



REVEALING
THE HIDDEN

THE CRADLE OF HUMANKIND

by Marli Swanepoel





REVEALING THE HIDDEN

LOCATION

Bolt's Farm,
R563, Sterkfontein,
Krugersdorp, 1739
GPS: -26.027694, 27.717387

PROGRAMME

Chiroptera Vivarium &
Visitor Centre

STUDY FIELDS

Environmental Potential,
Heritage & Cultural
Landscapes



-A.2-
REVEALING THE HIDDEN
OF THE CRADLE OF HUMANKIND

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requirements for the degree Masters in
Architecture (Professional)

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2016

DECLARATION

In accordance with Regulation 4(e) of the General Regulations (G.57) for dissertations and theses, I declare that this dissertation, which I hereby submit for the degree Masters of Architecture (Professional) at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

I further state that no part of this dissertation has already been, or is currently being, submitted for any such degree, diploma or other qualification.

I further declare that this thesis is substantially my own work. Where reference is made to the works of others, the extent to which that work has been used is indicated and fully acknowledged in the text and list of references.

Marli Swanepoel

-A.3-
ABSTRACT

Within our current society, humankind often separates 'human place' from 'natural place'. This alienation from nature leads human beings to believe that activities outside of protected natural areas have no effect on the areas demarcated as 'natural' (Mang 2007). This belief is evident within the landscape of the Cradle of Humankind, the only UNESCO-protected natural and cultural World Heritage Site, which is under threat from past and present social and economic activities, including acid mine drainage and poor farming practices. These activities within the Cradle are however not only threatening what is left of the historical landscape, but are also placing pressure on the hidden networks of the landscape. Among the networks which are hidden, is the vulnerable karst ecosystem, which hosts the endangered Schreiber's long-fingered bat colonies, which, in turn, impact on local farm production and the livelihoods of the community (Durand et al. 2010:74).

A significant, yet vulnerable area within the Cradle is Bolt's Farm, located south-west of the Sterkfontein Caves, and forms the focus of this dissertation. It hosts some of the oldest fossiliferous deposits discovered in the area, which offer modern humankind a view into the historical landscape of the Cradle. This historical layer of the landscape, together with the destruction caused by the economic layer, and the opportunities within the social layer, make up the landscape of Bolt's Farm.

Its existing networks are investigated, uncovering the threats to the landscape and using architecture as a way to reveal the opportunities inherent to the landscape. The proposed programme of a tourism route, linking archaeological and bat research facilities builds on the existing tourism network of the Cradle, while protecting the historical and natural landscapes, through the remediation of the destructive impact of the economic landscape.



-A.3-

OPSOMMING

In ons huidige samelewing, skei die mensdom dikwels 'menslike plek' van 'natuurlike plek'. Die vervreemding van die natuur bring mense onder die indruk dat aktiwiteite buite beskermde natuurlike areas geen effek het op die areas wat afgebaken is as 'natuurlik' nie (Mang 2007). Dié wanpersepsie word duidelik gesien in die landskap van die Wieg van die Mensdom, die enigste UNESCO-beskermde, natuurlike en kulturele Wêrelderfenisterrein wat in gedrang gebring word deur die sosiale en ekonomiese aktiwiteite van die verlede en hede, insluitend suur mynwater en onvanpaste boerderypraktyke. Dié aktiwiteite binne die grense van die Wieg is egter nie net besig om die historiese landskap in gedrang te bring nie, maar plaas ook druk op die verskuilde netwerke van die landskap. Dit sluit die kwesbare karts ekosisteem, waarvan die bedreigde Schreiber's lang-vinger vlermuis deel vorm in, wat op sy beurt die plaaslike boerderye en die lewensbestaan van die plaaslike gemeenskap beïnvloed (Durand et al. 2010:74).

'n Merkwaardige, maar tog kwesbare area in die Wieg is Bolt's se plaas. Dié area is suidwes geleë van die Sterkfontein Grotte, en vorm die basis van die verhandeling. Die area bevat van die oudste fossiel neerslae wat in die area ontdek is, wat die moderne mensdom insig in die historiese landskap van die Wieg bied. Saam met die historiese laag van die landskap, vorm die ekonomiese en sosiale lae, die landskap van Bolt se Plaas.

Die bestaande netwerke word ondersoek om die bedreigings van die landskap aan die lig te bring, en argitektuur as 'n middel te gebruik om die geleenthede wat eie aan die landskap is, te verbind. Die voorgestelde programme, in die vorm van 'n toerisme roete wat argeologiese en vlermuis navorsing fasiliteite verbind, bou op die bestaande toerisme netwerke wat gevind word in die Wieg. Terselfde tyd word die historiese en natuurlike lae van die landskap beskerm deur die remediëring van die vernietigende invloed van die ekonomiese landskap.



-A-
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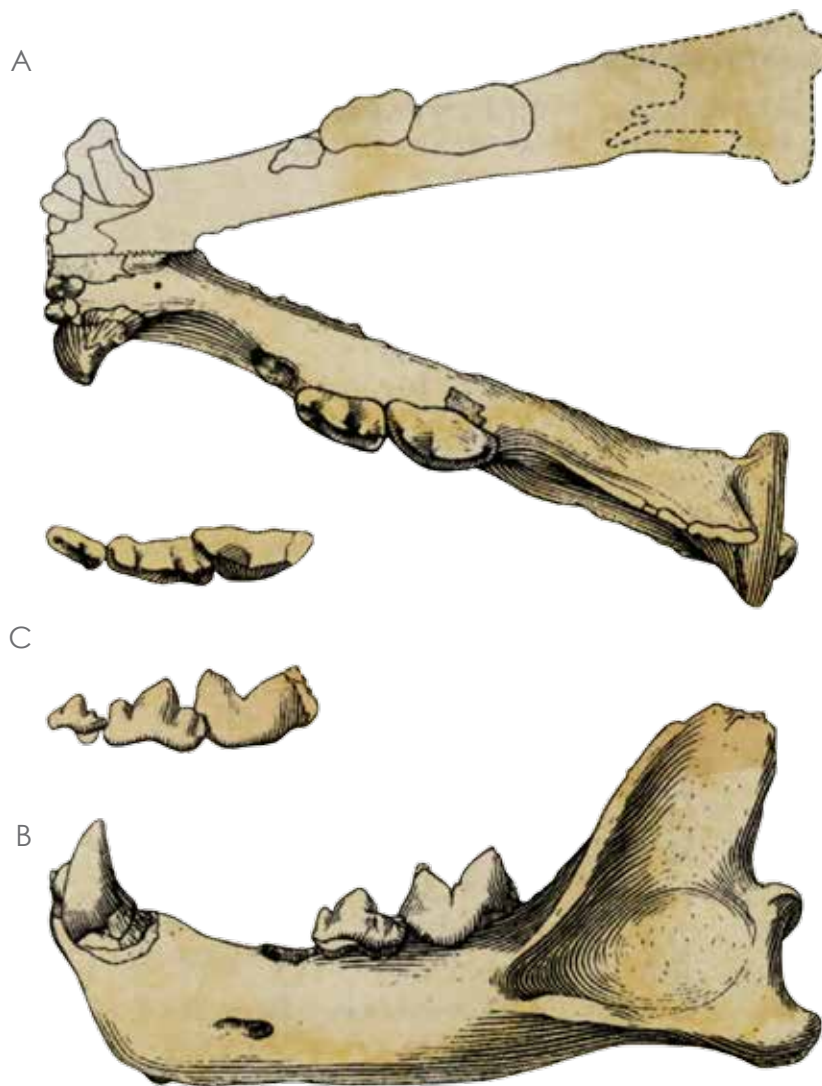
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BACKGROUND

THE LANDSCAPE OF THE
CRADLE OF HUMANKIND



▲
FIGURE B.1
DORSAL VIEW (A) & LEFT LATERAL VIEW (B) OF MANDIBLE
OF BOLT'S FARM 'A'. OCCLUSAL & OUTER LATERAL
VIEW (C) OF LEFT CHEEK TEETH OF SPECIMEN 'C'
(Cooke 1991:18)



-B-

THE LANDSCAPE

OF THE CRADLE OF HUMANKIND

B THE LANDSCAPES OF THE CRADLE OF HUMANKIND

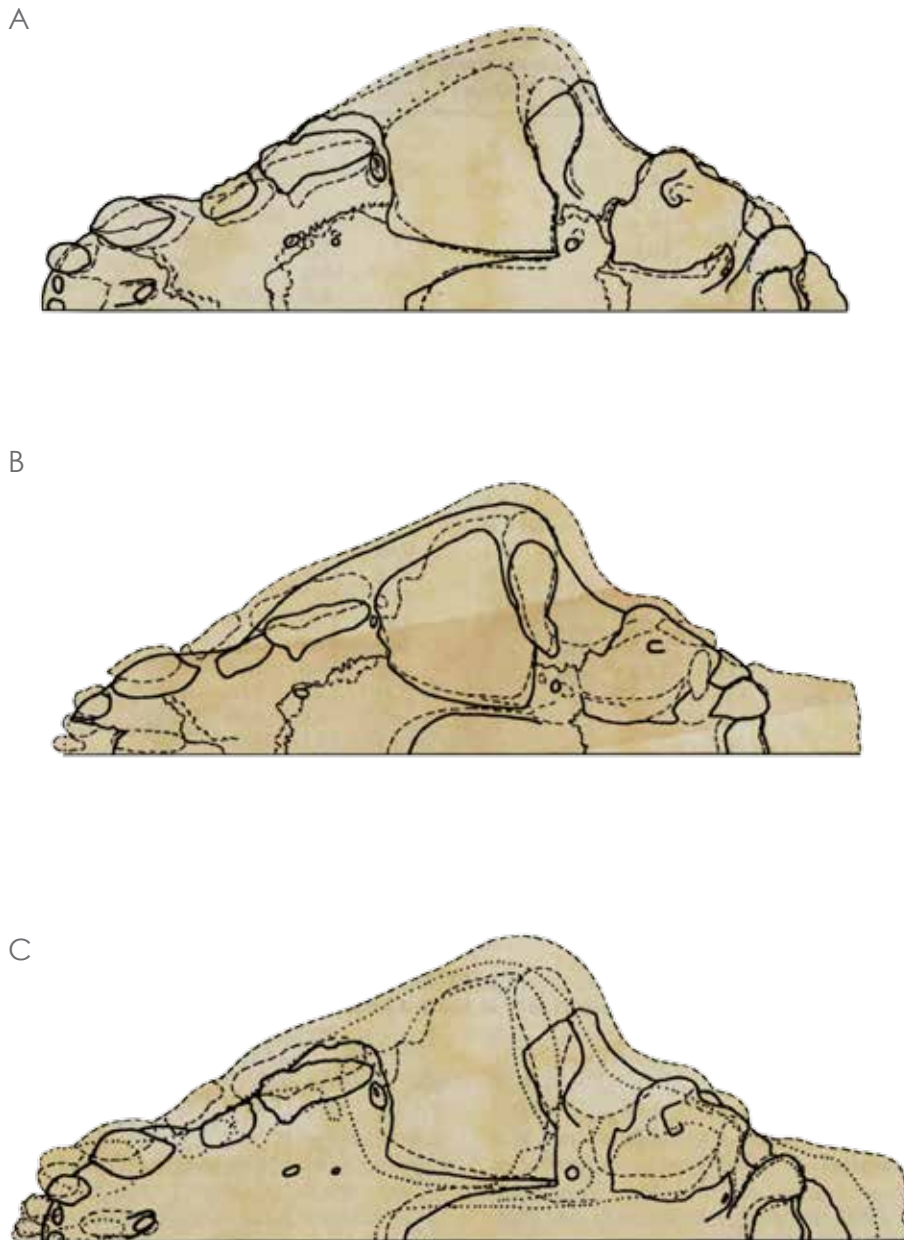
The Cradle of Humankind, located in the Gauteng and North West Provinces of South Africa, is home to a number of fossil-rich sites, including Sterkfontein, Swartkrans, Kromdraai and the Rising Star caves, where the fossiliferous deposits of Homo Naledi were recently discovered (Nhauro 2010:1). This view into the historical landscape of the Cradle offers only a small glimpse into the totality of this landscape, with the economic and social landscapes, together with the historical landscape, contributing to the current state of the Cradle of Humankind.

B.1 HISTORICAL LANDSCAPE

The Cradle of Humankind (hereafter 'the Cradle') is listed as both a natural and cultural world heritage site with the United Nations Educational Scientific and Cultural Organization (UNESCO) (The South

African Karst Working Group 2010:14). The Cradle is, however, not only unique due to its paleontological and archaeological significance, but also due to its morphology. It rests above a dolomitic karst system that host a unique ecosystem housing a variety of life, from micro-organisms to more than half of the known bat species in South Africa (The South African Karst Working Group 2010:16).

Together with the seminal fossil discoveries of what some believe to be pre-historic human-beings, the fossils of 13 Chiroptera families were discovered in the Cradle (Pretorius 2012:51). This fossil evidence suggests that bats existed in this landscape as far back as the Eocene era, placing these mammals in the landscape far earlier than humankind. It is this landscape where hominoid species once roamed and lived from the landscape, and the conditions within the subterranean layer of this landscape, which enabled the formation and preservation of the fossils of these species, bringing modern interest to this site through the archaeological record.



▲
FIGURE B.2
COMPARATIVE OUTLINES OF PALATAL
ASPECT OF DIFFERENT SPECIMENS OF
DINOFELIS
(Cooke 1991:18)

B.2 ECONOMIC LANDSCAPE

The Cradle is located adjacent to one of the richest gold bearing ridges in the world, with a few early gold mines, like the Kromdraai Mine, being located within the Cradle itself (Whatley 2015). As a result of the discovery of gold on the Witwatersrand, the city of Johannesburg was established in 1886, and its economy, together with the broader economy of South Africa grew upon its mineral wealth. The existence of these mines of the past might however be detrimental to the preservation of Cradle of Humankind World Heritage Site in its current state.

When many of the gold mines on the Witwatersrand closed down, dewatered voids, some up to 3km underground where left behind. Over time, these voids slowly started filling with water, and in 2002, the springs on West Rand started to flow again. These springs where however contaminated with Acid Mine Drainage AMD.

The Tweelopiespruit is one of the major arteries affected by AMD. The Tweelopiespruit flows through the Krugersdorp Nature Reserve, connecting with the Rietspruit River, which in turn flows into the Blaauwbankspruit, running through the Cradle (Durand et al. 2010:80). The degradation of the structure of the karst system is not the only concern of AMD, as it is also responsible for the degradation of soil quality, which in turn affects both the fauna, including the Schreiber's long-fingered bat, and endemic flora in the immediate environment (Cobbing et al. 2007:622).

This degradation of the ecology and structure of the karst system will have a

major impact on both archaeological and palaeontological heritage of the area, leading to the risk of this unique landscape losing it status as UNESCO World Heritage Site. This, in turn, will negatively affect the tourism, hospitality and education sectors of this site, ultimately leading to the loss of the a major part of the community's livelihood within the area (Durand et al. 2010:74).

B.3 SOCIAL LANDSCAPE

The Cradle serves as a popular tourist destination, not only for its archaeological and paleontological findings, but also for hosting a variety of adventure sports, game lodges and other tourist activities. The pressure tourism places on the area is, however, contradictory to the principle of conservation; a core principle of World Heritage Management. The principle states that World Heritage sites should ought to retain a function within the current community, while being conserved for future generations (Landorf 2009:53).

Eco-tourism is the fastest growing sector in the tourism industry, and is seen as a strategy to simultaneously promote nature conservation, as well as sustainable local development (Ross and Wall 1999 :123). Although the motivation for initiating eco-tourism initiatives varies greatly, the concept of eco-tourism introduces an alternative to traditional consumptive tourism. This concept starts to explore the possibility of tapping into existing tourism and recreational networks of the Cradle, implementing a strategy of preservation for the unique fossiliferous deposits of the historical landscape of the area, as well as a conservation strategy for the karst ecosystem, including a bat conservancy.





PERI-URBAN FRAMEWORK

THE CRADLE CORRIDOR

-C-

PERI-URBAN FRAMEWORK

THE CRADLE CORRIDOR

C.1 MANAGEMENT OF A WORLD HERITAGE SITE

World Heritage Sites, such as the Cradle of Humankind World Heritage Site, are often faced with the predicament of managing the balance between short-term economic gain and long-term preservation (Wager 1995:517). The increase of tourism within a given area often places pressure on its artefact or heritage resources, contradicting the core principle of conservation. The World Heritage Management principle of conservation states that World Heritage sites should retain a function within the current community, while being conserved for future communities (Landorf 2009:53). The balance between tourism and conservation thus relies on the community, taking into account both the values of and threats to the economy, heritage and ecology of the World Heritage Site, and the surrounding environment.

C.2 STRATEGY

The Cradle of Humankind World Heritage Site and Dinokeng are initiatives of the Gauteng Provincial Government to establish geo-spatial tourism destinations, close to the densely populated metropolitan areas of Johannesburg, Tshwane and Ekurhuleni. If managed and planned properly, local and international tourism can be used to add immense value in the form of the appreciation of the prehistoric remains to

the site, thereby provide contemporary worth to the area, helping to protect it. The area already boasts thousands of cyclists every weekend, and acts as a “garden” for the city.

Taking existing tourism networks into consideration (Annexure A), the framework focuses on developing a conservation strategy, which relies on the economic development of the Cradle, associated with tourism development. The rural nature of the Cradle and the richness its ecology holds within it is an opportunity for the area to become a heritage park, which is rich in memory and biodiversity. The group urban framework concentrates on the southern edge of the Cradle, which acts as the gateway to the larger world heritage site, and contains the highest known amount of discovered fossil sites. The framework not only aims to address the issue of conservation of the world heritage site, but also aims to address the unarticulated, commodified and fragmented nature of the Cradle of Humankind.

C.3 METHODOLOGY

The framework was developed for the Cradle of Humankind through determining a strategy for long term preservation, with short term gains. The dynamics of tourism and conservation were analysed, in order to draw on the positive qualities of each, while preventing possible economic, heritage and ecological threats.



- TOURISM CLUSTER ●
- TOURISM CORRIDOR - -
- VISITOR CENTRE ●
- PROPOSED INFO-CENTRE ●
- RESISTANT INFRASTRUCTURE ●
- PROPOSED INFRASTRUCTURE ○

▲
FIGURE C.1
PROPOSED HERITAGE
FRAMEWORK
(Author, 2016)



C.4 INTENTION

Owing to the location of the Cradle, an hour's drive away from two major cities, Pretoria and Johannesburg, the area is envisioned as a future tourism corridor, and as an escape from the city with activities, such as hiking, sporting activities and leisure.

C.4.1 HERITAGE & TOURISM

C.4.1.1 THE FOSSILS & OTHER TOURISM ACTIVITIES

The framework takes into account the location of the fossil findings within the boundaries of the Cradle. Due to the nature of the formation of fossils, the most fossils findings are clustered around the Riet Spruit and Blaauwbank Spruit. These water bodies run along the major vehicular routes, along which most other tourism activities are found, such as adventure sports facilities, sculpture gardens, and accommodation.

C.4.1.2 UNESCO HERITAGE CONSERVATION FRAMEWORK

The UNESCO strategy for managing tourism at World Heritage Sites include the following strategies (Pedersen 2002:96):

- reducing the number of visitors to a site;
- changing visitors' behaviour;
- dispersing or concentrating people to reduce use in a particular area;
- reducing conflicts between visitors;
- reducing conflict between local people and the communities;
- encouraging visitors to practise particular activities; and
- making the physical environment more resistant to impacts.

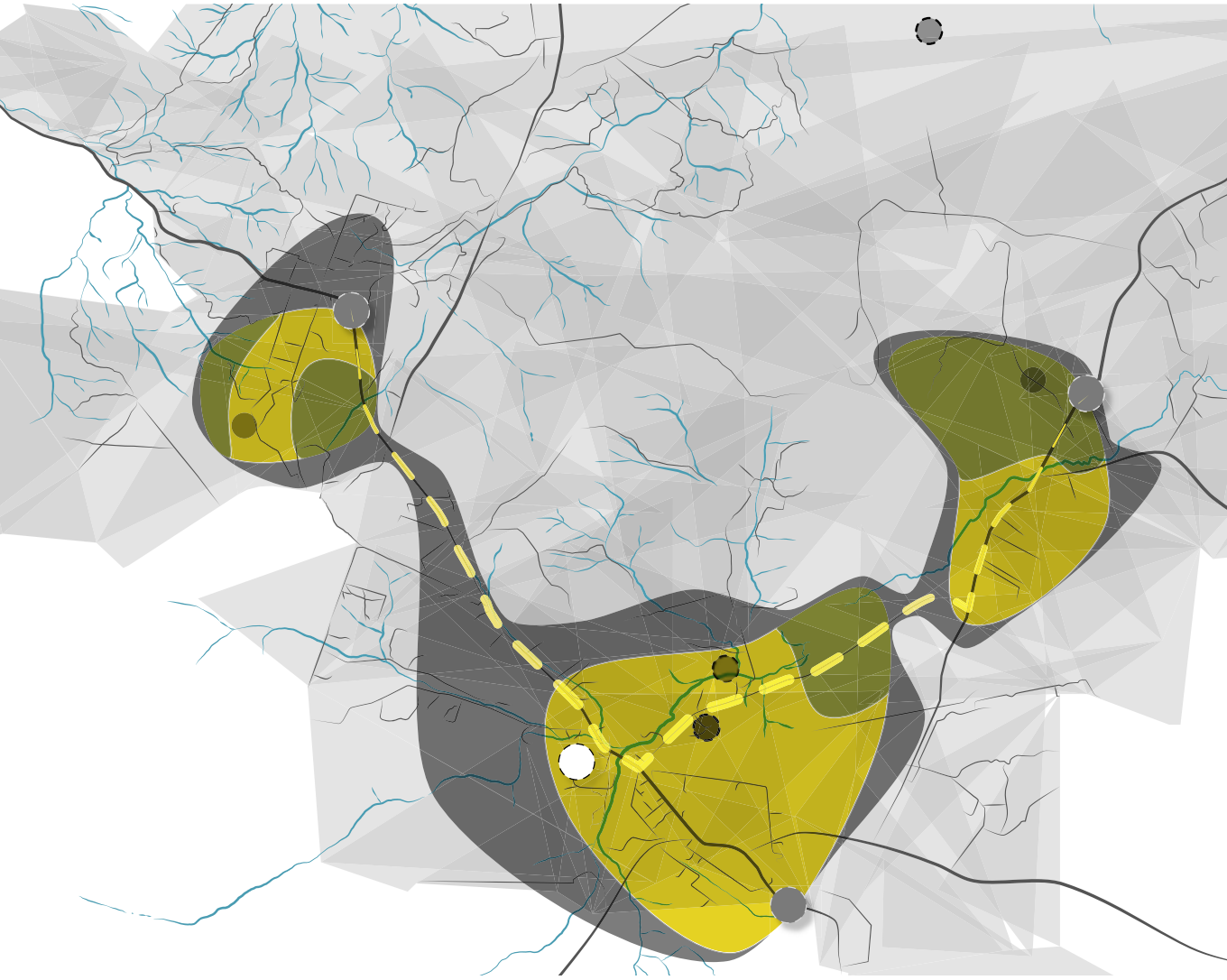
C.4.1.3 PROPOSED HERITAGE FRAMEWORK

With the development of the framework, the management strategies for World Heritage Sites, as proposed by UNESCO, which have a physical or spatial impact, were taken into consideration. The intention of the proposed framework is to cluster future commercial activities around existing commercial activities, with tourists moving along a "Cradle corridor". This corridor, with necessary infrastructure, accommodates tourism, while managing and limiting the extent to which the tourists are allowed to move within the Cradle. This approach protects existing sites, as well as future discoveries, and connects the site as one world heritage site. Information points, together with access to parking and transportation services, are placed at the entrances to the corridor, limiting vehicular activity in the area, and announcing the status of the site

C.4.2 ENVIRONMENTAL CONSERVATION

C.4.2.1 THE STATE OF THE ENVIRONMENT OF THE CRADLE OF HUMANKIND

Together with the seminal fossil discoveries of pre-historic humans, the Cradle also offers visitors to the area a view into the rich biodiversity of South Africa (Annexure A), spanning two biomes, including the grassland and bushveld biomes (Eloff 2010:19). The Cradle is also home to complex karst system, an underground network of rivers and cabins formed within carbonate rich rock such as limestone and dolomite (Leyland 2008:67). The surface of the landscape, as well as the hidden karst network, are, however, becoming increasingly threatened by a multitude of factors, such as mining, agriculture, tourism, and increased urbanisation of the area.



- BUFFER ZONE ●
- ECOLOGICAL PRESERVATION ●
- TOURISM CLUSTER ●
- TOURISM CORRIDOR - -
- VISITOR CENTRE ●
- PROPOSED INFO-CENTRE ●
- RESISTANT INFRASTRUCTURE ●
- PROPOSED INFRASTRUCTURE ○

▲ FIGURE C.2
PROPOSED ENVIRONMENTAL
FRAMEWORK
(Author, 2016)



C.4.2.2 CLIMATE CHANGE ADAPTION FOR NATURAL WORLD HERITAGE SITES

As a response to the state of environment, Falzon and Perry (2014) developed a practical guide for climate change adaption for natural world heritage sites. The guide proposes a holistic approach to the protection of the heritage and biodiversity, while retaining the site as a key for tourism. The strategy, as proposed by Falzon and Perry (2014) includes practical and strategic actions, such as creating buffer corridors, and the development of infrastructure.

C.4.2.3 PROPOSED ENVIRONMENTAL FRAMEWORK

Building on the proposed Heritage Framework for the Cradle, buffer zones are created around the commercial clusters, to limit public access into sensitive, undisturbed sites. The framework also builds on existing projects in the area, aiming at the removal of invasive species, the rehabilitation of the polluted river, and community uplifting and involvement. A sensitive intervention strategy is crucial, and therefore the strategy focuses more on long-term strategic interventions, with limited practical action.

0.4.3 COMMUNITY INVOLVEMENT 0.4.3.1 THE COMMUNITY OF THE CRADLE OF HUMANKIND

The majority of the community living within the border of the Cradle are employed in

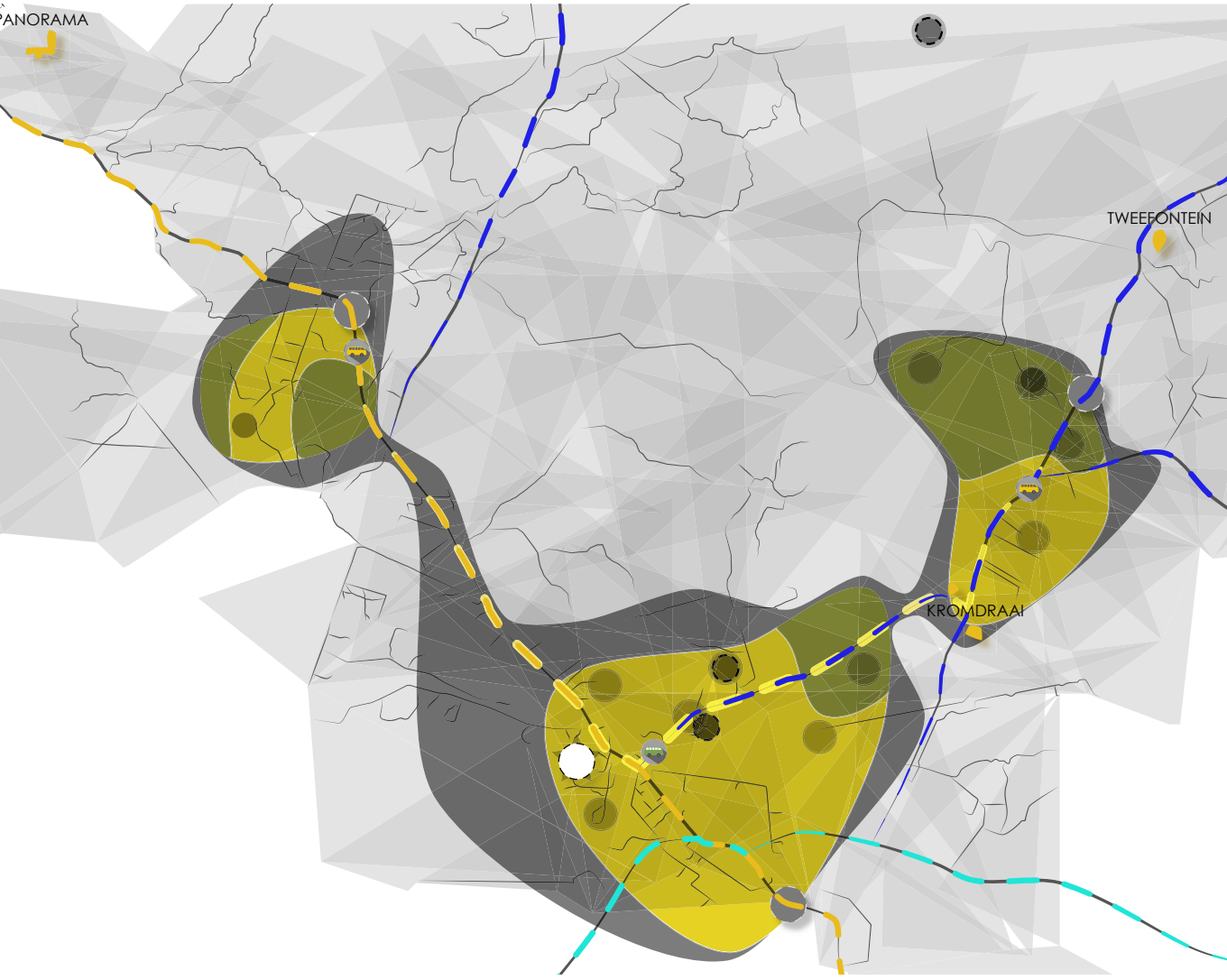
the agricultural sector, with more than three quarters of the community living in informal dwellings. The Panorama, Tweefontein and Kromdraai (Annexure A) informal settlements are the three major informal settlements found in the region, with many other small informal settlements dotting the landscape of the Cradle (Mogale City Local Municipality 2011).

C.4.3.2 COMMUNITY INVOLVEMENT & CURRENT STAKEHOLDERS

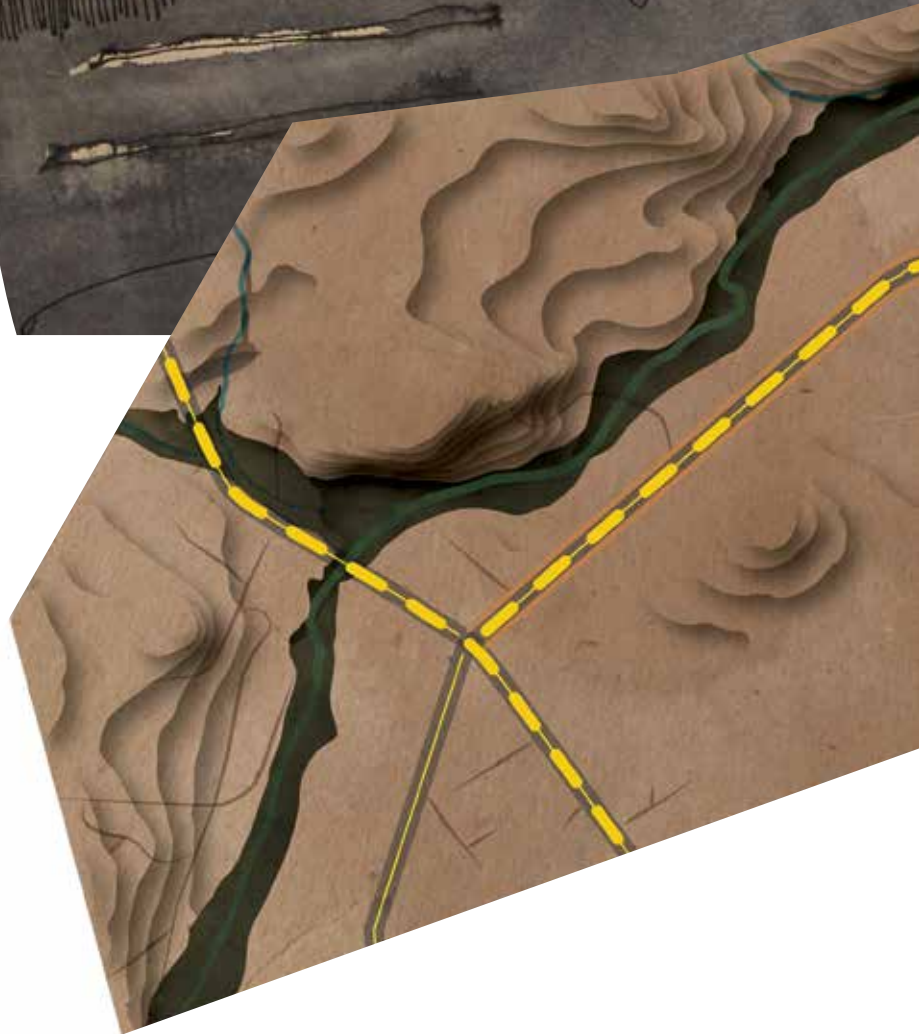
The Cradle of Humankind Trust aims to develop the region for the benefit of the tourism industry, together with the local community. The current stakeholders include the Mogale City local municipality, tourism establishment owner forums, and local community formations, amongst others. The COH trust aims to use tourism to uplift the community, through projects such as housing and skills development. The objectives of the trust include job creation, tourism job skills, and enterprise development (Mogale City Local Municipality 2011).

C.4.3.3 PROPOSED COMMUNITY FRAMEWORK

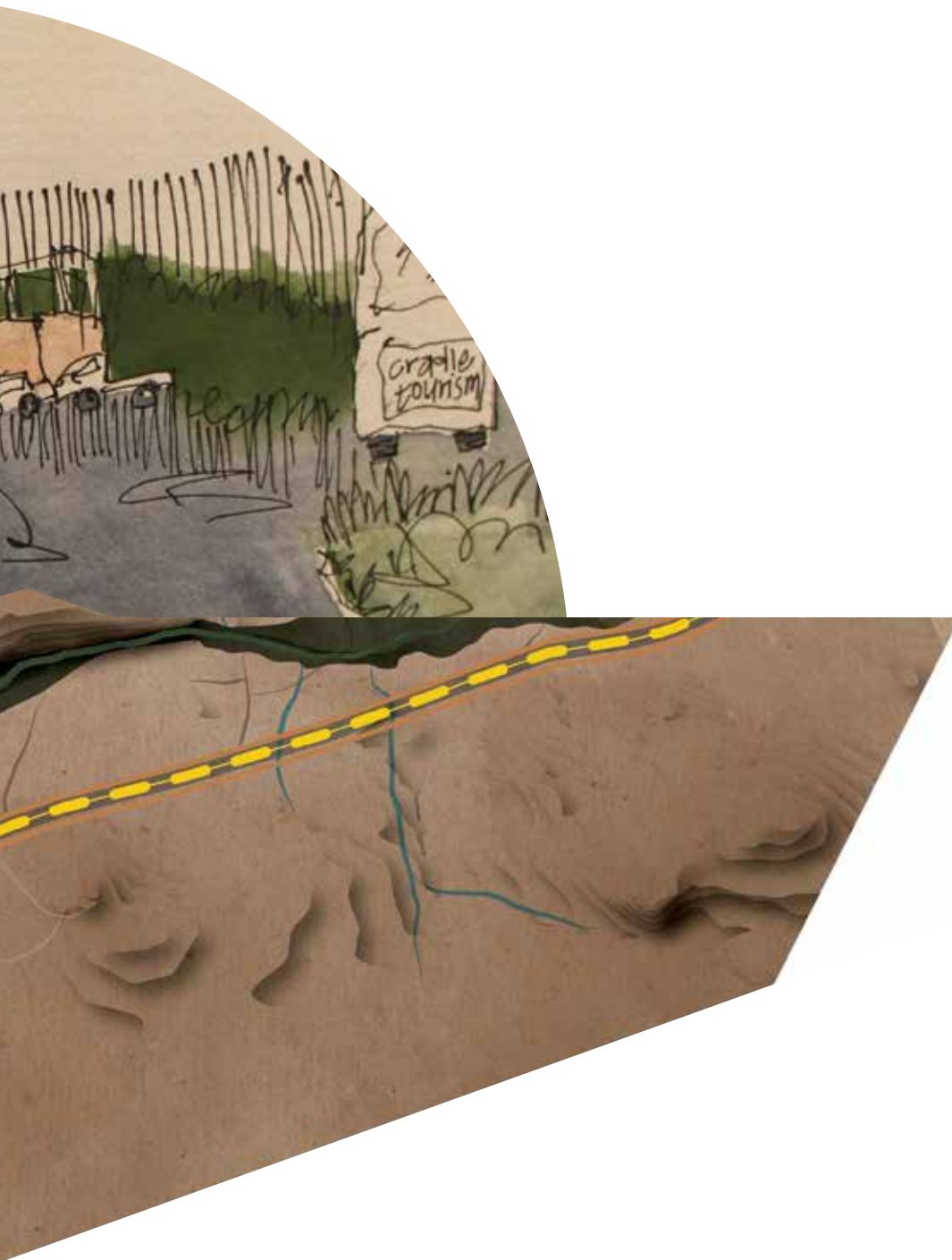
The proposed community framework aims to improve the access to the commercial clusters, providing local communities with the opportunity to engage with the tourism market, thus providing economic opportunities. The framework proposes a series of bus stops and routes connecting to existing train and bus stops, leading from the informal settlements along the “Cradle corridor”.



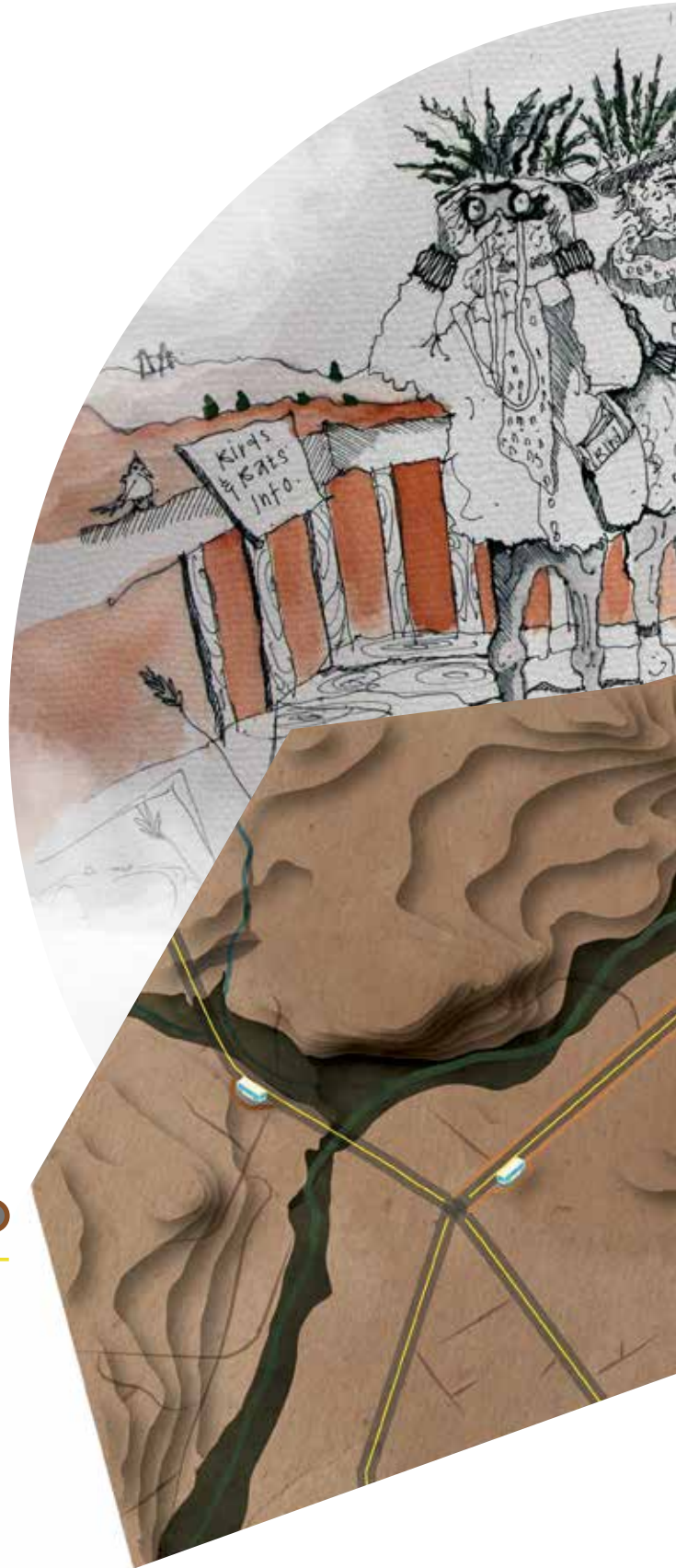
▲ FIGURE C.3
PROPOSED COMMUNITY
FRAMEWORK
(Author, 2016)



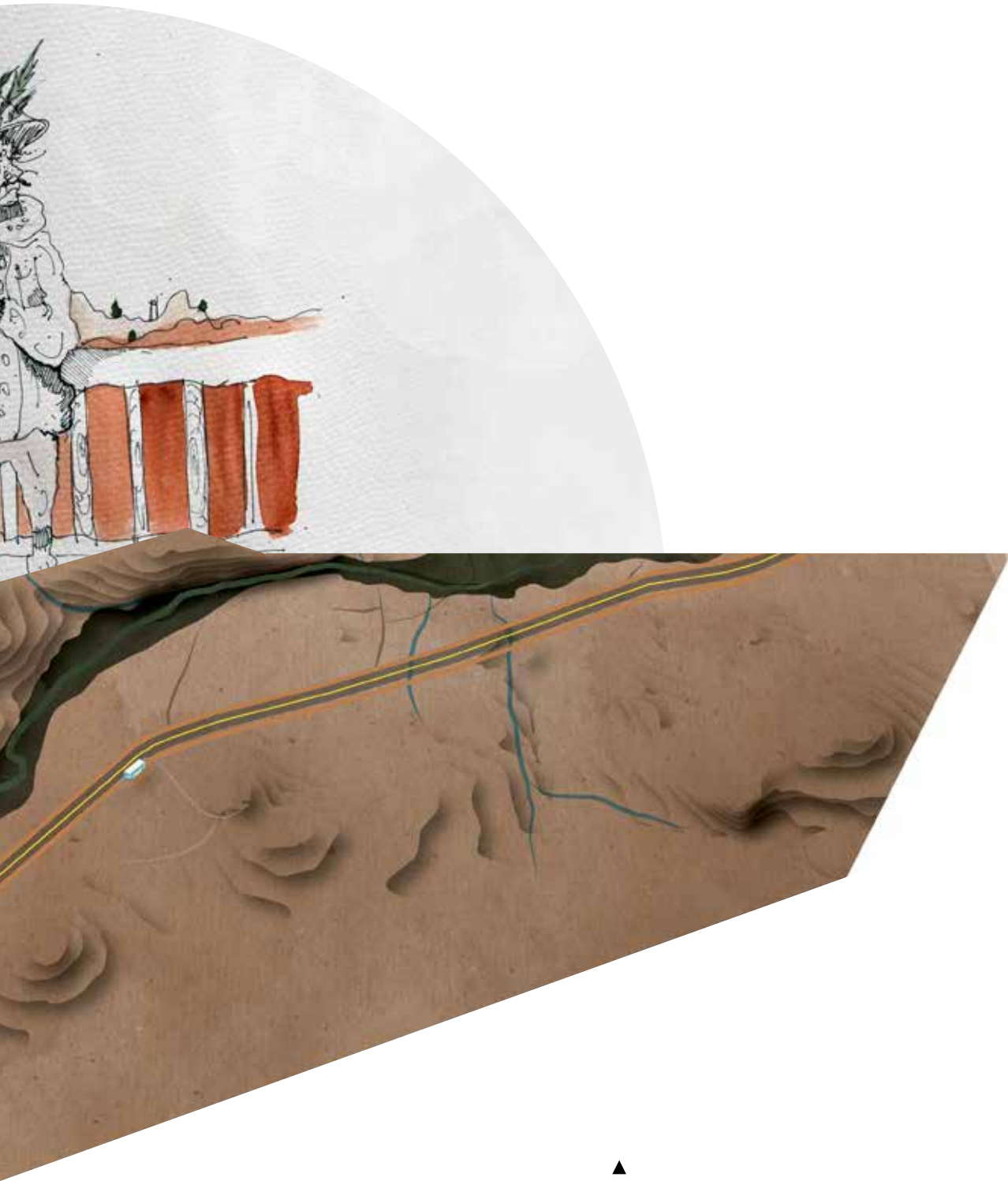
TOURISM BUS ROUTE - - -



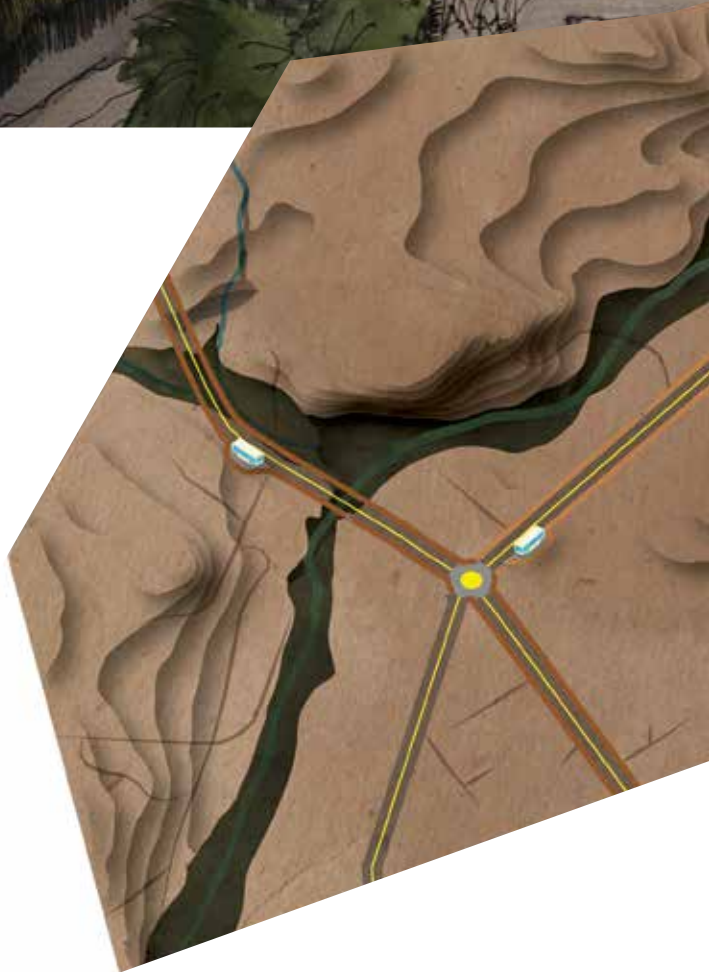
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FIGURE C.4
BUS ROUTES
(Author & Barnard, AA, 2016)








BUS STOP [2km] ●
TOURISM BUS ROUTE - -



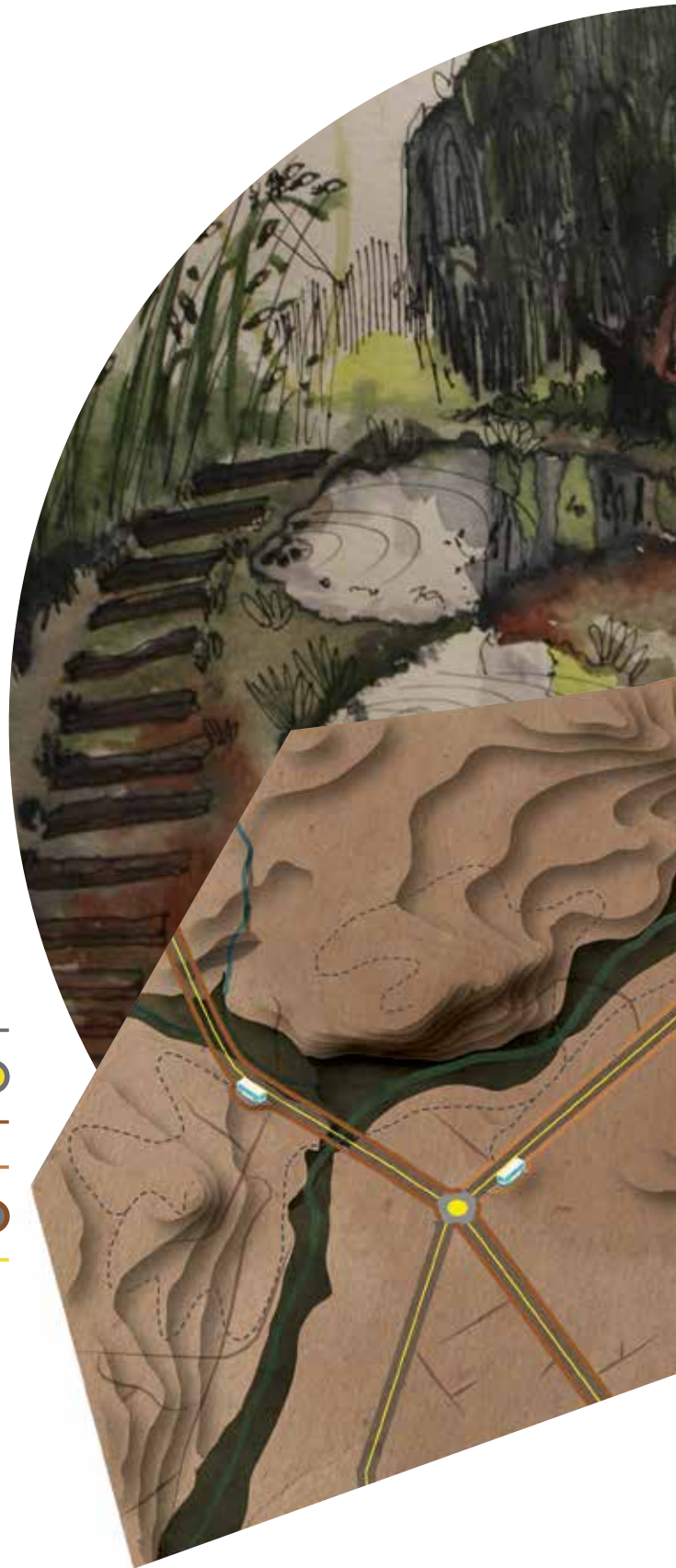
▲
FIGURE C.5
BUS STOPS
(Author & Barnard, AA, 2016)



- TRAFFIC CALMING CIRCLE 
- NEW CYCLING LANE 
- EXISTING CYCLING LANE 
- BUS STOP [2km] 
- TOURISM BUS ROUTE 



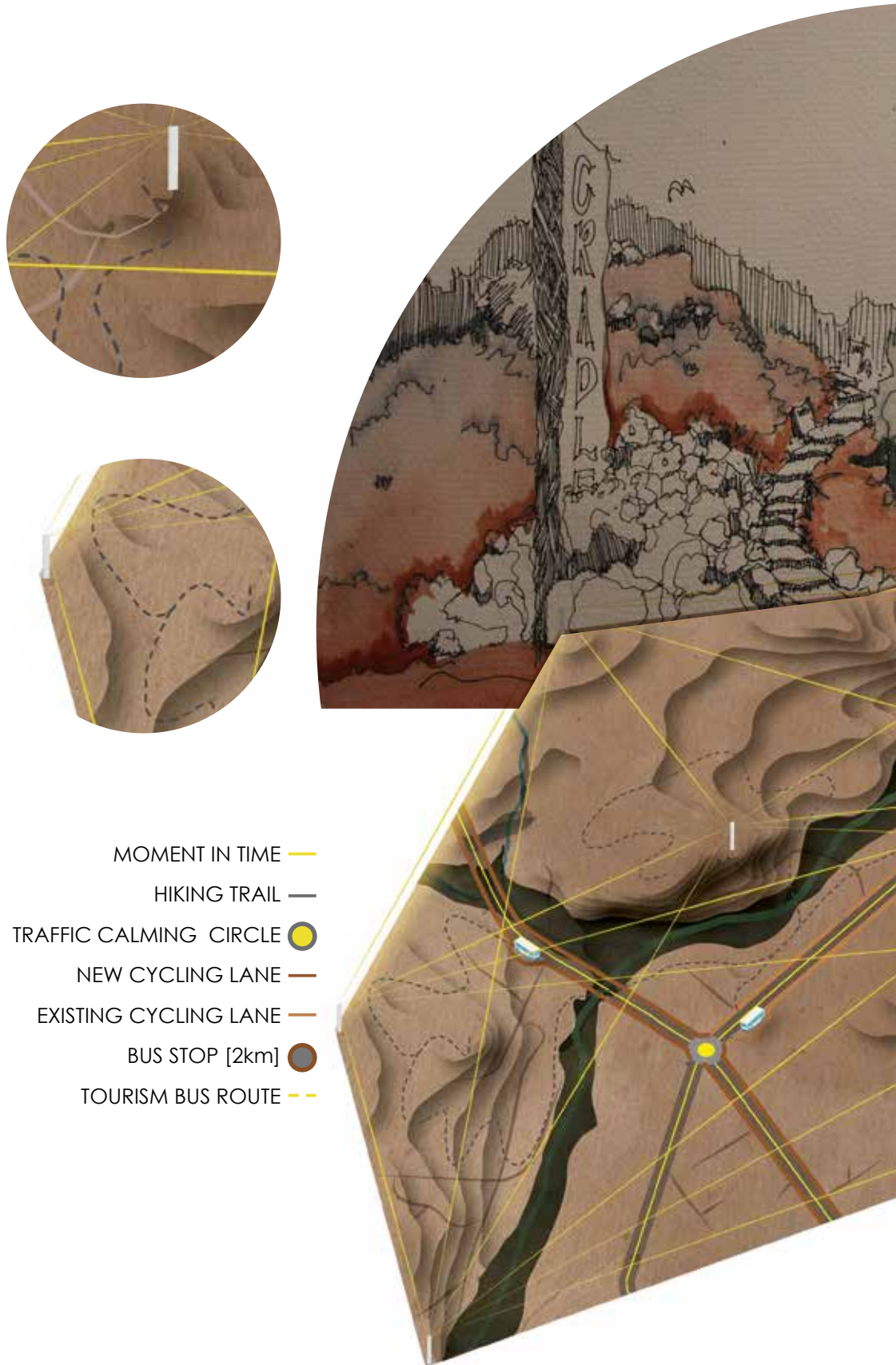
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FIGURE C.6
CYCLING LANES
(Author & Barnard, AA, 2016)

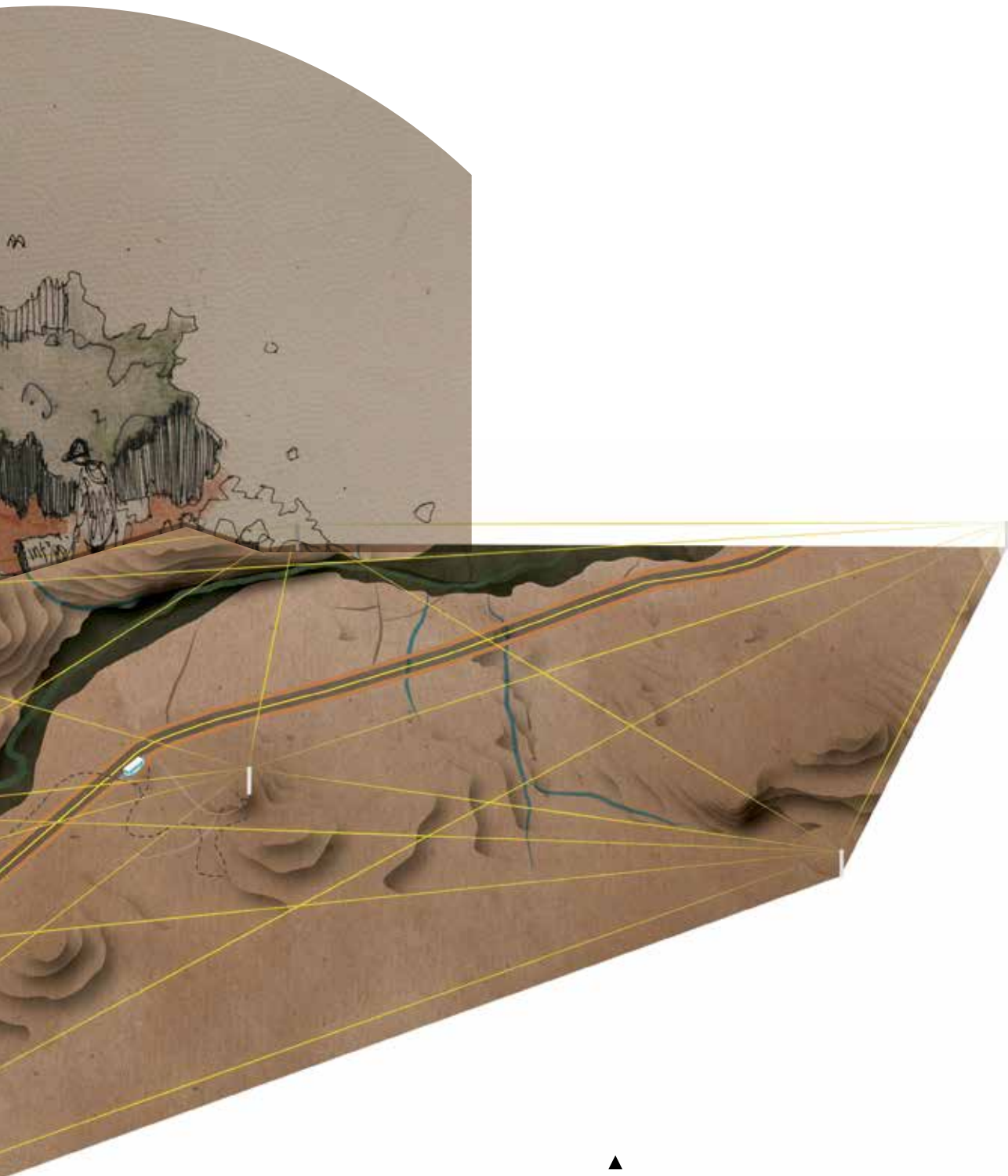


- HIKING TRAIL —
- TRAFFIC CALMING CIRCLE ●
- NEW CYCLING LANE —
- EXISTING CYCLING LANE —
- BUS STOP [2km] ●
- TOURISM BUS ROUTE - -



▲
FIGURE C.7
HIKING TRAILS
(Author & Barnard, AA, 2016)





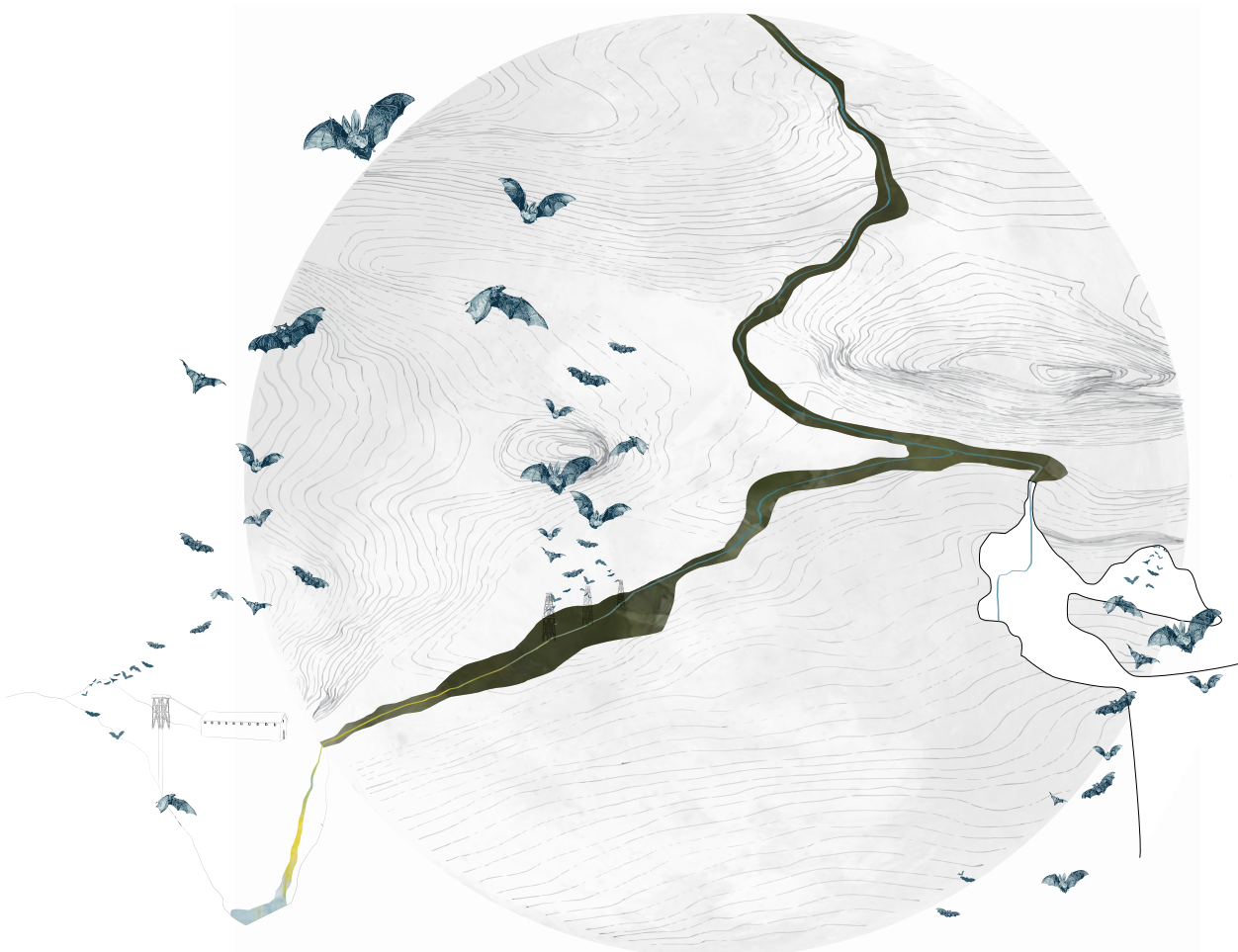
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FIGURE C.8
ORIENTATION DEVICES
(Author & Barnard, AA, 2016)





INTRODUCTION

CONNECTIONS & PLACE



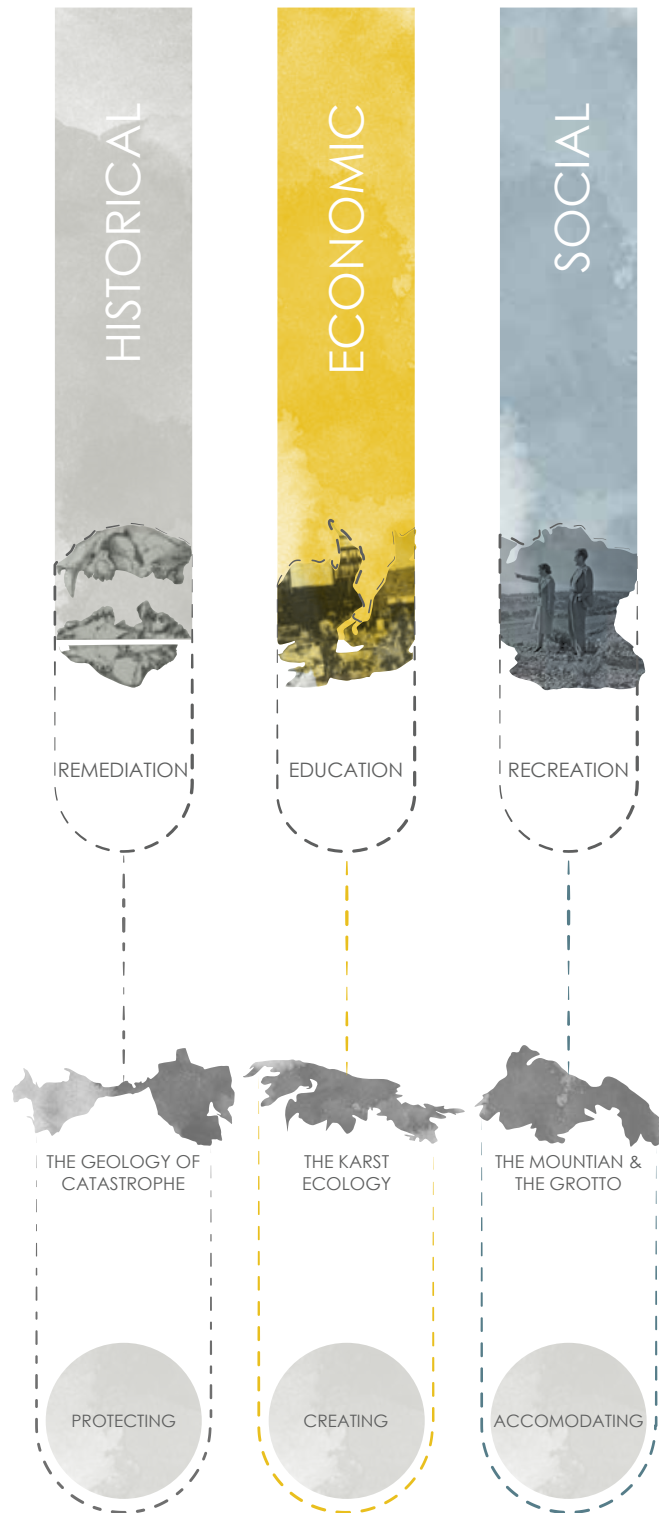
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FIGURE 1.1
BOLT'S FARM CONNECTIONS
CONCEPT IMAGE
(Author , 2016)

-1-

CONNECTIONS

INTRODUCTION TO THE DISSERTATION

Within our current society, humankind often separates 'human place' from 'natural place'. This alienation from nature leads human beings to believe that activities outside of protected natural areas have no effect on the areas demarcated as natural (Mang 2007). This belief is evident within the landscape of the Cradle of Humankind, the only UNESCO-protected natural and cultural World Heritage Site, which is under threat from past and present social and economic activities, including acid mine drainage and poor farming practices. The social and economic activities within the Cradle are however not only threatening what is left of the historical landscape, but are also placing pressure on the hidden networks of the landscape. This includes the vulnerable karst ecosystem, hosting the Schreiber's long-fingered bat colonies, which, in turn, impacts local farms and the livelihoods of the community (Durand et al. 2010:74).



▲
FIGURE 1.2
DESIGN
FRAMEWORK
(Author , 2016)

1.1 PROBLEM STATEMENT

The Cradle allows modern human-beings a view into the past landscape of the region. This view into the past, and the future of the landscape, is however under threat, due to past and present activities by humankind in and surrounding the Cradle. Not only is a disconnect between humankind and nature evident, but so too is a disconnect between the three layers of the landscape of the Cradle, namely the historical, economic, and social landscapes.

The rich pre-historical history, together with the geological and ecological significance, contributes to the unique character of the Cradle of Humankind. The tourism industry of the Cradle is, however, often viewed as a commodified heritage experience, removing the objects and artefacts from the context that give it meaning (Naidu 2008:190).

The challenge lies in the development of an appropriate architectural response to landscape, developing a tourism-based intervention, which aims to serve all three layers of the landscape, and reveals and connects the hidden and forgotten layers and networks of this landscape.

1.2 PROPOSED CONTEXT

The study area is situated towards the Krugersdorp border of the Cradle. The Cradle is most well-known for the series of fossil rich sites, including the Sterkfontein and Rising Star caves, where the fossiliferous deposits of Ms Pless and Homo Naledi were respectively uncovered (Nhauru 2010:1). The specific site is located in the North Eastern quadrant of Bolt's Farm, a site comprising the largest collection of fossiliferous deposits, ranging from between 1.5 and 4.5 million years ago (Gommerly

and Potze 2013, :2).

The fossiliferous deposits of Bolt's Farm are not only some of the oldest fossils discovered in the Cradle, but were discovered in the area of karst system most severely impacted by acid mine drainage (AMD) and sewage effluent from the West Rand (The South African Karst Working Group 2010:23). The influence of these two epochs of the landscape, the historical and economic ages, is seen in the current state of the landscape. These two layers of the landscape, together with the social landscape, determine the future of the Bolt's Farm.

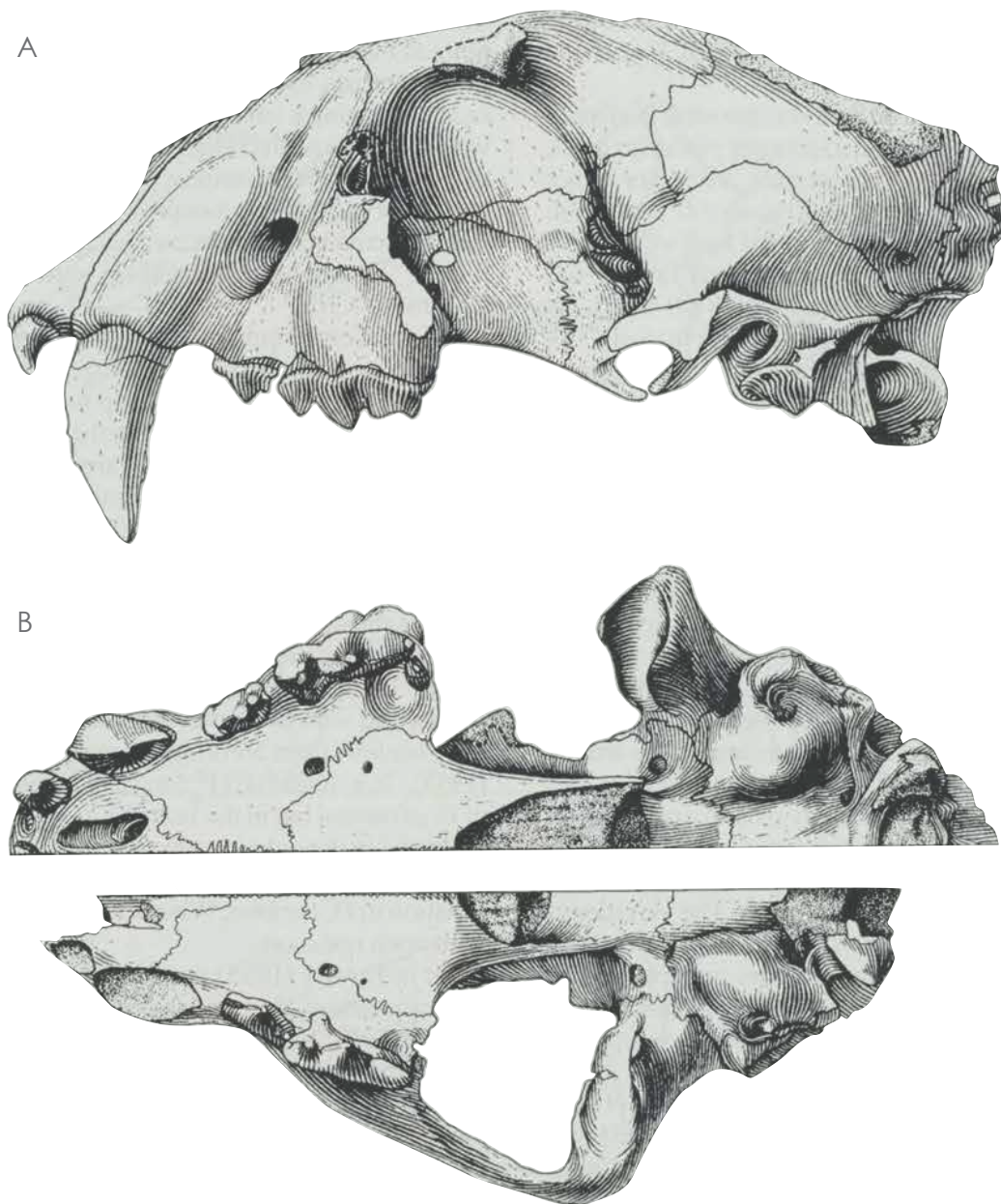
1.3 RESEARCH QUESTIONS

What is the current relationship between humankind and nature, and how has the structure of this relationship influenced the way in which the landscape has been formed by humankind?

What methods can be utilised to determine the existing networks of a place in order to understand the uniqueness and inherent potential of a place, as a way through which a scarred landscape can be remediated, local and visiting communities can be informed about the ongoing threats to the landscape, and all layers of the landscape can serve as recreation to all visitors (local and tourist)?

How can the relevance and importance of the fossiliferous deposits discovered at Bolt's Farm be understood and valued by the local and visiting tourism community, as a unique series of discoveries, and in the context of the Cradle specifically?

How can the perception of tourism in the Cradle move away from a commodified heritage experience to a 'take-home' visitor experience?



▲
FIGURE 1.3
LEFT LATERAL VIEW (A) & PALATAL VIEW (B)
OF THE CRANIUM OF *DINOFELIS BARLOWI*
(Cooke 1991:13)



1.4 DISSERTATION QUESTIONS

How can architecture assist the way in which the impact of human-beings in a landscape is perceived, by moving away from a disruptive impact on the living systems of the landscape towards a positive one?

What role can architecture play in the building of connections between the three layers of the landscape, namely the historical, economic, and social layers, as well as the relationships and connections between the current and future users and visitors to Bolt's Farm?

How can architecture create a physical interaction between the visitors and the landscape, including the living networks found in the landscape, without negatively disrupting the landscape, to be conducive to the formation of new memories and relationships, and so forming a take-home visitor experience?

In what way can spaces be created through architecture to allow for the co-evolution of humankind together with other living beings, to create spaces which are not only beneficial for the dominant user of the space, but which are mutually beneficial for all components hosted in the habitat?

1.5 DISSERTATION INTENTIONS

The intention of this dissertation is to reconsider the current discourse in architecture in dealing with the landscape, proposing an alternative method in which humankind actively engages with,

and accepts its role as a component of nature. The dissertation aims to establish a precedent for the tourism industry of the Cradle of Humankind, as well as a precedent for future developments in a karst region. It aims to introduce a new programme to Bolt's Farm, building on the existing tourism networks of the Cradle, to align the three layers of the landscape, increase the sense of ownership of the karst system, and to increase the biodiversity and ecological health of the site. The project aspires to develop an architecture which allows for co-evolution, creating spaces which allow for all users to not only co-exist, but to thrive in the habitat created.

1.6 RESEARCH METHODOLOGY

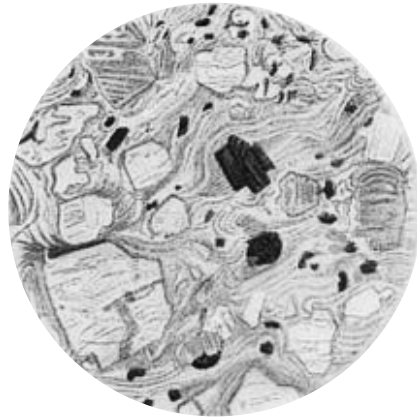
The research methodologies utilised in this dissertation aim to address the general and dissertation-specific questions, as well as support the development of an appropriate architectural response.

Archived and historical data, including archaeological reports, copies of original photographs, and maps, were collected so as to gain an understanding of the development of the site, both from an archaeological stance, as well as from the development of the site since the advent of humankind in the area.

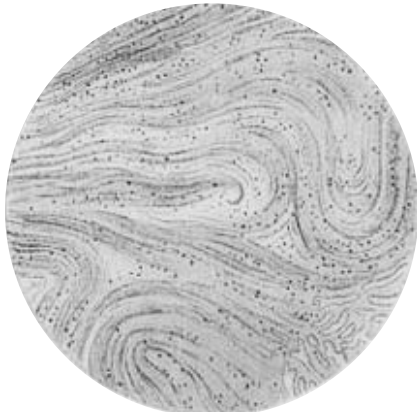
Desktop studies, including content analysis, secondary data analysis, and comparative analysis, together with participant observation, were utilised as a method to map the various layers of the landscape of Bolt's Farm. Together with the quantitative data gathered through desktop studies, the participant observation method allows for the collection of qualitative data.



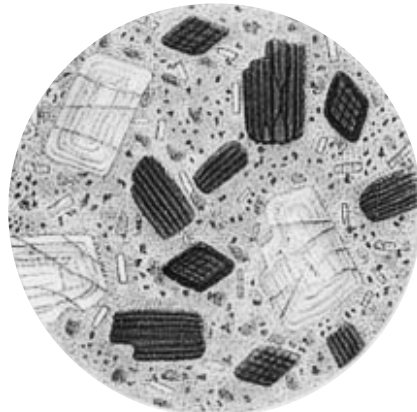
GRANITE



QUARTZ PORPHYRY



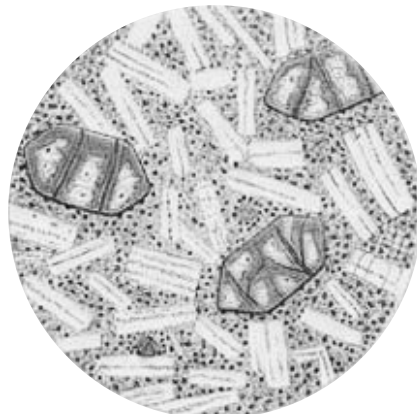
OBSIDIAN



PROPYLITE



ANDESITE



BASALT

▲
FIGURE 1.4
CHROMOLITHOGRAPH OF ROCKS
UNDER A MICROSCOPE
(Carambas Vintage, 1923)

A review of literature, together with the investigation of critical theories, contributed to the understanding and development of a theoretical response to the conditions of the context and specific site, in turn guiding the development of programme and design. The programme was further developed through case studies and interdisciplinary research, allowing for an understanding of the workings of various components of the chosen programme.

A conceptual design approach was developed as a response to the geology of the landscape, which was refined into a tectonic concept, and iterated through a critical review process.

1.7 DELIMITATIONS

The statement of significance of the Bolt's Farm as Natural and Cultural World Heritage Site as accepted as inscribed by The United Nations Educational, Scientific and Cultural Organization (UNESCO).

The urban framework for the development of tourism facilities does not aim to redesign existing tourism facilities, but serves as a guideline for further tourism development. The dissertation will not attempt to develop an alternative method for the treatment of acid mine drainage (AMD), but rather, suggests the implementation of existing passive treatment solutions for AMD as part of the larger framework.

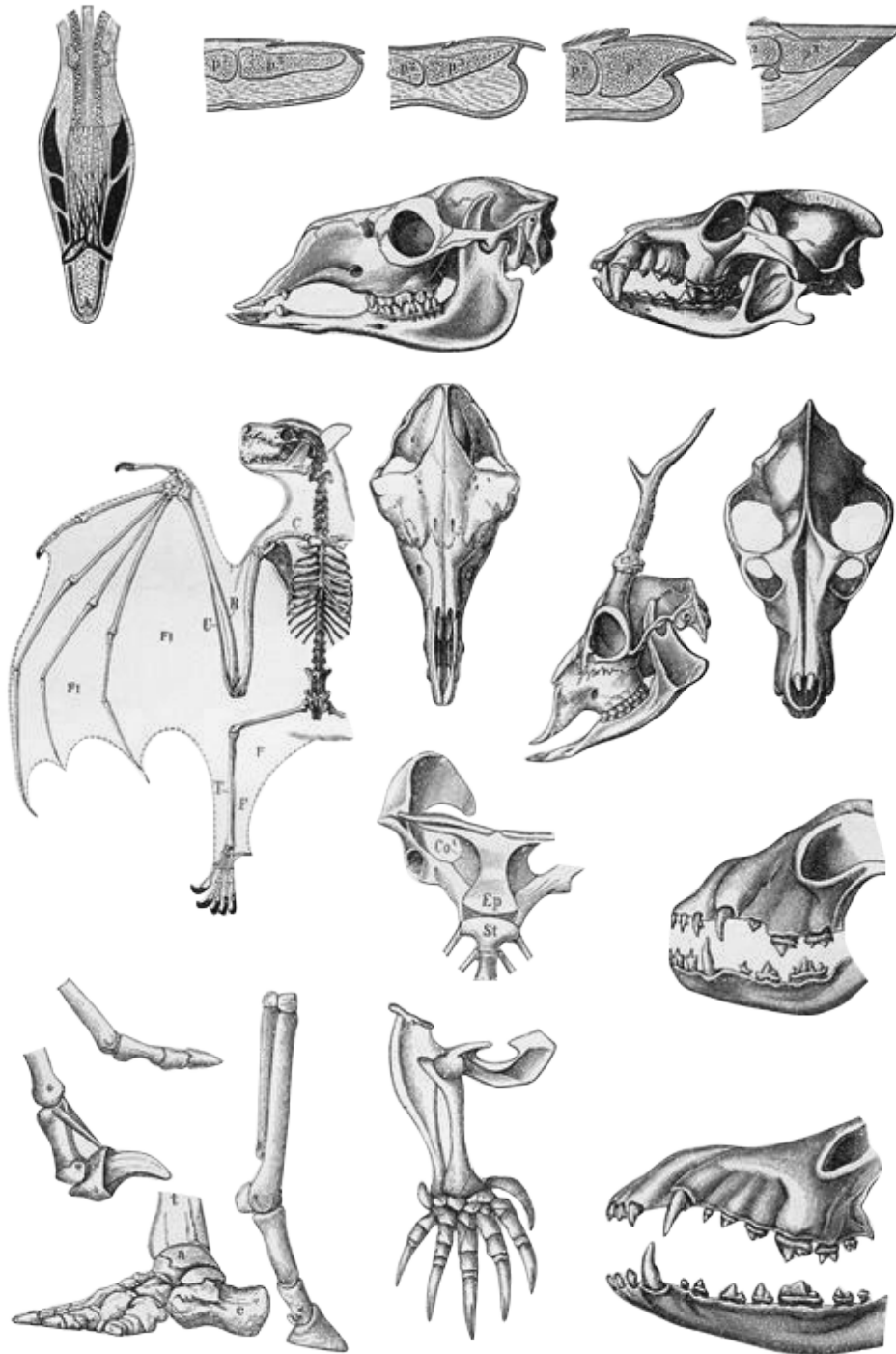
The dissertation will not attempt to develop a remediation strategy for the deteriorated structure of the karst system, but will focus on the development of strategies to reduce further destruction of the karst system, as well as strategies to remediate the lost habitat of the karst system.

1.7 ASSUMPTIONS

Although initial measures have been undertaken to improve the mine water treatment plant, the measures have proven to be ineffective during the wet summer rainfall seasons. The assumption is made that the State through the Inter Ministerial-Committee (IMC) on AMD and the Inter-Governmental Task Team (IGTT) will continue to develop the second phase of the Western Basin works for the significant mitigation and treatment of the raw mine water threat and sewage affluent, as stated in the State of Conservation Report for the Fossil Hominid Sites of South Africa World Heritage Sites (CSIR 2014:4).

The Sterkfontein stone aggregate quarry will obtain a decommissioning certificate within the next ten years.

Ongoing archaeological digs in the region of Bolt's Farm will remain active for a minimum period of 80 years.



▲
FIGURE 1.5
ANTIQUE ZOOLOGIST LITHOGRAPH PRINT OF BAT
SKELETON, SKULL, BRAIN, & INTERNAL ORGANS
(Bibliographisches, 1908)

1.8
GLOSSARY

Acid Mine Drainage (AMD)
(noun)

Acid mine drainage is defined as effluent containing sulphuric acid created by oxidation of pyrites in the rock, combined with water during mining operations. This contaminated water may be highly acidic, and therefore may have the ability to dissolve the dolomite, creating sinkholes, and destroying the karst formations (The South African Karst Working Group 2010:17)

Aquifer
(noun)

A water-bearing geological unit or set of units that yields a significant amount of water to wells or springs of a high enough quality to be economically usable (The South African Karst Working Group 2010:13)

Biome
(noun)

A homogeneous ecological formation that exists in a geographical region, such as bushveld or grassland (Krige and Van Wyk 2005:135).

Breccia
(noun)

Sedimentary rocks as a conglomeration of sand, mud and silt washed in from the surface of the landscape and containing fossil fragments (Cooke 1993).

Karst System
(noun)

A karst system is characterised by the relief caused by the dissolution of the, predominately carbonate rich, underlying rock, by the groundwater flow. Caves, sinkholes and aquifers are typical of a karst landscape, with distinctive soils, micro-climates, flora and fauna indicating the specific patterns of the karst hydrology.

Karst Ecology
(noun)

The interaction between the organism, and between the organism and the physical and chemical surroundings both within and on the exterior of the karst system.

Ecotone
(noun)

The narrow transitional zone between two distinct biomes (Krige and van Wyk 2005:136)

Chiroptera
(noun)

An order of flying mammals comprises the bats as they are they only mammals capable of true and sustained flight through use of webbed wings formed by their forelimbs (Jagnow 1998:34).

