

CENTRAL MARKET:
A Study of Architecture as Ecosystem

Emily G. Scali

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Susan Piedmont-Palladino
Committee Chair

Paul Emmons
Committee Member

Paul Kelsch
Committee Member

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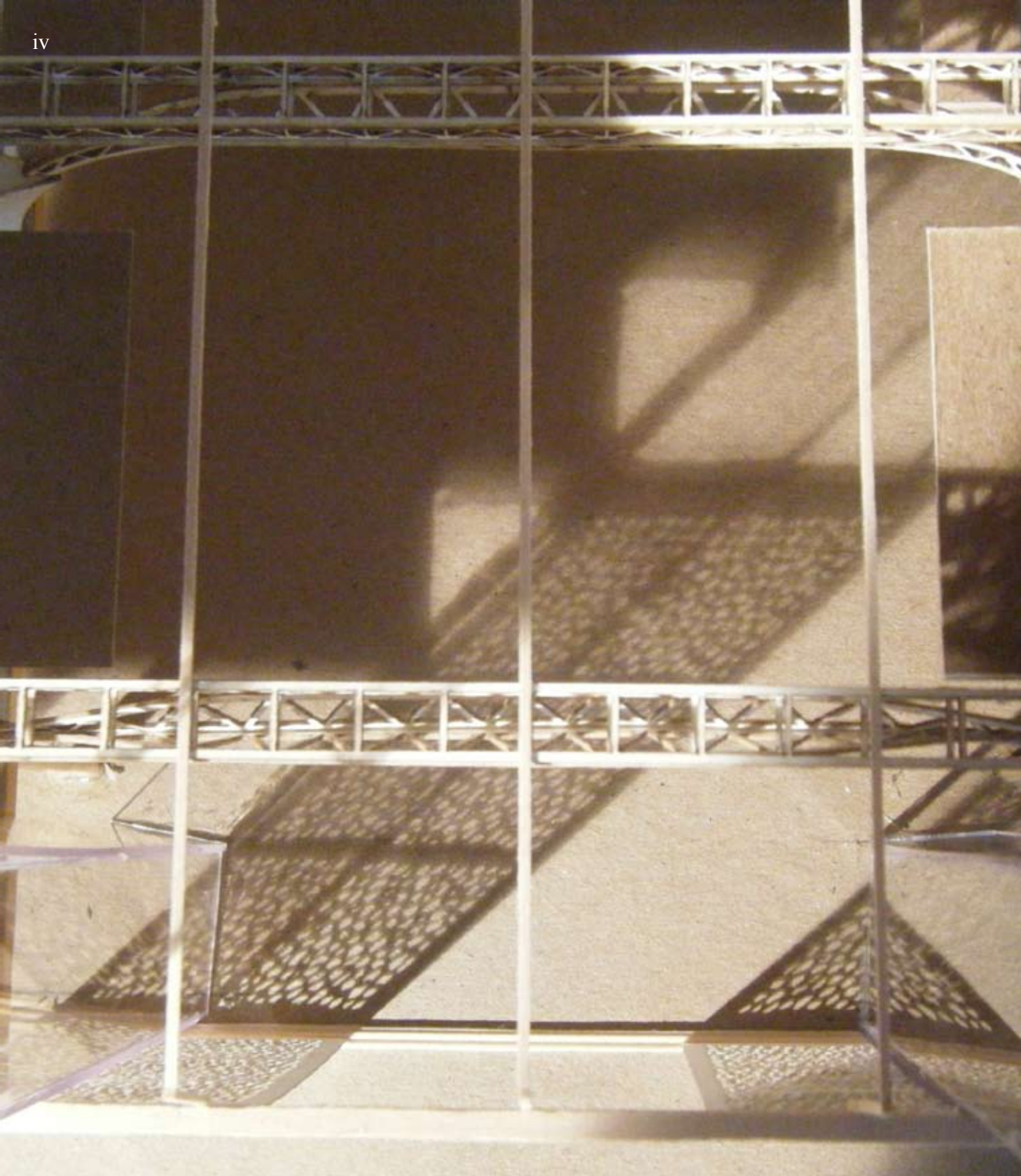
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ABSTRACT

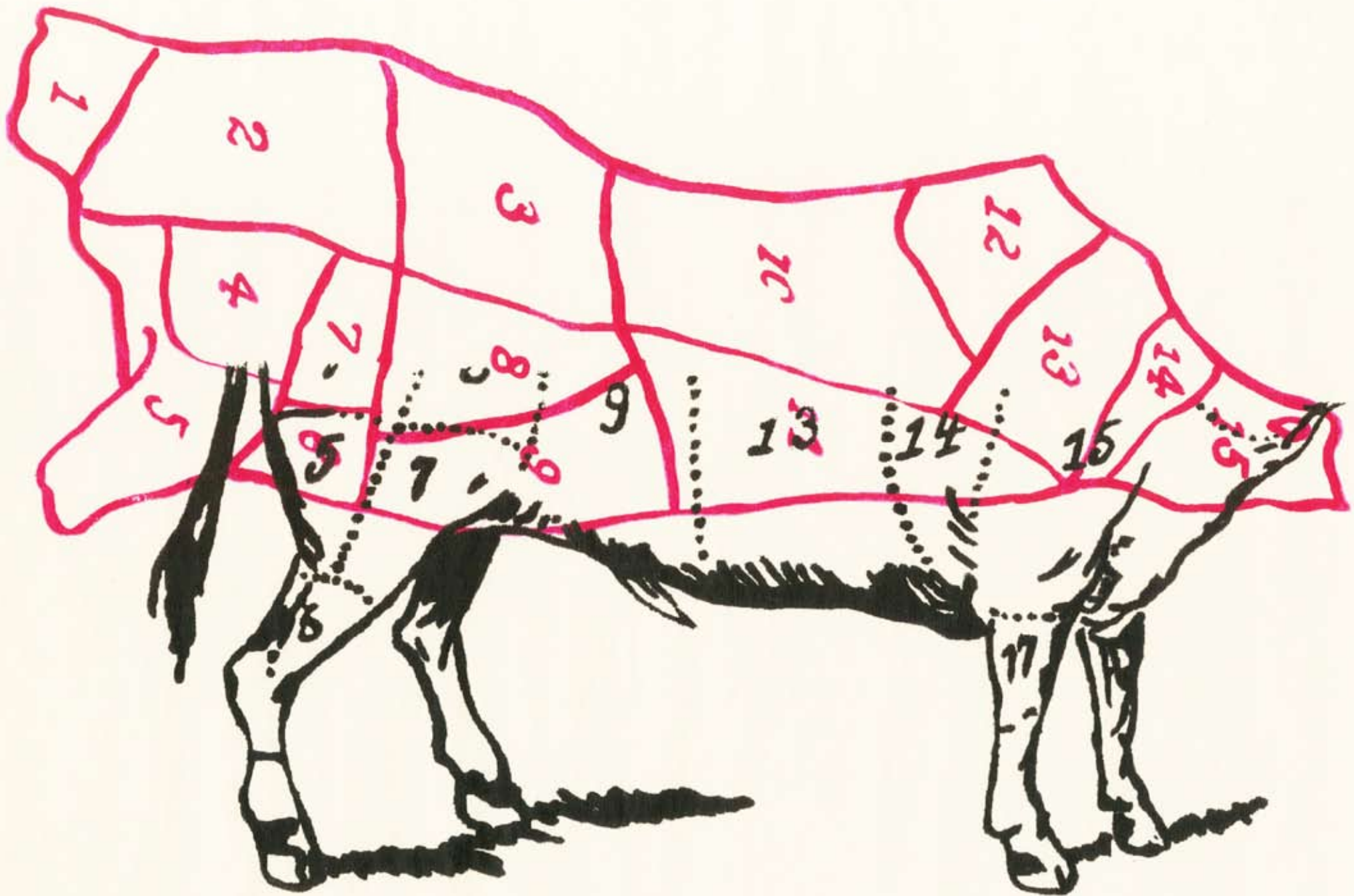
The city functions as an Urban Ecosystem. As buildings are primary components of this system, each structure must appropriate its environment for the Urban Ecosystem to thrive. Additionally, each building acts as an individual ecosystem. Each building consumes energy, produces waste, and serves as an environment for life to flourish.

This project investigates the study of architecture based on principles of ecology. The building holds a market, culinary school, and restaurants; receiving, transforming, and distributing sustenance to the city's inhabitants while supporting the greater metropolitan area farmers. The building exhibits the ubiquity of nature in the city and helps to revitalize an unhealthy part of Washington, DC's Urban Ecosystem.



For William G. Major, who showed me I could make something out of nothing.

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“Our society has no collectively shared cosmology or religious association with nature, we cannot rely on consensus iconography for communication. The earth and the sun are still universal symbols, and the global awareness of ecology has become a motivating psychological force; the world’s most potent source of symbolism.”¹

Introduction

Alberti raises the question, “If the city is like some large house, and the house is in turn like some small city, cannot the various parts of a house... be considered miniature buildings?”² Architecture is commonly studied as a demonstration of both the microcosm and the macrocosm, considering the scale of the human and the composition of the universe. The building exists as part of a neighborhood, a city, a country, and ultimately the cosmos, acting as a small component in a greater whole. Simultaneously, each building contains its own unique set of materials, spatial relationships, and working components that react and relate to one another.

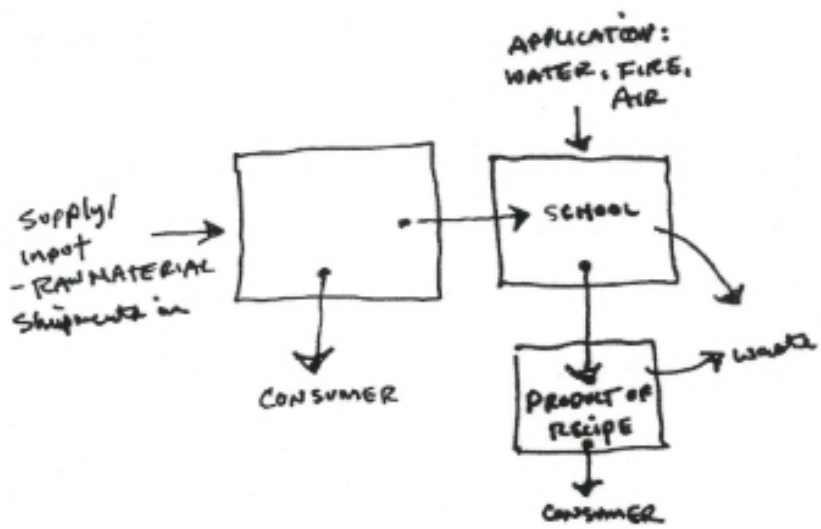
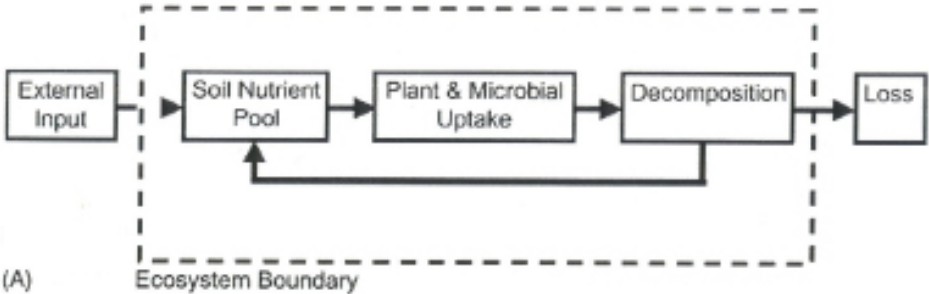
As architecture has been related to cosmological thought, it has drawn strong parallels to nature throughout time. The city has grown within, fused with, and set itself apart from nature since its initial conception. Cities historically developed with the necessity of protecting their inhabitants from the rigors and perils of wilderness by forming a boundary between civilization and the threats of wild nature.³ Over time, the perceptions of wilderness and the city have developed and changed, as modern urbanites look to natural wilderness as a place to recover from the harshness of metropolitan civilization.

Despite the changing dynamics between cities, mankind, and wilderness the urban landscape consistently relies upon patterns and processes found in nature. Cities draw comparisons to behavioral, ecological, and growth patterns displayed in nature. Recent global issues of material use and disposal, energy use, and population growth have highlighted these metaphors, and the city is being studied as a natural, evolving system. One idea studied at large is the concept of the city as an Urban Ecosystem.

As a basic unit for the study of ecology, an ecosystem is an entity of interdependent organisms which share the same habitat, interact, and react with all elements in their surroundings. The ecosystem is a means of studying the interactions between organisms and their environments at different scales. The Urban Ecosystem recognizes natural forces, cultural practices, time, population, and urban growth patterns as interdependent

entities in the city. Through this metaphor, interactions facilitated by the city’s infrastructure can be related to processes and functions of a natural ecosystem. Studying the natural evolution of a city provides keys to urban planning patterns, a means of sustainable design, and an understanding of the input and output of resources and wastes on multiple scales.

Given that the city is an Urban Ecosystem, each building within the ecosystem acts as an organism in the larger whole. Buildings act as architectural ecosystems, composed of processes affecting both the city and the individual building. In order to study something so formidable and complex as an ecological system, we can describe simplified versions of the system, which encompass the most important and basic properties and functions, breaking down a very complex topic into more easily-analyzed portions.⁴ The ecosystem concept can then be applied to design to produce architecture which cohesively fits into an urban setting, adapts to a changing environment, and allows its inhabitants to grow and be nurtured by its presence.



“Living in green homes, working in LEED-certified offices, and eating organic food allows us to pretend we are saving the world, when, in reality, we are only ratcheting up consumption in an unprecedented, drunken frenzy.”⁵

The Market Paradigm

This thesis began by considering the challenge of sustainably designing in a methodical way based on principles that would allow a building to grow as part of its environment while simultaneously considering the building as an environment in itself. The idea for the primary program, a market hall, grew out of a visit to London in the summer of 2009. Observing London's numerous daily open market buildings and street markets provided a new view and understanding about the essence of food in the city.

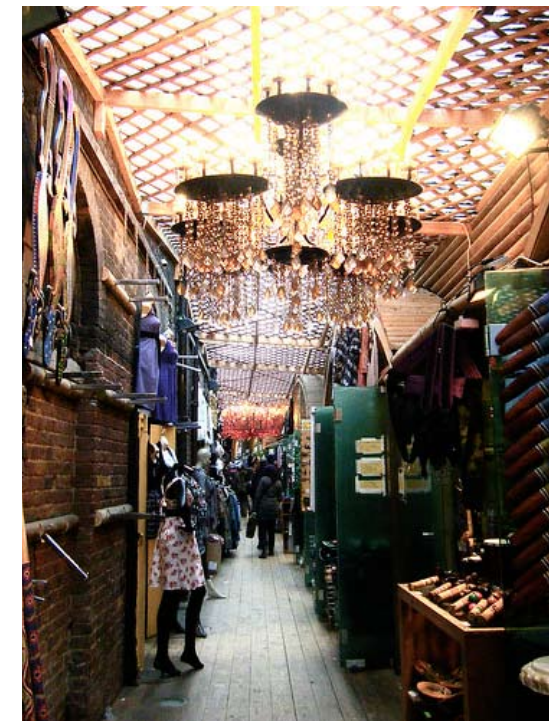
Although opportunities for consumption in the city are diverse, markets harbour a nostalgic energy which makes them appealing to the general public. Stemming from a history of pushcarts and immigrant merchants, the often-temporary street market allows the market to respond specifically to each locale and customer base. As a result, the street market articulates non-conformity: a wide variety of goods are sold without restriction on the quantity and types of goods each vendor can sell. This often results in the duplication of goods in adjacent market stands. Markets present economic challenges for the individual stall vendors. Two neighboring booths may sell the same product creating competition. In this scenario, vendors employ unique and often unorthodox marketing techniques including the fashioning of creative displays for their goods, suddenly lowering prices, and even yelling and waving their arms to bring in customers.

Besides the space required to sell goods, there exists a need for spaces to store goods, transport them to and from the market stall, and off-load goods into the building itself. Within each stall objects are hung, set down, stacked, folded, and laid out in various ways. Benches, chairs, and tables are necessities for both merchants and customers, and pathways are designed not only for transportation but also out of concerns for product display and the customer's experience as he perambulates about the market.

LONDON MARKETS



COVENT GARDEN MARKET



CAMDEN MARKET



BRICK LANE MARKET



LEADENHALL MARKET



BOROUGH MARKET



BIRMINGHAM MARKET

The market is an unusual and remarkable place in the city that demonstrates an urban ecological system. Markets have adapted from their historic form and function to meet the ever-changing demands of today's cities. They grow and change with the city fabric, creating short-lived moments and intransigent means of display. Despite these fleeting interactions, they still serve as a concrete element within the city. They manipulate and take advantage of public space, and provide a necessary service to the city. Markets often occupy and define public urban spaces, spawning other social activities such as street musicians and artists. The farmer's market depends on a local and dedicated customer base in order to thrive, and the profits generated help stimulate the local farming economy.

The common ecosystem diagram consists of energy flowing into the ecosystem, and waste being expelled from the system. From the scale of the city to the scale of the household, food is an imported energy. It is transformed via fire, water, and air through culinary skills to produce a refined food product, serving as energy for the city's inhabitants. As the market sells both the raw food product and the corresponding refined versions, the market's receiving, selling, distribution, and expulsion processes mimic the processes undertaken on food by the city at a large scale.

Upon returning to DC from London, it was noticed that the market building type is extremely rare, as temporary street markets are the current trend. New markets in the area open monthly in the middle of closed off streets, empty parking lots, and public plazas. However, these markets create no fixed space for people to relate to or understand the economics of the food market industry. There is no permanent, centralized space for market activities to flourish.

In L'Enfant's original plan, spaces were set aside for market buildings to be constructed. These buildings were conceived as landmarks and places of public gathering. Nine market buildings have existed in DC through the history of the city, but only three of these buildings are still standing. Out of those remaining buildings, Capitol Hill's Eastern Market is the only one that still retains its original function.

DC AREA MARKETS



DEL RAY MARKET



EASTERN MARKET



PENN QUARTERS MARKET



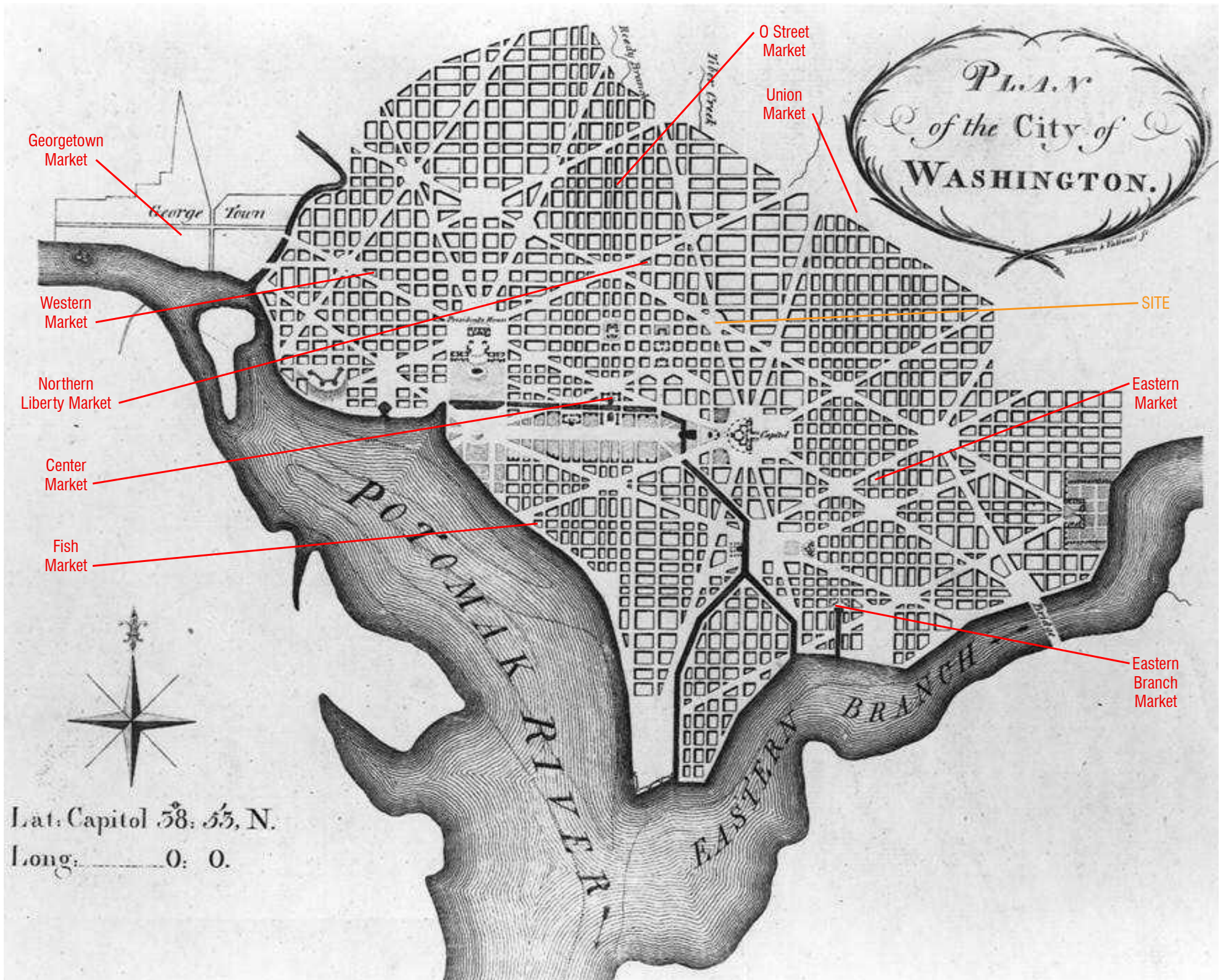
ALEXANDRIA MARKET



VERMONT AVENUE MARKET



DUPONT CIRCLE MARKET





GEORGETOWN MARKET

3276 M Street, NW
1795-1865, 1865-Present

Demolished in 1865 and rebuilt (left). Current site of Dean & DeLuca grocery store.



WESTERN MARKET

Near K and 21st Streets, NW
1872-c. 1967

Market located near Washington Circle. Demolished between 1964 and 1968.



NORTHERN LIBERTY MARKET [convention hall market]

5th St NW between K and L Streets
1874-1985

Fire in 1946 caused the building to be gutted. From that point on served as a wax museum and world's largest bowling alley until its demolition.

CENTER MARKET

7th St. & Pennsylvania Ave, NW
1871-1931

Located at the site of the current National Archives Building. The largest market building to be constructed in DC.

**FISH MARKET [seafood market]**

Maine Avenue, SW
1805-1960

Building demolished for I-395 freeway. Market vendors still exist in the area at a daily street market.

**O STREET MARKET [northern market]**

7th & O Streets NW
1881-Present

Served as a food market until 1968 riots forced it to close down. Reopened in 1980, but gang activity caused sales to be unsuccessful. Uninhabited since 2003 when the roof structure failed.





UNION MARKET [florida avenue market]

Florida Avenue & 4th Street, NE
1929-Present

The site chosen for the relocation of Center Market. Currently functions as a private wholesale market. Other warehouse buildings have been added to the site.



EASTERN MARKET

7th St. & Pennsylvania Ave, SW
1873-Present

The only market building in DC to still be standing and serving its original function. Constructed after the demolition of the Eastern Branch Market.



EASTERN BRANCH MARKET

Near K and 5th Streets, SE
1806-c. 1873

Located by L'Enfant at the head of the canal near the Navy Yard in DC's original plan. Although the canal was never constructed, the market was. Demolished sometime after becoming unusable during the Civil War. Drawing depicts the market as L'Enfant envisioned it, although in reality was only half was built.

“Nature in the city...is the consequence of a complex interaction between the multiple purposes and activities of human beings and other living creatures and of the natural processes that govern the transfer of energy, the movement of air, the erosion of the earth, and the hydrologic cycle. The city is part of nature. Nature is a continuum, with wilderness at one pole and the city at the other. The same natural processes operate in the wilderness and in the city.”⁶

Site Analysis

As the goal of the project is to understand the development of the urban and architectural ecosystems, a location was selected that seemed to represent an unhealthy urban ecosystem, with ambition to improve the area. This studied area is around the intersection of New Jersey Avenue NW and Massachusetts Avenue NW in Washington, DC.

The area is currently a wasteland of parking lots, nondescript buildings, and an overgrown, underused park. Additionally, the intersections of diagonal and orthogonal roads offer no order and follow no pattern present in the existing city structure. The area's demise was brought about by the intervention of I-395 in the late 1960's to early 1970's. Neighborhoods along the corridor were demolished, and communities split apart. The Government Printing Offices expanded their surface parking lots over the years, closing off First Street NW between Massachusetts Avenue and I Street in the process. The site is now un navigable by both automobile and foot, and offers little visual appeal.

Nonetheless, the location is surrounded by several parks, newly constructed hotels, and large office buildings. It is in close proximity to Union Station, offers views of the Capitol Building, and access to I-395. The intersection offers a prime location for a new, centrally located market building since it is amidst many residential areas lacking places to purchase food.



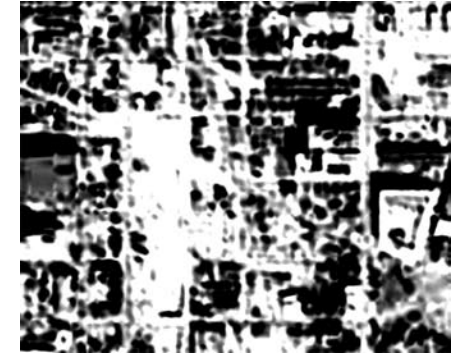
1960 AREA MAP



2009 AREA MAP



1951 DENSITY MAP



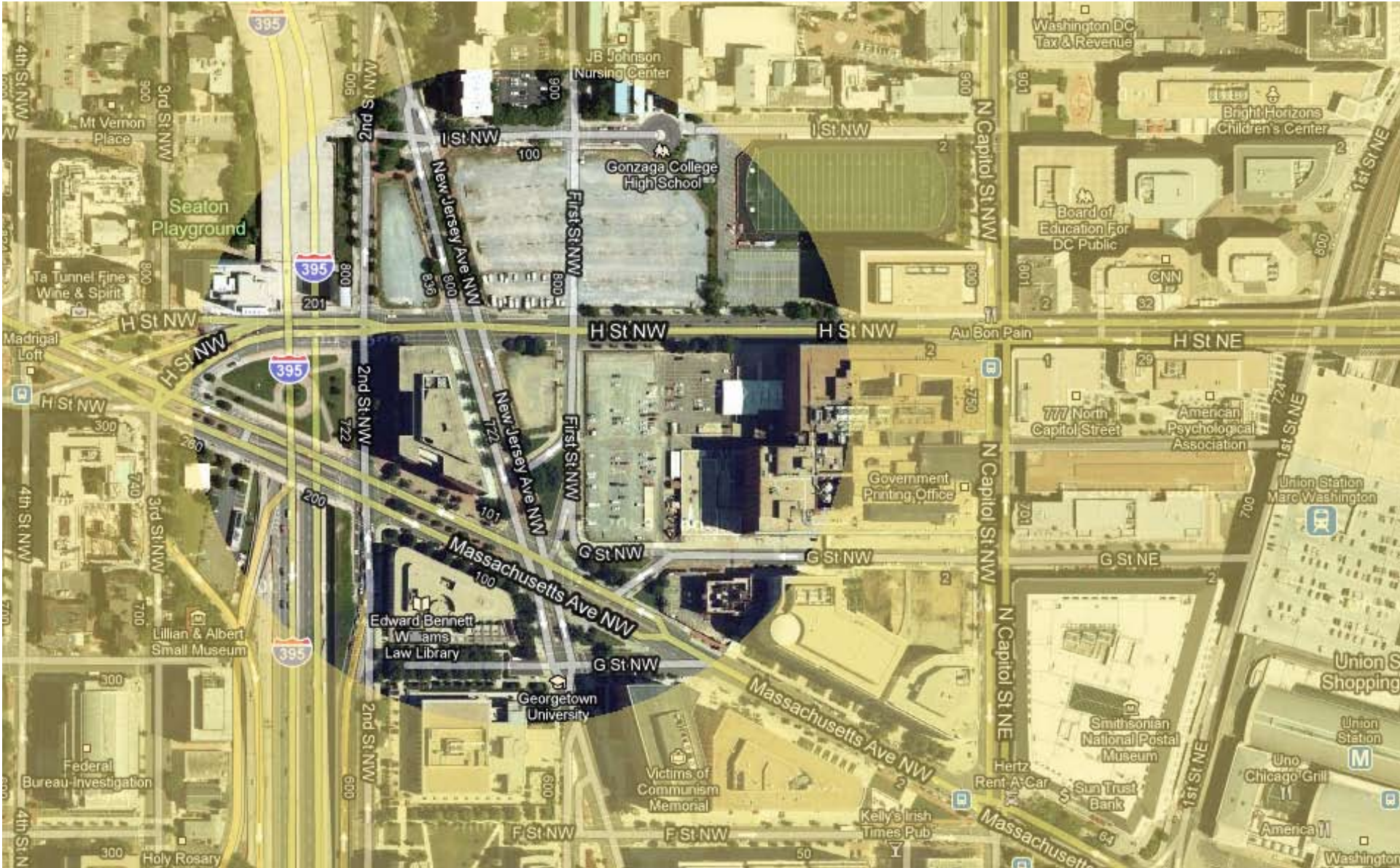
1968 DENSITY MAP



1983 DENSITY MAP

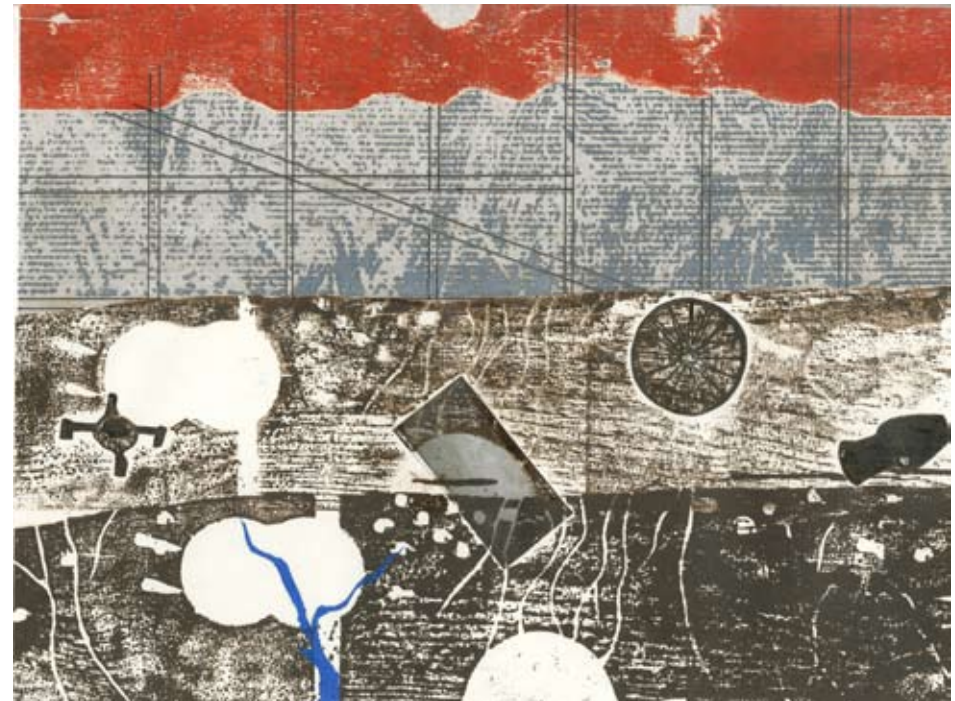
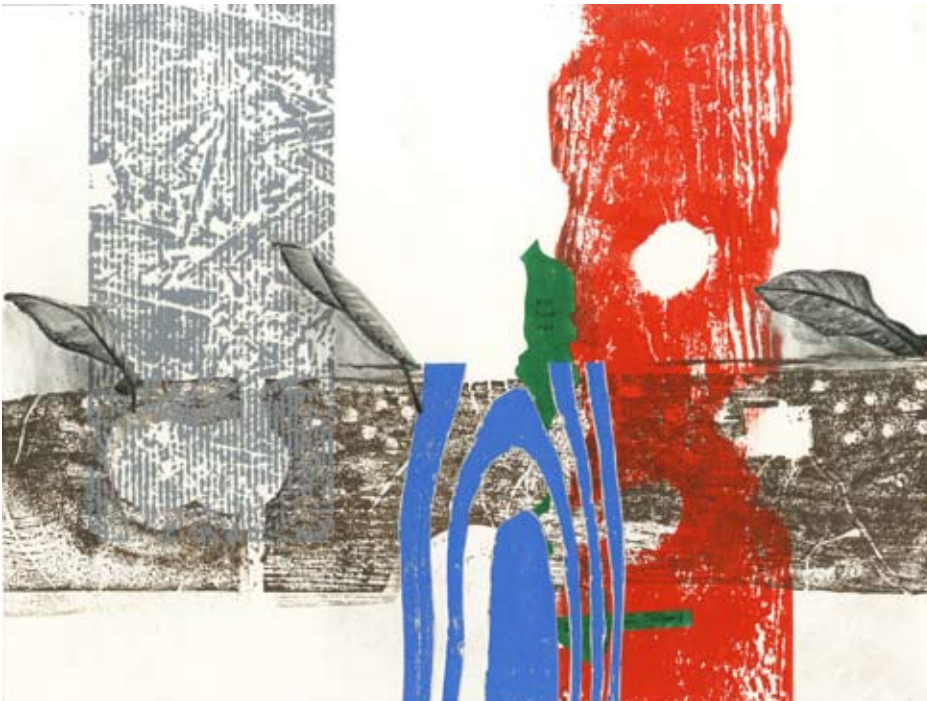
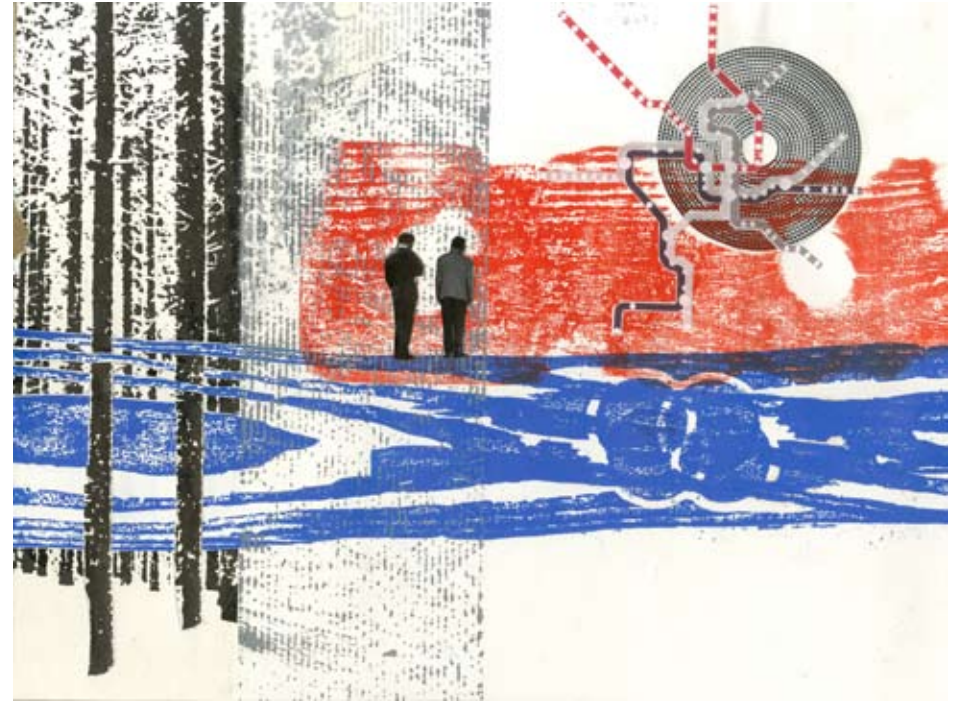


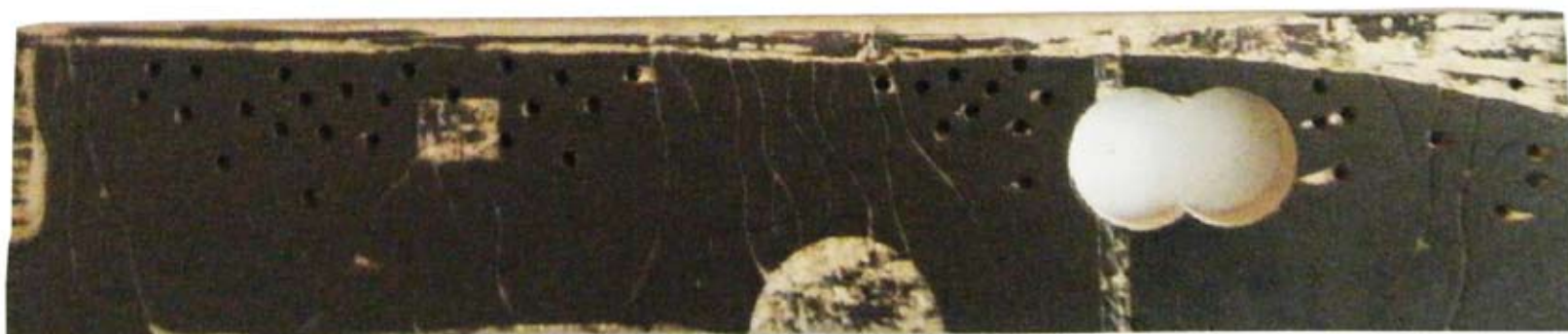
2009 DENSITY MAP

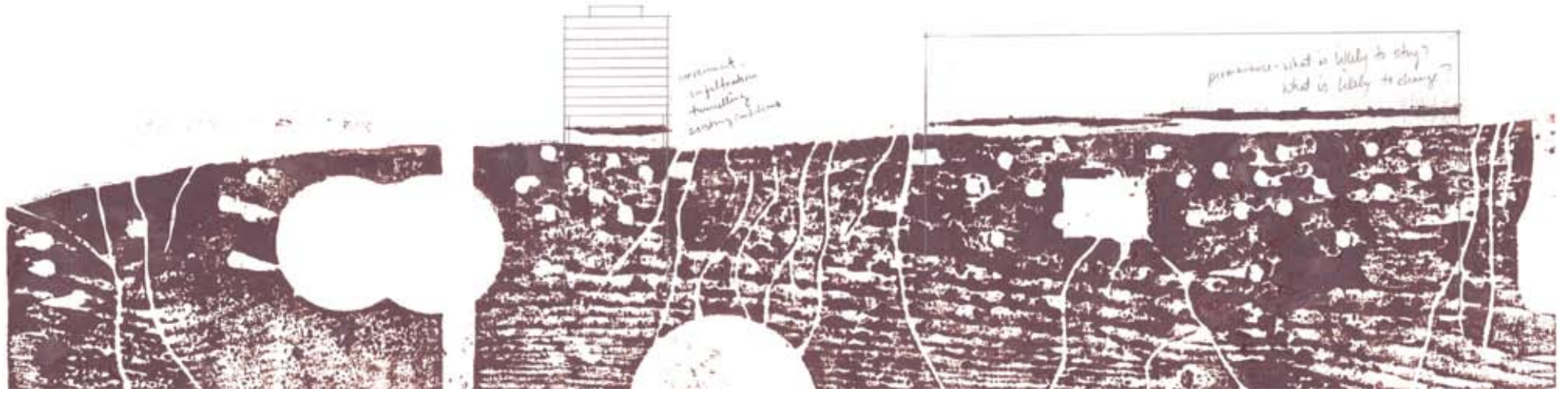


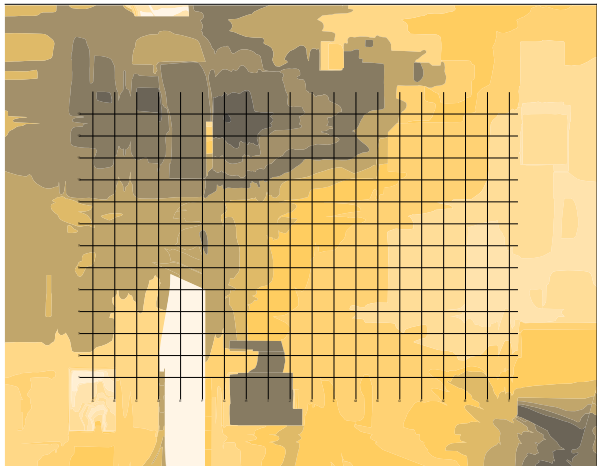
In the city, natural processes are defined as uncontrolled situations existing in the city produced by the forces of nature. These developments occur without direct intent, but are often influenced by the presence of humans. Some examples include radiating heat from impermeable surfaces that change exterior temperatures, or water flowing against its natural path due to a man-made addition.

The analysis of the natural processes contained within the site gives a means to understand the characteristics and the layers of information on the site which create the current urban ecological system. The site was studied by breaking its natural processes, properties, and characteristics into the categories of the four elements: Earth, Water, Air, and Fire. As each element displays different qualities and aids in describing different processes, the properties of the elements combined form a wholesome view of the site. The four elements that compose the site are interconnected and interrelated, just as the ecological processes in the city inform and affect one another. This analysis of natural processes on the site via the four elements made it possible to determine relationships between different parts and processes taking place in the area.

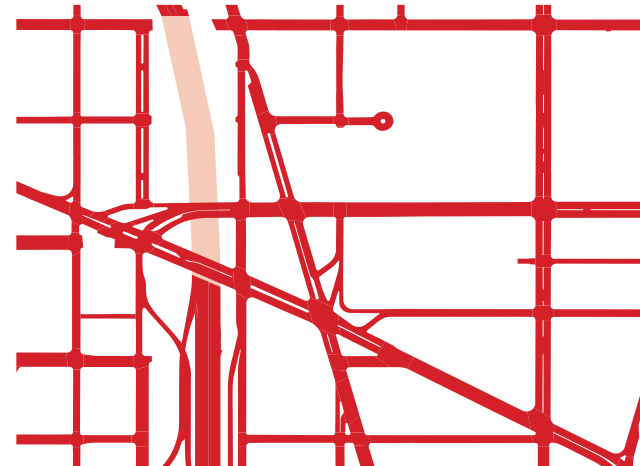
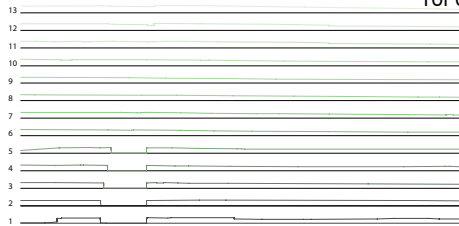
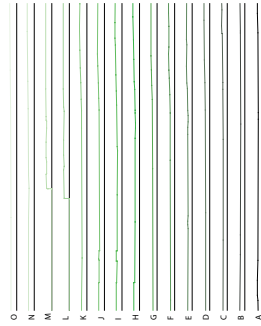








TOPOGRAPHY



ROADS



BUILT AND UNBUILT



LAND USE AND ZONING

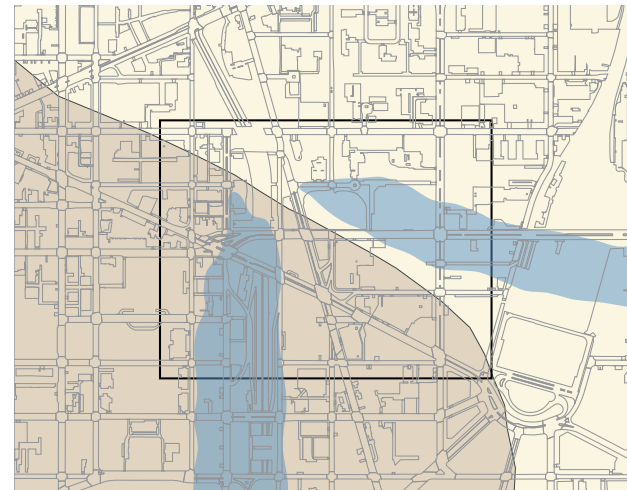
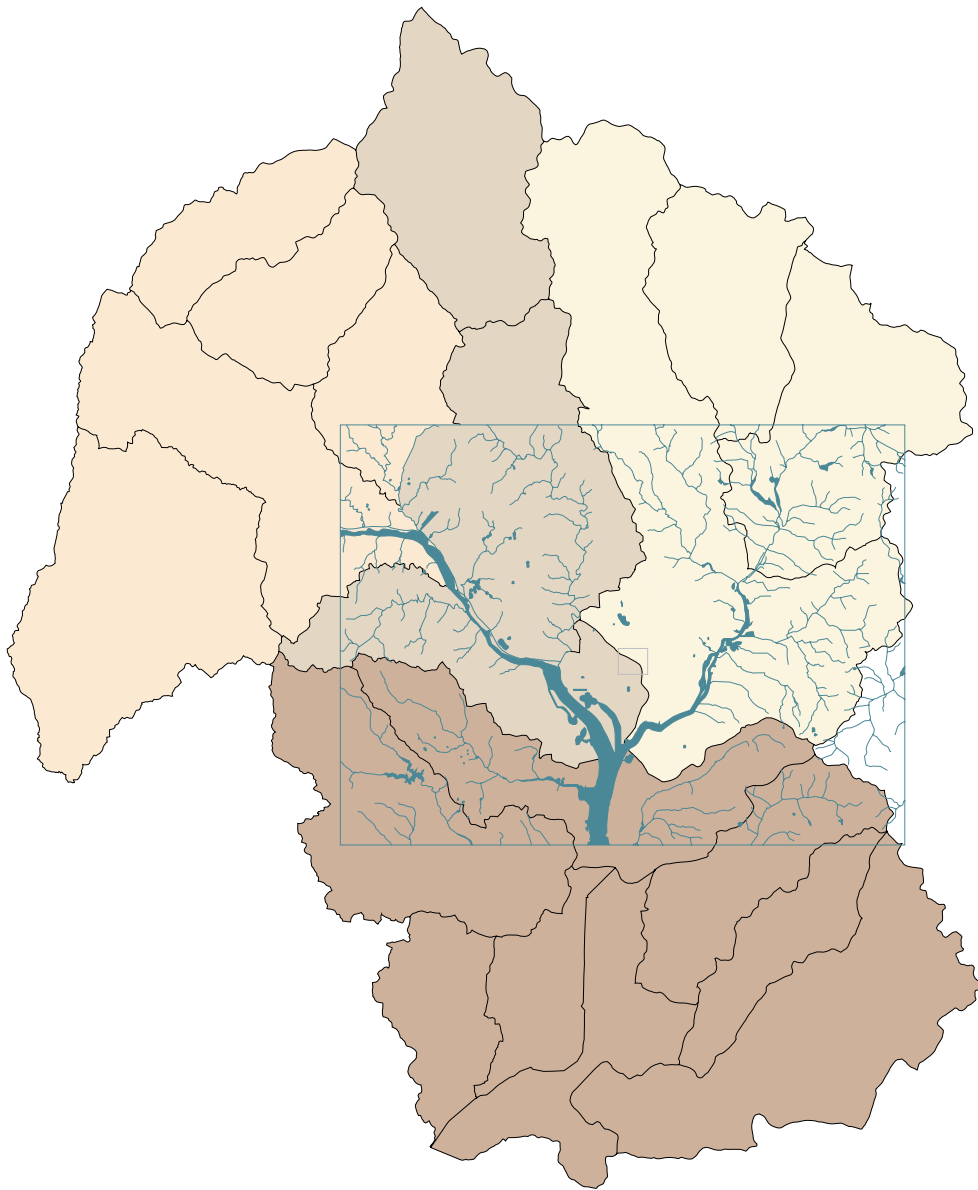


SOIL TYPE

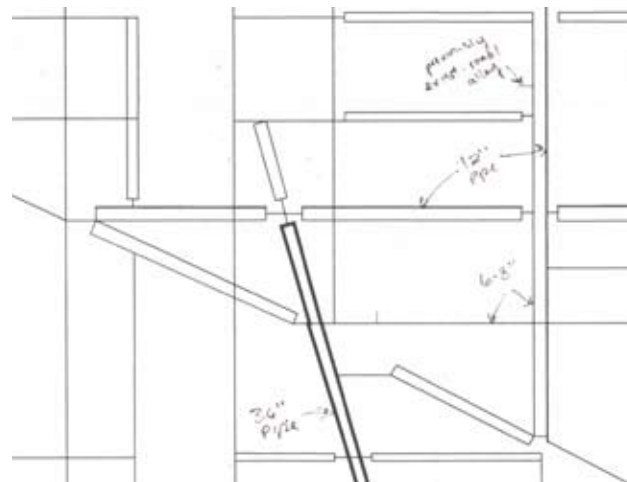




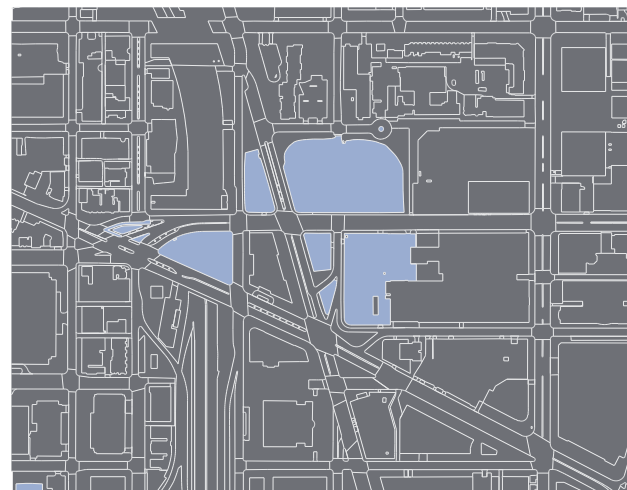
PRECIPITATION PATTERNS



WATERSHED



WATER PIPES

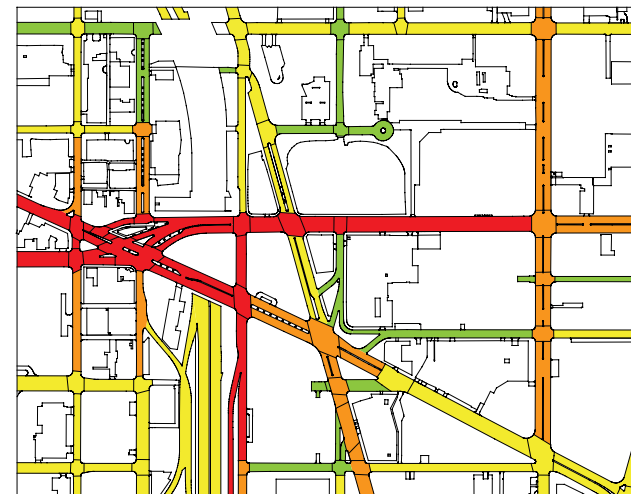


IMPERVIOUS AREA

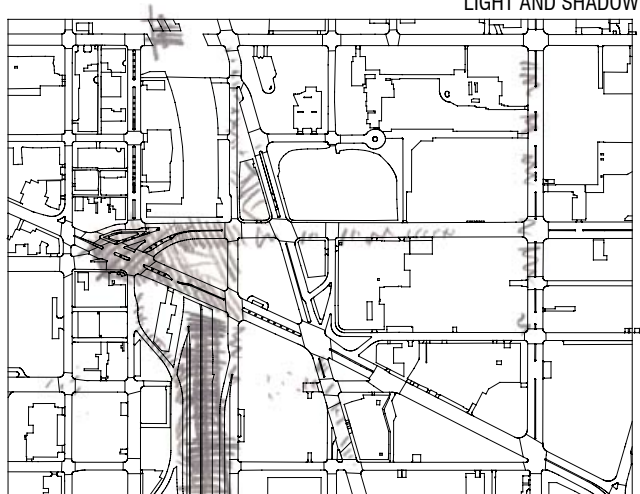




LIGHT AND SHADOW



TRAFFIC SPEED



NOISE



WIND



POLLUTION AND SMELLS

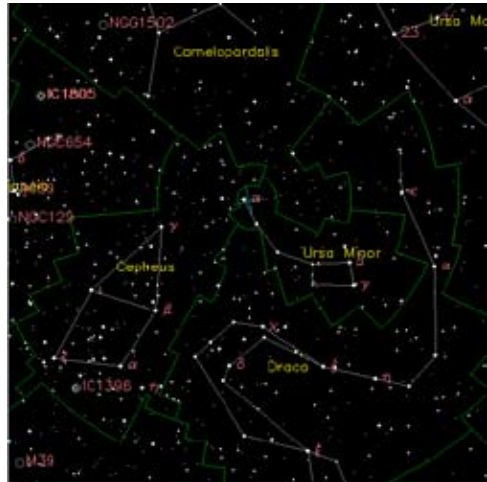




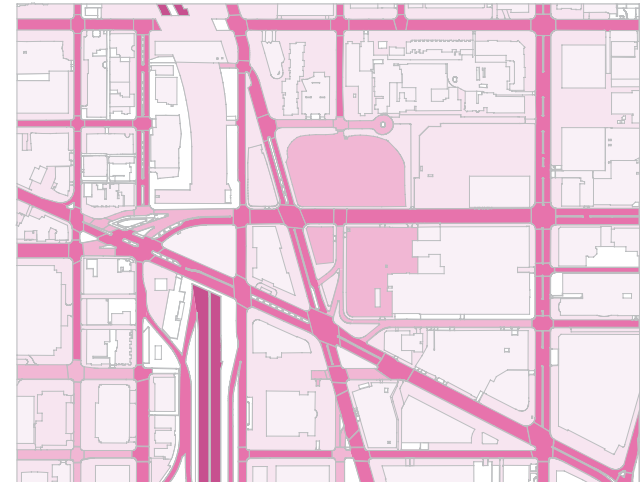
TREE LOCATIONS



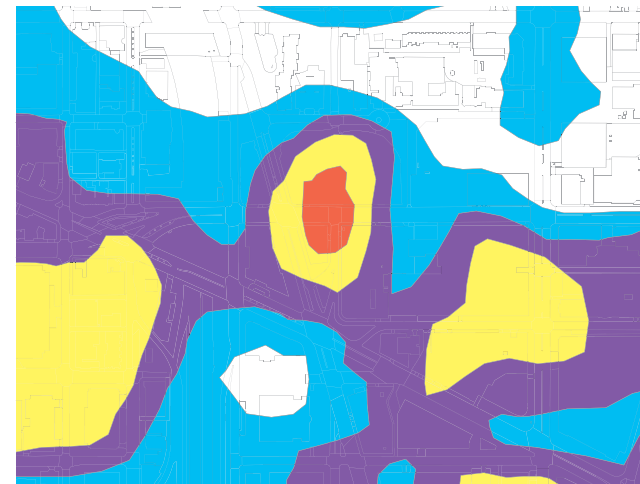
TREE COVERAGE



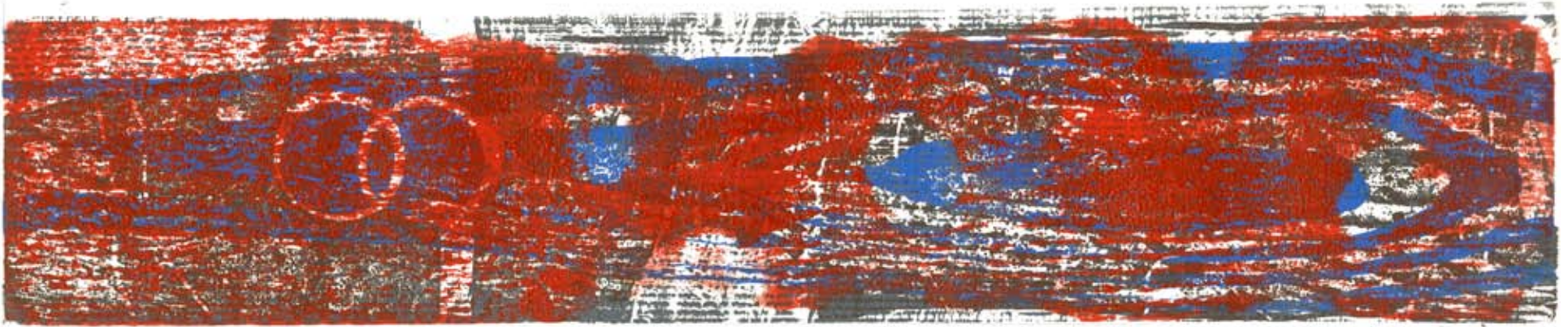
CONSTELLATIONS



OCCUPANCY

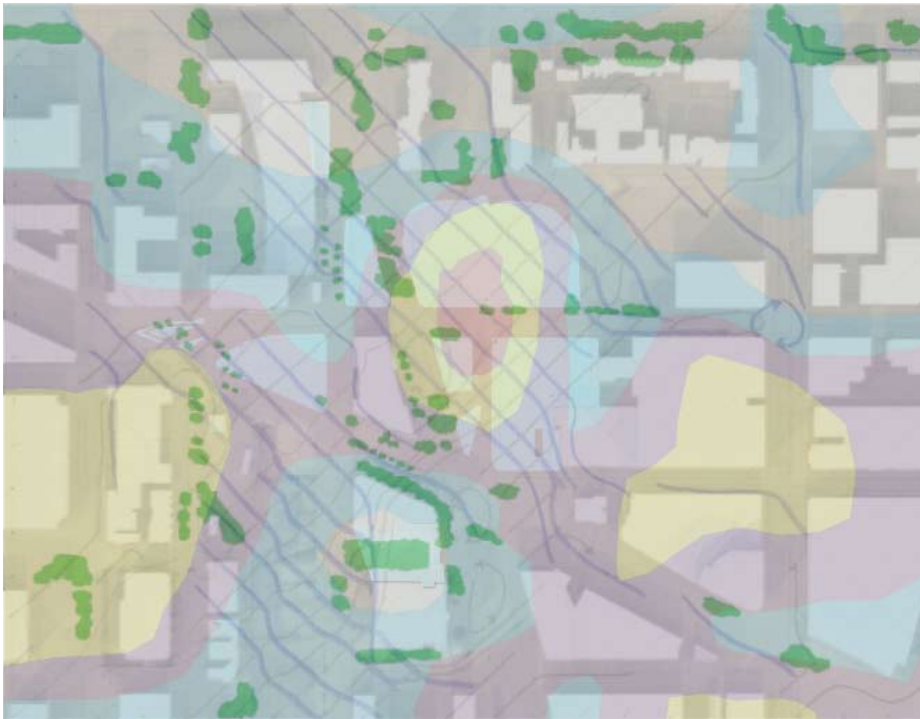


HEAT



The sites elemental qualities broken apart but then analytically assembled reveal both its shortcomings, which can be considered in design decisions, and its unique qualities, which can be preserved and exhibited. As it is currently under-used, mostly paved, and unnavigable, backed up traffic creates an urban heat island. However, the intersection provides an ideal spot for construction and redevelopment. Also, the history of the site is present in its soil type, while its topographic buildup acts as a boundary between two different watersheds.

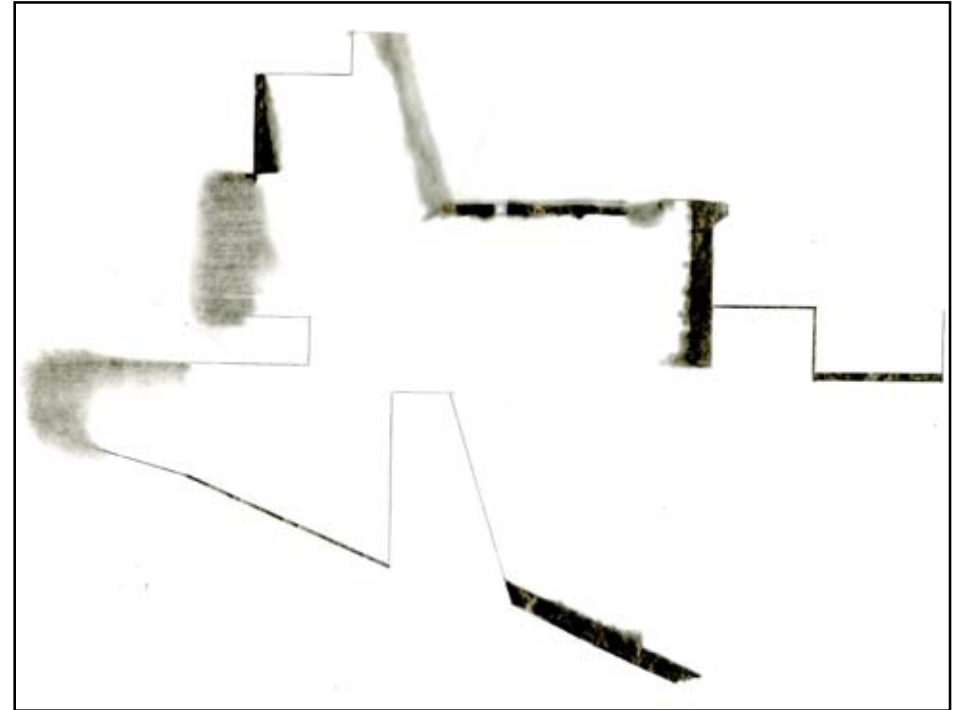




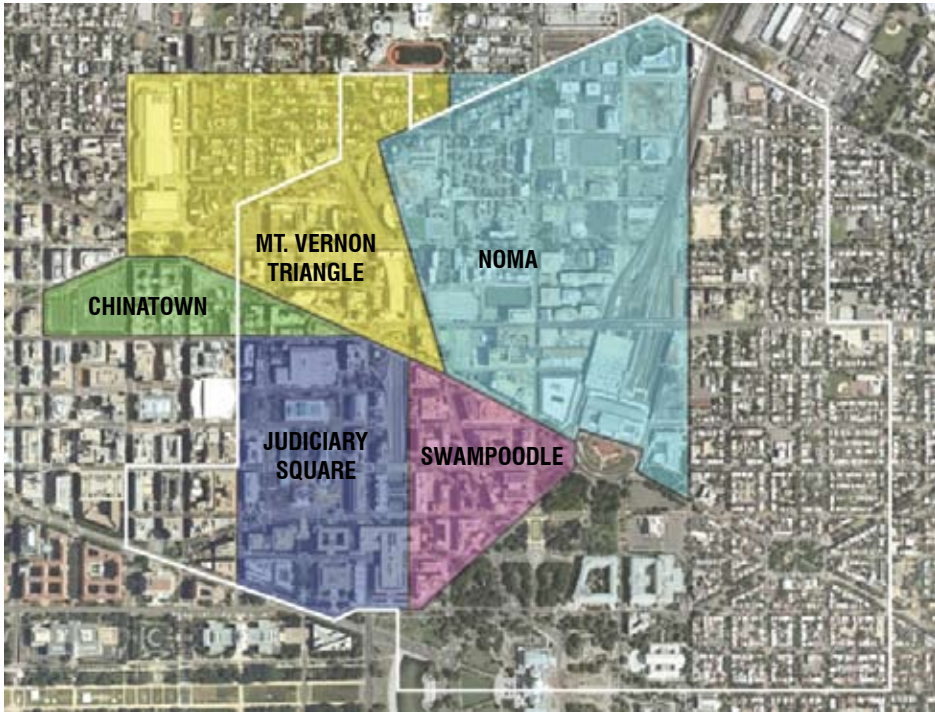
Although the city functions as a system, it is a heterotrophic system. The city does not actively produce energy, but only consumes energy and produces waste. However, the city provides in the form of knowledge, ideas, culture, myth, and ideologies. Social groups rise out of these components with their most common immaterial divisions being the neighborhood boundary. It was surprising to find that the chosen site lies at the intersection point of five different neighborhoods.

Boundaries are commonly defined as something that indicates or fixes a limit or extent. However, the ancient Greek word for boundary indicates a place from which something begins its presenting.⁷ Studying the neighborhood boundaries, their perception contrasts their actuality. Noticeable changes between neighborhood boundaries largely related to site materials and their maintenance, such as the condition of concrete sidewalks and maintenance of public grass areas. Robin Dripps writes that, “In nature, edges are never thin and unambiguous, but instead thick, overlapping, and even generative.”⁸ Ecotones are defined as places where ecosystems overlap, join, and change, such as the transition between a forest and a field. Similar boundaries were found between and within the area’s neighborhoods. These changes were documented and mapped in an effort to clearly understand the characteristics of the site and neighborhood boundaries. As the site lies primarily within the NoMA neighborhood boundary, this area was analyzed more closely. This mapping exercise resulted in the boundaries ranging from a thin, opaque line, to a somewhat translucent zone of change and distinction.

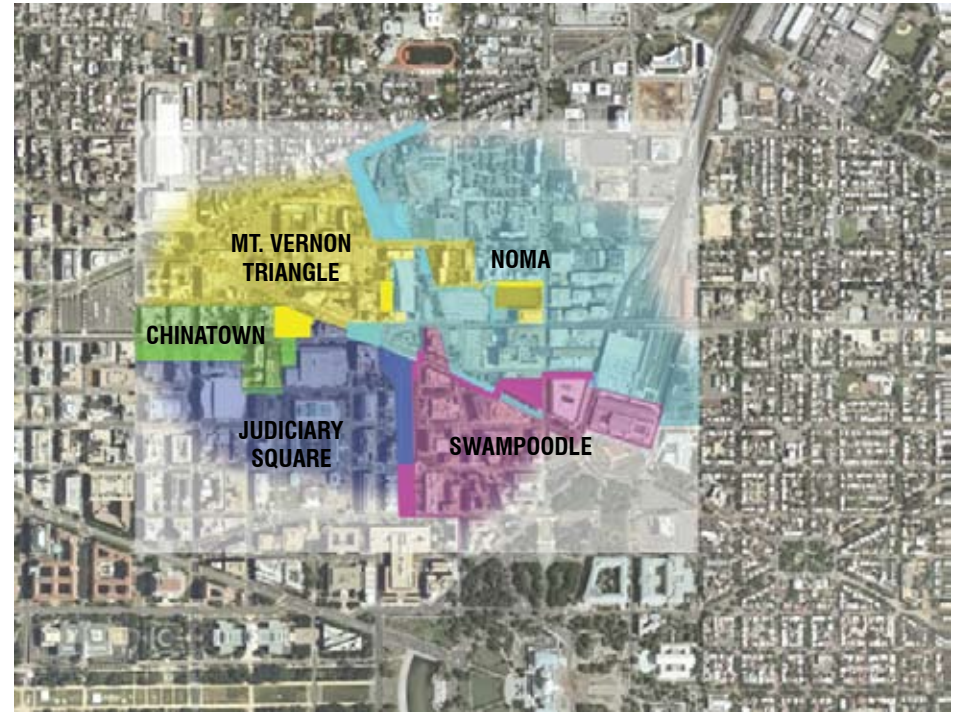
As the site is manipulated, and the building conceived of as an ecosystem in itself, the boundaries of the building should express these same ecotone qualities. A traditional site is considered as an area of land defined by legal, geographical, or physical boundaries.⁹ Instead, the boundaries should express relationships to the neighborhood boundary, varying in thickness, opacity, height, and concreteness.



NoMA BOUNDARY DIAGRAM



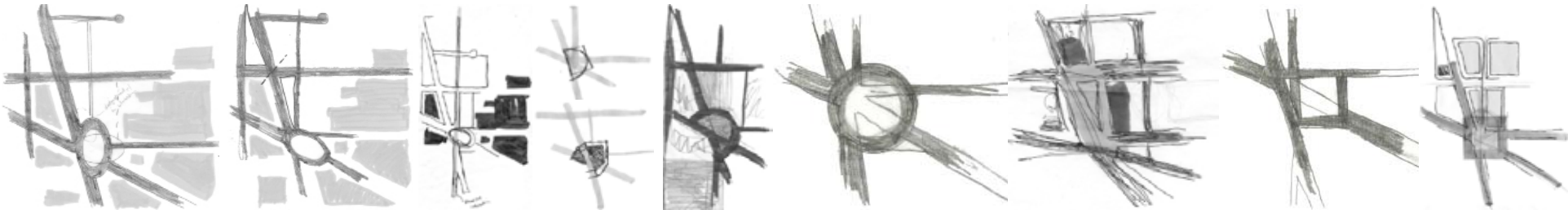
ACTUAL NEIGHBORHOOD BOUNDARIES

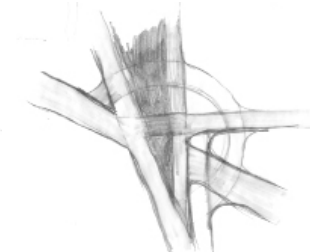
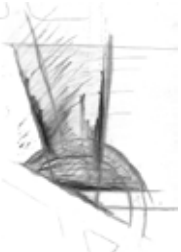
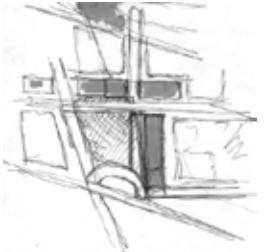
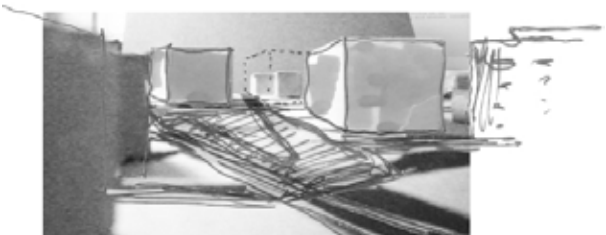


PERCEIVED NEIGHBORHOOD BOUNDARIES

*“All dreams of swelling resonate with reveries of rising dough, a substance composed of three elements: earth, water, and air. It awaits the fourth: fire. Those familiar with such dreams understand that in its own way, bread is a complete food!”*¹⁰

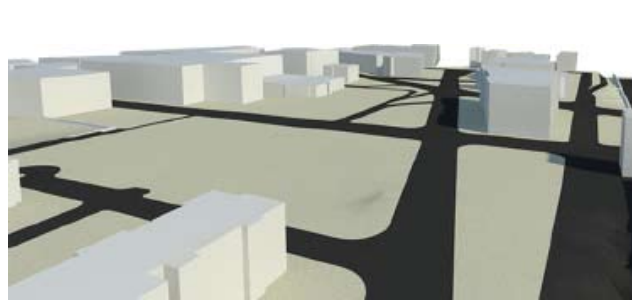
Preliminary Decisions







EXISTING DEVELOPMENT



As the site lies at the intersection of neighborhoods, New Jersey Avenue and Massachusetts Avenue act as vehicular and visual axes, traversing through and drawing the communities together. Nonetheless, the intersection is a confusing mess. Typically, diagonal road intersections in Washington, DC have traffic circles or squares to make them more navigable. Since there was previously a circle in this location, and one here in L'Enfant's original plan, the idea of such an addition was studied. A circle was designed to re-route and re-distribute traffic in the area, connecting New Jersey Avenue, Massachusetts Avenue, G Street, and a newly re-opened First Street.

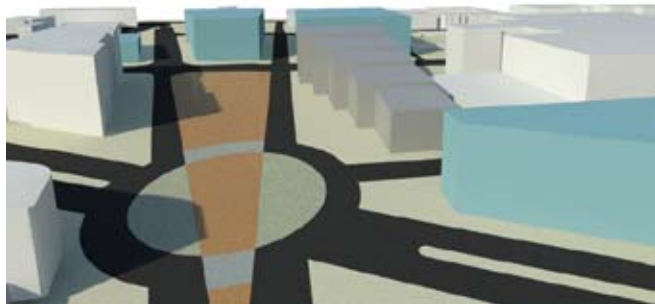
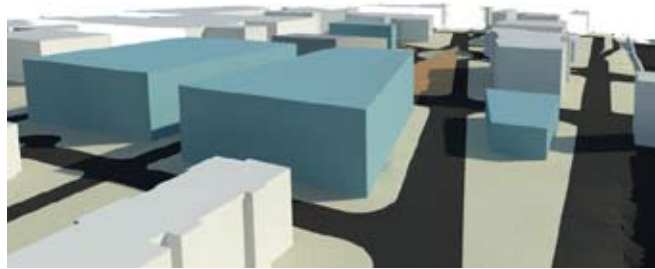
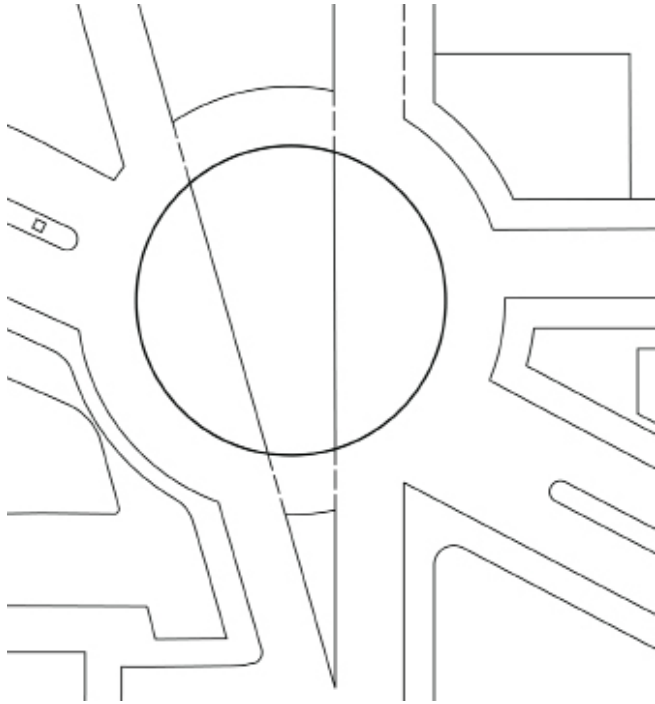
In order to partially restructure the city grid, the re-opening of First Street is imperative. Not only does this decision aid in revamping the intersection, but it breaks up the superblock currently between H and I Streets. As the size of the lots become more manageable, the size of future buildings built on these lots also become more realistic.

The triangular lot between New Jersey Avenue and First Street is reformed as a plaza that carries through the circle. The market building is sited between this plaza and the existing Government Printing Offices as a symbol of locality of food, gathering, and culture. It is a face to the new circle, and it expands its boundaries on busy Saturdays, spilling over the street and into the adjoining plaza, which doubles as a spot for locals to sit during their weekly lunch hour.



PROBABLE DEVELOPMENT

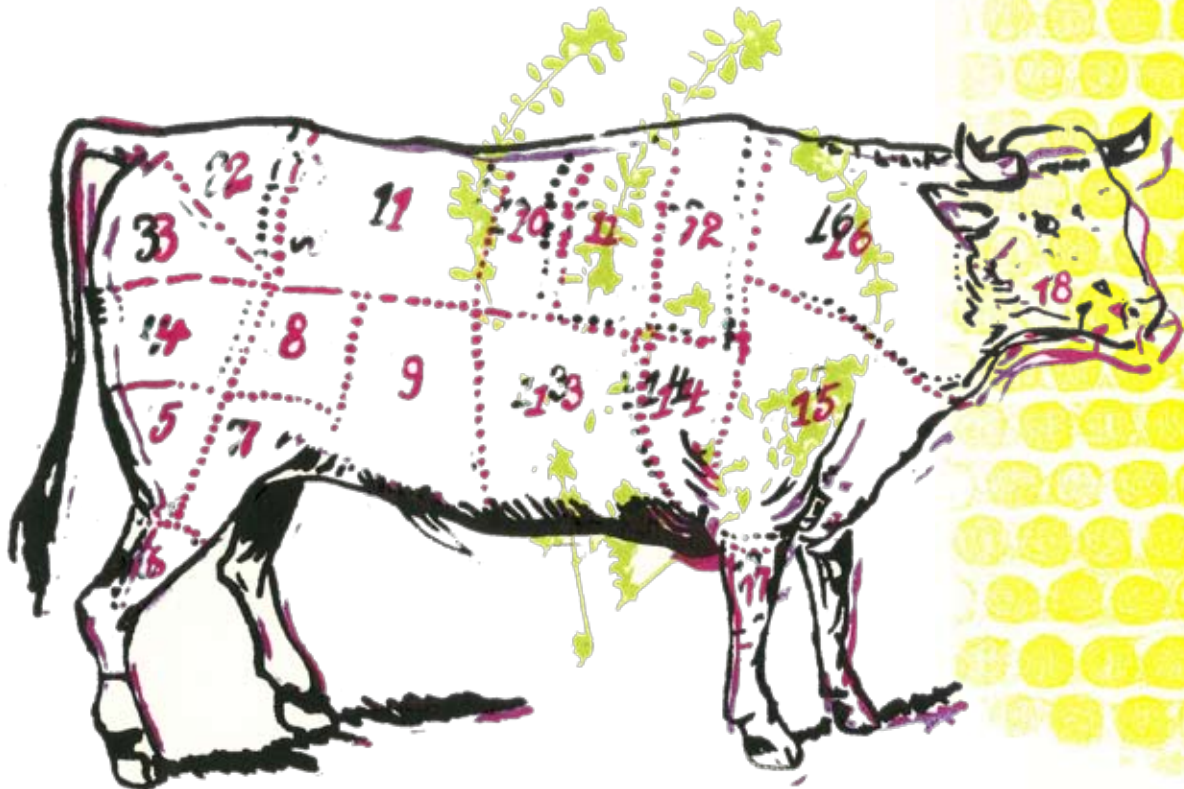




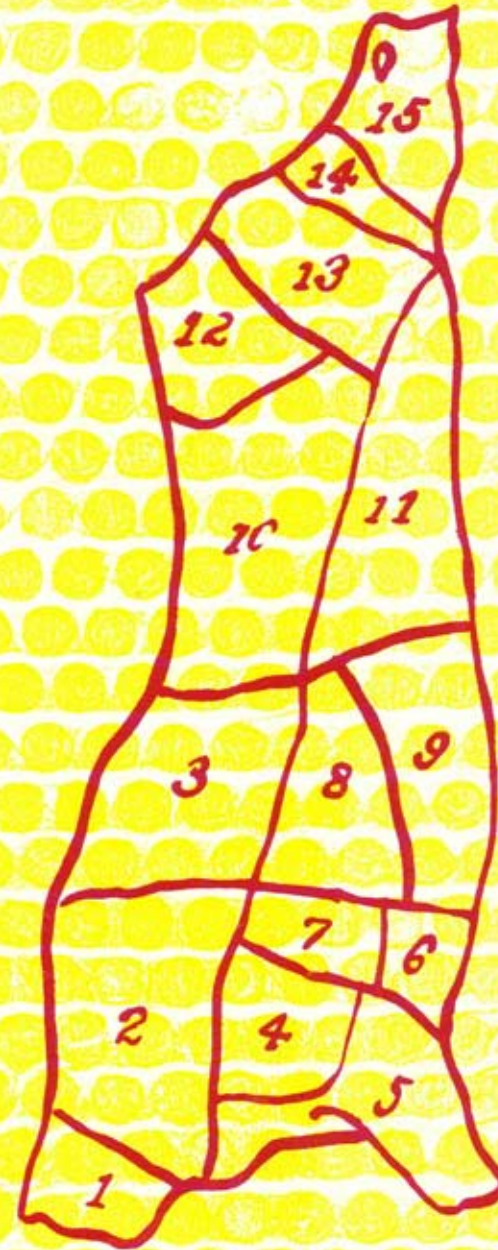
PROPOSED DEVELOPMENT

The term “foodshed” is used to describe the distance between where food is produced and the path of travel to where it is ultimately consumed. In the 1780’s, the typical person’s foodshed was fifty acres.¹¹ Technological advancements, global trade, and industrialization have taken roles over the years to allow our foodshed to be global. However, as healthy eating becomes a concern, as shipping costs rise, and as fuel is wasted in unnecessary transport, buying local foods has become more appealing.

Vendors at the current markets in Washington, DC travel from within approximately a 100 mile radius. The primary building materials were chosen from their availability within the same 100 mile radius. Four primary materials were chosen based on the four elements and their intrinsic qualities. The materials are considered sustainable based on the resources used to create and erect them, their recyclability, and their life span.



18th CENTURY BEEF DIAGRAM



20th CENTURY BEEF DIAGRAM

- **Brick [earth]**

Brick, a product of the earth's natural resources itself, demonstrates the solidity of the element. It is a natural insulator, has a long life span, and is recyclable.

Glen-Gery Brick Manufacturer, Manassas, VA

- **Steel [fire]**

With fire fusing together minerals to produce this material, steel inherently contains fire in its content. Its sensitivity to heat and cold with expansion and contraction makes this the fire material. It is one of the most highly recycled materials, has a long life span, and expels little waste in its production.

Crystal Steel Fabricators, Inc., Delmar, DE

- **Poured in Place Concrete [water]**

This fluid material commonly uses locally mined or recycled aggregates, is an insulating thermal mass, is durable, and is recyclable.

Lafarge Concrete, Towson, MD

- **Precast Concrete [water]**

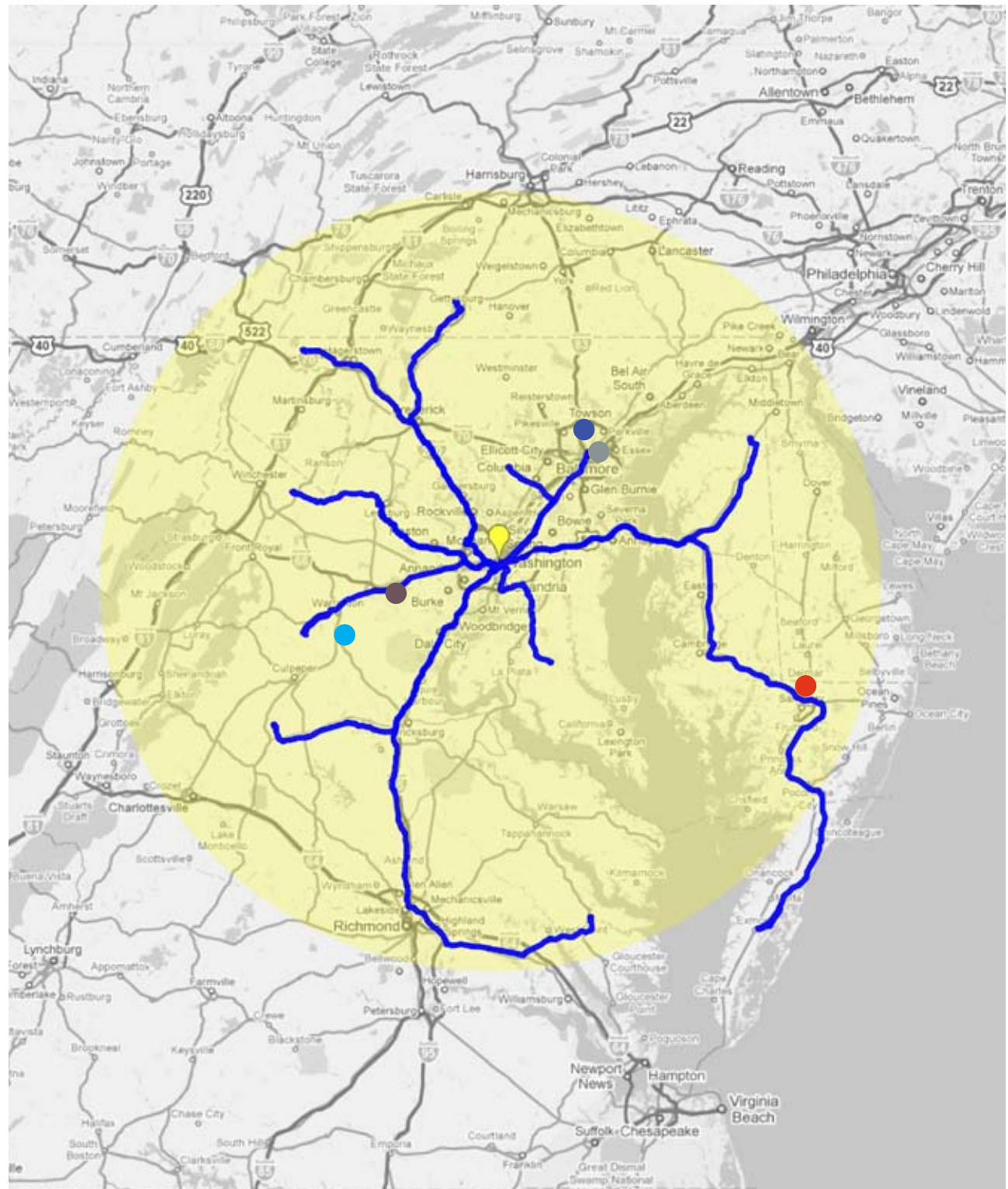
In addition to the qualities and properties of poured in place concrete, precast highly minimizes waste in all phases of its fabrication.

Smith Midland, Midland, VA

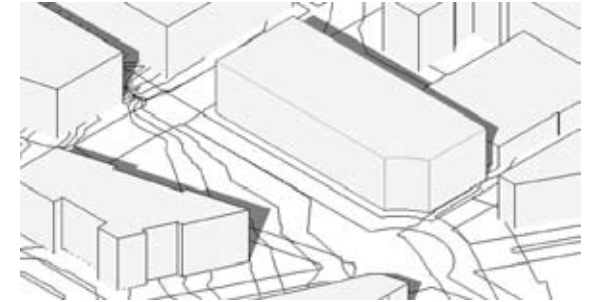
- **Glass [air]**

With its transparent qualities, glass allows light to penetrate spaces without obstructing views. When used in the form of operable windows, this material forms a boundary between interior and exterior allowing control of air flow.

Baltimore Glass Company, Baltimore, MD

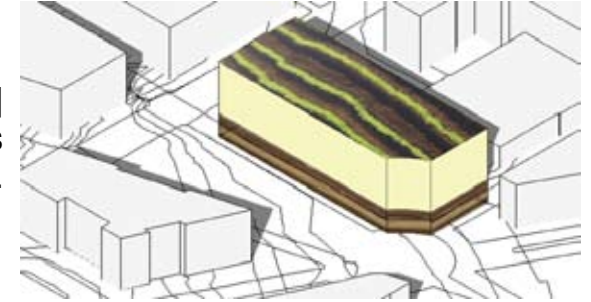


The massing and boundaries of the site begin to determine how the building should preliminarily take form. These decisions are influenced by the neighborhood boundary studies, the selected materials and their qualities, the influence of the four elements, and the new traffic circle.



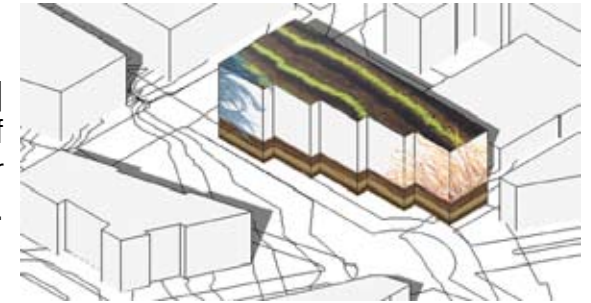
[earth]

As the building's foundation digs into the earth, its roof can be used as a new surface for growth.



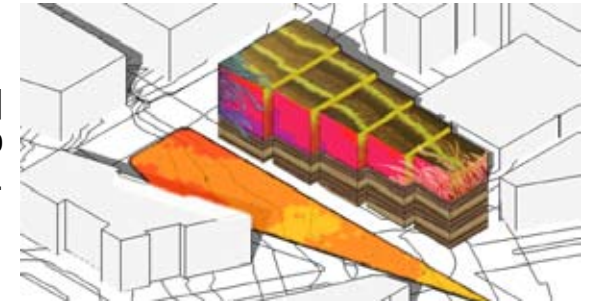
[air]

Stepping the building back could take advantage of the summer breezes while blocking the cold winter winds.



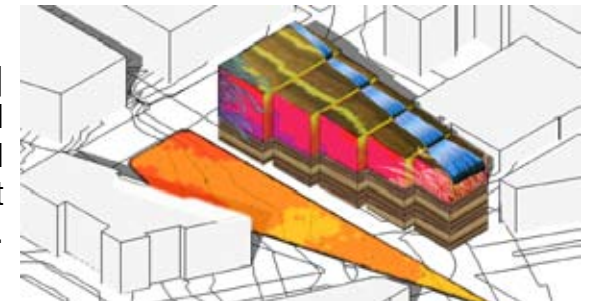
[fire]

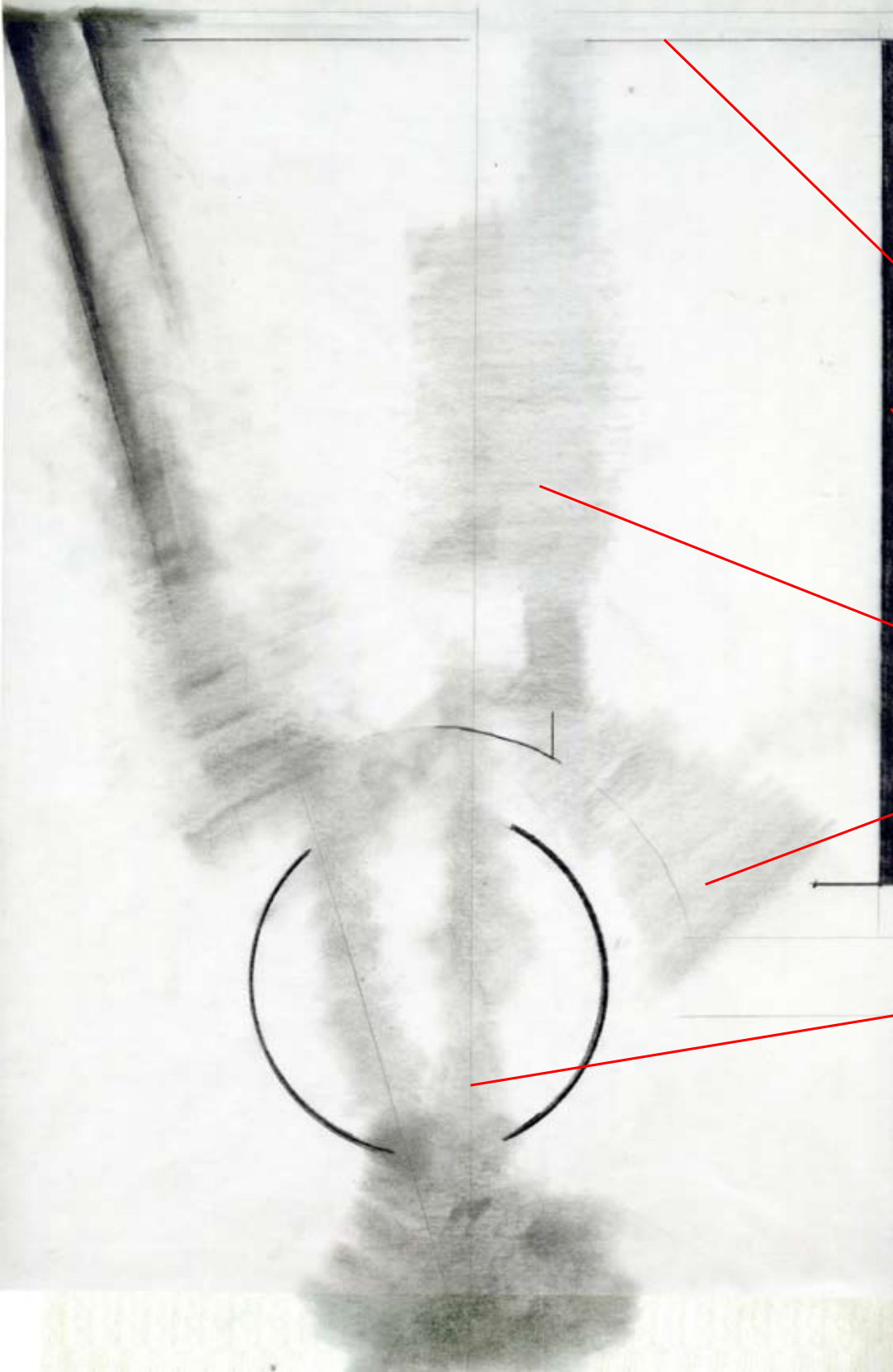
Stepping the building back from the street and also down allows light to penetrate the space.



[water]

Manipulating the slope of the roof allows control of drainage. Water can be centrally collected and reused while exemplifying the fact that the site is split between two watersheds.





The north side forms a hard edge to protect from harsh winds, traffic noise, and pollution.

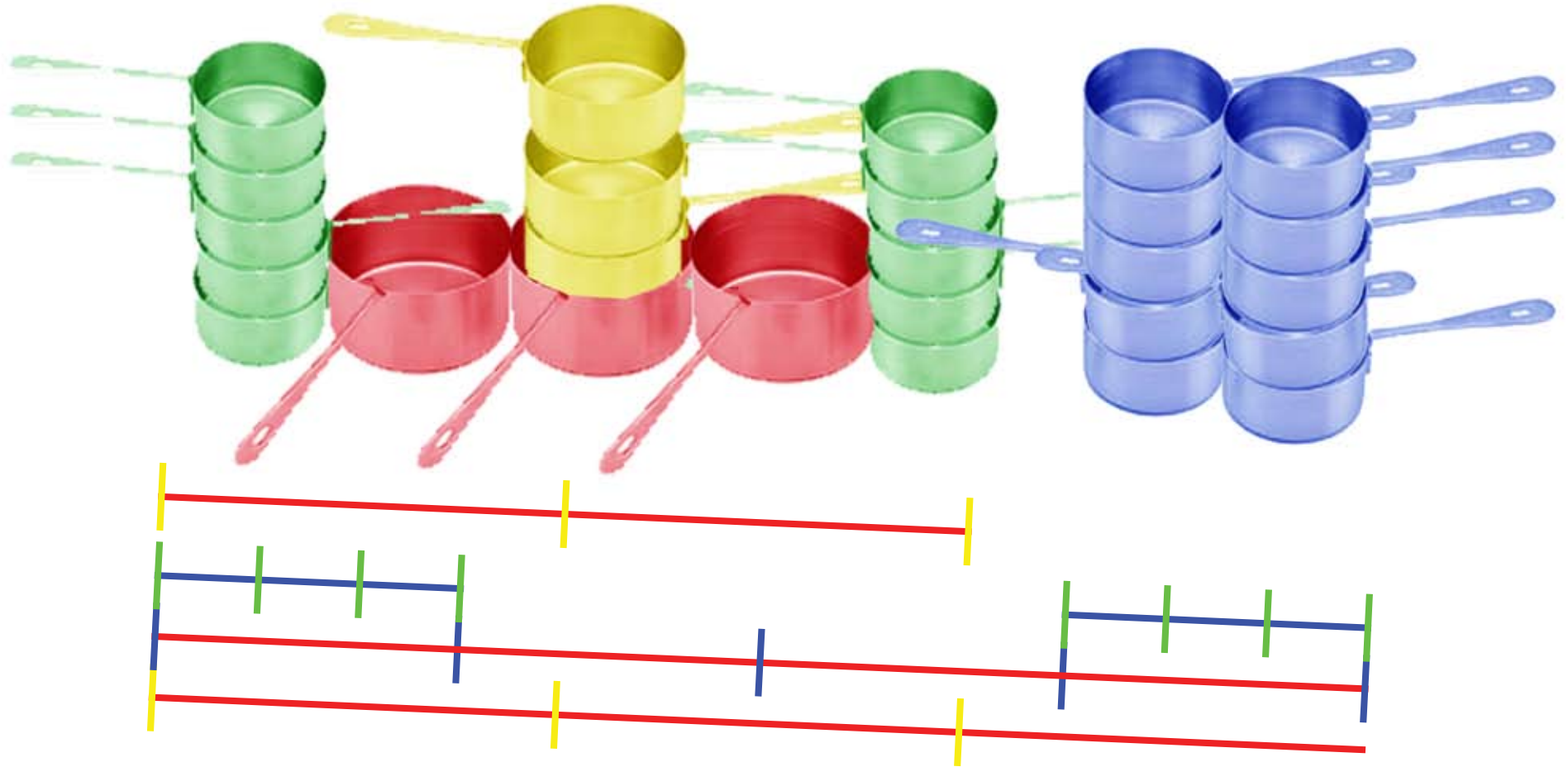
This thick, solid boundary acts as a service wall and division between Central Market and the existing Government Printing Offices.

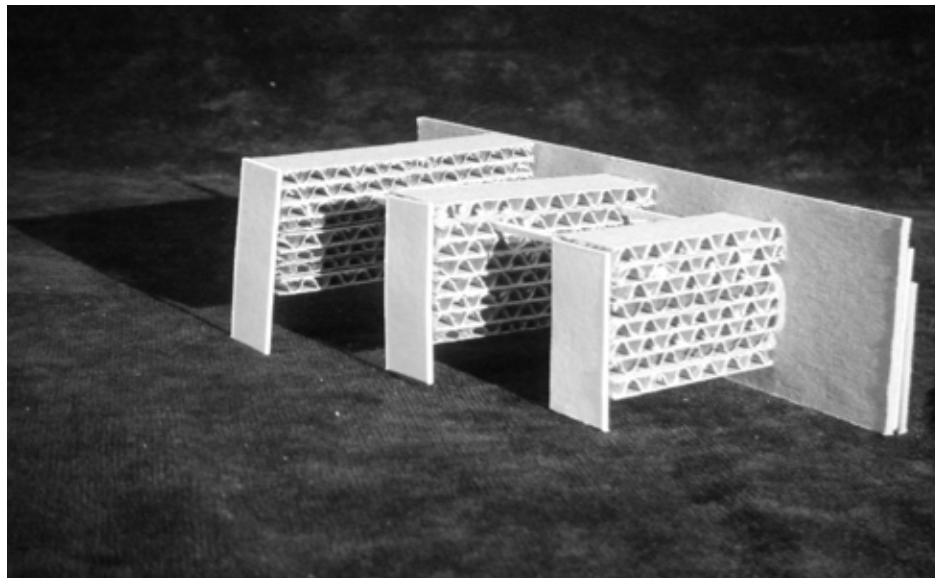
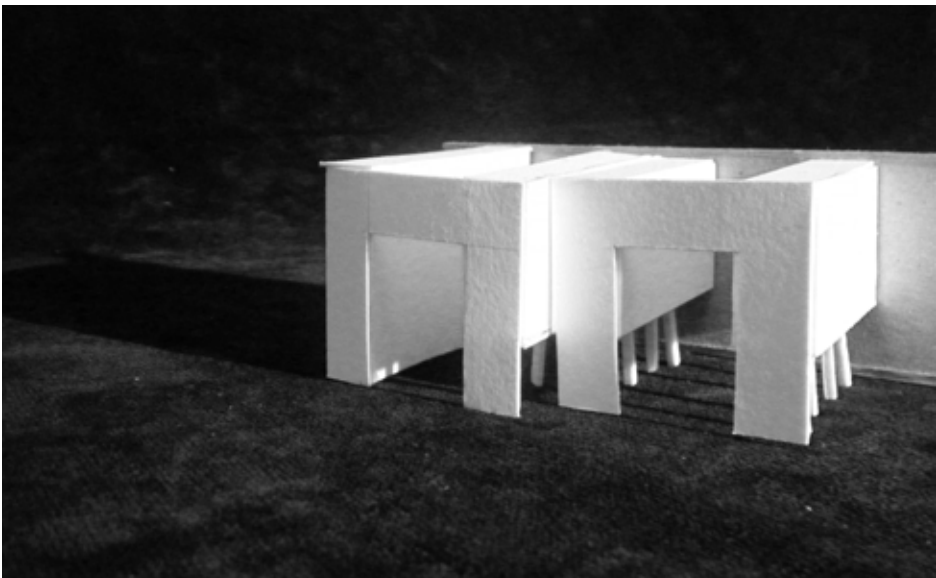
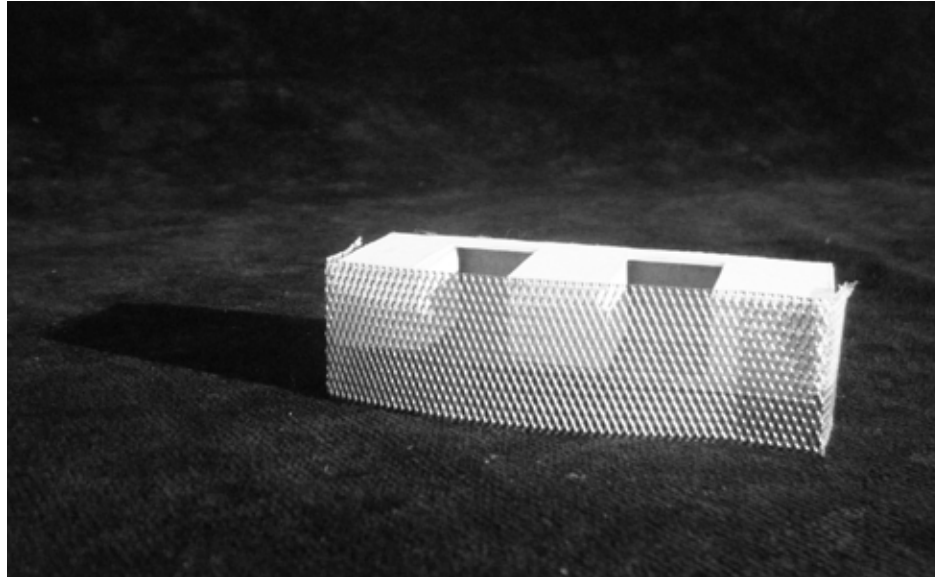
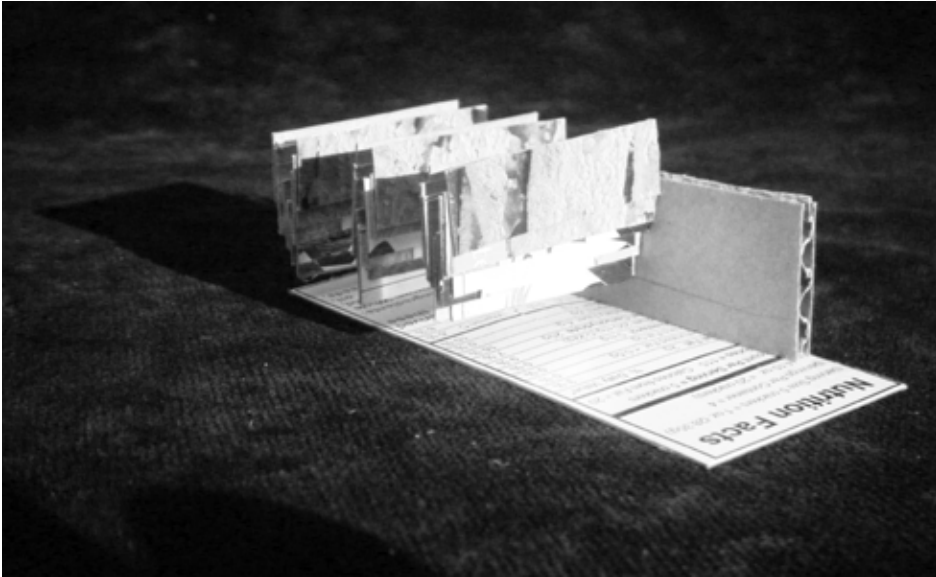
The western boundary is soft and bleeds into the plaza, forming a more transparent edge to easily draw patrons in.

The southern edge reacts to the circle and forms a main entry for the building. This open, permeable boundary takes advantage of southern light.

A pathway through the circle directs pedestrians north towards the newly opened, walkable First Street.

Relating the processes of cooking to designing, the buildings' proportioning system is based on the standard measuring cup. Volumetric measurements and spatial divisions are derived from a system of one third, one quarter, and one half divisions.





“The building grows out of the ground into its appropriate form. It is rationally developed within its particular situation and cultivated by the holistic forces of the present – the ordinary complexity of reality.”¹²

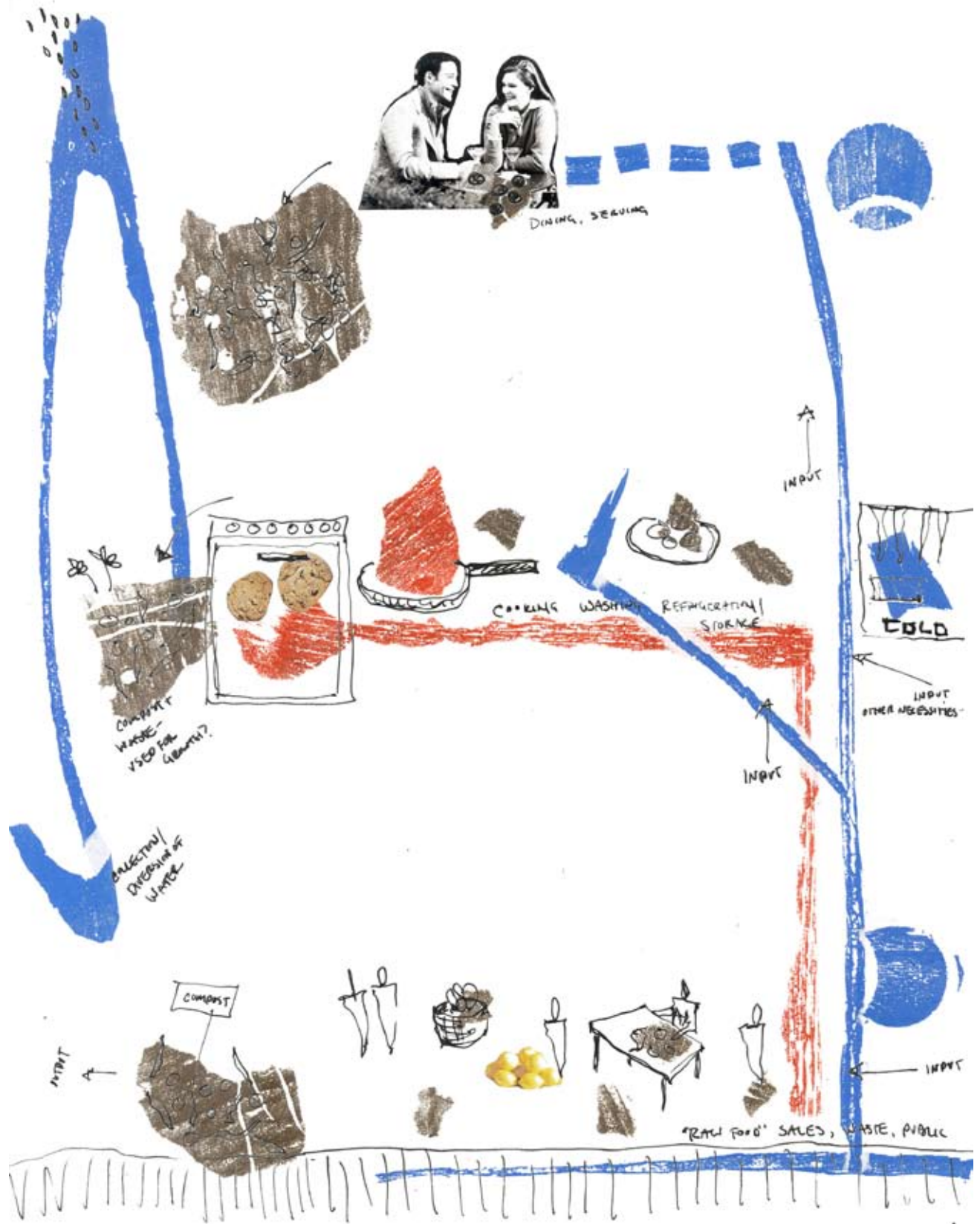
Constructing an Ecosystem

As the building takes shape, principles of ecology aid in the design of its elements. These principles allow the concepts behind the architectural ecosystem to become tangible building components. The principles, detailed below, are stratification, interdependence, and fluctuation. Similar to the four elements, the ecological principles work to independently and collectively describe and form the components and inner-workings of the ecosystem.

The principle of stratification describes that different levels of living systems are dependent on one another for survival. These levels are organized in a way that encourages organization and interaction between the different zones. The idea of stratification in architecture allows programmatic and other organizational complexities “to be managed in a coherent manner”.¹³

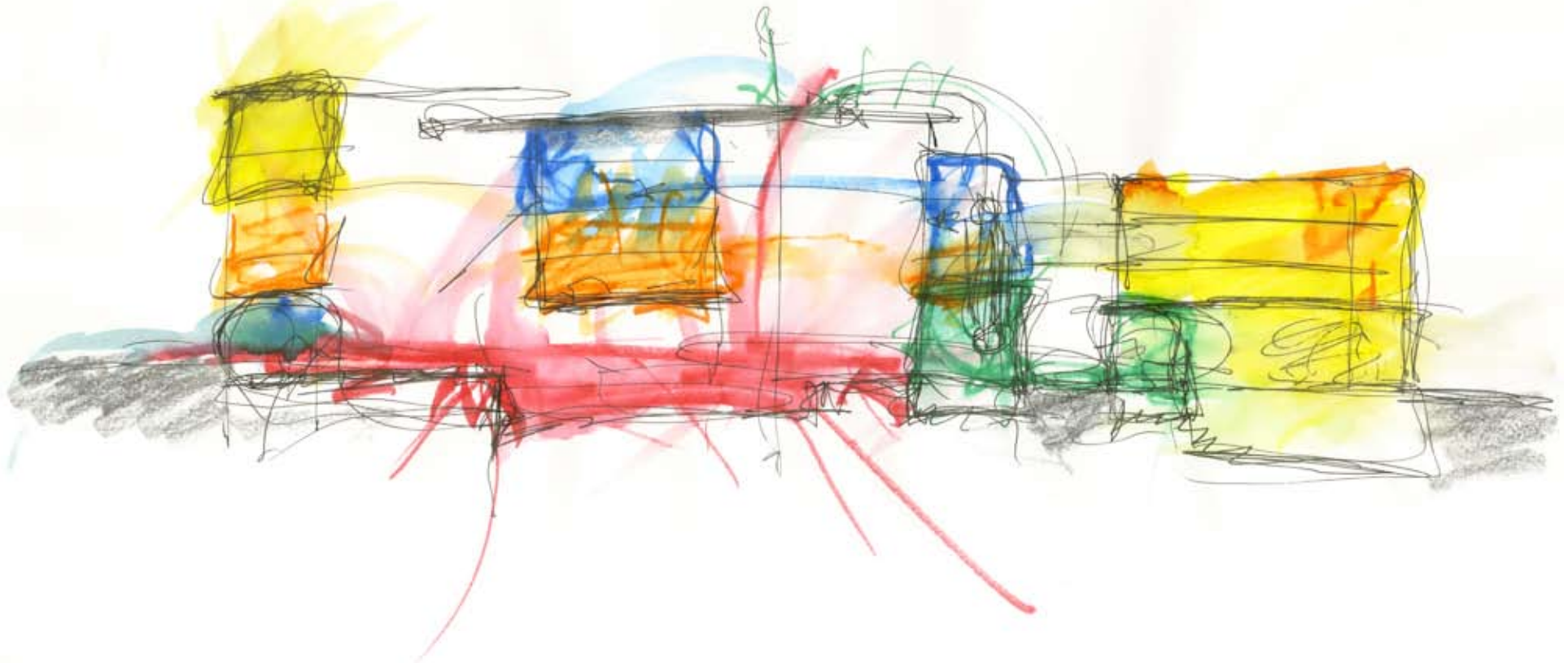
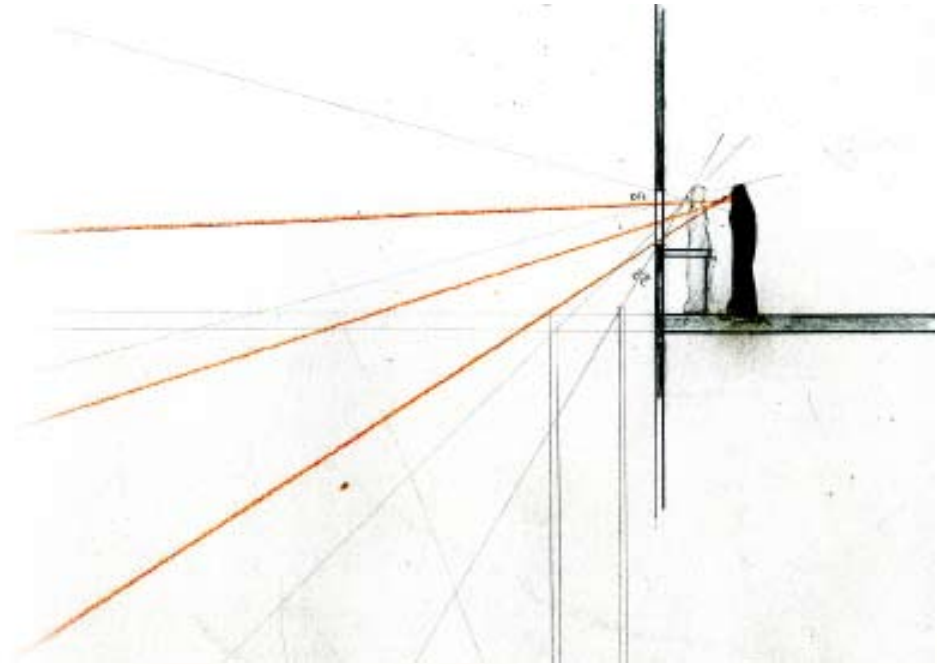
Within and between the zones of an ecosystem, organisms depend on other factors in the system for vitality and growth. For example, plants are dependent on sunlight and rain, while herbivores are dependent on those plants. Each part of the system plays a role to keep the ecosystem functioning properly. As the building forms an environment for interdependent architectural parts to exist, its components should allow its users to interact with them in multiple ways.¹⁴ The building’s users are inherent properties in the architectural ecosystem. The site also acts as a fundamental piece of the system.¹⁵

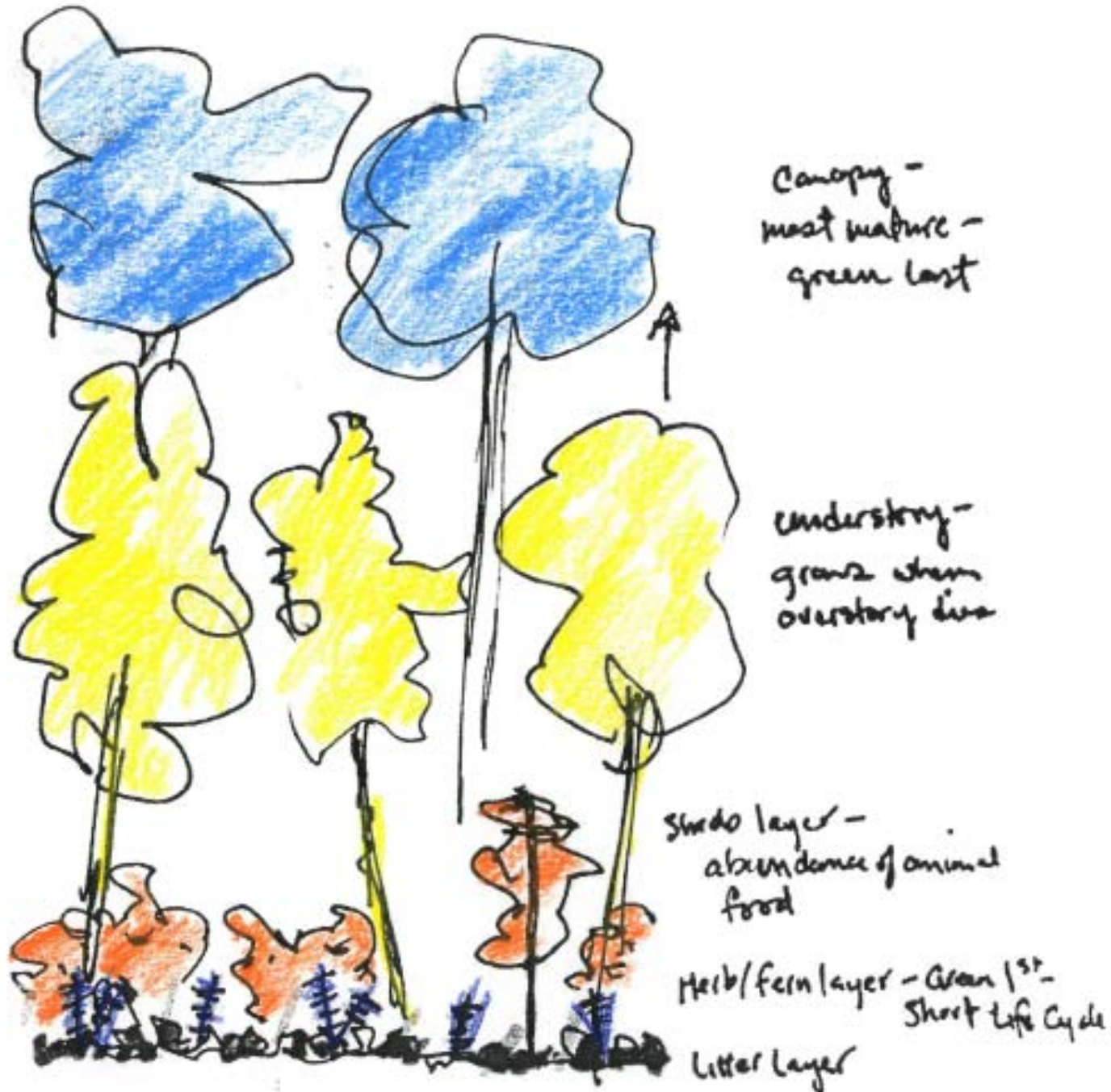
Ecosystems fluctuate to “adapt themselves to changing internal and external conditions” often through changes in population and re-balancing its organization.¹⁶ Portions of the ecological building are designed to change based on situations such as occupancy and weather. As the building adapts to its environment, it becomes an environment connecting the public to natural processes in the urban realm. Hence, these processes are experienced rather than figuratively represented.¹⁷



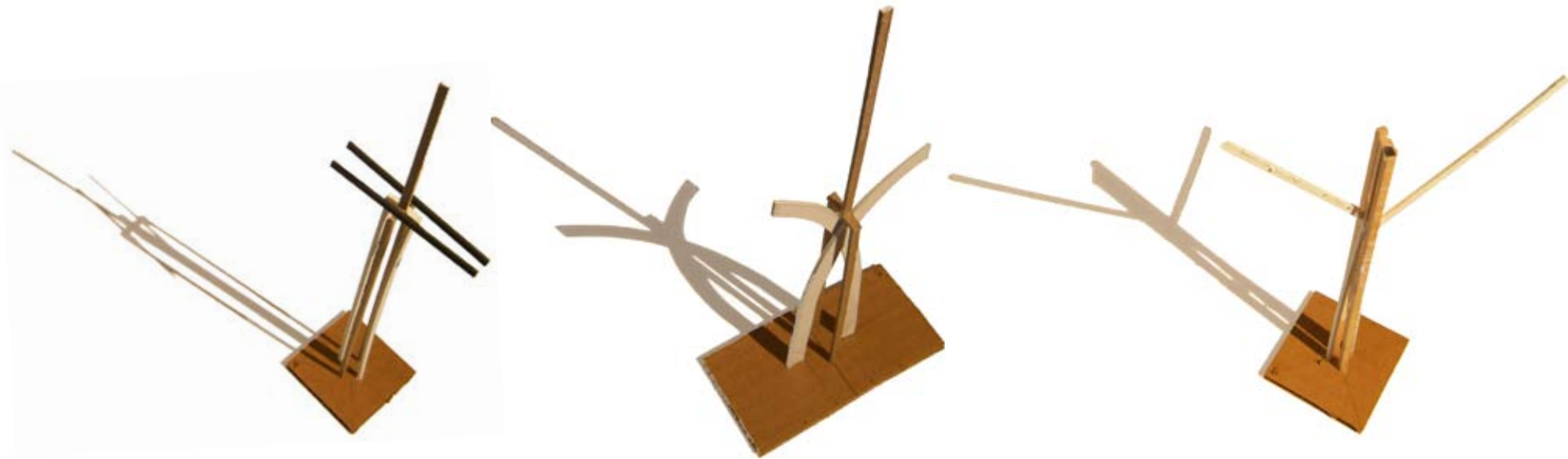
The building's program is organized using the model of ecological stratification. Forest stratification is used as an example, where each level depends on the other levels for structural integrity, nutrients and food sources, habitat protection, and population growth and survival.

Generally, as the user moves upward in the building, food reaches more refined levels. Yet, each level is interconnected with the last visually and programmatically. The market occupies the lowermost level of the building where consumers can enter, buy goods, and exit easily. Fresh ingredients from the market are moved to a second level culinary school. After food is refined with culinary practices, it is served in the restaurants on the third floor. From this level, patrons have a view down to both the culinary school and the market, watching and becoming aware of the paths and processes that their food undergoes to reach its final state. Housing for the culinary students to "nest" occupies the top levels of the building.





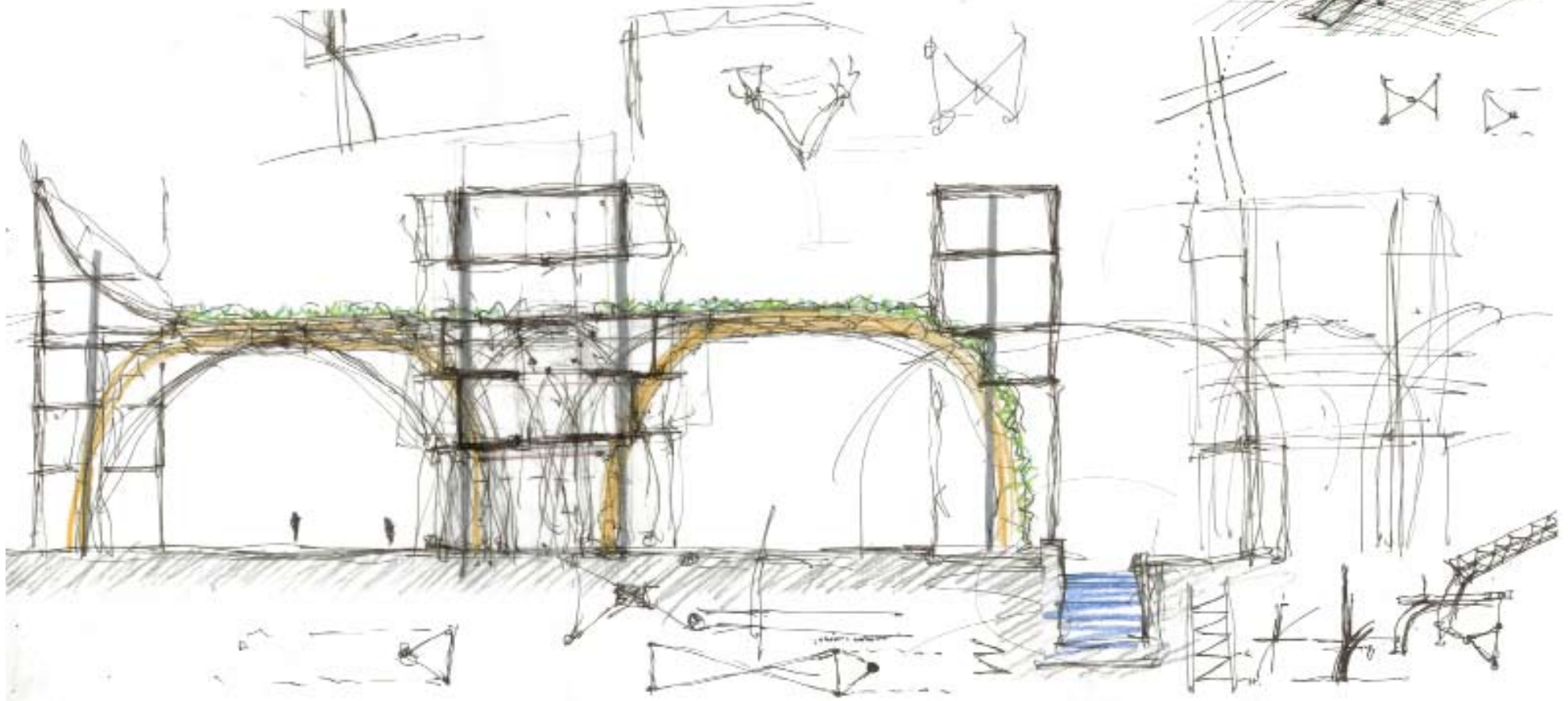
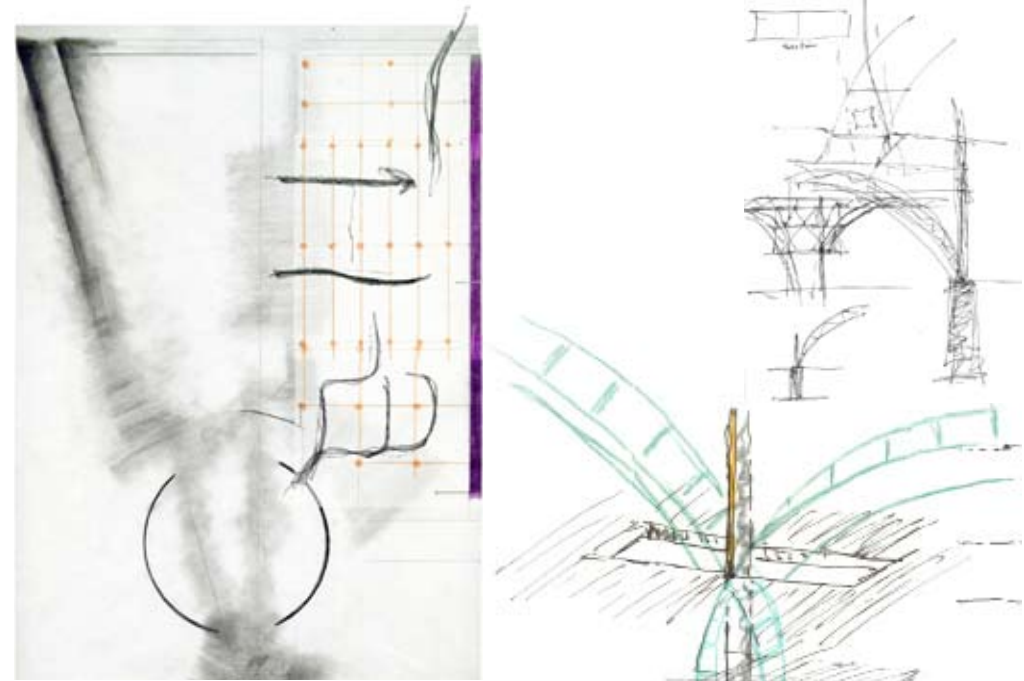


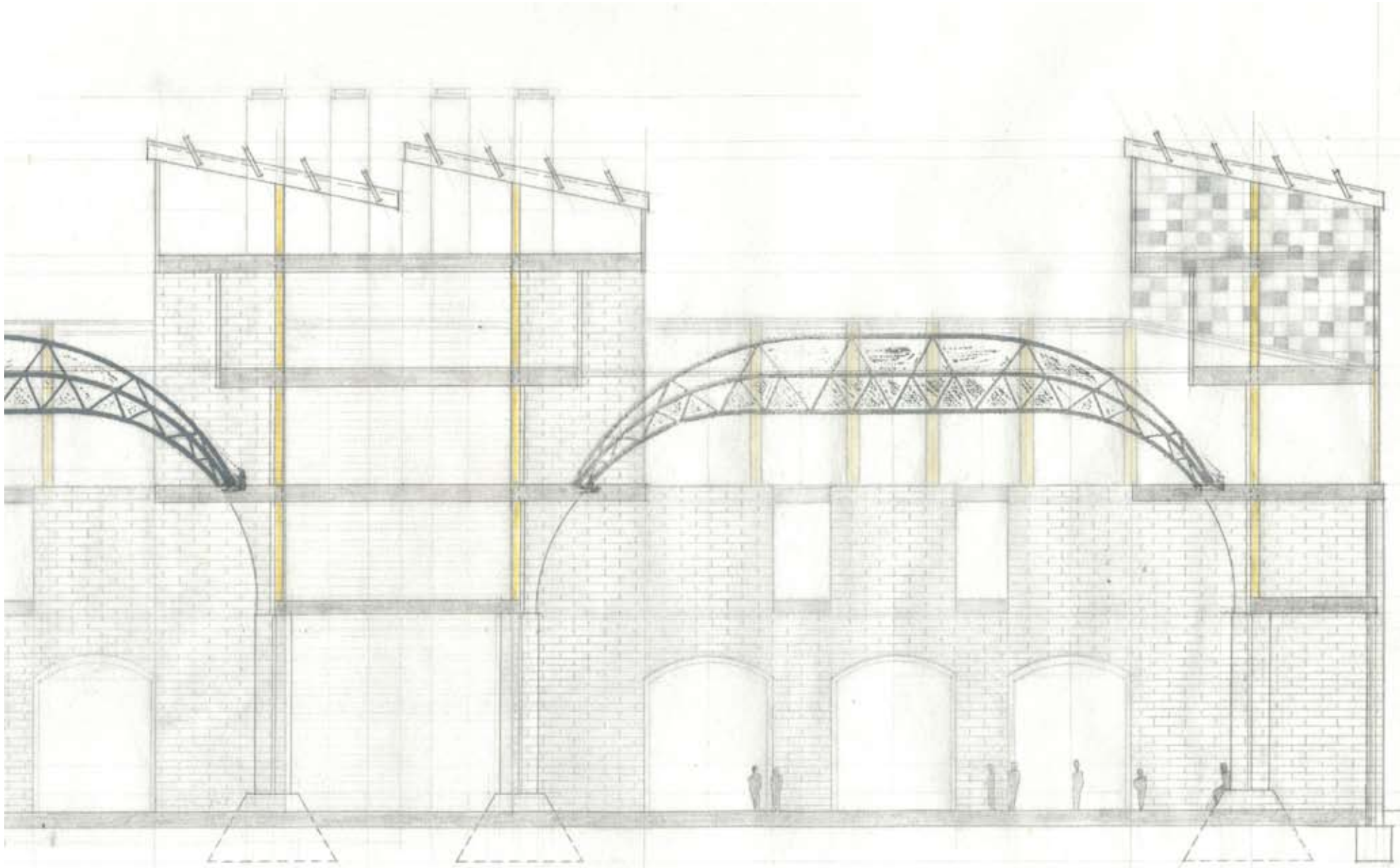


The building's structure is based on the concept of structural interdependence in plants. Typically, more densely grown plants grow to be taller and thinner in an effort to reach the sun. The plants are then individually less structurally stable than when they are grown independently. However, the densely grown plants as a group tend to be stronger and survive longer, as they rely on each other for structural support and protection from the elements.¹⁸

Instead of individual components, columns are grouped structural elements that supported each other and create a complex but stronger system. The columns are therefore free to branch out at higher levels and spawn new structural pieces.

The structural grid in itself encourages an east to west circulation pattern, allowing market vendors to arrive from the eastern, service side of the building, and market patrons to enter from the western, plaza side.





Steel columns support upper floors.

Combined steel box frame and space frame trusses span over and roof in the market floor. Upper trusses support garden spaces above.

Steel support base for truss.

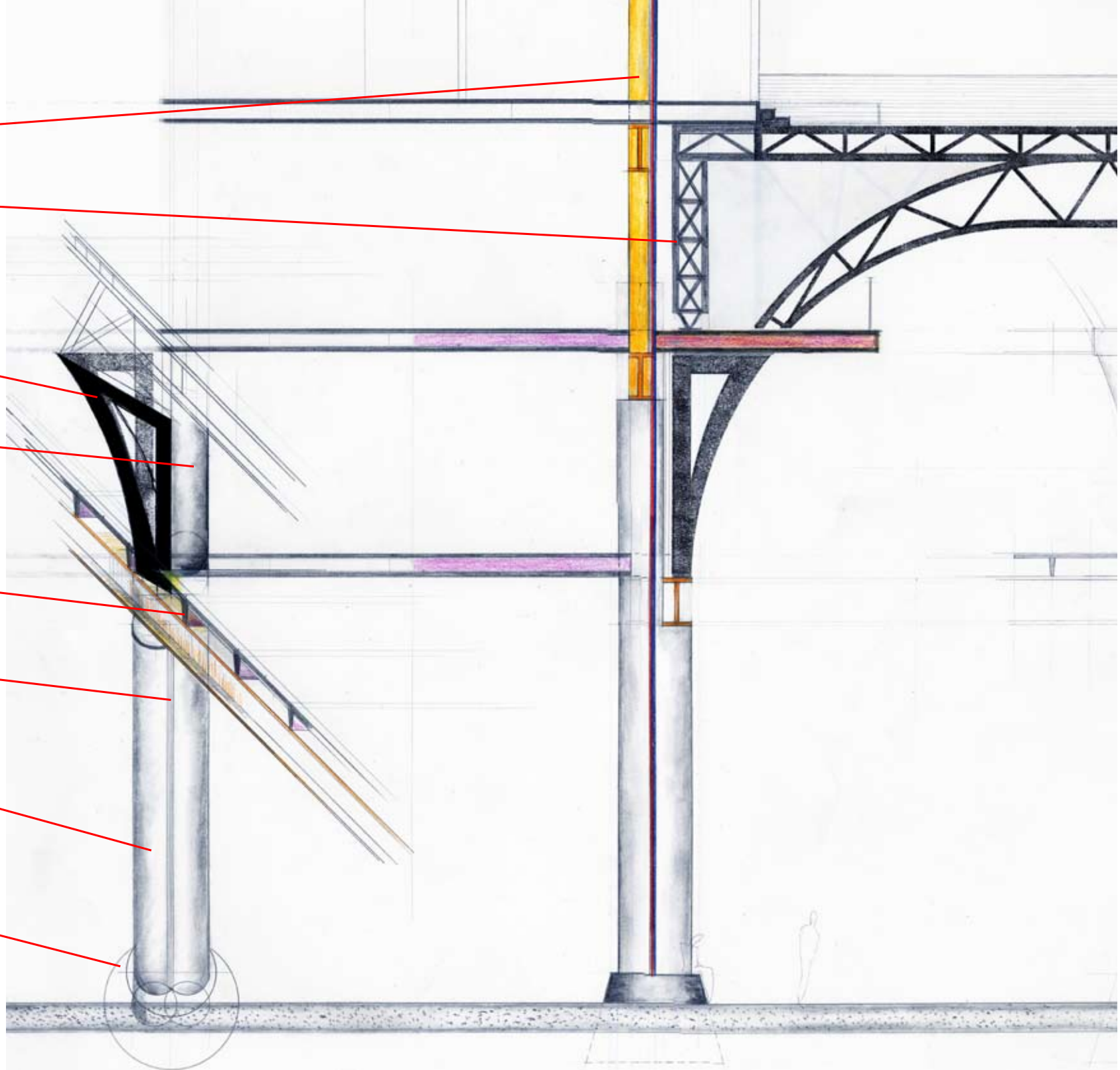
Single concrete column continues up through second floor. A steel girder supporting the third floor rests on top.

Precast double-tee floor supported by steel girders.

Exposed hot and cold water pipes run up one side of the column, while wastewater runs down the other side.

Two overlapping round poured-in-place concrete columns support the second floor.

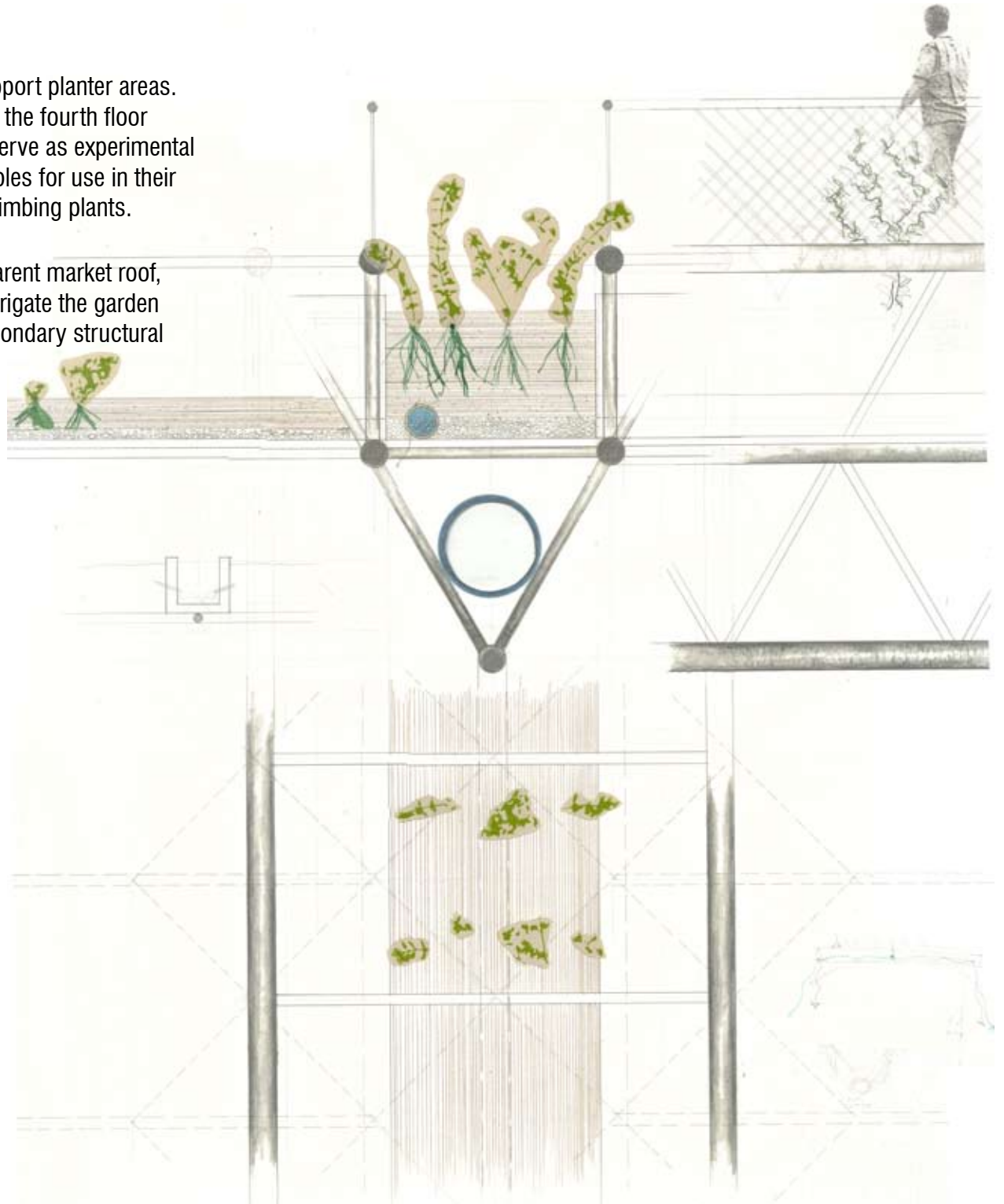
Poured in place concrete footing rises through floor to form a resting place for market patrons.

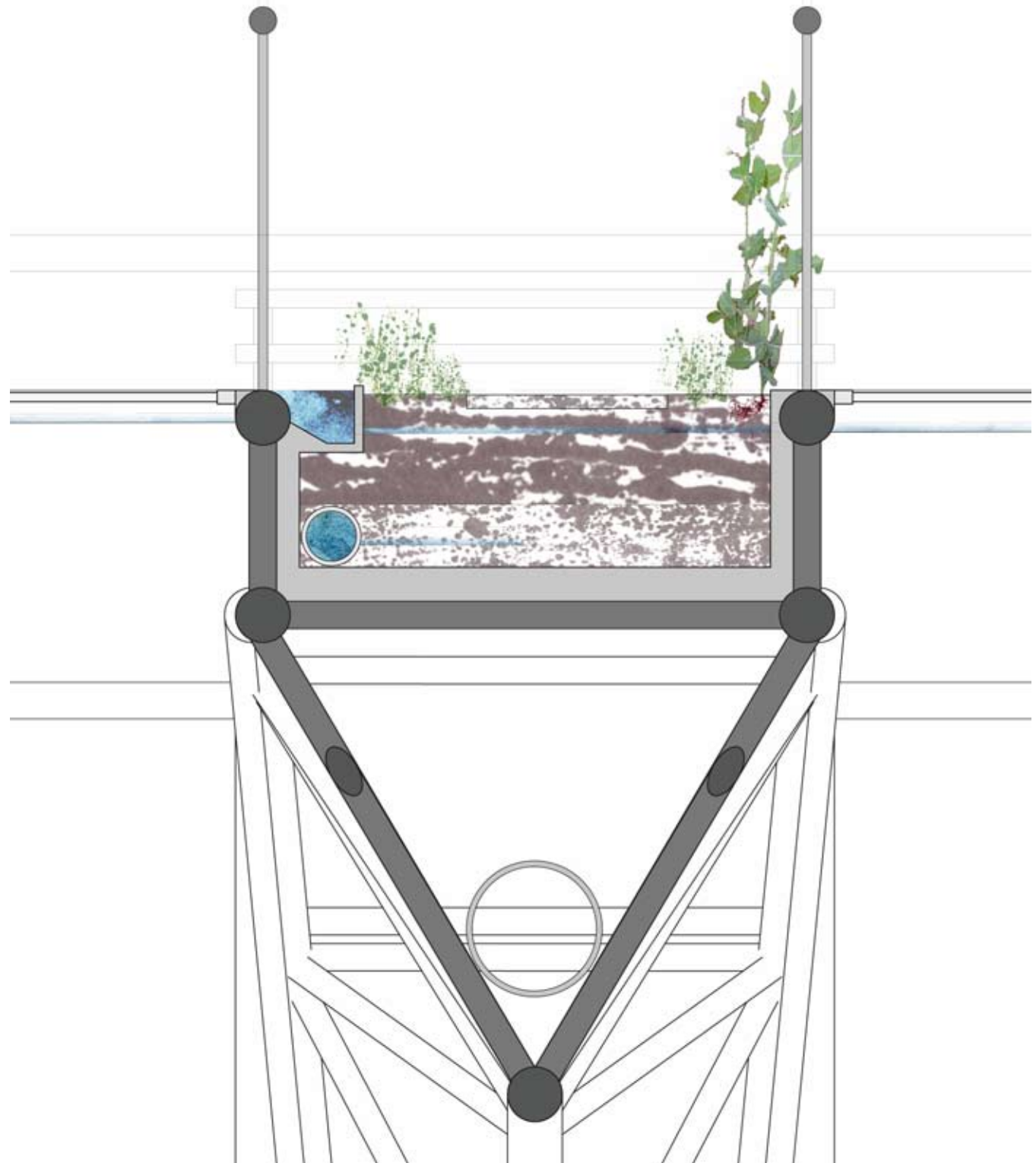
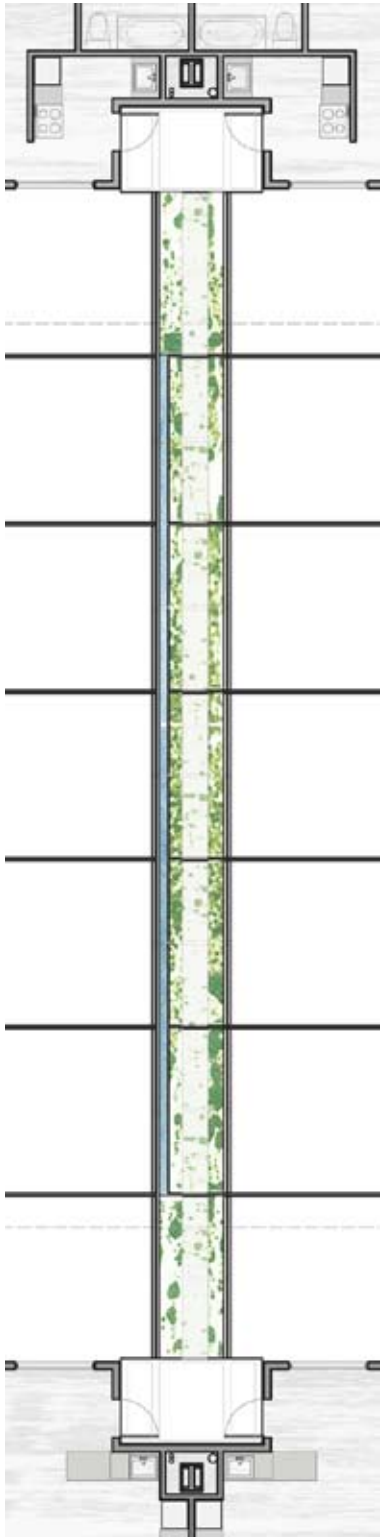




Within the long spanning trusses, the box trusses support planter areas. These spaces act as a shared outdoor space between the fourth floor student housing units. Away from public sight, they serve as experimental garden spaces for students to grow herbs and vegetables for use in their culinary pursuits. Wire railings double as space for climbing plants.

The top of the truss is at the same level as the transparent market roof, allowing stormwater runoff to be stored and used to irrigate the garden spaces. The water drains through channels in the secondary structural members that laterally tie the trusses together.

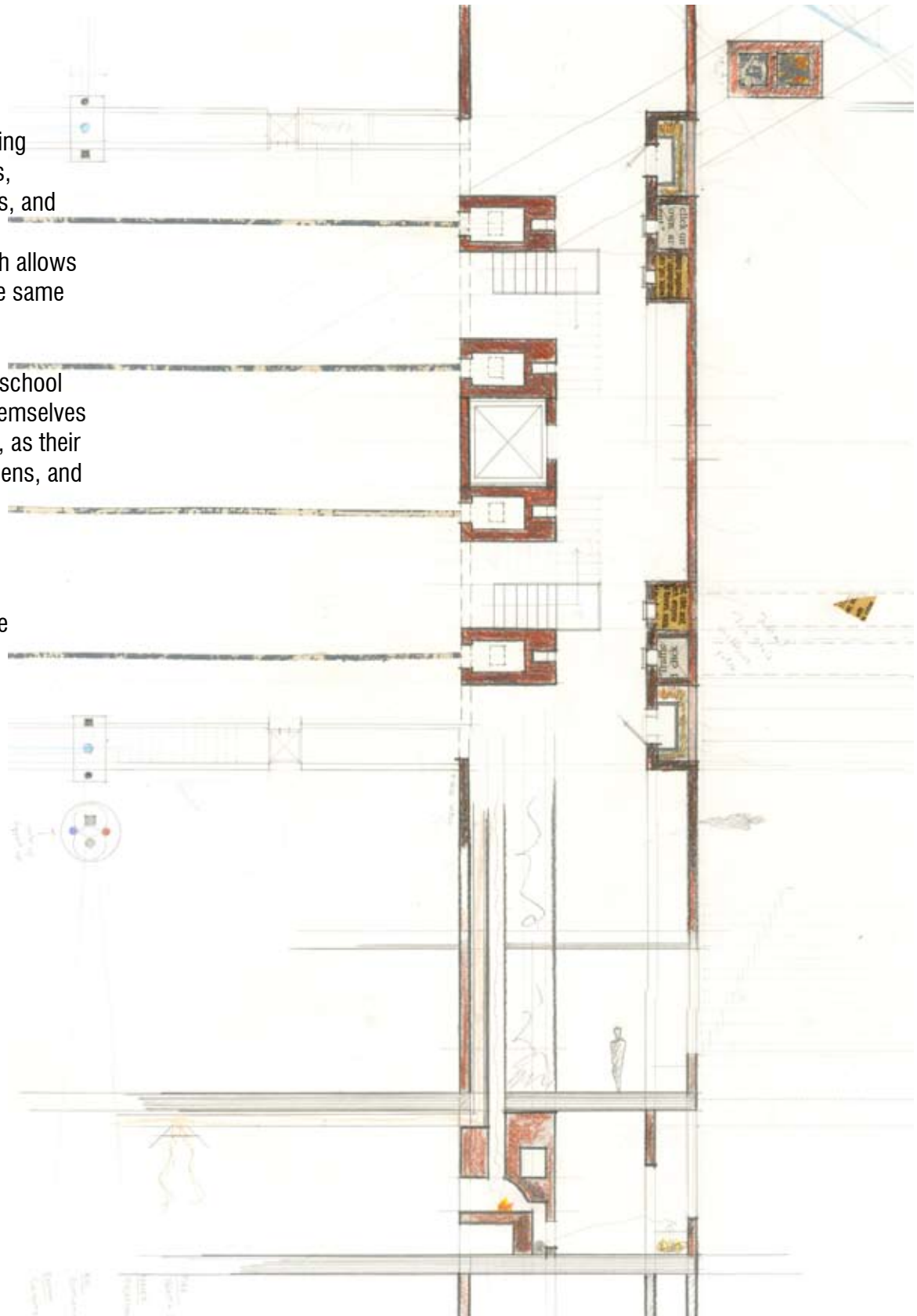




The thick, eastern edge of the building acts as a service wall, providing space for market vendors to unload their goods and park their trucks, creating a spine for circulation, accommodating mechanical systems, and incorporating spaces for trash, recycling, and compost collection. The brick bearing wall structure accommodates a brick screen which allows eastern light to flood into the market as the merchants enter from the same direction.

The mass contains chimneys that hold bread ovens for the culinary school and fireplaces and air vents for the other levels. The bread ovens themselves mimic the flow of product, energy, and waste present in the building, as their ash is collected to be used as a soil neutralizer in the building's gardens, and heat held in the firebrick could help supplement the building's heating system.

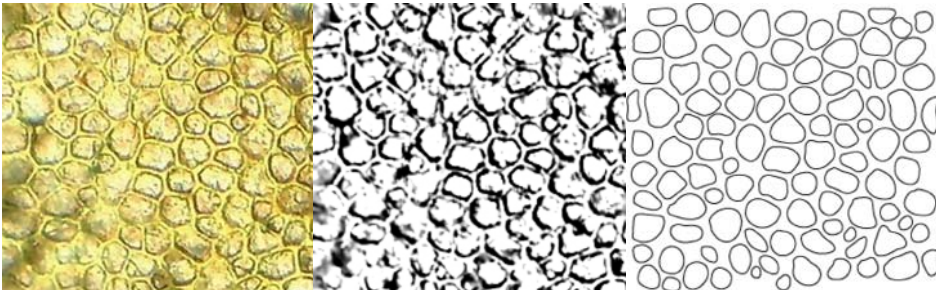
These vertical fire elements are supported with vertical fire escapes and elevators, further demonstrating the principle of interdependence between building components.





On the west side of the building, large doors slide open in the morning, signaling the start of the market and creating a large, open entryway. The doors are perforated with a pattern abstracted from the skin cells of a tomato, the most popular vegetable to be grown at home in the United States. The patterned metal acts as a shade for the glass-enclosed stair towers, casting elegant, long shadows onto the market floor.

The doors close in the evening, revealing entry doors into glass towers which take patrons up to the culinary school and restaurant levels. Patrons enter the market through these same doors in colder months and during inclement weather, when the large screen doors can remain closed or partially open, sheltering the space but still allowing light to come in.

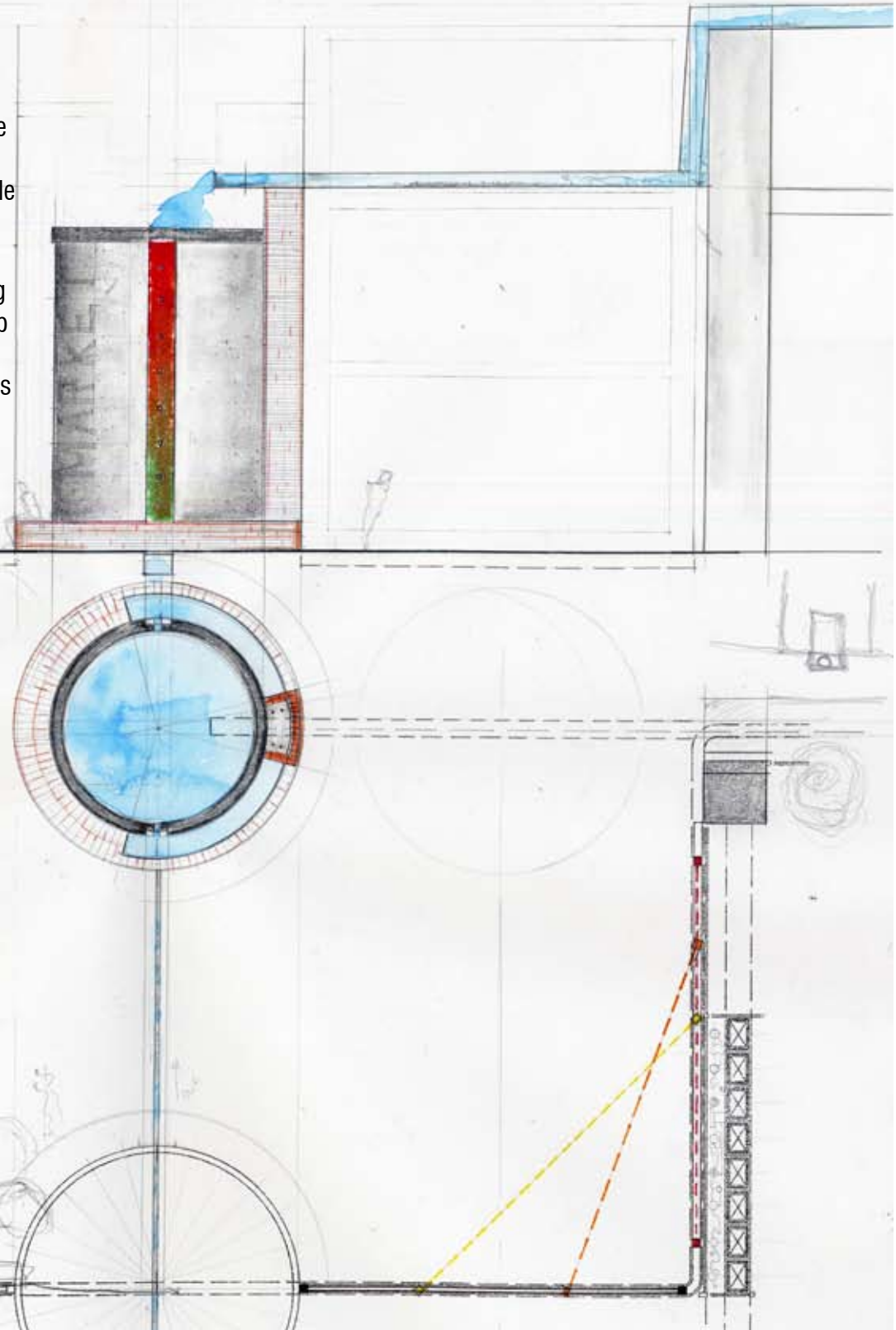


TOMATO SKIN CELLS MAGNIFIED 100x



A cistern for water collection marks the building's main entry. Stepped back from the street to receive the traffic circle, the building creates a space for meeting, waiting, and observing other market shoppers. The concrete holding tank in the middle of this space bears the name of the market, visible from the circle as patrons arrive at the building.

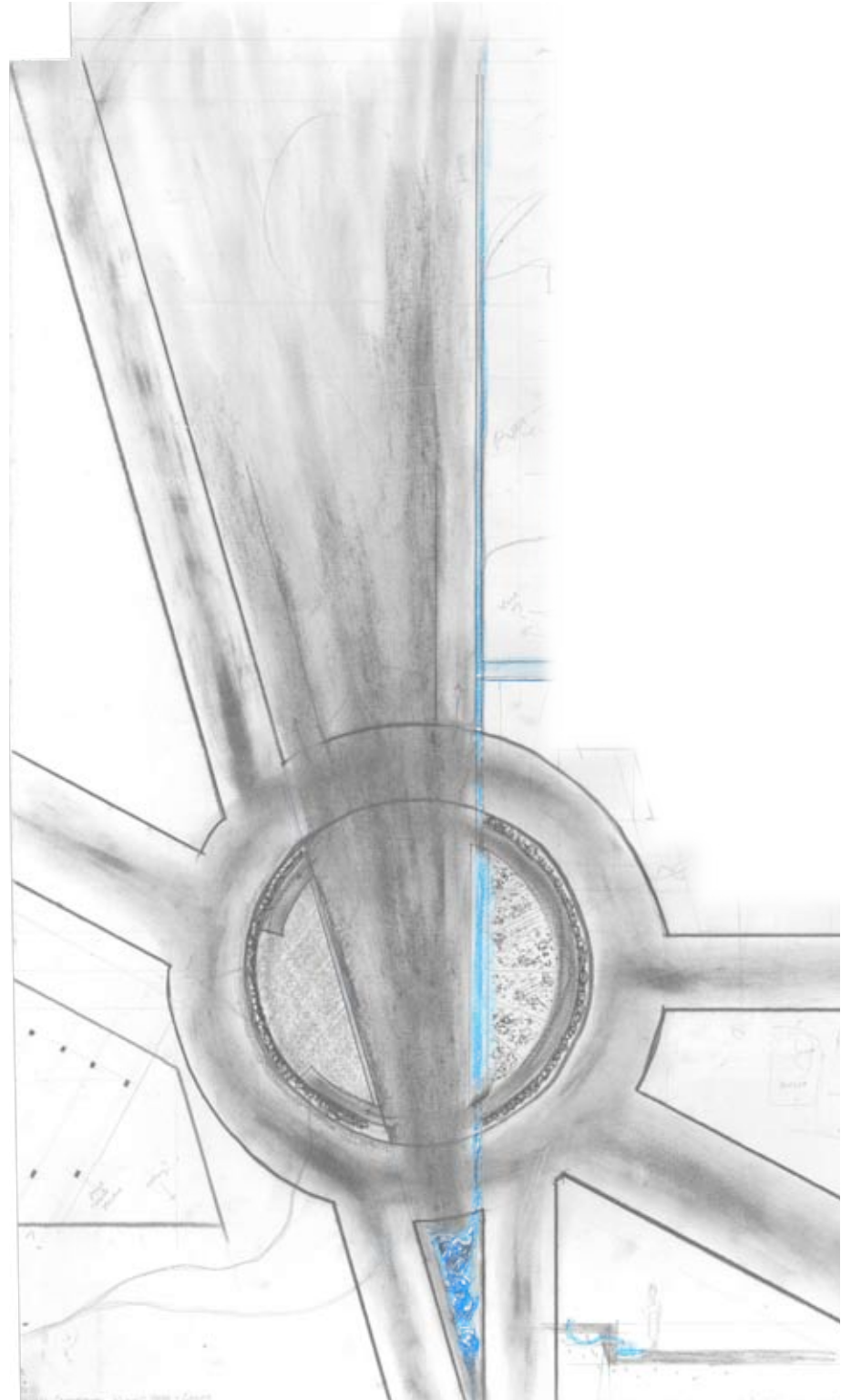
The top track for the large entry doors doubles as a gutter system, directing water to the cistern. As rainfall fluctuates monthly, a copper strip with weep holes indicates the water level in the cistern. The stored water is used to hose down the market floor at the end of each day. The excess water drains towards a channel in the ground and runs south through the circle.





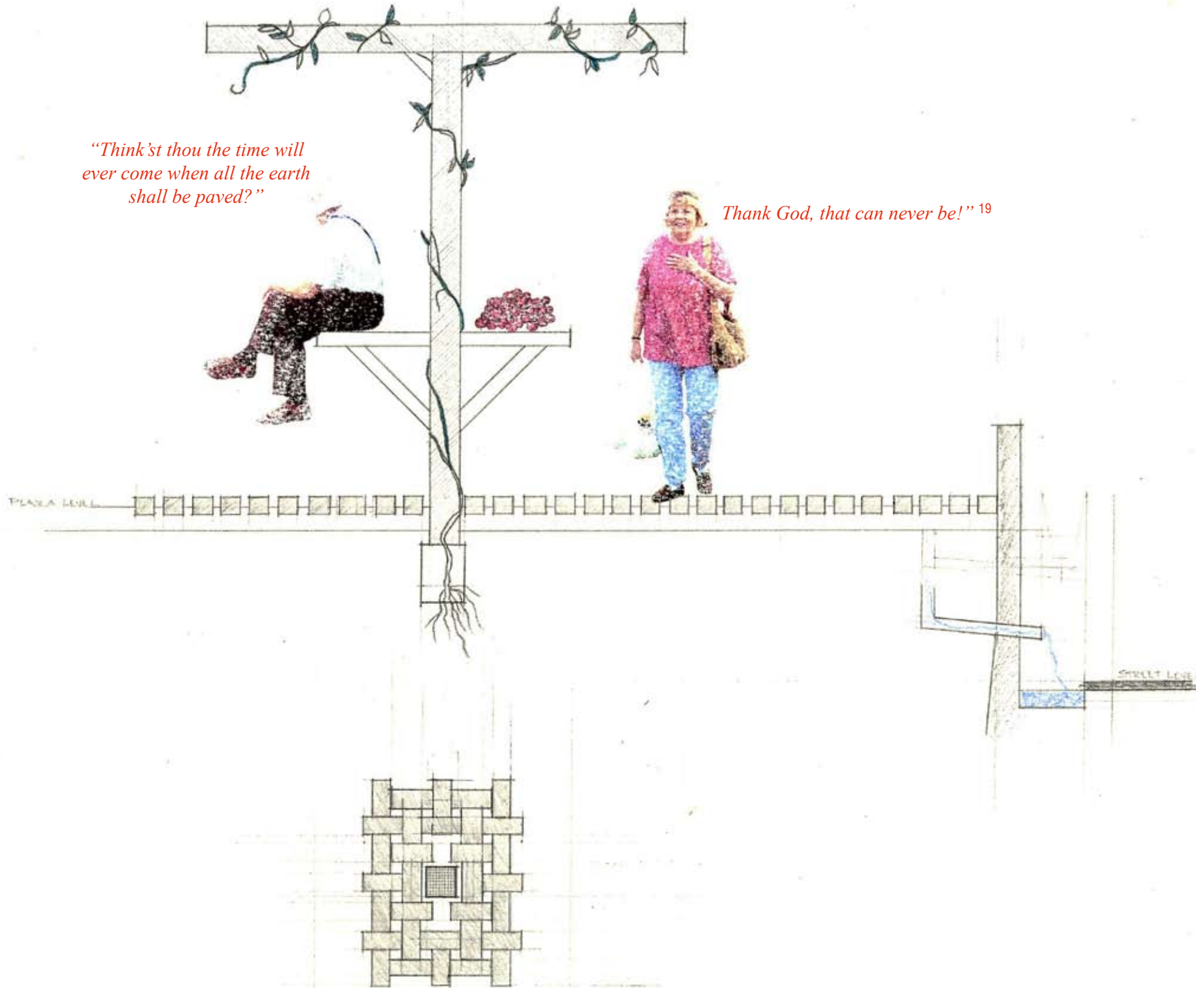
When runoff water drains from the building, it is directed to flow south, through the watershed that the majority of the site lies in. A channel to the right of the plaza area directs this water under the street, through the circle, and to a fountain in the triangular space south of the circle.

The plaza is surfaced with a permeable brick paving pattern, allowing water to penetrate and drain through the soil and creating a space for small plants or grasses to grow through. Vines can grow up and create shade for wooden structures placed in within the plaza. These structures serve as tables for outdoor markets which may take place temporarily in the plaza. At all other times they serve as seats.



"Think'st thou the time will ever come when all the earth shall be paved?"

*Thank God, that can never be!"*¹⁹



While the circle organizes the intersection of roads, it creates a commodious public space in its center. This space is designed to extend the market's message of local food and ecology back into the city. Community garden plots fill the center of the circle, providing areas for groups or individuals in the city to participate in and enjoy growing their own fresh foods. Classes sponsored by the culinary school for the public could also utilize these garden spaces.

Various garden plot sizes are accommodated in the space based on individual needs. Small, medium, and large sized plots fit within the designated garden area. Based on changing needs, the number of each sized plot fluctuates. Gardens are irrigated with water from the channel. Composting containers are built next to the gardens for yard waste collection.

The gardens have green spaces on each side which are surrounded by evergreen trees that block both the sounds and the views of traffic. Select trees are to be cut down and re-planted annually to be used as Christmas trees for the market. The remaining green spaces transition seasonally between a pumpkin patch and cutting garden.



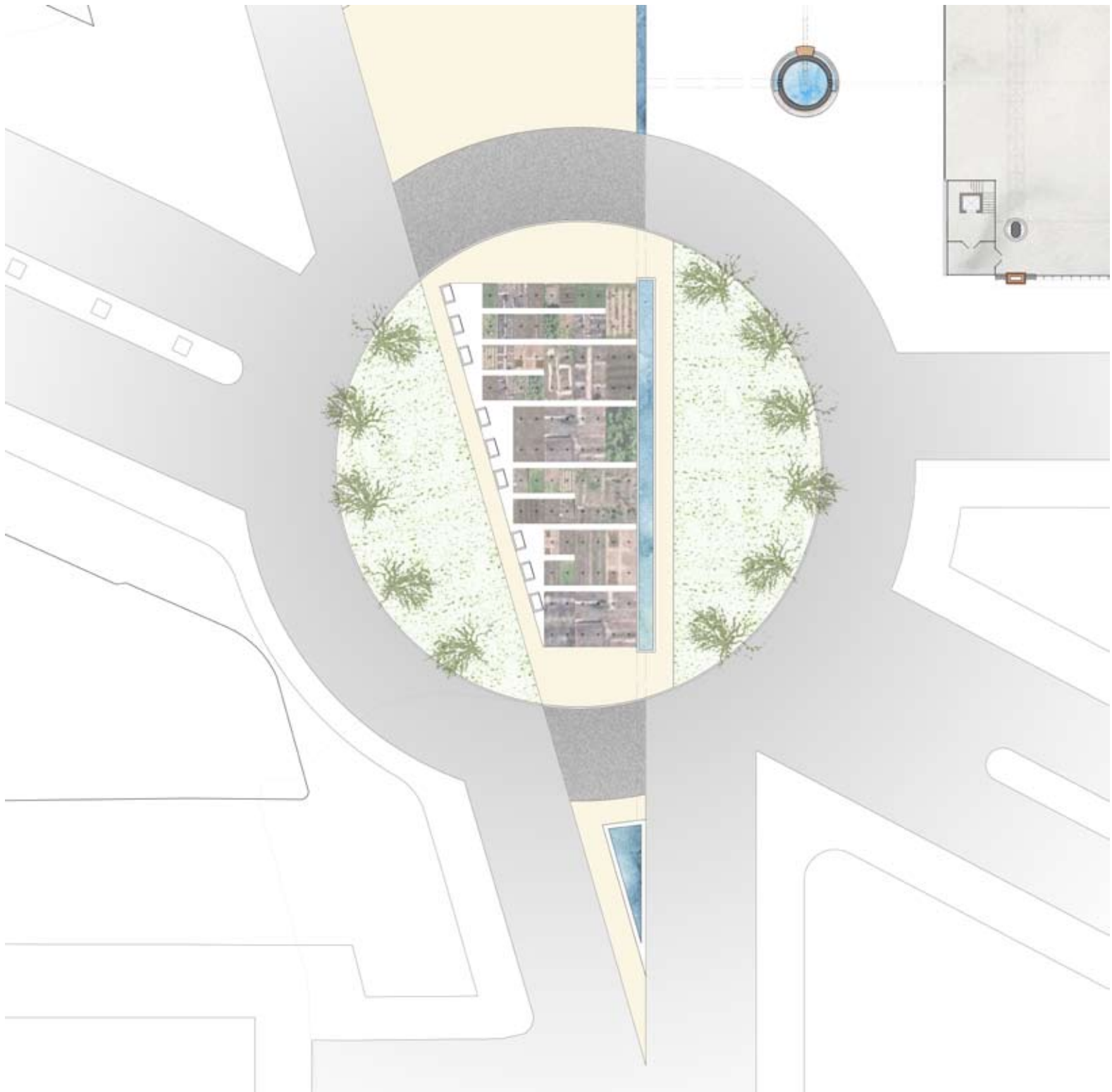
SMALL GARDEN PLOTS



MEDIUM GARDEN PLOTS



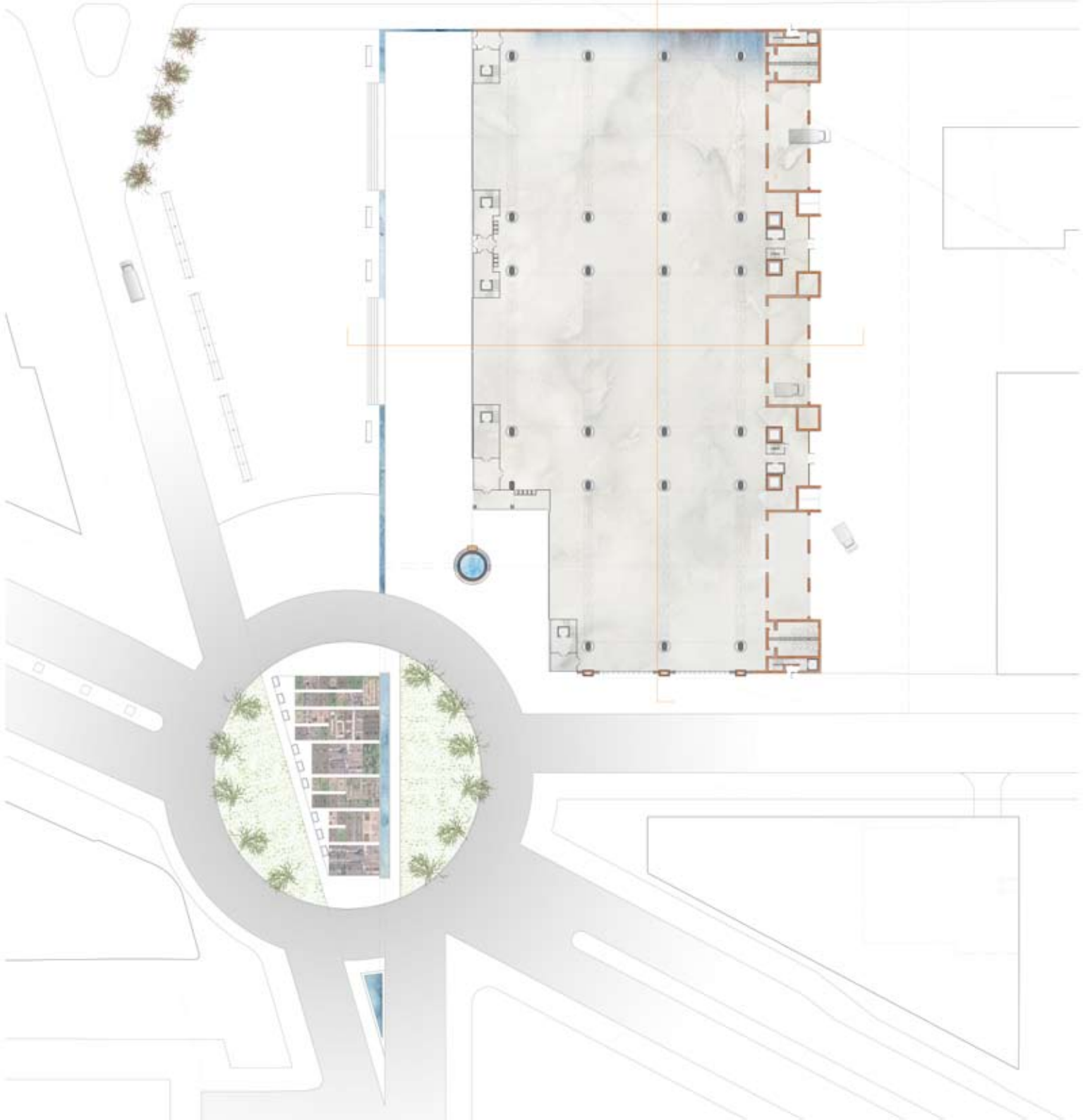
LARGE GARDEN PLOTS



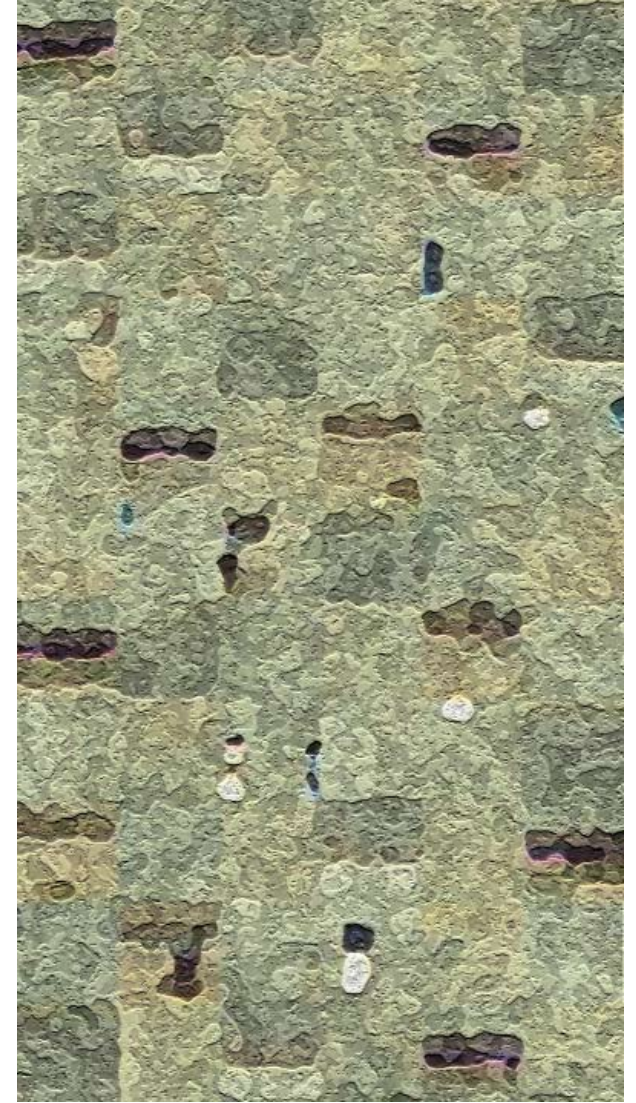
“Take all you want, but eat all you take.”²⁰

Final Drawings



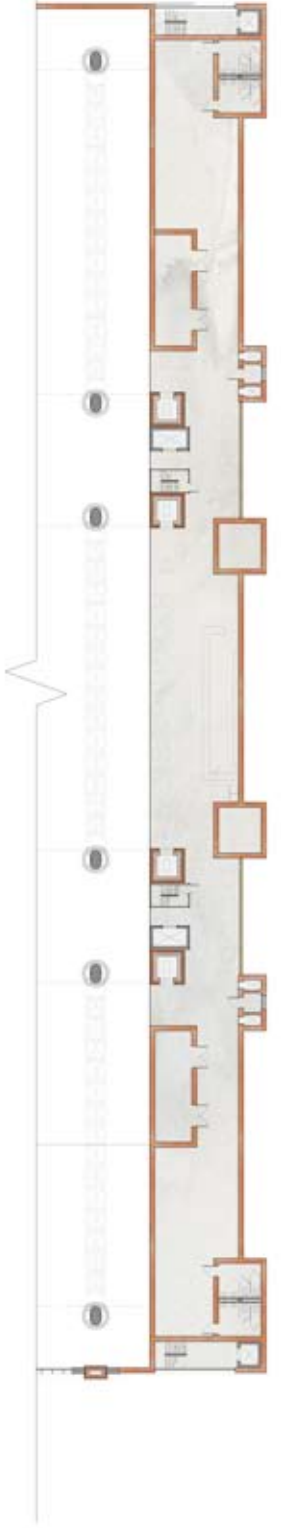
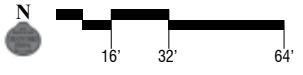


As the site is redeveloped, asphalt and concrete waste from demolition shall be salvaged and used as aggregate in the concrete for the market floor. The urban soil type on the site will be expressed within the floor of the building.



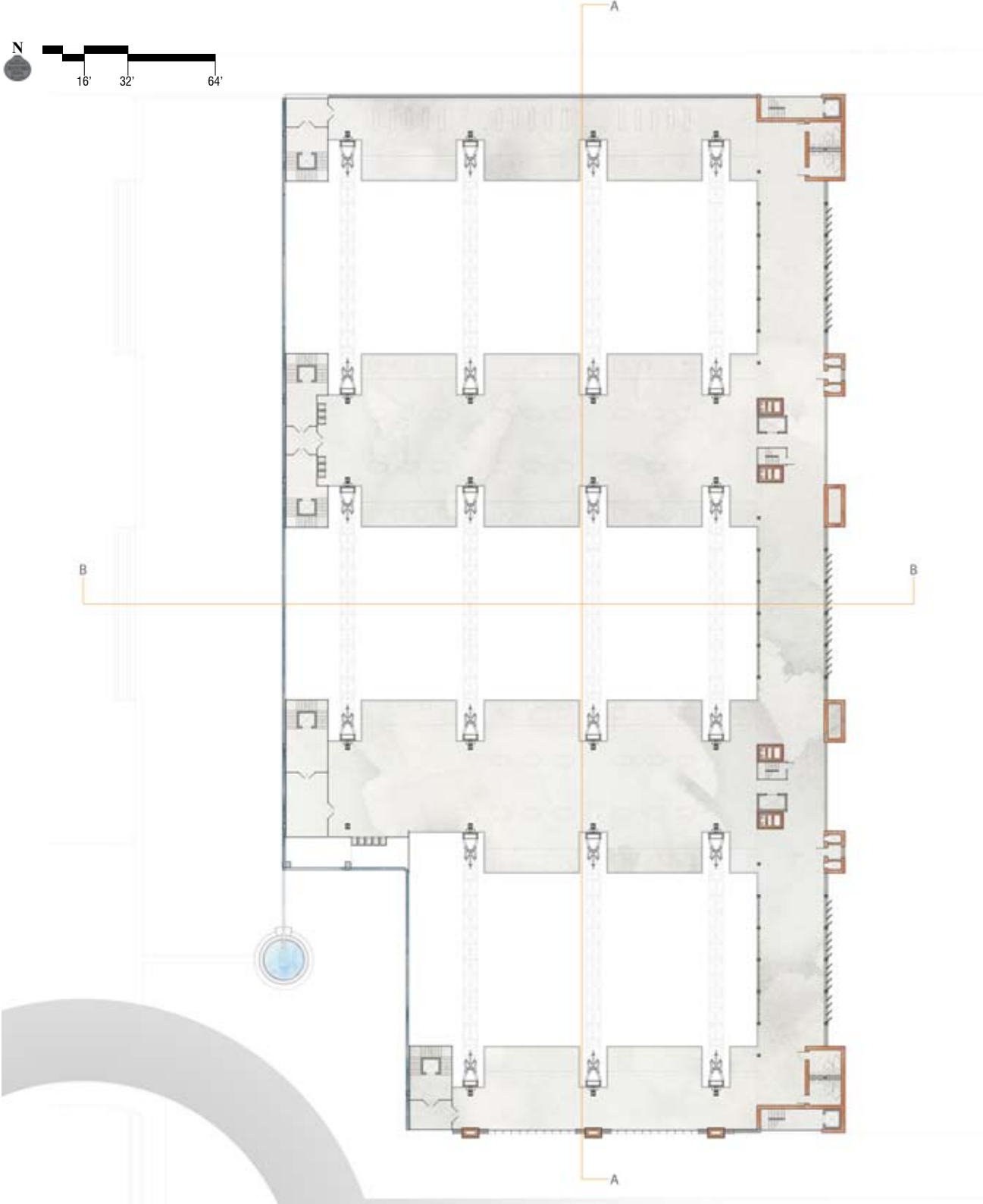




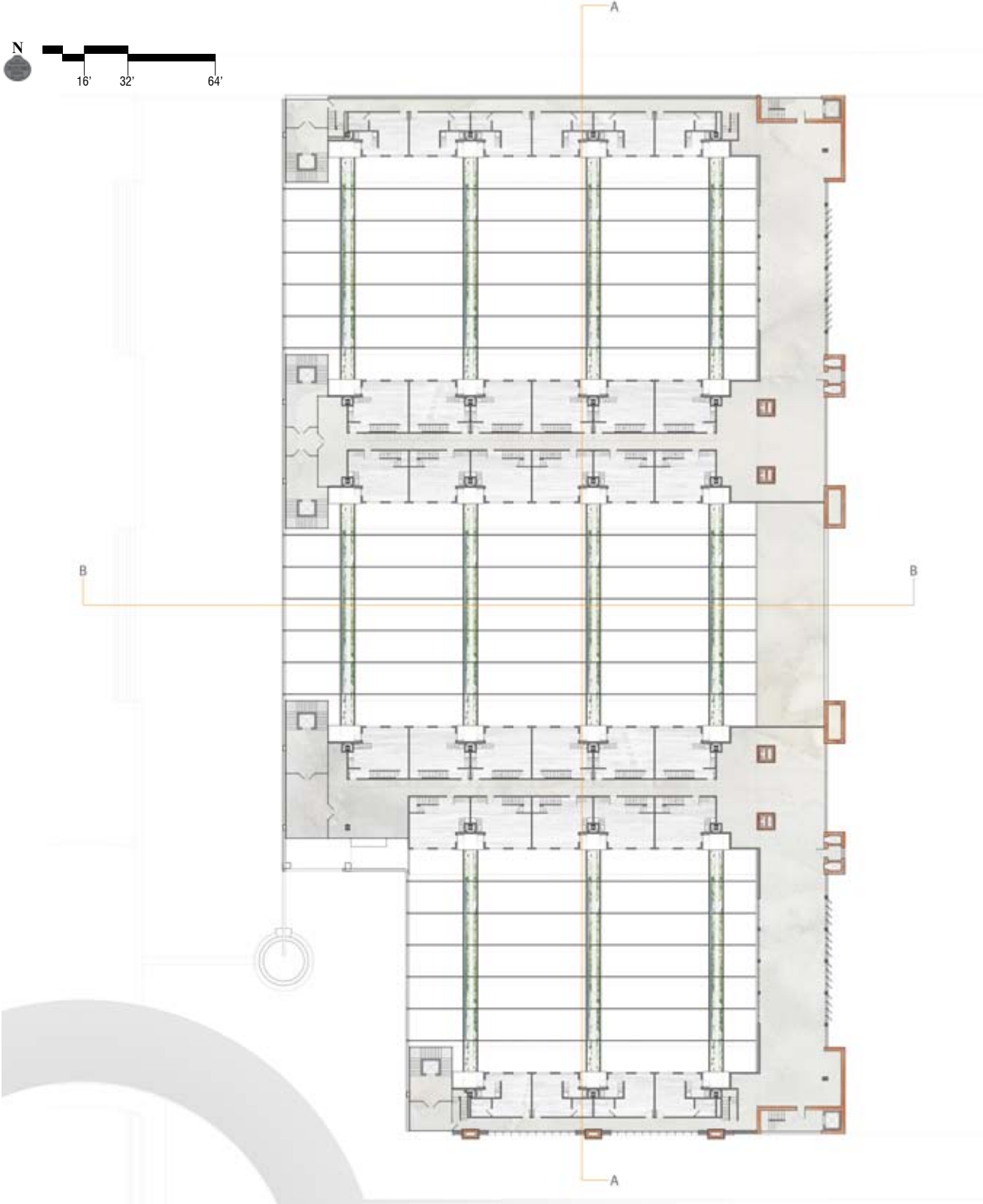
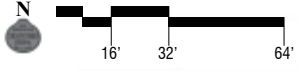


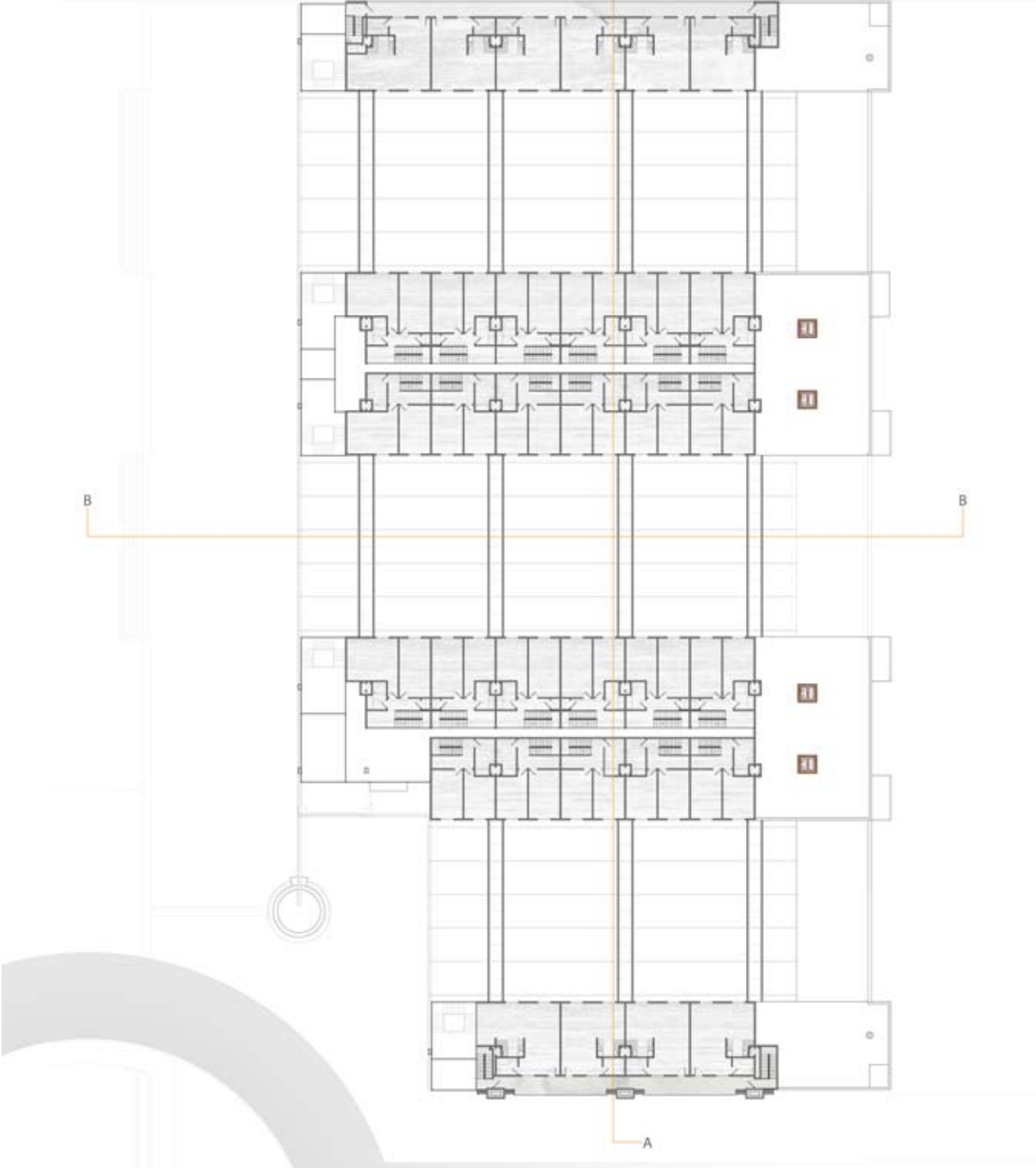
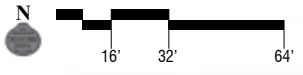


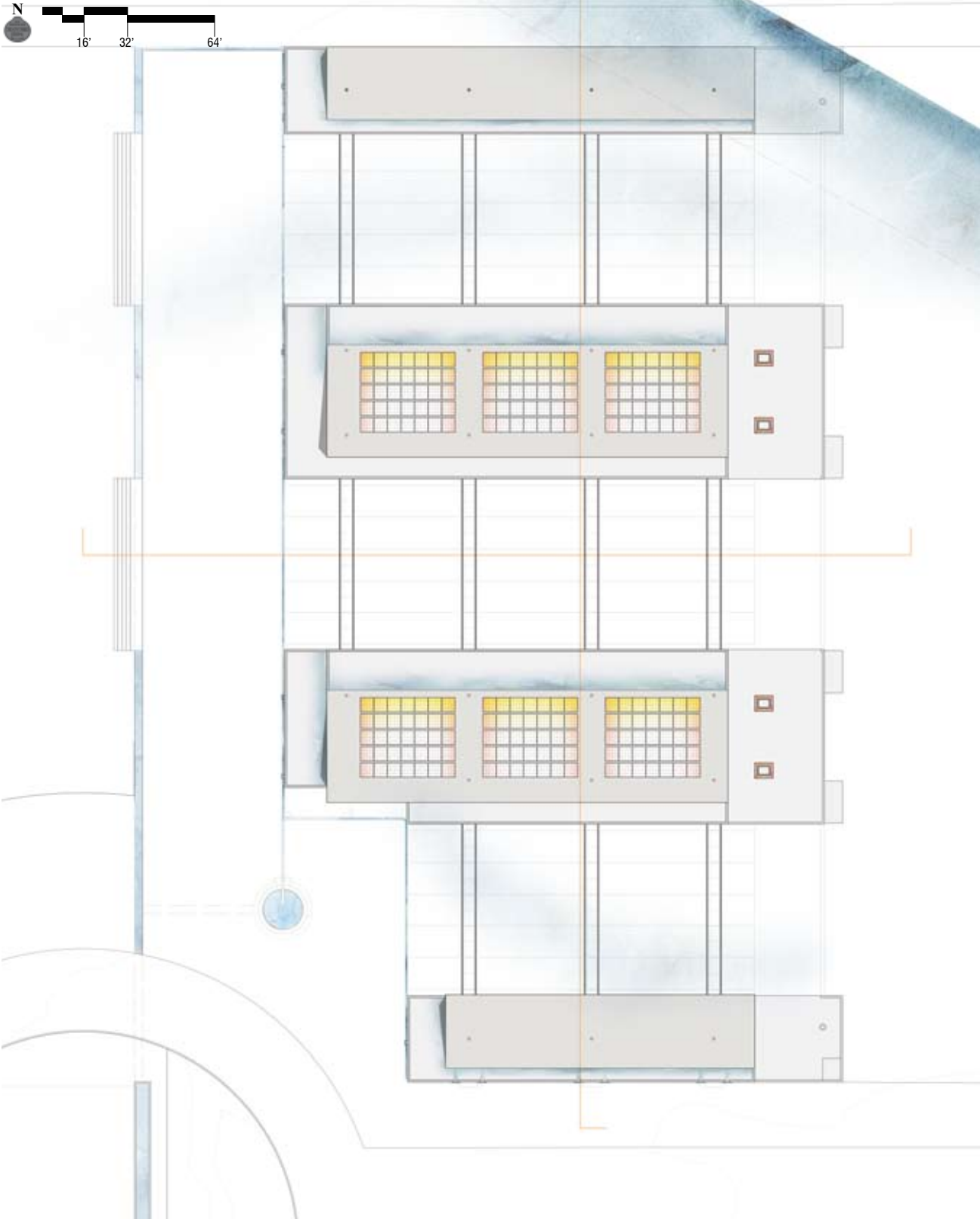




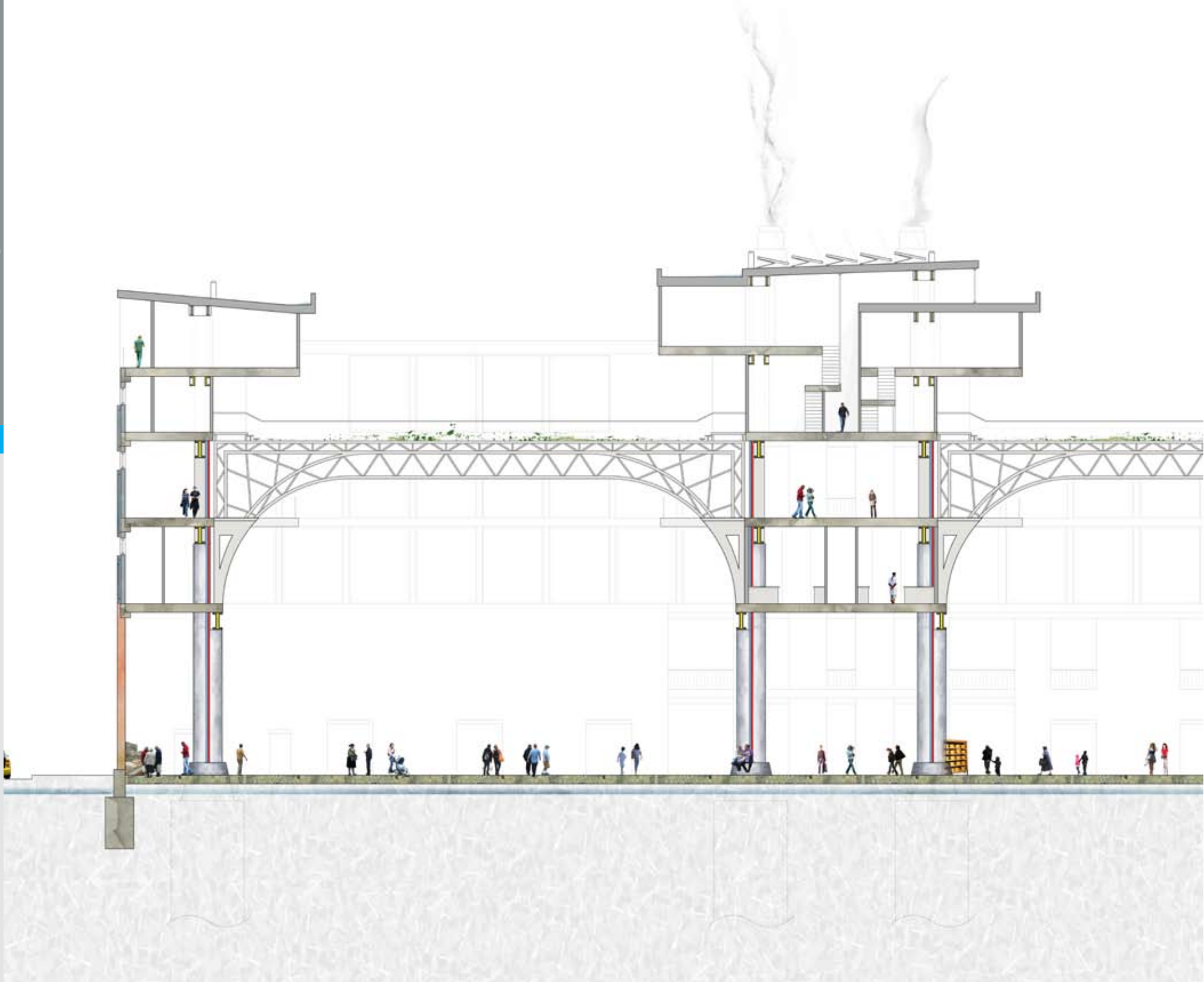


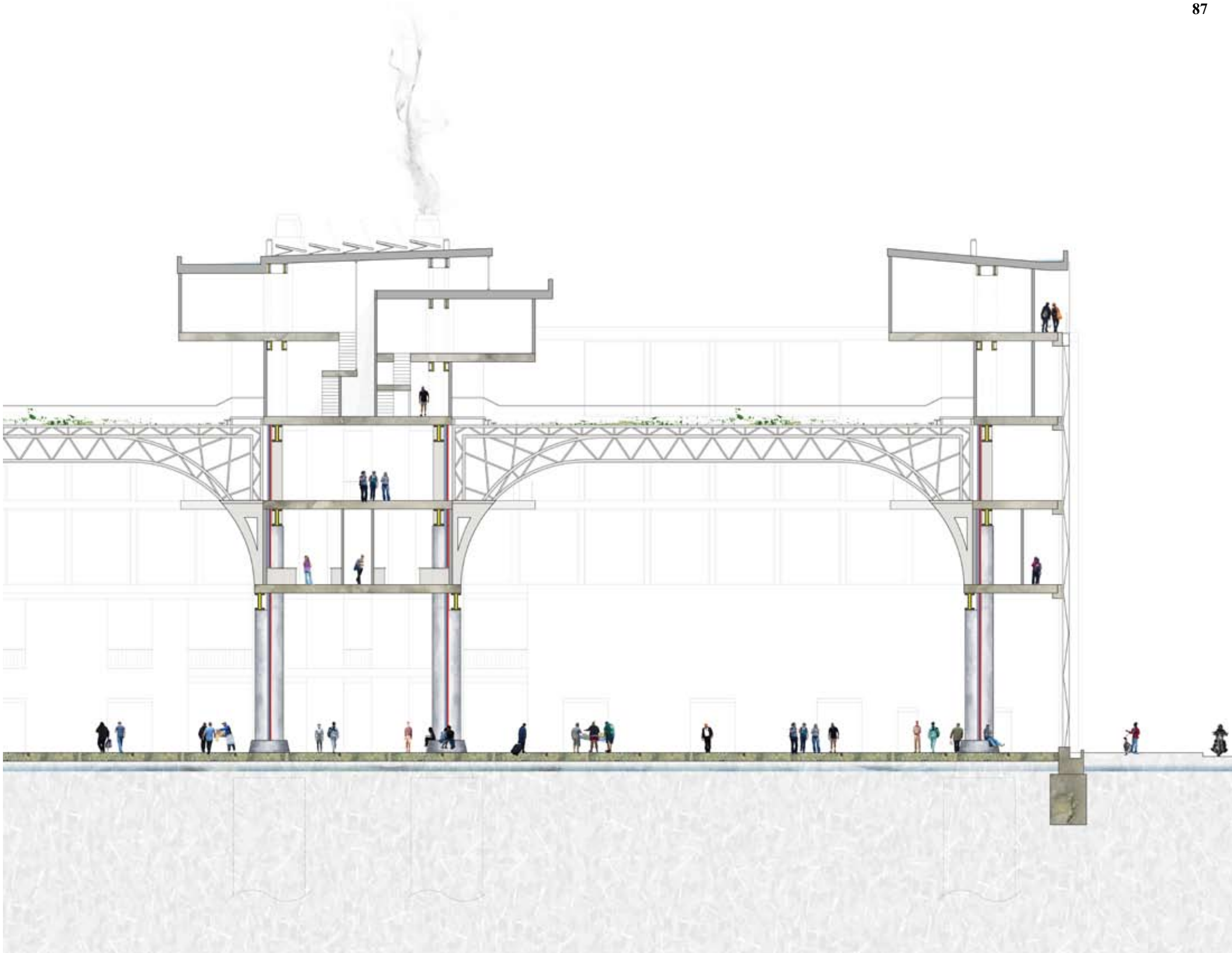


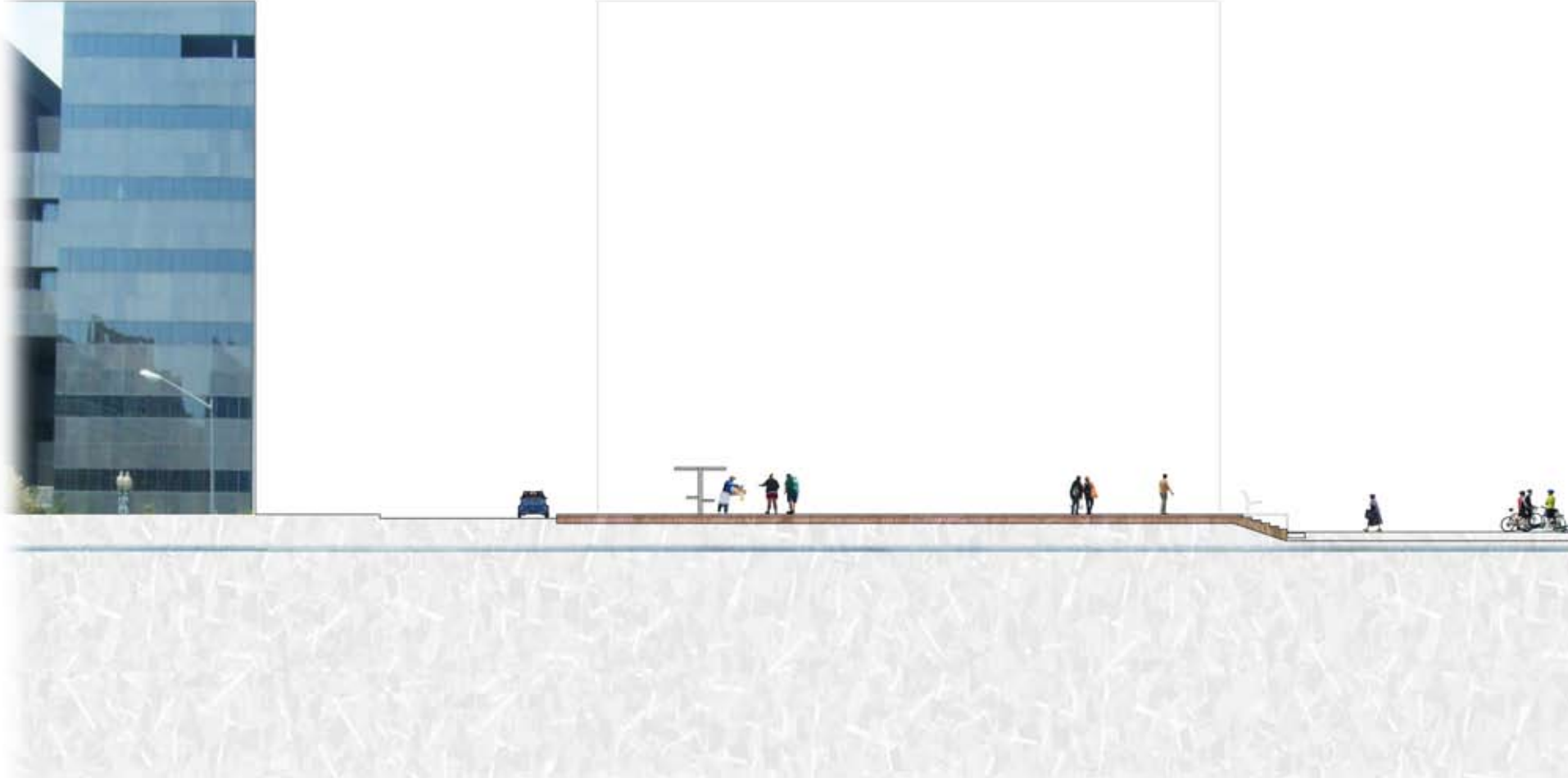


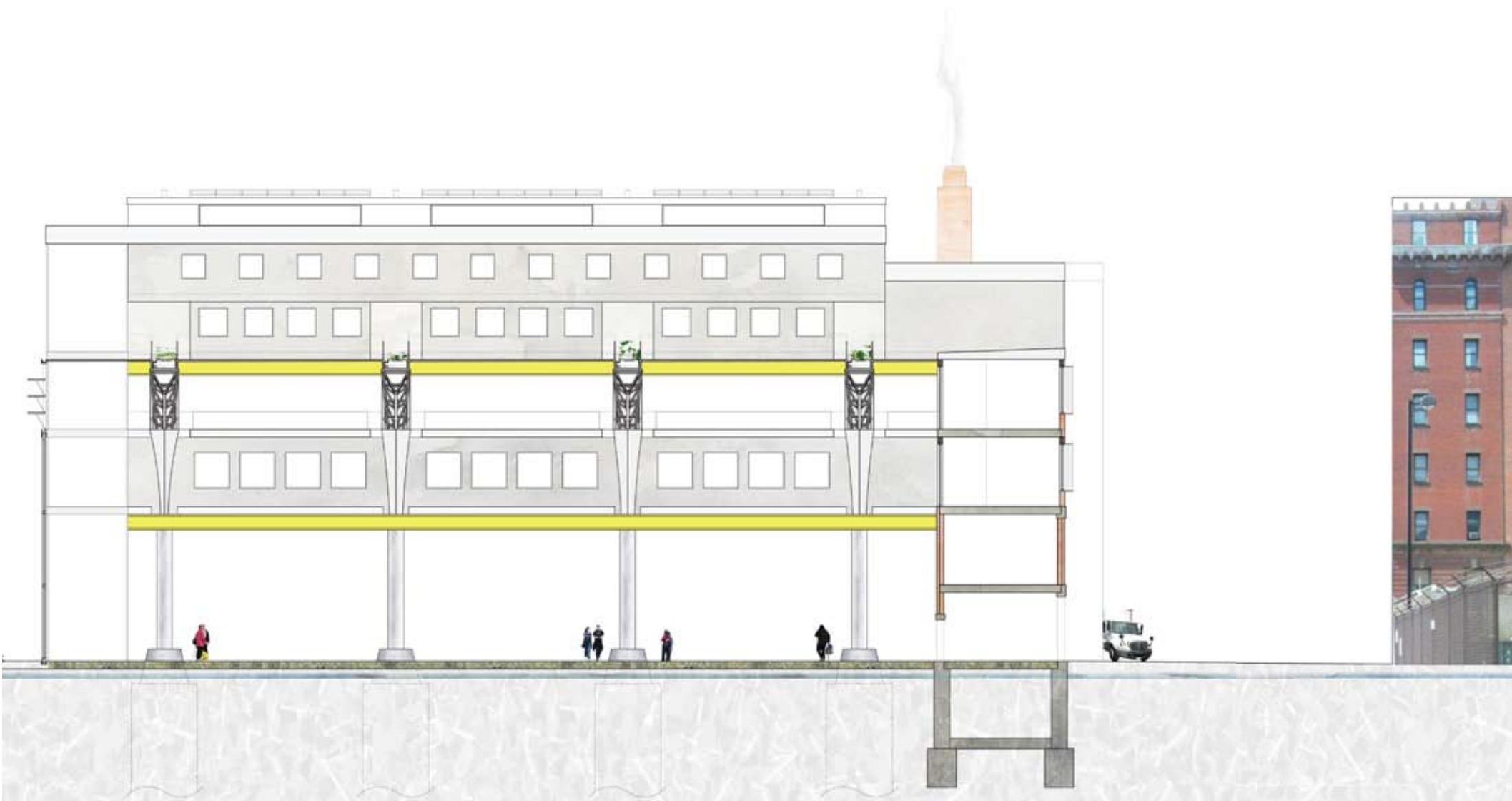


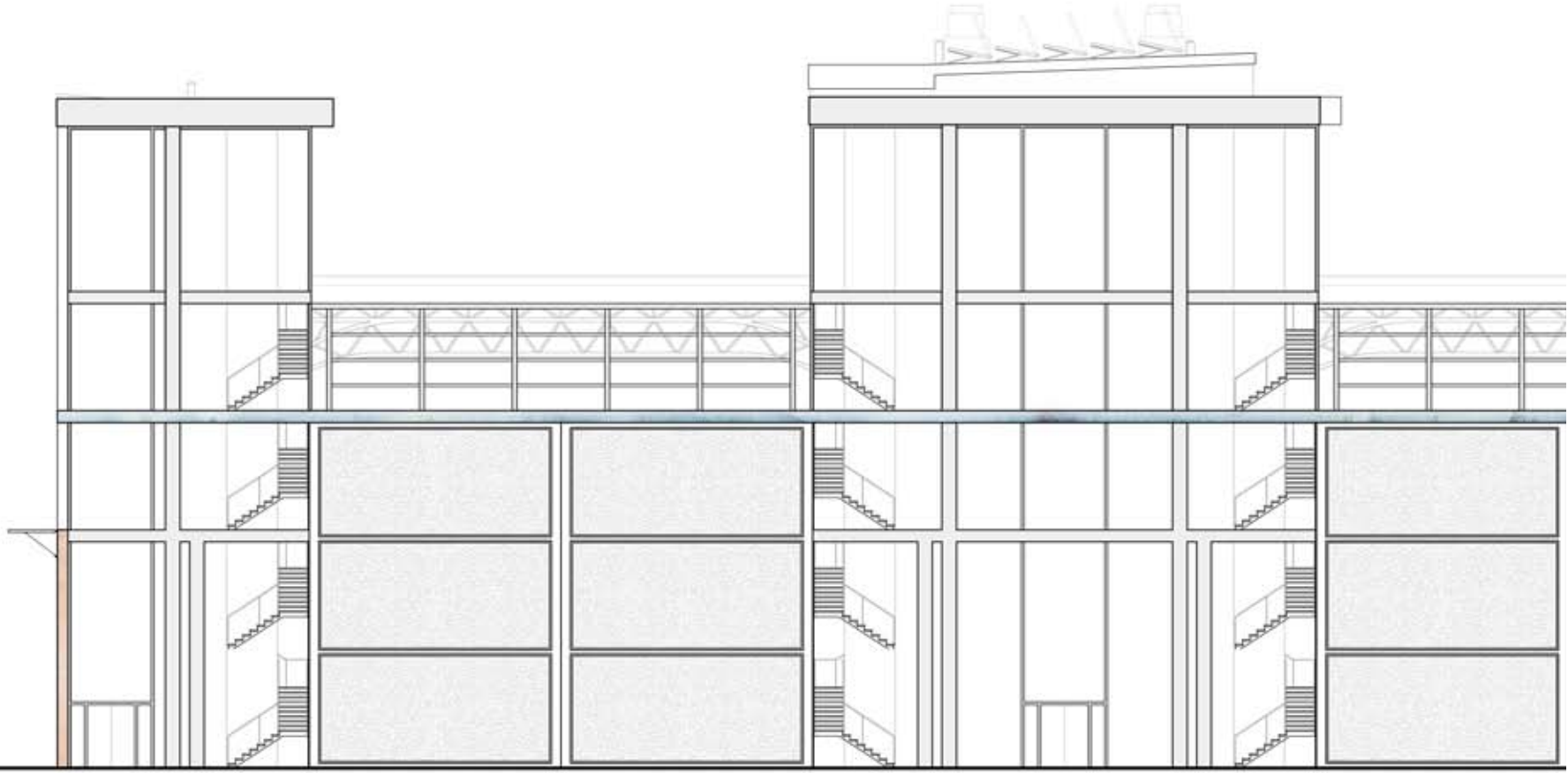




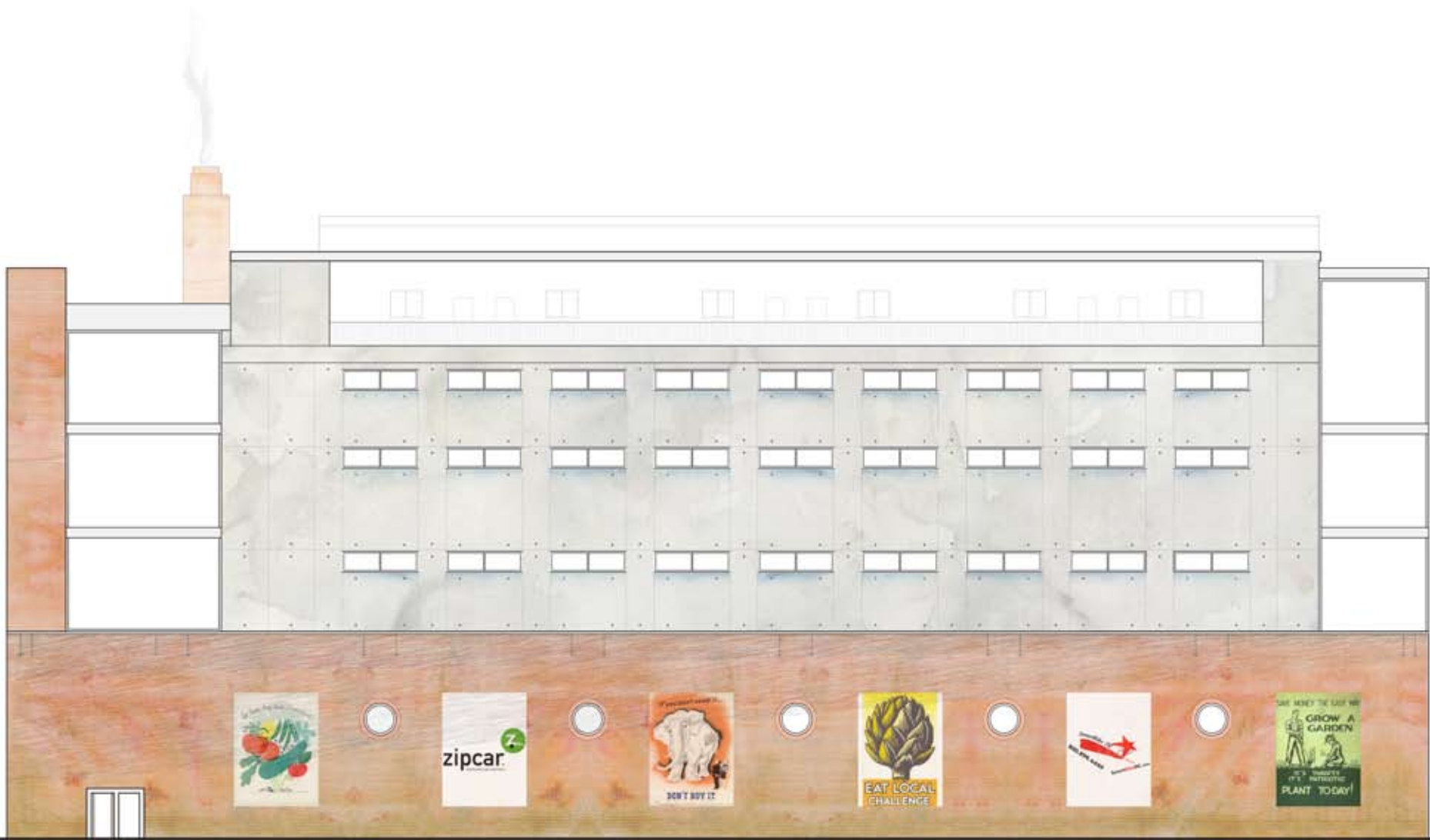




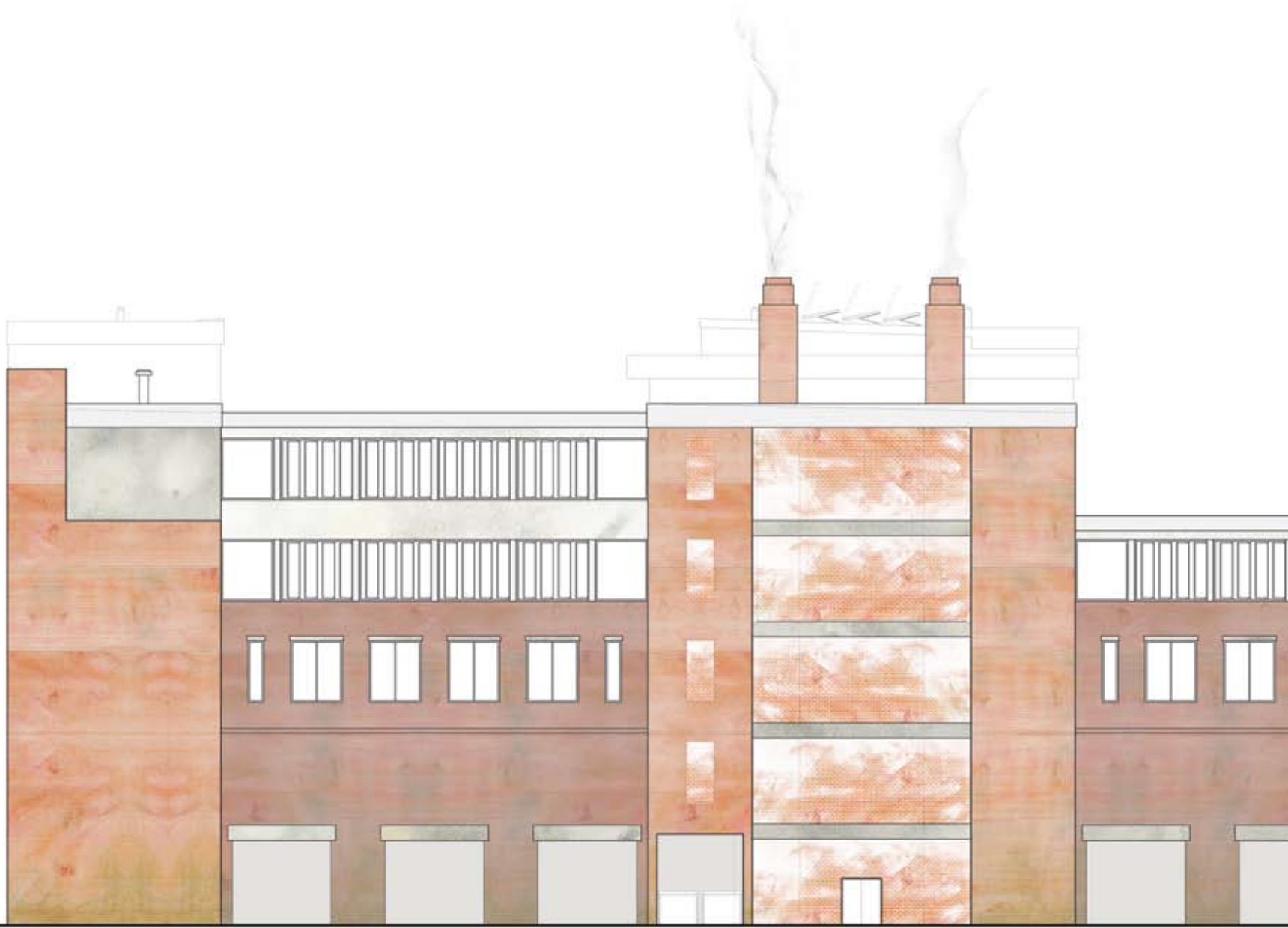


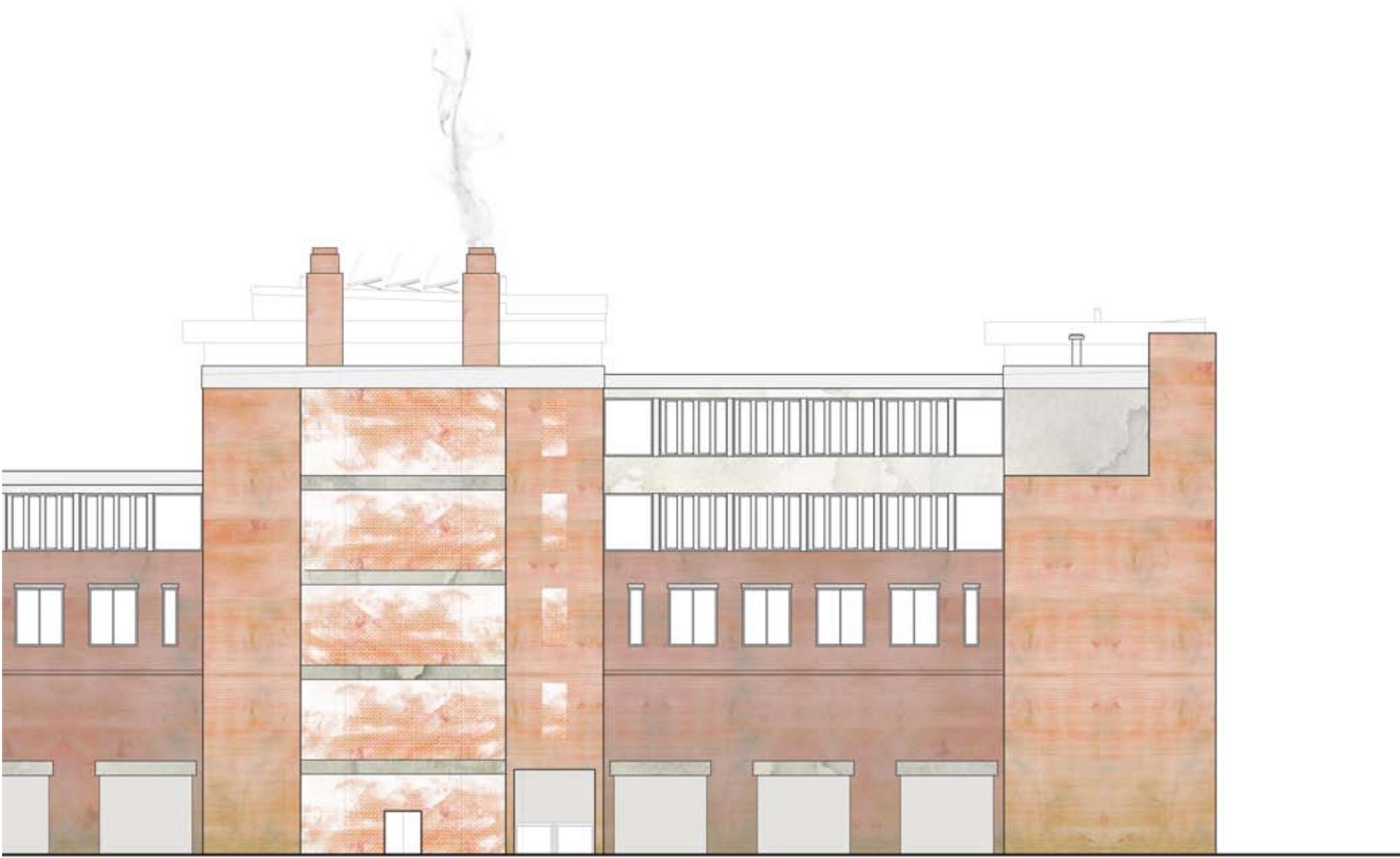








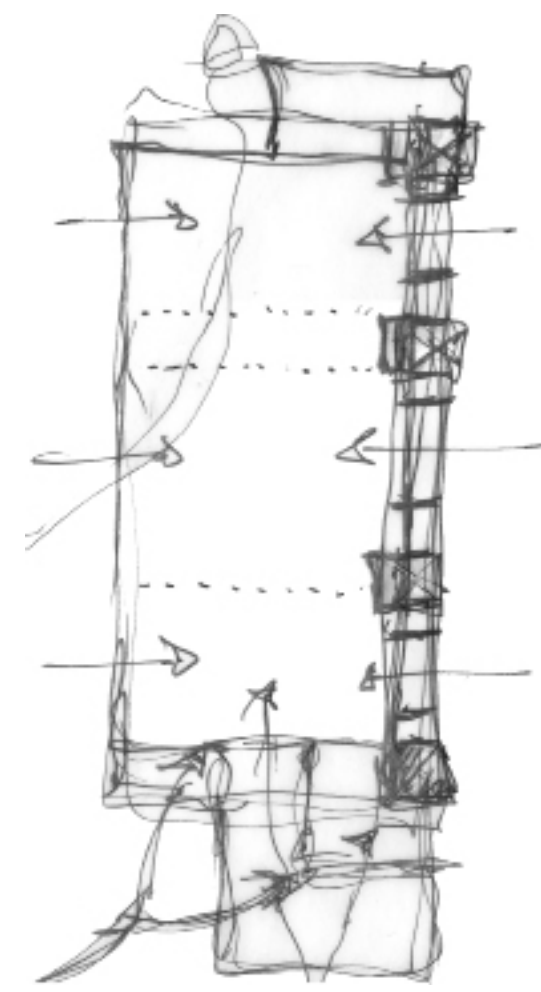




“For it is food which must needs repair all things and renew them, food must support them, and food sustain all things; yet all is vain, since neither the veins can bear to receive what is enough, nor does nature furnish all that is needful.”²¹

Notes

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- 3 Vera Vicenzotti and Ludwig Trepl, "City as Wilderness: The Wilderness Metaphor from Wilhelm Heinrich Riehl to Contemporary Urban Designers," Landscape Research Aug. 2009: 379-396.
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- 5 Robert Sumrell, "Green Screens: Modernism's Secret Garden," Design Ecologies: Essays on the Nature of Design, ed. Lisa Tilder and Beth Blostein (New York: Princeton Architectural Press, 2010) 90.
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- 8 Dripps 86.
- 9 Carol J. Burns and Andrea Kahn, "Why Site Matters," Site Matters: Design Concepts, Histories, and Strategies, ed. Carol J. Burns and Andrea Kahn (New York: Routledge, 2005) xiii.
- 10 Gaston Bachelard, Earth and Reveries of Will: An Essay on the Imagination of Matter, trans. Kenneth Haltman (Dallas, Texas: The Dallas Institute Publications, 2002) 65.
- 11 Ann Vileisis, Kitchen Literacy: How we lost knowledge of where food comes from and why we need to get it back (Washington: Island Press, 2008) 37.
- 12 Florian Sauter, "The Sun Also Shines Today," Natural Metaphor: An Anthology of Essays on Architecture and Nature, ed. Josep Lluís Mateo and Florian Sauter (Zurich: ACTAR & Earth, 2007) 96.
- 13 Batel Dinur, "Interweaving Architecture and Ecology: A Theoretical Perspective" in *The Design Out of Complexity Conference*, July 2, 2005, London: 8.
- 14 Dinur 7.
- 15 Dinur 8.
- 16 Dinur 3.
- 17 Dinur 8.
- 18 C.D.G. Harley and M.D. Bertness, "Structural Interdependence: An Ecological Consequence of Morphological Responses to Crowding in Marsh Plants," Functional Ecology 1996: 655.
- 19 Herman Melville, Pierre or The Ambiguities (New York: The Penguin Group, 1996) 231.
- 20 Tristram Stuart, Waste: Uncovering the Global Food Scandal (New York: W.W. Norton & Co., 2009) 204.
- 21 Lucretius, On The Nature of Things, trans. Cyril Bailey (New York: Barnes & Noble Publishing, Inc., 2005) 60.



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Ecosystem Boundary Diagram:

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“Think of the people you meet as fruits and vegetables. Some are sour, some are sweet, and some are too ripe. If you put together all the people you know and sprinkle on top everything you have learned from them, you realize your life is one delicious salad.” -A Farmer at Penn Quarters Market

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