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MEMORY AND DECAY

THE AUGMENTED LANDSCAPE OF HATHERLEY LANDFILL

KEITH FREIMOND

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To my parents.

Without your support, this would not have been possible.

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

Keith Freimond

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The dissertation looks at our technological environment that become so complex and independents that it is best perceived as a nature of its own. The short life cycle of technological devices leave them to be discarded when they become obsolete, introducing materials into an ecosystem that cannot process it.

Very few waste management strategies currently exist within the city of Tshwane and it is largely left to informal waste pickers or reclaimers who sort and gather this so-called waste and sell it third-party recycling companies. The dissertation thus aims to look at paradigm shift through which these obsolete objects are not seen as waste, but rather as anthropological relics than can become a commodity in our future society. A commodity that can be mined for its material, energy, nostalgic and narrative value and even the data it contains.

The site of investigation is Hatherley landfill where the landfill has become the livelihood of hundreds of informal workers who live on the landfill and in the neighbouring informal settlement, Phumolong. Methods used to keep the landfill contained and out of site, now make the daily movement of these workers a dangerous process and work conditions are hazardous. The intention is to change the nature of the current edge condition of the landfill and establish a porous quality connecting it to the neighbouring community with architecture mediating daily exchanges. The intention is thus to investigate architecture as a device, to augment such landscapes, for the mining of everyday objects as though they have become anthropological relics, and the re-processing of these commodities for re-consumption; brining together issues of man, nature and technology.

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The verhandeling kyk na ons tegnologiese omgewing wat so kompleks en onafhangklik geraak het dat dit ‘n natuur op sy eie beskou kan word. Die kort lewe van tegnologiese toestelle veroorsaak dat n oormaat daarvan weggegooi word wanneer dit uitgediende raak. Hierdie stel ons ecosisteem aan vreemde materiale voor, materiale wat ons ekosisteem nie kan prosesseer nie.

Baie min vullis bestuur strategië bestaan in die stad van Tshwane en meerendeels word die taak aan informele werkers op vullishope gelaat. Hierdie werkers sorteer en versamel hierdie sogenaamde afval en verkoop dit aan derde party herwinnings maatskapye.
Die verhandeling ondersoek dus ‘n paradigma verskuiwing waar hierde uitgediende objekte nie as afval gesien word nie, maar eerder as antropologiese oorblyfsels wat ‘n kommoditeit in ons toekomstige samelewing kan wees. n Kommoditeit wat bemyn kan word vir sy material, energie, nostalgie en narratiewe waarde en selfs vir die data wat dit bevat.

Hatherley vullishoop word ondersoek in hierdie verhadeling aangesien die vullishoop die lewensbestaans van honderde informele werkers wat in die naburige infromele nedersetting, Phomolong woon. Metodes wat gebuik is om die vullishoop af te sonder , maak die beweging van die werkers ‘n moeilik en gevaarlike prosess, terwyl werksomstandighede onvoldoende is. Die voorneme is dus om die natuur van die rand te verander en n poreuse gehalte te skep en dit verbind aan die naburige samelewing. The voorneme is dus om argitektuure te ondersoek as a toestel wat landskappe van afval aanvul, om elkedaagse objekte te bemyn asof dit ‘n antropologiese oorblyfsels is, en die her-verwerking van hierdie kommoditeite vir herverbruiking en so kwessies van die mens , die natuur en tegnologie saam te bring.

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Memory and decay: an introduction



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Background

The dissertation looks at our technological environment that has become so complex and independent that it is best perceived as a nature of its own. Increasingly, technological solutions are being applied to the many serious challenges facing the world and is used as a tool to boost economy and service delivery. This is happening on a ever increasing and precise scale. Nature and culture now seem to merge as no landscape on earth hasn't been affected by man's influence to some extent. Our cultural environment is changing our natural environment faster than our perceptions of nature is changing.

The dissertation aims to challenge current perceptions about nature, that affect the way we deal with issues of sustainability and problems such as waste. Current attempts to manage and recycle this so-called waste, have been left to a largely privatized industry which rely on informal waste-pickers or reclaimers who gather and sort waste on landfills. The collected waste is sold to third-party companies who buy the waste from the reclaimers and pay a rate per kilogram. These reclaimers refer to themselves as 'Bagariesi'; and is understood to mean "someone who is looking for something valuable" (Samson, 2010; p2). We however neglect to recognise cultural and environmental potential of these spaces of waste.

These reclaimers, however, have often been kicked off and prevented from entering landfills and are often exploited by companies who run and work on the landfills. Only in recent years, with the adoption of the new waste act, in 2009, has this informal industry been recognised (Samson, 2010; p2). This new legislation, however, doesn't yet resolve relations with the waste-pickers. Recent attempts by municipalities to work with the reclaimers, such as providing a fund for projects that attempt to uplift and allow the reclaimers to support themselves, have been mostly unsuccessful largely due to a lack of infrastructure to support the emerging industry.

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The dissertation thus aims to look at paradigm shift through which these obsolete objects are not seen as waste, but rather anthropological relics than have become a commodity in our future society. A commodity that can be mined for its material, energy, narrative and nostalgic value and even the data it contains. The dissertation also aims to challenge the way we perceive nature, which in today's society has become a subset of culture; exploring how technology might merge and even trade places with nature, bringing together issues of man, nature and technology. The project thus aims to investigate technologies and processes for how these commodities can be extracted and processed for re-consumption, through sustainable and resilient practices as well augment current waste-management practices done by the informal reclaimers.

The site for this investigation is Hatherley landfill, situated in Pretoria, on the periphery of the Mamelodi township. Originally the landfill was meant to be far removed from human settlements; with the ever expanding Mamelodi we now see a large informal settlement, Phumolong, to the north of Hatherley landfill; established in the early 2000's. Today we see hundreds of people crossing the landfill and working informally on the landfill, the majority inhabitants of Phumolong and neighbouring developments. For many inhabitant of Phumolong this landfill has become a valuable resource, and the source of their livelihood; enabling them to support themselves and earn a wage. As one of the Pretoria's oldest and largest landfill sites, this man made landscape will be the basis for investigating for how an architectural intervention might augment such landscapes and change the way we view such sites and their potential in environmental and cultural terms.

Problem statement:

The main problem revolves around how landfills are originally considered as places where the life cycle of products ends, meaning that resources and materials, which before where valuables, become useless and are disposed forever. This, however, needs to be reconsidered and as current practice on landfills indicate that this is no longer the

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reality. Man's relationship to these spaces of waste needs to be reconsidered as these can become valuable resources within communities. Issues such as scarring of landscape and visual discomfort, air and water pollution due to the presence of toxic substances, changes in soil fertility, loss of biodiversity, spreading of pathogenic agents and a host of vermin such as insect and rats are other issues regarding landfill sites. Hatherley landfill currently receives 120 444 tons of waste per year and is set to be under capacity for the next 60 years. With the growing pressure on natural resources current waste-management needs to be reconsidered.

Current waste-management practices are unsustainable due to a lack of infrastructure to support these functions. These practices are often dangerous and hazardous to individuals and are inefficient and also don't support associated programmes to enable entrepreneurship and empower communities.

On an urban scale, current regulations of landfills sites call for them to be removed and enclosed off from communities, however Hatherley landfill now lies in close proximity to the informal settlement of Phumolong. Methods use to enclose waste off from the neighbouring developments, now make the daily movement of hundreds of people who cross and work on the site a challenging and dangerous task.

Hypothesis:

By realizing the possible material and cultural value of landfills, extracting the value could improve the livelihood of neighbouring communities. By establishing a sustainable infrastructure on site, it is possible to support waste-picking activities on site and enable waste-pickers to support themselves. By reconsidering current practices on landfills it is possible to improve conditions on site using architecture as to support and mediate exchanges between the landfill and neighbouring community. By using architecture and technology as a way of augmenting natural processes on site it can bring greater meaning to the landscape.

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Objectives:

An investigation is thus under taken as to how such landscapes of waste can rather be seen for the material and cultural value, embodied energy and even the data it contains and how these can be extracted and reprocessed. This is to be done through sustainable and resilient means as a way to empower communities and adds value to the environment; supporting and enhancing existing networks of informal workers and augmenting current practices on site.

The intention is thus to investigate architecture as a device, to augment such landscapes, for the mining of everyday objects as though they have become anthropological relics. The dissertation will investigate processes of extracting commodities not only physical but also in cultural terms, and the reprocessing of these commodities for (re)consumption, through unprecedented programs and speculative technological systems, as well as enhance current practices on site and provide safe and comfortable spaces for this to occur. The intention is to explore new systems, processes and technologies for the extractions of commodities within waste sites with architecture as a bridge to re-establish man's relationship with nature and restore a sense of place to the scarred landscape; establishing a comfortable and safe environment for the informal workers supporting current practices on site.

On an urban scale how these spaces of waste can be seen as commodities in the construct of our cities both in terms of environmental and cultural constructs and how Hatherley landfill could be used to support the informal settlement of Phumolong and surrounding developments. The intention is thus to investigate the re-purposing of such sites as a public facilities and how they can act as a sustainable infrastructure within our cities. The aims is to challenge the policies and guidelines in which these sites are developed. The intention is to change the nature of the current edge conditions of the landfill and establish a porous quality connecting it to the neighbouring community with architecture mediating daily exchanges.

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Program and client:

The intention is not to simply design a recycling facility but to rather explore new systems, processes and technologies for the mining and extraction of commodities within waste sites with architecture supporting these functions. The programme does not envisage an end result for the landfill but rather a series of programmatic interventions that continually evolve and changes the landscape over time. The programme interacts with the sites' subsurface, surface and edge and attempts to mediate and enhance interaction between the urban actors and the landscape that already exist on site. Not only the material value of the relics is to be mined but will also investigate the embodied energy, nostalgic value and even the data it contains. The dissertation will look at the re-possessing of these commodities and possibilities for its re-consumption through didactic, practical, and recreational experiences.

Research methodology:

A literature study will be used to investigate relevant theories, history, programmatic requirements and technologies. The intention is to draw on extant theory to frame new theory regarding the social issues at stake. Relevant precedents and case studies with similar programmatic components will be investigated and where there are no relevant studies, it will be investigated through experimentations. In- depth site analysis will be conducted using photographic, video, analytical drawings and interviews, to determine the scope of the issue and will also form part of the qualitative and quantitative study of the site. These research methods will be used inform the architectural response which is to be developed and explored through sketching, planning, 3d computer modeling and physical models.

The project will investigate the use of archaeological methods of extracting value from landscape. The process is contained into three parts. Part 1 - surveying, part 2 - Excavating and part 3 - communication of findings.

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Research questions:

- How can architecture be used as a device to augment man-made landscapes, to re-appropriate and extract commodities from them?

- How can technology and design be used to change our perceptions of nature and natural systems?

- How can technology be used to form a symbiotic relationship with nature and even trade places?

- How can architecture act as a sustainable infrastructure to re-purpose landfill sites as public facilities?

- How can infrastructure enable communities and enhance current networks?

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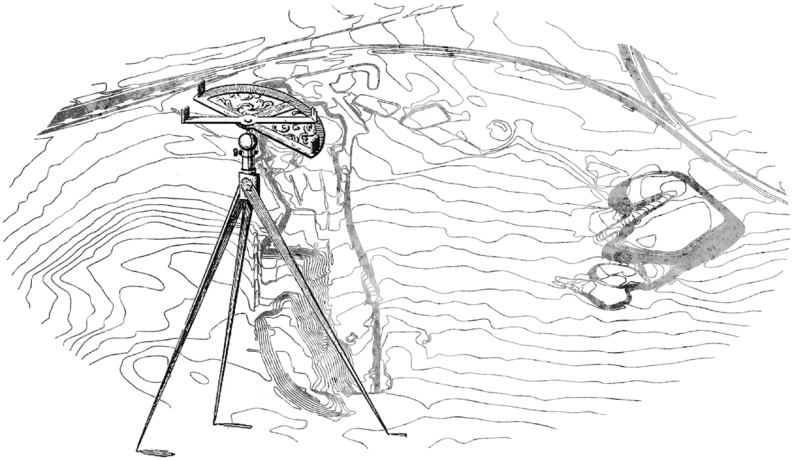
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Part

1

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Surveying



The survey is a type of field research by which archaeologists search for archaeological sites and collect information about the location, distribution and organization of past human cultures across a large area.

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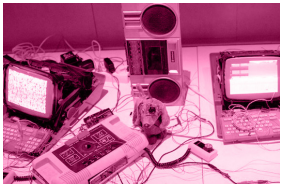
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[1.1] Collage
By author(2015)

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SURVEYING PARADIGMS



[1.2]
Obsolete technology as art.
(Andreotti, 2015, edited by author)

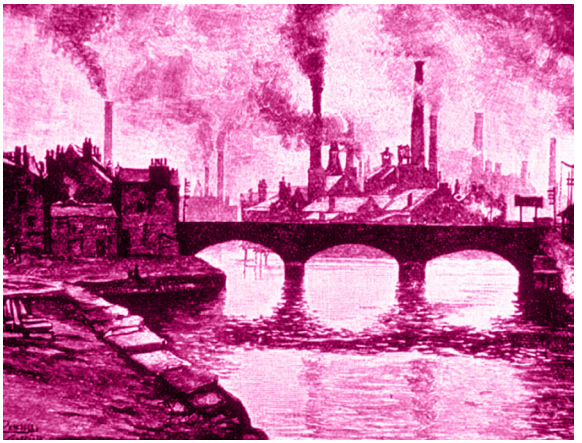
Humans have been impacting their environment from the start of our history. From stone tools to domestic fires and agriculture, man has shaped his environment to suit humanity's needs and to yield the most out of his natural environment. Today it is happening on an ever increasing as well as precise scale; scientific and technological solutions are being applied to most of the world's political, economic and environmental problems from genetic mutation, engineered microbes to creating digital networks. Rapid changes in technology and media have been offered as solutions to many problems and have become catalysts in shaping our cities.

The eventual obsolescence of these objects, however, have resulted in a fast-growing surplus of electronic waste around the globe (Andreotti 2015). Our reliance on fossil fuels has caused unintended side effects such a climate change and our planet is still trying to cope with the effects of industrialisation that has resulted in oceans full of plastic and landfills full of waste. We are continually changing nature both intentionally and unintentionally and our environments are forced to adapt.

[1.3]
Obsolete technology in landfills.
(van Mensvoort, 2009, edited by author)



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[1.4]
Industrial revolution.

(Fitzgerald, n.d, edited by author)



[1.5]
Atomic cloud after Nagasaki atomic bombing.

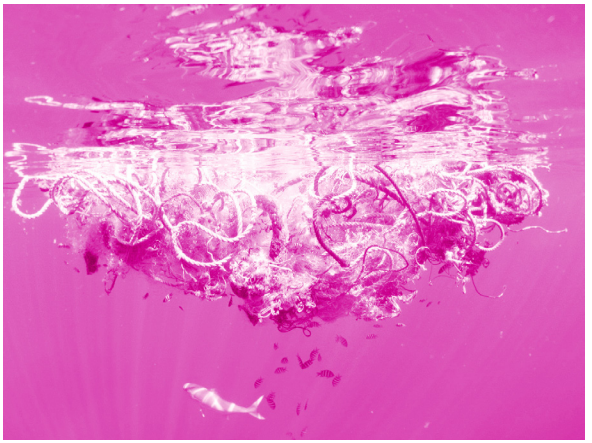
(Atomic archive, 1945, edited by au-

We have changed our environments to the scale that many argue that our current geological epoch should be designated as the Anthropocene; a chronological term that serves to show that humans have had a significant impact on earth ecosystems, on a scale comparable to major geological events that have shape previous epochs (Kolbert 2010). Events that include "meteorite strikes, extraordinary volcanic outbursts, colliding continents, and disappearing oceans" (Zalasiewicz et al. 2010:2228). All these events on the largest scale that seemingly even the world's largest number of people aren't able to match.

Several measurable scientific markers, however, have indicated otherwise, suggesting that "Humanity and its instrumentalities are thus the most potent and influential geological force (Sterling 2010)" even on a geological time scale that spans across billions of years, meaning man is making irreversible changes to our landscape. These markers

Images above used as evidence of man's influence on our environment. Comparable to major geological events that have shaped previous epochs.

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[1.6]
The great pacific garbage patch.

(Guerrisi, 2012, edited by author)



[1.7]
Urbanisation as a result of the great acceleration.

(Author unkown ,2008, edited by author)

include major changes the world has undergone, such as the industrial revolution in the early 1800's, resulting in the mass production of products leading to higher levels of carbon dioxide in the atmosphere and ultimately large quantities of waste entering the earth's ecosystem, leaving a distinct geological record (Kolbert 2010); the atomic age, from the first nuclear tests in the 1940's leaving behind a permanent record in the form of radioactive isotopes (Kolbert 2010); the 1940's also coinciding with the start of a mass production of plastics, introducing large amounts foreign material into the earth ecosystem (van Mensvoort 2011); as well as what is referred to as the 'great acceleration', a rapid increase visible in population growth around the world ''increasing by 2% per year" and "unprecedented changes in agriculture and food production", coinciding with the end of the atomic age in the 1960's (Sullivan 2015).

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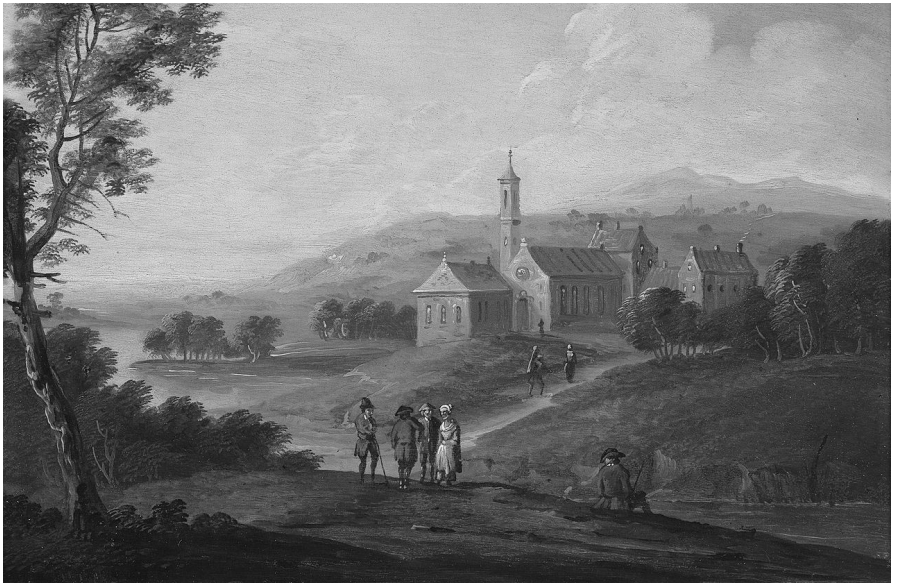
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This idea is, however, not new. As dr. Koert van Mensvoort (2014), artist, philosopher and scientist, known for his work on the philosophical concept of Next Nature, states:

"All species transform their surroundings. The dizzying complexity of landscapes on Earth is not just a happy accident of geology and climate, but the result of billions of years of organisms grazing, excavating, defecating, and decomposing. Nor is it unusual that certain lucky species are able to out compete and eventually entirely displace other species."

Many things are still unclear about this new suggested epoch, but what is clear is that this epoch is still in its infancy and the world is still coming to grips with what it means for the planet, the environment and the human race (Kolbert 2010). It is thus essential that we reconsider how we deal with issues facing the world, as the world and nature is changing faster than our perception of nature is.

Our perception of nature hasn't changed, despite major changes society has seen in the world. We still view nature as a static given; scerene, balances, harmonic and picturesque to be viewed from afar as



[1.8] Flusslandschaft mit einem Dorf und Wanderern. Typical 18th century landscape painting.

(Jan Pieter van Bredael, 1735)

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landscape paintings form the 18th century depicting the idyllic rural landscape would suggest. This perception is naïve and needs to be reconsidered as even the rural landscape has been transformed to our cultural ideals; rural landscapes are continuously marked by mechanised strategies and require irrigation in order to be cultivated. The rural landscape is not wilderness, but an ordered landscape: nature has taken an artificial patina and our perception of nature is simply a picturesque ideal (Smout et al. 2007:6).

Representation of landscapes how it has developed over time, is important in understanding our environment and reveals a deeper understanding of nature. South African artists such as Cecil Skotnes and William Kentridge have explored landscape representation through their works "with the purpose of communicating its social and historical dimensions" (Godby 2015, p.41). Kentridge realised that historical events leave little trace on the landscape thus developed new techniques to depict the social forms within landscapes. Kentridge used collage techniques depicting the landscape as a series of fragments, displaying that landscapes are formed by a number of influences (Godby 2015:38). In his work, landscapes were often depicted as animations, fluid and yielding, continually absorbing new features and memories.

[1.9]
The invention of Africa 1, mixed media.
(William Kentridge, 2012)



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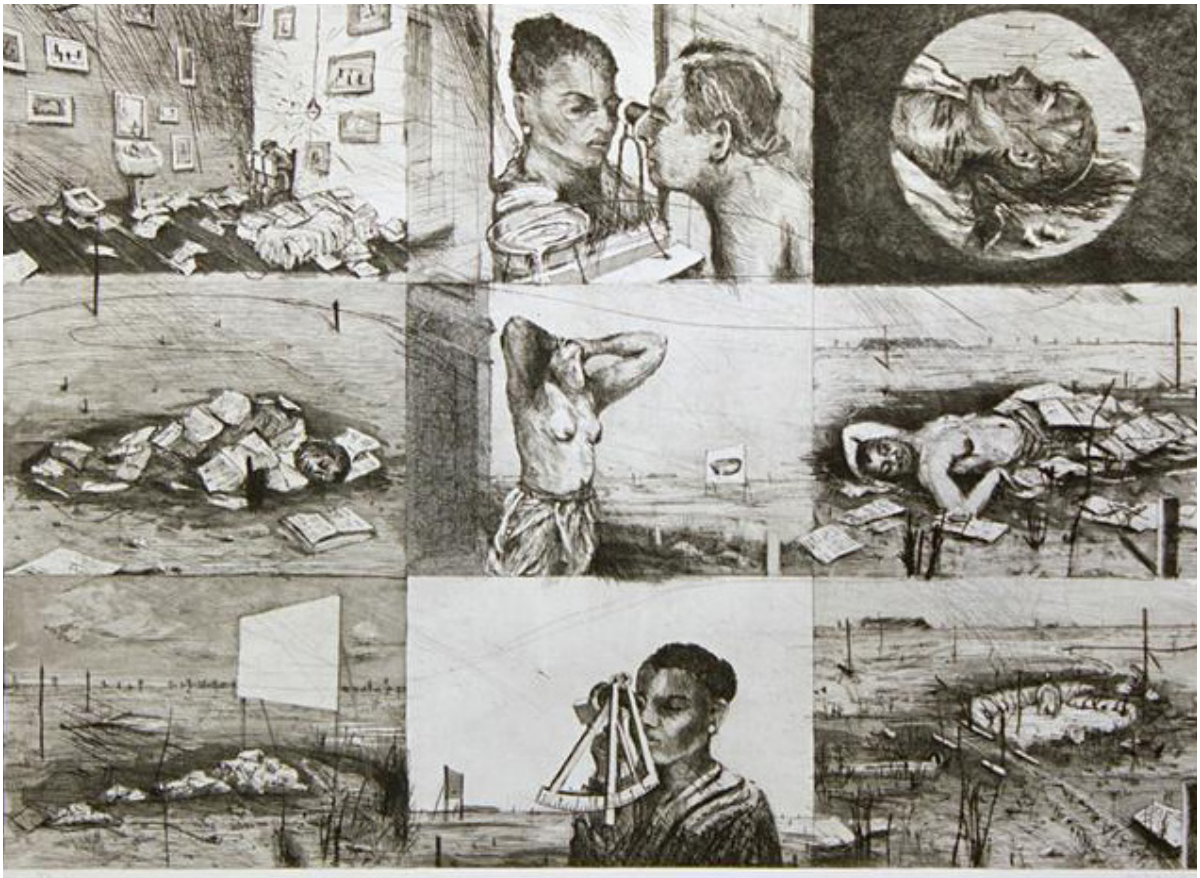
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[1.10]
Drawing for the film Other Faces.

(William Kentridge 2011)

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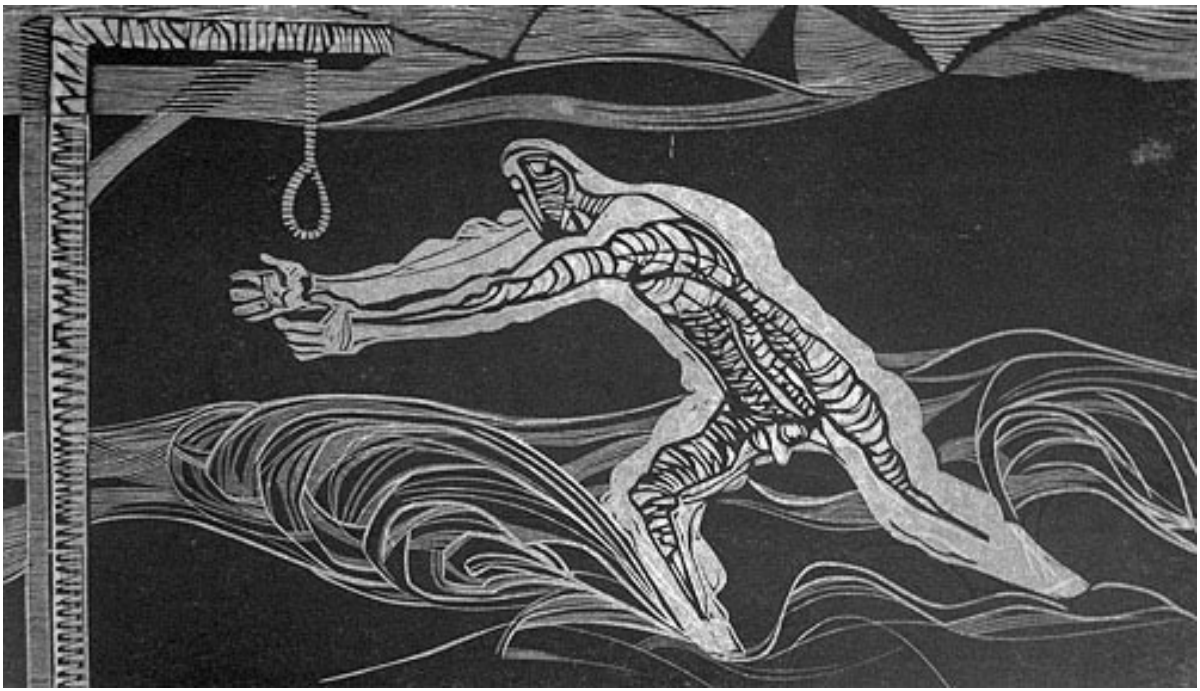


[1.11]
Still from the animation, Felix in Exile.

(William Kentridge 1994)

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[1.12]
The Gunner Makes the Land. The White Monday Disaster series. Print.

(Cecil Skotnes, 1975)

Skotnes on the other hand realizes the landscape's power for recalling memories, and juxtaposed abstracted landscapes with figures, and often uses the landscape to tell narratives, displaying the landscape as a stage for humans. Skotnes, not representing the landscape itself but rather an interpretation of landscape, in an attempt to reveal intangible components of the landscape and its cultural dimensions (Godby 2015:40)

Artist such as Kentridge and Skotnes have often pushed representation of landscape to reveal more complex truths, showing that landscapes have cultural dimensions as well and are not only part of our natural word. This view of the landscape is not shared among the ma-

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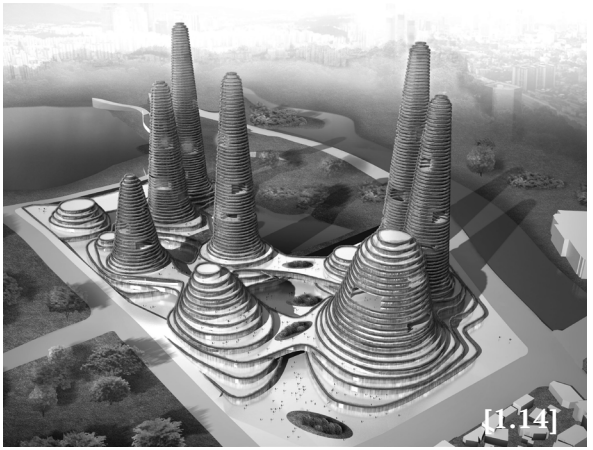
[1.13]
His Second Brave Pair.
The White Monday Disaster series.
Print.

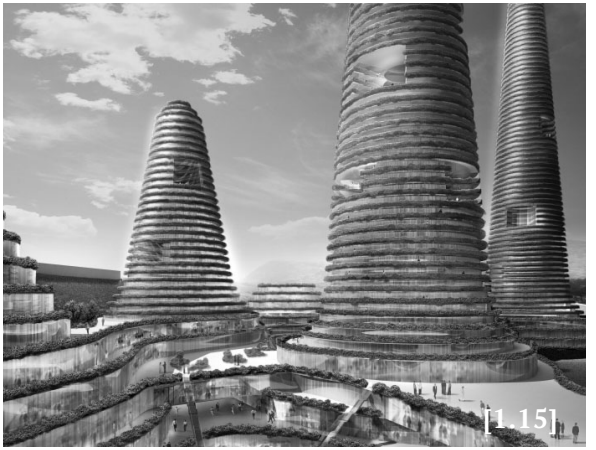
(Cecil Skotnes, 1975)

jority of society as we can see with the availability of kitsch art often sold along the road, displaying featureless landscapes representing the landscape as accessible if not familiar. Similarly Pierneef, one of South Africa's most popular artists, displayed a similar view towards landscapes, representing the landscape as empty, with repeating forms (Godby 2015, p.39).

Rarely is landscape used to refer solely to pastoral scenery or garden planting, for instance— images with which it is most conventionally associated. Instead, its usage is diverse and rich, embracing urbanism, infrastructure, strategic planning, and speculative ideas alongside the more familiar themes of nature and environment (Corner 2015).

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[1.14]


[1.15]

[1.14] [1.15] MVRDV Gwanggyo Power Center. Mixed use 77,000 inhabitants development near Seoul.

(Enhuber, 2011)

In our architectural environment there seems to be a renewed appreciation for landscape and the pastoral ideal, where architects seek to rather engage with the landscape than the urban condition. The results, often, speculative projects with whole cities with undulating form, mimicking the rural landscape, in an attempt to combine the urban and the rural (Castle 2013:6) a new expression of utopianism. Similarly, in many recent urban projects, the scale of landscape architecture has increased to work on an urban scale. Landscape theories such as landscape urbanism, led by architects James Corner and Charles Waldheim has gained popularity. The aim of landscape urbanism, to build our cities around natural systems by attempting to bring ecology into urbanism and where the landscape is reduced to its processes and exploited to act as infrastructure within our cities (Balmori 2014:78 - 79). Very few built examples, however, exist, greatly due to society's naive interpretation of landscape, with projects such as these, falling outside the general frame of understanding.

What this new appreciation of landscapes and its processes does show is that we can no longer accept the standard notions of sustainability. Society's approach to sustainability is to create environmentally responsive buildings and mostly aimed at reducing waste and using fewer resources. Although an important consideration, this narrow minded interpretation will not solve the issues plaguing our world,

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[1.16]


[1.17]

[1.16] [1.17] The highline. Field Operations. One of the few built examples of landscape urbanism

(Unknown author, 2009)

but will only postpone an inevitable outcome until buildings are able to add positively to the environment. Our attempts at sustainability view architecture and nature as opposing forces, where the creation of one leads to the destruction of the other, yet a mutually beneficial relationship between the two is obtainable.

In our attempts at sustainability, a reduction in waste is one of the main goals. Waste in its original meaning, referred to an environment no longer suitable to human habitation (Till, 2006. p67). But we must not necessarily see waste's relationship to nature as anti-ethical, as in ecosystems waste takes on a different meaning. As Capra (1996:101), leader of ecosystemic thinking, states: "all living organisms take in energy and matter and discard waste products was the most general characteristic of life he could identify". This occurs on all scales from a cellular level to up to a larger systemic level, "where all life uses the atmosphere and oceans as fluid media for raw materials and waste products and there is a continual movement of matter through living organisms and systems" (Capra 1996:18). In ecosystems our interpretation of waste thus does not exist; what is waste for one species is food for another, so that waste is continually cycled through the ecosystem, and as a whole generally remains without waste (Capra 1996:77).

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Architects such as Bjark Ingels have started to deal with issues of ecosystemic thinking by proposing what he calls a hedonistic sustainability, recognising our consumerist lifestyles and accepting waste as an inevitable product; attempting to transform the whole sustainability debate. Hedonistic sustainability looks at building as ecosystems where waste and resources can flow between the built environment, without needing to compromise on quality of life. (Ingles 2010) This idea builds on ecosystemic thinking "seeing the world as an integrated whole rather than a dissociated collection of parts" (Capra 1996:6). In its application, Ingels' projects however have been met with mixed results, often failing to properly integrate his buildings on an urban level or integrating with the landscape. What's missing from Ingels' vision is the landscape; his projects, often expressive and playful; but ultimately becomes islands in the landscape, the opposite of what is set out to be achieved. Ingels' projects rely on a connectedness of functions within a buildings, often proposing two very different functions within the same buildings, but neglect interconnectedness into the landscape ultimately becoming a superficial ecology. In contrast Capra calls for a deep ecology which "recognises the fundamental interdependence of all phenomena and the fact that, as individuals and societies, we are all embedded in (and ultimately dependent on) the cyclical processes of nature" (Capra 1996: 6).

[1.18] Right
Orestad development. Largely considered a failure.

(L. Olsson, J. Loerakker, 2013)

The problem with the majority of contemporary, sustainable projects is often a superficial understanding of nature. Nature is often mimicked copying its form without understanding the processes at a deep level, ultimately still working within an industrial paradigm only looking at the end product of sophisticated systems. (Armstrong 2013) Society tends to use technological solutions as a tool to solve many of the world's problems. A healthy relationship between technology and nature that is required. We still see architecture as a machine requiring external energy to be useful. (Armstrong 2013) Nature on the other hand deals with processes that are never static, or the systems are no longer living. As Armstrong argues (2013), the aim should be to develop more lifelike technologies that may be beneficial to our environments.

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[1.19]
Two plots developed by BIG Architects.

(L. Olsson, J. Loerakker, 2013)



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[1.20]
Conceptual image of how nature and culture have merged.

(Brendan Cormier, 2013)

Van Mensvoort (2013) proposes the idea of a “next nature”, a philosophical idea that seeks to shift our understanding of nature as we no longer are able to tell where nature ends and culture starts. Van Mensvoort (2013) argues that where technology and nature, traditionally seen as opposed, now appear to merge or even trade places. Next Nature is not the cultural ideal of an undisturbed picturesque landscape but suggest a nature that is continually evolving as nature is changing faster than our perceptions of nature is changing (Sterling 2010). Next Nature argues that nature is not simply a static entity that can only be “discovered, dissected and destroyed by human agency’’ (Sterling 2010), but that nature actually evolves through human technological intervention. Next nature asks that we must re-evaluate our roll in how we shape nature as van Mensvoort (2013) states:

”We must not see ourselves as the anti-natural species that merely threatens and destroys nature, but we should rather see ourselves as catalysts of evolution. With our urge to design our environment, we must design a Next nature that changes along with us.”

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[1.21]
Cultural imagery mimicking nature has become more recognisable than its natural counterparts.

(Koert van Mensvoort,2009)

Next nature attempts a shift our understanding of nature and asks us much deeper questions about our humanity and how we're going to shape it as we experience a paradigm shift in the way we live (Armstrong 2014). Interventions into nature should thus not be seen as anti-ethical to nature but a necessary part of its evolution. Similarly our technological environment should learn from nature, as it has done in the past, as it is just as complex and unpredictable as nature. The natural and the technological can thus fuse into a next nature as it already has begun to do.

"What we have to learn from nature is to understand its technology. We need to understand those processes through which these outputs are produced and how the outcomes are entangled to form more ecological forms of technology. These systems won't be machines but will be a different kind of technological platform, with completely different outcomes and impacts on the environment to those we associate with the industrial age. Potentially buildings can form systems that help us transform our waste into products that may replenish, not deplete our environment" (Armstrong 2014).

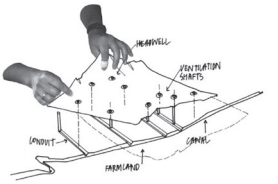
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The augmented landscape:

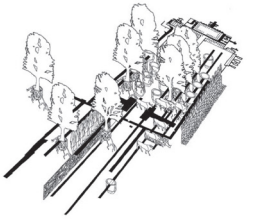
In designing a next nature we must not only consider architecture, but also its relationship to technology, nature and the landscape. What is thus proposed is an augmented landscape; technological and strategies fused into the body of architecture, technologies that "are essentially environmental as they employ air, water, sun, and earth to augment the performance of the building as well as the landscape" (Smout et al. 2007:9). An augmented landscape aims to understand natural processes on site and aims to augment them, using technological strategies to merge with and enhance environmental processes. Technology that is "embedded, contextual and visual" (Smout et al. 2007:9).

The architecture of the augmented landscapes aims to mediate, suggesting a sensitivity to the environment. The augmented landscape aims to engage and mediate various geographies, from memories and experiences to artifacts and technologies; interventions that play with both extremes, in order to resonate most in the contemporary world (Smout et al. 2007:9).

Architects Mark Smout and Laura Allen often explore the idea of the augmented landscape through speculative projects. In the Grand Egyptian Museum, an extensive project for the relocation of the Museum of Egyptian Culture on an exposed sand dune landscape as the site (Smout et al. 2007:9). The landscape is seen as a deep surface, which the architecture inhabits; the skin and roof merging with the strata of the landscape. Three subterranean galleries cut into the landscape, connected by chasms for ventilation and circulation. The landscape exploits environmental processes in order combat the harsh climate. Roofs are flooded with water and architecture takes advantage of the passage of sun, with the chasms clad in glazed tiles reflecting light down into the deep galleries (Smout et al. 2007:10). The project merges with the landscape where the natural and the artificial both inhabit the deep surface. The landscape here is restless, constantly active.



[1.22]
Museum of Egyptian Culture: Conceptual image of sunken chambers.
(Smout & Allen, 2002)



[1.23]
Museum of Egyptian Culture: Diagrammatic arrangement of structures.
(Smout & Allen, 2002)

[1.24]
Museum of Egyptian Culture: The environmental performance of the landscape.
(Smout & Allen, 2002)

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A: Chasms (external public areas) chronographically regulate light and shade

B: Tiled linings to chasm walls. Faceted tiles have a partial faience face to reflect the midday sun. Unfinished matt facets absorb and diffuse solar energy at dawn and dusk.

C: Excavated "deep surface" gallery spaces and circulation

D: Water-chilled draught corridors and service tunnels

E: The vegetal chronograph, a diurnally and seasonally changing landscape of blossoming vernacular planting. Varieties of water lilies bloom throughout the day, the blue from morning to midday and the white from late afternoon to the following day.

F: Final stages of the far-reaching *qanat* network. Networks of this kind bring life to an otherwise uninhabitable desert.

G: Cisterns

H: Irrigated "flood plain" gardens

I: Sunken and shaded workshop courtyards pierce and puncture the augmented landscape.

J: Evaporative cooling from irrigated landscape to museum spaces below (the Ancient Egyptians hung wet mats outside as cooling devices).

K: Mass temperature is controlled by constantly regulating the flow of water in the irrigated landscape and therefore the overflow of water down the chasm faces and floors.

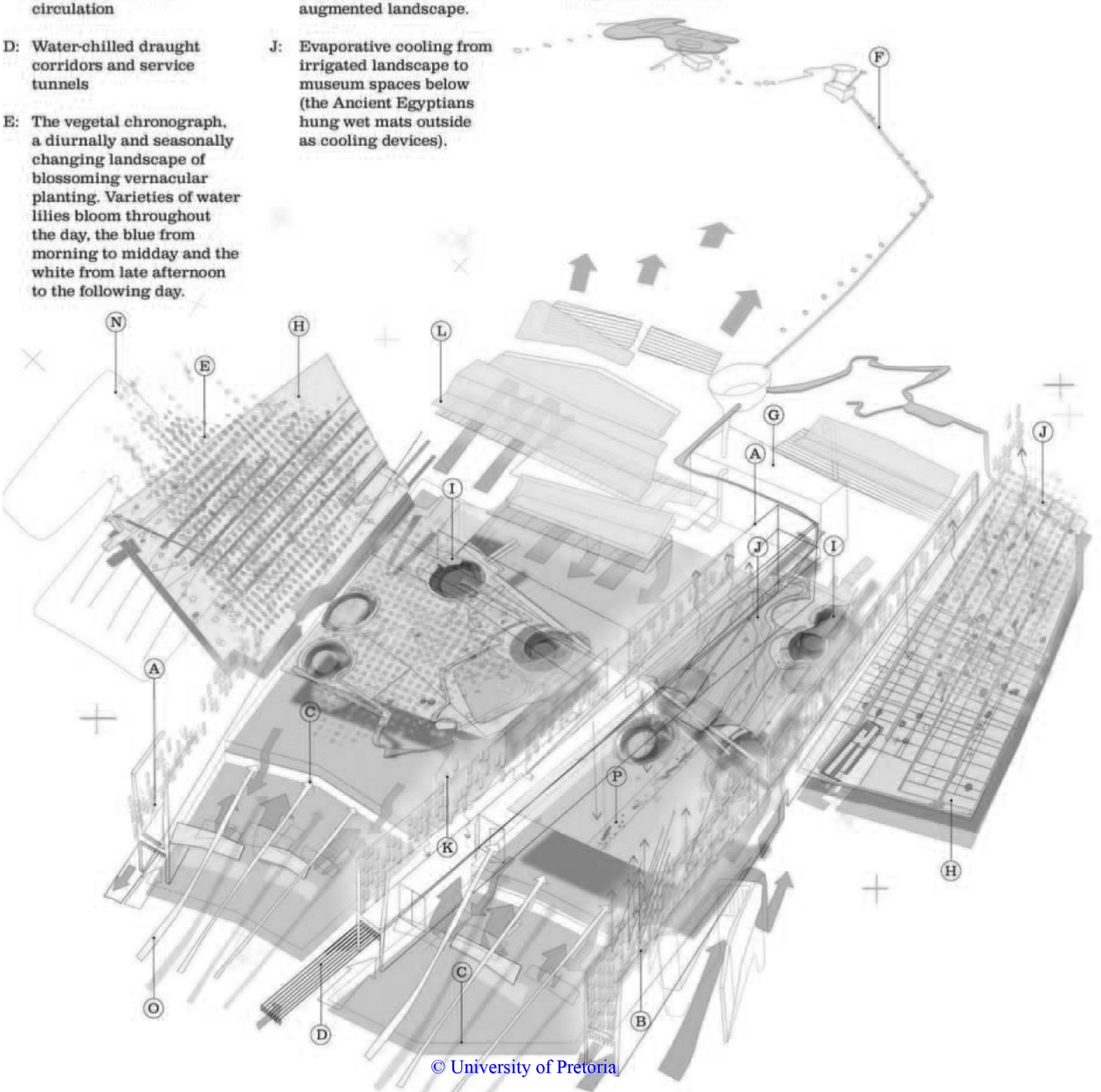
L: Profiled roof surfaces, with "wet blankets" to the internal faces, provide ventilation of thermally modified air to the main body of the museum.

M: Horizon

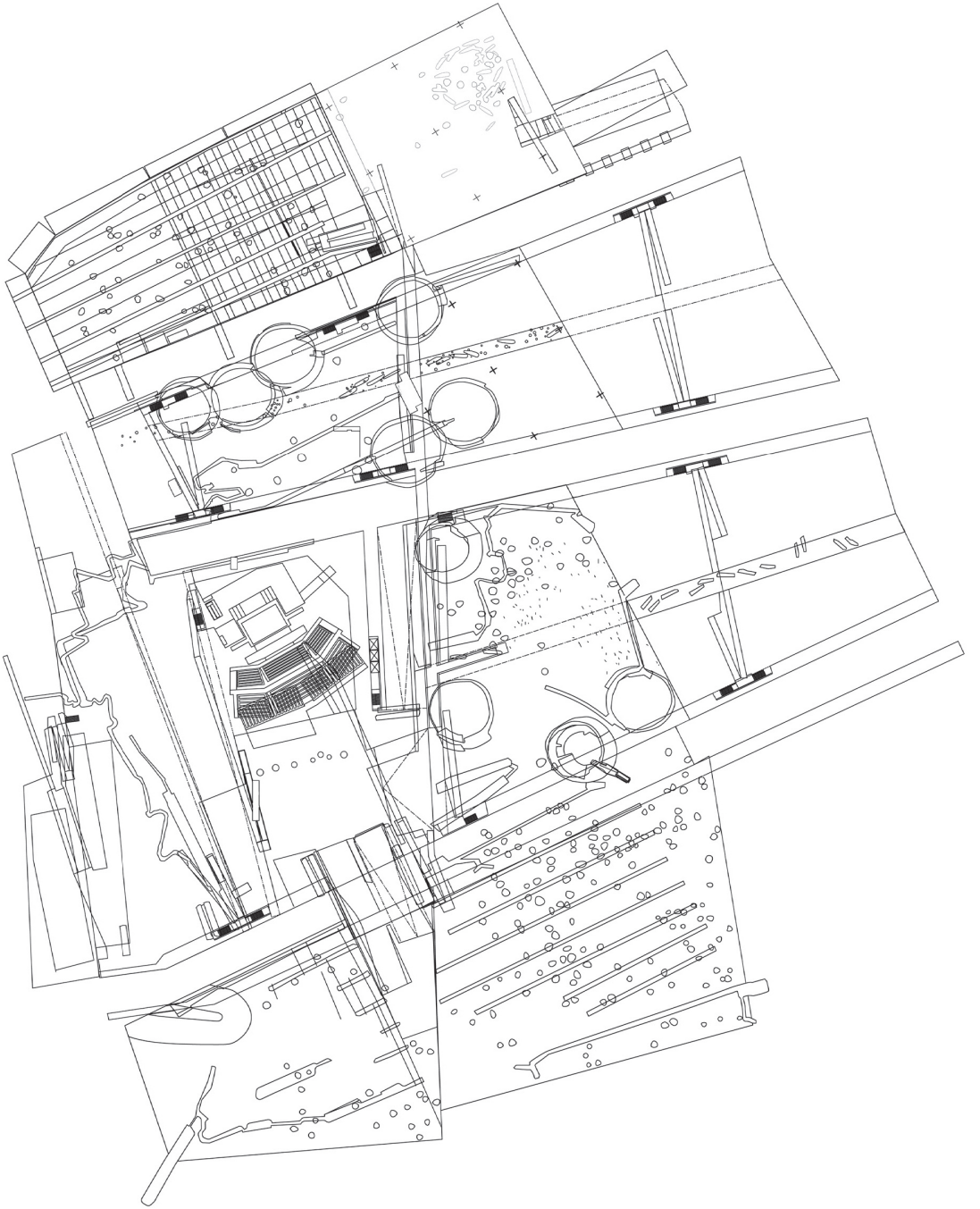
N: A frayed edge exists between the natural dunescape and the augmented landscape.

O: Prevailing wind draws out the museum's stale air through profiled surfaces.

P: Surface perforations



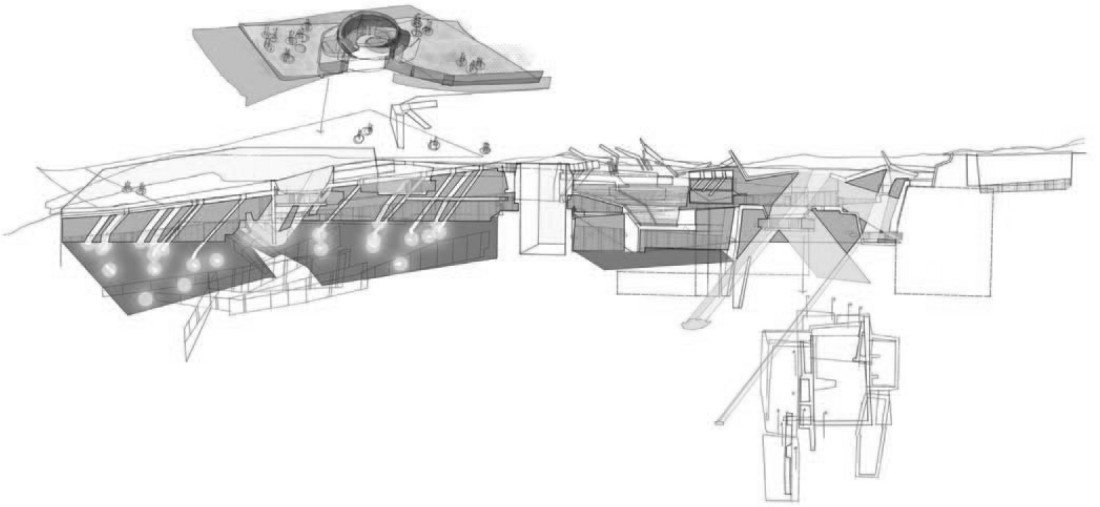
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[1.25]
Museum of Egyptian Culture: Section showing the architecture cutting into the deep surface.

(Smout & Allen, 2002)



[1.26] Left
Museum of Egyptian Culture: Plan

(Smout & Allen, 2002)

The augmented landscape successfully fuses issues of man, nature and technology. The architecture of the augmented landscape exploits the landscape as a cultural object to be transformed by man, but celebrates its natural processes to enhance its performance. The augmented landscape exploits resources on site, in order to positively impact its environment.

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Surveying new paradigms

In creating architecture that positively adds to its environment it is essential we understand the ecological processes of the landscape. Waste is a very important part of an ecological system. In our modern society, yet we seem to do our best to avoid its issues and its potential. Built into our cities we have systems that move discarded waste away from our city centres, yet rarely consider its final destination in an attempt to minimize the area it impacts. Rubbish is, however, always with us and corrupts our sense of propriety and thus we do everything to hide it and get rid of it. As Till (2009) states: “It pervades the air, swells in water, dissolves, rots, disintegrates, changes into smoke, into soot. Engulfing the world.”

Our society does its best to avoid issues surrounding waste and our cultural perceptions of waste prevent us from dealing with it. Garbage is only a modern conundrum and there is more of it than ever before and its management is a great challenge .It is only now that we start to realise its impact. Garbage is hugely misunderstood and popularly ignored other than as an environmental issue. Yet our city contains large amounts of wastelands in the form of industrial complexes, factories, and landfills, many in disuse in our post-industrial age mostly found in the peripheries of the city; areas that are un-habited, unsafe and un-productive. Curulli (2006:33) however poses a different perspective on wastelands, stating: ”Wastelands record memories and recall memories. They demand that we remember where we are, how we got there, what our values are.” As Till(2009:69) points out: ”waste and monument are only kept apart by fragile differences; that one could easily mistake the quarry for the great pyramids, but what separates the two is its spirit and its intent as it is a product of intentional human action.” Wastelands embody the passage of time.

Similarly, society views waste itself negatively yet the vast amount that we discard will create a record of our activities for future generations. In our current paradigm objects are assigned as one of two categories. Either transient or durable, where the value either increases of decreases over time. When objects’ value decreases to an extent

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that is worthless it becomes waste. Objects' values are not defined by stability but by their potential obsolescence (Till 2009:73). Yet with time certain objects regain value not as objects to be used as was originally intended, but start to take on new meaning as displayed by how valuable we hold archaeological artifacts. These artifacts are in most cases the waste left behind by previous human populations.

> ''99 percent or more of what most archaeologists dig up, record, and analyse in obsessive detail is what past peoples threw away as worthless—broken ceramics, broken or dulled stone tools, tool-making debitage, food-making debris, food waste, broken glass, rusted metal, on and on'' (Shanks et al. 2004:65).

Salvaged artifacts were considered worthless by previous societies. Archaeologist are slow to admit that what they are investigating is waste because of the cultural value associated with these artifacts. Looking at the way that previous cultures have dispersed their waste (or today's artifacts); unwanted objects were simply dropped on the ground (Shanks et al. 2004:65). Once permanent settlements were established, waste was often discarded into pits or buried (Shanks et al. 2004:65). It is only in recent times in highly populated centres that we have specialised services that move larger volumes of waste from streets to dumps or landfills on the outskirts of our cities. Could our landfills thus not become large resources of information and a record of contemporary society. What we throw away could not only have physical value, but an intangible value, for objects that we throw away represent a collective and cultural memory and will form a record for our future generations.

The connection between garbage and archaeology was only recently made in a field that is much older. In 1973 we saw projects like "archaeology of us" and "the garbage project" lead by Dr. William Rathje and a group of his archaeology students at the university of Arizona, that we saw archaeologist sorting through and collecting household refuse (Shanks et al. 2004:65; Allan 2012:3). It is however often denied that the work that was done is considered archaeology with the main rationale being that the material is not old enough and it is

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often that artifacts and sites need to be 25 years or 50 years older to be considered appropriate for investigation (Shanks et al. 2004:66). This is illogical as "it is a significant aspect of the garbage conundrum that archaeologists believe they should wait an arbitrary time to begin research while all kinds of information about how and where and when artifacts and sites were generated critical information on the most intimate dynamics of our social systems degrades"(Shanks et al. 2004:67).

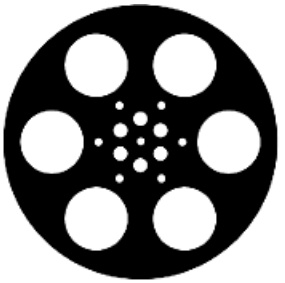
[1.27] Examples of obsolete data storage devices (Lost Formats Preservation Society, 2000)

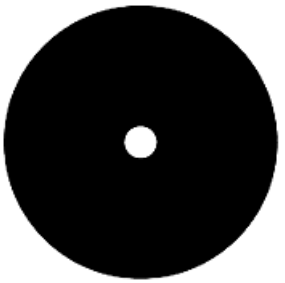
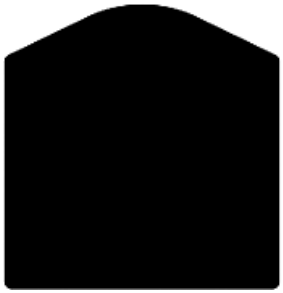
In many cases our landfills are much older than the required 25 to 50 years, yet we are slow to consider their cultural value as we do not want to associate waste with archaeology. Garbage should be a fundamental part of archaeology. Ruins are often included in the field of archaeology but landfills that contain vast amounts of building rubble are ignored. "Landfill sites are modernity's ruins" (Shanks et al. 2004:67).

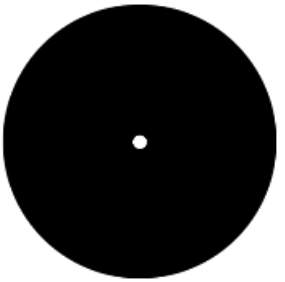
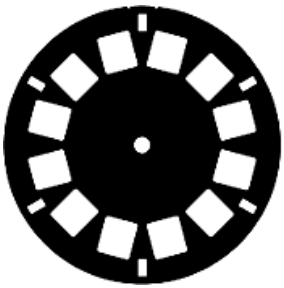
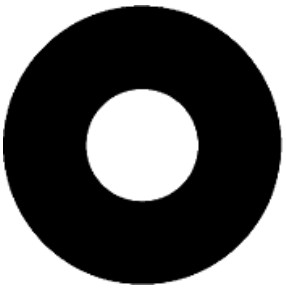
Waste as data:

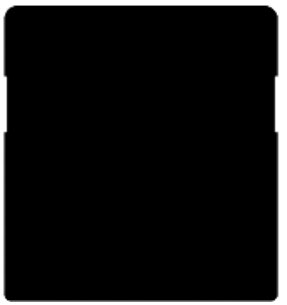
The findings of these archaeological digs of landfill sites reveal a great amount of data about our material culture and reveals accurately what, until that point in time, was only assumptions; the garbage was not decomposing in ways that were expected and the volume and types of waste contained within the landfill where also unexpected. Landfills are a great source of knowledge and can reveal our societies' consumption habits and can also influence the way we think about and dispose of trash (Allan 2012:4). As Dr. Rathje (2001:54) has said, "what people have owned - and thrown away - can speak more eloquently, informatively, and truthfully about the lives they lead than they themselves ever may."

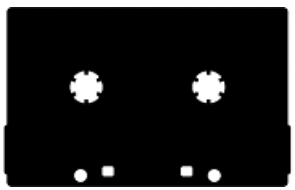
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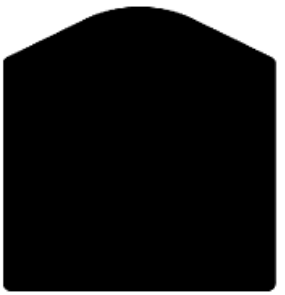









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Waste as narrative:

Archaeology is thus a far more complex field of research and goes further than society's current narrow-minded interpretations. It is very rarely that society deals with landfills and their archaeological implications. One of the recent investigations was that of Fresh Kills: the world's largest landfill that was reopened to be the final resting place for debris from the 9 -11 attacks, where the material deposited there held such vivid powers of remembering an event that greatly impacted society. Fresh Kills Landfill was originally opened in 1947 along the western coast of Staten Island as a temporary solution for New York City's waste problem (Vinnitskaya 2013). In the years to follow there was, however, an exponential rise in consumption and the landfill became New York's main landfill until its closure more than 50 years later (Vinnitskaya 2013).

In close successions to the aftermath of the events of 9 -11, representatives from thirty-three museums came together to consider how to document the events (Shanks et al. 2004:61). The main question being what things to collect and preserve for display for generations to come (Shanks et al. 2004:61) The ultimate selection was called "Bearing Witness to History", displaying artifacts dug up from Fresh Kills landfill along with associated stories, photographs and documents from the events of 9 - 11(Shanks et al. 2004:61). The resulting collection was a series of everyday objects, that were damaged by the event in some way as well as artefacts associated with the aftermath such as commemorative coins, artwork and rescue equipment (Shanks et al. 2004:61).

The process was about documenting a history that was in the process of being written, and each of the artifacts chosen served as material icons of a complex story. The narratives attached to the objects portrayed a very individual story, and their power to evoke ultimately formed part of a collective memory. It is interesting to note how mundane objects with narratives attached have the power to evoke vivid memories. Similarly, one can recall a memory from one's childhood.

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[1.28]
Cell phone used outside World Trade Center.
(National Museum of American History, Smithsonian Institution, 2002)

Archive entry:
On September 11, Bob Boyle, who worked near the World Trade Center, used this cell phone to contact family and friends.

Narrative:
On September 11, Bob Boyle was one of thousands of New Yorkers who tried to use their cell phones to reach loved ones. But the attack cut cellular service from the transmission tower located on top of the north tower of the World Trade Center, and other service quickly overloaded. Boyle, an amateur photographer, wanted to stay near the disaster scene to take pictures but reluctantly left in search of a better phone signal. Soon thereafter, the south tower collapsed near where he had been standing. He credits this cell phone with saving his life.



[1.29]
Purse and Wallet.
(National Museum of American History, Smithsonian Institution, 2002)

Archive entry:
This purse belonged to Lorraine Lee, who worked as an administrative assistant at Aon Risk Services, located on the 101st floor of the South Tower. The purse and its contents, including keys and 29 cards, were recovered from the debris of the World Trade Center.

Narrative:
After the first plane crashed into the North Tower, Lorraine Lee spoke with her sister, Patricia, and confirmed she was safe. Lorraine served as fire marshal for the 101st floor, and in times of emergency she was responsible for directing people towards the stairwell and making sure nobody was left behind. Shortly thereafter, a plane crashed into the South Tower, impacting the 78th-84th floors. According to newspaper reports, 99 percent of the people below the points of impact survived. Yet for those above the impact zones or trapped in elevators, there was no escape.

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Waste as Nostalgia:

Similarly our obsolete objects have value as nostalgia. Throughout the world our interfaces are mimicking nostalgic objects to appear more familiar and simple even though what lies behind is much more complex. Our digital readers mimic bookshelves and our software still uses an image of a floppy disk as a universal save icon, even though the newest generation won't ever come into contact with one. Our nostalgia is being mined and used in the digital world and has value, as the object we grew up with helped shaped our memories.

Architect and artist Daniel Arsham has often explored the use of nostalgia in his work, specifically in his series of 'Future Relic.' The artworks are a series of objects that represent obsolete technologies in various states of decay. The objects are cast in elemental material such as volcanic ash and crushed glass as though freezing them in time. Though a series of short films, Arsham explores the discovery of these 'relics' in a near post-apocalyptic future challenging the viewer to whether or not these objects should remain in a physical form, mining our everyday experiences and exploiting our nostalgia. His work brings together art, architecture and film and challenges the way we see objects we often consider waste.



[1.30]
Future Relic 1: Mobile phone.

(Daniel Arsham, 2013)



[1.31]
Future Relic 2: Camera.

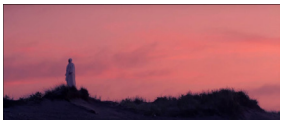
(Daniel Arsham, 2014)



[1.32]
Future Relic 3: Clock.

(Daniel Arsham, 2015)

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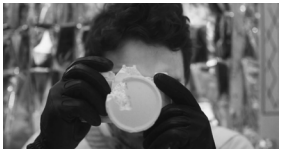





[1.33]
Video still:
Future Relic 1.

(Daniel Arsham, 2013)

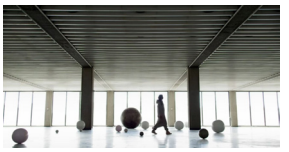





[1.34]
Video still:
Future Relic 2.

(Daniel Arsham, 2014)



[1.35]
Video still:
Future Relic 3.

(Daniel Arsham, 2015)

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Surveying technologies of memories:

Objects have a power to evoke memories. Events and objects and how we interpret them, therefore ultimately become part of our cultural memory. Cultural memory is constantly changing and evolving as we as a society constantly negotiate what to remember or disremember in order to honour or distort history. Other times we forget what seems of little importance. Remembering happens either at an individual level, recalling a personal past, or at a national level recalling a collective memory. Cultural memory lies at the crossing point between personal and collective and between past and future actively constructing the identity of a social group or of an individual (Plate & Smelik 2009:2-3).

"By remembering we form an idea of our self and shape a sense of our identity; thus we end up embodying the memory that inhabits us. Yet, memory is a dynamic phenomenon for any individual, but also for a culture as a whole. Memory is affected by politics, ideology, or art and popular culture. By changing over time, memory may unsettle received ideas of the past, and consequently also of the present and even the future" (Plate & Smelik 2009:1).

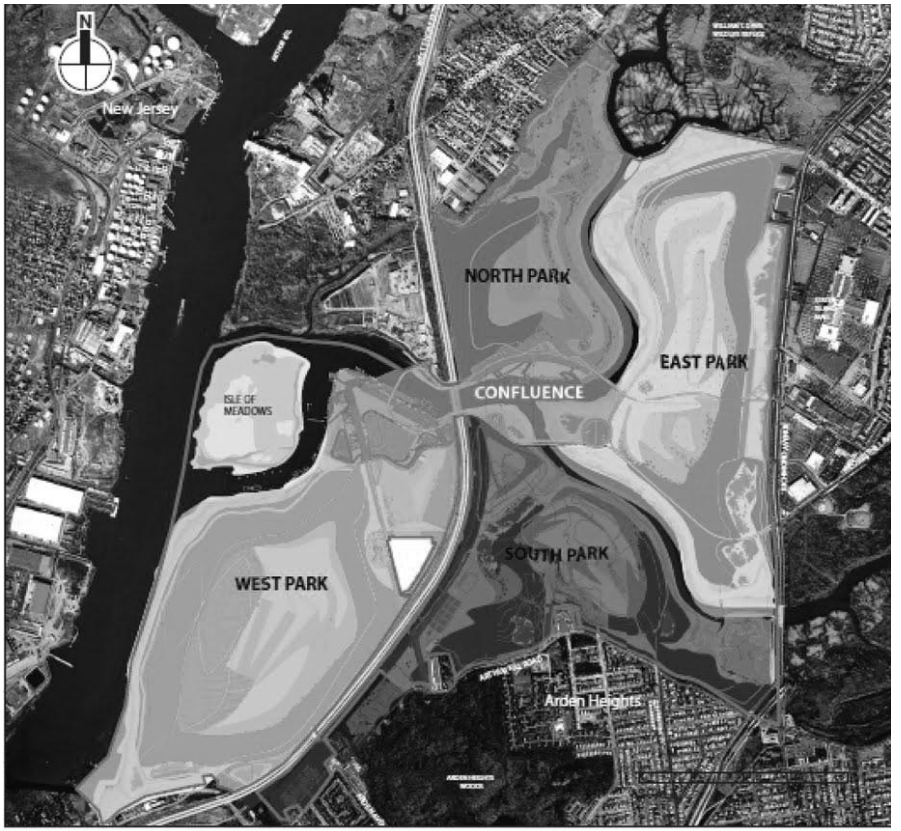
As social groups or as even as nation we share certain experiences that create collective identities and a sense of togetherness (Tierb 2009, p.26). Memory is always an imaginative reconstruction of the past, playing a strong role in buildings one's story and identity.

The interpretation of landscape itself also helps shape our memories. With the closure of the Fresh Fills landfill the question was also asked, what to do with the landfill itself; a landscape that holds such vivid memories while at the same time has been seen as negative space within its city. Ultimately a competition was held to explore the possibilities. The winning design is a master plan by James Corner's field operation, set to be implemented over the next 30 years, aiming to turn the landfill into New York's largest park. The park is to be dividing into 5 smaller parks, each with gathering and recreational

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areas, such as sports fields, waterfronts, footpaths and trails with scenic overlooks and an earthwork memorial to remember the 9 - 11 attacks(Vinnitskaya 2013). Other aims of the project include extracting methane gas from the landfill, to power the neighbouring community, and to restore some of the natural functions such as acting as an environmental buffer against Atlantic storms and hurricanes which New York faces regularly; the park will help to redistribute the accumulating water with its permeable soil and wetland areas (Field Operations n.d.).

Although the project will start to uplift the neighbouring community, which it has plagued for many years, the project, however, missed a larger opportunity to deal with material contained in the landfill. Rather than actively dealing with the rich layers, the project unfortunately covers the complexity contained underneath. The project also misses an opportunity by not addressing issues about its consumerist



[1.36]
Fresh Kills Park site plan.

(James Corner Field Operations, 2001)

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past. New York has not yet made any effort to mitigate its trash problem as the waste generated by its inhabitants is now simply diverted to several landfills in New-Jersey (Vinnitskaya 2013). Ultimately the largest criticism of the park lies in the question if its right to design a great park yet leave the question about waste unanswered and not engage with material that is wasted so easily.

A different finalist from the same competition attempted to deal with the complex layers of the landfill in a more active way. The project stands in opposition to the winning project, almost as an answer to the criticism Field Operation's project received. Developed by Mathur, da Cunha and Tom Leader Studio, the project aimed to respond to the landscape's "shifting nature" and "material diversity" (Holmes 2010). The developed proposal is ultimately not a master plan at all, but rather a series of catalytic interventions that do not propose an end-state for the landfill, but rather attempts to actively engage with the layers contained. Ultimately the proposal is a design process and strategy to deal with the future of the landfill.

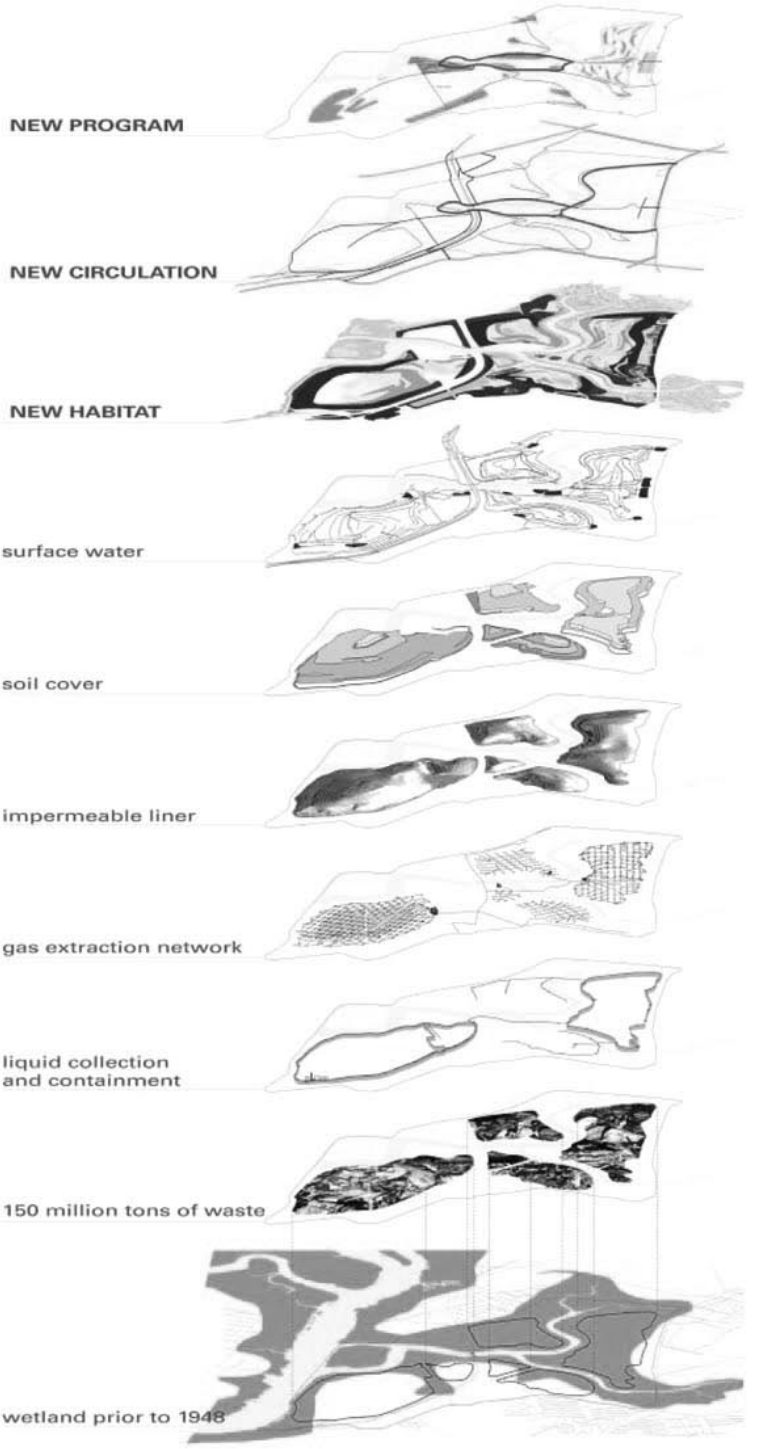
The project celebrates the diverse layers of the site, a series of interventions are proposed that all extend past the boundaries of the landfill and become transformative events in the neighbouring community (Mathur / da Cunha + TOM Leader Studio n.d.). The interventions are grouped as "event surface", "experimental field", "material datum",



[1.37]
Fresh Kills Park.

(James Corner Field Operations, 2001)

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[1.38]
Fresh Kills Park development strategy.

(James Corner Field Operations, 2001)

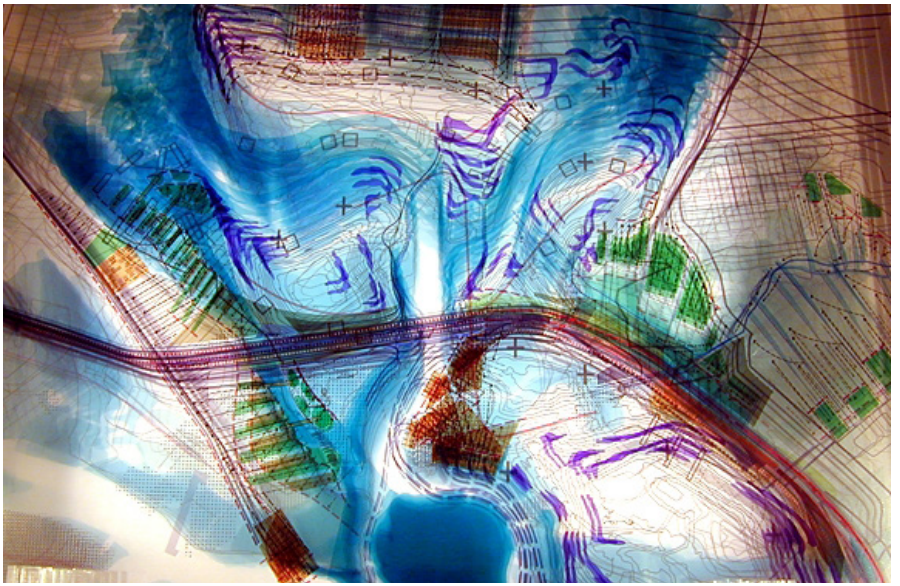
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"depositional edge", and "tectonic zone"(Mathur / da Cunha + TOM Leader Studio n.d.). Each of these interventions deals with a layer that formed the end state of the landfill. In phasing the project these interventions attempt to expose each of these layers and celebrates the diverse material depositions. The layers of the site includes debris from the twin towers of the World Trade Centre; city garbage which comprises the landfill; salt marsh deposits; glacial sediment deposited ten thousand years ago by the retreating Laurentide ice sheet and crushed rocks form 300 years ago from a geological fault line (Mathur / da Cunha + TOM Leader Studio n.d.; Holmes 2010).

[1.39.1-5]
Fresh Kills Park: Experimental strategies developed for the diverse material depositions.

(Marthur, Da Cunha & Tom Leader Studio, 2001)

The project has a greater understanding of the issues at hand and recognises how little we know about dealing with issues such as this, but acknowledges opportunity to engage with the material in a more meaningful way. Paradoxically it seems that materials need to decay to a certain point until we recognise their memories are worth preserving. As Tierb(2009:21) states: "Incompleteness and fragmentation possesses a special and evocative power".This leads to show in what an interconnected relationship memory and decay live together and how the two even seem to enhance each other.



[1.40]
Fresh Kills Park: Landscape strategies represented as layers.

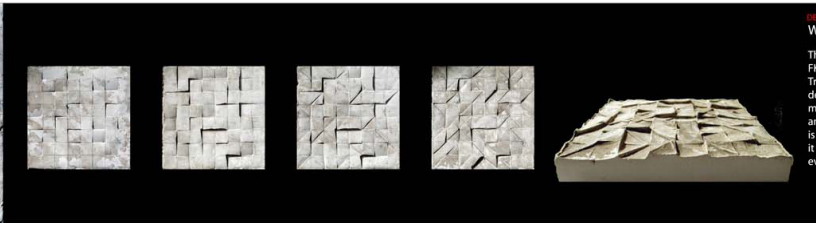
(Tom Leader Studio, 2001)

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SURFACE

DYNAMIC - 1





DEPOSITION - 1

WTC DEBRIS

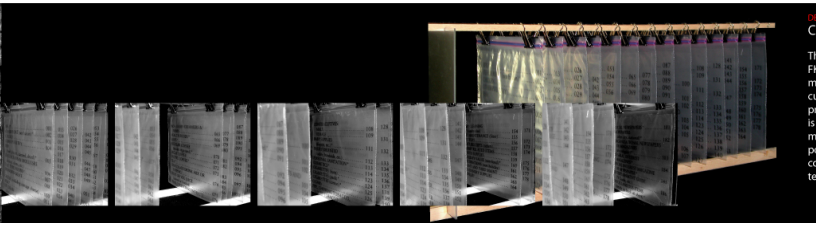
The most recent deposition on FK is the remains of the World Trade Center. Unlike previous depositions on this site this material defies any accepted and expected order. But while it is intrinsically incomprehensible, it is also a defining moment, an event that begins a new order.

[1.39.1]

FIELD

DYNAMIC - 2





DEPOSITION - 2

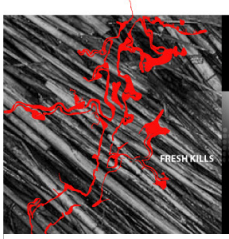
CITY GARBAGE

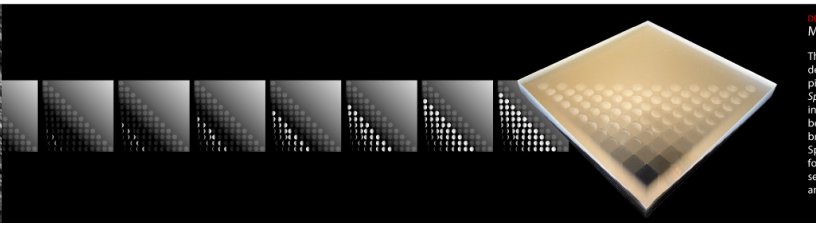
The most notorious deposition of FK is household waste -- rejected matter, from diverse places, cultures, and social strata. The processes by which this material is made and accumulated in the mounds of FK is inseparable from political conflict, cultural commentary, scientific study and technological innovation.

[1.39.2]

DATUM

DYNAMIC - 3





DEPOSITION - 3

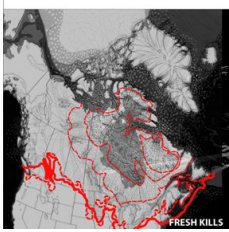
MARSH DETRITUS

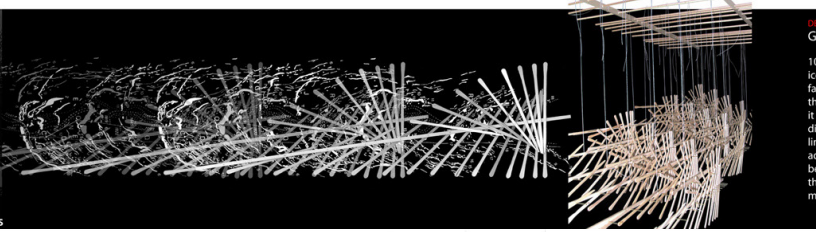
The salt marshes of FK are deposits of soil and detritus. The pioneer of this environment is *Spartina alterniflora*, an indigenous salt-tolerant grass. It begins in a seed or a raft that breaks away and roots itself. Spartina spreads rhizomatically, forming baffles that trap sediment and detritus, extending and raising land.

[1.39.3]

EDGE

DYNAMIC - 4





DEPOSITION - 4

GLACIAL TILL

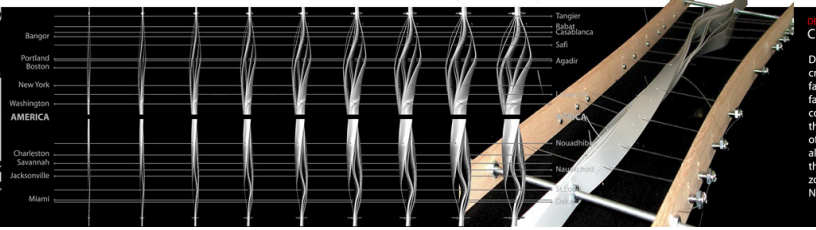
10,000 years ago the Laurentide ice sheet retreated from its farthest edge, just south of FK. In the process it deposited soil that it had eroded and carried from distant lands. The retreat was not linear. The sheet made minor advances, negotiating conditions behind and ahead of it, layering the land in accordance with this mediation.

[1.39.4]

ZONE

DYNAMIC - 5





DEPOSITION - 5

CRUSHED ROCKS

Deep under FK is a melange of crushed rocks along a geological fault called Cameron's Line. The fault marks a collision of two continents 300 million years ago that formed the super-continent of Pangea. Pangea later broke up along a fault some miles east of the Line, leaving a compressed zone of crushed rocks within the North American continent.

[1.39.5]

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YUNIBESITHI YA PRETORIA

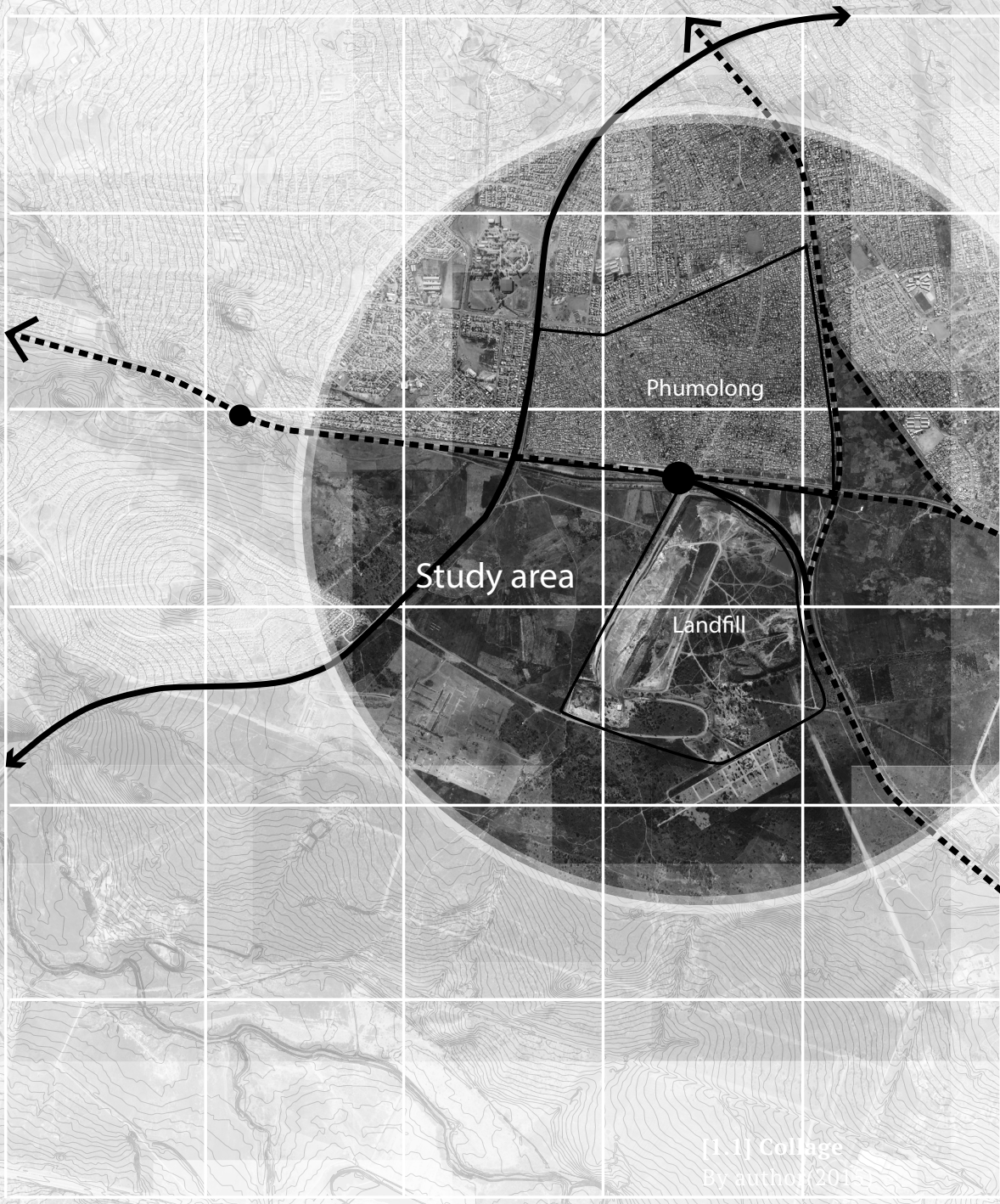
“Memory and decay exist in an inextricable relationship. Without memory, it is questionable as to whether decay exists, as there would be no recollection of the existence of an object in any other form than its current. Without decay, can memory exist? If nothing ever changes then one can never have a record of something in a previous state” (Almond 2009, p.13)

Memory and decay are two processes that exist on all landscapes. Elements and living creatures exert forces on a landscape leaving a memory while ‘natural’ forces counteract this, breaking materials down, fading memory. Everywhere around us nature and its forces are fading memory, the sun blasting radiation, fading colours. Similarly, water breaks down materials, making materials shrink and swell repeatedly, turning shiny new objects into what society calls waste. Spaces of waste are grand mnemonic device within our cities, yet its value in society is unrecognised and the memories it contains are disappearing.

Similarly, waste and growth lives in an inextricable relationship. Whenever we build, there will always be mounds of waste and scars in the landscape where the materials were sourced. The dissertation thus doesn’t attempt to subvert the problems of waste as an answer to the sustainable imperative, but acknowledges that all things become waste and attempts to find new meanings and new ways to re-consume them. Rather than seeing spaces of waste as negative spaces within our cites, see its potential for new growth.

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[ ] Collage
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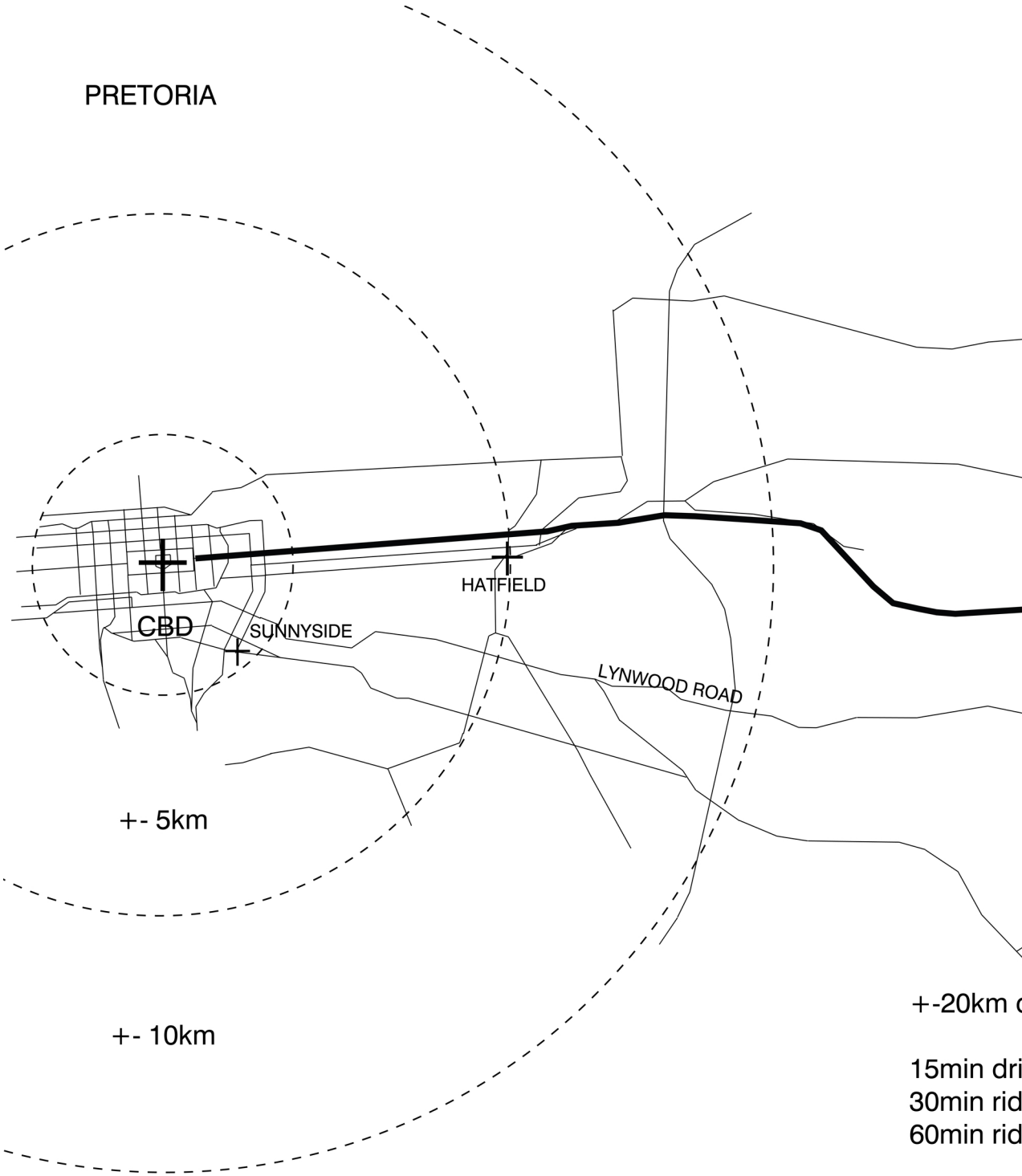
[1.41]
Study area.
(By Author, 2015)

SURVEYING LANDSCAPES

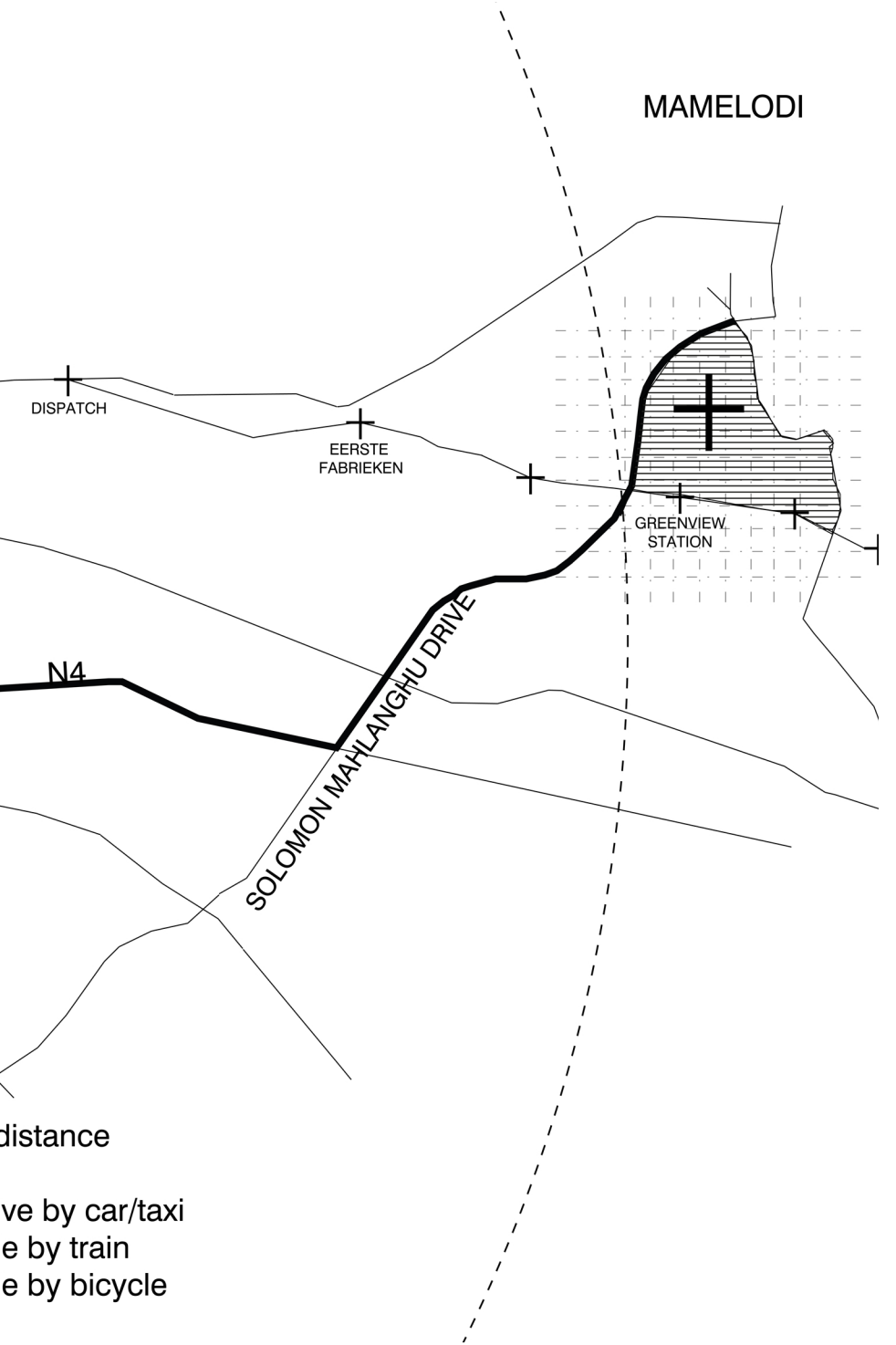
In considering relevant sites for the project, landfills are considered as sites that are commonly underutilised within city infrastructure. Landfills were born out of necessity to get rid of waste from within cities and today, while the environmental implication of landfills were often ignored. While there might be stricter policies around landfill operations, solid waste management principles haven't changed since the inception of landfills. As we are experiencing unprecedented environmental changes in the world with ever decreasing resources and an ever increasing populations and demand on resources, it is only inevitable that landfills will be reconsidered for the resources they contains as well as the space it takes up. Landfills are thus investigated as sites that could potentially successfully be re-integrated in social and cultural contexts, while at the same time augmenting the landscapes' natural processes and integrating it into a city infrastructure. The intention is to change it from a cost to society (contributing to global warming, groundwater pollution, smell and occupation of valuable land) (Jones et al. 2013:45) into a commodity that contributes economically, culturally and environmentally to our cities.

These opportunities are rarely recognised in a global context and even less so in our local context. In our local context, landfills were planned to be situated on the periphery of our cities. Apartheid spatial planning created buffer zones around city centres which included industrial areas and open spaces, increasing the inaccessibility from racially segregated residential areas (Philip et al. 2008:26,27). Landfill sites became part of this buffer around Pretoria, increasing the difficulty for the daily migration of workers living in informal settlements outside of the city centre. Today, there are a total of seven municipality owned landfills, however, two have recently been closed and many are soon to reach full capacity (Samson 2010:1). Ultimately Hatherley Landill was chosen to be investigated, as it is one of Pretoria's oldest and its largest landfills(du Plessis 2010:109).

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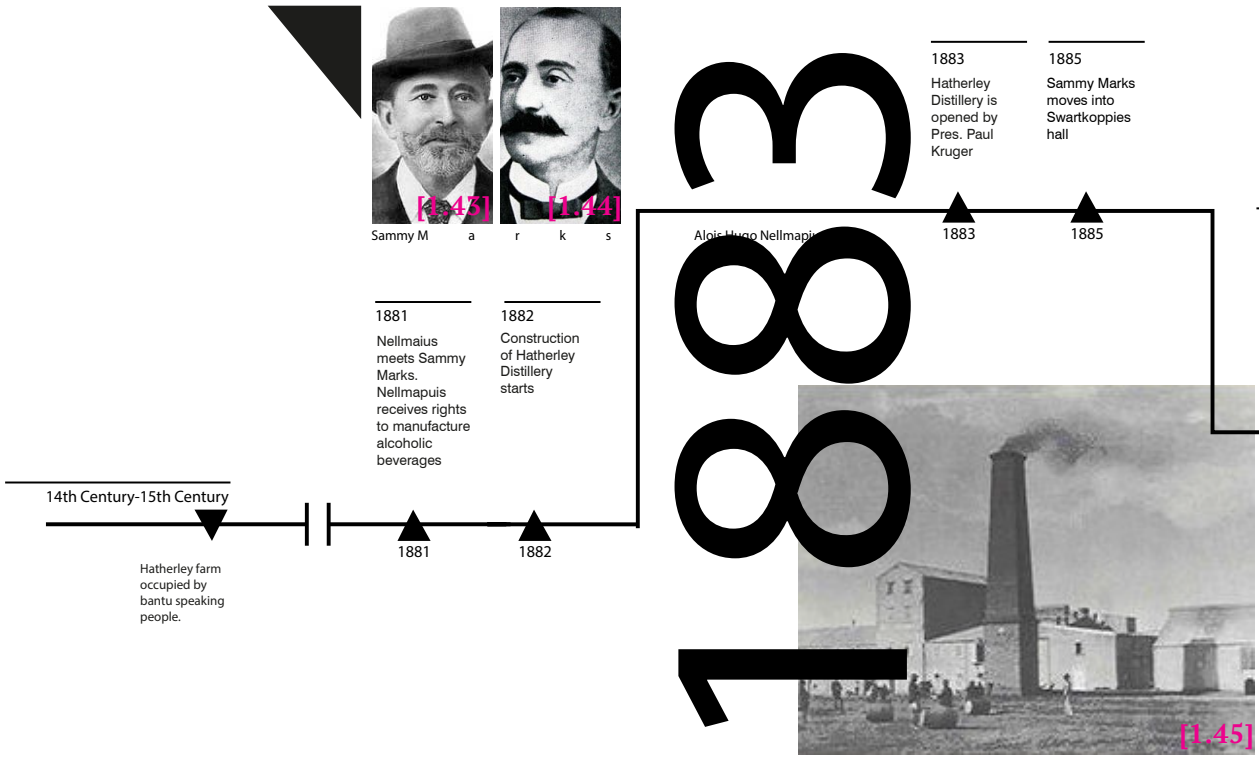


[1.42]
Hatherley landfill also lies in close proximity to Mamelodi as well as Nellmapius Township and is also well connected in terms of in terms of transportation infrastructure, thus making it ideal to investigate its reintegration into city infrastructure.
(By Author, 2015)

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Surveying the city as memory:

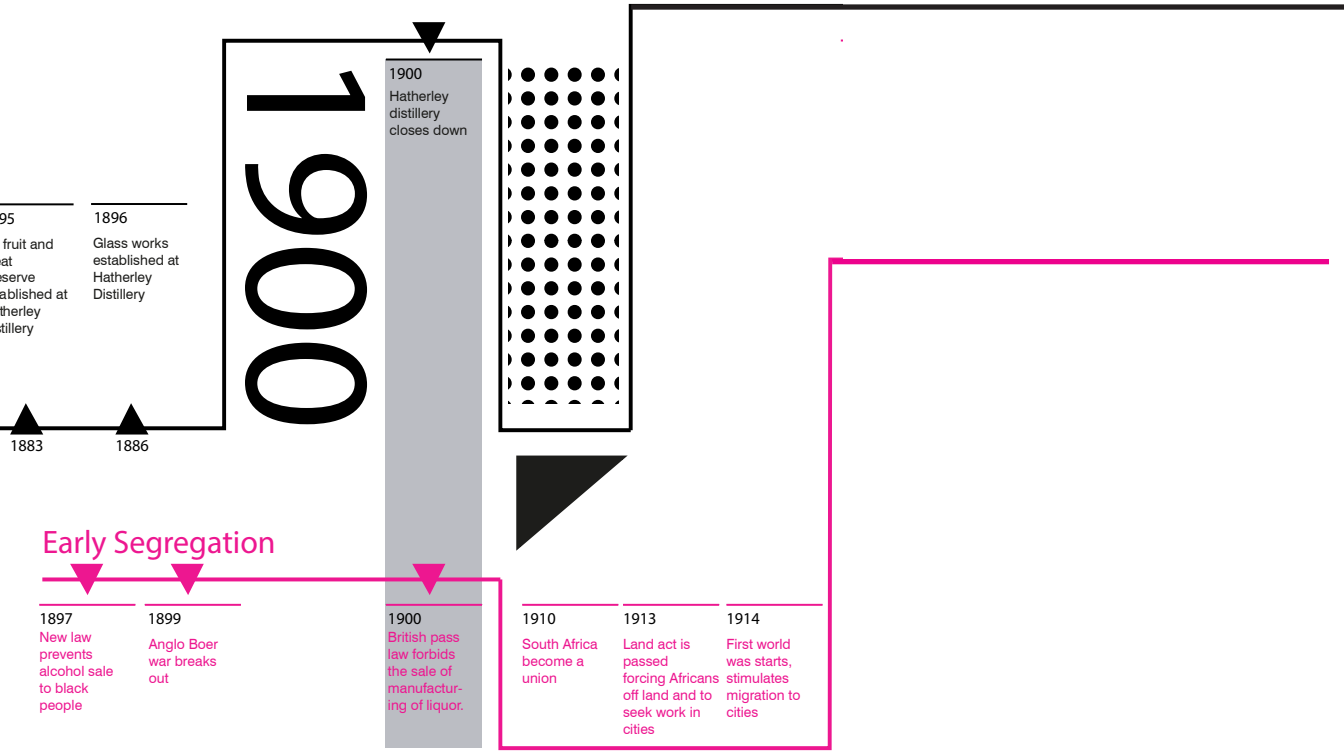
The history of the Hatherley landfill dates back to 15th century when Bantu nomads inhabited the area. Oral history and archaeological remains indicate it was inhabited from 1650 to 1820 (National cultural history museum 1996:ii). Artifacts such as ceramic fragments, stone tools, charcoal as well as stone enclosures where discovered on sites in close proximity to where the landfill sits today (National cultural history museum 1996:8,9). The archaeological surveys were undertaken to establish the heritage value of these sites as developments were proposed over the archaeological sites. Ultimately development of the area went ahead as the sites had no specific "cultural, emotional, historical or religious significance to the Ndebele people" (National cultural history museum 1996:ii). Today only one archaeological site remains close to Hatherley cemetery situated to the south of Hatherley landfill. There is, however a strong possibility that there are more historically significant sites that are located in the area that have not



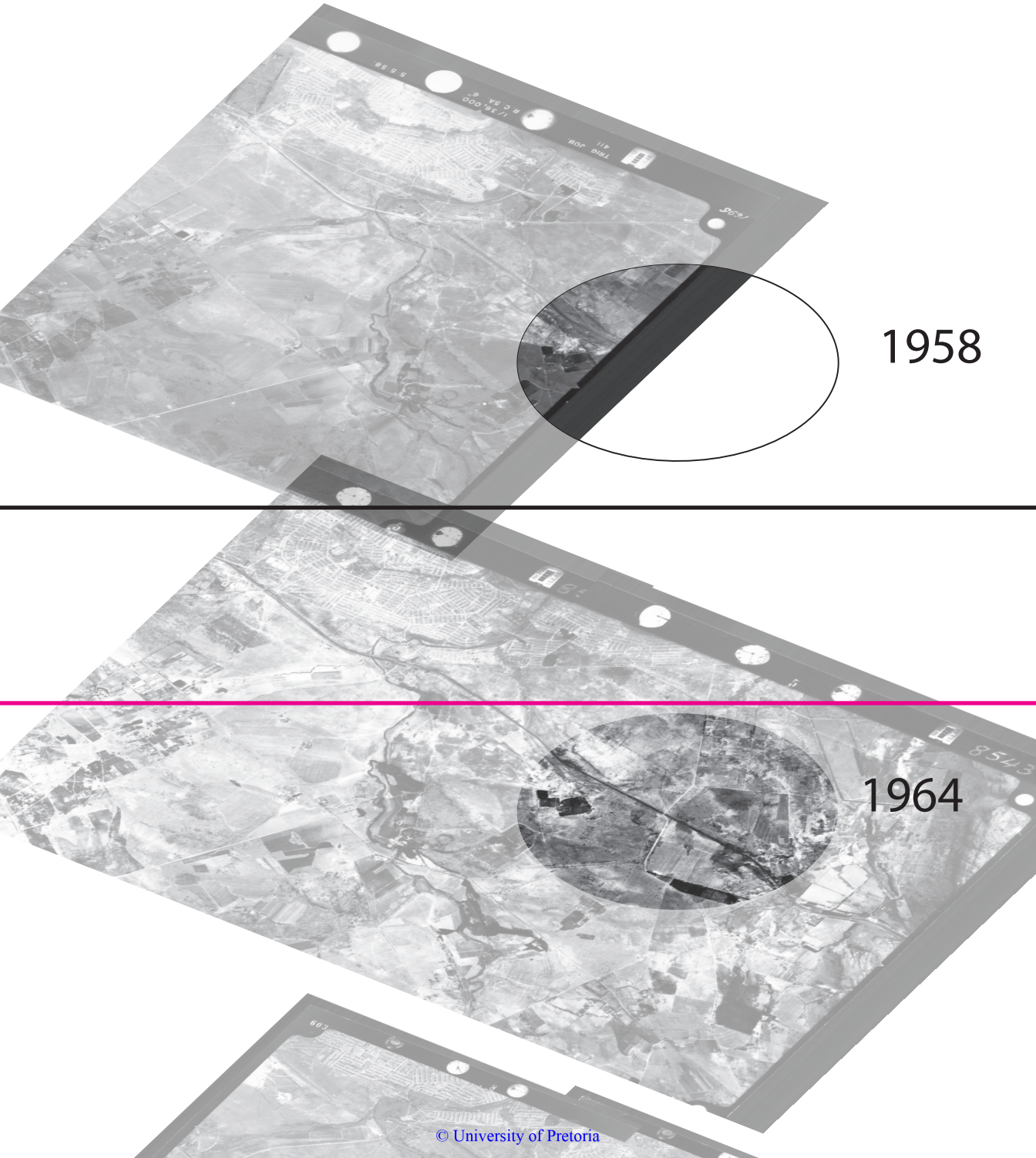
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been discovered yet scattered across the greater region.

Hatherley landfill also has a strong industrial heritage as it sits on Hatherley farm which saw Pretoria's first industrial movement when Sammy Marks and Nellmapius obtained the rights to produce alcohol on the farm (Orton 2009, p.18). Hatherley distillery, also known as Eerste Fabrieke was as a result, established in 1883(Orton 2009, p.18). Other industries where established on the farm but by 1900, with the end of Anglo Boer war nearing, the British passed a law forbidding the sale and manufacturing of liquor and the distillery was closed (Orton 2009, p.18). By 1945 the city bought the farm and established Mamelodi as a black township. To this date many developments have been established around Hatherley landfill with a 4th Nellmapius RDP development, to the south east of the landfill currently under construction. By 2005, Phomolong started developing, an informal settlement to the north of Hatherley landfill.



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As the informal settlements expanded, many now live in close proximity to Hatherley landfill, and many have started depending on the landfill as sources of income, working daily on these landfills, sorting through and gathering valuable materials. These workers often refer to themselves as ‘bagariesi’, meaning “someone who is looking for something valuable” (Samson 2010:2) which shows a positive outlook to the work that they do. The workers are otherwise referred to as waste pickers or reclaimers. These workers do important work, forming an integral part in Tshwane’s waste management system, by reducing the amount of space required to bury the waste and reintroducing materials into the industrial network. Yet often these workers are neglected, not recognised for the important role that they perform with many stigmas still attached to the work of reclaiming. People are slow to realize that these are often trained workers, doing honest hard work on a daily basis, providing a steady income for themselves. With an unemployment rate of nearly 40% in Tshwane, it is simply not realistic not to recognize the value of waste picking as a possibility for job creation.

1924
Nationalist party wins election in coalition with South African labour party

1929
Great depression forces both white and black people of land and into urban areas

1940
World war 2 stimulates further migration of African into urban areas

1948
National party wins election Existing segregation policies are further reinforced through legislation


[1.46]

1960
Implementstion of homeland policies commences

Segregation Consolidated

Apartheid - Control


[1.47]

1945

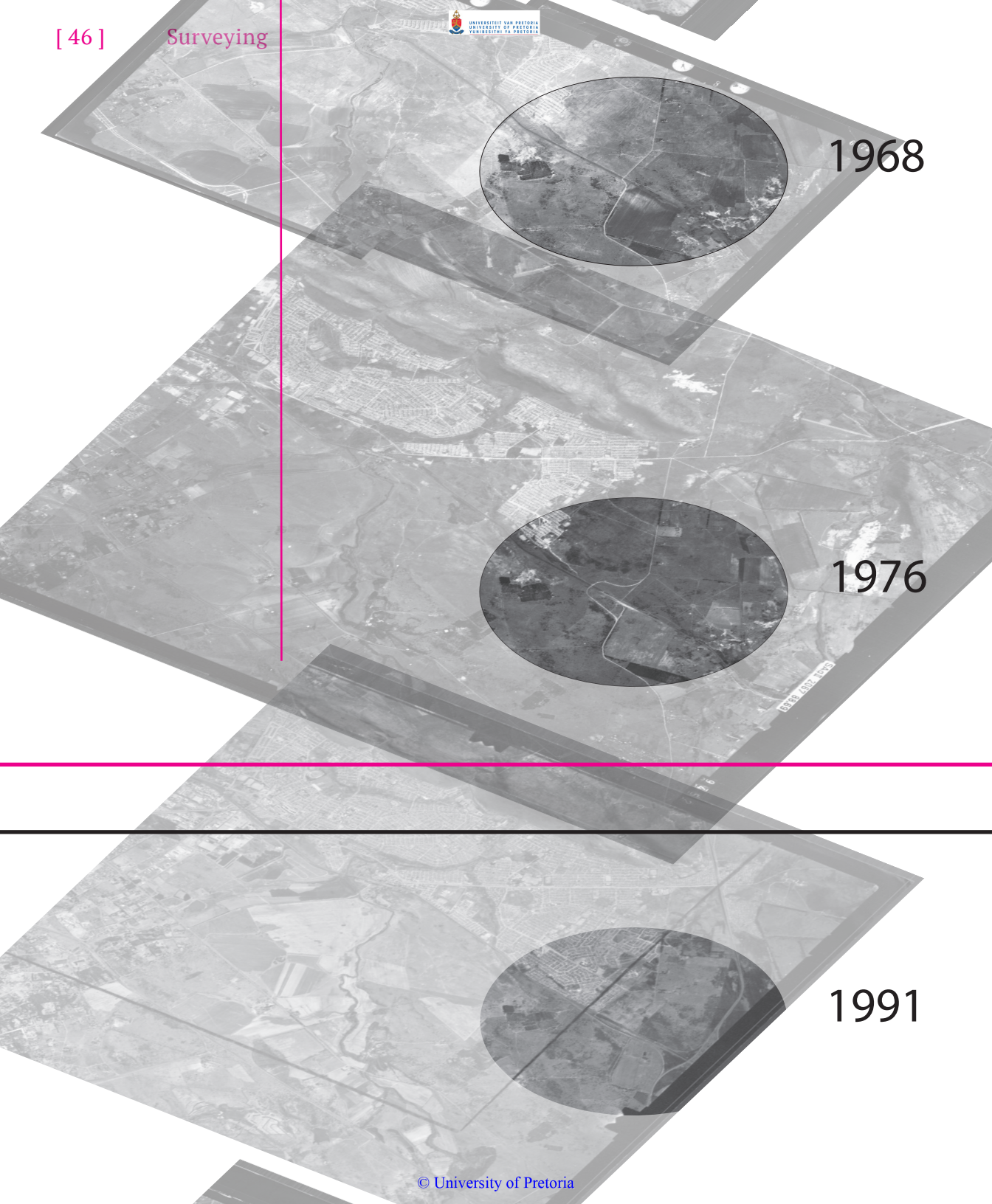
1945
City bought farm to establish Mamelodi as a black township.

1950
Residents from lady selborne to mamelodi

1953
Mamelodi declared black township by government. First black school opens

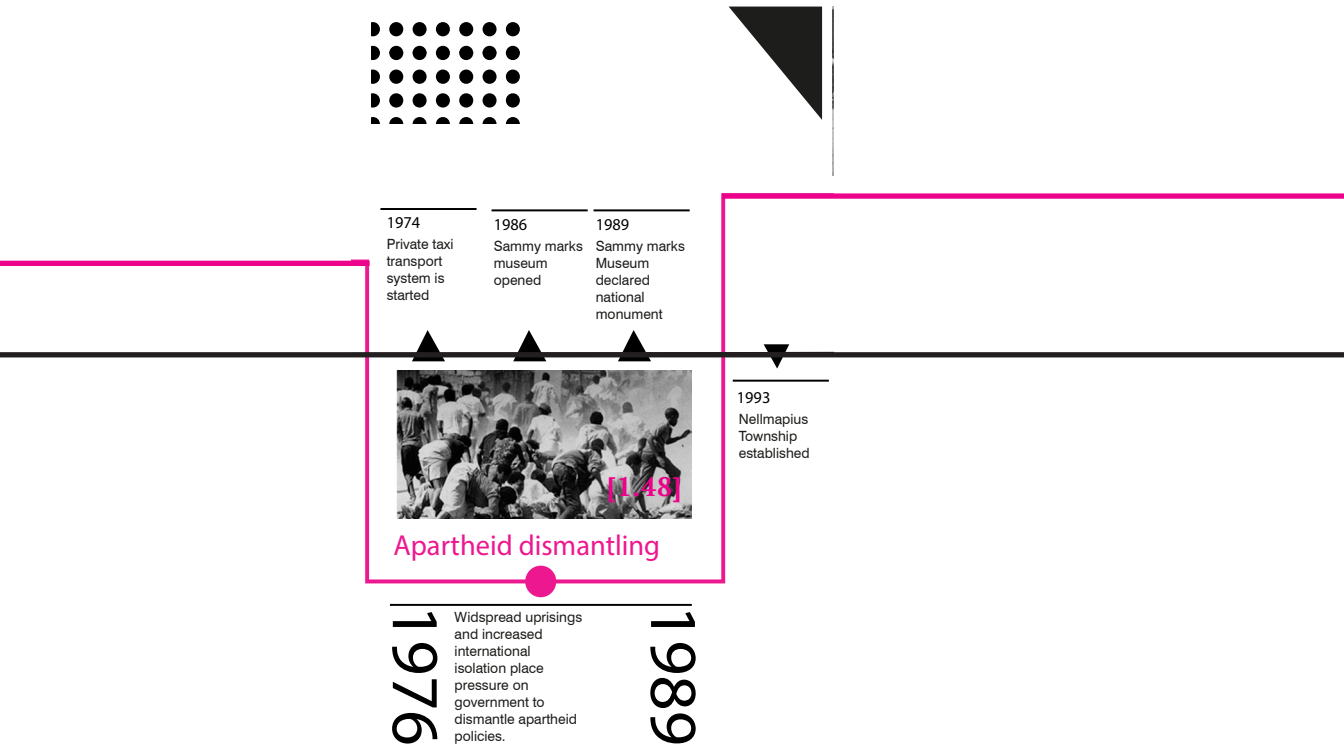
1952
Hatherley landfill opens

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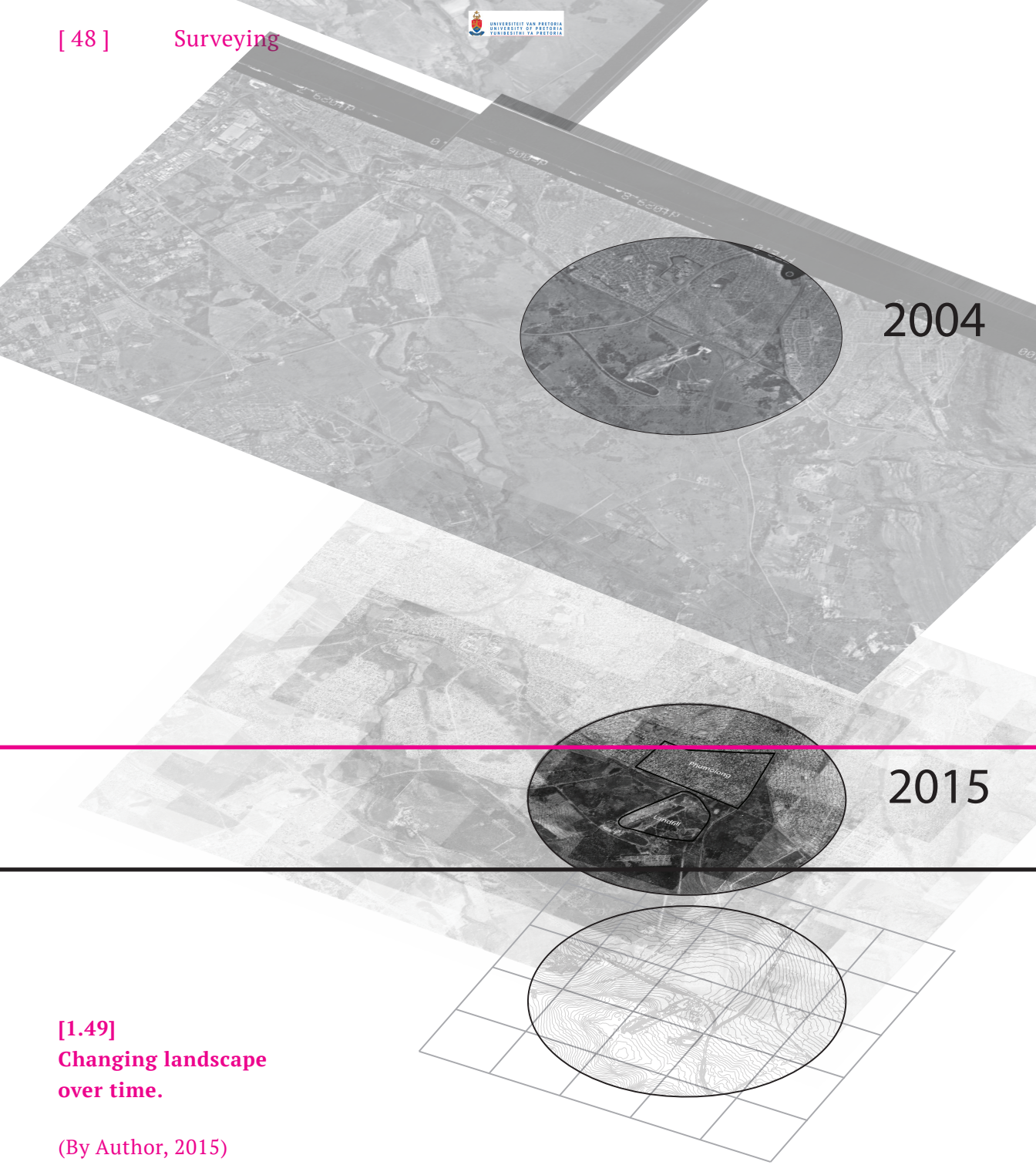


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Waste picking has been happening in Tshwane for at least 30 years (Samson 2010, p.2) yet the municipality has been slow to recognise the reclaimers. Reclaimers, as a result, have often experienced trouble accessing landfills sites and while recent attempts have been made to integrate waste pickers into the waste management system, attempts have been slow and largely unsuccessful. The majority of the problem lies in that reclaiming is still a largely unrecognised and unmanaged practice and it is only in 2009 with the new waste act that any legislation mentions reclaimers (Samson 2010:2). The very disorganized nature of reclaiming leads to a host of problems: many are still untrained and often process toxic waste, at the same time doing it in a very unsafe and environmentally unfriendly manner. Furthermore, the electronic waste is often burned illegally for the precious metals it contains, which poses danger to the reclaimers in the form of toxic fumes and starting wildfires. The unmanaged nature of landfill sites also results in a large number of children working on landfills with



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[1.49]
Changing landscape over time.

(By Author, 2015)

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some sources claiming up to 1 in 4 reclaimers are aged younger than 18 although exact figures on the number of workers are not available.

Reclaimers have often been banned from accessing landfill sites when working independently and in many instances reclaimers were exploited by contractors who obtained sole rights for reclaiming recyclables from landfills where the reclaimers were paid exceptionally low prices for the materials they reclaimed. Reclaimers often had to resort to sneaking though holes in fences and working at night. At Hatherley landfill, reclaimers organised a toyi-toyi (protested) by preventing trucks from accessing the landfill in order to counteract this.

The reclaimers have since regained access to landfills, but were only allowed back on the landfill when reclaimers agreed to establish a committee to represent them (Samson 2010:3). It was also agreed by both the company running the landfill and the reclaimers that rules would be established to govern how reclaimers worked on site. Once



1994 First democratic elections held

1995 Municipal boundaries re-demarcated

1996 Constitution of South

2003 Social grant program starts

2005 Phumolong established

1999 Nellmapius ext 3 Township established

1994 Democratisation

Intergration

2005 Planned and illegal protest in townships due to slow service delivery and poor living conditions

2007 Intergrated development plans are adopted by municipality

2008 Xenophobic violence occur in townships

2009 Global financial crisis occurs

2004

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this happened waste management officials realized the valuable job these reclaimers were doing by reducing waste and minimize space and money required to bury the waste and at the same time was reducing poverty and creating employment opportunities.

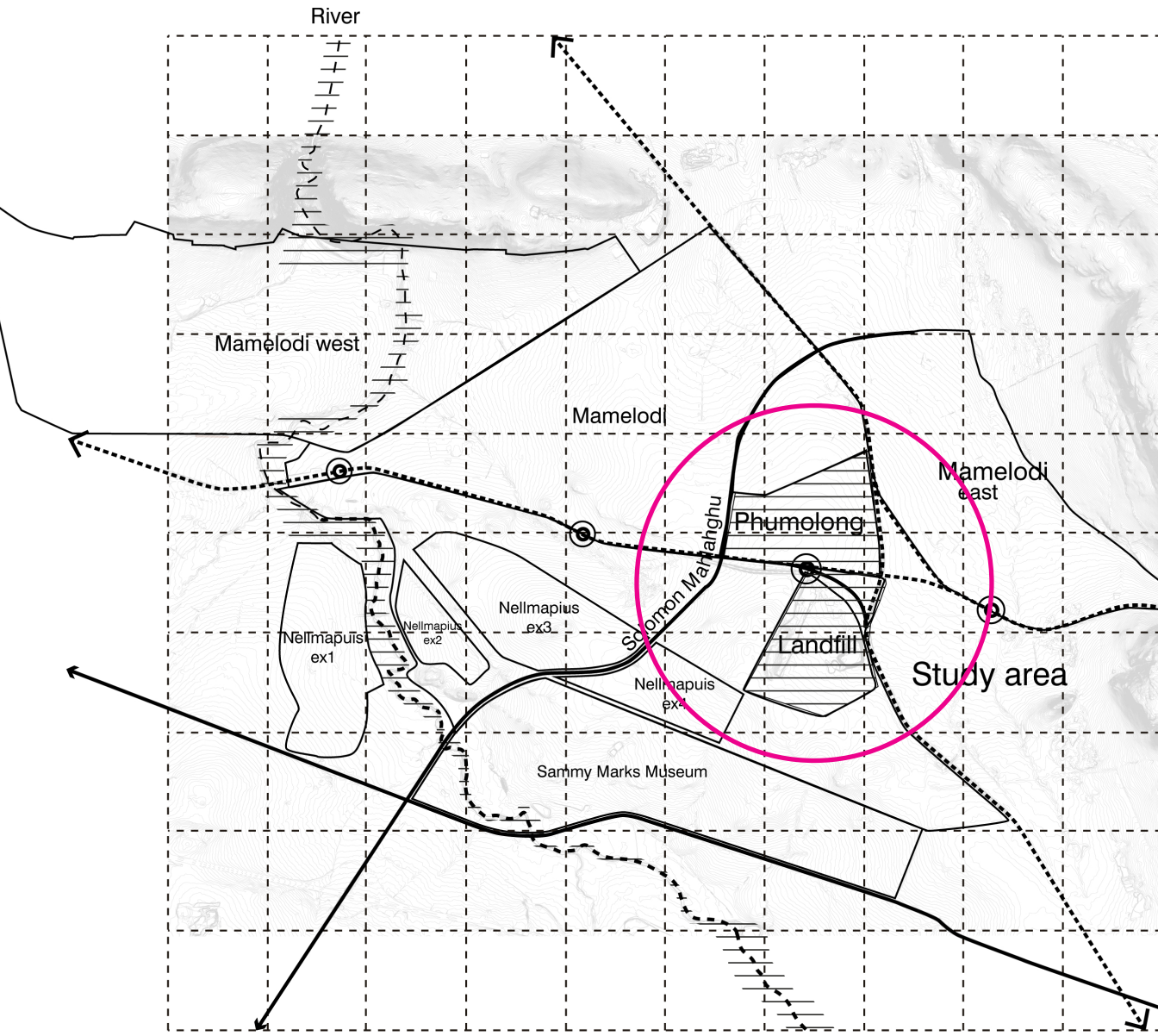
At this stage it seems that reclaimers now have secure, regular and independent access to landfills, however companies running operations on landfills have not always had the reclaimers best interest at heart which has resulted in many projects aimed at uplifting reclaimers to be largely been unsuccessful; training provided by the company running landfill sites was not deemed to be useful by the reclaimers who also did not receive the certificates promised to them. An attempt was also made to introduce a buy-back centre on the landfill, but ultimately resulted simply being large sheds for the storage of reclaimed material and has also had many management issue without any cooperation or support for the reclaimers (Samson 2010:4). The company running Hatherley landfill was also tasked with training and organizing reclaimers, yet had conflicts of interest regarding regularizing the reclaiming of materials; the company ultimately claiming a monopoly over the materials gathered and offering low price to the reclaimers (Samson 2010:5). In the end all these projects aimed at uplifting reclaimers mostly did not benefit the reclaimers as it was intended to do.

At this point in time reclaimers have unrestricted access to landfills across the city and even though the projects aimed at reclaimers where largely unsuccessful, by encouraging the reclaimers to form committees, the projects laid the foundation for easier organisation and ultimately the reclaimers regained their independence. Reclaimers have also successfully formed citywide networks in order to engage and negotiate with both the municipality and buyers of recyclable materials and “has made progress in attracting new buyers to the landfills, negotiating prices and helping reclaimers deepen their understanding of their role in the recycling economy” (Samson 2010:25). Many hurdles, however, still remain and more formalized engagement by the municipality and landfill committees are required.

[1.51]
Sketch of Bagariesi.

(By Author, 2015)

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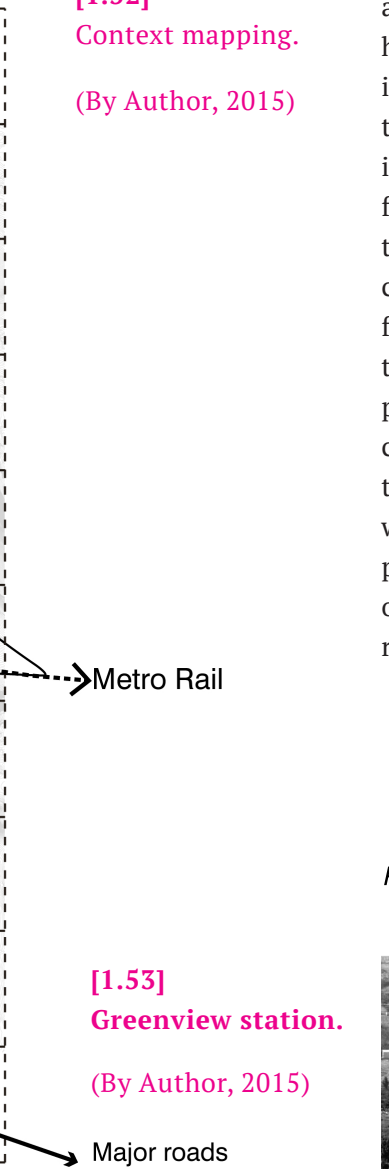
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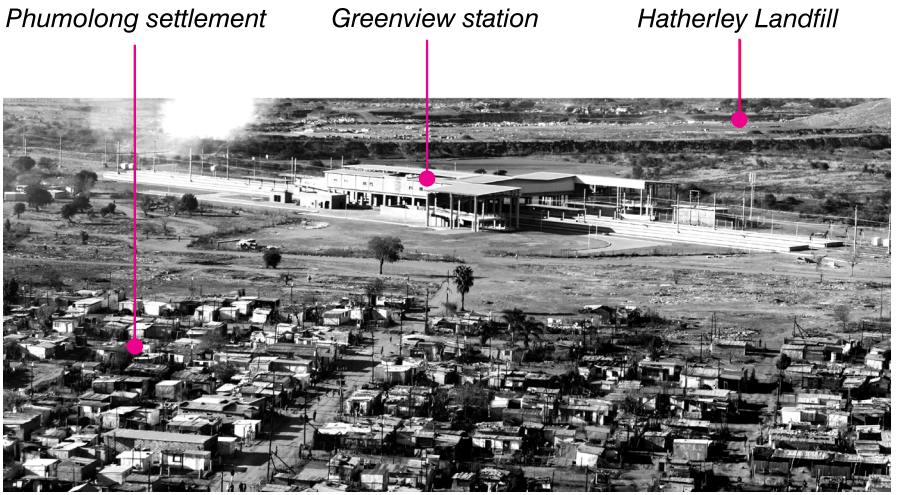
Surveying the city as object:

Separating the landfill and the informal settlement of Phomolong is a series of train tracks as well as Greenview train station. The station has recently undergone a major upgrade and a bridge addition which is still under construction. To the east of the landfill we see another train line, predominantly used as a goods rail transporting mostly industrial products. The train tracks currently isolate the landfill from the neighbouring communities with no formal crossing; with the exception of the bridge addition to the train station still under construction and Solomon Mahlango drive almost a kilometer away from the landfill. Despite this, daily, thousands of people cross the train tracks in order to access the landfill as well as to reach Nellmapius settlement to the south, by dirt road on foot, bicycle and in some cases even car as was observed during a site visit. In order to cross the train tracks is thus a very dangerous task especially for reclaimers who often carry large object, that cannot be sold to recycling companies back to Phomolong. The train lines however provide a great opportunity as the landfill can potentially utilise the rail system to receive and send goods.

[1.52]
Context mapping.

(By Author, 2015)

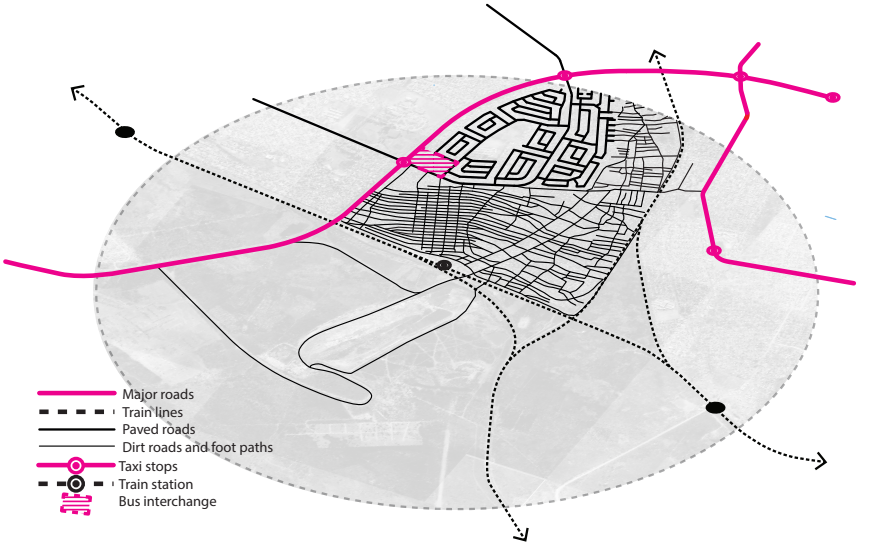




[1.53]
Greenview station.

(By Author, 2015)

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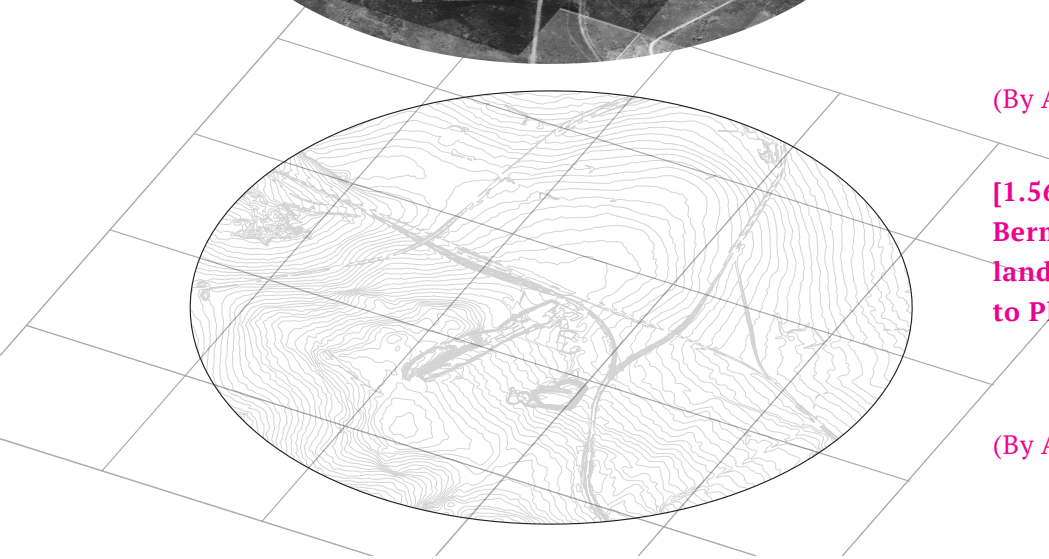
[1.54] Left
Meso mapping

(By Author, 2015)



[1.55] Right
Greenview station and train service road.

(By Author, 2015)



[1.56] Right
Bermed edge of landfill in relation to Phomolong.

(By Author, 2015)

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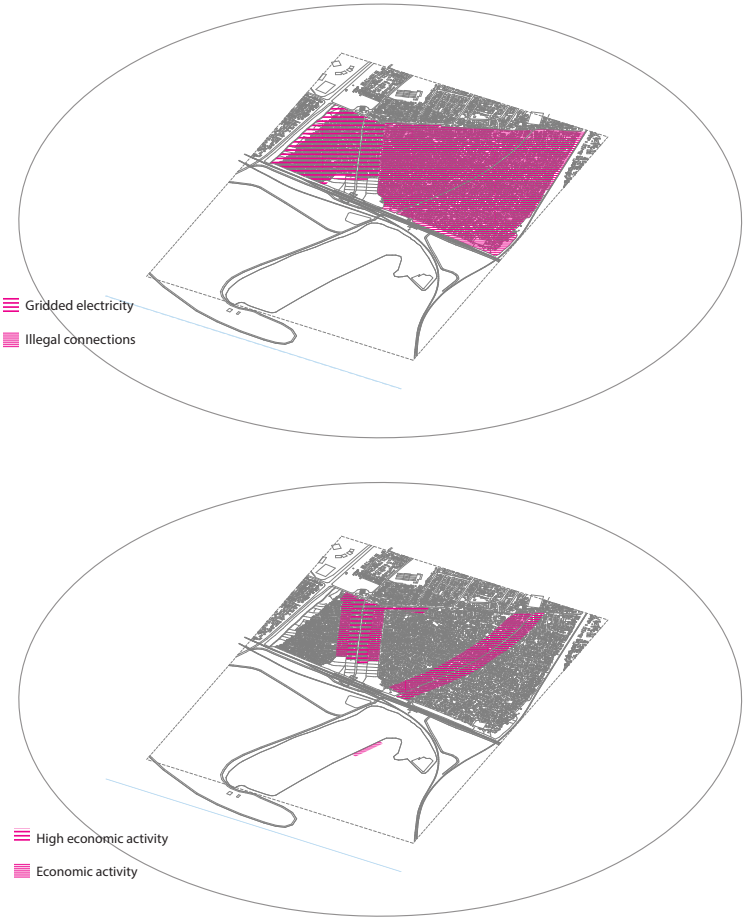
To the north of Greenview station a large portion of land was relocated to allow for construction of the station, creating a vast open area of land. To the northeast of the informal settlement is an important intersection splitting the bus interchange, suburban development, University of Pretoria Mamelodi campus and Phomolong collectively; showing the diverse nature of development in Mamelodi.

Running down from the bus interchange to Greenview station is a corridor where we see the majority of commercial activity in Phomolong, mostly spaza shops and taverns, with a few shops that sells reclaimed materials gathered from the landfill. Social and gathering spaces are also located along this corridor centered around light and water points. Except for the major corridor the remainder of Phomolong's road network is a very fine grained dirt road, contrasting with the road network in the surrounding areas which have been formalised. When wet, the clay soils and the very level landscape make movement difficult along the informal road. The majority of users navigate these pathways on foot and some by bicycle with few roads accessible to cars.





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[1.57] Meso mapping

(By Author, 2015)



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[1.58]
Photo collage of area relocated for Greenview station construction.

(By Author, 2015)

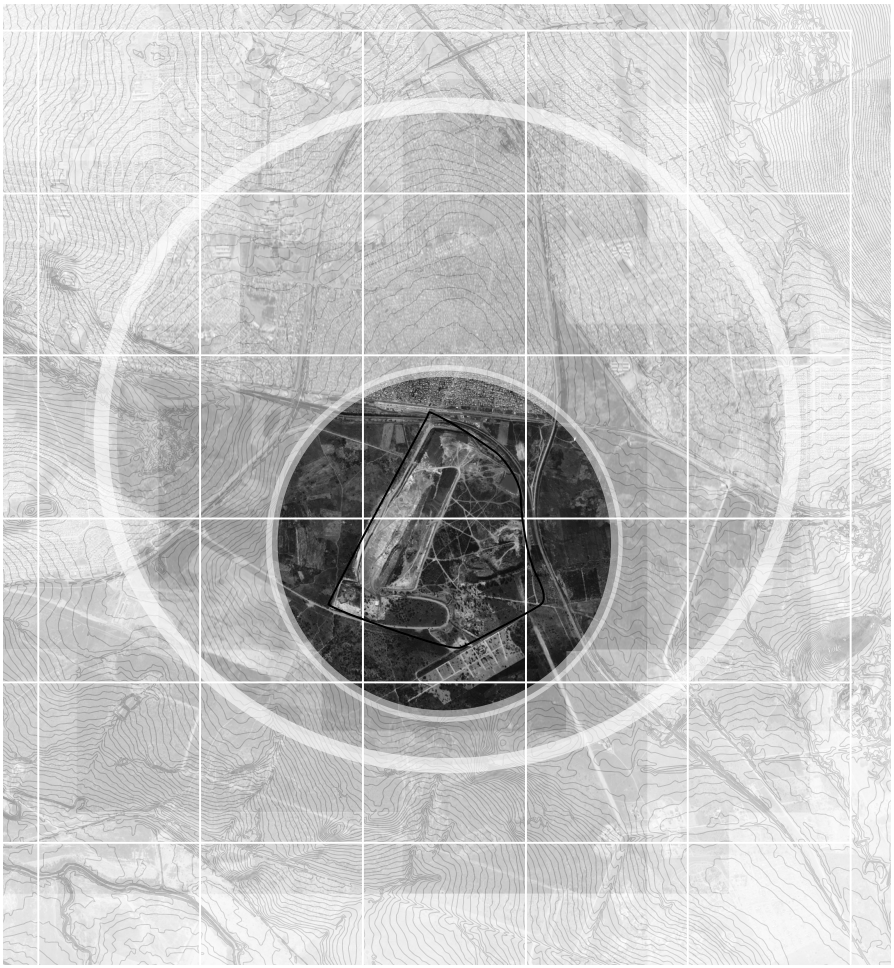


[1.59]
Main route leading to Greenview station.

(By Author, 2015)



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[1.60] Landfill location.

(By Author, 2015)



[1.61]
Landfill panorama.

(By Author, 2015)

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[1.62]
View from landfill edge into landfill.
(By Author, 2015)



[1.63]
Northern edge of landfill.

(By Author, 2015)



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[1.64]
Daily activities on landfill.



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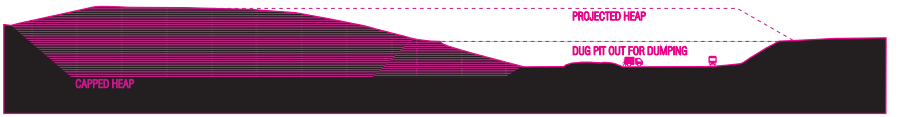


Activity in the area is very little during the day and majority of activity takes place early morning and early evening when large numbers of the community use public transport in the form of bus, train and taxi to commute to and from work. During the day we see large numbers of activity on the landfill starting early in the morning up until sunset. Trucks start coming in early in the mornings and are diverted to certain areas of the landfill where the specific types of wastes are dumped. Reclaimers then gather and sort valuable items that they either take home and use to make products, or sell to recycling companies that access the site regularly, providing the reclaimers the majority of their income. The waste that is unclaimed is then covered in a layer of soil. Once an area has been filled a new area is excavated where the unclaimed trash is dumped and covered with the excavated soil.



[1.65]
Section through land fill capped heaps.

(By Author, 2015)



[1.66]
Section through active dumping area on landfill.
(By Author, 2015)

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https://vimeo.com/148023177

Link to video mapping of Phomolong.



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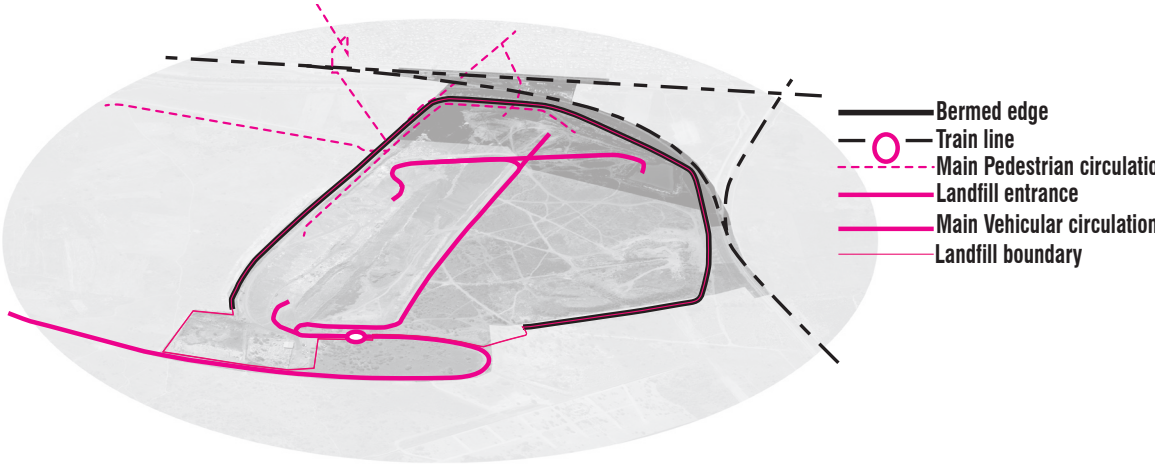
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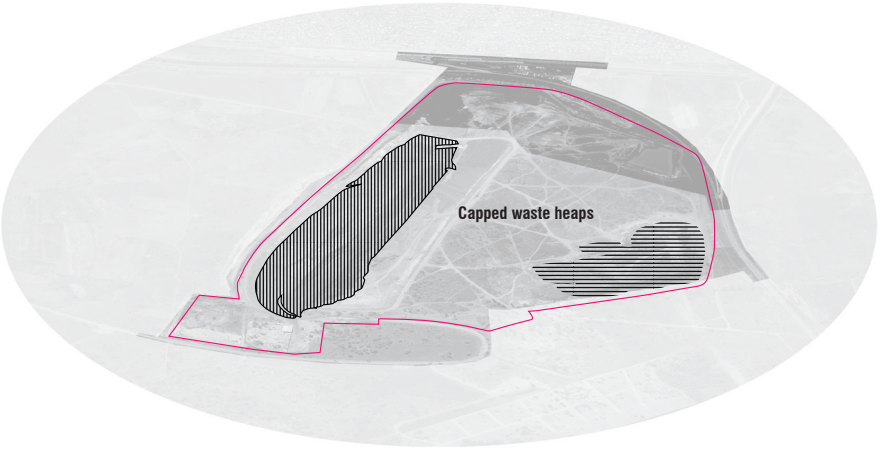
Link to video mapping of Hatherley landfill.

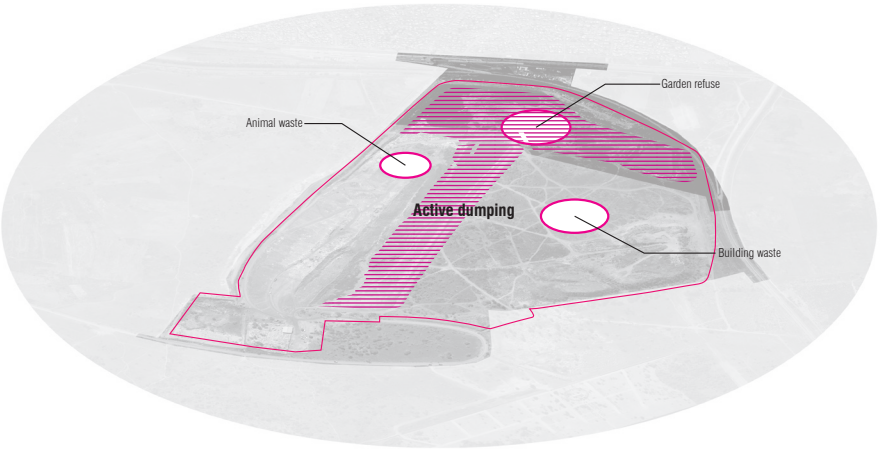


[1.67]
Landfill activity.
(By Author, 2015)

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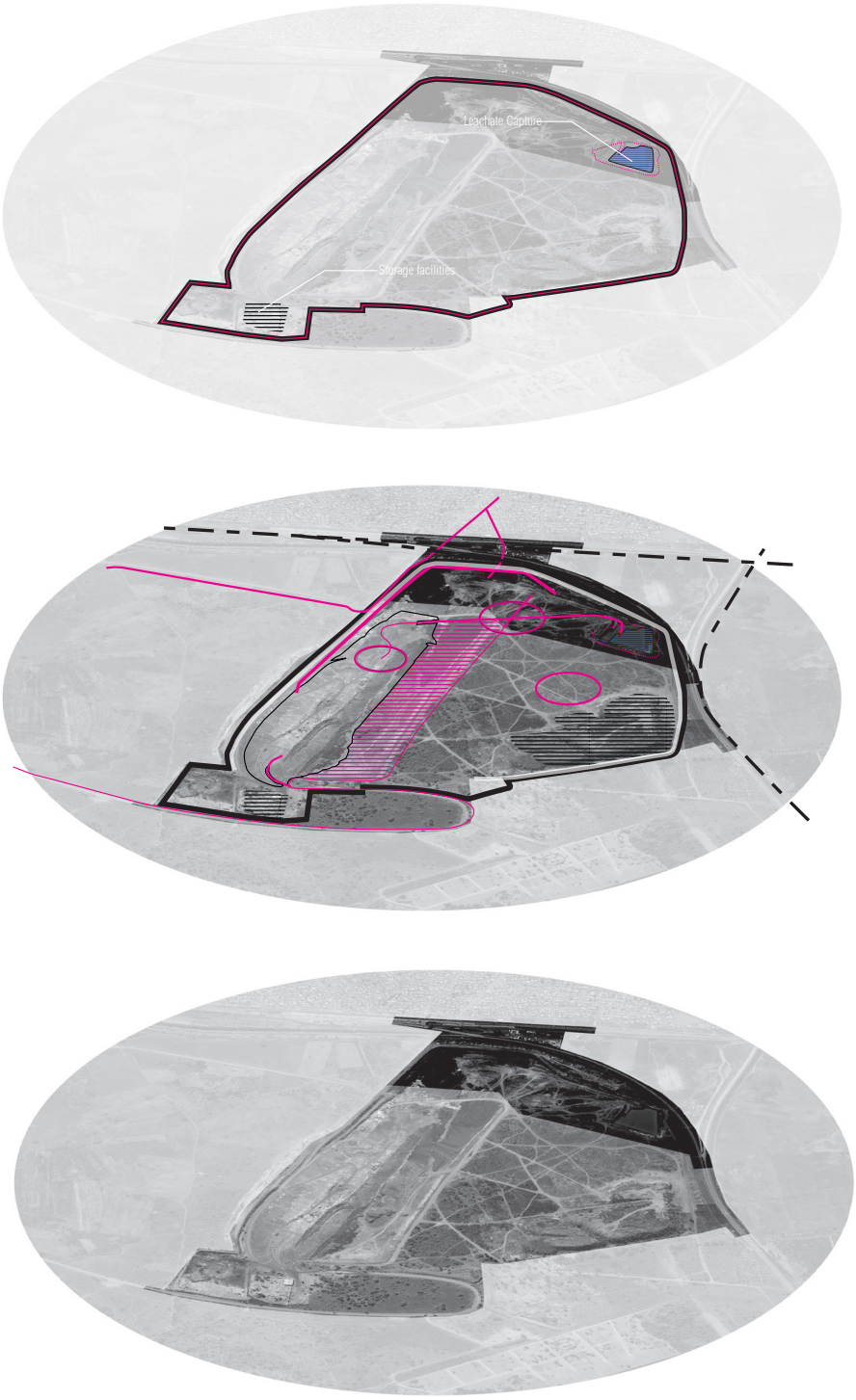




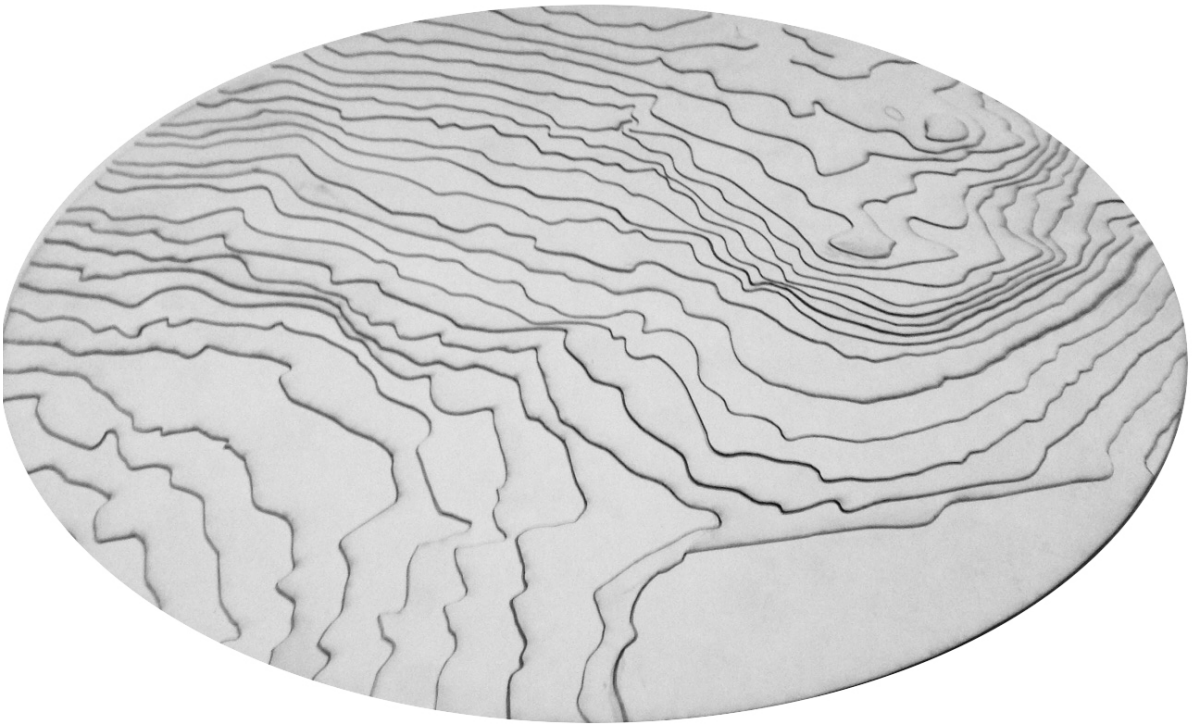
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[1.68]
Landfill mapping.

(By Author, 2015)



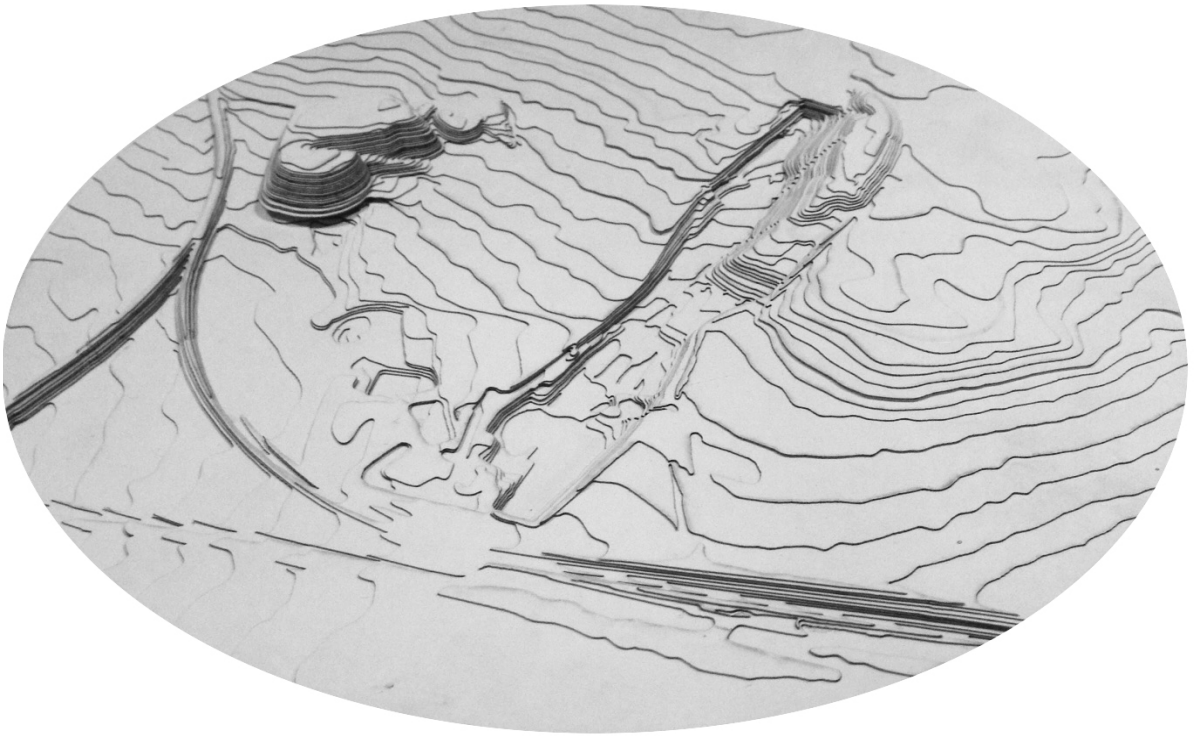
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[1.69]
Photo of physical model showing historic topography.

(By Author, 2015)

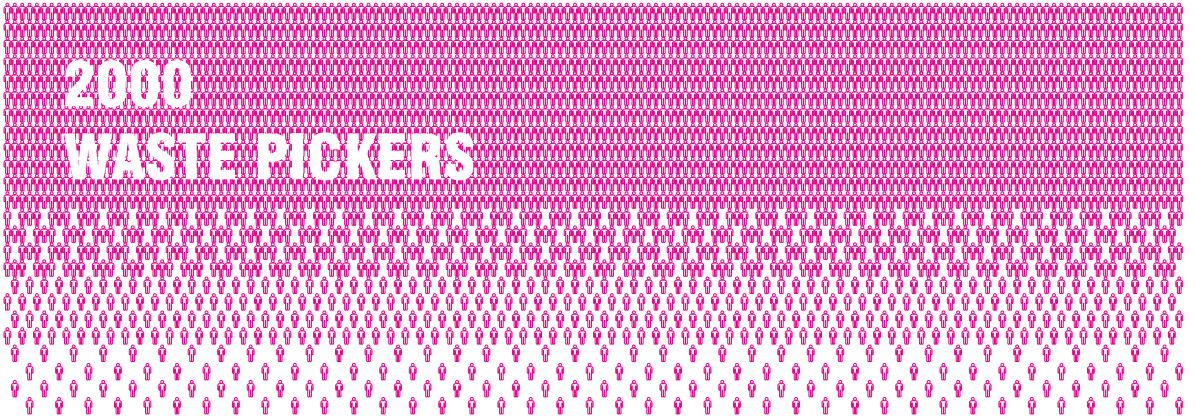
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[1.70]
Photo of physical model showing current topography.

(By Author, 2015)

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MAMELODI - Tshwane Region 6
established 1953
45.9km^2

334 577 People
48.02% Female
51.98% Male

Demographics:
B-98.89%
C- 0.40%
A - 0.22%
W - 0.14%

Language:
42.35% Sepedi
12.15% isiZulu
2.08% English
0.39% Sign

Transport:
50% - Taxi
33% - Train (5 stations)
6.4% - Bus
10.6% - Walk/Bicycle

Civic Functions:
12 Schools
10 Clinics/ Hospitals
2 Police stations
1 University

110 703 Households *DO NOT* have access to running water, electricity or a basic education

30 374 Shacks with an average of 5 people per shack

PHUMOLONG- Mamelodi ext. 6
established 2005
6.07km^2

27 164 People

Civic Functions:
0 Schools
0Clinics/ Hospitals
0 Police stations
0University

The average person has a monthly income of less than R3000.

24 359 households do not have access to rubbish disposal.

In 2014 there was 5146 reported crimes.

[1.71]
Mamelodi, Phomolong and Hatherley landfill datasheet.

(By Author, 2015)



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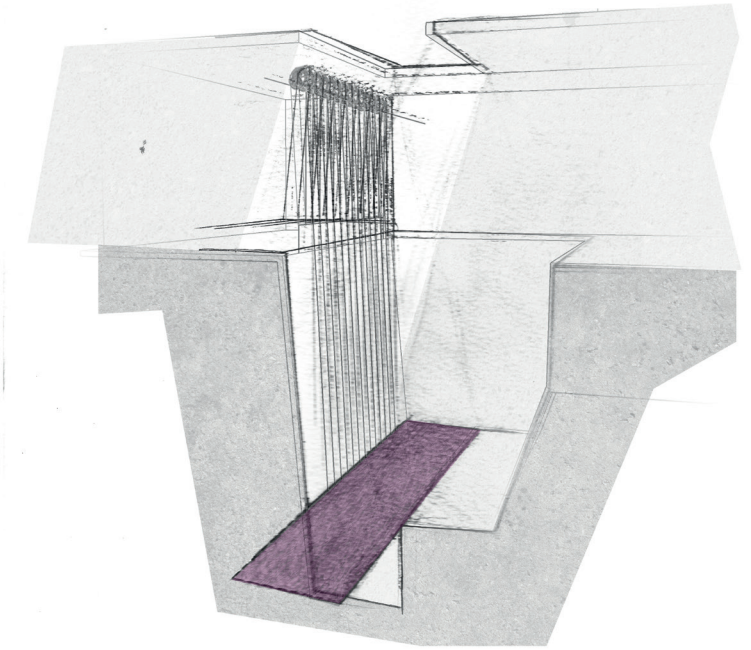
Surveying the city as data:

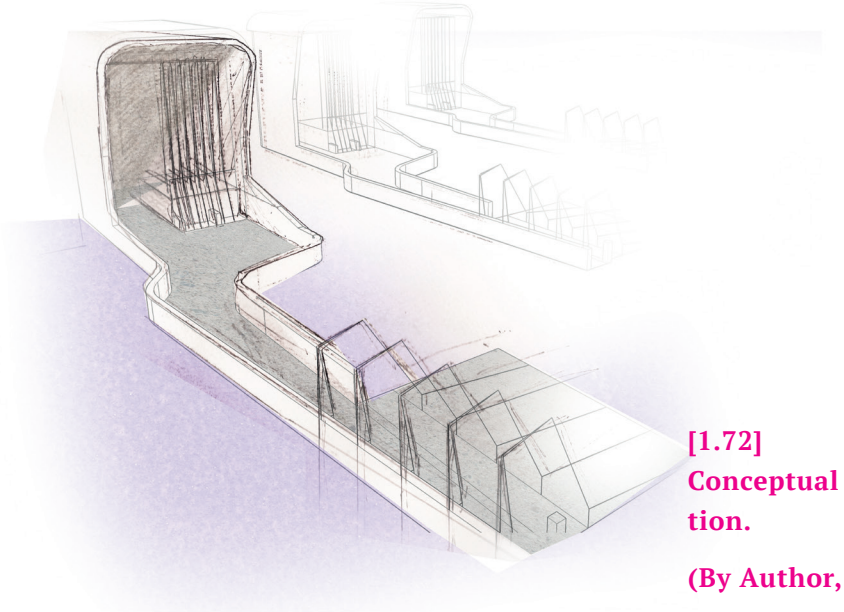
Daily almost 2000 reclaimers work on the landfill (Sanyal 2014). Figures indicate that the landfill has received between 120 000 (Snyman 2009:26) and 300 000 (Gauteng department of agriculture, conservation environment and land affair 2008:12) tons of waste each year and the volume is likely to increase. Approximately around 20% of waste is reclaimed (Gauteng department of agriculture, conservation environment and land affair 2008, p.12) yet the accuracy of these figures are debatable. None the less, massive amounts of waste has accumulated on the landfill over the years. The waste received on the landfill is mixed with the majority coming from households and only 10% garden refuse, 5% industrial waste (by products from industrial processes) and 10% building waste (du Plessis 2010:26). Making up 20% of household waste is electronic waste, potentially the most financially valuable waste, however processing this type of waste is the most difficult and the most dangerous. At the moment, very little electronic waste ever makes it to formal recyclers, unlike glass, paper and certain types of plastics (Sanyal 2014).

The majority of electronic waste is usually burned illegally on the landfill which poses a danger to the reclaimers as potentially toxic elements are released into the air. Electronic waste is usually burned for the metals it contains such as copper, however, burning the electronic waste is ineffective in extracting more precious metals such as gold, silver and palladium, that usually appear in smaller quantities and can only properly be extracted with large scale recycling. Despite this, reclaimers on the landfill can earn anything from R 4 000 - R 8 000 per month selling metals, compared to R 800 – R 1 200 reclaimers earn per month selling glass, paper and plastics(Samson 2010:16).

The neighbouring community of Phomolong, where the majority of these waste pickers live, there are just under 27 000 households. There are no official water connections and only about 30% have legal electrical connections with the majority of households resorting to illegal connections.

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[1.72]
Conceptual exploration.

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SURVEYING POTENTIAL FUTURES

The intention of the project is to re-establish waste as valuable resource in our communities both economically, culturally and environmentally. In surveying possible outcomes for the site the complex layers are unpacked and exposed in the project. The project doesn't attempt to propose an end-state for the landfill, but rather seeks to explore a series of catalytic interventions that actively engage with the complex and diverse layers contained within the landscape. The site's most basic processes are explored and is augmented by architecture by embedding the architecture and its functions into the landscape.

What is thus proposed is the mining of Hatherley landfill, mining its waste for its energy, data, narrative, nostalgic and material value, while exploring the environmental potential for landscapes of waste and establishing the landfill as an environmental, cultural and economic infrastructure within our city. It is proposed that materials contained in the site be excavated and the materials' cultural value be exacted, through a series of archaeological processes and is then broken down to be reconsumed and ultimately re-entering into the material stream creating and industrial ecology. The project seeks to challenge traditional waste management operations by not merely excavating materials to be recycled, but rather also explores its cultural opportunities. Mining as well as archaeological strategies are examined to exact the value contained within the landfill.

The archaeological excavation.

The archaeological process is a complex process and was thus simplified into three stages. First, Surveying; searching for sites of significant historical value, surveying the land and its context and conducting research in the form of mapping and examining documents from previous studies. Secondly, excavating; consisting of overlaying new geometry onto the site in the form of a grid before excavating in order to accurately analyse the fragments excavated and be able

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to place them into context. Stratification is also an important concept in archaeological excavation to properly place the fragments in context and accurately date its history. Artifacts are thus dug up layer by layers and the location and depth is documented. Artifacts are then cleaned and cataloged. Thirdly; analysis and communication: Artifacts are the analysed to determining history and relevance of the object and findings are then communicated.

Landfill mining.

Landfill mining differs significantly from traditional mining as there are other challenges involved. Landfill mining is a new concept. Very few examples exist and very little literature exists on the subject. Initial concerns in landfill mining involves the natural gas contained within the mounds. These concerns are related to the safety of mining as natural gas is dangerous when released in large quantities and at the same time poses environmental pollution as a potent greenhouse gas. It is therefore necessary to extract natural gas, prior to excavation. Excavation then follows, usually involving heavy machinery. Materials then need to be separated from the soil. Soil can be recovered and used in rehabilitation of the landfill. Separated materials then need to be sorted and separated in the different waste types.

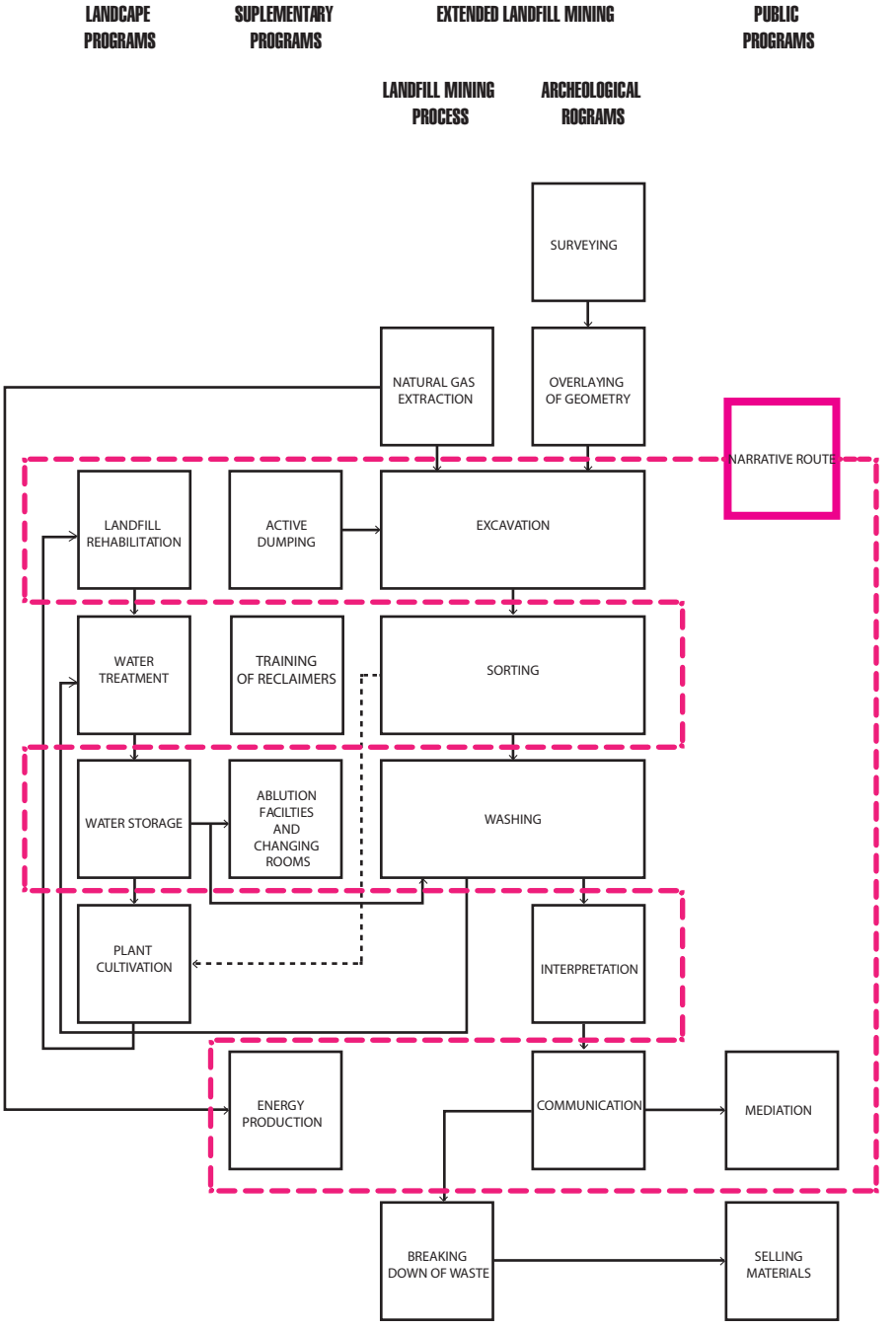
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In order to recycle waste, the waste need to be thoroughly cleaned before it is broken down using various processes depending on the waste type. The project however aims to challenge contemporary recycling methods which largely depends on machinery, by embedding the technology into the architecture.

The establishment of proper infrastructure will also help create a safer and more pleasant working environment for the reclaimers at the same time making waste management more efficient and effective. The intention of the project is to build on the networks already established on the landfill thus establishing a more stable future for the reclaimers while developing new skills. Supplementary programs are thus also explored in order to improve working conditions for the reclaimers along with providing ablution and changing facilities. Essential to the project is to also to expose the processes of landfill mining to the public and create a public interface that can be engaged with, exposing the other programs on site, yet separating users from dangerous processes.

Extended landfill mining provides many financial benefits thus making it feasible to be implemented on existing landfills subject to a number of variables (Jones et al. 2013:53). Landfill gas extraction is a very feasible operation, economically viable and has frequently successfully been integrated into existing landfills (Jones et al. 2013:46).

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[1.73]
Program diagram.

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There is increasing financial viability in the presence of industrial waste such as slags (Jones et al. 2013, p.46) which is prevalent on Hatherley landfill and regularly dumped. The recycling of glass, paper and plastic has been proven to provide a regular income to the reclaimers, yet with proper infrastructure and by processing materials on site, the efficiency and economic benefit can increase. Recycling electronic waste, the fastest growing waste stream (Sanyal 2014), also has great economic feasibility. Electronic waste, when melted down, can extract valuable metals such as copper, gold, silver and palladium. It is estimated that in each ton of electronic waste there is between 2 and 5 grams of gold (Al Jazeera 2014). With the volume of electronic waste Hatherley landfill receives, considering the value of gold alone, establishing an infrastructure to process electronic waste, could mean millions of Rands that a facility such as this can generate.

Ultimately, contemporary waste management strategies are ineffective and need to be reconsidered. Extended landfill mining is financially viable and is a relevant program to be implemented on the landfill. Cultural opportunities of waste are mostly neglected and it is thus a necessary exploration in order to realise the full potential of the landfill. The environmental benefits to landfill mining also creates the possibility for Hatherley landfill to positively impact the environment. With growing pressure on resources and unprecedented environmental change the world is experiencing, it is inevitable that landfill mining will have to be seriously considered in the near future.

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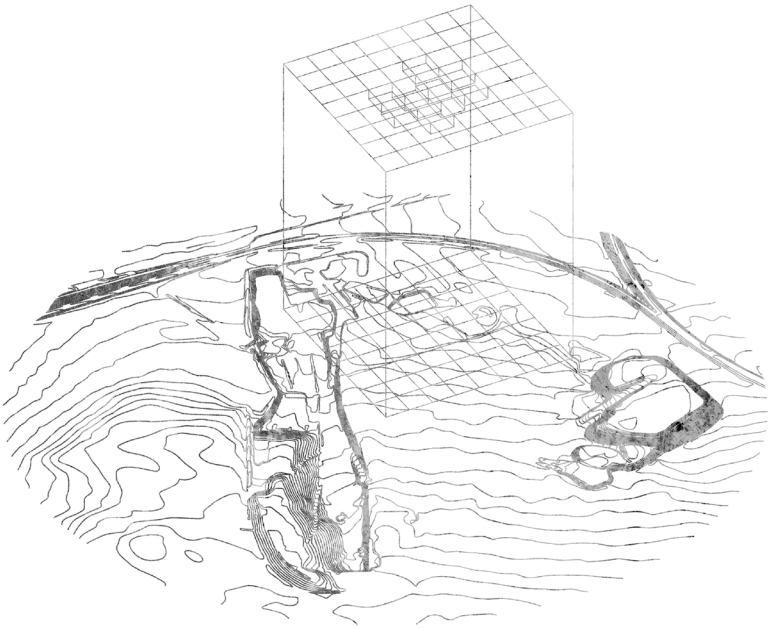
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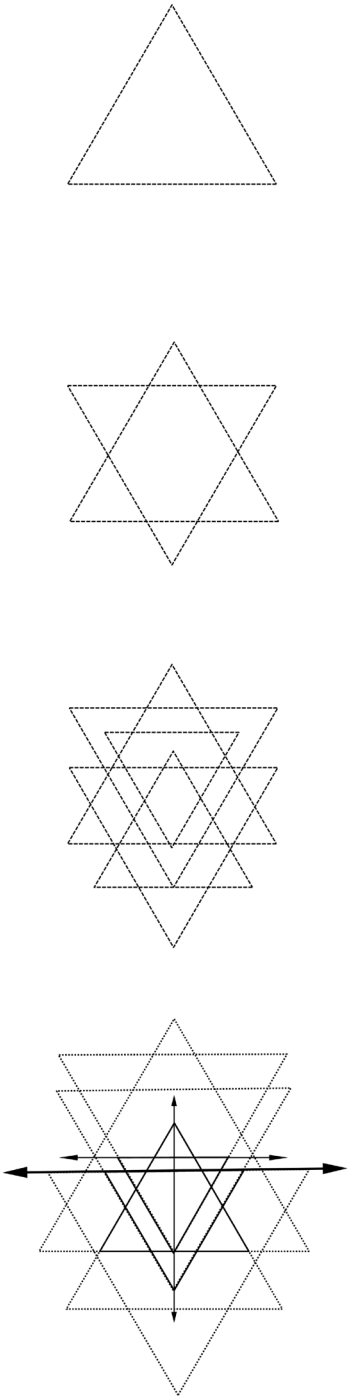
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Excavation



Excavation is the exposure, processing and recording of the strata of a site working within an overlaid new geometry.

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[2.1]
Ecotone geometries overlapping.

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NEW GEOMETRIES

Excavation starts by overlaying a new geometric order, forming a framework to work within. In investigating this geometric order the idea of the ecotone is investigated.

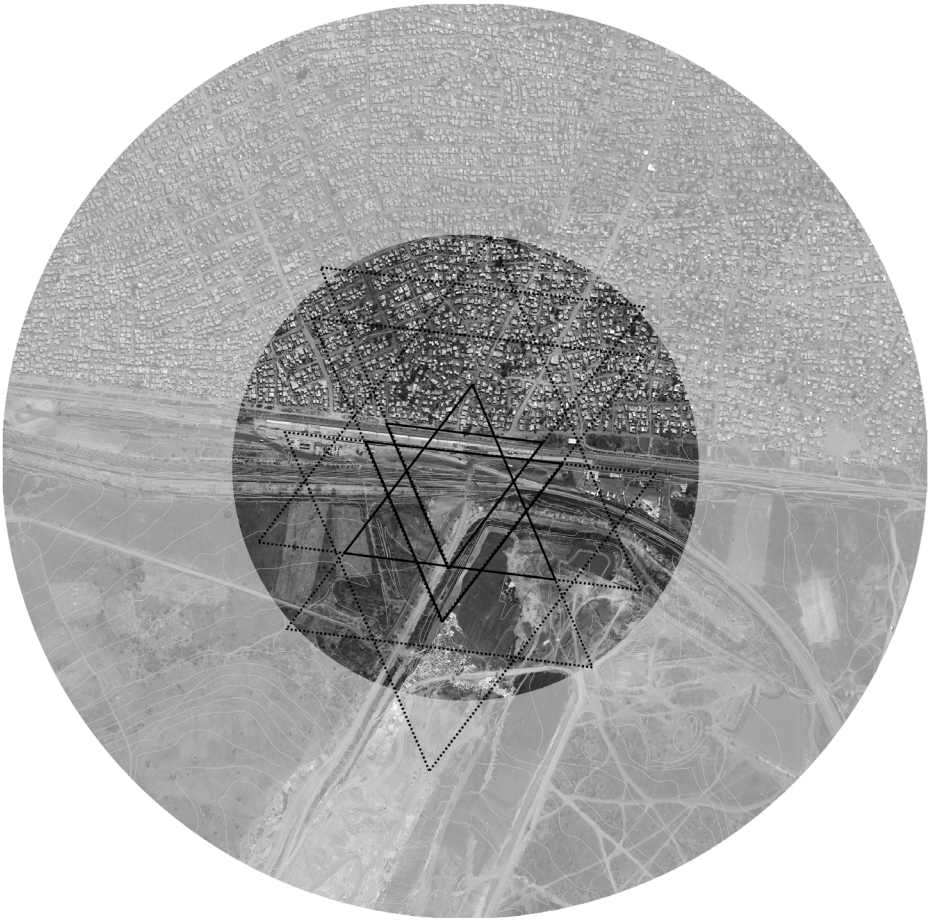
An ecotone is defined as:

Ecological zones where two distinct ecosystems overlap or grade into one another, they contain an abundance of diverse species and a complex set of exchange dynamics (Pendelton-Jullian 2009).

Taking a closer look at the severe boundary created by the railway tracks, we find that it has become a lifeless edge, despite the high levels of activity it sees on a daily basis. The existing fabric forms a geometry and where these geometries come together is as transitional zone. Communities and networks overlap and start to grind into one another, blurring the edges, but at the same time amplifying certain traits of each opposing element. These networks allow for the opportunity of the strengthening of these social systems through architecture and the housing of these interactions. They are areas of disturbance, catalysed by the differences in the two ecosystems, and they are often zones of conflict as well (Pendelton-Jullian, 2009).

By applying the theory of ecotones to social ecologies rather than biological ecologies, the crossing becomes a disturbed and tense space, owned by none but used by all: A heterogeneous space in tension due to its lack of ownership being taken.

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[2.2]
Ecotones overlapping at landfill.

(By Author, 2015)

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The implication within all these discussions is that work at the edge is unfettered and unencumbered by the inertia of core activity. It is more open to radically transformative and innovative forces and processes. These forces and processes, if tapped into, can re-shape and transform the core, something that the core will not do under its own constraints and conditions—under the shear inertia of its own historical operations. In these discussions edge and core are separate and unique fields of activity - discrete in their operations except for moments of catalytic communication (Pendelton-Jullian, 2009).

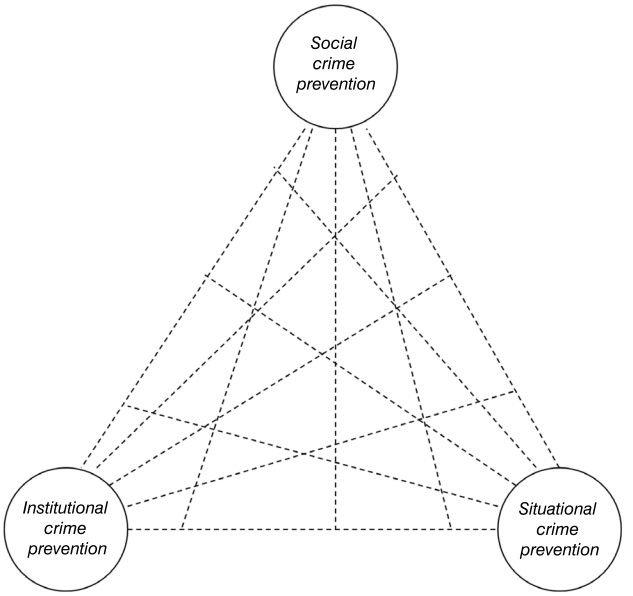
These spaces of high activity can then be seen as the nodes where intervention should take place, formalising the interactions to promote further growth. The overlapping geometries forming an order within to work.

The proposed urban vision looked at the Violence Prevention through Urban Upgrading model as a precedent to incorporate a similar methodology into the design approach (VPUU 2014).

The Violence Prevention through Urban Upgrading was a dual initiative between The City of Cape Town and the German Development Bank. The project is located in Khayelitsha, Cape Town, South Africa, and was implemented from 2006-2014. The project consists of an urban planning strategy that focused on activity nodes along main pedestrian routes to and from transport nodes. This created an activity spine with increased passive surveillance and safety through social engagement on a 24 hour basis (VPUU 2014).

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VPUU lense



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[2.3]
VPUU lens.

(By Author, 2015)

The project spans over 4 neighbourhoods thus reaching out to almost 20 000 people. The VPUU has a very clear approach and methodology, following a set of principles to support a participatory design approach, which allows residents to take ownership of the proposed interventions (VPUU 2014). The VPUU methodology focuses on analytical and statistical data for a baseline survey; a prioritisation process with community members to deduce which interventions should be ranked from most important to least important. These two elements helped to develop a strategy which informs individual interventions. The interventions were developed in cooperation with resident bodies. Implementation also focused on using local resources and skills (VPUU 2014).

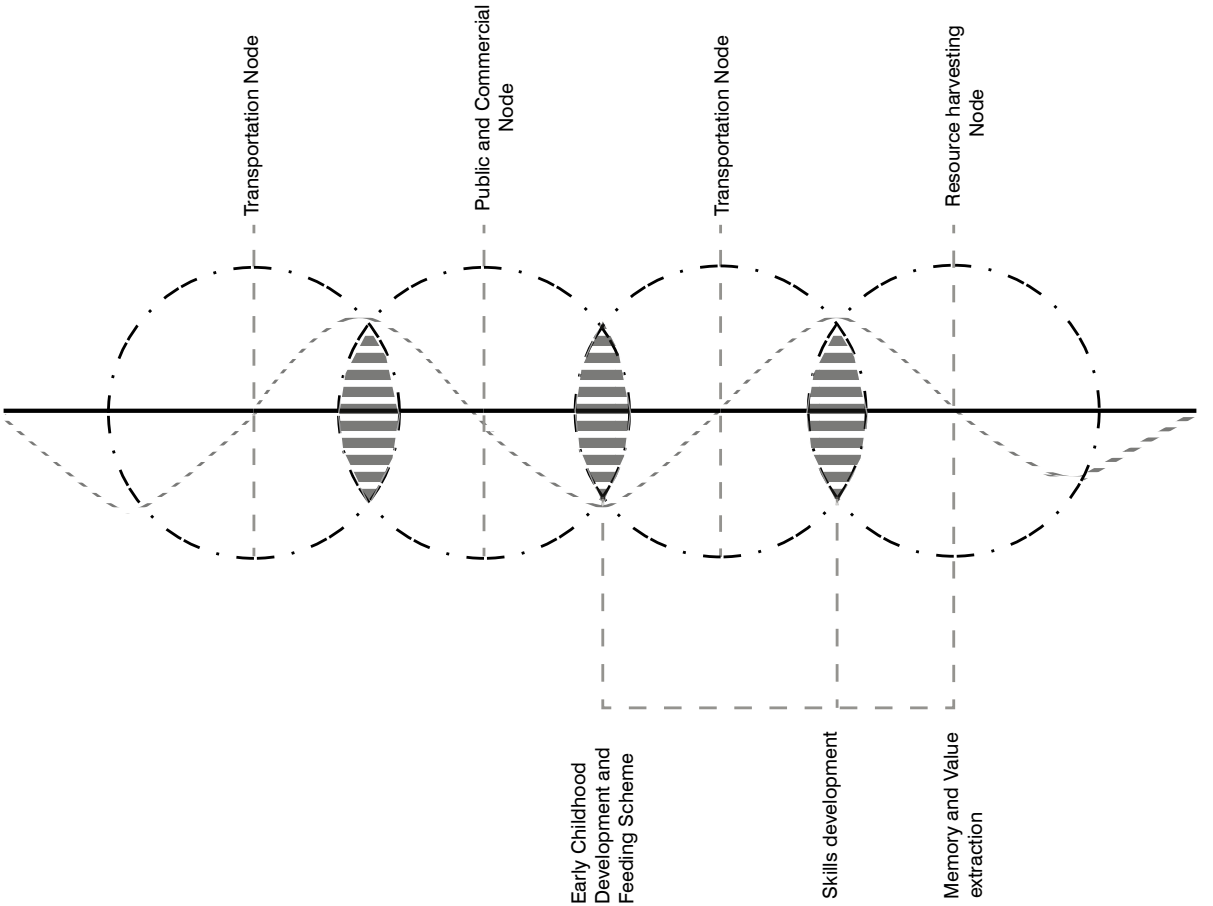
A key focus of VPUU is to create well managed and maintained spaces from the start. The model of intervention is based on an integrated approach between social and institutional dimensions to improve the socio-economic situation.

Their strategy matrix consists of the following divisions (VPUU 2014).

•Prevention: focusing on lifelong learning and includes early childhood development, schools and employment and income generating economic development.
•Cohesion: focusing on the community social capital includes community mobilisation, community delivery of services and urban management.
•Protection: focusing on community policing, and includes spatial planning, public safety as well as the legal and justice aspects of activities.
•Research and development: focusing on facts, and includes programme planning, information sharing and research and capacity building.

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PROGRAMMATIC ECOTONES



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[2.4] Programmatic ecotones.
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Urban framework approach

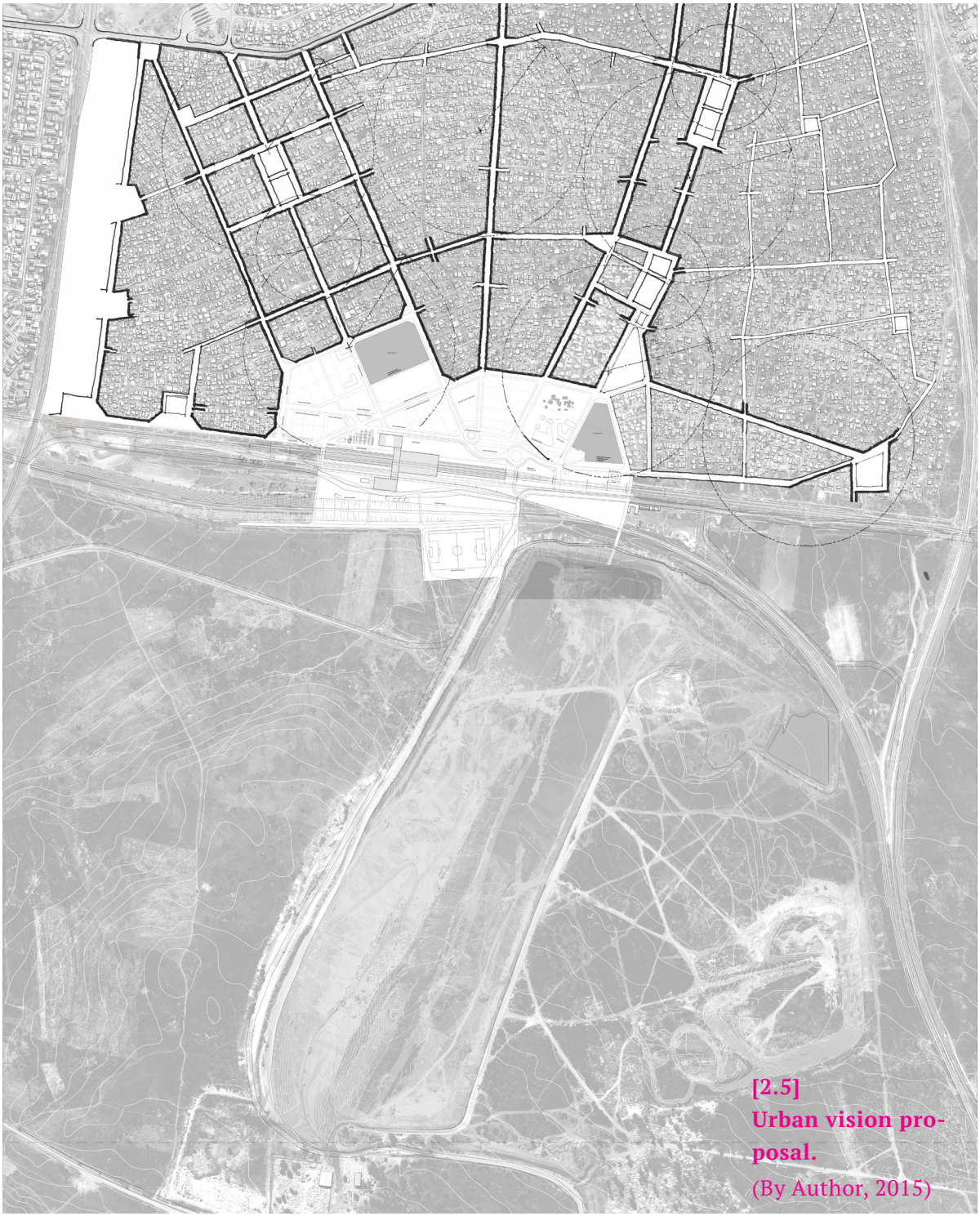
It proposes that when community participation is facilitated as sensitively as a delightful work of architecture, it has the ability to become a catalyst for further growth and improvement far beyond the initial scope of a design project.

Through the generation of a collective group proposal, the opportunity for development was established on the northern and southern edges. By reinforcing spaces where social and typological ecotones overlap, new places for the remaining community are created. Existing main routes between the transportation nerve center, (Solomon Mahlanghu road) consists of a bus terminus and informal taxi rank, and Greenview station, are formalized and exaggerated. This is to facilitate public movement through the enhancement of existing networks. Taverns, grocers and informal shops are found in close proximity to one another, as well as social networks which overlap, were considered as main informants.

The urban proposal focuses on the increase of passive surveillance (VPUU 2014) through the densification around existing public and residential squares, as well as open visual links and the introduction of functional landmarks. Proposing that the squares have 24 hour multi-functional programs, within the new defined precincts (commercial-, civic-, and production precinct). This should promote diverse users entering passively controlled spaces, which increases safety for children and women in these spaces.

The unhindered movement to and from the station is promoted through the amplified activity spines. The proposed sites for further intervention will focus on strengthening the link between the landfill and Phomolong. To promote further development on the southern side of the railway, a recreational precinct was considered. The two green areas are proposed to become Bamboo Balcooa plantations. This would introduce a new sustainable resource for construction within the community.

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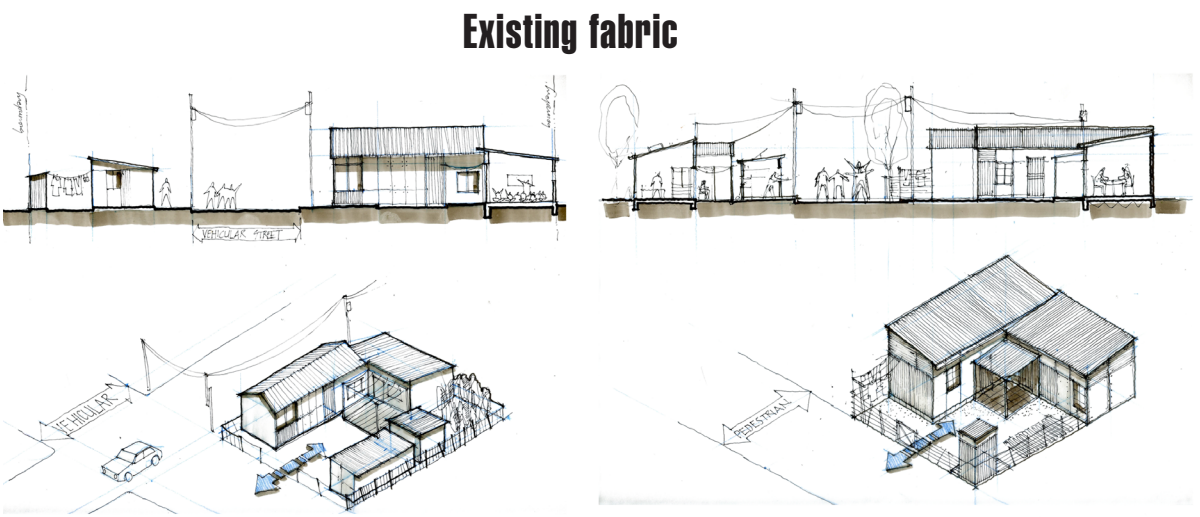
[2.5]
Urban vision proposal.
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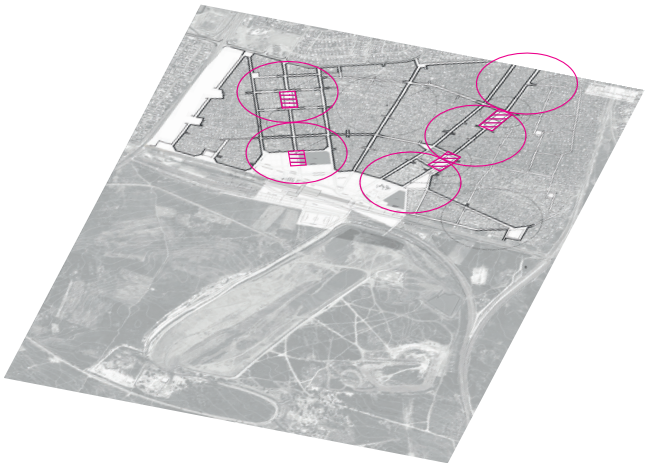
[2.6]
Urban vision proposal.
(By Author, 2015)



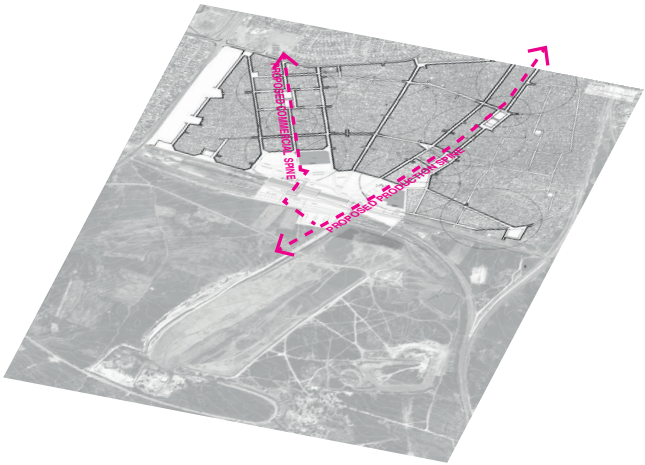
[2.7]
Typological study exploring possible development along spines. 1 story living unit developing into two story units with workshop/ commercial spaces below and living quarters above.
(By Author, 2015)

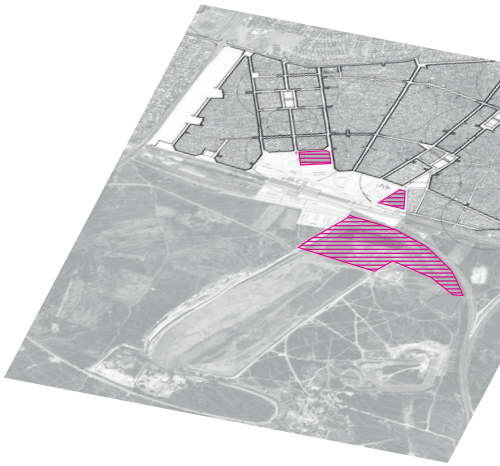


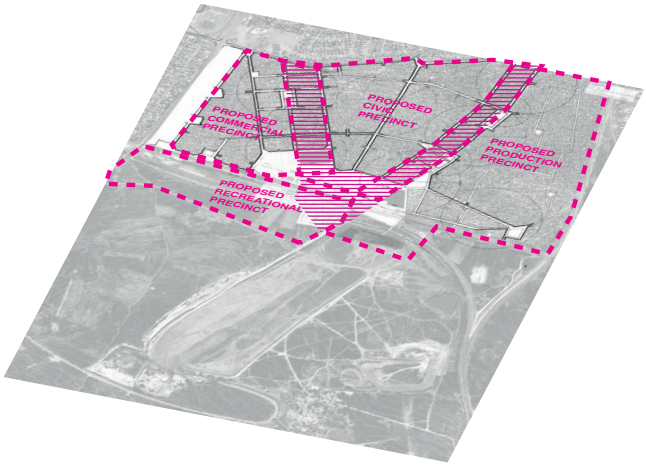
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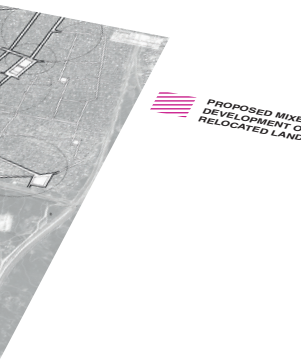
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The final urban vision proposes a phased approach.

Stage 1 sees the upgrade and strengthening of access roads, establishing a commercial spine and a production spine, creating small public spaces at short walking distances. The intension for the production spine being, materials gathered from the landfill be used to make products in workshop spaces that are proposed as future developments along the spine. The existing fabric, 1 story living unit developing into two story units with workshop spaces below and living quarters above. Similarly along the commercial spine 1 story living unit are to be developed into two story commercial spaces below and living quarters above as displayed by figure 2.3.3.

Stage 2 sees the establishment of key catalytic interventions including the landfill mining operation proposed at the landfill.

Stage 3 sees the establishment of 4 precincts: commercial, production, civic and recreational, to guide future growth while a mixed use development is proposed on the area where residents have recently been relocated.

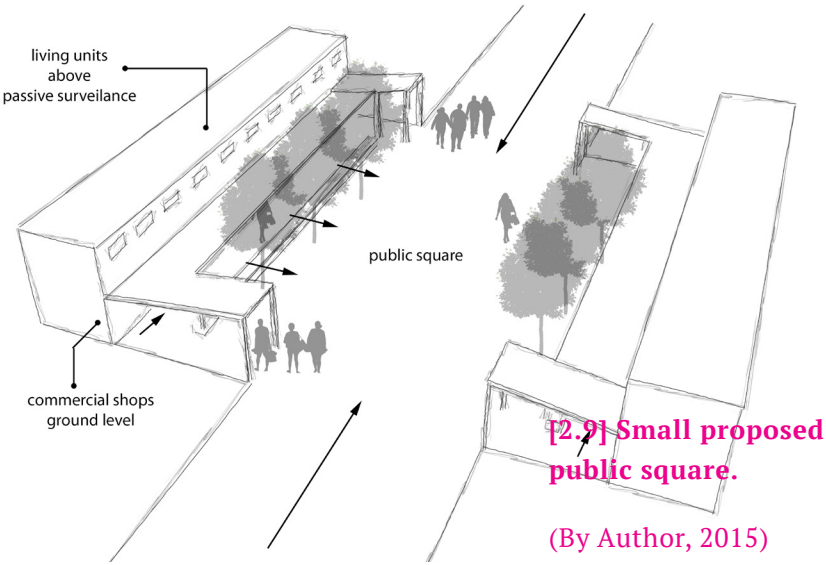






[2.8]
Final urban vision.

(By Author, 2015)



[2.9] Small proposed public square.

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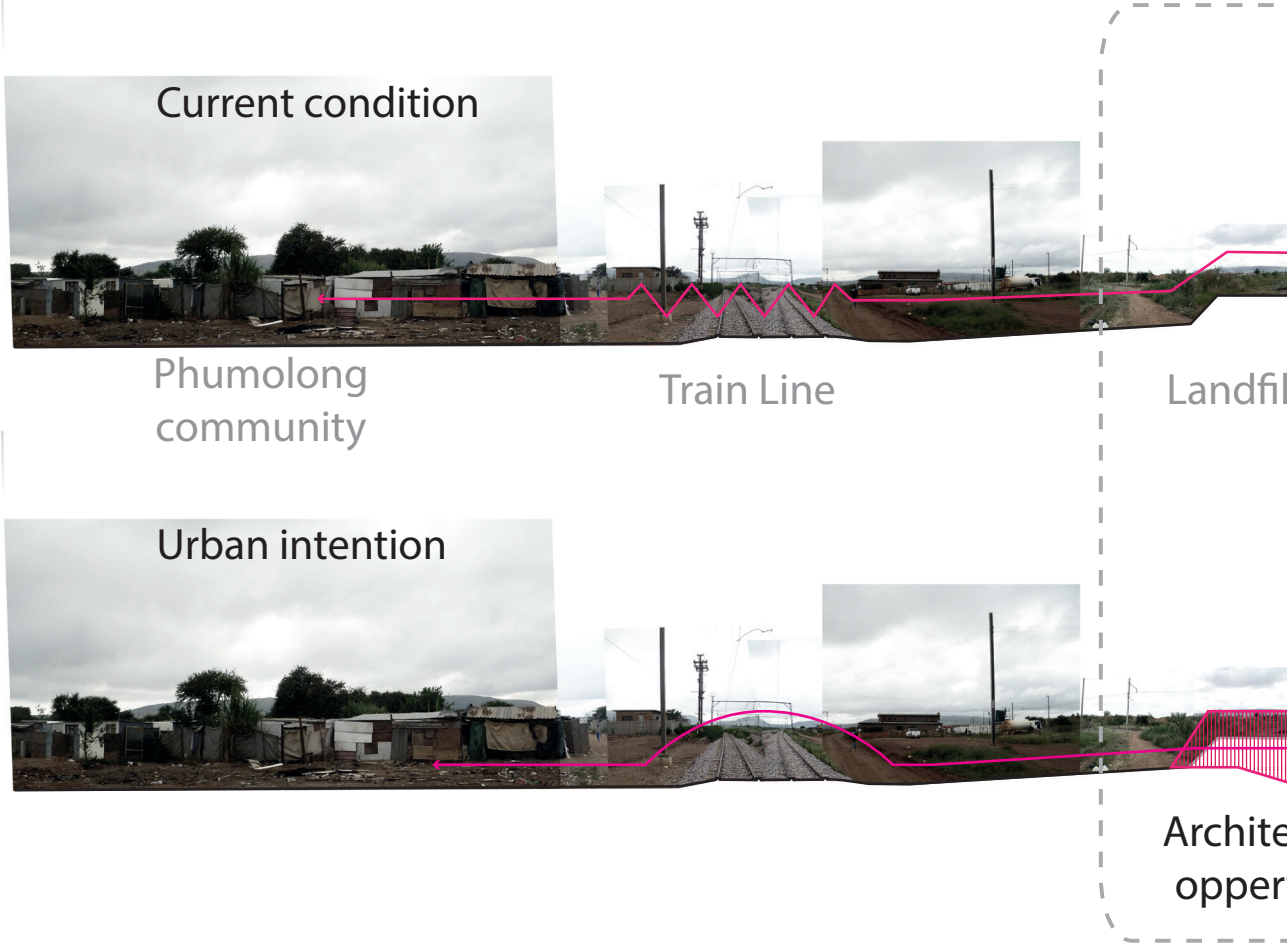


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[2.10]
Final urban vision.
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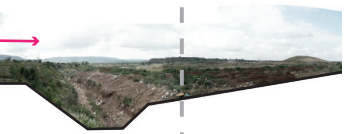
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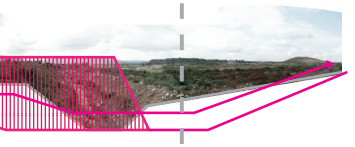
[2.11]
Urban intention.

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ll edge Landfill



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EXCAVATING THROUGH DRAWING

In exploring the architecture, several design informants were identified and considered. The project needed to meet these requirements in order to successfully integrate the project into the context, while exploring the landscape's cultural, economic and environmental potential. The informants were as follows:

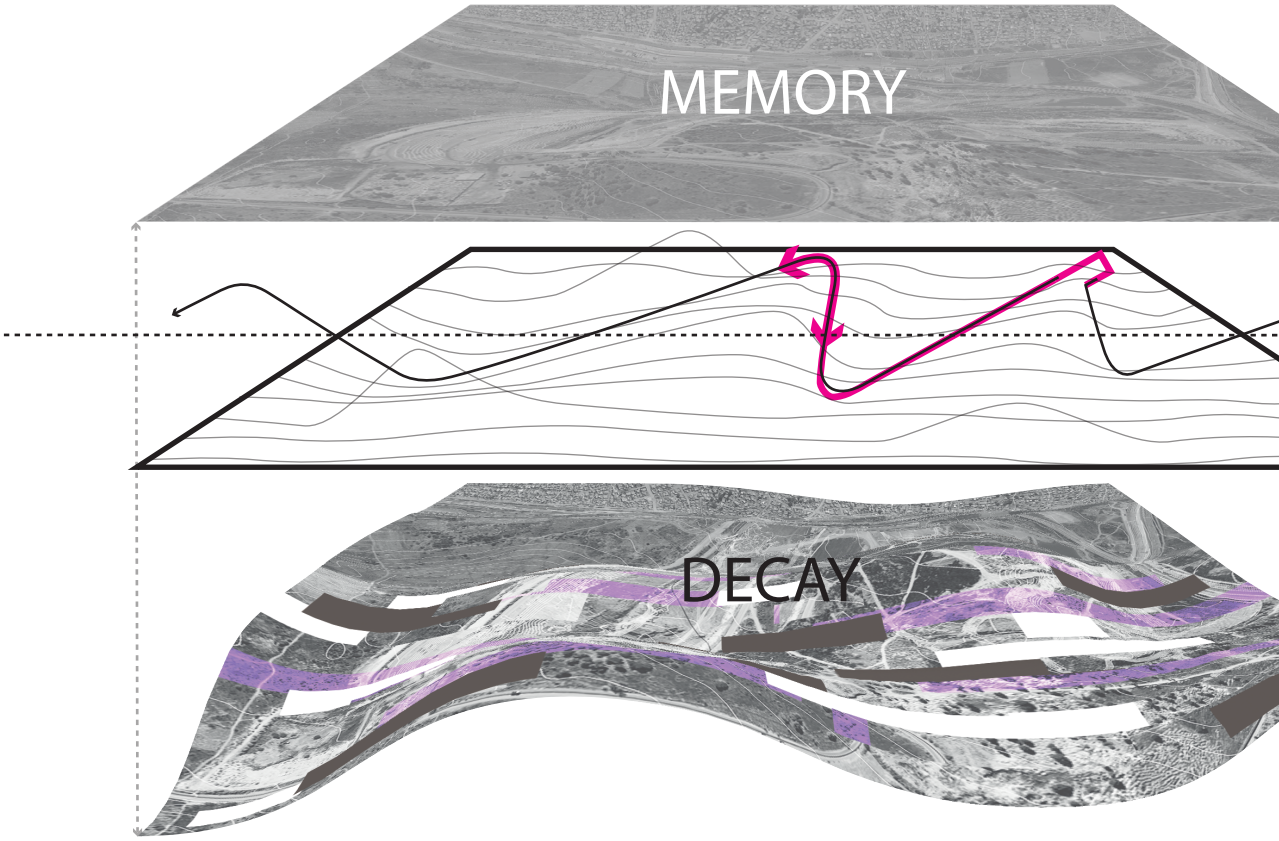
Urban:

The project explores the landfills site to act as a commodity within the constructs of our city, both in environmental and cultural terms, and aims to illustrate how it could be used to support the informal settlement of Phumolong and surrounding developments. The intention is to investigate the re-purposing of such sites as a public facilities and act as a sustainable infrastructure within our cities and activate surrounding communities.

Public access:

The intention is to change the nature of the current edge conditions of the landfill and establish a porous quality connecting it to the neighbouring community with architecture mediating daily exchanges. The intention it to expose the public to the functions on site, yet limit interaction for the potentially dangerous mining and processing programmes and separating public facilities from the worker facilities.

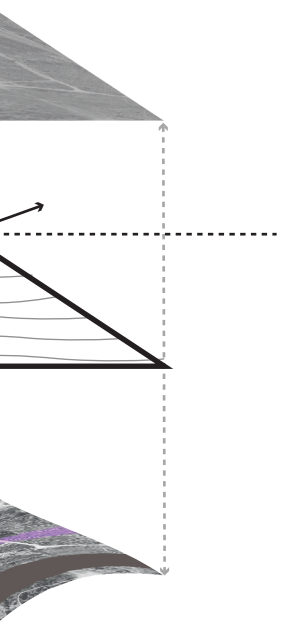
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[2.12]
Conceptual intention. The figure displays the landscape fluctuating between processes of memory and processes of decay, and the architectural opportunity to enhance these processes.

(By Author, 2015)

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Conceptual approach:

The conceptual approach of memory and decay was explored and how architecture and landscape could used to tell the landscape's narratives and convey the memories captured on site. By exposing both processes of memory and decay the project investigates how two processes can enhance each other.

Environmental performance:

Essential to the project and the theoretical approach is the environmental performance of the building looking to augmenting the landscape, utilising natural process and enhancing them through technology while using natural processes to enhance the performance of the building.

Technology:

Landfill mining requires various technologies in order to process waste. The intention is to challenge traditional waste processing strategies and embed the technology into the architecture and the landscape.

Landscape:

The landscape itself has many problematic issues including, water drainage and unstable soils as the majority of the landscape has been altered. The project attempts exploit these changes in the landscape to enhance the functions of the building.

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[2.13]
Archaeological archive exterior paving.
(I. Baan, 2009)



[2.14]
Archaeological archive exterior hexagonal profile.
(BI. Baan, 2009)



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[2.15] Left Archaeological archive exterior showing sunken space.

(I. Baan, 2009)

Archaeological tools as spatial elements:

The project investigates the use of archaeological tools as spatial elements. Archaeology relies on geometry and stratification in order to extract the value from sites and to record valid archaeological records. Ai Wei Wei's "Archaeological Archive", a pavilion, part of Jinhua Architecture Park, explored this idea. The structure houses archaeological artifacts while the landscape resembles an archaeological dig. The pavilion offers multiple vantage points where, when one moves around the pavilion, the geometries of the site is revealed. The landscape has an imposed hexagon geometry and the geometry is repeated as extruded profiles in the structure. The geometry is successfully used as an ordering tool while the pavilion can accommodate diverse range activities.

The intention is to investigate this theory through creating the architecture on the landfill. Elements of excavating and cutting into the landscape is investigated creating a new order on the landscape and leaving a new memory on site.



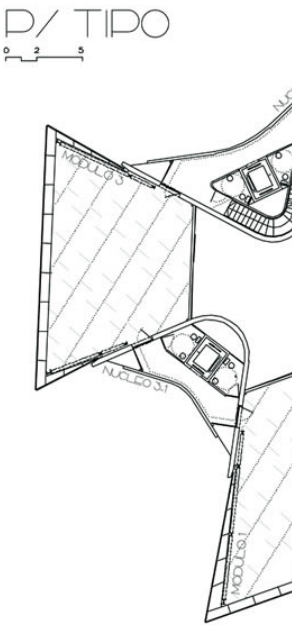


[2.16] Archaeological archive interior. (A. Pasternack, 2008)

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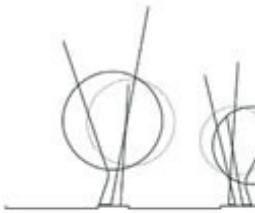
[2.17] Right
Torre cube plan.
(Estudio Carme Pinos, 2006)



[2.18] Left
Exterior of torre cube
(Estudio Carme Pinos, 2006)



[2.19] Right
Torre cube sections.
(Estudio Carme Pinos, 2006)



[2.20] Left
Torre cube central space.
(Estudio Carme Pinos, 2006)

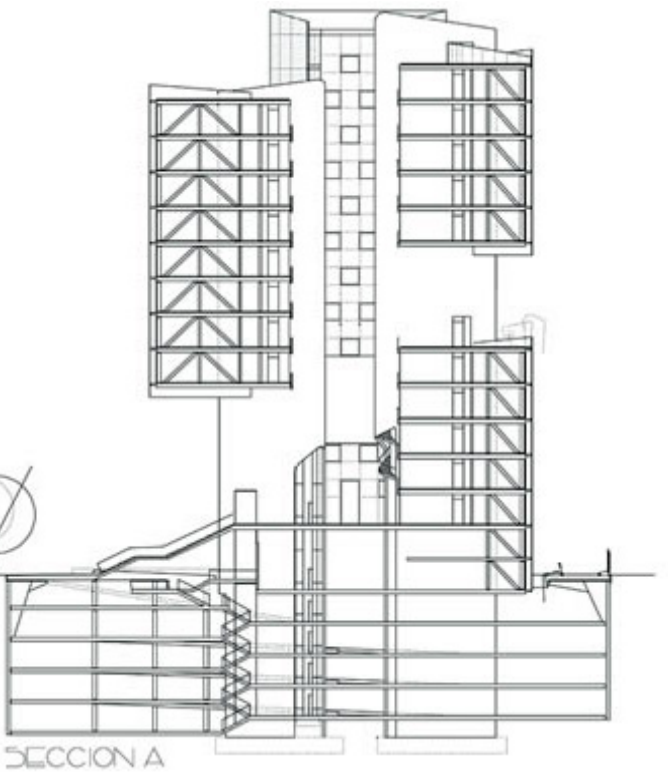
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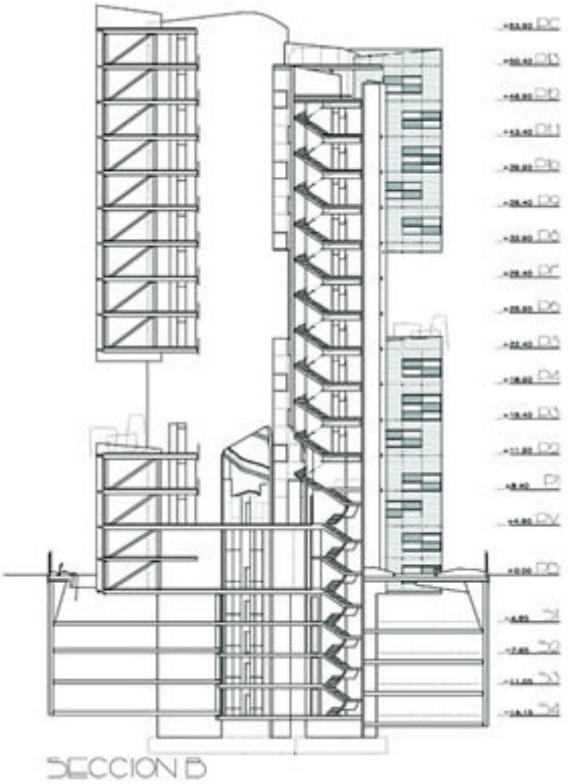


Service cores:

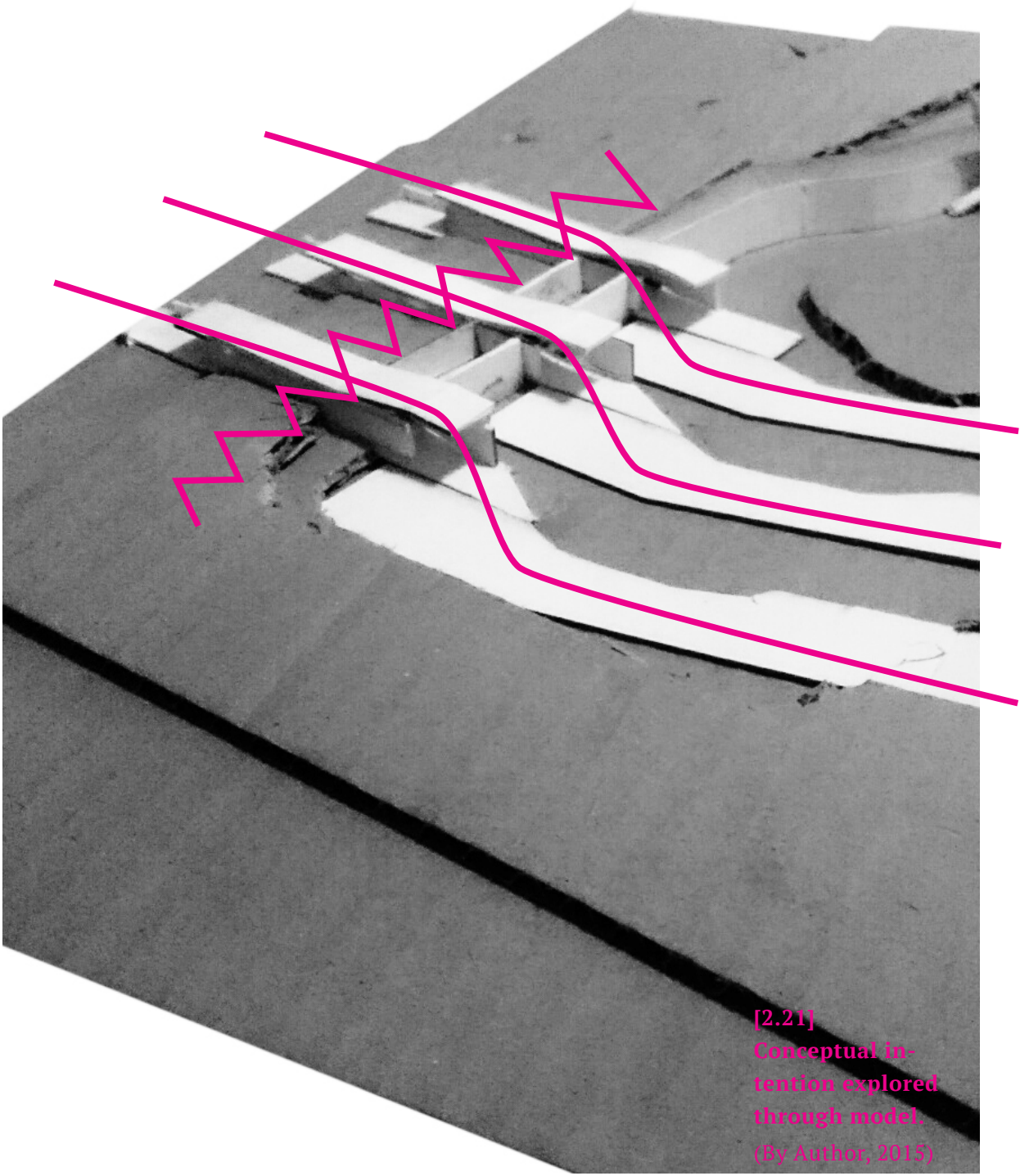
In planning the architecture the use of service cores was investigated. In investigating this, Carme Pinos' Torre cube project was identified as precedent. The building sits on a plinth where three service cores rise from the base structure. The cores act as structure and provide service and vertical circulation. Attached to the cores are open plan office spaces that cantilever from the structural cores. The cores provide adaptability for the building while providing necessary functions.

In investigating its application in creating the architecture it is suggested that the service cores are repeated and different functions of the building attach to the structures. The intention for this was so that possible future development could occur. Potentially, service cores could be repeated around the edge of the landfill and future development could attach to these core.





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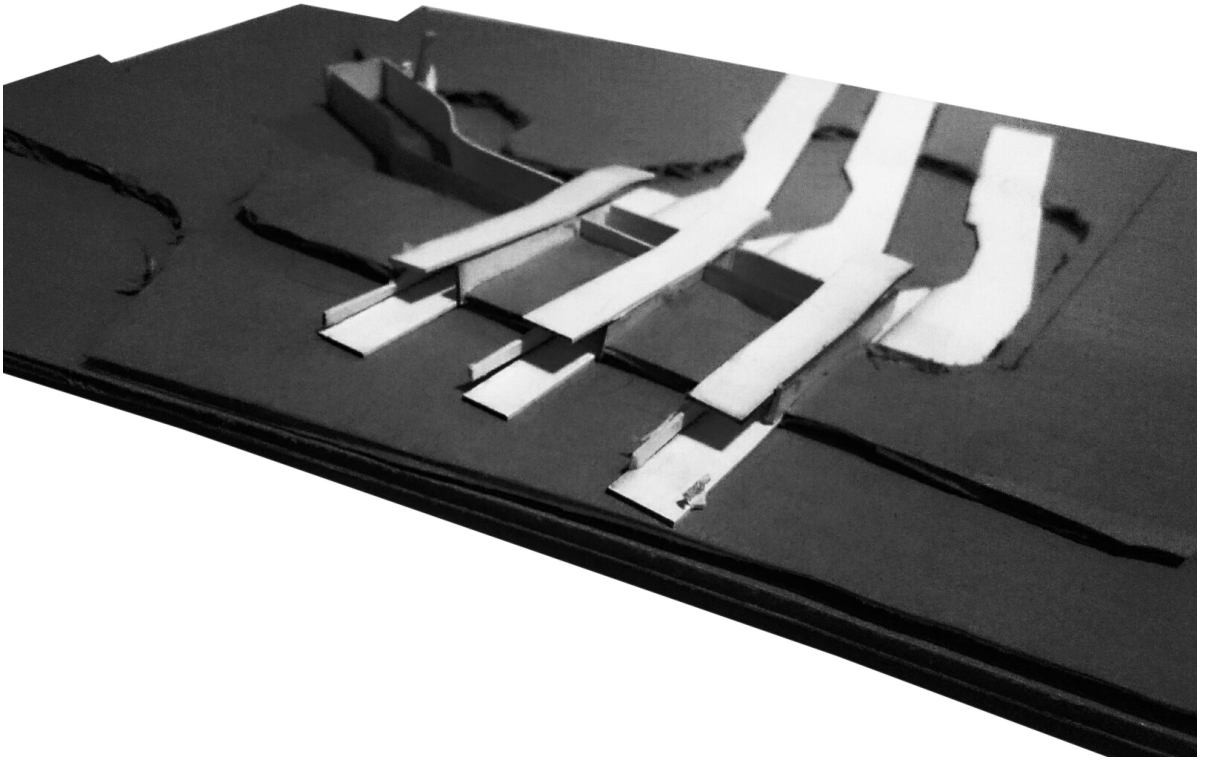


[2.21]
Conceptual intention explored through model.
(By Author, 2015)

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Design development:

Initial explorations revolved around establishing a strategy for the architecture to mediate exchanges on the edge of the landfill while infrastructural landscape element would mine the objects. The resulting structure was a series of infrastructural spines that cut through the edge of the landfill while the spines would extend into the landfill and grow as it mined the landscape. The intention was to activate the edge of the landfill while mining and reclaiming functions could continue on the landfill.

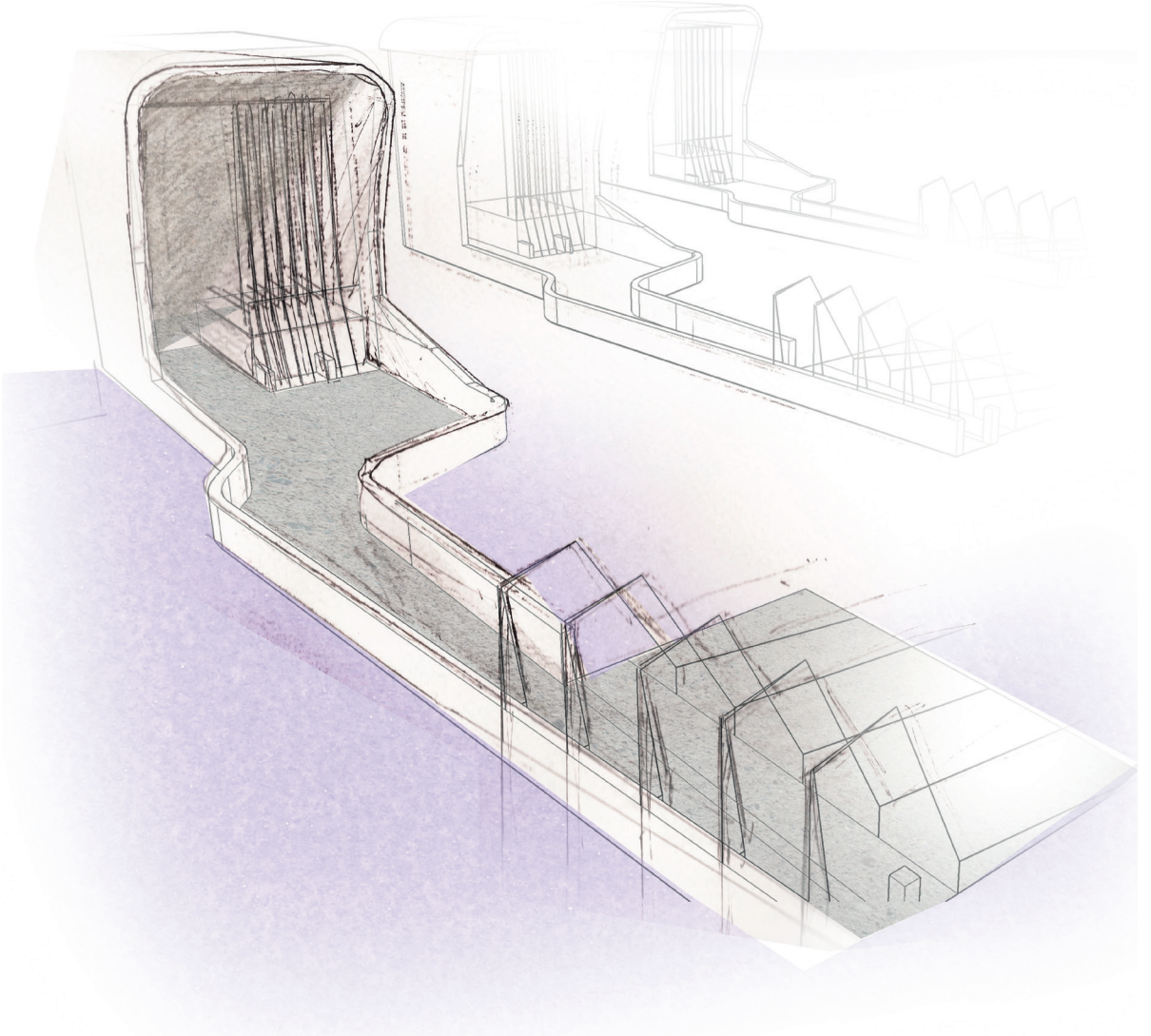


[2.22]
Conceptual intention explored through model.
(By Author, 2015)

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[2.23]
Conceptual spatial exploration.

(By Author, 2015)

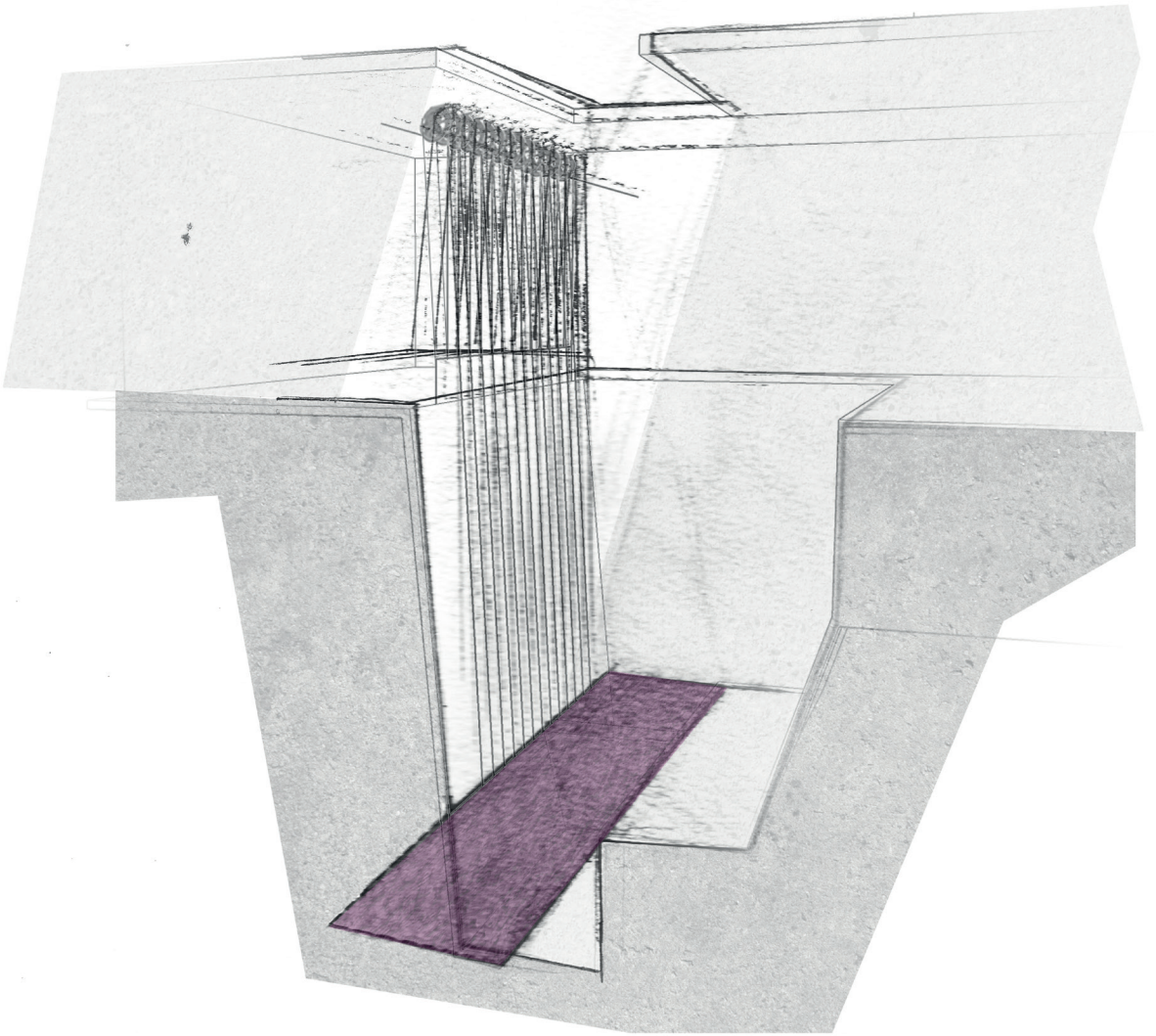


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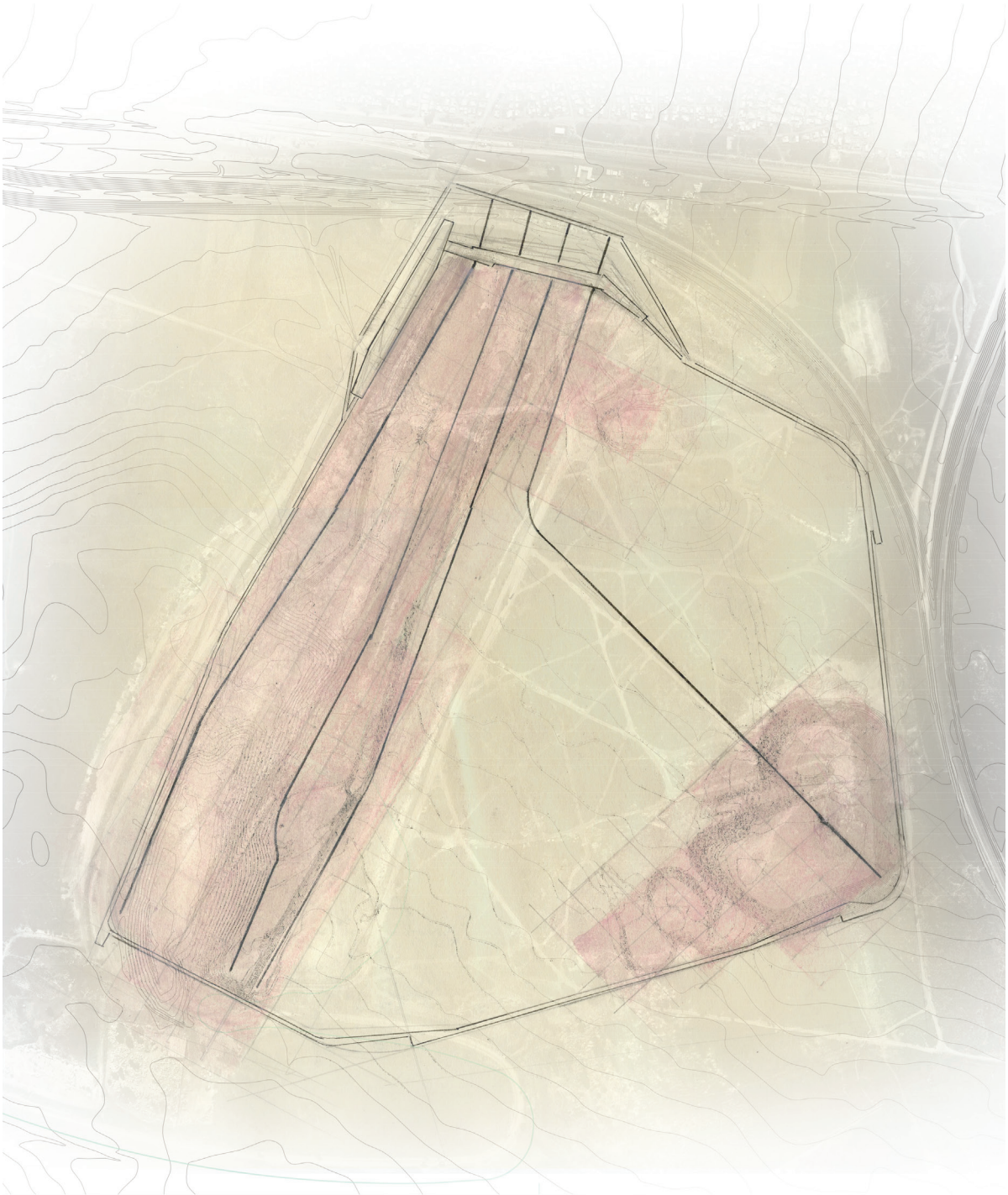
[2.24]
Conceptual spatial exploration.

(By Author, 2015)

Conceptual spatial investigations were done and the architecture was expressed as a series of chambers that decayed the objects at an accelerated rate using elemental materials such as water and light that, formed the ideal chemical environments to decay objects while toxic elements are broken down. The objects are decayed to a raw material that can be (re)consumed and are sold in markets spaces that connect to skills-development and education centres where these raw materials can be reprocessed.



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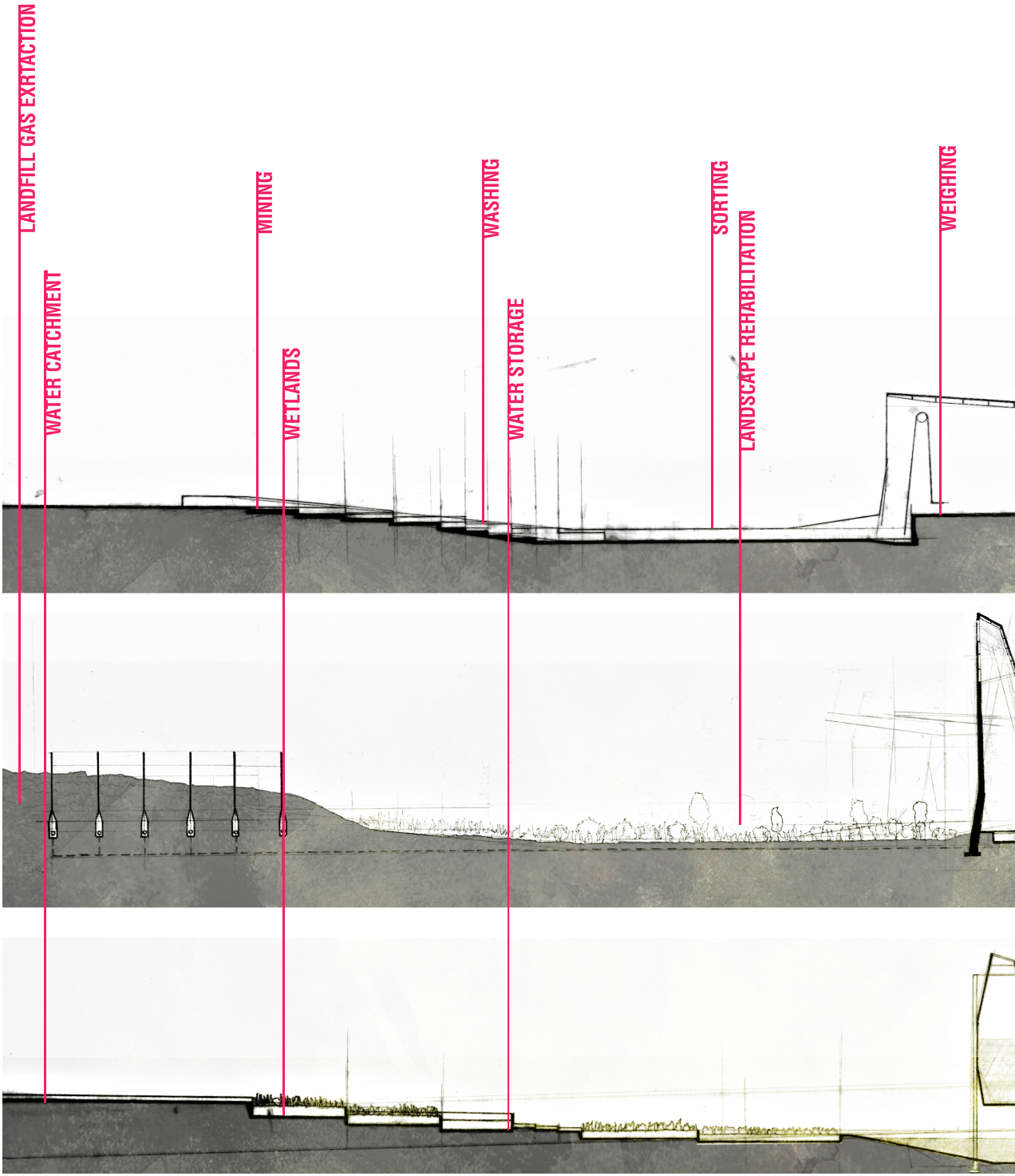
Following, explorations revolved about establishing a strategy for the whole site. The northern and western edges where chosen for architectural intervention as it is spaces that are most active, at the same time connecting to the proposed commercial as well as production spine, proposed in the framework. The northern part of the site was also chosen to create a connection to the rail system. The northern part of the site is also its lowest, making it the optimal positioning for the facility as it can use the slope of the site to efficiently move products. The northern part of the landfill has also recently been excavated making a good placement for the facility as it doesn't require more excavation in order to reach natural ground level as is with the rest of the site.

A route around the landfill was establishing in order to mediate the edge of the landfill, making it possible for visitors to see what goes on inside the landfill while keeping visitors safe from the landfill operation. The route acts as a running track and also forms part in the telling narrative of the site and will connect the various recreational and didactic spaces established for users

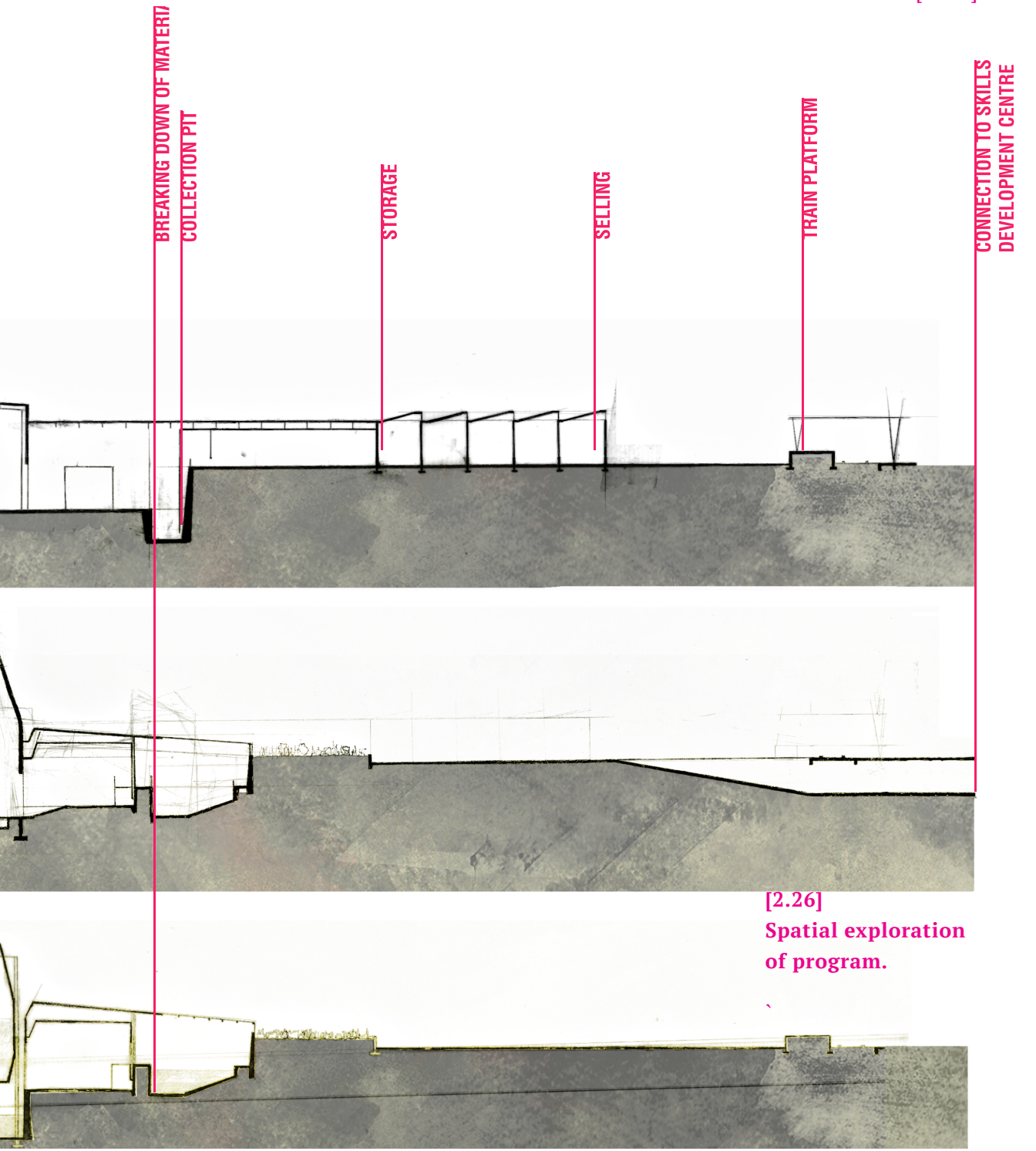
In responding to the recreational precinct established in the framework, a series of restrooms, changing rooms and ablution facilities was established. These facilities, are to be used by the workers that work on the landfill and can also be used in the mornings, evenings and over weekends by users who wish to use the recreation facility established in recreational precinct.

[2.25]
Master plan development.
(By Author, 2015)

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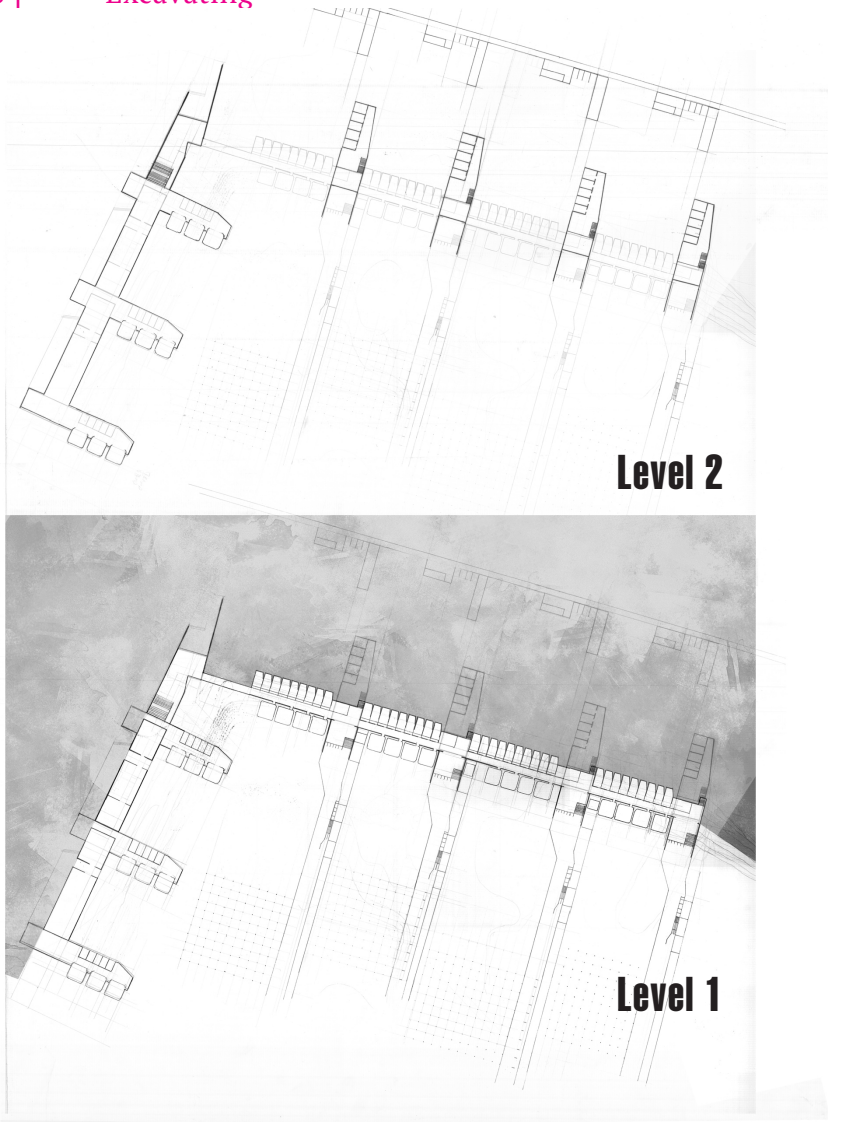


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[2.26]
Spatial exploration of program.

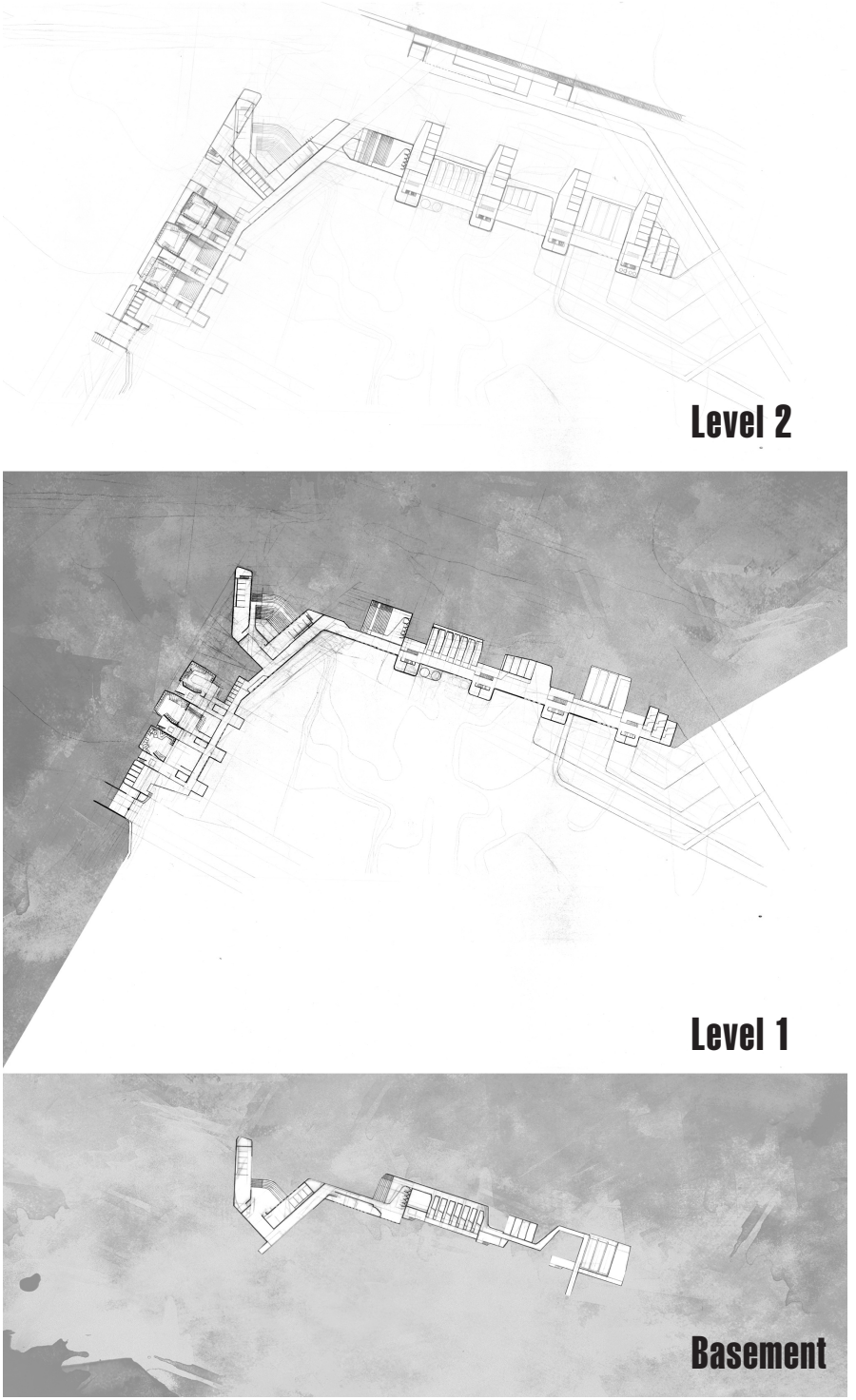
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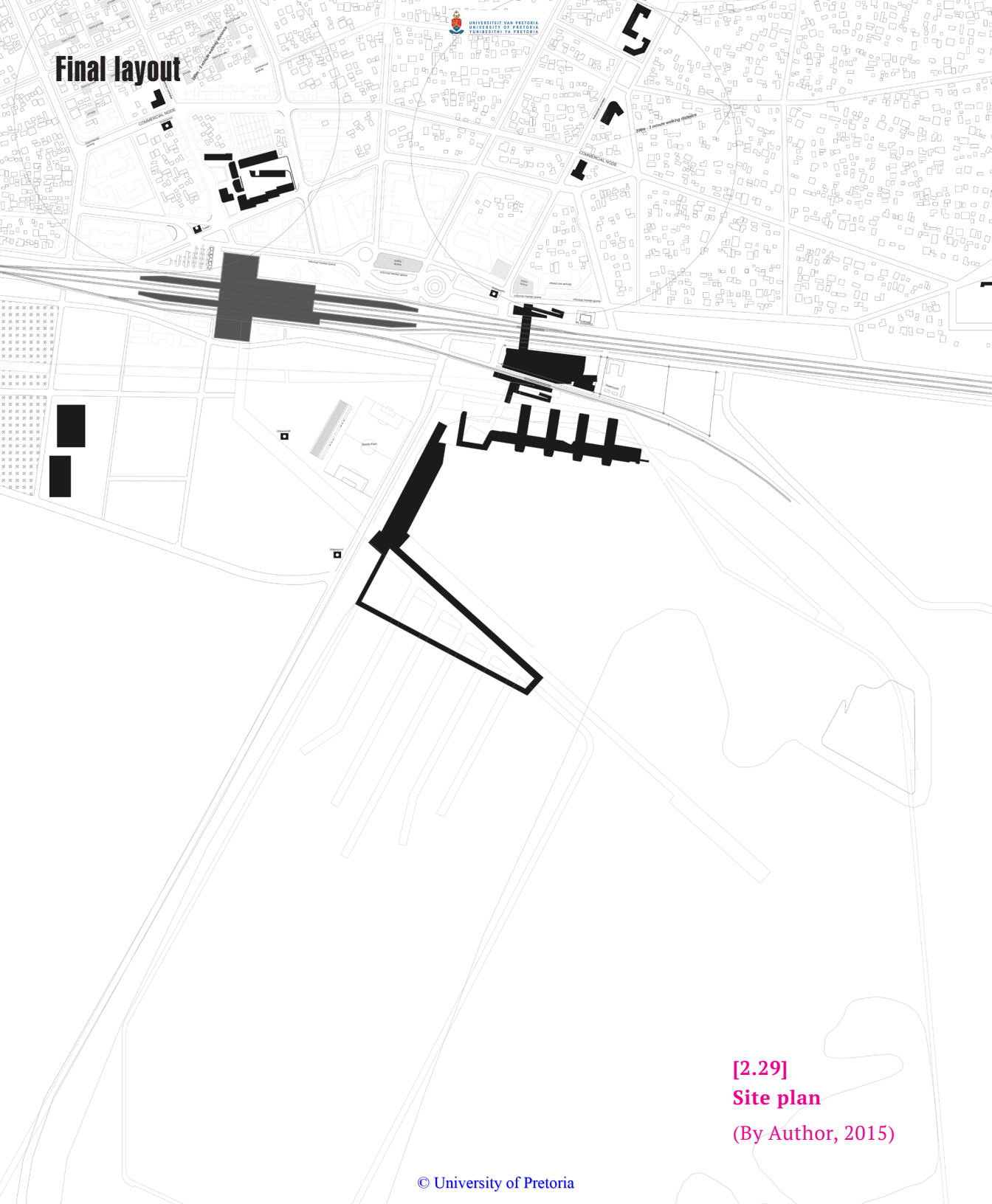
[2.27]
Iteration 1 plan.
(By Author, 2015)

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[2.28]
Iteration 2 plan.
(By Author, 2015)



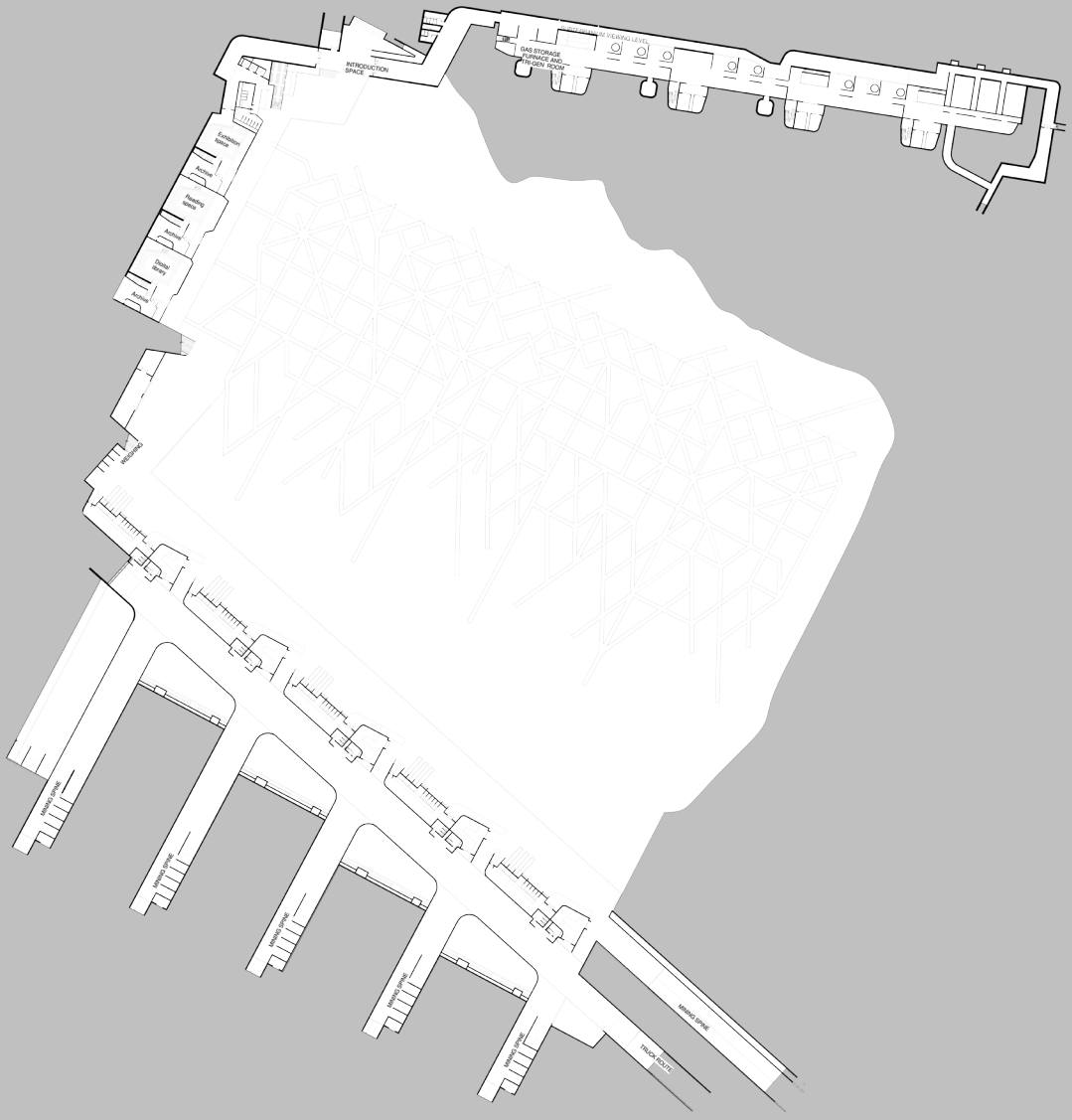
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[2.29]
Site plan
(By Author, 2015)

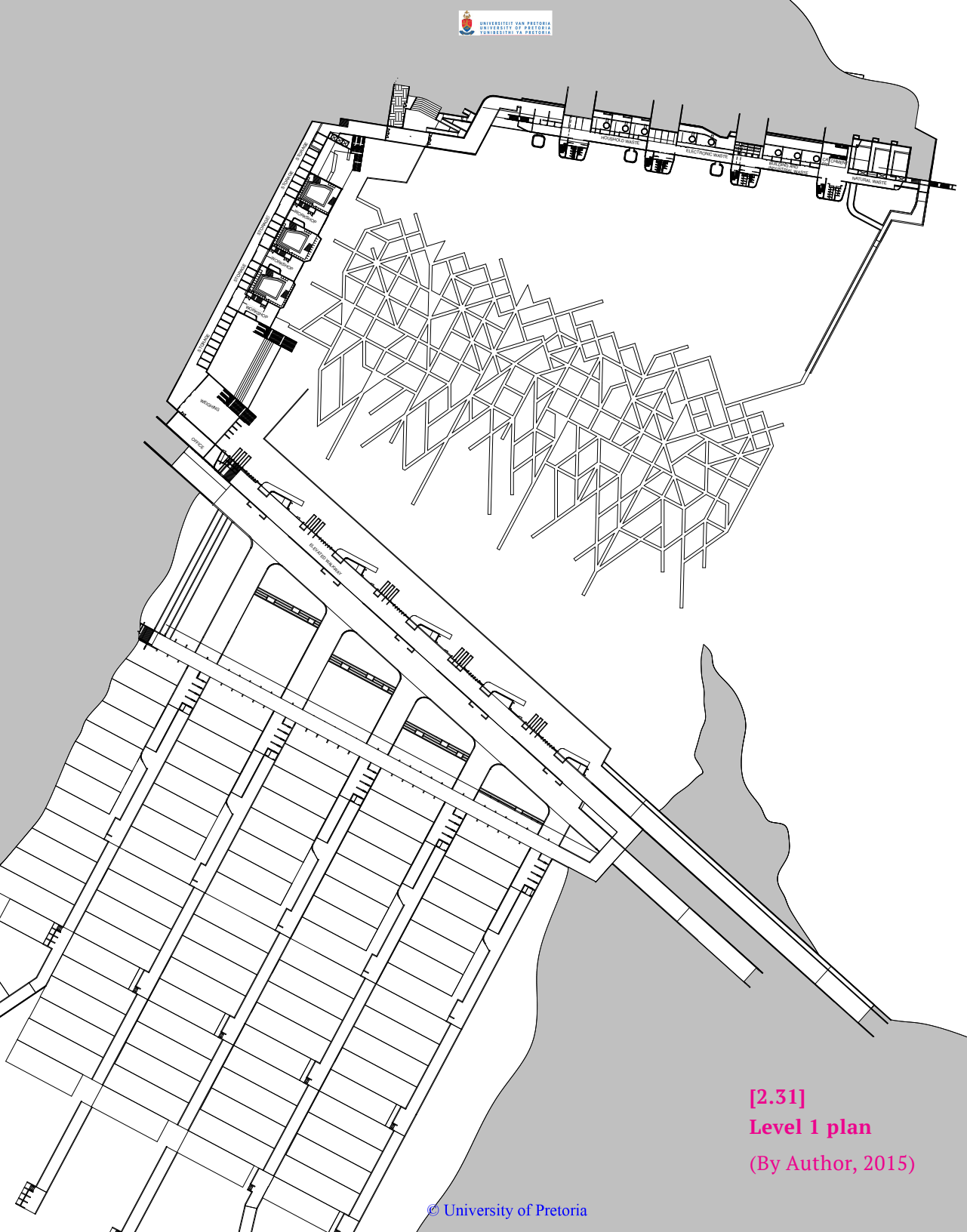
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[2.30]
Basement plan.
(By Author, 2015)

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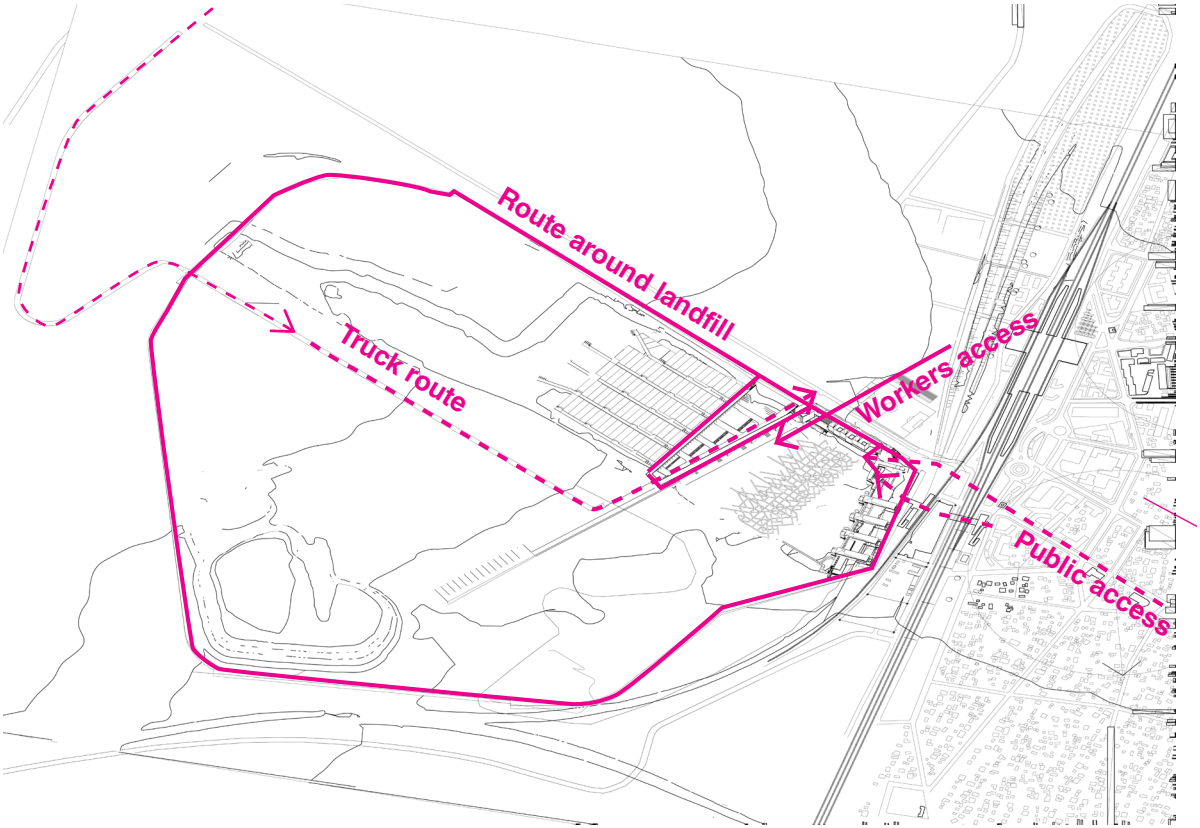
[2.31]
Level 1 plan
(By Author, 2015)

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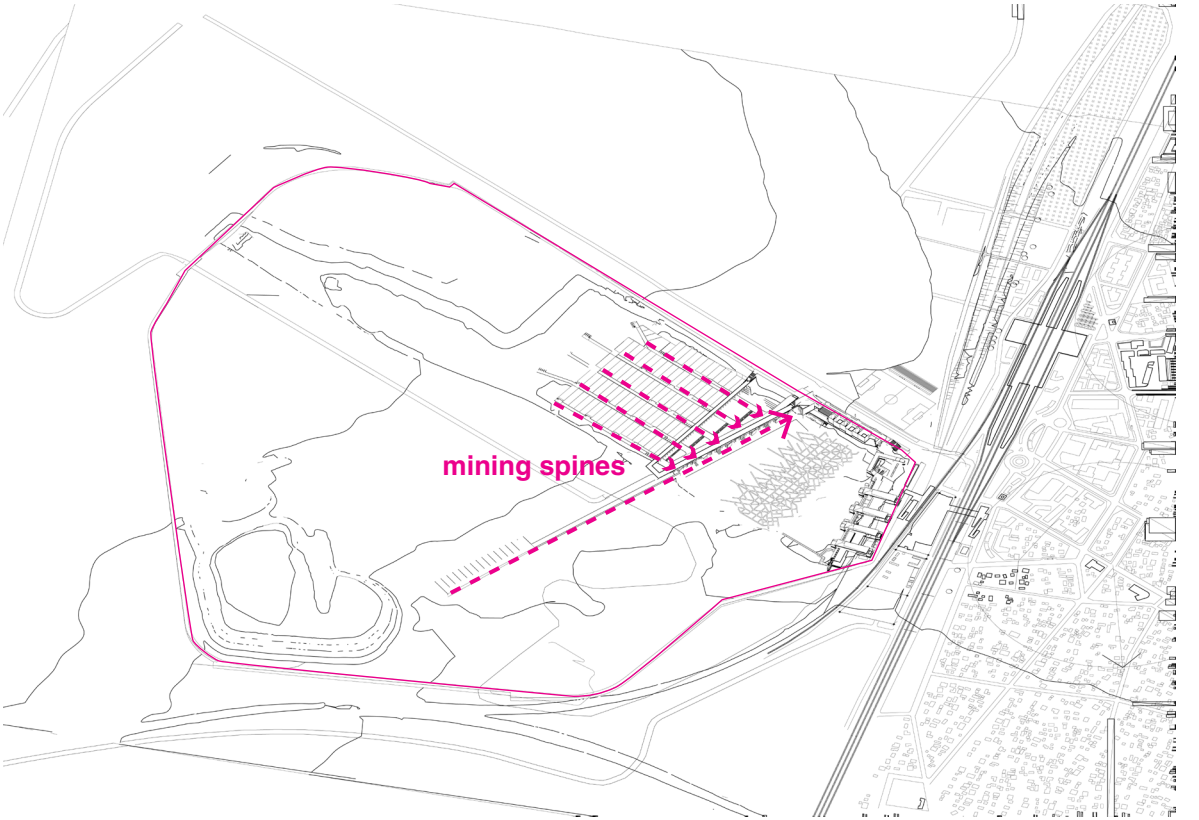
[2.32]
Level 2 plan
(By Author, 2015)

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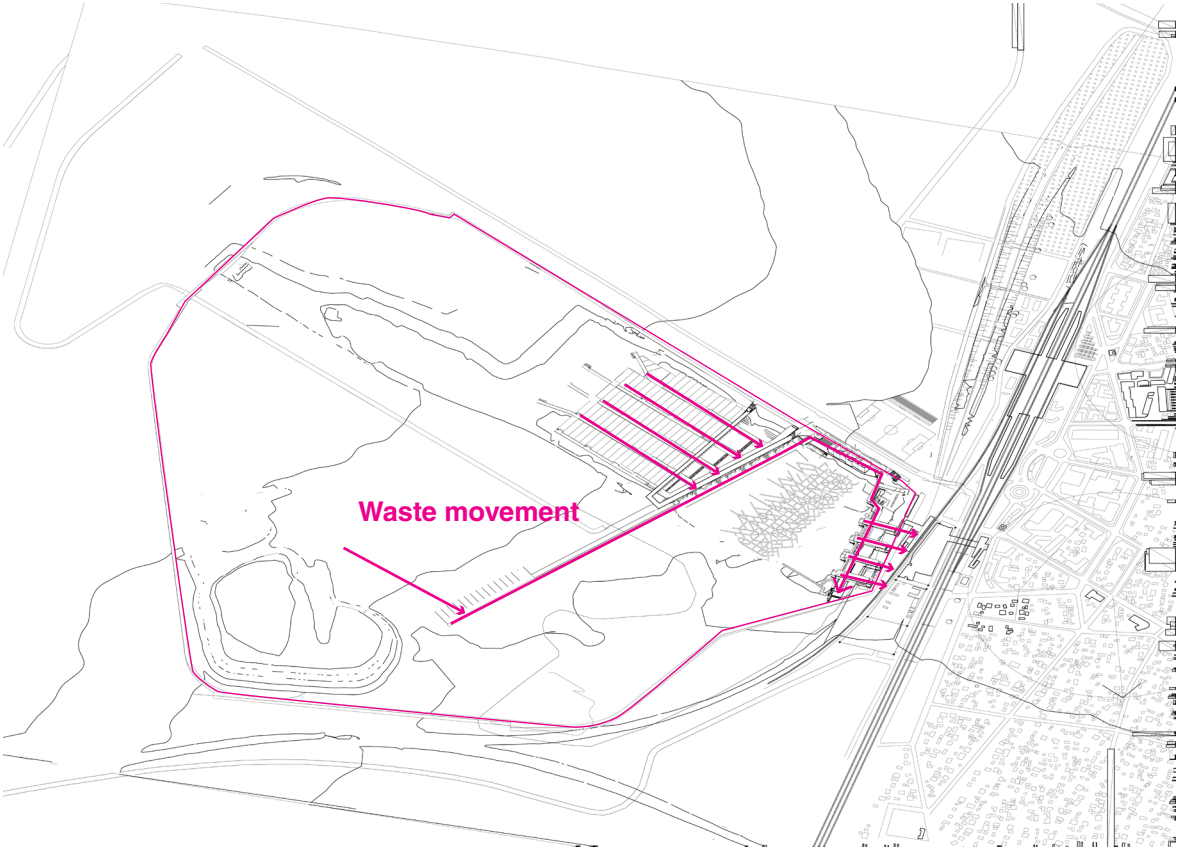
[2.32]
Landfill access
(By Author, 2015)

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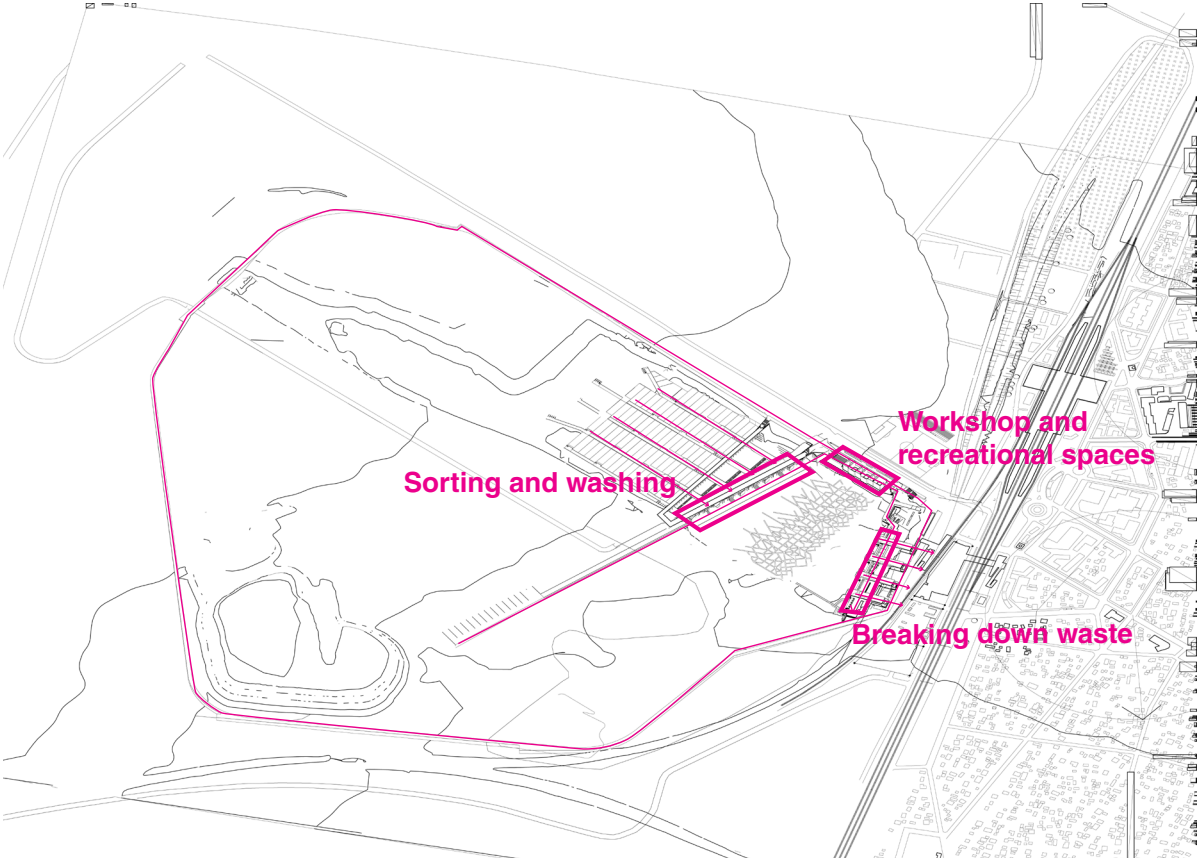
[2.34]
Mining spines
(By Author, 2015)

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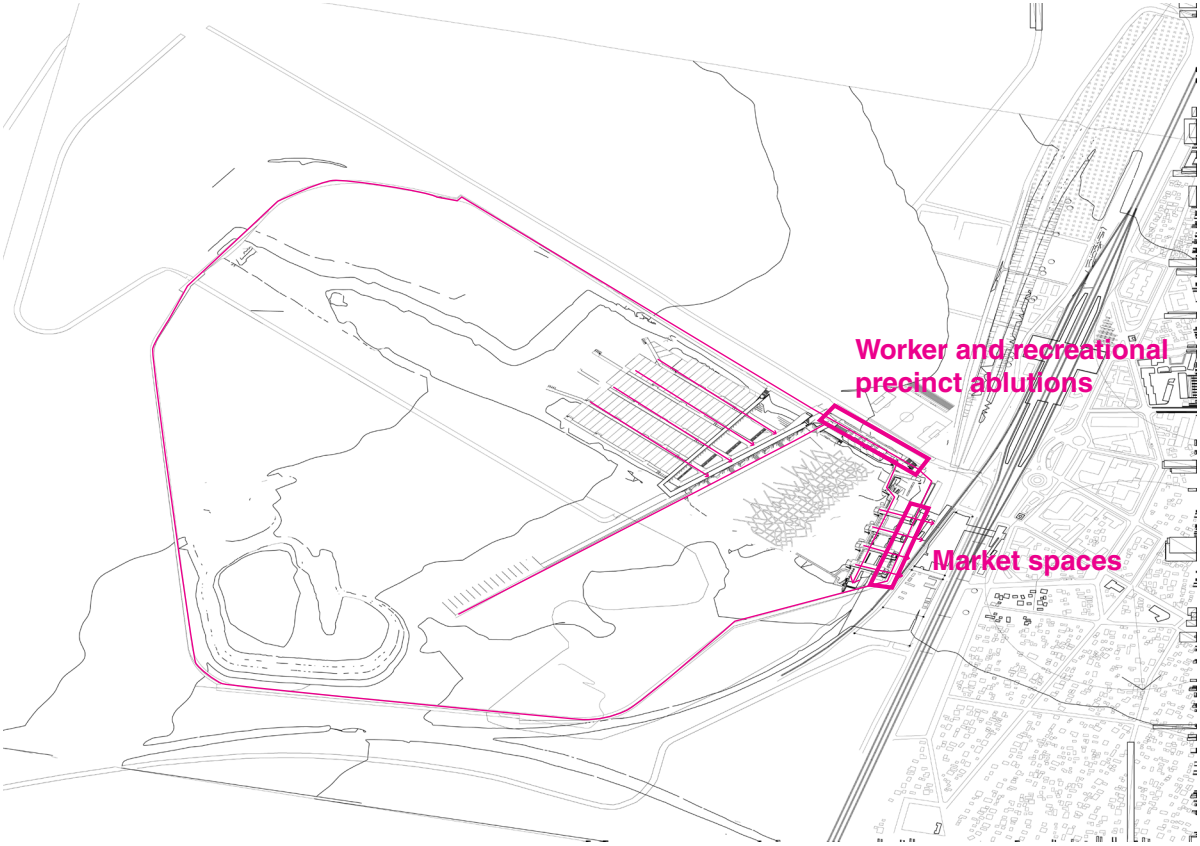
[2.35]
Waste movement
(By Author, 2015)

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[2.36]
Processes
(By Author, 2015)

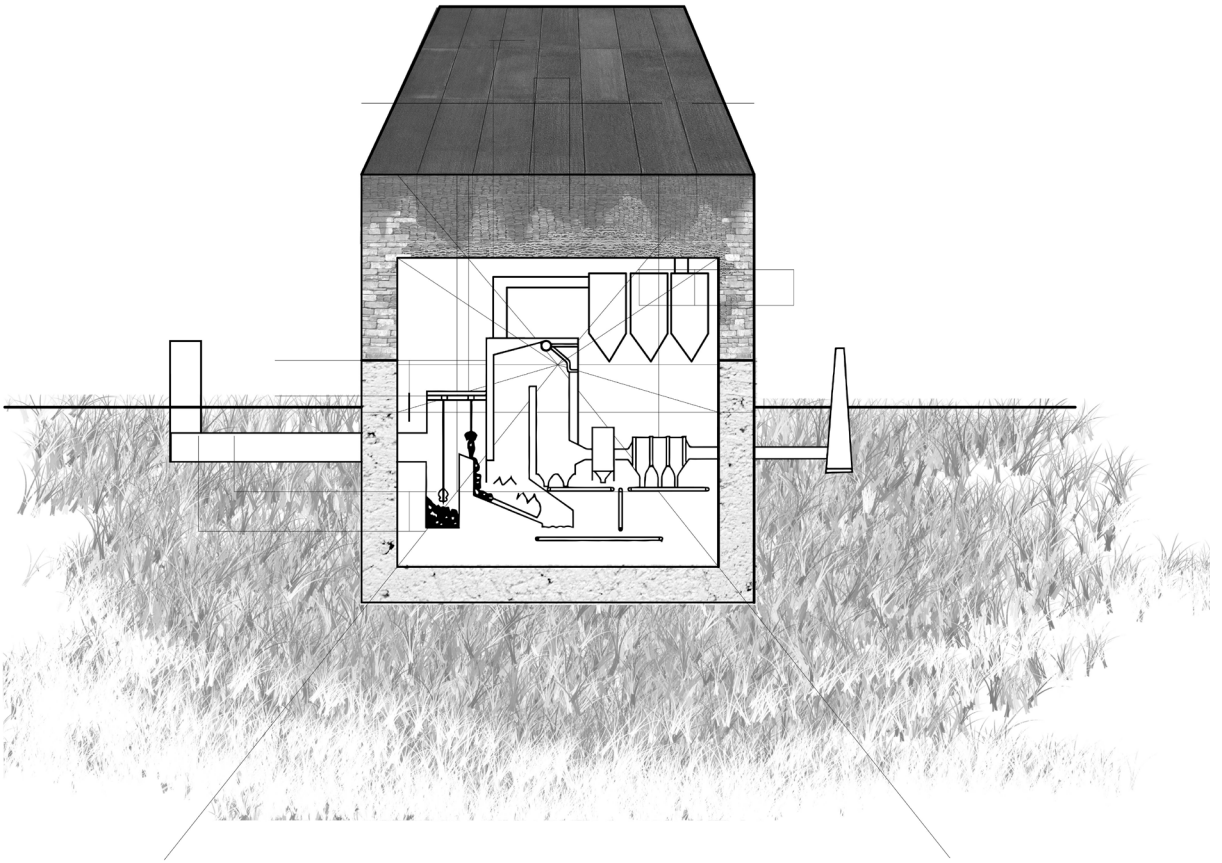
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[2.37]
Public programs
(By Author, 2015)

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[2.38]
Conceptual approach

(Author, 2015)

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EXCAVATING TECHNOLOGIES

The concept of memory and decay is taken through to the technical investigation. The overall strategy is to use stereotypic elements that cut and carve into the landscape, leaving a memory on the site while contrasting it with tectonic element that express specific functions and are allowed to decay and weather over time. Weathering is an inevitability effect on buildings and rather than postponing the inevitable weathering, the intention is to use it expressively and to become part of the design process. Weathering displays the passage of time on the building and enhances its memory (Mostafavi and Leatherbarrow:112). Rather than seeing the building as finished at the moment of completion, the building can morph over time, expressing its inhabitation as the most important aspect as opposed to its construction. It is proposed that reclaimed materials are used to mediate the two responses.

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GGBS concrete or limestone concrete

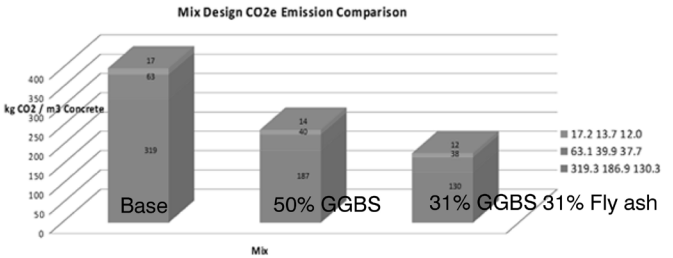


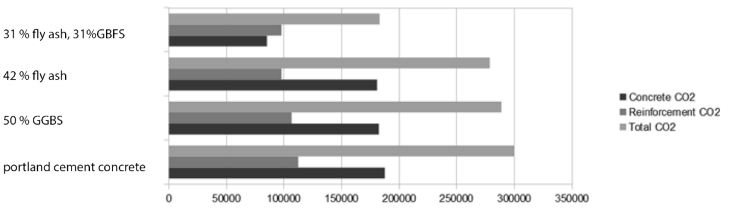
Portland cement concrete



High volume fly ash concrete (certain sources)

[2.39]
Colour of concrete depending on cement mixture





[2.40]
Embodied energy of different cement mixtures

(Author, 2015)

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Concrete:

Concrete elements are used as the main structural elements. In creating the concrete elements and the use of supplementary cementing materials such as fly ash and ground blast furnace slag reclaimed from the landfill is investigated. Fly ash is one the country's greatest waste streams, a by product of burning coal, the country's main power source. Fly ash accounts for almost 30% of total waste produced in South Africa (Department of Environmental Affairs 2012, p.15). Most of this is landfilled as only 6% is recycled (Department of Environmental Affairs 2012, p.18). Large amount of slag is also landfilled, a by product of iron and steel making. Both fly ash and slag(when granulated) can be used to supplement Portland cement and have a much smaller embodied energy than Portland cement. Both these materials can be excavated from the landfill and used in making concrete.

Various mixtures of these cementing materials were tested in order to determine the embodied energy of concrete. By using a 31% fly ash, 31% granulated slag and 42% Portland cement, the embodied energy of concrete can be reduced by 55%, making it more environmentally friendly while using a product that is mostly seen as waste and is found in vast amounts on landfills. By using fly ash and ground blast furnace slag it is also possible to manipulate the colour of concrete: high volumes of fly ash often produces a very dark colour. Concrete mixed with high volumes of ground blast furnace slag, create a light colour concrete instead.

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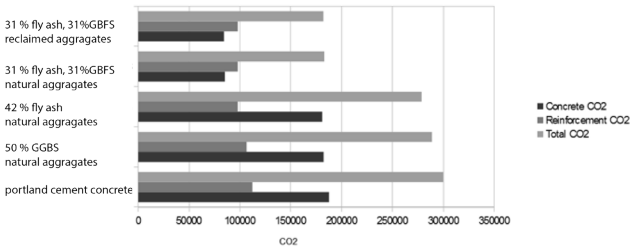
Site mixed concrete Mix Density of	1.0	m3 of concrete (kg)	2,360	Note: Density close to industry rule of thumb of 2 400 kg/m3.

	MIX ID:	Example 2	Mix 2					Scope emissions kg CO_2		
		Main Components of Concrete Mix	Input	Units	Mix Mass %	CO_2 kg	CO_2e %	Scope 1 Direct	Scope 2 Indirect	Scope 3 Other Indirect
Materials	1	Aggregates	19.4	Wheelbarrow(s)	75%	8.3	4.65%	2.2	6.1	0.0
	2	CEM V B	7.7	50 kg Bag(s)	16%	159.7	89.34%	126.0	30.5	3.2
	2.1	Ordinary Portland Cement	146.3	kg	6.2%	144.2	80.65%	119.7	21.3	3.2
	2.2	Fly Ash	119.35	kg	5.1%	0.2	0.10%	0.0	0.2	0.0
	2.3	GGBS	119.35	kg	5.1%	15.3	8.58%	6.3	9.0	0.0
	2.4	Limestone	0	kg	0.0%	0.0	0.00%	0.0	0.0	0.0
	3	Water	210	l	9%	0.2	0.11%	0.1	0.1	0.0
	4	Reinforcing steel	0	kg	0.0 %	0.0	0.00%	0.0	0.0	0.0
Services	5	Site mixed concrete	1.000	m^3	100%	10.5	5.90%	0.7	1.0	8.8
		Actual CO_2e emissions kg CO_2e per	1.00	m3 of concrete:		178.7	100.0%	129.1	37.7	12.0
		Specific CO_2e emissions kg CO_2e / m^3	1.00	m3 of concrete:		178.7		129.1	37.7	12.0

B

Site mixed concrete Mix Density of	1.0	m3 of concrete (kg)	2,360	Note: Density close to industry rule of thumb of 2400 kg/m3.

	MIX ID:	31% Fly ash 31% GGBS 100 % recycled aggregates	Mix 2					Scope emissions kg CO_2		
		Main Components of Concrete Mix	Input	Units	Mix Mass %	CO_2 kg	CO_2e %	Scope 1 Direct	Scope 2 Indirect	Scope 3 Other Indirect
Materials	1	Aggregates	19.4	Wheelbarrow(s)	75%	7.1	4.03%	1.1	6.1	0.0
	2	CEM V B	7.7	50 kg Bag(s)	16%	159.7	89.93%	126.0	30.5	3.2
	2.1	Ordinary Portland Cement	146.3	kg	6.2%	144.2	81.18%	119.7	21.3	3.2
	2.2	Fly Ash	119.35	kg	5.1%	0.2	0.10%	0.0	0.2	0.0
	2.3	GGBS	119.35	kg	5.1%	15.3	8.64%	6.3	9.0	0.0
	2.4	Limestone	0	kg	0.0%	0.0	0.00%	0.0	0.0	0.0
	3	Water	210	l	9%	0.2	0.11%	0.1	0.1	0.0
	4	Reinforcing steel	0	kg	0.0 %	0.0	0.00%	0.0	0.0	0.0
Services	5	Site mixed concrete	1.000	m^3	100%	10.5	5.94%	0.7	1.0	8.8
		Actual CO_2e emissions kg CO_2e per	1.00	m3 of concrete:		177.6	100.0%	127.9	37.7	12.0
		Specific CO_2e emissions kg CO_2e / m^3	1.00	m3 of concrete:		177.6		127.9	37.7	12.0



[2.41]
Embodied energy of recycled aggregates vs natural aggregates.

(Author, 2015)

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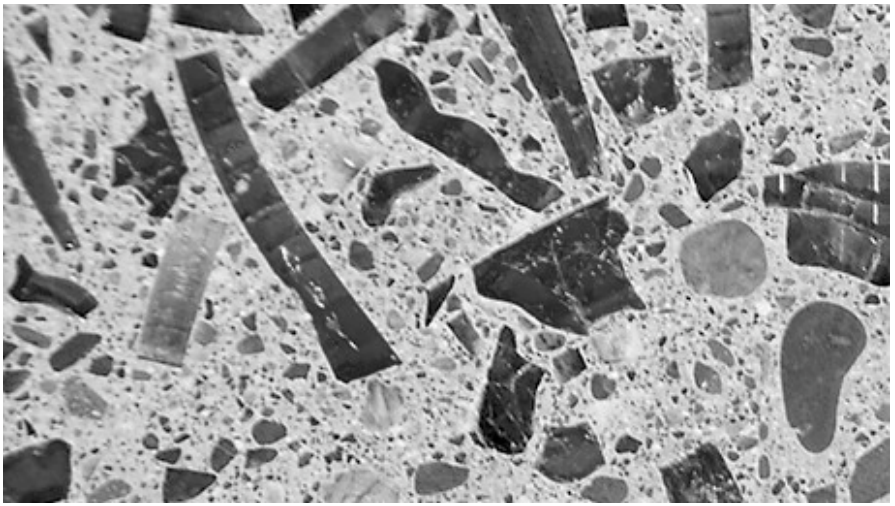
The use of reclaimed aggregates is also investigated in constructing the concrete. Various materials dumped on site can be used as aggregates in concrete such as slag, crushed glass and crushed concrete. Using slag has no negative impact on the performance of the concrete. Using crushed concrete as aggregate, however, results in a slightly lower density in the concrete, however, it preforms similarly to regular aggregates (Portland Cement Association 2015). Using glass as course aggregate also shows no negative effect in the performance when used with fly-ash (De Castro & De Brito 2013, p.12).

In terms of using reclaiming fine aggregates, concrete, masonry and glass can be used. By reusing concrete and masonry as fine aggregate, similar performance can be achieved as with using natural aggregates. By using glass as fine aggregate the performance on concrete is enhanced especially when combing it with fly-ash (De Castro & De Brito 2013, p.3).

In terms of embodied energy, using recycled aggregates makes very little difference as crushing and grinding of materials are required in order to use both natural and reused aggregates. There are however large amounts of energy that go into transporting materials and by using material on site, embodied energy can be reduced. What is ultimately the main motivation is that one can use materials that would otherwise be useless.

[2.42]
Exposed recycled aggregates in concrete.

(R. Zimmerman, 2011)



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[2.44.1]


[2.44.2]


[2.44.3]


[2.44.4]


[2.44.5]


[2.44.6]

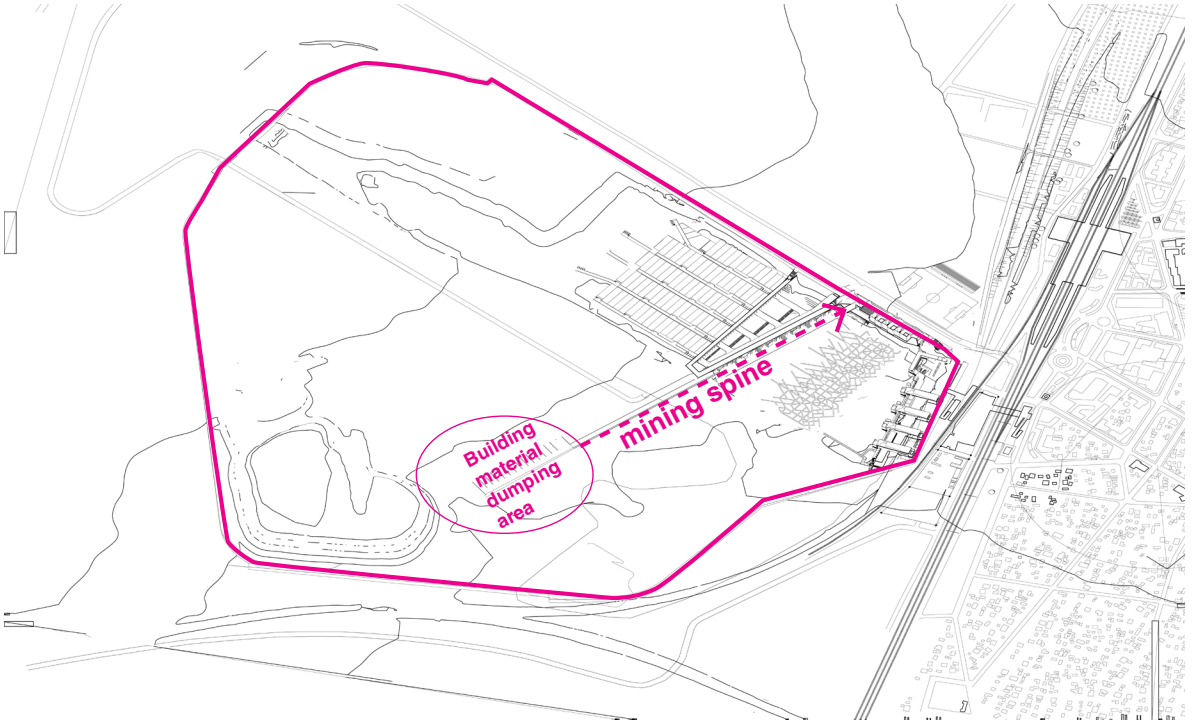
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[2.43.1-6] Materials available on site.

(Author, 2015)

Reclaimed materials:

A large portion of landfill is dedicated to dumping of building materials. It is suggested that the re-use of these materials be investigated. Large amounts of rubble, broken masonry units, stones and tiles can be seen lying on the landfill's surface with large volumes of fly ash also dumped in the area. It is thus proposed that an infrastructural spine be extended to the area of where the rubble is dumped and the materials mined. This will then become the catalyst in constructing the rest of the structures.



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[2.44]
Ningbo museum exterior.

(Amateur Architecture, 2013)



[2.45]
Ningbo museum facade.

(Amateur Architecture, 2013)



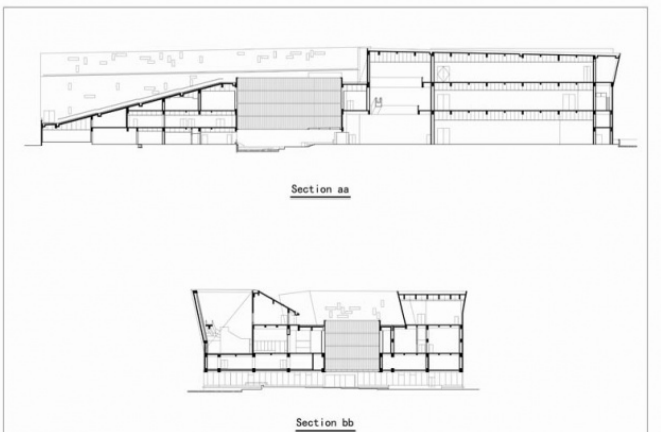
[2.46]
Detail of Ningbo museum facade.

(Amateur Architecture, 2013)

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In looking at its implementation, the architecture of Wang Shu is investigated. In many of his buildings, Shu uses reclaimed material in a pattern to create façades as can be seen in the Ningbo museum. The façades references a technique used in the area, where walls are dry packed so that they can be easily rebuilt after typhoons.

The use of material adds memory to the structure and conveys an identity of its context. This method continues a tradition of local craftsmanship. The materials used are sourced from the surrounding areas and some of the masonry units date back thousands of years.



[2.47]
Ningbo museum sections.
(S. Wang, W. Lu, 2007)



[2.48]
Ningbo museum elevations.
(S. Wang, W. Lu, 2007)

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[2.49]
Acid washed steel.

(I. Bergera, 2011



[2.50]
Acid washed steel.

(M. Garzaniti, 2005)

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Steel:

In creating the tectonic elements the use of steel sheeting is investigated. The intention is to allow the steel elements to decay and weather over time. Rather than preventing the weathering, this natural process is allowed and enhanced. It is also proposed that the weathering be expressed in the detailing of the project by controlling and allowing the staining the porous surfaces, transferring the memory from one material to the other.

Where possible, sheeting will be reclaimed from the landfill, although availability is limited as the majority is claimed by reclaimers on site. It is proposed that the steel sheeting be acid washed in order to accelerate its weathering, leaving it unfinished and exposed to the elements where it will oxidise and change colour over time.

[2.51]
Stained concrete.

(Grunge Textures, 2008)



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PANICUM MAXIMUM [2.52.1]



CYNODON DACTYLON [2.52.2]



DIGITARIA ERIANTHA [2.52.3]



CHLORIS GAYANA [2.52.4]



ERAGROSTIS CURVULA [2.52.5]



ERASROSTIS TEF [2.52.6]

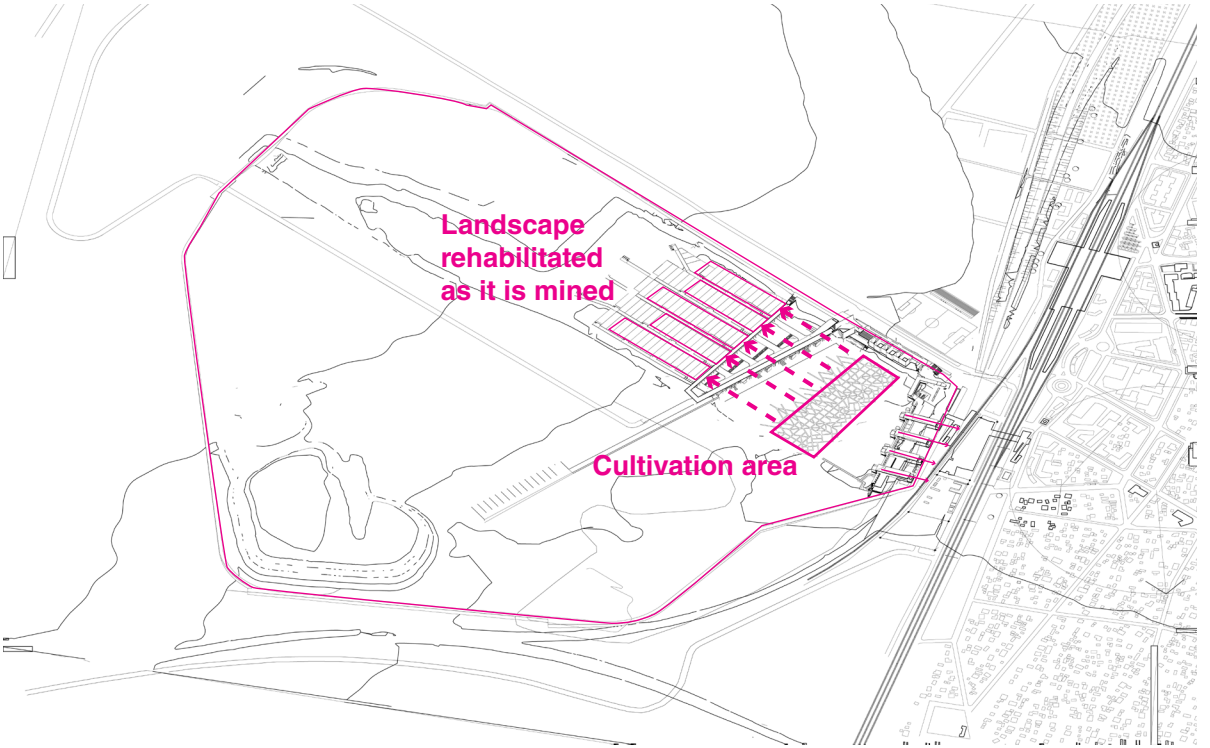
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[2.52]
Proposed grass species for landscape rehabilitation and soil stabilisation.

Landscape rehabilitation:

Essential to the project is the rehabilitation of the landscape. Once an area has been excavated; soil is separated and returned to the landscape. Soil is then stabilised using a seed mixture of grasses. It is also proposed that plants dumped on site be reclaimed and cultivated in order to introduce greater biodiversity to the landscape. The cultivated area is proposed in the central space along with a series of wetlands and retention ponds accessible to visitors.

[2.53]
Rehabilitation strategy
(Author 2015)



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PHRASMITES AUSTRALIS [2.54.1]



TYPITA CAPENSIS [2.54.2]



CYPERUS PROLIFER [2.54.3]



CYPERUS SEXANSULARIS [2.54.4]

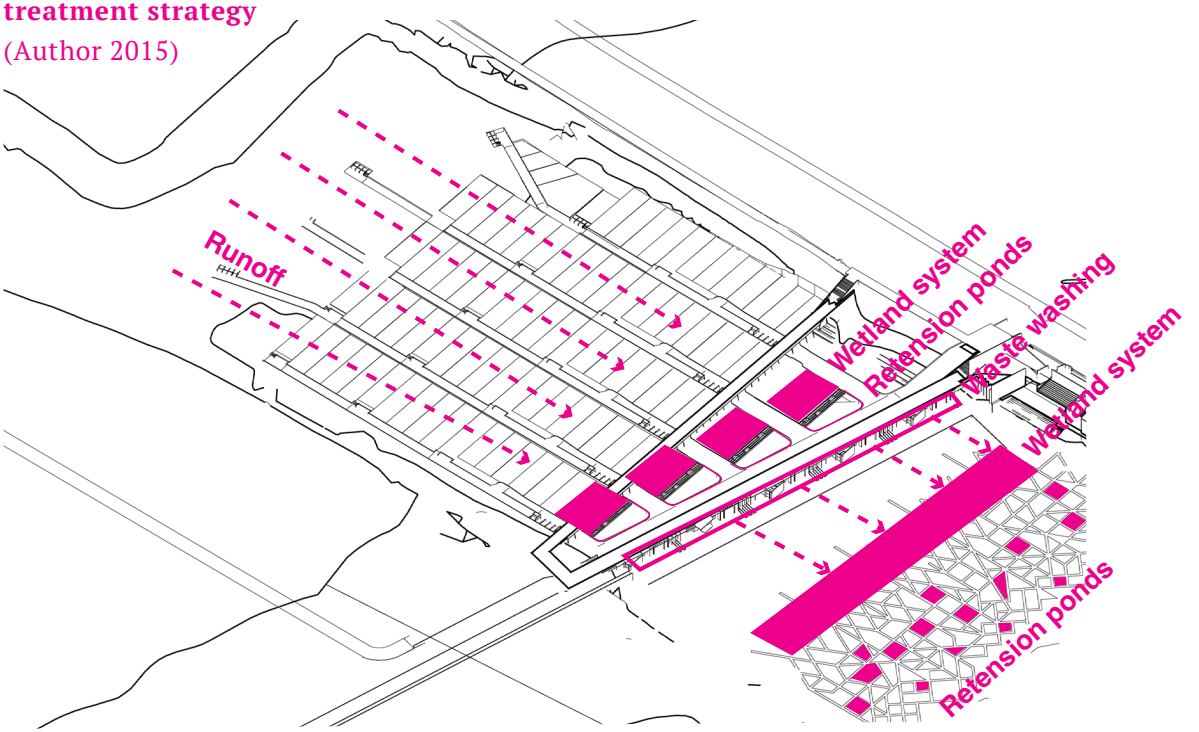
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[2.54]
Proposed wetland species for landscape rehabilitation

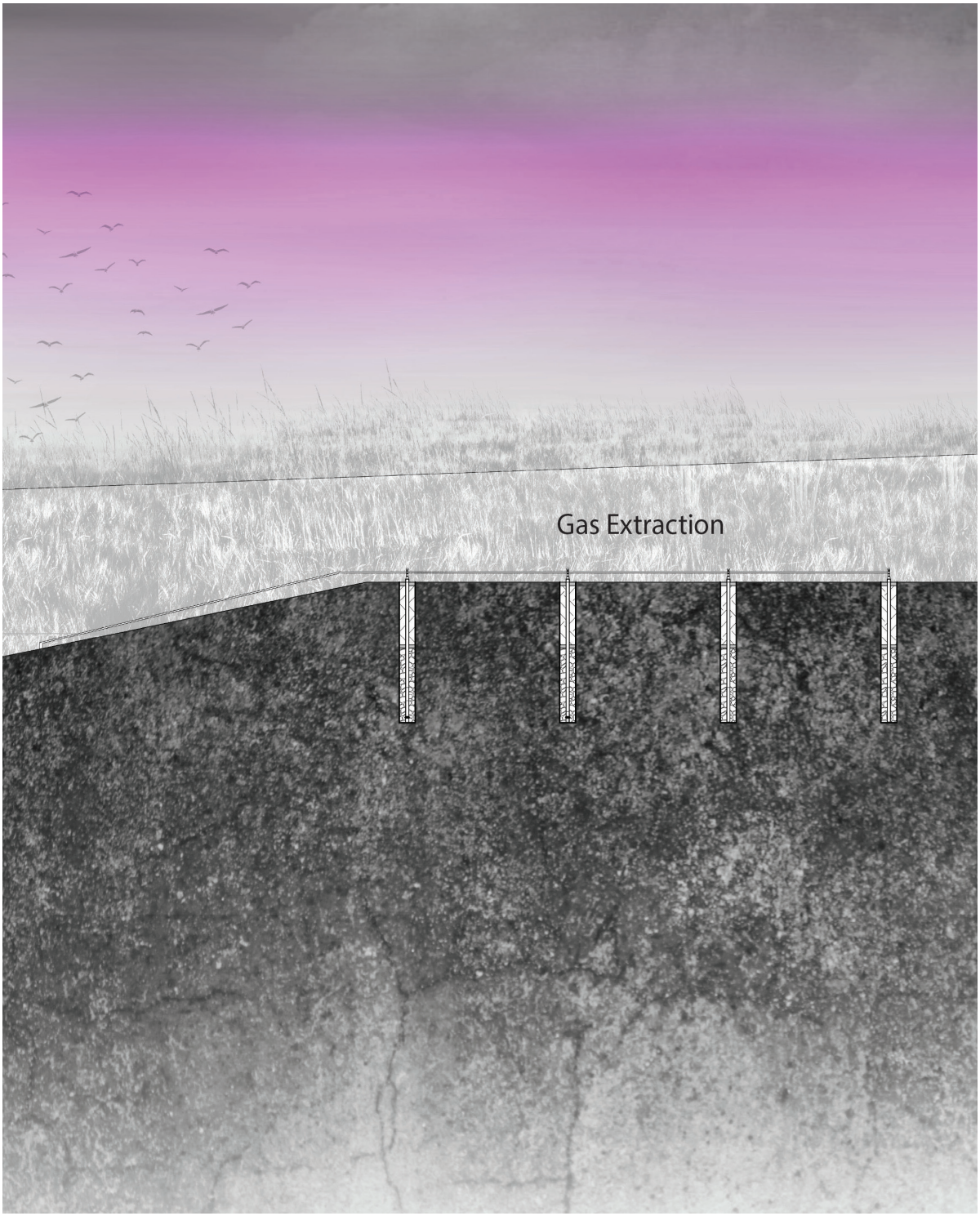
Water treatment:

Water run-off on site is a major contributor to the unpleasant smell on the landfill as it brings soluble matter captured in the landfill to the surface. In rehabilitating the landfill, water treatment is thus essential. It is thus proposed that the treated water is to be used for washing processes of the waste, irrigation of cultivated areas as well the workers ablution and washing facilities. A series of wetlands are thus proposed that treats water run-off. Water run-off is then captured and used in the waste washing facilities. The water used to wash waste is then sent though a series of wetlands again and captured to be used for cultivated areas as well as the building's water demand.

[2.55]
Proposed water treatment strategy
(Author 2015)



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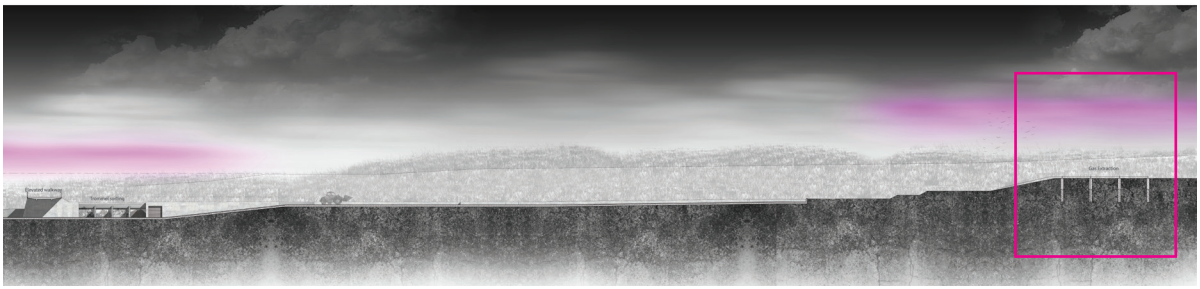
[2.56]
Gas Extraction system
(Author 2015)

ENERGY

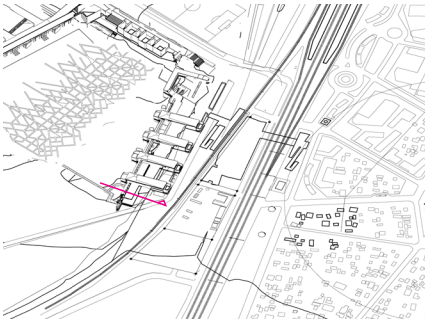
In order to safely mine the landfill and to prevent air pollution, natural gas first needs to be extracted. Landfill gas escaping through the soil is also one of the major causes of smell on landfills. By introducing a natural gas extraction system, the majority of smell in the landfill will be eliminated. Captured gas can then be used to produce electricity. Gas is extracted trough a borehole system where pipes are inserted into the soil. Gas follow the path of least resistance and then escapes though the pipe system.

A tri-generator system is thus proposed to produce energy that will be used in the processes within the building. A tri-generator uses natural gas to produce electricity, heat and cooling.

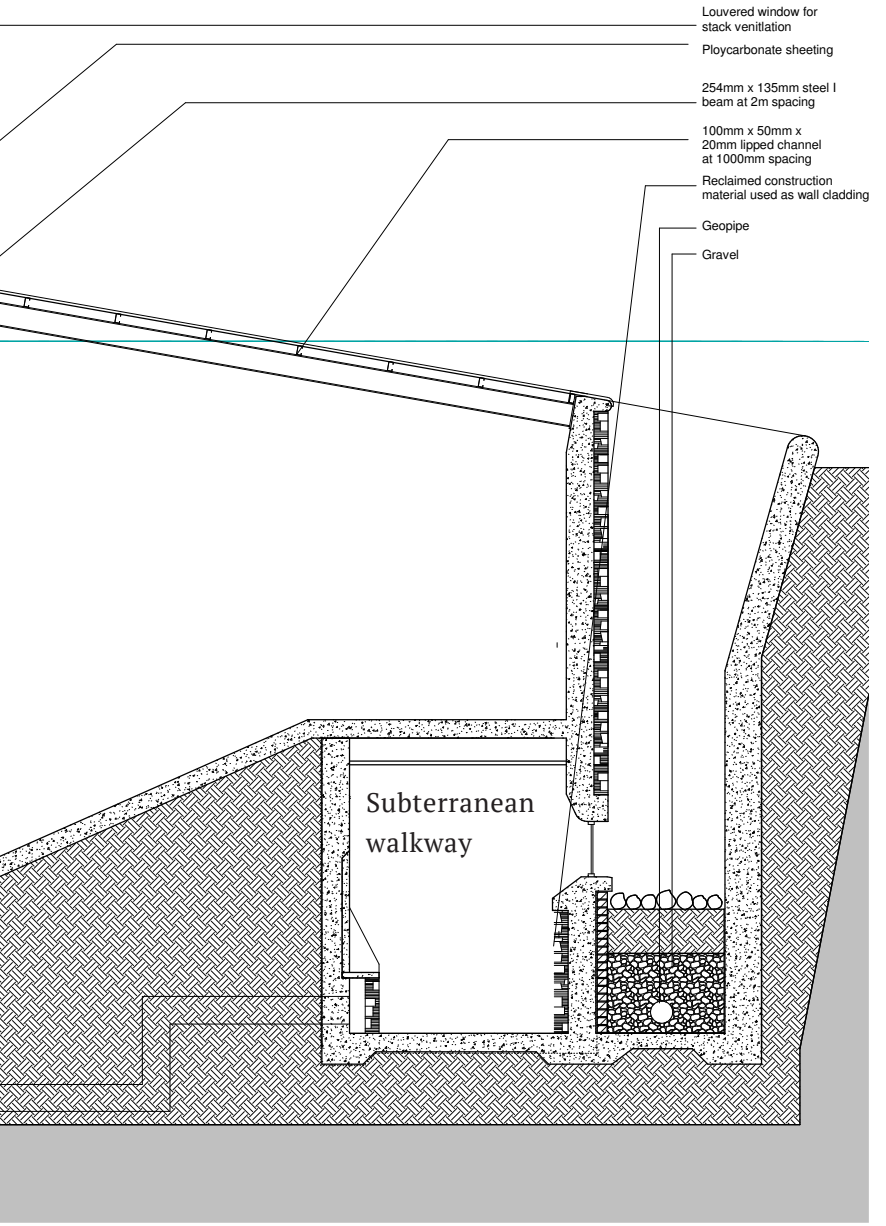
[2.57]
Gas Extraction in relation to mining
(Author 2015)



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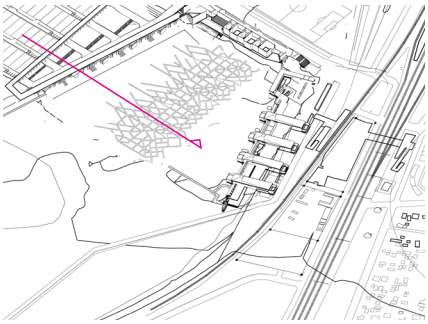


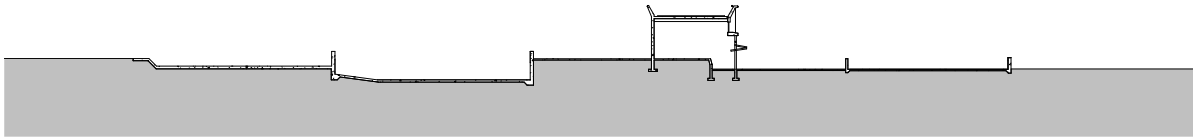
[2.58]
Section development
(Author 2015)

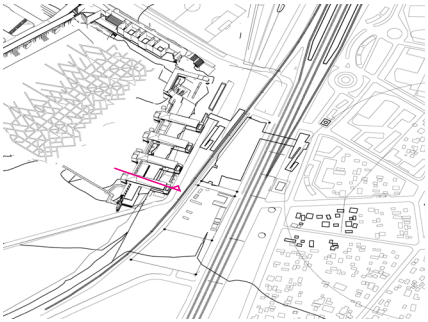
In developing the sections, a double skin wall is proposed to run along the centre of the northern wing of the building, to separate noisy and possible smelly processes. The double skin wall is used bring light into the spaces as well as ventilating the adjacent spaces. The double skin wall also provides services and a pipe system is cast into the wall connected to the trigen system in order to heat and cool the spaces.

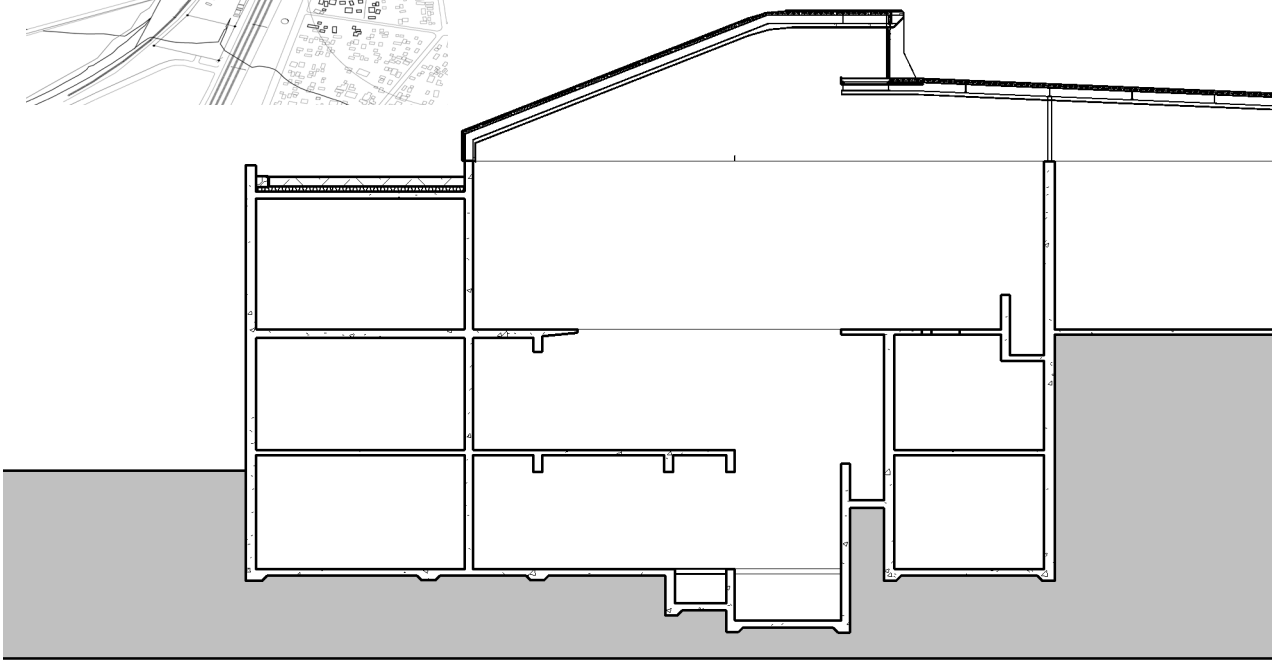
The form of the roof also curves in order to become and extension of the landscape

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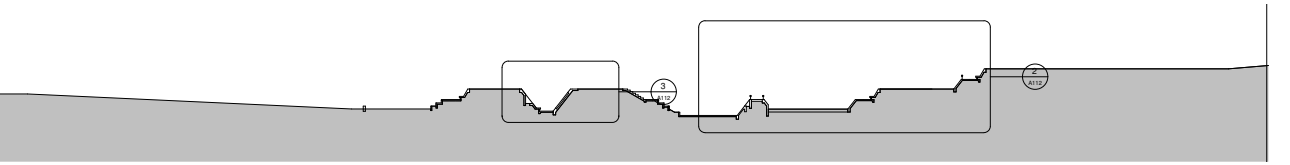






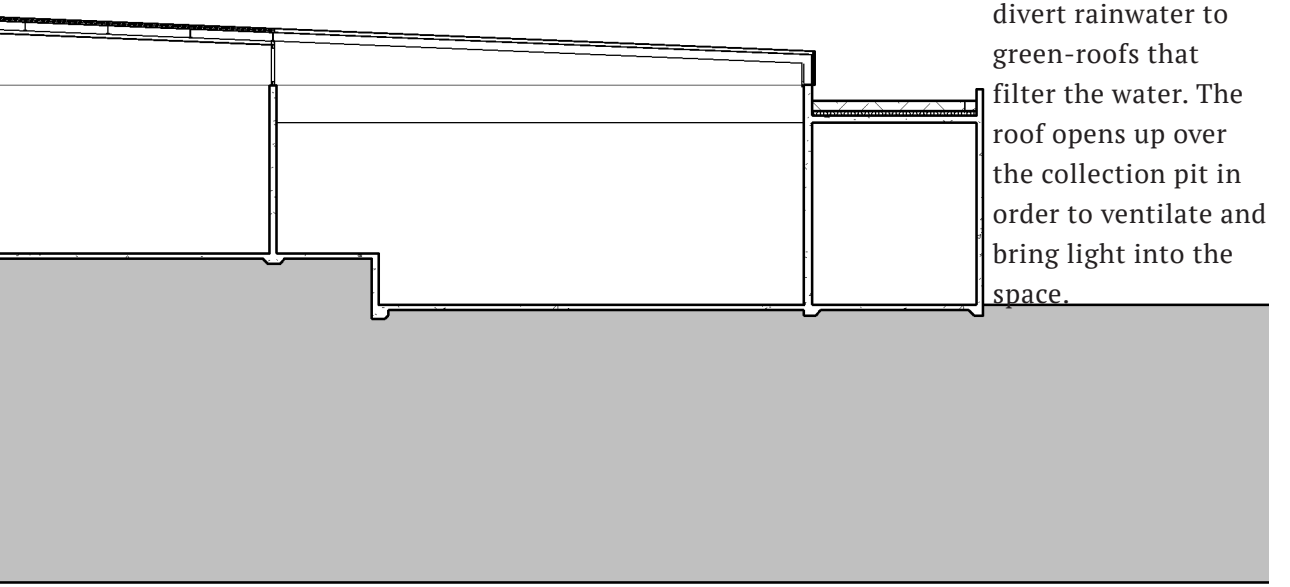
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[2.59]
Section through wetland, sorting and washing facility and cultivated area.
(Author 2015)



[2.60]
Section market and infrastructural core.
(Author 2015)

In developing the section the roof is shaped in order to divert rainwater to green-roofs that filter the water. The roof opens up over the collection pit in order to ventilate and bring light into the space.



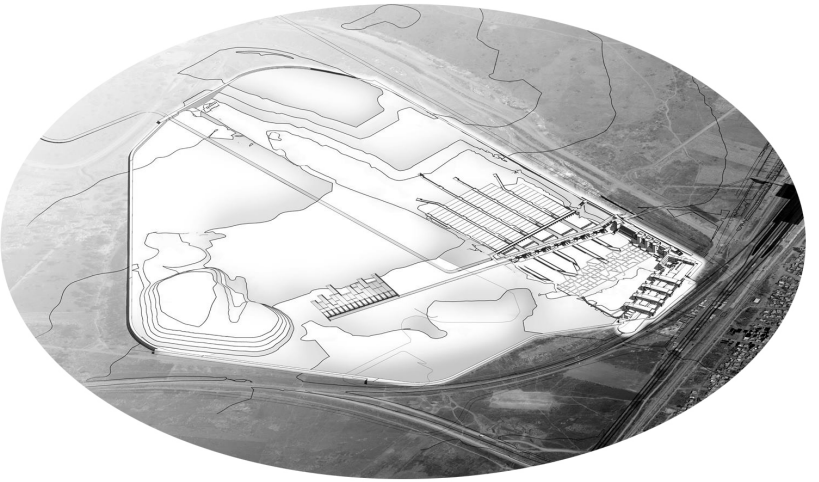
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Part

3

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Communication



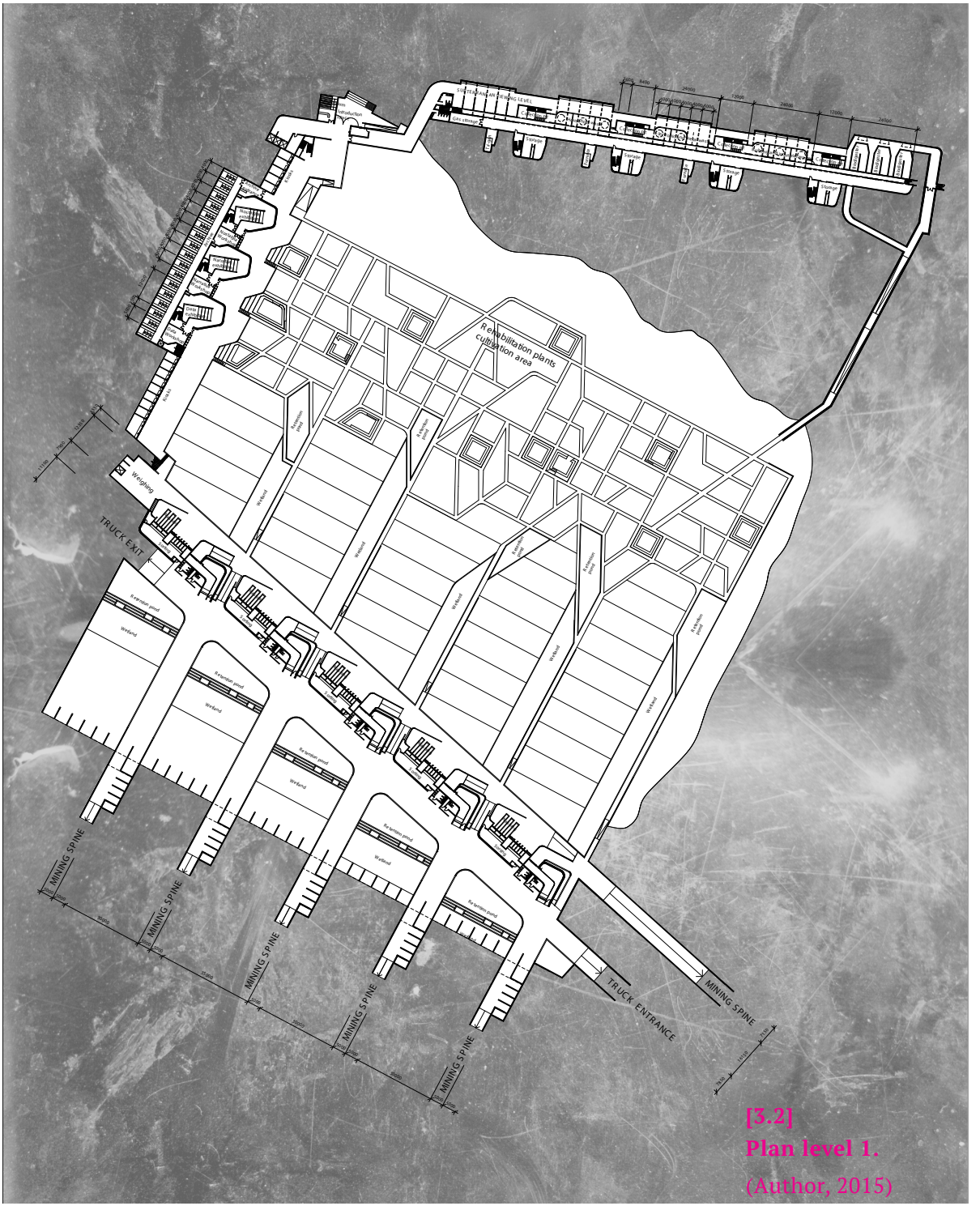
Interpreting and communicating findings.

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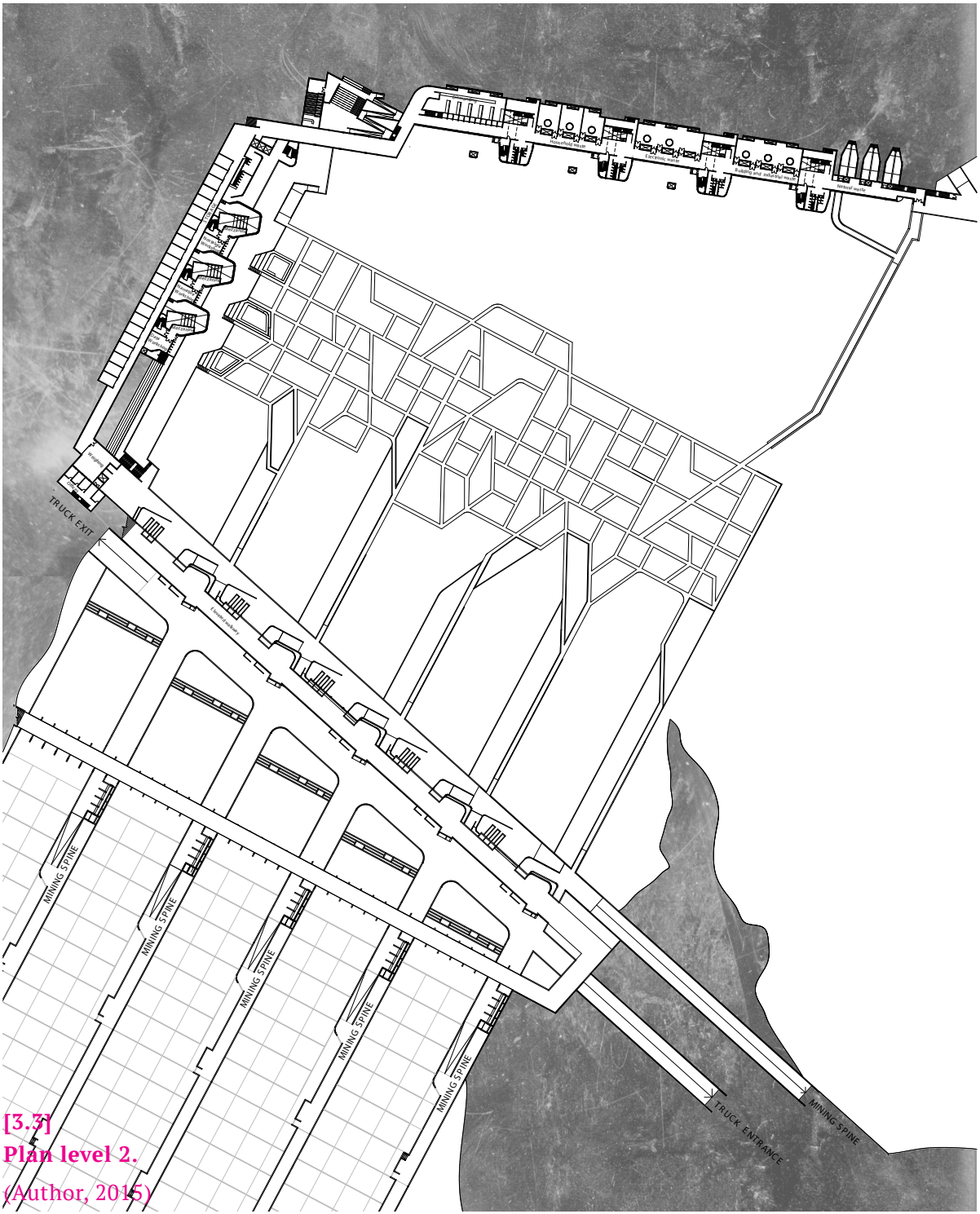
[3.1]
Site plan.
(Author, 2015)

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[3.2]
Plan level 1.
(Author, 2015)

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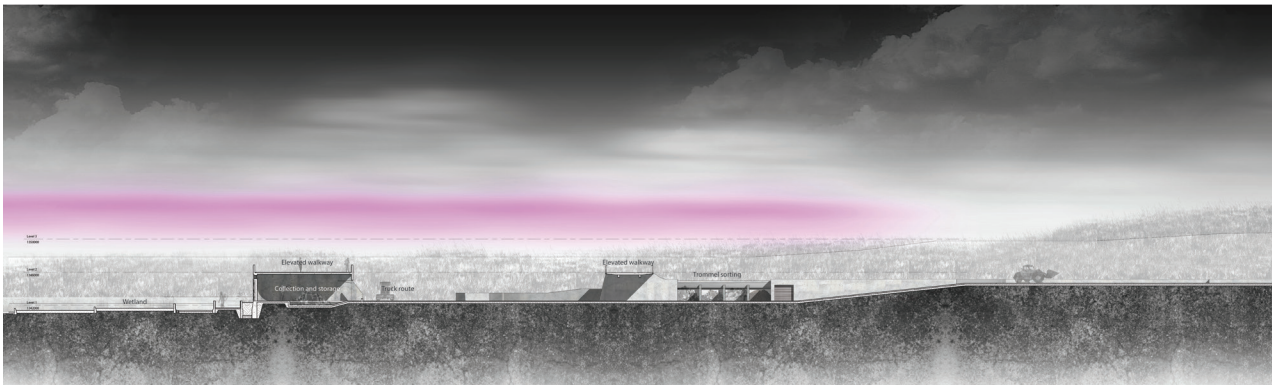
[3.3]
Plan level 2.
(Author, 2015)

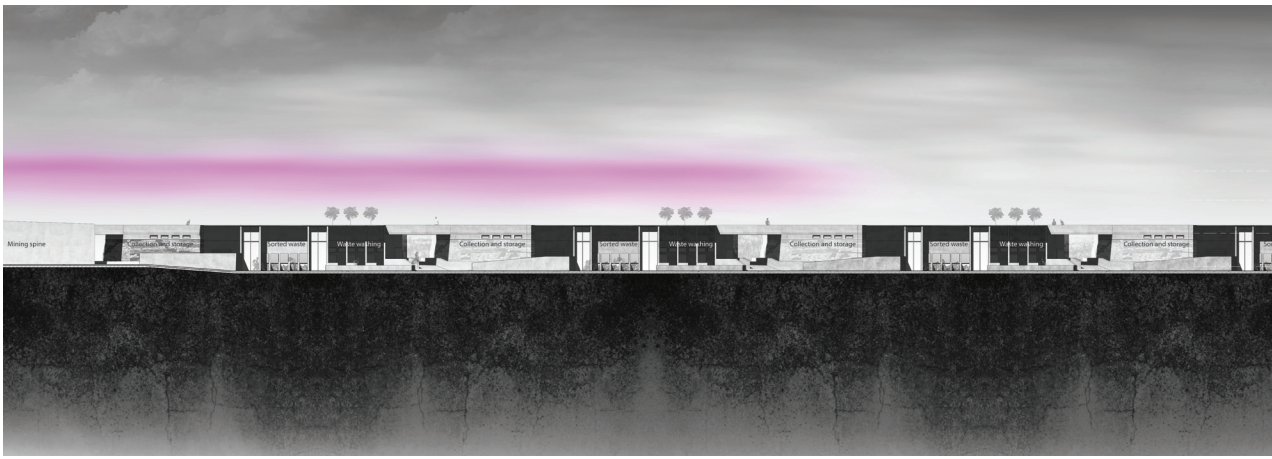
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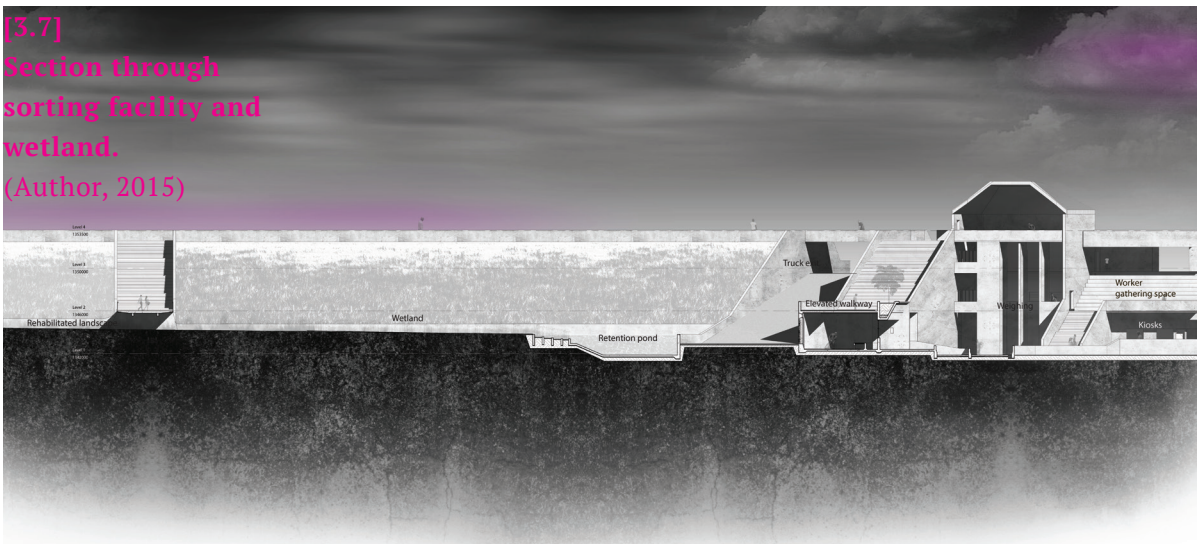
[3.4]
Plan level 3.
(Author, 2015)

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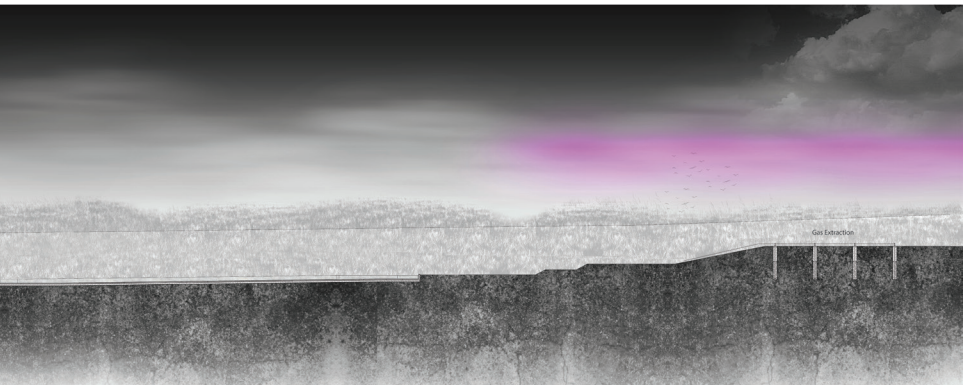




[3.7]
Section through sorting facility and wetland.
(Author, 2015)

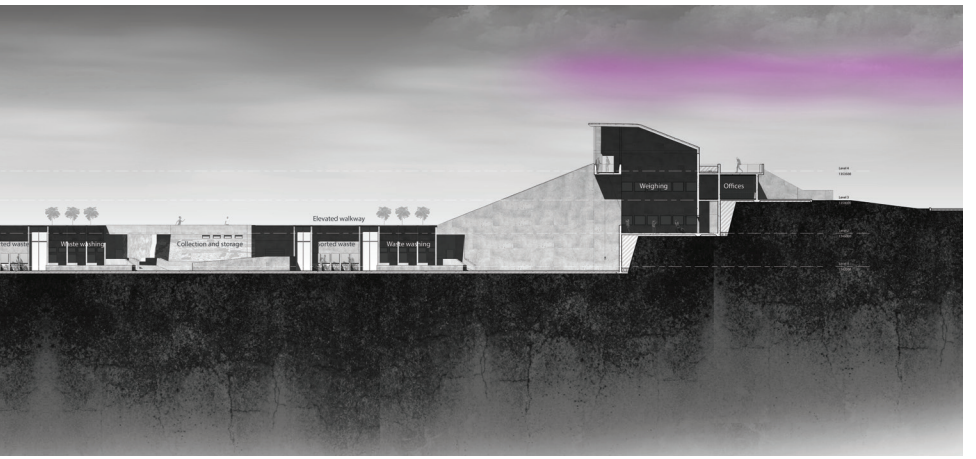


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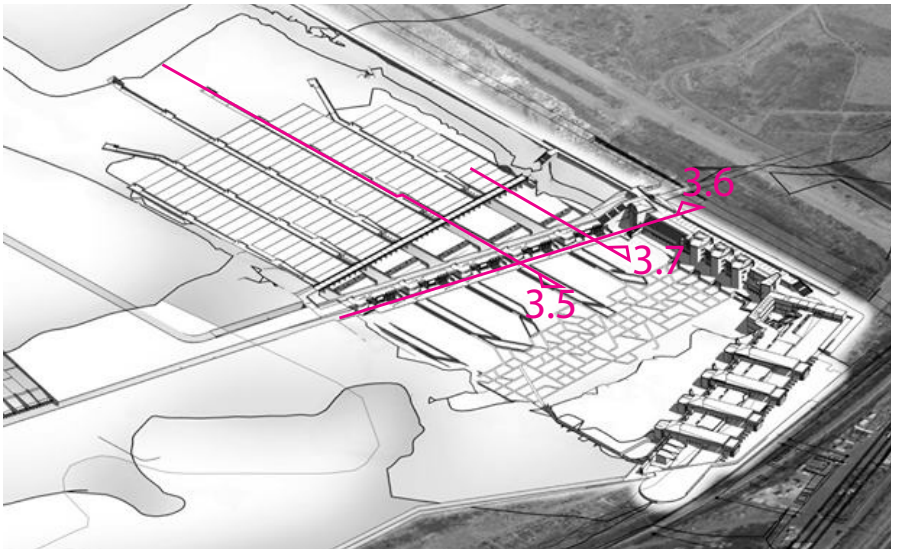
[3.5]
Section through mining spine.

(Author, 2015)



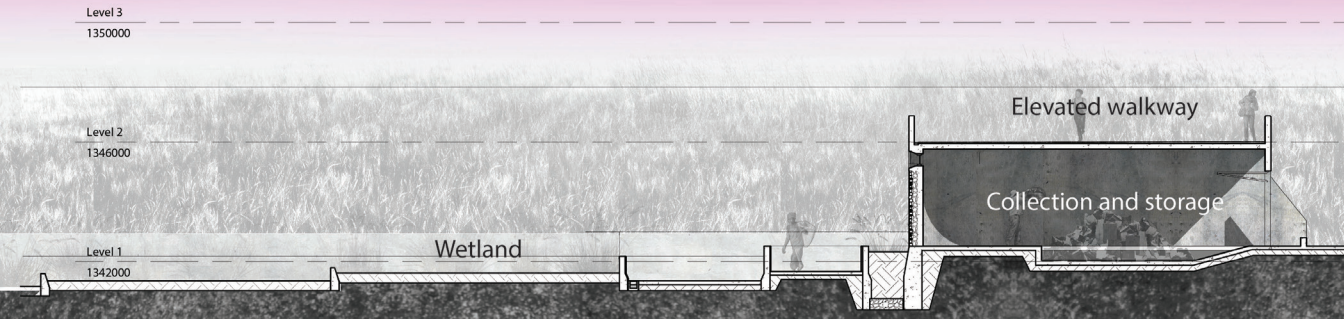
[3.6]
Section through mining spine.

(Author, 2015)



[3.8]
Axonometric of site
(Author, 2015)

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[3.5]
Section through mining spine.

(Author, 2015)

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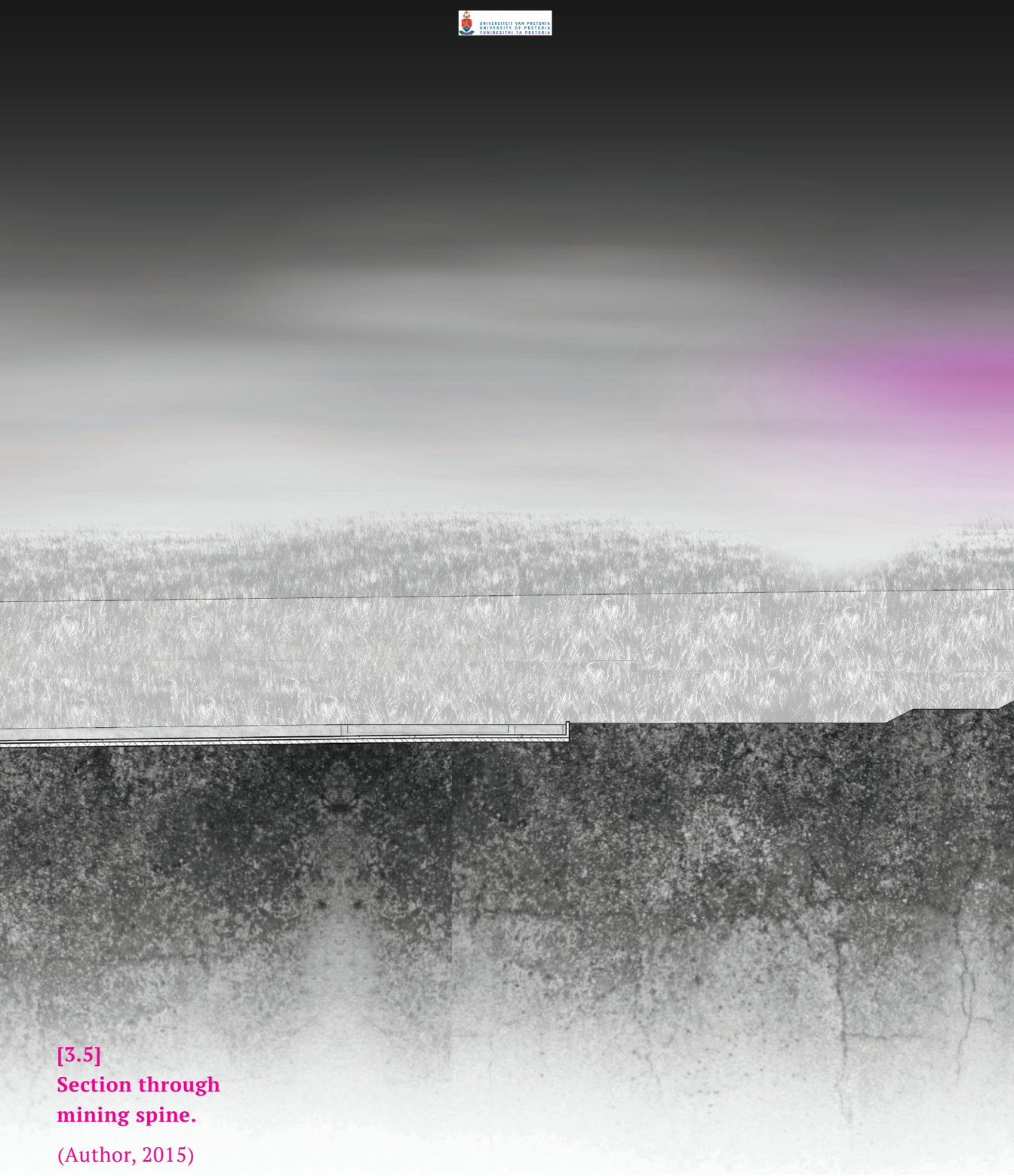
[3.5]
Section through mining spine.

(Author, 2015)

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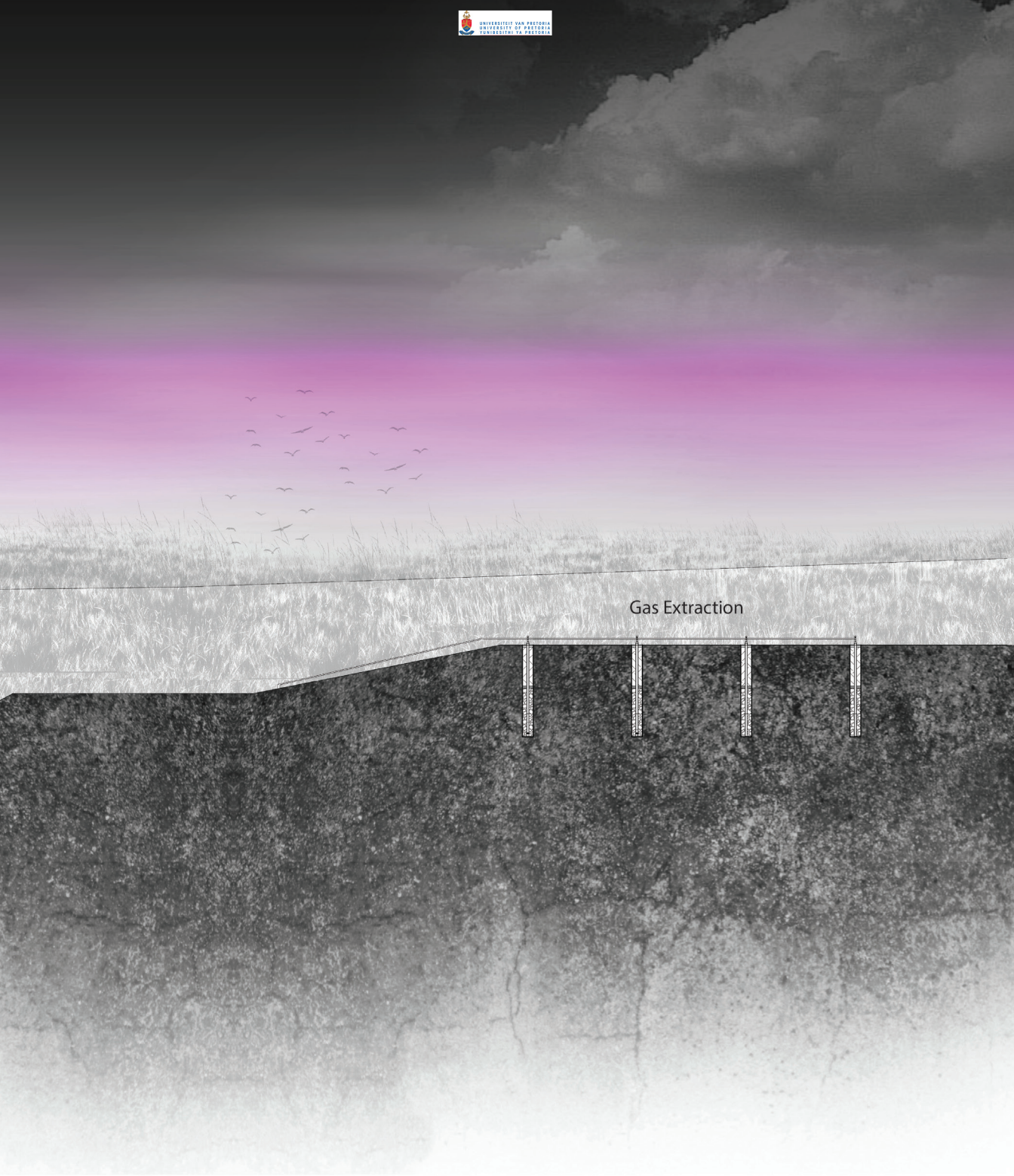
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[3.5]
Section through mining spine.

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[3.6]
Section through mining spine.

(Author, 2015)

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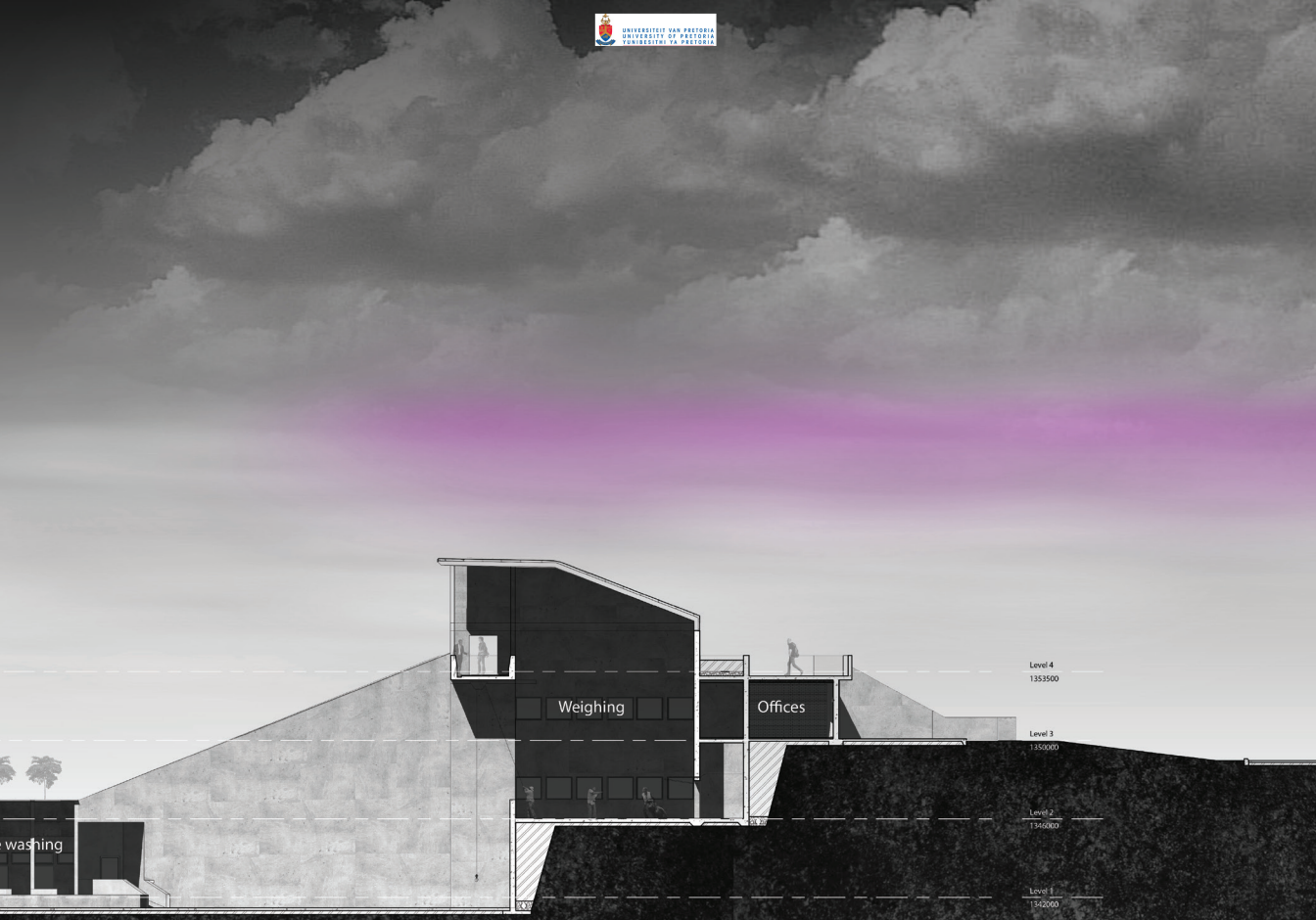
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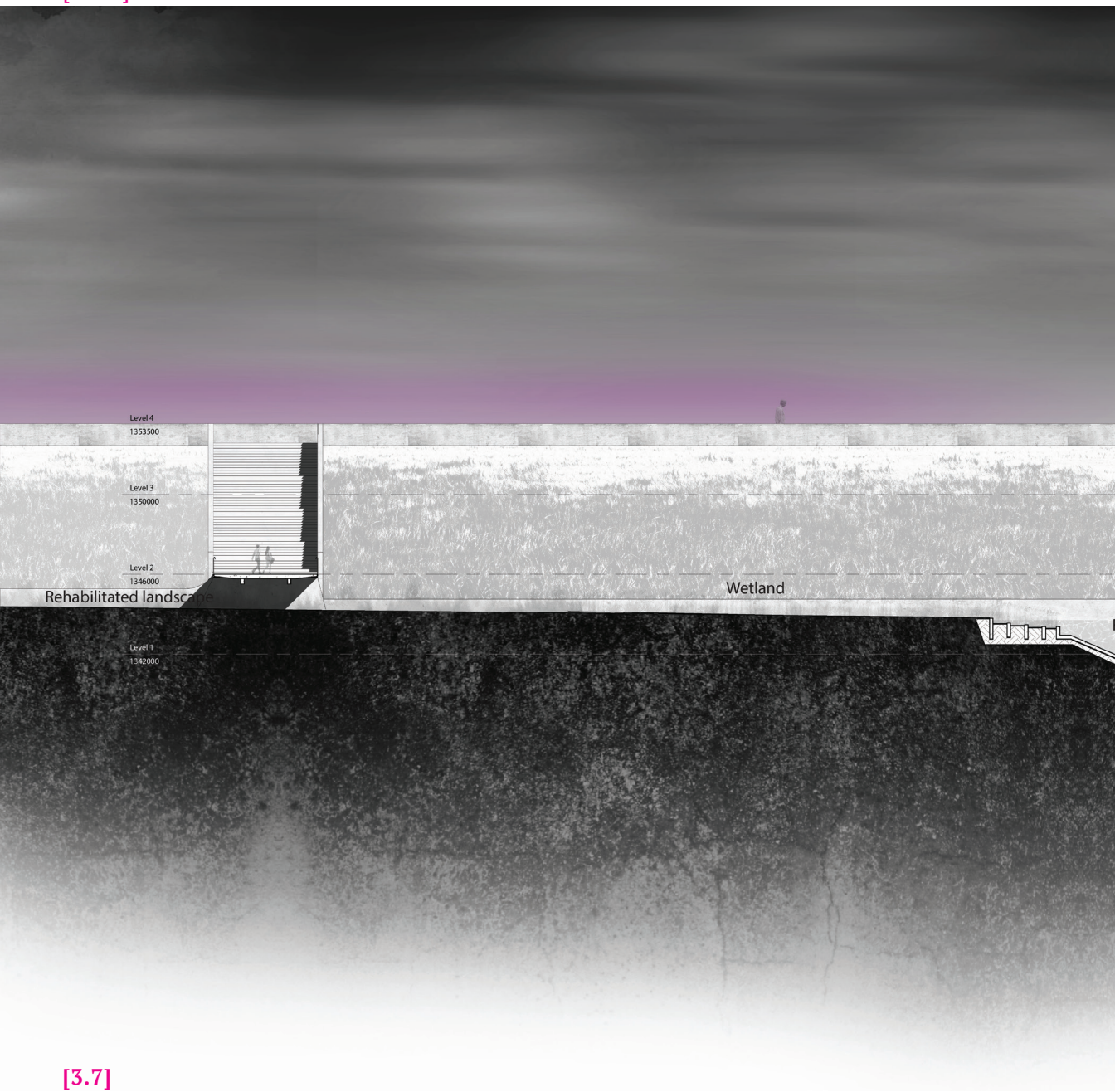
[3.6]
Section through mining spine.

(Author, 2015)

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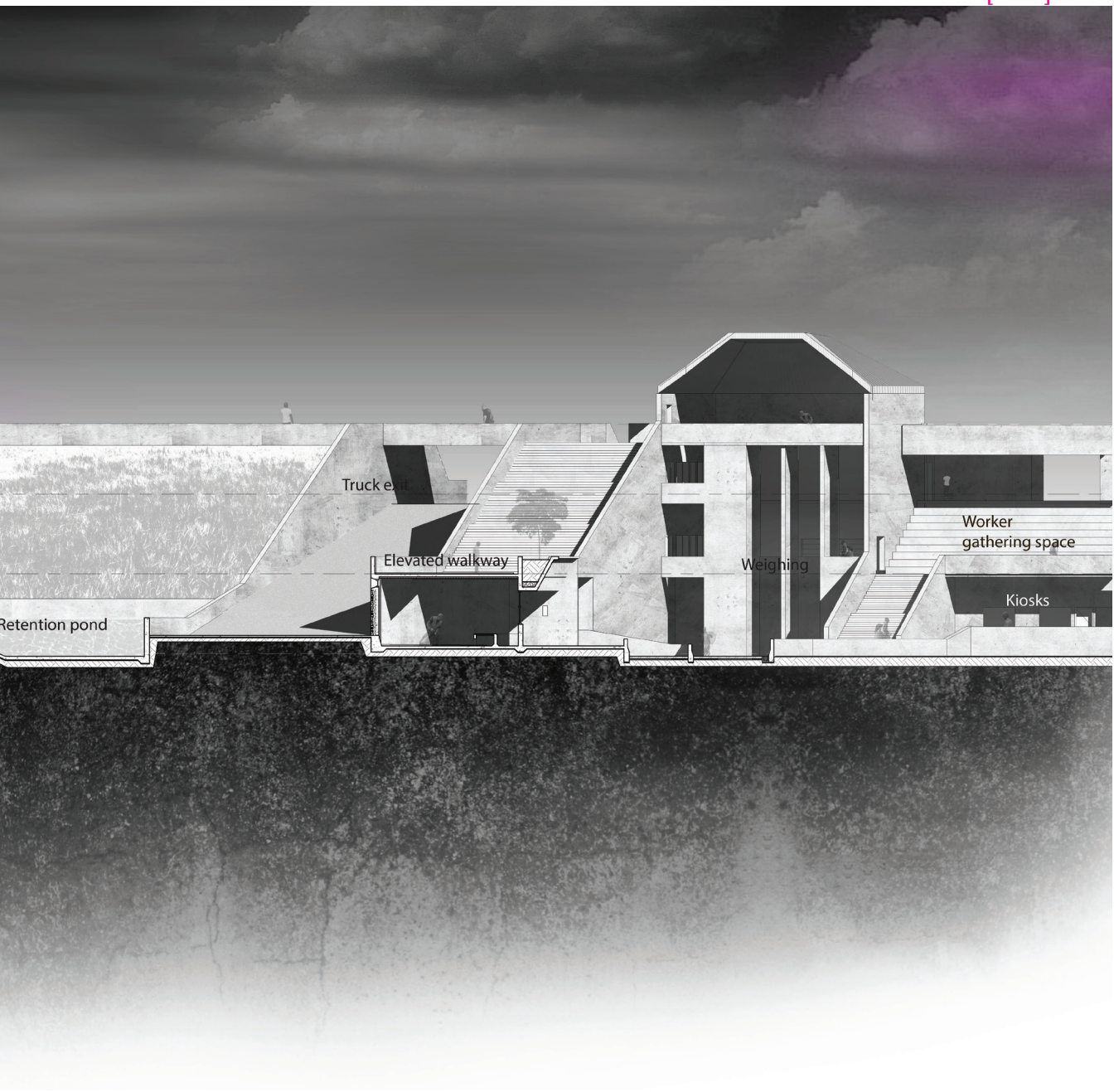
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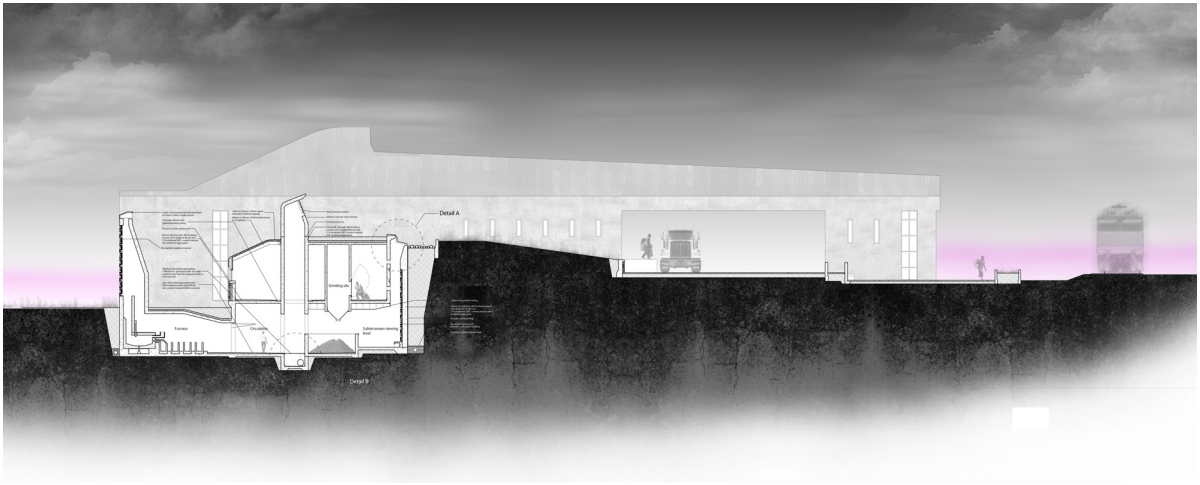
[3.7]
Section through sorting facility and wetland.

(Author, 2015)

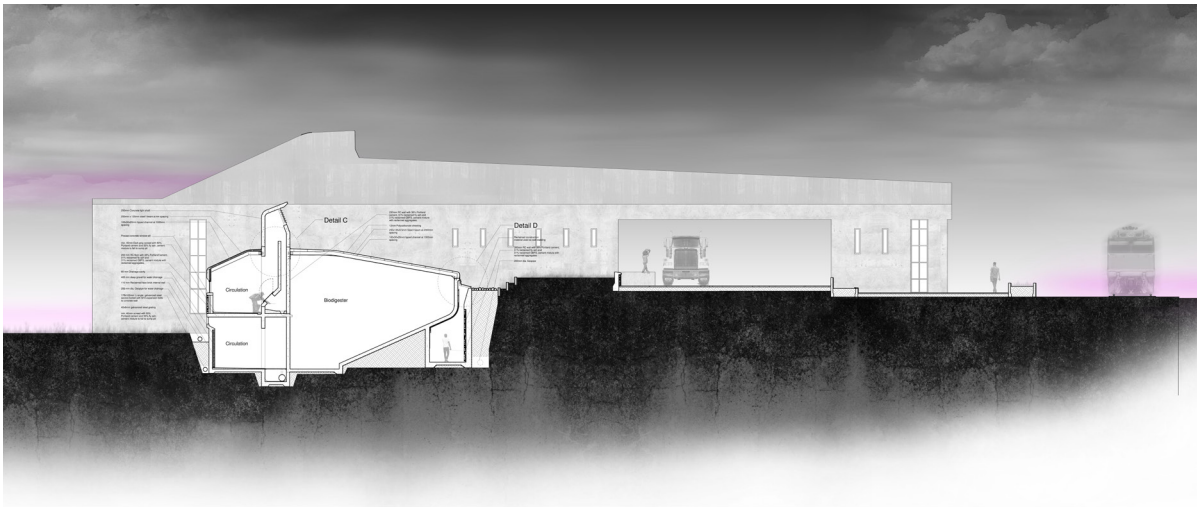
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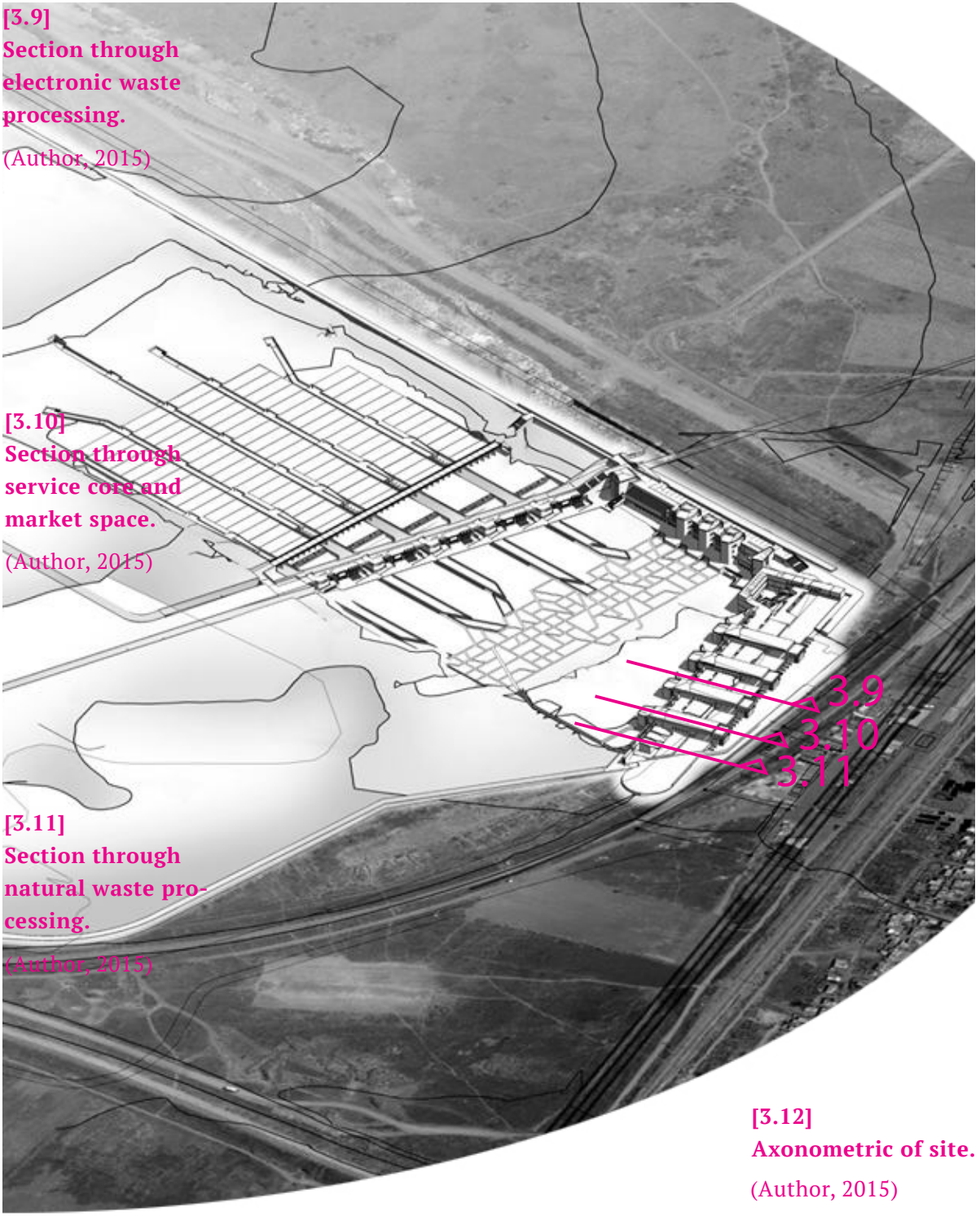
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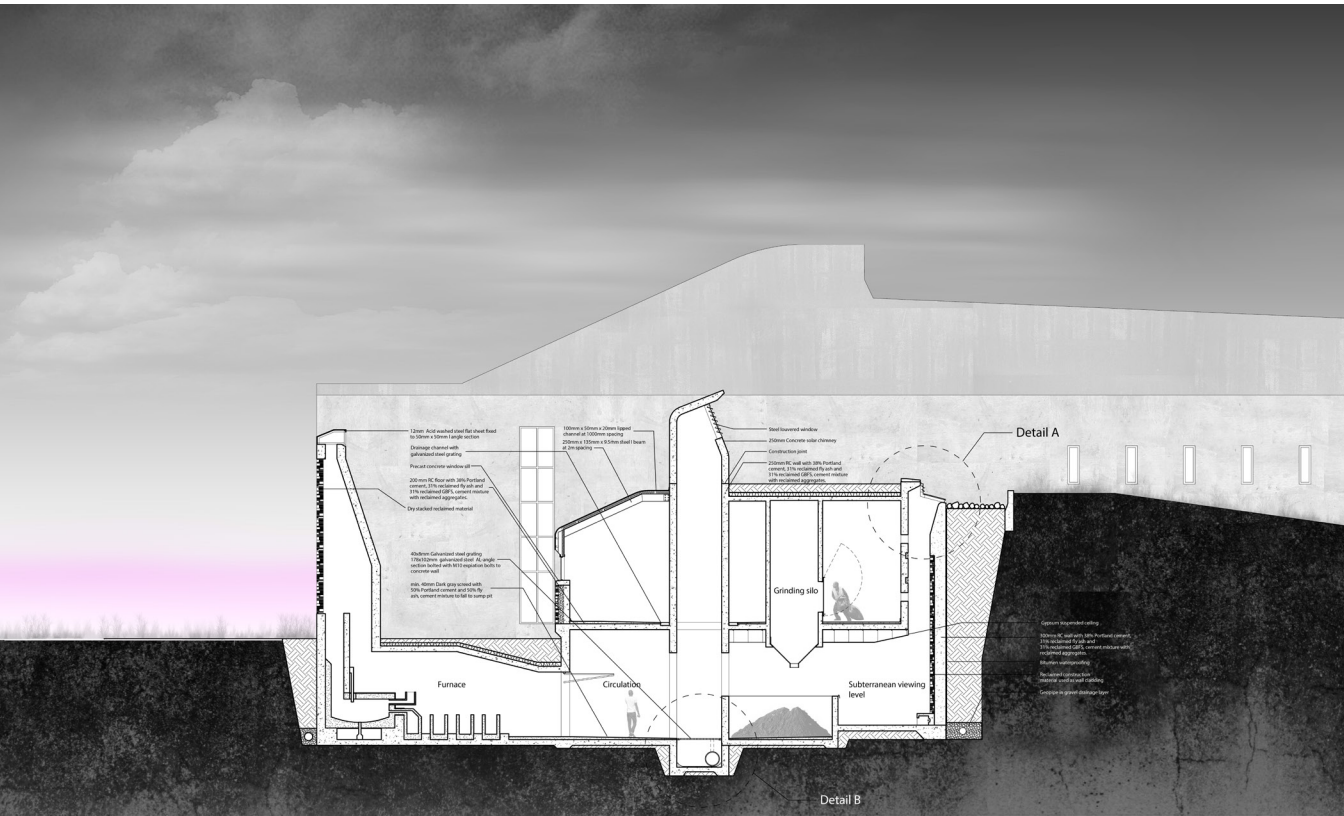
[3.9]
Section through electronic waste processing.
(Author, 2015)

[3.10]
Section through service core and market space.
(Author, 2015)

[3.11]
Section through natural waste processing.
(Author, 2015)

[3.12]
Axonometric of site.
(Author, 2015)

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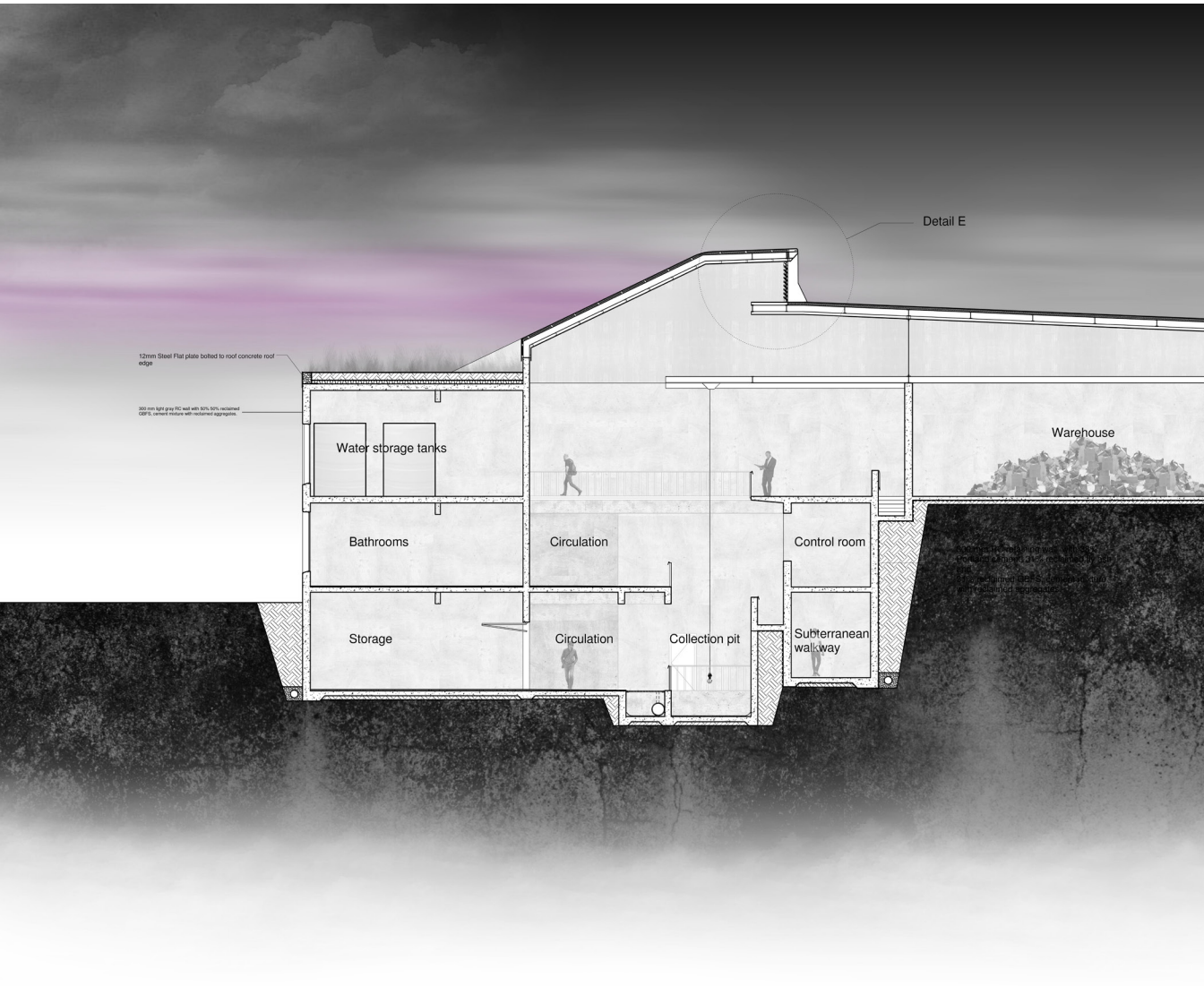
[3.9]
Section through electronic waste processing

(Author, 2015)

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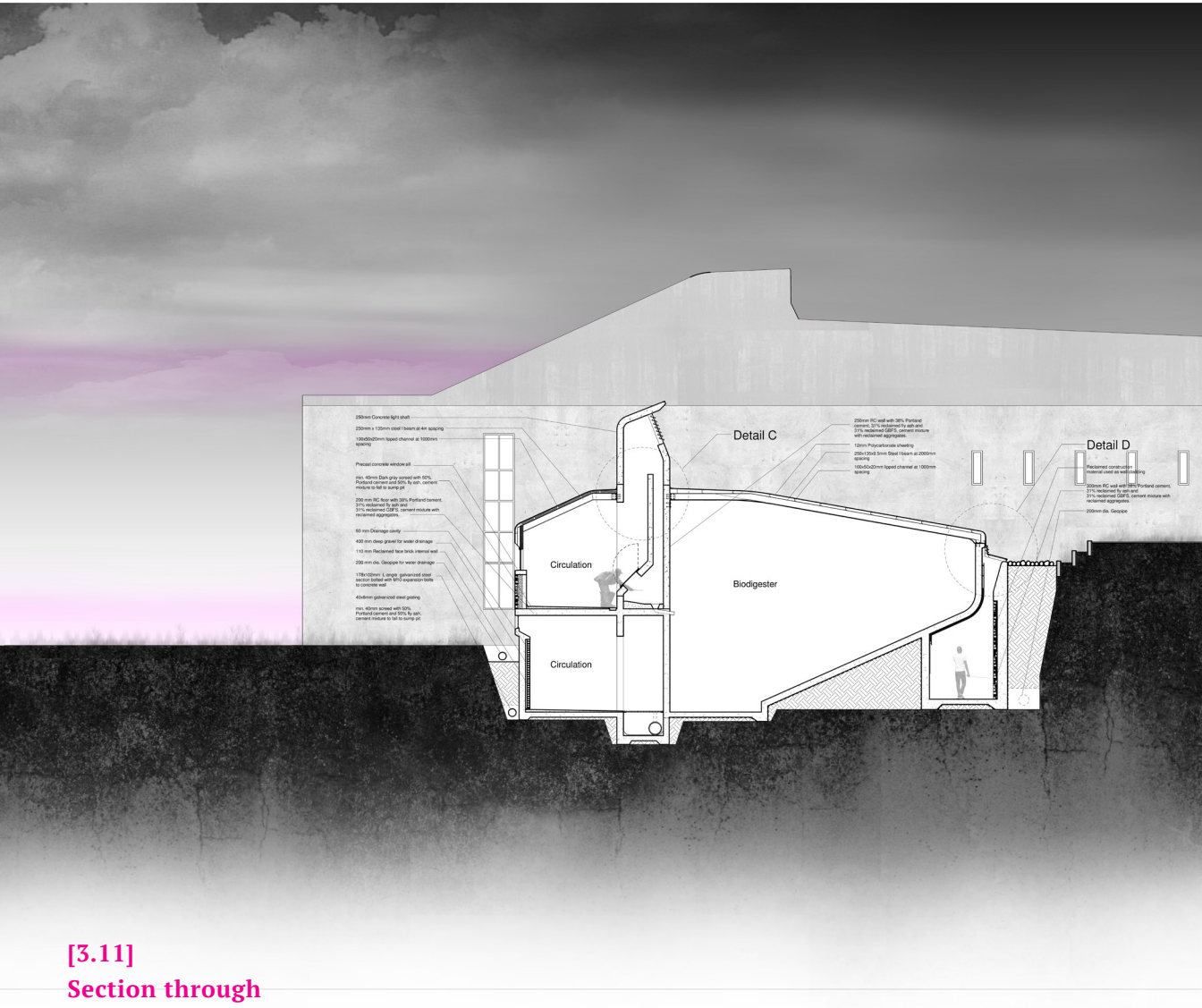
[3.10]
Section through service core and market space

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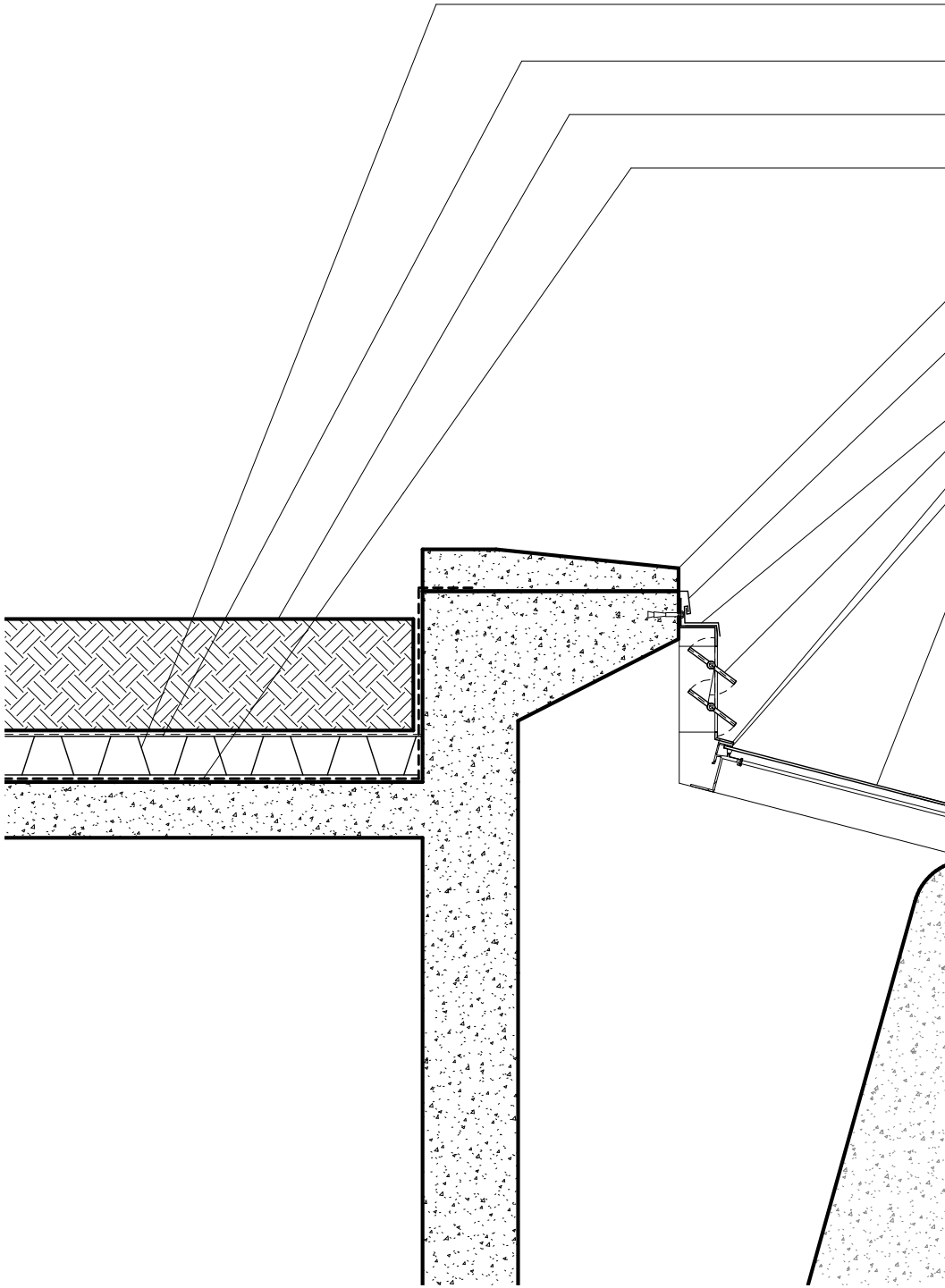
[3.11]
Section through natural waste processing

(Author, 2015)

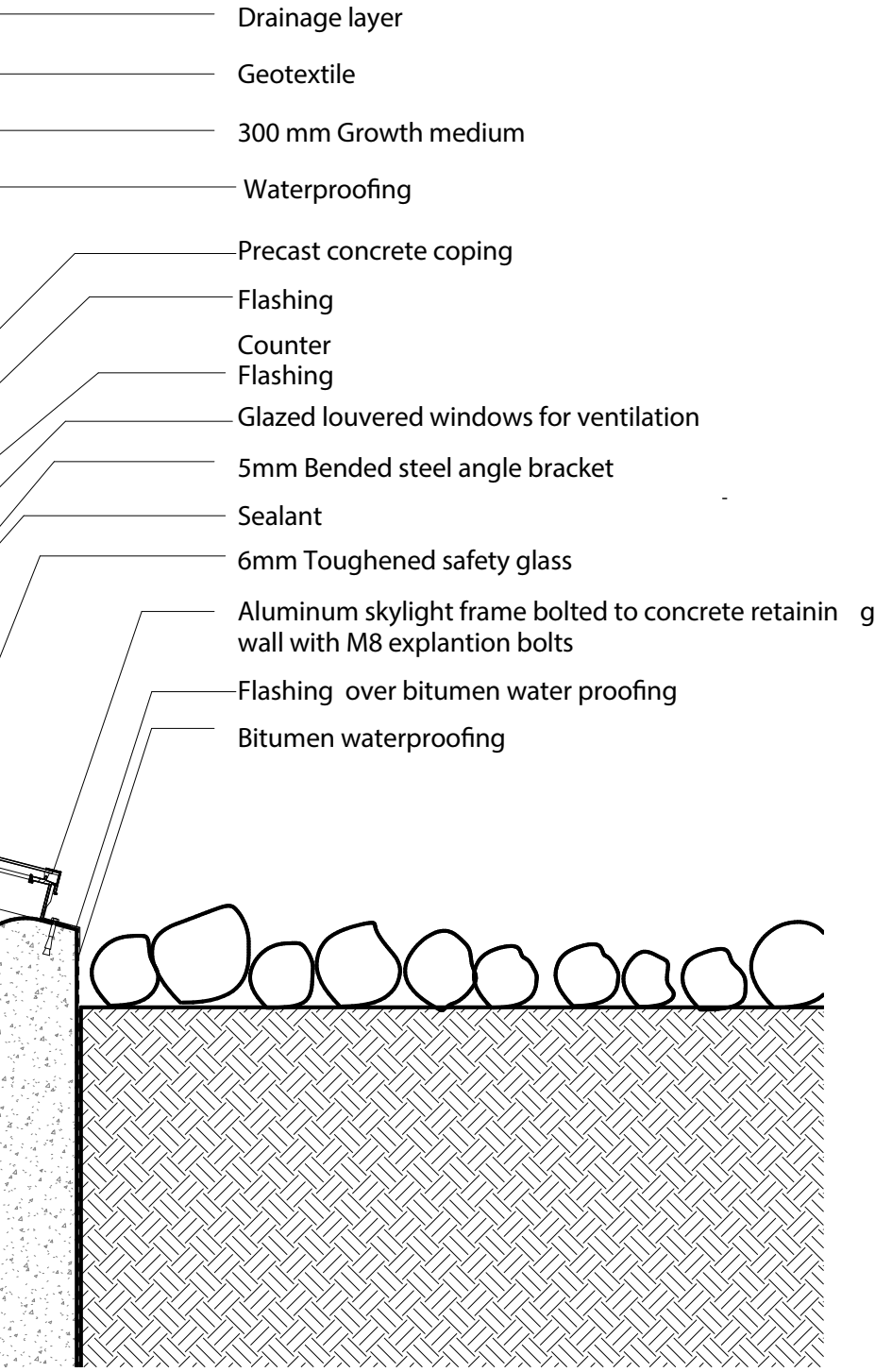
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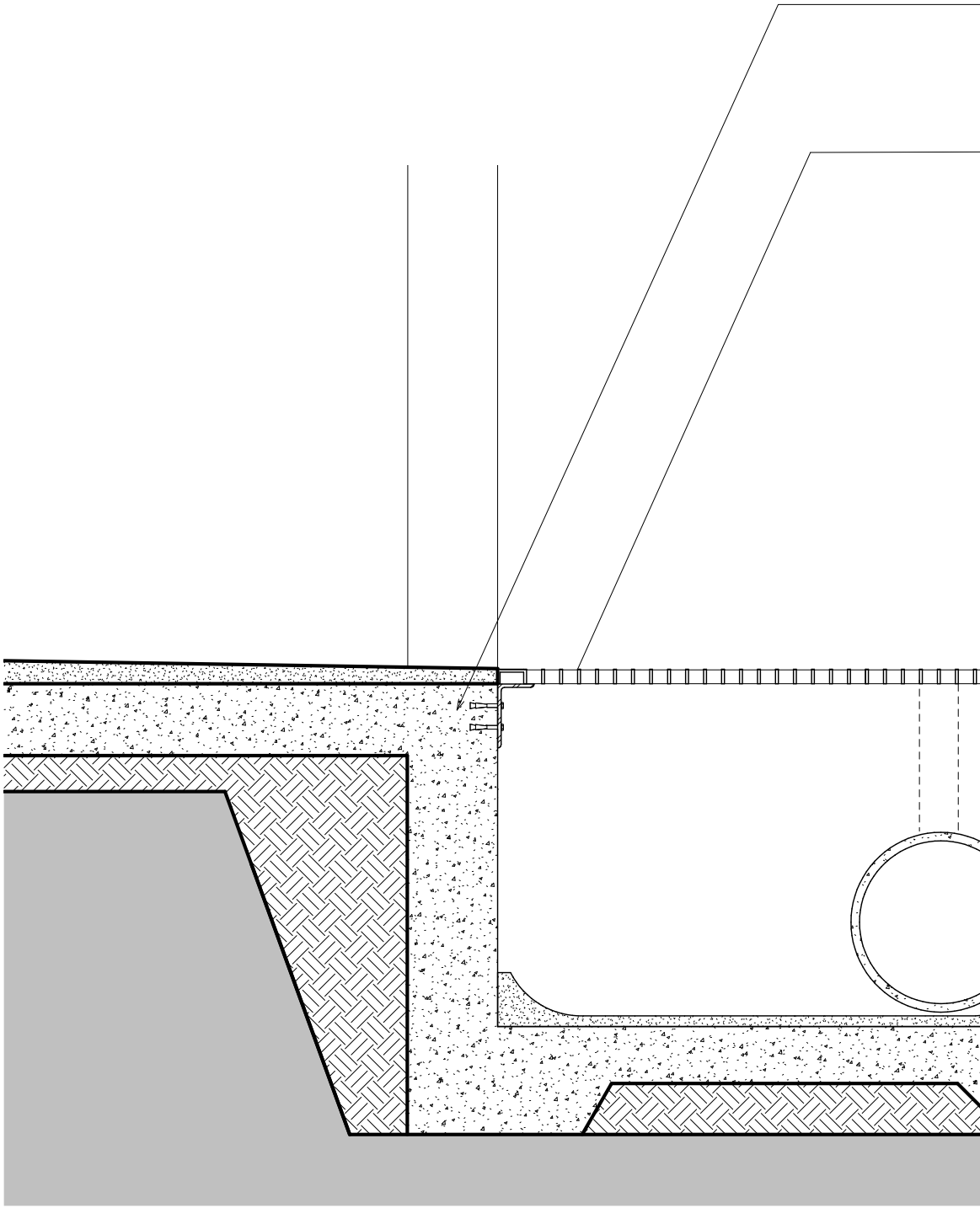
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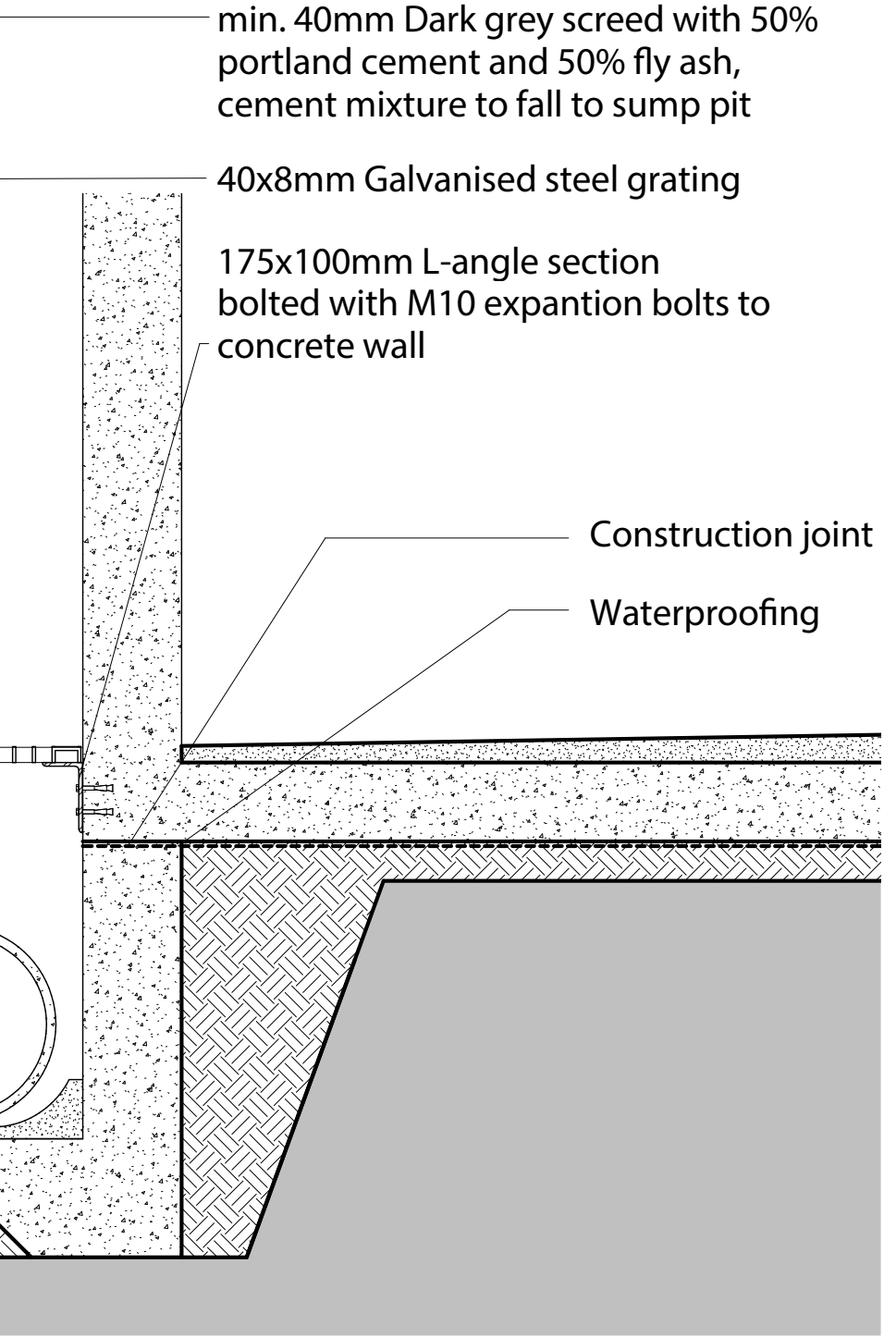
[3.12]
Detail A

(Author, 2015)

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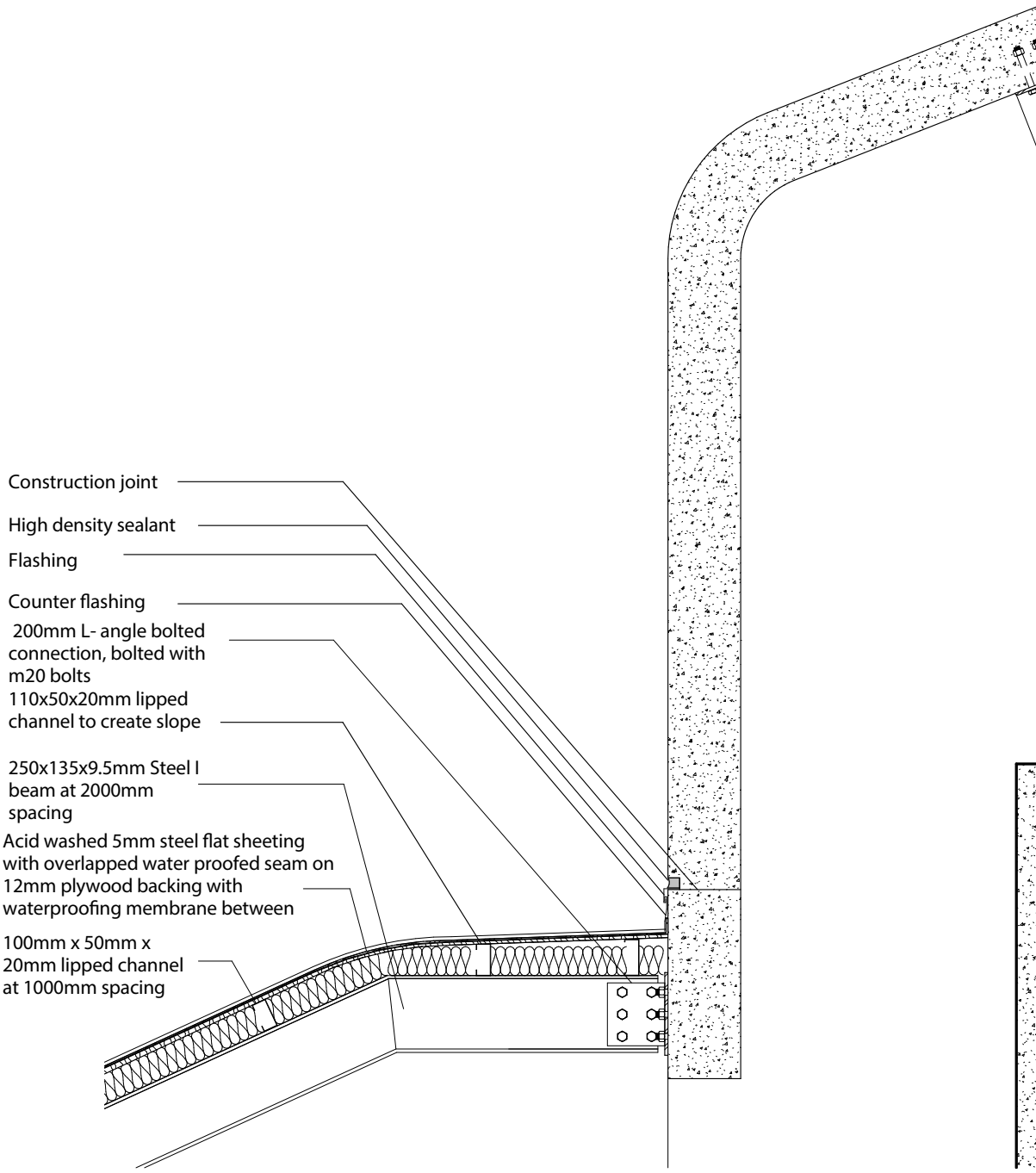
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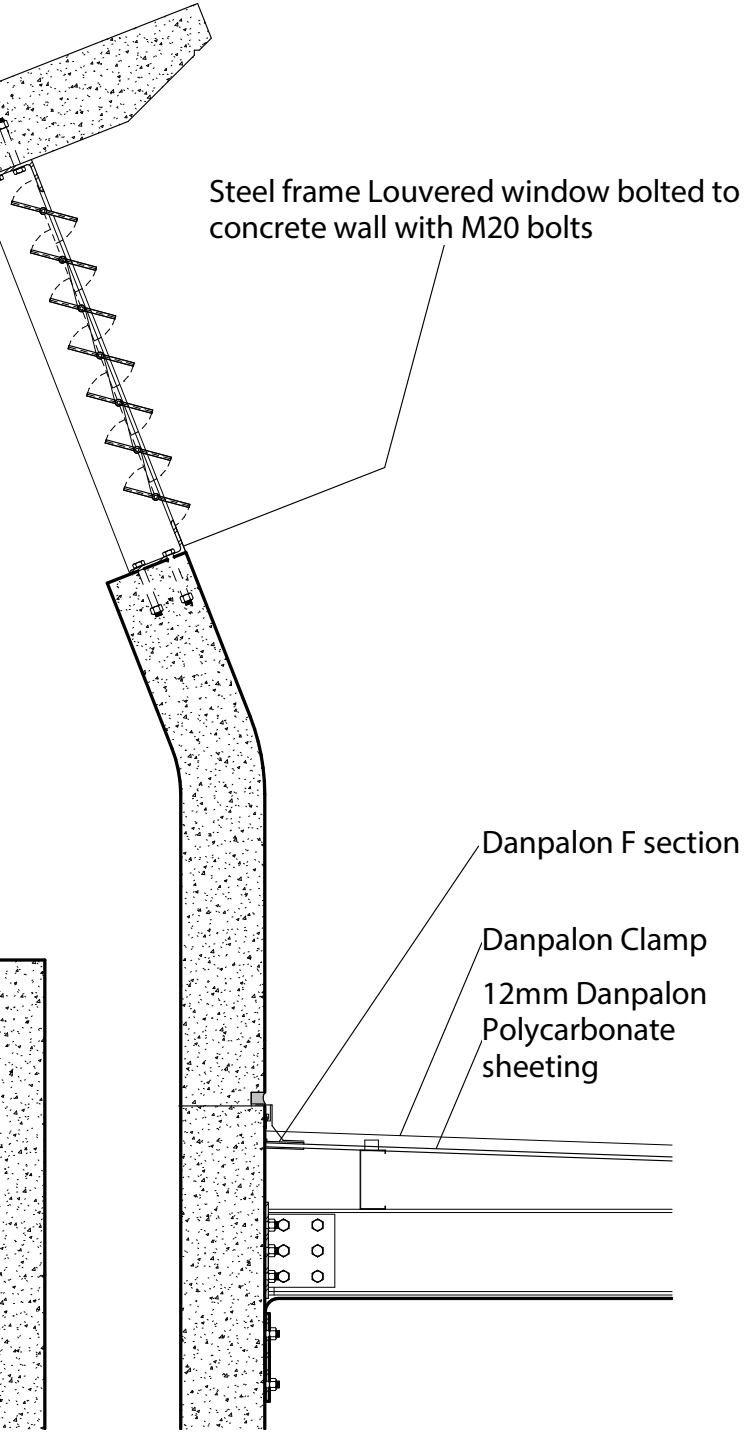
[3.13]
Detail B

(Author, 2015)

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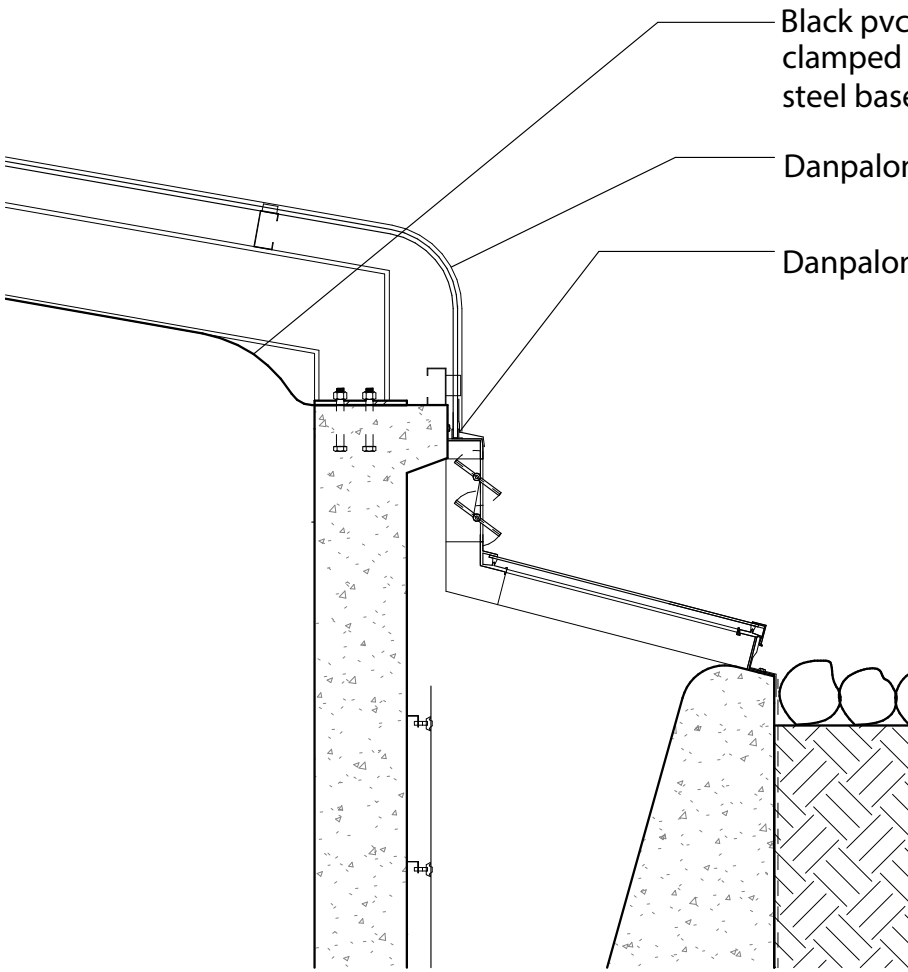
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[3.14]
Detail C

(Author, 2015)

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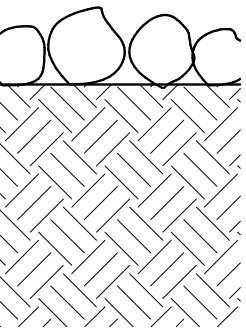


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sheeting
under 12 mm
e plate

n Clamp

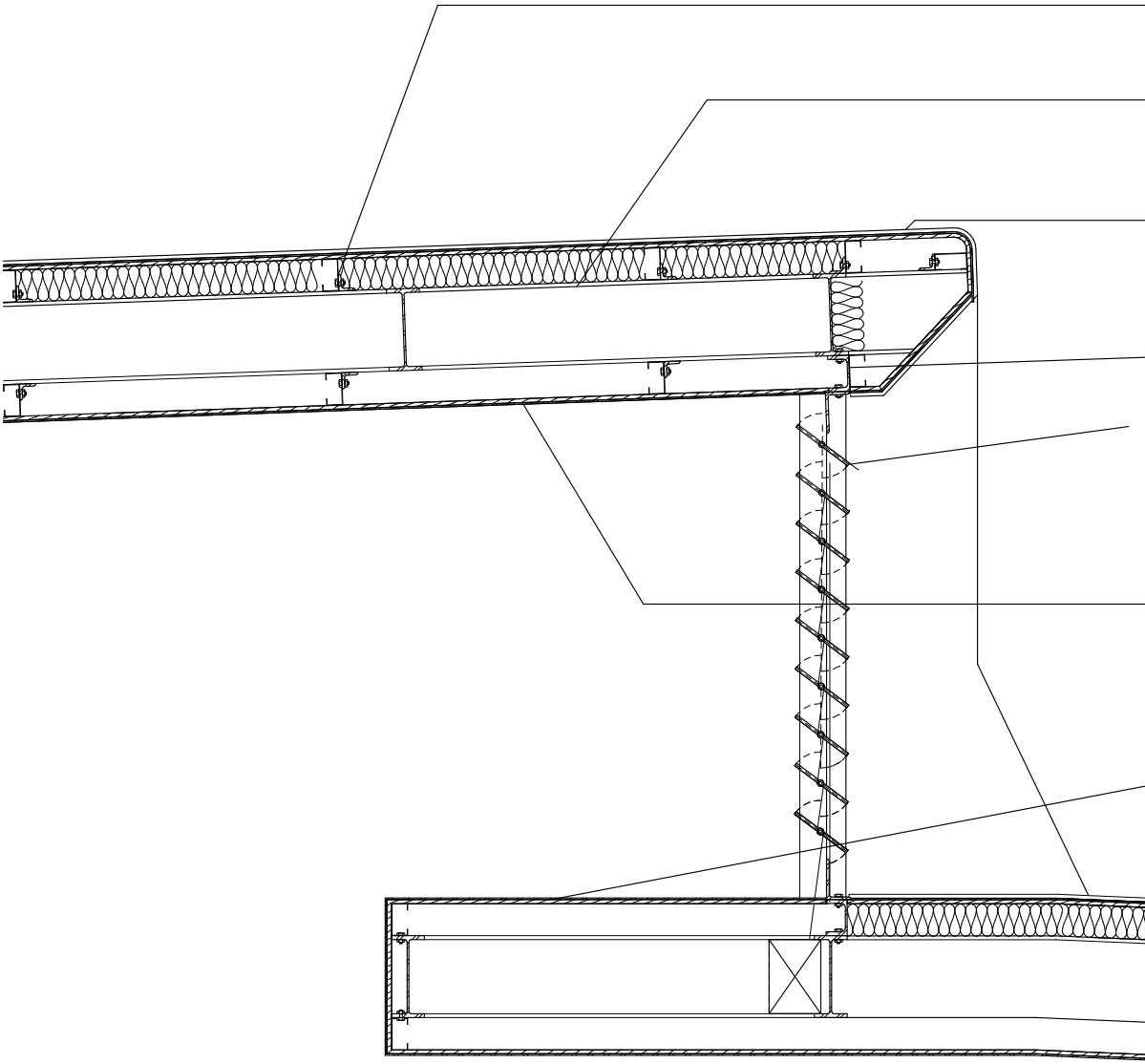
n F section



[3.15]
Detail D

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100x50x20mm lipped channel at 1000mm spacing bolted to 50x50mm L angle

250x135x9.5mm Steel I beam

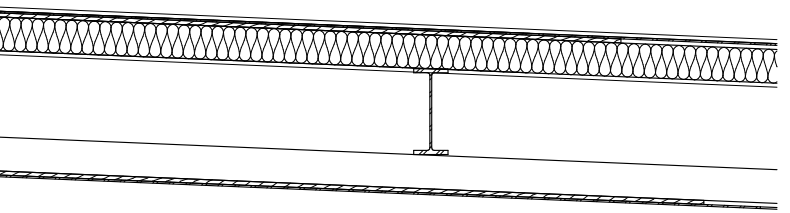
Acid washed 5mm steel flat sheeting with overlapped water proofed seam on 12mm plywood backing with waterproofing membrane between

125 x 65mm Hot rolled Parallel flange channel bolted to I beam

Mechanically operated glazed louvered window

5mm Perforated steel sheeting laminated to 12mm plywood backing ceiling

5mm Flat steel sheeting on 12mm plywood backing light shelf



[3.16]
Detail E

(Author, 2015)

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[5.18]
Perspective of elevated walkway.
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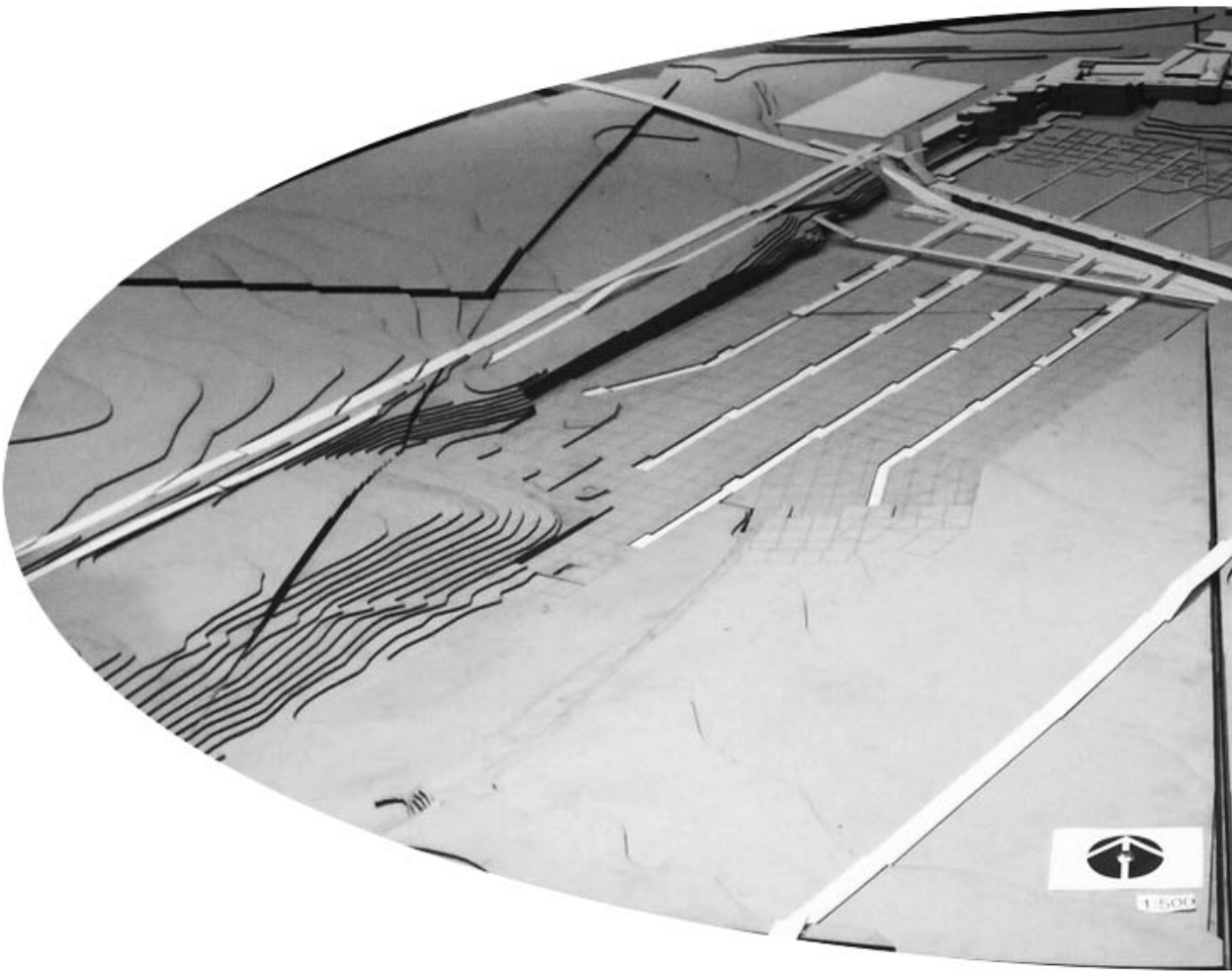


[3.19]
Perspective of Market spaces.
(Author, 2015)

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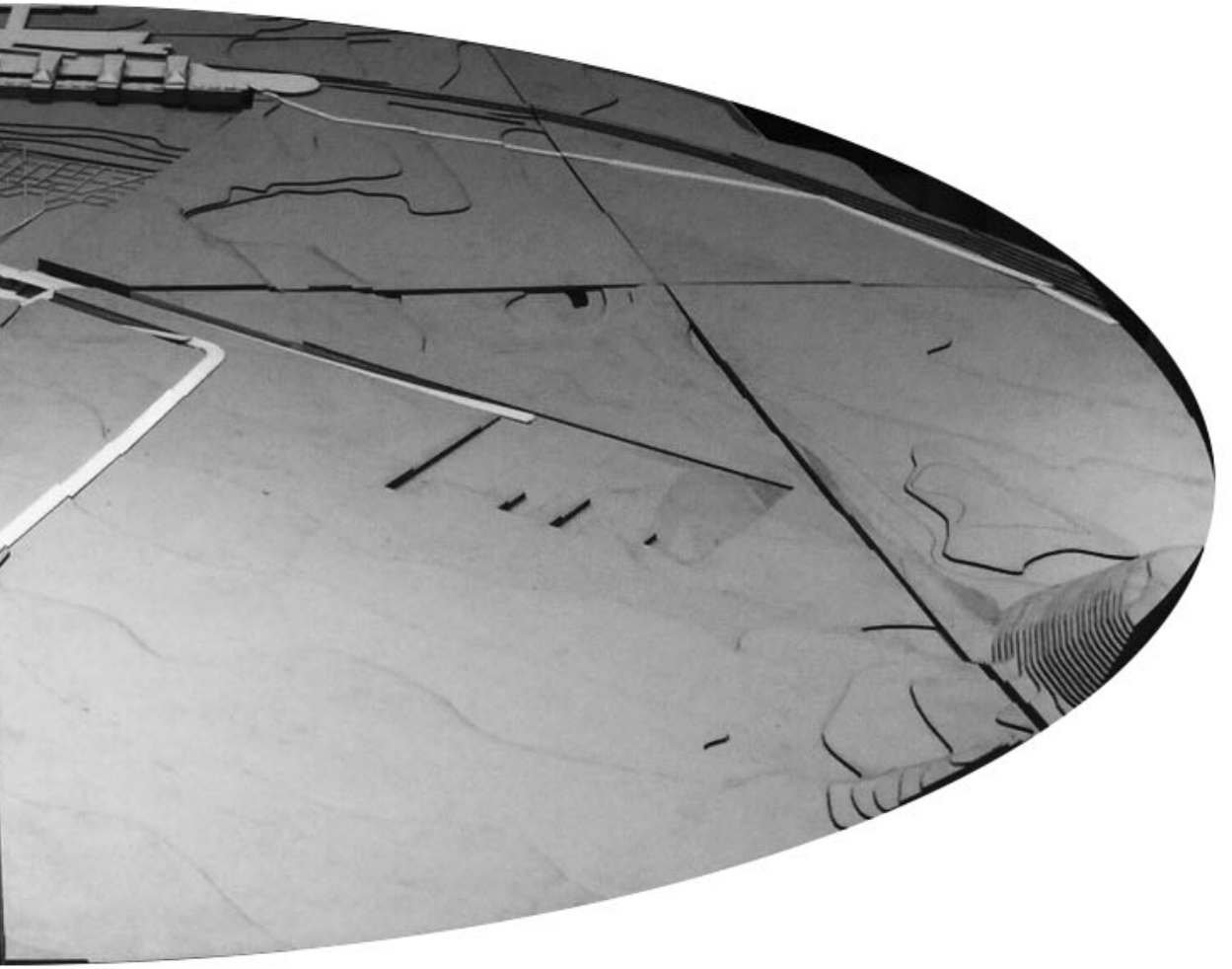


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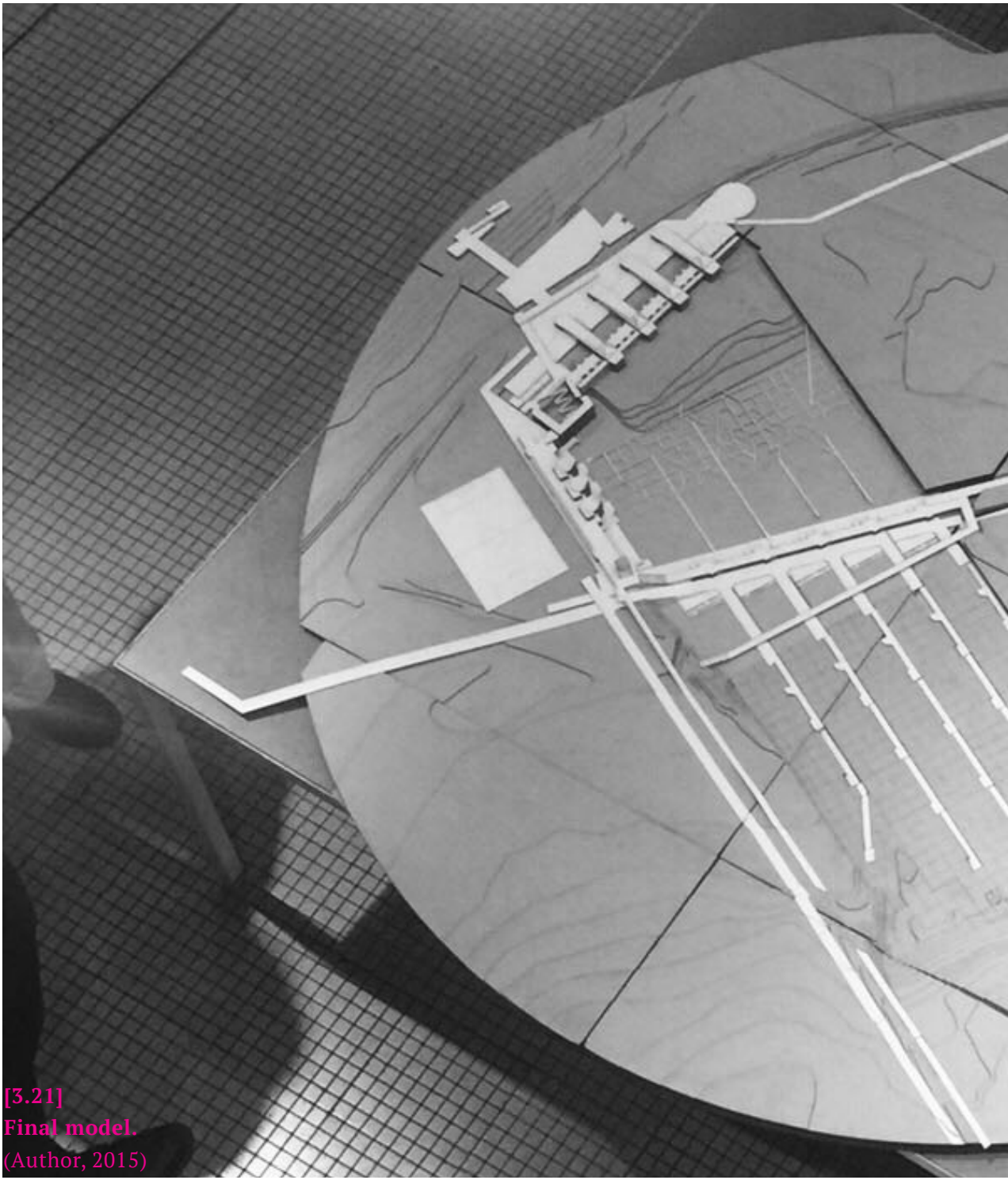


[3.20]
Final model.
(Author, 2015)

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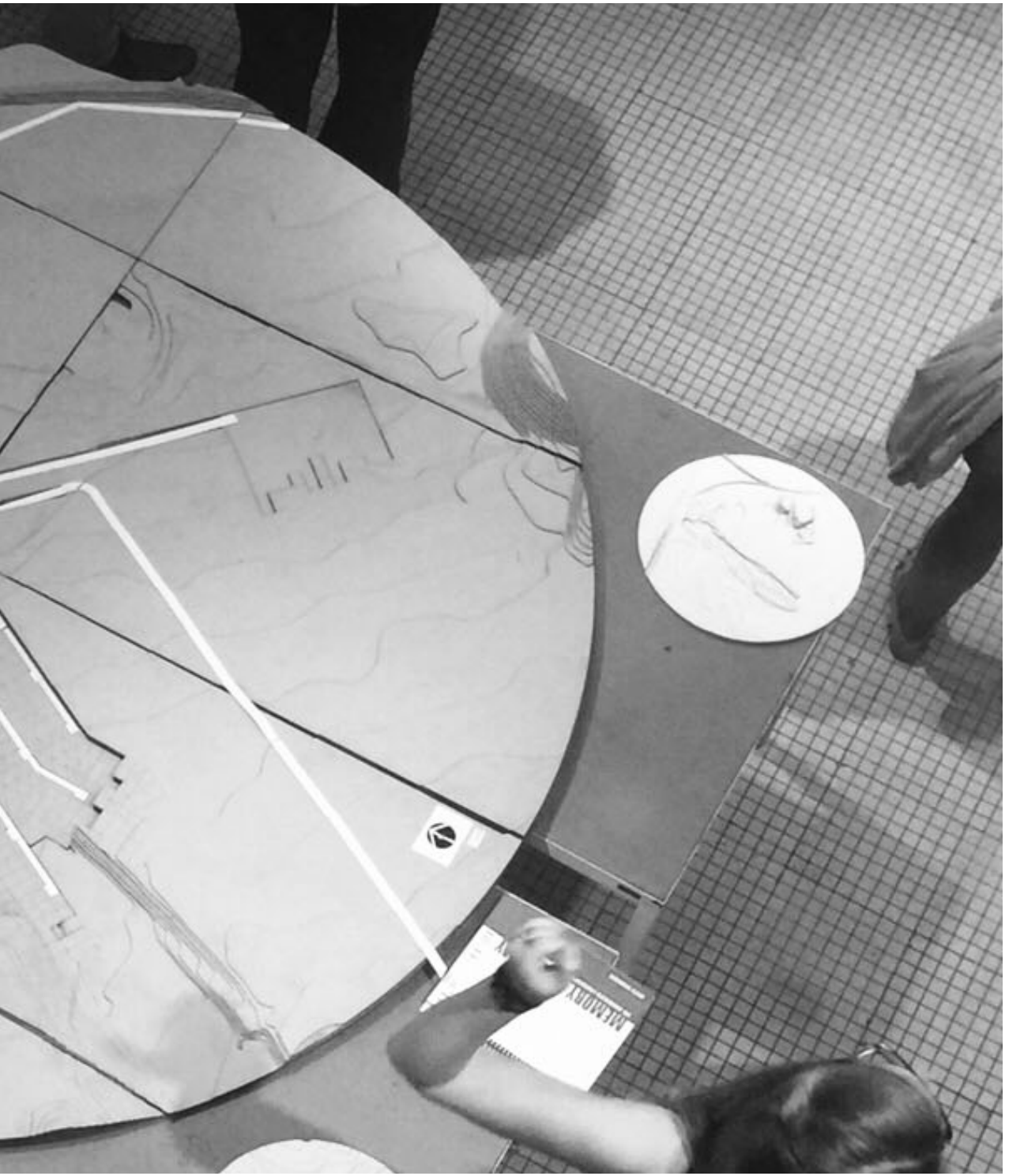


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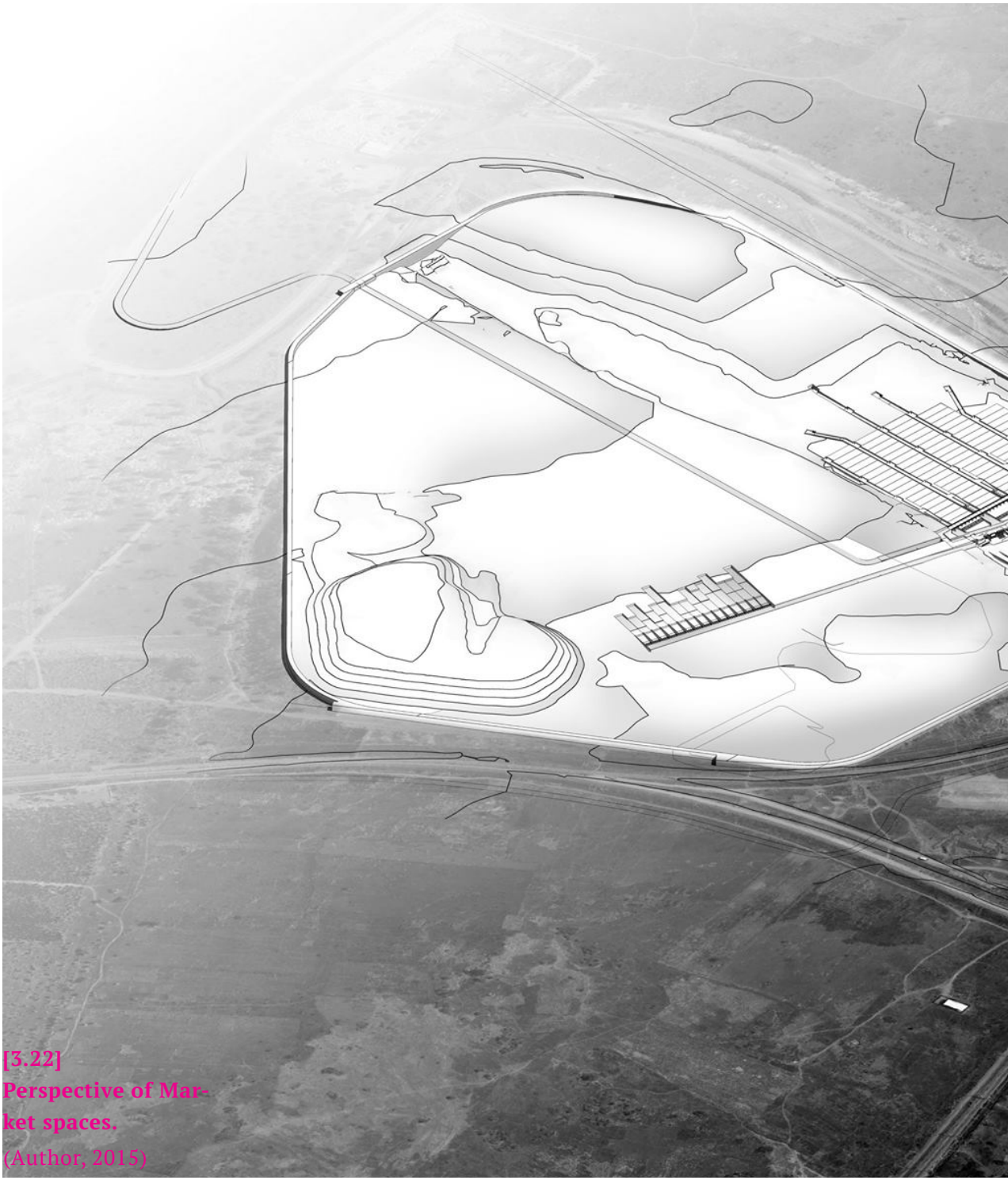


[3.21]
Final model.
(Author, 2015)

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[3.22]
Perspective of Market spaces.
(Author, 2015)

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Conclusion

Ultimately, contemporary waste management strategies are ineffective and need to be reconsidered. Landfill mining is financially viable and is a relevant program to be implemented on the landfill. Cultural opportunities of waste are mostly neglected and it is thus a necessary exploration in order to achieve the full potential of the land fill. The environmental benefits to landfill mining are great and create the possibility for Hatherley landfill to positively impact the environment. With growing pressure on resources and unprecedented environmental changes the world is experiencing, it is inevitable that landfill mining will have to be seriously considered in the near future.

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