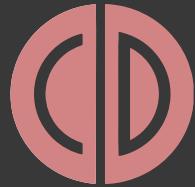




COLLEEN DUONG

Bachelor of Architecture | 2021
Carnegie Mellon University

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CONTENTS

RESUME

SPLIT HOUSE

Hazelwood, PA | Co-Housing

ECOLOGY MORPHOLOGY TYPOLOGY

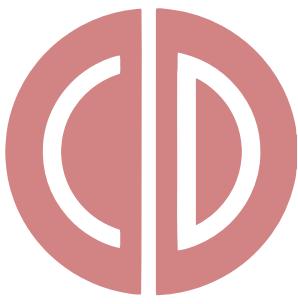
Six Mile Island, PA | Eco-Machine | Co-Housing

SCULPTURE PARK

Highland Park, PA

ENVIRONMENTAL CHARTER SCHOOL

Lawrenceville, PA



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EDUCATION

Carnegie Mellon University Pittsburgh, PA

2016 - Present

GPA 3.39/4.00

Bachelor of Architecture

Minor in Animation & Special Effects

Awards: Deans List, School Honors

SKILLS

Software

Adobe Software (Photoshop, Illustrator, InDesign, Premiere), Rhinoceros 3D, AutoCAD, Revit, SketchUp, Lumion, Keyshot, Fusion 360, RobotStudio, AutoDesk Maya, ZBrush, Substance Painter, 130 WPM

Fabrication

CNC Machining (Mill and Lathe), Woodwork, Lasercutting, 3D Printing, Industrial Robot Arm

Programming

P5JS, Javascript, HTML, Basic Python

RELEVANT COURSEWORK

- ø Architectural Studios
- ø Analog & Digital Media
- ø Fundamentals of Computational Design
- ø Materials & Assembly
- ø Rapid Prototyping
- ø Introduction to Architectural Robotics
- ø Introduction to Scenic Design

WORK EXPERIENCE

G70 Architects Honolulu, HI

July 2020 to Present

Remote Virtual Student Intern

- Working on graphics and diagrams for submittals: AIA Honolulu Design Awards 2020.

June 2019 to August 2019

Architectural Summer Intern

Project Submittal won Award of Merit for AIA Honolulu Design Awards 2019.

- Work on graphics and diagrams for submittals: AIA Honolulu Design Awards 2019, due diligence reports, and multiple project proposals.
- Construction Administration work done.

Carnegie Mellon University - Hazelwood Green Project Pittsburgh, PA

February 2019 to November 2019

Working with Professor Joshua Bard

Research Assistant

- Explore robotic steambending wood properties to design and fabricate five steam bent swings as part of the Hazelwood Green development plan.

Carnegie Mellon University Pittsburgh, PA

April 2017 to October 2018

CMU Ambassador

- Connect with alumni, parents, and friends of the University to gain an understanding of how their college experience shaped their lives
- Develop strategies to encourage new or increased participation

Leadership Enterprise for a Diverse America

Fall 2017 to Spring 2018

LEDA Peer Mentor

- Mentor incoming LEDA first-year college students through hosting regular meetings focused on the adjustment to college, study skills, and social interactions.

ACTIVITIES

Alpha Phi Omega Kappa Chapter, Carnegie Mellon Pittsburgh, PA

August 2018 to Present

Fellowship VP (Fall 2019)

- Approve project proposals and in charge of planning large brotherhood bonding events such as Fall Retreat.

Spring Booth Committee Chair (Spring 2019 to Spring 2020)

- Prepare construction details for the upcoming CMU Carnival Spring Booth Concessions event and lead the actual construction and design of the booth.

PR Chair (Spring 2020 to Summer 2020)

- Update social media and the organization's website. Communicates with other organizations and advertises service activities to the campus.

PR/Rush Design Team (Spring 2019 to Spring 2020)

- Design posters, calendars, stickers, and t-shirts for the positive promotion of the fraternity.

Habitat for Humanity Houston, TX

January 2018

- Assist with the construction of houses to help with the hurricane relief program in Texas after events with Hurricane Harvey.

LEDA Career Fellow Providence, RI

August 2017

Fellow

Split House co-housing

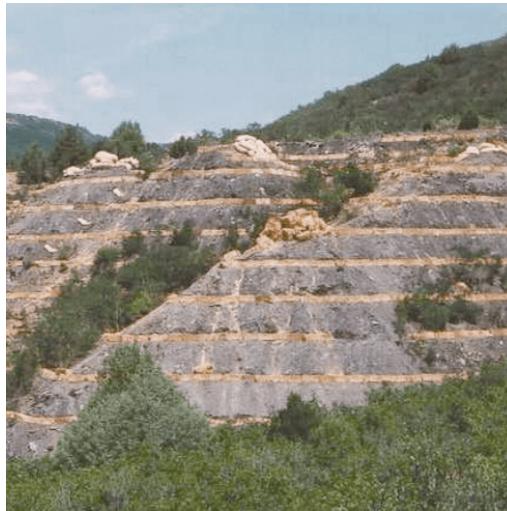


*Hazelwood, PA
Lithopic_NOW Studio
advised by Dana Cupkova*

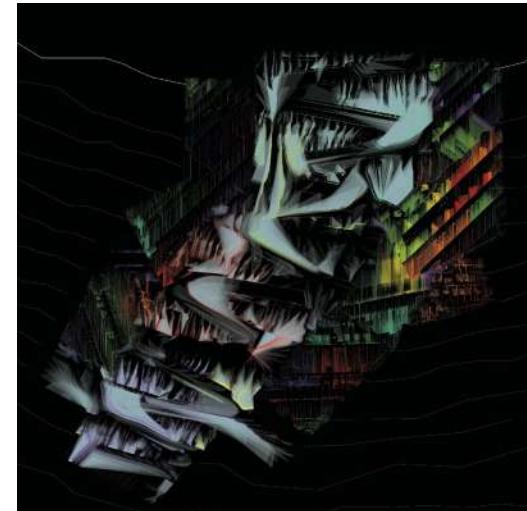
Embedded in an ecological hillside, the co-house focuses on taking advantage of landslides that occur in Pittsburgh due to heavy rain. The central greenhouse and co-housing rooftops collect mud and water and redirects it over, through, and around the architecture, allowing occupants to directly interact with the environment around them.



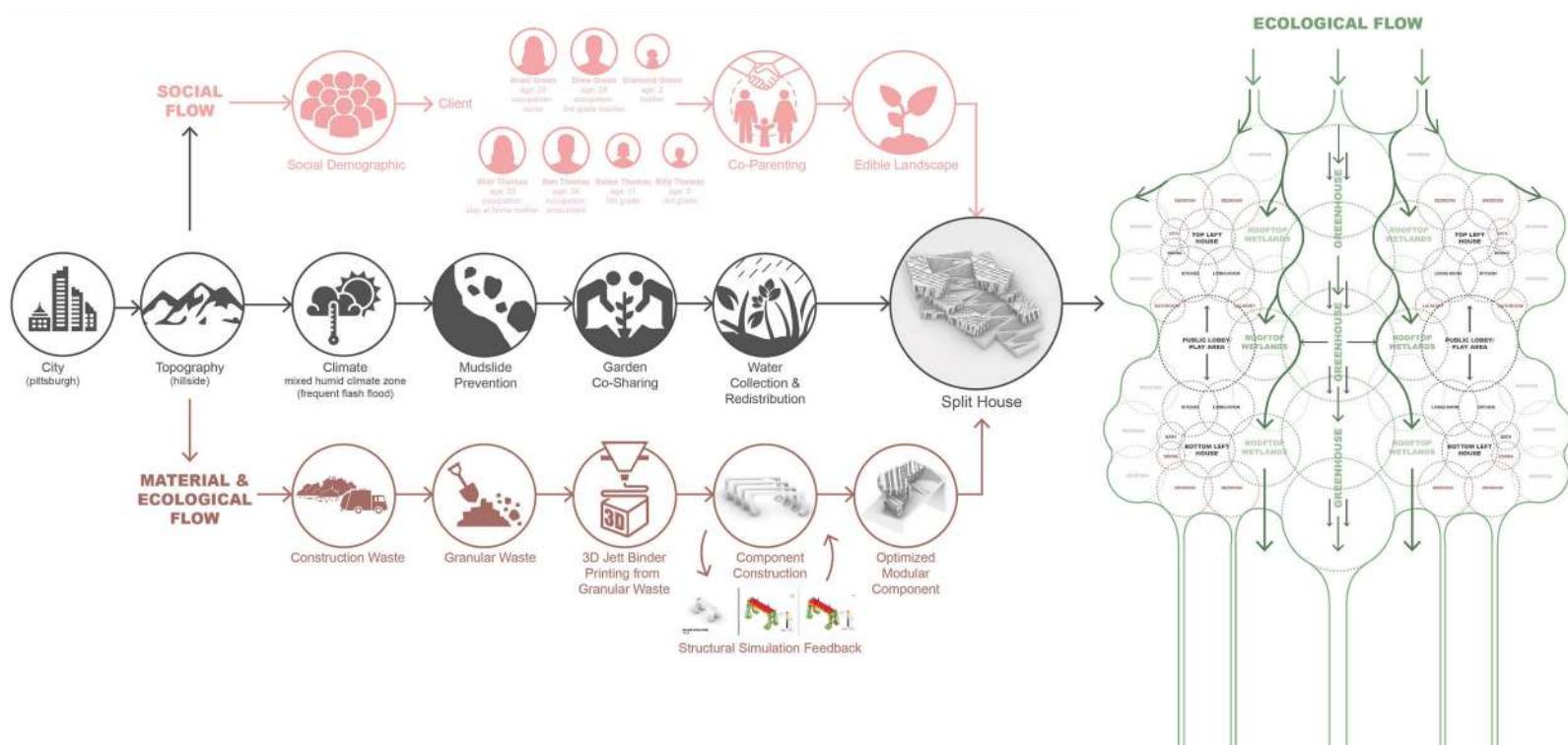
Housing Context



Hillside Topographical Condition



Water Flow Simulation of new house-landform



Interweaved Flows

Social | Material | Ecological

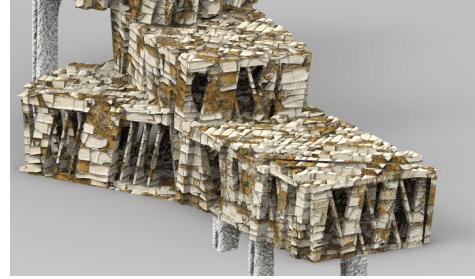
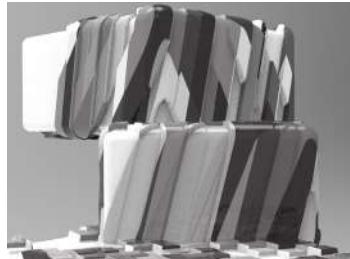
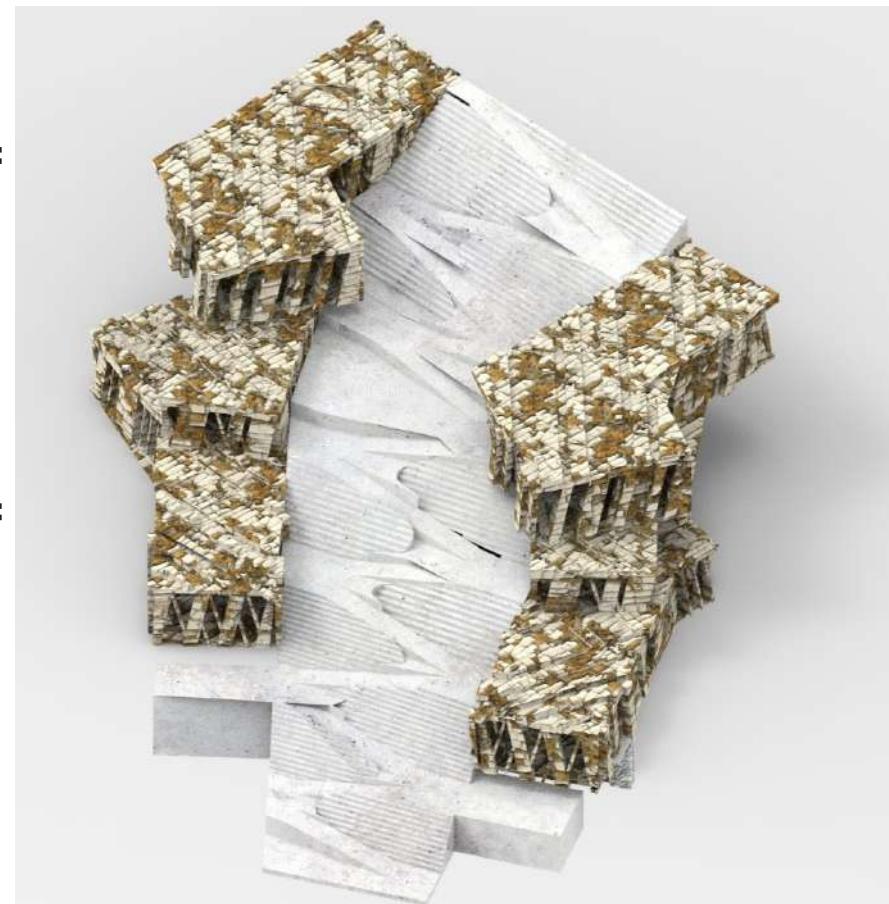
Coming out of a research studio "Lithopic (Living Stone) House: Ecologies of Earthen Matter", that was led in conjunction with a material science seminar, the design approach is underpinned by a potential of construction waste recycling through direct 3d binder-jet printing. This cradle-to-cradle method would reduce CO₂ levels by reducing the volume of new architectural materials, as well as offsetting waste streams heading to industrial landfills. Shaping printable components for minimal material use aligned with structural and ecological poten-

tial is coupled with a desire to integrate new landscape and biomass directly into the architectural form, function and experience.

The image above is a flow chart that shows the different properties of each flow category and how they all interweave with one another in the Split House.

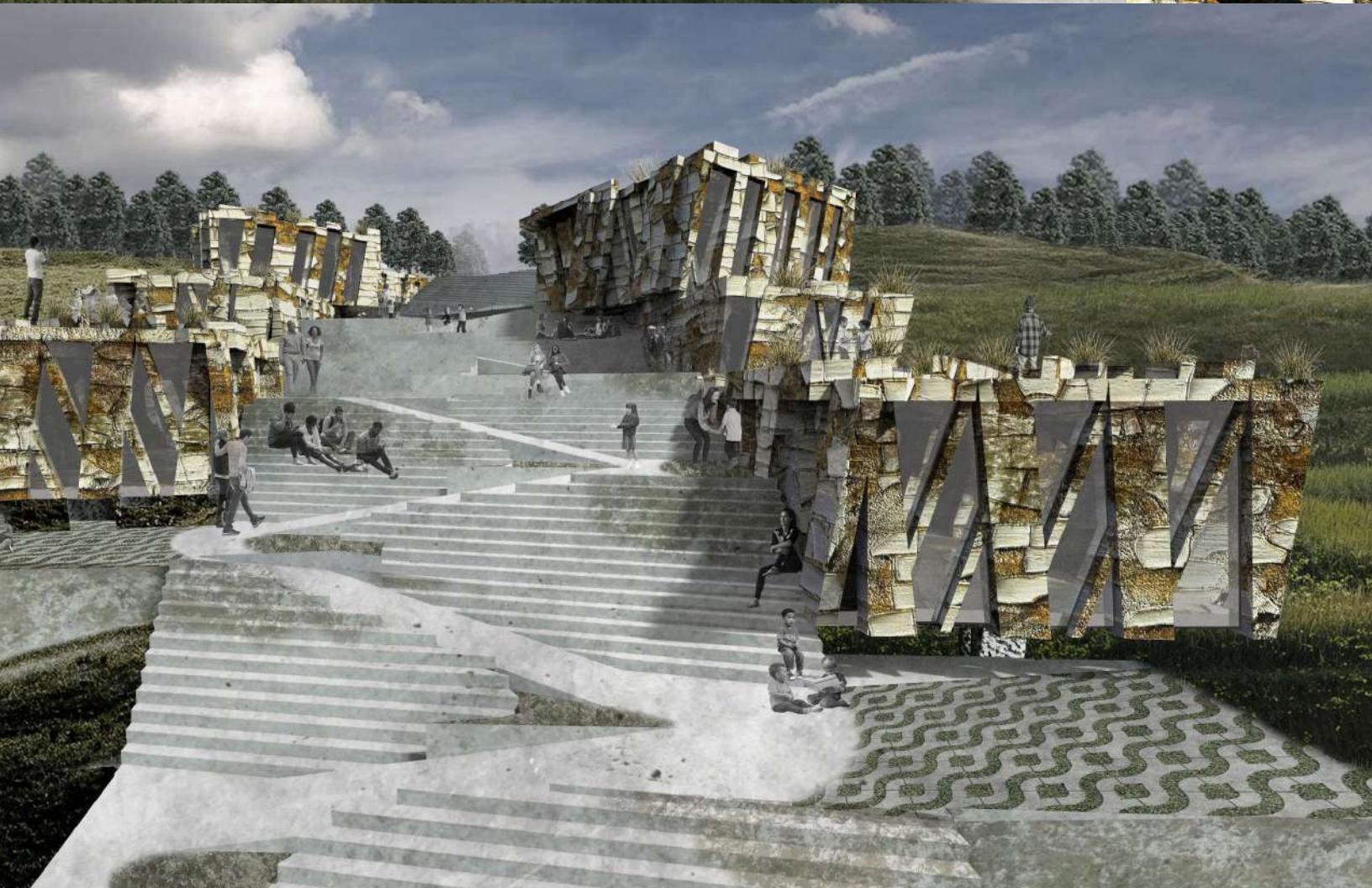
The image to the right shows GAN (Generative Adversarial Networks) images that study how ecological textures affects a landscape.

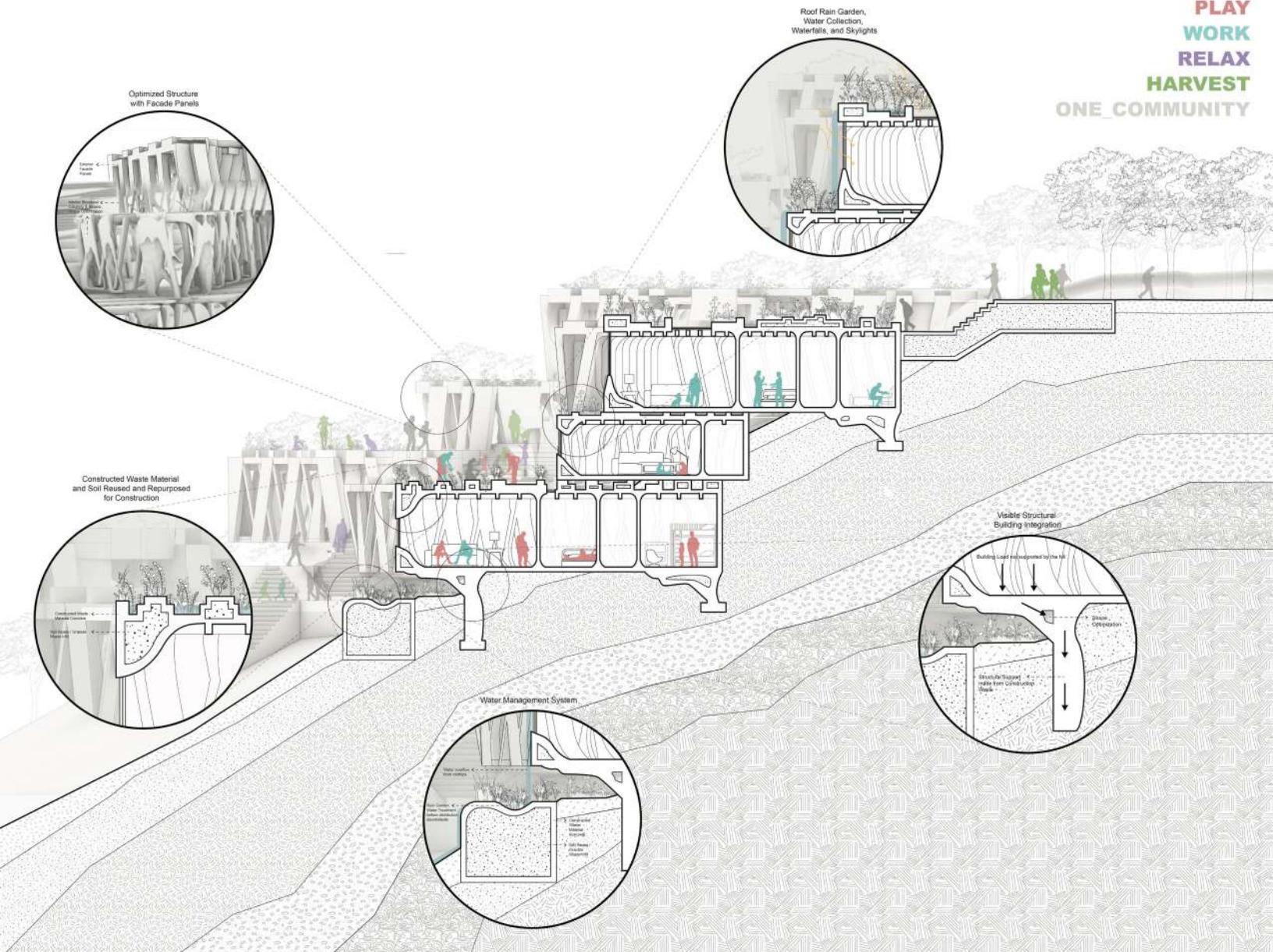




Design Process Workflow

Using artificial intelligence to identify ecological patterns that would support plant growth integrated into material form of the house.

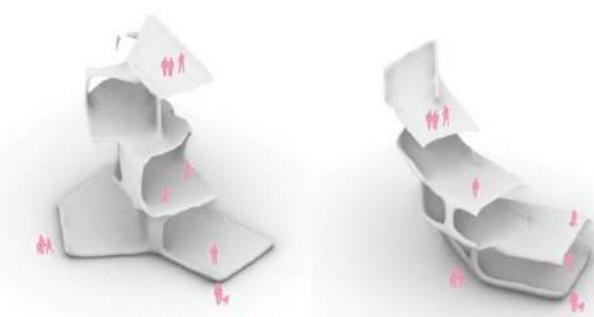




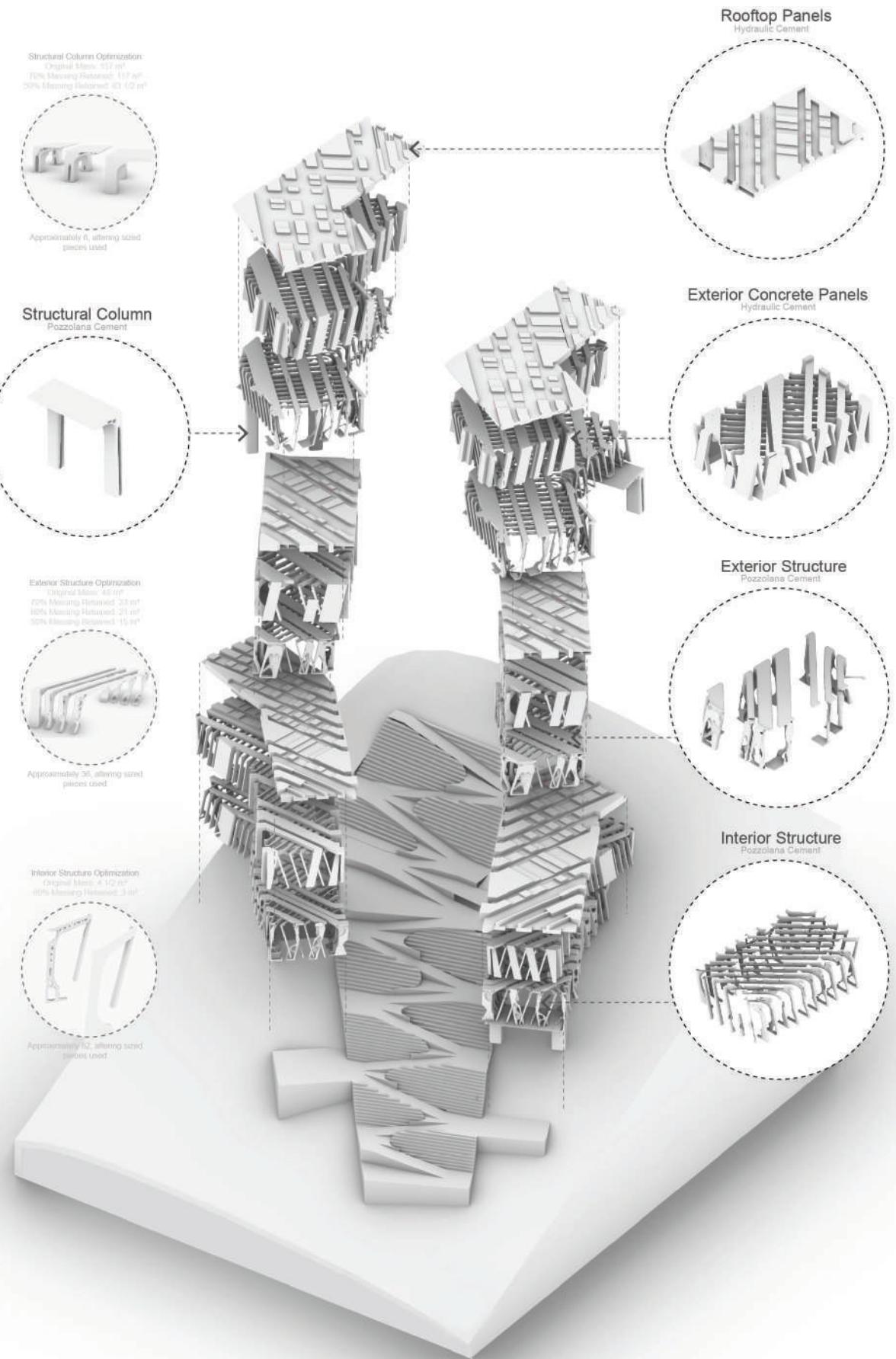
Hillside Condition

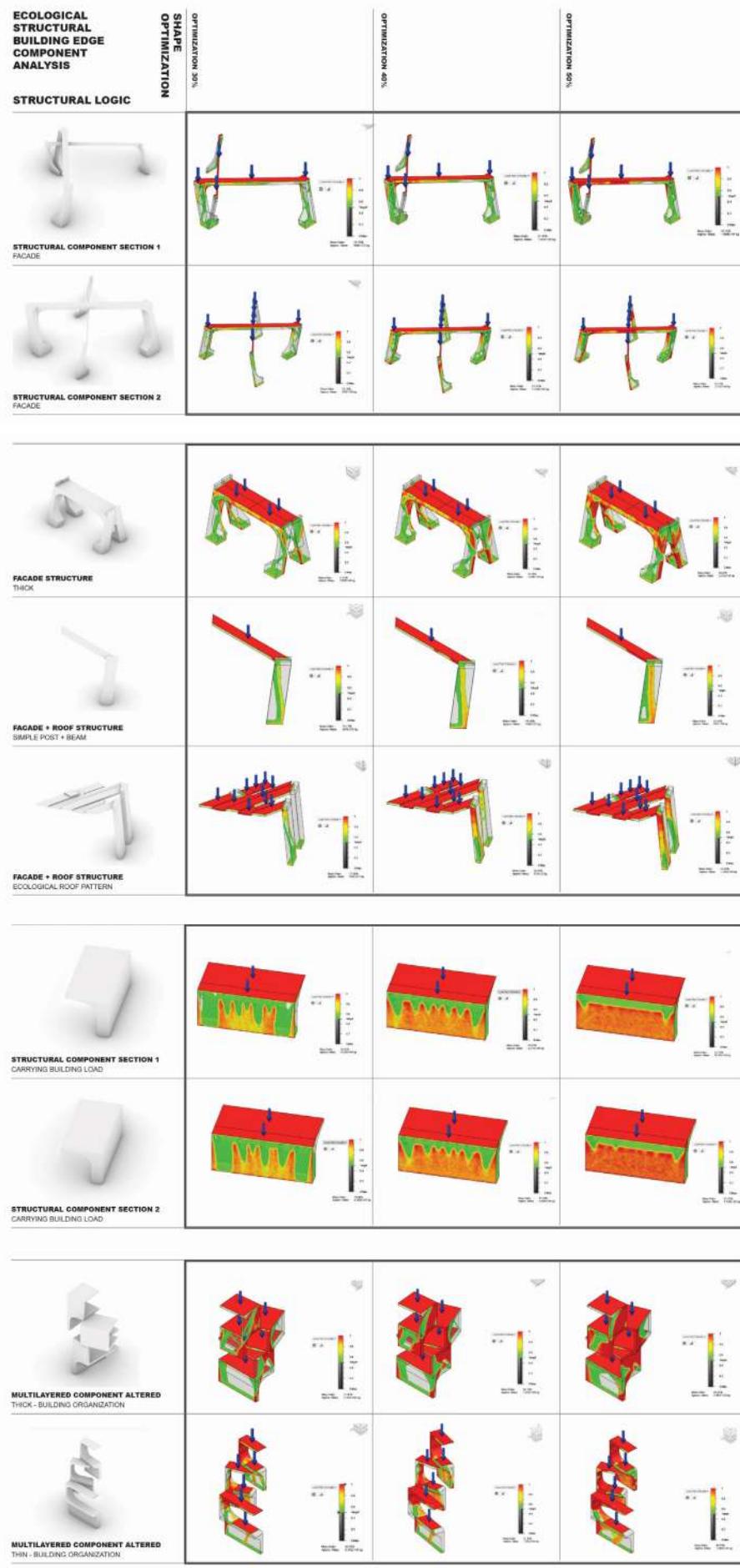
Material | Ecological Flows

Split House is a garden embedded into a hillside. It creates a form that allows flows of mud, water, and debris to be moved through, around, and over the entire structure, capturing the sediments into a new landform. Enforced by a central split that holds a stair-ramp circulatory greenhouse, this playscape manages natural flows, as well as acting as a shared public space for families and for the community of Hazelwood.



The image to the left displays a short series of form-finding studies to determine how spaces would be shared amongst various families and how different spaces would be placed on top another.





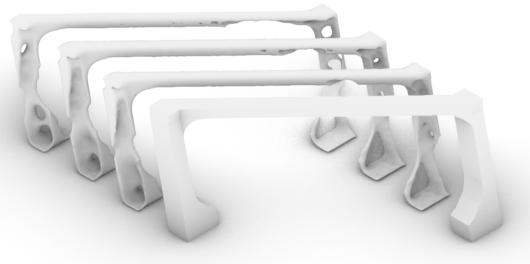
Material Optimization

Construction Waste & Recycling

The structure of Split House is made up of three main components: a thin interior column-beam system, a thick exterior column-beam system, and a structural support for the base of the building. The structural support is a component that embeds itself into the landscape to hold the building in place during landslides.

The images shown on the left are component studies that focus on understanding how much material can be optimized in the overall component's form to save material and reduce weight.

The design idea is for these different components to be optimized at different levels (60%, 70%, 80%, etc) and be used at different parts of the building structure depending on which section needs more strength and which needs less.



The image above shows the thick facade component and the different optimized levels of it (from left to right) - material retained: 50%, 60%, 70%, 100%.

**ECOLOGICAL
STRUCTURAL
BUILDING EDGE
COMPONENT
ANALYSIS**

STRUCTURAL LOGIC

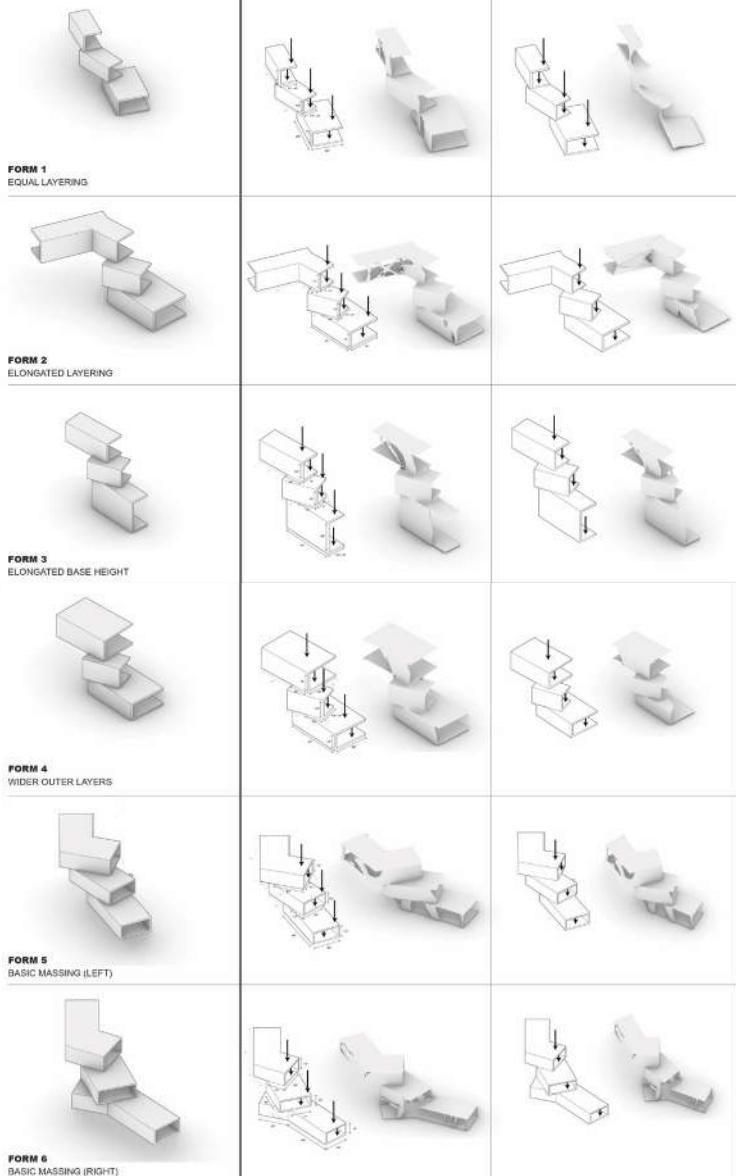
**SHAPE
OPTIMIZATION**

LOAD

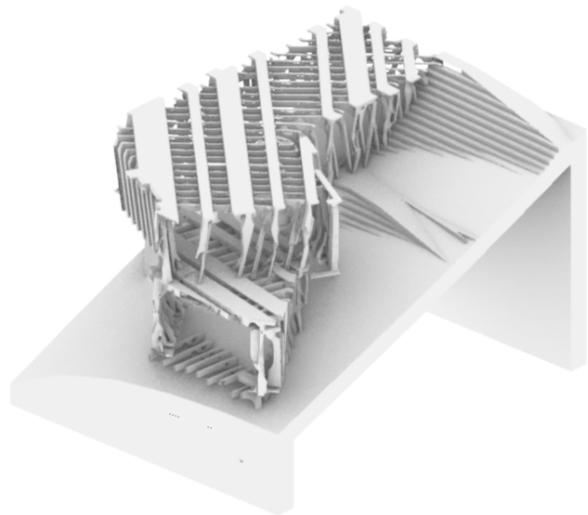
+ OPTIMIZATION 50%

LOAD

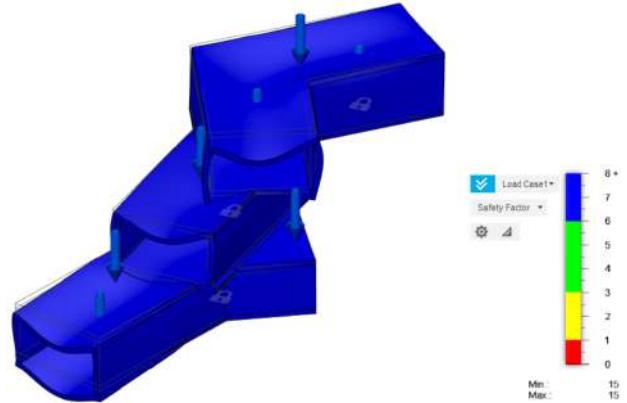
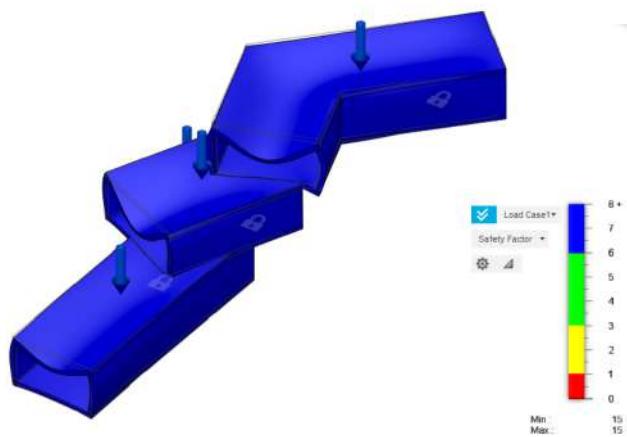
+ OPTIMIZATION 60%

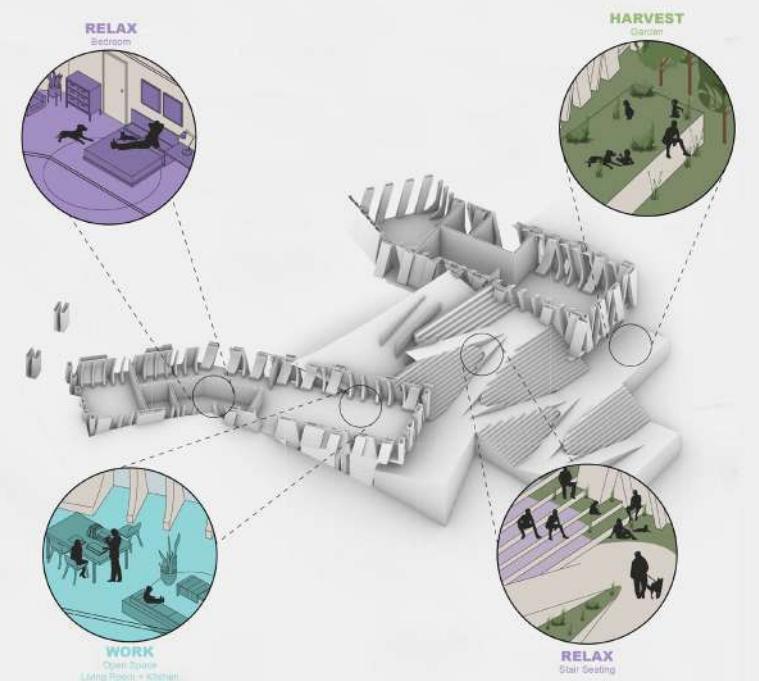
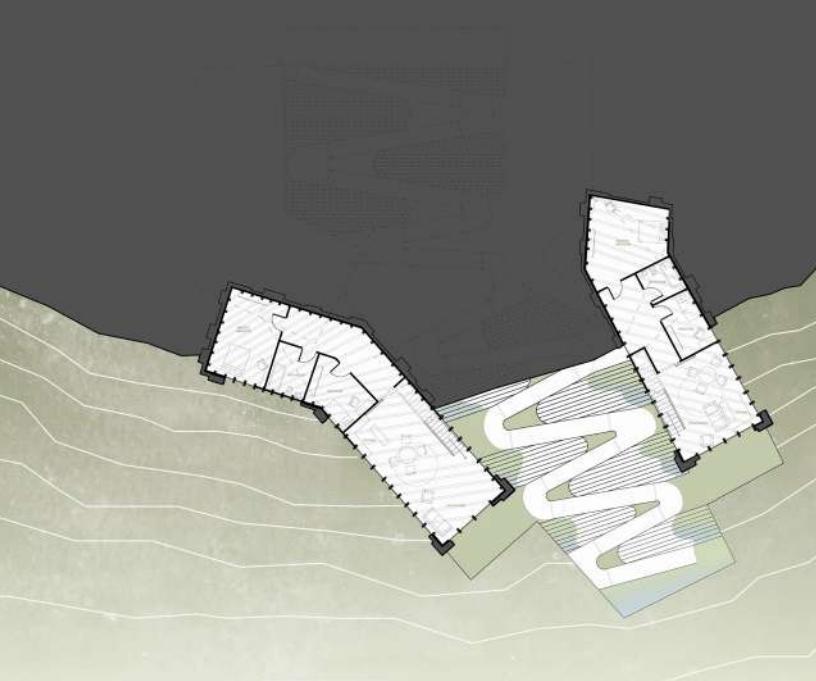
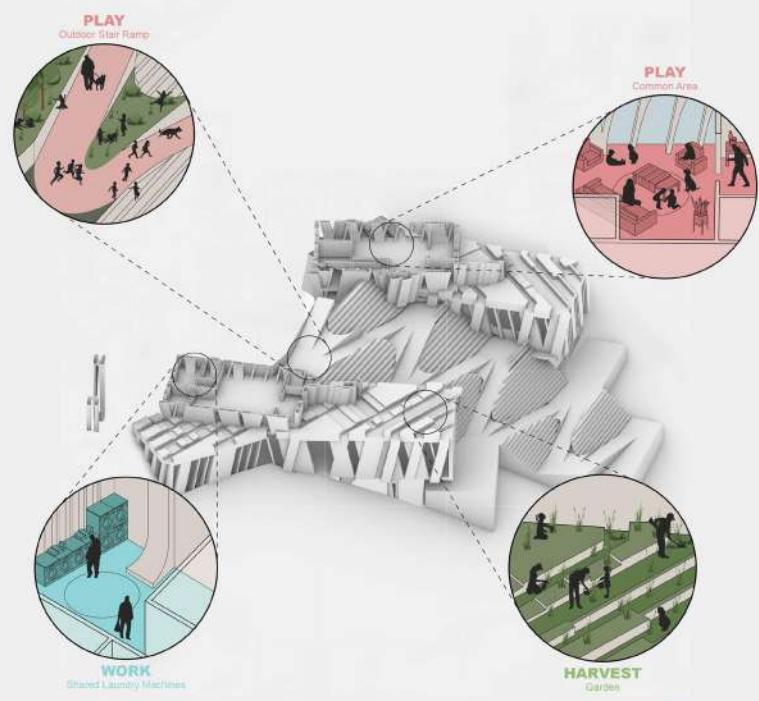
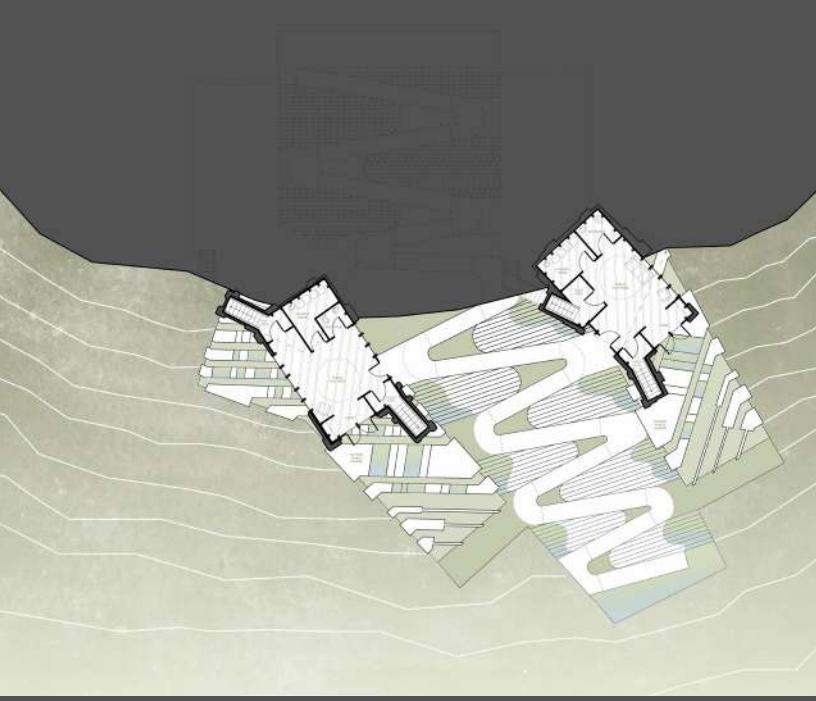
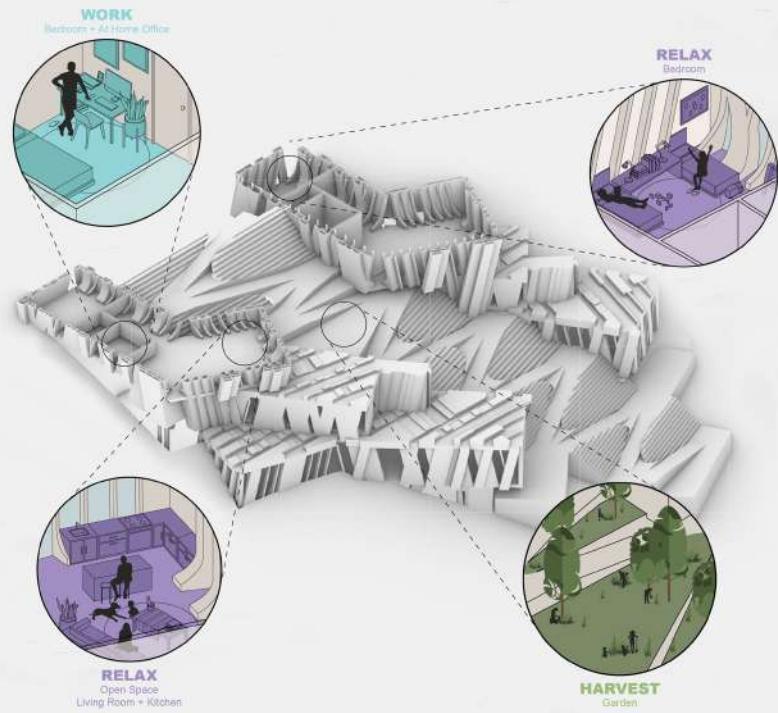
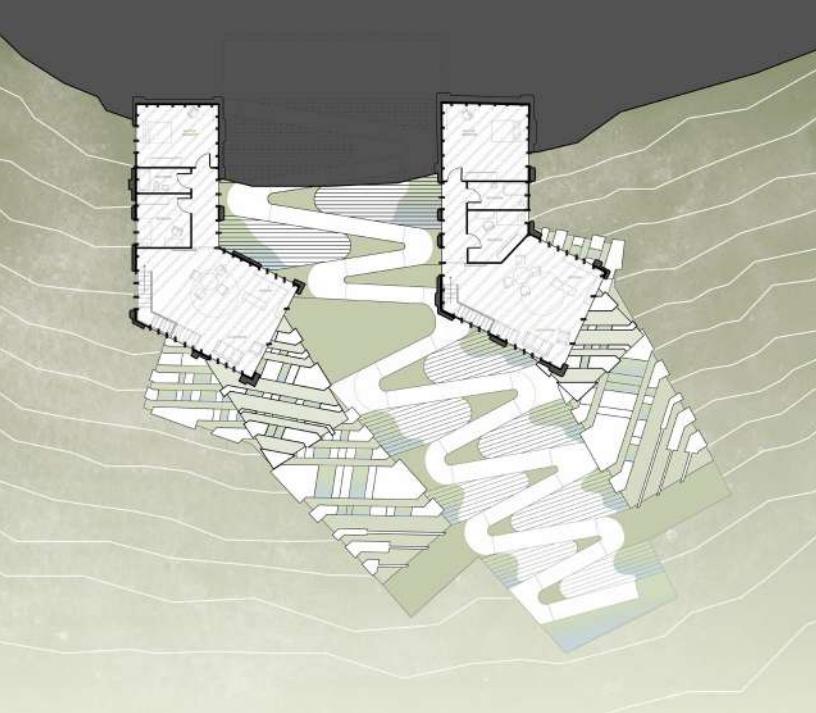


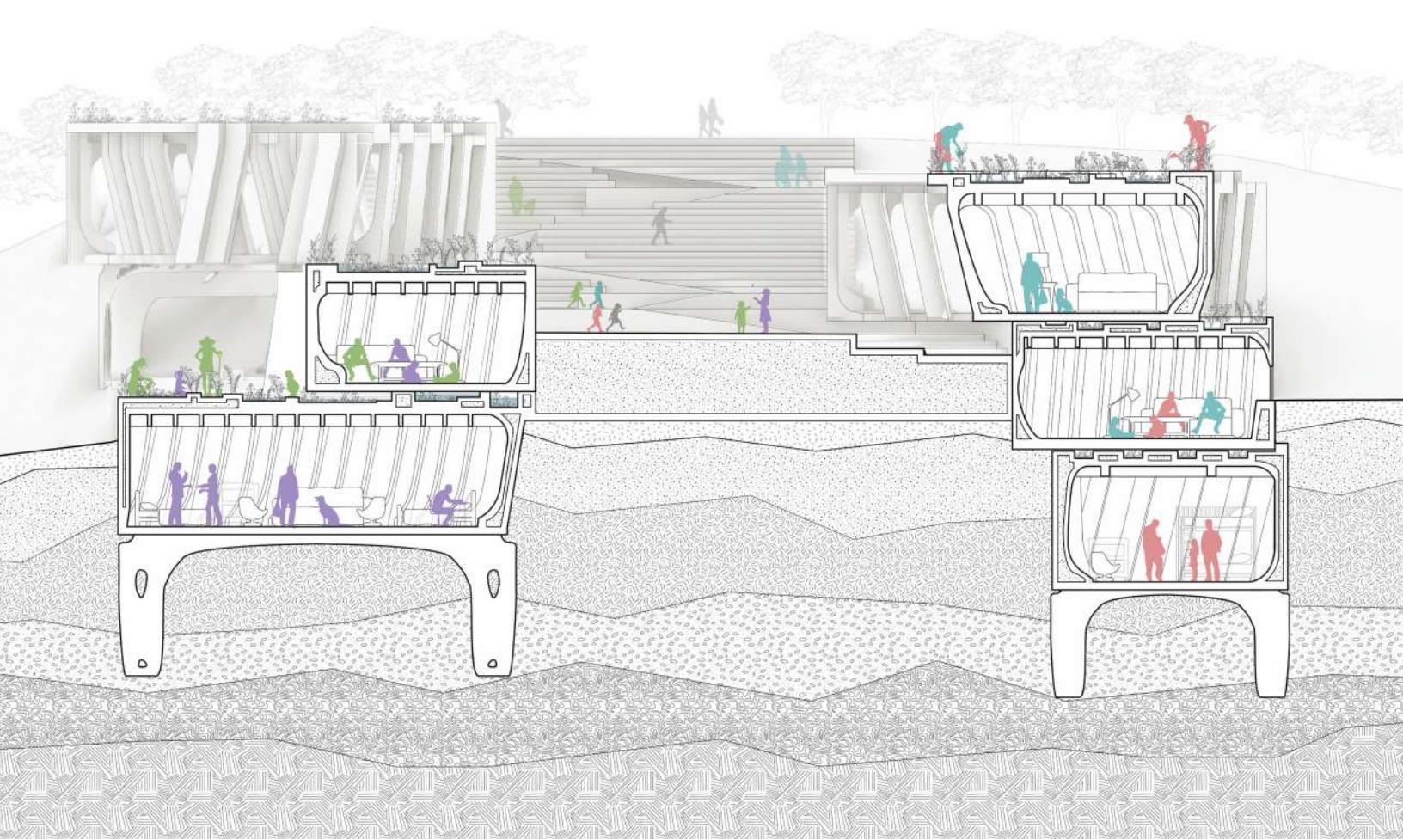
The images shown on the left are studies of how different masses can be stacked and which set of masses are the strongest to allow for more optimized components to be used in the overall structure.



The two images below study the stress applied to the housing masses and where more strengthened components are needed.







Co-Housing & Co-Parenting

Social Flows

Hazelwood's primary inhabitants belong to a racially diverse, underserved, economically and socially vulnerable demographic. Split House aims to enable a better future for the children of low-socioeconomic households by stabilizing the landscape into edible playscapes.

This spatial organization of the house proposes co-living, co-sharing, and co-parenting. Double house reduces

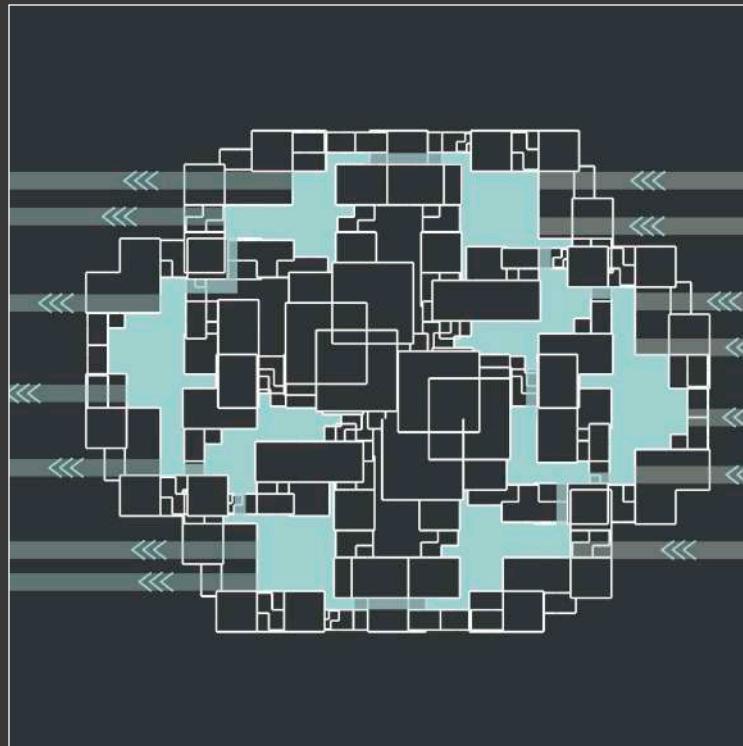
square footage by overlapping spaces to allow for co-parenting in conjunction with urban gardening and encourages collaborative decision- and place-making.

Adequate housing is critical for determining the health and education of children. 49% of people that live in Hazelwood are families with children under the age of 18, with the median household income of \$37,091. Amer-

ica struggles with creating "affordable housing" options because of the market pressure, causing homes to rise in price. However, sharing space for parenting time overlaps, utilities and urban gardens could help lower the housing cost.

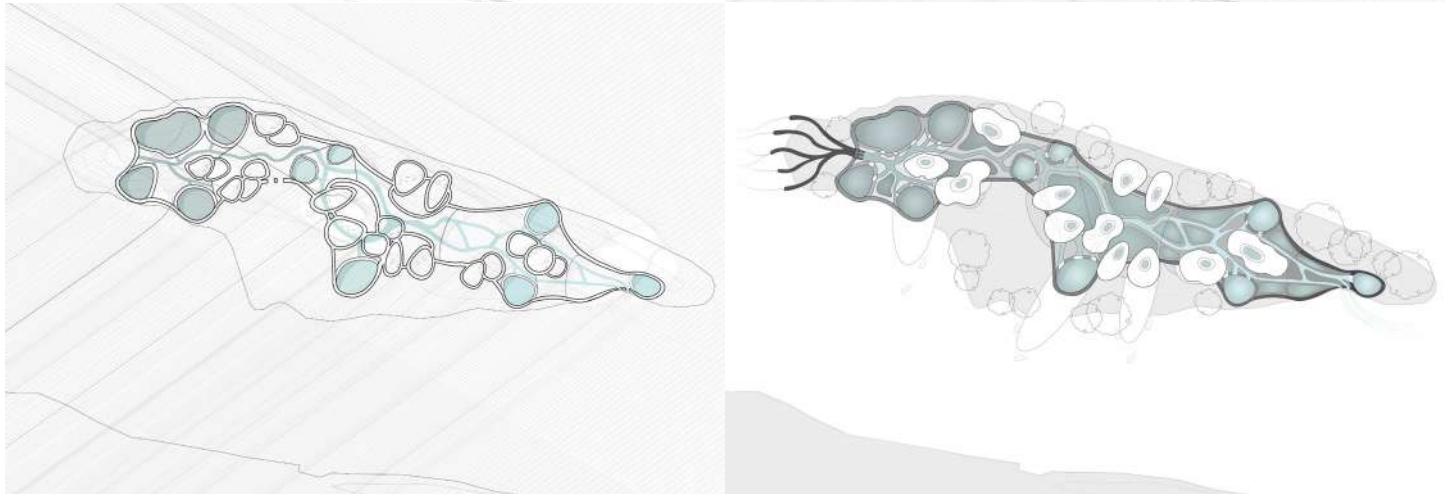
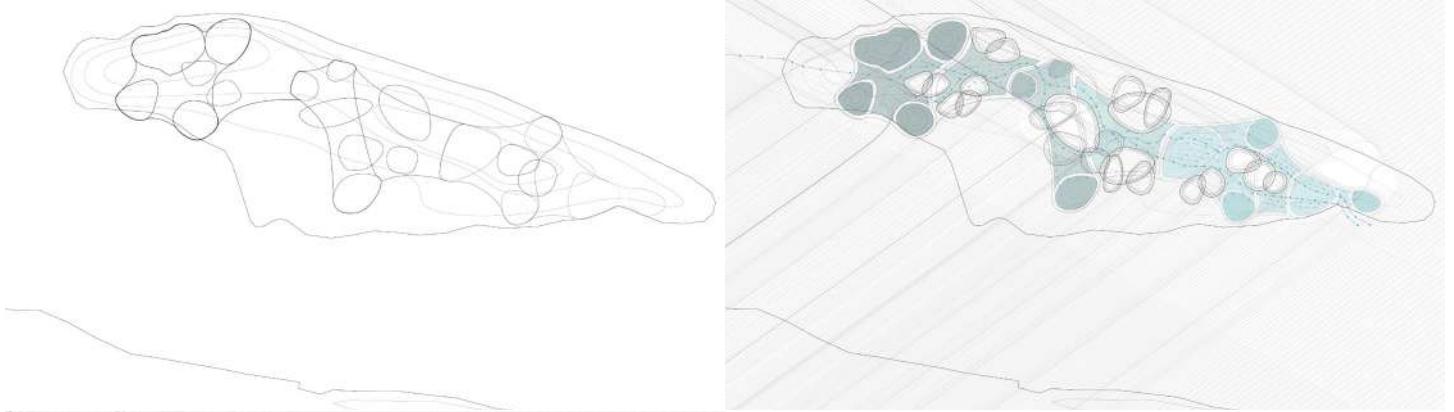
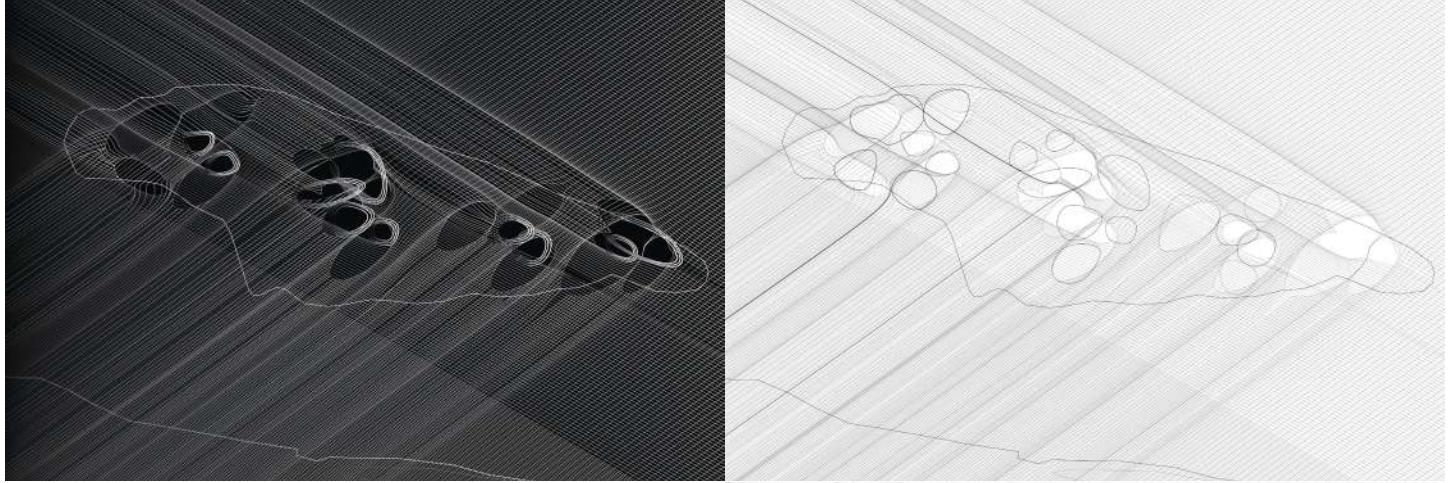
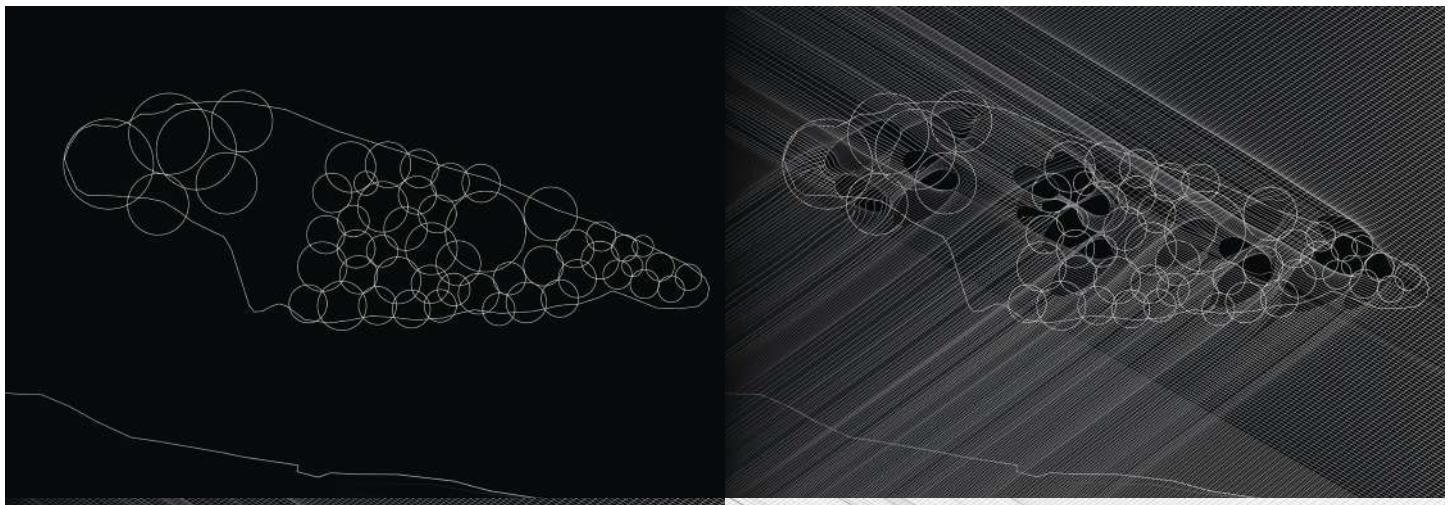


ECO-MACHINE co-housing

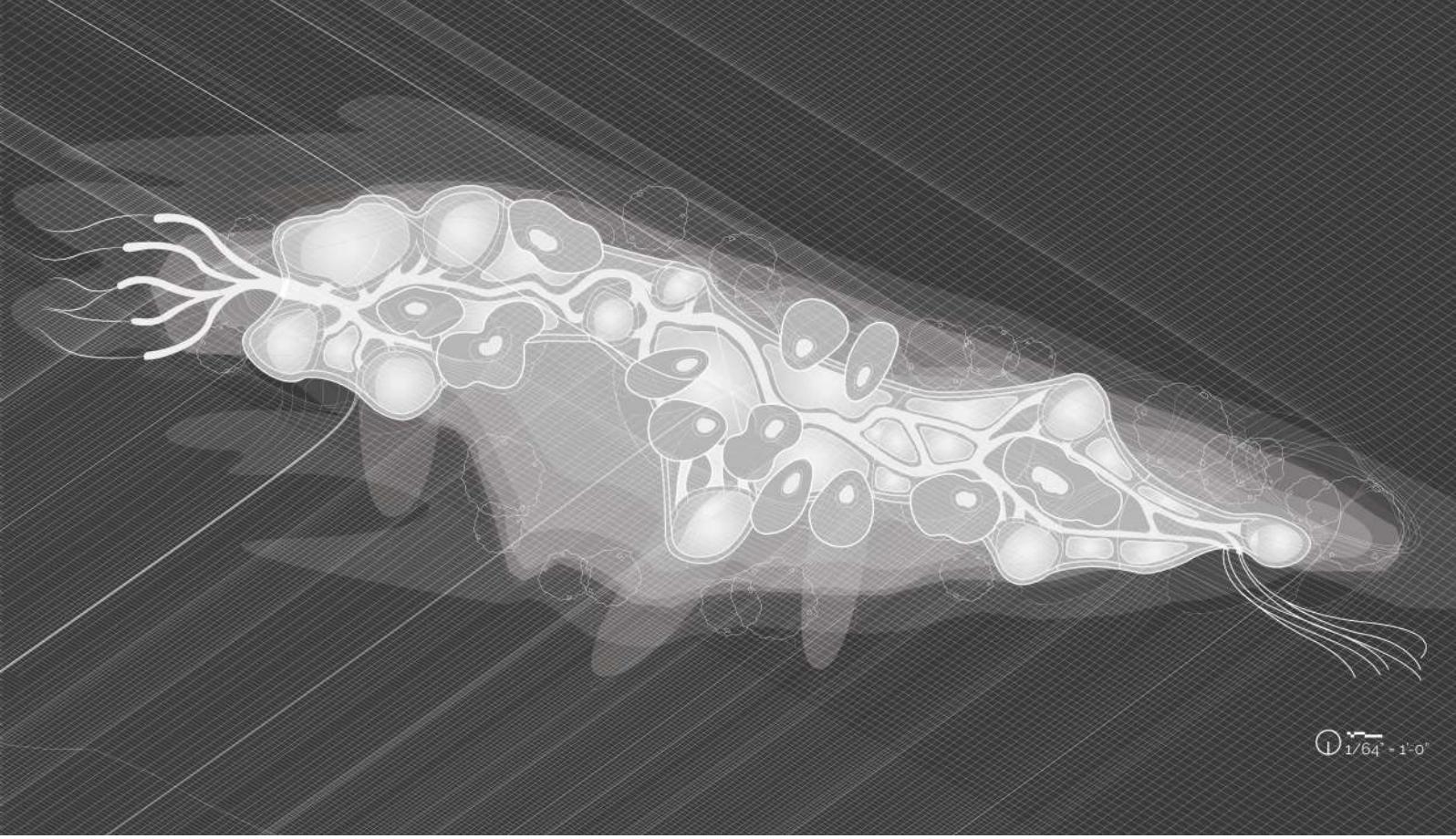


*Six Mile Island, PA
Environment Form & Feedback: Water Communities
advised by Matthew Huber & Dana Cupkova*

Students developed urbanization strategies to create co-housing and eco-machine prototypes onto the site. The project began by allowing students to develop an understanding and focused knowledge of a specific system's behavior and logic to get a clear understanding of how it could be incorporated into the site and integrated into the lives of those living there. The goal of this design was to design a large biofiltration system that would take water from the Allegheny River, clean it, and return it back to the river. The biofiltration system aims to use streams, waterfalls, and greenwalls to treat the water.



The architecture was carved through a wind analysis on the island. The images above show form finding through multiple simulation analyses on the existing site. These studies were then reshaped into architectural form that responds to the environment around it.



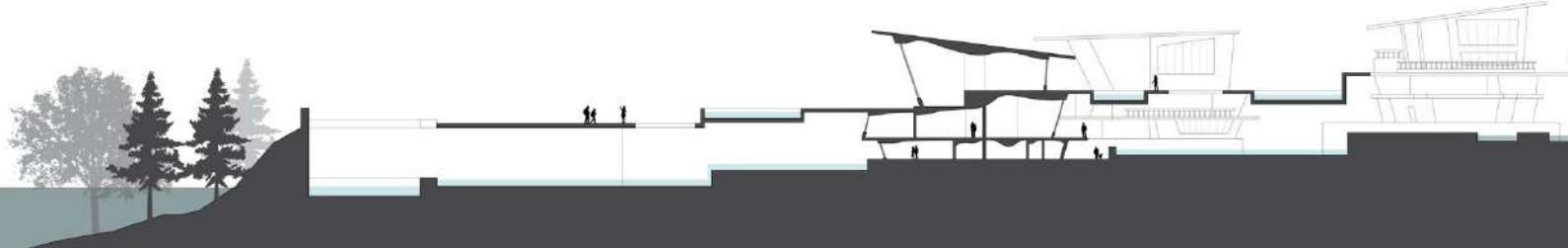
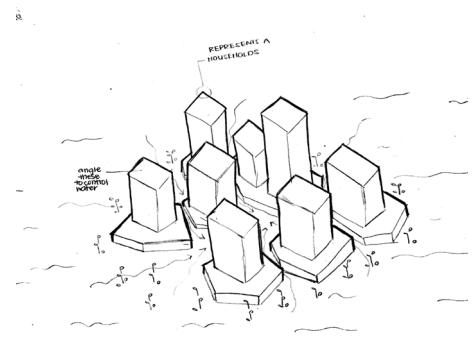
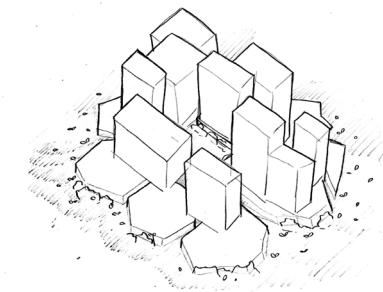
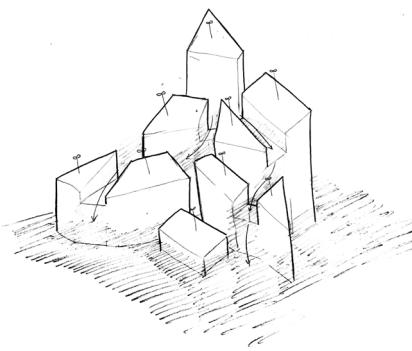
Island Over Time

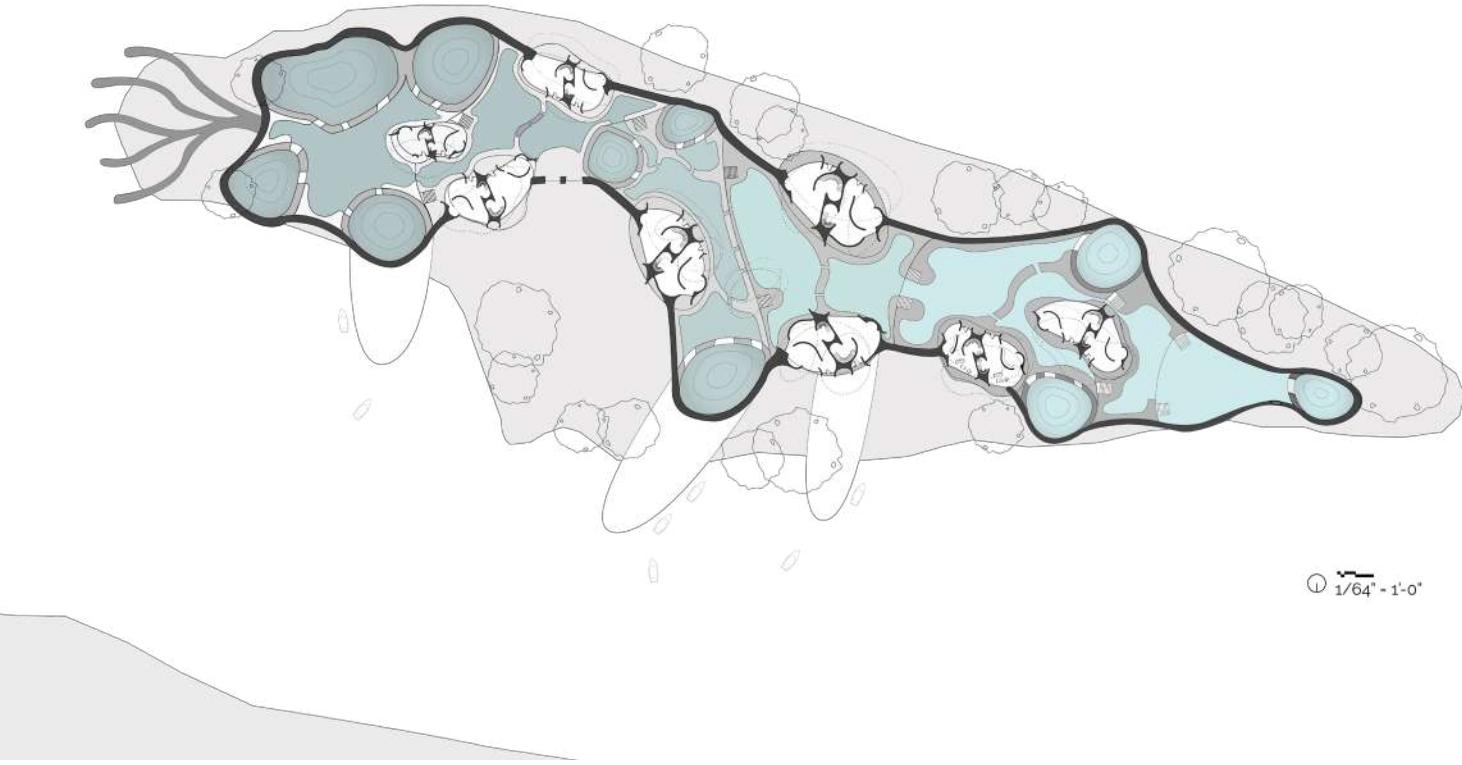
Over time the island will start to grow smaller and smaller (with the rising sea levels and erosion), but the architecture aims to still stay standing even as the island begins to fade away into the river..

Site Plan Top Level

Series of streams and openings that help guide the water through the structure and allow water to fall through the top and into the bottom layer of the system. The pump at the beginning tries to mimic the appearance of water flow streams and helps bring water into the system.

The image below displays a series of initial sketches that conveyed the idea of using streams to dictate paths and circulation of the water and the residents moving.





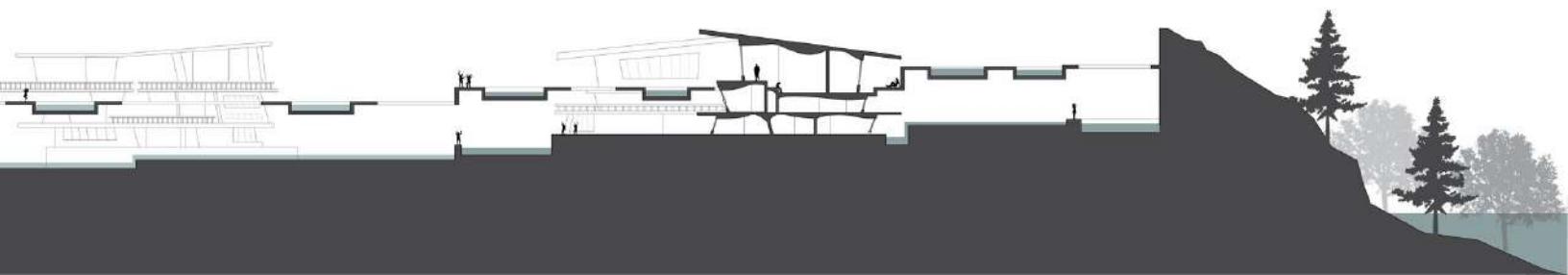
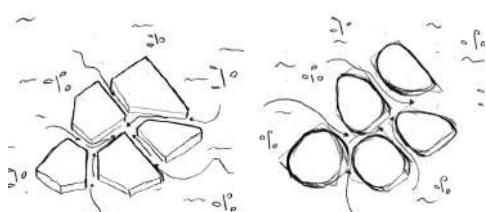
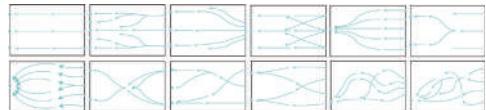
Site Plan Bottom Level

The bottom level of the system consists of a series of large pools that are surrounded by walkways to allow for residences to get into their homes. The water from the top level flows into these pools to create a waterfall effect for the residents to experience.

Architectural Form

The overall architectural form derived from an understanding of how water flows. Water tends to erode sharp turns and likes to free-flow through curved paths, which helped create the final form which mimicked the language of the water's movement.

The image to the right displays a series of diagrammatic studies to understand how water flow patterns can be affected by physical objects, like buildings, and help dictate overall form.



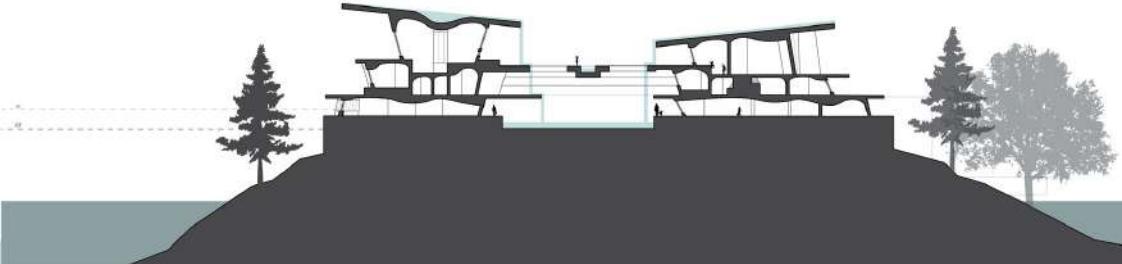
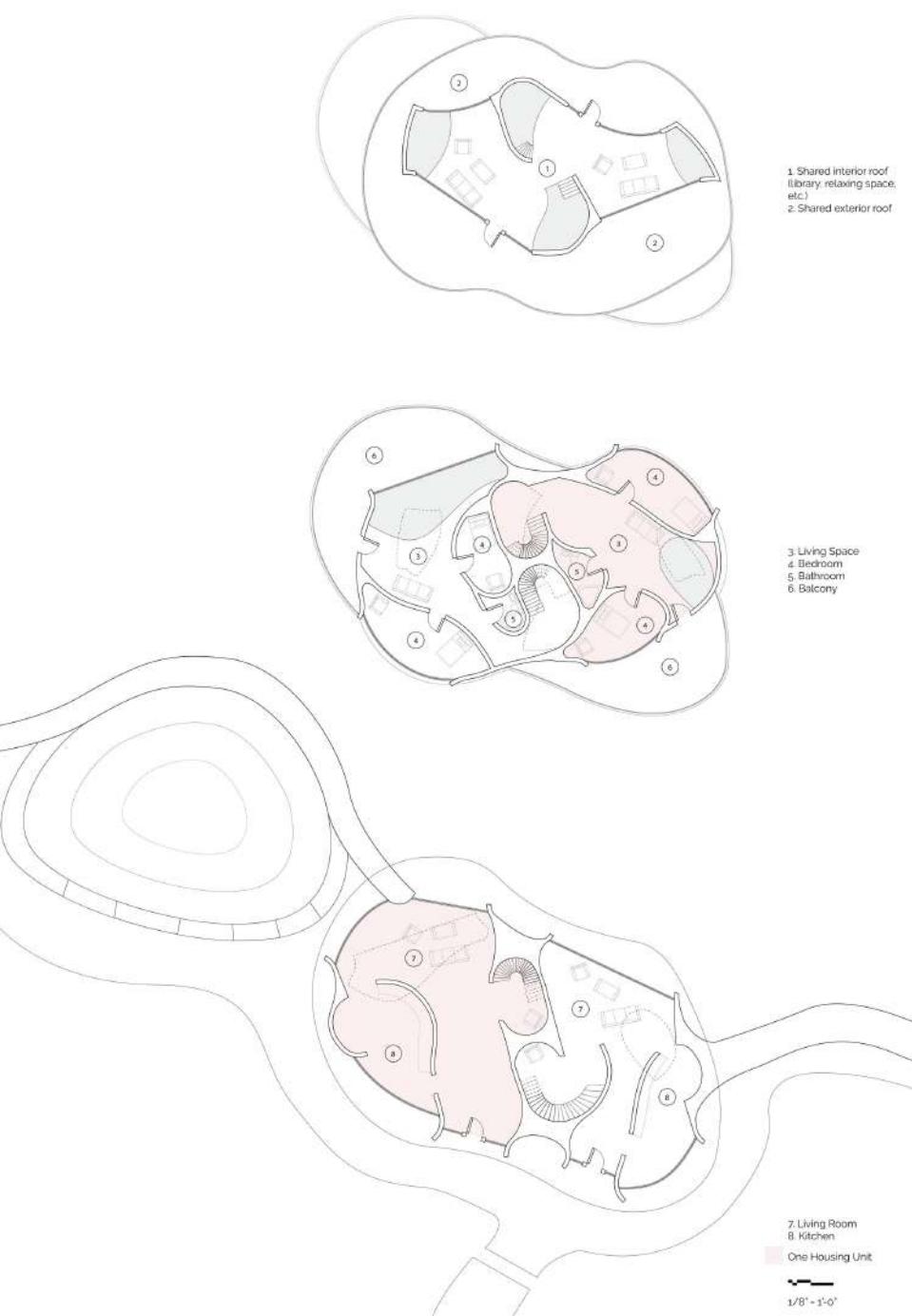
Co-Housing Plans

Each building holds multiple housing units depending on the shape of it. The core of the building consists of stairs that help inform the orientation of each floor; each floor is rotated a specific way (the first floor is rotated to follow waterflow, the second floor is rotated to get as much sunlight as possible, and the third floor is shaped by the wind).

The walls of the unit help inform the circulation flow that someone would walk while going through the house.

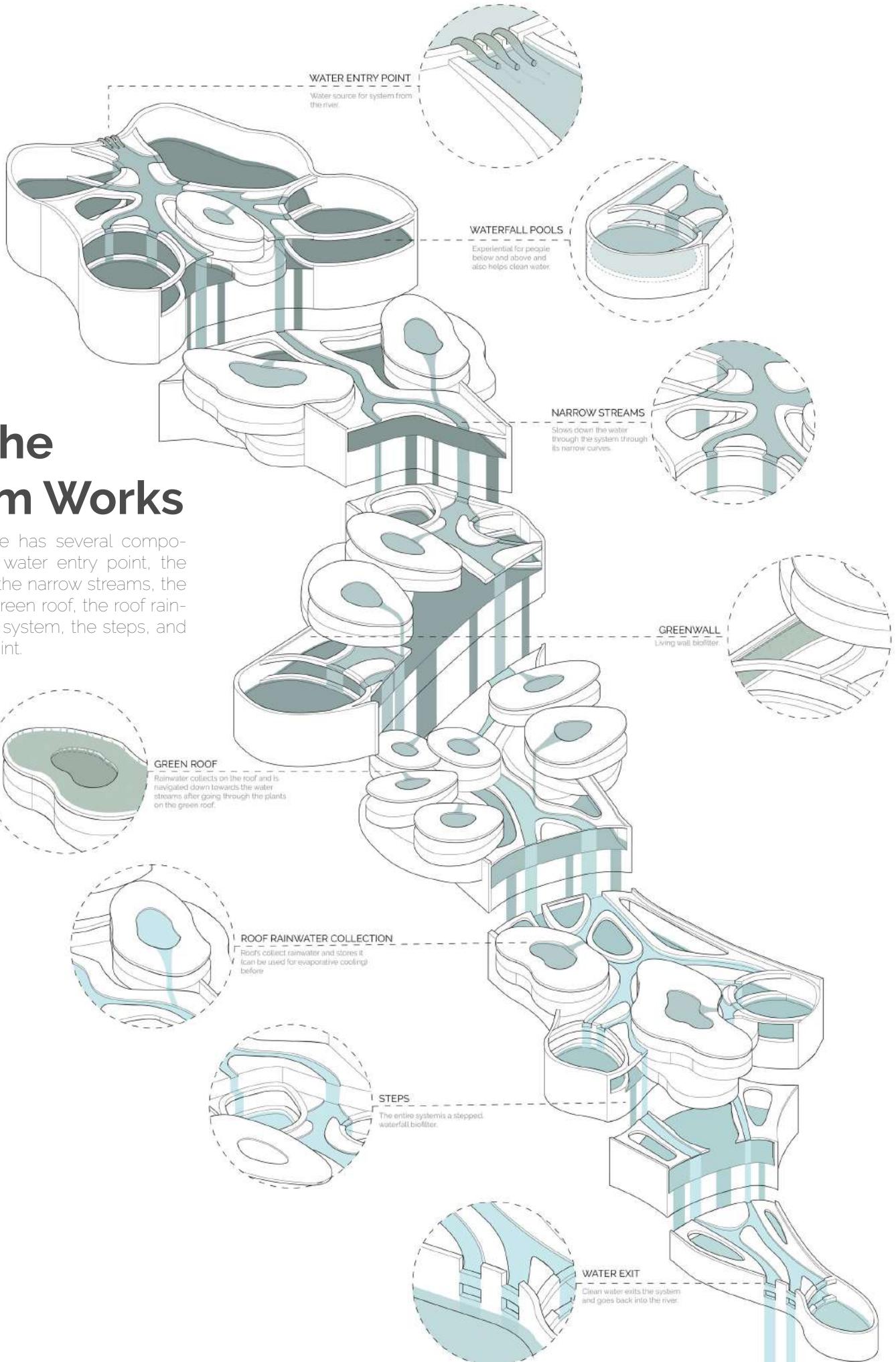
Section Series

The sections help show the main concept of the design, that water travels through both the system and the buildings at different ground elevations.



How the System Works

The ecomachine has several components to it: the water entry point, the waterfall pools, the narrow streams, the greenwall, the green roof, the roof rainwater collection system, the steps, and the water exit point.



Materiality & Experience

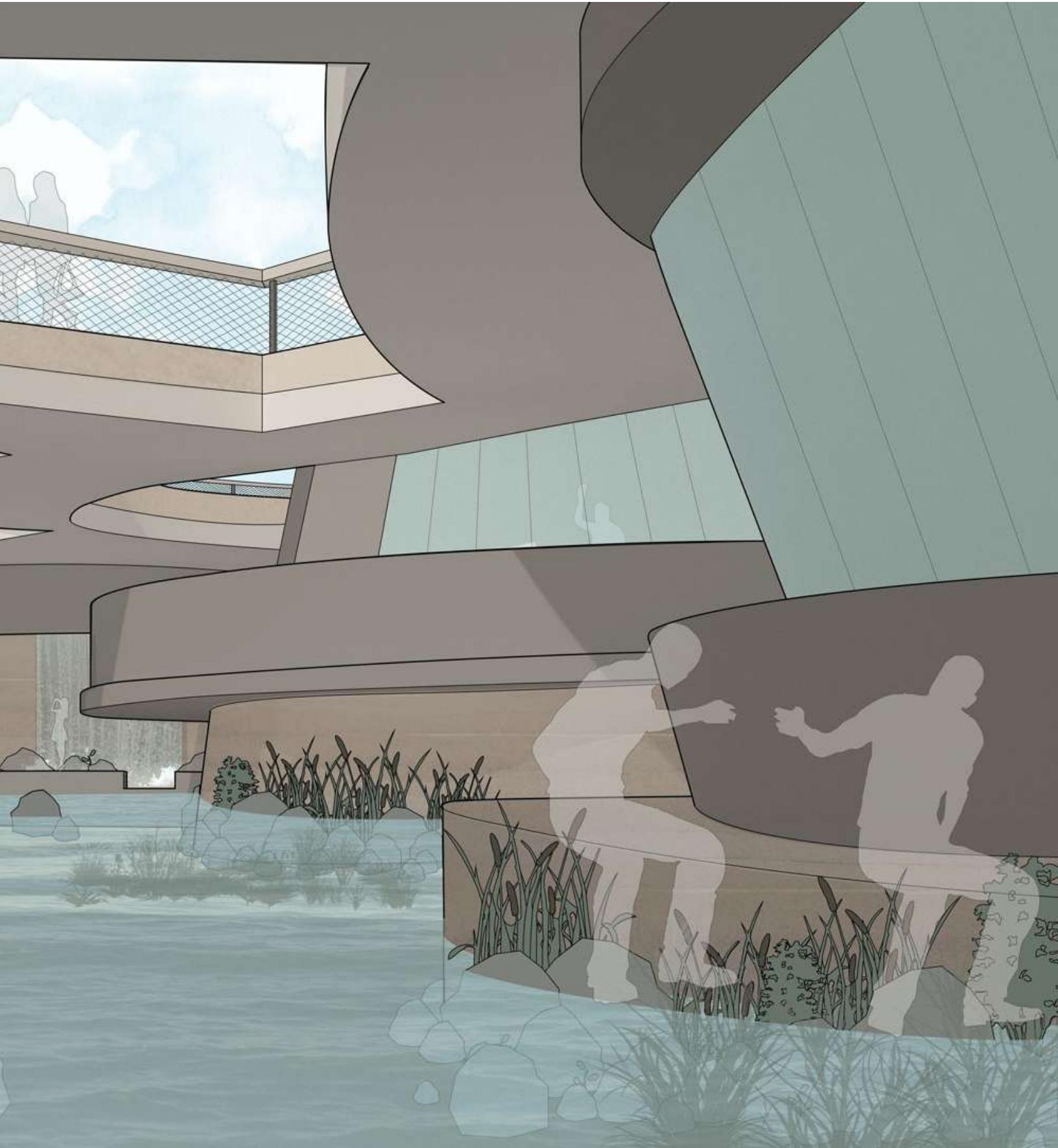
The materiality of the architecture is mainly concrete because the goal of this structure is to make sure it doesn't erode or dissolve with the constant contact with water. However, rammed earth walls and floors are also present in the structure (not the housing units) that would potentially wear away over

time, but wouldn't wear away too quickly. This opens the architecture to multiple possibilities of what it could become in the future. The rammed earth material is also used at the top level where residents walk to potentially wear away the streams at the top level and create new water openings, al-

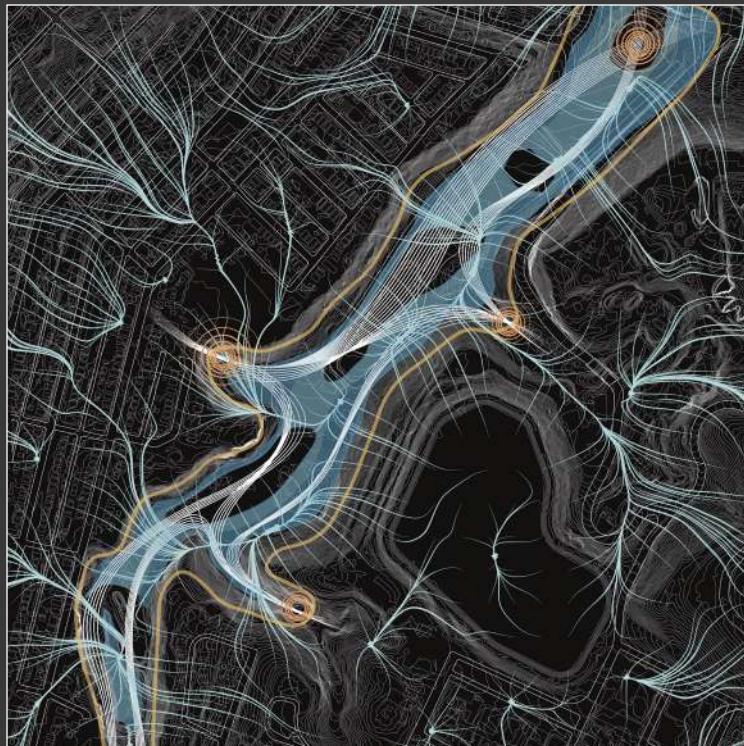


lowing for more water pathways. Another potential material that couldn't be shown in this perspective view is sand, which enhances the idea of architecture changing over time; this material would be used in pools or streams to create a certain textured feel for people experi-

encing the clean water physically.



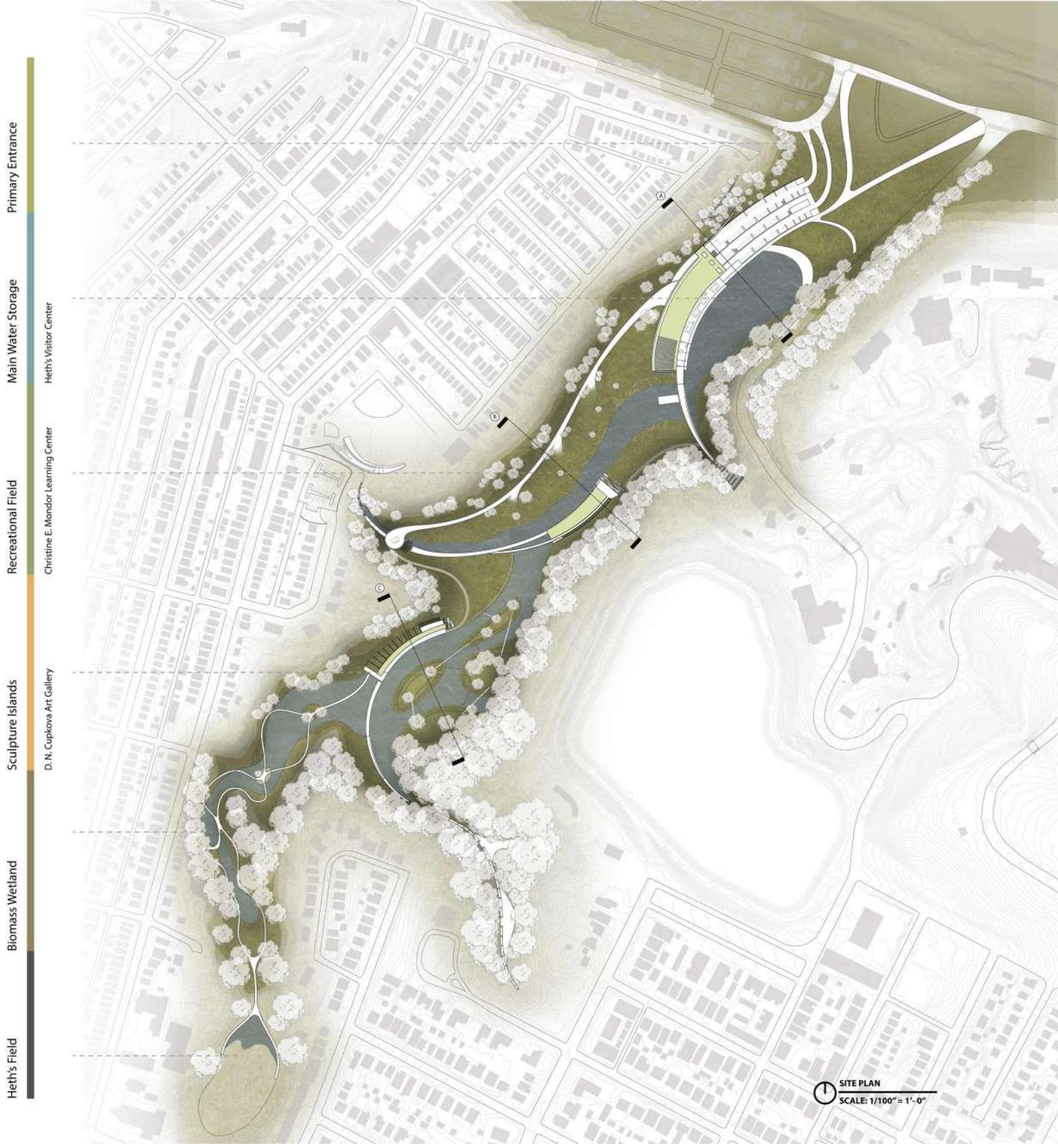
SCULPTURE PARK



*Highland Park, PA
INFRAstructure Studio
advised by Christine Mondor
in collaboration with Claire Koh*

This Sculpture Park aims to act as a recreational site for learning and for the environment. This project assumes that the animals have been freed from the Highland Park Zoo and the existing parking lot is no longer there, leaving the valley clear for design. Taking into consideration the existing reservoirs, the Sculpture Park collects the water from the neighborhood above at various entry points and brings the water down into the site.

Throughout the park there are different ecological conditions located on this site depending on the part of the valley it is within: wetlands, grasslands, streams, forests, etc. The site is constantly changing depending on the weather and the seasonal conditions, which will affect the experiential aspect of the site for visitors.



Zones

The sculpture park is separated into four different zones that have four different conditions and experiences.

Hardscapes

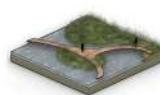
Each zone is separated by dams that allow for water to overflow from one zone to another (each zone is at a different elevation from the last) and also acts as a bridge for the main circulation path on the site for visitors.

These dams are also shaped in a way that guide the water and collect them into the different water channels in each zone.



Zone 1

The **First Zone** is the where the main water storage is located. It is also where the main entrance to the park is and where the main parking lot is located. This zone contains the visitor's center. The water from this water storage is collected and stored until there is an overflow of water, which will flow into an existing depression underneath the bridge at the end of the site. This pathway is connected to the Allegheny River.



Biomass Wetland



Building Edge



Bridge



Tributary



Sculpture Islands



Soft Waterfront



Circular Plaza



Stage + Amphitheatre



Productive Woodland

Zone 2

The **Second Zone** is the recreational field. This zone contains the learning center and the amphitheater on top of the visitor center. Since this area is made up of grasslands, it is used for more flexible outdoor activities and outdoor stage performances.

Zone 3

The **Third Zone** is the outdoor sculpture park, which also houses the indoor art center. This zone has several streams that form these sculptural islands that visitors can walk on. Depending on how much water is on the site (light, heavy, or no rain) the islands can change in size, altering the experience visitors can have. This zone is partially dry and wet.



Fractured Plaza



Rainwater Stair + Filter

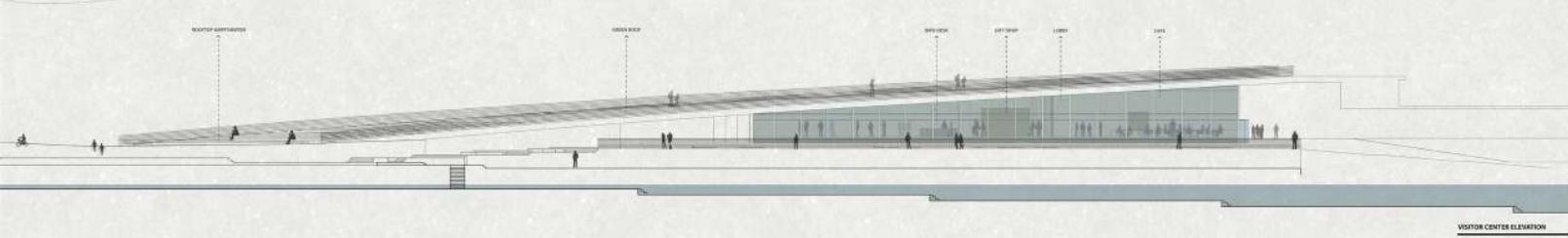


Natoli Rain Garden

Zone 4

The **Fourth Zone** to the south of the site is a Biomass Wetland. Connected to this zone is a rain garden at Heth's Field, located above the valley. This field collects the majority of the water from the neighborhood and transfers it to the wetlands with pipes. This zone is considered the wettest zone on the site since it is in the narrowest part of the valley.





The Visitor's Center



The Learning Center



The Indoor Art Center

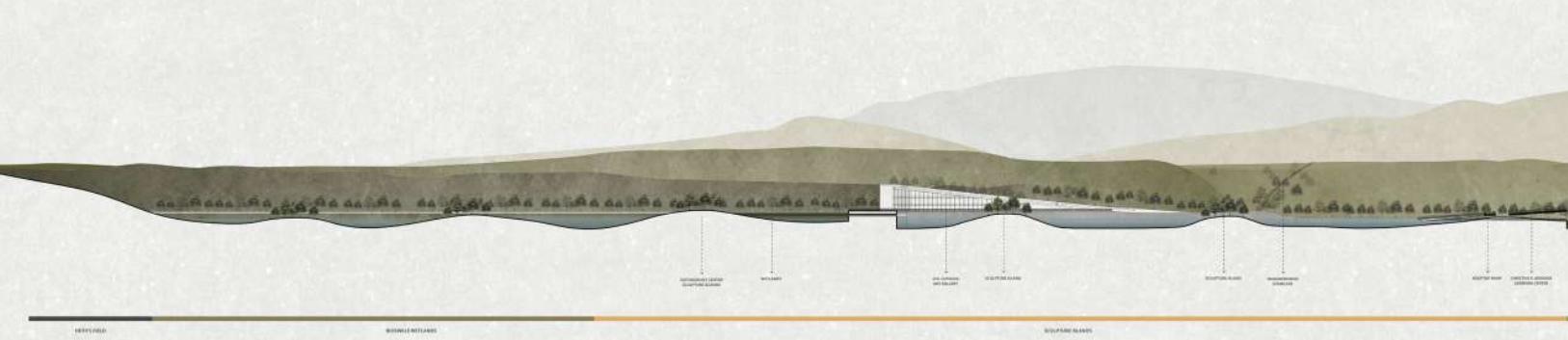
The Architecture

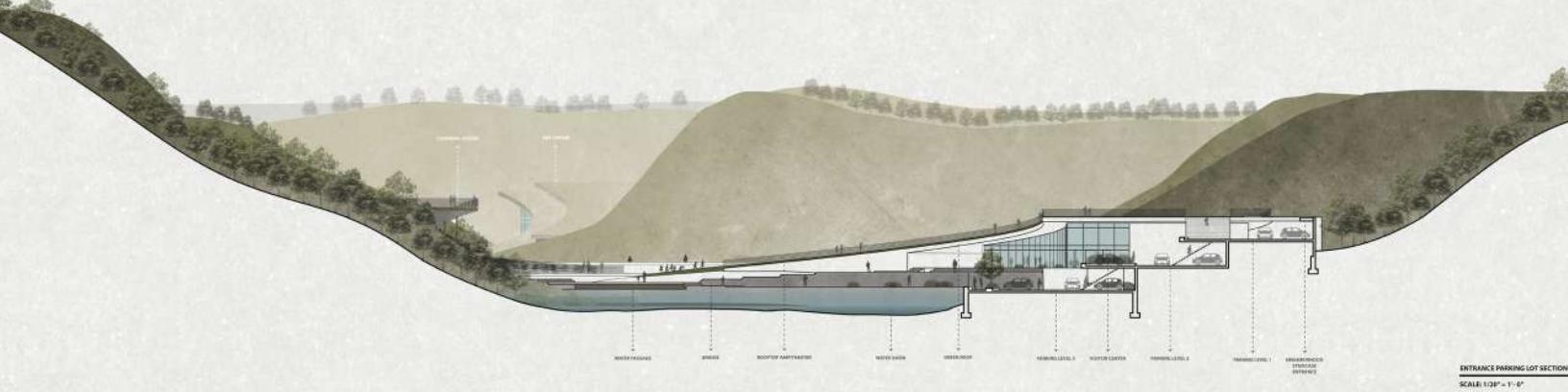
The architecture is integrated into the landscape. Each building hugs the edge of the landscape and actually brings it into the building when necessary. The side that hugs the landscape is where more private activities take place, depending on the building. The more open side of the building is a glass facade that allows for people to have a full view of the water next to the building. Each building also integrates a different rooftop condition.

The visitor center and learning center have a roof that slants into the grass and becomes a part of the landscape. This allows for people to go onto the roof and see an unobstructed view of the entire site in different perspectives.

The learning center's roof is also split into two parts to allow for light to filter into the hallway that is pushed against the landscape.

The art center's roof is split into two parts to allow for light to come into the building and shine onto the artwork.

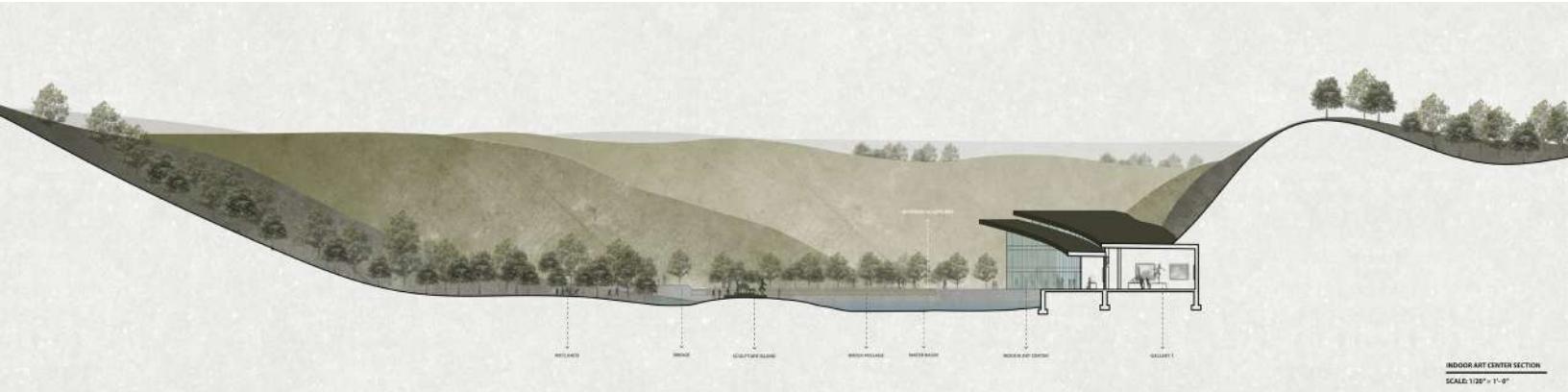




The Visitor's Center



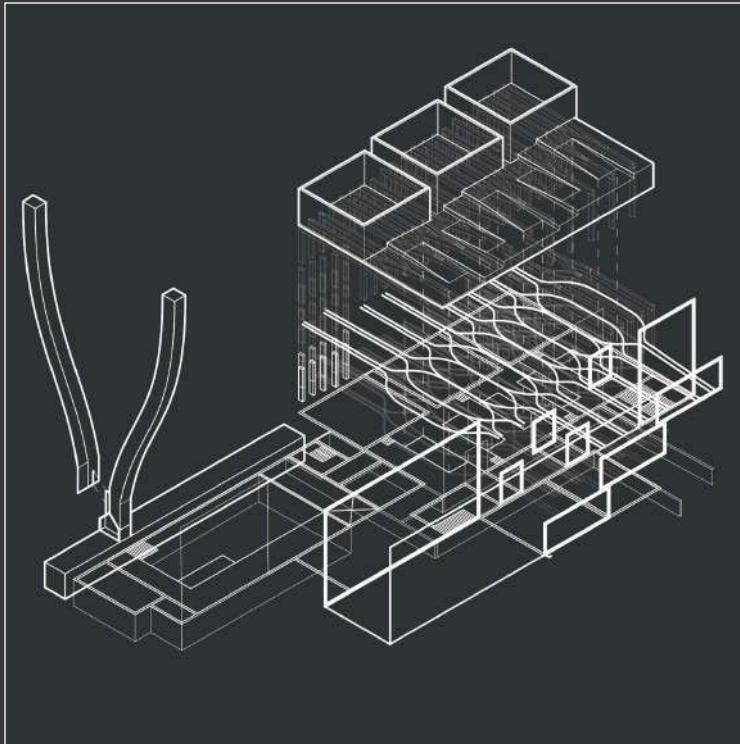
The Learning Center



The Indoor Art Center



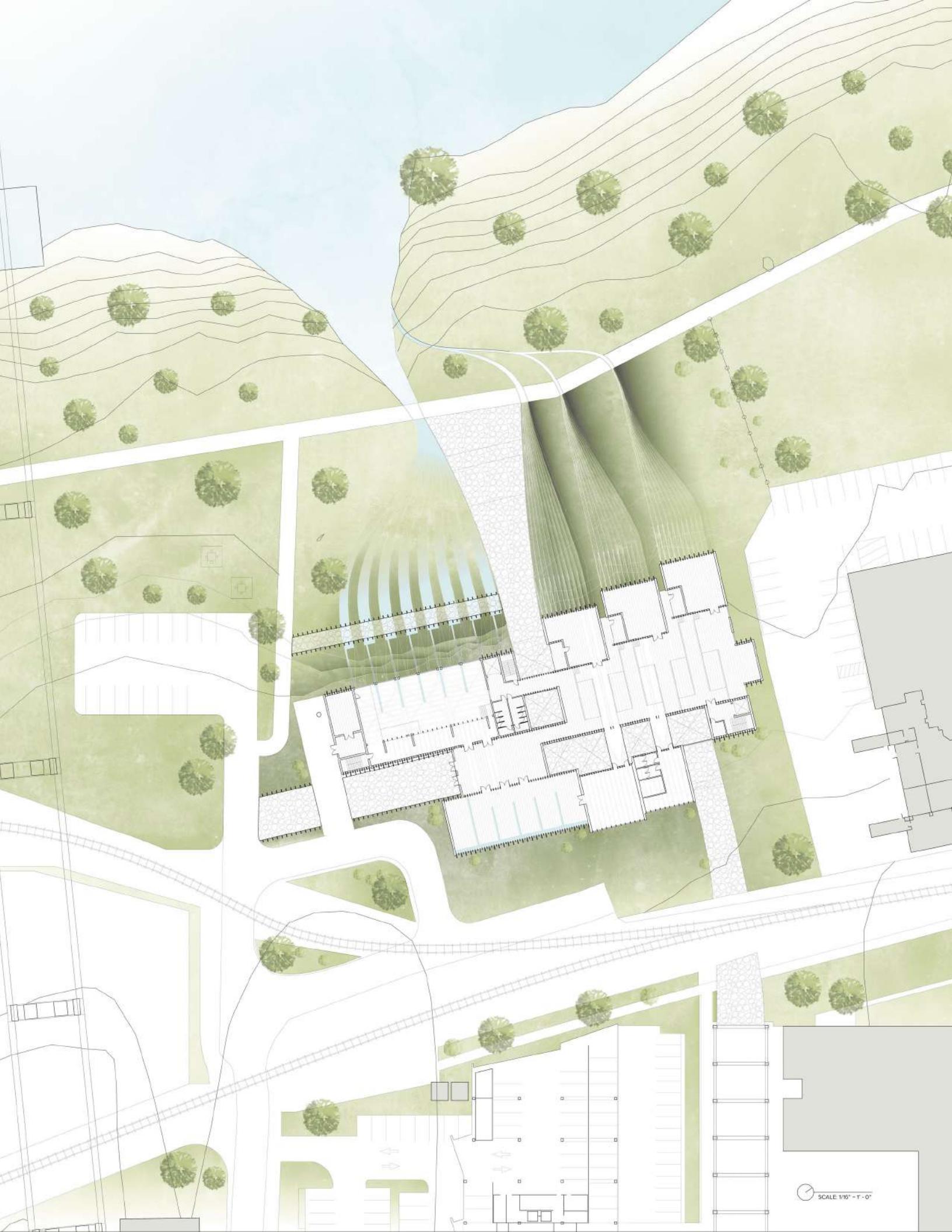
ENVIRONMENTAL CHARTER SCHOOL



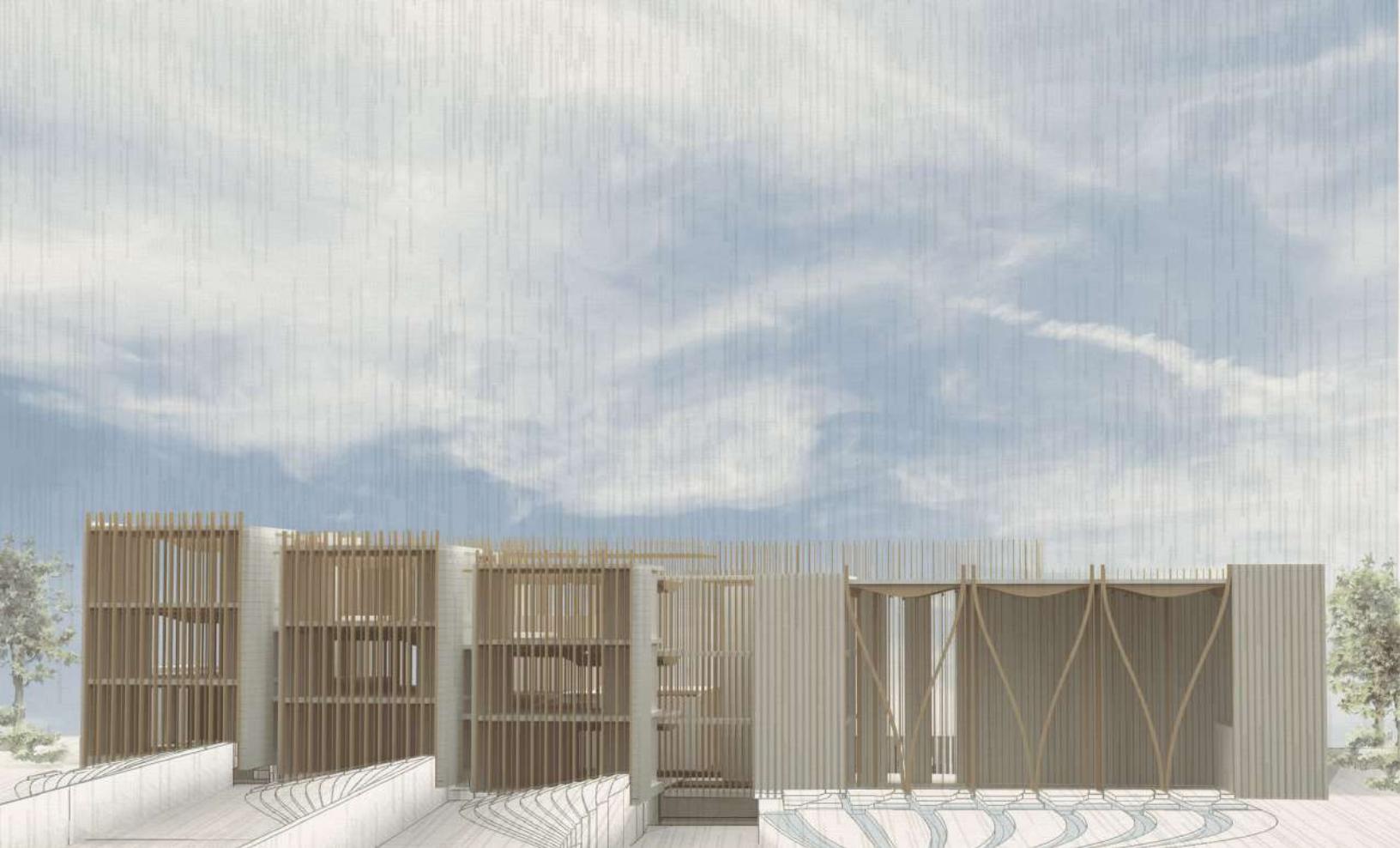
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Advanced Construction Studio
advised by Matthew Huber & Steve Lee*

Charter Schools were created to provide opportunities for teachers, parents, students, and community members to establish and maintain schools that operate independently from the existing school district structure to: improve student learning; increase learning opportunities for all students; encourage the use of different and innovative teaching methods; and create new professional opportunities for teachers.

An Environmental Charter School is a multi-disciplinary "out-the-door" learning approach that engages the students with environmental learning. The project aims to make the school into an environmental pedagogy for both the students and the public through green spaces and rainwater collection systems.



SCALE 1/16" - 1' - 0"



Water Inside Water Outside

The project site has five bounding conditions: The Allegheny River, The National Robotics Engineering Center (NREC), Railroad Tracks, the 40th Street Bridge, and an Industrial Passageway.

The image below displays a visual study of water-flow pathways through the building.

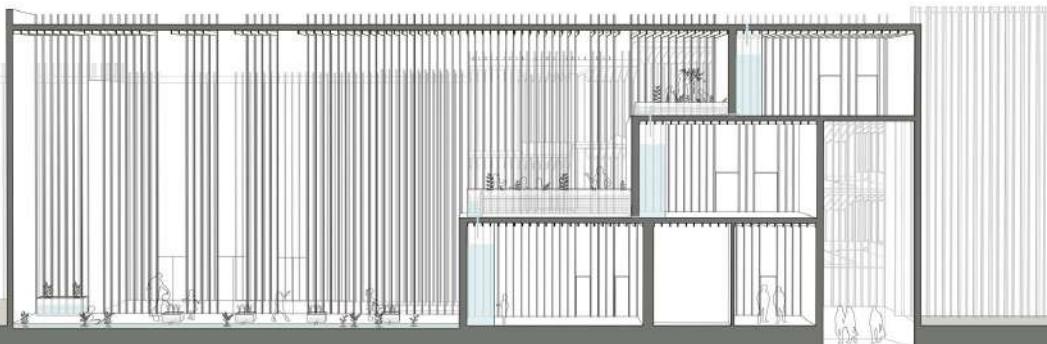
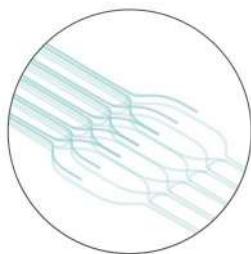
The school creates a connection with the Allegheny River. This provides an education opportunity to teach students about the environmental properties of water.

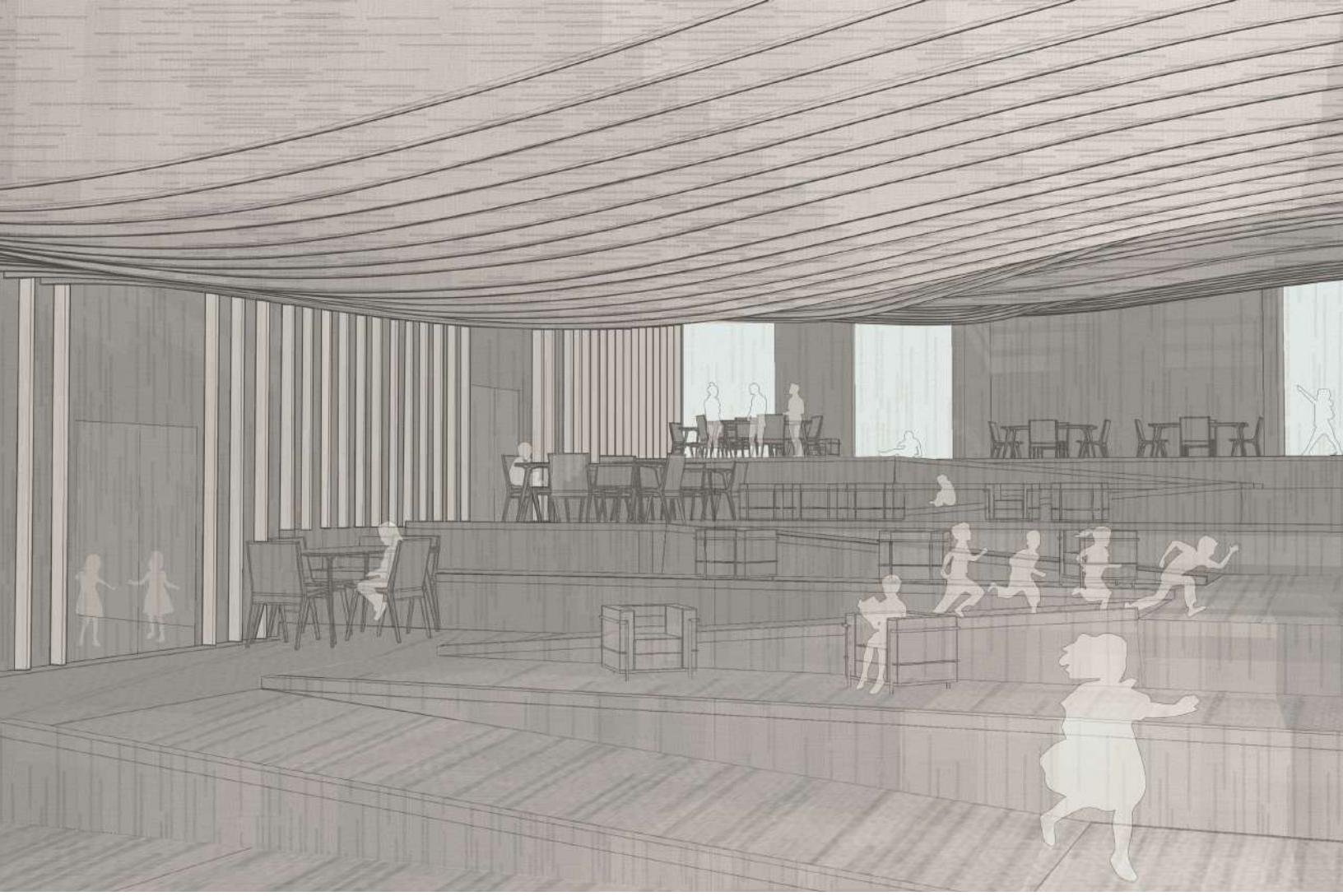
In addition to this connection, the building has an interior system that allows rainwater to collect from the roof. Then, this rainwater physically flows through the building and sustains the different levels of greenery that are located within the school's greenhouse.

VIR-GA (noun)

A mass of streaks of rain appearing to hang under a cloud and evaporating before reaching the ground.

To emphasize the use of rainwater within the building, the building facade mimics the visual language of water constantly falling down the building even when it is not raining.





Structural Timber

The collaborative spaces in the building, pictured above, have structural beams that span across the space's ceiling. These beams grow deeper in the central parts of the space to hold up the weight of the floor above and also mimic the horizontal movement of water through the building.

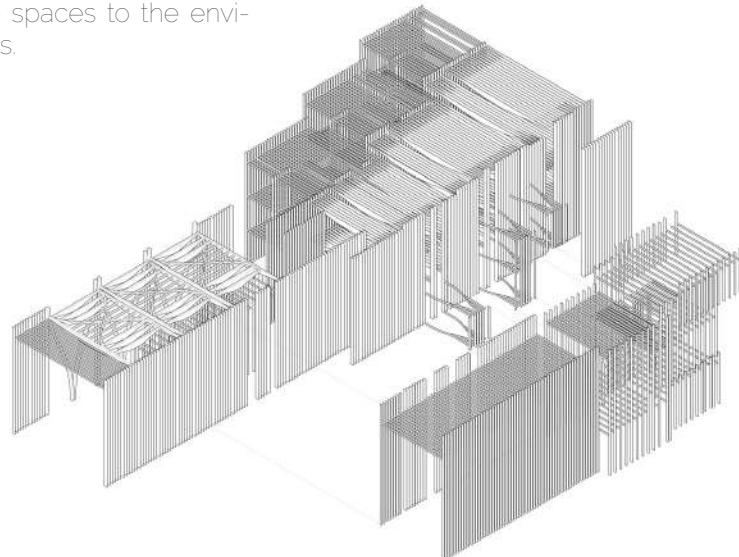
The structure of the entire building is made up of vertical and horizontal pieces of timber to create the idea of building something structural using many small pieces rather than a few large pieces.

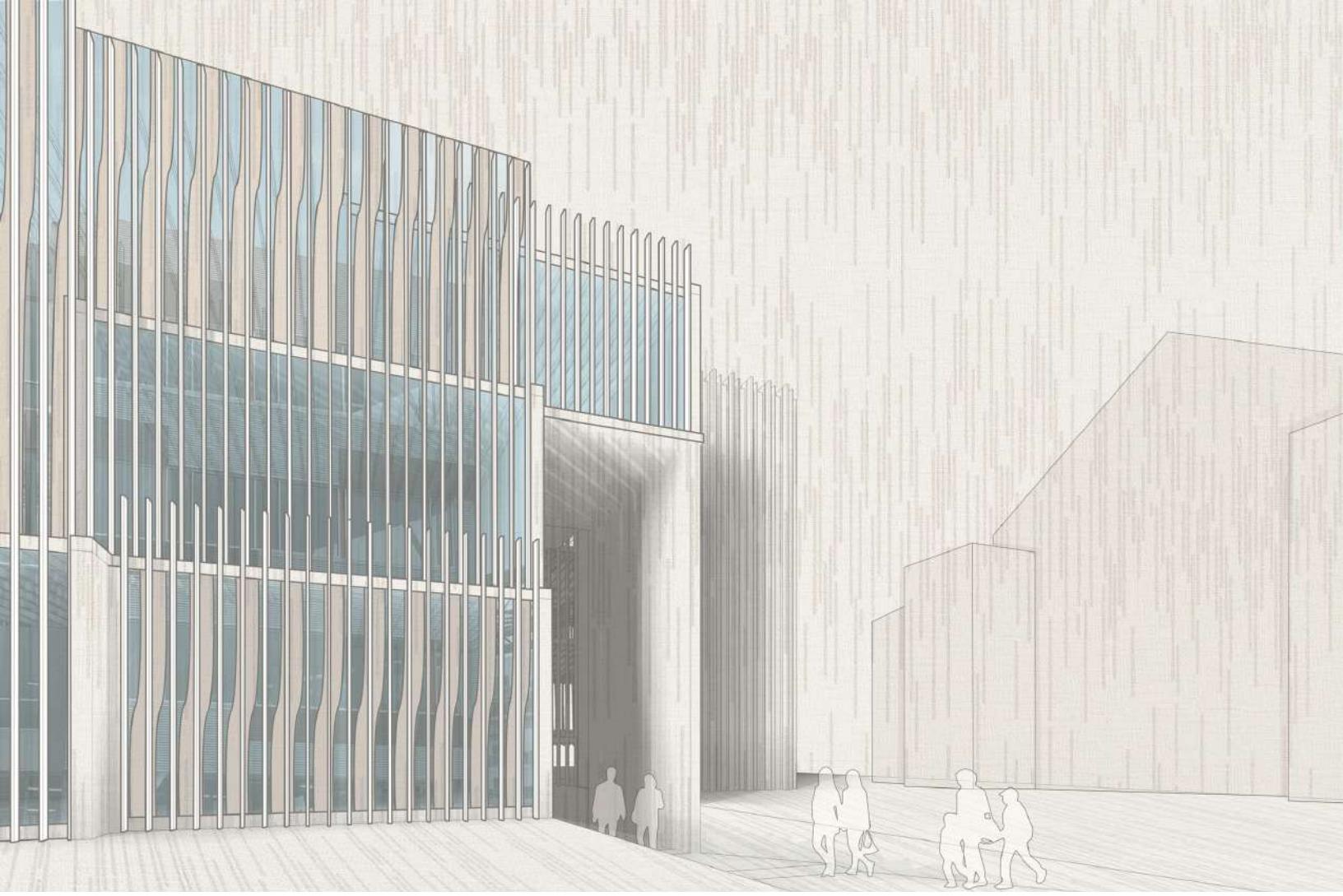
The image to the right displays the overall timber structural system of the entire building.

Circulatory Ramps

The collaborative spaces are made up of many ramps. The goal was to create a circulation throughout the entire building that the students could use more frequently to create a smooth transition from one space to another: the collaborative spaces to the environmental studios.

These ramps also act as an "endless outdoor space" by going through the entire building. This is made for rainy days when students are unable to go outside.





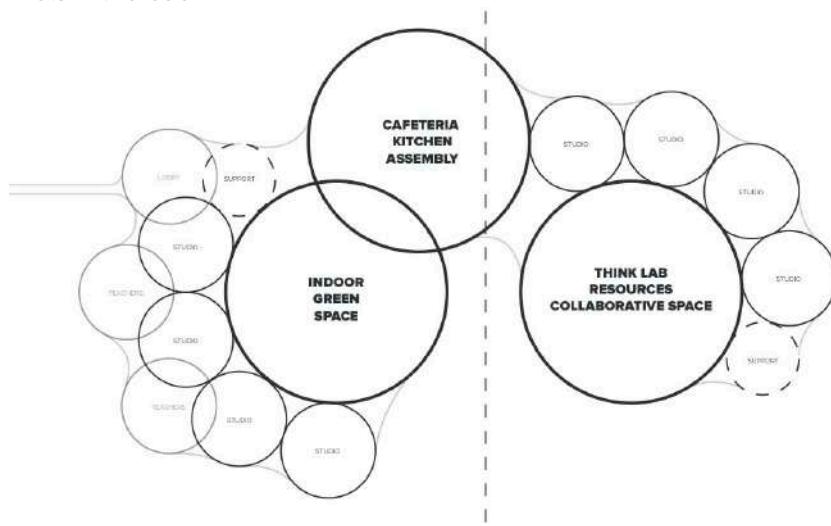
Public Passageway

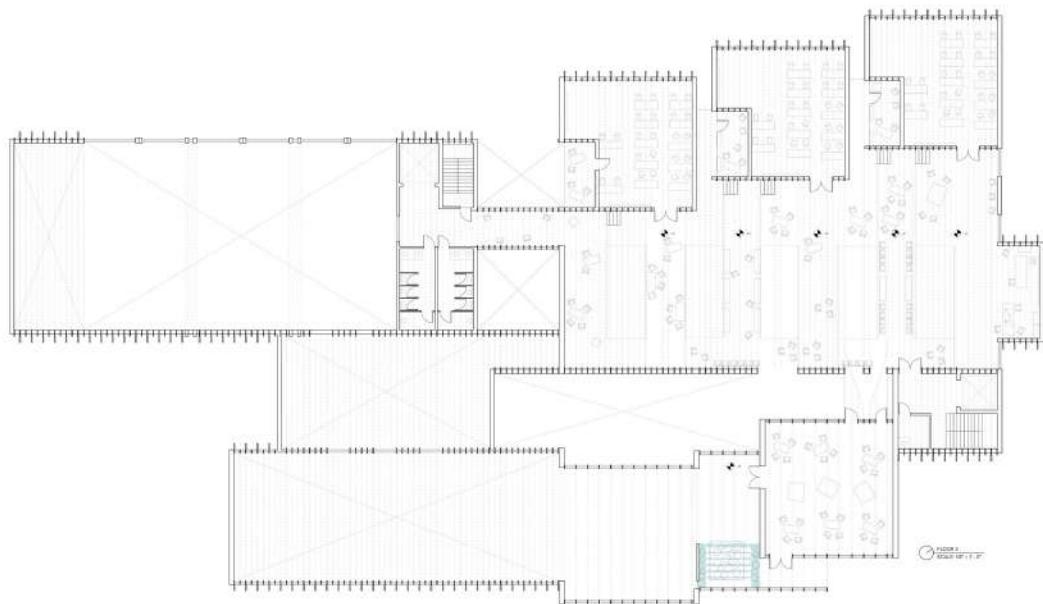
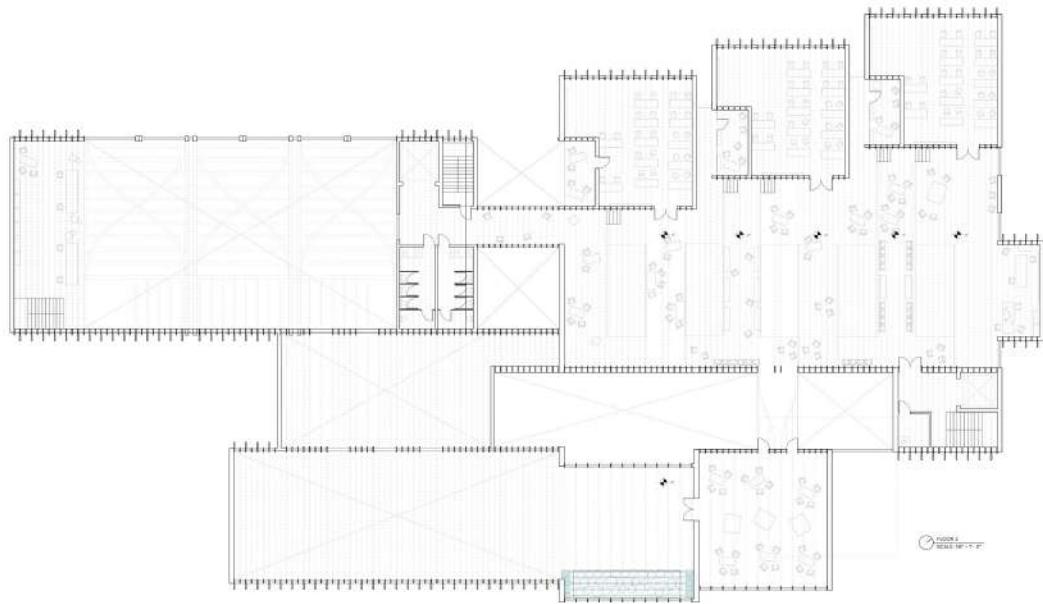
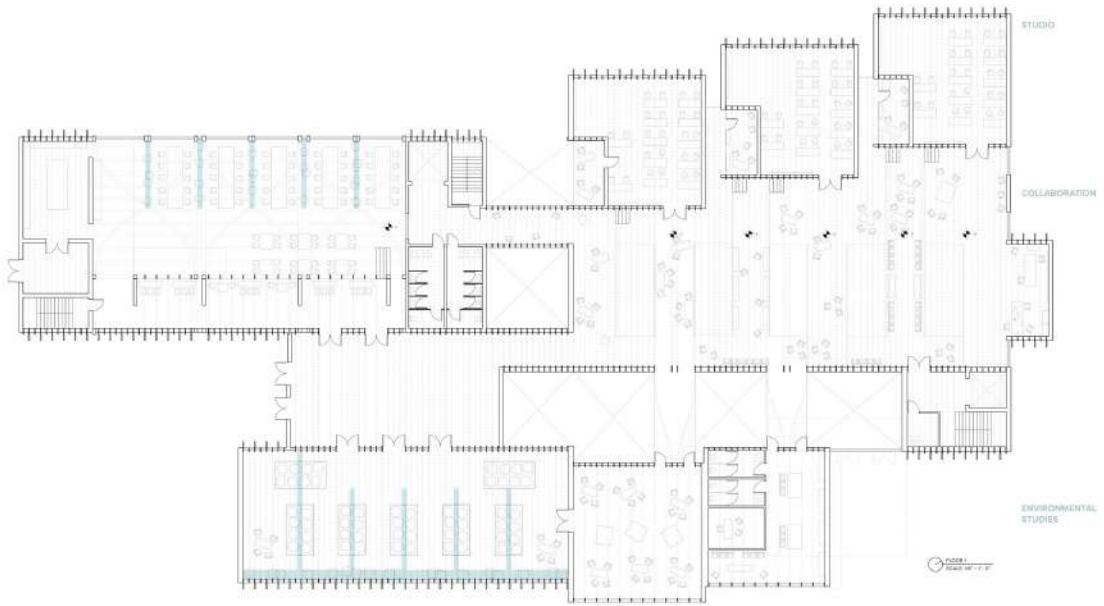
The building is divided into two major spaces by a public passageway. This public passageway directly connects with the industrial passageway across the street. It separates the green spaces and the collaborative spaces to give the opportunity to create "bridges" above this pathway to connect the two spaces.

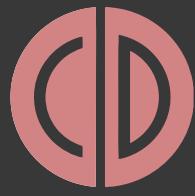
This pathway is sunken from ground level through the use of subtle ramps that go up and down the pathway. This was designed to create a distinct separation between the public and the private visitors, allowing them to interact with one another with a level of safety.

The main goal of this public passageway was to engage the community of Lawrenceville in learning about the environment by providing a passageway that leads directly to the water channels in the back.

The diagram below describes the organizational concept of the building that was separated by this central pathway.







Thank you

Please feel free to contact me if you have
any questions.

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