

CAYENNE

CAYENNE is an independent Master Thesis ideated by Andrew Parry and Tom Jones concluding the Master Program 'Architecture – Typology' at the Technical University of Berlin.

The project is presented through a website and displays film and animation material alongside the work composed in this document.

In order to receive the full experience of navigating through the project, please access the website at:

www.cayenne-stories.org



CAYENNE

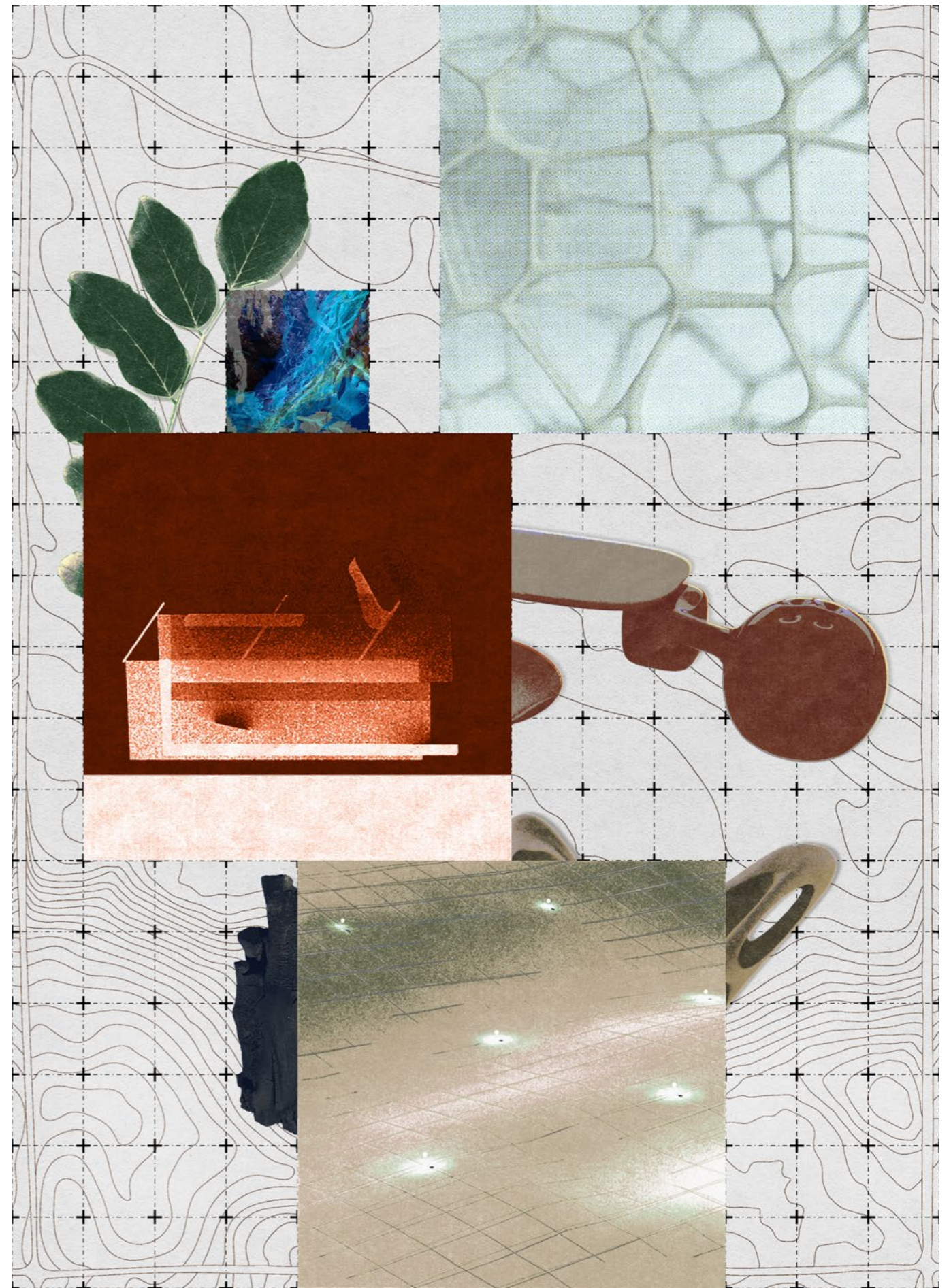
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Master Thesis
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MANIFESTO



Cayenne is an archeologist and anthropologist working on the excavation of a 21st century settlement, located on the old outskirts of the city of Berlin. Between the centuries, the site has its own diverse history, ranging from the 12th to 21st century.

Cayenne's background is also diverse. As the documentation progresses, a connection is made. Cayenne dreams; personalities are imagined, projecting characters and protagonists from the period into scenarios. It helps with the details that are physically missing.

The S.R.S stories chronicle a non-linear journey through the discovery of a research facility and settlement located in Grunewald, Berlin, Germany. S.R.S (Soil Remediation Studies) was part of an international soil research group and application of soil remediation. Documents show the social structure was complex and required a great deal of common unity applying the exchange and stay method of living. Living without borders, living within community, and living with work.

Founded in a crux between knowing and forgetting, the S.R.S can be understood as an alternative settlement or commune.

The similarities are endless. The degradation of soil was known throughout the world for many a year during this fraught period of unsettled divestment from reality, the common denomination seemed to place their trust in technocrats, the cult of the personality, restricted access to advancing technologies and powerful chemical industry for answers.

A one (or many) bottle solution(s) that had a profound impact on the order of things. Thing, is complex, things need time and patience to understand, to learn from. The value of time should not be measured in one's lifetime and that is where the one bottle solution fails. It relies on profit procured in a lifetime, its benefits are touted by suits and the application left to the farmer. The consumer consumes and the consequences are as disposable as the 'collateral damage' afforded to the critters. The main areas of study were certain; mycelial membranes as construction techniques, the production of terra preta, and the study of symbiotic relationships between mycorrhizal and plant root systems. Altogether a circular survival system, releasing the bonds of complex, catastrophic centralized global food, material, and energy systems.



PROTO(U)TOPIA

Terraform, Alliance, Territory & Response-ability

Understanding ecology means understanding alliances and Cyanobacteria.

Cyanobacteria is blue green algae. Cyanobacteria gave us Oxygen during the Protozoic (the root word being Greek - proto "former, earlier" and -zoic, a suffix related to zoe "life"). 2.5 billion years ago, Cyanobacteria oxygenated the earth's atmosphere through photosynthesis.

Prior to the Protozoic was the Archean, contrary to the Greeks description, anaerobic life existed, be it much more primitive. Reliant on the carbon dioxide and Sulphur rich environment, the change in atmospheric elements, irreversibly affected these early forms of life. The changes made by Cyanobacteria is a story of alliance and territory.

Our current situation is not a new one, changes in environment have a consequence, a Tentacular dimension (to use the urban dictionaries description "referring to a body of work that has many dependent and independent parts. As such, it is difficult to manage, difficult to understand and often difficult to finish.")

The main point to raise, is to

dismiss the notion of biological individualism, or any kind of individualism for that matter; we have never been individuals¹ is a notion critical to the study of how we have socially developed and apply data to our symbiotic position; we rather neglected and /or forgone our alliances that have maintained our collective interdependence.

We do exist in a complex symbiotic alliance, as Cyanobacteria still maintains its alliance with all the plants in existence on our planet, continuing to carry out photosynthesis as chloroplasts. Bacteria shapes our thoughts as Cordyceps manipulate the ant, sending their host on a death march to infect the rest of the colony. In order to continue our story, we need to act, we have response-ability² (as Donna Haraway would state, the act of, ability to respond).

Proto-garden – Forest Garden & Hunter-gatherer – Pastoralist – Agrarian?

As a species, our time in the prehistoric can be dismissed as a naive tumble through existence. Or we can evaluate some of the intricate relationships established during these formative periods of developed symbiotic sharing of territory, spinning together a

story of response-ability.

A presence that has been pushed to the sidelines, often left to small groups of indigenous peoples and considered an ontological delicacy – Animism – often considered pagan or shamanistic in practice, shapes a symbiotic culture of storytelling, praise is given to the relationships that provide, stories of heroic partnership between flora-fauna and human-kin are passed between the ages.

Our thirst for development has encouraged an idea of “progress” through “modernity” – reductionist, empirical data driven expansion that requires energetic consumption of resource and territory. Science is afraid of art, storytelling is art.

Storytelling advanced our symbiotic interdependent, interpretational, relationships with territory. The stories that need to be told are those stories of the forest garden, of dwelling and stewardship. Our technologies should not evoke dystopic visions of malpractice, elite synergy of carbon and silicone based lifeforms, and embrace an alliance of new methods of becoming comfortable with all matters of the soil. The agrarian lifestyle established by the Mesopotamians footprints

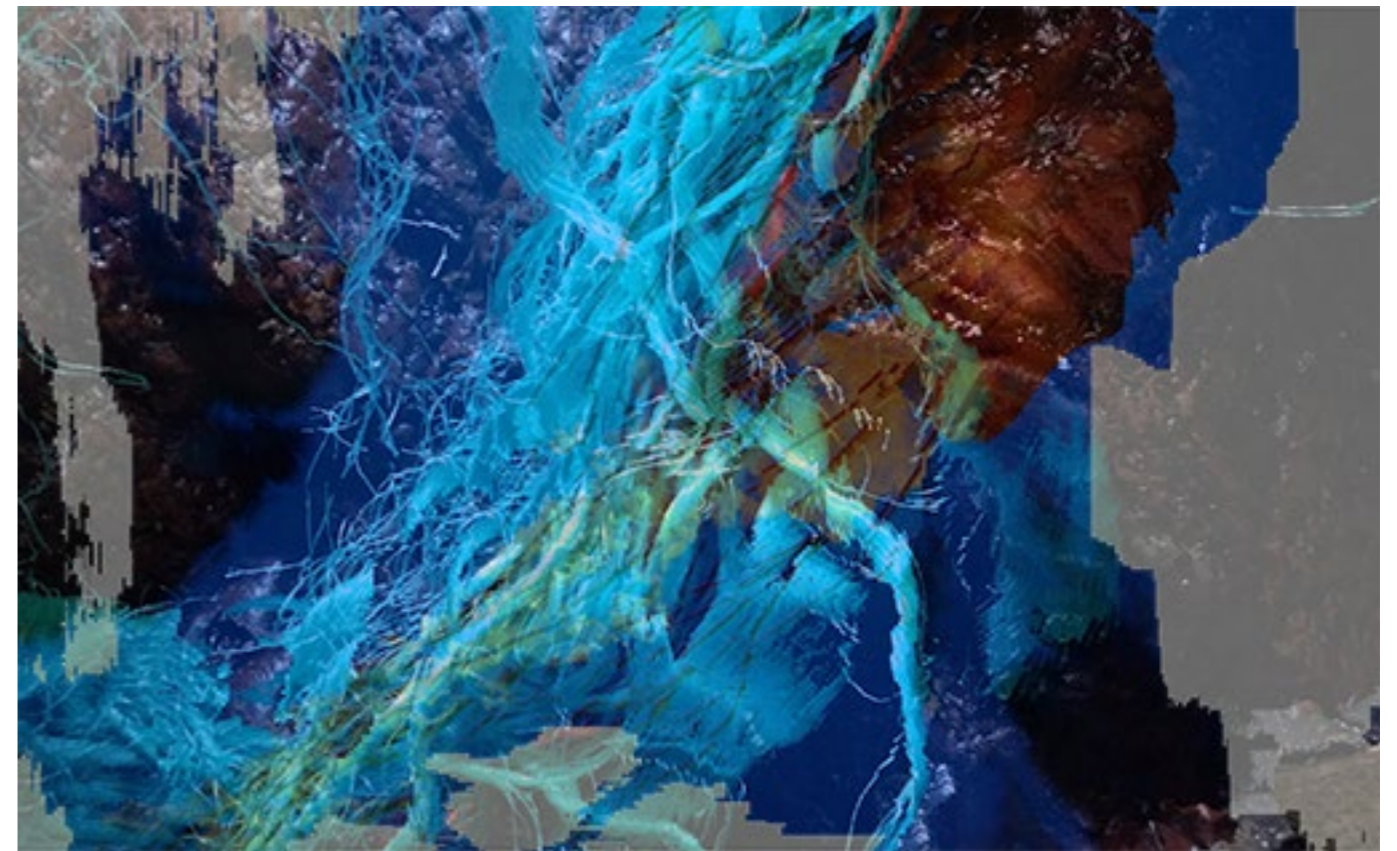
proceed and follow the society at writ, “modern” society placed a blindfold on and held its hand out to progress for guidance.

It is imperative to re-engage with storytelling as science, memories of dusty plains where there were once years of nourishing crops of corn fade away in the mid-west American agricultural stories. Replaced now by automation, however the memory is burnt on the soul, its twins are fertilizer and herbicide.

How to reconcile colonization – cultivation – management

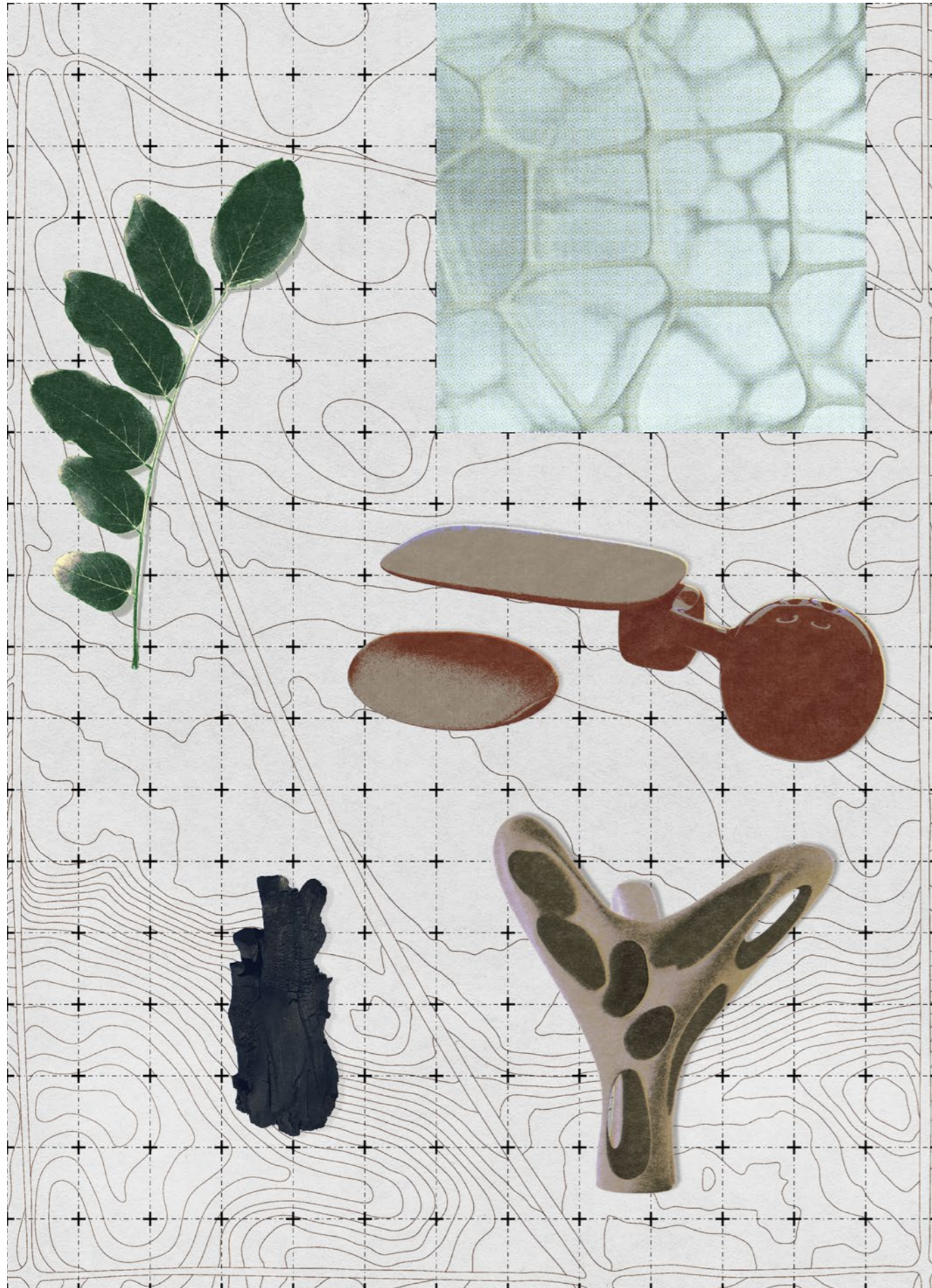
The question challenging our proto-topic investigation manifests in underscoring alliances, establishing stories and taking response-ability for futures- potential. Management is stewardship, cultivation is negotiation, territory is not a boundary or enclave, it is a cultivation of interrelationships developed, nurtured, studied and evoked through art.

We are in the grip of challenges beyond our comfort, we must continue to spread stories and make new alliances, we use a screen to contact, we sit in a chair for comfort and we sometimes feel the need to compose our surroundings to suit the perception of who we are.



1. Gilbert SF, Sapp J, Tauber AI. A symbiotic view of life: we have never been individuals. Q Rev Biol. 2012 Dec;87(4):325-41. doi: 10.1086/668166. PMID: 23397797.

2. Hazaway, Donna J. Staying with the Trouble, Durham : Duke University Press, 2016



SYMBIOSIS

Our current relationship to most survival systems are shrouded in loops upon loops of indirect strategies to reduce financial overheads. Profit and speculation persuade populations to accept what they are given, as choice. Our access to the fundamentals of material and food resources has become so abstract, generations must be educated in their origins.

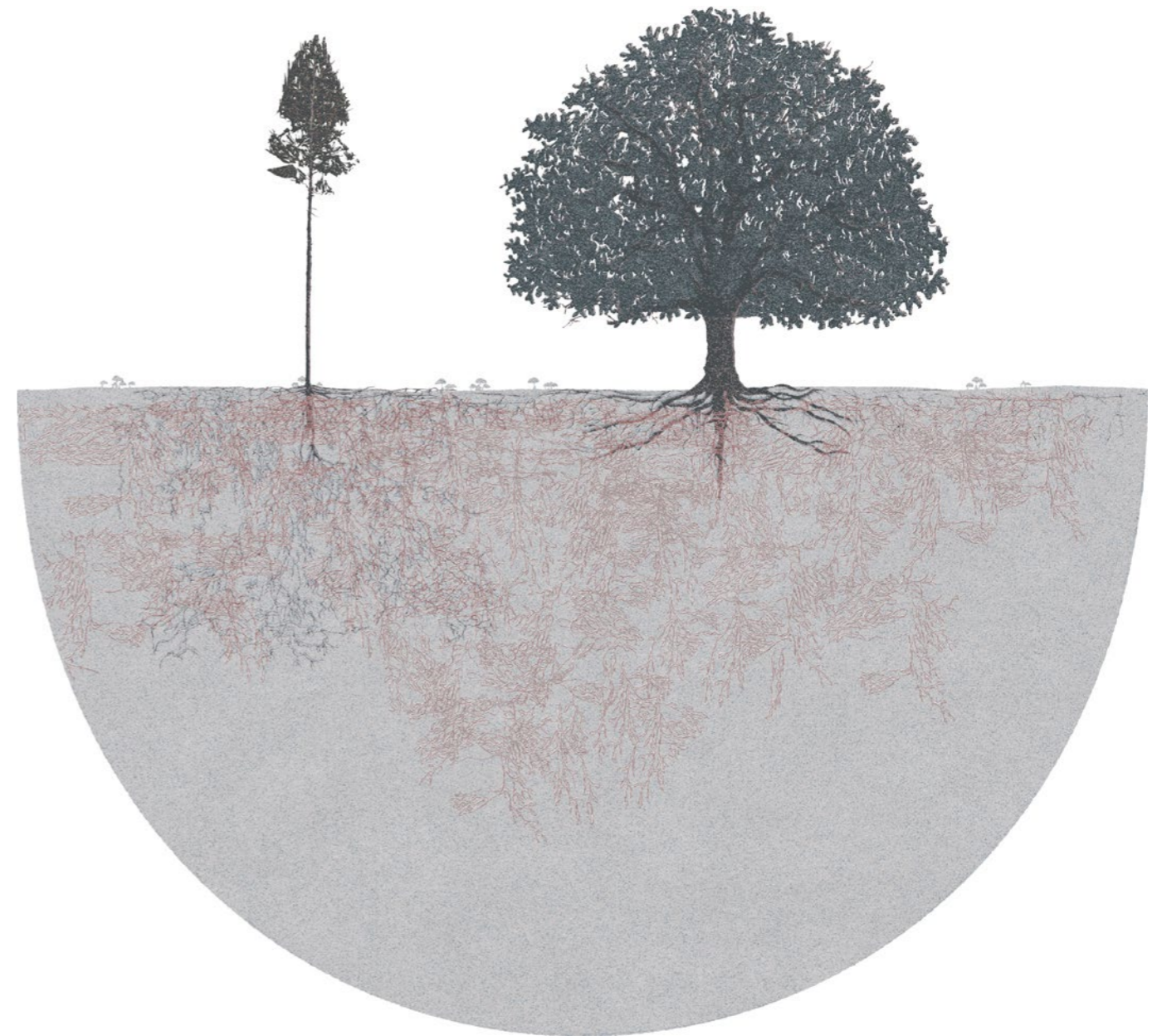
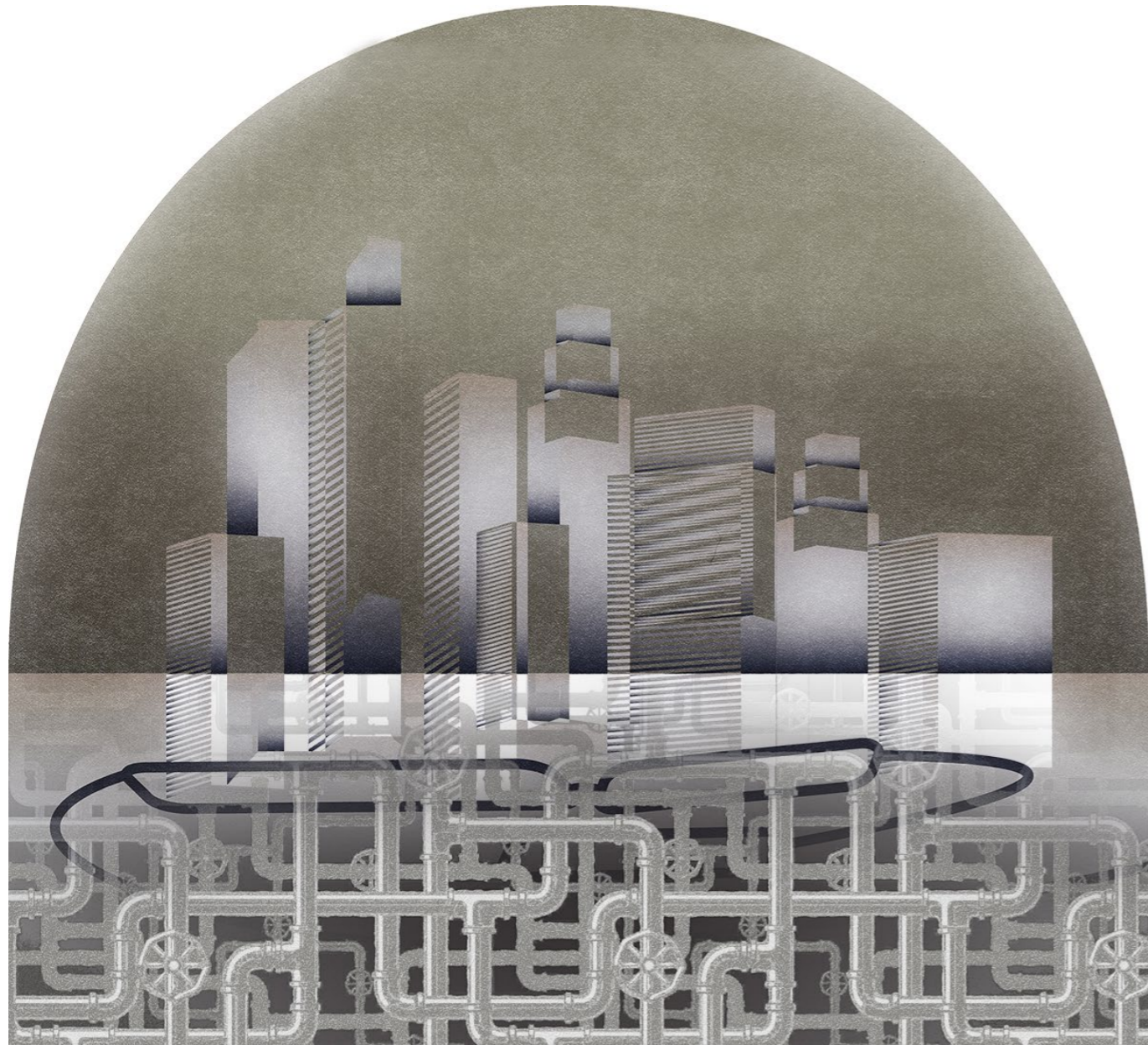
What if that process was a closed loop, what if one was faced with the reality of one's inevitability? Life's complex birth and composability are mirrored in all processes of life from nutrition to infrastructure. Cayenne's Stories explored the potential for inhabiting within its own survival system of symbiotic relationships.

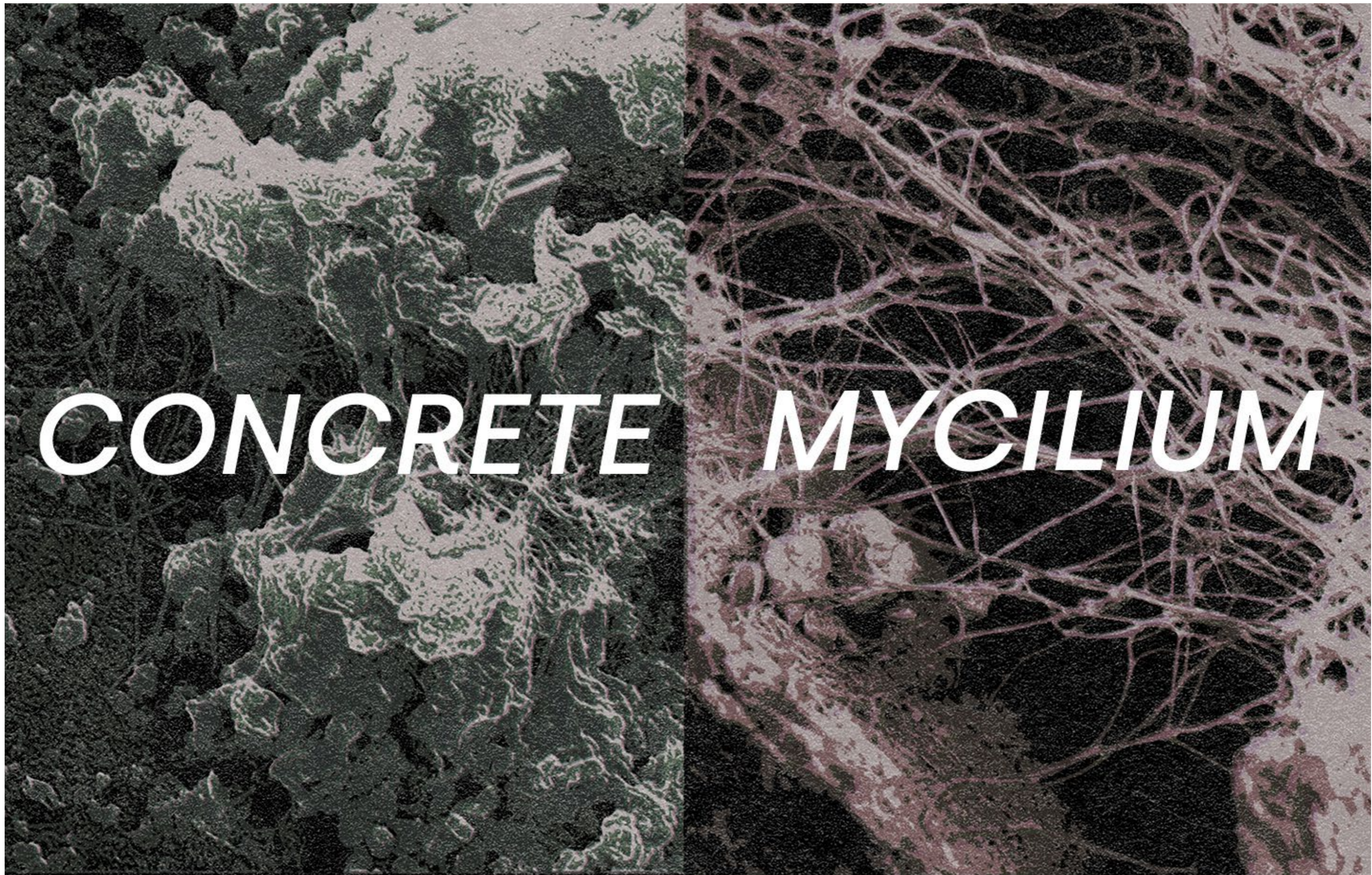
Relationships Extended

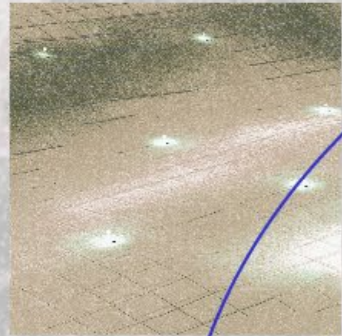
Complex systems rule our societies, our confidence and reliance on their protection is also a misguided attribute to our ignorance. Our fragile reliance only becomes apparent when the failure of the system reveals our dependency.

How would one perceive one's role within the system if one had direct contact?

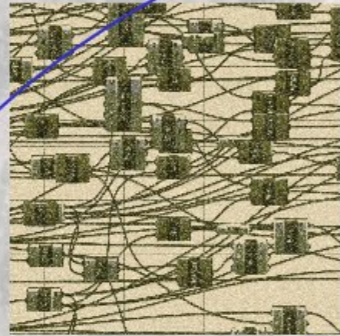
Cayenne's stories mark the dawn of symbiotic inclusivity: the use of mycelial membranes for ecological health. Linking mushroom cultivation, permaculture, eco-forestry, bioremediation, and soil enhancement.







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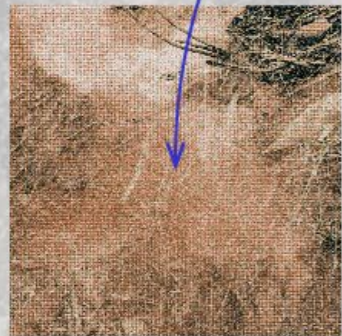
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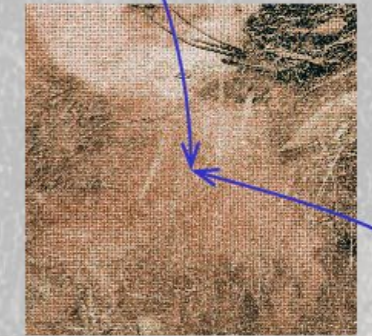
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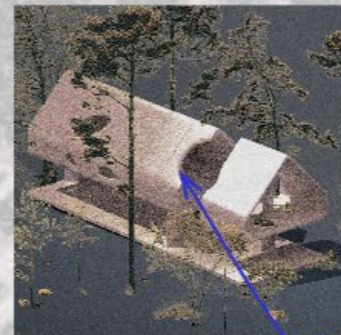


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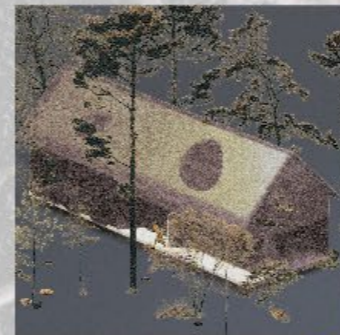


07.

- 01. Topographical design analysis
- 02. AI assisted evaluation and design
- 03. Printing of inoculated building substrate
- 04. Incubation of building form
- 05. Collection of material substrate
- 06. Processing of material substrate
- 07. Composting of material
- 08.1 Construction of printed elements
- 08.2 Habitation
- 08.3 Compostation
- 08.4 The ruin



08.1



08.2



08.3



08.4



KINSHIP

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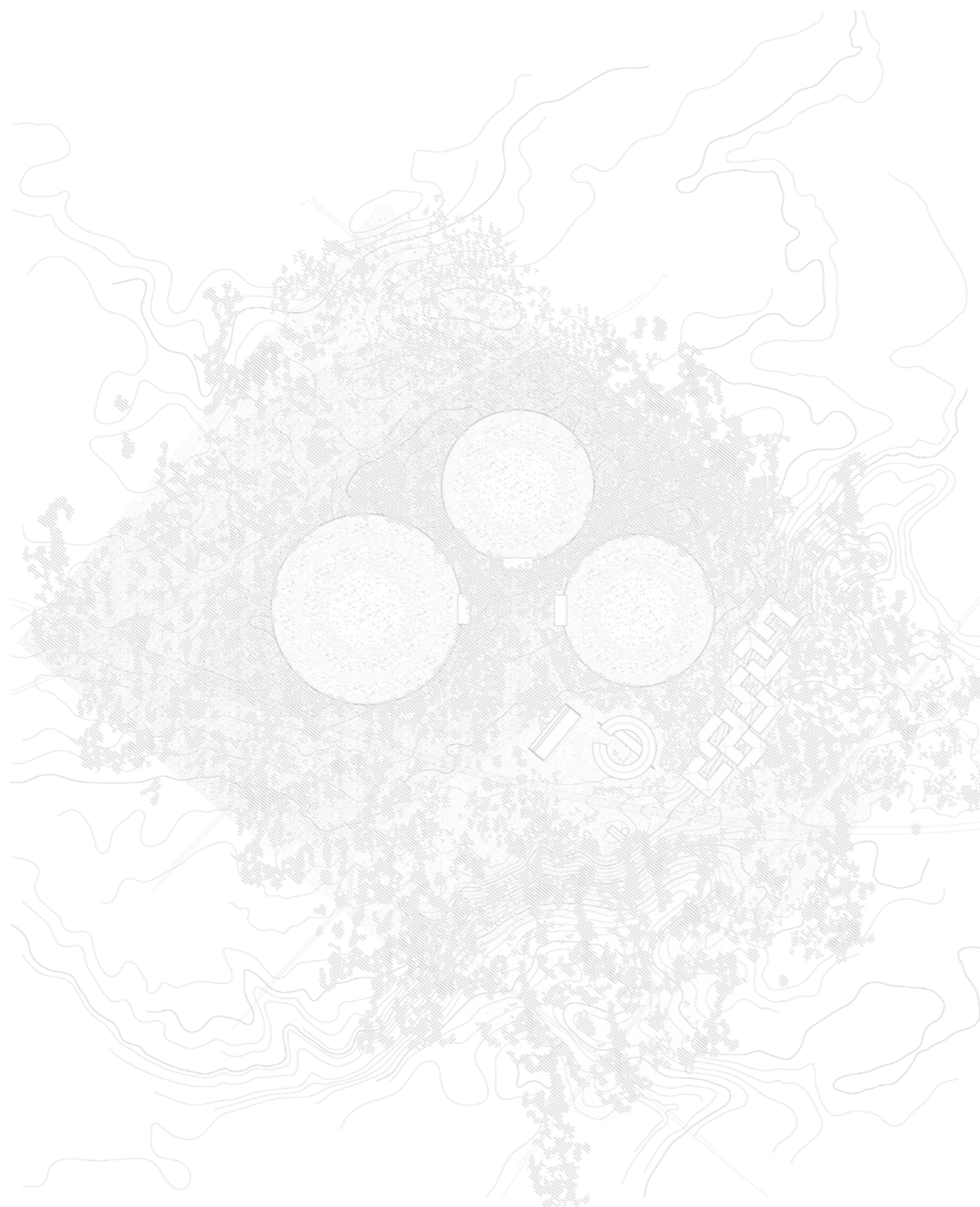
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AS FOUND

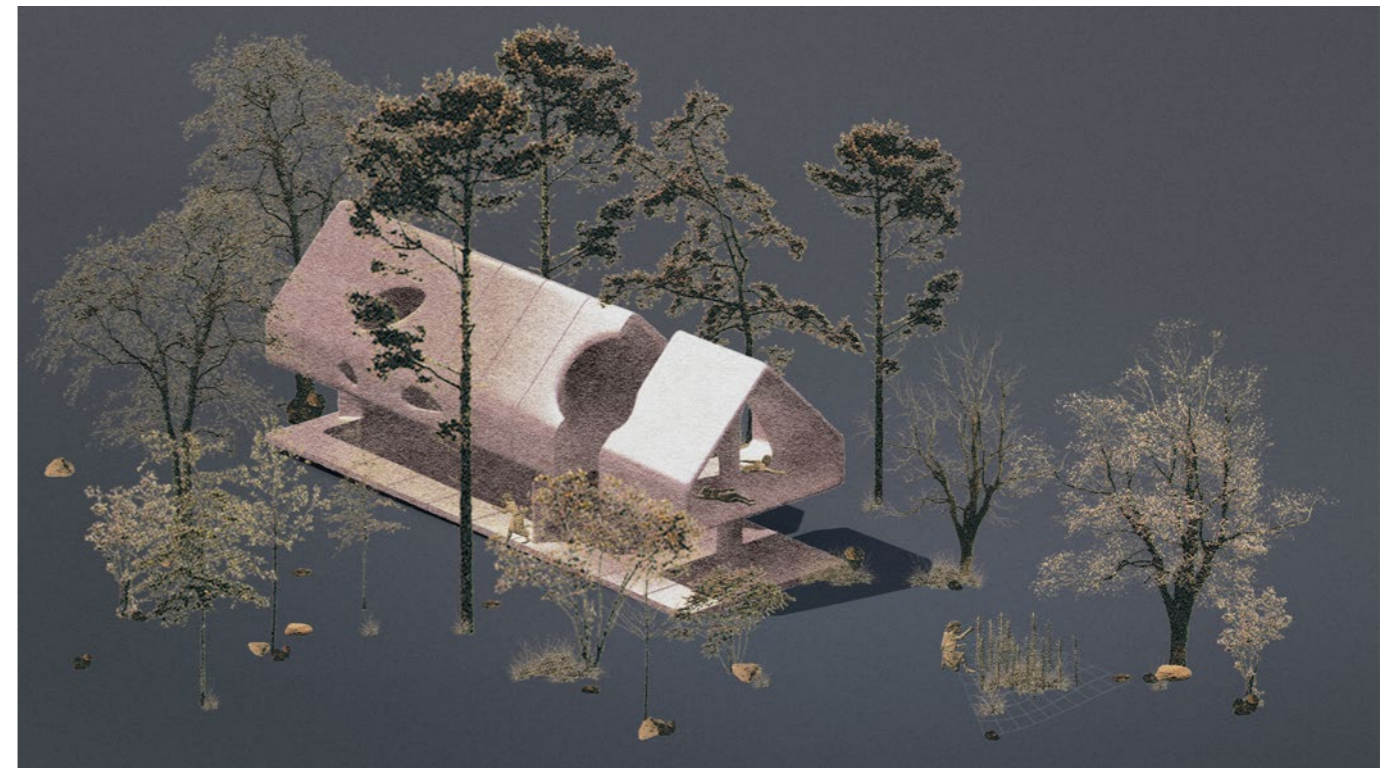
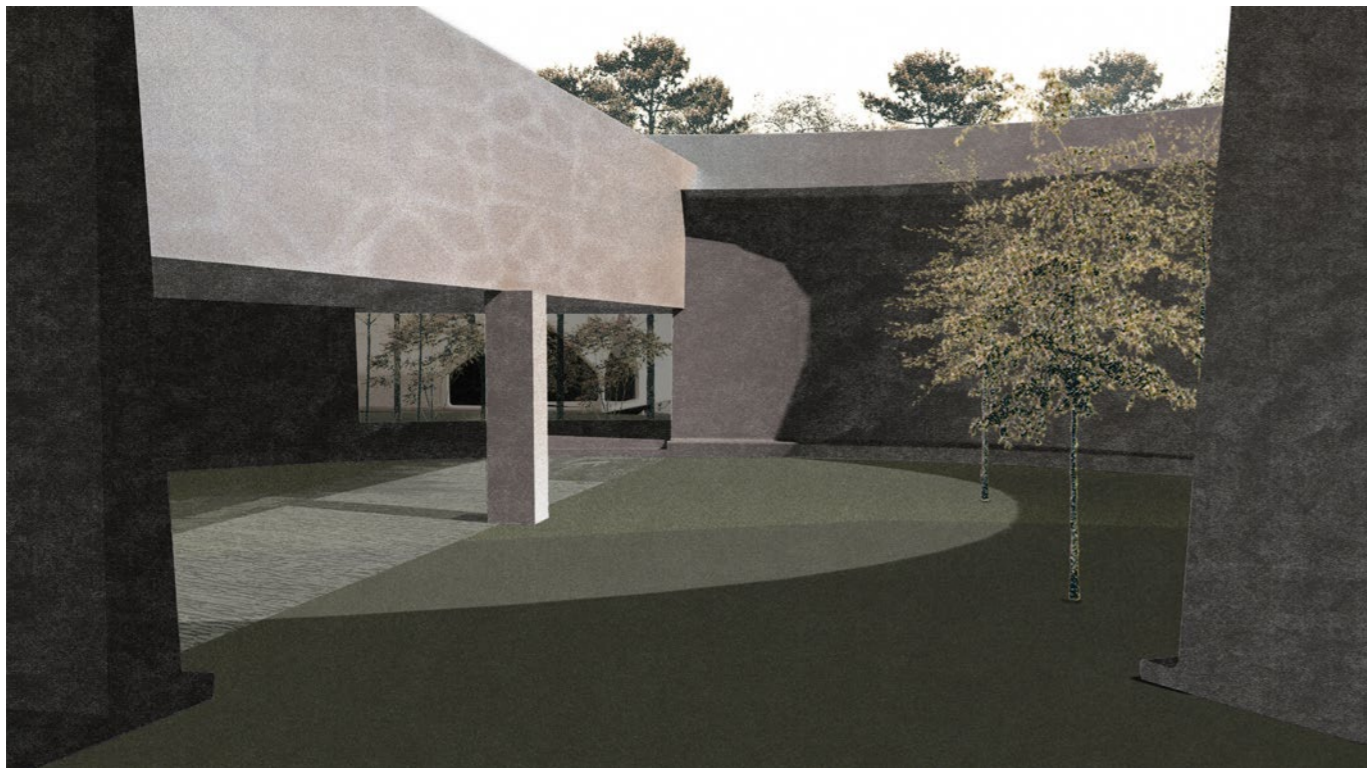
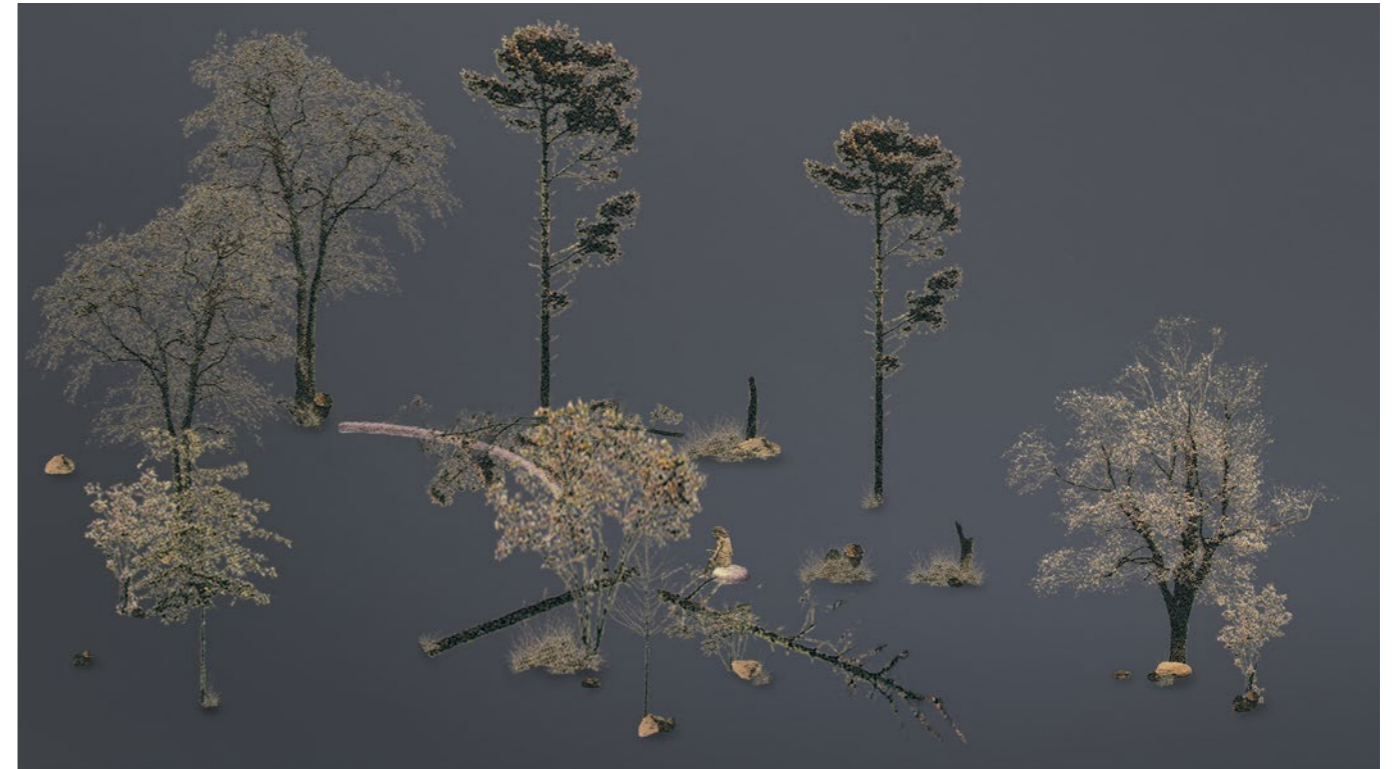
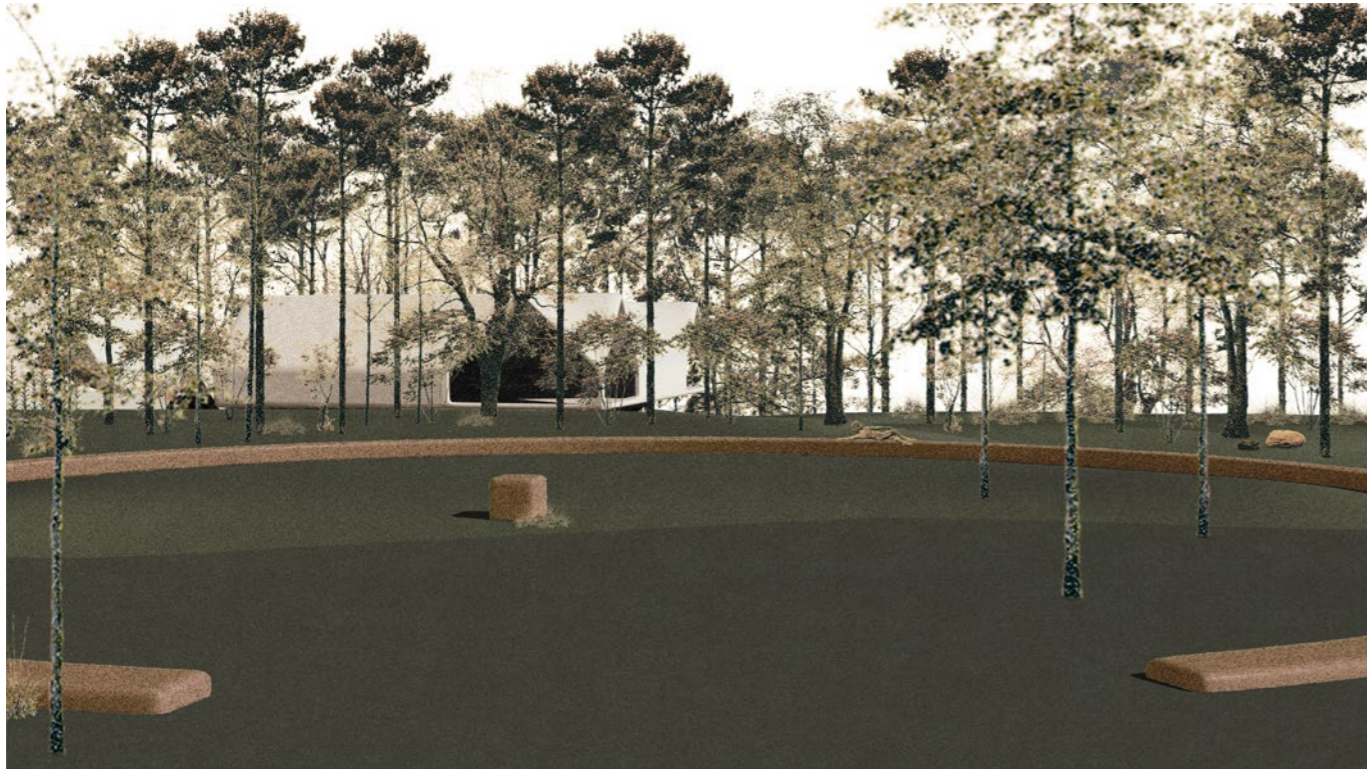
The degradation of soil was known throughout the world for many years during this fraught period of unsettled divestment from reality, the common denomination seemed to place their trust in technocrats, the cult of the personality, restricted access to advancing technologies, and powerful chemical industry for answers.

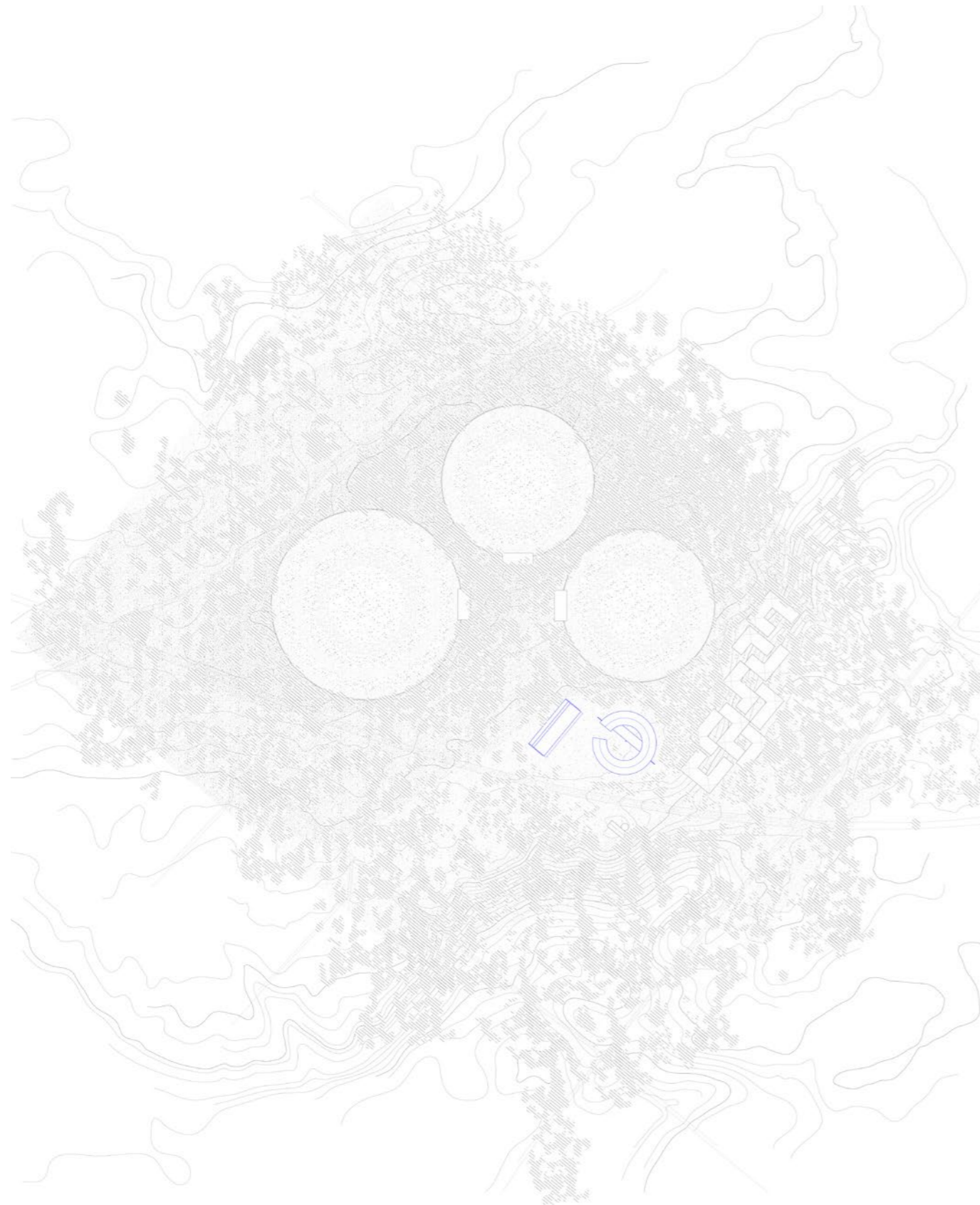
A one (or many) bottle solution(s) that had a profound impact on the order of things. Thing is complex, things need time and patience to understand, to learn from. The value of time should not be measured in one's lifetime and that is where the one bottle solution fails. It relies on profit procured in a lifetime, its benefits are touted by suits and the application left to the farmer. The consumer consumes and the consequences are as disposable as the 'collateral damage' afforded to the critters.

Soil remediation has no one fix solution, S.R.S's attempt to stitch together a variety of methods of soil nutrification was a noble effort, a catalyst for which we are grateful. Studying combined qualities and potential applications, the outcome of which became blueprints for preventing the complete desertification of productive lands.

The following pieces of information will hopefully bring into focus the qualities of the project that made Cayenne. Although never complete the parts embellish the whole. As it should be known that "the map is not the territory".

Two main areas of study were certain. The production of terra preta and the study of symbiotic relationships between mycorrhizal and critical life support systems.





ROTUNDA

The Rotunda is situated at the apex of the settlement, although not one part can fully function without the other, the Rotunda is the part where fruit, body, mind, and mechanical technology blend together in symbiosis, kinship, and ecology.

Millions of years of evolution are studied and utilized to manufacture efficient structures, while next-level DNA sequencing is applied in farming. a collaboration between two technologies, one human, and the other fungus-based.

The Rotunda is a semi-automated building containing the main research laboratories, large-scale 3D printing workshop, and assembly space. Acting as the knot within the project each function of the settlement is directly associated with the Rotunda.

SETTLEMENT

Measurements of the topology and an AI generative design program are sequenced in the Rotundas design and development laboratory.

Here the combination of optimal additive manufacturing meets the expertise of the next-gen DNA sequencer who supplies the optimum structural strain of mycelium culture to create the compostable dwellings.

PROCESSING PLANT

The processing plant receives detailed quantities of material and information from the Rotunda. The plant refines the biomass to be used in the substrate for structural buildings and for the bio-char retort.

The Rotunda can use precise calculations in order to use the optimum in material quantity, this reduces stress on the biosphere of the settlement and optimizes the production time and energy outputs.

FARMING

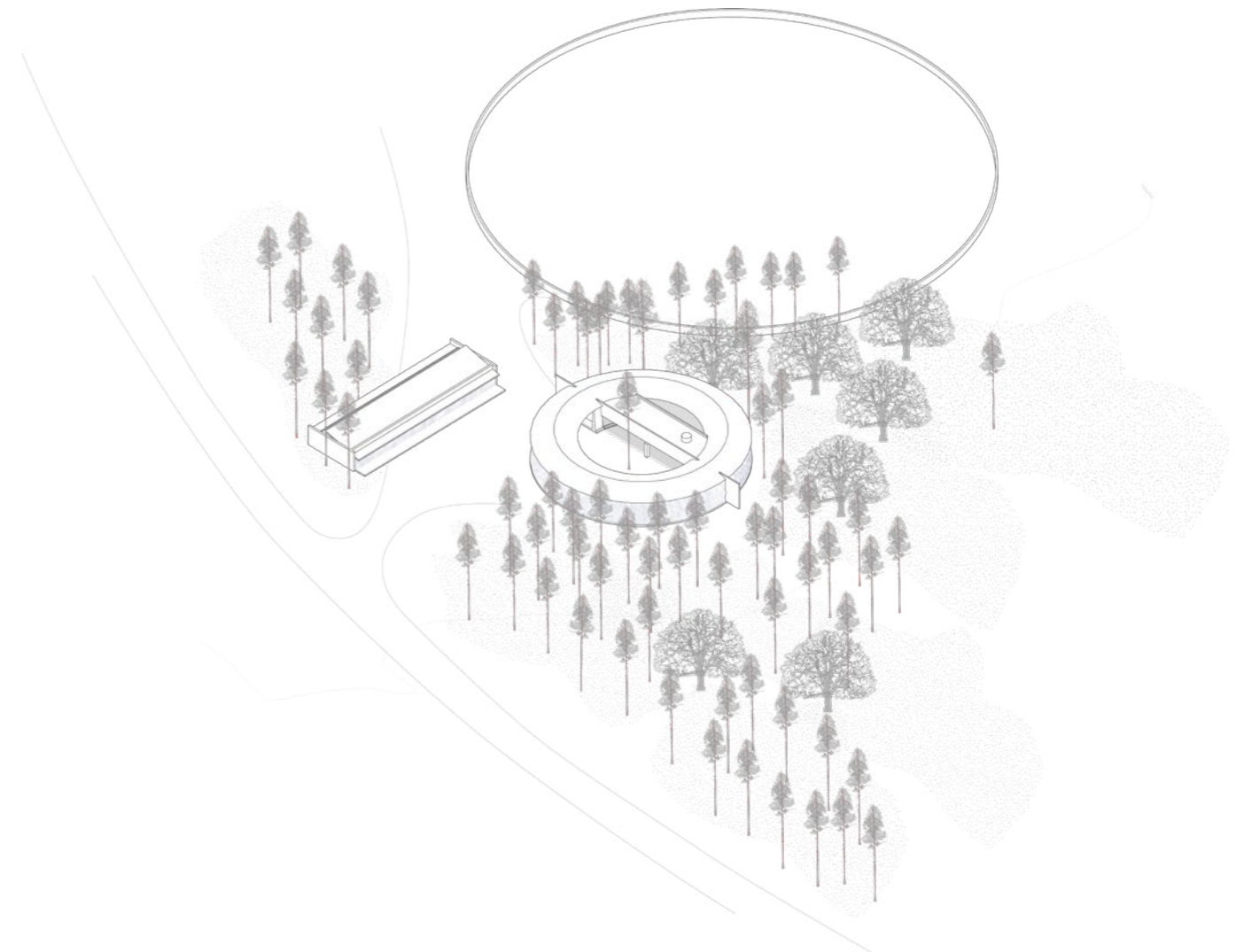
Results in the field are processed in the labs, samples are routinely extracted, and the composition of the soil is analyzed. At the heart of the research is the interaction and measurement of mycelium's, mycorrhizal symbiotic relationships between species.

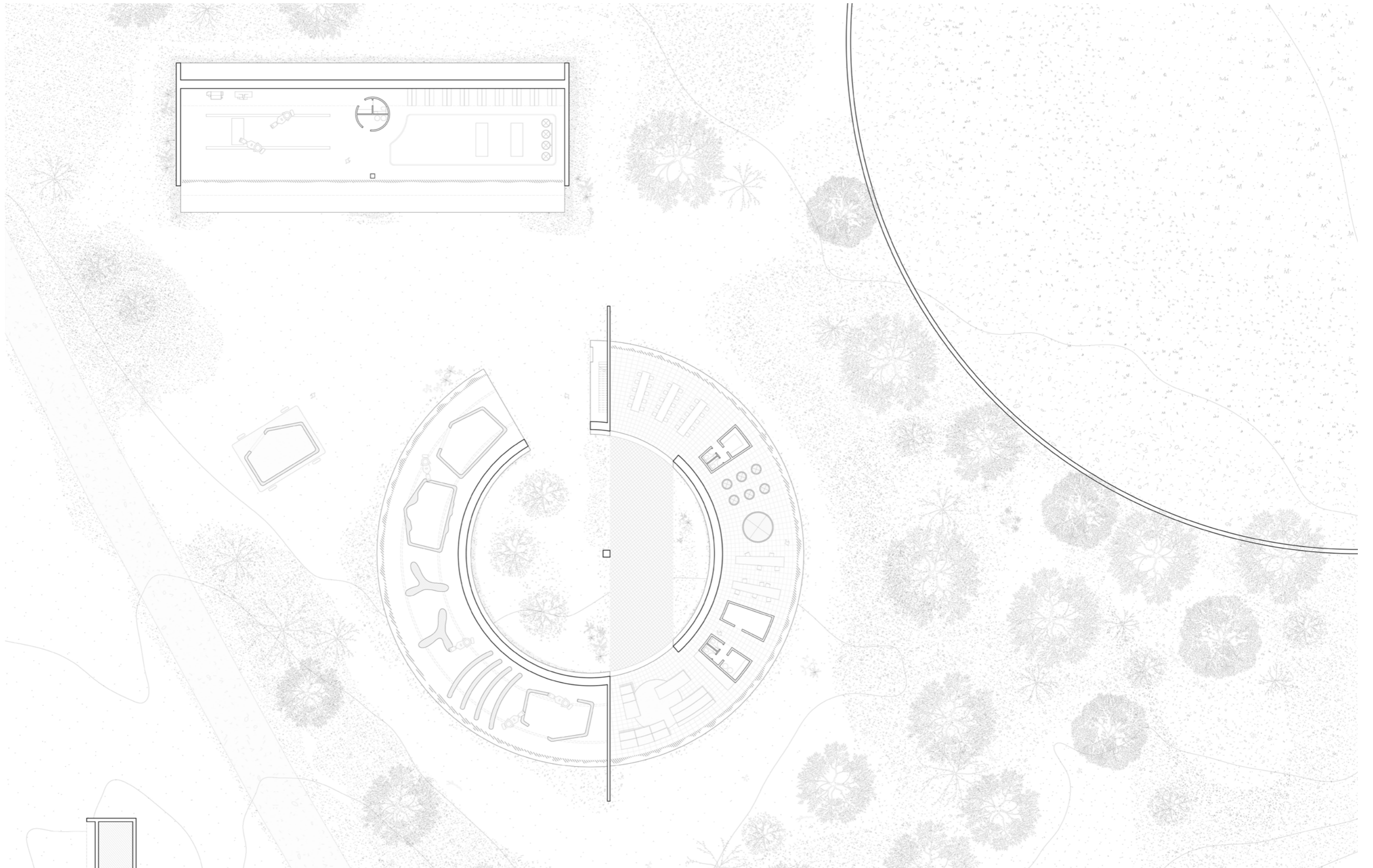
The evolution of the soil and biodiversity are monitored to evaluate the optimization of nutrient retention and exchange. Bio-char deposits are monitored, and feedback is given to the research in order to inform potential optimization of the soil.

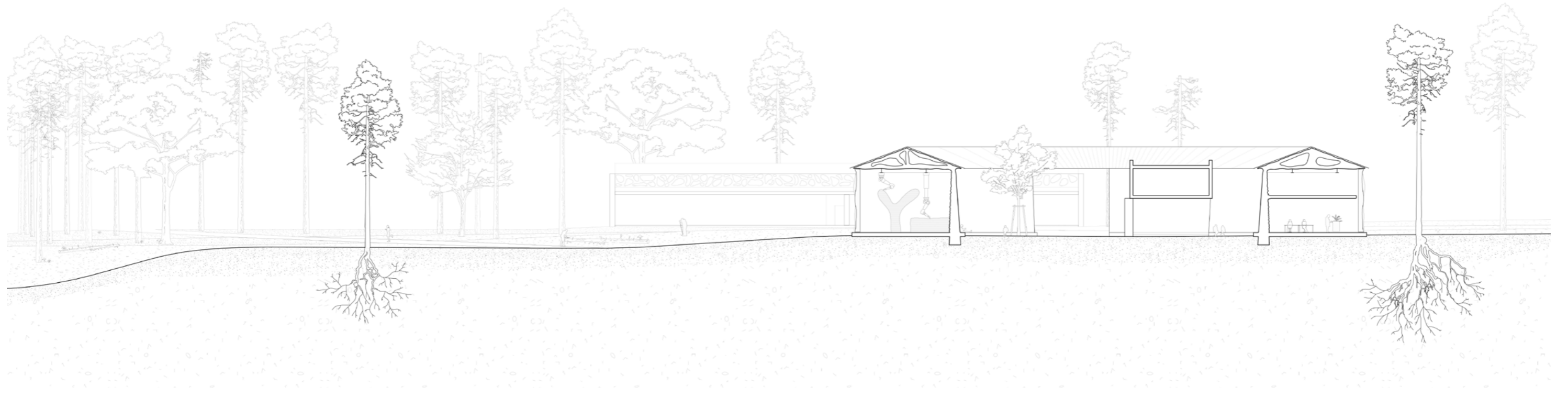
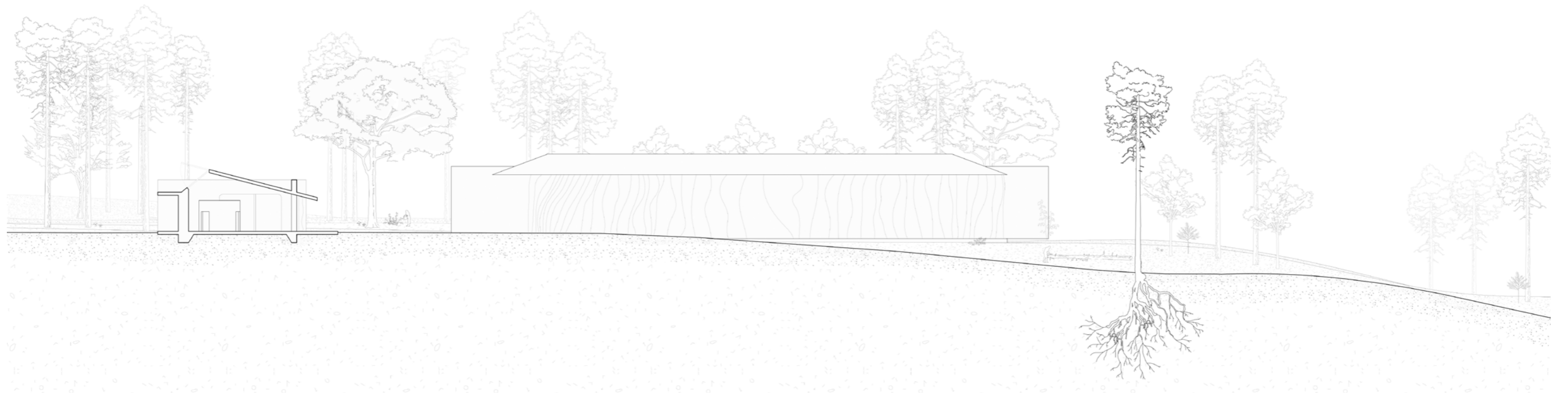
BIO-CHAR

Although the smallest structure on the site, the dedicated closed furnace (retort) produces the building blocks of a complex soil nitrification system in the form of char, while also providing energy through the thermal exchange.

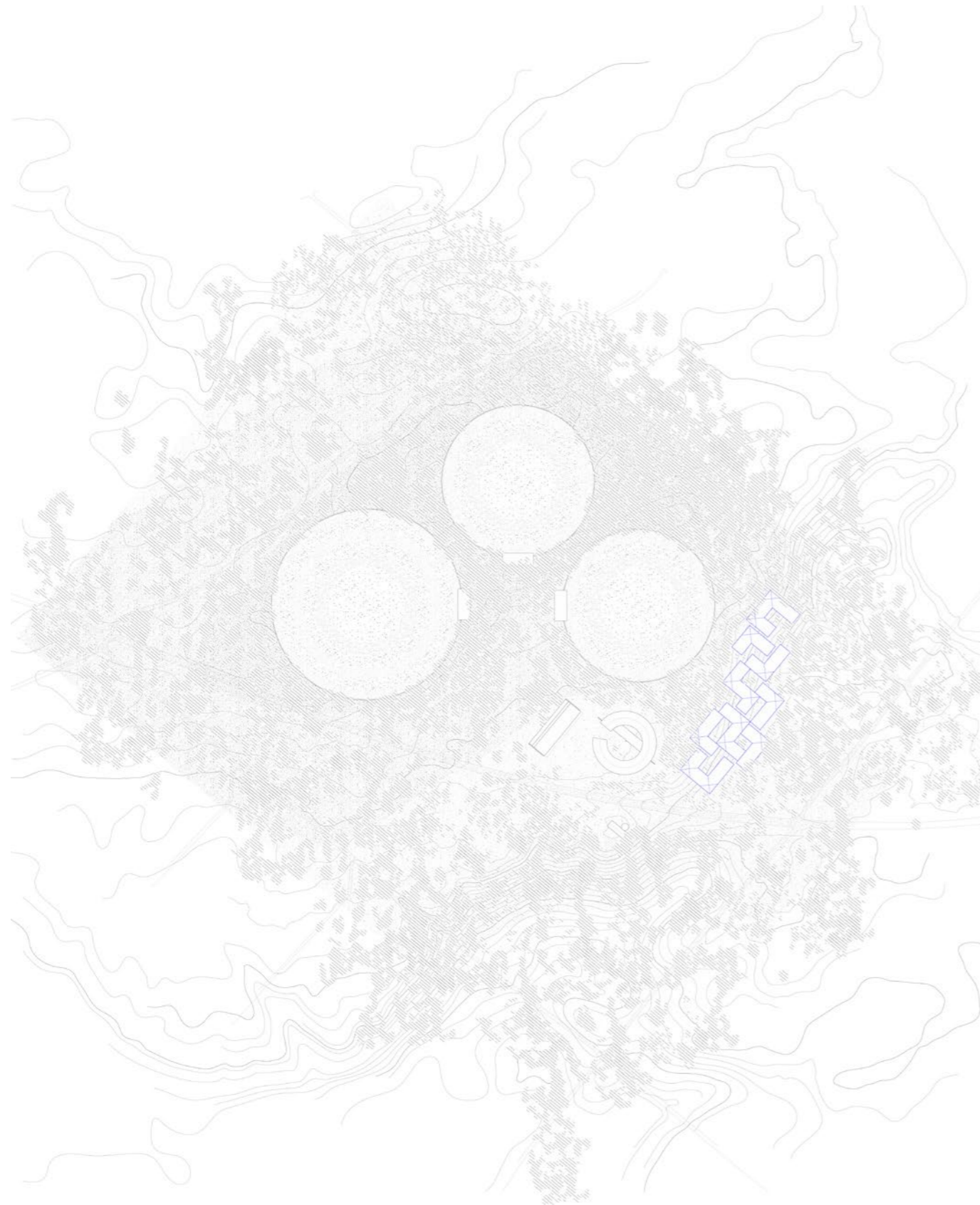
Char produces a microscopic network of surfaces equivalent to 340 m² per g. This quantity of surface area retains minerals and water preventing the leaching of nutrients.











DWELLING

The combination of millions of years of symbiotic advancement, and our latest technology in large-scale printing create a new relationship between the settlers and the land they occupy.

In one moment, shelter; containing all the comforts of dwelling. In another moment, compost; dismantled and returned to the earth, the duality of a life cycle.

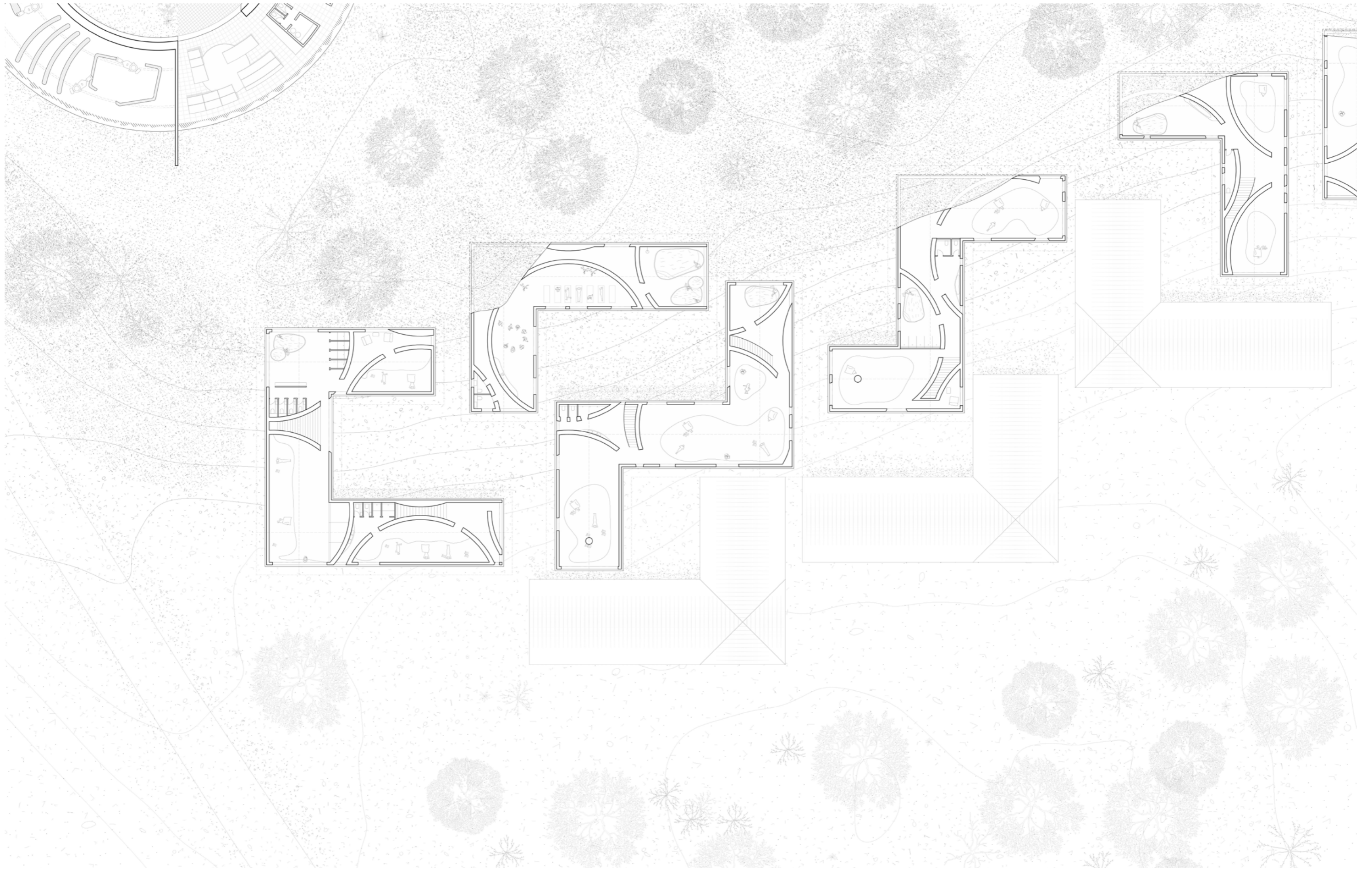
A cornerstone of the project's effectiveness is the ability to sustain maximum efficiency. A combination of generative design and AI assist with efficient additive manufacturing.

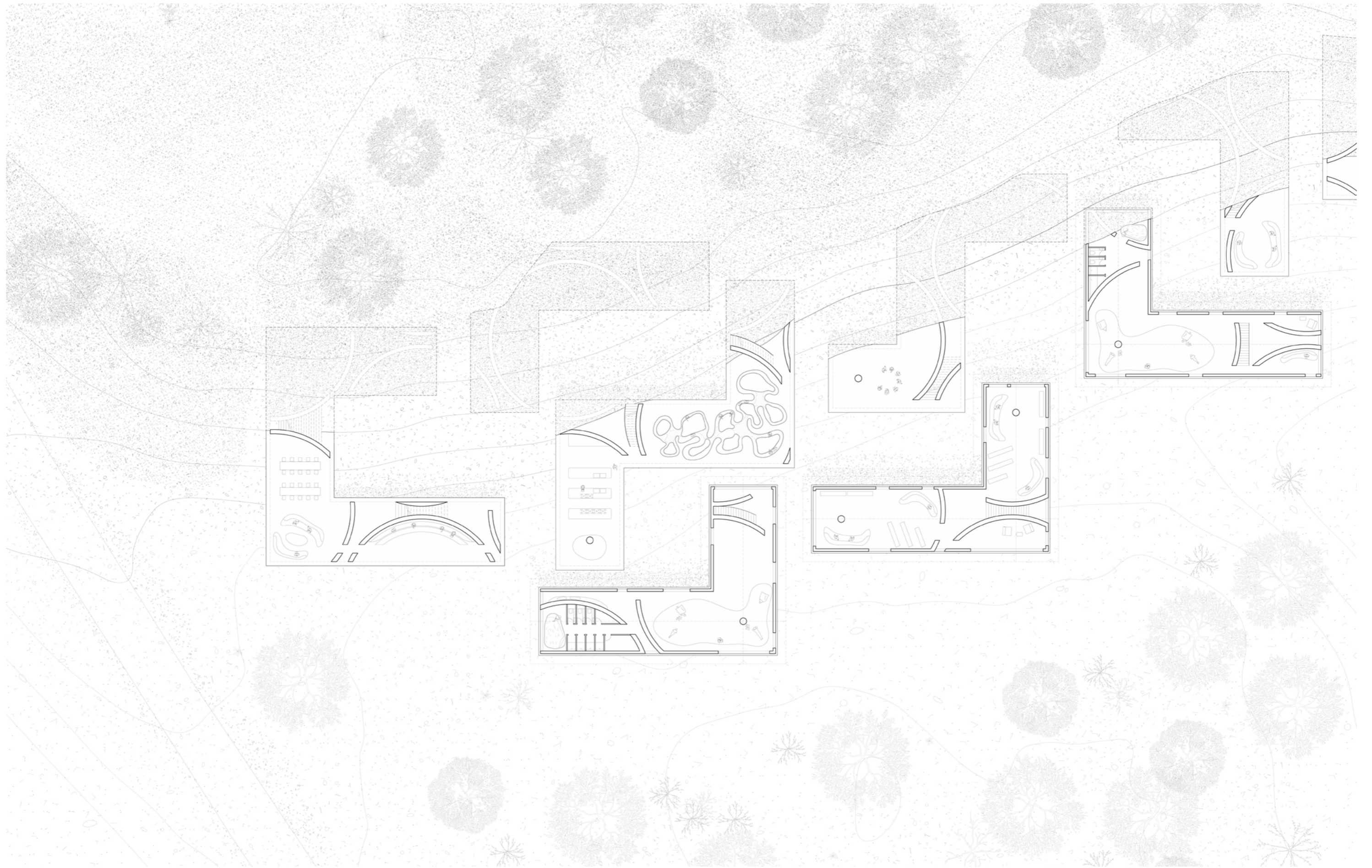
The settlement dwellings composed of printed sections of biomass, processed on-site are inoculated during the printing procedure with carefully selected fungus spores.

The sections once delivered to their site are mounted and insulated to create an environment where the fungus spores can germinate and expand through the biomass; breaking down the organic material, unifying the sections by replacing the form with its own complex matting of mycelium.

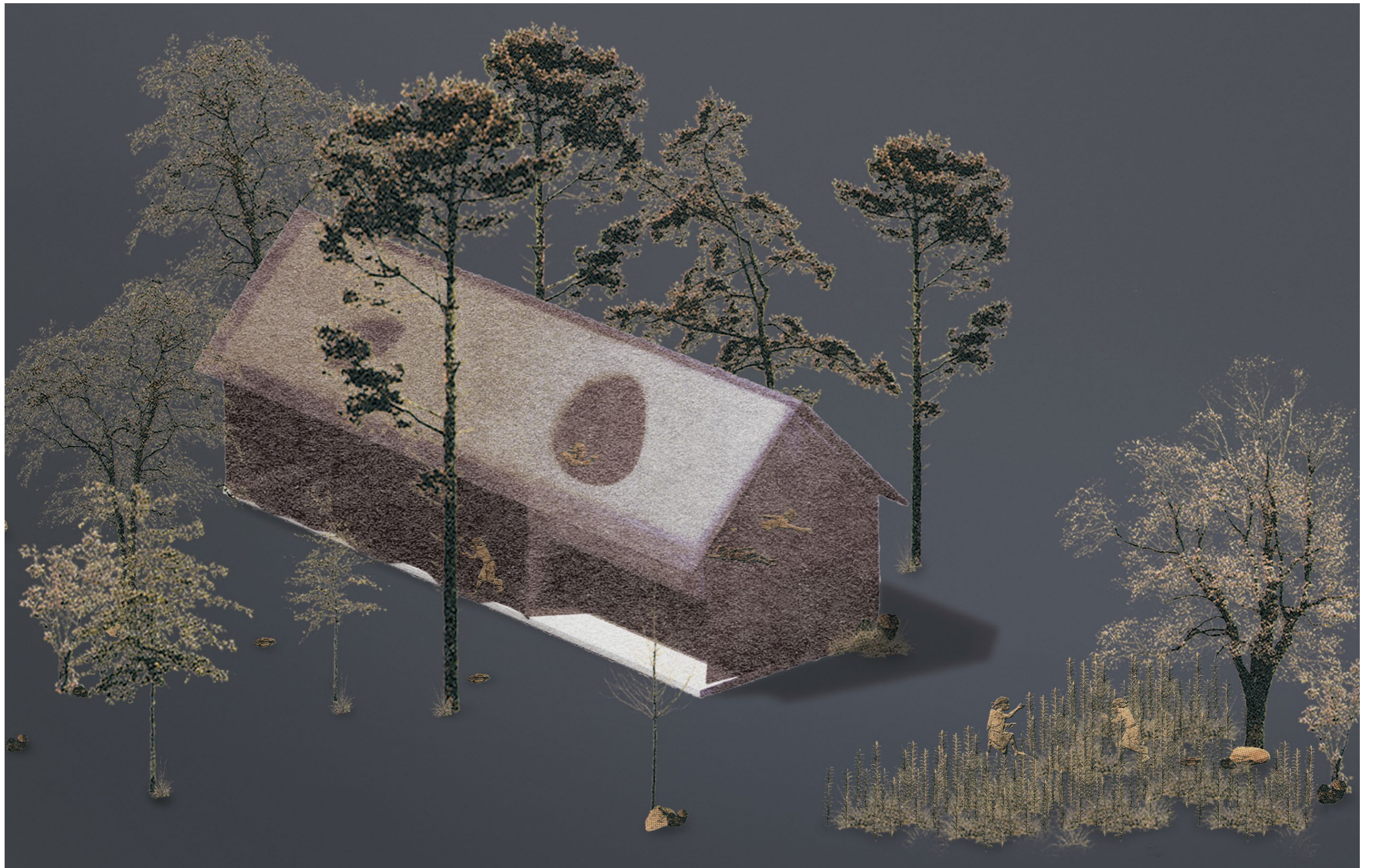
Once the mycelium has completely taken over the biomass, the incubation period is stalled, and moisture is removed with heat preventing the building from fruiting and overgrowing.

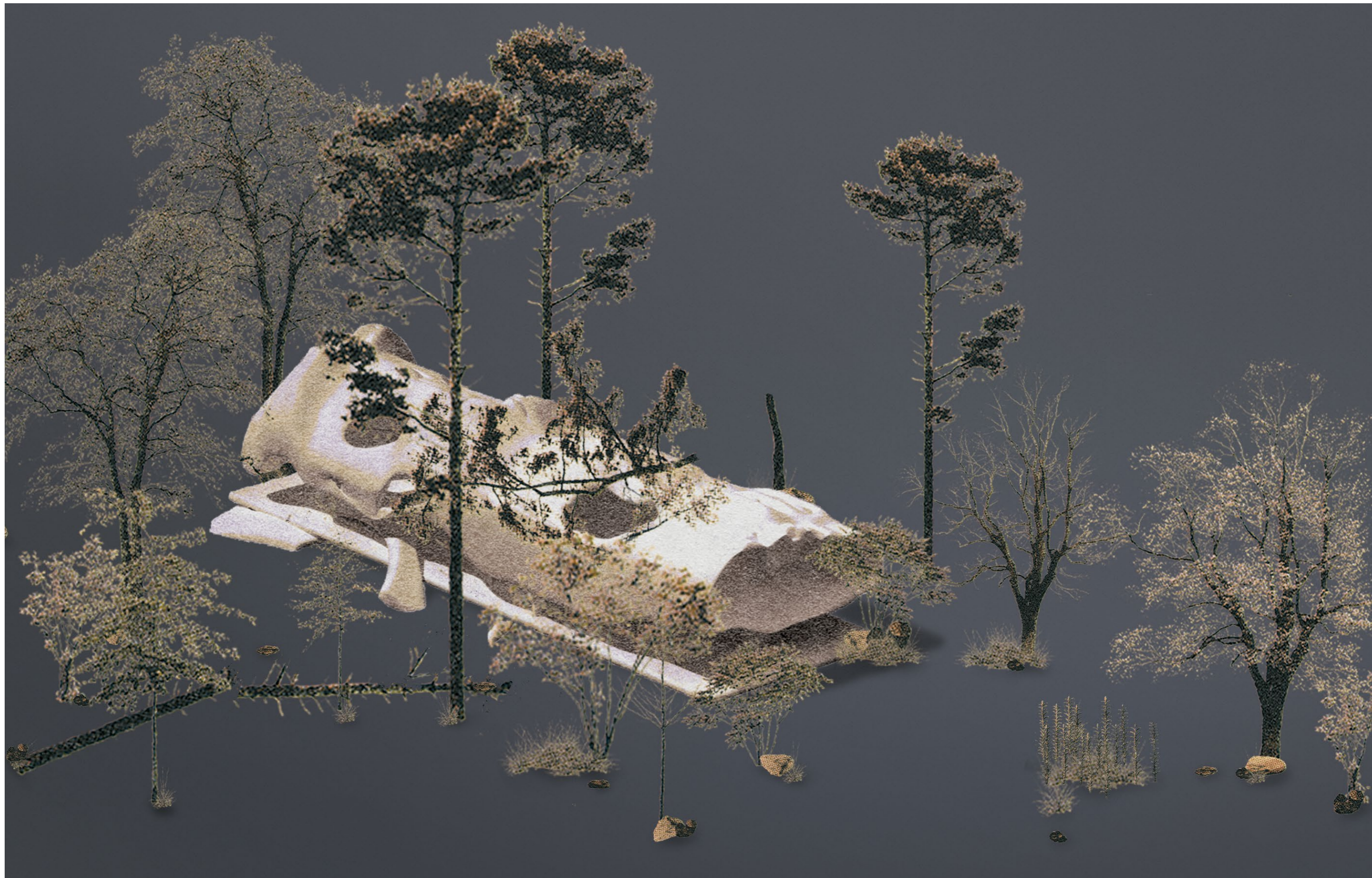
The structure is now ready to be weatherproofed, fitted out, and inhabited. Until it is ready to be composted, and the cycle completed.

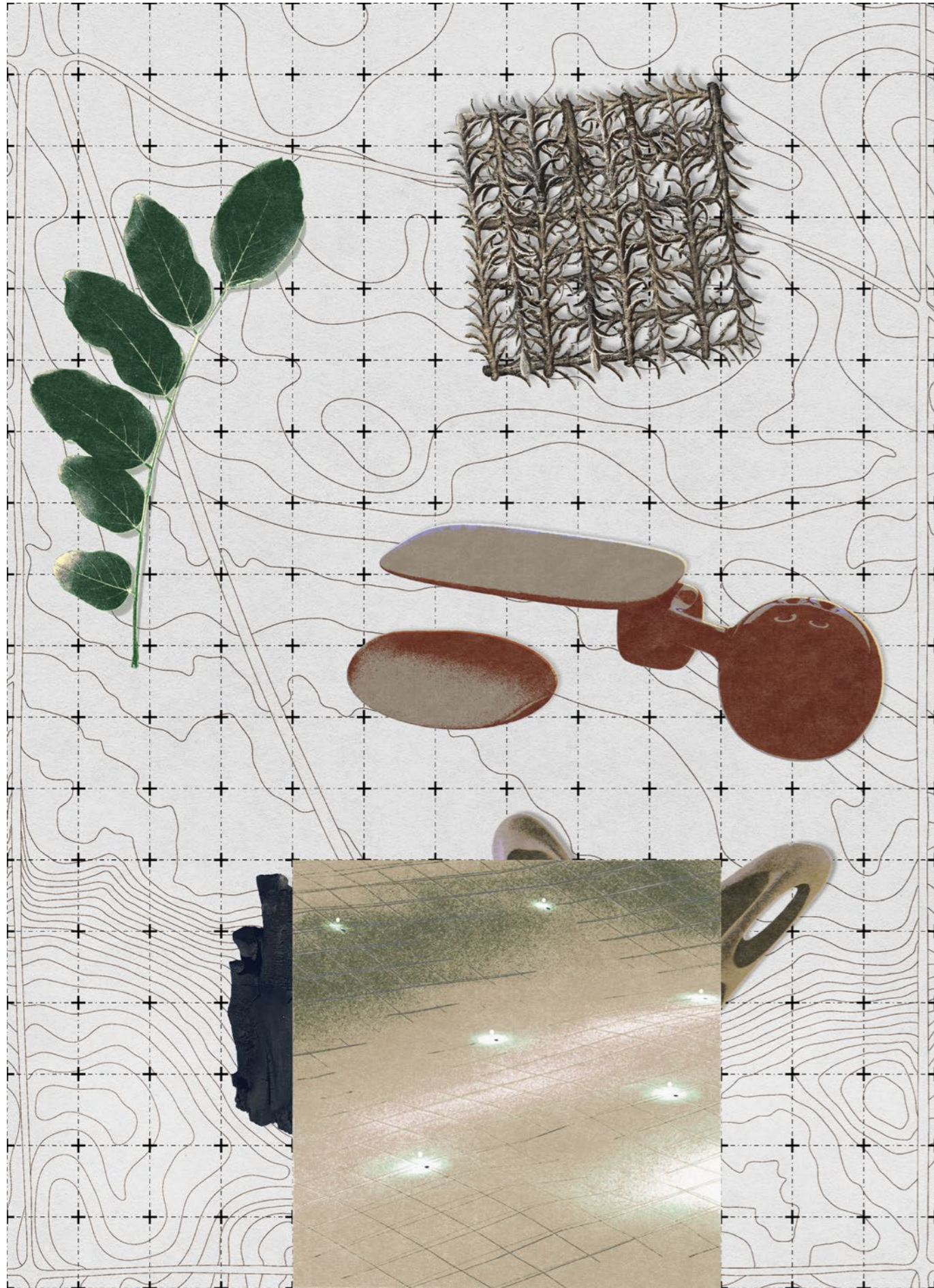




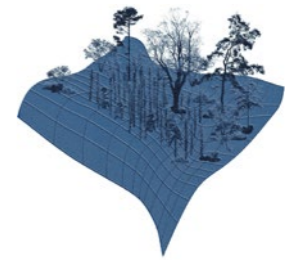
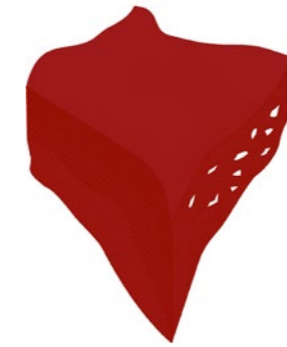


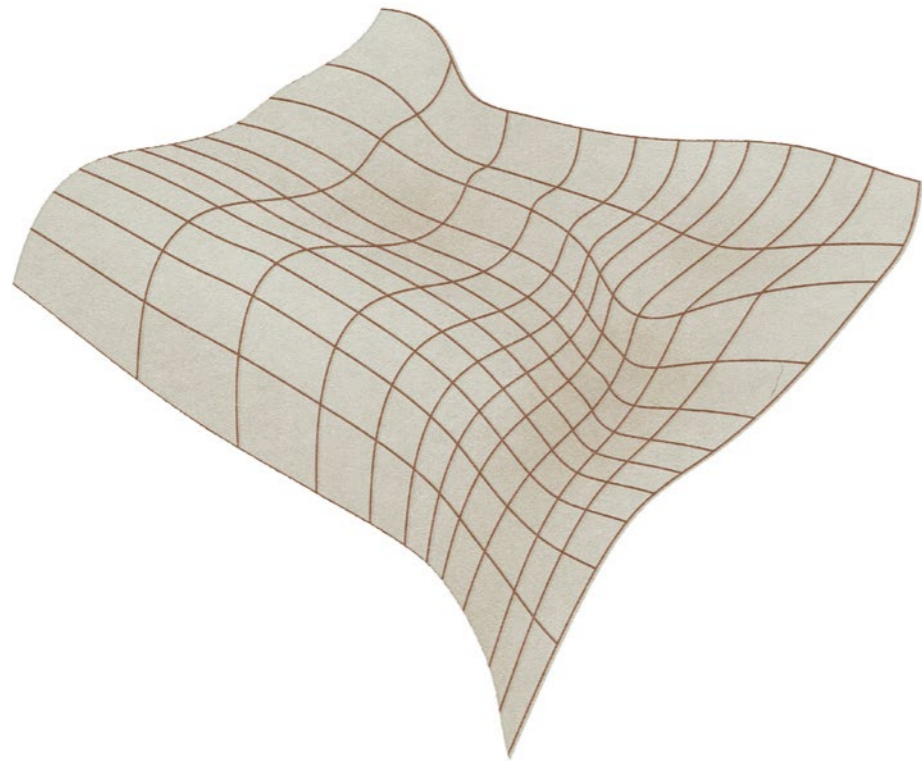






ECOLOGY





TERRITORY

The documented occupation of Grunewald has been recorded since the 16th century, the name derives from the hunting lodge of Grunewald erected in 1543 by order of Elector Joachim II Hector of Brandenburg and named "Zum Gruenen Wald". Later in the 19th century, the area would become populated by upper-class 'mansion colonies' promoted by Otto von Bismarck.

The territory surrounding the site is mostly considered a nature reserve, however many of the distinguishing features that have become synonymous with the region are products of industry and war.

Most striking is the "Teufelsberg". The constructed hill stands at 120.1m making it the highest elevation in Berlin, between 1950 until 1972 approximately 26 million cubic meters of excavated war debris and construction waste were deposited.

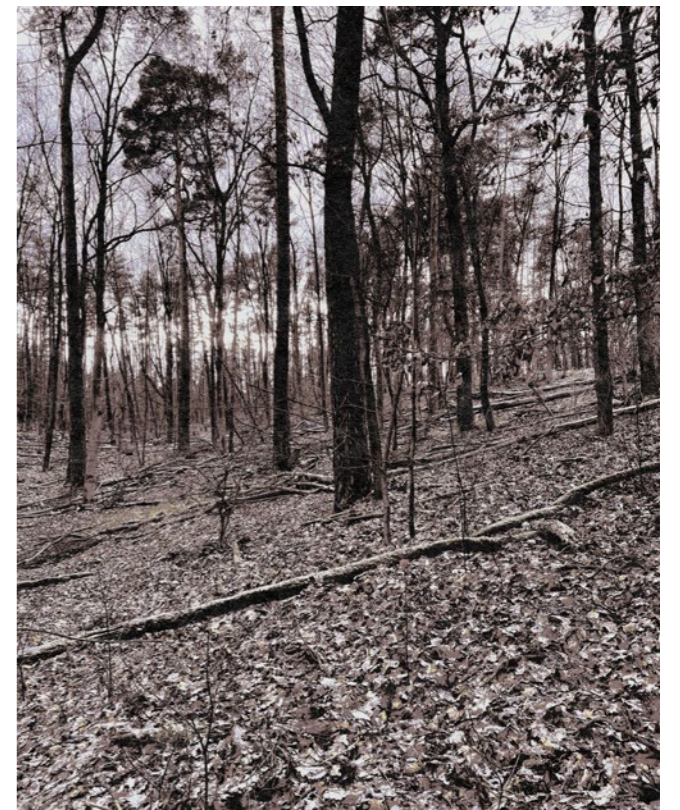
Another site of interest is "Sandgrube im Jagen 86 des Grunewaldes" a biotope near the site. The site is a product of sand mining for the construction industry of West Berlin between the 19th and 20th centuries. The excavation of 18 hectares dropping between 15 to 25m is below the water table, creating shallow waterholes and providing a rich diversity of flora enriching the quality varied habitats available to many species of wildlife.



Grunewald – 1953

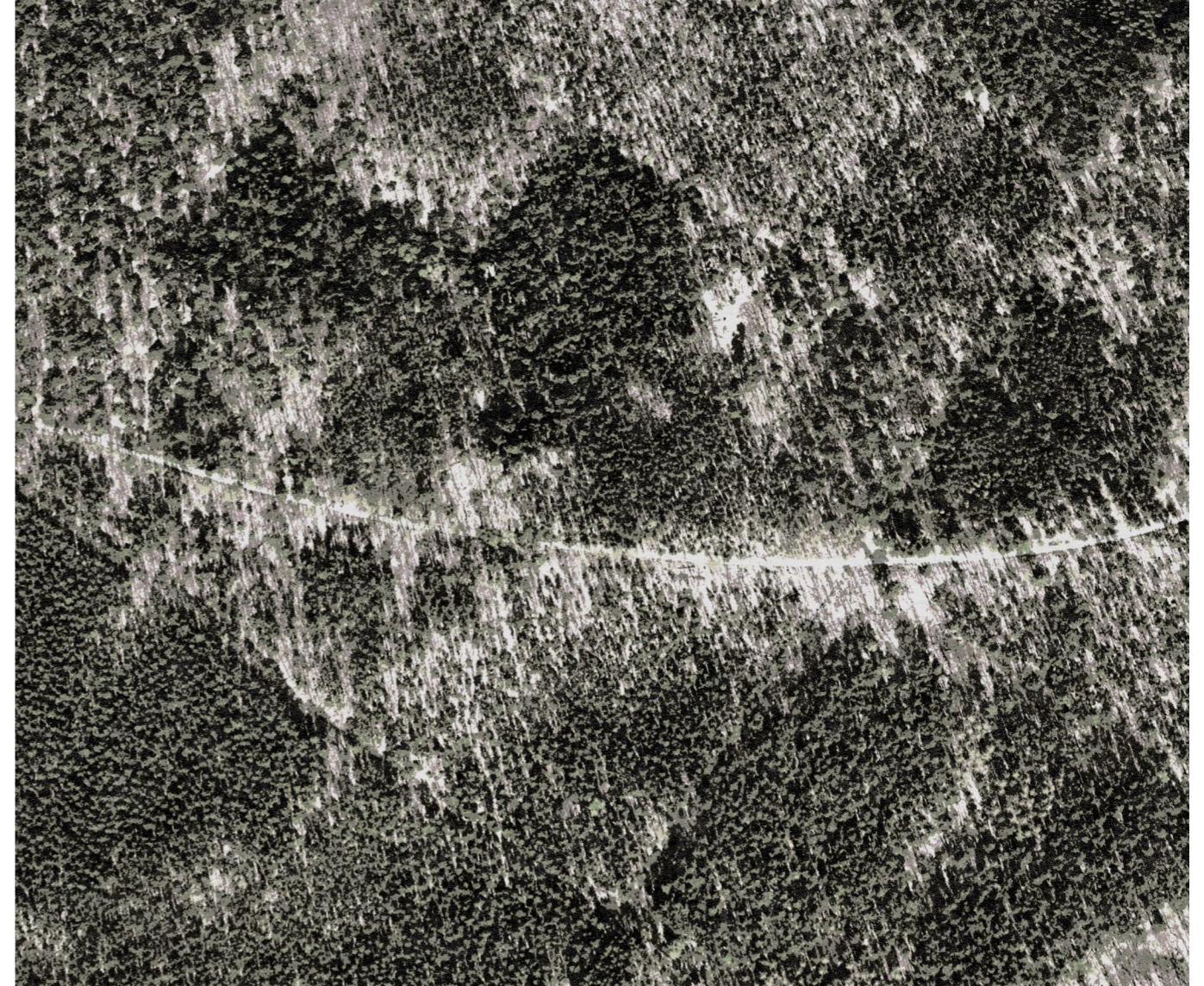


Grunewald – today





Gartenverein Grunewald e.V.



S.R.S Soil Remediation Studies



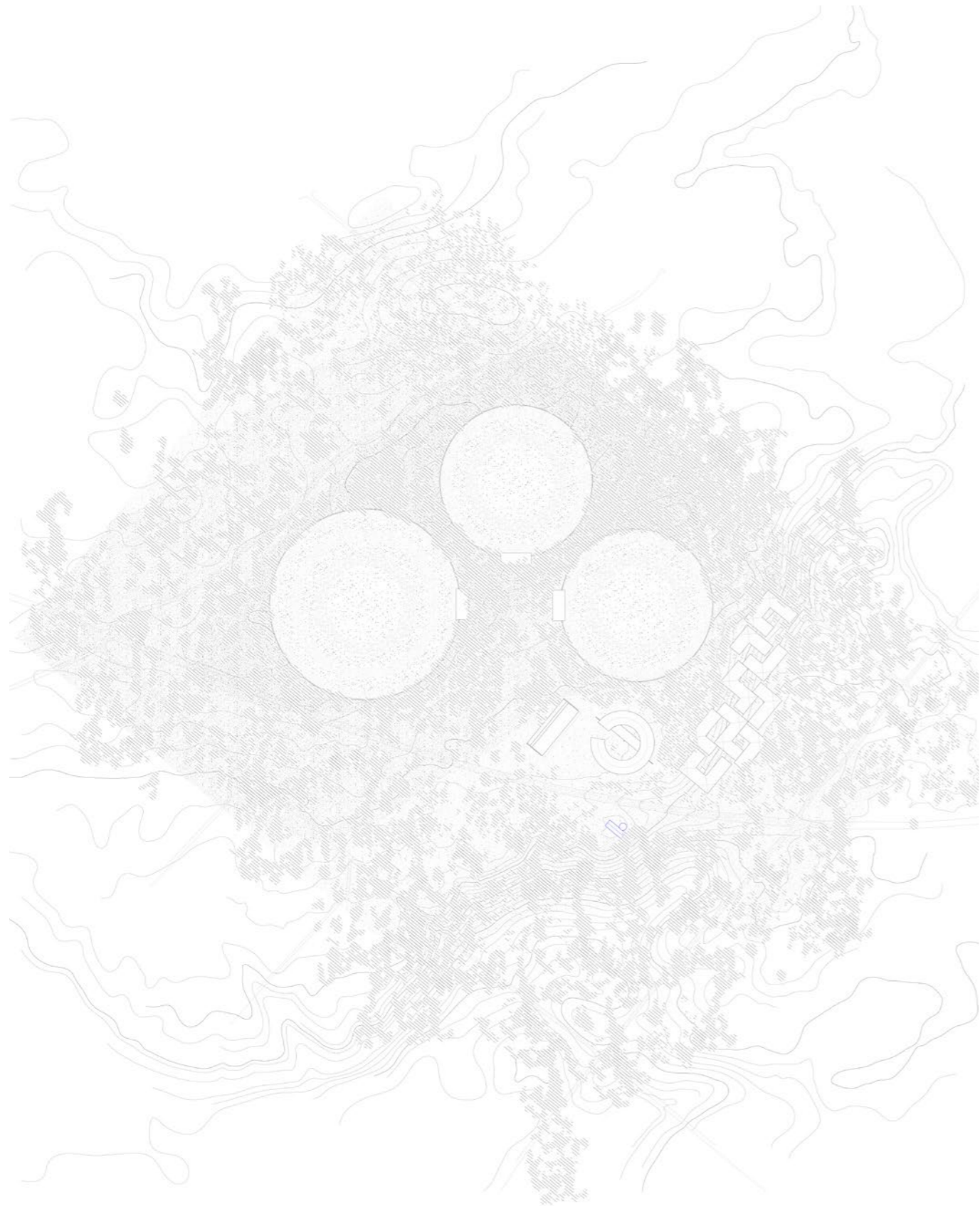
SOIL

A structure, identical to the processing plant is positioned towards the center of the site. The location and form provide the first clues to its function.

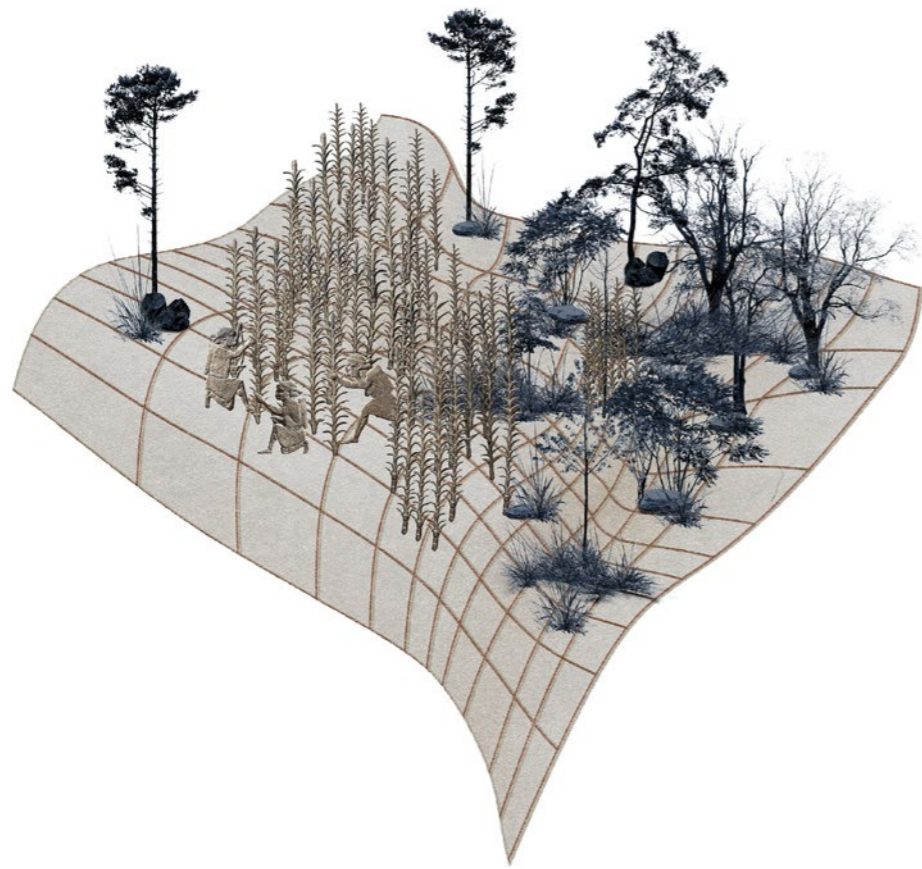
While the settlement outsourced energy from the traditional 'main grid' it seems that the S.R.S moved towards a decentralized, self sufficient energy model as the project matured. The second towers primary use was twofold, production of carbonated biomass and a thermoelectric facility.

The production of biochar from biomass was a prominent objective of the operation.

The enhancement of the soil substrate using a form of soil nitrification known as biochar or often referred to as terra preta as we are aware now began the accelerated process of soil structuring and nitrification. Biochar requires the combustion of biomass, biomass in the form of wood and brush; the outcome is biomass in the form of pure carbon. Pure carbon contains several qualities that are enhanced, and in-turn enhance the quality of soil.



FOREST GARDEN



The forest garden is a study in ecology. The primary task of the settlement is to establish healthy soil even with constant productive acts of farming are carried out. Nutrient cycles are monitored alongside the mycorrhizal relationships, this informs the settlers in optimized planting groups.

Any new site that is investigated for potential farming undergoes a complete analysis of the soil and subsoil. This gives the research team the information needed to aid the soil's optimum resource sharing. The research generally has two main problems on the site, potential pollutants caused by past industrial waste and poor soil quality.

The Discovery of toxic pollutants is dealt with using mycoremediation; a technique that uses next-gen DNA sequencing to establish the most efficient genesis of fungus. The fungus uses specific enzymes to break down the hydrocarbons of the pollutant.

Poor quality of soil is due to the levels of sand that constitute the bulk of the land in this region. Sandy soil lacks the ability to retain moisture and nutrients. The large particles that sand represents allow for fast dispersal of water and quick evaporation, nutrients also suffer as a response to this activity. A nutrient-rich mixture of biochar and compost is therefore needed to help create a more complex biome.



BIBLIOGRAPHY

All visual content was created by Thomas Jones and Andrew Parry. The text was written by Andrew Parry.

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Latour, Bruno. Circulating Reference. Sampling the Soil in the Amazon Forest

Thank you!