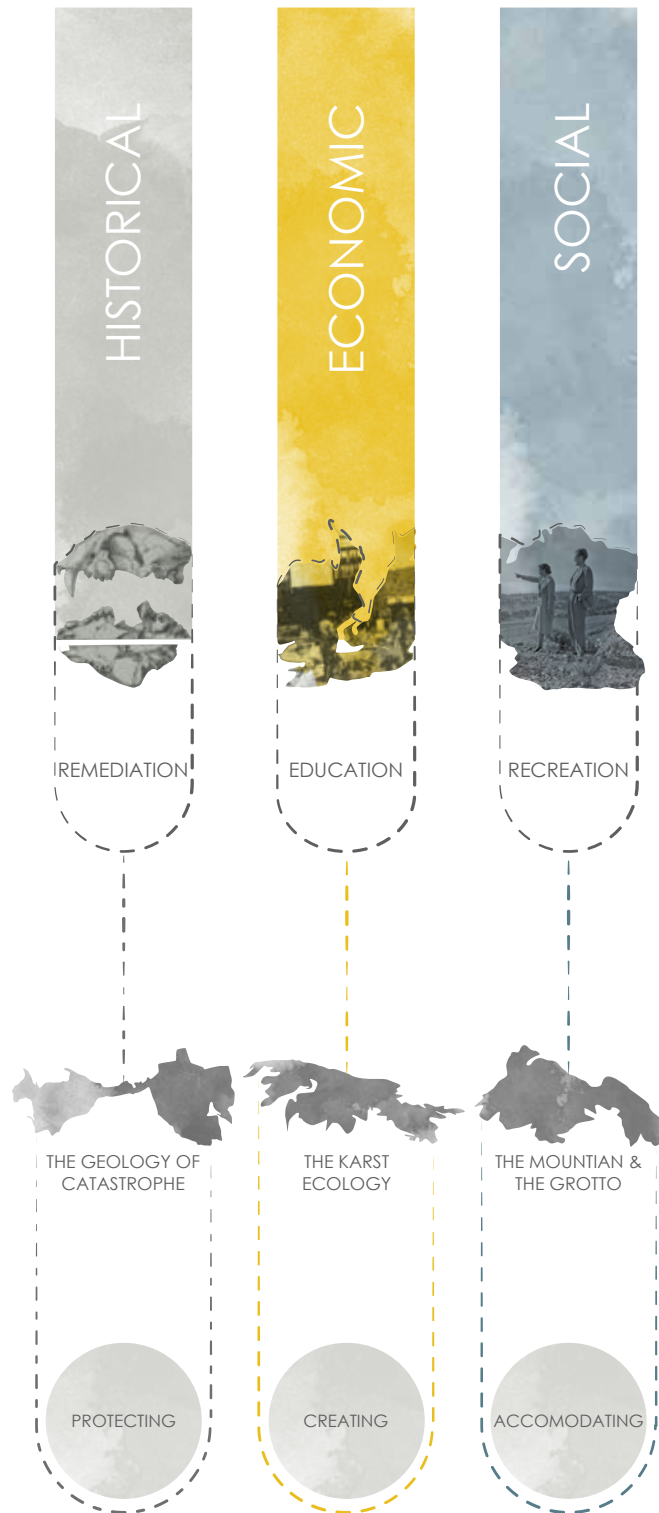




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## DESIGN DEVELOPMENT

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▲  
FIGURE 7.1  
DESIGN  
FRAMEWORK  
(Author , 2016)

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-7-

## DESIGN

### DEVELOPMENT

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The design strategy for the dissertation is developed as a response to the three layers of the landscape, namely the historical, economic and social landscapes. The design framework is manifest in the form of structures that are developed to protect the historical landscape. This is followed by the development of new and lost habitat as a response to the threats of the economic landscape. Lastly, the strategy focuses on developing structures that accommodate the programmes which enable and are enabled by the existence of the habitats in the form of tourism and research building on the social landscape (Fig. 7.1).

The development of the design is based on the objective of creating architecture which accepts the impact of humankind on the geology and ecological systems, investigating how this impact could improve, instead of leading to the demise of the landscape, its' networks, and the living systems to which it plays host.

The approach to the development of site and the individual interventions is based on five architectural intentions. The connecting of the three landscapes and its' networks, and the revealing of the hidden layers of the landscape are the two over-arching intentions, and are applied throughout the design, from site to detail level. The further three intentions structure the development of built form, and are applied to individual parts, building on one another. These

three intentions are the protection of the landscape, the creation of opportunities for habitats, and the accommodation of spaces for programmes, which build on the habitats.

#### 7.1

#### CONNECTING

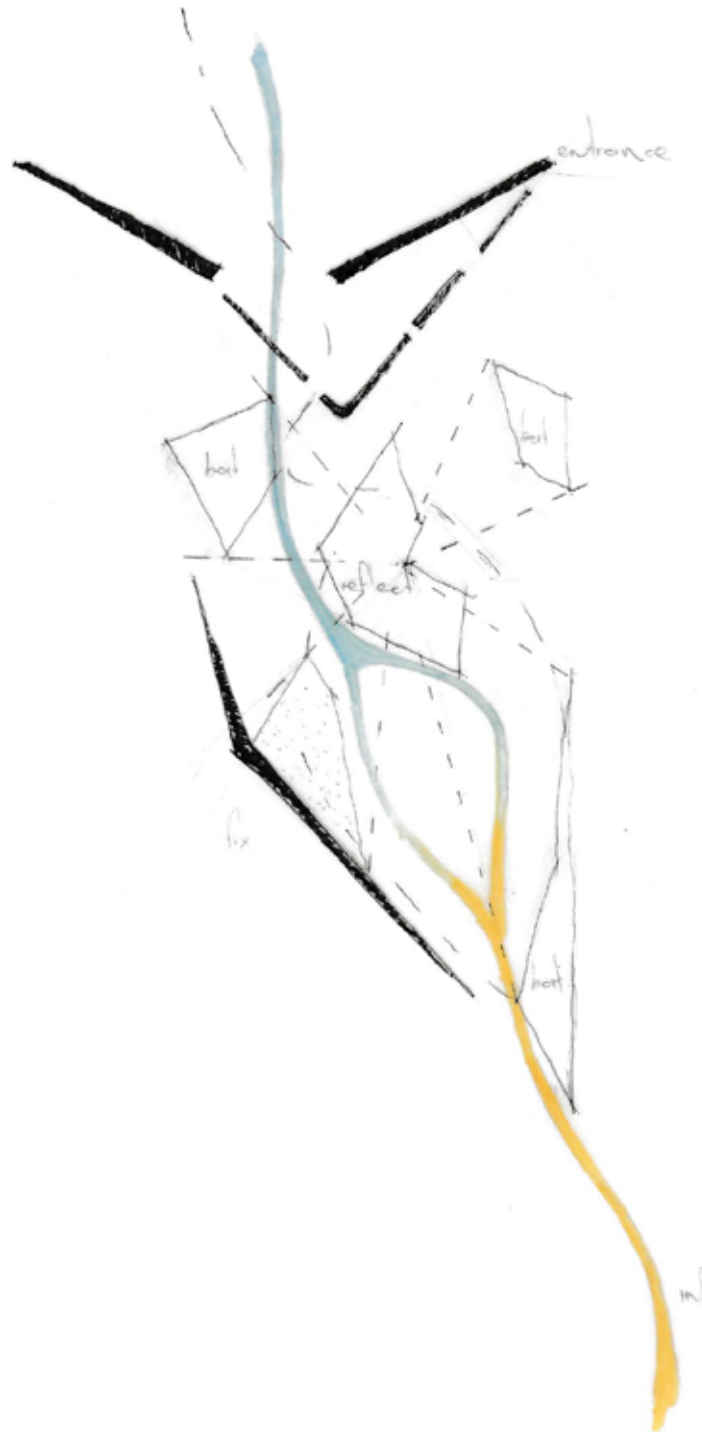
##### 7.1.1

##### ROUTE DEVELOPMENT

The development of the route is based on both a physical and physiological journey through Bolt's Farm. The route serves to connect the points of energy, thus the points of intervention, onsite, guiding visitors, researchers and staff from one point to another. The route also serves to guide visitors through the site to enhance the take-home visitors experience (Fig. 7.2), allowing the visitors to view the landscape from another perspective.

As the slope of the site is steep, specifically the connection between the Ticket Office and Quarry Pavilion, the route meanders up to the quarry, leading visitors through a large clump of trees, instead of directly connecting these two spaces (Fig. 7.5).

Other than guiding the users of the site from one space to another, the route serves to protect the site. The route not only reduces erosion and the trampling of endemic flora, but also channels storm water and acts as fire break to protect the landscape.



▲  
FIGURE 7.2  
ROUTE CONCEPT  
-APRIL-  
(Author , 2016)

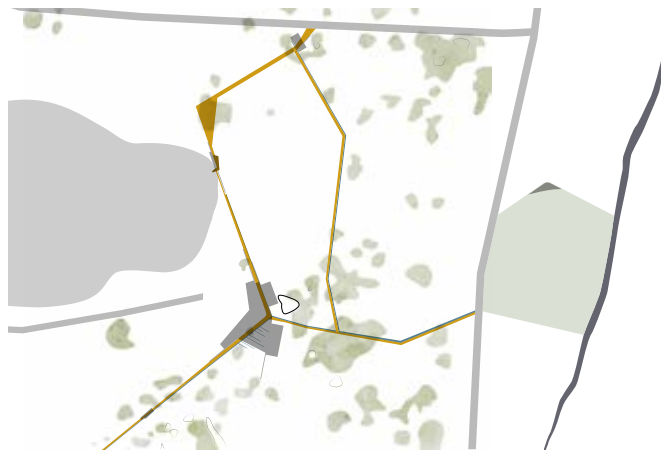
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FIGURE 7.3  
ROUTE DIAGRAM  
-APRIL-  
(Author , 2016)

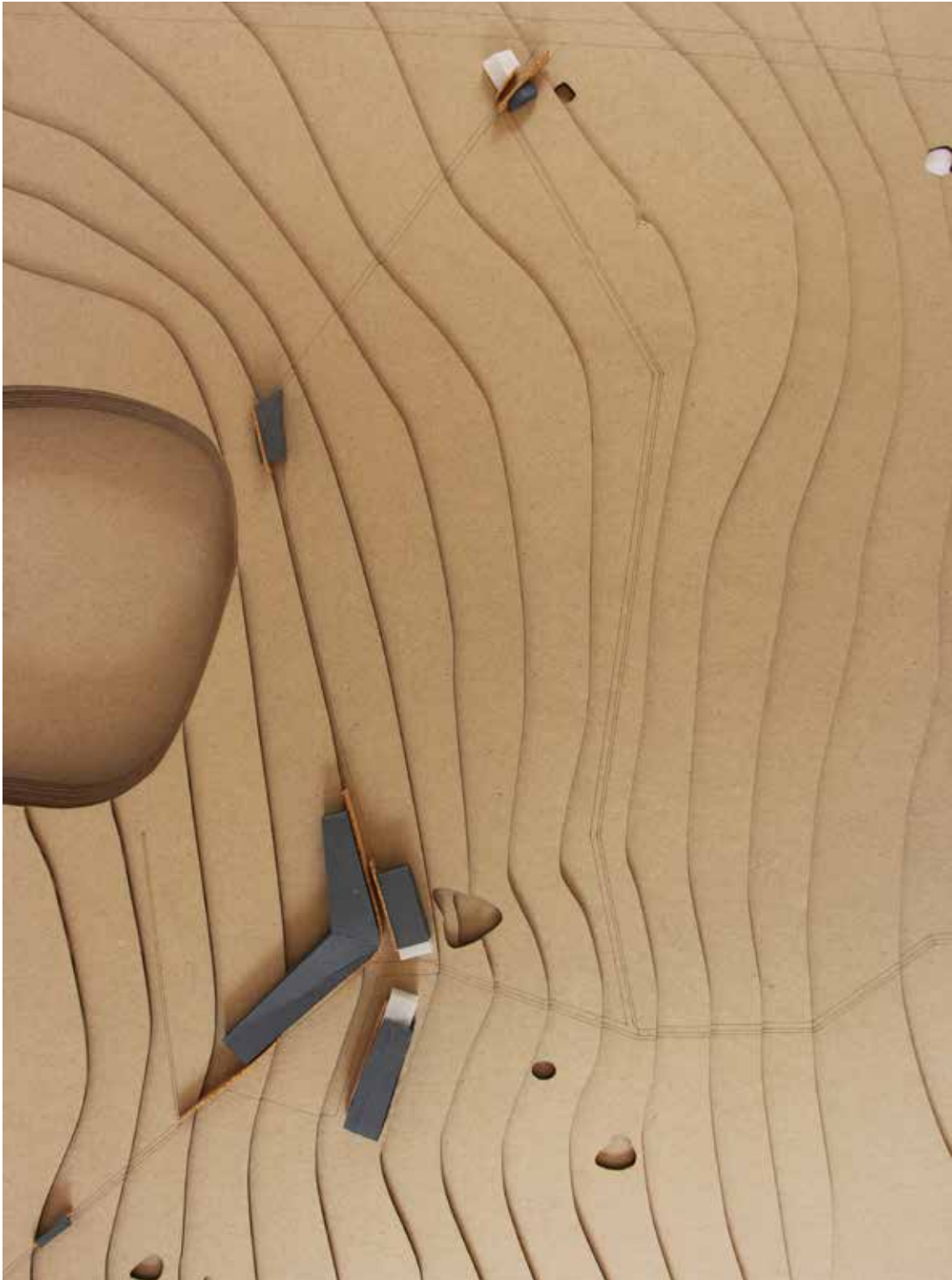


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FIGURE 7.4  
ROUTE DIAGRAM  
-JUNE-  
(Author , 2016)

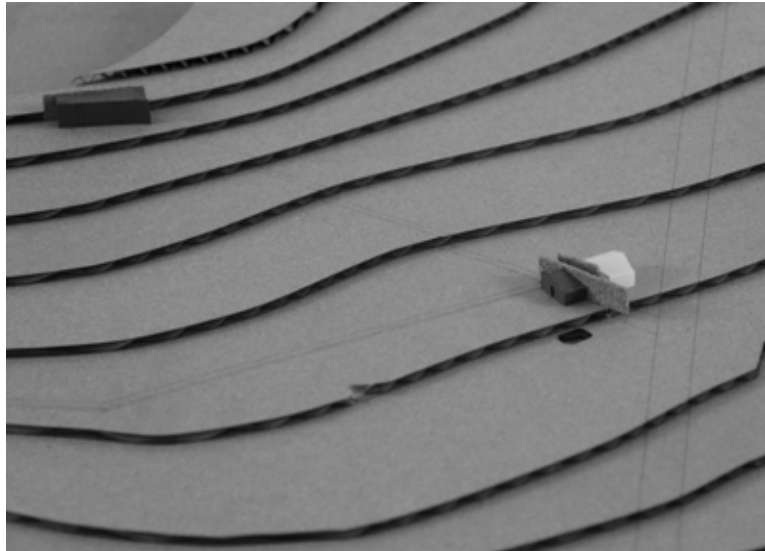


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FIGURE 7.5  
ROUTE DIAGRAM  
-AUGUST-  
(Author , 2016)

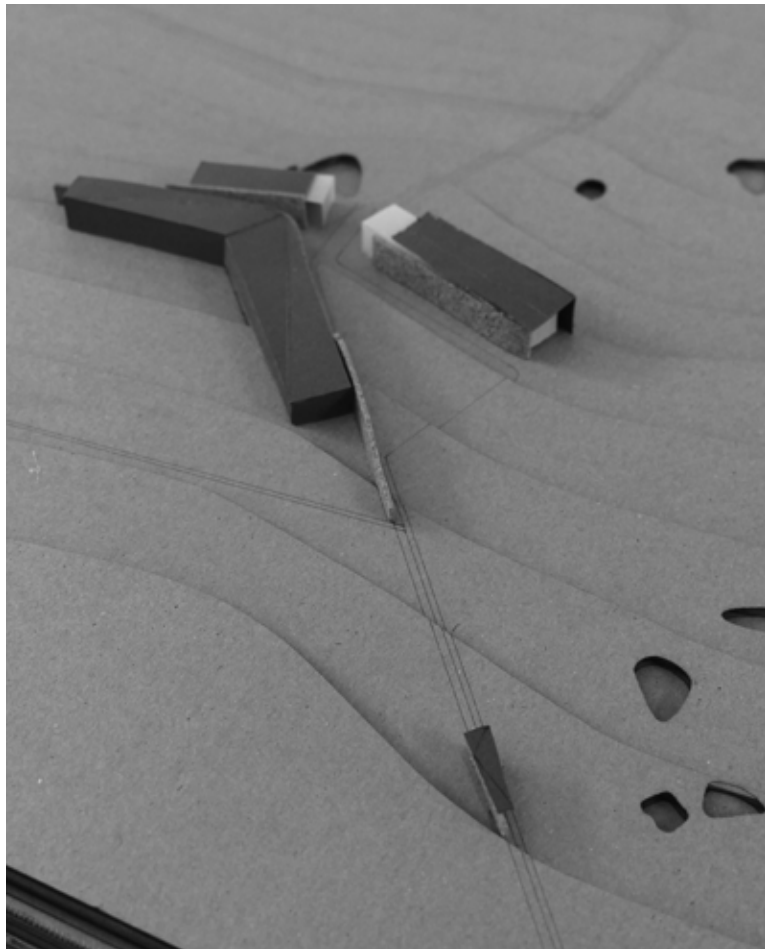




▲  
FIGURE 7.6  
SITE MODEL  
-JUNE-  
(Author , 2016)



▶  
FIGURE 7.7  
ROUTE BETWEEN TICKET  
OFFICE & QAURRY PAVILION  
-JUNE-  
(Author , 2016)



▶  
FIGURE 7.8  
ROUTE BETWEEN VIVARIUM  
& FIELDWORK STATION  
-JUNE-  
(Author , 2016)

7.2  
REVEALING  
7.2.1  
SCREENING & REVEALING

Along with the direction of the route, physical elements placed in the site direct the visitor's view. Throughout the site, the visitor's perception of the landscape is altered by screening and revealing the landscape.

7.2.1.1  
THE QUARRY PAVILION

The Quarry Pavilion introduces visitors to the threats to the seemingly pristine landscape. The aim of the pavilion is thus to shock, for rhetorical effect. As one approaches the pavilion, the quarry is not visible as seen in both the major design iterations. With the May iteration, the visitor is lead through the pavilion to the side of the quarry (Fig. 7.9). The design was developed further, to become narrower as one moves through the buildings, becoming more claustrophobic, introducing tinted light reminiscent of the colour of acid mine drainage, and turning the route at a sharp angle, forcing the visitor onto a viewing platform over the edge of the quarry (Fig. 7.10).

7.2.1.2  
THE FIELDWORK STATION

The screening element of the Fieldwork Station is applied for utilitarian purposes, amongst others. The initial design of the Fieldwork Station catered only for the use of archaeologists (Fig. 7.11), with the addition of functions, such as a bird hide, a screening elements is placed as a barrier between the visitors and viewed birds (Fig. 7.12). The screen allows archaeologists and visitors to move freely behind the screen, without disrupting the birdlife.

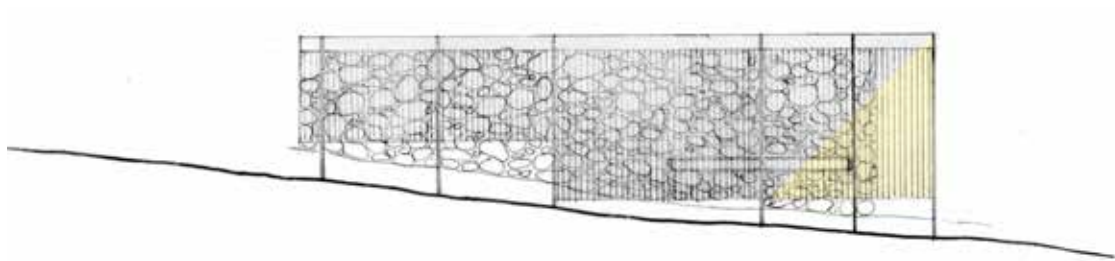
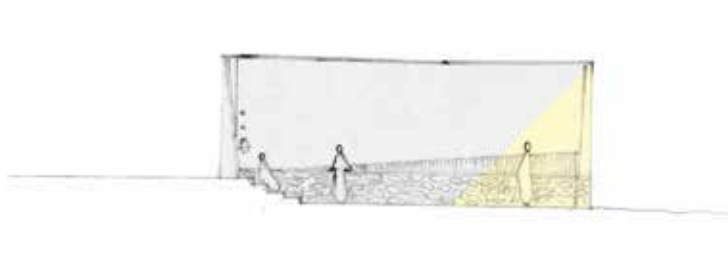
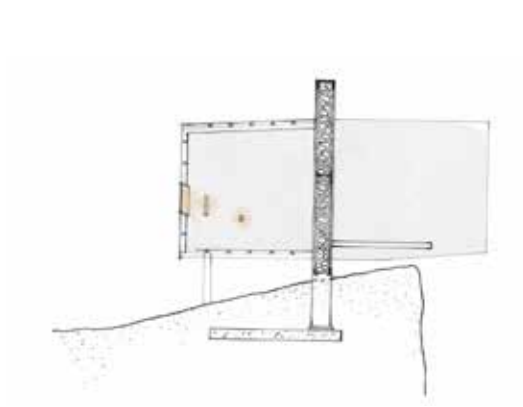
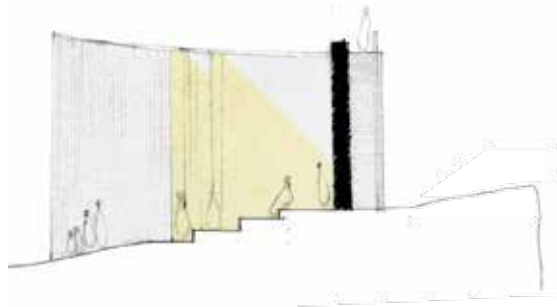
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FIGURE 7.9  
QUARRY PAVILION SECTION  
-MAY-  
(Author , 2016)

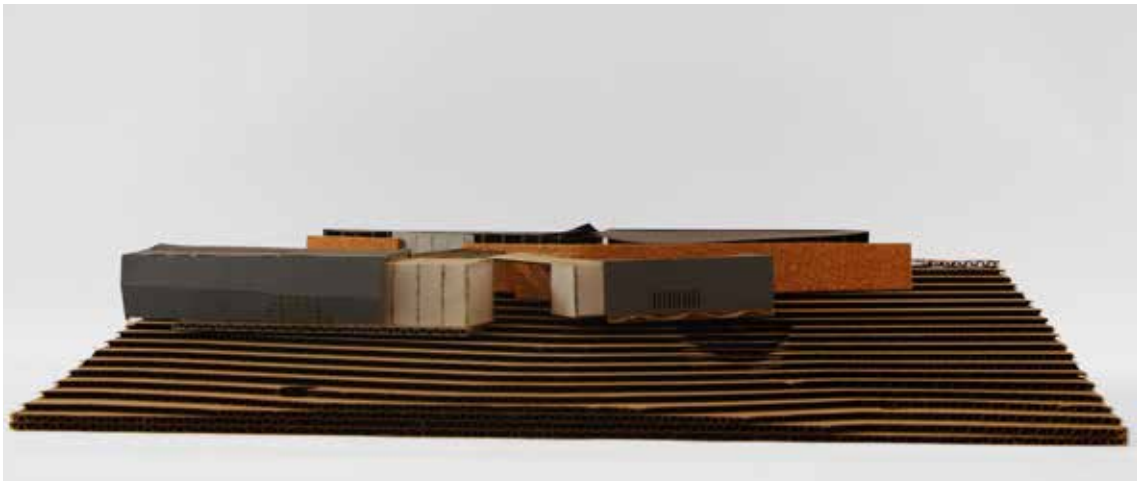
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FIGURE 7.10  
QUARRY PAVILION SECTION  
-AUGUST-  
(Author , 2016)

▶  
FIGURE 7.11  
FIELDWORK STATION ELEVATION  
-MAY-  
(Author , 2016)

▶  
FIGURE 7.12  
QUARRY PAVILION SECTION  
-AUGUST-  
(Author , 2016)









### 7.2.1.3 THE VIVARIUM

The Vivarium is located in close proximity to Cobra Cave, one of only a few caves in the area where Chiroptera fossils were discovered. The restaurant building is placed on the edge of the cave opening, allowing visitors to view the direct link to the karst system. The initial design allowed a large open view across the site (Fig. 7.13), the restaurant building was further developed to create a contrast between interior and exterior space, with a large glazed opening revealing the karst opening (Fig. 7.14). The design iteration, as developed by September (Fig. 7.15), moved away from revealing the karst opening in an abrupt manner, such as done by the Quarry Pavilion, and made use of a screening element, opening up to the karst opening as the visitor progresses through the restaurant building.

◀  
FIGURE 7.13  
VIVARIUM MODEL EAST ELEVATION  
-APRIL-  
(Author , 2016)

◀  
FIGURE 7.14  
VIVARIUM MODEL EAST ELEVATION  
-JUNE-  
(Author , 2016)

◀  
FIGURE 7.15  
VIVARIUM MODEL EAST ELEVATION  
-SEPTEMBER-  
(Author , 2016)

### 7.2.2 LAYERS OF THE BUILDING 7.2.2.1 STEREOTOMIC

Each building one encounters along the route makes use of large walls, seeming to protrude from the earth, protecting the site, guiding the visitor and, over time, creating habitat. These walls are constructed from materials of the site, such as earth and stone.

The initial design saw all of the walls being constructed out of rammed earth. With further development, each building was developed to respond to the typology relating to the circumstances of the site it is influenced by, for example the Quarry Pavilion. The Pavilion is influenced by the industrial typology of the mining industry, moving away from a rammed earth wall (fig 7.16) to a welded mesh wall, made up of large steel channels, and filled with loose stones, found in the quarry itself (Fig. 7.17).

The Ticket Office (Fig. 7.18), located at the entrance to the site, is based on a barn

typology, relating to the past and present farming activities of the surrounding area. With the development of the design, the construction material of the walls moved away from rammed earth to a patterned brick screen. The screen is constructed from reclaimed brick, found across the road in a kraal ruin.

As the design of the Vivarium progressed, the main construction material remained earth, due to its thermal and moisture control properties. The construction method, however, moved from rammed earth construction, to lime stabilised earth construction, supported on a stone wall of the same width.

The construction material of the final building on the route, the Fieldwork Station (Fig. 7.19), also changed as the design developed. The station makes use of a cavity wall with a passive evaporative cooling system, to act as a low-tech fridge. Rammed earth was thus seen as an unsuitable construction material, as it weathers at a faster tempo than does stone, when exposed to constant dripping water.

#### 7.2.2.1 TECTONIC

The structures developed around the habitat created by the large walls are formed through light-weight structures, resting above the landscape. The structures are clad with an internal and external skin, regulating the internal environmental conditions. With further development of the design, the different parts of which the structure is constituted are revealed. The external skin pulls away from the structure, to allow for light to penetrate the internal spaces, while exposing the structure (Fig. 7.20).

### 7.3 PROTECTION 7.3.1 WATER

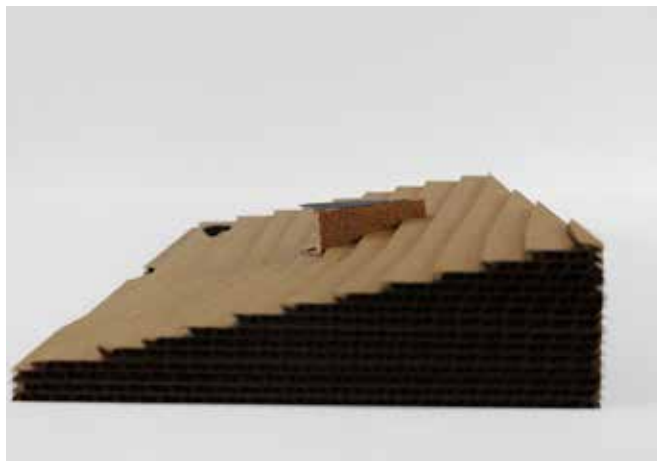
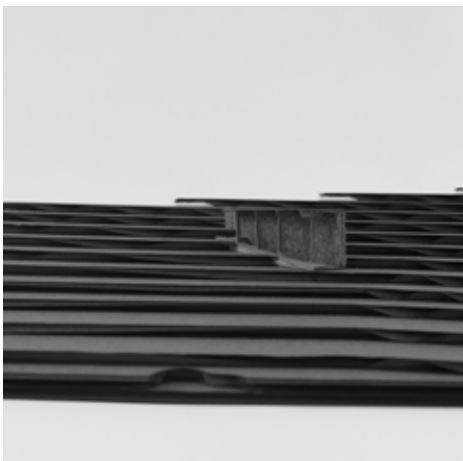
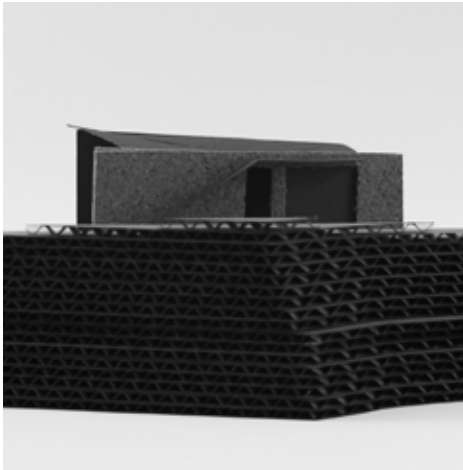
Water channels are proposed along the routes, running along the contours of the site to minimise the amount of water running down the slope to the openings and caves. The channels lead to one larger channel, running down the slope, leading the water to a retention pond. The water management strategy is to better control the quality and quantity of surface water infiltrating the karst system.

#### 7.3.2 FIRE

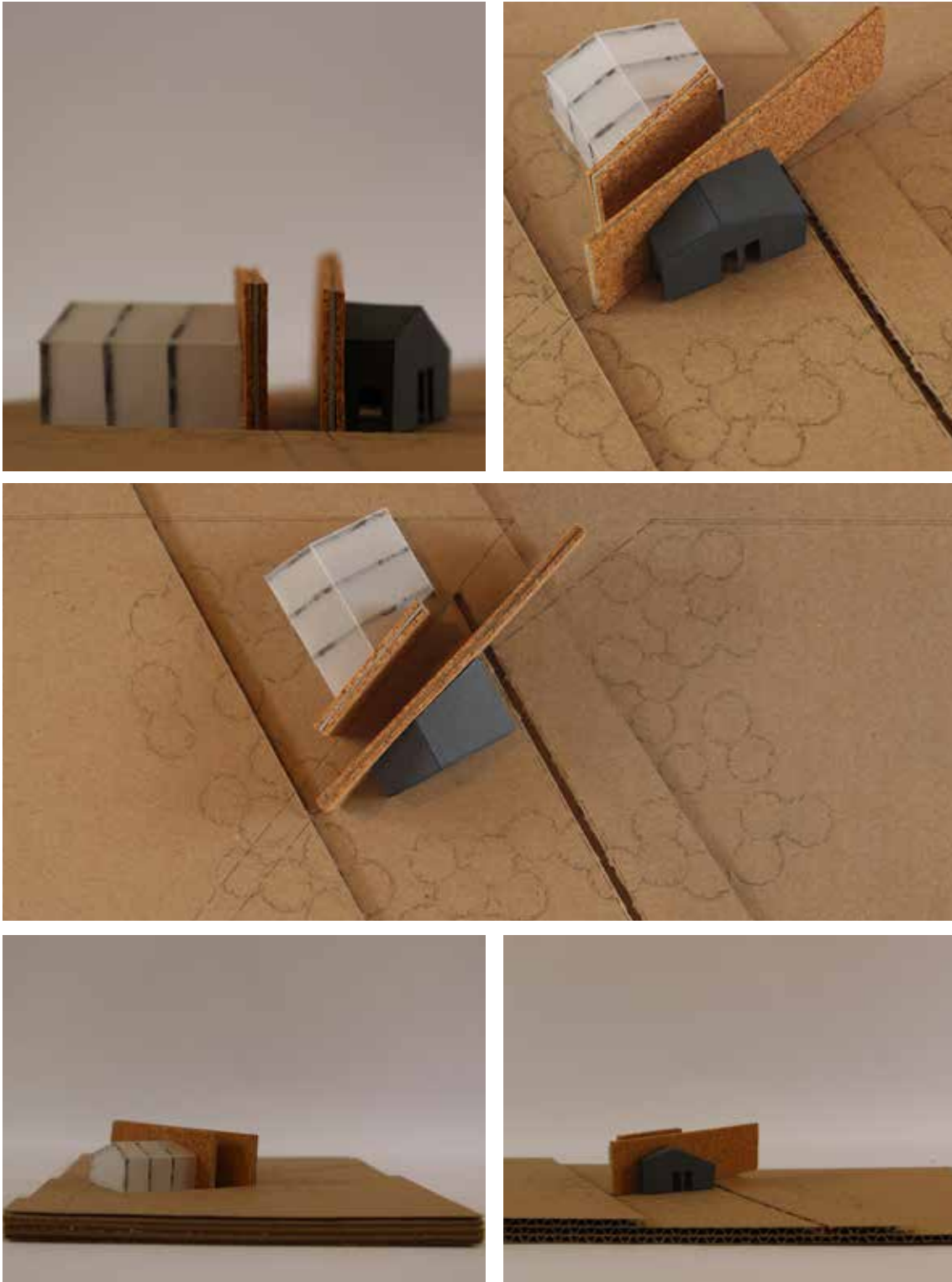
Veld-fires in the grassland biome in which the Cradle of Humankind is situated are inevitable. The proposed routes that connect the various buildings on Bolt's Farm are also utilised to serve as fire breaks. These routes not only serve the human visitors to the site, protecting the buildings, but create open pathways the veld animals use to navigate to safety. With further development of the Vivarium, a temporary habitat is created, hosting the species which flee from the fires, until the animals can safely retreat back into the veld.

### 7.4 CREATING HABITATS FOR CO-EVOLUTION 7.4.1 CHIROPTERA HOUSE

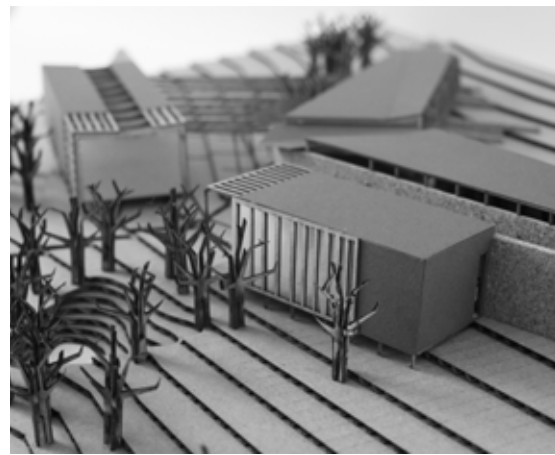
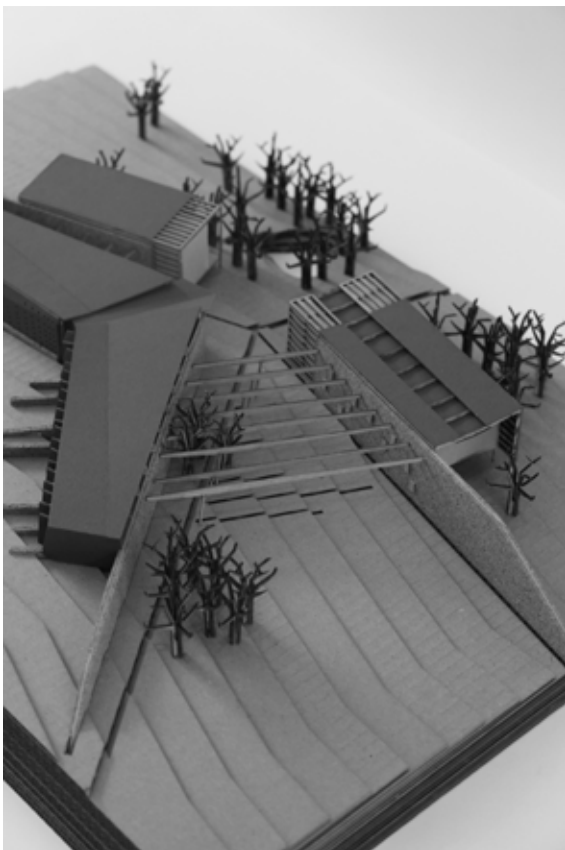
The immediate environment of an animal directly and indirectly affects the animals biological and behavioural responses (The National Institutes of Health 2008, :192). The noise, light, vibrations, and thermal comfort of a vivarium not only affect the well-being of the animal, but also the quality of research. Together with the animals hosted, a vivarium is also a workplace for employees (The National Institutes of Health 2008:193). The development of the habitat for the Schreibers' long-fingered bat habitat takes these two types of



▲ FIGURE 7.16 & 7.17  
QUARRY PAVILION & FIELDWORK  
STATION MODEL DEVELOPMENT  
(Author , 2016)



▲  
FIGURE 7.18  
TICKET OFFICE MODEL  
-JUNE-  
(Author , 2016)



▲ FIGURE 7.19  
VIVARIUM MODEL  
-SEPTEMBER-  
(Author , 2016)

users, namely the animals (bats) and the employees (chiroptera zoologists) into account, adding a third user, namely the (wildlife) tourist.

The design of the vivarium aims to create a favourable habitat to attract the Schreiber's long-fingered bat. The design of the vivarium not only strives to provide the ideal conditions for the bat colonies to thrive, but also to support a healthy social environment for the animals, mimicking the animal's natural environment (The National Institutes of Health 2008:193).

The Chiroptera House, as developed by April, (Fig. 7.21) is shown as one large internal space, allowing the wildlife tourists to walk underneath the opening and view the bats as they emerge and hang from the structure. With further research the internal space of the bat house is proven to be too large for the Schreiber's long-fingered bat species, as this species of bat prefers an internal space of 1-2 metre squared.

With the further development of the Chiroptera House, the internal space was reduced in order for the bat species to be able to heat up the space during the winter months with their radiating body heat. The design development by May (Fig. 7.22) did, however, not take into consideration the entirety of the eco-system in which the Schreibers' long-fingered bat species thrived, and did not offer the Chiroptera zoologists the opportunity to access the bats with ease.

A series of Chiroptera Houses are further developed, along with a micro-habitat, including a green wall hosting *Eulophia ovalis*, *Eulophia hians*, and *Eulophia inaequalis* orchids, in turn hosting various nocturnal flying insects. A series of water retention channels are also found in the foraging space at the openings of the Chiroptera Houses to host mosquitos, improving the biodiversity and foraging opportunities for the Schreiber's long-fingered bat (Fig. 7.24).

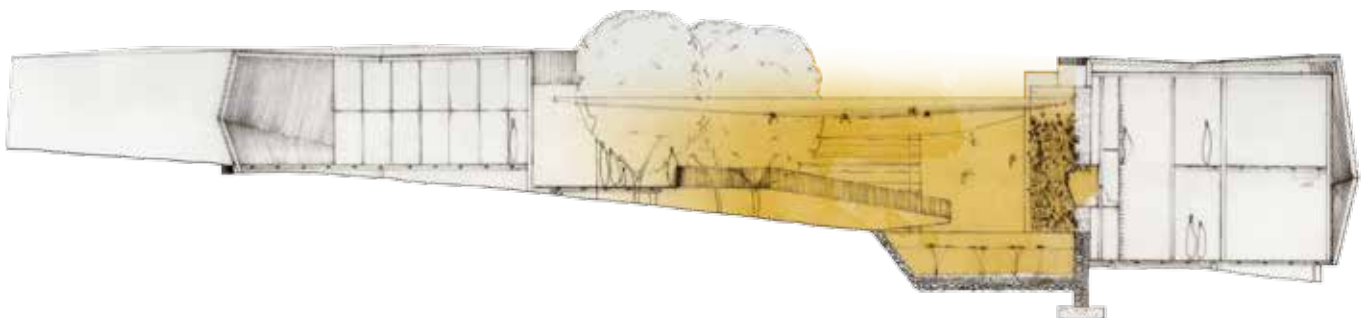
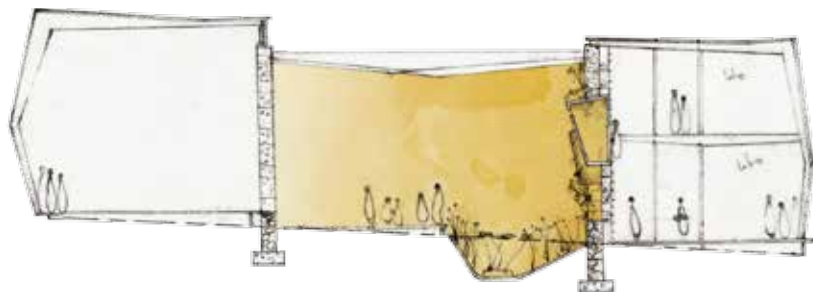
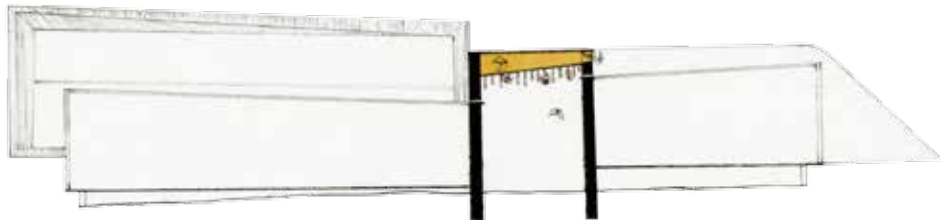
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FIGURE 7.20  
CHIROPTERA HOUSE  
-APRIL-  
(Author , 2016)

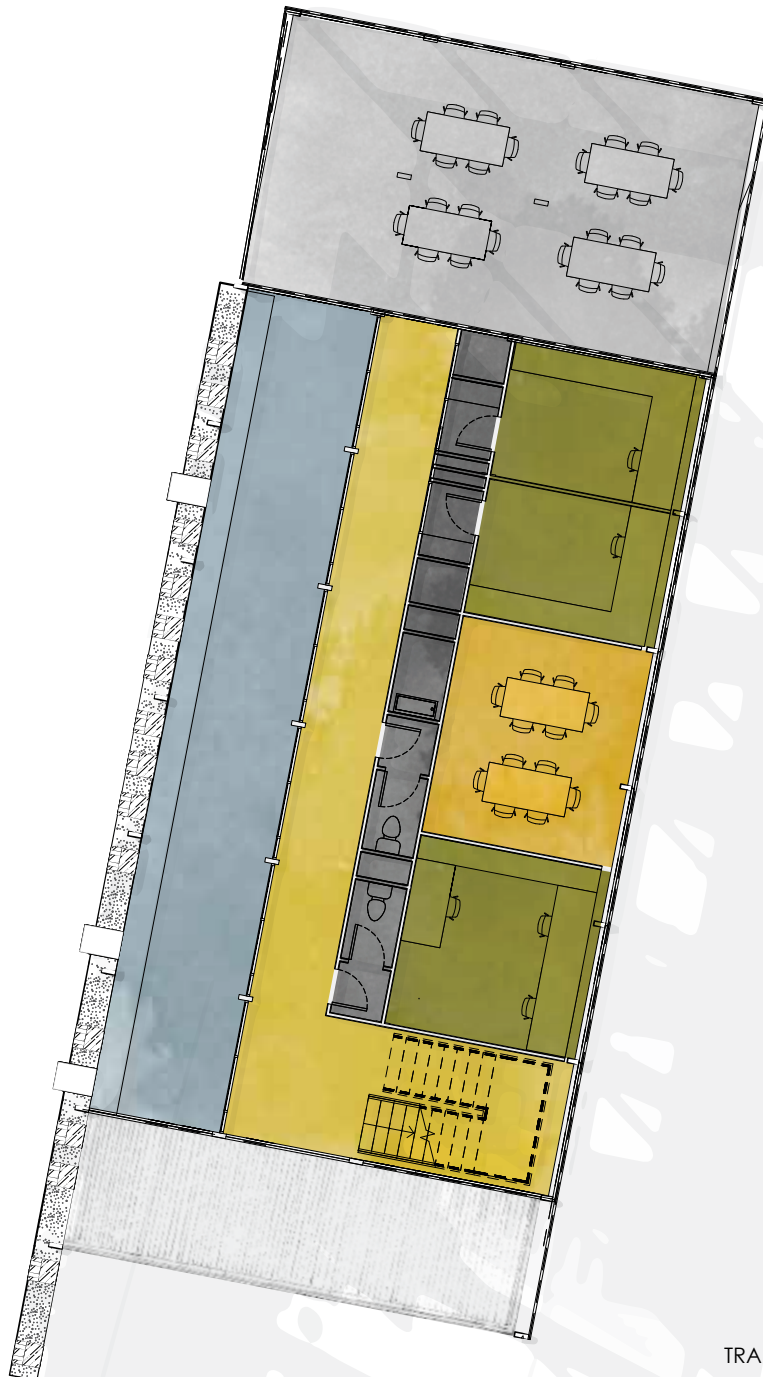
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FIGURE 7.21  
CHIROPTERA HOUSE  
-MAY-  
(Author , 2016)

▶  
FIGURE 7.22  
CHIROPTERA HOUSE  
-JUNE-  
(Author , 2016)

▶  
FIGURE 7.23  
CHIROPTERA HOUSE  
-JULY-  
(Author , 2016)







- PUBLIC SPACES ●
- TRANSITIONAL ZONES ●
- BARRIER ELEMENTS ●
- ANIMAL HOUSING ●
- VETERINARY CARE ●
- STAFF SUPPORT ●

◀  
FIGURE 7.24  
CLASSIFICATION OF VIVARIUM  
LABORATORY SPACES  
(Author , 2016)

## 7.5 ACCOMODATING 7.5.1 VIVARIUM LABORATORY

When designing for the employees, the occupational health and safety of the personnel become key considerations (The National Institutes of Health 2008:193). This includes factors such as sufficient air supply, adequate and hygienic work space and amenities like break-out spaces, training rooms, and staff offices.

Although natural light is favourable in some areas, including break out-spaces, controlled light is recommended for animal & laboratory spaces. The lighting requirements were taken into consideration, as seen in the June iteration, with the external skin controlling the lighting conditions of natural light. The external cladding is perforated in certain areas, to allow for the space to be lit up by both artificial and natural light.

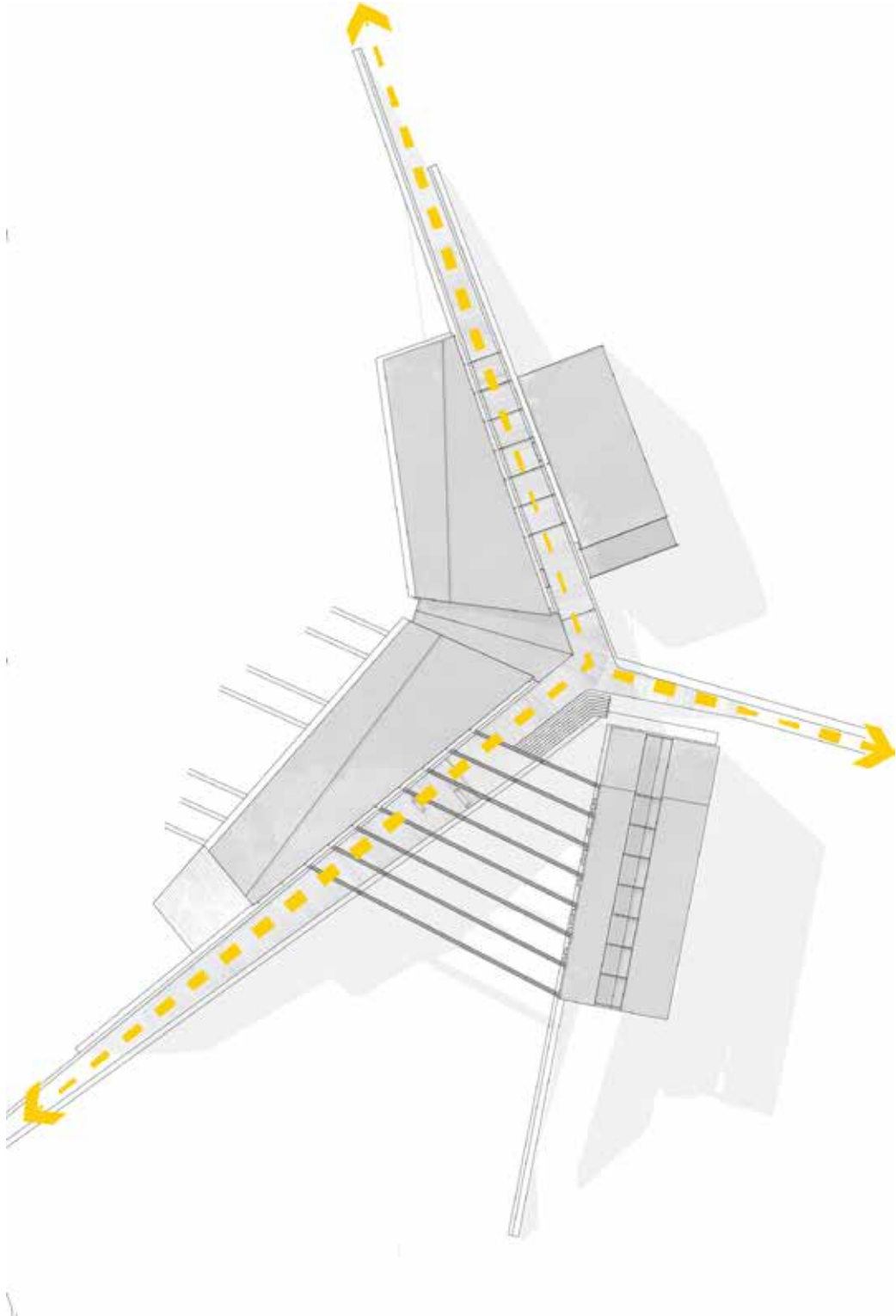
Traditional animal research facilities require support spaces, such as feed storage and quarantine areas for incoming animals. As the vivarium design creates a micro-habitat for the bats, these support spaces become redundant, and are not included within the laboratory spaces.

Hygiene is, however, a major priority when it comes to the design of the vivarium and laboratory spaces. The laboratory and supporting spaces are classified into the following zones:

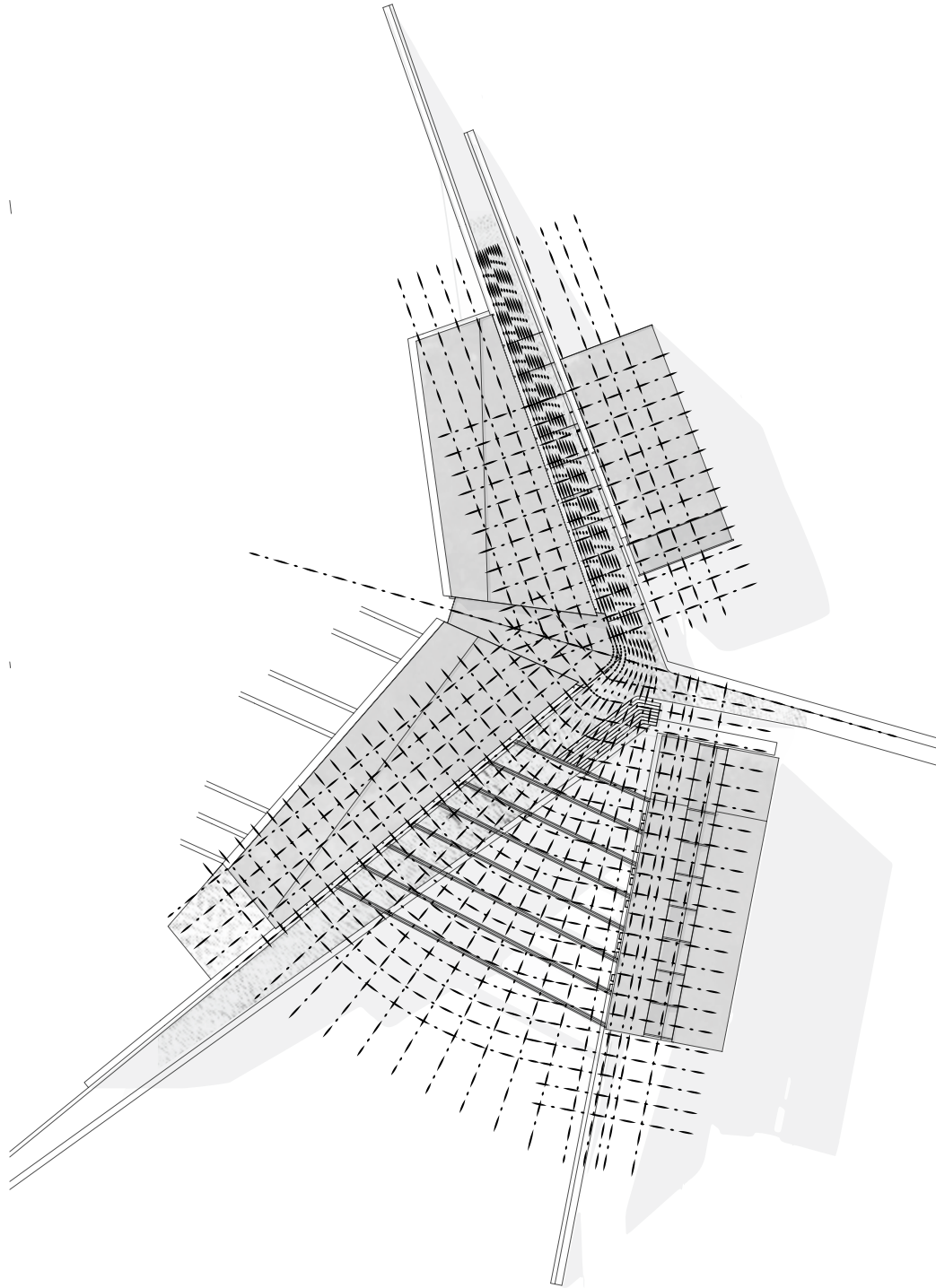
- Public spaces, including public corridors, training rooms and area where staff wear street clothing;
- Transitional zones, defined as areas of movement between the public areas and the areas the animals are housed;
- Barrier elements, including spaces such as airlocks and gowning areas;
- Veterinary care, including laboratories, clinical chemistry and histology rooms,
- Staff support areas; and
- Mechanical/ electrical equipment spaces (Stark et al. n.d.).

## 7.6 DESIGN RESPONSE SUMMARY

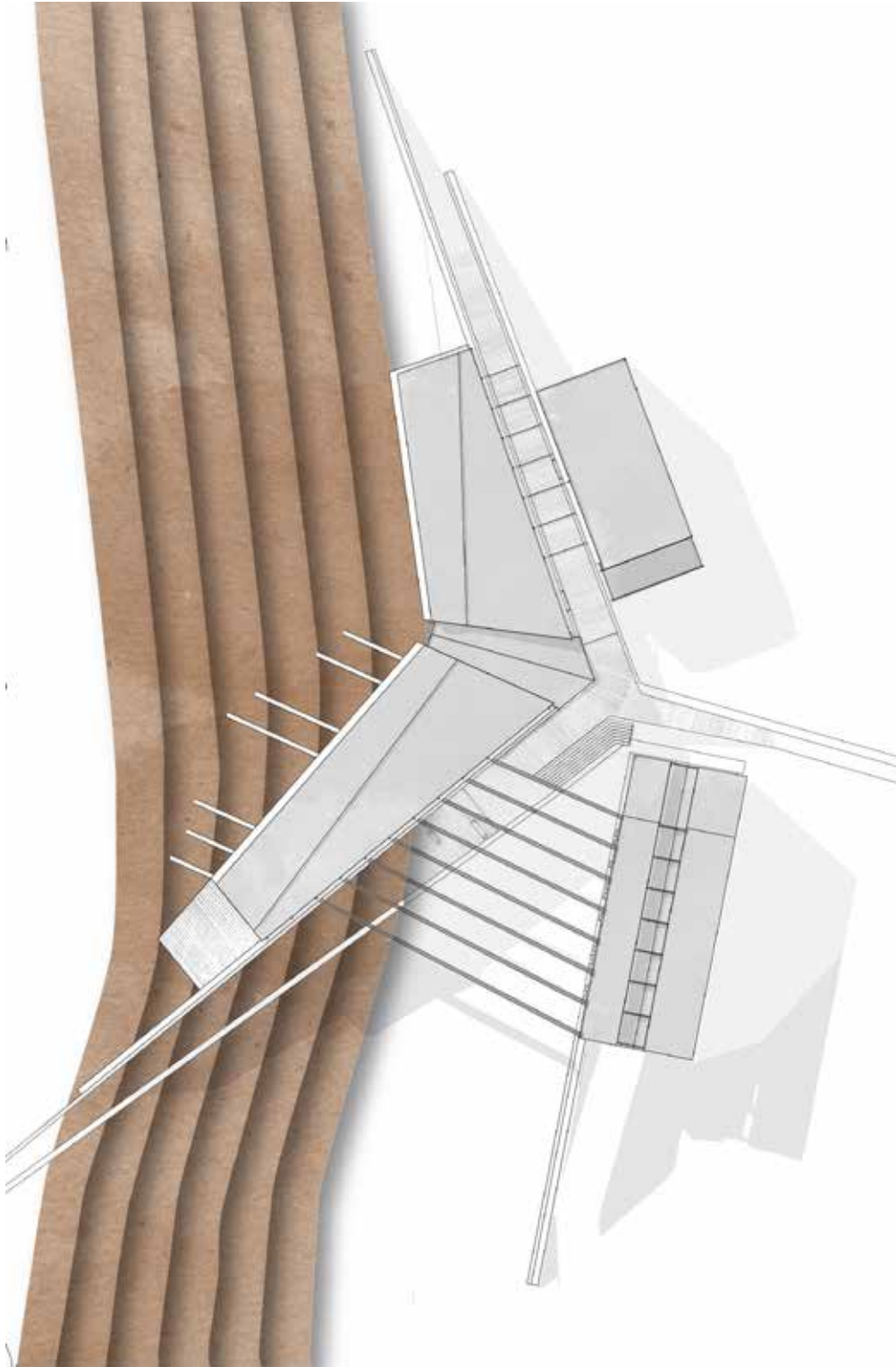
Together with the core intentions of protecting the landscape, creating habitat, and accommodation programme, the design of the Ticket Office, Quarry Pavilion, Vivarium, Fieldwork Station, and Amphitheatre is influenced by, and responds to various aspects of the landscapes, programmatic requirements, and the intended experiences of spaces. These influences include the relationship with the route running through Bolt's Farm, the geomorphology, including the slope of the landscape, and the openings to the karst system, the location of existing trees, and the views from specific vantage points in each building. The response to each aspect is illustrated through a series of diagrams based on the Vivarium.



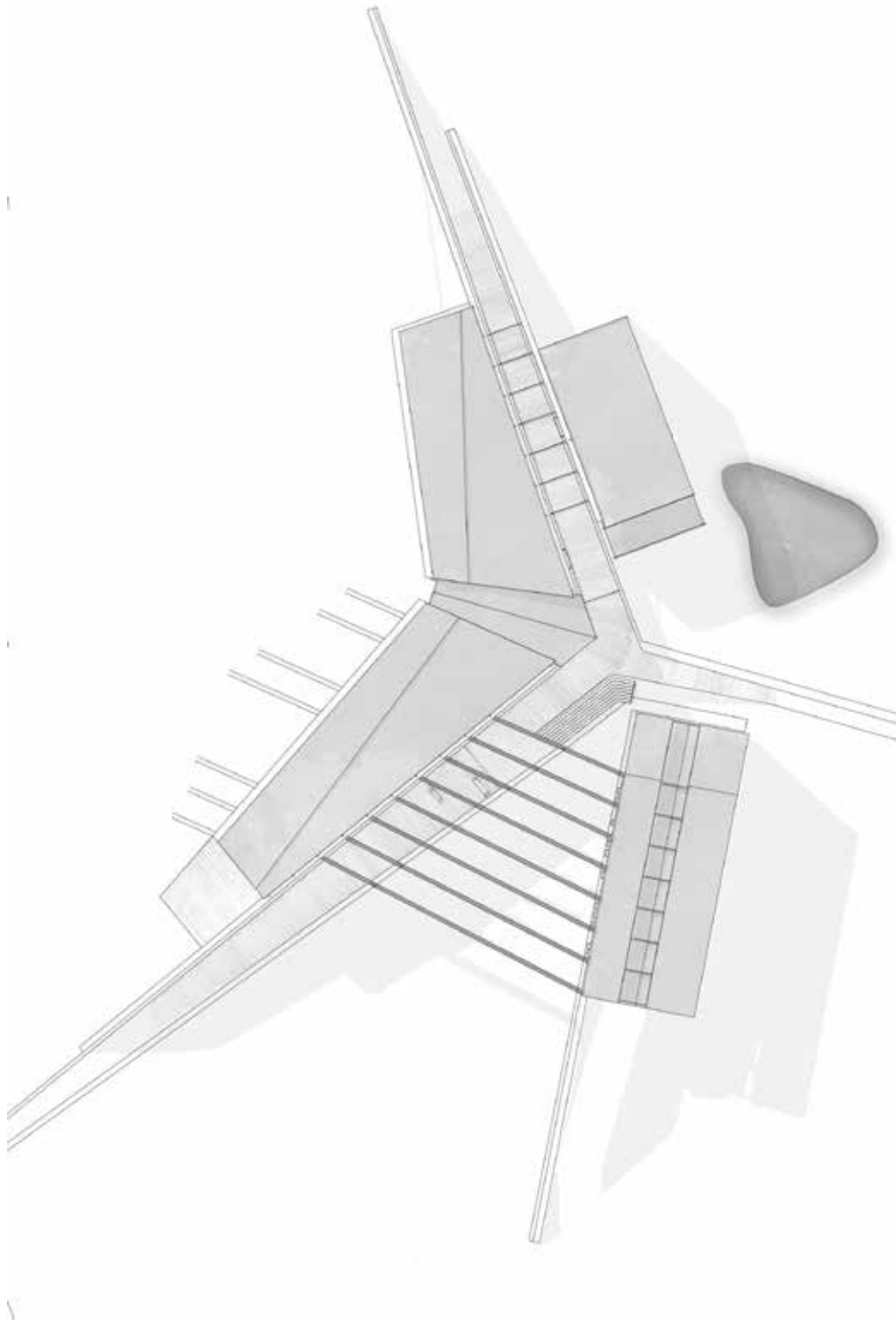
▲  
FIGURE 7.25  
RESPONSE TO ROUTE  
(Author , 2016)



▲  
FIGURE 7.26  
RESPONSE TO  
STRUCTURAL SYSTEM  
(Author , 2016)



▲  
FIGURE 7.27  
RESPONSE TO CONTOURS  
(Author , 2016)

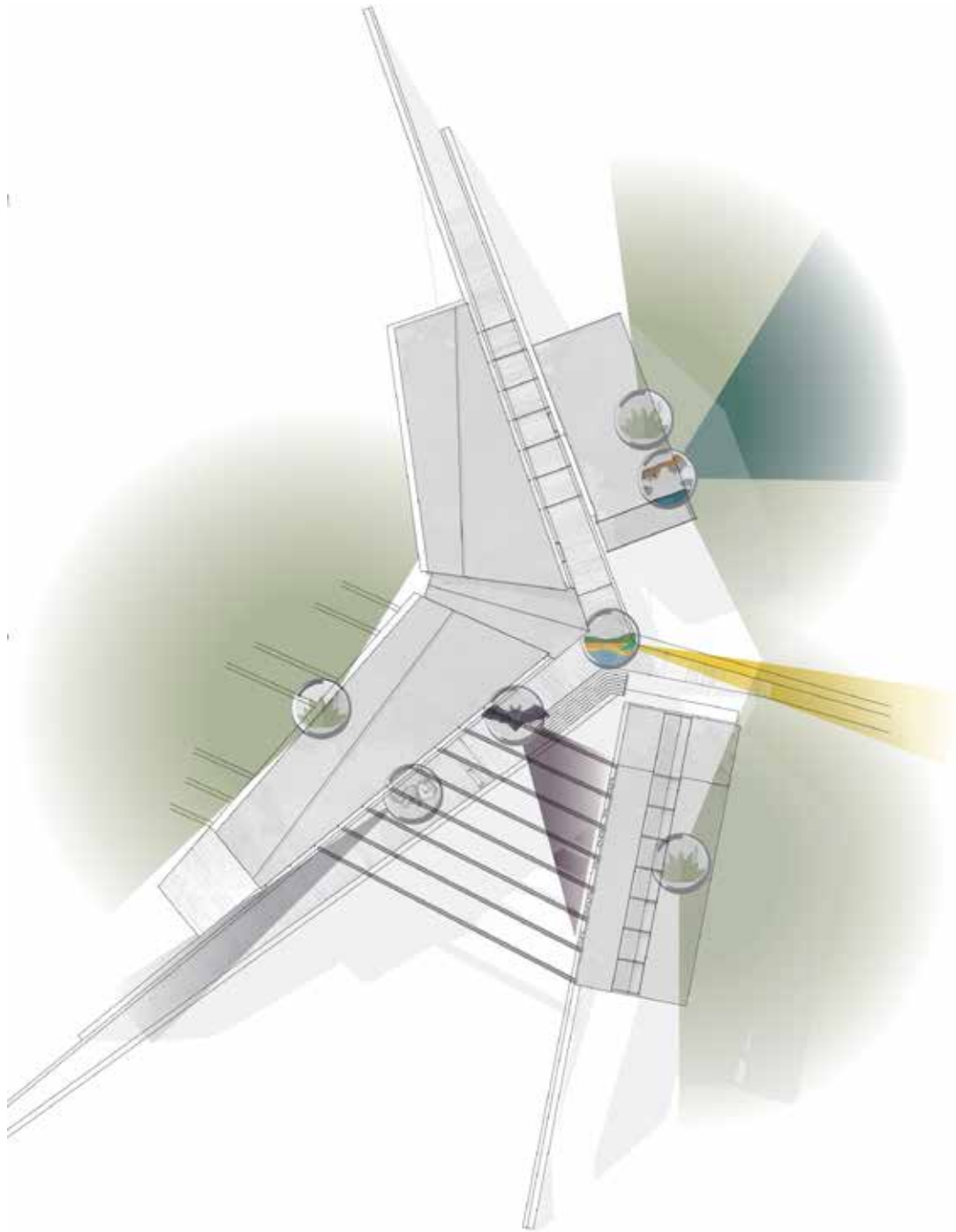


▲  
FIGURE 7.28  
RESPONSE TO  
CAVES & SINKHOLES  
(Author , 2016)



▲  
FIGURE 7.29  
RESPONSE TO  
VEGETATION & TREES  
(Author , 2016)





▲ FIGURE 7.30  
RESPONSE TO VIEWS  
(Author , 2016)

