Mentor: Mr Frans van Wyk

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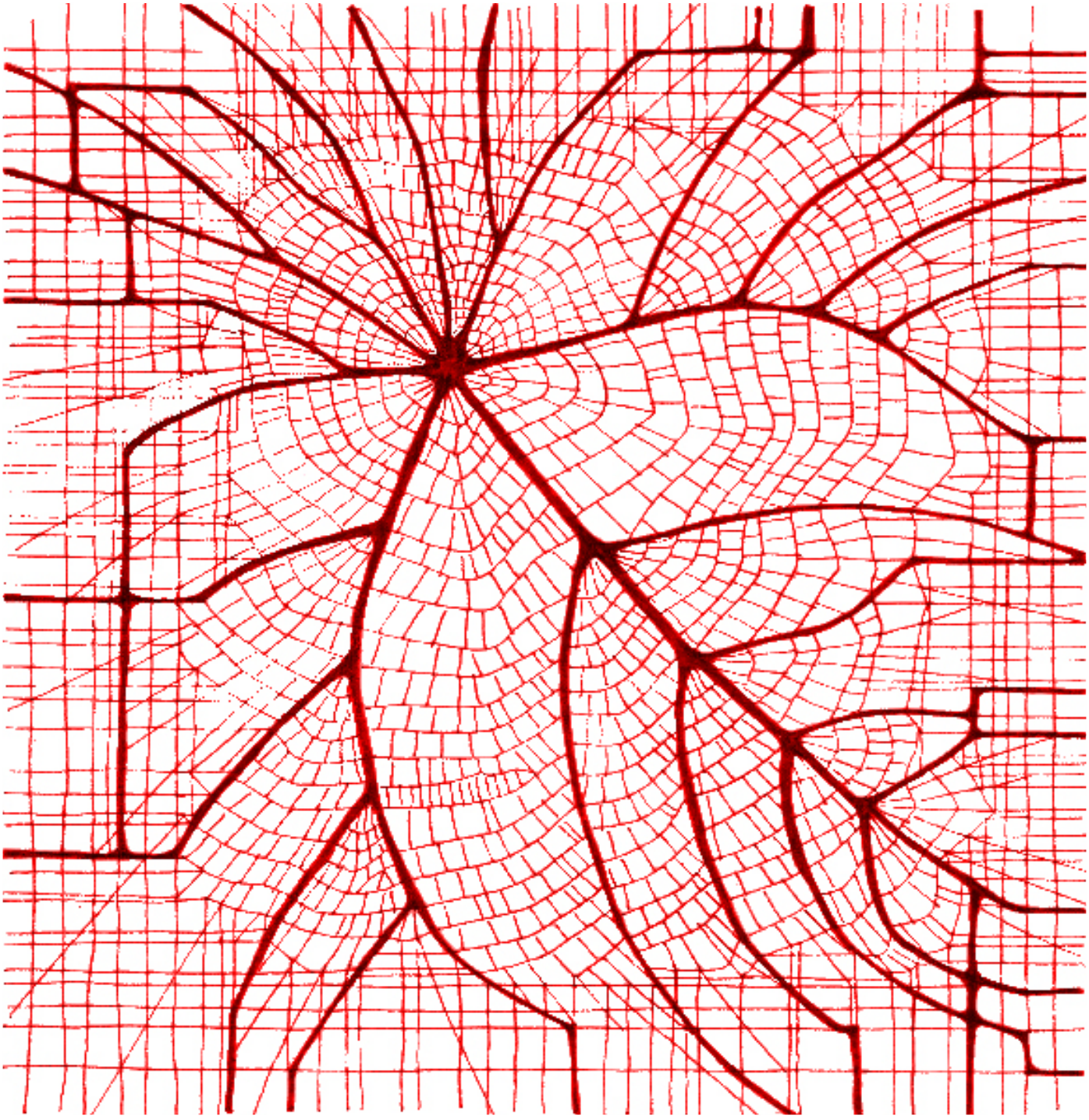


Submitted in fulfillment of part of the requirements for the degree Magister in Landscape Architecture (Professional) in the Faculty of Engineering, Built Environment and Information Technology, University of Pretoria. November 2005.

urban transfusion

REDEFINING AND ADDING VALUE TO OPEN SPACE WITHIN THE KNYSNA URBAN CONTEXT

Step into the clearing,
here insanity flees
with the rustling echoes
of forgotten
trees.

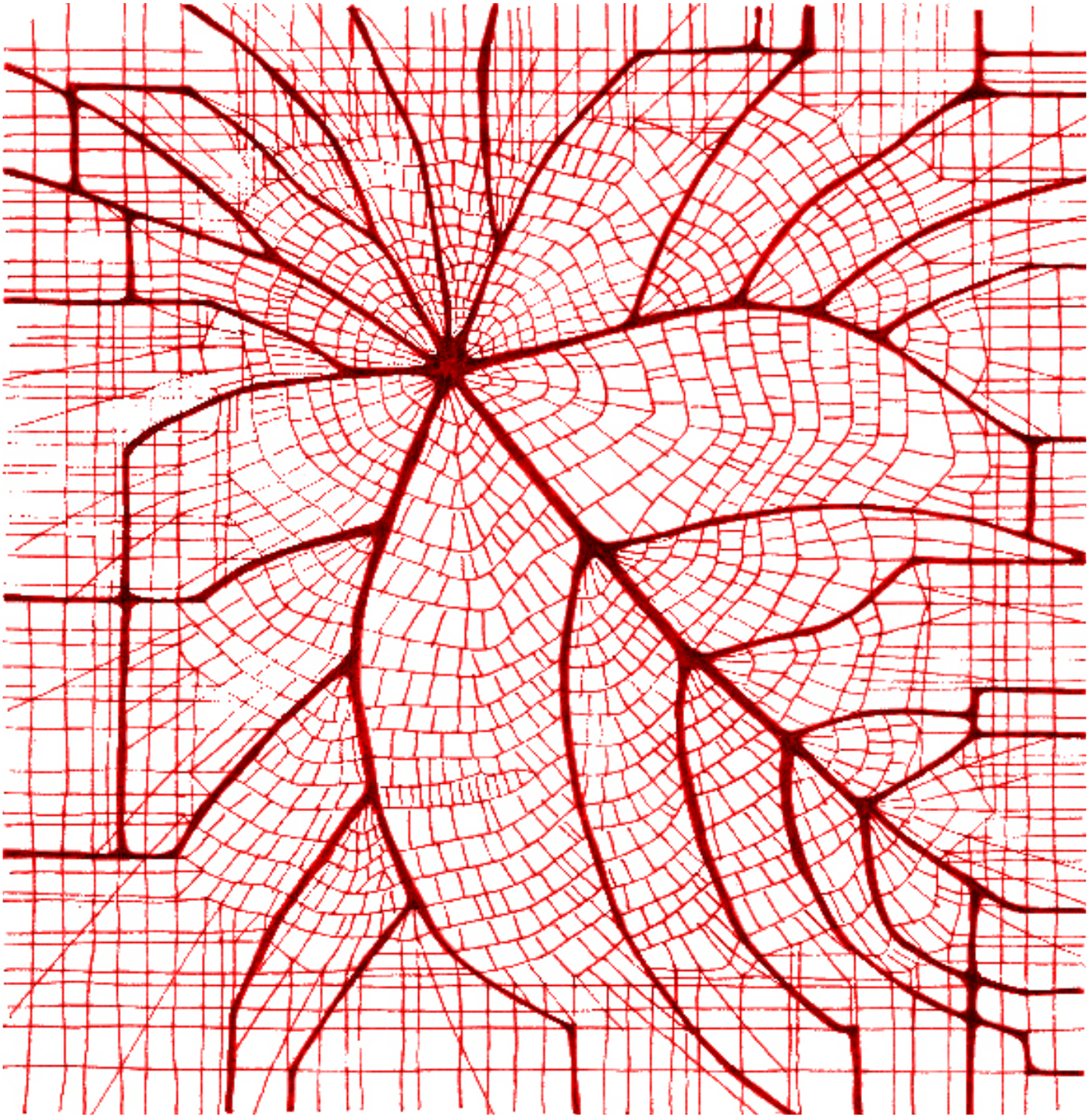
She whispers out loud.
Afraid to
ask
the obvious question,
are we failing this
task?

Beyond the hills a
smokey cloud
frames,
a truth she sees unsurely defined,
owning many
names.

Step out of the clearing,
but it has
grown.
Searching further, beyond
Standing still and
alone.

Her secret space suddenly lost.
Paved habitats engulf the
planes,
and a sapling reaches
silently through the urban
stains.

Dedicated to my parents, Neville and Elizabeth Howard: thank you for your infinite support in everything I do. I love you dearly. To my Father in Heaven, the Intelligent Designer, thank-you for daily inspiration and that You are the true designer of my existence.



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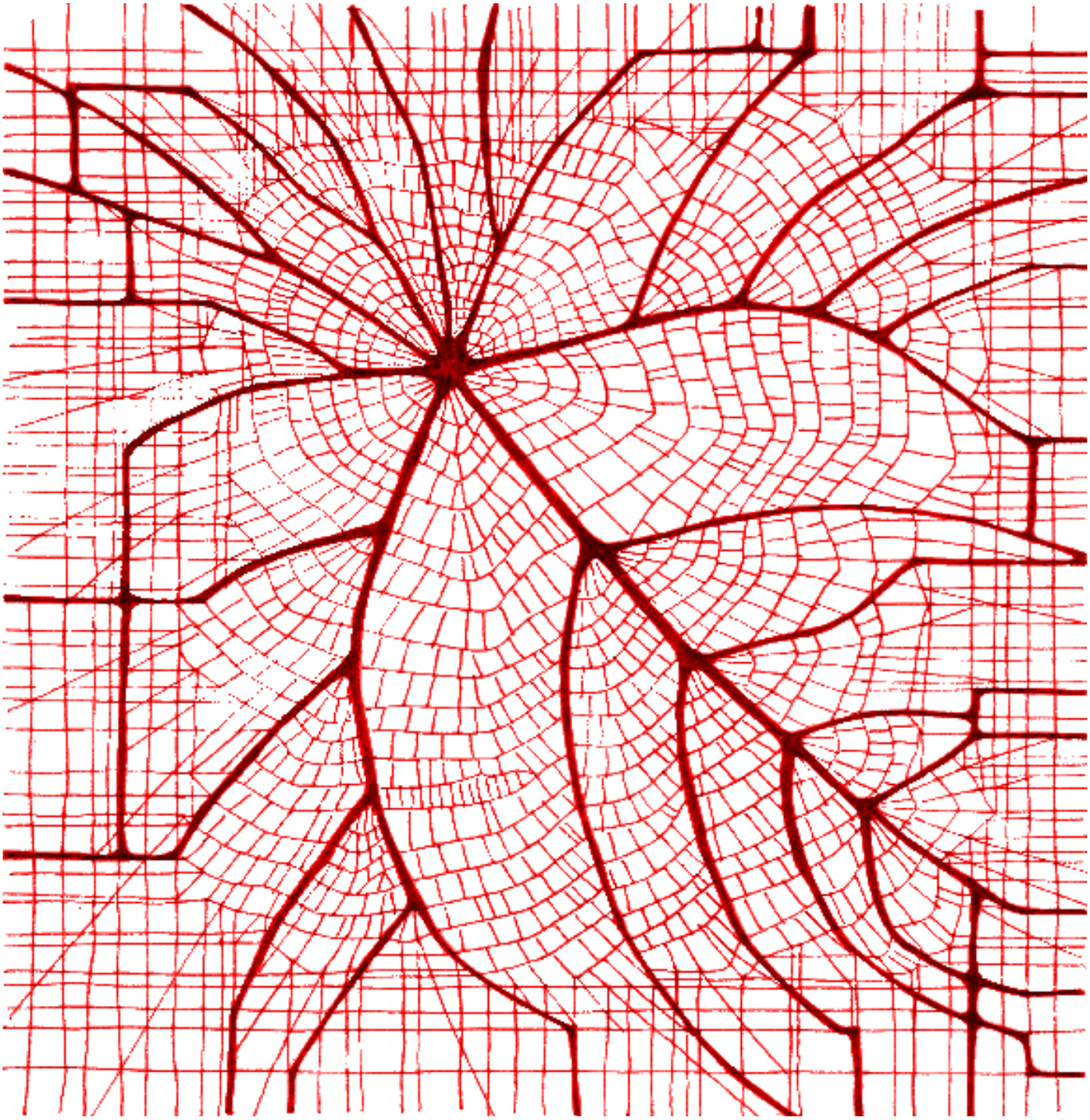


chapter 1
introduction

1.1. PROJECT BRIEF

On 22 February 2005 I received a birthday present from a representative of the Knysna Municipality. A thesis project was born along a phoneline between Pretoria and this Southern Cape town. Pledge Nature Reserve is a 10 hectare conservation area situated only 500m from the Knysna CBD. This reserve has developed into an open space of high ecological value due to rehabilitation and management actions. Socio-culturally the reserve is not functioning at its best potential as it does not have good accessibility, as well as having safety and security issues associated with it. Economically the reserve is also lagging as there is a definite need for added financial funding to increase its economic sustainability. The southern portion of the site is currently vacant, being degraded and infested with a number of alien invasive vegetation species. The client's desire is that this portion of the site be rehabilitated and transformed into a socio-culturally, economically and ecologically succesful urban open space that integrates the nature reserve into the Knysna urban fabric.

There is the belief that Knysna is a perfectly 'healthy' and prosperous town and many might wonder why time would be wasted on it while there are so many other, more obvious and needy areas in Southern Africa that require urgent attention. To a degree Knysna is a successful, culturally active, vibrant and environmentally-aware town, but like all other assumptions there is an underlying, brewing problem, which only at a later stage comes to one's attention. We need to attempt to take on the method of prevention rather than curing, trying to amend current practices that will most likely lead to problematic results in the future. ***Utopias do not exist.*** Knysna has issues and constraints related to the socio-cultural, economic and ecological environments, but fortunately a balance of opportunities and positive aspects do exist, making this project a viable and challenging thesis proposal.

1.1. Valuable fynbos specie, *Protea caffra*, inhabits Pledge Nature Reserve (Howard 2005)

Most South Africans have some kind of memory or feeling associated with Knysna. I think back warmly to long December holidays spent camping at Island Lake in Wilderness (60km West of Knysna) and invariably there were days when the weather was not suitable for beaching, sailing or windsurfing. Our family, Mom and Dad, my elder sister, Patricia, and my elder brothers, David and Desmond and I (the youngest by 8 years) would tumble into the station wagon and trek to Knysna for the day. Stuck in the back of the car amongst the beach-bags, cooler boxes and boogie boards, in case the weather turned for the better, I experienced cloudy Knysna with a delayed and backward view, my focus being the lagoon to the left as I dreamt of spending holidays on one of the houseboats gently chugging through the endless water entity, and the lush forested mountainside to the right. We would spend hours perusing the many uniquely-Knysna stalls and shops and then have a picnic at the 'Heads', hypnotized by the waves crashing against the weathered and ancient rocks. This town nestled in its breath-taking environment, with its deeply imprinted history and hosted by interesting and varied people inspired me to come back time and time again.

1.2. WHY KNYSNA?

The thesis study area, Knysna, is situated on the Southern coastline of the Western Cape Province, South Africa. Knysna lies within the scenic Garden Route area and the town's inhabitants boast that it is the most beautiful and popular tourist destination in South Africa. They are not alone in this assumption, as Knysna, and the rest of the Garden Route, become ensconced with thousands of visitors throughout peak season periods, as well as developers and property seekers desiring a share of this Eden.

What does the word Knysna mean to you? Does it bring back memories of glorious December holidays? The over-indulgence of the Oyster festival? Do you think of the forest, the lagoon, the thundering ocean framed by the 'heads', the quaint shops or the eccentric people? Do elephants and romantic stories cloud your thoughts; or are you a realistic kind that with angst remembers the great economic cost of visits and the bottleneck characteristic of the town?

1.3. SITE INTRODUCTION

The reserve is a protected area consisting of primarily endemic vegetation species and is situated within the developed urban fabric of Knysna. There are 3.5km of pathways through a varied indigenous palette of scrub forest and hillside fynbos, with striking vistas of the natural features of Knysna from the site's higher elevations. This area has become a sanctuary for more than one hundred bird species and has become a place where local fynbos diversity is well represented.

The value of this reserve lies in the fact that even though it is surrounded by urban land-uses, processes, elements and functions, precious ecological habitats and niches still function successfully. (Ukubona Development 2005) Pledge Nature Reserve is often named as the best kept secret of Knysna, but this is unfortunate, as it has so much potential as an educational and socio-cultural development tool.

1.4. CLIENT

An integrated and multi-faceted client consisting of:

Knysna Municipality

The Knysna Community:
Socio-cultural community
Economic community
Ecological community

Pledge Nature Reserve:
Board of Trustees
Governing Body
Curator

1.2. Art exhibition (Howard 2005)

1.3. Knysna artist on Main Road sidewalk (Nell 2005)

1.4. Children at Concordia township (Nell 2005)

1.5. Informal trade - Knysna western outskirts (Nell 2005)

1.6. Local craft (Nell 2005)

1.7. Informal fruit & veg trade at taxi rank (Howard 2005)

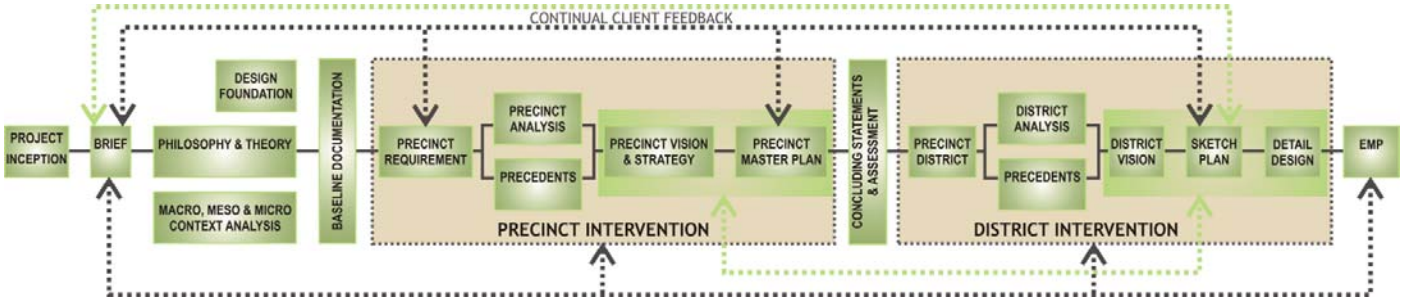
1.8. Stream through the Knysna forest (Nell 2005)

1.9. Knysna lily (Nell 2005)

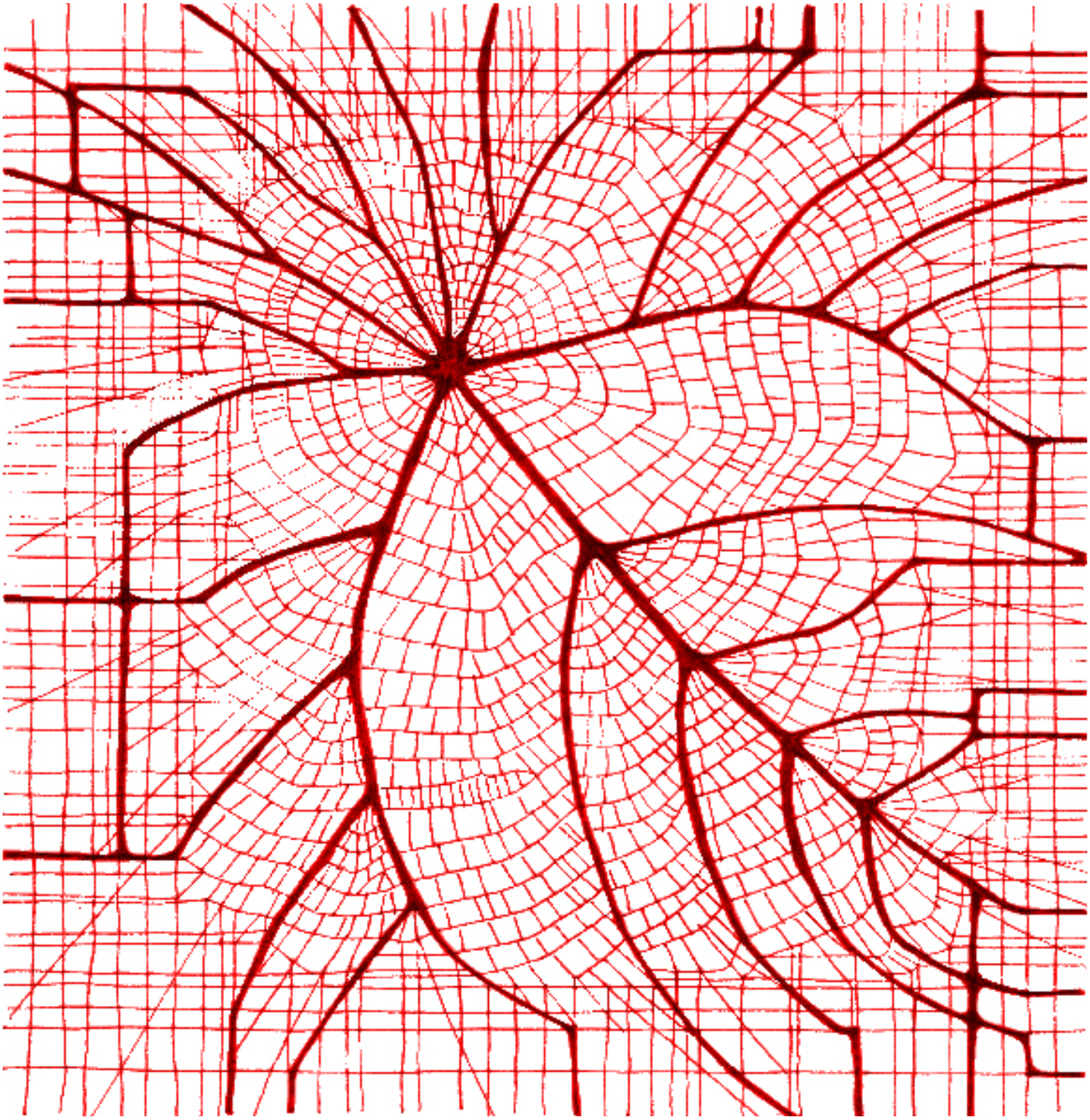
1.10. Knysna lourie (Nell 2005)

1.5. METHODOLOGY

A systemic approach to the thesis research whereby all research topics are integrated and connected, therefore creating an all-encompassing system that aids in the effective and thorough solution and response to the problem statement and vision. The general thesis development is linear with continual feedback cycles referring to previously gathered information and decisions made.



1.11. Methodology diagram (Howard 2005)



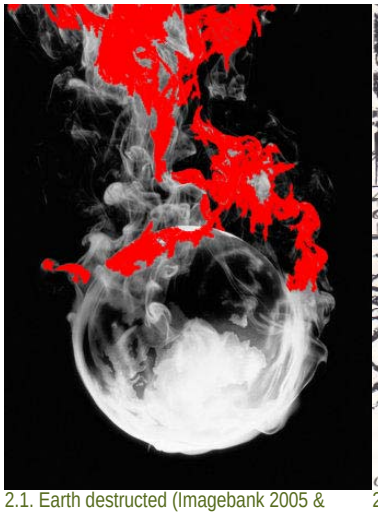
chapter 2
philosophy & theory

2.1. HUMANS AND ENVIRONMENT

The relationship that humans have towards their environments has consistently changed throughout our existence on this planet. It has evolved from one of harmony and sustainable existence to an approach that sees humans enforcing power and demands on it as seen by the enormous increase of energy and resource consumption, urban sprawl, industrialization of agriculture, dominance of individual transport, mass consumption and an increase in refuse and pollution. (Mayer 1998) At last we're starting to see the wood for the trees, even though so few are left, as the reactions to our arrogant and nonchalant behaviour are becoming more drastic and are starting to influence human comfort levels and causing an imbalance in the ecological order, for example an increase in pollution resulting in climate change, and resource consumption resulting in the loss of biodiversity and extinction of species due to habitat destruction.

We have reached a stage where our perception of the landscape we live in is greatly varied; we are confused about how to step into the future with regards to our approach to the environment. The landscapes that make up our realm of understanding can broadly be described as, the natural landscape, mainly untouched by human development, the rural landscape which sustains us and the urban landscape which has become the primary human habitat.

Humans have conceived a certain degree of understanding, although warped and egocentric, with regards to the natural and rural landscape. There is the realization that natural landscapes should be conserved and managed so that natural processes can function efficiently, so that humans have a playground to venture into over weekends, and so that future generations will be able to experience a portion of what exists today. The rural landscape is mostly seen as a food generator which should be managed and maintained for our continued existence. It is seldom realized that these landscapes have deep and complicated underlying processes which cause them to function efficiently; and often these processes are hindered by our loitering and selfish presence.



2.1. Earth destructed (Imagebank 2005 & edited Howard 2005)

2.2. Cartoon by Mauldin (Eckbo 1964)

"Man can hardly recognize the devils of

2.2. HUMAN HABITAT

The human habitat, primarily being the town or city, is a vibrant and dynamic hub in which humans operate at a greater degree of selfishness than in any other environment. The existence of the urban landscape phenomena within this environment has rarely been seen as an important entity; in fact it has hardly been acknowledged as an entity at all.

The modern city developed a relationship to nature in the 19th Century which was based on power over nature, distance from nature and compensatory mechanisms which catered for people's longing for nature (Ipsen 1998). Currently though, a paradigm shift towards a better environmental understanding is underway. To understand the role of the urban landscape processes, structure and functioning, one must have a certain understanding of the human habitat as an entity.

2.3. The urban habitat - Night time New York (Dodd & Donald 2004)

To analyse the processes of human habitat, structure and functions, one must view it as any other habitat. One of the primary characteristics of any habitat or network is the interconnectedness between its various processes, structures and functions, as well as the connectedness that exists between it and the surrounding processes, structure and functions. This fundamental characteristic is illustrated by Jakob von Uexküll's statement: "Like the spider with its web, so every subject weaves relationships between it and particular properties of objects; the many strands are then woven together and finally form the basis of the subject's very existence." ("Streifzuge durch die Umwelten von Tieren und Menschen" 1956, Cited in Norberg-Schulz 1971:9) The understanding of these intertwined relationships will guide us to an understanding of how a habitat comes into existence, how it exists, and how its continues to exist productively. Using Jakob von Uexküll's simile, the human habitat, including all extents of human settlements from the grouping of nomadic tents to large metropolitan urban environments, should be analysed and examined by viewing the different components as strands of a complete web.

The human settlement web is composed primarily of the socio-cultural, economic and ecological strands. The following sub-sections address the the primary strands of the human settlement web in response to the urban landscape.

2.2.1. SOCIO-CULTURAL STRAND

Urban inhabitants have lost contact with the landscape (Norberg-Schulz 1971:27) due to a common characteristic of the urban way of life whereby the city place and life is neither dictated by natural physical features or conditions, nor by the rhythm of nature. (Mayer 1998) Landscape levels are generally determined by ideologies and beliefs (Norberg-Schulz 1971:72) and to a large extent this is where the problem arises. The human belief of having power and control over all elements within physical reach has led to distorted approaches to the urban landscape, for example the baroque park's design which expressed the wish to humanize the landscape. (Norberg-Schulz 1971:72) Often many social and cultural problems within societies can be aided by creating healthy open spaces where communities can gather to interact and create a sense of unity therefore emphasizing Olmsted's idea of parks within the urban environment acting as "neighbouring" gathering places which are characterized by great civilizing forces with a democratic nature. (Grese 1992)

his own creation."

Albert Schweitzer (Wines 2000)

2.2.2. ECONOMIC STRAND

Essentially the functions of the city are that of production, consumption and sustaining. Production and consumption are well understood and have become the main goal of the urban economically-driven, while the sustaining factor has mostly been neglected. (Wang & Hu 1998) Most decisions that exist within the city environment are dominated by the need to increase economic prosperity, and therefore urban open spaces which do not present or produce any direct economic value are seen as useless and wasteful within this capitalist society. It is therefore necessary that the positive qualitative values as well as the indirect economic values of urban open spaces be brought to the forefront of arguments of this kind. This approach is validated by the following statement made in the UNEP, IUCN and WWF joint report, *Caring for the Earth,* in 1992: "Biodiversity must be conserved as a matter of principle, as a matter of survival, and as a matter of economic benefit." (Dramstad et al 1996)

2.2.3. ECOLOGICAL STRAND

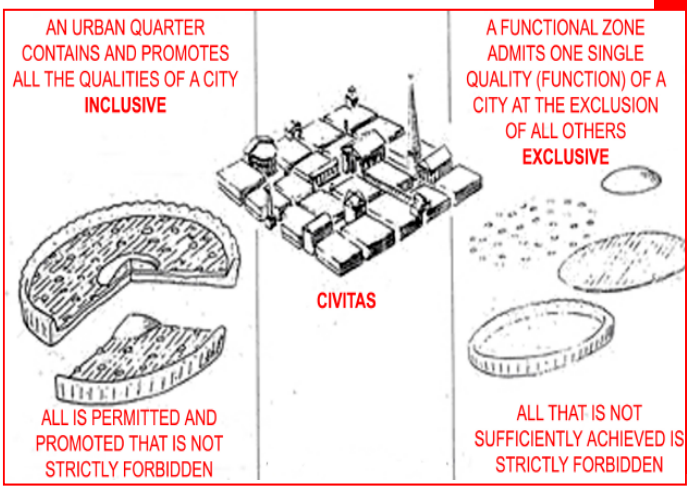
From ancient times humans have always had a need to give 'better definition to geography', for example the Great Wall of China, and have attempted to make the forms of the surrounding landscape more precise, or transform them to fit our general environmental image, for example the Egyptian Pyramids, which form an artificial row of mountains defining the boundary of 'civilized' space along the Nile, even though further south real mountains fulfill the same purpose. (Norberg-Schulz 1971:69-70) Therefore the landscape always had the function of forming the continuous background of our environmental image (Norberg-Schulz 1971:28). Today, we should see the landscape not only as the background but as one of the functional and purposeful entities of the entire environmental image, from which we can learn of successful guiding principles with regards to habitat development and management.

Piaget describes the process of a human's typical reaction to situations as a combination of 'assimilation' and 'accommodation'. Assimilation can be described as the action of the organism on the surrounding environment and accommodation can be described as the action of the surrounding objects on the organism. During assimilation the organism, rather than submitting passively to the environment, modifies it by imposing on it a certain structure of its own. (Norberg-Schulz 1971:10&11) An example of this is the manner in which humans demonstrate their power over the environment they find themselves in, rather than being guided by what the landscape subtly suggests. Piaget sees 'adaptation' as the equilibrium between assimilation and accommodation. To create successful sustainable and healthy urban environments it is essential that we achieve this state of equilibrium and therefore like the traditional Chinese, strive to create harmonious relationships whereby humans and nature become one. (Wang & Hu 1998)

2.3. CREATING A 'EUTOPIA' - GOOD PLACE

It is impossible to have utopian dreams for each urban environment. Understanding of the forces that cause change and making the most of the opportunities wherever and in whatever form they may arise is a better dream. We should strive to create a "Eutopia", meaning good place, rather than a "Utopia", a perfect place or no place. (Hough 1990) What is a good city? Leon Krier, one of the most influential traditional urbanists of our time has graphically compared the traditional urban environment to a pizza. He describes the traditional urban neighbourhood as a slice of pizza, containing within it all of the essential qualities and elements of the whole. In the same way he describes the modern suburb, formed from modern zoning, as ingredients of the pizza, all being separated from each other, therefore the modern city has all the ingredients but does not have the form. (Bess 2003)

New Urbanism is the movement to revive the physical forms of traditional cities due to problems that are related to the physical form of suburbia, such as suburban sprawl, the corresponding ecological and aesthetic degradation of the natural environment, and a growing sense that civility itself is in decline. (Bess 2003) New Urbanism is the attempt to employ, which also necessarily has entailed relearning, in our current circumstances the best practices of city-making from the past, toward the end of making better cities for the future. (Bess 2003) Inspiration should also be derived from existing conditions and by making use of all available opportunities. We should create an urban landscape which integrates ecology, people and economy, namely, multi-functional landscapes, productive landscapes and working landscapes. (Hough 1995) These landscapes will have great value from all perspectives.



2.4. The City-Pizza metaphor (Bess 2003)

2.4. URBAN OPEN SPACES

Urban open spaces can be defined as open-air spaces in the urban realm which offer functions and values to human and ecological habitats. These spaces include churchyards, parks, semi-private gardens, schools, waste and derelict sites, the urban fringe, wetlands, building courtyards, plazas and squares, industrial sites and institutions, and even a streetscape. Open spaces are valuable within the urban realm. The values of these spaces vary between those that are explicitly obvious, those that are unconsciously experienced and to those that are subdominant, yet vital forces within the given environment. Values associated with urban open spaces or primarily those that are intangible or indirect, rather than tangible and direct. Knowledge of all of these intangible values is essential to the understanding of the urban open space's function and character within the urban environment.

2.5. URBAN OPEN SPACE VALUES

Here follows an inventory and discussion of the values that urban open spaces (particularly green urban open spaces) have with regards to the city's socio-cultural, economic and ecological environments.

2.5.1 VALUES FOR THE SOCIO-CULTURAL ENVIRONMENT

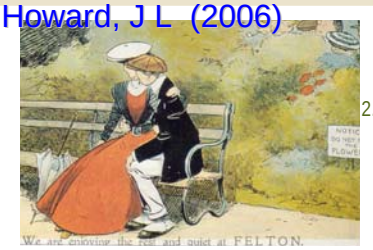
Open spaces within the urban fabric seem to have lost their purpose and are under-utilized; therefore, landscape planners, designers and managers need to have sound information on the benefits and functions of urban landscapes for society, as well as the types of spaces that people prefer. (Kendle & Forbes 1997) It is interesting that these values were held as so important by a society whose collective problems of poor housing and other more direct causes of ill health were far greater than ours are today. (Kendle & Forbes 1997) I believe that these social issues are still prevalent today, especially in developing countries like South Africa. Therefore, we should revert back to the 19th century beliefs of the importance of open spaces, especially green open spaces, in the urban setting.

The contemporary attitudes towards parks and open spaces, particularly green spaces, are confused and ambivalent. The majority of these areas are perceived as places of crime and moral degeneracy rather than owning positive experiences. The wider values of landscape and the scope for contribution to a sustainable society have been largely forgotten but it is undeniable that urban green has great potential value for humans at many levels. (Kendle & Forbes 1997) Socio-cultural benefits of urban open space are divided into two categories, namely the values experienced by the community and the values experienced by individuals.

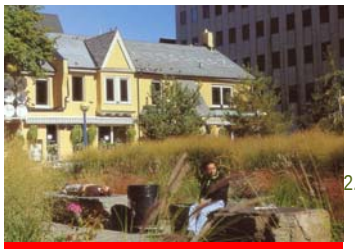
Frederick Law Olmsted stated that: *"There is increasing evidence suggesting that mental health and emotional stability of populations may be profoundly influenced by frustrating aspects of an urban, biologically artificial environment. It seems likely that we are genetically programmed to a natural habitat of clean air and a varied green landscape, like any other mammal. The specific physiological reactions to natural beauty and diversity, to the shapes and colours of nature, especially to green, to the motions and sounds of other animals, we do not comprehend and are reluctant to include in studies of environmental quality. Yet it is evident that in our daily lives nature must be thought of not as a luxury to be made available if possible, but as part of our inherent indispensable biological need."*
(Todd 1982)

2.5.1.1. EMOTIONAL RELIEF

The community experiences a sense of pride and achievement when involved, especially directly, with an urban open space. (Kendle & Forbes 1997) Rohde and Kendle state that urban parks and open spaces can cause a reduction in stress and therefore a directly related increase in happiness. An escape from the city, an opportunity to identify with nature, a sense of freedom, a peaceful retreat to repair emotions and a higher level of fulfilment is experienced. (Kendle & Forbes 1997) Urban open spaces offer respite from the frantic pace of city life (The Pennsylvania Horticultural Society 2005) and Wong states that a reunion with nature causes a re-awakening of an individual's sense of possibility and empowerment, restoration and a relief from daily struggle. (cited in Kendle & Forbes 1997)



2.5. Early 20th century park experience: 'We are enjoying the rest and quiet at Felton', Norhumberland (1909) Postcard from the collection of Fiona Jamieson (Woudstra & Fieldhouse 2000)



2.6. Urban relief in the Prairie Wildflower Garden, a portion of the Village of Yorkville Park, Toronto (Tate 2001)

2.5.1.2. COMMUNITY DEVELOPMENT & SOCIAL INTERACTION

During the design of Central Park, New York, Olmsted had a vision of nature as a healthful antidote to the city and saw parks as having a great civilizing force with a democratic nature and providing 'neighbouring' gathering spaces. (Grese 1992) Adams and Dove state that parks and other open spaces help build and strengthen ties among community residents by:

1. Bringing people together
2. Including those who are otherwise divided by race or class
3. Helping them work together on common projects (cited in Johnson 1995)

These ties labelled as "social capital" represent subtle but important assets for a community as they:

1. Provide avenues through which information, values, and social expectations flow
2. Empower people to tackle communitywide problems
3. Empower people to embark on collective actions and advocate effectively for their community (cited in Johnson 1995)

Research by Coley, Kuo and Sullivan on low-income housing developments has found that park-like public spaces encourage residents to: leave the isolation of their apartments and socialize with one another therefore forming lasting ties. (cited in Johnson 1995)

2.7. A community taking ownership of and pride in a local open space (Reid 1993)

2.5.1.3. CULTURAL

Wong argues that an increased sense of identity, ownership and a sense of integration rather than isolation are experienced by the various cultural groups of a community when accessible urban open spaces exist. (cited in Kendle & Forbes 1997) Furthermore, urban open spaces are perfect sites for outdoor festivals and concerts. (The Pennsylvania Horticultural Society 2005)

2.5.1.4. EDUCATIONAL & EXPERIENTIAL

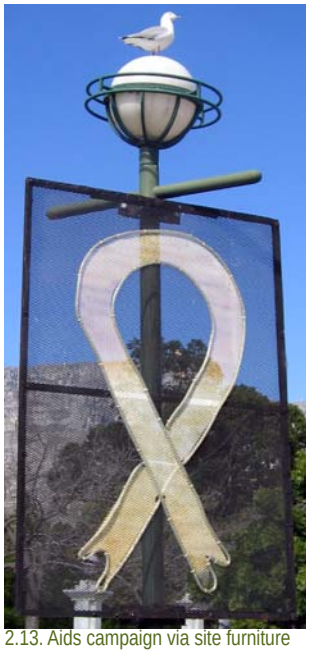
Urban green spaces provide opportunities for the community to participate in environmental care (Kendle & Forbes 1997) and skills development, and bringing people into contact with nature can motivate them to do something positive to enhance their environment. (Wiltshire website) Urban open spaces are areas where one can see nature at work, learn about the variety of flora and fauna species, local history and develop new skills. (Kendle & Forbes 1997) Humans have a certain appreciation for the surprises that come from letting nature have more control and find open spaces familiar and easy to understand (Kendle & Forbes 1997), while Adams and Dove also emphasize that aesthetic and visual diversity found specifically in urban green spaces offer positive experiential qualities to individuals. (cited in Johnson 1994) These outdoor spaces also encourage explorative and adventurous behaviour which in turn results in an increase in self-esteem. (Kendle & Forbes 1997)

2.8. Education through experience at Gwynns Falls Greenway in Baltimore (Harnik 2000)

2.9. Learning in a community garden - The Parterres, a portion of Parc de Bercy, Paris (Tate 2001)

2.10. & 2.11. Surrounding residents (primarily retired persons) of the George Botanical Gardens volunteer in the running and management of the site, with their quality of life being improved by having this green open space close to their living environment (Howard 2005)

2.12. Meditation (Imagebank 2005 & edited Howard 2005)



2.13. Aids campaign via site furniture in an urban open space system - Company Gardens, Cape Town (Howard 2005)

An example of an innovative health-focused program is the 'Hearts N' Parks' campaign which is supported by the National Heart, Lung, and Blood Institute and the National Recreation and Park Association of America. (Walker 2004)

2.5.1.5. YOUTH DEVELOPMENT

Parks can provide opportunities for children of all ages to build the skills and strengths they need to lead full and rewarding lives. The latest thinking about youth development makes a powerful case that children and adolescents are best served by a constellation of community-based activities that helps them build essential skills, knowledge, and aptitudes. (Walker 2004) The assets children and youth need for healthy development fall into four major domains: physical, intellectual, emotional, and social. And parks can offer programmess that are not only fun, but also help kids acquire assets in one or more of these domains. (Walker 2004)

2.5.1.6. SOCIAL IMPROVEMENT

Sampson, Raudenbush and Earls state that a reduction in crime and disorder, even in very poor communities, is a result of successful urban open spaces. (cited in Johnson 1995) Added benefits that have a strong 'public good' element, for example, improvements in water quality, causing better social environments, result from open-space preservation. (Bolitzer & Netusil 2000) Kuo refers to a series of studies that determined that having trees in public housing neighbourhoods lowers levels of fear, contributes to less violent and aggressive behaviour, and encourages better neighbour relationships and better coping skills. (Wolf 2004)

2.5.1.7. SPIRITUALITY & QUALITY OF LIFE

Urban open spaces offer an area which often has the potential for an individual to experience spiritual growth through meditation. These spaces also have the potential to cater for religious meetings, functions and festivals. It is found that quality of life is no less important than health and although modern medicine has made extraordinary advances in prolonging life, society is not so clear about how to make these extra years worth living. (Kendle & Forbes 1997) It is believed that urban open spaces can offer opportunities to increase an individual's 'quality of life'.

2.5.1.8. PHYSICAL HEALTH

Contact with the living world helps to maintain well-being and can prevent illness (Kendle & Forbes 1997) and improve health by appealing to the senses and by providing a place to enjoy fresh air and exercise. (Walker 2004) A range of passive and active recreational activities (bird-watching, fishing, hiking, cycling, walking, chess-playing, jogging) are available in urban open spaces. A study in Cleveland confirms the promise of parks in promoting health for Americans aged 50 and older as older park users (bikers, joggers, walkers) were found to be significantly healthier than non-park users and they stated to be feeling "renewed" after using the park, with greater frequency of use linked to better health. (Walker 2004)

2.5.1.9.MENTAL RELIEF & DEVELOPMENT

The 18th century philosopher, Johann Georg von Zimmerman stated that, "In nature deep solace is found for the pains and melancholy of life," and he advised his readers to practice escapism into green spaces. (Grese 1992) Urban parks of the 18th and 19th centuries were also seen as successful antidotes to counteracting public health problems, as New York physicians prescribed time in Central Park as routine treatment for their patients, especially those with nervous disorders. (Grese 1992) Contemporary studies by Rohde and Kendle state that urban open spaces have definite cognitive values as a reduction in mental fatigue is experienced when visiting such areas, as well as encouraging, especially in children, higher levels of mental development and stimulation. (Kendle & Forbes 1997) School-related studies show that children with ADHD (Attention Deficit Hyperactive Disorder) show fewer symptoms of the disorder and show more self-discipline in academics if they have access to natural settings. (Wolf 2004)

2.5.2. VALUES FOR THE ECONOMIC ENVIRONMENT

The statement, 'Money makes the World go round' is an excellent example of the human community's unhealthy veneration of financial resources. The making of money has become so important that the systems and characteristics of other ecological and socio-cultural environments that do actually have a large part in 'Making the World go round' are neglected. Hawken believes that commerce is central to the breakdown and functional transformation of land, water, air and sea from life-supporting systems into waste repositories. (cited in Motloch 2001) A transformation of commerce is required which sees the integration of economy and ecology, and which teaches us that wealth is short-lived unless based on the cyclical processes of nature. (Motloch 2001) To this I add that economical and ecological processes should also be integrated to socio-cultural processes, therefore creating a balanced, functional and sustainable urban environment. The economic order of a good city is characterized by marketplace diversity and entrepreneurial freedom. Its purpose is twofold: to create and distribute the material goods and services necessary to the material well-being of the populace, and, beyond this, to create the surplus wealth necessary for the various kinds of non-subsistence cultural endeavours—music, art, scholarship, sport—that are the very hallmarks of urban culture. Just as important, however, is the recognition that a good city is also a moral order. (Bess 2003) The marks of this order are the existence of various religious, civic, and political institutions that are sufficiently strong and influential to restrain the excessive individualism that a free economy encourages. Such institutions will seek to educate individuals in a variety of moral and intellectual virtues and to promote among individuals a sincere regard for the common good. If these institutions are in good working order, they will be promoting and sustaining a shared sense that the city is not only a marketplace but also a moral community, and that the market exists for the community and not the community for the market. (Bess 2003) Economic processes are essential, and can never be abolished or neglected, but as Hough believes, there is a need to invest in the protection of nature, society and culture, and this need has never been so urgent. (Hough 1990)

The general perception of Urban Open Spaces is that they are a waste of financial resources as they do not truly generate a tangible income and require a lot of capital input to plan, design, construct and manage them. Therefore, as population increases in towns and cities there is an ever-increasing demand for development areas and thus a loss of formal and informal open spaces in the urban fabric. We should learn from 'Catholic economy' which is an economy founded on the virtue that Saint Thomas Aquinas and Aristotle called liberality. This virtue teaches and governs the correct use of the goods of this world that have been given to us for our maintenance. As Saint Augustine says: "It belongs to virtue to use well the things that we can use ill."(Sorondo 2003) At the same time, parks managers face the challenge of "concentrated costs and diffuse benefits." The costs of building, maintaining, or upgrading parks are readily calculated and conspicuous. But the benefits parks provide are spread over many areas, making them hard to quantify and easy to overlook. (Walker 2004)

2.5.2.1. TOURISM

Urban open spaces have economic value by offering places where tourists have experiences of both the cultural and natural environment of the specific place, as well as being landmarks that attract tourists to particular areas, thus causing an indirect economic benefit to businesses surrounding the space visited.

2.5.2.2. SERVICES & PRODUCTS

Economic gain is achieved through services (parking, classes or programmed activities and recreation) and products (on-site gift shop purchases, equipment bought to participate in workshops, additional purchases may include plant and landscape equipment acquired as a result of learning about trees, wildlife or horticulture while at a park, food purchased for a picnic eaten on-site and other incidentals) associated with the open space. (Wolf 2004)

2.5.2.3. JOB OPPORTUNITIES

Youth, especially in developed countries, have long found holiday employment in parks and open spaces. For many young people, these jobs introduce the world of work, close to home and in a relatively protected setting. Urban open spaces can also offer longer-term jobs for community residents, as well as valuable training opportunities that equip both young people and adults to enter the workforce with marketable skills and experience. (Walker 2004)

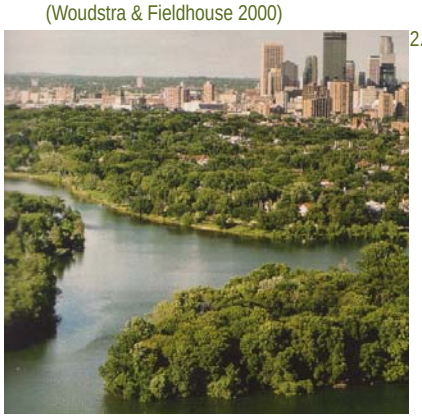
2.5.2.4. NEIGHBOURHOOD QUALITY

It has been confirmed by studies that there is a statistically significant link between property values and proximity to green space. One study found that the value of properties near Pennypack Park in Philadelphia increased from a distance of 760m to a distance of 12m by 1150%. (Walker 2004) Results from an analysis done in Portland, Oregon, indicate that distance from a home to an open space and the type of open space can have a statistically significant effect on a home's sale price. (Bolitzer & Netusil 2000) Properties very close to open spaces or parks may decrease in value due to noise and congestion, while properties located a few blocks away from the park receive benefits from proximity, but may not encounter any negative externalities. (Bolitzer & Netusil 2000)

2.14. Open spaces like Central Park in New York are often one of the primary attractions of an urban environment, therefore boosting economy through tourism (Harnik 2000)

Local communities benefit in various ways from the trade in biological resources. For example, the Makuleke community in the Kruger National Park had their land returned to them and are now developing infrastructure for tourists, as well as benefitting from consumptive wildlife resource-use. (Burger 2004)

2.15. Mobile food stall entrepeneur in St. James's Park, London (Woudstra & Fieldhouse 2000)



2.16. In the 19th Century the city of Minneapolis dredged swamps and ponds to form Lake Harriet (shown above) and the rest of the famous Chain of Lakes. Today this waterway continues to generate property value and tax revenue (Harnik 2000)

2.17. In Portland traditional sidewalk planting is being replaced by a series of interconnected swales which act as stormwater treatment cells which intercept and filter street runoff (Owens Viani 2005)

2.18. & 2.19. Create economic environments around and in pleasant open spaces, like this example in Wilderness (Viljoen 2005)

The national Center for Disease Control in the United States of America is conducting baseline studies on human physical activity levels, and how to motivate people to do basic physical activities, such as walking, on a routine basis. CDC is collaborating with urban planners to explore how urban form (such as street layout, the presence of sidewalks and parks proximity) can encourage walking and biking. (Wolf 2004)

2.5.2.5. ENVIRONMENTAL BENEFITS

American Forests has conducted 27 Urban Ecosystem Analyses in U.S. metropolitan areas in an effort to capture the value of services that trees provide in cities. Estimated findings were that tree cover in the urban growth boundary area had reduced stormwater storage costs by $910 million, and generated annual air quality savings of $19.5 million. The Center for Urban Forest Research has also conducted micro-scale studies, focusing on street tree costs and benefits. McPherson states that these calculated benefits include energy savings, reduced atmospheric carbon dioxide, improved air quality, and reduced storm water runoff. Environmental benefits modelling is often based on the economic principle of deferred costs, that is , if trees are not present, homeowners or municipal government would have to invest in additional engineered infrastructure or equipment to remedy environmental problems. For instance, tree canopies intercept rainwater, thereby reducing the amount of water falling to the ground and running off into stormwater collection systems, thus potentially saving a community the materials and construction costs of a stormwater system built for greater runoff capacity. (Wolf 2004)

2.5.2.6. RETAIL AFFECT

Investigations on the role of trees on shoppers' behaviour in retail business districts find that people claim that they are willing to pay about 10 percent more for products in a shopping area with trees, as compared to a comparable district without trees. (Wolf 2004) Laverne and Winson-Geideman refer to a study that found that rental rates of commercial office properties situated on sites with quality landscapes, including trees, were about 7 percent higher. (Wolf 2004)

2.5.2.7. HUMAN PHYSICAL HEALTH

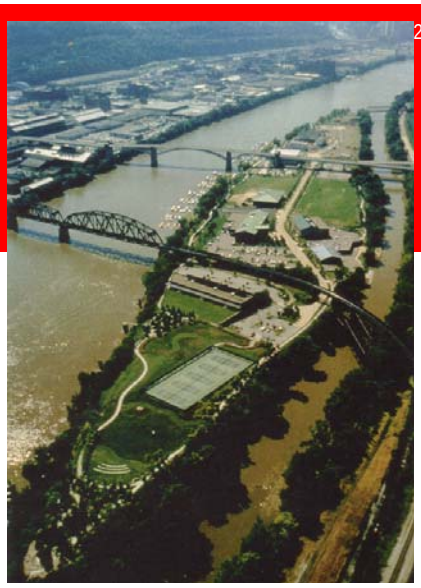
The positive economic consequences of routine, mild exercise are enormous when aggregated across entire cities or the nation as medical expenses are lower for people who do routine physical activities and exercise. As found by Wang and Dietz, a 2002 CDC (Center for Disease Control) study estimates that obesity-associated annual hospital costs for youths aged 6-17 were about $35 million between 1979 and 1981, and nearly tripled to $127 million during 1997 to 1999. Weight related medical expense trends for adults are equally alarming as studies referred to by Pratt, Macera and Wang, suggest that when inactive adults increase their participation in regular, moderate physical activity, annual mean medical costs are reduced by $865 per person (in 2000 dollars). (Wolf 2004) Studies also confirm that hospital patients recover more quickly and require fewer pain-killing medications when having a view of nature. (Wolf 2004)

2.5.2.8. HUMAN MENTAL HEALTH & EFFICIENCY

Mental health is a second arena of health benefits with economic consequences as recent studies have established that the presence of trees and 'nearby nature' in human communities generate numerous psychological benefits. It is also suggested that office workers with a view of nature are more productive, report fewer illnesses and have higher job satisfaction. (Wolf 2004) These studies therefore suggest extensive economic consequences for urban inhabitants who have views of trees and nature in the course of their normal, everyday activities and experiences. (Wolf 2004)

2.5.3. VALUES FOR THE ECOLOGICAL ENVIRONMENT

A good city exists within and is an ecological order. It is an artifact by means of which the human animal dwells in and on the landscape. If this artifact is created sensitively and well, both the human animal and the ecological order of which it is part will thrive. If it is not created well, both parties will suffer in the short- and long-term. (Bess 2003) Nature conservationists are realising that battles to save biodiversity cannot be won if they are only fought in habitats such as the rain forest. They have found that battles should be fought locally, with the urban population as a key group to be motivated. It is established that if urban communities do not care for the nature on their doorstep it is almost impossible to make them care for distant and abstract problems. (Kendle and Forbes 1997) Presenting arguments to preserve or restore urban open space solely as habitat for wildlife is seldom successful as the public and decision-makers are more likely to support urban wildlife habitat programs if other uses of urban green spaces are also accommodated. (Johnson 1995) The challenge for planners and designers is to minimise adverse impacts, capitalise on those attributes of other uses that enhance habitat value, and still protect sensitive habitats. (Johnson 1995) McHarg states that it is reasonable to suggest that nature performs work for man without his investment and that such work does represent a value. (McHarg 1969) The following ecological value discussion is specifically related to urban green open spaces.

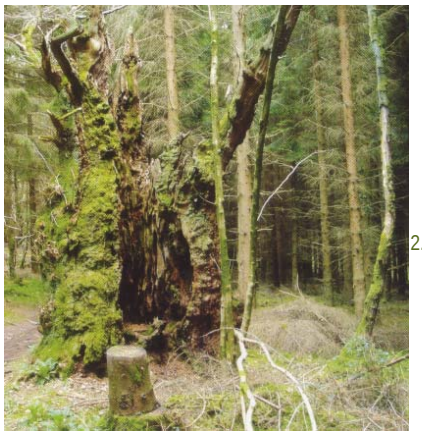


2.20. Bio-diversity and ecological resources are increased as Herr's Island in the Allegheny River, Pittsburgh, evolved from a brownfield site of rail yards and a slaughterhouse to a park system with the associated amenities (Harnik 2000)

2.5.3.1. HABITATS, RESOURCES & ALIEN ERADICATION

A habitat is an area where an organism lives. An organism finds food, shelter, and everything else it needs to live within its habitat. Various values to habitats exist due to urban greening, namely bio-diversity increase, which reflects increased ecosystem balance, better habitat diversity, as well as habitat or niche completion. (Kendle & Forbes 1997) According to McHarg one of the natural processes that perform work for man and, therefore, add value to the ecological order, is forest and wildlife inventory increase (McHarg 1969), or as we may call it bio-diversity increase. One of the aims of the Metropolitan Open Space System (MOSS) of Johannesburg City is to protect habitat for the diversity of plant and animal species so as to ensure the protection of healthy, viable and sustainable ecosystems as well as the conservation and the preservation of biological diversity. (Russouw 2003)

Urban greening has an added advantage as it aids in resource protection, species recovery, species introduction and species reintroduction into the urban ecological community. (Kendle & Forbes 1997) The leaves of indigenous trees and other vegetation types are eaten by many insects, and dead leaves are transformed into humus. Trees also provide nesting and breeding sites for birds. (Enviro Facts 1999) Well-managed and effective urban greening which ensures establishment of endemic vegetation has a definite benefit as it aids in species replacement and therefore the eradication of alien species. (Kendle & Forbes 1997)

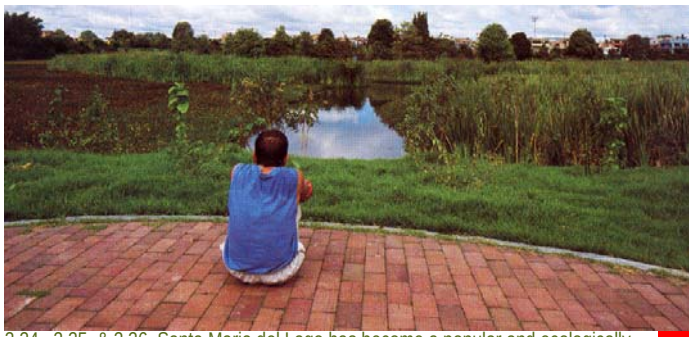


2.21. A project being undertaken by the Rebuilding Biodiversity Group in Great Britain is the removal of conifers from ancient woodland sites so that the broad-leafed woodland ecosystem is allowed to recover (Baines 2005)

2.5.3.2. LAND: SOIL QUALITY, QUANTITY & CONTROL

According to McHarg natural processes of value to a metropolitan environment include drought and erosion control, as well as topsoil accumulation. (McHarg 1969) Johnson supports this by arguing that urban greening definitely aids in erosion control and, according to research completed by Adams and Dove, soil as a resource is improved due to sediment trapping and nutrient retention. (cited in Johnson 1995) Soil benefits from trees and other vegetation types, as their far-reaching roots hold the soil in place, preventing erosion. (Enviro Facts 1999) Some trees, like acacias, have bacteria in their roots, which convert nitrogen from the air into nitrates which the tree can use to grow, whilst the soil is enriched. (Enviro Facts 1999) Further benefits of urban greening with regards to soil quality and quantity improvement include the broader implications of land reclamation. (Davie 2002) Innovative planning and design of urban open spaces may include the re-use and recycling of solid waste. (Davie 2002)

2.22. & 2.23. No city is 'all built-up'. Create parks and open spaces on underused or misused sites like this one in Chicago (Harnik 2000)



2.24., 2.25. & 2.26. Santa Maria del Lago has become a popular and ecologically healthy wetland in Bogotá, Columbia due to it's rehabiitation as part of a wetlands restoration plan for the Bogotá River Greenbelt (Martignoni 2005)

2.27. & 2.28. The channelised Los Angeles River has been so mistreated that one proposal called for using it as a freeway during the dry season. But given half a chance, the river's ecology can flourish, and educate, and there is a growing movement to develop parks and trails along it (Harnik 2000)

2.5.3.3. WATER: MANAGEMENT, QUALITY & CONTROL

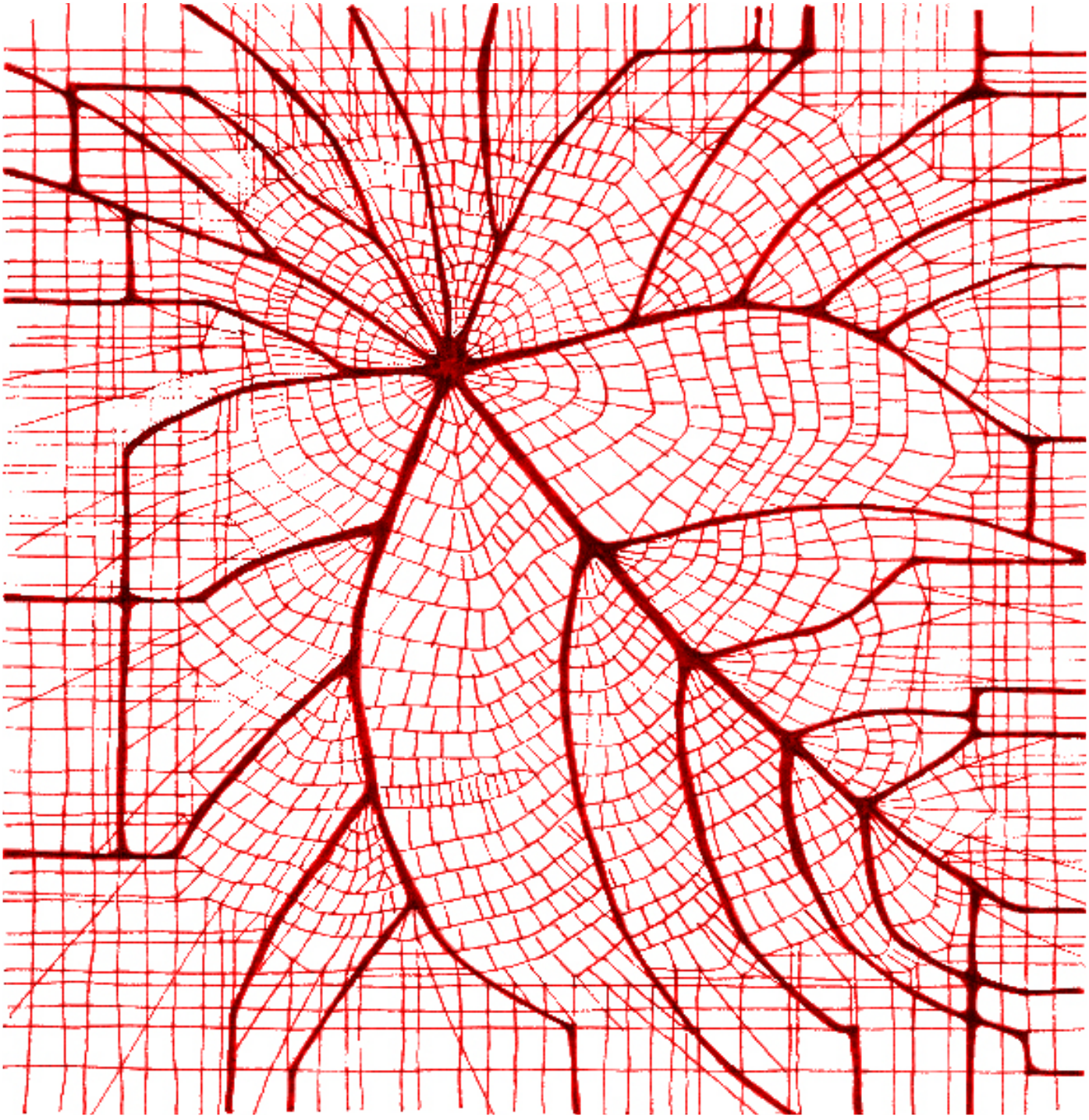
Natural processes of value to metropolitan areas include water purification, water storage and flood control. (McHarg 1969) Greening along a watercourse, properly designed, can serve the basic functions that foster a healthy environment. It helps provide an antidote to some forms of non-point source pollution (storm-water from urban and agricultural runoff) by acting as a filter, conduit and sink. Greening as filter and sink: As water sheet flows across the land, it picks up many elements. A well-vegetated riparian edge allows some of the water to pass through, but slows it down and diffuses the flow allowing different elements, including pollutants, to drop out. Green areas can also store surface water in a porous floodplain or riparian wetland for a long enough period of time to reduce flooding in peak runoff events. (Weekes 1998) An urban green area can absorb rainwater, like a great sponge, and help it replenish groundwater. Therefore, rainwater should be infiltrated near to where it falls, or else it should be detained near to where it falls, and discharged slowly. Urban greening therefore aids in watershed stabilization, stormwater detention and flood storage, therefore controlling flooding. (Johnson 1995) Another one of the aims of Metropolitan Open Space System (MOSS) of Johannesburg City is to protect water quality, including the quality of surface and underground drinking water and the quality of lakes and streams and water-based recreation. (Russouw 2003)

2.5.3.4. AIR: CLIMATE AMELIORATION & POLLUTION

The cities create the filthy air, while natural processes of the countryside, and to a lesser degree urban green spaces, include atmospheric pollution dispersal and climatic amelioration. (McHarg 1969) Furthermore urban greening definitely aids in climate and air quality improvement, reduction of global warming and carbon dioxide. (Davie 2002) Plants are the only species to manufacture its own food through photosynthesis, by taking in carbon dioxide and releasing oxygen. Trees thus help to maintain low levels of CO2, thereby reducing the greenhouse effect. Trees are also called the "lungs" of a city, for absorbing pollutants and releasing oxygen. (Enviro Facts 1999) According to Dr Debra Roberts, Deputy Head of Environmental Management, Development Planning and Management Unit of the eThekwini Municipality, Climate disruption is the biggest environmental threat to people and the global ecosystem and, at the moment, the issue is not receiving the attention it deserves. The eThekwini Municipality has responded to the issue of climate change at different levels, one being consideration given to the open space system due to the importance of greening to micro-climate amelioration. (Meyer 2005,vol.10,no.3,p.12-14) Johannesburg City within its Metropolitan Open Space System is placing emphasis on preserving open space for the protection and enhancement of air quality. (Russouw 2003)

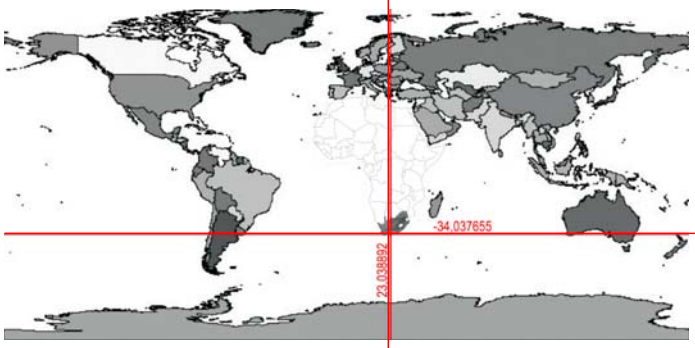
2.5.3.5. EDUCATION & SCIENCE

Urban green areas provide opportunities for education and scientific research. (Kendle & Forbes 1997) Cole states that contact with nature should be the experience of many, not few, and that a clear understanding of, and concern for, nature is best instilled through direct and frequent experience. (Cited in Kendle & Forbes) Environmental literacy lies at the heart of understanding the places with which we are familiar and it is important for people to know the environment around them and for the users to have an awareness of the place that is part of everyday life. Environmental ignorance plays a big role in people's lack of understanding and compassion for natural processes and functions. There has to be a change in attitudes and the way we experience nature to have a true and valuable understanding. (Makhzoumi & Pungetti 1999) Educational landscapes that are fun as well as instructive should be created. (Makhzoumi & Pungetti 1999) According to the Johannesburg City, another aim of MOSS (Metropolitan Open Space System) is to provide places for education and research on ecological, environmental and appropriate cultural resources. (Russouw 2003)



chapter 3
context analysis

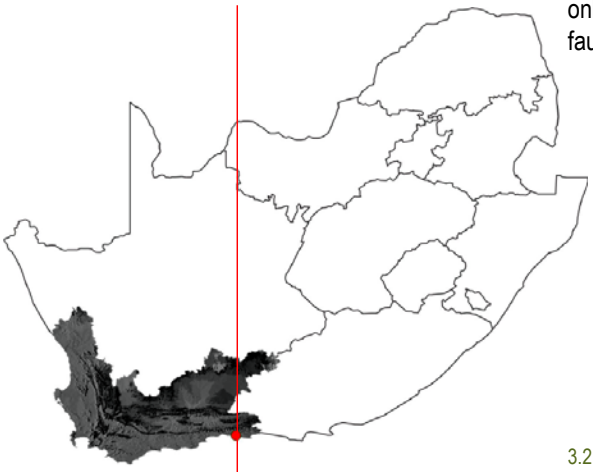
3.1.GENERAL CONTEXT DESCRIPTION



3.1. World map (Enpat 2002 & edited Howard 2005)

3.1.1. MACRO-SCALE: SOUTH AFRICA

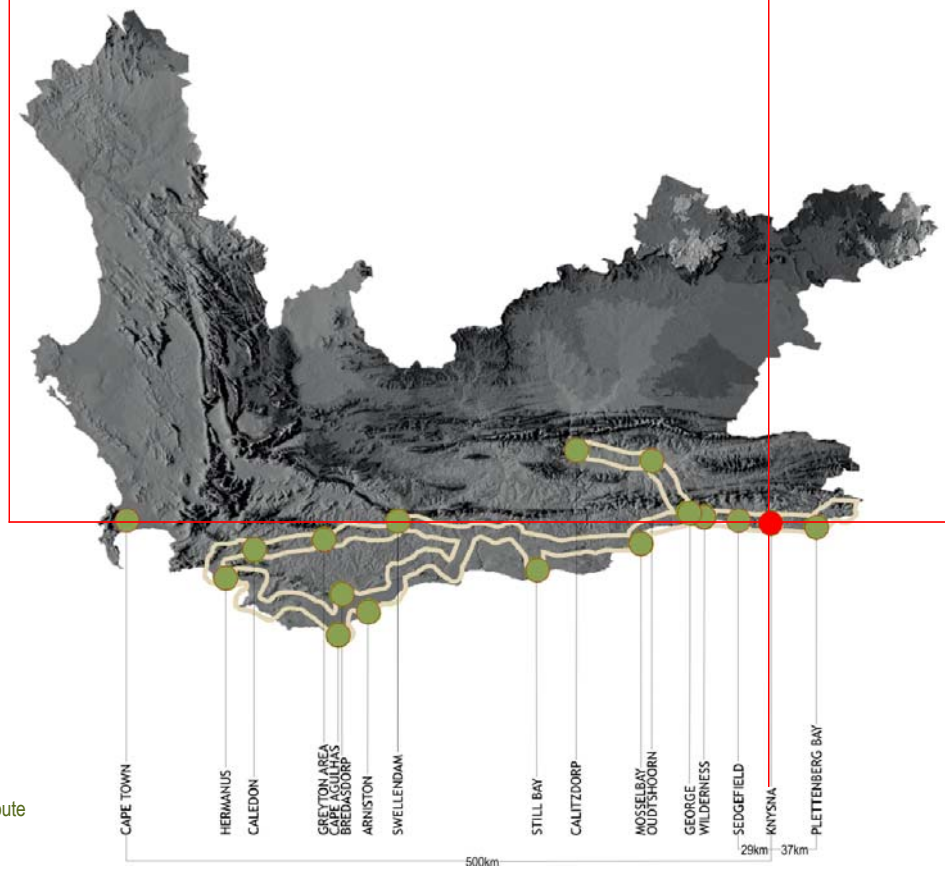
Designing within the South African environment is an exciting challenge with a diversity of factors which influence proposed interventions. Principles of the 1996 South African Constitution that are important themes of this thesis are the belief that South Africa belongs to all who live in it and that we are united in our diversity, and that we are to heal the divisions of the past and establish a society based on democratic values, social justice and fundamental human rights. (Constitution of the Republic of South Africa, 1996)



3.2. South Africa (Howard 2005) and Western Cape (Enpat 2002)

3.1.2. MESO-SCALE: WESTERN CAPE & GARDEN ROUTE

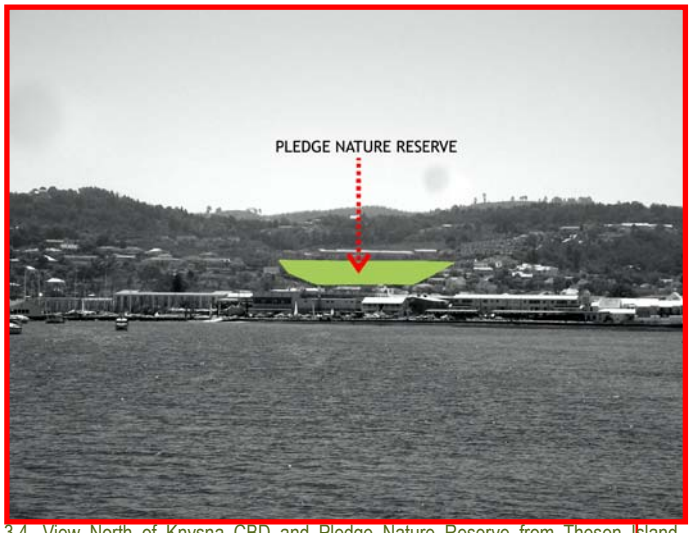
The Western Cape is characterized by a varied landscape with mountain ranges, coastal scenery, wine farms, unique floral kingdoms, and rural towns, to bustling metropolitan areas like Cape Town. (Vermeulen 1999) The province is divided into ten tourism regions, each with its own particular and unique character. One of these districts is the Garden Route, situated on a narrow coastal plain and stretching eastward from Heidelberg to the Tsitsikamma Forest and the Storms River. This area has great aesthetic value and is characterized by evergreen forests, the only natural lakes area in South Africa, long beaches and a diversity of fauna and flora. (Van Wijk 2000)



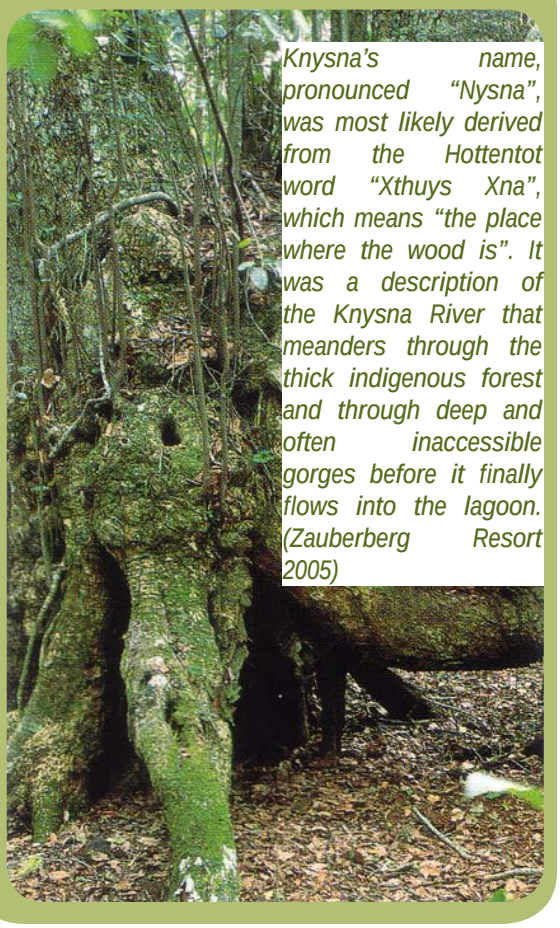
3.3. Western Cape (Enpat 2002) and Garden Route (Howard 2005)

3.1.3. MICRO-SCALE: KNYSNA

Knysna is referred to as the 'jewel of the Garden Route' and is embraced by the Outeniqua Mountains to the north and the 21 hectare Knysna Estuary of the Knysna River, and Indian Ocean, to the South. The Heads act as a striking gateway to Knysna, guarding the narrow inlet to the estuary. (Vermeulen 1999)



3.4. View North of Knysna CBD and Pledge Nature Reserve from Thesen Island (Howard 2005)



Knysna's name, pronounced "Nysna", was most likely derived from the Hottentot word "Xthuys Xna", which means "the place where the wood is". It was a description of the Knysna River that meanders through the thick indigenous forest and through deep and often inaccessible gorges before it finally flows into the lagoon. (Zauberberg Resort 2005)

3.5. A stinkwood coppicing (Nell 2005)

3.6. Knysna aerial photograph (Knysna Municipality 2000) and location of Pledge Nature Reserve (Howard 2005)

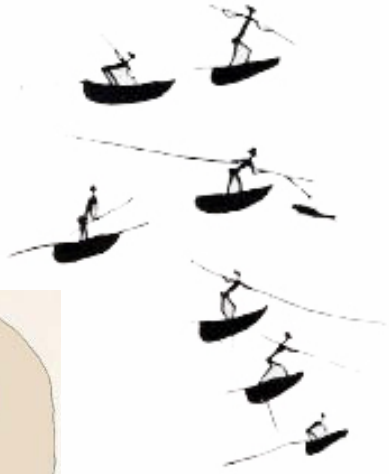
3.1.3.1. KNYSNA HISTORIC CONTEXT

The hunter-gatherer-herder communities of southern Africa inhabited the Garden Route area from the Stone Age time. The herders referred to themselves as Khoinkhoin, 'men of men', the stem Khoi is a better term to name the herders, and the herders themselves spoke of the hunters as San. (Inskeep 1978:87)

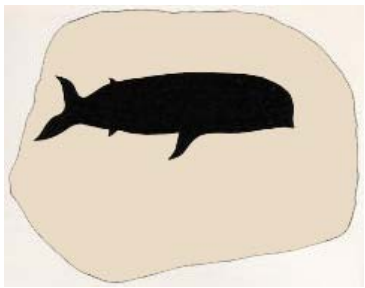
The languages of the hunters and herders incorporated a number of 'clicks' which made the tongue sound so foreign to many of the early travellers that they must often have doubted whether it was a language at all. (Inskeep 1978:86) The Khoi named a local river in the area by a word that sounded like 'Knysna' to the early Europeans. Scholars offer several translations of this Khoi term, 'place of wood, fern leaves, or, simply referring to the steep sandstone cliffs today called 'The Heads'. (Zauberberg Resort 2005)

Man as a hunter lived in the landscape like any other animal; he drew sustenance from it and returned a little to it including, in due course, himself. He cannot properly be understood except in relation to the environment in which he lived. (Inskeep 1978:16) He lived in absolute harmony with nature, only using resources when necessary. Man as the herder did manipulate and modify his environment, but his scope for doing so was limited by what nature provided (Inskeep 1978:16); therefore he also lived in harmony with his environment and his takings did not exceed his basic requirements for survival. Both groups were able to obtain enough nourishment for their support without destroying that on which they depended. These human social groups were able to survive because they achieved a state of equilibrium within their environment. (Inskeep 1978:104)

3.7. A sketch done by Samuel Daniel in 1851 of Bushmen armed for an hunting expedition (Wilson & Thompson 1982)



3.8. Khoi-San painting of fishermen (Inskeep 1978)

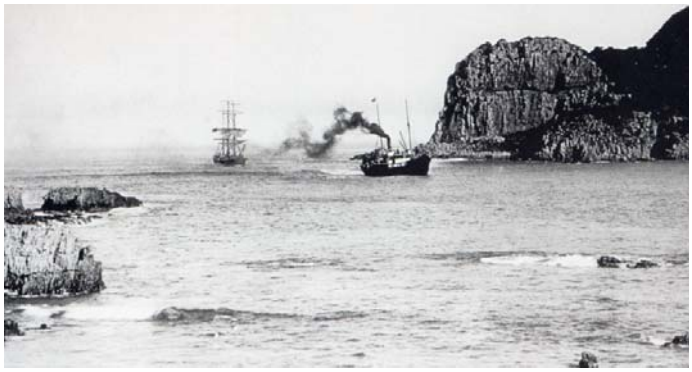


3.9. A Khoi-San painting of a whale on a water-worn block of stone (approximately 300mm long) from a coastal cave near Knysna (Inskeep 1978)

The 18th Century saw the destruction of this equilibrium with the settlement of Dutch colonialists. The Khoi-San scattered under this intrusion and were displaced to the less pleasant and unwanted remoteness of the Kalahari. (Inskeep 1978:86) The Dutch settlers went about annexing land in this beautifully lush area, and created farms around the available resources.

The natural forests near Cape Town were all but denuded by timber demands for ships and wagons by the 1770's, and a keen interest in Knysna's forest timber supplies developed. The timber trade also attracted many farmers as it provided a more reliable form of income. By the end of the 18th Century there were about twelve dwellings between George and Knysna. At this time George Callander was sent to investigate the possibility of shipping timber from Outeniqualand. He was the first European to settle at the Knysna Heads. (Nell 2005)

In 1804 George Rex, a timber merchant and the presumed bastard child of King George III and a Quaker named Sarah Lightfoot (Phantom Forest Eco Reserve 2005), purchased the farm Melkhoutkraal, effectively taking ownership of all the land surrounding the lagoon. (Tiscover AG 2005) This leading landowner, timber dealer and agriculturist was described as the 'Founder and Proprietor' of Knysna on his gravestone and it was largely due to his persistent representations that the Knysna Estuary was opened as a harbour in 1817. (Ukubona Development 2005) Naval and commercial ships brought supplies into the area and later timber was shipped out of the area. Hundreds of ships used the port of Knysna between 1817 and 1954, after which it was deproclaimed. (Nell 2005)



3.10. The SS Agnar tows an unknown sailing ship into Knysna Harbour in 1910. The first ship to enter the Heads, the Emu, struck a submerged rock on 11 February 1817 (Nell 2005)

3.11. Knysna Main Road in 1933 (Nell 2005)

3.12. Gold miners in the 1880's (Nell 2005)

In 1870 Arnt Leonard Thesen and his family moved from Norway to Knysna and set up the first trading store and counting house. A gold nugget was found by James Hooper in a river bed on his farm Ruigtevlei in 1876, and due to its significance the authorities made a grant for further prospecting. 1881 saw the settlements of Melville and Newhaven united to form the town of Knysna. (Tiscover AG 2005)

In the 1880's George Parkes, an industrialist from England purchased over 3,400 hectares of Knysna forest to provide a source of wood for his factory which was producing edge tools. He established the first primitive sawmill in the forest and a mill conveniently situated in the centre of Knysna. (Tiscover AG 2005)

In 1885 the search for gold recommenced in the Karatara River after years of postponement and this proved to be a successful venture. Many fortune seekers descended on the Millwood Area over the next 10 years, until it ceased to be a lucrative operation. (Tiscover AG 2005) In 1904 Charles Wilhelm Thesen bought Paarden Island, part of the Melkhoutkraal Estate, and began processing timber on the island (now Thesen Island) in 1922. (Tiscover AG 2005)

For 200 years woodcutters eked out an existence in the forests. Many built wood and corrugated iron shelters up in trees near their working places at the time, as a precaution against elephants. By 1900 there were about 1400 woodcutters. The forests were closed in 1939 to protect them from being completely denuded and the Woodcutter Annuity Act was passed, entitling the woodcutters to be pensioned off. (Nell 2005)

3.13. The bridge over the Knysna River was completed in 1895, but was later washed away during a flood (Nell 2005)

Following the 1994 elections, Knysna, like the rest of the country, experienced socio-cultural rejuvenation. The Knysna community became more diverse due to the increased migration of the Xhosa culture to the Western Cape from the Eastern Cape. Although these individuals moved into this area, there was no strong economy to support them, but this is improving as time passes, especially with the great building boom which seems to be never-ending.

The building boom has direct and problematic impacts on the natural environment of the region, as the urban sprawl of informal townships, as well as high-value residences, negatively affects the preservation of this environment's ecological character.

Yet again we are reminded that the three environments, socio-cultural, economic and ecological, are closely connected and have an over each other.

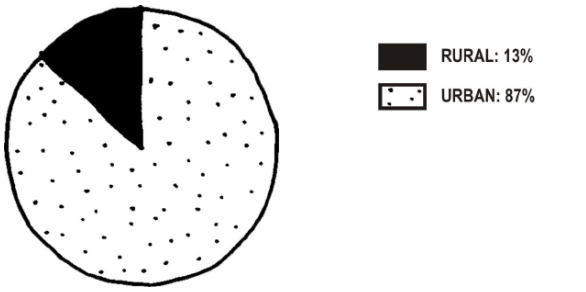
History should guide us in making decisions about present and future development. We should learn from previous mistakes, and successes with reference to the built environment, and the way in which humans approached the landscape in which they lived and worked.

3.14. Master Road builder Thomas Bain completed 24 passes in his career, including the Prince Alfred's Pass, built from Knysna to Avontuur (near Uniondale between 1860 and 1867). Among other major roads and passes he built were the old road that links George to Knysna (1867-1882) (Nell 2005), the old road between Knysna and Humansdorp, the Bloukrans and Storms River passes (1879-1885), the road through Baviaanskloof (1880-1890) and the Swartberg Pass (1883-1887) (Nell 2005)

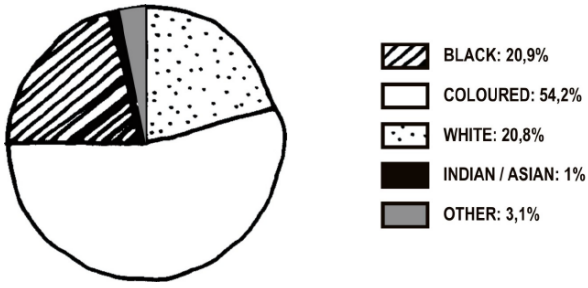
3.2. SOCIO-CULTURAL ENVIRONMENT

3.2.1. POPULATION STRUCTURE

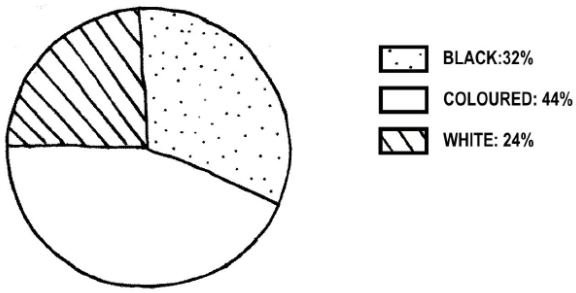
South Africa's population was estimated to be 46.6 million in the Mid-year population estimates 2004 (Statistics South Africa 2004), with approximately half of the population living in urban areas, while the rest live in the non-urban, rural areas of the country. (Vermeulen 1999) The population growth rate is 1.9%, and although this has been declining steadily over the last few years, the total population will continue to increase. The government's Reconstruction and Development Programme aims for 2.1% fertility by 2010, 1.9% population growth, and stabilisation of the population at 80 million by 2100. (DEAT 1999)



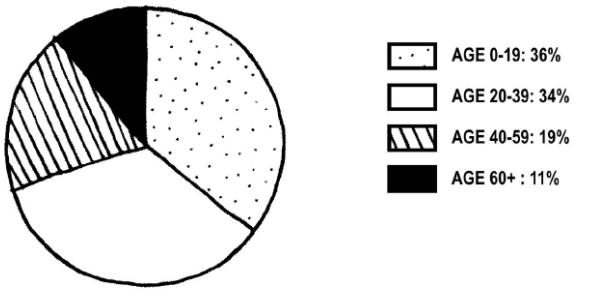
3.15. Western Cape Province population location (Vermeulen 1999)



3.16. Western Cape Province population groups (Vermeulen 1999)



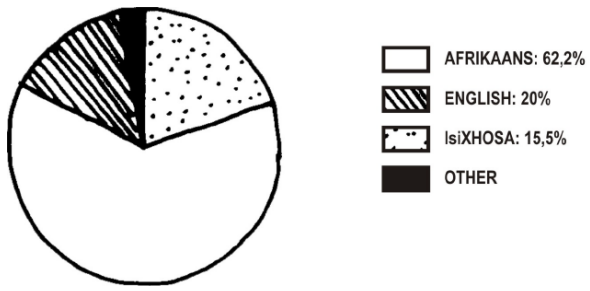
3.17. Knysna population groups (South African Statistics Council 2001)



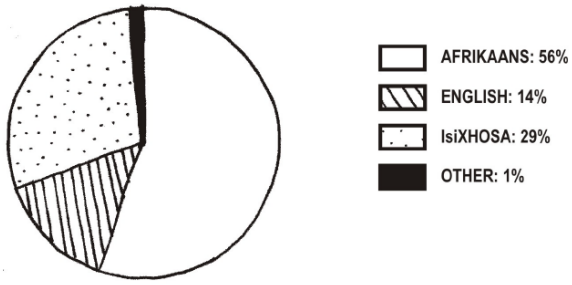
3.18. Knysna age groups (South African Statistics Council 2001)

3.2.2. LANGUAGES

Of South Africa's eleven official languages the principle languages of the Western Cape are Afrikaans, English and isiXhosa (Vermeulen 1999) In Knysna the majority of the population's first language is Afrikaans, spoken primarily by the Coloured and White inhabitants, followed by isiXhosa, spoken primarily by the Black inhabitants, and then English which is spoken primarily by the White inhabitants. (South African Statistics Council 2001)



3.19. Western Cape Province languages (Vermeulen 1999)



3.20. Knysna languages (South African Statistics Council 2001)

3.2.3. RELIGION

No government restrictions exist with regards to religion in South Africa. The Christian faith is predominant in South Africa while traditional African beliefs remain important, especially in rural areas. The Hindu and Islam beliefs are equal amongst mainly the Asian communities, with the Islamic community growing rapidly. (Burger 2004)

3.21. The original Anglican Church in Main Road which was the first church to be built in Knysna (1849-1855) (Howard 2005)

3.22. The Holy Trinity Church at Belvidere, consecrated on 5 October 1855. (Howard 2005)

3.2.4. CULTURE

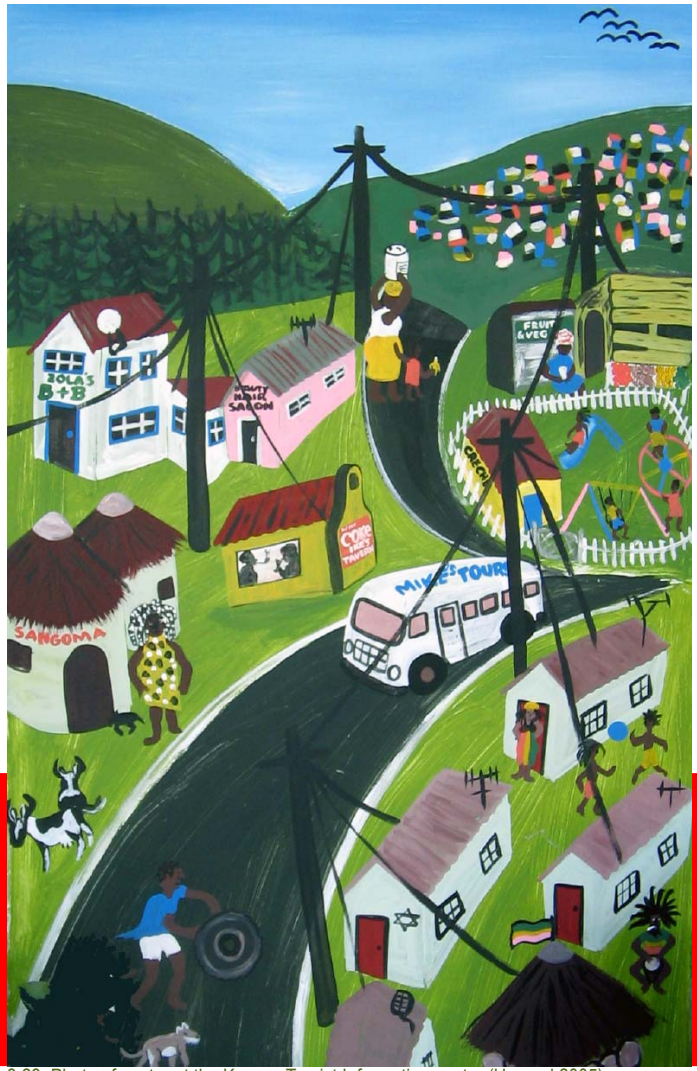
The cultural landscape of South Africa consists of a fascinating mix with African, Eastern and Western influences reflected in most areas of society. (Vermeulen 1999) According to The Constitution of South Africa everyone has the right to freedom of expression, which includes freedom of artistic creativity. (Constitution of the Republic of South Africa, 1996: Section 16.1.c)

The aim of the Cultural Industries Growth Strategy, established by the Department of Arts and Culture and the Department of Trade and Industry, is to enhance the potential of South African cultural industries to contribute to job and wealth creation. The key recommendations were: (Burger 2004)

1. developing education and training opportunities
2. increasing local and international demand for cultural products
3. encouraging the industries to work together
4. generating information
5. continuing to raise the profile of the cultural industries in the media and in government departments

3.24. Photo taken of a signboard of cultural events in the Knysna Tourist Information centre (Howard 2005)

Due to its great scenic beauty, Knysna has become a natural drawcard for aspiring artists, sculptors and photographers. Many professional artists have also settled in the town (lucrative trade of local and overseas clients). The Knysna Arts Festival is held annually towards spring, attracting budding artists from all over the country. At least four permanent art galleries are found in Knysna, and another four arts and crafts markets are held in and near the town on a weekly basis – an indication of the supply and demand of arts and crafts in Knysna. (Nell 2005)



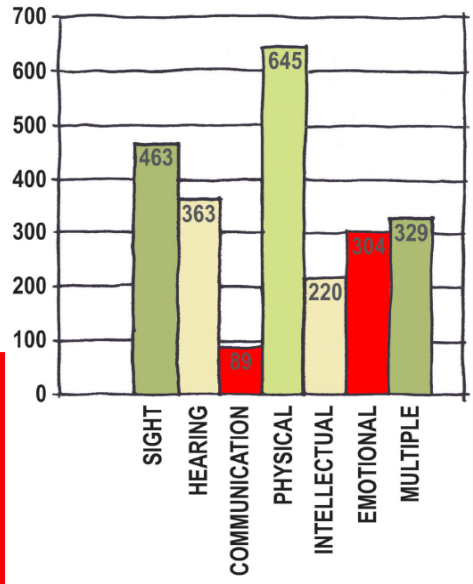
3.23. Photo of poster at the Knysna Tourist Information centre (Howard 2005)

The community of Knysna is viewed as vibrant, active and eccentric, and it is believed that it is culturally pro-active and healthy. Although a number of cultural and social groups exist within this region, a definite lack of community integration is experienced and the town is still characterised by a certain degree of separatism and racial disdain. An attempt should be made to unite the community to create better relationships and inter-cultural understanding and acceptance.

3.2.6. DISABILITIES

According to the 2001 Census approximately 5% of the recorded community of Knysna has a disability of some kind. It is important to take this portion of the community into consideration during planning and design phases.

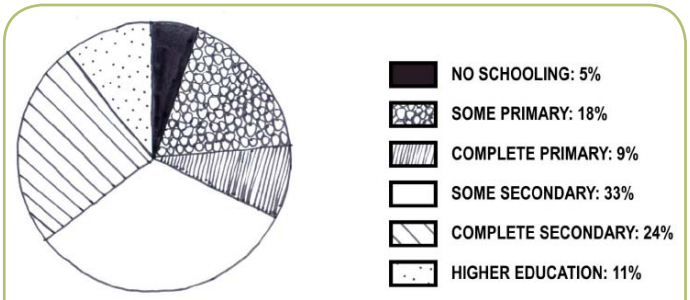
25. Take disabled persons into regard at all times of the project progress (Imagebank & edited Howard 2005)



3.26. Persons with disabilities in Knysna (South African Statistics Council 2001 & Howard 2005)

3.2.7. EDUCATION

According to The Constitution of South Africa everyone has the right to a basic education, including adult basic education; and to further education, which the state, through reasonable measures, must make progressively available and accessible. (Constitution of the Republic of South Africa, 1996: Section 29.1.a,b), and everyone has the right to establish and maintain, at their own expense, independent educational institutions that do not discriminate on the basis of race; are registered with the state; and maintain standards that are not inferior to standards at comparable public educational institutions. (Constitution of the Republic of South Africa, 1996: Section 29.3.a,b,c)

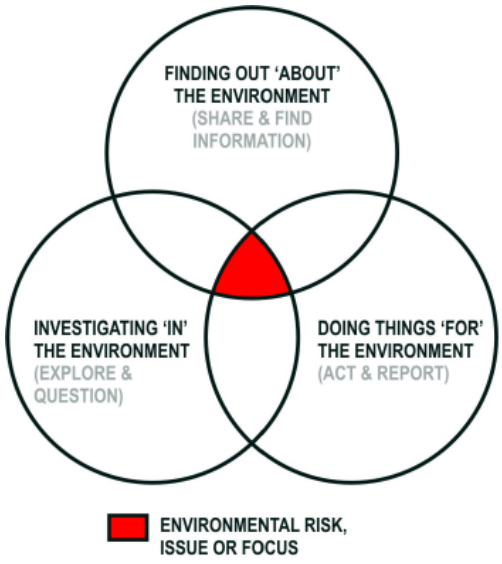


3.29. Knysna education statistics (South African Statistics Council 2001)

The last eleven years has seen a great growth in the number of schools and the size of the schools in the Knysna region. Still a lack of education amongst the community is a powerful social problem, and should be approached within the development framework.

Environmental education has become an increasingly important facet of the South African Educational System and is being integrated into a number of facets of learning. Within our changing global circumstances it is essential that children, as well as adults, are exposed to the various facets of our socio-cultural, economical and ecological environments. An increased knowledge of the environment we live in will aid in awareness, responsibility and therefore improve sustainable living.

Environmental education processes have much in common with outcomes-based education. Both encourage active learning in local environments and the developing of skills, understanding and values in real-life contexts. Cross-curricular learning has always been a feature of envrionmental education processes. Similarly, Curriculum 2005 encourages teachers to make links between Learning Areas. The Education Department, in collaboration with the Departments of Environmental Affairs and Tourism (DEAT) and Water Affairs and Forestry (DWAF), is developing a National Environmental Education Programme (NEEP) to promote environmental learning in schools. The NEEP Active Learning Environment model (below) shows how education processes 'in, about and for' the environment can encourage active learning. (BEEP 2000)



3.27. The NEEP Active Learning Environment model (BEEP 2000 & edited Howard 2005)


3.30. Art work by a Grade 4 student (BEEP 2000)

3.28. Painted walls at Knysna Primary School (Howard 2005)

3.2.8. SPORT AND RECREATION

The result of cooperation between Recreation South Africa, the South African National Recreation Council and the SRSA is the development of the South African National Games and Leisure Activities (SANGALA) Programme. The programme was launched in February 1996 to involve South Africans in healthy recreational activities in the nation-building process. (Burger 2004)

SANGALA consists of the following: (Burger 2004)

1. Community: Targeting the broad community without any differentiation in age or status
2. Training: Specialising in the training of community recreational leaders
3. Corporate: Aimed at middle and senior management in both the private and public sectors
4. Senior: Encourages physical activity among seniorcitizens. More than 200 000 senior citizens participate annually in this project
5. Street: A life-skills project for homeless children
6. RecRehab: A project for the rehabilitation of youth and women in prisons, and trains leaders to present recreational activities in prison

Prominent recreation in Knysna is generally associated with the active tourist industry. Fishing, boating, exploring, snorkelling and scuba-diving, birding, hiking and playing golf are some of the popular recreational activities of this town. A part of the annual Oyster Festivel (July) in Knysna includes sporting events and competitions such as angling, cycling and mountain bike tours, bowling, golf days, fun runs, marathons, cross-country and the street mile, canoe races, and the outdoor adventure exposition.

Sports and recreation areas in Knysna include:

1. The school sports grounds which are well-used and maintained
2. The Knysna sports grounds which are poorly maintained and not well-used due to lack of accessibility
3. A well-utilised sports field in the northern black suburb
4. Lagoon walkway which has moderate use, with safety and security as an issue
5. Pledge Nature Reserve which, due to its lack of accessibility and the safety issue, is not well-utilised

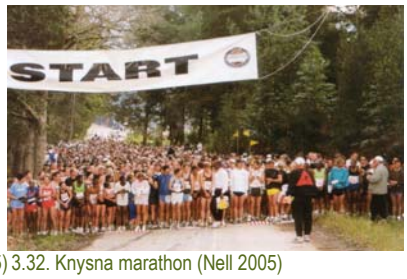
Knysna has no park or open space system in which the community can gather for informal recreation which is not primarily driven by tourism and economic gain.

3.34. Sports grounds at Knysna Primary School (Howard 2005)

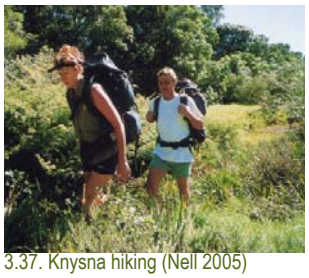
3.35. Sports field in the Northern township suburb of Knysna (Howard 2005)

3.36. Poorly maintained and inaccessible Knysna sports grounds (Howard 2005)

3.31. Oyster Festival sign (Nell 2005)

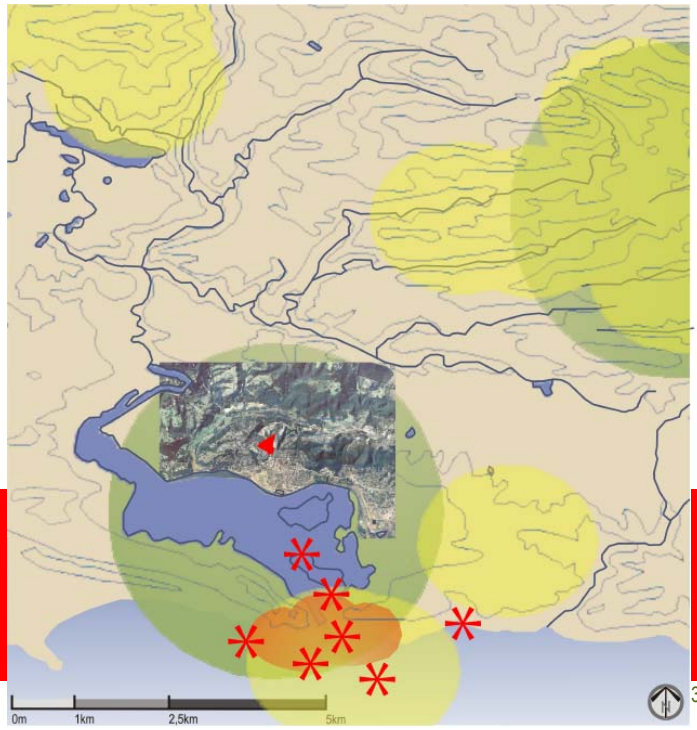


3.32. Knysna marathon (Nell 2005)



3.37. Knysna hiking (Nell 2005)

3.38. Recreational, tourist boat trips (Nell 2005)



3.33. Knysna information map (Enpat 2002, Knysna Municipality 2000 & edited Howard 2005)

3.3. ECONOMIC ENVIRONMENT

3.3.1. MACRO SCALE GENERAL OVERVIEW

The economy of South Africa was originally built on natural resources, with mining and agriculture the mainstays of the Gross Domestic Product. Recently, however, there has been a shift from production towards manufacturing. (DEAT 1999) The recently completed South African National Land Cover Data Set estimates the largest land use to be agriculture (86% mostly natural veld with about 12% cultivated). Urban and industrial land uses comprise 1.4%, forestry comprises 1.5%, and conserved areas 6%. As at 1996, there were 422 protected areas, made up of national parks and provincial reserves with a total area of 6.7 million ha (Kumleben et al. 1998). If the large Kruger National Park and Kalahari Gemsbok Parks are excluded, only 4 % of the surface area of South Africa is formally protected. (DEAT 1999)

3.3.1.1. EMPLOYMENT AND SKILLS DEVELOPMENT

Employment and skills development continue to be high on the Government's agenda. In June 2003, at the Growth and Development Summit, government, business, trade unions and community leaders agreed on a range of programmes and initiatives designated to create jobs, reduce unemployment and further boost skills development. (Burger 2004)

3.3.1.2. EXPANDED PUBLIC WORKS PROGRAMME

The aim of the EPWP will be to facilitate and create employment opportunities for the poor and vulnerable, through integrated and co-ordinated labour-intensive approaches to government infrastructure delivery and service provision. (Burger 2004)
The objectives of the EPWP are: (Burger 2004)
1.Job creation
2.Poverty alleviation
3.Investment in social and economic infrastructure
4.Human resource development through the training of participants

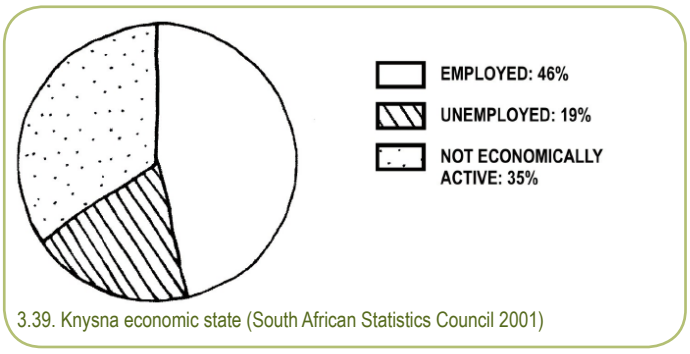
3.3.2. MESO SCALE GENERAL OVERVIEW

Unemployment has become a critical problem in the Garden Route region as the farming and forestry industries no longer support the growing population of poorer communities as they used to. The lack of jobs has been exacerbated in recent years by a steady influx of 'immigrants' looking for work. Although there is a widespread belief that these newcomers are from Malawi, Zimbabwe and Mozambique, the reality is that the vast majority come from Fort Beaufort, Humansdorp and other Eastern Cape towns whose depressed economies also offer few opportunities for work. (Vacation Technician 2005)

3.3.3. MICRO SCALE GENERAL OVERVIEW

Knysna has grown from a little coastal village to a fully fledged developed town with almost every conceivable amenity. Businesses have boomed and the town has a firmly established industrial sector, a local brewery and a yacht factory. In the wake of its development, golf courses, bed-and-breakfast establishments and various tourist-related businesses have mushroomed. Construction businesses are booming and the price of real estate is soaring in a hitherto unknown sense of prosperity as one development after another gives rise to yet another suburb and more employment. Due to its proximity to the indigenous forest, Knysna has some of the finest wooden furniture manufactured from stinkwood, yellowwood and other timber. Where its economy was once almost entirely tourist-related, Knysna now has a far more permanent, solid economy to carry it through the year. (Nell 2005)

Even though the economy has boomed to such an extent more than half of the community is still unemployed or economically inactive. Due to this economic stagnancy issues of homelessness, poverty and other related effects are evident



3.39. Knysna economic state (South African Statistics Council 2001)

3.40. The active tourism industry in Knysna is represented in this image (Howard 2005)

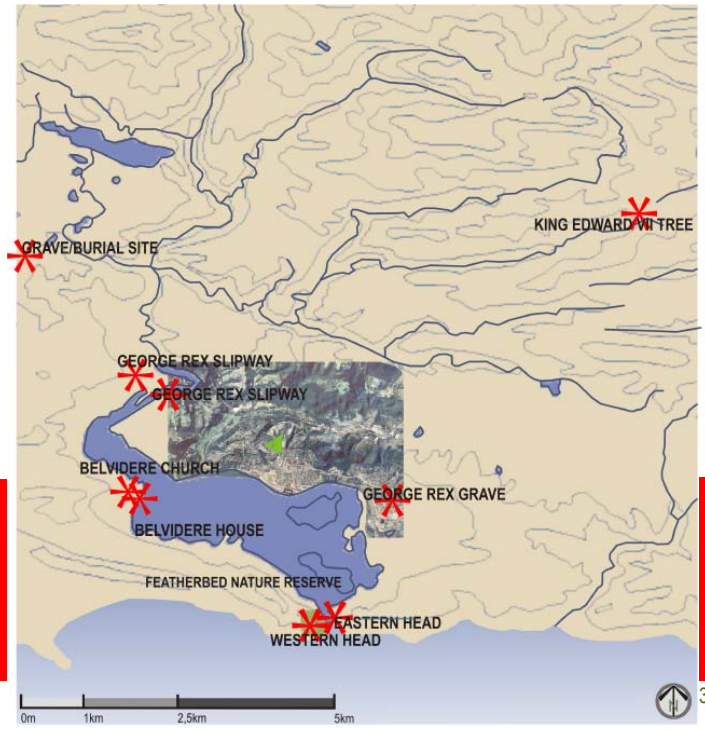

3.41. Homeless individual in Anglican Church grounds (Howard 2005)

3.3.4. TOURISM

South Africa is one of the fastest-growing tourism destinations in the world, with 6,4 million tourists visiting the country during 2002. Overseas arrivals increased by 20,1% (just over 1,8 million people) during 2002. (Burger 2004) An increasingly popular segment of the South African tourism industry is Eco-tourism, as it unlocks the natural and cultural assets of the environment to the visitor, and generates foreign exchange for the promotion and conservation of the country's ecological resources. Eco-tourism includes bird-watching, nature photography, hiking and mountaineering, visits to cultural heritage villages and site of San rock art. (Vermeulen 1999) Cultural tourism is another fast growing form of tourism, estimated at approximately 10% growth per annum. The SATOUR survey in 1997 showed that 21% of overseas visitors were interested in South Africa's cultural attractions, these attractions composed of 42% historical sites, 38% museum or art gallery, 27% cultural village and 17% theatre. (Vermeulen 1999)

Tourism is the most viable industry for the Garden Route and should be stimulated as much as is environmentally acceptable. A well-preserved natural environment forms the backbone of this tourism industry and therefore to secure its future, there is a need to maintain this environment. It is essential that the development of this industry involves employers and employees from within local communities, therefore aiding in the improvement of the region's economic state. (Vacation Technician 2005)

3.42. The Kaaimans railway bridge which is a popular image of the Garden Route Tourism region (Howard 2005)



LEGEND: KNYSNA REGION CULTURAL & HERITAGE SITES

- CULTURAL SITE
- ECOLOGICAL HERITAGE SITE
- PLEDGE NATURE RESERVE
- 100M CONTOURS

3.43. Knysna information map (Enpat 2002, Knysna Municipality 2000 & edited Howard 2005)

Come the season, and more specifically December, Knysna bursts at its seams, more than doubling its population for three weeks. The main road through town was not designed for the traffic at this time of year, and congestion is a daily issue. It is a time of insanity for many. Some business turnovers quadruple, while others shut down for the season. Expenditures soar in the brief season and many locals stay out of town due to the inevitable traffic jams as the masses descend upon Knysna. There is a brief respite over Christmas, then momentary madness over the New Year and almost exactly one week later, the sudden, relative silence of the new year that Knysna is about to face. (Nell 2005)

3.44. Knysna voted as most popular town for two years (Nell 2005)

Tourist attractions of Knysna include festivals such as the Oyster festival which is an event of sport and leisure in July and the Pink Lourie festival which is a gay festival in May, visits to beaches such as Buffels Bay, Goukamma, Brenton-on-Sea, Noetzie, Bollard's Bay, scuba or snorkelling at the Heads, cruises on the lagoon, visits to Nature reserves (Featherbed Nature Reserve), adventure centres, cultural visits to memorial sites like Georege Rex's Gravesite, churches and art galleries. (Nell 2005)

3.4. ECOLOGICAL ENVIRONMENT

3.4.1. GENERAL INFORMATION

According to The Constitution of South Africa everyone has the right to an environment that is not harmful to their health or well-being; (Constitution of the Republic of South Africa, 1996: Section 24.a) and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation, and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. (Constitution of the Republic of South Africa, 1996: Section 24.b:i,ii,iii)

MacDonald states that virtually all ecosystems in South Africa have been modified or transformed by human activities. These transformations and modifications include areas placed under cultivation for commercial crops or subsistence agriculture; overstocking, overgrazing and poor land-use management; deforestation for commercial timber production; the invasive spread of alien plants; urbanization and settlements; the impoundment of rivers; mining; transportation; industrialisation and subsistence and commercial harvesting of indigenous plant products. (DEAT 1999)

The Garden Route is literally being loved to death by an ongoing influx of home-owners, all of whom hope that the development will cease once they have secured their bit of paradise, and it is noted that some towns are just a generation away from being overcome by environmental problems usually associated with big cities, namely water shortages, the mushrooming effect of informal settlements, poor water quality and loss of natural open space. Rapidly expanding development projects include golf course estates, new residential suburbs, commercial areas as well as informal 'townships', and even though these townships do not waste as much water as the golf courses or create as much rubbish as the richer suburbs, they still place a tremendous amount of pressure on the environment. (Vacation Technician 2005)

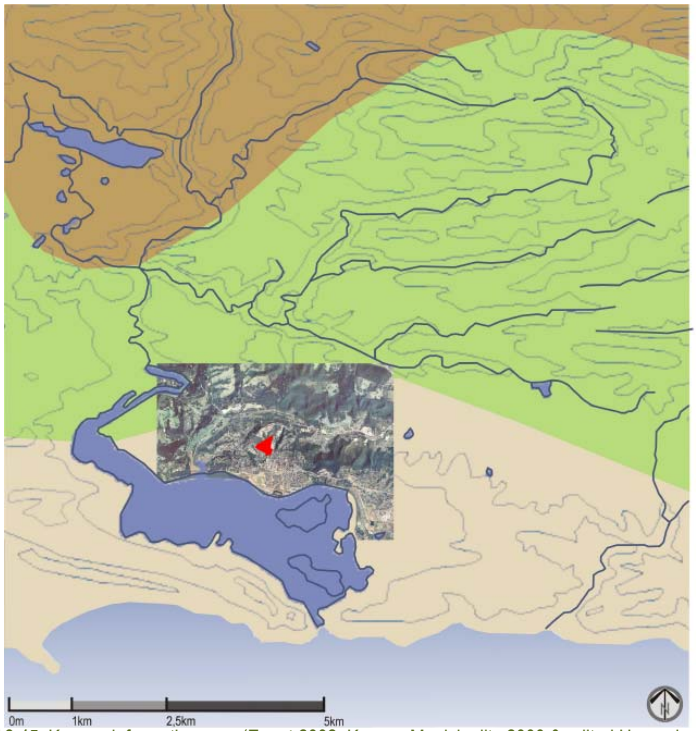
3.46. Sketch of 'The Heads' by Adelai Hodgson (Allanson et al 1993)

3.4.2. ABIOTIC CHARACTER

3.4.2.1. TOPOGRAPHY

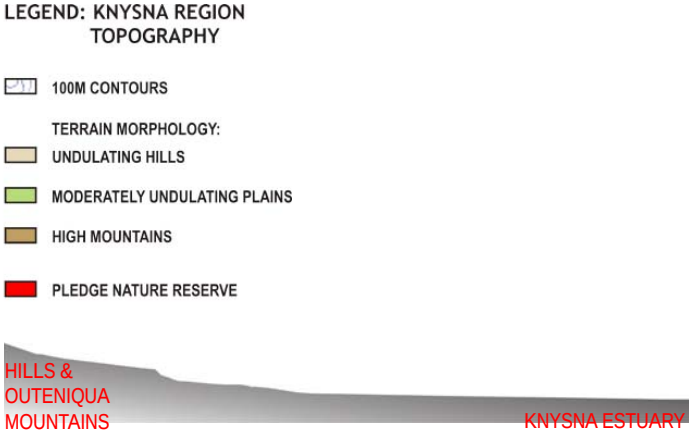
South Africa has an area of 1 219 090 km² with a coastline of approximately 3000 km, and is characterized by three broad topographical regions, namely the narrow coastal strip, the large inland plateau and the escarpment (impressive mountain ranges and hills, dominated by the Drakensberg Range). (Vermeulen 1999)

Knysna's altitude stretches from 0-150m above sea level. Knysna is composed of a variety of landforms, ranging from gentle slopes to cliff structures such as the well known 'Heads'. The Western Head is largely undeveloped (Featherbed Nature Reserve) and the Eastern Head is predominantly developed by luxury houses.



3.45. Knysna information map (Enpat 2002, Knysna Municipality 2000 & edited Howard 2005)

3.47. View of Knysna 'Heads' (Howard 2005)



3.48. Typical section through Knysna - topographical variation (Howard 2005)

3.4.2.2. GEOLOGY

The diversity and richness of mineral deposits of South Africa (including coal, iron, copper, gold, platinum) were the catalyst for European colonisation, and economic development. Although these are distributed across the country, the most economically important deposits (gold, coal and platinum) are found in Gauteng Province, which is now the most populous, and affluent area. (DEAT 1999)

The Knysna Heads, cliffs and hills to the east are part of the Table Mountain rock formation and consist of immense portions of medium- to coarse-grained sandstone, which is an important class of sedimentary rock, consisting of consolidated deposits of predominantly sand-sized, quartz-rich grains, cemented by various materials, including silica and calcium carbonate. (Nell 2005)

The oldest rocks in region, Precambrian (2500 – 4600 million years ago), occur near the Outeniquas, and consist mainly of twisted bands of schist, phyllites and feldspathic quartzite typical of the Kaaimans Formation. (Nell 2005) To the west the formations merge with gneissic granite. (Nell 2005) Along the coast a number of instances of a Pleistocene sequence of high littoral terraces (ancient shoreline) can be found at altitudes ranging from only 5m to 60m above sea level. The oldest of these is the pro-Formosa shoreline, which is situated between 57m to 63m above sea level at the base of the Brakkloof Formation. Next in the sequence a 30m shoreline predominates in a number of places, particularly at Robberg. Along the eastern side of the Knysna estuary are traces of another shoreline about 15m to 20m above present day levels. Yet another ancient shoreline is discernible on an erosional bench on the western side of the estuary 4m to 6m above present day levels. (Nell 2005)

3.4.2.3. SOIL

South African soils are generally thin and moderately fertile. This has contributed to agricultural development, although some areas are marginal, and suffering from degradation and soil erosion. (DEAT 1999)

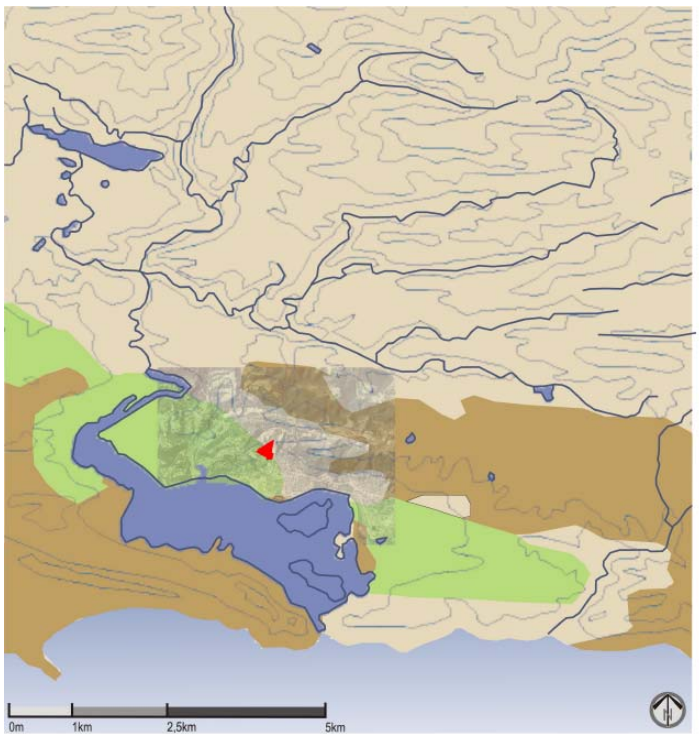
Three distinctive soil categories have been distinguished in the Knysna region:

1. Youthful, shallow, azonal soils with partially developed horizons
2. Brown and grey soils formed under present conditions
3. Palaeosols – ancient relics from the past that include laterites, a red clay formed by rock decay

Soils are generally acidic, with a pH between 4,5 and 5,5. Azonal soils occur on all steep slopes, on recent dunes and particularly in wetlands. They are sandy in texture and relatively shallow, with a maximum depth of 30m. Part of the wetlands where layers of silt have repeatedly laid down have developed deep, dark, organic-rich soils. The young brown and grey soils presently being formed are most abundant on the forested areas of the foothills. (Nell 2005)

At the heads and near Keurboomstrand (east of Plettenberg Bay), Spectacular arches and caverns have been carved into the sandstone formations by wave and wind erosion over millions of years. Many of these arches and caves provided shelter to Strandlopers who lived on what they could collect from the shores in ancient times. (Nell 2005)

3.50. Natural rock arch (Nell 2005)



3.49. Knysna information map (Enpat 2002, Knysna Municipality 2000 & edited Howard 2005)

3.4.2.4. HYDROLOGY

The most limiting natural resource of South Africa is water. Most of the major rivers have been dammed or have water abstraction schemes in place, in order to supply industry, agriculture, and domestic users. The government is committed to supplying all South Africans with 20-30 litres of clean water per day, increasing to 50-60 litres within 5 years. However, currently 16 million people do not have access to clean drinking water. (DEAT 1999)

The catchment area of Knysna, the freshwater environment, with all its rivers, lakes and streams, which are fed by rain, lies within the Cape fold mountainbelt, with its extended faults and vast east to west corrugations. The locality of the town is believed to be part of a drowned valley that silted up. (Nell 2005)

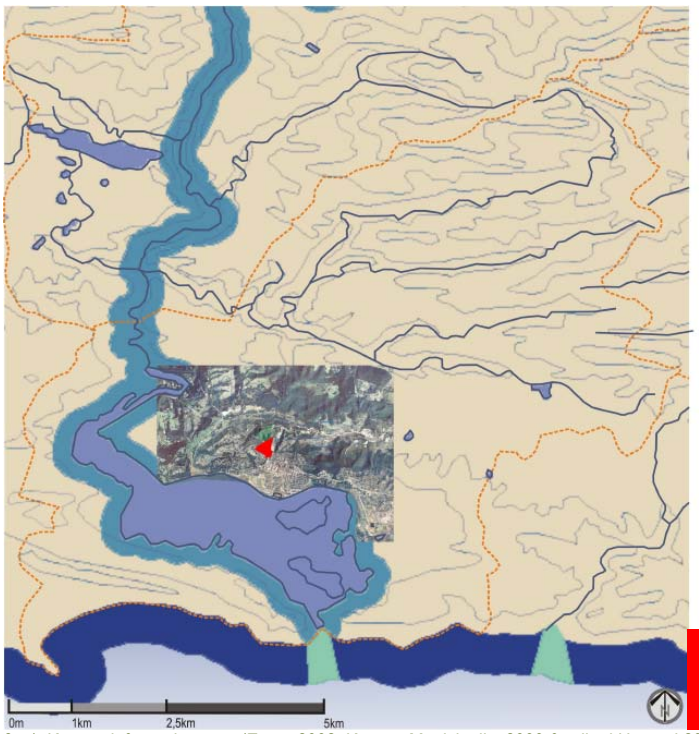
The estuary is seen as the heart of Knysna and tides rise and fall with an average of 1,7m, therefore flooding the estuary area. The S-shaped lagoon has an extent of up to 3,2km wide and 12km long. (Nell 2005) It comprises about 1827 hectares of some of the finest wetlands in the country and is home to a wide variety of fish and crustacean species which are unique to this area. (Nell 2005) The main tributary of fresh water is from the Knysna River which is fed by a number of tributaries which include the Swartkops, Steenbras, Gouna, Rooi-els, Lelievlei, Witels, Palmiet, Dwars, Kruis, Oubos and Lawnwood Rivers, while some streams enter the estuary directly, including Hornlee, Hunter's Home, Ouplaas, Salt River, Eastford, Westford and Brenton Streams. (Nell 2005)

Today the estuary is relatively clear, as is the river, though peat-stained from vast vegetation patches and humus upstream in the indigenous forests and exotic plantations; this also affects the clarity of the upper reaches of the lagoon. Once every 10 to 12 years, particularly heavy showers in the catchment area cause the river to flood its banks and stain the whole estuary brown. The salinity levels of the estuary vary from area to area, tide to tide, and season to season and can range from zero parts per thousand to hypersaline conditions of 36,7 parts per thousand. (Nell 2005)

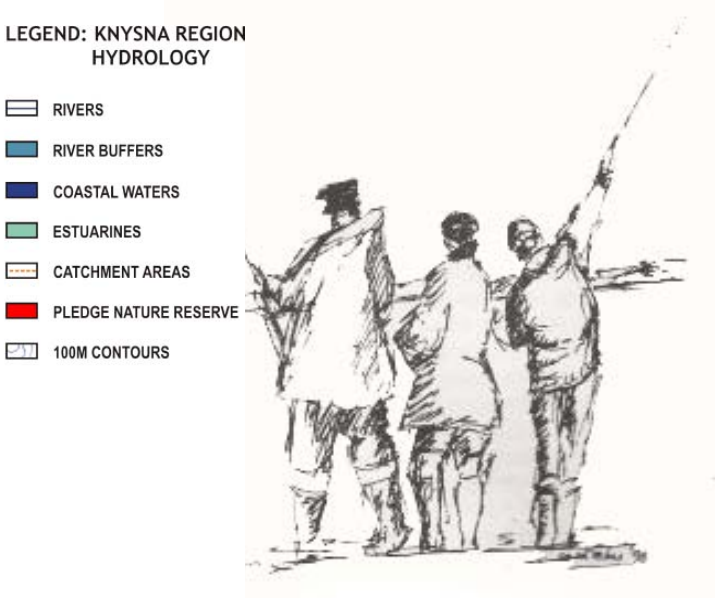
The catchment area of the Knysna River comprises 315 square km, and the Knysna estuary basin spans approximately 400 square km. The Knysna river has its origins high up in the Outeniqua Mountains, where the average rainfall exceeds 1000mm per annum. (Nell 2005)

Human functions of recreation, tourism and commercialism occur on and around this water body. The sheer volume of human activity, namely boating, bait collection and fishing on the lagoon puts extreme pressure on the environment. This natural feature is threatened by pollution and silting, removal of water for agriculture, industry and for the town's fresh water requirements. (Vermeulen 1999) The estuary is home to the Pansy Shell, the Knysna Seahorse and more than 200 fish species.

3.52. The Knysna estuary has numerous functions within the socio-cultural, economic and ecological communities (Howard 2005)



3.51. Knysna information map (Enpat 2002, Knysna Municipality 2000 & edited Howard 2005)



3.53. Sketch of Fishermen at Knysna estuary by Adelai Hodgson (Allanson et al 1993)

3.4.2.5. CLIMATIC INFORMATION

The climate in South Africa is typically warm and dry, with winter temperatures rarely falling below 0°C, and summer maxima frequently above 35°C. The average annual rainfall is approximately 500mm (considerably less than the world average of 860mm). Most of the central and eastern parts of the country enjoy summer rainfall, whilst the western side of the country is the winter rainfall region. (DEAT 1999)

CLIMATIC AND ATMOSPHERIC CHANGE

According to the State of the Environment Report, South Africa is sensitive to climatic changes, and contributed about 1,2% to global warming in 1990. (Burger 2004) The levels of sulphur dioxide, nitric oxide and ozone are, on average, within the accepted South African guidelines for human health and the prevention of direct ecosystem damage. The Report states that there are, however, occasions, especially in the major urban areas, when the concentrations of sulphur dioxide, nitric oxide, ozone and smoke particles could lead to further health problems in people who have respiratory problems. According to the Report, susceptible terrestrial and freshwater ecosystems are likely to show the adverse effects of acid deposition in a few decades if the current emission rates of sulphur dioxide and nitric oxide continue or increase. The Department is operating three climatic change projects, namely:

1. Cities for Climate Protection:

To help local governments identify and implement actions that meet their objectives, as well as address global climate change. (Burger 2004)

2. Demonstration Projects Linking Climate Change and Sustainable Development:

Various institutions, including educational institutions, private, and non-profit organisations implement a number of projects on behalf of the Department countrywide. These projects include the promotion of eco-villages in urban and rural areas; rural energisation; renewable energy technology; community-based greening and waste recycling; low-tech energy solutions such as thermally efficient and renewable-energy solutions in housing; clean transport systems; carbon sequestration and conservation; and industrial energy efficiency. (Burger 2004)

3. Climate Change, Public Awareness and Education:

The objective of this project is to increase public awareness of global climate change in South Africa, and to assist government in its efforts to educate students on the importance of such change within the country. (Burger 2004)

3.54. Wind direction indicator outside the Knysna Angling Club at the estuary (Howard 2005)

Knysna has a temperate climate with rain occuring throughout the year, with the heaviest falls in the winter months between May and September. The annual rainfall, mainly orographic, ranges from 500mm to 1200mm. Temperatures range from an average of 25˚C in summer and 19˚C in winter. Sporadic snowfalls occur on the higher Outeniqua peaks. Berg winds occur during winter and cold fronts during spring and autumn contribute further to a very equable climate. (Vermeulen 1999) The temperature of the water in the lagoon in summer averages 18˚C and occasionally a large body of cold water averaging only 10˚C may move towards Knysna due to the dynamics of the Agulhas current, driving some marine species to seek refuge in the estuary. (Nell 2005)

Knysna's microclimate is not greatly affected by the urban fabric. With structures having a maximum height of three storeys (Knysna building regulation to prevent view disturbances), and therefore not causing severe shade and wind tunnelling. Areas close to the estuary are cooler due to cool breezes from the water-body. Heavy urban vehicular traffic does cause a certain amount of discomfort in the town, especially in the busy roads like Main Road and Waterfront Drive, which host many trucks and buses. The town's layout has been guided by the view of the estuary, and most of the homes and tourist-focused commercial facilities have a southern orientation therefore resulting in inefficient use of sunlight energy. Knysna is also located on the southern aspect of the Outeniqua hills, therefore being shaded by the topography. The town consists of a high percentage of hard surfaces (paved, tarred roads and pavements, roofs) which results in excessive stormwater which is currently carried away in undergrounds pipes. These hard surfaces also absorb great amounts of heat from the sun, thus resulting in increased urban warmth.

3.4.3. BIOTIC CHARACTER

3.4.3.1. FLORA

South Africa enjoys the third-highest level of biodiversity in the world. The remarkable richness of its biodiversity is largely the result of the mix of tropical Mediterranean and temperate climates and habitats occurring in the country. Some 18 000 vascular plant species occur within the boundaries of the country, of which 80% occur nowhere else. (Burger 2004)

The national tree of South Africa, the Real Yellowwood (*Podocarpus latifolius*) (Burger 2004), is indigenous to the Knysna forests.

3.55. Images of the Podocarpus latifolius (Palgrave 2000)

The easiest way to describe the country's natural heritage is on the basis of a systematic classification of regions, or biomes. A biome can be defined as a broad ecological unit representing a major life zone, which extends over a large area, and contains relatively uniform plant and animal life closely connected with environmental conditions, especially climate. (Burger 2004) South Africa hosts seven biomes and is one of six countries in the world with an entire plant kingdom within its national confines; known as the Cape Floral Region (CFR). (Burger 2004) The CFR is located at the southern tip of the African continent and is one of the world's most biologically interesting ecosystems and an epicenter of diversity and endemism. The defined area of the floral region is less than 90,000 square kilometres, yet it contains the highest density of plant species in the world, exceeding that of many tropical rainforest systems. Nearly 70% of the plant species and 20% of the genera here are endemic. (C.A.P.E. 2004)

The rich biodiversity of the CFR is due to an extensive and complex array of habitat types derived from topographical and climatic diversity in the region's rugged mountains, fertile lowlands, semi-arid shrublands, and coastal dunes. (C.A.P.E. 2004)

Unfortunately, biodiversity in the CFR is under threat due to the spread of invasive alien species, land-use transformation due to agriculture and urbanisation, unsustainable harvesting and poor land-use planning. Underlying causes for this current decrease in biodiversity in the region include: (C.A.P.E. 2004)

1. Lack of capacity and poor co-ordination between bodies responsible for the management of natural resources
2. Lack of awareness of the importance of biodiversity and the impacts of urgent measures to meet the basic needs of society

The Biomes represented by the Cape Floristic Region:

Fynbos Biome

The fynbos biome is one of the six accepted floral kingdoms of the world. This region covers only 0,04% of the land surface of the globe. Fynbos is the name given to a group of evergreen plants with small, hard leaves (such as those in the Erica family). It is made up mainly of three groups of plants, namely the proteas, the heathers and the restios, and incorporates a diversity of plant species (more than 8 500 kinds, over 6 000 of which are endemic). The biome also contains flowering plants, now regarded as garden plants, such as freesia, tritonia, sparaxis and many others. Protected areas cover 13,6% of the fynbos biome and include the Cape Peninsula and Agulhas National Parks. (Burger 2004) Dispersal of seeds often only occur during times of fire, ants also act as seed dispersers. (Vermeulen 1999)

Forest Biome

South Africa has few forests. The only forests of significance are the Knysna and Tsitsikamma forests in the Western and Eastern Cape, respectively. Other reasonably large forest patches that are officially protected are in the high-rainfall areas of the eastern escarpment, and on the eastern seaboard. Forest giants such as yellowwood (Podocarpus spp.), ironwood (Olea capensis) and lemonwood (Xymalos monospora) dominate. The indigenous forests are a magical world of ferns and lichens. (Burger 2004)

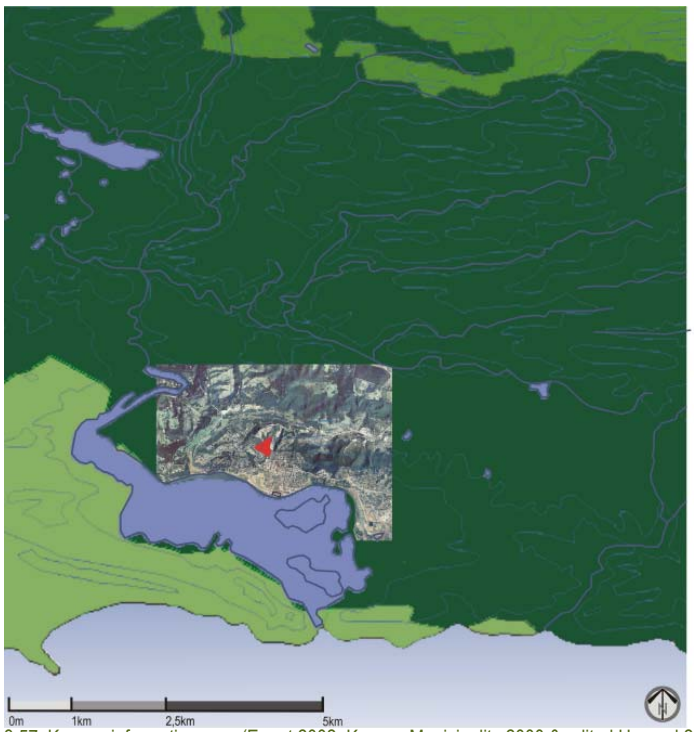
Thicket Biome

Subtropical thicket ranges from closed shrubland to low forest, dominated by evergreen succulent trees, shrubs and vines. It is often impenetrable and has little herbaceous cover. Roughly 20% of the species in the thicket biome are endemic to the biome. (Burger 2004)

The Knysna flora region is made up of:
Fynbos, coastal (scrub forest and coastal fynbos) and forest vegetation:

FOCUS ON THE KNYSNA FOREST
The Knysna Forest is one of the greatest natural heritages of South Africa and today measures some 80,000 hectares in size. (Ukubona Development 2005) Botanists have classified the Knysna forests into six different types: dry scrub, dry high, medium moist, moist high, wet high and wet scrub forests. The type of forest is determined by numerous factors, such as climate, soil type, rainfall and topography. A vast number of species of trees and shrubs, ferns and mosses, and fungi and wild flowers conglomerate over layers of sandstone and quartzite to form the glorious indigenous forests along the Garden Route. (Nell 2005) Examples of Knysna forest trees include the Yellowwood, Stinkwood, Blackwood, White Alder, Ironwood and the Hard Pear. (Ukubona Development 2005)

3.56. Knysna information map (Enpat 2002, Knysna Municipality 2000 & edited Howard 2005)



3.57. Knysna information map (Enpat 2002, Knysna Municipality 2000 & edited Howard 2005)

Ferns are abundant, notably the seven-week fern (Rumohra adiantiformis) which grows in large numbers, while numerous other species occur near streams, on rotting logs, in trees, under trees, along roadsides, in full sun, in dappled sun, part shade, full shade and deep shade. (Nell 2005)

Many fungi species occur, among which are bracket fungi, often seen growing on the stems of trees or the bark of decomposing trunks. They attack living trees, their spores entering the bark through wounds caused by wind damage and injuries inflicted by animals, birds and insects. The spores cause heart rot and hollow the tree out from the inside. An apparently healthy tree might be terminal with heart rot, and only after felling it would a woodcutter discover his labour had been in vain. (Nell 2005)

3.58. A selection of low growing vegetation species found in the Knysna forest (Nell 2005 & Howard 2005)

The Knysna lily (Cyrtanthus elatus), also known as the George lily, still occurs in damp parts of the forests and mountains. This beautiful plant has become increasingly rare due to human and animal predation. The leaves are strap-shaped and have glossy green sheen, with six to ten brilliant scarlet funnel-shaped flowers blooming between December and February. The pink George lily (a variety of the scarlet Knysna/ George lily) was once prolific along the old Knysna/George road, but sadly has also been reduced and is on the verge of extinction in the forests. (Nell 2005)

Alien threats

Alien trees species like the Hakea, Australian Acacias and Pines pose a threat to the indigenous vegetation of Knysna. (Vermeulen 1999)

3.4.3.2. FAUNA

In addition to South Africa's extraordinarily varied plant life, a wealth of animal life exists in the region. The country hosts an estimated 5,8% of the total mammal species in the world, 8% of bird species, 4,6% of the global diversity of reptile species, 16% of the total number of marine fish species, and 5,5% of the world's classified insect species. In terms of the number of mammal, bird, reptile and amphibian species which occur in this country only, South Africa is the 24th-richest country in the world and the fifth-richest in Africa. Marine life is similarly diverse, partly as a result of the extreme contrast between the water masses on the east and west coasts. Three water masses, the cold Benguela Current, the warm Agulhas Current and oceanic water make the region one of the most oceanographically heterogeneous in the world. According to the White Paper on the Conservation and Sustainable Use of the Biological Diversity, over 10 000 plant and animal species, almost 15% of the coastal species known worldwide, are found in South African waters, with about 12% of these occurring nowhere else. (Burger 2004)

The Fynbos Biome Habitat

The biome is not very rich in bird and mammal life, but does include the grysbok, the geometric tortoise, the Cape sugar-bird and the protea seed-eater, which are endemic to the area. The mountains are the habitat of the leopard, baboon, several types of eagle, honey-badger, caracal and rhebuck. (Burger 2004)

The Brenton Blue Butterfly only occurs on the south facing slopes of coastal fynbos at Brenton-on-Sea. This butterfly's survival is largely determined by the presence of the host plant, *Indigofera erecta*, which the larvae exclusively feed on. The butterfly's existence is being threatened by the destruction of its habitat due to increasing pressure from developments, the fynbos vegetation being replaced with unfavourable coastal thicket and the indiscriminate use of herbicides and insecticides which reduce and change insect populations. (Cape Nature Conservation 2000)

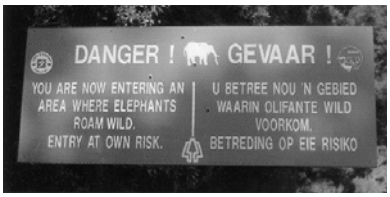
3.59. Brenton Blue Butterfly (Cape Nature Conservation 2005)

The Forest Biome Habitat

Over the ages, the Knysna forests have offered shelter from the pressures of humans to a host of wild animals, which still survive, although the forest elephant has become all but extinct, the bloubok completely extinct, and the number of other animals have dropped drastically. Some secretive creatures still make the forest their home. In the forest canopy, the Narina Trogon and Knysna Lourie still fly furtively among the branches. Other forest dwellers include the bushbuck, blue duikers, bushpigs, chacma baboons, vervet monkeys, and smaller mammals, like the woodland mouse. The top of the food chain in the forest is the elusive leopard. The presence of small mammals means there should be predators to tap this source. Besides leopard, the forests are abundant with seldom-seen predators, such as the large-spotted genet and caracal. Honey badgers forage in the forest for rodents, insects, fallen fruit and honey, and more than 60 bird species are found. Bushbuck are most abundant, yet seldom seen due to their consummate stealth, and their colours blend in perfectly with the environment. At Brenton-on-Lake, the animals have become quite tame and move about peacefully from one garden to another; proof that humans and some wild animals can co-exist. (Nell 2005)

The forest and its denizens are inextricably bonded and co-dependent. The forest provides food and shelter, and the animals give thanks by spreading its seeds and controlling its enemies in an ongoing cycle of life and death. (Nell 2005) The indigenous forests where once home to the greatest of all living land mammals – the elephant (*Loxodonta africana*). Unfortunately, the history between humans and this beast is one of confrontation. When the first settlers arrived, there was enough space for both humans and elephants to give each other wide berth, and as a result the elephants gradually moved deeper into the forests. Then the woodcutters arrived and there was an inevitable competition for the same habitat. (Nell 2005) These elephants carried excellent ivory and were therefore systematically hunted. Sportsmen too, were attracted to the forest by the size of the elephants, and, using the local inhabitants as guides, they hunted the big bulls and carried away their heads, tucks and tails as trophies. (Ukubona Development 2005) In 1870, between 400 and 500 elephants remained in and around the forests. By 1902, their numbers had dwindled to between 30 and 40 individuals. By 1920 only 12 had survived and in 2005 only three remain in the forests. Understandably, they avoid humans. The Department of Forestry carefully monitors their whereabouts, often under difficult circumstances. (Nell 2005) Their greatest enemy today is the excessive damp, inflicting them with rheumatism. (Ukubona Development 2005)

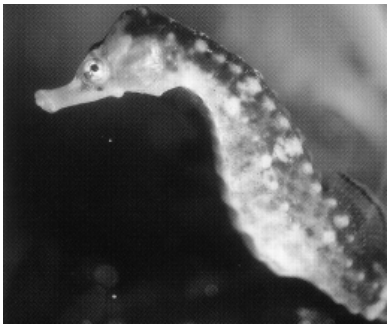
3.60. Tame elephants in the Knysna elephant park (Nell 2005)



3.61. Sign warning people of elephants. Only 3 highly elusive elephants remain in the forest (Nell 2005)

Marine Life

The marine life of Knysna varies greatly from microscopic invertebrates, to fish and shellfish, water birds and sea mammals. Each species fills a niche and link in the foodchain. Some, like the Knysna Seahorse (*Hippocampus capensis*) are unique and occur only in the Swartvlei, Knysna and Keurbooms estuaries. This creature is regarded as the most threatened seahorse in the world. The estuary is home to a vast array of creatures, some, like the seahorse, are seldom seen, while others, like the Southern Right Whale, may on occasion explore the mouth of the estuary, foraging for minute crustaceans. Other creatures here include oysters, mussels, sea squirts, whelks, limpets, stranded jellyfish and bluebottles. Sharks are often seen by deep-sea fishermen and, during the right time of year, both humpback and Southern Right whales can also be spotted. Dolphins are occasionally seen on the breakers and beyond as they prey on smaller species of fish. (Nell 2005) Pollution and silting up of the estuary, as a result of excessive development in Knysna, are serious threats to the marine life habitat. (Vermeulen 1999)



3.62. The rare Knysna Seahorse *Hippocampus capensis* (Nell 2005)

3.4.4. SYSTEMS AND PROCESSES

3.4.4.1. CONSERVATION AND PRESERVATION

A large number of the most famous game parks in the world and nature reserves are located in southern Africa, and South Africa is especially renowned for its abundant wildlife and spectacular scenic beauty. RSA boasts a network of well-managed game parks and nature reserves. (Vermeulen 1999) National parks and nature reserves are either controlled by national, provincial or municipal authorities or by private stakeholders. Apart from protecting and conserving the natural heritage of the country, game and nature reserves also play an important role in educating youth and creating a general awareness of the need and importance of nature conservation. (Vermeulen 1999)

CONSERVATION AREAS

South Africa boasts some 403 terrestrial protected areas, with a total area of 6 638 658 ha or about 5,44% of its total land area. Twenty-two of these protected areas are national parks, and their total area makes up 53,09% of South Africa. A further 13,82% are State forests in terms of the National Forests Act, 1998 (Act 84 of 1998). Provinces are legally responsible for 30,51% of South Africa's protected area estate.

There are a number of management categories of protected areas in South Africa, which conform to the accepted categories of the World Conservation Union (IUCN). The National Environment Management: Protected Areas Bill, which was tabled in Parliament in August 2003, seeks to establish a representative system of protected areas as part of a national strategy to protect the biological diversity of South Africa, and to ensure that biodiversity is able to bring about sustainable benefits for future generations. (Burger 2004)

CONSERVATION CHALLENGES

South Africa faces many of the problems experienced by developing countries, in which rapid industrialisation, population growth and urbanisation pose a threat to the quality of the environment. The Department is reforming environmental law to introduce reform in biodiversity conservation, pollution, waste management and environmental planning. (Burger 2004)

URBAN CONSERVATION

Rapid urbanisation and its concomitant environmental impact are posing serious challenges for South African planners and environmentalists. Up to 16 000 ha of farmland is lost to urban development each year. Low-density urban sprawl and the rapid growth of informal settlements contribute to increasing competition between urban land-users for diminishing space and resources. As a result, many informal settlements are located on marginal and environmentally sensitive land, posing serious threats to human well-being and ecosystems. The environmentally friendly use and development of land can be promoted through official planning processes such as integrated development plans and land-development objectives. New planning and environmental legislation provides for environmental concerns in urban planning and development. Regulations making environmental-impact assessments compulsory for certain planned developments were promulgated in September 1997. (Burger 2004)

PRESERVING GENETIC DIVERSITY (Burger 2004)

South Africa, with its wide range of natural resources, is an ideal proponent to apply the principle of sustainable use of these resources. There is a wide range of benefits derived from the conservation of biodiversity. A large portion of the South African population is directly dependent on biological resources for subsistence purposes, including the gathering, harvesting or hunting of plants and animals as a source of food, medicine, shelter and trade. The use of biological resources therefore provides a buffer against poverty as well as a source of economic gain. A number of industries in the country, such as the fishing, hunting, wild flower and wood-harvesting industries are directly dependent on its biological resources.

The main attractions are nature-based tourism facilities such as national parks and private game reserves. There are some 9 000 privately owned game ranches in South Africa, expanding at a rate of 300 000 ha per annum. The contribution of these areas in maintaining South Africa's unique biodiversity is incalculable

SENSITIVE COASTAL AREA LEGISLATION

"The Environmental Conservation Act, 1989 (Act 73 of 1989) makes provision for the protection of areas which have particular environmental importance, which are sensitive, or which are under intense pressure from development". In terms of this legislation, the Garden Route coastal area from Tergeniet in the west to the Kaaimans River in the east was identified and proclaimed as the Outeniqua Sensitive Coastal Area (Outeniqua SCA) in 1997. On 27 November 1998, the Minister of Environmental Affairs and Tourism extended the Outeniqua Sensitive Coastal Area to include portions of the area between the Kaaimans and Bloukrans Rivers. The implication of the SCA status is that certain activities, which may have a detrimental effect on the environment, are now prohibited unless a permit has been obtained prior to the activity being undertaken. "The SCA Regulations are aimed at controlling small-scale activities at the individual plot level in an effort to ensure sustainable development of the coast". (Knysna Municipality)
The scheduled activities include the following:

1. Disturbance of vegetation (trampling, cutting or removal)
2. Earthworks (excavation, moving, removal, deposit, compacting of soil, sand, rock or rubble)
3. Dredging (dredging, excavation, removal or moving of soil, sand or rock from a river, tidal lagoon, tidal river, floodplain or wetland)
4. Dune rehabilitation (planting on, or covering of dunes or exposed sand surfaces with any vegetative, natural or synthetic material, or the erection of structures and walls thereon with the purpose of preventing the sand from being eroded, accreted or moved by wind or water)

RESERVES

Featherbed Nature Reserve

This reserve is located on the Western portion of the Knysna Heads and has an extent of 70 hectares. It is privately owned and managed and protects the scrub forest and coastal fynbos, which only grows in a few places along the coast, and acts as a habitat for the rare Blue Duiker. This reserve is only reachable by boat and offers functions of recreation (nature trail of 2km) and restaurant facilities. (Vermeulen 1999)

Brenton Blue Nature Reserve

The Endangered Wildlife Trust, the Green Trust and the Lepidopterists' Society in partnership with the Wildlife and Environment Society of South Africa (WESSA) initiated this unique reserve, home to one of the rarest butterflies in the world. It is now managed jointly by Cape Nature Conservation, butterfly specialists and local role-players. (Cape Nature Conservation 2000)

Pledge Nature Reserve

Pledge Nature Reserve is a community project situated within the confines of a developed urban and central commercial area of Knysna. It is 10 ha in extent and easily accessible by car or on foot and its nearest entry point is within 500 meters of the town's busy Main Street. The Reserve offers 3.5 km of pathways through scrub forest and hillside fynbos with fine views over the lagoon. The site was once an abandoned brickfield heavily infested with exotic invader jungle and was also an indiscriminate dumping ground for human household discards. After only ten years of restoration there is no longer any evidence of this former degradation. Today Pledge Nature Reserve is a sanctuary for more than one hundred bird species and a place where our local fynbos diversity is well represented.

Forest Conservation

Aims of the Pledge Nature Reserve Trust:

- To restore the Reserve to its original state of fynbos and forest by the eradication and prohibition of invader species, and then to conserve the Reserve in an natural a state as possible.
- To re-introduce other indigenous plan species and to permit the cultivation of plants of South African origin in selected areas of the Reserve
- To develop trails, pathways and facilities in the Reserve in a manner sensitive to the environment for the benefit of the public and for educational purposes
- To raise sufficient monies to enable the reserve to become self-funding in the long term

(Pledge Nature Reserve Trust)

For many years the forests were mercilessly robbed of their rich resources, supplying timber to the furniture, construction and mining industries. Today the forests are managed according to strict conservation principles. (Vermeulen 1999) The Knysna/Uniondal road (R339) snakes through these forest to wonderful braai spots and picnic facilities, giving access to hiking and biking trails, the Valley of Ferns and a few of the so-called 'Big Trees' (huge yellowwoods found deep in the forests and grotesquely gnarled stinkwood trees). The R339 takes one past localities with names from days gone by, such as: Kom-se-Pad, Veldmanspad, Hoenderspoor, Bakhuisdraai, Knoetskraal, Tata Riet se Ga, Skuinsbrug, and Ysterhoutrug, while another 'Big Tree' can be found at Veldbroeksdraai. (Nell 2005)

Many indigenous forests were managed under the auspices of the Southern Cape Indigenous State Forests and have recently been transferred to the South African National Parks (SAN Parks). (Nell 2005)

3.4.4.2. MANAGEMENT

ENVIRONMENTAL MANAGEMENT (Burger 2004)

Environmental management in South Africa is the responsibility of various government institutions as they ensure that land owners respond to the importance of the environment. At central government level, the Department of Environmental Affairs and Tourism is the central policy-formulating and co-ordinating body.

The vision of the Department is to lead environmental management and tourism in the interest of sustainable development and to contribute to the improvement of the quality of life of all South Africans by:

1. Promoting the sustainable development, utilisation and protectio of the country's natural and cultural resources
2. Establishing responsible tourism that ensures environmental sustainability and contributes to job creation and a better quality of life for all
3. Harnessing the skills, experience and knowledge of the environment of all South Africans
4. Fostering equitable access to the benefits derived from the country's natural and cultural resources
5. Empowering the South African public, communities and organisations through participation, environmental education, capacity-building, research and information services
6. Working with all relevant stakeholders and spheres of government in the spirit of good governance
7. Ensuring that all international participation and obligations are undertaken in accordance with South Africa's environmental policies and principles

WATER-QUALITY MANAGEMENT (Burger 2004)

Quality management of national water resources in South Africa is the responsibility of the Directorate: Water Quality Management of the Department of Water Affairs and Forestry. Water-quality management involves the maintenance of the fitness of water resources for use on a sustained basis, by achieving a balance between socio-economic development and environmental protection. From a regulatory point of view, water-quality management entails the ongoing process of planning, development, implementation and administration of water-quality management policy; the authorisation of water-uses that may have, or may potentially have, an impact on water quality; as well as the monitoring and auditing of the aforementioned. The evolution of South African society and the imperatives for equity of access to water served as the driving forces behind the water-law reform process, which culminated in the National Water Act, 1998 (Act 36 of 1998).

The Department has adopted a hierarchy of decision-taking with regard to source-directed water-quality management:

1. Pollution prevention: preventing waste production and pollution or degradation of the water resource wherever possible.
2. Waste minimisation and remediation: if waste production and pollution or degradation of the water resource cannot be avoided, it must be minimised and remedied.
3. Precautionary principle: if there is no alternative to the disposal of waste and/or the discharge of water containing waste, the precautionary principle applies. In applying this principle, the disposal of waste and/or discharge of water containing waste will only be allowed if the receiving environment has the capacity to assimilate the additional waste load.
4. Differentiated approach: if the receiving water resource has the capacity to assimilate an additional waste load, i.e. when the requirements of the reserve and the other waste users are not threatened, relaxation from prescribed standards or requirements may be considered. This approach is followed for all potential sources of pollution (as defined by the Act) and not only for hazardous substances.

COASTAL MANAGEMENT (Burger 2004)
The Department of Environmental Affairs and Tourism Subdirectorate: Coastal Zone Management is the lead agent for coastal management. This requires empowering coastal users, decision-makers, and the people to sustain and manage the coastal zone and its resources appropriately. The Coastal Management Bill sets out a new approach to managing the coastal resources of the nation, in order to promote social equity and make the best economic use of coastal resources, while protecting the natural environment. The White Paper on Coastal Management was launched in June 2000. According to the White Paper, the coast has been a driving force in the national economy. Its products account for about 35% of the national Gross Domestic Product (GDP) of South Africa and has enormous development potential.

A number of far-reaching initiatives were undertaken. These include:
1. The ruling by the Port Elizabeth High Court in favour of the banning of private 4x4 vehicles on South African beaches. The regulation came into effect in January 2002
2. The removal/bulldozing of illegal cottages on the Wild Coast
3. The declaration of a Whale Sanctuary in Hermanus
4. The restructuring of the fishing-rights dispensation to control the exploitation of coastal and marine resources

These measures supplement the illustrious programme of action already anticipated in the White Paper. Elements of this programme include the following:
1. Diversifying coastal economies and optimising benefits for local coastal communities
2. Promoting coastal tourism, leisure and recreational development
3. Establishing 'one-stop-shops' for development approvals
4. Improving public access to the coast and coastal resources
5. Developing ports and harbours
6. Improving coordination and integration of coastal and marine-resource management
7. Improving the monitoring and management of coastal pollution
8. Rehabilitating degraded coastal areas and resources

3.4.4.3. POLLUTION

AIR POLLUTION (Burger 2004)
According to the UN, the transportation sector worldwide now accounts for as much as 73% of global carbon emissions. Vehicles emit huge quantities of carbon monoxide, nitrogen oxides and volatile hydrocarbons. Most of the petrol used in South Africa contains lead, which poses another serious health risk, particularly for children, as it can hamper their mental development. Oxides of nitrogen combined with water vapour create acid rain. Carbon monoxide can kill a person in a matter of minutes if large enough quantities are inhaled, and hydrocarbons harm human health as well as the environment. The increasing number of vehicles on the roads is compounding the air pollution challenge.

MARINE POLLUTION (Burger 2004)
More than 80% of marine pollution originates from land-based sources such as pipeline discharges, rivers and stormwater run-off. There are many places where water or water containing waste is discharged into the sea. Forty sea outfalls have been formalised through exemptions issued by the Department of Water Affairs and Forestry in terms of the Water Act, 1956 (Act 54 of 1956). An increasing source of concern is non-point-source pollution, especially that coming from the burgeoning informal settlements that form part of many coastal cities. Such pollution is generally the result of inadequate sanitation and other infrastructure, and is very difficult to control or monitor. The balance comes from industrial discharges, urban run-off, and oil exploration and production, the latter contributing only 2%. Of the pollution emanating from shipping activities, the majority comes from vessel operations, with only 12% from tanker accidents. SILTATION

3.4.4.4. RECYCLING AND REUSE

Almost every type of paper produced in South Africa has a recycled content. Each ton of waste paper recycled saves about 17 pine trees, and a ton of recycled paper could save 3m³ of landfill space, meaning that South Africa could save 10 million trees annually. South Africa follows the USA and Japan as the best collectors of used metal beverage cans in the world. The recovery rate of metal beverage cans sold in South Africa has grown to 63%.

A major role in this regard has been played by the Collect-a-Can project, which was founded in 1993 to reduce litter and optimise the recovery of metal beverage cans. In the process, informal employment has been created for over 30 000 people. In comparison with other countries, South Africa has a high returnable glass-container market: 33% of all glass containers produced are returnable or reusable, and these are also recycled. The Minister of Environmental Affairs and Tourism announced, at the 10th anniversary of Collect-a-Can in April 2003, that 37 773 people were earning or supplementing their income through can recoveries, and that more than R270 million had been paid out to collectors over the last 10 years. (Burger 2004)

WASTE MANAGEMENT (Burger 2004)
Towards the end of 2002, government published the White Paper on Integrated Pollution and Waste Management , which outlines its new thinking in relation to pollution and waste management. The Government believes that pollution prevention is one of the most effective means of protecting people and the environment. Pollution prevention eliminates costly and unnecessary waste and promotes sustainable development. It aims to reduce risks to human health and the environment by trying to eliminate the causes, instead of treating the symptoms, of pollution. This objective marks a major shift in emphasis from control to prevention. The White Paper also stresses the need to make pollution prevention a part of everyday activities. Effective pollution prevention not only focuses on the installation of pollution-abatement equipment in industry, but also on the shared responsibility of all sectors of society to protect the natural resources of South Africa, which involves:

1. Innovation in product design and production
2. The encouragement of cost savings through efficiencies and conservation
3. Insisting on sound management of persistent bio-accumulative and toxic substances, and eliminating their use where necessary

In line with global trends, municipalities across South Africa are in the process of implementing so-called integrated waste management plans and policies, and it is essential that waste management options suite specific local conditions and needs. (Meyer 2005:vol.10,no.3)

KNYSNA WASTE-BY-RAIL:

BACKGROUND: In 1989 the Knysna waste disposal site was closed down as it posed a serious health threat to surrounding residents. A previously unused site was then re-opened on a temporary basis while investigations were undertaken to find a new site. Consultants identified and investigated 21 possible sites, but none of these sites were found suitable, either geologically or by the community. In 1994, the District Council commissioned Ingérop Africa to investigate and identify a suitable sub-regional site. After extensive investigations and public consultation, a report on the various options was published and presented to the community. The options included incineration and road and rail transport to George. The Knysna Council resolved to develop the preferred local site, but there was still very stiff opposition from the adjoining community, and by the end of 1996 the matter was still not resolved. During 1997, Spoornet commissioned Ingérop Africa to investigate the planning and costing of a regional waste by rail project for the Southern Cape District. The study assessed the viability of moving waste by rail from the main generators in the region to the existing landfill site at PetroSA. The results of the study were presented to the local authorities in the region and in August 1997 the Knysna Council made the decision to rail its waste to PetroSA. (Meyer 2005: vol.10,no.3)

NATURE OF THE SYSTEM:

1.The receiving and transfer system: which includes a facility where the collection vehicles discharge waste into a ground level conveyor system, which, in turn, feeds into a compactor. Waste is compacted into 28m³ containers. The receiving facility is located in an existing small freight yard alongside the upmarket waterfront development in the heart of Knysna (Site most acceptable to community). The facility is operated and managed by the Knysna Municipality on behalf of Spoornet. The operation of the station ensures that solid waste is exposed to the atmosphere for only a very short time, before it is sealed into a container. There is therefore little likelihood of odours or pests becoming a nuisance. There is, however, an odour control system in place. This transfer station was the first to be licensed with the Department of Water Affairs and Forestry (DWAF) and the process and requirements have set a precedent for future transfer stations. (Meyer 2005:vol.10,no.3)

3.63. The receiving facility, located at an existing small freight yard alongside the upmarket waterfront development in the heart of Knysna (Meyer 2005: 10:3)

3.64. The ground-level conveyor system (Meyer 2005:10:3)

2.The transportation by rail: once full (20t), the containers are transported to PetroSA (near to Mossel Bay) 120km to the west via George. Transportation by rail entails an average of two containers removed daily from the transfer station during the year. During the holiday season, this can increase to up to six containers a day. Standard rail trucks were converted to accommodate the specially developed loading and handling equipment. An Environmental Impact Assessment along the route was undertaken by Spoornet to identify any significant impacts that the system may have, particularly as the section between George and Knysna is a well-known scenic route. (Meyer 2005:vol.10,no.3)

3.65. Railway line across the Knysna estuary (Howard 2003)

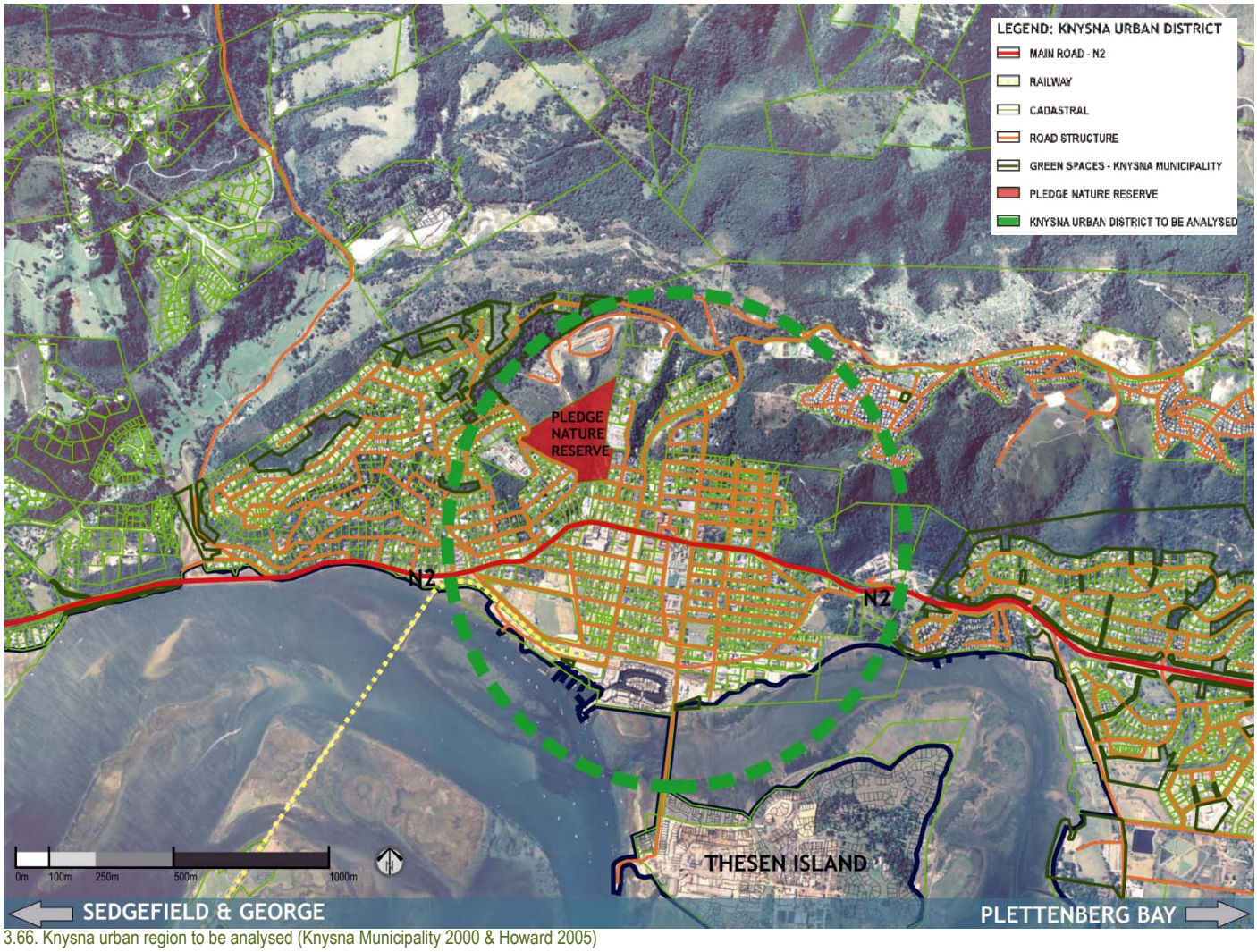
3.The off-loading and disposal: takes place at the large PetroSA landfill. The landfill is DWAF-licensed and serves PetroSA and the town of Mossel Bay. (Meyer 2005:vol.10,no.3)

ISSUES: Gates comments that it is unfortunate that waste is immediately containerised and removed once collected. The constraints of the Knysna site did not allow for a more integrated facility to be provided (Separation of materials for recycling and therefore cost saving). In response to the question whether it is a case of shifting the problem (from Knysna to Mossel Bay), Gates argues that land-filling is still the most cost effective way of treating waste in South Africa. Fortunately, the PetroSA landfill is a large and well-managed permitted site with ample airspace. A very serious waste problem, which had started to have major social and environmental impacts for Knysna, had been resolved in an innovative and environmentally sound way. (Meyer 2005: vol.10,no.3)

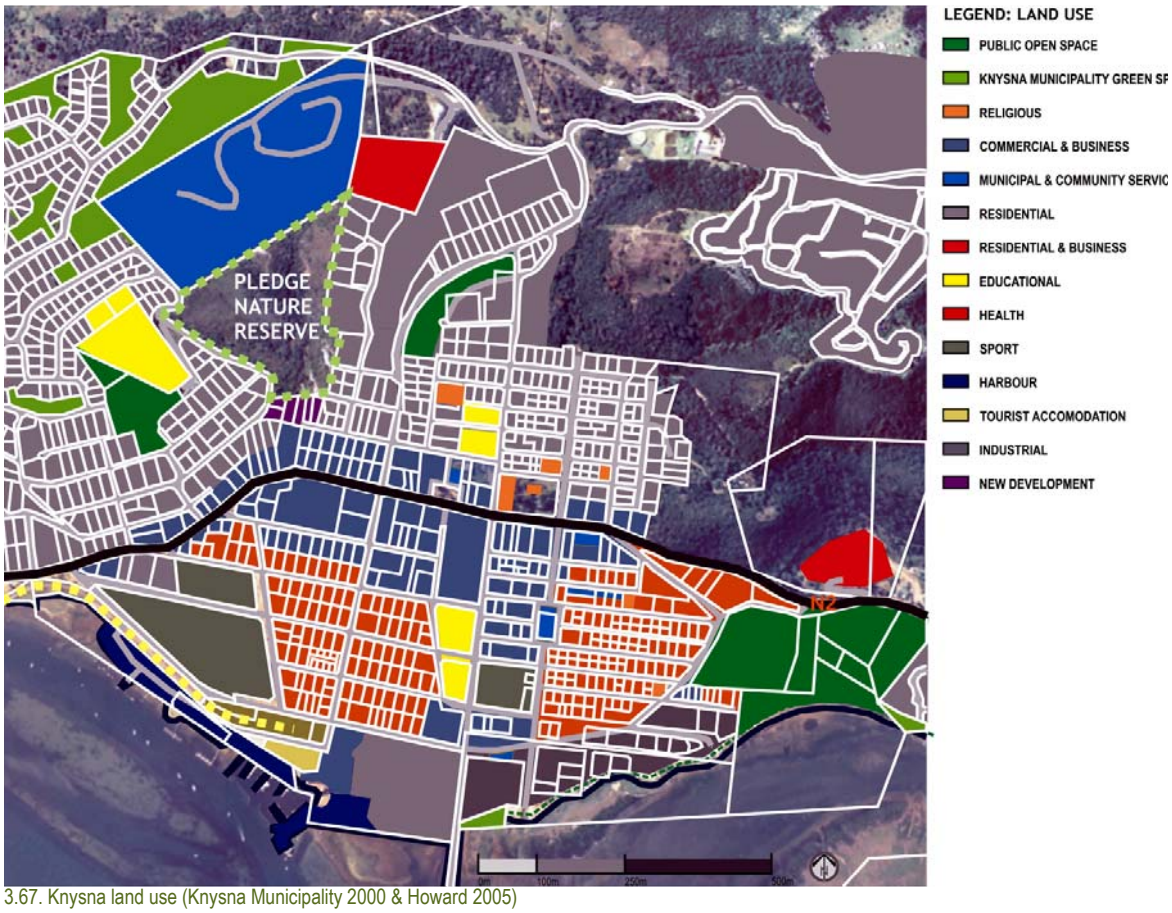
SUCCESS? Tony Gates, project manager of Ingérop Africa, is of the opinion that this Knysna waste-by-rail system, the first system of this kind in South Africa, has proved to be a success and set the standard for similar systems. Waste management in the region has been improved significantly, the receiving facilities are compact and very inconspicuous and the community has benefited from a more environmentally sustainable system. Although it is predominantly a rail system, it is, in fact, an intermodal system as was illustrated during heavy rains experienced in the region during December 2004, which resulted in the railway line being washed away. Road transport was immediately put into operation in accordance with the environmental Response Action Plan, and waste was removed daily until the rail had been repaired. (Meyer 2005:vol.10,no.3)

FUTURE: The Knysna system has the capacity to cope with the projected population growth in the area for at least the next 30 years. With effective waste minimisation programmes in place the system can even have a longer lifespan. According to Gates there are technically no real constraints to the system. (Meyer 2005:vol.10,no.3) According to John Jaftha of the Knysna Municipality, one of the problems encountered after closing their only landfill was dealing with waste types such as garden waste and builders' rubble, as these are expensive to put through a transfer system. Local drop-off sites for garden waste and builders' rubble had to be established. (Meyer 2005: vol.10,no.3) One of the positive spin-offs of the project is that there is a far greater emphasis on recycling of waste. The Knysna Municipality, which operates a two-bag municipal refuse-system, has spearheaded this drive. Green plastic bags are provided free of charge, in which all recyclable materials should be placed. Knysna has subsequently become one of South Africa's leading recycling settlements. (Meyer 2005:vol.10,no.3)

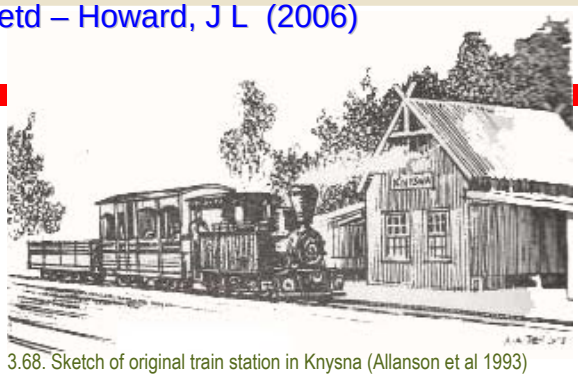
3.5. KNYSNA MAP ANALYSIS



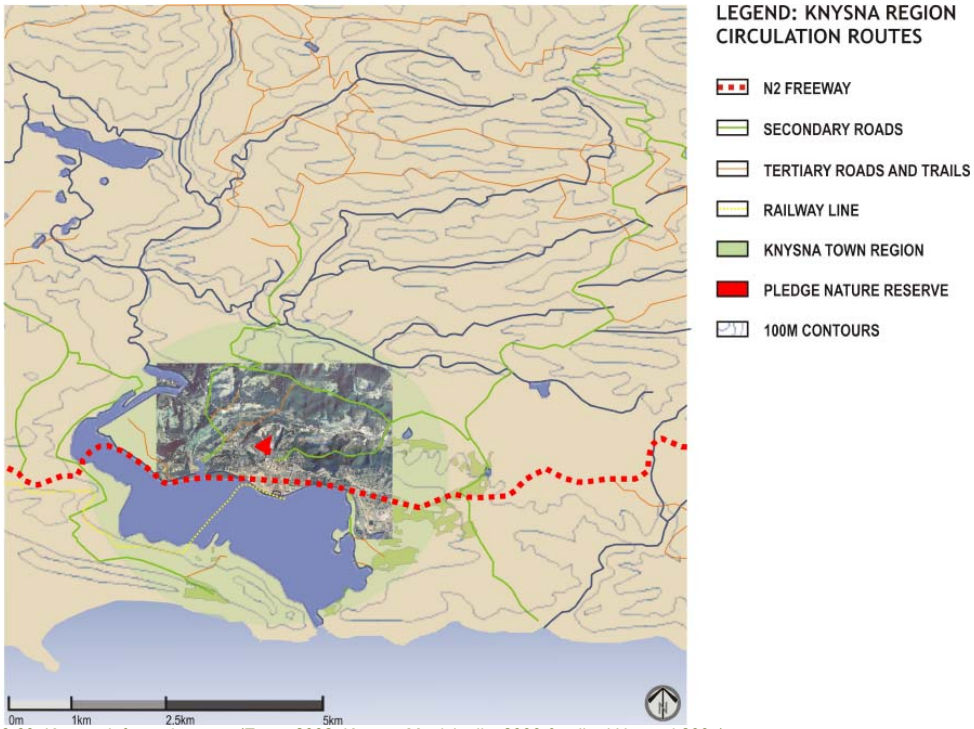
3.66. Knysna urban region to be analysed (Knysna Municipality 2000 & Howard 2005)



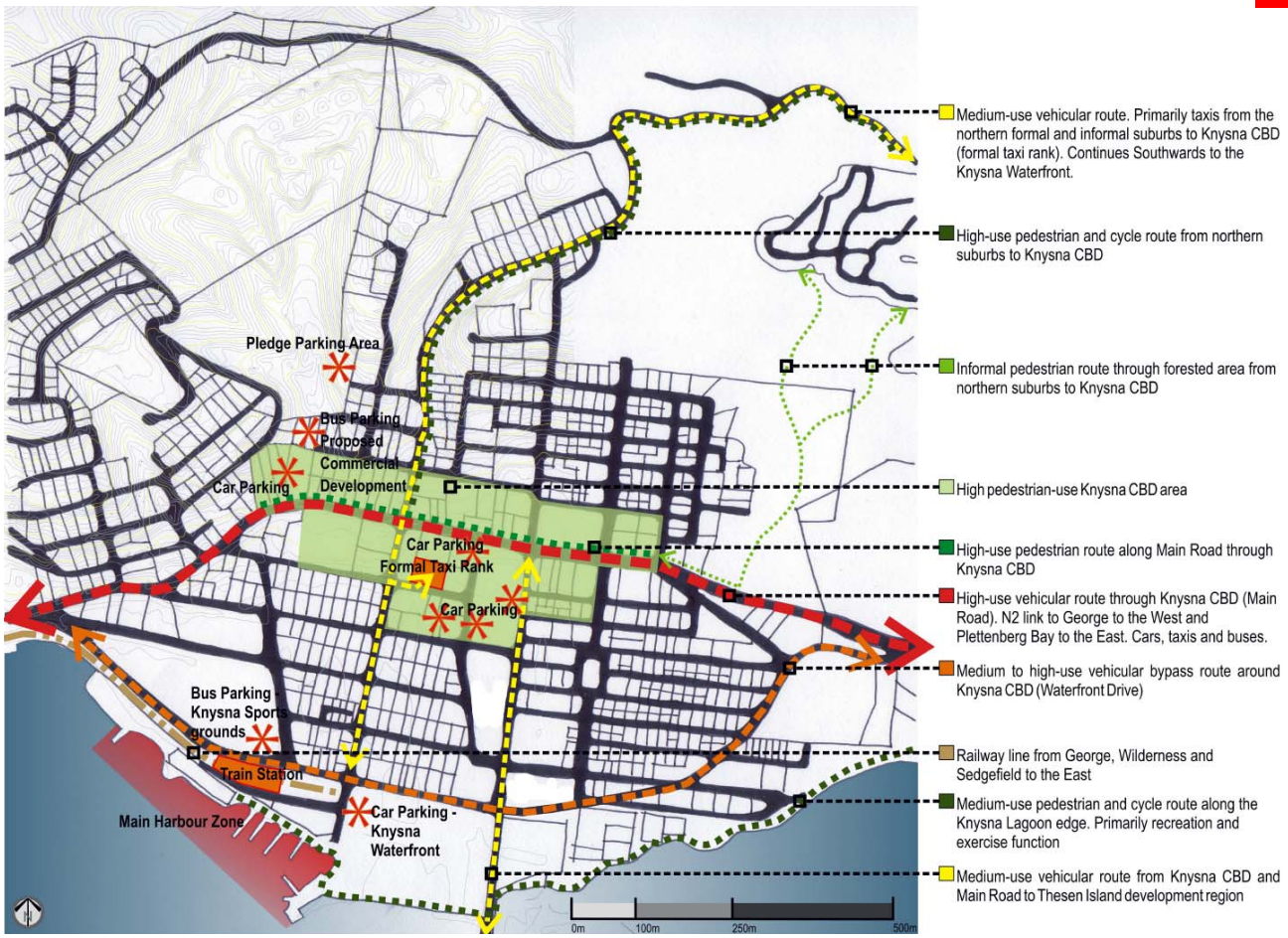
3.67. Knysna land use (Knysna Municipality 2000 & Howard 2005)



3.68. Sketch of original train station in Knysna (Allanson et al 1993)

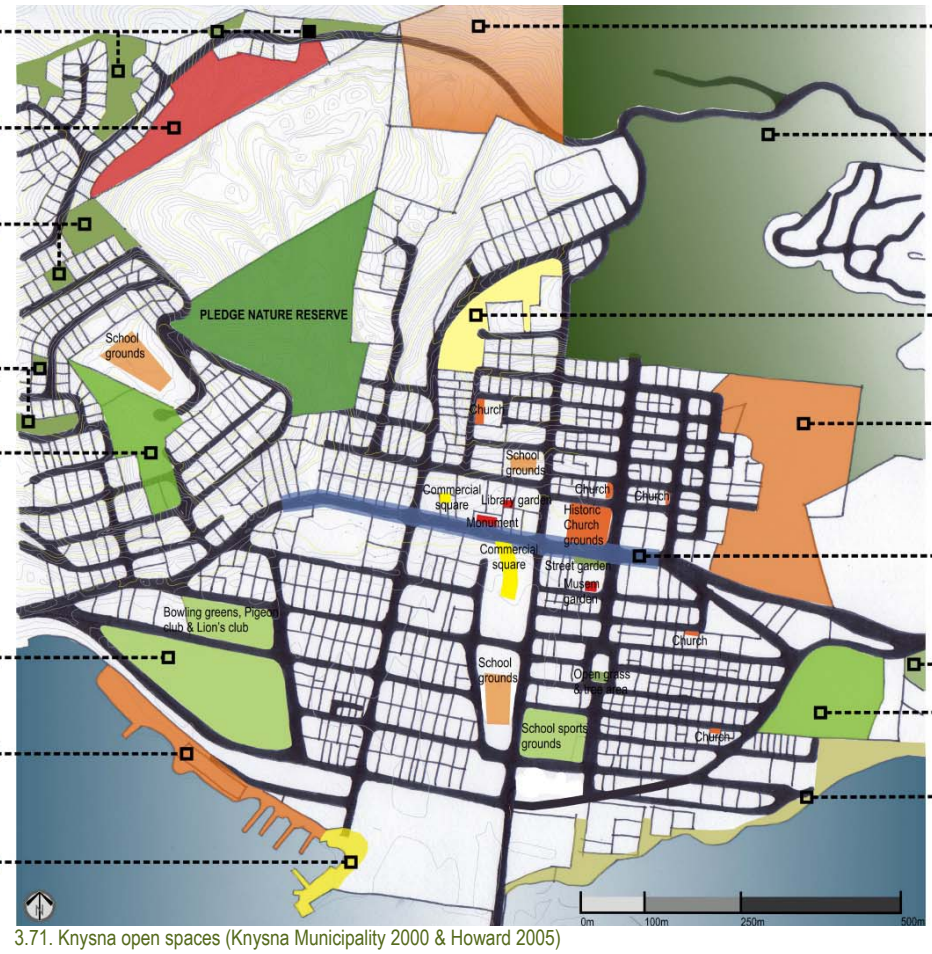


3.69. Knysna information map (Enpat 2002, Knysna Municipality 2000 & edited Howard 2005)



3.70. Knysna circulation (Knysna Municipality 2000 & Howard 2005)

OPEN SPACES



Open spaces primarily grass-covered with alien trees.

Vacant land dropping off steeply to the south. Infested with alien trees (mainly black wattle). Striking views southward to

Open spaces primarily grass-covered with alien trees.

Open spaces primarily grass-covered with alien trees.

Riverine corridor. Indigenous vegetation throughout. Island in an urban fabric. Fairly steep north-south. Some short-cut

Knysna sports grounds. Poorly planned and managed. Lots of wasted space and poor accessibility.

The Knysna lagoon-side waterfront with the Knysna yacht basin, other jetties and small tourist facilities / restaurants and the Knysna Angling Club.

Knysna commercial and tourist Waterfront Centre.

Western portion grassy and eastern portion infested with alien vegetation (primarily black wattle). Steep central section. N2 bypass servitude cuts east-west

Multiple land-use area. Large number of informal dwellings and related infrastructure. Steeper portions densely forested with indigenous and alien vegetation. Trails through the forested areas representing short-cuts to town.

Very steep. Mainly alien trees and grass. Major arterial road adjacent running north-south as well as a well-utilized pedestrian

Moderately steep. Covered in alien trees. Major pedestrian movement from external suburbs to Knysna CBD. Potential as western gateway into 'Knysna Forest'. Recreation potential.

Vibrant streetscape environment. Knysna Main Road.

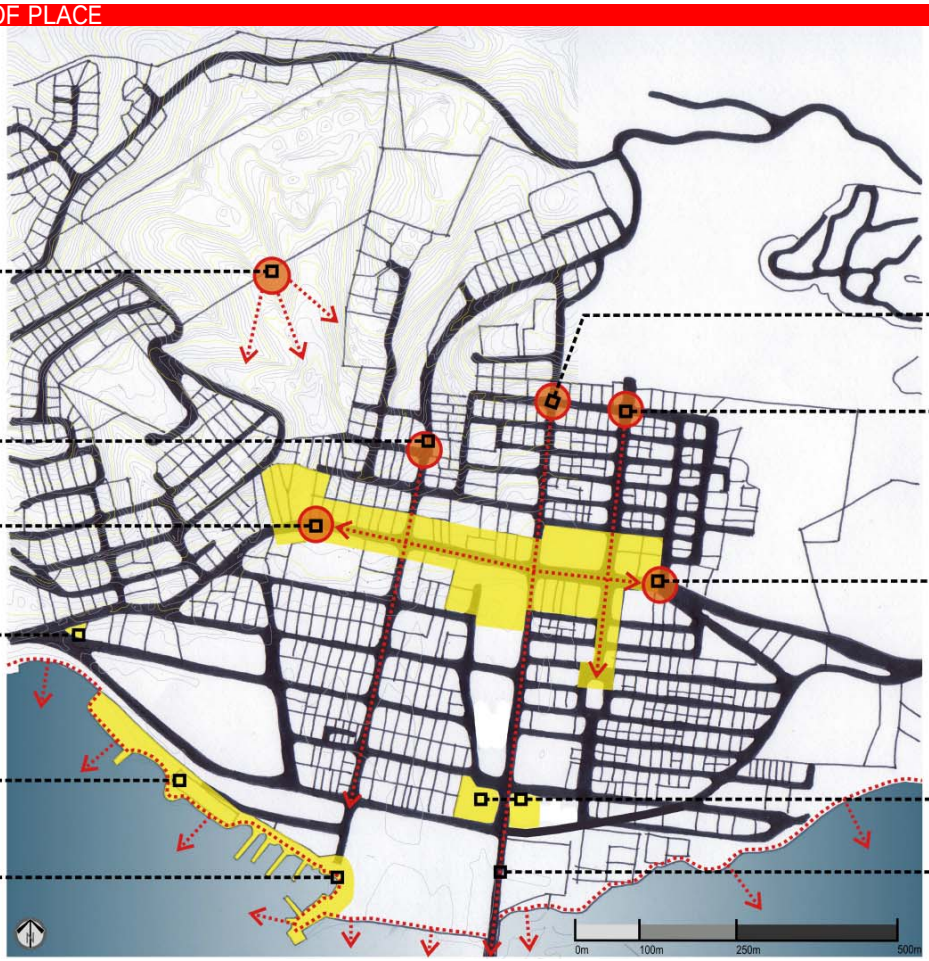
Cemetery. Lawn and random indigenous and exotic tree mix.

Grassed open space with scattered trees and exercise elements. Fairly landscaped and well maintained.

Lagoon walkway running east-west. Occasional clustered trees mainly to the north. Walkway is fairly popular, particularly for those enjoying exercise such as jogging, walking and cycling. Concern in this area regarding

3.71. Knysna open spaces (Knysna Municipality 2000 & Howard 2005)

VIEWS AND SENSE OF PLACE



Lookout point from Pledge Nature Reserve with over 180° views of the Knysna region

Linear Southward view from this point down Grey Street to the Knysna Waterfront

View Eastward of the vibrant Main Road

High sense of place. Restaurant acts as gateway into the Knysna CBD area

Waterfront region having a uniqueness and high sense of place

Varying views of the Knysna estuary all along the estuary edge

View Southward down Long Street towards Thesen Island

View Southward down Queen Street towards the Knysna Municipality building at the T-junction

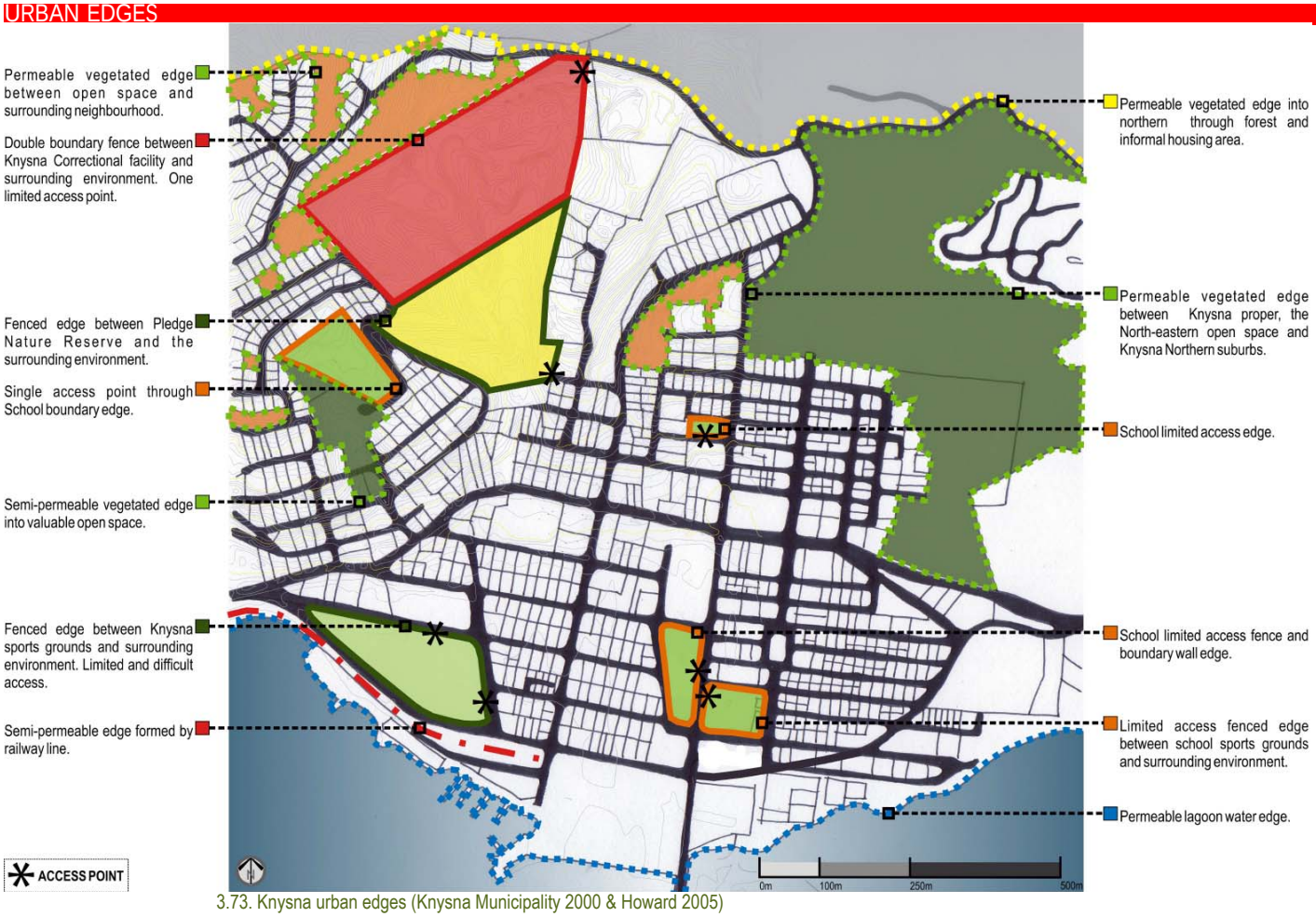
View Westward of the vibrant Main Road

Mini commercial district with a high sense of place due to function and architecture

Route towards Thesen Island which has developed into an area with a high sense of place

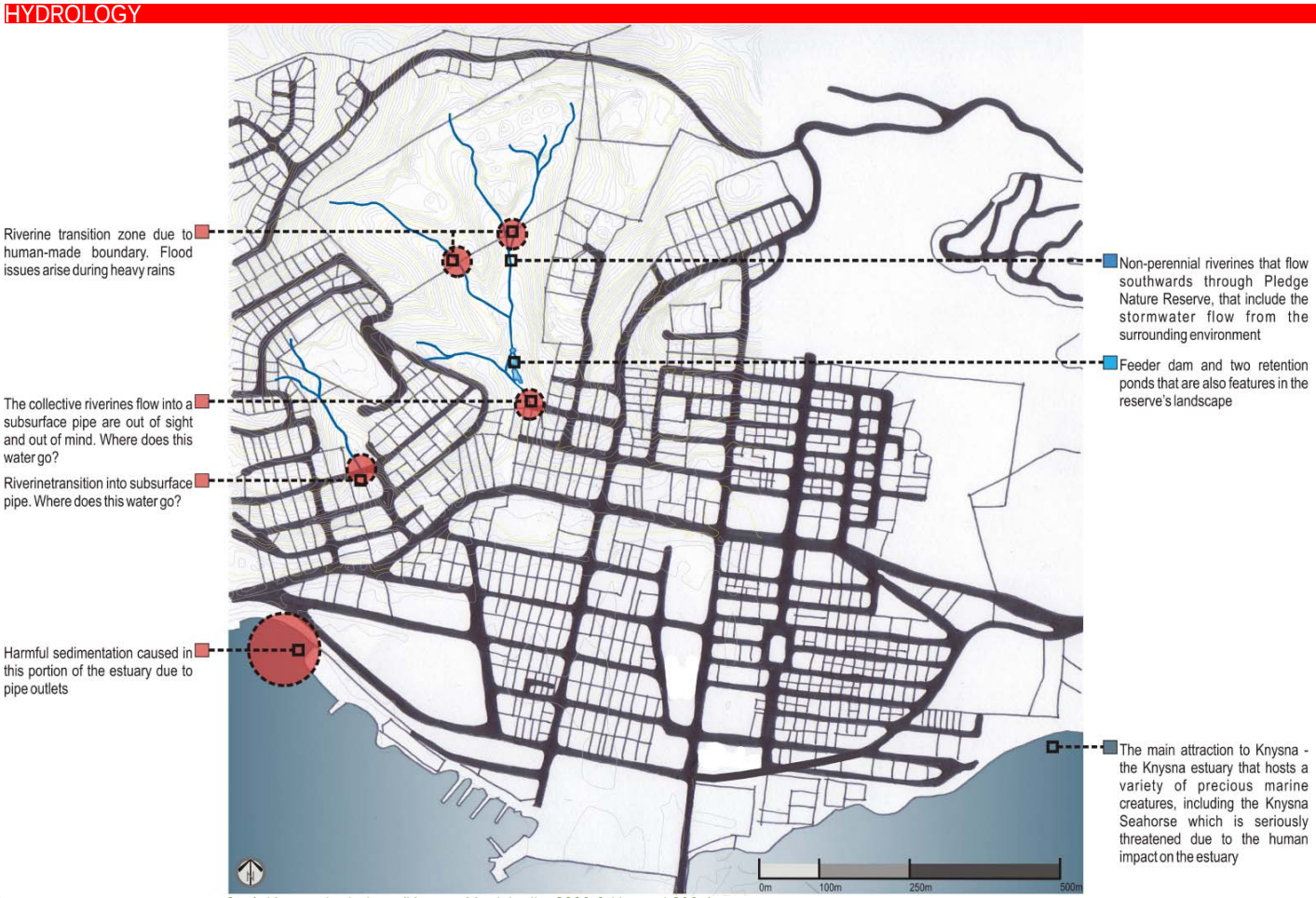
3.72. Knysna views and sense of place (Knysna Municipality 2000 & Howard 2005)

URBAN EDGES



3.73. Knysna urban edges (Knysna Municipality 2000 & Howard 2005)

HYDROLOGY



3.74. Knysna hydrology (Knysna Municipality 2000 & Howard 2005)

3.6. GUIDELINES DERIVED FROM CONTEXT ANALYSIS

3.6.1. GENERAL CONTEXT

- Respond to fundamental human rights
- South Africans are united in their diversity
- Respond to applicable legislation
- Respect the aesthetic and ecological character and the over-developed nature of the Western Cape and Garden Route
- Work with and not in opposition to existing features like "The Heads", Knysna Estuary and Featherbed Nature Reserve
- Refer to all historic inhabitants of the region (Hunter-Gatherer-Herders, Dutch Colonialists, British Colonialists) and how they lived in and altered the environment

3.6.2. SOCIO-CULTURAL ENVIRONMENT

- Cater for all demographic groups and the varied cultures, and refer to the various ways which they respond to the urban landscape in which they live and work
- Limit the use of a specific language and rather use signage symbols and drawings for clarity
- When written instructions are required use at least the three majority languages, namely Afrikaans, English and isiXhosa
- Promote freedom of expression as far as possible
- Pay attention to the Cultural Industries Growth Strategy established by the department of Arts and Culture in conjunction with the Department of Trade and industry
- Explore the possibility of an outdoor art exhibition area to promote local community art and culture
- Cater for persons with disabilities at all times and unite them into the environment, therefore preventing feelings of alienation and discomfort
- Everyone has the right to education and to initiate an independent educational institution
- Refer to the lack of education in the community and attempt to create practical educational tools within the landscape proposal and as part of the Environmental Management Plan
- Approach the SANGALA programme as a nation-building process and as part of planning and design
- Improve accessibility and management of existing sporting facilities
- Provide accessible and comfortable open spaces in the urban environment which can be used by neighbouring communities

3.6.3. ECONOMIC ENVIRONMENT

- Respond to the fact that the South African economy has mostly been built on the use of natural resources (mining and agricultural) and that their has been a shift to the use of human resources (manufacturing)
- Respond to statement that if the Kruger National Park is excluded, only 4% of the surface area of South Africa is formally protected and that we are therefore losing much of our valuable open space and natural resources
- Create opportunities for employment and skills development within the precinct
- Promote the tourism industry of Knysna, especially eco-tourism and cultural tourism

3.6.4. ECOLOGICAL ENVIRONMENT

- Environmental protection is an essential aspect to be maintained within the design proposal
- Respond to the statement that virtually all ecosystems have been modified by human intervention
- The Garden Route region and Knysna is being 'Loved to Death' with a loss of natural open spaces due to urban sprawl
- Great design opportunities exist due to the topographical variance of the town
- Derive design inspiration from the geology of the area, for example the old shorelines, which have educational merit
- Respond to the fact that in South Africa many people do not have access to clean water
- Design and educational value exists in the fact that the town is believed to be part of a drowned valley that silted up
- Take into account that the estuary rises up to 1,7m during high tide
- Inspiration to be drawn from the hydrological character of the area, namely the Knysna River originating high up in the Outeniqua Mountains and the Knysna Estuary as host to many species
- Respond to how human activity has placed strain on the estuarine environment and that it is threatened by pollution and silting, and removal of water for agriculture and industry
- Attempt to decrease urban pollution by reducing cars by providing pedestrian-friendly corridors and by greening the urban environment
- Natural views to be respected with a 3-storey limit on structures
- The potential of northern views to be explored
- Protect existing bio-diversity and increase bio-diversity by re-establishing rare species
- Create an awarenss of indigenous flora and fauna through education and demonstration
- Respond to the fact that bio-diversity in the Cape Floristic Region is under threat due to human intervention
- Approach the problem of invasive vegetation during the planning and design stages and via the EMP
- Respond to the issue of urban sprawl
- Work with and not in competition with other nature reserves
- Refrain from purely conserving and preserving, but rather efficiently manage the urban landscape
- Explore the potential for the development of a recycling centre, with materials being used in arts, craft and education
- Approach air pollution problems by promoting pedestrian and other sustainable methods of getting around
- Work with the current waste management method in Knysna, namely the Waste-by-rail, refer to the issues and problems, as well as the successes experienced (for example provide a unit in which inhabitants without jobs can separate and sort materials
- Explore the potential of education through waste
- Even though the waste system has a long term capacity, consider other methods of reducing and recycling waste

3.6.5. KNYSNA MAP ANALYSIS

- Promote pedestrianisation in the town by creating spaces in which the individual feels comfortable and safe to move alongside other circulation routes
- Respond to and rehabilitate where possible the existing open spaces within the urban area and make use of vacant, misused and brownfield sites for future open spaces
- Make use of views and features while creating links between environments with high sense of place and value
- Attempt to make edges permeable therefore increasing accessibility
- Examine the urban hydrology and stormwater management according to opportunities and constraints so that this urban resource is used to its full potential

3.7. BRIEF DEVELOPMENT

Due to the philosophical and theoretical investigation, as well as the urban context analysis, the project brief and site has evolved to incorporate an extended portion of Knysna's urban environment.

Pledge Nature Reserve is to form part of a Precinct development which includes re-use of mismanaged and vacant areas, while linking the nature reserve to the urban fabric and providing vital community amenities financed by viable economic ventures which are responsive to the ecological environment.

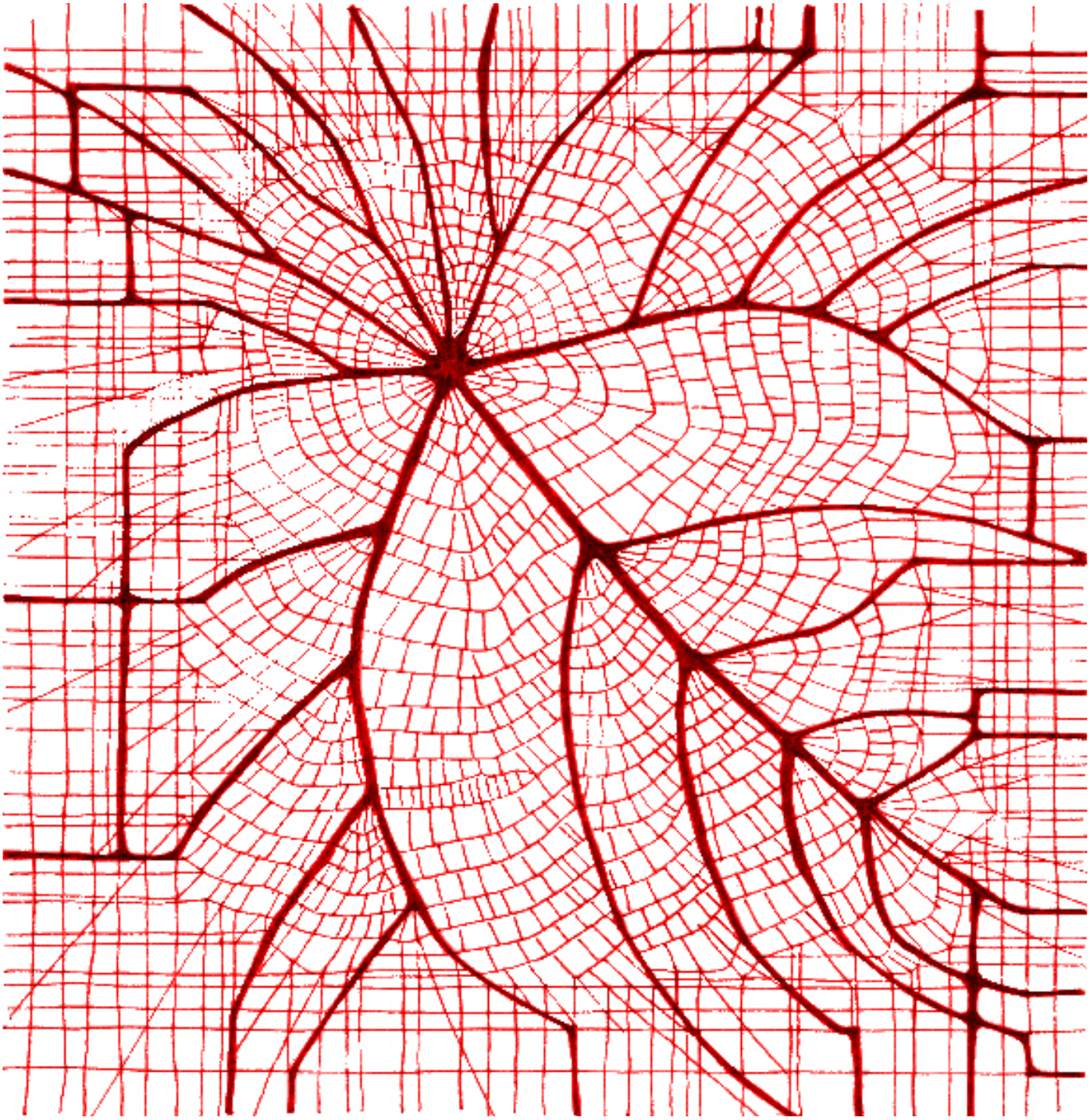
Two concepts explored for this urban intervention:

3.7.1. PRECINCT CONCEPT 1

3.75. Urban intervention Concept 1 (Knysna Municipality 2000 & Howard 2005)

3.7.2. PRECINCT CONCEPT 2: CHOSEN AS THE URBAN INTERVENTION PRECINCT

3.76. Urban intervention Concept 2 (Knysna Municipality 2000 & Howard 2005)



chapter 4
design foundation

4.1. INTRODUCTION

According to the philosophical discourse in Chapter 2 there is a need for contemporary cities to reach a stage of equilibrium so that harmonious relationships are formed between the socio-cultural, economic and ecological environments, therefore creating a unified entity rather than one in which the elements are continuously in opposition. This unified entity seldom occurs out of the blue, but is created gradually through interventions and methodologies instituted into the three currently individual environments. Eventually a decision-making process whereby an individual environment starts taking one or both other environments into consideration is developed, and with that baby steps are taken to uniting these separate entities. With each of these baby steps the city or town goes through a process of evolution, developing from a consuming entity into one that is sustaining, and in essence a 'Eutopia' or good place.

Urban open spaces can be seen as one of the battle grounds on which environment oppositions have been heard. It has been proven that open spaces do have valid and essential socio-cultural, economic and ecological values within the urban fabric, but so often the potential for these values to be experienced is not realized, therefore resulting in opinions that these spaces may be used for better, more financially rewarding purposes.

How can we make use of the potential that these open spaces have and how can we add socio-cultural, economic and ecological value to these areas?

Nine planning, design and management principles are to be applied to the project at the various phases. Each of these principles should be approached and utilised in such a way so that they have a positive effect on the socio-cultural, economic and ecological values of the landscape at hand, whether it is an entire precinct development or a single open space. The nine principles include permeability, variety, legibility, robustness, personalization, visual appropriateness, security, greening and sustainability. It is believed that with the effective application of these principles the open space will function successfully, with the values discussed previously being realized. It is important to note that these principles should not be applied in isolation but in unity, as they are interconnected, overlapping and responsive to each other.

4.2. PRINCIPLES

Here follows a brief discussion of each principle with examples of application.

PERMEABILITY

VARIETY

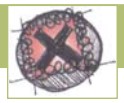
LEGIBILITY

ROBUSTNESS

PERSONALIZATION

VISUAL APPROPRIATENESS

SECURITY



GREENING

SUSTAINABILITY

KEY WORDS AND ASSOCIATED CONCEPTS

accessibility, interconnectedness, visual & physical, network, linkage

diversity, meaning, choice, variety within unity

clarity, understanding, association, reading the landscape, identity, sense of place

flexibility, adaptability, hardiness, healthiness, vigour, choice, complexity

temporary or permanent, community participation, local neighbourhood, open

meaning, aesthetics, context, interpretations, support responsiveness, experience

safety, vulnerability, visibility, choice, control, solitude without isolation

bio-diversity, greenways, networks, multiple purposes, habitat, recreation

best practice, balance, harmony, utopia, environmental design philosophy, health

4.2.1 PERMEABILITY

Permeability of public open space depends on the number of alternative routes to the space and the visibility of these routes. A lack of physical permeability or accessibility prevents people that do not know the area from making full use of the urban amenities. (Bentley et al 1985) Humans must be able to orient themselves, and therefore know where they are, so that they can identify with the environment in which they find themselves, as stated by Norberg-Schulz. (Motloch 2001)

Visual permeability is essential for safety, security and easy orientation and understanding of the urban fabric. Both physical and visual permeability depend on how the network of public spaces divides the environment into blocks (areas of land entirely surrounded by public routes). (Bentley et al 1985)

Permeability requires a design process whereby you:

- analyse the layout of existing routes,
- locate new routes,
- demarcate route use intensity,
- design junctions, and
- check the practical size of blocks

It is important to use existing routes and link open spaces to the surrounding environment. Permeability and accessibility should be achieved at two scales, namely (Bentley et al 1985)

1. links which connect the site to city as a whole, and
2. links which connect site to immediate local surroundings.

PERMEABILITY BASELINE REQUIREMENTS

SOCIO-CULTURAL

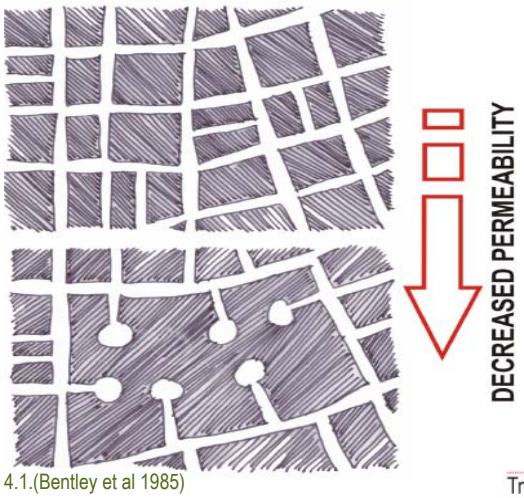
Refer to the existing visual and physical permeability of the urban environment with regards to socio-cultural regions and nodes, especially open spaces.

GENERAL REQUIREMENTS:

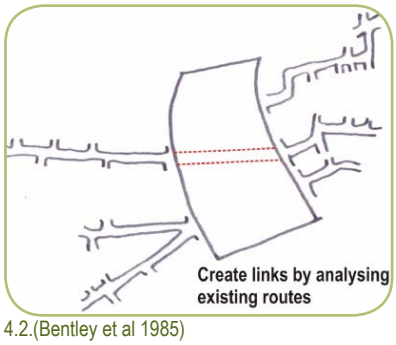
- Set up a framework whereby the socio-cultural regions and services (childcare, health, old age, education, library) have improved accessibility
- Public social and cultural amenities and other public spaces, especially those that incorporate open spaces, should be accessible to all community members from both living and working environments, therefore preventing territorialism and privatization of spaces
- Visual and physical permeability is an essential requirement for public spaces as this ensures that users, especially tourists, do not get lost or confused within the urban environment
- Access and support for learning should be provided, while the designer should exploit the potential for community education in public spaces as much as possible
- The community should be able to use the accessible public space comfortably and should be able to feel free to express themselves in appropriate ways, therefore revert from making use of permanent traditional “KEEP OFF THE GRASS” signs
- Users should have access to clean facilities, services and drinking water

SPECIFIC REQUIREMENTS:

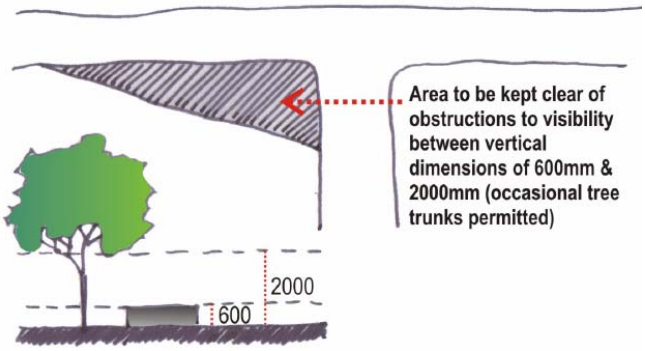
- Public transport nodes, and required parking areas, are to be provided throughout the precinct in order to assist the need of transport
- Public transport to be accessible to disabled persons
- Circulation routes should be designed for the specific user with the possibility of separating user groups (vehicular, pedestrian, disabled persons, cyclists), achieving improved permeability and pedestrian safety
- Promote pedestrian traffic above vehicular traffic
- Link the precinct and district designs to existing transport nodes (taxi ranks, bus stops, train stations)
- Focus on the design of the precinct’s various access routes to and from other precincts to ensure user clarity and legibility by using clear signage, variation in surface materials and patterns, as well as hard and soft landscaping elements
- Primary and secondary precinct and district routes are to be of a smooth and even surface and thereofre easily navigable by wheelchair
- Make use of detail design to discourage vehicle speeding



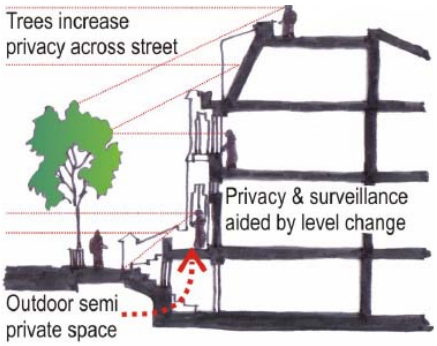
4.1.(Bentley et al 1985)



4.2.(Bentley et al 1985)



4.3. (Bentley et al 1985)



4.4. (Bentley et al 1985)

4.5. Street blocks in Barcelona have rounded corners which improve circulation and movement channels (Mower 1977)

ECONOMIC

Refer to the existing urban economic permeability. Are economic nodes and districts visually and physically accessible and is the economic market accessible to the local community?

GENERAL REQUIREMENTS:

- A redeveloped and upgraded public realm will attract people, and thus money to the precinct. This money will benefit the local economy.
- Commercial facilities, especially those that promote the use of associated open spaces, should be easily visible and accessible to the entire community
- Improve access to economic services and facilities, namely banks, stores, communication facilities, tourist centres and informal markets (stimulate local economics of region)
- Open spaces related to tourism should be well located with good visual permeability, therefore ensuring efficiency and clarity of use
- Efficiency improved by situating essential services within 400m (easily walkable distance for the average person) from any point in the precinct
- Tourist bus stops and an information centre to be located within the precinct near a transport node giving tourist access to the tourist attractions
- Encourage businesses to locate in the precinct by creating high quality facilities for them to rent/buy in appropriate locations

SPECIFIC REQUIREMENTS:

- Place commercial activities near to access routes and focal points
- The commercial region of the precinct should have good visual and physical permeability, therefore attracting tourists and buyers to the area, and resulting in increased financial support of the rest of the precinct districts
- The recreation routes should be situated close to working and living environments, therefore resulting in a reduction in travelling costs to suitable recreation zones

ECOLOGICAL

Refer to the existing visual and physical permeability of ecological nodes and districts in the urban environment.

GENERAL REQUIREMENTS:

- Improve accessibility and linkage to urban green spaces
- Derive planning and design inspiration from the countryside and its natural processes and systems, therefore allowing the natural landscape to permeate the urban landscape
- Natural processes and systems should continue beyond human-made boundaries, for example human impacts upstream and downstream of a riverine corridor should be taken into consideration and an ecological management plan should be applied to the urban open space system of the urban environment
- The potential for environmental education within the open space system should be revealed, and made accessible to educational institutions and the rest of the community, therefore increasing community awareness of environmental and ecological issues
- The urban open space system should be permeable according to the required wildlife movement (especially small wildlife species)
- Environmental impact is reduced by situating essential services within 400m (easily walkable distance for the average person) from any point in the precinct

SPECIFIC REQUIREMENTS:

- Hydrological permeability to be enhanced by improving soil quality and water absorption, therefore preventing excess sedimentation that may result in blockage and flooding, and by resurfacing water movement, and specifically designing ecological quantity and quality treatment methods
- Temporarily separate conservation worthy regions from human use, therefore ensuring habitat growth and protection
- Fenced areas should allow for accessibility of small mammals species, unless the species within the fenced areas are being protected
- The precinct and district is to be well served by public transport, therefore promoting lower-energy transportation
- Pedestrian and cyclist movement networks are promoted which result in improved urban sustainability

4.2.2 VARIETY

A perceptual mix exists with regards to open space due to the fact that different users interpret the spaces in different ways and associate different meanings with them. The designer should promote variety by increasing choice with varied form, use and meaning. An attempt should be made to attract a variety of people at different times for various reasons. Choice within the urban environment depends greatly on the mobility of the user, as greater variety can be achieved over large ranges, while low mobility user's choices depend on a close grain of variety.

Both developers and planners desire efficient environments (economic efficiency and management efficiency respectively). These efficiencies may seriously coarsen the grain of variety, as variety within districts is reduced and districts become more specialized zones of single use. Interaction between activities should exist and activities should give each other mutual support, as shop owners will pay higher rental if pedestrian traffic is high. Therefore compatible uses and times of use, high concentrations of pedestrian flow, and feasible uses (functional, political, economical) should be promoted. (Bentley et al 1985)

VARIETY BASELINE REQUIREMENTS

SOCIO-CULTURAL

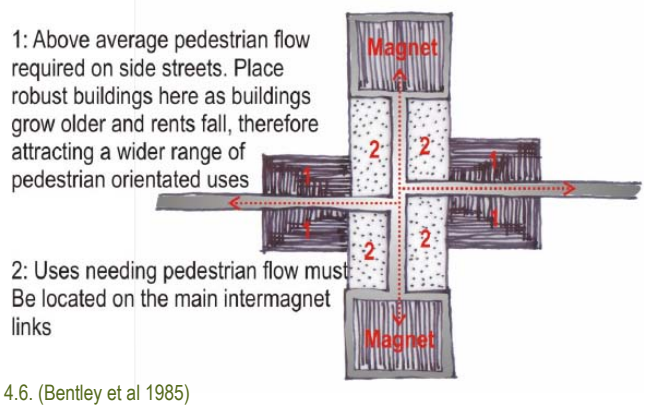
Refer to the urban community's social and cultural amenity needs according to the variety or lack of variety that is currently provided.

GENERAL REQUIREMENTS:

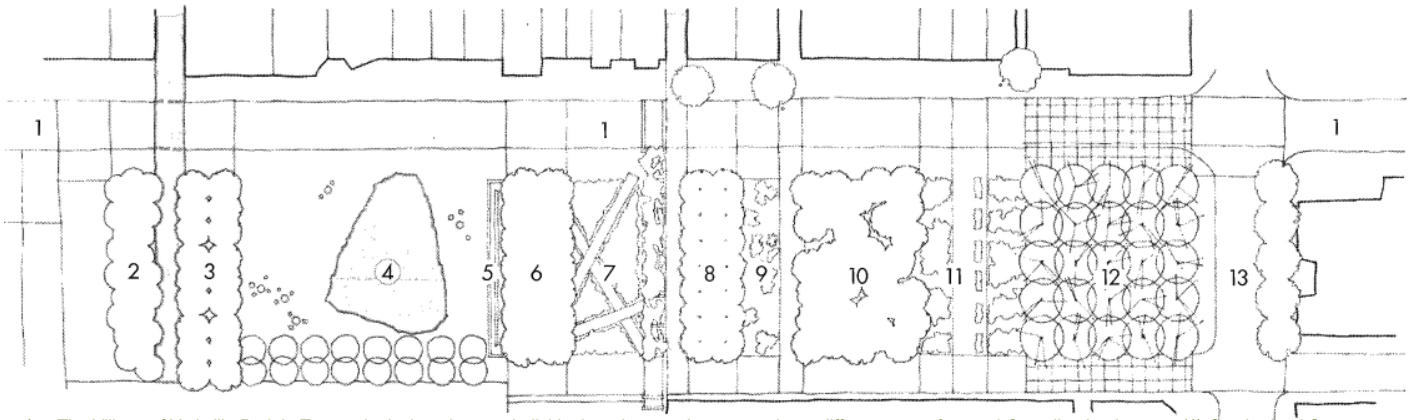
- Amenity and function diversity will ensure satisfaction of the diversity of urban users
- The precinct functions should be diverse and should cater for the community's socio-cultural diversity
- The amenities and functions provided in the precinct design should respond to the urban amenities of the surrounding area, to prevent duplicity and redundancy
- The precinct should provide a variety of activities, therefore satisfying the diversity of user groups
- Cater for all socio-cultural and age groups within a community with regards to available functions and the different times and methods of use

SPECIFIC REQUIREMENTS:

- District and detail design should be inspired by all community groups so that a variety of meanings are realized by the of diversity of users through varying uses, forms and aesthetic characteristics
- Attempt to achieve a diversity of character while maintaining design unity and connectivity to the precinct
- The design should respond to the variety of the existing urban context, using the historical, architectural, cultural, social and artistic context as inspiration
- Provide seating in a variety of positions therefore providing the user with choice (sunny and shady seating areas)
- Create a variety of spaces at different scales to cater for small and large groups
- Provide a variety of routes, with stair or ramp options at various positions within the design
- Contrasting open spaces to be created with greater or less activity
- Use the district functioning and design to promote skills development in a diversity ways



4.6. (Bentley et al 1985)



4.7. The Village of Yorkville Park in Toronto is designed as ten individual gardens each representing a different type of natural Canadian landscape. (1) Cumberland Street, (2) Amelanchier Grove, (3) Herbaceous Border Garden, (4) Rock in Canadian Shield Clearing, (5) Water Curtain, (6) White Alder Grove, (7) Ontario Marsh/BC Douglas Fir Boardwalks, (8) Crab Apple Orchard, (9) Fragrant Herb Rock Garden, (10) River Birch Grove, (11) Prairie Wildflower Garden, (12) Scots Pine Grove, (13) Bellair Street (Tate 2001)

ECONOMIC

Refer to the urban environment's commercial, business and tourist amenities and analyse what is required regarding economic variety.

GENERAL REQUIREMENTS:

- The city community has a variety of economic needs at varying times and it is important to refer to these and make recommendations
- A greater diversity of functions and uses results in increased urban economic efficiency and tourist satisfaction
- When a requirement is not met within the precinct, a clear linkage should be created to the environment in which it is found
- Explore the potential for a variety of training and skills development opportunities
- The potential and variety of outdoor retail possibilities should be considered as far as possible
- The precinct zone should provide a variety of services and products and should be well located so that they are used by a variety of people at different times and for different reasons
- Provide various tourist nodes with varying attracting features

SPECIFIC REQUIREMENTS:

- The district design should stimulate a variety of economical functions and amenities which respond directly to the surrounding context
- An attempt should be made to associate a variety of jobs to this district design and therefore promote the development of a diversity of skills

ECOLOGICAL

Refer to the ecological diversity of the urban environment and the ecological value of the varying open spaces

GENERAL REQUIREMENTS:

- Attempt to protect all of the ecological resources and not just those that have socio-cultural value
- Bio-diversity should be promoted by creating a variety of habitats in as many places as possible within the precinct
- The precinct should act as a bio-diversity node which permeates into the rest of the urban environment
- The variety of ecological processes that exist within the urban environment should be integrated as a complete system within the precinct design, therefore improving ecological efficiency

SPECIFIC REQUIREMENTS:

- Make use of a variety of endemic plants that attract a diversity of fauna species to the open spaces
- By establishing a variety of endemic vegetation species, better ecological health is created and the eradication of alien vegetation is improved
- Derive design inspiration from the diverse natural habitat of the surrounding natural area
- A diversity of ecological processes should be made visible and rehabilitated within the district design and the potential for their use in a variety of education methods should be explored
- Provide places in the precinct and district planning and design for fauna and flora habitats
- High diversity and density of wildlife in the urban realm adds to public amenity

4.2.3 LEGIBILITY

Legibility is the quality which makes a place graspable. Both physical form (aesthetic levels) and activity patterns (complementary patterns of use) should be legible. According to Lynch place identity depends on its imageability. The ability to image a place depends on its physical characteristics, the associations it induces and the strength of its boundaries. (Bentley et al 1985) Design of settings with strong boundaries and appropriate physical characteristics evokes meaningful associations and promotes place specific sense of community (PSSOC). (Motloch 2001)

Lynch has further coined five elements which are key to making a place legible, namely nodes (focal places, junctions), edges (linear, not containing obvious paths, riverways, railways, elevated motorways), paths (channels of movement), districts ("flesh" of the urban environment having minor paths and nodes) and landmarks (point references, most people experience from outside). It is essential to combine new and existing elements and relate them to each other, to reinforce paths (providing character and therefore a hierarchy of paths), to reinforce nodes and provide intermediate markers for interest. (Bentley et al 1985)

Rapoport suggests several ways to 'make place', namely altering the perceptual characteristics of settings to make them more noticeably different, using elements and cues that are culturally appropriate, relating elements and cues to known legends, concepts, ideas or identities of a group, controlling which groups occupy settings and when they do, and by promoting certain behaviours in a setting and over time associating these behaviours with the setting (Motloch 2001)

LEGIBILITY BASELINE REQUIREMENTS

SOCIO-CULTURAL

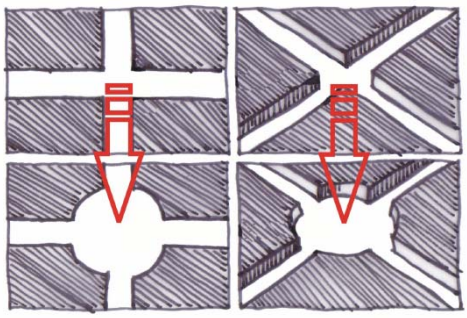
Refer to the the user's understanding of the urban environment and whether social and cultural amenities are easily located and whether the roles and functions of the various districts within the city / town legible to the user.

GENERAL REQUIREMENTS:

- Urban planning and design should respond to the surrounding context and existing socio-cultural environment
- Where possible reinforce existing socio-cultural nodes, paths and districts
- New socio-cultural nodes, paths and districts should be situated according to the surrounding environment and should respond to the context of the area
- The precinct design should be legible to all social groups of all the varying cultures and ages
- Urban open spaces within the precinct should have functions and forms that are easily understandable to all users

SPECIFIC REQUIREMENTS:

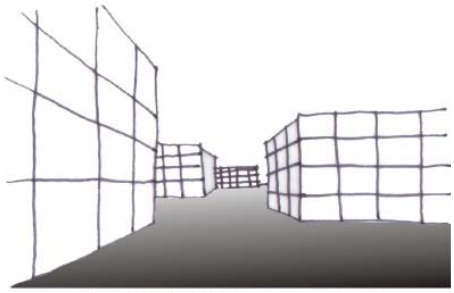
- Legibility can be achieved with clear and understandable signage which is strategically placed throughout the precinct
- Signage should not rely on one language for clarity, and should preferably be composed of symbols which are legible to all social groups
- The signage should form part of a site furniture language, therefore creating better district and precinct unity
- Signs which direct the users to the nearest medical facility are essential
- Precinct legibility for the disabled (blind especially) should also be taken into account
- Private, semi-public and public spaces should be legible to the user, while appropriate interfaces should be created between these spaces
- Site legibility is also created with soft and hard landscaping features and elements
- The strategic placement of information booths within the precinct design to assist tourists, as well as the local
- Edges, especially at level changes, are to be clearly distinguishable through the use of colour and texture
- Material selection and design should enhance legibility and sense of place



Increase legibility by reinforcing nodes

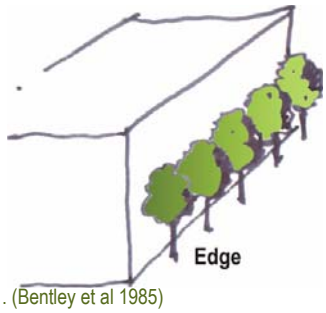
4.8. (Bentley et al 1985)

4.10. (Bentley et al 1985)

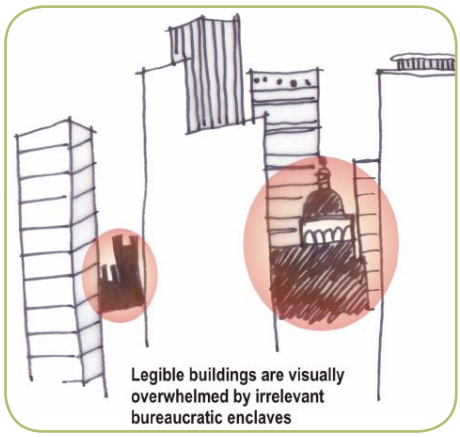


Lack of legibility: important public buildings and publicly-irrelevant private ones often look alike

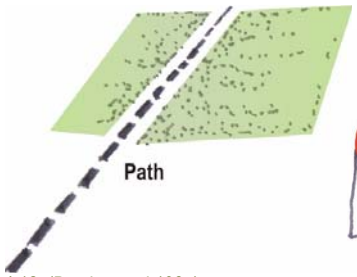
4.15. (Bentley et al 1985)



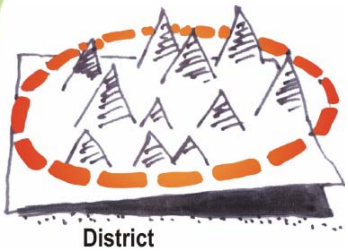
4.11. (Bentley et al 1985)



4.9. (Bentley et al 1985)



4.12. (Bentley et al 1985)



4.13. (Bentley et al 1985)

4.14. (Bentley et al 1985)

ECONOMIC

Refer to the urban environment's is legibility to buyers and tourists, and to whether the required commercial facilities, amenities and districts are understood within their locations.

GENERAL REQUIREMENTS:

- Precinct planning and design should respond to the existing commerical and business character of the city / town
- Precinct legibility is increased by a well-defined pattern of movement and adequate signage ensures that the tourist and buyer stay satisfied and comfortable
- Users of the district should feel comfortable while using the precinct and district space, and user happiness results in the possibility of the user spending more time and money in the space

SPECIFIC REQUIREMENTS:

- The precinct is to be planned according to a hierarchy of spaces, with commercial facilities having a secondary, but vital position alongside primary ecological and socio-cultural spaces
- Information booths offer job opportunities for the local community
- The design of the precinct and district site furniture should include local community artists' work, products and materials; therefore these elements in the landscape acting as functional marketing tools for local craft and industry
- Legibility elements within the precinct and district designs to be constructed of local materials and products using local workforce

ECOLOGICAL

Refer to the legibility of the urban open spaces according to their value, use and usability within the city / town.

GENERAL REQUIREMENTS:

- The urban environment should become increasingly ecologically legible to promote ecological and environmental awareness amongst the urban community
- The precinct design should promote ecological and environmental awareness and therefore spaces with high ecological and educational value should be made very legible to the user
- The precincts conservation and fragile habitat areas should be legible to users, therefore preventing habitat destruction due to user ignorance

SPECIFIC REQUIREMENTS:

- Areas of danger, for example potential flood or unstable areas, and ecological rehabilitation areas should be well marked, with clear signage and understandable rules
- Attempt to create legibility with as much soft landscaping as possible

4.2.4 ROBUSTNESS

The term robustness may encompass terms like flexibility, adaptability, healthiness and vigour. Within the context of the urban environment robustness may be understood as a single place which is used for a variety of purpose, thus offering the user more choice. The way in which a place is designed should be structured by the way in which it will be used.

Functions should not be separated in public outdoor space as once a space is chopped up there is a loss of robustness. Characteristics like privacy are not generally required in public open spaces as people come to experience other people. A variety of functions and activities should be available in the open space system and the functions and activities should not inhibit each other or the users, but rather support each other. The design of public outdoor space should be complex, taking in mind that the edge of the space is where most of the activity takes place, and the designer should capitalize on the active elements located at ground floor level.

An appropriate and comfortable micro-climate should exist whereby choice between, for example, shade and sun should be available at any time or any place. (Bentley et al 1985) Over time a changing community structure causes a change in the open space environment. This environment should therefore evolve to fit the people who live and work in it and should reflect the community's new values and needs. (Hough 1990)

ROBUSTNESS BASELINE REQUIREMENTS

SOCIO-CULTURAL

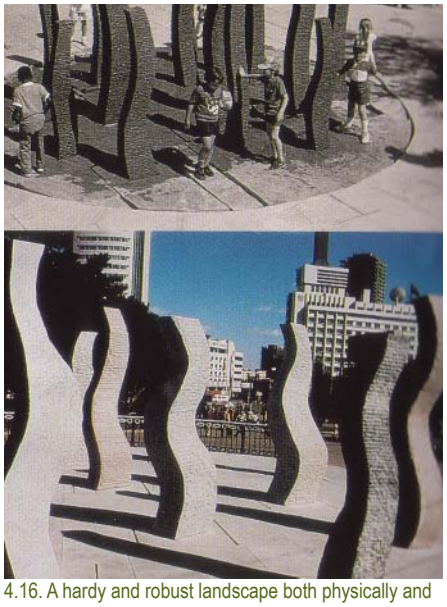
Refer to the existing robustness of the urban environment and whether it is adaptable to changing community structures and whether such a need exists.

GENERAL REQUIREMENTS:

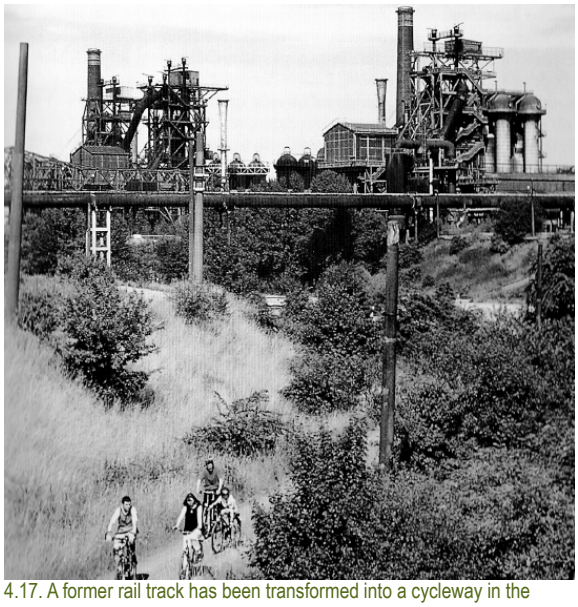
- The proposed urban open spaces and precinct design and functions should be adaptable with regards to a changing urban culture and the resultant change in requirements
- The precinct framework should be flexible according to the variety of ages, cultures and social groups that may use it

SPECIFIC REQUIREMENTS:

- The district design should be adaptable to changing social functions and varying social and cultural groups that use the space, as the social structure of the community will always have an affect on urban open space
- The space should contain elements that are hardy and robust and offer various functions to the diverse urban community
- The planning and design should be practically robust therefore providing required urban services and required infrastructure



4.16. A hardy and robust landscape both physically and functionally (Amidon 2001)



4.17. A former rail track has been transformed into a cycleway in the Duisburg North Landscape Park (Tate 2001)

ECONOMIC

Refer to the adaptability of the town / city according to a changing economic environment, for example loss of jobs or and increase or decrease in tourist numbers.

GENERAL REQUIREMENTS:

- The precinct design should responde to areas that have become economically stagnant and have low vibrancy due to low economic use
- The precinct evironment should include commercial functions which are robust with regards to changing economical structures so that functions do not become outdated and inactive

SPECIFIC REQUIREMENTS:

- Materials and elements used in the district design should be hardy and robust, therefore being vandal resistant and weather resistant so that maintenance costs are reduced
- Spaces should be used effetively and efficiently as robust layout and design accommodates maximum space use
- Public spaces should be as robust as possible in order to allow for varying use intensity while maintaining design character
- Hard and semi-hard open spaces should be open for changing functions like exhibitions,festivals and informal trading
- The precinct and district planning and design should be able to accommodate the individual person as well as large groups without loosing it's sense of place
- Different spaces are to be used for learning, playing, recreation, sitting, resign and walking, and these spaces should be robust to accommodate maximum space use

ECOLOGICAL

Refer to the robustness and legibility of the city / town's surrounding and inner ecological environments.

GENERAL REQUIREMENTS:

- Urban open space environments should be adaptable and flexible according to the variety of fauna and flora species which potentially inhabit the space, and to the possibility of change within the ecological structure of the open spaces
- Open spaces should be hardy and able to adapt to the harsh urban circumstances, such as climatic or human influence
- The overall planting and habitat design should be hardy with regards to alien vegetation encrouchment
- As far as possible revert from developing and altering greenfield sites, therefore preferably use brownfield sites which can easily be adapted with regards to function and form

SPECIFIC REQUIREMENTS:

- Precinct and district planting should be hardy due to the climatic and urban influences, as well as the constant human impact
- Vegetation areas that are specifically meant to be protected should be buffered by hardy vegetation or hard landscape elements
- Bio-diversity is to be maximized by creating robust habitats that fulfil the needs of the selected habitat species
- Vegetation choice to be suited to the climatic conditions of Knysna

4.2.5 PERSONALIZATION

Personalization within a public open space is very difficult, but the designer should make it possible for users to personalize, either temporarily or permanently, the environment they use according to their own tastes and values. Personalization should not be random and the designer should have control.

A method of personalization includes the community participation process whereby stimulation and inspiration is derived from the context and community. (Bentley et al 1985) Community participation in a neighbourhood project increases a sense of community, bringing people together, building interaction skills, confidence and trust, while uniting the community in a competitive spirit and increasing inter-group interaction. (Motloch 2001)

According to Motloch, open-ended design is another method of managing sense of community and the designer should accommodate evolving internal and external conditions. Open-ended design processes and products will also facilitate establishment and evolution of individual and group-specific territory, jurisdictions and expressions. (Motloch 2001)

The designer may manage a sense of community and therefore increase personalization by placing emphasis on community placeness. The designer should have a clear understanding of the community values, hopes, dreams and aspirations, the community as a physical setting, the resources available for intervening in that setting and should propose interventions to enhance community sense, structure and function while maintaining dialogue with community and sub-groups. (Motloch 2001) Human comfort also forms an important part to how a community experiences and personalizes the space.

PERSONALIZATION BASELINE REQUIREMENTS

SOCIO-CULTURAL

Have an understanding of who the community is and what environmental values are important to them, as well as the requirements they have for urban open space.

GENERAL REQUIREMENTS:

- Planning, design and management of urban open spaces should actively involve the urban community at all phases
- Community involvement is achieved through public participation processes, through communicating with the community leaders, government and municipal officials, and specific socio-cultural groups and organizations (eg. educational institutions) that the project affects
- Ensure that the precinct's open spaces contain functions that require ongoing involvement throughout each phase of the project, stretching from planning phase through to operational phase
- The precinct design should promote community individuality, personalization and due pride, therefore creating an environment in which crime that is caused by frustration and disrespect (vandalism and robbery) is lessened
- Spaces are to be shared or made available to the entire local community

SPECIFIC REQUIREMENTS:

- Design features that provide the opportunity for community or individual expression and personalization (community art)
- The local community should be able to put their imprint on the landscape
- Set the basic plan or 'canvas' in place and then work with the community artists to achieve the final product
- Make provision for pin boards and art walls for community announcements and expression
- User comfort is essential for open space success, therefore ensuring better use. Make use of materials that minimise unnatural solar reflection, provide seating in sunny and shady areas, and arrange structures to direct air movement to create comfortable environments
- Noise is diminished by screening and appropriate layout
- Where necessary the traffic noise streets is to be minimised by using absorbing material, planting and other screens
- Create spaces in which the user can choose in terms of environmental control, eg. the option between shade or sun
- Provide public toilets within the precinct

4.18. A little girl personalising her space with a piece of chalk, making it her own (Imagebank 2005)

4.19. Hand imprints in paving to personalize a space (Fletcher 2002)

4.20. A cats' eyes mural on a Kentish Town Road was designed by pupils from Hawley Infant School with designer Harry Dobbs. It aims to engage passers by, and embed community involvement into the streetscape (Beaumont 2005)

ECONOMIC

Refer to the state of the local economy and determine what local services and products are in demand and whether a potential exists for the development of new local services and products

GENERAL REQUIREMENTS:

- Involve the community in decisions regarding the products and services that the precinct will offer
- Encourage and possibly subsidise small business development and empowerment schemes through the precinct project
- The precinct development should involve local businesses as far as possible
- Small businesses like street markets and vending is encouraged in order to improve the living standard of local underprivileged persons

SPECIFIC REQUIREMENTS:

- Allow the community to be able to personalize services and products, therefore attributing their own uniqueness and character to the precinct landscape
- Skills development must forms an essential part of the precinct economic plan
- Make use of local products, materials and services within the design as far as possible
- Local labour should be used during construction, and local management and maintenance teams should be used during the operational phase

ECOLOGICAL

Refer to the state of the ecological environment surrounding and within the city / town and the relationship that humans have with these environments.

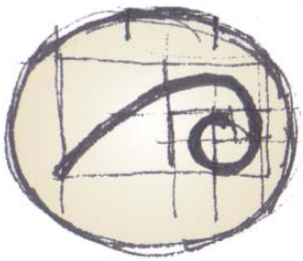
GENERAL REQUIREMENTS:

- Attempt to reunite humans with the surrounding environment's ecological personality
- Involve the human community in rehabilitation projects within the precinct zone so that a better and more respectful relationship is developed

SPECIFIC REQUIREMENTS:

- Allow the precinct design to be an introduction of indigenous nature's personality into the urban setting, therefore allowing ecology to place it's own imprint on the urban environment
- Allow for obvious or subtle environmental education methods within the design, therefore promoting the precense and increased value of urban ecology

3.2.6 VISUAL APPROPRIATENESS



People interpret places as having meaning and Rapoport states that placeness occurs when a setting becomes functionally, culturally, aesthetically and associationally meaningful. (Motloch 2001) Places that support responsiveness and have quality are visually appropriate. Visual appropriateness is very important as urban environments are frequented by large numbers of people with a variety of backgrounds. Different social groups have different interpretations as their environmental experiences and objectives differ. (Bentley et al 1985)

Sense of community is also managed by taking community change and landscape meaning into consideration. Communities evolve over time due to changing resident values, aspirations and activities, resident migration, changing resources and perceptions of resources, and evolving contextual conditions. The urban landscape becomes the collective litter of these changing cultures and conditions. Therefore, the designer should optimize meaning, function and associations which the landscape communicates to various groups. (Motloch 2001)

The designer should also define the public realm as the interpretations people give to a place can reinforce its responsiveness at three different levels, namely, supporting legibility, variety and robustness. To support legibility one has to relate to the contextual cues, while robustness and variety are concerned with how the place is used. (Bentley et al 1985) Richness involves detailed design and design for all of the senses (motion, smell, hearing, touch and sight). It is a great challenge to design for the non-visual. Choice is involved in experience as one may change position, or focus on different sources. The basis of visual richness is visual contrast (orientation and likely position from which viewed), viewing distance, viewing time, techniques and materials used. (Bentley et al 1985)

VISUAL APPROPRIATENESS BASELINE REQUIREMENTS

SOCIO-CULTURAL

Refer to the community's visual requirements for open spaces within the urban setting.

GENERAL REQUIREMENTS:

- The visual quality of the urban precinct should be applicable to all cultural groups of the community so that each user is able to derive meaning from it
- Visual characteristics and aesthetics are to be inspired by both the historic and contemporary characteristics of the various cultures
- Visual appropriateness includes user comfort
- Designed elements to be part of a design language
- Visual quality to be derived from the city context with community art being a main feature of the proposed development

SPECIFIC REQUIREMENTS:

- Visual elements to unify the precinct design
- Visual quality may be enhanced by making use of views in and out of the site
- Enhance good views, and vistas to important focal points
- Site furniture is designed to fit into the character of the district while the range itself plays a role in creating a sense of place. Includes street lights, pedestrian lights, benches, litter bins, bicycle stands, notice boards, water fountains and bus shelters
- Precinct and district lighting should not cause visual pollution and destroy the aesthetic quality of the environment and glare and discomfort from the light source should be minimized
- Design principles of scale, proportion, rhythm and balance, etc. to be used

4.21. Visual appropriateness and aesthetics created with focal accent trees (Tate 2001)

4.22. Space visually appropriate according to how it is used and whether the user feels at ease - Bloemenhof Park in Johannesburg (Amidon 2001)



4.23. Landscape elements have different meanings to each person that uses the space (Betsky 2002)

ECONOMIC

Understand and refer to the ethical battle between economic value and aesthetic quality within the urban environment and therefore attempt to enhance visual appropriateness to achieve a balance between economy and aesthetics.

GENERAL REQUIREMENTS:

- The precinct should be visually appropriate to the environment in which it is located, therefore stimulating and attracting 'desired' users
- Focal points in the precinct environment play a big part in visual appropriateness, and commercial facilities should be located close to these areas so that users (buyers, service users and tourists) are attracted to these areas
- A diversity of uses are to e created to allow for economic generation and multiple functions
- Aesthetic quality therefore plays an important role in attracting buyers and tourists to commercial facilities
- The individual and community as a whole should be able to derive meaning from the open space and be able to identify with the space due to richness of design, as such a space will result in more users and therefore a potential of higher direct and indirect economic gain
- Locate tourist attractions within the precinct, and use existing tourist attractions and potential tourist attractions

SPECIFIC REQUIREMENTS:

- Ensure that clear links exist between focal points, high aesthetic areas and commercial facilities
- High economic funds are not always required in creating visually effective landscapes, as recycled materials can be used to create impressive visual elements
- Use views in precinct design to attract tourists to lookout points and therefore also the surrounding facilities
- Involving the local community in aesthetics and artistry will promote the local economy

ECOLOGICAL

Refer to the way in which the community makes use of high ecological value environments and whether aesthetic value is an important drawing force for use

GENERAL REQUIREMENTS:

- Refer to the above-mentioned assessment within the precinct design with an attempt to prove to the community that high ecological value areas have a unique aesthetic quality
- Within the design refer to the ethical battle between ecology and aesthetic value
- It is not an essential requirement that ecological environments be visually appropriate as they are designed to reflect a natural state which is ecologically appropriate
- But visual inappropriateness may influence the 'human respect' factor, as the community's pride of the open space may be diminished, causing harm to the environment
- Enhance the human-nature connection through visually appropriate design
- Create a balance between hard and soft open spaces, with hard spaces being used for activities such as play, sport, recreation, cultural entertainment, parades and political ceremonies, meeting and socialising, visitor's destination for lingering and resting, backdrop for markets, vending and festivals, access to other facilities, transport nodes and routes. These spaces take the form of

SPECIFIC REQUIREMENTS:

- Use endemic and indigenous vegetation so that the aesthetic potential of thes are demonstrated to the communitycent plants as focal points in the site design
- Derive design inspiration from the beauty of the natural context
- Plants should be chosen to fit the aesthetic character of the site
- Natural views to be enhanced, specifically those that are Knysna's focal points (Estuary and The Heads)

4.2.7 SECURITY

The notion that physical environments can either increase or reduce opportunities for crime is not new as certain environments can impart a feeling of safety while others can induce fear. The designer should attempt to alter the environment, therefore making it more difficult to commit a crime.

Five principles which are crucial to establishing how the physical environment either reduces or increases the opportunities for crime have been identified, including (Kruger et al 2001)

1. surveillance and visibility,
2. territoriality,
3. access and escape routes,
4. image and aesthetics, and
5. target hardening.

The following safe community principles being key design concerns have been identified, namely (Luymes & Tamminga 1995)

1. visibility of others,
2. visibility by others,
3. choice and control,
4. environmental awareness and legibility, and
5. solitude without isolation.

SECURITY BASELINE REQUIREMENTS

SOCIO-CULTURAL

Refer to the city / town's general crime rate, and safety and security issues, and earmark problematic areas.

GENERAL REQUIREMENTS:

- Designed spaces should incorporate specific safety and security approaches, for example those defined by the CSIR's Manual for Crime Prevention through Planning and Design, so that social crimes may be diminished through adequate built environment design
- Urban open space design should promote and enhance security so that the users feel free to use the space without feeling vulnerable
- A balance should be achieved between public, semi-public and private spaces, with no space being completely secluded or overly exposed
- Urban open space should be appropriately delineated and designed so that certain areas are not accessible by night, while those that are accessible at night are adequately designed
- Precinct structures to comply with safety requirements

SPECIFIC REQUIREMENTS:

- Measures taken include well lit routes, routes and spaces overlooked by occupied areas, and clear visual links between spaces
- Outdoor lighting to be included in all public spaces and living environments, as well as building entrances, walkways, sidewalks and streets, focal features and streams / canals
- Security elements (lighting and CCTV) to be vandal- and weather-resistant, so that they are always operational , therefore ensuring continued space security
- Design specifications to comply with that of safety regulations

4.24. CCTV is not always an effective remedy to safety and security problems as they cameras merely record events and do not prevent them (Wouldstra & Fieldhouse 2000)

4.25. This Wild Pear in the Company Gardens in Cape Town has great historical value and is being protected from human interference, therefore retaining the city's agricultural history (Howard 2005)

ECONOMIC

Understand how the buyer / tourist experiences the safety and security of the urban environment.

GENERAL REQUIREMENTS:

- The precinct framework aims to generate a safe environment that will be beneficial to tourism in the area
- It is essential that open spaces, particularly those that have high tourist visits, should have good security, therefore ensuring positive use and return visits
- A high degree of safety and security will increase the neighbourhood quality, and therefore applicable and specific design principles should be applied to the urban open space effectively so that it is suited to the surrounding environment
- Open spaces focused on recreation should be designed with security as one of the major factors; otherwise users will revert to using distant areas, indoor-exercise, or no exercise at all, therefore resulting in unhealthy, unbalanced lifestyles and increased traveling costs

SPECIFIC REQUIREMENTS:

- Security elements (lighting) to be locally produced to boost local economy
- Security elements to be vandal- and weather-resistant, therefore minimising maintenance costs

ECOLOGICAL

Refer to the safety and security of green / ecological open spaces within the urban environment.

GENERAL REQUIREMENTS:

- Ecological and natural processes and habitats should be protected, and fragile environments should be secured against harmful actions
- Guidelines for the protection of open spaces should be included within an environmental management plan (EMP)

SPECIFIC REQUIREMENTS:

- Minimize glare of outdoor lighting
- Water that open space users come in contact with is to be clean and risk free
- Explore the possiblity of using thorny and bushy vegetation as an alternative to manufactured fencing

4.2.8 GREENING

Urban greening is defined as “an integrated, citywide approach to the planting, care and management of all vegetation in a city to secure multiple environmental, economic and social benefits for urban dwellers”, according to a Congress background document. This includes street trees, parks or urban open spaces, trees in private gardens, nurseries, green corridors, and community and residential food gardens. (Davie 2002)

Greening the city represents an adaptation and a practical response to the physical and psychological pressures of urbanization as it helps to mitigate the loss of ‘natural space’ owing to development and also provides a counterbalance to an expanding human dominated landscape. (Searns 1995)

The principles and attributes of the Greenways movement are studied as a basis for the ‘greening’ design principle. Greenways can be defined as networks of land containing linear elements that are planned, designed and managed for multiple purposes including ecological, recreational, cultural, aesthetic, or other purposes compatible with the concept of sustainable land use. (Ahern 1995)

It appears that the majority of greenways fall into one of three major categories, and that the three types are increasingly overlapping in comprehensive greenways systems or networks: (Fabos 1995)

1. Greenways of ecologically significant corridors and natural systems which occur mostly along rivers, coastal areas and ridgelines
2. Recreational greenways where networks of trails and water link land and water-based recreational sites and areas
3. Greenways with historic heritage and cultural values

GREENING BASELINE REQUIREMENTS

SOCIO-CULTURAL

Refer to and understand how, why and when the local community and tourists use urban green open spaces.

GENERAL REQUIREMENTS:

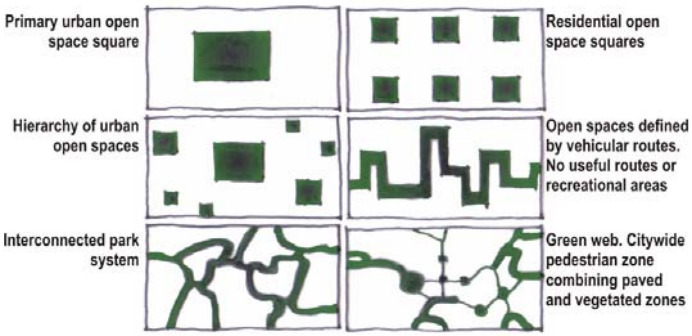
- The precinct’s open spaces should incorporate natural environments which promote easy exercise and enjoyable recreation
- Open space designs should incorporate green environments which offer appropriate uses and activities and which stimulate the user in as many ways as possible, both consciously and sub-consciously, for example sensory experience
- The social context should be taken into consideration when planning green aspects within the open space, and green spaces should respond to all of the previously mentioned principles
- Create a balance between hard and soft open spaces, with hard open spaces being used for activities such as play, sport, recreation, cultural entertainment, parades and political ceremonies, meeting and socialising, visitor’s destination for lingering and resting, backdrop for markets, vending and festivals, access to other facilities, transport nodes and routes. These hard open spaces take the form of mixed-mode streets, pedestrian orientated streets, squares/plazas, markets, parking areas and public transport stops and stations. Soft open space incorporate parkways, parks (regional and neighbourhood), sports fields,play spaces and river corridors

SPECIFIC REQUIREMENTS:

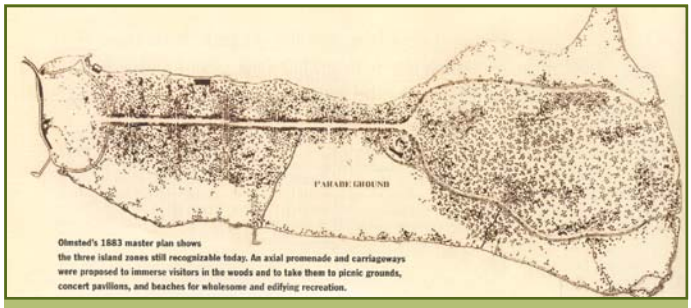
- The micro-climate of the site will be altered to fit the human comfort levels by means of sun/shade patterns, evaporative cooling techniques and directing natural air movement
- This environment is to act as an example of how natural habitats are successfully integrated in the urban realm

A simple definition of a greenway is 'a route which is good from an environmental point of view.' The route need not be for people and need not be flanked by vegetation, but it must be environmentally good. (Turner 1995)

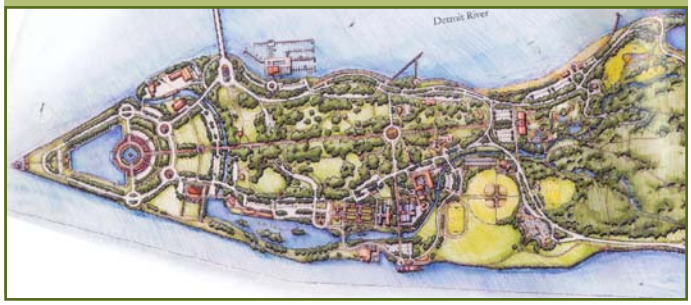
Urban greening falls under local government jurisdiction and should be a part of governmental Integrated Development Plans and Land Development Objectives. However, priorities lie elsewhere for the immediate future, namely housing, drinking water, sanitation and other basic services, and greening gets limited financial support. (Davie 2002)



4.26. Various open green spaces in the urban environment (Trancik 1986)



4.27. Detroit's Belle Isle Park still has remnants of the original Olmsted Plan of 1883 (Martin 2005)



4.28. A recreational greenway alongside a water edge (Crandell & Landecker 1998)

4.29. Experience nature - Detroit's Belle Isle Park (Martin 2005)

ECONOMIC

Refer to the economic inputs and outputs of green open spaces in the urban setting.

GENERAL REQUIREMENTS:

- Attempt to balance the economic inputs and outputs, and even increase outputs over inputs, of the urban green space by providing economic facilities in and around the space
- City 'Greening' should be placed effectively throughout the design, therefore decreasing the need for added infrastructure and services (eg. stormwater drainage)
- The choice of plants should be appropriate to the required function and to the context of the area

SPECIFIC REQUIREMENTS:

- Indigenous plants that are cultivated on site are more economically viable than plants that are out-sourced

ECOLOGICAL

Refer to the overall health, vitality and functioning of green open spaces, as well as the state of street trees and transitional landscaping, within the urban environment.

GENERAL REQUIREMENTS:

- Primarily endemic and secondarily indigenous vegetation to be implemented, unless exotic species are required for specific educational purposes
- Vegetation which is not enedemic or at least indigenous should be established in a controlled manner and be managed, therefore preventing undesired spreading of plant species
- Systematic eradication of all alien invaders within the urban open spaces, and the surrounding environment
- Education about the positive impacts of endemic gardening through design and demonstration
- Make use of companion planting and permaculture principles as far as possible
- Plant selection to be motivated by the vegetation palette of the region

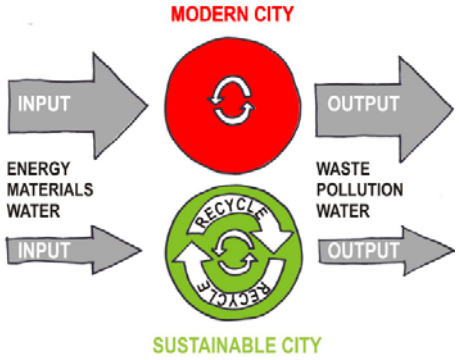
SPECIFIC REQUIREMENTS:

- Plan for large green spaces covered with trees enhance the micro-climate to fit the human comfort levels in a sustainable manner
- Habitat creation through greening includes a coordinated landscaping strategy that takes planting, water, soil, climate, etc, into account
- No invaders or aggressive plant material to be used
- Plant selection is to fit the local biome and plant community

4.2.9 SUSTAINABILITY

Hough states that there is a need for the development of an environmental ethic in which there is a fundamental acceptance of investment in the productivity and diversity of natural systems and a reconciling of economic development initiatives and environmental conservation. Furthermore, he states that although conflicting points exist between the priorities of development versus the preservation of natural wealth, the principle of investment in nature, where change and technological development are seen as positive forces to sustain and enhance the environment, must be the basis for an environmental design philosophy. (Hough 1990)

We need a new picture of urban culture that reconciles the advantages of urban life with sustainable development. (Mayer 1998) Motloch emphasizes the importance of community sustainability, as residents which sustain themselves without depleting environmental or human resources, or degrading environmental or human systems will feel a sense of being part of a viable and healthy community. The designer should now act as a facilitator for resident participation in the decisions that affect their future quality of life and their ecological, physiological and psychological health and productivity. (Motloch 2001)



SUSTAINABILITY BASELINE REQUIREMENTS

SOCIO-CULTURAL

Refer to the community's understanding and application of the sustainability issue with regards to theory and practice.

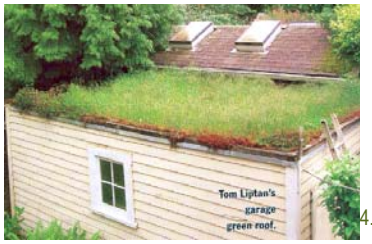
GENERAL REQUIREMENTS:

- Sustainability aspects of the project should be made understandable to users, therefore enhancing the educational characteristics of the space while promoting a 'best practice' approach primarily through demonstration methods

SPECIFIC REQUIREMENTS:

- Community involvement throughout the project is essential
- Human comfort levels are to be achieved

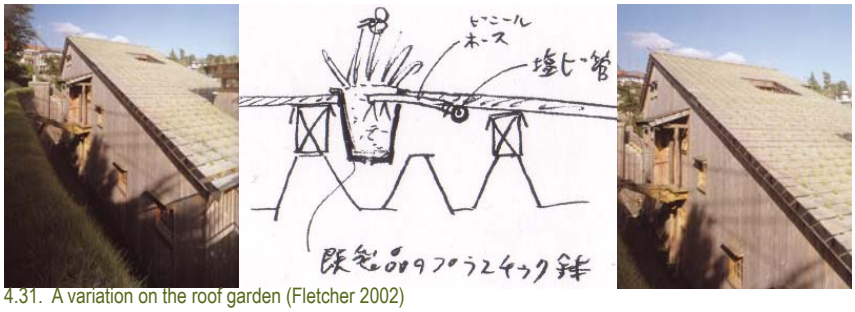
To 'sustain' means to keep going. Improving the relative sustainability of a city requires an evaluation of those features which affect its pattern of inputs and outputs. This is likely to include earth, water, and vegetation, building types, transport systems and spatial organisation. (Gardenvisit.com) A city with high inputs (of energy, food, water etc.) and high outputs (of thermal pollution, sewage, vegetable waste etc.) is relatively less sustainable than a city of the same size but with lower levels of input and output. The social, physical and biological systems in urban areas are as complex as natural systems. Sustainability planners need to study, model and make proposals for the urban landscape at all scales and levels, in time and space, and beyond the usual span of three generations. (Gardenvisit.com 2005)



4.30. Roof garden in Portland (Viani 2005)


4.32. Use of solar power (Amidon 2001)


4.33. An eco-san toilet (Garduno 2005)


4.31. A variation on the roof garden (Fletcher 2002)

ECONOMIC

Understand the role of sustainability within the economic realm of the urban environment.

GENERAL REQUIREMENTS:

- The local community, especially those members that have been previously disadvantaged, should be employed as far as possible, therefore achieving economic empowerment
- The designer should take the environment into consideration by choosing materials and methods which are environmentally-friendly and economically efficient
- Design should minimise the ongoing costs associated with provision of water and energy as well as disposal of sewerage and solid waste through adequate and thoughtful design

SPECIFIC REQUIREMENTS:

- Involve the local community in creating and providing products and services
- As far as possible products should be made of locally-sourced materials

ECOLOGICAL

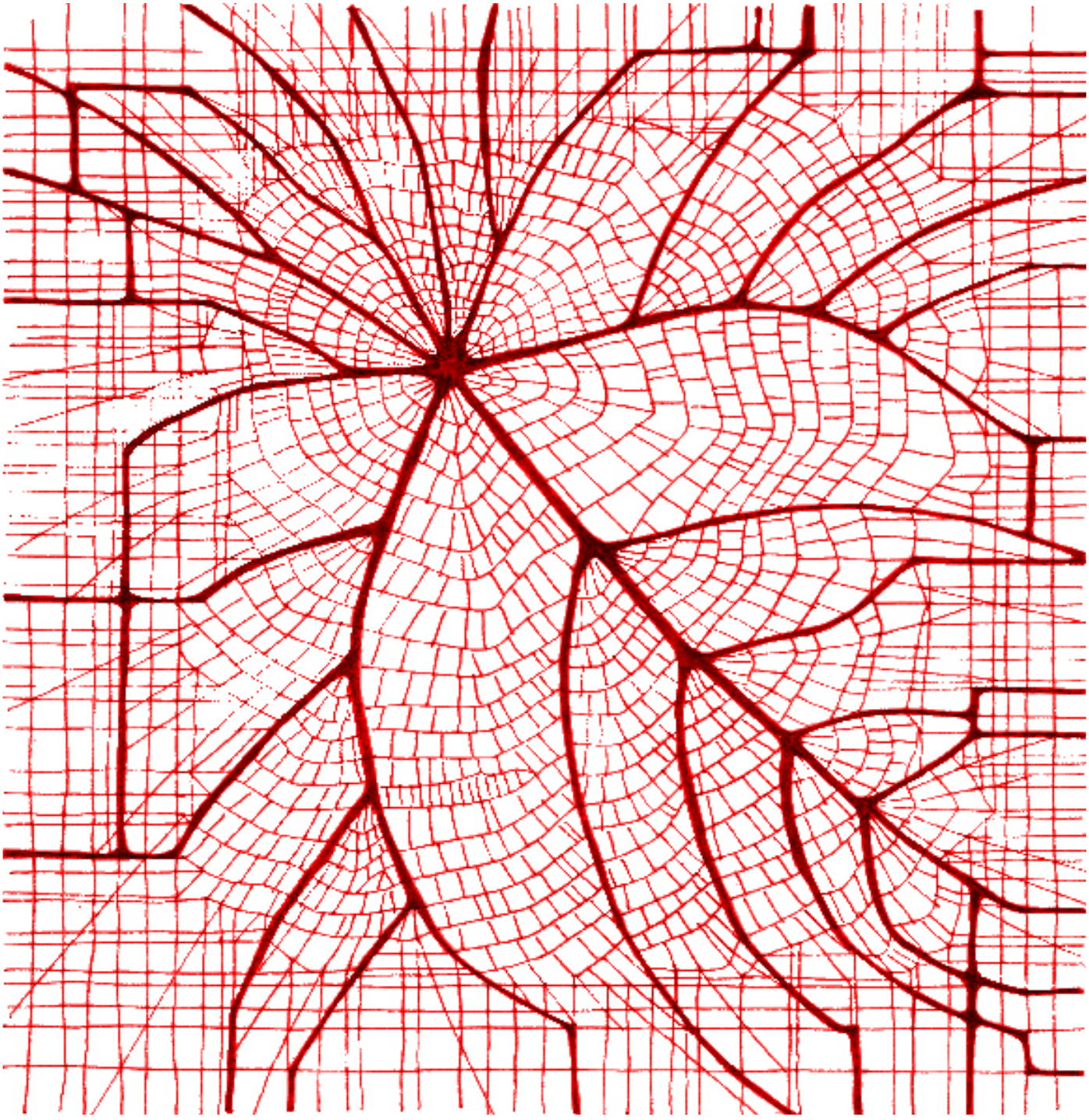
Promote simple and user-friendly methods of achieving ecologic sustainability, and refer to existing sustainable practices.

GENERAL REQUIREMENTS:

- Innovative recycling methods of solid waste and reuse should be put in place, and be made accessible for educational purposes
- A variety of pollution control methods should be attempted within the design and should be made accessible and understandable for educational purposes
- Alternative and renewable energy creation methods and uses should be included within the design and be made accessible for educational purposes
- The precinct and district's resources should be adequately managed to achieve optimum use and improved ecological functioning

SPECIFIC REQUIREMENTS:

- Indigenous vegetation suited to the climatic conditions of Knysna, therefore minimising water use
- Development to occurr on sites that are already damaged and built upon in order not to disturb existing fauna and flora
- Rainwater to be harvested and used on site, allowing infiltration on site and thus feeding the ground water
- Detention and retention facilities incorporated in runoff systems
- Runoff reduced by using pervious or absorbent surfaces
- Hard landscaping mimised , pervious surfaces specified for car parking and paths
- The use of water-efficient devices is encouraged (dry composting toilets, drip irrigation)
- Grey-water recycling will allow water for irrigation and some other purposes
- Passive heating, cooling and ventilation systems to be used that are environmentally responsive
- Choice of surface material to improve micro-climate conditions to the user
- Use electricity generated from renewable sources, ie. wind, sun, biomass
- 80% of the construction materials and components to be made from materials and components with low embodied energy. Low embodied energy materials include locally (within country) made and sourced timber, concrete, concrete blocks, timber windows, and doors, etc
- 90% of materials and resources to be from renewable resources
- 10% of building materials and components to be reused or supplied by recycled sources



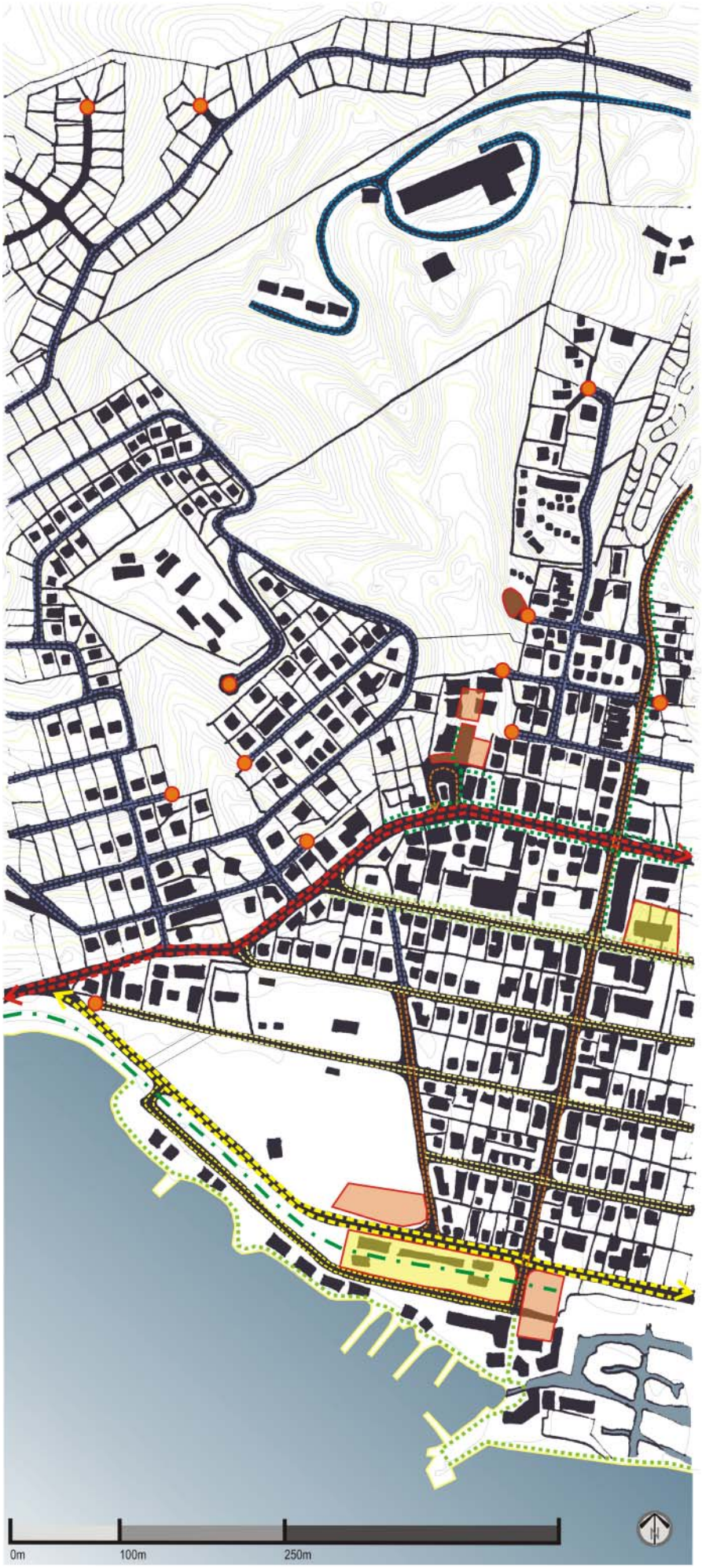
chapter 5
precinct intervention

5.1. PRECINCT ANALYSIS

5.1. Precinct land use (Knysna Municipality 2000 & Howard 2005)

KEY POINTS TO CONSIDER:

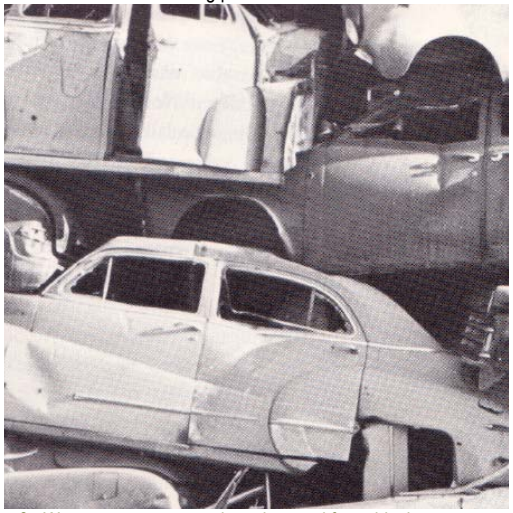
- No community facility, other than the user-specific Correctional Facility, Epileptic Centre and school, exist in this proposed precinct region
- Take the Correctional Facility into consideration by proposing the combination of ecological and social rehabilitation within the environmental management plan
- Create a link, be it physical or institutional, between Pledge Nature Reserve and the nearby school
- Promote the infiltration of indigenous vegetation into the surrounding residential areas by proposing the planting of popular indigenous street trees, special access into the reserve for the surrounding neighbours, and education about the positive impact of indigenous planting by demonstration methods
- Vacant, misused and underused sites are to be incorporated within the precinct master planning, especially those areas with the potential for community service and ecological rehabilitation, and with the possibility of added economic empowerment to the community
- Promote the accessibility of the estuary edge through precinct planning
- Explore the potential that this precinct region has for residential development, therefore preventing further urban sprawl into the valuable ecological surrounds
- Enhance existing open spaces through rehabilitation and improved planning, while increasing accessibility and connections to the surrounding environment
- Landuses proposed within the precinct development should be uniqe and should not replicate those of surrounding areas, therefore a unique need and character should be created within the precinct region



5.2. Precinct circulation and movement information (Knysna Municipality 2000 & Howard 2005)

KEY POINTS TO CONSIDER:

- Provide adequate, safe and legible pedestrian access to the various transport nodes and parking facilities
- Provide adequate parking facilities for all vehicle types near to the transport nodes and those facilities that require parking
- Taxi and bus stops should be positioned appropriately in the precinct
- Relate the functions of the proposed precinct to the intensity of traffic of the associated routes
- Where necessary alter traffic intensity by adequate design, such as traffic passifying methods and the 'Woonerf' concept (discussed in precinct design discourse)
- Route surfaces should be appropriate to the user requirements
- Create links to existing pedestrian routes



5.3. We must attempt to reduce the need for vehicular transport as much as possible, with the promotion of sustainable transport systems (Eckbo 1964)

5.4. Precinct ecology (Knysna Municipality 2000 & Howard 2005)

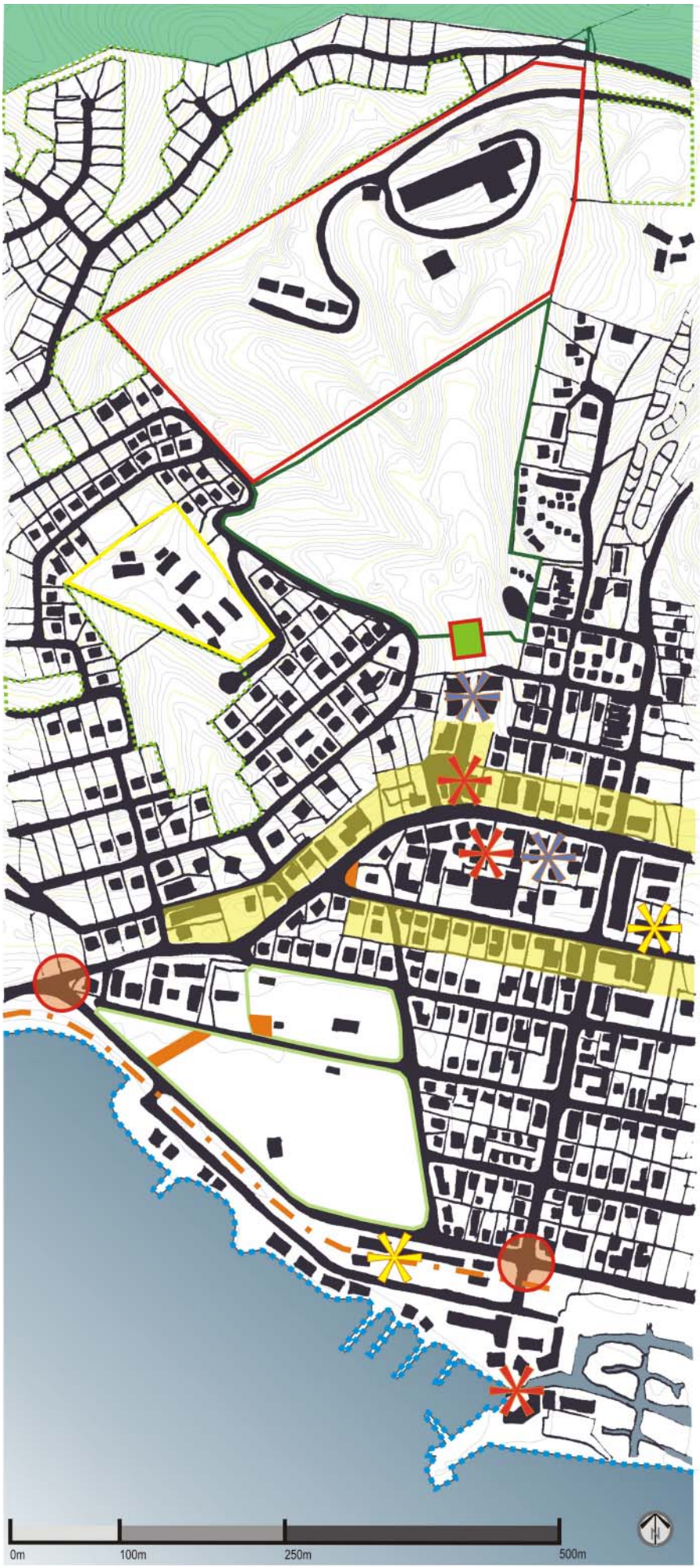
LEGEND: ECOLOGY

- HIGH VALUE INDIGENOUS HABITAT
- PREDOMINANTLY INFESTED WITH ALIEN INVASIVE VEGETATION, REHABILITATION REQUIRED
- LOW VALUE HABITAT DUE TO HUMAN INTERVENTION & LAND SHAPING, CONSERVATION & PROMOTION OF OPTIMAL USE REQUIRED
- INDIGENOUS & ALIEN VEGETATION MIX, REHABILITATION OF ALIEN INFESTED AREAS REQUIRED
- ESTUARY EDGE WITH HIGH AMOUNTS OF SEDIMENTATION, POTENTIAL AS RECREATION & EDUCATION AREA
- HIGH POTENTIAL VACANT & UNDERUTILIZED 'GREEN' SITES WITH MIXED INDIGENOUS & EXOTIC VEGETATION
- DEGRADED VACANT SITE WITH HIGH POTENTIAL FOR SOCIO-CULTURAL, ECONOMIC & ECOLOGICAL FUNCTIONS
- INDIGENOUS TREE
- ALIEN INVASIVE TREE
- EXOTIC STREET TREE WITH HISTORIC VALUE
- 2 METRE CONTOURS

KEY POINTS TO CONSIDER:

- Only indigenous vegetation to be established within the precinct
- Promote the establishment of more street trees, while exploring the variation between mixed, random planting, and specific, proportional planting (refer to precinct design discourse)
- Plan for the rehabilitation of degraded areas by promoting habitat creation and development
- Eradicate all alien invasive species through an Integrated Pest Management Plan incorporated into the Environmental Management Plan
- Maintain exotic trees if they have historic value and high aesthetic value
- Each district and transition zone should have a specific approach to planting, as discussed the the precinct design discourse

5.5. The servitude alongside the sports field which requires rehabilitation to increase ecological value (Howard 2005)

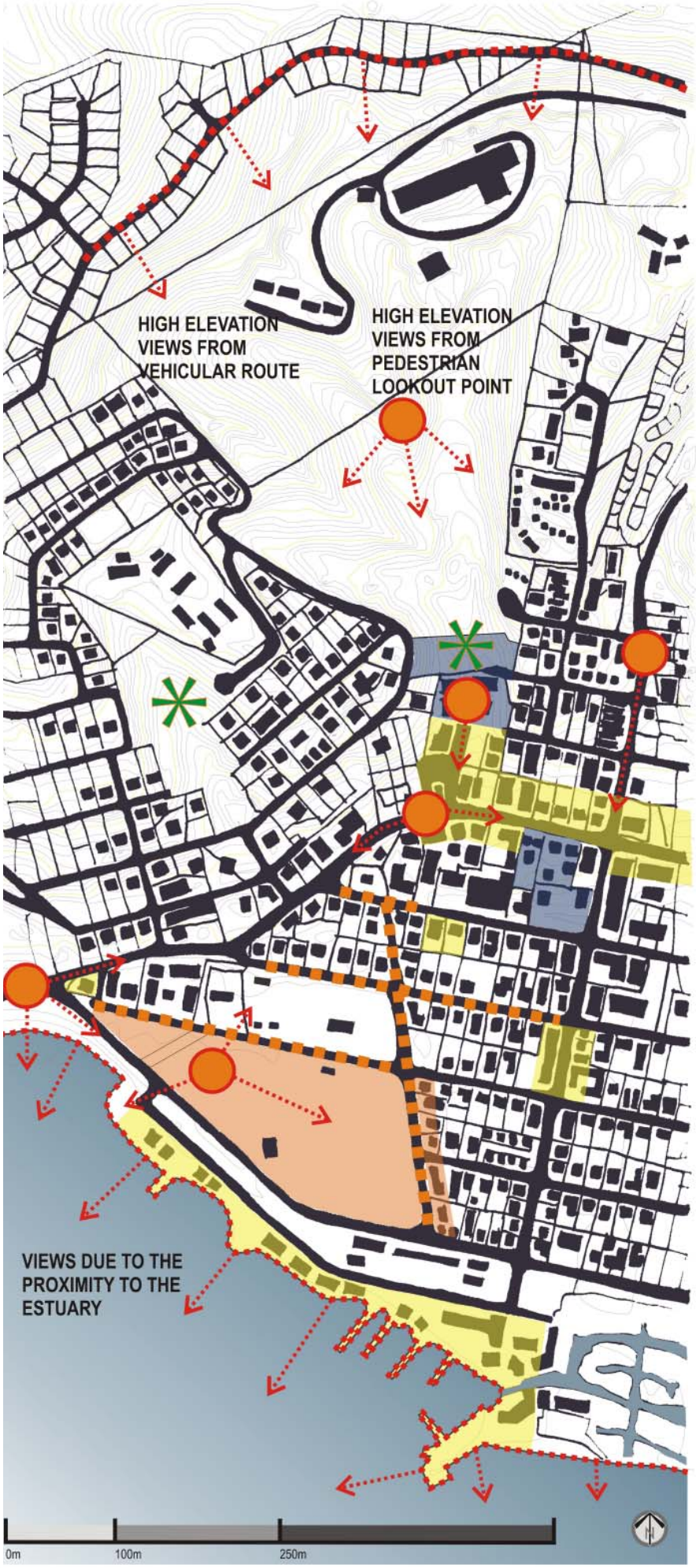


5.6. Precinct nodes, edges and landmarks (Knysna Municipality 2000 & Howard 2005)

KEY POINTS TO CONSIDER:

- Propose guidelines for the increased safety and improved permeability of existing open spaces
- Increase accesibility of community sportsgrounds while providing privacy where necessary, therefore create a mix of private, semi-private, semi-public and public spaces
- Create legible and safe, pedestrian-pleasant links to existing nodes and proposed nodes
- Explore the potential of creating gateways and landmarks at key areas within the precinct so that they have a role within the urban realm
- Enhance the vibrant commercial edge and use it to promote the precinct development by creatiing clear links and underlying connections through functions and aesthetics
- Provide nodes and paths along the estuary edge which are linked to nodes and paths of the precinct development

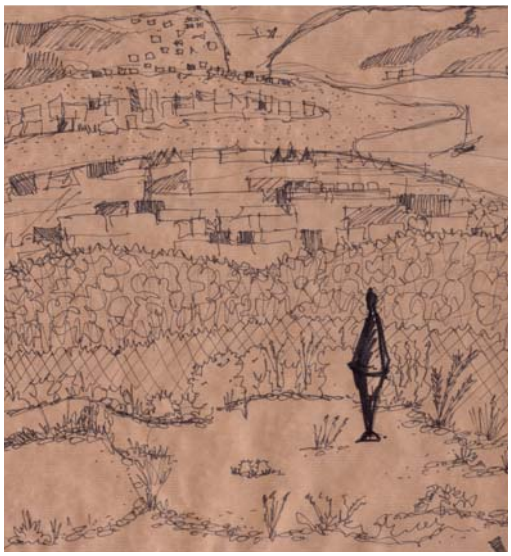
5.7. The commercial and tourist node directly south of Pledge Nature Reserve (Howard 2005)



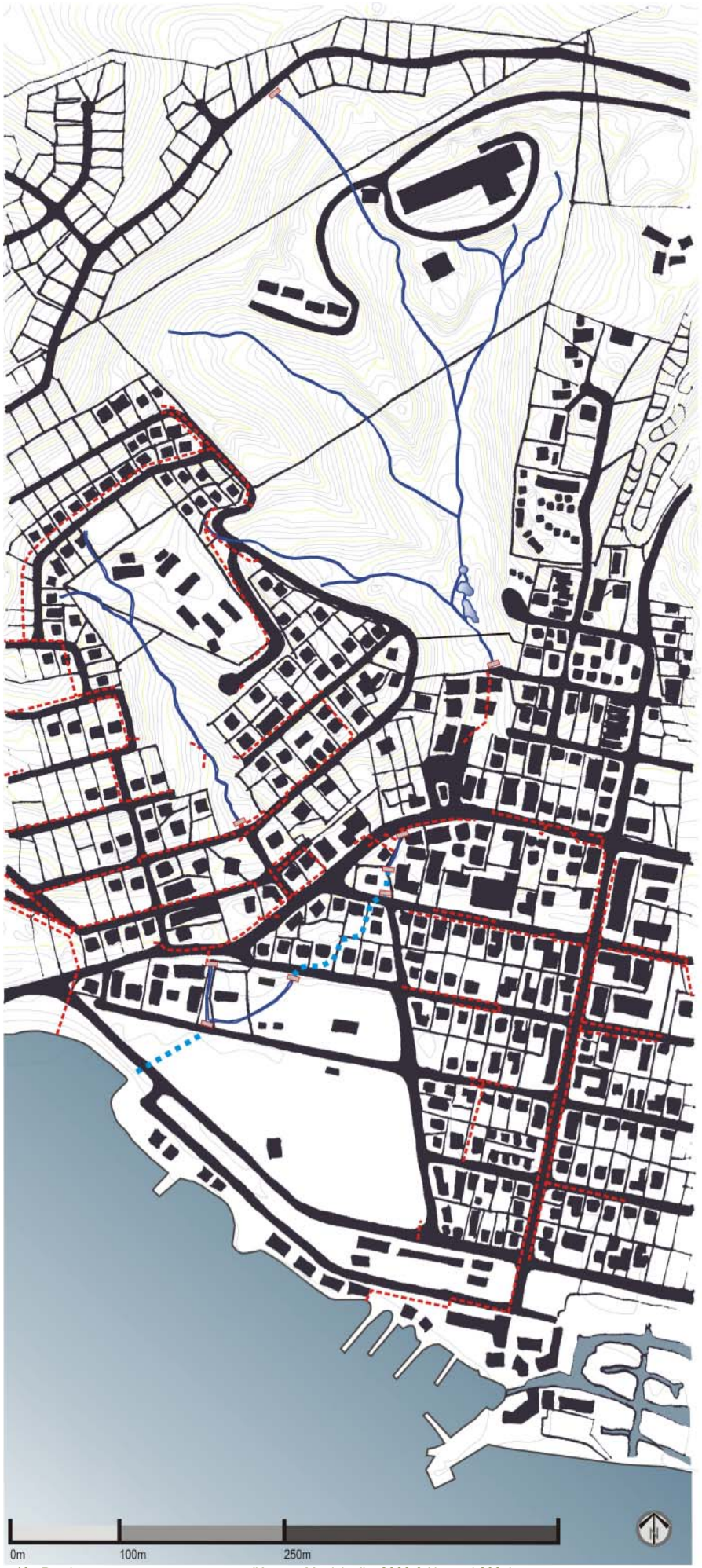
5.8. Precinct views, sense of place, energy and vitality (Knysna Municipality 2000 & Howard 2005)

KEY POINTS TO CONSIDER:

- Enhance existing views and create new views within the precinct development
- Explore the potential to create areas within the precinct with a high sense of place by providing unique functions and a specific user-friendly character in which the community feels satisfied
- Stimulate urban renewal projects through this urban precinct
- Increase vibrancy and activity in allocated areas, as these areas will act as catalysts for activity for the rest of the urban surrounds



5.9. Sketch of the view of Knysna from the look-out point of Pledge Nature Reserve (Howard 2005)

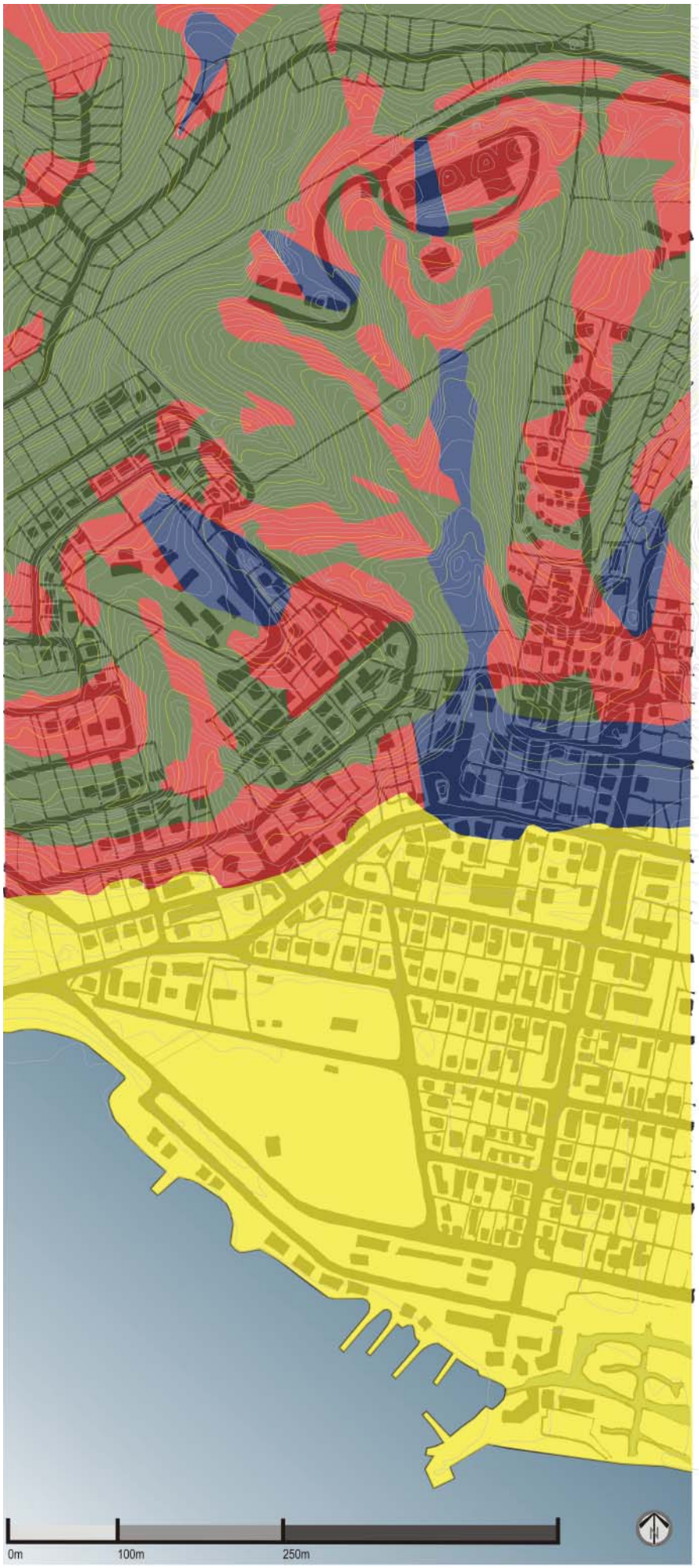


5.10. Precinct stormwater management (Knysna Municipality 2000 & Howard 2005)

KEY POINTS TO CONSIDER:

- Explore the potential of revealing subsurface water sources and drainage lines where possible in the precinct development
- Create symbolic representations of the water lines
- Design those areas of water tranisition from surface to subsurface so that both functionality and visual appropriateness is increased
- Stormwater should be retained and managed on site as much as possible, through retention, detention and infiltration methods
- Provide guidelines on flood management and prevention within the Environmental Management Plan
- Explore the idea of reconnecting people to water, so that the community has an understanding and consciousness of the importance of water quantity and quality within the urban environment
- Explore the potential of education via water through the precinct, as water and the symbolic representation of water is the primary feature and linking element within the precinct design (refer to precinct design discourse)

5.11. A stormwater outlet into the estuary. Siltation has become a problem in the hydrological environment (Howard 2005)



5.12. Precinct slope analysis (Knysna Municipality 2000 & Howard 2005)

KEY POINTS TO CONSIDER:

- Use the great variation in slope as a feature and gain design inspiration from various slope treatment methods
- See the slope as an opportunity rather than a challenge and explore the potential of terracing, retaining walls, berms and the combinations of these
- Explore various methods of slope stabilization and include these as guidelines within the Environmental Management Plan

5.13. The varied topography of Knysna. The town's altitude stretches across approximately 150m (Howard 2005)

5.14. An art sculpture created as a feature around a litterbin at the Knysna Waterfront (Howard 2005)

5.2. PRECINCT ANALYSIS SUMMARY

5.2.1. OPPORTUNITIES

- Areas with high ecological value having potential for habitat creation and community environmental education
- Vacant and underutilized sites that have potential for community upliftment projects as well as urban greening
- Stunning views in all directions to be utilized
- Existing infrastructure and services throughout the precinct area
- Proximity to the lagoon and harbour edge
- Proximity to the CBD, therefore decreasing vehicle-use
- Proximity to public transport nodes
- Proximity to schools
- Working within a dynamic community of entreupeneurs and artists, who have respect for the natural environment
- Great opportunities exist due to the topographical variance of the town

5.2.2. CHALLENGES

- Achieving effective ways of linking the various spaces to create an open space system
- The community's reliance on vehicular transport
- Flooding of Pledge Nature Reserve during heavy rains
- Designing for permeability while maintaining security
- Motivating the use of a portion of the sports grounds for medium density housing
- Raising streams from their subsurface positions
- Riverine and slope stabilization
- Financing of the project, especially those sections of the project that are community and not economically orientated
- Controlling and eradicating alien vegetation species
- Controlling sedimentation within the riverine system and estuary
- Pollution control
- Habitat protection in public areas

5.15. A portion of an exposed stream which is polluted, and has low ecological value (Howard 2005)

5.16. A concrete channel which has no ecological value (Howard 2005)

5.17. This area adjacent to the Knysna Main Road has great potential as a high value open space (Howard 2005)

5.3. PRECEDENT STUDIES

The approach to each study varies according to what the desired objective and outcome is. The precedent studies chosen have definite similiarities to the thesis proposal, either due to location, function, challenges and opportunities, symbolism, ideals, or a combination of these. A summary of the key points will be provided as a guideline for the future design process.

5.3.1. BOGOTÁ DRESSES IN GREEN

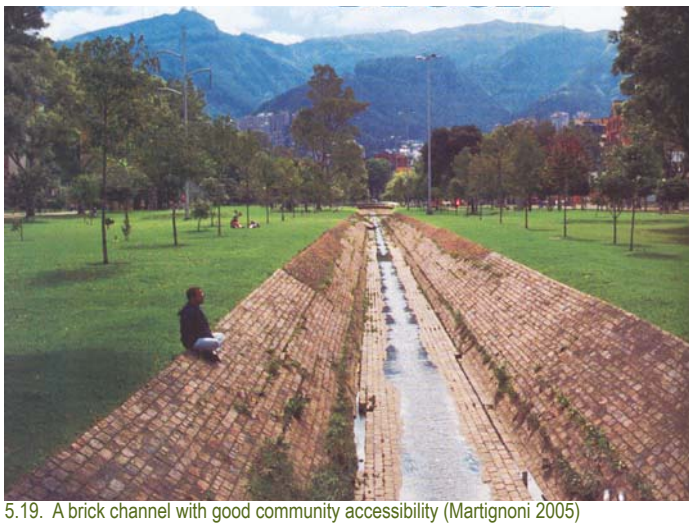
Between 1997 and 2003, Bogotá, Columbia's capital city, invested in public space like never before. The city is bounded on the east by a ridge of mountains, the East Hills, and on the west by the Bogota River. Many streams flow toward the city from the mountain basins, and secondary rivers run along the edges to finally merge with the Bogotá River. This system of rivers, lakes, and wetlands provides drinking water for the city as well as rich habitat for fish and wildlife. (Martignoni 2005)

Poverty and crime had physically degraded many neighbourhoods, and negative impacts were felt due the city's rapid and unplanned expansion with the building of urban and suburban settlements in environmentally vulnerable areas. Bogotá city went about creating and implementing a public space renovation plan, which consists of three sections, namely the Wetlands Restoration Plan for the Bogotá River Greenbelt, a Management Plan for Bogotá's Mountain Preserve and its reconnection to the city's green spaces, and plans for urban park system revitalisation and reforestation. (Martignoni 2005)

The Wetlands Restoration Plan was required due to problems of flooding and poor water quality. Because the lakes and wetlands naturally collected and stored stormwater runoff, flooding was not an issue in the city's early years, but in the nineteenth century, when settlement started to sprawl without any planned drainage or sewerage systems, those water bodies became the sole repositories for all urban waste and served as natural sewerage-treatment plants. To alleviate increasing water pollution the growing city built aqueducts, drainage systems, and treatment plants; and over time, the four primary rivers were transformed into underground canals, erasing them from view, and consciousness. Residents eventually lost awareness of the vital link between the city's physical and cultural landscape and the natural environment. The plan for the Bogotá River Greenbelt was to recreate the river's natural characteristics and native flora, including the aquatic ecosystems throughout the city, and establish new ones as part of a connected wetlands network. One popular wetland, the *Santa Maria del Lago*, illustrates how successful rehabilitation of a degraded place can elicit a conscientious response from its users, as before commencement of the project, the 7,3 hectare wetland, located in a residential area, was an unofficial dumping ground, filled with trash and closed to the public. Untreated sewerage seeping into the site mingled with stormwater. The project team went about piping the wastewater into the city sewerage system and allowed the natural depression that forms the wetlands to capture free-running stormwater. They replaced sickly eucalyptus and acacia trees with an assortment of native aquatic plants, shrubs, and trees. A grassy expanse with benches, paths, and other amenities now surrounds a roughly circular shallow lake, the natural form of the original site. Today the spot is popular with community residents, who take excellent care of it. In some cases the rehabilitation of existing wetlands has been controversial with the public because some of the designs lack a naturalistic appearance, for example the use of concrete to contain and channel surface water. (Martignoni 2005)

5.18. A study of the rehabilitation of the Bogotá wetland system (Martignoni 2005)

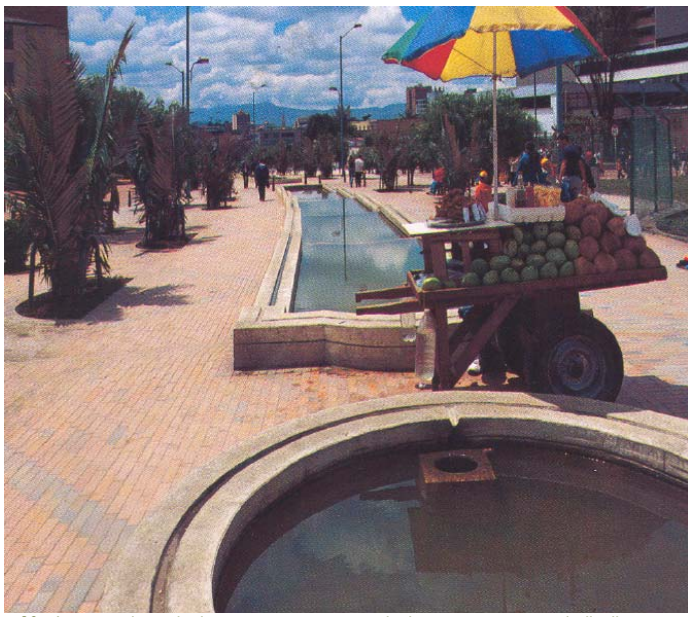
The Management plan for the Mountain Preserve and the reconnection plan for the City Green create intriguing links, both visual and ecological between Bogotá's natural and built landscapes. The fundamental purpose of the reconnection plan is the preservation of the cultural and natural components of the mountain landscape, understood as a whole, and its relationship with the city. This relationship was historically both visual and functional, taking the forms of rivers and streams flowing from the mountain into the city, but as most of the rivers and streams dried up or were piped underground, that link was lost. The plan strives to recreate that unique connecting ecosystem. (Martignoni 2005)



5.19. A brick channel with good community accessibility (Martignoni 2005)

The aims and vision of the City of Bogotá was to work beyond the level of aesthetics while fostering social and environmental sustainability through urban design. Specific focus was placed on community participation, restoration of the natural environment, and improvement of the quality of built public space. (Martignoni 2005)

Water served as the unifying theme in all three projects, symbolically emphasising water's cultural and historical importance to Bogotá, while water sources were physically restored wherever possible. Water was treated as a visual thread linking the mountains to the city via channels lined with stone, brick, grass and other materials, through parks and linear green spaces, forested avenues and streets, bike paths, and walkways. Therefore water is the vital link, not only between diverse sites, but also between past and present, space and time. In everything the design team considered how to revitalize the river and wetlands as ecological and recreational sites and how to recover their original functions and natural attributes. (Martignoni 2005)



5.20. At some places in the open space system design streams are symbolically represented by water features (Martignoni 2005)

5.3.2. DURBAN COMMUNITY OPEN SPACE SYSTEM

In order to demonstrate the advantages of improved environmental management to local communities, a project was undertaken to create recreational open spaces in high-density residential areas that would contribute to the ecological functioning of Durban's open space system. (Ethekwini Municipality 2005)

The project was also intended to address issues such as:
1.Poverty alleviation
2.Improved quality of life
3.Equal access to resources
4.Job creation (Ethekwini Municipality 2005)

The Environmental Management Branch was granted capital funds for the project and worked in partnership with Parks Department officials (the implementing agent for the project) and local councillors in selecting project sites in five previously disadvantaged community areas. In all the projects it was stipulated that part of the budget should be used for the production and erection of educational signage. A further requirement was that local labour should be used in the development of these sites wherever possible. (Ethekwini Municipality 2005)

The different types of open spaces developed included:
1.Children's and sports playgrounds
2.Riverine walking trails
3.Picnic sites (Ethekwini Municipality 2005)

The key problems encountered were:
1.Operational funds were not budgeted for by the Parks Department (they had assumed these would be forthcoming from the Environmental Management Branch)
2.Vandalism
3.Wasted resources as a result of poor project management, and
4.Disgruntlement of local communities at being involved in the development but not the maintenance of the project areas (Ethekwini Municipality 2005)

The problems encountered in the five project areas highlighted a number of issues that have relevance for sustainability planning in general namely,
1.The need for linked capital and operating budgets.
2.The need for effective and well-coordinated project management from cradle to grave.
3.The need for effective communication between line functions and formal definitions of project responsibilities.
4.The need to maximise stakeholder ownership through involvement in all stages of the project cycle: planning, implementation and management.
5.The realisation that the cheapest solution is not always the most sustainable one. (Ethekwini Municipality 2005)

5.3.3. JOHANNESBURG OPEN SPACE GUIDELINES

The following guidelines for open space planning for the province and Greater Johannesburg have been compiled by Gauteng Nature Conservation (Grobler, 1996):
1.Large open spaces are better than small ones, as bigger areas will maintain a higher diversity of species. Such areas tend to withstand disturbances for longer periods of time, as natural processes function more effectively;
2.The principle of concentric zoning should be applied where a core open space exists with minimal human activity (passive recreation), surrounded by a buffer area where more human activities are allowed (active recreation). It is therefore not advisable that high density development takes place on land directly neighboring a core nature area;
3.No development should take place in the 1 in 50 year floodline, plus an additional 40 meters outside this line (to accommodate higher floods due to densification in the catchment). This 40m distance will also keep indigenous vegetation intact and allow for rehabilitation of the area;
4.Evaluate whether waste land and disturbed land could form part of an open space system;
5.When developing and managing open spaces, the safety aspect should be recognised and addressed;
6.Consolidated open spaces are better than fragmented spaces;
7.Where land needs to be conserved as open space, but ownership vests in a private person, development restrictions should be applied to that area;
8.Any new vegetation planted should be indigenous;
9.Disturbed open spaces should be rehabilitated and managed with the emphasis on removing aggressive invasive plants and replacing them with indigenous species;
10.Open spaces should not only have a recreational function but should simultaneously have a conservation function;
11.Adopt an ecological approach when assessing the amount of open space to be provided; and
12.A policy should be formulated for areas where red data species occur. (Greater Johannesburg Metropolitan Council 2000)

According to the Local Agenda 21 Process the following issues still need attention:
1.Encroachment onto and use of public open spaces for business purposes
2.Stringent measures to control use of open space
3.Design of public open space and parks
4.Assessment of whether there are sufficient open spaces and parks in the Inner City
5.Pathways and paving throughout parks
6.Greening of the Inner City (Greater Johannesburg Metropolitan Council 2000)
7.Control of use of parks

According to the Metropolitan Open Space study completed by Mark Wood Consultants in 1994 the main problems associated with open space are:
1.Implementation and funding
2.Spatial planning
3.Status of, or attitude towards open space
4.Environmental conservation
5.Social needs
6.Public participation (Greater Johannesburg Metropolitan Council 2000)

5.21. A view of Johannesburg from the perimetre gold mine dumps (Dodd & Donald 2004)

5.3.4. THE COMPANY'S GARDENS, CAPE TOWN

Key points regarding the planning and design of open space corridors were observed during a visit to the Company Gardens in Cape Town.

- The treatment of stormwater and existing streams in surface vegetation- and rock-lined channels. These features are both aesthetical and ecological, as water is dissipated and aerated, and habitats are created in and along the water body
- Pedestrians are the primary users of this corridor with pedestrian-friendly and safe routes and pathways
- Signage is made legible with symbols and pictures
- Elements in the landscape, such as lighting features, have added functions of promoting the awareness of current social issues, such as HIV-Aids
- There is a clear distinction between private, semi-private and public spaces
- Primarily indigenous vegetation is utilized, with the exception of roses and other similar plants in the formal gardens
- Views are accentuated as far as possible
- Historic elements, both ecological and human-made structural features, have been kept within this greenway, and are well-maintained and protected
- The space is well-utilized by a variety of users, namely tourists, school excursion groups, businessmen and women, students from nearby universities and colleges, and people that live and work in the area

5.23. Company's Gardens signage (Howard 2005)

5.24. A rock channel adjacent to the primary pedestrian route in the Company's Gardens (Howard 2005)

5.22. *Stelitzia juncea* in the Company's Gardens (Howard 2005)

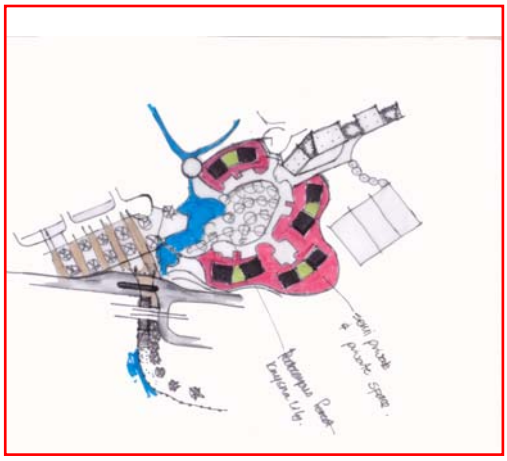
5.25. High permeability pedestrian boulevard adjacent to historic features in the landscape (Howard 2005)

5.26. Vegetated channel (Howard 2005)

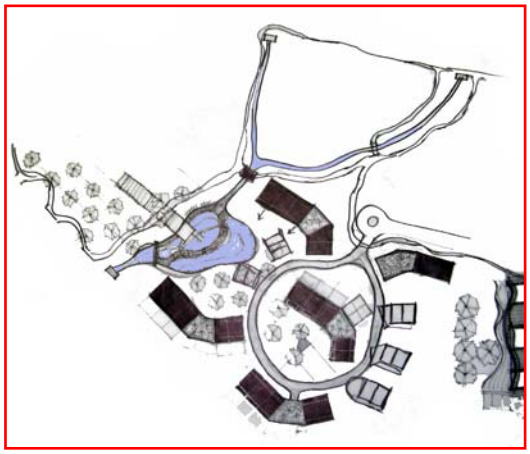
5.27. Pergola with historic value restored and maintained as a feature (Howard 2005)

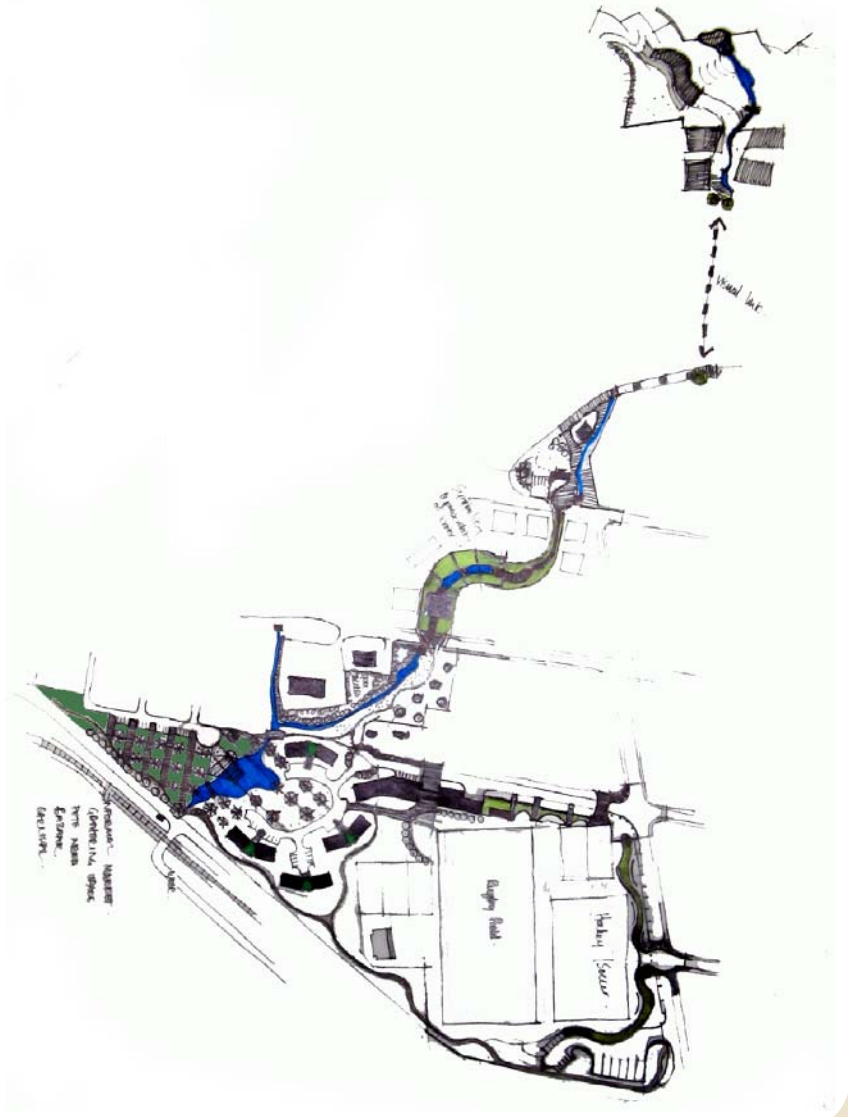
5.4. PRECINCT VISION STATEMENTS

- Add socio-cultural, economical and ecological value to existing urban open spaces,
- While responding to the community requirements and the context of the environment
- Creating unity throughout the precinct by using a design language which evolves within each unique space and function,
- And maintaining the baseline design principles so that what is achieved within the precinct may permeate into the rest of the urban environment.



PRECINCT DEVELOPMENT





5.5. MASTER PLAN

TRANSITION ZONE 1:
Infiltration of endemic vegetation from the nature reserve into this area. Social rehabilitation through ecological rehabilitation.

DISTRICT 1:
Environmental Management Plan to ensure the rehabilitation and continued ecological improvement of the reserve, therefore acting as an ecological node within the town.

TRANSITION ZONE 2:
Crucial link between Pledge Nature Reserve and the urban fabric of Knysna, as this area is to act as the primary access point into the reserve.

DISTRICT 2:
The southern portion of the reserve to be rehabilitated and designed to function as an environmental education centre, and as an integration region between nature and the surrounding urban setting.

TRANSITION ZONE 3:
Primarily a visual and superficial physical link is created between District 2 and 3 with the symbolic representation of the sub-surface stream, constructed of blue-pigmented concrete pavers and in situ concrete.

DISTRICT 3:
The proposed soup kitchen and community craft centre whereby unemployed individuals make products primarily of recycled elements.

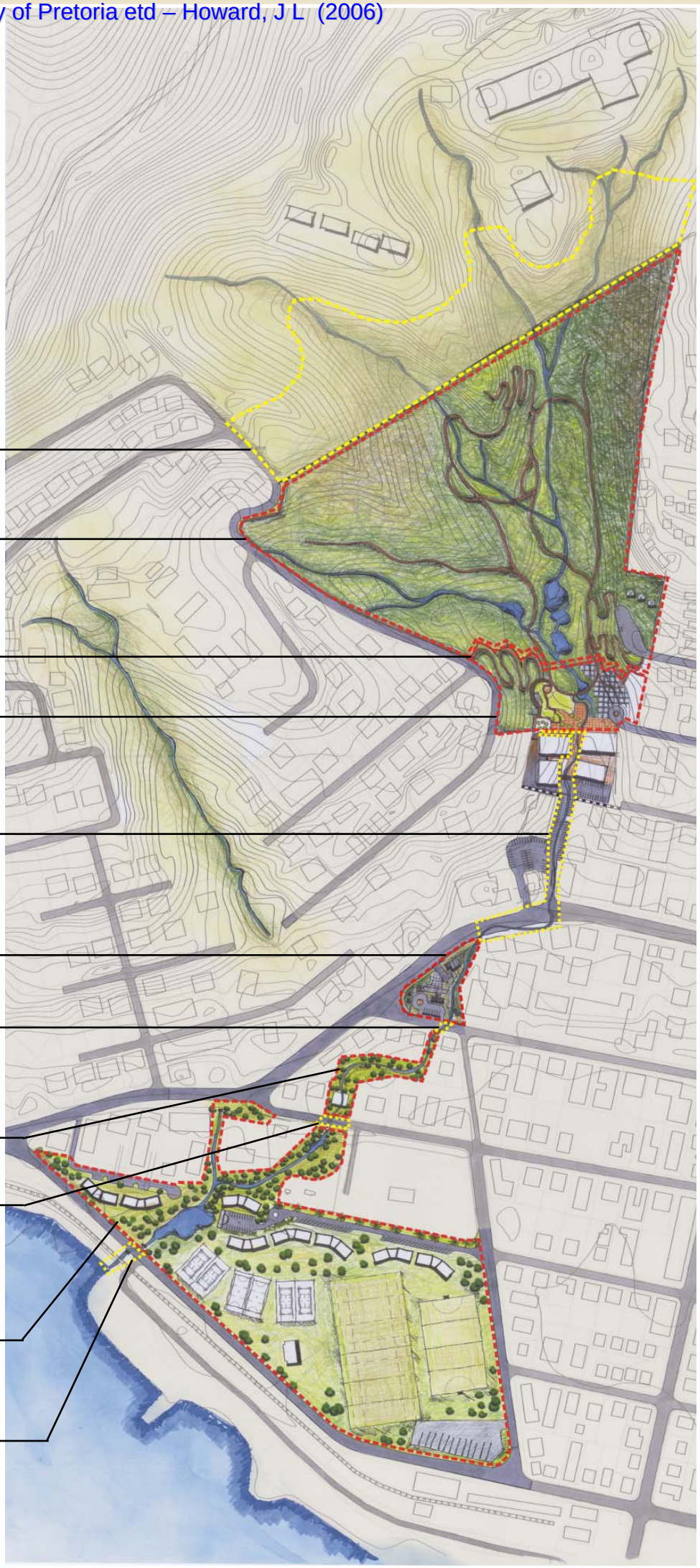
TRANSITION ZONE 4:
Pedestrian crossing and traffic passifier over the symbolic stream feature.

DISTRICT 4:
Proposed intermediate formal urban open space which links District 3 and 4. Surrounding buildings to open up and gain value from this space.

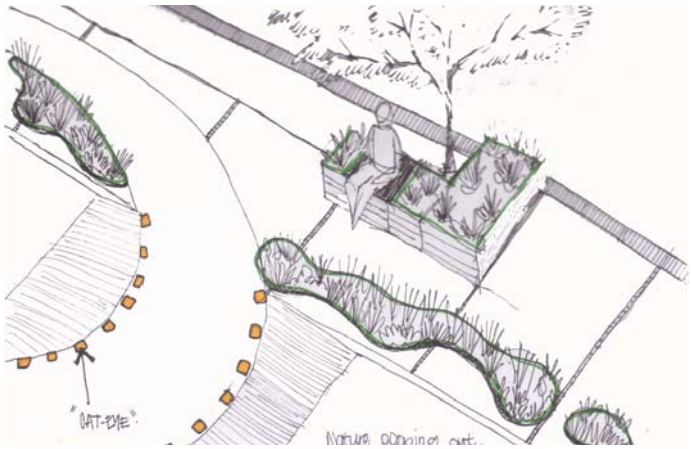
TRANSITION ZONE 5:
Pedestrian crossing and traffic passifier over the symbolic stream feature.

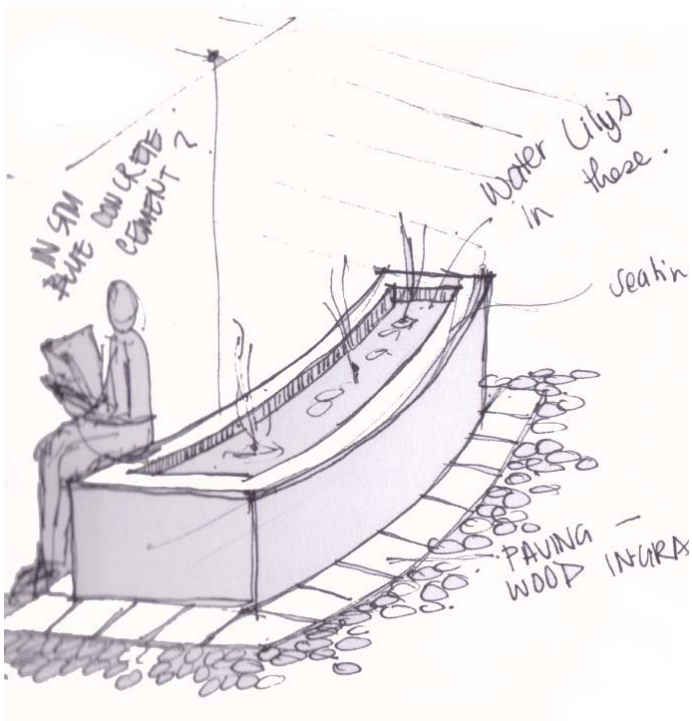
DISTRICT 5:
Proposed urban recreational park to be situated around proposed low- to middle-cost housing. The presernt sports ground to be replanned to improve efficiency of space and accessibility to the Knysna community

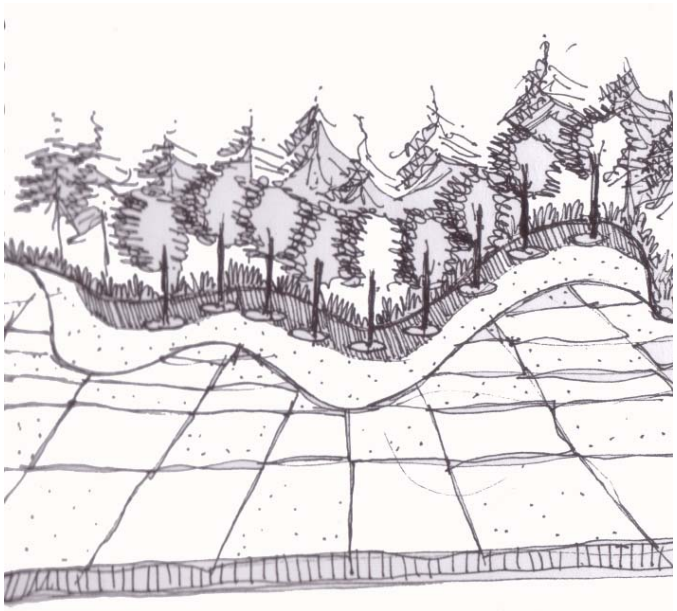
TRANSITION ZONE 6:
Pedestrian crossing and traffsic passifier over the symbolic stream feature. This tranisition zone is the final link between the proposed urban open space system and the estuary and its perimetre walkway.

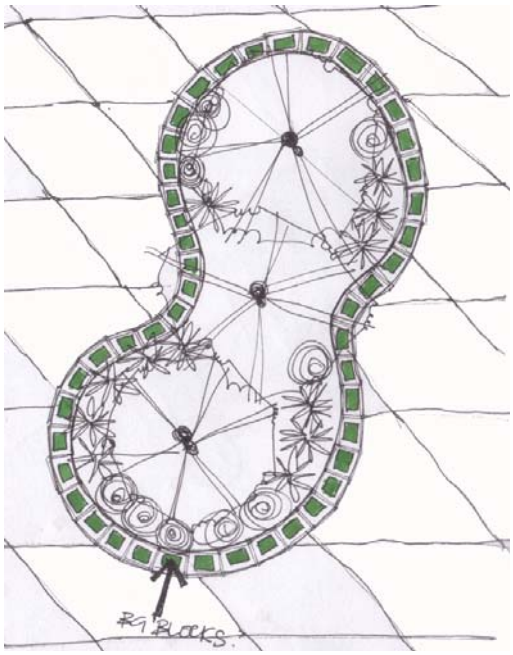


CONCEPT SKETCHES

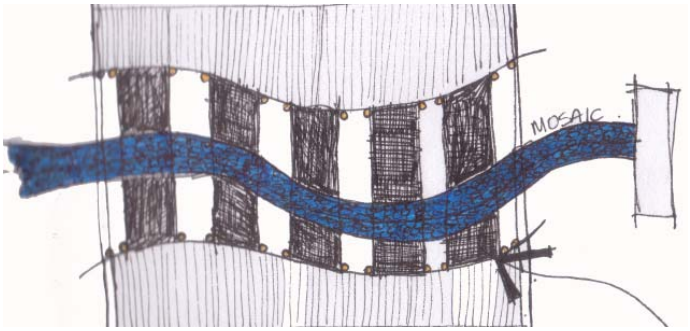


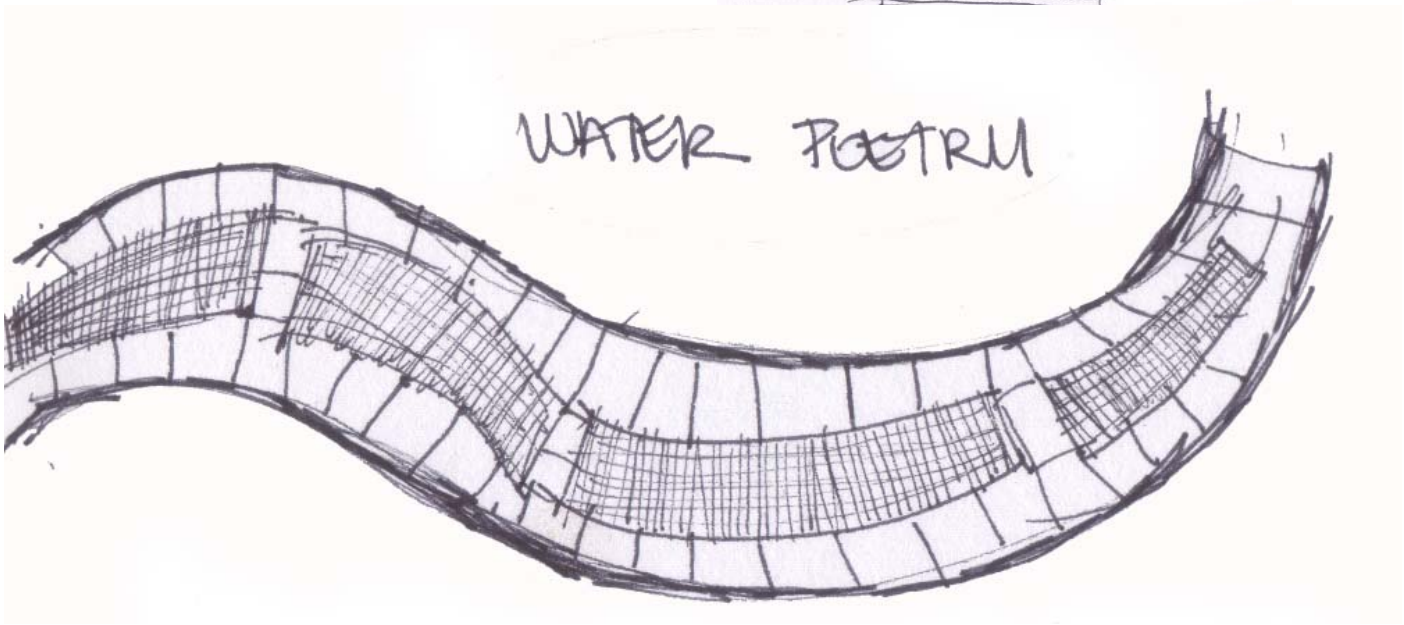


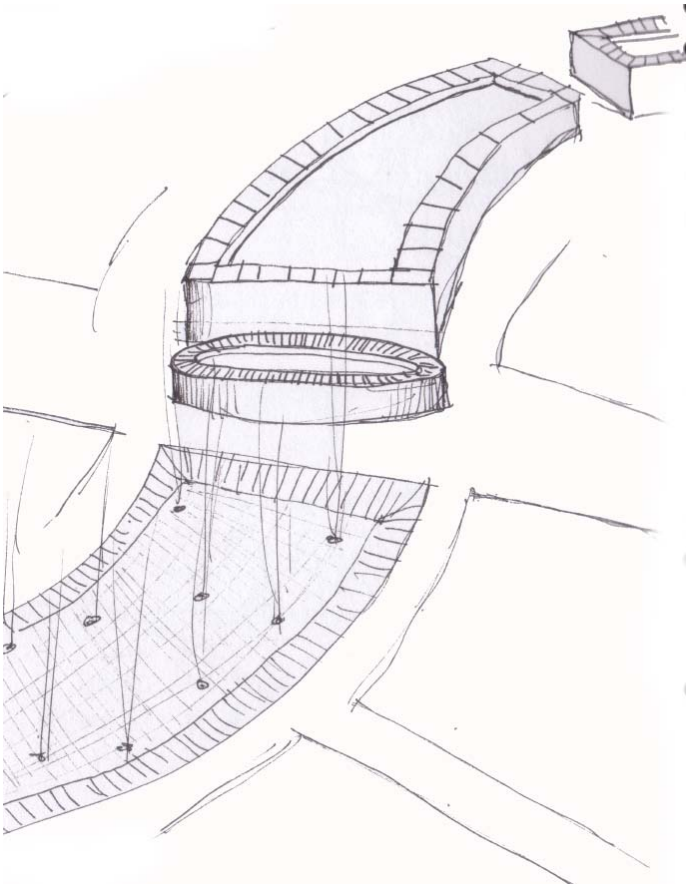


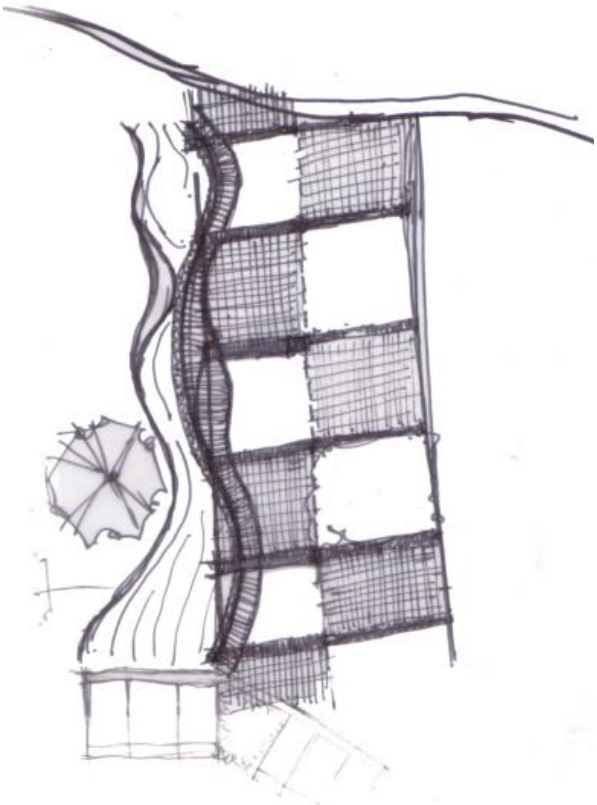


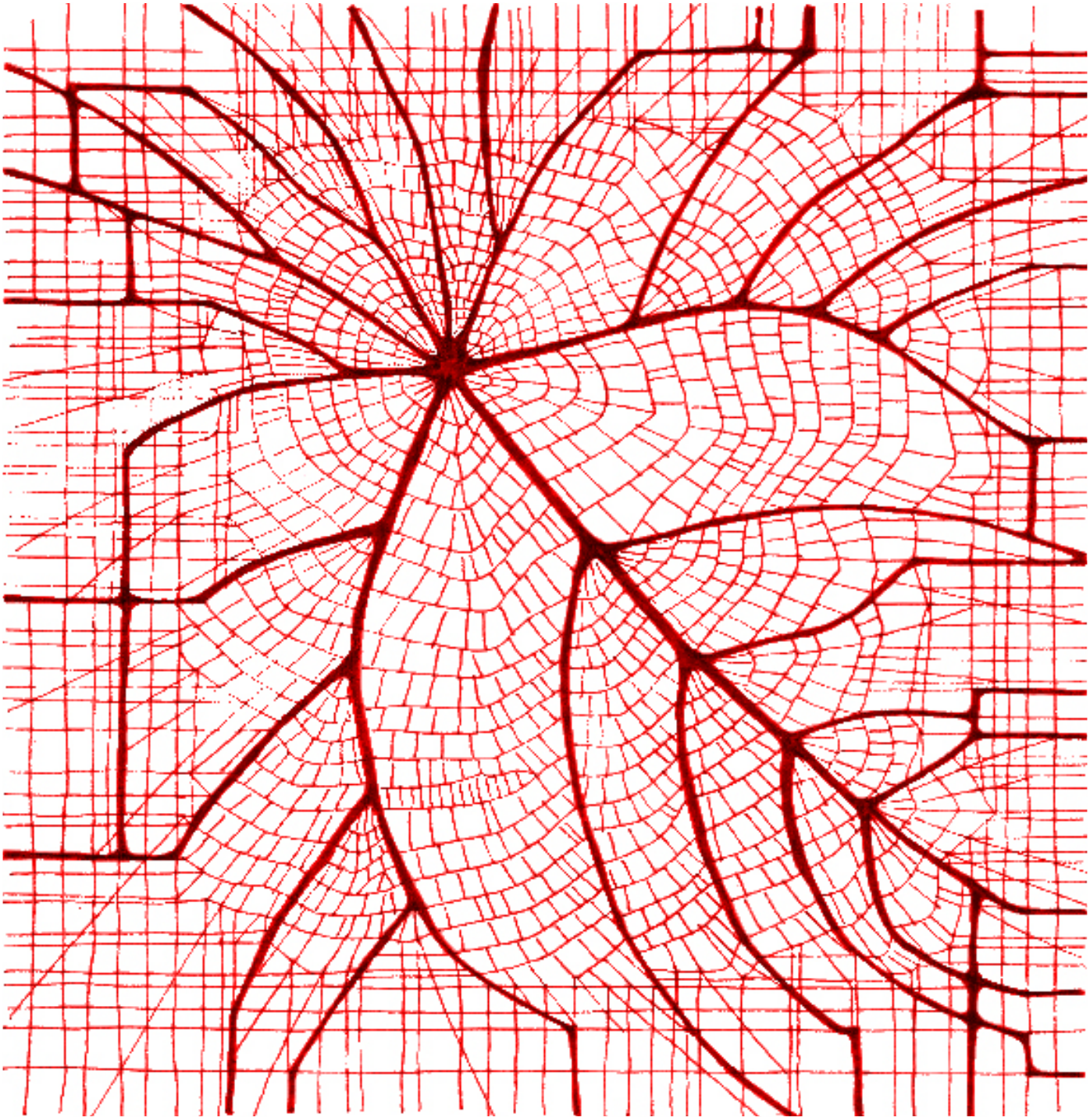
CONCEPT SKETCHES











chapter 6
precinct district

6.1. DISTRICT ANALYSIS

6.1.1. PLEDGE HISTORY AND DEVELOPMENT

Before Knysna was officially named a town, it was made up of small settlements, on of which was Newhaven. In 1820 George Rex gave 40 morgen of Eastford to Admiralty. Some of this land was used by the Admiralty to set up a small boat building yard on the edge of the lagoon. The remainder of the 40 morgen was used as commonage. In 1825, permission was granted for the village of Melville to be built on the common. The village grew slowly at first, and by mid-century only a handful of simple houses had been erected. However, as settlement of the Cape Colony intensified, the demand for the rich timber resources of the Knysna area grew rapidly. As the area flourished, the settlements of Newhaven and Melville experienced their first 'housing boom'. Woodcutters, furniture makers, coastal traders and related service providers settled in the area. It was to feed this boom and the subsequent demand for kiln-dried bricks, that brickfields sprang up around the edge of the settlements, where there was ample raw material and firewood on hand. One of these brickfields, on the northern edge of the town limits, as they were then, was in an area called Bok-se-Kloof. It is here, today, more than 100 years later, that the Pledge Nature Reserve lies, being restored, where possible, to its original natural beauty.

Just when the Bok-se-Kloof brickfield closed, is not known. Certainly, by the 1920's, the area was known as the "old brickfield". Daisy Eberhard, whose family was among the pioneers of the area, took over the 'Brownie' movement in 1927 and, wanting a suitable meeting place for her group, she approached the Knysna Town Council to allow her to use a portion of Bok-se-Kloof. In 1929, in support of her application, 500 yards of fencing was erected on the hillside and valley floor for her use. She described the area as being "adjacent to the old brickfield with a clear stream flowing through it." It was here that, under the guidance of Daisy Eberhard, generations of Knysna's youth first discovered the diversity of the Cape's botanical heritage.

Daisy Eberhard's "clear stream" did not remain clear for long. Ravaged by urban encroachment, the stream silted up and stopped flowing regularly. However, with its banks denuded and sterile, it frequently flash flooded after heavy rain. This caused silt and urban rubbish to be dumped into the fragil Knysna lagoon. The land itself, being part of a valley and largely unsuitable for housing, escaped major development. But it was left as waste ground – an informal dump, where invader vegetation soon took root.

The following year, the Department of Forestry received notice of an offer of sponsorship for a non-commercial forest conservation project in the Southern Cape. The Wildlife Society agreed to adopt Bok-se-Kloof as an environmental rehabilitation project for the Branch and a project presentation was drawn up which resulted in a generous rant from SC Johnson & Son, whose range of household products include the Pledge furniture care range, after which the Pledge Nature Reserve is named.

A group of vandalized buildings on the site, which once housed the Voortrekker Youth Movement, were bought by the Wildlife Society and presented to the Reserve. These underwent extensive renovations to provide a store, an office, toilets and a curator's cottage. Local business and individual support included the supply of tools, equipment and material and on April 3, 1989, Margaret Addinall, together with six workers, started the immense task of clearing the wattle jungle and other invader growth. On April 20, after having received approval from the Town Council, the Pledge Nature Reserve Management Committee was officially formed with Margaret Addinall as the Reserve's first curator. By the end of September, the worst was over and the transformations of the valley had begun. (Brochure)

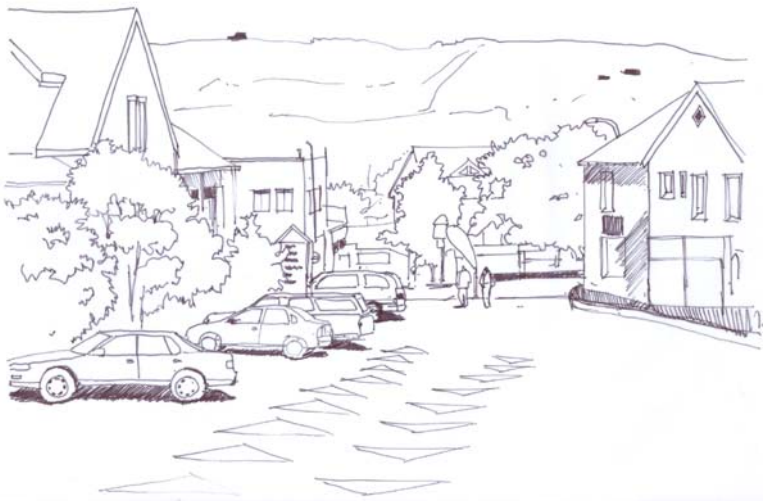
6.1. & 6.2. Indigenous vegetation species of Pledge Nature Reserve (Howard 2005)

6.3. Northern view of Pledge Nature Reserve from the proposed residential and commercial development site which is currently bus parking (Howard 2005)

6.1.2. MAP ANALYSIS OF DISTRICTS 2 AND 3

6.4. District study areas (Knysna Municipality 2000 & Howard 2005)

6.5. District surrounding land use (Knysna Municipality 2000 & Howard 2005)



6.6. Commercial and business land use to the south of Pledge Nature Reserve (Howard 2005)

6.7. Commercial facility to the left foreground, site for future commercial and residential development in the middleground, Pledge Nature Reserve in the background, with surrounding adjacent residential areas and the correctional facility to the north (Howard 2005)

6.8. District circulation & movement information (Knysna Municipality 2000 & Howard 2005)

6.9. Pedestrian footpath in Pledge Nature Reserve (Howard 2005)

6.10. Primary vehicular access point to proposed new development (Howard 2005)

6.11. The pedestrian access point via a stairway from the residential area to the proposed development site (Howard 2005)

LEGEND: LEGIBILITY

- FENCED EDGE
- PROMINENT ROAD EDGE BETWEEN RESIDENTIAL AREA & RESERVE
- EDGE DUE TO LEVEL CHANGE
- BOUNDARY WALL EDGE
- EDGE ACCESS POINT
- ECOLOGICAL NODE
- TOURIST INFORMATION NODES
- VIEWPOINTS & POTENTIAL VIEWS
- MODERATE TO HIGH SENSE OF PLACE
- 2M CONTOURS

6.12. District legibility information (Knysna Municipality 2000 & Howard 2005)

6.13. Barbed wire fence edge surrounding Pledge Nature Reserve (Howard 2005)

6.14. Limited information of and accessibility into the reserve (Howard 2005)

6.15. Structures on the reserve which serve as an office, curator residence, boardroom and toilet facilities (Howard 2005)

6.16. District hydrology and stormwater (Knysna Municipality 2000 & Howard 2005)

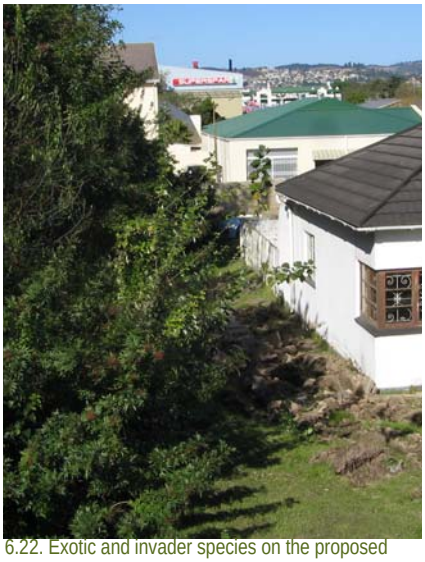
6.17. Poor quality of riverine downstream of Pledge Nature Reserve (Howard 2005)

6.18. A pleasant space is created by this water body in Pledge Nature Reserve (Howard 2005)

6.19. District vegetation (Knysna Municipality 2000 & Howard 2005)

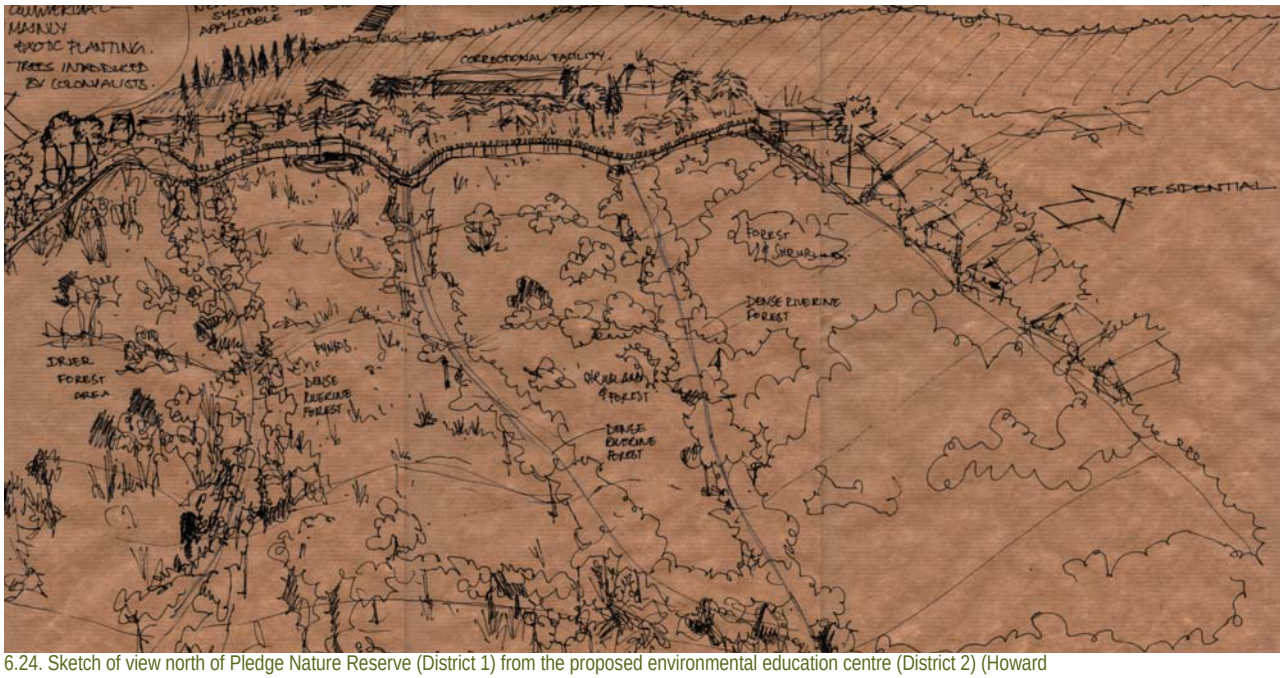
6.20. Pledge Nature Reserve dense vegetation on western boundary. Invasive specie problem (Howard 2005)

6.21. Degraded vegetation on the proposed new development site (Howard 2005)



6.22. Exotic and invader species on the proposed District 3 site (Howard 2005)

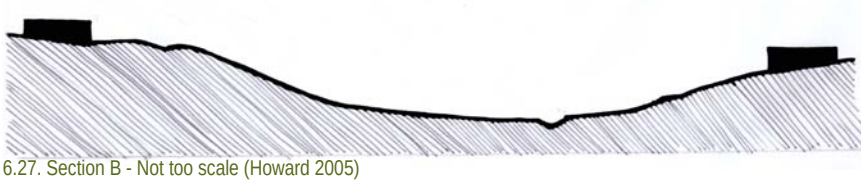
6.23. District micro-climate (Knysna Municipality 2000 & Howard 2005)



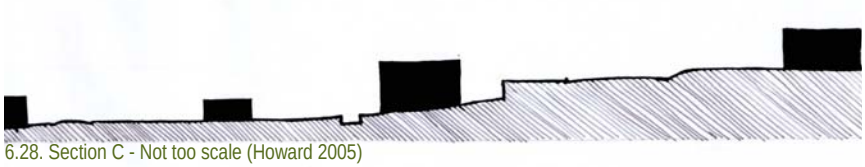
6.24. Sketch of view north of Pledge Nature Reserve (District 1) from the proposed environmental education centre (District 2) (Howard 2005)

6.25. District slope and contours (Knysna Municipality 2000 & Howard 2005)

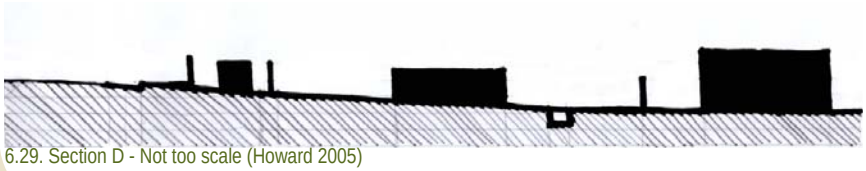
6.26. Section A - Not too scale (Howard 2005)



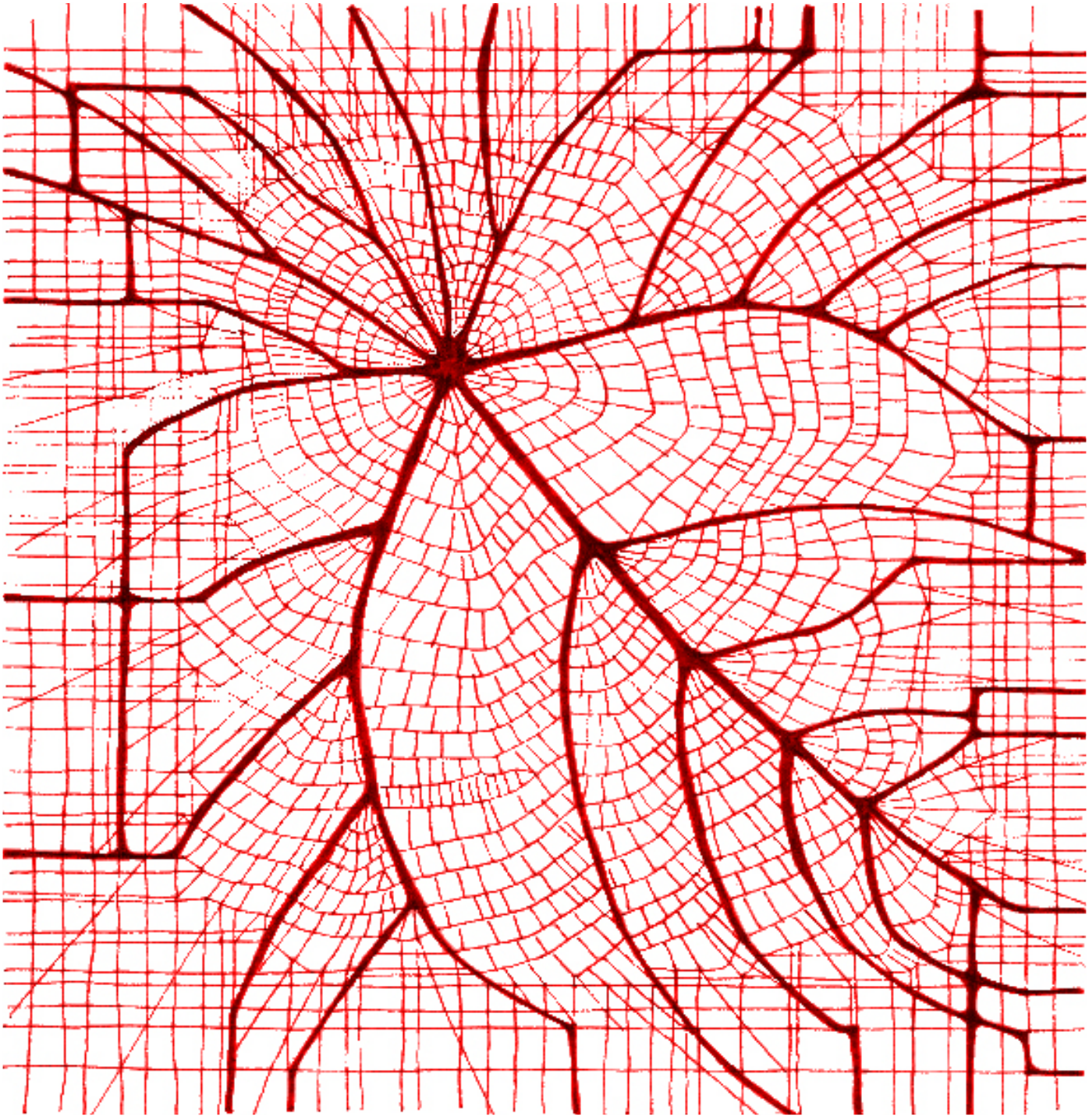
6.27. Section B - Not too scale (Howard 2005)



6.28. Section C - Not too scale (Howard 2005)



6.29. Section D - Not too scale (Howard 2005)



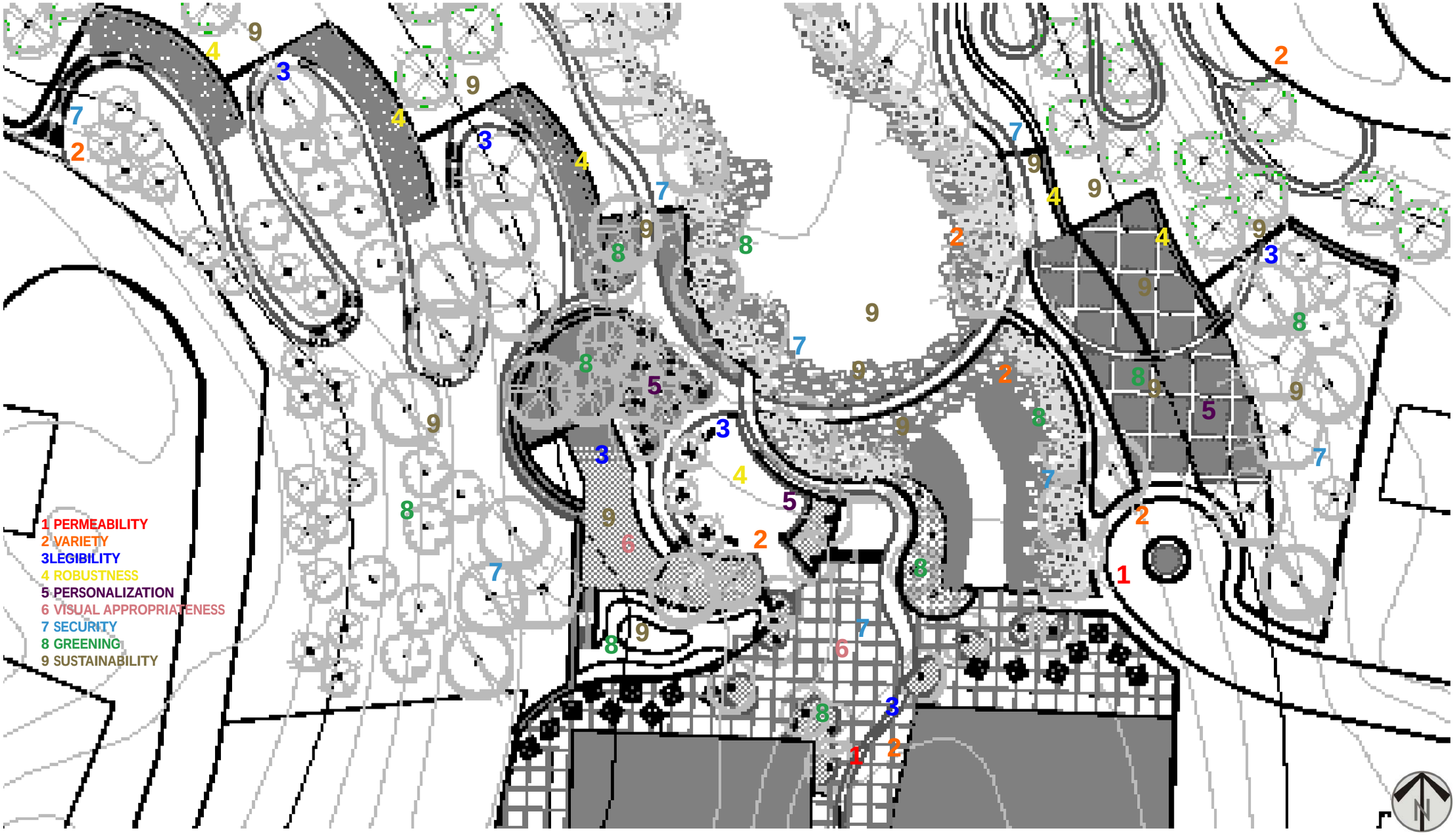
chapter 7
design development

7.1. INTRODUCTION

Within each district, design focus is layered according to the design principles discussed in Chapter 4.

7.2. ENVIRONMENTAL EDUCATION CENTRE: DISTRICT 2

The creation of an environemtnal education centre on this brownfield site with the main design focus being rehabilitation, applicability to the site features, space creation, education through demonstration and experience, and the integration of the urban and natural environments in a cohesive manner. An essential factor is to increase the sites current social, economic and ecological value.



7.1. Plan of District 2: Environmental Education Centre (Scale 1:500)

7.2.1. PERMEABILITY

- Public transport accessibility - turning circle
- Disabled persons accessibility - ramps at most places
- Circulation routes take all users into consideration - ramps, steps and material use easily navigable
- Permeability represented by the 'gabion' element - promotion of transparency and seeing into the structure. Gabions used for most elements in this landscape (symbolism)
- Pedestrian traffic promoted - enough space and fluidity of movement
- Primary entrance points have high accessibility and legibility
- Commercial facility (nursery) close to primary access point
- Soil quality and water absorption improved by creating indigenous habitats
- Looking-window walls created as an educational element offering visual permeability into the nature reserve

7.2.2. VARIETY

- Skills development in a diversity of ways (gardening, information, sales, tourism)
- Seating provided in variety of positions (shade and sun, views)
- Variety of routes provided
- Spaces created at different scales for various associationis and experiences
- Variety of economic options (nursery, advertising, site rentals, tours)
- Variety of endemic vegetation and increased bio-diversity in as many places as possible
- Diversity inspired by surrounding natural habitats

7.2.3. LEGIBILITY

- Clear legibility between public, semi-public and private spaces by level differences, material changes, vegetation and hard landscaping
- Hierarchy of spaces created by accessibility and function
- Legibility signage legible and forms part of site furniture language

7.2.4. ROBUSTNESS

- Spaces are adaptable to changing functions (large or small gatherings, performances, flea-markets, lectures, fofrmal or informal gatherings)
- Required infrastructure is provided
- Site furniture is robust, being hardy to site conditions and uses
- Planting robust and hardy, being endemic and indigenous to the area

7.2.5. PERSONALIZATION

- Community allowed to personalize this space by creating 'rental squares' that community members can buy and propogate indigenous vegetation to sell to the nursery
- The community may use the space for education and performances, as well as advertising
- Services offered by this open space to be personalized by the community to add vibrancy and distinctness (tours, products sold in site shop, performances)
- Indigenous vegetation introduced to the community through rehabilitation of habitats and creation of new learning habitats

7.2.6. VISUAL APPROPRIATENESS

- Aesthetic, yet functional site furniture relating to the history of Knysna (nautical), using a mix of materials with corten, stainless steel, wire gabions, rocks, planting and timber
- Each element of site furniture within an overall language
- Lighting pollution minimised by using downlighters and the reflection of light downwards

7.2.7. SECURITY

- Primary access routes well lit, while secondary routes are not lit to prevent use and therefore a false sense of security
- Lighting design to be robust, weather- and vandal-resistant
- Thorny and spined vegetation is used at areas that may be high risk for hide-aways, as well as areas where habitats are to be protected

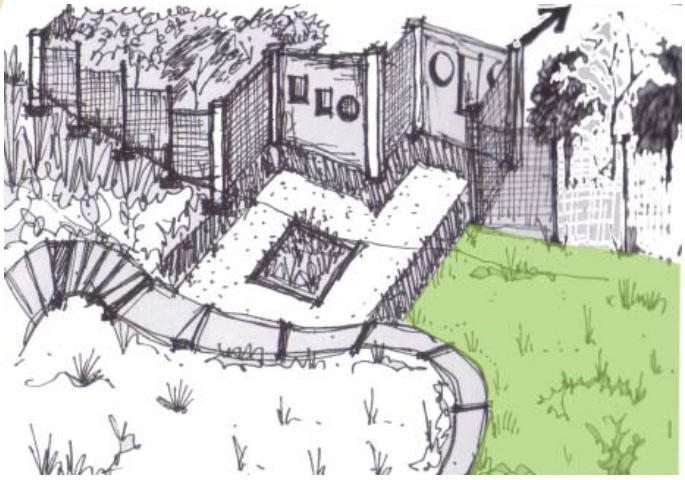
7.2.8. GREENING

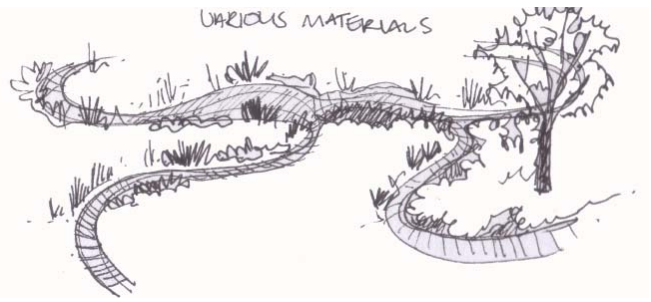
- Trees used to increase human comfort levels (shade and sun)
- Integration of organic and geometric, with organic represented by greening
- Vegetation to be hardy, therefore only a selection of indigenous species to be used
- Indigenous vegetation propogated on site in community gardens and used for rehabilitation
- Planting according to the desired ecological and educational requirements of the design, with the creation of wetland, forest, intermediate forest and fynbos biomes
- Semi-formalised planting at high-use areas

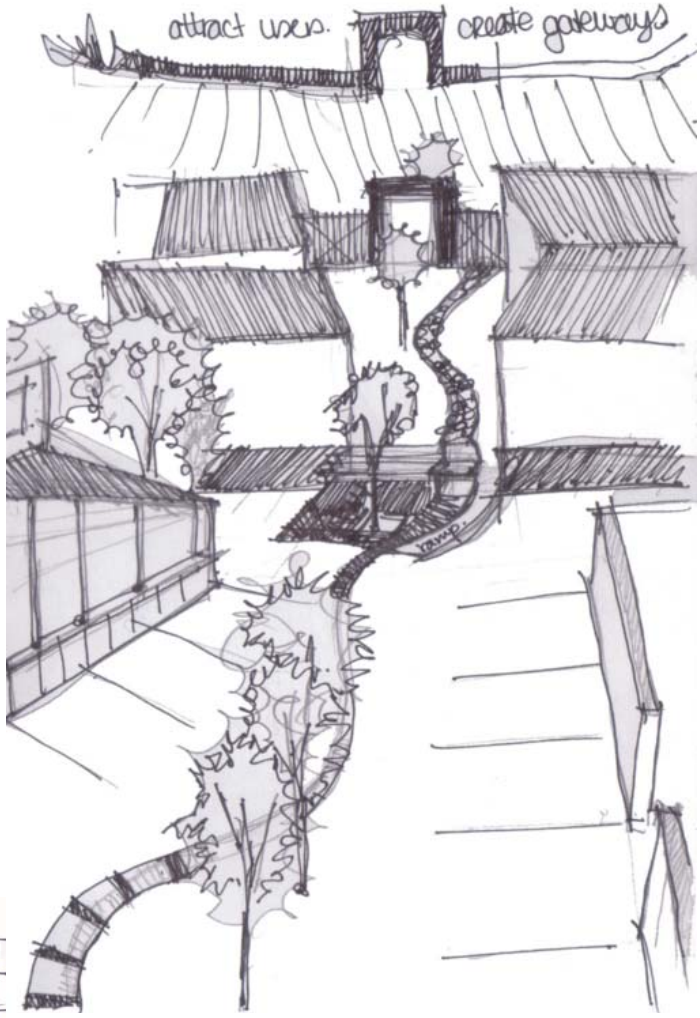
7.2.9. SUSTAINABILITY

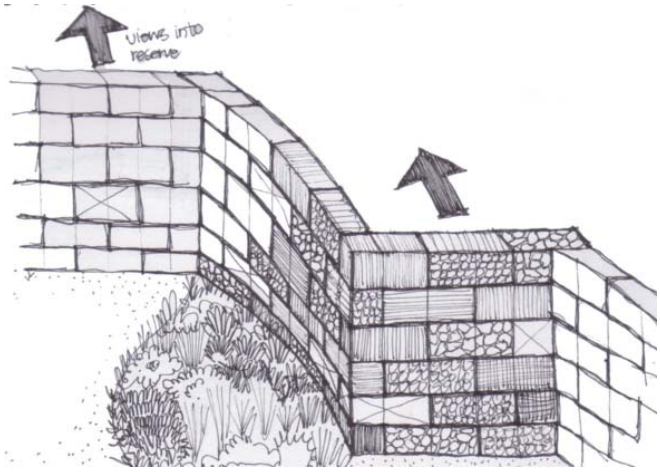
- Community participation in the community propogation gardens
- Local community services, materials, products and labour to be used in landscape features, structures and elements
- Eradicated trees to be used as a material - poles and lattices
- Slope paths and boundary walls to be aligned with contours to minimise impact
- Creation of roof garden to reduce stormwater runoff
- Runoff from paving to be directed to vegetated areas
- Stormwater to be retained to prevent erosion and flooding
- Habitats created (stream and wetland, forest recreation, slope rehabilitation

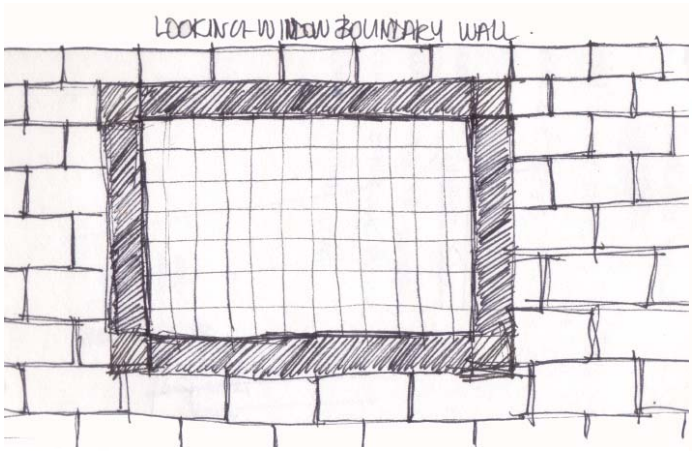
CONCEPT SKETCHES

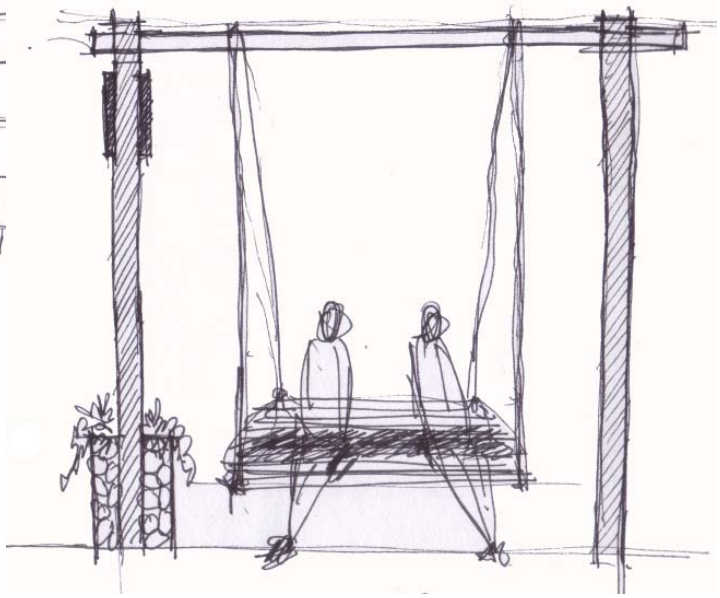


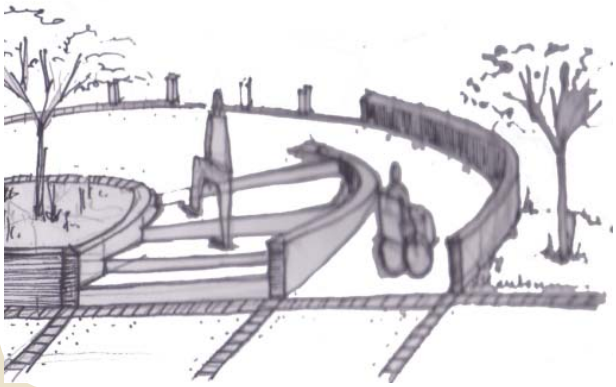












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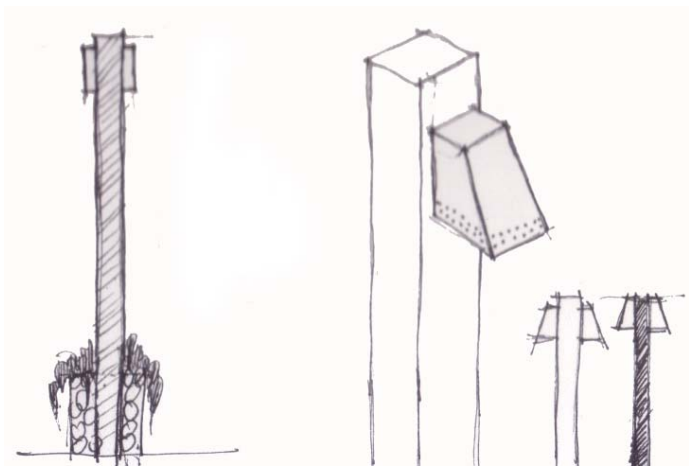

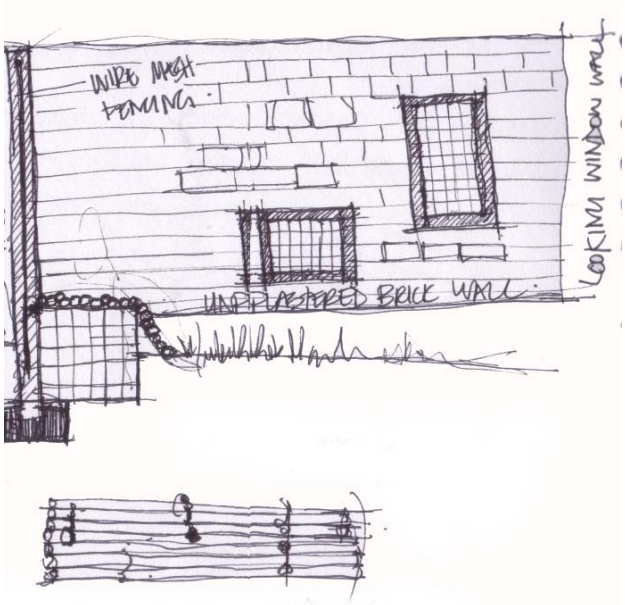

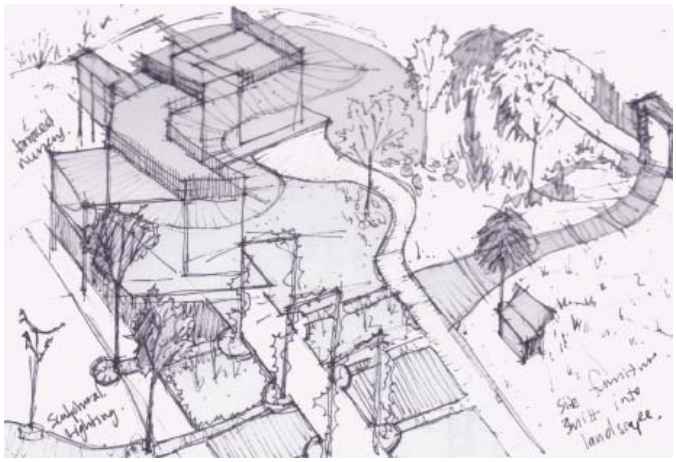

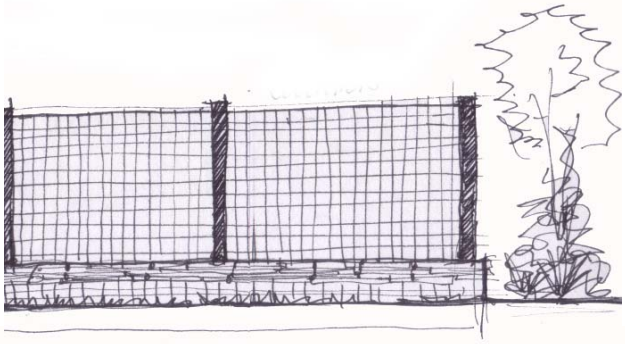

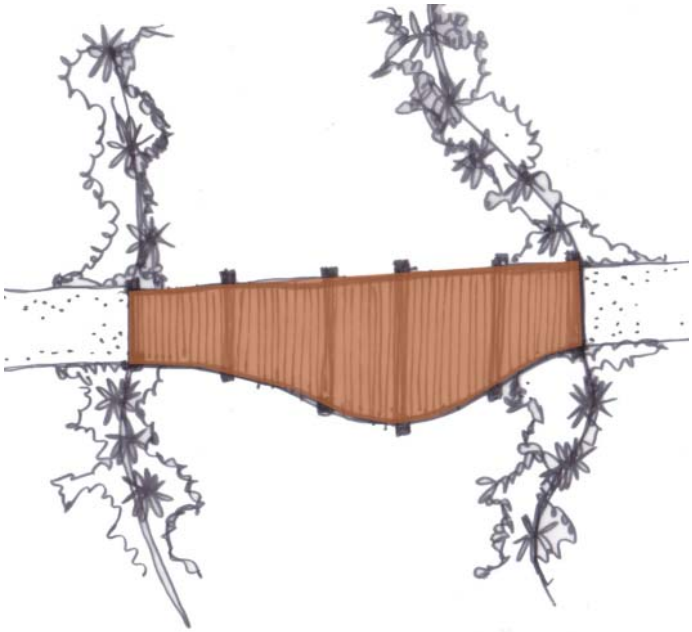

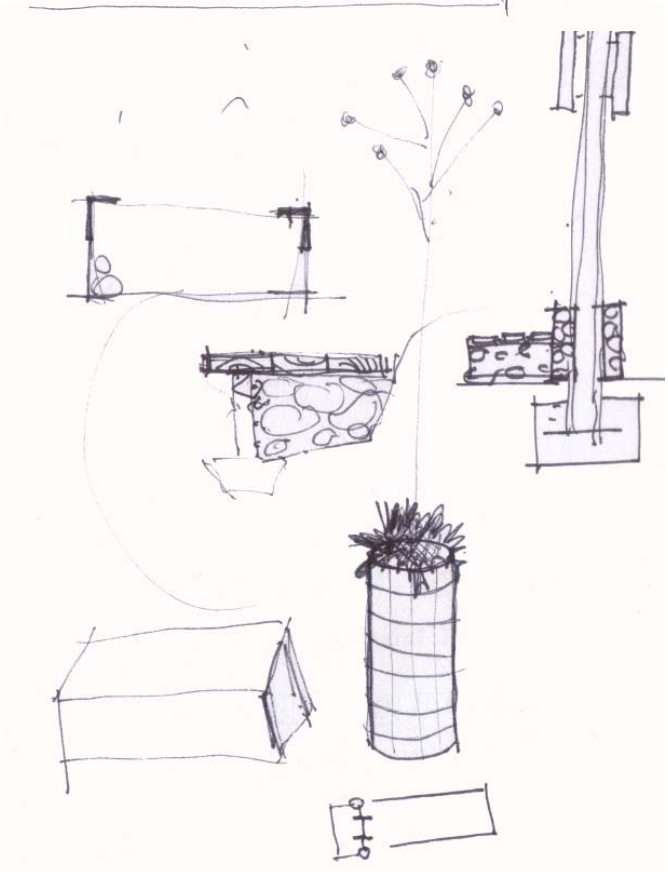

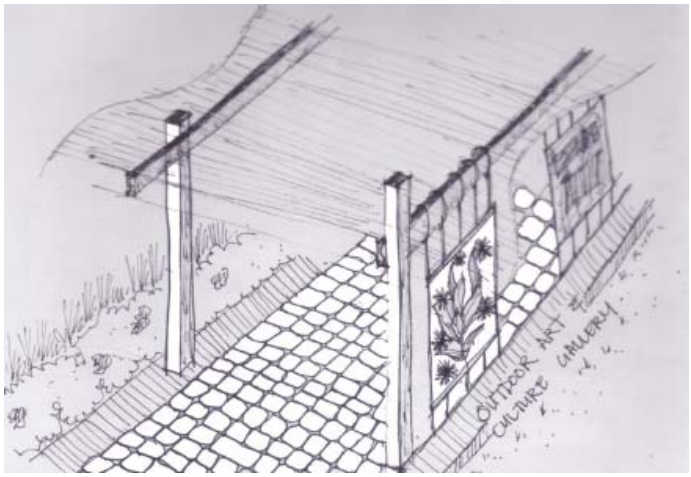

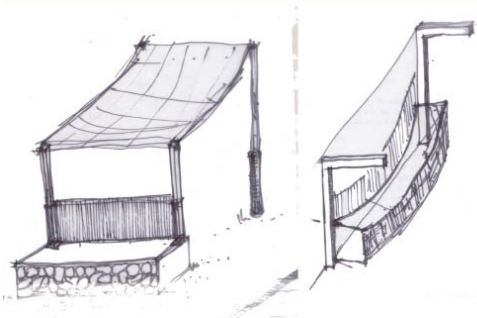

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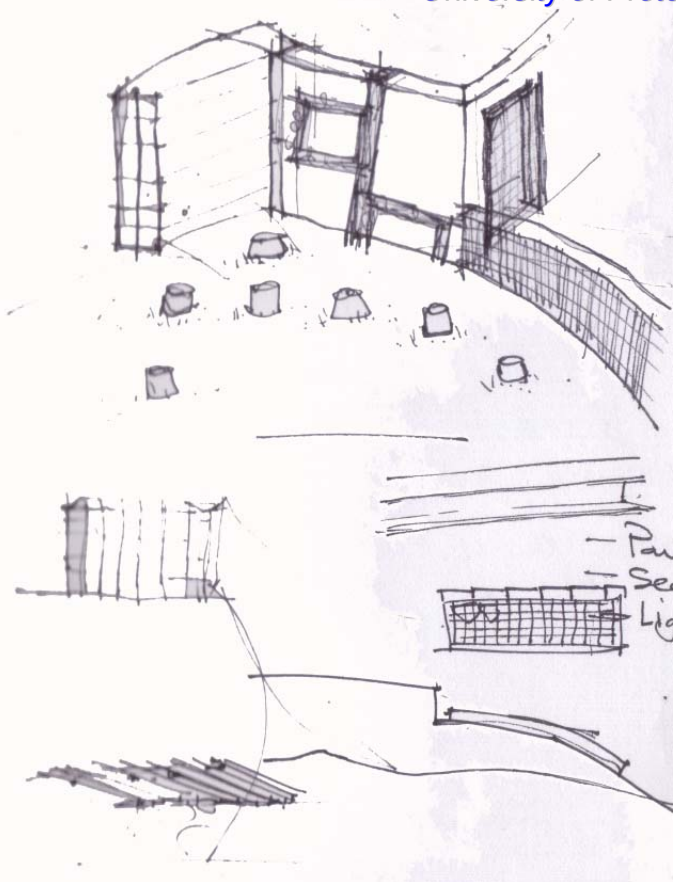

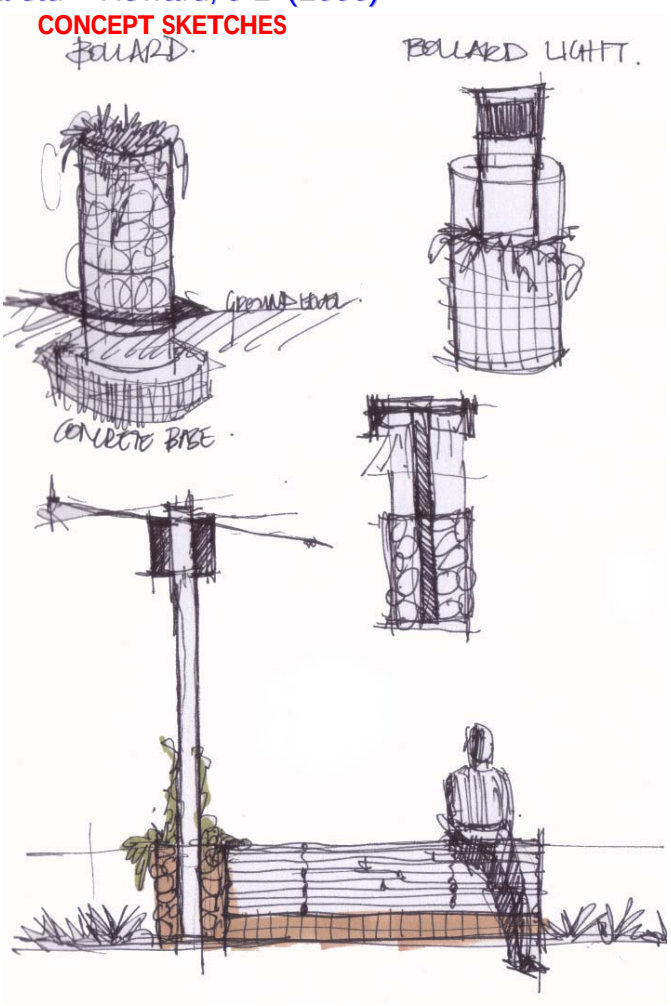

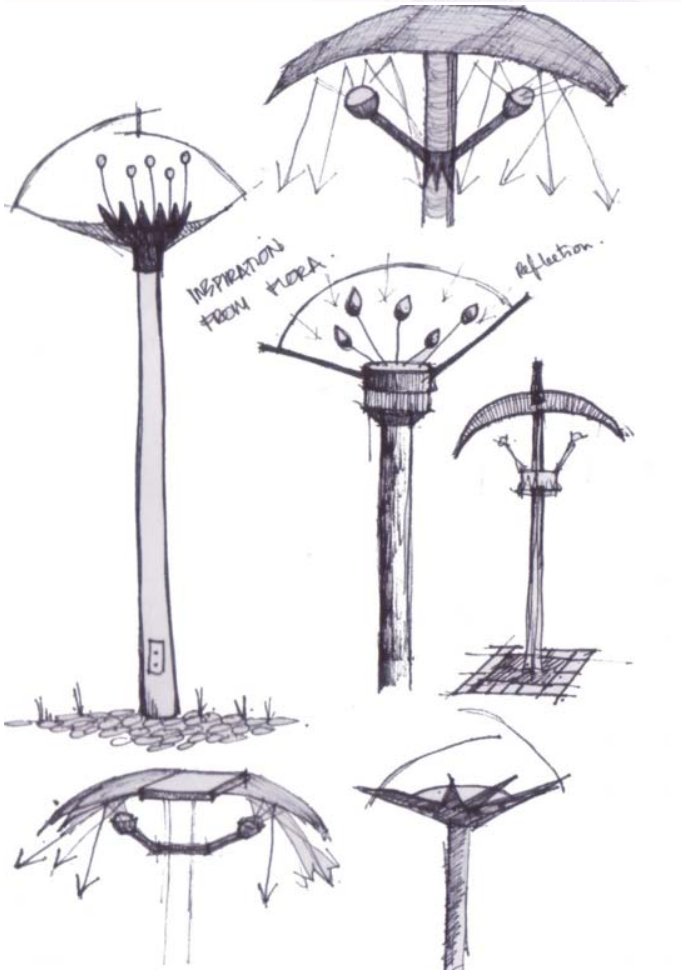

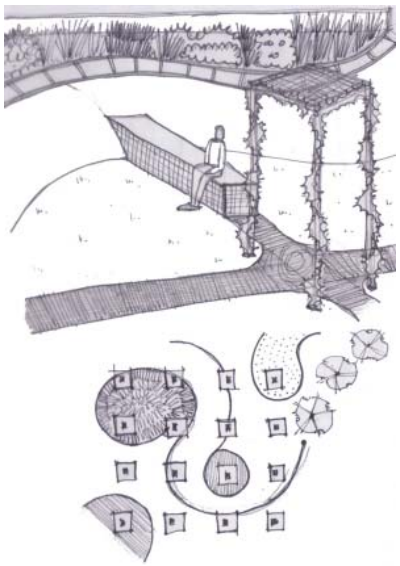

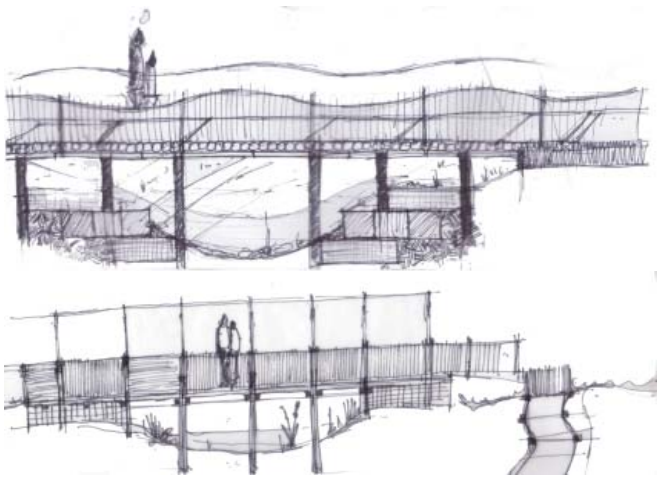

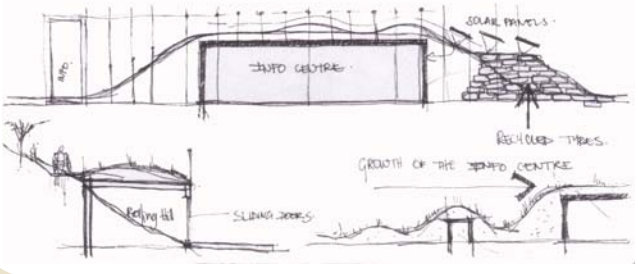

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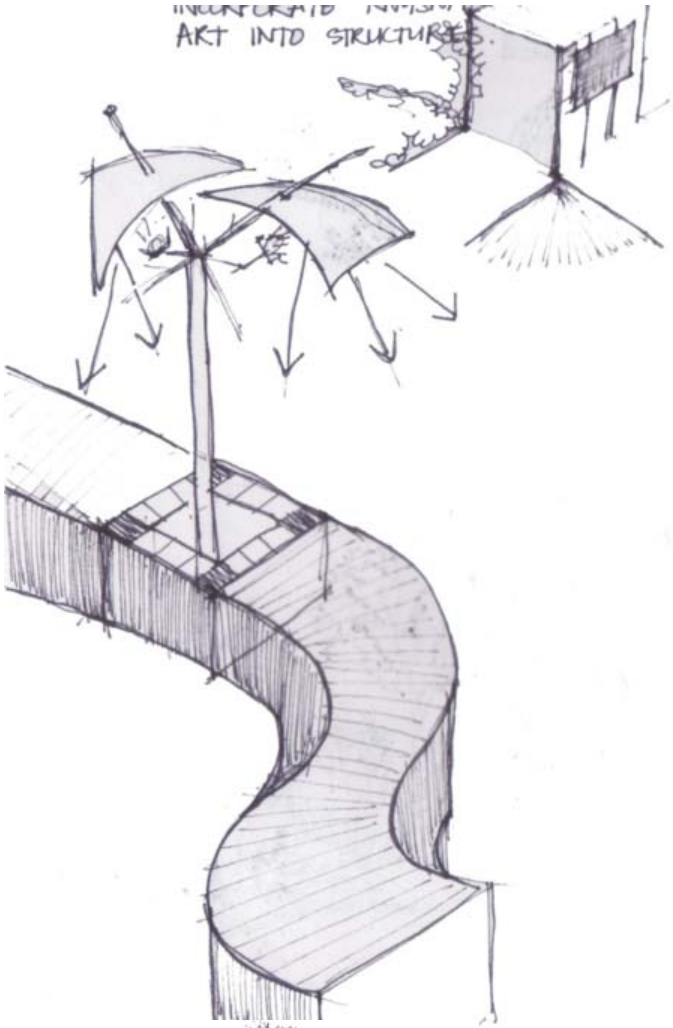
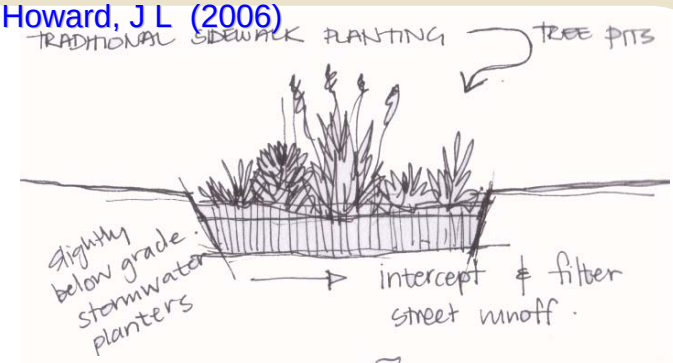
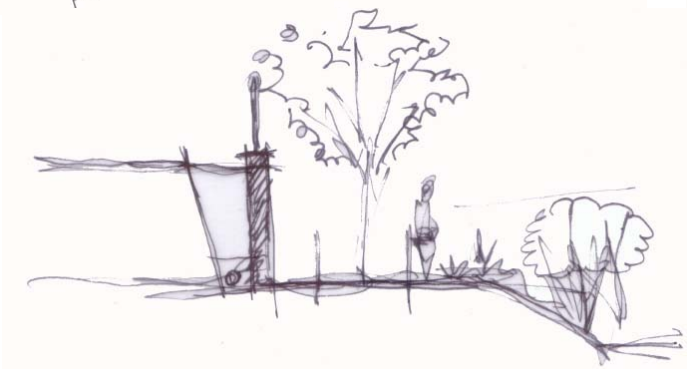
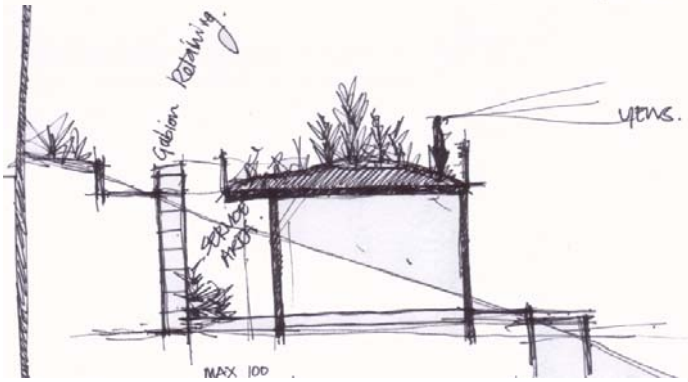
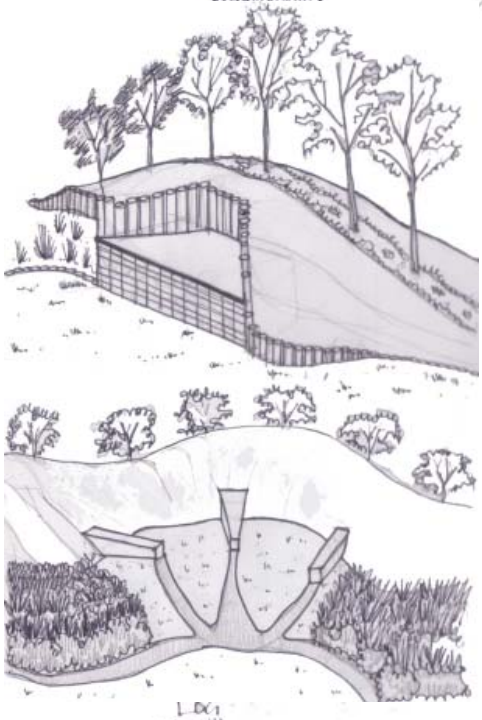
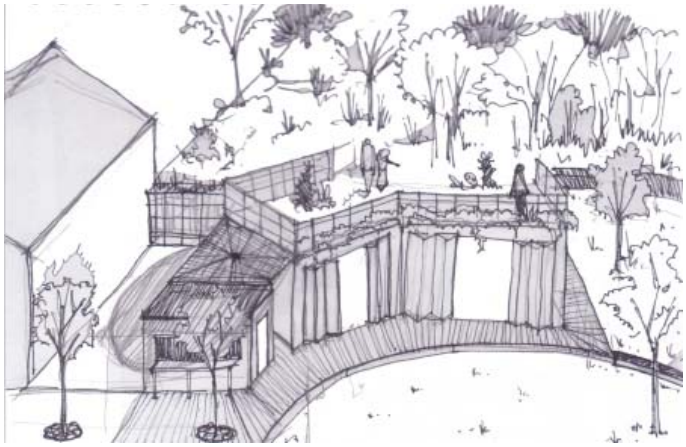


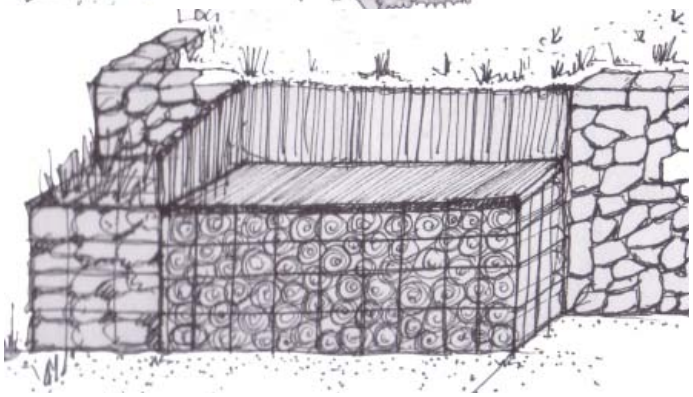


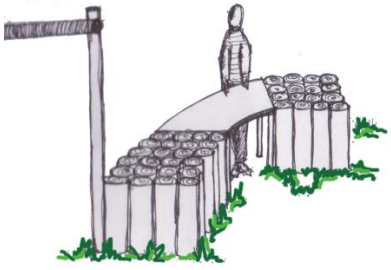








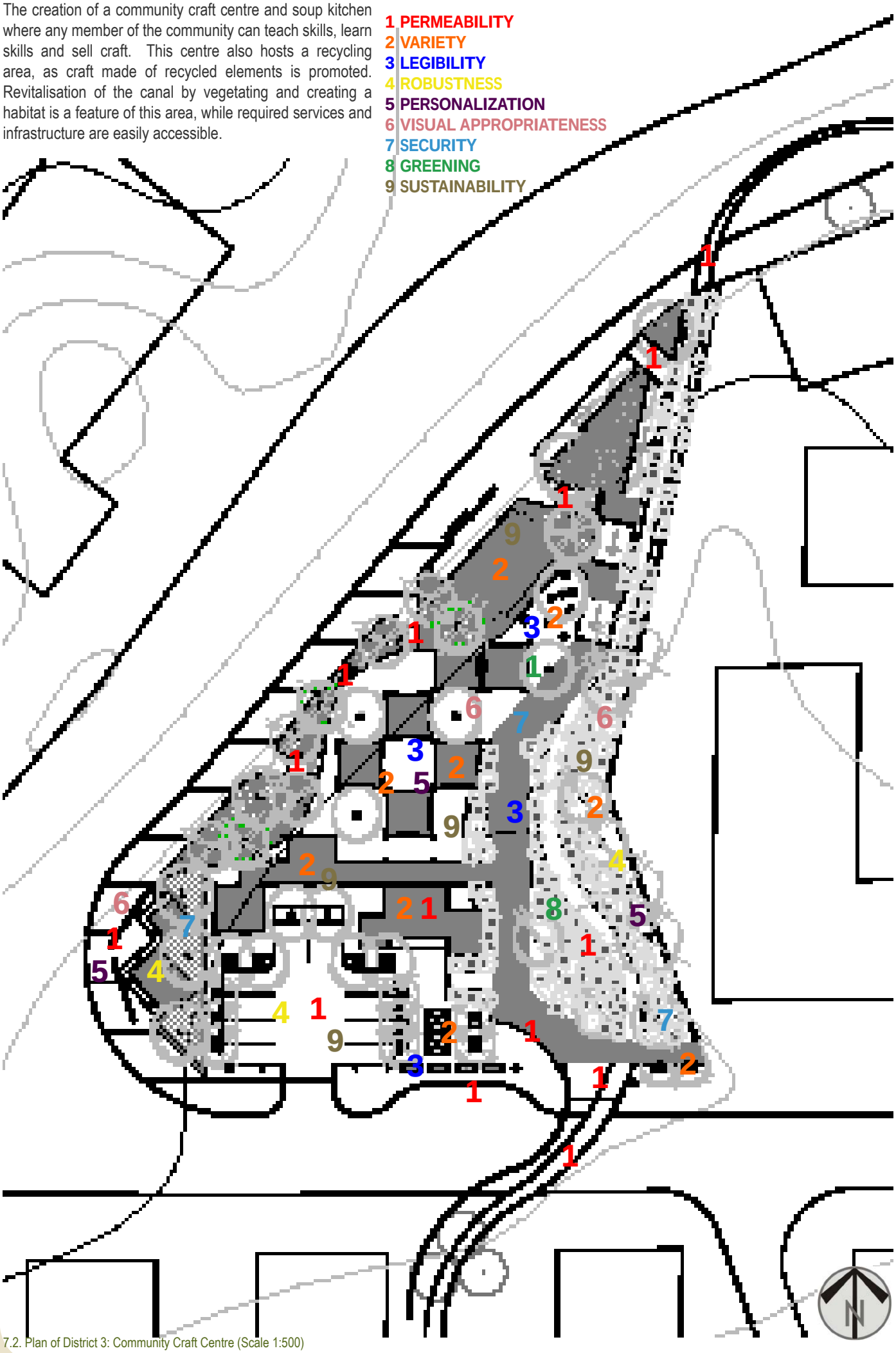




7.3. COMMUNITY CRAFT CENTRE: DISTRICT 3

The creation of a community craft centre and soup kitchen where any member of the community can teach skills, learn skills and sell craft. This centre also hosts a recycling area, as craft made of recycled elements is promoted. Revitalisation of the canal by vegetating and creating a habitat is a feature of this area, while required services and infrastructure are easily accessible.

1 PERMEABILITY
2 VARIETY
3 LEGIBILITY
4 ROBUSTNESS
5 PERSONALIZATION
6 VISUAL APPROPRIATENESS
7 SECURITY
8 GREENING
9 SUSTAINABILITY



7.2. Plan of District 3: Community Craft Centre (Scale 1:500)

7.3.1. PERMEABILITY

- Public transport accessibility - bus stop
- Disabled persons accessibility - site completely accessible by ramps
- Circulation routes take all users into consideration - ramps, steps and material use easily navigable
- Permeability represented by the 'gabion' element - promotion of transparency and seeing into the structure. Gabions used for most elements in this landscape (symbolism)
- Pedestrian traffic promoted - enough space and fluidity of movement
- Primary entrance points have high accessibility and legibility
- Commercial facility (restaurant and community craft shope, and soup kitchen) close to primary access point
- Soil quality and water absorption improved by creating indigenous habitats
- Looking-window walls created to increase security through visual permeability
- Anyone in the community is able to use this site to create craft from recycled elements

7.3.2. VARIETY

- Skills development in a diversity of ways (craft skills, sales, tourism, food preparation)
- Seating provided in variety of positions (shade and sun, views)
- Variety of routes provided
- Spaces created at different scales for various associationis and experiences
- Variety of economic options (craft shop, entrepeneuring, services)
- Variety of endemic vegetation and increased bio-diversity in as many places as possible
- Seating provided in a variety of locations

7.3.3. LEGIBILITY

- Clear legibility between public, semi-public and private spaces by level differences, material changes, vegetation and hard landscaping
- Hierarchy of spaces created by accessibility and function
- Legibility signage legible and forms part of site furniture language

7.3.4. ROBUSTNESS

- Spaces are adaptable to changing functions (large or small gatherings, performances, flea-markets, lectures, fofrmal or informal gatherings)
- Required infrastructure is provided
- Site furniture is robust, being hardy to site conditions and uses
- Planting robust and hardy, being endemic and indigenous to the area
- Parking area can be used for other functions (flea-market)

7.3.5. PERSONALIZATION

- Community allowed to personalize this space by creating personal working spaces in the craft area
- The community may use walls for advertising and community art
- Services offered by this open space to be personalized by the community to add vibrancy and distinctness (tours, products sold in site shop, performances)
- Indigenous vegetation introduced to the community through rehabilitation of habitats and creation of new learning habitats

7.3.6. VISUAL APPROPRIATENESS

- Aesthetic, yet functional site furniture relating to the history of Knysna (nautical), using a mix of materials with corten, stainless steel, wire gabions, rocks, planting and timber
- Each element of site furniture within an overall language
- Lighting pollution minimised by using downlighters and the reflection of light downwards

7.3.7. SECURITY

- This area very well lit for user comfort at all times
- Lighting design to be robust, weather- and vandal-resistant
- Thorny and spined vegetation is used at areas that may be high risk for hide-aways, as well as areas where habitats are to be protected

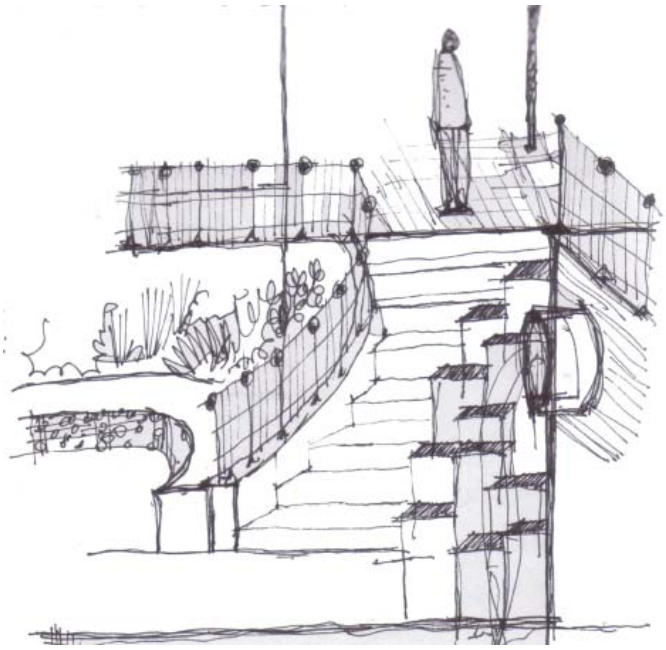
7.3.8. GREENING

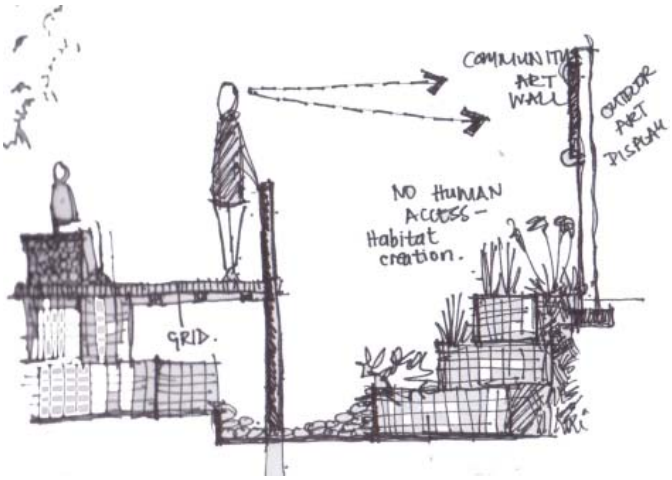
- Trees used to increase human comfort levels (shade and sun)
- Integration of organic and geometric, with organic represented by greening
- Vegetation to be hardy, therefore only a selection of indigenous species to be used
- Planting according to the desired ecological and educational requirements of the design, with the creation of wetland, forest, intermediate forest and fynbos biomes
- Semi-formalised planting at high-use areas

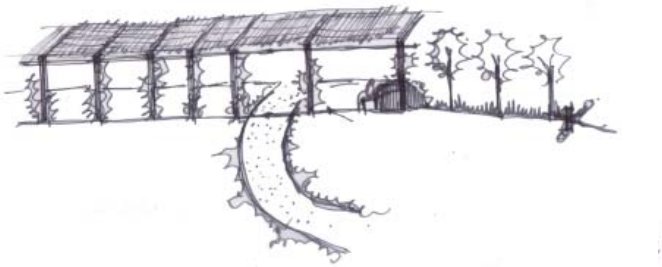
7.3.9. SUSTAINABILITY

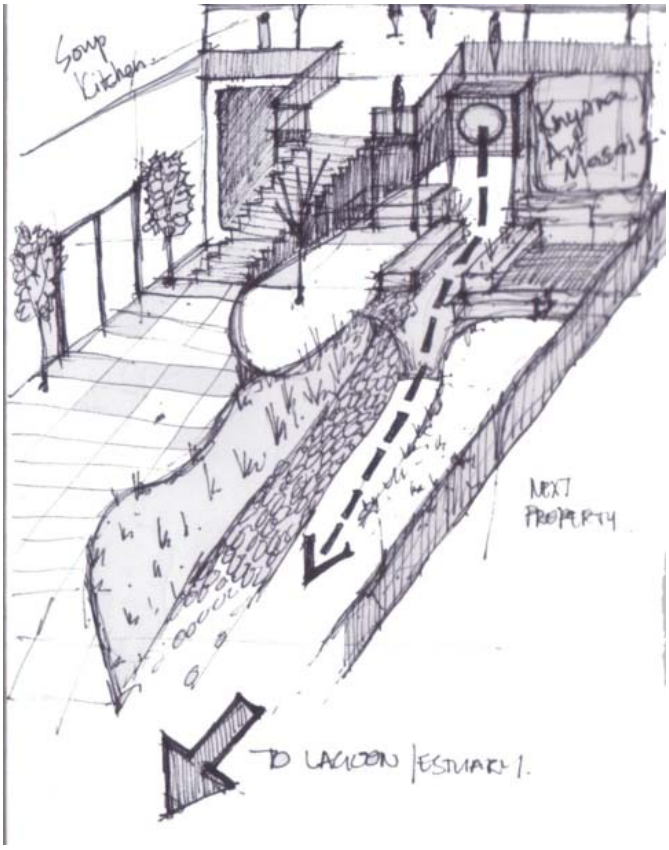
- Recycled material drop-off zone, new products created from recycled elements
- Local community services, materials, products and labour to be used in landscape features, structures and elements
- Eradicated trees to be used as a material - poles and lattices
- Runoff from paving to be directed to vegetated areas
- Habitats created (stream and wetland, beneath boardwalk, shaded spots at buildings, informal slope vegetation)

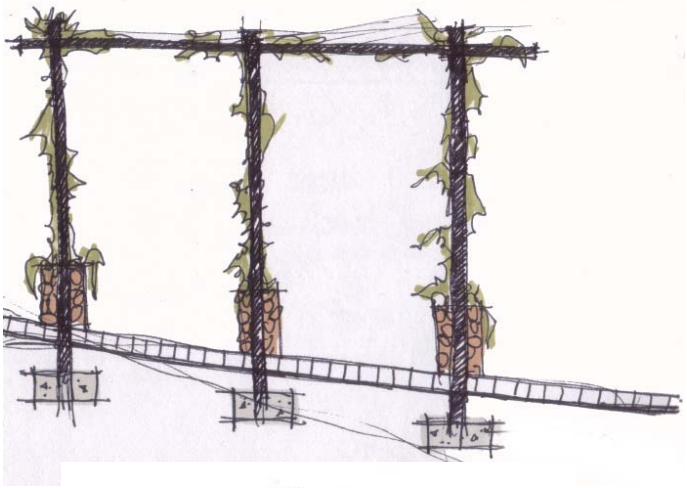
CONCEPT SKETCHES

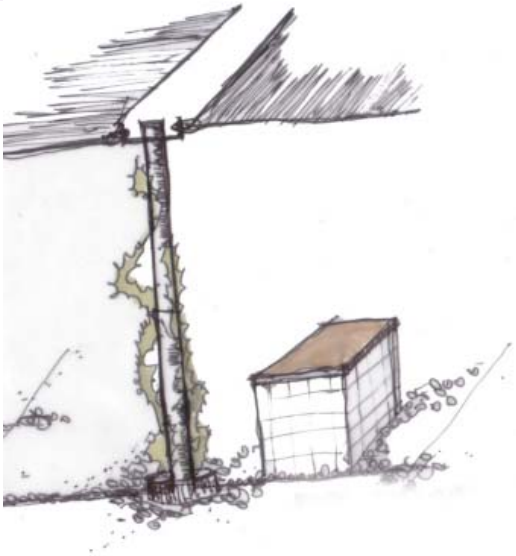


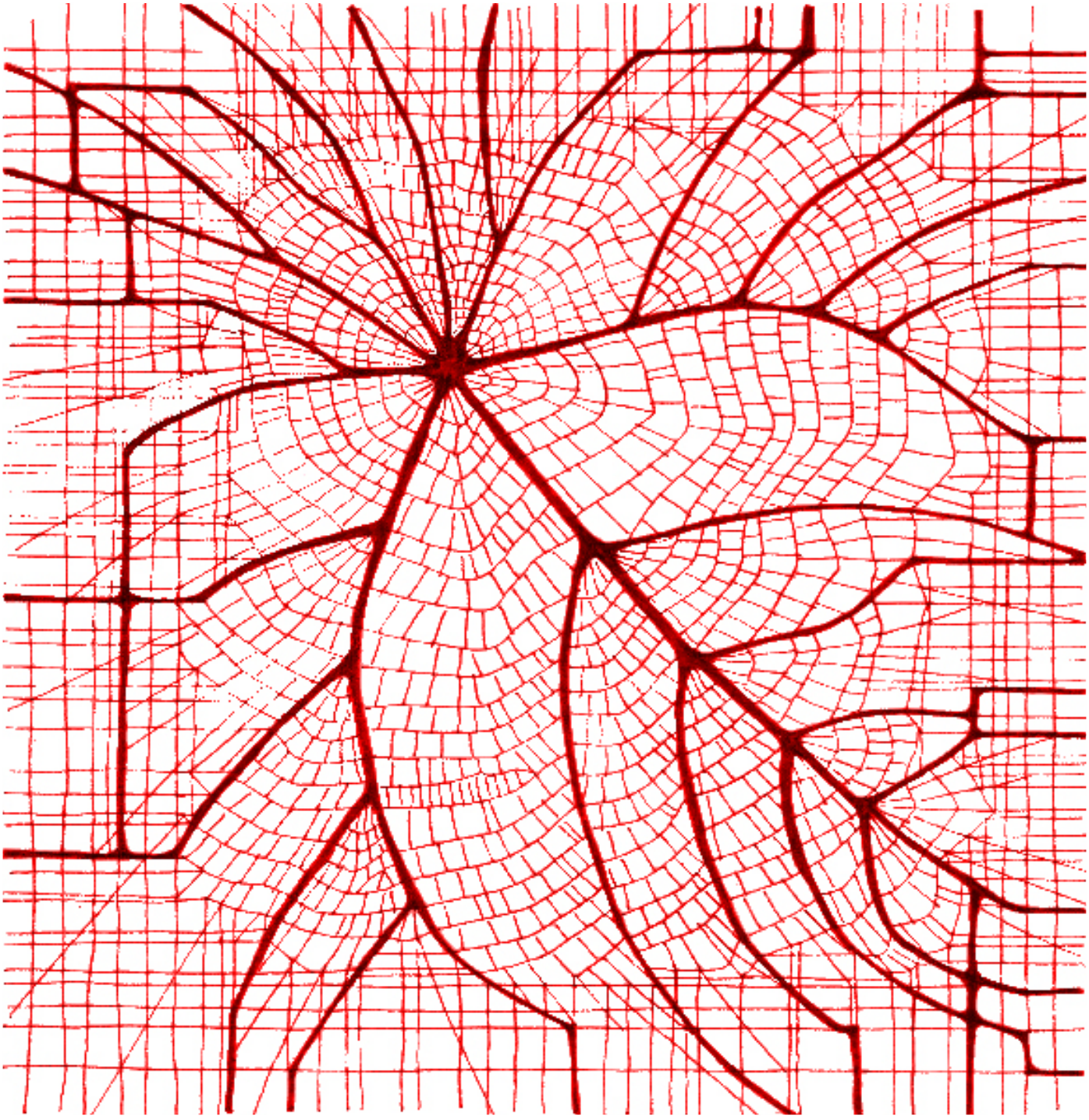












chapter 8
technical information

8.1. VEGETATION LIST (Jofffe 2001) (Palgrave 2000) (Venter & Venter 2002)

TREES

BOTANICAL NAME	ENGLISH COMMON NAME	DESCRIPTION	DESIGN VALUE	
Apodytes dimidiata	White Pear	■ Evergreen ■ Open spreading crown ■ Maximum height of 25m ■ White flowers from September to April ■ Fruit: Black flattened drupe from December to June	■ Effective screen plant with dense glossy foliage Can be grown as a hedge and reacts well to pruning ■ Attractive specimen plant on the lawn, especially when in flower or fruit ■ Successful shade tree ■ Non-invasive root system	
Calodendrum capense	Cape Chestnut	■ Evergreen to deciduous - depending on habitat ■ Roundish dense canopy ■ Maximum height of 25m ■ Light to dark pink scented flower sprays from July to March ■ Fruit: strongly warty splitting capsule from January to May	■ Valuable shade tree ■ Suitable for street and parking lot plantings at the coast where it is evergreen ■ Attractive specimen tree especially on a lawn with the light grey bark, large leaves, masses of large pink flowers and knobbly fruit ■ Non-aggressive root system	
Celtis africana	White Stinkwood	■ Deciduous, semi-deciduous in forests ■ Round dense canopy ■ Maximum height of 40m ■ Yellowish-green flowers at same time as leaves, from August to October ■ Fruit: small yellowish drupe from October to February	■ Good shade tree ■ Popular street tree - in spite of losing leaves ■ Appropriate in shrubbery - allows sun in winter and shade in summer ■ Architecture of branches make it a focal point ■ Good container plant - water at least once a week ■ Reacts well to pruning	
Diospyros whyteana	Forest Monkey Plum	■ Evergreen ■ Dense roundish to pyramidal crown ■ Maximum height of 15m ■ White to creamy-yellow sweetly-scented from July to November ■ Fruit: roundish red fleshy berry enclosed in papery calyx drying to red from November to June	■ Attractive - neat habit, glossy dark green leaves and the masses of red fruit ■ Good hedge ■ Accent plant ■ Attractive container plant - don't let soil dry out for long periods ■ Root system not aggressive	
Ekebergia capensis	Cape Ash	■ Evergreen ■ Roundish crown ■ Maximum height of 20m ■ White loose spray sweetly-scented from September to December ■ Fruit: Spherical, fleshy, red when mature from November to April	■ Good street tree or shade tree in parking lots ■ Shape and size ideal for park ■ Non-aggressive root system ■ Plant it in suitable spots, especially near or at water points	
Ficus capensis	Cape Fig	■ Evergreen ■ Large spreading ■ Up to 12m, can reach 25-30m in some conditions ■ Young leaves conspicuous red ■ Fruit: Figs (3 to 4cm) produced in large heavy branched clusters on the stem and low on the main branches, become red mottled with cream or pink from September to March	■ Good shade trees - park etc. ■ Surface roots problem in small garden	
Grewia occidentalis	Dewberry, Cross-berry	■ Evergreen to semi-deciduous ■ Open but somewhat tangled crown with a spread of up to 5m, in certain areas tends to scramble, main stems somewhat angular ■ Maximum height of 10m ■ Pink to dark mauve in clusters from October to January ■ Fruit: 4-lobed and square, reddish brown, slightly fleshy and shiny when mature from January to May	■ Takes pruning well and should be trimmed once a year to keep in neat shape ■ Used effectively in shrubbery, giving a delightful display of glossy leaves and mauve flowers ■ Root system non-aggressive and can therefore be planted close to structures	

	SOCIO-CULTURAL VALUE	ECONOMICAL VALUE	ECOLOGICAL VALUE	HABITAT
	■Infusion from root bark - enema for intestinal parasites ■Leaves boiled whole and eaten with porridge	■Excellent wood for furniture (tables and benches) ■Also used for flooring, veneering, panelling, engraving for printing and for rifle stocks	■Ripe fruits eaten from the tree by birds - Rameron pigeons, Redwinged starlings, Pied barbets, Black-eyed bulbuls ■Dropped fruit eaten by Spotted ground thrushes and Helmeted guineafowl	■Variety of habitats ■From evergreen montane forests to wooded grassland ■Plants from open exposed rocky ridges are gnarled and sometimes not higher than 1m
	■Cut flowers long lasting in water ■Crushed seeds can be boiled and soap made from the resultant oils	■Wood popular for furniture, moderately heavy with smooth finish ■Also used for cabinet-work, turning and shelving ■Implement handles - tough and pliable wood	■Attracts various insects and butterfly species to the flowers with the instar larvae of swallowtail species of butterflies feeding on the leaves ■13 other insect species have been identified as feeders ■Fruits eaten by samango and vervet monkeys but also various bird species (Cape parrots, Rameron pigeons, cinnamon doves)	■Not restricted to any specific habitat ■Forest habitat - straight stems, sometimes buttressed ■Hot, dry valleys - low, gnarled with dark grey bark and small leaves and flowers
	■Ripe fruit has pleasant sweet taste with thin flesh ■Popular bonsai specimen	■Leaves and young branches eaten by domestic stock ■Wood used for general timber on the farm and for manufacturing furniture (good wood for shelving as it takes nails and screws well and doesn't warp) ■Young branches and coppice shoots are popular as handles for implements ■Wood carves easily and is durable (household articles - spoons to dishes)	■Popular tree with fruit-eating birds ■Larvae of the African snout and blue-spotted charaxes butterlies live on the tree	■High rainfall areas in forests and along streams ■Lower rainfall areas in woodland or grassland, on termite mounds or on rock outcrops ■Not restricted to a specific type of soil
	■Enema made from bark to treat impotency and infertility ■Itchy rash on skin is treated with an infusion of the leaf and root ■Berries are edible but with a bittersweet taste and therefore not popular ■Yellowish seeds can be roasted, ground and used as a substitute for coffee with an agreeable taste ■Popular to bonsai	■Leaves browsed by stock and game ■Good furniture wood for making small household articles (excellent pick handles)	■Popular with fruit-eating birds (Rameron pigeons, African green pigeons, louries, barbets and bulbuls), which open the papery calyx as soon as it starts to turn red to get at the fleshy red berries	■Grows in forests, scrub forests, shady kloofs and on mountain slopes ■Mostly in shade along mountain streams
	■Bark contains 7,23% tannin and is used for tanning leather ■Bark used as emetic and in treatment of dysentery ■Leaves used as a remedy for intestinal worms ■Decoction of root used for a chronic cough and taken orally for the relief of headaches	■Good furniture and panelling wood, must be treated with zinc chloride against insects ■Good general timber (beams) ■Domestic stock and game	■Baboons, vervet and samango monkeys, bushpig, bushbuck and nyala eat the fallen fruit underneath the tree ■Attracts fruit-eating birds (Knysna and purple-crested louries, barbets, hornbills, bulbuls and mousebirds) ■Larvae of the white-barred charaxes feed on the leaves	■Mostly evergreen woodland ■Riverine, coastal sandveld or ■Montane forests above 1200m altitude ■Always in well-drained soil
	■Figs sweet but insipid flavour but can be used for jam if apples of other suitable fruits are added ■Several African folk remedies: ■Burns and septic conjunctivitis are treated with an application of its latex and an infusion from its leaves and bark is administered to cows if their milk-production is inadequate	■Timber little commercial value, but has practical uses: drums, brake blocks are wagons, sticks fire by friction	■Fuit attract birds	■Forests ■Open wooded grassland
	■Bruised bark soaked in hot water is used for dressing wounds ■Assegai handles and walking sticks made from branches of this tree in Eastern Cape and in Zimbabwe ■Ripe fruits eagerly eaten by humans who enjoy its sweet fruity taste ■In certain areas where the sugar content of the fruits is high, fruits are collected and dried for later use, dried fruits are sometimes boiled in milk - beats any milkshake ■Beer brewed from ripe fruit in certain areas	■Leaves browsed by cattle, goats and game	■Ripe fruits eaten by various birds (Knysna louries, speckled mousebirds, black-eyed and Cape bulbuls and barbets) ■Instar larvae of the rufous-winged elfin butterfly and buff-tipped skipper butterfly live on the leaves	■Wide variety of habitats from arid Karoo ■Coastal dune bush to evergreen montane forests

BOTANICAL NAME	ENGLISH COMMON NAME	DESCRIPTION	DESIGN VALUE	
Halleria lucida	Tree Fuchsia	■ Evergreen ■ Oppposite branches and a dense roundish crown with somewhat drooping branches ■ Maximum height of 30m in forests and 10m in wooded grassland ■ Orange to red single or cluster flowers from April to December ■ Fruit: fleshy berries, black when mature from June to February	■ Well-suited to shrubbery where it provides glossy-green foliage and colour ■ Inclusion in garden for bird enthusiast ■ Non-aggressive root system	
Ilex mitis	Cape Holly	■ Evergreen ■ Dense slightly elongated to rounded crown ■ Maximum height of 30m ■ White to cream-coloured clusters, sweetly-scented from September to February ■ Fruit: roundish fleshy berry and glossy red when ripe from March to May	■ Good accent plant ■ Near to water ■ Street tree ■ Root system not aggressive	
Kiggeleria africana	Wild Peach	■ Semi-deciduous to evergreen ■ Broadly rounded, spreading to pyramidal ■ Maximum height of 20m ■ Yellowish to greenish-white male and femal on separate trees and differ, from August to January ■ Fruit: roundish woody capsule with warty surface splitting into 5 valves, orange-red seeds from February to July	■ Can be planted in camps to provide shade for animals during summer ■ Windbreak along margins of crops ■ Effective shade tree if lower branches are pruned away to give the tree a clear and straight trunk ■ Root system non-aggressive	
Leucadendron argenteum	Silver Tree	■ Evergreen ■ Conical, spreading as it ages ■ Maximum height of 6m ■ Silver leaves accent ■ Male flowers - apricot, Female flowers - silver sheen ■ Cones release small black seeds in Autumn	■ Ornamental tree - especially with regards to foliage ■ Plant in lawn or shrubbery	
Nuxia floribunda	Forest / Wild Elder	■ Evergreen ■ Dense rounded crown ■ Maximum height of 20m ■ Much branched heads up to 300mm in diameter, white and scented flowers, buds sticky and resinous from May to August ■ Fruit: capsule splitting into 2 valves from June to October	■ Attractive street and garden tree ■ Root system non-invasive and can be planted next to paved areas and structures ■ Focal feature when in full flower	
Olea europaea subsp. africana	Wild Olive	■ Evergreen ■ Spreading rounded crown ■ Maximum height of 14m ■ Sweetly-scented creamy-white inflorescences from October to February ■ Fruit: thinly fleshy drupe black when mature from March to August	■ Ideal choice for garden or street ■ Windbreak, protection, shading ■ Extensive root system - good tree for stabilising erosion dongas ■ Root system sometimes aggressive and it is not advisable to plant the wild olive closte to structures or paving	
Podocarpus falcatus	Outeniqua Yellowwood	■ Evergreen ■ Conical to rounded and sparse, open texture ■ Maximum height of 15m, natural habitat can reach 60m ■ Fruit: Male cones 1cm x 0,3cm; large fleshy rounded seeds (female cones) ripen to deep yellow September to May	■ Attractive foliage plant ■ Can look impressive lining a driveway or an avenue ■ Planted singly or in groups in park or garden ■ Windbreak or screen on a farm (wood utilised)	
Podocarpus latifolius	Real Yellowwood	■ Evergreen ■ Large rounded with clear trunk ■ Up to 20-30m in height ■ Fruit: Cones July to September, with seeds ripening from December to February	■ Seeds and receptacles are very showy - striking when tree is bearing heavily ■ Worthwhile garden subject even though it grows very slowly	
Rapanea melanophloes	Cape Beech	■ Evergreen ■ Medium to tall usually 4 to 10m (forest 20m) Flowers: small greenish or whitish, inconspicuous in few-flowered clusters from June to August, continuing on to December ■ Fruit: spherical thinly fleshy, up to 5mm, green becoming white and finally purple from September to March	■ Hardy and attractive in garden	

	SOCIO-CULTURAL VALUE	ECONOMICAL VALUE	ECOLOGICAL VALUE	HABITAT
	■An infusion made from moistened dry leaves and roots is dripped into the ear to relieve earache ■A straight, dry branchlet can be used as the turning stick when making fire by friction ■Black fleshy fruits are edible, with a sweet taste and can be stored for a reasonably long period when ripe	■Leaves browsed by stock and game	■Nectar-rich flowers very popular with sunbirds and bees ■Popular with fruit-eating birds (Rameron pigeons, Knysna and purple-crested louries, Cape parrots, Kurrichane, thrushes, bulbuls, robins and white-eyes)	■Mostly near water ■Also on rocky outcrops on grassy mountain slopes ■Wooded grassland ■And in evergreen forests
	■Fruits are edible with a faint sweetish taste, but can be bitter ■Pieces of bark chewed as purgative - having a mild action in most people	■Wood makes good and durable furniture and is still used for tables and chairs today, wood darkens slightly after many years of oiling taking on a beautiful honey colour	■Ripe fruits popular with most birds (Rameron pigeons, cinnamon doves, Knysna and purple-crested louries, black-eyed bulbuls, red-winged and plum-coloured starlings, and pied and crested barbets)	■Evergreen woodland and forests ■Always near water or with its roots in the water ■Grows mostly in shade
		■Leaves contain hydrocyanic acid and are not utilised by stock or game ■Wild peach wood was popular for furniture and is still used by a few cabinet makers in the Eastern Cape and KwaZulu-Natal ■Also for beams and floor-boards	■Oil-rich aril on the seeds attracts many fruit-eating birds species (Rameron pigeons, cinnamon doves, olive woodpeckers, Knysna and puple-crested louries, crowned and trumpeter hornbills, Cape and Heuglin's robins, boubou shrikes, red-winged starlings, Cape thrushes, white-eyes and mousebirds) - makes it difficult to find ripe seeds in open capsules ■Larvae of the garden acraea, dusky-veined acraea and the battling glider butterflies eat the leaves - and these are eaten by Klaas's, Diederik and emerald cuckoos	■Evergreen forest ■Rocky outcrops ■Wooded grassland ■Along drainage lines ■More gnarled in full sun and dry habitat with smaller, thicker texture leaves
	■Foliage popular for floral arrangements		■Attracts useful insects like bees and butterflies	■Eastern slopes (especially Table Mountain)
	■Education and skills-training - honey-making	■Leaves browsed by stock and game ■Copious nectars makes it a good honey-tree ■Wood can be used for parquet floors, turnery and furniture (relatively heavy with a pleasing light colour and very fine grain, colour of oiled furniture deepens to a light brown after about 10 years)	■Bunches of flowers attract all kinds of insects and they in turn attract many insect-eating birds	■Evergreen montane forests ■Along rivers in high-lying areas
	■Fruits edible, some trees bitter but others quite pleasant to eat ■Leaves soaked in water substitute for tea ■Infusion from fresh bark is used to relieve colic ■Infusion from leaves is used as an eye lotion for humans and cattle ■Decoction of leaves is used as a gargle for sore throats ■Snuff made from dried leaves is used to stop bleeding of the nose ■Some areas juice is used to make ink ■A favourite for training as a bonsai	■Much browsed by stock and game ■Valuable fodder tree in drier areas ■Termite and borer-resistant wood makes durable fencing posts lasting for up to a century ■Resistant to most diseases - succesfully used as a graft for the cultivated olive ■Popular wood for turnery, carvings, cabinet work and furniture (wood darkens with age)	■Tree occurs on calcrete soil and acts as an indicator for calcrete ■Attracts fruit-eating birds	■Almost any type of habitat ■Especially woodland, stream banks and rocky hill slopes
	■HIstorical value - big tree (tallest South African forest tree)	■Pale-yellow fine-grained wood is very popular for boat-building, ceilings, window frames, floorboards, table tops and high quality furniture ■Experimental plantings have shown that this yellowwood can be grown in plantation format in much the same way as pine	■Fleshy female fruit eaten by bats, monkeys, bushpigs and birds (pigeons, louries, parrots)	■Coastal swamp forest ■Mountain forest
	■Timber - Floors in the fine old Cape homesteads	■Yield fine timber of a uniform pale yellow colour, seasons and saws well, works easily and takes a good finish ■One of most used and popular indigenous timbers	■Fleshy female fruit eaten by bats, monkeys, bushpigs and birds (pigeons, louries, parrots)	■Evergreen forests ■Patches of mountain forest and also on exposed mountainsides (low growing and stunted)
	■The Zulus use a decoction of the bark as an expectorant and an emetic	■Wood is fine-grained, very attractive and durable, it works well and takes a fine polish - much prized for cabinet work and in recent years has been used in the making of violins	■Fruit eaten by birds ■Flowers attract useful insects like bees and butterflies	■Evergreen forest ■Riverine fringes ■Sometimes drier coastal and mountain forests

BOTANICAL NAME	ENGLISH COMMON NAME	DESCRIPTION	DESIGN VALUE	
Rothmannia capensis	Wild Gardenia	■Evergreen ■Contorted ■Usually 7m, natural habitat up to 20m ■Flowers are large creamy-white bells and speckled maroon December to February ■Fruit: rounded (5-6cm diameter)	■Attractive floral tree ■Non-aggressive root system ■Suitable for any size garden	
Salix mucronata	Cape Willow	■Evergreen ■Weeping ■Usually 8m, natural habitat up to 12m ■Small yellowish flowers in short spikes August to October ■Fruit: small capsules that split to release tufted woolly seeds	■Wonderful for planting next to large dams and along streams ■Rather aggressive root system	
Vepris lanceolata	White Ironwood	■Evergreen ■Dense and rounded, shrub or tree ■Usually 7m, natural habitat up to 28m ■Sprays of tiny yellowish flowers December to March ■Fruit: dotted with oil glands that release a citrus smell when crushed, small slightly fleshy fruits ripen to black	■Good screen plant	
SHRUBS				
Aloe arborescens	Krantz Aloe	■Medium Evergreen ■Rounded ■2 x 3m ■Spikes of brilliant-red tubular flowers high above leaves (produce abundant nectar) from May to July ■Succulent blue-grey leaves	■Important garden speciment - nectar and colour ■Excellent focal plant in rockery ■Used as a hedge to protect stock ■Crops situated on a bank to help control erosion	
Aloe ferox	Bitter Aloe	■Medium Evergreen ■Bare stem, small rounded crown of leaves and branches ■2,5 x 1m ■Tall stunning spikes of tubular orange-red flowers that are carried on showy candelabra-like flowerheads from May to September ■Thick rosettes of thorny succulent leaves	■Focal point for rockery ■Non-aggressive root system	
Anisodontea scabrosa	Pink Mallow	■Small Evergreen ■Rounded, tend to become leggy, sparse and untidy ■1,8 x 1m ■Masses of smallish (2cm) pink-mauve flowers each marked with dark-pink streaks (free-flowering) from August to March ■Soft hairy three-lobed leaves that are aromatic and often sticky	■Mass plant this rather erect shrub to form a good groundcover ■Plant in informal border ■Use as a temporary filler until slower shrubs have grown and established themselves	
Barleria obtusa	Bush Violet	■Small Evergreen ■Rounded bushy shrub that tends to sprawl or scramble ■0,75 x 1m ■Small soft oval leaves covered in silky hairs ■Masses of tubular blue-mauve, pink or white flowers from March to April	■Wonderful for an informal area of the garden where it can happily scramble ■Suited to tub or container - flowers and leaves hang over edges	
Buddleja saligna	False Olive	■Large Evergreen ■Much-branched crown with drooping branches ■4 x 3m ■White to cream-coloured flowers from August to January ■Fruit: 2mm long capsule from September to March	■Tends to become untidy and woody after a season or two ■Should be pruned back fairly hard after flowering to ensure neat, compact shape ■Excellent hedge or screen and reacts well to pruning ■When in flower - superb focal point ■Non-aggressive root system - can be planted near buildings and other structures	

	SOCIO-CULTURAL VALUE	ECONOMICAL VALUE	ECOLOGICAL VALUE	HABITAT
	■ Traditional remedies prepared from this tree deal with the healing of wounds, burns and rheumatism	■ Strong hard wood is used for building, spoons and tools	■ Baboons, Vervet and Samango Monkeys, bushpigs and Grey Duiker have liking to fruit ■ Always with a bird or two in branches ■ Attracts useful insects like bees and butterflies	■ Forests ■ Kloofs ■ Forest margins ■ Rocky ridges
	■ Baskets made from the young shoots ■ Wood is used as firesticks ■ Branch tips and leaves are widely used to treat rheumatism and fever	■ Wood used to make household articles and ornaments	■ Monkeys eat the flowers ■ Leaves browsed by game and used as fowl food ■ Larvae of the African Leopard butterfly feed on the leaves ■ Water birds breed in tree ■ Control erosion on stream banks (Plant trees close together)	■ Leans far out of water ■ Along rivers and streams
	■ A root remedy is traditionally used to treat flu and colic	■ Hard, white, strong and pliant wood is used for implement handles (hammers, picks), tent hoops and durable roof beams	■ Fruit favoured by Redwinged Starling, Blackeyed Bulbul, doves, louries and pigeons ■ The Citrus Mocker, Whitebanded and Greenbanded Swallowtail butterflies breed on this tree ■ Porcupines eat the bark, ringbarking and eventually killing the trees ■ Excellent for the bird garden - the flowers lure insect pollinators which, in turn, attract insectivorous birds	■ Coastal bush ■ Riverine bush ■ Evergreen Forest ■ Dry Forest ■ Sand dunes
	■ Fresh leaf sap is used to treat bruises, burns, abrasions and other skin complaints		■ Nectar attracts sunbirds, Crested Barbet, Cape White-eye, Blackheaded Oriole, Streaky-headed Canary, Yellowthroated Sparrow, Blackeyed Bulbul and Grey Lourie (some eat flowers) ■ Woodhoopoes probe for insects under dead, dried leaves	■ High mountainous areas
	■ Purgative drug used in several medicines - eg. 'Lewensessens' ■ Leaf gel is used to make preserves and is used in hair and skin care products ■ Split or crushed leaves are applied directly onto sunburn, burns and scalds, open wounds, sores, itchy insect bits or ulcers ■ Dried, ground leaves used as snuff	■ Cut leaves exude copious thick yellow juice which is collected and concentrated by boiling to a dark brown lumpy substance called Cape Aloes. This is used to produce a purgative drug and has been exported for more than 200 years	■ Attractive to birds - nectar ■ Attractive to useful insects like bees and butterflies	■ Bush scrub ■ Hillsides ■ Rocky mountain slopes
			■ Attractive to useful insects like bees and butterflies	■ Along the coast nd
			■ The leaves are often brosed by s game ■ Flower attract butterflies	
	■ Root scrapings used as a purgative and to induce vomiting ■ A decoction made from leaf is used to treat coughs and colds	■ Straight stems are used for fence poles ■ Heavy, dense wood makes an excellent fuel generating intense heat ■ Favourite with bee farmers as the mass of flowers produce copious nectar and pollen	■ One of best trees to attract butterflies - masses of small white flowers	■ Most habitat types ■ Except in forests ■ Very common in dry, deciduous woodland along drainage lines

BOTANICAL NAME	ENGLISH COMMON NAME	DESCRIPTION	DESIGN VALUE	
Buddleja salviifolia	Sagewood	■ Large Semi-deciduous to evergreen ■ Dense roundish crown with drooping branches ■ 5 x 4m ■ White to purple tubular scented flowers from August to October ■ Fruit: ovoid capsule from October to December	■ If pruned often can be used as edge - attractive when in full flower ■ Perfect background plant ■ Neat and colourful container plant ■ Must be pruned if tree is required ■ Aggressive root system	
Burchellia bubalina	Wild Pomegranate	■ Medium Evergreen ■ Round form that stays neat ■ 2,5 x 1,5m ■ Clusters of tubular nectar-rich orange to coral-red flowers from September to January	■ Ornamental ■ Does well in a large container ■ Plant under large trees or in a mixed shrub border	
Carissa macrocarpa	Big Num-num	■ Large Evergreen ■ Usually forms a dense throny shrub, it may also grown into a small tree up to 4m high ■ 3 x 2m ■ Strong stiff spines, once or twice forked and glossy dark green foliage ■ Large up to 5cm long bright-red oval fruits that are deliciouscious and rich in Vitamin C ■ Starry-white, sweetly-scented flowers from September to January	■ Attractive ornamental ■ Popular both for its excellent nutritious fruits and for its ability to form a dense impenetrable hedge ■ Set the plants out close together, about a metre apart, to form the hedge, and prune if necessary ■ Wind resistant	
Cassinopsis ilicifolia	Holy Cassinopsis Lemon Thorn	■ Medium Evergreen ■ Round to scrambling, may form a small tree ■ 2,5 x 4m ■ Insignificant creamy-green flowers from September to November ■ Oval bright-orange fruits	■ May be allowed to scramble into surrounding trees and shrubs ■ Prune back to keep it looking like a shrub ■ Dense and can be used to form an effective natural barrier since it is fairly spiny - set new plants close together ■ Clusters of tubular nectar-rich orange to coral-red flowers from September to January	
Chrysanthemoides monilifera	Bush-tick Berry	■ Medium Evergreen ■ Large, dense and spreading (prune to keep neat) ■ 2 x 2,5m ■ Daisy-like yellow flowers in Spring ■ Sweet, tasty purple, black or red berries	■ Excellent hedge, windbreak or screen plant ■ Plant singly or in large groups to form attractive and effective groundcover, even under large mature trees ■ Use as a temporary filler, until slower shrubs have grown and established themselves	
Crassula ovata	Pink Joy	■ Small Evergreen ■ Rounded ■ 1,8 x 1,5m ■ Masses of pretty pale-pink, star-shaped flowers from May to July ■ Dark green succulent leaves	■ Sheltered position ■ Ideal for rockery or for an informal shrub border ■ Grow in large decorative containers	
Dietes grandiflora	Wild Iris	■ Small Evergreen ■ Clump of strap-shaped leaves ■ 1 x 1m ■ Large delicate white-orange-and-mauve flowers on 1m tall stalks	■ Mass plant ■ Singly as accent plant next to pond, steps or an attractive rock	
Dodonaea angustifolia	Sand Olive	■ Large Evergreen ■ Rounded dense and sometimes small tree up to 6m ■ 4 x 4m ■ Small yellow-green flowers from April to August ■ Decorative clusters of winged greensih-red fruits ■ Droopy shiny leaves which are resinous	■ Good hedge or screen plant ■ Stabilise sand dunes and control erosion	
Felicia filififolia	Fine-leaved Felicia	■ Small Evergreen ■ Rounded ■ 1 x 1m ■ Masses of pale-mauve to white daisy flowers in September	■ Plant in groups in informal border or in rockery	
Gardenia thunbergia	Starry Gardenia	■ Large Evergreen ■ Rounded shrub or small tree ■ 5 x 3m ■ Large starry white fragrant flowers in summer ■ Distinctive egg-shaped grey fruits are speckled with whitish encrustations (very hard and woody and remain on the tree for a long time)	■ Breathtaking in full flower - scent fills air ■ Plant near stream or pond ■ Decorative shrub ■ May be grown in a container ■ Use in an informal border, or in an open space as a focal feature	

	SOCIO-CULTURAL VALUE	ECONOMICAL VALUE	ECOLOGICAL VALUE	HABITAT
	■A decoction of the root is used as a remedy for coughs and colic ■Infusion of leaves is applied as eye lotion ■Fresh or dried leaves boiled and used as tea - drink without milk but with honey	■Flowers produce a fair amount of pollen and nectar, making it a popular tree with bee farmers ■Leaves browsed by game	■One of best plants to attract a variety of insect species and therefore insect-eating birds ■At least 15 species of butterflies visit these bushes when in flower, but it is the host plant for only one species, the African leopard butterfly ■Valuable for stabilising embankments along dams, furrows, streams and rivers - strong roots able to grow in flowing water, habit of sending out strong shoots after veld fire, adaptability to soil and climatic conditions	■Forest margins ■Rocky outcrops ■Along drainage lines, especially those with permanent water
	■Roots are traditionally added to body washes and used to prepare a love charm		■Whitebellied, Collared Olive and Black Sunbirds are lured by rich nectar and are constant visitors in early summer ■Attractive to useful insects like bees and butterflies	■Forests ■Light shade
	■Delicious fruit eaten whole ■Exceptional jellly made from fruit ■Pink dye is obtained from the fruit		■Baboons, monkeys and fruit-eating birds and other animals enjoy fruit ■Attractive to useful insects like bees and butterflies	■Coastal bush ■Coastal forest and sand dunes
	■Seeds are worn as ornaments ■A bark remedy traditionally treats dysentery		■Attractive to birds (fruit) and useful insects like bees and butterflies	■Edge of evergreen forest ■Riverine bush ■Wooded kloof and along streams
	■Berries used to be important food source for Khoi (now eaten by children) ■Traditionally leaf infusions are used to deal with fevers ■Fruit juice is taken in small doses to purify the blood and deal with impotence	■Soap has been made from the ashes	■Fruit-eating birds such as African Green Pigeon, Fiscal Flycatcher, Redwinged and Glossy Starlings, Crested and Blackcollared Barbets and Collared Sunbirds are partical to the fruit ■Larvae of Common Opal, Beaufort Opal, Natal Opal, Coast Copper and Thysbe Copper butterflies feed on this plant	■On the flats and on the mountain slopes
	■Roots were once eaten by the Khoikhoi ■Other African tribes are said to have grated the root and cooked it, after which it was eaten with thick milk		■Flowers attract a variety of insects, such as bees, beetles with a metallic sheen and beautiful butterflies (Burnished Opal, Cape Black-eye and Pale Hairtail)	■Rocky slopes ■Sheltered ravines ■Intermingled with riverside vegetation
			■Attract lots of bees and other pollinators	■Forest margins ■Near streams
	■Traditional remedy for fever, colds, throat infections, flu and arthritis is prepared from the new leaf tips (well known to early Cape settlers, who used it to treat fever) ■Plant was also used to cure pneumonia, tuberculosis and skin rashes		■Attractive to useful insects like bees and butterflies	■A variety of habitats ■Fromarid semi-desert regions to the margins of moist evergreen forest (reaches 7m)
	■In rural areas it is often used as fuel (this poisons sheep)		■Attractive to useful insects like butterfies and bees	■Rocky places ■Often on hillside and mountainsides
	■A root infusion is traditionally used to treat biliousness while a remedy prepared from the leaves is a treatment for syphilis	■Hard wood is used for tools and implement handles	■Antelope eat the fruits and the flowers attract moths ■Attractive to other useful insects like bees and butterlies	■Evergreen forest and woodland

BOTANICAL NAME	ENGLISH COMMON NAME	DESCRIPTION	DESIGN VALUE	
Grewia occidentalis	Crossberry	■ Large deciduous to evergreen ■ Rounded to long, narrow and spase, to creeper ■ 5 x 3m ■ Starry pink-purple with a central mass of fluffy stamens from November to February ■ Small edible four-lobed fruits	■ Non-aggresive root system - can be positioned alongside driveways and other structures ■ Use in informal border in home garden to attract birds ■ Prune whenever necessary to keep neat	
Helichrysum splendidum	Cape Gold	■ Small Evergreen ■ Rounded dense and erect ■ 1,5 x 1,5m ■ Small golden yellow flowers in flattish heads from October to January ■ Attractive silver-grey foliage	■ Aromatic ■ Dazzling groundcover	
Hypoestes aristata	Ribbon Bush	■ Small Evergreen ■ Rounded dense and erect ■ 1,5 x 1m ■ Pretty spikes of tubular mauve or pink flowers (petals curl over like ribbons) from May onwards	■ Mass plant under large trees - effective groundcover	
Leonotis leonurus	Wild Dagga	■ Medium Evergreen perennial ■ Rounded ■ 2 x 2,5m ■ Bright orange nectar-rich velvety flowers are displayed in whorls at the tops of each stem in Autumn ■ Sweet, tasty purple, black or red berries	■ Perfect candidate for the bird garden ■ Use in informal mixed border, on a rockery, or closed planted in groups of 3-5 plant, along a driveway	
Leucospermum cordifolium	Nodding Pincushion	■ Small Evergreen ■ Neat round symmetrical bush ■ 1,5 x 2m ■ Masses of gorgeous salmon-pink to apricot 'pincushion' flowers from July to December	■ Plant on sloping bank or in raised rockery for better drainage	
Leucospermum cuneiforme	Common Pincushion	■ Large Evergreen ■ Neat compound rounded shrub, often multi-stemmed shrub, but may also form a small tree up to 3m with a single trunk ■ 3 x 3m ■ Showy yellow flowerheads fade to apricot or orange and then finally to red from August to February (almost anytime) ■ Smooth fruits resemble ticks, hence the common name 'Luisiesbos' ■ Leathery leaves overlap neatly are square across the top and are clearly notched	■ Perfect for informal shrub border or plant a single specifmen in the centre of a lawn	
Lobostemon fruticosus	Agtdaegeneesbos	■ Small Evergreen ■ Rounded bushy ■ 1 x 1m ■ Beautiful pink or blue bell-shaped flowers from August to November ■ Narrow oval hairy leaves grow all the way up soft-wooded stems	■ Rockery ■ Mixed border	
Melianthus major	Giant Honey Flower	■ Medium Evergreen ■ Drooping ■ 2,5 x 3,5m ■ Long leaves - crushed distinctive and unpleasant smell ■ Rusty-red flower spikes are carried high above the foliage in Spring ■ Inflated 'balloon-like' fruits	■ Lush-looking ornamental ■ Focal point (plenty of room to spread) ■ Plant alongside a stream or pond	
Metalasia muricata	White Bristle Bush	■ Medium Evergreen ■ Much-branched rounded shrub, sometimes small tree ■ 3 x 3m ■ Massess of white, pink, red or purple honey-scente flowers displayed attractively in flattish heads at tips of erect branches anytime, especially spring ■ Fuits are nutlets with bristles	■ Looks decorative for most of year ■ Plant freely in coastal gardens ■ Set plants out in groups of 3-5 in herbaceous border or position a single plant strategically in a small garden where it can be the centre of attraction when in flower	

	SOCIO-CULTURAL VALUE	ECONOMICAL VALUE	ECOLOGICAL VALUE	HABITAT
	■The sweet fruits are widely eaten in Africa - they are often picked and stored for later use - boiled in milk they taste like milkshake ■In Botswana people drink the juice of the crushed fruits either fresh or fermented ■Brusied bark soaked in hot water is traditionally used to dress wounds ■Rootbark deals with bladder problems ■A shampoo prepared from crushed bark and regularly used prevents hair going grey	■Xhosa make assegai handles and the San make bows from the wood	■Birds eat fruit - Speckled Mousebird, Blackeyed and Cape Bulbuls, Crested and Blackcollared Barbets ■Larvae of the Rufous-winged Elfin and Buff-tipped Skipper eat the leaves	■Scrambles in evergreen forests ■Shrub or small tree on forest margins, in open woodland, coastal bush and wooded hillsides
	■Popular traditional medicine plants and this species has been used to treat rheumatism	■Some areas used as fuels	■Attractive to useful insects like bees and butterlies	■Rocky places ■Forest margins
	■Crushed leaves used as a poultice for sore eyes		■Bees, flies and other small insects visit the flowers, providing a source of food for insectivorous birds like the Puffback, Southern Boubou, robins, thrushes, and barbets	■Dry thicket ■Forest and damp places
	■Traditional remedies prepared from the leaves heal colds, flu, coughs, bronchitis, headaches, asthma, and high blood pressure ■A leaf and root remedy is used as snakebite ■A flower and leaf treatment deals with tapeworm ■The earliest dwellers in South Africa chewed and smoded this plant instead of tobacco ■Sweet, tasty purple, black or red berries		■Nectar-rich flowers entice butterflies, bees adn birds, such as the Whitebellied, Black, Yellowbellied, Olive, Collared and Marico Sunbirds ■Insectivorous birds visit gardens to hunt for insects attracted by the flowers	■Amongst rocks in grassland
		■Excellent cutflowers - last up to 4 weeks	■Attractive to birds ■Attractive to useful insects like bees and butterflies	■Most anywhere - South-western Cape
			■The nectar-rich flowers lure sunbirds, sugarbirds and many others	■Variety of habitats from winter rainfall scrub to subtropical coastal dune forest, from the edges of the Karoo to the margins of temperate evergreen forest
	■Popular traditional medicine plant ■Leaves fried in sweet oil, pulped leaves and leaf decoctions are all old Cape remedies for ringworm, sores, ulcers, burns and wounds ■The name 'Agtdaegeneesbos' refers to the fact that it is supposed to be able to heal all conditions within 8 days	■Small Evergreen ■Neat round symmetrical bush ■1,5 x 2m ■Masses of gorgeous salmon-pink to apricot 'pincushion' flowers from July to December	■Attractive to useful insects like bees and butterflies	■Common in South-western Cape
	■Various leaf remedies are traditionally used to treat sores, bruises, septic wounds, ringworm, backache and rheumatism ■Dried powdered leaves are placed directly on open wounds, burns and sores to relieve pain, retract the wound and speed up healing ■Root infusions are traditionally used to treat cancer ■Poisonous (incorrect usage)		■Larvae of the Foxtrot Copper feed on this plant ■Invasive, may sucker and become a nuisance if not controlled	■Riverbanks and stream banks
	■In Lesotho a tea is prepared from the dried leaves ■Used as firewood in many areas	■Stock such as sheep browse the foliage when food is scarce	■Stabilize coastal dunes ■Attractive to useful insects like bees and butterflies	■Coastal dunes ■Mountainous areas ■Rock outcrops ■Along streams

BOTANICAL NAME	ENGLISH COMMON NAME	DESCRIPTION	DESIGN VALUE	
Nymania capensis	Chinese Lanterns	■Large Evergreen ■Rounded ■4 x 2m ■Pretty dark-pink bell-shaped flowers from July onwards ■Ornamental pink-red balloon-like seed-pods that are papery and inflated ■Tiny leathery leaves	■Decorative ■May survive in container in dry position ■Imitate natural conditions ■Plant on steep slope to ensure adequate drainage	
Ochna serrulata	Small-leaved Plane	■Medium Evergreen ■Round ■2,5 x 2,5m ■Golden-yellow flowers each with a tuft of fluffy stamens in the centre from September to October ■Flowers followed by shiny black fruits suspended below bright red sepals	■Decorative ornamental (pinkish-bronze spring foliage) ■Suitable for informal mixed border ■Place strategically amongst rocks ■Prune to give compact shape as may become a little untidy	
Pelargonium cordifolium	Heart-leaved Pelargonium	■Small Evergreen ■Robust rounded much-branched bushy ■1 x 1m ■Pink to purple flowers with dark markings displayed well above leaves from June to January with a peak in spring ■Heart-shaped aromatic leaves	■Position in groups of 3-5, either in a shrub border, on a rockery, or at the edge of a pond (not saturated moisture) ■Line paths, edging along front of flowerbed that contains taller shrubs	
Plectranthus fruticosus	Forest Spurflower	■Small Evergreen ■Rounded large texture ■1 x 1m ■Masses of attractive pyramidal spikes of pink or bluish-mauve flowers from December to February ■Heart-shaped leaves tinged purple beneath	■Can be grown in containers ■Mass plant in shade	
Plumbago auriculata	Cape Leadwort	■Medium Evergreen ■Tendency to scramble ■3,5 x 3m ■Masses of powder blue or white flowers anytime in summer	■Allow to scramble up amongst other shrubs or trees, or mass plant it on a sloping bank ■Attractive informal hedge ■En masse - groundcover for large garden ■Plant along fence to form a screen or in an informal border where it can be neatly pruned	
Polygala virgata	Purple Broom	■Medium Evergreen ■Oval crown, base bare and untidy ■2 x 1m ■Purple spikes of sweetpea-like flowers from July to September	■Charming and beautiful shrub - eye-catching ■Plant behing other shrubs (a bit leggy) and close together in groups of at least 3-5	
Protea cynaroides	King Protea	■Medium Evergreen ■Rounded compact ■1,8 x 2m ■30cm flowerhead (red leafstalks) pinkish from May to December	■Grown anywhere	
Protea grandiceps	Peach Protea	■Medium Evergreen ■Neat rounded bush ■1,5 x 1,5m ■Broad grey leaves with red margins ■Flowerheads are cylindrical and have peachy-pink bracts, tipped with white haris from August to January	■Can live for up to 20 years in garden	
Protea magnifica	Bearded Sugarbush	■Medium Evergreen ■Spreading rounded shrub, sometimes sprawling ■2 x 2m ■Up to 20cm flowerheads are filled with a mass of soft white hairs, often tipped black or brown in the centre, outer bracts vary in colour from soft pink to a deep rose (June to January) ■Broad grey-green leaves	■Raise in bed - in a rockery or on a very steep slope ■Thrives high on hot and dry mountains in summer	
Rhamnus prinoides	Dogwood	■Large Evergreen ■Rounded dense bushy shrub, sometimes scrambles into other plants, or small tree up to 6m ■4 x 4m ■Small greenish flowers from October to December ■Round Pea-sized fleshy fruits which ripen to purple	■Lovely waterside plant or hedge ■Non-aggressive root system	
Rothmannia globosa	Bell Gardenia	■Large Evergreen ■Shrub or slender smaller tree up to 6m ■6 x 4m ■Scented creamy-white bell-shaped flowers in early spring (August to November) ■Large round green fruit (about 2,5cm diameter) become hard woody and brown when ripe	■Decorative ornamental shrub ■Perfect for schools, home gardens, parks and office complex gardens ■Use in shrub border or plant it alongside a large dam, a stream or pond	

	SOCIO-CULTURAL VALUE	ECONOMICAL VALUE	ECOLOGICAL VALUE	HABITAT
		■ Fruit stems - attractive and unusual addition to flower arrangement	■ Flowers attract sunbirds and honeybees	■ Hot dry areas
	■ A root decoction is traditionally used by the Zulus to treat children with bone diseases		■ Fruit-eating birds are lured by the fleshy fruits ■ Larvae of the One Spot Redwing moth feed on Ochna species	■ Forest margins ■ Rocky hill slopes
			■ Flowers attract many pollinating insects, such as bees	■ Moist places on forest margins, on hillsides and on riverbanks
	■ Stems rubbed on windowsills repel flies		■ Larvae of the Gaudy Commodore and Garden Inspector butterfly feed on this plant	■ Forests on the mist belt
	■ Traditional remedies prepared from the roots or leaves are used to relieve headaches, treat fractures and wounds, and to remove warts		■ Butterflies are constant visitors in warmer months ■ Larvae of the Common and Short-toothed Blue butterfly feed on this plant	■ Scrub ■ Thicket ■ Valley bushveld
	■ Traditional remedies prepared from the leaves and stems are used as blood purifiers	■ Flowers last in fower arrangement	■ Leaves are heavily browsed ■ Bees pollinate the flowers	■ Grassland and forest margins
	■ Cultural value - the Protea used as a South African symbol	■ The flower is an important export in the cutflower trade	■ Flowers attract sunbirds (Greater Doublecollared Sunbird) and sugarbirds (Cape Sugarbird) ■ The Protea Canary eats the seeds ■ Larvae of the Orangebanded protea butterfly and Protea Scarlet butterfly feed on this protea	■ Mountain ranges ■ Grows right at the coast and high up in mountains (up to 1500m)
	■ Cultural value - the Protea used as a South African symbol		■ Protea flowers attract sunbirds (Greater Doublecollared Sunbirds) and sugarbirds (Cape Sugarbirds) ■ The Protea Canary eats the seeds	■ Coastal mountain ranges ■ Usually confined to the summits and uppermost slopes (between 1200 and 1700m)
	■ Cultural value - the Protea used as a South African symbol		■ Protea Canary eats the seeds	■ Mountains encountered at elevations of between 1200 and 2700m ■ Favours dry exposed sites which are hot in summer and cold in winter
	■ A root decoction is traditionally used to deal with pneumonia ■ A paste from the green leaves is applied to sprains ■ In Ethiopia leaves are used as stimulants in wines and beers	■ Hard heavy white wood is suitable only for small articles, such as walking sticks ■ Parts of the plant are used as protection against lightning	■ Flowers attract insects such as bees, and birds ■ Starlings, bulbuls and barbets are attracted by the fruit ■ Larvae of the Forest-king Charaxes and Pine Tree Emperor moth feed on the plant	■ Margins of evergreen forest ■ Along riverbanks ■ Riverine bush
		■ The pale grey wood is is hard and heavy, but too small to be of any value	■ Fruit eaten by monkeys ■ Speckled flowers attract carpenter bees	■ Coastal and dune bush ■ Along riverbanks ■ Margins of evergreen forest

BOTANICAL NAME	ENGLISH COMMON NAME	DESCRIPTION	DESIGN VALUE	
Tecoma capensis	Cape Honeysuckle	■ Medium Evergreen ■ Yellow-flowered form is neater, less sprawling ■ 2-3m x variable ■ Spikes of lovely yellow, orange, red or salmon trumpet-shaped flowers (rich in nectar) in spring and autumn	■ Excellent for bird garden ■ Tendency to spread and scramble - prune to keep neat ■ Plant alongside Plumbagos ■ Plant it singly or in groups of three in a mixed border, on a golf course, or in large numbers to form an attractive informal hedge ■ It can be allowed to scramble into surrounding trees or shrubs to show itself off to advantage	
GROUNDCOVERS				
Adiantum capillus-veneris	Maidenhair Fern	■ Delicate fern with flat heart-shaped leaflets carried on wiry black stems ■ 30 x 30cm	■ Useful plant for water garden - plant in protected area near a stream or pond ■ Use in window boxes or large containers	
Agapanthus africanus	Dwarf Agapanthus	■ Clumps of strap-shaped leaves ■ Rounded heads of blue or white tubular flowers displayed on stalks (45-55cm) from December to March ■ 35 x 35cm	■ Mass plant under trees ■ Steep banks ■ Containers ■ In front of shrubs as border	
Agapanthus praecox	Agapanthus	■ Clumps of strap-shaped leaves ■ Large rounded heads of lovely blue or white tubular flowers that are displayed on tall stalks (1-1,2m) ■ 50 x 60cm	■ Mass plant under trees ■ Steep banks to hold the soil ■ Large containers or planter boxes ■ Along front of shrub border ■ Popular with landscapers	
Aloe striata	Coral Aloe	■ Clump of stiff succulent leaves ■ Boat-shaped blue- to grey-green succulent leaves that are smooth, flat and broad; spineless margins have reddish edges ■ Branched flower stalks 1m tall of pretty pink-red to bright orange tubular waxy flowers from July to October ■ 30 x 50cm	■ Spectacular colour display in winter ■ Tough and adapts to difficult conditions	
Arctotheca calendula	Cape marigold	■ Creeping and climbing plant ■ Leaves are green above and grey below ■ Pretty yellow daisies anytime in the year ■ 10 x 40cm	■ Excellent and groundcover and hardy ■ Large area to be covered in a short time ■ Plant on sloping embankments which are not too steep ■ Use as border in front of shrubs	
Aristea ecklonii	Blue Stars	■ Decidiuos to evergreen clumped plan with strap-shaped leaves ■ Sea of dainty flowers that creates a beautiful splash of blue-mauve from October to December ■ 50 x 25cm	■ Excellent groundcover for shady bed	
Bulbine frutescens	Stalked Bulbine	■ Basal clump of strap-shaped succulent grey-green leaves ■ Star-shaped yellow or orange flowers from September to June ■ Pretty yellow daisies anytime in the year ■ 30 x 40cm	■ Mass plant ■ Widely used by landscapers ■ Combines well with blue Agapanthus ■ 10 x 40cm	
Clivia miniata	Bush Lily	■ Dark green strap-shaped leaves ■ Showy rounded clusters of bright-orange trumpet-shaped flowers in spring ■ 45 x 60cm	■ Plant near a shady pond or stream, under large trees or in large containers or tubs	
Cotyledon orbiculata	Pig's Ears	■ Basal clump of roundish succulent grey-green leaves, each with a red margin ■ Orange-red bell-shaped flowers are carried at the top of a longish stalk (75-90cm) from August to September ■ 30 x 45cm	■ Excellent plant for rockery and container	
Crassula multicava	Fairy Crassula	■ Rounded ■ Misty mass of tiny starry pink flowers are displayed in large heads above attractive rounded succulent leaves (from July to September) ■ 20 x 30cm	■ Plant on damp shady rockeries	
Crocosmia aurea	Valentine Flower	■ Deciduous - clumps of strap-like leaves ■ Stunning sprays of brilliant-orange star-shaped flowers are displayed on tall, somewhat drooping stalks (1-1,2m) from February to April ■ 95 x 30cm	■ Mass plant	
Drosanthemum speciosum	Red Ice-plant	■ Bushy plant ■ Small succulent leaves ■ Beautiful shiny red or orange 'vygie' flowers with pale yellow centres in spring ■ 40 x 60cm	■ Mass plant in rockery on on bank to form a groundcover ■ Extremely colourful addition to a succulent garden ■ Could be planted in a container	

	SOCIO-CULTURAL VALUE	ECONOMICAL VALUE	ECOLOGICAL VALUE	HABITAT
	■Powdered bark is used for bleeding gums, and is said to relieve pain, fevers and influenze, and to induce sleep	■Stock and game browse the leaves	■Nectar-rich flowers attract honeybees, butterflies (Pea Blue, Smokey Blue), sunbirds (Collared Black, Marico and Scarletchested) and the Cape Sugarbird	■Margins of evergreen forest ■In bush and scrub in coastal areas and along streams
	■Leaves traditionally smoked to ease the symptoms of head and chest colds ■Old European remedy for asthma, coughs and kidney problems ■Early settlers in Cape also used it for chest complaints and colds			■Near moisture ■Shaded banks ■Along small perennial streams ■Cliff faces
	■Use traditionally as an antenatal and post-natal medicine	■Propogation	■Attractive to useful insects like bees and butterflies	■From sea level up to the mountain tops
	■Traditional remedies prepared from this plant act as aphrodisiacs and as an antenatal and post-natal treatments to ensure an easy birth and healthy children	■Propogation ■Low maintenance	■Flowers attract a variety of insects and insectivorous birds	■Grassland and rocky hillsides
			■Rich in nectar, the pretty flowers attract shimmering sunbirds	■Hot dry areas
		■Sheep are partial to the flowers	■Larvae of the Painted Lady butterfly feed on this plant	■Sandy, well-drained soil, on sand dunes, stream banks and rocky outcrops
	■Traditional remedies prepared from this plant are used to deal with coughs, internal sores and venereal disease ■Regarded as a good luck charm		■Excellent for bird gardens ■Allow natural leaves to form a mulch ■Insects and other useful creatures that aid decomposition hide in the mulch and end up as birdfood (Cape Robin, Burchell's Coucal and Southern Boubou found scratching around in such area)	■Forest margins ■Along stream banks ■Grassland and scrub
	■The clear gel or leaf sap in the leaves (applied as warm poultice) is traditionally used for mosquito bites and to heal cuts, abrasions, burns, wounds, rashes and boils, eczema and cracked lips		■Attractive to useful insects like bees and butterflies	■Dry, sandy or rocky areas, often on poor soils
	■Ease childbirth, to treat snakebite and as a painkiller ■Rhizomes are highly poisonous and usage should be discouraged	■Excellent cutflowers for the vase ■Propogation	■Attracts useful insects like bees and butterflies	■Partial shade of forests and coastal bush
	■Excellent plant for rockery or container ■Corns and planter warts are softened and removed by applying the cut surface of a leaf to them - leaf strips are bandaged to warts ■Juice is used to treat epilepsy	■Sheep and goats feeding on this plant may be poisoned	■Larvae of the Natal Opal, Burnished Opal, Cape Black-eye and Common Black-eye butterflies feed on this plant ■Bright flowers attract sunbirds and bees and provide lovely spring colour	■Grassland ■Rocky koppies
		■Propogation	■Larvae of the Tailed Black-eye butterfly feeds on crassulas	■Rocky outcrops in the shade
	■Corms are traditionally used to treat dysentery	■Excellent cutflowers ■Propogation	■Bushpigs eat the corms ■Birds eat the seeds	■Moist shady places in forests
			■Useful insects like bees and butterflies are attracted to this plant	■Rocky dry places

BOTANICAL NAME	ENGLISH COMMON NAME	DESCRIPTION	DESIGN VALUE	
Eucomis autumnalis	Pineapple Flower	■ Deciduous ■ Broad wavy soft-textured strap-shaped leaves ■ Yellow-green flowers carried on a spike (60cm tall), at the top of spike (densely packed) is a rosette of leaf-like bracts - the flowers resemble a pineapple, in summer ■ 50 x 50cm	■ Unusual and attractive groundcover mass planted under trees	
Felicia amelloides	Blue Felicia	■ Rounded form - perennial ■ Pretty blue-purple daisy flowers from September to March ■ 60 x 60cm	■ Mass plant ■ Line edge of shrub border ■ Could be planted in rockery or in a large tub or planter box	
Gazania krebsiana	Gazania	■ Basal clump of grey-green leaves ■ Pretty daisy flowers on longish stalks, bright colours with stripes (only open in sun) in spring and summer ■ 25 x 30cm	■ Unusal and attractive groundcover mass planted under trees	
Geranium incanum	Carpet Geranium	■ Creeping ■ Masses of attractive roundish mauve flowers are displayed on silvery leaves from September to May ■ 30 x 30cm	■ Beautiful free-flowering groundcover - mass plant ■ Overhang a terraced wall or in large container ■ Edging plant - informal border ■ Plant on large sloping banks	
Haemanthus albiflos	Dappled Snowbrush	■ Deep green low-gloss strap-shaped leaves are broad and speckled with white (very attractive) ■ A 'brush' of white flowers, surrounded by waxy bracts is displayed at the end of a quaintly leaning stalk (about 40cm long) from April to June ■ Bright orange berries ■ 30 x 40cm	■ Excellent evergreen groundcover for shady areas ■ Always look good ■ Large groups under trees or in big containers, ■ Edge of pathway (in front of Clivias)	
Kniphofia praecox	Red-hot Poker	■ Large clumps of strap-shaped leaves ■ Stunning poker-shaped heads composed of bright-orange, closely packed flowerbuds are carried on tall (1,5m) stalks and become yellow as they open in winter ■ 1 x 1m	■ Looks attractive next to a dam or stream, or in a mixed shrub border	
Pelargonium peltatum	Ivy-leaved Pelargonium	■ Climbing scrambling groundcover ■ Ivy-shaped leaves ■ Pink, mauve or white flowers from August to January ■ 50cm - 2m x variable	■ Allow to scramble up into trees or cascade over a terraced wall, or over edge of a large container ■ Groundcover under large trees or hanging basket	
Plectranthus verticillatus	Money Plant	■ Glossy dark-green semi-succulent foliage tinged with maroon ■ Creeping ■ Tubular white flowers with purple markings ■ 20 x 50cm	■ Groundcover under trees	
Rumohra adiantiformis	Knysna Fern / Seven Week Fern	■ Clumps of leaves - glossy light-green leathery fronds are coarsely toothed and roughly triangular in shape ■ 1 x 1m	■ Shady spot near a pool or stream	
Tulbaghia violacea	Wild Garlic	■ Clumps of strap-like grey-green leaves that smell of garlic when bruised ■ Small rounded heads of pretty mauve flowers are displayed on long stalks (about 40cm tall) in summer ■ 30 x 25cm	■ Plant in small groups in a rockery ■ Use an edging plant along front of informal border (very striking) or along a pathway ■ Mass plant	
Veltheimia bracteata	Bush Lily	■ Glossy deep-green wavy leaves ■ Bulbous that boasts dense spikes of tubular pink-red to deep-red flowers that are carried at the top of long stalks (50cm tall) from July to September ■ 25 x 40cm	■ Fare well in containers ■ Keep in shade	
Watsonia species (Knysnana - soft pink; angusta - orange-red; borbonica - white; pillansii - apricot to pale orange)	Watsonia	■ Clumped leaves ■ Deciduous to evergreen corm-plant ■ Flowering times vary, colours vary from white to pink, orange and mauve) ■ 1,75m x 20cm	■ Plant in masses for a beautiful groundcover	
WATER PLANTS				
Aponogeton distachyos	Cape Pondweed Waterblommetjie	■ Masses of sweetly scented white flowers on short stalks from July to October ■ Broad glossy oblong green leaves that float on water's surface ■ 10 x 95cm	■ Vigorous and rampant grower ■ Water garden	

	SOCIO-CULTURAL VALUE	ECONOMICAL VALUE	ECOLOGICAL VALUE	HABITAT
	■Facilitates the rapid knitting of lacerated skin ■A bulb decoction is traditionally used to deal with stomach-ache, back-ache, syphilis, urinary problems and fevers, and is said to assist with recovery after operations	■Excellent cutflowers	■Useful insects like bees and butterflies are attracted to this plant	■Grassland
		■Propogation	■Cheerful flowers lure bees and other insect pollinators that in turn attract insectivorous birds	■Often found growing on hillsides in nature
	■Flowers are eaten raw ■Felt from the leaves is made into skirts in Lesotho ■This plant is traditionally used to deal with sterility problems in women, and with sickly babies		■Attracts useful insects like bees and butterflies	■Dry areas
	■Leaves have been used as a tea substitute - hence the name 'Bergtree' ■Leaf infusions are traditionally used to treat menstrual problems, venereal disease and bladder infections	■Propogation	■Attractive to useful insects like bees and butterflies	■Near the Cape Coast
	■A traditional remedy prepared from this plant is used to deal with coughs	■Propogation	■Attractive to useful insects like bees and butterflies	■Shady places in forest and woodland
			■Excellent plant for bird garden - nectar-rich flowers attract pollinating insects and sunbirds (Whitebellied and Black Sunbirds)	■Marshy places
	■Sour-tasting leaf sap is used to treat sore throats	■Propogation	■Larvae of the Water Bronzze, Common Geranium Bronze and Dickson's Geranium Bronze butterflies	■Coastal or succulent thicket
		■Propogation	■Larvae of the Gaudy Commodore, marsh Commodore, Garden Inspector, Dry Leaf Commodore and Eyed Pansy butterfly feed on Plectranthus ■Attracts birds - nectar and insects	■Wet and dry places in woodland, scrub forest and on forest margins
		■Attractive foliage lasts well in a vase - flower arrangements - fronds are gathered in the wild and expressly cultivated for this purpose, and are often exported to Europe		■Forest margins ■Sometimes rocky hillsides
	■Traditionally used to treat asthma, rheumatism, fever, colds and tuberculosis, and is planted as an aphid and snake repellent ■Green parts are used as spinach	■Propogation	■Attractive to useful insects like bees and butterflies	■Rocky slopes and cliffs in grassland and near rivers
			■Attracts useful insects like bees and butterflies	■Forests ■Thickets ■Coastal bush
		■Popular cut flowers	■Attractive to birds - nectar ■Attractive to useful insects like bees and butterflies	■All parts of South Africa - 70 species
	■Winter dinner ingedrient - whole flower cluster with its bracts is edible - Cape waterblommetjiebredie ■Soups, salads and picles are made from the fresh plant ■Starchy rhizomes were once eaten by the Khoi and San ■Sunburn, abrasions and burns are traditionallly treated with juice from fresh stems	■Propogation ■Waterblommetjie available in cans ■Goats and pigs can be fed the stems	■Attractive to useful insects like bees and butterflies	■Dams and pools in south-western Cape

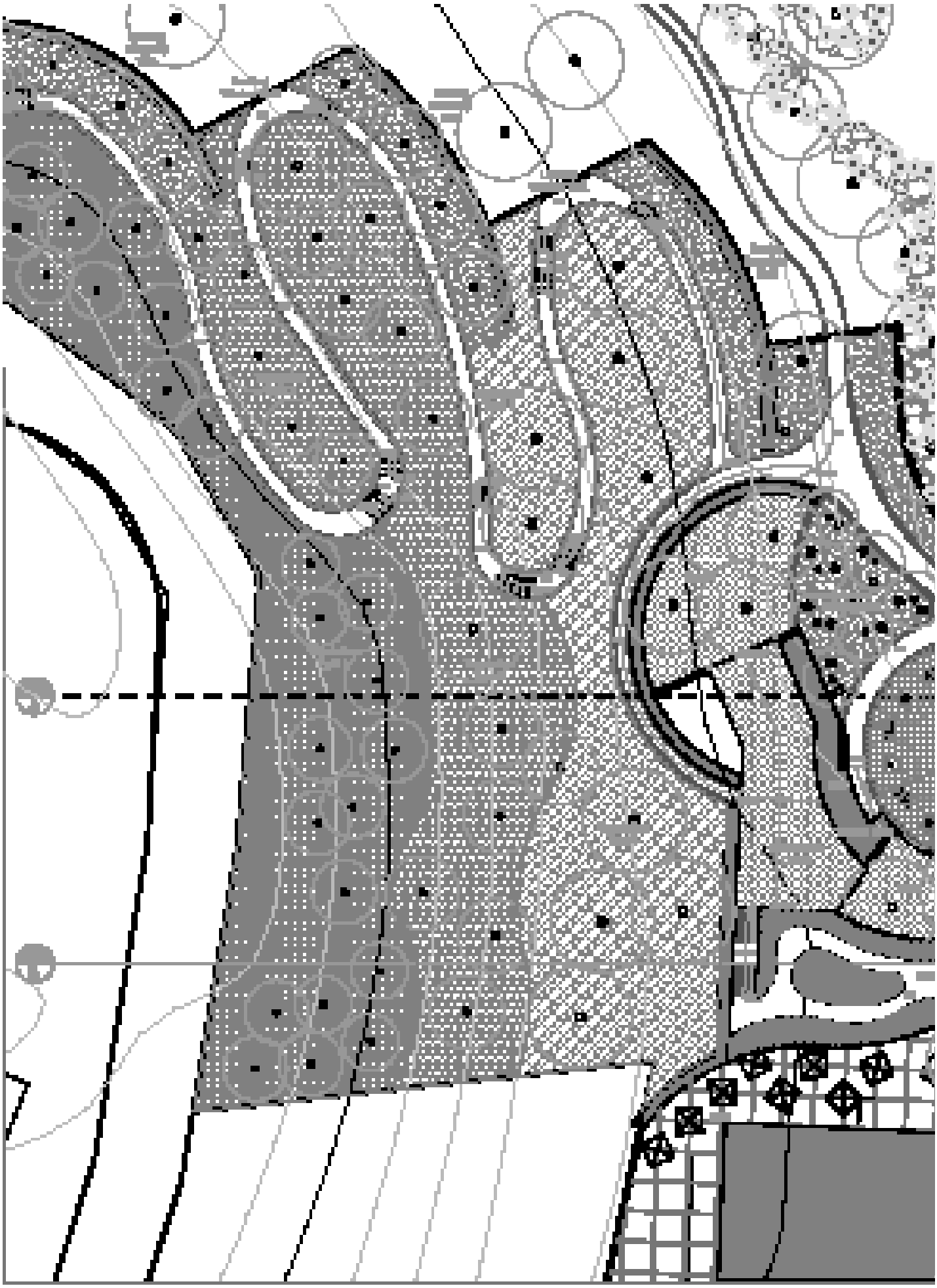
BOTANICAL NAME	ENGLISH COMMON NAME	DESCRIPTION	DESIGN VALUE	
Chondropetalum tectorum	Western Cape Thatching Reed	■ Clump of dark-green reed-like stems with a neat yet spiky profile ■ Dark brown flowers appear at the tips of the culms ■ 1,5 x 1,5m	■ Decorative, ornamental ■ Waterside planting Low-maintenance feature planting - combine well with proteas, pincushions and ericas ■ Looks good amongst rocks	
Crinum bulbispermum	Orange River Lily	■ Large lightly scented white to pink drooping lily-like flowers at the top of a stout flowering stalk (1m tall) from September to October; each petal streaked reddish down its middle ■ Clump of long (1m) blue-green strap-shaped leaves ■ Bulbs are poisonous ■ 40 x 95cm	■ Waterside planting	
Crinum macowanii	River Lily	■ Large beautifully scented bell-shaped pale-pink to dark-pink (or white) flowers, sometimes darkly streaked at tip of lon stalk (1-1,2m tall) from Octover to February ■ Clump of strap-shaped green leaves ■ Bulbs are poisonous ■ 40 x 95cm	■ Plant near water	
Cyathea dregei	Tree Fern	■ Distinctive fern with sturdy dark-brown to blackish trunk topped by lush arching light-green fronds ■ 4 x 2m	■ Appearance lends a luxurious tropical atmosphere to the garden - beautiful fronds and a graceful form reflected in water take one instantly to the depths of a cool and peaceful forest ■ Focal point ■ Situate where some of its roots will be relatively dryish while the others can reach for the permanently damp areas	
Cyperus textilis	Basket Grass	■ Clump of bare stems, each topped by a rounded head of narrow spiky leaves ■ 1,5 x 1m	■ Attractive accent plant for a dam or pond ■ Use alongside a stream, at the base of steps	
Gunnera perpensa	River Pumpkin	■ Very large rounded pumpkin-like leaves that areise from ground level and are carried on long reddish stalks ■ Masses of tiny pink-red flowers are carried on a tall spike (about 1m) above the leaves from September to February ■ Small fleshy fruits ■ 60 x 60cm	■ Extremely attractive foliage plant for water garden ■ Unusual ornamental ■ Try it in a vlei, near a river or next to a large dam where there is an overflow of excess water from time to time ■ Very neat looking	
Impatiens hochstetteri subsp. hochstetteri	Wild Impatiens	■ Rounded form ■ Soft oval leaves ■ Small mauve flowers with flat rounded petals in summer ■ 30 x 40cm	■ Lovely groundcover for dappled shade near a pond or stream ■ Edge of shady pathway or at base of dripping tap	
Juncus effusus	Mat-rush	■ Looks like a restio or reed ■ Spiky-looking clumps of smooth bright green culms (stems) ■ Very small inconspicuous flowers ■ Capsules that contain golden-brown seeds ■ 70 x 30cm	■ Excellent for use in well-watered beds, or in wetlands ■ Popular with landscapers - mass plant ■ Accent plant ■ Perfect for swampy, marshy areas, or for use alongside a stream, pond or large dam	
Nymphaea nouchali	Blue Waterlily	■ Showy star-like blue or pinkish flowers are displayed about 5-8cm from September to April ■ Large glossy-green rounded leaves that float on the surface of the water ■ Very small inconspicuous flowers ■ Capsules that contain golden-brown seeds ■ 70 x 30cm	■ Ponds and wetlands	
Nymphoides thunbergiana	Small Yellow Water Lily	■ Dainty starry yellow flowers with feathery-edged petals from October to May ■ Glossy deep-green rounded leaves that float on the surface of the water ■ 8 x 80cm	■ Ornamental ponds or dams - enhance the setting ■ Soften harsh edges	

	SOCIO-CULTURAL VALUE	ECONOMICAL VALUE	ECOLOGICAL VALUE	HABITAT
	■ Thatching of fishermen houses ■ Traditionally associated with thatched roofs of Cape Dutch architecture	■ Making of brooms ■ Thatching ■ Propogation	■ Stream bank stabilisation	■ Typical part of Western Cape Fynbos and occurs from the sandy coastal regions to the foothills of the mountains
	■ Roasted joints traditionally applied to aching joints, and used to deal with backache, rheumatism, septic sores and abscesses ■ Leaf sap is used for earache	■ Propogation	■ Attracts useful insects like bees and butterflies	■ Near rivers, along streams and in seasonal pans (often submerged in spring)
	■ Bulb decoctions are traditionally used for kidney and bladder diseases, itchy rashes, tuberculosis, and rheumatic fever ■ A boiled bulb compress is applied for backache	■ Propogation	■ Attracts useful insects like bees and butterflies	■ Along rivers
			■ Protected plant	■ Stream banks ■ Grassland on the edge of forests ■ Occasionally in forests
	■ Stems are used to make traditional sleeping mats and for weaving (collecting and winnowing baskets, and grinding mats)	■ Tradtional Nama beehive houses are made from mats - in hot weather the culms shring, allowing air through, but in cold wet weather they swell and become nearly waterproof ■ Propogation	■ Wetland creation	■ Wet places such as on riverbanks and stream banks an in marshy places
	■ Stems and flowerstalks are eaten raw, or cooked after removing the fibrous bits, or made into a beer ■ Roots are eaten after removing the outer skin ■ A traditional remedy prepared from the roots is taken to ease menstrual pain and to tone the uterus during preganancy ■ In large doses it causes the uterus to contract and expel a retained placenta (cattle and women) ■ A root remedy treats female infertility, another deals with colds, stomach problems and rheumatic fever	■ Propogation	■ Clump of bare stems, each topped by a rounded head of narrow spiky leaves ■ 1,5 x 1m	■ Damp, marshy areas and along stream banks
	■ Traditional remedies prepared from the leaves and stems deal with eczema	■ Propogation	■ Larvae of the Silver Striped Hawk, Large Striped Hawk and Balsam Striped Hawk moth feed on this species	■ Damp shade of forest
	■ Rounded form ■ Soft oval leaves ■ Small mauve flowers with flat rounded petals in summer ■ 30 x 40cm	■ In Japan - cultivated in paddy fields and the harvested culms are woven into Japanese tatami mats ■ Natal - weaving fibre - items including sleeping and sitting mats, rolled twine, spoon baskets and beer strainers ■ Propogation	■ Attractive to birds ■ Attractive to useful insects like bees and butterflies ■ Perfect habitats for many types of bird, insect and amphibian	■ Cosmopolitan - occurring naturally in swamps and streambeds
	■ Tubers collected from swamps and shallows are cooked like potatoes - do not have strong flavour ■ In Namibia peeled tubers are boiled or roasted, and are regarded as a staple food ■ Zimbabwe - eaten raw ■ Other areas - flowerheads and seeds are eaten ■ Extracts of the flower are said to be a stimulant or aphrodisiac in low doses ■ Traditionally powdered roots are used to treat asthma, coughs and colds	■ Propogation	■ Lovely scent of these striking flowers fills the air, and they attract beetles, bees and other insects ■ Hippos, baboons and monkeys eat the exposed tubers ■ African and Lesser Jacanas trot over the leaves with their specialised feet looking for insects ■ Purplse Gallinule, Pygmy Goose and Wattled Crane eat the fruits	■ Pools, dams, lakes and rivers
		■ Propogation	■ Attractive to useful insects like bees and butterflies	■ Streams, ponds, rivers and pools

BOTANICAL NAME	ENGLISH COMMON NAME	DESCRIPTION	DESIGN VALUE	
Senecio glastifolius	Waterholly	■Deep green leathery holly-like leaves ■Produces masses of large daisy flowers in spring ranging in colour from pinks through to deep mauve from September to October ■1 x 1m	■Fairly sturdy ■Plant so that roots can take advantage of water overflow ■Alongside streams and ponds ■Plant at back of mixed shrub border	
Typha capensis	Bulrush	■Clumps of long greyish strap-shaped leaves ■Velvety-brown cylindrical inflorescences carried on long slender stalks ■2m x 60cm	■Focal point in water garden	
Wachendorfia thyrsiflora	Bloodroot	■Spikes of deep-yellow starry flowers displayed on tall spikes (1,2 - 1,5m high) from September to November ■Pleated deep-green strap-shaped leaves ■1 x 1m	■Should have place in every water garden ■Focal point and centre of attraction ■Use alongside gentle flowing stream, or in swampy, marshy places	
Zantedeschia aethiopica	White Arum Lily	■Large attractive white flower spathes displayed on tall stems (1,2 - 1,5m) from September to January ■Flowers develop into a dense mass of small fleshy fruits ■Clump of lush long-stemmed arrow-shaped leaves ■95 x 50cm	■Wonderfully adaptable ■Plant anywhere in garden or water garden ■Perfect for planting along stream banks, at edges of ponds where there is an overflow of excess water, and in marshy areas	
CLIMBERS				
Clematis brachiata	Traveller's Joy	■Masses of fragrant creamy flowers each with a conspicuous tuft of yellow stamens in summer ■Decorative feathery seedheads ■Soft green foliage, deciduous ■4 x 2m	■Vigorous and spreads fast ■Plant against tree, trellis, fence etc. ■Needs space	
Jasminum multipartitum	Starry Wild Jasmine	■Rounded shrub to a scrambling climber ■Glossy dark green foliage ■Masses of jasmine-like flowers (white), fragrant tinted deep-pink below from August to January ■Small shiny-black fleshy fruits ■2-3m x variable	■Excellent choice for bird garden ■Mass plant ■Train over trellis or other structure	
Rhoicissus tridentata	Bushman's Grape	■Rounded shrub to a scrambling climber ■Glossy dark-green foliage - evergreen to deciduous ■Scrambles into surrounding vegetation ■Inconspicuous yellow-green flowers from November to January ■Reddish fleshy berries - edible but sour ■3 x 1,5m	■Use against a fence to form a screen ■Cover trellis or pergola, hanging baskets	
Senecio macroglossus	Flowering Ivy	■Scrambling creeper ■Attractive ivy-like, semi-succulent leaves ■Pretty lemon-yellow daisy flowers anytime especially in summer ■3 x 1,5m	■Grows well in container ■Provide trellis for support ■Excellent groundcover - scramble over and disguise a large bank or slope that is held in place by rocks	

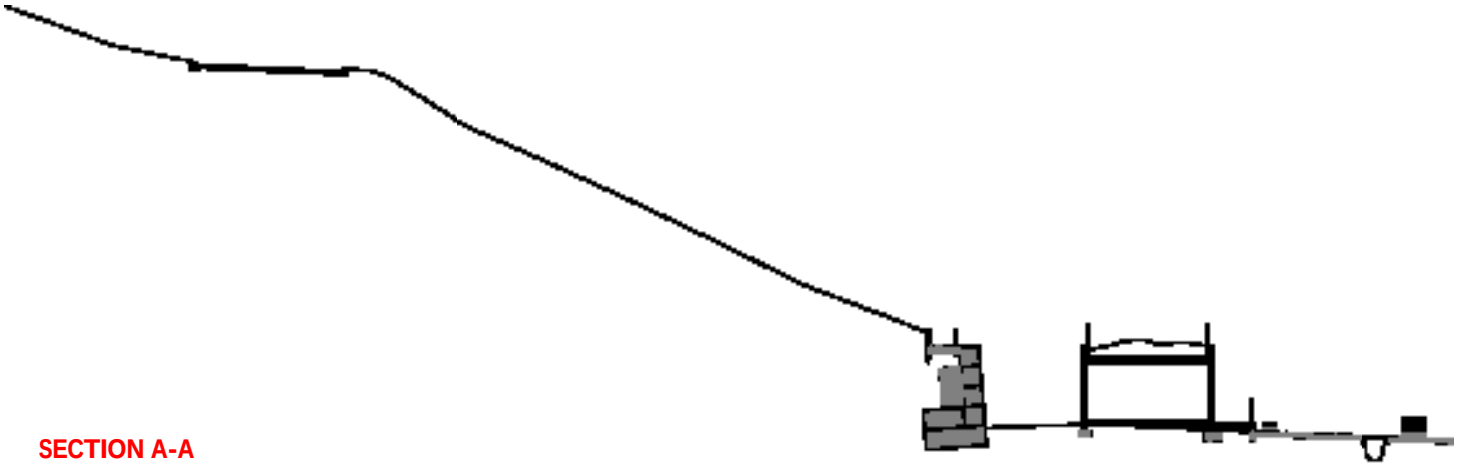
	SOCIO-CULTURAL VALUE	ECONOMICAL VALUE	ECOLOGICAL VALUE	HABITAT
			■Attractive to useful insects like bees and butterflies	■Rocky hillsides with fynbos ■Karroid scrub ■Stream banks and in marshy ground
	■The roots and young shoots are edible ■Dried dehusked rhizomes are beaten to a starch-rich reddish meal - used same way as other meal ■Decoctions of the rhizome are traditionally sued to promote fertility, strengthen labour contractions and to expel the placenta (humans and animals), and increase male impotency and libido ■Root infusions are used to treat enteritis, kidney and bladder problems, dysentery and venereal diseases	■Bulrushes used for thatch, weaving, hand brooms, sitting mats ■Pillows stuffed with fluffy seeds ■Propogation	■Excellent bird plant - nests (slender leaves and flowerheads - material)	■Cosmopolitan plant along streams, edges of dams, in marshes
		■Propogation	■Attractive to useful insects like bees and butterflies	■Swampy places along the edges of streams and occasionally in the water
	■A heated poultice made from the leaves is traditionally used to treat boils, wounds and sores ■Gout and rheumatic joints are treated in the same way ■A boiled rhizome and honey mixture is gargled for a sore throat, or swallowed for heartburn and bronchitis	■Excellent cutflowers for the vase ■Propogation ■The leaves are used to tint wool many shades of yellow	■Fruits popular in birds ■Porcupines and pigs eat the underground tubers	■Clumps of long greyish strap-shaped leaves ■Velvety-brown cylindrical inflorescences carried on long slender stalks ■2m x 60cm
	■Traditional remedies prepared from this plant are used to deal with colds, syphilis, intestinal worms and snakebite ■Headaches are soothed by drinking a tea made from the leaves		■Attractive to useful insects like bees and butterflies	■Grassland scrub and open woodland
	■In famine times people eat the fruits ■Used to make herb tea and potpourri	■Propogation	■Flowers attract insects to the garden and insectivorous birds ■Fuit popular with fruit-eating birds ■Game browse leaves ■Larvae of the Cambridge Vagrant butterfly, the Variable Prince, Oleander Hawk, Death's Head Hawk, and King Monkey moth feed on Jasminum species. ■Hawk moths pollinate the flowers	■Woodland, thicket and rocky slopes
	■A traditional remedy using the tubers tones the uterus during pregnancy ■Another deals with menstrual cramps and infertility in women ■Bladder and kidney complaints are treated with this plant	■Propogation	■Fruit enjoyed by birds ■Bushpigs, baboons and porcupines eat the tubers (maybe toxic to man) ■Black Rhino and other game browse the leaves ■Larvae of the Fervid Tiger, Trimen's False Tiger and Cape Hawk moth feed on plant	■Coastal and evergreen forest, forest margins and grassy hillsides
	■Been cultivated in Europe since 1875	■Propogation	■Larvae of the White Bear moth feed on this plant	■Forest margins, sandy to rocky places

8.2. ENVIRONMENTAL EDUCATION CENTRE CONSTRUCTION PLAN



NOT TO SCALE

8.3. ENVIRONMENTAL EDUCATION CENTRE SECTIONS



SECTION A-A
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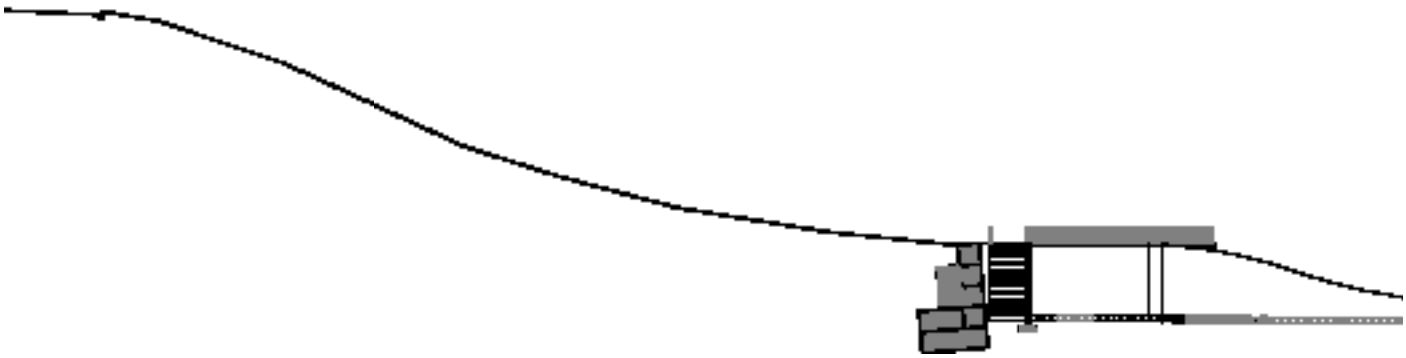

SECTION B-B
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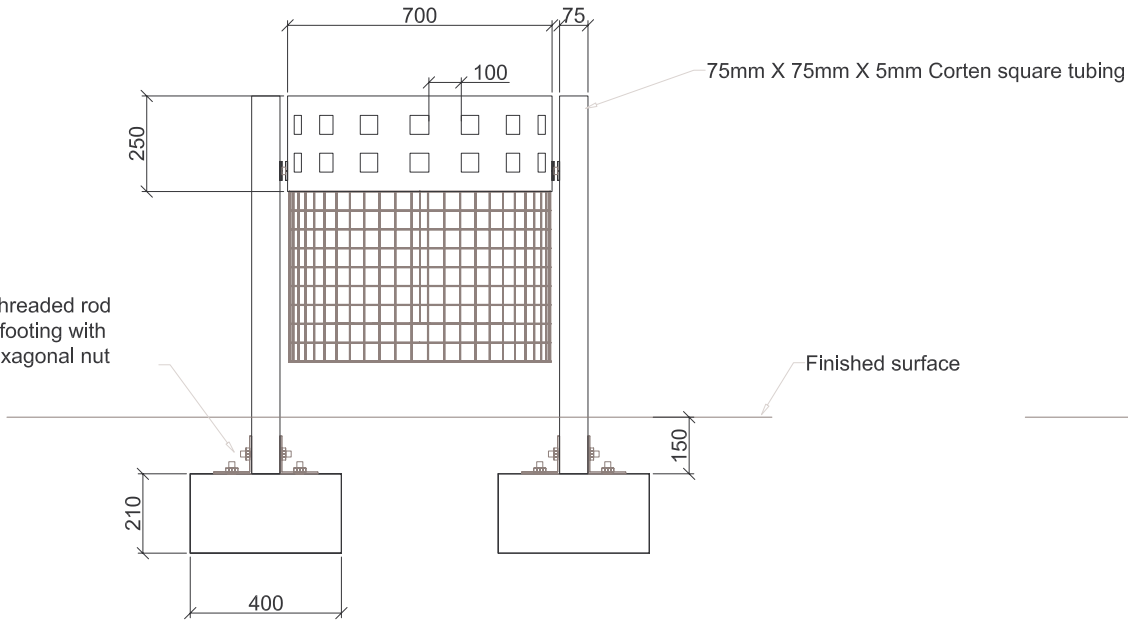
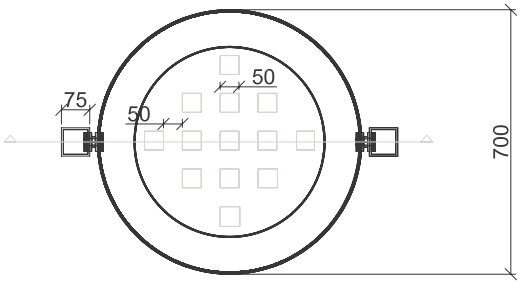
8.4. ENVIRONMENTAL EDUCATION CENTRE DETAILS

8.4.1. SITE FURNITURE

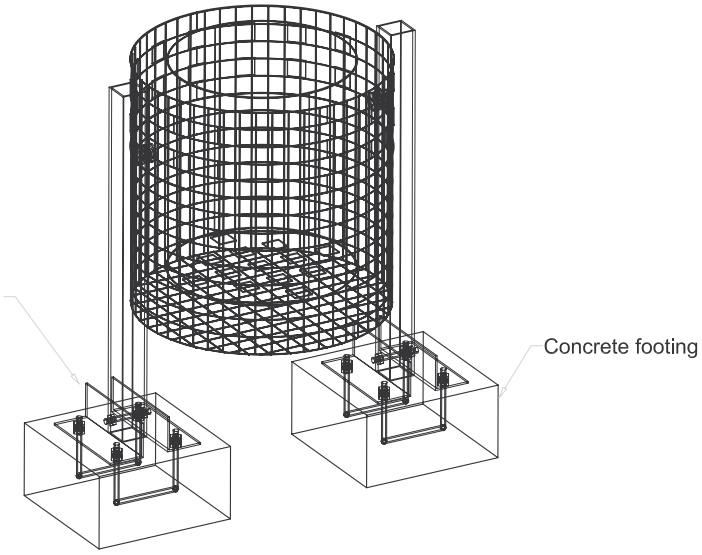
LITTERBIN
SCALE 1:20



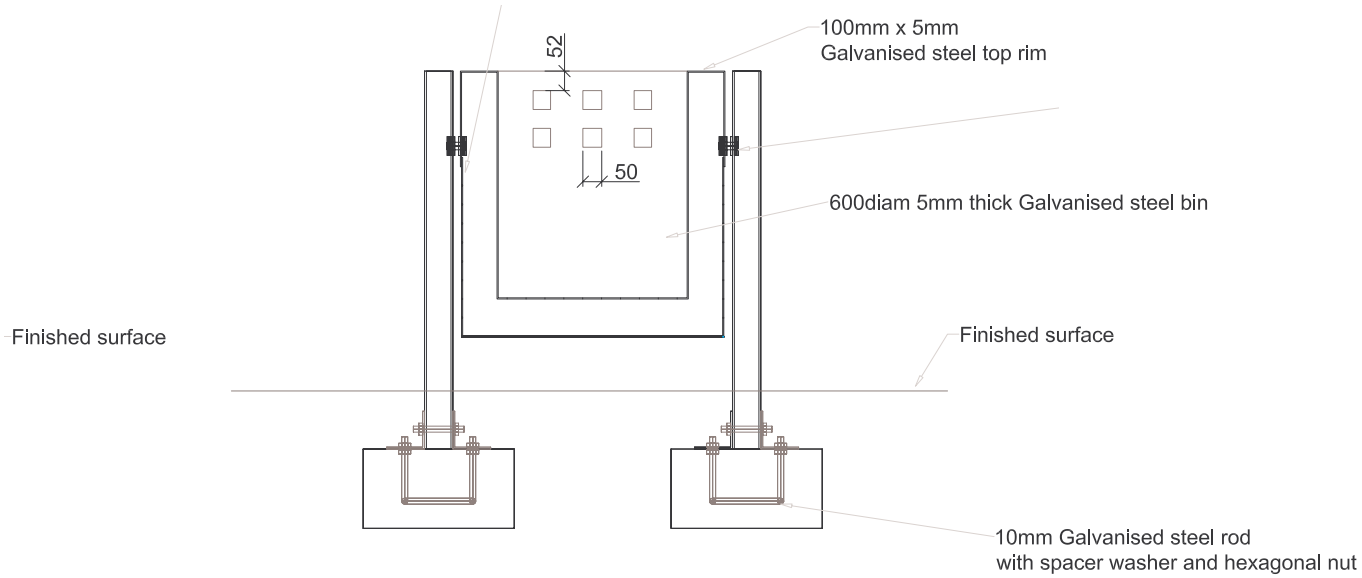
Elevation



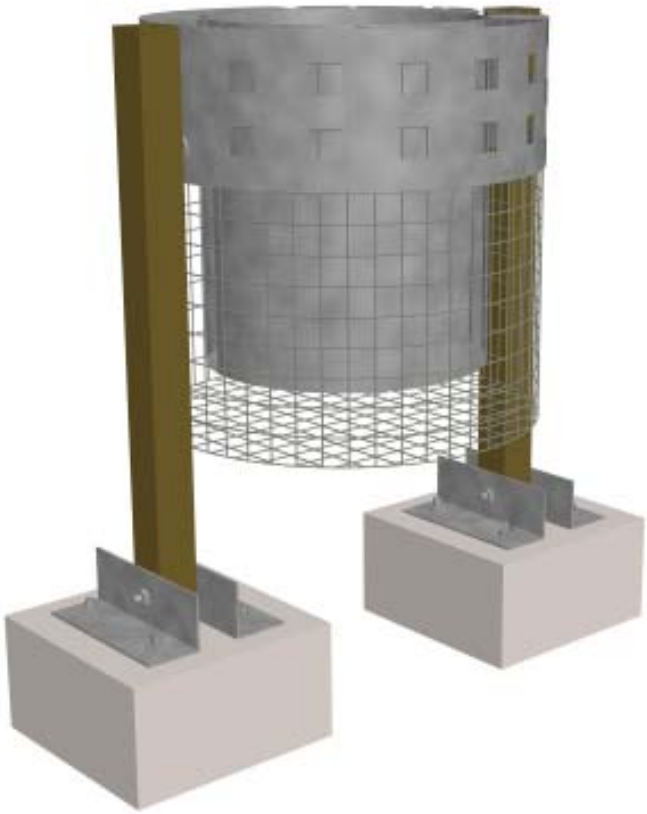
Plan

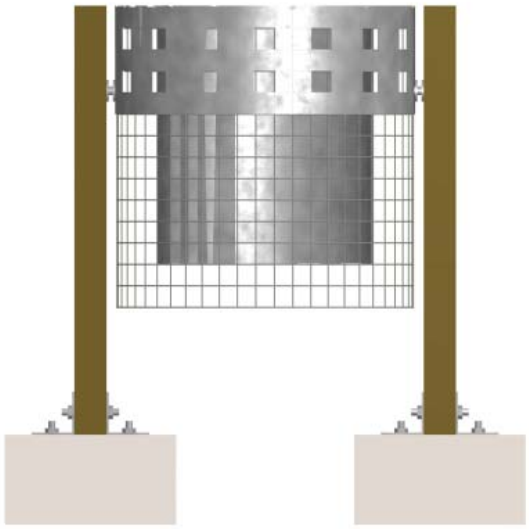


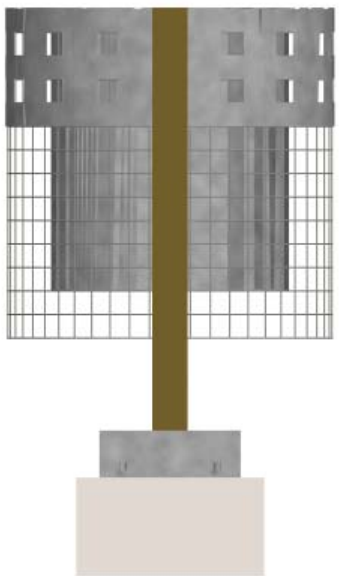
Perspective


52
50
100mm x 5mm
Galvanised steel top rim
600diam 5mm thick Galvanised steel bin
Finished surface
Finished surface
10mm Galvanised steel rod
with spacer washer and hexagonal nut

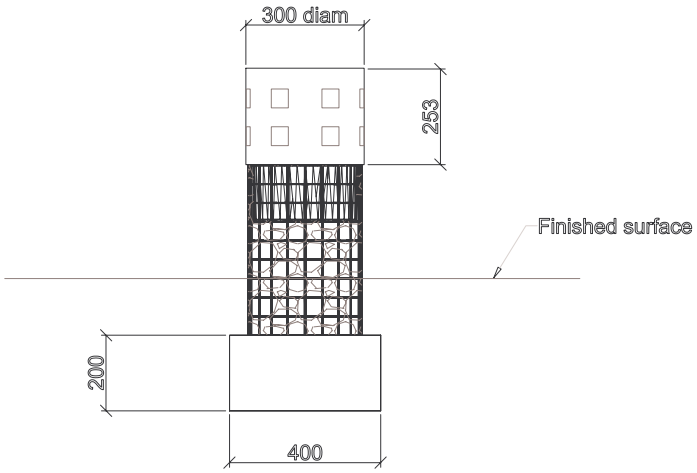
Section



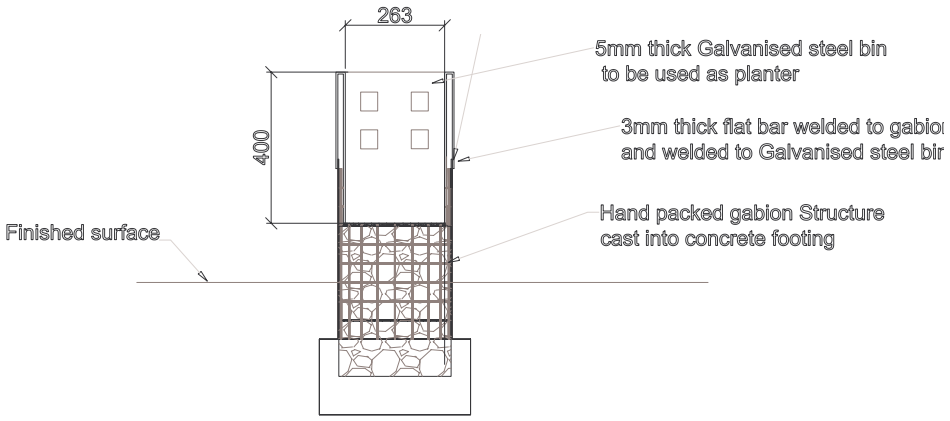




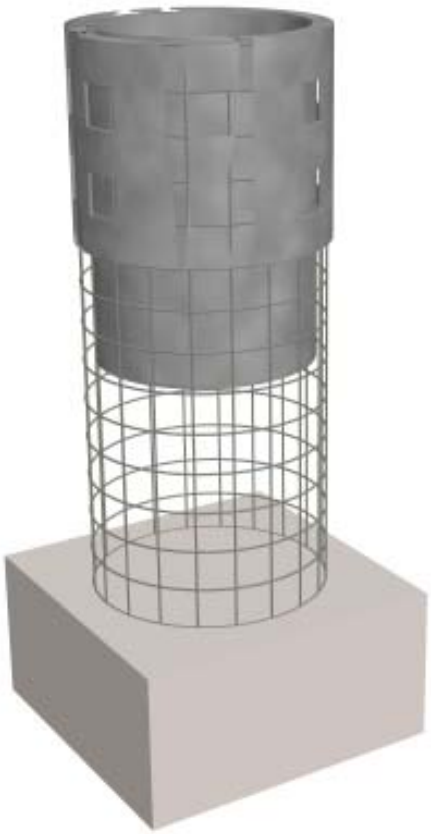
BOLLARD
SCALE 1:20

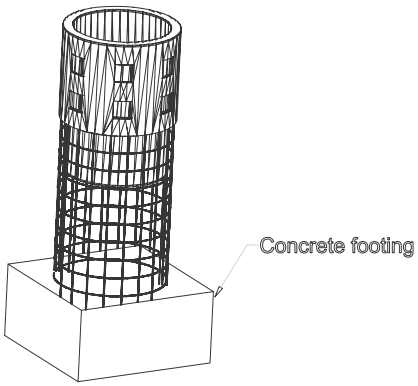


Elevation

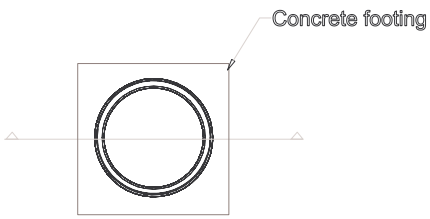


Section





Perspective



Plan

POST-STOP LIGHT AND BENCH
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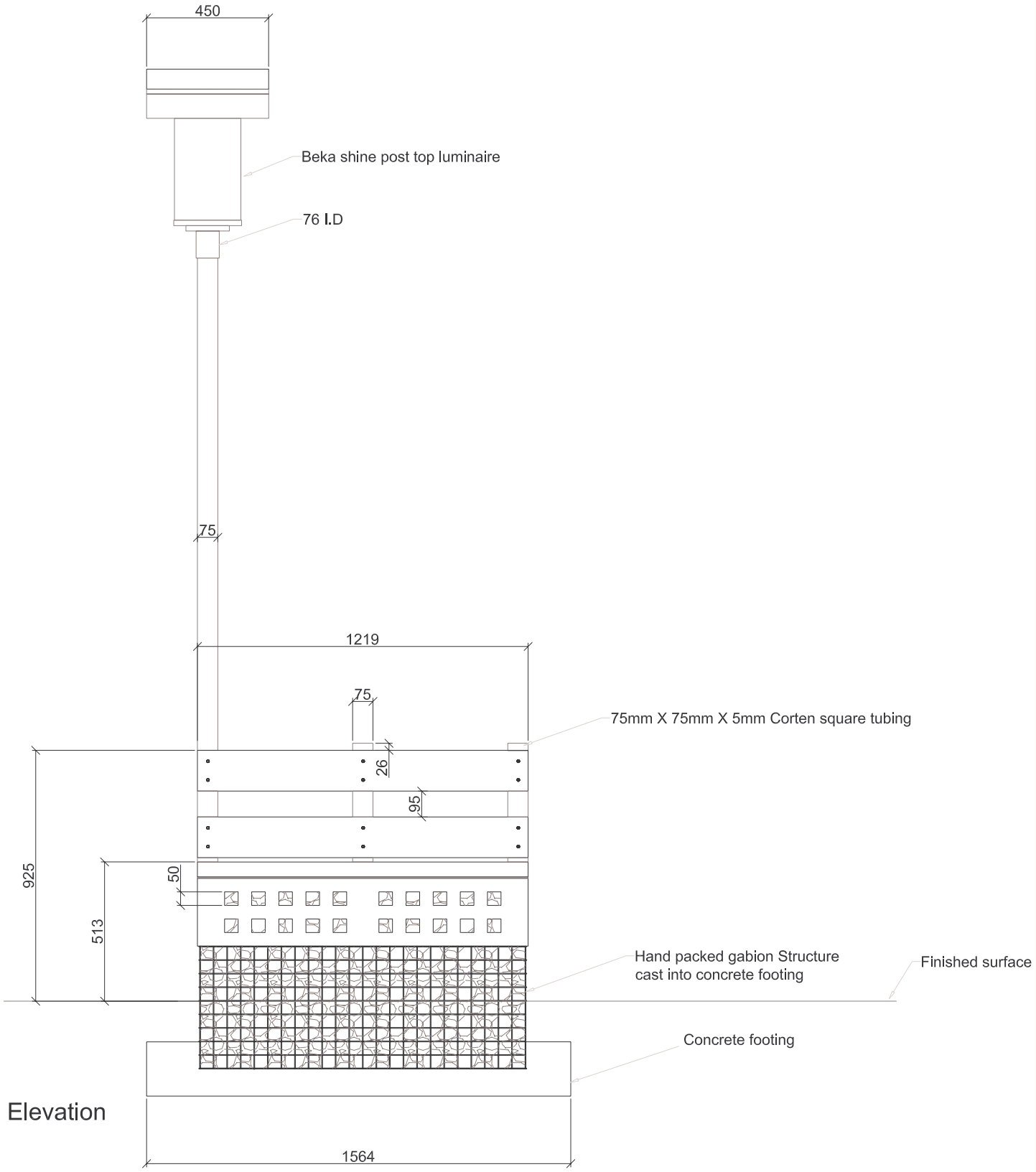
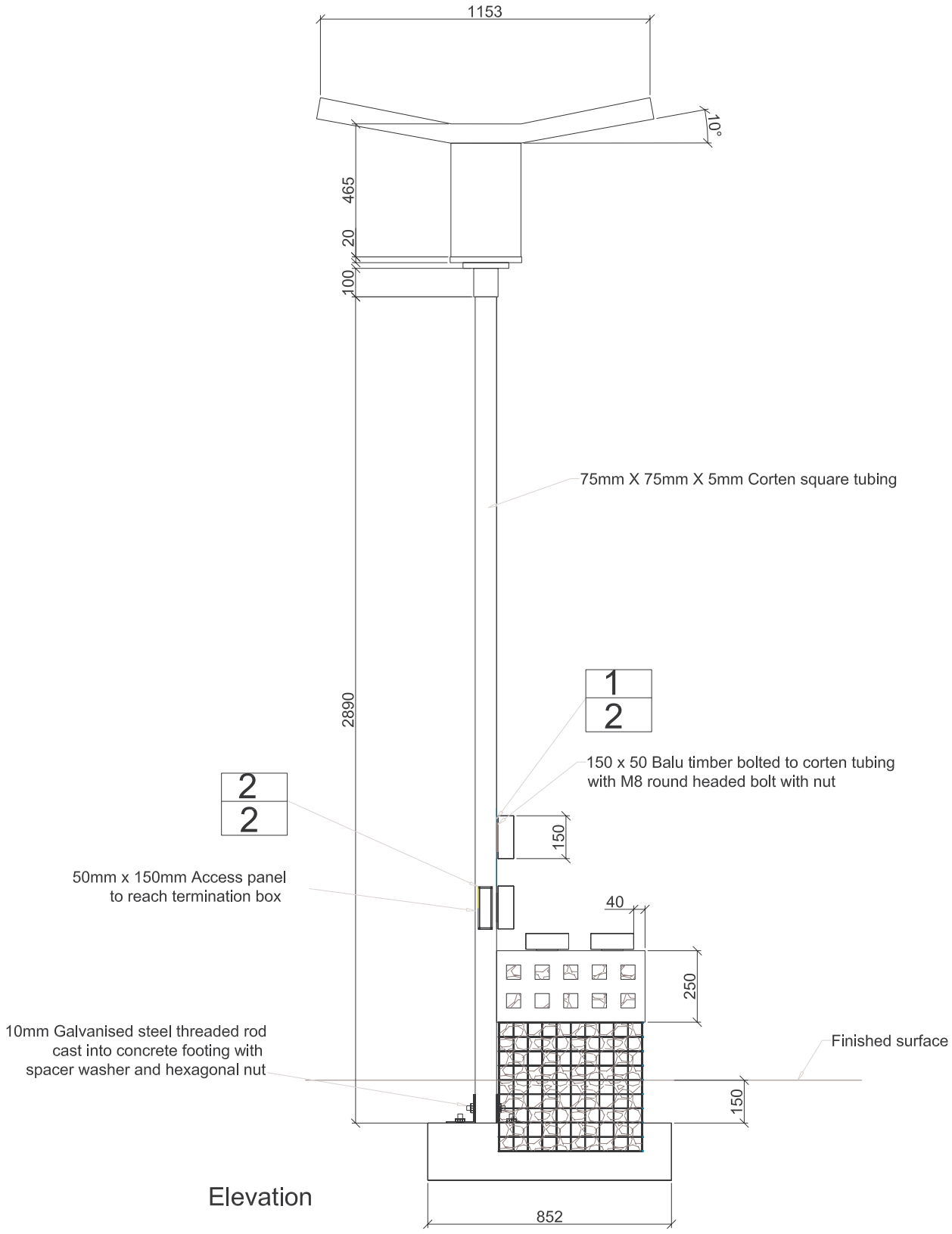
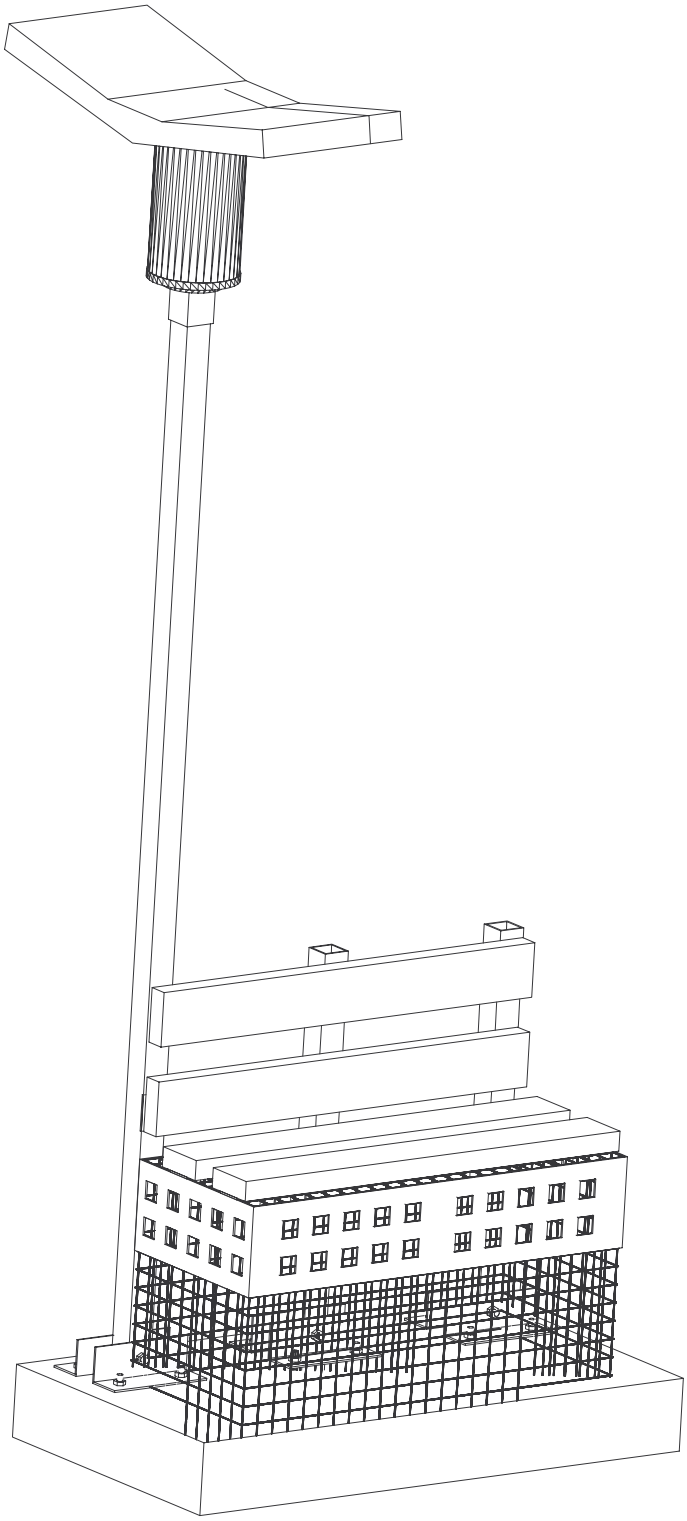
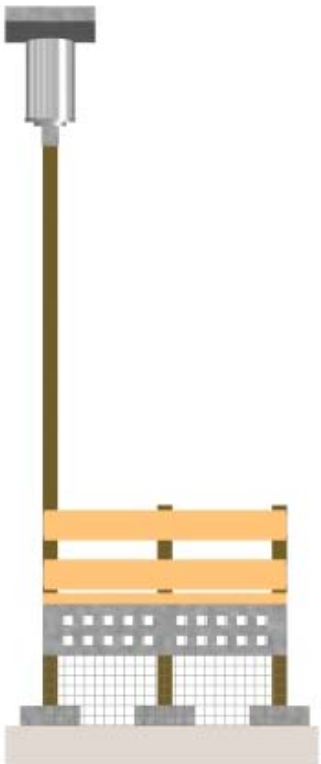
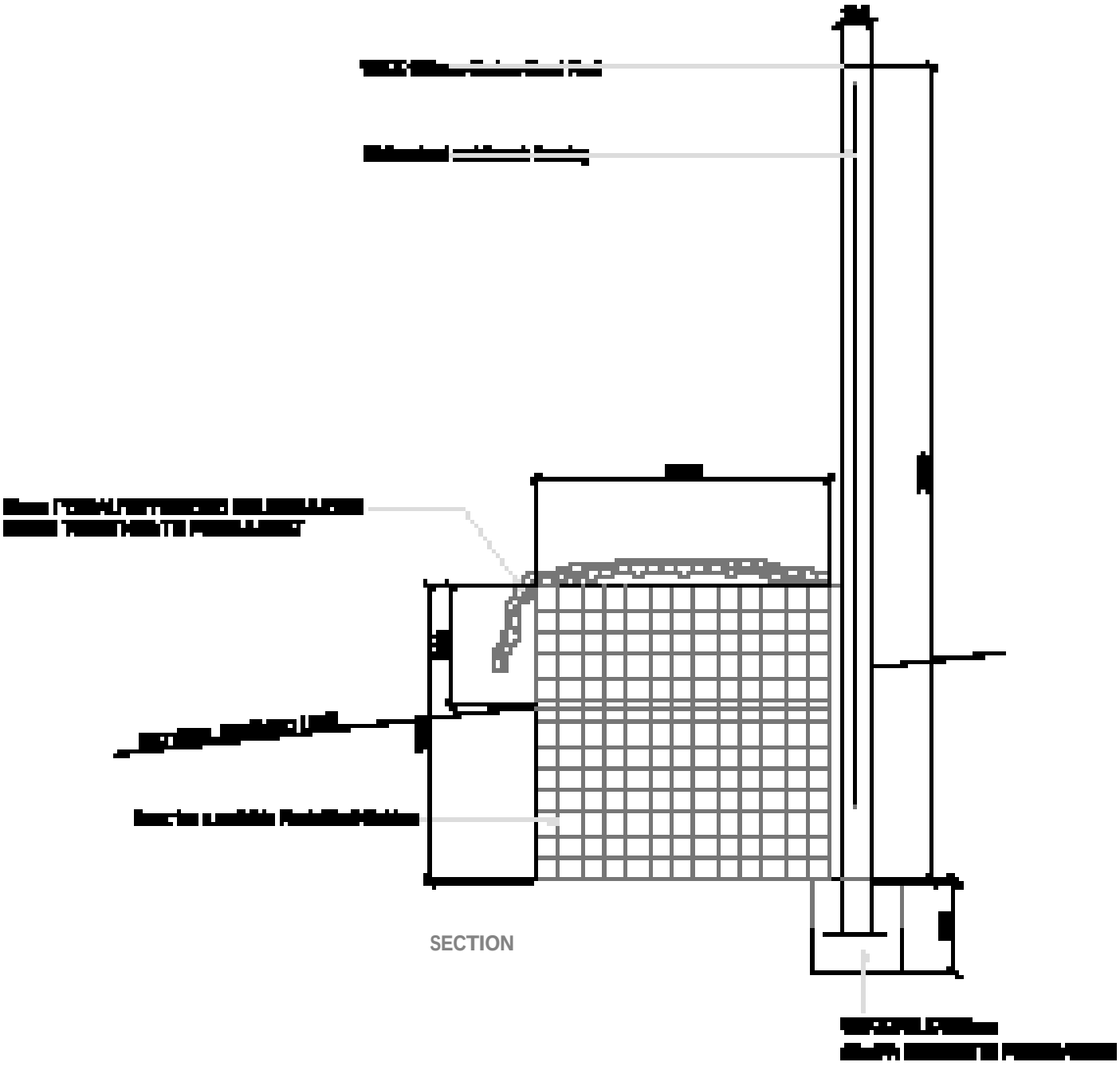


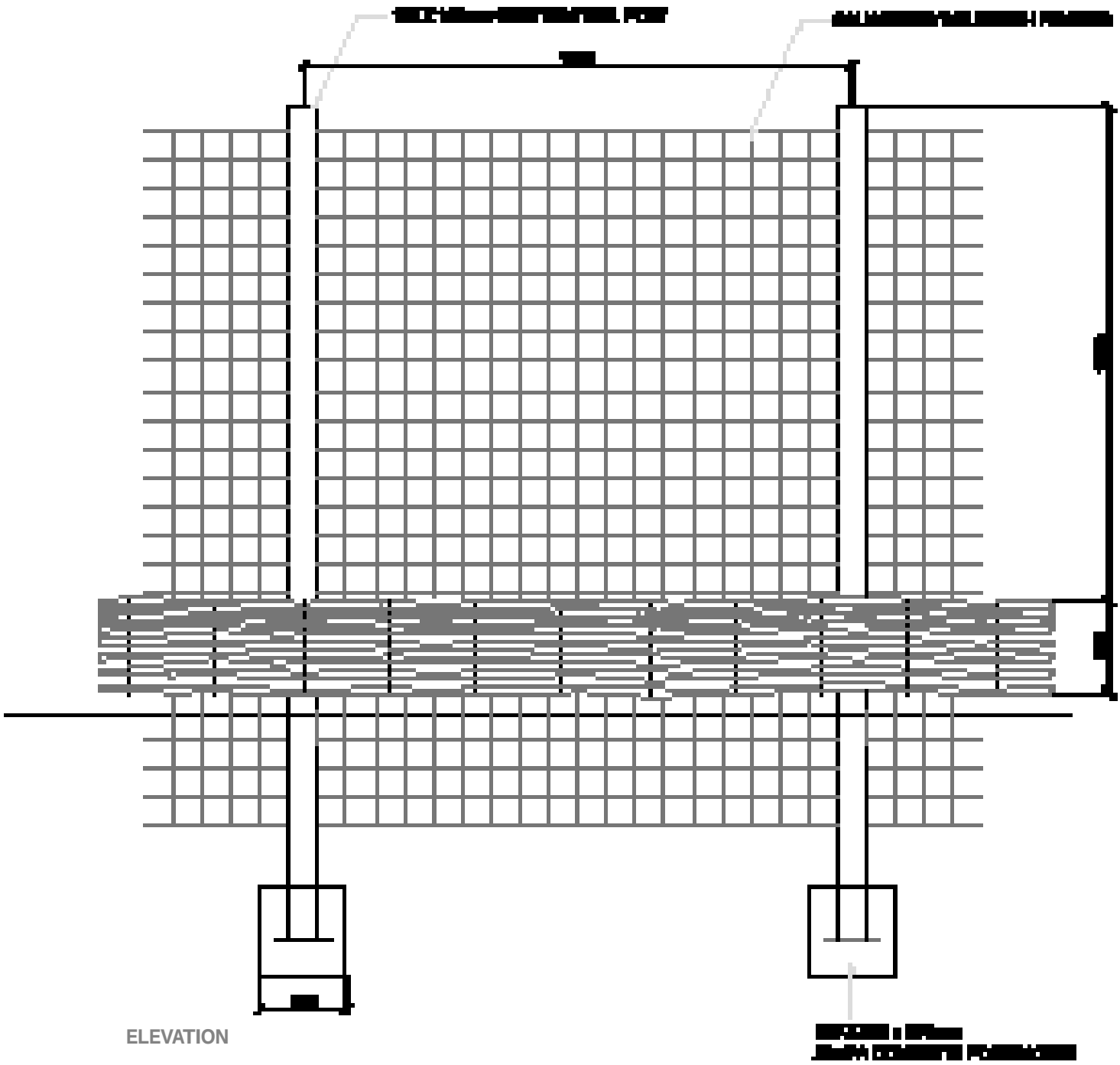

1153
10°
465
20
100
75mm X 75mm X 5mm Corten square tubing
2890
1
2
150 x 50 Balu timber bolted to corten tubing
with M8 round headed bolt with nut
2
2
150
50mm x 150mm Access panel
to reach termination box
40
250
10mm Galvanised steel threaded rod
cast into concrete footing with
spacer washer and hexagonal nut
Finished surface
150
Elevation
852



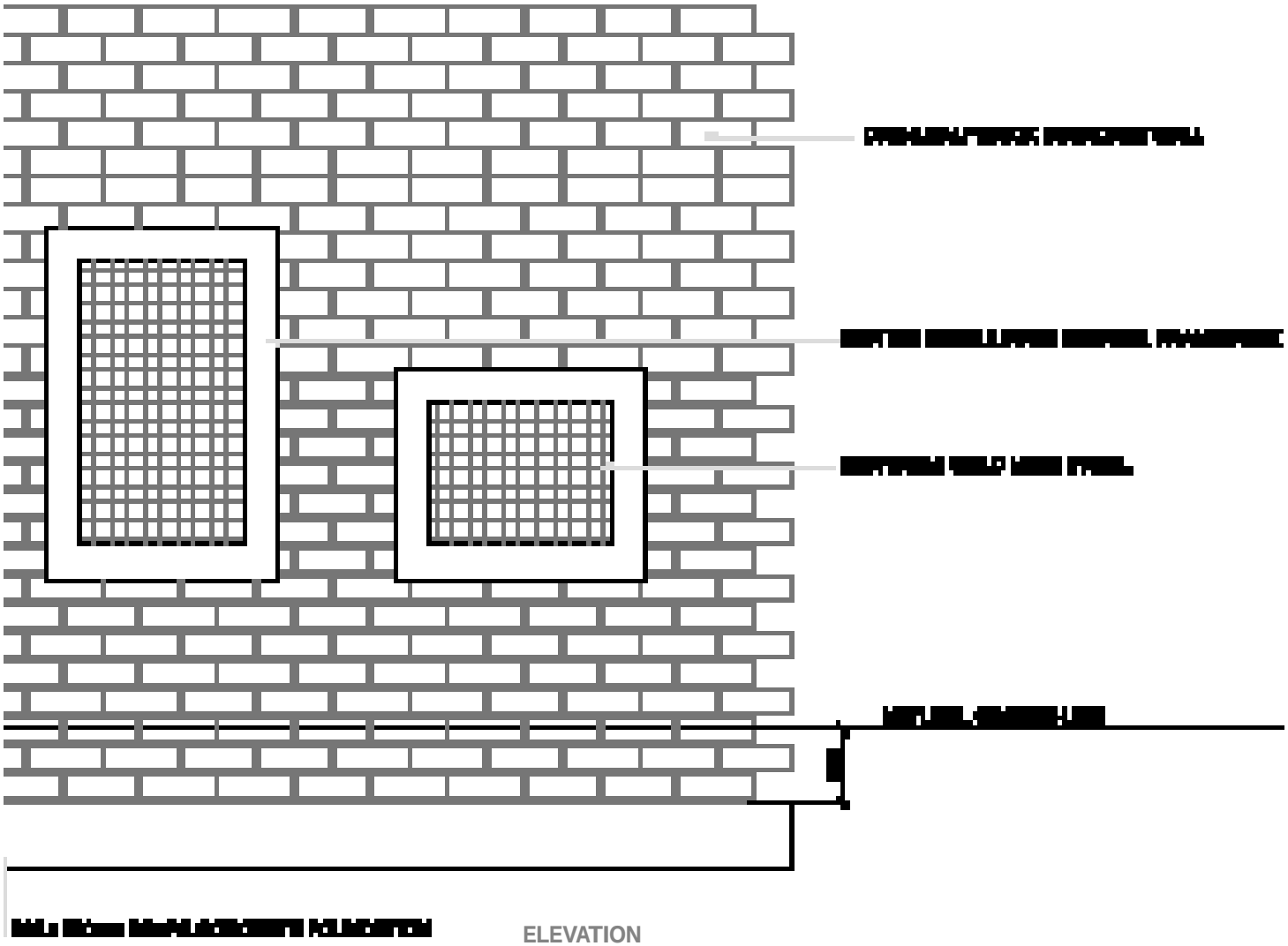


GABION-SEATING BOUNDARY WALL
SCALE 1:20

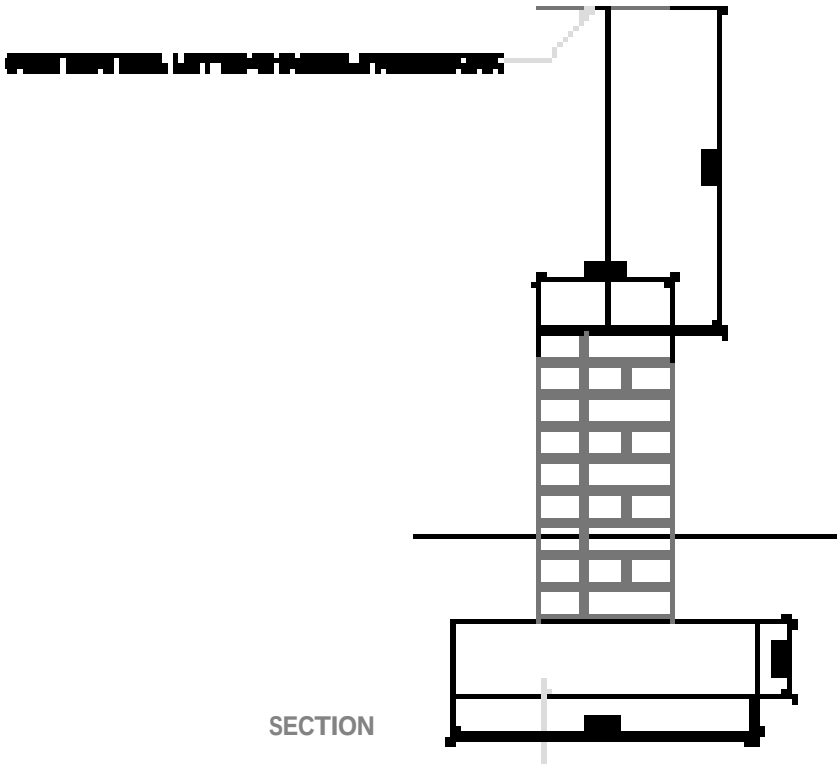



ELEVATION

LOOKING WINDOW BOUNDARY WALL
SCALE 1:20

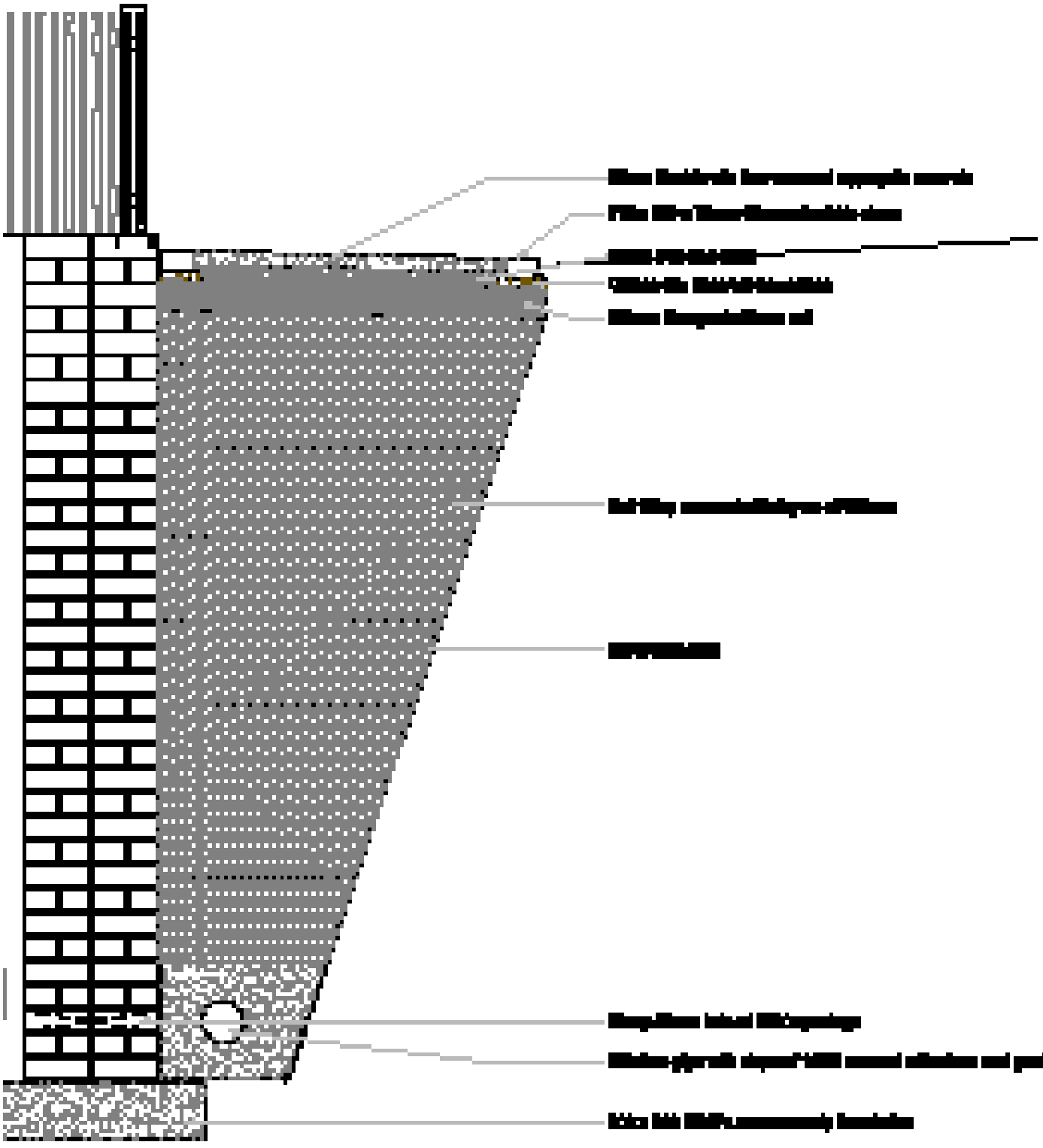


ELEVATION

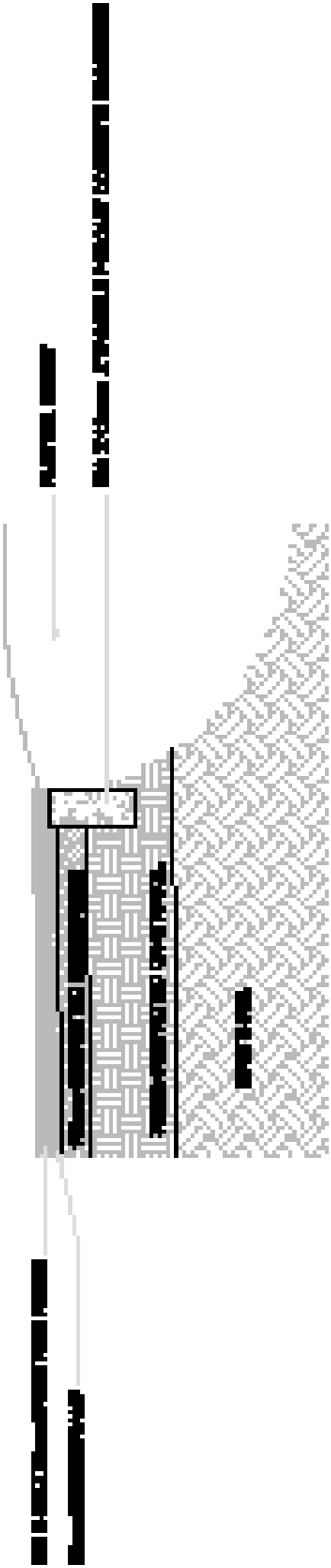


SECTION

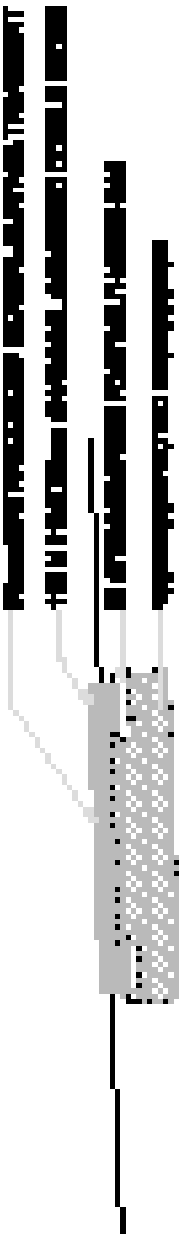
BRICK RETAINING WALL AND WALKWAY
SCALE 1:20



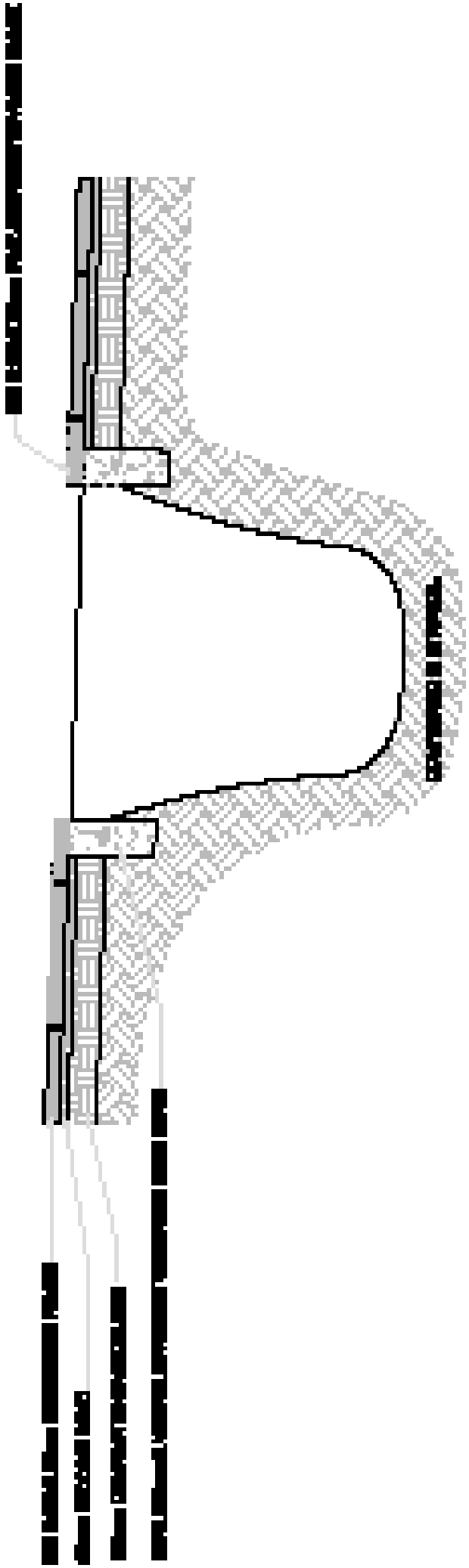
PAVING & EDGING
SCALE 1:20



ECOBOND WALKWAY
SCALE 1:20

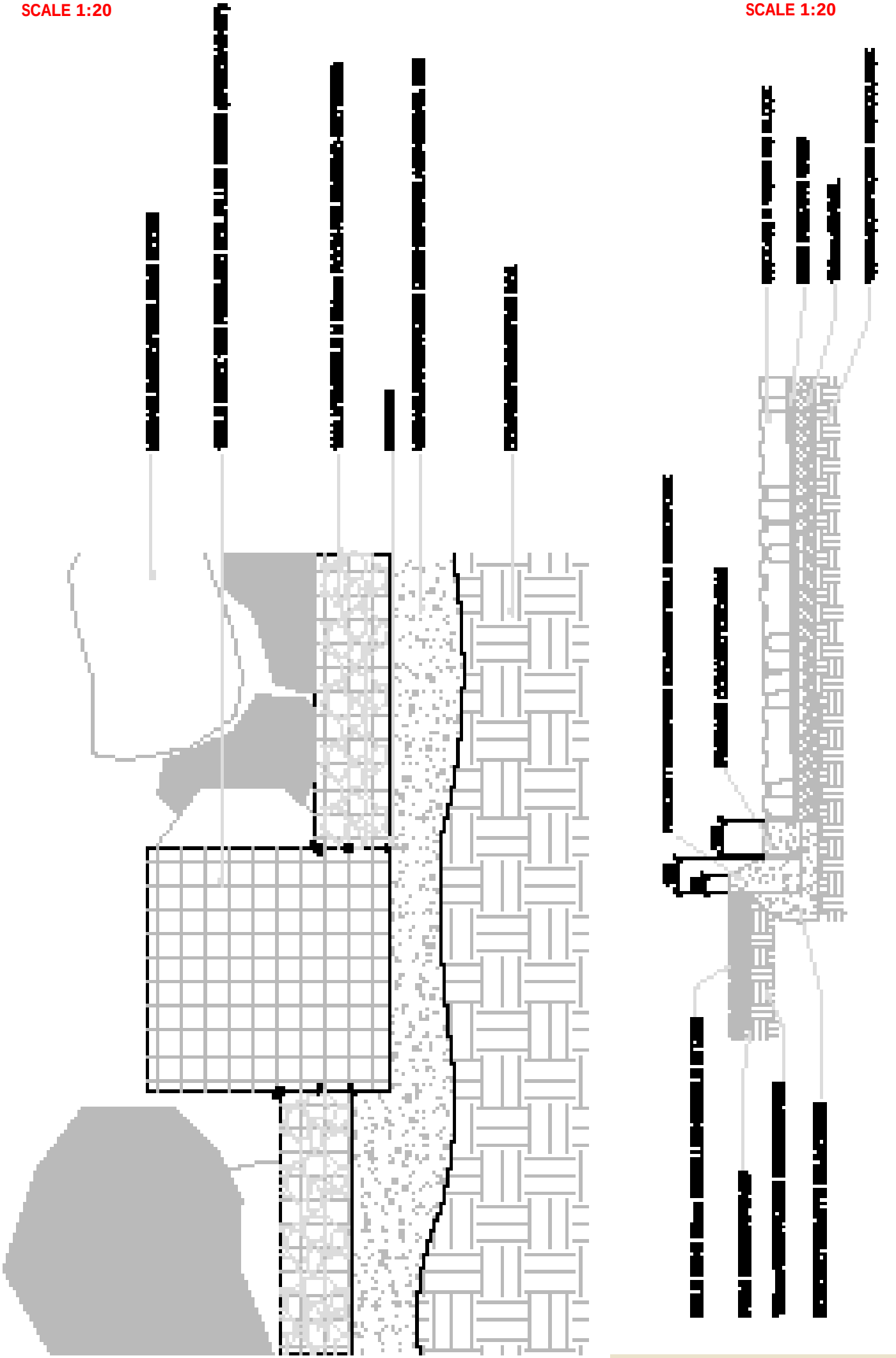


PAVING & TREE PLANTER
SCALE 1:20

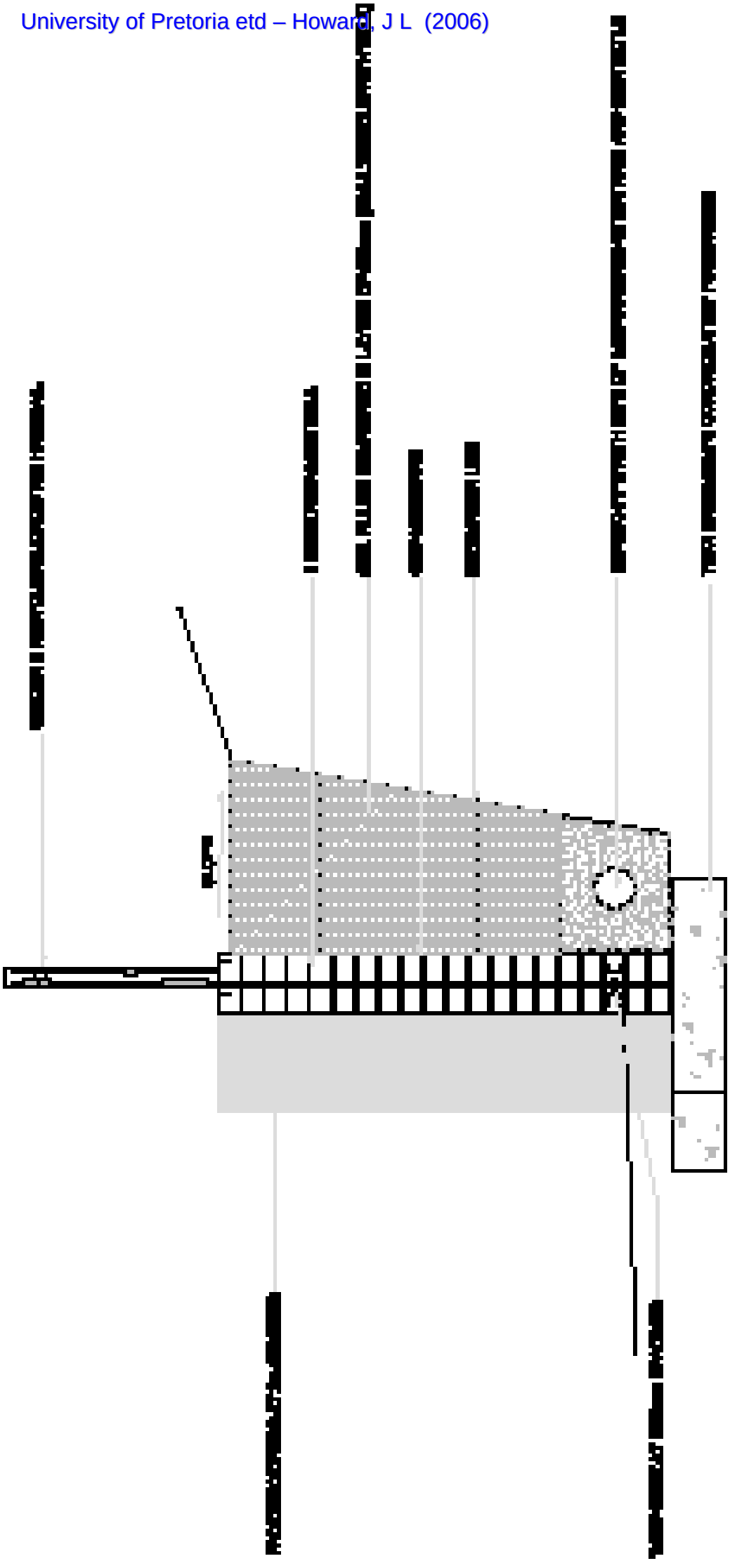


RENO-MATTRESS STREAM LINING & TREE BASKET
SCALE 1:20

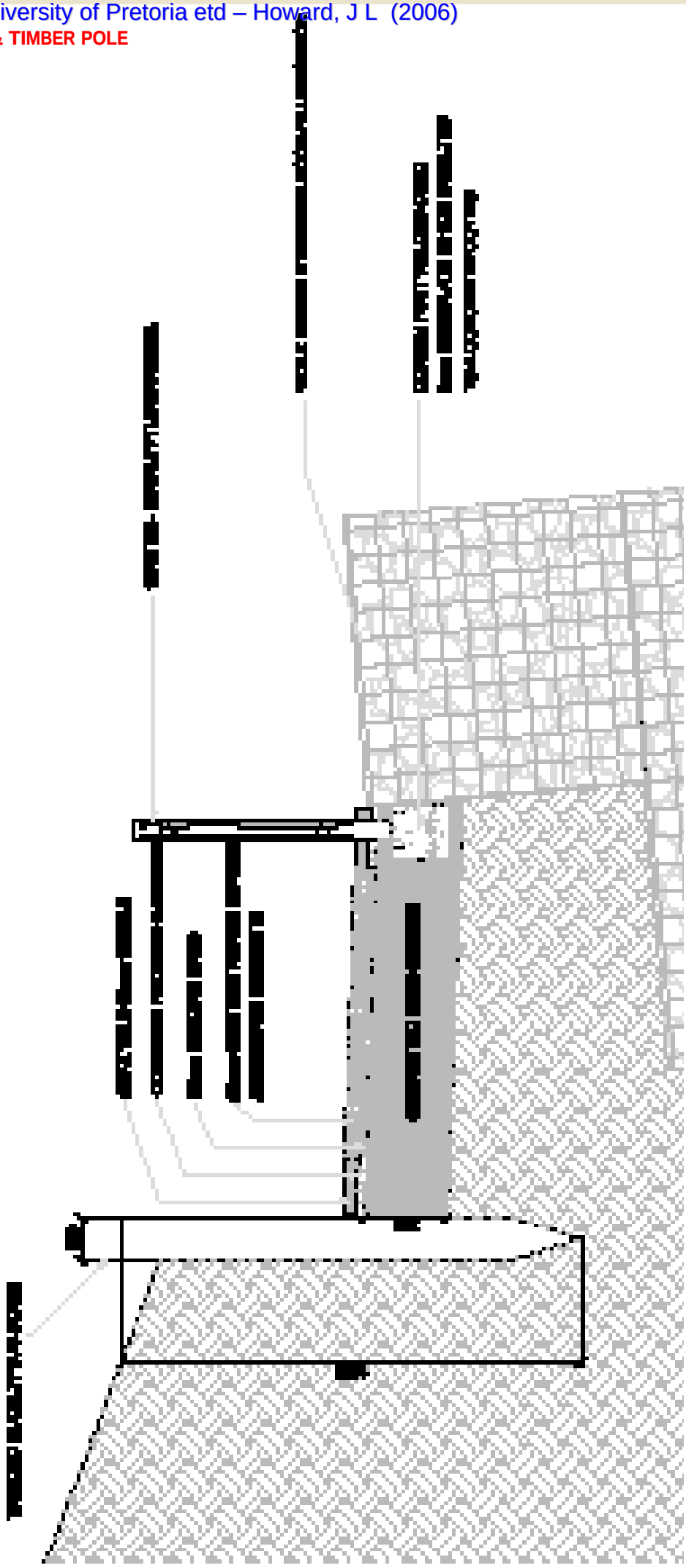
BG BLOCK PAVING
SCALE 1:20



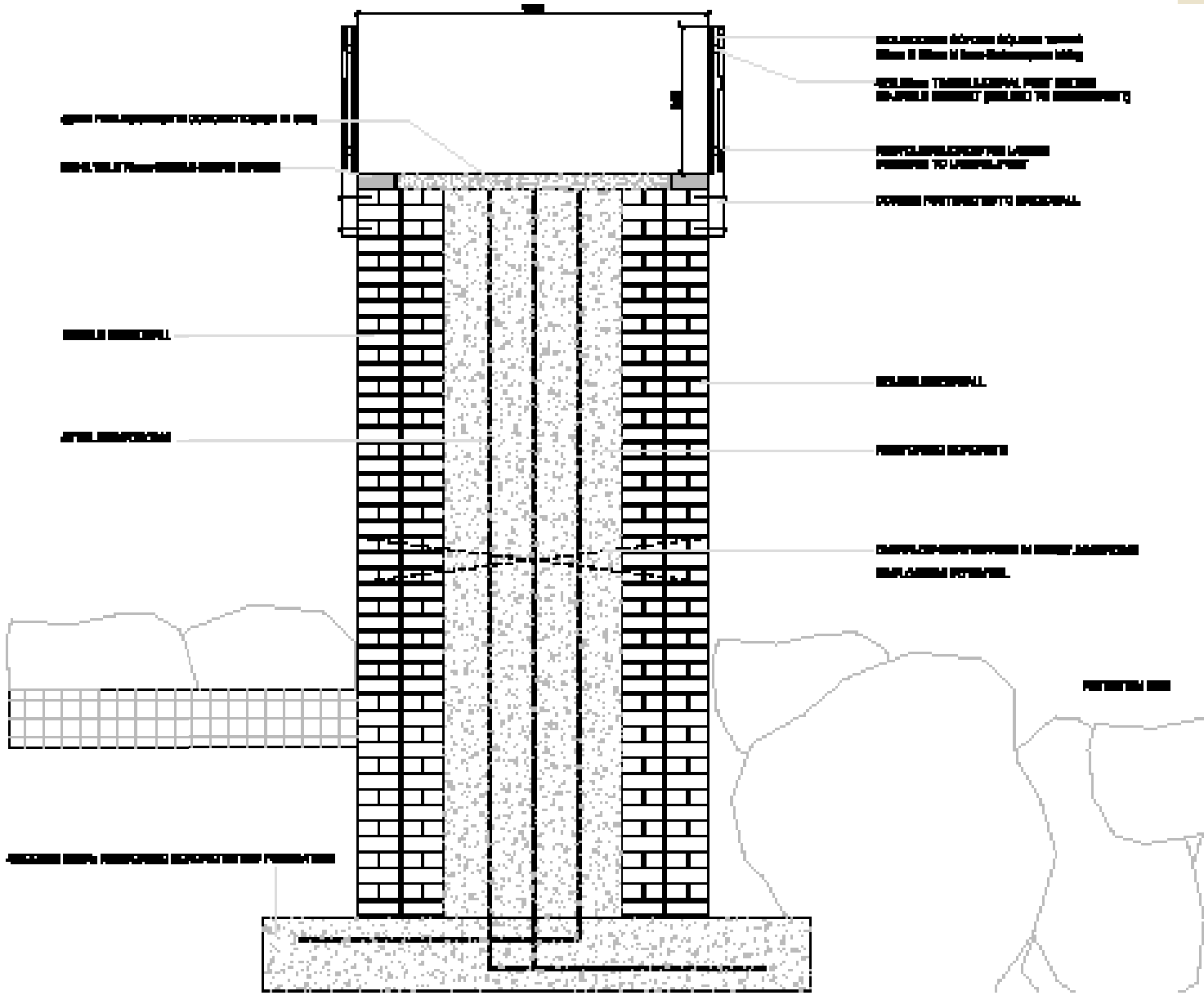
RETAINING WALL
SCALE 1:20



WALKWAY, GABION REINFORCING & TIMBER POLE REINFORCING
SCALE 1:20



WALKWAY & WEIR
NOT TO SCALE



PAVING PATTERN
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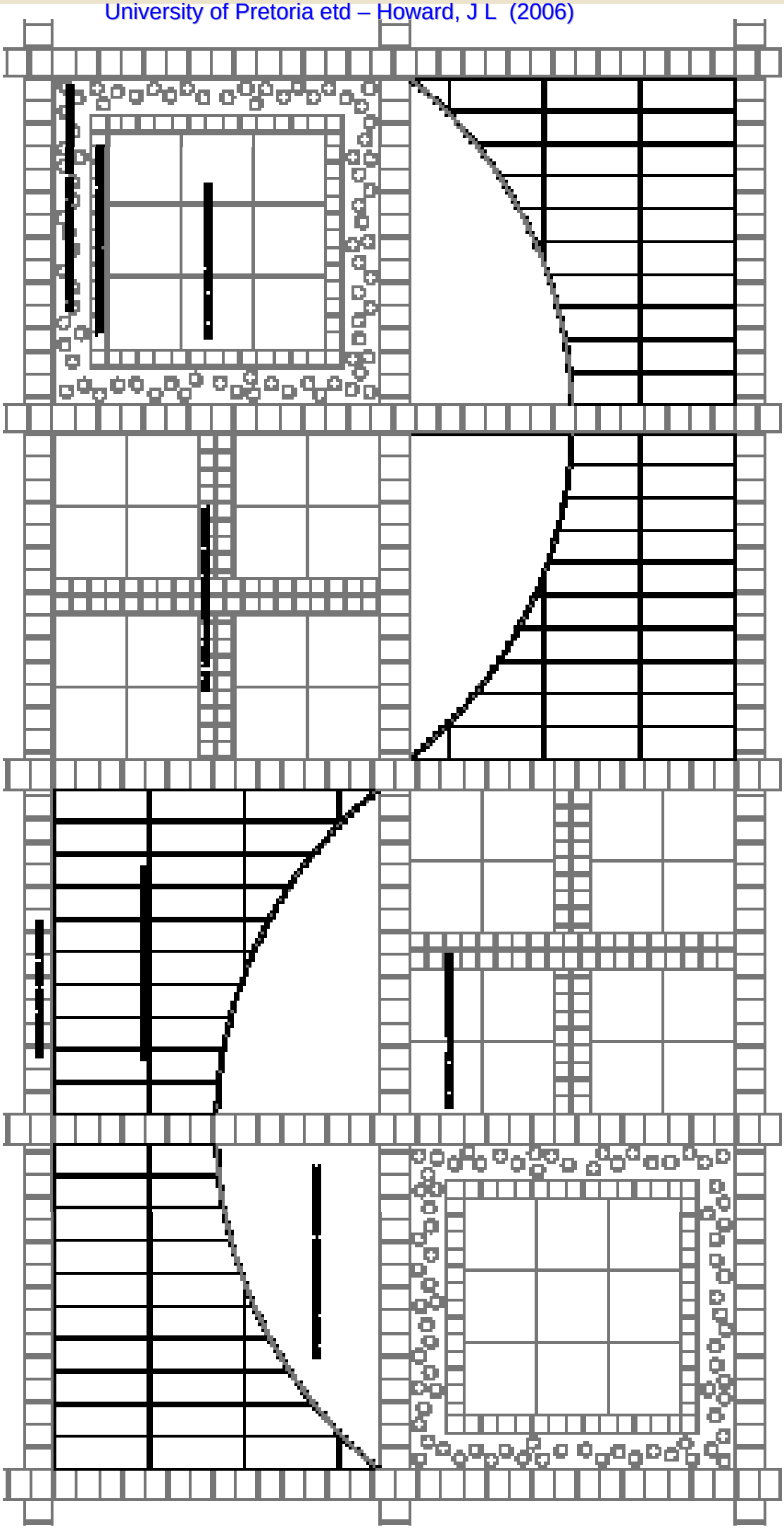
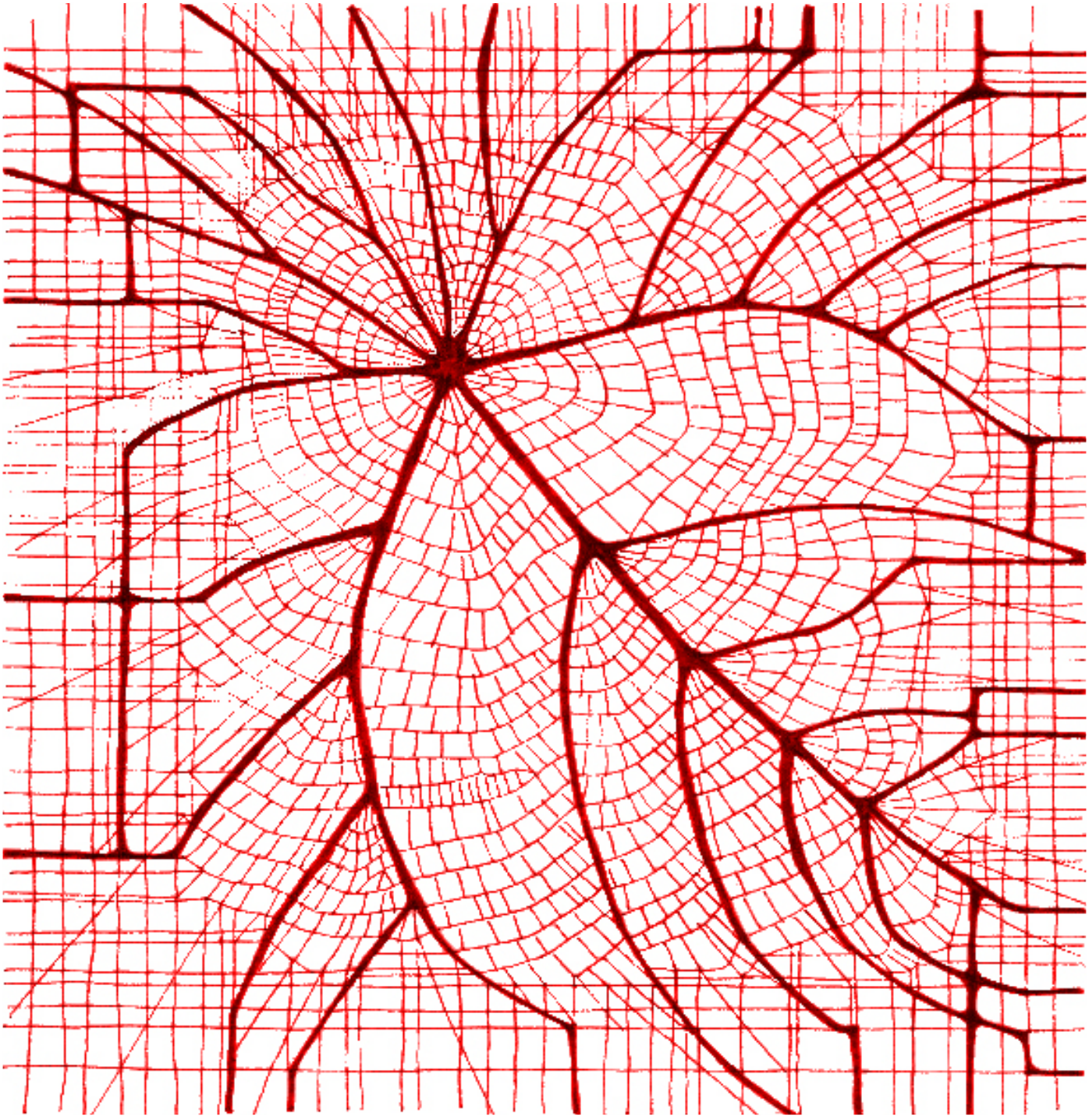
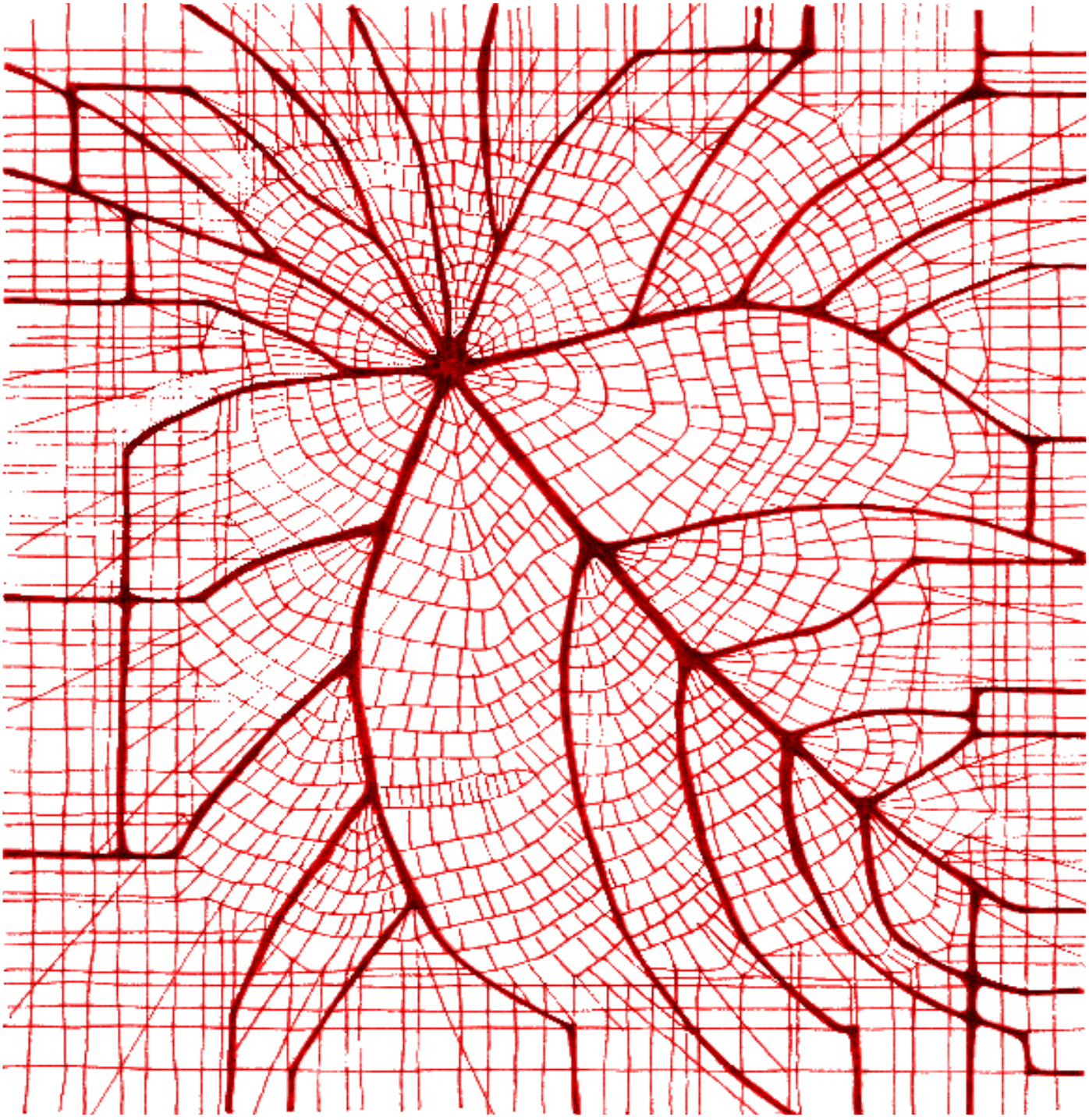




chapter 9
conclusion

As the sun sets and the shadows grow long, the landscape and its people slow down. Each have fulfilled the days goals, part of a greater vision, a greater plan. The gathering and forming of social connections, the exchange of skills, and trade, and teaching through demonstration and experience.

I believe that the precinct, and the two specific districts, are planned to achieve increased value. Open spaces have been found, re-created and upgraded by forming a balance between the social, economic and ecological values. Spaces created for human experience, fulfillment and empowerment, while sustaining a functional and sustainable urban landscape.



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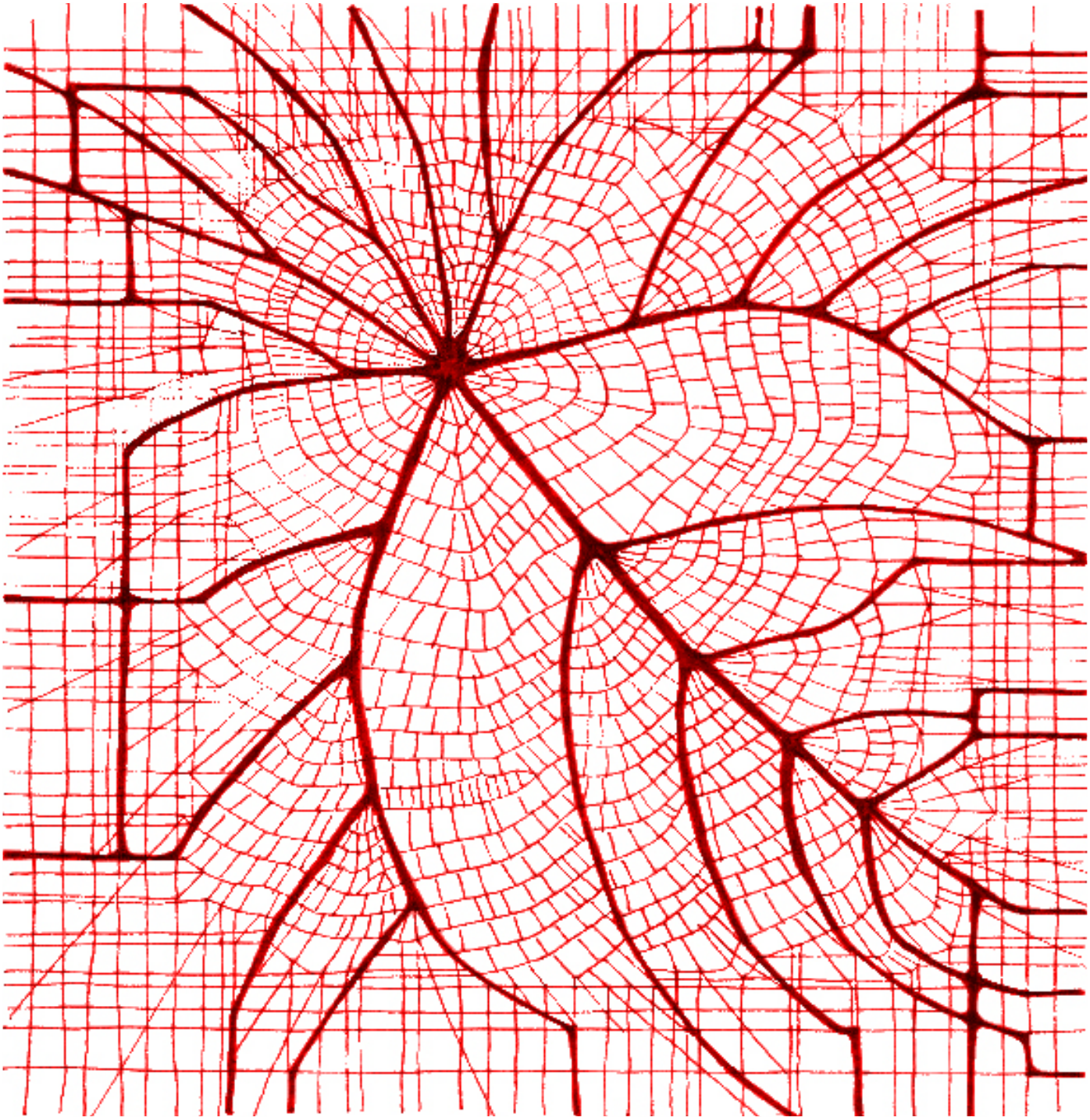

acknowledgements

THANK-YOU TO:

Jill Dempere for all the information regarding Pledge Nature Reserve, and making my site visits that much more pleasant.

Frans van Wyk for his patience and guidance through this extensive learning curve.

My year-old friends from Waterkloof Baptist, especially Jen and Kirsty, for all the support, and balancing my life with laughs and spiritual guidance, and Dalene Reyburn for using her talent to help me in a grammatical time of need.

Interdesign team for infinite positivity, jokes and much-needed caffeine stimulation.

My studio friends who have battled through this year armed with stress-relievers, wine and pizza. A special thanks to Hannelie and Gavin, my corner mates, and to Annelize, Deborah, Edna and Suzanne, for always giving me hope and faith.

Dr. Gareth Jones for the past 6 years of evolved but constant friendship, and for his never-fail belief in me and my abilities.

Judy, Hugo and family, for being my home away from home.

My family who are always there as my foundation in good and bad times.