PORTFOLIO
NORMAN
KEYES

TABLE OF CONTENTS

PLUG-IN HOUSE: RE-FRESHKILLS

Studio ADV IV , Spring 2024
Instructor: Esteban De Backer

In New York City, the history of trash and land speculation are intimately linked. At Freshkills, Robert Moses planned to use solid municipal waste to transform the intractable salt marsh into developable land. This original three-year dumping plan quickly ballooned out of scale as Freshkills became New York City's primary landfill, closing in 2001 after accepting 150 million tons of trash.

However, the extreme height of the trash mounds--each standing between 100' to 180' tall--presents an opportunity. Rising sea levels will render the town of Travis uninhabitable. Developing a portion of the mounds for residential use can serve as a resilience strategy for these inhabitants, allowing them to relocate within a quarter mile of their current homes. The proposed "Plug-In House" also taps directly into the landfill's gas collection infrastructure.

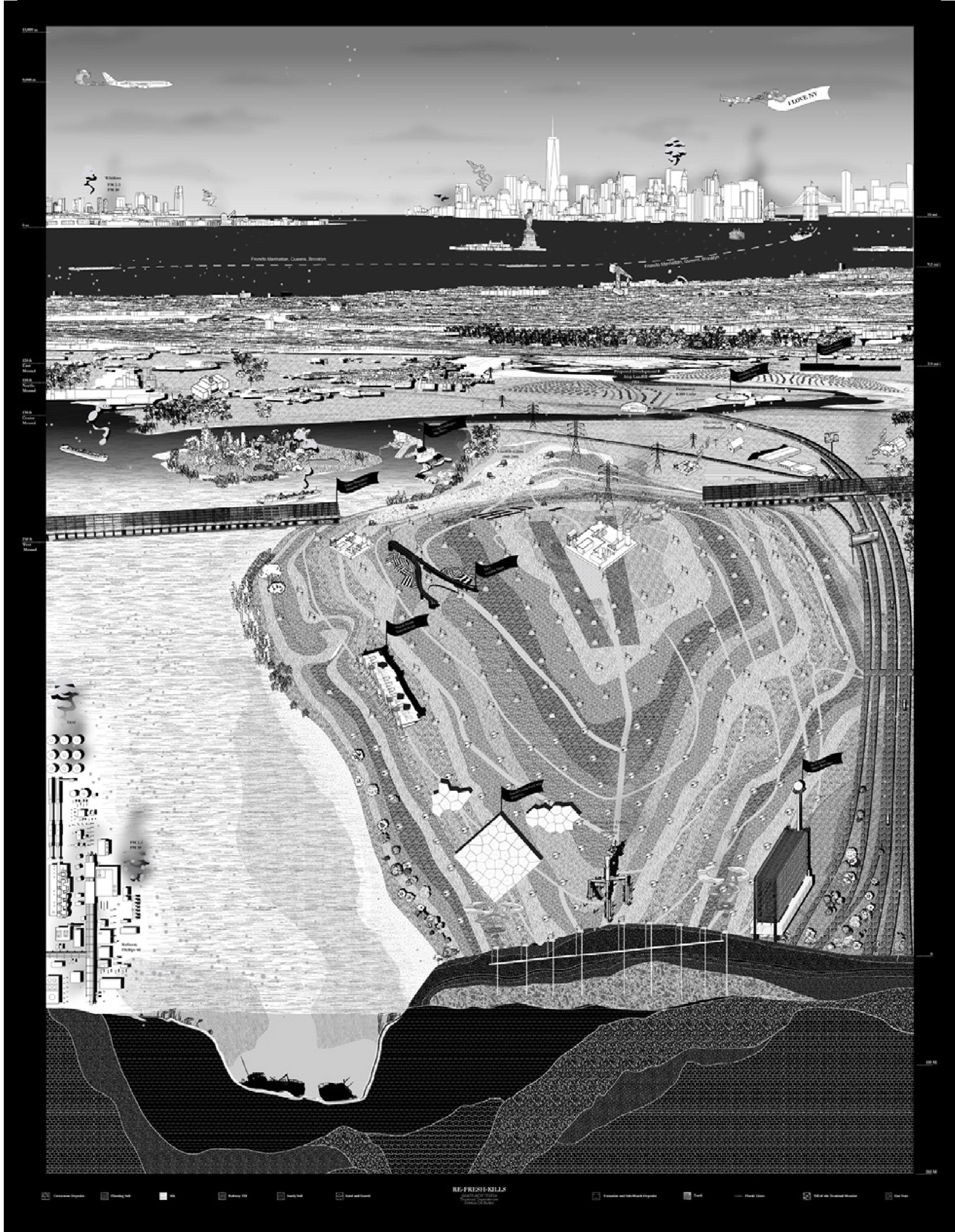
The mounds provide two main challenges to construction. First, is that the land above the landfill is structurally unstable and expected to settle between 10 and 13 percent. Second, is that the thin high-density-polyethylene (HDPE) membrane which hermetically seals the trash from its surroundings, cannot be punctured, precluding the use of piles.

To prevent placing foundations on the landfill itself, I utilize the edge condition just beyond the HDPE membrane to install a single-mast cable-stayed cantilever which directs the load of the housing platforms to the surrounding solid ground. The raised platforms gently follow contours of the mound and continue the grasses of the park onto the integrated green roof.

This project consists of three simple moves. Technically, the project addresses the infrastructural considerations by raising the architecture above the flood area. It sidesteps the structural issues of the landfill by cantilevering the floors until they just touch the mound and utilizes the expansive, porous structure to capture and treat rainwater for self-sufficiency.

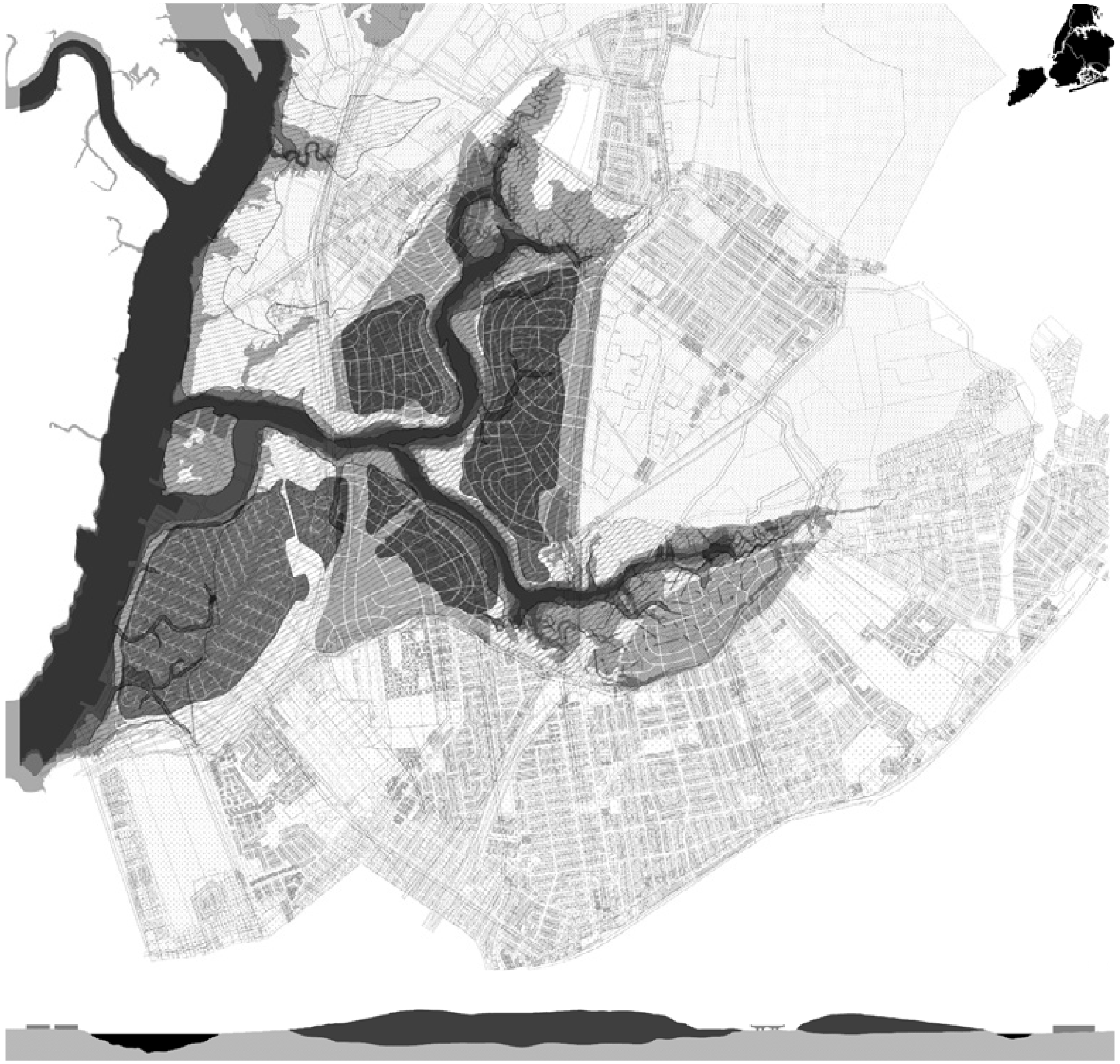
Architecturally, the combination of dense private spaces on the first floor along with ample shared amenities and expansive communal spaces in the "houses" on the roof leverage the economic and environmental gains from density while providing some of the comforts and image of the typical single family home.

Rhetorically, the integration of the communal housing scheme directly into the hill, taps into the desire to live sounded by nature like the historic sprawling estates. However, the increasingly communal configuration undermines the exclusivity of private land claims and enclosure acts that define the early estates and would have been reproduced by Robert Moses' suburban development scheme.



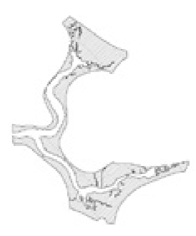
Collective drawing illustrating the site condition of Freshkills park

Collage of 9/11 debris screening and Robert Moses' Development Plan over Jasper Francis Cropsey painting of Staten Island



150 years of modifications to the salt marsh property ownership and property ownership around it

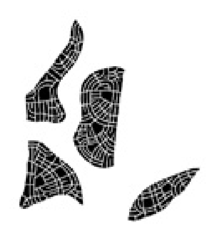
1887 salt marsh



2025 salt marsh

2025 landfill & park

2025 gas lines



1950 Moses' Plan

1887 water level

1950 proposed water level

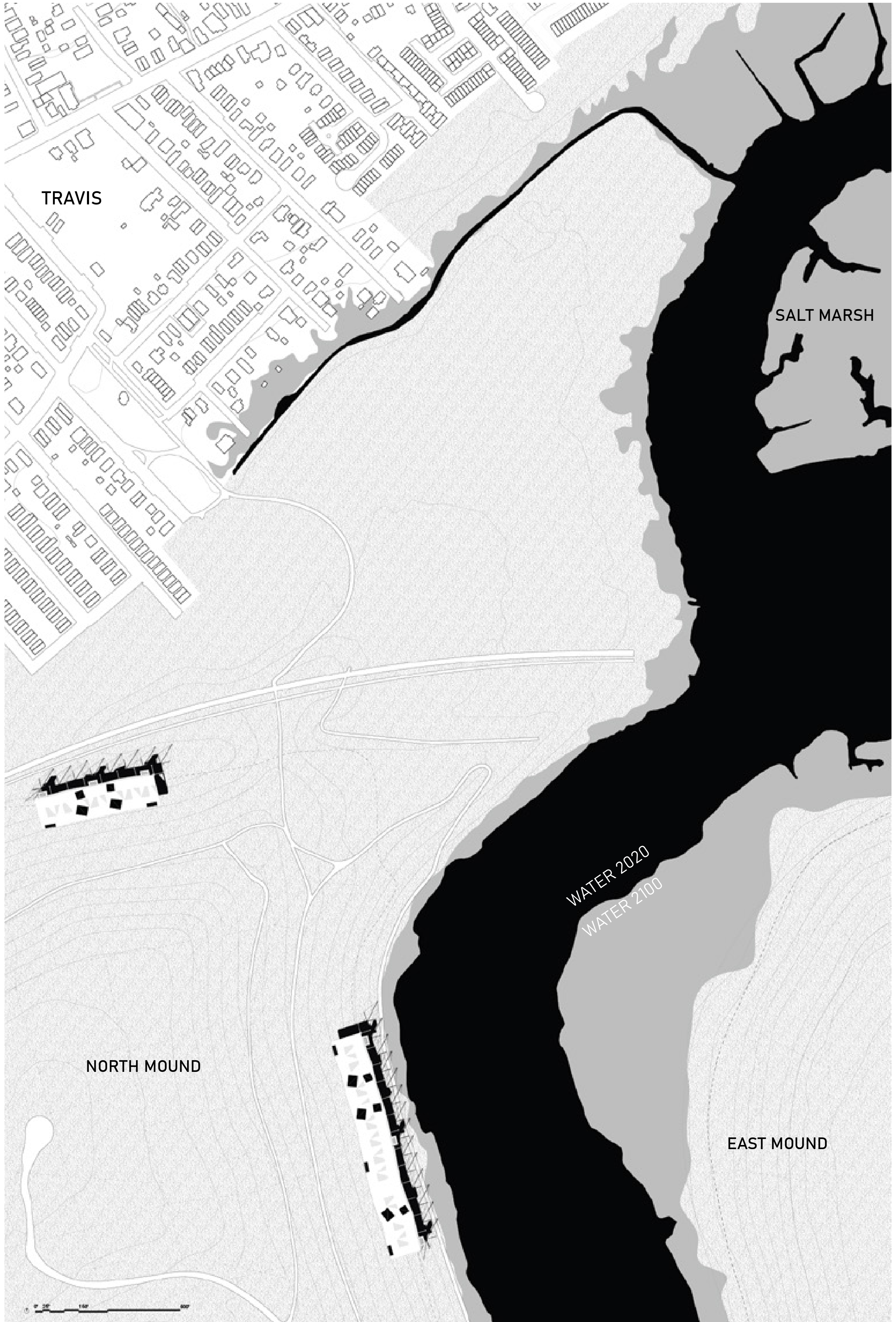
2025 water level

2100 water level

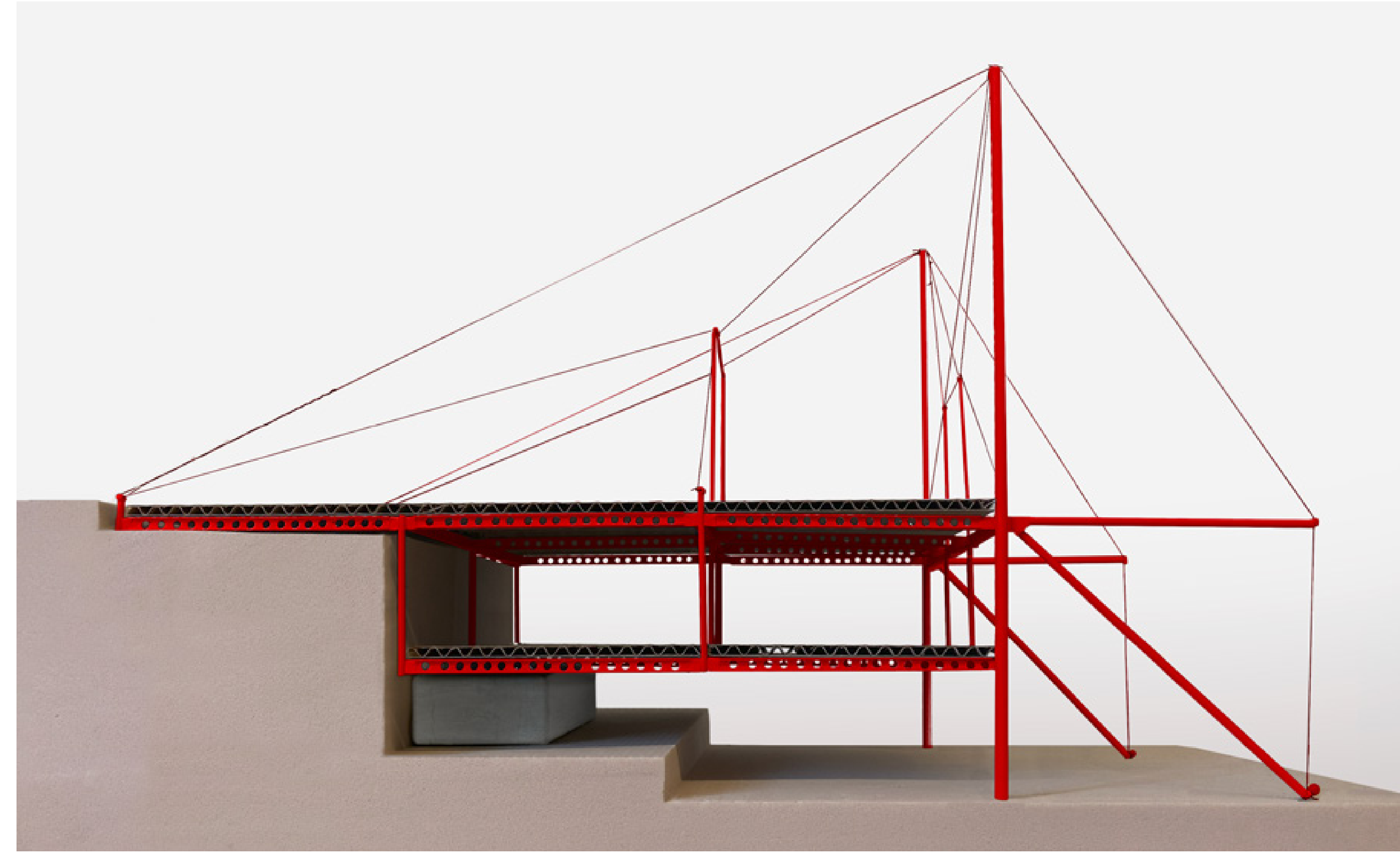
1887: Marshland & estates

1950: Moses' development plan (not realized)

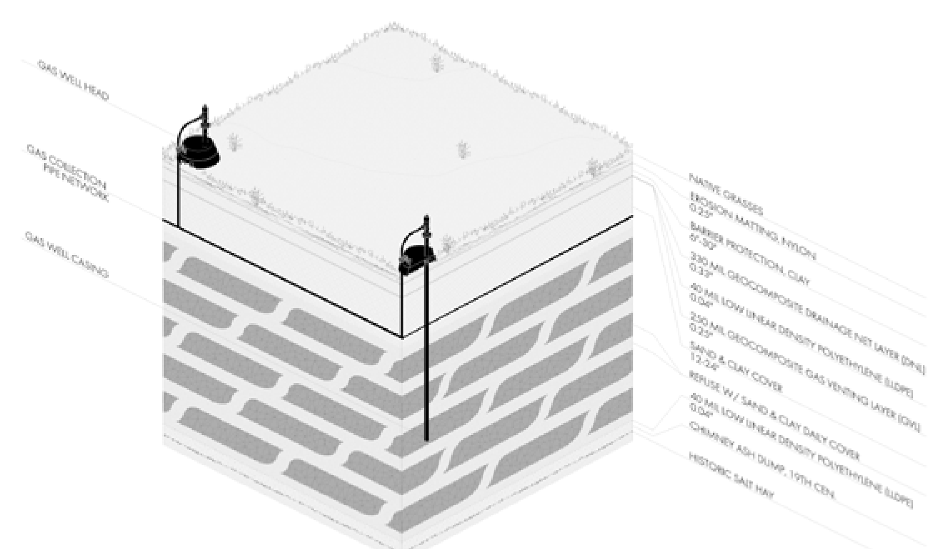
2020: Landfill, park, and suburbs



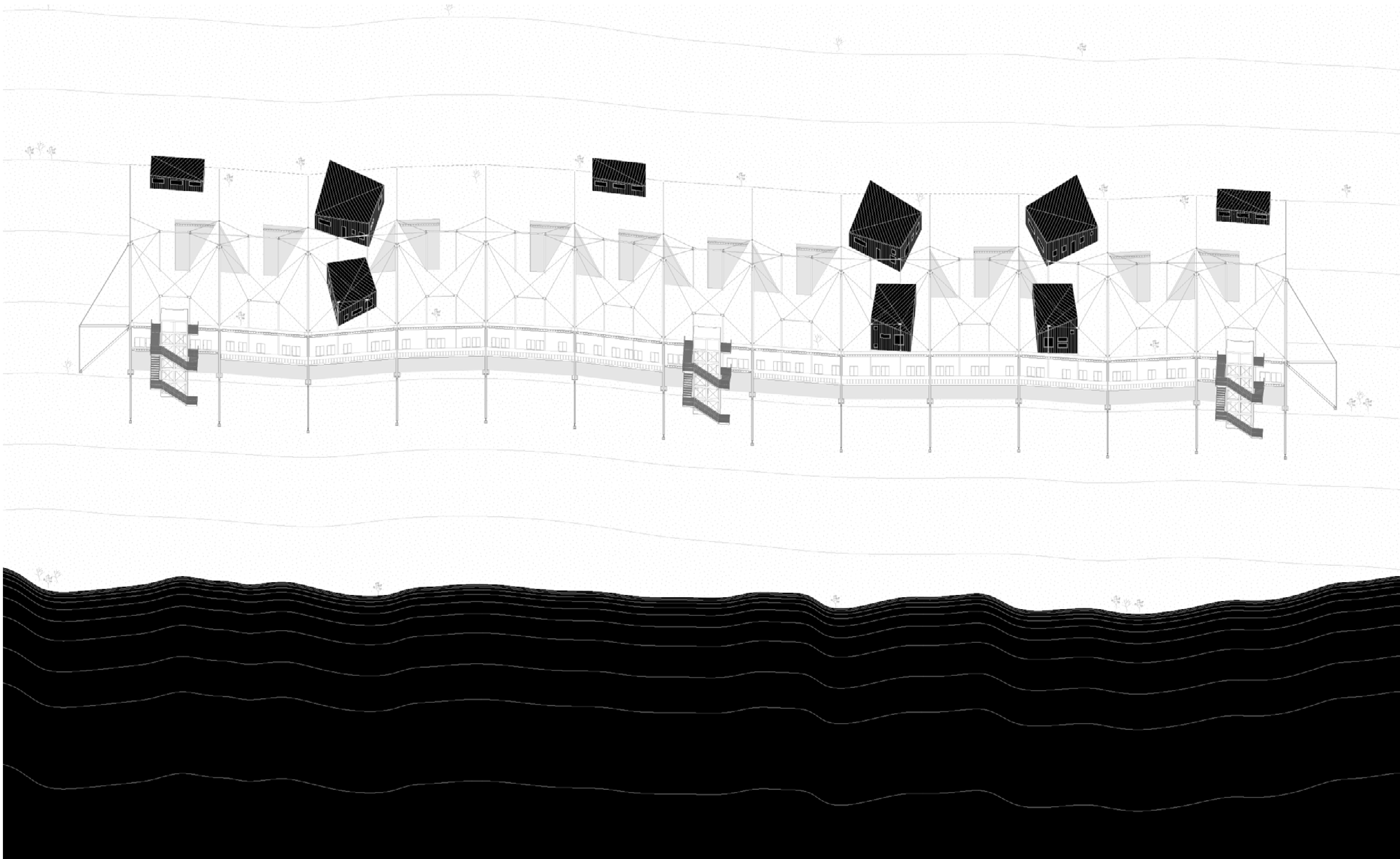
Proposed relocation for the town of Travis, water 2100



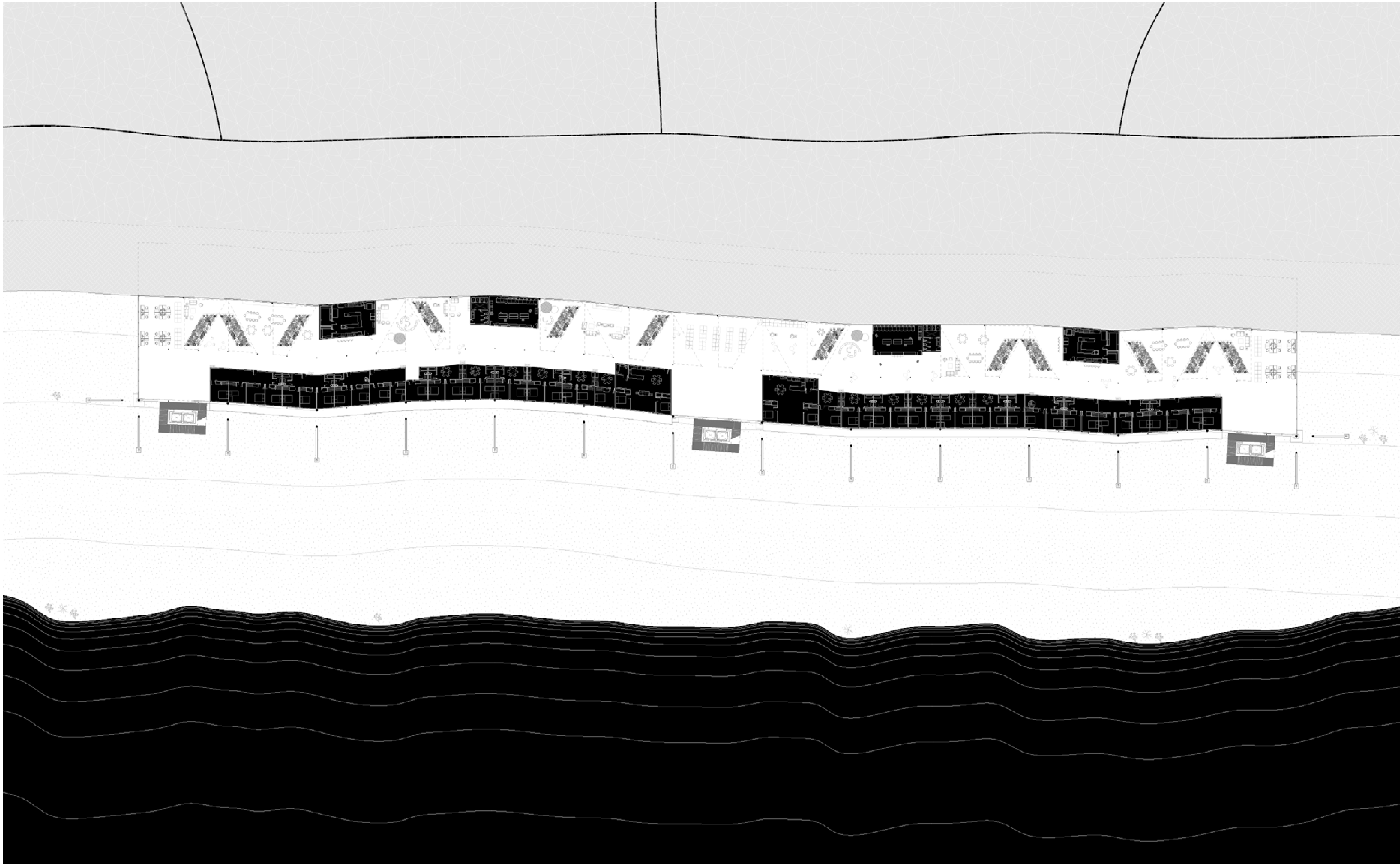
1/8" scale model of single-mast cable stay cantilever structural system



Section chunk of landfill and methane collection system

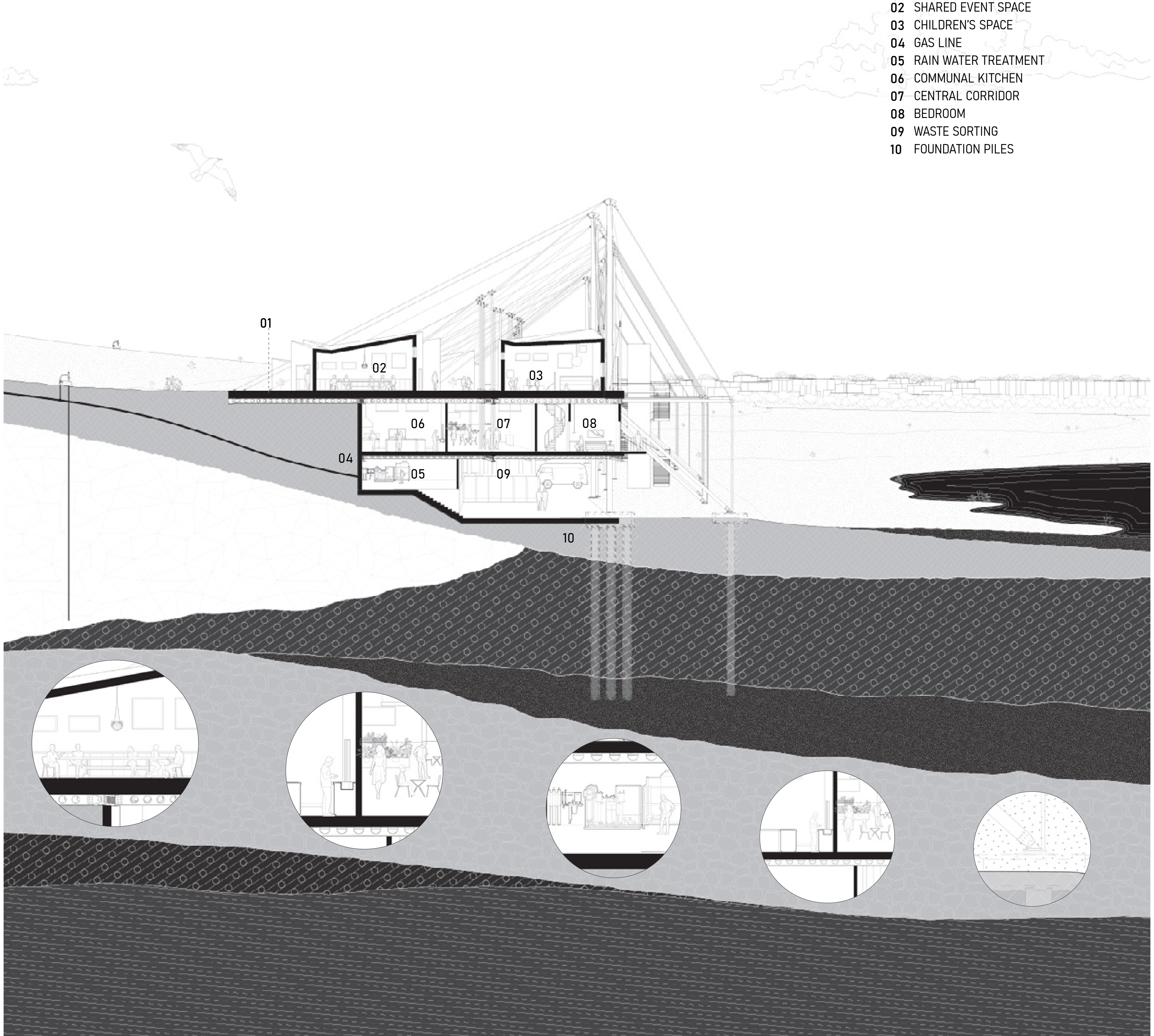


Elevation oblique of the Plug-In House on the North Mound



Second floor plan showing gradation of communal living arrangements

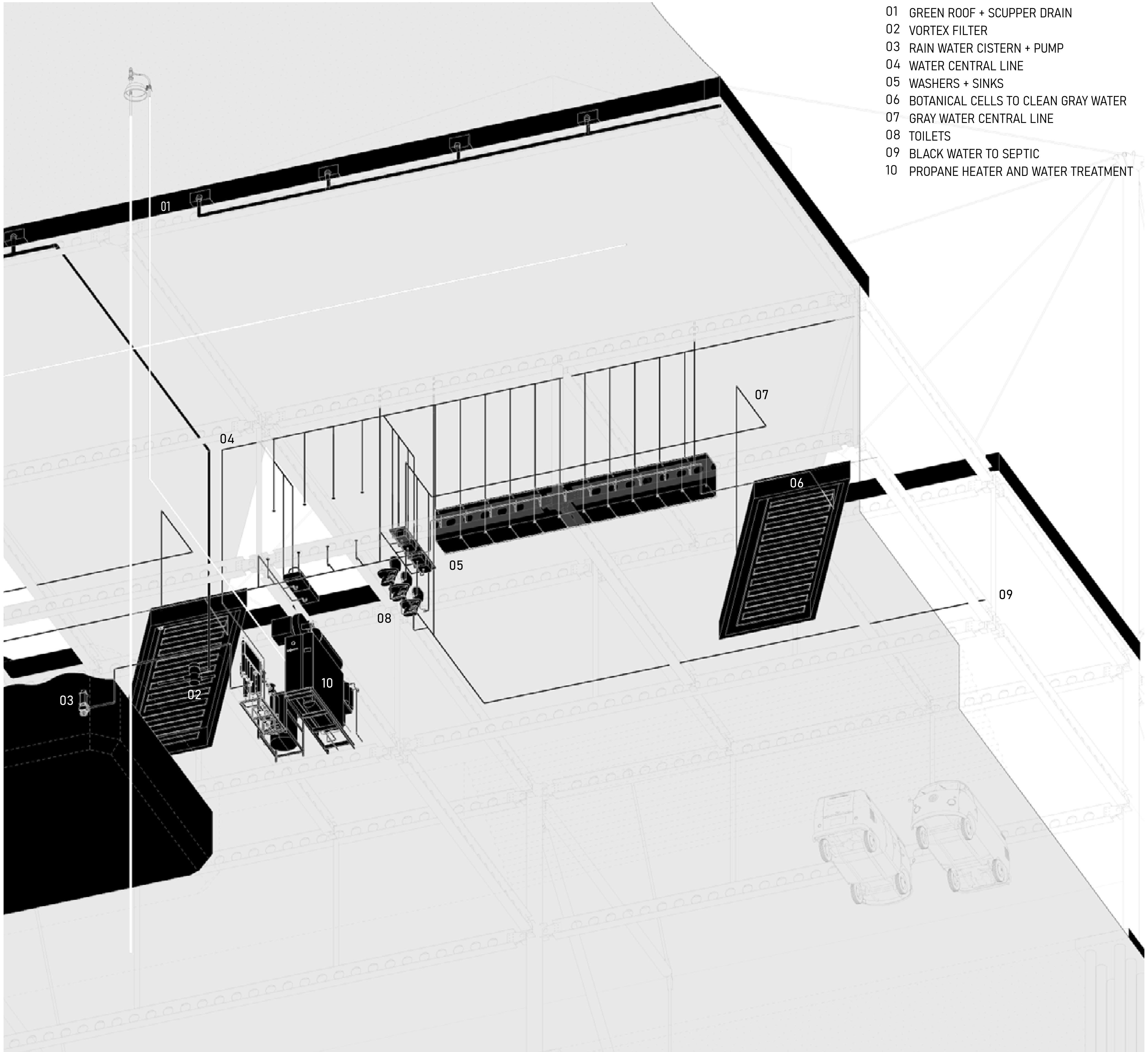
01 GREEN ROOF
02 SHARED EVENT SPACE
03 CHILDREN'S SPACE
04 GAS LINE
05 RAIN WATER TREATMENT
06 COMMUNAL KITCHEN
07 CENTRAL CORRIDOR
08 BEDROOM
09 WASTE SORTING
10 FOUNDATION PILES



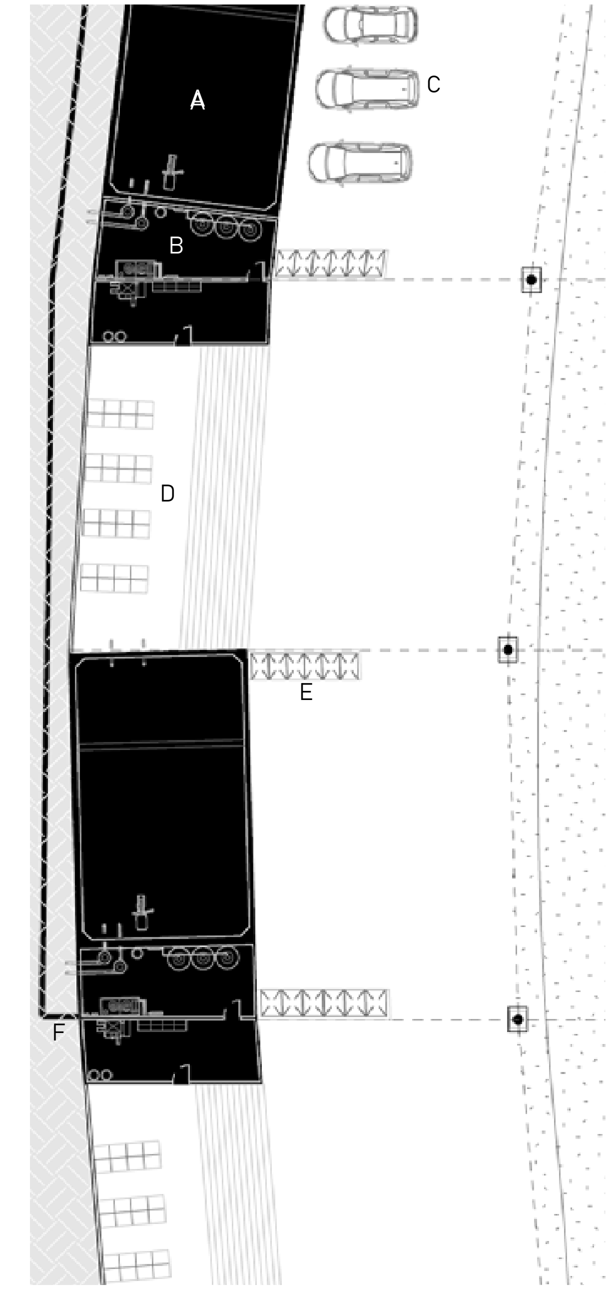
Architectural section of the Plug-In House and geological section of the North Mound

Plan call out of the second floor

01 PRIVATE APARTMENT
02 SEMI-COMMUNAL LIVING
03 KITCHENETTE
04 SHARED BATHROOM
05 MORE COMMUNAL
06 BALCONY
07 LIVING AREA
08 BOTANICAL CELL
09 SHARED LAUNDRY
10 COMMUNAL BATHROOM
11 CHILDREN'S AREA
12 COMMUNAL KITCHEN



Worm's eye view of rain water collection, treatment, and circulation through the scheme



First floor plan with cistern, mechanical, & parking

A RAINWATER CISTERN
B WATER TREATMENT MECH.
C PARKING
D STORAGE
E SORTED RECYCLING CHUTES
F METHANE GAS LINE

ROOTED: RADICAL FOUNDATIONS

Studio ADV V , Fall 2024
Instructor: David Benjamin

The global population will increase to 9.7 people from 8.2 billion people by 2050. Building new residential structures at a density factor of 680 square-feet-per-person would result in 226 billion meters-squared or 2.4 trillion square feet of additional housing. That is bigger than the state of Utah in housing alone.

In the U.S., building at the current square-feet-per-person, 784, would require an additional 28.3 billion square feet, roughly twice the size of L.A. Building the 40 million new homes that President Biden promised at 2,000 square feet for every 2.57 people creates close to 80 billion square feet of housing, which is slightly larger than half of Connecticut.

Currently, the growing demand for housing is being addressed through the new typology of a "five over one" development: dimensional lumber framing above a concrete podium. A typical development with 120,000 square feet of residential space requires a podium made of 130,000 cubic feet of reinforced concrete which emits, in total, 2,648 metric tons of CO2 for the base and foundation.

If the built environment is to serve as an agent for carbon removal, then finding ways to reduce carbon emissions from foundations is paramount.

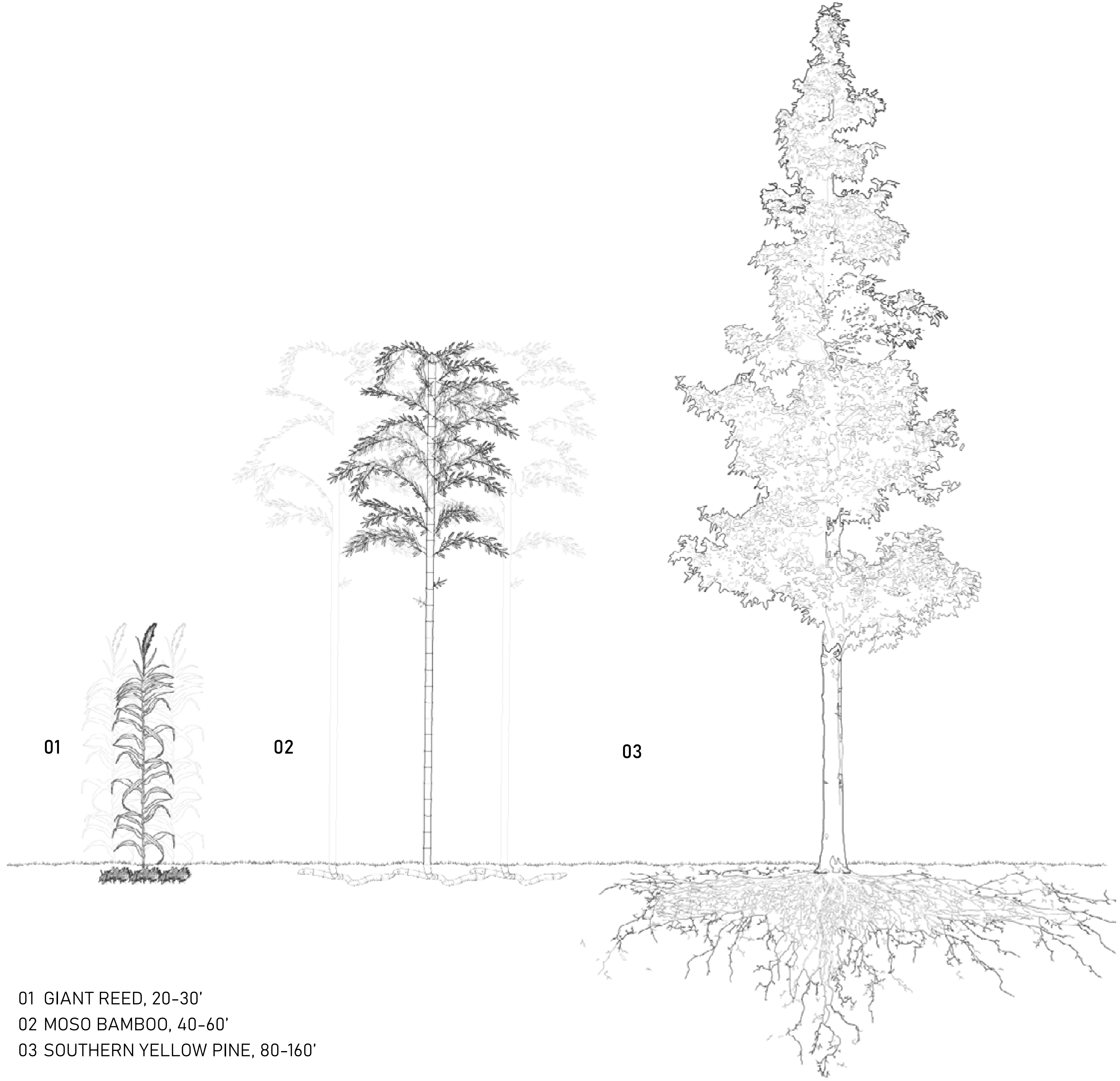
Typical foundations have three requirements: Stabilize the soil, create a structural connection to the superstructure, and support a flooring system.

Among concrete's many wonderful qualities for construction are how it ties structure together as a monolithic unit and its resistance to decomposition in soil at the transition between the water table and the air above. Many regenerative materials can get close to concrete's bearing capacity, but exposure to both air and water render them susceptible to rapid decomposition.

To investigate carbon negative foundations, I explored 12 assemblies that range from convention to radical, and span from immediately deployable to profoundly slow for a new manufactured housing unit, 730 square feet, for FEMA emergency response. These units can later be aggregated onto a mass timber podium to create a long-term, multifamily structure.

Of these 12, the four most radical are *baubotanik*, or grafted living trees, living bamboo rhizomes, a composite rhizome pad, and biomass burial through a stabilized landfill structure. The pad and landfill are both methods to forestall decomposition, while the bamboo and *baubotanik* structure sidestep decomposition by keeping the roots alive. Of the living foundations, the bamboo rhizome is the most compelling as it strikes a balance between speed to maturity--5 years rather than 10-20 for the sycamore--and net carbon removal.

Ultimately, a least emitting conventional foundation is a concrete footer that caps a series of timber pile and supports a raised mass timber floor system. This maximizes the amount of biomass in the foundation while utilizing concrete for the air-soil transition.



01 GIANT REED, 20-30'
02 MOSO BAMBOO, 40-60'
03 SOUTHERN YELLOW PINE, 80-160'

Biomass comparison for giant reed, moso bamboo, and souther yellow pine

EXPERIMENTAL STRUCTURE: BUNDLED REED COLUMN

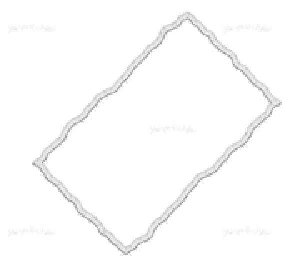
Reeds readily accessible in New York

Shift reeds to achieve uniform height

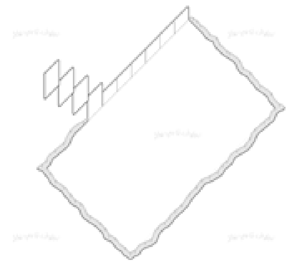
Secure bundle with fasteners, tighten as it dries

Structural test of reed column, not suitable parallel to load

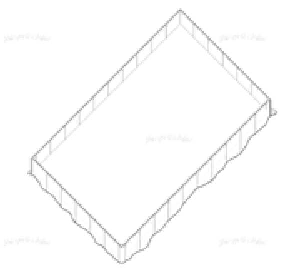
EXPERIMENTAL FOUNDATION: RHIZOME COMPOSITE PAD



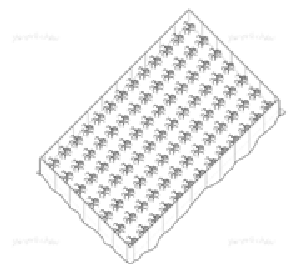
1. Dig perimeter trough



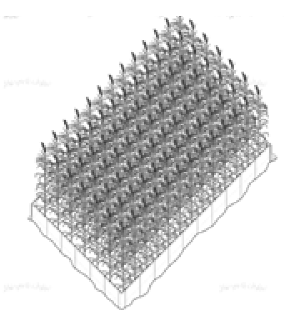
2. Place exterior form-work



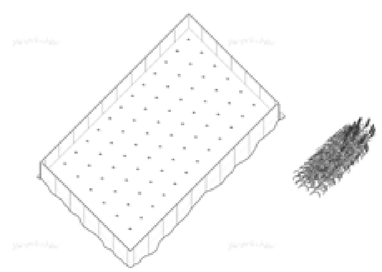
3. Prepare ground for tilling



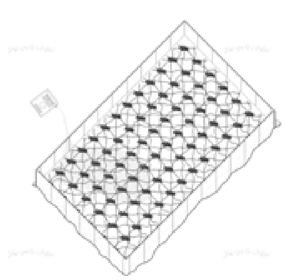
4. Plant giant reed rhizomes



5. Grow for 2-3 years

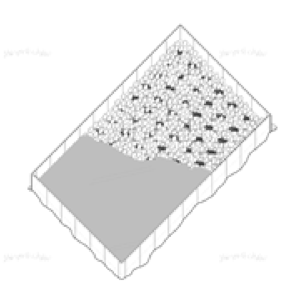


6. Harvest reed

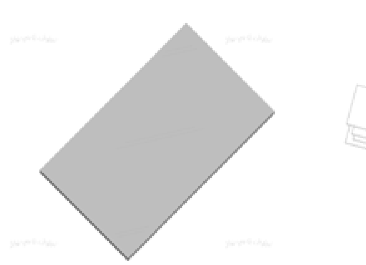


7. Rinse rhizome with borax preservative

8. Add gravel scree

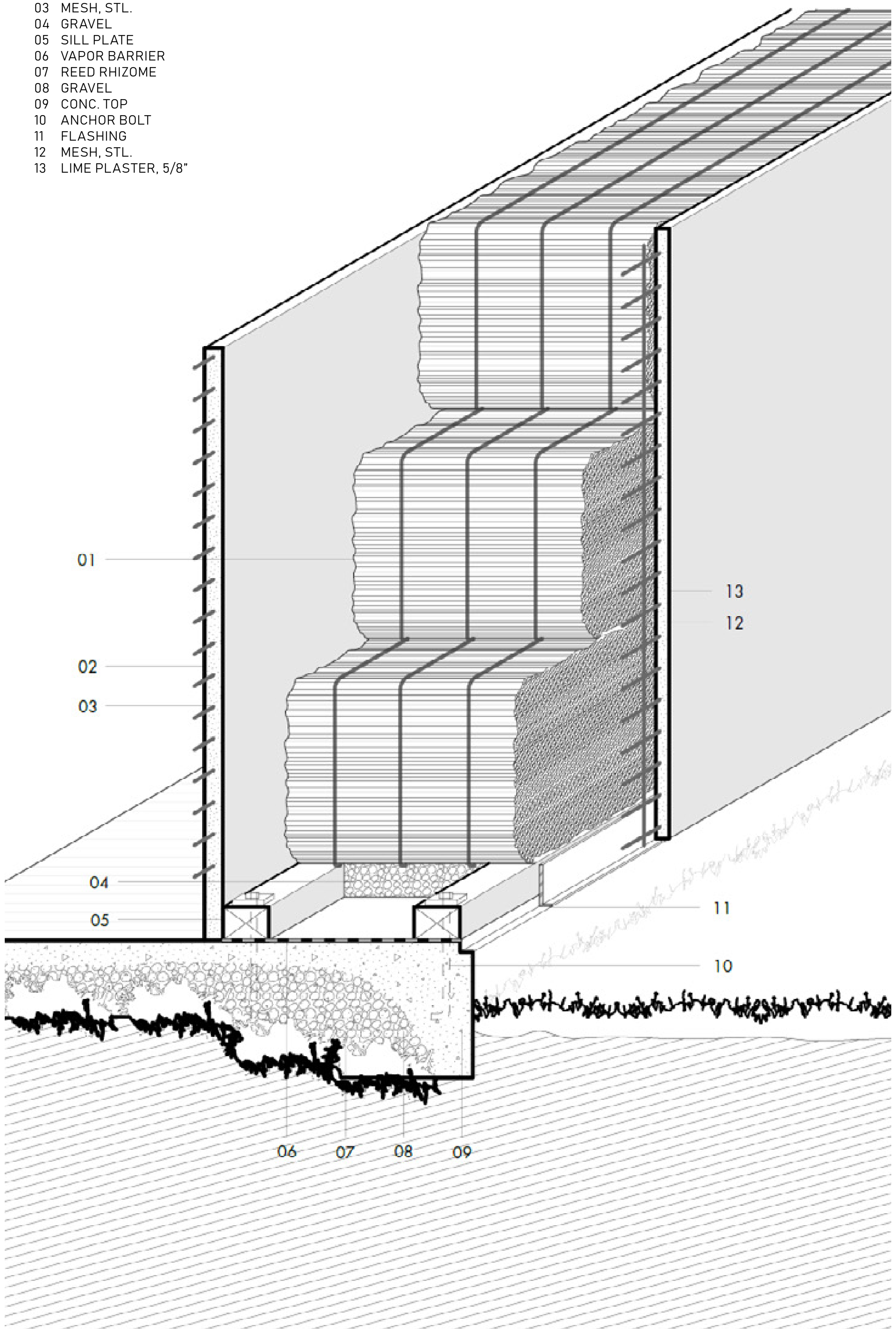


9. Apply concrete topcoat



10. Remove form-work once cured

01 3 ST G STRAW BALE
02 LIME PLASTER, 5/8"
03 MESH, STL.
04 GRAVEL
05 SILL PLATE
06 VAPOR BARRIER
07 REED RHIZOME
08 GRAVEL
09 CONC. TOP
10 ANCHOR BOLT
11 FLASHING
12 MESH, STL.
13 LIME PLASTER, 5/8"



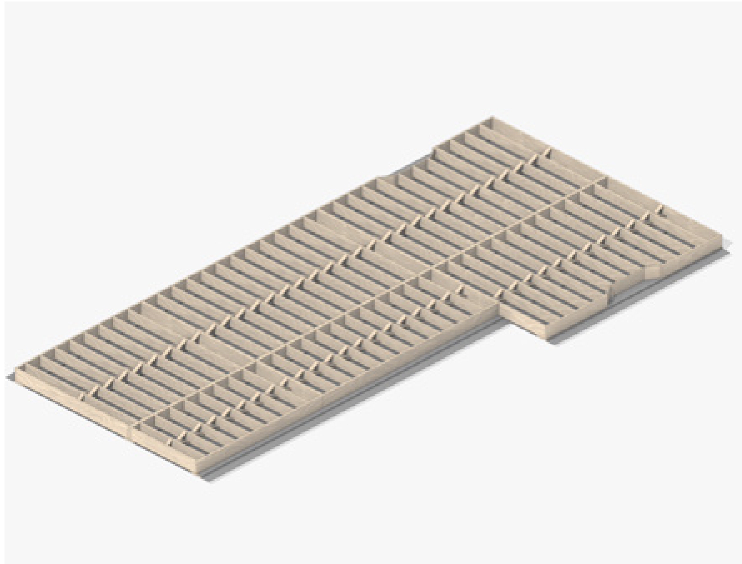
Wall section detail demonstrating how to combine structural straw bales with composite rhizome pad

Structural plywood frame to contain and load the straw

Compressing the straw to ensure structural integrity

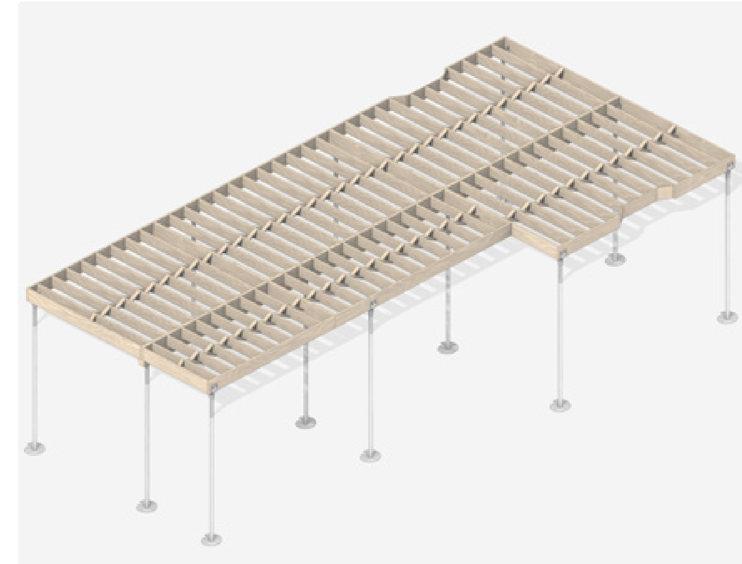
Structural straw block mock up, grasses strongest when compacted and load perpendicular to stalk

MATRIX OF FOUNDATION SYSTEMS MEASURED

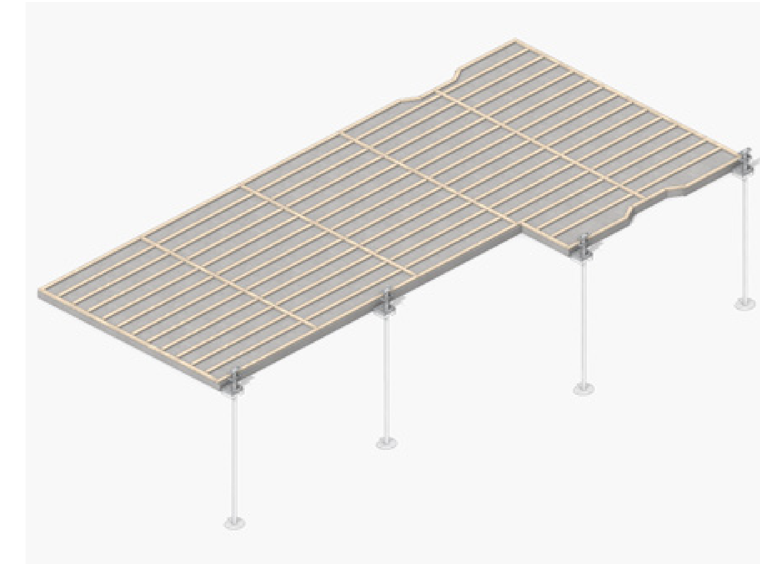


1. Wooden sleepers

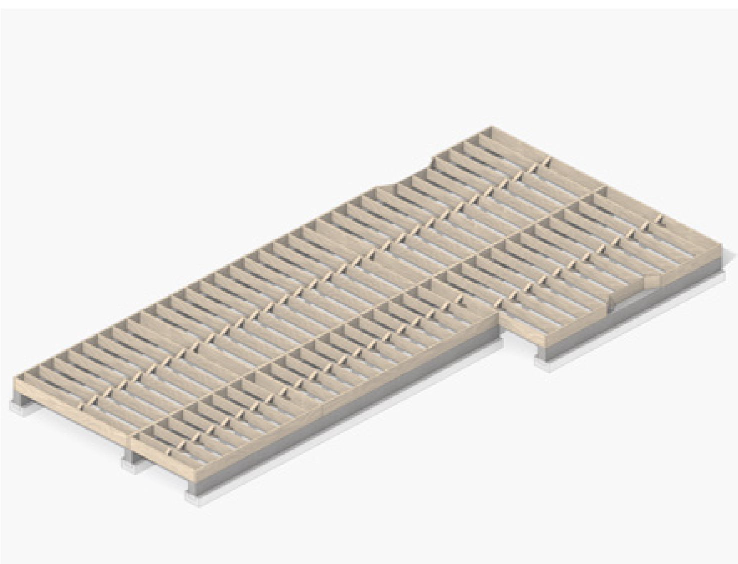
2. CMU block



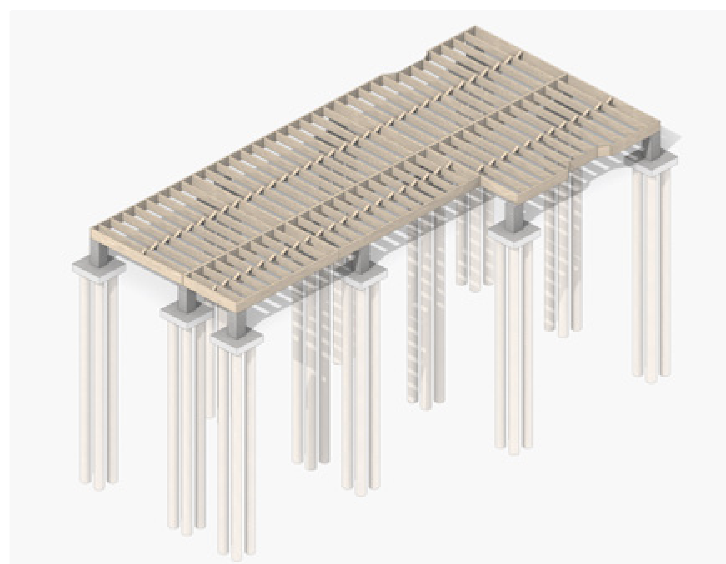
3. Helical piles



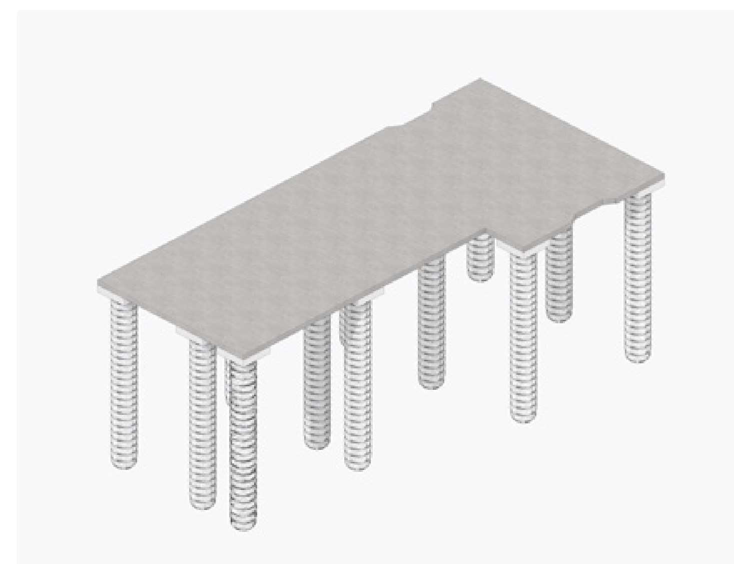
4. Underpinning existing foundation (helical piles)



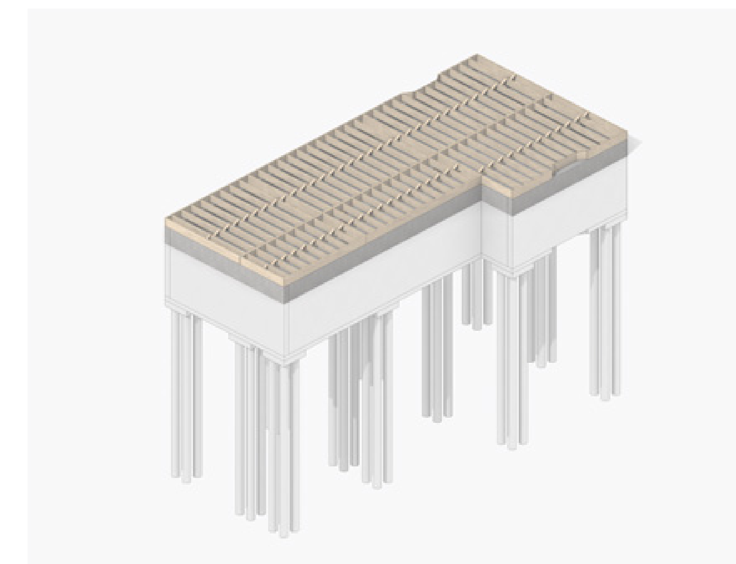
5. Concrete skirt



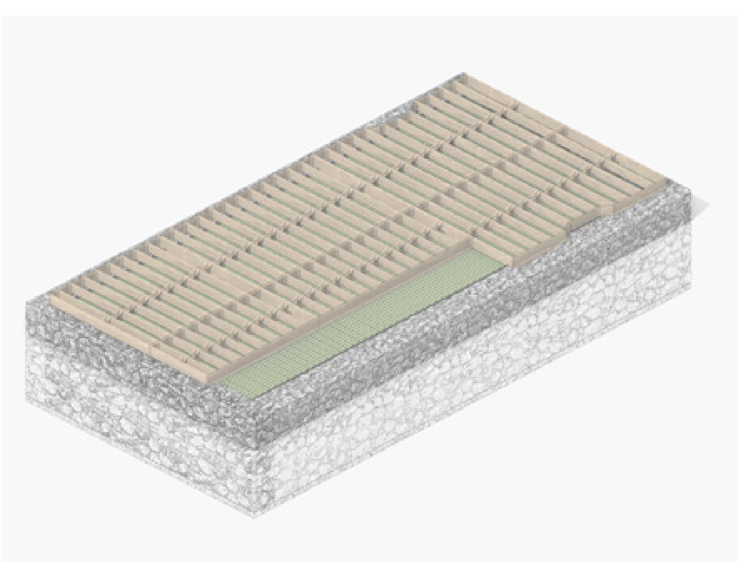
6. Concrete footers with timber piles



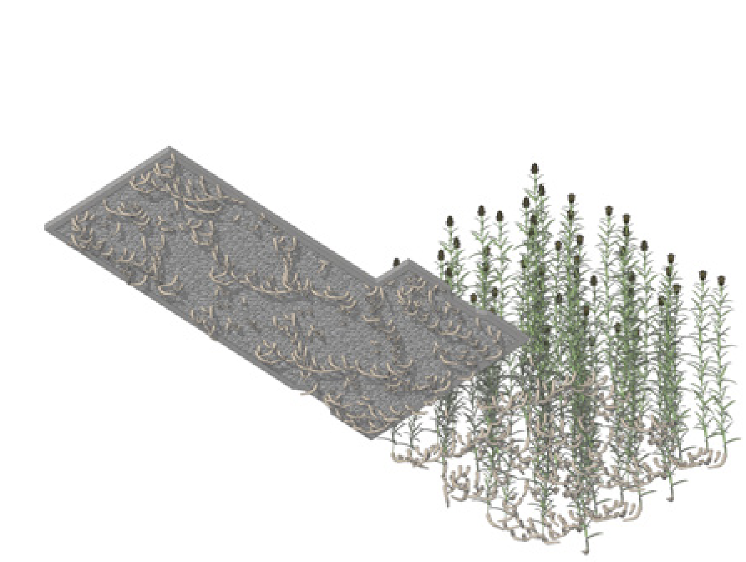
7. Concrete raft with geopiers



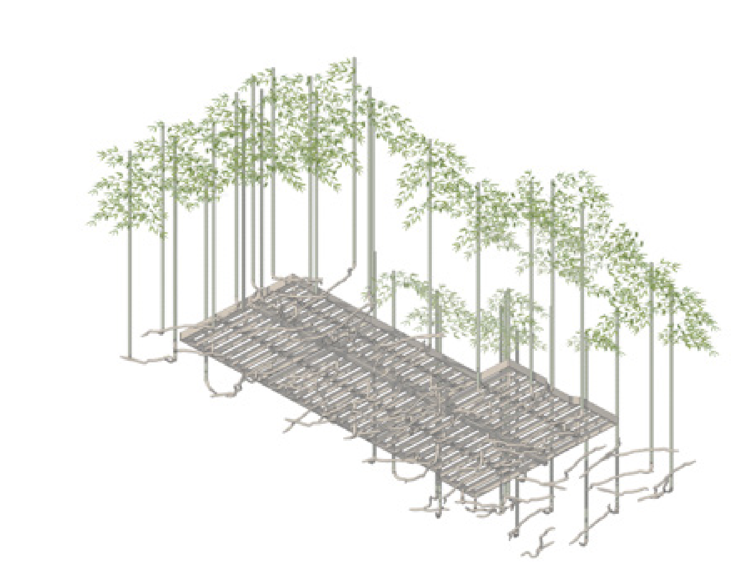
8. Concrete basement with concrete piles



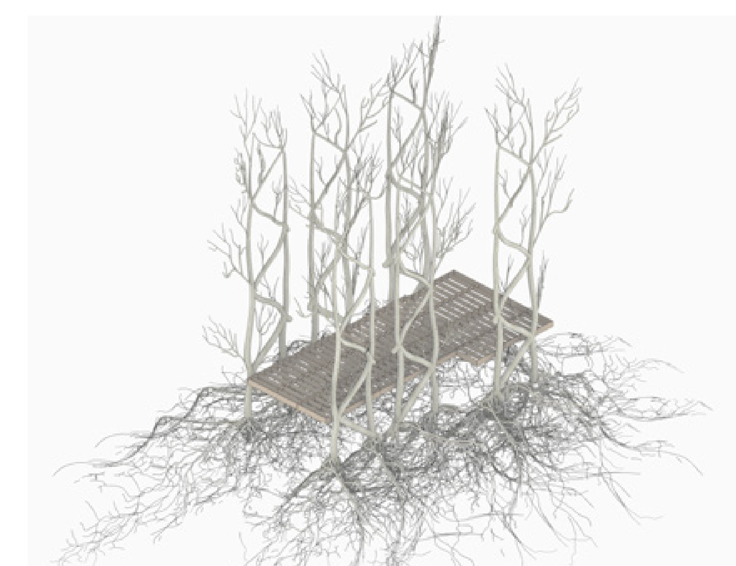
9. Biomass landfill foundation



10. Reed rhizome composite pad



11. Living bamboo rhizome



12. Baubotanik (grafted sycamore trees)

Foundation Type	Surface Prep	CO2 Prep	Ground Stabilization	CO2 Stab'n	Connection	CO2 Cxn	Floor	CO2 Floor	Deployment	Duration	Source	Net CO2 (lbs)	Per Sf (730)
Sleeper	Light Grading	0.0091	Sleepers	-0.34	VB	0.09	Dim Lumber	-2.10	1 day	20 years	Post	-2.34	-0.0032
Cinder Block	Gravel	0.0091	Gravel (agg)	10.1	Block	0.02	Dim Lumber	-2.10	1 day	30-50 years	Home Nation	8.03	0.0110
Helical Pile	None	0.0092	Steel Screw pile	3.41	Pile Bracket	0.00	Dim Lumber	-2.10	1 week	50-100	Repair	1.32	0.0018
Existing	None	0.0123	Underpinning	2.00	Bolts	0.09	Dim Lumber	-0.57	3 months	50-100	Repair	1.53	0.0021
Skirt	Moderate Grading	0.0148	Skirt foot	1.34	Skirt Pier	1.76	Dim Lumber	-2.10	1 month	25-400	Green Builder	1.01	0.0014
Footer	Light Grading	0.012	Timber Pile	-11.72	Pier	1.57	Dim Lumber	-2.10	1 month	25-400	Green Builder	-12.24	-0.0168
Raft	Moderate Grading	0.031	Geopier	7.46	Foot	1.12	Conc	6.05	2 moths	25-400	Green Builder	14.66	0.0201
Basement	Excavation	0.2447	Conc Pile	6.16	Walls	8.74	Conc	6.05	3 months	25-400	Green Builder	21.19	0.0290
Landfill	Excavation	0.1726	Geotextile	-10.27	Bamboo Mattress	-14.92	Dim Lumber	-2.10	1 year	35 years	geosynth	-27.11	-0.0371
Root Pad	Till	0.0091	(Roots)	-7.71	Gravel Agg	5.61	Conc	3.57	2 years	18-145	IOP	1.48	0.0020
Living Bamboo	Till	0.0091	(roots)	-3.66	Stl. Cxn	0.38	Dim Lumber	-2.10	5 years	25 years		-5.37	-0.0074
Baubotanik	Till	0.0091	(roots)	-8.34	Stl. Tube	0.33	Dim Lumber	-2.10	10 Years	25-1000	ResearchGate	-10.10	-0.0138

Final table showing total CO2 emissions for each foundation type compared to speed of implementation and longevity

Reinforced Concrete

Volume Conc (cuft)	100	Rhino
% Conc	0.98	
% Steel	0.02	
Conc Dens (lbs/cuft)	150.00	ansys
Steel Dens (lbs/cuft)	487.30	ansys
Emitted CO2 per unit conc	0.12	ansys
Emitted CO2 per unit virgin	2.33	ansys
Emitted CO2 per unit recycl	0.66	ansys
% virgin	0.60	ansys
% recycled	0.40	ansys
M Ton Conc	6.67	
M Ton CO2 Emitted Conc	0.82	
M Ton Steel	0.44	
M Ton CO2 Emitted steel	0.74	
Total CO2 Emitted, M Ton	**1.56**	

Stainless steel

Volume SS (cuft)	100	Rhino
% Steel	1.00	
Steel Dens (lbs/cuft)	483.84	ansys
CO2 per unit virgin SS	5.87	ansys
CO2 per unit recycled SS	1.19	ansys
% virgin	0.66	ansys
% recycled	0.34	ansys
M Ton Steel	21.95	
Total CO2 Steel Emitted, M T	**93.91**	

Biomass Landfill

Volume Landfill (cuft)	100.00	Rhino
% Wood Chips	0.90	MNDOT
% Geotextile	0.0024	
% VB (PE)	0.0016	
Expansion Factor (chips less dens	2.50	Rural Tech Inn
Density Chips (Pine)	12.86	Calc
Density GText	9.38	Ansys
Density VB (PE)	59.27	Ansys
Emitted CO2 Wood per unit	0.27	Ansys
Emitted CO2 GText per unit	4.50	Ansys
Emitted CO2 VB per unit	2.20	Ansys
M Ton Woodchip	0.10	
M Ton CO2 Emitted Woodchip	0.03	
M Ton Geotextile	0.00	
M Ton CO2 Emitted Geotextile	0.00	
M Ton VB	0.01	
M Ton CO2 Emitted VB	0.00	
Carbon in Pine	0.50	Penn State
C to CO2	3.66	
CO2 Sequestered (M Ton)	0.19	
Net Carbon Sequestered, M Ton	**0.18**	

Aggregate (concrete)

Volume Agg (cuft)	100	Rhino
% Agg	0.98	
% Steel	0.02	
RCA Stacking Density kg/m3	1,396.00	Scidirect 5
RCA Stacking Density lb/cuft	87.15	Calc
Steel Dens (lbs/cuft)	487.30	ansys
Emitted CO2 per unit Agg	0.10	ansys
Emitted CO2 per unit virgin S	2.33	ansys
Emitted CO2 per unit recycle	0.66	ansys
percent virgin	0.60	ansys
percent recycled	0.40	ansys
M Ton Conc	62.06	
M Ton Steel	0.44	
M Ton CO2 Emitted Conc	6.27	
M Ton CO2 Emitted steel	0.74	
Total CO2 Emitted, M Ton	**7.00**	

Excavation

Volume Soil cuft	100.00	Rhino
Fuel Use (L/m3)	0.30	SciDirect 6
Fuel Use (gal/cuft)	0.002	Calc
GHG from fuel (kg CO2/m3 soil)	1.00	SciDirect 6
Emitted CO2 lbs cuft	0.06	Calc
Density Soil (kg/m3)	1,140.00	SciDirect 6
Density Soil (lb/cuft)	71.17	Calc
M Ton Soil Moved	15.69	
Total CO2 Emitted, M Ton	**0.0028**	

Pine

Volume Dim Lumber (cuft)	100.00	Rhino
% Timber	1.00	
#10 screw, 2.5" (cuin)	0.02	
Screw Count	10.00	
Pine Dens (lbs/cuft)	32.14	ansys
Steel Dens (lbs/cuft)	487.30	ansys
Emitted CO2 per unit virgin STL	2.33	ansys
Emitted CO2 per unit recycled STL	0.66	ansys
Emitted CO2 per unit Pine	0.27	ansys
% virgin	0.60	ansys
% recycled	0.40	ansys
M Ton Pine	1.46	
M Ton CO2 Emitted Pine	0.40	
M Ton Steel	0.02	
M Ton CO2 Emitted steel	0.04	
Carbon in Pine	0.50	Penn State
C to CO2	3.66	
CO2 Sequestered (M Ton)	2.67	
Net Carbon Sequestered M Ton	**2.24**	
NET CO2 Lbs	4,936.10	
Harvest		
Tons Green/Acre SY Pine Forest clearcut	86.00	ResouceWise
Green Ton/ Acre to MBF/ Acre	5.84	USDA
bdf in mbf	1,000.00	
Boardfeet to Cubic Boardfeet	0.08	
Efficieny Round log to Dim	0.76	Bioresources
cuft per acre (southern yellow pine, clearcut)	932.25	
Acres Needed	**0.11**	

Mass Timber

Volume Mass Timber (cuft)	100.00	Rhino
% Timber	1.00	
Steel Fasteners (% of vol timber)	0.0025	SciDirect 1
Glulam Dens	35.60	ansys
Steel Dens (lbs/cuft)	483.84	ansys
Emitted CO2 Glulam	0.45	ansys
Emitted CO2 per unit virgin SS	5.87	ansys
Emitted CO2 per unit recycled SS	1.19	ansys
% virgin	0.66	ansys
% recycled	0.34	ansys
M Ton Glulam	1.61	
M Ton CO2 Emitted Glulam	0.72	
M Ton Steel	0.05	
M Ton CO2 Emitted steel	0.23	
Carbon in Pine	0.50	Penn State
C to CO2	3.66	
CO2 Sequestered (M Ton)	2.96	
Net Carbon Sequestered M Ton	**2.72**	
Harvest		
Tons Green/Acre SY Pine Forest clearcut	86.00	ResouceWise
Green Ton/ Acre to MBF/ Acre	5.8425	USDA
bdf in mbf	1000	
Boardfeet to Cubic Boardfeet	0.08	
Efficieny Round log to Dim	0.76	Bioresources
cuft per acre (southern yellow pine, clearcut)	932.25	
Acres Needed	**0.11**	

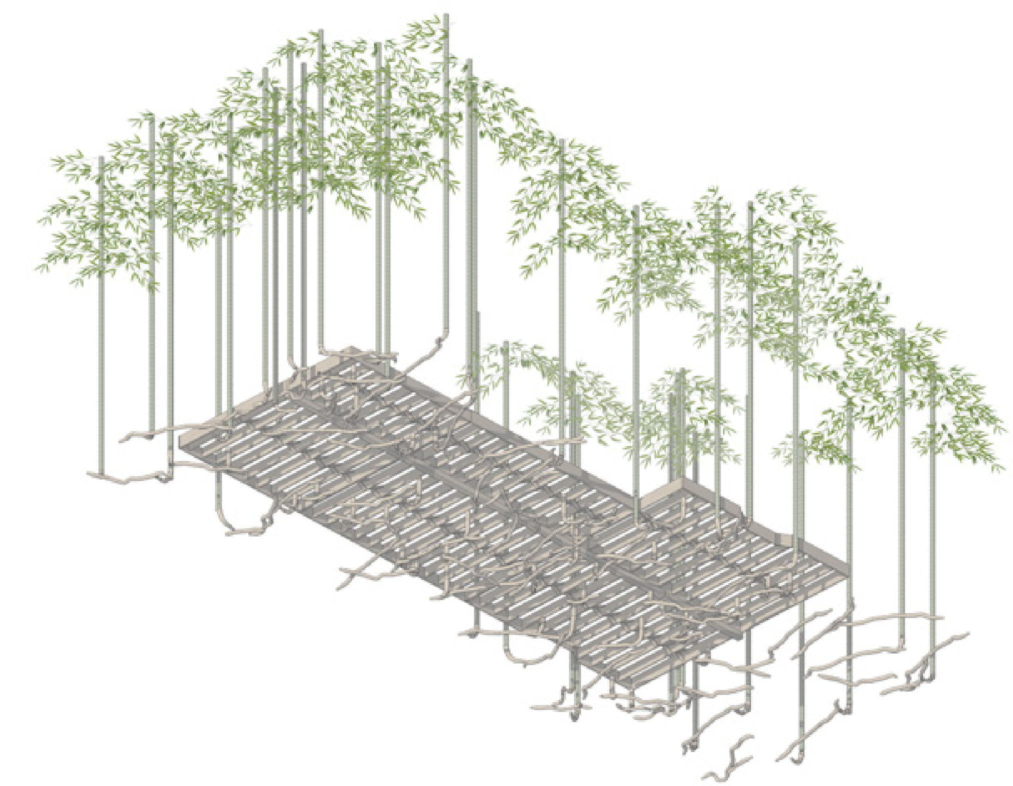
Bamboo

Volume Bamboo (cuft)	100	Rhino
% Bamboo	1.00	
Steel Fasteners (% of vol timber)	0.0025	SciDirect 1
Bamboo density (lbs cuft)	43.20	ansys
Steel Dens (lbs/cuft)	0.33	ansys
Emitted CO2 Bamboo per unit	0.45	ansys
Emitted CO2 per unit virgin SS	5.87	ansys
Emitted CO2 per unit recycled SS	1.19	ansys
% virgin	0.66	ansys
% recycled	0.34	ansys
M Ton Bamboo	1.96	
M Ton CO2 Emitted Bamboo	0.87	
M Ton Steel	0.00	
M Ton CO2 Emitted steel	0.00	
Carbon in Bamboo	0.50	Penn State*
C to CO2	3.66	
CO2 Sequestered (M Ton)	3.59	
Net Carbon Sequestered M Ton	**3.59**	
Harvest		
Volume bamboo harvest (m3/acre)	12.75	SciDirect 2
Volume bamboo harvest (cuft/acre)	450.09	Calc
Acres Needed	**0.22**	

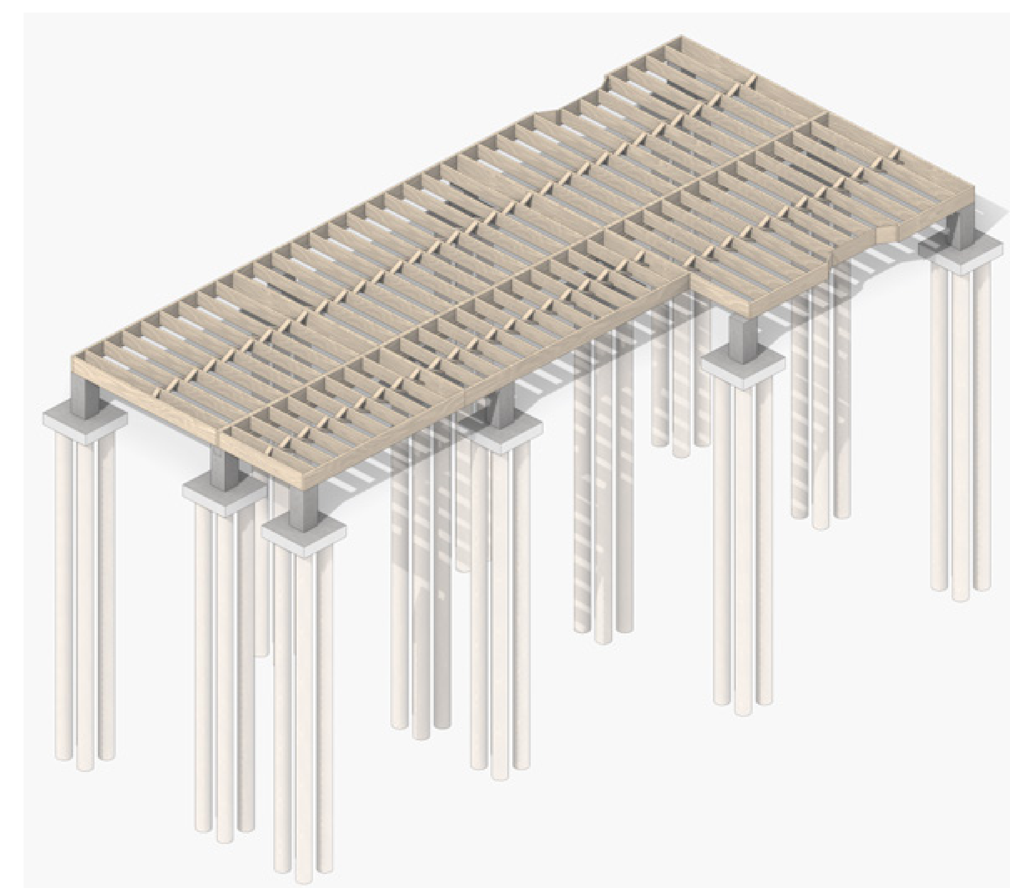
Giant Reed

Volume Reed	100.00	Rhino
% Reed	1.00	
Apparent density (kg/m3)	587.00	SciDirect 4
Apparent (lb/cuft)	36.65	Calc
Ton/ha (marginal land)	18.00	SciDirect 3
Emitted kg CO2eq /ha	2,636.00	SciDirect 3
Sequestered kg CO2eq /ha	5,757.00	SciDirect 3
Emitted kg CO2eq /Acre	6,513.69	SciDirect 4
Sequestered kg CO2eq /Acre	14,225.83	Calc
M Ton Reed	1.66	
M Ton CO2 Emitted Reed/Acre	6.51	
M Ton CO2 Sequestered Reed/Acre	14.23	
Net Carbon Sequestered M Ton	**7.71**	
Harvest		
M Ton/ha (marginal land)	18.00	SciDirect 3
M ton/Acre	44.48	
Acres Needed	**0.04**	

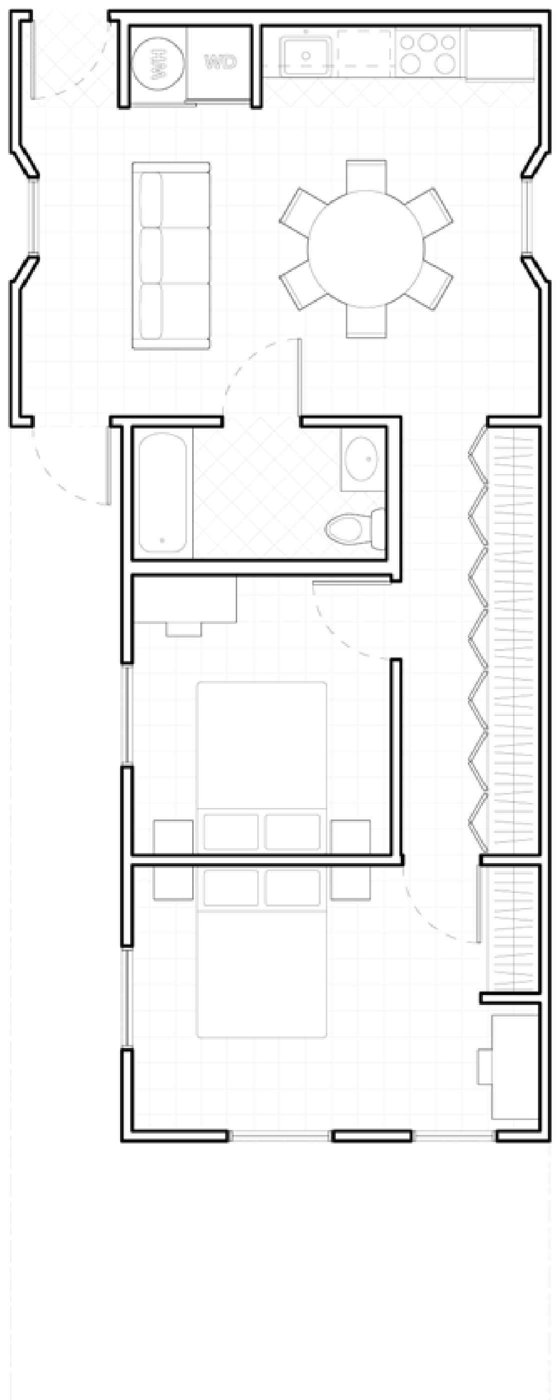
Sample calculations for 100 cubic feet of each material respectively



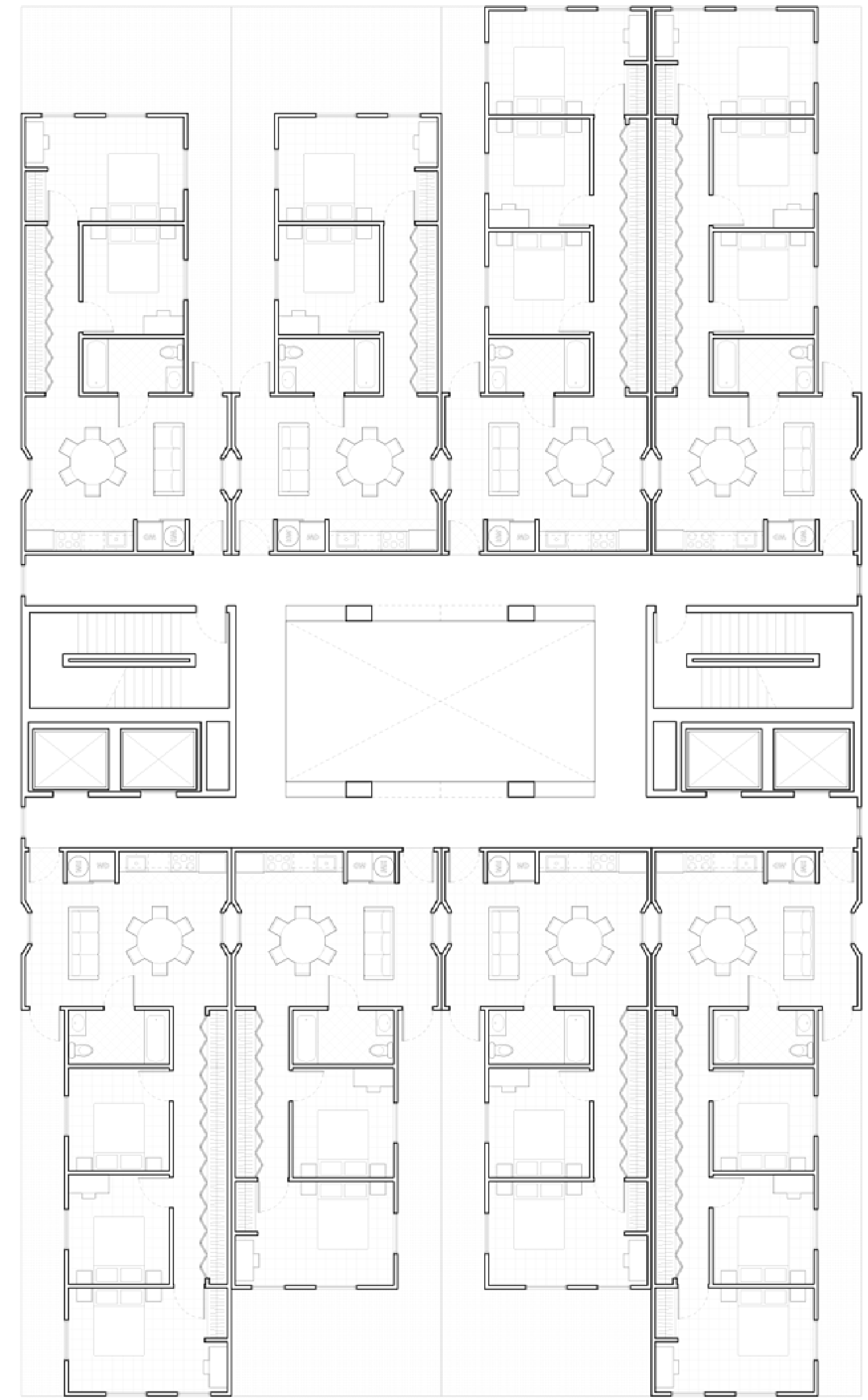
11. Living bamboo rhizome



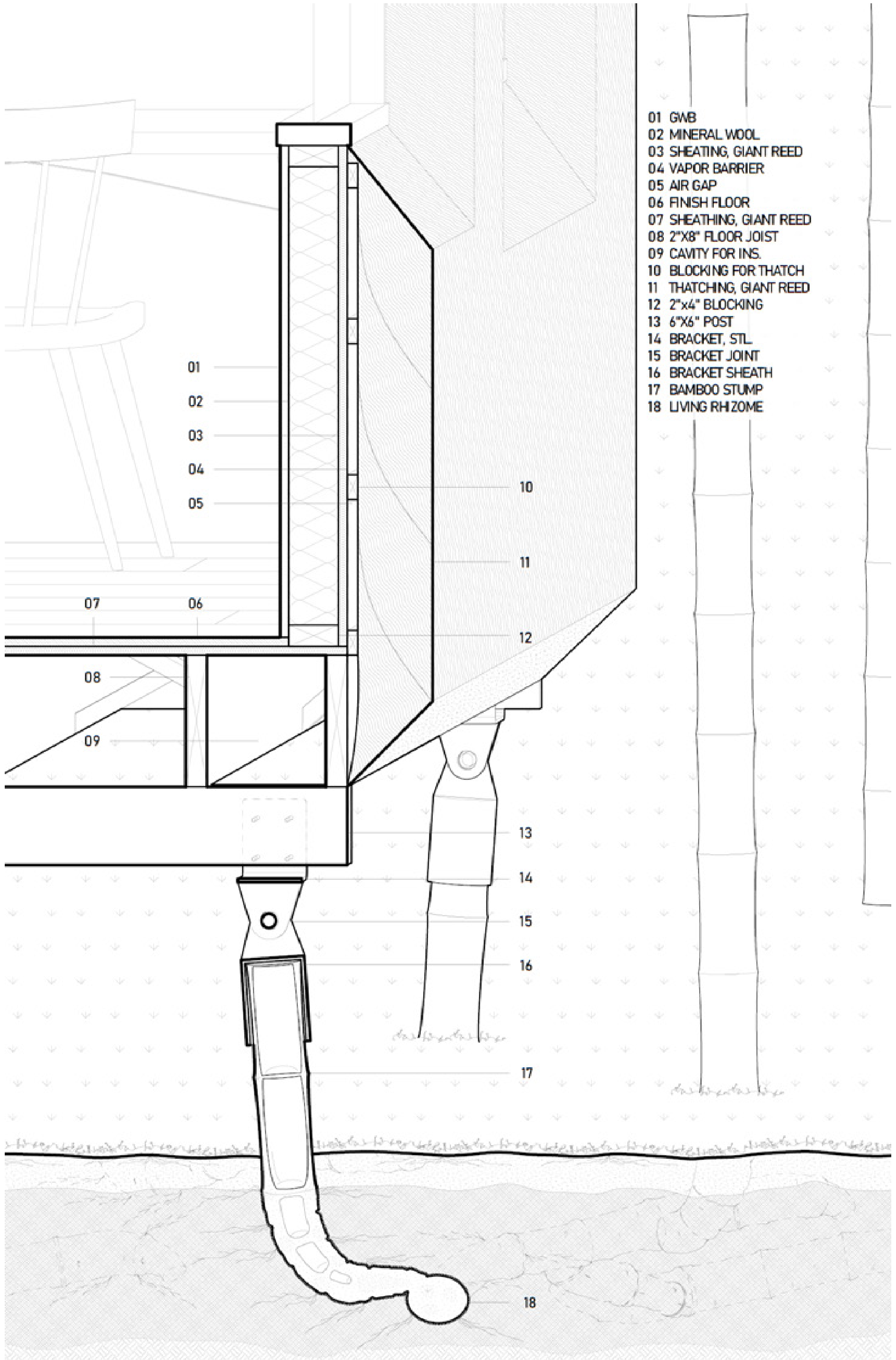
6. Concrete footers with timber piles



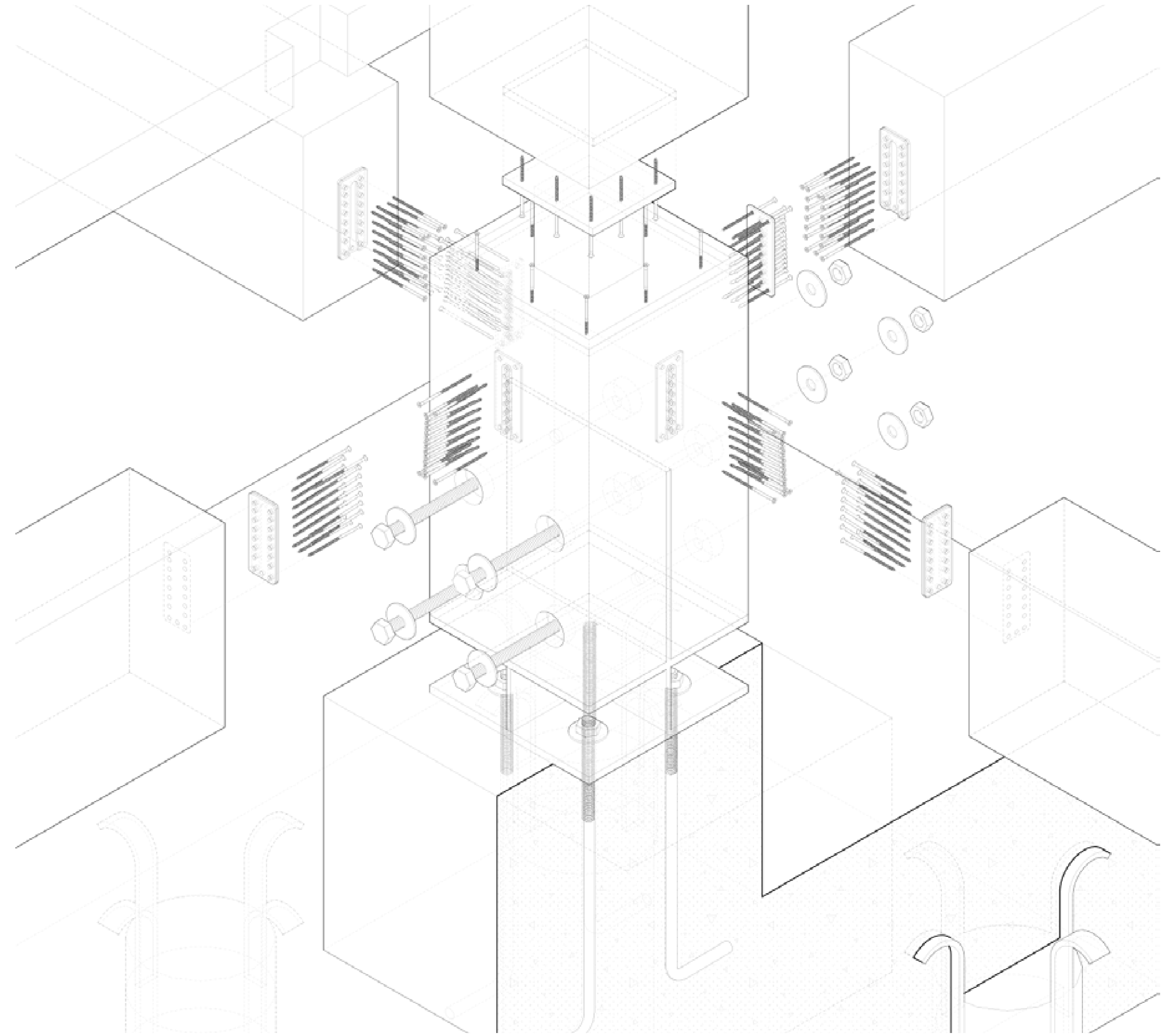
Proposed FEMA Manufactured Housing Unit plan



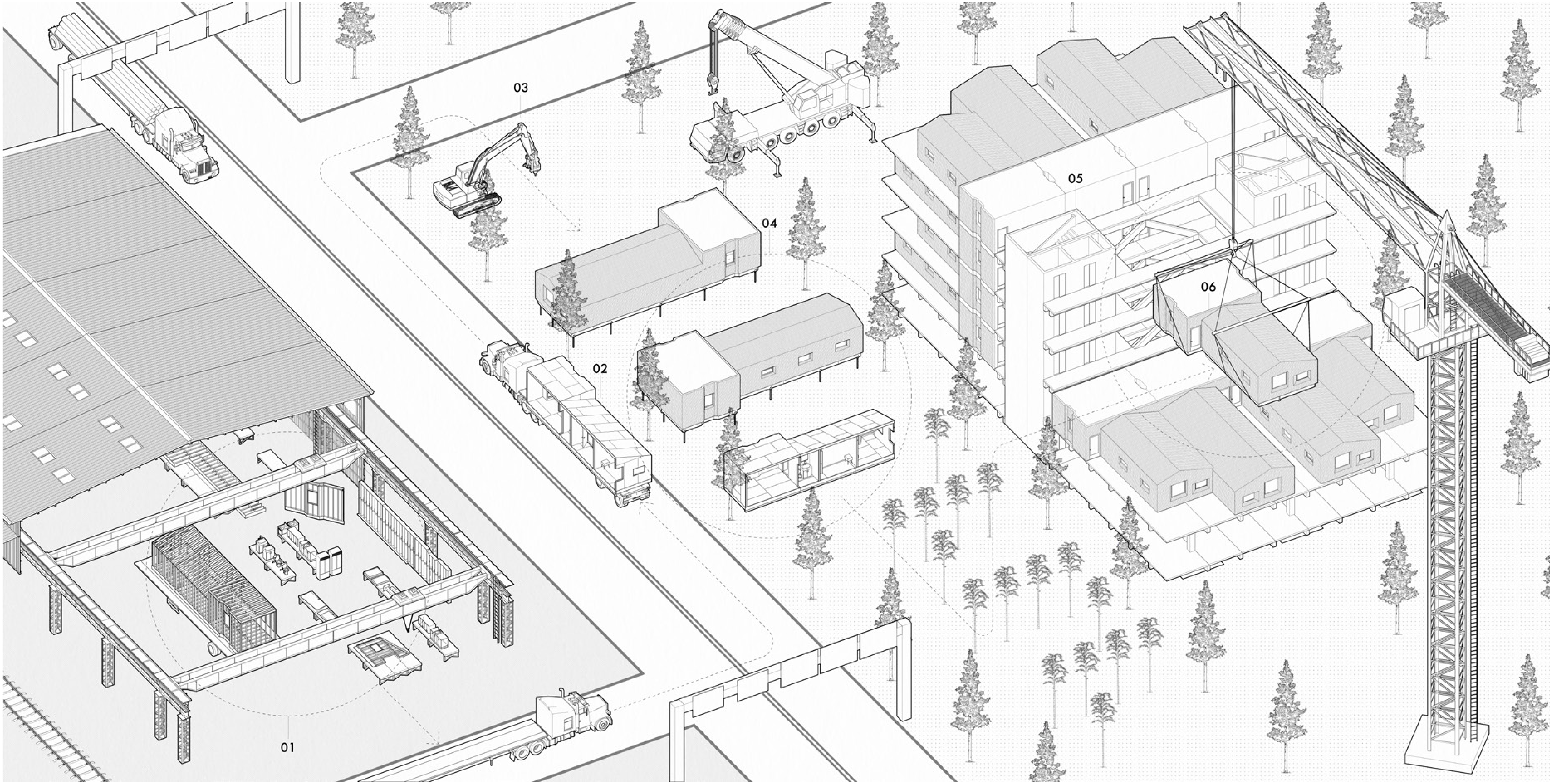
Floor plan for aggregation of FEMA Manufactured Housing Units for long term housing



Foundation detail for unit on living bamboo rhizome



Exploded axon detail of concrete footer to CLT structure and floor system



Isometric illustrating the three phases of emergency housing unit deployment

01 HOUSING UNIT PRODUCED IN FACTORY
02 TRANSPORTATION FROM FACTORY TO FEMA GROUP SITE
03 GROUND PREP AND FOUNDATION BORING
04 INTERMEDIATE SINGLE FAMILY CONFIGURATION
05 CENTRAL CORE AND PODIUM FOR AGGREGATION
06 HOUSING UNIT STACKED ON PODIUM FOR LONG TERM

THE LIBRARY OF THINGS

Fall 2023, Studio Core III
Instructor: Gary Bates

Partner: Eric Hu

To address the complexities of intergenerational living, "The Library of Things" augments the typology of multifamily housing by incorporating the logics and services of the library.

The household is not a static nor a standardized unit. People come and go at different stages of their lives and when they live together, their demands for space and for things can fluctuate significantly over time. The organizing principle for this scheme is a central "library" that offers families "things" (baby strollers, hobby equipment, walkers, etc.) and space (one bedroom to four) as they need it with the ability to return them after use.

Running through the center of the building is a mobile winch-and-gantry system that holds the collection and circulates along a central track. Residents can call an item from the system, cycle through the various things, and employ the winch to raise it to the entrance of their apartment. As things are added into the system and circulate through the building, this central storage begins to form a community archive. In addition to celebrating the lives and things of the residents, the availability of these essential items helps to mitigate over consumption and to reduce the financial burden of significant life changes.

Flanking the central atrium containing the gantry are two double-wide corridors. These corridors enable expanding wall sections to protrude into the walkway and link adjacent apartments. In addition to activating the corridor space, this mechanism enables the apartment to expand and contract as families do.

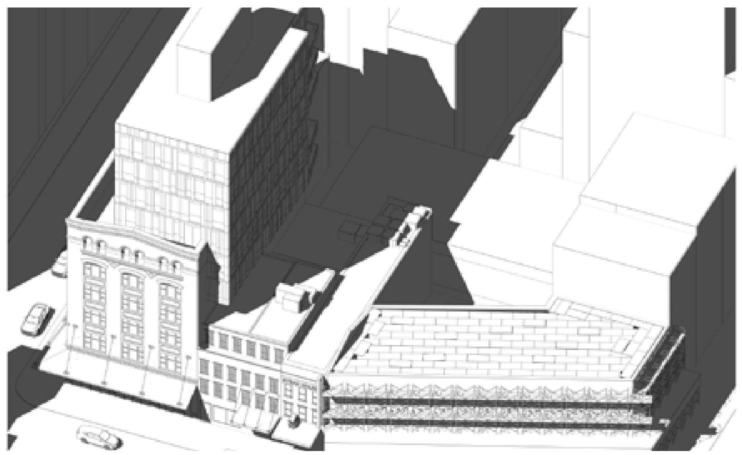
The overall form of the project was intended to accommodate a large number of units while maintaining avoiding visually disruptive moves such as towers. The roof line undulates as it circumscribes the building to negotiate the different heights of neighboring buildings and echoes the varied grade of the site.

Walking under the gantry bridge that connects the north and south blocks reveals the central garden that connects the people, flora, and fauna from Convent to Amsterdam avenue. In addition to accommodating the spatial and material needs of the residents, maximizing the using courtyard space and sunlight at the center of the scheme was paramount.

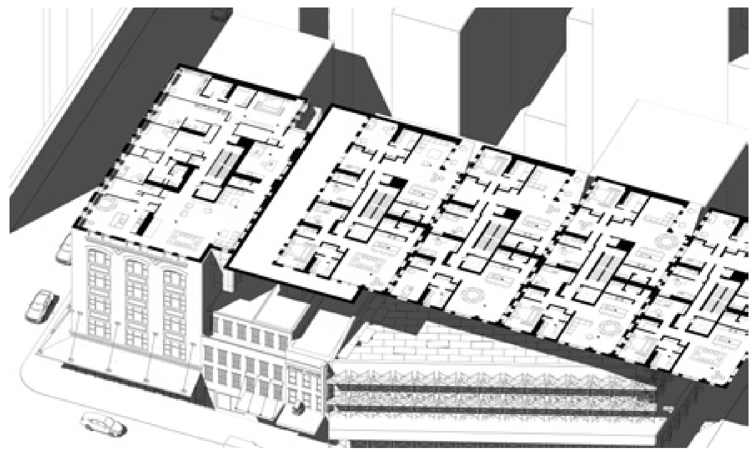
The ground level holds extensive facilities and gardens that support the residents and the broader community. To address the extensive pollution that permeates the site, a schedule of remediating plants has been developed to complement the generational timescale of the residents. The south-eastern corner of the building pulls back from the facade of the old MTA bus depot to create a welcoming front garden.

Conceptual site plan animated by proposed community facilities

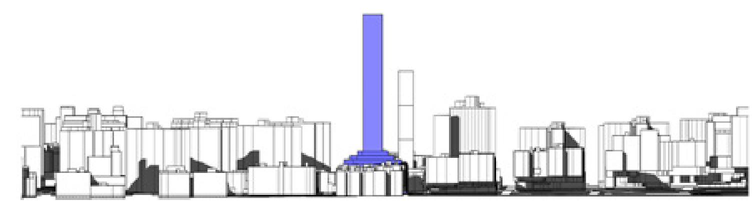
ZONING STUDY



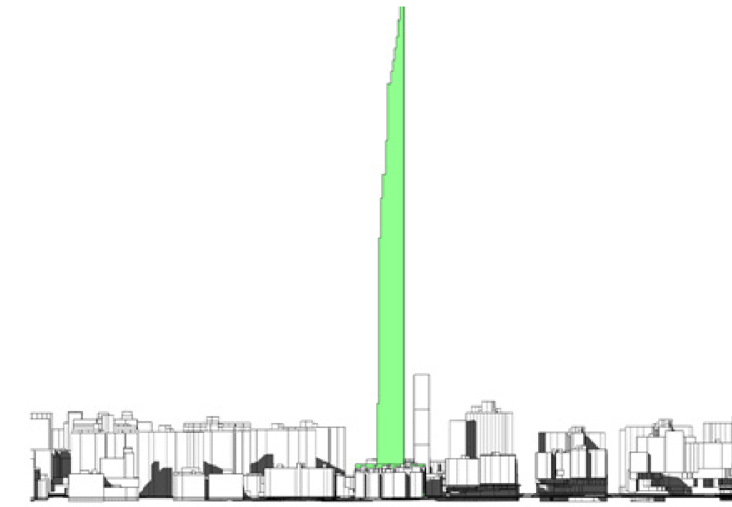
Case Study: SHoP Architect's Porter House & air rights transfer



Representation of floor area gained through transfer

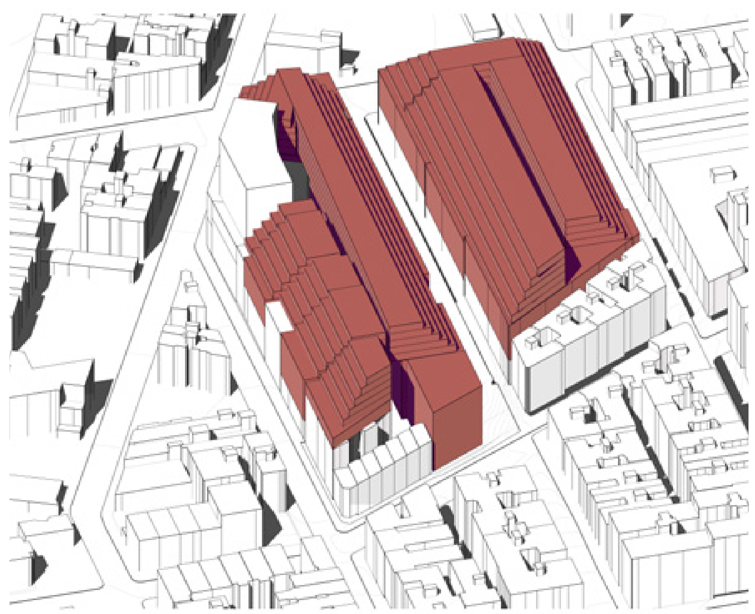


Elevation of hypothetical tower

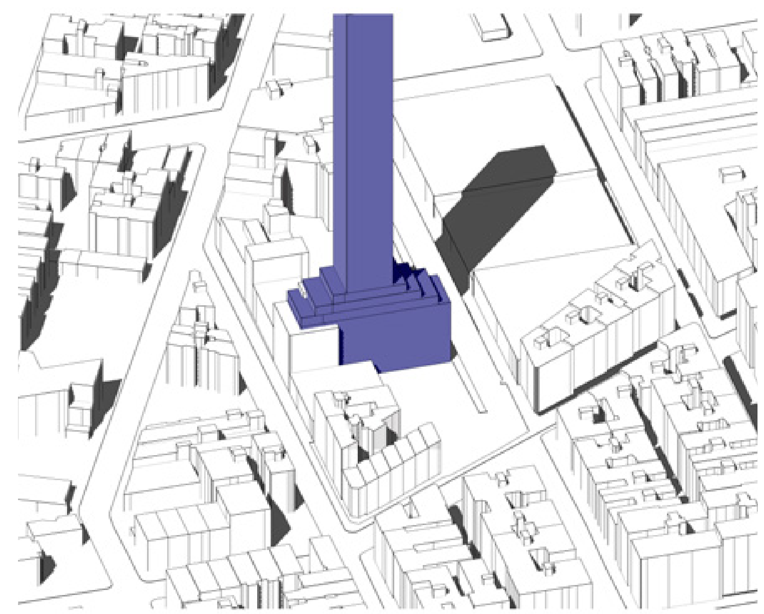


Elevation of 111 W 57th placed on the site

South-east isometric of the site: 454 w 128th Street



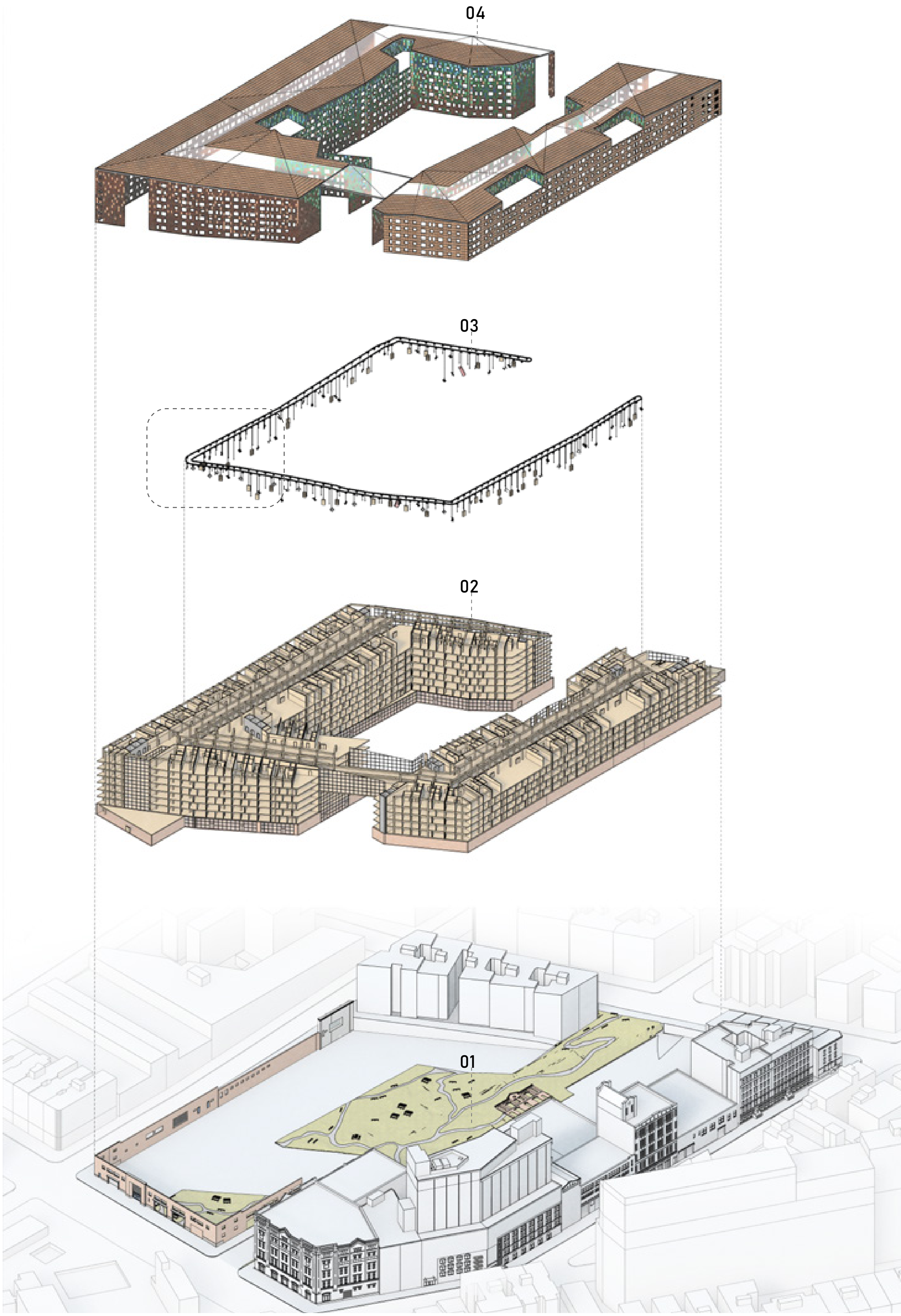
Visualization of potential air rights north and south of W 128th



Potential air rights as residential tower, similar to W 57th street

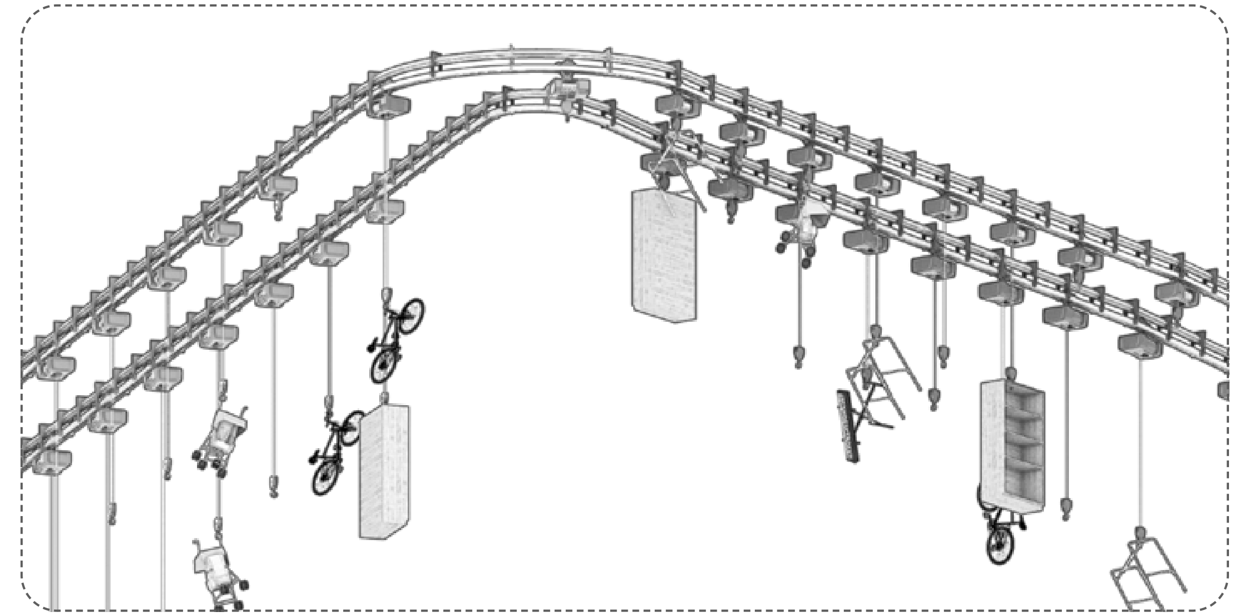
SHoP's 111 w 57th Street placed on site for size comparison

View of the massing on the site from the north, 1/32"



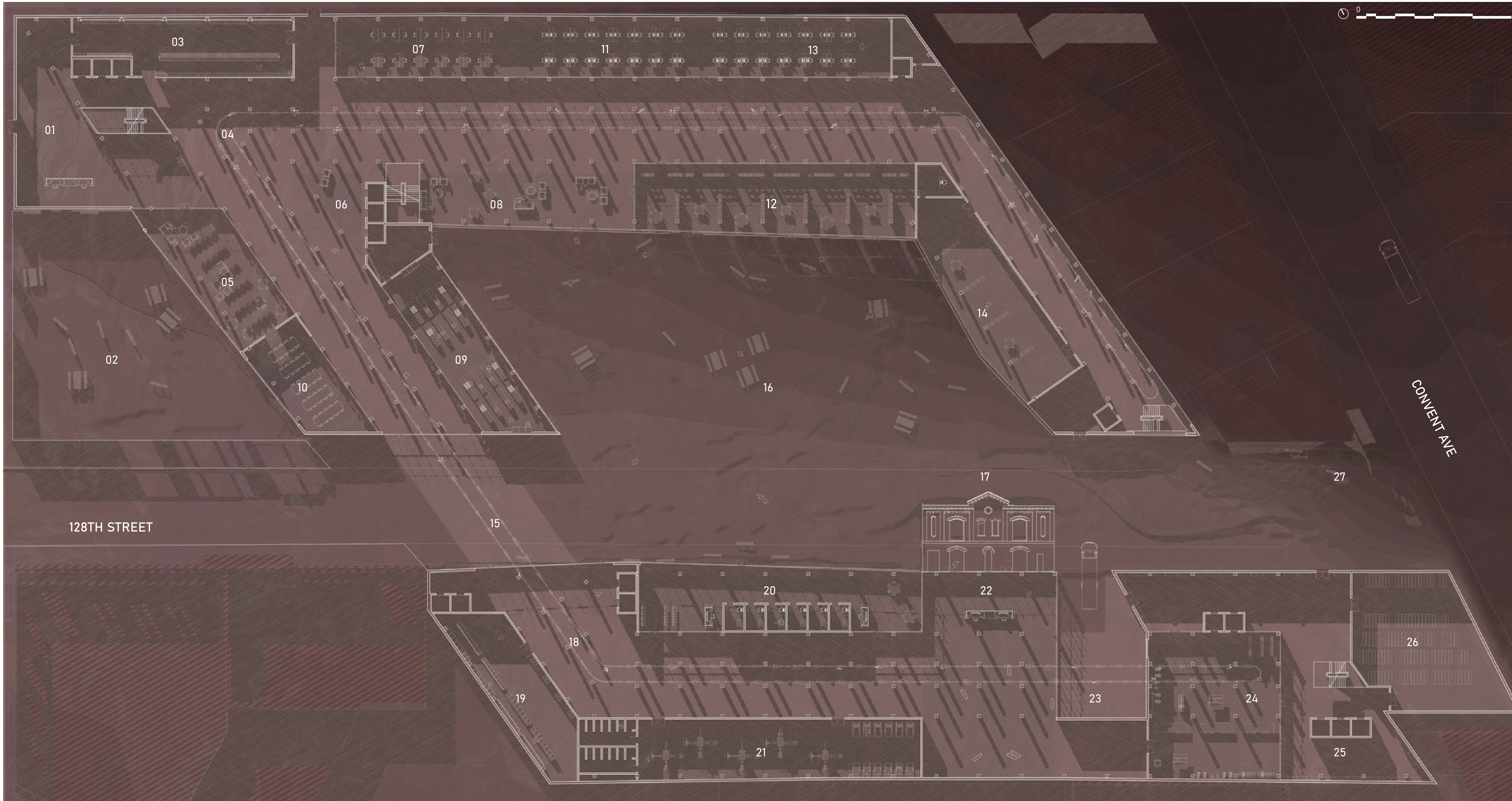
Exploded axon of materiality on site

01 EXISTING BUILDING FACADES AND CENTRAL GARDEN
02 CROSS LAMINATED TIMBER CONSTRUCTION
03 GANTRY FOLLOWS SLOPE OF ROOF LINE
04 TERRACOTTA FACADE AND ROOF TILES



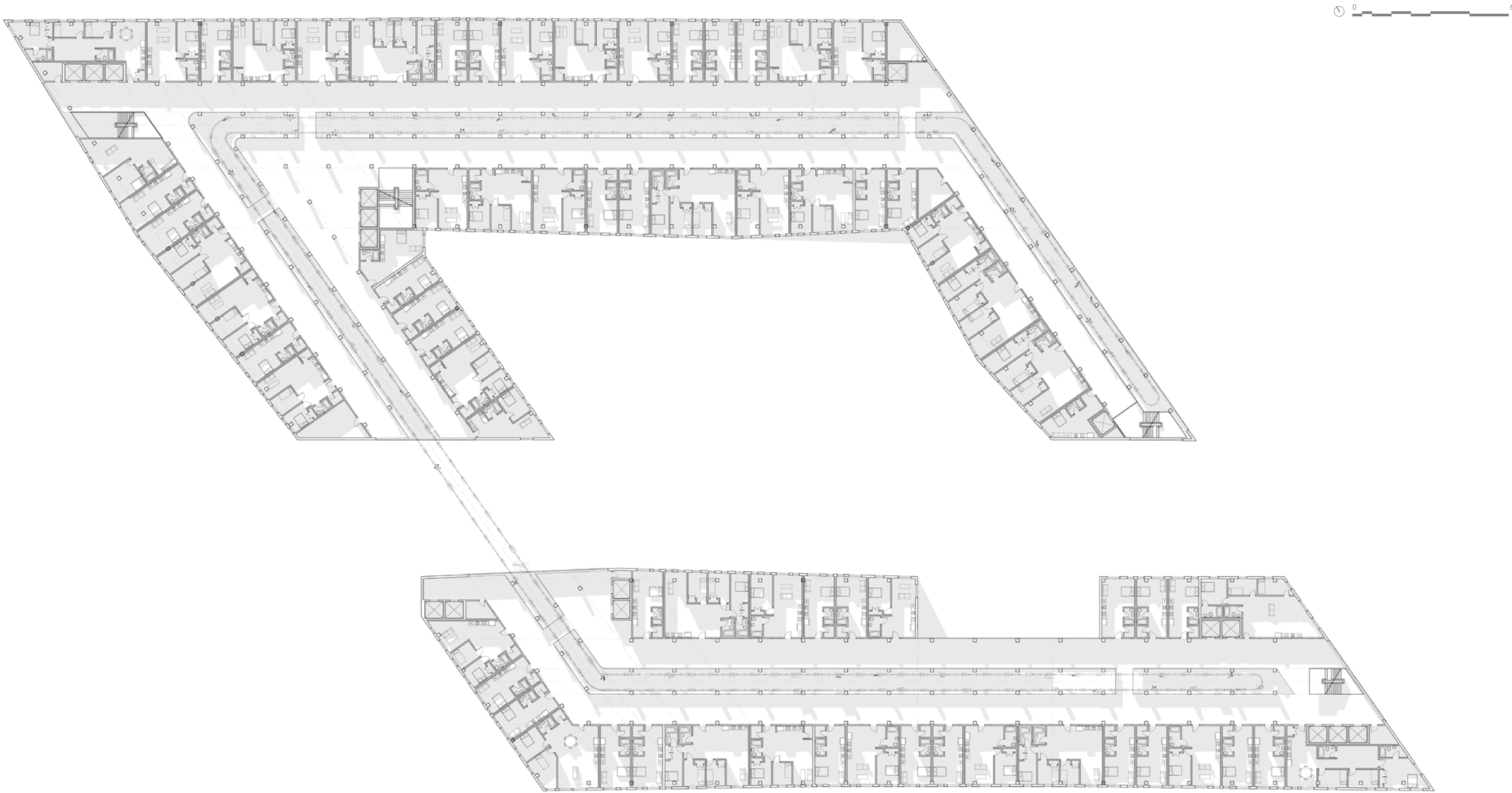
Things on central gantry system

Collage of things found on the sidewalk

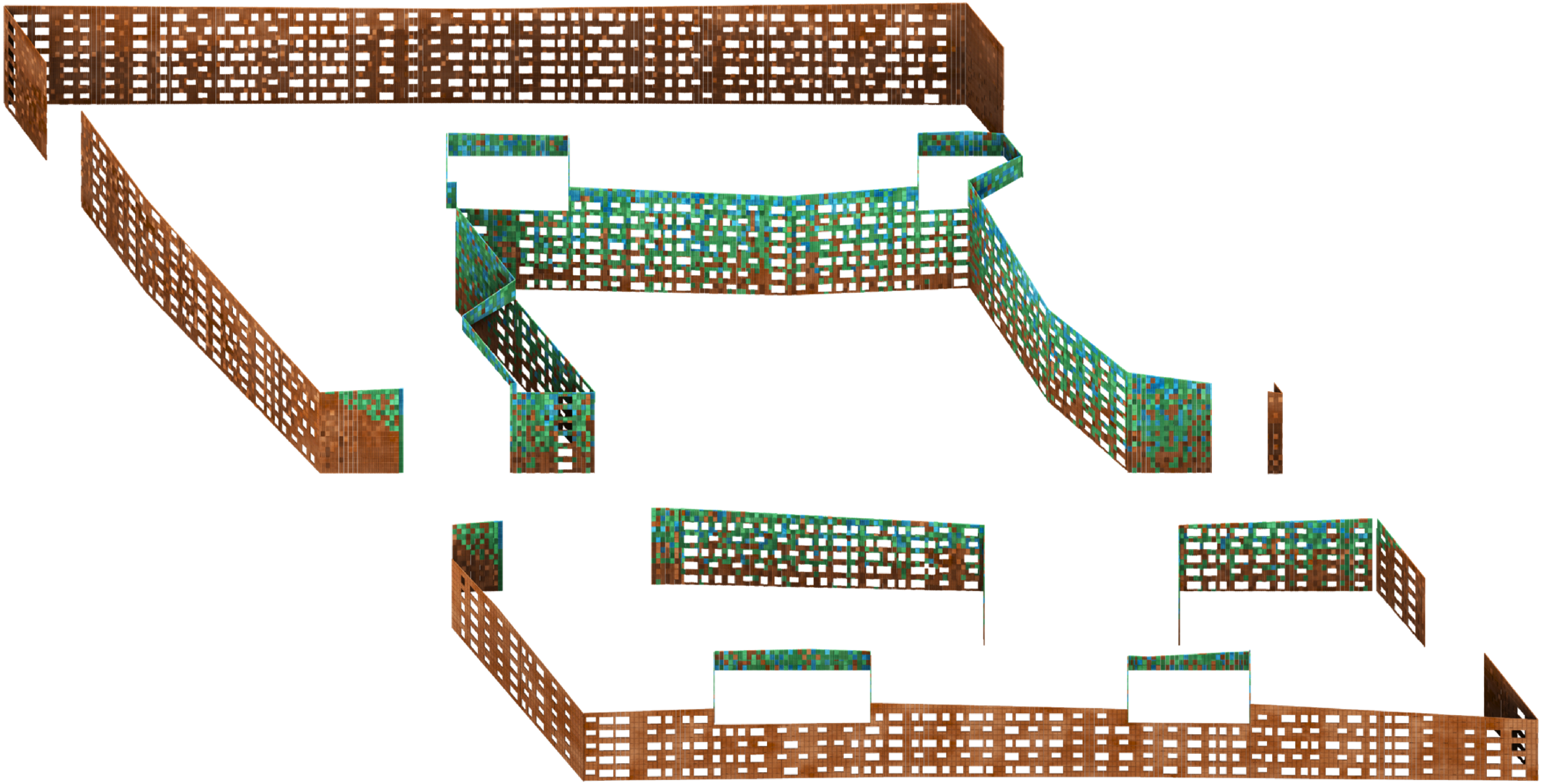


01 MAIN ENTRANCE
02 FRONT COURTYARD
03 MAIL ROOM
04 ATRIUM
05 COMMON AREA
06 WAITING AREA
07 COMPUTER ROOM
08 LOUNGE
09 COMMUNAL KITCHEN
10 NORTH ATRIUM
11 WORK FROM HOME
12 READING ROOM
13 OFFICES
14 DAY CARE
15 BRIDGE ABOVE
16 CENTRAL COURTYARD
17 ORIGINAL FACADE PATIO
18 SOUTH ATRIUM
19 LAUNDRY ROOM
20 SENIOR CARE
21 GYM
22 CIRCULATION DESK
23 LOADING AREA
24 REPAIR AND WOODSHOP
25 MECH ROOM
26 LONG TERM STORAGE
27 16FT RISE TO CONVENT AVE.

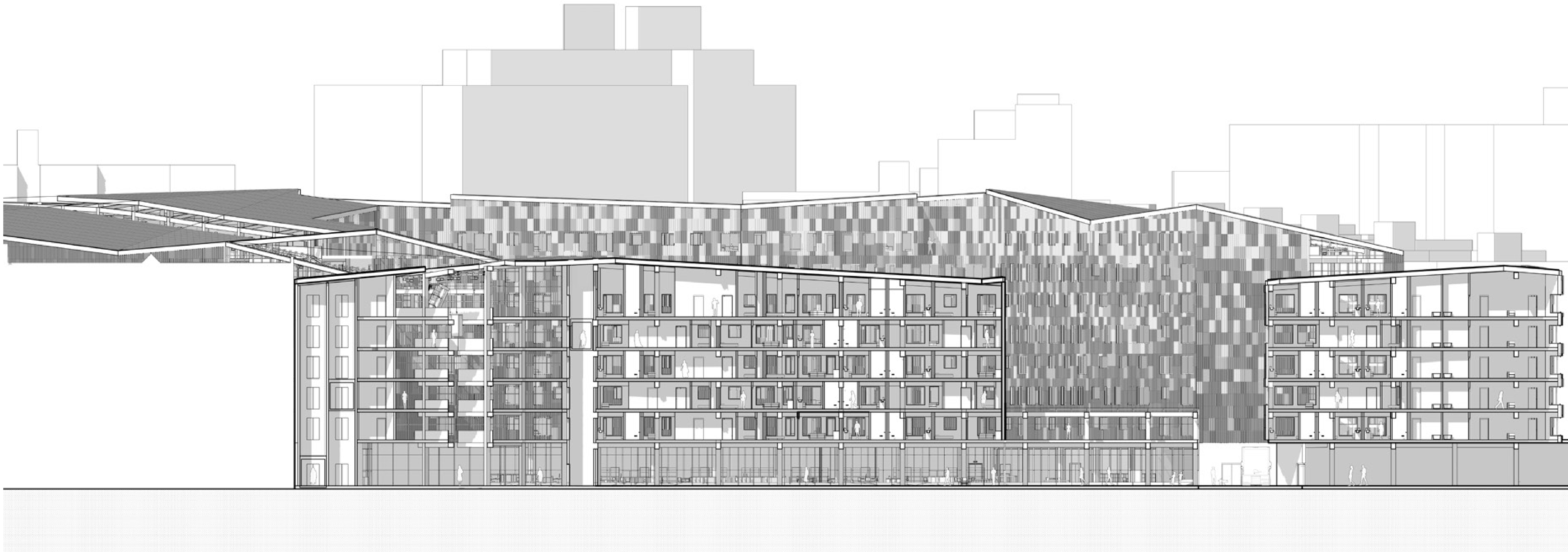
Ground floor plan overlayed on collage of the site conditions



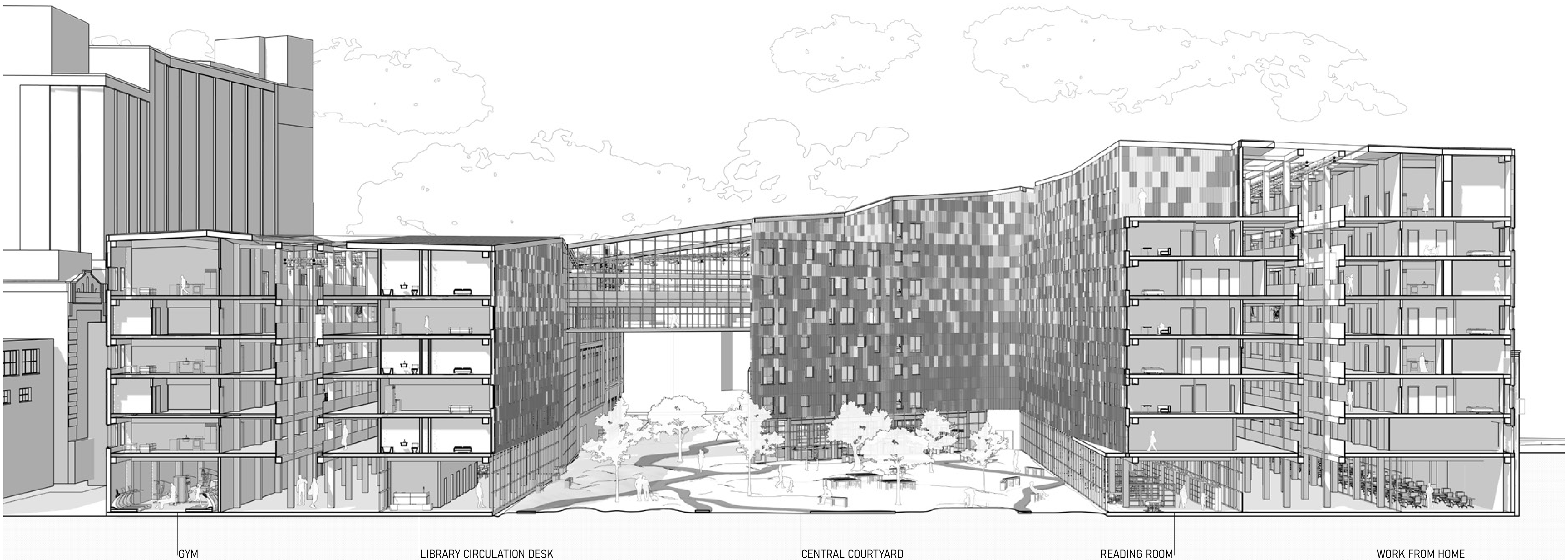
Third floor plan showing the apartment layouts across the building



Oblique of the various colors and profiles of terracotta tile used



Longitudinal section through south bay of the building

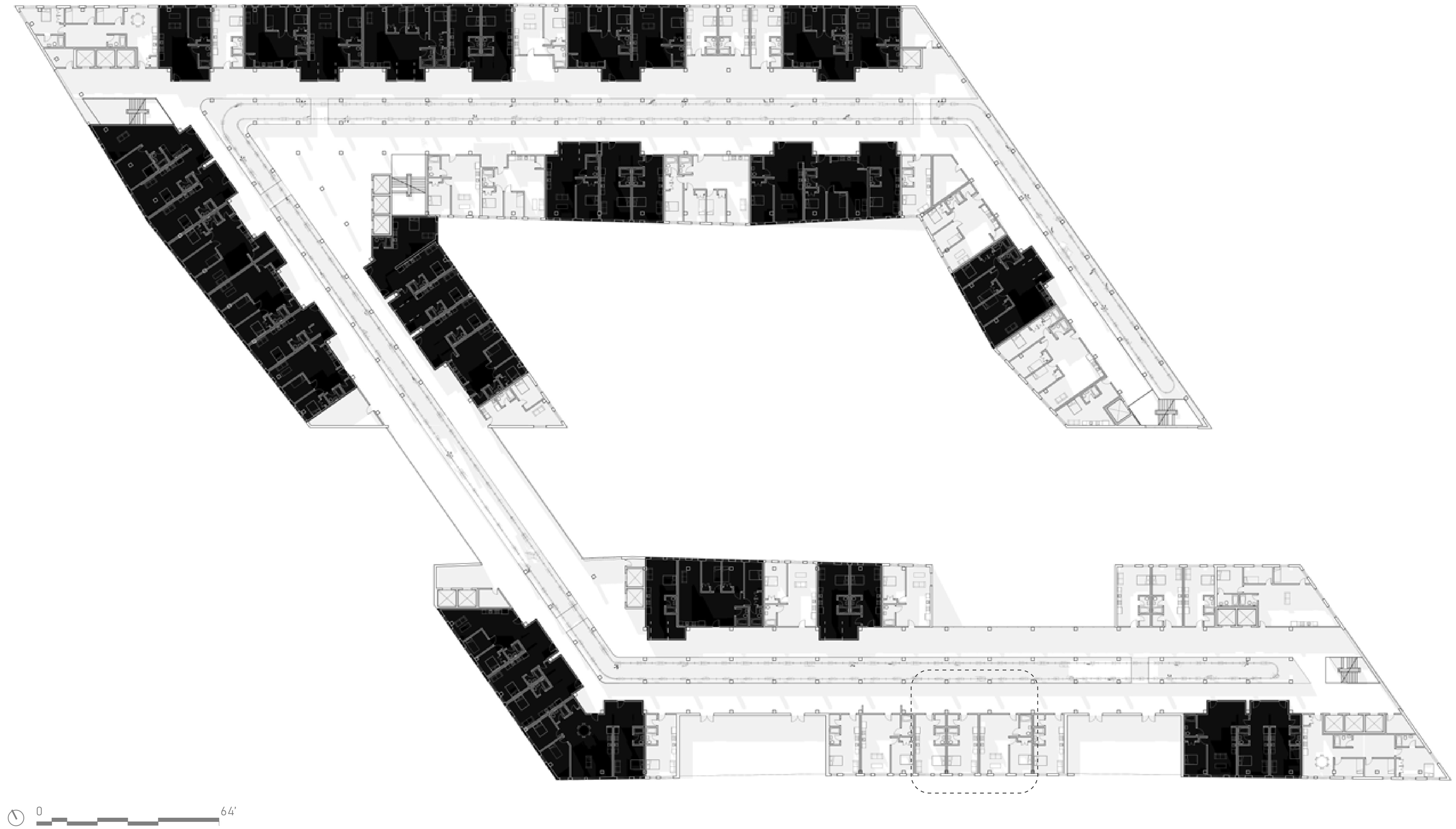


Section perspective revealing the apartment schemes on the north and south blocks along with views of the gantry and central garden

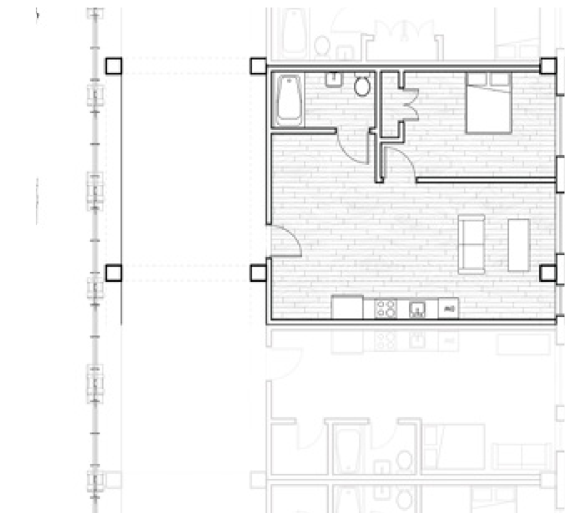
1/4" Sectional model showing how track relates to the units above the original building

Perspective down central gantry-way

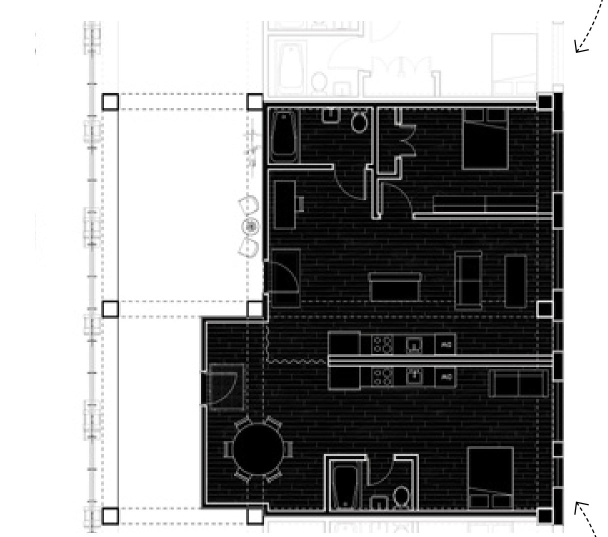
Existing facade becomes patio



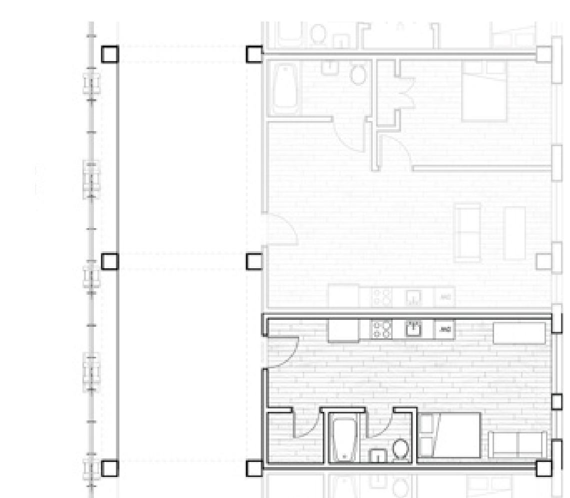
Floor plan after many years of expansion and contraction, fp 6



Studio apartment



Conjoined apartments with additional space



Single bedroom apartment

THE GREAT RE-USE PAELLA TRAIN

Design Elective, Spring 2025
Instructor: Mireia Luzárraga

Teammates:
Flora Ng
Nicholas Richards
Ambika Chaudhry
Yaqoub Hasan

To introduce an element of domesticity to the school, our team endeavored to create a system of mobile kitchenette trolleys specifically catered to the needs of cooking paella. Each station of the "train" is dependent upon another. The cooking station utilizes greens from the hydroponic garden and the garden reuses the rinse water from the washing station.

Washing Trolley
The washing trolley enables these various forms of cleansing by supporting a five-gallon water bottle about five feet above the ground. Storing the water at this height lets gravity do the work of cleaning without the need for pumps or electricity. A short piece of PVC tubing guides a small stream of water into the stainless steel bowl below, leaving enough room for hands, plates, or whatever else one may need to wash. A small brass nozzle connects the bottom of the bowl to a longer stretch of PVC tubing that guides the grey water to the basin of the subsequent planting trolley. Thin metal fencing extends out the back of the trolley for drying plates and utensils.

The foundation of the washing station is a heavy steel dolly, which was discarded because a wheel mount had broken off of the axle. Steel EMT conduits create the vertical structure. The rear columns are bolted into the baseplate while the front columns sit in the slots intended for the original dolly handle. Drilling holes into the conduit perpendicular to its length create connection points at different heights. The exposed metal rods from the fencing slot into these holes, establishing the horizontal drying rack without the need for other fasteners. A simple nail through the column lets the conduit bear the weight of the water by supporting the plywood ring that surrounds the bottle.

Criss-crossing steel cables race from the baseplate, over the fencing in the back, through the vertical conduit, back through the front section of fencing, and down into the handle slots to link everything structurally and add rigidity. Finally, a pair of bent steel conduits span across the trolley to another CNC'd piece of plywood and taut steel cable to clamp the back wheels together, securing them to the trolley.

Serving paella from the central cooking station

Team photo showing everyone with their respective trolley

Elevation of the washing trolley

The three stations together

Detail showing the axle lock, column connection, and cable mounts

Horizontal elements slot into holes in the vertical element

PVC tubing guides the used water into the following garden trolley

SLOWING DOWN MIDTOWN

Core I Studio, Fall 2022
Instructor: Carlyle Fraser

The essential feature of Midtown Manhattan is transience. Each morning, hundreds of thousands of people flow into this region only to ebb back home by the end of the day. Many of these people come to work in the commercial center. Office buildings and the process of development serve as both symbols and physical manifestations of the flow of these people and the capital that enables them.

The past three years have forced us to reckon with our spatial relations to work and the economic implication of digital workspace. A "flight to quality" has consolidated the footprint of used office space, allowing for the possibility of domestic conversions to meet residential demand. Responsible conversions could potentially sidestep the terrors of standard development that profit on cycles of aggressive devaluing.

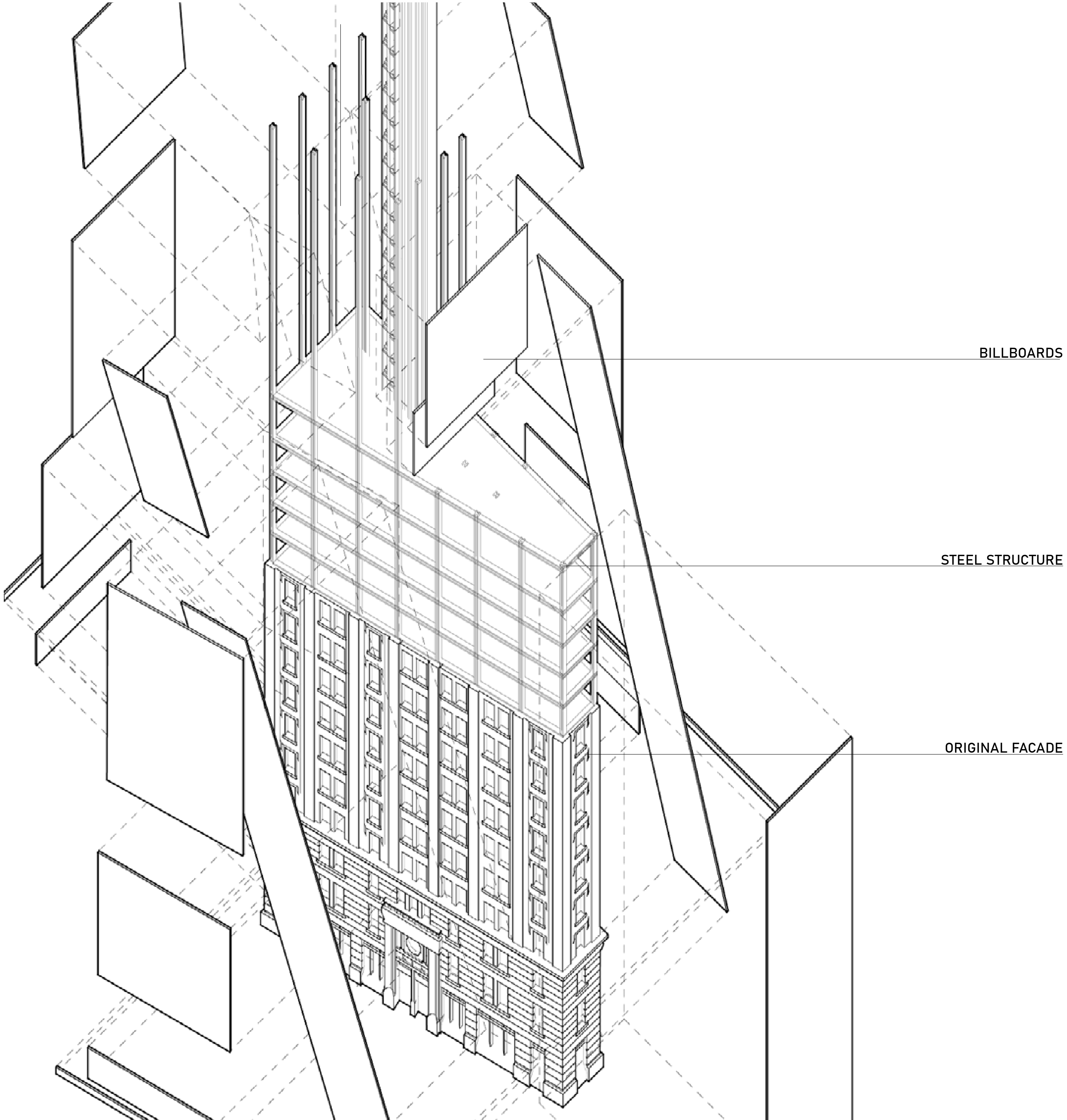
The kaleidoscopic advertisements that typify Times Square, though, render the spaces behind them uninhabitable by blocking all access to light. Dividing the surface of these billboards to create a series of operable louvers that allow light to enter from above or from the side while maintaining a unified image for pedestrians below can serve to subsidize these new housing and amenities. The 2D real estate funds 3D real estate rather than precluding it.

One Times Square–with its steel skeleton and shroud of billboards–is a prime candidate for conversion to residential space, ushering in local residents as well as the new year. The peripheral billboards that define Times Square can begin to hold public amenities that are likewise needed.

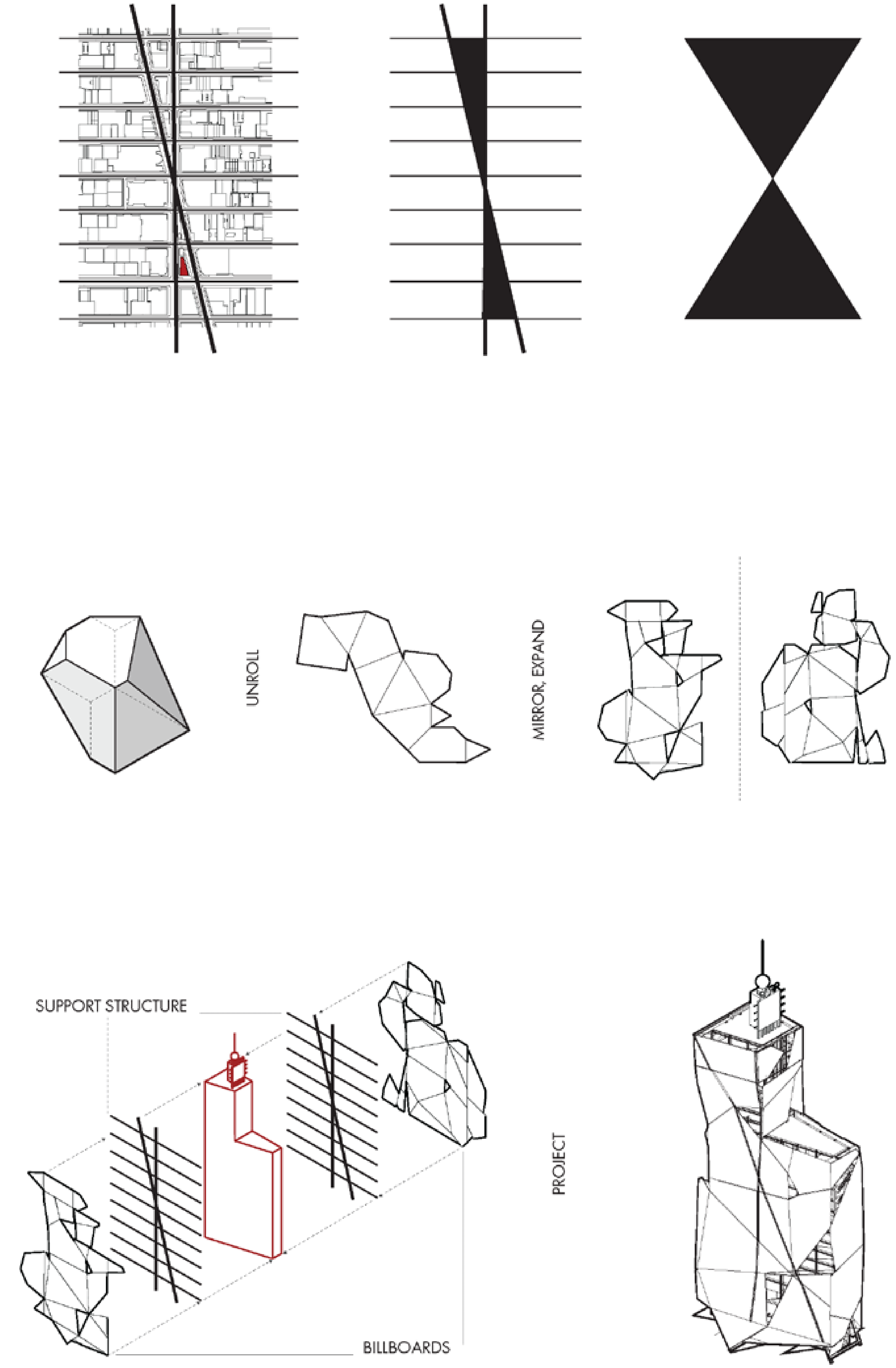
Above and beyond housing, we can begin to rethink and reshape how we engage with transience, especially how we encounter each other every day on the street. Times Squares typifies the chaos and spectacle of such a dramatic confluence of people–defined by ephemerality. Perhaps we can, in addition to carving out space for the domestic, begin to channel this transience into a space of spontaneous conviviality and companionship.

The common area in between can become a permanent dining space, encouraging people to slow down and share a meal together. Humanizing the program of Times Square by appropriating these spaces changes the relationship between the commercial and residential space.

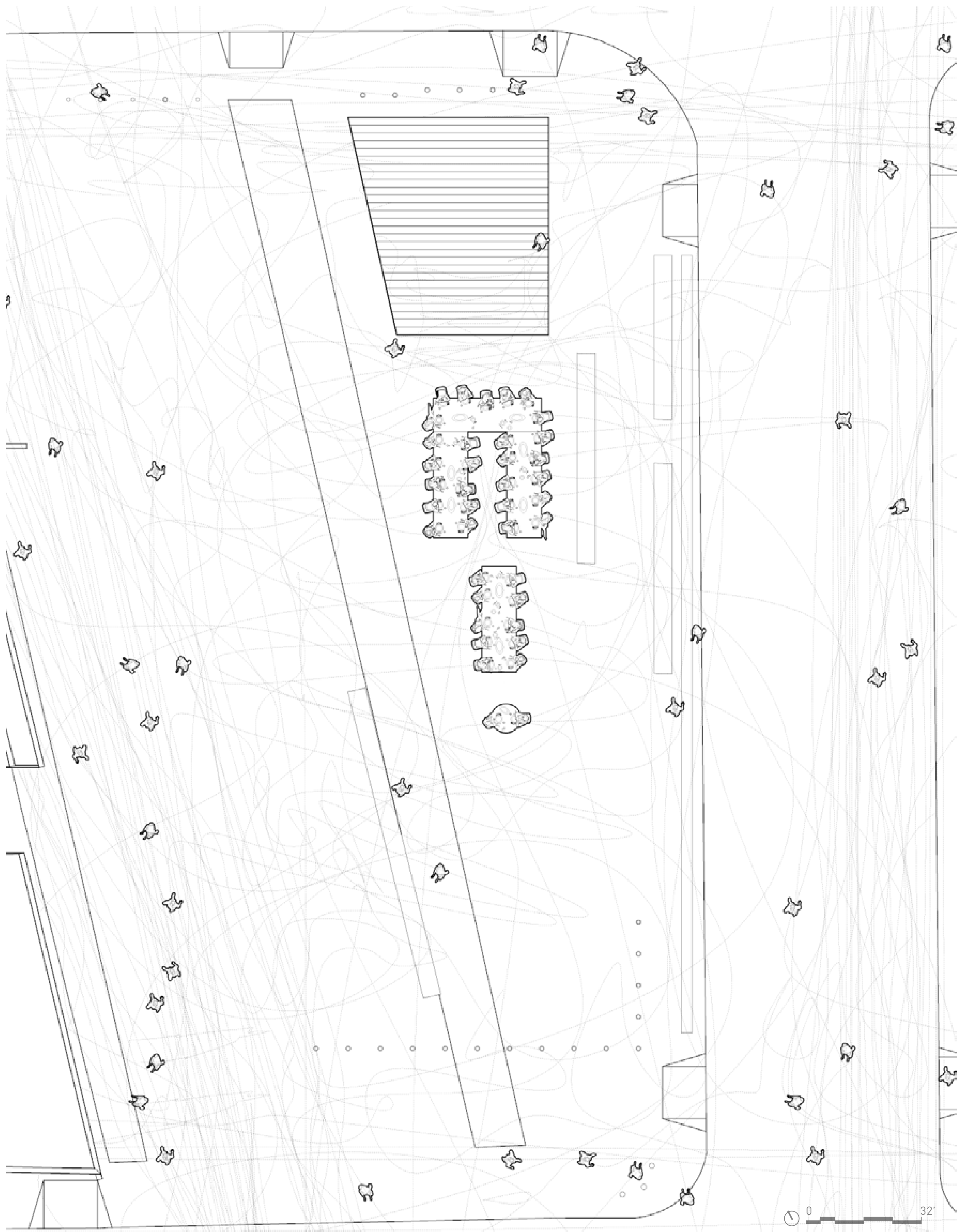
Shadow projection of final intervention on One Times Square



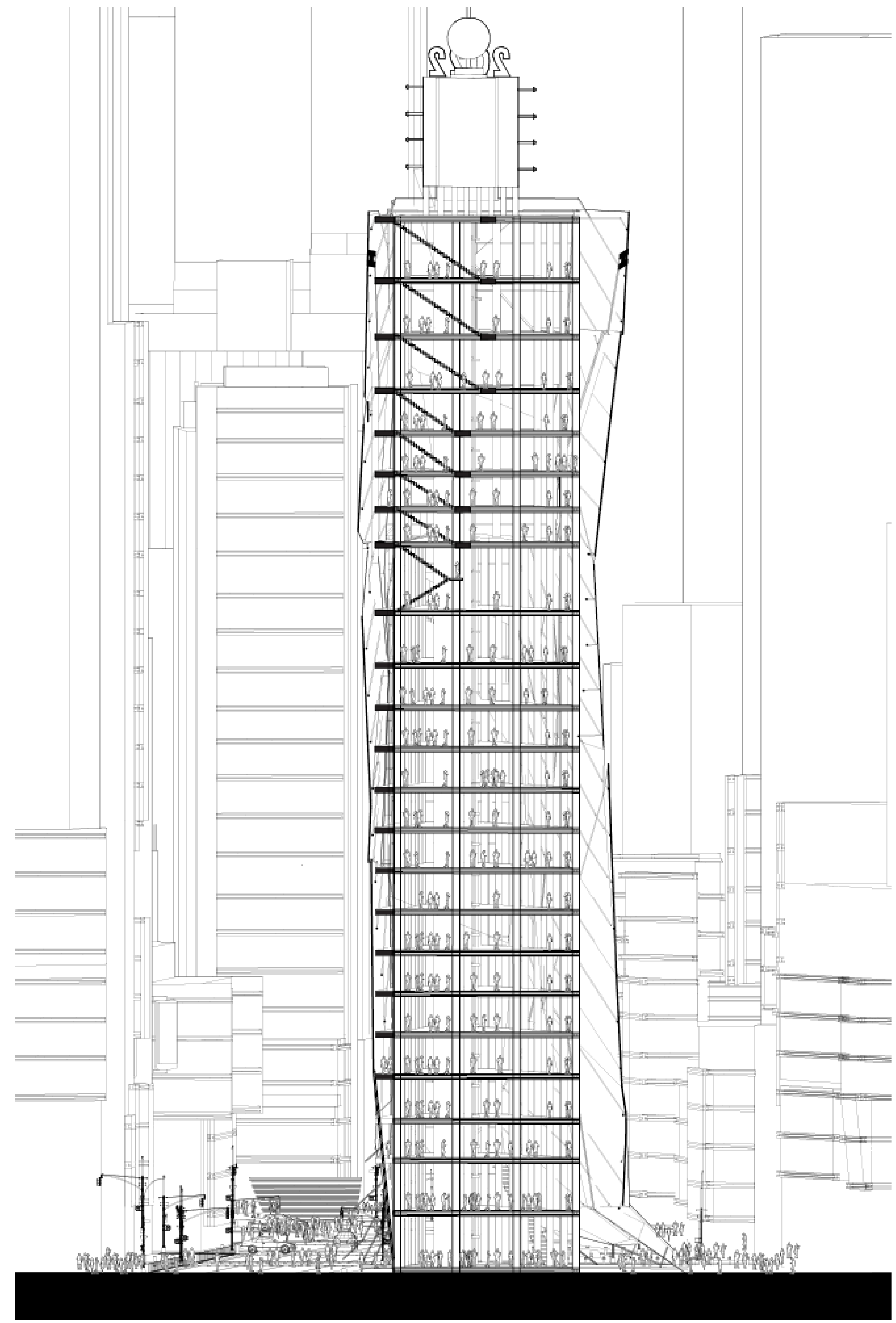
Exploded axon revealing the original facade and steel strucutre beneath the billboards

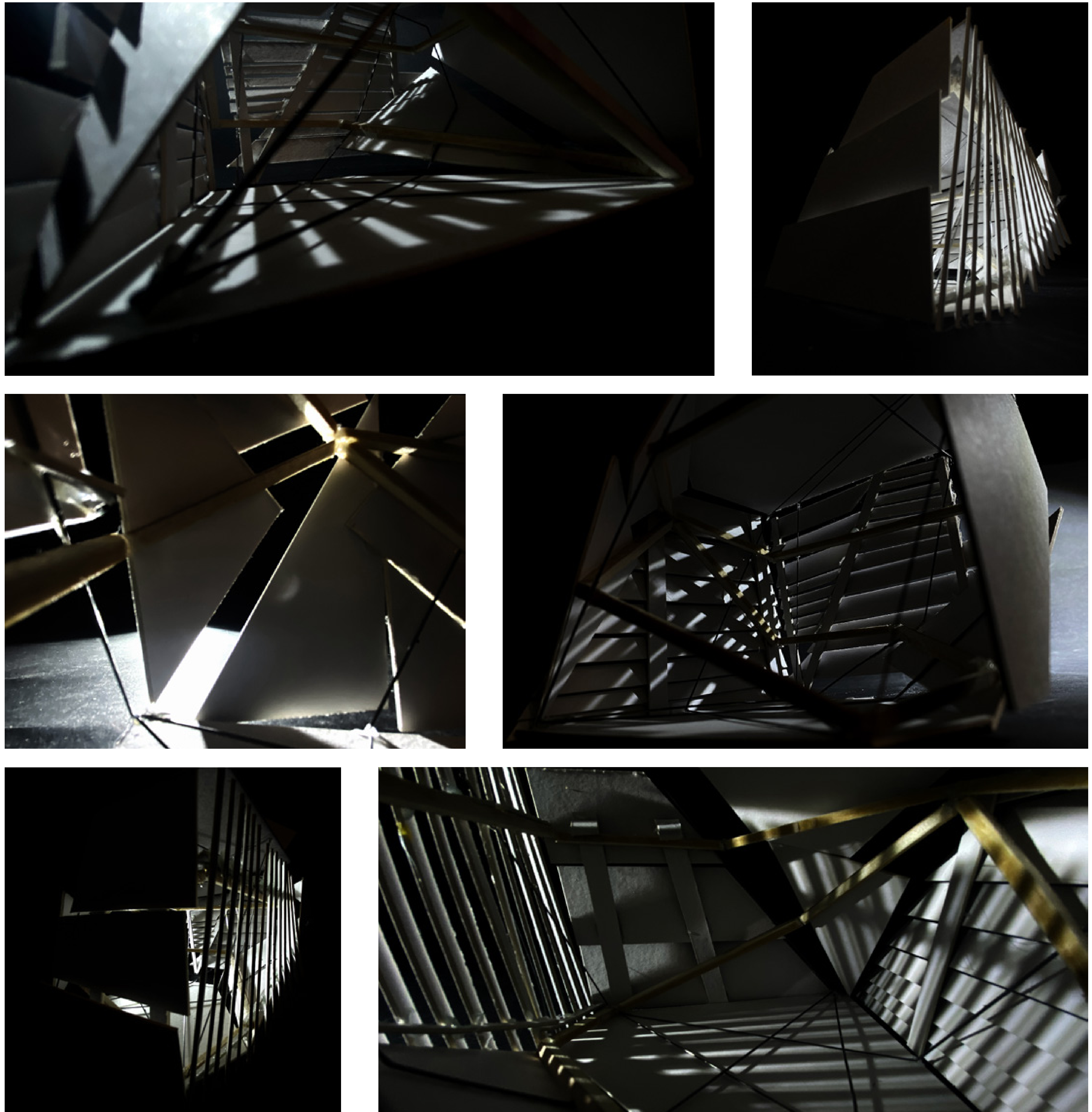


Translating the site condition into the proposed structural form

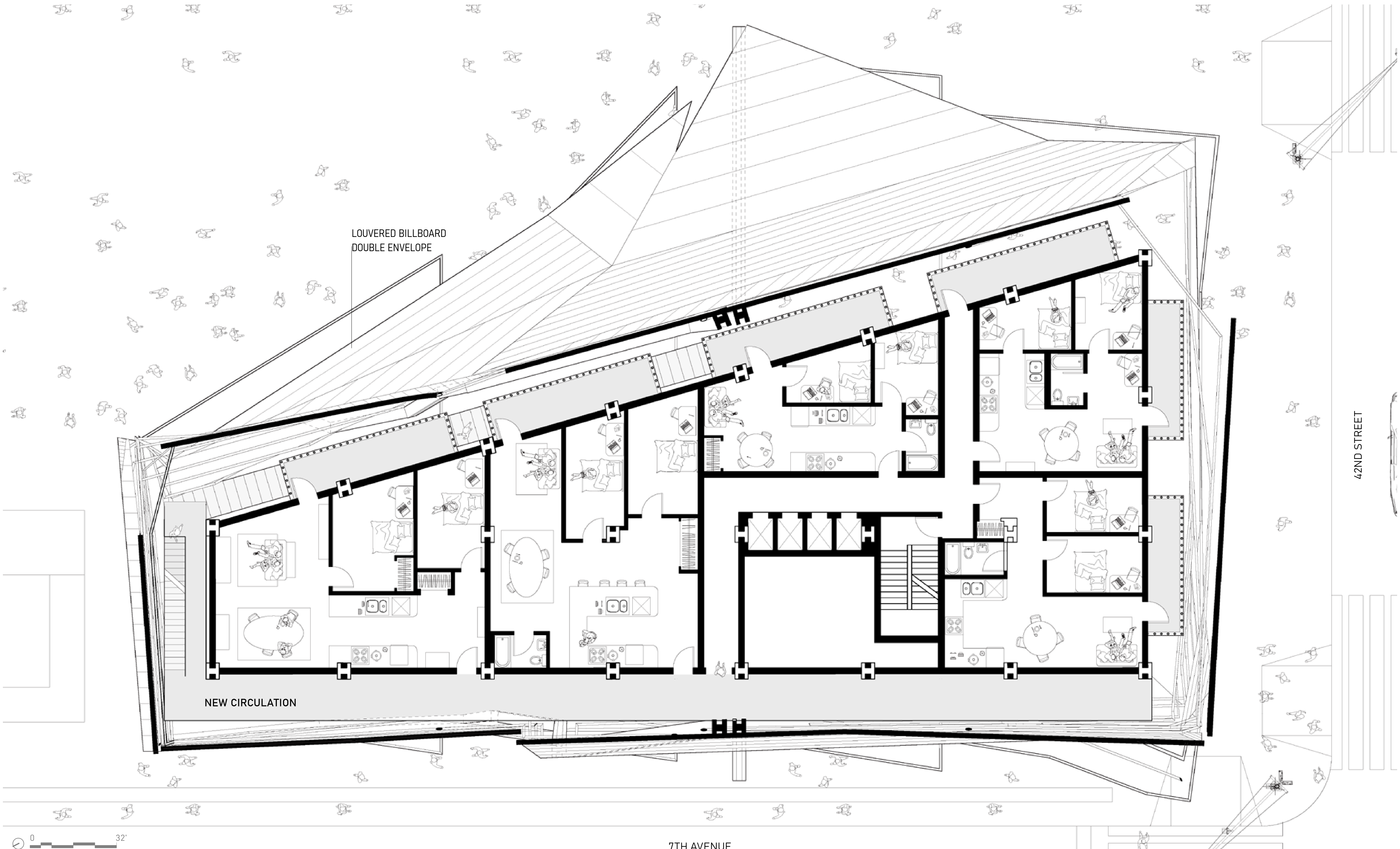


North triangle of Times Square set up for permanent dining


Back section of One Times Square after conversion to residential



Lighting studies for louvers



Plan of One Times Square after residential conversion

1"-32' scale model of One Times Square with louvered billboard and circulation system

ORIENTALISM & THE PICTURESQUE

Systems of Vision and Le Corbusier's Algiers

This section on Le Corbusier's plan for Algiers follows a discussion of how Oreintalism, as a mode of perception, utilizes the same aesthetic mechanisms as the "picturesque" as formulated by Richard Payne Knight and Uvedale Price.

These mechanisms include freezing economic development, mediated perception, reliance on a canon of previous representations, and playing with "near" & "far" by manipulating nature and the built environment to control visual access.

Le Corbusier's fascination with the "*Orient*" is well documented in his writings. Zeynep Celick recounts Le Corbusier's avid anticipation for the scenic approach to Istanbul from the sea. Tracing the "innumerable travel accounts" he must have read in preparation for his "voyage d'Orient," he dreamed of a city full of light, color, and majesty. Instead, he was betrayed to find rain, mud, and crowds of Europeans.

"I *want* Stamboul to sit upon her Golden Horn... I *want* light to screech on the surfaces of domes... minarets *should* thrust upward and the sky *must* be blue... I *want* a city all white...". Celick notes that "'[Le Corbusier] "had to work at it... [he] wanted to love this place.'" This moment of anticipation and disappointment is revealing of the orientalist imaginary and how it operates based on desire. The sky and the city *must not* be gray and wet as they are in France and the people there *must not* be European. The gaze inspired by art and travel diaries demands a difference in both people and territory.

What is most insidious about this desire for difference, however, is how it translates into the politics and governance of settler-colonial rule. In July of 1830, France invaded Algeria, marking the beginning of a roughly 130 year period of brutal colonization that would only be overthrown through revolution. In addition to the massacres and inhumane treatment of the indigenous population, it is estimated that "more than 3 million hectares of agricultural land had passed from control of Muslim natives into the hands of European colonists." This is a direct result of a series of Land Laws initiated in the 1840's which sought specifically to transfer land holdings over to European colonists under the pretext that they farmed and thus utilized the land more efficiently.

As John Ruedy explains in "Land Policy in Colonial Algeria; the Origins of the Rural Public Domain," three strategies were used "to free land for colonizers." These were "*refoulement*, the pushing back of the natives, *resserrement sur place*, their compression on the spot, or *cantonnement*, a euphemism that could mean either or both of the preceding." Over the course of France's colonial rule, the manner of this redistribution can be roughly characterized by starting with "official colonization" in the nineteenth century, where the colonial government transfer "properties in the public domain to incoming colonists" and "private colonization" in the twentieth century, where European settlers purchased the land directly from the natives or other Europeans. Thus, by the beginning of the twentieth century, the economic conditions of industrial agricultural practices coupled with legal policies that encouraged European settlement and occupation of Algeria created a new class of colonists, differentiated in both culture and economic resources.

It is within this colonial context that Le Corbusier presented his master-plan to the mayor, Charles Brunel, for the transformation of Algiers: Project "A." In his letter dated 1933, Le Corbusier proposes that Algiers ought to join an axis of global cities, including Paris, Barcelona, and Rome, and stand as the "head" of the African continent–allegedly "ceasing to be a colonial city". This unifying proposal is part of his attempt to curb the damaging effects that the "incoherence of arbitrary groups" has brought onto the global economy, rendering the world "less arbitrary and less dangerous." This provides the premise under which Le Corbusier suggests that Algiers should finally undertake modern city planning.

The city of Algiers sits on the rocky cliff face between the mountain of Fort-l'Empereur and the Mediterranean Sea. Figure 6 shows Le Corbusier's proposed plan for the city. His suggested modifications are so grand and so sweeping that it is difficult to see the old city at first. Included in the master-plan are designs for a new business city, a new sports center and beach resort, and radical approaches to incorporating residential structures above and below Fort-l'Empereur. Connecting these various programs are an elevated bridge that unites the top of the business center to residential buildings on top of the mountain and a massive highway system that runs under this bridge, cutting through the old city and connecting the beach resort and suburb of Hussein Dey to the suburb of St. Eugene.

In writing about the city of Algiers, Le Corbusier is fixated on the spatial function and significance of the casbah. For Le Corbusier, the casbah serves as a model, a relic, and an opportunity. First, he differentiates what he categorizes as "pure and efficient stratification" of the casbah from the "harmful stratification" of the abutting neighborhood. As is illustrated in his drawings and images (fig 7) the casbah is successful in how the buildings utilizes differences in topography. The heights of equally tall buildings are staggered as they move up the hill. This differentiation provides access to fresh air and, more importantly, access to the view.

For Le Corbusier, this system speaks to a kind of efficiency in habitat that is inspiring and hopes to "improve" upon. The newer neighborhood, however, segments buildings and blocks by creating cavernous streets that Le Corbusier characterizes as "gutters and reverberating wells". The photograph in figure 3 illustrates how the two neighborhoods stand distinct in plan. Out of context, the organically shaped and clearly defined roads in the cityscape on the right could be compared to a medieval European city, like Paris before Haussman.

In drawing this comparison, Le Corbusier is not only speaking to how the spatial logic of the casbah is functionally superior for dealing with the conditions of the terrain, but that the preservation of the "adorable casbah" is essential for establishing a purity of place that differentiates Algiers from the Paris, Barcelona, or Rome.

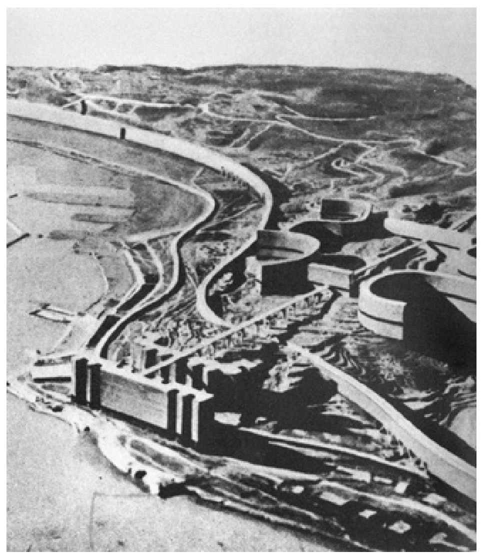
What Le Corbusier took away from the casbah, justly or otherwise, was that an efficient use of space through dramatic consolidation and compartmentalization can be employed in service of the view. This lesson can be seen most clearly by contrasting the sheer magnitude and scale of his proposed structures with their tiny footprints. In his note to Mayor Brunel, Le Corbusier boasts that compacting the entirety of the business city into a 150 meter tower at the "nose" of Algiers. After the scheduled demolition of the *Quartier de la Marine* this would result in "98% of free land!". As Celick points out, clearing the space in this quarter would enable the two mosques on the Place du Gouvernement to stand, in Le Corbusier's words, "in a 'vast ensemble of new [and] grand Muslim architecture,as monumental as it would be picturesque."

Despite providing inspiration, Le Corbusier recognized that the casbah had its own problems. As Celick explains, "if Algiers was to become the capital of French Africa, the misery of its Muslim population had to be addressed, the casbah 'purified' and reorganized, its population reduced." Le Corbusier's plan to "improve" the casbah was to clear out the slums, convert the mansions to schools and museums, and maintain the residential integrity of the upper casbah in hopes to "initiate an indigenous 'renaissance.'"

In the light of these obvious attempts to "improve" casbah and awareness of the history of changes of it, Celick is wary

Figure 6: Le Corbusier's plan "A" for Algiers, 1932, Fondation Le Corbusier

of analyses that reduce Corbusier's appreciation of the casbah to that simply of a timeless artifact. However, the decision to maintain principally the aesthetics and idea of the casbah within this highly modern master plan is a decision to include archaizing architectural elements within the scheme. The social function of which, as Brown alludes to with Neoclassical architecture in eighteenth century Britain, is an attempt to legitimate a claim by creating a continuity through pastiche. It is a strategy to temper both dramatic aesthetic changes and the changes in social conditions by making a claim to the legacy which the archaic style represents.



View of model for plan "A," Fondation Le Corbusier

For Le Corbusier, the casbah had to be "improved" in so far as enough issues were resolved to pacify the native population, but "preserved" so that its form and aesthetics were still recognizable. And despite any changes made to the casbah, the entirety of the plan was predicated on keeping the it "separated entirely… by means of a level difference.'" While there were some points of connection to the viaduct, economically speaking the bulk of the profitable activities in the city existed outside of and above the casbah, relegating it as a type of economically dependent enclave.

In terms of economic growth, Le Corbusier's estimated that in the years following 1933, the population of Algiers will increase by upwards of 100,000 to 200,000 people. To accommodate such growth, he introduces two housing schemes outside of the casbah. The first is a series of apartments that reside underneath the encircling highway. The second is a series of serpentine buildings on top of Fort-l'Empereur. However, following the strict segregationist policies referenced above, the entirety of these developments would be allocated to European settlers.

The displacement and relegation of the native population within the casbah for the European settlers in Le Corbusier's new housing schemes can be seen as an extension of the refoulement, resserrement sur place, and cantonnement which were in part responsible for overcrowding of the casbah in the first place.

Above and beyond expanding the territory available to incoming European settlers at the expense of the local native Muslim population, the true power of the Obus plan is how it too operates as a complex system of vision. Comparing the plan for Le Corbusier's project "A" with Brown's Stowe Gardens, there emerge clear compositional similarities. The sweeping highway that unites the entirety of the Obus plan can be read like the perimeter walk of Stowe gardens. While the path paired with the line of trees helps to demarcate and facilitate in the surveying of property lines, here the highway completely encircles the old city, giving visual access to those with the means to buy one of Le Corbusier's apartments or a car unparalleled access to views of both the sea and the old city.

Furthermore, while trees and landscaping are the primary tools for Capability Brown, for Le Corbusier the building is paramount. Just as the clumps of trees act as coulisses at Stowe, for a settler fortunate enough to occupy an apartment on Fort-l'Empereur, the built structures of the highway, viaduct, and business city serve as compositional elements to shape the picturesque view within the "98% of free land" between them and the sea. In addition, the status of being situated on top of the mountain further emphasizes, spatially, their "positional superiority" in addition to giving them visual access to the casbah and native population below.

As Celick concludes, Le Corbusier's plan for Algiers would have been an "appropriation… as no colonial planner had elsewhere ever achieved." While Project "A" is unique in both its scope and seductive architectural form, it is not unique in its goals nor its mechanisms.

As discussed above, the picturesque is that aesthetic mechanism which can render territories visible, comprehensible, and ownable. It operates through the manipulation of knowledge, vision, and consequently the material world. Furthermore, such a conception can be used to understand Orientalism as the logic of the picturesque displaced onto a people and its territory. Taking both Stowe and Le Corbusier's Algiers as models, it can then be understood that for a territory to qualify as picturesque, it must be totally controlled and intentionally held in an artificial state of economic development.

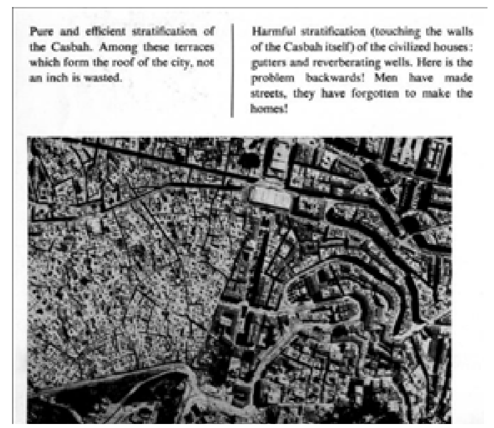


Figure 7: Le Corbusier, "1931-1934: Algiers, Capital of North Africa," in The Radiant City.

WORKS CITED

Brown, David and Williamson, Tom. Lancelot Brown and the Capability Men; Landscape Revolution in Eighteenth-century England. Reakton Books: London, 2016.

Celik, Zeynep. "Le Corbusier, Orientalism, Colonialism," Assemblage 17 (1992): 59-77.

Colomina, Beatriz "Battle Lines: E. 1027," in The Architect: Reconstructing Her Practice, ed. Francesca Hughes (Cambridge: MIT Press, 1996), 2-25.

Le Corbusier. "1931-1934: Algiers, Capital of North Africa," in The Radiant City: Elements of a Doctrine of Urbanism to Be Used as the Basis of Our Machine-Age Civilization (New York: Orion Press, 1967 [1933]): 226-237.

Knight, Richard Payne. "An Analytical Inquiry into the Principals of Taste," [1805] and Uvedale Price, "An Essay on the Picturesque, as Compared with the Sublime and the Beautiful," [1794] in The Genius of the Place: The English Landscape Garden 1620-1820 (Cambridge, 1988), pp. 348-350, 351-357.

Mailllet, Arnaud. The Claude Glass : Use and Meaning of the Black Mirror in Western Art. Zone Books, New York, 2004.

McLeod, Mary Caroline. Urbanism and Utopia: Le Corbusier from Regional Syndicalism to Vichy, Vol I & II, Princeton University, 1985.

Ruedy, John. Land Policy in Colonial Algeria; the Origins of the Rural Public Domain, University of California Press: Berkeley, 1967.

Said, Edward. Orientalism, First Vintage Books Edition: New York, 1979.

1:1 FABRICATION

Design Elective, Spring 2025
Instructor: Zachary Mulitauaopele

Partner: Kwamina Akwa

The central goal for this project was to navigate the details for how to join disparate organic and manufactured materials. The inspiration came from a desire to float a series of stones through an elaborate contraption of timber and steel cable.

A fifteen-foot long branch provided the primary material for the structure, expanding the reach of the piece as the tapered frames hang down from the central piece of square HSS tubing. The dowels going through the mitered corners serve to contrast the qualities of the raw branches and further highlight the challenge of attempting to do joinery with unprocessed pieces of wood.

The hanging stones keep the entire structure stable. Their mass far exceed the other hanging elements and therefore maintains any orientation that the pivoting joints will allow.

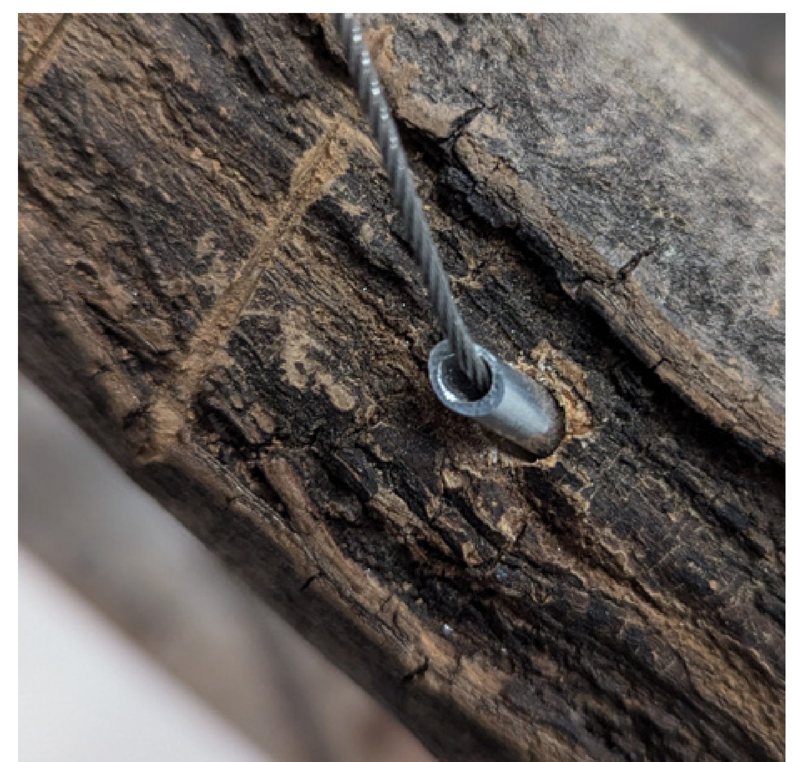
Fifteen-foot branch found in Morningside Park

The branch was broken down and mitered to make the hanging frame

Numerous jigs were used to ensure that all of the holes were straight and even

Cable grooves notched into vertical HSS

Dowel detail through a miter



Cable detail through a miter

Hanging stone

STOP COP CITY

Studio Core II, Spring 2023
Instructors: Mark Wasiuta & Jarrett Ley

The proposed Public Safety Training Center in Atlanta, better known by its pejorative nickname: Cop City, stands at the intersection of a series of damages– immediate and latent, local and national. Of these, the most pressing are the environmental destruction required to build the center and the future violence that will be enacted by police as a result of this increasingly militarized training.

Here, I propose an infrastructural system that would enable the protesters of the proposed Cop City development to occupy the contested Dekalb County forest indefinitely by moving all critical training, living, and media infrastructures into the forest canopy.

This system serves to mitigate the potential damages of Cop City through the material and rhetorical instrumentalization of nature. The iconic tree-sits in the forest have helped to delay the construction schedule by over a year. However, the makeshift encampments that support these canopy platforms remain vulnerable to police raids on the forest floor. By facilitating and systematizing the day-to-day occupation of the canopy, the "forest defenders" can remain in the woods indefinitely to conduct strategic forms of environmental resistance.

The central tactic here is the introduction of endangered species. The Indiana Bat is a protected migratory species with summer habitats ranging from Indiana to northern Georgia. The addition of artificial bark wraps, which has shown to be a highly effective artificial habitat, can doubly serve as cauls that protect the host trees from the grip of the extensive cabling system proposed.

Above and beyond the ecological benefit of hosting these bats, trees that are marked as particular habitats themselves become federally protected, protecting the cable structure by changing the legal status of the trees.

Thus this project consists of three simple moves. Architecturally, the canopy system creates a new ground plane which transforms the spatial relationship between the protesters and police, disrupting the constant cycle of raids and relocation on the forest floor.

Legally, the incorporation of endangered species' habitats into the canopy system appropriates federal environmental protections to political ends.

Rhetorically, the explicit forest stewardship counters the police's bluff of ecological improvement, neutering any pretenses that Cop City perpetuates anything other than violence.

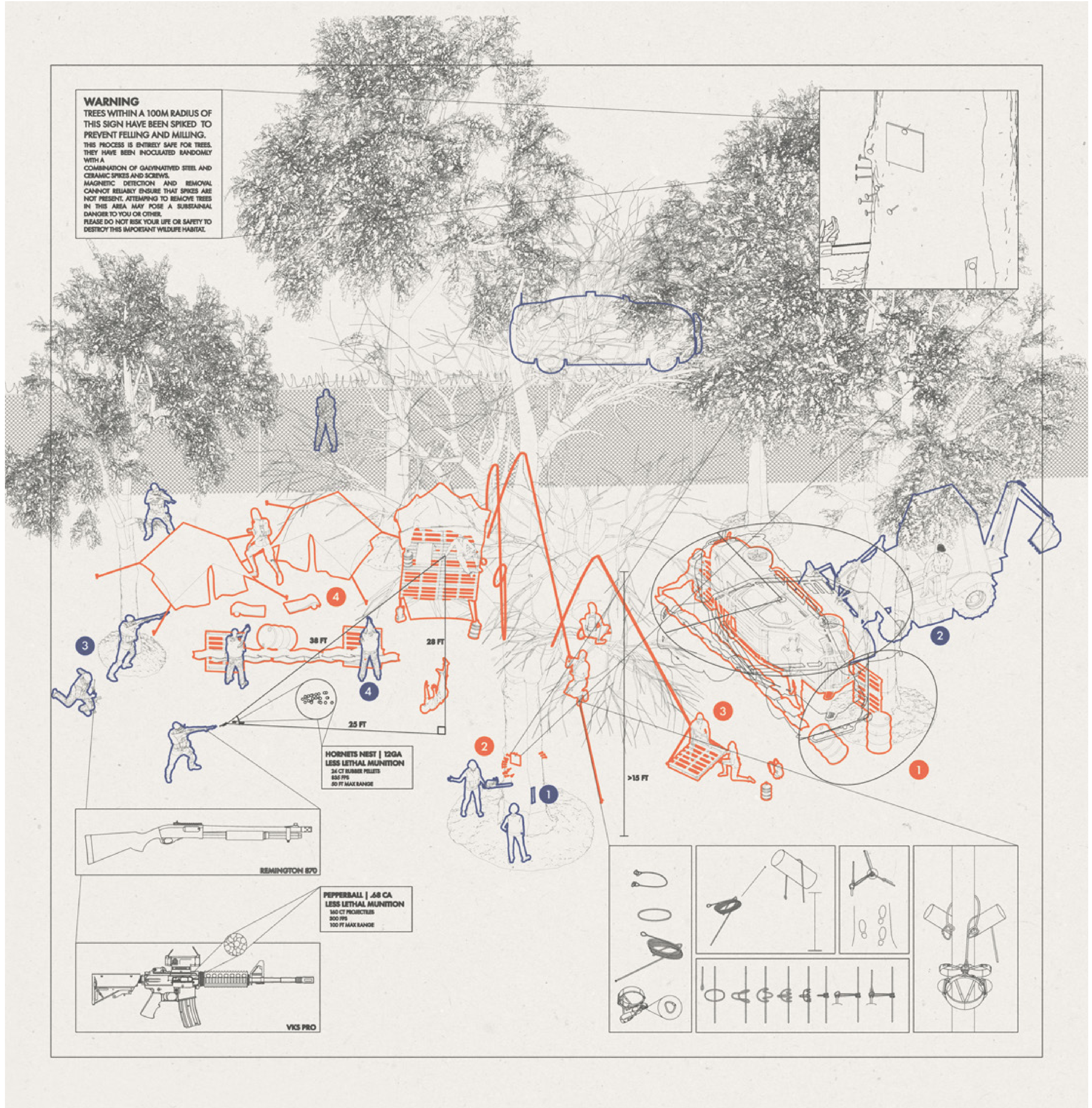
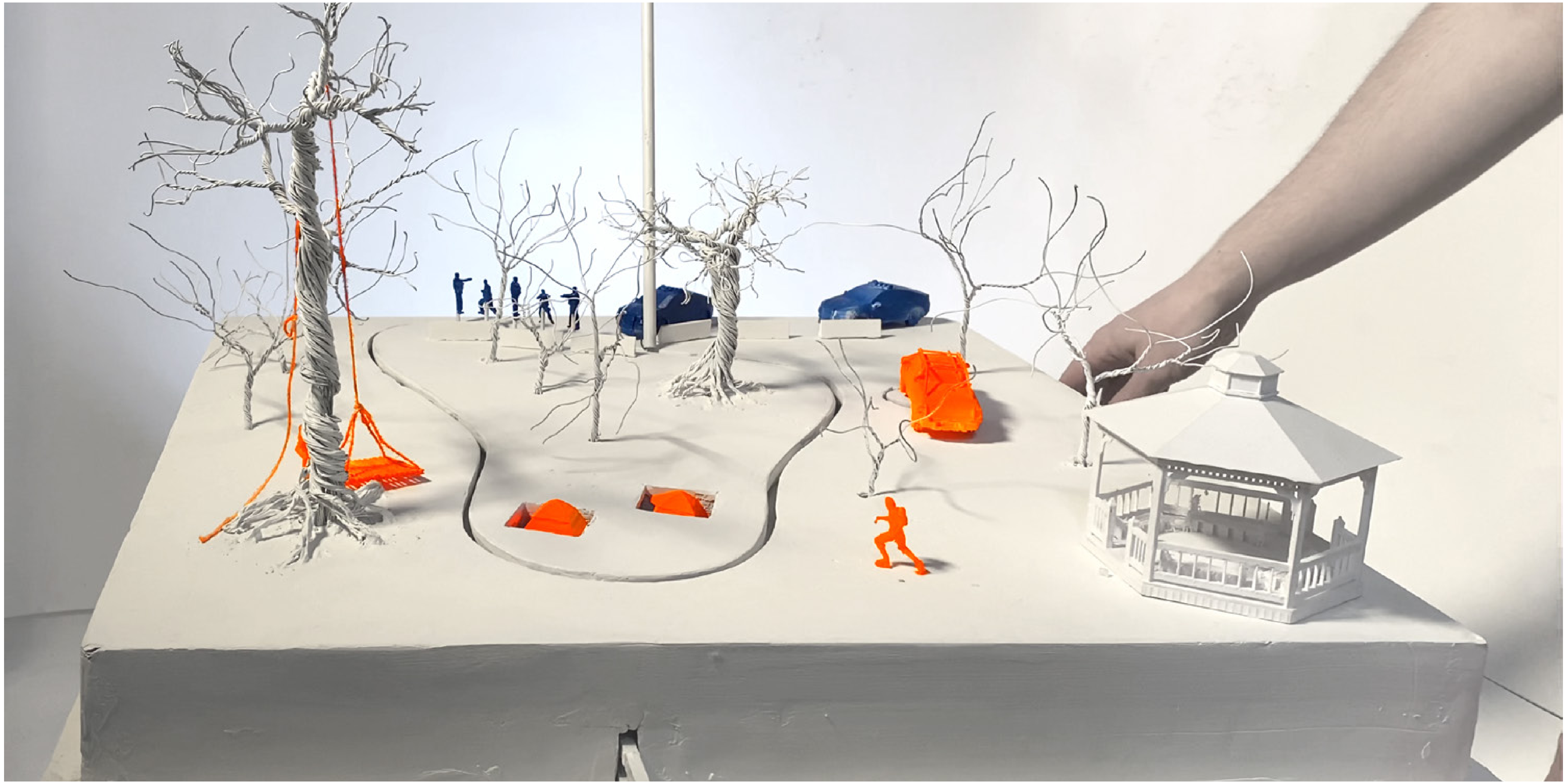
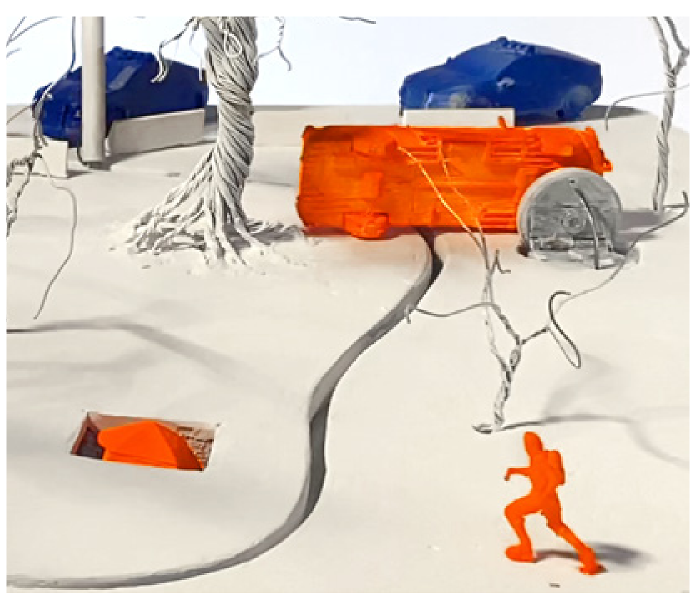


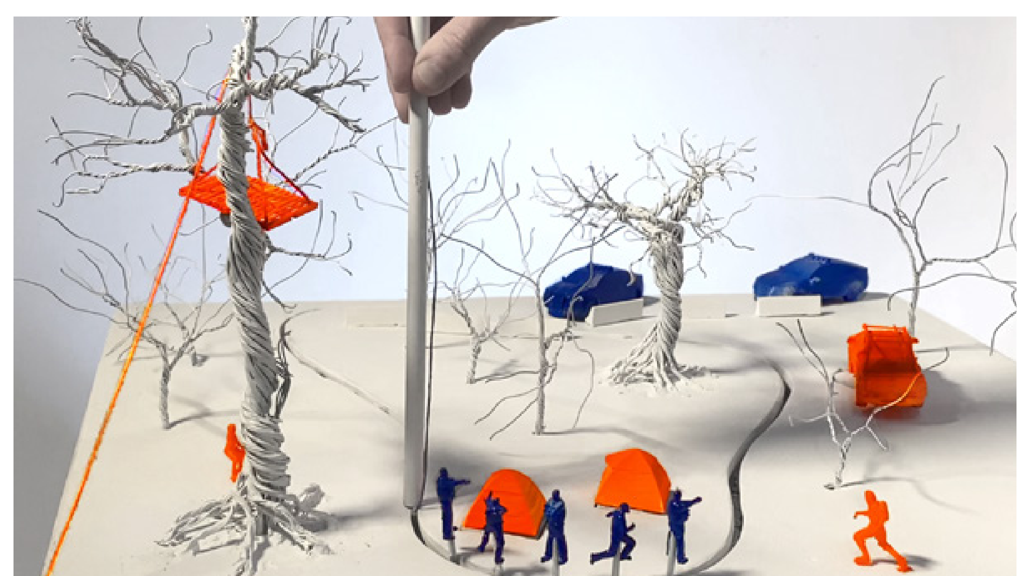
Diagram of protestor and police tactics to date in the Weelaunee forest in Atlanta, Georgia



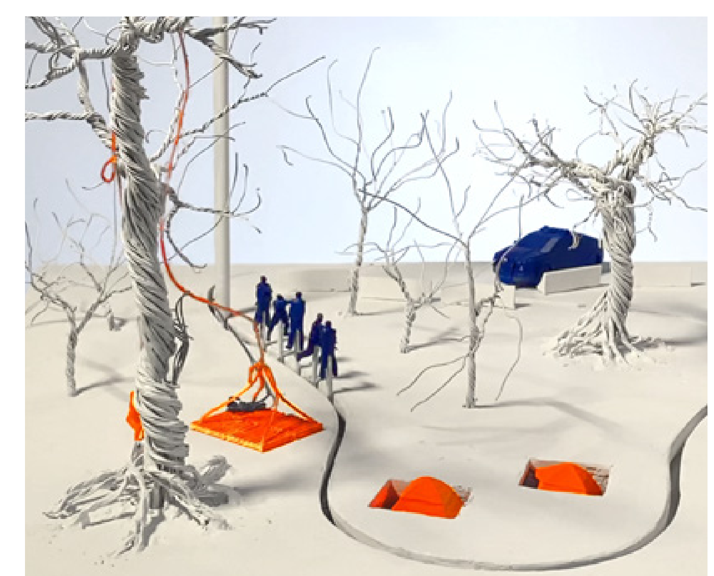
Model of forest raid tactics: intial condition



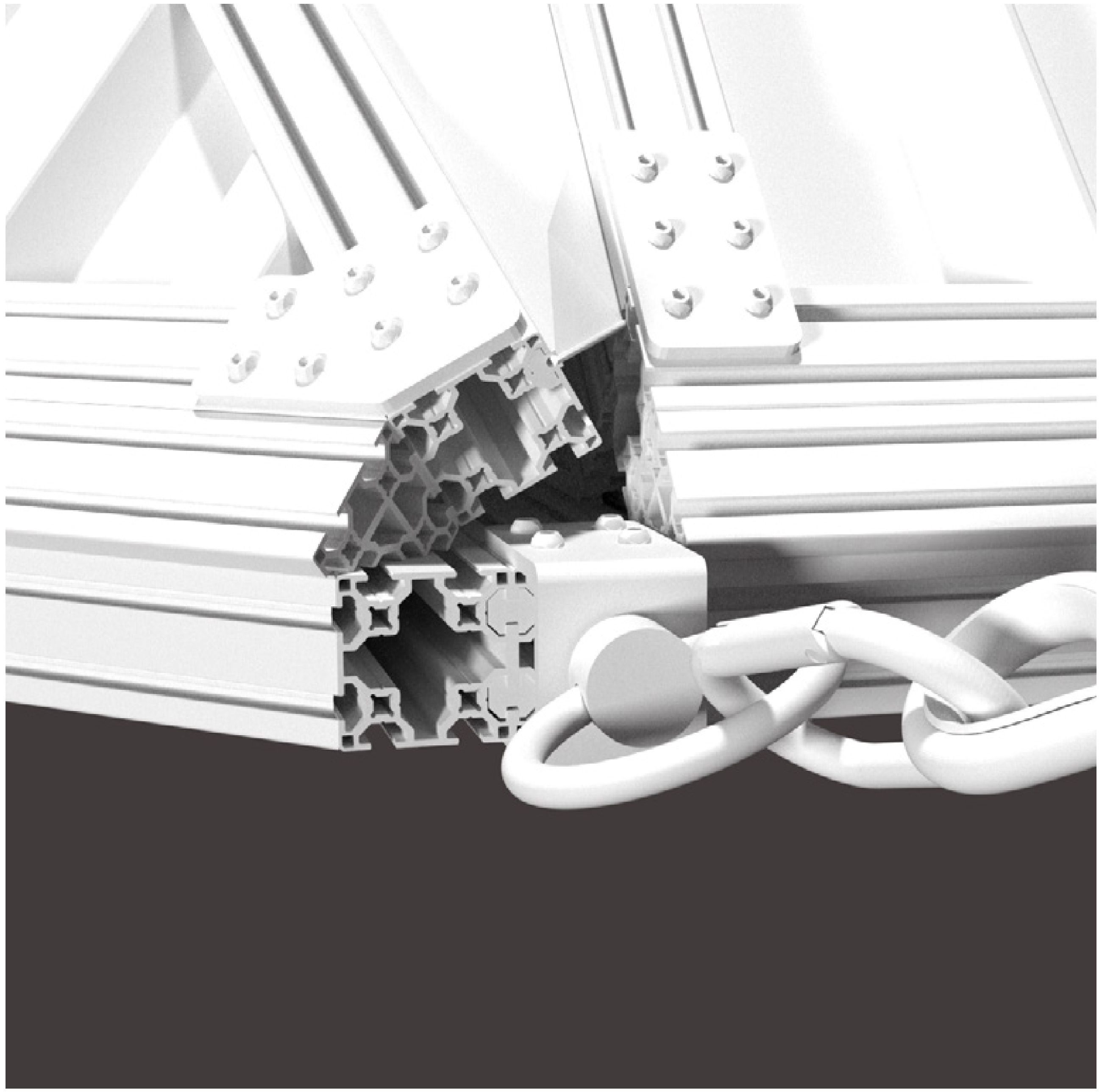
Protesters set up barricades



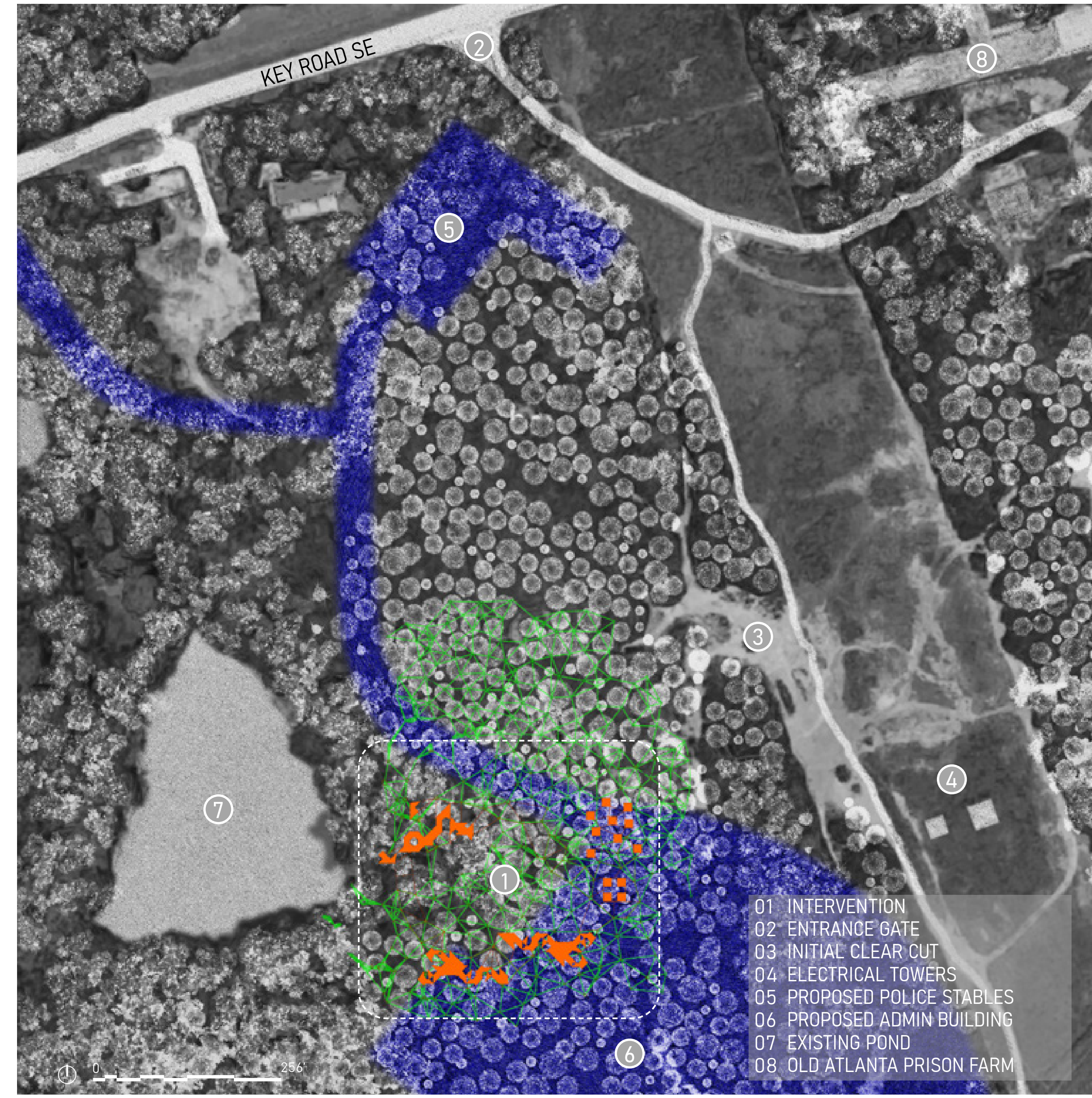
Simulation model activated by police raid



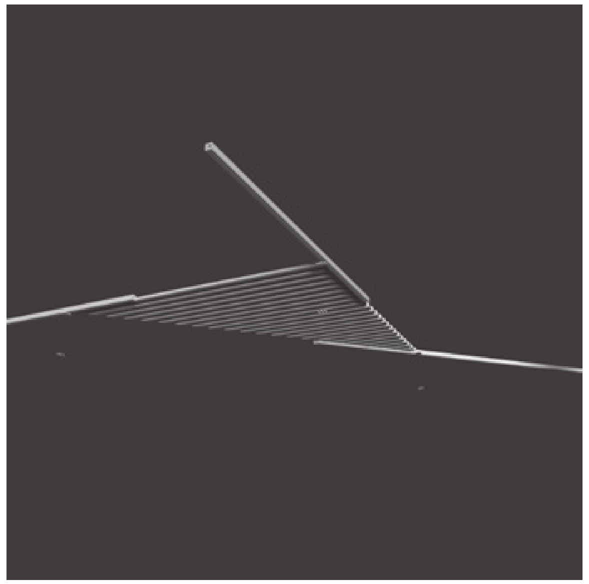
Police destroy encampment



Detail view of platform connection detail to cable system

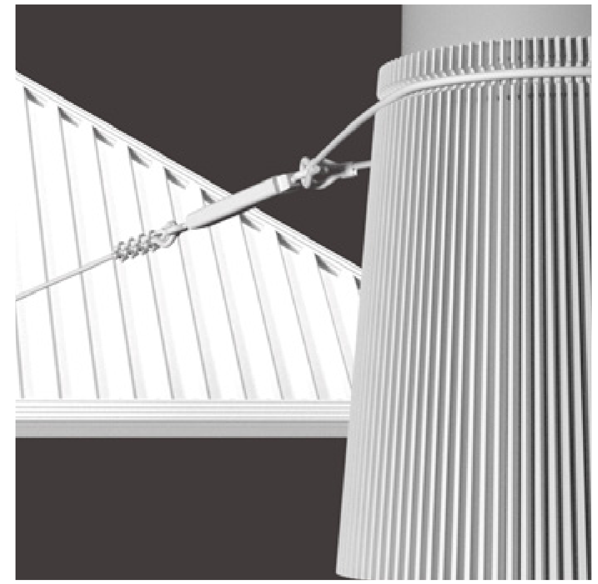


Site plan of intervention overlaid on proposed developement area in Weelaunee Forest

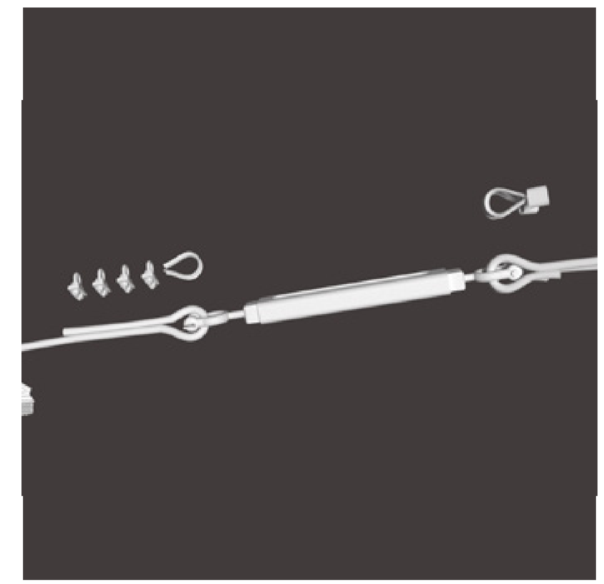


Steel decking and aluminum extrusions

T-slot loops for connecting the circulation netting



View of bat habitat and cable connection



Steel turnbuckle on the support cable

View of the structure in the trees

Living quarters

Training and mobilization area

Media control zone


01
02
03
04
05
06
07
08
01 ENDANGERED INDIANA BAT
02 LIVING AREA
03 PROTESTER RETURNING
04 TRAINING AREA
05 SOLAR PANELS
06 MEDIA AREA
07 ARTIFICIAL BAT HABITAT
08 POLICE RAID

IN THE FLESH

Studio ADV VI, Spring 2025
Instructor: Karla Rothstein

Partner: Arissara Reed

Neither wholly water nor land, the intractable wetland manifests the thinnest boundary between material, immaterial, and spiritual realms. The rituals of returning to sites of burial and offering reinforce the tie between material and immaterial. Maintaining and celebrating these rituals strengthens the connection to the presence and expansive interdependence of these dimensions. To die is not to cease, but to continue transformed. Life and death fold into each other, unbound from separate worlds or fixed materiality. That which cannot maintain our material life can sustain another. To offer the flesh of the body back to the cycle of life is an act of generosity.

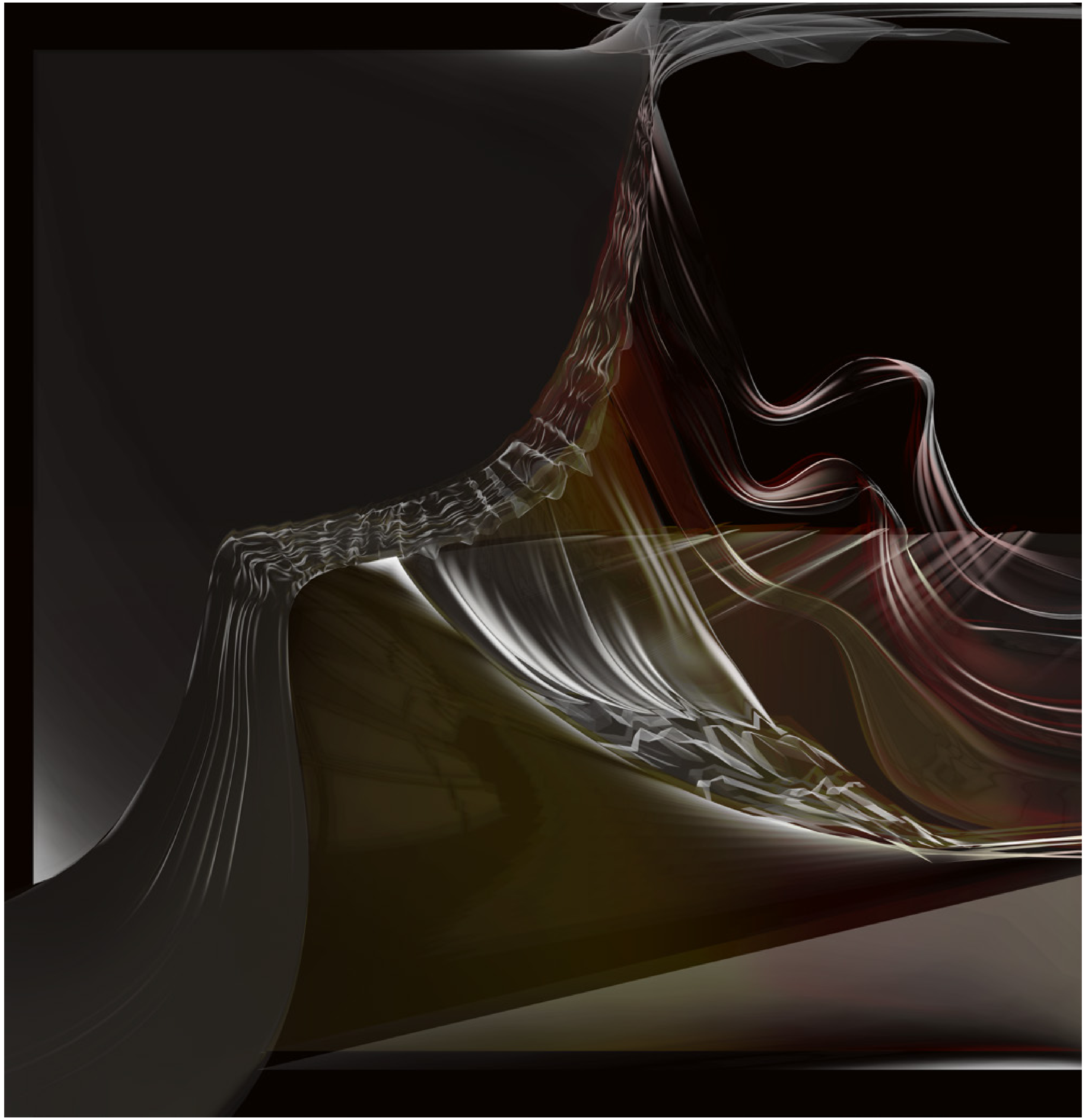
At Hart Island, the expanding salt marsh provides the most ecologically active and spiritually latent site to encounter death. Here, we are proposing a new alternative to conventional burial by offering the body to the wetland. Specifically, we are constructing a series of tidal pools to house the grass shrimp. A native scavenger, the shrimp will be nurtured by the bodies of loved ones placed into the marsh. Hosting the excarnation of the body, the flesh will be offered as a direct transition from death to life. In this ritualized process, the body is not treated as a clinical object. Its transformation is compassionate and energetic. One becomes the ocean. A dignified death sustains life.

In the first half of the semester, we undertook a series of material studies to explore the nature of impermanence. Employing sugar and rice paper we explored the structural and transformational properties of these delicate and soluble materials. The intricate and organic pools and pleats temporarily freeze time and establish a structural logic before ultimately dissolving. After midterm, we continued these investigations using thread and organza, exploring how the material responds to the applied organizational structure.

Over the next 75 years and beyond, Hart Island may too surrender to the Long Island Sound with sea levels projected to rise by 6ft. It begins slowly and escalates quickly. We are fostering the native grass shrimp as the primary agent for our proposed excarnation. Under ideal conditions, a large number of small shrimp can reduce a body to bones in a little as a couple of days and up to a few weeks. In addition to the shrimp, we are employing other key species such as eelgrass, cattails, and mud snails to further support the salt marsh ecosystem. The salt marsh is a unique ecosystem that welcomes the rising sea level while mitigating rapid erosion.

The five pools are populated according to the intertidal zone. The shrimp, snails, and grasses digest and transform the body into rich nutrients which are further sequestered and utilized in the successive pools. These remaining pools are organized by other key species which regulate key nutrients, such as water lilies and irises which host flocking bacteria to capture nutrients in its roots, before flowing into the sound.

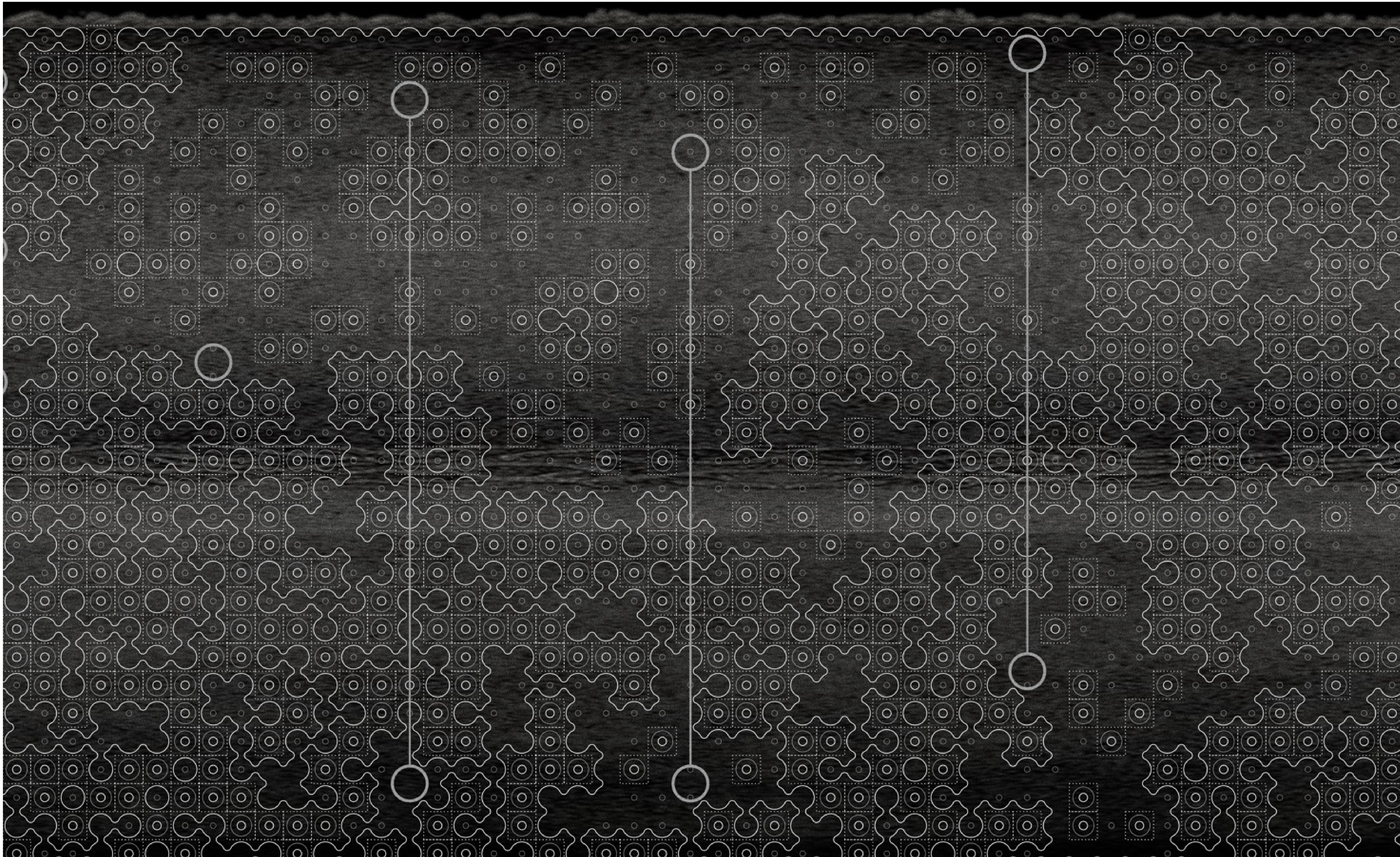
For our architecture, the translucent outer enclosure allows for an inner pool to maintain a habitable conditions for the shrimp and wetlands during the freezing winters. The architecture thus facilitates the process of excarnation and wetland water transformation by hosting it all year long.



Material mapping that illustrates the appearance and structural qualities of the sugar as it is heated, cooled, and dissolved

Sugar is melted and pulled at different temperatures corresponding to molecular change

Samples are submerged in super-saturated sugar solution to preserved them in like a bog

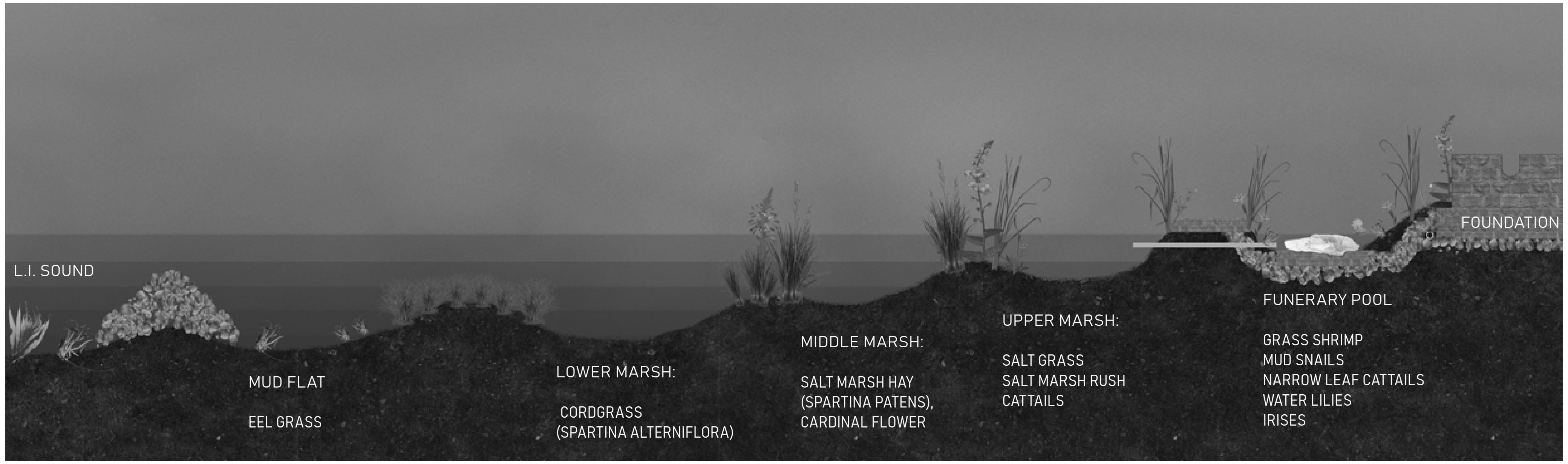


This translation of a bog explores the nature of dissolution--the moss is suspended in the water and yet the water is also suspended within it

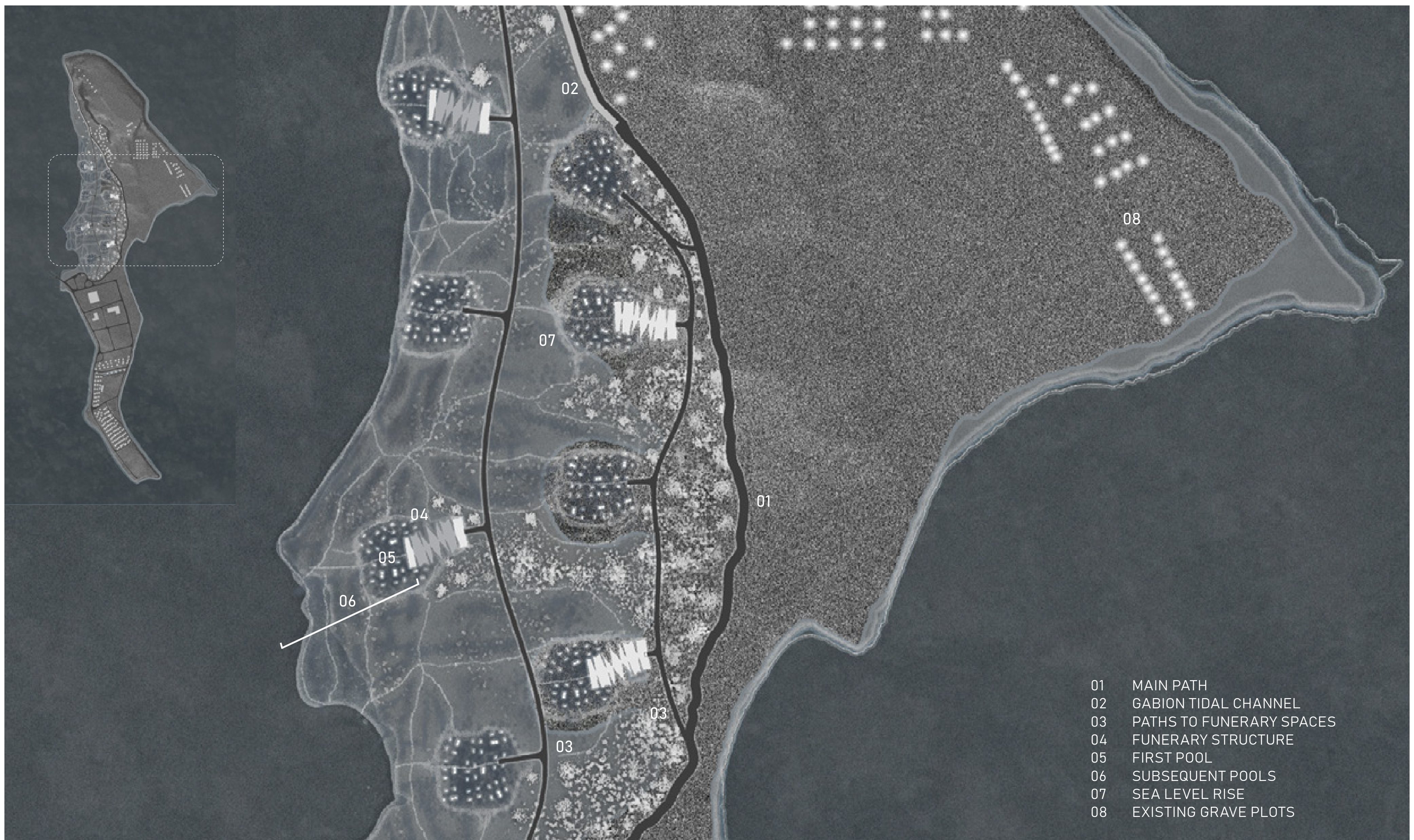
Sea level around Hart Island, 2025

Sea level around Hart Island, 2075

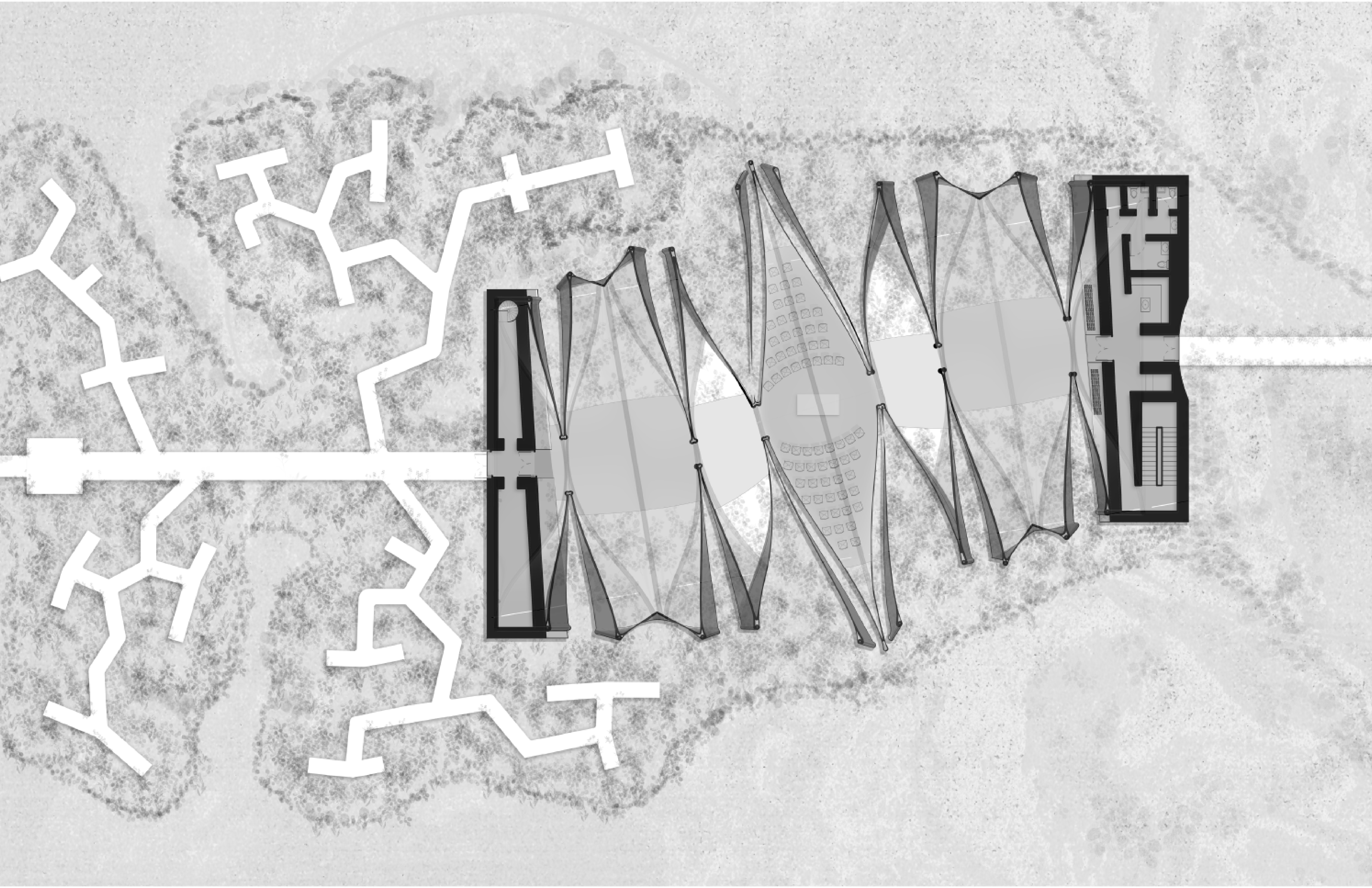
Sea level around Hart Island, 2100

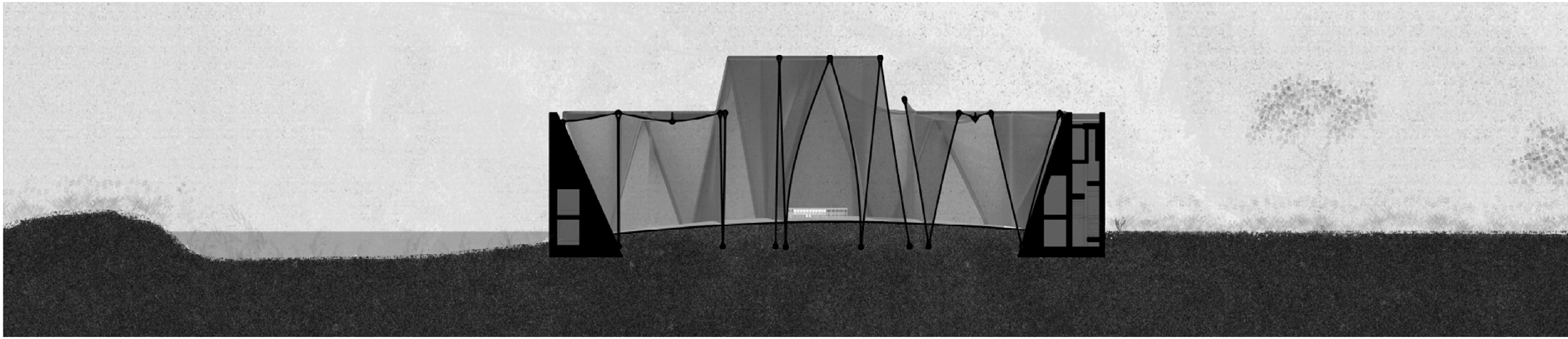


Section of tidal pools illustrating key species in each intertidal zone

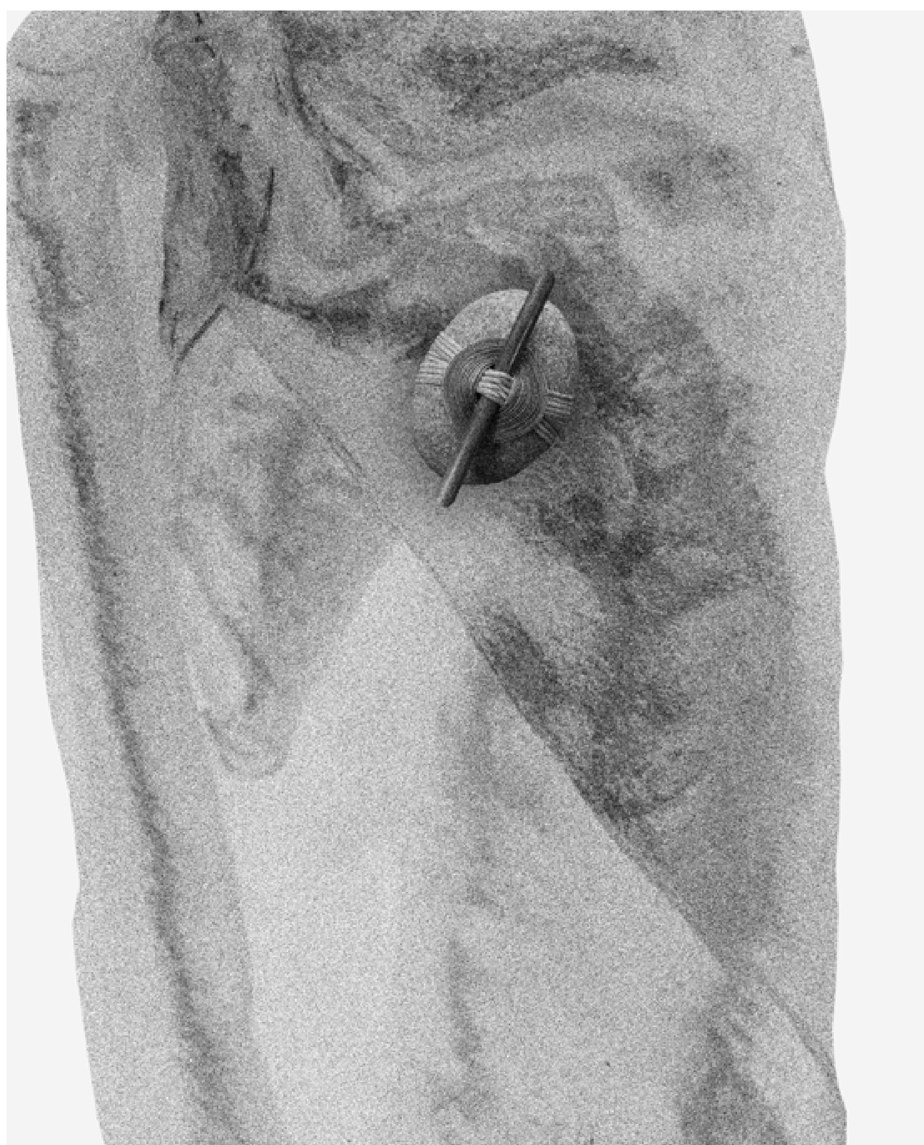


Site plan showing the two phases of the intervention and the sea level rise by 2075

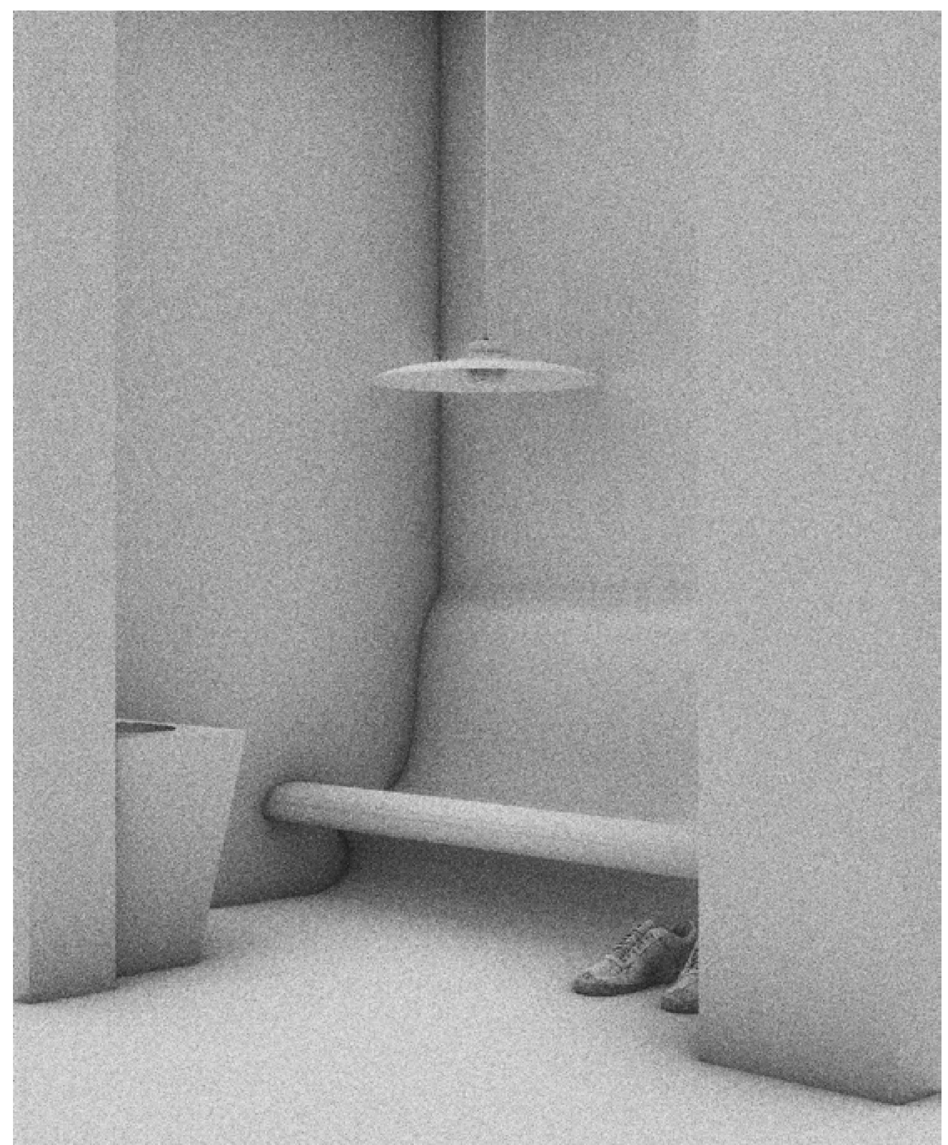




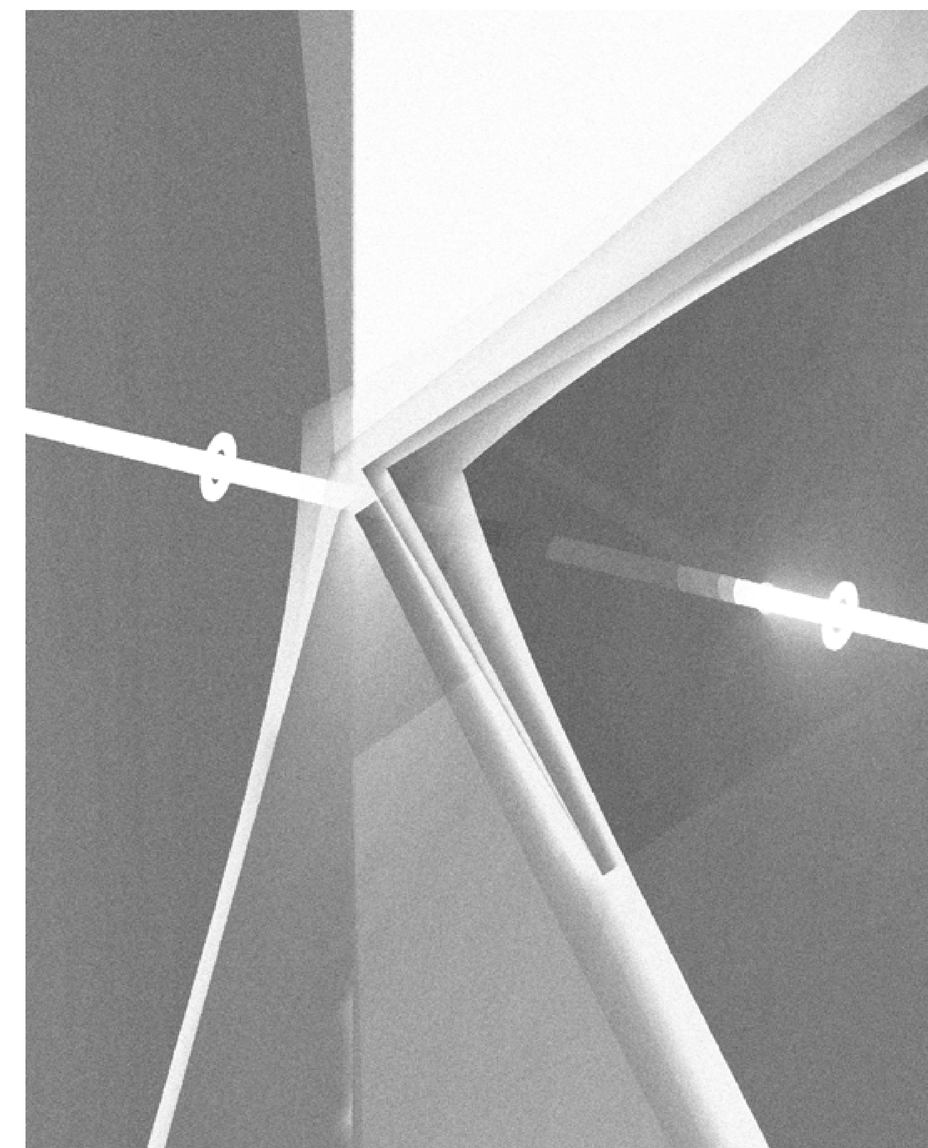
Section through the funerary space and how it meets in the excarnation pool



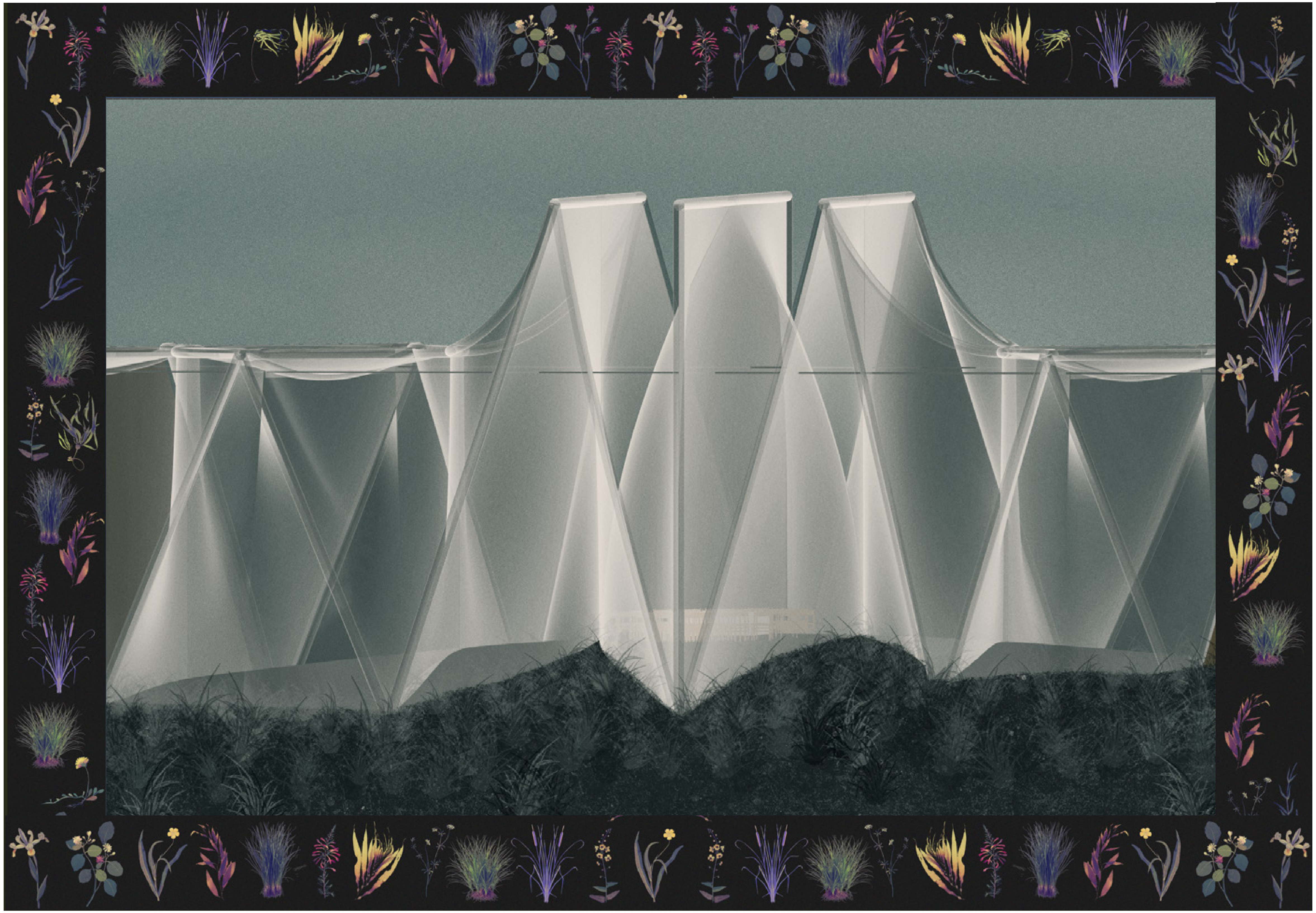
Detail of the funerary shroud closure



Interior space for attendees to cleanse themselves



Structural detail of the steel cable piercing and



Elevation of the funerary space demonstrating the veiling properties of the "shrilk"--shrimp & silk bioplastic--through the wetland plants

•••