

DESIGN DEVELOPMENT



Figure - 8.1 - Photograph of a floor drain in the Rietvlei Abattoir (By Author).

DESIGN INFORMANTS

The design of an abattoir has to firstly conform to numerous legislative elements which dictates certain aspects regarding general layouts and flow of the spaces. Not only does the positioning of the abattoir in the public realm require a fine balance between legislation and design, but also the strong heritage of the site needs to be addressed. A series of informants were identified at an early stage to direct the design process:

Legislation:

The abattoir firstly has to adhere to the legislation set out by the Department of Agriculture and the Red Meat Association.

Production:

Abattoirs are production lines and require a detailed process orientated layout to aid in the success and ease of production.

Orientation:

For optimal environmental performance, the building needs to make use of the site's northern orientation for day lighting and thermal performance.

High Street:

To test the hypothesis, the building has to interact and establish a relationship with the high street that edges the site on the northern boundary.

Heritage:

The site was chosen due to its strong industrial heritage of which there are remains scattered around the site. The framework proposal is based on historical activities in and around the precinct and therefore the design of the abattoir should continue and reinforce this relationship with the past.

Environmental Performance:

As previously stated, abattoirs are extremely resource intensive and produce large amounts of waste. Addressing these factors in the design of the abattoir are of utmost importance, not only to achieve a sustainable energy efficient design, but also to create a seamless introduction of the abattoir into the public realm. These factors need to be satisfied in order for the building not to become a health and safety hazard.

Regenerative Principles:

The Hannover principles as previously discussed is to incorporated into every design decision to aid the design in an regenerative architectural direction.

PART 1: THE SITE

The completion of the development framework resulted in a triangular site situated on the high street. The site contains two of the underground bunkers used for the distilling of whiskey on the southern side and is flanked on the east by the new heritage development and ceremonial square.

On the western side, other side of love drive, a new feedlot is proposed as an upgrade of the existing informal cattle farming taking place on the site. Animals are to be lead directly into the abattoir from the feedlot, eliminating vehicular transportation of animals.

On the north eastern corner of the site, the new pedestrian entrance, which acts as a direct link (underneath the rail) to melodi, is located. The site is therefore perfectly situated to interact with the high street, the pedestrian entrance, heritage on site and the new feedlot. The building must now be designed as to establish relationships with these four elements and inte-

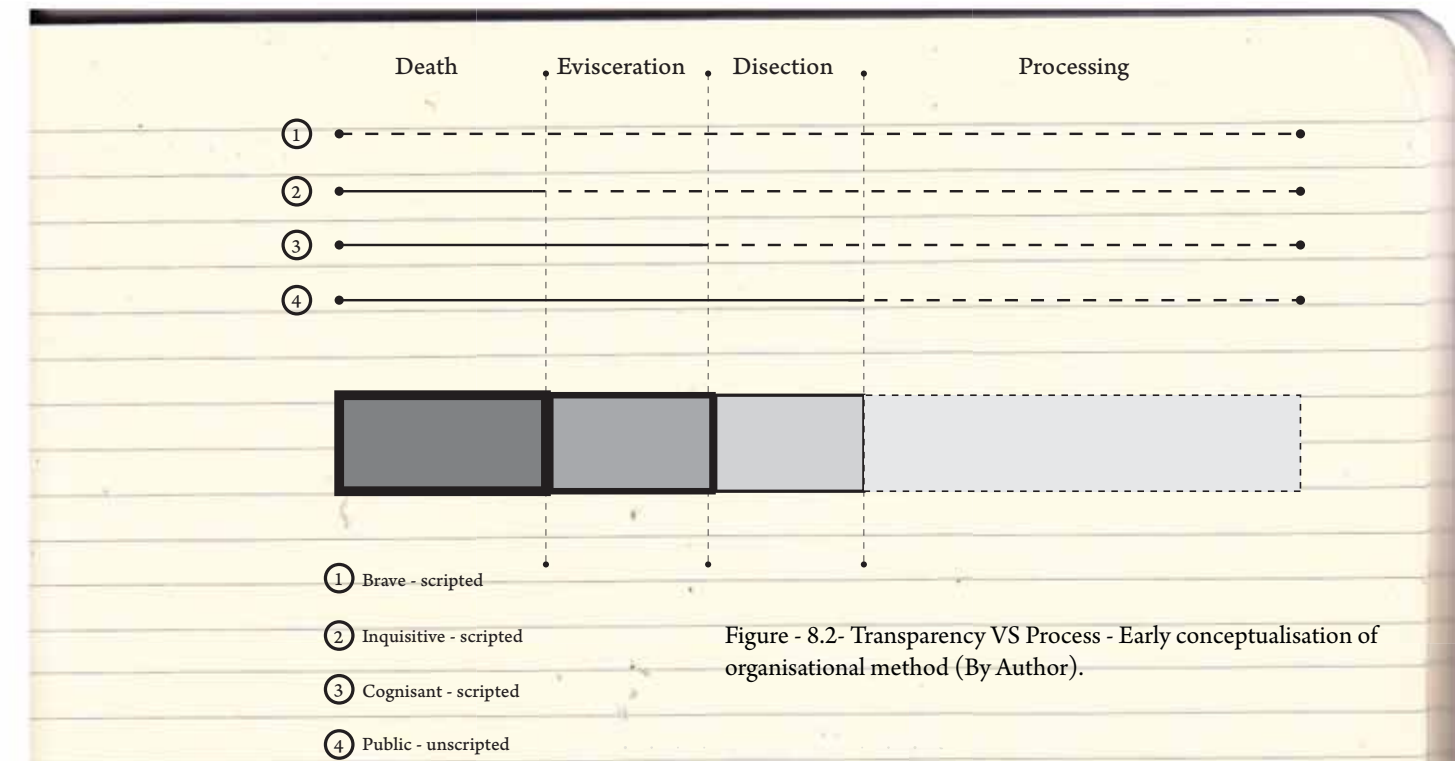


Figure - 8.2- Transparency VS Process - Early conceptualisation of organisational method (By Author).

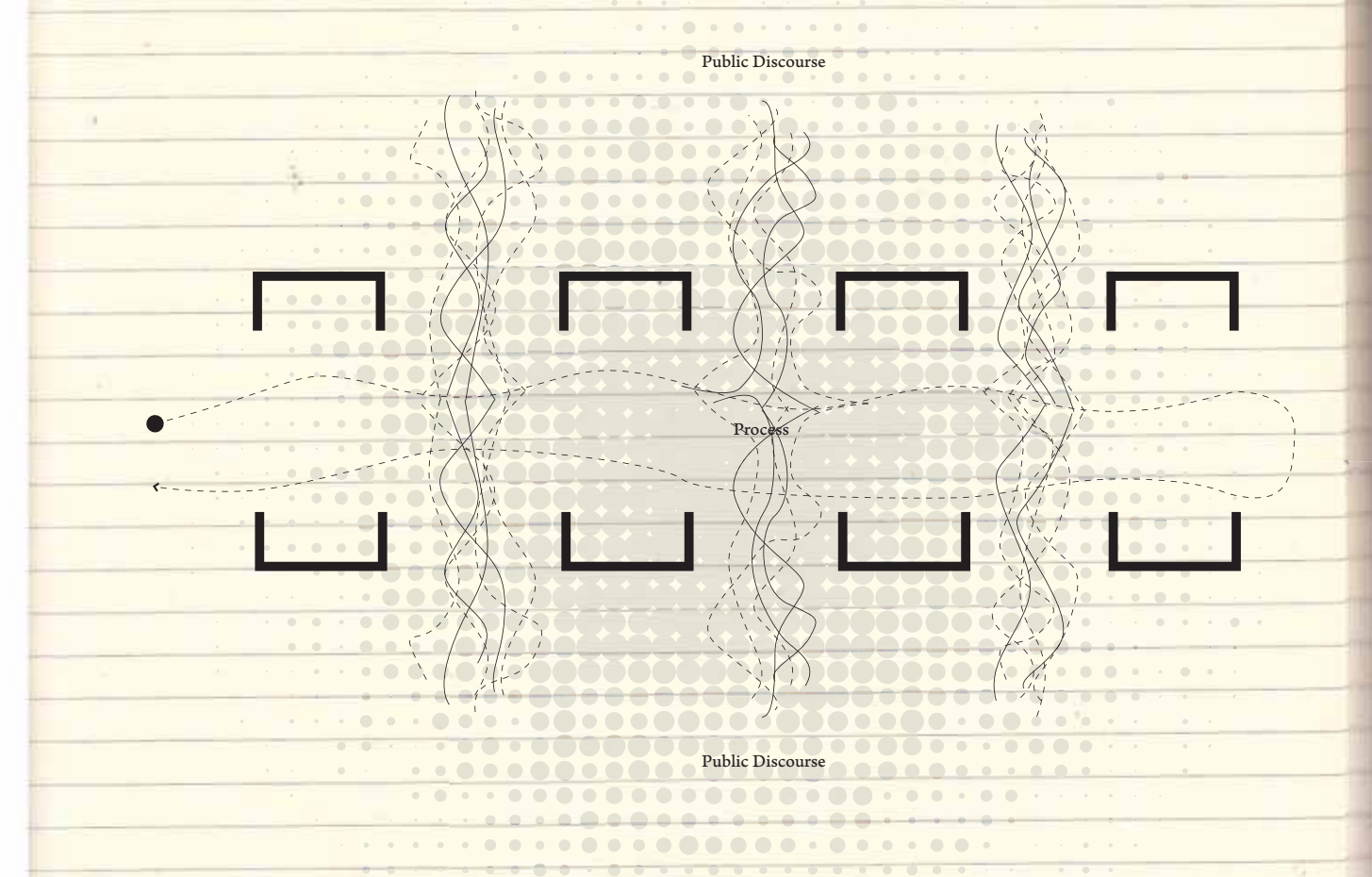


Figure - 8.3- Rhythm - Establishing a sequence of hiding, and showing the abattoir to the high street (By Author).

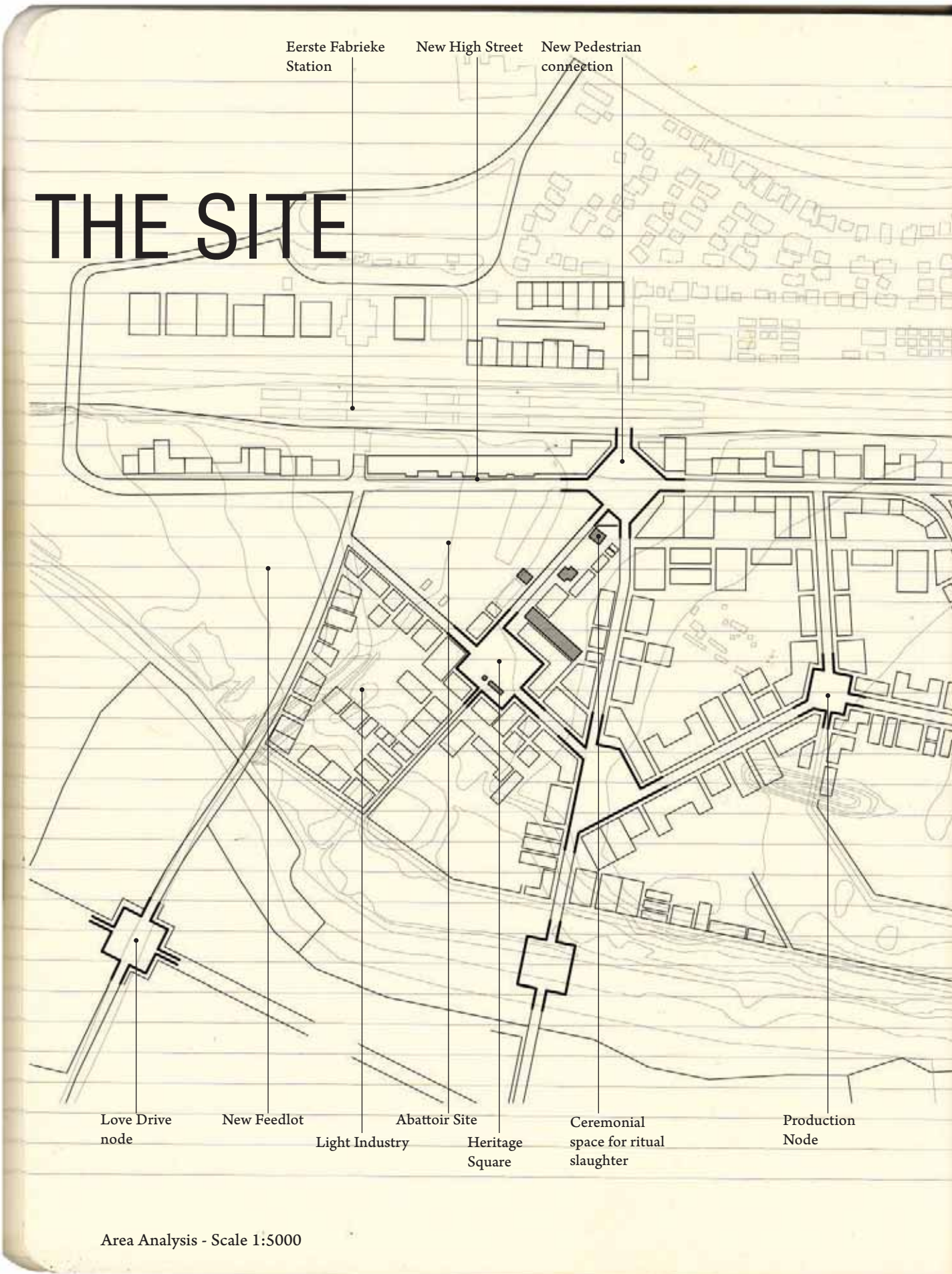


Figure - 8.4- Area plan with important contextual elements (By Author).

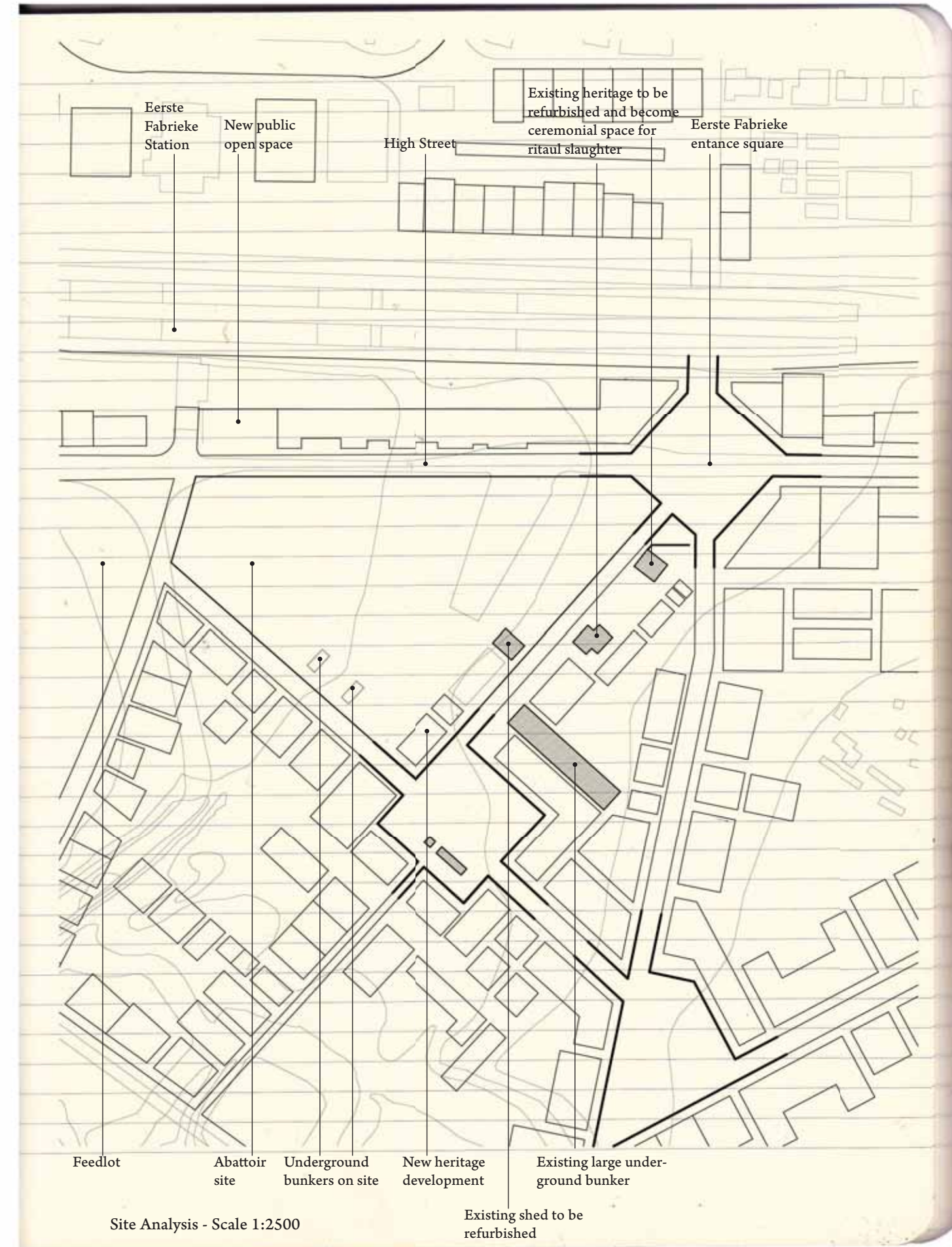


Figure - 8.5- Site plan with important contextual elements (By Author).

PART 2 : CONCEPT

The first conceptual development established a series of connections along a linear process to the high street on the northern side and the heritage on the southern side. The initial response was to recess the slaughtering pit or the dirty process into the ground to relate to all the sunken chambers on site and also to control heat gain in the abattoir.

The conceptual model shown in fig 8.6 - fig 8.10 on the right shows the linear sunken slaughter pit covered with a series of connections which was conceived as human processes over production process. The string shows product in from the feed-lot situated on the western side of the site and product out into the meat market at the eastern edge. The white cubes are the public spaces which engage with the abattoir creating a direct platform for engagement.

On the northern edge the high street was conceptualised as a constant condition against which the changing nature of the linear production line would be juxtaposed. At this stage the southern edge was to be programmed as an heritage area and another constant condition against which the design could be juxtaposed.

Diagrammatic explorations followed attempting to translate the concept into architecture. The exploration started with a literal translation of the concept model which is based on a layering of processes.



Figure - 8.6- Conceptual photograph - A linear process (as shown by the light) with relationships established over it (By Author).

The concept was to establish four layers namely:

Animal / Slaughter Process

Workers Circulation

Public Interaction

Product Circulation,

and to layer them over one another with intersections between all four. The process was conceptualised linearly as to make it possible for the public to interject at any point. Fig 8.2 shows an early concept of transparency vs process with regard to public discourse and Fig 8.3 depicts a concept of establishing a rhythm of displaying and hiding the abattoir at times.

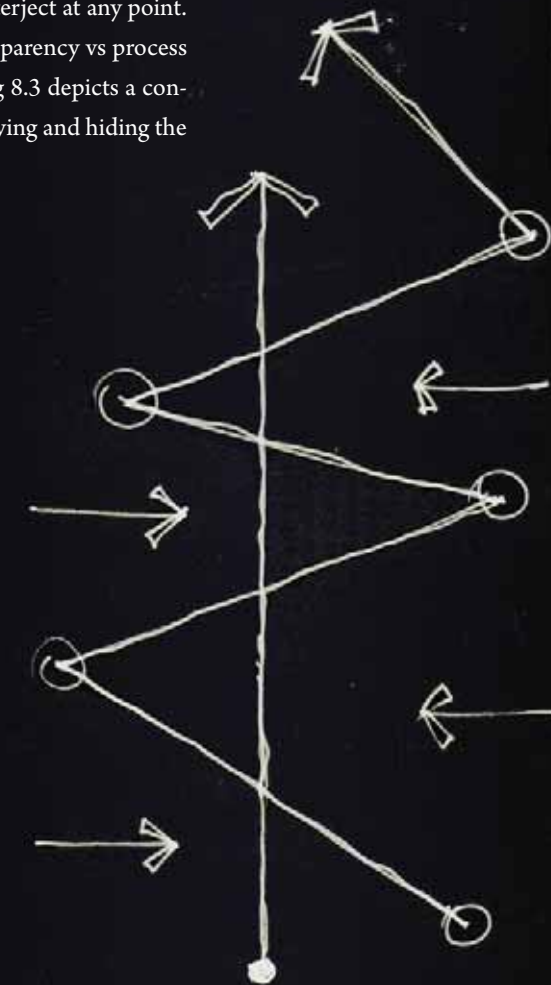


Figure - 8.7- Conceptual diagram. A reinterpretation of fig - 8.6.

CONCEPT

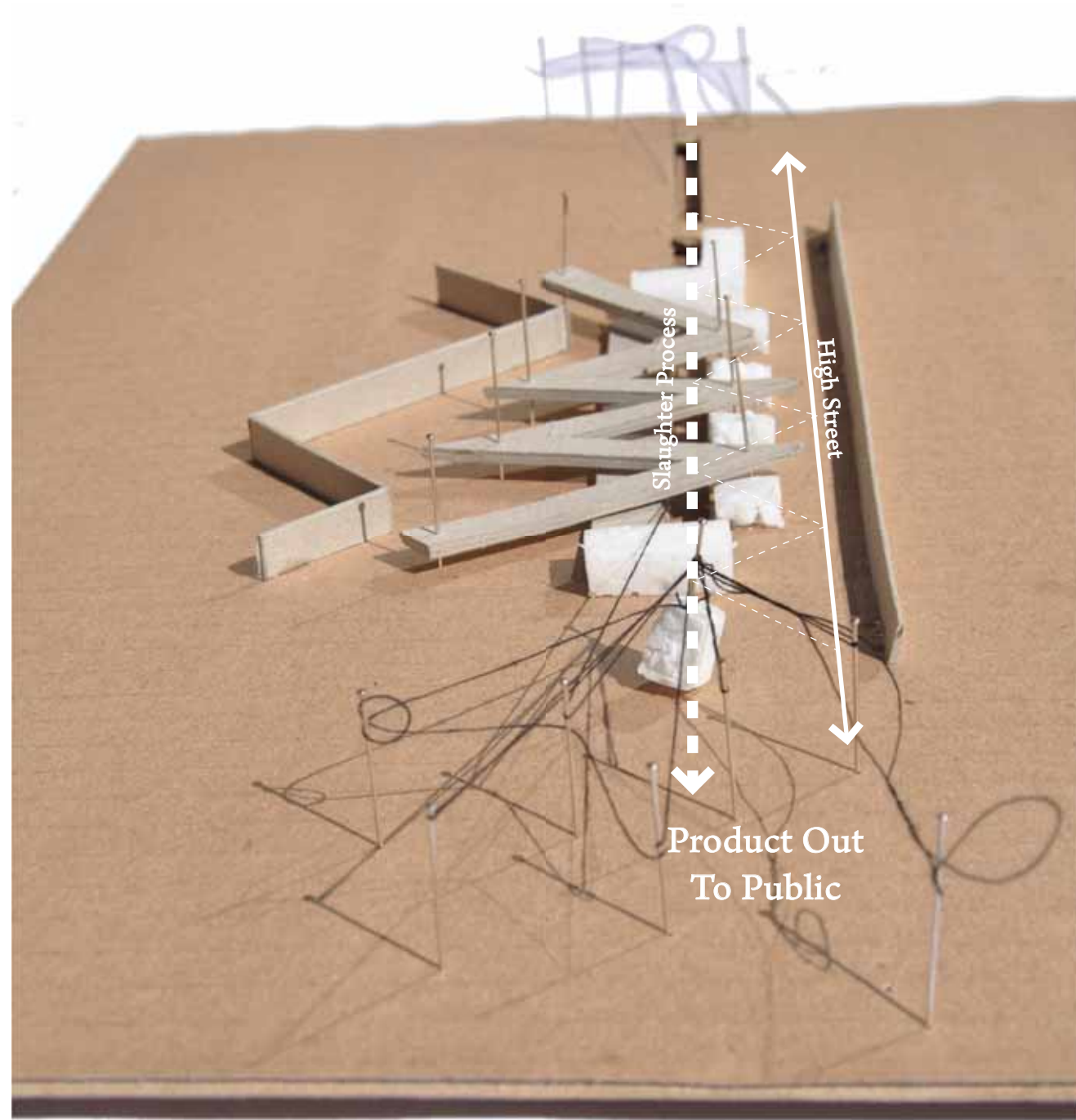


Figure - 8.8- Conceptual model one "Connections" - View looking west - Constant interaction needs to be established (By Author).

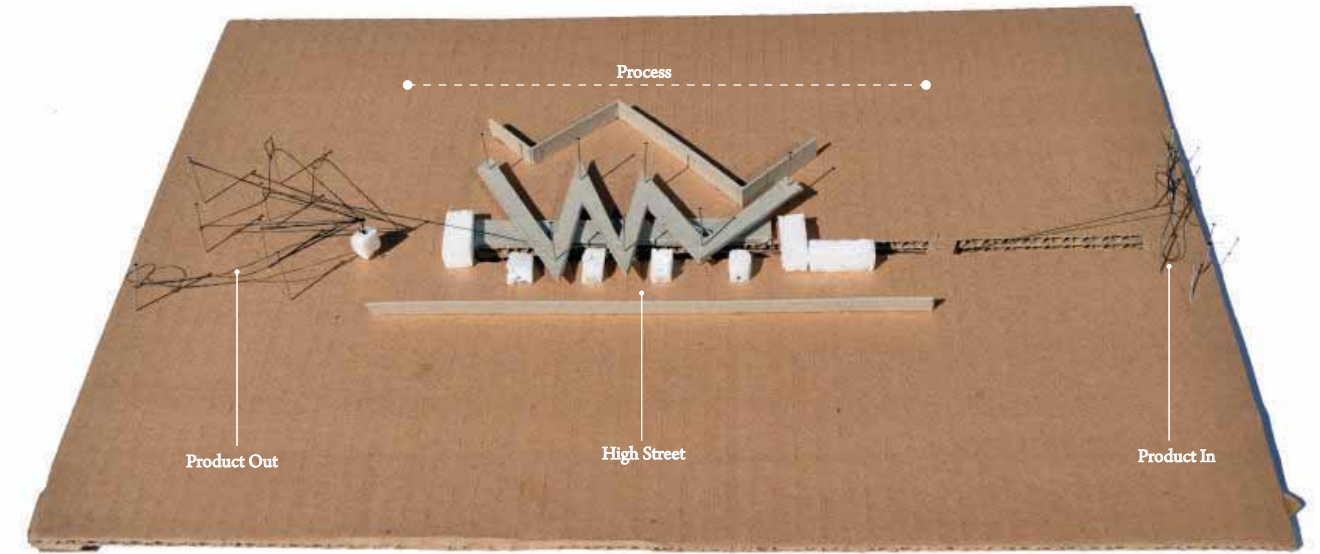


Figure - 8.9- Conceptual model one "Connections" - View looking south at the high street interface (By Author).

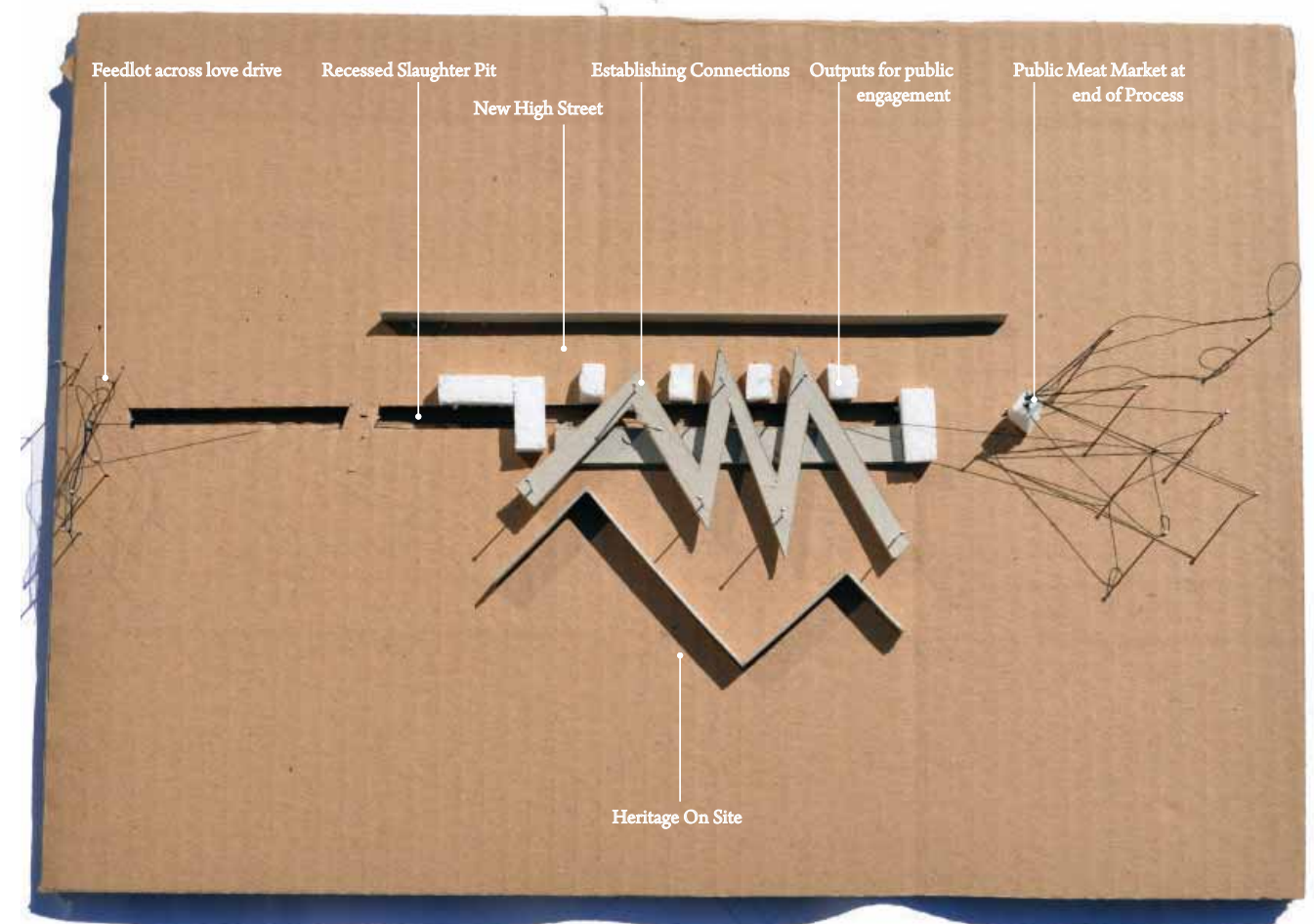


Figure - 8.10 - Conceptual model one "Connections" - Plan view (By Author).

PLANNING

8.3

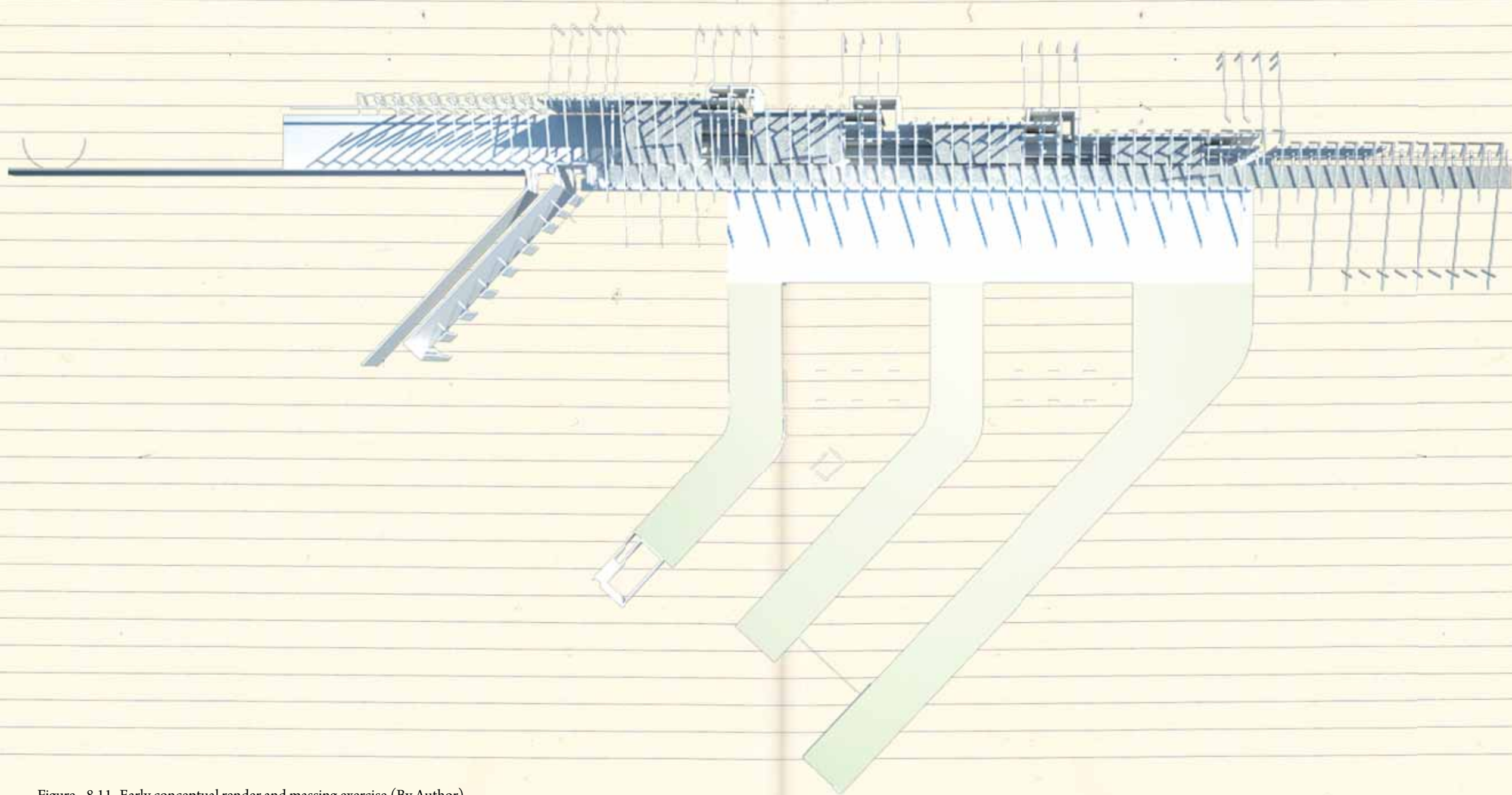


Figure - 8.11- Early conceptual render and massing exercise (By Author).

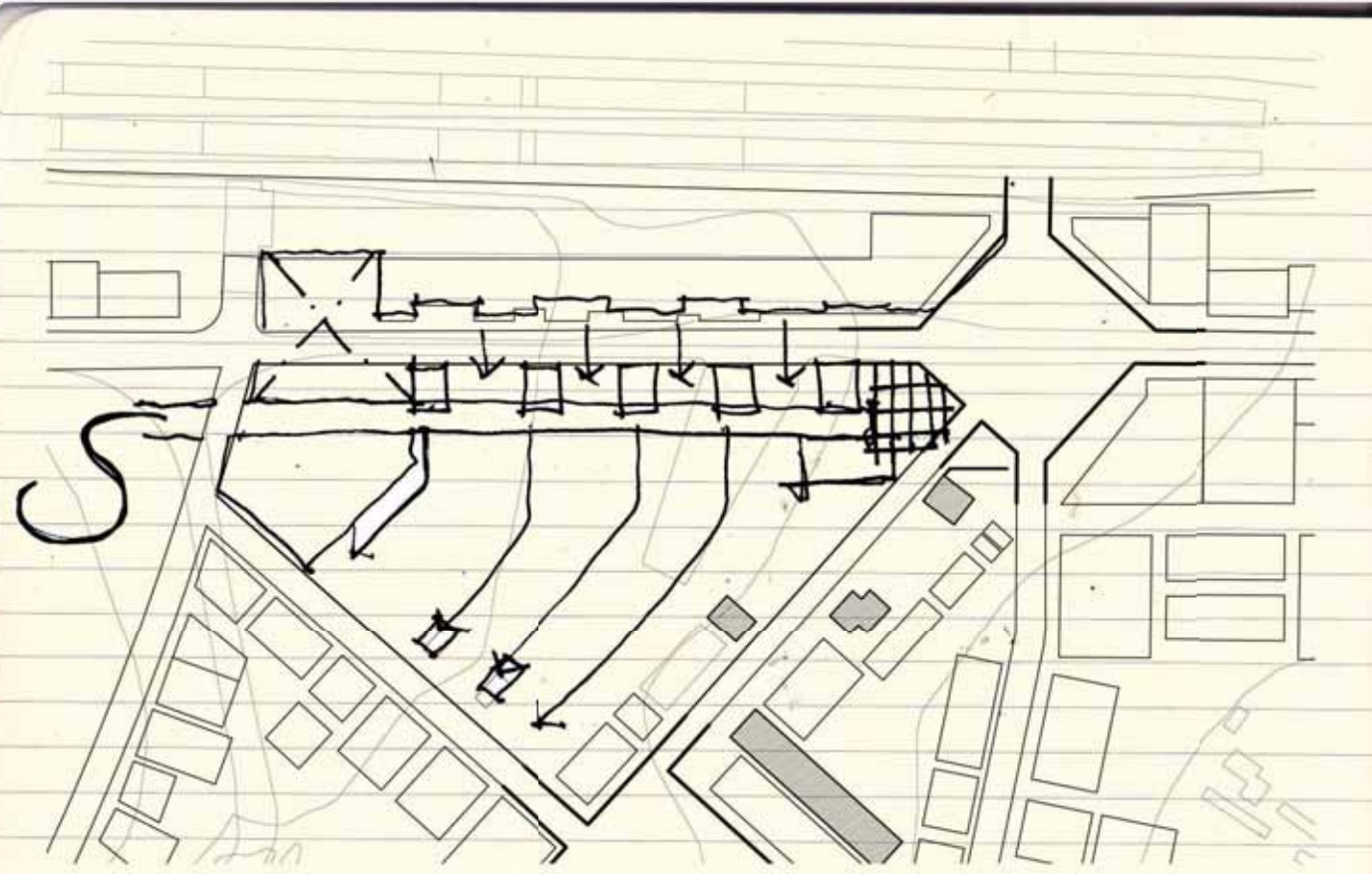


Figure - 8.12- Conceptual diagram of important connections. A linear process is established with identification of connections to the heritage on the south western edge.

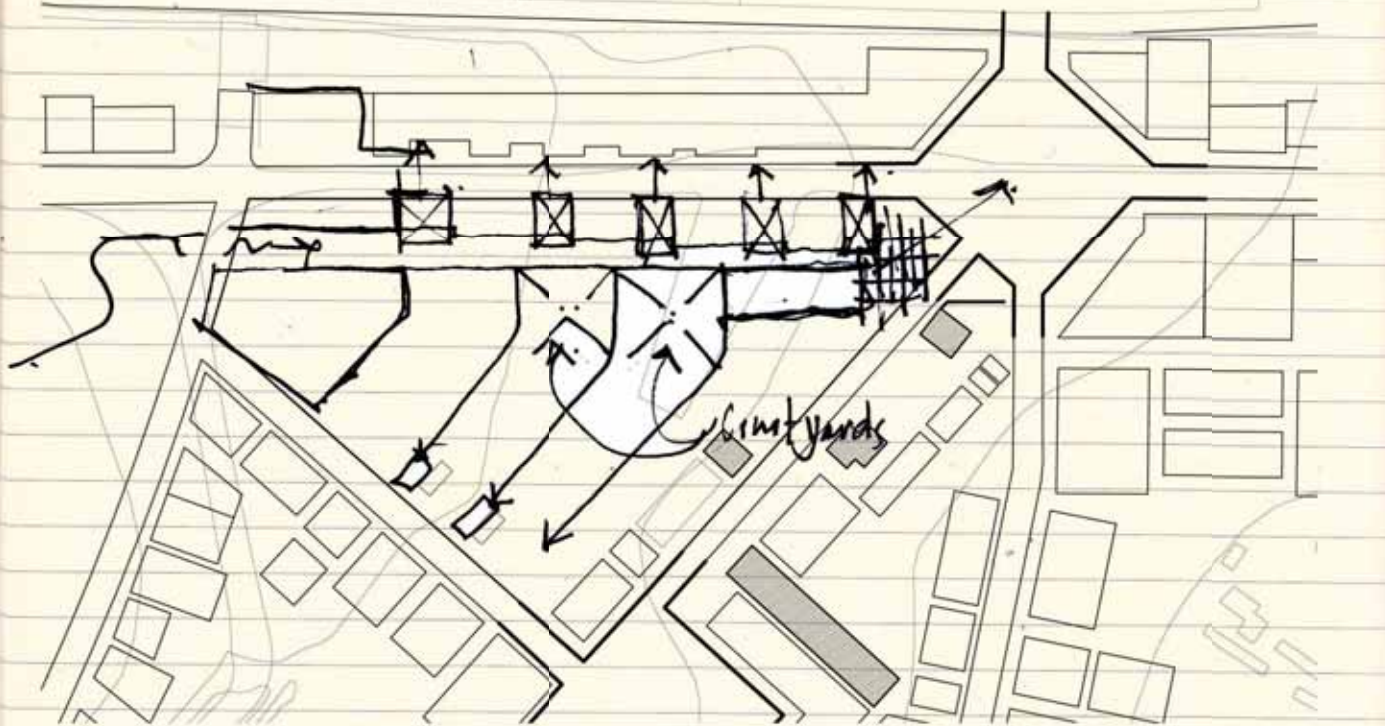


Figure - 8.13- Conceptual diagram exploring further relationships between connecting elements and separate pavilions, which interact with the high street (By Author).

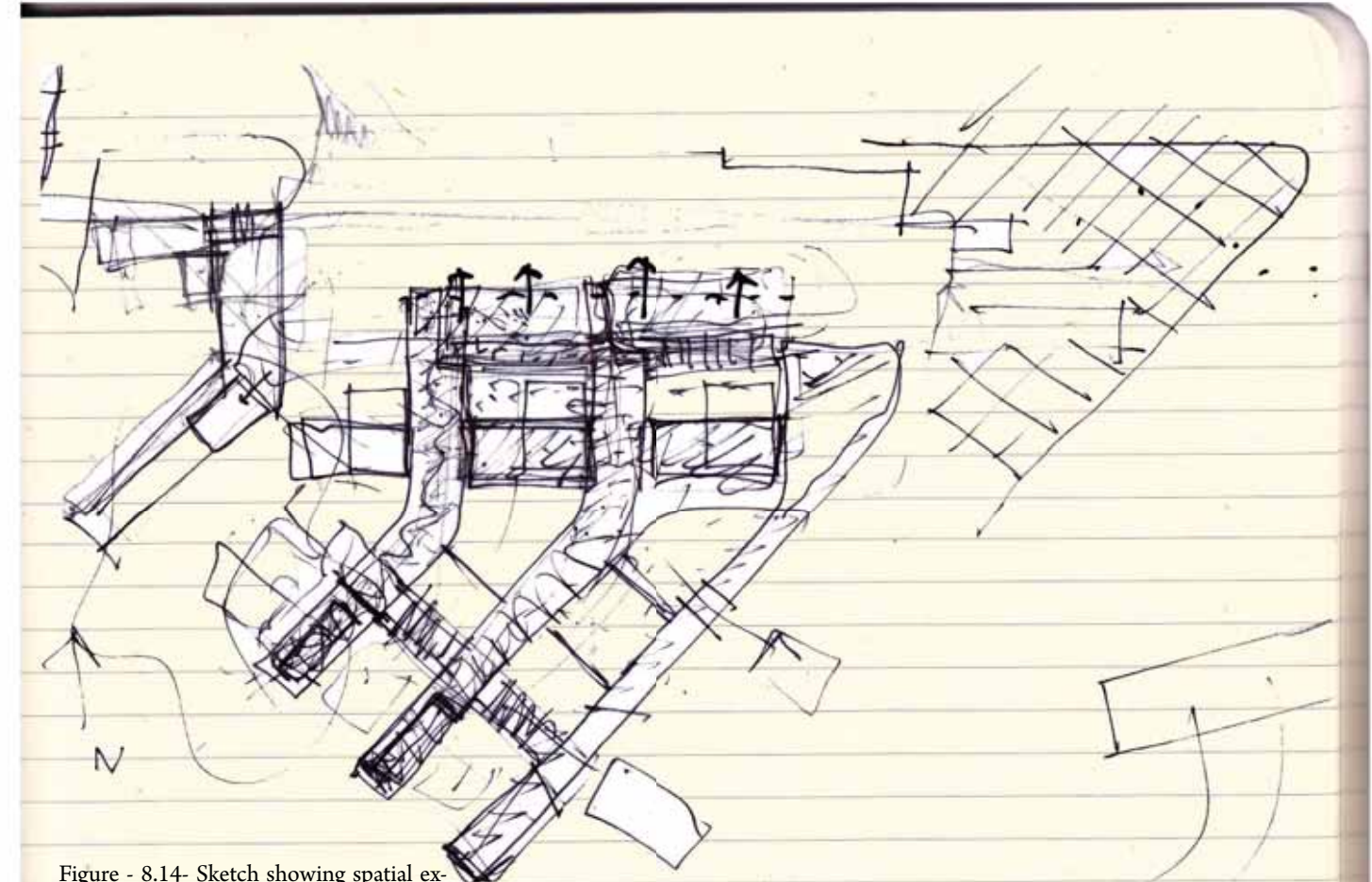


Figure - 8.14- Sketch showing spatial exploration of connecting elements. The possibility of courtyards between these elements can allow for southern light to enter and create views out of buildings, aiding the humanisation of the space (By Author).

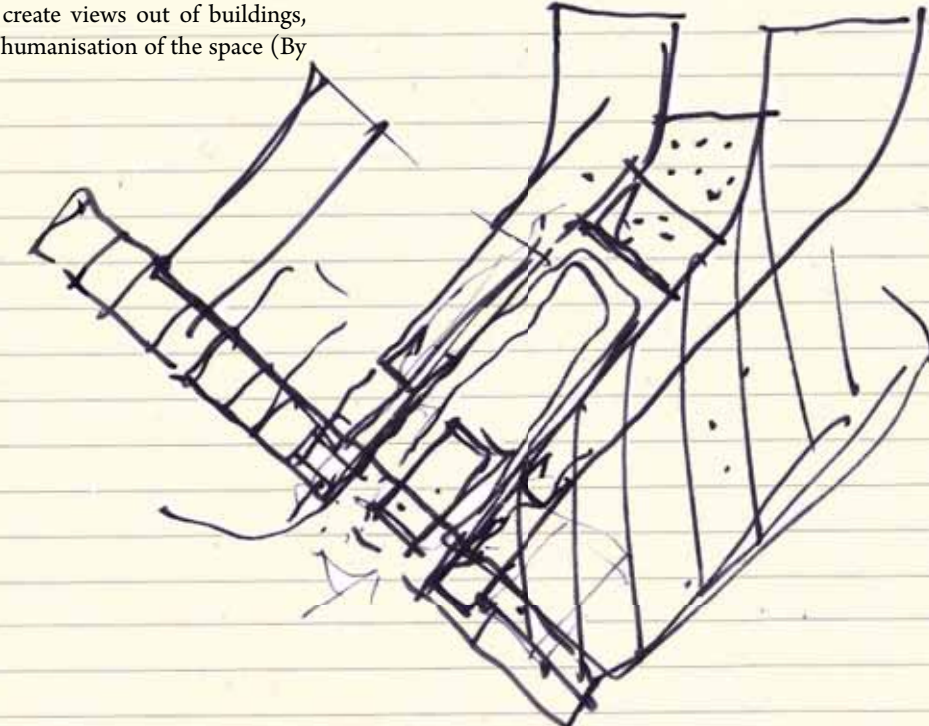


Figure - 8.15- A more detailed look at the connecting elements - possibilities of creating recreational spaces for employees, entrances and other employee orientated programming (By Author).

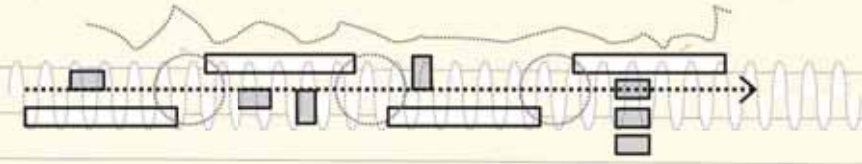


Figure - 8.16- A Sequence of early diagrams explored the design of the process. Firstly, the linear process with spaces clipping onto it was developed. The line at the top represents the unscripted public process (By Author).

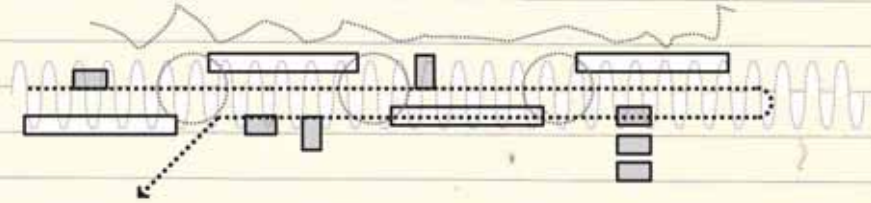


Figure - 8.17 - Secondly, the process is to return on itself, so that the bottom half of the site can be utilised and connected with the heritage. (By Author).

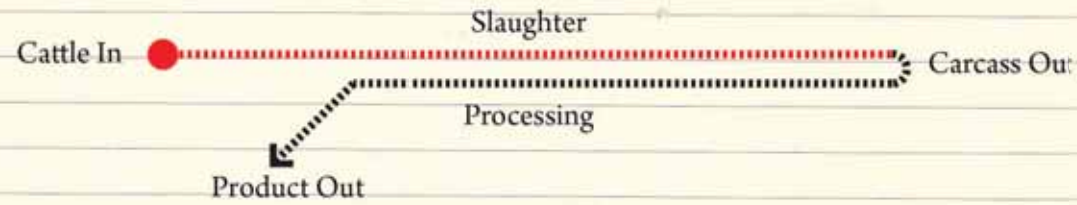


Figure - 8.18 - The process was then defined - The slaughter process will be parallel to and against the high street with the returning line comprising of the meat processing (By Author).

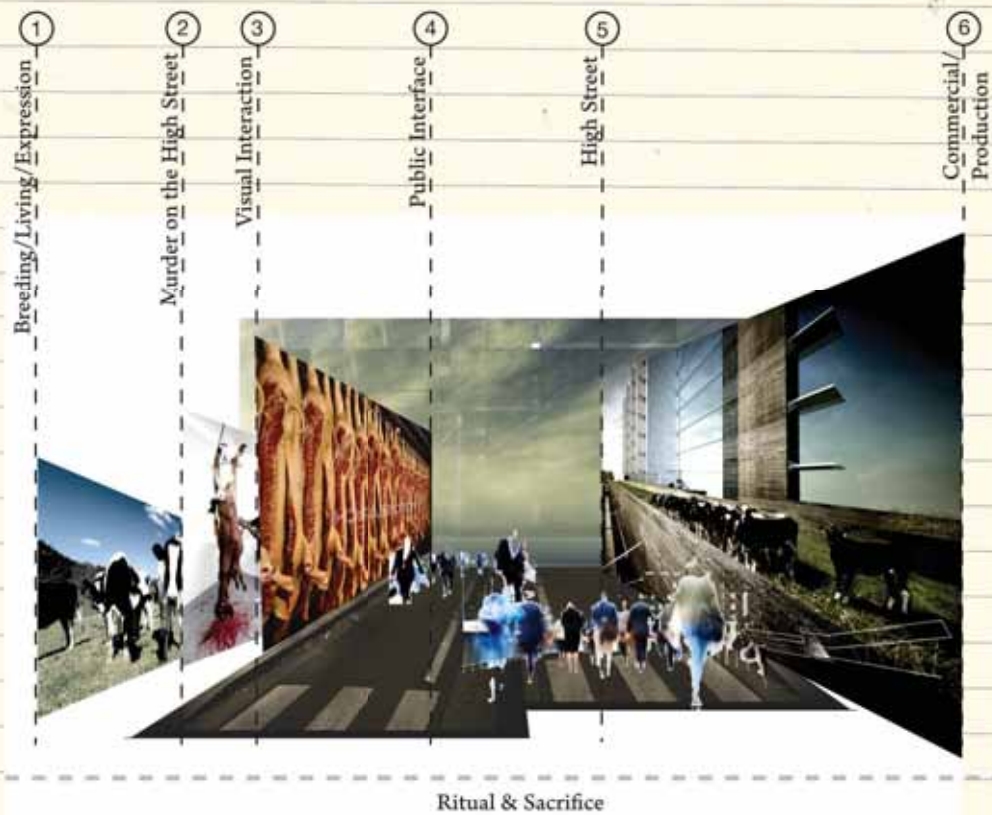


Figure - 8.19- A layered interface - Early conceptual diagram illustrating a multiple layered facade with which the public can engage to the level they wish. This was later translated into the output pavilion model (refer to fig 8.18) (By Author).

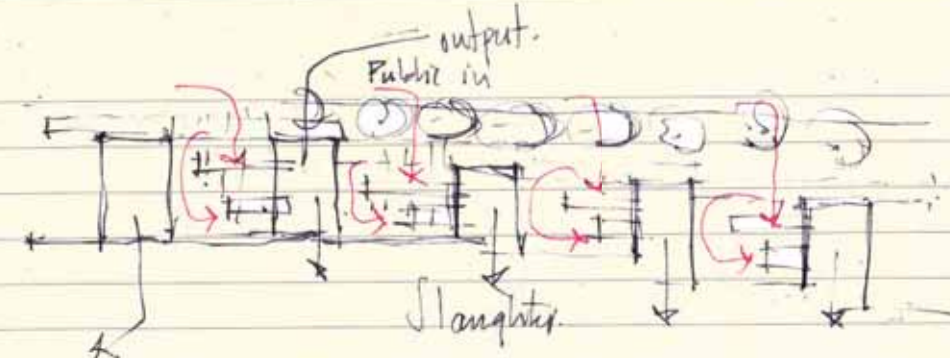


Figure - 8.20 - Output Pavilions - Conceptual Sketches - These pavilions establish a platform for engagement with the public. There are to be five platforms intersecting with the high street. The closed space is to be conceived as the space where the animal by-products get sanitised (so that it can be processed outside without posing any hygienic threat), the in between spaces are based on the spatial quality found in harbours, where fresh fish gets processed and sold directly to the public (By Author).

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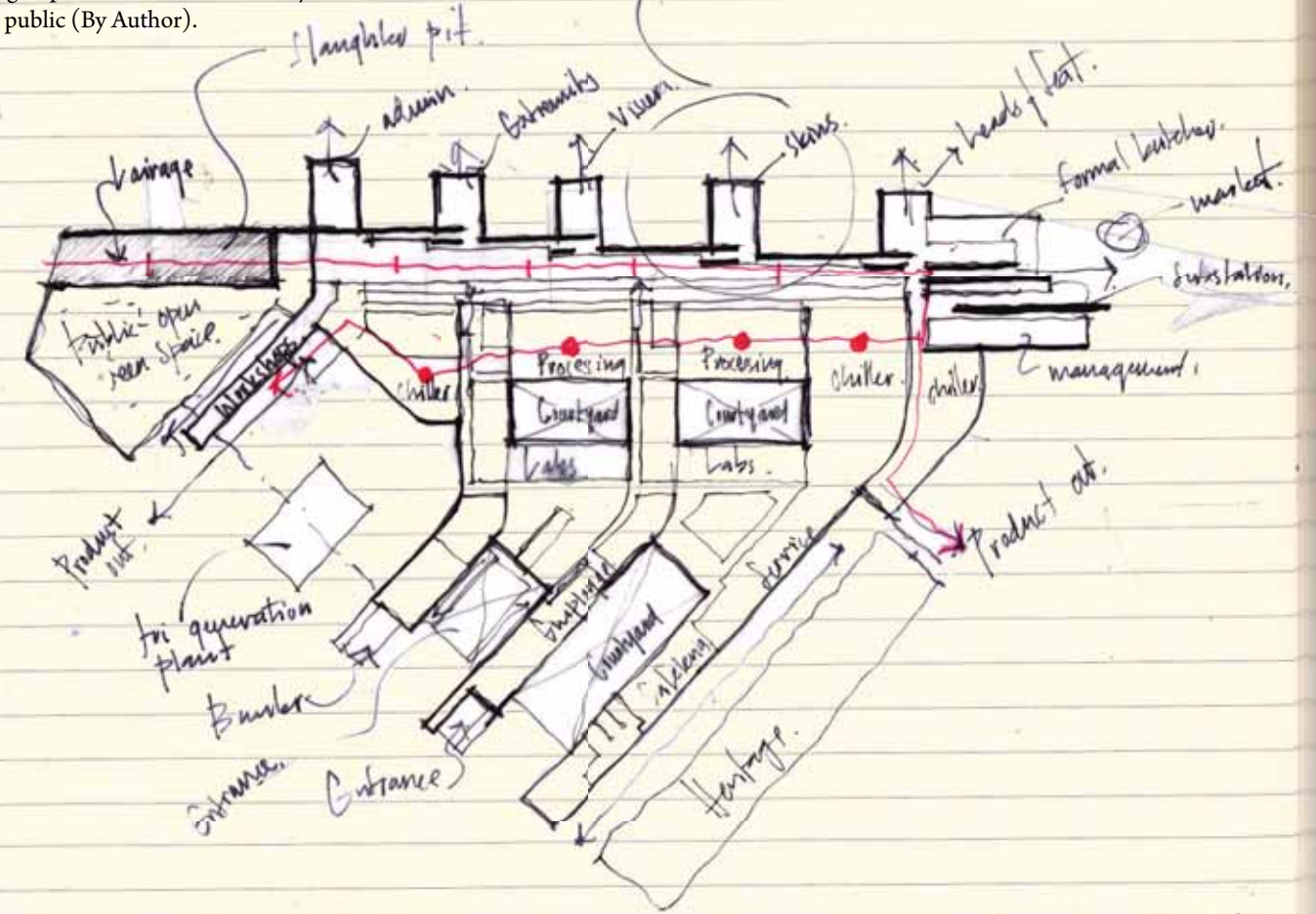
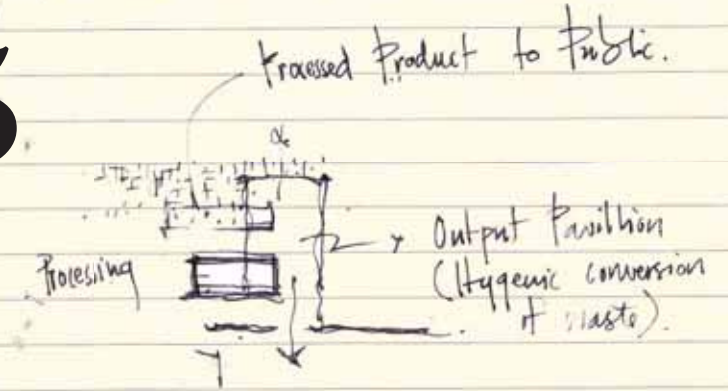


Figure - 8.21- Further diagrammatic exploration of the spatial potential of the linear process and the connecting elements attached to it. A clear form and general organisation starts to develop.

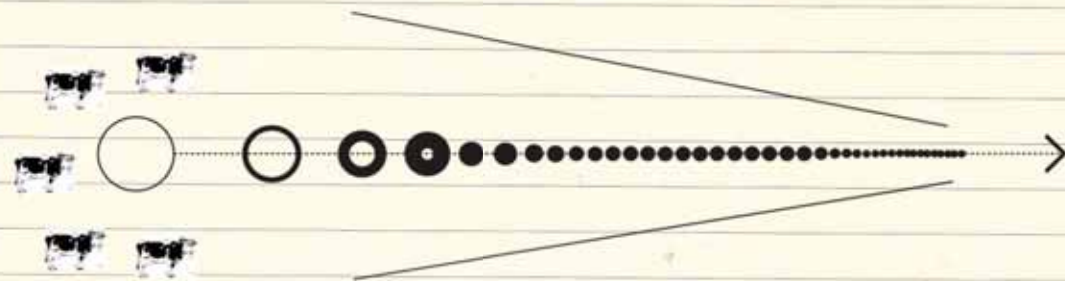


Figure - 8.22- Concentrating a process from a natural environment to a processed environment. Conceptual diagram (by Author).

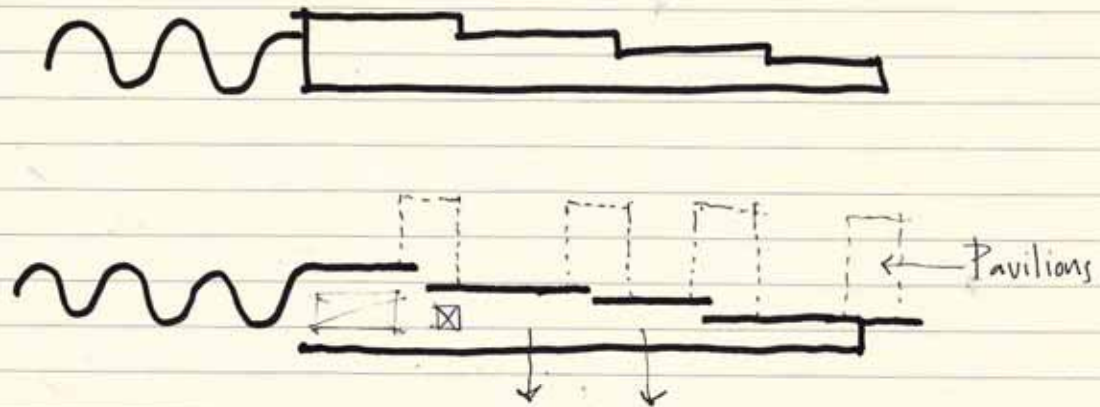


Figure - 8.23 & 24- Diagrammatic exploration of slaughter pit plan. The diagrams explore the concentration of the process. As spatial requirements become less at the end of the slaughter line the pit narrows. This results in a steeping northern edge, which translates as the wall separating the public from the slaughter process. These steps create places for the pavilions to clip onto (by Author).

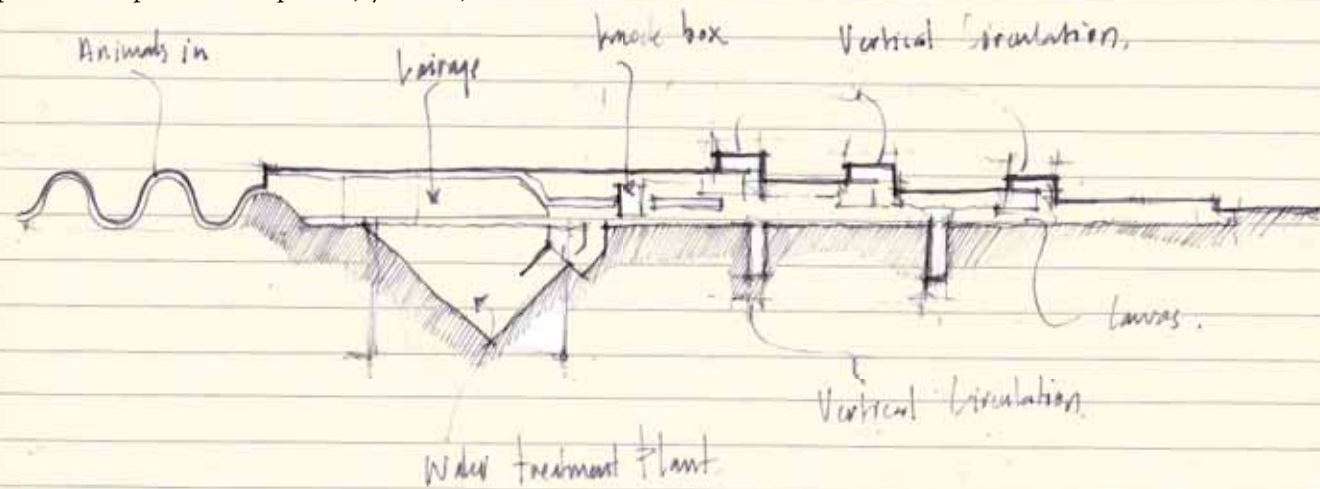


Figure - 8.25- Final conceptual sketch of lower ground floor plan / slaughter pit plan. The plan starts with the animals entering the pit via a Temple Grandin curved cattle chute. This leads the cattle to the lairage area, which is flank on the southern side by the waste water recycling plant. From here, they enter the CO2 knock box. After stunning, they never touch the pit floor again, only blood and viscera come into contact with the pit floor from there on (by Author).

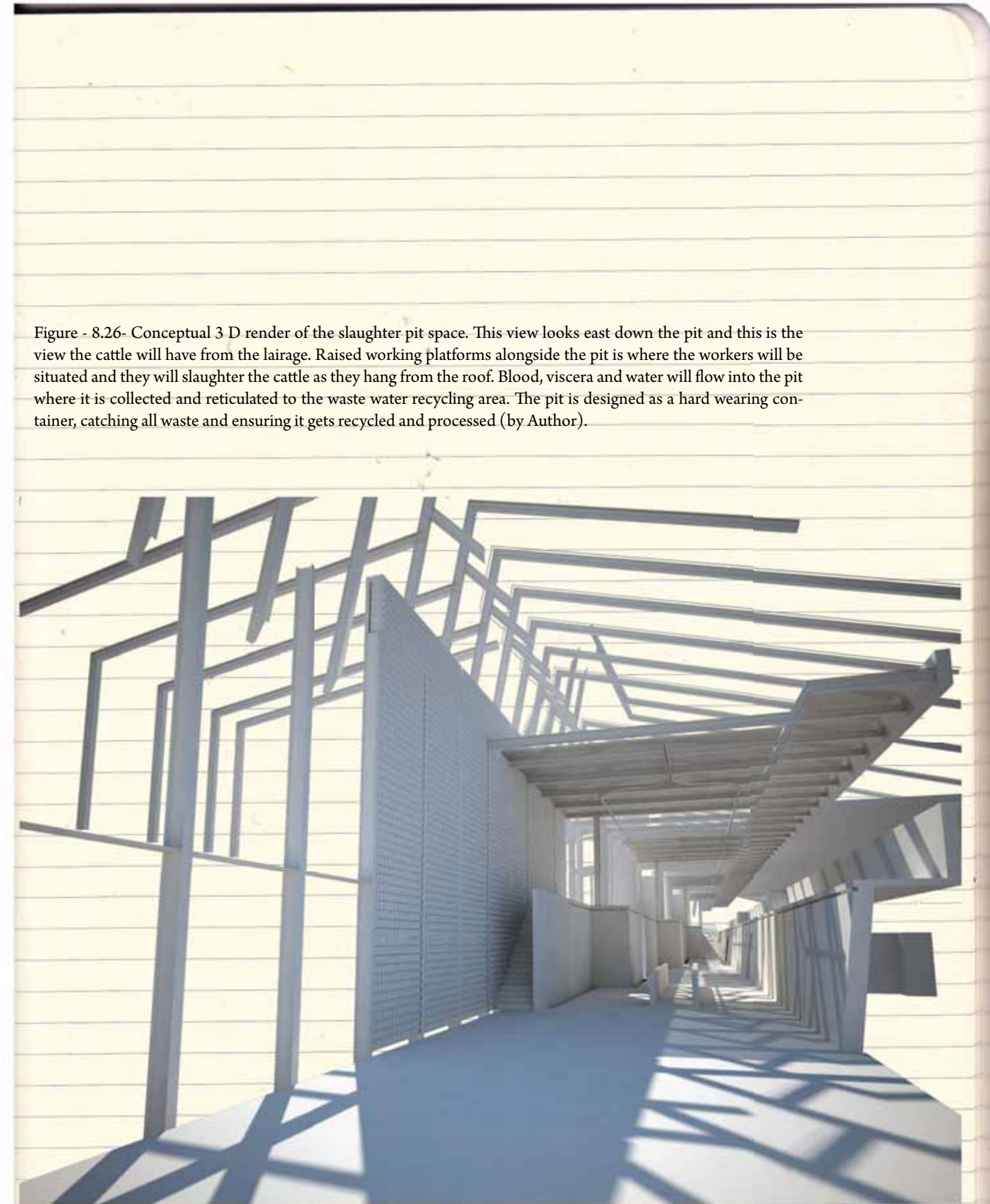


Figure - 8.26- Conceptual 3 D render of the slaughter pit space. This view looks east down the pit and this is the view the cattle will have from the lairage. Raised working platforms alongside the pit is where the workers will be situated and they will slaughter the cattle as they hang from the roof. Blood, viscera and water will flow into the pit where it is collected and reticulated to the waste water recycling area. The pit is designed as a hard wearing container, catching all waste and ensuring it gets recycled and processed (by Author).

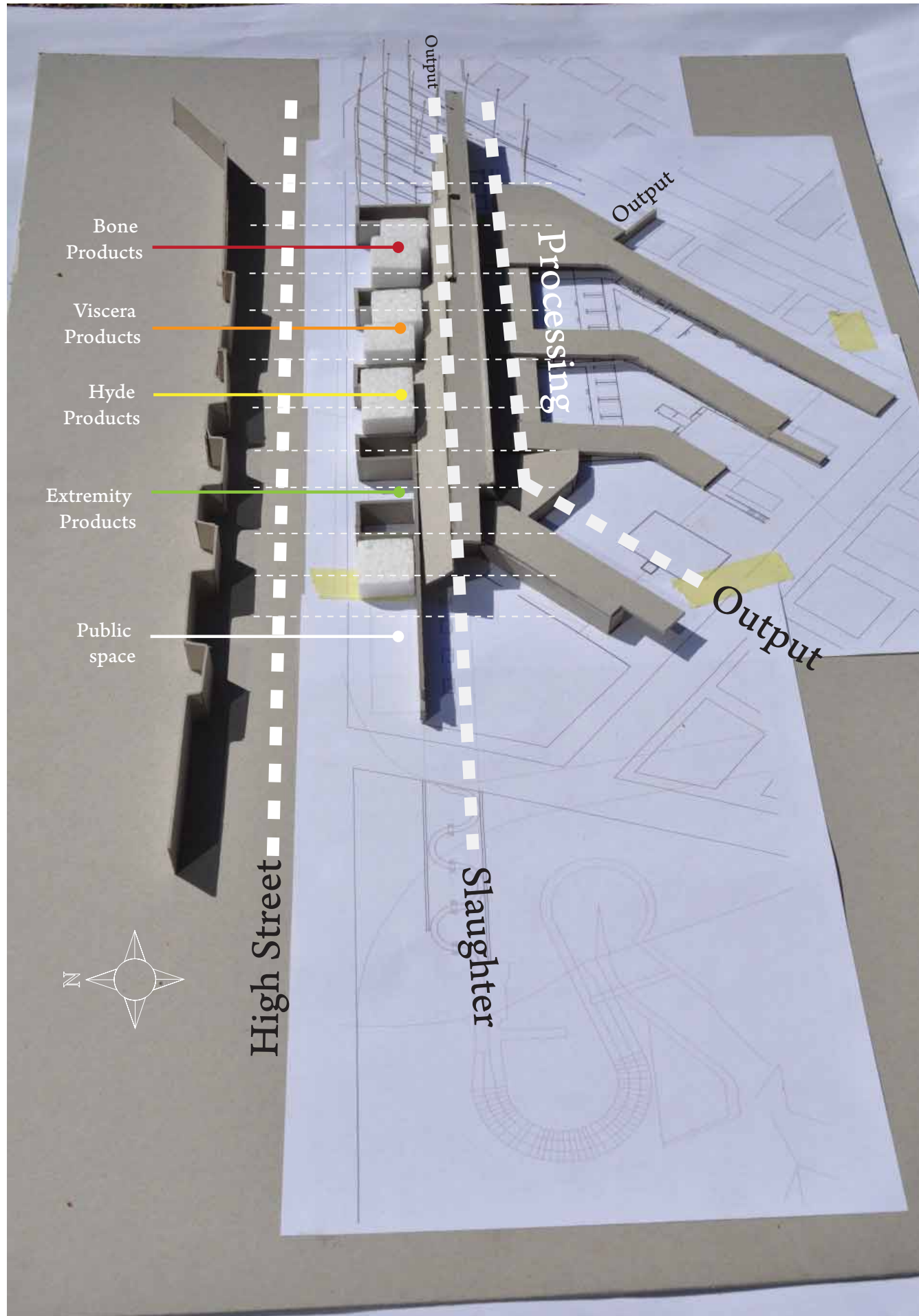


Figure - 8.26 - Conceptual model two "Form" - View looking east (By Author).

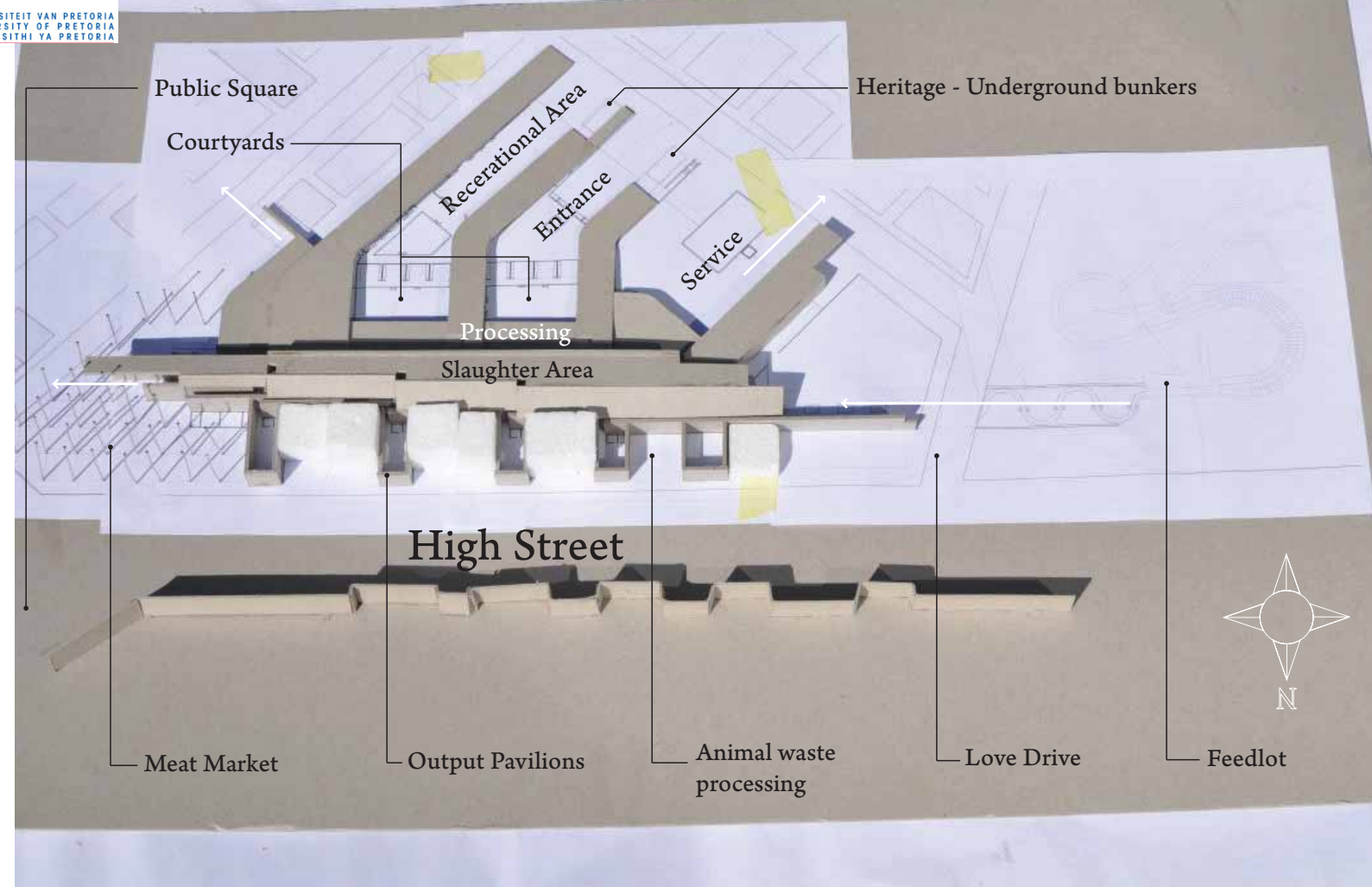


Figure - 8.27 - Conceptual model two "Form" - Plan view (By Author).

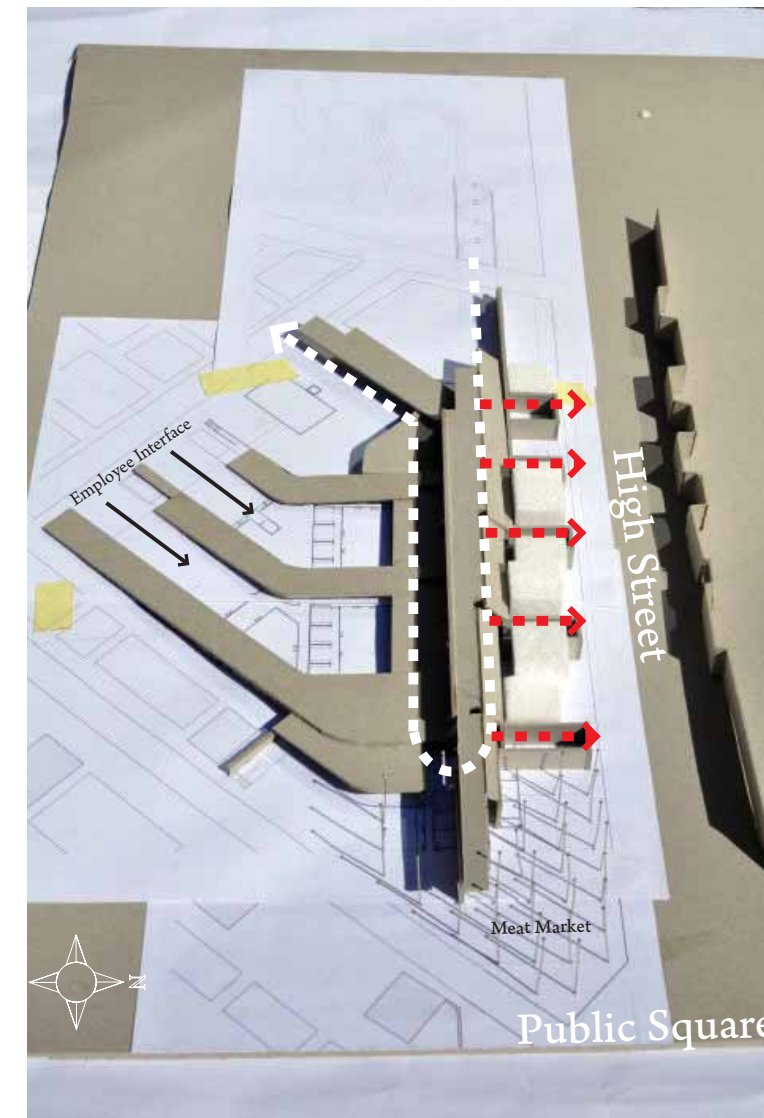


Figure - 8.28 - Conceptual model one "Form" - View looking west (By Author).

SECTIONAL DEVELOPMENT

8.4

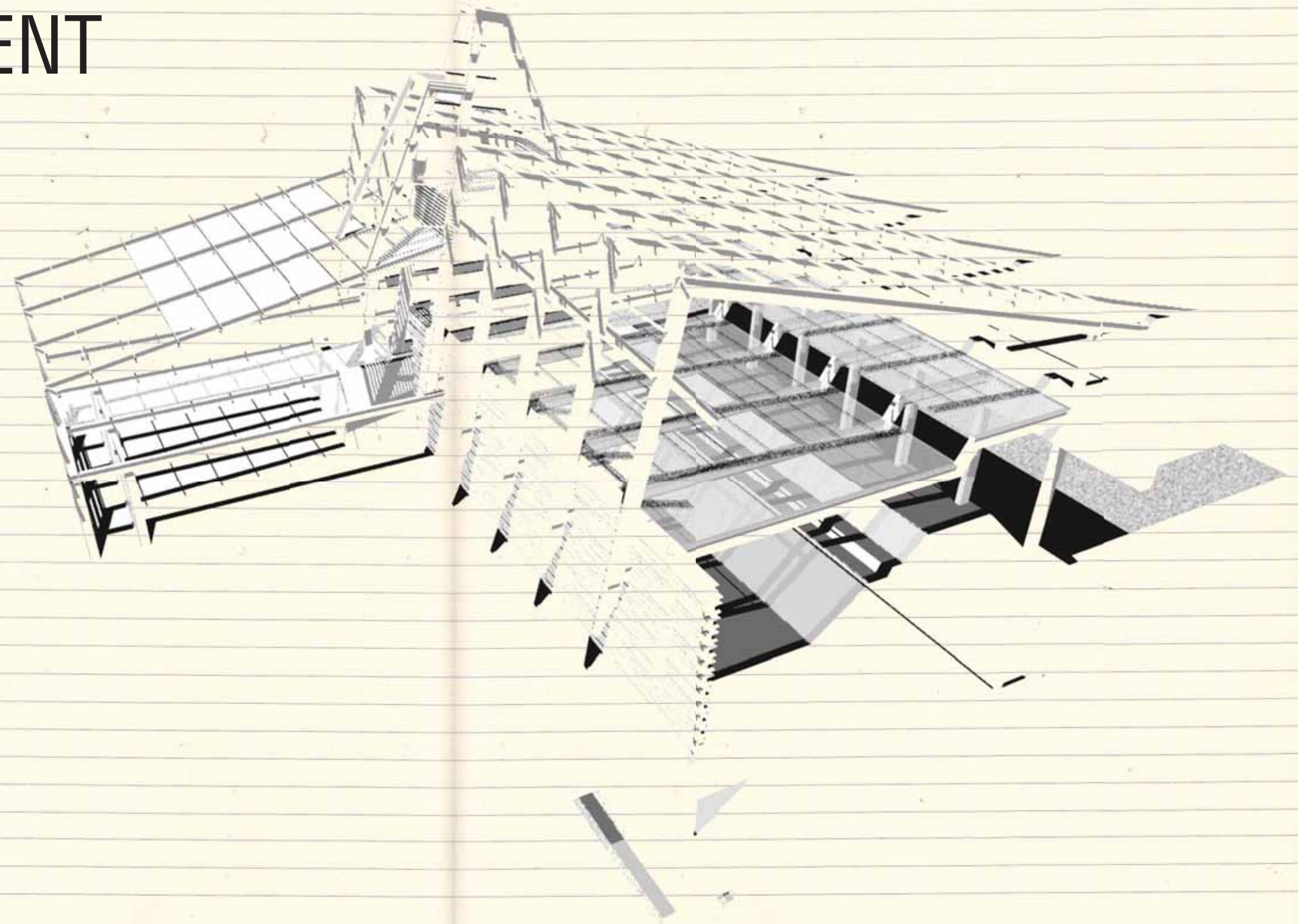


Figure - 8.29 - Conceptual render of 3 dimensional development of the tectonics of the structure (By Author).

PART 3: SECTION CONCEPT

The concept for the section was discovered after a visit to a local abattoir and witnessing the inner workings of such a space. As discussed in the precedent chapter (6.4) the three planes of architecture acquire different functions.

The concept was to design the sectional aspect of the building as to create these three planes and their respective functionality formally and tectonically distinctive. Secondly the sectional properties must respond to the site and its historical conditions such as the underground bunkers on the southern side which requires a response from the building. Thirdly the building has to respond to its high street condition in a layered fashion which was already discussed in the planning section of this chapter.

The sectional development utilises the output pavilions to achieve this layered facade.

Lastly the sectional properties of the building was informed by environmental considerations and to employ passive design principles. Cross ventilation, daylighting, heating and cooling were aspects considered in the design of the building. The passive systems were considered as to work in harmony with the mechanical systems.



Figure - 8.30 - Conceptual 3 dimensional render (By Author).



Figure - 8.31 - Early conceptual diagram (long section) depicting the recessed slaughter pit with the roof floating above (By Author).

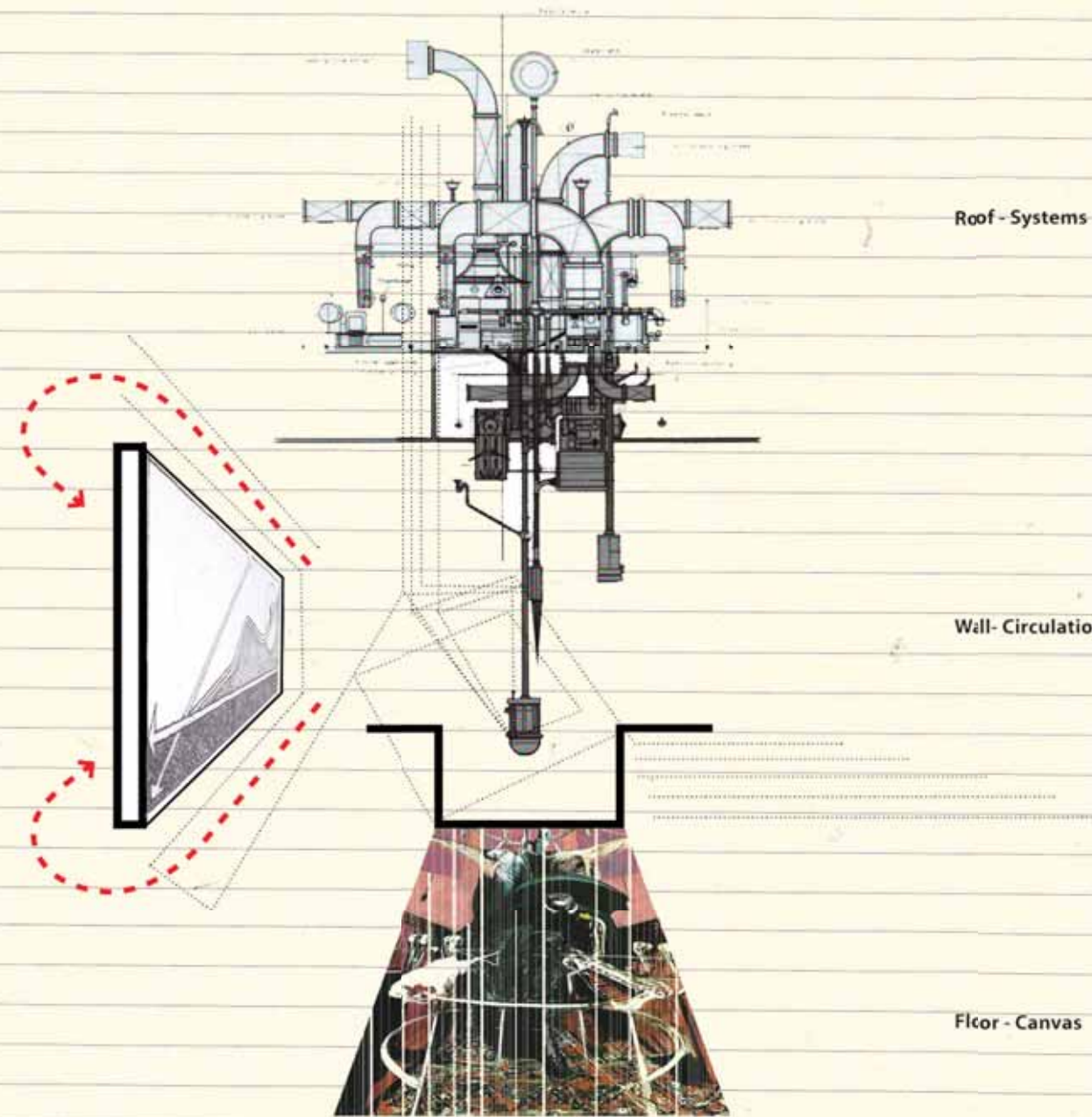


Figure - 8.32 - Section concept diagram depicting the three planes and their respective functions.

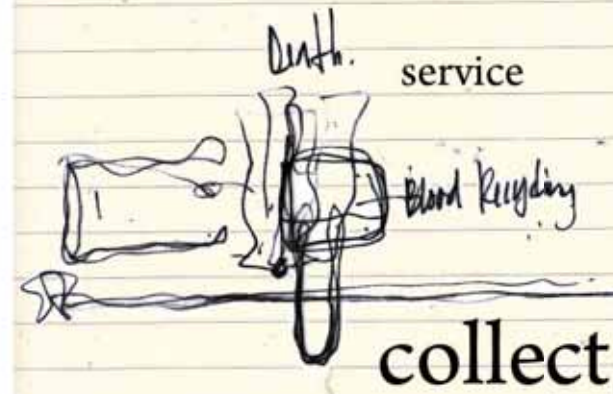
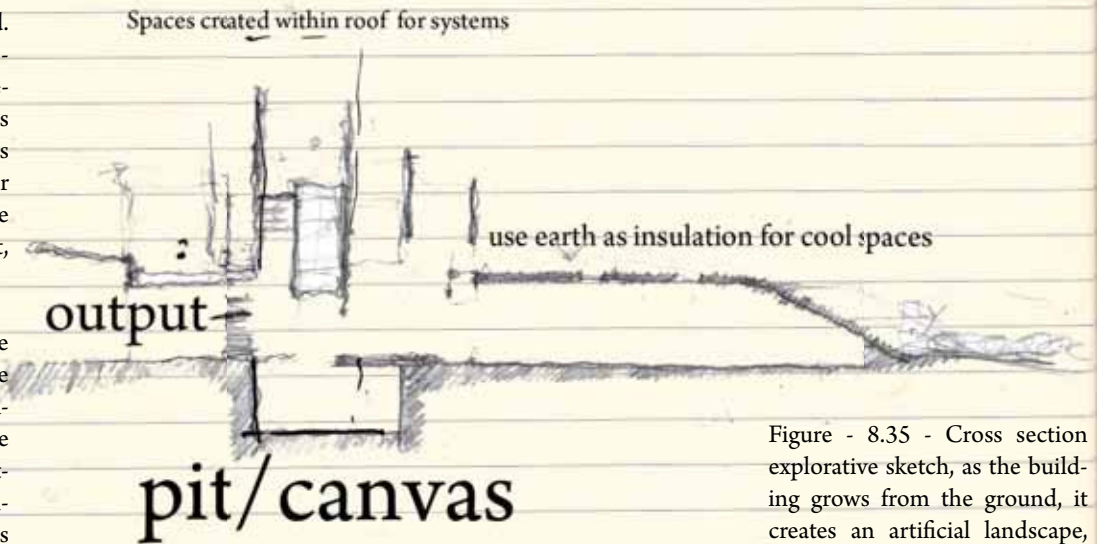


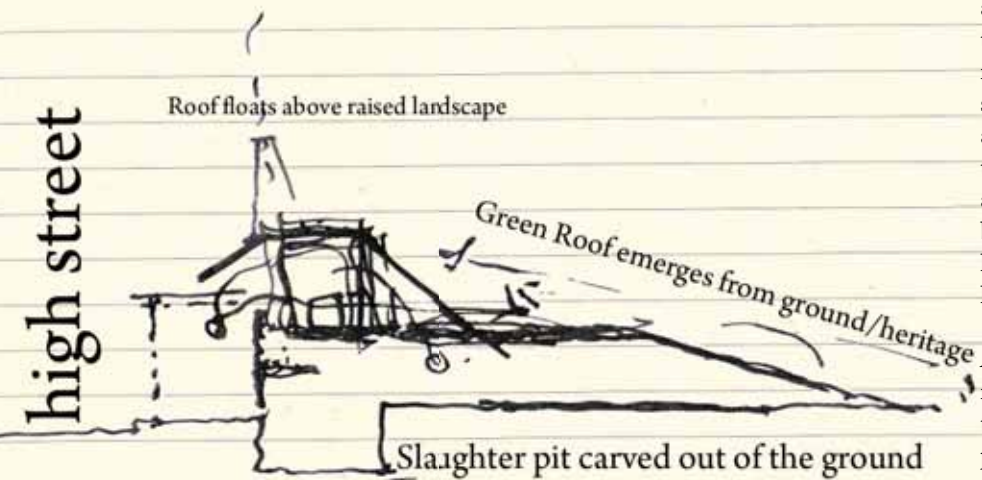
Figure - 8.33 - Cross section explorative sketch, a relationship between the floor and the roof is explored in function and in form. The roof is to engage with the public whilst acting as the central nervous system of the abattoir. The floor of the pit is to act as a canvas but also a channel, collecting all waste from animals as well as water. All waste is to be reticulated via the pit to an on site recycling plant (By Author).

Figure - 8.34 - Cross section explorative sketch, the roof as a space is explored. The output pavilion establishes a platform for engagement with the public. In this sketch, circulation elements were to form another layer to the facade, separating the public and the slaughter pit, spatially.



The decision to make the building grow out of the ground is made. The decision is two fold: connect the building to the buried heritage and provide adequate insulation for the large spaces which have to remain cool, by using the earth (By Author).

Figure - 8.35 - Cross section explorative sketch, as the building grows from the ground, it creates an artificial landscape, above which the roof is designed to float. The decision is taken to add vertical elements to the roof to visually anchor it, these elements are to become chimney stacks, to serve both mechanical and passive systems. The circulation element dividing the public and slaughter space is replaced by a wall over which the roof hangs, hinting towards what happens behind it.



At this point a decision was made to devise a "typical section" model, which is to be applied across the linear slaughter area (By Author).

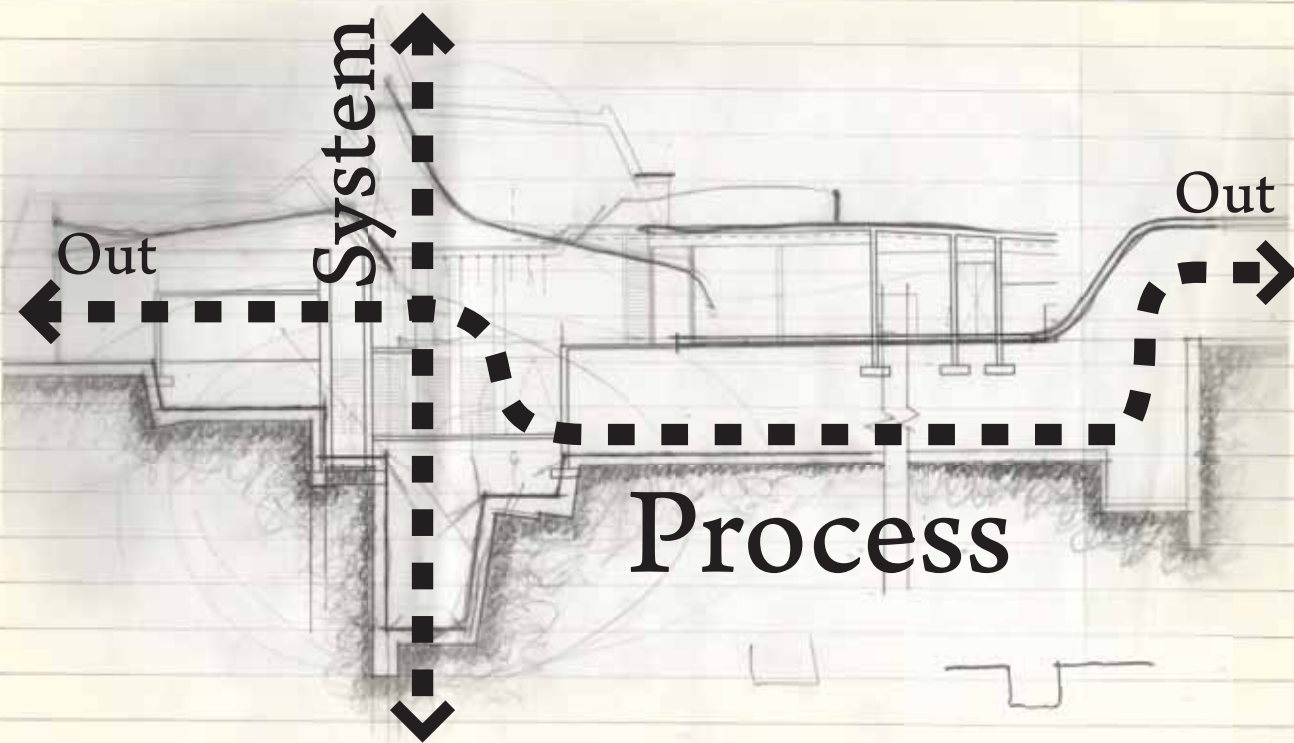


Figure - 8.36 - Further exploration of the building in section and the separation of levels. The "typical section" model is explored. This model is to be applied at the four output pavilions, where the main abattoir and the pavilion roofs meet. Furthermore, the slaughter process is explored on different levels (By Author).

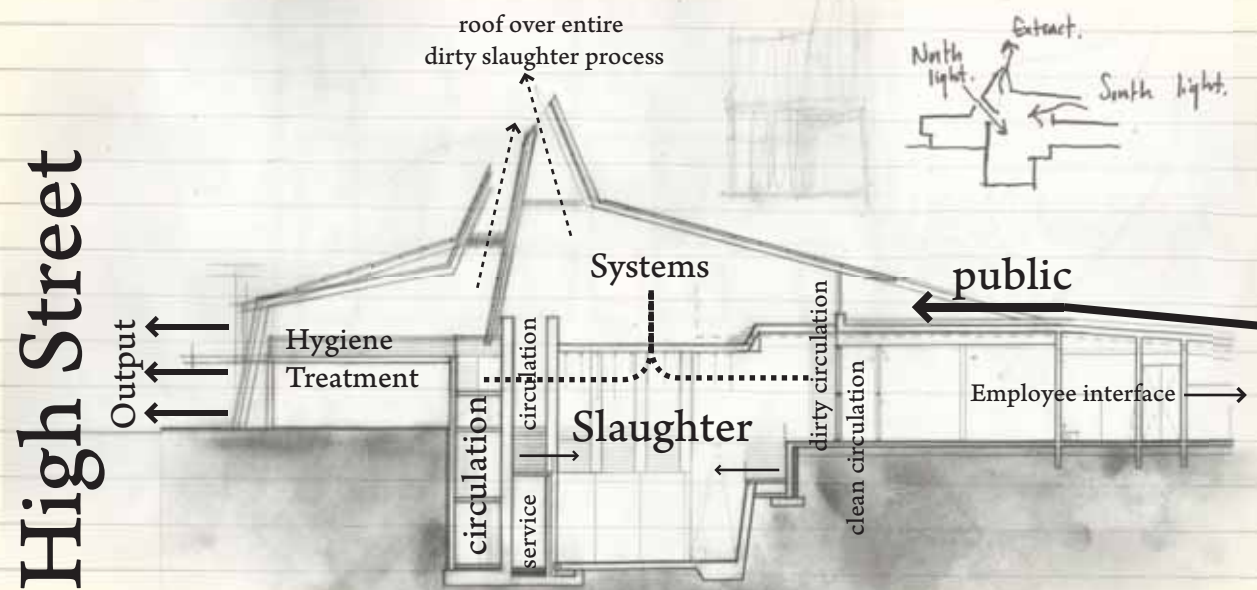


Figure - 8.37 - Further development - The two roofs are designed to meet within a combined chimney stack. The roofs are designed so that no warm or stale air can be trapped within the space. The roof funnels the warm air out to the chimney at the highest point. The roof space is defined by a floor which is added, the floor also denotes circulation beneath it by a step within the floor (By Author). The step also creates space for the services contained in the roof to be distributed to the rest of the building (By Author).

Figure - 8.38 - Typical cross section through slaughter pit beyond the output pavilion - This roof section was designed around cross ventilation and daylighting. The roof is perched on top of the wall, with windows separating it on both the northern and southern sides. This allows for ample daylighting and by making the windows operable, cross ventilation is possible. The air cooled over the grass on the roofs on the south, will move through the building, sucking the stale air out of the slaughter pit. This is achieved by using a steel mesh floor which allows the entire roof and pit space to be vented (By Author).

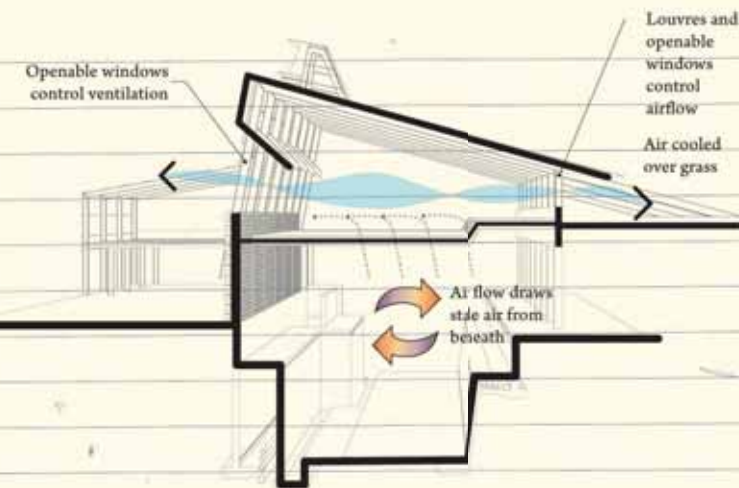


Figure - 8.39 - Light explored on section. The north facing windows are to be designed with a large window head which makes the roof appear as if it returns on itself. This is to exclude sun travelling to deep into the pit and creating uncomfortable condition for the workers. The sun is only to illuminate the pit itself. By lifting the roof on the southern side constant south light can provide illumination to the roof and slaughter space (By Author).

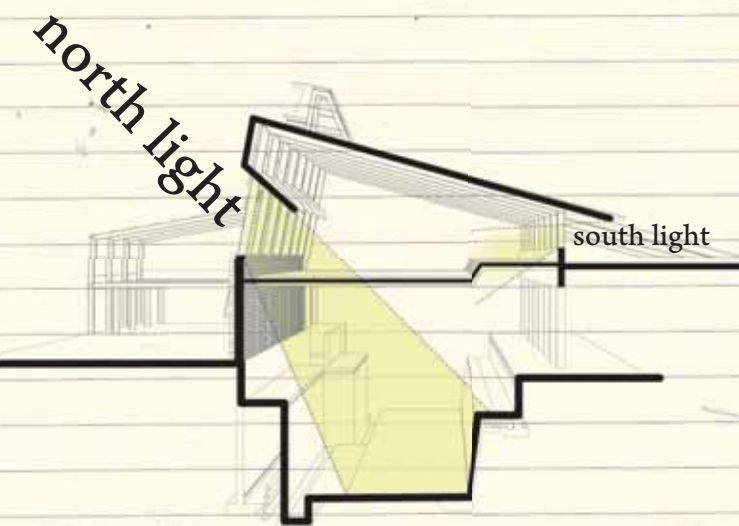
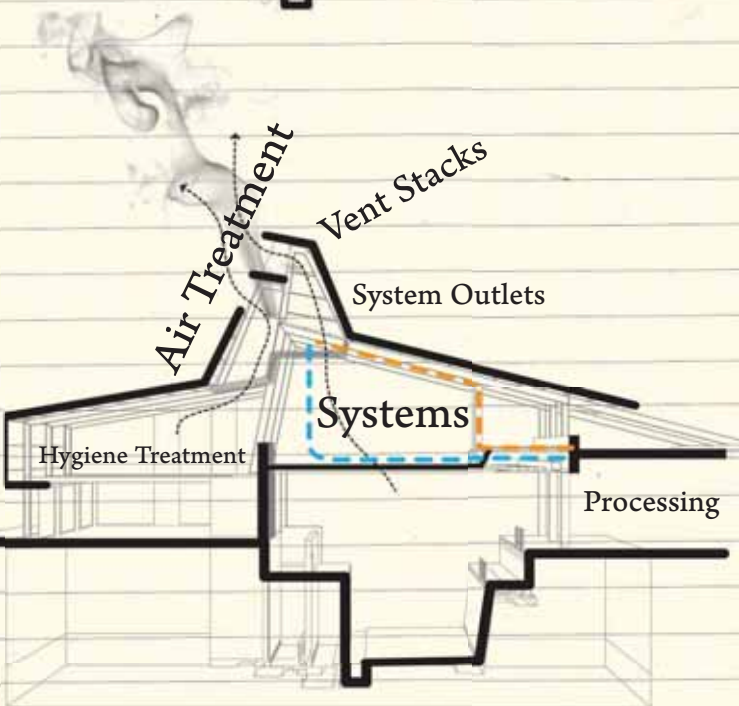


Figure - 8.40 - Section through chimney stack part of roof. This model is to be repeated four times throughout the building, with the section shown in fig. 8.35 to connect these elements.



These stacks are to work passively and actively. Warm stale air can continuously flow out through the stacks, whilst systems such as an air scrubbing system, condensers of the air conditioning and refrigeration systems and the extraction system will be situated within them. The systems located in the roof will plug into the processing spaces situated underneath the green roofs, which fall and disappear into the ground (By Author)

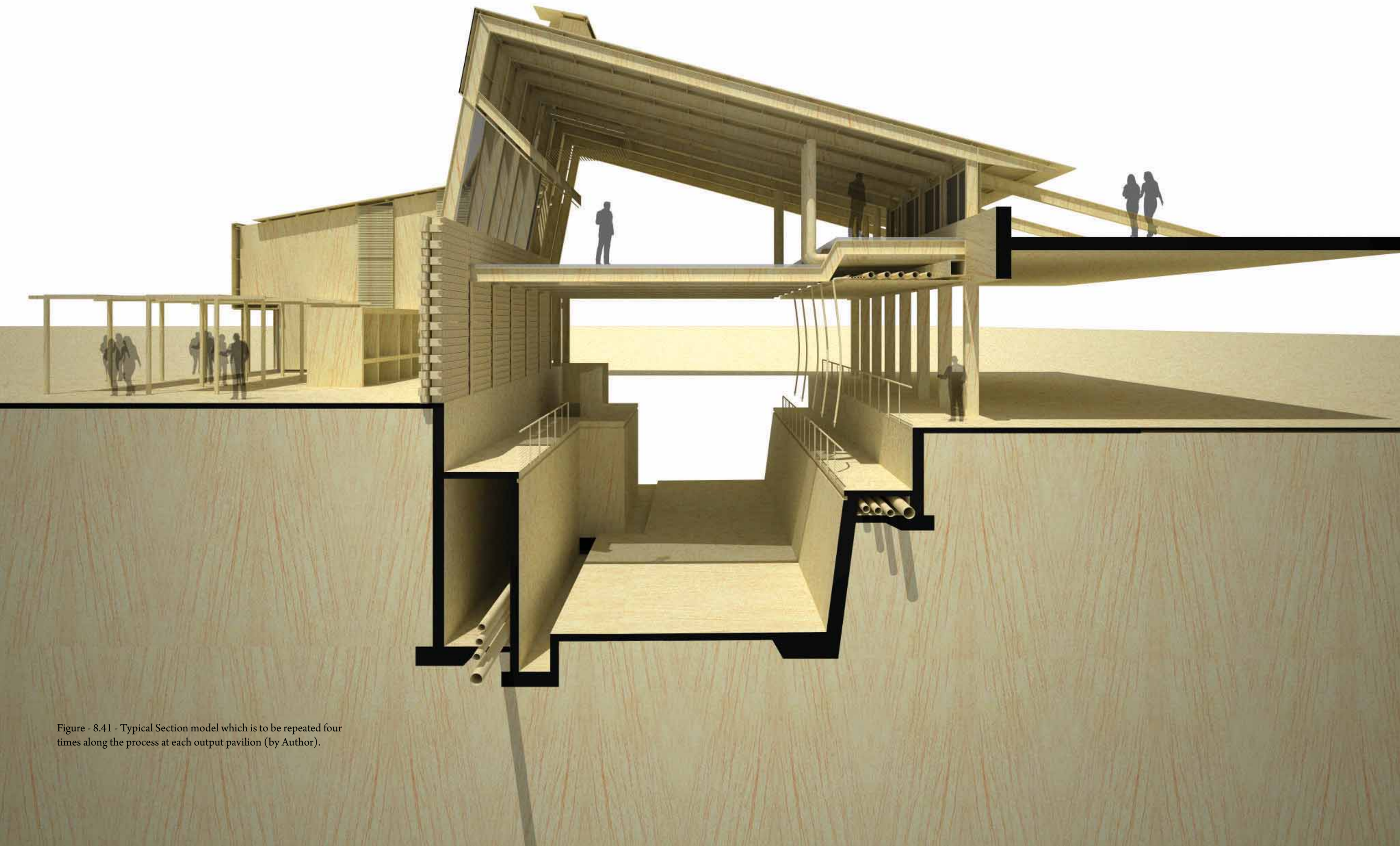


Figure - 8.41 - Typical Section model which is to be repeated four times along the process at each output pavilion (by Author).

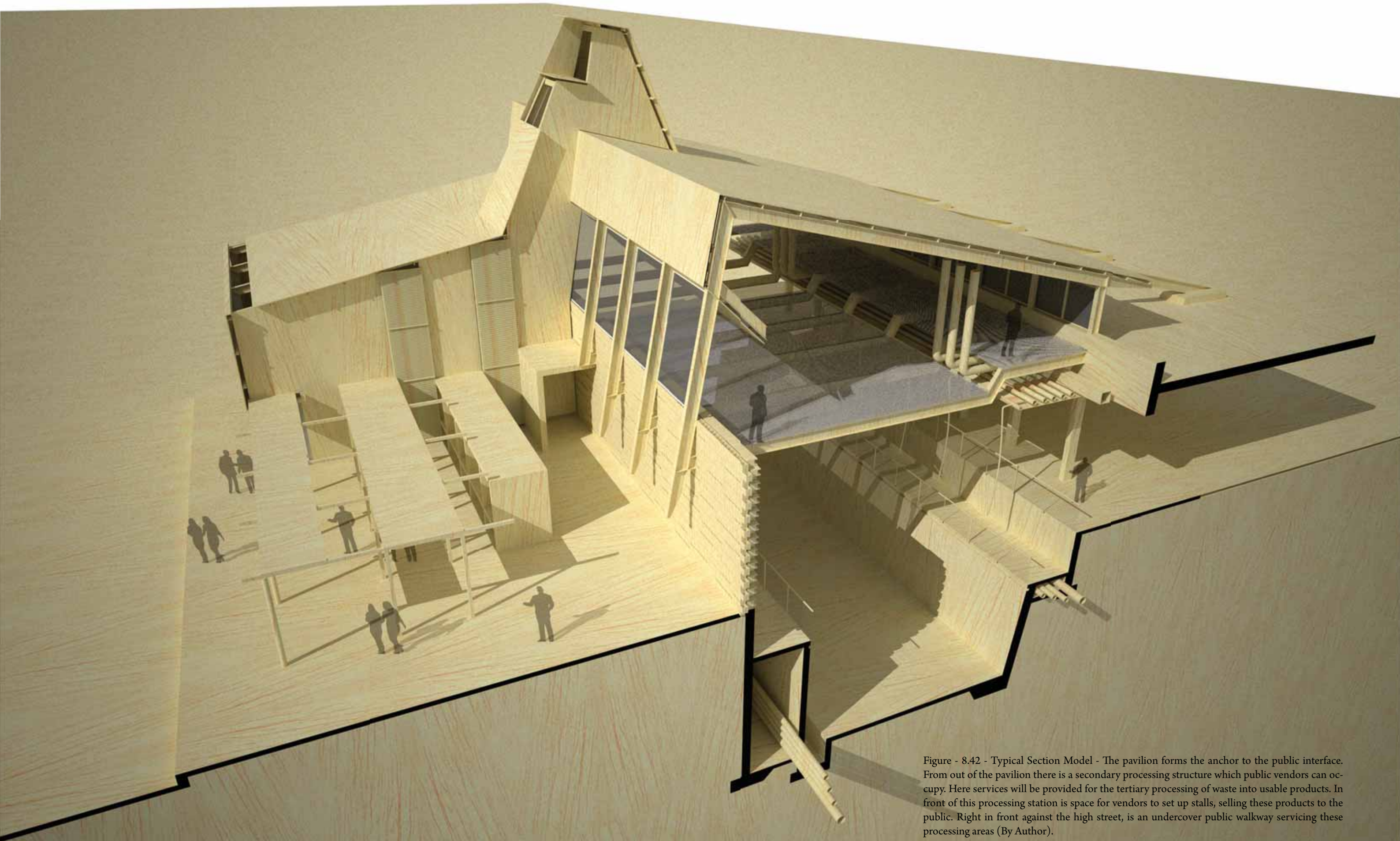


Figure - 8.42 - Typical Section Model - The pavilion forms the anchor to the public interface. From out of the pavilion there is a secondary processing structure which public vendors can occupy. Here services will be provided for the tertiary processing of waste into usable products. In front of this processing station is space for vendors to set up stalls, selling these products to the public. Right in front against the high street, is an undercover public walkway servicing these processing areas (By Author).

REGENERATIVE DESIGN APPLICATION

The following outlines how the Hannover regenerative principles influenced the design decisions and final product.

1

Insist on rights of humanity and nature to coexist

Response: The abattoir plants itself within the public realm in a constructive manner. It attempts not to deter any public activity around it and provides facilities to amplify such activities. The building functions at such a sustainable level that it acts as a positive power plant supplying itself with energy where possible. The process housed, although industrialised, is natural and unavoidable and the placement of the building reunites the consumer with the product. In this case, it attempts to close the hyper separated state between the animals and the people who consume them.

2

Recognise interdependence

Response: The abattoir depends on the natural and man made elements around it. It requires the people to make use of its facilities, whilst also providing a foothold for the entire area to develop. Its placement encourages the connection of separated communities and provides these communities with common ground, employment and economic venture.

3

Respect relationships between spirit and matter

Response: The abattoir serves its surrounding communities directly and indirectly through supporting a series of small business incubators scattered across the development. It encourages trade and economic development and is based on the ritual slaughter methodology of reclaiming the entire animal and respecting/ acknowledging the animal. In striving for economic progress the building addresses the animal and the communities spiritual connection to it with civility.

4

Accept responsibility for the consequences of design decisions

Response: The dissertation focuses on the coexistence of industry within the public realm, mediated through regenerative and sustainable principles. The aim of the design is to achieve a symbiosis between industry, society and nature, by providing a new interface based on heritage, recycling / ritual and economic progress.

5

Create safe objects of long-term value

Response: The abattoir is the heart of the new development. By incorporating a feedlot into the scheme, the abattoir will have constant business due to its preferred location to its consumers. The building incorporates numerous technologies which make it safe to operate within the public realm. These systems process waste into usable products and even by-products which can support the peri urban agriculture (high nutrient slurry from bio gas digester can be used as compost), which happens within the area. The building taps into the existing community network with a constant supply of numerous products.

6

Eliminate the concept of waste

Response: Abattoirs produce large amounts of waste. Waste forms the most important cog in the design of the new abattoir. Not only does it provide the connection to rituals but also provides economic opportunities surrounding it that are exploited. The building functions on a zero-waste concept and finds functional use for all types of waste.

7

Rely on natural energy flows

Response: Natural energy flows are incorporated into the design to relieve the stress on exhaustive mechanical systems. Passive design principles are incorporated throughout the building in the form of ventilation, insulation, heat gain and loss and solar energy. Energy is also produced from organic waste, further emphasising natural energy flows.







8

Understand the limitations of design

Response: The design does not attempt to solve all the inherent problems in Mamelodi or solve all the social-ills concerning animal slaughter. The building aims to provide a sustainable foothold for future development and addresses possibilities of production within densely populated areas. The abattoir does not aim to turn people into vegetarians nor increase meat consumption, it strives to create a public discourse which can start to break down society and nature's hyper separated state.

FINAL LAYOUT

Basement Plan - Key

-  Slaughter Pit
-  Cattle chute and lairage
-  General Circulation
-  Water Treatment Plan
-  Service areas
-  CO₂ Stun Box

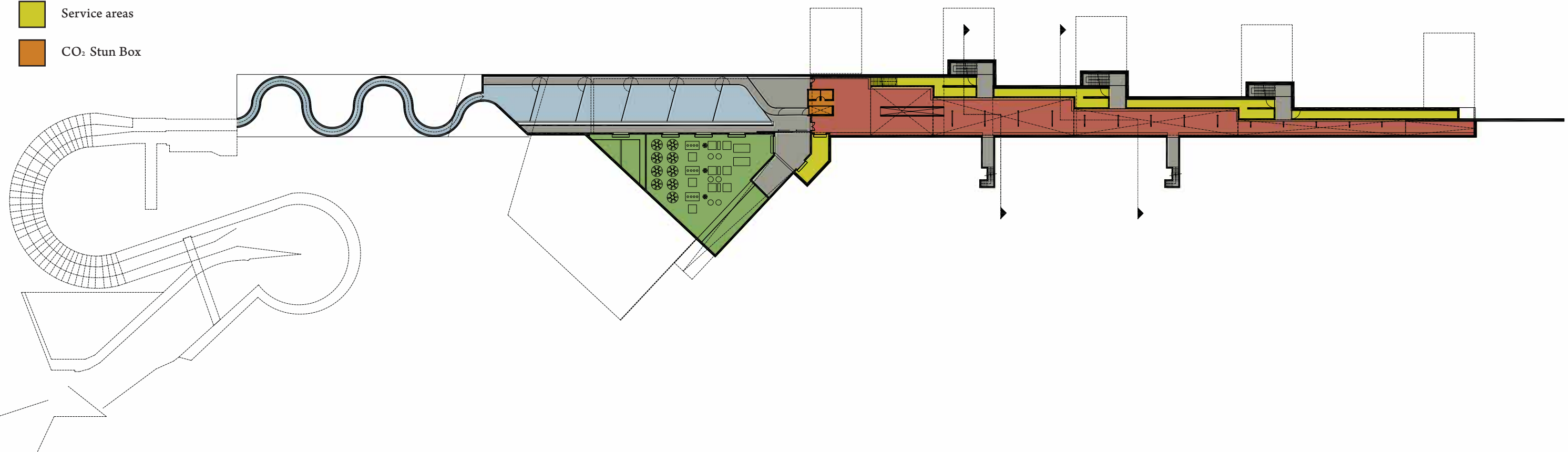
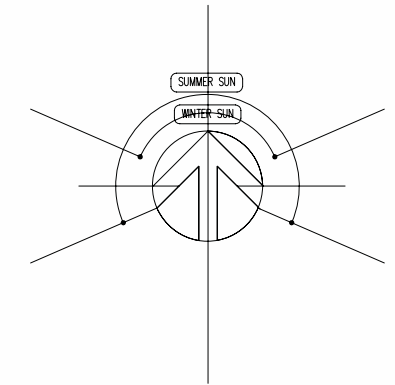
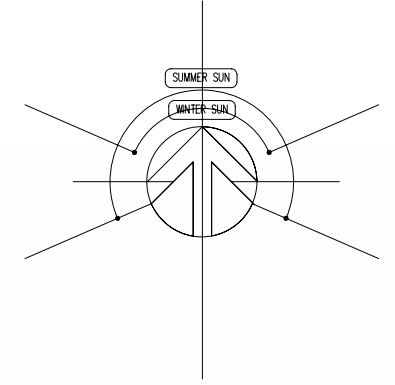


Figure - 8.43 - Basement Plan (By Author).

Ground Floor Plan



- Slaughter Process
- Processing Spaces
- Primary Circulation
- Service Spaces
- Ablution
- Labs
- Freezers
- Offices
- Recreational spaces
- Dispatch Area
- Educational/ Conference Space
- Cafeteria

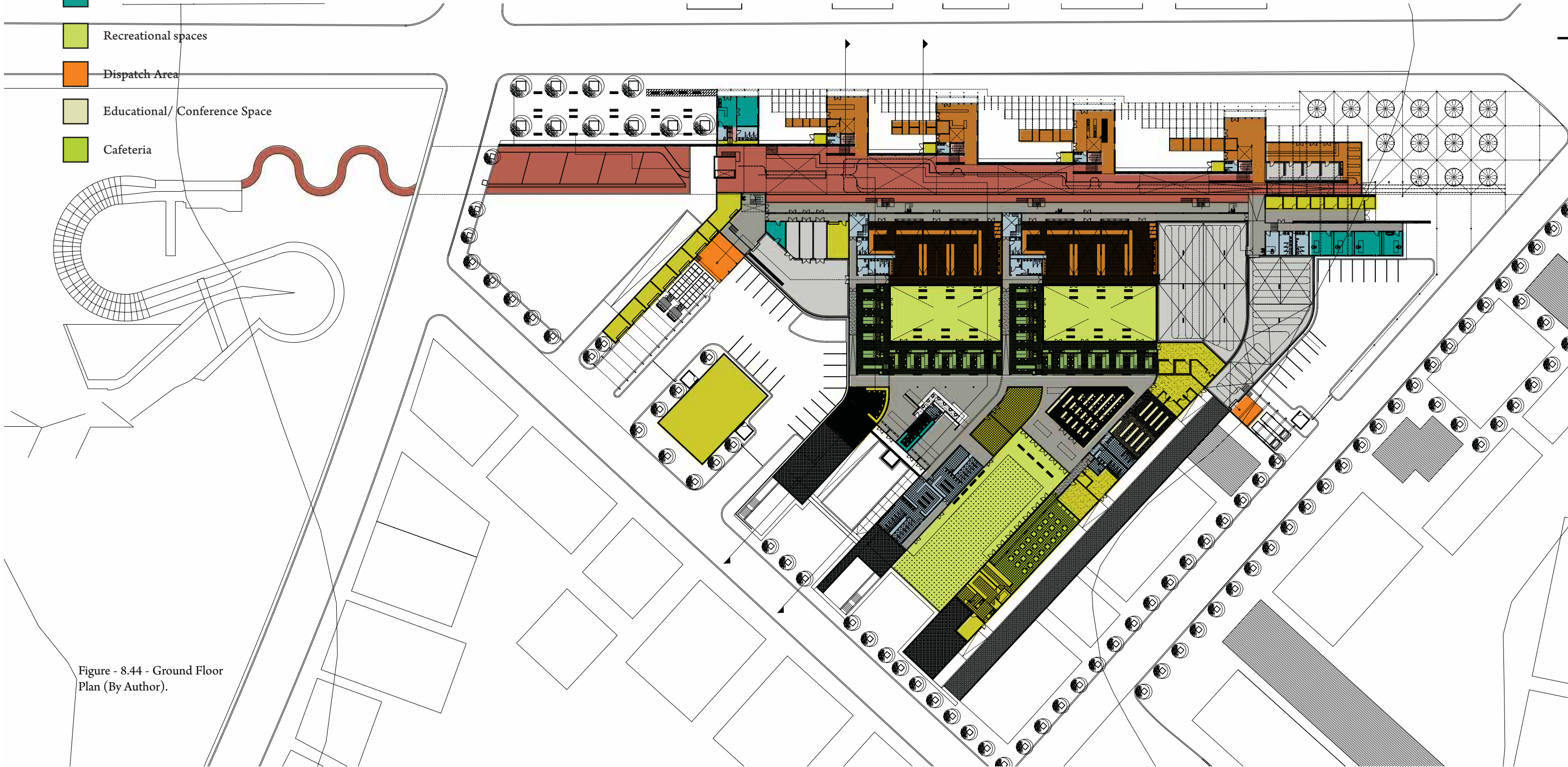


Figure - 8.44 - Ground Floor Plan (By Author).

Service Floor Plan - Key

- CO₂ Stunning
- Processing Spaces
- Primary Circulation
- Service Spaces
- Offices
- Recreational spaces

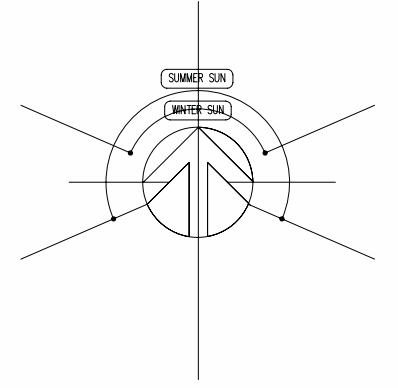


Figure - 8.45 - Service Floor Plan (By Author).



Figure - 8.46 - Early 3D image of the building, view looking north. The building grows from the southern edge with the roof floating above the new ground plane (By Author).

Figure - 8.47 - Above - 3D of high street with the repetitive pavilion model. The public spaces in between start to develop (By Author).

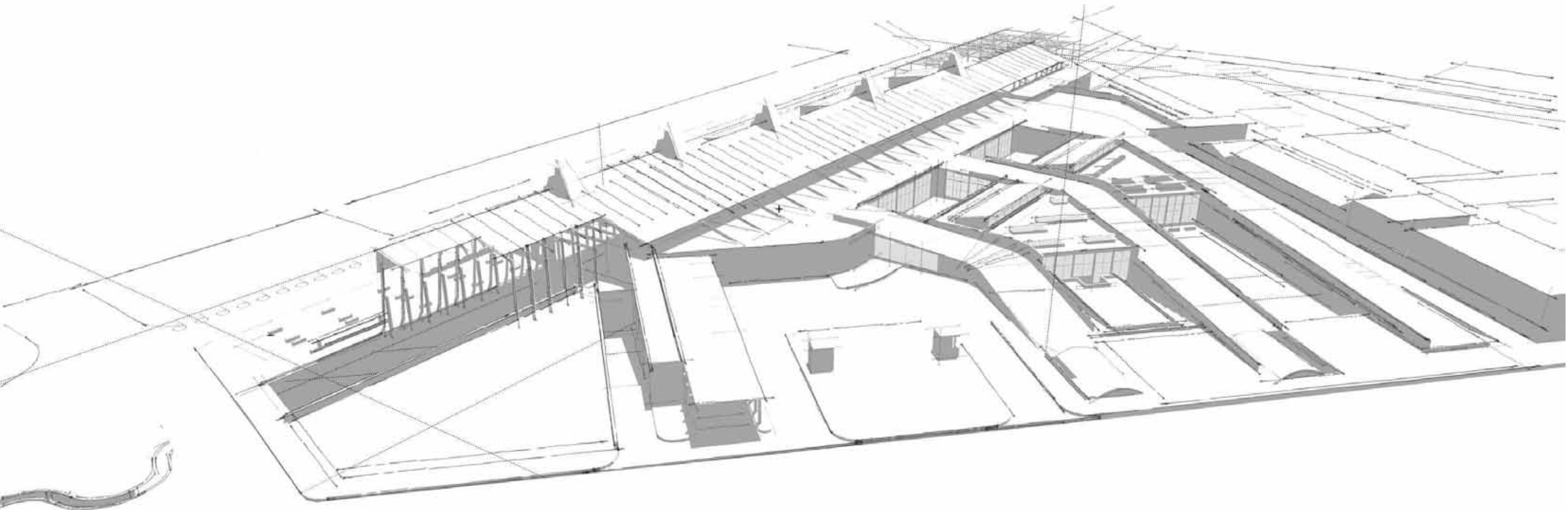


Figure - 8.48 - 3D view from above depicting the entire building form and its connections to all the edges of the site (By Author).

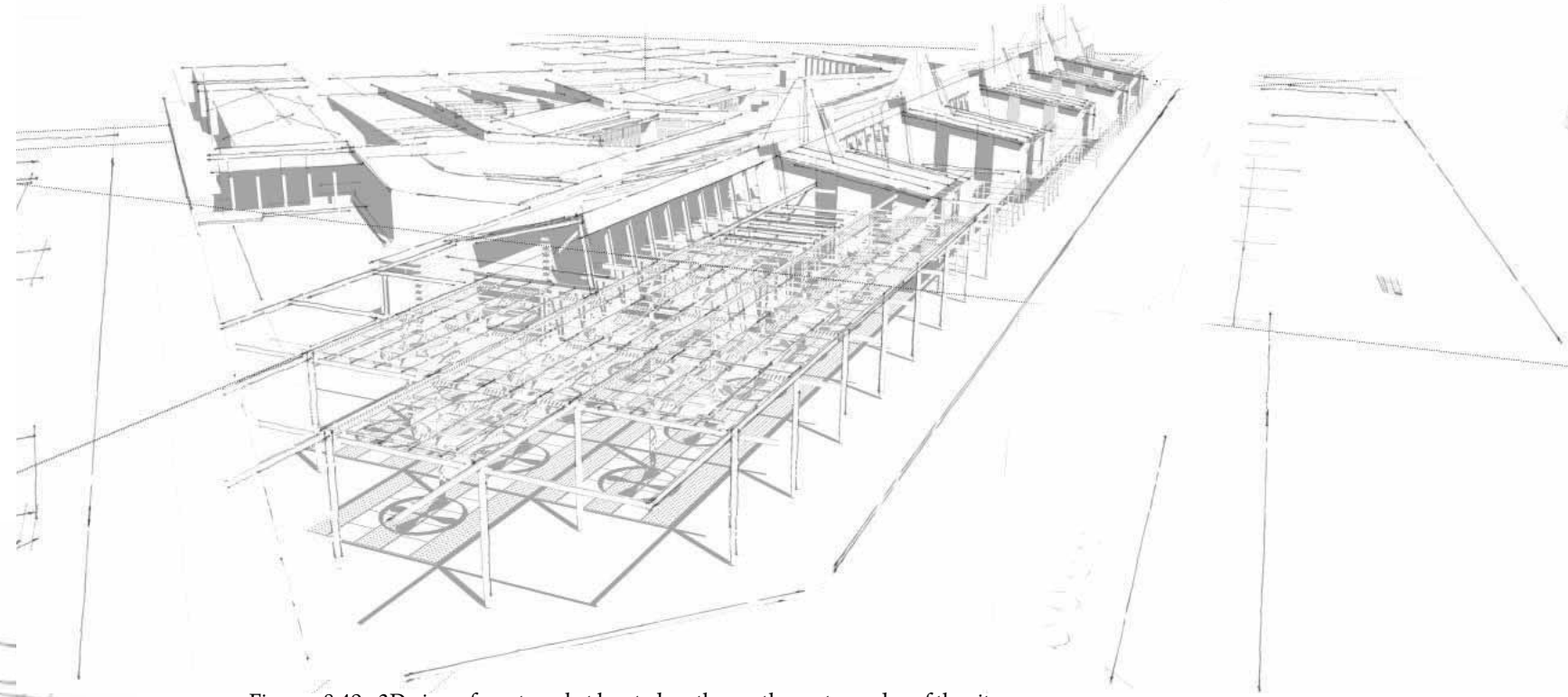
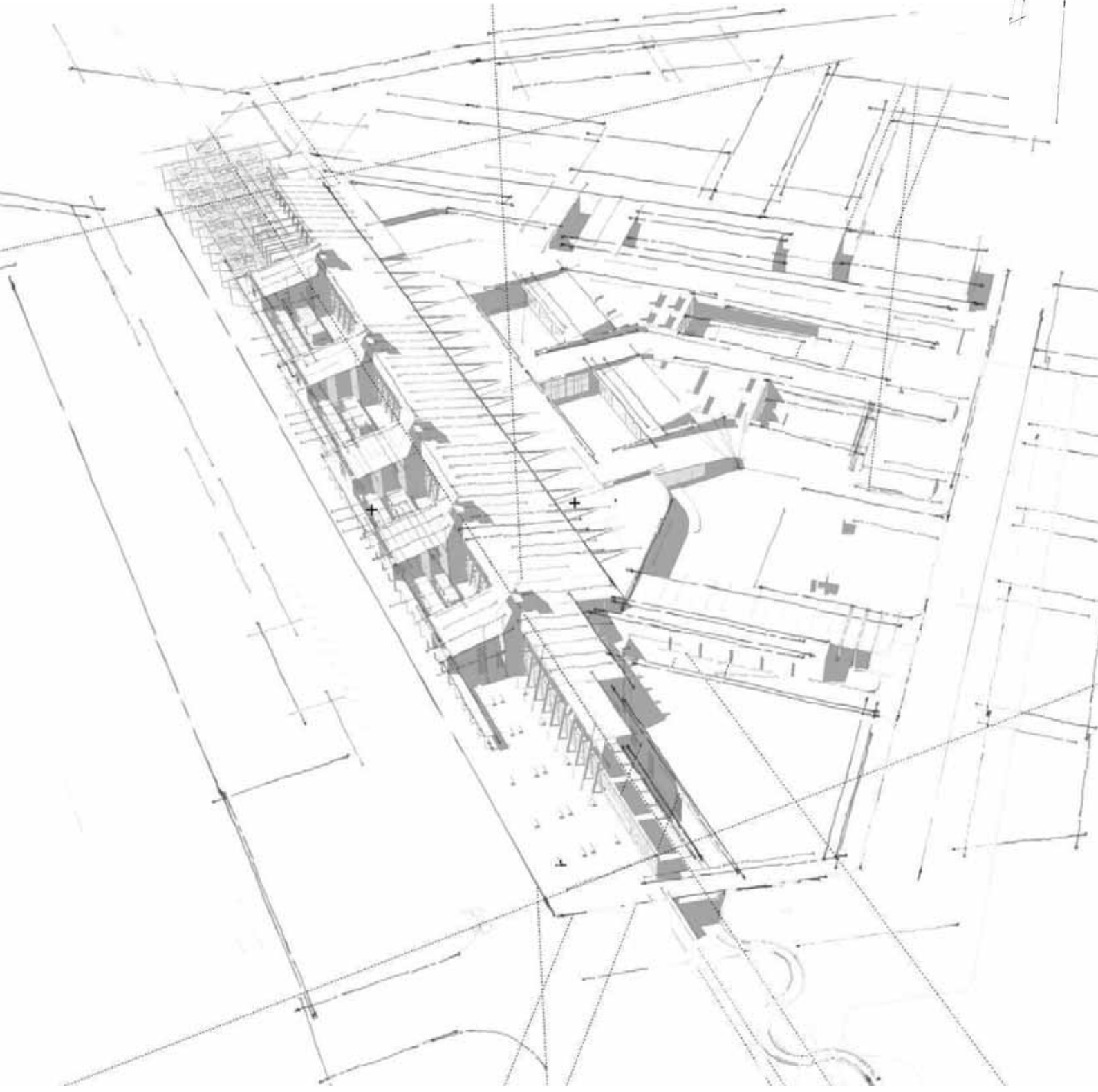


Figure - 8.49 - 3D view of meat market located on the north - eastern edge of the site.



Figure - 8.50 - Close up 3D view of the processing pavilions (By Author).