

# **SUBLIME SIMPLICITY**

An Alternative Approach to the  
Adaptive Reuse of a Quarry in Midrand,  
through Minimal Landscape Design

Ruth A. Manda



## SUMMARY

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**Dissertation Title:** Sublime Simplicity: An Alternative Approach to the Adaptive Reuse of a Quarry in Midrand, through Minimal Landscape Design

**Master Plan Title:** Quarry X Master Plan

**Programme:** Regional mixed-use park

**Current Site Description:** Privately owned, open-cast granite quarry

**Site Address:** A portion of the remaining extent of Portion 1 of the Farm: Waterval 5-IR, Midrand, Johannesburg, South Africa.

**GPS Coordinates:** 26°01'44.1"S 28°06'59.7"E

**Research Field:** Environmental Potential  
Heritage and Cultural Landscapes

**Client:** City of Johannesburg  
Johannesburg City Parks  
Johannesburg Development Agency

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Individuals involved in waste management

**Key Words:** Adaptive reuse  
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Minimalism

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**Course Co-ordinator:** Arthur Barker

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## **DECLARATION**

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In accordance with Regulation 4(c) of the General Regulations (G.57) for dissertations, I declare that this dissertation, which I hereby submit for the degree Master of Landscape 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 my dissertation has already been, or is currently being, submitted for any such degree, diploma or other qualification.

I further declare that this dissertation 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.

Ruth A. Manda

## **ABSTRACT**

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This dissertation explores the adaptive reuse and integration of wasted sites, with specific emphasis on quarries. Quarries are a contested landscape for reuse as they have the potential to become public open spaces for communal enjoyment, or sites for municipal and industrial waste disposal. The former adding cultural value to an urban context, the latter perpetuating unsustainable practices that characterise the modern era.

Quarry X in Midrand, is positioned between two coinciding issues facing the urban context. Firstly, as a rapidly developing urban area, Midrand's sprawling nature has resulted in a neglect of green infrastructure, particularly open green space. Secondly, unsustainable waste management practices have resulted in two landfills (which previously catered to the waste produced by Midrand) to reach capacity and close.

Considering the two urban issues mentioned above, as well as the industrial sublime qualities of Quarry X, this dissertation proposes a minimal landscape architectural intervention for the adaptive reuse of Quarry X. The proposed design aims to reconcile the friction between modern-day exploits and cultural enrichment – creating a captivating destination of public use and interest.

## **THANK YOU**

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To my mother, father and brother for your endless love and care. I am truly grateful to have each of you by my side. It is your continued support that has helped me reach this milestone. Nditikuyanjani.

To my friends for counseling me through the trials and tribulations of Masters. We've come a long way and I'm so proud of us all.

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## GLOSSARY

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**Adaptive Reuse.** Refers to the reuse of a building or landscape through typological, technical and/or strategic approaches to accommodate a new use or uses. It is also known as recycling or conversion.

**Construction and Demolition Waste (or Builders' Rubble).** "Waste, excluding hazardous waste, produced during the construction, alteration, repair or demolition of any structure, and includes rubble, earth, rock and wood displaced during that construction, alteration, repair or demolition" (Department of Environmental Affairs 2012:3).

**Heritage resource.** A broad, generic term covering any physical, natural and/or spiritual properties and features adapted, used and created by humans in the past and present. They are the result of continuing human activity and embody a range of community values and meanings. These resources are non-renewable and finite (De Jong & Van Schalkwyk 1998:2).

**Industrial Sublime.** An aesthetic ideal characterised by the contradictory fascination and shock at products of economic growth and industrialisation such as landfills, mined sites, oil rigs and manufacturing factories.

**Landfill airspace.** "The volume of space on a landfill site which is permitted for the disposal of municipal solid waste (MSW). The space is initially occupied by air which will eventually be displaced by the disposed waste" (The Solid Waste Association of North America 2005).

**Landscape Narrative.** The interplay and mutual relationship between landscape and narrative (Potteiger & Purinton 1998a:5) articulated through various design practices.

**Quarry.** An excavation or pit (usually open to the air) from which dimension stone, rock, construction aggregate, sand, gravel or slate is extracted. It is different to a mine only by the content being extracted – which is building materials and dimension stone. Mines, however, extract valuable minerals such as metals (e.g. gold), coal and gemstones (The Institute of Quarrying 2018).

**Minimalism.** An art movement (within the umbrella of Modern art) during the 1960s and 1970s which was characterised by abstracted and linear forms that did not refer to any recognisable subject matter. The movement has since been extrapolated to landscape design as an approach to environmental issues such as mounting waste and dwindling resources.



# **1**

---

# **INTRODUCTION**

“We still believe we can move on from one resource to another as each is used up: and we are prepared even, as in many mining operations, to destroy one resource – the land – in order to get to another – the buried minerals. If the halcyon days are over, then our response has been to rediscover the principle of conservation and the recycling of land.”

– Bradshaw & Chadwick (1980: 282-283)







**Fig. 1.1** Panoramic view of Quarry X (Author 2019)

## **1.1 PROLOGUE**

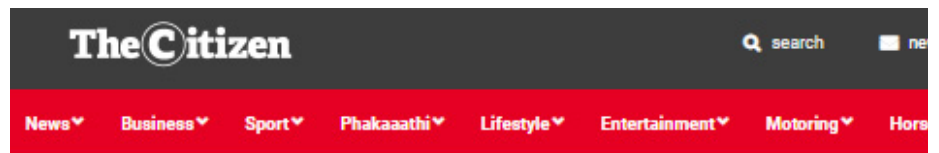
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The two articles presented on the facing page form the bud of this dissertation. What began as a matter-of-fact investigation of waste and how it can be reused, evolved to a point where waste not only represented literally waste.

Waste became a metaphor for the wasteful and exploitative ways humans interact with the environment.

How one wasteful activity is used to “mitigate” another.

How wound after wound is created in the landscape...



south africa 27.6.2018 10:14 am

## No more space for dumping in Joburg



Citizen Reporter

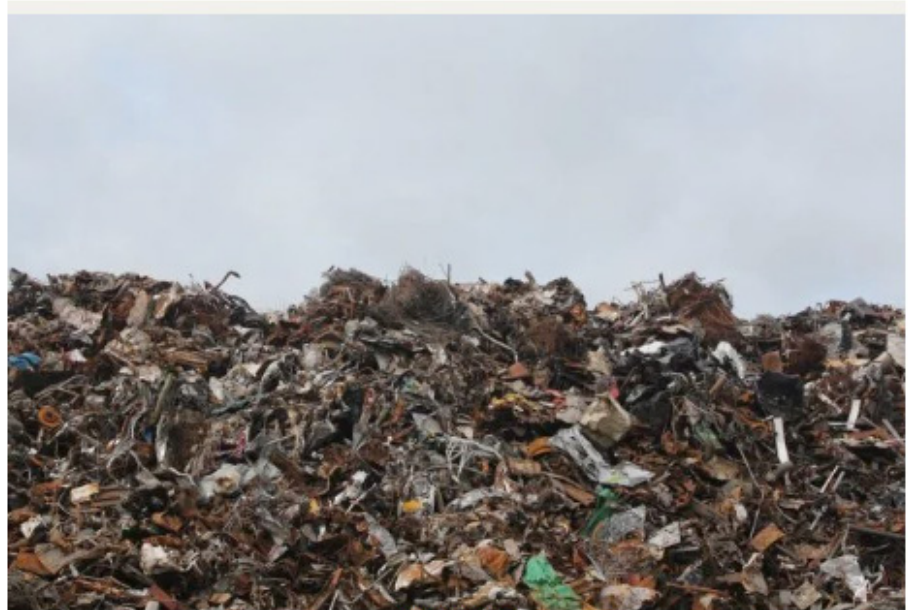


Photo: Pexels

**Fig. 1.2 (cropped)**

South African news article regarding limited landfill airspace in the City of Johannesburg (The Citizen 2018)

**Fig. 1.3 (cropped)**

Australian news article regarding the proposed conversion of a quarry into a landfill (Mornington Peninsula News Group 2013:15)

**The City of Johannesburg has warned that there may be a dumping disaster within six years as the City runs out of landfill space.**

1.2

# Tip planned for Arthurs Seat quarry

By Mike Hast

AN old quarry on the eastern side of Arthurs Seat could become the Mornington Peninsula's newest rubbish tip.

Hillview Quarries, owned by R E Ross Trust, is expected to submit an application to the shire council in about four weeks.

The landfill plan would see the former Pioneer Quarry, which is east of Arthurs Seat State Park and north of Arthurs Seat Rd, used to dump household waste – 75 per cent from the shire and 25 per cent from outside. Up to 100 trucks a day would enter the bush precinct off Boundary Rd in Dromana.

The proposal has raised the ire of near neighbours on Boundary Rd as well as residents of Arthurs Seat Rd and is likely to generate widespread criticism by environmentalists.

Objectors include Jacinta and Kelvin Banks, whose property adjoins the Pioneer Quarry land, their next door neighbour Peter Guy, Andrew Reynolds of Boundary Rd, long-time Dromana resident John McLean-Wilson and several residents of Arthurs Seat Rd.

**1.3** They are concerned about potential noise, smell, fire, leaking methane gas

myself to the gate to stop this tip."

Jacinta Banks, who has lived on Arthurs Seat for more than 25 years with husband Kelvin, where the couple has raised three boys, said the proposal would turn Dromana into "an industrial town instead of a tourist town".

"The old quarry is surrounded by pristine, green wedge land that is protected by planning overlays for bush-fire, significant landscape, vegetation protection, erosion management and environmental significance," she said.

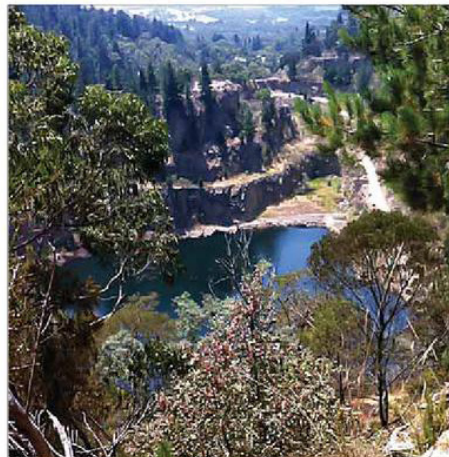
Kelvin Banks said objectors were fearful that if the Pioneer Quarry proposal was approved, "Hillview will ask to turn its existing quarry into a tip when it reaches the end of its life".

Peter Guy said there would be a hue and cry from Arthurs Seat Rd residents when they found out about the plan.

"Hillview Quarries owner R E Ross Trust claims it is a friend of the environment, but this is an act of environmental vandalism," he said.

Andrew Reynolds said he was concerned about noise and smell, but the biggest worry was fire.

A fire starting in the proposed tip could race up Arthurs Seat and threaten Red Hill Consolidated School and



**Sylvan spot:** The former Pioneer Quarry on Arthurs Seat may become a rubbish tip.

## The Ross Trust

THE R E Ross Trust owns Hillview Quarries Pty Ltd and Peninsula Waste Management Pty Ltd. The trust was established in Victoria in 1970 by the will of Roy Ross, who founded Hillview Quarries in 1968 and died in November 1970 aged 71.

Mr Ross was a keen bushman, had an extensive knowledge of native plants and trees, and made a study of the habits of birds and their calls.

His will directed the trust donate money to three fields – social welfare, education of foreign students, and nature conservation "with particular regard to the purchase of land for the protection and preservation of flora and fauna", states the trust's website.

Ross Trust has given more than \$80 million since 1970.

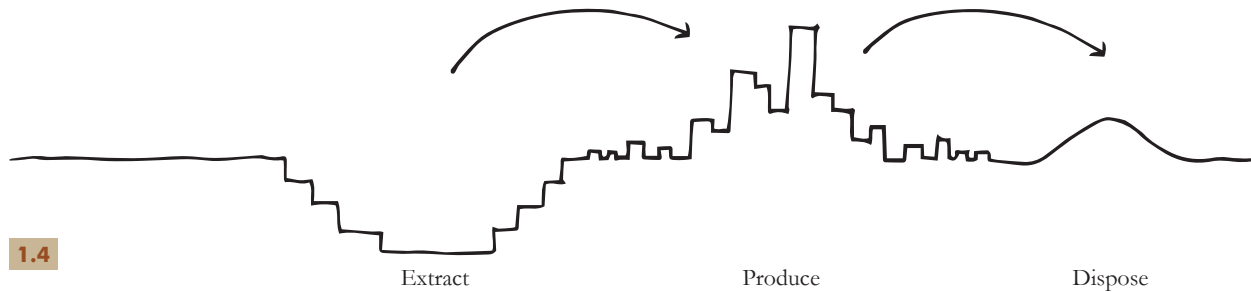
## 1.2 BACKGROUND

Rising global and urban populations have resulted in rapid waste accumulation and environmental degradation (among other consequences) (Arbona et al. 2002). To mediate these negative environmental impacts, adaptive reuse has been utilised as a strategy to reuse existing buildings and landscapes (Arbona et al. 2002). This is an attractive alternative to new development, especially in the sustainability paradigm which advocates for the suitable use of natural resources and land. However, there may be competing interests as to what the new function of the building or landscape should become – this is the case for quarries.

Because of their proximity to urban cores and the rising need for alternative waste disposal sites (as existing landfills reach capacity), urban quarries face an imminent possibility of being reused as landfills (Department of Water and Sanitation 2005: 225). Not only does this possibility fail to recognise the unique spatial and visual qualities of the quarry which much of the public have likely never experienced, but it misses an opportunity to add cultural value to an urban context in the form of open green space.

Figure 1.4 illustrates the detrimental cycle of mineral extraction, production and waste disposal, which is amplified by unprecedented population growth and high consumer lifestyles. Luckily, this cycle is under serious scrutiny, however there must be proactive proposals to counteract it.

**Fig. 1.4** Detrimental cycle of mineral extraction, production and waste disposal (Author 2019)



## 1.3 GENERAL ISSUES

### 1.3.1 Urbanisation

The world's population is steadily growing, with Africa's population being the fastest growing in the world (UN Department of Economic and Social Affairs [UN DESA] 2014). This growth is mainly in urban areas. Since 2014, there have been more people living in urban areas than in rural areas (UN DESA 2014:7). This trend in urbanisation is likely to continue, with the world urban population projected to grow from 54.5% in 2014 to 66% in 2050 (UN DESA 2014:7).

The 2011 National Development Plan estimates that South Africa's (SA) urban population will reach 70% in 2030, and almost 80% in 2050 (National Planning Commission 2011).

Urbanisation offers benefits such as economic options, better education and health, as well as access to improved infrastructure and services. However, when unregulated, this “transformative force” (UN Habitat, 2016:27) poses a threat to quality urban spaces.

#### 1.3.1a Horizontal Urbanisation

The roaming offspring of urbanisation – vast, horizontal urban growth has become a characteristic feature of numerous metropolitan areas around the world. This flight from historic urban cores to newly urbanised areas on the urban periphery (and beyond) is understood as a phenomenon which contributes to negative outcomes such as environmental degradation (McKinney 2002). Compared to the modest and incremental growth of traditional cities, newly urbanised areas have developed quicker than they can be examined by academics (Berger 2006:19).

**Fig. 1.5** Aerial photo of Waterfall Distribution Campus. Midrand, South Africa. Quarry X can be seen to the right (Waterfall City 2016)



## 1.4 URBAN ISSUES

### 1.4.1 Wasted sites

In architectural literature, wasted, abandoned or derelict sites are common terms used interchangeably to describe land with little or no activity, and that are largely ignored within the design of the built environment. Wasted sites include (Berger 2006:36):

- landfills;
- former industrial-manufacturing sites;
- infrastructural corridors;
- vacant urban land;
- extractive landscapes; and
- toxic landscapes.

Despite their real or perceived contamination, these sites are now being considered for their immediate potential for economic redevelopment (Kirkwood et al. 2004:3). Shunned sites can potentially be valuable assets to an urban area. This dissertation focuses on extractive landscapes – specifically quarries.

### 1.4.2 Lack of Public, Green Open Space in Urban Areas

As part of green infrastructure, green open space not only serves an ecological purpose, but a cultural one – providing intangible benefits to people through spiritual enrichment, cognitive development, reflection and aesthetic experiences. It also serves as a place for civic engagement and recreation (Millennium Ecosystem Assessment 2005).

Although the value of public, open green space is frequently acknowledged in numerous municipal frameworks and guidelines, such as the Johannesburg Spatial Development Framework 2040 (CoJ 2016:14), the implementation thereof is usually privately zoned (Schäffler 2013:42) – particularly in urban areas, where there is limited space. Therefore, alternative spaces need to be investigated such as the wasted sites mentioned previously.



**Fig. 1.6** Vacant urban land in Midrand (Author 2019)

### 1.4.3 Unsustainable Waste Disposal

#### 1.4.3a Landfills

Increased population growth and urbanisation inevitably results in increased amounts of waste being produced. It is estimated that 3.40 million tonnes of solid waste will be generated in 2015 (World Bank 2018). That is an increase of 70% from 2.01 tonnes in 2016 (Kaza et al. 2018:17). But where does all this waste go? Globally, landfills remain the preferred option to dispose of solid waste (Kaza et al. 2018:5).

South Africa's waste management issues stem predominately from its over-reliance on landfills. Alarming, in 2011, approximately 91% (98 million of 108 million tonnes) of waste generated in SA was disposed of at a landfill site (Department of Environmental Affairs 2012). Although there are 29 municipal landfill sites based in Gauteng, many have reached or are nearing capacity (Gauteng Department of Agriculture and Rural Development 2009). To make matters worse, waste that could be recycled (such as papers, plastics, glass, metals and tyres) is being landfilled (Oelofse 2012). This culmination of practices has undoubtedly put increasing pressure on landfill airspace.

However, there are strategies, science and technologies being explored to find alternative, sustainable solutions to landfills (Institute of Waste Management of Southern Africa 2017). One such alternative is the re-use of abandoned quarries as landfills (Department of Water and Sanitation 2005: 225). Although the conversion of quarries into landfills has been described as a "promising solution" to the increasing problem of limited landfill airspace (El-Fadel et al. 2001:515), it does not resolve waste management issues in the long-term. Furthermore, it competes with the need for public, green open space in urban areas.

#### 1.4.3b Illegal Dumping

In South Africa, illegal dumping is common, particularly in urban areas (DEA 2018:41). Not only is the activity detrimental to human health and the environment, but the economy too – for example, Pikitup spends approximately R80 million per annum clearing illegal dumping alone (Pikitup 2015:6). Factors that are believed to contribute to the problem include (CoJ 2011:38):

- the relatively high costs of collection, transportation and disposal of waste;
- the rather early closing times of some landfills and other management facilities, making them inaccessible to the working population; and
- lack of understanding of the environmental and economic impacts of dumping waste.

Construction and demolition waste, also known as "builders' rubble," constitutes the majority of illegal dumping (CoJ 2017:38). This can be associated with gaps in the regulation of builders' rubble (Simelane 2017:101-102):

- developers are not required to submit waste management plans when submitting building plans, therefore it is unknown how builders' rubble generated during construction will be handled; and
- insufficient enforcement of waste management by-laws by law enforcers.

When cleared, most illegally dumped waste ends up in a landfill – further putting strain on an already dwindling landfill airspace.

**Fig. 1.7** Waste reclaimer at a landfill. Johannesburg, South Africa (Skuy 2015)

**Fig. 1.8** Pikitup clears illegally dumped rubble along Old Pretoria Road (Sandton Chronicle 2018)



## 1.5 LANDSCAPE ARCHITECTURAL ISSUE

A popular reuse of quarries is for recreational purposes (Martin and Berlin (2012:20)). This is because many quarries possess a unique spatial landscape which can offer interesting opportunities for “adventure style” recreation such as hiking, rock climbing and water-based activities. While these activities are valuable and can appeal to many potential visitors, the adaptive reuse of quarries needs to be rethought in a way that attempts to do more than provide an “adventure” destination.

Considering the general and urban issues outlined beforehand, quarries can begin to mitigate the environmental and financial burden caused by unsustainable waste management practices, while also providing a space for public engagement through various activities.

**Fig. 1.9** Concept image of Landscape Architectural issue



1.9

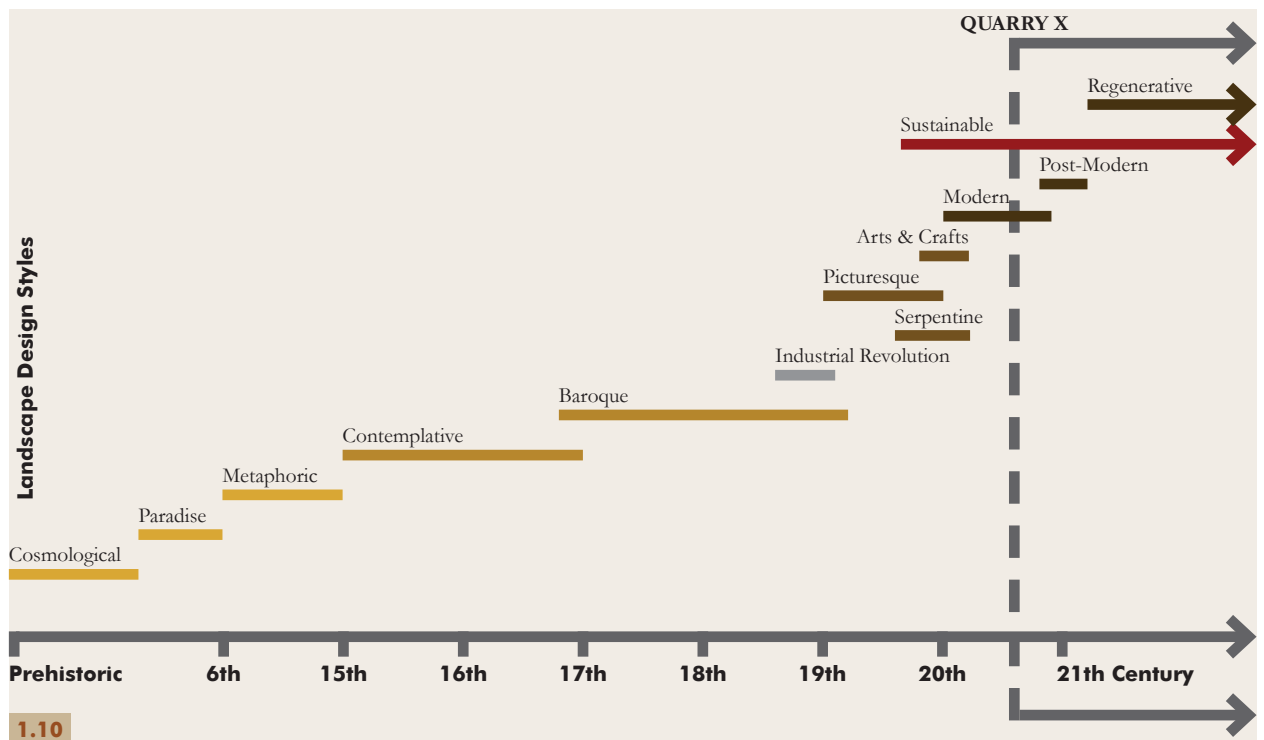


### 1.5.1 Position in the continuum of Landscape Architectural Thinking

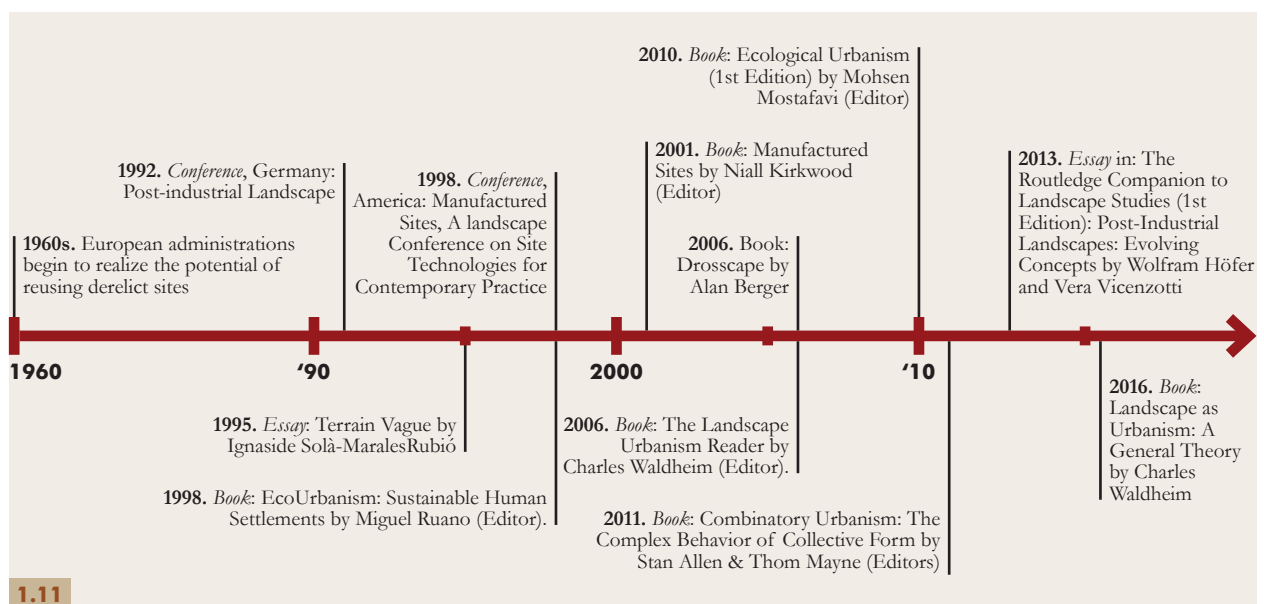
The adaptive reuse of wasted sites is situated within the sustainable landscape design style. The approach aims to medicate the negative environmental effects that define the 21st century.

**Fig. 1.10** Timeline of landscape design styles indicating when Quarry X began extraction (Author 2019)

**Fig. 1.11** Timeline of events and publications (within sustainable landscape design) that refer to the adaptive reuse of wasted sites in landscape architecture (Author 2019)



1.10



1.11

## 1.6 PROBLEM STATEMENT

Exhausted quarries face the imminent possibility of being reused as landfills. This prospect competes with the need for public, green open space in urban areas. Furthermore, it ignores the unique spatial, visual and physical qualities of most quarries – qualities which make it ideal to be reused as public, open space.

## 1.7 RESEARCH QUESTION

How can Quarry X be adaptively reused as a public, open space using a minimal landscape design approach which exhibits the industrial sublime qualities of Quarry X, and utilises sustainable waste management practices?

## 1.8 RESEARCH OBJECTIVES

- To use an alternative, minimal landscape design approach to adaptively reuse Quarry X
- To utilise recycled builders' rubble as the predominate construction material in the landscape design at Quarry X
- To design an experiential route at Quarry X which accentuates its industrial sublime qualities

## 1.9 RESEARCH METHODOLOGY

With reference to Landscape Architecture Research by M. Elen Deming and Simon Swaffield, the research methodology is a combination of descriptive, interpretive and projective methods.

Firstly, quantitative and qualitative data of the site is collected through a desktop study, visualizations (photographic and drawn), field studies, mapping and spatial analysis.

Then, a literature review of the relevant theories is outlined and related to Quarry X. With this basis, minimalism is described in general before relevant influences and case studies pertaining to minimal landscape design are analysed and interpreted in more depth. From this, general design principles are extracted.

Lastly, through an iterative and explorative design process (which included hand and model work, as well as computer aided design) – a final design is proposed at master plan and sketch plan level, with the addition of technical resolution.

## 1.10 LIMITATIONS & DELIMITATIONS

The author does not set out to reconfigure the waste management protocol that currently exists in South Africa. The dissertation merely sets out to propose an alternative to quarry re-use once it has seized operation – which includes waste management. Therefore, Quarry X is used as a “testing ground” for the dissertation hypothesis.

Furthermore, the sheer size of the entire site does not allow for it to be designed in detail within the prescribed time. The scope of the project includes the master plan design of Quarry X and the surrounding areas (which are also privately owned). From this, the author has selected an area of focus for the landscape sketch plan design and associated technical details.

## 1.11 ASSUMPTIONS

The author assumes that the proposed Waterfall Masterplan is valid.

## 1.12 PURPOSE AND SIGNIFICANCE

Today, the notion of sustainable design sits at the very core of the landscape architecture discourse. Sustainability can be traced back to the early 1960s with the publication of Rachael Carson's seminal book: *Silent Spring* (1962), which interrogated the extensive use of insecticides, particularly DDT and advocated that they be used more responsibly in order to mitigate negative impacts on the natural environment.

The word “sustainability” became widely used in the late 1980s after the Brundtland Commission of the United Nations (in 1987) provided the most widely used definition of sustainable development as: “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations General Assembly 1987).

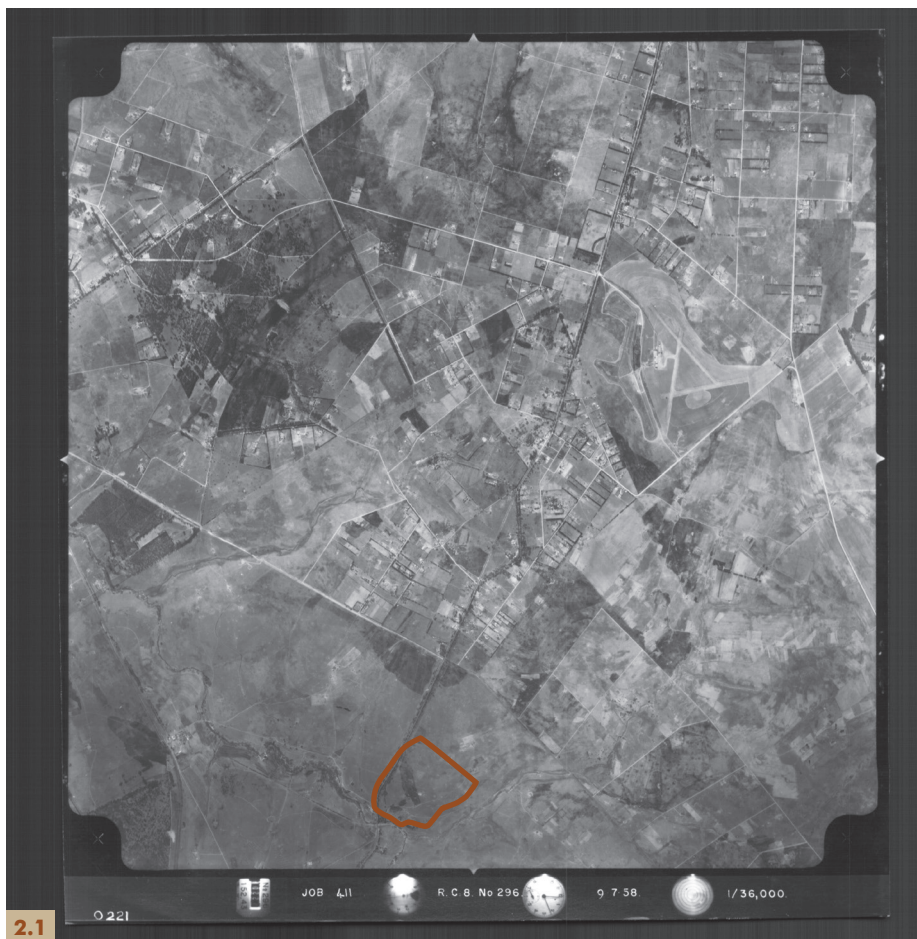
Adaptive reuse is one such strategy towards development which aims to conserve resources by utilising what the built environment already has to offer – whether it be an abandoned warehouse or an exhausted quarry. This dissertation proposes an alternative approach to such quarries, which views them for more than their potential to just become “green oases,” but also for their potential to enlighten the public on the unsustainable and detrimental practices that define the modern day. Quarries can then become dynamic sites in which multiple issues affecting its context can be addressed.





**2**

**URBAN CONTEXT**



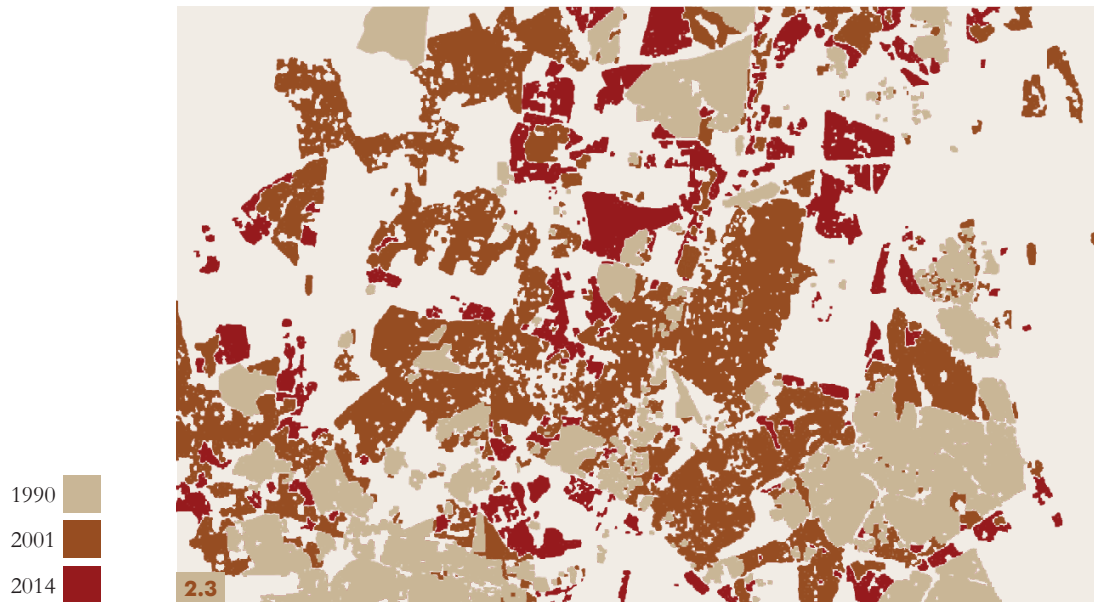
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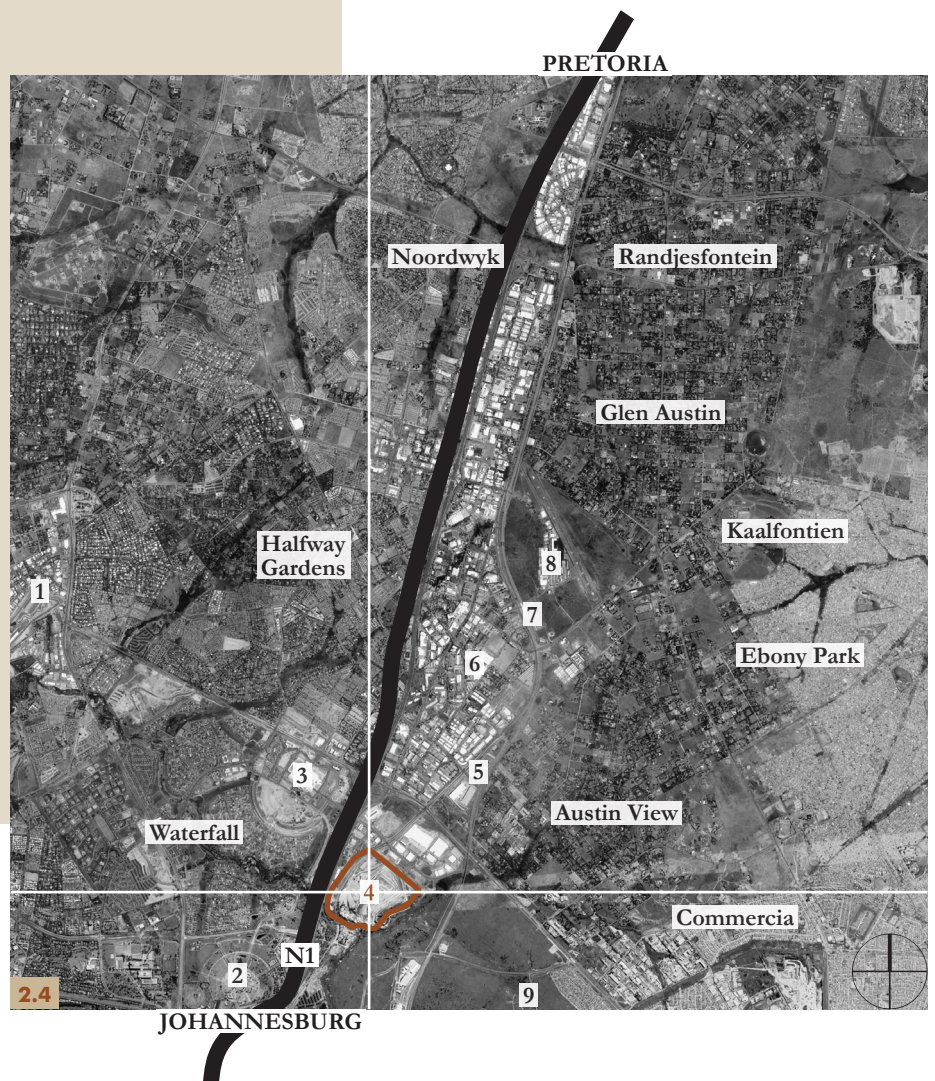
2.2

**Fig. 2.1** Aerial image of Midrand area, 1958. Area of Quarry X indicated (Chief Surveyor General 1958)

**Fig. 2.2** Aerial image of Midrand area, 1991. Area of Quarry X indicated (Chief Surveyor General 1991)



1. Kyalami Grand Prix Circuit
2. Waterval Islamic Institute
3. Mall of Africa
4. Site: Quarry X
5. Nizamiye Complex (Mosque, Clinic, Bazaar and School)
6. Gallagher Convention Centre
7. Gautrain Station
8. Grand Central Airport
9. Waterfall Cemetery



**Fig. 2.3** Urban land cover of Midrand area in 1990, 2001 and 2014 (Author 2019)

**Fig. 2.4** Aerial image of Midrand area, 2019 (Google Earth 2019)

## 2.1 A BRIEF HISTORY OF MIDRAND

Situated between Johannesburg and Pretoria, Midrand (previously known as Halfway House) is a new, rapidly developing urban node (Figures 2.1 – 2.3).

Initially a rather “unremarkable” sprawl of villages (Joyce 1996:35), early plans indicate how overlooked the area between Pretoria and Johannesburg was (Figure 2.5).

Modern day Midrand began to emerge from the late 1880s with the development of a stage-coach station in the west and a ceramics industry in the east. As Johannesburg and Pretoria were connected by stage-coach and post-cart services, it was reasonable for a stop-over station to be developed between the two towns – this allowed passengers to rest, as well as horse and mule teams to change. This facility became known as the “Halfway House.” Naturally, development around this transport node followed – a hotel and post-office were established in 1889 (De Jong & Van Schalkwyk 1998:10).

The Johannesburg elite took interest in Halfway House and established country resorts there to engage in leisurely activities. President Paul Kruger often stopped at the small town during his travels between Johannesburg and Pretoria (De Jong & Van Schalkwyk 1998:11).

Although Halfway House was officially declared a town in 1920, development was slow and it remained

a dusty, one-horse town for decades to come (De Jong & Van Schalkwyk 1998:11). Tangible residential, commercial and industrial development only began in the late 1930s as a result of its convenient and accessible location within the developing Gauteng. Despite this advance, Halfway House was still not acknowledged in even basic spatial plans (Figure 2.6).

It was not until 1981 when general spatial planning recognised Halfway House as an area for major urban development, essentially closing the “gap” between Johannesburg and Pretoria (Figure 2.7). That same year, the Halfway House/Olifantsfontein and Clayville/Olifantsfontein local area committees amalgamated to form a new local authority which is known today as Midrand (De Jong & Van Schalkwyk 1998:12).

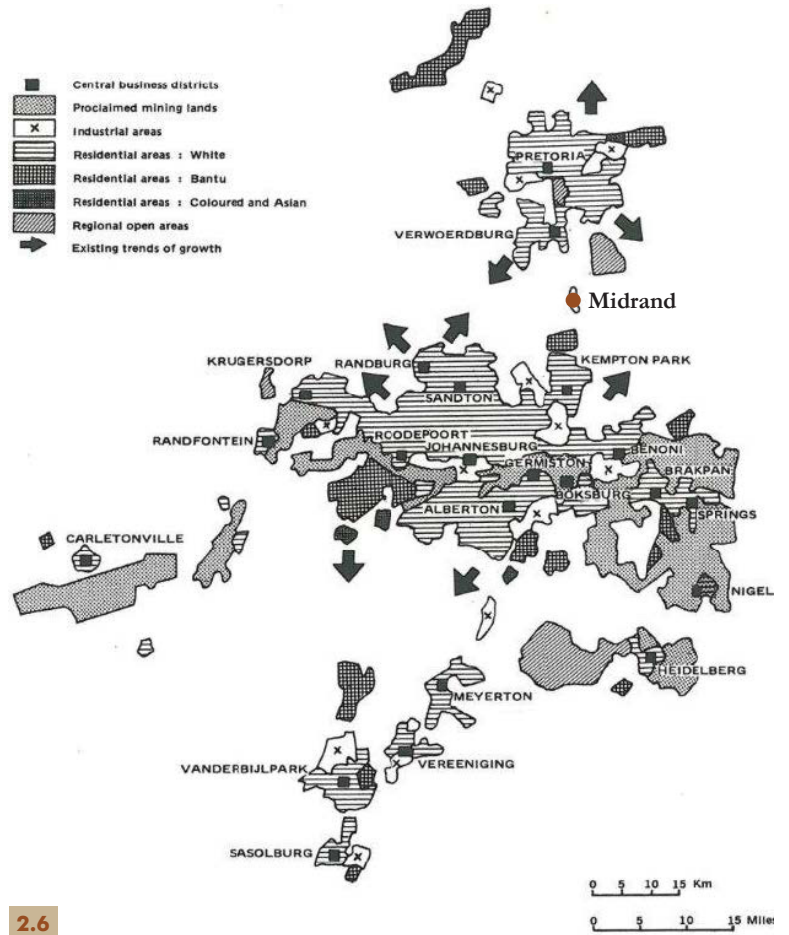
Since then, a slew of new residential, commercial and industrial development has been established. The town’s proximity to air, vehicular and railway links have attracted much investment and has contributed to its fast growth.



**Fig. 2.5** Southern Transvaal settlement pattern, 1896. All but a railway line crosses what is now known as Midrand (Departments of Planning and the Environment [DPE] 1974:10)

2.5

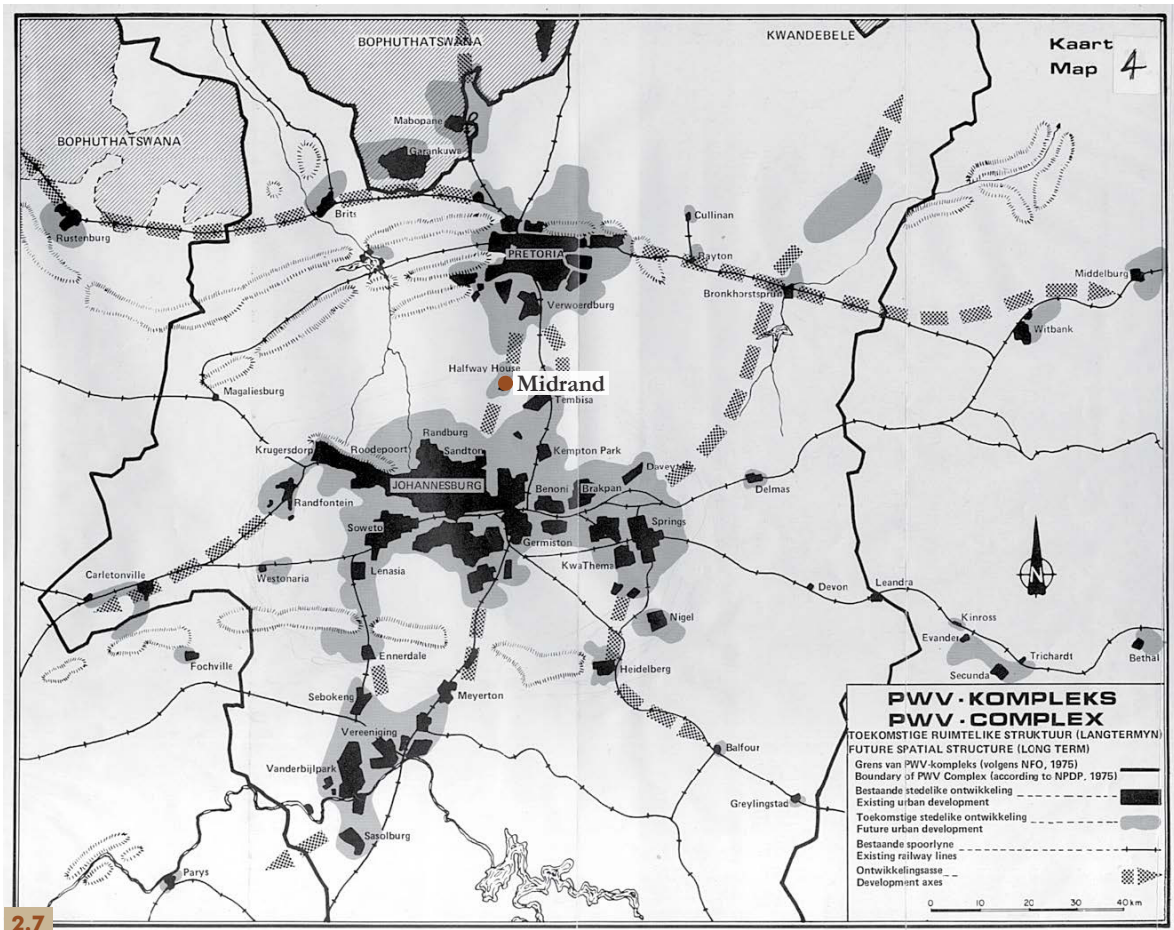




**Fig. 2.6** Simplified urban land-use of the Pretoria-Witwatersrand-Vaal Triangle (PWV) Complex, 1973. Halfway House is not explicitly named but indicated as an "industrial area" (DPE: 1974:39)

**Fig. 2.7** Spatial development strategy for the PWV Complex, 1981. Halfway house is indicated as a "existing urban development" with "future urban development" surrounding it (Office of the Prime Minister 1981)

2.6

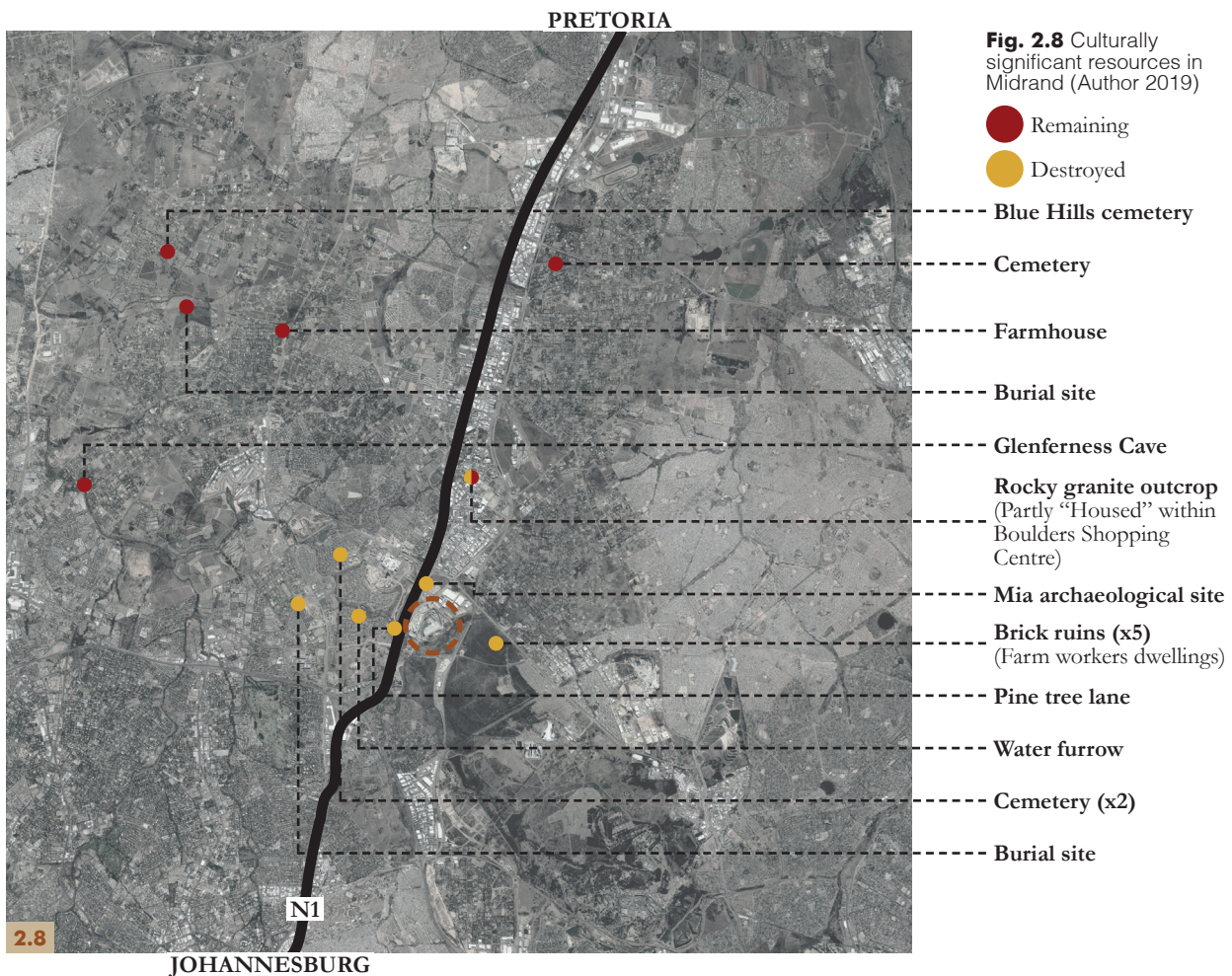


2.7

However, this boom in development has been devastating to the area’s cultural resources. A 1998 survey of cultural resources in the Midrand Municipal area identified 51 sites of cultural significance. It was anticipated that all the identified sites would be impacted upon to various degrees by future development, and that necessary procedure(s) should be followed to protect the “local legacy” (De Jong & Van Schalkwyk 1998:2). It is clear from a desktop and field study undertaken by the author that many of these sites have been effected due to development. Historic buildings have been destroyed, cemeteries vandalised or eradicated, and historic stands of trees removed.

Despite this, some (including the most sensitive) have remained relatively intact (Figures 2.10 – 2.12). Many of Midrand’s cultural resources remain

threatened, particularly archaeological sites and graveyards because of their physical vulnerability and low visibility. The full extent of the areas cultural resources may never be known (De Jong & Van Schalkwyk 1998:13), as a new kind of built landscape is currently sweeping over Midrand.





2.9

**Fig. 2.9** Excavation of Mia archaeological site – an early Late Stone Age shelter built using rocks from the Allandale Dyke, 1998 (Mason 2012:217)

**Fig. 2.10** Blue Hills cemetery consisting of over 30 graves, dating between 1938 – 1969. A stone wall surrounds the cemetery (Author 2019)

**Fig. 2.11** Glenferness Cave was occupied by the early Tswana. Due to squatting and vandalism, a security fence was erected around the site (Author 2019)

**Fig. 2.12** Headstone of the Smit family burial site containing 7 graves, dating between 1911 – 1926. The unprotected site is located in a street reserve area overgrown with veld grass (Author 2019)



2.10



2.11



2.12

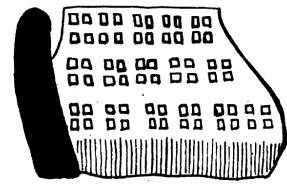


**Late Stone Age (30,000 BP - 200 AD)**

Early Tswana hunter-gathers used suitable local rock to manufacture stone artefacts. Temporary settlement often occurred on upper valley slopes or in caves close to rivers

**Early Iron Age (200 AD - 1000AD)**

Hunter-gathers spoke Bantu languages, such as Tswana, kept domesticated animals, grew crops and manufactured pots and iron implements.



Drawing of pot fragment (Mason 1951:77)

**1820s**

First white people arrived including hunters, traders, missionaries and other travellers

**Late 1880s**

Development of a stage-coach station to the west of Midrand and a ceramics industry in the east

**1889**

Establishment of a hotel and a post-office (which was demolished in 1987)



**1925**

Halfway House Estate was established

**1920**

Halfway House became a town

**1939**

Second post-office established

**Late 1930s**

Beginning of industrial, commercial and residential development

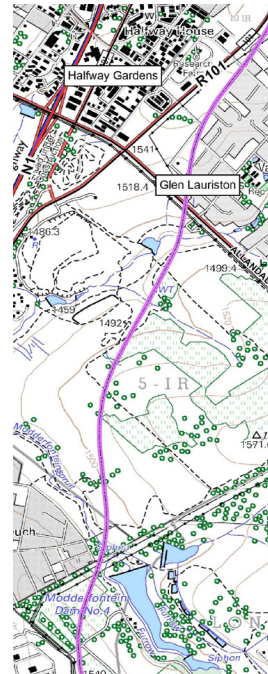
**1940s**

Permanent occupation began when Voortrekker farmers established farms such as Olifantsfontein and Randjesfontein. The practice of burying themselves, their descendants and their workers on or near their farms began



**1950s - 1980s**

Area divided into farms, often with names which describe the local geographical conditions: Blue Hills, Waterval and Diepsloot



**1980s**

Farms, rivers and other permanent features formally surveyed and mapped

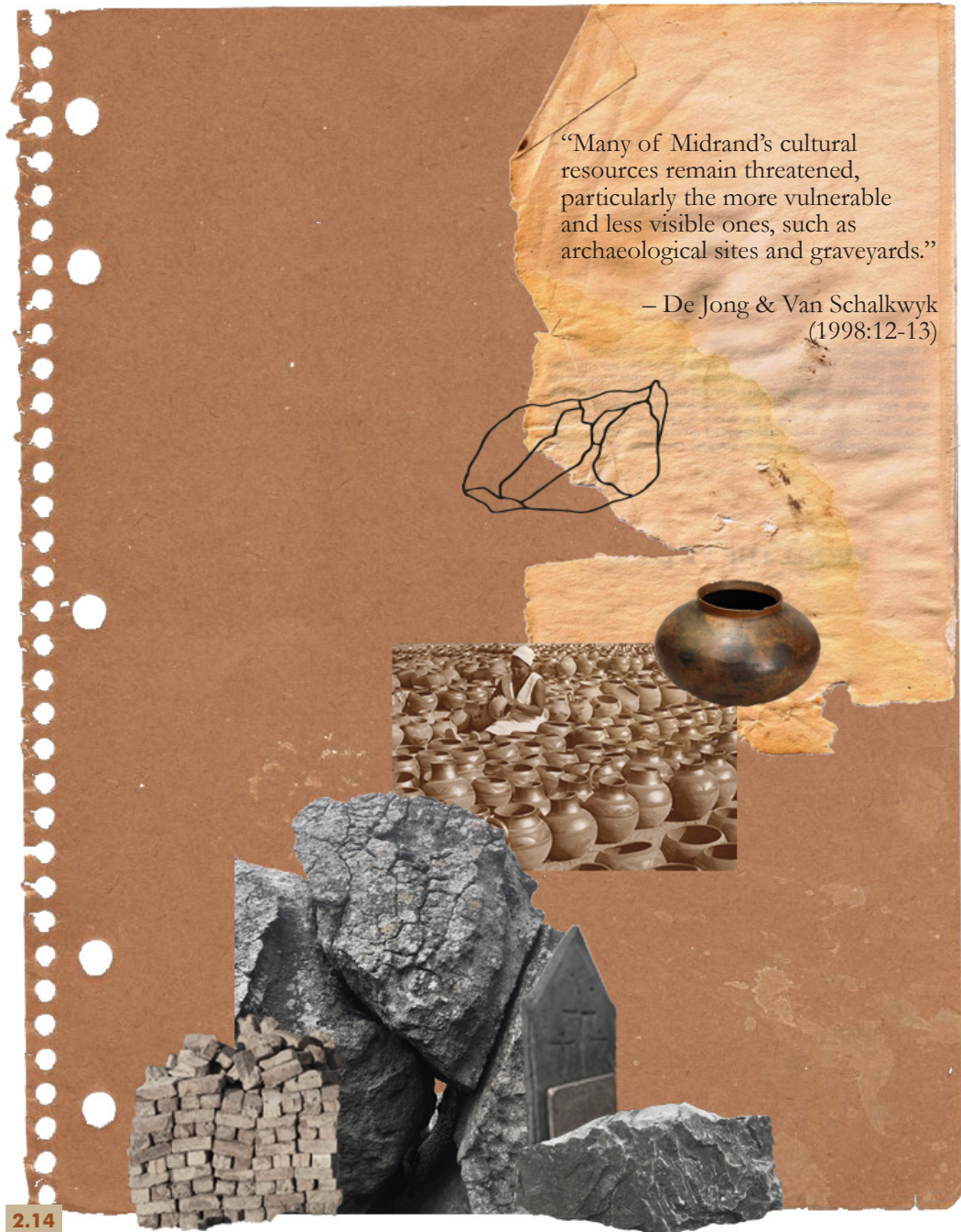
**1981**

Halfway House/ Olifantsfontein and Clayville/ Olifantsfontein local area committees amalgamated to form a new local authority called Midrand

2.13

**Fig. 2.13** Brief timeline of Midrand history (Author 2019)

**Fig. 2.14** Concept image of Midrand cultural resources (Author 2019)



2.14

## 2.2 URBAN ANALYSIS

### 2.2.1 Horizontal Urbanisation (or Urban Sprawl)

The current spatial pattern of the greater Johannesburg metropolitan region can be described as what Varnelis (2005:183) calls “cluster-based network urbanism” – a sprawled assortment of high-density nodes surrounded by low-density, horizontal suburbia, that are stitched together by highways and transit networks. This growth pattern is due to a combination of apartheid and post-apartheid planning. During apartheid, large numbers of marginalised racial groups were displaced to “homelands” located on the periphery of cities (Peberdy et al. 2017:40). Then, since 1994, there has been a steady rise in gated and car-orientated developments (such as malls) located on the periphery of cities due to perceived safety concerns and somewhat lax planning direction (CoJ 2016:38). Figure 2.15 illustrates this sprawled patchwork of growth. Newly urbanised areas such as Rosebank, Sandton and the emerging Midrand are located in areas further and further from the historic urban core of Johannesburg CBD. These areas are connected by highways such as the N1 and railway systems, most notably, the Gautrain. Townships such as Diepsloot, Tembisa and Alexander are located on the peripheries and have little to no transit infrastructure linking them to Johannesburg CBD or newly urbanised areas.

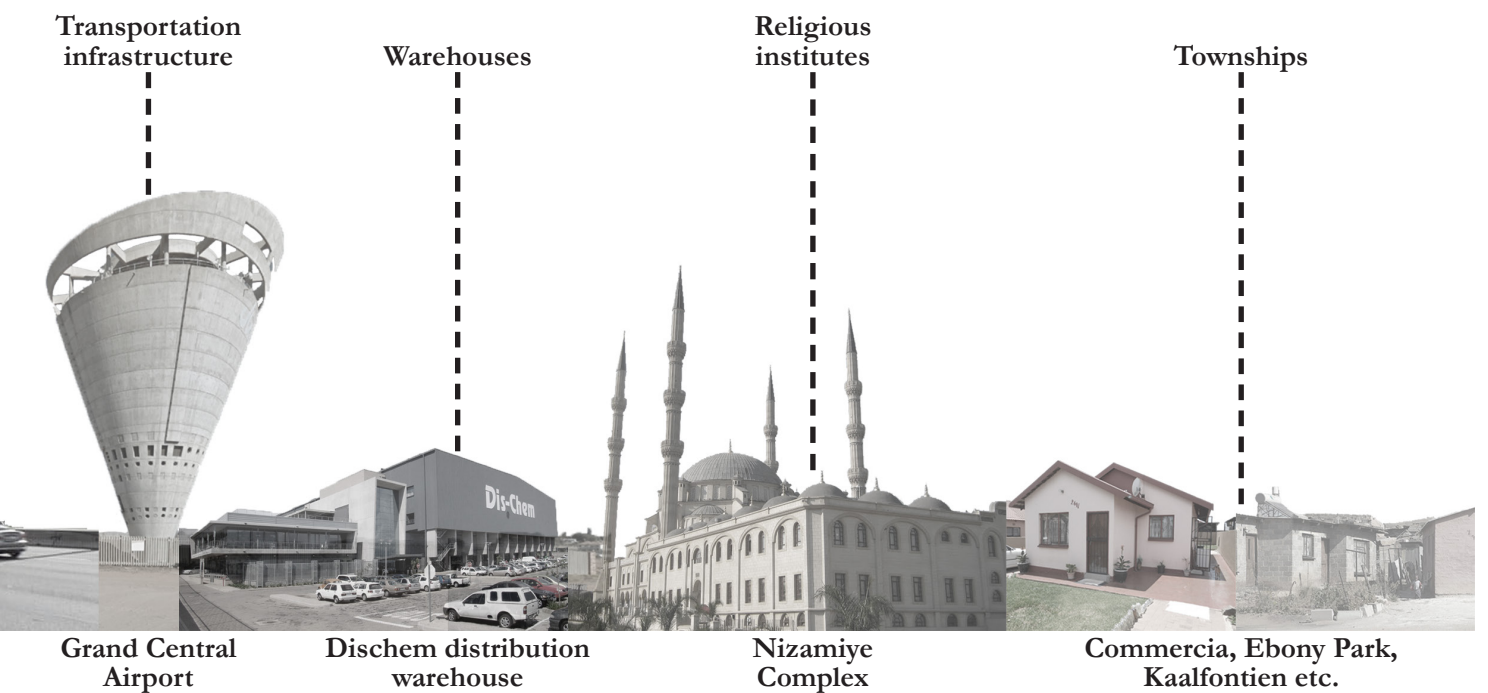
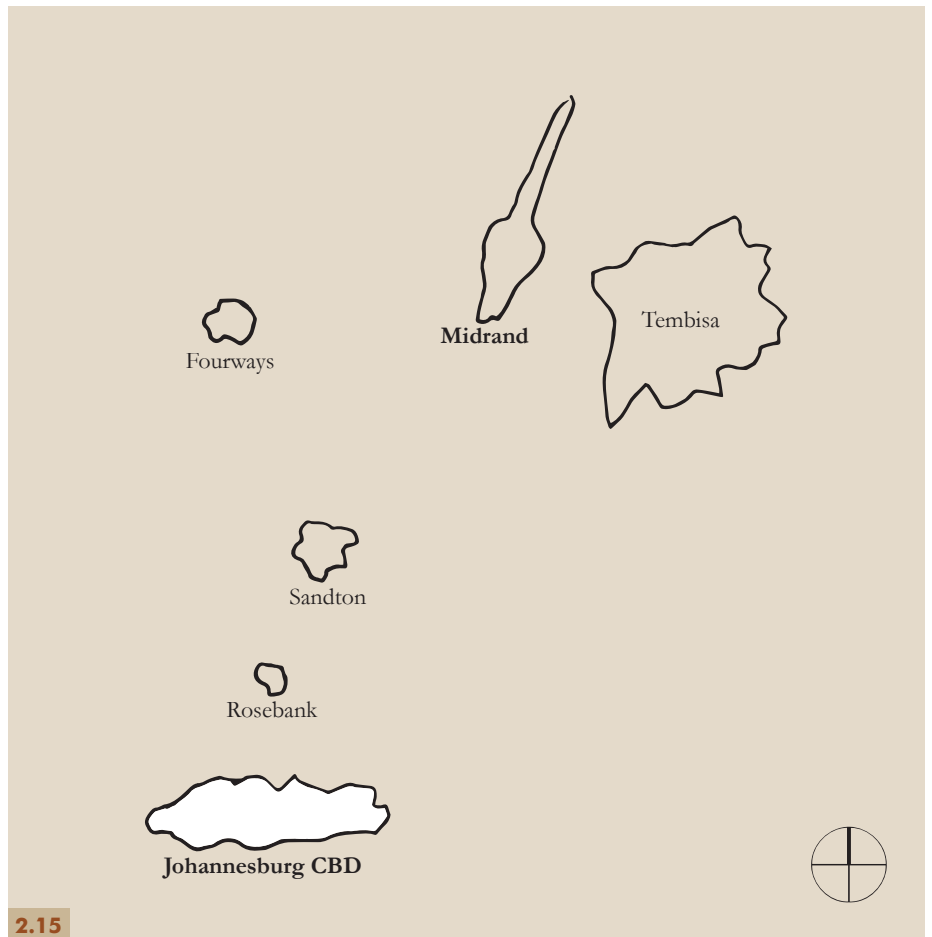
Furthermore, low-cost government housing – commonly referred to as Reconstruction and Development Programme (RDP) housing – are usually located on the periphery of urban cores where land is cheap (Peberdy et al. 2017:99).

As urban development increases, so too does spatial inequality, fragmentation and disconnection. This highlights a constraint unique to African cities in that the “fast pace of urbanisation and urban growth contrasts with the slow pace of structural transformation” (African Development Bank et al. 2016:149). That is, as the urban population grows (and disperses), so too must the structural components (such as transit infrastructure) – forming a mutually supportive relationship for sustainable urban growth.

The urban morphology of Midrand is characterised by low-density, horizontal development and limited land-use diversity. Industrial warehouses and residential developments are a common sight. This kind of urban growth does not utilise land sustainably and puts increasing pressure on the natural environment (CoJ 2016:38).



**Fig. 2.15** Sprawled patchwork of growth in the Johannesburg region (Author 2019)  
**Fig. 2.16** Typical built pattern of Midrand from west to east (Author 2019)



— EAST

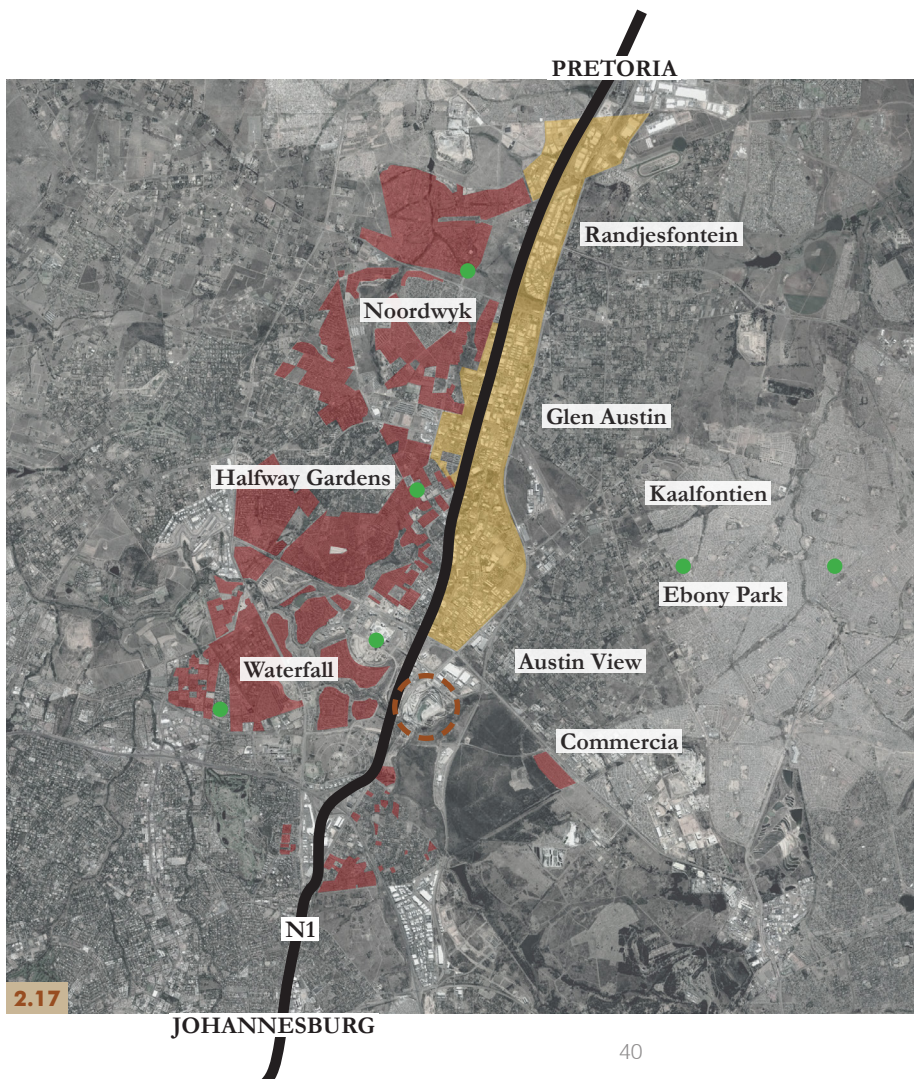
### 2.2.2 Isolationism

As mentioned previously, since 1994 there has been an increase in gated and car-orientated development in South Africa – especially in areas such as Midrand. This spatial disconnection inherently breeds a lack of social and community cohesion, especially between people of different backgrounds. A study concluded that 77% of all gated communities in the Gauteng City-Region fall within wards that have a higher than average score for social isolation (Abrahams, Bobbins & Trangoš 2015).

Figure 2.17 shows the extent of gated communities in Midrand. There is a clear divide with most gated communities located in the more affluent suburbs to the west, and few located in disadvantaged communities to the east. Moreover, one cannot ignore the role infrastructure (the N1 highway) plays in this separation – reminiscent of apartheid planning.

Interestingly, Midrand is located close to RDP housing where predominantly disadvantaged communities reside. Because RDP housing is located on the periphery of cities, these communities are located far from major economic centres where employment opportunities are most likely to be found.

At only 7.8km, Midrand is located the shortest distance from public housing developments compared to older economic centres such as Johannesburg and Pretoria (Peberdy, Harrison & Dinath 2017:100). This proximity highlights a significant opportunity for Midrand to provide a public space of activity that can foster social cohesion between members of differing communities. Increased public activity results in increase inclusivity and social interaction.



**Fig. 2.17** Isolationism in Midrand. Gated communities are highly prevalent to the west of the N1 (Author 2019)

- Gated community
- Economic strip
- Public, green open space



### 2.2.3 Public, Green Open Space

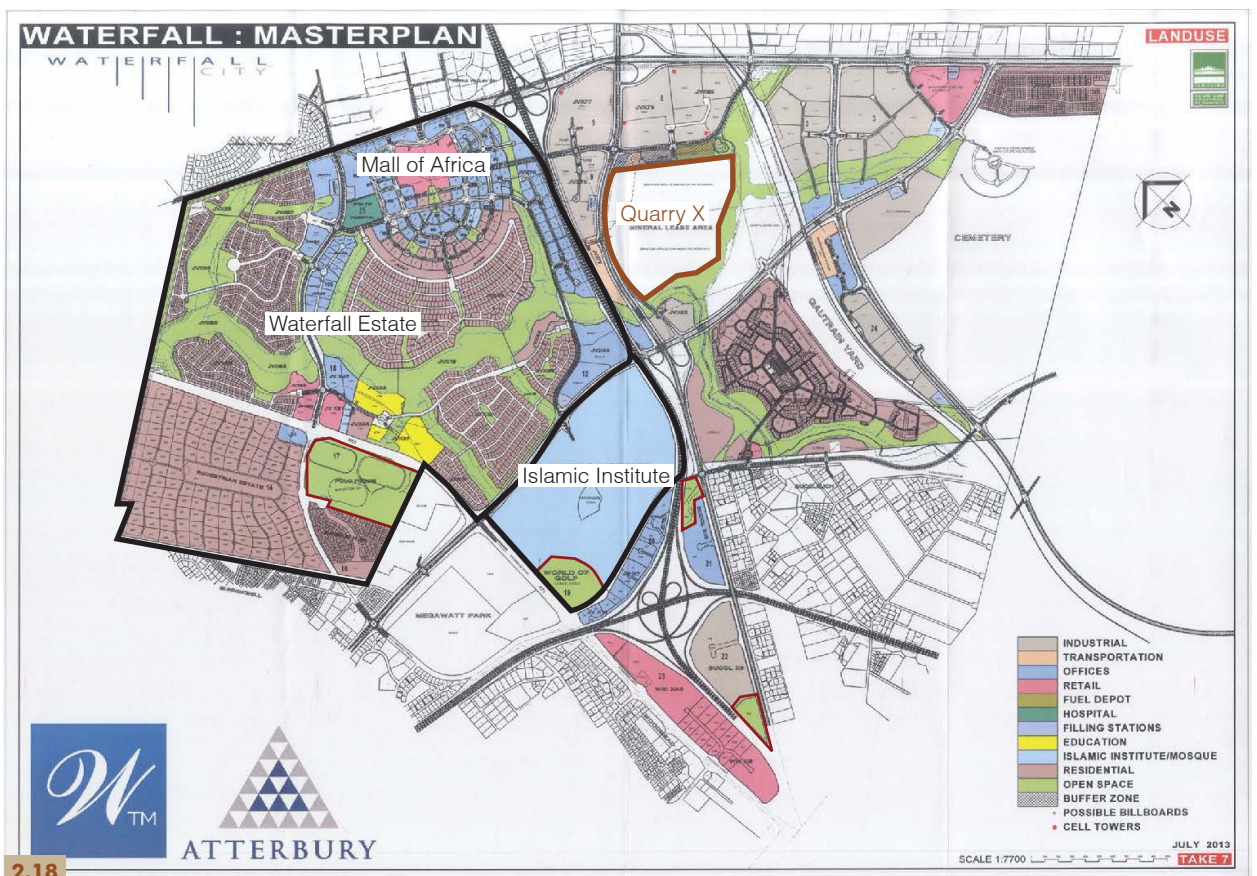
As alluded to beforehand, Figure 2.17 illustrates the few public, open green spaces in Midrand. The west side of the N1 highway is home to most of them. The majority of open green space is reserved to private residential areas and institutions such as schools.

With reference to the Waterfall Master Plan (Figure 2.18), provision for public, green open space has been ill-considered. There is a total of 4 designated open spaces (outside of the regulatory 30 metre buffer adjacent to rivers) – two are within gated communities, and the remaining two are leftover spaces close to busy highways.

Furthermore, the African Green City Index recommends a minimum of 60m<sup>2</sup> of green space per person. However, the Midrand area is below this recommendation (Khanyile 2017). While there is the possibility of accessing green space on the urban periphery, much of this space is privately owned with restricted access (Khanyile 2017). Another major deterrent to potential visitors of green open space is perceived safety and security concerns.

Alternative areas need to be explored to mitigate the discrepancy between the need for green open space in an urban area, but lack of space to implement it.

**Fig. 2.18** Waterfall Master Plan of future land use (Murray 2014:2). Open space has been ill-considered with provision for only 4 (indicated) open spaces outside of the regulatory 30 metre buffer adjacent to rivers

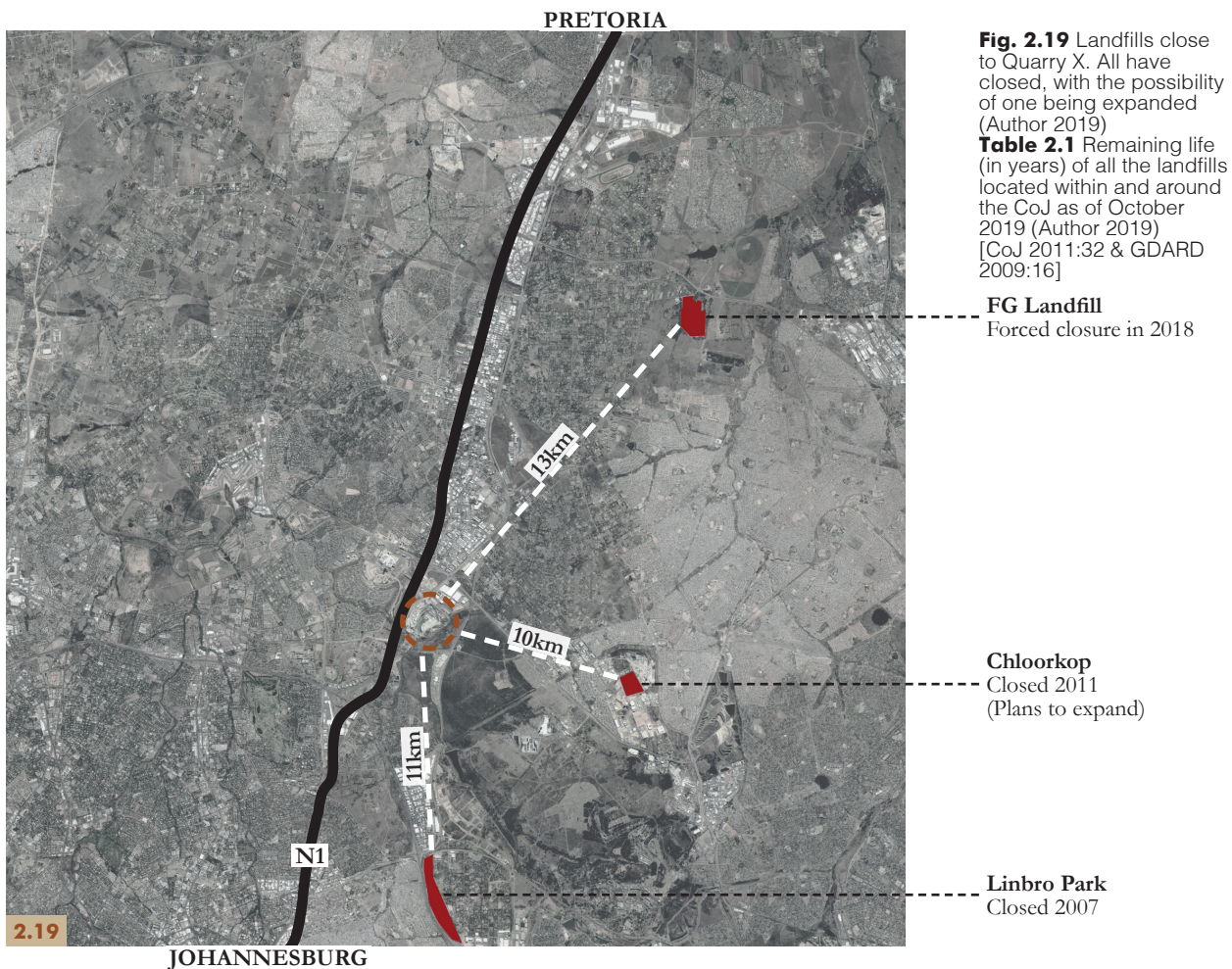


### 2.2.4 Waste Management

In 2009, Pikitup Johannesburg (the official integrated waste management service provider to the CoJ) initiated the Separation at Source (SaS) programme on a voluntary basis in some areas of the City (Pikitup B n.d.). When this proved unsuccessful, mandatory SaS was introduced from the 1st of July 2018 in areas already receiving the SaS service in order to increase participation rates and subsequently extraction rates of recyclable materials (ibid.). 5 out of the 11 wards that comprise Midrand are among the areas affected by mandatory SaS. Currently, there are no penalties for noncompliance. According to Pikitup, this is to give residents “a fair opportunity to improve the recycling rates” (ibid.). This suggests that the CoJ acknowledge that building an awareness for recycling is a gradual process. Although, penalties do remain an option, the CoJ are more invested in intensifying its education and awareness programmes, and possibly introducing incentives (ibid.). Over the next 3 years, the CoJ intends to roll-out the SaS programme to the entire Metropolitan in a bid to reduce municipal solid waste disposed at landfill sites (ibid.). This highlights a growing awareness, concern and attempt to mitigate the waste management issue in the Johannesburg region.

Table 2.1 shows the remaining life (in years) of all the landfills located within and around the CoJ. Landfills located close to Midrand (Chloorkop, FG Landfill and Linbro Park) have now closed. As of July 2007, the privately owned Mooiplaats in Centurion agreed with Pikitup to accept waste from Midrand and Ivory Park at a cost of R52 per ton and approximately R2.59 million per annum (CoJ 2011:vi). These costs have undoubtedly increased over the coming years due to inflation.

It is clear to deduce from the table that Midrand is in dire need of waste disposal solutions within a feasible proximity.



AUTHORITY NAME	LANDFILL NAME	APPROX. DISTANCE FROM MIDRAND CBD (KM)	REMAINING LIFE (IN YEAR) WITH NO INTERVENTION
<b>COUNCIL</b>			
Pikitup	Ennerdale	70.5	Expected closure in 2011
Pikitup	Goudkoppies	48.2	Expected closure in 2016
Pikitup	Kya Sands	25.6	Closed in 2002
Pikitup	Linbro Park	12.7	Closed in 2007
Pikitup	Marie-Louise	43.2	Reached permit capacity in 2011 but still in use
Pikitup	Robinson Deep	44.4	Expected closure in 2018
<b>PRIVATE</b>			
Averda	Genesis	44.2	Unknown
Interwaste	FG Landfill (Ekurhuleni Metropolitan Municipality)	10	Forced closure in 2018
<b>PRIVATE (OUTSIDE COJ)</b>			
EnviroServe	Chloorkop (Ekurhuleni Metropolitan Municipality)	10.4	Closed in 2011 (Plans to expand)
The Waste Group	Mooiplaats (Tshwane Metropolitan Municipality)	22.2	50 years

Table 2.1

### 2.2.4a Illegal Dumping

Illegal dumping is very much prevalent in Midrand (Figure 2.20), particularly around the developing urban core. In line with the research, builders' rubble forms the majority of these illegal dumping sites. It has become such an issue that the CoJ allows uncontaminated builders' rubble (free of organic matter and steel) and soil to be deposited at certain Pikitup landfills for free (Pikitup C n.d.). These landfills (Ennerdale, Goudkoppies, Linbro Park, Marie Louise and Robinson Deep) are equip with rubble crusher machines that process builders' rubble. The final product is re-used as cover material at the landfills to mask the odour of other waste, and to construct temporary access roads within the landfill sites (Randburg Sun 2016). Contaminated or mixed rubble is not accepted for crushing, however, it is accepted and disposed of at all operational

landfills at a fee of R85.10 (incl VAT) per ton. Furthermore, builders' rubble can also be disposed of at Pikitup depots at a maximum of one bakkie load, per resident, per day (Pikitup C n.d.). Although Midrand has no usable landfill space, there is potential to access facilities for sustainable waste management such as rubble crusher machines. Where possible, waste should be diverted from landfills through recycling and reuse in order to alleviate pressure on operational landfills.

**Fig. 2.20** Illegal dumping site on vacant land adjacent to Old Pretoria Road, Midrand. Much of the waste is builders' rubble consisting of concrete, brick, soil and plastic (Author 2019)





**3**

**SITE CONTEXT**

### 3.1 IMMEDIATE SITE CONTEXT

Quarry X is located within a predominantly industrial area of Midrand. Fig. 3.2 illustrates the extent of development proposed in the areas surrounding the site. Because of its central location, Quarry X (and the large open space south-east of it) has the potential to function as a regional mixed-use park in the heart of vast, built-up development. The unique site could potential attract members of the Midrand community and beyond.



**Fig. 3.1** Immediate site context around Quarry X (Author 2019)

**Fig. 3.2** Proposed future development around Quarry X according to the Waterfall Master Plan (Author 2019)

Potential for a regional mixed-use park in the heart of built-up development

- Offices
- Residential
- Industrial
- Retail
- Islamic Institute/ Mosque
- Fuel depot
- Transportation





**Fig. 3.3** Warning signage at the boundary of Quarry X (Author 2019)

**Fig. 3.4** Geological position of Quarry X (Author 2019) [adapted from Norman & Whitfield 2006]

3.3

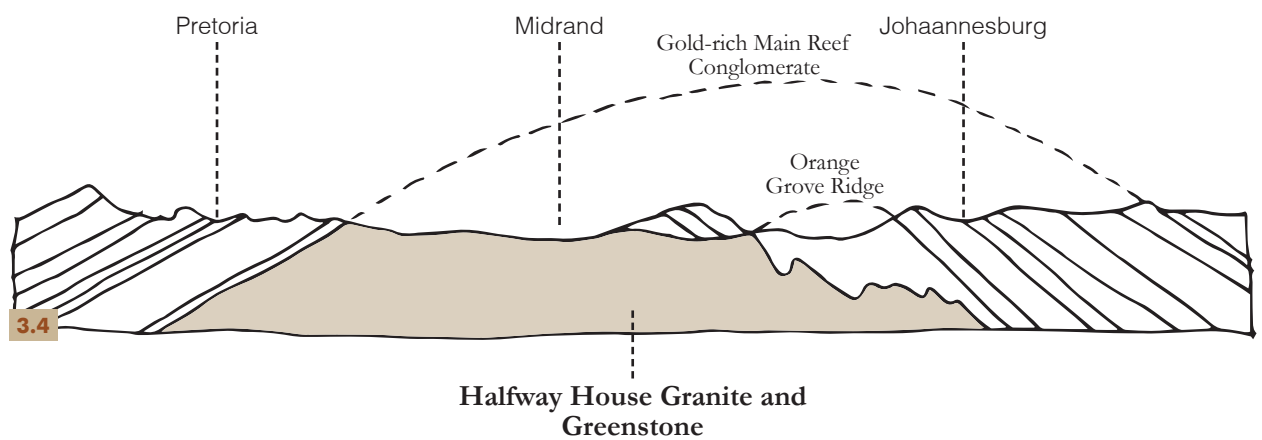


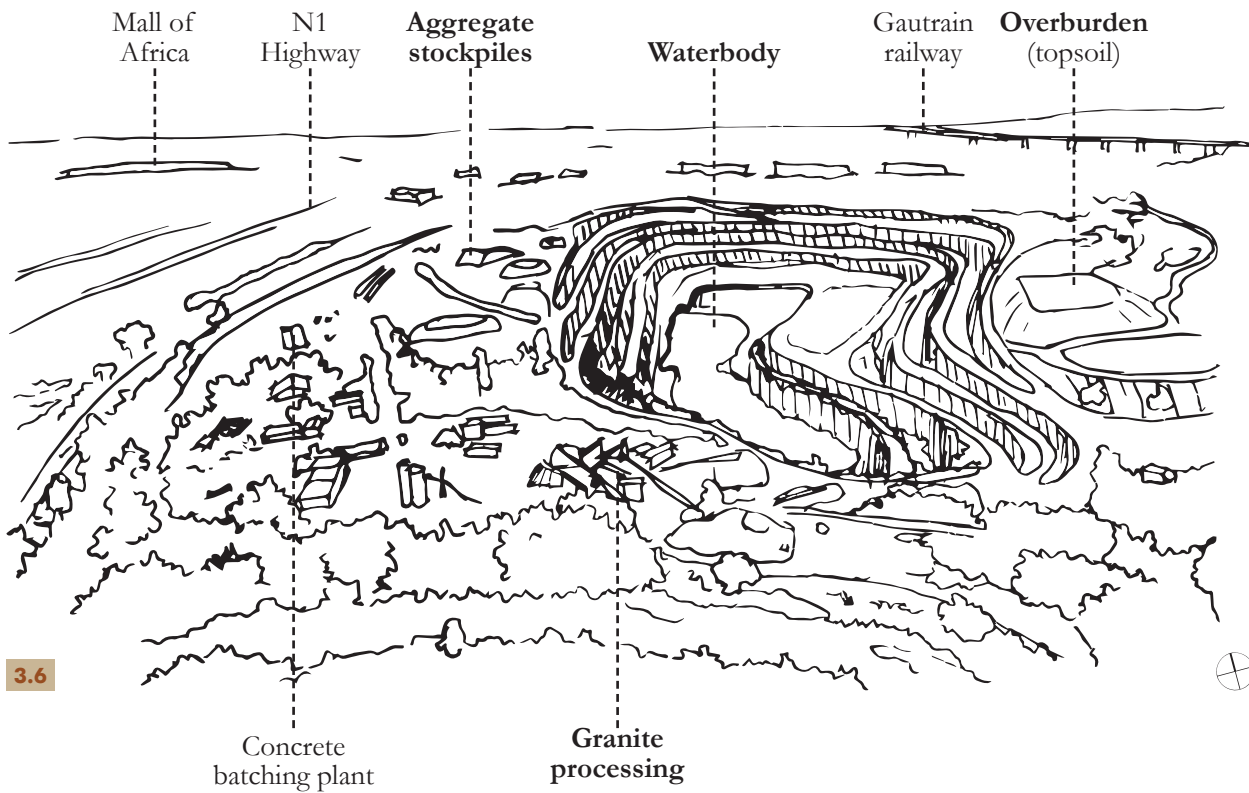
## 3.2 SITE ANALYSIS

### 3.2.1 About the Quarry

Quarry X is a privately-operated open-cast granite mine situated on the Halfway House Granite and Greenstone geology (Figure 3.4). Quarrying operations began in the 1960's (Umhlaba Environmental Consulting CC 2017) and continue today. Granite rock is loosened through conventional drilling and blasting techniques before being crushed and screened. The quarry produces aggregates and sand for ready-mix concrete which is used for the construction and road building industry within Gauteng (Umhlaba Environmental Consulting CC 2017).

Because of the quarry's age and unique spatial and visual qualities, it should be regarded as a valuable industrial heritage asset to Midrand and reused for public interest once operations have sieved. This point will be elaborated on in the Theoretical Discussion chapter.



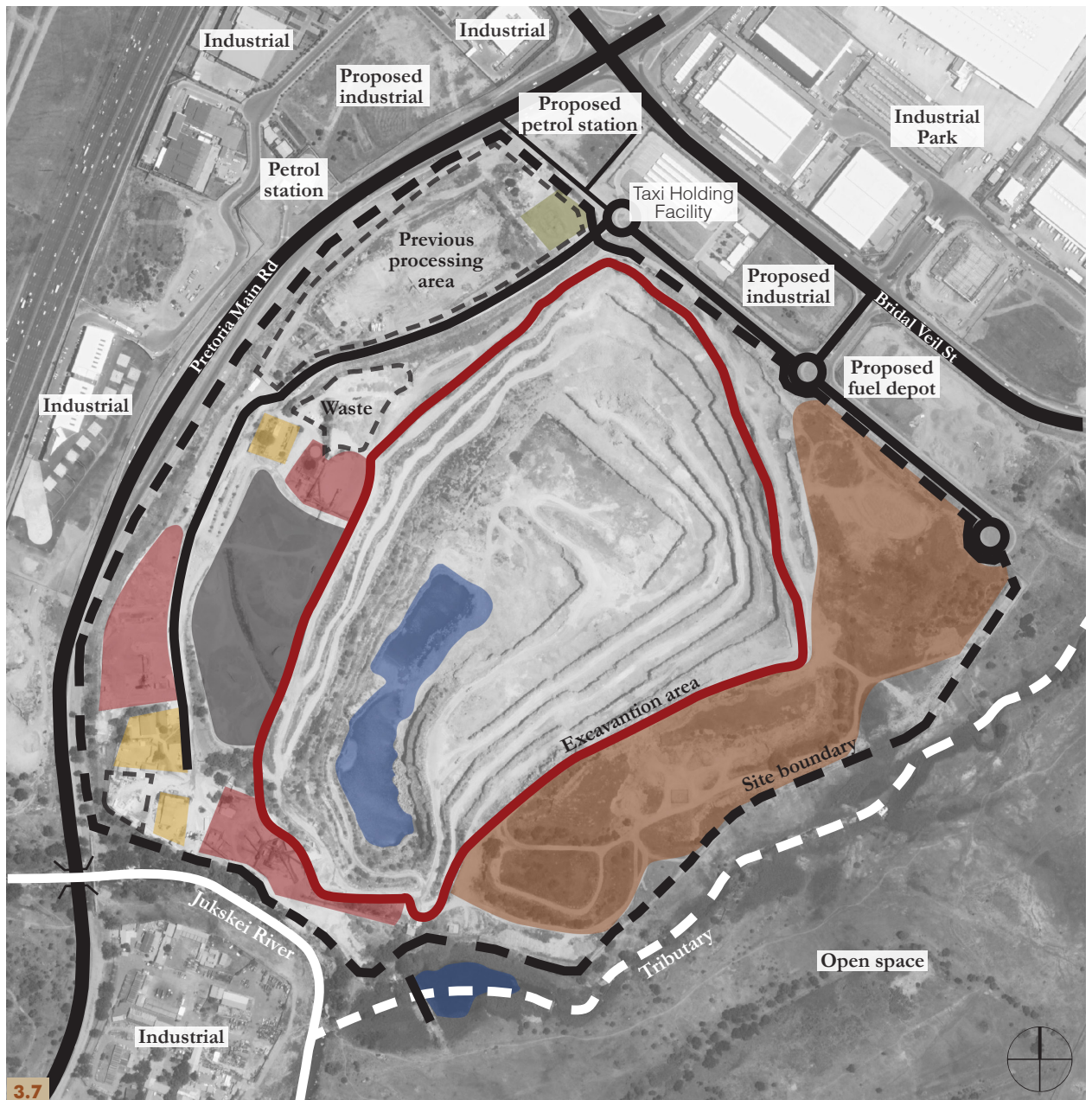


**Fig. 3.5** Sketch of Quarry X showing terraces (Author 2019)

**Fig. 3.6** Sketch of aerial view of Quarry X (Author 2019)

**Fig. 3.7** General layout of Quarry X (Author 2019)

-  Aggregate stockpiles
-  Processing area
-  Overburden (topsoil)
-  Admin/Offices
-  Waterbody
-  Builders' rubble stockpiles



### 3.2.2 Vegetation and Biodiversity

The entire site is located within the Egoli Granite Grassland, a poorly conserved and highly threatened grassland vegetation type endemic to Gauteng (Bredenkamp 2006:59).

Critical Biodiversity and Ecological Support areas are located within the site – these areas are “required to meet biodiversity targets and support ecological function and should be used to guide all spatial planning in the region” (SANBI 2014:36). A significant area of biodiversity being the wetland area to the south-east.

The street reserve area of the access road leading to and from site are designed and manicured landscapes consisting of lawn and avenues of Combretum trees (Figure 3.10). This is because there is current and future development proposed by Waterfall City along these roads.



3.8

- Critical biodiversity area
- Ecological support area
- Transformed grassland
- Rehabilitated grassland
- Chloris gayana* embankment
- Eucalyptus* forest
- Disturbed grassland

**Fig. 3.8** Vegetation map (Author 2019)  
**Fig. 3.9** *Chloris gayana* embankment (Author 2019)  
**Fig. 3.10** Manicured landscape before one reaches Quarry X (Author 2019)  
**Fig. 3.11** Landform and unique features plan (Author 2019)  
**Fig. 3.12** Planted mound up to 3 metres high (Author 2019)  
**Fig. 3.13** Rocky cliff faces with vegetation (Le Roy 2013)



3.9



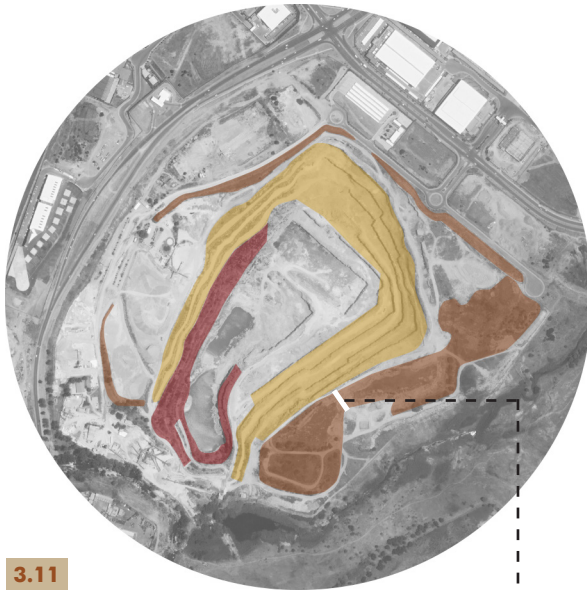
3.10

### 3.2.3 Landforms and Unique Features

Three artificial, constructed landform types have been identified on site: cliffs, mounds and terraces. The jagged, granite cliffs faces are mostly bare, with the odd intrusion of veld grass

The mounds in the eastern area of site is overburden (the soil and rock materials which overlie the rock to be quarried) (Integrated Publishing n.d.) which is stockpiled and typically used for quarry rehabilitation purposes. The remaining mounds are used for dust and sound control purposes.

The terraced landscape is a distinctive (and captivating) topographic feature of the quarry – especially at such a large scale. This area consists of granite rock faces of up to 15 metres high.

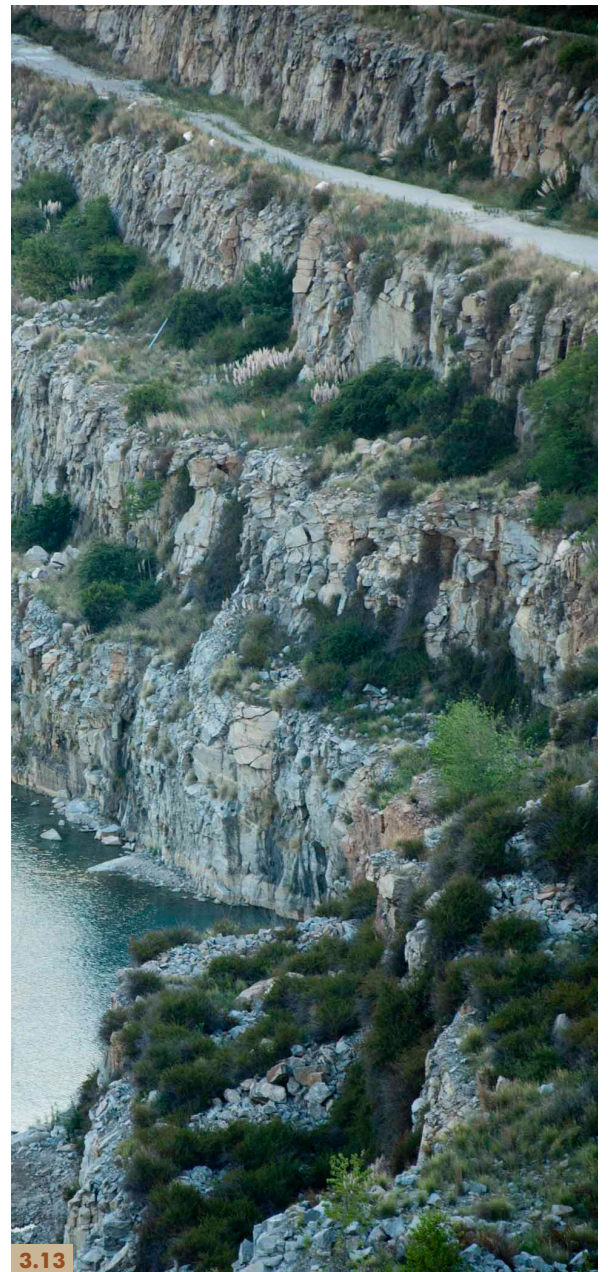


3.11

Cliffs Mounds Terrace Cut in mound



3.12

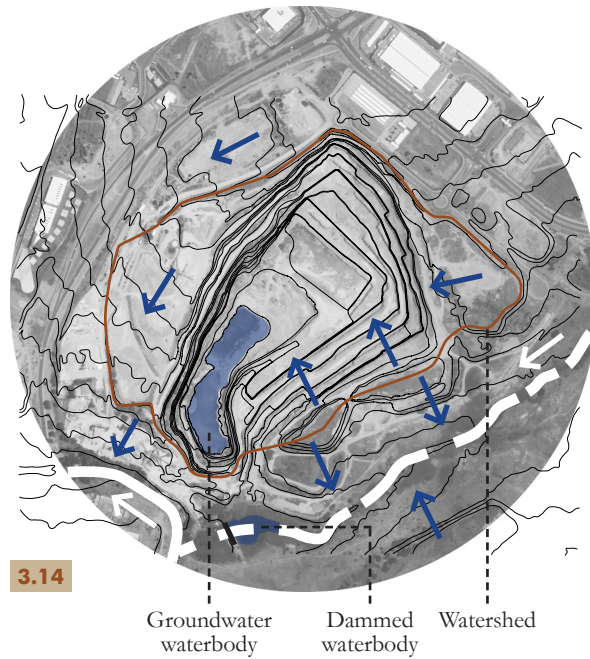


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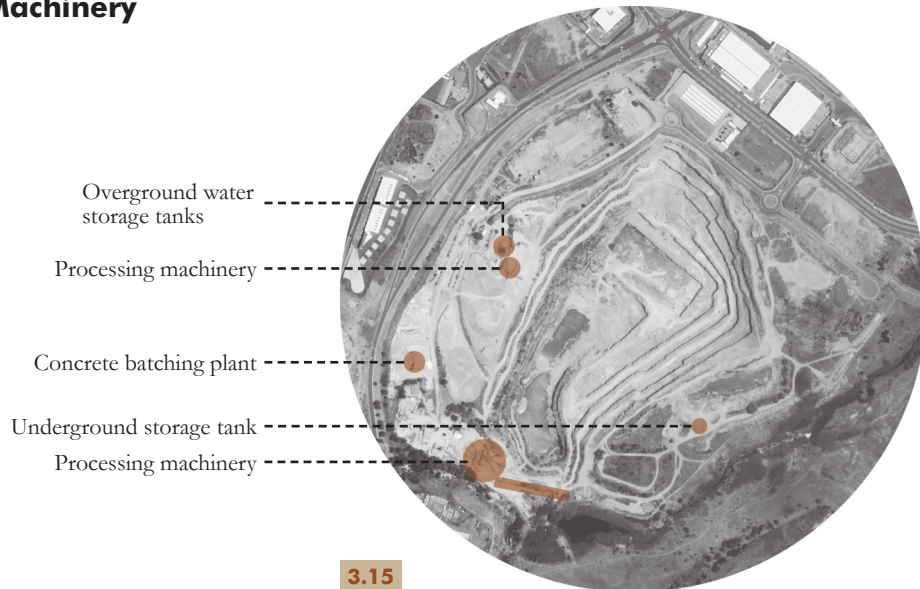
### 3.2.4 Topography and Hydrology

Generally, stormwater flows in a north-east to south-west direction and enters the Jukskei River which flows in a north-western direction.

The quarry nestles a striking turquoise groundwater waterbody at its heart. This appealing water colour is due to very fine particles suspended in the water column. With adequate water circulation these fine will be displaced.



### 3.2.5 Structures and Machinery



**Fig. 3.14** Hydrology Plan (Author 2019)

**Fig. 3.15** Structures and machinery plan (Author 2019)

**Fig. 3.16** Concrete batching plant (SA Builder 2019)



### 3.3 ILLEGAL DUMPING

#### 3.3.1 On Site

During initial site visits, dumping of builders' rubble was highly prevalent in the area of the site as indicated in Figure 3.7. However, as of September 2019, this area has been formalised with fencing and an entrance (Figure 3.19). While some merely dump large piles rubble (Figure 3.18), others take care with the placement of building material (Figure 3.17) – perhaps for reuse by others. Additionally, while on site, the author witnessed what looked to be builders collecting “usable” bricks and loading them into their vehicles.



3.18



3.17

**Fig. 3.17** Fencing has been erected around the area where individuals are dumping building and demolition rubble (Author 2019)

**Fig. 3.18** A large pile of dumped builders' rubble consisting predominantly of concrete (Author 2019)

**Fig. 3.19** Neatly stacked bricks covered in plastic material (Author 2019)



3.19

### 3.3.2 Jukskei River

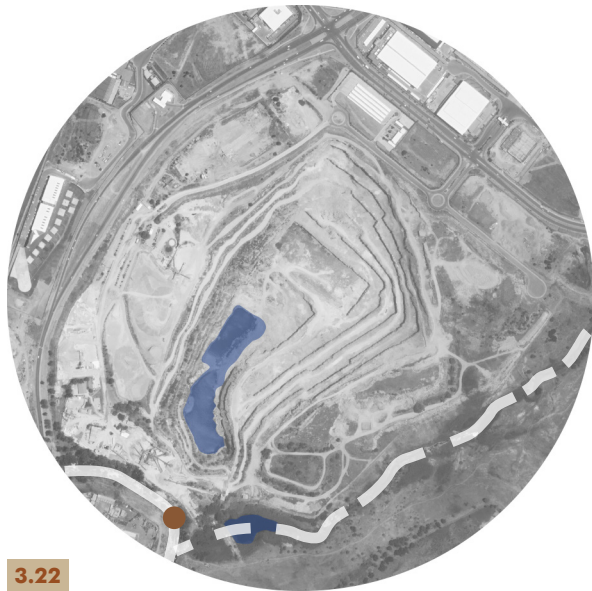
Jukskei River is highly polluted mainly due to the number of informal settlements established adjacent to the river despite the risk of flooding (Figure 3.20). At bridge intervals, one can see the accumulation of waste and debris caught on large broken tree trunks and branches after heavy rains (Figure 3.21). There is currently a Jukskei River Clean-Up committee where local residences volunteer to clean and maintain the river (Midrand Reporter 2019). Residences include Alexander, Fourways and Waterfall Estate. The aim is for every neighbourhood bordering the river to be involved in the clean-up effort. In February 2018, The CoJ undertook a major clean-up of the river after pressure from the Buccleuch Residents & Ratepayers Association (in ward 32). In 2010, a Basic Assessment Report was conducted for a proposed litter trap in Jukskei River (indicated in Figure 3.22) (GDARD 2010), however, as of October 2019, these plans have not materialised. Sustainable waste management is an integral and collective effort, especially in the protection of natural resources.



3.20



3.21



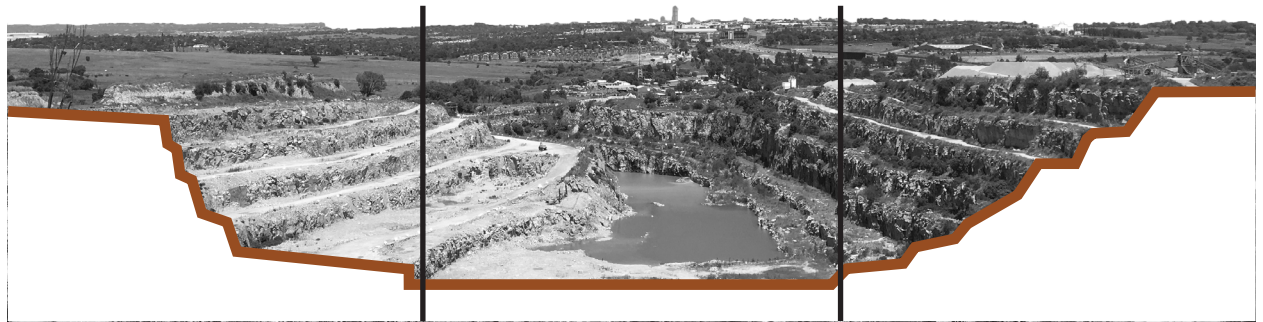
3.22



### 3.4 SITE POSSIBILITIES

The large extent of the site and its distinct spatial qualities make for multiple possibilities. Table 3.1 outlines the possibilities for Quarry X. The top row indicates baseline possibilities, while the bottom row indicates a more enhanced scenario to each baseline possibility. While there is great value in reclaiming the quarry from a purely ecological perspective, there is

even greater value in addressing social, cultural and environmental aspects too – especially pertaining to waste management. Therefore, a mixed-use site is required.



**BASELINE POSSIBILITIES**

Landfill (Waste)	Rehabilitate	Abandon (Unlikely)
<p><b>Benefits</b></p> <ul style="list-style-type: none"> <li>Mitigates dwindling landfill airspace near Midrand</li> </ul> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>Potential ground and water pollution</li> <li>Expensive to convert quarry to a landfill</li> <li>Potential disease from rodents, insect and bacteria</li> <li>Potentially unsafe</li> <li>Unpleasant smell</li> <li>Litter (when windy)</li> <li>Noise</li> <li>Eyesore</li> </ul>	<p><b>Benefits</b></p> <ul style="list-style-type: none"> <li>Repair of some ecosystem attributes, processes, or services</li> <li>Aesthetic improvement</li> <li>Minimal costs</li> </ul> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>Missed opportunity for public open space</li> <li>Long-term process</li> <li>Potentially unsafe</li> </ul>	<p><b>Benefits</b></p> <ul style="list-style-type: none"> <li>No cost</li> </ul> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>Very unsafe</li> </ul>

**ENHANCED SCENARIOS**

Recycle	Reclaim	Fill (uncontaminated material)
<p><b>Benefits</b></p> <ul style="list-style-type: none"> <li>Waste diverted away from landfills</li> <li>Mitigates dwindling landfill airspace near Midrand</li> <li>Opportunity to integrate informal waste pickers</li> </ul> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>Lack of public engagement and awareness of sustainable waste management practices may result in low quantities of recyclable material</li> </ul>	<p><b>Benefits</b></p> <ul style="list-style-type: none"> <li>Repair of some ecosystem attributes, processes, or services considered useful in the regional context</li> <li>Land stabilisation</li> <li>Potential for public open space</li> <li>Public safety guarantee</li> <li>Aesthetic improvement</li> </ul> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>Potentially expensive, depending on reclamation methods</li> <li>Long-term process</li> </ul>	<p><b>Benefits</b></p> <ul style="list-style-type: none"> <li>Cost effective</li> <li>Improved safety</li> </ul> <p><b>Disadvantages</b></p> <ul style="list-style-type: none"> <li>Unique spatial and visual qualities of quarry lost</li> <li>Long-term process</li> </ul>

**Table 3.1**

**Fig. 3.20** Shack near the edge of the Jukseki River. Stjwetla informal settlement, Alexandra (Seleka 2019)

**Fig. 3.21** Waste and debris caught on large broken tree trunks under a bridge across Jukseki River (Author 2019)

**Fig. 3.22** Plan indicating proposed litter trap in Jukseki River, north of Quarry X (Author 2019)



**4**

**THEORETICAL DISCUSSION**

## 4.1 CONSERVATION THEORY: ADAPTIVE REUSE

Scholarly literature regarding adaptive reuse is situated within contemporary architecture conservation theory and practice. The earliest theoretical discussion on adaptive reuse began in the late 19th century as a strategy to preserve historic monuments. Eugène Emmanuel Viollet-le-Duc (1814-1879) lead the restoration movement, while John Ruskin (1819-1900) lead the anti-restoration movement (Plevoets & Van Cleempoel 2012).

Since then, and still today, adaptive reuse theories have been heavily applied to architecture (buildings). Literature on its application to landscape architecture is minor yet developing. There appears to be an interest in this topic within the landscape architectural discourse due to an increase in the number of implemented landscape design projects which exhibit adaptive reuse.

According to Plevoets and Van Cleempoel (2011), contemporary theories on adaptive reuse can be characterised into three approaches: typological, technical and strategic. It is important to note that these approaches were in reference to historic buildings. The author has attempted to extrapolate these approaches to landscape design in Table 4.1. The dissertation considers each approach to adaptive reuse which are further explored in the Design Development and Technification chapters.

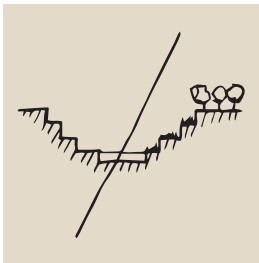

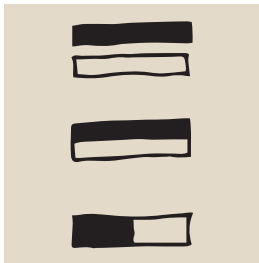
### 4.1.1 Adaptive Reuse and applicability to Quarry X

From approximately 2020, Quarry X will be at least 60 years old. Considering the South African National Heritage Resources Act (Act 25 of 1999) (Republic of South Africa 1999), the quarry can technically be classified as a cultural landscape, deserving of the necessary protocol, protection and management. Perhaps the most well-known international standard for the study, documentation, conservation and interpretation of industrial heritage is The Nizhny Tagil Charter. It clearly states:

*“Sympathetic adaptation and re-use may be an appropriate and a cost-effective way of ensuring the survival of industrial buildings, and should be encouraged by appropriate legal controls, technical advice, tax incentives and grants”* (TICCIH 2003:3).

Again, reuse is specifically referencing buildings, however, the author believes the same approach can be applicable to industrial landscapes such as quarries.

One must believe the place is worth saving – which usually goes simultaneously with what the public deem to be aesthetically valuable or “attractive.” Ultimately, is a quarry worth saving? Why should it not be turned into a landfill?

	TYPOLOGICAL	TECHNICAL	STRATEGIC	
DESCRIPTION	Change of landscape <b>type</b> to accommodate new use(s). Landscape categories each contain several landscape types. E.g. Category: Extractive. Type: Quarry	Technical guidelines on <b>how</b> to adapt a landscape to allow a new use(s)	Focuses on the <b>design strategies</b> applied to the reuse of a landscape	<b>Table 4.1</b> Approaches to adaptive reuse in landscape design (Author 2019) [Adapted from Plevoets and Van Cleempoel (2011) and extrapolated to landscape design]
EXAMPLE	 <p>Quarry landscape type converted into public park landscape type</p>	 <p>How to remove toxins from soil to allow vegetation to grow, and thus allow the landscape to be used as a sports field</p>	 <p>To design landscape around, within or over an existing feature on site</p>	
ASSESSMENT	Opportunities and constrains towards the reuse of each landscape type	Effectiveness of biological, chemical or physical technicalities	Effectiveness of each design strategy in promoting a new use(s)	

**Table 4.1**

## 4.2 ENVIRONMENTAL AESTHETICS

### 4.2.1 Aesthetic/s

The word “aesthetic” is from the Greek word *aisthetikos* meaning “of or for perception (of things) by the senses, perceptive,” which is in turn derived from *aisthanesthai* – meaning “to perceive (by the senses or by the mind), to feel” (Online Etymology Dictionary n.d.). In the early 18th century, German philosopher Alexander Baumgarten appropriated and popularised the term “aesthetics” [bold ‘s’ by author] to mean a *subjective* quality of what is sensed, believed and/or imagined. This was opposed to the popularly held notion that aesthetics is an *objective* quality of what is known through rational thought (Carroll et al. 2011:31). Modern day aesthetics has been defined by Susan Feagin as the “branch of philosophy that examines the nature of art and the character of our experience of art and of the natural environment” (1999:11-12).

### 4.2.2 Environmental Aesthetics

A relatively new branch of philosophical aesthetics which arose in the late 20th century, environmental aesthetics (EA) can be defined broadly as the “interaction between an individual and the environment, in relation to beauty,” which includes “both the physical environment and the objects that occupy it, as well as the psychological and physiological processes of human perception and cognition” (Carson n.d.). Its development was highly influenced by eighteenth-century landscape aesthetics, particularly the picturesque (Figure 4.1) and the sublime (aesthetic categories which are expanded upon later in this chapter).

Previously, the study of aesthetics was confined to the world of art and the appreciation of artistic objects. Conversely, EA focuses on the philosophical issues concerning the appreciation of both natural and human (human-influenced and/or human-constructed) environments (Carson n.d.). Human experience within a given environment results in an aesthetic experience.

### 4.2.3 Aesthetic Experience and Aesthetic Value

Aesthetic experience is the multifaceted response an individual has to an object or environment when appreciated or experienced aesthetically (Perry 2013). An individual can either feel pleasure (positive experience) or displeasure (negative experience). Consequently, a positive or negative aesthetic experience results in an object or environment possessing positive or negative aesthetic value (Plato & Meskin 2014).

There are generally two groups of theories which dispute what actually qualifies as an aesthetic experience: namely the cognitive and non-cognitive group (Perry 2013). The cognitive group believe that for someone to have a genuine aesthetic experience, they must have reasonable *objective* knowledge of the object or environment being viewed. For example, if someone is looking at a landscape, they must have knowledge of botany, ecology and other aspects of natural science to have a true aesthetic experience. In contrast, the non-cognitive group believe that one does not need to be intellectually versed to have a true aesthetic experience, it is rather linked to an individual’s emotional and feeling-related states and responses.

The author believes it is almost impossible to completely disassociate one’s experiences, preferences and/or snap judgments when having an aesthetic experience towards an object or environment. Therefore, aesthetic experience and value undeniably have an element of subjectivity.

Some philosophers have attempted to ground aesthetic research in some objectivity and scientific rigor: Kant (1790) believed that for something to be deemed beautiful (positive value), it requires universality – that is, other people must agree that the said object/environment is beautiful too. Generally, there are three aesthetic categories which are deemed to possess high aesthetic value.

**Fig. 4.1** The typical picturesque landscape was deemed the most ideal aesthetic (Author 2019)



4.1

#### 4.2.4 The Big (Landscape) Aesthetic Three

Three aesthetic categories (touted by the west) have dominated what humans would today deem to be pleasurable (aesthetically positive or valuable) landscapes: the beautiful, the sublime and the picturesque (Brook 2013:110).

The beautiful represents that which is elegant, smooth and ordered. There is harmony in the landscape composition which is evident in traditional pastoral landscapes (Figure 4.2). General characteristics included: large expanses of manicured lawn; calm water; some variety of plants and trees; possibly some animals, but nothing “abrupt, chaotic or demanding” (ibid.). Small classical buildings were also a common feature in pastoral-style parklands.

Conversely, the sublime represents the grandeur, terror and wildness of nature. Edmund Burke developed the theory of the sublime in his 1757 book: *A Philosophical Enquiry into the Origin of our Ideas of the Sublime and Beautiful*, in which he argues that sublimity and beauty are mutually exclusive. The sublime possesses qualities of greatness beyond all probable calculation, measurement or imitation; therefore, an emotional response is characteristic of sublime landscapes. Images depicting the apocalyptic and overwhelming power of nature (Figure 4.3) can be classified as sublime, as well as images of vast, majestic views of the natural environment (Figure 4.4).

The picturesque is perhaps the most influential of the aesthetic categories – especially in relation to the landscape architectural discipline. Picturesque theory was developed by William Gilpin in his 1770 book: *Observations on the River Wye*, and most notably, Uvedale Price, in his 1794 book: *An Essay on the Picturesque as Compared with the Sublime and Beautiful*. The picturesque is irregular, vivid and rustic – the intermediate of the beautiful and the sublime. Beauty lies in elements of wildness, irregularity and decay such as overgrown structures and “unkempt” vegetation (Figure 4.5). Many picturesque landscapes read as a landscape painting (which were popular during the 18th century), with foregrounds, middle-grounds, and backgrounds, to create an alluring “scene.”

#### 4.2.4a Why Those Three?

Many academics in the field of aesthetics, biology and psychology have theorised what it is about the three aesthetic categories mentioned previously that appeal to humans. The answer may lie in human evolution. Studies such as the “savanna hypotheses” (Orians 1986) and the “prospect and refuge theory” (Appleton 1990), all align with a preference for landscapes which accommodate hunter-gathering survival. Early man required a landscape form to hide while also having unhindered views of a greater landscape – a landscape that felt safe.

The feeling of safety and unease can be linked to each aesthetic category. The beautiful represents safety, in its harmonious order; the sublime represents unease, but an appetite for adventure; and the picturesque is a confluence of the two.

However, in the age of the Anthropocene, there is an emerging aesthetic category which appears to defy commonly held views about what is considered a pleasurable landscape.

**Fig. 4.2** 'Audley End and the Temple of Concord' (1792) by William Tomkins. Oil on canvas (Art UK n.d.)

**Fig. 4.3** 'An Avalanche in the Alps' (1803) by Philip James De Loutherbourg (Tate n.d. A)

**Fig. 4.4** 'The Plains of Heaven' (1851–3) by John Martin. Oil on canvas (Tate n.d. B)

**Fig. 4.5** 'Tintern Abbey: The Crossing and Chancel, Looking towards the East Window' (1794) by Joseph Mallord William Turner. Oil on canvas (Tate n.d. C)



### 4.2.5 The Industrial Sublime

The industrial sublime is an aesthetic category which emerged from the First Industrial Revolution (approximately 1760 to 1840) with the transition from hand production methods to machines. During this period, man-made structures began to encroach into the idyllic landscape, and while some landscape painters deliberately omitted these structures from their paintings, others chose to embrace them into the composition of their artworks (Legro 2014) (Figure 4.6).

It wasn't until the "Machine Age" of the 1920s and 30s when there was a fixation on, and admiration for the functionality and streamlined forms in machines (Staples 2002).

As technology and industrial knowledge advanced, the industrial sublime grew to embody not just the machines of manufacturing, but the many other products of economic growth such as consumption, waste disposal and mined sites. Canadian photographer Edward Burtynsky exemplified modern-day industrial sublime in a 15-photograph exhibition titled: *Edward Burtynsky: The Industrial Sublime* (Figure 4.8). The images evoke contradictory fascination and shock at the countless ways humans assert their power onto the environment.

General characteristics of industrial sublime landscapes are (Figure 4.7):

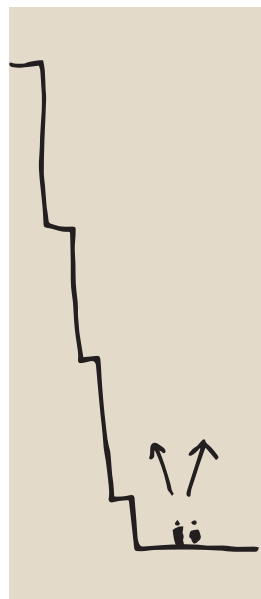
- Artificiality;
- Gigantic scale;
- Repetition (and thus pattern); and
- Starkness (to adjacent environment)



**Fig. 4.6** 'Storm King on the Hudson' (1866) by Samuel Colman. Oil on canvas (Smithsonian American Art Museum)

**Fig. 4.7** General characteristics of industrial sublime landscapes (Author 2019)

**Fig. 4.8** Photograph of Carrara marble quarries in Italy (2016) by Edward Burtynsky (Edward Burtynsky n.d.)



4.7





4.8

### 4.2.6 Environmental Aesthetics, Industrial Sublime and applicability to Quarry X

Industrial sublime landscapes such as Quarry X possess the capacity to elicit both pleasure and displeasure. Pleasure at their distinctiveness, and displeasure at their destructive nature. Perhaps this duality is the reason humans find these landscapes so intriguing despite their grave consequences to the environment? There is no denying the destructive nature of Quarry X, however, one cannot help but be taken by its extraordinary nature – its sheer size and depth; its rocky, terraced structure; and its vivid turquoise waterbody (Figure 4.9).

A study regarding the landscape attractiveness of abandoned quarries concluded that the main indicators of an abandoned quarry’s attractiveness is their uniqueness, aesthetic appeal, interest, and the curiosity they raise (Baczyńska et al. 2017).

Table 4.2 summarises the criteria to measure quarry attractiveness in relation to Quarry X.

Much of the criteria in Table 4.2 relate to the general characteristics of industrial sublime landscapes mentioned previously, especially regarding gigantic scale and starkness. On average, Quarry X scored high – meaning it can be considered an attractive landscape. It is evident that many of the high scoring criteria is based on contrast. The more the quarry contrasts with the adjacent landscape, or “typical” types of landscapes – the more attractive.

Considering this, the author believes the landscape design itself should also relate to the idea of contrast – that is, if the quarry is a representation of chaos, destruction and excess, the landscape design must represent clarity, construction and restrain.

**Fig. 4.9** Distinct nature of Quarry X (Author 2019)  
**Table 4.2** The attractiveness of Quarry X according to specific criteria (Author 2019) [Based on Baczyńska et al. 2017]



4.9

CRITERIA	HIGHEST SCORE	MEDIUM SCORE	LOWEST SCORE	QUARRY X SCORE
Vertical differentiation of the area	Over 25m	10 – 20m	Below 5m	High
Percentage of natural succession	Below 10%	30 – 69% %	90 – 100m %	High
Boundary contrasts for particular types of land cover	E.g. between trees and slight traces of natural succession	E.g. between trees and grassland	E.g. between trees and trees	High
The state of quarry preservation	Good	Average	Bad	Medium
Number of adjacent area types	3 or more	1 – 2	Same area types	Medium
The presence of surface waters	Entire quarry interior	Huge reservoir making 40 – 60% of quarry area	Lack of surface water	Low – medium
Road, route accessibility	Good	Average	Very aggravated	High <b>Table 4.2</b>

## 4.3 MINIMALISM

Aside from its origins in the art sphere, landscape architect Peter Walker believes minimalism in landscape design is a successful approach to tackle “the most critical environmental problems we currently face: mounting waste and dwindling resources” (2006:208). This does not necessarily mean that the final design is reductivist or simple in appearance – it may be minimal in the resourceful use of material for example.

Beyond the visual, thoughtfully designed minimal landscapes serve as a place for contemplation and repose from “an increasingly bewildering, spiritually impoverished, overstuffed, and undermaintained garden Earth” (Walker 1998:87).

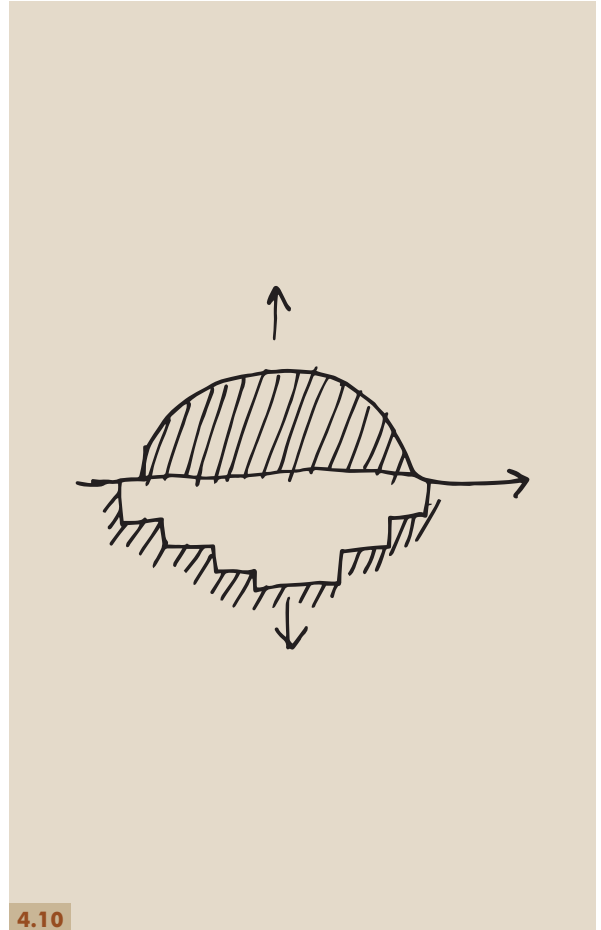
Minimalism in landscape design will be further elaborated in the next chapter, where its origins and relevant example will be discussed. At this point, it is important to make clear that minimalism (as outlined by Walker above) is a sustainable approach to landscape design.

### 4.3.1 Minimalism and applicability to Quarry X

At a site as large as Quarry X, minimalism is an economical approach to the landscape design. It would not be feasible to design every square metre of the site (especially if it had to be implemented in one phase). It is a common practice on very large wasted sites to simply leave areas “untouched,” except for perhaps maintenance purposes. At Duisburg-Nord Landscape Park in Germany (previously a disused but intact blast furnace plant turned recreational park), some areas were left, and natural succession inevitably took place. One may still deem this planting beautiful or even “designed,” but the designer had little to no influence on the result.

Additionally, a minimal landscape design does not attempt to compete with the inherently overwhelming nature of Quarry X, it does however, seek to accentuate the existing spatial and visual qualities of the Quarry. In this regard, there is a sense of clarity within the “chaotic” landscape of the Quarry, offering exploration and moments of solace for visitors to contemplate the nature of such a site.

However, it is aimless having a minimalist approach if there is nothing informing what the minimal design will be. There must be a guiding thread which grounds the design in some formality, so the landscape does not end up littered with many arbitrary elements that have no meaning or relation to the context.



4.10

**Fig. 4.10** Mounting waste and dwindling resources (Author 2019)

## 4.4 NARRATIVE IN LANDSCAPE

Whether it be from fables, natural processes or cultural practices – contemporary landscape design is becoming increasingly interested in, and inspired by, landscape narratives (Potteiger & Purinton 1998b:136). Landscape narratives “designates the interplay and mutual relationship between landscape and narrative” (Potteiger & Purinton 1998a:5). Figure 4.11 summarises the two main components of a narrative: the story (*what* is told) and telling (*how* it is told), where “telling” encapsulates both the process and the final product. According to Potteiger and Purinton (1998b:137), landscape narratives are produced over three related realms outlined as follows:

- The **story realm** focuses on the actual narrative as outlined in Figure 4.11. The emphasis is on the “author” or designer using the structuring elements of a story (event, plot, character etc) to create meaning.
- In the **contextual/intertextual realm**, the story and sites outside the story intertwine in a multifaceted interpretation of a narrative. Meaning is not generated from the designer’s perspective, but from the individuals and communities in a particular context.
- Finally, the **discourse realm**, which focuses on the uses and purposes of stories, whose story is told, and the ideologies, institutions and worldviews stories create and sustain.

A well-formulated landscape narrative considers each realm and employs a variety of design practices to shape such a narrative, specifically: naming, sequencing, framing, revealing/concealing, erasing, gathering, recycling, referencing, inscribing, registering and opening (Potteiger and Purinton (1998b:142–143). These design practices are further elaborated in the Sketch Plan Design Development chapter, however, what is important to highlight at this point is the practice of opening i.e. “open narratives.”

Potteiger and Purinton (1998b) highly recommend “open narratives” as opposed to rigid, scripted and explicit closed narratives. Open narratives recognise that sites are shaped by natural and cultural processes, resulting in multiple accounts or “authors” of a particular site. Furthermore, open narratives take into consideration that in many designed landscapes, visitors rarely enter and exit at a specific point and therefore cannot experience a landscape narrative in a beginning-middle-end sequence. It is therefore bestowed onto the visitor to formulate sequences, create links and decipher meaning. Essentially, open narratives are more about *showing*, rather than *telling*.

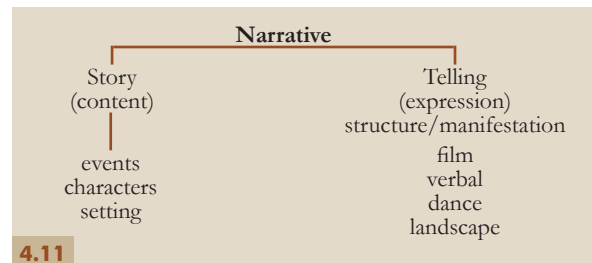
**Fig. 4.11** Components of a (Author 2019) [Adapted from Potteiger & Purinton 1998a:3]

**Fig. 4.12** Sequencing, framing and concealing/revealing design practices (Author 2019)

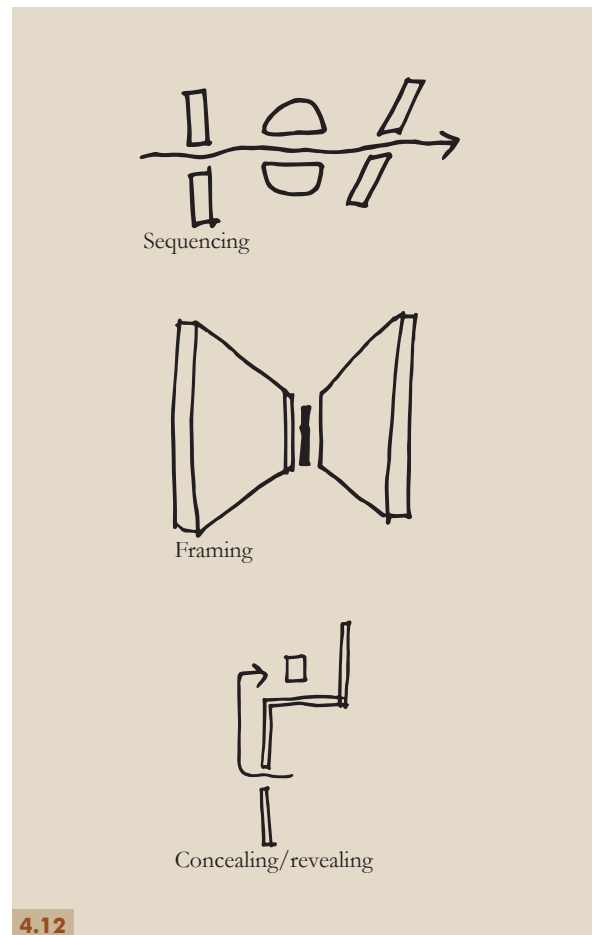
### 4.4.1 Narrative in landscape and applicability to Quarry X

Prescribing a landscape narrative (which is inspired by the context) on Quarry X not only informs the spatial landscape design, but also communicates a local sense of place (Potteiger and Purinton (1998b:136).

Moreover, as mentioned in the Context chapter, Quarry X is positioned between two contrasting communities with generally different backgrounds and experiences. With reference to the “open narrative,” the landscape design can be accessible to multiple visitors or “readers” who can freely interpret the narrative within their personal frame of reference. This adds richness to the initial narrative and contributes to a sense of place.



4.11



4.12

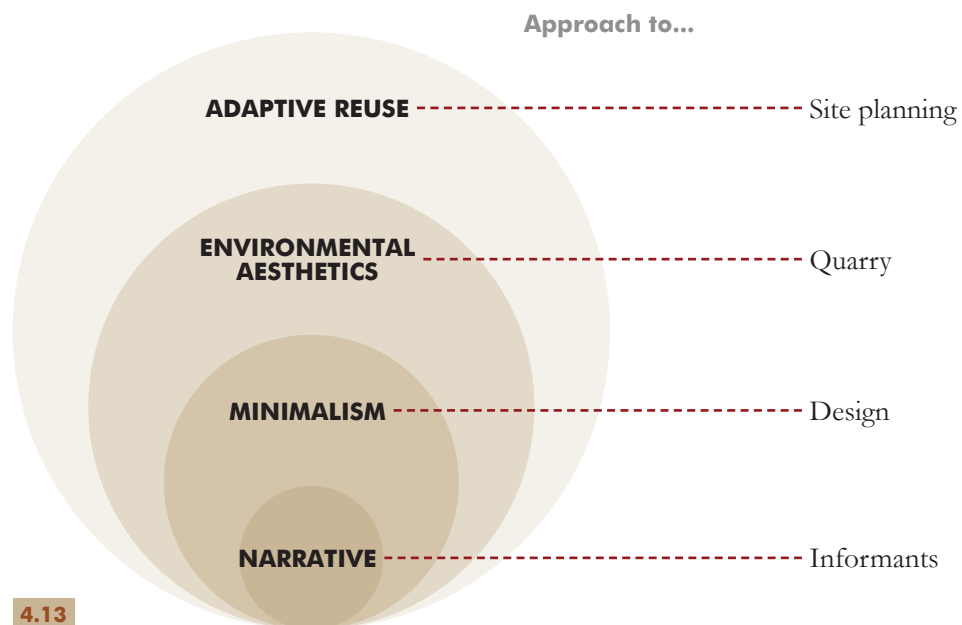
## 4.5 HIERARCHY OF THEORY

The hierarchy of the theory is outlined in Figure 4.13. Adaptive reuse theory relates to the overall concept of reusing Quarry X for new programs.

Environmental aesthetics focuses on the Quarry and how it can be viewed as attractive as “typical” landscape types.

Minimalism refers to the landscape design approach that will be applied to Quarry X.

Narrative in landscape gives guidance to the design approach through the consideration of contextual informants and design practices.



4.13

**Fig. 4.13** Hierarchy of theory (Author 2019)

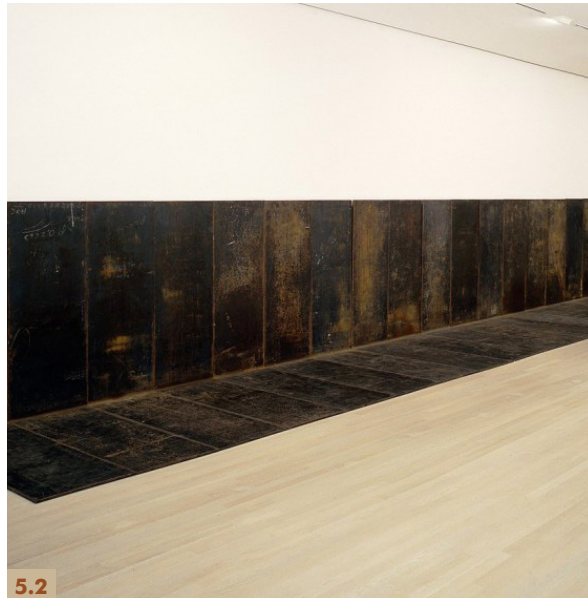


# 5 MINIMALISM

## 5.1 INTRODUCTION TO MINIMALISM

Minimalism began as an art movement (within the umbrella of Modern art) during the 1960s and 1970s. It is frequently likened to classicism due to its interest in meticulously distilling art forms and basing art in mathematics and logic (Marien & Fleming 2005:616). Minimalist artists sought purity, order and clarity in a “dysfunctional” world. Their artwork rejected any recognisable subject matter and frequently featured basic, linear forms (Marien & Fleming 2005:616) (Figure 5.1). Moreover, Minimalist artists refrained from any self-expression through their artwork, a stance which opposed Abstract Expressionists. To further remove themselves from their artwork, Minimalists often explored the methods, techniques and materials of the industrial world (Marien & Fleming 2005:617) (Figure 5.2); or simply light – in what was dubbed the “light and space” sub-movement (Figure 5.3). This detached approach to artmaking meant the art became an object, seen in and for itself.

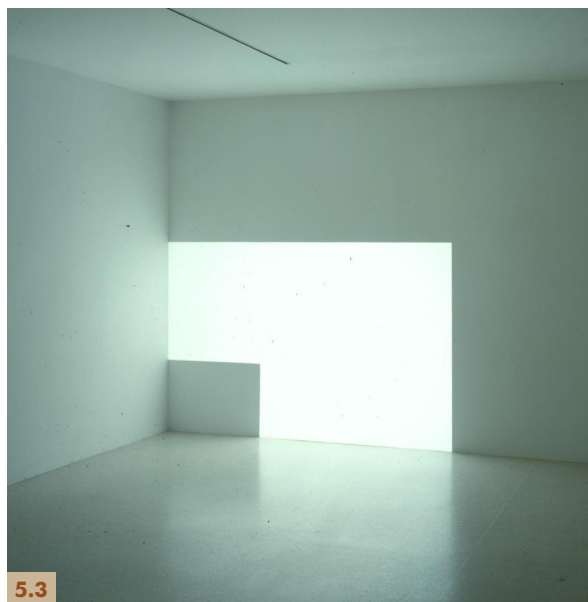
It is important to note that during this time, Land and Environmental art was also developing. This movement rejected the restrictive confines of the gallery or museum – redefining sculptural art and blurring the boundaries between “object” and landscape (Figure 5.4).



5.2



5.1



5.3

**Fig. 5.1** 'Black Plank' (1967) by John McCracken. Polyester resin, fiberglass, and plywood (National Gallery of Art n.d.)  
**Fig. 5.2** 'Fall' (1968) by Carl Andre. Hot-rolled steel (Guggenheim n.d.)  
**Fig. 5.3** 'Porter Powell (White)' (1967) by James Turrell (Turrell n.d.)  
**Fig. 5.4** Aerial photograph of 'Amarillo Ramp' (1974) by Robert Smithson (Holt/Smithson Foundation 2017)





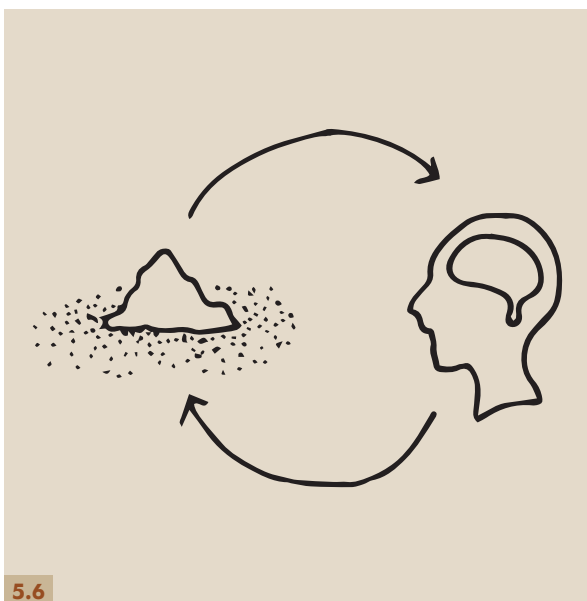
5.4

## 5.2 INFLUENCES ON MINIMALISM IN LANDSCAPE DESIGN

### 5.2.1 Japanese Garden Design and Philosophy

Minimal landscape design has its roots in Japanese garden design and philosophy, particularly the Zen Buddhist gardens, which sought enlightenment through contemplation and meditation. Because of the tight and hostile sea boundary, the outlook on landscape in Japan was introvert and in-depth (Jellicoe 1995:85). Like China, the garden landscape was a microcosm of the natural landscape; however, the Japanese did not “borrow” the landscape like the Chinese did, rather, they contained it within an invisible frame (ibid.). Because of this sense of enclosure, attention was focused inward on the miniature of nature and stimulating the senses.

Symbolism and analogy through material and placement were prominent design mechanisms to represent a subject or story, such as man’s journey through the world – leaving the garden to the personal interpretation and imagination of the visitor. The Zen garden at Ryoan-ji (Figure 5.5) is perhaps the most profound example of Japanese garden design, composed of 15 thoughtfully placed rocks within a walled courtyard of quartz gravel and moss. The design is based on the Buddhist belief that the mind is a void in which worldly events float – the gravel representing the mind, and the rocks the worldly events (ibid. pp. 84–85). Ultimately, the design is left to the interpretation of each visitor.

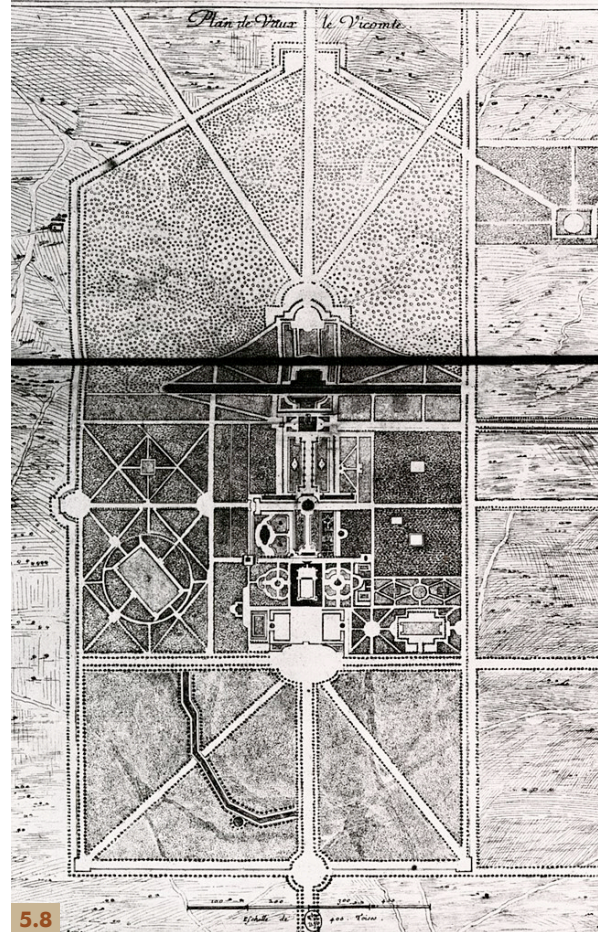


**Fig. 5.5** Minimal palette symbolising greater ideas at the Zen garden at Ryoan-ji, Kyoto, Japan  
**Fig. 5.6** Symbolism as a design principle (Author 2019)

### 5.2.2 Classical French Garden Design by André Le Nôtre

During the 16th and 17th century, the French monarchy exuded “delightful materialism” (Jellicoe 1995:178) through their grand châteaux and great gardens. It was André Le Nôtre who revolutionised French garden design by eradicating the idea of compartmentalising the garden, in favour of organising it (ibid.) with mathematical precision. The vast scale of Le Nôtre’s projects meant that the garden was no longer an annexure to the house, but a primary space that commanded attention.

Vaux-le-Vicomte (Figure 5.7) was Le Nôtre’s first major work. The plan (Figure 5.8) shows how the garden was organised through meticulous proportioning and subdivision by primary and secondary axes – a landscape design feature Le Nôtre became best known for. The grand scene not only expresses the elegance and poise of man, but stimulates the senses too.



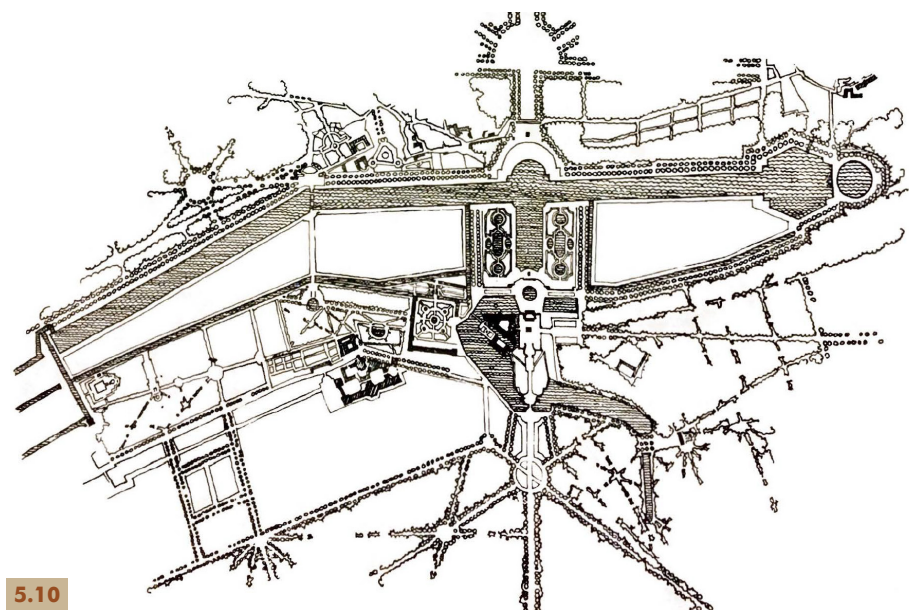
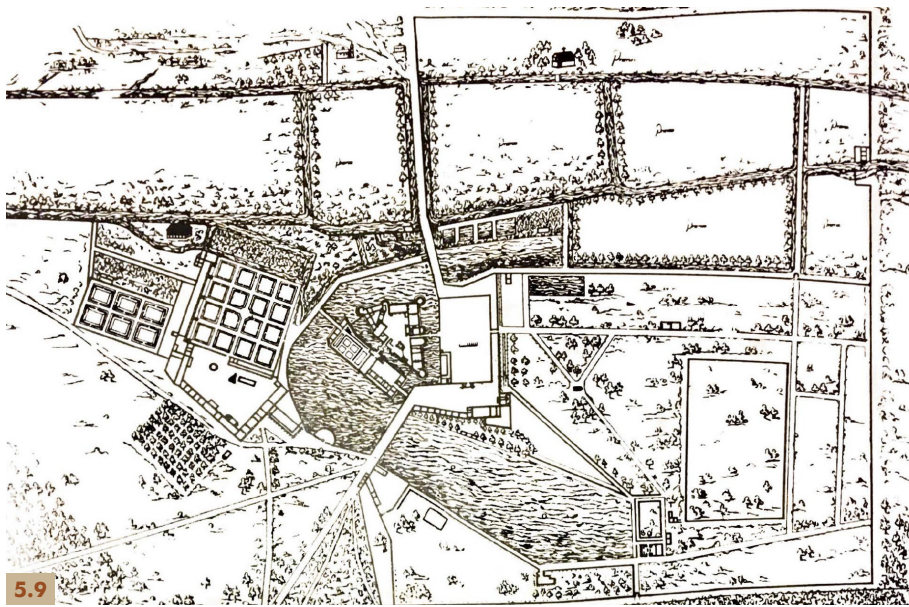
**Fig. 5.7** Aerial view of Vaux-le-Vicomte (Wall Street Journal n.d.)

**Fig. 5.8** Plan of Vaux-le-Vicomte showing primary and secondary axes (Hazlehurst, F. H. 1980:22)



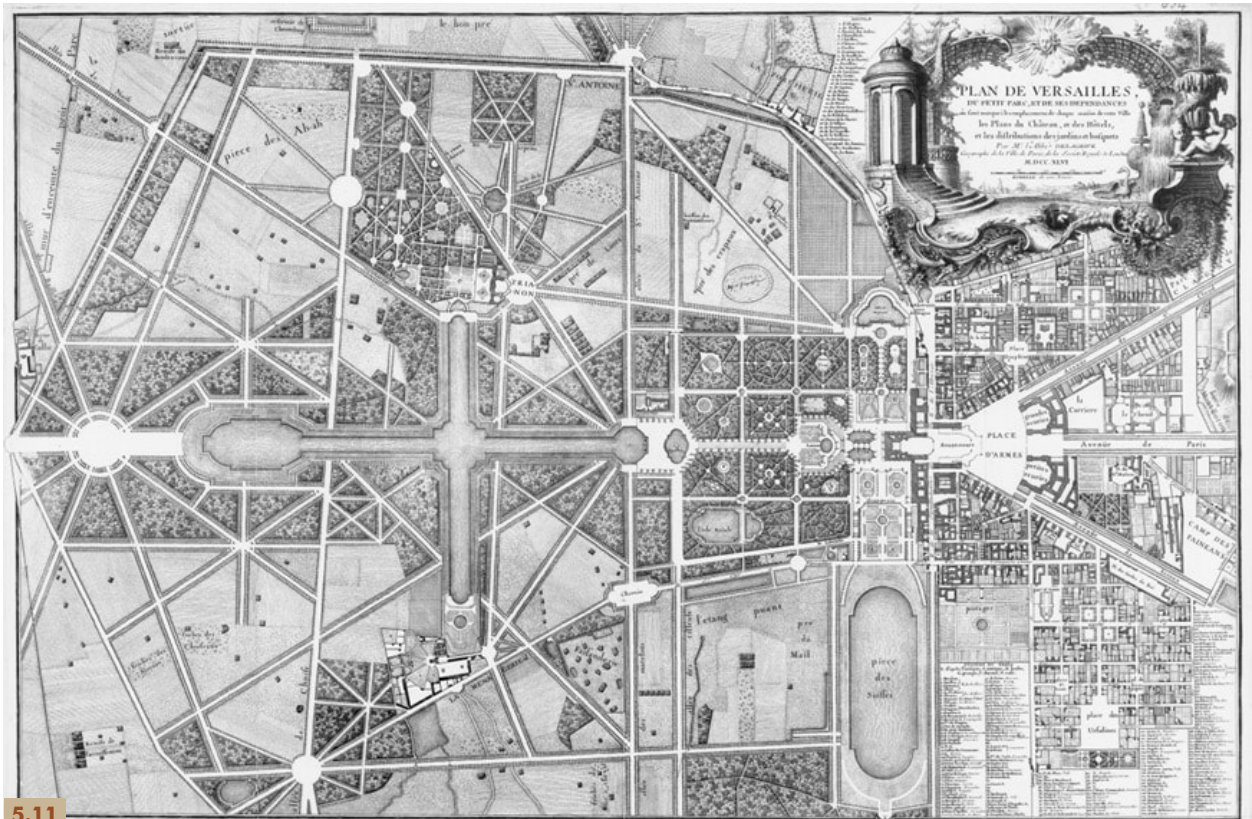
At Chantilly, Le Nôtre continues his signature design principles. A comparison of the original site plan (Figure 5.9) and Le Nôtre's plan (Figure 5.10) show how he again uses axes to organise space. However, unlike Vaux-le-Vicomte, the house is offset from the main axis (perhaps because of its awkward triangular footprint). The house is secondary to the landscape.

**Fig. 5.9** Plan of Chantilly (before) (Jellicoe & Jellicoe 1996:184)  
**Fig. 5.10** Plan of Chantilly (after) (Jellicoe & Jellicoe 1996:184)



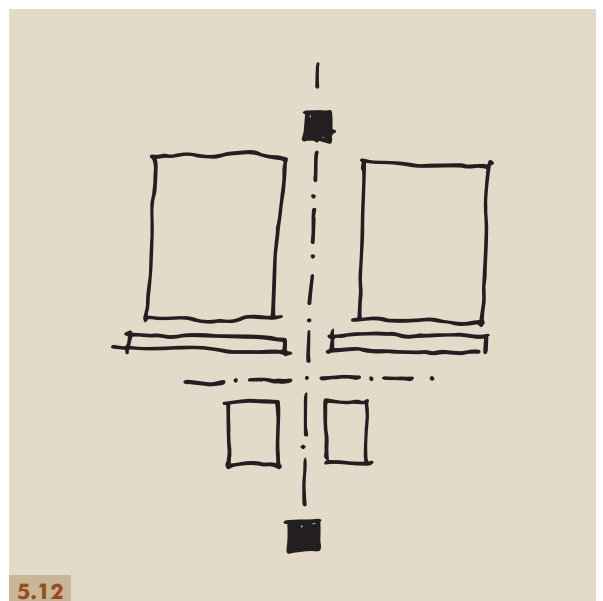
Finally, Versailles – the peak of Le Nôtre’s work – far exceeding the scale and magnificence of his previous projects. It is clear from the plan (Figure 11) that Le Nôtre stayed true to his key organising mechanism – the axis. From this, the planting, terraces, avenues and pathways were laid out in a harmonious, logical system.

**Fig. 5.11** Engraving of Versailles (1746) by Jean Delagrive (Inexhibit 2018)  
**Fig. 5.12** Axis and focal point in landscape design are powerful design principles (Author 2019)



5.11

Le Nôtre’s work is an example of formal expression – which was achieved using a relatively minimal palette of lawn, gravel, shrubbery and water. His formal and geometrical organisation of space expressed human dominance over nature, while simultaneously embracing nature – although heavily controlled. Peter Walker has stated that minimalism does have “many compelling affinities with classicism (Walker 2006:207). Le Nôtre’s work reminds contemporary landscape architects about the value of formality and basic yet powerful landscape design principles such as axis, focal point and symmetry (Figure 5.12).



5.12

## 5.3 MINIMALIST LANDSCAPE ARCHITECTS

### 5.3.1 Andrea Cochran

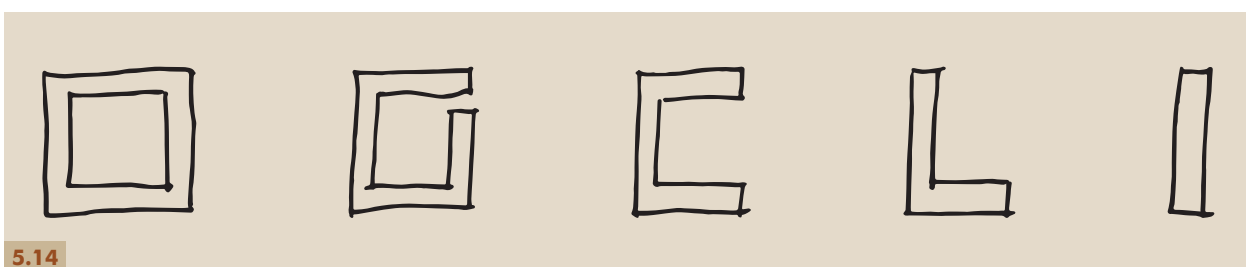
Acclaimed landscape architect Andrea Cochran is best known for her serene, minimal landscape designs. Cochran is particularly inspired by minimalist sculptors such as Walter De Maria, Robert Irwin, Donald Judd and Richard Serra. She highlights the installation *Two Running Violet V Forms* (Figure 5.13) by Irwin as suggesting space (Garden n.d.). Situated within a Eucalyptus grove, the installation consists of two, fence-like structures in a V-form. The violet, plastic-coated, chain-like material is supported on stainless steel poles that average a height of 7.5 metres. This simple intervention acts as a screen which reflects the changes in light throughout the day – giving the viewer a diverse experience of the grove which is dependent on the season and time



of day. Cochran believes, design is an “editing process.” She elaborates: “It’s stripping away the unnecessary and bringing it back to essential qualities of space and place. It’s about highlighting the quality of the place, making the invisible to become visible” (Nob Hill Gazette 2019). For Cochran, design is an iterative process in which she seeks a “purer” iteration from the last (Figure 5.14).

**Fig. 5.13** ‘Two Running Violet V Forms’ (1983) by Robert Irwin (UC San Diego Stuart Collection n.d.)

**Fig. 5.14** Stripping away until the essential is left (Author 2019)



**5.14**

Although Cochran describes herself as “very much a minimalist,” (Funderburg n.d.) she values material that expresses the passage of time such as weathering steel. Cochran uses weathering steel extensively in the Children’s Garden (Figure 5.15 – 5.17) to subtly sculpt the earth; drama is created through the contrast between the colour of the

planting and the steel. Not only is weathering steel reminiscent of the earth-like tones of soil, but it honestly displays the inevitable transformation of the material by the natural elements. Thus, through the carefully selection of material and colour, the experience of space can be heightened.



5.15

**Fig. 5.15** Children’s Garden showing dynamic design (Stewart 2002)

**Fig. 5.16** Children’s Garden (Stewart 2002)

**Fig. 5.17** Corten steel used to sculpt landscape (Stewart 2002)

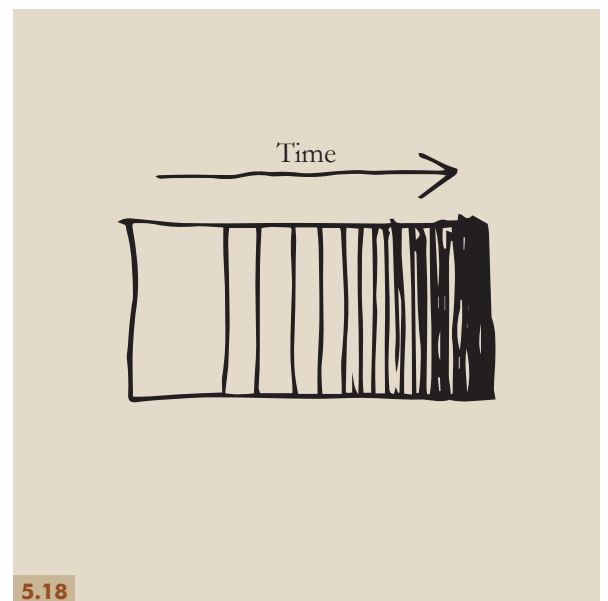
**Fig. 5.18** Passage of time expressed on material (man-made or natural) (Author 2019)



5.16



5.17



5.18

### 5.3.2 Bernard Lassus

Visual artist, colourist, landscape architect and town planner Bernard Lassus proposes a concept he calls “minimal intervention.” Lassus believes “it is not thus necessary that physical transformation occur for there to be a landscape intervention” (Lassus 1998:72), and that from this viewpoint the minimal intervention brings “other tangible dimensions to the already there” (ibid.) to highlight (or manipulate) an aspect or aspects of the “already there,” (i.e. existing) in a landscape. The word “tangible” meaning clear, definite or real and not relating only to touch but all the senses. Lassus uses his project *The Tulip* (Figure 5.19) to illustrate minimal intervention. He inserted a strip of white Bristol paper into the bell of a red tulip. Light from the sun penetrates through the red petals and emits a rosy hue onto the

paper inside the tulip. This reveals to him that an “air rosé” (ibid. p. 13) [“rosy air”] or rose-coloured light is being contained inside a “volume” created by the petals. Through the simple act of inserting a white strip of paper inside the tulip and observing this “coloured air,” his knowledge and interpretation of the tulip has transformed, even though he has not transformed the tulip physically. A botanist dissects plants to gain knowledge of them, Lassus on the other hand, gained knowledge through this non-intrusive method. Thus, a tangible dimension (the sight of the rosy hue on the white paper) has been brought to what is already there (the tulip), to highlight an aspect of the existing (the rose-coloured light contained within the bell of the tulip) without making any physical alteration(s) to the existing.



**Fig. 5.19** 'The Tulip' (1965) by Bernard Lassus (Lassus 1998)

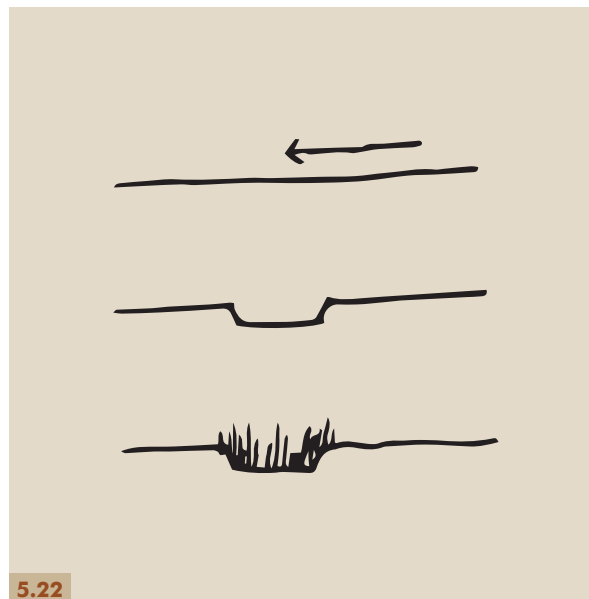
**Fig. 5.20** A minor intervention can encourage great results (Author 2019)

**Fig. 5.21** 'Secant' (1977) by Carl Andre (Walther 2000:527)

**Fig. 5.22** Grove of trees at the 9/11 Memorial (PWP Landscape Architecture n.d)

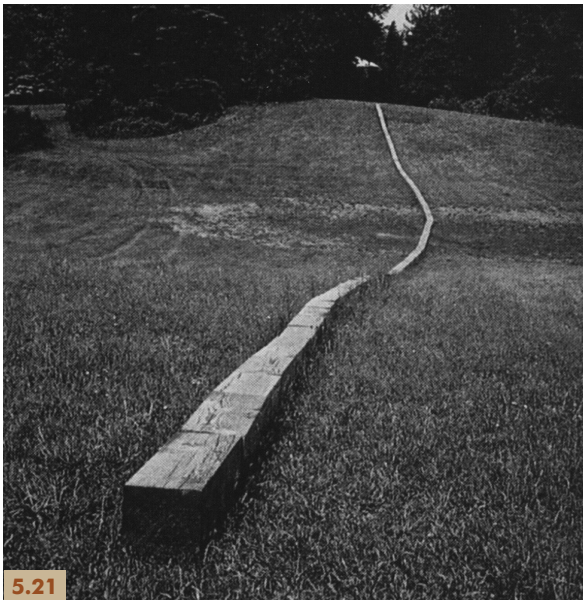
**Fig. 5.23** Large void which contrasts with the tree grove (PWP Landscape Architecture n.d)

Considering this example, minimal intervention denotes a concept of extreme delicacy to landscape design, one which can appear as if nothing was designed in the first place. It may be used to highlight nuances within a landscape such as a crack on a rock face, or a single alien plant amongst indigenous vegetation – nuances one would never notice, unless provoked. Minimal design can serve as a very provocative design approach.



**5.22**





5.21

### 5.3.3 Peter Walker

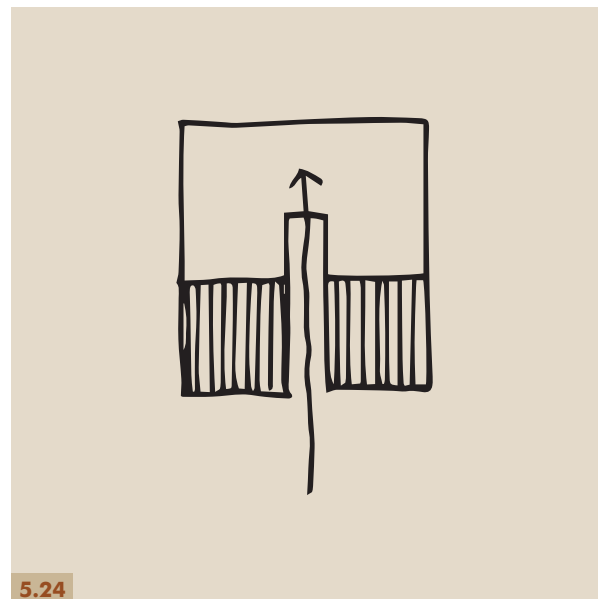
It was during a summer tour of French gardens in the 1970s when landscape architect, art collector and self-professed minimalist, Peter Walker visited Chantilly by Le Nôtre, which he describes as “a great garden of stone, water, space, and light, another example of form reduced to its essential perfection” (Walker 2006:207). It was from this point when he began to critically review his own landscape design work and noticed it was in stark contrast to the minimalist artwork he was collecting (ibid. p. 206). Walker cites the metal floor work of Carl Andre (Figure 5.2) as a powerful metaphor for gardens. He describes: “all flat ground plane and almost no third dimension, yet completely controlling the character and nature of the ‘empty’ space above” (ibid. pp. 206–207). Walker also references another work by Andre: Secant (Figure 5.21). Walker states that this “ordinary meadow” (ibid. p. 207) was transformed into a place that “demanded-and generated-consciousness” (ibid.) just by the simple placement of a long row of cut timber pieces. This delicate gesture on a relatively monotonous, unassuming landscape shifts a viewer’s perception, even if monetarily. This example demonstrates how contrast can evoke an impactful (mental) response. Walker creates significant contrast at the 9/11 Memorial using just trees. By planting over 400 trees in a grove (Figure 5.22), it contrasts with the two sculptural voids (Figure 5.23) where the Twin Towers once stood. Visitors are made keenly aware of the shift from shade to light, sheltered to exposed – strengthening the dramatic and emotional impact of the voids.



5.22



5.23



5.24



# 6

## **DESIGN DEVELOPMENT: MASTER PLAN**

## 6.1 APPROACH TO MASTER PLAN

As mentioned in the Theory chapter, there are three approaches to adaptive reuse: typological, strategic and technical. Typological and strategic will be explained in this chapter while technical will be explained in the Technification chapter.

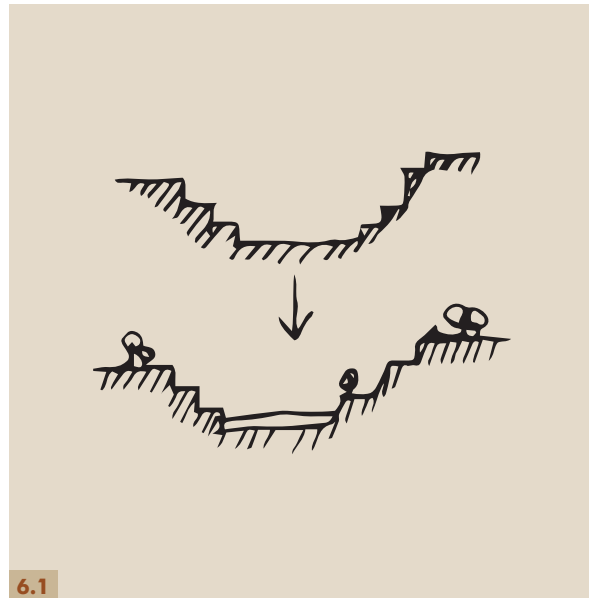
### 6.1.1 Typological

Typological is fairly straightforward – the quarry landscape type will be converted into a mixed-use park landscape type. Natural stone quarries are well suited for this transition because of their unique characteristics such as their physically stable quarry faces and benches, waterbody (Lintukangasa et al. 2011:123) and stockpile of overburden. If well-considered, these features can be utilised in the adaptive reuse of Quarry X.

### 6.1.2 Strategic

Within landscape design, one can discern two general strategies to how wasted sites (which includes urban quarries) are perceived and therefore approached in terms of their reuse (Höfer & Vicenzotti 2013). Table 6.1 outlines these two design strategies as well as the combination approach the dissertation will apply to Quarry X.

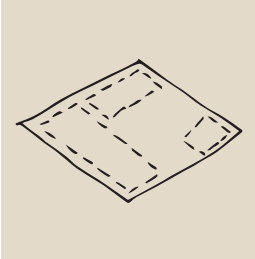
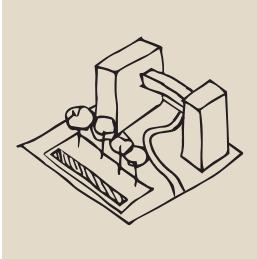
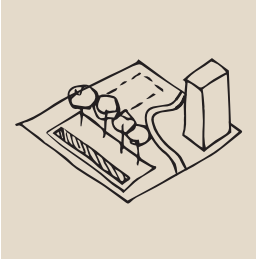
The “Clean Slate” strategy is generally characteristic of American adaptive reuse projects, while the



6.1

“Idealisation” strategy is characteristic of European projects (especially in Germany) (Höfer & Vicenzotti 2013:406).

Quarry X is a landscape-dominant site that is not characterised by many buildings and/or structures such as steel factories for example. Therefore, much of the site manipulation is with regards to the landscape.

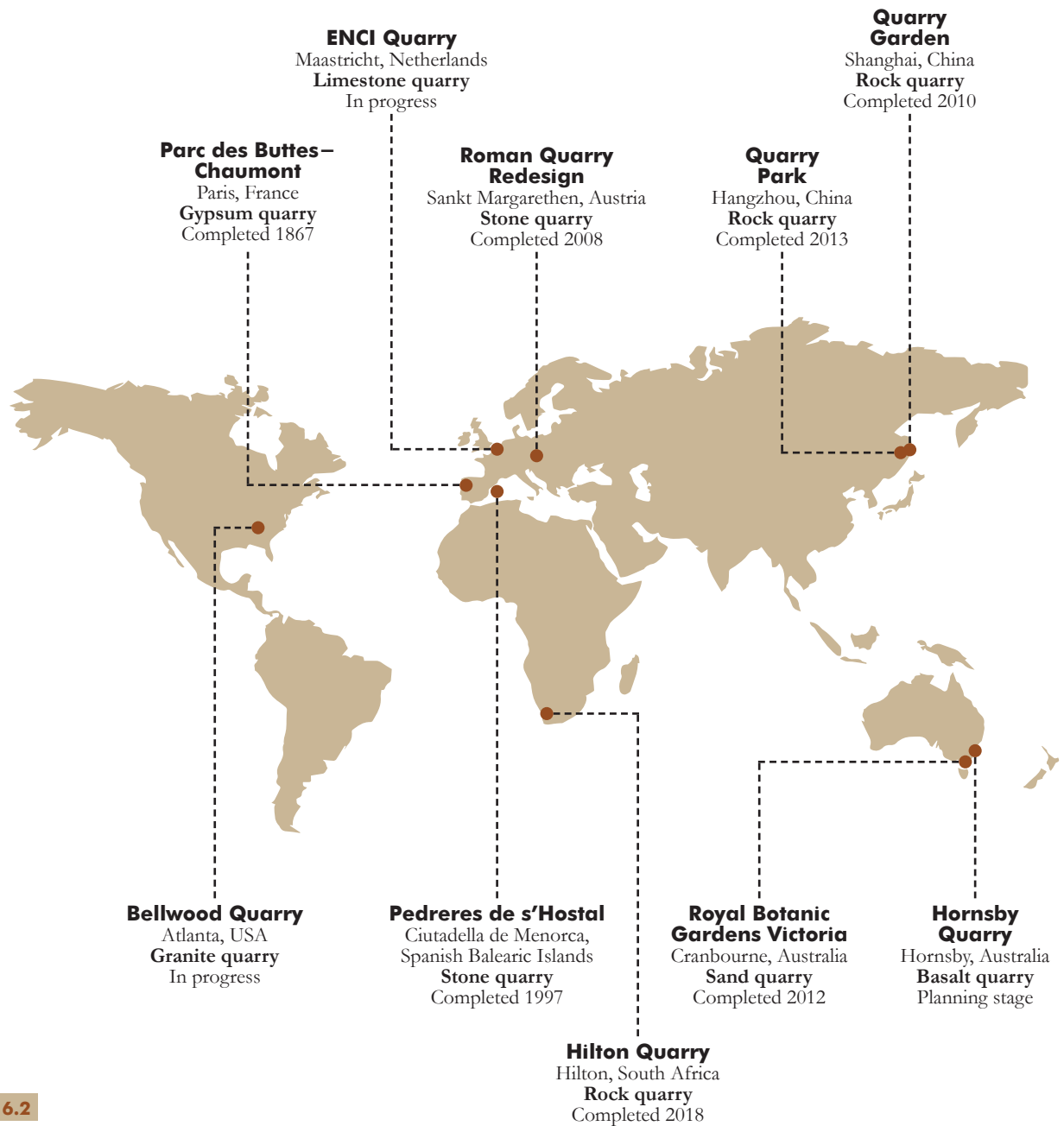
CLEAN SLATE	IDEALISATION	COMBINATION
		
<ul style="list-style-type: none"> <li>• Site considered as an opportunity for economic development in metropolitan areas</li> <li>• Site remediated of any environmental hazards as far as possible to improve public health and protect investors from any future liability</li> <li>• Heritage aspects (such as buildings and machinery) and spatial qualities of site often erased</li> <li>• Romanticised view of historic industrial relics which are often used as merely decorative elements</li> </ul>	<ul style="list-style-type: none"> <li>• Site appreciated for its indifference and seen as a unique space with a specific character</li> <li>• Sites seen as part of nature or wilderness (an idea related to the nature conservation movement)</li> <li>• Entire site signifies an important component of an area’s cultural history worth maintaining and/or celebrating</li> <li>• Existing structures understood as complex systems and considered as one layer of information in the design process</li> </ul>	<ul style="list-style-type: none"> <li>• Quarry is viewed for its potential for economic development in the Midrand area as well as for its uniqueness</li> <li>• Site also intended to address urban issues (in relation to waste management)</li> </ul>

**Table 6.1** “Clean Slate” vs. “Idealisation” strategies (Author 2019) [Adapted from Höfer & Vicenzotti 2013]  
**Fig. 6.1** Quarry converted into landscape park (Author 2019)

Table 6.1

## 6.2 PRECEDENTS

Globally, there are relatively few projects in which quarries have been intentionally reused to serve as public open space. Figure 7.0 indicates some of the more notable examples, where three will be described and analysed. These three were chosen as they each represent a different strategy to the adaptive reuse of urban quarries.



**Fig. 6.2** Global map indicating projects which have (or are planning to) reuse quarries as public, open space (Author 2019)

### 6.2.1 Parc des Buttes–Chaumont

**Program:** Public park  
**Engineer:** Adolphe Alphand

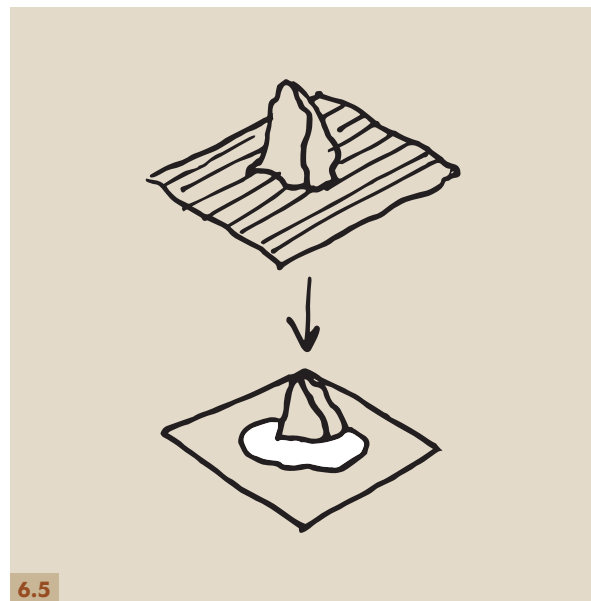
One of the first notable transformations of a quarry site into a public, green open space is Parc des Buttes-Chaumont. Part of the site was exploited for gypsum and by the end of the 1850s, the quarries were exhausted (Paris Digest n.d.). Thereafter, Napoleon III decided to turn the abandoned site into a public park (ibid.). Extensive earthworks were carried out to create a cave within the quarry, a lake (Figure 6.3) and a waterfall (ibid) – completely transforming the initial appearance of the site into a picturesque oasis. Furthermore, new elements inspired by classical architecture were added.

#### 6.2.1a Conclusions Drawn

Existing landforms on site can be manipulated in ways to create a unique experience for visitors. There is an idealisation of the old site through the incorporation of the gypsum cliff, however, it appears from present-day images, that other remnants of the old site were destroyed. Including those which may have added an additional attraction to the park.



**Fig. 6.3** An artificial lake surrounds the steep cliffs of the former gypsum quarry at Parc des Buttes-Chaumont. Temple de la Sibylle sits at the top of the cliff. Photo taken between 1890 and 1900 (Gallica n.d.)  
**Fig. 6.4** Parc des Buttes-Chaumont (Vandevivere 2007)  
**Fig. 6.5** Park manipulated and transformed to a typical picturesque scene (Author 2019)



## 6.2.2 Quarry Garden

**Program:** Public park

**Landscape Architect:** THUPDI & Tsinghua University, Beijing

Through ecological restoration and culture reconstruction strategies, this abandoned quarry was transformed from a hazardous, inaccessible space, to an attractive landmark. Visitors can experience the magnitude of the quarry in all its honesty, as well as the natural landscape.

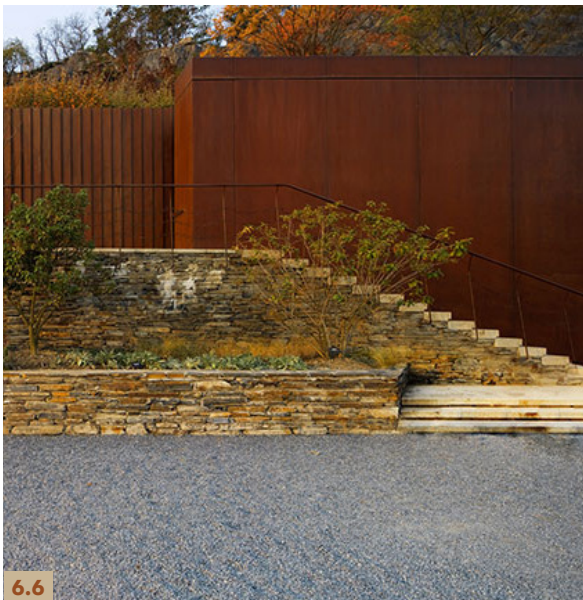
Based on the site analysis, the site was split into three areas, each with different design strategies to respond with the different area conditions. The Lake Area reconstructed the landform and enriched the ecological community through an understanding of oriental natural landscape culture. The Platform

Area improved spatial sequence and the ability for sightseeing around the landscape. Finally, the Deep Pool Area created a dramatic route for visitors to explore the quarry from other angles (ASLA 2012).

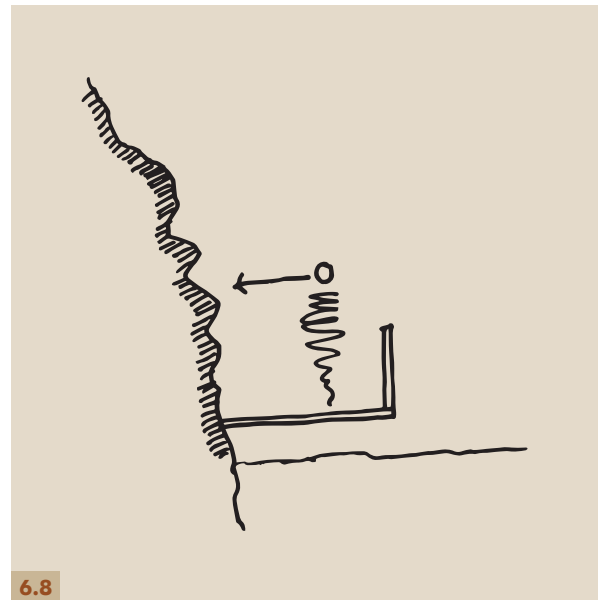
### 6.2.2a Conclusions Drawn

The design unapologetically celebrates the local mining industry by allowing users to get up-close-and-personal with the “rough” areas of the quarry, such as the cliff face by the Deep Pool. This gives visitors a more enriching experience of the entire landscape in addition to the ecological and social benefits.

Furthermore, by splitting the site into different areas and strategies rather than implementing a generic strategy over the entire site, the final design was comprehensive and site specific.



6.6



6.8

**Fig. 6.6** Natural stone used at Quarry Garden (Chen 2012)

**Fig. 6.7** Aerial view of Quarry Garden showing the different areas (Chen 2012)

**Fig. 6.8** “Rough” areas of the site celebrated (Author 2019)

**Fig. 6.9** Viewing platform at ENCI Quarry overlooking the large extent of the site (Afasia Arch Zine 2018)

**Fig. 6.10** Extent of viewing platform and stairs (Afasia Arch Zine 2018)

**Fig. 6.11** Steel stairs leading down ENCI Quarry (Afasia Arch Zine 2018)

**Fig. 6.12** Movement and pause to take in unique elements of the site (Author 2019)



6.7

### 6.2.3 Recovery of The ENCI Quarry — Luikerweg Viewpoint and Stairs

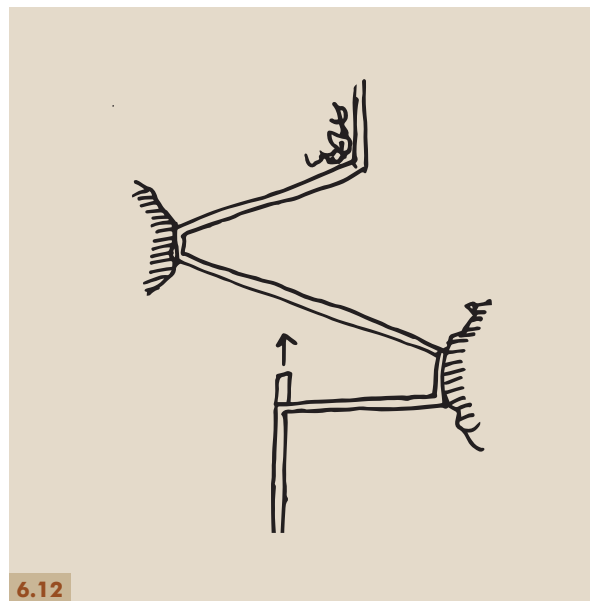
**Program:** Viewpoint and trails  
**Architect:** Rademacher de Vries

This scenic route is part of a larger scheme to transform the first and only cement quarry in the Netherlands into a natural reserve. First, visitors are led to panoramic views of the quarry before descending 50 metres down a staircase and into the quarry where they have intimate access to an uncommon landscape within the context. Rest areas are strategically positioned with stratigraphic transitions that mark major geological events in the history of the earth. Furthermore, the platform is symbolically aligned with the Luikerweg—the old road that used to connect The Netherlands to Belgium.

When the large-scale transformation is completed, the connection between the neighbouring countries will also be restored (Afasia Arch Zine 2018).

#### 6.2.3a Conclusions Drawn

This intervention is more subdued compared to the previous two precedents. The focus here is on movement and pause – this allows visitors to appreciate aspects of the site which are probably less known to the public (such as the geological strata). Beyond the spectacular views, each quarry has unique aspects and/or qualities which can be utilised to enhance the visitors experience of the site.

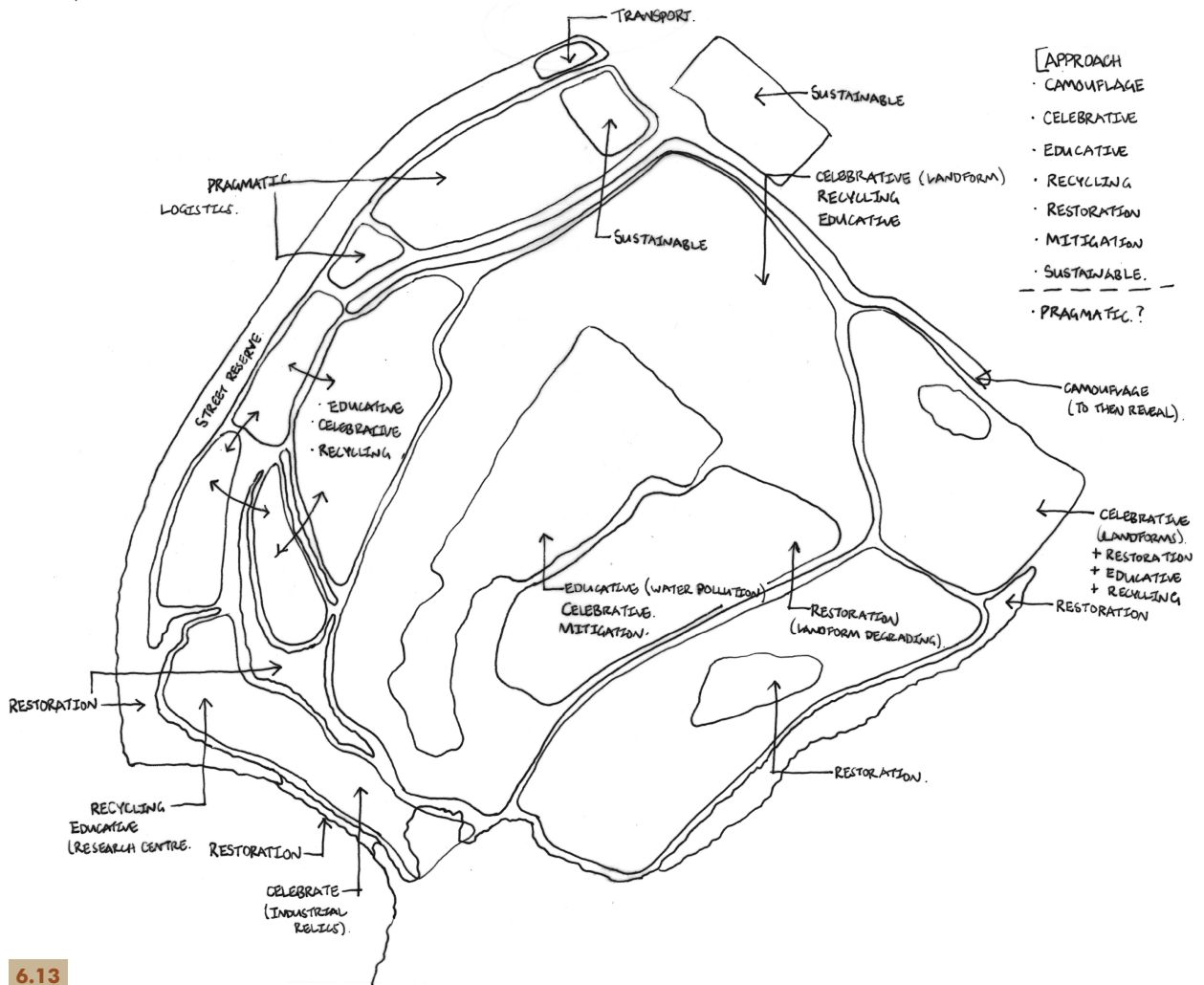




## 6.3 MASTER PLAN DEVELOPMENT

### 6.3.1 Initial Zoning

Initial zoning of the site was characterised under seven general sub-approaches set out by Mira Engler (1995). These sub-approaches are: camouflage, restoration, recycling, mitigation, sustainable, educative and celebrative. Engler applied these sub-approaches to “waste landscapes” – literally disposal and treatment facilities; however these sub-approaches are equally relevant to wasted sites in general (such as Quarry X). As the master plan was iterated, the sub-approaches were shifted and/or added/subtracted from each area.

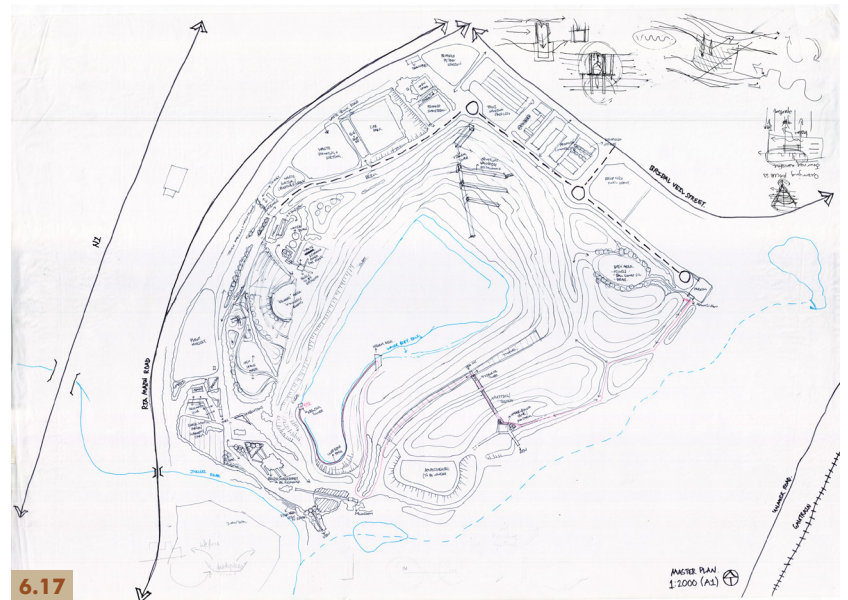


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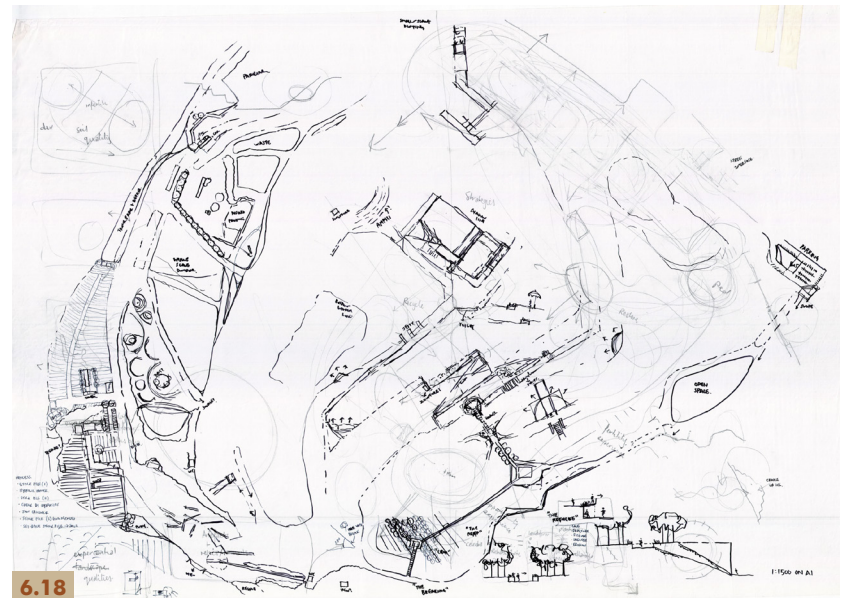
**Fig. 6.13** Initial Master Plan zoning (Author 2019)



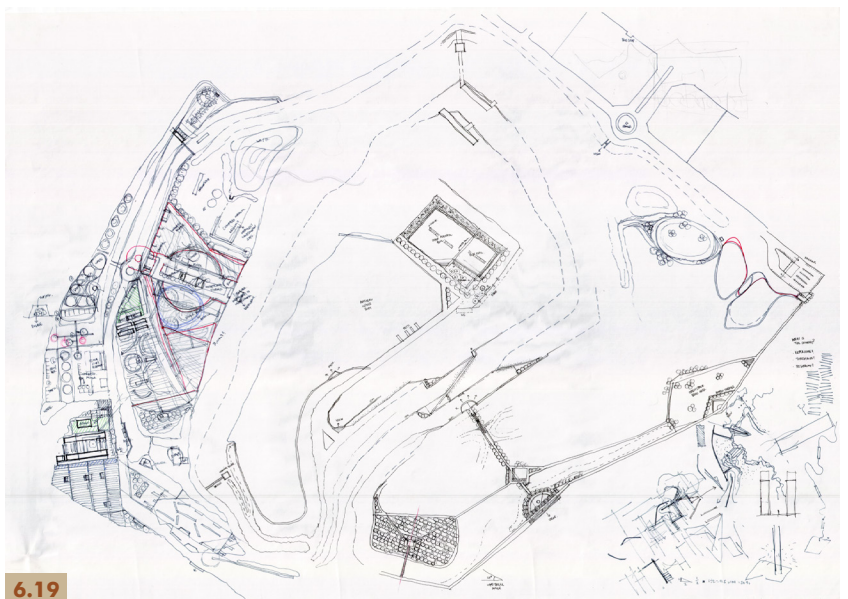
**Fig. 6.17** Active programmes moved to the west area of site. Addition of buildings within quarry (Author 2019)

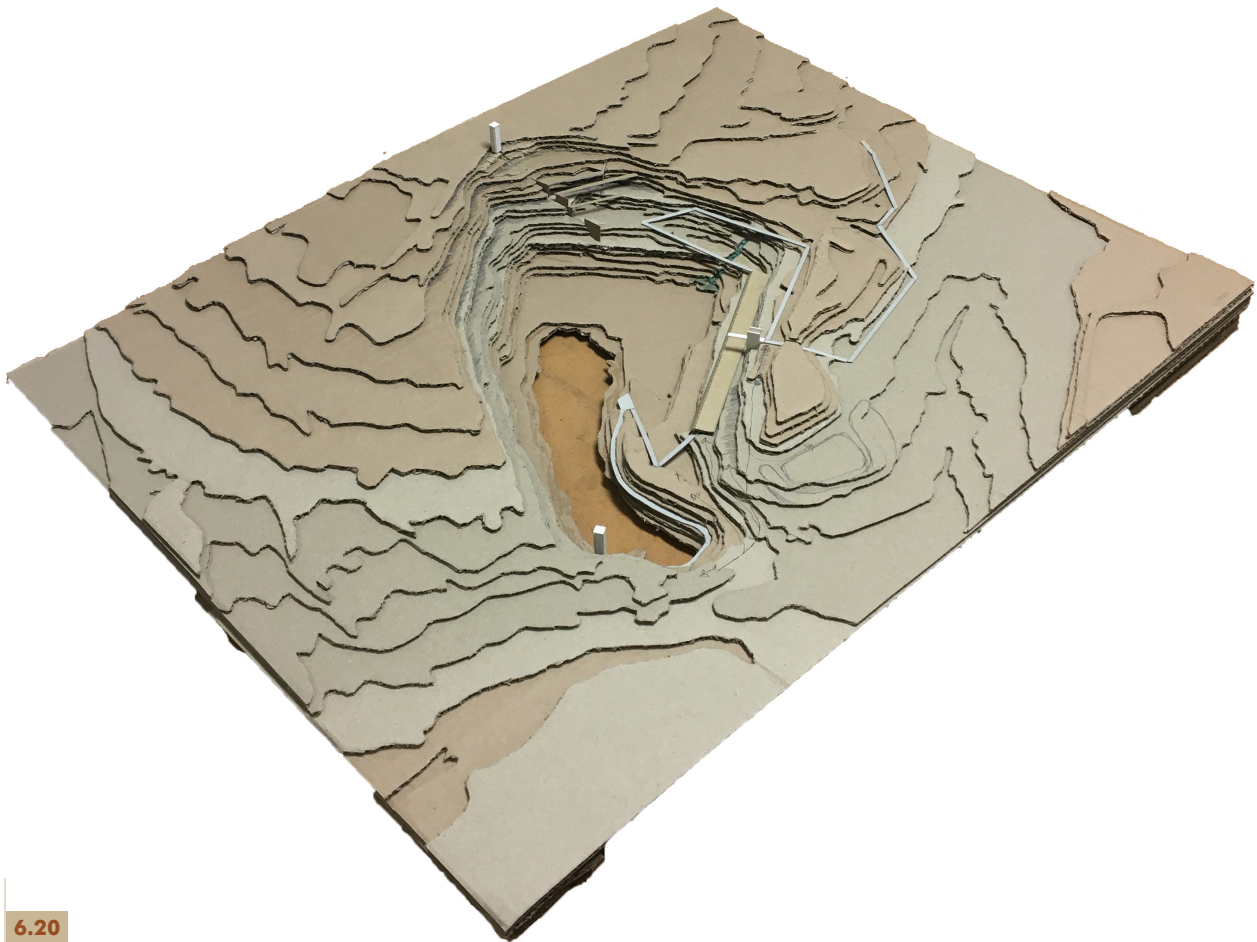


**Fig. 6.18** Exploration of experiential walkway to the east of site. Addition of natural pool at the bottom of quarry (Author 2019)



**Fig. 6.19** Formalisation of areas (Author 2019)

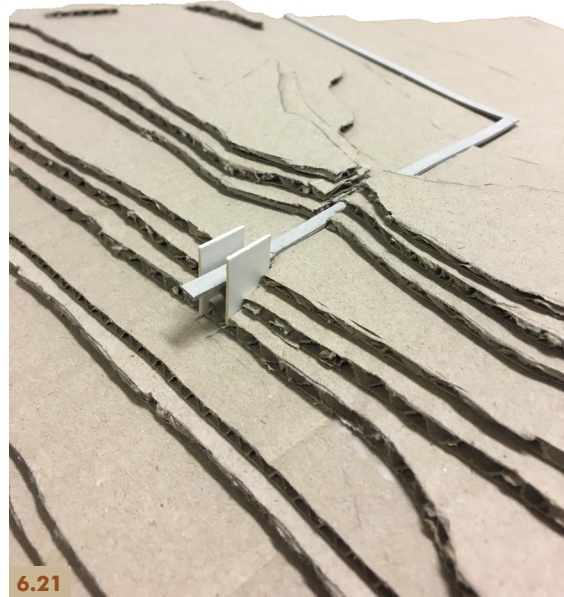




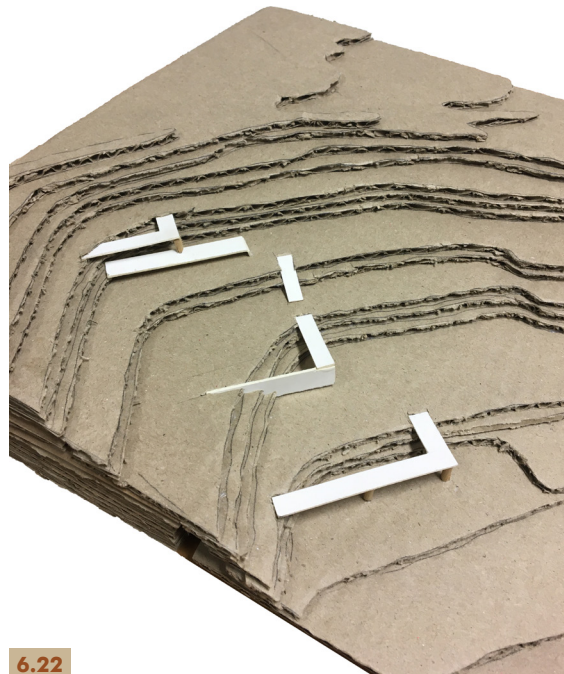
6.20

**Fig. 6.20** Model exploring experiential walkway in/ out of quarry, with viewing platforms and viewing towers at key intervals (Author 2019)

### 6.3.3 Moments within Master Plan



**Fig. 6.21** Model exploration of main lookout point (Author 2019)



**Fig. 6.22** Model exploration of restaurant, event space, gallery and viewing platform (Author 2019)

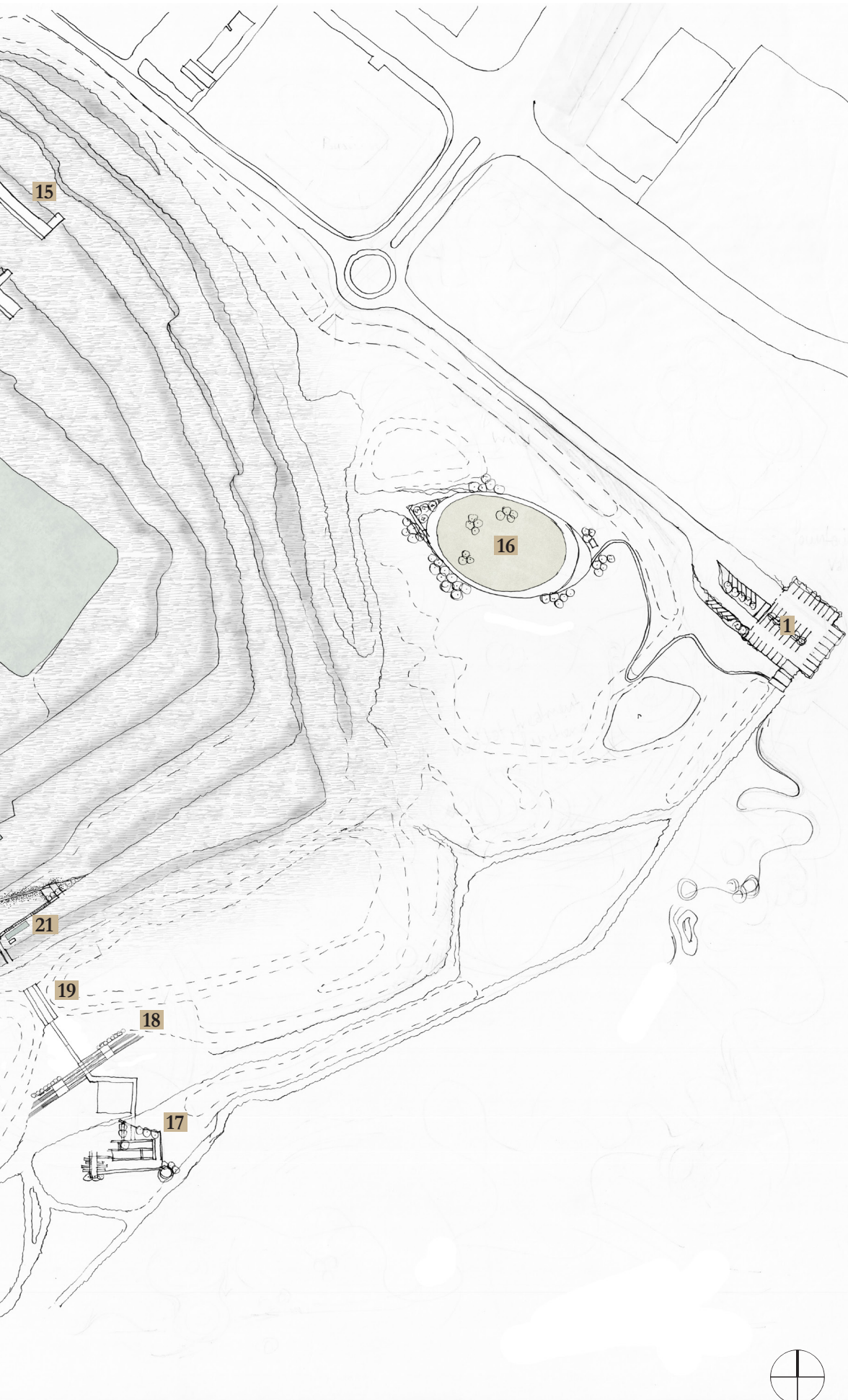
# 6.4 FINAL MASTER PLAN



6.23

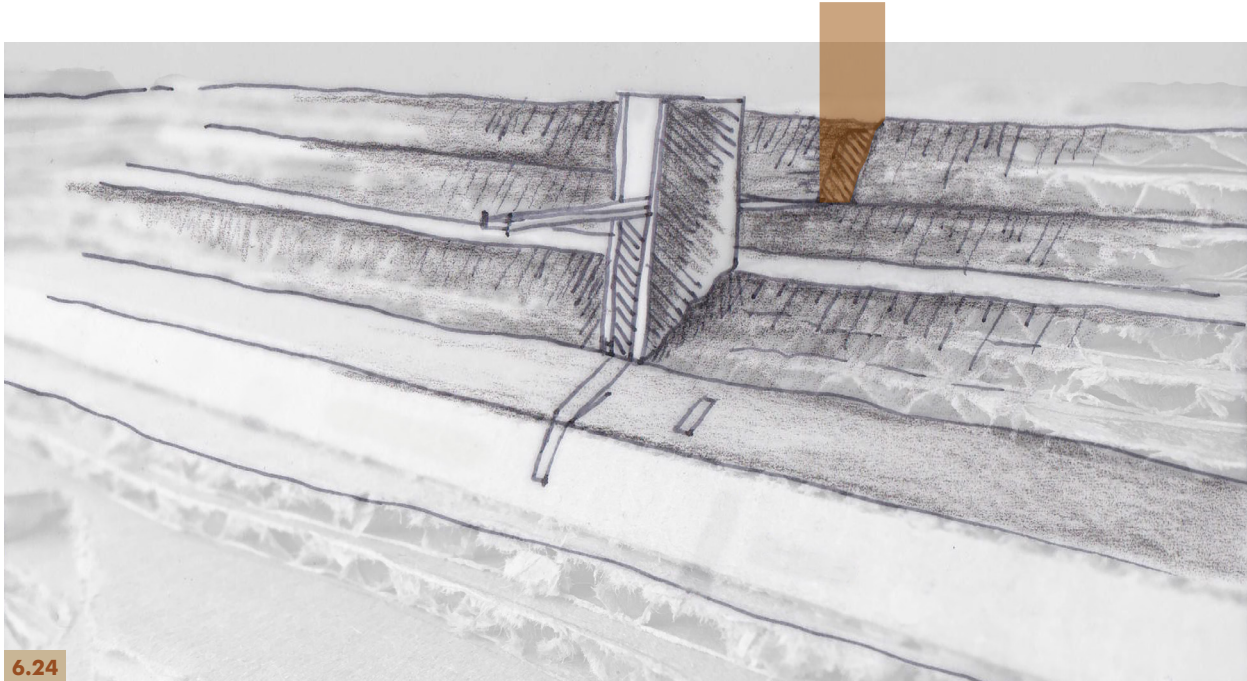
**LEGEND**

1. Parking
2. Stockpile Square
3. Café
4. Plant nursery
5. Reservoir
6. Builders' rubble sorting, processing and distribution
7. Paper, plastic, glass (from visitors) sorting and distribution
8. Biodiversity research hub
9. Experimental farm
10. Relic Square
11. Viewing tower
12. Jetties
13. Constructed wetland
14. Viewing platform
15. Restaurant, event space and gallery
16. Great lawn
17. The Settlement
18. Ramped terraces
19. The Cut
20. The Sublime and The Descent
21. Pool

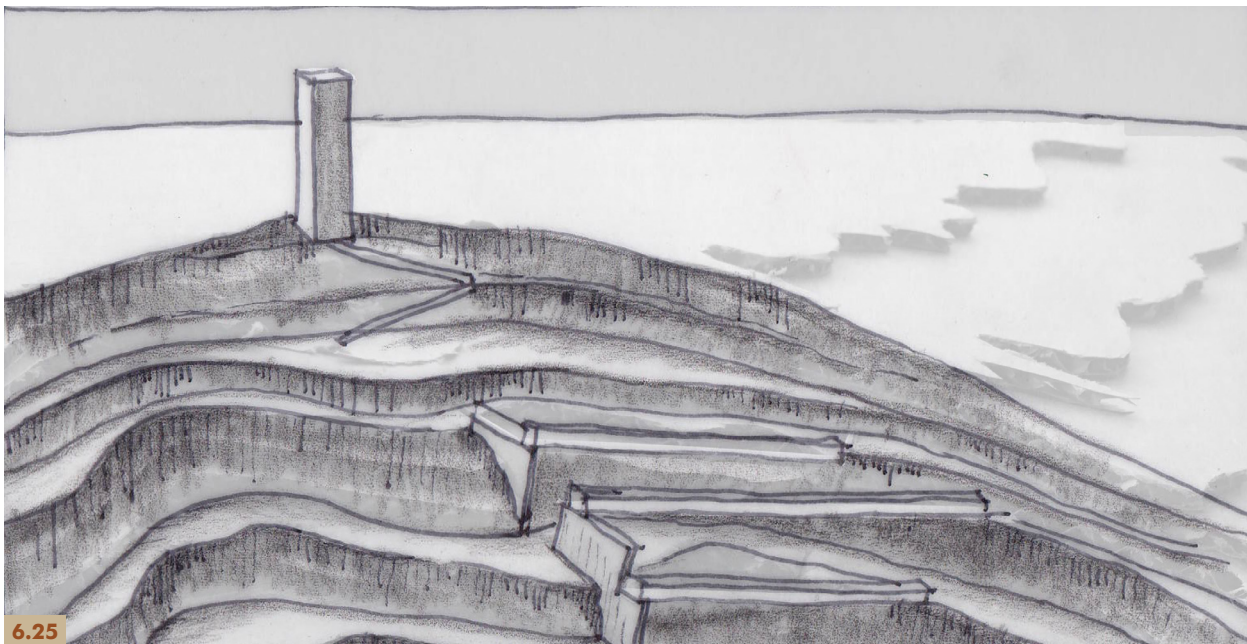


**Fig. 6.23** Final Master Plan. Not to scale (Author 2019)

### 6.4.1 Master Plan Perspective Images



6.24



6.25

**Fig. 6.24** Perspective of The Sublime, indicating entrance/exit through mound (Author 2019)  
**Fig. 6.25** Perspective of viewing tower and horizontal spanning restaurant, event space and gallery on quarry terraces (Author 2019)





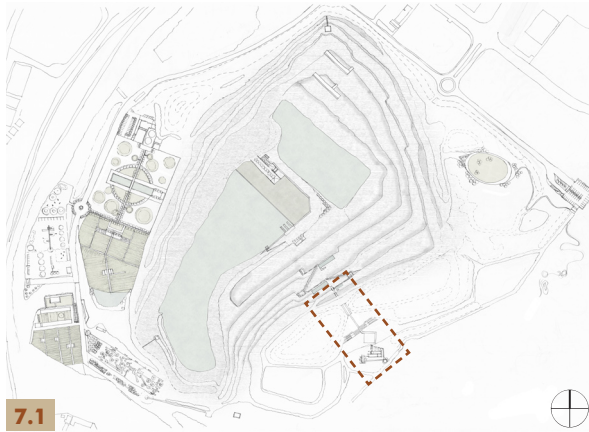


**7**

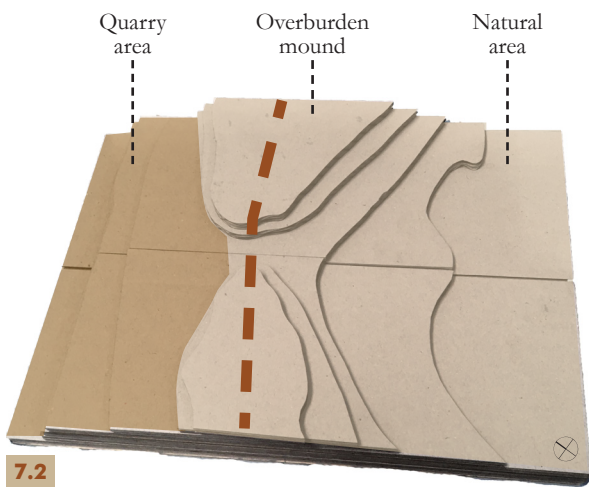
**DESIGN DEVELOPMENT:  
SKETCH PLAN**

## 7.1 INTRODUCTION

The sketch plan area focuses on part of the experiential route into and down the quarry (Figure 7.1) which is inspired by Midrand’s cultural resources. The area was chosen as there is a distinct transition between the “outside,” natural area of the site, and the “inside,” artificial quarry (Figure 7.2). This transition is made even more apparent as an overburden mound separates the two sides. A powerful and meaningful route can be designed (using a minimal design approach) which capitalises on this visual and spatial contrast.



7.1



7.2

**Fig. 7.1** Master Plan indicating Sketch Plan area (Author 2019)  
**Fig. 7.2** Two distinct areas separated by an overburden mound (Author 2019)

## 7.2 PRECEDENT

### 7.2.1 Cultural Landscape Path in the Regional Park of The Minci

**Location:** Virgilio, Mantova, Italy

**Program:** Rest areas

**Architect:** Archiplan Studio

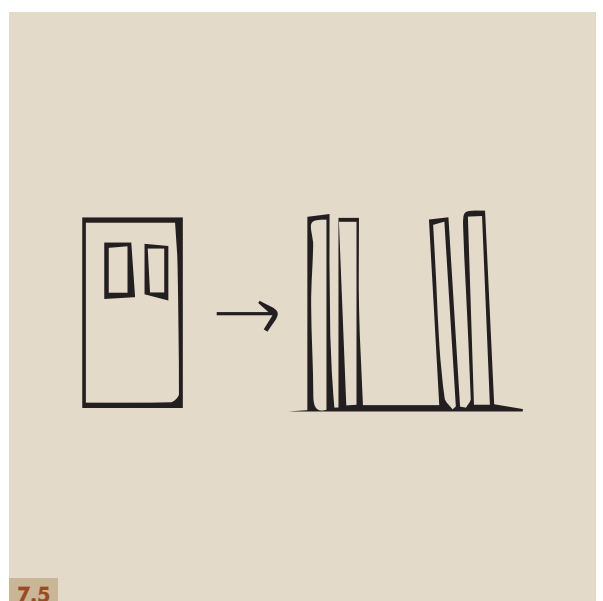
**Completion:** 2013

This project consists of five lightweight structures or “landmarks” along a pedestrian path that runs along the bank of a river. The path is located within a historically and culturally significant landscape where the cultural attraction is the figure of the Roman poet Virgil. His poetry is integrated with the river landscape through the series of structures.

The rest areas and accompanying structure are: the “door courier” (Figure 7.3) which is placed to correspond with an ancient post road, and emphasizes its geographical position. The “gate of the fort” (Figure 7.4) is configured as formal reference marks and the presence of the nearby fort of Pietole from which he draws the figures of bastions. The “gateway to the Eclogues” points metaphorically to the landscape fragment described by Virgil in his poems. The “door of the Georgics,” placed at the same Virgilian ancient court, represents the balance between nature and man’s work sung by Virgil in his opera. Finally, the “door of Travata” located in a pumping station of the 20th century celebrates man’s attempt to govern the natural element of water (Landezine 2013).

#### Conclusions drawn

Physical site conditions and Virgil’s poetry is not interpreted too literally by the designers – this results in a thoughtful design response which does not distract from the surrounding cultural landscape, but draws attention to aspects within it. Moreover, the restricted material palette and use of weathered steel for all the structures creates unity between the “family” of installations.



**Fig. 7.3** The “door courier” (Mambrin 2013)

**Fig. 7.4** The “gate of the fort” (Mambrin 2013)

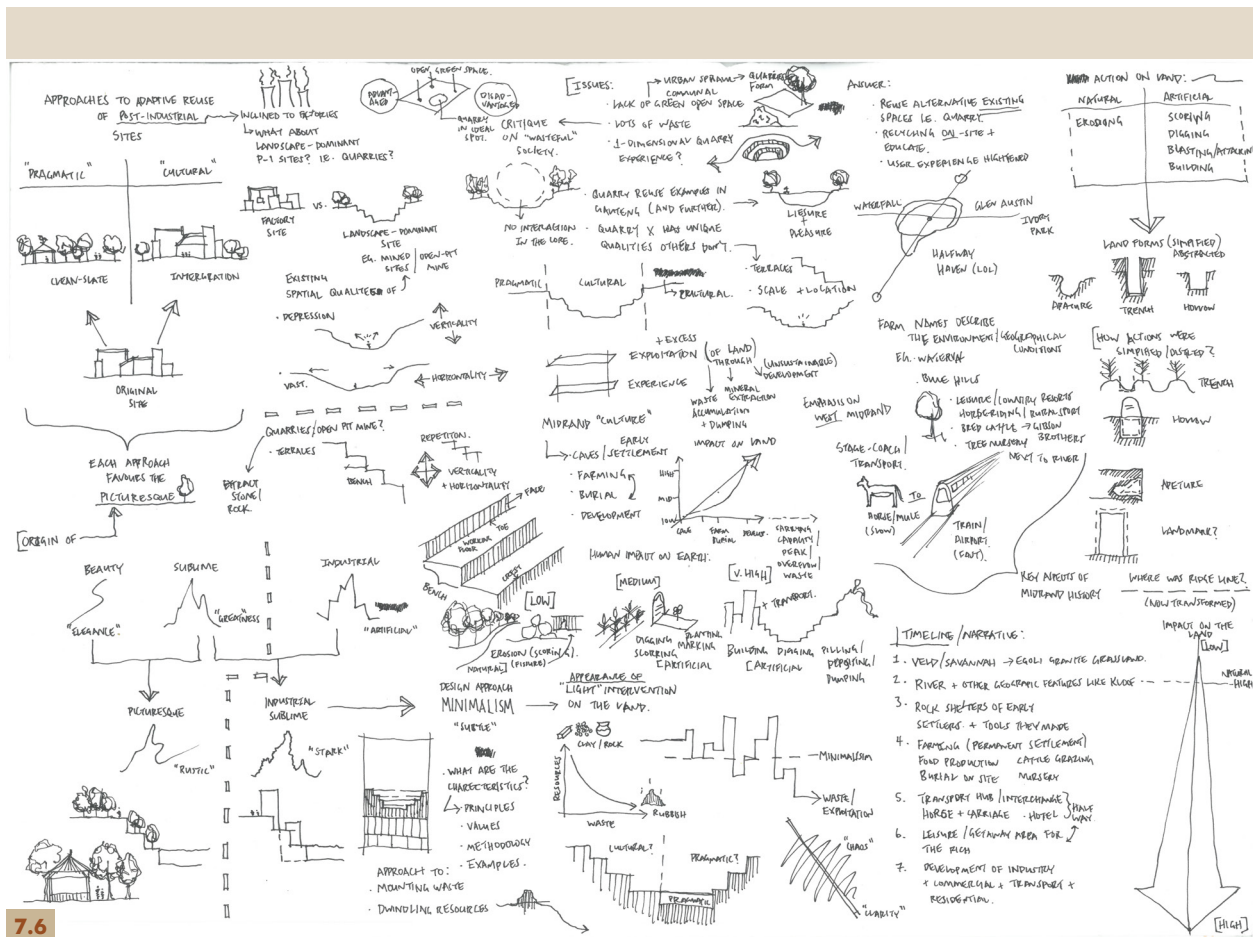
**Fig. 7.5** Inspirational for design not interpreted too literally (Author 2019)

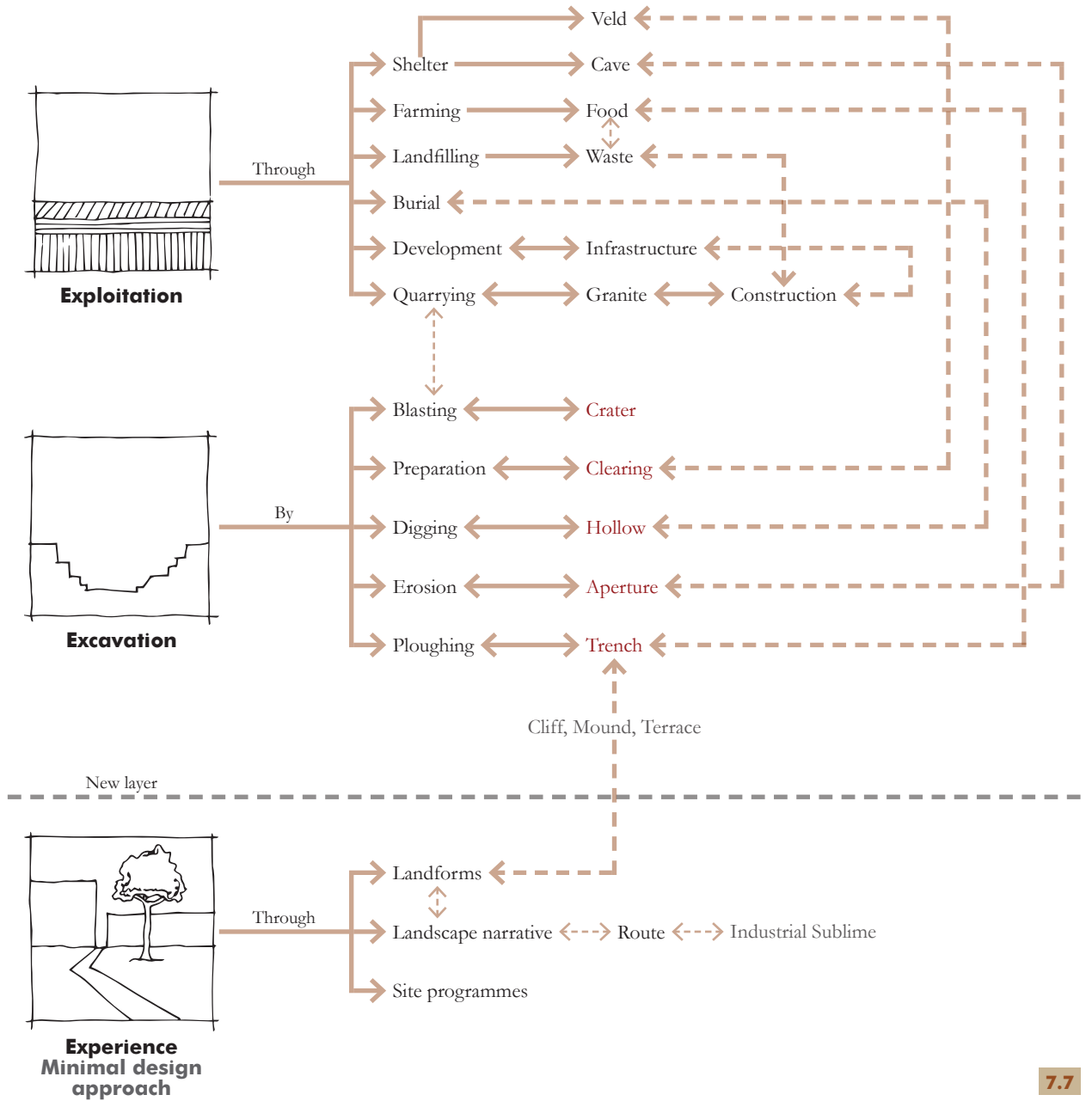
### 7.3 CONCEPT

The concept began to take form after an all-encompassing exploration of the themes and research presented thus far (Figure 7.6): unsustainable waste management practices, lack of public green open space, urban sprawl, the industrial sublime, narrative in landscape and minimalism. Key elements were extracted and summarised in a conceptual mind-map (Figure 7.7). Quarry X, and the context Quarry X is situated in, has been subject to different forms of exploitation and excavation. The land is exploited (made use of) for beneficial purposes – whether it is to conceal waste or grow crop. The forms of exploitation stated in the mind-map undoubtedly impact the land to varying extents. This exploitation is performed through excavation methods – of which five spatial forms were identified. The new, experiential, layer derives cues from

these spatial forms – this will be further explored in this chapter. The experiential layer also acts as a sobering reaction against the “excess” that the exploitation and excavation layers represent. The notion of contrast was first brought up in the conclusion of the industrial sublime section of the Theory chapter, where a minimal landscape design approach was seen as appropriate.

**Fig. 7.6** Exploration of concept (Author 2019)  
**Fig. 7.7** Mind-map of concept (Author 2019)



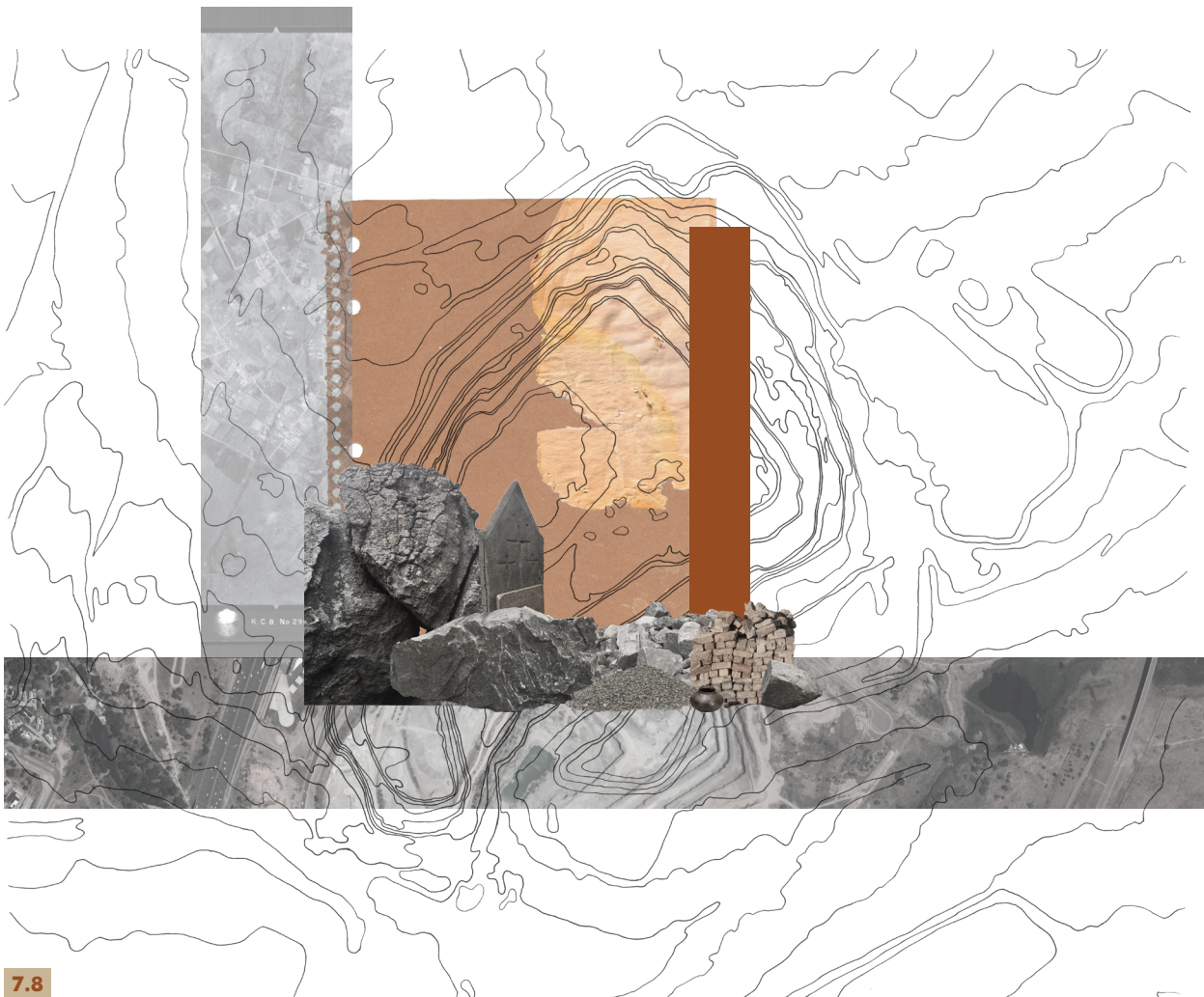


## 7.4 THE NARRATIVE

### 7.4.1 Summary

As mentioned in the “Narrative in Landscape” section in the Theory chapter, a narrative embedded in the landscape can inform the spatial landscape design and communicate a local sense of place.



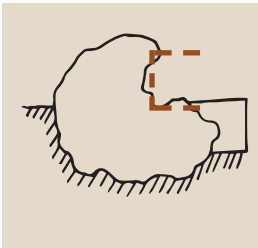

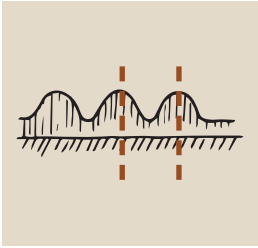

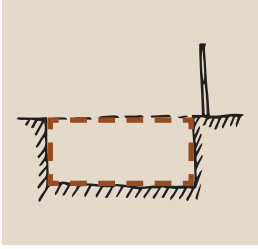


In line with keeping an open narrative, as Potteiger and Purinton (1998) recommend, inspiration for the narrative was derived from Midrand’s cultural resources and what was interpreted by the author as the “accumulation of excavation and exploitation in Midrand” (Figure 7.8). These cultural resources exhibit stories of multiple “authors.” The narrative is summarised in Table 7.1 according to two of the realms outlined by Potteiger and Purinton’s (1998b:137) [see Page 68 for full description of realms]. In addition, spatial forms extracted from each phase of the story is also included.



7.8

**Fig. 7.8** Conceptual image of the accumulation of excavation and exploitation in Midrand (Author 2019)



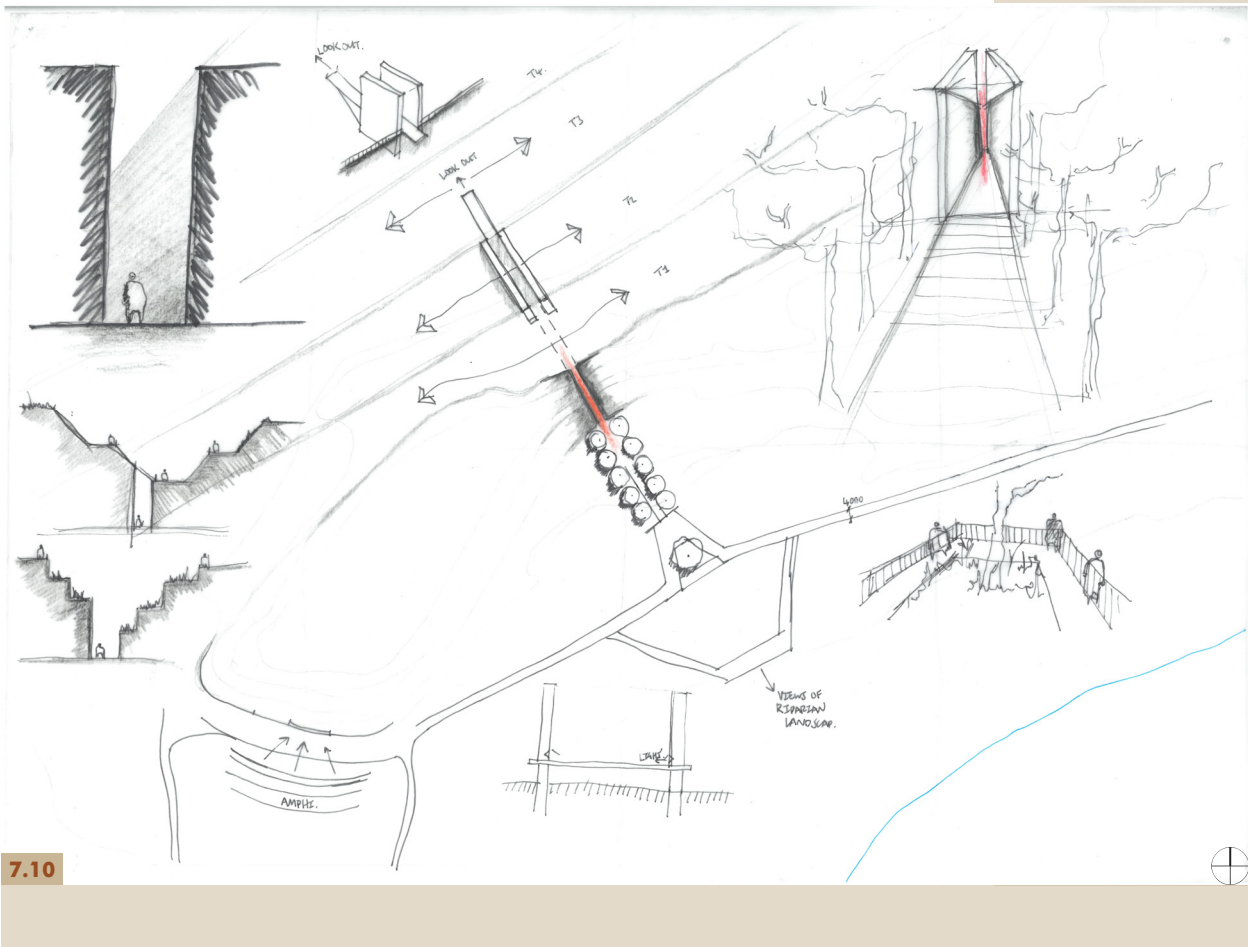
STORY REALM	CONTEXTUAL REALM	SPATIAL FORM
Hunter-gathering	 <p>Mia archaeological site</p>	 <p>Clearing</p>
Hunter-gathering	 <p>Glenferness Cave Rocky granite outcrop</p>	 <p>Aperture</p>
Cultivating	 <p>Brick ruins; Farmhouse; Pine tree lane; Water furrow</p>	 <p>Trench</p>
Burying	 <p>Cemeteries Burial sites</p>	 <p>Hollow</p>
Extracting	 <p>Quarry X</p>	 <p>Crater</p>

**Table 7.1** The narrative summarised according to two of the realms outlined by Potteiger and Purinton's (1998b:137), with spatial forms extracted from each phase of the story (Author 2019)

**Table 7.1**



7.9



7.10

**Fig. 7.9** Exploration of spatial forms using foam (Author 2019)  
**Fig. 7.10** Initial sketches imagining the Sketch Plan area. Not to scale (Author 2019)

### 7.4.2 The Arrangement and Naming of Zones within the Narrative

The arrangement of the narrative naturally called for the naming of the key zones within it. Naming not only bestows identity to each zone, but Potteiger and Purinton (1998) believe that naming assist in situating a place within its larger context. The names of each zone (in order) are: The Settlement, The Cut, The Sublime and The Descent (Figure 7.11).

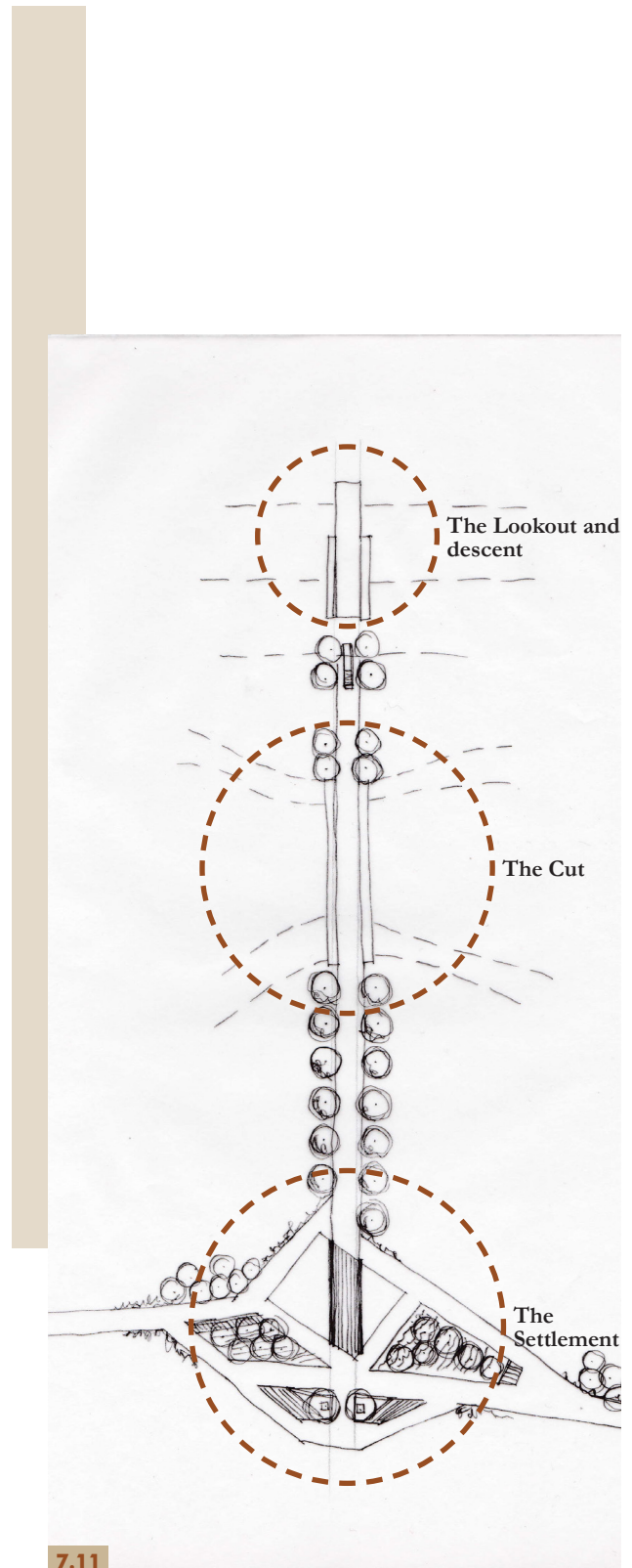
**The Settlement** is situated on the natural side of the mound and represents the earliest cultural resources pertaining to Midrand's history of hunter-gathering, agriculture and associated burial.

Once visitors exit The Settlement, they ascend towards **The Cut**. The Cut represents the stark and dramatic transition from the relatively "idyllic" landscape the visitor has left behind, and are now faced with the vast, extractive landscape. As the visitor starts to lower into the quarry, they can begin to take in its enormity and alternative beauty.

But it is not until they reach the look-out area do they see the full extent of Quarry X. Hence naming this zone **The Sublime**, as the scene they witness would be truly breathtakingly – the full extent of the sheer scale, the repetitive terraces, the cliffs and the large waterbody. This zone also demands a moment of contemplation and realisation – of the (negative) impact we as human have on our own environment.

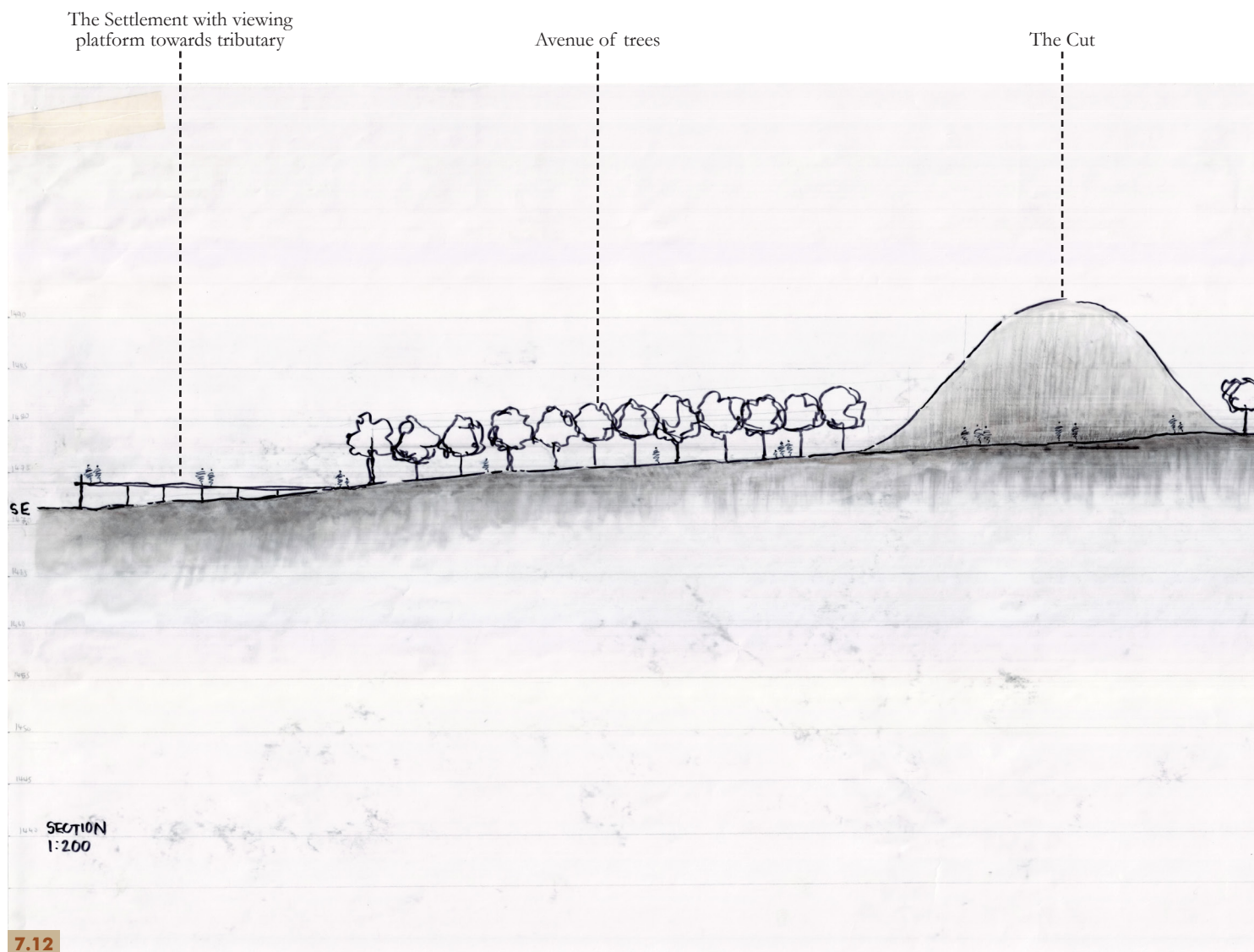
After such an overwhelming experience, **The Descent** offers some respite while still allowing larger views of the quarry during the descent. While The Sublime views the quarry on a macro, public scale, The Decent allows the visitor to observe the Quarry on a micro, intimate scale – such as the texture of the granite rock face.

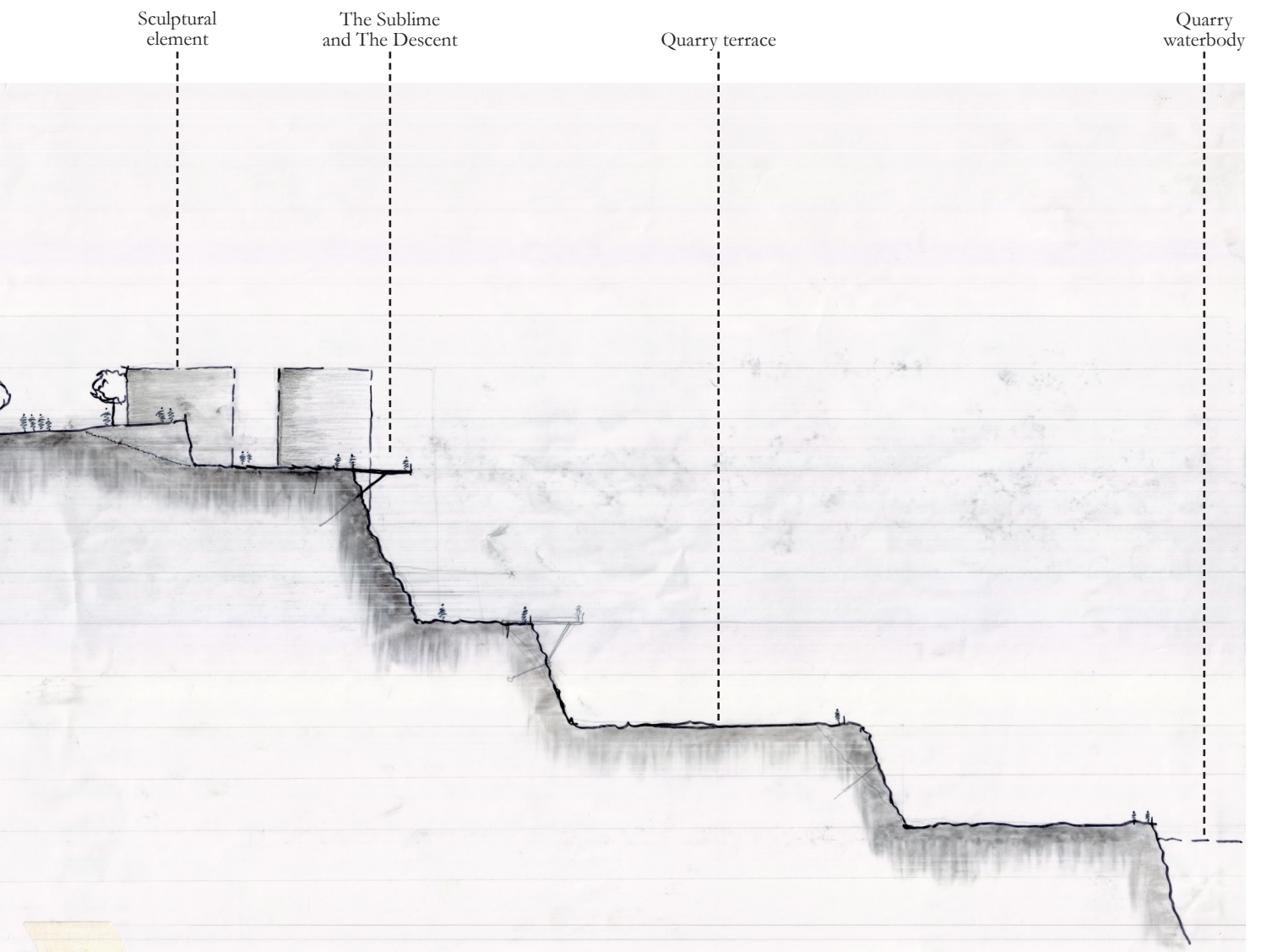
Although the zones are arranged in this manner, it will obviously not be experienced by every visitor in the order outlined above.



**Fig. 7.11** Exploration of sketch plan area highlighting the different zones. Not to scale (Author 2019)

**Fig. 7.12** Section through exploration of sketch plan area. Not to scale (Author 2019)

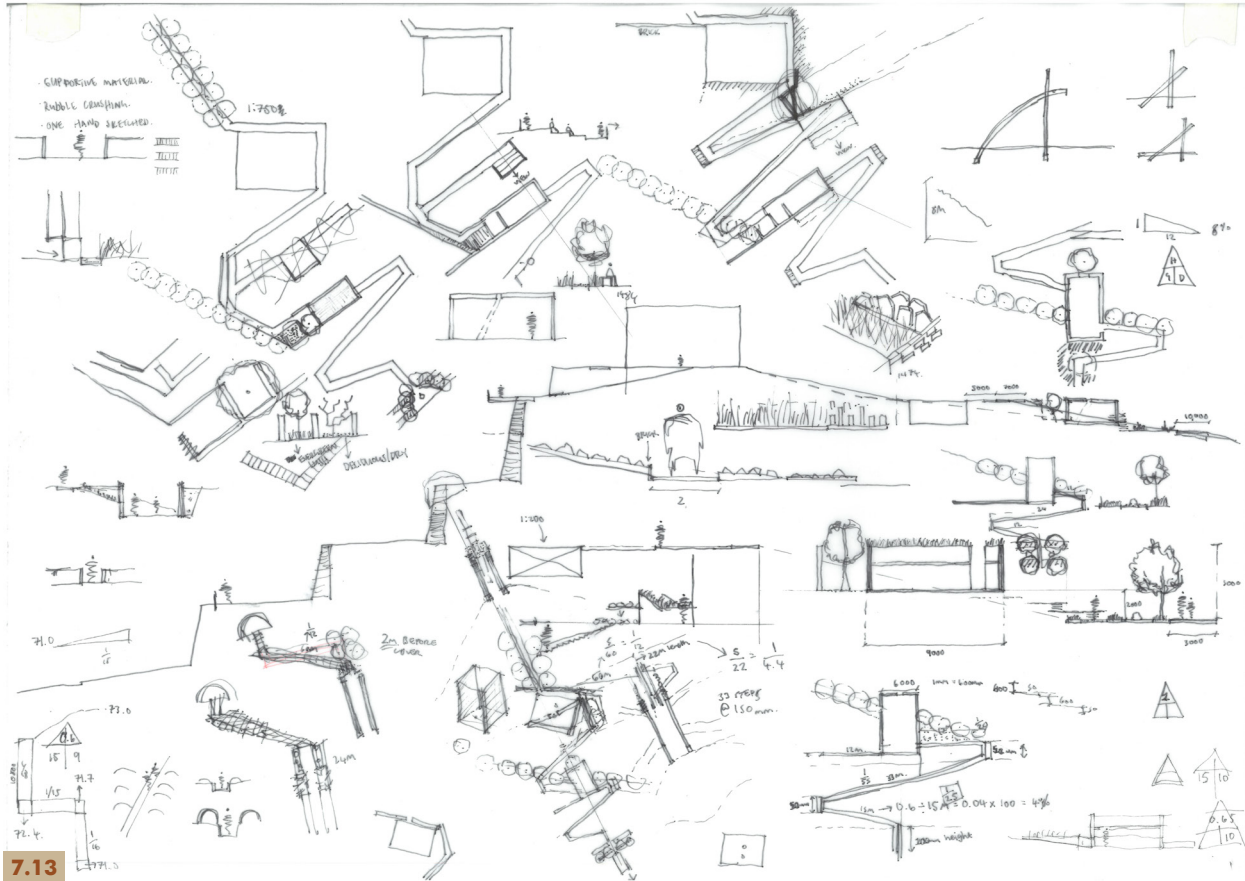




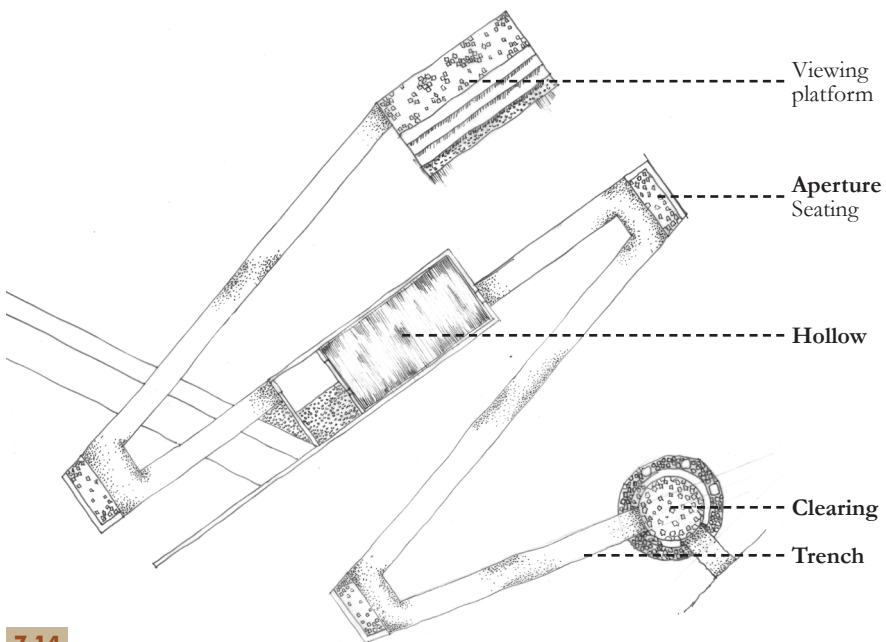
## 7.5 THE DESIGN

### 7.5.1 Exploration of The Settlement

The development of The Settlement was focused around the spatial form of the clearing, trench, hollow and aperture (Figure 7.14) – which were informed by the cultural resources in Midrand (Refer to Table 7.1).

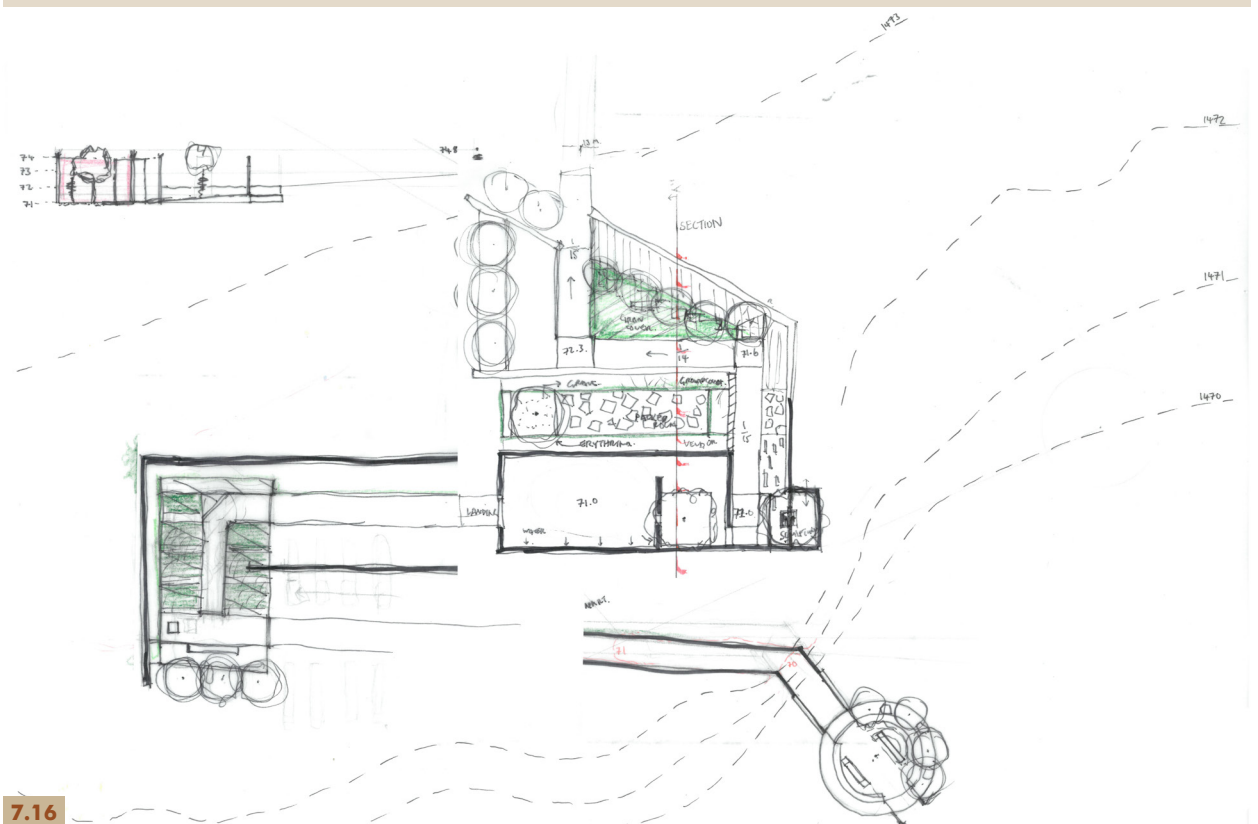
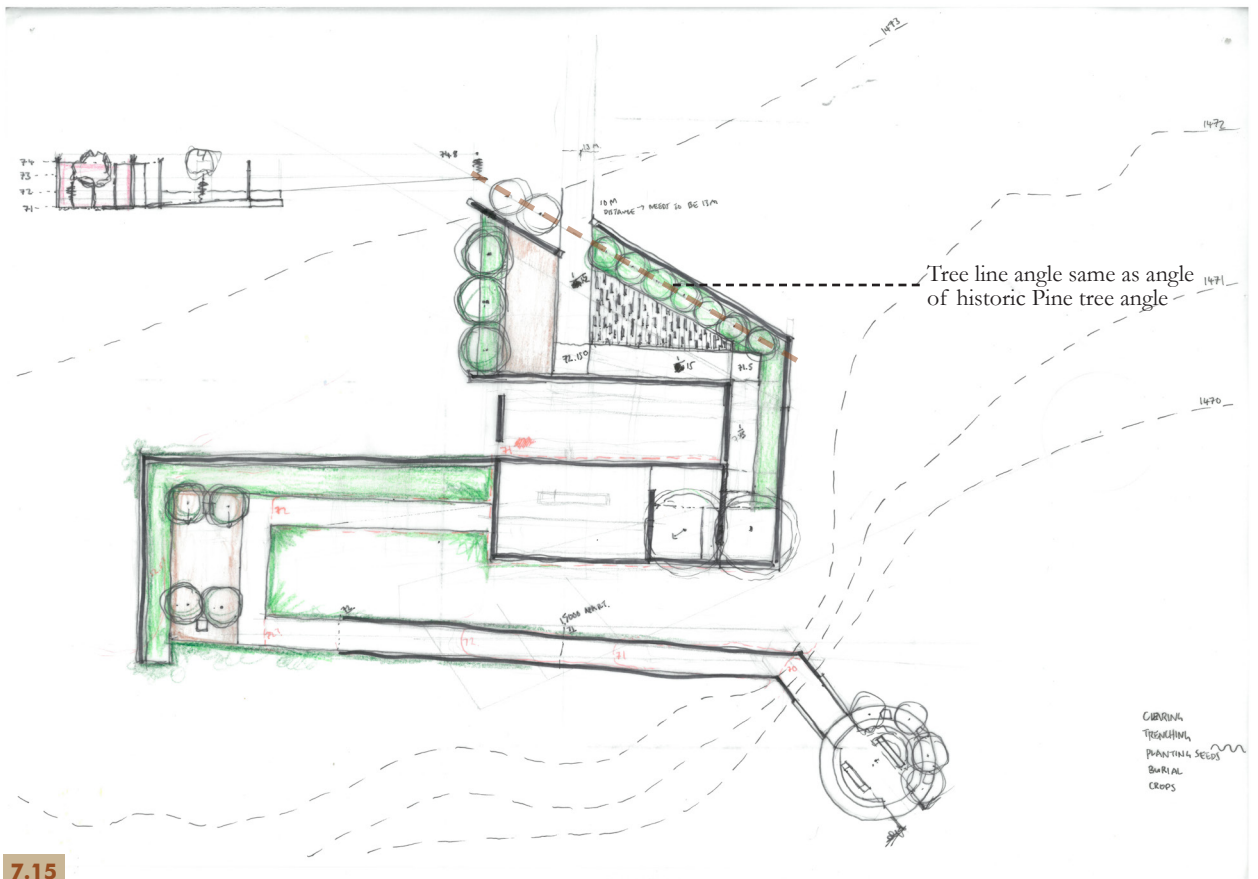


7.13



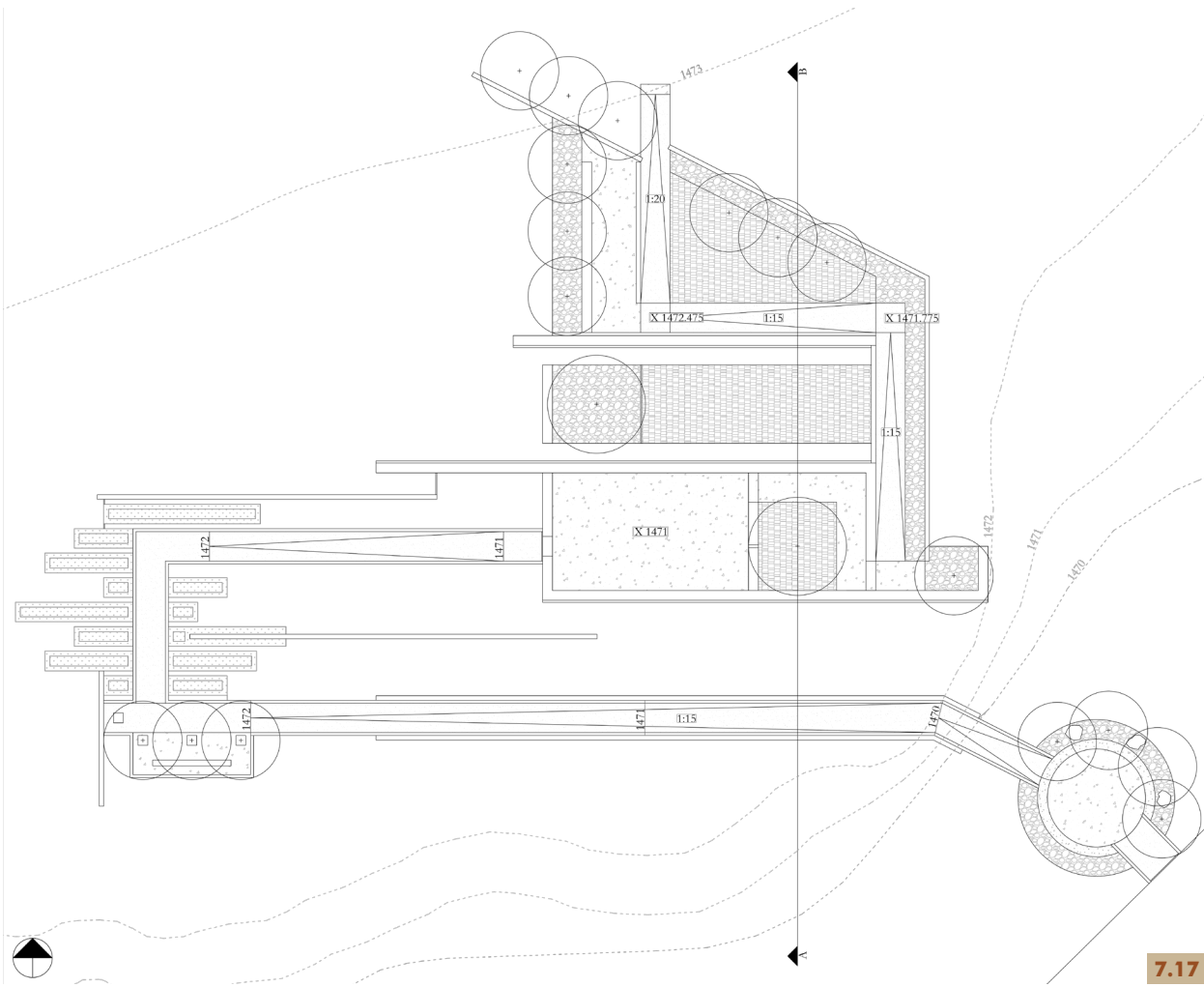
7.14

**Fig. 7.13** Initial explorations of The Settlement (Author 2019)  
**Fig. 7.14** Early iteration of The Settlement highlighting the spatial forms. Not to scale (Author 2019)

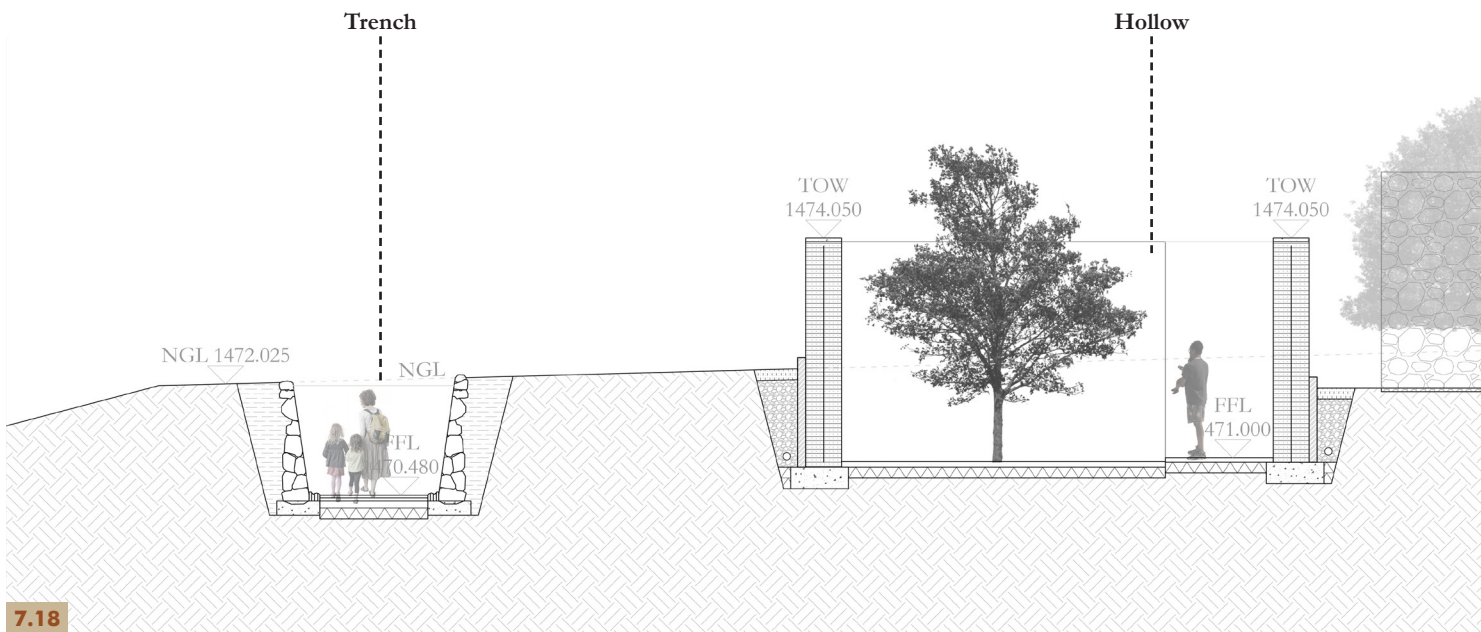
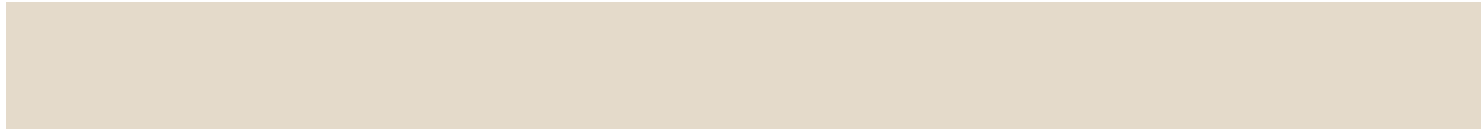


**Fig. 7.15** Developed iteration of The Settlement. Not to scale (Author 2019)

**Fig. 7.16** Further development of The Settlement. Not to scale (Author 2019)



7.17



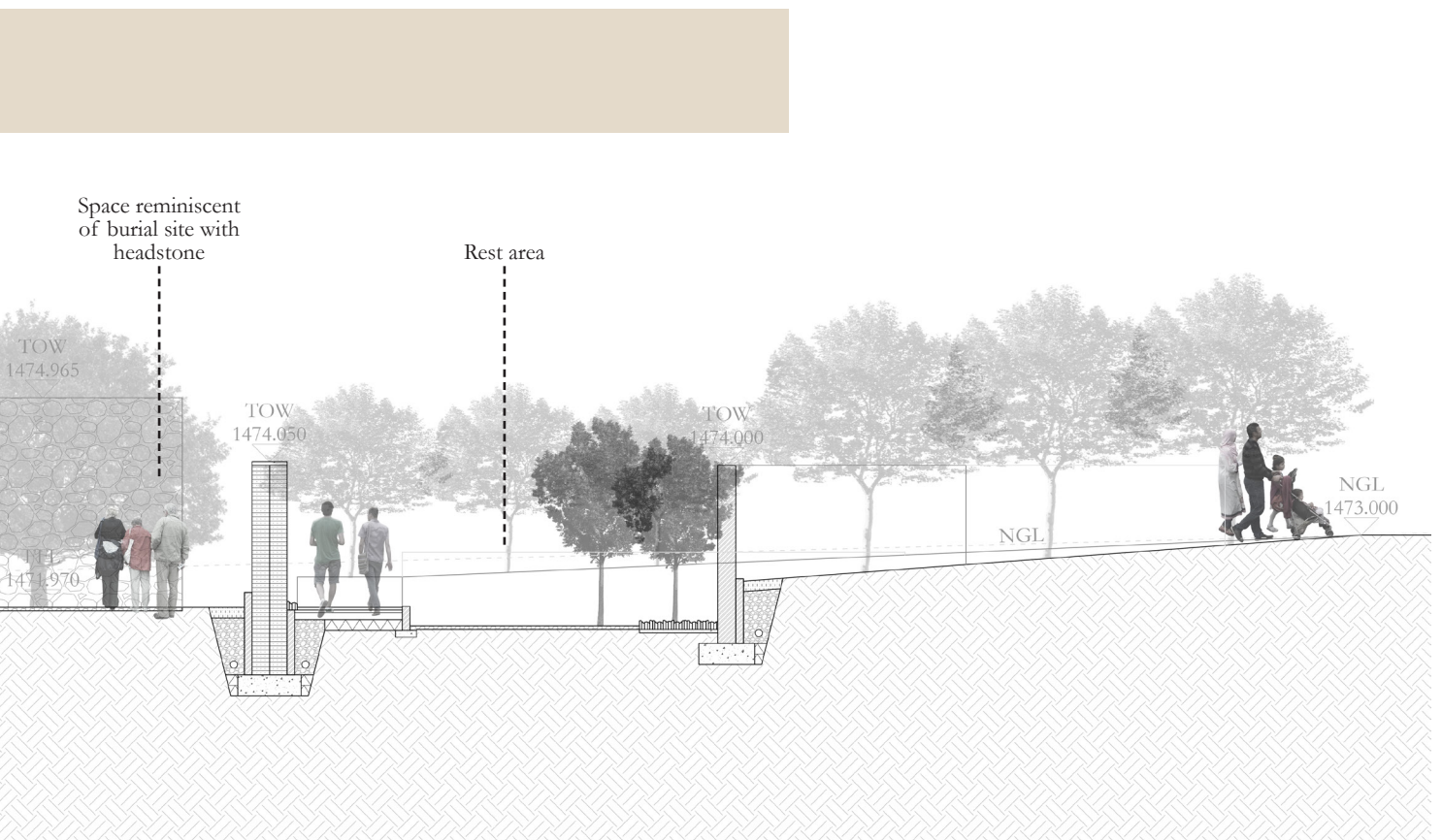
7.18



To strengthen the open narrative, the narrative is not represented too literally. Elements of the design have been simplified and/or abstracted – leaving the interpretation of the design to the visitor. This is in line with the minimal design approach of symbolism.

**Fig. 7.17** The Settlement iteration. Not so scale (Author 2019)

**Fig. 7.18** Section through The Settlement iteration. Not to scale (Author 2019)



## 7.5.2 Exploration of The Sublime and The Descent

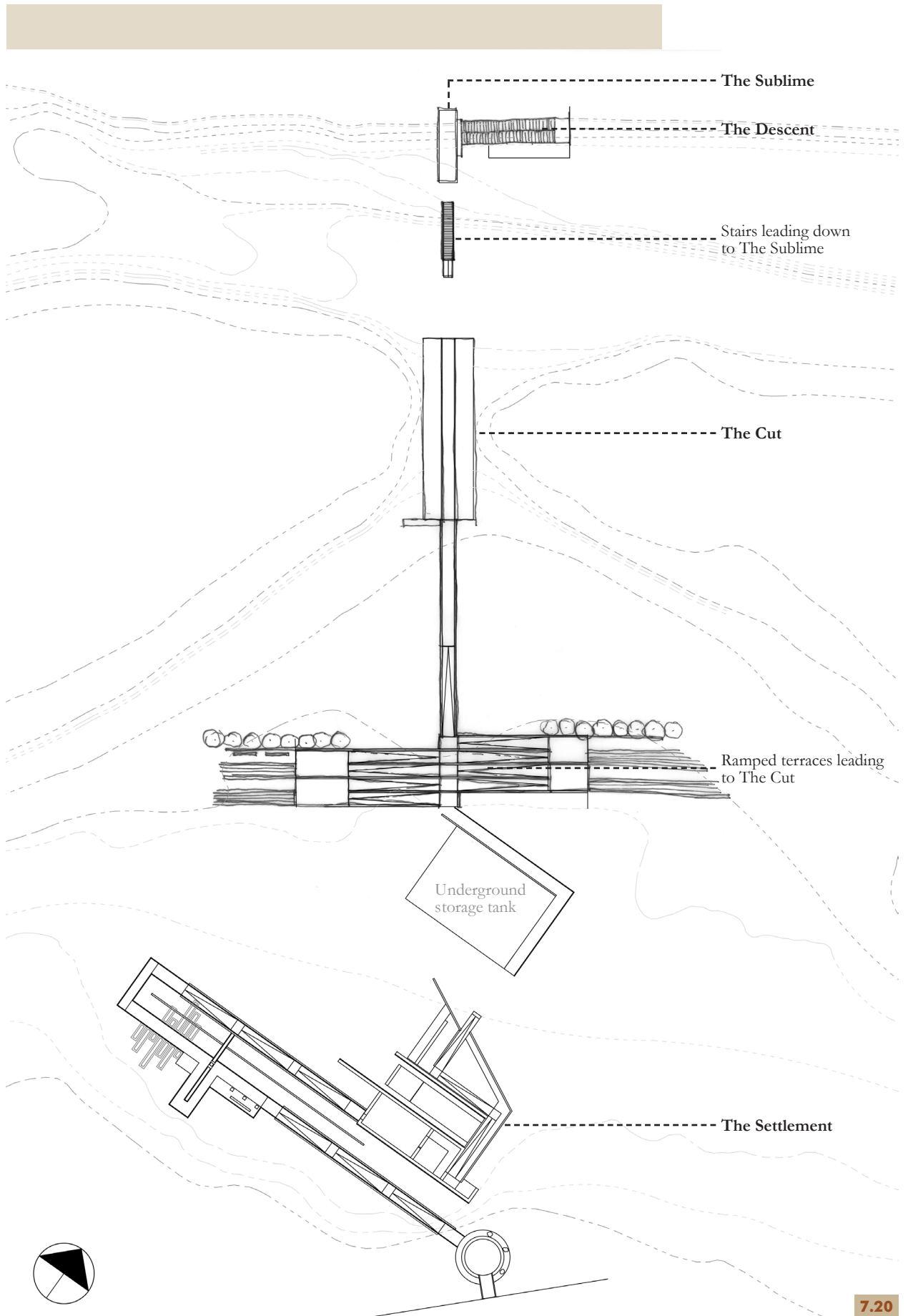


7.19

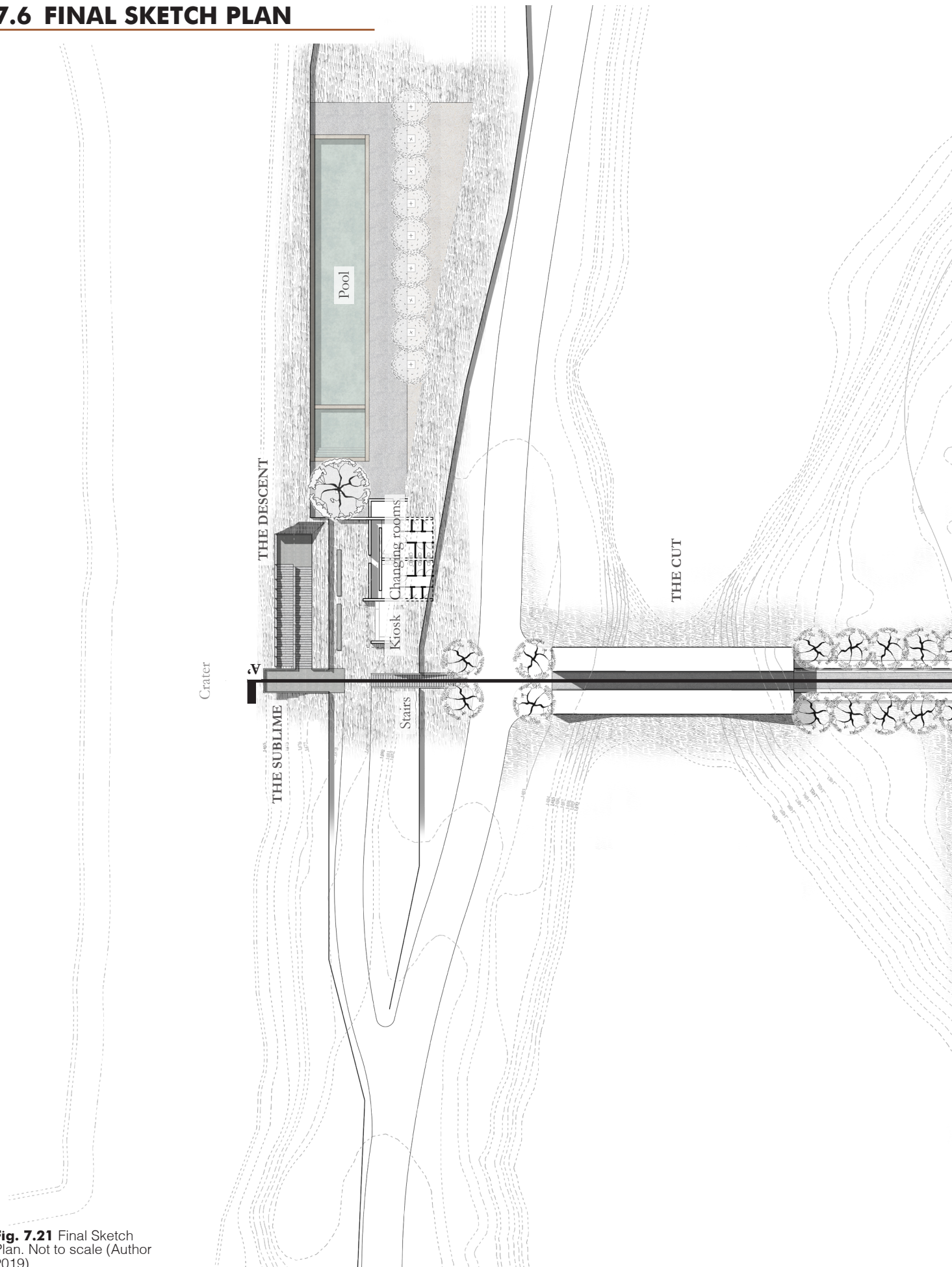
**Fig. 7.19** Model exploration of The Sublime and The Descent (Author 2019)

**Fig. 7.20** Sketch Plan iteration. Not to scale (Author 2019)

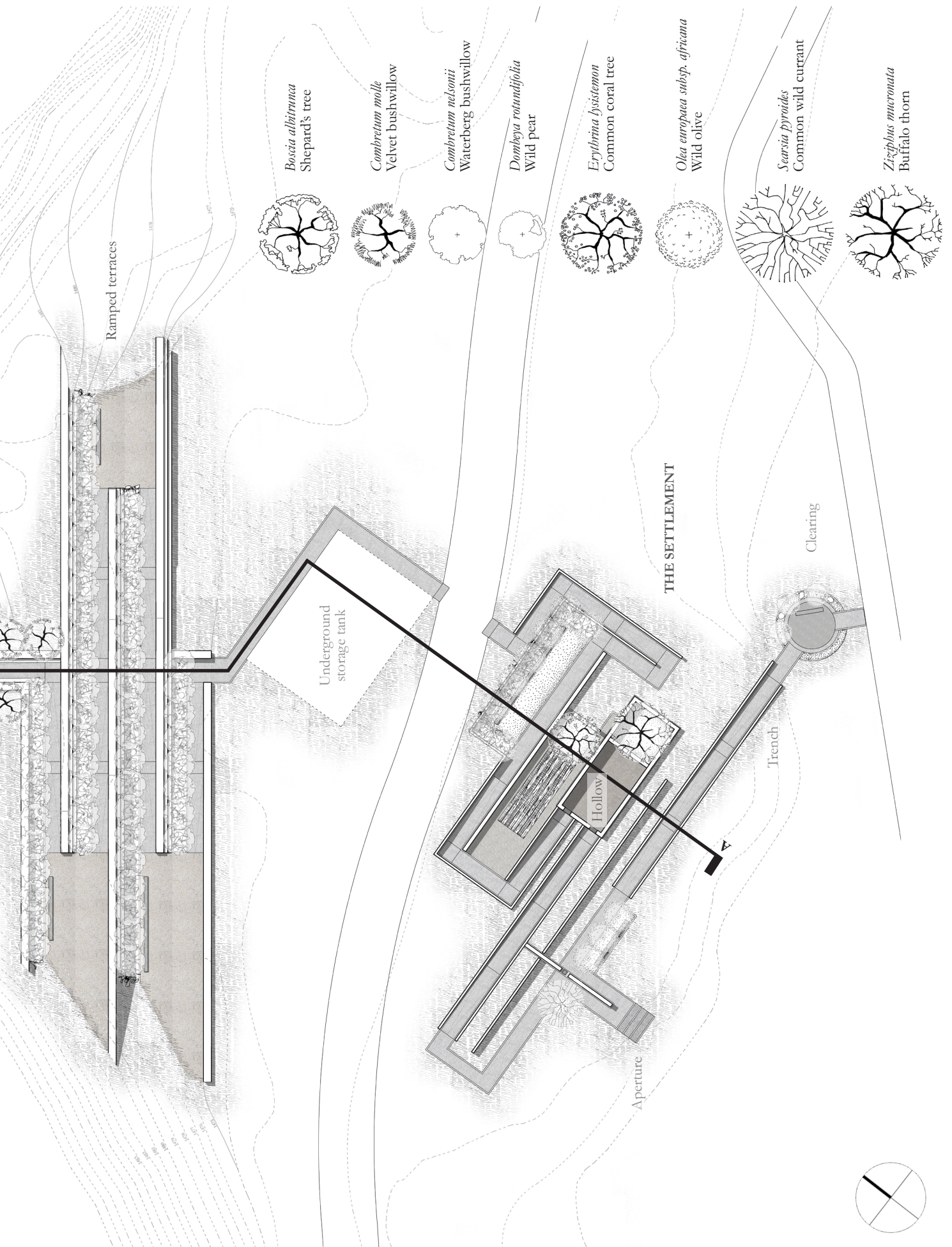
### 7.5.3 SKETCH PLAN ITERATION

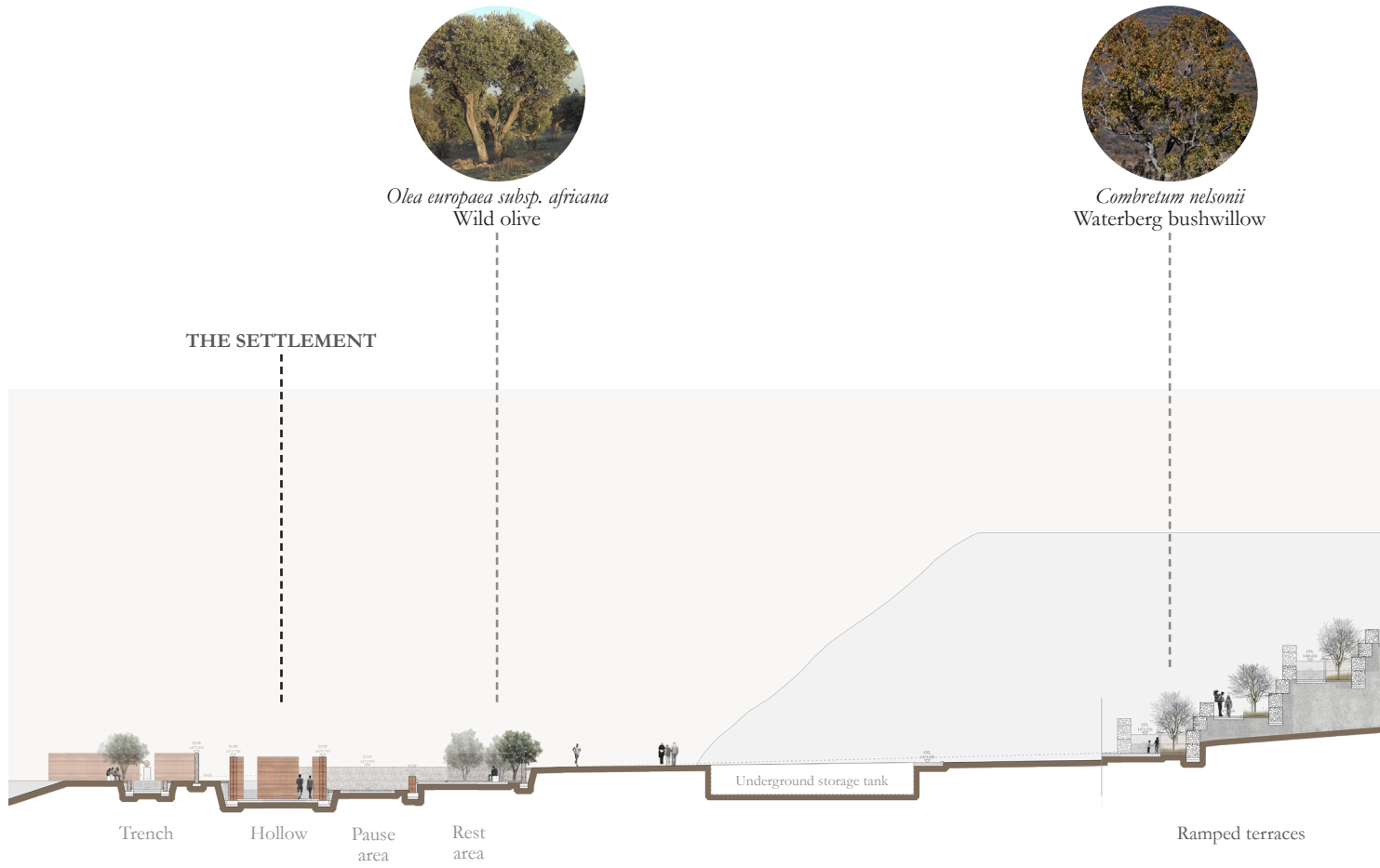


## 7.6 FINAL SKETCH PLAN



**Fig. 7.21** Final Sketch Plan. Not to scale (Author 2019)





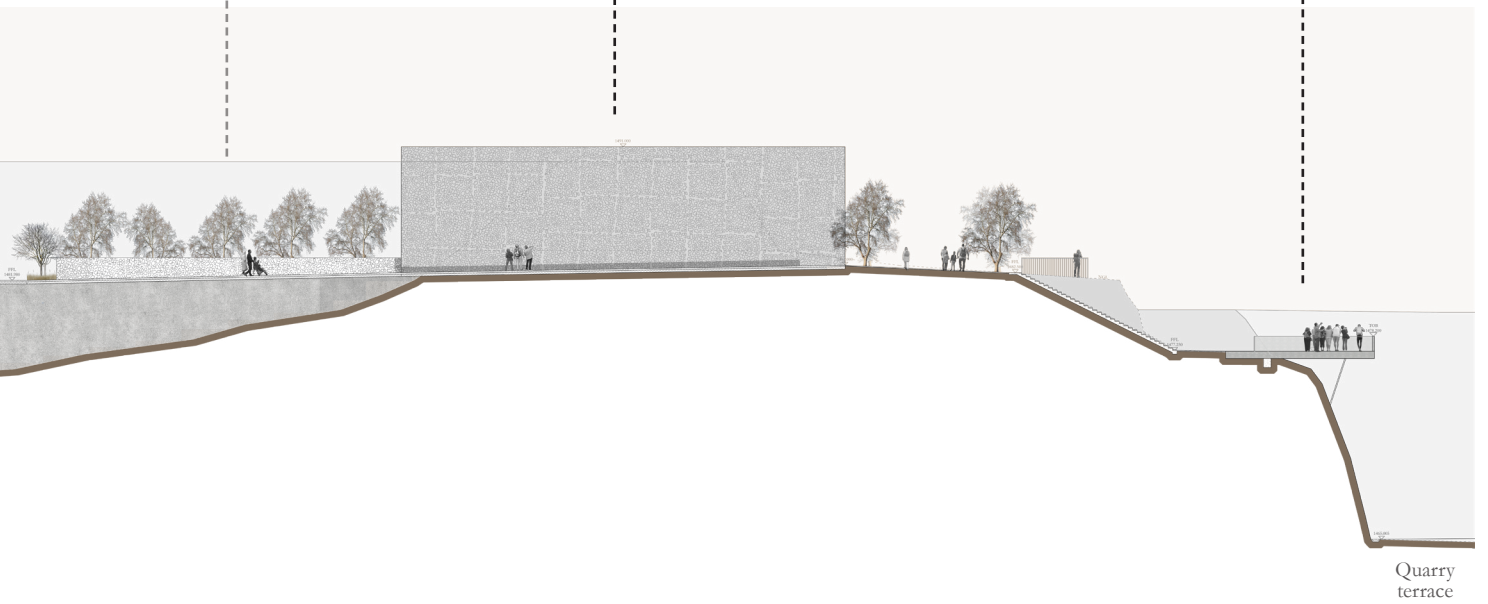
**Fig. 7.22** Section A - A'.  
Not to scale (Author 2019)



*Combretum molle*  
Velvet bushwillow

THE CUT

THE SUBLIME





**Fig. 7.23** View from the “clearing” towards the “trench” within The Settlement (Author 2019)



**Fig. 7.24** Rest area within The Settlement (Author 2019)

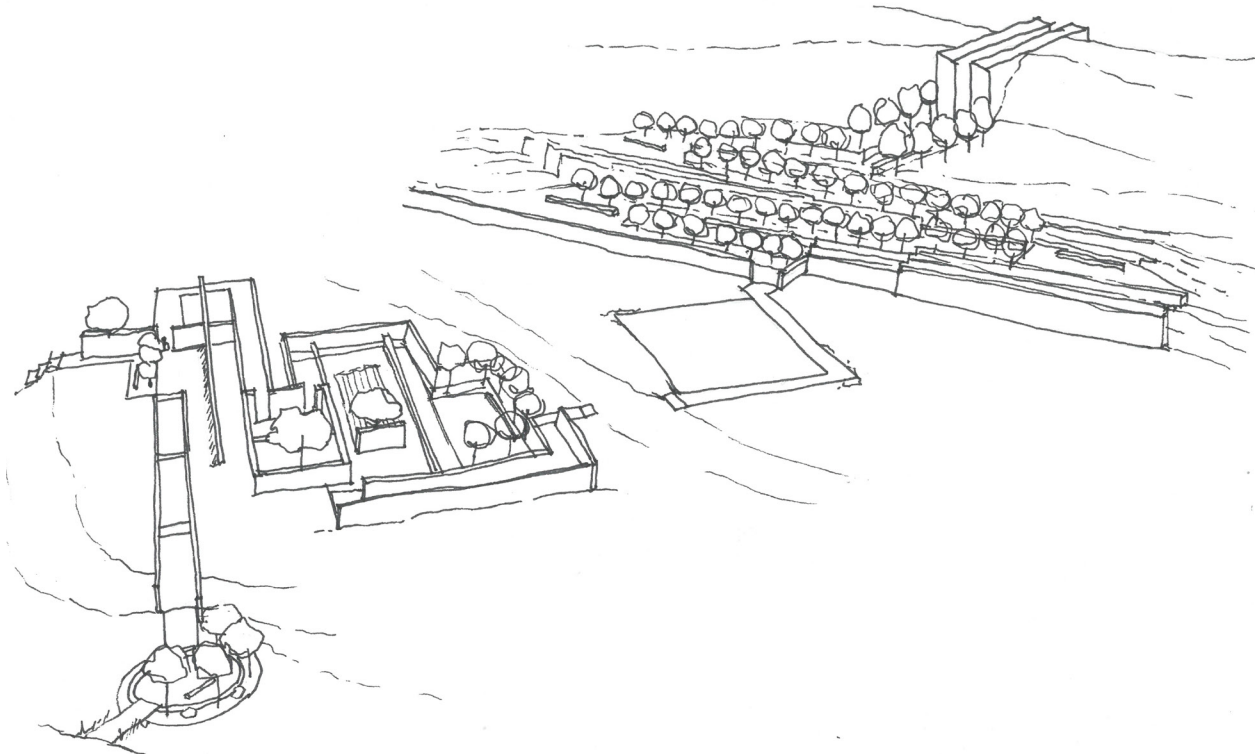




**Fig. 7.25** View of pause area within The Settlement representative of Midrand's agricultural history (Author 2019)



**Fig. 7.26** Ramped terrace area with The Cut in the background (Author 2019)



**Fig. 7.27** Sketch of aerial view of final sketch plan area (Author 2019)





**8**

**TECHNIFICATION**

## 8.1 INTRODUCTION TO TECHNIFICATION

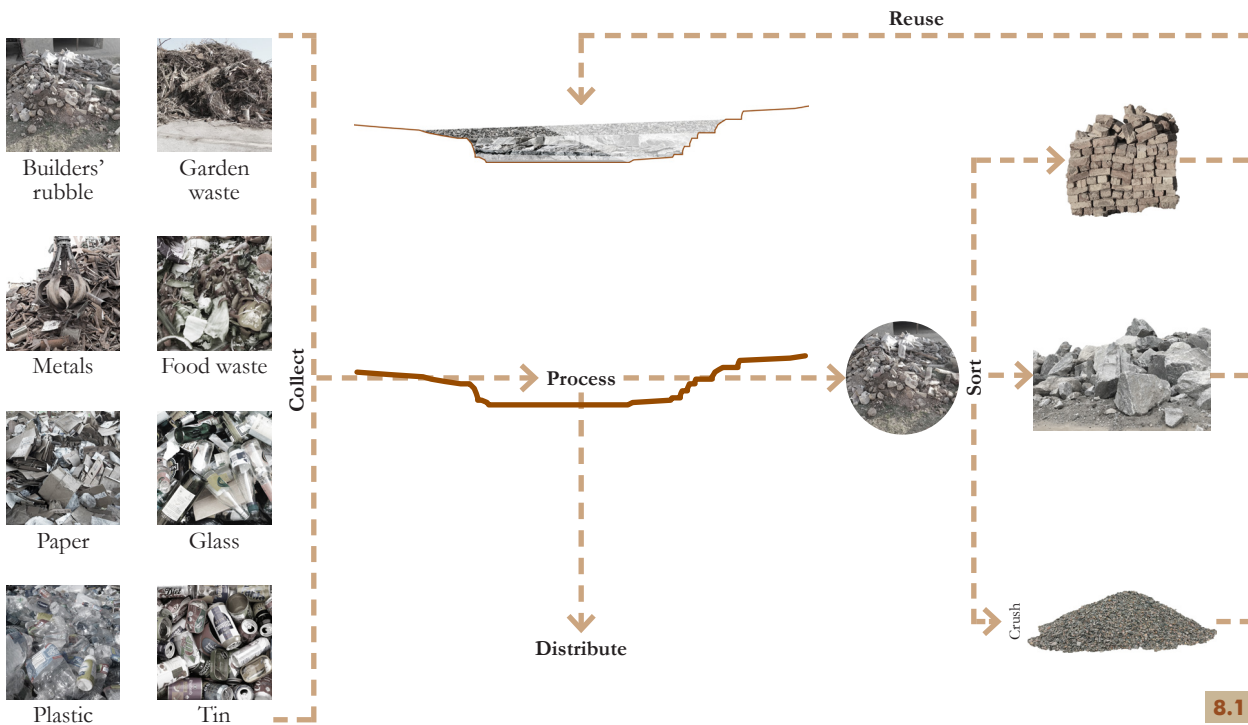
The following chapter splits technification into Master Plan and Sketch Plan. The Master Plan will address waste management; the water strategy; the planting strategy; and slope stabilisation and erosion control.

The technification of the Sketch Plan area will include the relevant construction detailing – with specific emphasis on the reuse of builders’ rubble.

## 8.2 MASTER PLAN

### 8.2.1 Waste Management

Quarry X will not only function as a regional mixed-use park, but as a location where waste produced within the site is collected, sorted and distributed (to the relevant recycling companies and waste reclaimers). Builders’ rubble is a special exception as it is used in the construction of the site. Once construction of the site is complete the designated builders’ rubble processing area will cater to the general public.



**Fig. 8.1** Waste management strategy (Author 2019)

**Table 8.1** Water pollutants and method of removal (Author 2019) [adapted from Vosloo 2017]

**Fig. 8.2** Summary of water strategy (Author 2019)

### 8.2.2 Water Strategy

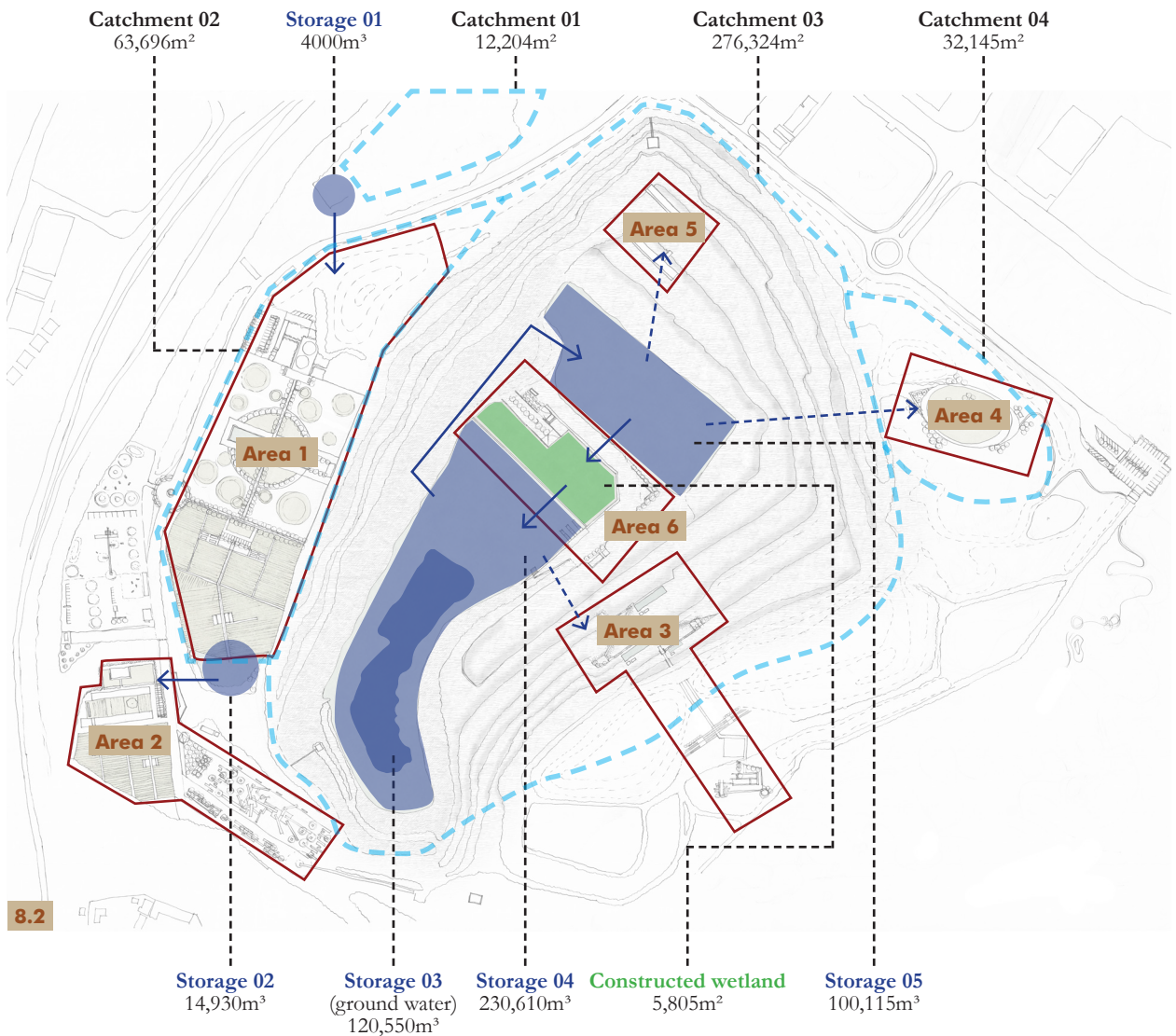
In line with the sustainable outlook of the adaptive reuse of Quarry X, the overall approach to water is to capture, clean, store and distribute as much surface water as possible for reuse within the site – namely: irrigation and the pools.

Table 8.1 outlines the five types of water pollution and the method each can be removed from the water.

Quarry X contains mainly floating debris, contaminants lighter than water and contaminants heavier than water. Figure 8.2 summaries the water strategy. For full water calculations please refer to Appendix A.

WATER POLLUTION	METHOD OF REMOVAL
Floating debris i.e. plastic bags, bottles and cans	Trash trap/gridded inlets
Contaminants lighter than water i.e. hydrocarbons such as petrol, diesel, oil	Removed/separated in an oil trap
Contaminants heavier than water i.e. dirt and other sediments	Settle in a structure where water is allowed to be stilled through sedimentation, detention and retention ponds, septic tanks or oil traps
Dissolved minerals i.e. nitrates, sulphates, phosphates and other minerals which are essentially plant nutrients	Nutrient uptake through by wetland plant species
Microbes i.e. pathogens/bacteria that cause sickness	Chemical application such as chlorine or with ultra-violet spectrum lights

**Table 8.1**



**8.2**

### 8.2.3 Planting Strategy

The site has been separated into 5 zones (Figure 8.3) depending on the planting and/or soil conditions: transformed grassland, compacted soil with no vegetation, granite rock with no vegetation, cliffs and aquatic.

#### Transformed grassland

The transformed grassland area is well established with the odd area of disturbance and invasive species. There is no need for drastic manipulation of this zone, however, all alien and invasive species would need to be removed and disturbed areas seeded with an indigenous grass seed mix. Thereafter, the area would need to be carefully monitored to prevent re-emergence of any invasive species.

#### Compacted soil with no vegetation

Because this area is frequented by heavy vehicles and/or used to stockpile aggregate, the soil is highly compacted with almost no vegetation. In this case, the soil structure must be “opened” if successful plant growth is to take place. Ripping of the soil to a depth of about 50mm is required. Ideally, the ripping should incorporate organic material. Topsoil is spread and plants can be introduced – when they become established, they will be able to maintain the structure of the soil themselves by their root growth and contribution of organic matter (Bradshaw & Chadwick 1980:88).

#### Granite rock with no vegetation

The proposal for this zone is to allow it to naturally colonise with planting overtime. Instead of visitors seeing an “instant” effect of lush green terraces, they will see a gradual development of vegetation in this area – encouraging them to revisit the site to view this progression. This relates to the minimal design principle of expressing the passage of time – here it is done through plant material. Furthermore, this natural colonisation of endemic species is better than introduced plant material because they will be adapted to the local ecotype (ibid. p. 209).

Granite is a hard, acidic rock which is nutrient poor (ibid. p. 203). Major nutrient supply is supplied through rain and is very limited (ibid. p. 205). These may seem like inhospitable conditions for plants, but plant growth is possible. Fine material accumulation is very important to encourage plant colonisation (ibid.) – seeds fall into small crevices of fine material where they find moisture and protection (ibid. p. 207). The passage of heavy machinery on quarry surfaces creates fines, so the horizontal benches at Quarry X have an accumulation of fine on these surfaces. Another source of fines can be through the recovered concrete crushing process – this is expanded on later in the chapter. The fines are spread over the relevant areas with fertiliser and some lime (which is reapplied in subsequent years to maintain growth) (ibid. p. 207). As long as there is fine material, seeds will be able to fall into small

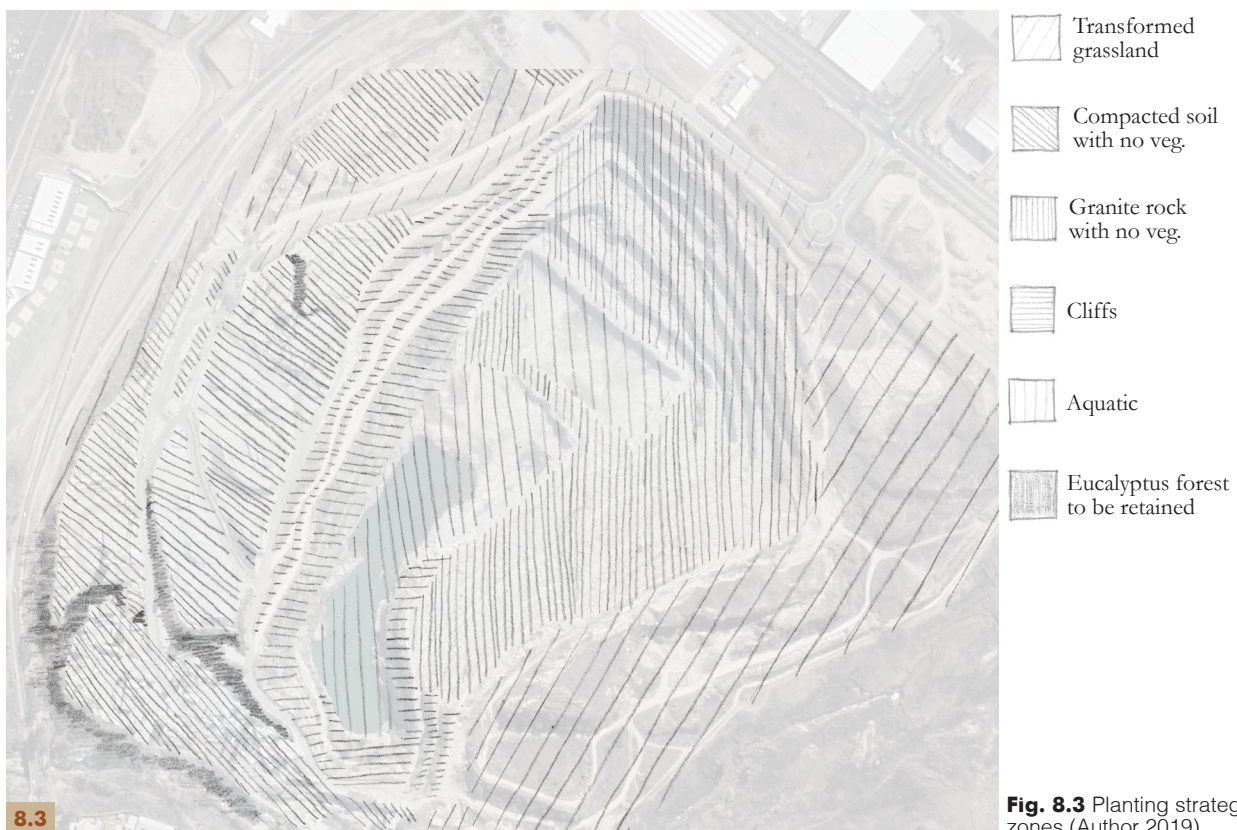


Fig. 8.3 Planting strategy zones (Author 2019)

8.3



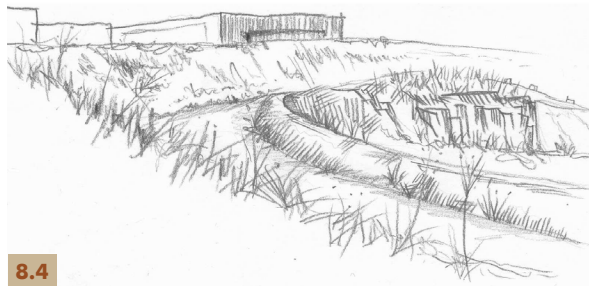
crevices of moisture and protection. The establishment of trees in this zone does not require fine material because trees can root downwards into moisture layers. However, trees do require a pocket of water-absorbent material of about 5 litres. This is to provide enough moisture in the dry season (ibid. p. 205).

**Cliffs**

Similar to the transformed grassland zone, the cliff vegetation is well established. It appears to be a rehabilitation effort by the owners of Quarry X and contains indigenous vegetation. This zone should be monitored to prevent re-emergence of any invasive species. There is an opportunity to make strategic openings in the rock face, to allow plant growth.

**Aquatic**

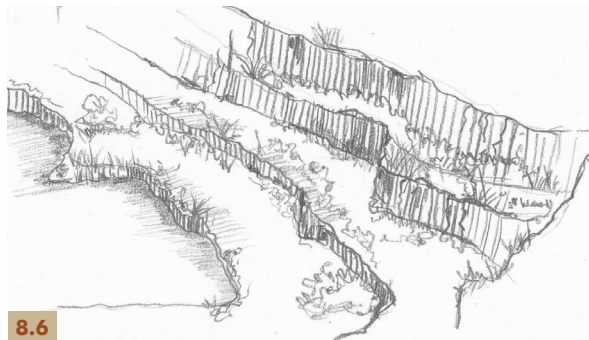
Unlike the granite rock terraces, quarry floors accumulate fine material (ibid.) and are therefore more hospitable for plants to naturally colonise. The boundary between the reservoir and the quarry floor is made more formalised.



8.4



8.5



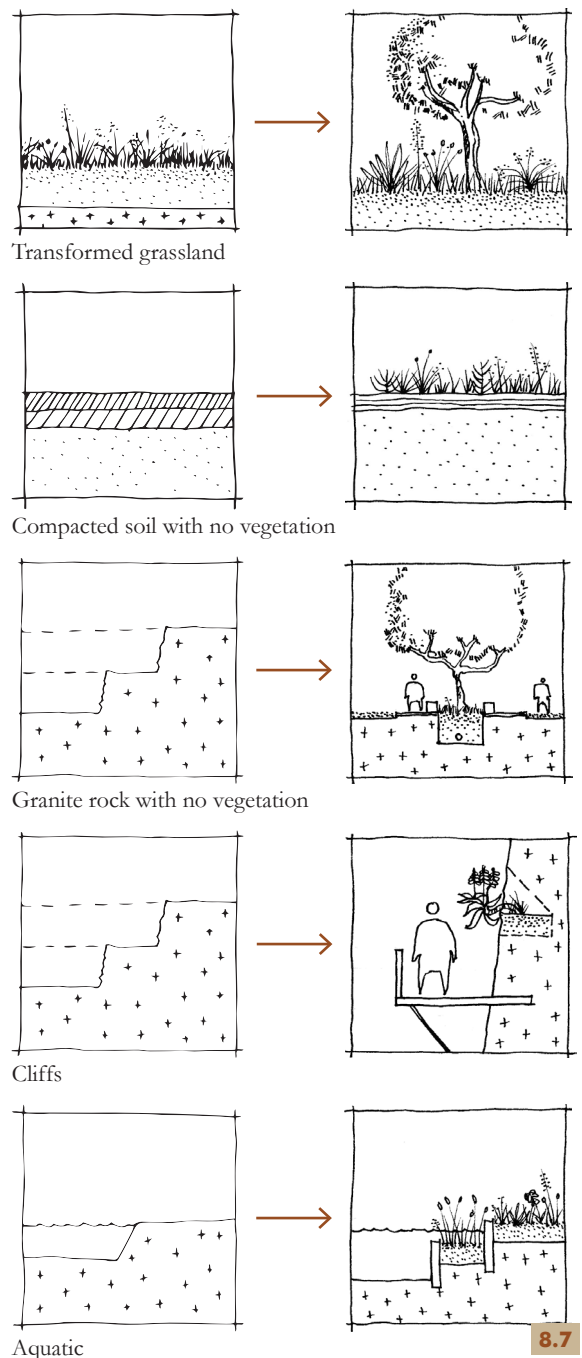
8.6

**Fig. 8.4** Sketch of transformed grassland (Author 2019)

**Fig. 8.5** Sketch of dumped rubble which contributes to compacted soils (Author 2019)

**Fig. 8.6** Sketch of cliff and aquatic area (Author 2019)

**Fig. 8.7** Plant strategy zones and approach (Author 2019)



8.7

### 8.2.4 Slope Stabilisation and Erosion Control

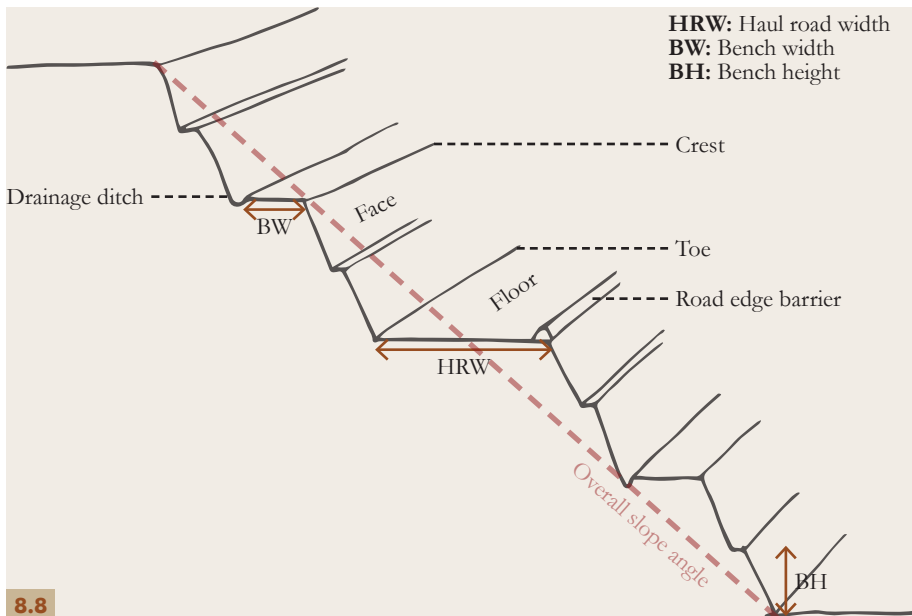
Quarry X is a privately-owned quarry registered under the Department of Mineral Resources South Africa; therefore, it must adhere to strict health and safe regulations. Quarrying methods must maintain slope stability to ensure the safety of those who access or work at the quarry. This is beneficial as when extraction has ceased, a relatively stable quarry remains from a geo-technical perspective. Figure 8.8 illustrates the common features of a quarry. Multiple bench quarries require careful planning and closer supervision than single bench quarries, however, each level can operate independently (Integrated Publishing n.d.).

The bench heights are determined by equipment limitations and geologic conditions (Integrated

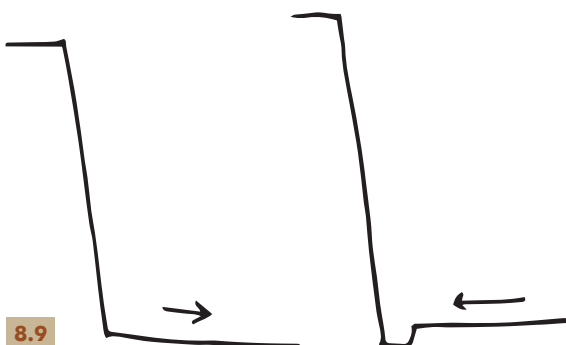
Publishing n.d.), and therefore would never exceed what is deemed a safe height.

At Quarry X, the vertical benches (generally 12 metres), and horizontal benches (generally 8 metres) appear physically stable, although a thorough geo-technical examination is required before the public could access the site.

Quarry X does not have a defined drainage ditch on any of the horizontal benches, this contributes to erosion and loss of fines over the crest. Figure 8.9 shows how the slope can be manipulated to incorporate a drainage ditch. Water from the drainage ditch can be diverted into the quarry reservoir. Furthermore, the drainage ditch can also act as a catch ditch – which literally catches eroded rock fragments that may fall from the vertical rock face.



8.8



8.9

**Fig. 8.8** Common features of a quarry (Author 2019) [Adapted from Gambrenk 2010]

**Fig. 8.9** Horizontal bench manipulation to incorporate a drainage ditch (Author 2019)

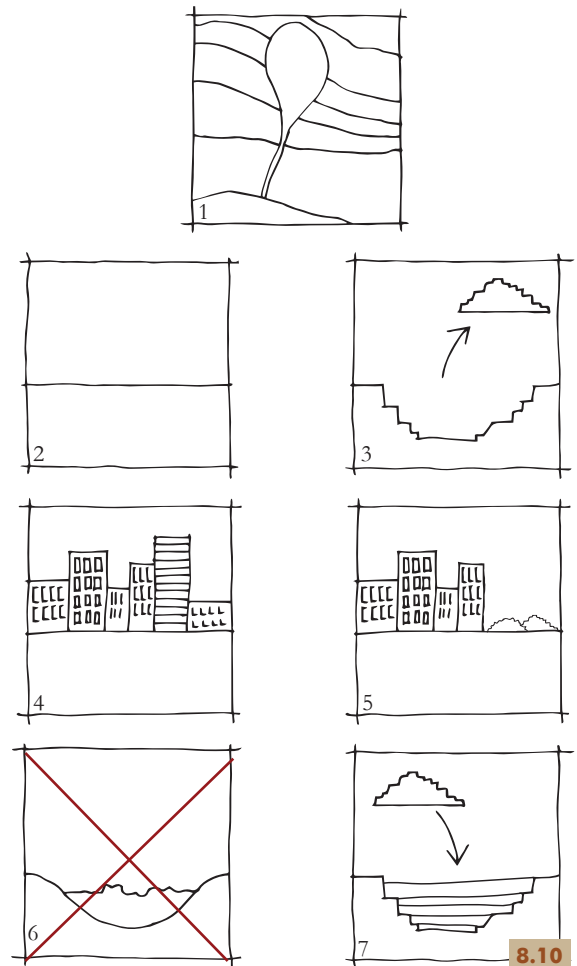
## 8.3 SKETCH PLAN

### 8.3.1 Builders' Rubble

Builders' rubble is used for the construction of the site as far as possible. The reuse of this material at a quarry evokes the cradle-to-cradle concept. Instead of the material being dumped at the nearest landfill, it is given new life as construction material (Figure 8.10).

The relevant quantities required would have to be sorted and stockpiled before construction of the site officially begins. After construction is complete, the designated builders' rubble recycling area will cater to the general public.

Builders' rubble consists mostly of concrete (Figure 8.11). In this rapidly developing world, approximately 6 billion tons of concrete is produced globally per year (Marinković 2013:45). This industry is detrimental to the environment as the main component of concrete is aggregate – which comes from natural rock. Therefore, it is important to not only reduce the use of concrete, but to reuse it as far as possible to preserve natural resources.



8.10

**Fig. 8.10** Instead of builders' rubble ending up in a landfill, it can be reused at Quarry X as construction material. Natural material returned to "origin" (Author 2019)

**Fig. 8.11** The composition of builders' rubble mainly consists of concrete (Author 2019)



8.11

The idea of recycling demolished concrete originated at the end of World War II after extensive destruction was caused to entire cities through strategic bombings (Figure 8.12). A dilemma occurred as these cities had to be rebuilt, and large amounts of rubble had to be cleared (Frick 1987:1). The logical solution was to reuse the demolished concrete to construct new buildings. Enormous, landscaped mounds, known in Germany as Trümmerberg (rubble mountain) (Figure 8.13), were also created using the demolished concrete as fill material.

Because builders' rubble is non-combustible and inert (without the power to move) – it has high potential for recycling. However, in South Africa, there is very little awareness of the recycling opportunities for builder's rubble (CoJ 2017:41). This is exemplified by the fact that 85% of builders' rubble is landfilled in South Africa (Barnes & Basson 2016:151), and only 6% is recycled (DEA 2018:18). Data regarding builders' rubble quantities in the Johannesburg region is sparse. Builders' rubble generation in the Johannesburg Municipality is projected to increase to 370,00 tonnes per annum by 2022 (CoJ 2011:24). However, this figure is based on amounts recorded at landfills, it does not take into consideration illegal dumping or private landfill companies; therefore, the quantity could be much higher.

However, according to GreenCape, the “market for builders' rubble is growing across South Africa,

especially in the Western Cape and Gauteng. There are growing opportunities for businesses and investors seeking to capitalise on this material, particularly in the Western Cape” (GreenCape 2018:54).

Builders' rubble is predominantly crushed and reused as aggregate. This aggregate is used within the following applications (from highest to lowest material value) (GreenCape 2018:54):

- Re-concreting – finely ground recovered concrete incorporated into a ready-mix or precast concrete process;
- Foundations;
- Sub-base or base layers of parking lots and roads;
- Platforms for housing developments, pipe bedding and fence line foundations; and
- Fill.

All the applications mentioned above are within the civil engineering sphere. This dissertation will explore alternative ways to reuse builders' rubble within a landscape architectural application. Figure 8.14 outlines the composition of builders' rubble and how it can be processed. While Table 8.2 outlines how builders' rubble can be used within the ground, wall/vertical and sky planes of a space.

**Fig. 8.12** German women clear rubble from bomb damaged buildings in Berlin, 1945 (Imperial War Museum 1945)  
**Fig. 8.13** Grüner Heiner rubble mountain in Baden-Württemberg, Germany is 395 metres high (Creative Commons 2005)



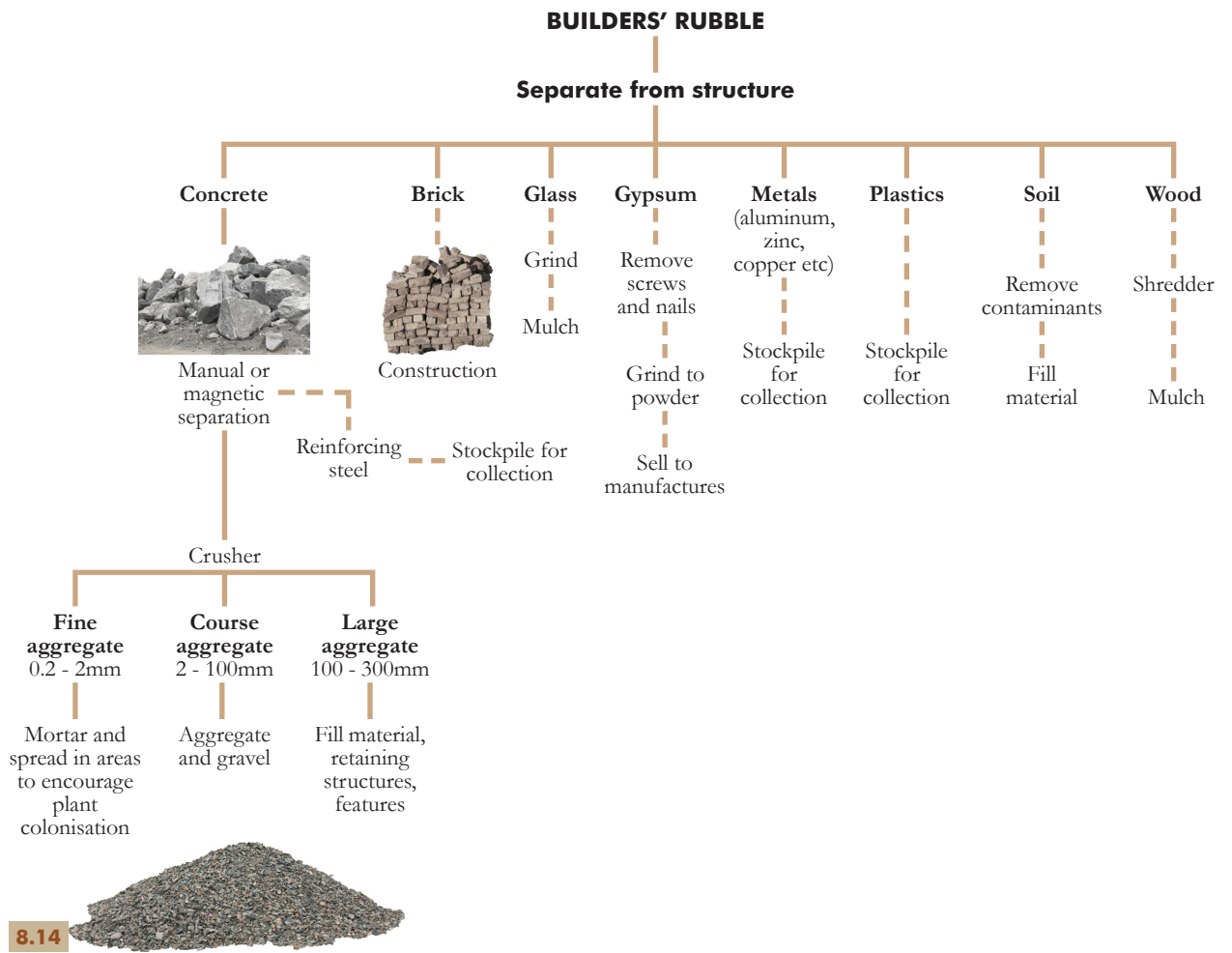
8.12



8.13

**Fig. 8.14** A breakdown of the composition of builders' rubble (which consists mainly of concrete) and possibility of each material (Author 2019)

**Table 8.2** How builders rubble can be used in ground, wall/vertical and sky planes (Author 2019)



GROUND	WALL/VERTICAL	SKY	OTHER
<ul style="list-style-type: none"> <li>• Paving</li> <li>• Packed material,</li> <li>• Paving edge,</li> <li>• Gravel</li> <li>• Breakwater structure</li> <li>• Fill for earth mounds</li> </ul>	<ul style="list-style-type: none"> <li>• Cladding</li> <li>• Retaining wall (dry or wet packed)</li> <li>• Fill for gabion wall</li> </ul>	<ul style="list-style-type: none"> <li>• Hanging elements</li> </ul>	<ul style="list-style-type: none"> <li>• Outdoor furniture elements e.g. seating, lighting</li> <li>• Artistic/sculptural elements</li> </ul>

**Table 8.1**

## 8.4 TECHNIFICATION OF SKETCH PLAN AREA

### 8.4.1 Material

As mentioned previously, where possible, builders' rubble will be used as construction material. The previous section indicated the potential reuse of builders rubble in landscape design. This section will show it applied in instances within the Sketch Plan area.

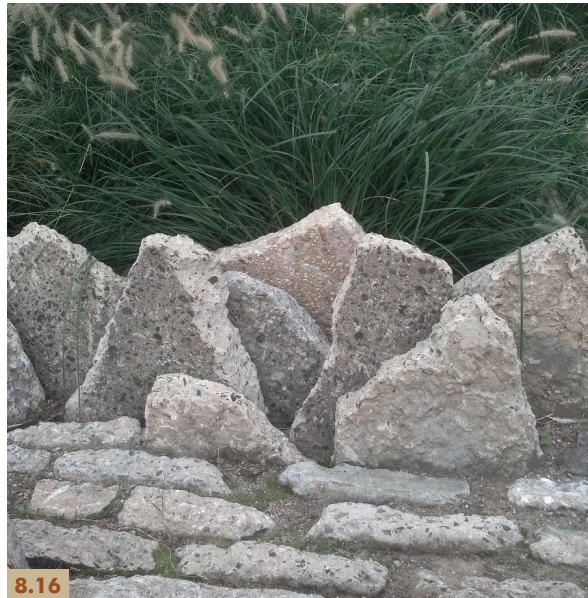
Builders' rubble may appear disorderly, but once it is sorted, the different materials can be used in unique ways. Either in a raw state (individual bricks), or as a mixture to form another material (aggregate within concrete).

**Fig. 8.15** Recycled runway concrete used to stabilise slopes at Orange County Great Park, USA (Lamb 2009)

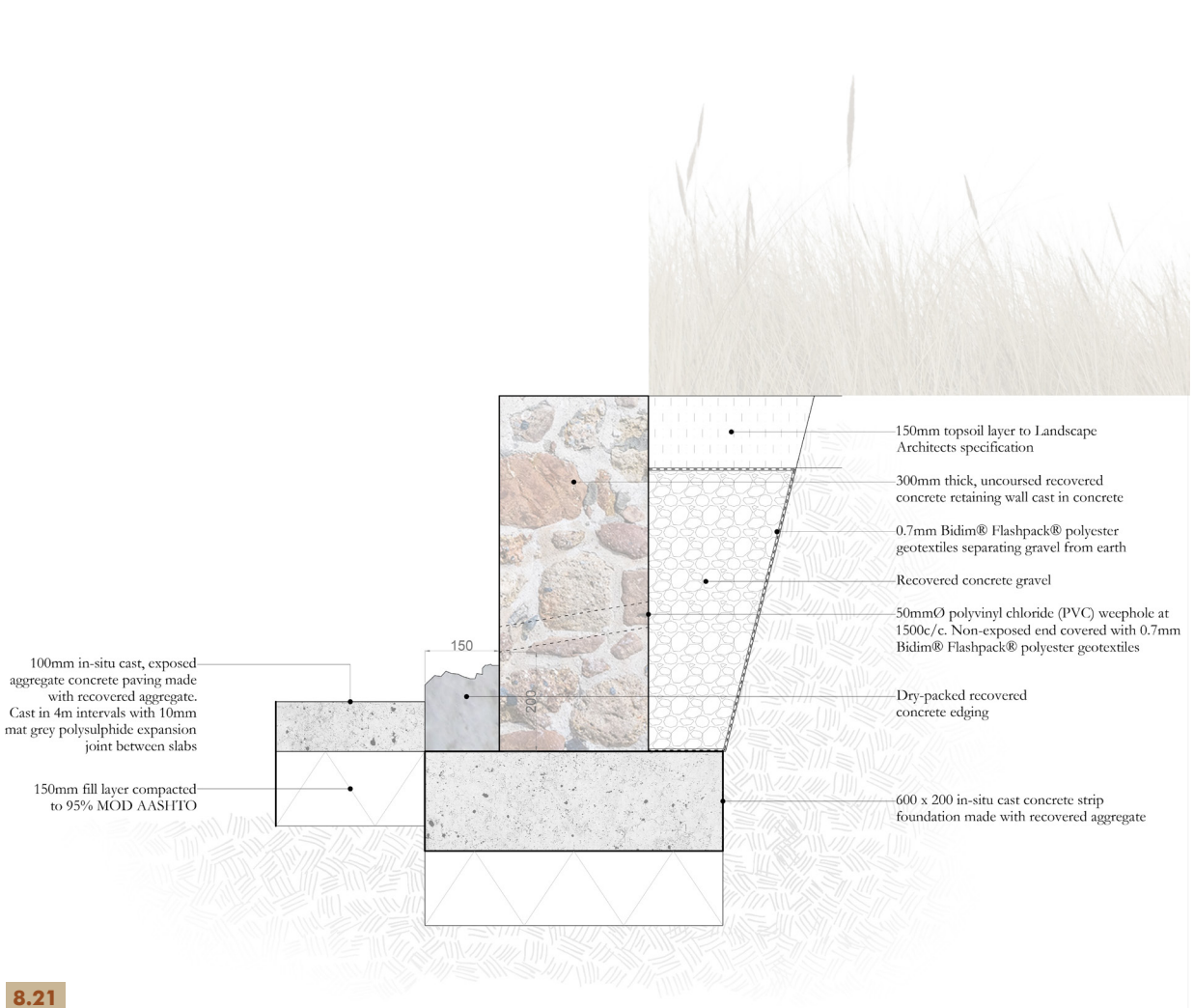
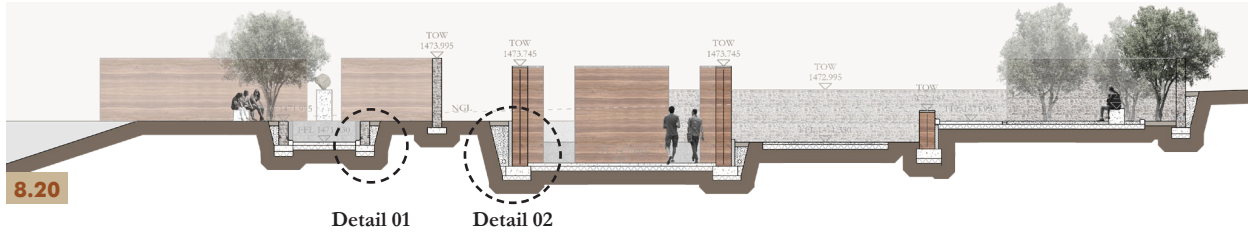
**Fig. 8.16** Reused concrete paving edge at Queens Plaza, USA (Horton 2012)

**Fig. 8.17** Recovered material used on the façade of Ningbo Museum, China (Middle East Architect n.d.)

**Fig. 8.18** Rubble used in parking area at Artémisia cultural space in La Gacilly, France (La Plage Architecture et Paysage 2018)







**Fig. 8.20** Section through The Settlement indicating detail areas (Author 2019)

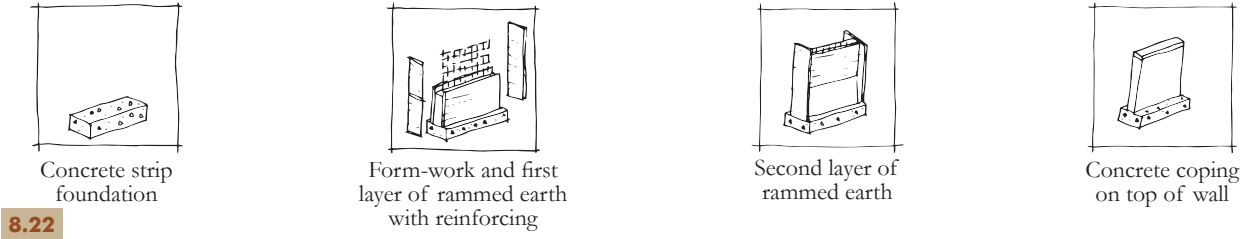
**Fig. 8.21** Detail 01 through recovered rubble retaining wall (Author 2019)

**Fig. 8.22** Typical process of rammed earth construction (Author 2019)

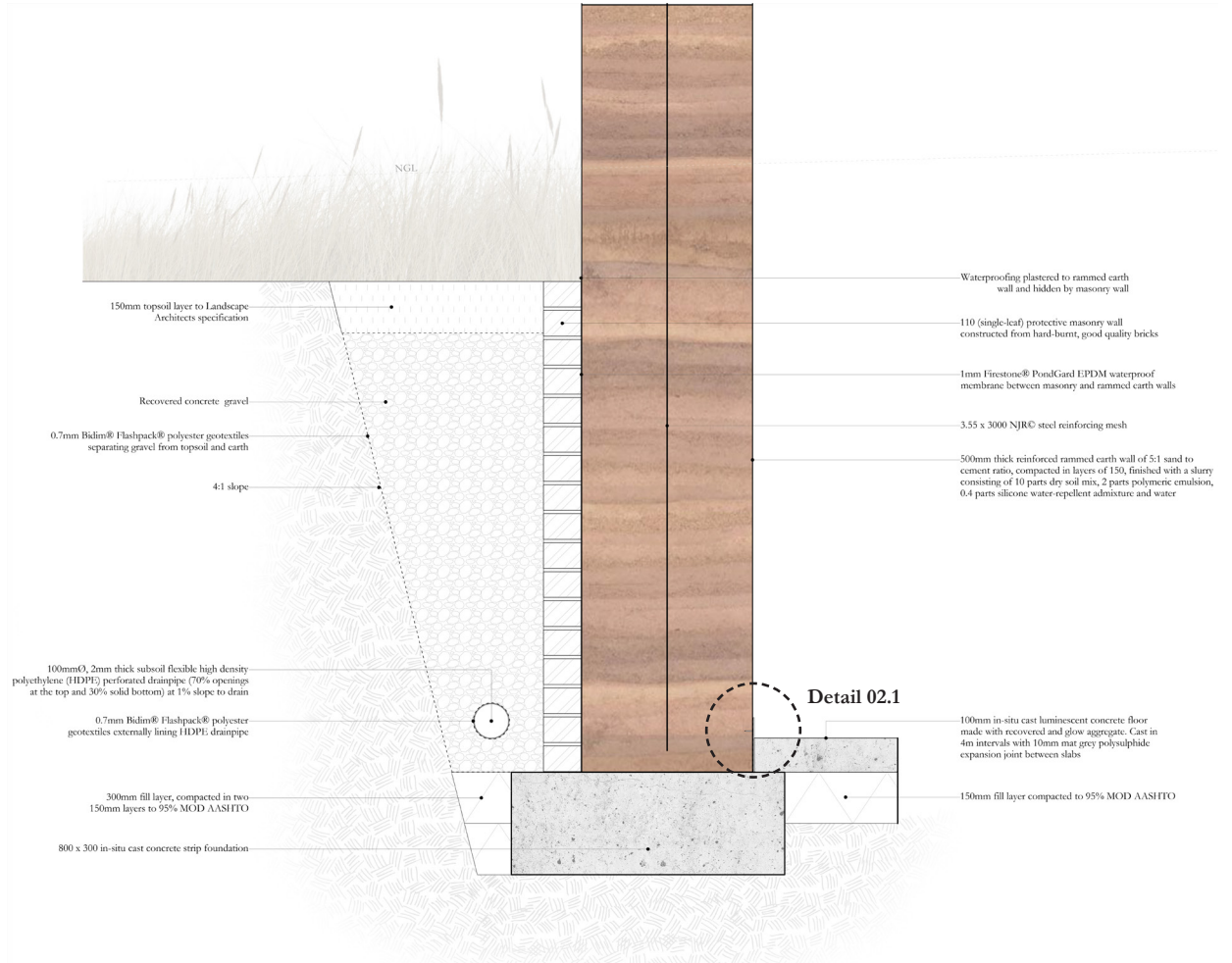
**Fig. 8.23** Detail 02 through rammed earth wall (Author 2019)

**Fig. 8.24** Detail 02.1 indicating skirting around rammed earth wall (Author 2019)

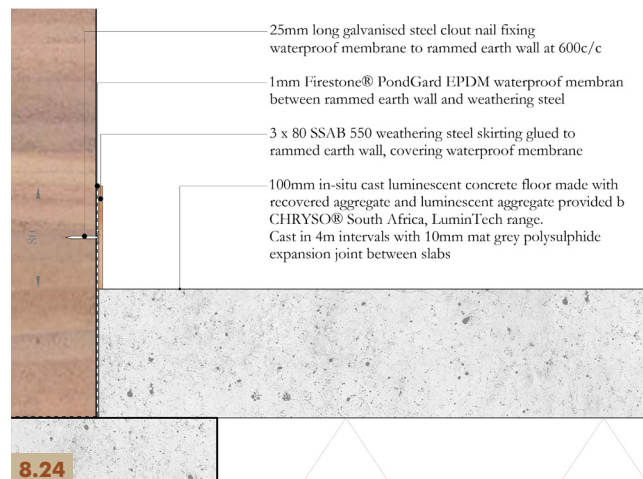




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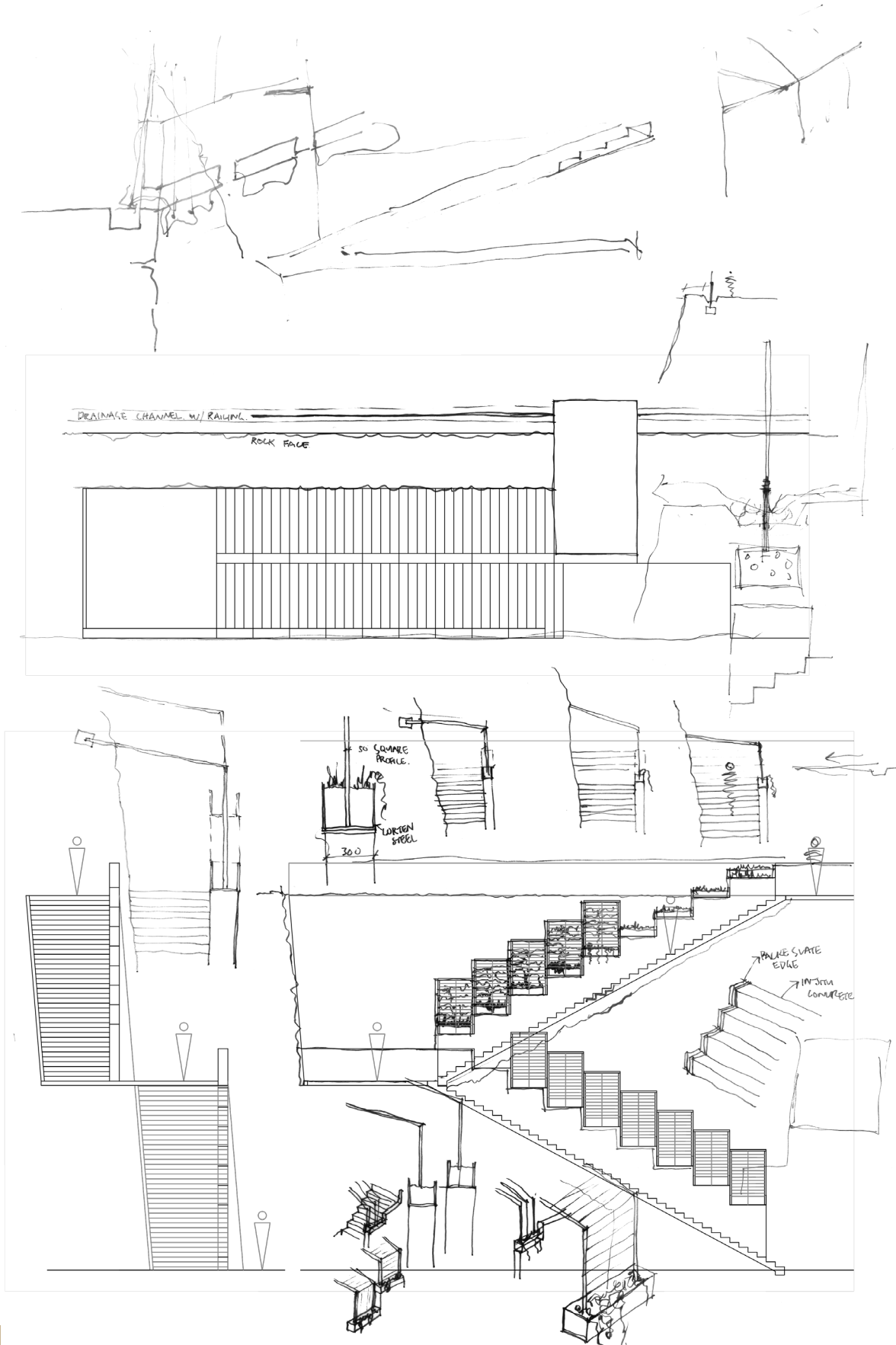


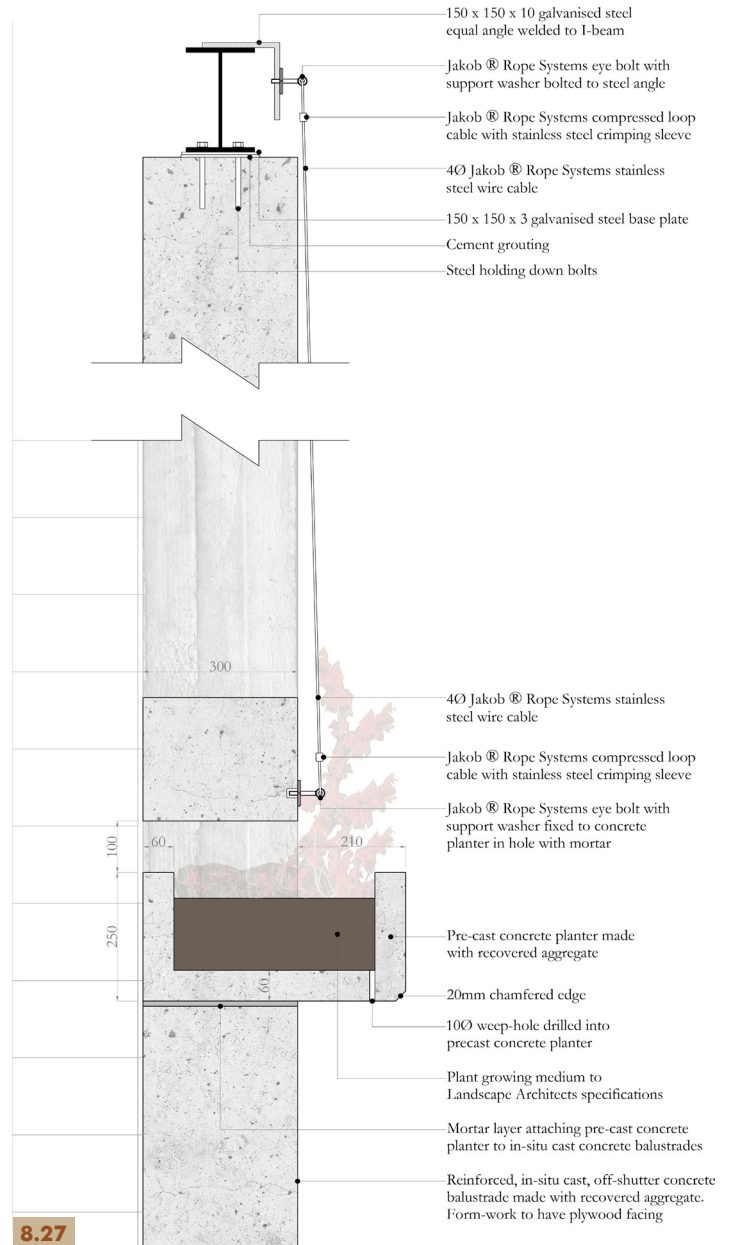
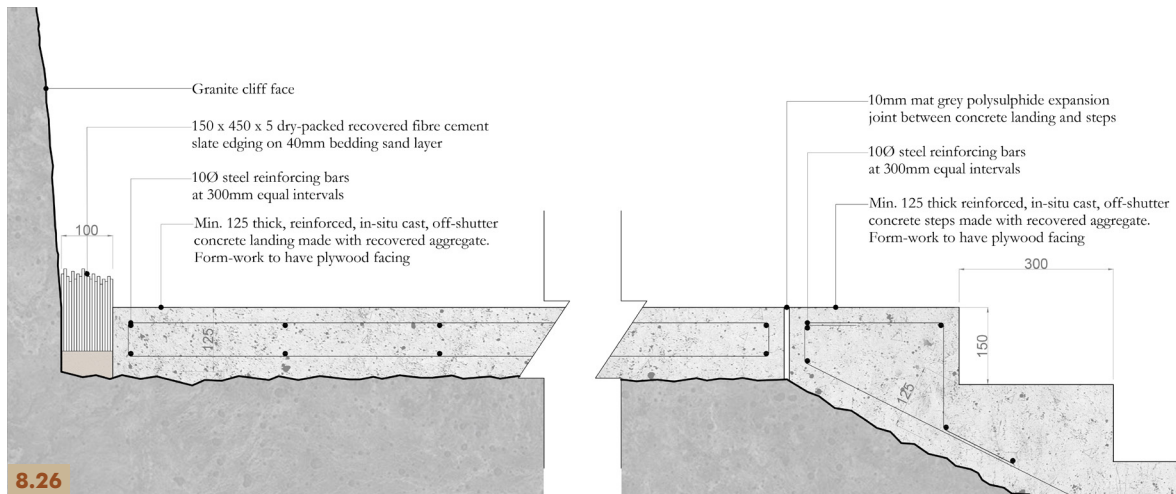
8.23



8.24

### 8.4.3 Exploration of The Descent





**Fig. 8.25** Technical exploration of concrete steps and planting screens at The Descent (Author 2019)

**Fig. 8.26** Details of concrete steps (Author 2019)

**Fig. 8.27** Detail of concrete planter boxes and wire trellis (Author 2019)







# 9 CONCLUSION

## CONCLUSION

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The intention of this dissertation was to propose an alternative approach to the adaptive reuse of quarries. This was done through a minimal landscape design approach, which utilised waste material (in this case builders' rubble) sustainably in the construction of the site, while also recognising the unique visual and spatial qualities of many quarries.

Through the design proposal, it is hoped that quarries (as well as other wasted sites) are considered in built environment planning. Not only will this utilise space, but it will de-stigmatise and make the public more aware of pressing environmental issues such as poor waste management and natural mineral depletion.

Although locally there is a lack of proposals (let alone implemented projects) which consider the reuse of quarries, there is great value for such proposals in future; there is even greater value if that quarry can responsibly address multiple local issues concurrently.





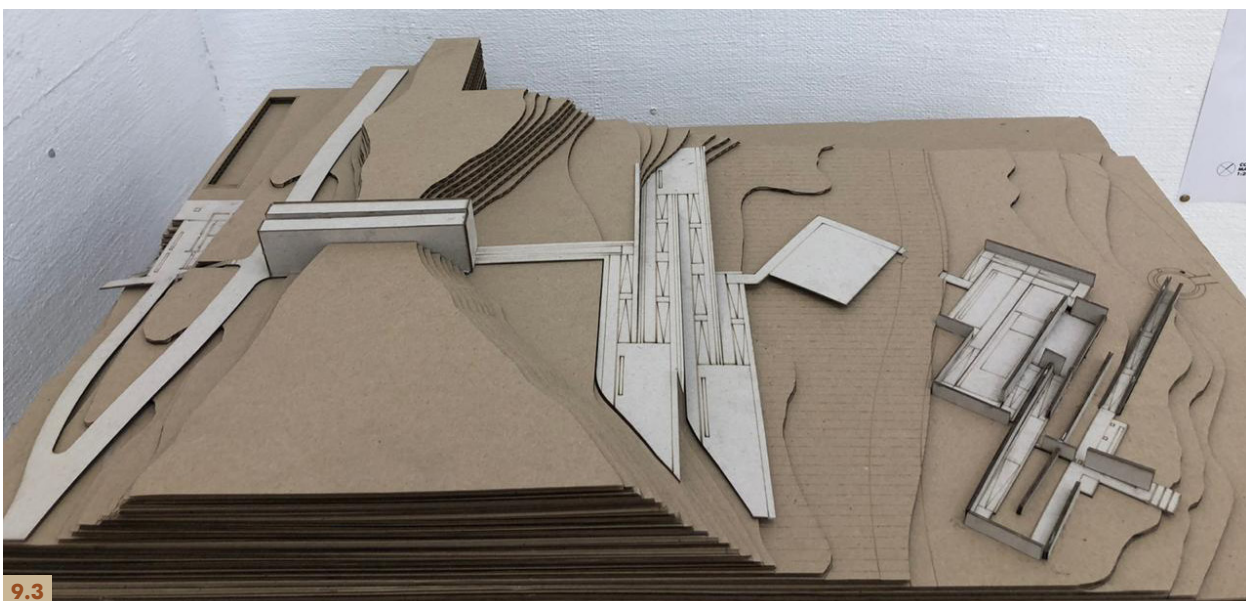
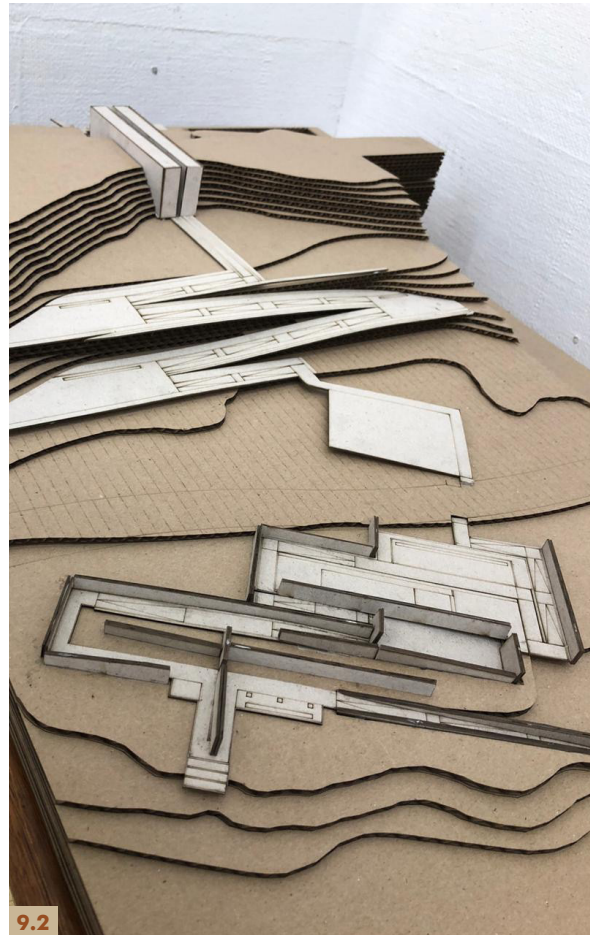
## **FINAL PRESENTATION**

22 November 2019

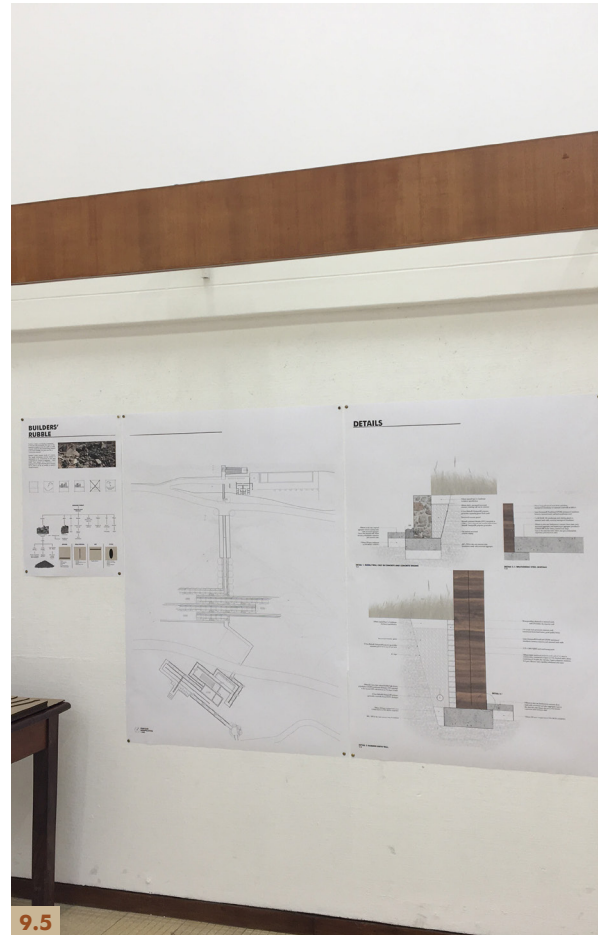
**Fig. 9.1** Final model of sketch plan area (Author 2019)

**Fig. 9.2** Final model of sketch plan area (Nelissen 2019)

**Fig. 9.3** Final model of sketch plan area (Nelissen 2019)



**Fig. 9.4** Process models  
(Author 2019)  
**Fig. 9.5** Technification  
posters (Author 2019)  
**Fig. 9.6** Final presentation  
(Author 2019)



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## **9 CONCLUSION**

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# APPENDIX A: WATER CALCULATIONS

## WATER MANAGEMENT MODEL

### A WATER RESOURCE INFORMATION (YIELD, m<sup>3</sup>)

#### A1 RAIN WATER HARVESTING DATA

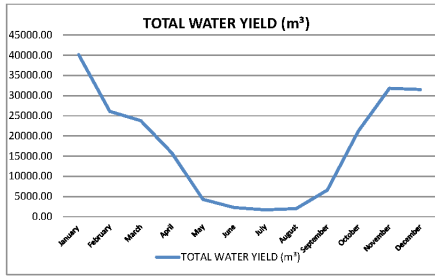
DESCRIPTION	AREA (m <sup>2</sup> )	RUNOFF COEFF. (C)
Catchment A (Gravel)	12204	0.75
Catchment B (Urban/Agri)	63696	0.65
Catchment C (Granite)	276324	0.75
Catchment D (Park)	32145	0.15
Storage C	24110	1
<b>TOTAL AREA (A)</b>	<b>408479.00</b>	
<b>WEIGHTED C</b>		<b>0.70</b>

#### A2 RECYCLED / ALTERNATIVE WATER SOURCE

MONTH	SOURCE 1		SOURCE 2		TOTAL / MONTH (m <sup>3</sup> )
	WEEKLY YIELD (m <sup>3</sup> )	MONTHLY YIELD (m <sup>3</sup> )	WEEKLY YIELD (m <sup>3</sup> )	MONTHLY YIELD (m <sup>3</sup> )	
January	0	0.00	0	0.00	0.00
February	0	0.00	0	0.00	0.00
March	0	0.00	0	0.00	0.00
April	0	0.00	0	0.00	0.00
May	0	0.00	0	0.00	0.00
June	0	0.00	0	0.00	0.00
July	0	0.00	0	0.00	0.00
August	0	0.00	0	0.00	0.00
September	0	0.00	0	0.00	0.00
October	0	0.00	0	0.00	0.00
November	0	0.00	0	0.00	0.00
December	0	0.00	0	0.00	0.00
<b>ANNUAL AVE.</b>		<b>0.00</b>		<b>0.00</b>	<b>0.00</b>

#### A3 TOTAL WATER YIELD

MONTH	AVE RAINFALL, P (m)	CATCHMENT YIELD (m <sup>3</sup> ) (Yield = P x A x C)	ALTERNATIVE WATER SOURCE (m <sup>3</sup> )	TOTAL WATER YIELD (m <sup>3</sup> )
January	0.140	40142.22	0.00	40142.22
February	0.091	26092.44	0.00	26092.44
March	0.083	23798.60	0.00	23798.60
April	0.055	15770.16	0.00	15770.16
May	0.015	4300.95	0.00	4300.95
June	0.008	2293.84	0.00	2293.84
July	0.006	1720.38	0.00	1720.38
August	0.007	2007.11	0.00	2007.11
September	0.023	6594.79	0.00	6594.79
October	0.074	21218.03	0.00	21218.03
November	0.111	31827.05	0.00	31827.05
December	0.110	31540.32	0.00	31540.32
<b>ANNUAL AVE.</b>	<b>0.723</b>	<b>207305.90</b>	<b>0.00</b>	<b>207305.90</b>



## 9.7

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## B WATER DEMAND

### B1 LANDSCAPE IRRIGATION DEMAND (m<sup>3</sup>) (Including constructed wetland)

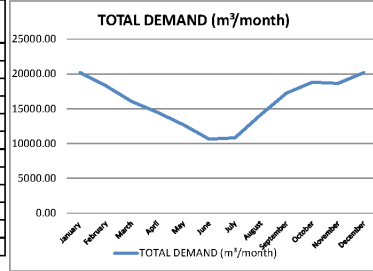
DESCRIPTION:	LAWN (m <sup>2</sup> ):	14024	AGRI (m <sup>2</sup> ):	22771	PLANTING (m <sup>2</sup> ):	26013	TOTAL MONTHLY IRR. DEMAND (m <sup>3</sup> )
MONTH	WEEKLY IRR. (m)	MONTHLY DEMAND (m <sup>3</sup> )	WEEKLY IRR. (m)	MONTHLY DEMAND (m <sup>3</sup> )	WEEKLY IRR. (m)	MONTHLY DEMAND (m <sup>3</sup> )	
January	0.02	1121.92	0.025	2277.1	0.005	520.26	3919.28
February	0.02	1121.92	0.025	2277.1	0.005	520.26	3919.28
March	0.02	1121.92	0.025	2277.1	0.005	520.26	3919.28
April	0.02	1121.92	0.025	2277.1	0.005	520.26	3919.28
May	0.01	560.96	0.025	2277.1	0.005	520.26	3358.32
June	0.01	560.96	0.025	2277.1	0	0	2838.06
July	0.01	560.96	0.025	2277.1	0	0	2838.06
August	0.02	1121.92	0.025	2277.1	0	0	3399.02
September	0.02	1121.92	0.025	2277.1	0.005	520.26	3919.28
October	0.02	1121.92	0.025	2277.1	0.005	520.26	3919.28
November	0.02	1121.92	0.025	2277.1	0.005	520.26	3919.28
December	0.02	1121.92	0.025	2277.1	0.005	520.26	3919.28
<b>ANNUAL TOTAL</b>		<b>11780.16</b>		<b>27325.2</b>		<b>4682.34</b>	<b>43787.7</b>

### B2 ALT DEMAND

MONTH	PERSONS	WATER / CAPITA / DAY (l)	DOMESTIC DEMAND (m <sup>3</sup> /month)
January	41975	4	5204.9
February	41975	4	4701.2
March	41975	4	5204.9
April	41975	4	5037
May	41975	4	5204.9
June	41975	4	5037
July	41975	4	5204.9
August	41975	4	5204.9
September	41975	4	5037
October	41975	4	5204.9
November	41975	4	5037
December	41975	4	5204.9
<b>ANNUAL TOTAL</b>		<b>503700</b>	<b>61283.5</b>

### B3 EVAPORATION LOSS (For 'open' reservoirs) (Excluding C) 35mm - 45mm/week in summer

MONTH	EVAPORATION RATE (m/week)	EVAPORATION RATE (m/month)	TOTAL LOSS (m <sup>3</sup> /month)
January	0.04	0.16	11060.96
February	0.035	0.14	9678.34
March	0.025	0.1	6913.1
April	0.02	0.08	5530.48
May	0.015	0.06	4147.86
June	0.01	0.04	2765.24
July	0.01	0.04	2765.24
August	0.02	0.08	5530.48
September	0.03	0.12	8295.72
October	0.035	0.14	9678.34
November	0.035	0.14	9678.34
December	0.04	0.16	11060.96
<b>ANNUAL TOTAL</b>	<b>0.32</b>	<b>1.26</b>	<b>87105.06</b>



### B4 TOTAL WATER LOSS & DEMAND

MONTH	TOTAL DEMAND (m <sup>3</sup> /month)
January	20185.14
February	18298.82
March	16037.28
April	14486.76
May	12711.08
June	10640.30
July	10808.20
August	14134.40
September	17252.00
October	18802.52
November	18634.62
December	20185.14
<b>ANNUAL TOTAL</b>	<b>192176.26</b>

## 9.8

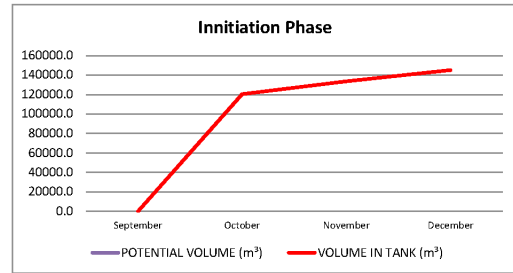
**C WATER BUDGET**

RESERVOIR CAPACITY (m<sup>3</sup>): 470205  
 MIN VOLUME (m<sup>3</sup>): 120550

**C1 WATER BUDGET**

**INNITIATION PHASE**

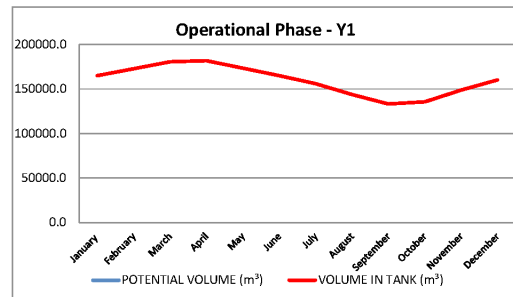
MONTH	YIELD (m <sup>3</sup> /month)	DEMAND (m <sup>3</sup> /month)	MONTHLY BALANCE	POTENTIAL VOLUME (m <sup>3</sup> )	VOLUME IN TANK (m <sup>3</sup> )
September	6594.8	17252.0	-10657.2	0.0	0.0
October	21218.0	18802.5	2415.5	120550.0	120550.0
November	31827.0	18634.6	13192.4	133742.4	133742.4
December	31540.3	20185.1	11355.2	145097.6	145097.6
<b>ANNUAL AVE.</b>	<b>91180.2</b>	<b>74874.3</b>	<b>16305.9</b>		



**C2 WATER BUDGET**

**YEAR 1**

MONTH	YIELD (m <sup>3</sup> /month)	DEMAND (m <sup>3</sup> /month)	MONTHLY BALANCE	POTENTIAL VOLUME (m <sup>3</sup> )	VOLUME IN TANK (m <sup>3</sup> )
January	40142.2	20185.1	19957.1	165054.7	165054.7
February	26092.4	18298.8	7793.6	172848.3	172848.3
March	23798.6	16037.3	7761.3	180609.6	180609.6
April	15770.2	14486.8	1283.4	181893.0	181893.0
May	4301.0	12711.1	-8410.1	173482.9	173482.9
June	2293.8	10640.3	-8346.5	165136.4	165136.4
July	1720.4	10808.2	-9087.8	156048.6	156048.6
August	2007.1	14134.4	-12127.3	143921.3	143921.3
September	6594.8	17252.0	-10657.2	133264.1	133264.1
October	21218.0	18802.5	2415.5	135679.6	135679.6
November	31827.0	18634.6	13192.4	148872.1	148872.1
December	31540.3	20185.1	11355.2	160227.2	160227.2
<b>ANNUAL AVE.</b>	<b>207305.9</b>	<b>192176.3</b>	<b>15129.6</b>		



9.9

**Fig. 9.7** Water calculations, page 01 (Author 2019)  
**Fig. 9.8** Water calculations, page 02 (Author 2019)  
**Fig. 9.9** Water calculations, page 03 (Author 2019)

