

## Design Portfolio

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2023



Student Work

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The Atmospheric Water Harvesting Centre - The Central Building & The Two Greenhouses (2023).



MA Architecture Year 5 (2022-2023)

The Atmospheric Water Harvesting Centre



The Atmospheric Water Harvesting Centre - Rendered Front View.



# The Atmospheric Water Harvesting Centre

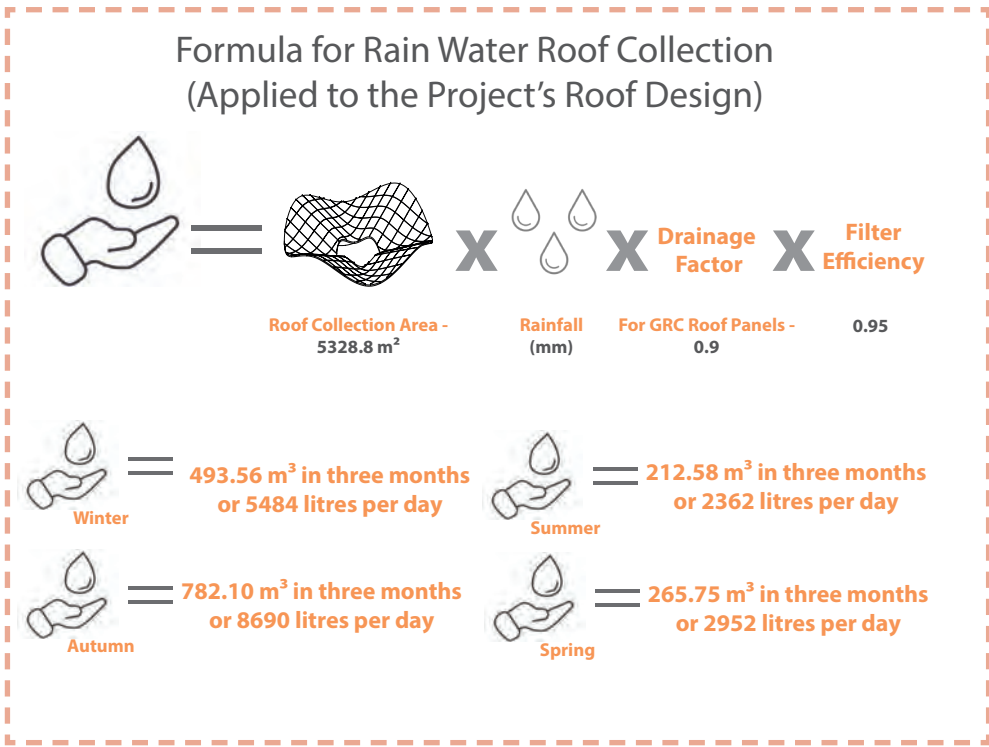
## MA Architecture Year 5 (2022-2023)

The summer of 2022 was proclaimed to be the driest summer in the UK in the last 50 years. The conditions, which have almost completely deprived some areas of rainfall all summer, have prompted the National Drought Group to move parts of the Southwest, parts of Southern and Central England into official drought status. Hosepipe bans remained in place for Cornwall and parts of North Devon all summer of 2022.

The Atmospheric Water Harvesting Centre’s vision is to find solutions to the water shortage problem in Cornwall during hot summer months. The design acts as a strategic public-serving architectural intervention to help restore the Cornish agricultural lands through innovative water harvesting processes.

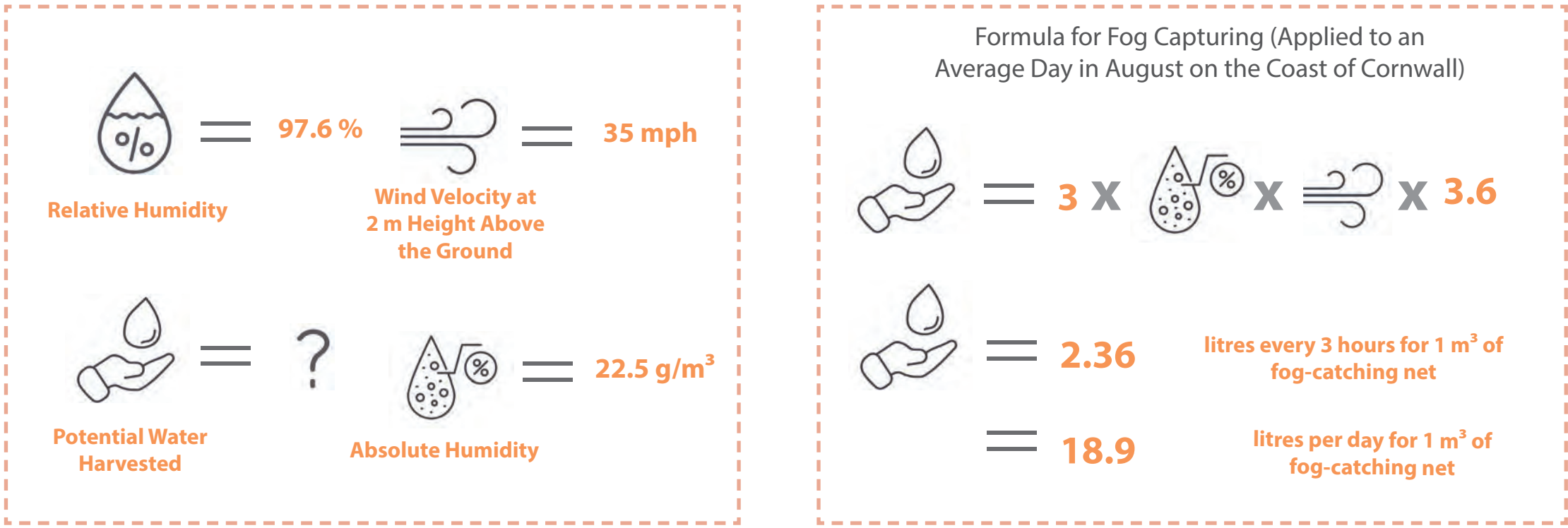
The project’s site is the St. Austell Clay Pits in Cornwall. The site is formed by a group of locations within active China clay quarries that form a single Site of Special Scientific Interest. The first year of the prototype building will have the purpose of harvesting fog, dew, and rain from the air. The water collected will be used to maintain one acre of wheatland and crops in greenhouses. In 5-10 years’ time, if successful, the prototype could be replicated and could become a regional/national strategy to provide water for agricultural lands in the UK.

### Rain Capturing



The Parametric Roof of 5328.8 m<sup>2</sup> was the most efficient design in terms of rain water collecting capacity.

### Fog Capturing

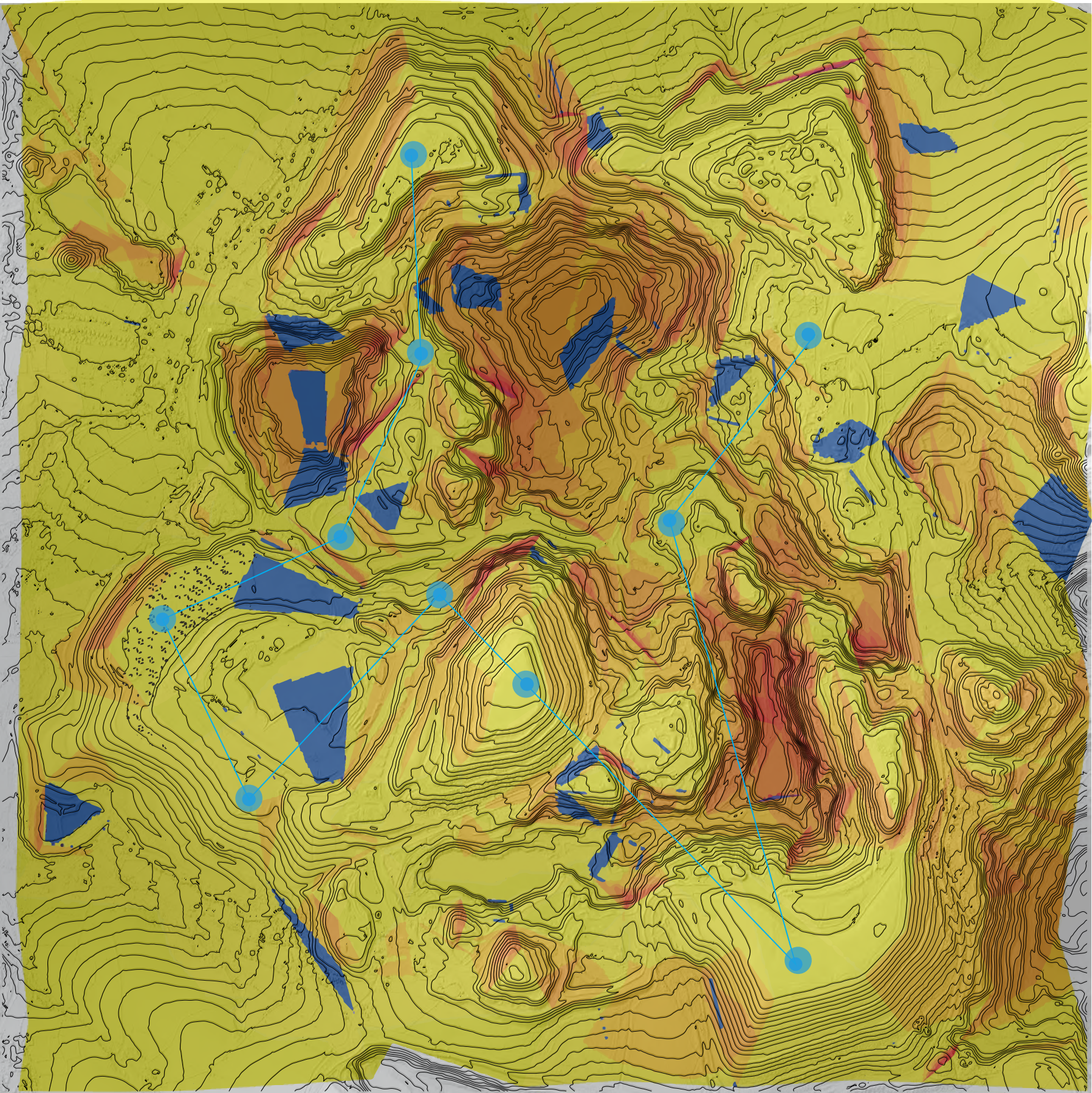


During rainy season the building’s roof harvests the rainwater to maintain the plants within the greenhouses.

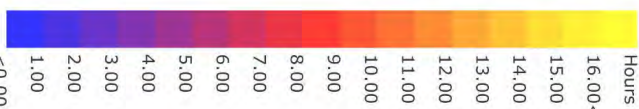


St Austell China Clay Pits - Site Analysis

St. Austell Clay Pits expand over 0.6 hectares of land. The design will only cover a small part of the abandoned clay pits. The heights of several clay mountains reach 70 metres.

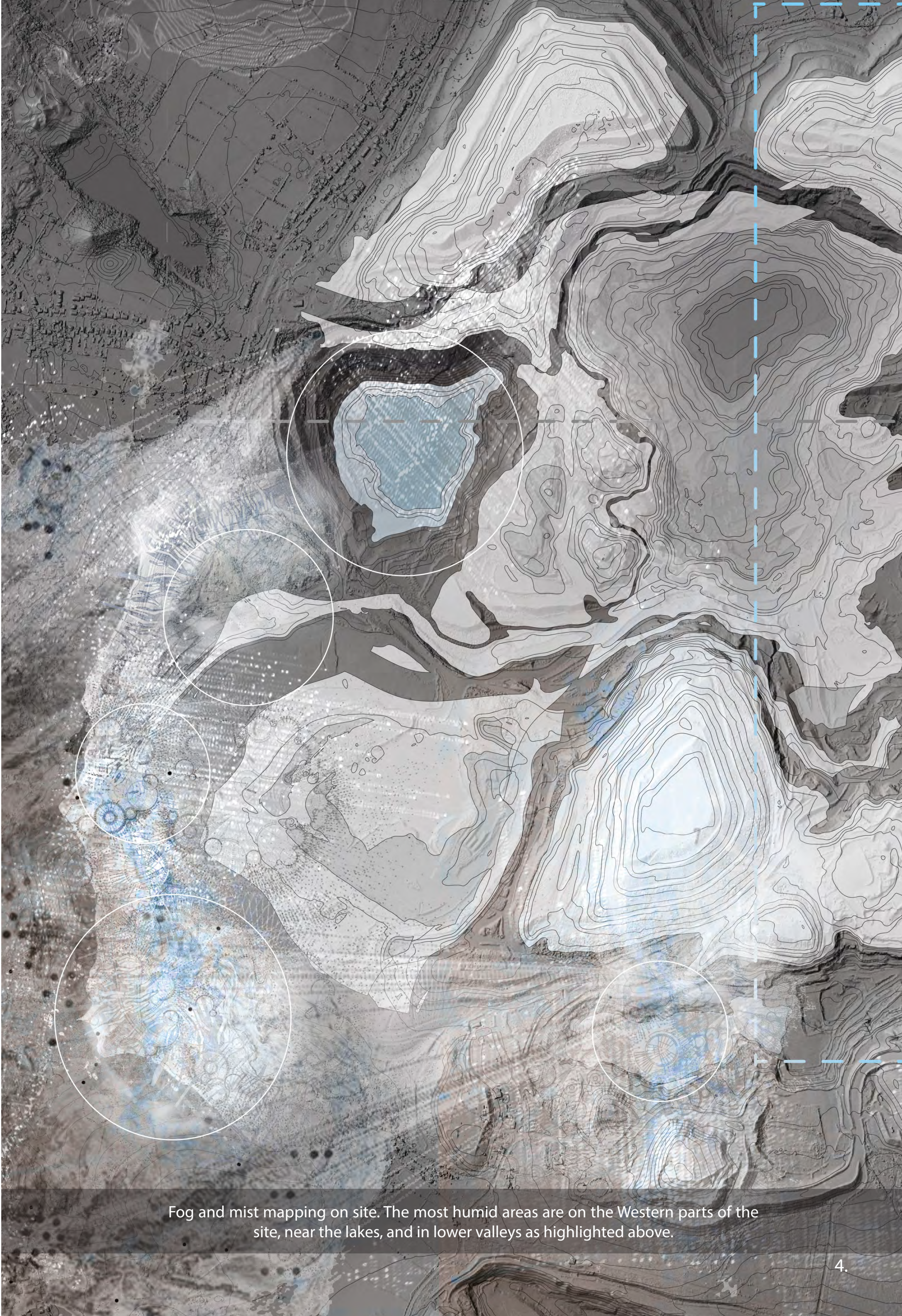


Sunlight Hours Analysis May-August 2022  
(Wheat Growing Season)



Scale 1:8000

Illustrated Site Plan with Daily Sunlight Hours during May-August 2022 ( Wheat Growing Season).

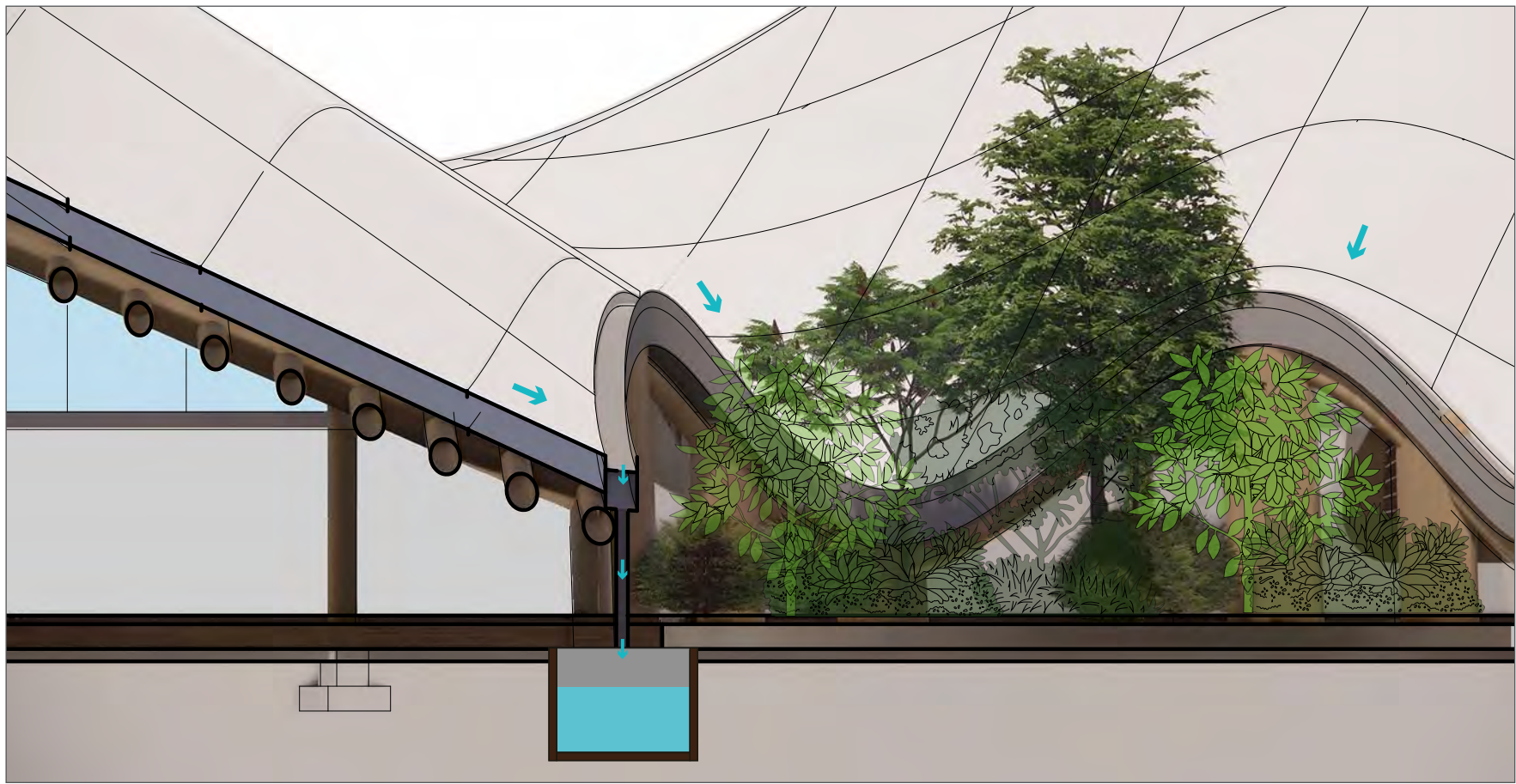


Fog and mist mapping on site. The most humid areas are on the Western parts of the site, near the lakes, and in lower valleys as highlighted above.

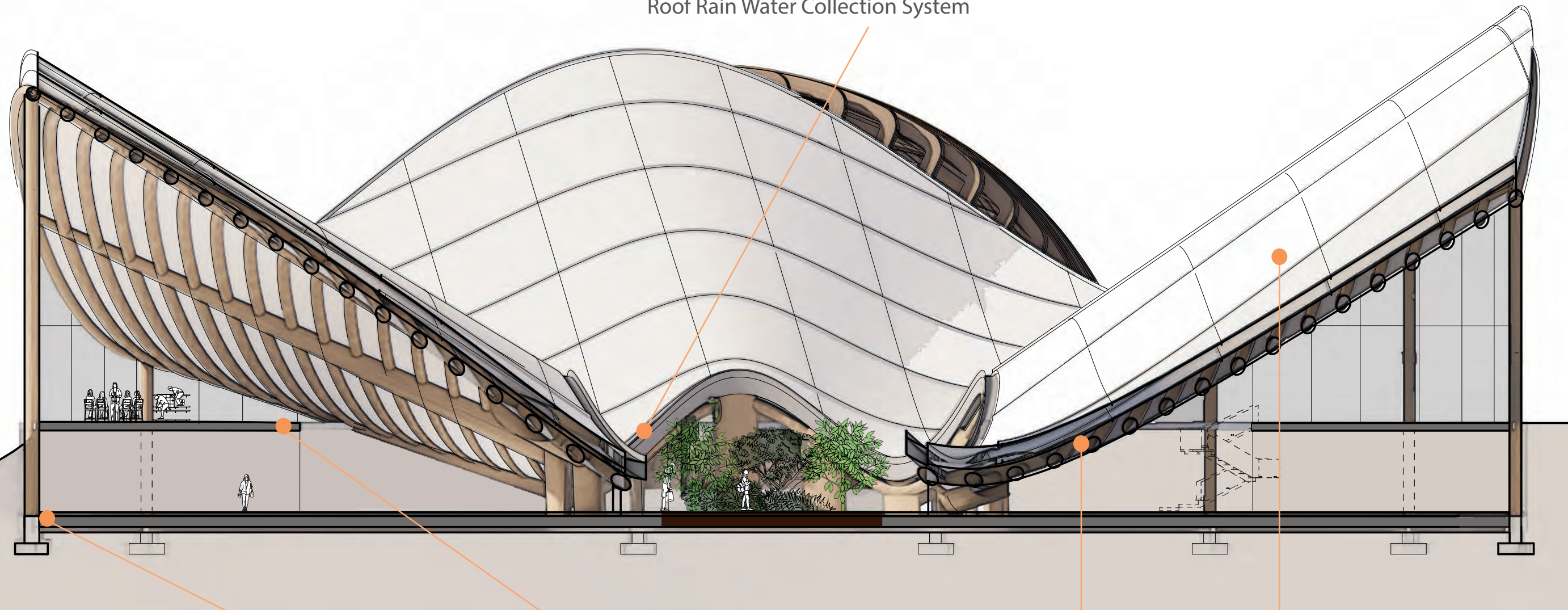


The Atmospheric Water Harvesting Centre

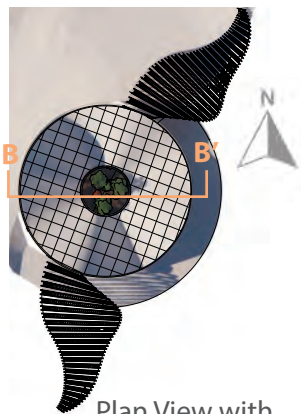
St Austell China Clay Pits - Site Analysis



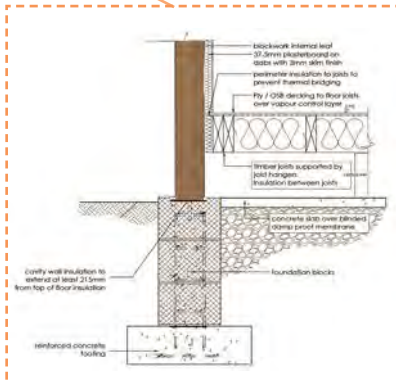
Roof Rain Water Collection System



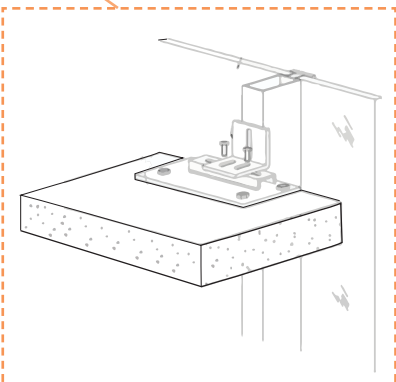
Section Drawing BB' of the Atmospheric Water Harvesting Centre



Plan View with Section Line



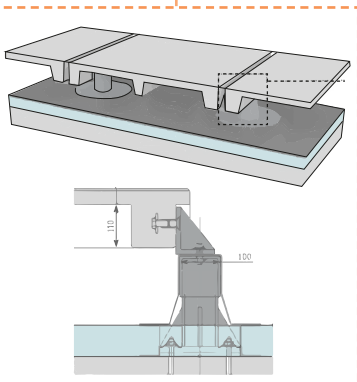
Accoya Wood Column and Concrete Foundation Connection



Connection Between Concrete Floors and Glass Facade

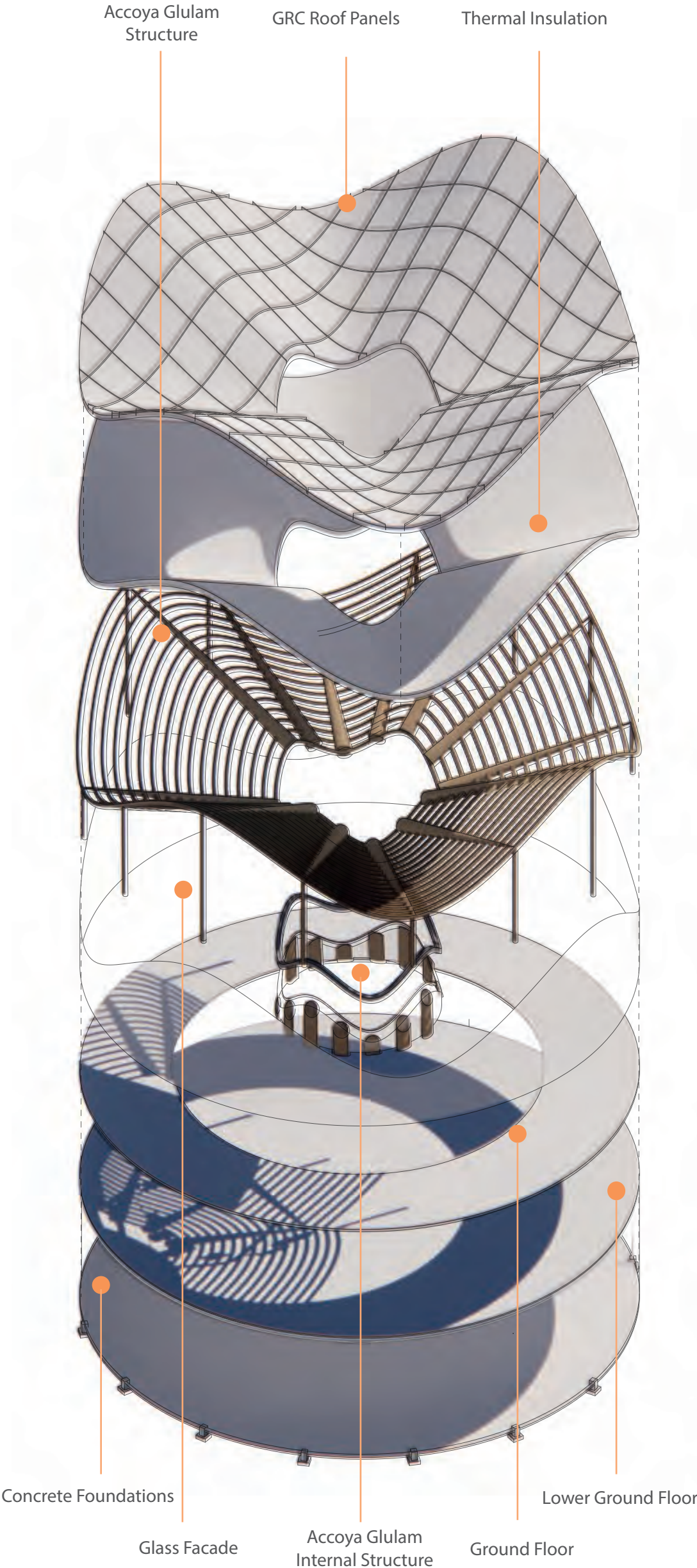


Curvature Accoya Glulam Ceiling Structure

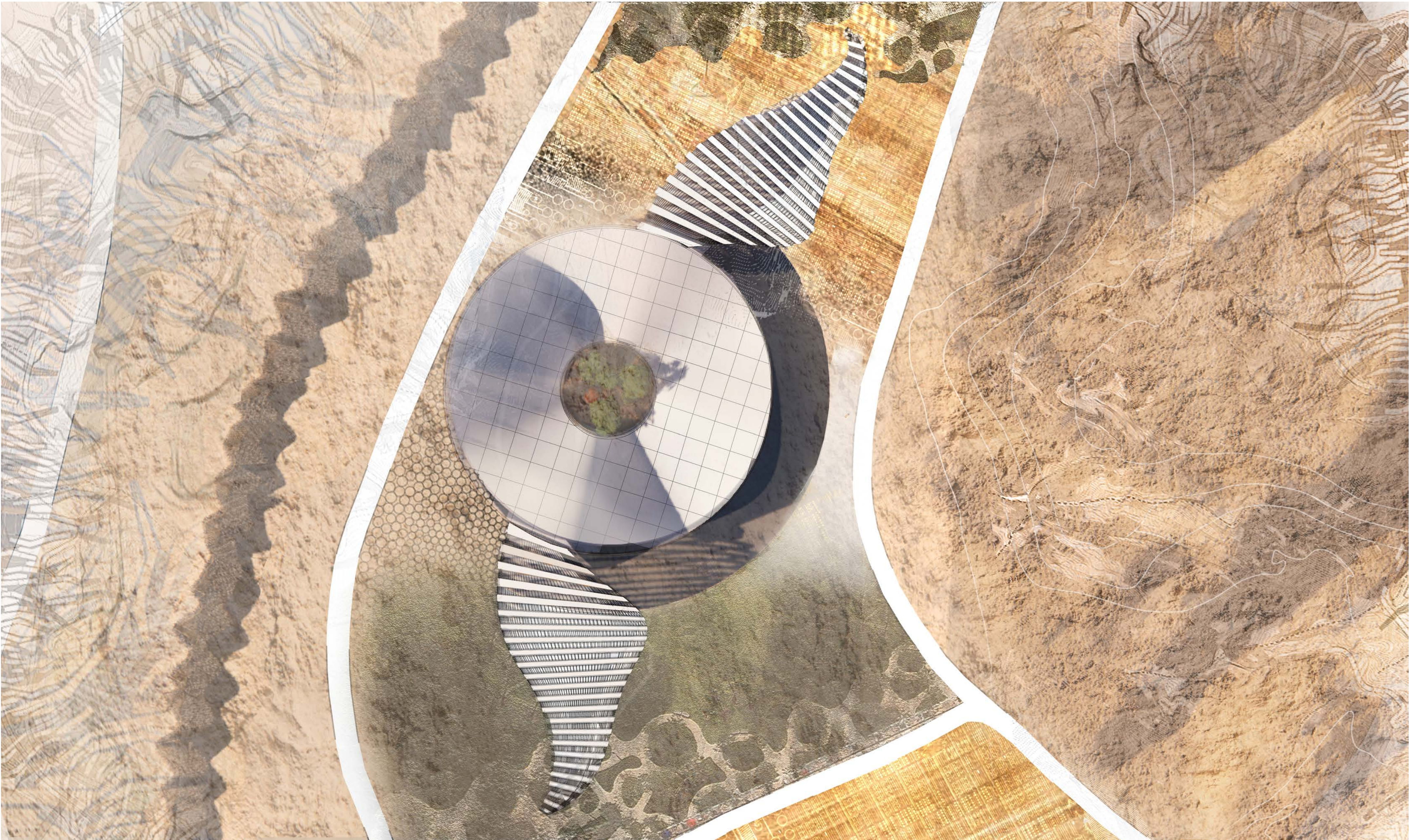


GRC Roof Panel - Construction Detail

Exploded Building Structure



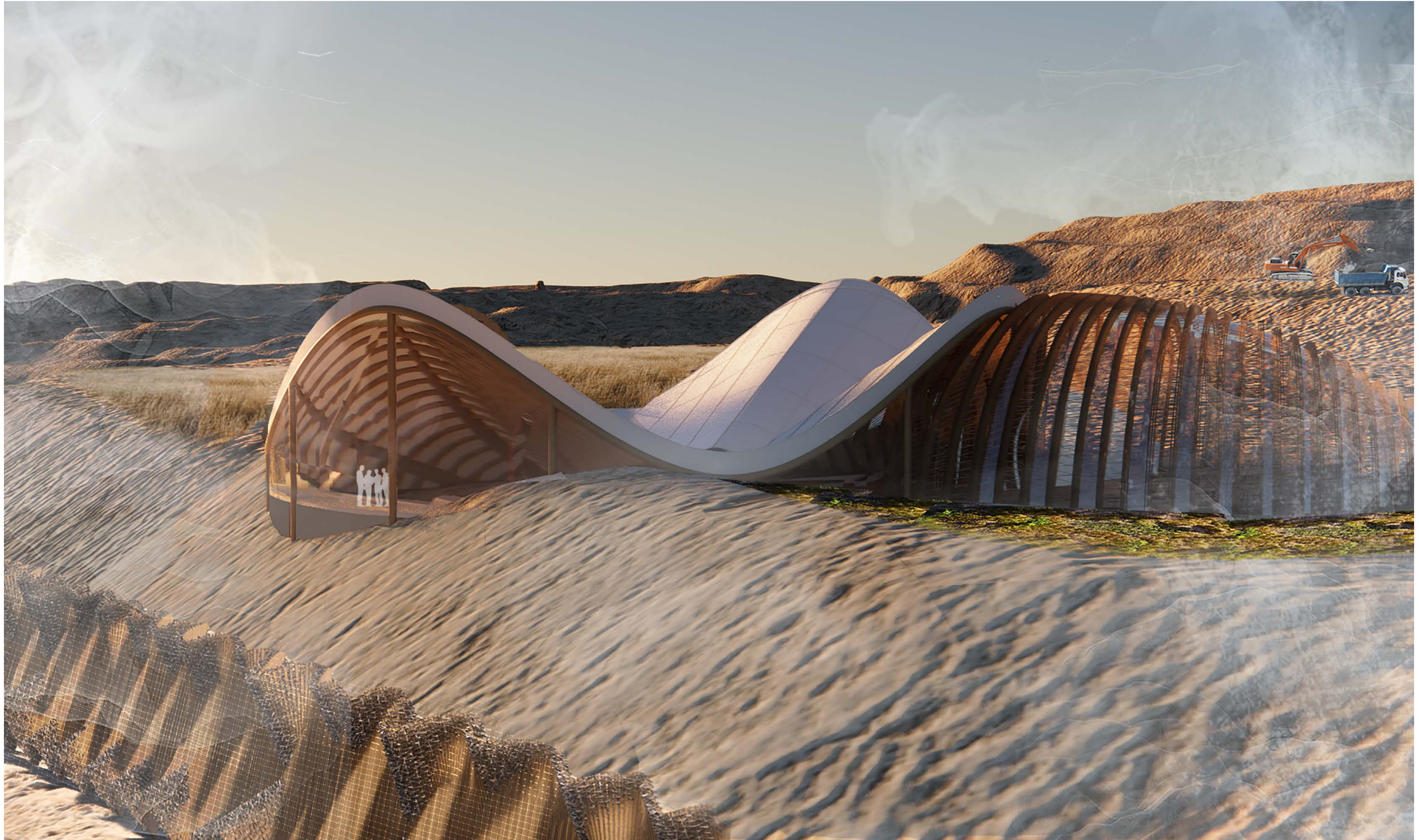




Exterior Plan Drawing at 1:200 scale highlighting the Central Building, the Greenhouses, the Wheatland, and Fog Mapping on the Left-hand Side.



## The Atmospheric Water Harvesting Centre - Perspective View in Summer



The Atmospheric Water Harvesting Centre & Vertical Fog Capturing Nets on the bottom left side of the image.



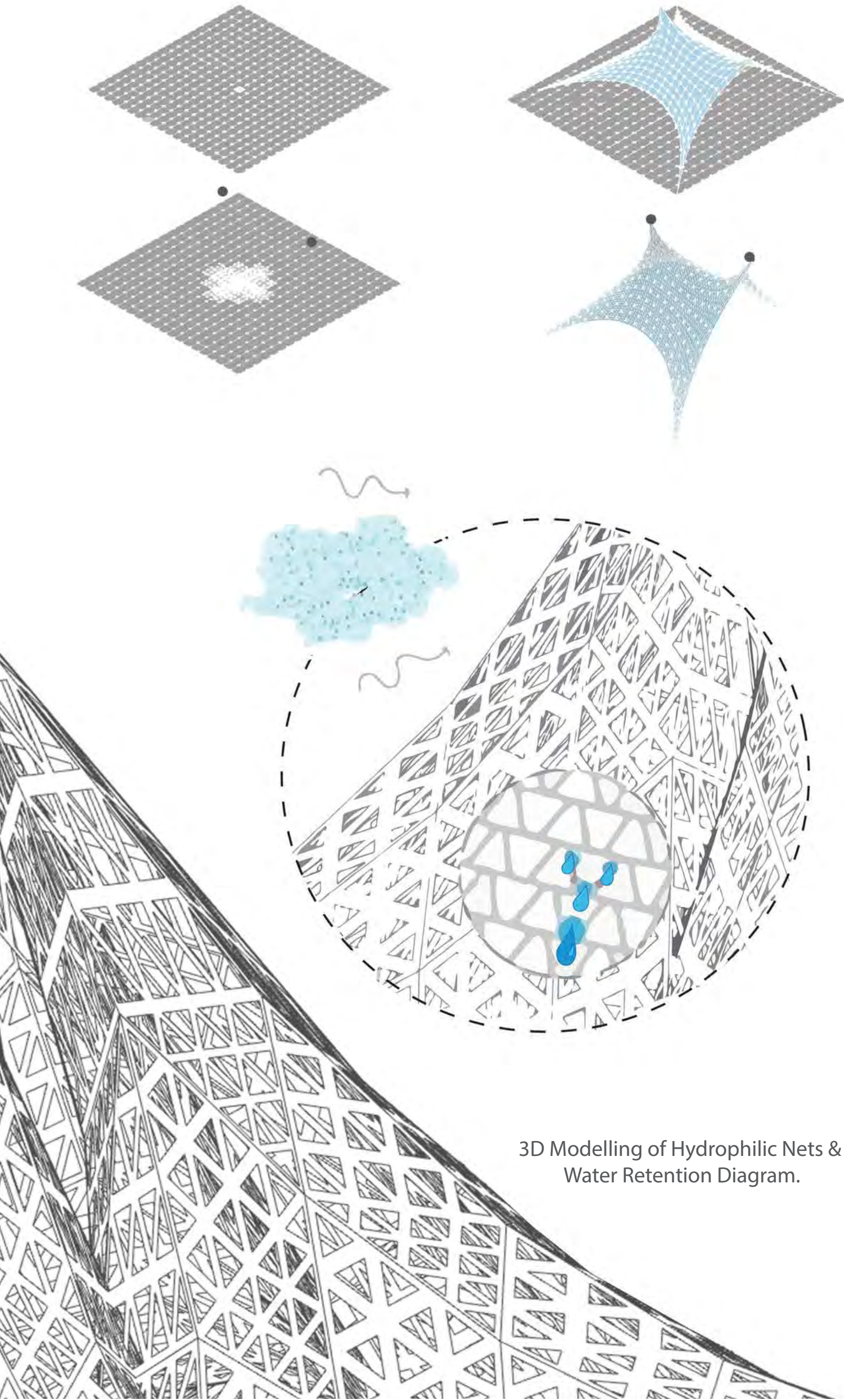


The Atmospheric Water Harvesting Centre's Greenhouses are connected to the Central Building and utilise the water harvested from fog and rain to irrigate the plants inside.

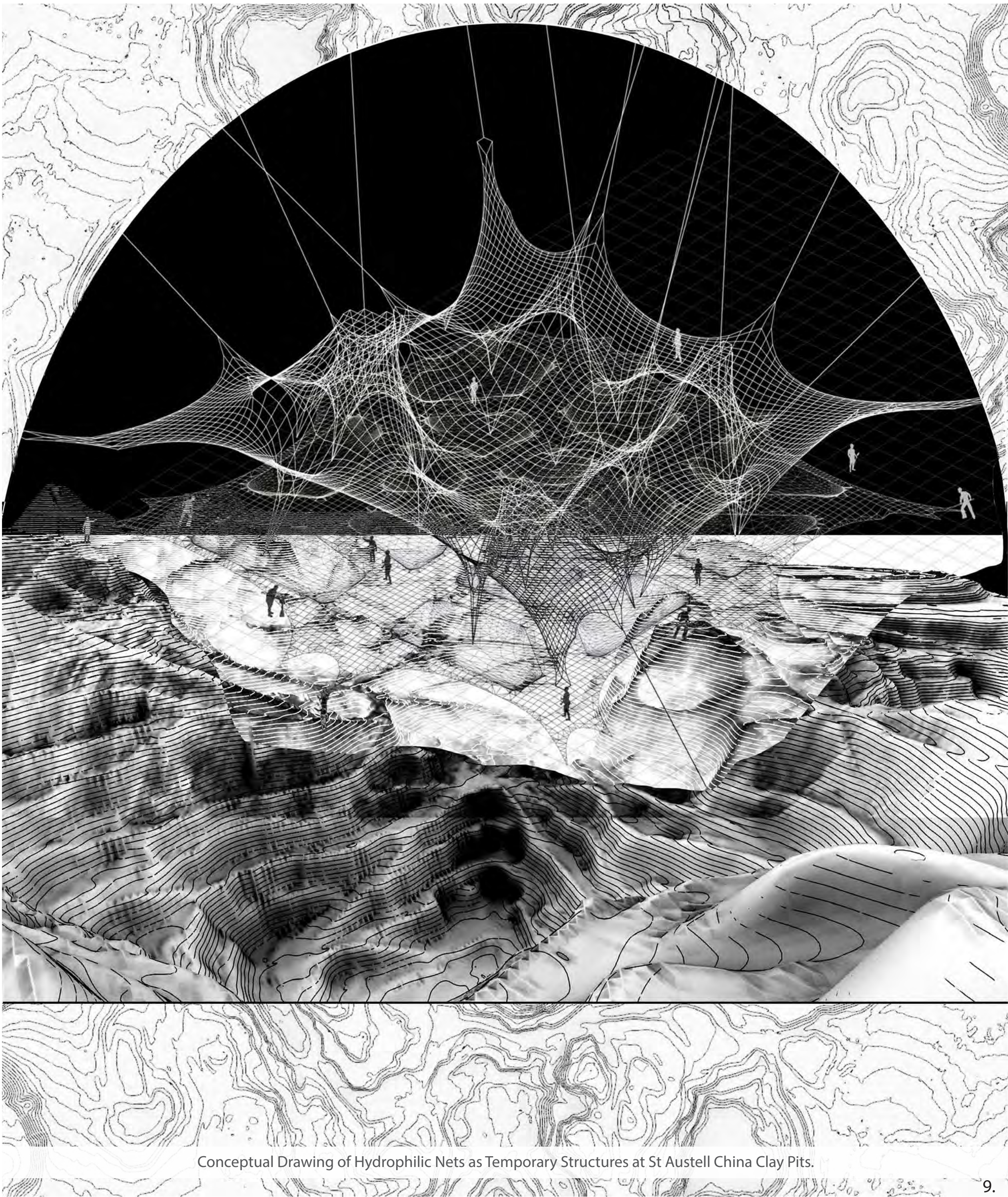


# Initial Design Idea of Fog Capturing Nets

The project includes two typologies of hydrophilic nets - horizontal and vertical. This page highlights the initial ideas of the horizontal nets. These structures will be semi-temporary, which can be quickly built and removed. Consequently, they can be placed anywhere on site.



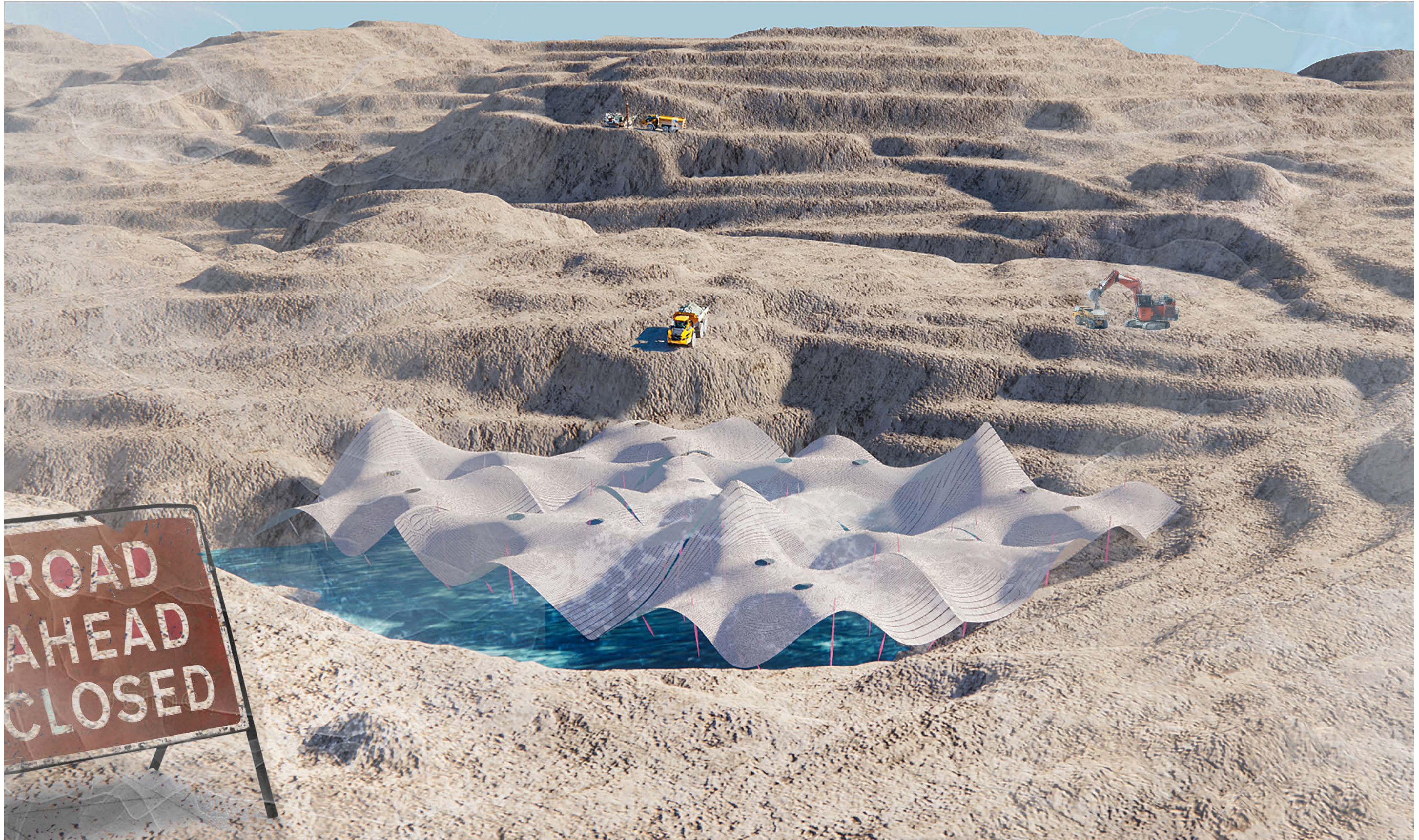
3D Modelling of Hydrophilic Nets & Water Retention Diagram.



Conceptual Drawing of Hydrophilic Nets as Temporary Structures at St Austell China Clay Pits.



## The Horizontal Fog Capturing Nets - Perspective View in Summer

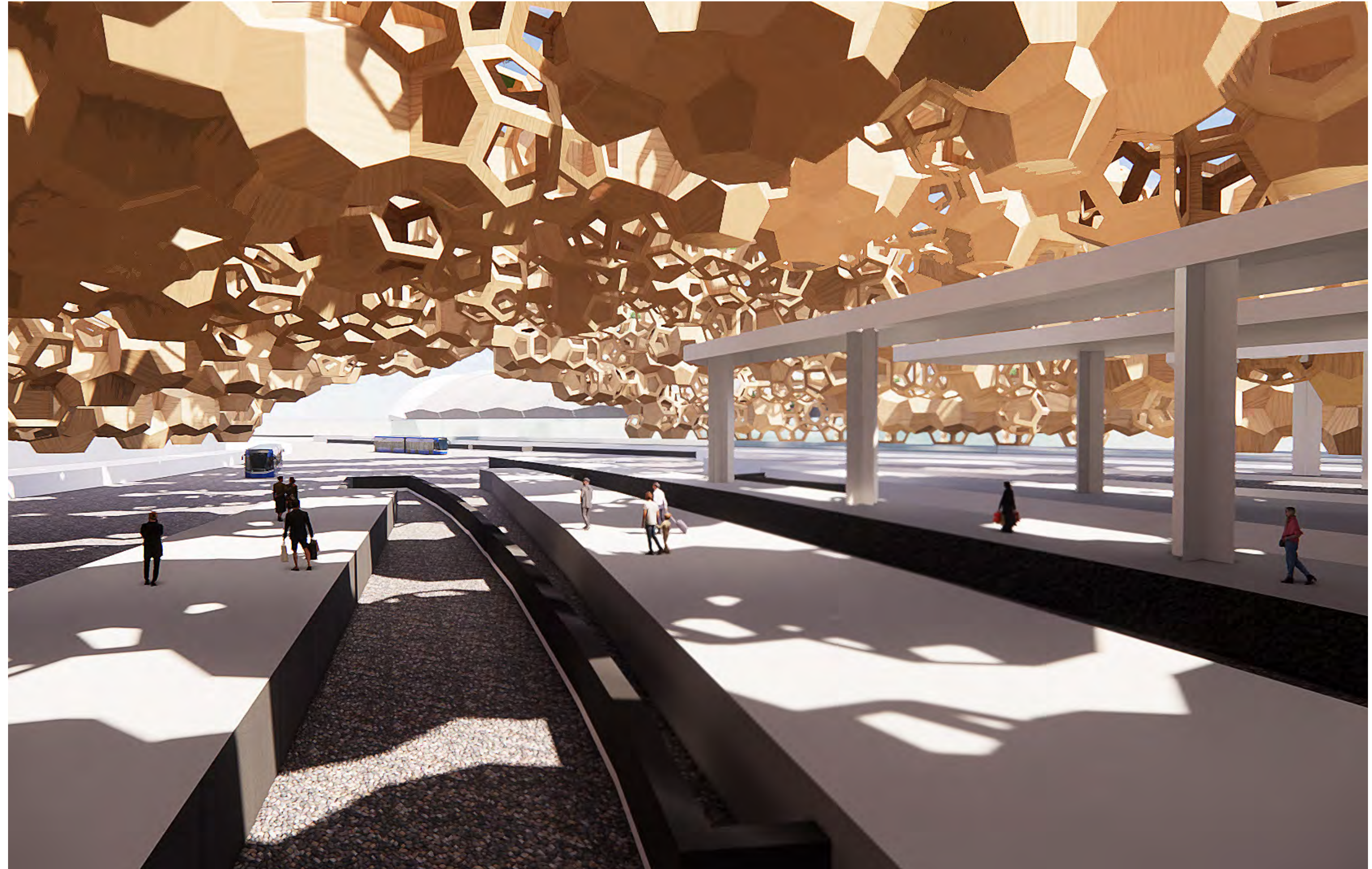


The Horizontal Fog Capturing Nets are placed above the abandoned lakes (former China Clay pits). The areas surrounding the lakes are active mining zones, but the nets do not interfere in the mining process.



MA Architecture Year 4 (2021-2022)

The Bio-Cooling Home

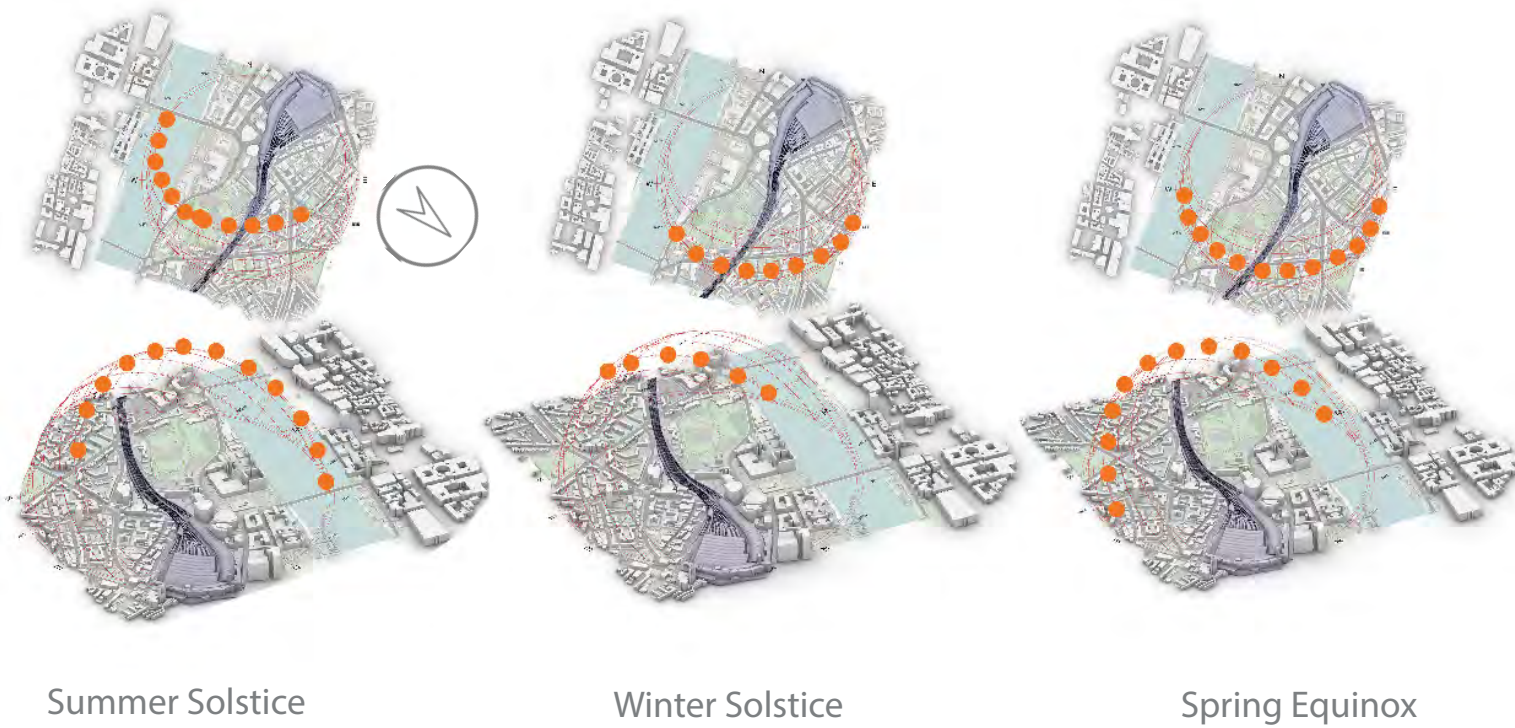
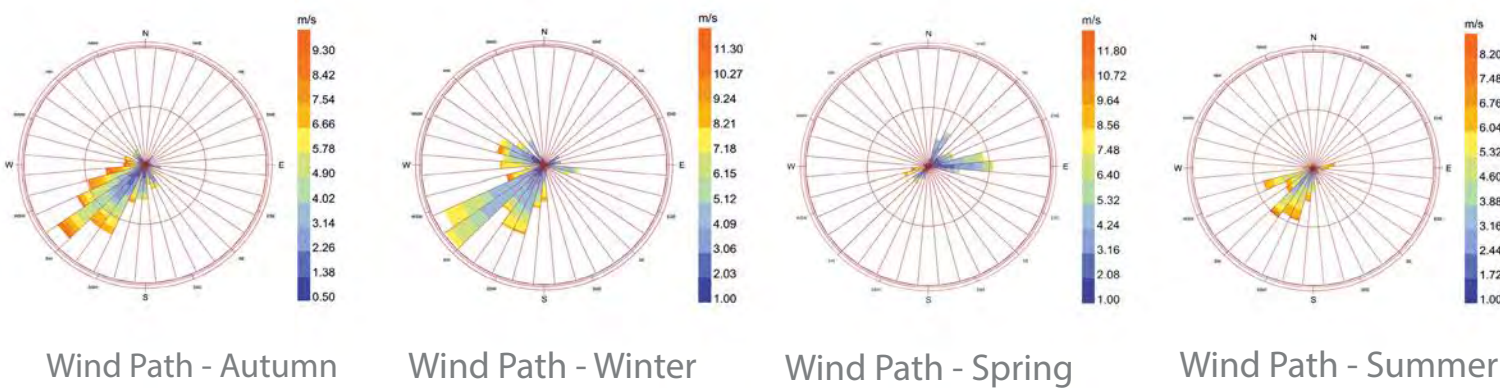


The Bio-Cooling Home - Rendered Perspective View.

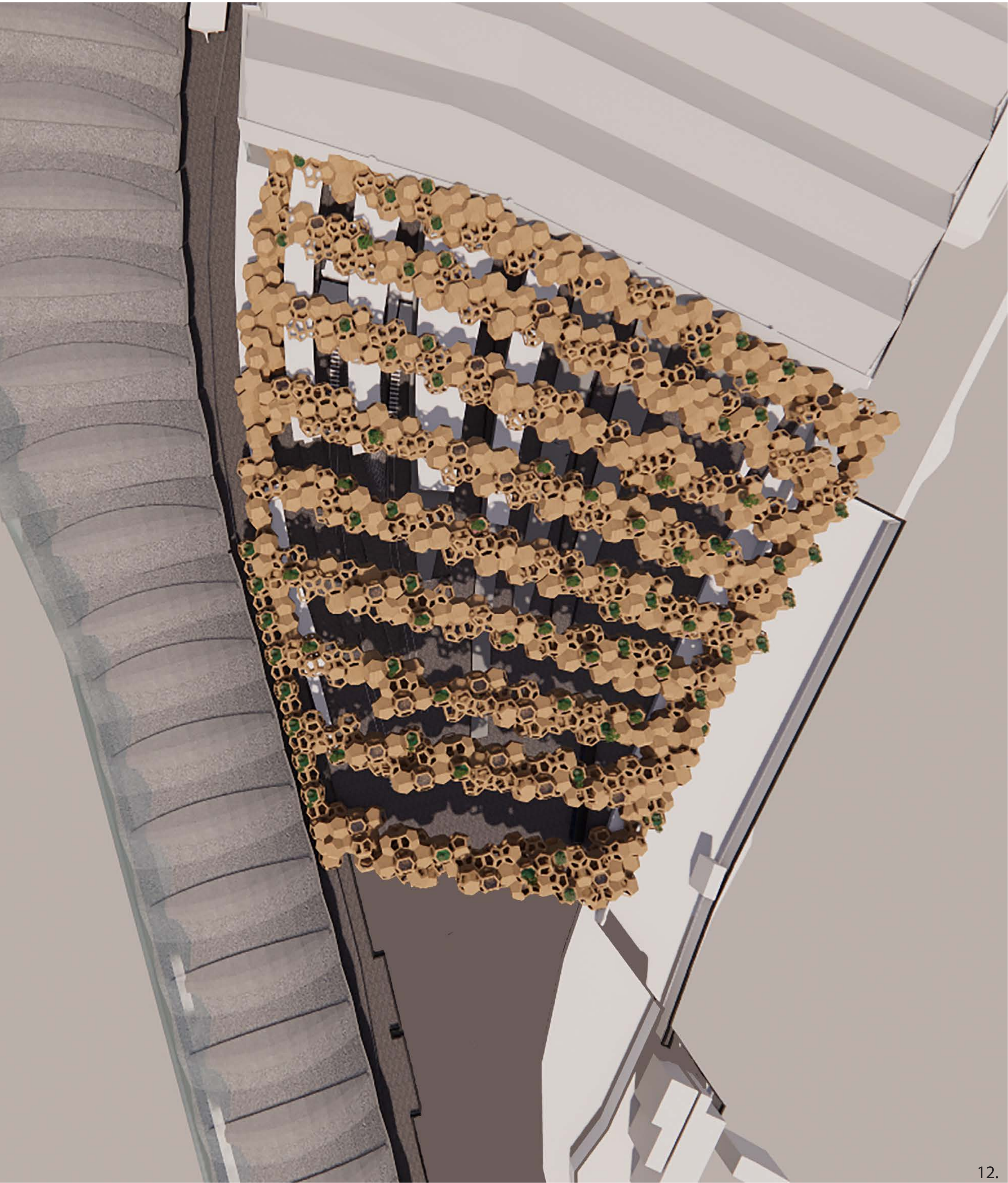


# The Bio-Cooling Home

The concept of the project is to provide eco-friendly solutions to increase London's housing stock in 2050, a time when the city is said to face an increase in temperature of up to 6.5 °C during hot summer days. The new building is an innovative timber structure with Weaire-Phelan modules. Due to this change of temperatures, a new evaporative cooling system has been studied. Th system is designed to cool down the housing modules during the hot summer of 2050 without any mechanical cooling device. In parallel, the evaporative cooling system will lower the rising temperatures of the Bakerloo line platform at Waterloo Station. In terms of heating the homes during cold days, this will be done through a heat exchange process. The heat from the underground will be transferred to each housing module through ventilation shafts.

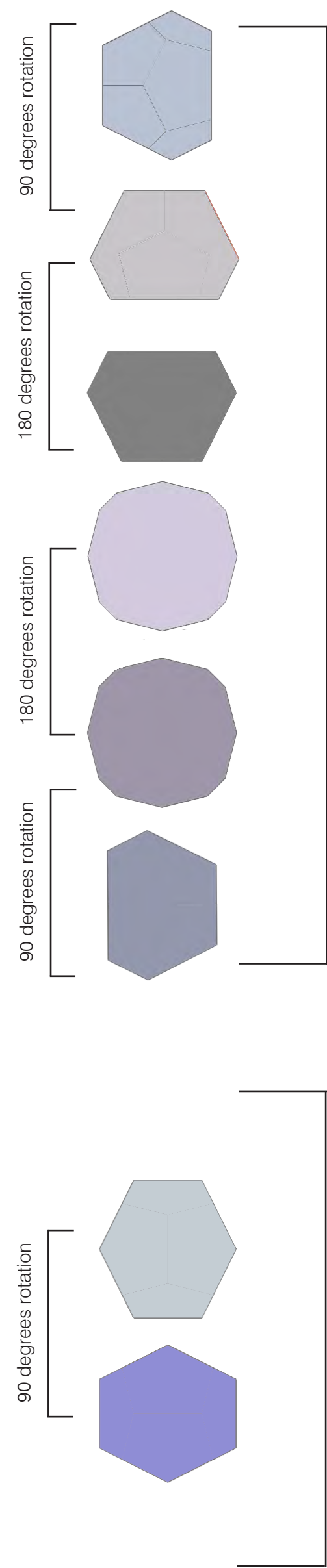


Waterloo Station, London - Site Weather Analysis



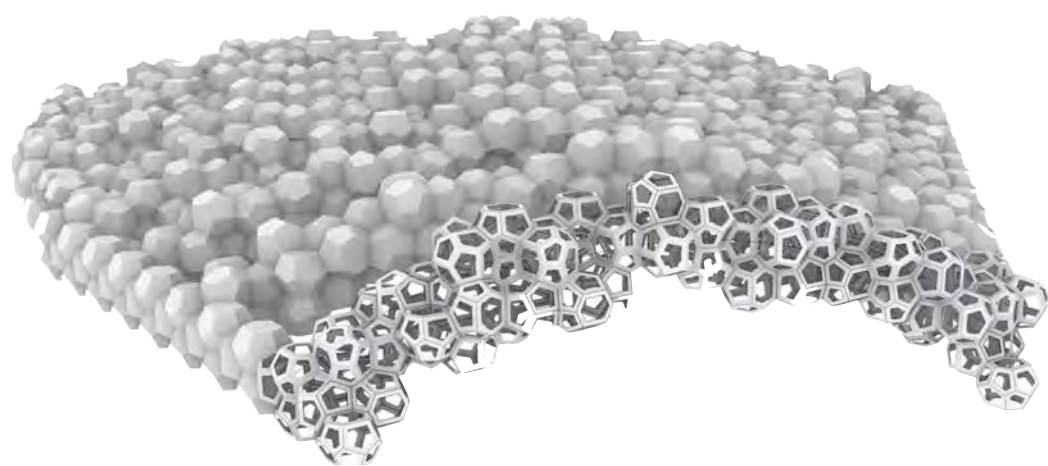


The Bio-Cooling Home  
Weaire-Phelan Arch Structure

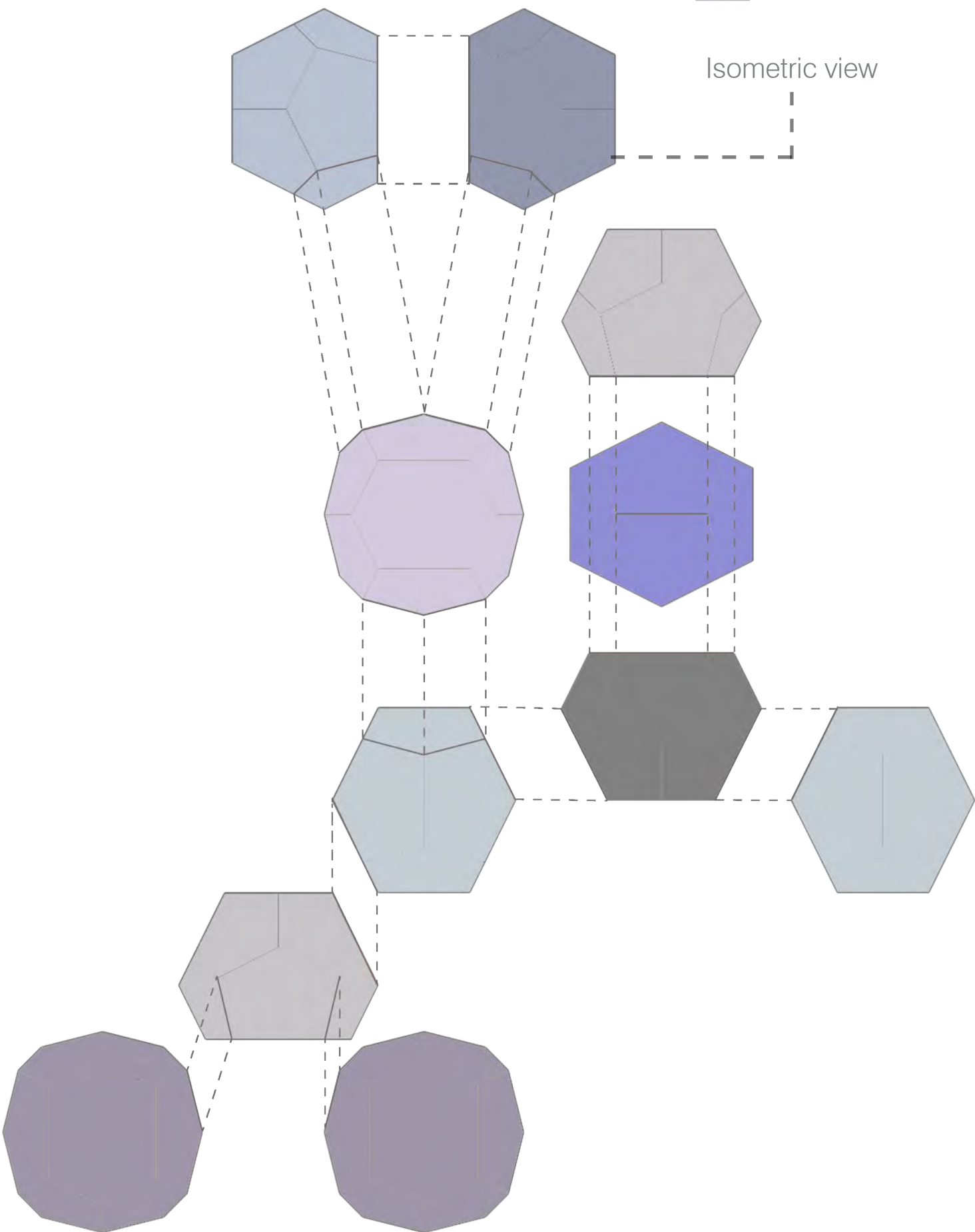


Six different rotations of the same tetrakaidecahedron with two hexagonal and twelve pentagonal faces, possessing two mirror planes and a roto-reflection symmetry.

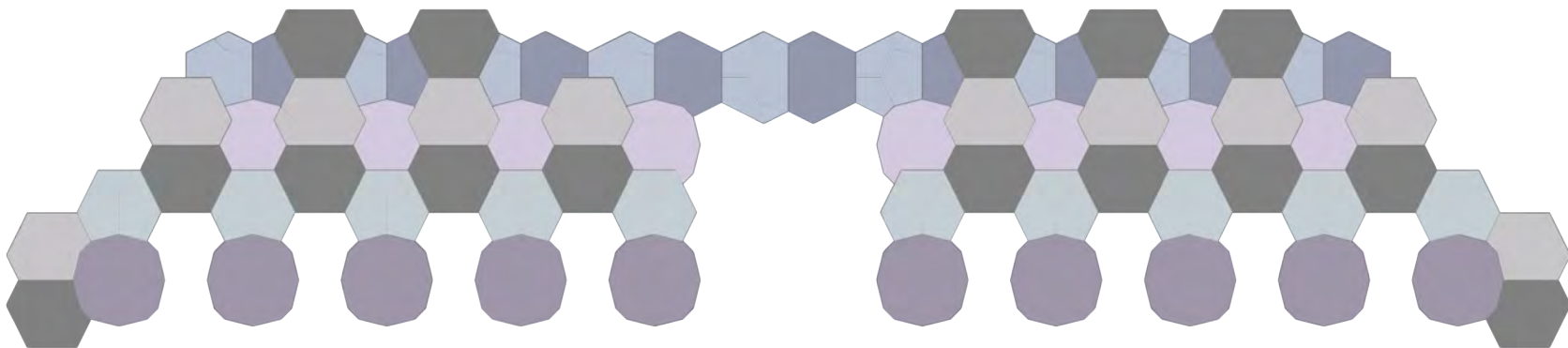
Two rotations of the same irregular dodecahedron with pentagonal faces, possessing tetrahedral symmetry.



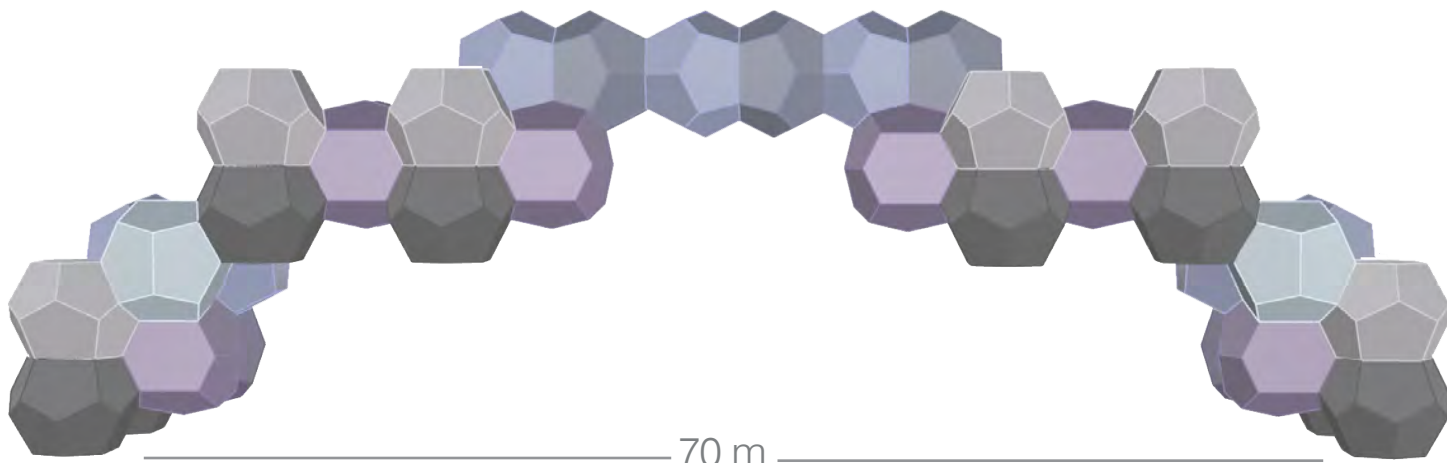
Isometric view



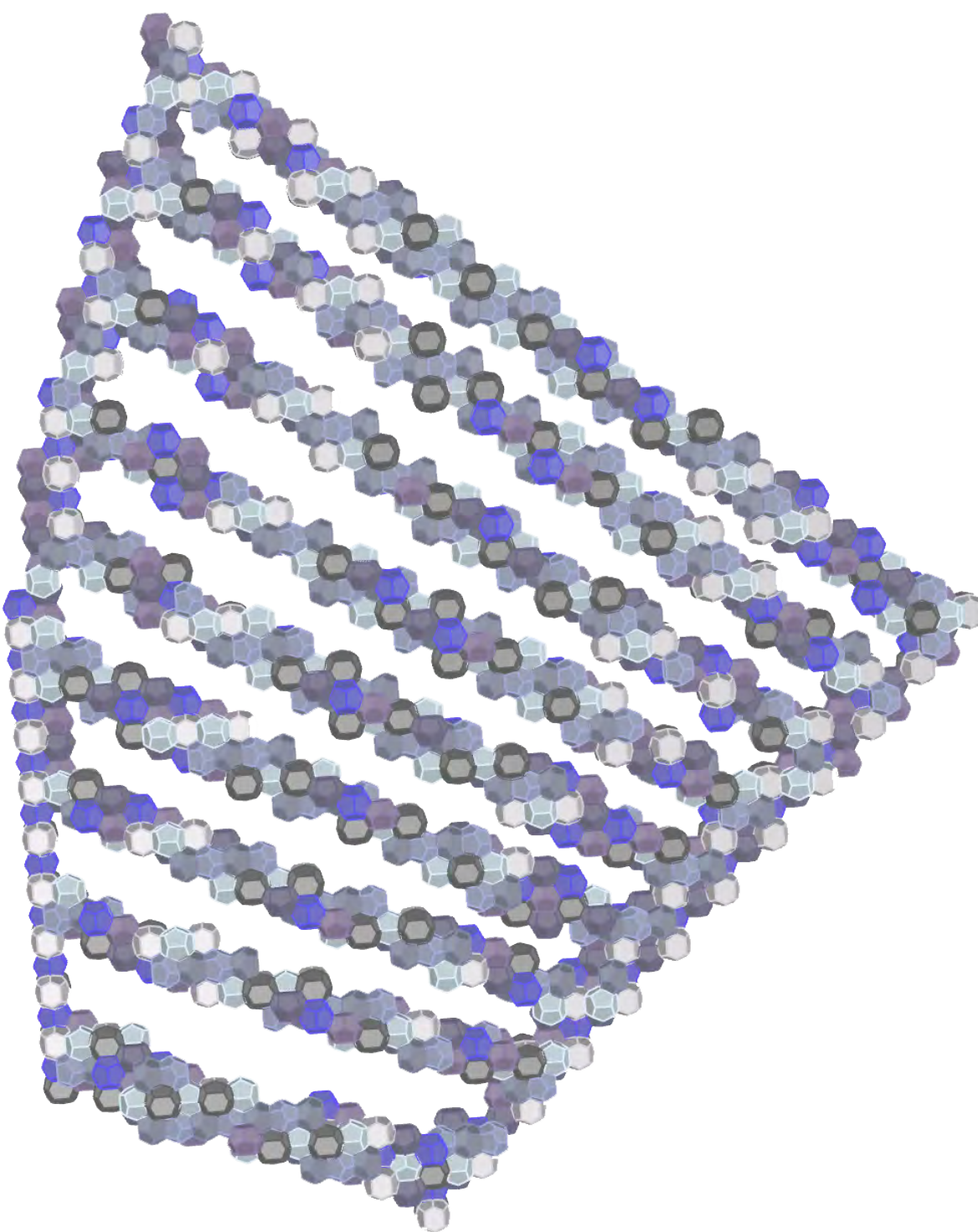
The connection pattern of Weaire-Phelan units.



Front view of a complex Weaire-Phelan arch-like structure.



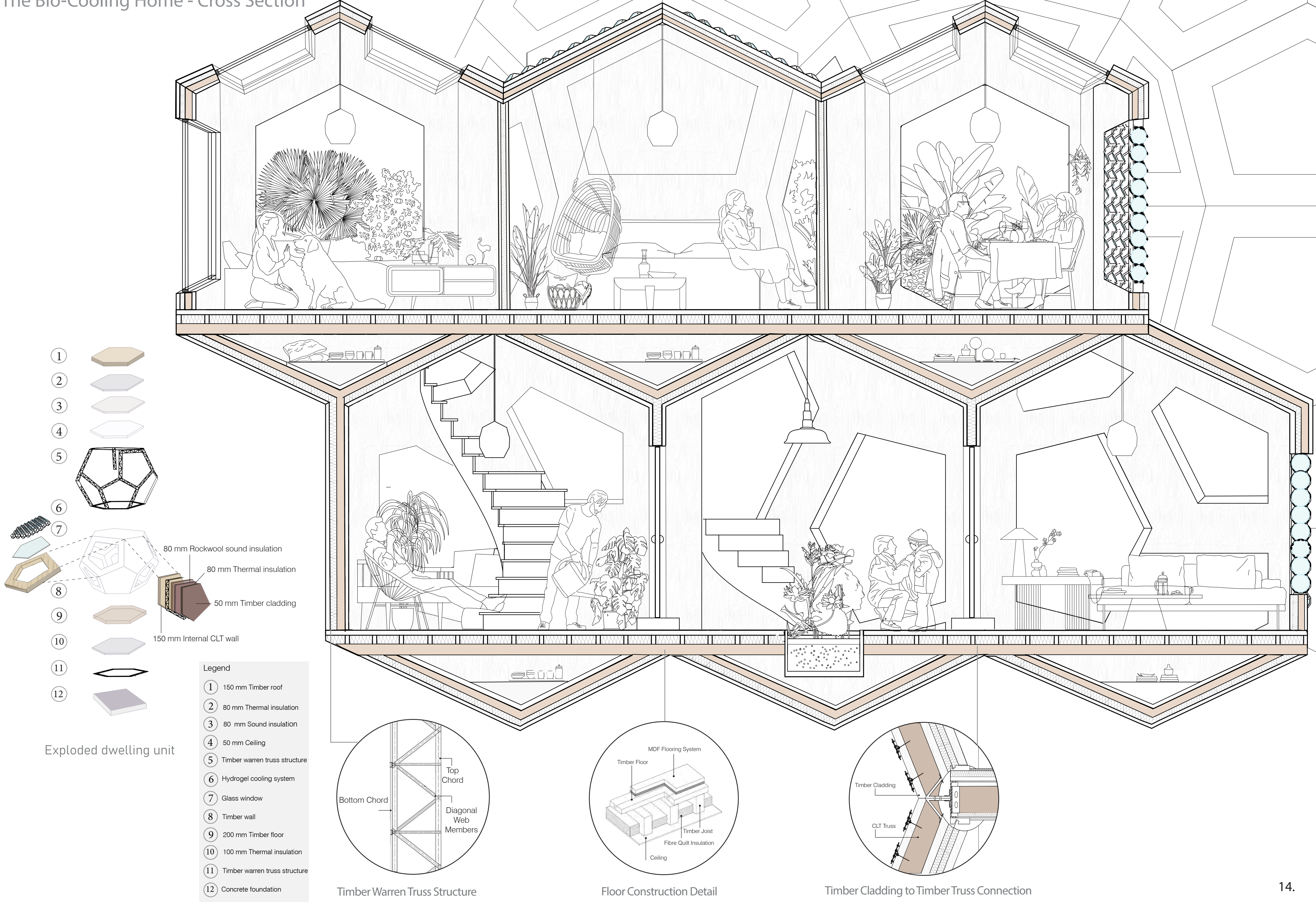
Arched Weaire-Phelan structure.



Weaire-Phelan arches following the direction of the trainlines at Waterloo Station.

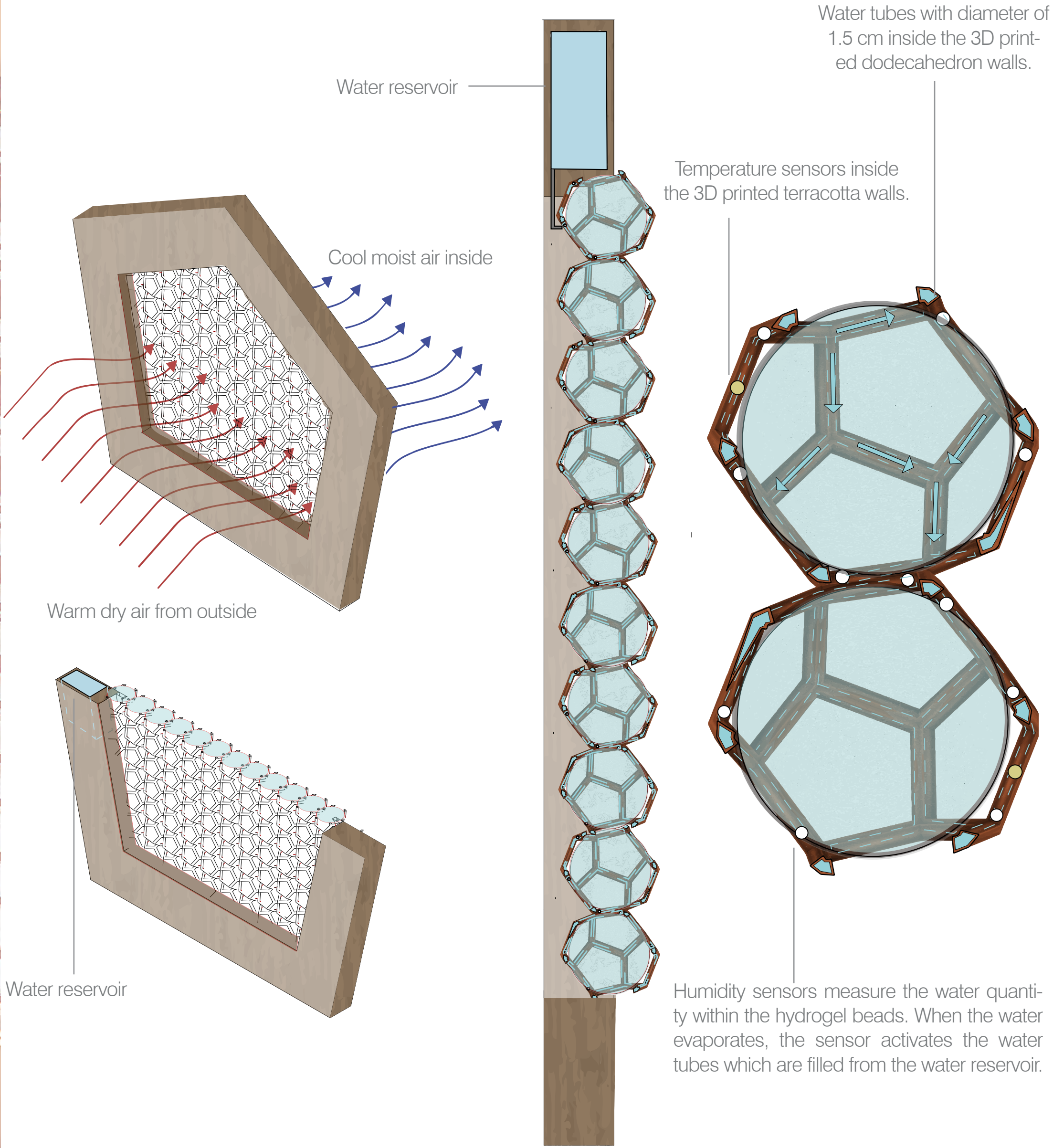


The Bio-Cooling Home - Cross Section





The Structure of the Bio-Cooling Window







Rendered roof view.



Rendered interior bedroom view.



BA Architecture Year 3 (2020-2021)

The Cranbrook Wellness Garden

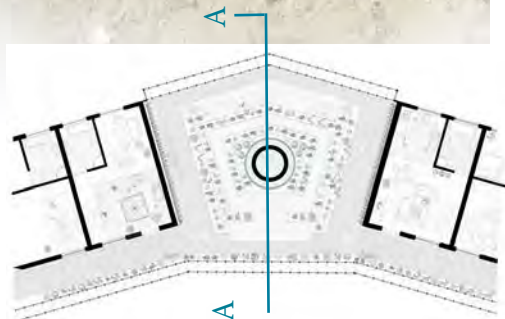


The Cranbrook Wellness Garden, Cranbrook Estate, London.



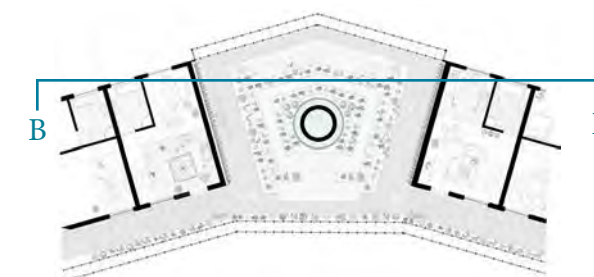
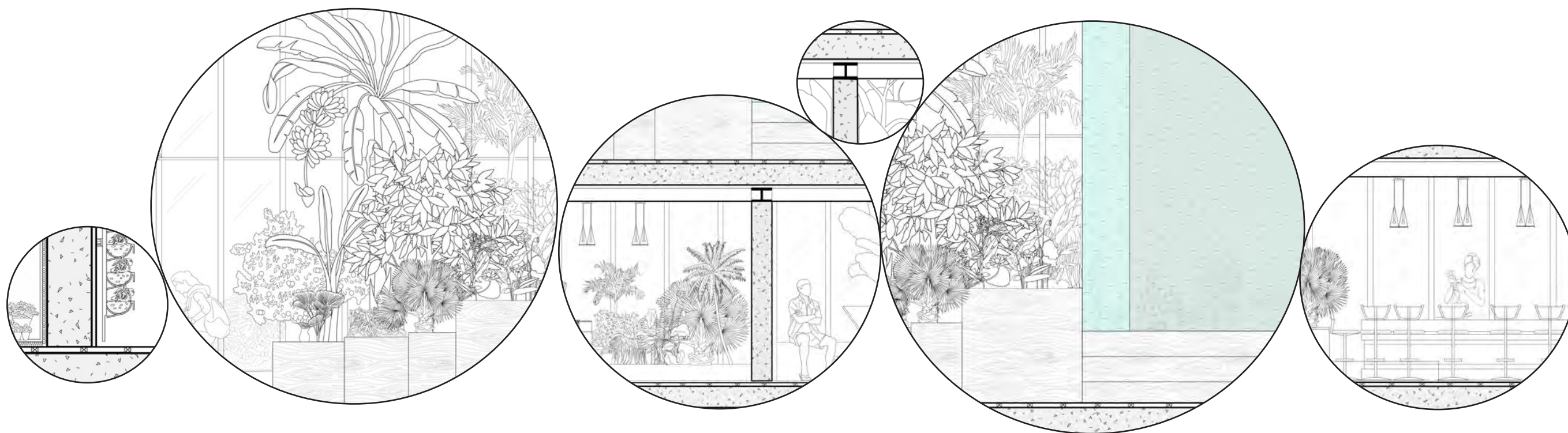


1:50 Scale Section (AA) Through the Community Garden and Kitchen in Harold House, Cranbrook Estate





De-alienating the Home: The Cranbrook Estate, London  
The Cranbrook Wellness Garden & Housing



1:50 Scale Section (BB) Through the Community Garden and Kitchen in Harold House, Cranbrook Estate



BA Architecture Year 2 (2019-2020)

The Euston Biophilic Sports Field

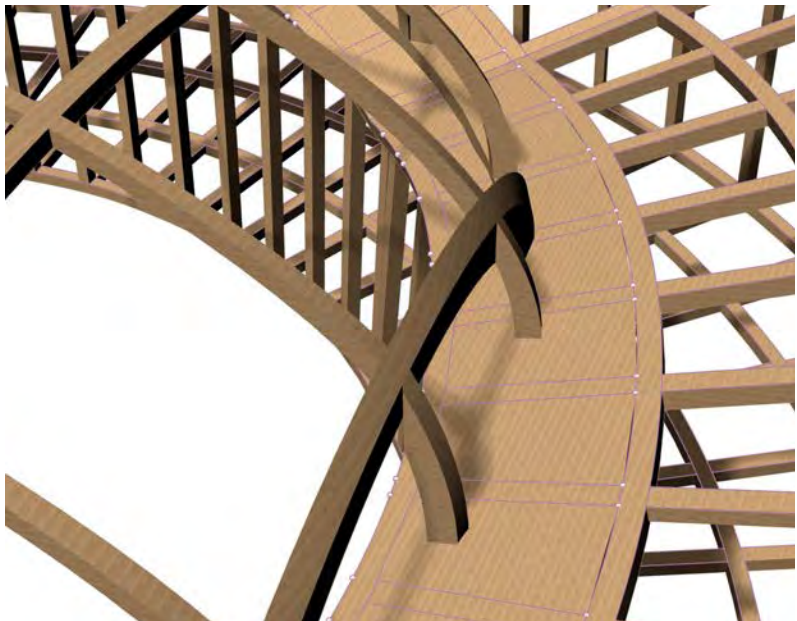
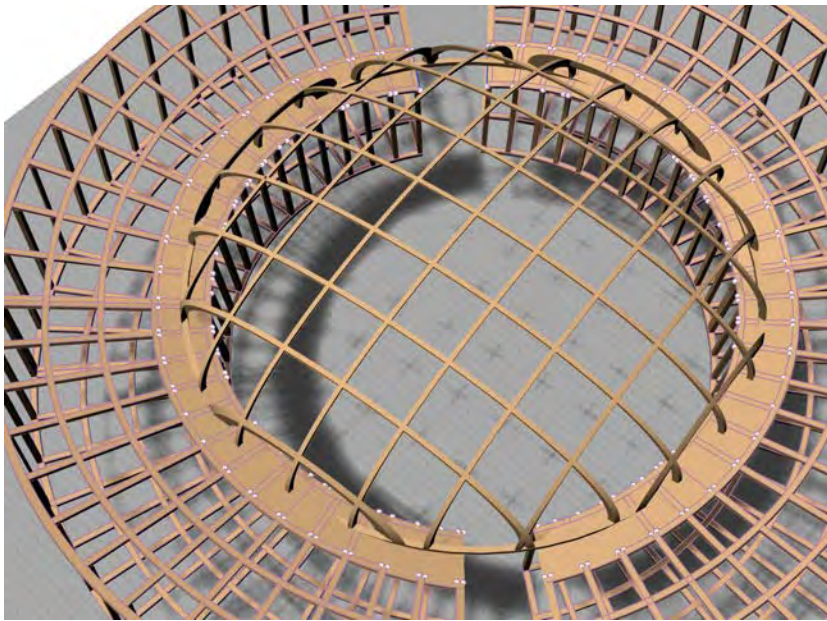


The Euston Biophilic Sports Field - Section Through Yoga Spaces





1:50 Scale Section of the Timber Structure Encompassing the Natural Swimming Pool, Gym, and Butterfly House.



3D Model of the Timber Parametric Structure.



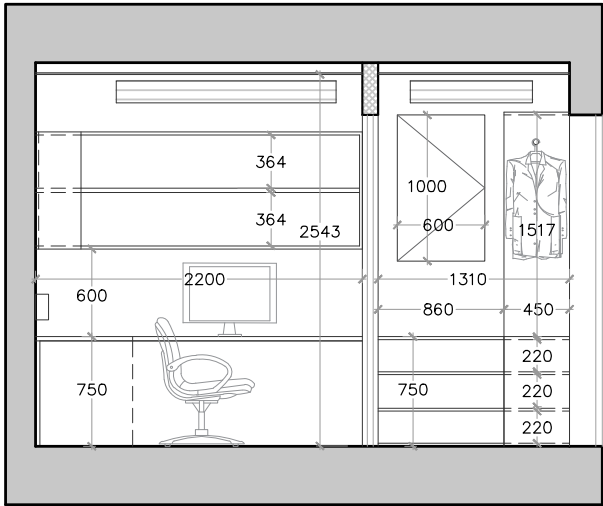
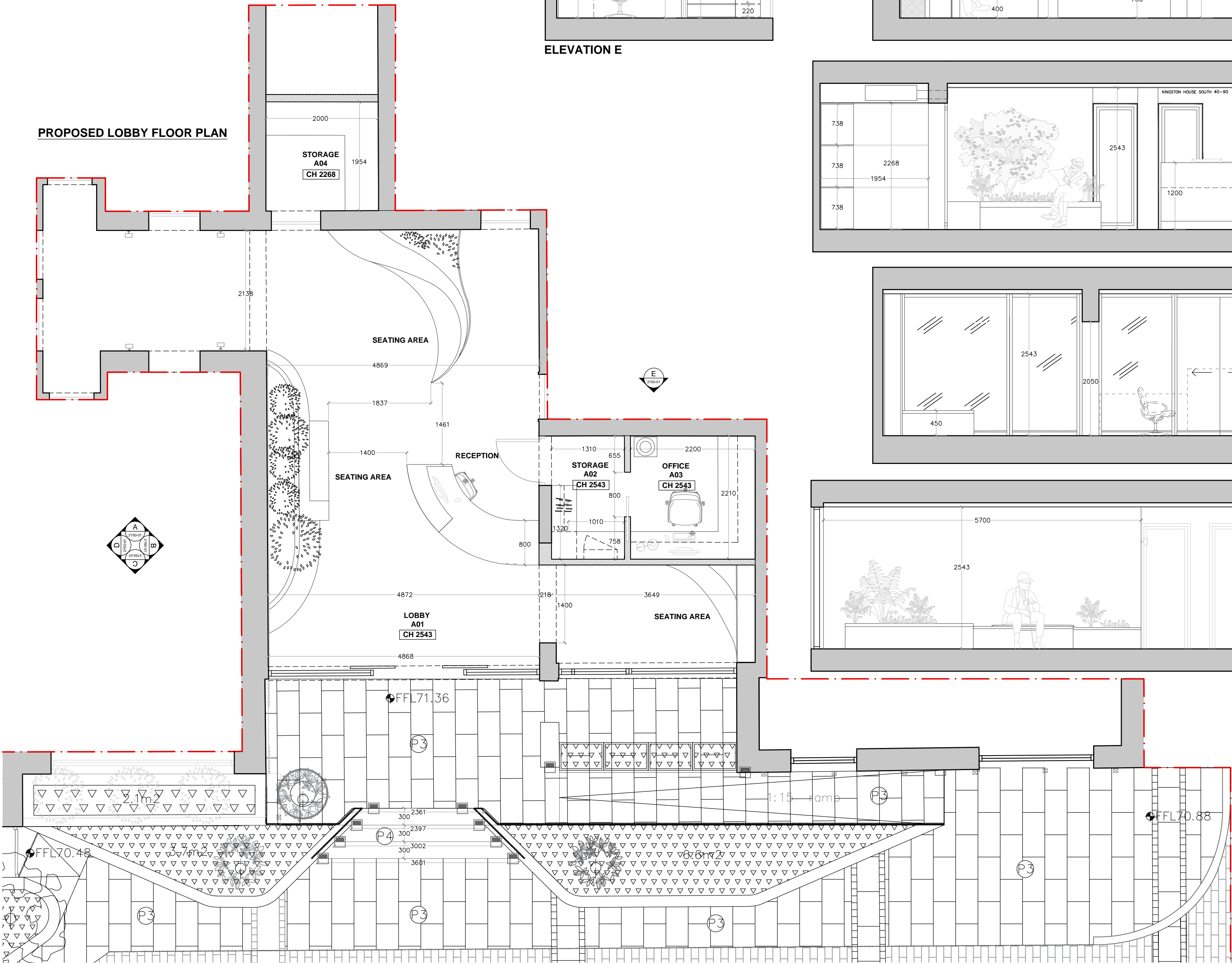
Work Experience

Studio Rinaldi Architects

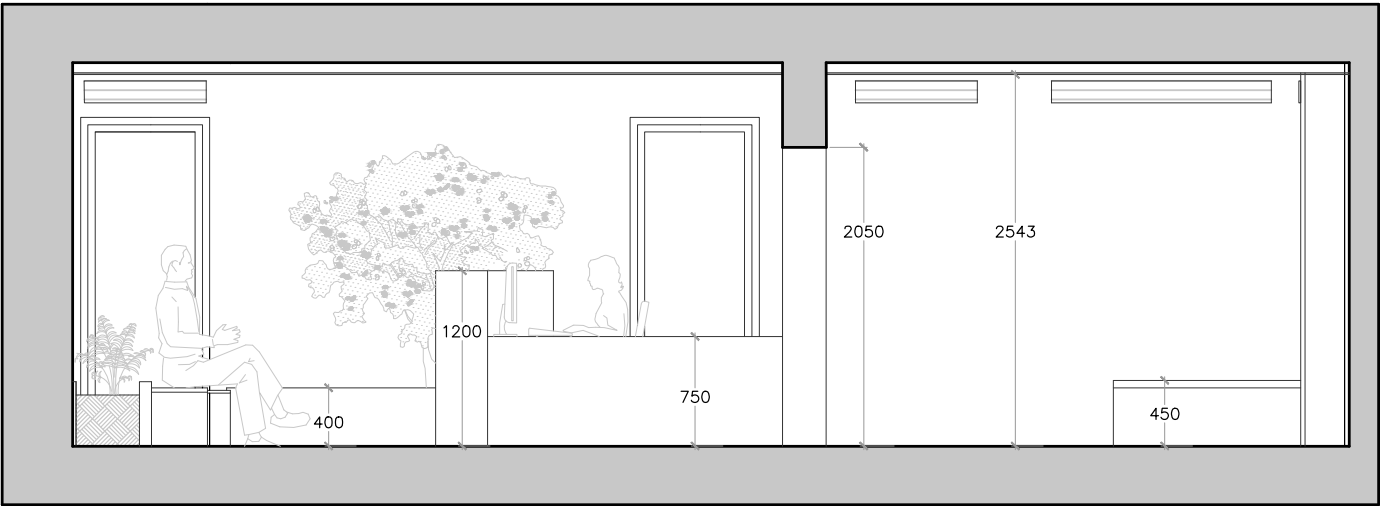


Rendered View of Lobby Space in Knightsbridge, London (Studio Rinaldi Architects, 2022).





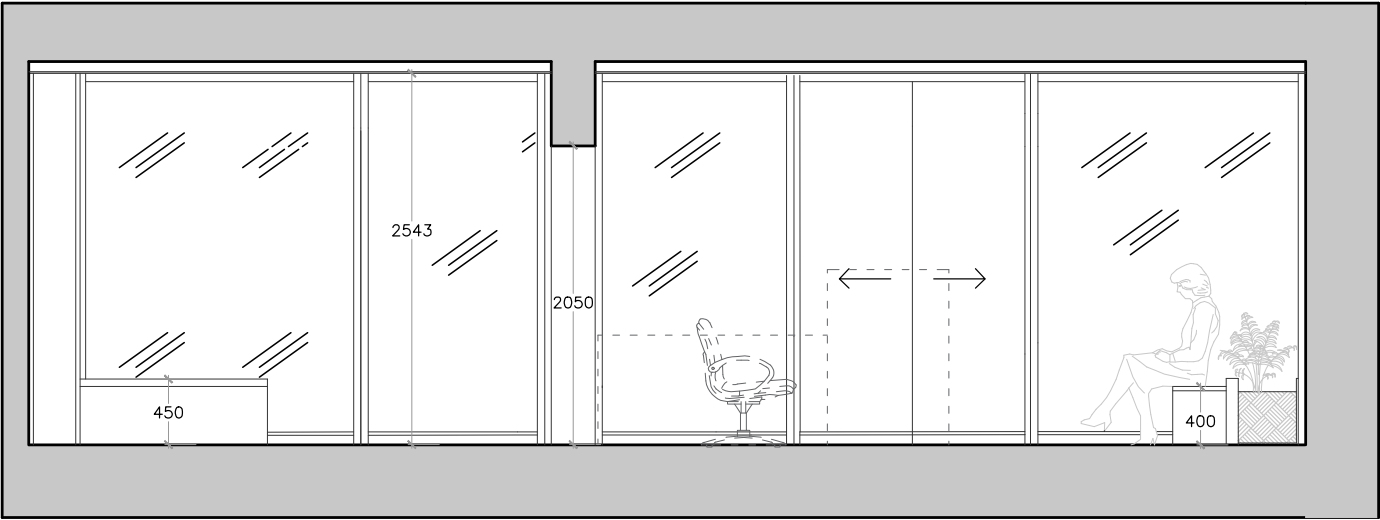
ELEVATION E



ELEVATION A



ELEVATION B



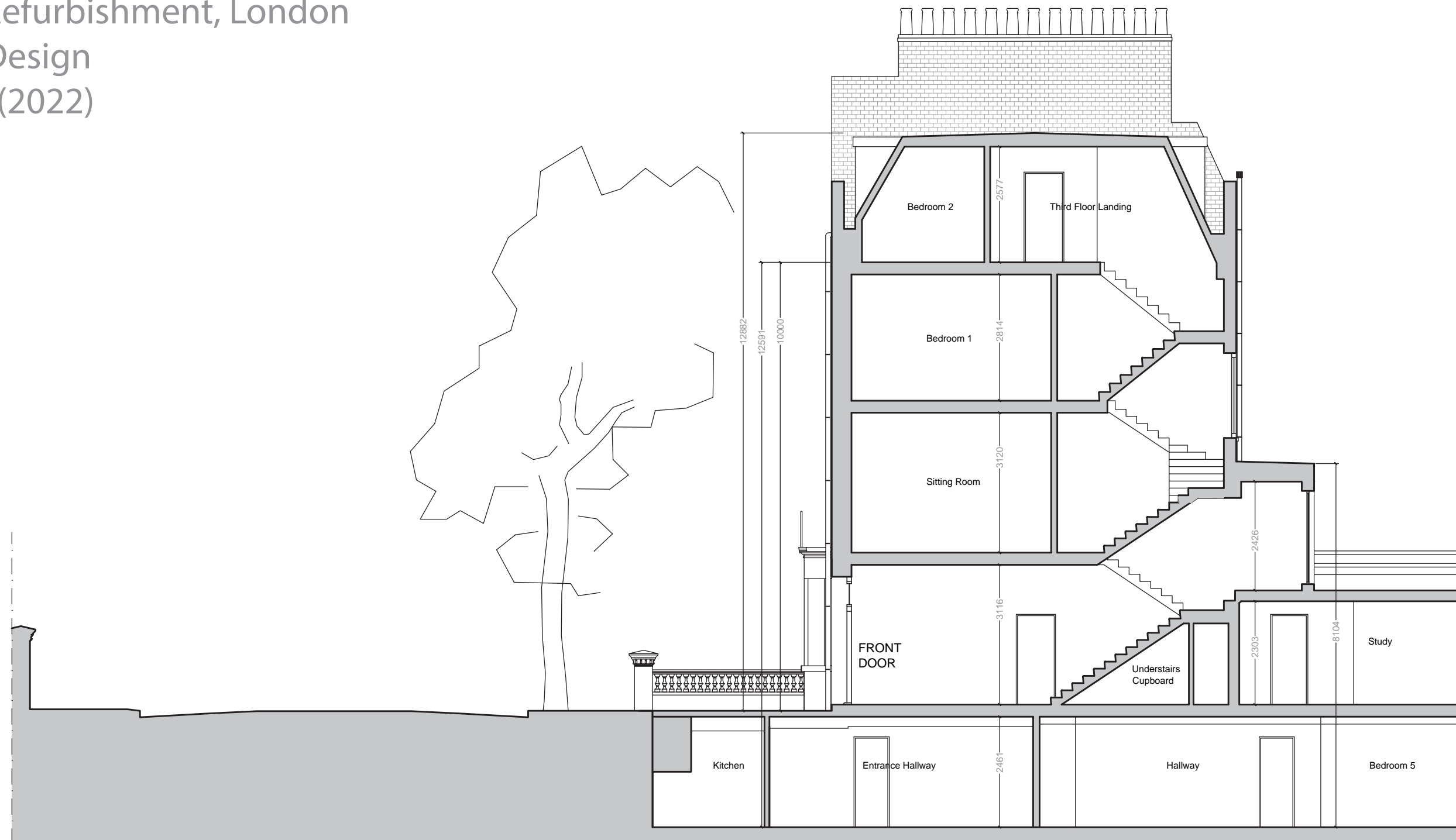
ELEVATION C



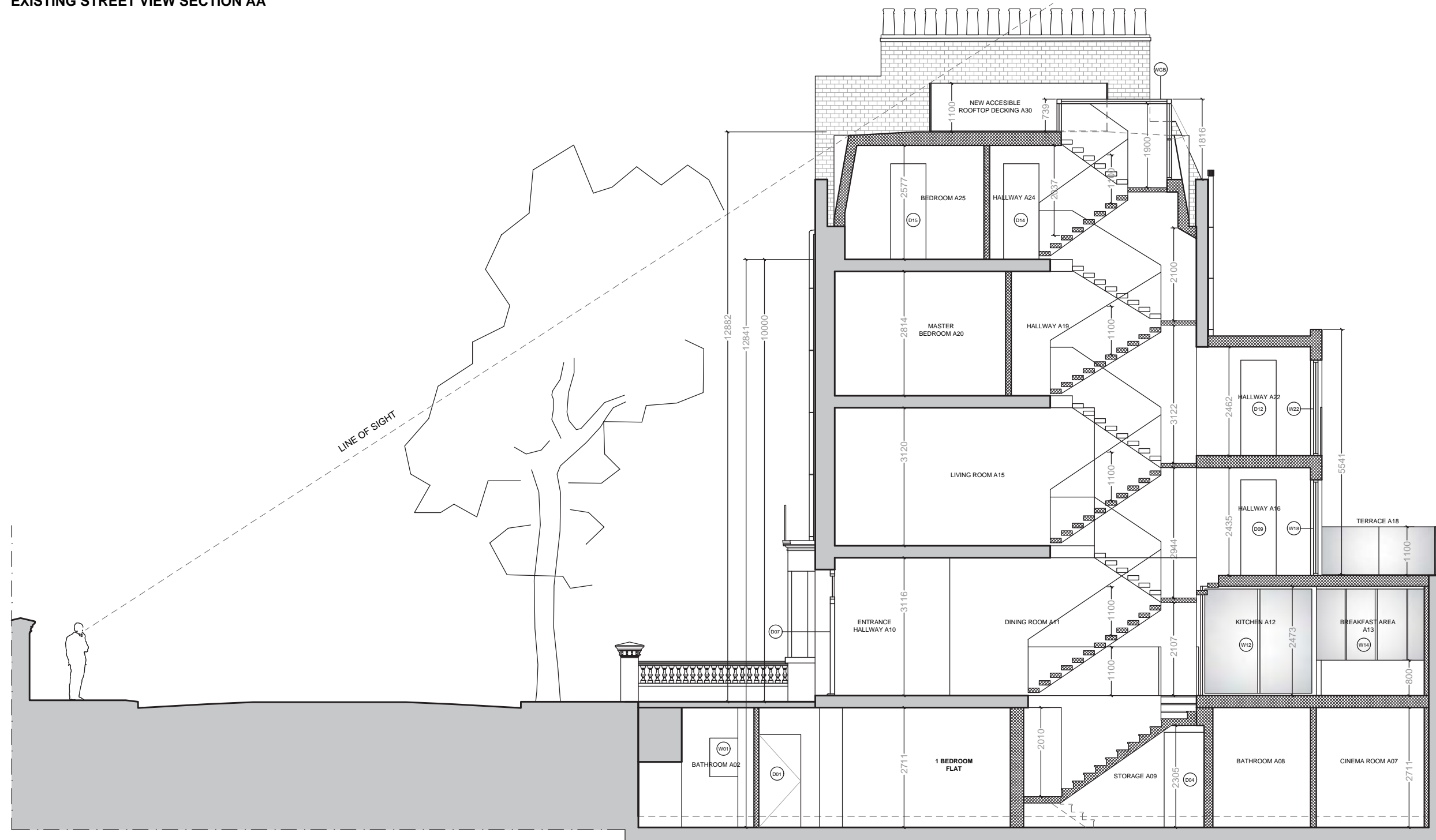
ELEVATION D



Notting Hill Townhouse Refurbishment, London  
RIBA Stage 4 - Technical Design  
Studio Rinaldi Architects (2022)

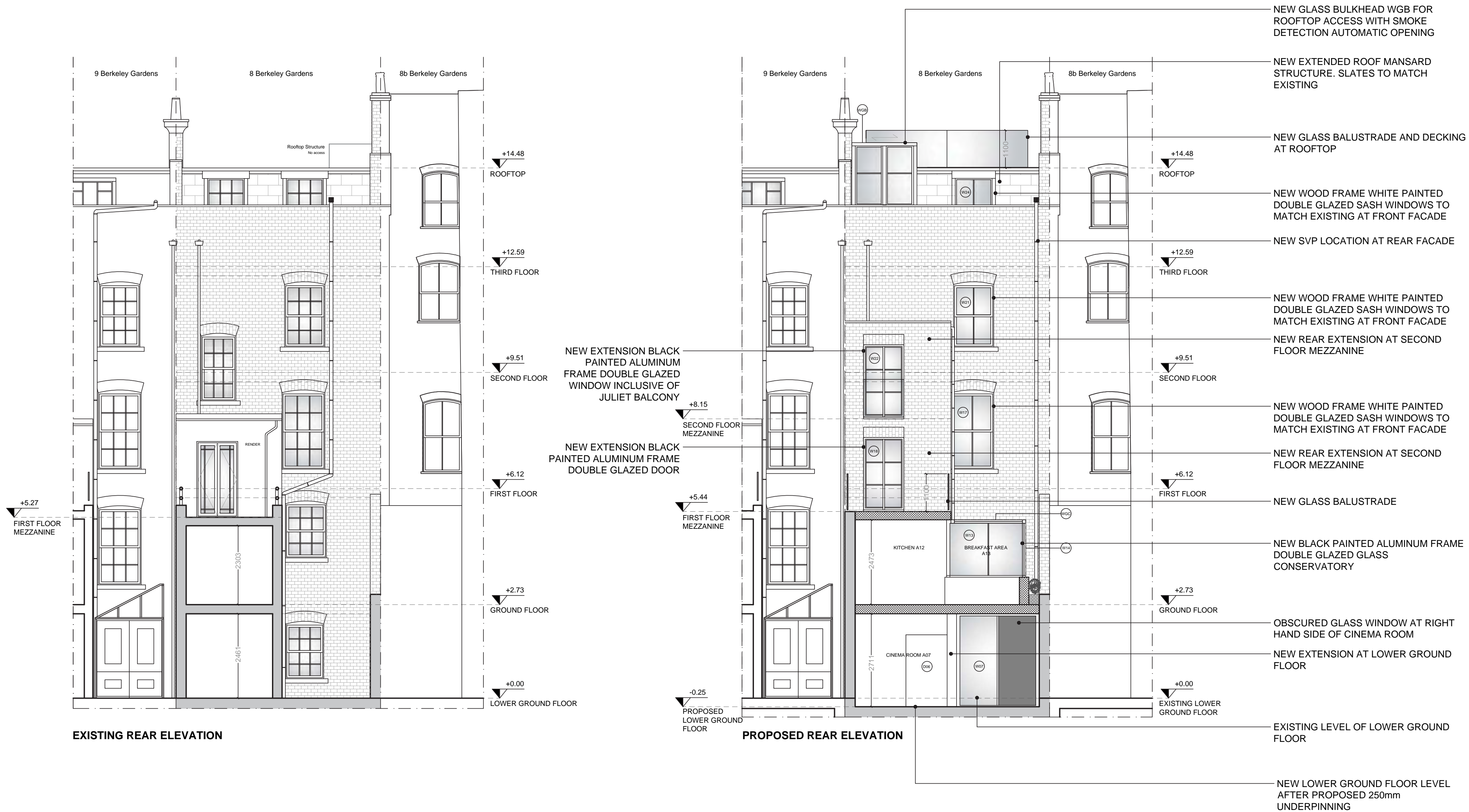


**EXISTING STREET VIEW SECTION AA**



**PROPOSED STREET VIEW SECTION AA**







## Studio Rinaldi Architects (2021)





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