

## ABSTRACT

Title of Thesis: FOOD FOR THE CITY: CULTIVATING  
COMMUNITY IN BALTIMORE CITY

Min Soo Kang, Master of Architecture, 2016

Thesis Directed By: Professor Matthew Bell, FAIA  
University of Maryland, School of  
Architecture, Planning and Preservation

One in four residents of Baltimore City live in a food desert. Food desert disproportionately affects the low income neighborhoods more than the neighborhoods with financial stability. Throughout history, food became a commodity that depends on and dictates the market force. Food sources were being eliminated in the inner city while the suburbs saw rising development of grocery stores. Without grocery stores and other food retailers, communities are missing gathering and commercial hubs that make neighborhoods livable and help the local economy sustain and thrive. This thesis studies why food was further displaced from suffering communities and how an inclusive sustainable urban food system can help create a hub of neighborhood revitalization and promote health, social, safety, stability, and economic well-being of the community.

FOOD FOR THE CITY:  
CULTIVATING COMMUNITY IN BALTIMORE CITY

by

Min Soo Kang

Thesis submitted to the Faculty of the Graduate School of the  
University of Maryland, College Park, in partial fulfillment  
of the requirements for the degree of  
Master of Architecture  
2016

Advisory Committee:  
Professor Matthew Bell, Chair  
Professor Brian Kelly, Committee Member  
Lecturer James Tilghman, Committee Member

© Copyright by  
Min Soo Kang  
Master of Architecture

## Preface

“Physical poverty is not an abstraction, but we almost never think of impoverishment as evidence of a world that exists. Much less do we imagine that it’s a condition from which we may draw enlightenment in a very practical way.”

– Samuel Mockbee



Photo by author



## Dedication

Grandmother, thank you for everything

Christian Serrano, your spirit lives on forever in my heart

Baltimore City, stay strong

## Acknowledgements

Professor Matthew Bell, FAIA, Chair

Professor Brian Kelly, AIA

Lecturer James Tilghman, AIA

Associate Professor Luis Diego Quiros

Associate Professor Madlen Simon, AIA

Vivek Sastri

# Table of Contents

Preface.....	ii
Dedication.....	iii
Acknowledgements.....	iv
Table of Contents.....	v
List of Figures.....	vii
List of Abbreviations.....	ix
Chapter 1: Introduction.....	1
Chapter 2: Defining the Problem.....	2
<i>Consuming Empire: History of Consumption and Distribution</i> .....	2
<i>Food Desert in Baltimore</i> .....	9
Chapter 3: Site.....	14
<i>Site Criteria: Analysis of Overall Baltimore City</i> .....	14
<i>Site Selection Matrix</i> .....	15
<i>History of Selected Site</i> .....	18
<i>Analysis of Selected Site</i> .....	24
<i>Brief Description &amp; Location of Site</i> .....	24
<i>Surrounding Land Use</i> .....	25
<i>Analysis of Natural and Built Environment</i> .....	26
<i>Analysis of Selected Building: The American Ice Company</i> .....	28
Chapter 4: Precedent and Program.....	30
<i>Food Hub Definition</i> .....	30
<i>Precedent Analysis</i> .....	32
<i>Crop Harvest and Cultivation</i> .....	39
<i>Conventional Industrial Food System and Local Food System</i> .....	39
<i>Hydroponic/Aquaponics Agriculture System</i> .....	40

<i>Crop Selection and Yield</i> .....	42
<i>Urban Farm Precedents</i> .....	46
<i>Programs and Description of Proposed Food Hub</i> .....	47
Chapter 5: Design Principles and Methods.....	50
<i>Design Principles</i> .....	50
<i>Methods</i> .....	50
<i>Users</i> .....	52
<i>Design Process</i> .....	54
Chapter 6: Architectural Response .....	58
<i>Holistic Intervention: Master Plan</i> .....	58
<i>Architectural Response</i> .....	62
<i>American Ice Company Market Hall</i> .....	62
<i>Community Garden &amp; Glass House Pavilion</i> .....	65
<i>Community Center</i> .....	67
<i>Row Homes and Apartments</i> .....	68
Chapter 7: Conclusion.....	69
Bibliography .....	70

## List of Figures

Figure 1: Public Housing Projects and Areas of Minority Concentration in 1940. (ArcMap GIS, modification by Author) .....	6
Figure 2: Public Housing Zones & Food Desert in 2015 (ArcMap GIS, modification by Author).....	10
Figure 3: Town market and industrial market system (Author) .....	12
Figure 4: Regional – local food system (Author) .....	12
Figure 5: Baltimore’s food desert and resources in 2015 (ArcMap GIS, modification by Author).....	13
Figure 6: Federal Poverty Level Median Income below 185% (Author) .....	14
Figure 7: District 9 <sup>th</sup> , 7 <sup>th</sup> , 8 <sup>th</sup> , and 6 <sup>th</sup> with the highest population group living in Food Deserts (ArcMap GIS, modification by Author) .....	15
Figure 8: Site Selection Matrix – 9 <sup>th</sup> District (Author).....	16
Figure 9: Population living in Food Desert and Poverty (Author) .....	16
Figure 10: Anchor Institution’s Investment Area (ArcMap GIS, modification by Author).....	17
Figure 11: M.E. area of food desert and food resources (ArcMap GIS, modification by Author).....	18
Figure 12: Site plan (ArcMap GIS, modification by author).....	19
Figure 13: Railroad and Highway on site (ArcMap GIS, modification by author) ....	20
Figure 14: Super Pride Markets (ArcMap GIS, modification by author).....	21
Figure 15: Highway Routes in Baltimore City (ArcMap GIS, modification by author) .....	23
Figure 16: Figure - Ground of site (ArcMap GIS, modification by author).....	23
Figure 17: Land use, Crime, Vacancy of site (ArcMap GIS, modification by author) .....	24
Figure 18: American Ice Company (Google Maps, modification by author).....	24
Figure 19: American Ice Company Footprint (Author).....	25
Figure 20: Existing site plan (ArcMap GIS, modification by author) .....	25
Figure 21: Rain water runoff on site (Author).....	26
Figure 22: Sun study of site (Author) .....	27
Figure 23: Sun study of massing (Author).....	27
Figure 24: Existing facade study of American Ice Company (Author) .....	28
Figure 25: Inclusive Urban Food System (Author) .....	30
Figure 26: Precedent Program Tabulation - Union Kitchen (Author) .....	32
Figure 27: Precedent Program Tabulation - Whole Foods (Author) .....	33
Figure 28: Precedent Program Tabulation - Union Market (Author) .....	35
Figure 29: Precedent Program Tabulation - Bread for the City (Author).....	37
Figure 30: Precedent Program Comparison and Synthesis (Author).....	38
Figure 31: Annual Agriculture yield versus Hydroponics yield (Author).....	40
Figure 32: Hydroponic Modular Section and Plan (Author) .....	41
Figure 33: Hydroponic N.F.T. and Aquaponic System (Author) .....	41
Figure 34: Crop Selection of Annual Harvest (Author).....	44
Figure 35: Crop Harvest Annual Schedule (Author) .....	45

Figure 36: Urban Farm precedent comparison (Author) .....	46
Figure 37: Proposed Program Tabulation (Author) .....	49
Figure 38: Intervention Method (Author) .....	51
Figure 39: Program Typologies (Author) .....	51
Figure 40: 24 Hour Active Programming (Author) .....	52
Figure 41: User Study (Google Maps, modification by author) .....	53
Figure 42: Program Arrangement Study 1 (Author).....	54
Figure 43: Program Arrangement Study 2 (Author).....	55
Figure 44: Program Arrangement Study 3 (Author).....	55
Figure 45: Scheme 1 - Building Edge (Author).....	56
Figure 46: Scheme 2 - Courtyard (Author).....	56
Figure 47: Scheme 3- Gatehouse (Author) .....	57
Figure 48: Proposed Master Plan of District 9 (Google Maps, modification by Author).....	58
Figure 49: Proposed Master Plan of Site (Author) .....	59
Figure 50: Proposed Perspective of Route 40 (Author).....	60
Figure 51: Proposed Perspective of New Street (Author) .....	60
Figure 52: Proposed Massing and Program (Author).....	61
Figure 53: Proposed Perspective of New Market Hall (Author) .....	62
Figure 54: Proposed First Floor Plan (Author).....	63
Figure 55: Proposed Second and Third Floor Plan (Author).....	64
Figure 56: Proposed Elevation - South Market on Route 40 (Author) .....	65
Figure 57: Proposed Section - through Market Hall (Author).....	65
Figure 58: Proposed Section - through Market, Garden, and Community Center (Author).....	66
Figure 59: Proposed Elevation - Market, Garden, and Community Center (Author). 66	
Figure 60: Proposed Perspective of Community Garden (Author) .....	66
Figure 61: Proposed Perspective of Glass House (Author) .....	67
Figure 62: Proposed Section - through MARC ramp, Garden, Housing (Author).....	68
Figure 63: Proposed Elevation - Row Homes on new street (Author) .....	68
Figure 64: Proposed Elevation - Housing and Community Center on Edmondson Avenue (Author) .....	68
Figure 65: Proposed Perspective of Overall Intervention (Author).....	69

## List of Abbreviations

- M.E. = Midtown – Edmondson
- N.F.T.= Nutrient Film Technique
- S.Q.F.T. = square foot (plural feet)

## Chapter 1: Introduction

According to John Hopkins Bloomberg School of Public Health, one in four residents of Baltimore City live in a food desert.<sup>1</sup> Food desert means to be living in a zone that does not have a food resource within a ¼ mile of walking distance. Food desert disproportionately affects the low income neighborhoods more than the neighborhoods with financial stability. Throughout history, food became a commodity that depends on and dictates the market force. Thus, food was further displaced from the low-income neighborhoods.

Many urban cities across the United States are converting back to the practice of local food systems to increase food access, local food production, preserve regional farmland, and revitalize local food economies. Various communities and nonprofit organizations have formed partnerships to promote equitable food systems especially for low income communities that are on the front line of food injustice. Food hubs can provide a mutually beneficial relationship across the food system from the food producers to consumers. Such relationship present an opportunity for distressed communities to make healthy food sourcing a profitable enterprise that can benefit all participants of the food system.

---

<sup>1</sup> Baltimore City Government, "Mapping Baltimore City's Food Environment: 2015 Report".



## **Chapter 2: Defining the Problem**

### *Consuming Empire: History of Consumption and Distribution*

Food security is a concept that has transformed and evolved societies. The earliest human society relied on method of hunting and gathering for source of food. The nomadic communities were not permanent settlers but moved from land to land where food was available according to the season. The hunting and gathering method became a form of survival for the human society before methods of agriculture were invented. Society's dependence on food demanded for new form of lifestyle. The search for food security lead to cultivation of plants and domestication of animals. The Neolithic era is a direct result of the development of agriculture. The revolution transformed the mobile communities into settled agrarian communities that relied on the natural resources the land could provide. Human society started to control their natural environment and aimed to produce surplus of resources to satisfy the food insecurity. Development of agriculture and gaining food surplus allowed for communities to invest time into political, social, and economic expansion. Food surplus created denser population that lead to larger communities, accumulations of resources and tools, and specialization in various occupations allowing for these complex societies to transform into civilizations. As civilizations gained control of water it allowed for trading and political exchanges to occur among other civilizations. Man being able to navigate the sea lead to greater visions and ambitions for the growing civilizations. Many societies sought out trading routes and also lands to colonize for economic and political gains. The Commercial Revolution or the Age of Discovery occurred after the Neolithic Revolution and focused on economic

expansion through colonialism and mercantilism. Established European states were frontiers in looking for new trade networks which led to new international trade networks to be created. The European states competed against each other to acquire power through colonized lands. The “ideological and political ambitions of colonial expansion, national-building, and architectural manifestos generated new settlements and cities across Europe, North America, Africa, and the Middle East”.<sup>2</sup> Commercial Revolution started to displace agriculture production out of their city to provide land for city expansion and development.

The Industrial revolution displaced food production farther from its center. The rise of technology brought a new “era of agriculture, textile and metal manufacture, transportation, economic policies and the social structure”.<sup>3</sup> Population shifts started to occur in the late 19<sup>th</sup> century as people moved from rural to urban areas. The industrialization relocated jobs to cities and new technologies allowed for farming to become less labor intensive. For instance in the United States of America, farmers made up 64% of the labor force in 1850. The percentage decreased to 43% by 1890. Steam power also played a role in displacing food production outside of the city and encouraged dependency on outside lands for food security. The steam power created continental travel throughout America by network of railroad systems. Having access to the west created agriculture development on the Great Plains. Combined with the inventions of metal tools and improved practices increased food production drastically. Food security in the urban cities were filled by resources from the farms outside of the city.

---

<sup>2</sup> Imbert, Dorothe, *Food and the City: Histories of Culture and Cultivation*. (Washington D.C.: Dumbarton Oaks, 2015), 1-2.

<sup>3</sup> Montagna, Joseph A., "The Industrial Revolution".

By the mid-20<sup>th</sup> century, countries around the globe were becoming industrial cities. As industrialization became globalized, the American economy benefitted from the “increased availability of factories and labor in industrializing countries with lower wage laws, it also suffers the consequences of domestic unemployment, dependence on outside nations for basic goods, and declining urban areas that once feature industrial jobs”.<sup>4</sup> As the industrial conventional agriculture displaced urban “food production farther from its center, the relationship between living, working, and eating became more abstract”.<sup>5</sup> “Urban centers were created through food-producing units. It expresses a long tradition of exchange between city and cultivation”<sup>6</sup>. Modern methods of conventional agriculture and transportation played a big role in decentralizing cities and communities. “Ultimately, the interrelation of urban and cultivation across times and geographies points to our current conflicted notions of urbanity”.<sup>7</sup> “In the context of food, global industrialization has resulted in a predominant dependence on an industrialized, corporatized, and globally interconnected food production system for basic food consumption needs”.<sup>8</sup>

By the 18<sup>th</sup> century Maryland had evolved into a plantation colony. Baltimore being the second most important port with its extensive system of rivers and harbors brought a rise of plantation development on its vast fields. The majority of production on these fields were tobacco which required labor intensive work. To fill the demand for tobacco, plantation owners resorted to the practice of slavery. In 1700,

---

<sup>4</sup> Croog, Rebecca L., "Baltimore and the Cherry Hill Urban Garden: Tearing Down and Building Up the Physical and Imaginative Spaces of Post-Industrial Urban Food Systems".

<sup>5</sup> Imbert, Dorothe, *Food and the City: Histories of Culture and Cultivation*. (Washington D.C.: Dumbarton Oaks, 2015), 5.

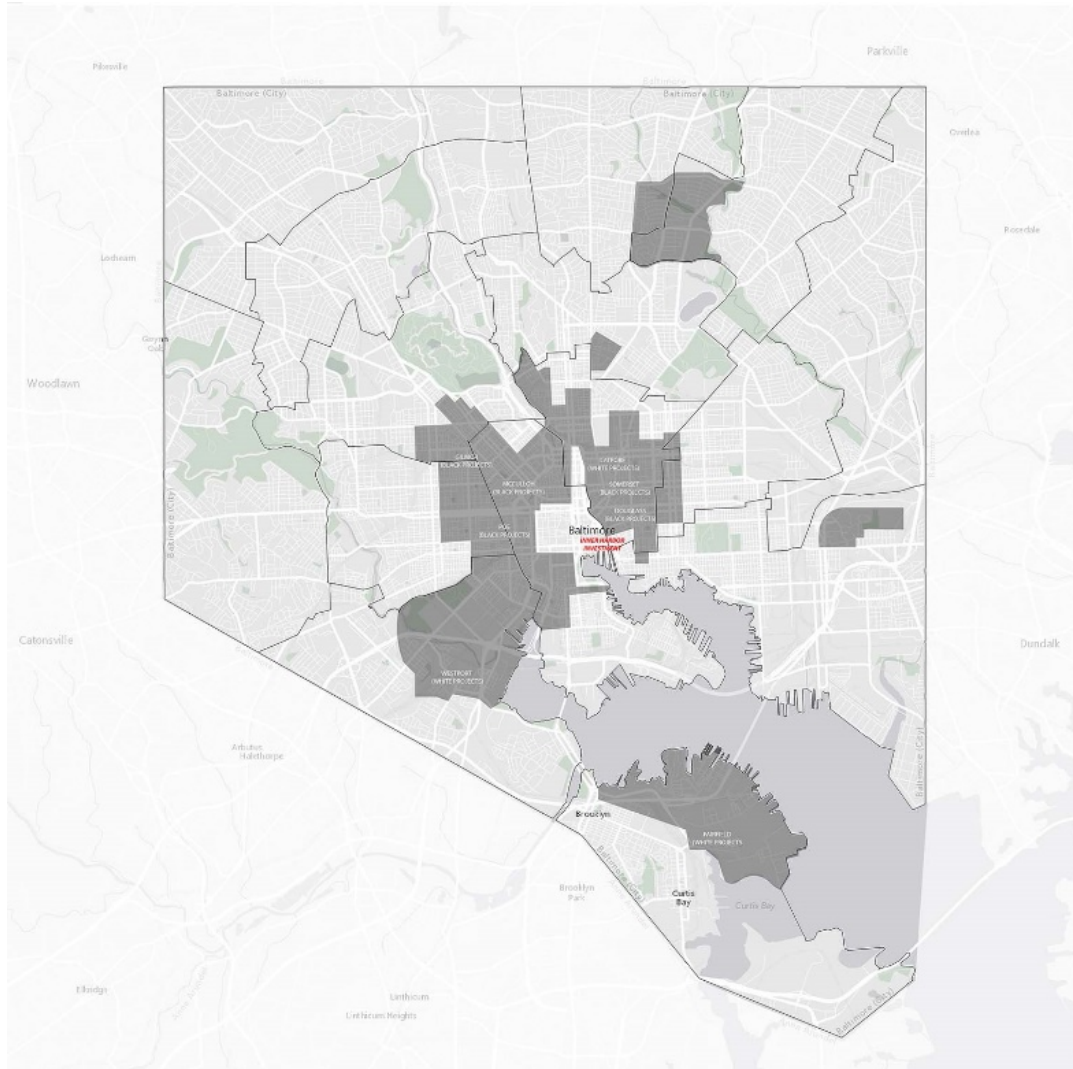
<sup>6</sup> Imbert, Dorothe, *Food and the City: Histories of Culture and Cultivation*. (Washington D.C.: Dumbarton Oaks, 2015), 4.

<sup>7</sup> Imbert, Dorothe, *Food and the City: Histories of Culture and Cultivation*. (Washington D.C.: Dumbarton Oaks, 2015), 9.

<sup>8</sup> Cockrall-King, J., *Food and the City: Urban Agriculture and the New Food Revolution*. (Amherst, NY: Prometheus Books, 2012) 35.

Maryland's total population was 25,000. The population grew 5 times over 55 years and within the total 130,000 population, 40% were African Americans. Baltimore was a Southern city that practiced slavery legally until the American Civil War. When slavery was finally abolished, Baltimore's black population saw drastic rise. Freed slaves from all parts of Maryland left their region for the city looking for work. However, the city was not welcoming to the influx of population. Such is the case in 1910, a black lawyer purchased a property in one of Baltimore's best neighborhoods. The city responded by enacting the first citywide segregation law in the United States. The residential segregation bill made it illegal for blacks to live in white neighborhoods. Although the blacks were allowed to move into mixed blocks, some were still penalized by politicians. By the 1930's, African American's population contributed to 20% of Baltimore's overall population. 89% of the African Americans residing in Baltimore were confined to designated lands surrounding the downtown central business district that equated to 2% of the city's landmass. Both formal and informal methods of segregation denied the expansion of these designated lands. In 1934, the Federal Housing Administration was created that promised accessible homeownership to whites by a guaranteed loan process. African Americans were openly rejected from these loans and whites were denied loans if the area of purchase was close to black neighborhoods. Investment in black neighborhoods was impossible. FHA's loan further defined the dichotomy of black and white neighborhoods. By the 1940's the government at local, state, and federal level believed that the use of public housing projects could help relieve the issue. The public housing projects such as Poe, McCulloch, Somerset, Gilmor, and Douglass

were developed in neighborhoods with the highest African American density (Figure 1).



**Figure 1: Public Housing Projects and Areas of Minority Concentration in 1940. (ArcMap GIS, modification by Author)**

The neighborhoods were located in East and West Baltimore where it lacked stable employment as influx of African American residents increased rapidly. By 1950's the demand for housing by the blacks increased as Baltimore saw more influx of African-American migration to the city. "For decades to come, politicians would find it easier to concentrate public housing projects in black areas or wastelands than to disperse

them throughout the city. These concentrations resulted in “a public housing program that would aggravate poverty and disease”.<sup>9</sup> Expansion of public housing projects were halted by white residents’ complaints and the city’s new vision for the city. Baltimore city adopted a decade long project of urban renewal that demolished projects to make room for new high rise public institution buildings. The urban renewal displaced 25,000 Baltimoreans; African American were the majority of this population. Further distress was brought onto the black communities during the Baltimore riot of 1968. The black communities were frustrated from the social inequality and sought to tilt the city’s black and white economic imbalance. Many citizens of the projects were frustrated with the stores owned by the whites who had humiliated or exploited the black community. The riots were not purely about the discrimination but against the system that has kept opportunity away from those most in need. The damage of the riot effected properties of Baltimore tremendously. The whites owned the shops were targeted but ultimately the fire spread into the black communities. The fires caused by the events of the riot totaled \$79 million today’s dollars in damage and it mostly effected the black neighborhoods. After the riots, the white merchants effected by the fires collected insurance money and left the city to rebuild their business in suburban developments. "What little confidence there had been among investors that they could ride out the weak market before the riots waned away as the scale of vandalism after the riots increased”.<sup>10</sup> “The seeming inability of city authorities to control it in any way became evident, and the polarization between landlord and tenant intensified. Values, which had been moving downward before,

---

<sup>9</sup> Pietila, Antero, *Not in My Neighborhood: How Bigotry Shaped a Great American City*. (Chicago: Ivan R. Dee, 2010), 86.

<sup>10</sup> Pietila, Antero, *Not in My Neighborhood: How Bigotry Shaped a Great American City*. (Chicago: Ivan R. Dee, 2010), 90.

seemed to plummet sharply”.<sup>11</sup> Paralleling the social turmoil along with industrial production moving overseas due to post-industrial period saw the decline in employment which drew many of the white’s to move to suburban development.

The implications of the post-industrial period in Baltimore was devastating, causing a 10.3% unemployment rate and 30,000 empty lots. Baltimore’s public spending was dedicated to Baltimore County’s suburban development and to the city’s tourist areas rather than being used to rehabilitating the urban residential spaces. Baltimore’s population of 950,000 in 1950 decreased to 787,000 by 1980. As the white population in the city shrunk as they moved to the suburbs, black residents’ city migration increase again. In 1950, African-Americans accounted for 24% of the city’s population. This percentage increased and by 2000, 65% of Baltimore’s total population were African-American demographics. The shrinking population had great implications on the commerce especially within the city’s traditional Howard and Lexington streets. By the 1970’s and 1980’s, the white community sought out suburban mall developments in Columbia, Golden Ring, White Marsh, Hunt Valley, Security Square, Hunt Valley, Owings Mills, and others. Baltimore’s vacant lots of today are direct implications of the segregation movements. Baltimore’s history of social dislocation continues to affect the modern day residents. Baltimore is still suffering from the goals of early segregation policies to confine the African American community in a single location and separate them from opportunities. This cyclical

---

<sup>11</sup> Stegman, Michael A. *Housing Investment in the Inner City: The Dynamics of Decline; a Study of Baltimore, Maryland, 1968-1970*. (Cambridge, Mass.: M.I.T. Press, 1972).

process has yet to be unraveled, leaving Baltimore residents stuck in a broken system of the past.

### *Food Desert in Baltimore*

“Once food in the city is recognized not as an independent item nor as a matter of self-indulgent urban lifestyles, but as a dense network of activities and organizations with numerous social, economic and health consequences comprising complex systems, our understanding of urban life and its problems is profoundly improved and a rich series of programs, policies and physical interventions can be developed and implemented. Food can operate as a social, economic, nutritional, educational and entrepreneurial mechanism, and as a tool for increasing the health of individuals, communities, cities and even regions.”<sup>12</sup>

-Kameshwari & Kaufman

For millions of Americans in hundreds of neighborhoods across the country, healthy, nutritious, and affordable foods are out of reach. We have an epidemic of type II diabetes and child obesity that result from those situations. It is especially difficult for people living in urban low-income communities to find healthy food options. “One in four of Baltimore’s residents live in food deserts – areas where residents lack both access and sufficient economic resources to purchase healthy food” stated Mayor Stephanie Rawlings-Black (Figure 5). “Of the approximately 621,000 people living in Baltimore, the 2015 Food Environment Map shows that 25% (158,271 people) live in food deserts” (p23).<sup>13</sup> A food desert is defined as an area where the distance to a supermarket or supermarket alternative is more than ¼ mile, poverty rate of the community is 20% or greater, over 30% of households have no transportation access, and low score of Healthy Food Availability Index. Also

---

<sup>12</sup> Pothukuchi, Kameshwari, and Jerome L. Kaufman. "Placing the Food System on the Urban Agenda: The Role of Municipal Institutions in Food Systems Planning."

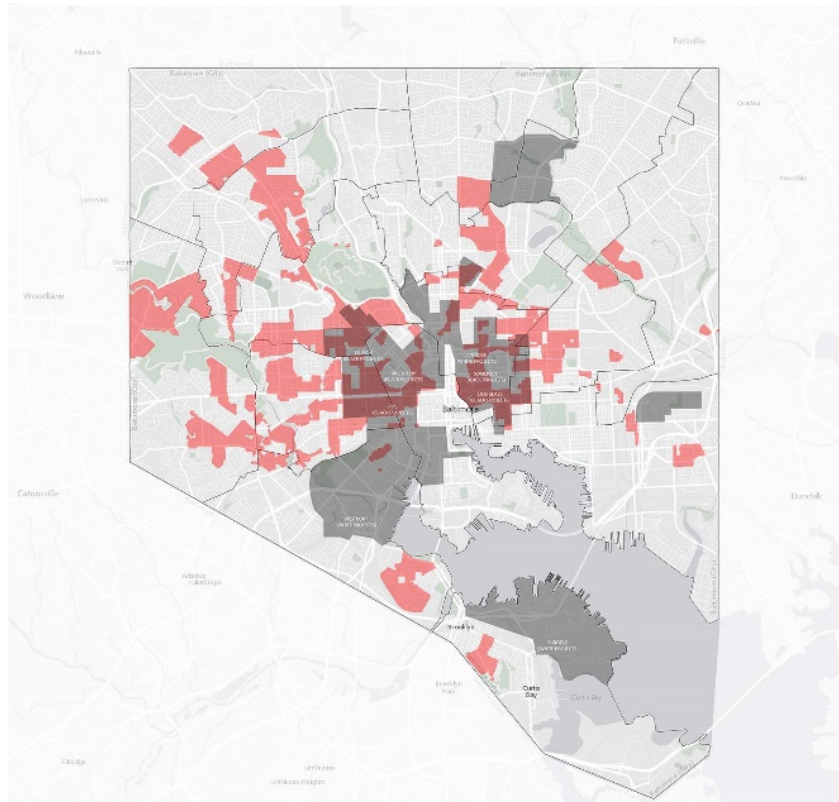
<sup>13</sup> Baltimore City Government, "Mapping Baltimore City's Food Environment: 2015 Report."



according to the Department of Planning, 48% of the neighborhoods in Baltimore contain food deserts. The scale of the problem can vary from whole neighborhoods to a few blocks. The impact of food deserts also greatly effects the children of the city's poorest neighborhoods. As many as one in three children living in Baltimore live in a food desert. Food deserts also disproportionately affect over one third of the African American population in Baltimore who are more likely to suffer economically than white residents. The food desert in these low income neighborhoods are directly related to the past history of Baltimore. When the white residents of Baltimore city left for the suburbs, commercial development followed. Development of suburbs changed the typology of food markets in many ways. Grocery stores and supermarkets replaced local markets. Food sources were being eliminated in the inner city while the suburbs

city while the suburbs saw the rising development of grocery stores (Figure 2).

Despite the complexity of the issues revolving around food deserts, the issue seems to be rooted in poverty. Food became a commodity that depended on and dictated the market



**Figure 2: Public Housing Zones & Food Desert in 2015 (ArcMap GIS, modification by Author)**

forces. “Supermarket redlining” was the model for the supermarket industry that prioritized profit maximization thus avoiding low-income communities. More than an economic anchor, supermarkets are a symbol of a community’s livability” (p36)<sup>14</sup>. The lack of healthy food retailers also hinders community economic development in neighborhoods that need private investment, activity hubs, and jobs creating boundaries between the social classes. The interplay between racially stratified urban planning and supermarket redlining suggests that the food desert as a phenomenon is a direct implication of urban histories and the mechanisms of under-regulated capitalist economy that excluded certain neighborhoods (Figure 3). The high rate of food deserts within the city, 30,000 vacant lots, and 10.3% unemployment rate bring great opportunity for city to rise collectively through food. The city of Baltimore through collaborations with many institutions and local sectors has promised to reform its current state of food access. "I know that we can increase access to healthy and affordable foods as we move forward to dismantle this inequality in our city," stated Mayor of Baltimore City Rawlings-Blake. Food infrastructure is the underlying foundation of a sustainable community. Utilizing the development of urban food production infrastructure as a criteria for urban growth can foster sustainable growing communities economically, socially, and environmentally. By increasing the number of food access points for fresh products, food insecurity will be reduced and food deserts will be eliminated. A local food system that is carefully planned can provide food security to lower income communities that are suffering the most from food deserts (Figure 4). “Food can operate as a social, economic, nutritional, educational

---

<sup>14</sup> Turque, Bill, Debra Rosenberg, and Todd Barrett. "Where the Food Isn't."

and entrepreneurial mechanism, and as a tool for increasing the health of individuals, communities, cities and even regions.”<sup>15</sup>

Food Distribution Evolution

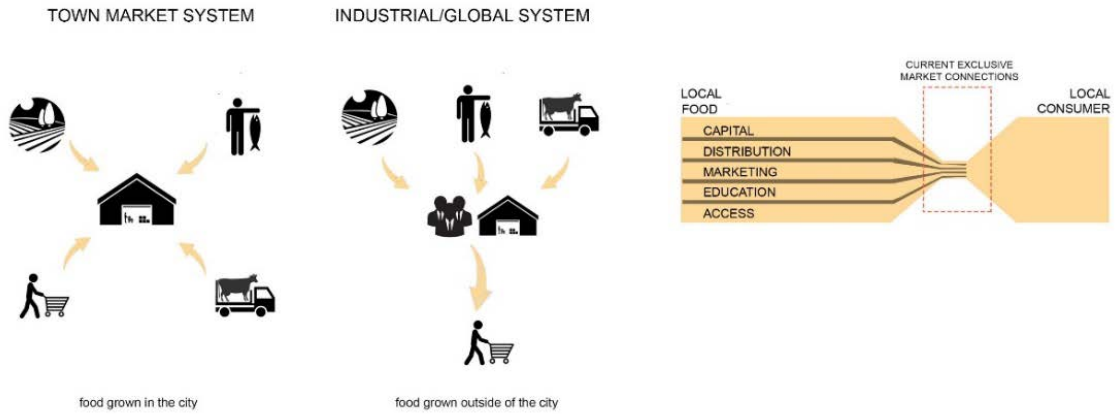


Figure 3: Town market and industrial market system (Author)

Food Distribution Evolution

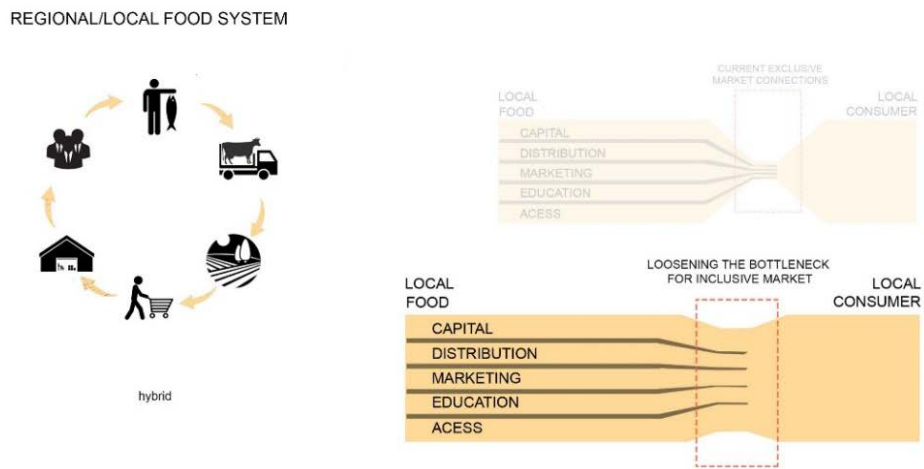
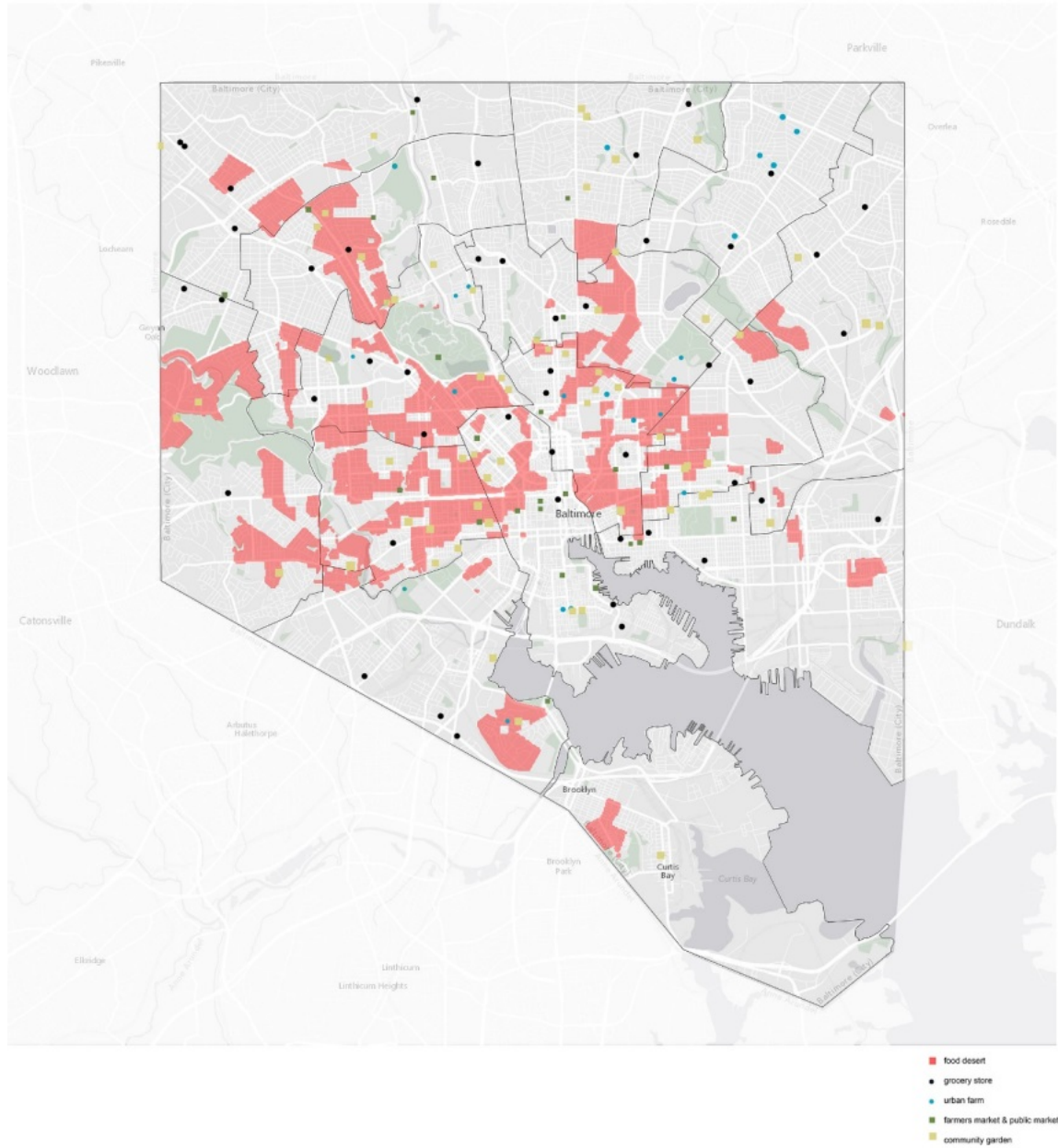


Figure 4: Regional – local food system (Author)

<sup>15</sup> Pothukuchi, Kameshwari, and Jerome L. Kaufman. "Placing the Food System on the Urban Agenda: The Role of Municipal Institutions in Food Systems Planning."



**Figure 5: Baltimore’s food desert and resources in 2015 (ArcMap GIS, modification by Author)**

## Chapter 3: Site

### Site Criteria: Analysis of Overall Baltimore City

**Key Words:** food desert, Federal Poverty Level (FPL), access, Healthy Food Availability Index (HFAI), anchor institutions.

#### List of Site Selection Criteria:

-District that needs social, economic, and political involvement and boost.

-District that has high ratio of food deserts which is ¼ mile from a supermarket.

-District with the highest population group living in food deserts according to Baltimore Food Environment Report 2015.<sup>16</sup>

-District with high ratio of 30% of households have no vehicle available according to Baltimore Food Environment Report 2015.<sup>17</sup>

-District with high ratio of the median household income is at or below 185% of the Federal Poverty Level.<sup>18</sup>

-District with low score of average Healthy Food Availability Index for all food stores.

-District with high ratio of corner stores as possible site intervention.

Federal Poverty Level Median Household income below 185%

# Household Resident	Median Income
1	\$20,664.50
2	\$27,990.50
3	\$34,316.50
4	\$42,642.50
5	\$49,968.50
6	\$57,294.50
7	\$64,620.50
8	\$71,946.50

\*<http://ccf.georgetown.edu/wp-content/uploads/2012/04/Federal-Poverty-Guidelines.pdf>

**Figure 6: Federal Poverty Level Median Income below 185% (Author)**

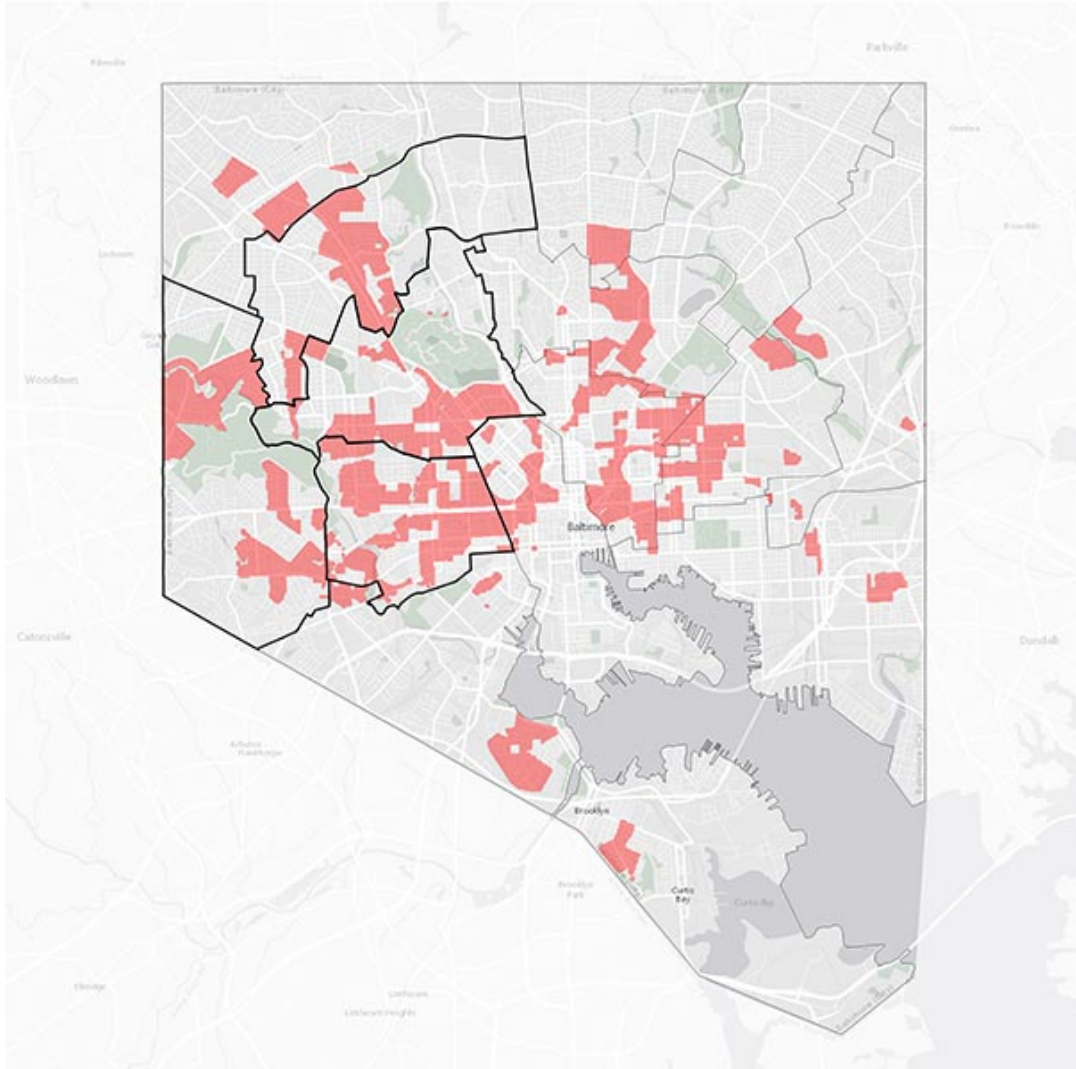
<sup>16</sup> Baltimore City Government, "Mapping Baltimore City's Food Environment: 2015 Report."

<sup>17</sup> Ibid

<sup>18</sup> Georgetown University Health Policy Institute, "2012 Federal Poverty Level Guidelines".

- Anchor Institutions within or near the district preferred.
- District with high ratio of vacant lots. Or District with park space for agriculture.

Site Selection Matrix

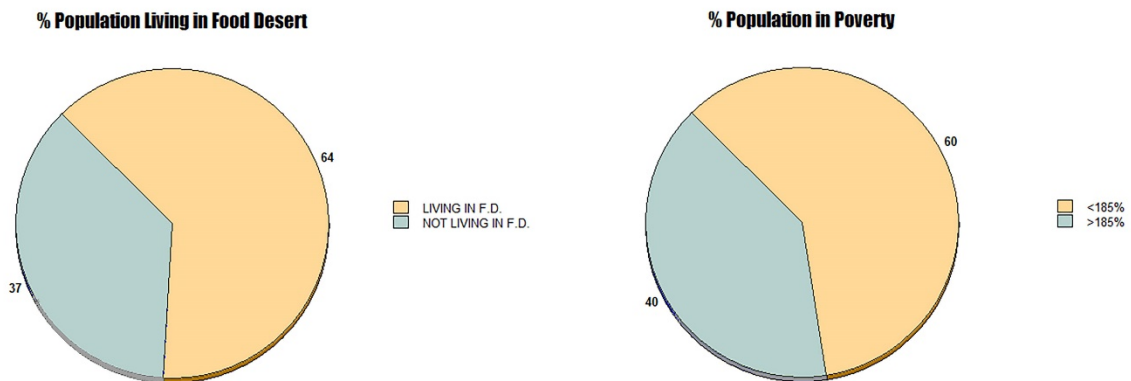


**Figure 7: District 9<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>, and 6<sup>th</sup> with the highest population group living in Food Deserts (ArcMap GIS, modification by Author)**

DISTRICT	POPULATION	% OF POPULATION LIVING IN F.D.	>1/4 MILE FROM SUPERMARKET	INCOME <185% F.P.L.	HOUSEHOLD W/O VEHICLE	STORES WITH LOW H.F.A.I.
CITY AVERAGE		25%	85%	42%	30%	58%
9TH	29,189	63.7%	91%	59%	61%	59%
7TH	20,705	47.6%	98%	47%	38.5%	69%
8TH	17,465	38.8%	98%	37%	25%	62%
6TH	15,705	35.2%	95%	48%	29%	62%

F.D. = Food Desert, F.P.L. = Federal Poverty Level, W/O = Without, H.F.A.I. = Healthy Food Availability Index

**Figure 8: Site Selection Matrix – 9<sup>th</sup> District (Author)**

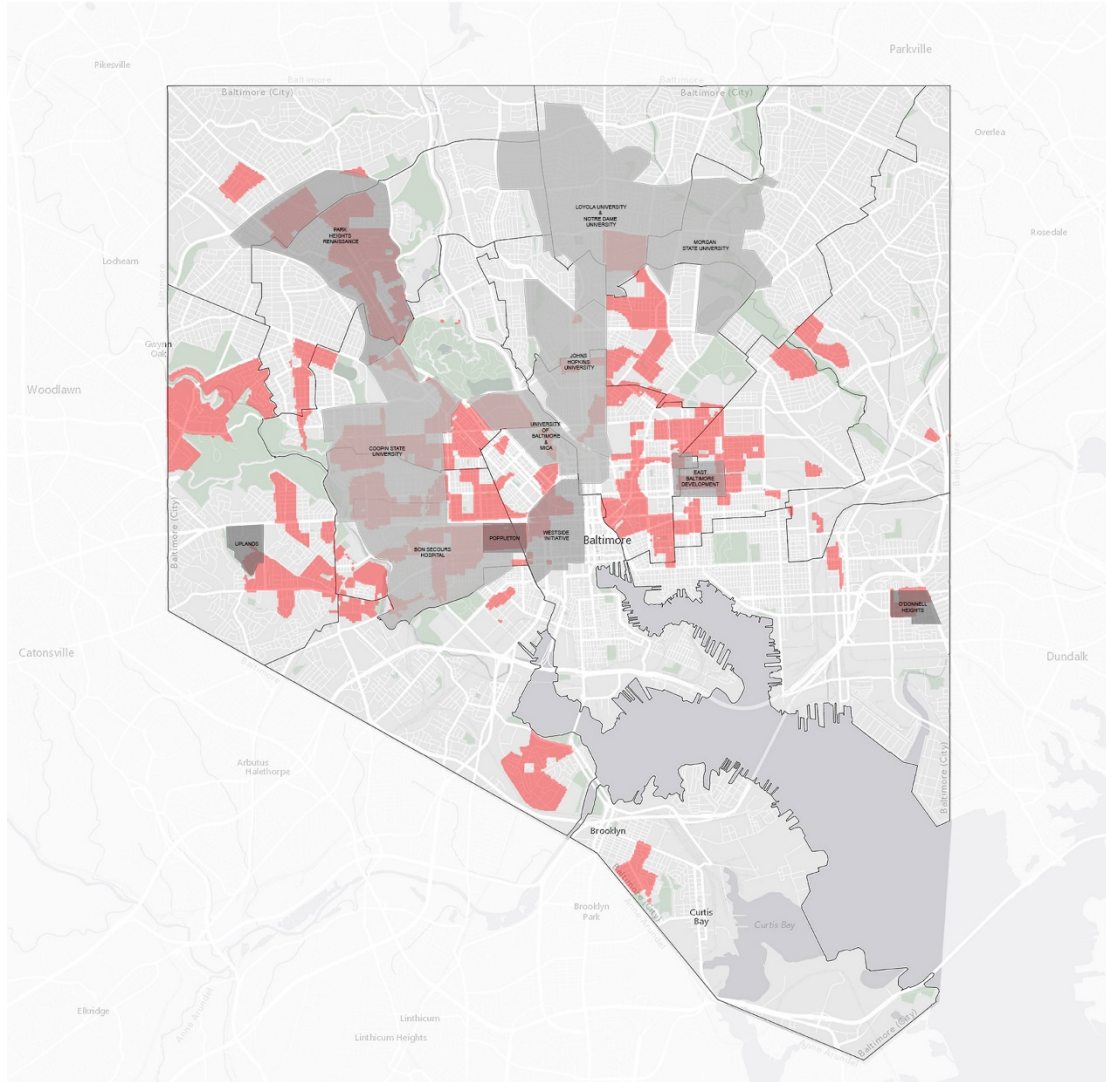


**Figure 9: Population living in Food Desert and Poverty (Author)**

The 9<sup>th</sup> District of Baltimore City has 29,189 total residents. Currently, there is one grocery store, one public market, and 10 community gardens (Figure 11). Contrasting with the lack of healthy food resources, 9<sup>th</sup> District has the highest concentrated corner stores (89) in Baltimore. The residents most likely travel outside of the district to go to a supermarket. Of the total population of 9<sup>th</sup> District, 63.7% are living in a food desert equaling 18,593 people in total (7,500 children + 3,500 seniors + 7,593 others), three times more than Baltimore city’s average. 61% of the population suffer from access issues which is double the city’s average (Figure 8). Poverty is also prevalent affecting 60% of the district (Figure 9). There are anchor

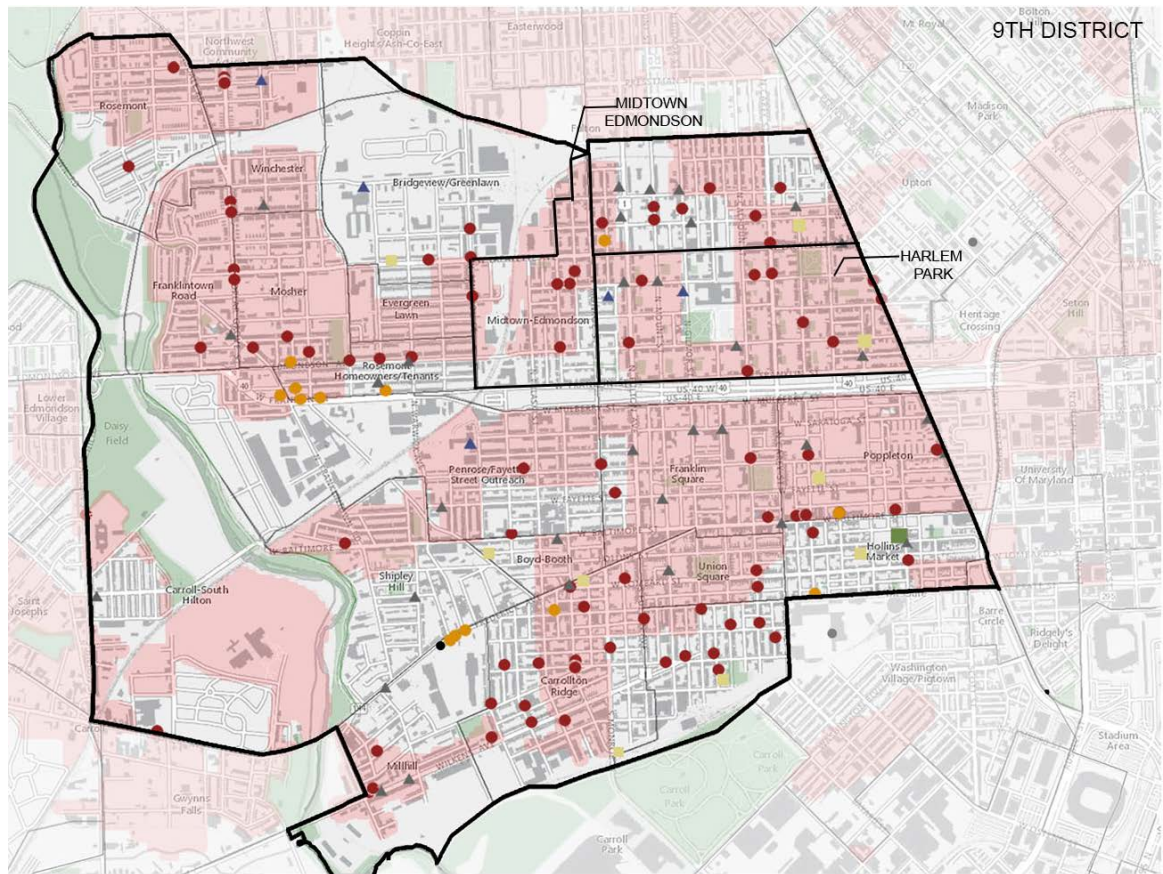


institutions such as Bon Secours Hospital, Coppin State University, and Westside Initiatives that could serve to be great resources to initiate public-private partnership (Figure 10).



**Figure 10: Anchor Institution's Investment Area (ArcMap GIS, modification by Author)**





- SUPERMARKET (1)
- CORNER STORE (89)
- CONVENIENCE STORE (14)
- FARMER'S MARKET (0)
- PUBLIC MARKET (1)
  
- COMMUNITY GARDEN (10)
- ▲ FOOD PANTRY & MEAL SITES (37)
- ▲ AFTER SCHOOL MEAL SITES (19)

**Figure 11: M.E. area of food desert and food resources (ArcMap GIS, modification by Author)**

### History of Selected Site

The rise and fall of Midtown-Edmondson's economic development throughout history resulted in the now suffering economic, social, and political condition. A once walkable community with thriving local business shops was slowly dismantled into large industrial zones. Important time periods that had direct implications on the formation of today's Midtown-Edmondson are highlighted below

to carefully study the elements that ultimately lead to the desolation of the neighborhood.

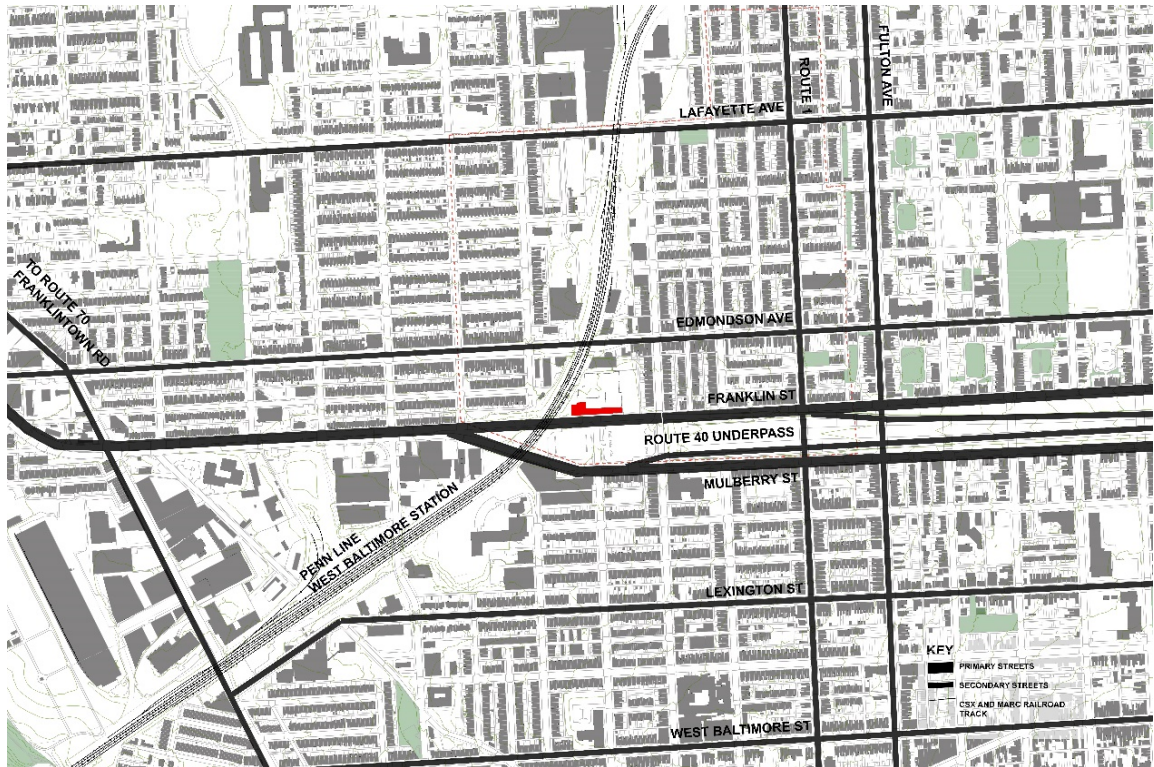
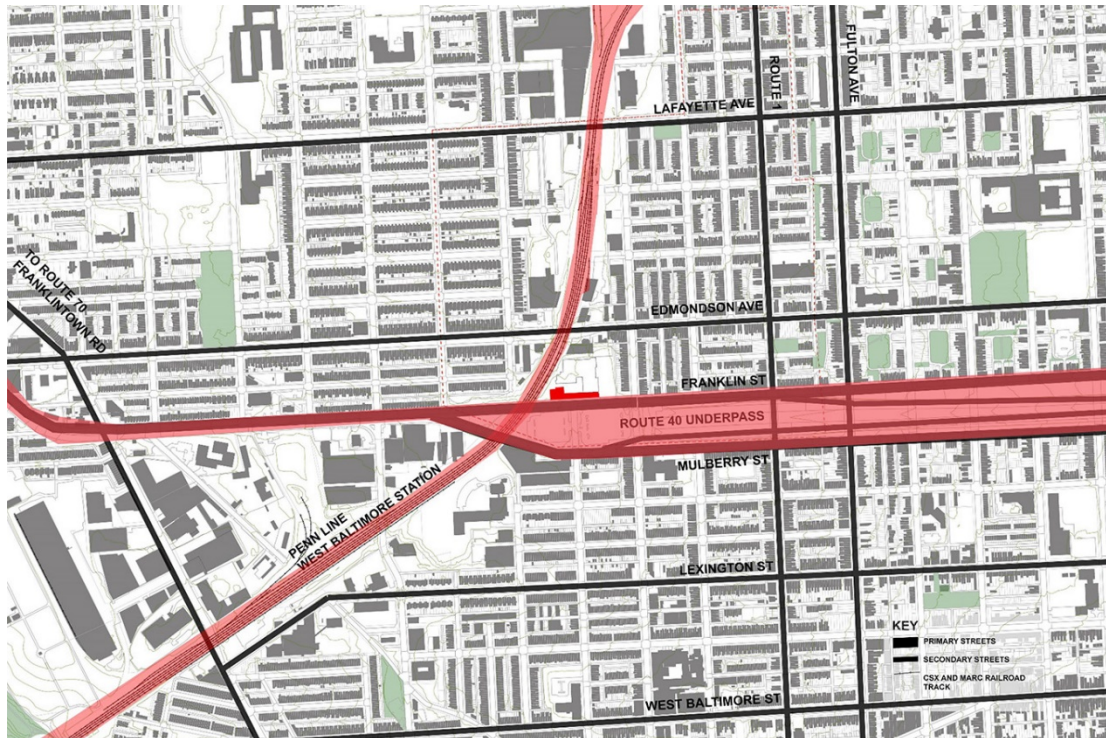


Figure 12: Site plan (ArcMap GIS, modification by author)

In 1887, Midtown – Edmondson (M.E.) started as a residential development built by local small builders (Figure 13). The row homes were vacation homes for city dwellers. Streetcar infrastructure expansion down Edmondson Avenue in 1890's lead to an increase of middle class white population. In the early 1900's, Edmondson Ave and Franklin Street served as roads connecting Baltimore City with Baltimore County and these streets became more favorable for commercial development. The CSX Railroad constructed few years later ran right through the center of the neighborhood and further facilitated the transition from residential to industrial development area (Figure 14). The industrial developments were concentrated along both now historic railroad tracks and electric streetcars routes. The transition from



residential neighborhood to industrial zone eliminated food sources and other local shops in a once thriving neighborhood. As one resident stated, "We were raised working in the store on the first floor and living in back of the store and on the second floor. We all worked in the store."<sup>19</sup> Once prevalent community owned and operated shops were quickly being replaced by big industrial corporations.



**Figure 13: Railroad and Highway on site (ArcMap GIS, modification by author)**

The 1940s – 1950s brought racial shift in the demographics of M.E, once a segregated white neighborhood. Due to industrial development, whites moved towards Baltimore County. The empty houses were bought by African Americans who were living in the neglected and overcrowded segregated neighborhoods. The displaced population now found a new place of residence. The African American residents of M.E. were able to establish a new identity and practice their culture that

<sup>19</sup> Sandler, Gilbert, *Glimpses of Jewish Baltimore* (The History Press: 2012), 87.

had been suppressed in the housing projects. Clubhouse of Bandolero's Motorcycle Club at 2024 Edmonds Avenue and Uptown Car located at Monroe and Edmondson Avenue were popular leisure locations for West Baltimore. In 1968, the assassination of Martin Luther King Jr lead to civil disturbance in across the nation. Baltimore saw riots that lead to six people dead and hundreds injured. The stores on Edmondson Avenue and Payson Streets were looted. The looted corner stores and small businesses never reopened but some institutions such as Green's Hardware remain today.

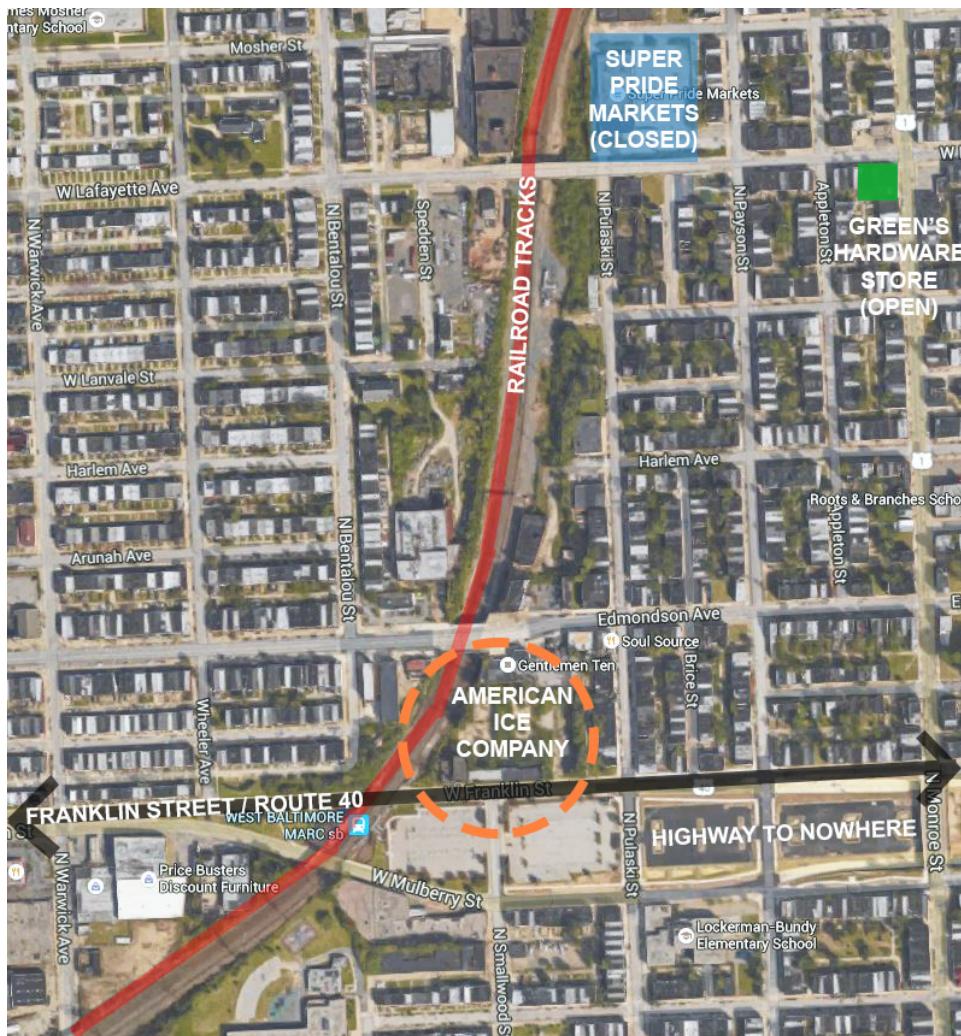


Figure 14: Super Pride Markets (ArcMap GIS, modification by author)

Further distress was brought to the broken community when the city of Baltimore established a highway project that cut through existing neighborhoods. The “Highway to Nowhere” established in 1969 envisioned eastern terminus of Maryland’s Interstate 70 that is a major transcontinental route to be connected to the western edge of the business district of Lexington Market located in downtown Baltimore (Figure 15). The new highway was proposed on once thriving Franklin Street and Mulberry Street and cut right through neighborhoods of Poppleton, Harlem Park, Lafayette Square, and Rosemount. The 1.4 mile long and 30 feet level of sunken ground that comes to an abrupt stop at MARC station due to cancellation of construction displaced 37,000 urban housing units (Figure 16). The highway physical divided of the northern and southern west Baltimore. The shrunken population of neighborhood and it’s approximation to a major highway routes generated crime, abandoned building, and drug trade. In 2000, M.E.’s last food resource Super Pride Groceries Supermarket at 2000 W Lafayette Ave shut down, further eliminating food resources (Figure 14). The rise and fall of once thriving neighborhood resulted in the now suffering economic, social, and political conditions (Figure 17). As of the 2010 census, the total population of the neighborhood is 1,163 people. 97% of the population is African American, 1% white, and 2% other races. The population suffers from 13% unemployment rate with the median household income being \$23,819. 33% of the population is living below the poverty line compared to the city’s average of 23%.<sup>20</sup>

---

<sup>20</sup> Baltimore City Department of Planning, *Baltimore Neighborhood Profiles*.



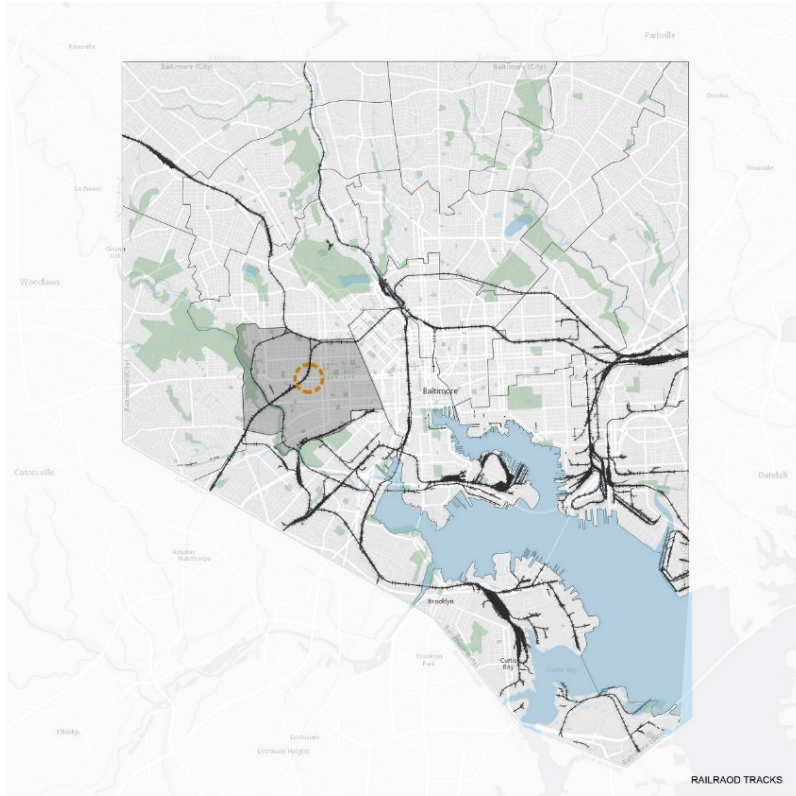


Figure 15: Highway Routes in Baltimore City (ArcMap GIS, modification by author)



Figure 16: Figure - Ground of site (ArcMap GIS, modification by author)



Figure 17: Land use, Crime, Vacancy of site (ArcMap GIS, modification by author)

*Analysis of Selected Site*

*Brief Description & Location of Site*

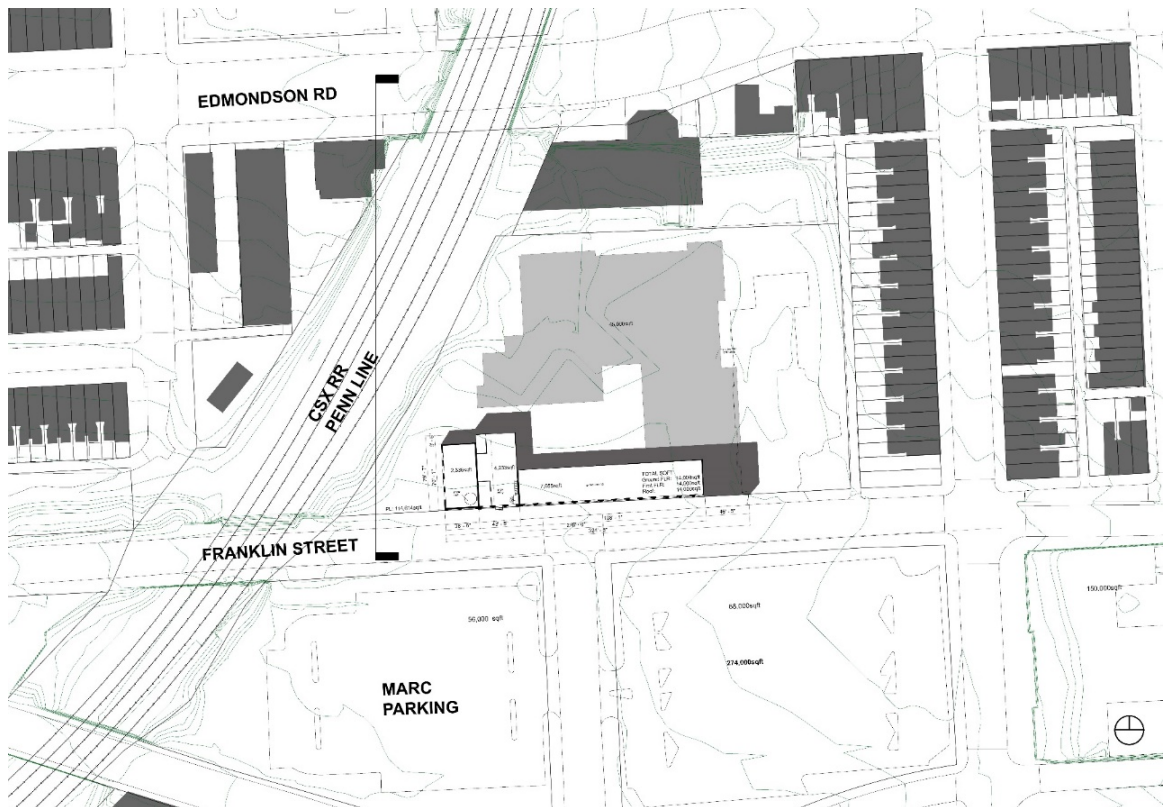
- Historic Name: American Ice Company
- Location: 2100 W Franklin Street
  - Baltimore City, MD 21233
- Architect: Mortimer & Co. New York
- Builder: Fidelity Construction Company, Baltimore
- Period of Significance: 1911
- Ownership: Private
- Historic Function: Industry – manufacturing facility
- Vacant – not in use
- Materials:
  - Foundation walls – Brick
  - Roof - Asphalt



Figure 18: American Ice Company (Google Maps, modification by author)

American Ice Company		Area (s.f.)
Existing Building Footprint		
Ground Level		14,000
Lofted Level		14,000
Roof Level		14,000
		<b>46,000</b>
Burned Building Footprint		
Ground Level		45,000
		<b>45,000</b>
Property Line Overall Footprint		
		<b>114,614</b>

**Figure 19: American Ice Company Footprint (Author)**



**Figure 20: Existing site plan (ArcMap GIS, modification by author)**

### Surrounding Land Use

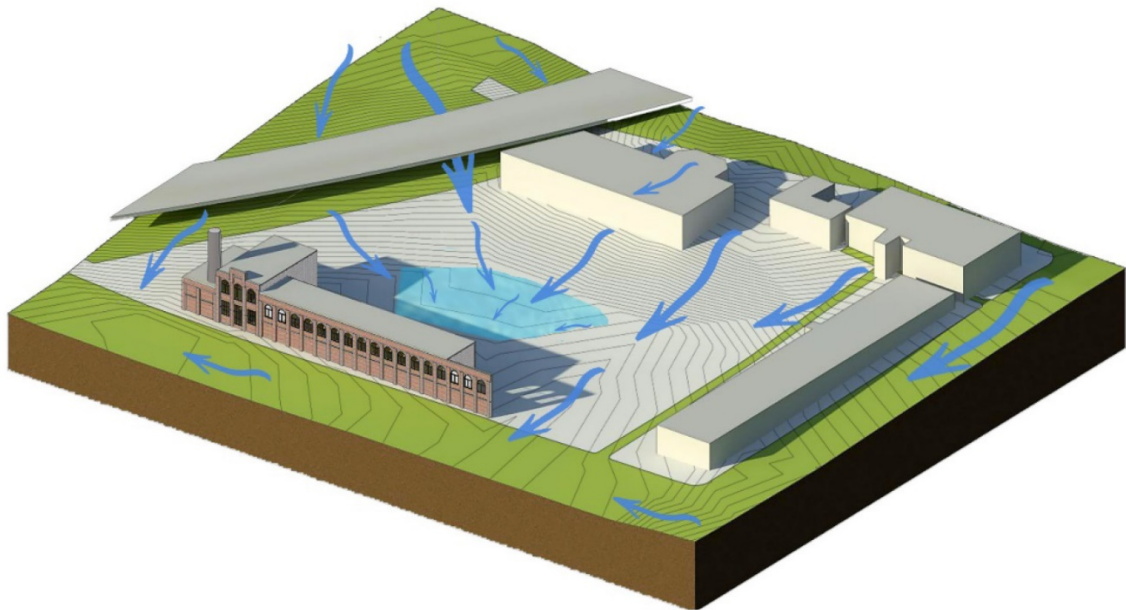
The lot where the building stands has multiple land uses. The west end of the lot is capped by the railroad tracks. The north end of the lot holds small auto service shops and other businesses in deteriorating buildings. There were originally 33 row homes built along the east end of the lot. Many of them are in very deteriorating state



from years of neglect and abandonment. The south façade along Franklin Avenue served as the street front while the north façade faced the loading lot. The building is two levels with long facades facing both north and south. The American Ice Company is located on the south end of the lot. The blocks adjacent to lot hold various land uses such as housing, MARC parking, light industrial to small private businesses, and schools (Figure 17).

### *Analysis of Natural and Built Environment*

The chosen site suffers from rain water runoff due to the raised railroad track to the west and 18 feet of hill to the south of the site (Figure 21). The place of collection is where the old building stood and lacks permeability. The sun study suggests that the site gets plenty of natural light throughout the year, ideal for production of crops (Figure 23).



**Figure 21: Rain water runoff on site (Author)**

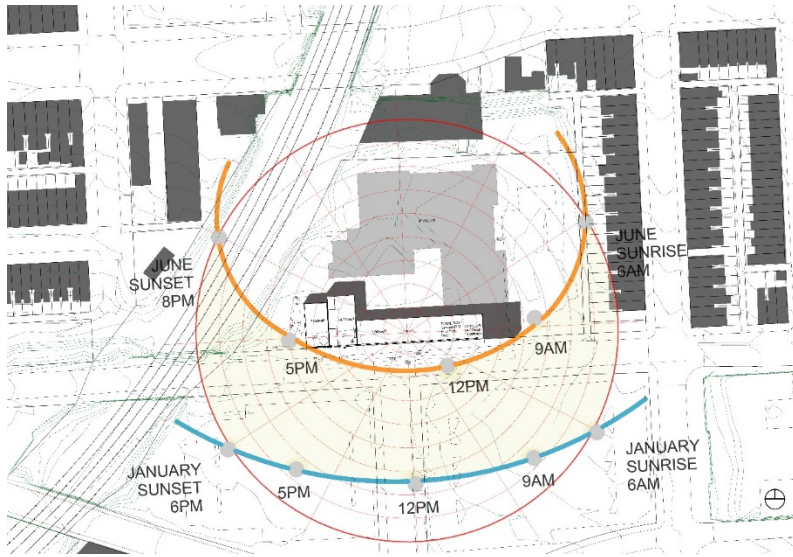


Figure 22: Sun study of site (Author)

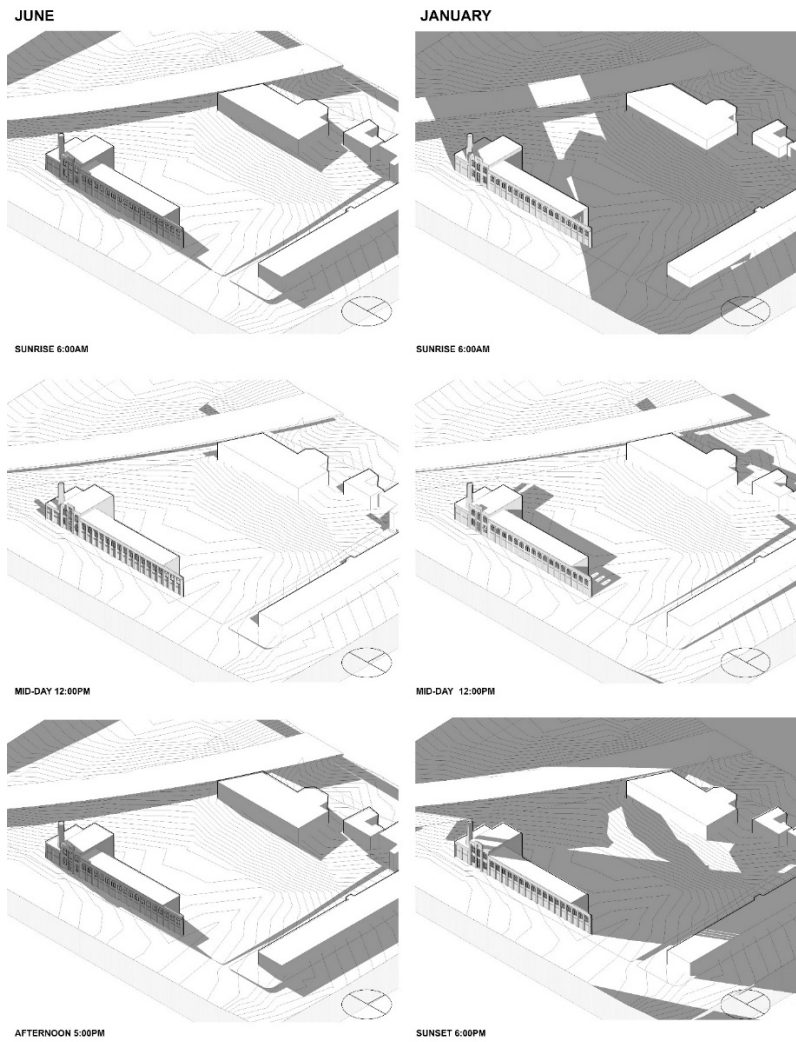
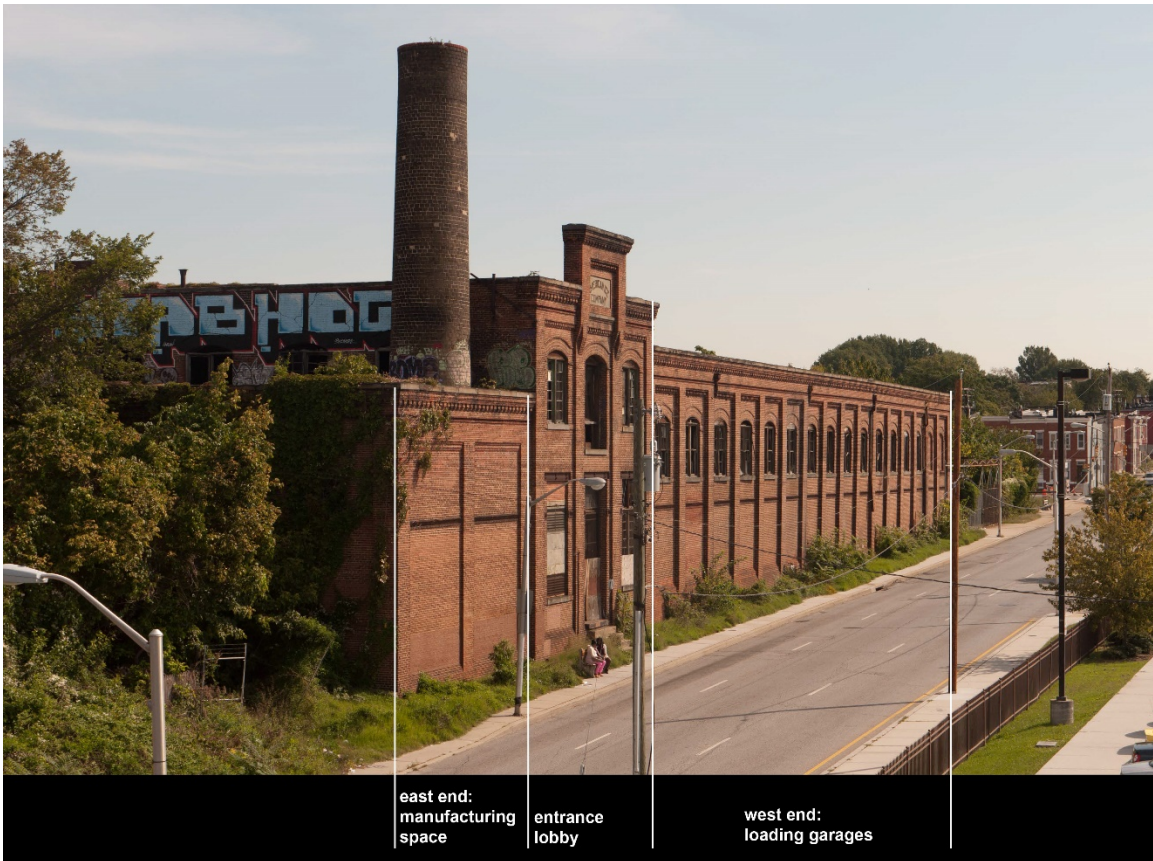


Figure 23: Sun study of massing (Author)

Analysis of Selected Building: The American Ice Company



**Figure 24: Existing facade study of American Ice Company (Author)**

The American Ice Company located on 2100 W Franklin Street was constructed in 1911. The building butted with the CSX Railroad/West Baltimore MARC stop. The building was originally used for manufacturing and ice delivery throughout the Mid-Atlantic States. The railroads allowed for American ice Company to supply Baltimore, New York, D.C. year round. By 1941, the company was the second largest distributor of manufactured ice in the United States. However, with the rise of home electric refrigerators in homes brought rapid decrease of demand on manufactured ice. In 1960's the American Ice Company sold the property to the local Baltimore American Ice Company. By this time several renovations and reconstructions had been done to the building to replace the garages that originally

served horse drawn wagons. The loading docks expanded throughout the site until 2004 when a fire destroyed all the recent additions and severe damage to the northeast corner of the original building. The building has not been operational since. Recently in 2013, the National Register of Historic Places named the American Ice Company building a historic.

The west end of the American Ice building holds two rectangular volumes and was used to manufacture and process the ice. One of these rectangles had three bays on the south façade that are projected and topped by stepped parapet that served as the entrance area of the building (Figure 24). 21 bays adjacent to the volumes served as loading docks for trucks. The majority of the building is constructed in red brick laid in American bond. The expanded loading dock that once stood on the lot behind the original building is now a vacant lot.



# Chapter 4: Precedent and Program

## Food Hub Definition

Food Hub:

“Centrally located facility with a business management structure facilitating the aggregation, storage, processing, distribution, and/or marketing of locally/regionally production food products.”<sup>21</sup>

-U.S. Department of Agriculture

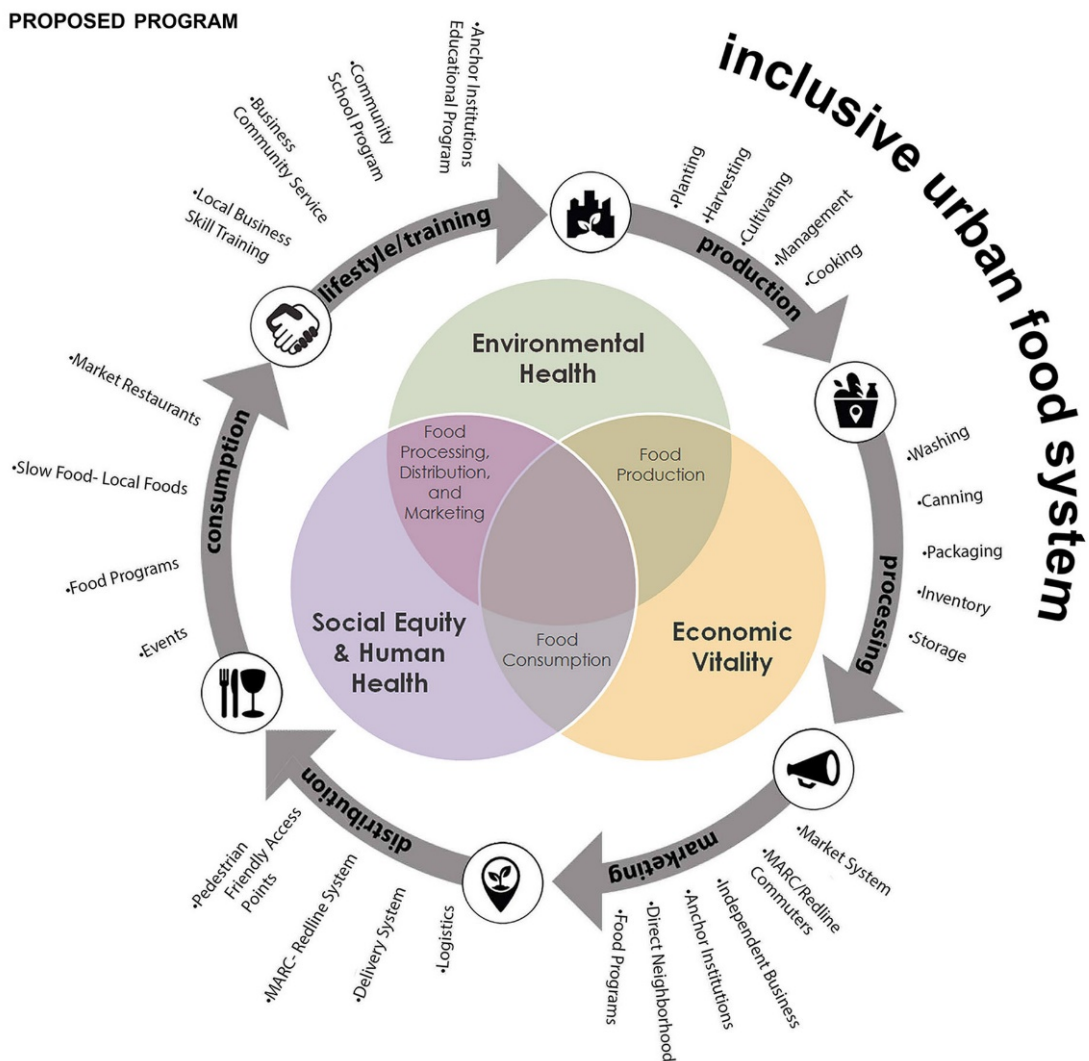


Figure 25: Inclusive Urban Food System (Author)

<sup>21</sup> U.S. Department of Agriculture, "Sustainable Agriculture & Food Systems Funders. Regional Food Hubs: Linking producers to new markets."

The proposed Food Hub combines programs from food incubator, market system, education and health system to eliminate food insecurity, low employee rate, low economic stimulation and health education within the community. Production, processing, marketing, distribution, consumption, and lifestyle, the six elements of Urban Food System, can be translated into three building typologies - food incubator, market, community center. Proposed Food Hub aims to combine these programs to provide healthy good food and lifestyle for the community members of the Midtown-Edmondson neighborhood. The main programmatic elements include agriculture and food product production facility, market halls, health and skill training facility synthesized into these three categories.

1. Food Incubator: Community Kitchen and Urban Farm
  - a. Production
  - b. Processing
  - c. Distribution
2. Market
  - a. Marketing
  - b. Consumption
3. Community Center
  - a. Lifestyle
  - b. Training

Partnering with nearby anchor institutions such as Coppin State University and Bon Secours Hospital can help lead to greater rate of success. Simple planning methods such as catering system supported by these institutions or donated health services from the hospital can be a method to help the community. Combining food

incubator, market system, and community center can lead to a sustainable food system supporting the community, local businesses, and private institutions.

Precedent Analysis

1. Food Incubator:

a. Community Kitchen - Union Kitchen, NOMA D.C. 6,500 ft<sup>2</sup> (Figure 26)

i. Union Kitchen is a food incubator located in Washington D.C. Their vision is to provide space and infrastructure for local entrepreneurs. Union Kitchen aims to build an “interconnected platform for small businesses.”<sup>22</sup> The shared kitchen facility provides infrastructure at a low-cost, low-risk, full-service “kitchen for local businesses to establish their operations, streamline their distribution, and drive growth at every stage of the entrepreneurial process”.<sup>23</sup> Union Kitchen also provides catering connections, marketing, financing, and facility maintenance for the local businesses (Figure 26).

Precedent	Program	Area (sq.ft.)
Union Kitchen, NOMA D.C.		
	Program	Area (sq.ft.)
COMMUNITY KITCHEN	(1) Prep Area with 19 prep tables 3' x 6'	940
	(1) Cooking Area with 4 ovens, 8 pot burners, 14 burner range, 1 charboiler	135
	(1) Packaging Area with 5 storage racks and 2 tables	350
	(1) Kitchen Member Shared Office Space	2,000
	total	2,425
SUPPORT - shared facilities	(1) Admin Office	350
	(1) Freezer	110
	(1) Kitchen Member Fridge 6'x2'x6'	240
	(1) Commercial Fridge	130
	(1) Loading Area with 10 storage racks 6' x 2' x 7'	350
	Circulation + 11 Storage Racks 6' x 2' x 7'	1,370
	(1) Water Closet Unisex	70
	total	2,620
PARKING	Loading Parking	440
TOTAL	COMMUNITY KITCHEN + SUPPORT + PARKING - OFFICE SPACE	4,485
TOTAL	COMMUNITY KITCHEN + SUPPORT + PARKING - OFFICE SPACE	6,485



**Figure 26: Precedent Program Tabulation - Union Kitchen (Author)**

<sup>22</sup> Union Kitchen, *About (Union Kitchen: 2016)*.

<sup>23</sup> Ibid

b. Urban Farm: Whole Foods & Gotham Greens Brooklyn, NY –  
20,000 ft<sup>2</sup>

i. Gotham Greens is an urban agriculture system that aims to bring fresh, local and pesticide free vegetables grown using ecological and environmentally friendly methods. In 2013, Gotham Greens collaborated with Whole Foods to build a 20,000 ft<sup>2</sup> greenhouse system on the roof of its new facility in Gowanus Brooklyn. The urban farm was the first building that integrated both supermarket and commercial rooftop farm. Vegetables such as salad greens, tomatoes, and herbs are produced all year through a hydroponic system. The hydroponic system produces 200 tons of food annually. Ten acres of farm land would be needed to produce the equivalent amount. Thus, the system uses 20x less irrigation or 66% - 84% less water used in fields. The harvested vegetables are delivered downstairs to the market eliminating travel footprint and also providing the freshest products to the customers as possible. The 87,400 ft<sup>2</sup> parking facility allows for 6,000 ft<sup>2</sup> of 247 PV modules at 10 degree tilt as parking canopies. The PV system provides 56kW energy for the site (Figure 27).

Precedent	Program	Area (sq.ft.)
Whole Foods Roof Top Urban Farm, Brooklyn NY		
	Program	Area (sq.ft.)
URBAN FARM	Hydroponic Agriculture Greenhouse rooftop	18,500
	(1) Storage	1,500
		<b>20,000</b>
SUPPORT - shared facilities	PARKING with 157kW Combined Heat and Power (CHP) Plant & 325kW solar PV	<b>87,400</b>
TOTAL	URBAN FARM	<b>20,000</b>
TOTAL	URBAN FARM + SUPPORT	<b>107,400</b>



Figure 27: Precedent Program Tabulation - Whole Foods (Author)



## 2. Market:

- a. Union Market - NOMA D.C. - 20,000 ft<sup>2</sup>
  - i. The famous Center Market built in 1871 relocated to the current location of Union Market in 1931. Initially started as an open-air market with 700 vendors, it evolved to an indoor market due to the city's ban of outdoor meats and eggs in 1962. The program, which evolved from market to wholesale operation, started to decline in merchants in 1989 due to modern distribution centers and supermarkets in the suburbs. Today Union Market has been renovated to renew the spirit of the market as the center for the community. More than 100 local entrepreneurs are able to employ 1,500 people ranging from skills within food production and related services. The indoor facility houses 40 permanent local artisans, while the outdoor houses various rotating local businesses throughout the year. Events such as outdoor theater and a local artist festival are a few of the big events held annually. The permanent vendors share a community kitchen and other support infrastructure. Individual stalls can also have small kitchenettes or full kitchen depending on the vendor's mission. The remainder of the space is for circulation that doubles as dining spaces (Figure 28).

Precedent	Program	Area (sq.ft.)
Union Market, NOMA D.C.		
	Program	Area (sq.ft.)
MARKET	(9) 10' x 10' Small Market Vendor	100
	(20) 10' x 20' Medium Market Vendor with small kitchen	200
	(4) 22' x 40' Large Market Vendor with medium kitchen	880
	(2) 32' x 60' Retail Stores or Restaurants	1,920
	(1) 22' x 40' Local Farm Vegetable Stand	200
		total
DINING	Indoor Shared space with public circulation	4,000
	Outdoor Space	5,500
		total
SUPPORT - shared facilities	Public circulation around stalls	4,200
	Private Elevator and stairs for vendors only	800
	(1) Water Closet Men - 3 Stall/2 Urinal	310
	(1) Water Closet Women - 4 Stall	270
	(1) Water Closet Cleaning Storage	135
	Storage	1,700
	Loading Dock	400
	total	7,815
PARKING	Loading Parking	19,710
	Public Parking	58,500
		total
TOTAL	MARKET+DINING+SUPPORT-PARKING	20,000
TOTAL	MARKET+DINING+SUPPORT+PARKING	99,000



**Figure 28: Precedent Program Tabulation - Union Market (Author)**

### 3. Community Center

#### a. Bread for the City – Shaw D.C. – 20,041 ft<sup>2</sup>

- i. Bread for the City, located in Shaw D.C., is a comprehensive non-profit organization to serve the disadvantaged populace (Figure 29). The organization formed in 1974, has two major components mapped by the original organizations Zacchaeus Free Clinic providing free medical clinic and project coalition of downtown DC churches to feed and clothe the poor, “our mission is to provide free comprehensive services (food, clothing, medical care, legal assistance, and social services), to

DC's low-income population in an atmosphere of dignity and respect".<sup>24</sup> Bread for the City is able to feed 9,000 DC residents monthly with products donated by the city and the onsite roof garden. The 2,250sqft garden roof is about to produce 15% of the needed food annually. The program also provides cooking classes, garden/agriculture workshops, and health services. When interviewed the architect of the new facility, he stated that the biggest design challenge was how to arrange the programs so that clients of the facility are comfortable visiting the space without losing their dignity by being on display of the public. The original building structure lacked open space where clients could wait and receive service. The clients of the facility were forced to wait outside in line, in display for the public to see their problems. The architectural problem lead to further displacement of those in need. The new addition to the existing building focused on "the double-height atrium houses the main front and rear entrances, reception, and vertical circulation (an elevator and open stair), with direct entrances to the medical/dental clinic, the legal clinic, the food bank, board room, social services, and administration".<sup>25</sup>

---

<sup>24</sup> Bread for the City, *Mission and Vision*, (Bread for the City: 2009).

<sup>25</sup> Kendall Dorman. Wiebenson and Dorman Architects

Precedent	Program	Area (sq.ft.)
Bread For the City, Shaw D.C.		
	Program	Area (s.f.)
FOOD SERVICES	Food Pantry	1,300
	Waiting Room + Entrance Lobby	1,300
	Kitchen	300
		<b>2,900</b>
SOCIAL SERVICES	Counseling private rooms (7)	630
	Social services	1,100
	Legal Counseling	1,600
	Development Counseling	1,216
		<b>2,816</b>
HEALTH SERVICES	Medical private rooms + sink (18)	2,200
	Doctor's office/lounge	500
	Waiting Room	1,100
	Reception/Enrollment	400
		<b>4,200</b>
ADMIN + SUPPORT	Flex Meeting Room	1,300
	Admin private office (9)	970
	Entry	205
	Fire Stair (2)	300
	Stair + Elevator	500
	W/C (10)	900
	Storage (7)	300
	Circulation	3,400
		<b>7,875</b>
URBAN FARM	Roof top garden	<b>2,250</b>
	ALL - URBAN FARM	<b>17,541</b>
	ALL + URBAN FARM	<b>20,041</b>



Figure 29: Precedent Program Tabulation - Bread for the City (Author)

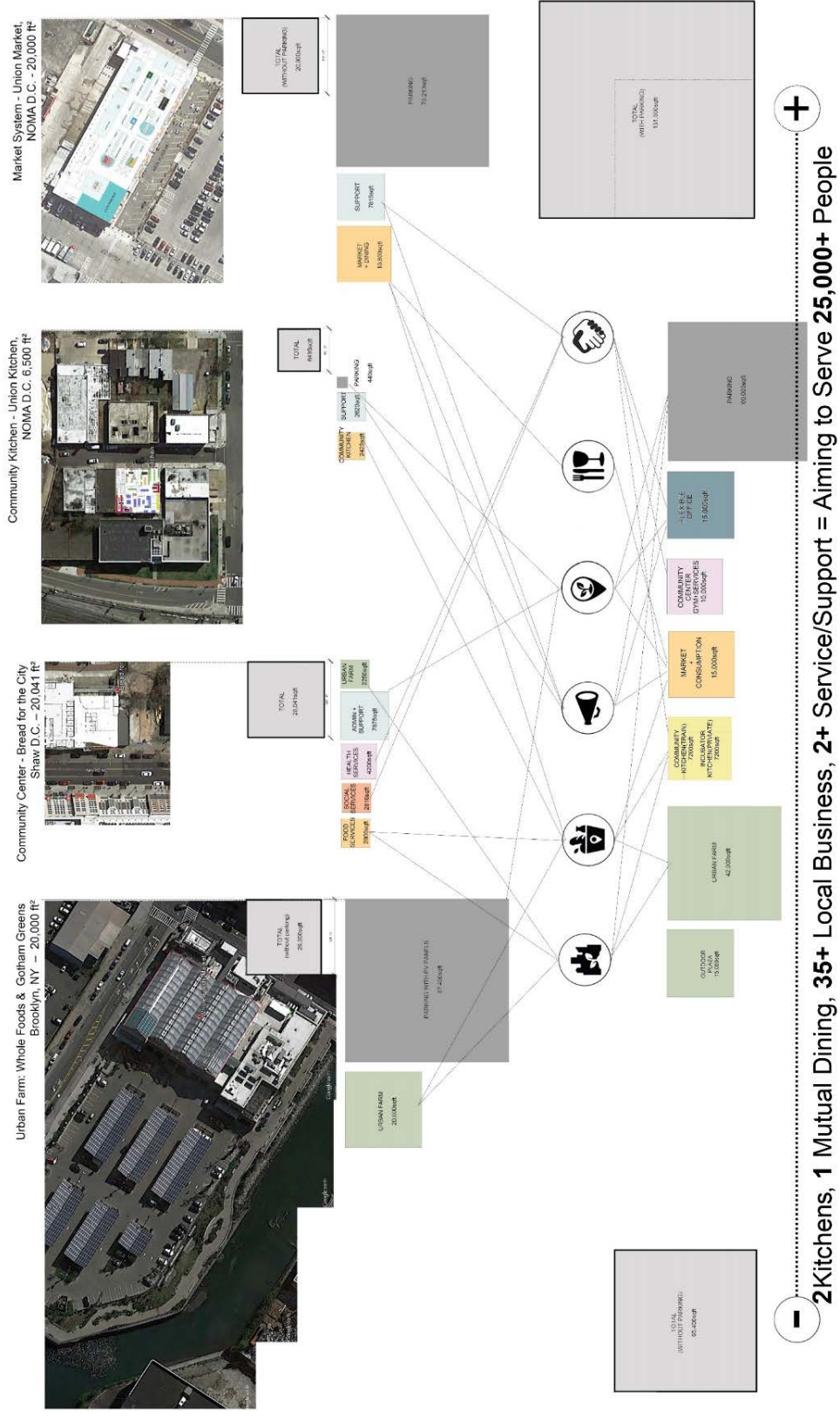


Figure 30: Precedent Program Comparison and Synthesis (Author)

## Crop Harvest and Cultivation

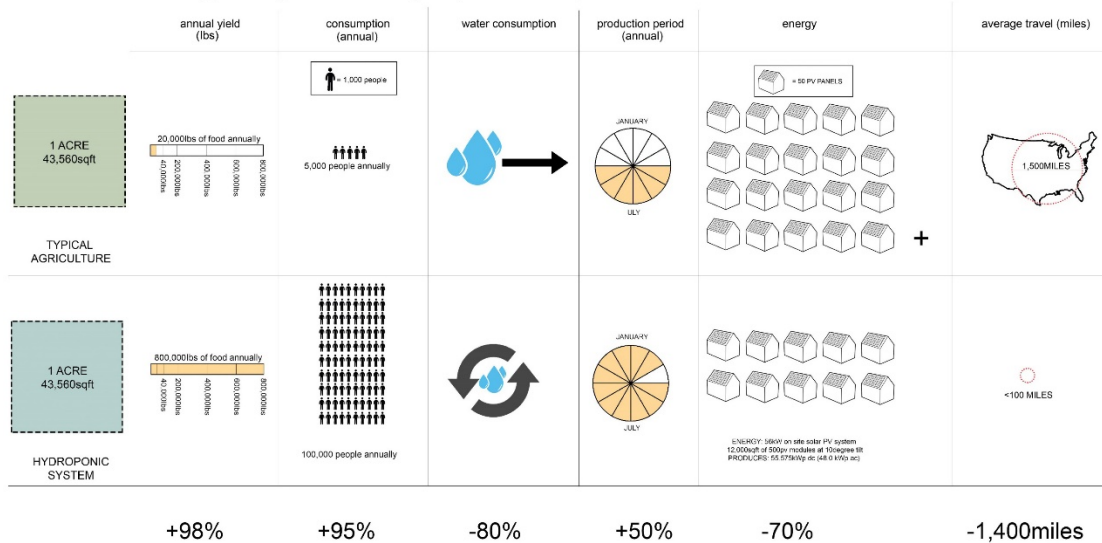
### Conventional Industrial Food System and Local Food System

Conventional industrial food system is a method currently used in the United States. Alternative methods such as local food system are started to be practiced today. The conventional food system prioritizes production for maximum efficiency to lower consumer costs. Vertical integration and global trade are used to achieve maximum revenue. Recent study by John Hopkins Center for a Livable Future shows that these mechanized concentrated production and mass transportation to supermarkets has led to global ecosystem fertilizer runoff, greenhouse gas emission, rise of travel footprint, and many other problems. Conventional industrial food system averages about 1,500miles from farm to plate. 40% of mass produced products are thrown into waste due to its expiration date and lack of freshness from miles of traveling.

Alternative food system promotes a network of food production and consumption aiming to be economically and geographically accessible. Alternative food system aims to reduce food transportation and increase marketing resulting in fewer people between the producer and the consumer. The alternative local food system allow for face to face interaction creating relationship within the community leading to stronger sense of trust and social connectedness. Therefore, the local food system can be a system used to revitalize a community suffering from economic and socially

## Hydroponic/Aquaponics Agriculture System

Food Production: Typical Agriculture & Hydroponics Comparison



**Figure 31: Annual Agriculture yield versus Hydroponics yield (Author)**

Alternative food system can be achieved in many ways. Urban cities today started to practice hydroponic methods to yield maximum crop production. Hydroponic method can grow plants using mineral nutrient solutions in water without soil. Being able to grow in vertical stacks within an indoor environment maximizes production while minimizing ecological and land footprint (Figure 31).

The Nutrient Film Technique (N.F.T.) system will be used for the hydroponic systems. The plants are grown in individual pots with draining medium such as grow rocks or perlites. The individual pots are planted in PVC pipes that are used into containing the flow of water. The root of the plants are submerged into the running water. Nutrients and water pumped from a water reservoir below. The water will eventually recirculate all the plantings beds connected to the same reservoir.

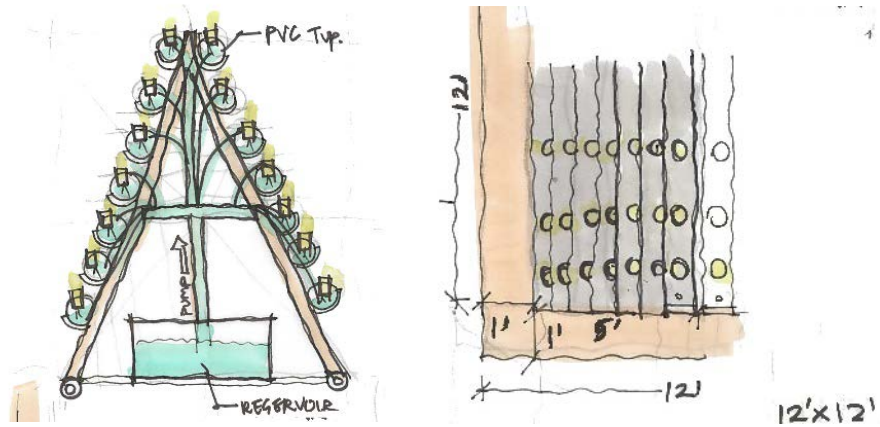


Figure 32: Hydroponic Modular Section and Plan (Author)

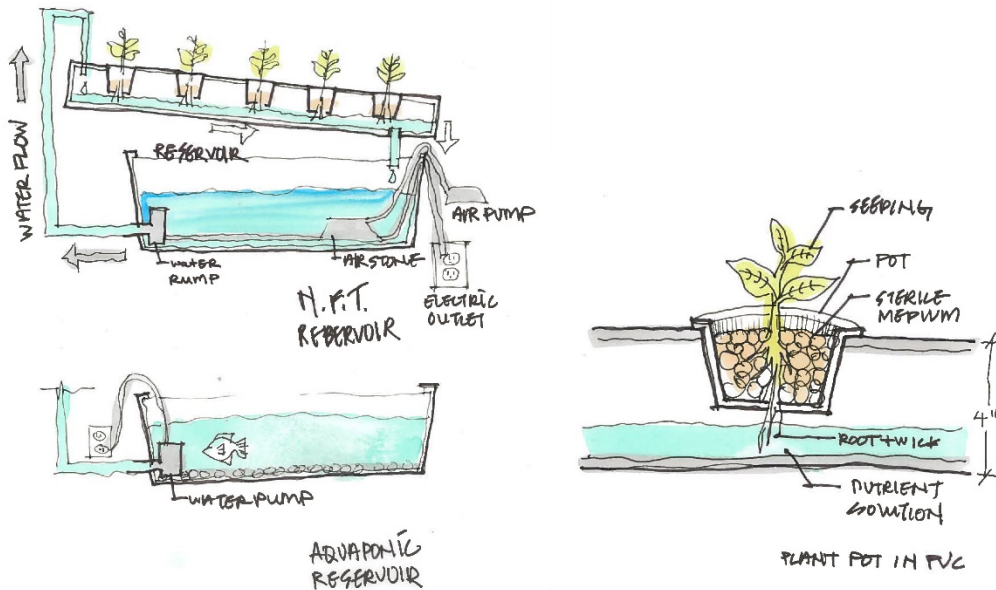


Figure 33: Hydroponic N.F.T. and Aquaponic System (Author)

The pots are planted within 10' long and 4" diameter PVC pipes with 14 holes to fit the pots. A 36 gallon reservoir is recommended for the above size. Each modular planting system will have 14 PVC pipes yielding 196 plants per 10' x 10' (100sqft) modular (Figure 33). It was estimated that for circulation and spacing for sun light, each modular system will be sized as 12' x 12' (144sqft). Within the



planned 25,000sqft of space, about 180 modular systems can be placed with each plant receiving 30 beds.

Aquaponics is a method that combines both hydroponics and conventional aquaculture. Crops are raised with snails, fish, crayfish, or prawns in a symbiotic environment. Aquaponics help solve the issue of increased toxicity from animal excretion accumulation by feeding the hydroponic system. The plants can break down the byproducts into nitrates, which are vital in serving as nutrients for the plants (Figure 33). The integration of both systems allows for cultivation and harvest of wider range of products while reducing water usage. Due to the natural filtration, the water is never discharged or exchanged but recirculated and reused. Allowing the water to naturally flow downward helps reduce energy consumption. Aquaponics will be combined with the outdoor garden bed vegetables for production of tilapia.

#### *Crop Selection and Yield*

The Food Hub aims to feed the 25,000+ people annually. This number will feed 100% of the population in food desert (18,593 people) and plus. The surplus can be sold to MARC station commuters for economic gains that could be regenerated into the community. Integrating both outdoor garden and greenhouse hydroponic with stacked rotating growing bed system will maximize crop production in less footprints than outdoor system alone. Indoor hydroponic and outdoor garden bed methods will both incorporate maximum growth per square footage using sustainable energy sources, controlled light and temperature to maximize production, controlled

environment that eliminate pests, insects, and disease. Crops are selected according to production method and period, maturity period, and yield per given square footage.

The hydroponic system alone will yield 100 tons or 200,000Ibs of food within minimum of 10,000sqft annually. The yield can feed 25,000 people annually.

For the outdoor garden beds, three types of vegetable will be grown. Onions, carrots, and potatoes are chosen from above selection criteria. Each plant will have eight garden beds. Individual beds are 100sqft of space. Each garden beds will yield 150Ibs of carrots, 220Ibs of onions, and 200Ibs of potatoes. Since each crop will have four greenhouse units, it will produce a total of 3,600 Ibs of carrots with three harvest cycles, 1,760 Ibs of onions, and 6,400 Ibs of potatoes annually. The outdoor garden beds will produce a total of 14,960 Ibs of food annually through the outdoor greenhouse at the facility totaling of 5,408sqft of space. Other 7,529sqft to satisfy total planned outdoor harvest of 13,000 sqft that could yield up to 18,700 Ibs of crops will be sourced from Harlem Park community grow satellites and anchor school garden programs. The outdoor garden system will ultimately yield 33,660 Ibs of food annually.

The hydroponic system alone will yield 100 tons or 200,000Ibs of food within minimum of 20,000sqft annually. The yield can feed 25,000 people annually.

Following the Whole Foods + Gotham Greens collaboration of rooftop greenhouse of 15,00sqft producing 200,000Ibs or 200 tons of food annually. To produce this amount through standard agriculture method, one will need 10 acres of land. The hydroponic method will save average of 80% less water used in fields and using sustainable energy system such as PV systems will help supplement the recirculation hydroponic

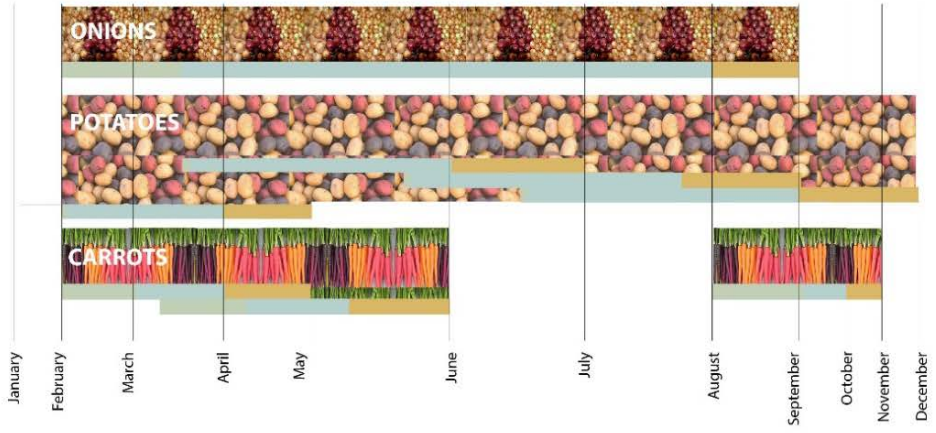
pumps, ventilation fans, and evaporative cooling panels in hot weathers. The wasted heat from buildings at cold night will be captures to heat the greenhouses. Potato, broccoli, lettuce, herb, tomato, and cabbage are chosen for their high annual yield, staggering growth seasons for year round production, and moderately fast growth period (Figure 35). With careful scheduling of plant to maximum production annually will yield 162,200 Ibs of food. Adding the result with the outdoor garden system (33,660 Ibs) will produce 195,660 Ibs of food annually (Figure 34).

PLANT NAME	INDOOR SEED	OUTDOOR SOW	GROWTH PERIOD	YIELD lbs PER 100sqft MODULAR	# MODULAR	HARVEST PER YEAR	TOTAL lbs ANNUALLY
<b>OUTDOOR GARDEN BED VEGETABLES</b>							
Onion	Feb - March	April	3 to 4 months	220 lbs	8	1	1,760 lbs
Potatoes	n/a	April - May	100 days	300 lbs (1.5 lbs each)	8	4	9,600 lbs
Carrots	n/a	April	90 days	150 lbs	8	3	3,600 lbs
Satellite Gardens	-	-	-	-	-	-	18,700 lbs
<b>total</b>							<b>14,960 lbs</b>
<b>total of both</b>							<b>33,660 lbs</b>
<b>INDOOR GARDEN BED VEGETABLES</b>							
Potatoes	n/a	April - May	100 days	300	30	4	36,000 lbs
Broccoli	n/a	April - May	4 months	400 lbs (2 lbs each)	30	2	24,000 lbs
Lettuce	Feb - March	April	80 days	250 lbs	30	4	24,000 lbs
Herbs	Feb - March	April	90 days	150 lbs	30	4	18,000 lbs
Tomatoes	March	May	4 months	250 lbs	30	2	24,000 lbs
Cabbage	Feb - March	April	4 months	400 lbs (2 lbs each)	30	3	36,000 lbs
<b>total</b>							<b>162,200 lbs</b>
<b>total of both</b>							<b>195,660 lbs</b>

**Figure 34: Crop Selection of Annual Harvest (Author)**



OUTDOOR GREEN HOUSE VEGETABLE SCHEDULE



INDOOR HYDROPONIC VEGETABLE SCHEDULE

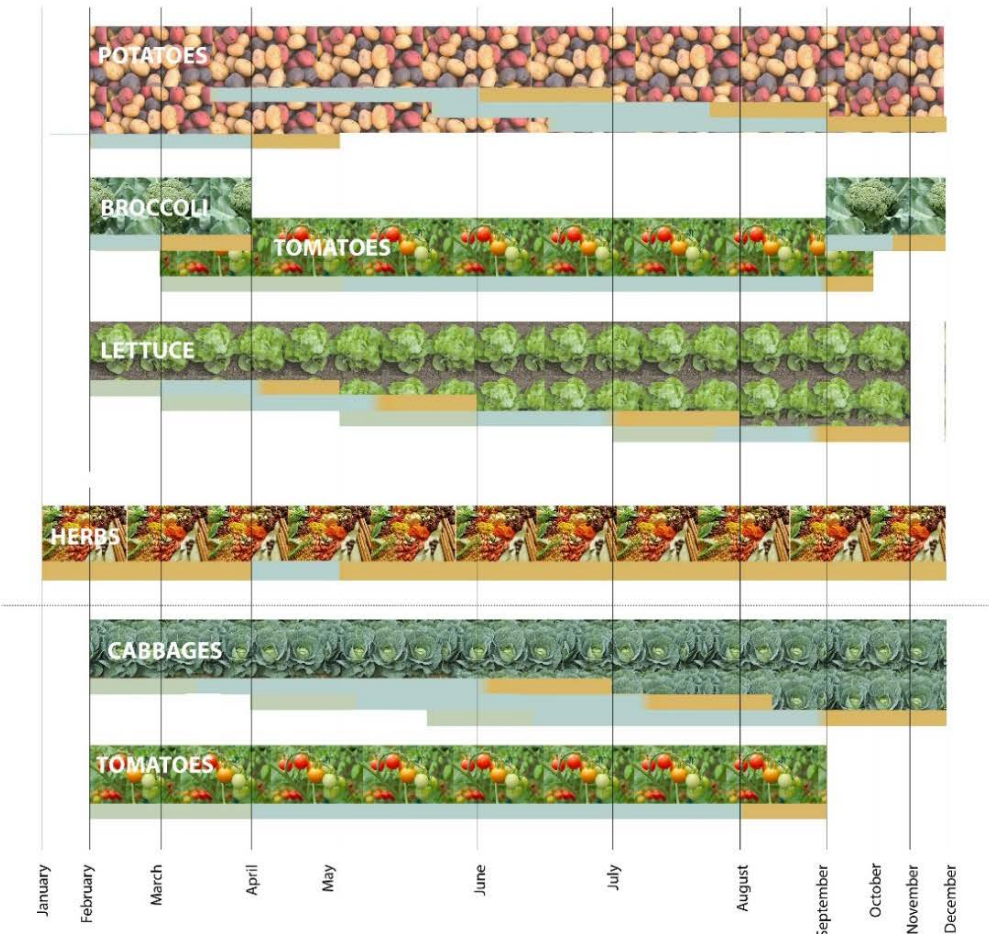


Figure 35: Crop Harvest Annual Schedule (Author)

## Urban Farm Precedents

### *Hydroponic System Crop Yield Analysis from Precedents (Figure 36)*

- 10,000 people = 40 tons or 80,000Ibs = 5,000sqft
- **\*25,000 people = 100 tons or 200,000Ibs = 10,000sqft**
- 50,000 people = 200 tons or 400,000Ibs = 20,000sqft

#### Food Production: Urban Farm Precedents

25,000sqft = 50,000 people



**Figure 36: Urban Farm precedent comparison (Author)**

### *Crop Yield: Current Practice Precedents*

1. Gotham Greens Gowanus, Whole Foods NYC
  - TYPE: Hydroponics GreenHouse Rooftop
  - CROPS: Salad greens, tomatoes, and herbs
  - All Year Yield - Year Long Jobs 30 employ
  - SQFT: 20,000 or ~1/2 acre
  - CROP YIELD: 50,000 people annually or 200 tons/annual. It will take 10 acres farm to produce this amount.
  - WATER: 20x less than irrigation system (save 66%-84% water used in fields)
  - ENERGY: 56kW on site solar PV system
    - 6,000sqft of 247pv modules at 10degree tilt
    - Total size: 55.575kWp dc (48.0 kWp ac)
  - TRAVEL FOOTPRINT: No miles
  
2. Gotham Greens Greenpoint NYC
  - TYPE: Hydroponics Green House Rooftop
  - CROPS: Salad greens, tomatoes, and herbs
  - All Year Yield - Year Long Jobs 30 employ

- SQFT: 15,000 or ~1/2 acre
  - CROP YIELD: 25,000 people annually or 100 tons/annual. It will take 5 acres farm to yield this amount.
  - WATER: 20x less than irrigation system (save 66%-84% water used in fields)
  - ENERGY:
  - TRAVEL FOOTPRINT: No miles
3. Growing Power Milwaukee Wisconsin
- TYPE: Aquaponics & Green House & Land Gardening
  - CROPS: FISH (yellow perch and tilapia), 150 CROPS
  - All Year Yield - Year Long Jobs
  - SQFT: 92,500sqft or ~ 3acres
  - CROP YIELD: 10,000 people annually or 40 tons/annual. It will take 3 acres farm to yield this amount.
  - WATER: 20x less than irrigation system (save 66%-84% water used in fields)
  - ENERGY:
  - TRAVEL FOOTPRINT: No miles

*Programs and Description of Proposed Food Hub*

**Food Hub: The Collective - Services Practicing Urban Food System (Figure 37)**

1. Production 42,000 ft<sup>2</sup>
  - a. Food Incubator: Urban Farm
    - i. Hydroponic planting, harvesting, cultivating 25,000 ft<sup>2</sup>
    - ii. Outdoor harvesting 13,000 ft<sup>2</sup>
      1. Worm composting bins L= 22"x W= 16" x H=24"
      2. Planting beds L=max 50' x W=4' x H=9"
    - iii. Cleaning and packaging 1,000 ft<sup>2</sup>
    - iv. Storage 2,000 ft<sup>2</sup>
2. Processing 7,200 ft<sup>2</sup>
  - a. Food Incubator: Community Kitchen
    - i. Prep area 1,000 ft<sup>2</sup>
    - ii. Cooking area 170 ft<sup>2</sup>
    - iii. Microbrewery 2,500 ft<sup>2</sup>



- iv. Packaging 500 ft<sup>2</sup>
- v. Storage 1,000 ft<sup>2</sup>
- vi. Freezer 200 ft<sup>2</sup>
- vii. Kitchen Member Fridge 250 ft<sup>2</sup>
- viii. Commercial Fridge 200 ft<sup>2</sup>
- ix. Shared Open Office Space 200 ft<sup>2</sup>
- 3. Distribution & Storage & General Support 63,300 ft<sup>2</sup>
  - a. Distribution
    - i. Loading Dock 500 ft<sup>2</sup>
  - b. Storage
    - i. Product Storage 500 ft<sup>2</sup>
  - c. General Support
    - i. Water Closet 800 ft<sup>2</sup>
    - ii. Mechanical Rooms 1,500 ft<sup>2</sup>
    - iii. Parking 60,000 ft<sup>2</sup>
- 4. Marketing 5,400 ft<sup>2</sup>
  - a. Market and Vendors 4,000 ft<sup>2</sup>
  - b. Grocery Stand 1,000 ft<sup>2</sup>
- 5. Consumption 5,000 ft<sup>2</sup>
  - a. Dining Space – Indoor 2,000 ft<sup>2</sup>
  - b. Dining Space – Outdoor 3,000 ft<sup>2</sup>
- 6. Lifestyle & Training 2,500 ft<sup>2</sup>
  - a. Lifestyle
    - i. Lobby 150 ft<sup>2</sup>
    - ii. Community Fitness Center 1,000 ft<sup>2</sup>
    - iii. Anchor Institution sponsored Health Care Services 1,000 ft<sup>2</sup>
  - b. Training
    - i. Lobby 150 ft<sup>2</sup>
    - ii. Sharing facilities from Community Kitchen

TOTAL

- ALL - ROOFTOP URBAN FARM – PARKING = 49,560 ft<sup>2</sup>
  - + Grossing Factor of 1.4 maximum = 69,384 ft<sup>2</sup>
- ALL + ROOFTOP URBAN FARM – PARKING = 65,400 ft<sup>2</sup>
  - + Grossing Factor of 1.4 maximum = 91,560ft<sup>2</sup>
- ALL + ROOFTOP URBAN FARM + PARKING = **151,560 ft<sup>2</sup>**

## PROPOSED PROGRAM

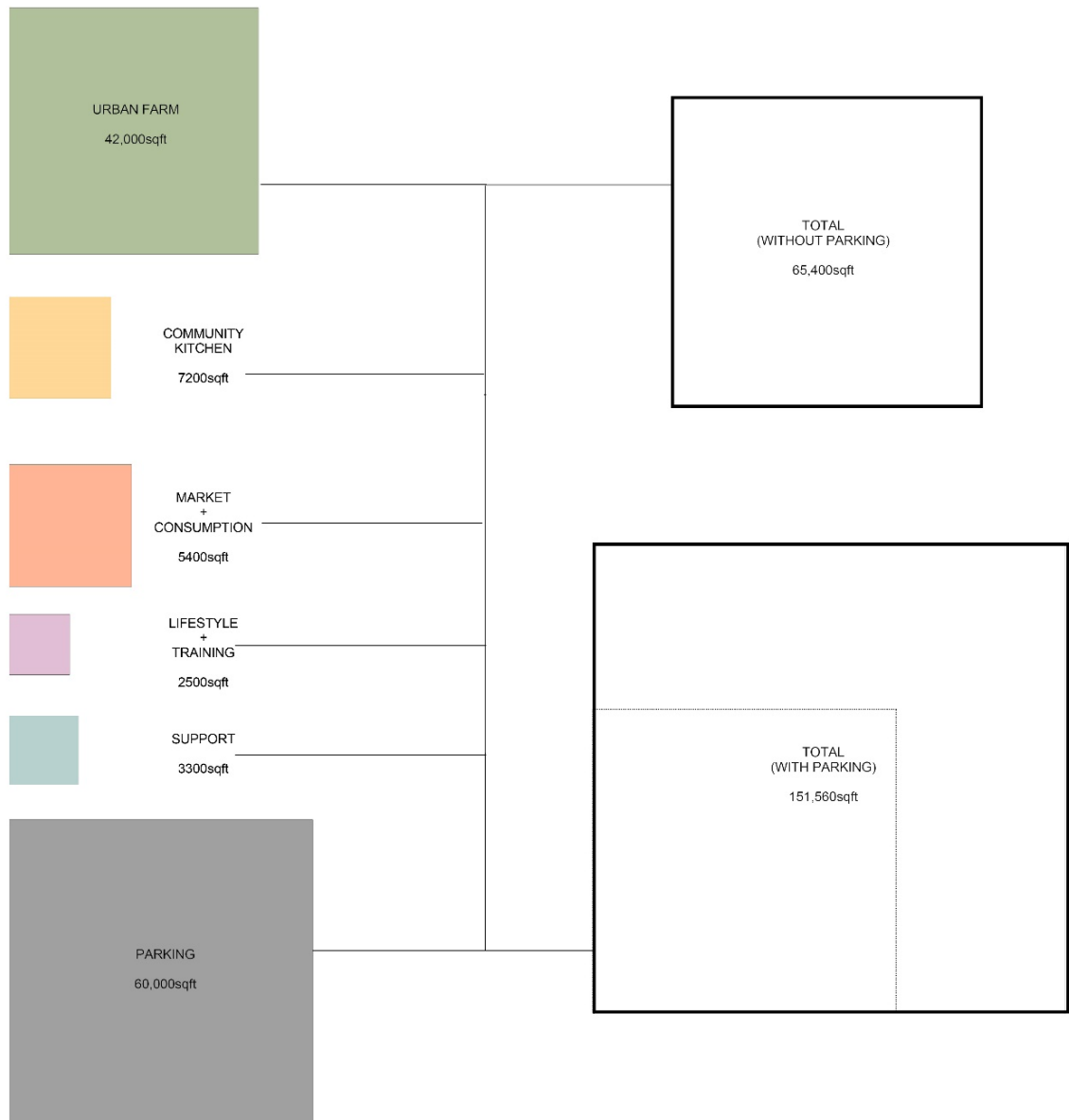


Figure 37: Proposed Program Tabulation (Author)

## **Chapter 5: Design Principles and Methods**

### *Design Principles*

After analyzing the existing site challenges, thesis principles were synthesized to properly suggest a solution.

Existing Site Challenges:

1. Disconnect of neighborhoods within District 9
2. Vacancy (over 50% of the existing buildings)
3. Lack of access to resources
4. High rate of crime and low rate of education

The architectural response will tackle the existing challenge of disconnect by reshaping and improving connectivity between the neighborhoods. Existing vacancy will be utilized with other assets to harvest food for the city and increase resource to density the neighborhood. Lack of access to the resources will be addressed by developing various methods of local-regional food distribution system. By creating a 24-hour Community Hub, we can also start to reduce the existing crime and lack of jobs and skill training (Figure 40).

### *Methods*

The proposed program for the site will address the principles through a food incubator, market hall, and community center (Figure 39). These typologies morphed from precedent studies will provide not only a sustainable food system but also an inclusive community that supports each other.

## METHODS



- SUSTAINABLE LOCAL FOOD SYSTEM**
- Food production
  - Food distribution
  - Food consumption
  - Workshops



- ACCESS**
- Bicycle & Pedestrian routes
  - Free WiFi = opportunities
  - Corner Store Distribution
  - Food truck to Parks/Business Lunch
  - Farmer's Market
  - Food Festival



- COLLABORATION**
- K-12/Anchor Universities
  - Private/Public Development
  - Start-Up support
  - Lecture & Workshops



- EMPOWERMENT**
- Share responsibilities= Shared opportunities
  - Community Inclusion through Skill training
  - Job Placement
  - Child care services



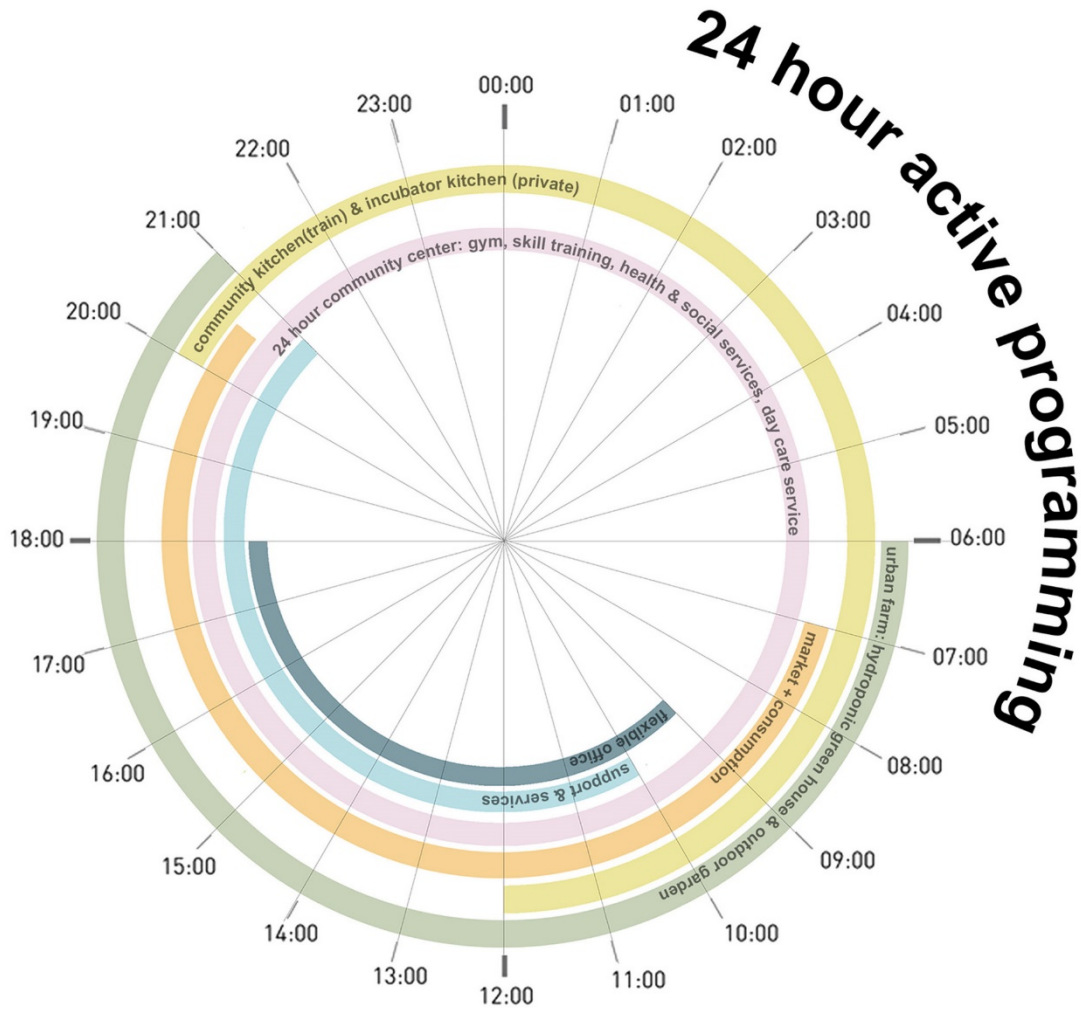
- HEALTH/ WELLNESS**
- Daily Exercise Programs
  - Sports after work
  - Health clinical services
  - Life/Social service counseling

Figure 38: Intervention Method (Author)

## TYOLOGY



Figure 39: Program Typologies (Author)



**Figure 40: 24 Hour Active Programming (Author)**

Users

A holistic plan aims to address programs for all users from the community, youth to seniors and also visitors of the community within The Hub. Nearby school students can harvest food at their school’s satellite garden and practice entrepreneurship of food through The Hub. MARC commuters will most likely engage in the market hall and café for food stop in the morning and grocery shopping after work. Improving the safety and quality of the MARC station will increase more user flow into The Hub. The Incubator Kitchen and market hall can provide work

placement and business startup opportunities for people of the community. Anchor institute of Bon Secour could also use the Community Center as a place of satellite health services. The Community Center also provides services such as skill training and childcare services for working parents. The Community Center also has transitional housing on the upper levels for those that need immediate housing support. The Community Kitchen within the Community Center will provide free cooking lessons and meals for the community for sustainable healthy lifestyle (Figure 41).

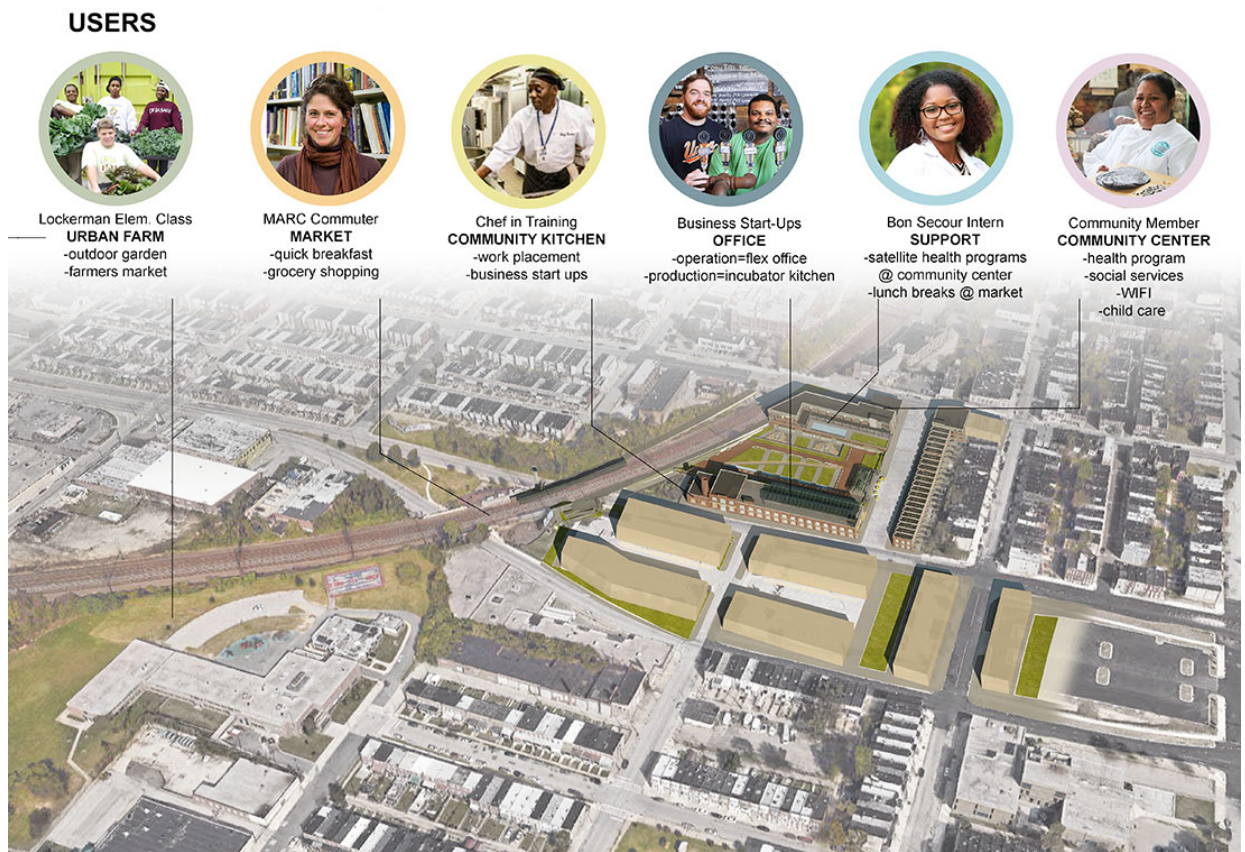


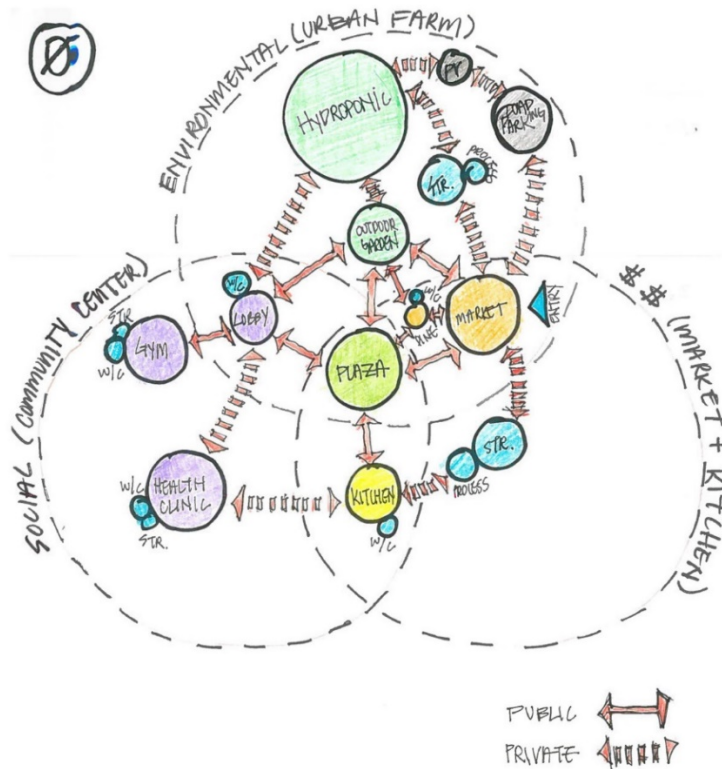
Figure 41: User Study (Google Maps, modification by author)

Design Process

“We think that good public spaces offer opportunities to interact with other people in the neighborhood and help foster social resilience.”<sup>26</sup>  
- Helle Søholt CEO of Gehl Architects

Analysis and synthesis of the site’s challenges established parameters for arranging the proposed programs. Majority of the arrangements started to have a common factor, which a public garden space seems to be the central sharing space for all users (Figure 42). Though some programs will have to be housed in separation, the Community Garden can provide a common and mutual place for everyone to interact with each other and help foster social resilience (Figure 47).

**PROGRAM ARRANGEMENT**



**Figure 42: Program Arrangement Study 1 (Author)**

<sup>26</sup> Helle Soholt, “Access to public spaces is a human right”



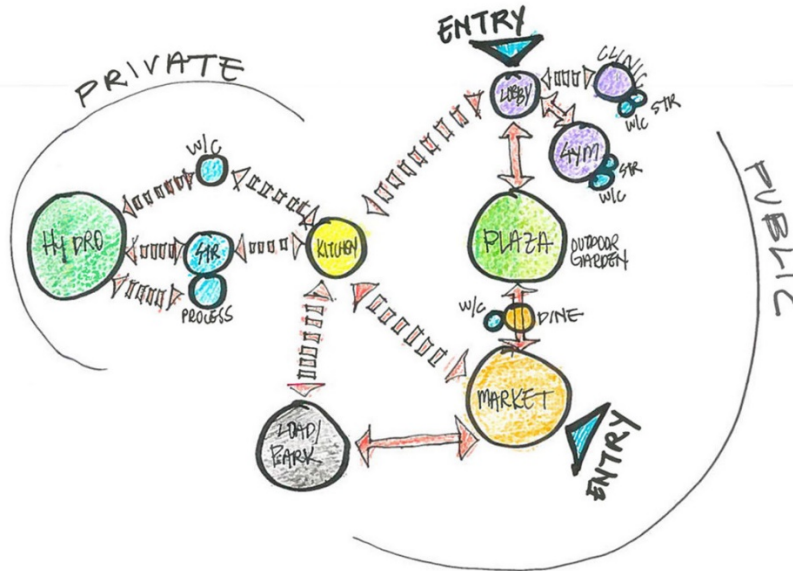
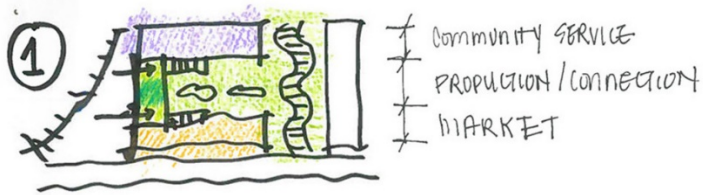


Figure 43: Program Arrangement Study 2 (Author)

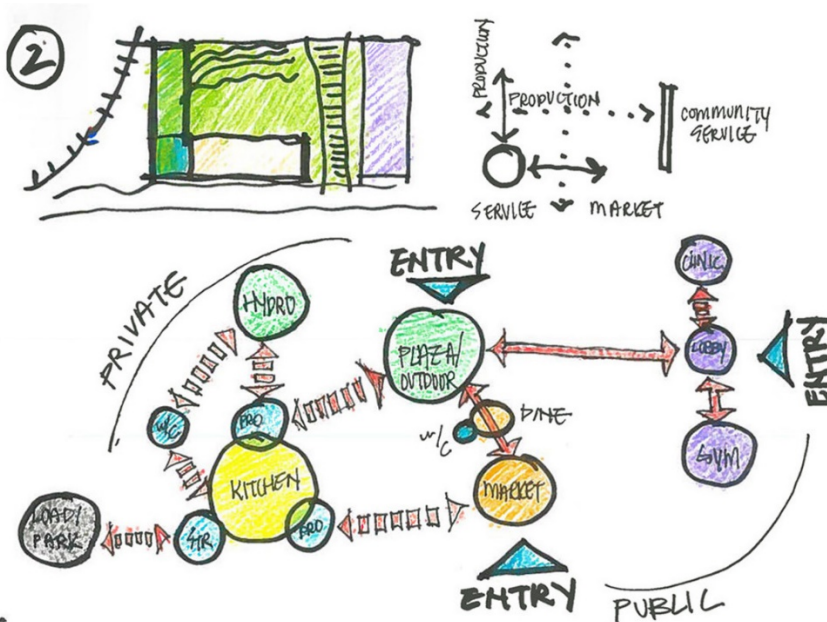


Figure 44: Program Arrangement Study 3 (Author)

scheme 1: building edge

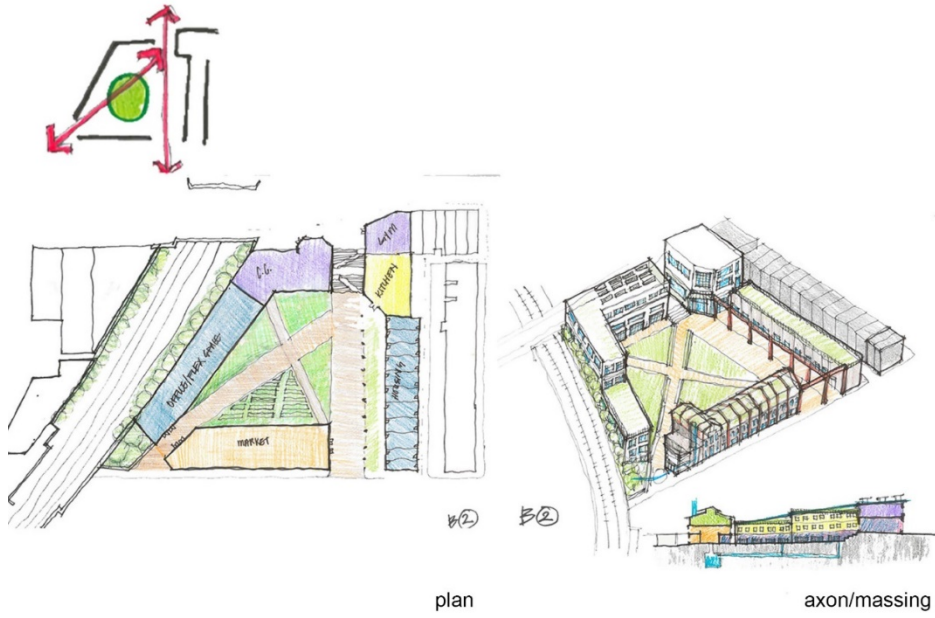


Figure 45: Scheme 1 - Building Edge (Author)

scheme 2: courtyard

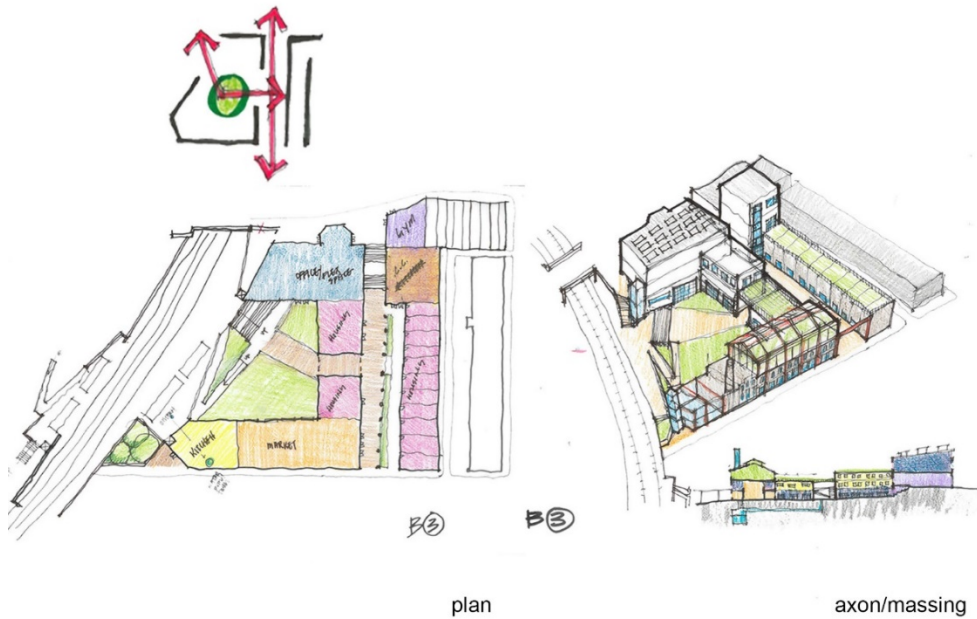
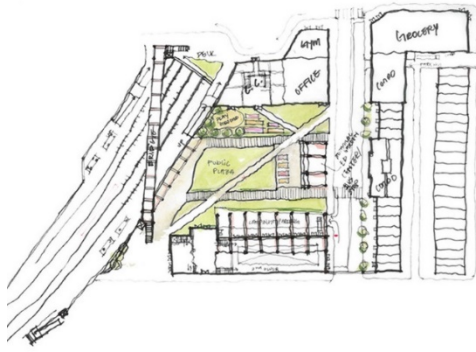
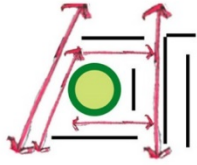
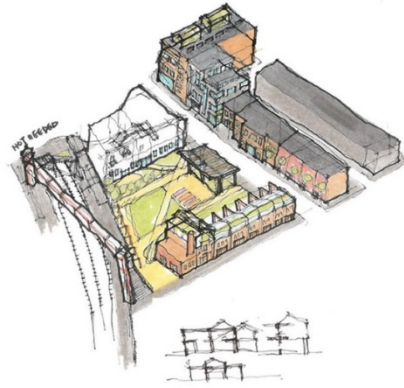


Figure 46: Scheme 2 - Courtyard (Author)

scheme 3: gatehouse



plan



axon/massing

**Figure 47: Scheme 3- Gatehouse (Author)**

# Chapter 6: Architectural Response

## Holistic Intervention: Master Plan

Not only is it important to address the issues of the chosen site, it is imperative to reach beyond. The proposed intervention diagram below utilizes and connects the nearby resources to have a symbiotic relationship with the chosen site (Figure 48). Bike routes, bike share, and truck delivery programs situated at satellite gardens, parks, and schools will provide access to food and safety. The abundance of corner stores also allows for the possibility of satellite healthy food and information stand that could serve as immediate resource.

### PROPOSED INTERVENTION

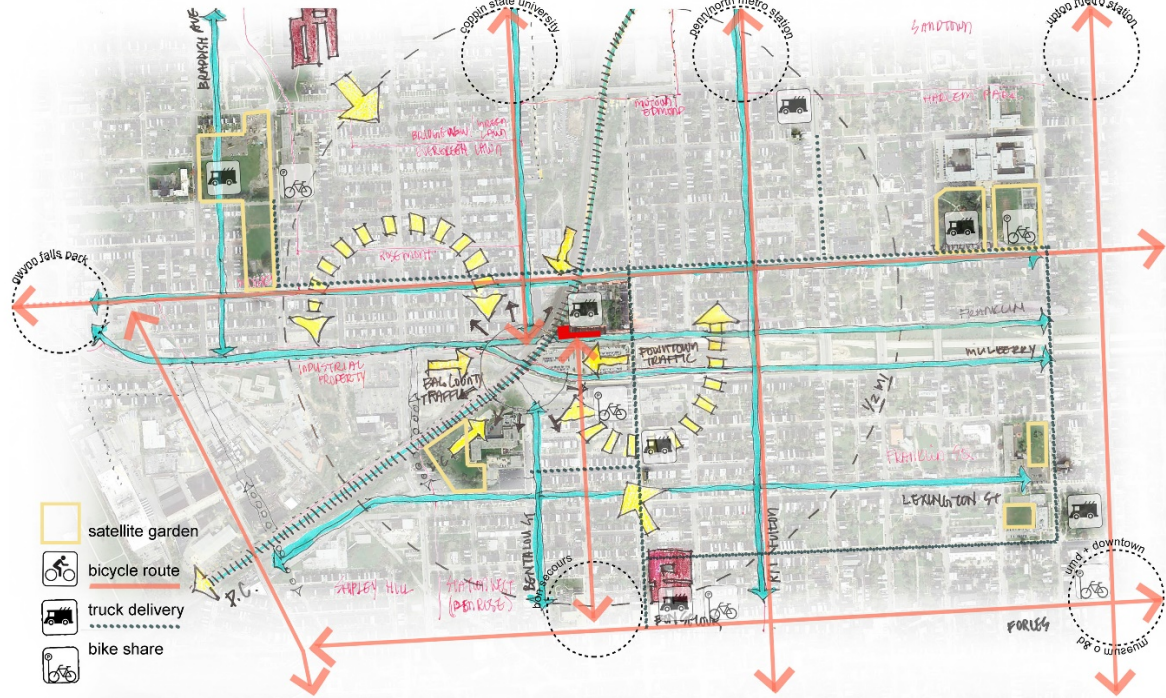


Figure 48: Proposed Master Plan of District 9 (Google Maps, modification by Author)



## PROPOSED MASTERPLAN



**Figure 49: Proposed Master Plan of Site (Author)**

The overall intervention will happen in incremental phasing. Phase 1 of intervention will feature a new street allowing pedestrian and vehicular connection of Edmondson Avenue on the north and Franklin Avenue/Route 40 on the south (Figure 51). This phase will also include repurposing of the American Ice Company into The Hub’s market hall and incubator kitchen, community center, community garden, and completion of the residential block on the east that will help define the street edge of the new street (Figure 52). Phase 2 will address the lack of ADA access to the MARC station by providing elevators and pedestrian ramps, mix-use residential with retail on the ground floor to infill the Route 40 Underpass (Highway to Nowhere). Phase 3 and 4 will continue to infill the Route 40 Underpass with mix-use buildings aiming to stitch back the north and south of District 9 (Figure 49). The incremental growth will allow for inclusion of the community in the process.



**Figure 50: Proposed Perspective of Route 40 (Author)**



**Figure 51: Proposed Perspective of New Street (Author)**

# PROPOSED MASSING

## WEST MARC STATION

- ADA
- STATION
- SAFETY
- PEDESTRIAN PATH
- MURAL



## COMMUNITY CENTER

- KITCHEN
- GARDEN
- DELIVERY
- SKILL TRAIN
- TRANSITIONAL HOUSING
- CLINIC
- PLAY
- NURSERY
- GYM
- POOL



## URBAN GARDEN

- GARDEN (INDOOR & OUTDOOR)
- PAVILION
- SEATING
- PLAY
- SAFETY



## FOOD MARKET

- KITCHEN
- MARKET
- FOOD TRUCK
- OFFICE (FLEXIBLE)



## GLASSHOUSE CAFE

- TERRARIUM
- FREE WIFI
- CAFE
- BIKE SHARE

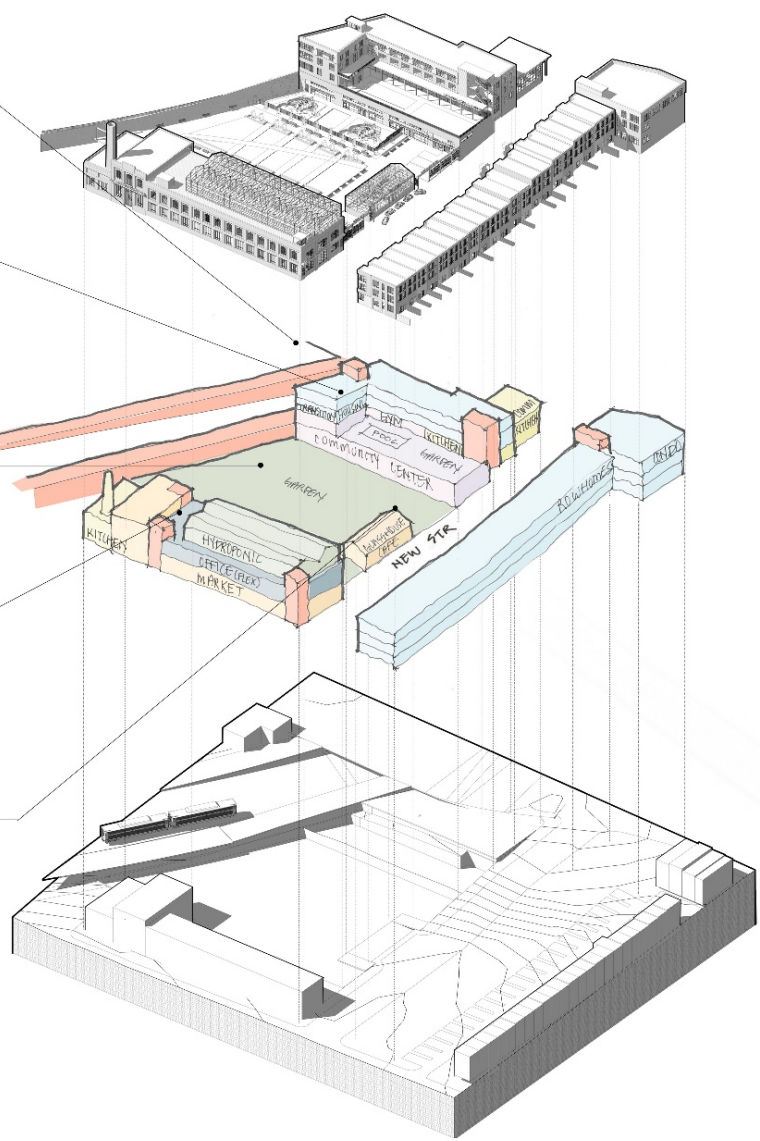


Figure 52: Proposed Massing and Program (Author)



## Architectural Response

### American Ice Company Market Hall

The existing American Ice Company will be repurposed into an open market hall (Figure 53). The old loading hall will be converted into a market hall that can hold more than 35 flexible stalls of different scales (Figure 54). Additionally, new balcony above the market hall will allow for extra gathering spaces and rentable office spaces for organizations that are housed within the complex (Figure 55). The old entry and lobby hall will house the new entry and lobby space with other services such as bathroom, reception and space for gathering. The old manufacturing hall with the de-shafted smoke tower will be converted into an incubator kitchen with flexible prepping, storing, and loading accommodations (Figure 55).



**Figure 53: Proposed Perspective of New Market Hall (Author)**

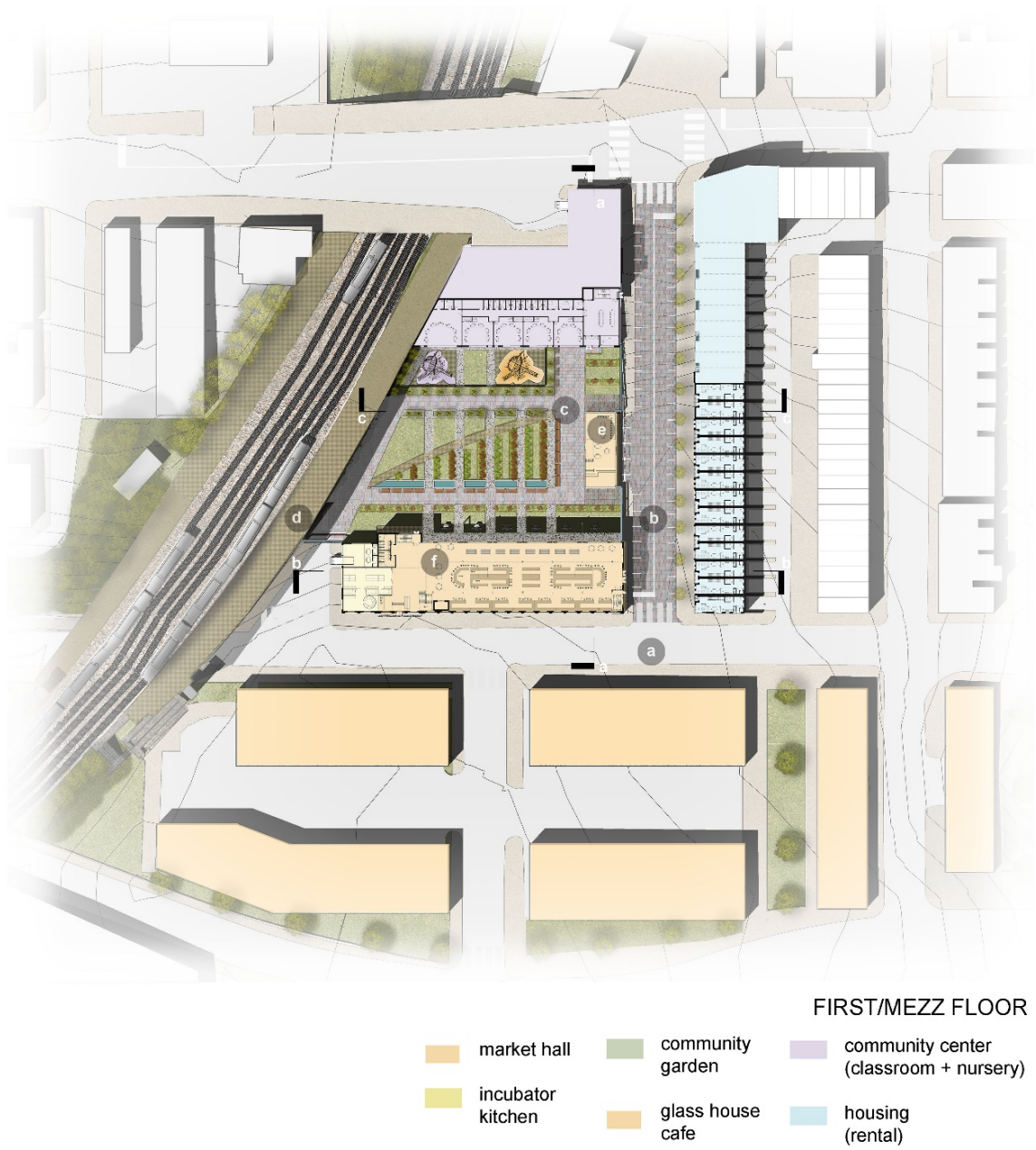
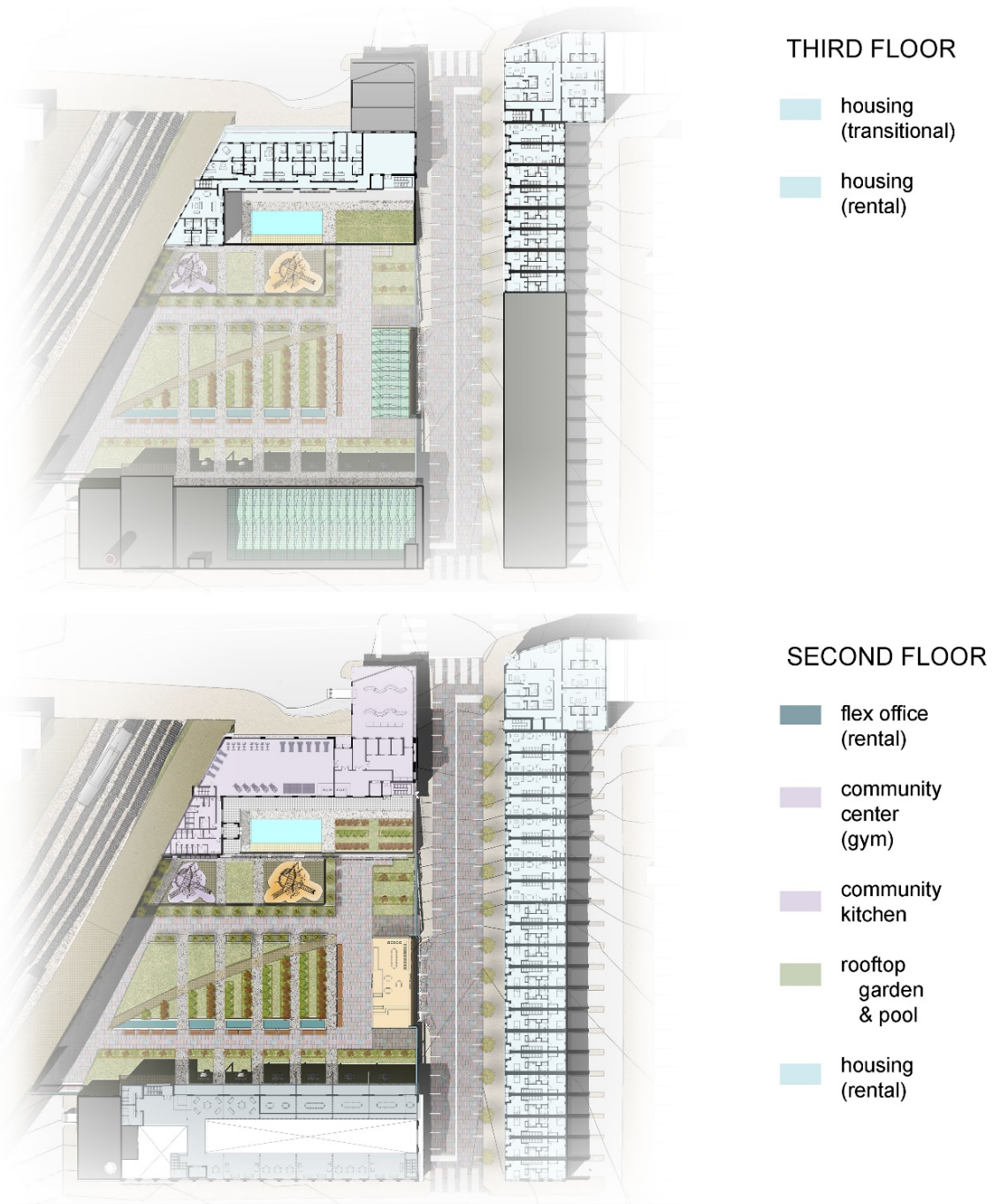


Figure 54: Proposed First Floor Plan (Author)

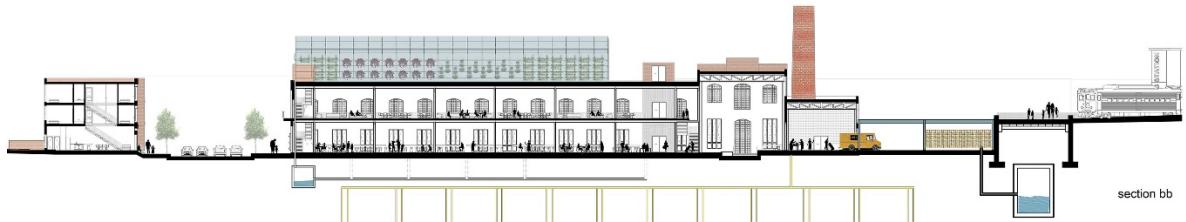


**Figure 55: Proposed Second and Third Floor Plan (Author)**





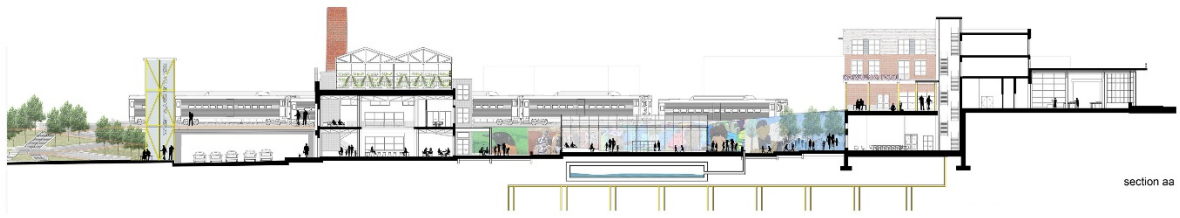
**Figure 56: Proposed Elevation - South Market on Route 40 (Author)**



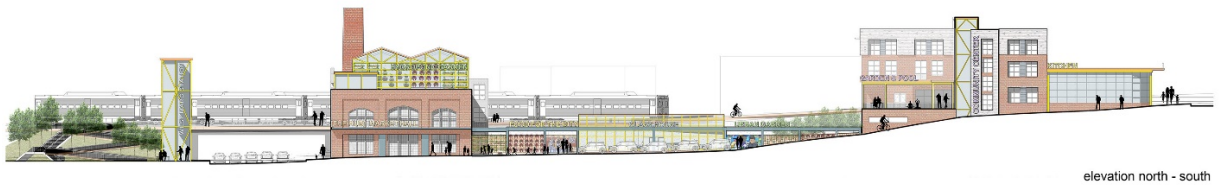
**Figure 57: Proposed Section - through Market Hall (Author)**

### *Community Garden & Glass House Pavilion*

The existing lot behind the American Ice Company is a brown field that has become a victim of neglect. Excavation of existing the concrete pad will help clean up the brown field and also provide opportunity for geothermal and rain water retention cistern. The geothermal system combined with solar panels on the roof tops of the building interventions will harvest energy to power the proposed interventions and also feed into the city's power grid (Figure 58). The retention cistern will hold the rainwater runoff but also provide grey water to be filtered and used for the production of the crops in the Community Garden and the roof top hydroponic system. The public garden will be open throughout the day but will be closed at certain times. Creating a flexible green trellis gate system and indoor glass house allows for permeable and porous transition from the street to the garden (Figure 59).



**Figure 58: Proposed Section - through Market, Garden, and Community Center (Author)**



**Figure 59: Proposed Elevation - Market, Garden, and Community Center (Author)**

Once you enter the park, you can engage in the various activities happening within (Figure 60). Both the market and community center have their own green spaces for their needs but the center of the garden is an open green plaza that can grow vegetables seasonally. Planters will use the filtered water from the cisterns located under the Glass House pavilion and MARC station ramp.



**Figure 60: Proposed Perspective of Community Garden (Author)**

The Glass House Pavilion provides an open space that allows for flexibility of program. At times it can function as space for Pop-Up Stores, but mostly it is used to provide indoor gathering space for the community. It also can function as a gatehouse where parents can easily drop off their kids who will be greeted by child care providers to be taken to the nursery. It will also house planters that are in the garden during winter time (Figure 61).



**Figure 61: Proposed Perspective of Glass House (Author)**

### Community Center

The Community Center is situated adjacent to the market hall. The ground floor of the building will house the nursery program with separate entry from the entry on Edmondson Avenue (Figure 62). The entry from Edmondson Avenue will accommodate the gym, satellite clinics, community kitchen, and other administrative offices to promote healthy lifestyle while defining the street edge (Figure 58). The floors above provide transitional housing options for those who need immediate assistance.



**Figure 62: Proposed Section - through MARC ramp, Garden, Housing (Author)**

*Row Homes and Apartments*

The new street provides opportunity to complete the existing row home block running north and south on the east side of the chosen site. The row homes are designed with site context in mind but also providing flexibility for the users to personalize their home. The entry of the row homes are accompanied by stoops to mitigate the topography change and also provide place of gathering. Apartment options are provided on the north end of the street that helps continue the street edge of Edmondson Avenue.



**Figure 63: Proposed Elevation - Row Homes on new street (Author)**

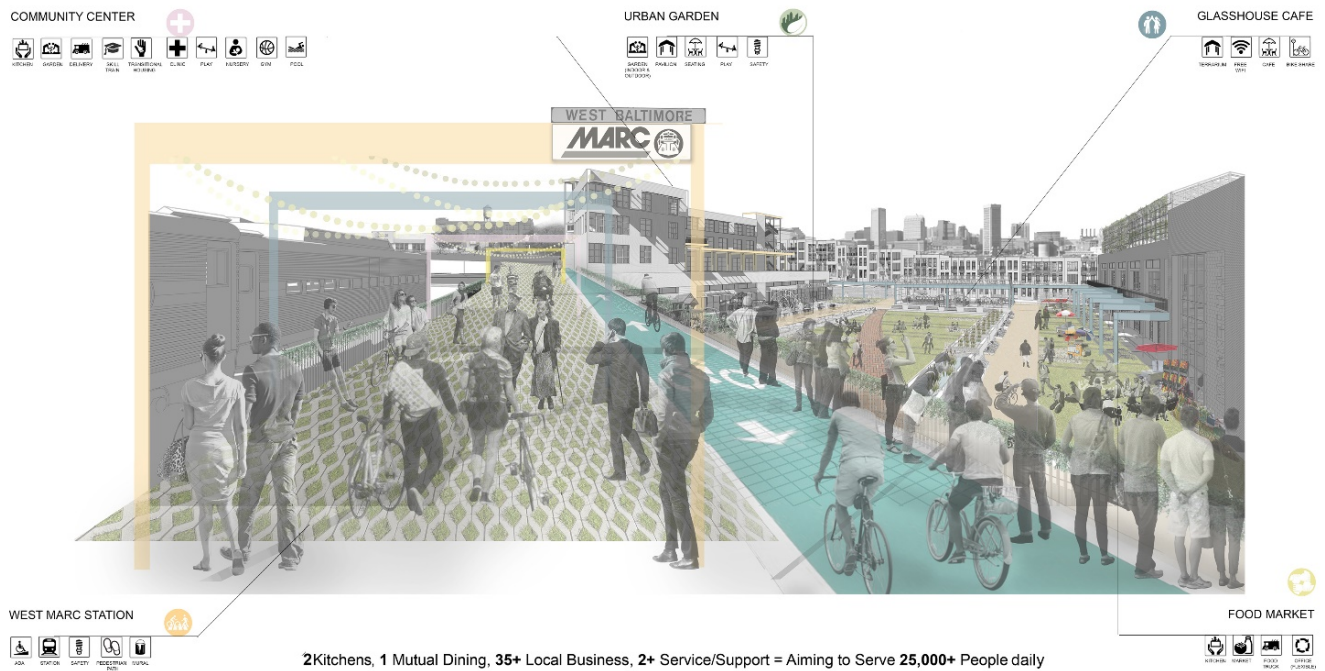


**Figure 64: Proposed Elevation - Housing and Community Center on Edmondson Avenue (Author)**



## Chapter 7: Conclusion

The overall intervention aims to provide a thriving Community Hub servicing all users at all times (Figure 65). The goal of this thesis was to present a set of flexible frameworks that can foster inclusive and resilient communities. This thesis was not just about food, it was about creating a palette of solutions that could be used for any challenges the low- income neighborhoods face today. Architecture has the power to provide beyond shelter and provide good public spaces that offer opportunities to interact with other people in the neighborhood and help foster social resilience.



**Figure 65: Proposed Perspective of Overall Intervention (Author)**

## Bibliography

- Behrens Buczynski, Amanda, Holly Freishtat, and Sarah Buzogany.  
"Mapping Baltimore City's Food Environment: 2015 Report." *Baltimore City Government* 2015. Accessed October 25, 2015.  
<<http://archive.baltimorecity.gov/Government/AgenciesDepartments/Planning/BaltimoreFoodPolicyInitiative/FoodDeserts.aspx>>.
- Cromley, Elizabeth C. *The Food Axis: Cooking, Eating, and the Architecture of American Houses*. Charlottesville: University of Virginia Press, 2010.
- Croog, Rebecca L., "Baltimore and the Cherry Hill Urban Garden: Tearing Down and Building Up the Physical and Imaginative Spaces of Post-Industrial Urban Food Systems" In *Student Publications. Paper 249*. Accessed October 25, 2015. <[http://cupola.gettysburg.edu/student\\_scholarship/249](http://cupola.gettysburg.edu/student_scholarship/249)>
- Hagen, Petra, and Rolf. Toyka. *The Architect, the Cook, and Good Taste*. Birkhäuser Architecture Press, 2007.
- Horwitz, Jamie and Paulette Singley. 2004. *Eating Architecture*. Boston, M.A.: MIT Press, 2004.
- Imbert, Dorothe. *Food and the City: Histories of Culture and Cultivation*. Washington D.C.: Dumbarton Oaks, 2015.
- King, Jennifer. *Food and the City: Urban Agriculture and the New Food Revolution*. Amherst, N.Y.: Prometheus Books, 2012.
- Montagna, Joseph A. "The Industrial Revolution." *Yale Press* 1981. Accessed October 26, 2015.  
<<http://www.yale.edu/ynhti/curriculum/units/1981/2/81.02.06.x.html>>
- Pietila, Antero. *Not in My Neighborhood: How Bigotry Shaped a Great American City*. Chicago, I.L.: Ivan R. Dee, 2010.
- Pothukuchi, Kameshwari, and Jerome L. Kaufman. "Placing the Food System on the Urban Agenda: The Role of Municipal Institutions in Food Systems Planning." *Agriculture and Human Values: Journal of the Agriculture, Food, and Human Values Society* 16.2 (1999): 213-224.
- Sandler, Gilbert. *Glimpses of Jewish Baltimore*. The History Press. 2012. 87-88.
- Stegman, Michael A. *Housing Investment in the Inner City: The Dynamics of Decline; a Study of Baltimore, Maryland, 1968-1970*. Cambridge, M.A.: M.I.T. Press, 1972.

Turque, Bill, Debra Rosenberg, and Todd Barrett. "Where the Food Isn't."  
*University of Cincinnati* 1992. Accessed October 26, 2015.  
<[http://www.uc.edu/cdc/urban\\_database/food\\_resources/where\\_food\\_isnt.pdf](http://www.uc.edu/cdc/urban_database/food_resources/where_food_isnt.pdf)>  
>

United States Department of Agriculture "Sustainable Agriculture & Food Systems  
Fundamentals. Regional Food Hubs: Linking producers to new markets." *United  
States Department of Agriculture* 2010. Accessed October 25, 2015.  
<[http://www.safsf.org/documentsold/USDA\\_FoodHub\\_updateNov2010.pdf](http://www.safsf.org/documentsold/USDA_FoodHub_updateNov2010.pdf)>