2002, 281).

## **Interview with Mr Ernest Vorwerk, the Chairperson of the Cleland Mkondeni Conservancy**

**16 March 2003**

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### **Question 1: Are conservancies involved in urban stream protection?**

Mr Vorwerk indicated that they are not involved in urban stream protection as a rule. They have from time to time done some litter cleanings, however the Conservancy Members have not done so for some time now. He further indicated that he has undertaken some water quality sampling, but this has been undertaken in his personal capacity and not in his capacity as Chairperson of the Conservancy.

### **Question 2: What sources of funding do conservancies have?**

There is no set funding allocations for conservancies. It is dependent on small donations from mostly private companies. This includes current donations from Meadow Fields, Abedeare Cables and Collins Construction. Reference was also made to a R2200, 00 grant from a Non-governmental Organisation. (Land Use International). This funding is directed at the eradication of alien invasives and land use education rather than stream protection and rehabilitation.

This prompted a further enquiry as to whether the Department of Water Affairs and Forestry “working for working” project injects any funding into this conservancy. Mr Vorwerk confirmed that the conservancy was not involved in these types of projects.

### **Question 3: What are the priorities of this conservancy?**

Mr Vorwerk indicated that their work is mostly reactive in nature. They are basically only “fighting fires”. He qualified this statement by referring to examples, such as identifying illegal dumping and his efforts to protect wetlands from the effects of development. Other projects include educational programmes which have been undertaken at Scottsville, Pelham and Epworth schools. As previously mentioned, he again referred to the fact that the Conservancy Members, have from time to time teamed up with the Hesketh Conservancy to undertake litter clean-ups.

**Question 4: It there interaction with the Municipality/Msunduzi Catchment Management Forum?**

Mr Vorwerk indicated that there is very limited interaction between the Conservancy and the Municipality. At this stage this is limited to attendance of the Local Agenda 21 Forum, but even this is done on an unofficial basis. There is no interaction with the Msunduzi Catchment Management Forum.

**Question 5: What level of public participation does the conservancy enjoy?**

Mr Vorwerk indicated that past public participation was generally good. There is a fair amount of interest in consideration work. Mr Vorwerk indicated that he, as a rule, does not actively canvass people but rather depends on voluntary assistance of people who have an interest in the environment.

**Question 6: What ideas can you offer to achieve better USC protection and management?**

Mr Vorwerk thought it essential that there should be a Metropolitan Open Space System with a proper implementation plan which could protect natural open space areas, together with a proper maintenance plan. The value of hiking trails was also discussed, but it was acknowledged that this would only be viable if security is increased.

**Question 7: Have you undertaken any stream rehabilitation work?**

Rehabilitation work would only be undertaken if there is a definite need. This was not considered as a priority for the conservancy.

**General:**

Mr Vorwerk referred to the project to undertaken in the Msunduzi Municipality to determine the environmental knowledge and to pave the way for future decision to take the natural environment into consideration. Despite the relative failure of the project, it was also ill timed with the sections nearing, their in all likelihood would be a change in Councilors, which would require the re-initiation of the project and retraining of persons. In additions, one of the recommendations that an Environmental Manager be appointed to lead the Local Agenda 21 Forum has also failed.

**Interview with Dr. N. Quinn, the chairperson of the Msunduzi Catchment Management Forum. 1 August 2003.**

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**Question 1: What is the mandate of the Msunduzi Catchment Management Forum (MCMF) ?**

Dr. Quinn commenced by advising that the MCMF has no legislative mandate. The National Water Act No. 36 of 1998 is focussed on creating structures at a macro level such as Catchment Management Agencies and not a local level. Rather than having a mandate the MCMF consists of a group of stakeholders, in this instance consisting of Dr Quinn representing the Centre for Environment and Development of the University of Natal, Department of Water Affairs and Forestry, the Msunduzi Municipality and the Department of Agriculture and Environmental Affairs, who have a shared vision of catchment management. Although the Provincial Department of Water Affairs and Forestry forms part of the forum, the forum would be able to be more successful if they had more support from the National Department of Water Affairs and Forestry.

**Question 2: What role does the MCMF fulfil with regard to USC management? What programmes have the MCMF adopted or initiated in support of USC management?**

The MCMF currently perform the function of a 'Watchdog body', identifying problem situations. The forum is also actively involved in point source pollution reduction and other stream related concerns. Reference was made to the bank collapse problem identified in the Townbush stream on the Monzali estate and their active involvement with developments which affect urban streams such as the new Liberty Life regional shopping centre and its affect on the Townbush stream.

Once a problem has been identified, the forum plays an important role in determining the extent of the problem and who the relevant role players would be who need to be involved in addressing this problem. The MCMF thus plays a co-ordinating and facilitative role. Masters students with the Department for Environment and Development are tasked to perform the ground work determining the extent of the problem and sustainable options as part of their practice field work. This then forms the basis to approach the relevant stakeholders to address the problem. Specific mention was made of the work and success of the MCMF referring to the successes of the prosecution of point source pollution in the Baynes spruit as well as the

work done in relation to the earlier problem in the Townbush spruit. The forum is also involved 'clean-up days', such as the work done in the Bayne Spruit. Appropriate activities are undertaken on world recognised environmental days such as the World Wetlands day.

In response to a question as to whether the work undertaken is of a pro-active or re-active nature Dr. Quinn advised that most of the work is re-active in nature. Although it would be preferable to be more strategic and pro-active in nature, resource constraints have resulted in a re-active *modus operandi*.

The MCMF therefore do not have specific programmes which it is solely involved with. It rather undertakes corrective actions using the combined experience and resources of its co-opted stakeholders.

**Question 3: Does the MCMF initiatives have political support and by-in from other role players co-opted onto this forum?**

All the initiatives are undertaken in partnership with all the role players including the Department of Water Affairs and Forestry, the Municipality, the Department of Environmental Affairs and other appropriate role players depending on the site situation. In attending to the Townbush stream bank collapse matter, the forum had involved students of the Department of Environment and Development, the Department of Water Affairs and Forestry, Department of Agriculture and Environmental Affairs, the Municipality, the Department of Transport and the land owner. It is therefore considered that there is political support and by-in for the projects which the forum involves themselves in.

**Question 4: Does the MCMF provide financial support for USC management including erosion control and rehabilitation work?**

Dr. Quinn advised that the Msunduzi Catchment Management Forum receives no financial support. The work that is undertaken is dependent on the capacity of the stakeholders that make up the forum. The University of Natal (Department of Environment and Development) provide funding from their research budget for students to undertake the required studies, whilst the representatives from the government departments are dependent and restricted by their own departmental budgets. The MCMF therefore does not have an operational budget

but is dependant on the funding and resources which the various stakeholders can be brought to the table.

**Question 5: How well integrated is the actions of the MCMF with other water related roleplayers such as Umgeni, the Municipality, Department of Water Affairs and Forestry and other environmental roleplayers?**

The nature of the activities undertaken require integration. Although integration happens at the forum level, the integration of Departmental Strategies is lacking. It was acknowledged that the current drafting of Integrated Development Plans is going some way to address this problem, and despite the future anticipated success of these plans, it is considered that the level of integration will still be more at a macro level.

**Question 6: What progress has been made with the involvement of the public in Catchment Management in Pietermaritzburg?**

The process for the establishment of a Catchment Management Forum for Pietermaritzburg has been broadly consultative, however it appears that the consultation has not reached the ground roots level measures against the attendance of the consultative meetings. In fact, the Minister of Department of Water Affairs and Forestry has returned the application for the establishment of a Catchment Management Agency, sighting the lack of public consultation. The MCMF is of the opinion that the stakeholder representation has to be extended and that the convening times of the consultative meetings have to be scheduled after hours in order to allow better private involvement. This however may not have the required buy-in from the public sector.

**Question 7: What are the future plans of the MCMF, bearing in mind the intentions of the Msunduzi IDP to “clean up its rivers”?**

Generally there are three objectives, namely to:

- (1). for Department of Water Affairs and Forestry to recognise the value and need for participation at ground level for catchment fora such as the MCMF,
- (2). be able to be more strategic in its operations and thus be more pro-active rather than being re-active.
- (3). work more conjunctively with other stakeholders to achieve better results.

**Interview (telephonic) with Mr Gavin Holmes: Msunduzi Municipality: Forward Planning  
Division: 23 March 2003**

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Following the interviews with Mr Ian Parker and Mr Ernest Vorwerk, the suggestion was made that I also discuss this topic of environmental consideration of applications with Mr Gavin Holmes due to his involvement with Local Agenda 21. He indicated that this forum plays a minor role in the development application procedure and assessment of development related applications.

He indicated that some 18 months to two years ago funding was made available by the Development Bank of South Africa to initiate a training programme to elevate the value of the environment and which was to assist all staff to consider any decisions against an environmental background. For instance, the consideration of a special consent to allow a person to operate a vehicle repair business from his home based on his ability to retain a livelihood may appear to be fairly harmless. However, if the required attention is not given to the environmental impacts such as the removal of old oil and grease, the illegal dumping of this could lead to environmental problems. This project was only nearing completion at that stage and thus it was not possible to determine the impact of the training as yet. Concern was also expressed at the timing of this training as the next local government elections are due at the end of the year which would see the election of new councillors and thus the need for fresh training.