

Biophilic Design and Independent Senior Assisted Living

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I became interested in this topic through my personal experience with my Grandmother and the nursing home she was admitted to when I was 13 years old. Throughout her life she had a passion for gardening and a strong love for nature, especially trees. At the time it never occurred to me that more exposure to nature would have made her last few years more positive and improved her overall quality of life. The nursing home she lived in was beautiful and the staff was incredibly nice. But being located in Ohio, the majority of the year is cold and being able to enjoy nature outside is harder. If only biophilic design was treated as a priority in the design, nature would have been admired all year long creating a more nurturing and overall more comfortable home.



Table of Contents

01

Topic

Literature Review
Biophilic Design
Precedents

02

Design Agenda

Design Intent
Scale
Material
Experience

03

Program

Masterlist of Spaces
Relationships of the Space
Case Study
Diagramming

04

Site

Context and Background
Surrounding Amenities
Documentation

01

Topic

Literature Review
Precedents

Literature Review

Introduction

As the average lifespan extends and the population increases, we need to consider increasing solutions to house and care for our elderly. Currently, the majority of elderly homes are cookie cutter versions of each other with little design intent other than the ADA requirements to ensure the basic health and safety of the residents. Individuals who reside in these homes suffer from a variety of issues, from compromised mobility, to mental and physical illness. This environment increases depression, anxiety, and stress, creating a domino effect for further medical issues in addition to the neglect from a newer issue staff shortages (HRW 2021). What solutions could be incorporated into the built environment to help solve these issues?

As a society we escape to nature for healing (Seymour 2016). As we age, mobility may prevent us from experiencing nature in the way we did when we were younger. But, we must have the ability and access to continue utilizing the natural world, despite changes in mobility (NIH 2020). This literature review will discuss

the benefits and impact of nature on human beings, and how incorporating nature into the built environment can help solve these issues. One way is through the use of biophilic design. Biophilic design This literature review will also examine the current state of elderly homes, the human response to nature, and how biophilic design can stimulate the human response to nature, generating positive health effects.

Elder Care

In Japan, caring for, and living with your elders is embedded into the culture (Hayashi 2013). This was reinforced legally under the Meiji Civil Code of 1898, which stipulated the patriarchal family house system. "Under the system, the eldest son is responsible for his elderly parents, this includes other members within the extended family who are part of the same living arrangements. In return, they inherit the family's assets" (Hayashi 2013). This keeps the elders in a physical setting they are familiar with, creating less confusion as they age with the aid of individuals they recognize.

Whereas in the United States, it is considered acceptable for elders to relocate to nursing homes rather than live with family members. Besides the financial cost of putting someone in a nursing home there also is a mental cost. Elderly individuals showed effects of anxiety and depression, suffering from worse mental health outcomes (Drageset 2015). These mental illnesses are caused by a variety of factors that all contribute to and cause negative impacts on the wellbeing of the individual. They are described in five dimensions that include “emotional support, esteem support, material support, instrumental support and active support” (Drageset 2015). Material support is where nursing home patients feel like they are at home, “Older people should be able to continue their lifestyle prior to their admission to a nursing home” (Eijkelenboom 2017). Once an individual has a routine, it is very difficult to completely uproot the life they have lived for, perhaps, decades to move into a new place with unfamiliar people. The place they move to should feel like another home. There are different aspects that comprise the idea of ‘home’ to an individual. In the case of the aging, these elements can be broken down into location and the outdoors, and private and semi-public spaces. Within those spaces, home is delineated through their personal belongings as well as their ability to use technology (Eijkelenboom 2017). But Eijkelenboom, in his research has concluded, it is very

difficult to emulate a sense of home successfully and evenly. One of the most important spaces in a nursing facility that contributes to a feeling of home is a private room (Eijkelenboom 2017). A private space directly influences the individual occupying it. It is important to design a space that could potentially feel like home, but more importantly, instill comfort, safety and a sense of well-being because “most individuals do not wish to leave the home they have lived in for a long time” (Eijkelenboom 2017).

Exposure to Nature

One of the ways our wellbeing can be positively impacted, is through exposure to nature (Robbins 2020). Immersion into nature provides relaxation, inner peace, and serenity. Nature provides positive mental and physical health effects that directly translate back to an individual's life. The presence of nature “can promote social cohesion and group-based activities, aspects that are crucial for maintaining social ties, developing communities, and increasing individual's well-being” (Seymour 2016). Simply being exposed to a small amount of nature has healing power, which can spread across many aspects of an individual's life. Journalist, Jim Robbins, wrote, “it can lower blood

pressure and stress hormone levels, reduce nervous system arousal, enhance immune system function, increase self-esteem, reduce anxiety, and improve mood. Attention Deficit Disorder and aggression lessen in natural environments, which also help speed the rate of healing. In a recent study, psychiatric unit researchers found that being in nature reduced feelings of isolation, promoted calm, and lifted mood among patients” (Robbins 2020).

Findings from a study done in Wales immersing a parent and a child in nature vs. indoors showed that nature provoked positive communication and trust. The outdoor site included nature trails, and the interior space was an education center with wildlife exhibits and child-focused craft activities; “the children were significantly more talkative in the natural environment than in the indoor environment and that parent-child connected communication episodes were significantly longer in the natural environment. Additionally, both the parents and the children produced a proportionally higher number of responses in the natural environment than in the indoor environment” (Faulkner). Based on this study, the correlation between nature and communication becomes clear: exposure to nature is a key contributor to social interaction and individual development. The question now becomes, is it possible to incorporate nature into the built environment, in a way so that the same benefits occur?

Biophilic Design

Biophilic design, is one such solution. Biophilia is defined as “the innate human instinct to connect with nature and other living beings” (Vidovich). Biophilic design brings nature to the built environment by inspiring a connection with nature in a place it normally wouldn’t be. Three categories exist under biophilic design; nature in the space, natural analogues, and nature of the space. Nature in the space is defined as literally placing nature in a space, such as plants, animals, water, scent, and other natural elements. Natural analogues is the representation or addition of nature through materiality into building design such as, furniture, ornamentation, decor, colors, objects, spatial ornamentation, patterns, and shapes. Nature of the space is defined as “The incorporation of spatial elements commonly found in nature such as expansive views, places of sensory refuge (such as a quiet and dark room that simulates a cave), and a mild sense of risk (like stepping stones over a shallow pond)” (Vidovich). Through these categories, an interior ecosystem can grow, specifically designed for the occupant, and the spaces’ intended use.

Precedents

Day Center and Home for the Elderly of Blancafort designed by architect Guillem Carrera in 2013 in

Blancafort Spain, is a good example of biophilic design without the use of literal plants - nature of the space. The building uses floor to ceiling windows and glass doors that flood the space with natural light, an abundance of unfinished wood for the flooring, window treatments throughout the center, and an inner courtyard with a single olive tree. The color palette is white and grey allowing the wood to pull through, and warm the space, to create an inviting and comfortable environment for the occupants. The minimalist design allows for the elderly occupants to feel comfortable.

An example of biophilic design that uses plants - nature in the space - is the Jewel Changi Airport designed by Safdie Architects in 2019. "Jewel combines two environments—an intense marketplace and a paradise garden—to create a new community-centric typology as the heart, and soul, of Changi Airport" (Pintos 2019). The space is also accessible to the public offering a variety of "indoor gardens and leisure attractions, retail offerings, restaurants and cafes, and hotel facilities" (Pintos 2019). The space seamlessly bridges nature and a hectic airport space. From above, the space can easily be mistaken for a forest. The plant placement was designed to fool visitors into believing the space is not landscaped, creating the illusion it is wild.

Qantas Sydney First Lounge designed by Marc Newson is a pre-flight destination at the Sydney airport

in Australia and an example of natural analogues. The space includes a kitchen restaurant, lounge areas, a day-spa, a private library, personal work suites, business facilities and conference capabilities, and a full concierge service. The space is riddled with living plant walls in the lounge and spa areas. The plant walls were purposely placed in the areas where relaxation is most desired. Oak was used at least once in every other room complimented with concrete and marble with grey veins. The color palette allows for natural light to reflect and beam through the space. Biophilic design was seamlessly integrated into this space. The space is extremely cohesive and understandable, "the concept is so clearly targeted towards the desire for 'human' experiences" (Stouhi 2020).

Conclusion

Studies show that connecting with nature provides physical and mental health benefits. However, current nursing home design does not make this a priority. The elderly need multiple ways to immerse themselves in nature, especially if mobility is an issue. By using various biophilic design strategies, it is possible to mimic the health benefits provided by nature. The forthcoming design thesis seeks to examine the reinvention of the nursing home interior as it relates to biophilic design, to create a more holistic and healthy environment for all its residents.

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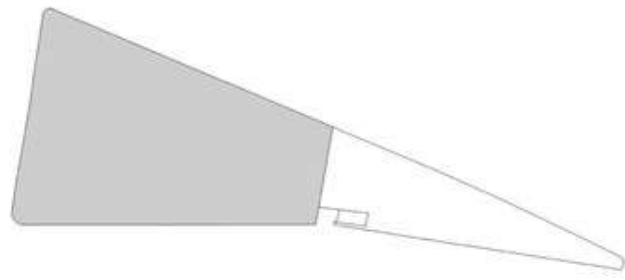
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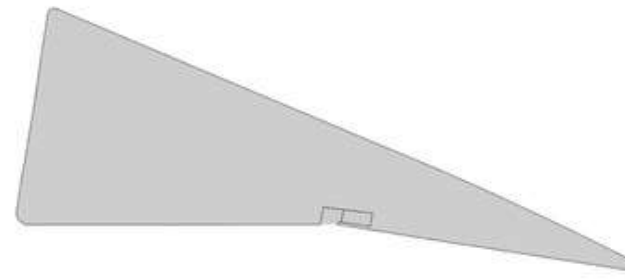
Located: Los Angeles
Opened: 2019
Architect: Lorcan O'Herlihy Architects

The building uses floor to ceiling windows and glass doors that flood the space with natural light, an abundance of unfinished wood for the flooring, window treatments throughout the center, and an inner courtyard with a single olive tree.

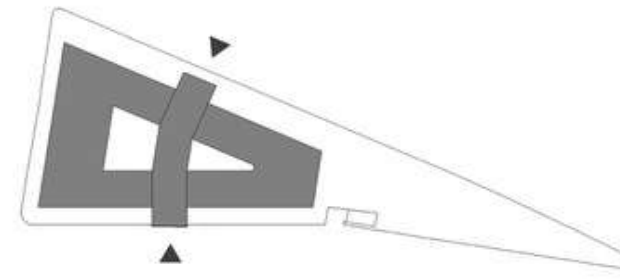
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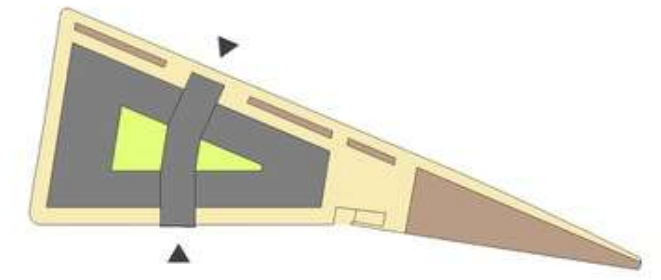
ampliació solar



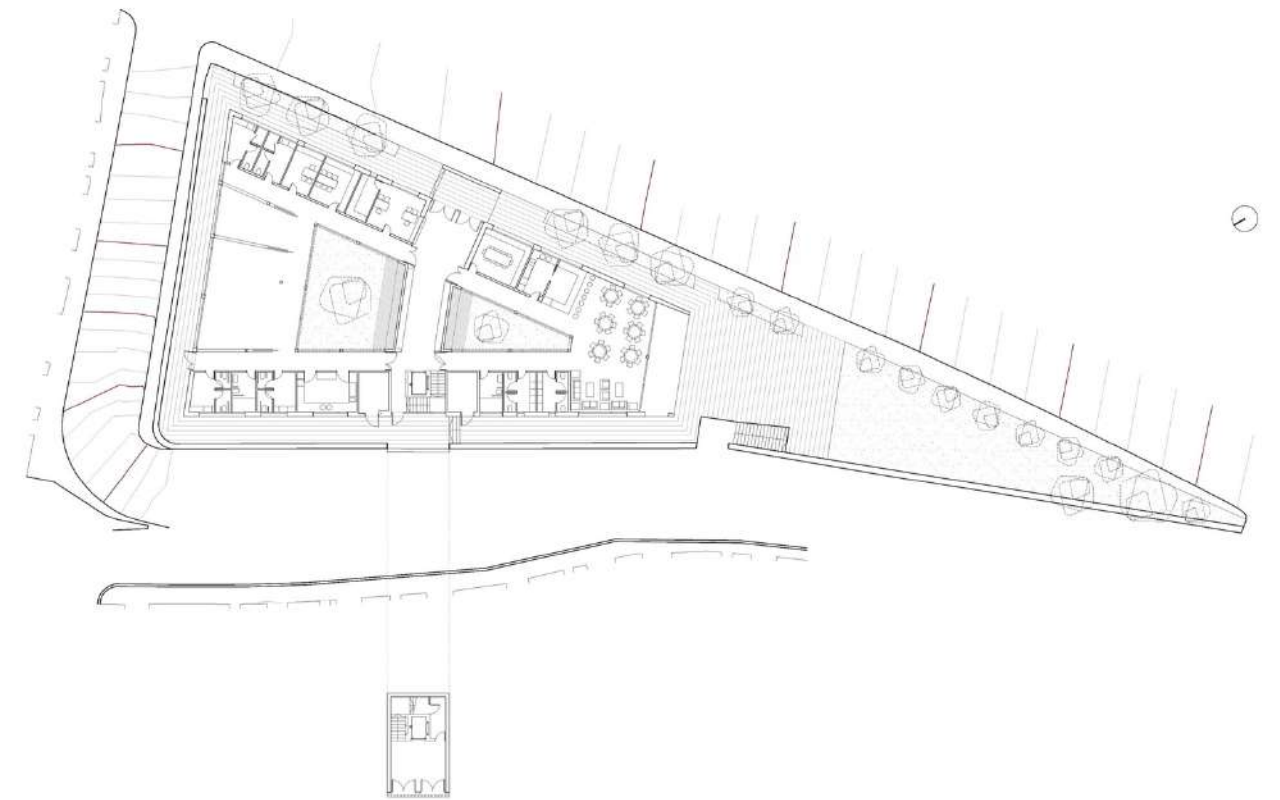
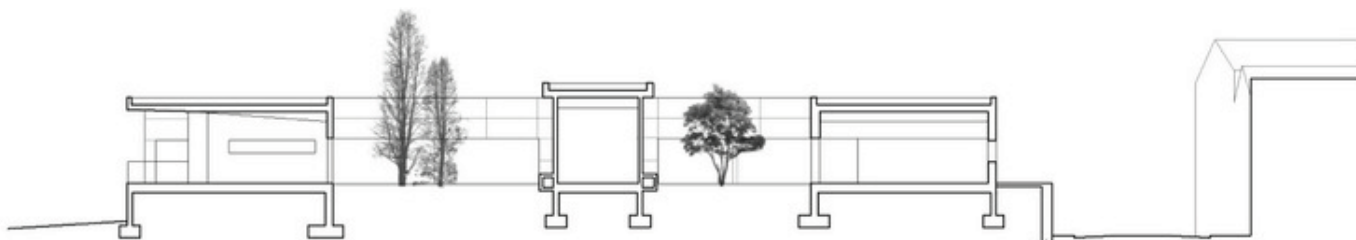
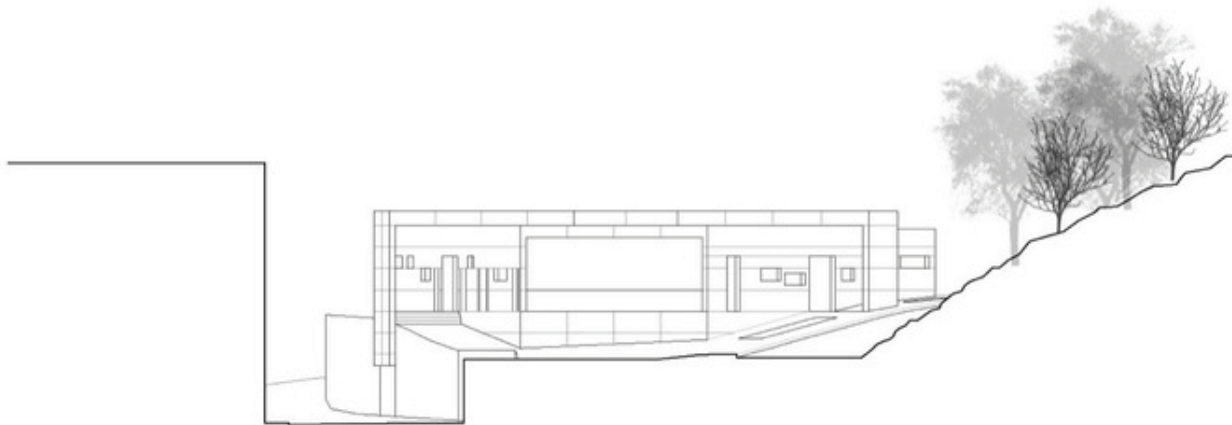
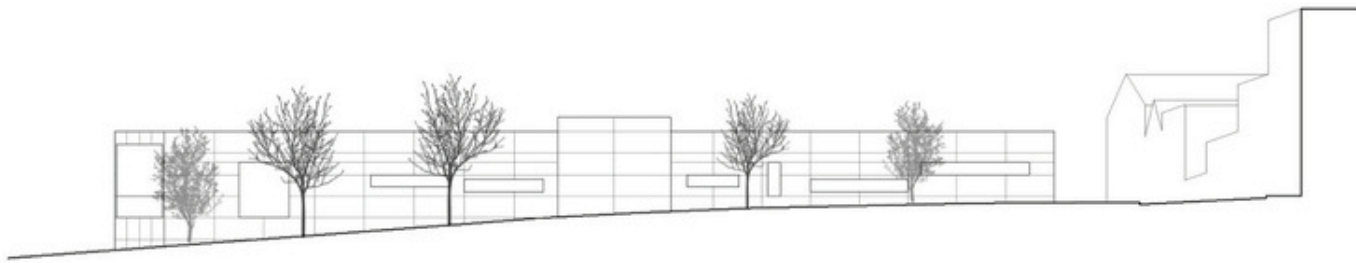
implantació edifici



zonificació



- Patis
- Zona Peatonal
- Jardí
- Edifici





Located: Changi, Singapore
Opened: 2019
Architect: Safdie Architects

Jewel combines two environments—an intense marketplace and a paradise garden—to create a new community-centric typology as the heart, and soul, of Changi Airport.

02

Design Agenda

Design Intent

Scale

Material

Experience

DESIGN PROBE I SCALE

Dried Plant Wall Kit:

- plant wall panels
- wall attachment equipment
- attachable framing
- cleaning instructions & care
- placement directions

panel system placement

1	2	3
4	5	6
7	8	9

moss panels

seamless
border



DESIGN PROBE 2 MATERIAL

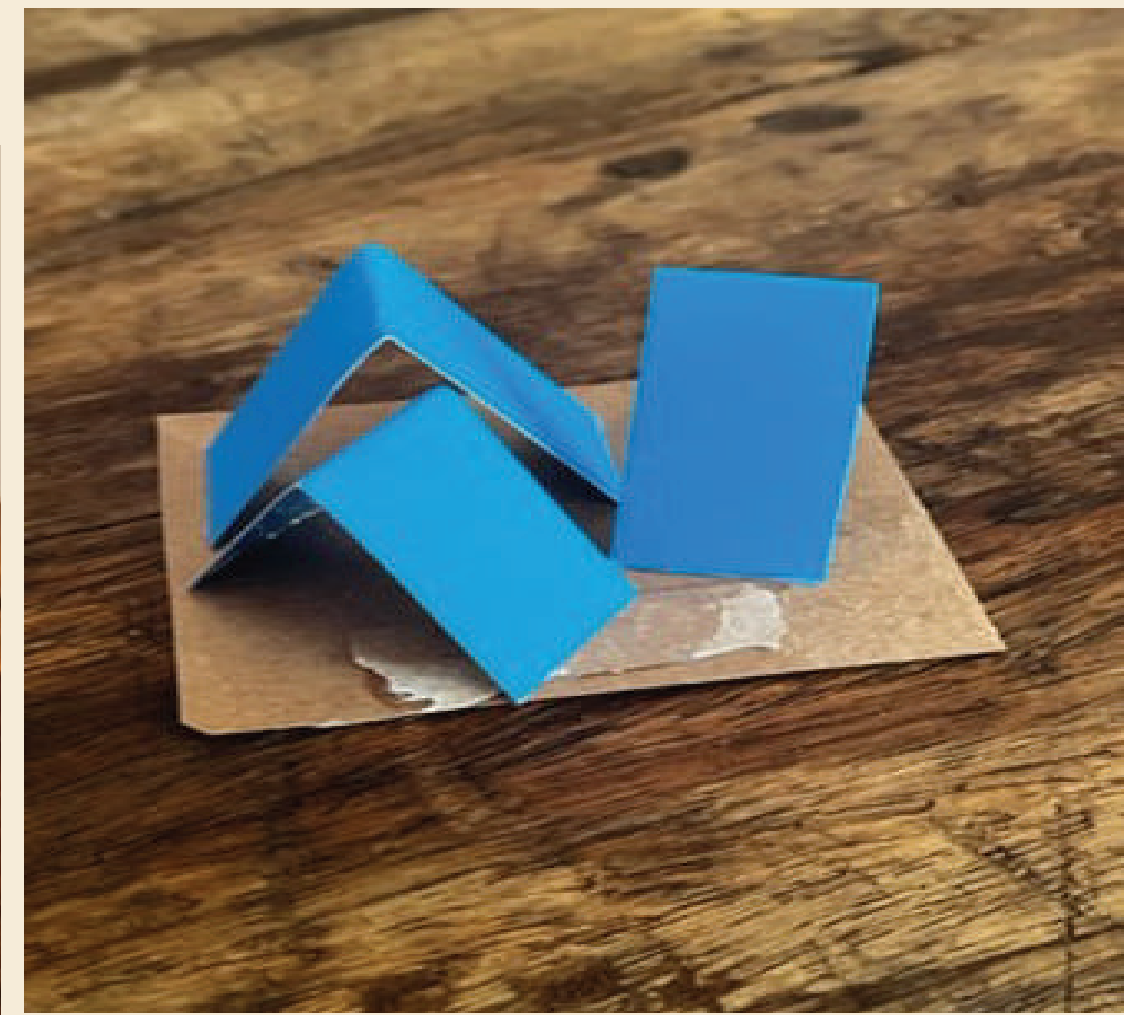
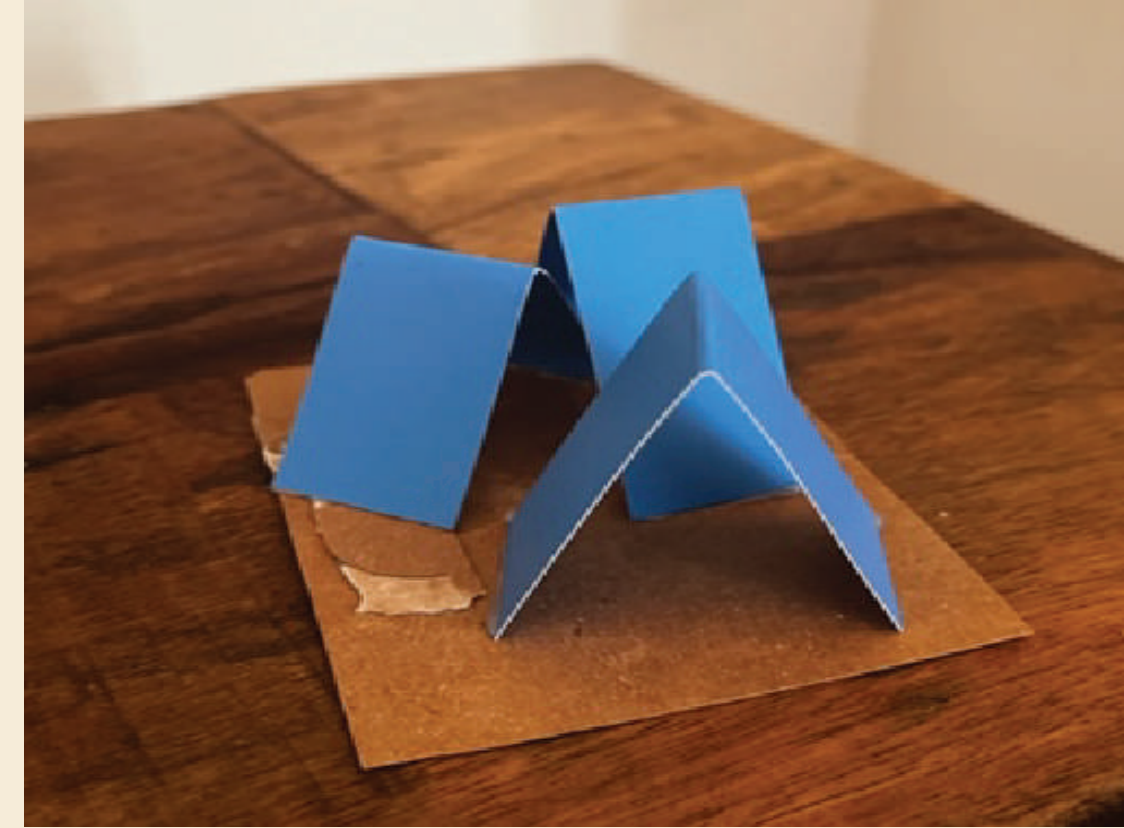
CONCEPTUAL MODELS:



MODEL 1



MODEL 2



MODEL 3

DESIGN PROBE 2

MATERIAL

Prototype Panel:

- bunny tail grass
- protea flower
- various fungus
- oak tree bark
- lichen
- moss
- leaves
- seed pods



DESIGN PROBE 3

EXPERIENCE

EXPERIENCE

Design two spaces that clearly create two very different experiences for the users, each user will spend a couple of hours in each room and then be assessed based on the experience.

ROOM 1

- *designed like a typical hospital room*
- *sterile design*
- *minimal color*
- *zero biophilic design*
- *diffused natural light*
- *bright iridescent light (cool light)*

ROOM 2

- *designed with more residential influence*
- *comforting color palette*
- *natural elements (wood, stone, etc)*
- *An abundance of natural light*
- *Warm light*
- *biophilic design throughout*

INTERVIEW

*Kate Anderson,
Physician Assistant Student &
Patient Care Technician,*

*Reading Hospital,
Orthopedics and Trauma Unit*

*Do you think there is enough natural light in the patient rooms?
No*

*Does natural light affect the patients cognitively?
Absolutely, patients with dementia and alzheimers are affected by the amount of sun. We call it sundowners; When the sun goes down, they forget alot and are not cognitively aware.*

*Is sterile design chosen over good design?
Yes, cleanliness is the top priority. Minimal color, and clean edges is normal.*

*Do you think plant life in the hospital would affect the patients?
Yes, would create a better environment for the patients that positively affects their cognitive motor functions by bringing life into certain spaces.*

*Should certain areas have more natural light than others?
Yes, the patients' rooms for sure need more natural light compared to radiology rooms and x ray rooms that need complete darkness to operate.*

03

Program

Masterlist of Spaces

Relationships of the space

Case Study

Diagramming

Program

- **Lobby / Reception**
 - Guest Check in
 - General Information
 - Security
- **Public Restroom**
 - Gender Neutral Restrooms in Public Spaces
- **Medical Clinic**
 - Emergency Medical Needs
 - Check Ups
 - General Medical Needs
- **Nurse Stations**
 - Caretaker Station
 - Resident Medical Needs
- **Kitchen**
 - Food Preparation
 - Resident Group Cooking Activities
- **Dining Area**
 - Resident Dining Area
 - Resident Guest Dining Area
 - Breakfast
 - Lunch
 - Dinner
 - Snack
- **Laundry**
 - Resident Laundry Activities
 - Staff Laundry Area
- **Salon**
 - Hair Salon and Barber

- **Community Area**
 - Resident Group Classes
 - Resident Group Exercise
 - Resident Group Learning
- **Lounge Area / Entertainment Area**
 - Resident Socializing
 - TV Area
 - Overall Relaxing Community Area
- **Resident Rooms**
 - Private Bathroom
 - Private Bed Space
 - Private Kitchen / Kitchenette
- **Outdoor Gathering / Garden**
 - Outdoor Group Activities
 - Areas to Eat
 - Areas to Relax / Lounge
 - Gardening Opportunities
- **Sacred Spaces (Meditation, Chapel, Prayer Room)**
 - Area for Religious Practice
 - Quiet Space for Spiritual Purposes
- **Gym**
 - Basic Exercise Equipment
 - Area for Group Physical Activities
- **General Store**
 - Basic Household Necessities Available
- **Library**
 - Quiet Area
 - Large Book Selection



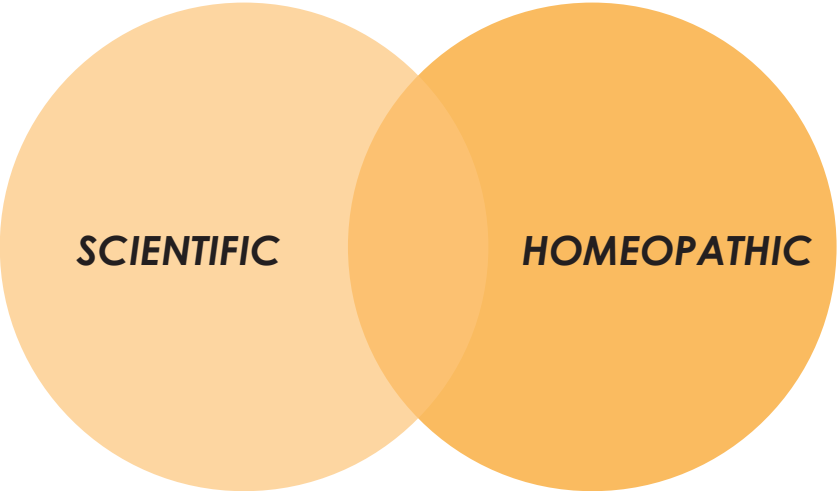
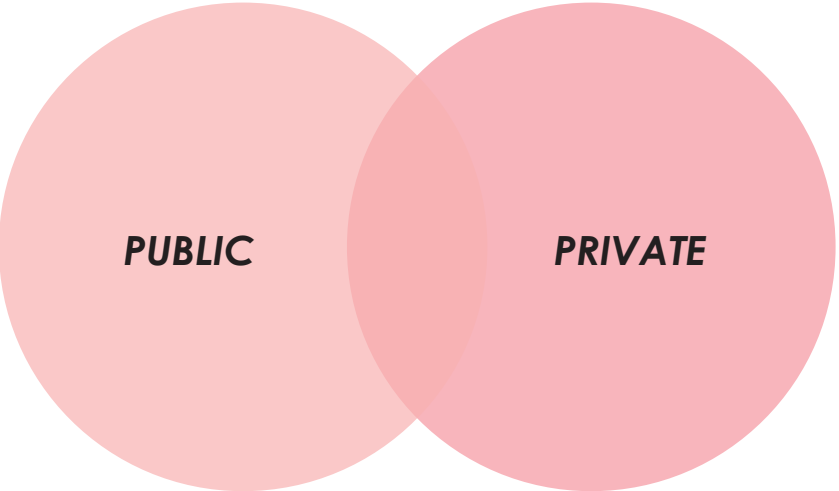
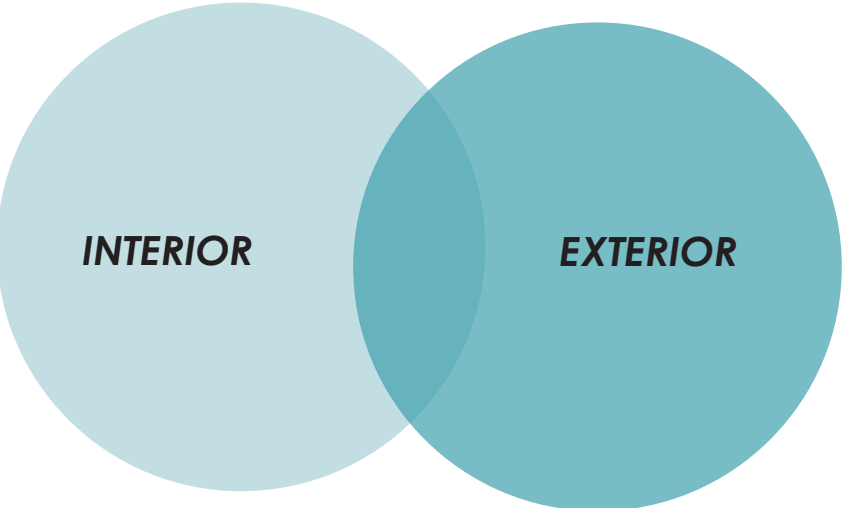
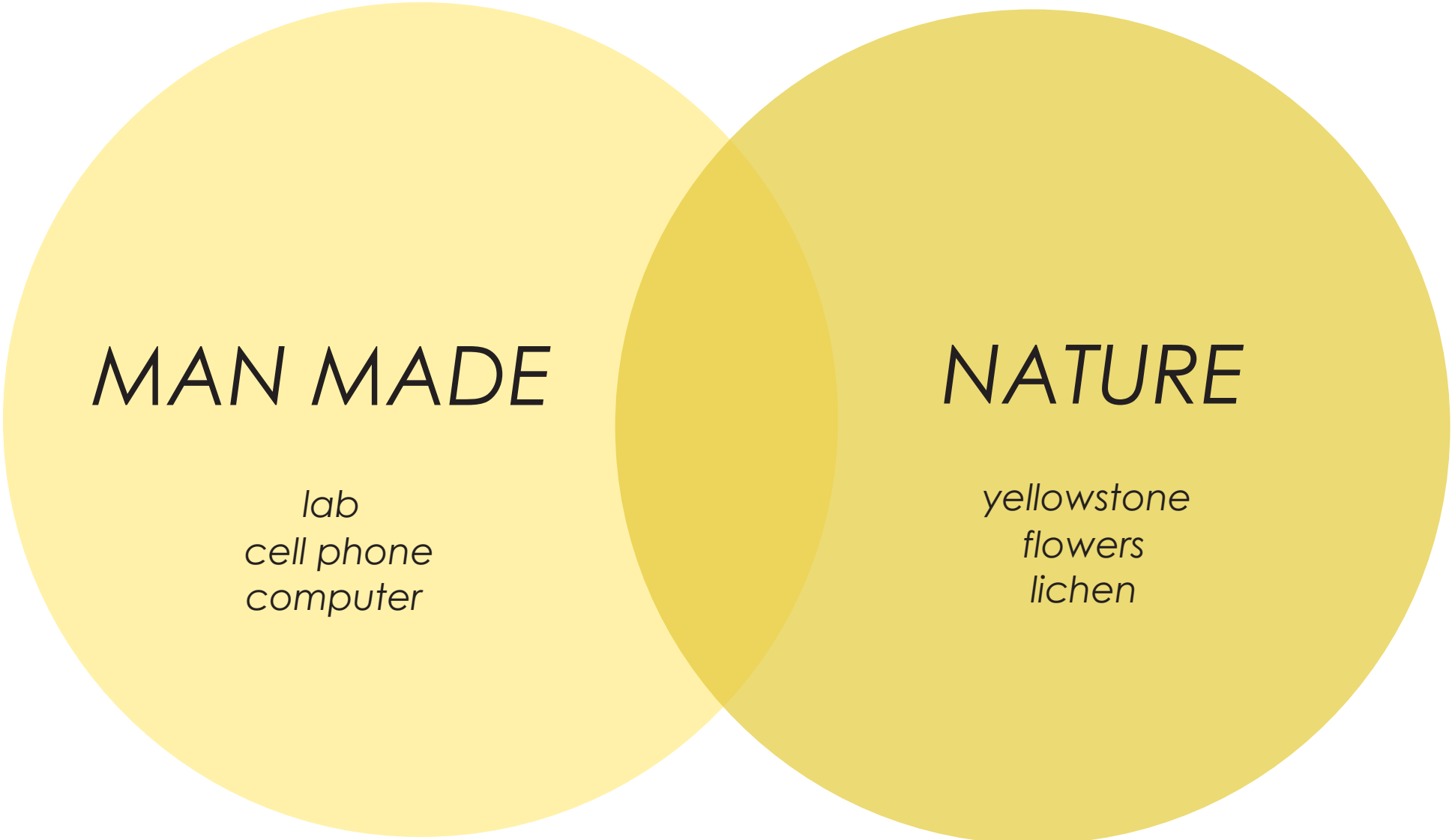
Dichotomies of the Space

MAN MADE vs. NATURE

INTERIOR vs. EXTERIOR

PUBLIC vs. PRIVATE

SCIENTIFIC vs. HOMEOPATHIC



FALLING WATER

FRANK LLOYD WRIGHT

5330 sqft

1939

■ MAN MADE vs. NATURE

■ INTERIOR vs. EXTERIOR

Originally the house was built as a vacation home for the Kauffman Family. They wanted their house near the waterfall, so Wright did the unthinkable and designed the house in coordination with the waterfall. Cantilevered terraces of local sandstone blend harmoniously with the rock formations, appearing to float above the stream below. The first floor entry, living room and dining room merge to create one continuous space, while a hatch door in the living room opens to a suspended stairway that descends to the stream below. Glass walls further open the rooms to the surrounding landscape.



FALLING WATER

FRANK LLOYD WRIGHT



INTERIOR vs. EXTERIOR

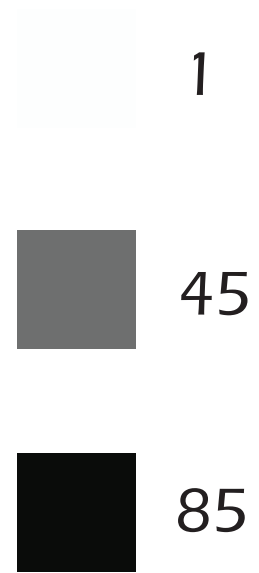


MANMADE vs. NATURE

FALLING WATER

FRANK LLOYD WRIGHT

CONTRAST STUDY



RATIO 1 : 85



PARRISH MUSEUM

Herzog & de Meuron

34510 sqft

2012

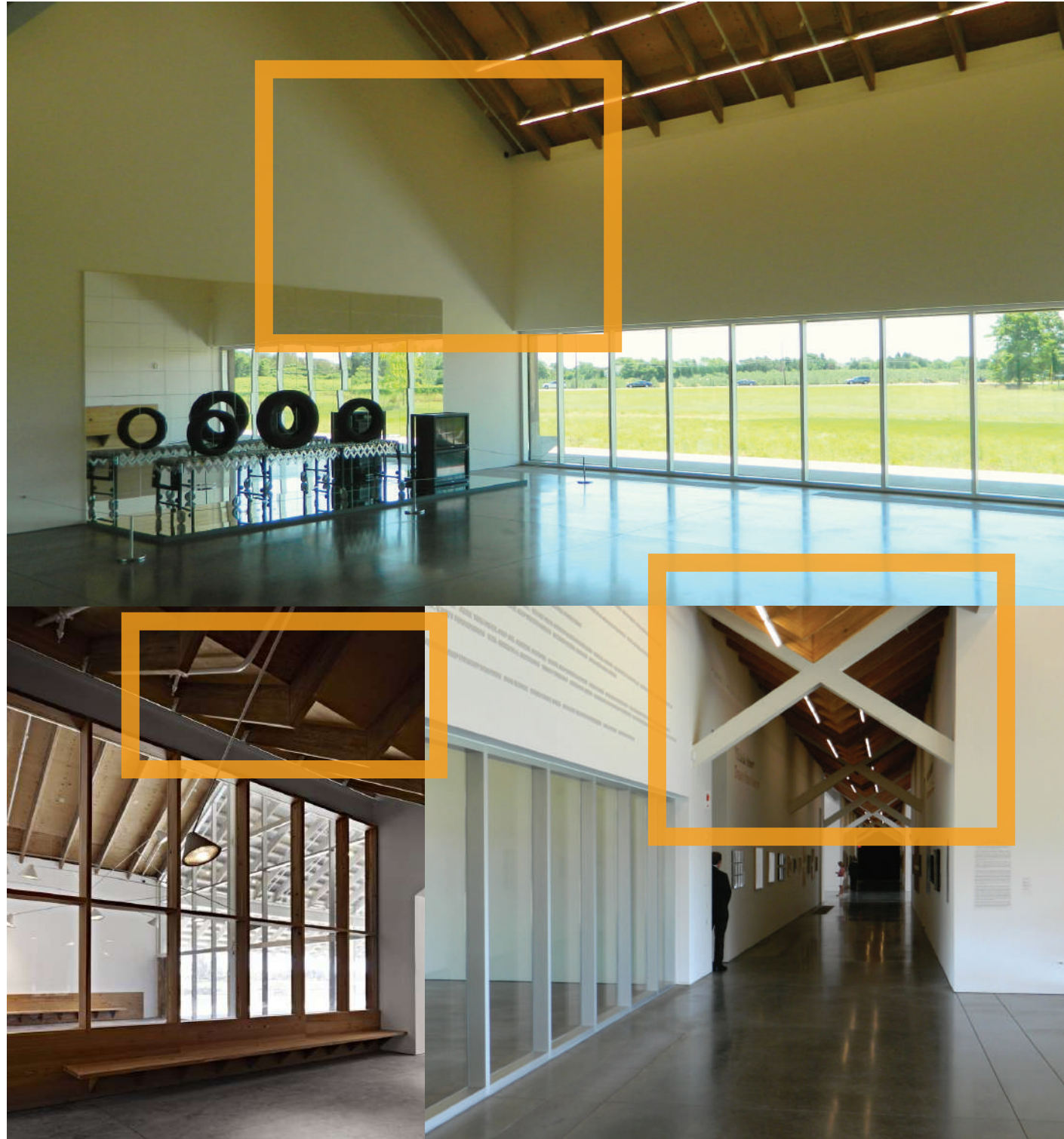
■ PUBLIC vs. PRIVATE
■ LIGHT vs. SHADOW

Inspiration behind the design came from the surrounding landscape and the architects' visits to the artists' studios. This was the starting point for the design of the Parrish Art Museum which began with the basic parameters for a single gallery space, using the proportions of a studio. Two of these galleries flank a central circulation spine that produces the simple extruded form of the building. The building has an east-west orientation to take advantage of the natural north light. The layout of the museum is designed so as to optimize the functionality of the museum with ten interior galleries.



PARRISH MUSEUM

Herzog & de Meuron



LIGHT vs. SHADOW



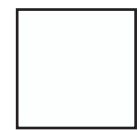
PUBLIC vs. PRIVATE

PARRISH MUSEUM

Herzog & de Meuron

CONTRAST STUDY

OF THE SPACE



1



20



40

RATIO 1 : 40

WITH OCCUPANTS



1



45



85

RATIO 1 : 85



04

Site

Context and Background
Surrounding Amenities
Documentation

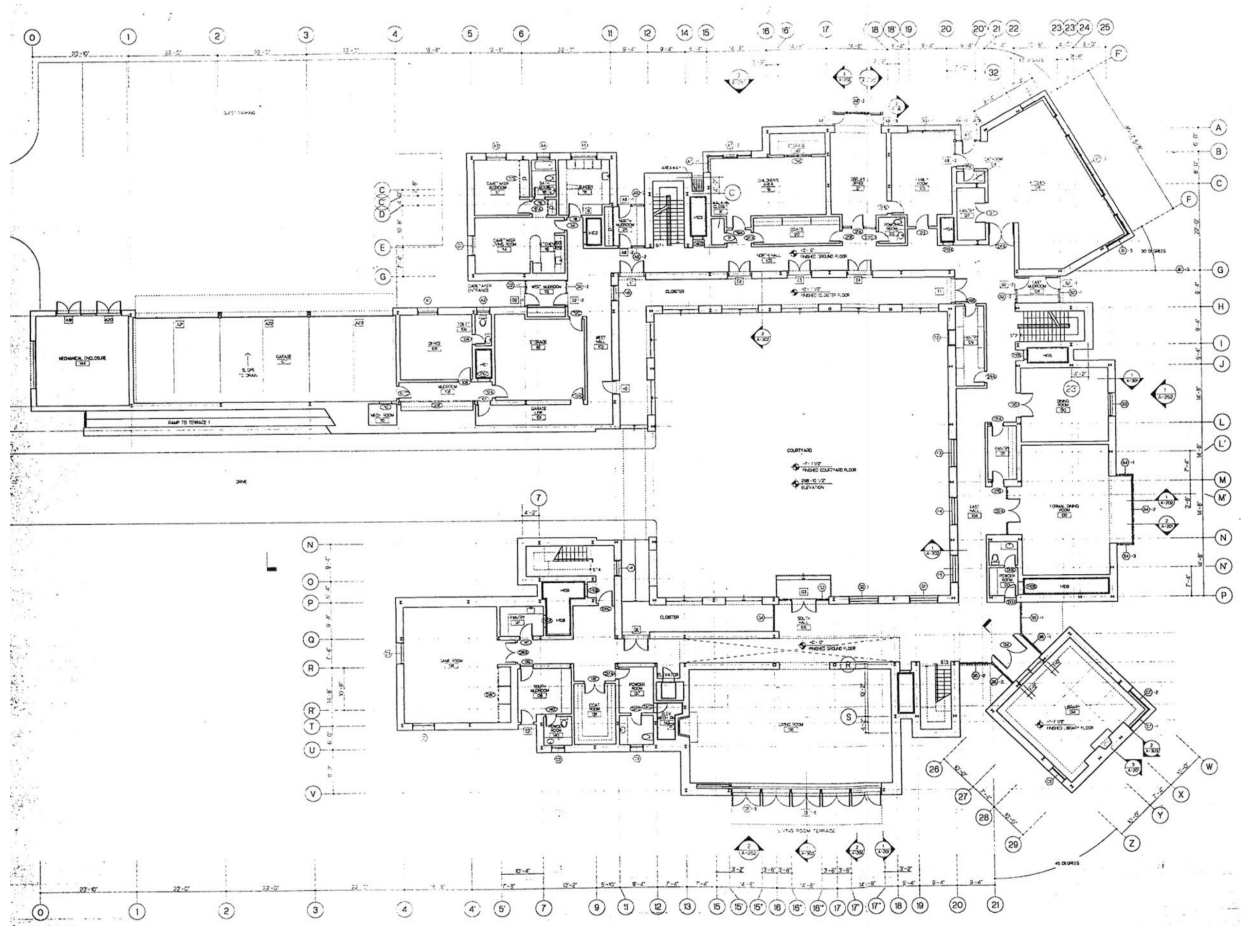
7111 SHEAFF LN

Rafael Viñoly

53,502 sqft

1998

- Fort Washington, Pennsylvania
- Located on a 70 acre plot of land
- Built in 1998 and designed by Rafael Viñoly (Rafael also designed the Kimmel Center).



7111 SHEAFF LN

Rafael Viñoly

NEARBY AMENITIES

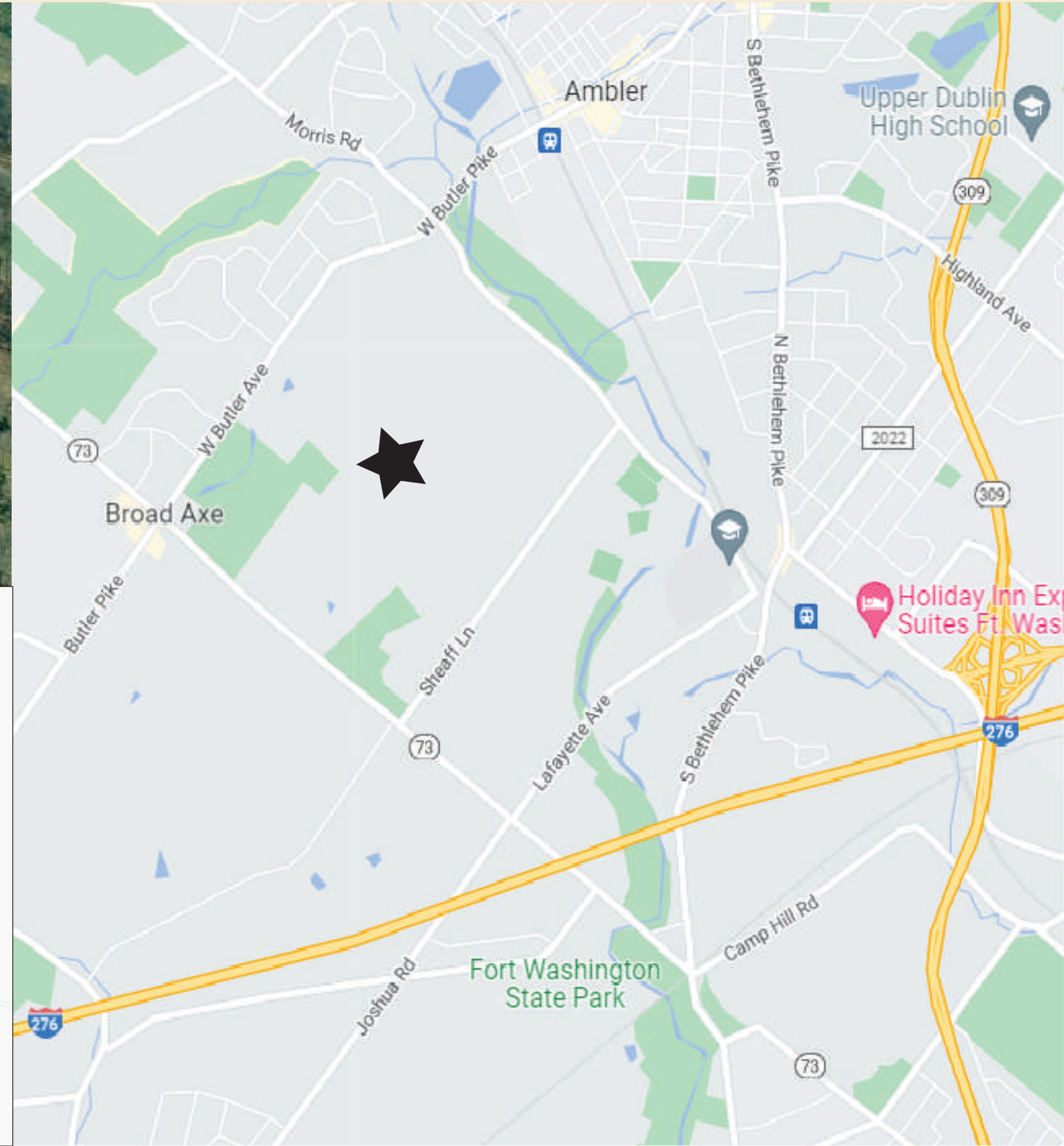
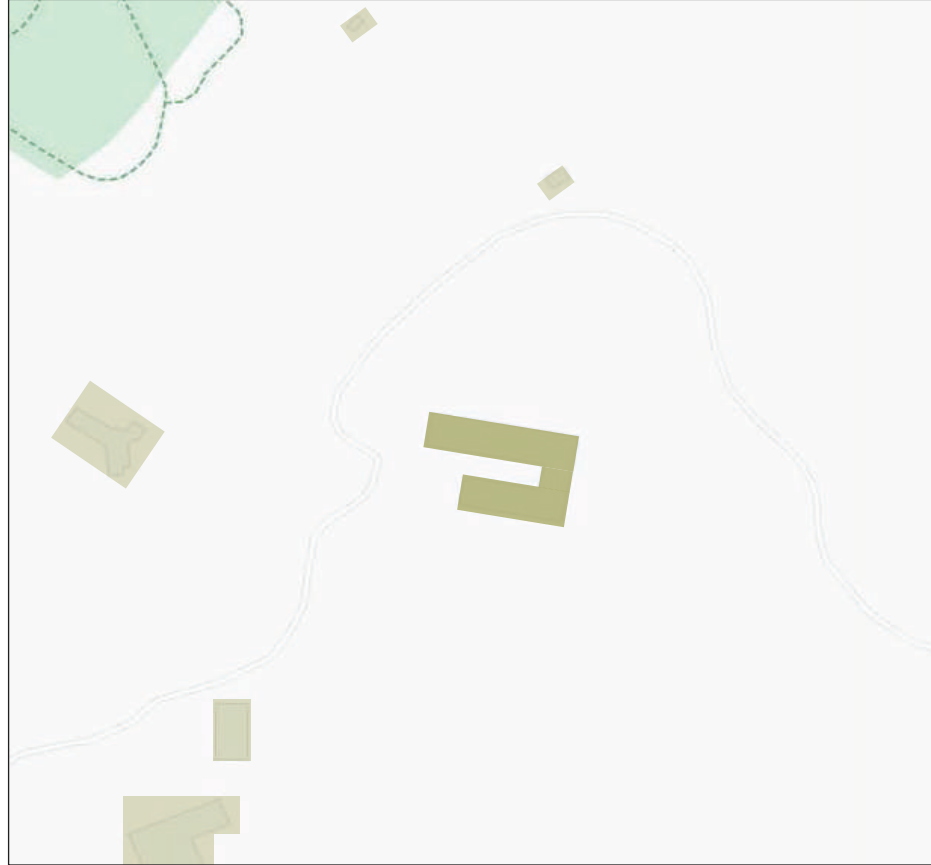
- Chestnut Hill Hospital, 3.1 miles
- GIANT Grocer, 4.5 miles
- King of Prussia Mall, 12.1 miles
- PHL Airport, 28.7 miles
- 30th St Station, 16.9 miles

- Lower Merion Synagogue, 16.2 miles
- Church of St. Martin, 6.2 miles
- Muhammad Mosque, 13.1 miles

- Plymouth Performing Arts, 3.5 miles
- Movie Tavern Flourtown, 2.8 miles
- Best Western Inn, 3.3 miles



Site Map



Biophilic Design

Nature in the Space



Nature in the Space addresses the direct, physical and ephemeral presence of nature in a space or place. This includes plant life, water and animals, as well as breezes, sounds, scents and other natural elements.

Natural Analogues



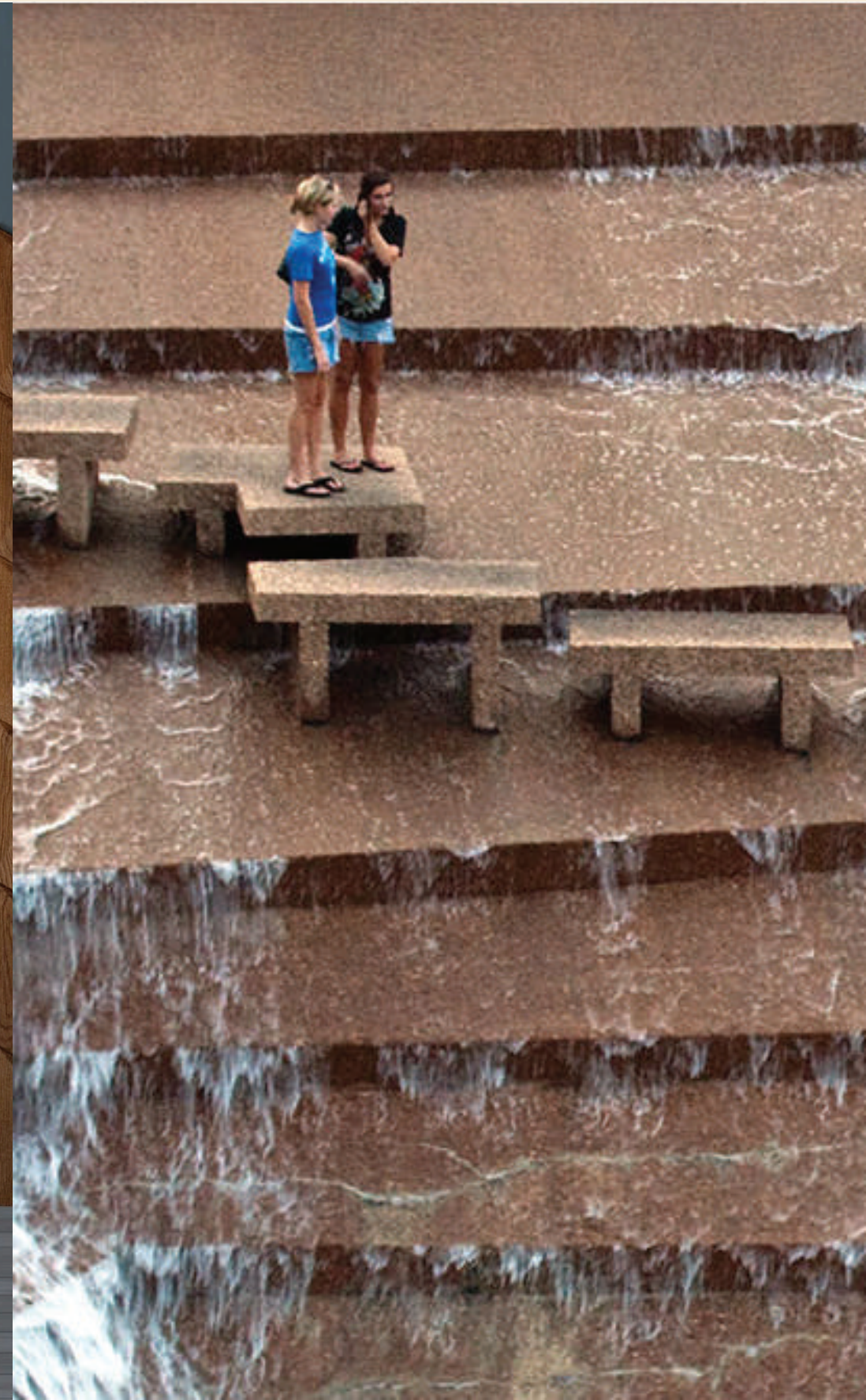
Natural Analogues addresses organic, non-living and indirect evocations of nature. Objects, materials, colors, shapes, sequences and patterns found in nature, manifest as artwork, ornamentation, furniture, décor, and textiles in the built environment.

Nature of the Space



Nature of the Space addresses spatial configurations in nature. This includes our desire to be able to see beyond our immediate surroundings, our fascination with the unknown; obscured views and revelatory moments.

Biophilic Design



Implementation

Nature in the Space

- Stimulating views to elements of nature.
- Interactions that stimulate our other senses of sound, touch, and smell.
- Subtle changes in air and surface temperature, humidity and airflow.
- Plant features in the space, direct nature.
- Presence of water.

 **MAN MADE vs. NATURE**

 **INTERIOR vs. EXTERIOR**

 **PUBLIC vs. PRIVATE**

Natural Analogues

- Patterns, shapes, textures or numerical arrangements found in nature.
- Using materials, grains, textures and elements in design that distinctly reflect the environment
- Symmetries, hierarchies and geometries found in nature

 **MAN MADE vs. NATURE**

 **LIGHT vs. SHADOW**

Nature of the Space

- Reflecting light off of a surface.
- Oversized windows
- Skylights
- Mezzanine level
- Open-plan spaces
- Glass or transparent partitions and
- Walls to rooms that provide uninterrupted views.

 **INTERIOR vs. EXTERIOR**

 **PUBLIC vs. PRIVATE**

Client Profile

Hospice Care

Rehabilitation

Skilled Nursing

60

70

80

90

100

Nursing Home

Assisted Independent Living

Residential living



Transferring



Dressing



Washing



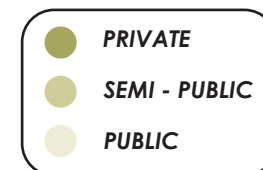
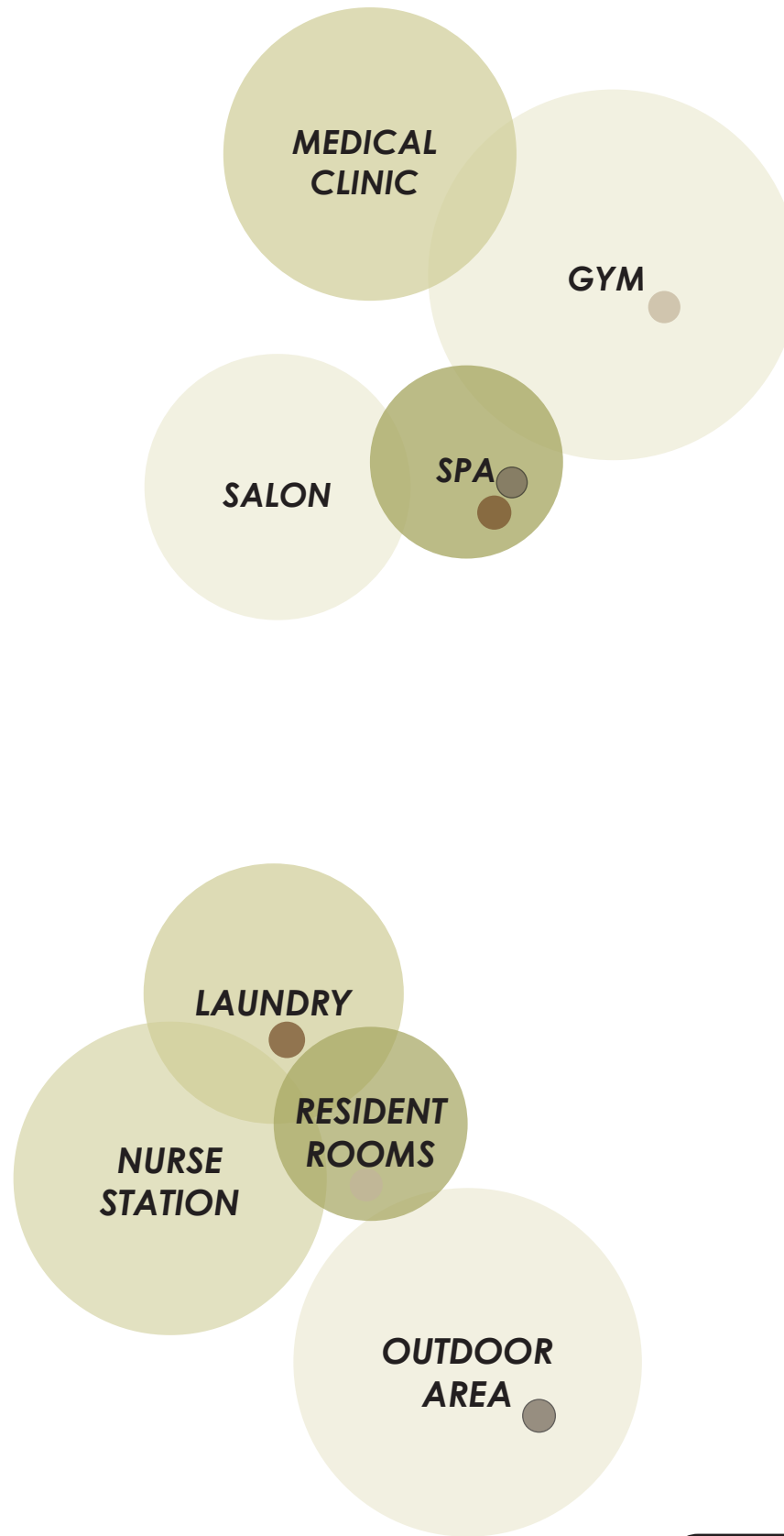
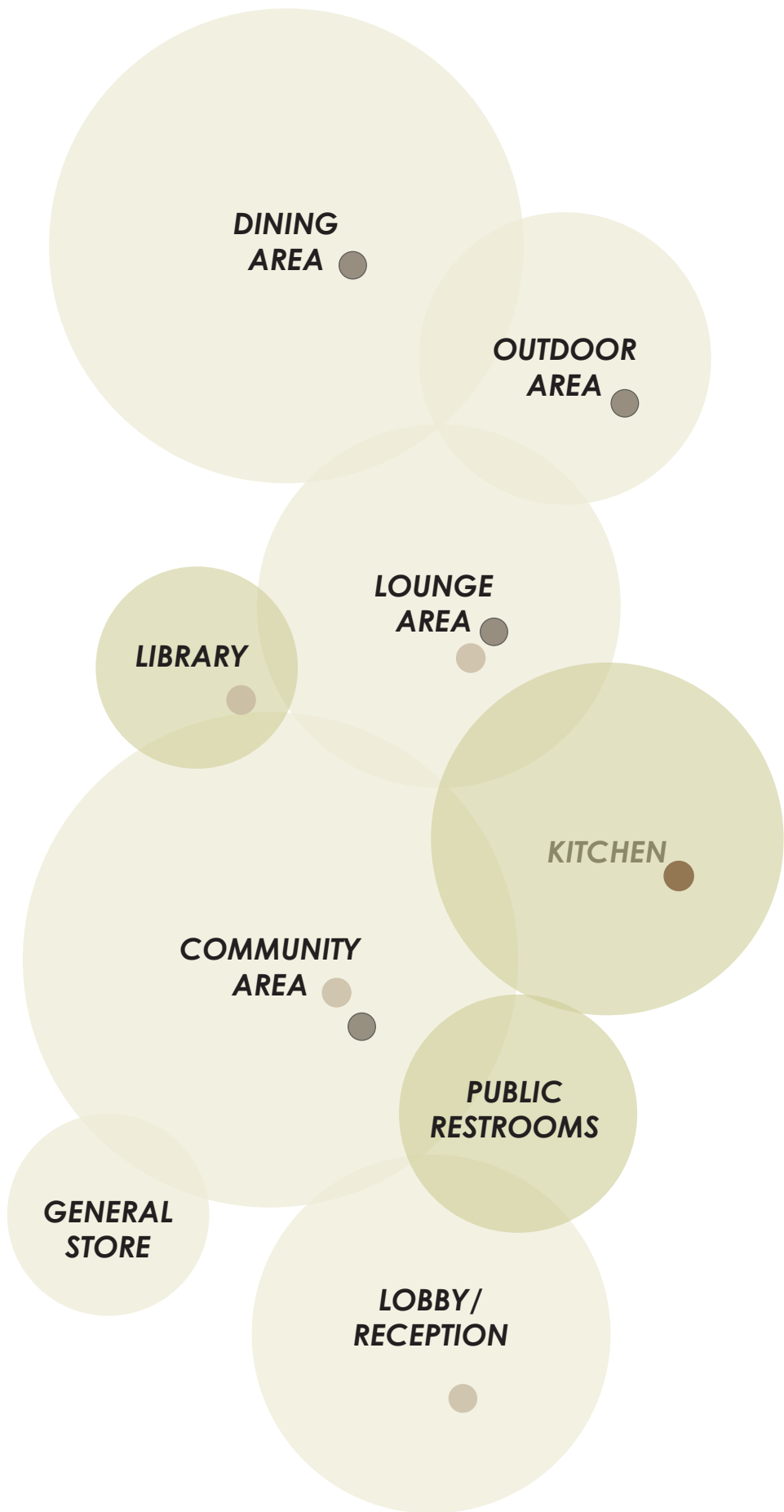
Eating



Toileting

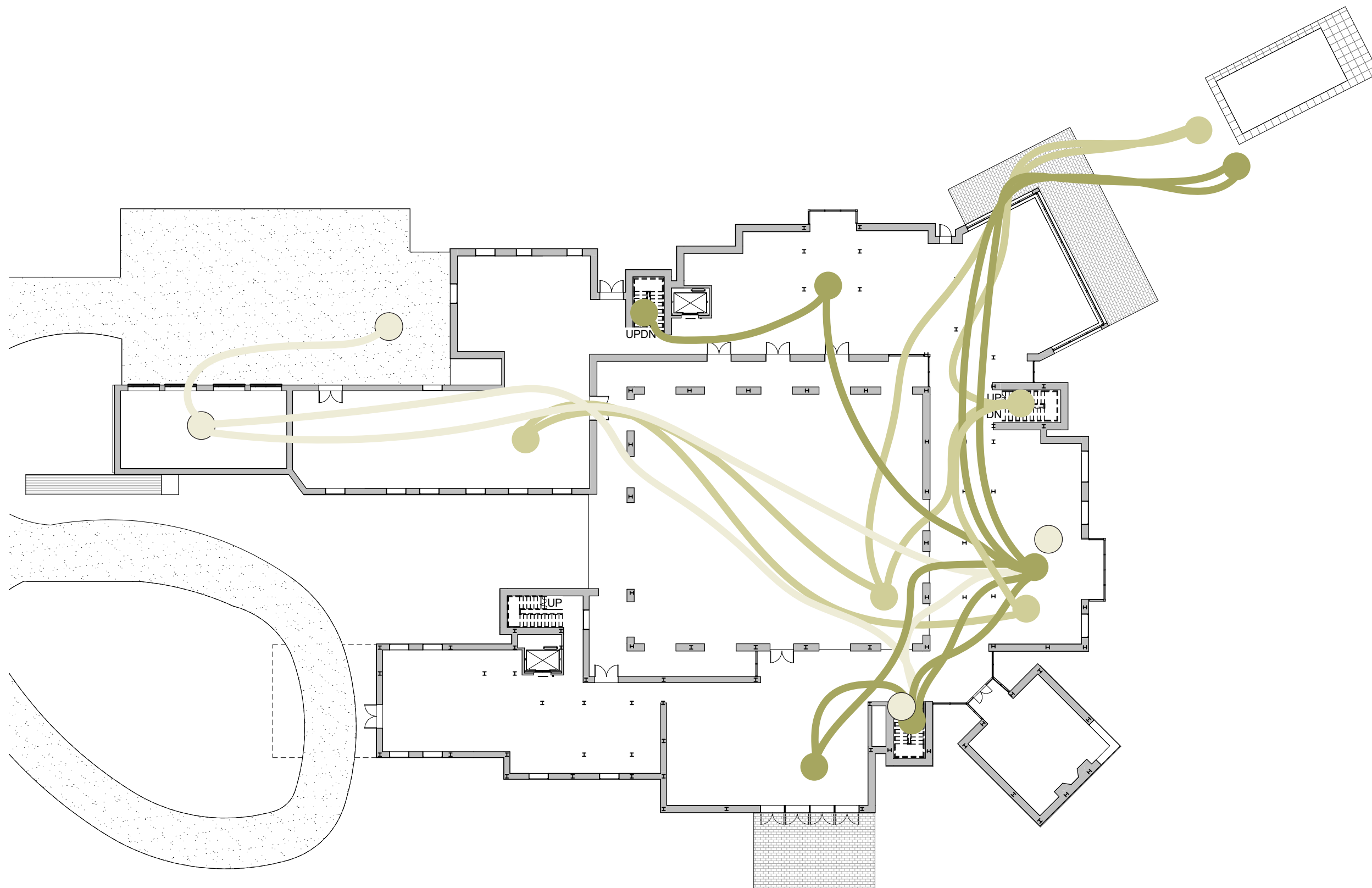


Mobility



- Lobby / Reception**
Guest Check in
General Information
Security
- Public Restroom**
Gender Neutral Restrooms in Public Spaces
- Medical Clinic**
Emergency Medical Needs
Check Ups
General Medical Needs
- Nurse Stations**
Caretaker Station
Resident Medical Needs
- Kitchen**
Food Preparation
Resident Group Cooking Activities
- Dining Area**
Resident Dining Area
Resident Guest Dining Area
Breakfast
Lunch
Dinner
Snack
- Laundry**
Resident Laundry Activities
Staff Laundry Area
- Salon**
Hair Salon and Barber
- Community Area**
Resident Group Classes
Resident Group Exercise
Resident Group Learning
- Lounge Area / Entertainment Area**
Resident Socializing
TV Area
Overall Relaxing Community Area
- Resident Rooms**
Private Bathroom
Private Bed Space
Private Kitchen / Kitchenette
- Outdoor Gathering / Garden**
Outdoor Group Activities
Areas to Eat
Areas to Relax / Lounge
Gardening Opportunities
- Spa / Bathhouse**
Public and Private Spa Activities
- Gym**
Basic Exercise Equipment
Area for Group Physical Activities
- General Store**
Basic Household Necessities Available
- Library**
Quiet Area
Large Book Selection

Circulation Diagram



Resident no. 1
Needs help with one ADL

- Morning Hygiene
- Dressing
- Breakfast
- Morning Swim
- Lunch
- Community Bingo
- Rest / Nap
- Dinner
- Reading
- Evening Hygiene
- Sleep

Caretaker
Aids Resident no. 1

- Clocks into Work
- Administer Medication
- Aid Mobility / Toileting
- Meal Break
- Administer Medication
- Aid Mobility / Toileting
- Meal Break
- Aid Mobility / Toileting
- Administer Medication

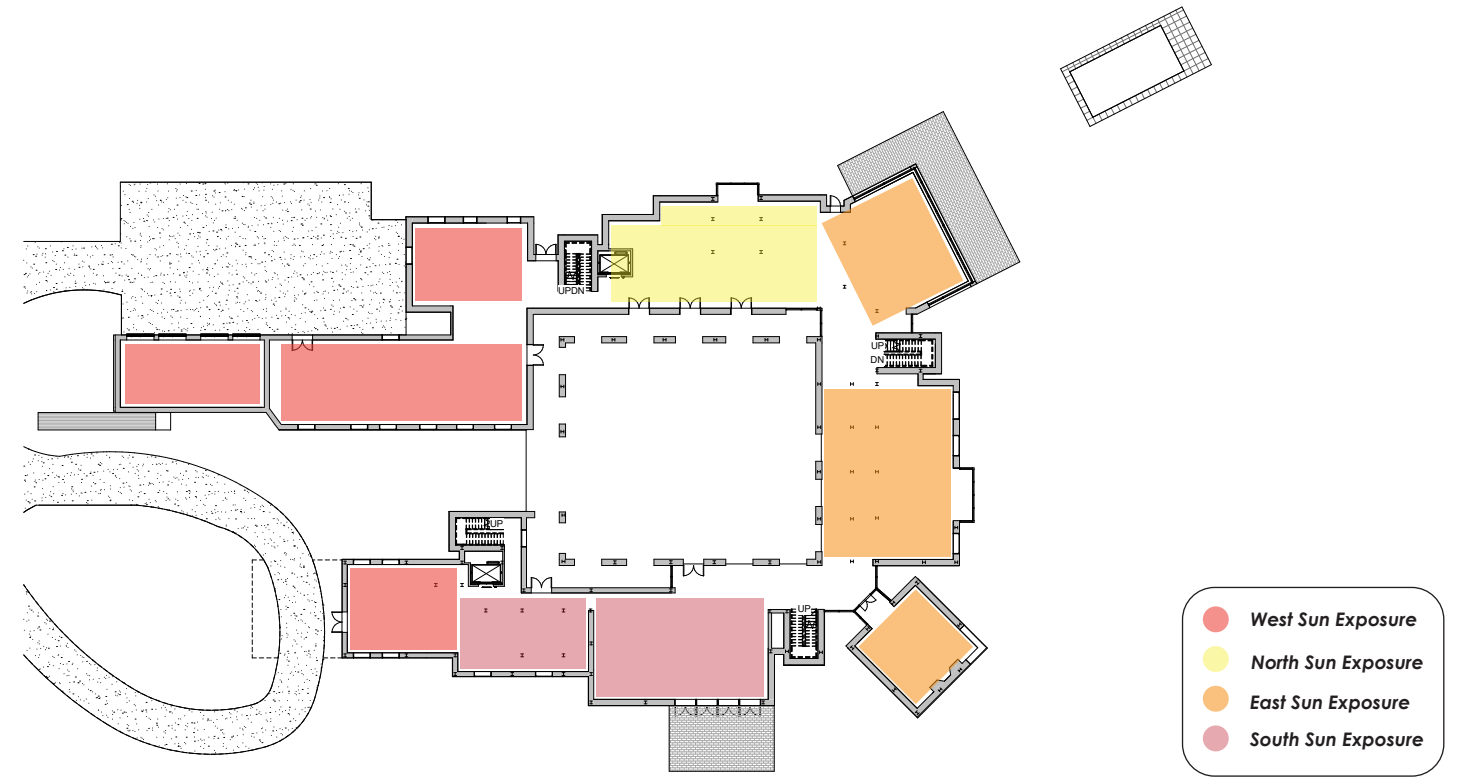
Resident no. 2
Does not need help with ADL

- Morning Hygiene
- Dressing
- Breakfast
- Morning Workout
- Lunch
- Afternoon Swim
- Rest / Nap
- Dinner
- Watch TV
- Evening Hygiene
- Sleep

First Floor



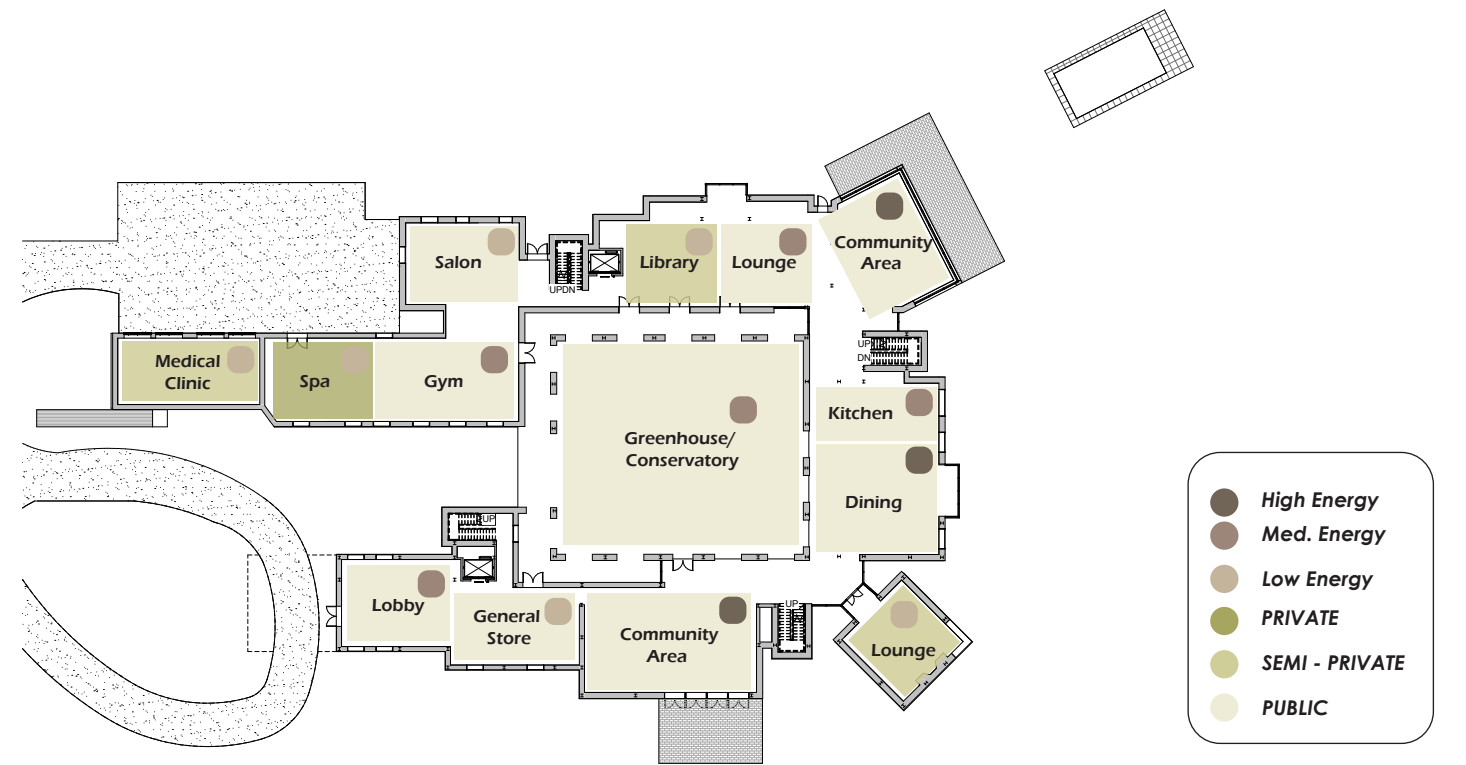
First Floor Supporting Diagrams



Natural Light Diagram



Blocking Diagram



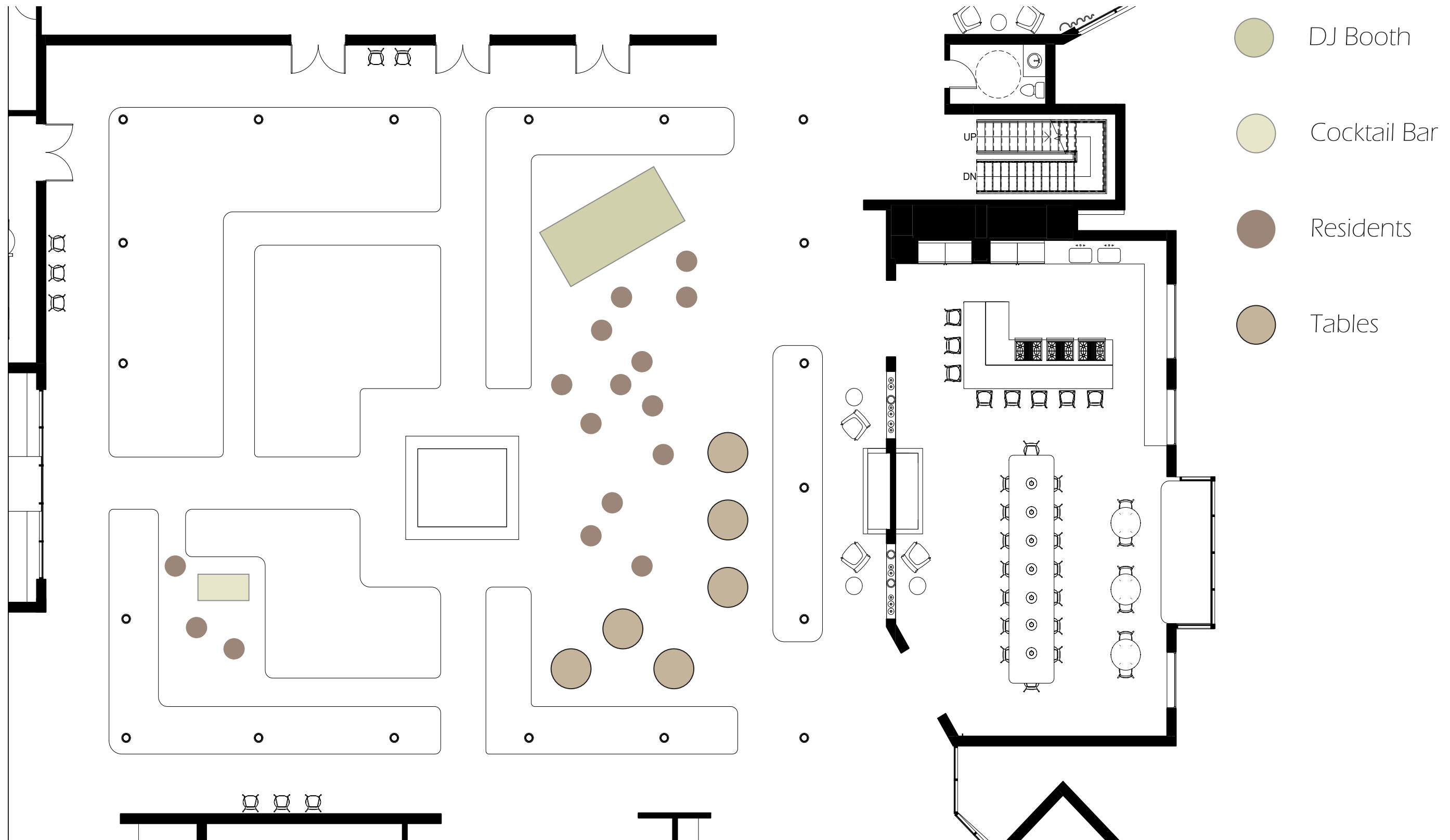
Energy Density Diagram

Vegetation Type Diagram



- Vegetables / Herbs
- Vegetables / Ornamental
- Ornamental Foliage

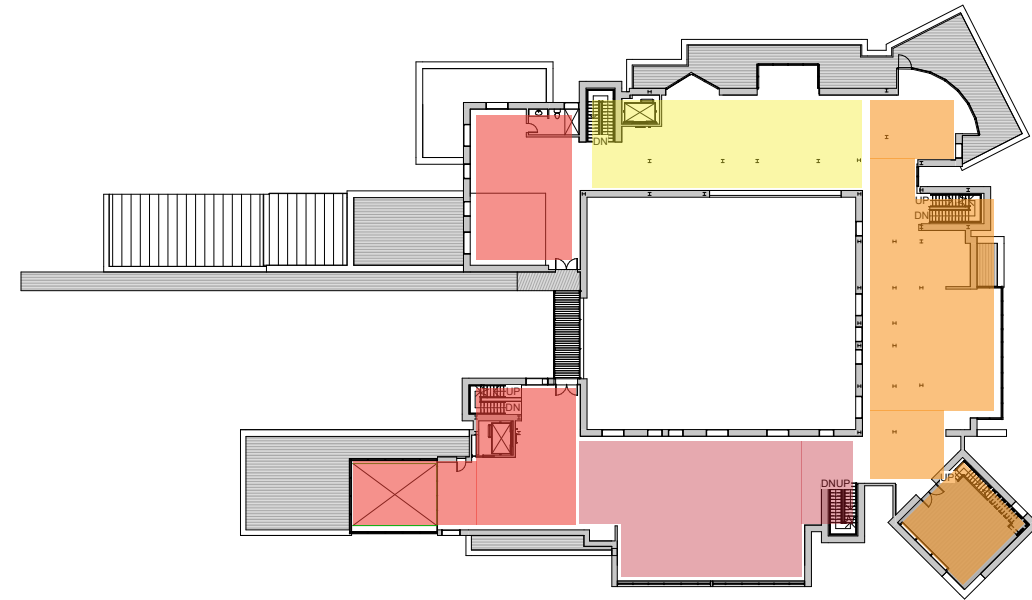
Transformable Space Diagram



Second Floor

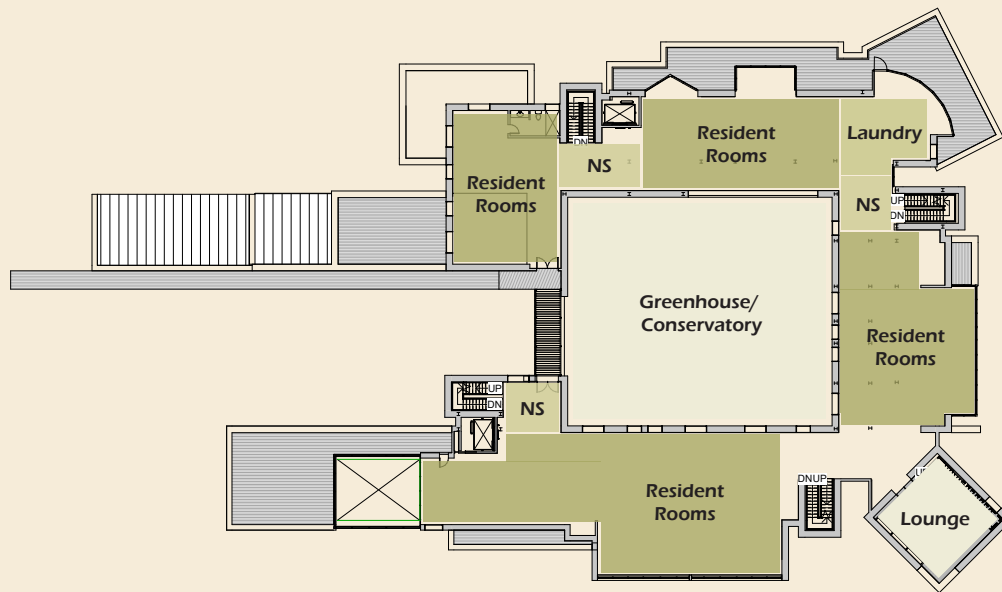


Second Floor Supporting Diagrams



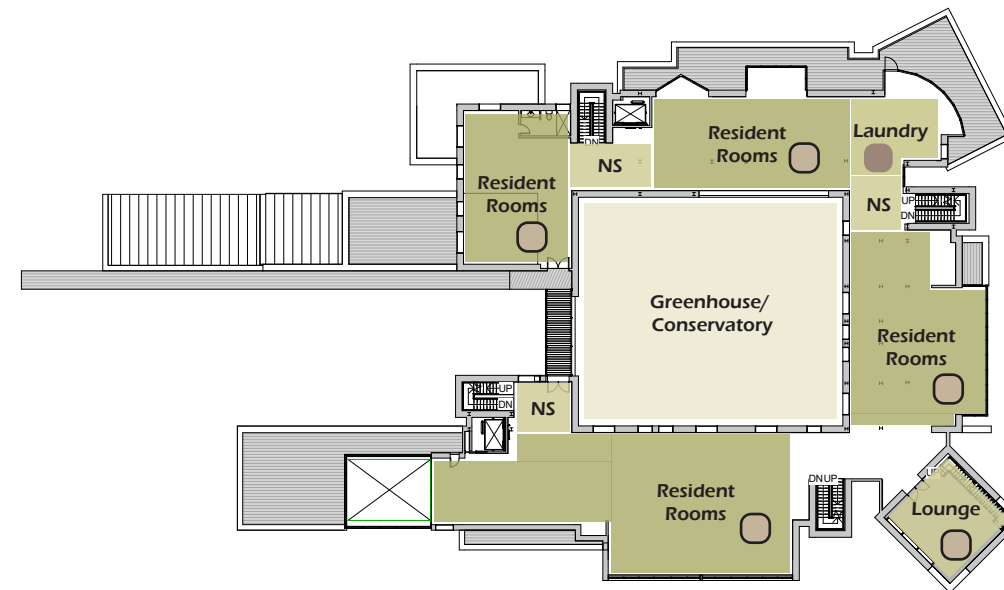
- West Sun Exposure
- North Sun Exposure
- East Sun Exposure
- South Sun Exposure

Natural Light Diagram



- PRIVATE
- SEMI - PRIVATE
- PUBLIC

Blocking Diagram



- High Energy
- Med. Energy
- Low Energy
- PRIVATE
- SEMI - PRIVATE
- PUBLIC

Energy Density Diagram

Stoop Culture Diagram



Coffee / Tea



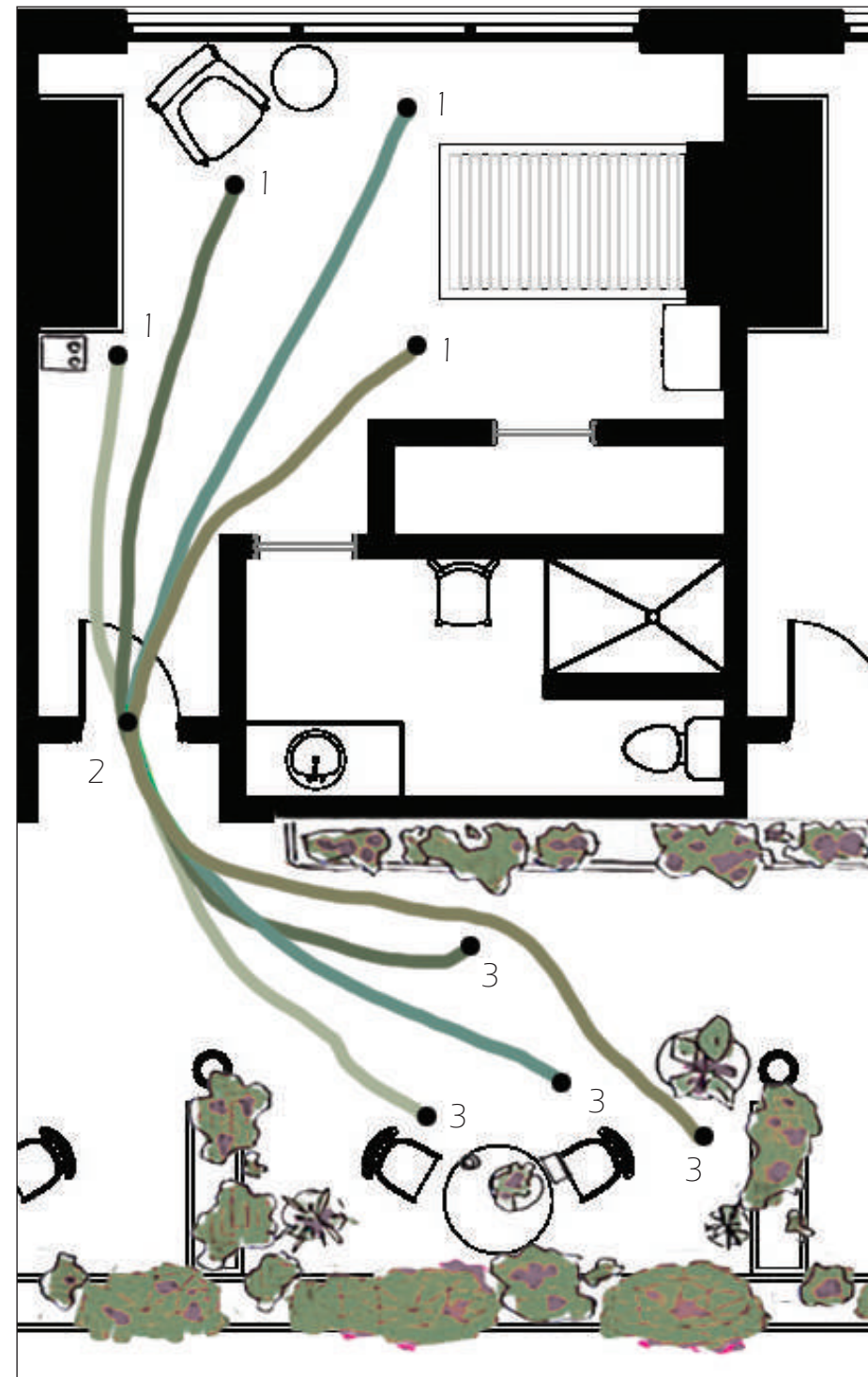
Socializing



Reading



Gardening



Coffee / Tea

1. Makes a cup of coffee / tea
2. Leaves room
3. Relaxes in personal balcony



Reading

1. Gets a book from the side table
2. Leaves room
3. Relaxes in personal balcony



Socializing

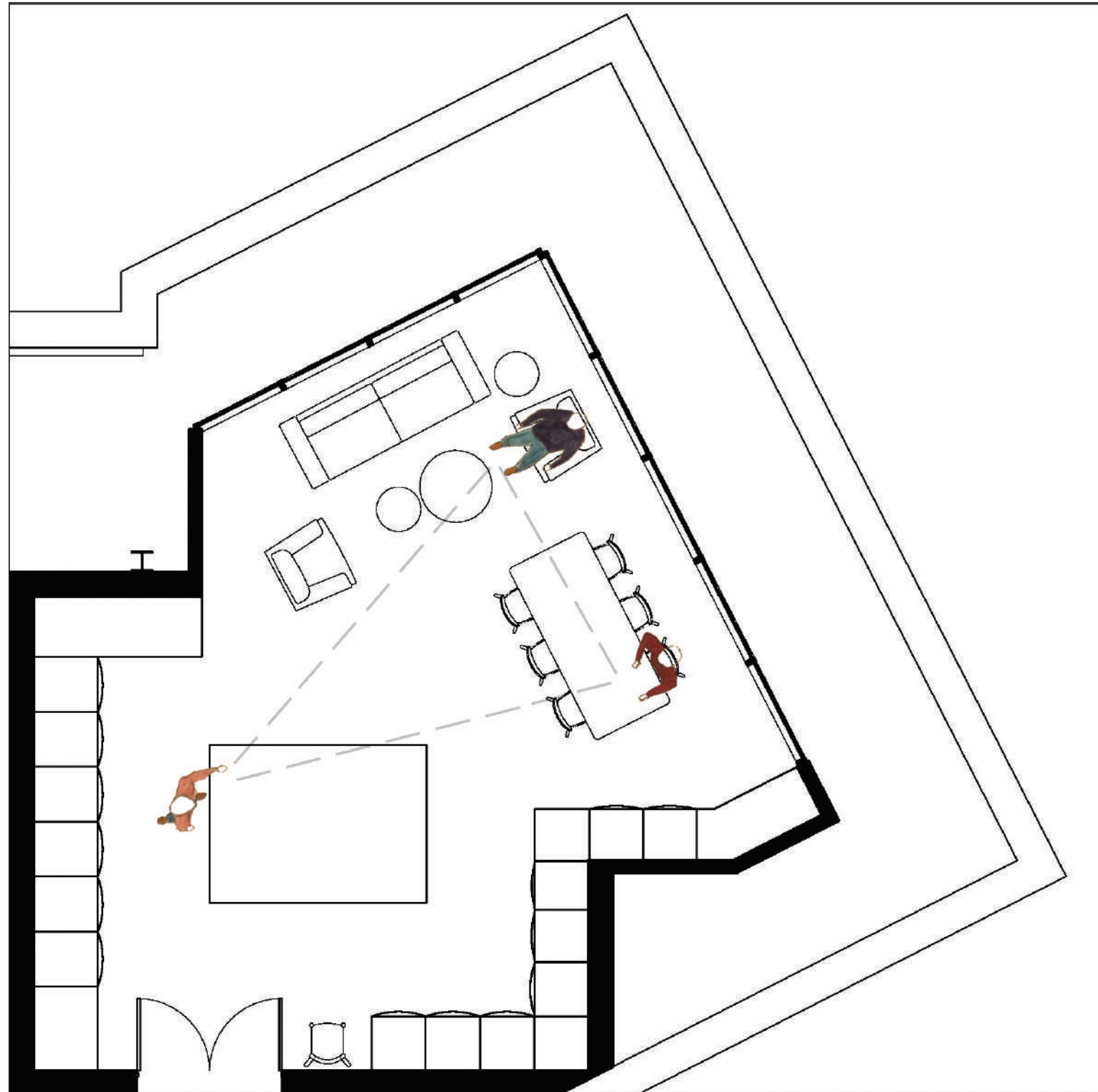
1. Gets up from chair
2. Leaves room
3. Meets a friend in the hallway



Gardening

1. Retrieves gardening tools from the closet
2. Leaves room
3. Tends to balcony foliage

Laundry Room Diagram



● Washing

● Lounging

● Folding

Section Cuts

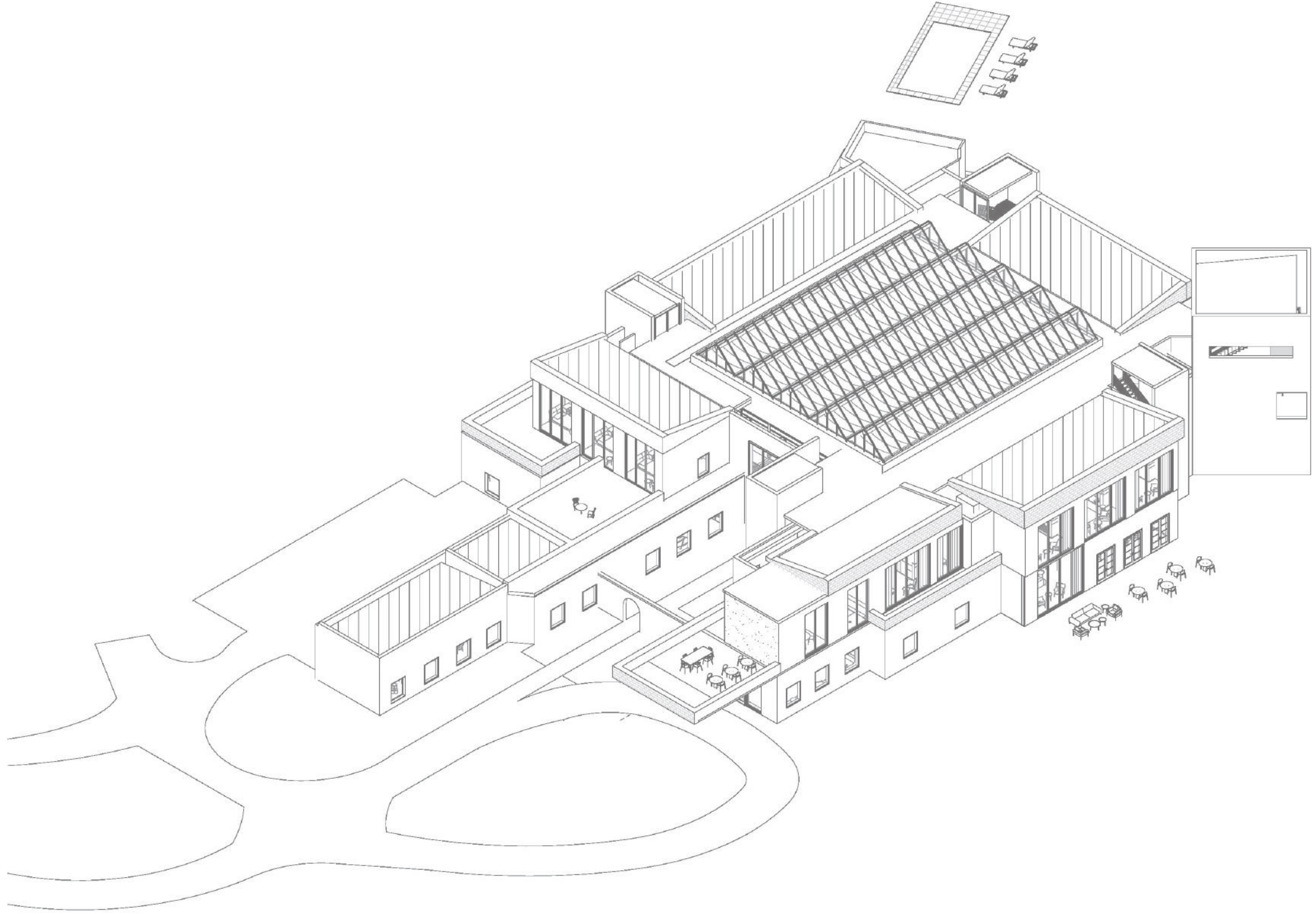


Section B B



Section A A

Axon Diagram



Resident Entrance



Reception



Community Dining



Lounge Area



Greenhouse View



Resident Room



Resident Hallway



Greenhouse Balcony Overlook



"Organic architecture seeks superior sense of use and a finer sense of comfort, expressed in organic simplicity."

- Frank Lloyd Wright.