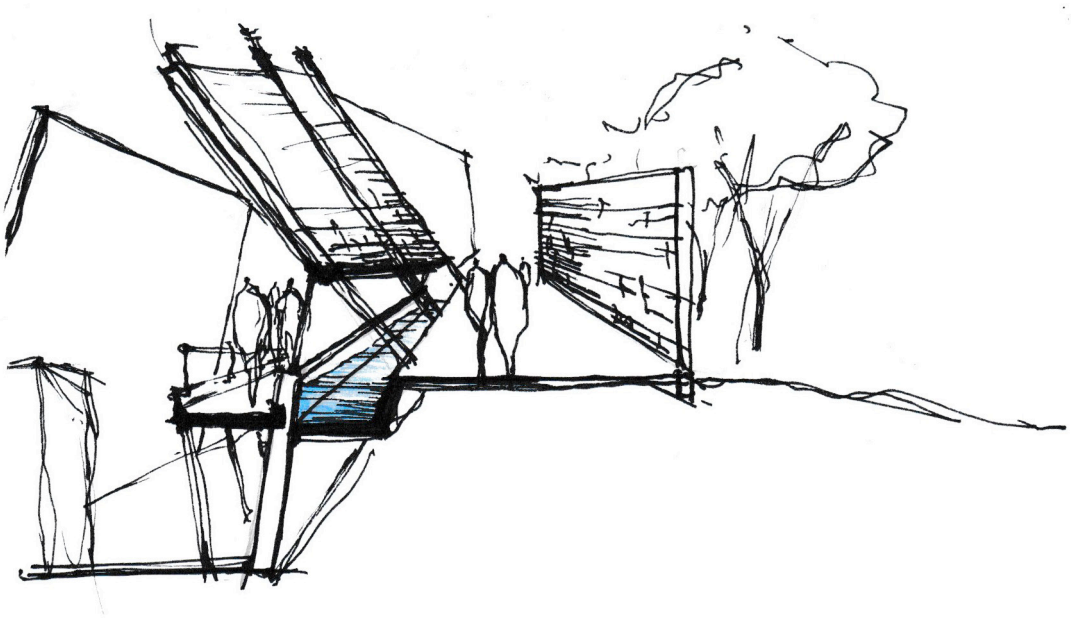


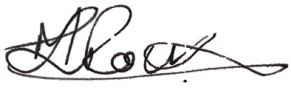
Tactile Memory

A haptic architectural approach is explored as a way of revitalizing the historic lime works in Olifantsfontein through the process of making ceramic works as an exhibitionist element.

Monique Le Roux
2013112541

This dissertation is in partial fulfilment of the requirements for the MArch.(Prof) degree.

University of the Free State
Department of Architecture



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Declaration:

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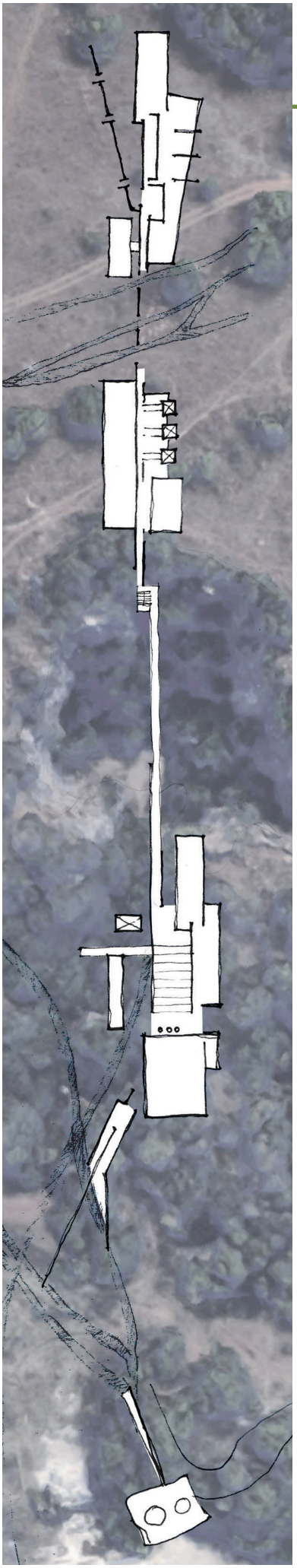


Preamble

This dissertation explores the reactions that architectural experience can elicit, specifically by means of sensory stimulation. William J Mitchell associates sensory stimulation with the recollection of memories (2005:8), which causes an enhanced experience through a layering of different times/moments (the current moment and the remembered time).

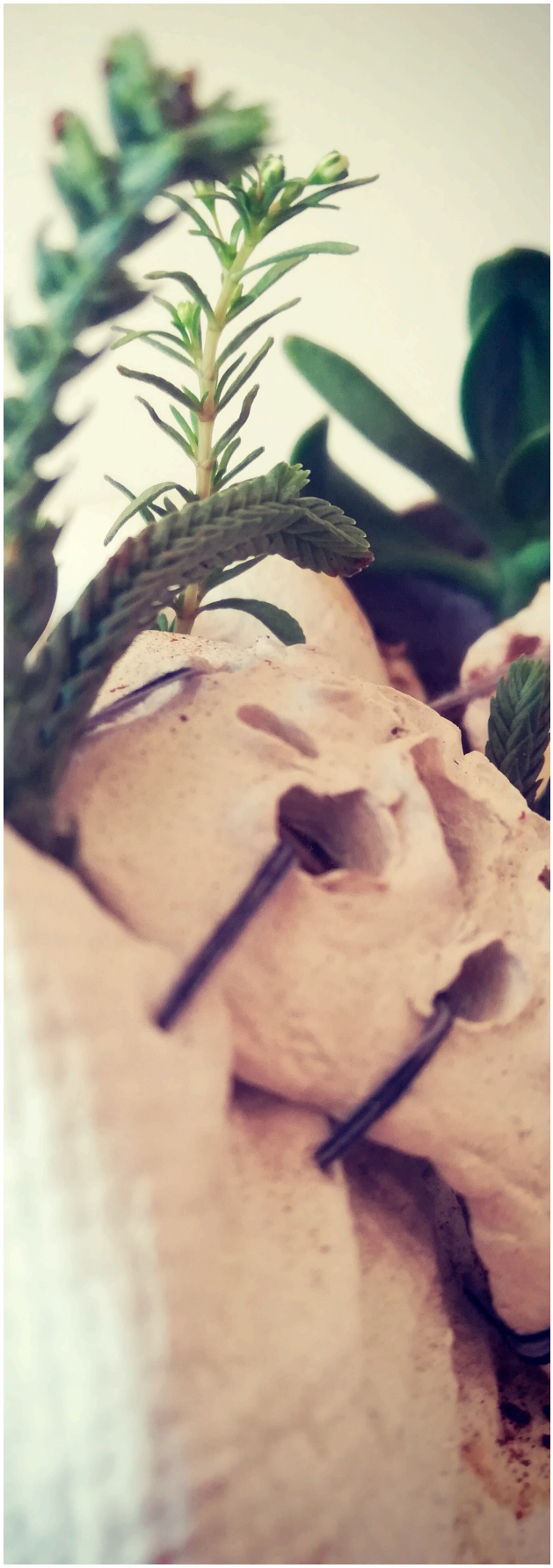
Time is an important factor in the exploration, and as such the research is focused on sites with layered historical narratives within the South African context. The art history and development of Olifantsfontein in Gauteng recently came to light with the publication of Olifantsfontein Potteries 1907-1962. The potteries were originally started by Cullinan as part of the Consolidated Rand Brick, Pottery and Lime Company (Conrand). Between 1895 and the late 1950's Conrand was the driving force behind the development of Olifantsfontein. The original site of Conrand has since been subdivided and developed, but the portion that housed the lime works remains undeveloped. Some reminders of the lime works remain on the site, albeit in a state of ruination. These include a lime quarry, a historic lime kiln and a cemetery.

The proposed intervention aims to celebrate the history of Olifantsfontein through the development of ceramics studios and galleries on the aforementioned site. The proposed program alludes to the concept of haptic architecture as a stimulus for recollection.

The enhancement of architectural experience is further explored by developing the process of ceramic making as an exhibitionist element to showcase the tactile quality of the program. For this purpose the aspects of ceramic making is examined and discussed.

Table of contents

Introduction



The proposal of a ceramic studio in Olifantsfontein is grounded in the retention of memory. Even though the site housed one of the largest ceramic studios in South Africa, few reminders of this illustrious past remain.

A historic lime kiln and quarry on the site form a basis for the ordering of the program on the site. The design proposal aims to incorporate these features into an architectural promenade. The promenade places the site features in dialogue with the proposed additions in an attempt to initiate meaningful experience.

The theoretical discourse is centred on the way in which architecture touches its users. Haptic architectural principles are explored to understand the emotional effect that architecture can produce.

These principles are supported by an analysis of the site's history and its present condition. A thorough understanding of programmatic requirements of ceramic studios is essential to the development of the project.

For the purpose of compiling the aforementioned research, this document is subdivided into five parts and culminates in a reflection. Parts 1 to 3 incorporate the gathering of information that informs the design resolution. Parts 4 and 5 consist of the synthesis of the gathered information into a design solution.

Project Outline

Location

Black Korhaan Drive, across from the Eridanus gate of Midstream Ridge. Remainder of portion 46 of the farm Olifantsfontein 410 JR, Centurion, Gauteng.

Coordinates:
Longitude: 25.928797°
Latitude: 28.212959°

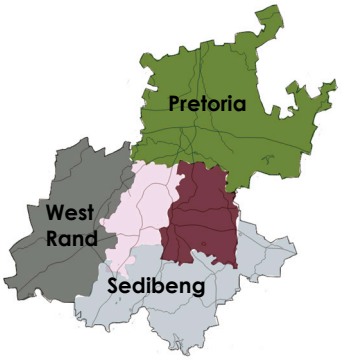


Fig. 1: Le Roux, M. 2019. Olifantsfontein is in the Ekurhuleni district of Gauteng, indicated in red.

Client

Ceramics Southern Africa (CSA)
Client's Aims:

- Improve the quality of ceramics produced in South Africa
- Foster an interest in ceramics among the general public
- Economic empowerment (Ceramics Southern Africa, 2011)

Client's Methods:

- Host workshops
- Host and curate ceramic exhibitions

Brief:
The client requires a space where ceramic crafts can be practiced, taught, exhibited and traded. The client would further need office space to operate from. The design should encourage public interaction and make use of natural lighting and ventilation to meet the requirements for the making and drying of pottery.

Ceramics Southern Africa

Fig.2: CSA. 2019. Logo. Computer generated image.

Project Outcome

Orchestrating an enhanced architectural experience that celebrates the artistic history of the site and the ceramic art.

Fig.3: Le Roux, M. 2019. Ceramic workshop.

Accommodation List

- Ceramics Studio -Drying area
  -Kiln (wood fire)
  -Kiln (barrel)
  -Glazing area
  -Material store
  -Training workshop
- Shop/exhibition area
- Hand-made tile factory -Drying area
  -Kiln (wood fire)
  -Glazing area
  -Material store
  -Office for placing of order specifications

Fig.4: Le Roux, M. 2019. Ceramic exhibitions.

Research Methods

Site Analysis

The site analysis includes a gathering of geographical information as well as the history of the site and experiential factors. This information then informs the research question.

Research Question

How can a haptic approach to architecture and the exhibition of the ceramic making process assist in the revitalization of the historic lime works in Olifantsfontein, Gauteng?

Conceptual Framework

Touchstone:
- Tactility and Intimacy
- Imprint
- Balance with Nature
- Edge Porosity

Concepts:
- Contact with Otherness
- Dematerialization
- Landscape Classification

Theoretical Investigation
- Hapticity
- Ruination
- Promenade
- Materiality
- Light

Case Study

Name and Location	Programme	Relevance
Clay Cafe', Olifantsfontein, South Africa	Pottery painting and cafe'	Programmatic, surrounding vernacular

Precedent Studies

Name and Location	Programme	Relevance
Ardmore, Mooi River, KwaZulu-Natal, South Africa	Ceramic studio	Programmatic
Terra Cotta Studio, Vietnam	Ceramic studio	Programmatic
Pinch Library, China	Library	Structure
Olympic Archery Range	Archery pavilion	Plan typology

Part 1

Project Rationale and Underpinning

1.1 Project Rationale

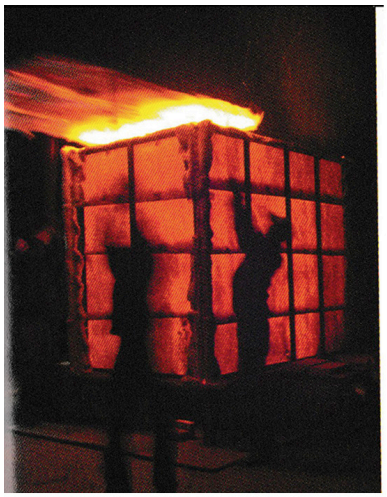
Figure 1.1: The Linnware brand. Photograph: Hattingh, T. 2017.

1.1.1 The Historic and Social Context

The original Conrand site housed the Transvaal Potteries (1906-1914), the Ceramic Studio (1925-1942) and Linnware (1942-1954). The proposed site is one of the few remaining undeveloped portions of the original Conrand complex. In celebration of the ceramic art history of the site, the development of a ceramic studio and exhibition spaces is proposed.

The social context of the project plays a role in the development of the accommodation list. The site is situated near Tembisa, an impoverished area with a high unemployment rate (Katumba, et al., 2018). In an attempt at job creation, the proposed studio is expanded to include the following:

- A small ceramic studio for 1 or 2 established artists.
- A ceramic workshop for the large scale production of hand-made ceramic wares. This space is used for teaching ceramics classes on weekends.
- A studio for the production of large ceramic works (larger than 1000x500x500mm).
- A workshop for handmade tiles. The workshop is aimed at producing tiles for specialist installations or for restoration purposes.



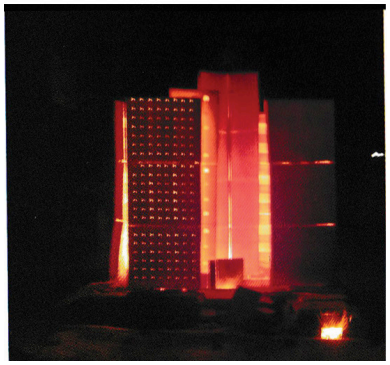


Figure 1.2: Fired-in-place sculpture. Photograph: Olsen, F. 2011.

1.1.2 The Client

Ceramics Southern Africa (the client) is committed to the advancement of ceramics as an industry that can contribute to education and recreation in the South African as well as global context (Ceramics Southern Africa, 2011). The project focuses on the following aspects:

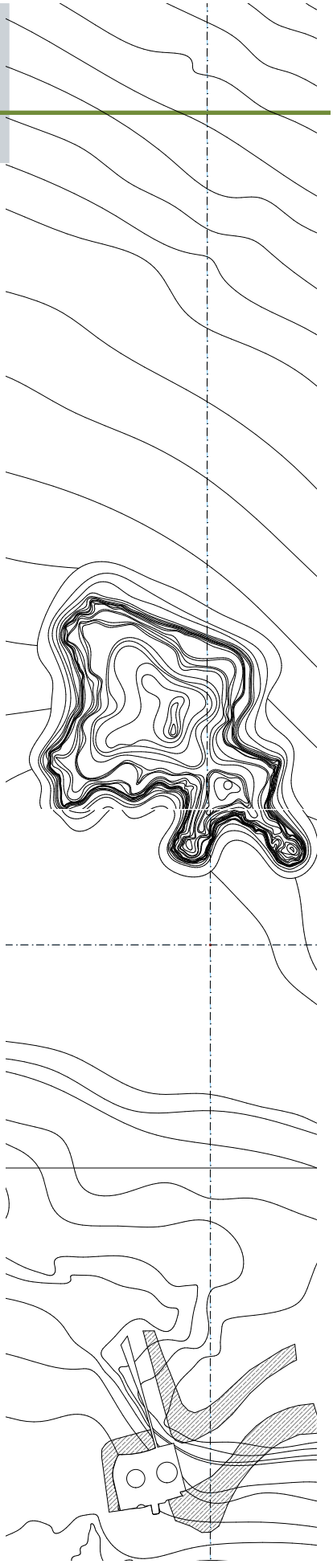
- The facilitation of job-creation within the field of ceramic art.
- Housing events that contribute to public interest in ceramics.
- Creating a space for experimentation within the ceramic art.

To enhance opportunities for experimentation in ceramics, the mixing of natural glazes is facilitated. Ash from wood fire kilns and from the burning of plant material is mixed into the glaze to produce certain effects (Hopper, 2018). Greenhouses (to house plants that are not resistant to frost damage) and areas for the burning of plant material are accommodated.

A sculpture park is incorporated in the design. The park consists of fired-in-place sculptures that are added annually as a festival event. This attempts to advance public interaction with and knowledge of ceramic art.

Conceptual Underpinning

1.2



Hapticity (Program)

Hapticity as a concept is derived from the tactile nature of the proposed program. This concept does not focus only on an improved tactile experience for the person making ceramics. Instead, haptic architectural qualities are researched as a method of enhancing the tactile experience of a visitor to the studios. This raises the following question: To what extent can architecture stimulate a persons sense of touch without physically touching the person.

Ruin (Site - Present)

Current site conditions allude to ruination as a theme. The ruined lime kiln on the site forms a beacon. It The characteristics of ruins is analyzed in an attempt to understand why these dematerialized structures are so appealing, The discussion further investigates whether these characteristics can be encouraged through design.

Promenade (Site - Future/Envisioned)

Architectural promenade is investigated as a method for realizing the topographic aim of the project; Historical features on the site (the lime kiln and quarry) and the access road are spaced far apart. The spaces between these features are vast. The project aims to unify these features through a linear arrangement of spaces. The challenge lies in arranging the program on the site to create a thread that binds together the experience of the site features.

Problem Statements and Aims

1.3

1.3.1 The Topography

Problem Statement
Historical features on the site (the lime kiln and quarry) and the access road are spaced far apart. The spaces between these features are vast.

Aim
The project aims to unify these features through a linear arrangement of spaces. The challenge lies in arranging the program on the site to create a thread that binds together the experience of the site features.

1.3.2 The Program

Problem Statement
The main aim of the client is to improve the quality and knowledge of ceramic art in Southern Africa. The question arises whether architecture can play a role in this improvement or if that responsibility rests solely on the shoulders of ceramic artists and teachers.

Aim
Ceramic studios have certain requirements that allows it to function optimally. The design intervention aims to celebrate these requirements as architectural features to foster an understanding of the ceramic making process among the general public.

1.3 Touchstone

Definition and Approach

The term touchstone is defined as a recognized standard or code according to which the quality of things is measured (Cambridge Dictionary, 2019). Erin Morgenstern refers to a touchstone in the novel The Night Circus, explaining it as a "…physical element to hold on to. Something to prevent drifting" (2011: 112). Resultantly, it can be understood as something containing an essence that you do not wish to stray from and that will be used to measure the suitability of the result. This touchstone is focused on the qualities of making ceramics. The intention is to imbue the architectural design with these characteristics in order to create an embodied experience of the process associated with ceramics.

Fig. 1.2: Le Roux, M. 2019. Photograph of the touchstone.

Fig. 1.1: Le Roux, M. 2019. Tactile qualities of the touchstone.

Initial Ideas

Tactility and Intimacy

Touch is essential to the making of a ceramic work. The shape and movement of the potters hands give form to a piece of clay, imprinting unique qualities of the ceramicist into the vessel. The intimate relation between the maker and the material imbues the final object with characteristics that are uniquely attuned to the shape and size of human hands. Deforming and inconsistency of texture and shape further enhance the connection with the user of the object. These unique and imperfect characteristics enhance its reliability.

Imprint

Textures and objects leave imprints in the soft clay that is made permanent by the firing of the pot. Ceramics allow for surface formation, decoration and imprint. Surface treatment is a tool in memory and tactile recollection. A variety of textures are imprinted onto the separate clay shells that make up the touchstone.

Fig. 1.3: Le Roux, M. 2019. Imprints into sewn together shells.

Balance with Nature

The four natural elements are used in the making of ceramics. The material, earth, is mixed with water to achieve a malleable consistency. The moulded material is then air dried and fired. These elements need to be perfectly balanced for the ceramic work to be completed successfully. Succulents are planted inside the aforementioned clay shells. The plants fill out the form of the shells and the shells hold together the soil that the plants grow in. If the shells are sewn together too tightly, it will suffocate the plant, but if it is not tight enough, the soil will fall out and the plants will die. A harmonious balance is required.

Fig. 1.4: Le Roux, M. 2019. The sewn together shells.

Fig. 1.4: Le Roux, M. 2019. The shells form a pot that hold the plants.

Retrospective Ideas

Edge porosity

The edges of the individual shells are porous, creating a blurred edge. The shell does not stop abruptly, but fades out instead. This suggests a threshold response where the building extends into the landscape. The sewn together shells emphasize this blurred edge between inside and outside. Openings between shells create a porous edge. Folds at the edges of the shells create recesses that give the object depth and provide ideal spaces for the plants to grow.

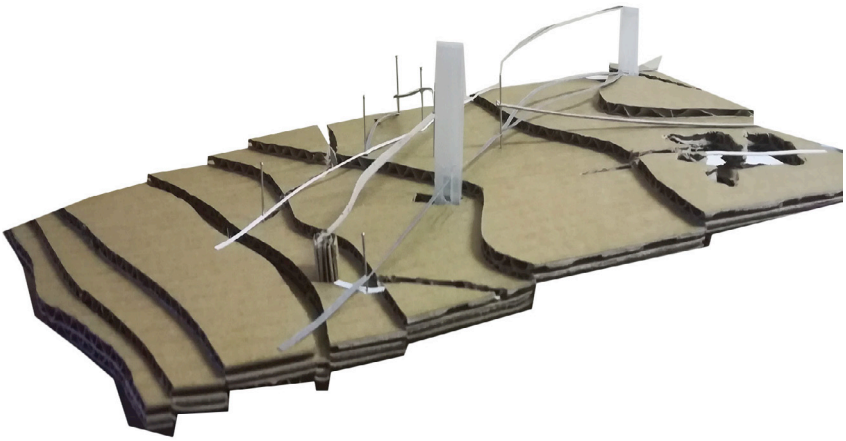
Fig. 1.3: Le Roux, M. 2019. Plants growing in the porous edge of the shells.

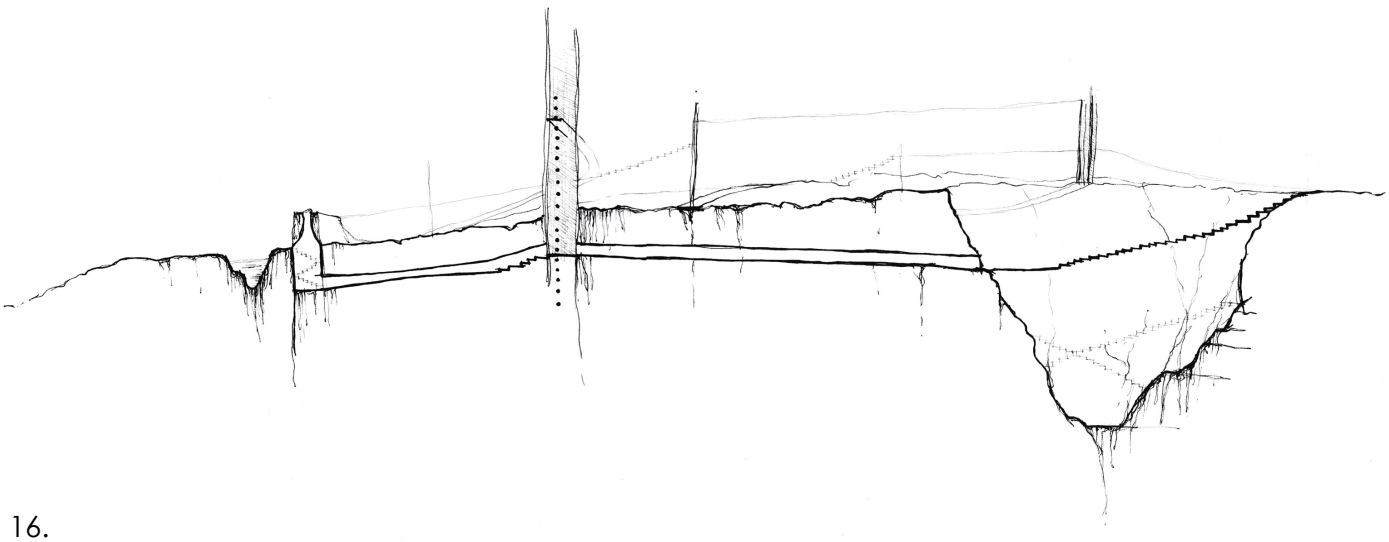
Contact with Otherness

In a ruin, the original unity of the building is lost, allowing the viewer to form new, personal connections and unities. This contributes to the evocative qualities of a ruin. Pottery creates the same experience, a finished product allowing the viewer to make personal associations with it that may not have been the intent by the artist.

These qualities are used as tools to create an evocative architectural experience. Layers of desire lines formed on the site over the years form the base of this concept, illustrating the daily rituals of people long dead. Where the paths cross, one comes into contact with otherness, experiencing a brief moment of someone else's path.

Fig. 1.3: The ruin of the lime kiln on the proposed site. Photograph: Le Roux, M. 2019.



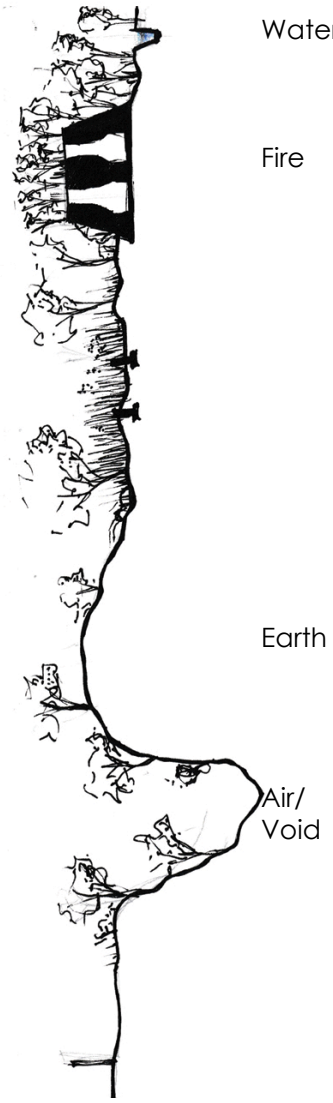


Dematerialization through the Elements

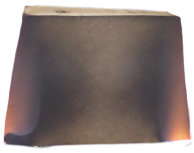
Ruination over time is caused by the four natural elements break down the mass of a material, causing it to become unstable but at the same time bringing it into a state of delicacy where it can be adapted and used.

The same elements have the opposite effect on clay, providing it with elasticity and hardening it into a material that is still delicate but also durable.

Symbols of the elements are also prominent on the site, with the quarry, small hills, the existing lime kilns and the stream symbolizing air, earth, fire and water respectively.



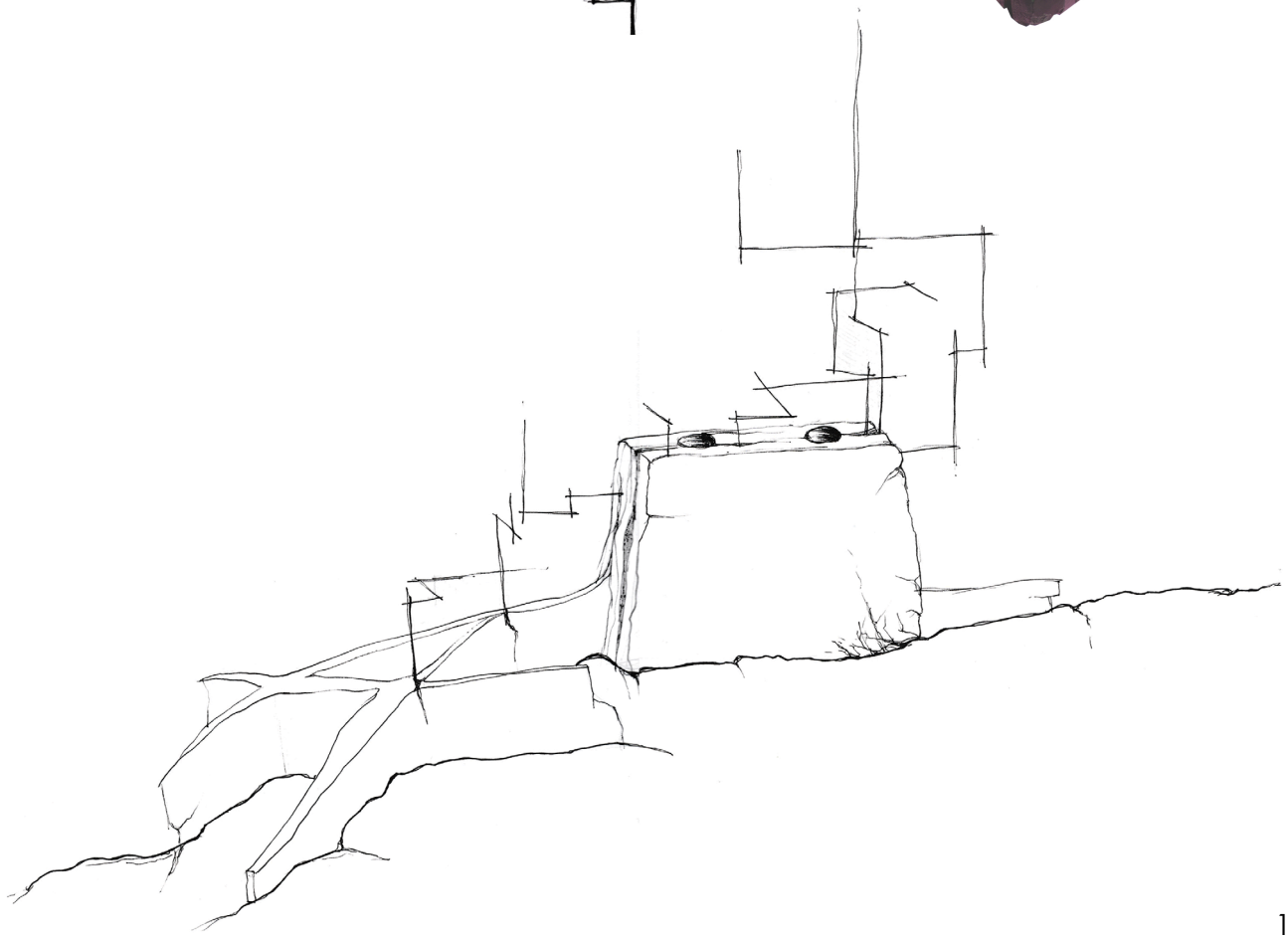
Water



Fire

Earth

Air/
Void

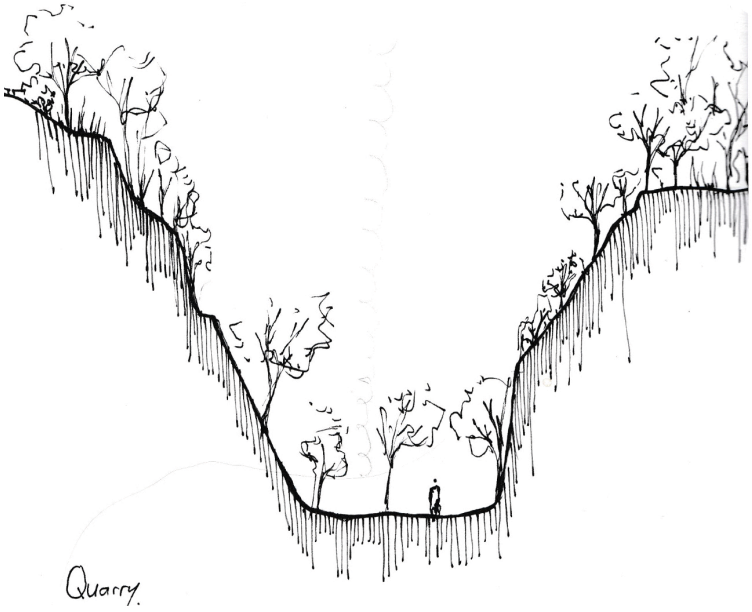


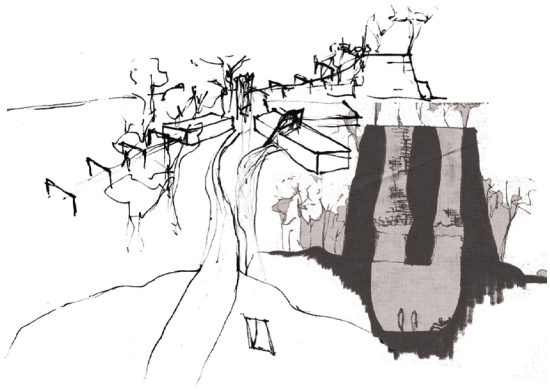
The Vertical and the Horizontal

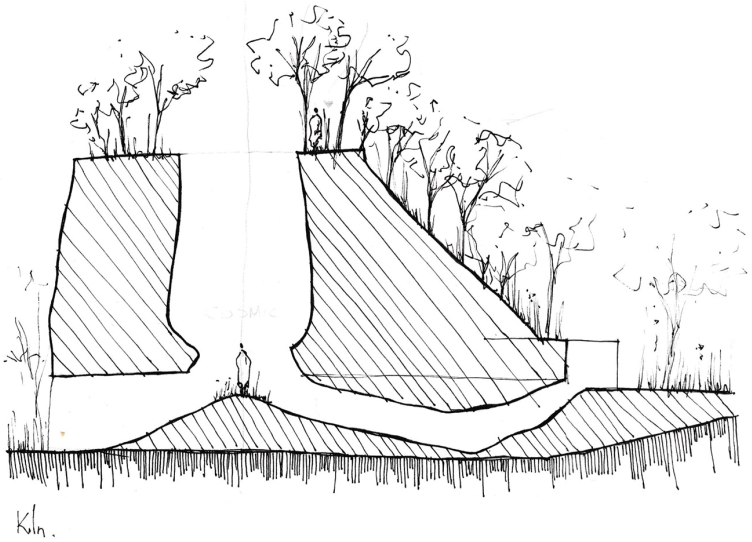
The proposed site is large and mostly undeveloped. This abundance of space suggests a horizontal development of single storey buildings.

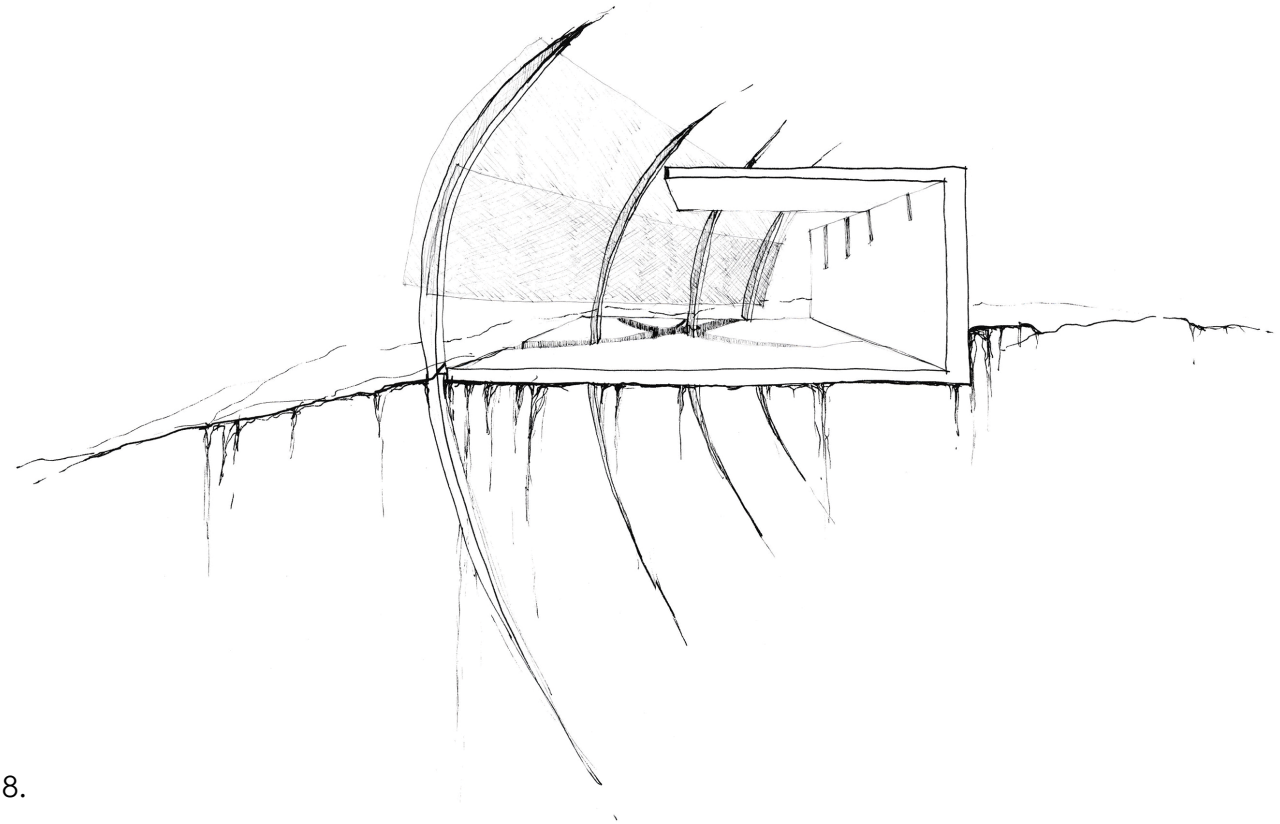
Two historic features on the site (the quarry and the kiln) suggests an alternative approach. The depth of these features results in a heightened experience of the vertical.

By incorporating underground elements in the design, the architectural response can interact with the vertical elements on the site without overpowering the horizontal site.









Part 2

Site and Programmatic Influences

Overview

Fig. 2.1: Site vegetation
Photograph: Le Roux, M. 2019.

This part of the book discusses the site and programmatic influences that shape the project. The site influences include basic location, climatic and topographical information. It is supplemented by a study of the history of the site, focusing on events that shaped the site as well as moments of cultural significance. In combination with the layout of features on the site, it suggests certain ordering principles that aids in the planning of the project. The Olympic Archery Pavilion designed by Enric Miralles and Carme Pinos is analysed because the plan contains a similar order.

Materials and vernacular architectural characteristics influence morphological aspects of the project, supplemented by a case study of the Clay Cafe', located near the site. The Clay Cafe' also has programmatic similarities with the proposed project.

Programmatic requirements in terms of accommodation lists and functional requirements form a baseline for the project. Two ceramic studios are analysed: The Ardmore studio is beneficial in terms of accommodation and the use of space. It also exemplifies the possible economic benefits of a ceramic studio. Terra Cotta Studio focuses on the celebration of the pottery making process, as opposed to the more generic design of Ardmore.

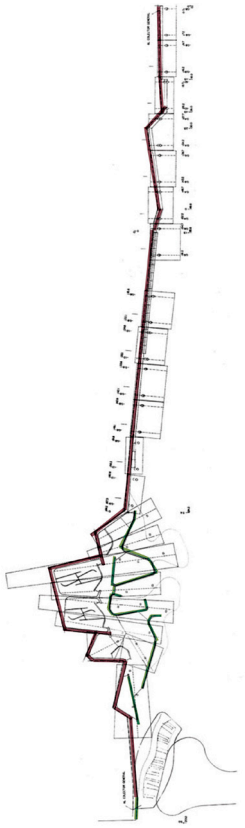


Fig. 2.2: Miralles, E & Pinos, C. 1991. Archery Pavilion plan.
Adapted by author.

Fig. 2.3: Clay Cafe interior.
Photograph: Le Roux, M. 2019.

Fig. 2.4: Artists of Ardmore Studio.
Photograph: Ardmore. 2019.

Location

2.1

Fig. 2.5: Le Roux, M. 2019. The site is located in Gauteng, South Africa.

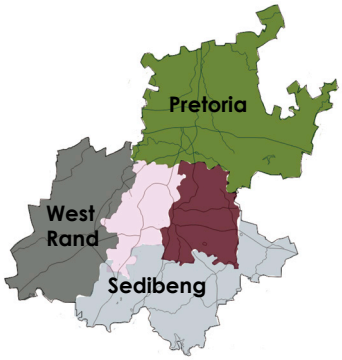


Fig. 2.6: Le Roux, M. 2019. Olifantsfontein is in the Ekurhuleni district of Gauteng, indicated in red.

Fig. 2.7: Le Roux, M. 2019. The site (red) in the Ekurhuleni district with O.R. Thambo airport as reference.

The site is located in Olifantsfontein (figures 2.1-2.3) between a large townhouse development called Midstream Estate and an industrial area producing mainly construction materials (tiles, bricks, pipes, cement and precast concrete elements). To the South of the site lies Tembisa Township (see figure 2.4). Social functions are developing along the periphery of Midstream (restaurants, child play areas, craft centres). These disparate environments each functions separately within its own boundary, demarcated by a fence and surrounded by roads. Cohesion between separate zones is limited to access gates and vehicles.

Between 1895 and the late 1950's, the Consolidated Rand Brick, Pottery and Lime Company (Conrand) was the driving force behind the development of Olifantsfontein, forming a link between industrial, residential and artistic environments. Residences, pottery studios and factories were combined in a single compound.

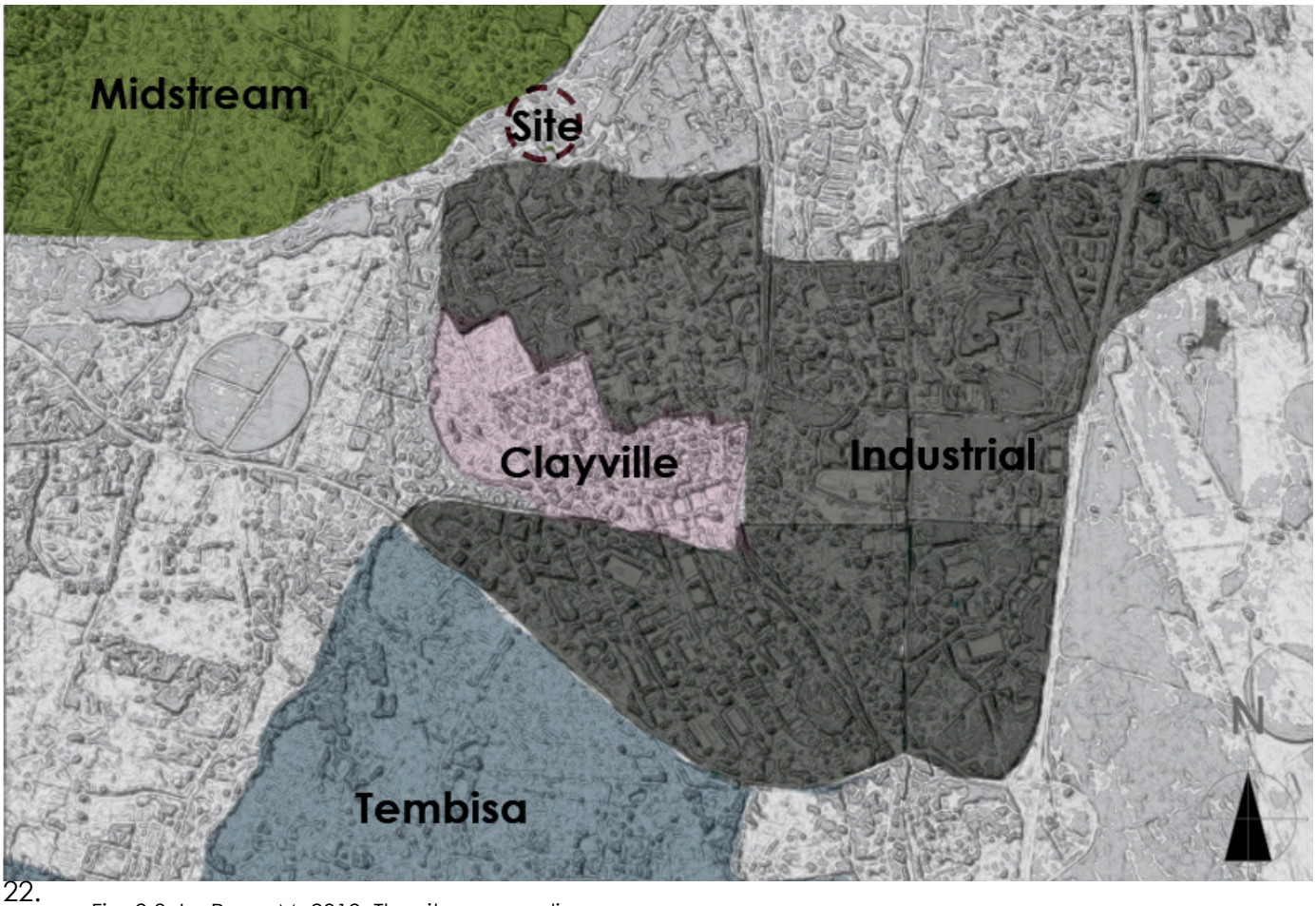


Fig. 2.8: Le Roux, M. 2019. The site surroundings

2.2.1 Surrounding Functions

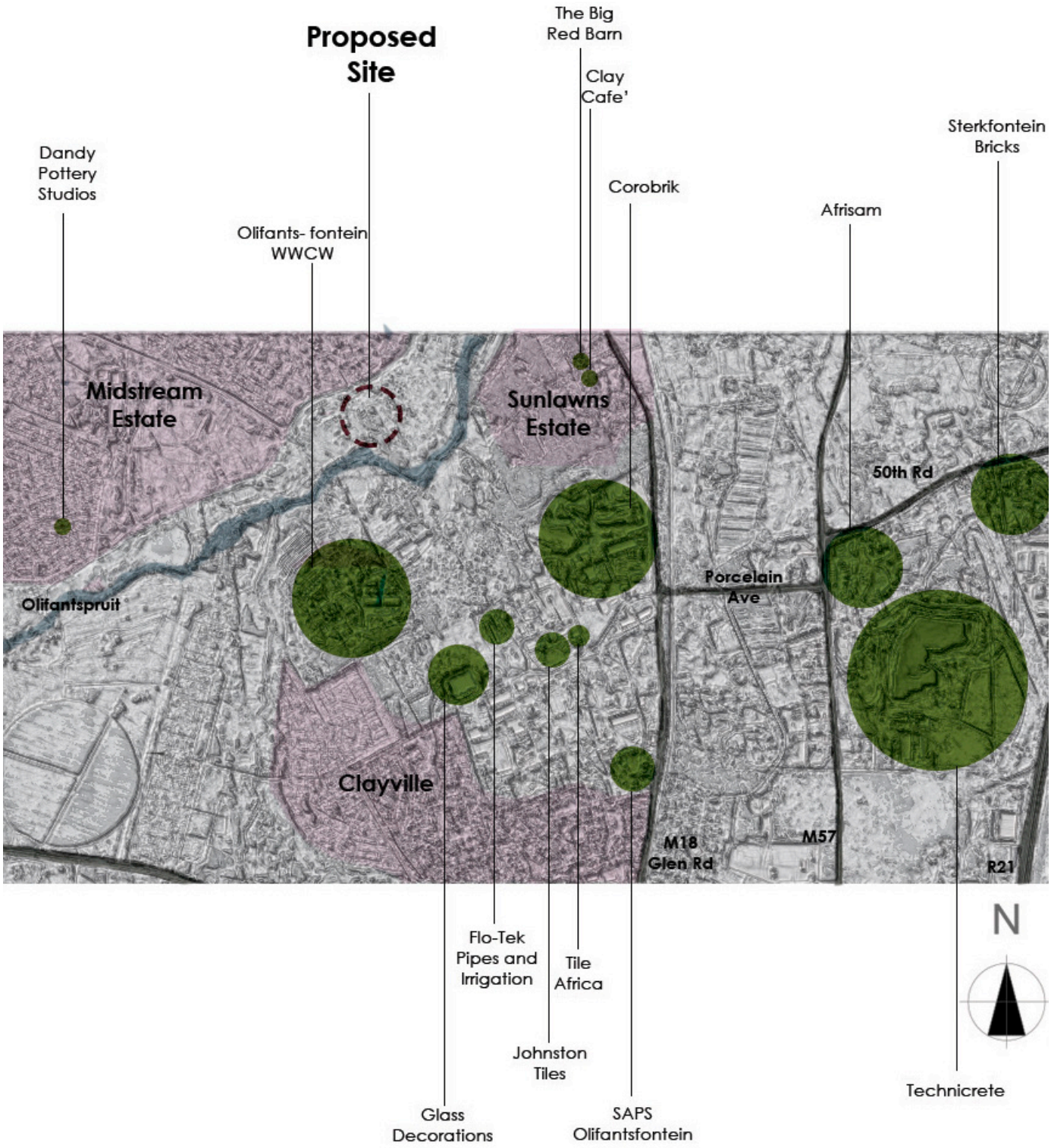


Fig. 2.9: Le Roux, M. 2019. Functions in the vicinity of the site.

2.2.2 Climate

The Köppen Classification for Olifantsfontein is "Humid Subtropical Climate" (Weatherbase, 2019). The table below indicates temperature differences and monthly rainfall recorded in 2018/2019 (World Weather Online, 2019). Large temperature differences are rare, allowing for the use of outdoor spaces all year round. The area receives rain for the majority of the year, signifying the design of covered courtyards, patios and walkways.

Month	Max Temp (C°)	Min Temp (C°)	Rainfall (mm)	Rainfall (days)
January	30	22	282	25
February	29	20	125,8	18
Marh	30	19	60,9	13
April	25	17	125,7	21
May	21	11	2,68	3
June	19	8	0,03	0
July	17	7	0,31	0
August	23	11	1,59	2
September	27	14	0,92	0
October	28	19	124,6	10
November	29	21	100,4	16
December	31	23	185,1	22

The average annual rainfall for Gauteng is 699.3mm (Zondi, 2017: ii).The prominent wind direction is North-North-East in winter and south-west in summer. This should be taken into account when designing outdoor drying areas, which may need to be screened. It also influences the placement of kilns to reduce the amount of warm air that gets blown into occupied spaces in summer.

The sun path for winter and summer is shown below, indicating the angle of the sun's rays throughout the day (GAISMA, 2019):

Summer Solstice

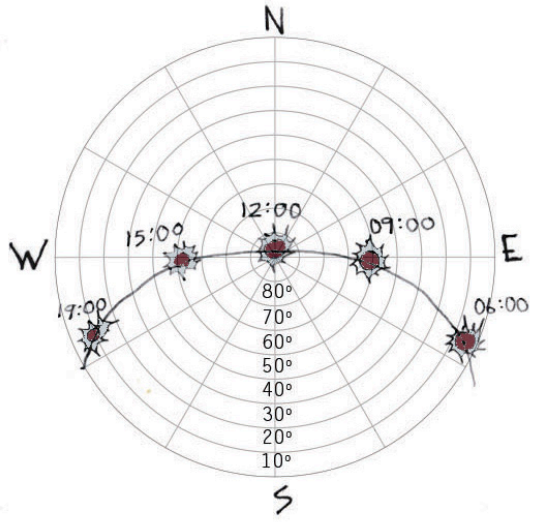


Fig. 2.10: Le Roux, M. 2019. The sun path during the summer solstice.

Winter Solstice

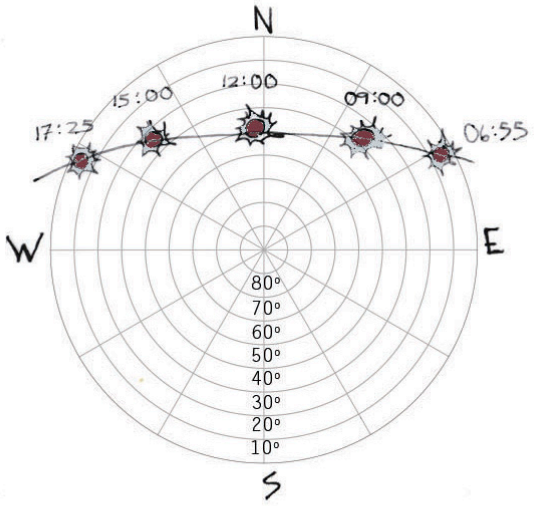


Fig. 2.11: Le Roux, M. 2019. The sun path during the winter solstice.

2.2.3 Topography

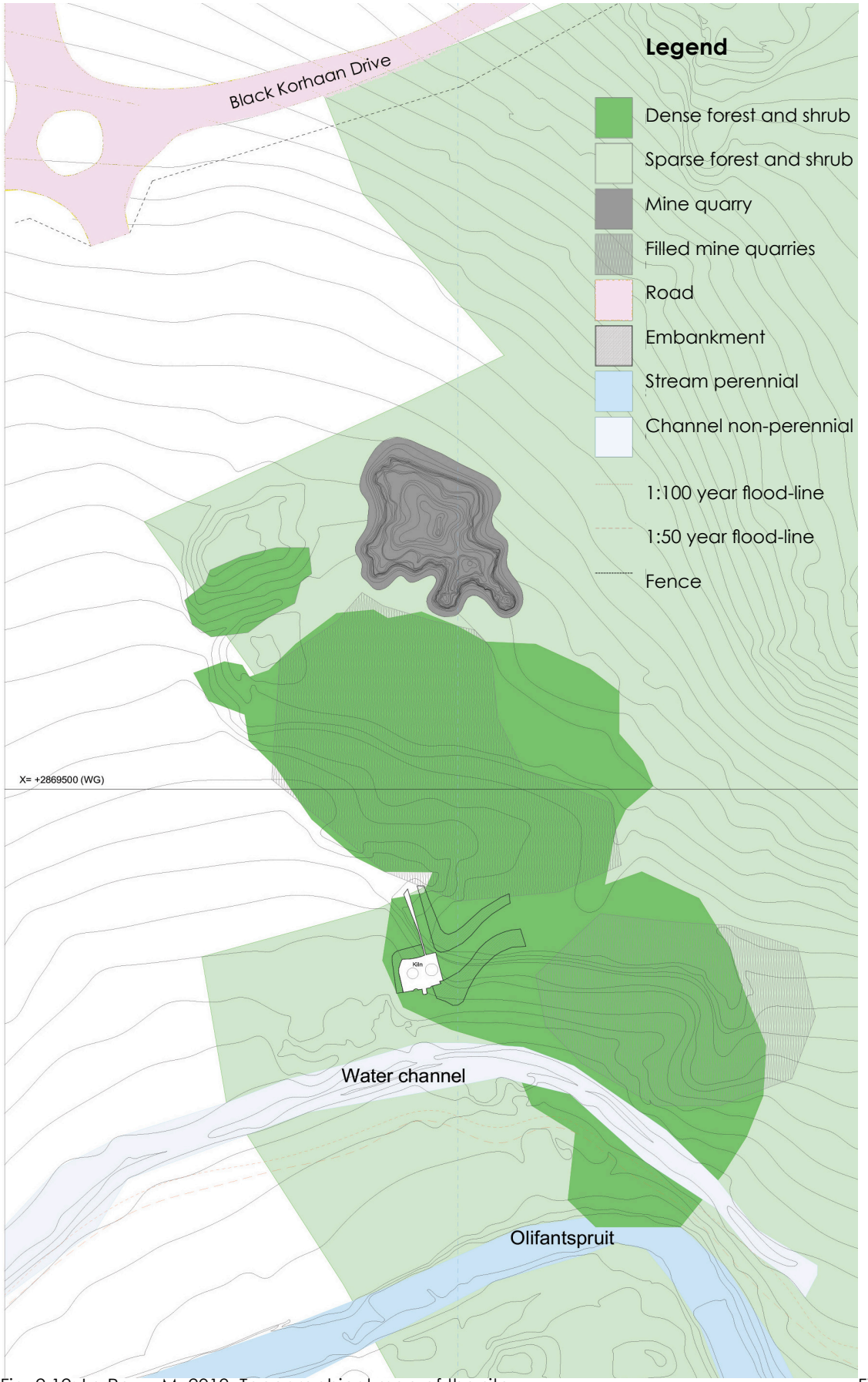


Fig. 2.12: Le Roux, M. 2019. Topographical map of the site.

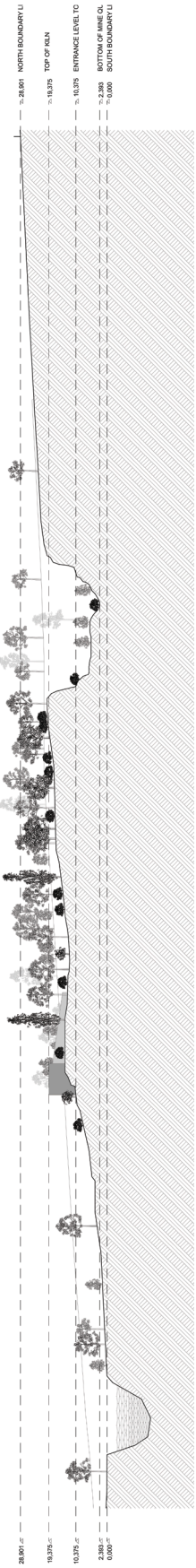


Fig. 2.13: Le Roux, M. 2019. Topographical section showing fall of the site.

Historical Context

2.3

1840 Farmer Frederik Andries Strydom settled in Olifantsfontein (Küsel & van der Ryst, 2018: 11).

1892 Midrand's initial railway station was constructed on the Olifantsfontein farm. This lead to the discovery of fire clay and limestone deposits (Küsel & van der Ryst, 2018: 12).

1895 John Richard Holmes founded a lime burning business and a brick manufacturing plant, the Kaal Spruit Fire Brick Company (Glen Austin Residents Association, 2015).

1896 Thomas Cullinan established a brick and tile manufacturing plant at Olifantsfontein after renting approximately 1900 ha ground with rights to mine clay (Küsel & van der Ryst, 2018: 14).

1896-1898 Cullinan bought and installed brick- and pipe-manufacturing equipment on the Olifantsfontein farm (Küsel & van der Ryst, 2018: 14).

1899-1902 During the Anglo Boer War no notable battles occurred in the area, but the Boers did demolish the railway tunnel close to what is now the Pinedene Station. It was reconstructed in 1901 by the Imperial Military Railways (IMR) (Küsel & van der Ryst, 2018: 13).

1902 Holmes Lime Works and the Rand Brick and Tile Company (founded by Cullinan), merged to make the Consolidated Rand Brick, Pottery and Lime Company (Conrand) (Küsel & van der Ryst, 2018: 14).

Figure 1: View of Conrand (Jacobsson, 1936)

1905 Spinney Green was constructed for the works director of Conrand (Küsel & van der Ryst, 2018: 17).

1906 Cullinan started the pottery works (Transvaal Potteries), hiring accomplished potters from Britain (Küsel & van der Ryst, 2018: 15).
Anglo-Boer War orphans were housed in a hostel and trained in the craft of pottery making and ornamentation (Van Schalkwyk, 2016:10).

1910 A reporter called Olifantsfontein "the bleakest place in Africa" (as cited by Helme, 1974:135). This resulted in Cullinan planting 1000's of eucalyptus trees to break the Highveld wind and improve the living environment close to the works.

1914 The Transvaal Potteries were closed (Küsel & van der Ryst, 2018: 20).

1925 The Ceramic Studio was created in the workshops of the Transvaal Potteries, renowned for the manufacture of tile murals (Küsel & van der Ryst, 2018: 22). The Ceramic Studio was founded by Marjorie Johnstone and Gladys Short (Artefacts, 2010).

Figure 2: Marjorie Johnston in the Ceramic Studio (Van Eeden, 1996: 81)

1940's — Lime works resumed (Küsel & van der Ryst, 2018: 69).

1942 — Ownership of the Ceramic Studio changed and it was retitled as Linnware (Artefacts, 2010).

1939-1945 — During WWII the Ceramic Studio almost closed down because of the reduction in staff and the unattainability of international clay and glazes. The majority of the glazes used by Linnware had to be made locally (Hattingh, 2017).

1954 — Linnware closed down (Hattingh, 2017).

Late 1950's — All lime quarrying and burning activity on the site ceased (Küsel & van der Ryst, 2018: 53&70).

1957 — Tembisa Township was established with the relocation of people from Midrand, Alexandra, Kempton Park and Germiston (Küsel & van der Ryst, 2018: 73).

1958 — Large residential development occurred to the west of the lime processing plant, consisting of more or less 150 houses, shops and a church. Many of the residents were employed at the Olifantsfontein industries (Küsel & van der Ryst, 2018: 71).

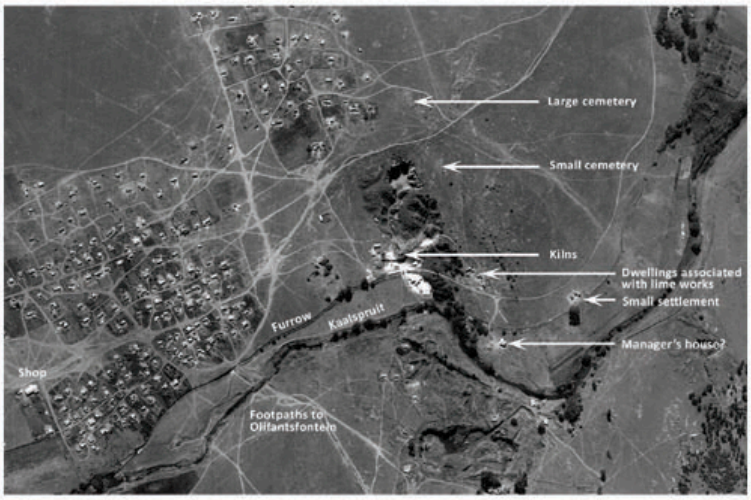


Figure 3: The proposed site and surroundings at 1958 (Küsel & van der Ryst, 2018: 67)

1970's — The area surrounding the lime works resumed agricultural use (Küsel & van der Ryst, 2018: 76).

1980 — The majority of the residential facilities from 1930 were demolished. The few remaining cottages came to be known as Clayville (Küsel & van der Ryst, 2018: 17). Spinney Green was renovated by Cullinan Holdings into a guest house with a restaurant. It is currently known as the Spinney Green Restaurant and exhibits some pottery made by the Ceramic Studio (Küsel & van der Ryst, 2018: 17-18).

Figure 4: The area at 1980 (Küsel & van der Ryst, 2018: 76)

2017 — The Sunlawns Estate in Olifantsfontein is still owned by members of the Cullinan family, who obtained a salvaged barn from an adjacent farm. The structure became part of a restaurant and venue on the estate called the Big Red Barn (Küsel & van der Ryst, 2018: 20). This development also includes a rose nursery, a cycle track and a ceramic painting studio (The Big Red Barn, 2019).

Fig. 2.14: Linnware bowl. Photograph: Riaan Bolt Antiques. 2015.

Fig. 2.15: Linnware pots. Photograph: Riaan Bolt Antiques. 2015.

2.3.2 The Studios

2.3.2.1 Production

Three ceramic studios were housed in the Conrand complex (figure 2.16): The Transvaal Potteries, The Ceramic Studio and Linnware. These studios produced a varitety of household items like plates, mugs and vases. The Ceramic Studio also made tiles for murals, fanlights and ceramic switch-plates.

The Transvaal Potteries employed mainly accomplished British artists. Due to economic difficulties the studio was closed down.
The Ceramic Studio proved to be much more successful than its predecessor. This studio produced a remarkable output over a short period of time. The products were mainly designed by five local artists, all of whom were educated at the Durban Technical College. Three of these artists (Joan Methley, Thelma Newlands-Currie and Gladys Short) also studied in London at the Royal College of Art (Heymans 1989: 22).

Products made by Linnware are distinguished by the blue and green glazes mixed at the studio (figures 2.14 and 2.15). These products are now highly sought after collector's items (Heymans 1989: 131). The studio was also known for its production of tiles for murals. Tiles were commissioned for the Pretoria University College, a Potgietersrus hostel, Johannesburg station and several buildings designed by Sir Herbert Baker.

Fig. 2.16: The Consolidated Rand Brick, Pottery and Lime Company at Olifantsfontein. (Küsel & van der Ryst, 2018: 17)

2.3.2.2 The Architecture of the Studio's

Large bottle kilns were connected to the studio spaces by means of a small enclosed antechamber with a lean-to roof. The silhouette formed an intricate gestalt that dominated the skyline and reflected the function of the buildings.

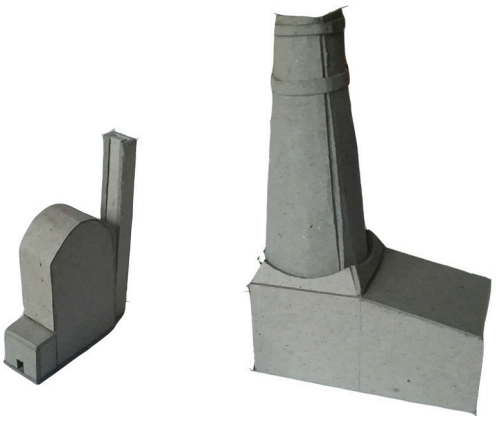


Fig. 2.17: le Roux, M. 2019. The size relation between a standard wood fire kiln (generally used for private studios) and the bottle kilns of the Olifantsfontein studios.

Fig. 2.18: The bottle kilns of the Olifantsfontein studios. (Heymans, J.A. 1989).

Fig. 2.19: "Olifantsfontein kilns and workshops", painting, bt Thelma Newlands-Currie (n.d).

2.3.2 Desire Lines

Three aerial photographs are available of the site, taken at 1937, 1958 and 1980 respectively. The most prominent feature of these photos is the desire lines that cover the site. A desire line is defined as an informal pathway formed by regular pedestrian use, usually forming a short-cut or a direct path to something (Kohlstedt, 2016).

The desire lines are layered together to create a pattern over the area where the project is situated. This pattern is used to create meandering paths throughout the site, with intersections between paths creating nodes where fired in place sculptures are exhibited. This creates an additional layer over the grid of buildings.

Fig. 2.20: Le Roux, M. 2019. Desirelines on the site for the years 1937, 1958 and 1980.

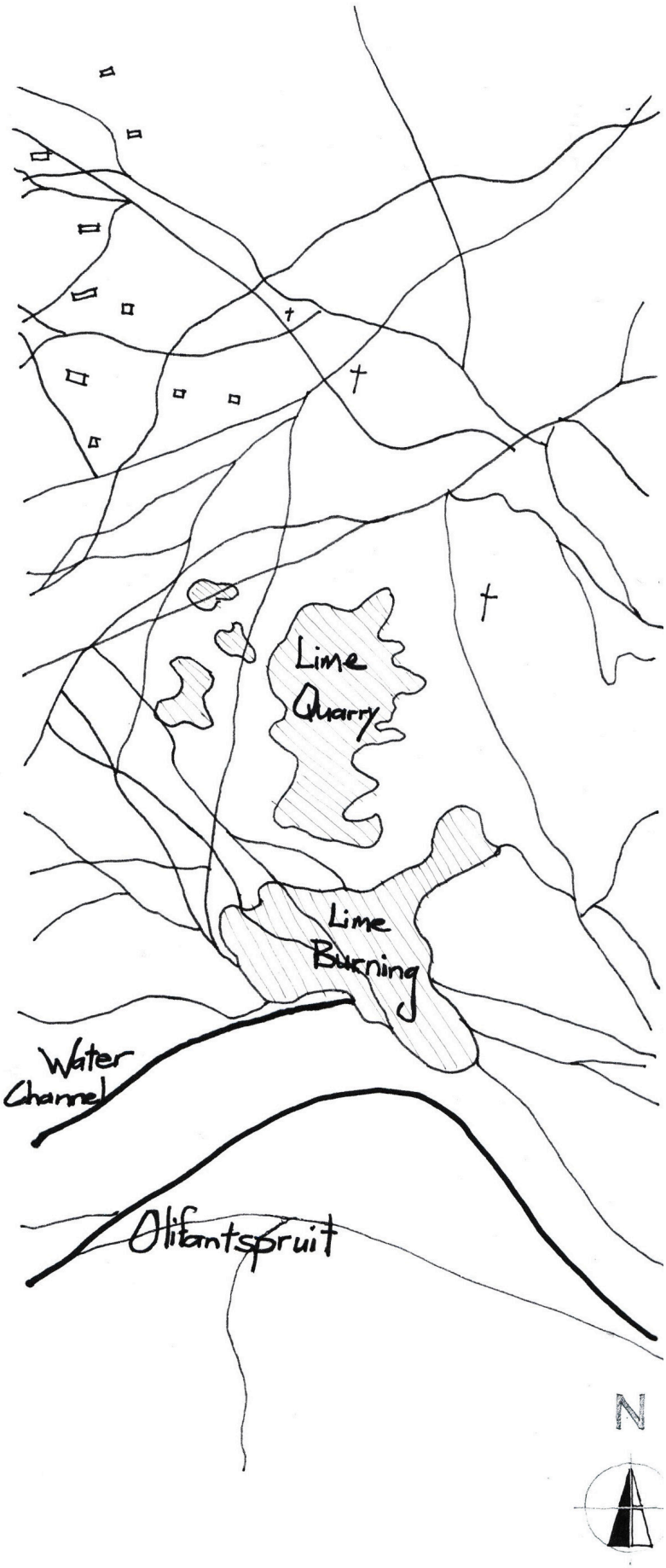


Fig. 2.21: Le Roux, M. 2019. Merged desirelines of the three years.

Site Orientation and Linearity

2.4

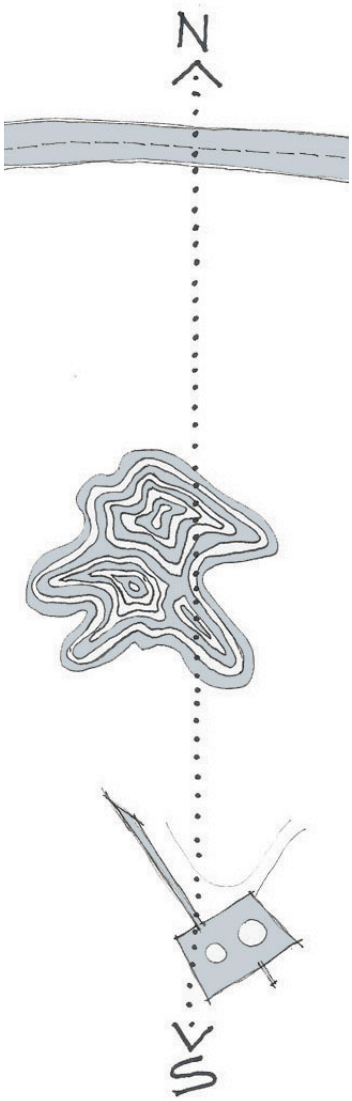


Fig. 2.22: Le Roux, M. 2019. The spine connecting the site features.

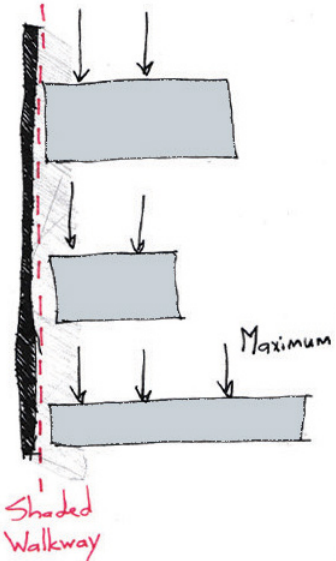


Fig. 2.23: Le Roux, M. 2019. The spine wall as shading element.

2.4.1 Features

The site is characterised by archaeological features from the lime quarrying operations from 1895. These include the quarry hole and the lime kilns. The path that connects the shortest distance between the access road, the quarry and the kilns forms a North-South axis on the site. By distributing the proposed functions along this path, visitors can access these features along with the added accommodation as a holistic experience.

Fig. 2.24: Le Roux, M. 2019. Diagrammatic section through the site.

Fig. 2.25: Le Roux, M. 2019. The quarry hole.

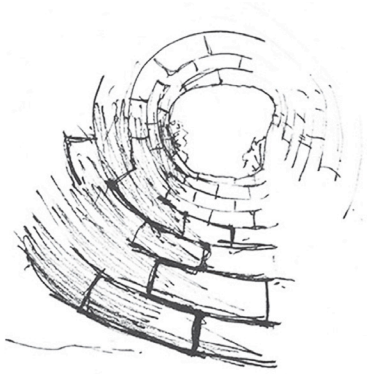


Fig. 2.26: Le Roux, M. 2019. View inside kiln .

2.4.2 The Grid

The ramp that leads to the top of the kiln is edged by a masonry wall. This wall meets the aforementioned axis at a 16° angle. A grid that is 16° off the axis is layered over the site, allowing for the juxtaposition of certain elements.

2.4.3 The Spine

The length of the project is orientated towards East and West. To get sufficient natural light into the majority of the spaces, the building is fragmented into masses and courtyards connected by a wall element. The wall forms a North-South axis, screening courtyards and walkways from late afternoon sun. The building masses can then have maximum North frontage.

The formation of a strong path allows the buildings attached to it to populate the peripheral vision of the visitor. This enhances the interiority of the experience and stimulates connection with the space (Pallasmaa, 1999: 7). This notion is discussed further under the theoretical underpinning of the project.

2.4.4 Precedent Study: Olympic Archery Range

- Program: Archery Pavilion
- Architects: Enric Miralles and Carme Pinos
- Location: Barcelona
- Year: 1991

This archery range was designed for the 1992 Olympics. The brief called for a competition pavilion and a practice range. These two functions are separated by an archery range (approximately 70 metres long). This resulted in a linear development with a concrete wall forming a spine that connects the entire design (Obiol, 2017).

-The Spine-

On plan the functions are arranged within two walls: a retaining wall and a feature wall overlooking the archery range. Services are tucked into the retaining wall that is nestled into the slope of the site (figure 2.17). The feature wall creates public spaces that open onto the archery range. The public spaces alternate between external niches and interior masses opening onto the range.

Fig. 2.27: Roof of the archery range as seen from the top of the hill. Photograph: Janssen, D. 2017. Adapted by author.

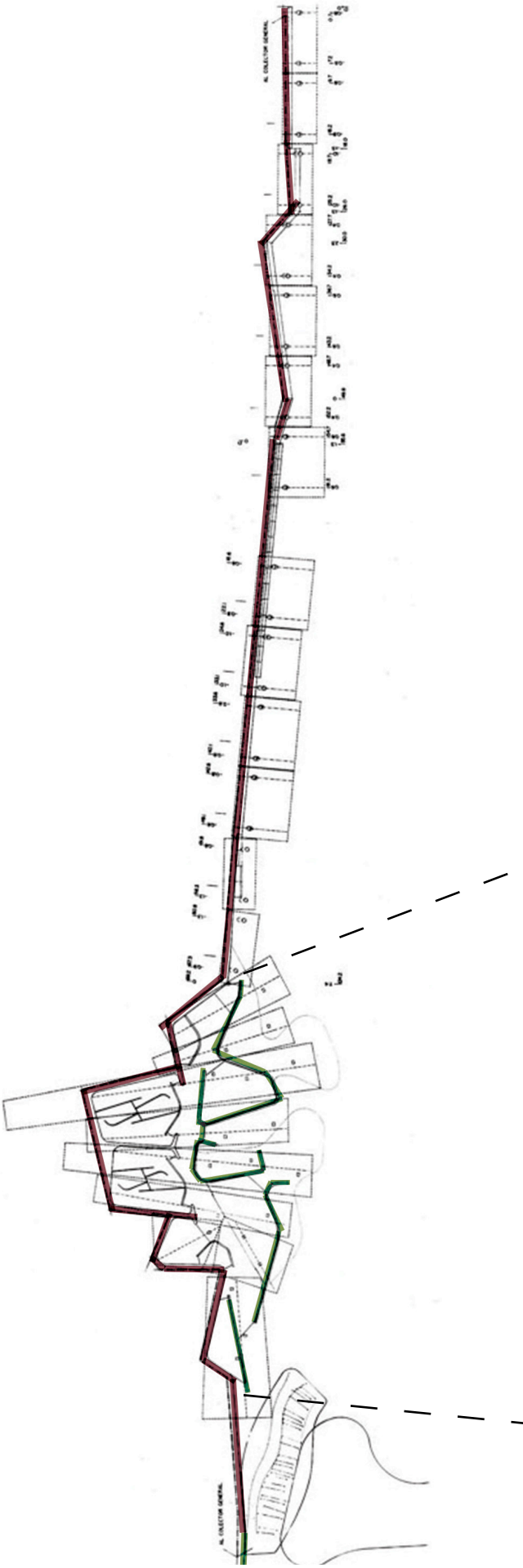
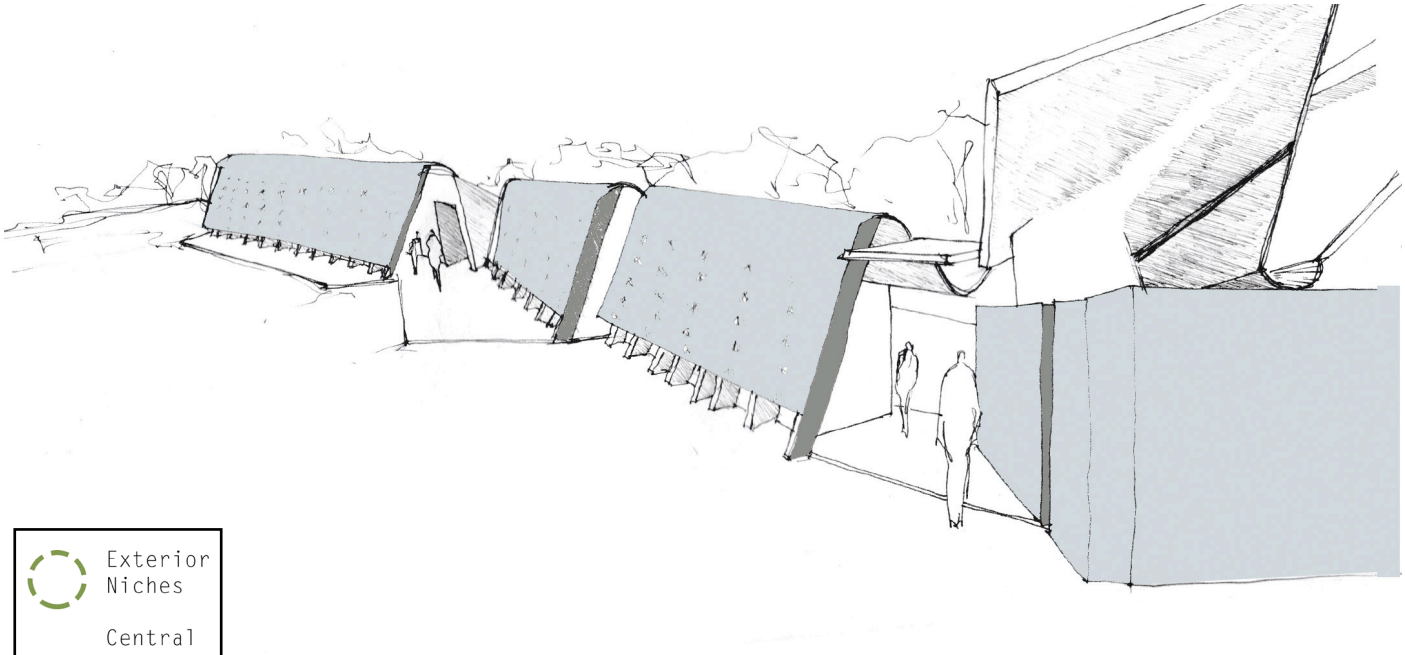
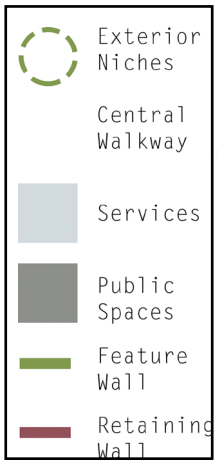
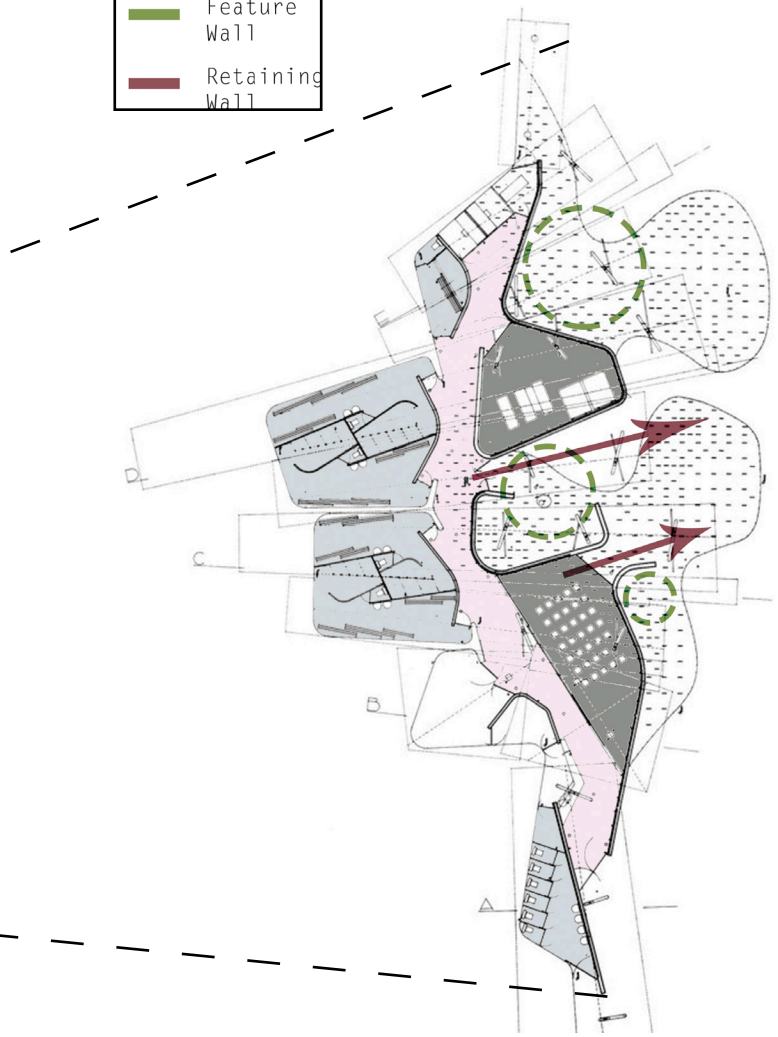


Fig. 2.28: Miralles, E & Pinos, C. 1991. Archery Pavilion plan. Adapted by author.







-Light-

Seen from outside, portions of the spine wall are experienced as solid masses. From inside the pavilion, small openings in the exterior wall dematerializes its mass and it instead resembles a light screen.

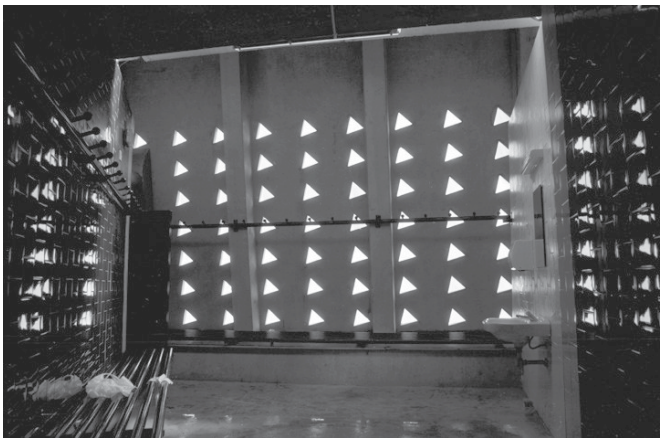


Fig. 2.29: Archery range interior. Photograph: Janssen, D. 2017.

Lessons learnt:

- A continuous wall element: niches for services and social spaces.
- The shape of the wall determines the relationship between inside and outside spaces.
- Inhabitable threshold spaces enhance this relationship.

Qualitative Site Analysis

2.5

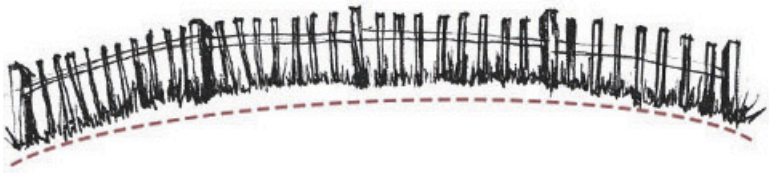
2.5.1 Textures

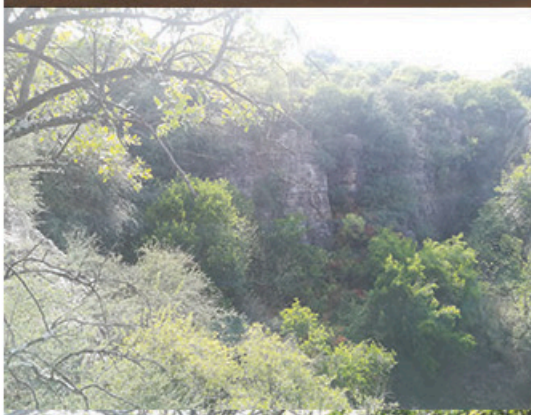
After operations at the lime processing plant ceased, large amounts of limestone was left on the site. Lime adds calcium and magnesium to the soil as well as reducing its acidity, which allows plants to absorb nutrients from the soil (Carroll, 2018). This caused the development of dense and varied vegetation on the site, creating diverse textures, colours and scents.
Existing masonry work is abundant near the lime kilns. This ranges from mostly intact clay brickwork to rough stone walls in an advanced state of decay. The variance in texture alludes to the age of the works, hinting at its rich history.

2.5.2 Thresholds

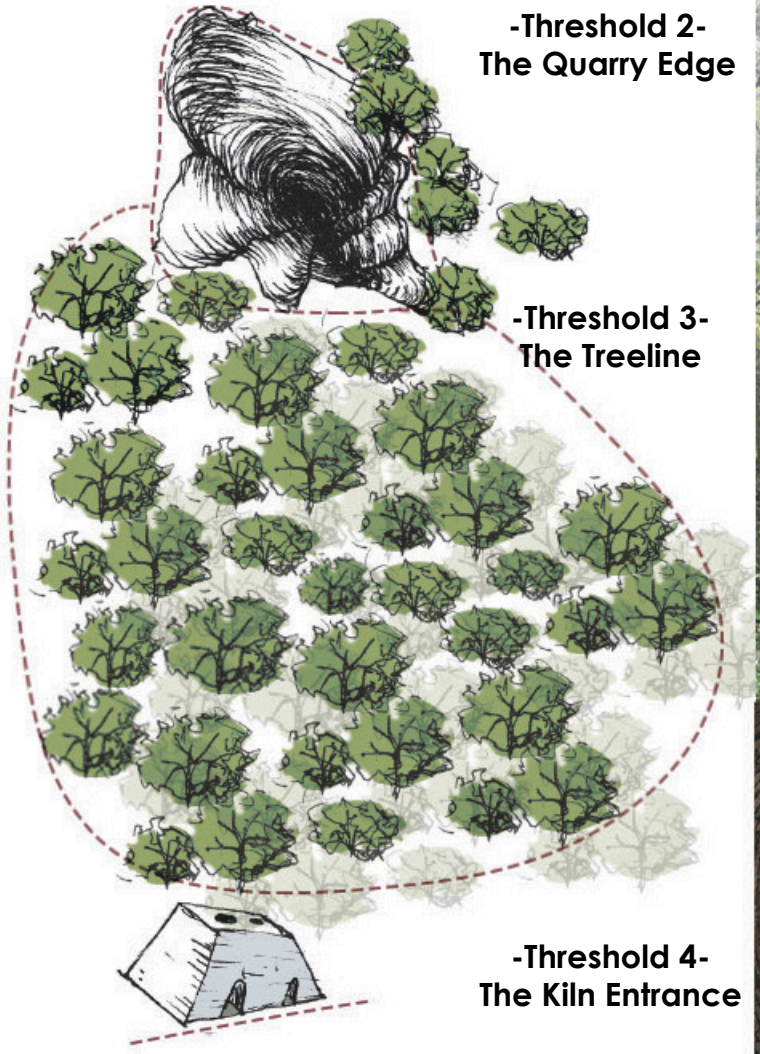
Several thresholds are found on site that separate different spatial experiences. One enters the site through a gate in the concrete fence that surrounds the entire property. Beyond the fence is typical Highveld scenery scattered with patches of wildflowers and a few trees. Vegetation becomes denser closer to the lime quarry. The walls of the quarry show the rock layers beneath the site as well as scars made by machinery. Beyond the quarry the site is thickly forested with various trees and shrubs. At the southern edge of the densely vegetated area lies the partially overgrown lime kilns. It is a stone and masonry structure entered through the 2 meter high arch of the original draw hole, with an interior space large enough for 2 to 3 people to stand comfortably. The space is lit through the opening at the top of the kiln, creating a cosmic experience where one's only view is of the sky.

-Threshold 1-
The Fence





-Threshold 2-
The Quarry Edge



-Threshold 3-
The Treeline

-Threshold 4-
The Kiln Entrance

2.5.2.1 Edge Conditions

- A fence around the property forms an uncomfortable edge that denies access and interaction. The overgrown and unpaved sidewalk worsens the situation by creating an environment unwelcome to pedestrians.
- Edges around the quarry are impossible to transgress without climbing gear, but the visual continuity over the quarry lessens the severity of the threshold.
- The edge around the forest is permeable yet prominent, creating a defined yet welcoming inside.
- A small opening into the kiln emphasises the mass of the kiln, but the abundance of natural light within the space beckons the visitor inside. This strong threshold emphasises the experience of entering but it does not discourage access.

2.5.2.2 Visual Connection

Also prominent is the thresholds between the different zones mentioned in the introduction (industry and residential). The slope of the site allows these thresholds to be visually overcome. From the entrance some chimneys and factory roofs from the industrial area are visible beyond the trees. A ramp allows the top of the kilns to be accessed. From here the houses of midstream estate is visible.

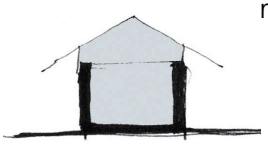
Fig. 2.30: Le Roux, M. 2019. View from the site entrance.

Fig. 2.31: Le Roux, M. 2019.
View from the top of the kiln.

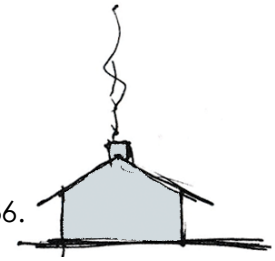
2.5.3 Surrounding Vernacular

Buildings in the area are mainly residential and small recreational, generally constructed with one or more of the following characteristics:

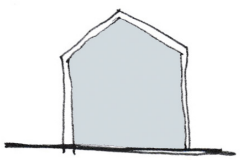
Porch with a lean-to roof.



Masonry walls with light roof structure.



Pitched roof with a chimney as a feature element.



Portal frame imitating barn construction, often clad in profiled metal sheeting.

2.5.3.1 Case Study: Clay Cafe'

- Program: Coffee shop, ceramics painting
- Architect: Unknown
- Location: Sunlawns Estate, Olifantsfontein
- Year: Circa 2017

This project is located in the same area as the proposed site. Some similarities also exist between its program and that of the proposed project. The analysis of this study is twofold: As an understanding of the architectural language of the area and to aid in understanding the programmatic requirements of the project.

Fig. 2.32: Clay Cafe exterior. Photograph: Le Roux, M. 2019.

A vernacular of masonry walls with a light roof (refer to 2.5.3) is used in this design as a method of differentiating between served and service spaces. A pitched roof with steel columns and glazed walls form the central served space. Services are articulated as exposed masonry boxes with flat roofs that push into this central space (figure 2.33).

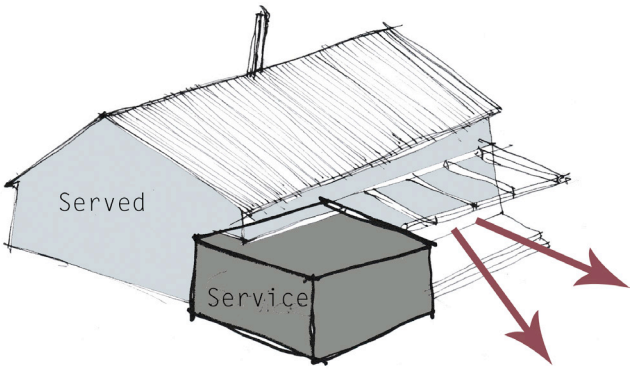
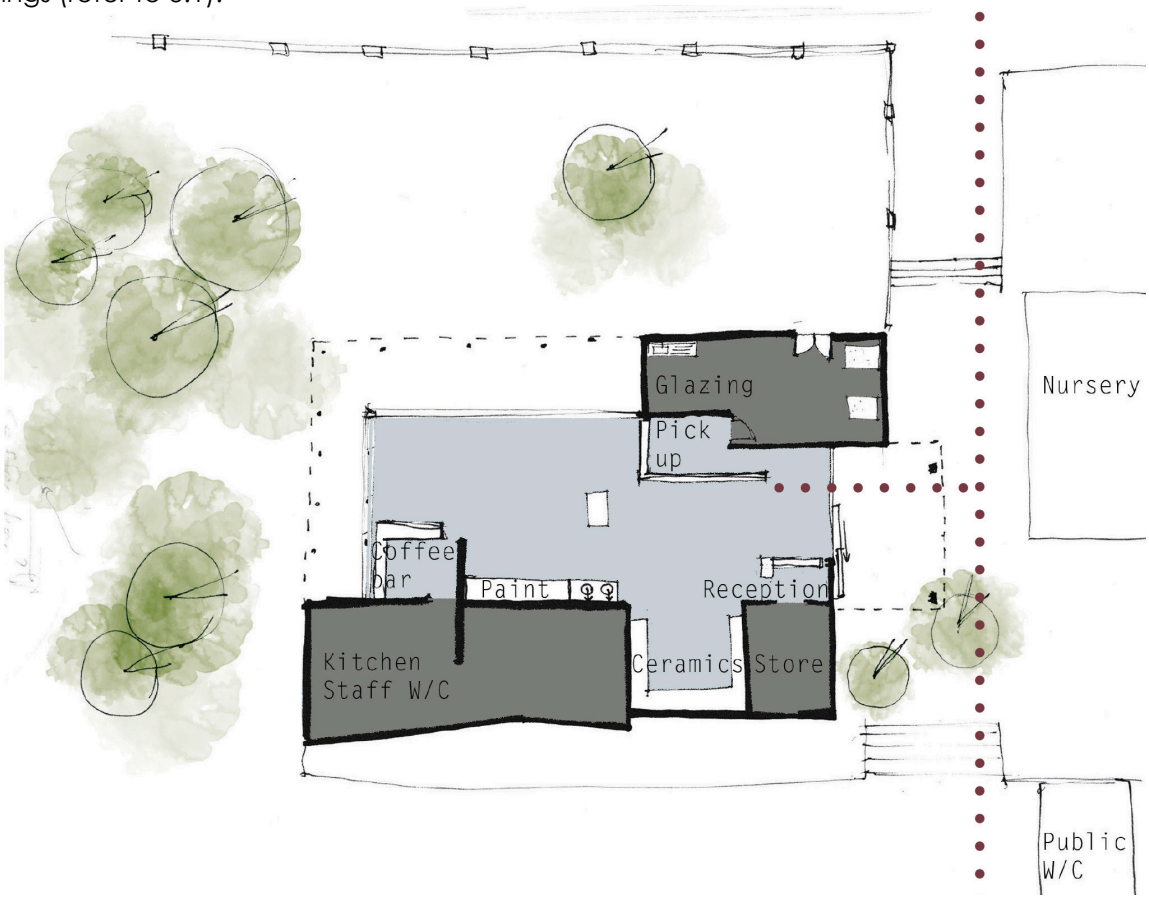


Fig. 2.33: Le Roux, M. 2019. Architectural language of service and served spaces.

The building is accessed from a central path instead of directly from the road. This creates an axis with the buildings pushed to the periphery, stimulating an immersed experience instead of a series of object buildings (refer to 3.1).



-Materiality-

A low wall enclosing the pick-up area is constructed with a row of bricks manufactured at Conrand. These bricks are placed so that the original Cullinan branding is visible.

Basins in the rest-rooms and at the paint station are ceramic bowls attached to a concrete counter top.

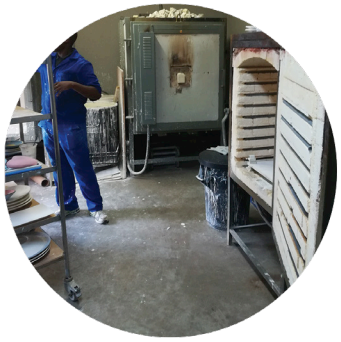
Seating for ceramics painting is situated within the large central space. The pitched roof is supported by steel trusses that allow for an unobstructed interior space.

A fireplace forms the central point of the plan, which elicits a comfortable feeling of being at home.

-Equipment-

The glazing room contains:

- 2 electric kilns
- Double basin
- Mobile shelves
- Large tubs of glazing material
- Door leading outside



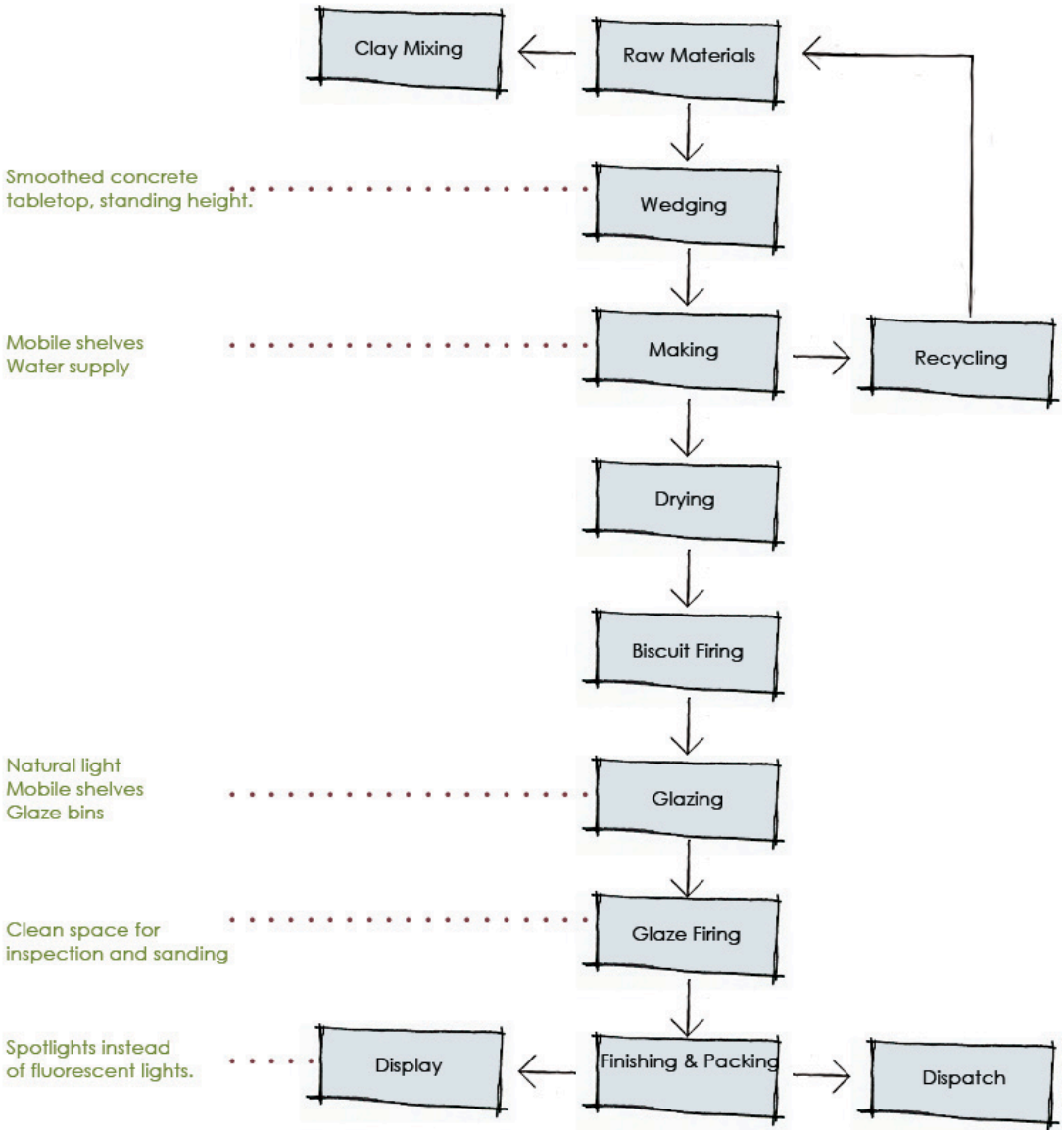
Lessons learnt:

- An improved understanding is gained of the size of programmatic requirements.
- Articulation of services
- Materials and morphology of buildings surrounding the site.

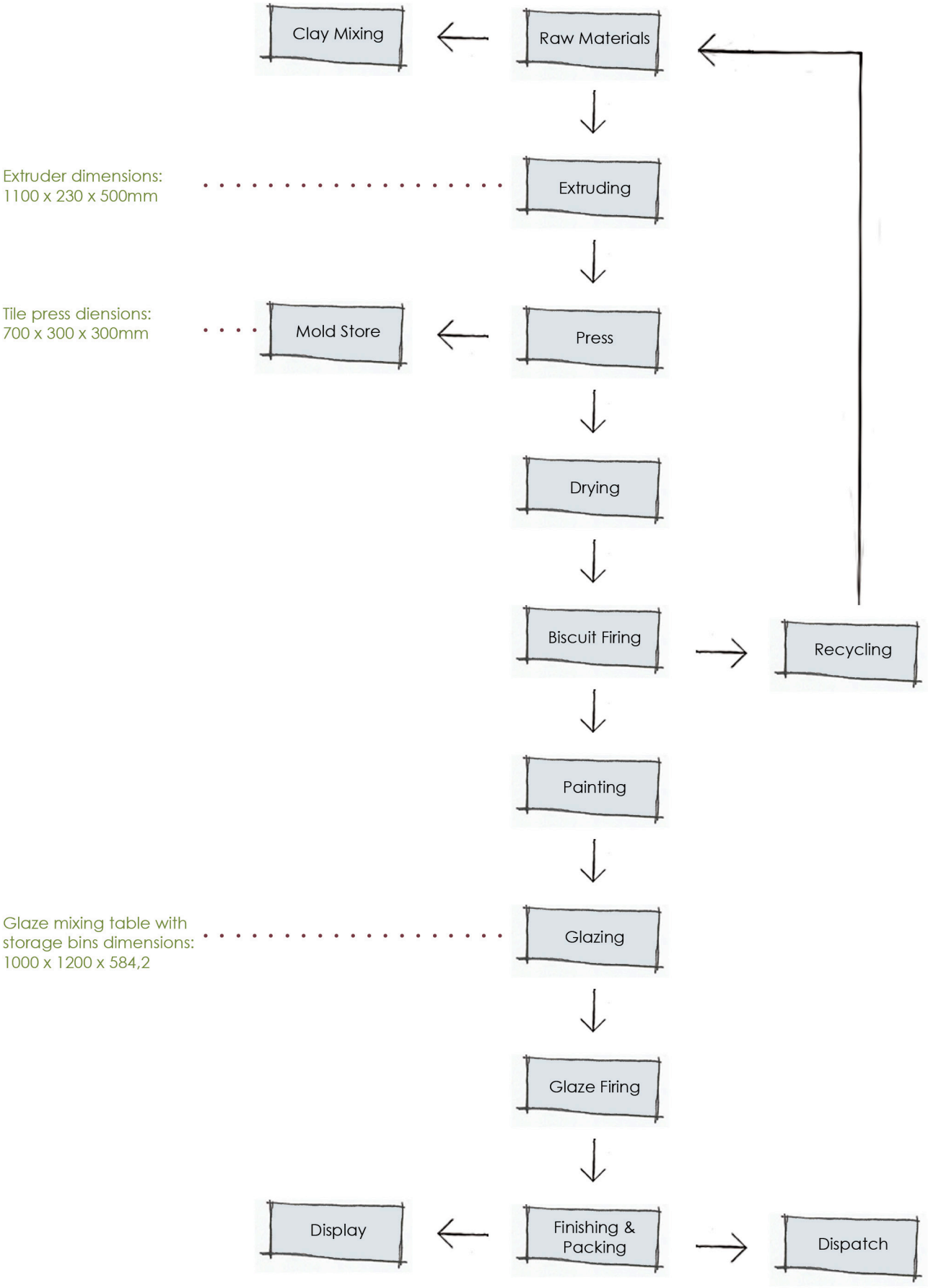
2.6.1 Accommodation List

• Ceramics Studio -Drying area	92m²
-Kiln (wood fire)	25m²
-Kiln (barrel)	4m²
-Glazing area	66m²
-Material store	20m²
-Training workshop	140m²
-Modeling studio	40m²
-Private studio space	140m²
• Shop/exhibition area	92m²
• Hand-made tile factory -Drying area	36m²
-Kiln (wood fire)	12m²
-Glazing area	66m²
-Material store	12m²
-Office for placing of order specifications	
	745m²

Workshop Flow Diagram



Tile Production Flow Diagram



2.6.2 Functional Requirements

The studio spaces should have drainage systems to allow water to drain away after cleaning. This water needs to be filtered of clay slip before it can enter the storm water system. This can be done with settling ponds or with water tanks and filters (see 5.2.3).

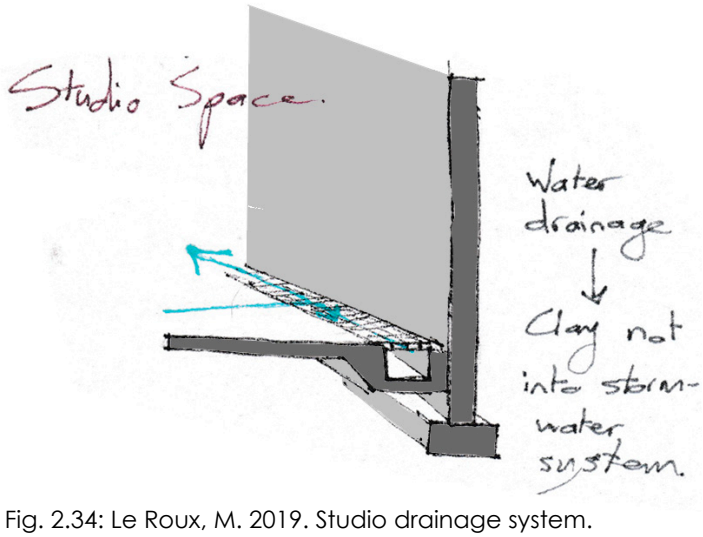


Fig. 2.34: Le Roux, M. 2019. Studio drainage system.

Drying areas can be located near kilns. Heat escaping from the kilns warm up the drying area resulting in shorter drying times.

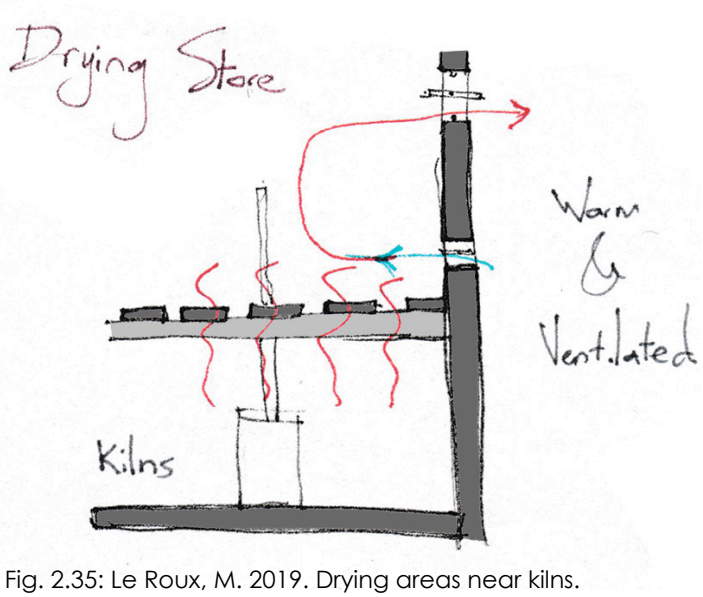


Fig. 2.35: Le Roux, M. 2019. Drying areas near kilns.

The diagrams show the basic functioning of a wood fire kiln and the double walled construction of a bottle kiln.

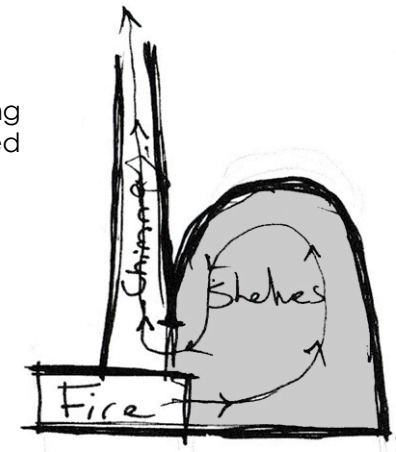


Fig. 2.36: Le Roux, M. 2019. Wood fire kiln.

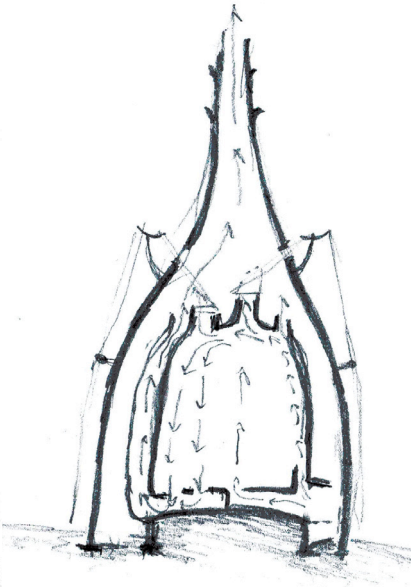
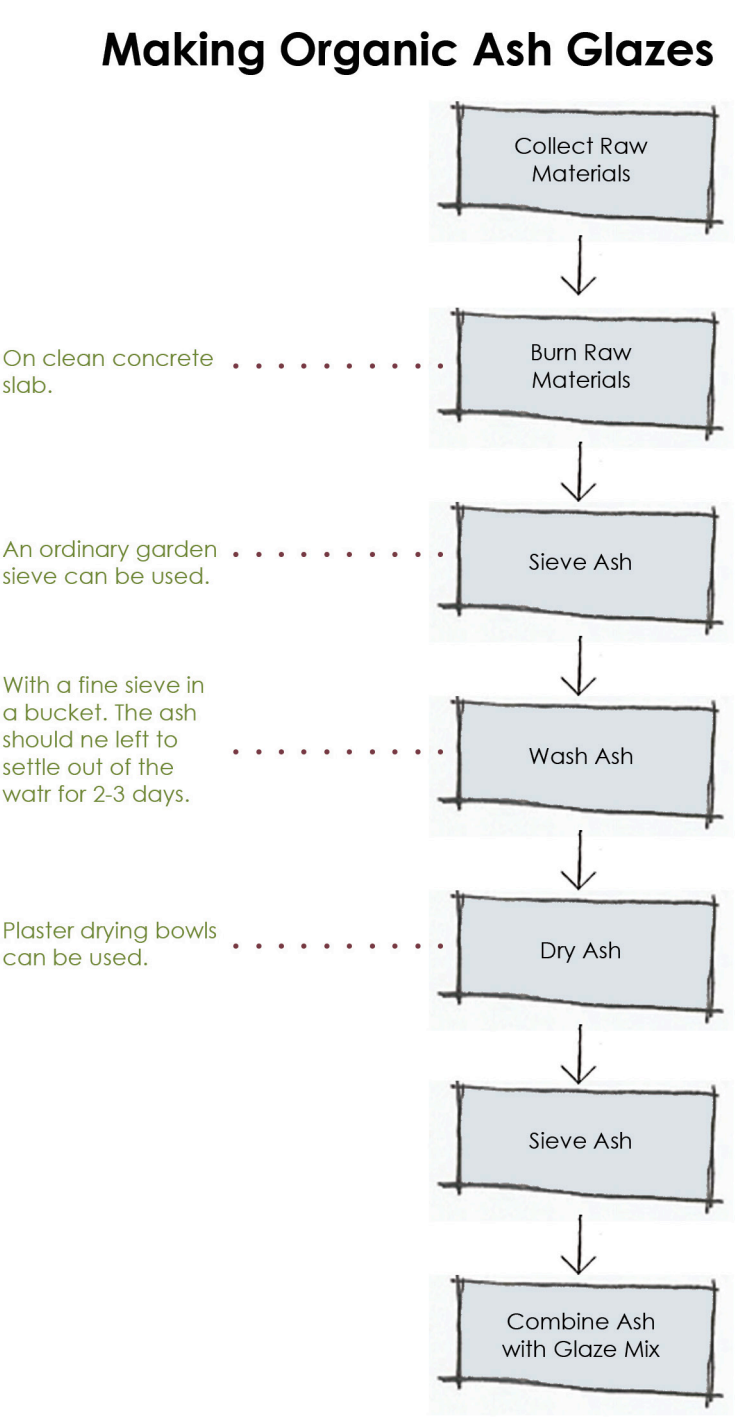


Fig. 2.37: Le Roux, M. 2019. Double walled bottle kiln.

2.6.3 Glaze Mixing

To enhance opportunities for experimentation in ceramics, the mixing of natural glazes is facilitated. Ash from wood fire kilns and from the burning of plant material is mixed into the glaze to produce certain effects . Any plant material can be used, as well as fruit and vegetables (Hopper, 2018). The abundant grass, wild-flowers and trees on the site would be suitable for this purpose. To house plants that are not resistant to frost damage, greenhouses are designed near glazing areas.



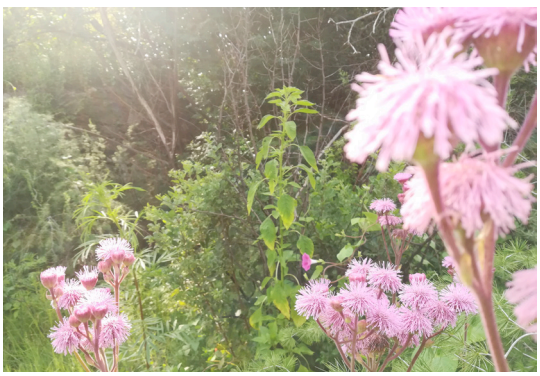


Fig. 2.38 (Right): Vegetation on site. Photographs: Le Roux, M. 2019.

Fig. 2.39: "Turning Point" Site fired terra-cotta, by Nina Hole, 2005.
The sculpture covered with fibre blankets.

2.6.4 Fired-in-Place Sculptures

Historic desire-lines are mapped on the site in the form of tiled pathways. Fired-in-place sculptures are built at the nodes where these pathways cross. One or two sculptures are added to the sculpture park annually. This yearly event can coincide with a ceramics festival that allows the public to see the firing of the sculptures (similar to Burning Man).

The air dried sculpture is placed on a concrete podium and covered with an insulating fibre blanket before it is fired. This allows the sculpture to retain the heat from the fire and increase its temperature. The blanket is removed when the sculpture reaches peak temperature. The entire firing process takes two to three days (Zettersen, 2015).

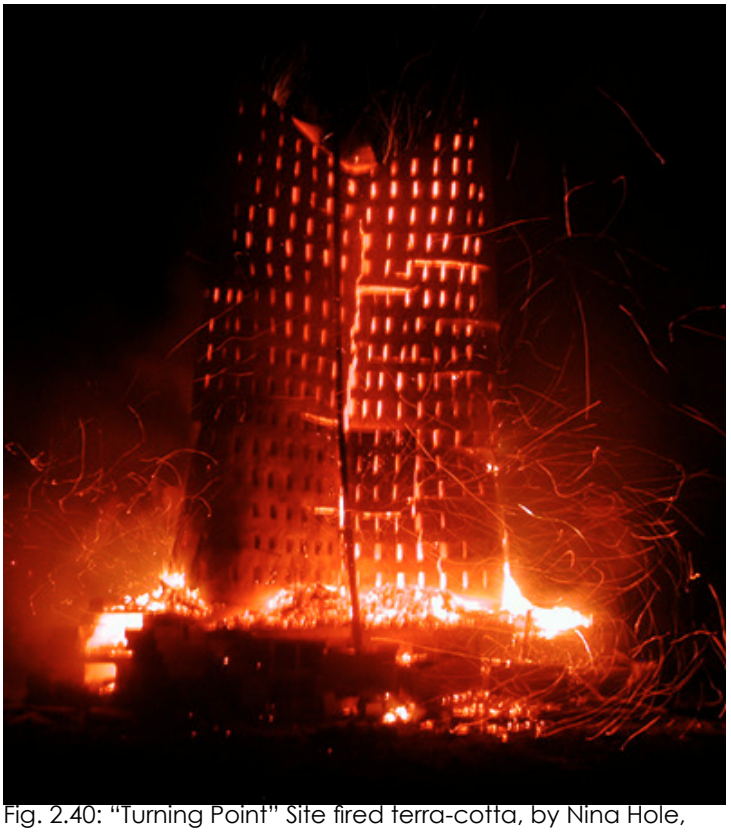
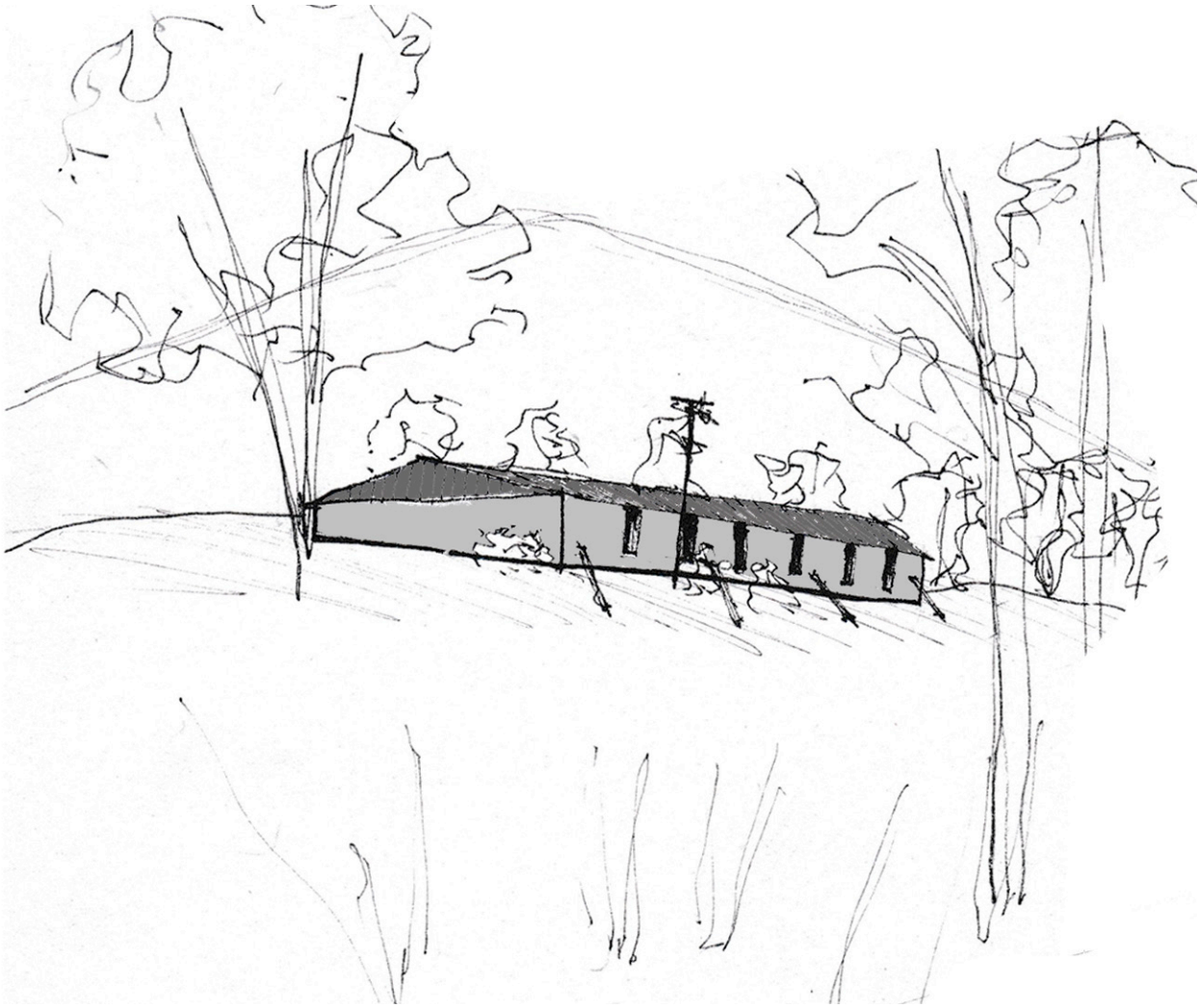


Fig. 2.40: "Turning Point" Site fired terra-cotta, by Nina Hole, 2005.
After the removal of the fibre blankets.

Fig. 2.40: "Turning Point" Site fired terra-cotta, by Nina Hole, 2005.
The finished sculpture.

2.6.5 Precedent Study: Ardmore Ceramic Studio



- Program: Studio space, training area, shop
- Architect: Unknown
- Location: Mooi River, KwaZulu Natal
- Year: 1985

Fig. 2.41: Some of the artists employed by Ardmore. Photograph: Ardmore Ceramic Art, 1992.

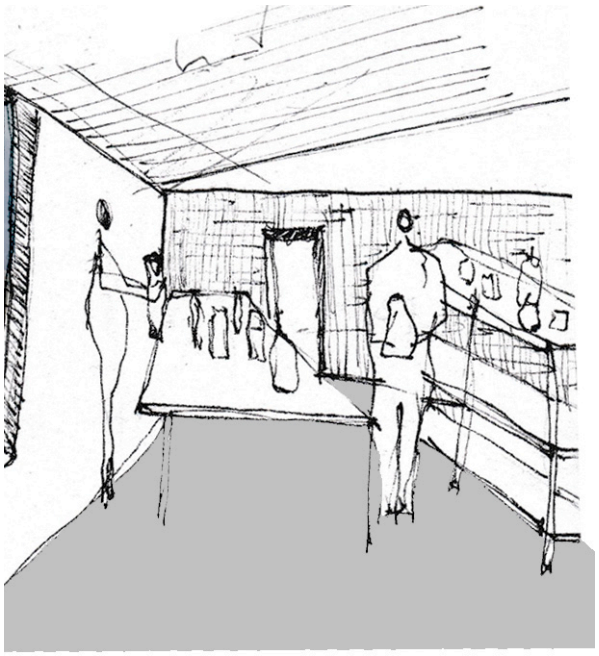
Ardmore was established by Fee Halsted and Bonnie Ntshalintshali in 1985. The studio employs and trains local artists. Materials are provided by the studio and the infamy of the Ardmore brand ensures that ceramic works are sold.

This precedent exemplifies the social and economic impact that a ceramics workshop can have on a community. Work opportunities are created and the skill set that the artists develop opens career opportunities that would otherwise have been unavailable. In 2004 70 artists were employed by the studio (Ardmore Ceramic Art, 2019).

The Ardmore complex consists of a showroom and three main studios. The first studio facilitates the moulding or throwing of the pieces. In the second studio these pieces are detailed with textures and markings. The third studio is used for the painting of the completed pieces (Portfolio, 2015).

Public interaction does not end with the showroom. All the studios are accessible, allowing the visitor to understand the process behind each piece of ceramics. A deeper appreciation of the artwork once the process is understood (Portfolio, 2015).

An old barn of stone construction with a tin roof is converted into a self help studio available to local artists for producing ceramic sculpture, wall relief and functional ware. The work is thrown, hand built and decorated in the studio before being fired in electric kilns.



Design shortcomings:
The space within the barn is too deep to be effectively lit by the windows in the exterior walls, so the women tend to do detail and painting work on the expansive lawn outside. This is a characteristic element of the studio, and could have been incorporated into the design as a series of porches.

Lessons learnt:

- Ceramic workshops can have a social and economic impact on the area.
- The production of ceramic works includes several stages. Labour can be subdivided where different people work on the same object without impacting the quality of the product.
- Outside working space is important.
- Interior spaces should be lit naturally as far as possible.

Fig. 2.42: Artists from Ardmore doing detailed work outside on blankets. Photograph: Scott, G. 1999.

2.6.6 Precedent Study: Terra Cotta Studio

- Program: Ceramics studio
- Architect: Tropical Space
- Location: Vietnam
- Year: 2017

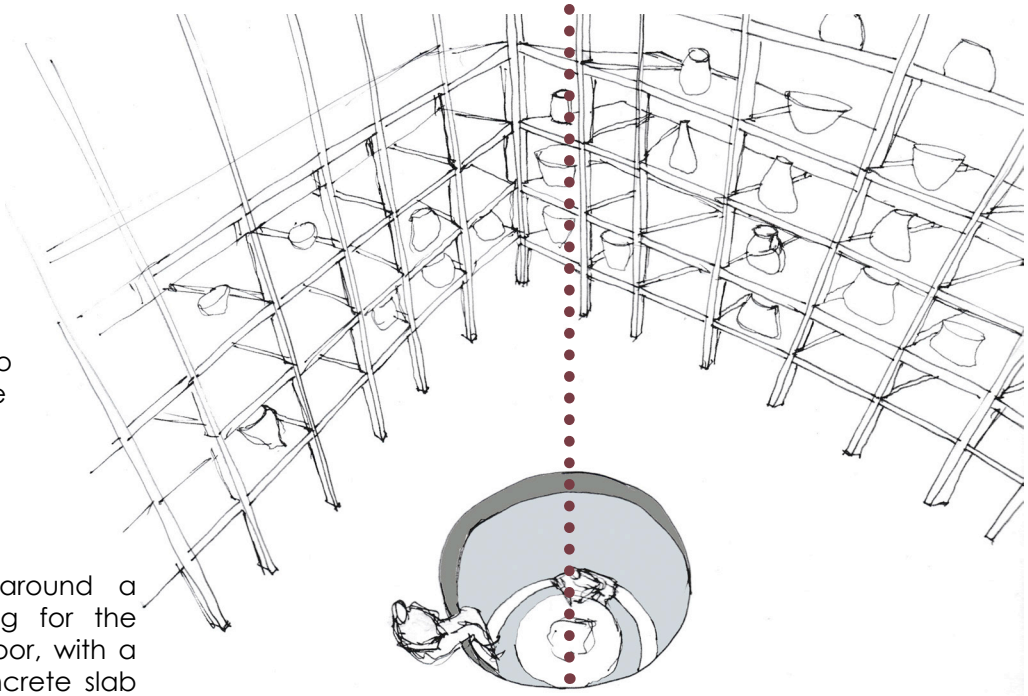


Fig. 2.43: Le Roux, M. 2019. The central potter's wheel.

The building is centred around a potter's wheel. The seating for the wheel is sunken into the floor, with a circular opening in the concrete slab above. This brings light into the space while providing the potter with a view of the sky. It also signifies a relationship with the earth and the sky (figure 2.43).

Storage of drying pots is used as an exhibitionist element. The shelving stretches over two storeys. The outer skin reminds of the construction of ventilation holes in wood fire kilns.

The roof consists of glass panels in a steel frame, simulating the experience of being outside.

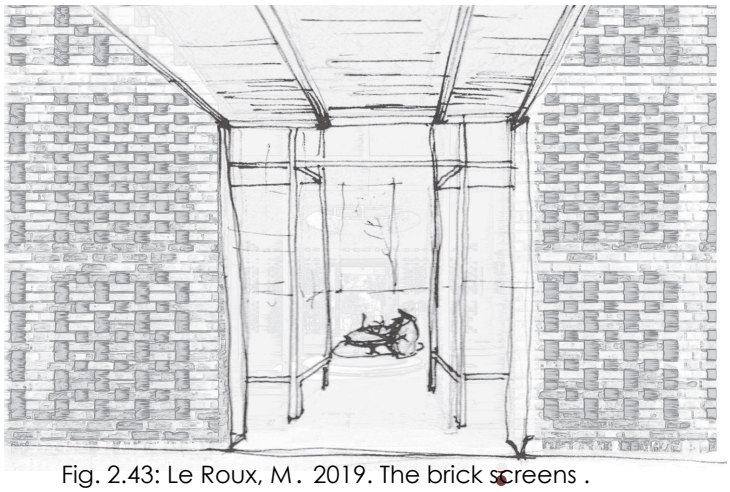


Fig. 2.43: Le Roux, M. 2019. The brick screens .

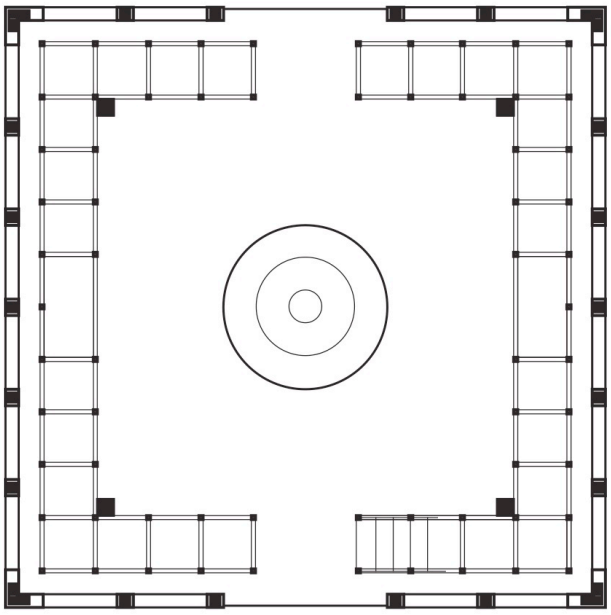


Fig. 2.44: Tropical Space. 2017. Terra Cotta Studio Floor Plan.

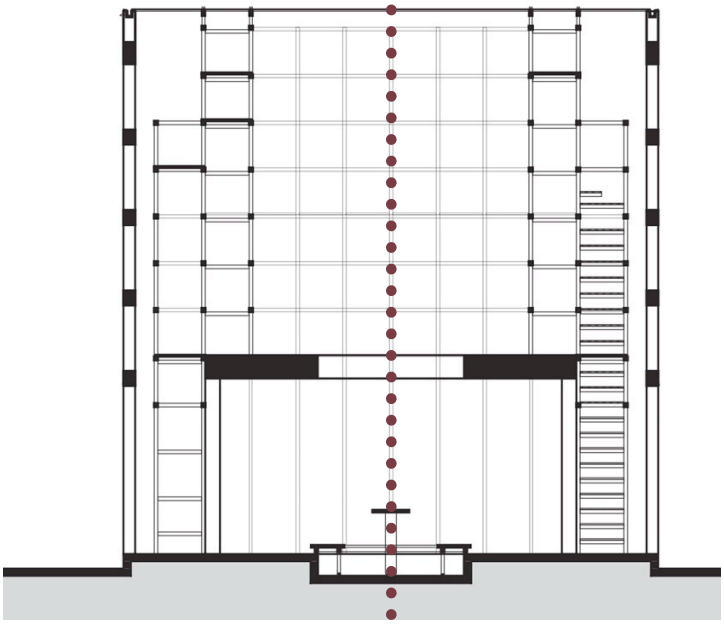
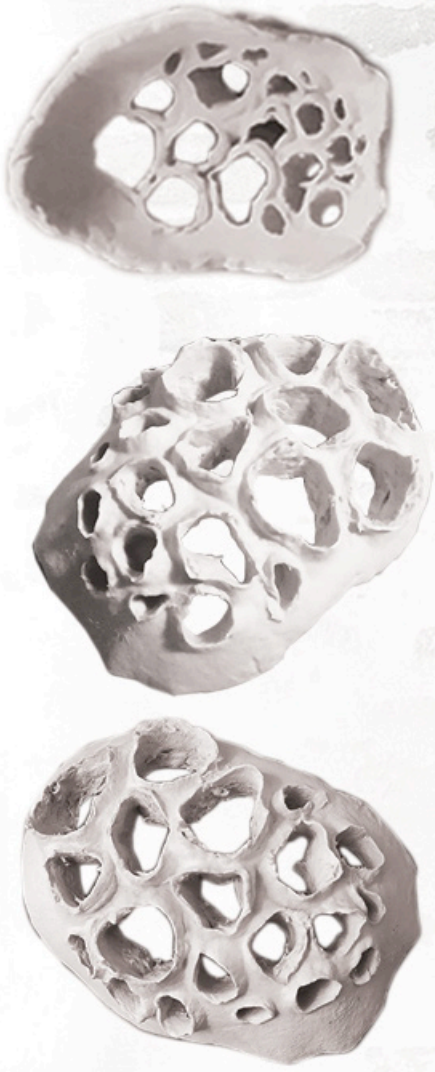
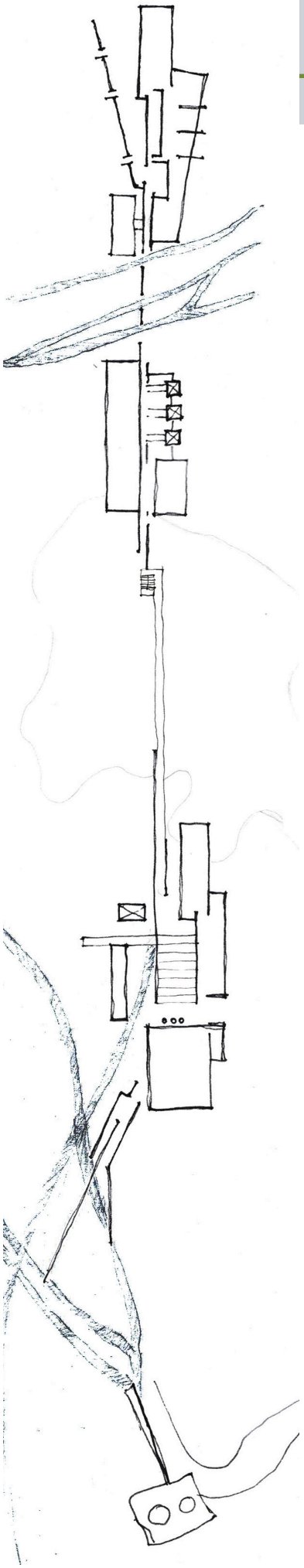


Fig. 2.45: Tropical Space. 2017. Terra Cotta Studio Section. Adapted by author.

Part 3

Theoretical Approach





Introduction

The discourse is divided into three approaches: Haptic architecture, ruination and the architectural promenade. These approaches are discussed with specific regard to the reaction elicited by architectural experience.

Hapticity as a concept is derived from the tactile nature of the proposed program. Haptic architectural qualities are researched as a method of enhancing the tactile experience of a visitor to the studios. The question whether a person's sense of touch can be stimulated without physically partaking in the ceramic making process is raised.

Current site conditions allude to ruination as a theme. Entering the ruined lime kiln on the site provides an exhilarating experience. The characteristics of ruins is analyzed in an attempt to understand why these dematerialized structures are so appealing, The discussion further investigates whether these characteristics can be encouraged through design.

Architectural promenade is investigated as a method for realizing the topographic aim of the project; Historical features on the site (the lime kiln and quarry) and the access road are spaced far apart. The spaces between these features are vast. The project aims to unify these features through a linear arrangement of spaces. The challenge lies in arranging the program on the site to create a thread that binds together the experience of the site features.

Program

HAPTICITY

Site (present)

RUIN

Site (envisioned/future)

PROMENADE

Fragile Architecture

1. Fragmentation
2. Simultaneous space

Variation

1. Light
2. Texture

1. Fragmentation

2. Texture

Fragile Architecture

1. Fragmentation
2. Simultaneous space

Variation

1. Light
2. Texture

Liminal Space

3.1 Hapticity

"My work explores the limit of phenomenology – of the imaginary and the hidden. It invites the viewer into a downward transcendence, a retreat from visibility. This allows the viewer to observe the freedom from dualities of invisibility and visibility, of imperceptions and perception, untruth and truth, matter and spirit, intangible and tangible, and transports them to a realm where there is no distinction between the two, where perfect balance is achieved" (Bhana, 2016).

Figure 3.1: "Oh Almighty, Lead us from the unreal to the real, from darkness to light, from death to immortality Oh Almighty, May there be Peace, Peace, Peace", projection onto stoneware ceramic pieces, by Poorvi Bhana (2009). (Source: sasolsignatures.co.za/blog/hall-fame-poorvi-bhana).

The quote by Poorvi Bhana, a South African ceramic artist, expands on the experience of art as something that is not merely optical. She suggests that the experience can have a meditative and introversive effect that transports the viewer beyond what is seen to that which is absent. In seeing what is not there, the viewer completes the exhibition with a personal narrative that is invisible yet significant to the experience of the art.

3.1.1 Tactility and Memory

Juhani Pallasmaa encourages a similar retreat from visibility by expressing the value of fragile architecture (1999). He explains strong architecture as possessing uniform surfaces, solidity of volume, geometric clarity and simplistic aesthetics (Pallasmaa, 1999: 2). The central experience provided by this kind of architecture is visual. Of opposing qualities, fragile architecture has a haptic effect that advocates dialogue (Pallasmaa, 1999: 5). Haptic architecture offers a reprieve from the fast paced, visually oriented and technologically developed contemporary world. It encourages the engagement of "slowness and intimacy" (Pallasmaa, 1999: 2). Consequently, vision grounds us in the present, while tactile interaction induces the experience of more than one time at once. Tactile architectural qualities can therefore be used as a subtle method of enhancing the historical memory of the site as a narrative overlay to the contemporary experience.

The notion of tactility and memory enhancement is supported by William J Mitchell in the book Placing Words (2005:8). Stimulation of a sense (sight, hearing, touch or smell) can cause the resurgence of a memory that the stimuli is associated with. An example is the smell of fresh cookies at a bakery that reminds you of your grandmother's kitchen. The experience of sitting at the bakery is heightened by the nostalgic recollection of a familiar place. The same applies to tactile architecture. While all people may not share in a moving experience of recollection by this approach to architecture, it does initiate the opportunity for a more meaningful experience.

Figure 3.2: The tactile quality of the proposed program is supplemented by haptic architecture Photograph: Stump, H. 2017

3.1.2 Fragile Architecture and Gestalt

The value of fragile architecture is established in terms of initiating meaningful experience. As a practical approach to the design of these spaces, the gestalt of the architecture is considered. Fragile architecture suggests a faint gestalt. Gestalt translates from German as shape and is defined by psychology as: "the whole can be greater than the sum of its parts" (Weiten, 2014: 146). It is used to explain why the eye groups together certain elements to create a singular form. A faint gestalt would then suggest the exchange of a singular form for the expression of diversities. Pallasmaa explains a faint gestalt as permitting additions and modifications. A strong singular form is discarded in favour of the expression of multiplicities created by problems and physical constraints (1999: 7). Architecture with a faint gestalt expresses different functions and elements instead of hiding it within a singular shell.

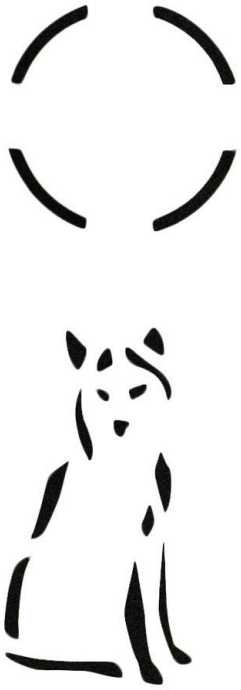
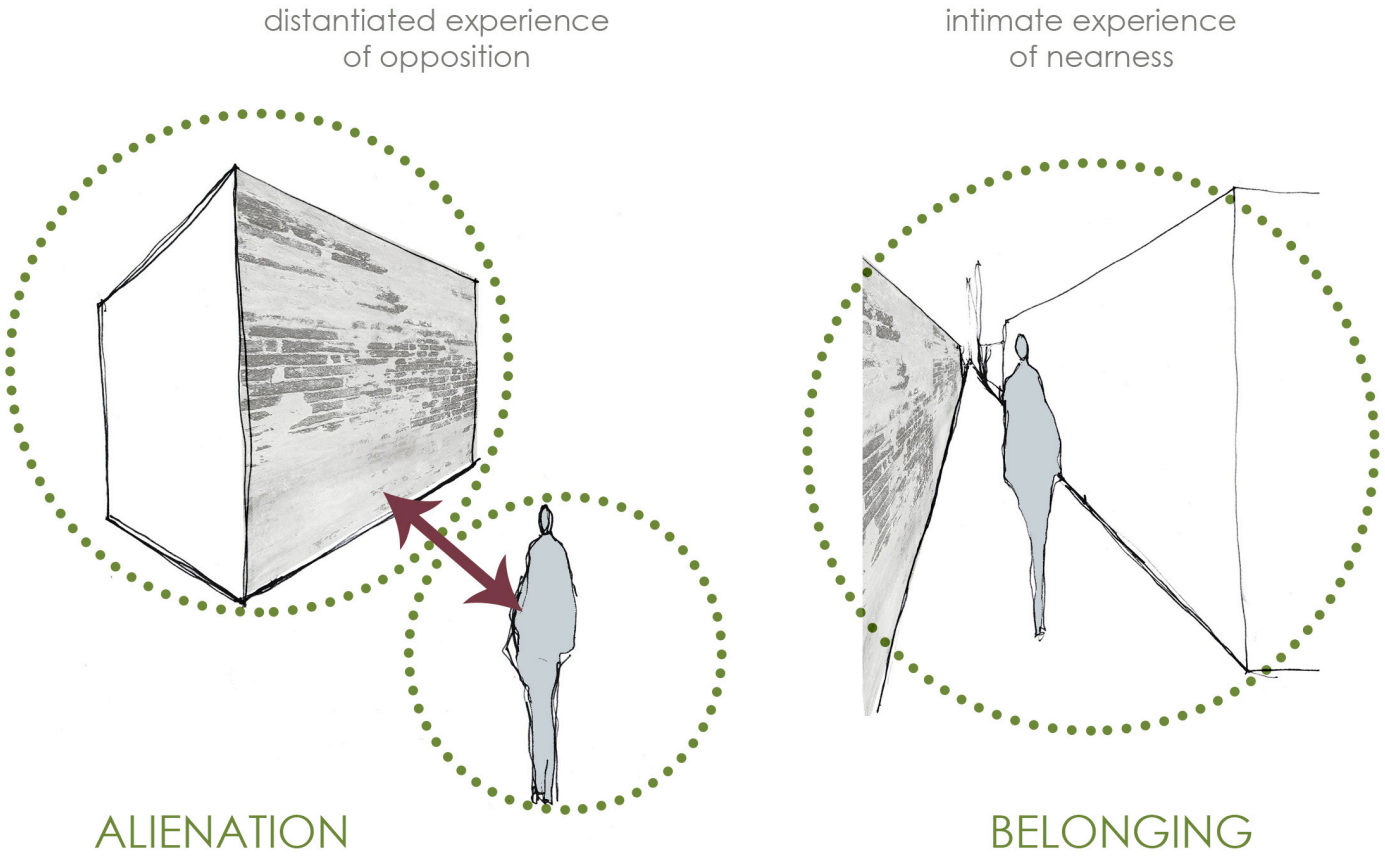


Fig. 3.3: Cengage Learning. 2013. Gestalt explains that the images are mentally completed and seen as whole figures. Computer generated image.

3.1.3 Fragile Architecture and Simultaneous Space

A fragile architectural assembly consists of a succession of architectural fragments arranged to form a composition. These fragments blur the differentiation between the object and its context (Pallasmaa, 1999: 7). An assembly that creates simultaneous space pulls us in to experience it as a fully embodied sensation. Simultaneous space is an enclosed area formed by placing buildings on the periphery instead of as the central focal point. The buildings give way to create space (Pallasmaa, 1999: 7).

Simultaneous space induces a feeling of nearness. The user and the architecture are not experienced as separate entities because the architecture is "intimately occupying the space with us" (McCarter, 2016: 32). As a result the space fosters a feeling of belonging instead of alienation.



3.1.4 Variation and Surprise

Aside from fragile architecture, a prominent characteristic of haptic architecture is depth and texture. This includes variation in illumination and temperature to enhance sensory stimulation. The scale of spaces also play a role in haptic experience. A variation in scale reduces monotony of experience (Pallasmaa, 1999: 1). A double volume space has a more prominent effect when juxtaposed against an area with a low ceiling. Architectural environments that layer conflicting elements are generally more appealing than repetitive settings (Pallasmaa, 1999: 6).

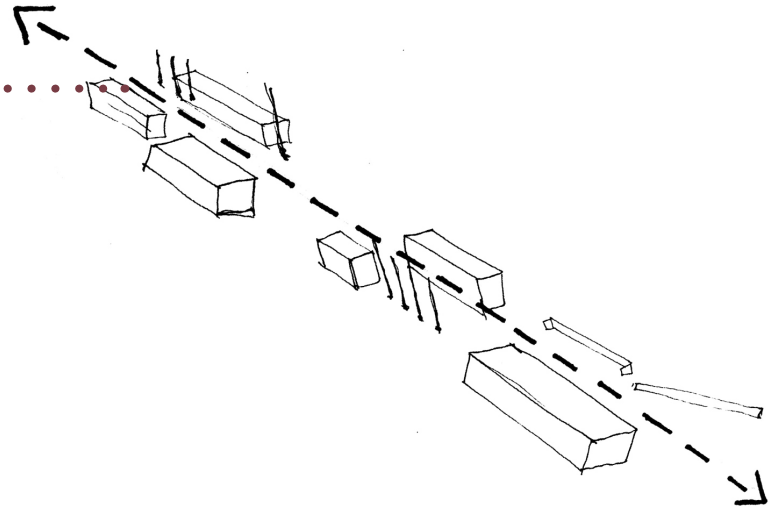
Michael Taussig supports the notion that conflicting elements encourage tactile experience (1991: 149). He explains that something that catches the spectator by surprise "happened to him" and as a result it achieves a tactile characteristic. The distraction that something provides to the wandering eye is tactile. Movies are used as an example, emphasising the sporadic place and focal changes that strike the viewer (Benjamin, 1869: 238).

Architecture is mainly perceived through usage and proprioception (Taussig, 1991: 149). Proprioception is the way that the movement or position of the body is perceived in a space. It also involves the sensation of effort or force exerted by the body (Taylor, 2009: 1143). This sense can be stimulated by alternating the volume of spaces, by adding steps or ramps to walkways or by varying the texture of floor finishes. It is perceived as a tactile stimulus that adds an experiential layer over the visual impact of a space. This layering enriches the experience of the space.

Fragile Architecture

Different functions and elements are articulated in building exterior instead of hiding it within a singular shell.

Instead of designing the architectural intervention as a central focal point, enclosed areas are formed by placing buildings on the periphery. A central walkway draws people into the spaces.

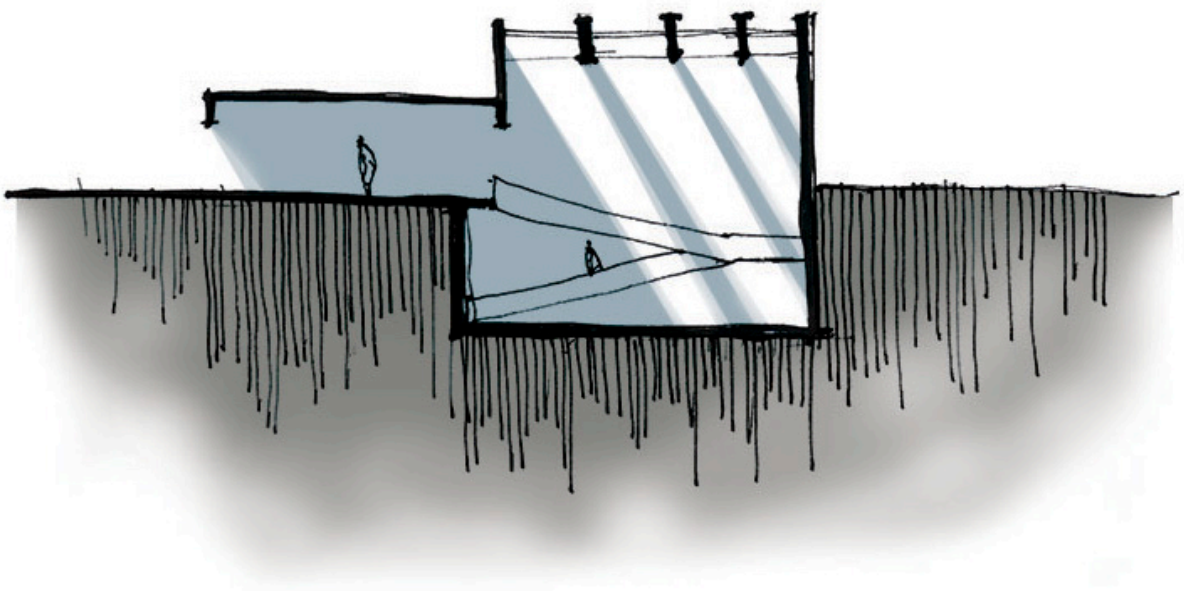


Variation

Variation in the scale of spaces is perceived as a tactile stimulus.

Light

Light and the absence thereof create variations in the experience of a space. The juxtaposition of well-lit and dark areas are surprising. Darkened spaces force people to rely more on other senses. People are more likely to touch the walls of a corridor if they cannot see exactly where it leads. This provides the opportunity for designing handrails and wall surfaces with different textures.



3.2 The Appeal of the Ruin

Figure 3.4: The ruin of the lime kilns on the proposed site. Photograph: Le Roux, M. 2019.

The ruin of the 1895 lime kilns on the site induces some of the haptic qualities discussed above (refer to figure 3.2.1). Ruination causes a diminishing of the architectural form, resulting in an intimate and vulnerable fragile architecture (Pallasmaa, 1999: 6). Ruins are fragmented remainders of structures that entice us for several reasons. The process of the decay of something is appealing in terms of its human/mortal aspect: It ages and crumbles, just like people age and die. The being of the structure is established as something relatable (Ginsberg, 2004: 290). Another appealing aspect of ruins is the unique quality of its surfaces. The decay of a material creates textured and coloured surfaces, adding depth and sensory enticement to a space (Ginsberg, 2004: 293). According to Pallasmaa, this encourages an experience that is haptic instead of visually oriented (1999: 1).

3.2.1 Fragmentation and Mental Image

Fragmentation of the whole caused by decay allows for new connections to form (Ginsberg, 2004: 302). When presented with an incomplete image, one is able to complete the image oneself. In doing so, the experience is personal and the completed mental image is uniquely attuned to what the viewer finds important. A piece of yourself is projected onto the ruin. In this way, we are more fascinated by a ruined fragment than a completed whole. When working with clay to produce an object, this projection is made corporeal. One projects a mental image onto the material to give it physical form. Both experiences inspire the writing of a personal and unique narrative. The proposed design should act as a setting onto which these narratives can play out.

3.2.1 Fragmentation and Liminal Space

The aforementioned fragmentation further blurs the boundaries between inside and outside, giving free reign to the occupation of nature. The result is a unique experience that places one in a liminal space that is both inside and outside, simultaneously enveloped and exposed. St. John Wilson recognizes the impact of being subjected to this simultaneous experience when he writes of "enjoyment at the same time of intense sensations of being inside and outside, of envelopment and detachment, of oneness and separateness" (St John Wilson, 1989: 66).

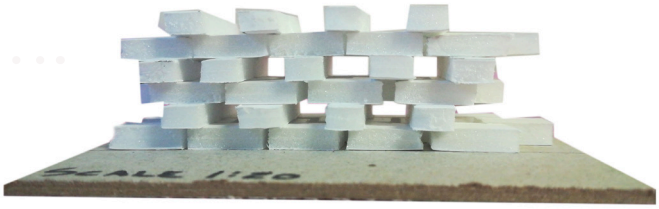
Mortality - material selection

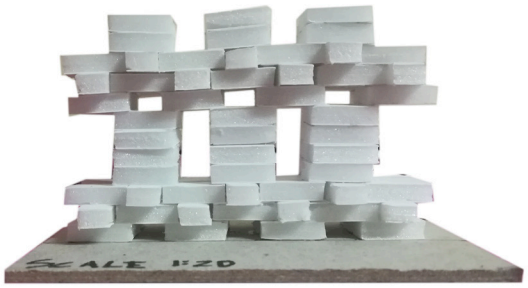
aterials are selected for the project that expresses the passage of time. Timber is used for e xposed trusses and handrails, as wood speaks of two existences in two different times: Its f irst lifetime as a growing tree and its second as an artefact of human construct (Pallasmaa, 1 999:3). When lightly finished, timber changes colour, eventually turning a soft grey and further s ymbolising the passage of time. The masonry spine wall also changes over time because the e xposed bricks support the growing of moss. Reflection ponds are placed on the shaded side o f the wall to encourage growth.

ccording to a study of materials and sensations, tactile timber elements (handrails) promote f eelings of desire, satisfaction and fascination (Crippa, et al., 2012). The light finish of the timber e lements not only show the progression of time, but it also enhances the visual and tangible p erceptibility of the grain of the timber.

Surface texture

The design aims to promote these desirable qualities of ruins. Materials are selected and used in a way that enhances depth and texture of surfaces. Different brick bonds and masonry screens make up a wall that forms the spine of the project. These bonds aim to create differentiation in texture and openings allow for a play between shadow and the golden light of the setting sun.





Orchestrated experience - Variation

The effect of these qualities suggests pockets of experiences. These experiences need to be strung together, where the particulars of each moment is magnified as it comes into contact with a different moment (inducing the haptic effect of alternating places and focal points). Shadows cast by the masonry screen wall are enhanced when experienced next to a smooth wall bathed in light. The spine wall connects these different spaces and a continuous promenade joins the experiences to form a narrative.

Figure 3.4: A for Architecture. Brick House. Prune, India (2014). Photograph: Patil, H. 2016.

Threshold spaces

Threshold spaces like porches and courtyards stimulate the experience of being outside and inside simultaneously. These spaces can mediate between the spine wall and the functions attached to it, forming pockets and niches that are not only thresholds between inside and outside but also between the public visitor and the more private production space. The use of porches further respond to the farmhouse vernacular that is still commonly used in the area (refer to 2.5.3 Surrounding Vernacular).

3.3 The Promenade

The architectural promenade is means of connecting the currently fragmented site features in a singular architectural experience. While visiting the Athenian Acropolis, Le Corbusier was mesmerised by the organisation of buildings on the hill and how this, accompanied by the varying levels, create a rhythm of distinct mass and a form of living elasticity. The experience as one's body moves through the space is important and Le Corbusier referred to it as a promenade architecturale (Laubscher, 2015: 107). The Oxford Dictionary of Architecture associates a promenade with a shaded and paved walkway that is considered to be an initial form of a public park (Curl & Wilson, 2016: 602).

Villa Savoya, a residential design by Le Corbusier, exemplifies the promenade architecturale. The promenade is not in a public setting as with the route up Acropolis hill or as the aforementioned definition implies, but rather involves the circulation design within this private holiday home. The vertical circulation forms a transitional element between Paris and the rooftop garden of Villa Savoya, as well as between the fast pace of the machine (car) and the slower pace of the residence and the garden (Laubscher , 2015), There are two methods of vertical circulation (see figure 3.5). One, a stair that provides fast and efficient circulation which is most commonly used by staff. The second, slower method of circulating is in the form of a central ramp that intercepts with the stair at different levels before turning away again and focusing instead on the view from a window or of the outdoor living room on the first floor. These views are experienced as unexpected delights that turn the circulation into an orchestrated series of events instead of a mere method of going up and down (Le Corbusier, 1934: 24).

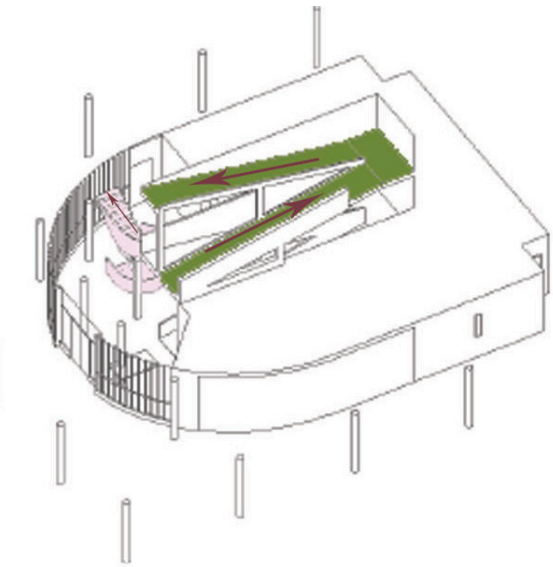


Figure 3.5: Morrissey, D. 2008. Ground floor of *Villa Savoya.* Computer generated image, edited by Le Roux, M. 2019.

Jacques Laubscher identifies another example of the architectural promenade in Le Corbusier's work. Laubscher emphasises his frequent reference to a steamship called the Aquitania in the book Vers Une Architecure. The promenade of the ship is also depicted on the cover of the book. This promenade does not string together a series of views or events. Its qualities are instead derived from the "prominent diagonals" (Naegele, 2001: 7) formed by the 1 point perspective view as one walks down the deck (see figure 3.6). This perspective is enhanced by the straight horizontal lines formed by the rails and the clean connection between wall, floor and roof. The length and width of the corridor further intensify the one point perspective, which in turn emphasises the idea of a forward movement. Le Corbusier describes the experience of this long promenade as gratifying, with an exciting volume (Le Corbusier, 1946). Laubscher further argues that the sensation of this walkway influenced his designs (Laubscher, 2015: 109). Perhaps the long central corridors of Unite d'Habitation or the extent of the ramp in Villa Savoya that provides a lengthy promenade.

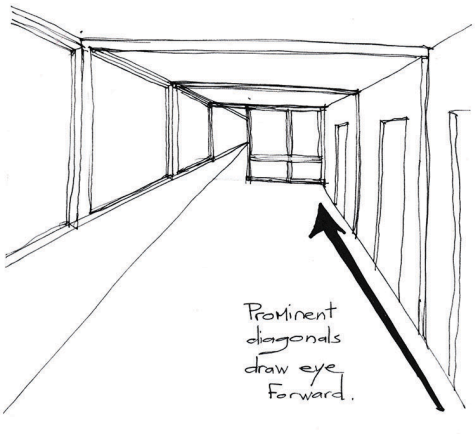


Fig. 3.6: Le Roux, M. 2019. The promenade of the steam ship Aquitania.

Promenade as approach to fragile architecture.

In the proposed project, the promenade is used as a catalyst for dialogue between historic and contemporary development as well as between the maker and the viewer. The axial promenade of the Aquitania creates a rigid route with a clear goal/endpoint. This requires spaces at the periphery of the walker to enforce the route. Peripheral and expected vision is essential to the experience of architecture. By arranging spaces at the periphery of a walkway, a person is placed in an interior space. This encourages emotional connection instead of alienation (Pallasmaa, 1999:7).

Overlapping characteristics of ruination and the promenade

A peripheral building is not a main focal point and resultantly its form isn't experienced as a strong singular image, relating to the appealing fragmented form of a ruin. Expected vision implies that there is something beyond what can be seen (refer to figure 3.7), hinting at exploration to find that which is anticipated. Not seeing the whole picture also recalls ruination, allowing the viewer to complete the picture themselves and encouraging participation. This sense of exploration recalls the unexpected views, connections and turns of the Villa Savoya ramp. A sense of mystery is achieved.

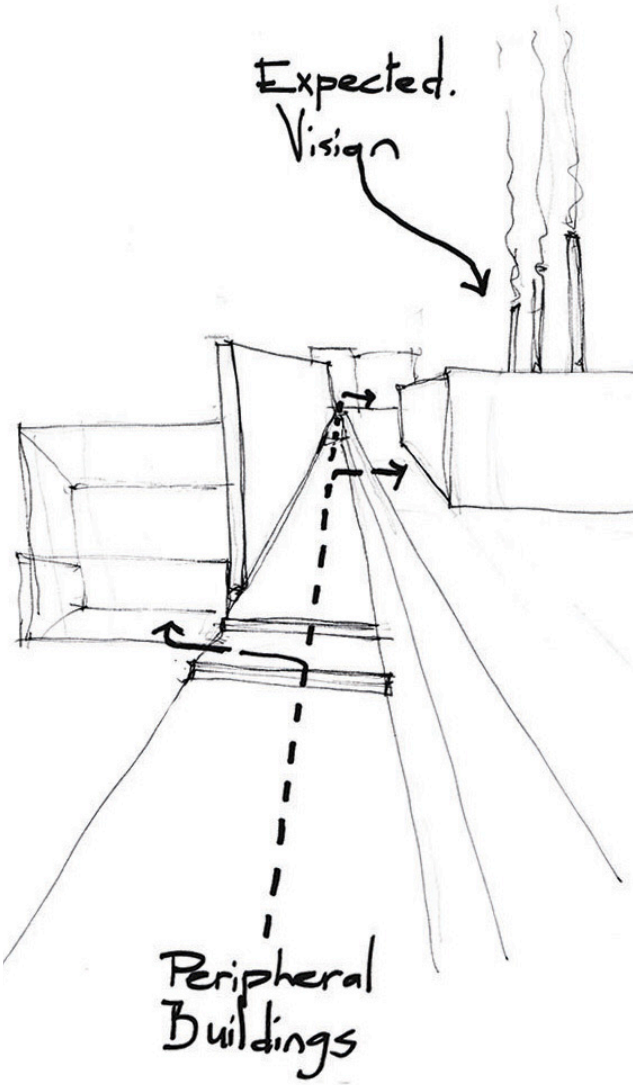
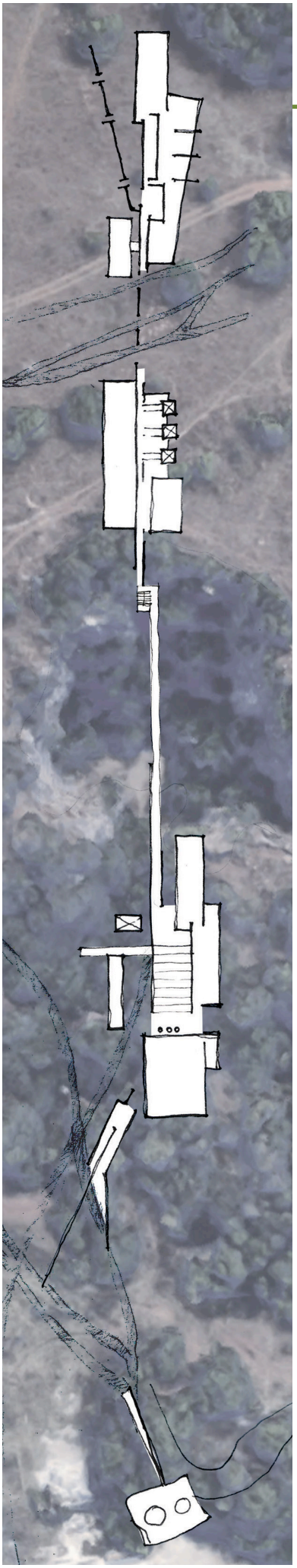


Fig. 3.7: Le Roux, M. 2019. Peripheral and expected vision .



Conclusion

Haptic architecture, ruination and the architectural promenade are discussed as architectural means to elicit certain reactions.

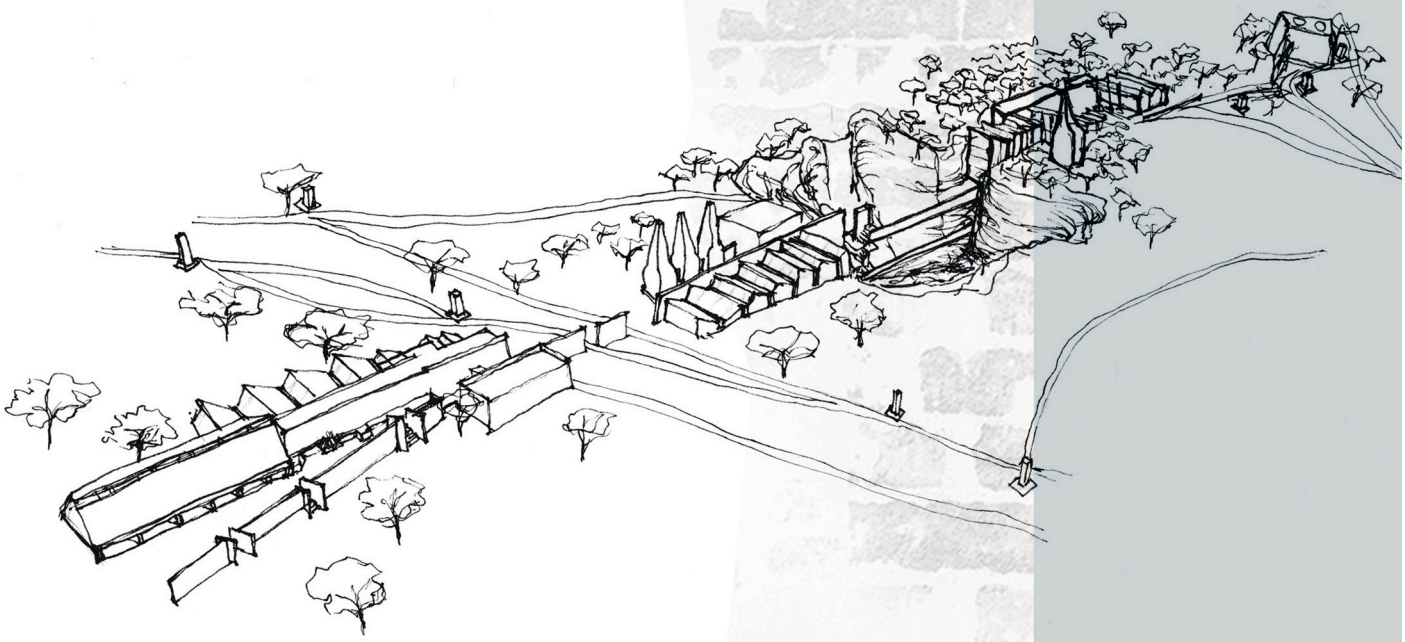
Research of haptic architecture suggests that a visitor to the studios could possibly be immersed in a tactile experience. In order to initiate this experience a fragile approach to design is adopted. This includes the expression of project-specific multiplicities and the design of intimate interior spaces of varying sizes and with fluctuating light quality.

This tactile experience is enhanced by designing according to the appealing characteristics of ruins. The characteristics are encouraged through the use of materials that change over time, textured surface treatments and the design of liminal spaces.

The element that ties the entire project together is a central walkway. This promenade orchestrates the experience of the aforementioned architectural qualities.

Part 4

Design Synthesis



4.1 Design Development

Parts 2 and 3 of the document shaped the development of the design and as such the research was done simultaneous to the progression of the design. Basic site ordering principles are derived from the site analysis and influenced the initial organization of the site. The discussed programmatic information guided the design and allowed the functional requirements to generate project specific details.

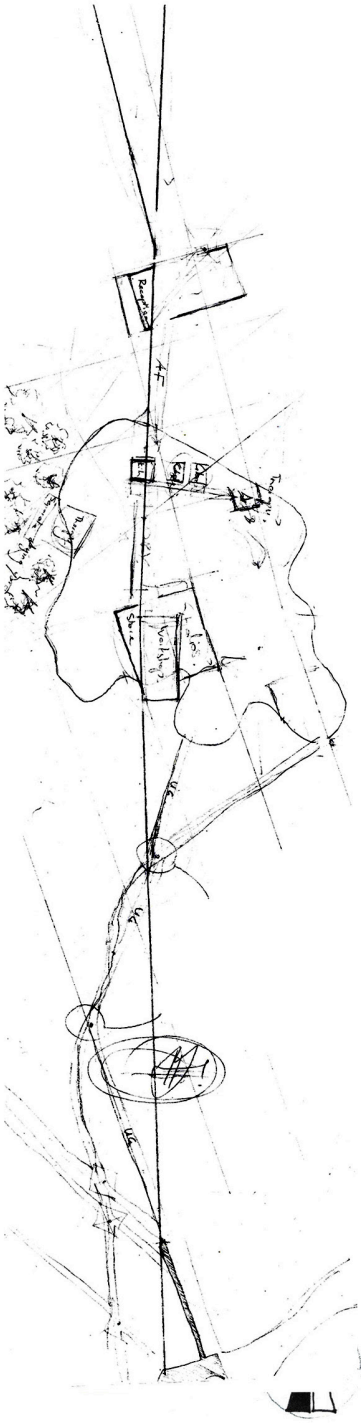
While the later stages of the design was mainly developed using a computer program, hand drawings and physical model building was essential to the intuitive earlier stages of the project.

The site topography and the size of the site posed some challenges. The distance between the access to the site, the lime quarry and the lime kilns created a significant challenge in terms of the arrangement of functions. The length of the area to be developed suggests a linear arrangement, but the program necessitates the grouping of certain elements. An essential part of the process is to insert the proposed programme on the site as a thread that binds together the aforementioned site features into a continuous experience.

Part 4 is a culmination of the decisions made throughout the design process. The process is discussed as it developed chronologically, which involved a back-and-forth development of individual functions and the project as a whole.

Site Organization

4.2

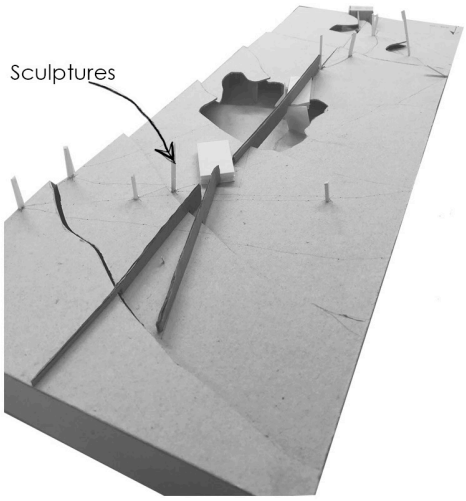


-The Spine-

The program is organised along a spine between the access road, quarry and lime kiln. A diagonal wall (on a 16 juxtaposed grid, see 2.4.2) meets the spine at a reception lobby. These walls form an interior space that aims to draw people in.

-The Sculpture Park-

Desire lines from when the lime operations were active is mapped on the site as meandering pathways. Sculptures are placed where two pathways meet.

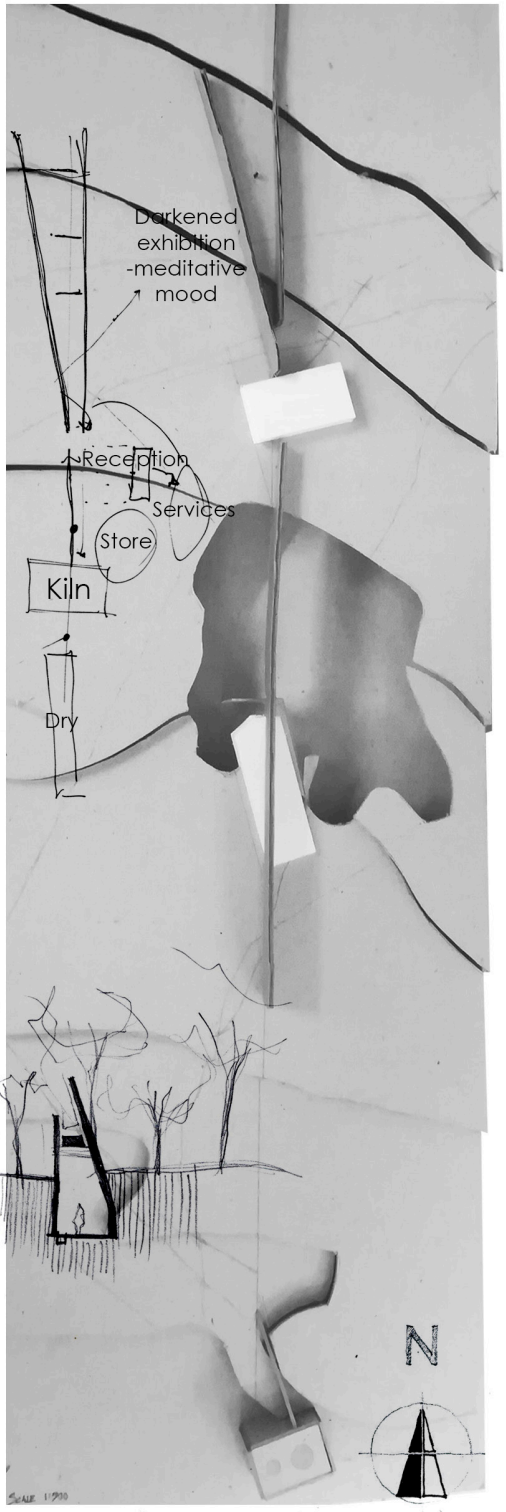


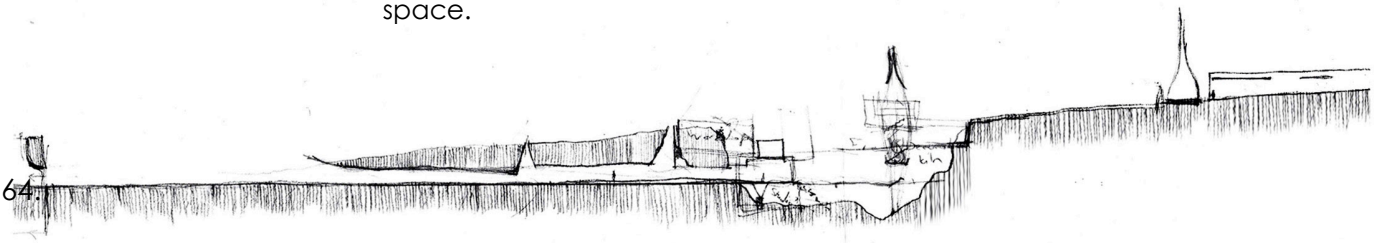
-The Studios-

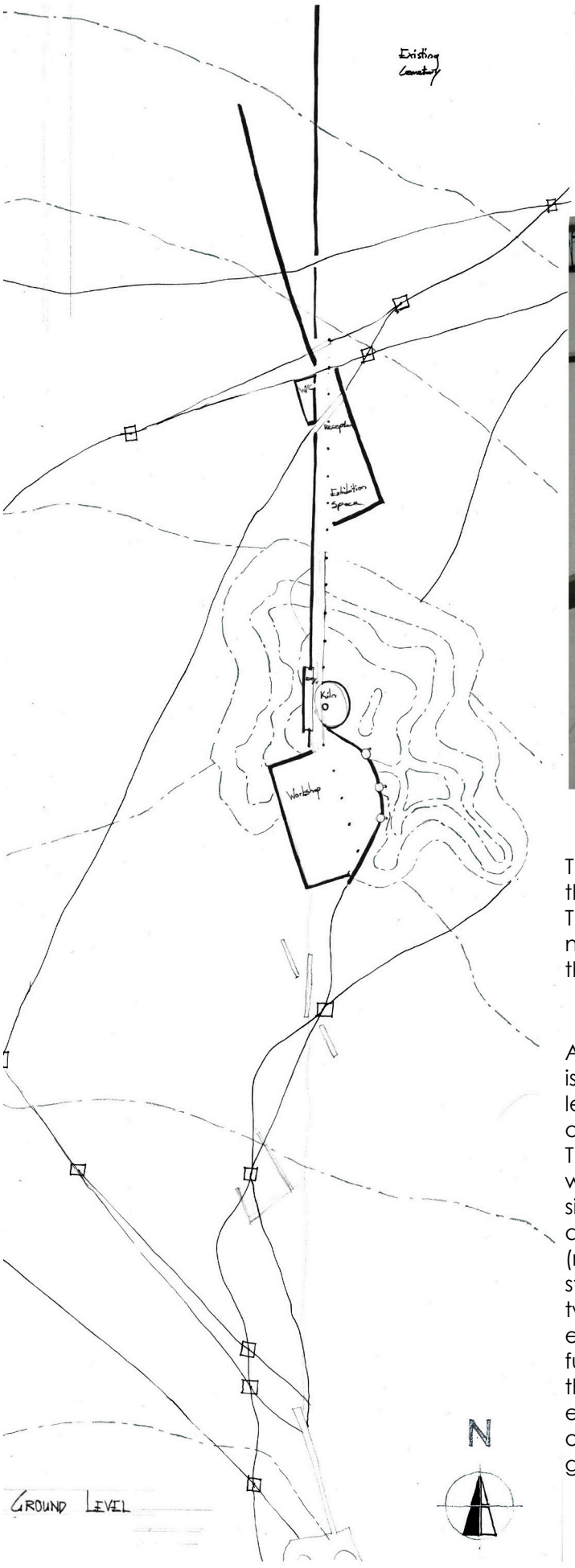
A workshop is situated at the edge of the quarry on ground level, with a large studio below it . This reversed hierarchy allows students at the workshop to observe the professionals in the studio as a learning opportunity.

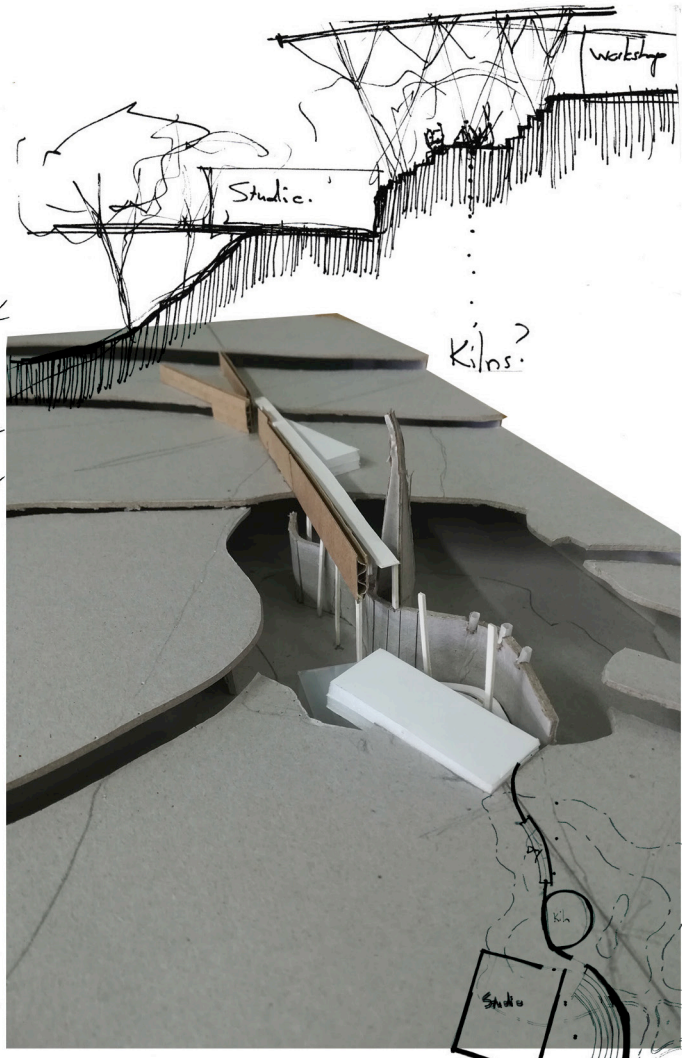
-The Tunnel-

The floor of the lime kiln is used as a horizontal datum. This level is at the middle of the depth of the kiln. A tunnel is designed as connection between the kiln and quarry. The tunnel functions as an exhibition space.







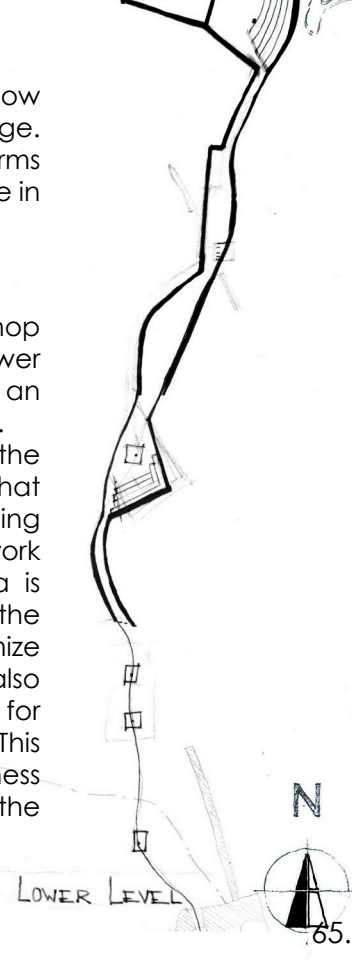


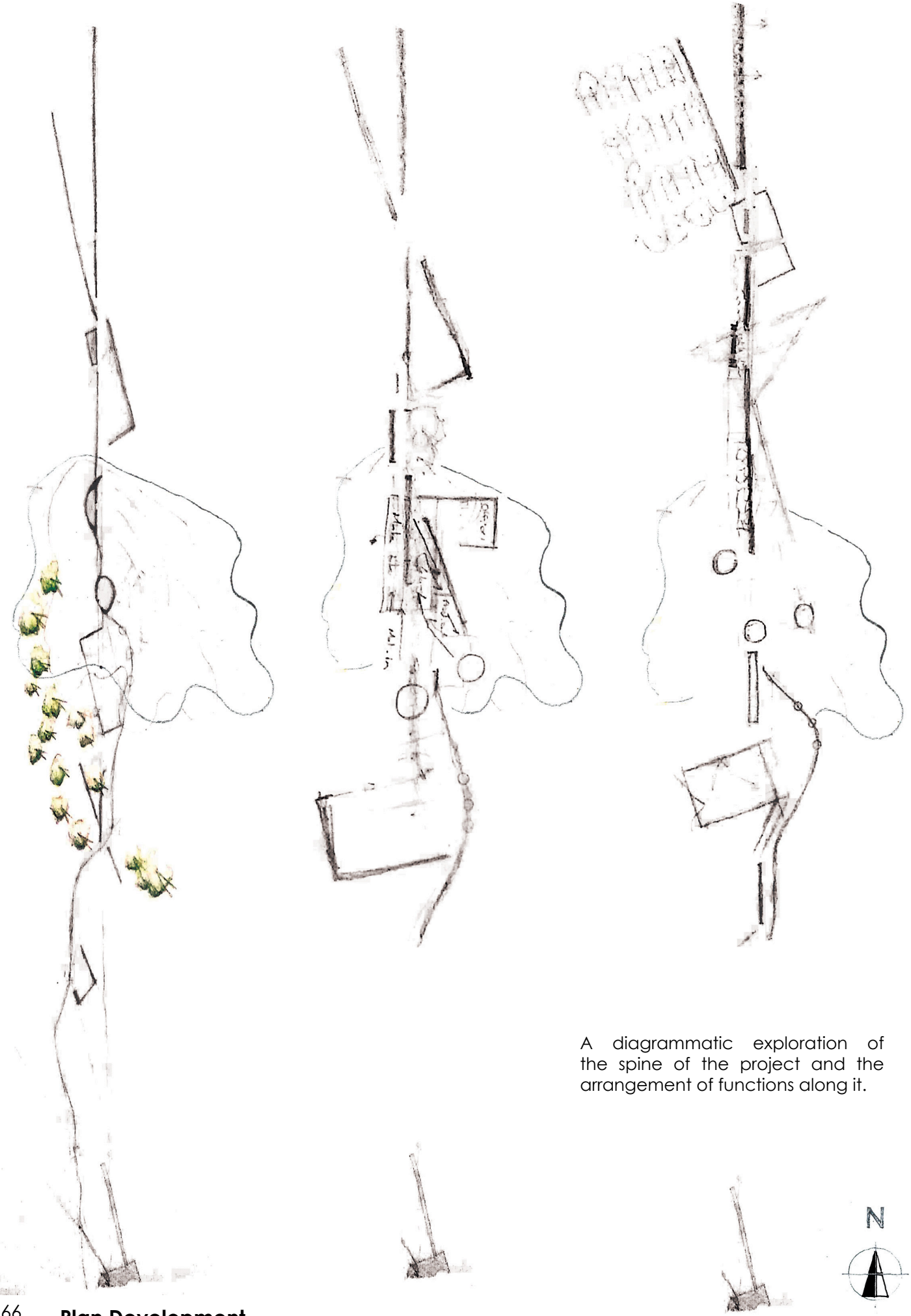
-The Spine-

The spine is curved to follow the line of the quarry edge. This curvilinear line forms niches for exhibition space in the exhibition tunnel.

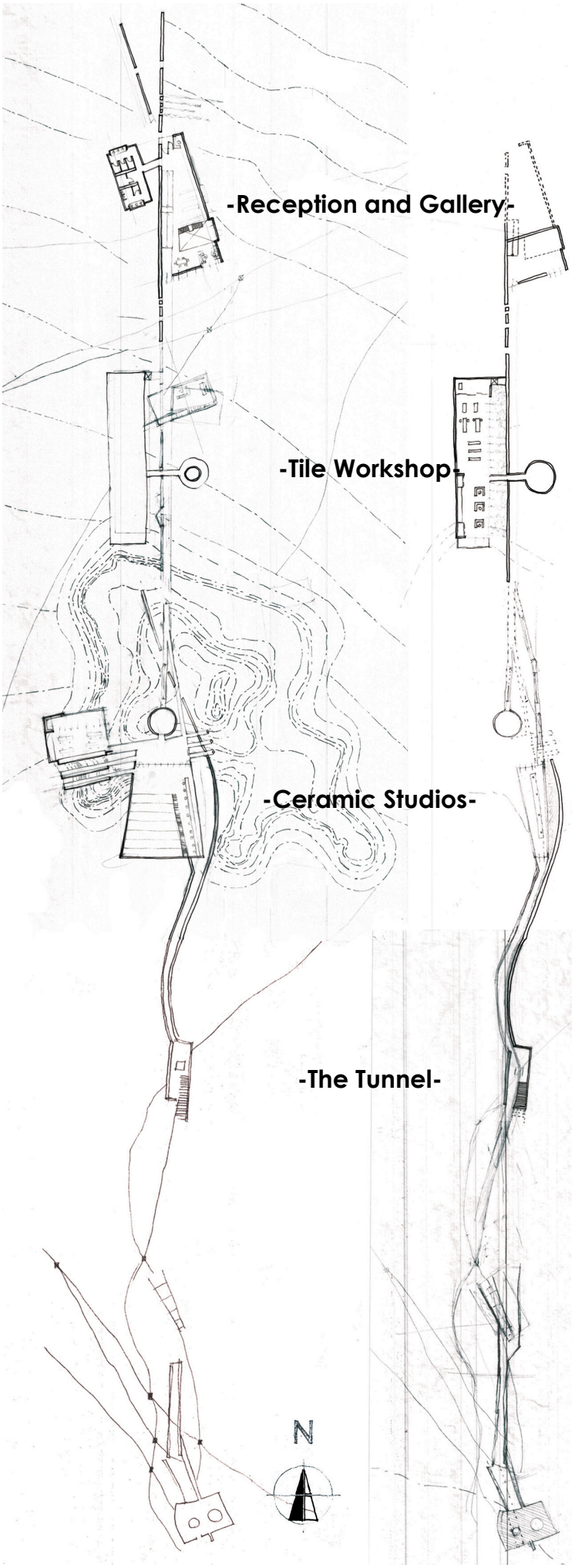
-The Studios-

A ground level workshop is connected to the lower level studio by means of an outdoor decorating area.
This area is inspired by the women of Ardmore that sit outside when doing delicately detailed work (refer to 2.6.4). The area is stepped to connect the two levels and to maximize exposure to light. It can also function as an auditorium for the screening of films. This encourages an awareness of the studio among the general public.





A diagrammatic exploration of the spine of the project and the arrangement of functions along it.



The project spine starts and finishes with exhibition spaces with the production facilities as connection. The spine wall guides a walkway allowing the public to observe the production process.

Exhibit

Production

Exhibit

The diagram below shows the sectional development of the ceramic studio at the edge of the quarry. The floor is stepped so that the space can be used to teach workshops on weekends.

A large bottle kiln similar to those used by the original Transvaal Potteries and Linnware is constructed to the North of the studio. It forms a beacon along the spine.

Development of the Tile Workshop

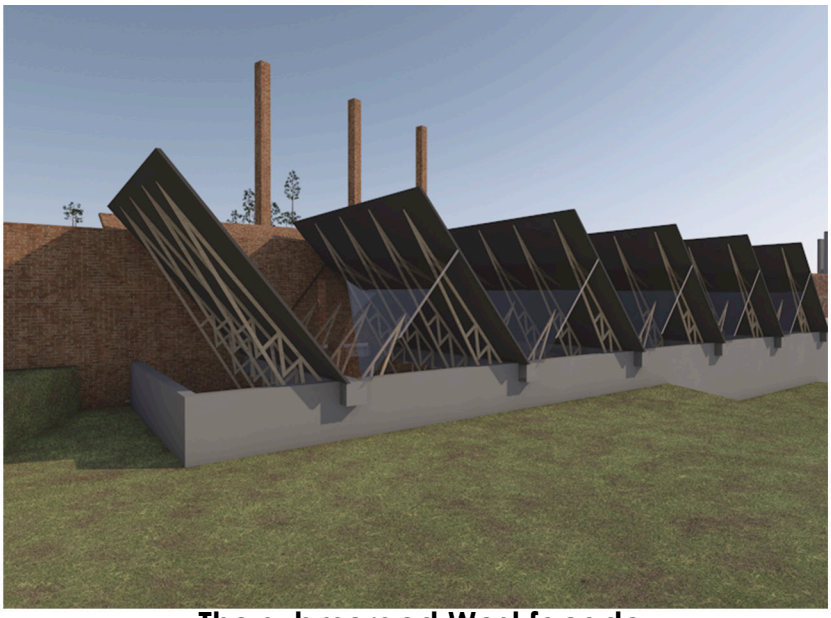
4.3

The tile workshop is facilitated in a linear building arranged along the spine at the edge of the quarry. Three main factors influencing the design of the space is the programmatic requirements (see 2.6.1), the building orientation and the exhibition of the production process.

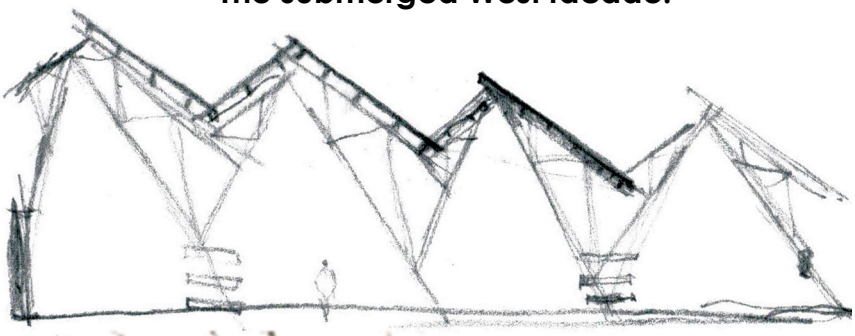
-Orientation-

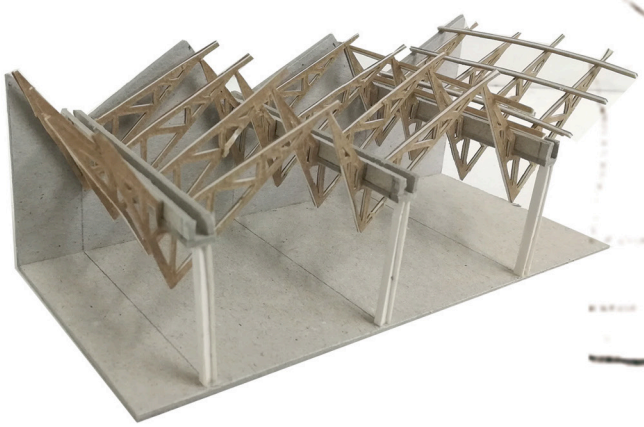
The length of the building is orientated East and West with the 2 shorter façades facing North and South. This poses a problem in terms of natural light and heat gain. To reduce heat gain from the West facade, the building is submerged. To draw sufficient natural light into the space, a saw-tooth roof is designed. The initial trusses form a triangular shape that supports shelving. This reduces the amount of furniture that touches the floor to simplify the cleaning process.

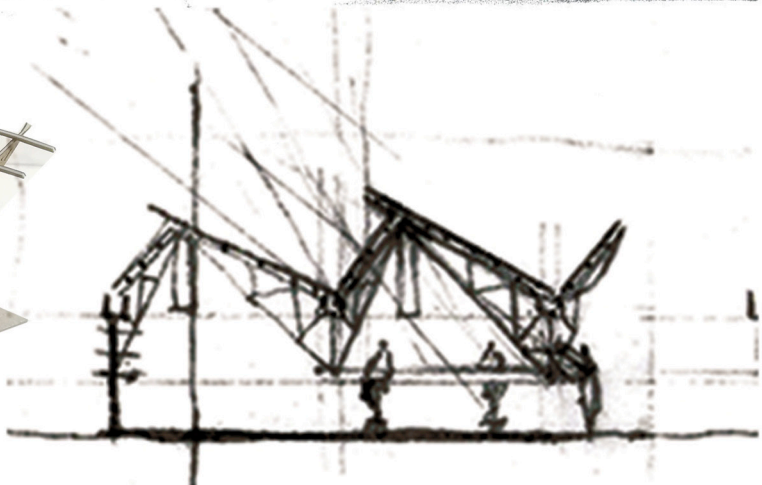
These trusses do however reduce the amount of usable space within the building and it limits circulation.
The trusses are raised to allow people to move beneath it and mobile shelves are used for easy cleaning and the movement of tiles between different work stages.



The submerged West facade.

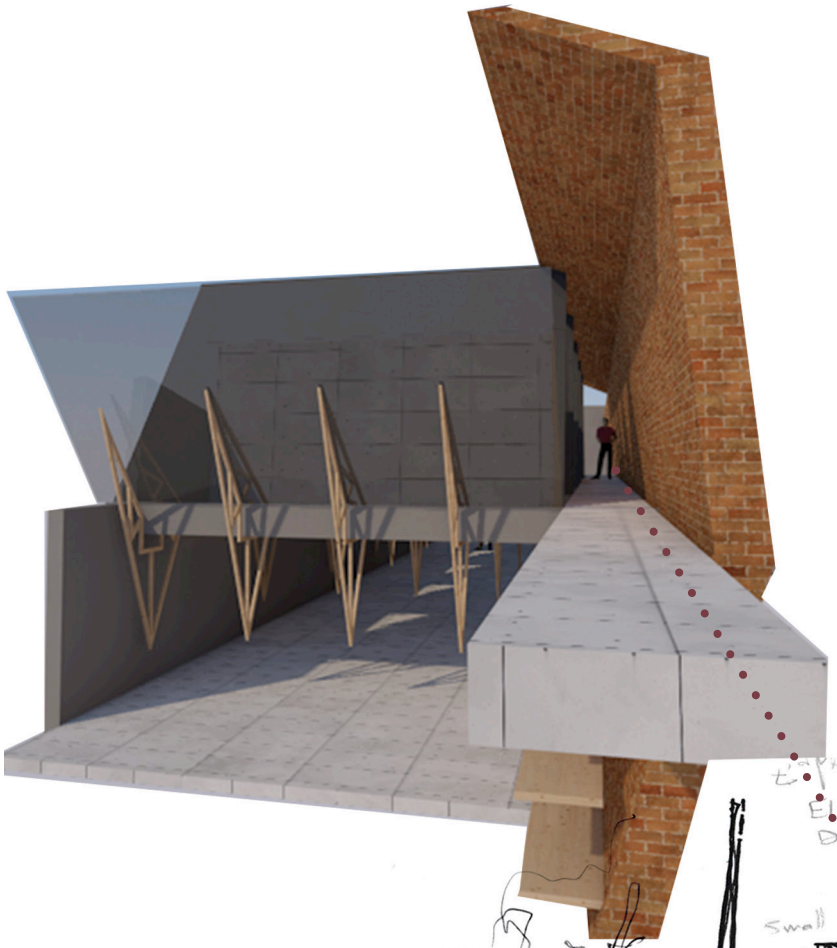




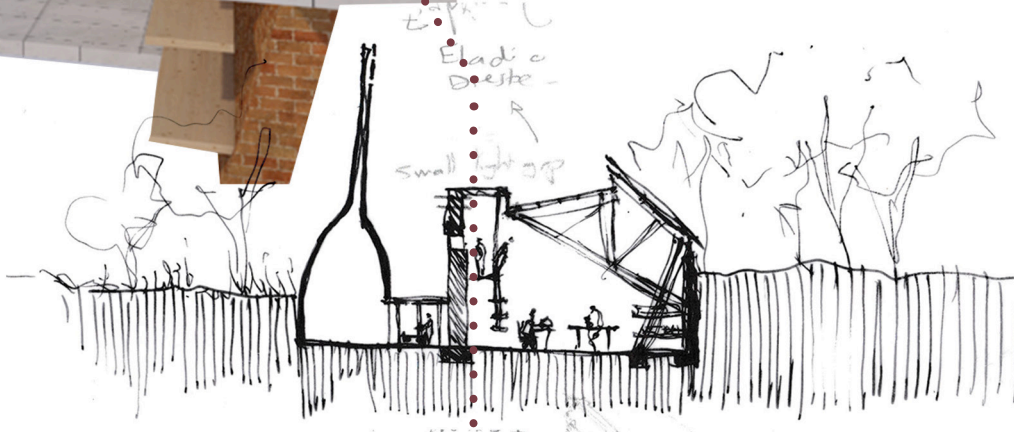


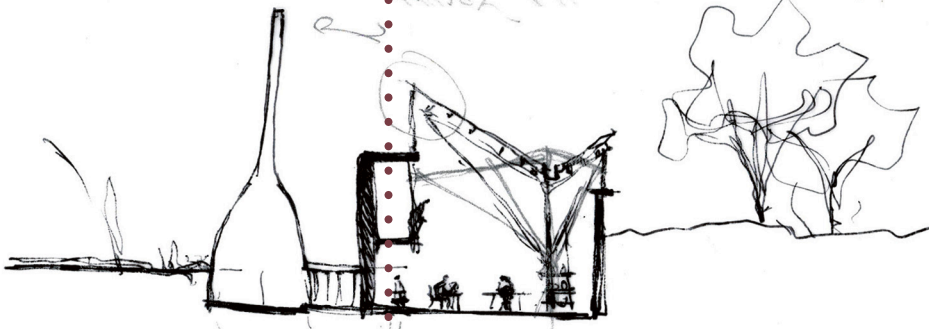
Initial truss design.

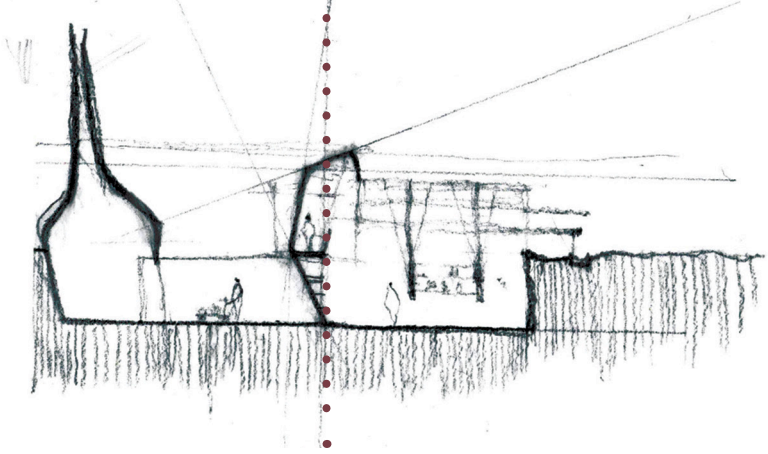
Roof with north-facing polycarbonate panels.



Walkway



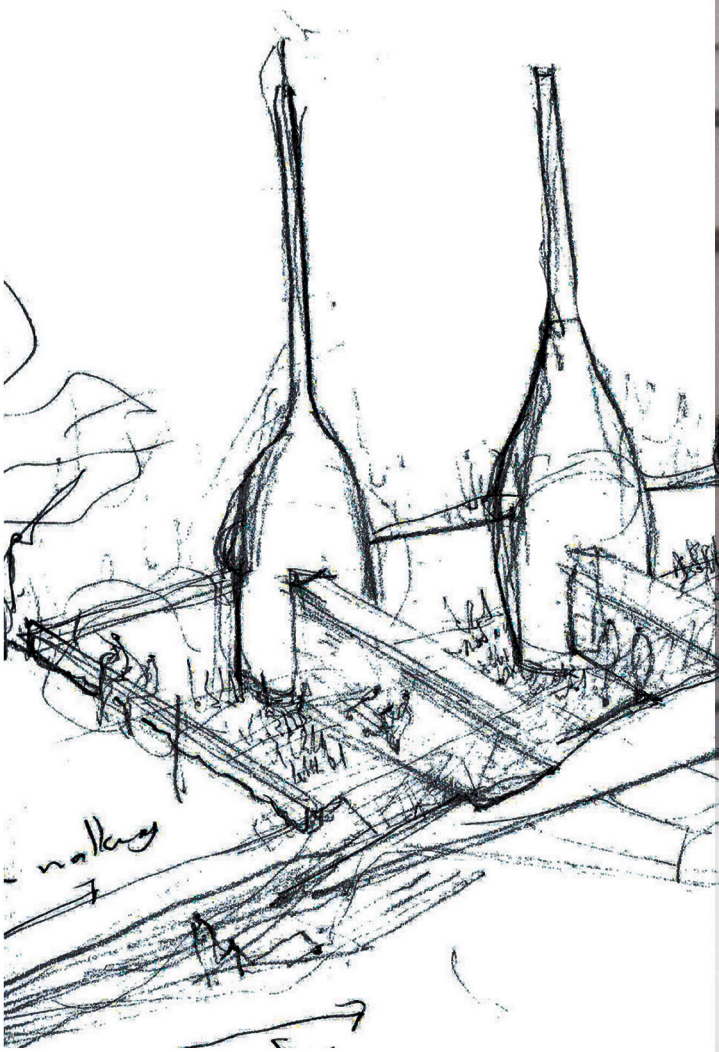


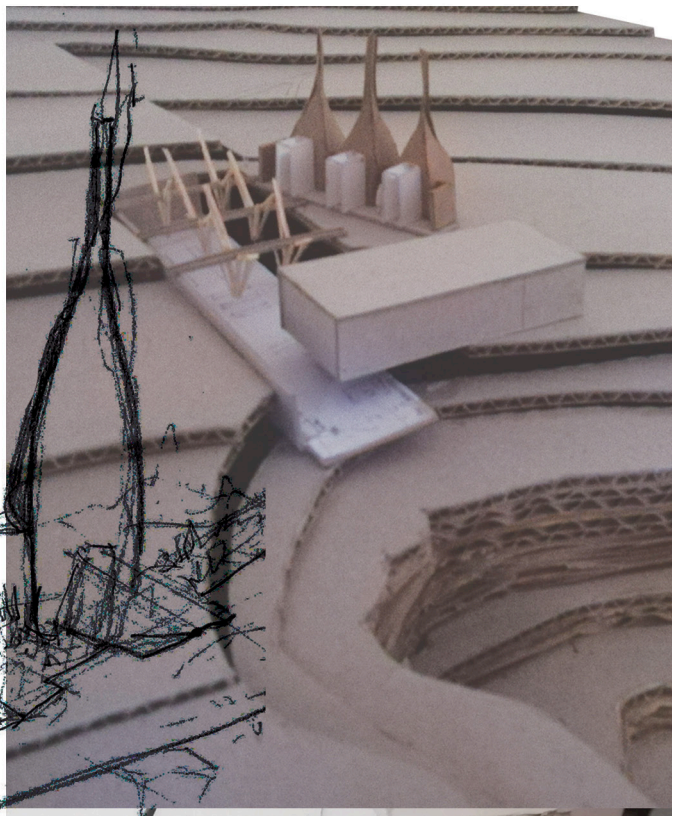


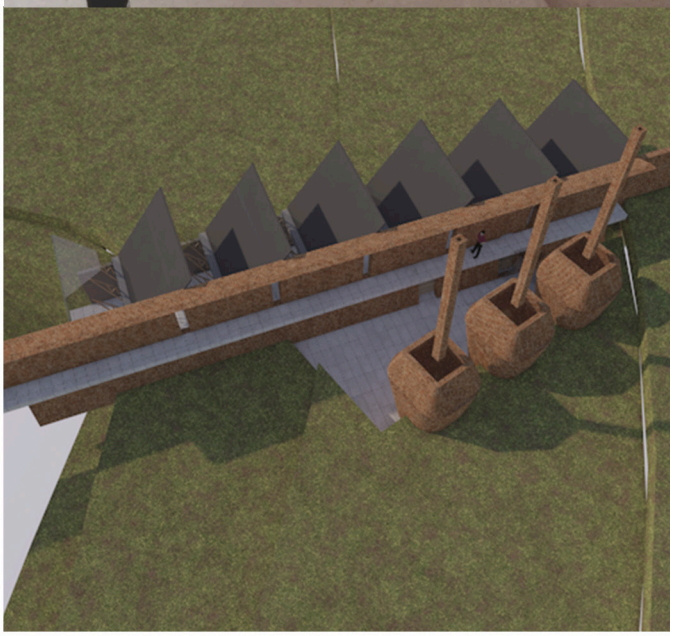
-Exhibition of the Process-

The central spine and walkway is explored as a mediator between the production area and the public.

The sections indicate different ways of treating the spine wall. The walkway forms a catwalk on ground level with views into the submerged production space.







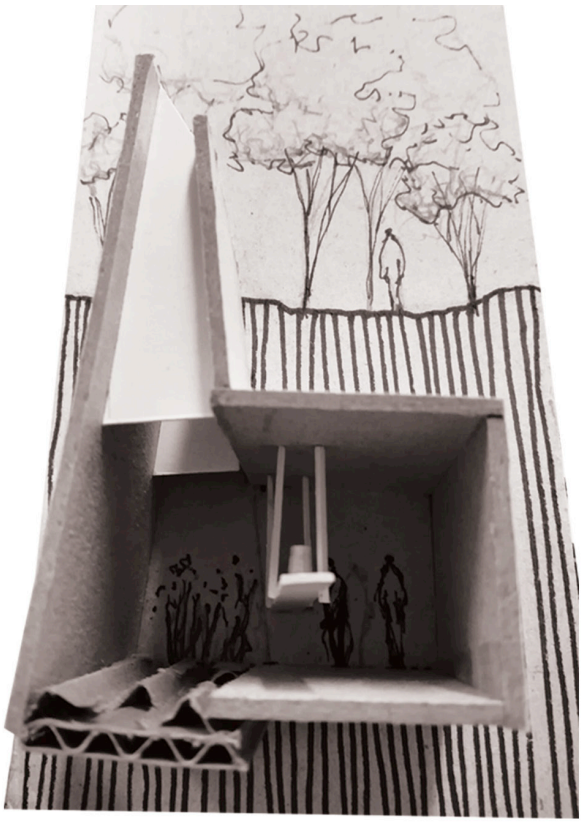
Three bottle kilns are used for biscuit and glaze firing of the tiles. A sunken courtyard is formed between the workshop and these kilns. The court brings light into the building and allows for ventilation.

Warm air from the kilns make the court an ideal place for the drying of the tiles. It is also used for the burning of plant matter used in glaze mixing.

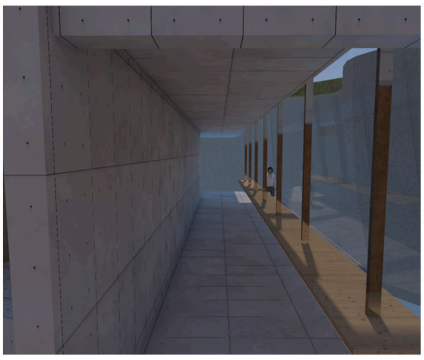
The aforementioned walkway moves between the court and the production space, allowing for public views of both areas and forming a roof over the doors that lead to the courtyard. In this the embodied sensation of simultaneous space is explored (see 3.1.2).

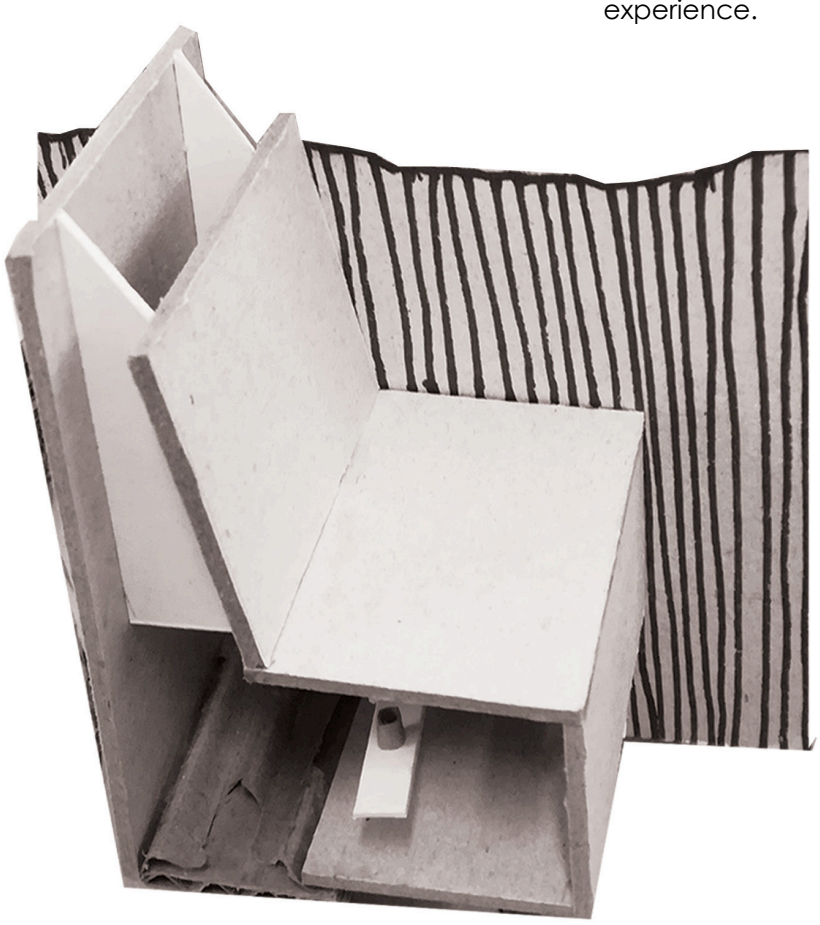
Development of the Tunnel

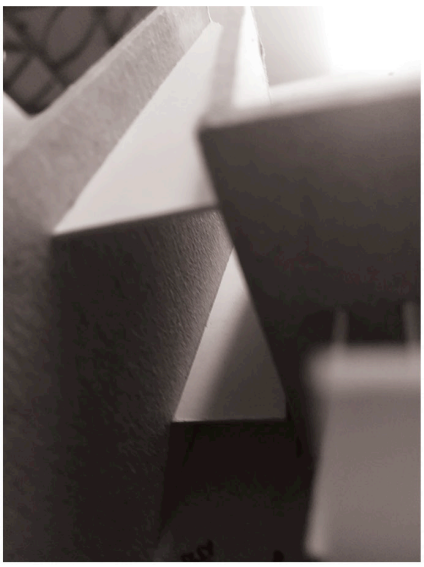
4.4



The treatment of light is essential to the design of the tunnel and is explored through sectional models.
A shaft draws light into the underground tunnel. The top of the shaft is left open to assist in the ventilation of the spaces. The base of the shaft consists of a large planter. The exhibition area is separated from the vegetation with a floor to ceiling window. The vegetation induces a feeling of being outside while within an enclosed space, inducing a liminal experience.





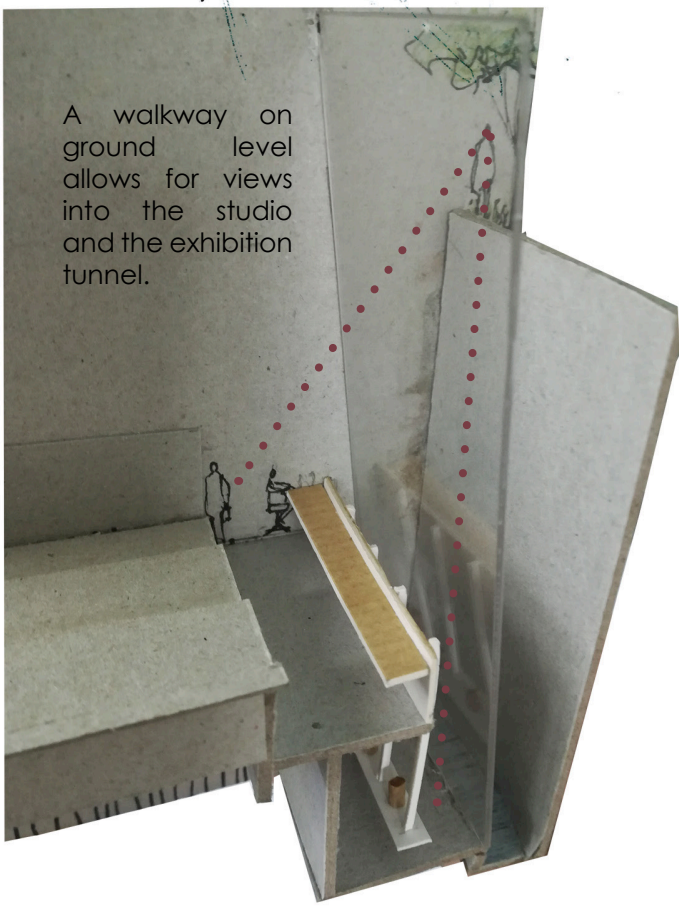


Tunnel connection to the Studios

4.5

The ceramic studios are grouped to the south of the lime quarry. This is also the entrance to the exhibition tunnel that connects the quarry and the historic lime kilns. Spaces where the two functions overlap provide opportunities for the exhibition of the ceramic making process.

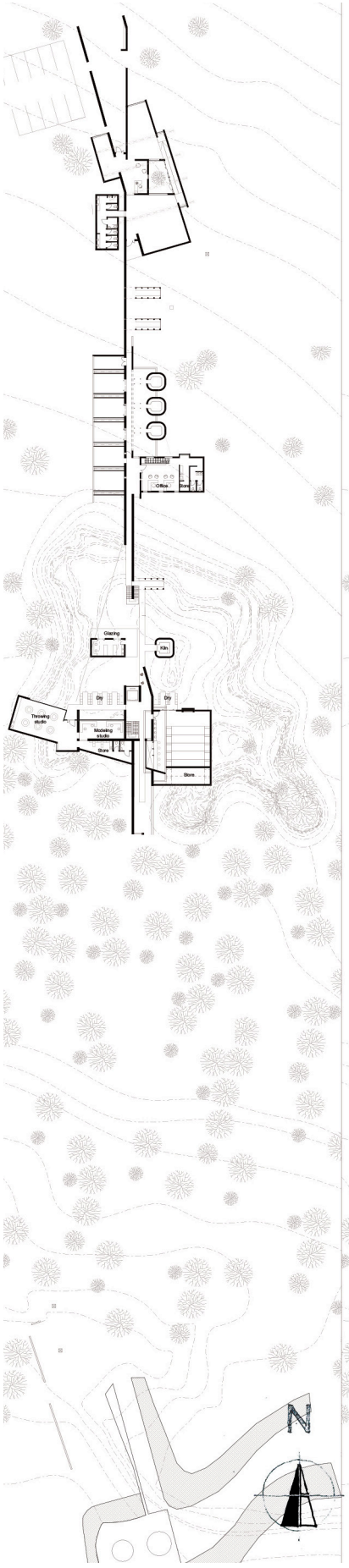
A glass curtain wall draws light into the studio and the exhibition tunnel.
A reflection pond at the base of the curtain wall adjusts the quality of the light.

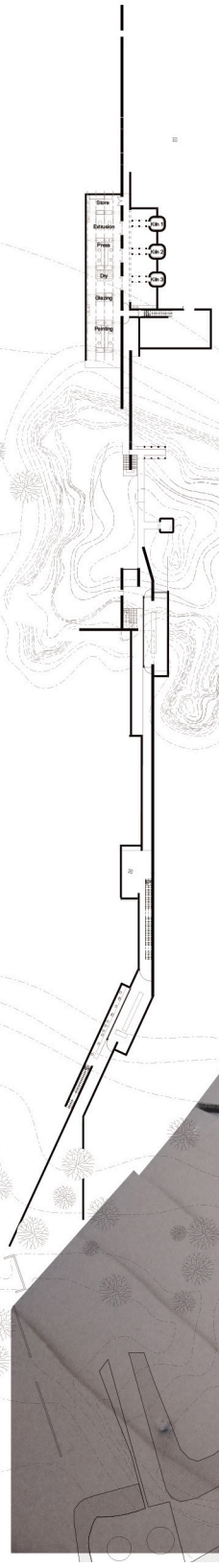


A walkway on ground level allows for views into the studio and the exhibition tunnel.

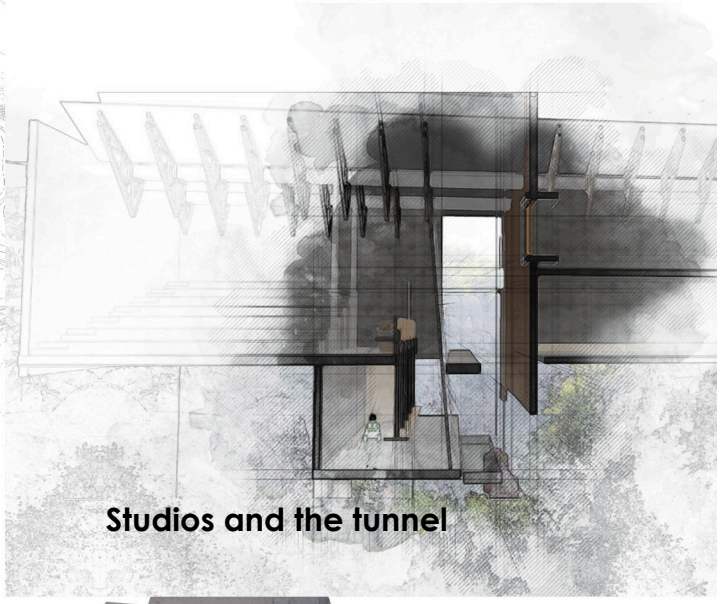
Arrangement along the Spine

4.6

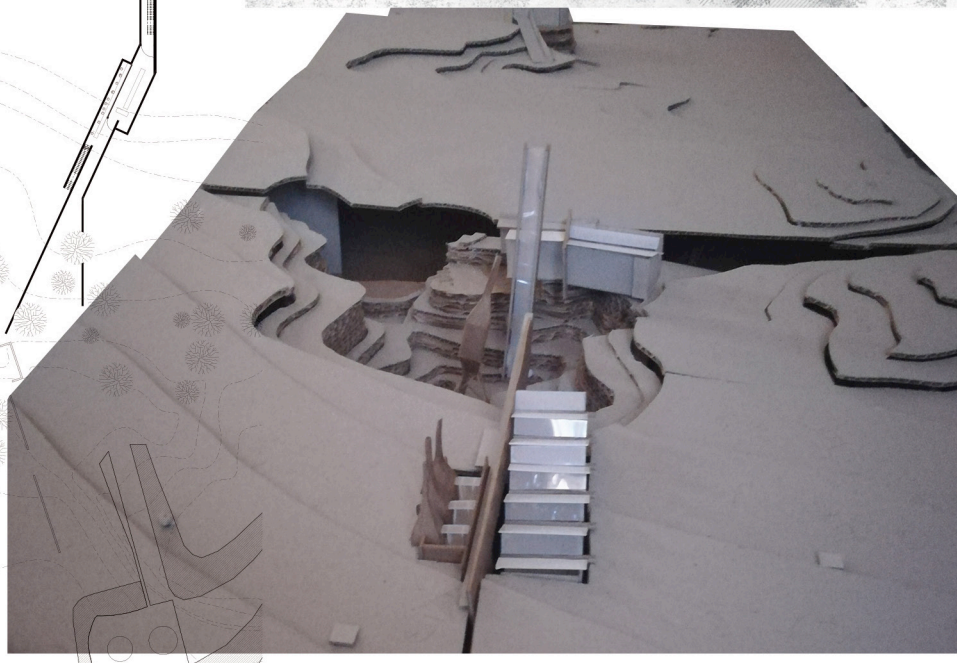




Tile workshop: approach from the quarry



Studios and the tunnel

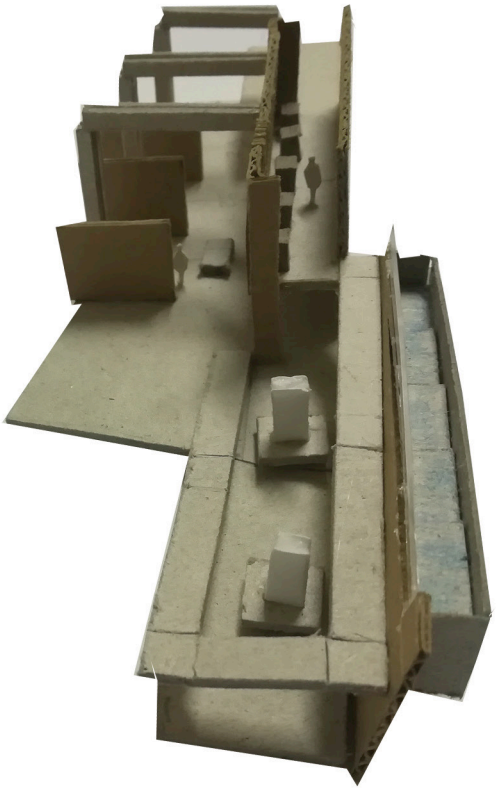


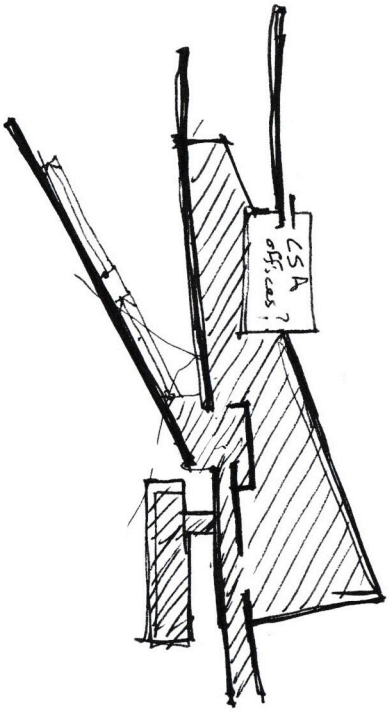
Development of the Gallery

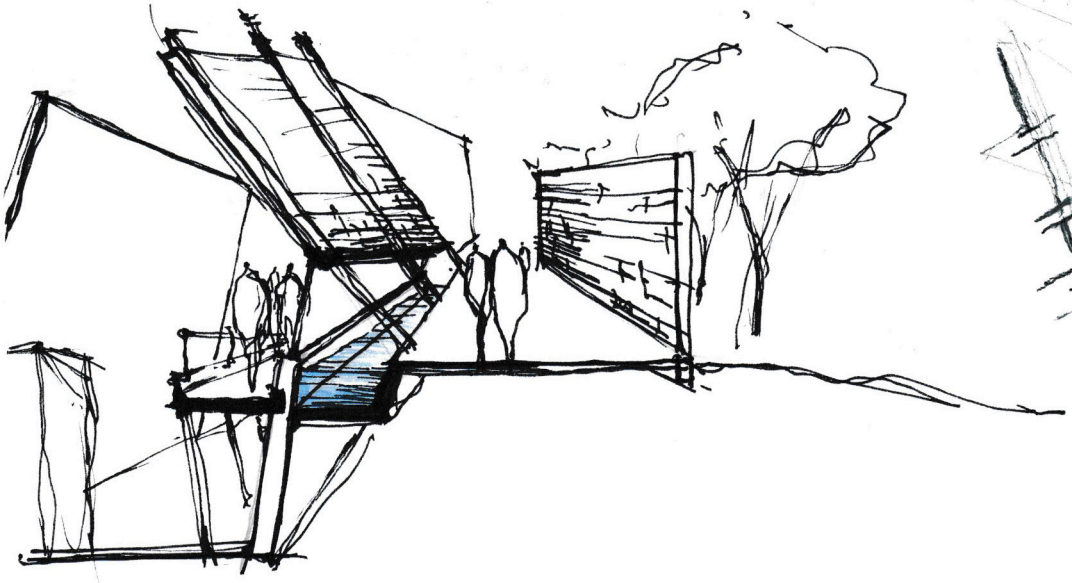
4.7

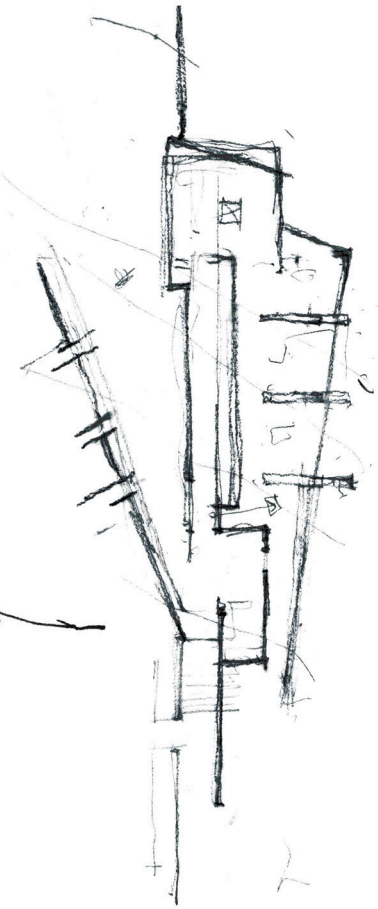
Due to the slope of the site, the entrance and exit of the gallery is not on the same level. This necessitated the incorporation of a circulation ramp.

The gallery is developed through a series of spaces with alternating volume and light quality.



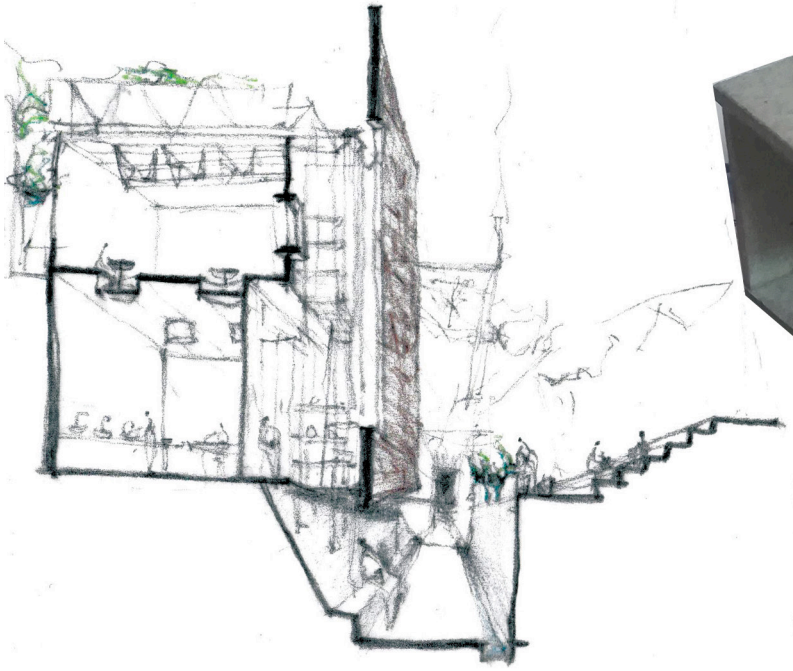


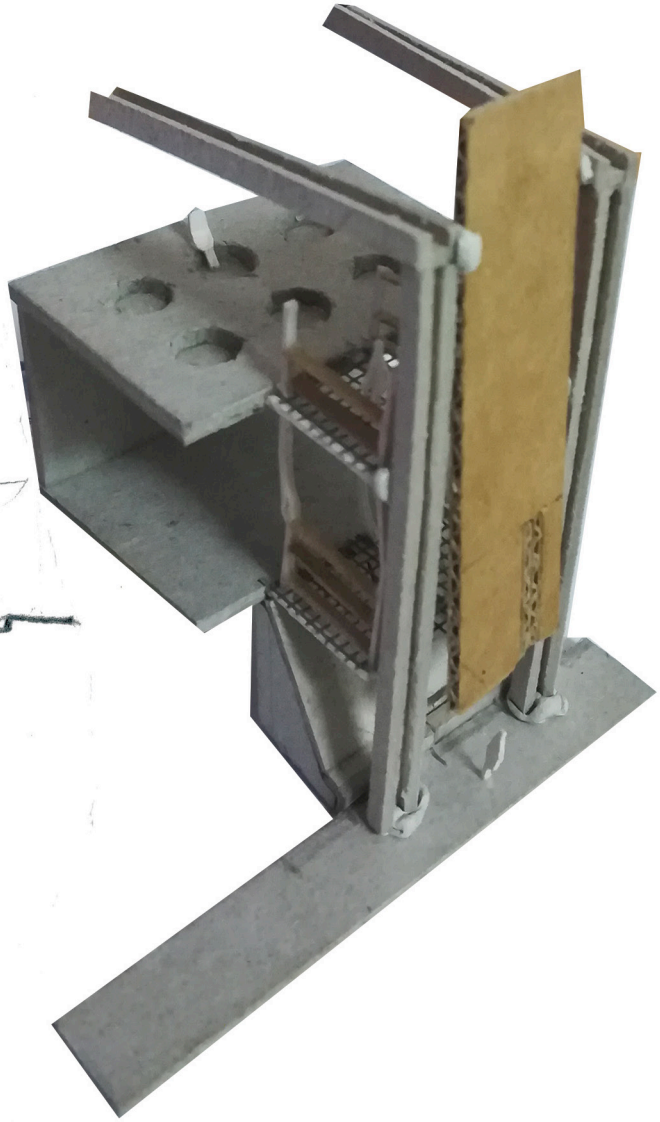


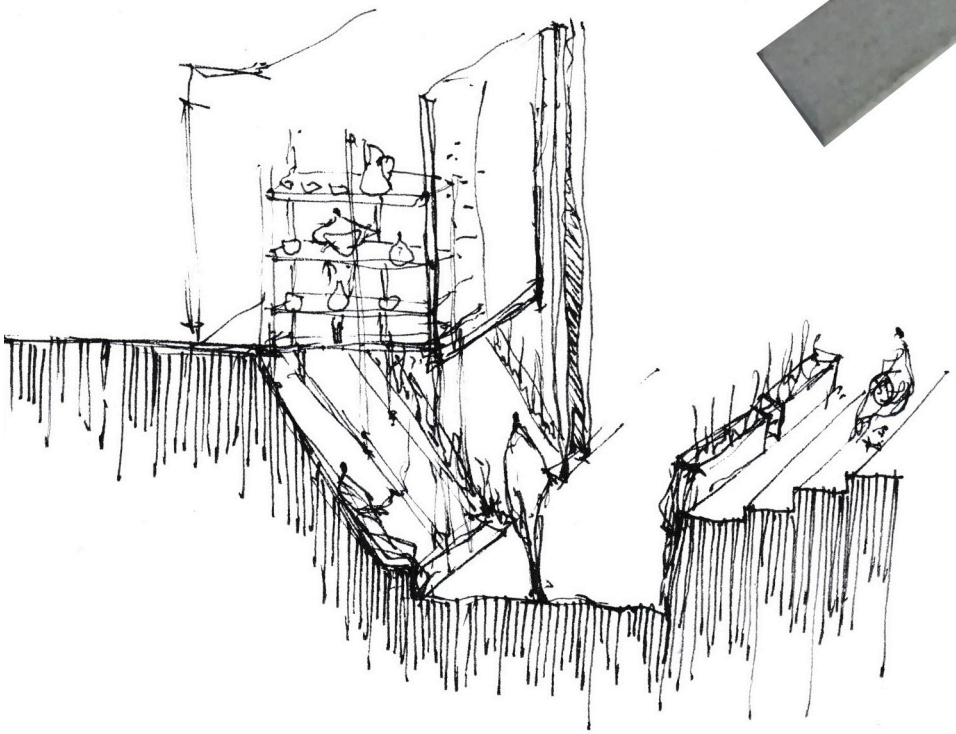


Development of the Studios

4.8







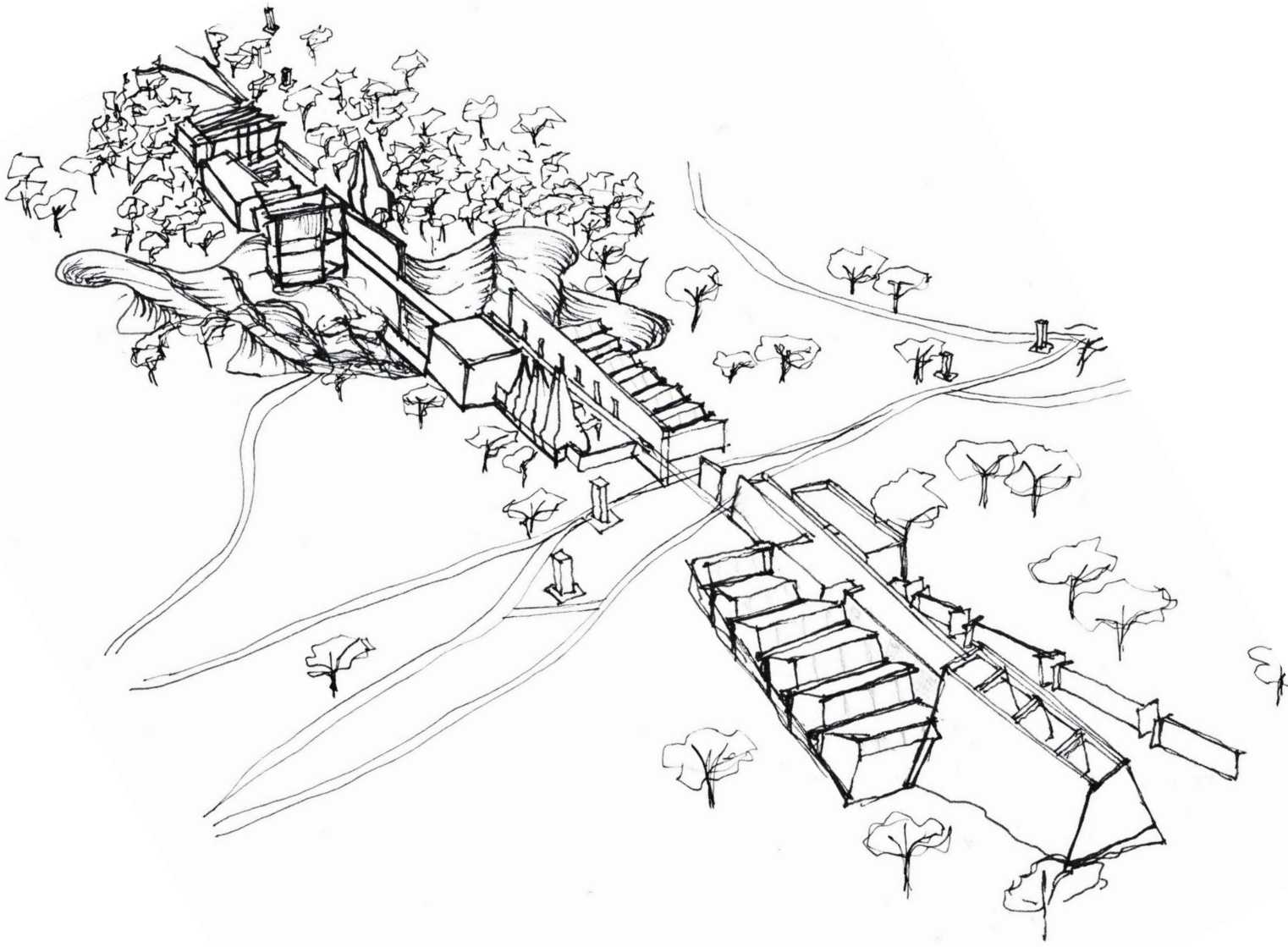
The previous rendition of the studio design cluttered the edge of the quarry. This is replaced by a narrow design that is nestled into one of the niches formed at the quarry edge.

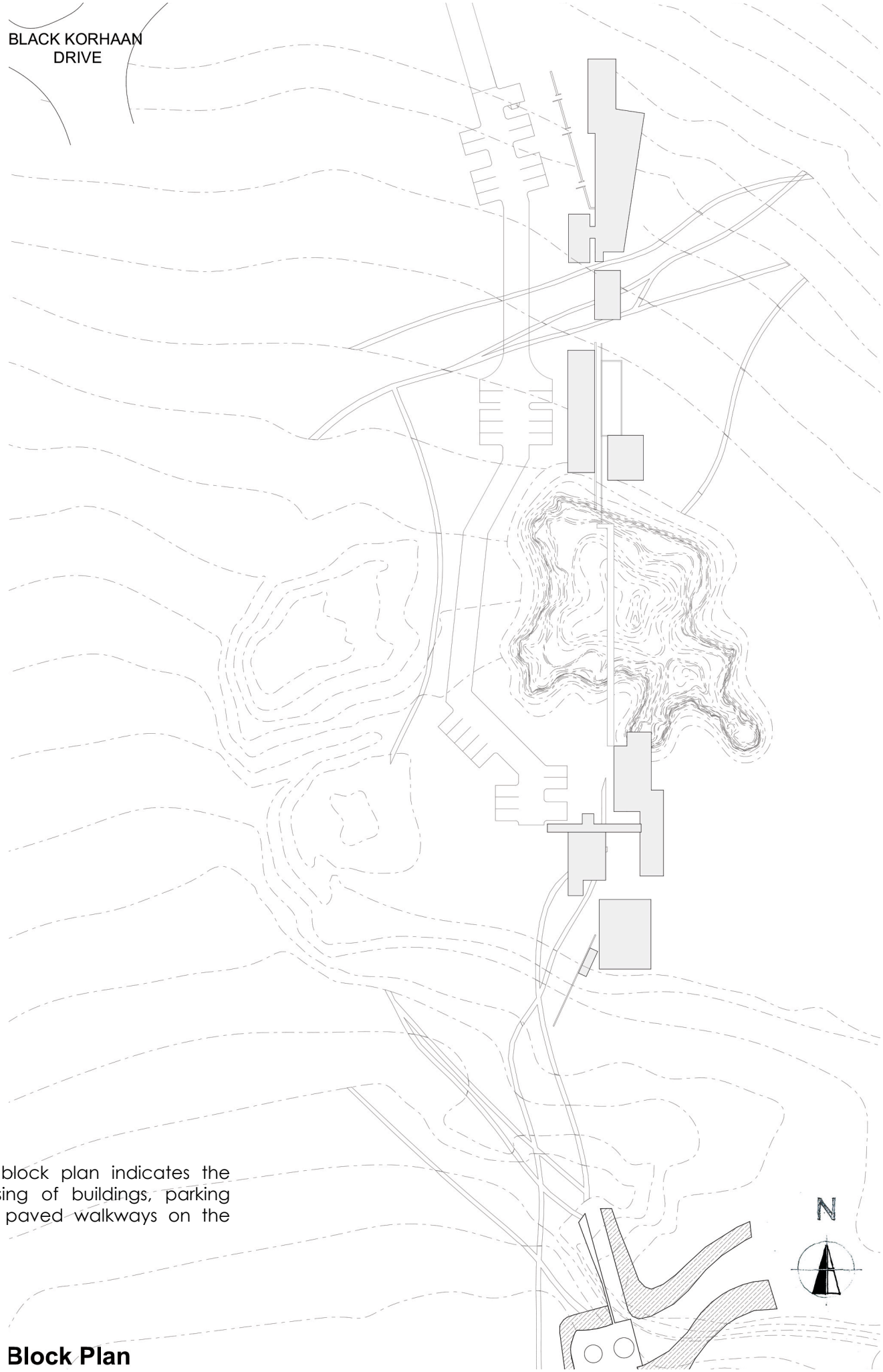
Interaction between the studios and the tunnel below is developed.

Towards a Final Design

4.9

An essential part of the design synthesis is to incorporate public exhibition spaces, private production spaces and historic site features into a singular experience.

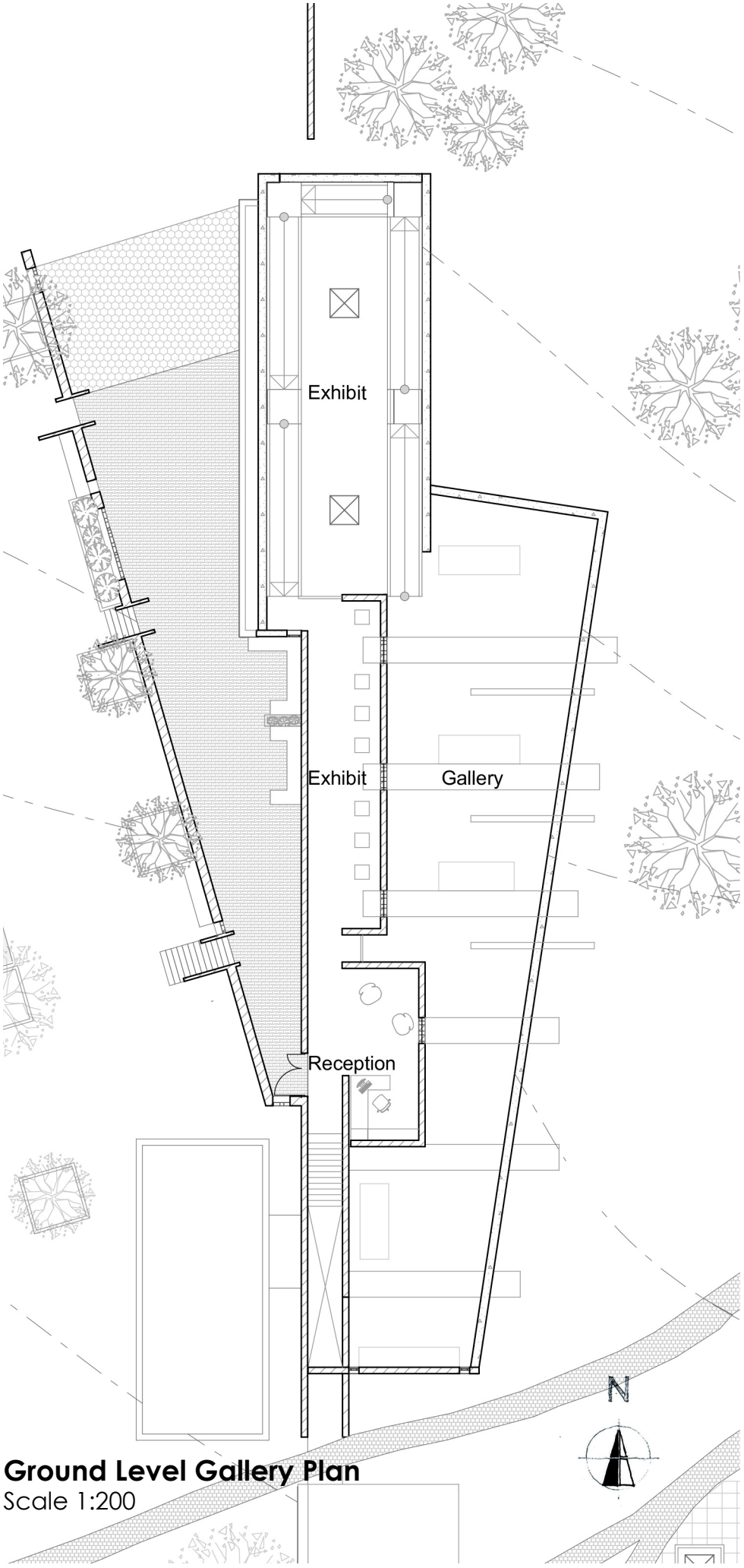




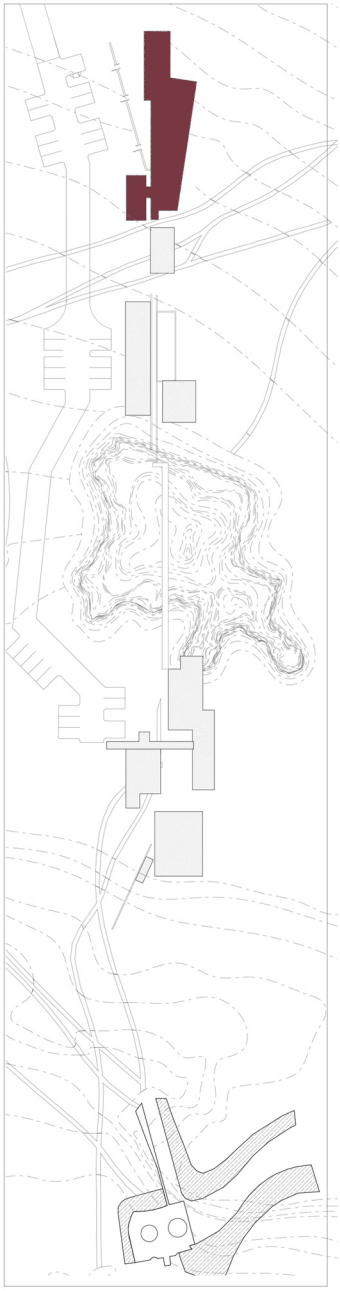
The block plan indicates the massing of buildings, parking and paved walkways on the site.

78.

Block Plan



Ground Level Gallery Plan
Scale 1:200

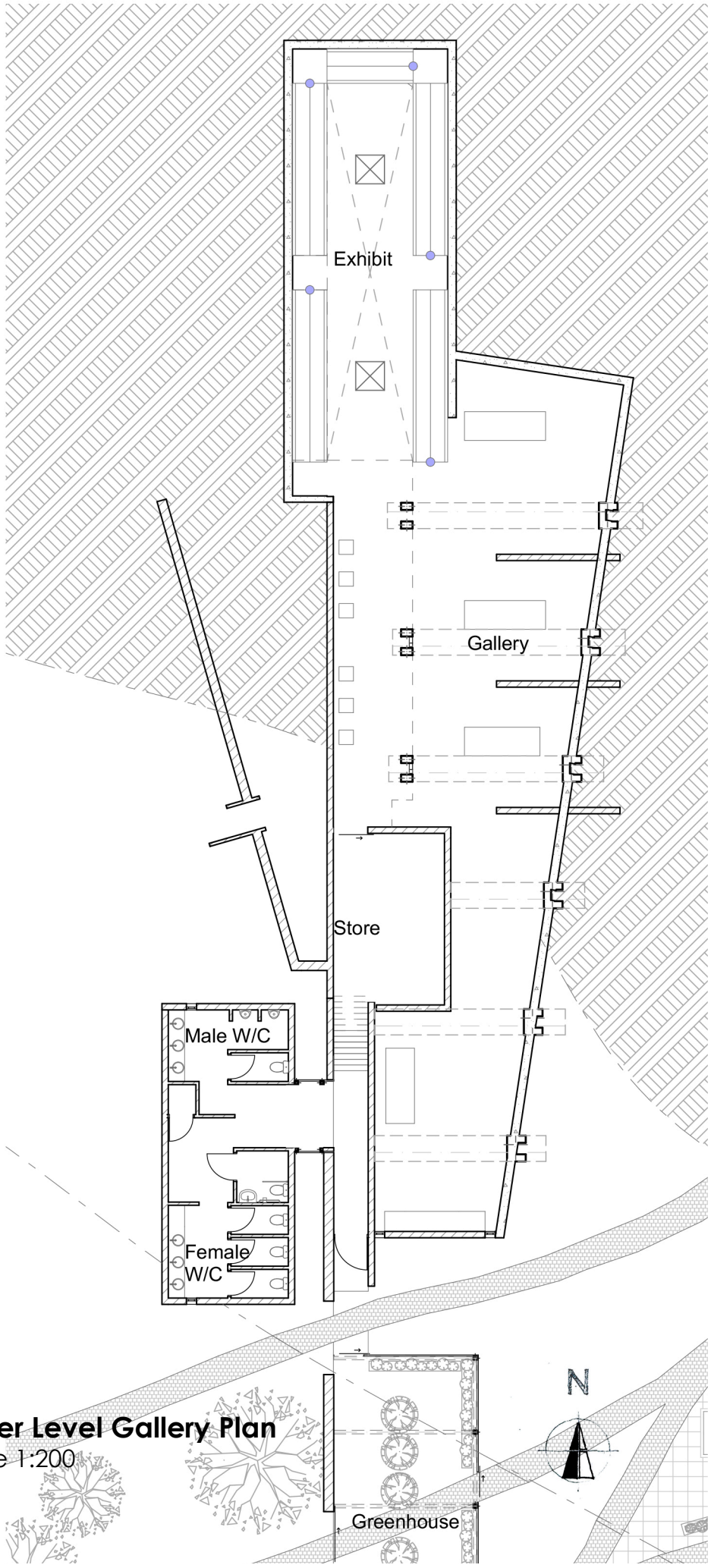


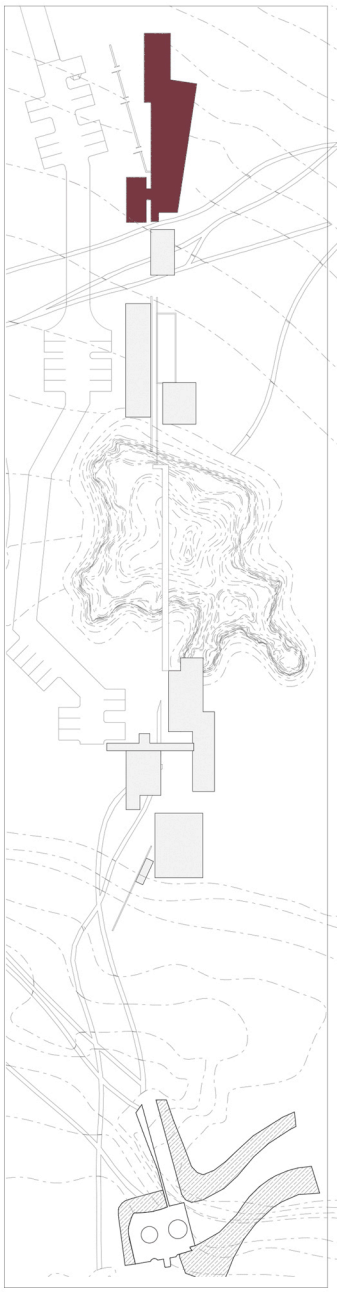
-The Spine-

A diagonal masonry wall leads visitors toward the gallery entrance and reception. This wall shades an outdoor waiting area.

A small viewpoint is incorporated between the reception and the first exhibit. From here the lower level gallery is visible.

A ramp leads you down to the gallery. This ramp circumvents two large fired-in-place sculptures.



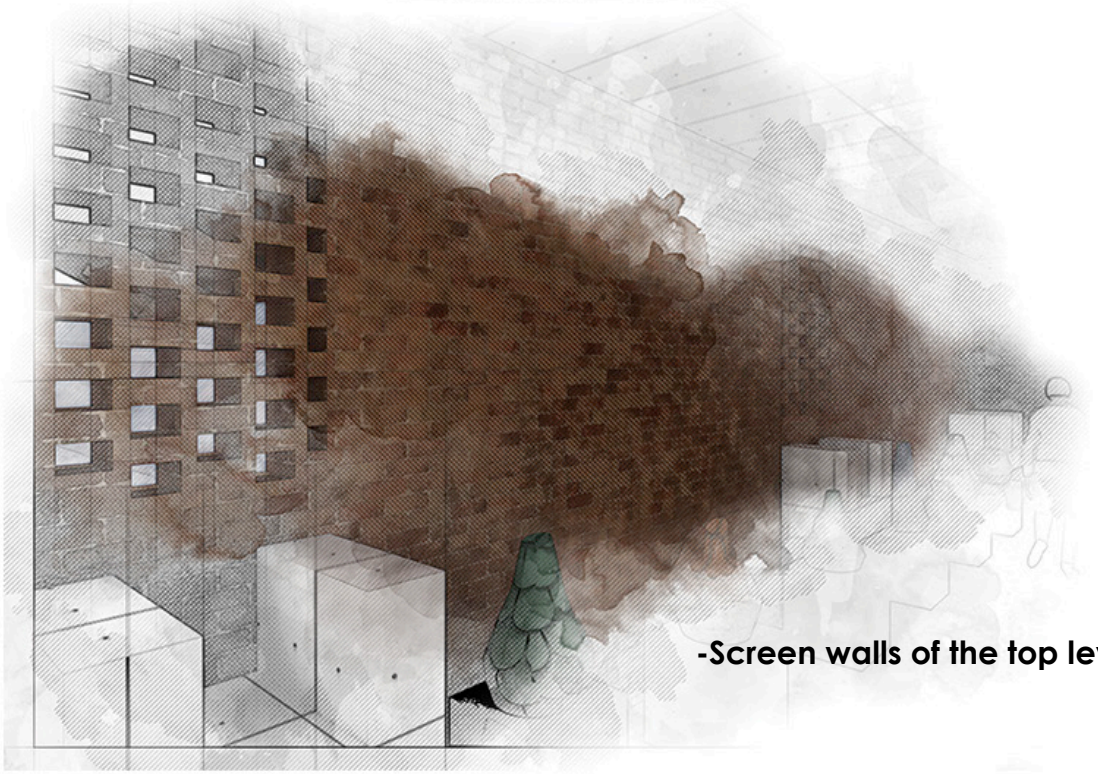


Lower Level Gallery Plan
Scale 1:200

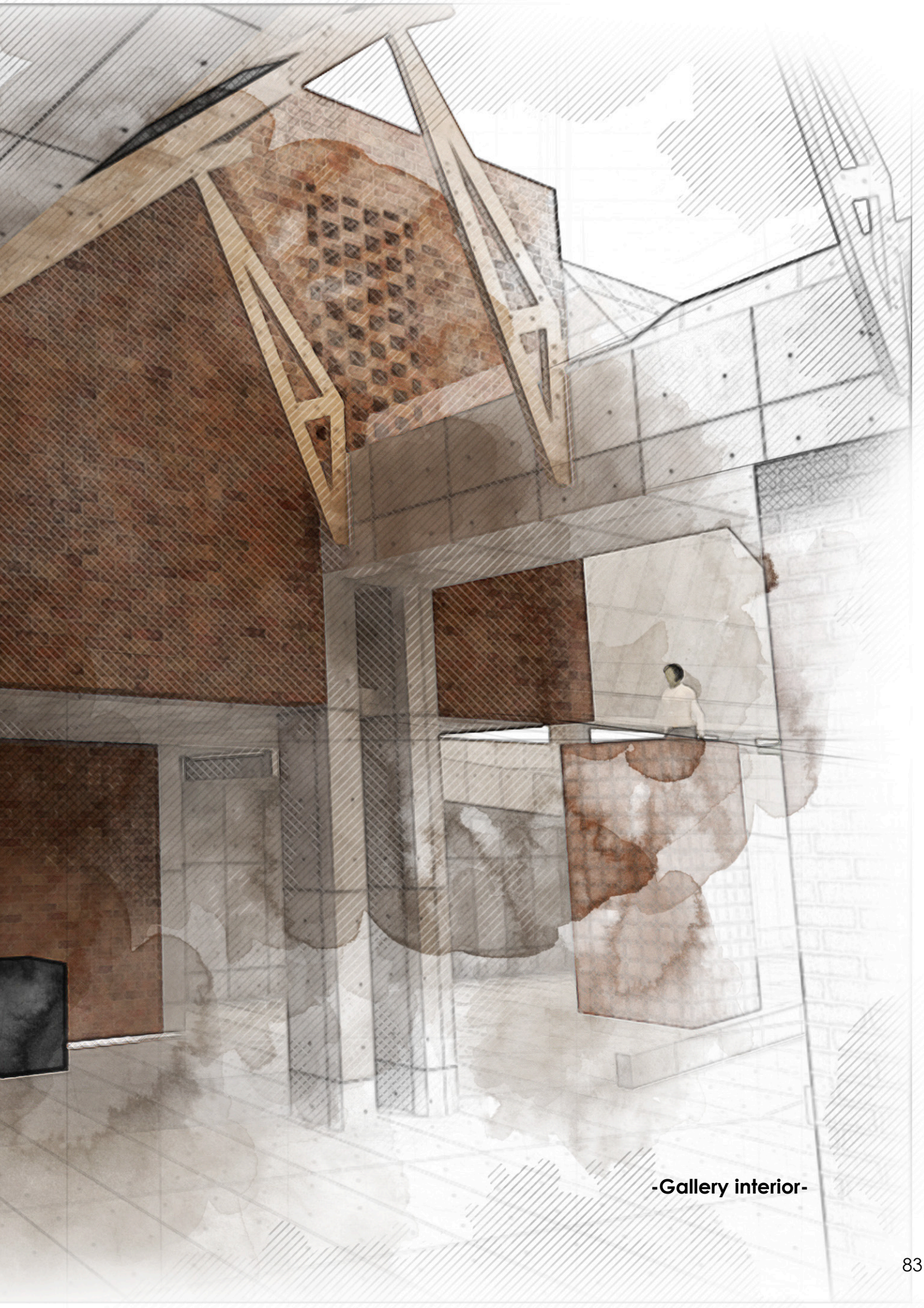
-The Spine-

A portion of the gallery is below ground level due to the slope of the site. The two levels are designed so that both the entrance and the exit is on ground level.

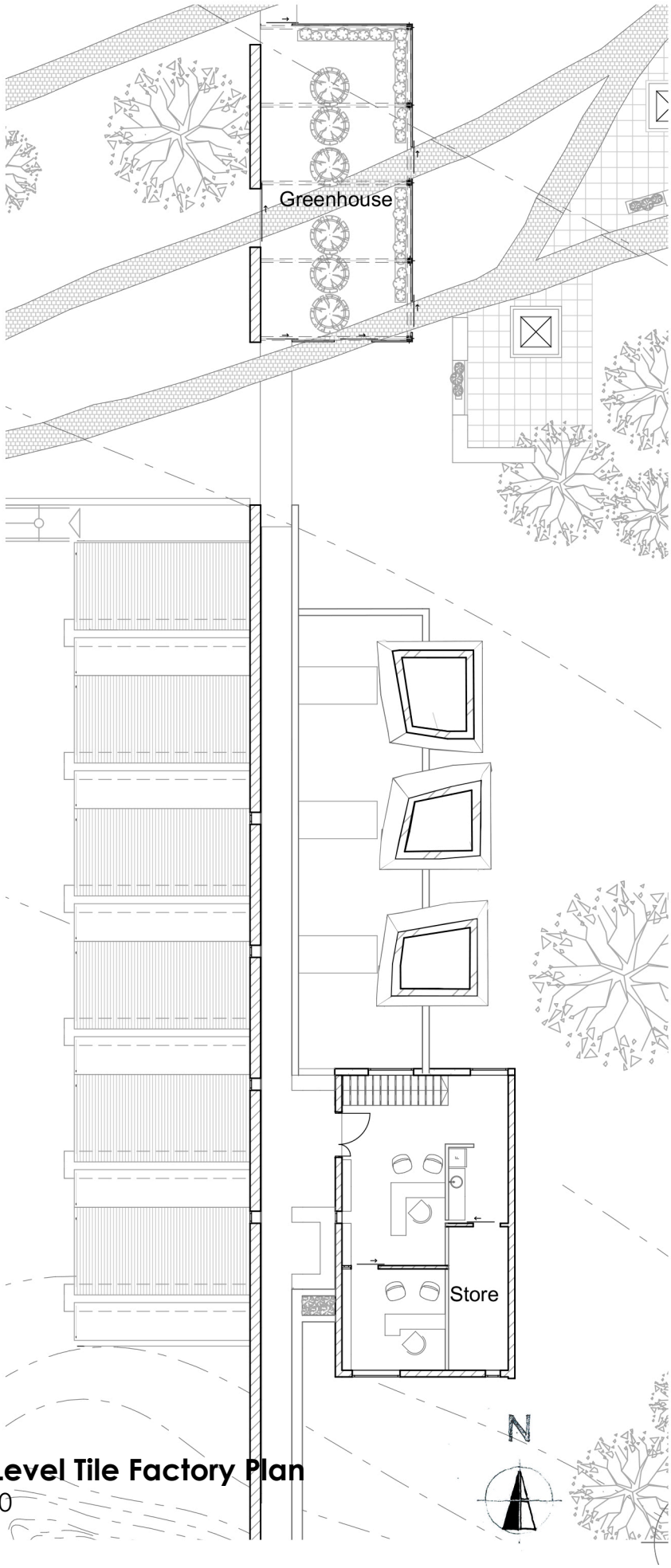
-Section though the top level exhibit and the gallery below-

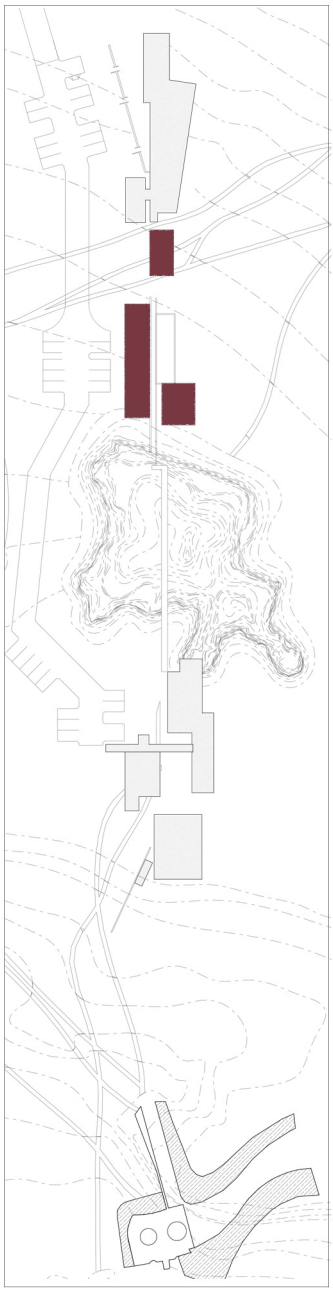


-Screen walls of the top level exhibit-



-Gallery interior-



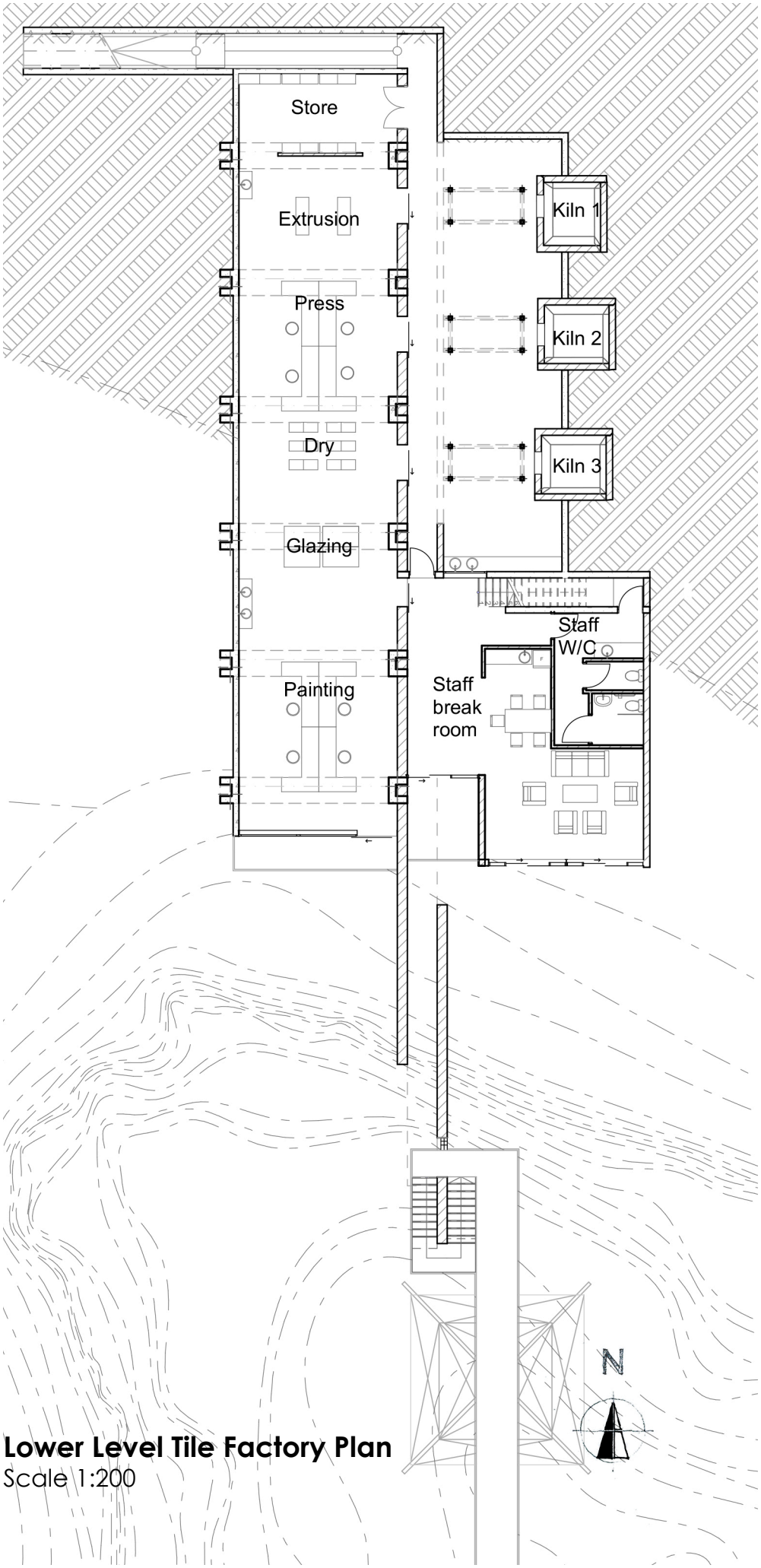


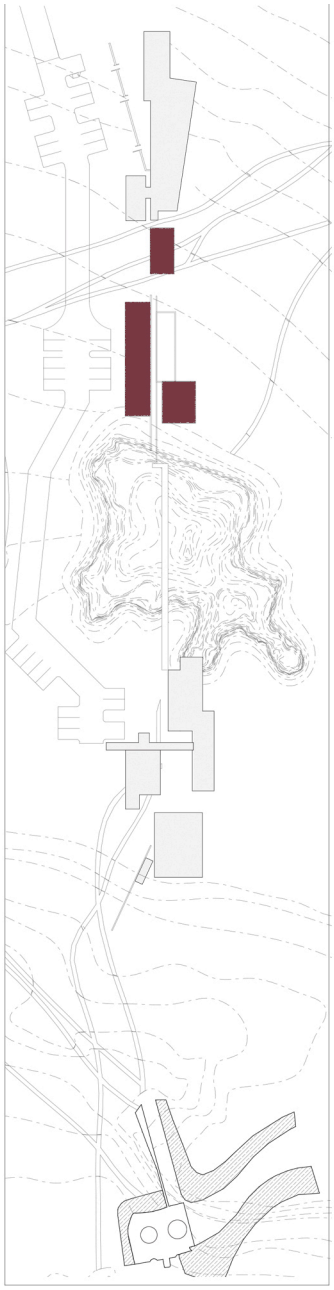
-The Spine-

A public walkway moves through the tile workshop. It provides a vantage point from where the production can be observed without hindering the process.

Ground Level Tile Factory Plan

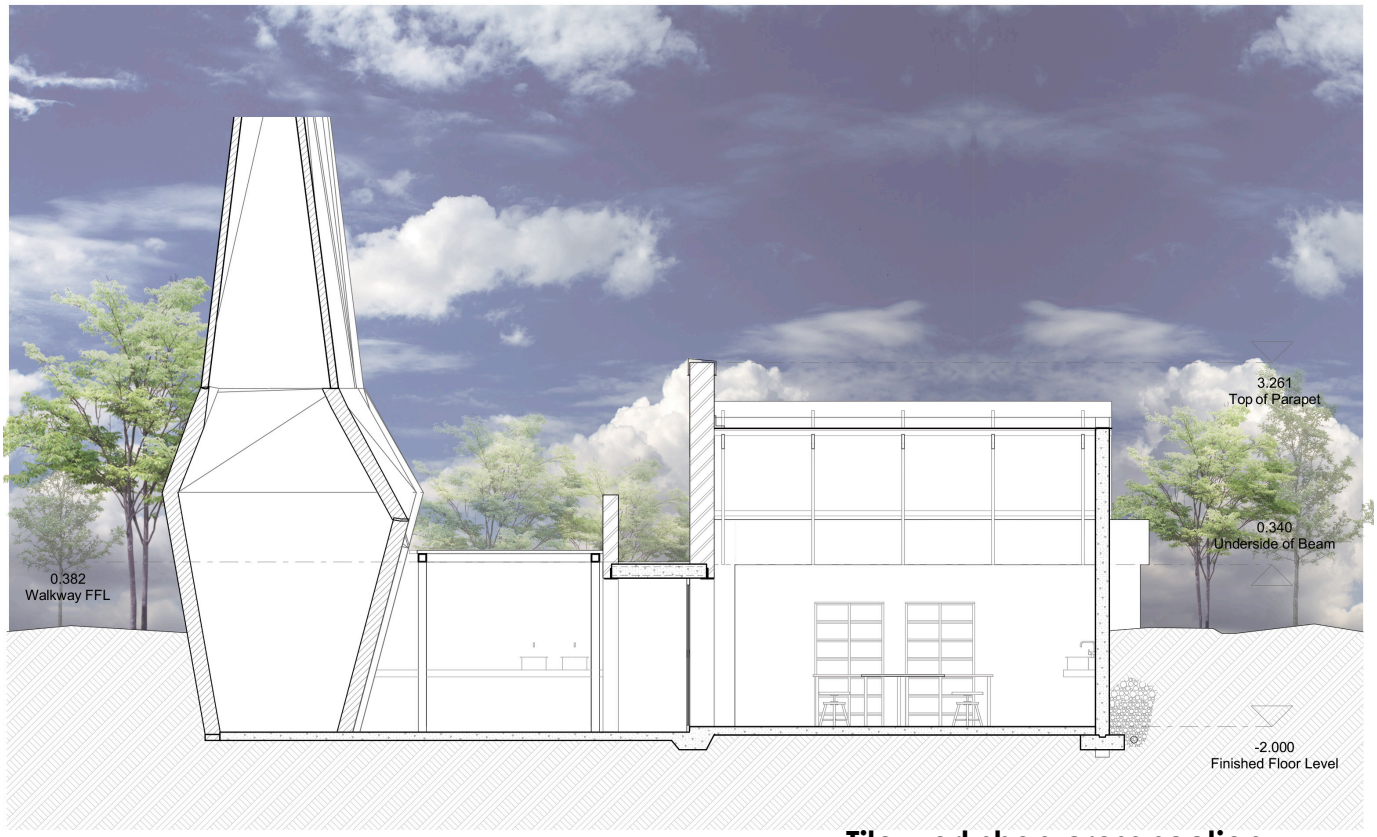
Scale 1:200





Lower Level Tile Factory Plan
Scale 1:200

A concrete worktop and sinks are added in the courtyard for the burning and washing of plant material to be used in glaze mixtures.

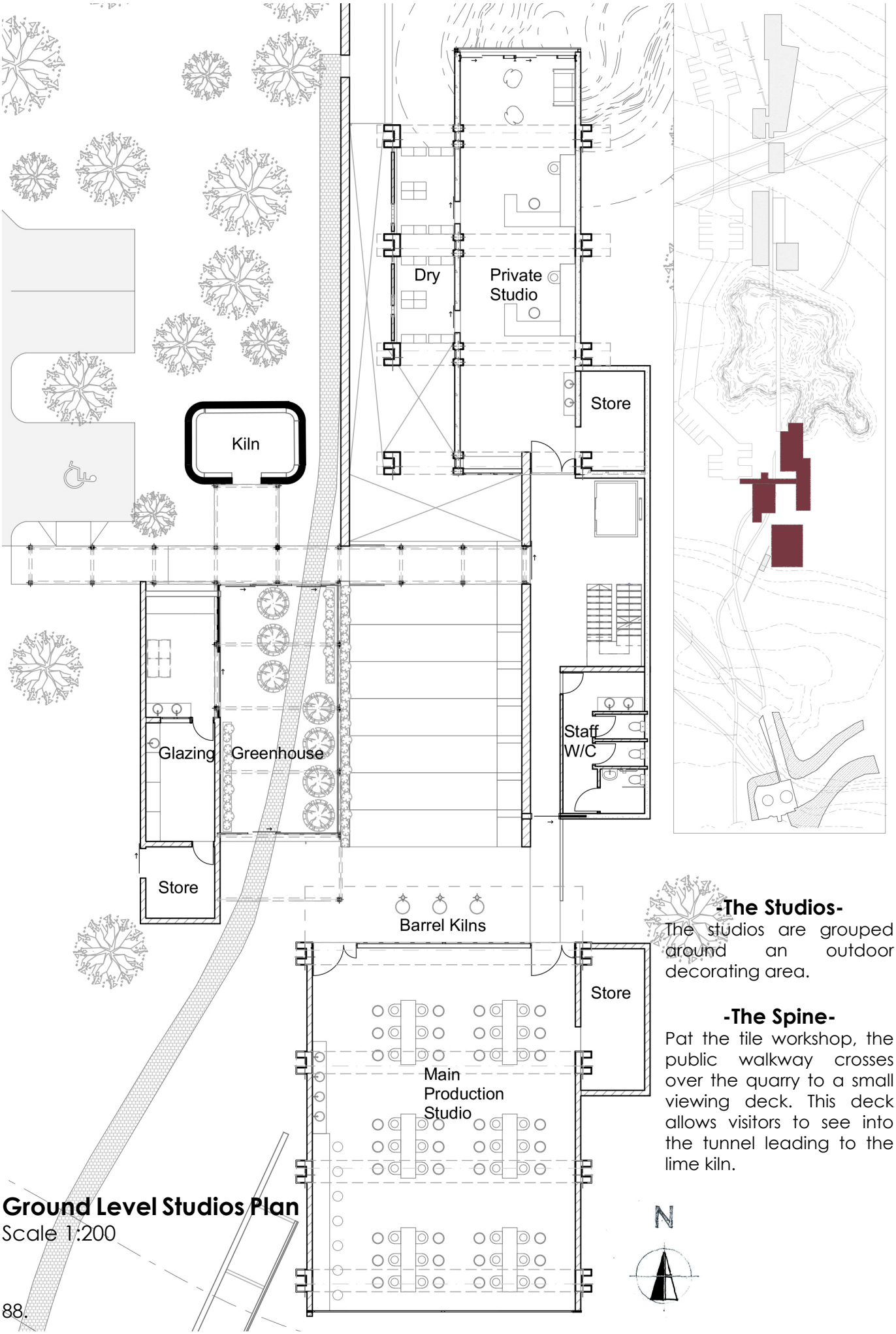


-Tile workshop cross section-

-Tile workshop interior-

-Tile workshop interior-

-Tile workshop interior-



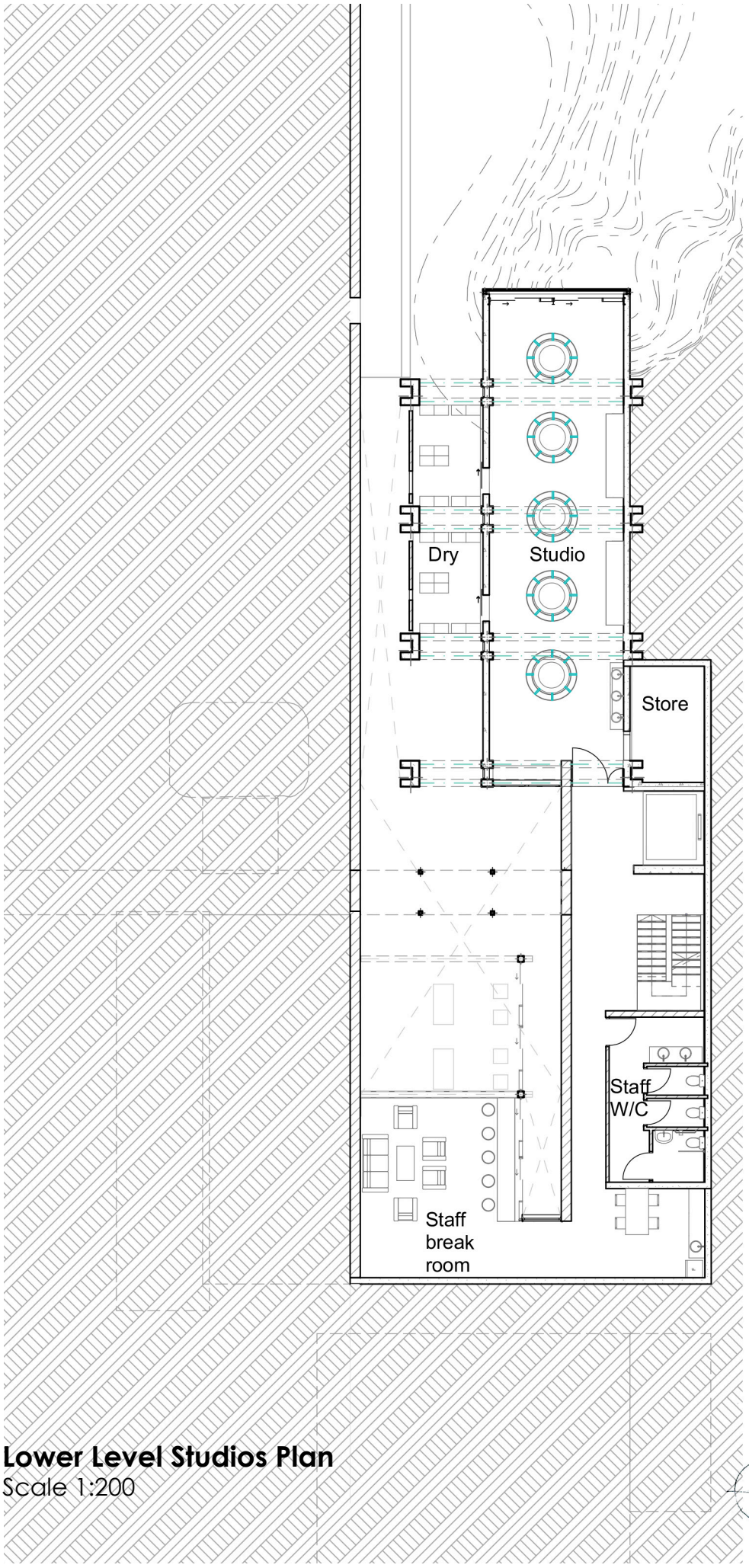
Ground Level Studios Plan
Scale 1:200

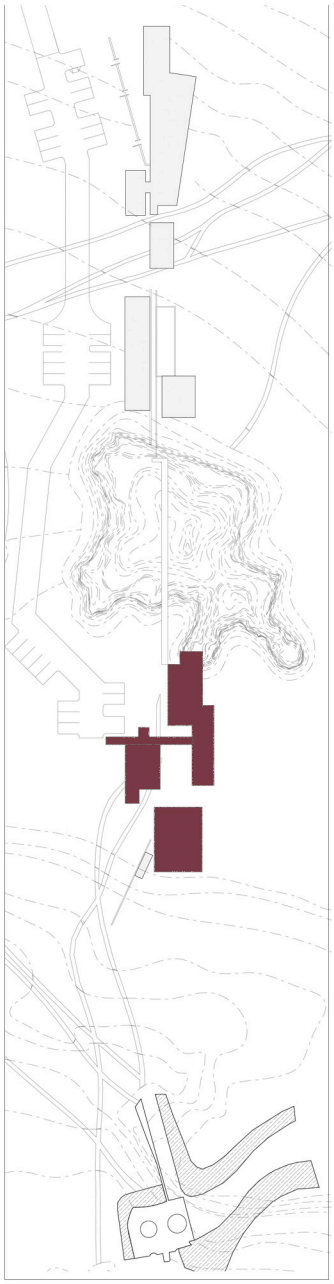
-The Studios-

The studios are grouped around an outdoor decorating area.

-The Spine-

Pat the tile workshop, the public walkway crosses over the quarry to a small viewing deck. This deck allows visitors to see into the tunnel leading to the lime kiln.



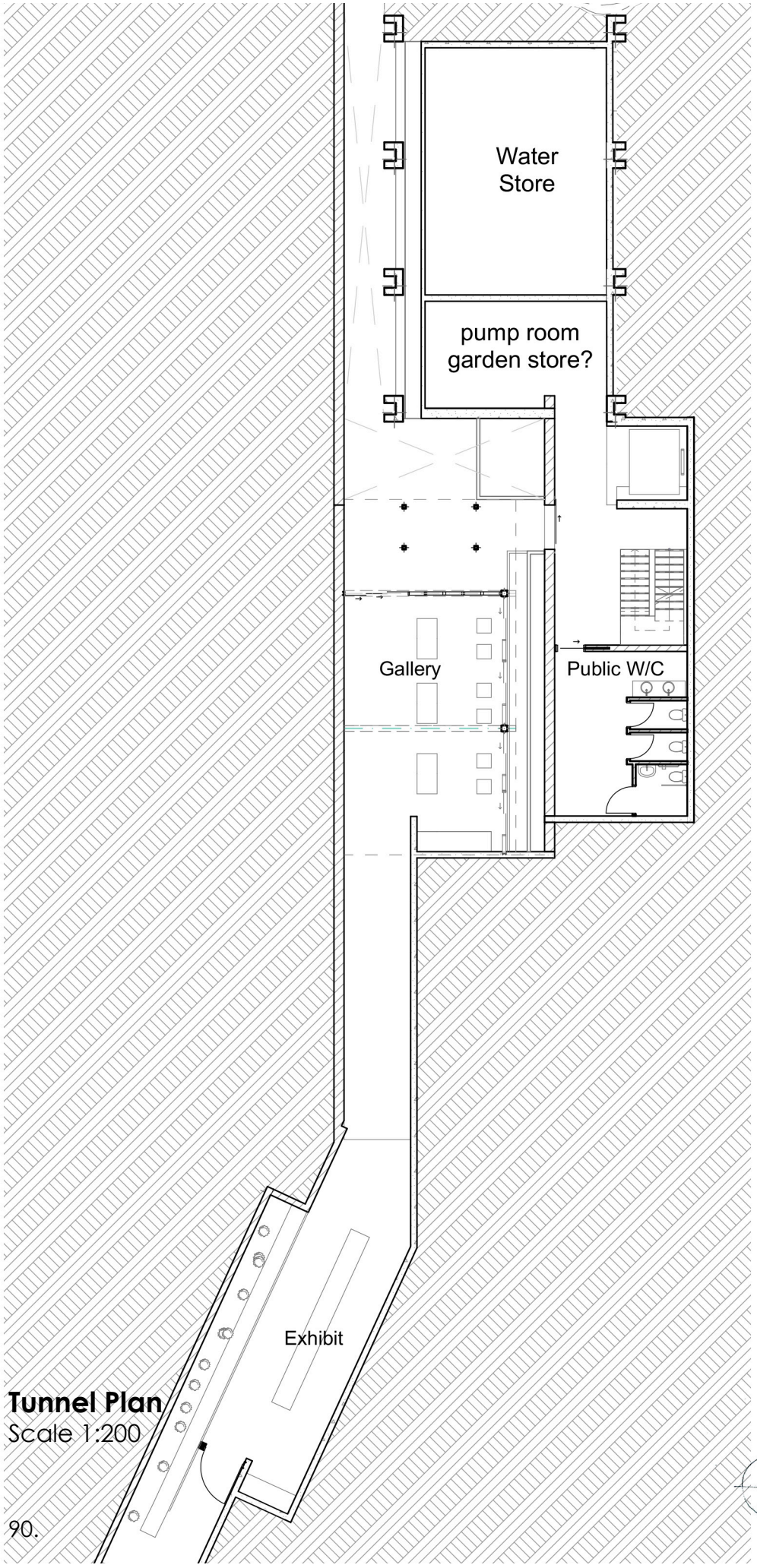


-The Studios-

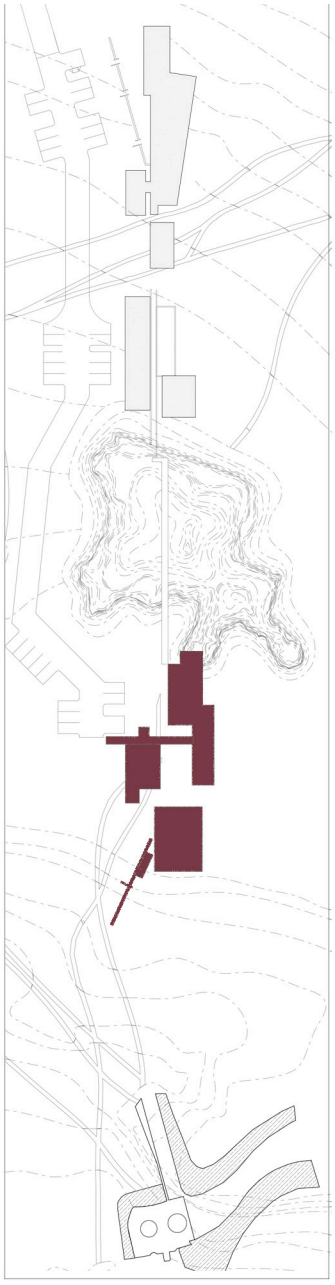
The lower level studio is equipped with large built in turning wheels to fscilitate the throwing of large ceramic works.

Lower Level Studios Plan

Scale 1:200



Tunnel Plan
Scale 1:200

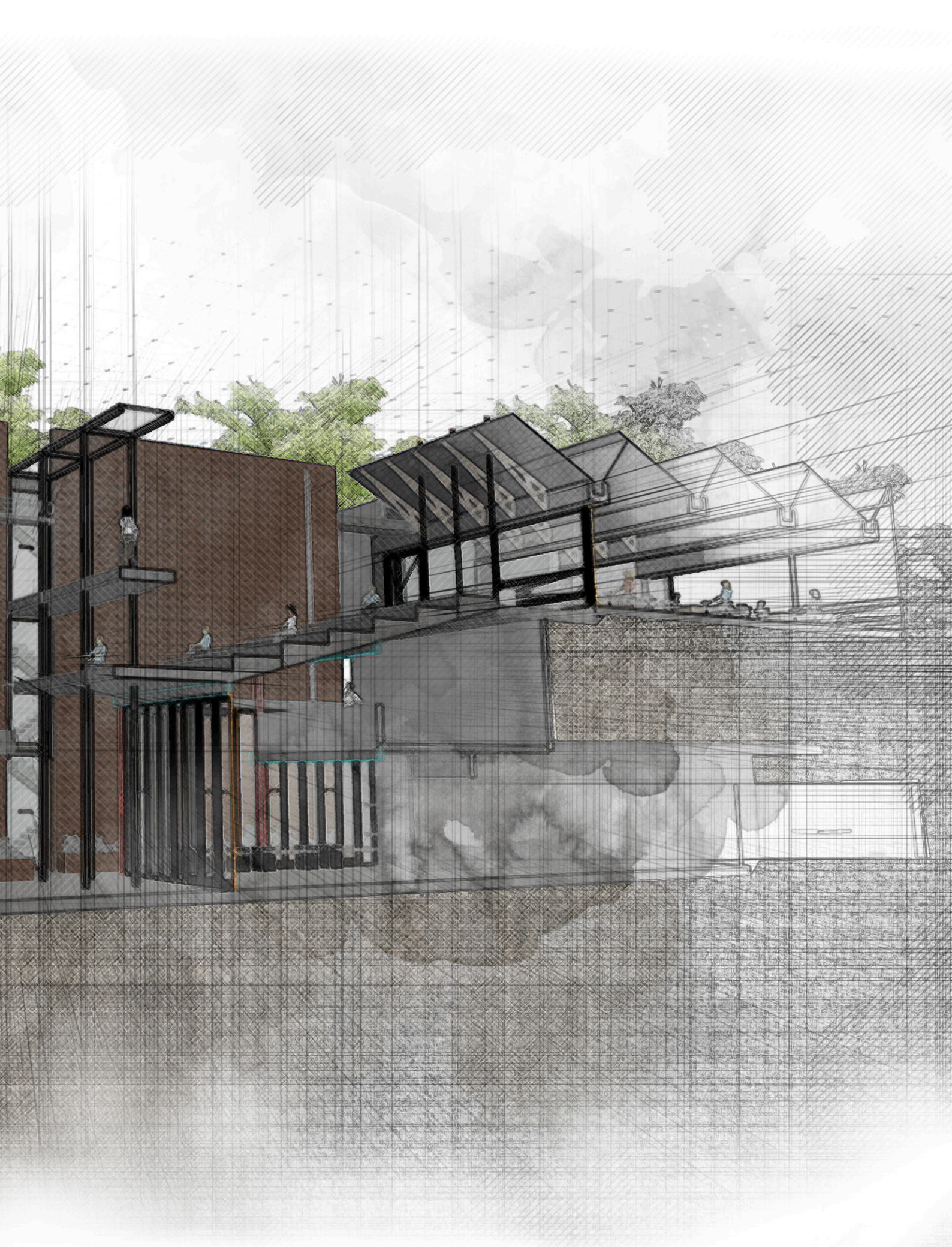


-The Tunnel-

The tunnel is entered from through the bridge over the quarry. One enters a triple volume open air space with built in seating. The backrest of the seating is slanted to allow views into the drying areas of the studios. The floor of the drying areas is steel mesh to allow for optimal ventilation.

-View from the triple volume entrance to the tunnel-

-Section through the private studio and the workshop with the large turning wheels.-



-Section through the studios and the tunnel.-

-Interior of the studio with the large throwing wheels-

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Part 5

Technical Synthesis

Table of contents

Introduction

The proposed project encompasses a ceramics studio, exhibition areas/ galleries and a ceramic tile production facility (figure 5.3). It is located on the remainder of portion 46 of the farm Olifantsfontein 410 JR, Centurion, Gauteng (figures 5.1 and 5.2). The client (Ceramics Southern Africa) requires a facility where ceramic crafts can be practiced, taught, exhibited and traded.

The proposed site used to be property of the Consolidated Rand Brick, Pottery and Lime Company (Conrand), owned by Thomas Major Cullinan. It is currently owned by the Bondev Group developers. These developers are also involved in the development of Midstream Estate to the North of the site. An inactive lime quarry and a lime kiln is located on the site. The project aims to combine these historical features with the new studios and production spaces as a celebration of the ceramic arts and the role it played in the development of Olifantsfontein (see section 2.3). The project buildings are arranged along an axis that aims to immerse the visitor in an embodied experience of the place, its history and of the art of making. These buildings/structures constitute a gallery, a tile workshop, three new wood fire kilns, a bridge crossing the quarry, ceramic studios, another new wood fire kiln and three barrel kilns, an underground exhibition space connecting the bridge and the existing lime kiln (figure 5.3).

Fig. 5.1: 2019. Olifantsfontein is in the Ekurhuleni district of Gauteng, indicated in red (author).

Fig. 5.2: The site (red) in the Ekurhuleni district with O.R. Thambo airport as reference (author).

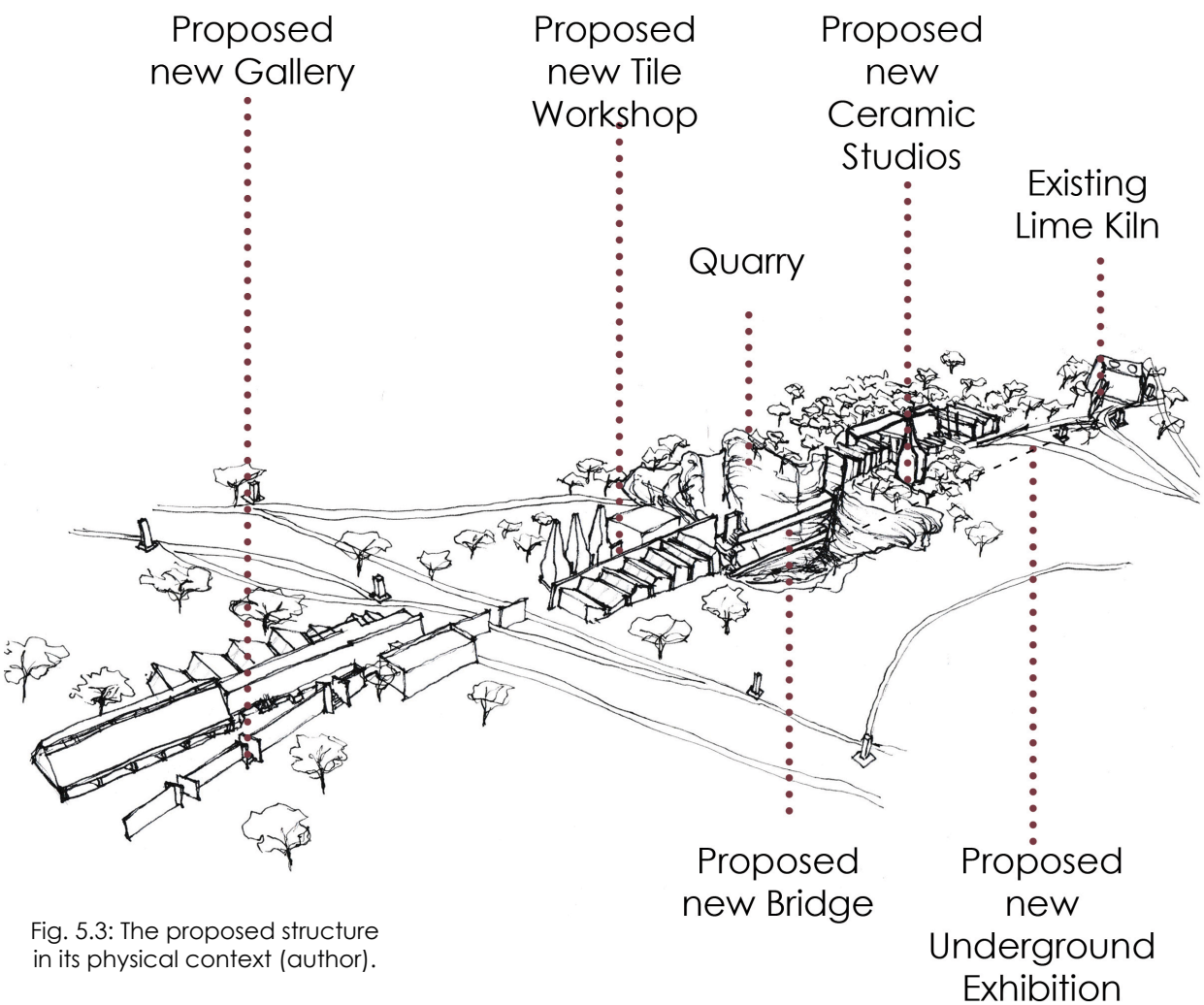


Fig. 5.3: The proposed structure in its physical context (author).

5.1.1 Cadastral Information

The site is located on the farm Olifantsfontein 410 JR, on the remainder of portion 46 (African Heritage Consultants; Environomics, 2018: 1). Figure 5.4 indicates the 1890 survey of the original farm. Since then, the site has been subdivided into smaller portions.

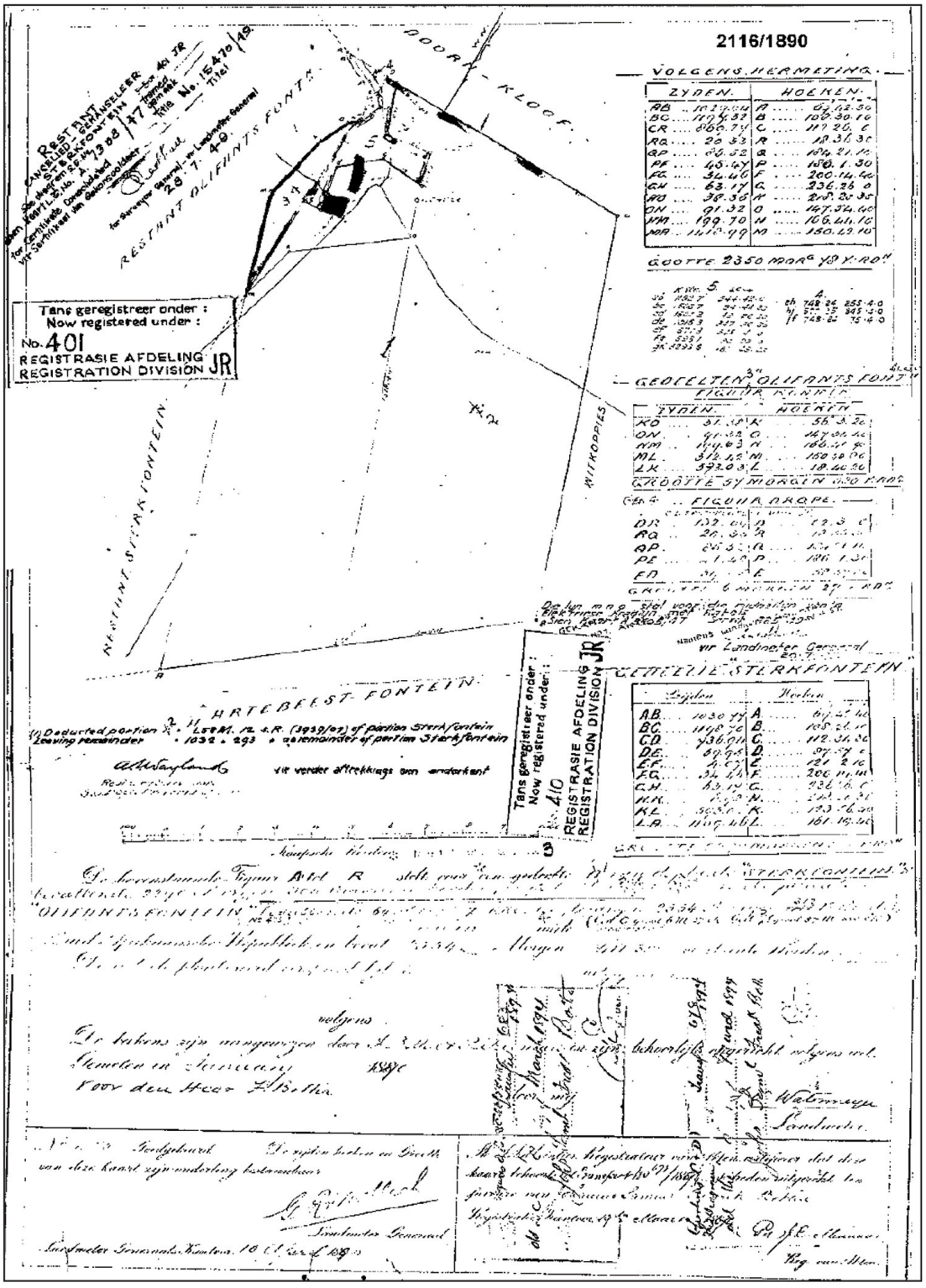


 Figure 5.4: Olifantsfontein 410 JR as surveyed in 1890. Accessed at www.csg.dla.gov.za.

The proposed development is situated on this farm, to be further subdivided for the purpose. There is therefore no SG diagram for the site, but some information can be obtained from the SG diagrams of the sites surrounding it (see appendix A for original drawings). This aids in the development of a site plan (drawings Sheet 1). An electric power line servitude entering the portion is indicated on the diagram for portion 117 of the farm Olifantsfontein 402 JR (details regarding the servitude are shown in Appendix A).

Figure 5.5: SG diagram overlaid on map of Olifantsfontein 402 JR showing proposed site. (Information accessed at www.csg.dla.gov.za. Compiled by author).

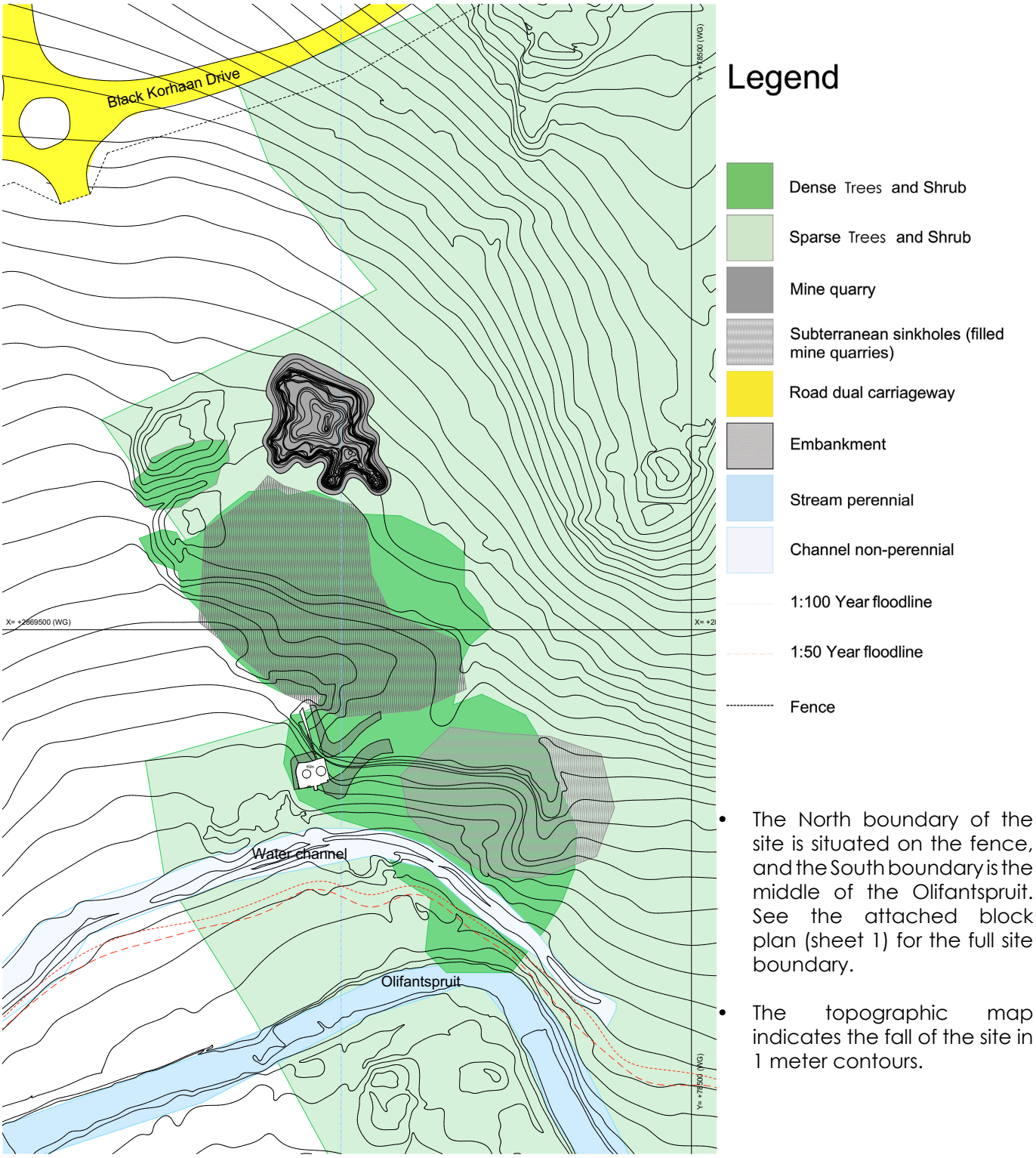
5.1.2 Development Rights

The site falls under the control of the Ekurhuleni Municipality, and is classified as rural (SABdata, 2017). The geographic information website (SABdata, 2017) specifies no zoning limitations (see appendix B), allowing mixed use of the site. The Bondev Group (developers of Midstream) obtained development right of the property following the township establishment process (African Heritage Consultants; Environomics, 2018: 7).

Development is, however, influenced by historically sensitive areas on the site: Lime kilns, quarries and cemeteries that relate to the originating of Olifantsfontein (refer to Part 2 section 3: Historical Context). None of the quarries are still active. The historical significance of these elements are rated as provincial, local and local, respectively. A detailed description of the historical report is attached (Appendix C).

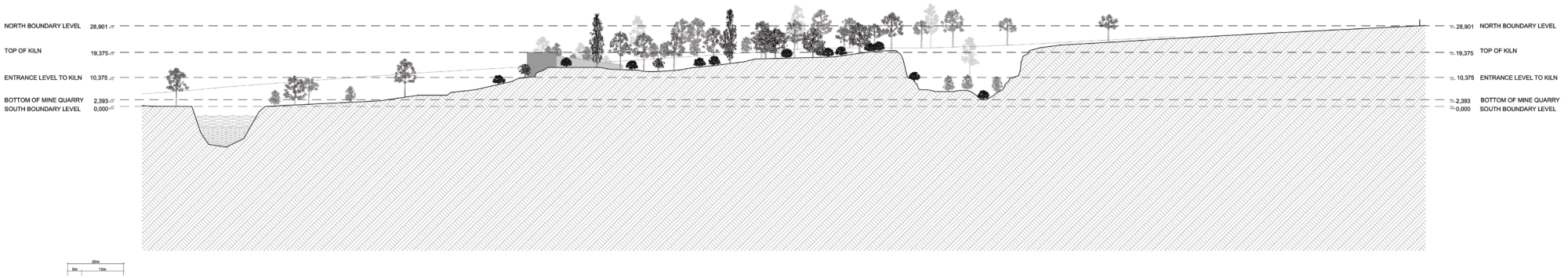
5.1.3 Topographic Analysis

A topographic map (figure 5.3) and sections (figure 5.4) are shown below. The map indicates possible sinkholes in the area. These are located over mine quarries that have been filled up, but the stability of the filling is uncertain and, if constructed over, would need to be refilled and compacted (Zeederberg, 2019). Where the map indicates a mine quarry, the unfilled quarry holes are shown.

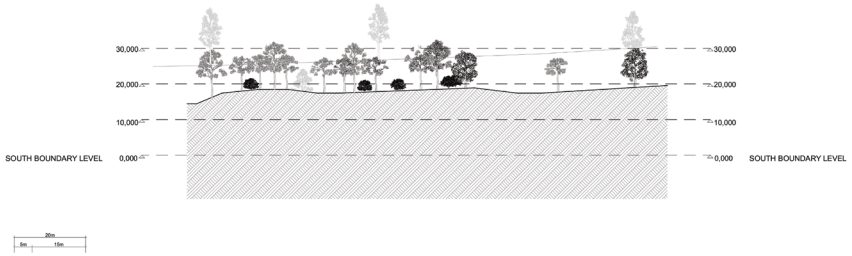


- The North boundary of the site is situated on the fence, and the South boundary is the middle of the Olifantspruit. See the attached block plan (sheet 1) for the full site boundary.
- The topographic map indicates the fall of the site in 1 meter contours.

Figure 5.6: Topographic map of the proposed area of Olifantsfontein 410 JR to be developed (author).



Section AA
Scale 1:500



Section BB
Scale 1:500

CONSTRUCTION
CONS 7908

DEPARTMENT OF
ARCHITECTURE

UNIVERSITY OF THE FREE S

PROJECT
DISSERTATION

BUILDING
REMAINDER OF
PORTION 46 OF
FARM
OLIFANTSFONTE
410 JR

DRAWING TITLE
SECTION AA
SECTION BB

SCALE	ASSESSMENT D
1:500	20.03.201

STUDENT NUMBER

Figure 5.7: Sections showing the topography of the site (author).

5.1.4 Geotechnical Analysis

There are sediments of dolomite, limestone, iron formation, shale and quartzite in the Olifantsfontein region (see figure 5.5). Dolomite can dissolve in a water carbon dioxide mixture. Over millions of years of this dissolving process, karst develops. This includes subsurface hollows and cave systems. It can then cause the formation of sink-holes. When building under these circumstances, care should be taken with water and pile foundations may be required (Council for Geoscience, 2009: 5). Alternatively, limestone is a stable rock, but when it erodes it causes sandy soil and sludge (O'Byrn, 1967: 218).

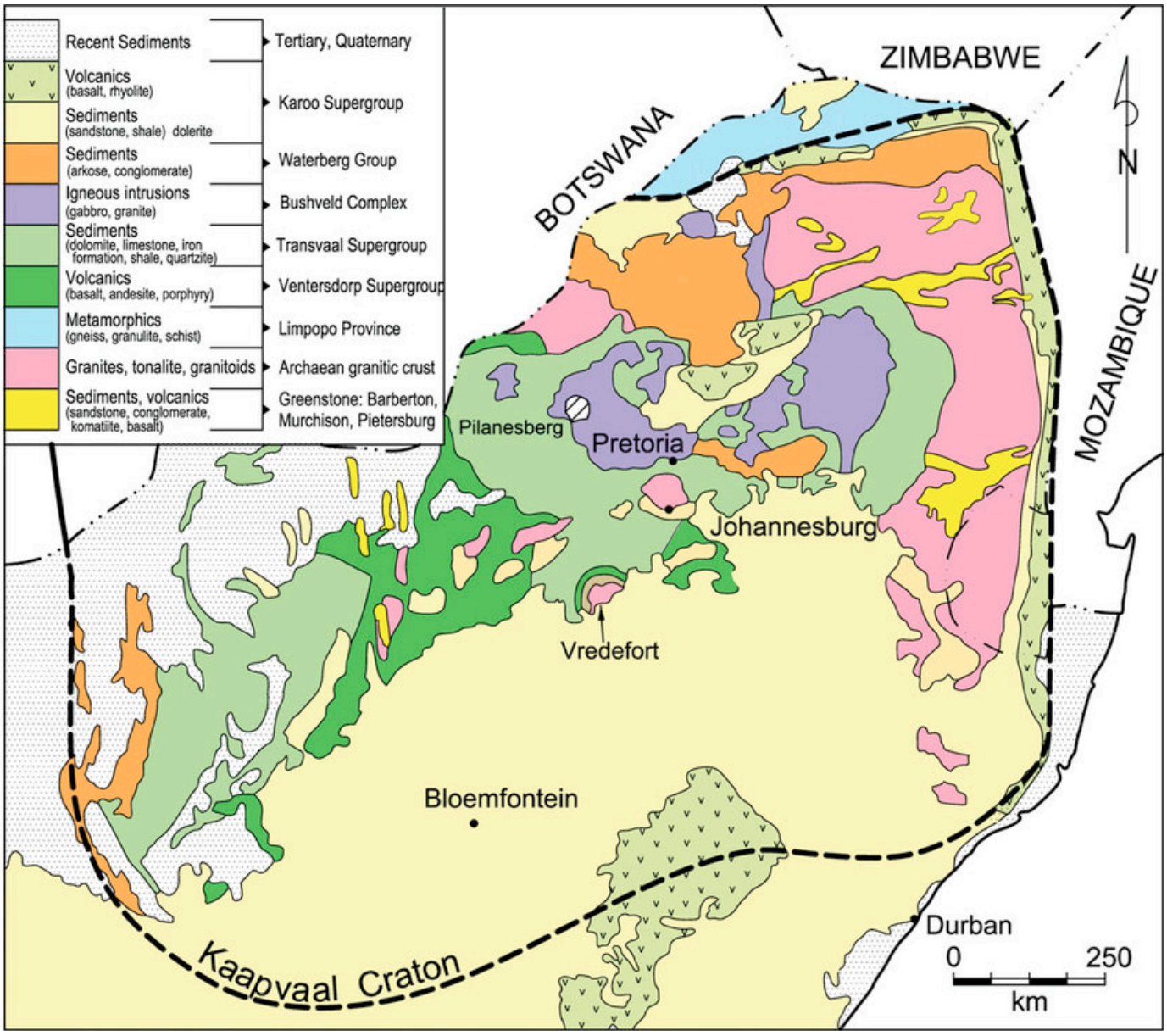


Figure 5.8: Geological map showing sedimentary composition. (Image: Cawthorn, 2015).

Clay was discovered on the site up to a depth of 16m. In the early 1900's, this was extensively mined by the CONRAND Company. Lime deposits were also discovered and mined. Altered primary limestones are still prominent on the site (figure 5.6), covered by dolomites (African Heritage Consultants; Environomics, 2018: 29).

Figure 5.9: Limestone covered with dolomite on the site. Photograph: Van der Ryst, M. 2017

The movement of the clay soil combined with the instability of the dolomite and the backfill of the quarries indicate an unstable soil condition that would likely result in the use of pile foundations (Council for Geoscience, 2009: 5), raft foundations or replacement and compaction of soil. The treatment of surface water is also important. It should not be allowed to dam up for extended periods of time. All water leaks from damaged pipes should be addressed as soon as possible (Council for Geoscience, 2009: 8).

Structural Investigation

5.2

Introduction

The project includes two exhibition areas, a tile production space, a bridge and ceramic studios (refer to figure 5.17). Every space presents a specific construction challenge, each of which is discussed in this chapter as follows:

5.2.1 Retaining walls and tunnel construction.
The exhibition areas are located at the start and finish of the North-South axis of the project. The Gallery has a lower level that is partially below ground level and the underground exhibition space is entirely underground. Retaining walls and tunnel construction is analysed to understand the construction of these spaces.

5.2.2 Columns and beams
The length of the project is orientated towards East and West. To get sufficient light into deep spaces, a sawtooth roof is designed. The trusses that create the shape of the roof is supported on a column and beam structure which is briefly discussed. These sawtooth roofs are used throughout the project.

5.2.3 Sawtooth roof

The development of the aforementioned roof trusses is discussed along with connection details.

5.2.4 Openings and screens
The supporting structure over openings is briefly discussed. A suspended masonry screen is used as shading element at the studios. Methods of supporting the screen is discussed.

5.3.5 Bridge
A bridge is designed to span the inactive lime quarry on the site, connecting the tile workshop with the studios. Due to the complexity of the structure, it is not resolved in detail here. Precedents and the possible applications thereof is discussed.

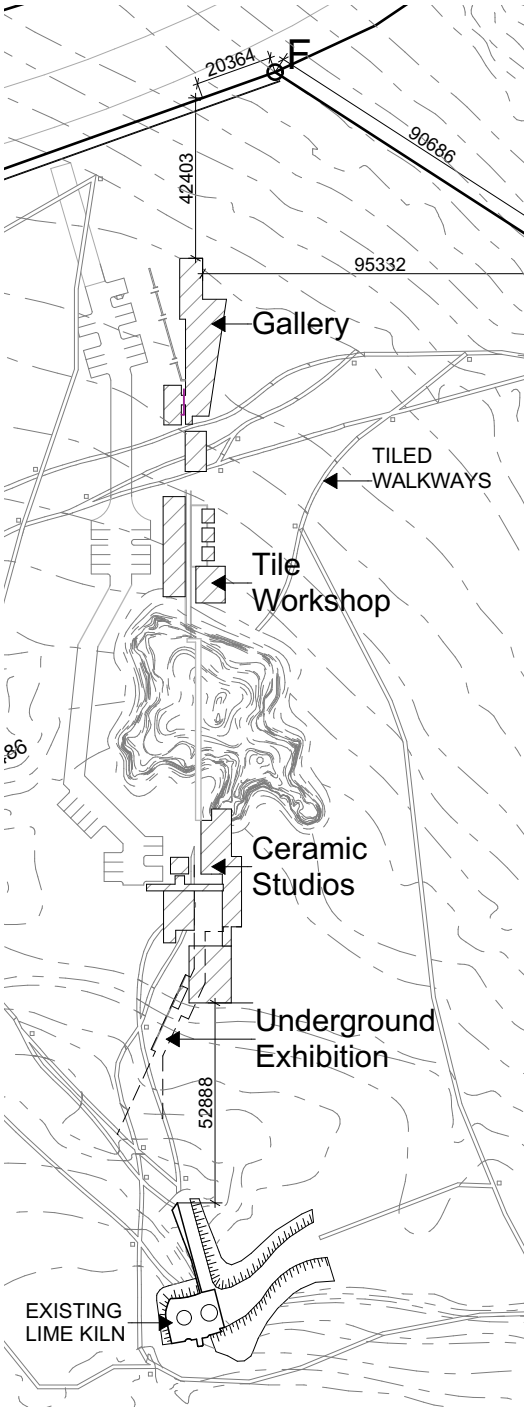


Figure 5.10: Main structures of the project (author).

5.2.1 Retaining walls

Due to the fall of the site, some portions of the buildings are partially underground. All underground portions of the design is highlighted in figure 5.11. Masonry and concrete cantilevered retaining walls are used in the construction of the underground spaces. These walls are supported on reinforced concrete footings with in-situ concrete floors.

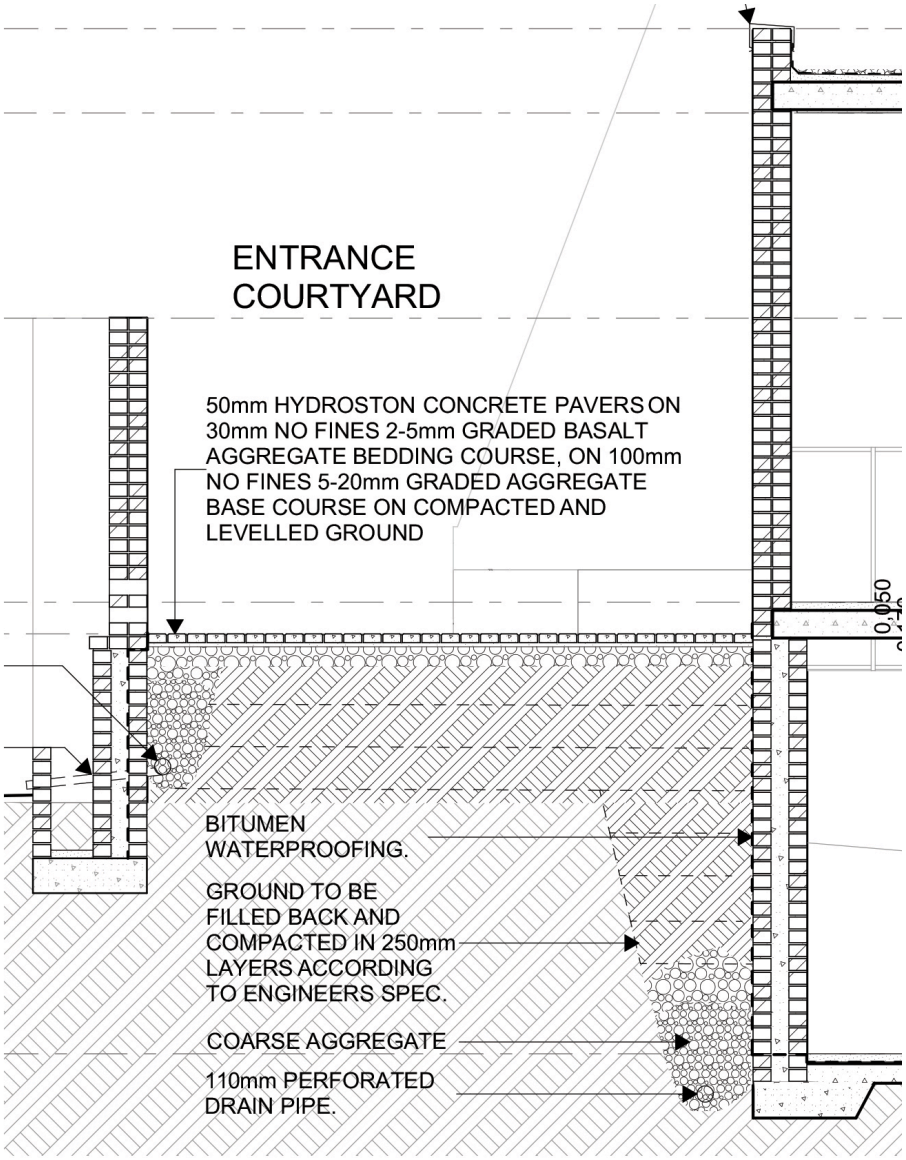


Figure 5.12: Gallery retaining walls detail (author).

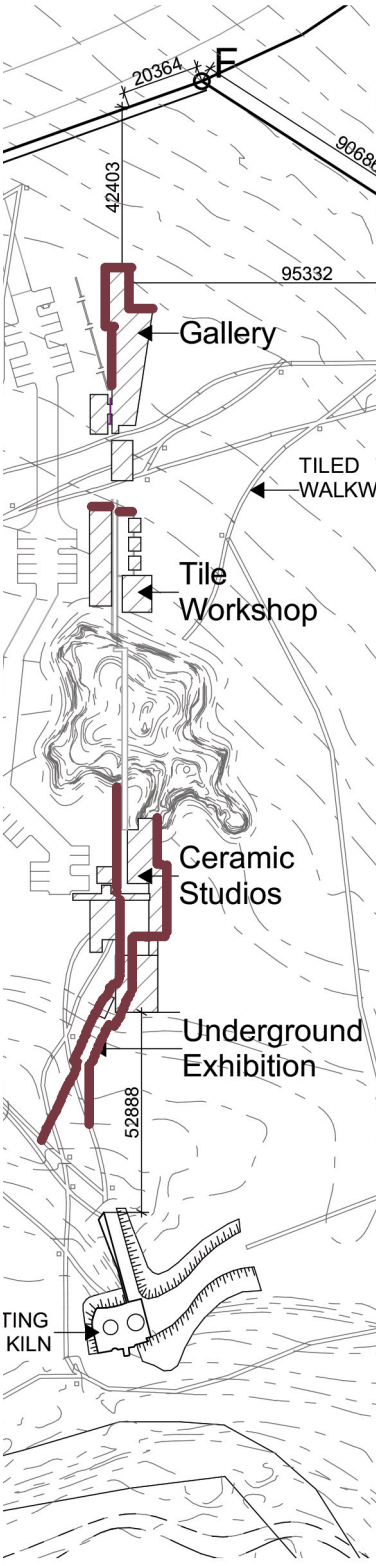


Figure 5.11: Location of new retaining walls (author).

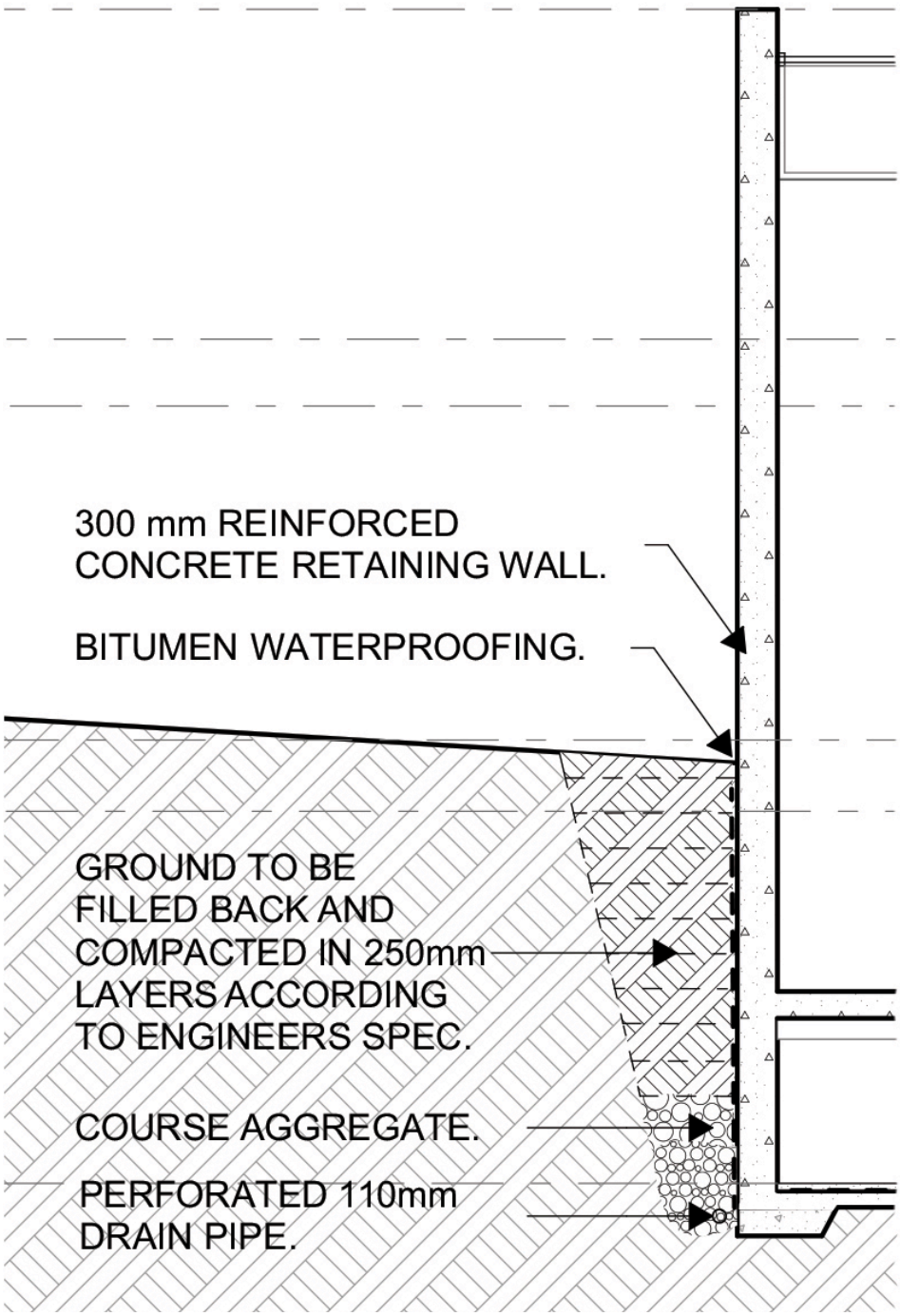


Figure 5.13: Gallery retaining wall detail (author).

5.2.2 Tunnel Construction

The southernmost portion of the exhibition area (refer to figure 5.17) is dug with a tunnel borer, because it minimizes the disturbance of the ground surface. An additional benefit of a tunnel borer is that it creates even tunnel walls that are watertight (Popular Mechanics, 2008). The machine produces a structurally sound cylindrical tunnel into which concrete walls are cast. Where vertical openings are added for ventilation, the hole in the tunnel is strengthened with a concrete beam (Engineer, 2019).

5.2.2 Columns and beams

The superstructure of the project consists of a combination of load bearing walls and a column and beam structure (indicated in figure. The precast concrete columns and beams form part of the support system for saw tooth roofs (see section 5.3.5). This is applicable to the Northernmost gallery, the tile production space and the studios (figure 5.17).

The beams double up as gutters in the valleys of the roof, supported on concrete columns with the same profile (figures 5.19 and 5.20). The columns are spaced at 4411mm centre to centre.

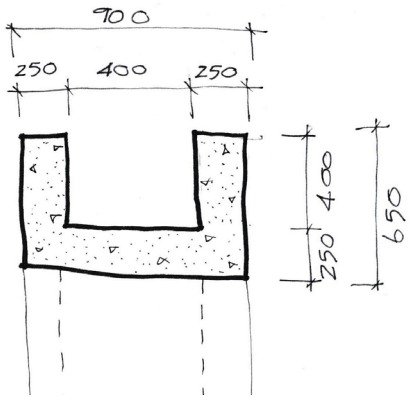


Figure 5.15: Structural gutter dimensions (author).

Figure 5.16: Structural gutter and column frame (author).

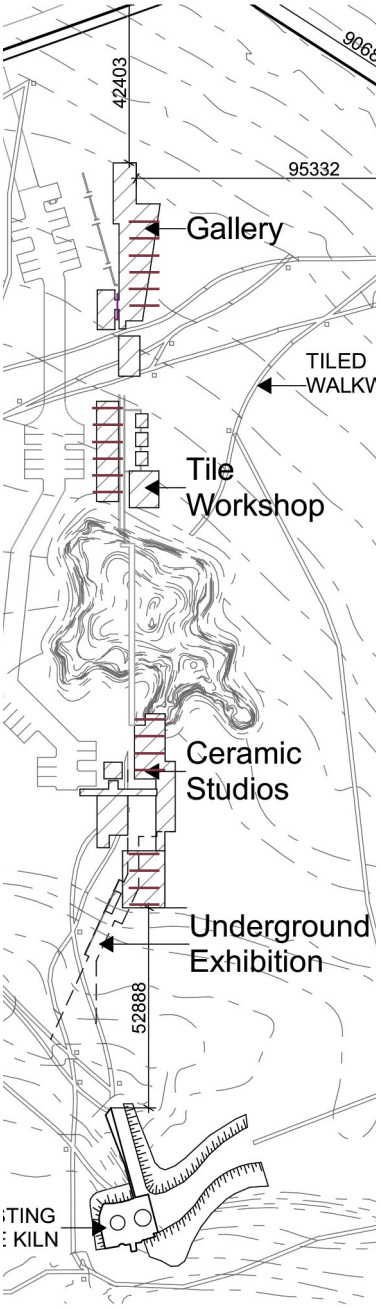


Figure 5.14: Location of column and beam frames (author).

5.2.3 Roof Trusses

The trusses discussed here are applicable to the northernmost gallery, the tile production space and the studios. The shape of the saw tooth trusses are determined by typical factory roof designs and vernacular (site) pitched roofs. The result is a factory roof typology that is slanted to imitate the silhouette created by the surrounding residential architecture (see section 2.5.3 Surrounding Vernacular). The shape of the truss allows for south-facing glazing to bring light into the spaces.

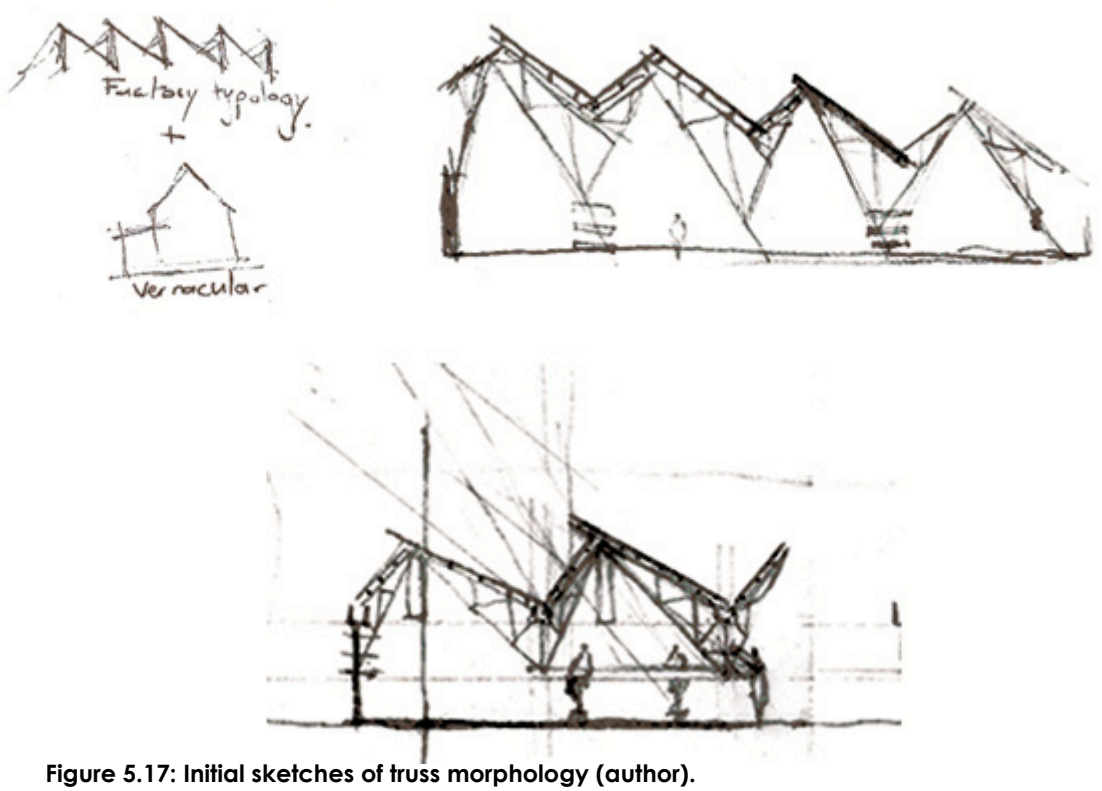


Figure 5.17: Initial sketches of truss morphology (author).

The timber trusses are attached to structural concrete gutters (refer to section 5.3.3)using angle cleats.

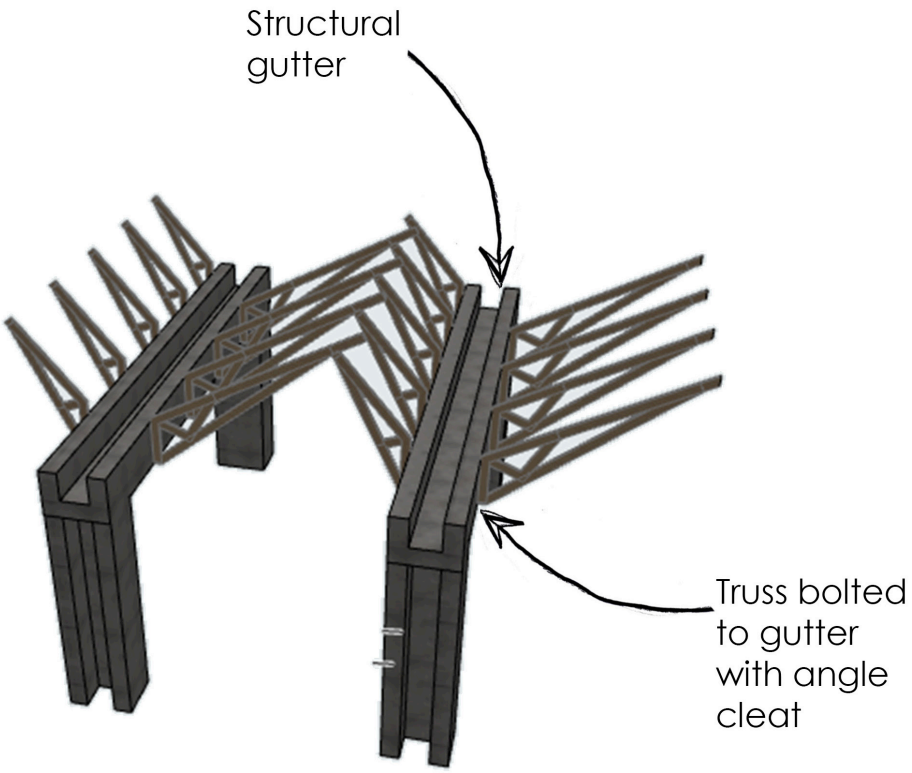


Figure 5.18: Timber truss diagram (author).

5.2.4 Masonry screens

Masonry screens are used as shading elements. The lines indicated in figure 5.19 represent screens that are suspended above the ground. The following details assist in the design of a support system for the screens.

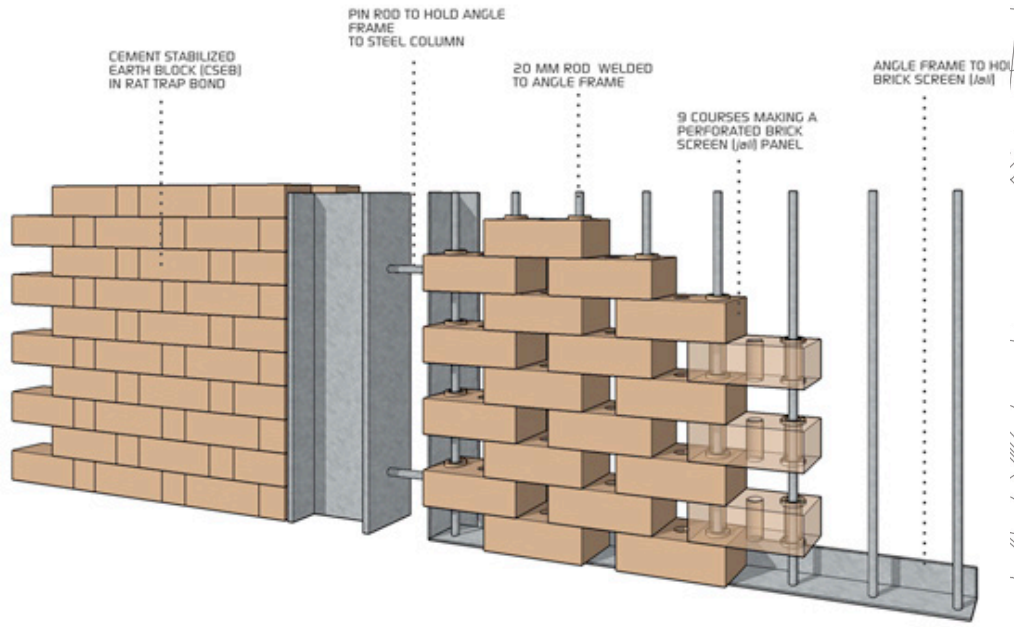


Figure 5.20: Brick screen detail. Maya Praxis Architects.

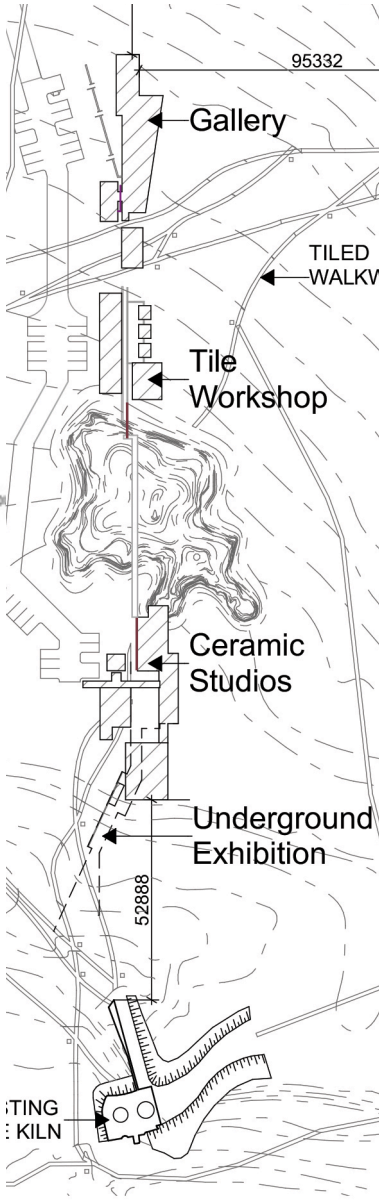


Figure 5.19: Location of masonry screens (author).

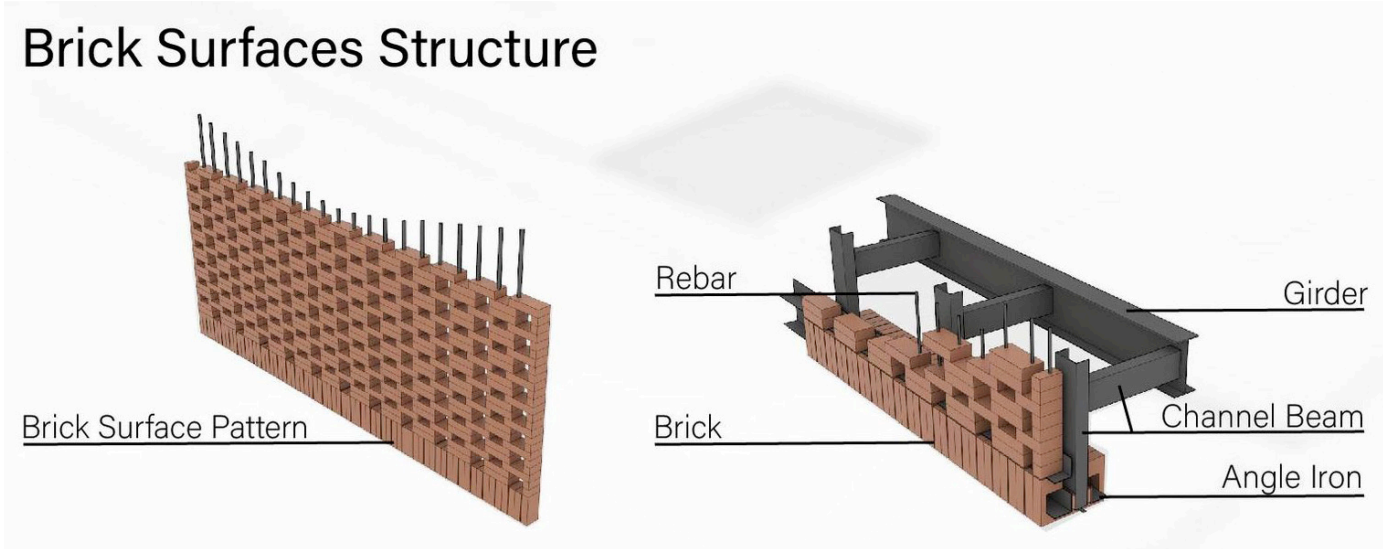


Figure 5.21: Brick screen detail. Naghshe Khak Architectural Group.

5.2.5 The bridge

The bridge that spans the quarry is approximately 50 meters long and consists of two walkways directly below one another. The top walkway is 14 meters from the deepest point of the quarry and the lower walkway 7 meters. Several structural systems were considered as possible solutions for the bridge structure.

Precedent Study 1: La Sallaz Footbridge

Figure 5.22: 2b Architectes. La Sallaz Footbridge. Passerelle de la Sallaz, 1010 Lausanne, Switzerland (2012). Photograph: Frwei, R. 2015.

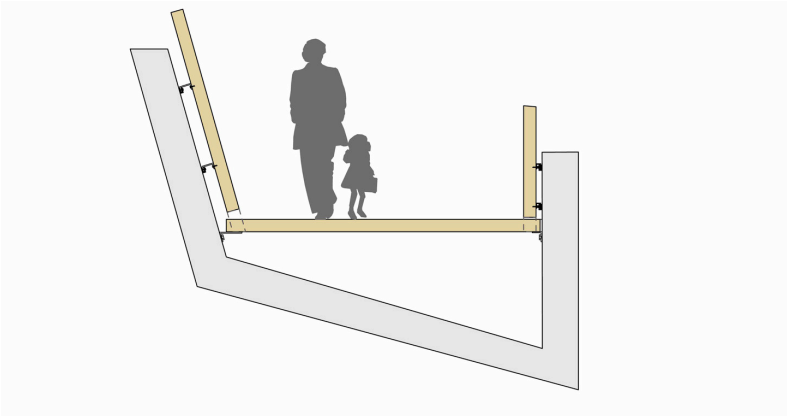


Figure 5.23: 2b Architectes. 2015. *La Sallaz Footbridge walkway section*.

Location: Passerelle de la Sallaz, 1010 Lausanne, Switzerland
Architect: 2b Architectes
Project year: 2012

The footbridge is used as a precedent study because of its clean lines and the relatively delicate mass of its structure. It is supported at three points: The edges are built into man-made hills with the compacted earth as support. The centre of the bridge is supported by four slanted concrete columns (see figures 5.26 and 5.28). The walkway is constructed of a series of thick pre-cast concrete channels that span between these three supports (2b architectes, 2015). A timber structure is attached to the inside of these channels which provides a level surface to walk on.

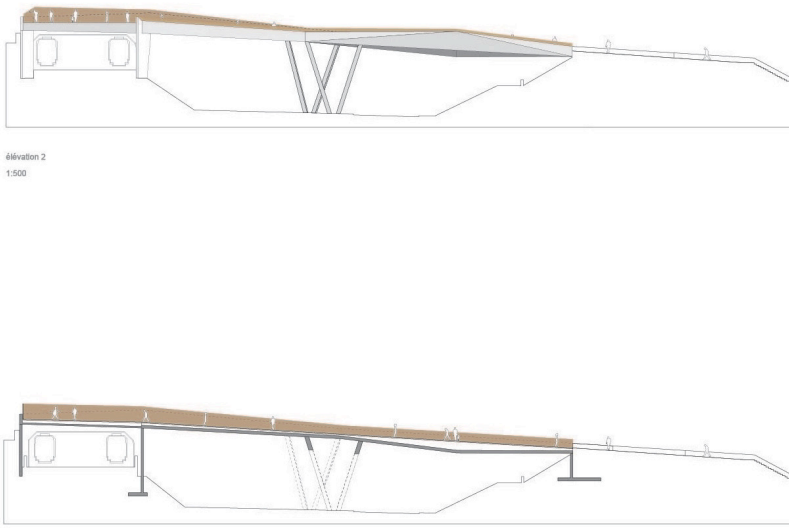


Figure 5.24: 2b Architectes. 2015. *La Sallaz Footbridge*.

Precedent Study 2: STIHL Treetop Walkway

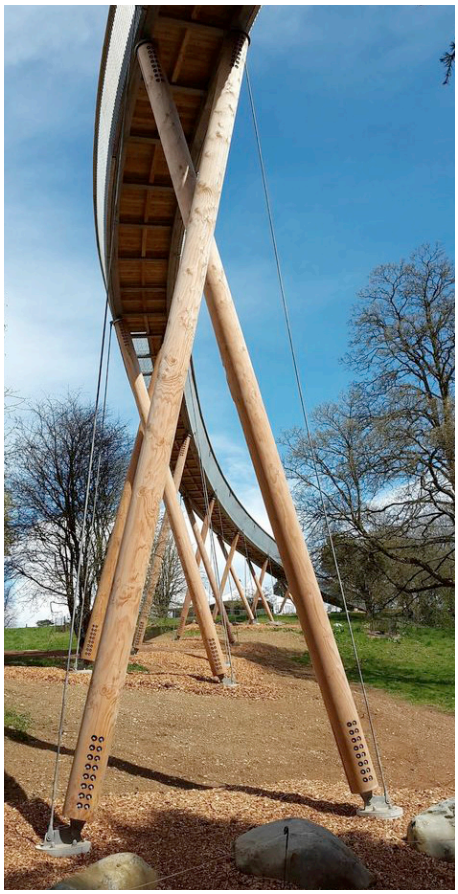


Figure 5.25: Glenn Howells Architects. *STIHL Treetop Walkway*. Westonbirt, United Kingdom (2016). Photograph: Parrish, R. 2016.

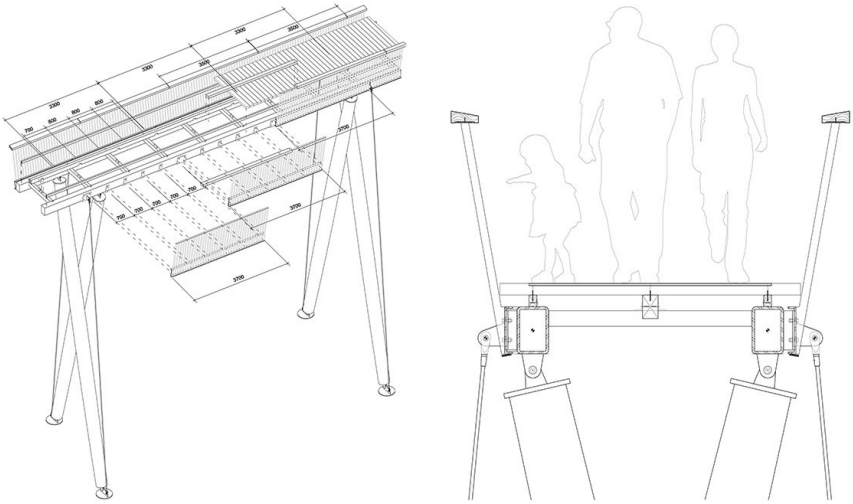


Figure 5.26: Glenn Howells Architects. 2017. *STIHL Treetop Walkway construction details.*

Location: Westonbirt, United Kingdom
Architect: Glenn Howells Architects
Year completed: 2016

The structure comprises of pairs of tapered timber columns at regular intervals along the walkway. Each pair of columns cross and is braced with tensioned steel cables (figures 5.28 and 5.29).The bridge is 284 metres long and its highest point above ground level is 13,5 metres (Glenn Howells Architects, 2017).

Considering the height and length of the bridge, the structural system should be able to sufficiently support the proposed design. However, the large amount of thick columns required to support the walkway does have a strong presence which could overpower the delicate sculptural quality of the quarry.

In consultation with an engineer (von Geys0, 2019) the following solution was discussed. The bridge is supported by two pylon like structures that each consists of four diagonal columns made from 120x120mm steel hollow square sections. These columns are connected horizontally at regular intervals with steel rods. The structure is cross braced using cables. The walkway consists of a steel frame that holds the steel mesh floor of the walkway. The steel frame spans between the pylons by means of two vertical steel rods connected with cables (see figure 5.30).

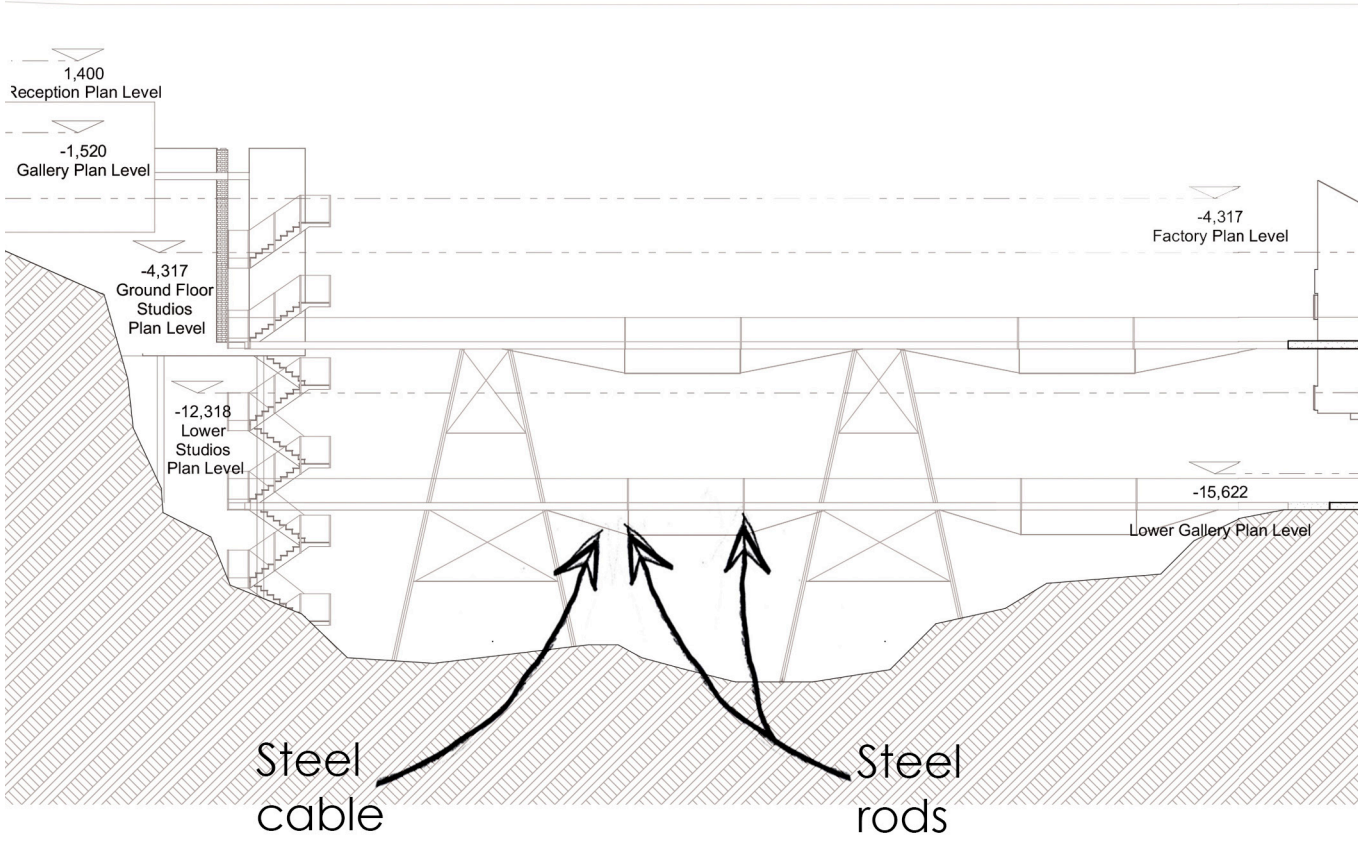


Figure 5.27: Bridge section through quarry (author).

5.3 Sustainable Design Aims

The approach to sustainable design is focused on passive design principles, water management and electricity generation.

5.3.1 Site Orientation

The length of the project is orientated towards East and West. To get sufficient natural light into the majority of spaces, the development consists of separate units connected by a continuous wall element. The masonry wall forms a North-South axis, that screens courtyards and walkways from afternoon sun (refer to figure 5.7).

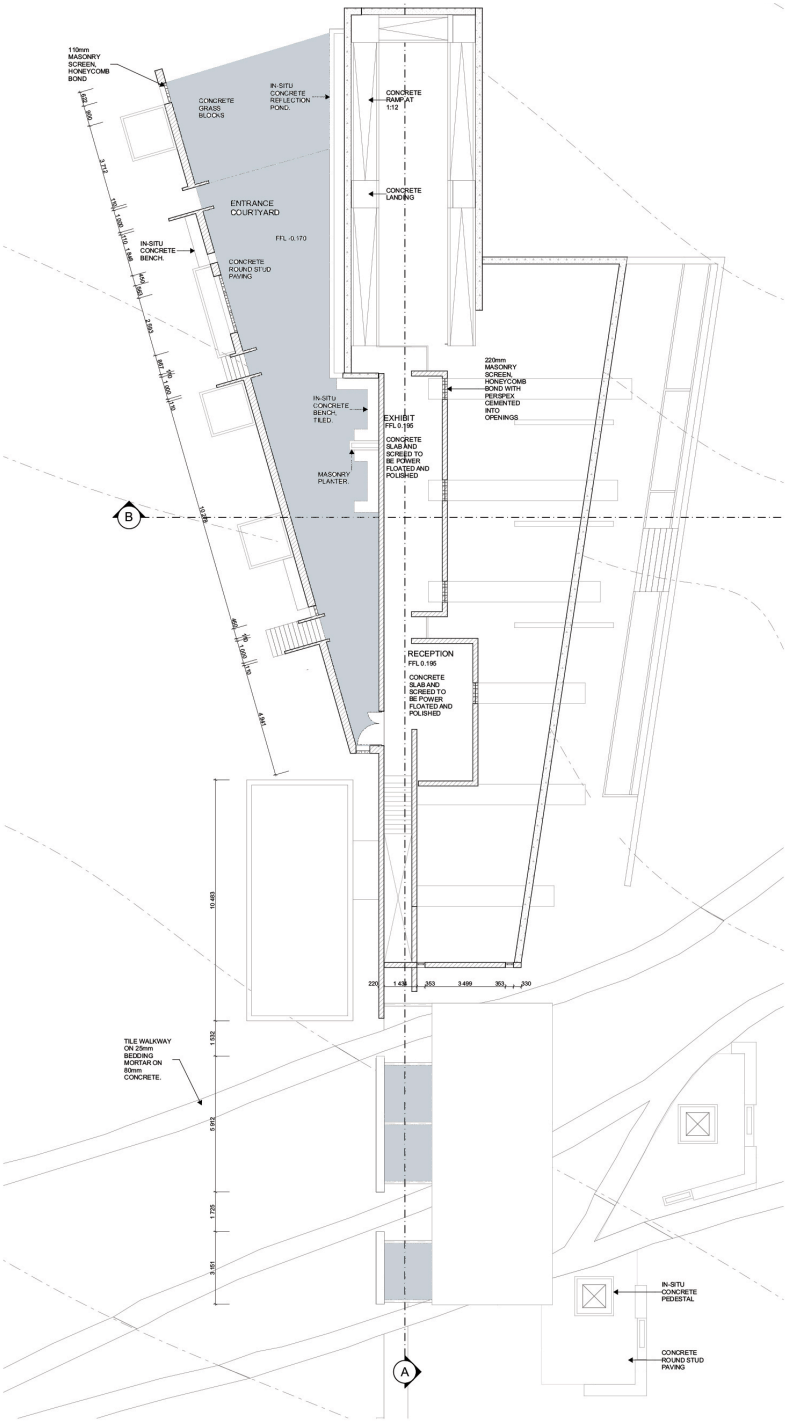


Figure 5.28: Outdoor spaces shaded by North-South wall (author).

5.3.2 Ventilation

The design includes a long underground tunnel with exhibition and meditative/reflective spaces. These spaces are naturally ventilated to reduce energy consumption and enhance the experiential quality of the tunnel. The following approaches to underground ventilation are adapted from a study by Kazemzade and Vaezizadeh (2013: 65-67). Wind enters the space from the south in summer and the north in winter (according to the prominent wind direction).

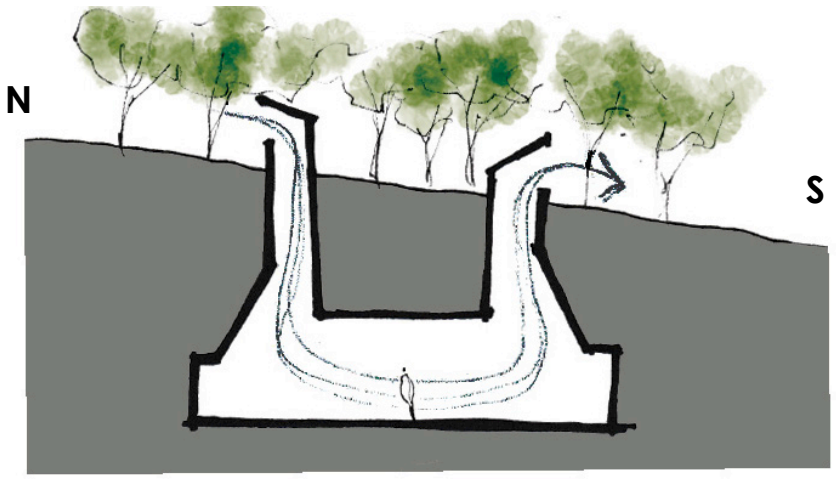


Figure 5.29: Cross ventilation through chimneys. Wind direction is shown for winter. (Author).

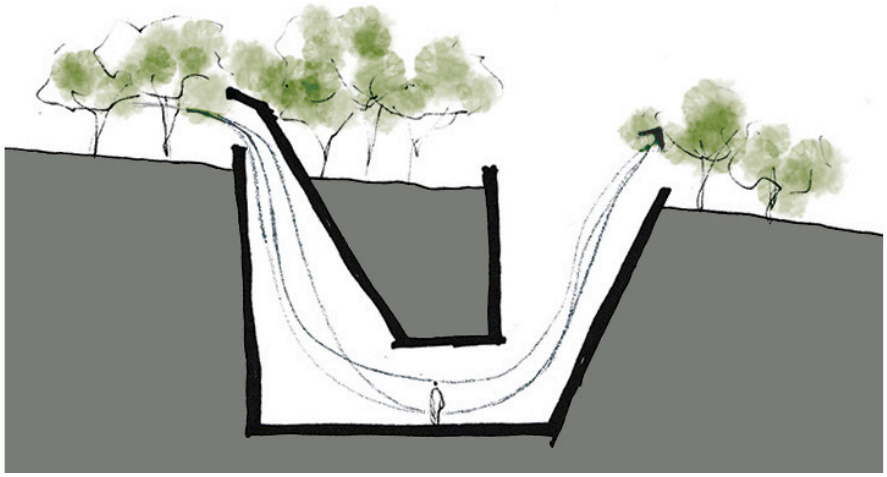


Figure 5.30: Cross ventilation through chimney and excavation of earth. This method is most applicable in areas where the site slopes drastically. (Author)

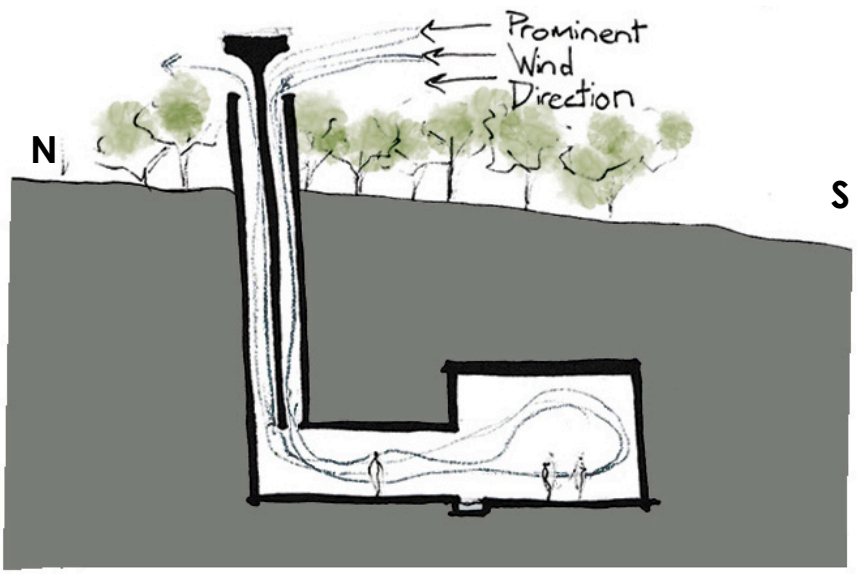


Figure 5.31: Wind catcher with water feature. Wind direction is shown for summer (author).

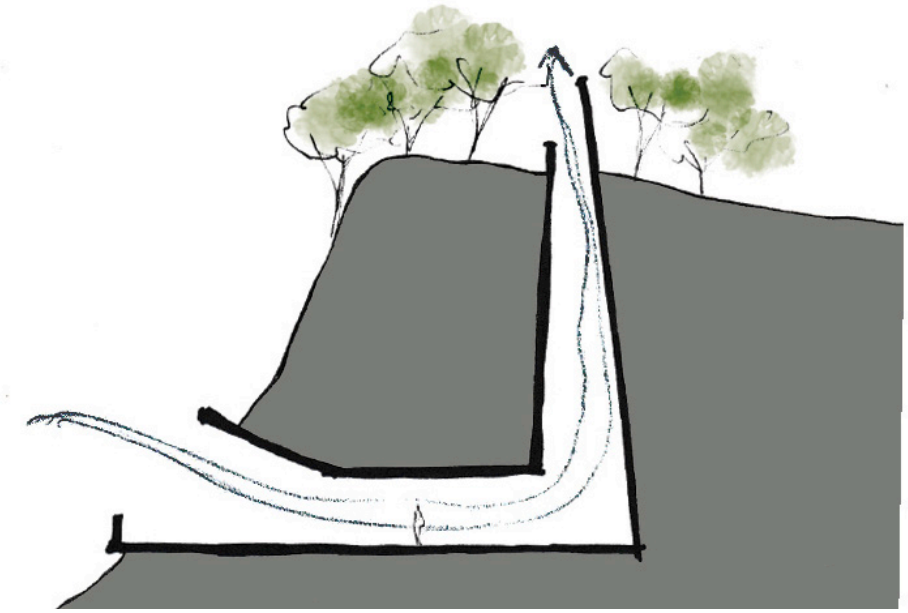


Figure 5.32: Cross ventilation at the edge of the quarry (author).

5.2.3 Water management

Rainwater harvest

The ceramic making process makes use of large quantities of clean water. To supplement the municipal supply, rainwater can be harvested and cleaned. This requires a large roof area, a storage space for the water and a pump to circulate the water. The dimensions of the plant is approximately 3m x 3m x 3m. These dimensions include the pumps required to circulate the water. For rainfall data see part 2.2.2 Climate.

The water is stored in pre-cast concrete tanks. These tanks can be placed underground or used as retaining walls. With the tank at this level, storm water can be directed into the tank through channels that slope to the tank inlet.

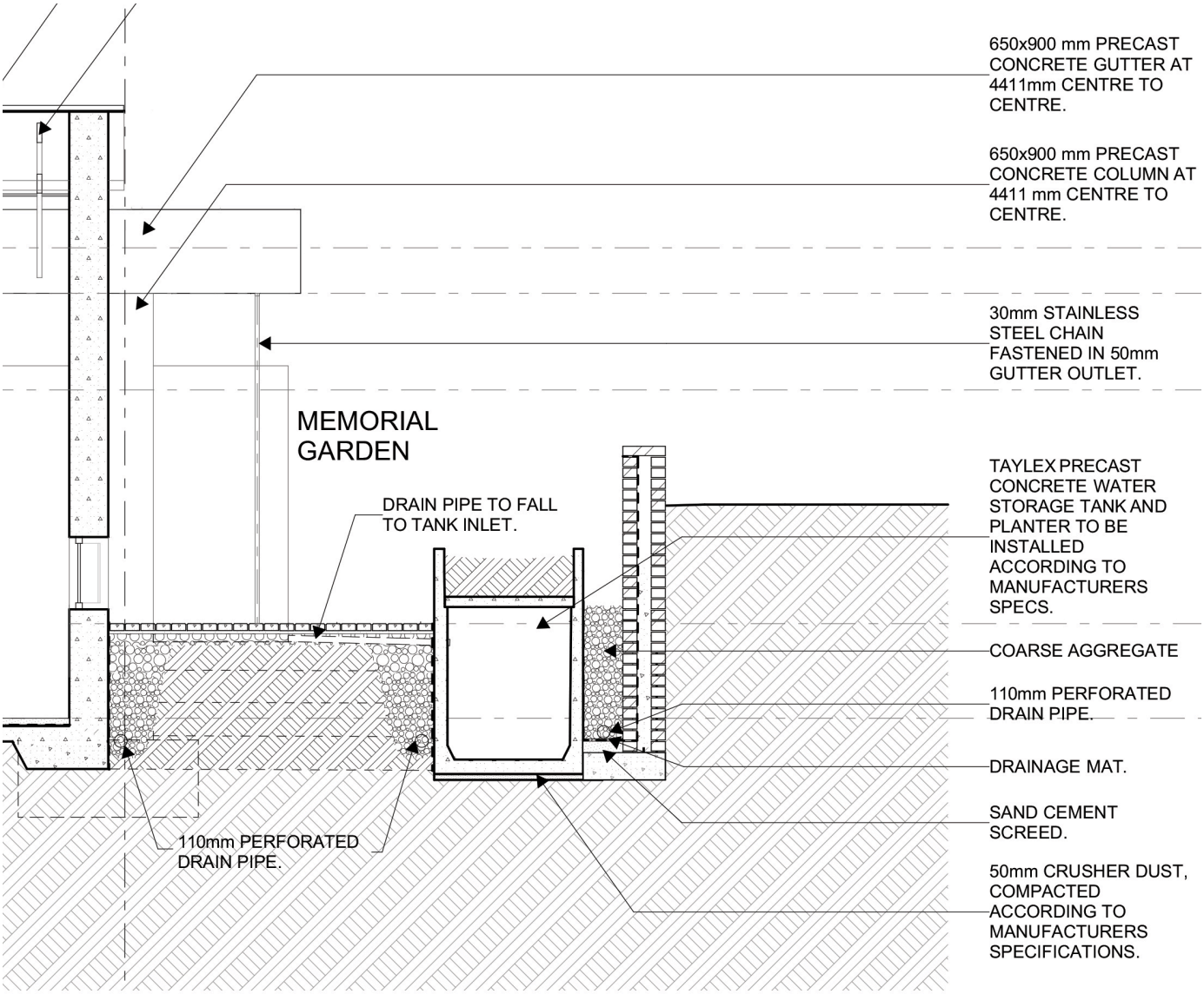


Figure 5.33: Installation of storage tank at the gallery (author).

Water re-use
Studios need to be rinsed out frequently to remove clay dust. To prevent contaminated water from entering the municipal storm water system, the runoff can be cleared of clay slip and recirculated (Young, 1999: 19). This can either be done by including large tanks with filters to remove clay in the studio drainage system, or with a series of settling ponds. A settling pond allows the clay particles sink to the bottom while the clear water is removed from the top of the pond (see figure 5.15). The clay particles can take up to 24 hours to settle out (LeValley, 2014). After the removal of clay particles, the water is stored and used to irrigate vegetation in the courtyards and greenhouses.

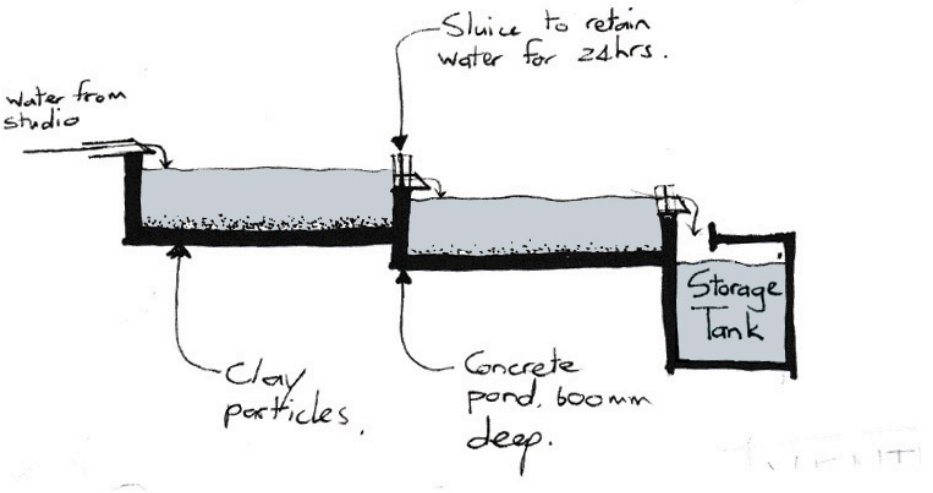


Figure 5.44: Settling ponds and storage tank (author).

The use of settling ponds aid in the evaporative cooling of adjacent spaces. The water in the pond evaporates. The hot air consequently becomes cool and humid, which is then drawn into the building through cross ventilation (Muller, 2013: 109). These ponds must be kept separate from ceramic drying yards, as the additional humidity lengthens the drying process of ceramic works and could eventually lead to mould.

5.3.4 Electricity Generation

The following method of electricity generation is still unproven, but it may be useful in the future development of the proposed project. The method is discussed followed by a description of equipment produced by Green Turbine as a possible application of the method/principles.
A large amount of heat is wasted through the chimney and walls of a kiln. The most usable of this heat is the warm flue gas that accumulates at the roof of the kiln and subsequently escapes through the chimney. Labi, Habib and Ahmed (2019) recommend a model for the utilization of waste heat from kilns to produce electricity (Ahmed, et al., 2019).

The heat of the flue gas warms up water, which turns into steam. This steam turns a turbine that powers an electrical generator (Woodbank Communications, 2005). To achieve this, the flue gas is taken out of the kiln at ceiling level and pumped into a water tube boiler (Labi, et al., 2019: 5).

Generally, the Rankine cycle is used in this process (Figure 5.16). This cycle starts by passing heat from the flue gas through a waste heat recovery steam generator (WHRSG). The heat surrounds fluid (usually water) in tubes, converting the water into steam. The steam moves a turbine that is connected to a generator. This generator converts the mechanical energy of the moving turbine into electrical energy. The steam is then transported to a condenser, turning it back into a liquid and pumping it back to the WHSG (Ahmed, et al., 2019: 6-7).

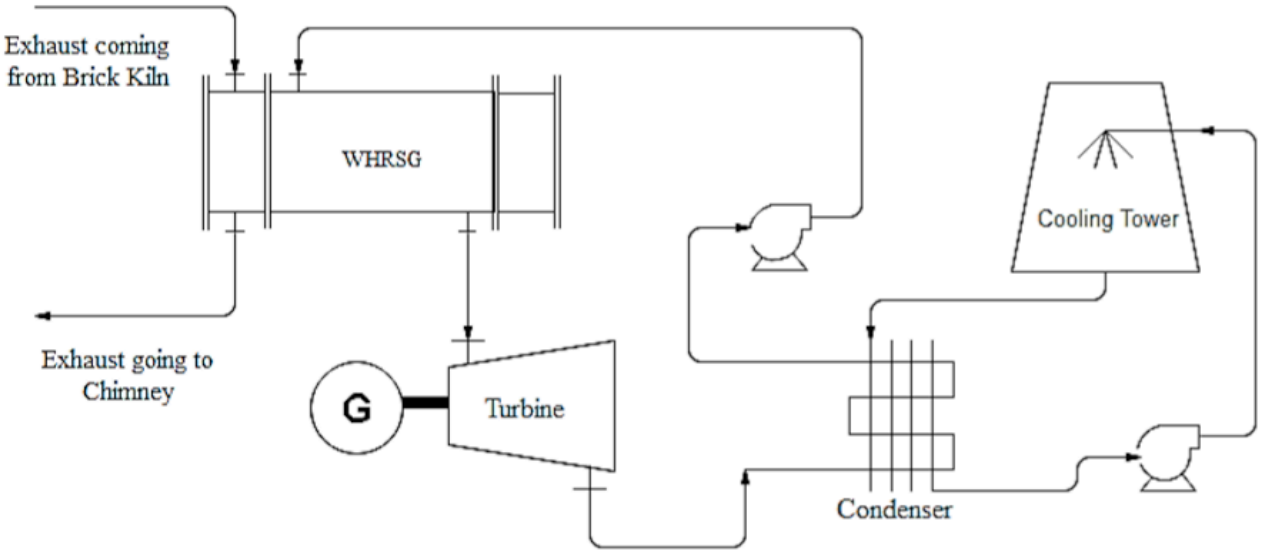


Figure 5.16: Labi et al. 2019. Configuration of a Rankine system.

The Rankine system requires constructing a small scale power plant, which is expensive and space intensive (Ahmed, et al., 2019: 11). This could outweigh the financial and environmental benefits. As an alternative to a power plant, the Dutch company Green Turbine produces small scale steam powered generators specifically for the conversion of excess heat into electricity (Green Turbine, 2014). The generator is equipped with a "turbine, PLC, vacuum pump, vacuum vessel, inverter, condenser, feed pump, rectifiers, speed control, piping, fittings, flanges, steam valve and coil and amp and voltmeter" (Green Turbine, 2014). The overall dimensions of the generator are 1000x750x2200mm (l x w x h). This generator needs to be connected to a 4000 mm diameter boiler (ZVU Engineering, 2018). The heat from the kiln is then redirected into the boiler, from where the steam enters the generator and is converted to electricity.

These Green Turbine components are still expensive, but the compact size reduces the site area required. The entire process can be facilitated within a 6x6m room. This process is only discussed in theory, as the application thereof is not yet refined nor is its effectiveness tested.

5.4 Materials

5.4.1 Clay bricks

Bricks are used to construct the North-South spine of the project. Clay bricks respond to the history of the site. Cullinan established a brick and tile manufacturing plant on the site in 1896 (refer to section 2.3). The use of brick construction also refers to the theoretical approach of tactility. The size of standard clay bricks are determined according to the size of a person's hand (Pienaar & Pienaar, 2013: 207). This humanizes the material and it relates to the tactility of the program (ceramics production).
On a more practical level, clay brick is an effective material because it is commonly used in the area. The material and the skills associated with it is readily available.

5.4.2 Concrete

Retaining walls are constructed with concrete instead of brickwork to emphasise the aforementioned axis as a feature element. Columns and beams are also concrete because the columns form part of the retaining walls. By using similar materials difficulties regarding different expansion rates is limited.

5.4.3 Timber

Time and the passage thereof is an important theoretical approach to the design of the project. Timber is used for the roof trusses because wood speaks of two existences in two different times: Its first lifetime as a growing tree and its second as an artefact of human construct (Pallasmaa, 1999:3).
Timber is also more economical than steel because the trusses only span 4400mm (Pienaar & Pienaar, 2013: 280).

5.4.4 Polycarbonate sheets

The timber roof trusses are designed to allow north light into the building. For this purpose, the roof panels facing north are of multiwall polycarbonate sheets. These sheets consist of a cellular structure that provides thermal insulation to reduce heat gain. It also filters sunlight to reduce glare, because the polycarbonate layers are manufactured with a UV filter (Palram South Africa, 2019). This means that the intensity of damaging ultraviolet rays from the sun that enters the building is reduced, which in turn reduces heat gain (Zeiss, 2018). Furthermore, the cellular construction strengthens the panel for impact resistance (Palram South Africa, 2019). This is beneficial during hailstorms that generally occur in summer (Dyson, 2009).

The polycarbonate panels can be fastened directly to 50 x 75mm timber purlins using a Fastmount metal clip. It consists of two parts that clip together, with one part screwed into the timber purlins and the other into the polycarbonate sheet. This simplifies the waterproofing process as no holes are made in the sheet (Perspex South Africa, 2015).

5.5.1 Underground W/C's

Some of the toilets at the studios (refer to figure 5.17) are situated 8 metres below the natural ground line. Drainage and ventilation requires special consideration.

Drainage
Plumbing at ground level depends on gravity to drain sewage and wastewater through the slope of the pipes. Currently, the site does not have a sewage connection point. This connection point would likely be installed near the road north of the site, because of a large residential development taking place across the road. The site falls away from this road (see section 5.1.3), implying that the sewer connection would be on a higher level than the majority of the project. As a result, sewage and wastewater would need to be lift-pumped to the sewer connection (figure ??). This is done with a sewage ejector pump and a sump basin (figure??). Sewage water flows into the sump basin until it is full. The ejector pump the n pumps the liquid up to the level of the sewage connection (Stickley, 2019). Backwater valves are also required, as this prevents sewage from flowing back into the studio bathrooms. To avoid clogging of the pipes, pressure–assisted toilets are installed. These toilets make use of air pressure to force wastewater through pipes (McGrath, 2019).

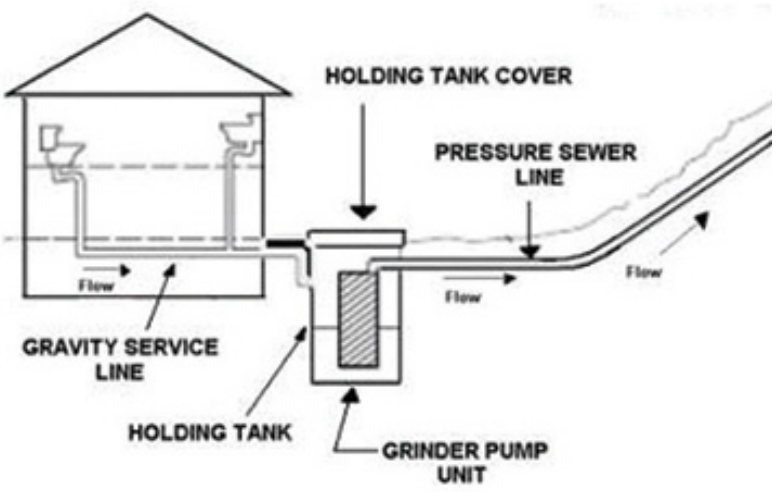


Figure 5.16: Strongman Pumps. 2019. Configuration of lift-pumped sewage using a sewage ejector pump and sump basin.

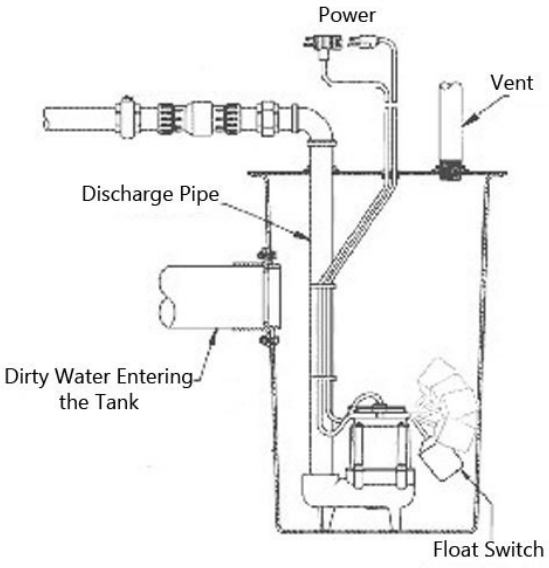


Figure 5.16: Strongman Pumps. 2019. Connection requirements for sewage ejector pump and sump basin.

The sump basin is situated at the toilets at the studios because it is the lowest point that requires sewage removal. Sewage and wastewater from all the toilets on the site flows into this basin by means of gravity. Once the basin is full, the water is pumped up to the municipal sewage connection point.

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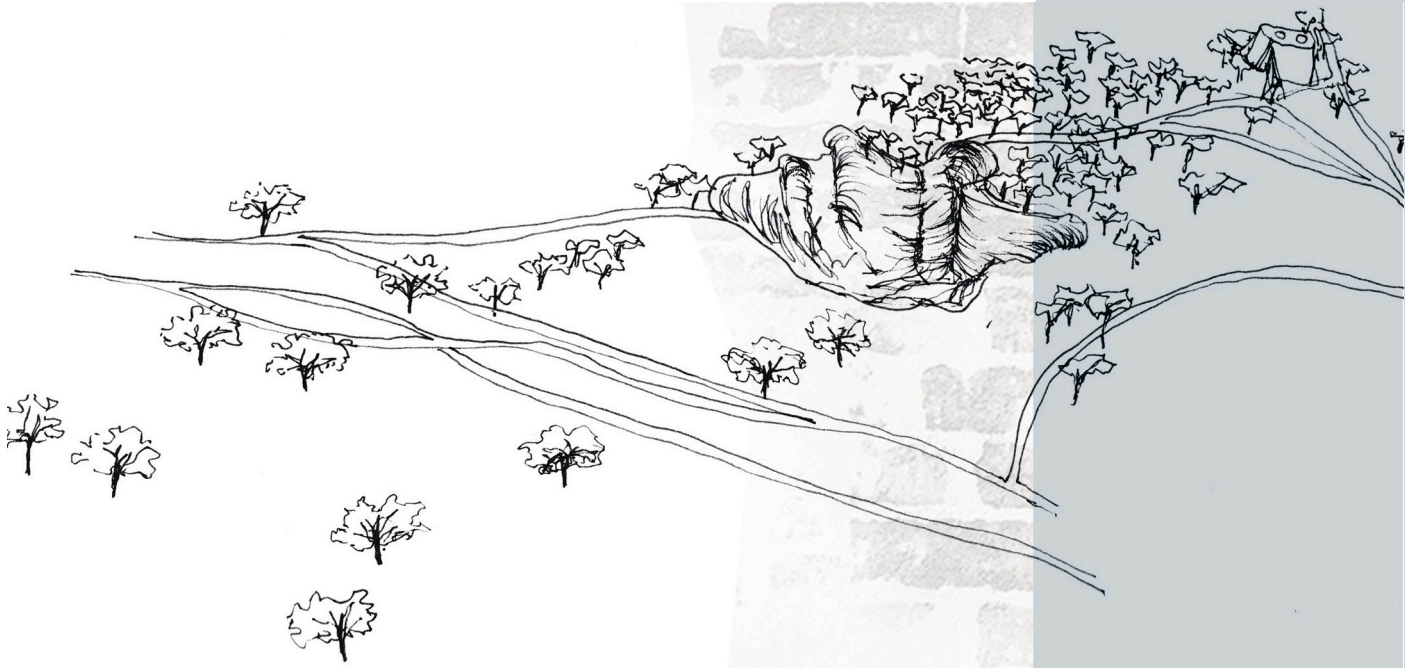
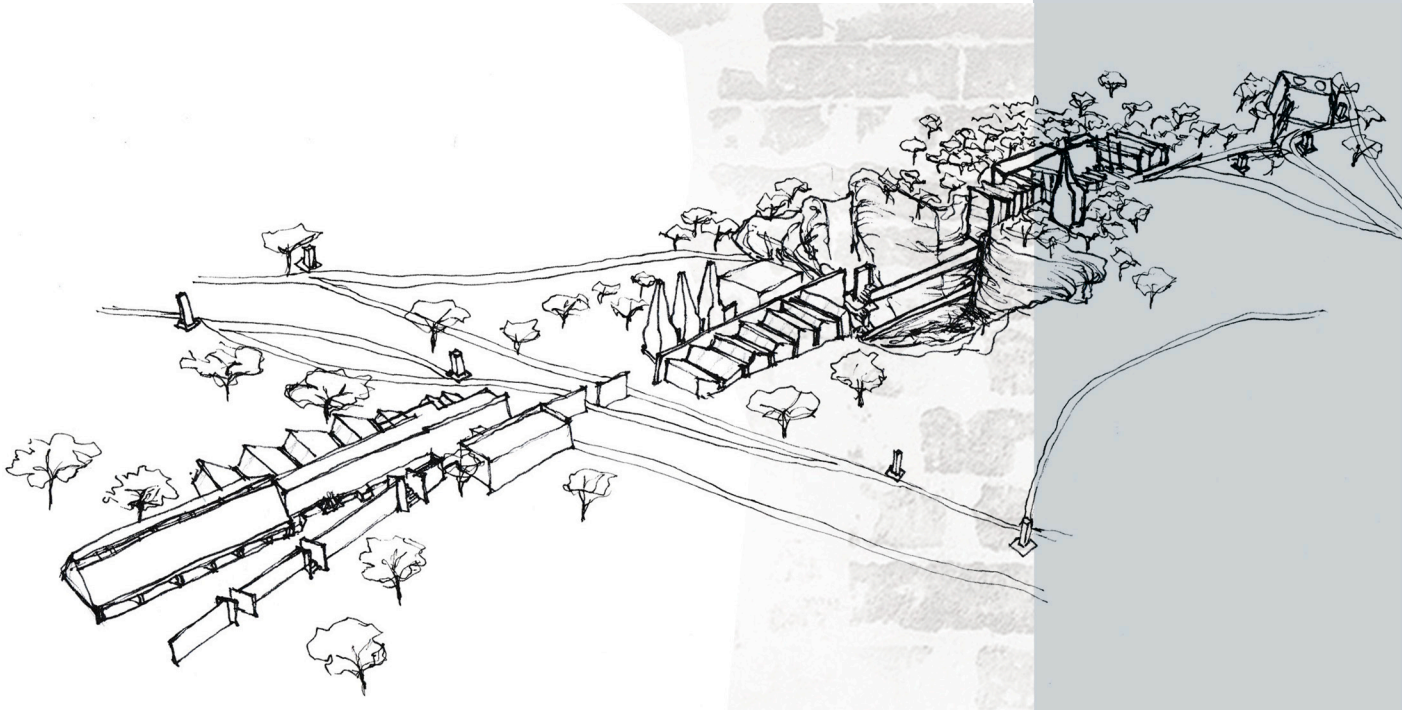
Reflection





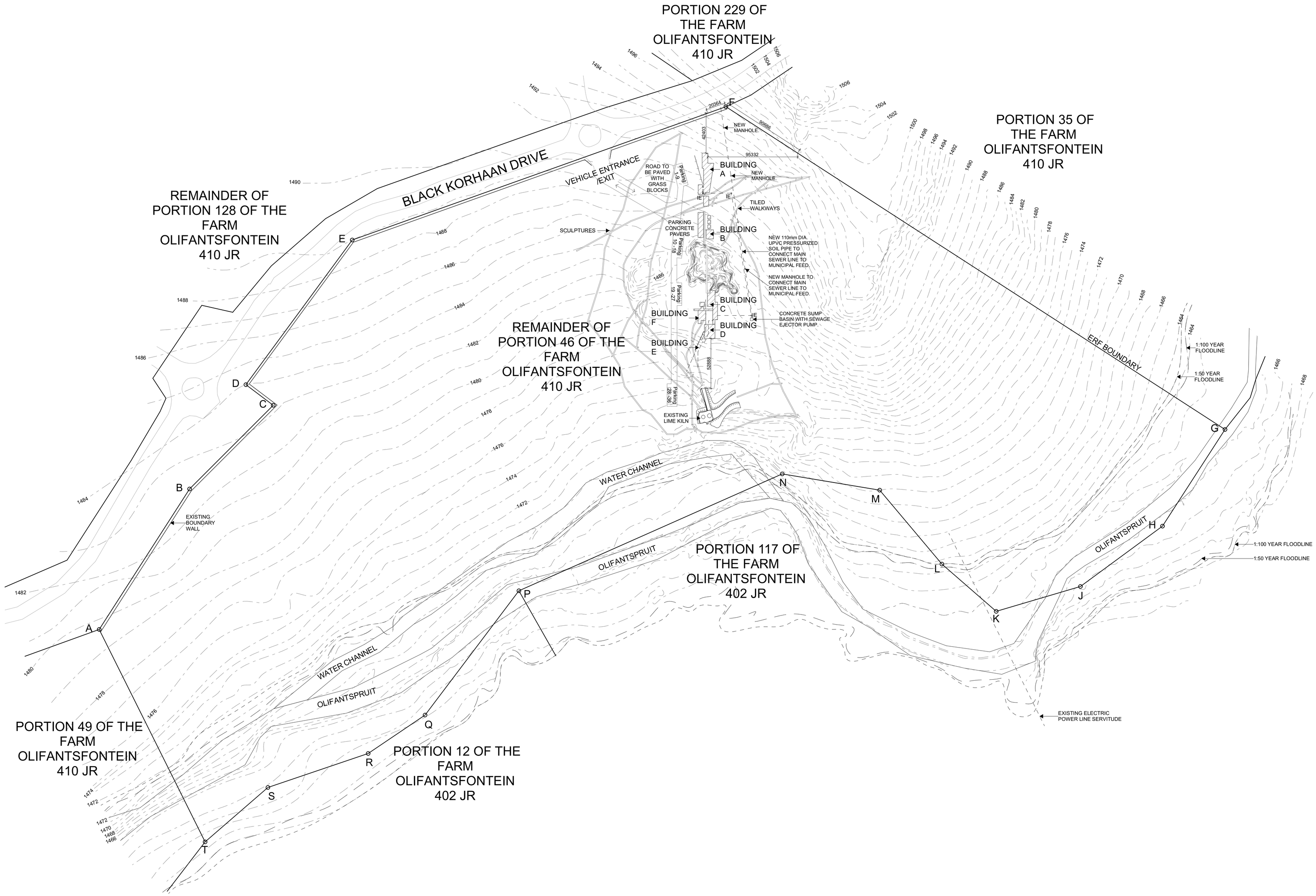
The development of this dissertation satisfied a personal curiosity to understand the effect that architecture can have on peoples emotions, memories and decisions. Designing a tactile encounter without the physical act of touching is especially intriguing.

Initial aims set out for the project involved the development of the project spine and the formulation of a program specific design. The research questions the extent to which architecture can affect people and their emotions. The theoretical approach proved effective in the formulation of a practical guide to design for emotional impact. These guidelines assisted in the development of the continuous architectural promenade that binds the project together.

Incorporating a public promenade into the design without disrupting the production process was challenging. It did however result in the exploration of building morphologies that would not otherwise have been considered.

Challenges associated with the project assisted in the developing of problem-solving skills. The exploration of architecture and sensations broadened my perspective on the drastic effect that subtle architectural decisions can have.

Tactile Memory



Block Plan

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JK	93246mm
KL	76482mm
LM	102569mm
MN	104941mm
NP	305898mm
PQ	165339mm
QR	72938mm
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ST	88228mm
TA	252038mm

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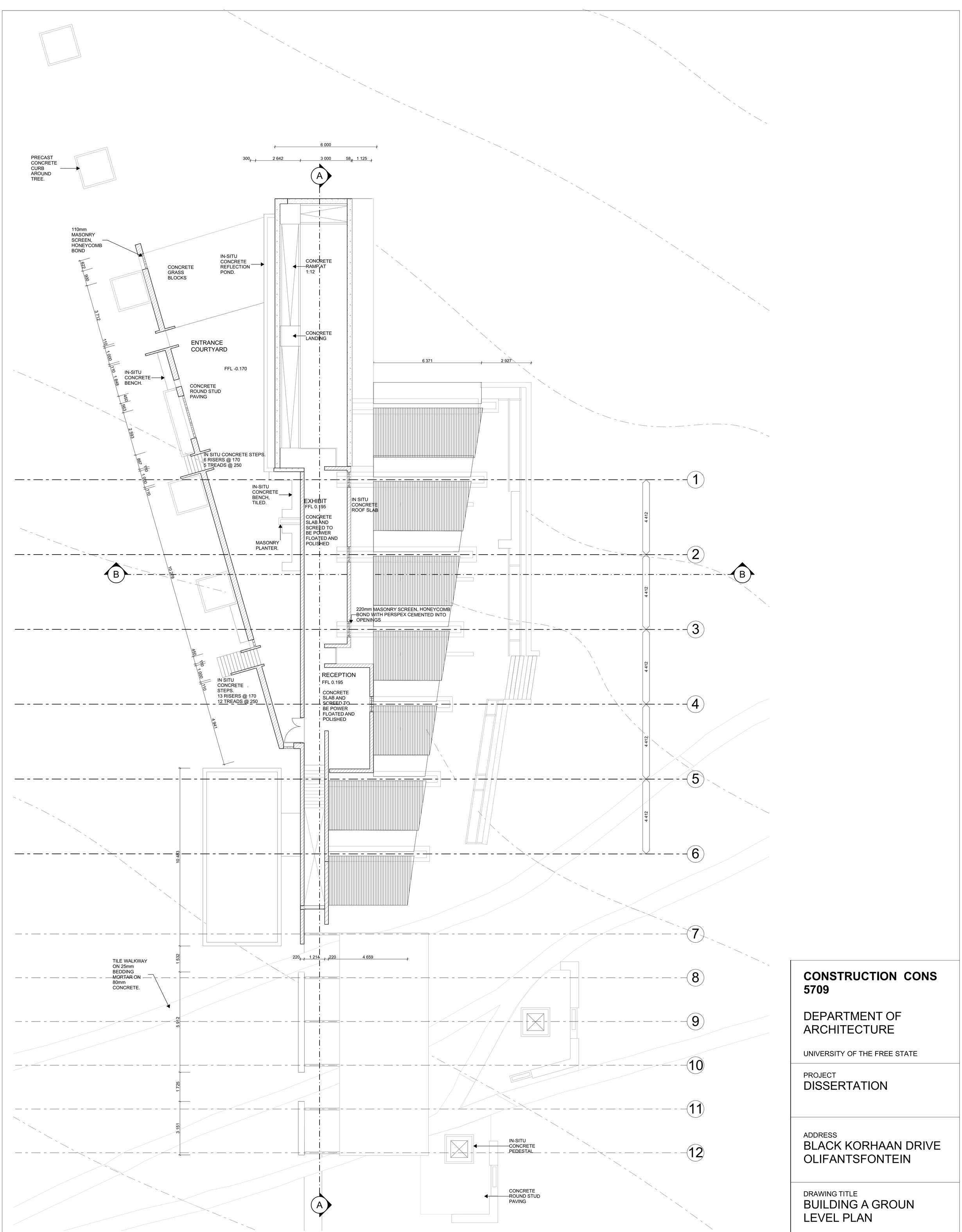

Building A Ground Level Plan

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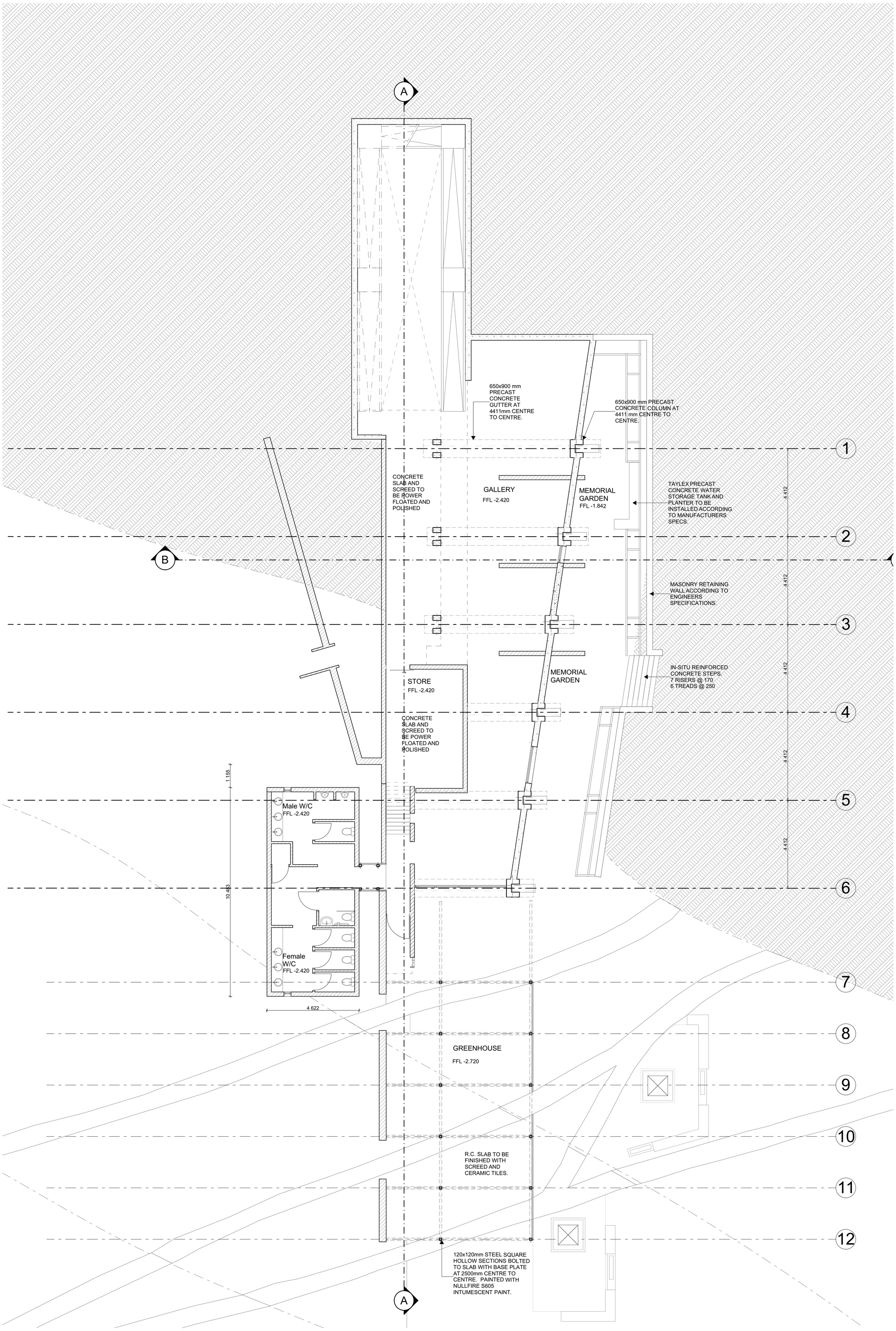

Building A Lower Level Plan

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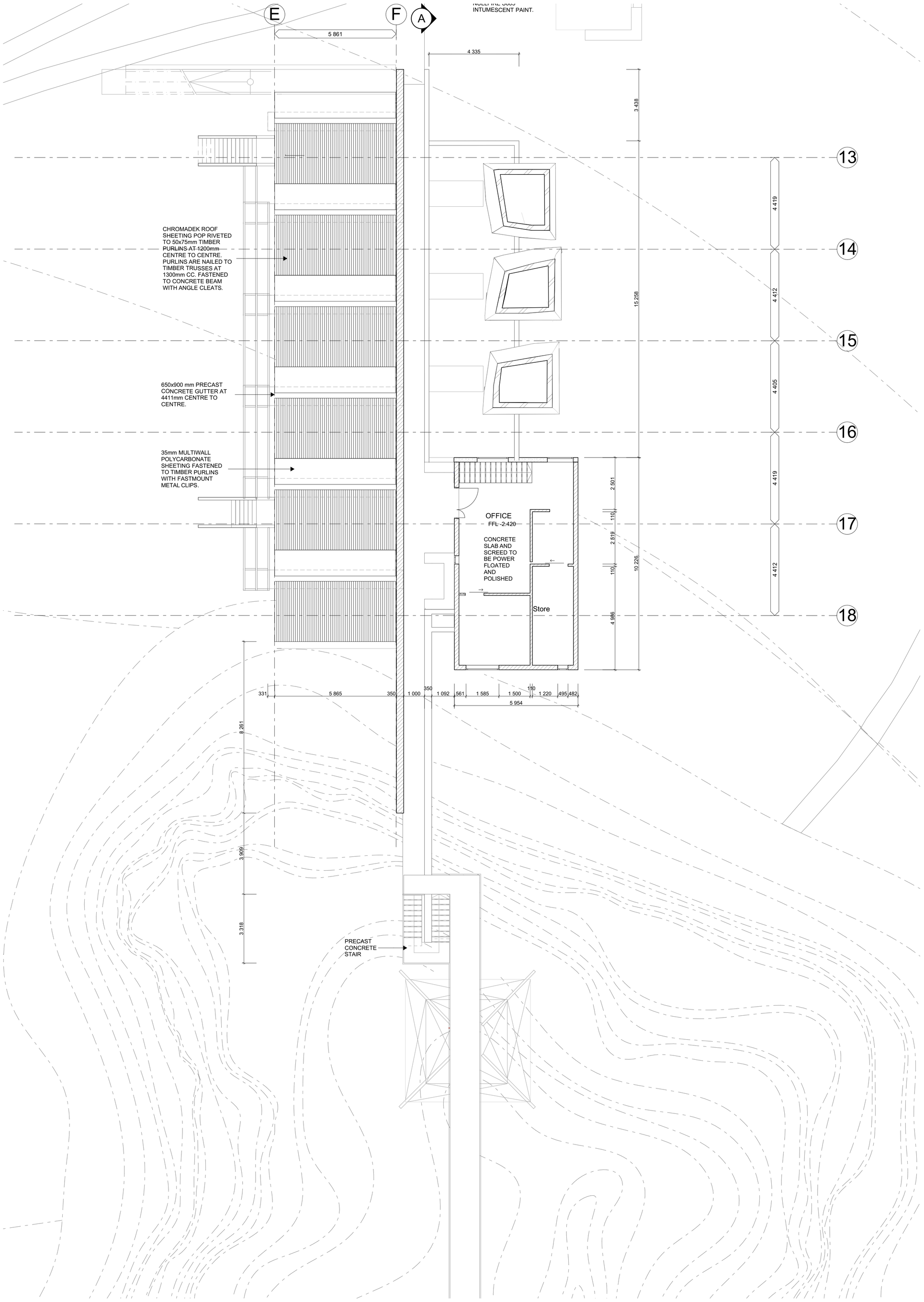

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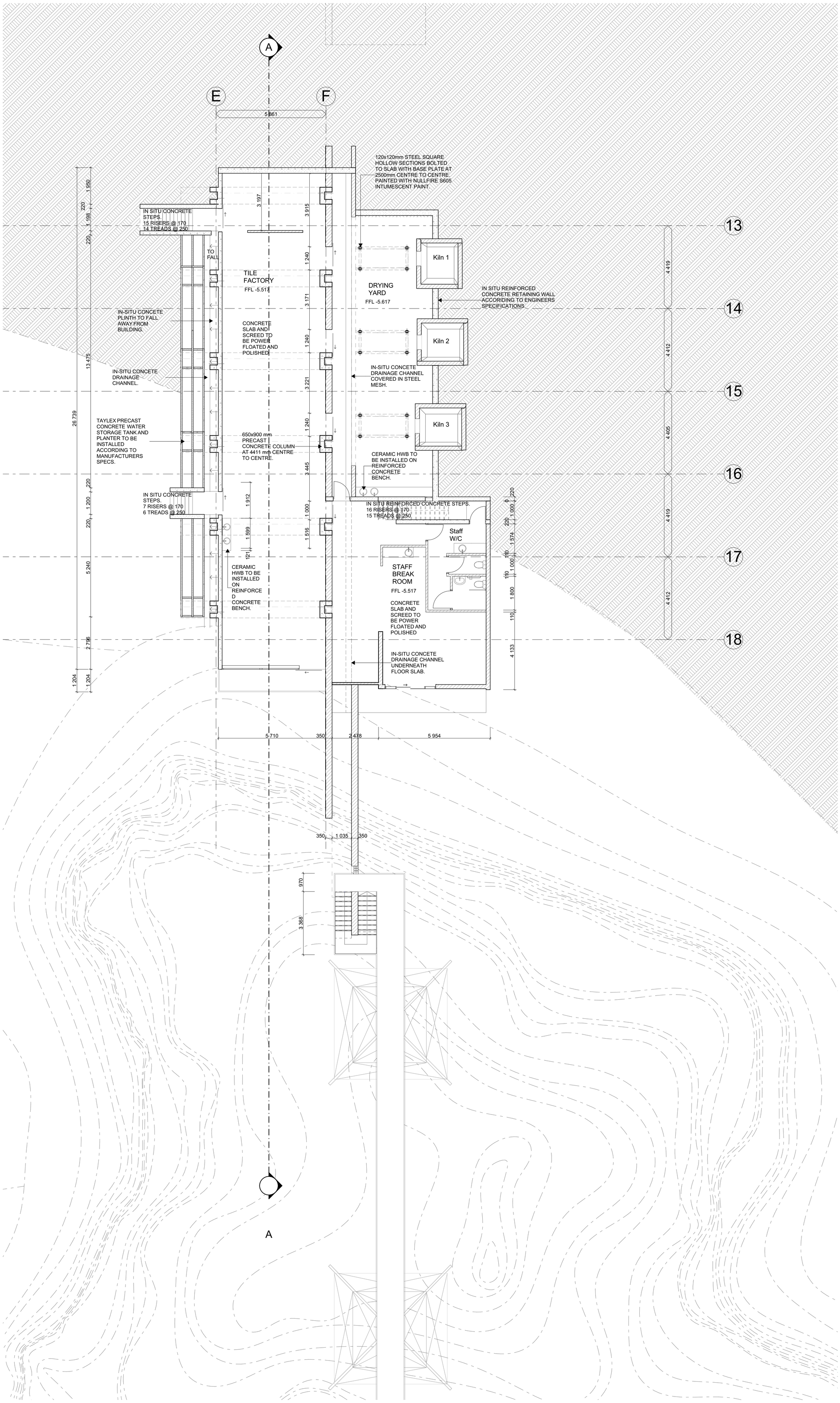

Building B Lower Level Plan

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DISSERTATION

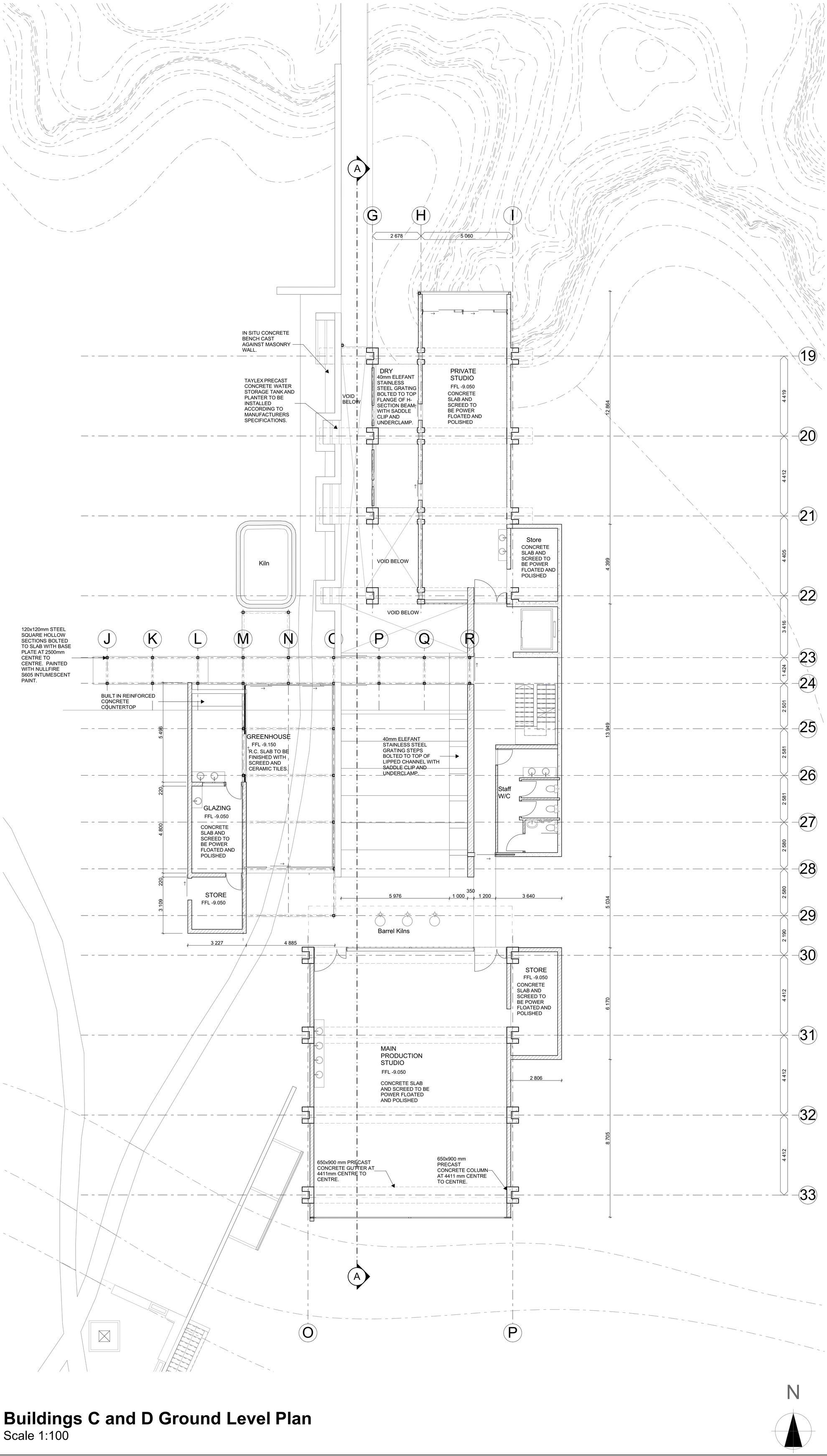
ADDRESS
BLACK KORHAAN DRIVE
OLIFANTSFONTEIN

DRAWING TITLE
BUILDING B LOWER LEVEL PLAN

SCALE	ASSESSMENT DATE
1:100	22.11.2019
DRAWING NUMBER **A105**	STUDENT NUMBER **2013112541**

M. LE ROUX

ARCHICAD EDUCATION VERSION



Buildings C and D Ground Level Plan

Scale 1:100

N

CONSTRUCTION CONS 5709

DEPARTMENT OF ARCHITECTURE

UNIVERSITY OF THE FREE STATE

PROJECT
DISSERTATION

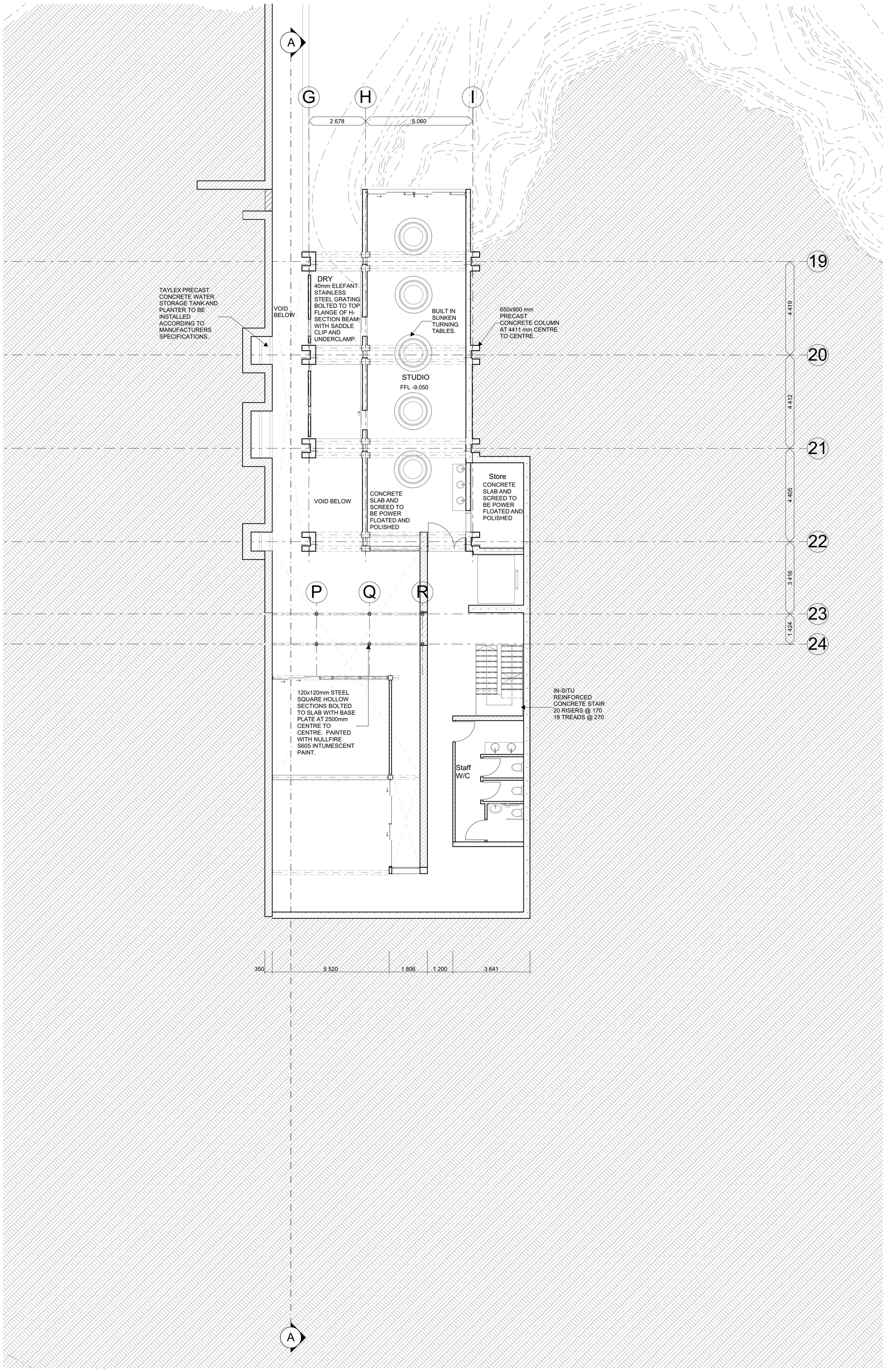
ADDRESS
BLACK KORHAAN DRIVE
OLIFANTSFONTEIN

DRAWING TITLE
BUILDINGS C AND D
GROUND LEVEL PLAN

SCALE	ASSESSMENT DATE
1:100	22.11.2019
DRAWING NUMBER **A106**	STUDENT NUMBER **2013112541**

M. LE ROUX

ARCHICAD EDUCATION VERSION



Building C Lower Level Plan

Scale 1:100

N

CONSTRUCTION CONS 5709

DEPARTMENT OF ARCHITECTURE

UNIVERSITY OF THE FREE STATE

PROJECT
DISSERTATION

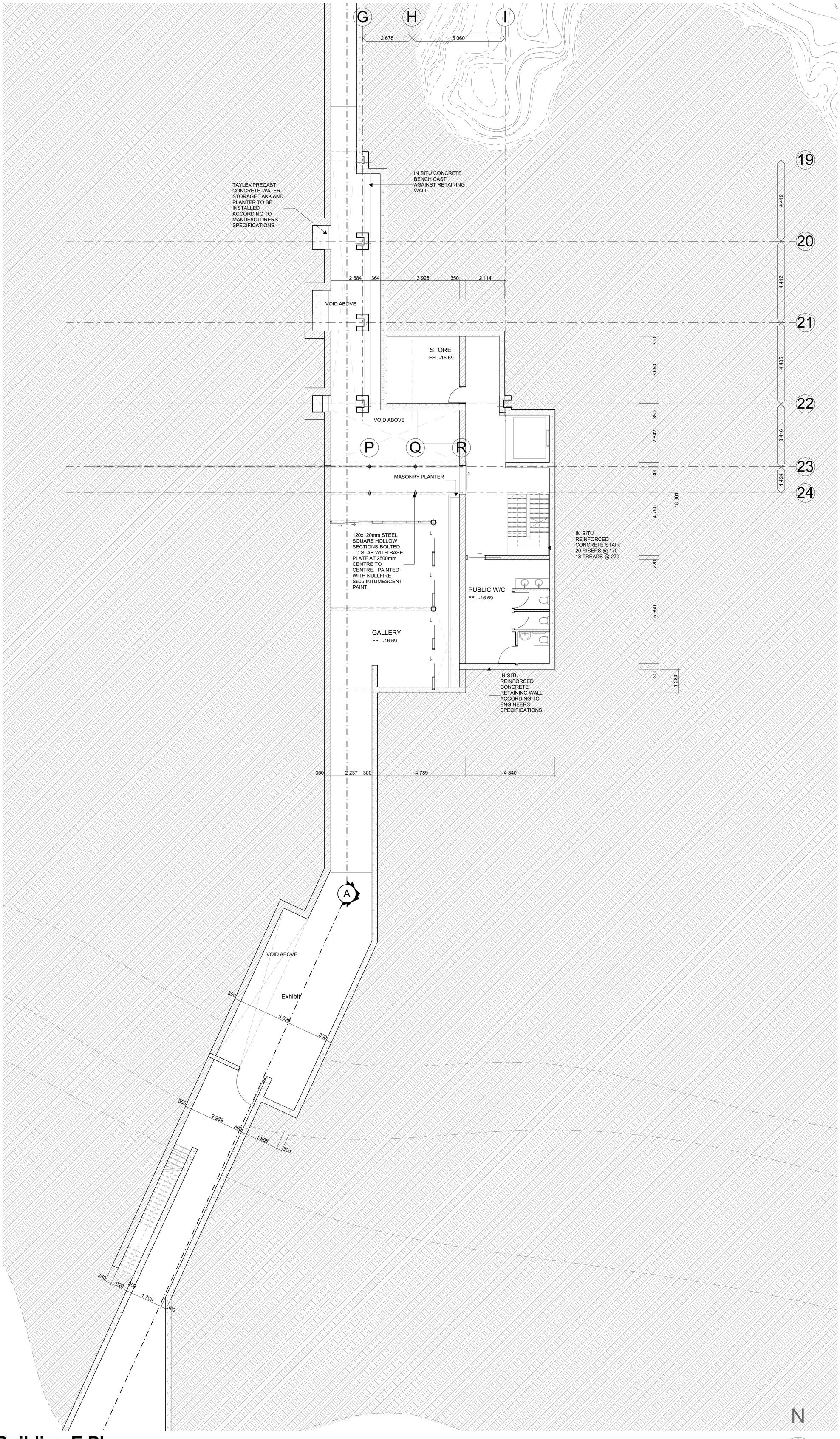
ADDRESS
BLACK KORHAAN DRIVE
OLIFANTSFONTEIN

DRAWING TITLE
BUILDING C LOWER LEVEL PLAN

SCALE	ASSESSMENT DATE
1:100	22.11.2019
DRAWING NUMBER **A107**	STUDENT NUMBER **2013112541**

M. LE ROUX

ARCHICAD EDUCATION VERSION



Building E Plan
Scale 1:100

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DEPARTMENT OF ARCHITECTURE

UNIVERSITY OF THE FREE STATE

PROJECT
DISSERTATION

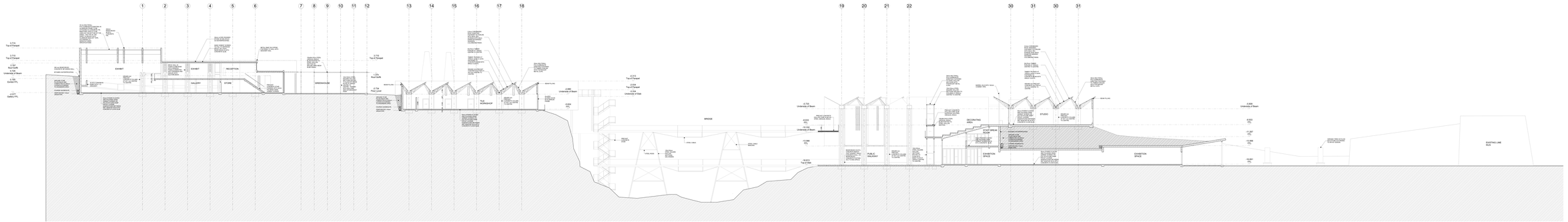
ADDRESS
BLACK KORHAAN DRIVE
OLIFANTSFONTEIN

DRAWING TITLE
BUILDING E PLAN

SCALE	ASSESSMENT DATE
1:100	22.11.2019
DRAWING NUMBER **A108**	STUDENT NUMBER **2013112541**

M. LE ROUX

ARCHICAD EDUCATION VERSION



Section AA
Scale 1:100

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DEPARTMENT OF ARCHITECTURE

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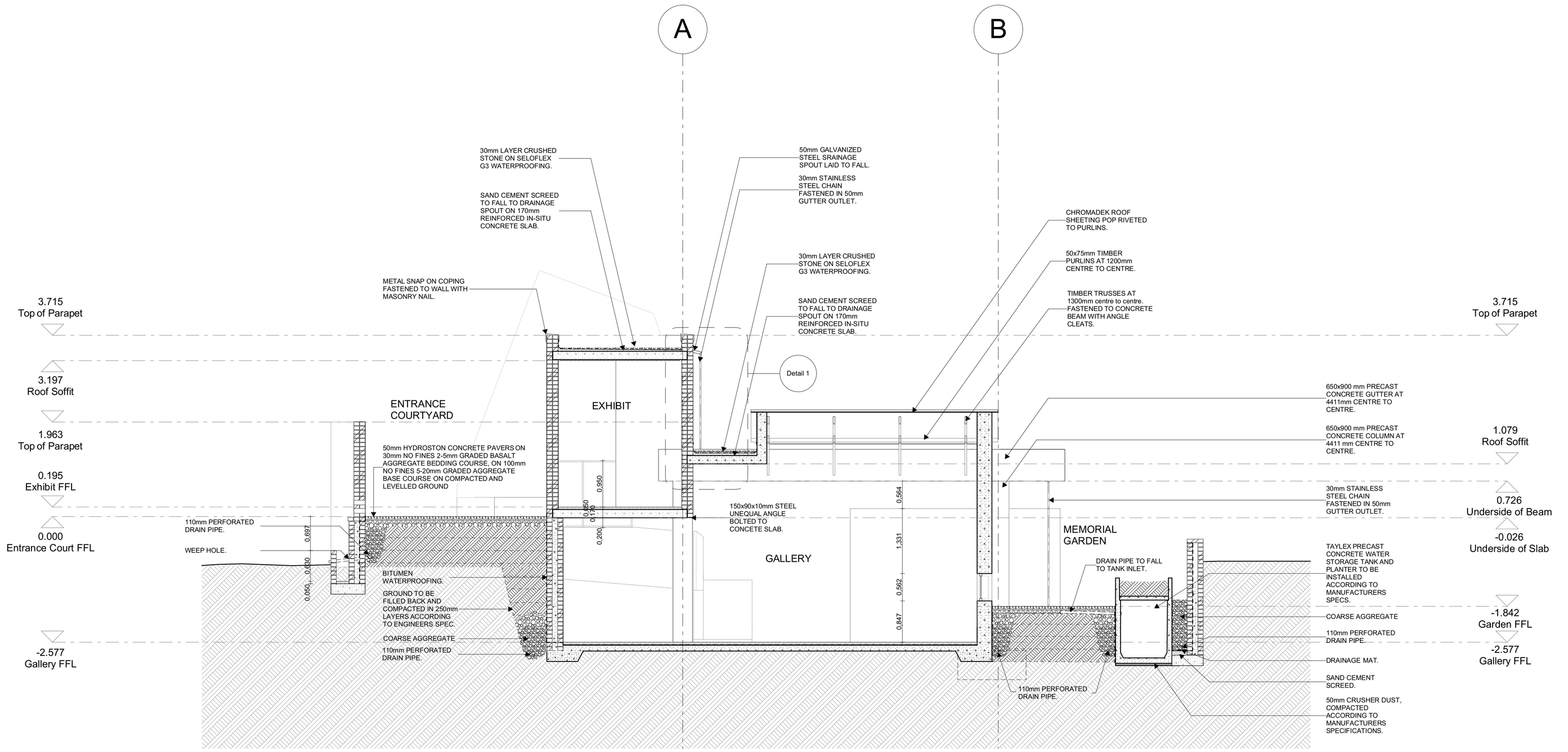
PROJECT
DISSERTATION

ADDRESS
BLACK KORHAAN DRIVE OLIFANTSFONTEIN

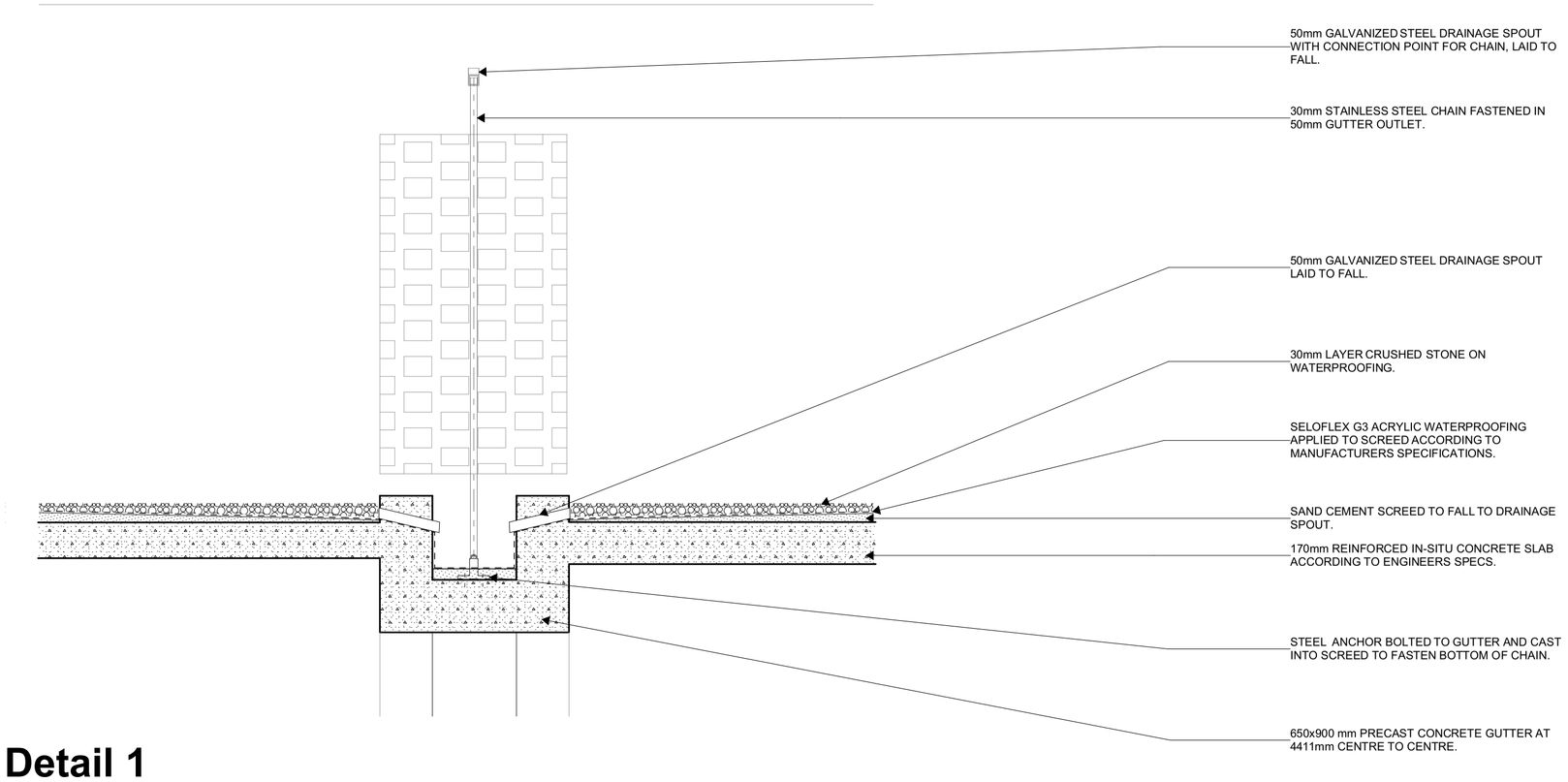
DRAWING TITLE
SECTION AA

SCALE	ASSESSMENT DATE
1:100	29.10.2019
DRAWING NUMBER	STUDENT NUMBER
A301	2013112541

M. LE ROUX



Section BB
Scale 1:50



Detail 1
Scale 1:20

CONSTRUCTION CONS 5709

DEPARTMENT OF ARCHITECTURE

UNIVERSITY OF THE FREE STATE

PROJECT
DISSERTATION

ADDRESS
BLACK KORHAAN DRIVE
OLIFANTSFONTEIN

DRAWING TITLE
SECTION BB
DETAIL 1

SCALE	ASSESSMENT DATE
1:100	29.10.2019
DRAWING NUMBER **A302 D1**	STUDENT NUMBER **2013112541**

M. LE ROUX