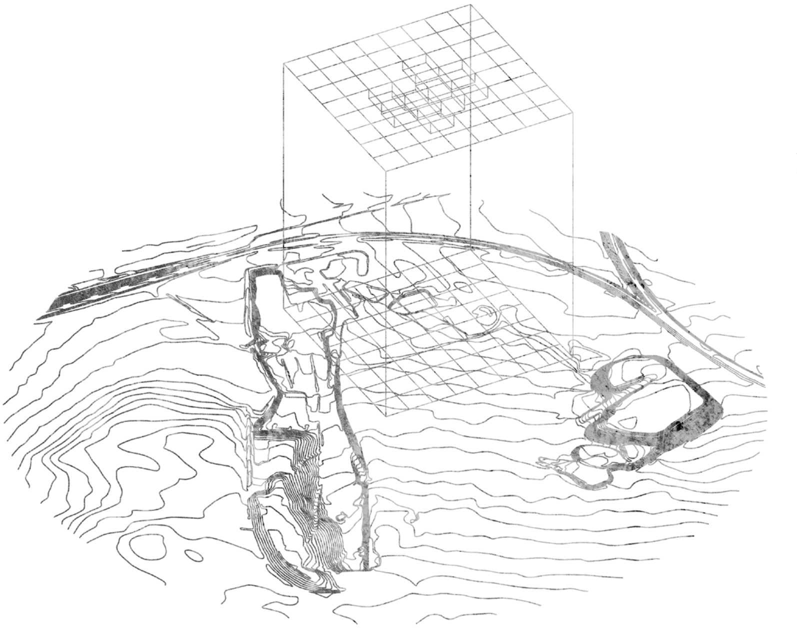
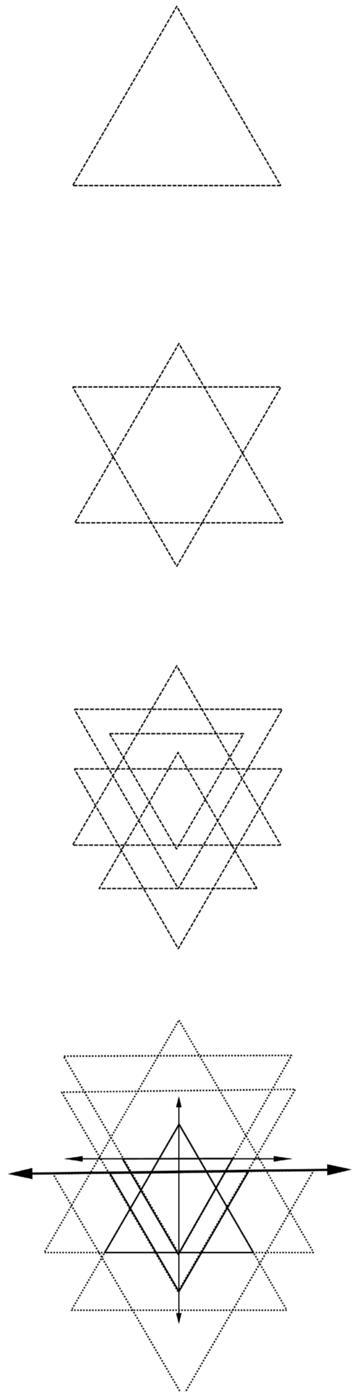
Part

2

Excavation



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



[2.1]
Ecotone geometries overlapping.

(By Author, 2015)

NEW GEOMETRIES

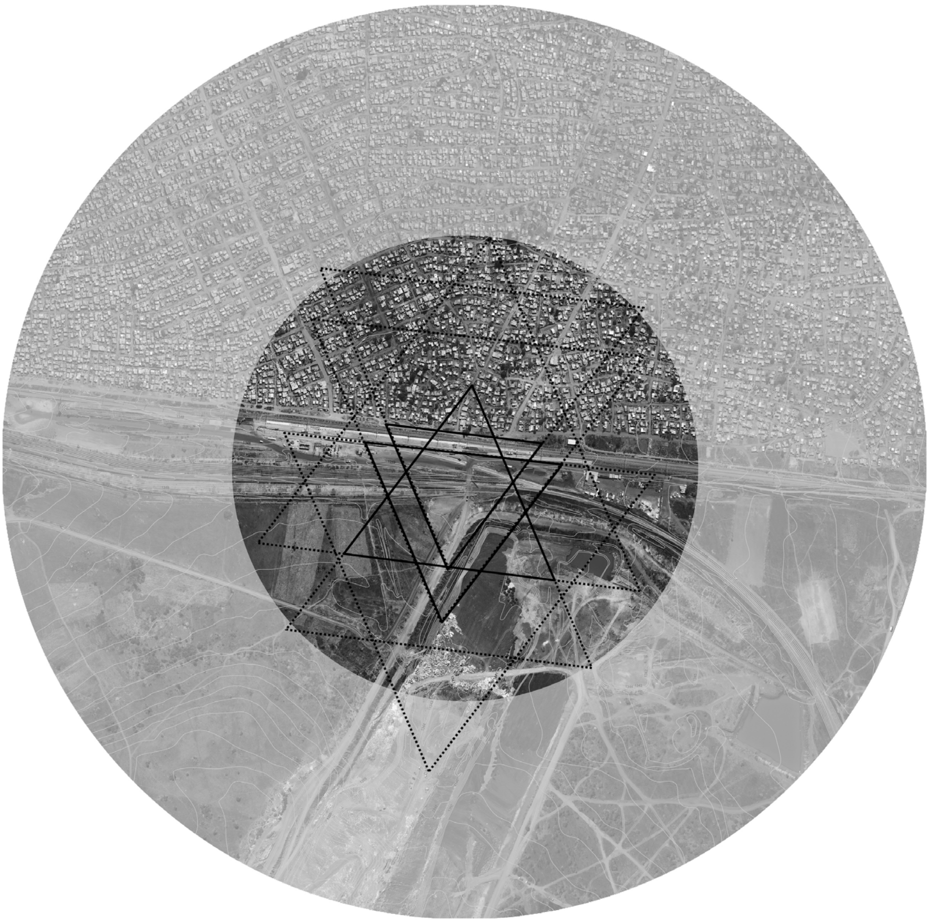
Excavation starts by overlaying a new geometric order, forming a framework to work within. In investigating this geometric order the idea of the ecotone is investigated.

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.



[2.2]
Ecotones overlapping at landfill.

(By Author, 2015)

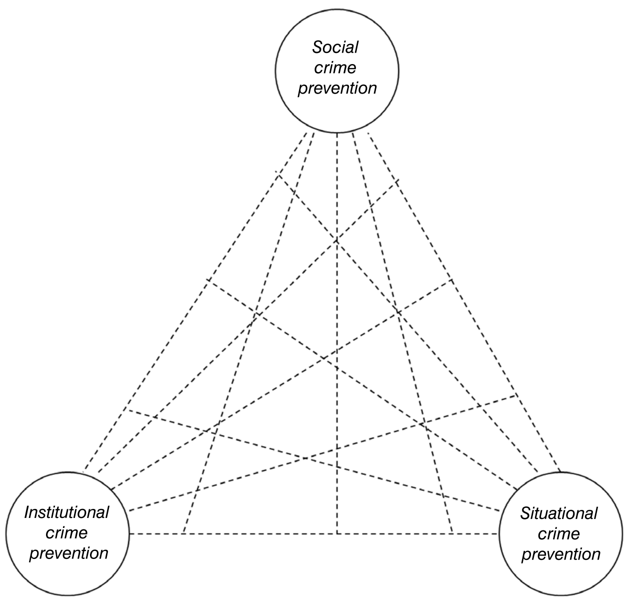
The implication within all these discussions is that work at the edge is unfettered and unencumbered by the inertia of core activity. It is more open to radically transformative and innovative forces and processes. These forces and processes, if tapped into, can re-shape and transform the core, something 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).

VPUU lense



Social crime prevention
Institutional crime prevention
Situational crime prevention

[2.3]
VPUU lens.

(By Author, 2015)

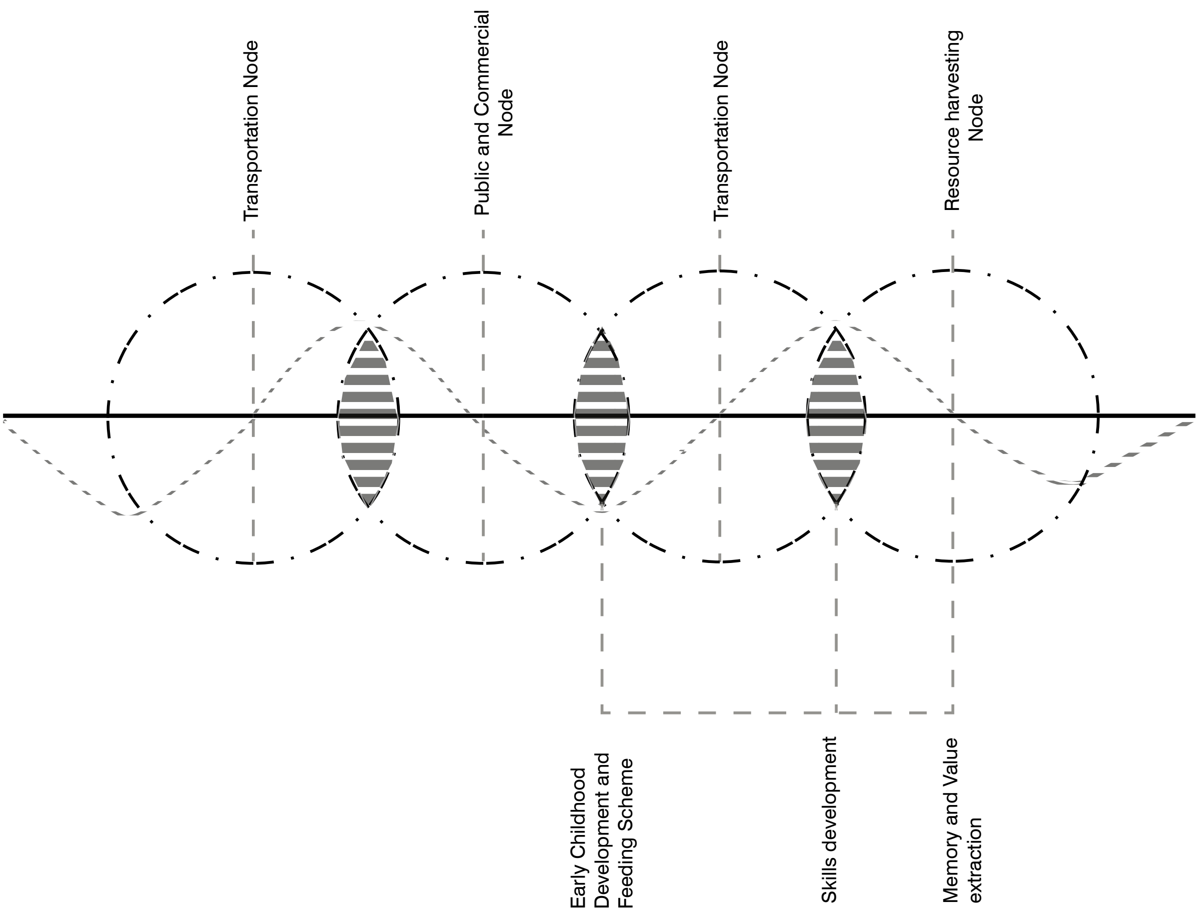
The project spans over 4 neighbourhoods thus reaching out to almost 20 000 people. The VPUU has a very clear approach and methodology, following a set of principles to support a participatory design approach, which allows residents to take ownership of the proposed interventions (VPUU 2014). The VPUU 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.

PROGRAMMATIC ECOTONES



[2.4]
Programmatic ecotones.
(By Author, 2015)

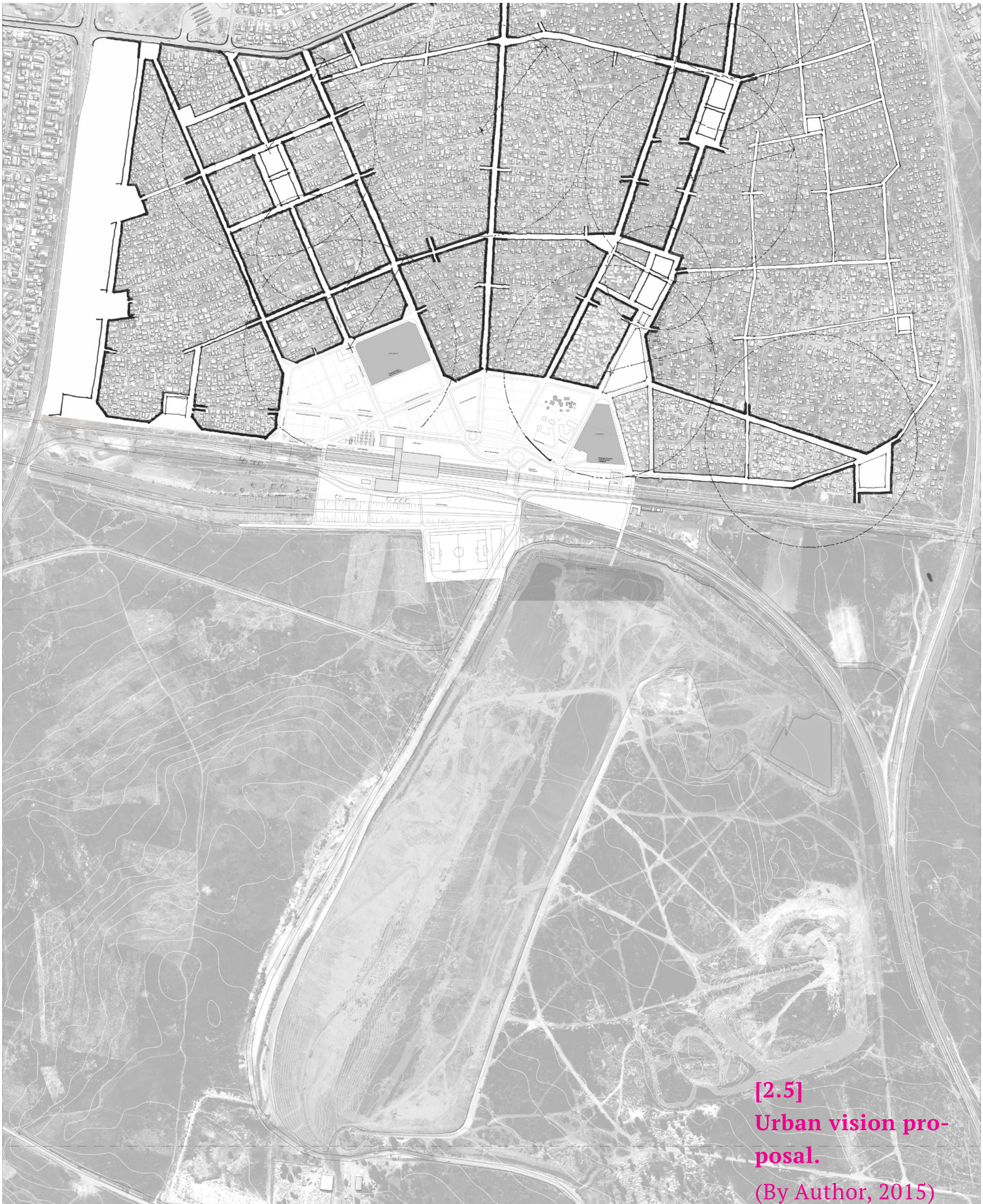
Urban framework approach

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.

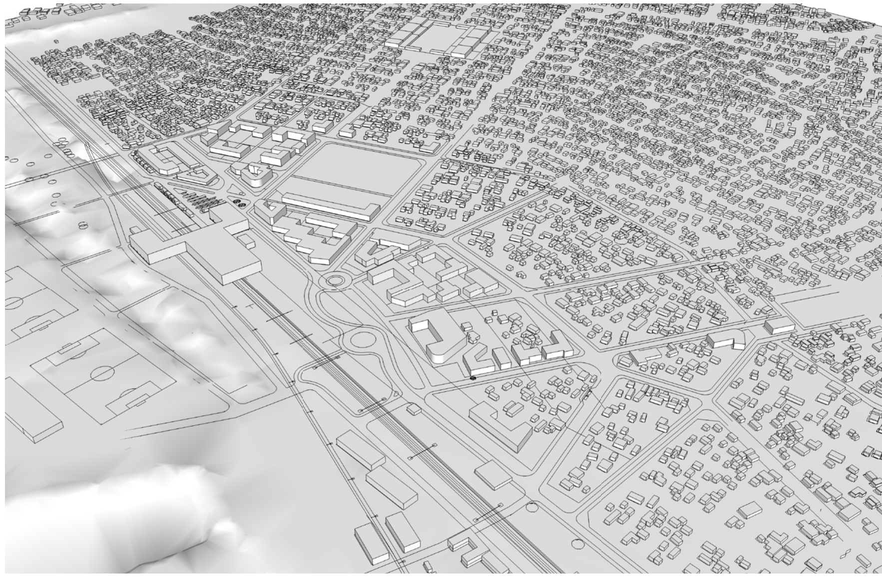
The unhindered movement to and from the station is promoted through the amplified activity spines. The proposed sites for further intervention will focus on strengthening the link between the landfill and Phomolong. To promote further development on the southern side of the railway, a recreational precinct 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.



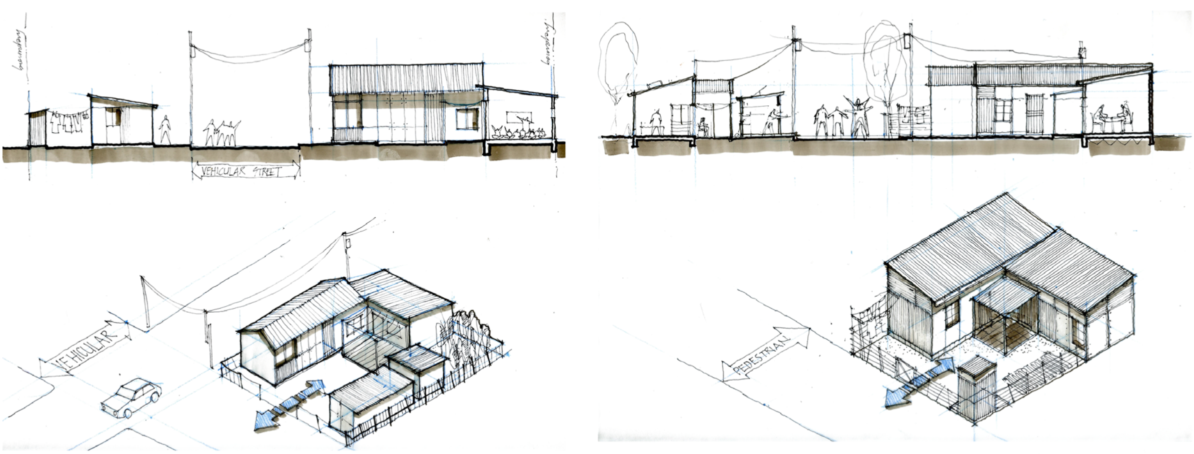
[2.5]
Urban vision proposal.
(By Author, 2015)

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

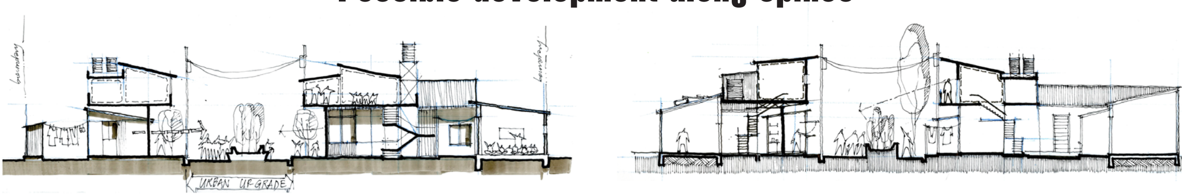
[2.7]
Typological study exploring possible development along spines. 1 story living unit developing into two story units with workshop/ commercial spaces below and living quarters above.
(By Author, 2015)

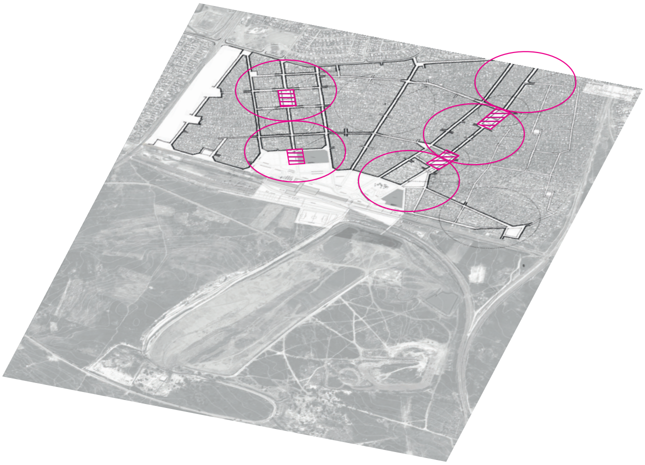


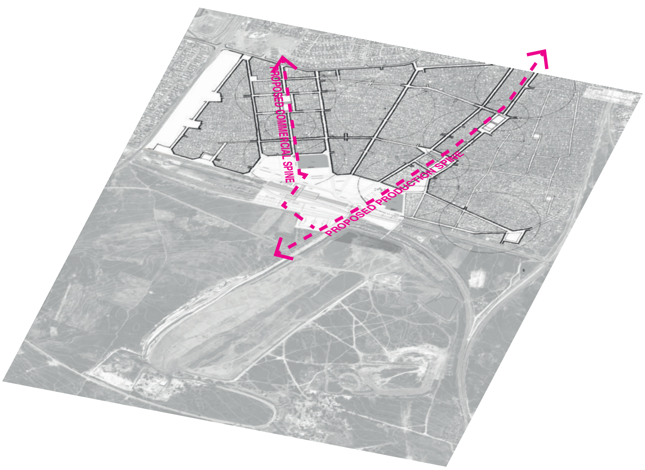
Existing fabric

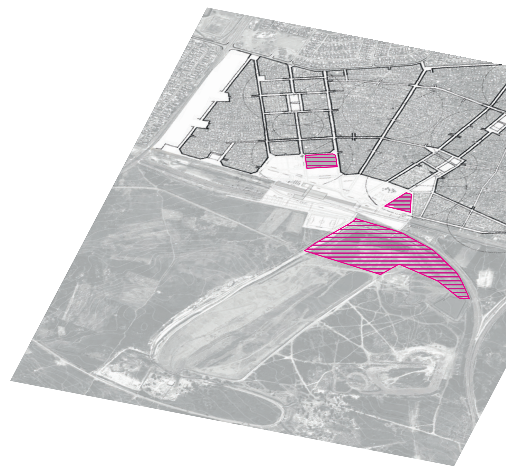


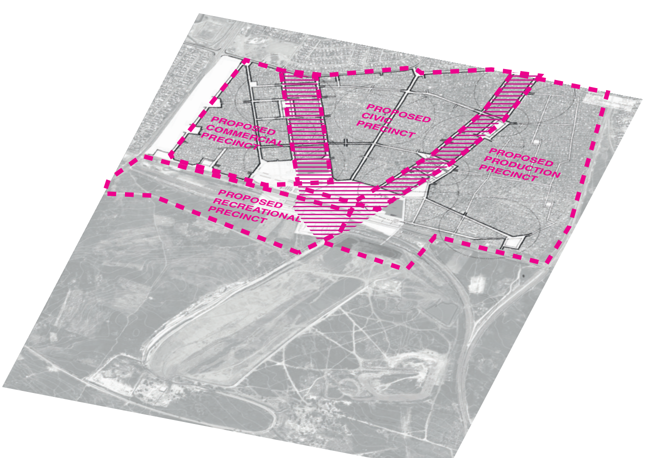
Possible development along spines






PROPOSED COMMERCIAL SPINE
PROPOSED PRODUCTION SPINE




PROPOSED COMMERCIAL PRECINCT
PROPOSED CIVIC PRECINCT
PROPOSED PRODUCTION PRECINCT
PROPOSED RECREATIONAL PRECINCT

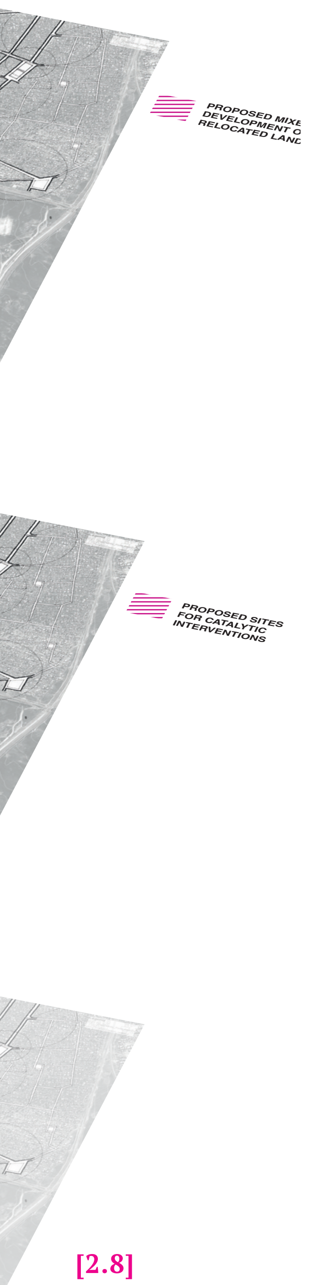

SITE LOCATION

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.

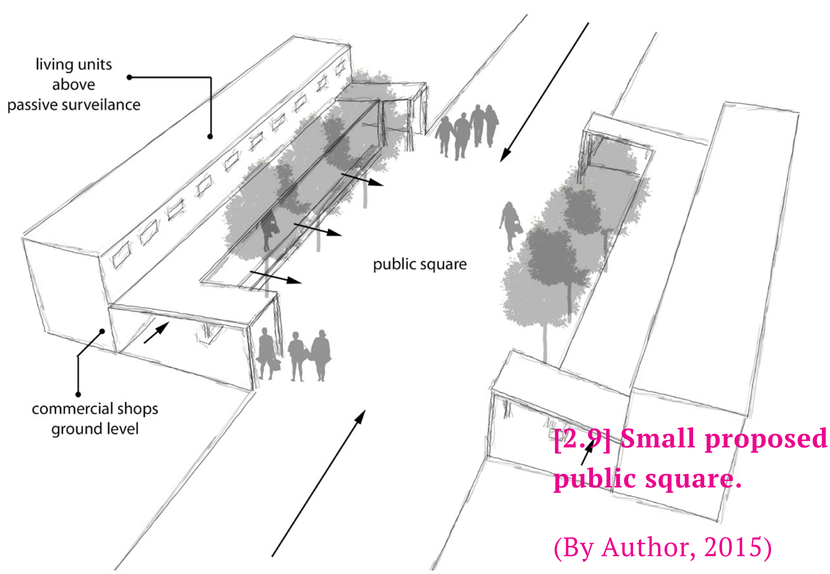
Stage 2 sees the establishment of key catalytic interventions including the landfill mining operation proposed at the landfill.

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.

(By Author, 2015)


Pedestrian corridor
Pedestrian corridor
10 101.500 m²
Proposed Urban Agriculture (Ursula)
Market space
Market space
Market space
Formal Retail Space
Formal Retail Space
Formal Retail Space
Formal Retail Space
Mixed Use (Commercial and Housing)
Mixed Use (Commercial and Housing)
Mixed Use (Commercial and Housing)
Church/ Community Centre
Landmark (water point)
Landmark (water point)
Markespace
Markespace
Taxi Rank
public ablutions
Public Space
Informal Market Space
1348
1348
1348
possible wetland
possible wetland
possible wetland
Recreational Precinct

[2.10]
Final urban vision.
(By Author, 2015)

[2.11]
Urban intention.

(By Author, 2015)

EXCAVATING THROUGH DRAWING

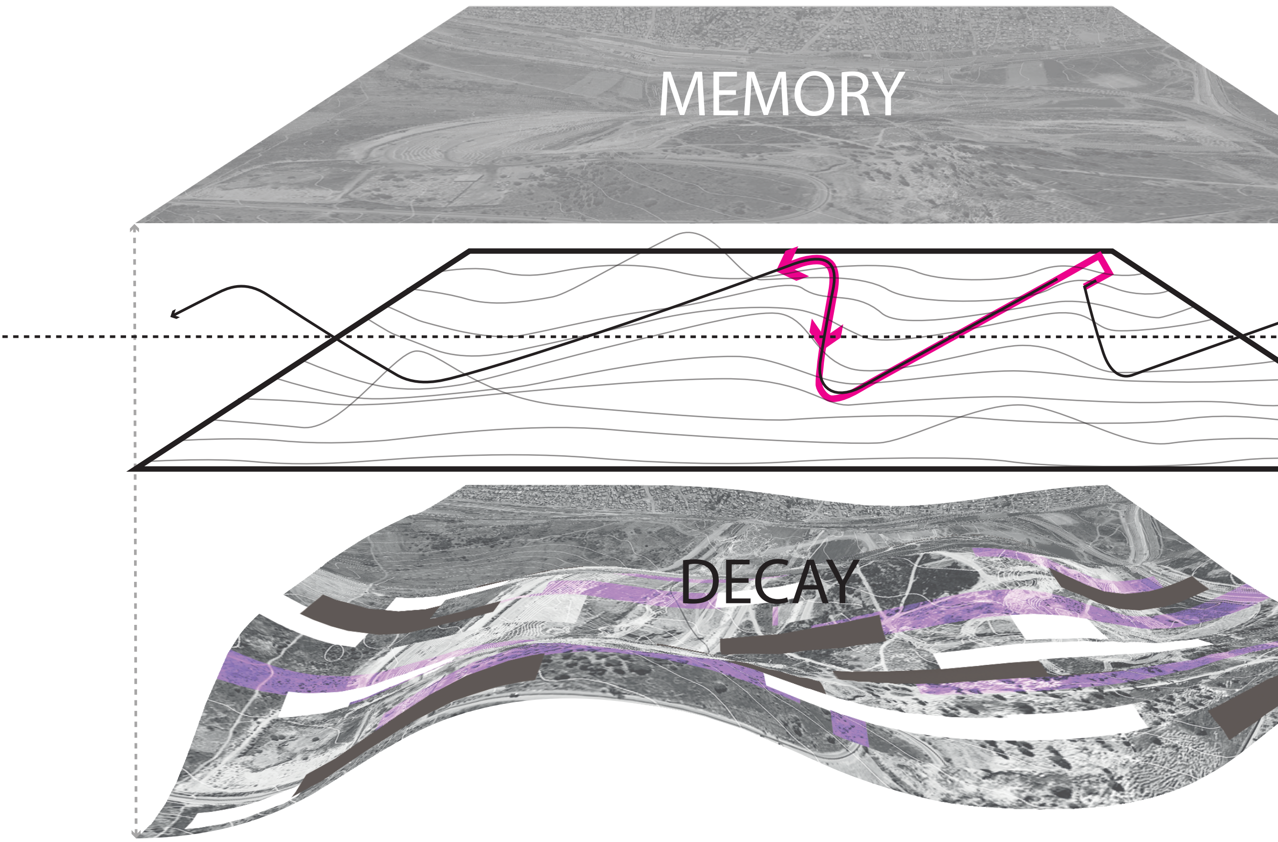
In exploring the architecture, several design informants were identified and considered. The project needed to meet these requirements in order to successfully integrate the project into the context, while exploring the landscape's cultural, economic and environmental potential. The informants were as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

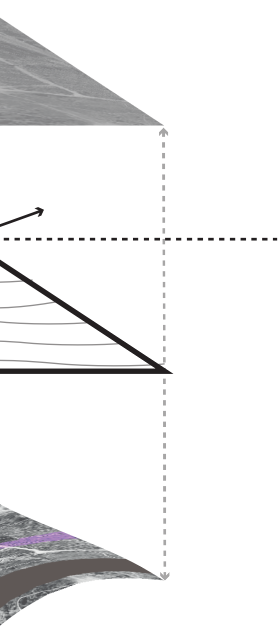
Public access:

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.



[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)



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.

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

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

[2.15] Left Archaeological archive exterior showing sunken space.

(I. Baan, 2009)

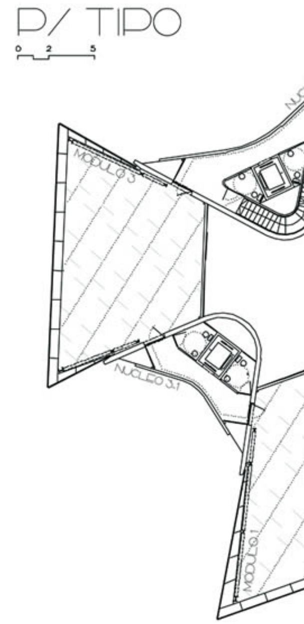
Archaeological tools as spatial elements:

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.

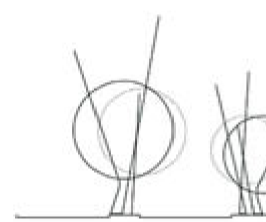
[2.16] Archaeological archive interior. (A. Pasternack, 2008)

[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)

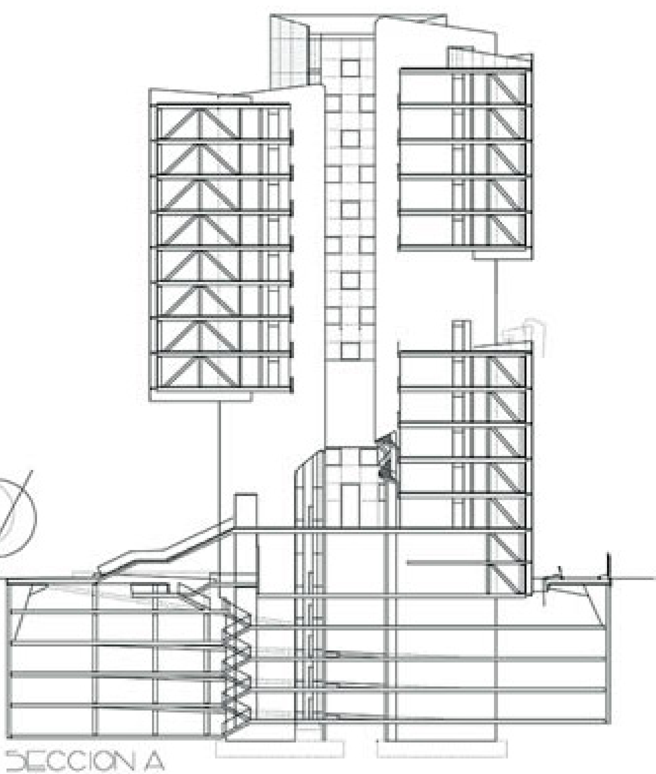


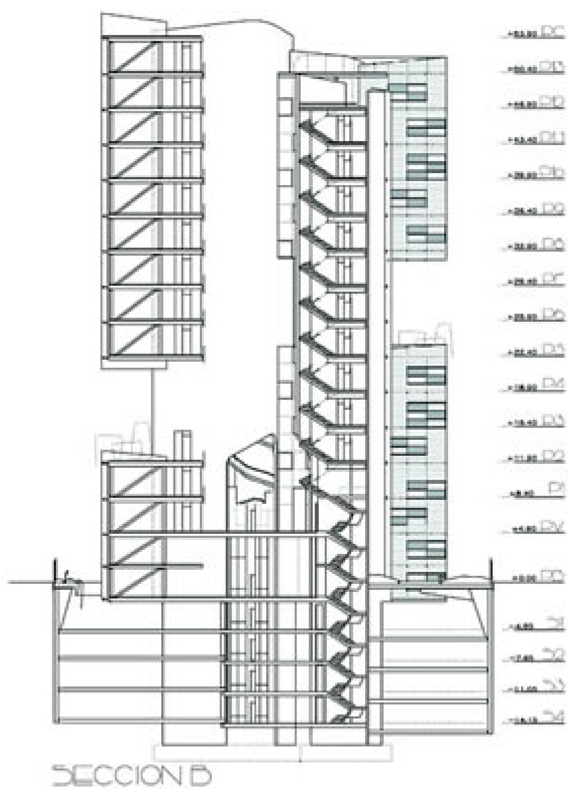
[2.20] Left
Torre cube central space.
(Estudio Carme Pinos, 2006)

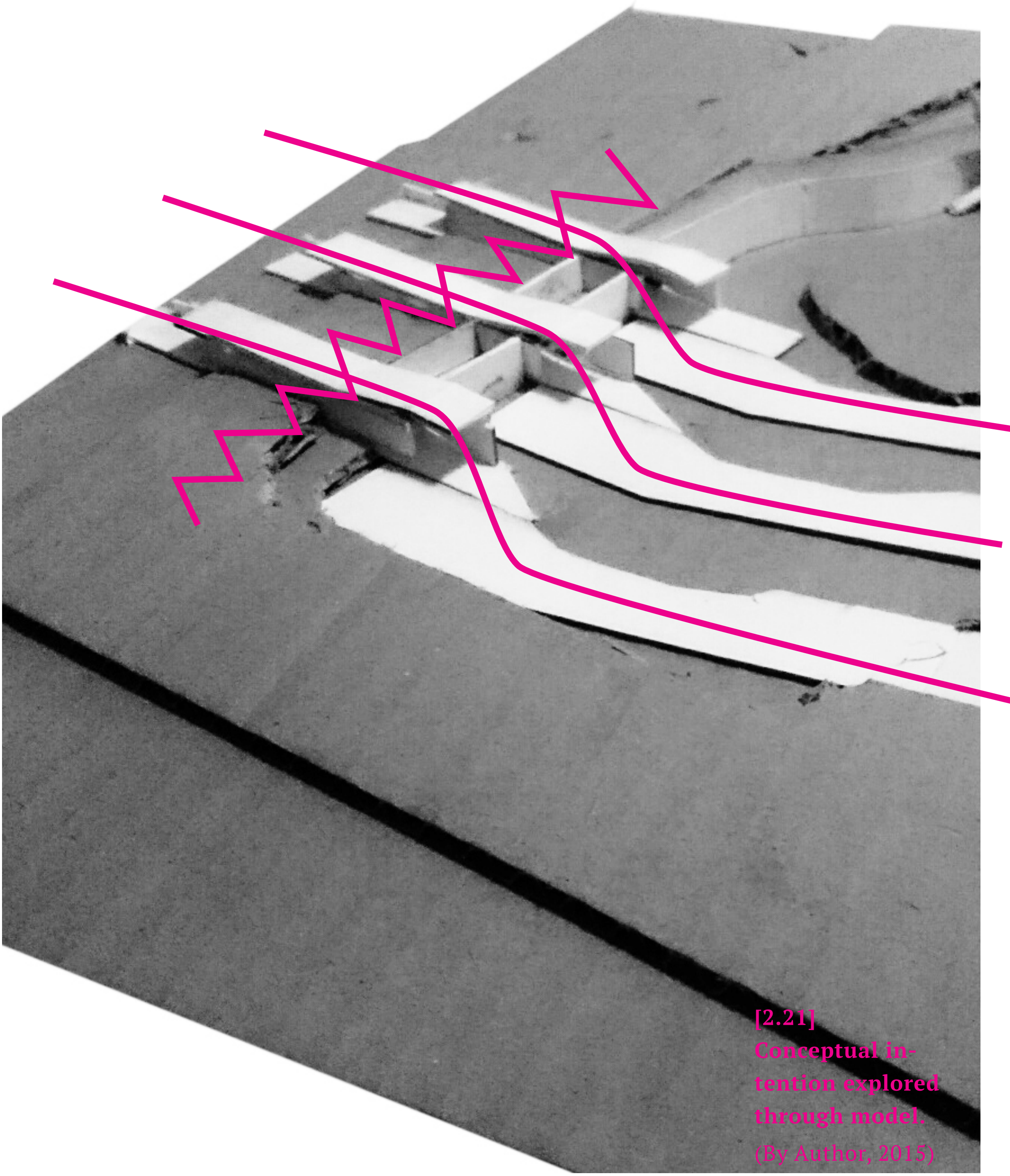
Service cores:

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.



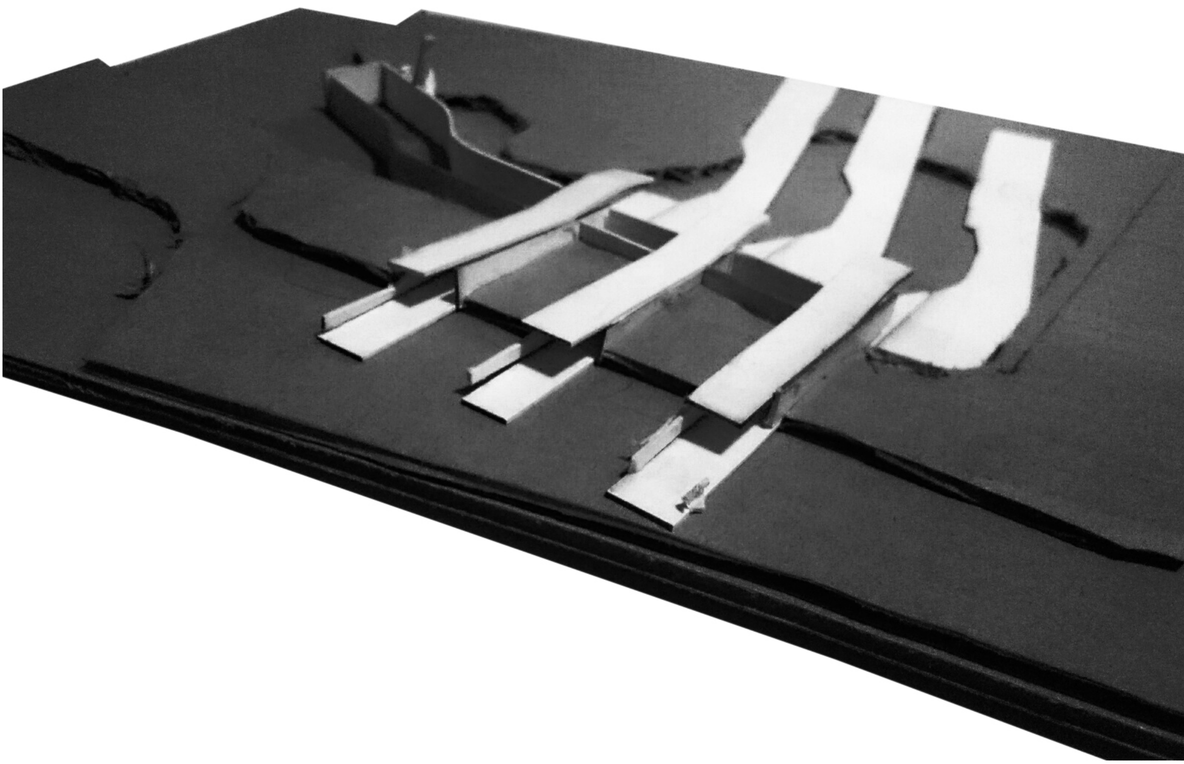




[2.21]
Conceptual intention explored through model.
(By Author, 2015)

Design development:

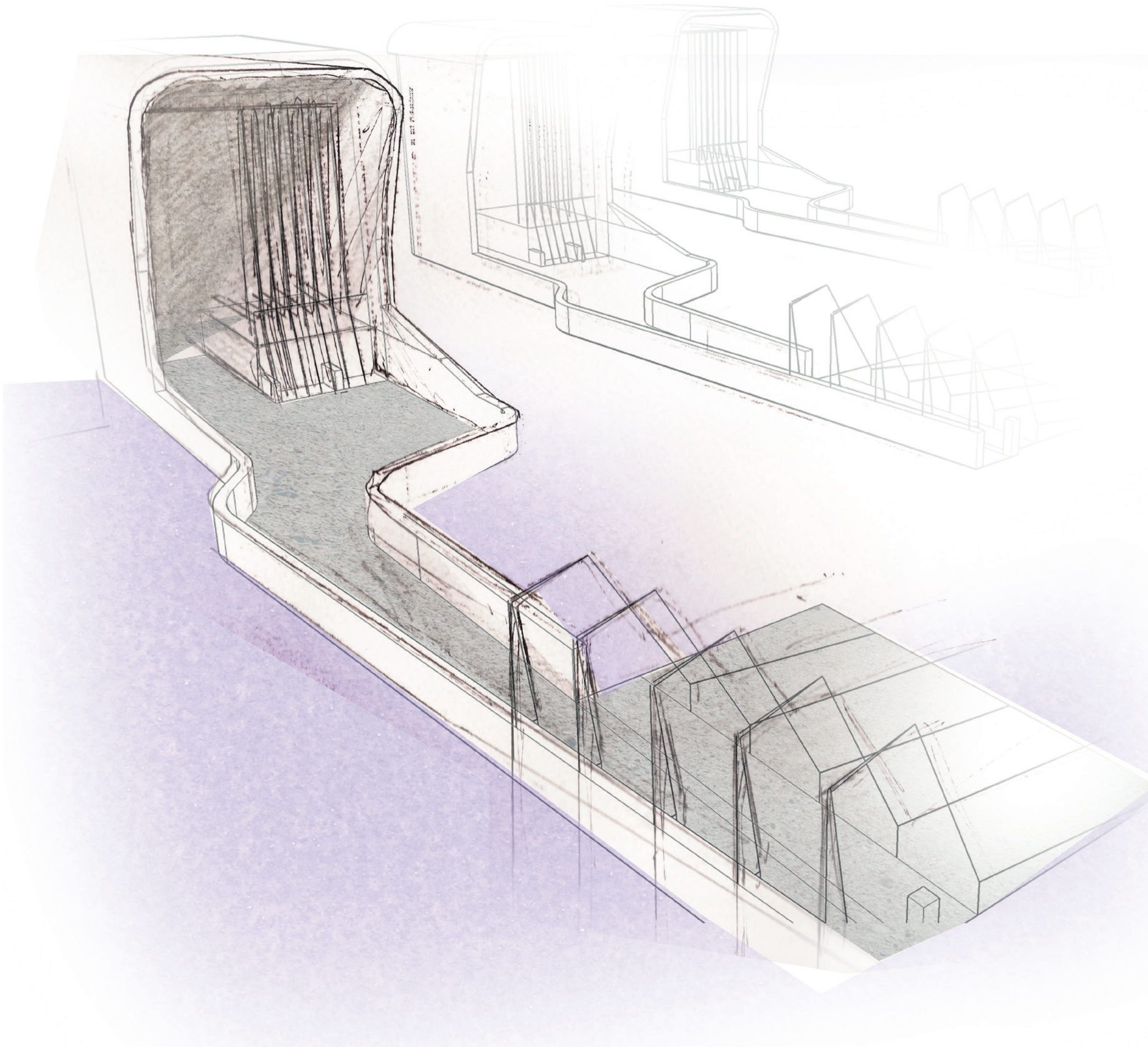
Initial explorations revolved around establishing a strategy for the architecture to mediate exchanges on the edge of the landfill while infrastructural landscape element would mine the objects. The resulting structure was a series of infrastructural spines that cut through the edge of the landfill while 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)

[2.23]
Conceptual spatial exploration.

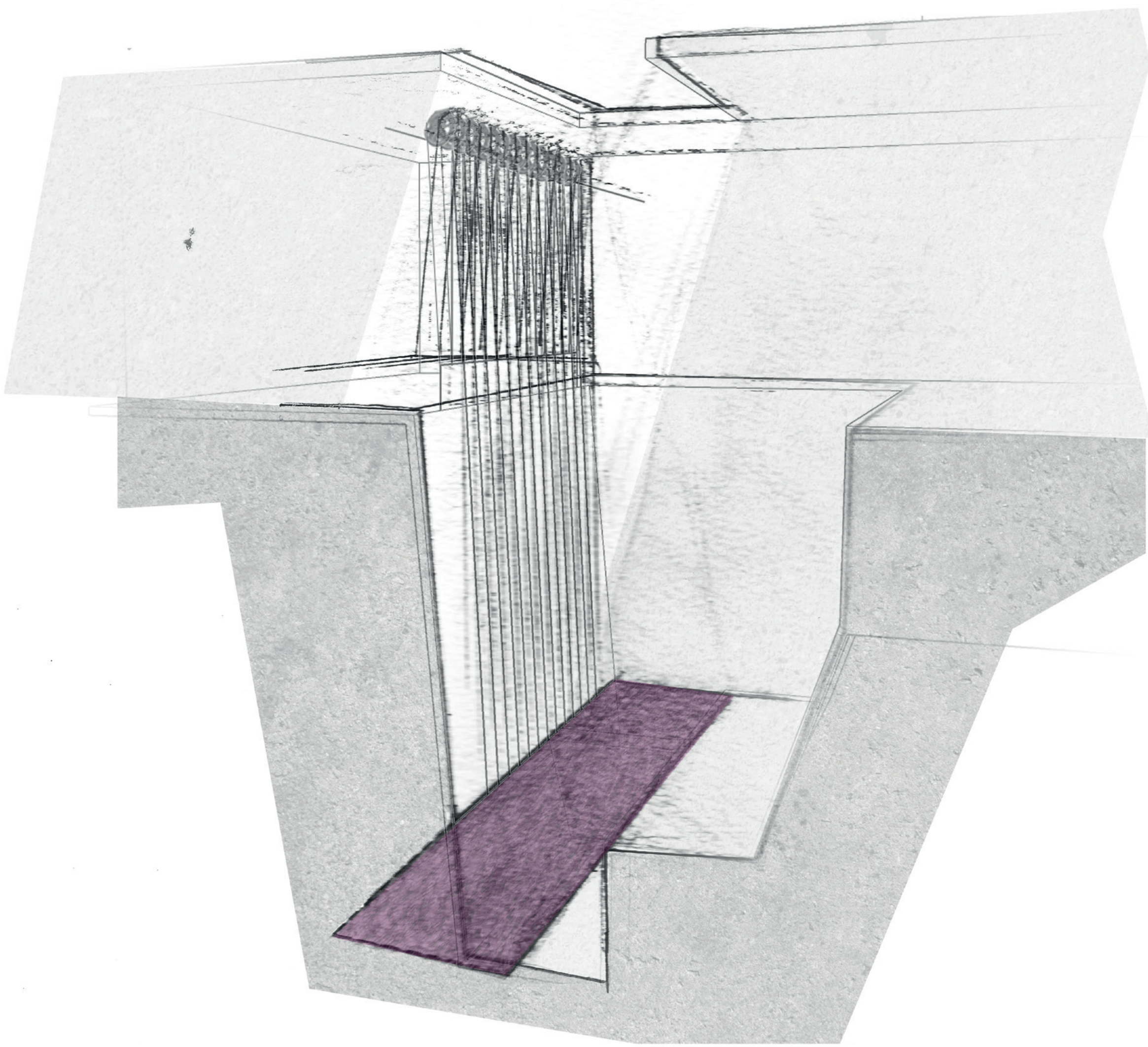
(By Author, 2015)

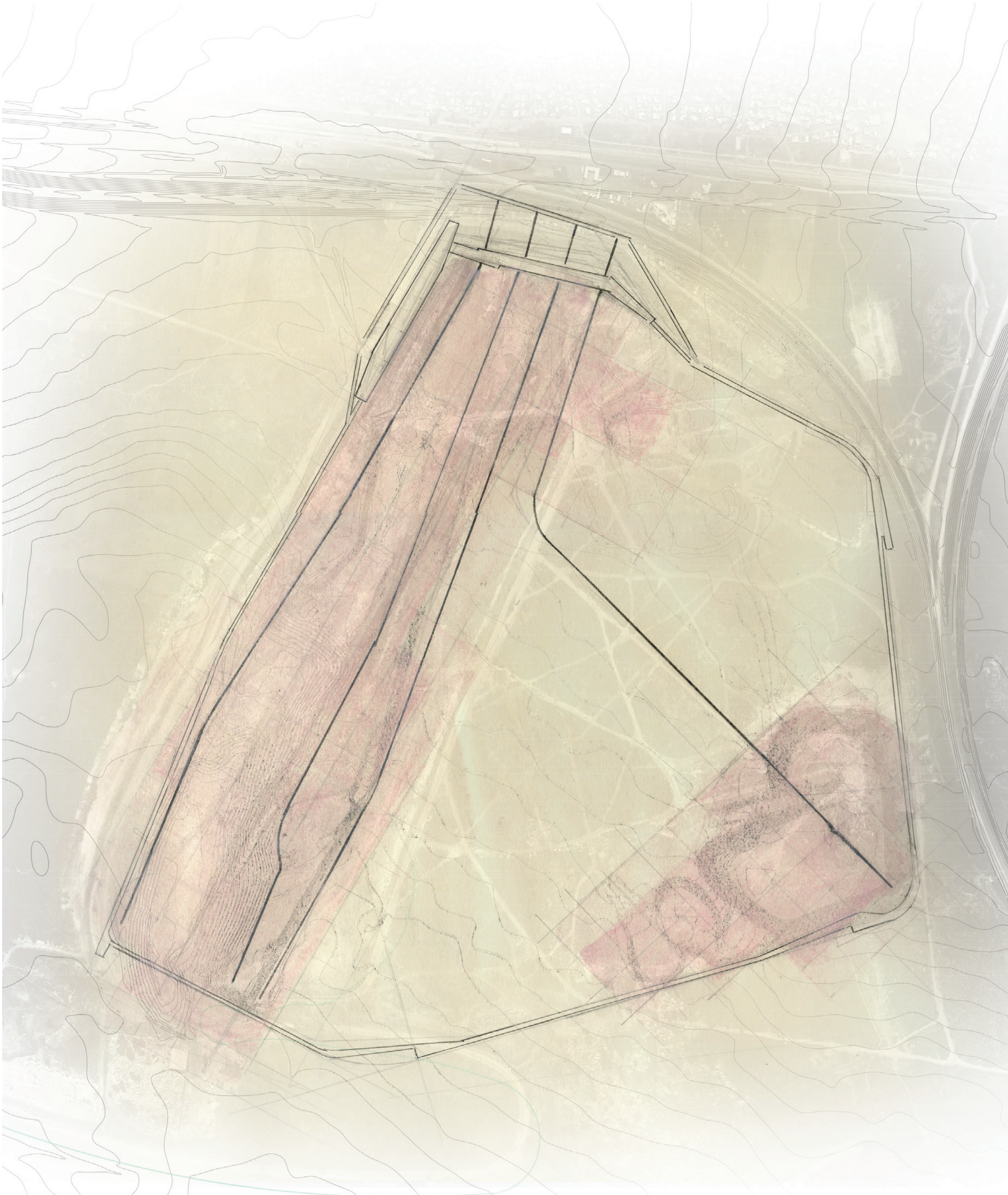


[2.24]
Conceptual spatial exploration.

(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.



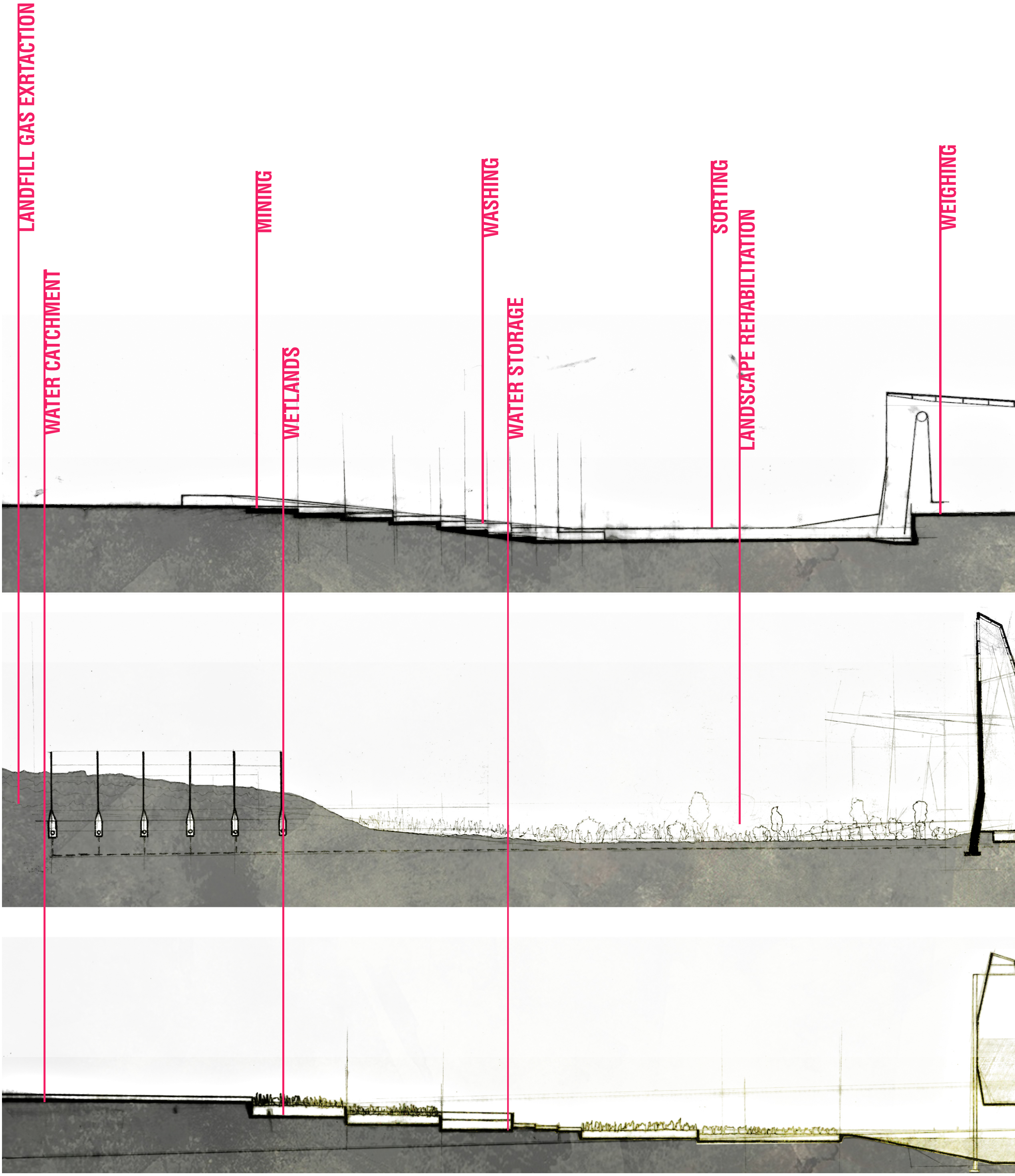


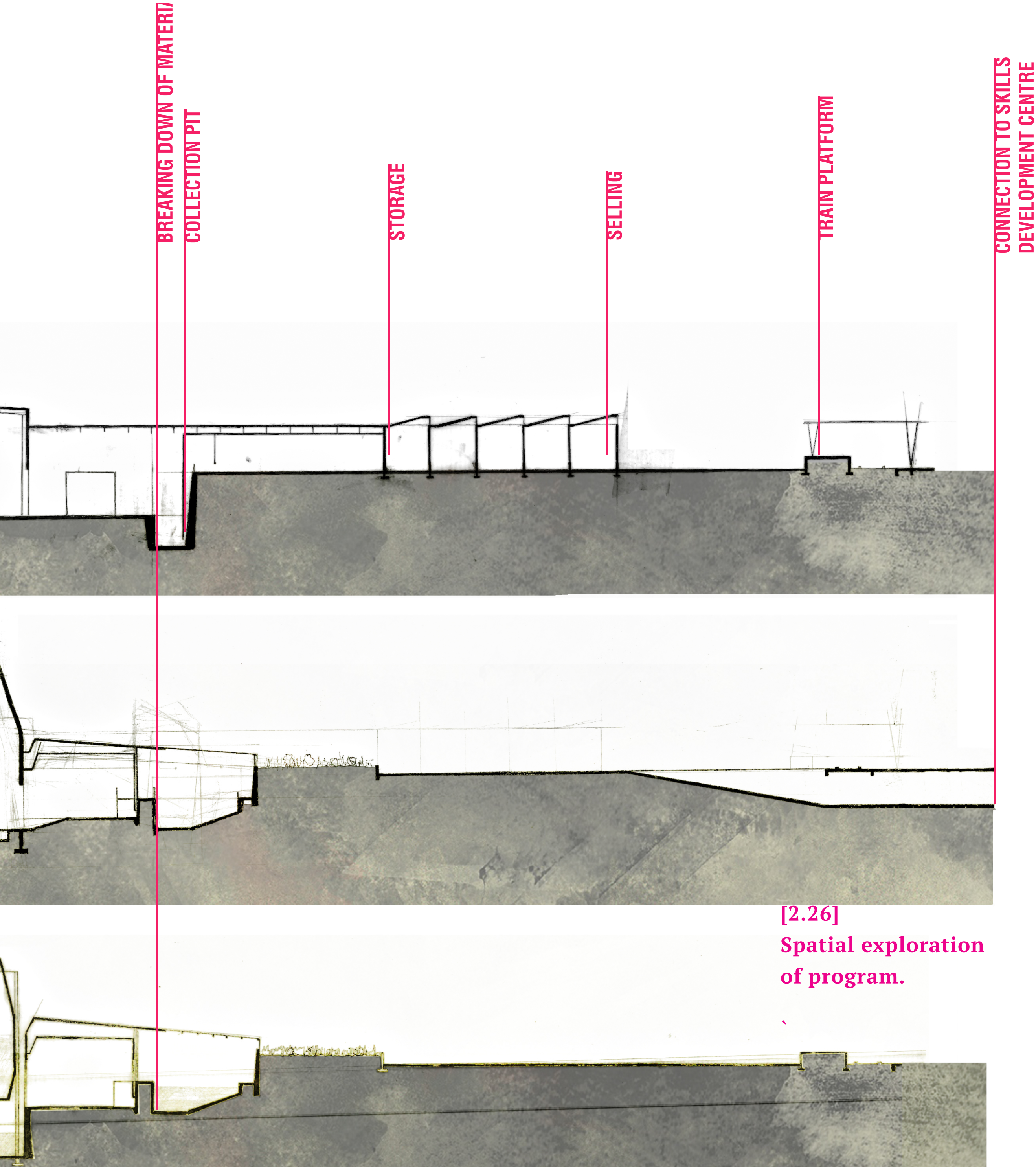
Following, explorations revolved about establishing a strategy for the whole site. The northern and western edges where chosen for architectural intervention as it is spaces that are most active, at the same time connecting to the proposed commercial as well as production spine, proposed in the framework. 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)


LANDFILL GAS EXRTACTION
WATER CATCHMENT
MINING
WETLANDS
WASHING
WATER STORAGE
SORTING
LANDSCAPE REHABILITATION
WEIGHING



[2.26]
Spatial exploration of program.

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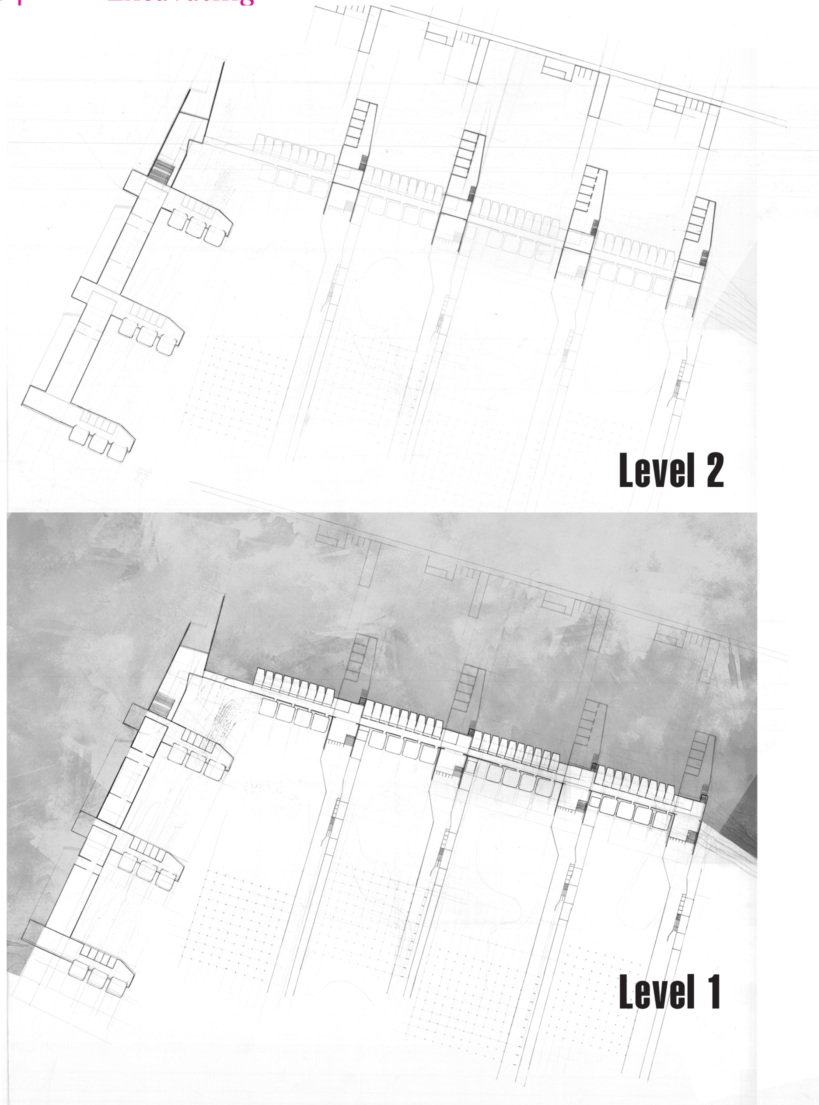
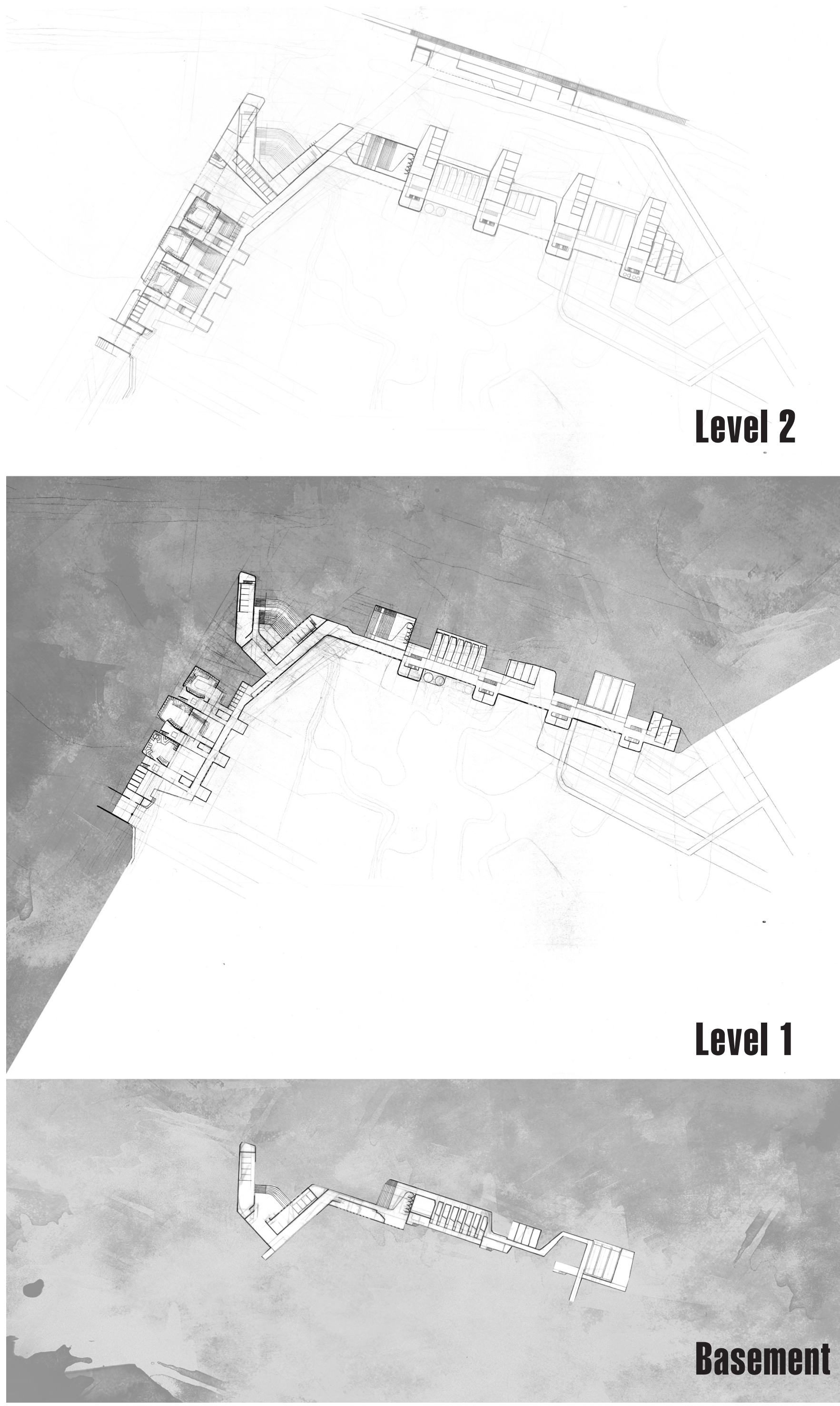
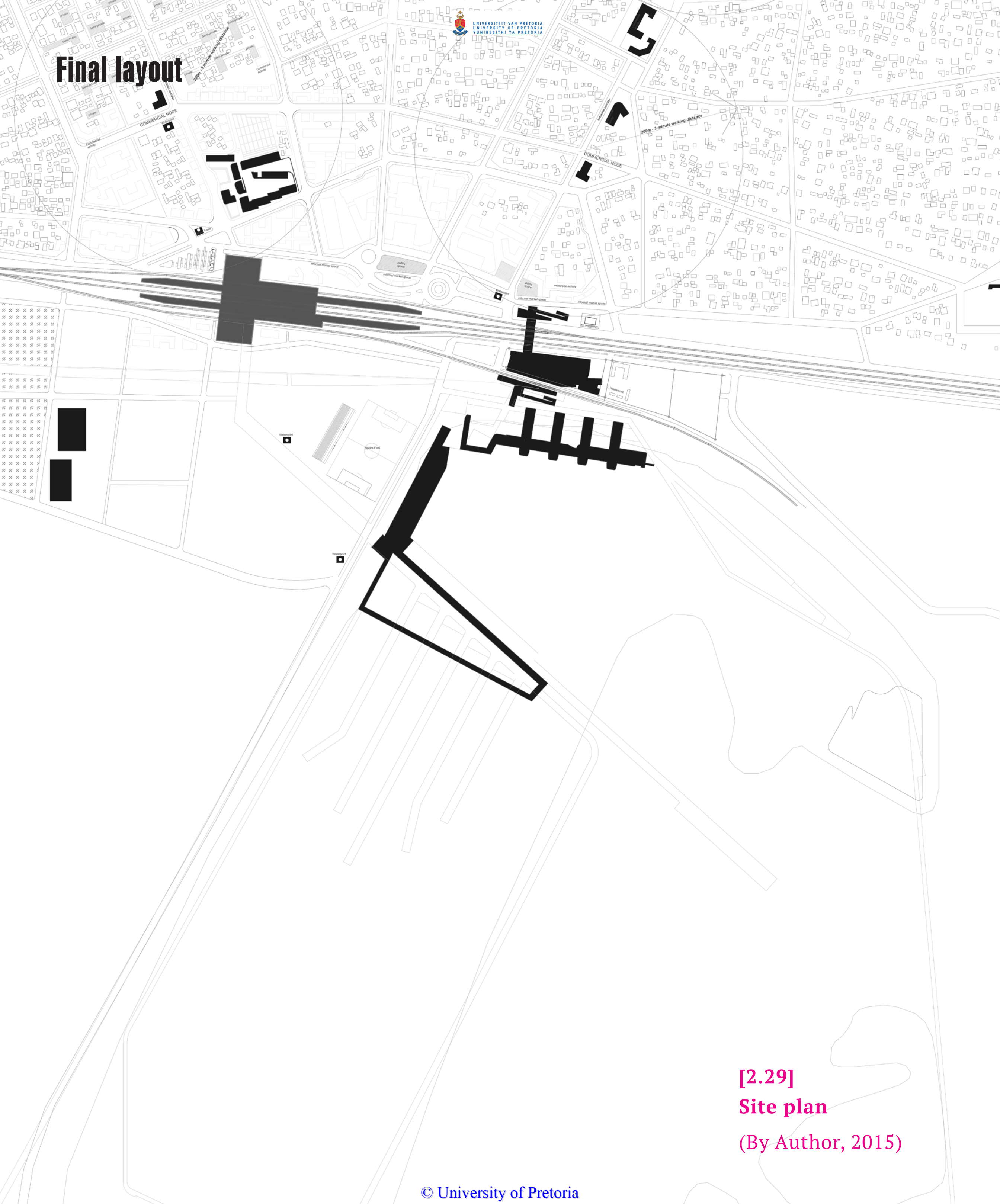


[2.27]
Iteration 1 plan.
(By Author, 2015)

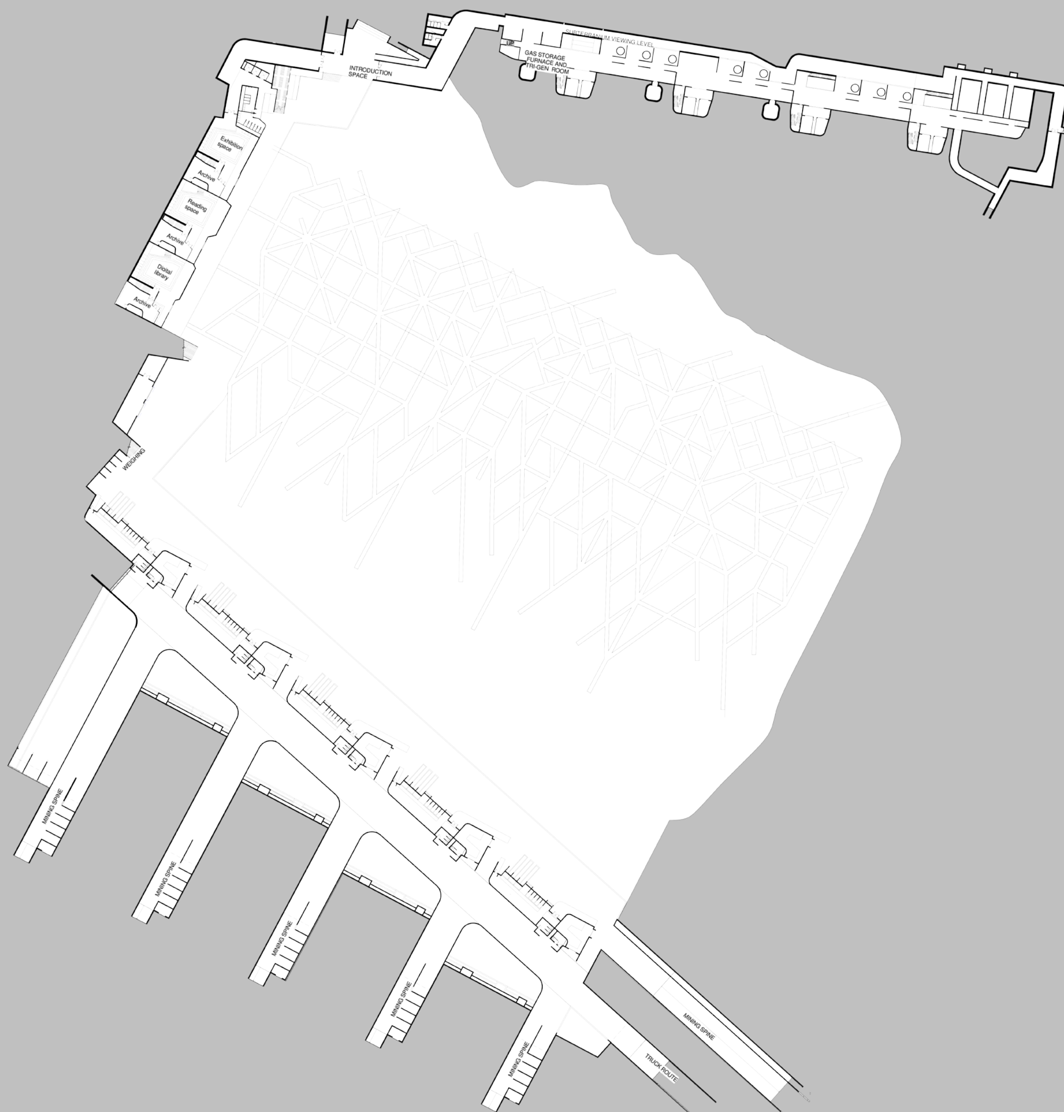
[2.28]
Iteration 2 plan.
(By Author, 2015)



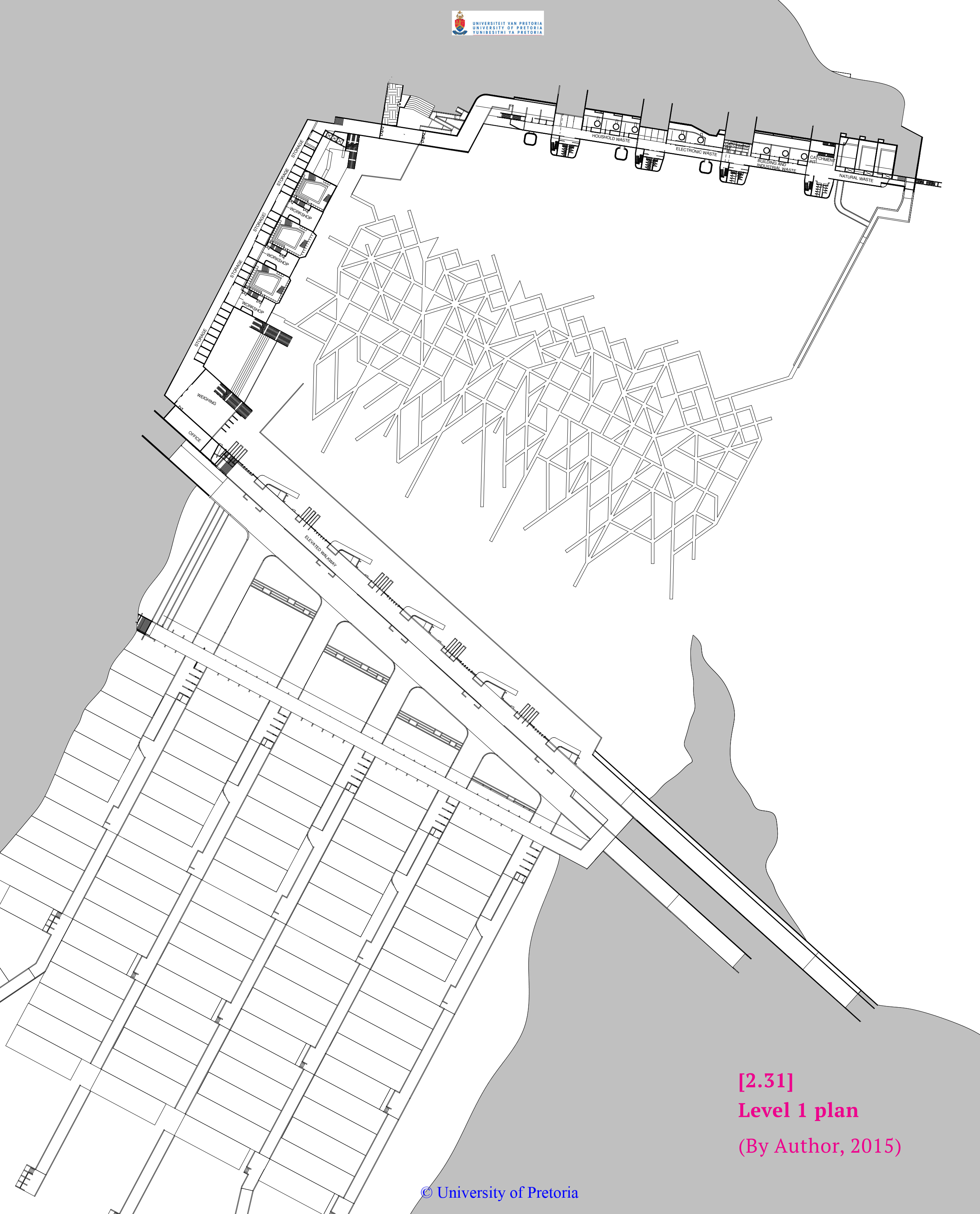
Final layout



[2.29]
Site plan
(By Author, 2015)

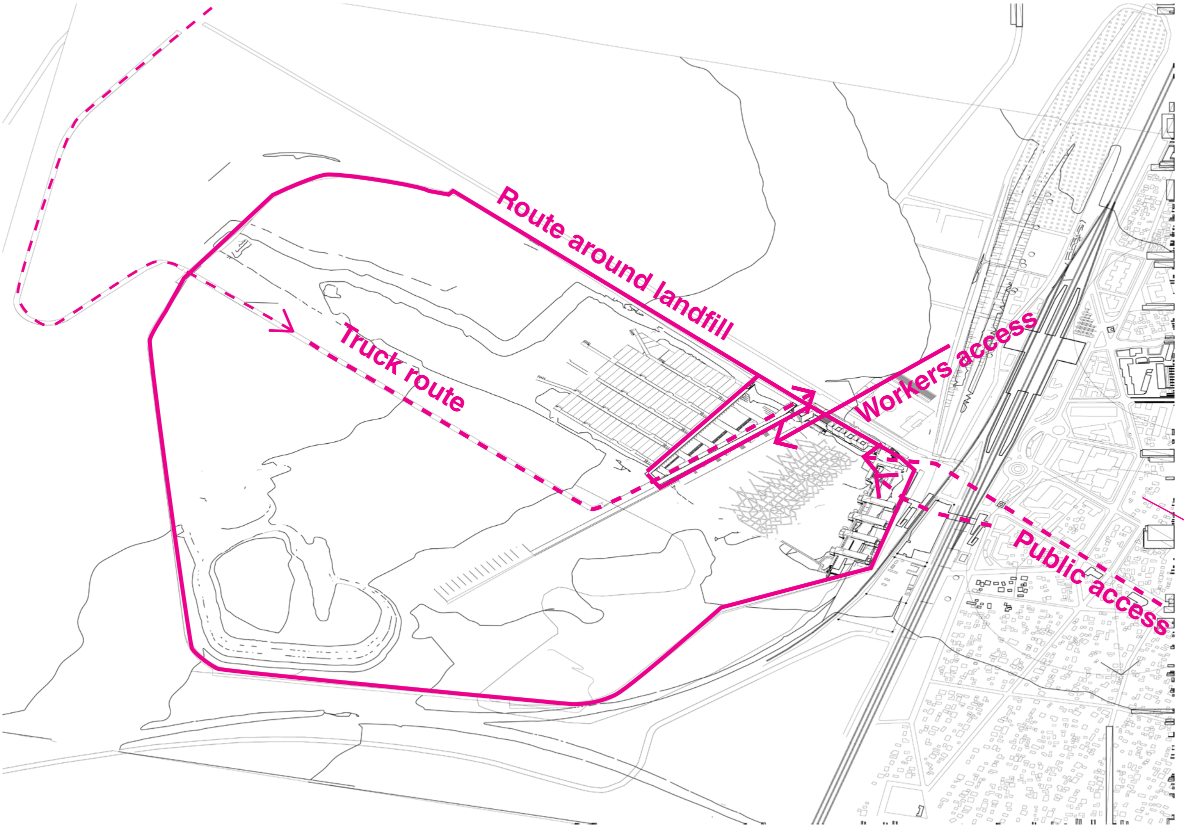


[2.30]
Basement plan.
(By Author, 2015)

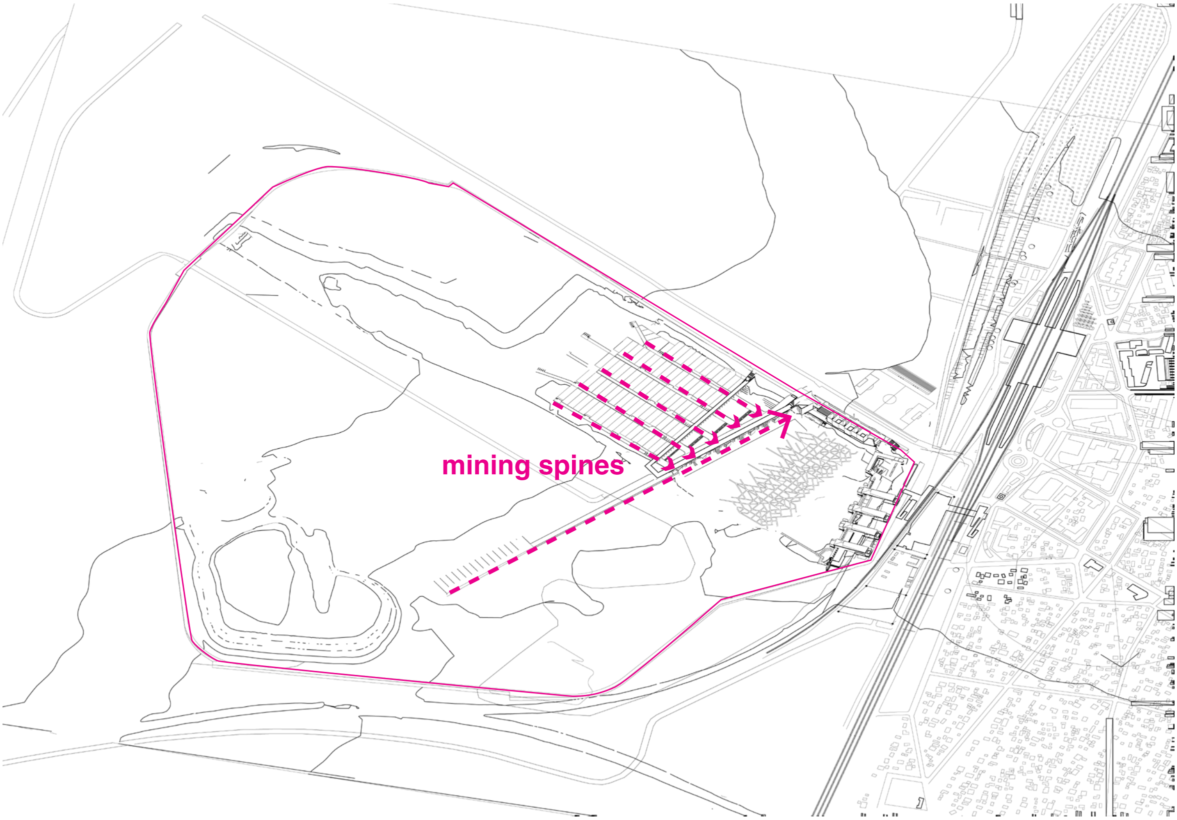


[2.31]
Level 1 plan
(By Author, 2015)

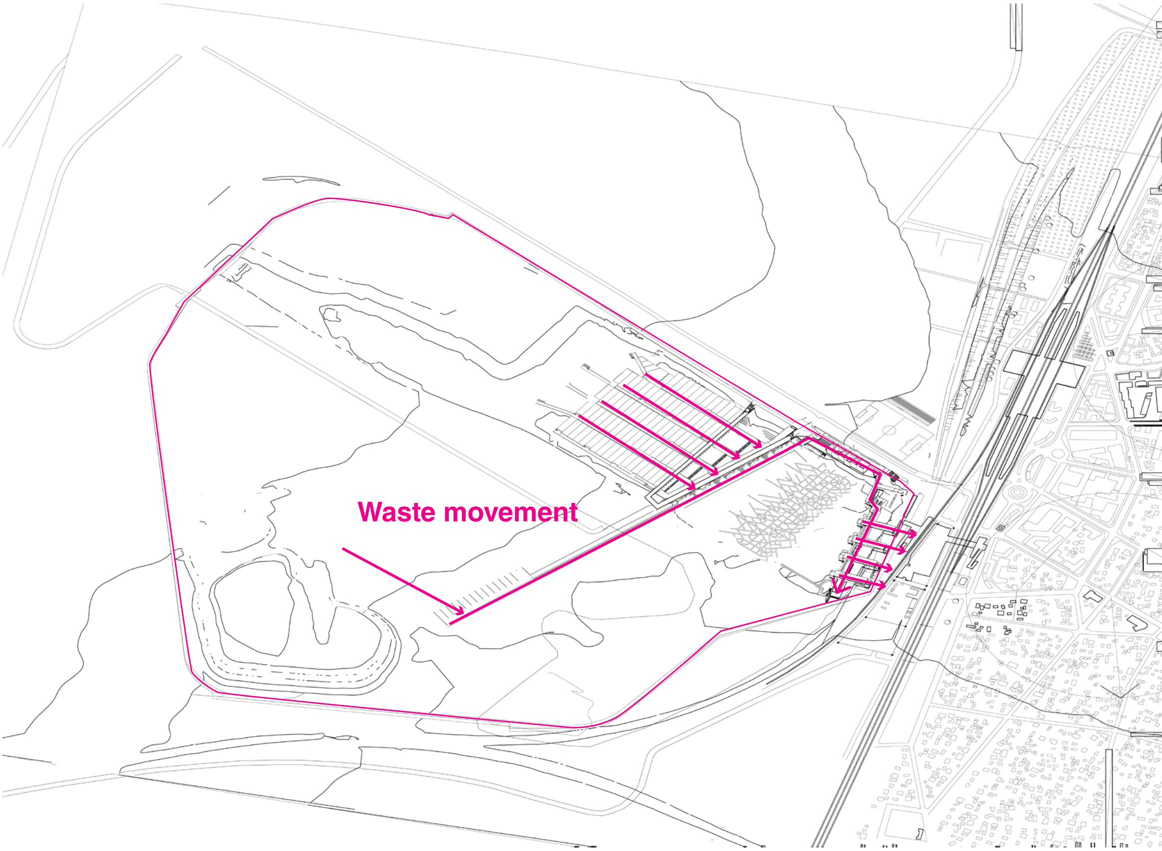
[2.32]
Level 2 plan
(By Author, 2015)



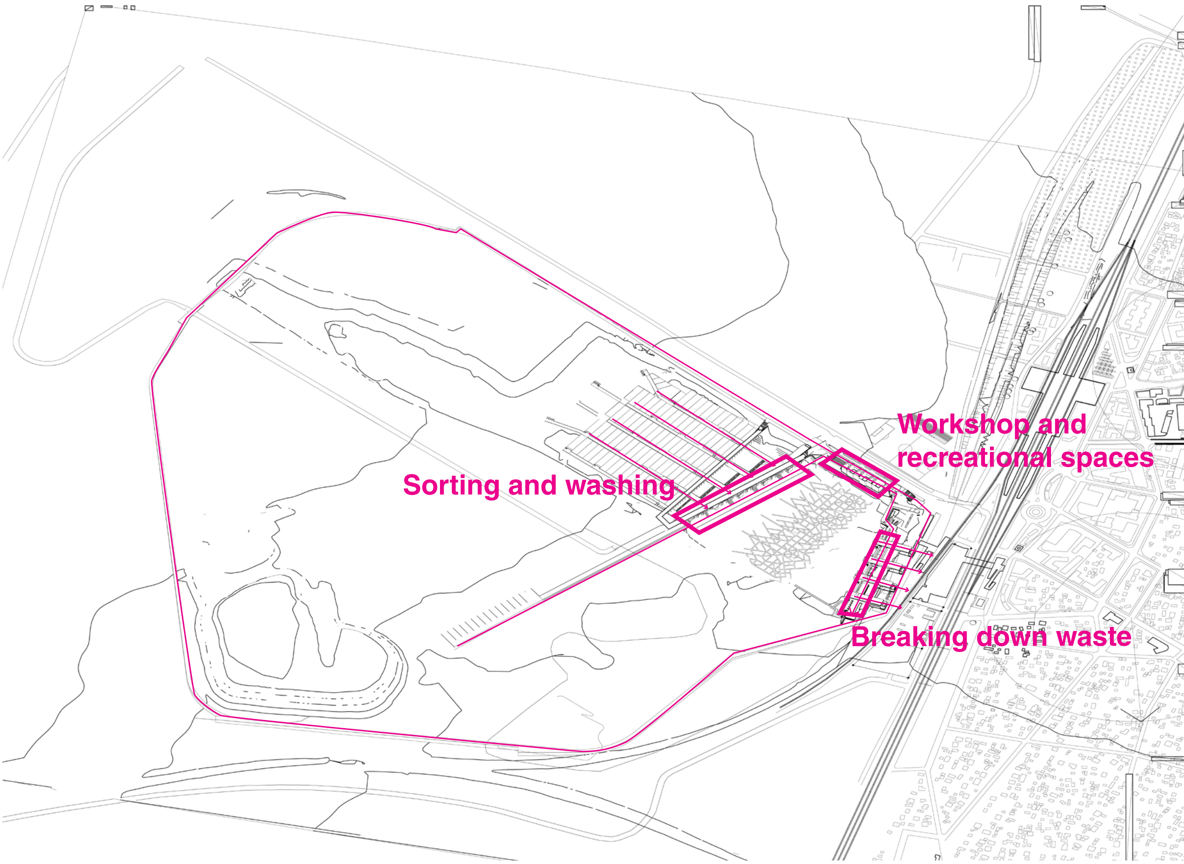
[2.32]
Landfill access
(By Author, 2015)



[2.34]
Mining spines
(By Author, 2015)

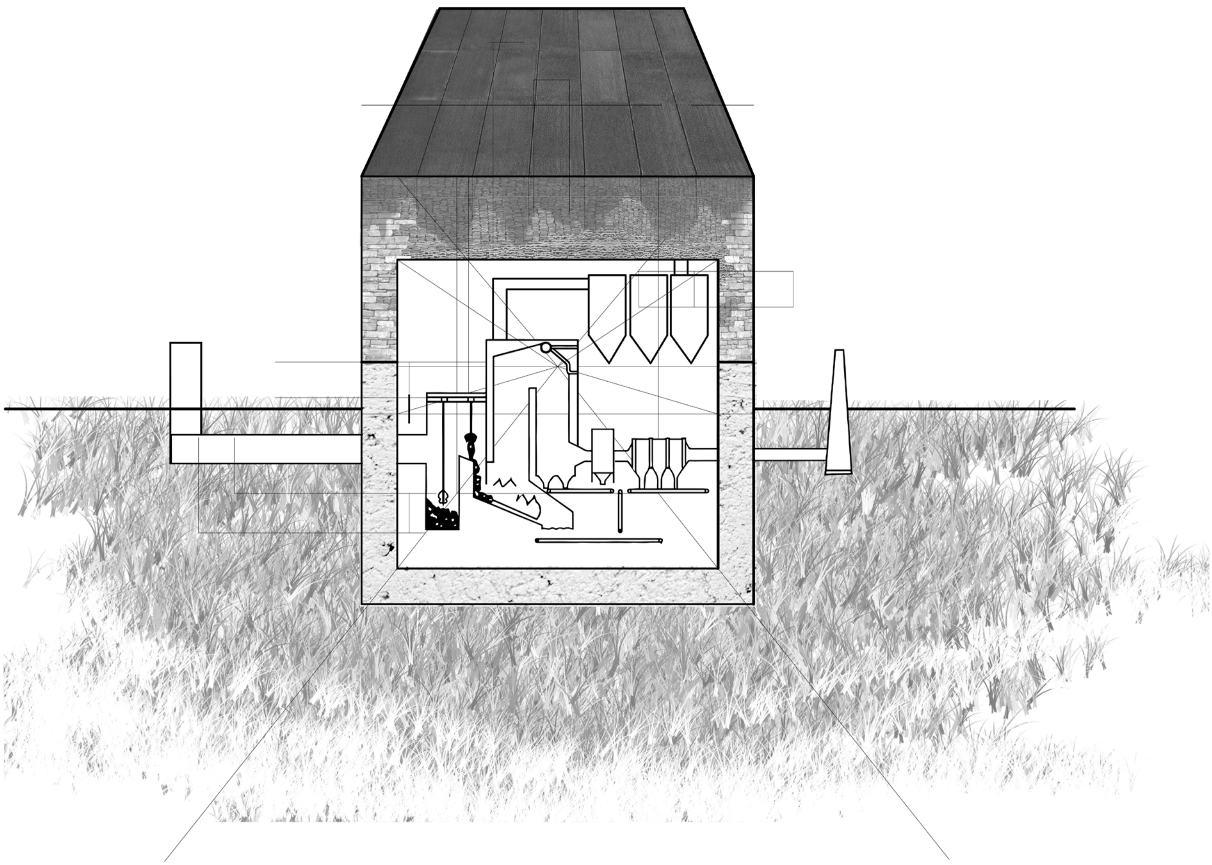


[2.35]
Waste movement
(By Author, 2015)



[2.36]
Processes
(By Author, 2015)

[2.37]
Public programs
(By Author, 2015)



[2.38]
Conceptual approach
(Author, 2015)

EXCAVATING TECHNOLOGIES

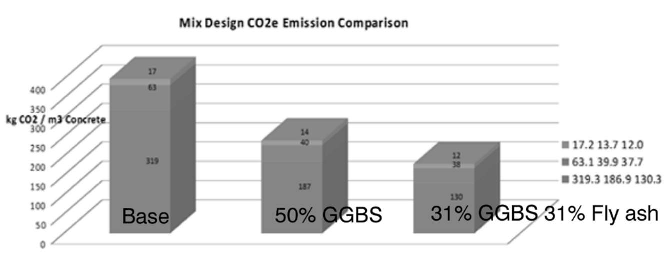
The concept of memory and decay is taken through to the technical investigation. The overall strategy is to use stereotypic elements that cut and carve into the landscape, leaving a memory on the site while contrasting it with tectonic element that express specific functions and are allowed to decay 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.

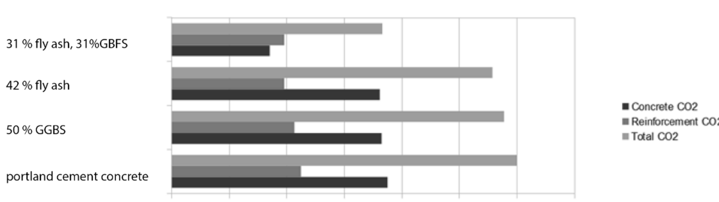
GGBS concrete or limestone concrete

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)

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.

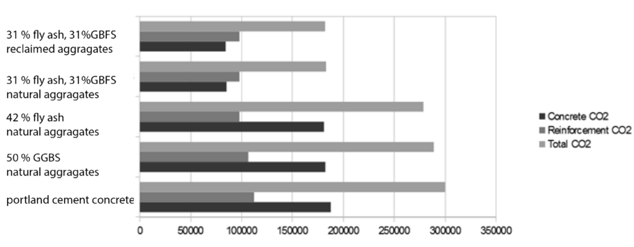
Site mixed concrete Mix Density of 1.0 m3 of concrete (kg) | 2,360 | Note: Density close to industry rule of thumb of 2 400 kg/m3.

A

	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
	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.						

B

	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
	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.						



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

(Author, 2015)

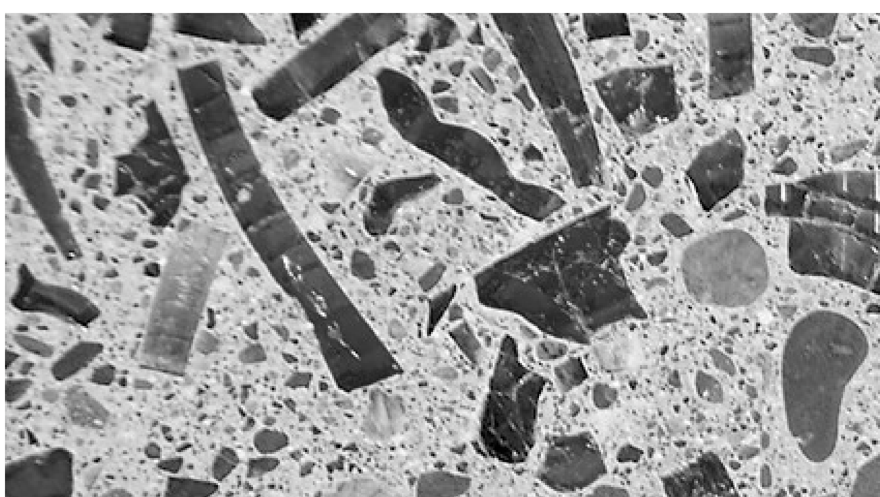
The use of reclaimed aggregates is also investigated in constructing the concrete. Various materials dumped on site can be used as aggregates in concrete such as slag, crushed glass and crushed concrete. Using slag has no negative impact on the performance of the concrete. Using crushed concrete as aggregate, 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)




[2.44.1]


[2.44.2]


[2.44.3]


[2.44.4]


[2.44.5]

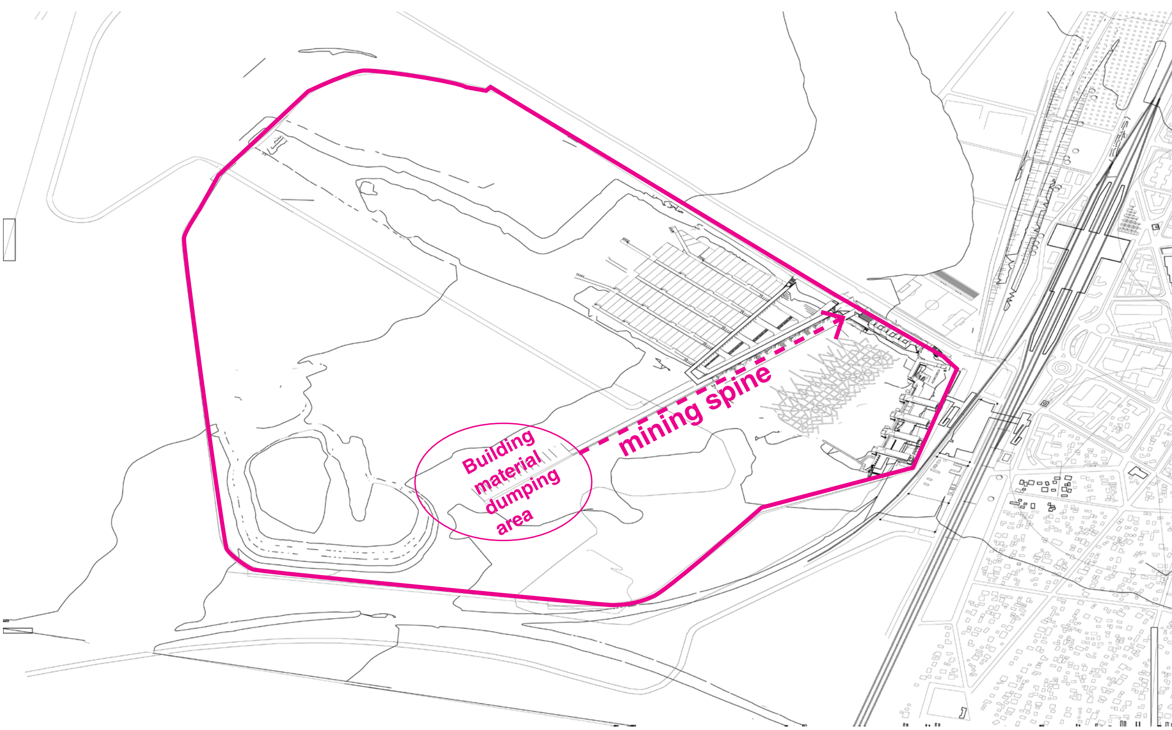

[2.44.6]

[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.



[2.44]
Ningbo museum exterior.

(Amateur Architecture, 2013)

[2.45]
Ningbo museum facade.

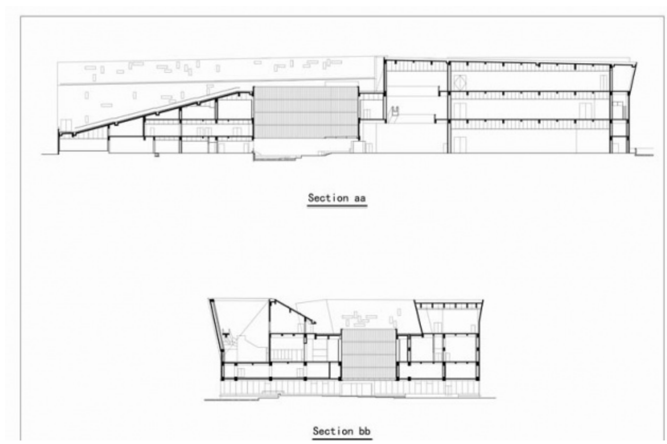
(Amateur Architecture, 2013)

[2.46]
Detail of Ningbo museum facade.

(Amateur Architecture, 2013)

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)

[2.49]
Acid washed steel.

(I. Bergera, 2011

[2.50]
Acid washed steel.

(M. Garzaniti, 2005)

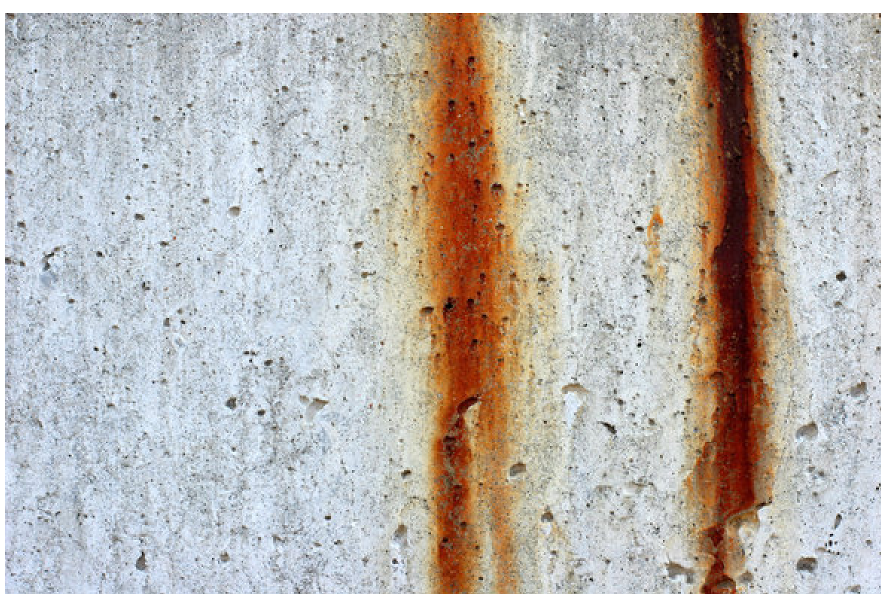
Steel:

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)




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]

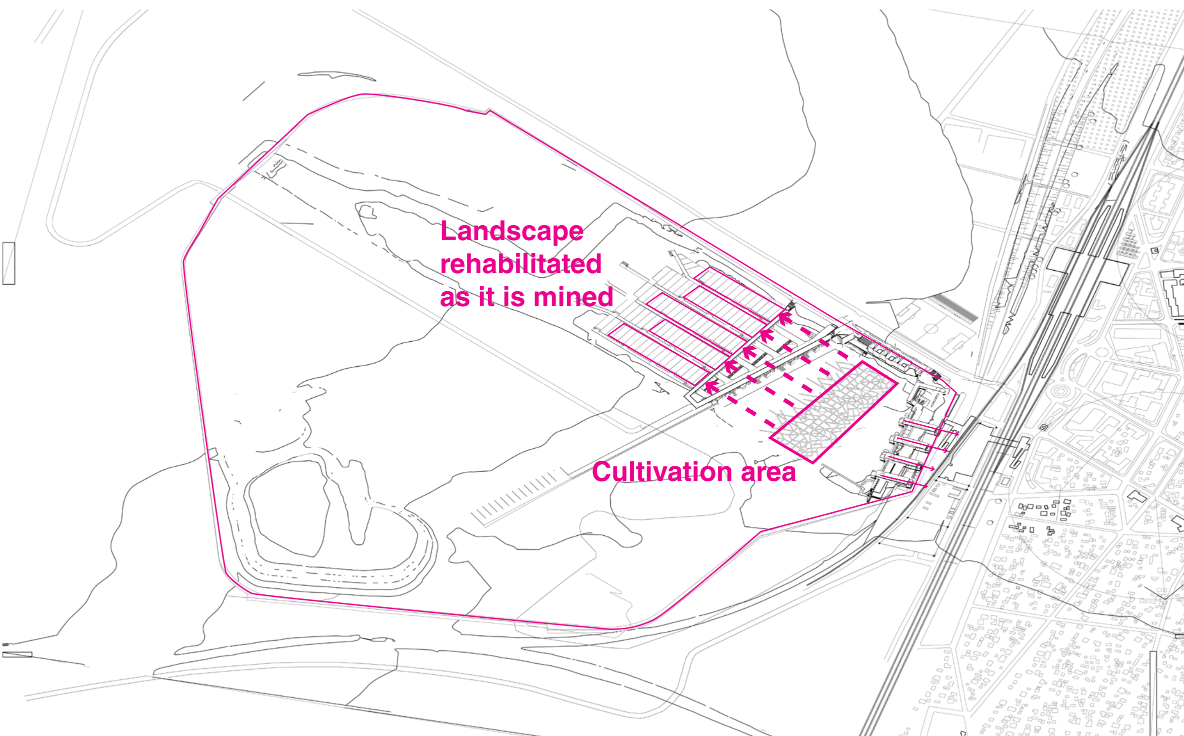

ERASROSTIS TEF [2.52.6]

[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)



PHRASMITES AUSTRALIS [2.54.1]

TYPITA CAPENSIS [2.54.2]

CYPERUS PROLIFER [2.54.3]

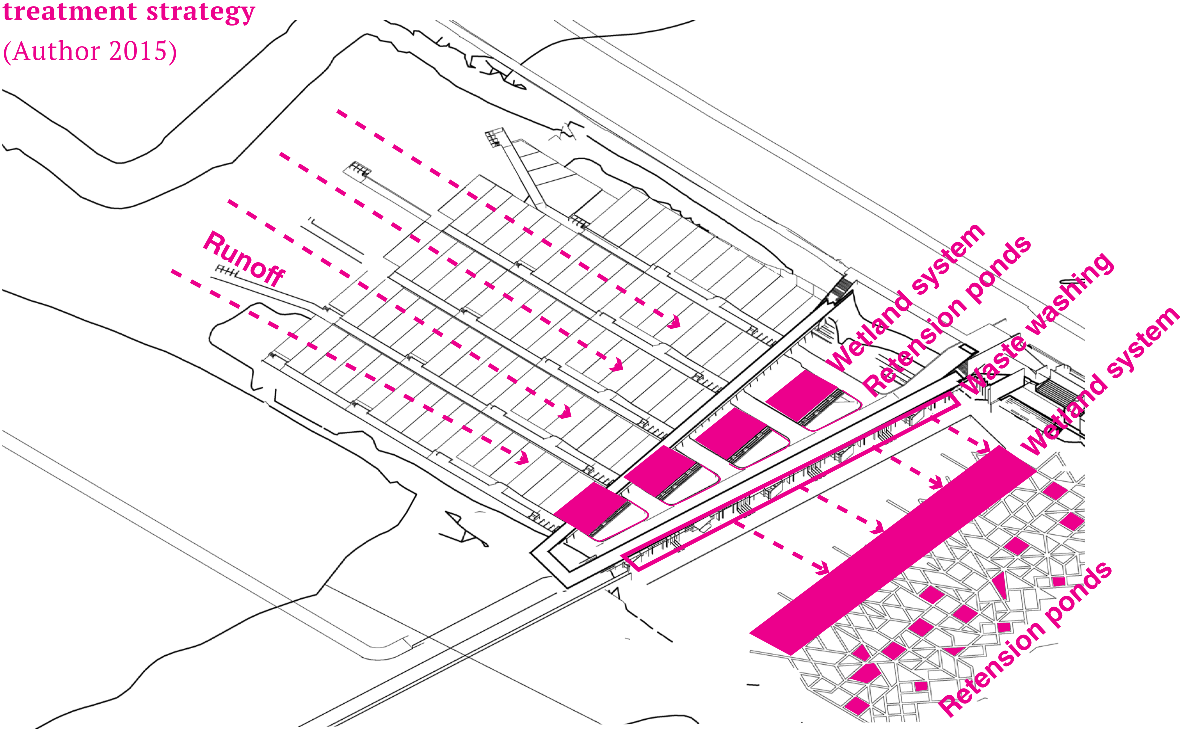
CYPERUS SEXANSULARIS [2.54.4]

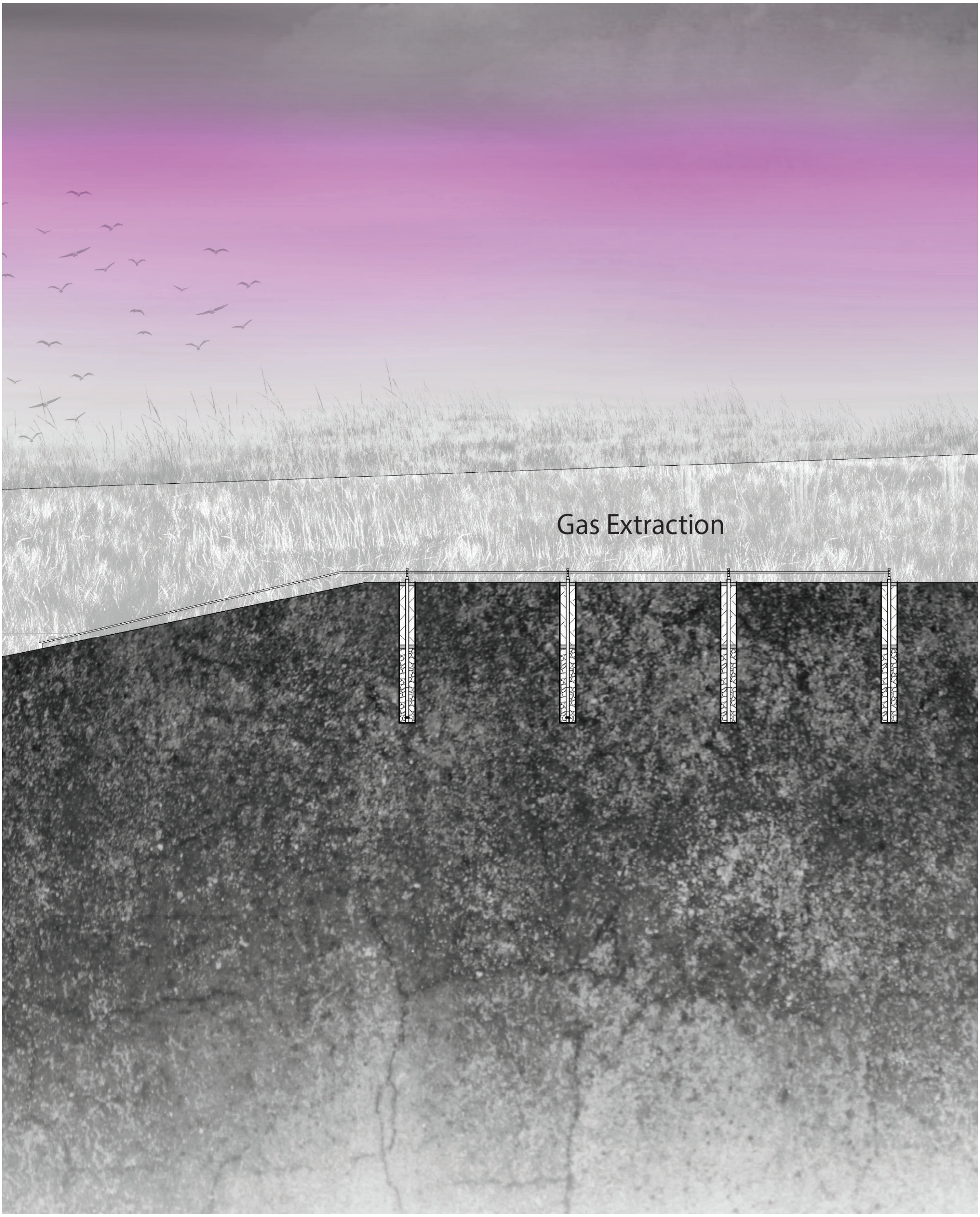
[2.54]
Proposed wetland species for land-scape rehabilitation

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)




Gas Extraction

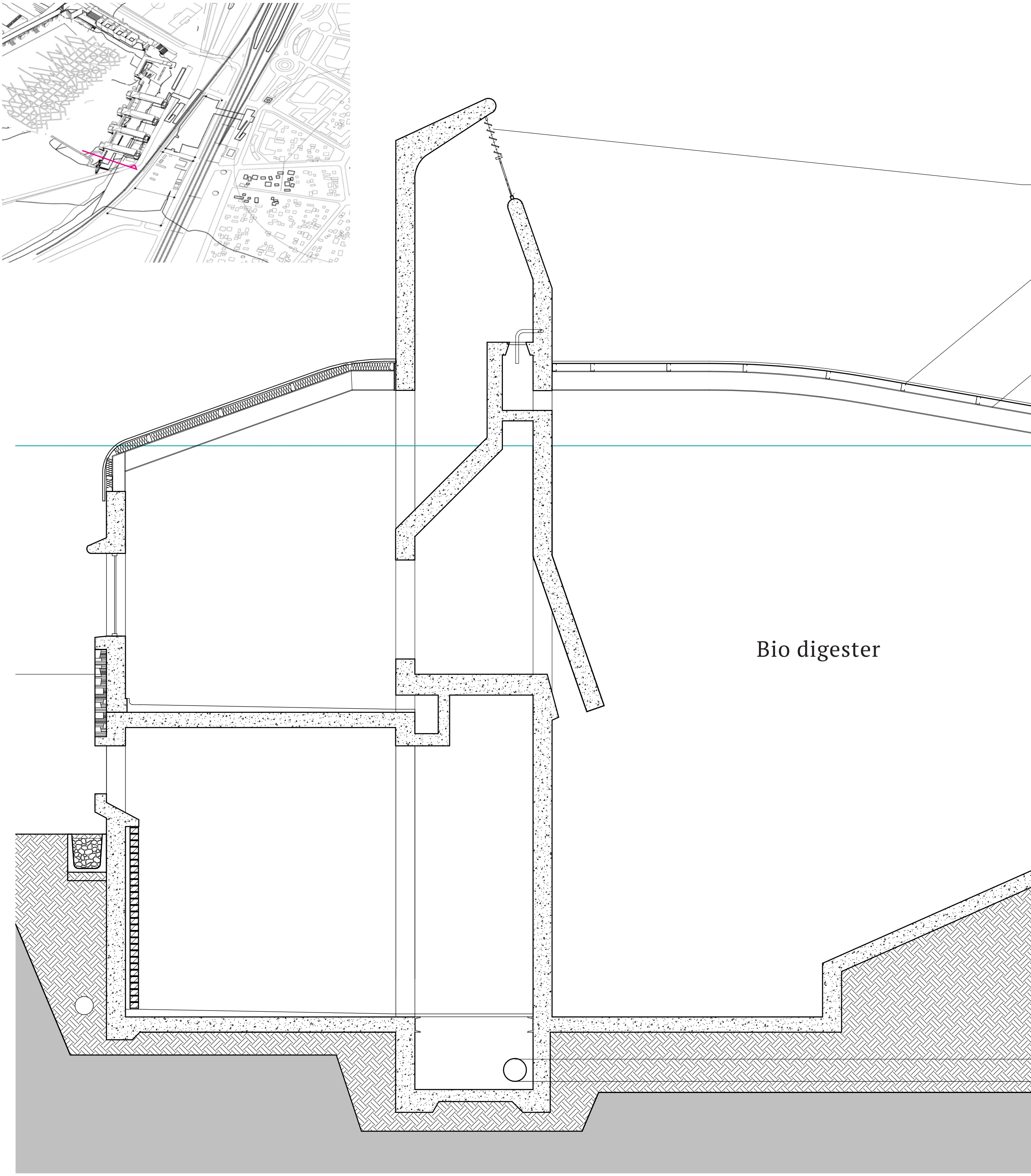
[2.56]
Gas Extraction system
(Author 2015)

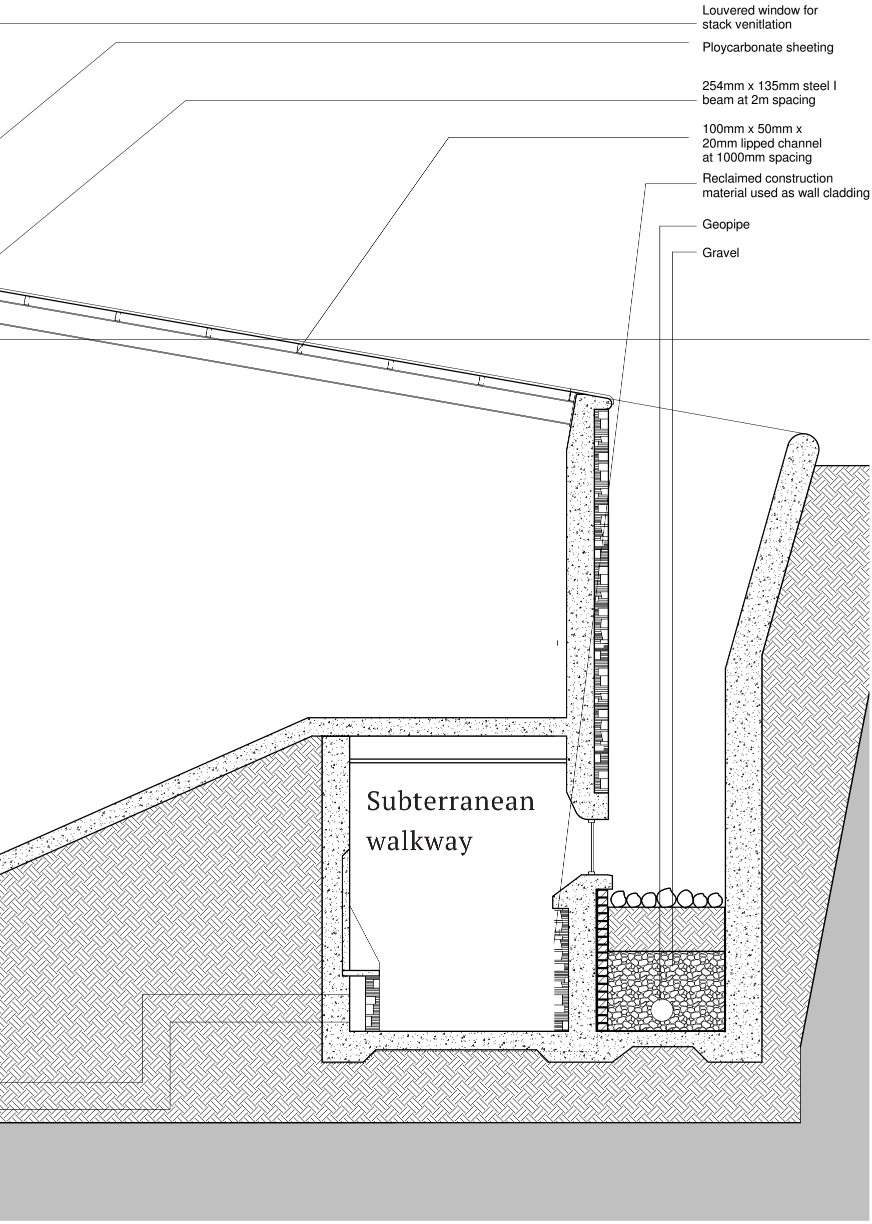
ENERGY

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)

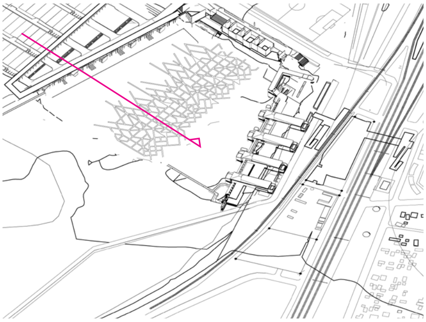

Bio digester

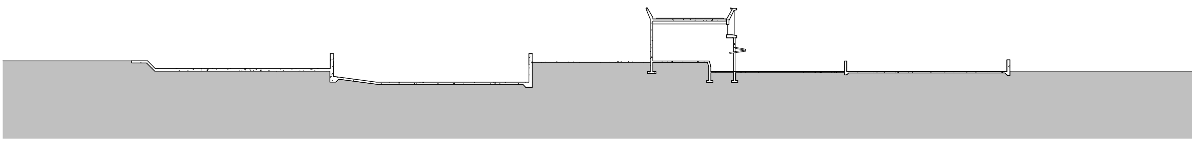


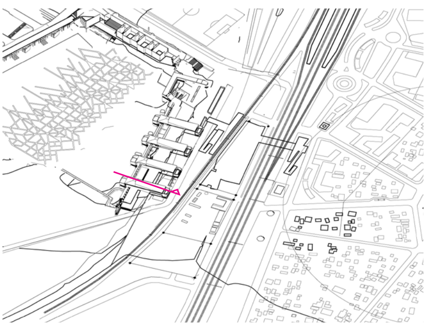
[2.58]
Section development
(Author 2015)

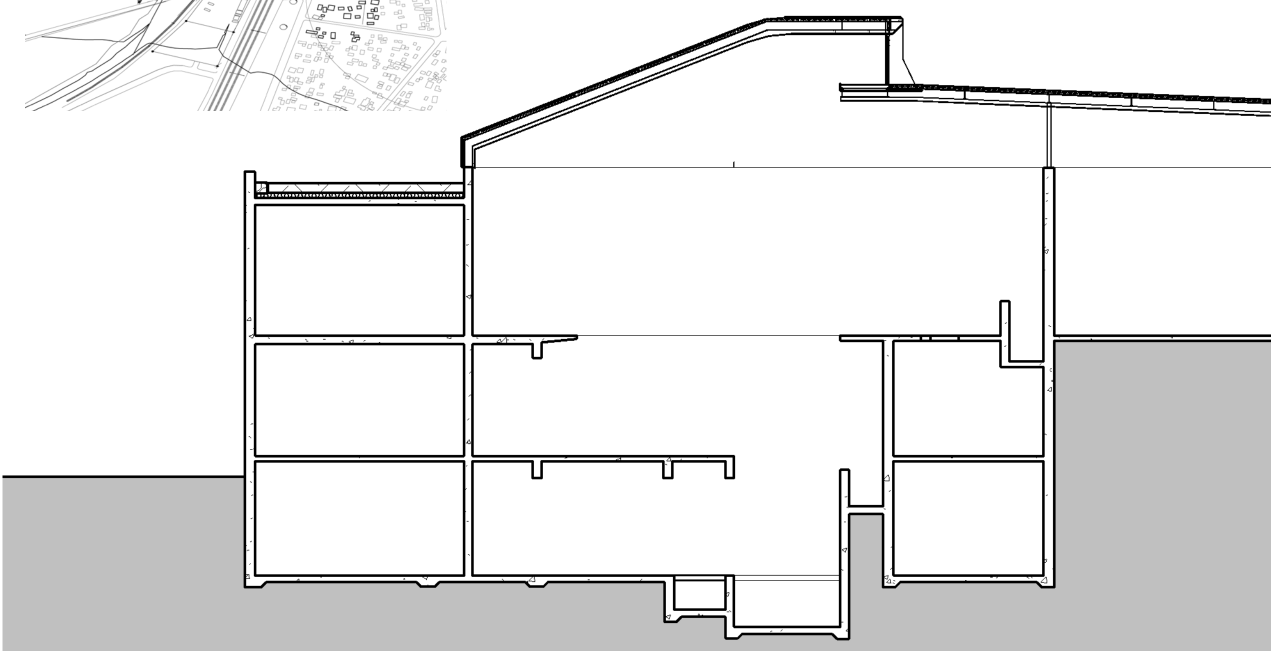
In developing the sections, a double skin wall is proposed to run along the centre of the northern wing of the building, to separate noisy and possible smelly processes. The double skin wall is used bring light into the spaces as well as ventilating the adjacent spaces. The double skin wall also provides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

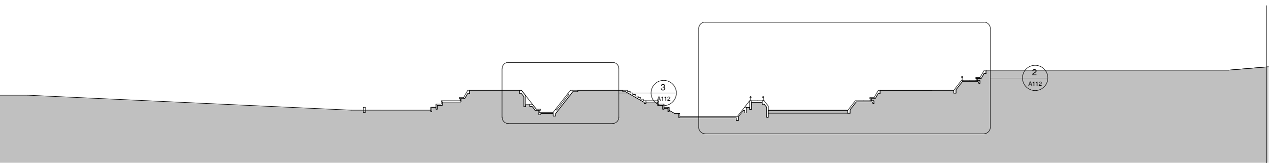








[2.59]
Section through wetland, sorting and washing facility and cultivated area.
(Author 2015)



[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.