ABSTRACT

Title of Document:	OPERATION MARKET GARDEN: ESTABLISHING A SUSTAINABLE FOOD SYSTEM IN WEST BALTIMORE'S POPPLETON NEIGHBORHOOD.
	Amy Marin, Master of Landscape Architecture, 2014
Directed By:	Dr. Byoung-Suk Kweon, Assistant Professor Department of Plant Science and Landscape Architecture

Food deserts and food insecurity are public health concerns, associated with negative health outcomes for children and adults and connected to poverty, racial disparities, and other social inequalities. Urban agriculture offers one solution to the food accessibility issues in West Baltimore. Besides the initial purpose of food production, urban agriculture can play an important role in contributing at varying scales to the social interactions and economic viability of communities. These multifunctional landscapes can be used as design solutions for challenges posed by urban development.

This thesis explores the roles that landscape architecture and urban agriculture can play in improving food environments for schools, families, and communities located in urban food deserts. This investigation examines urban agricultural planning strategies that address food accessibility issues and yield fresh produce, while also providing

valuable public open space for community members. This project applies these strategies to the West Baltimore neighborhood of Poppleton to offer a critique of proposed urban agriculture solutions.

OPERATION MARKET GARDEN: ESTABLISHING A SUSTAINABLE FOOD SYSTEM IN WEST BALTIMORE'S POPPLETON NEIGHBORHOOD

By

Amy Marin

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Advisory Committee:
Dr. Byoung-Suk Kweon, Chair
Assistant Professor

Dr. Victoria Chanse
Assistant Professor

Professor Jana Vandergoot
Assistant Professor

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Introduction

In an effort to improve the city of Baltimore's food accessibility, the Department of Planning, Baltimore Office of Sustainability, Baltimore Development Corporation, and the Baltimore City Health Department recently proposed the Baltimore Food Policy Initiative (BFPI). According to the BFPI website, "[t]he goal of BFPI is to increase access to healthy and affordable foods in Baltimore City food deserts." (Baltimore Food Policy Initiative, 2014) In partnership with BFPI, Johns Hopkins Center for a Livable Future mapped socioeconomic factors such as walking distance to supermarkets; vehicular accessibility; and federal poverty levels, to locate existing food deserts throughout Baltimore. West Baltimore was identified as one of the major areas affected by food inaccessibility. Within west Baltimore, several community statistical areas (Poppleton/Hollins Market/The Terraces, Sandtown-Winchester/Harlem Park, and Southwest Baltimore) have been identified as among the top ten Baltimore neighborhoods having a high percentage of vacant or abandoned residential properties (Baltimore Neighborhood Indicators Alliance & Jacob France Institute, 2013). Baltimore City's comprehensive master plan (titled "Live Earn Play Learn") identifies the Poppleton neighborhood as a "distressed area" and potential candidate for a major mixed-income redevelopment project (Baltimore City Planning Commission, 2009). The City's plan to redevelop the vacant properties in Poppleton and the City's selection of the neighborhood as a future site for the expanded Red Line light rail recommends addressing the neighborhood's food security issues during the planning process.

Urban agriculture offers one solution to the food accessibility issues in West

Baltimore. Urban agriculture can be described as a public or private industry that produces, processes, and distributes food within an urban center or city (Gorgolewski, Komisar, & Nasr, 2011). Besides the initial purpose of food production, urban agriculture can play an important role in contributing at varying scales to the social interactions and economic viability of communities. These multifunctional landscapes can be used as design solutions for challenges posed by urban development.

This thesis explores the roles that landscape architecture and urban agriculture can play in improving food environments for schools, families, and communities located in urban food deserts. This investigation will examine urban agricultural planning strategies that will address food accessibility issues and yield fresh produce, while also providing valuable public open space for community members. Then, it will apply these strategies to the west Baltimore neighborhood of Poppleton to offer a critique of proposed urban agriculture solutions.

The purposes of this study are to:

1. Evaluate the agricultural opportunities of the city-owned vacant land between Sarah Ann Street, North Amity Street, West Fairmount Avenue, and North Schroeder Street in West Baltimore.

2. Investigate how the site might be re-developed to best serve the neighborhood food accessibility issues and initiate social interactions between the existing stakeholders in the surrounding communities.

Food Desert Environments

Baltimore Food Deserts

According to the USDA, food deserts are areas in urban neighborhoods and rural towns that do not provide easy access to fresh, healthy, and affordable food (United States Department of Agriculture, 2009). In 2009, approximately 14 percent of low-income families in Baltimore lived in food deserts (Baltimore City Food Policy Task Force, 2009). Johns Hopkins Center for a Livable Future and the Baltimore Office of Sustainability mapped the food environments of Baltimore City and located areas facing problematic food issues (Figure 1). The Johns Hopkins team created a new comprehensive definition for food deserts that explored beyond the economic and accessibility components traditionally used to map poor food environments. While there are many characterizations of food deserts, this thesis adopts the Johns Hopkins definition, describing a food desert as "an area where the distance to a supermarket is more than ¼ mile, the median household income is at or below 185 percent of the Federal Poverty Level, over 40 percent of households have no vehicle available, and the average Healthy Food Availability Index score for supermarkets, convenience and corner stores is low (measured using the Nutrition Environment Measurement Survey)" (Johns Hopkins Center for a Livable Future, 2012). In order for an area to be classified as a food desert, it must meet all four criteria:

1. Distance to Supermarket
2. Poverty Measure
3. Vehicular Availability
4. The Quality and Availability of Healthy Food

Food retail such as farmers' markets, public markets, and virtual supermarkets are excluded from the food desert analysis due to their limited hours and days of

operation although their locations are included on the map generated by Johns Hopkins Center for a Livable Future.

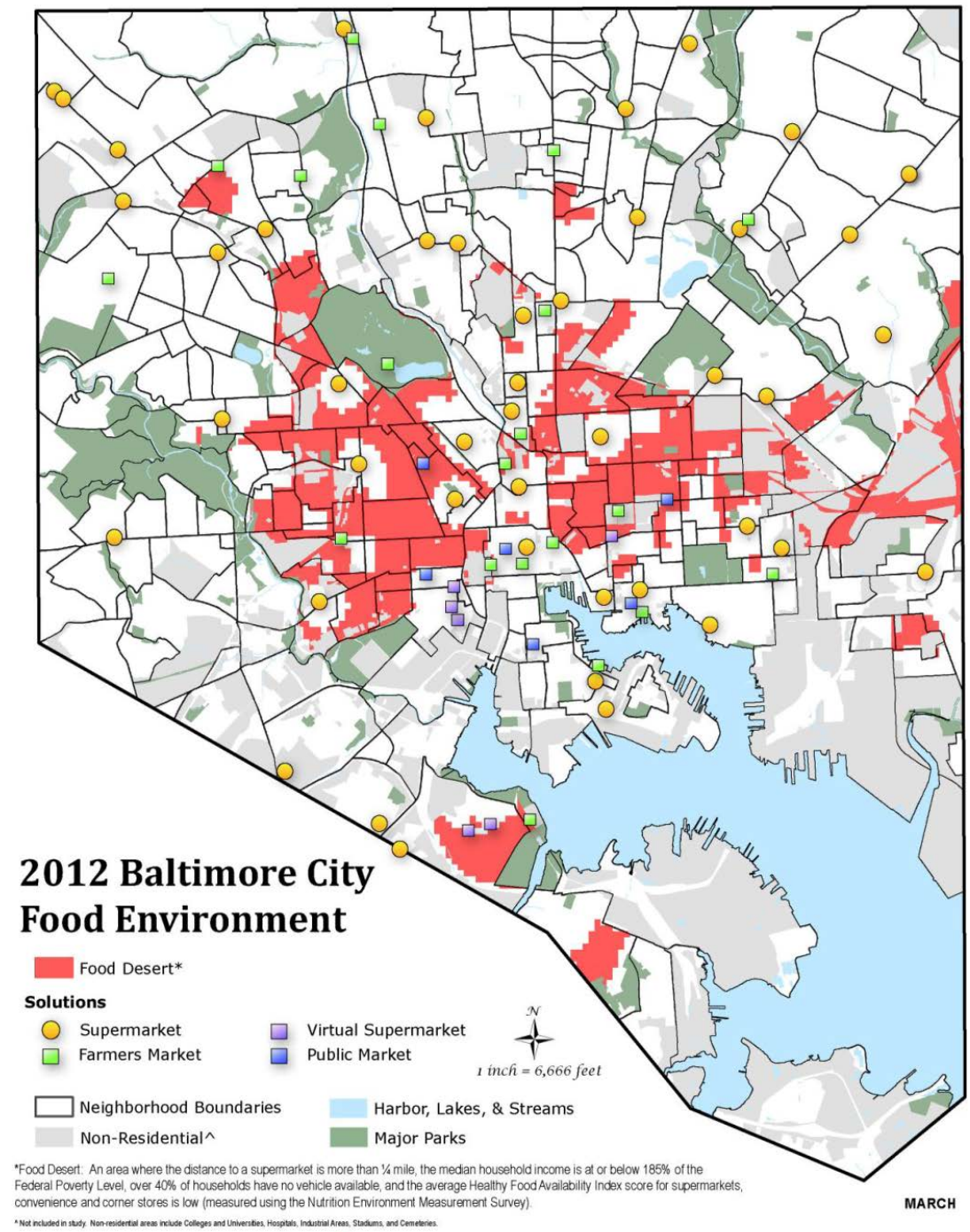

Figure 1. Baltimore City Food Desert Map.

Public Health

According to a study conducted by the Robert Wood Johnson Foundation, Baltimore is the least healthy municipality in the state of Maryland (Robert Wood Johnson Foundation, 2014). The Baltimore City Health Department published a report in 2008 stating that more than one third of adults surveyed in Baltimore were obese and another one third of adults were overweight (Office of Epidemiology and Planning, Baltimore City Health Department, 2008). In order to fully understand the public health implications of living within a food desert, federal, state, and local governments, and research institutions are examining local food environments through research and community studies. Focus on food access has increased as researchers try to better understand the factors besides personal behavior and genetics that may lead to differences in diet and health outcomes (Diez Rouz & Mair, 2010). In 2009, researchers from the School of Public Health at the University of Minnesota studied the link between poor dietary patterns and obesity rates, and scarce neighborhood access to food (Larson, Story, & Nelson, 2009). This research suggested that neighborhood residents who have better access to grocery stores and limited access to convenience stores consume healthier diets and experience lower levels of obesity. The study also concluded that residents living in low-income, minority, and rural neighborhoods are more likely to encounter poor access to supermarkets and healthy food.

A study conducted in Marion County, Indiana, examined the relationship between chain grocery access and body mass index (BMI) (Chen, Florax, Snyder, & Miller, 2009). The investigation used an econometric model to assess data collected

by the Marion County Health Department Adult Obesity Needs Assessment Survey that interviewed 3,550 individuals concerning their demographics, socioeconomic status, education, health behaviors, and self-reported weight and height data. The study also questioned the participants about their willingness to travel for food, the availability of transportation, traffic conditions, and the spatial scale of the city. The results of the study showed that proximity to a grocery store has a small negative impact on BMI.

In North Carolina, researchers constructed a two-month intervention for four small Latino food stores, known as *tiendas* (Ayala, Baquero, Laraia, Ji, & Linnan, 2013). Four stores were randomly selected to be part of the store-based intervention: the experimental stores stocked and promoted fruit and vegetable packages, while two stores served as a control group that did not offer the fruit and vegetable packages. Through customer-reporting, the study found that the customers who shopped at the *tiendas* where the packages were sold increased their fruit and vegetable intake by one serving. The customers shopping at the two control group *tiendas* displayed no change in consumption of fruits and vegetables. The study concluded that, in order to impact the public health of underserved communities, environmental change strategies that promote healthy eating are needed.

Baltimore Food Policy Initiative

The Baltimore City Government recognizes the public health implications of food deserts and is working to improve the urban food environments in affected city neighborhoods. The Baltimore Food Policy Task Force, constructed by Mayor Sheila Dixon, developed the following recommendations in 2009 to increase healthy food

accessibility and consumption citywide (Baltimore City Food Policy Task Force, 2009):

1. Expand and Promote Farmers' Markets
2. Expand and Promote Community Supported Agriculture
3. Support Continued Research on Food Deserts and Collaboration with Policymakers
4. Support a Central Kitchen Model for the Baltimore City Public School System
5. Support for Community Gardens and Urban Agriculture
6. Expand Supermarket Home Delivery Program
7. Improve the Food Environment around Schools and Recreation Centers
8. Support Street Vending of Healthy Foods
9. Create healthy Food Zoning Requirements or Incentives
10. Develop a targeted marketing campaign to encourage Healthy Eating among Baltimoreans

At the behest of the Food Policy Task Force, the Department of Planning, the Baltimore Office of Sustainability, the Baltimore Development Corporation, and the Baltimore City Health Department established the Baltimore Food Policy Initiative (BFPI) in 2010 with Holly Freishtat as the Food Policy Director (Baltimore Food Policy Initiative, 2014). The BFPI acknowledges that the food desert maps generated by Johns Hopkins Center for a Livable Future "…define the areas of greatest need, track progress, and help to better inform policy recommendations that aim to increase access to healthy foods in and around food deserts and to improve the overall food environment in Baltimore City." (Baltimore Food Policy Initiative, 2014). The BFPI

works to better food policy and regulations, healthy food retail, and school food programs, operating under the guidance of the Baltimore Sustainability Plan, whose Greening Goal #2 is to establish Baltimore as a leader in sustainable, local food systems (Baltimore City Planning Commission, 2009).

Strategy A under Greening Goal #2 is to increase the percentage of land under cultivation for agricultural purposes (Baltimore City Planning Commission, 2009). In 2012, BFPI updated the city's zoning code to support urban agriculture, which is defined as "the cultivation, processing, and marketing of food, with a primary emphasis on operating as a business enterprise for income-generation." (Baltimore City Department of Planning, 2012). The new zoning removed permit requirements for hoop houses, allowed permitted-use of community gardens and farm stands in community-managed open space, and approved urban agriculture as a conditional use with permits and management plans (Baltimore City Department of Planning, 2012). Homegrown Baltimore is the city government's urban agriculture program that aims to turn vacant land into urban farms in areas where the scale of blight far exceeds the development demand for housing. Baltimore's Adopt-a-Lot Program, managed by Baltimore's land bank, allows residents to use lots for one year at a time in hopes that the licenses will give some function and purpose to the derelict land.

BFPI issued the *Request for Qualifications (RFQ): Urban Agriculture in the City of Baltimore* in the spring of 2011 with the goal of developing pre-identified, city-owned, vacant properties for the purposes of urban agriculture (Baltimore City Department of Planning & Department of Housing and Community Development, 2011). The RFQ envisioned for Baltimore:

1. The development of entrepreneurial urban farms
2. The improvement of food security in food deserts
3. And the transformation of derelict land to provide economic, social, and environmental benefits

The accepted RFQ applicants were granted five year leases at the rate of $100/year. Non-profit farms are not taxed. When meeting specific standards, for-profit farms are eligible for tax breaks. Funding is available to assist with initial financial costs. The following farms were accepted and their operation status as of November 2013 is indicated (A. Cocke, personal communication, November 15, 2013):

1. Big City Farms (in operation and has a lease for 1.5 acres of land in west Baltimore)
2. Five Seeds Farm (in operation but have not agreed on a lease)
3. Our Farm Next Door (unsure if still in operation; Baltimore City Department of Planning requested that they receive additional training but it did not occur)
4. Real Food Farm (in operation and has a lease for 1.5 acres of land in Clifton Park)
5. Seed & Cycle (does not operate as a farm but rather as a retailer, selling plant starts, compost, and other supplies to other growers; lease negotiations occurred but were never agreed upon)

A second RFQ is expected to be released in early 2014 although it has yet to occur.

Urban Agriculture's Role in the Community

Local Food Source

American history provides multiple examples of urban agriculture used for the food security purposes during times of adversity: Victory Gardens during World War I and II and community gardens during the Great Depression and the Long Depression of the 1890s (Nordahl, 2009). In 1942 victory gardens produced approximately 7.5 billion pounds of food to supplement wartime food export and increase domestic security (Lawson, 2005).

Figure 2. The Biddison Family tending their victory garden in Baltimore, Maryland in July 1943 (Baltimore Sun Photo Archive, 2014).

What role can urban agriculture play in relieving today's food security issues? Urban agriculture offers the opportunity to produce fresh vegetables and fruits within the city limits, increasing their local availability. About 15 percent of the food

produced around the world is grown in cities (Fox, 2011). Produce yields vary based on the availability and condition of the land used for farming; the weather conditions in regards to the amount of sunlight received and water available; and the skill of the farmer. Urban farms tend to use intensive growing methods that yield approximately 13 times more per acre than rural farms (Heimlich & Barnard, 1993). A survey conducted by the Urban Design Lab at Columbia University compared USDA/Conventional Average Yields (pounds/square foot) with "Bio-intensive Low" Average Yields and found that in respect to dark green vegetables, such as broccoli, kale, and spinach, the "Bio-intensive Low" growing methods had almost doubled the yield at 0.95 pounds/square foot as compared to the USDA/Conventional growing methods which yielded 0.49 pounds/square foot (Urban Design Lab at the Earth Institute, 2012).

	Food Group	USDA / Conventional Average Yields (lbs./s.f.)	"Bio-intensive Low" Average Yields (lbs./s.f.)	Estimated NYC annual retail (x 1,000,000 lbs.)	Estimated Land area needed for cultivation: USDA / Conventional Average Yields (acres)*	Estimated Land area needed for cultivation: "Bio-intensive Low" Average Yields (acres)*
Vegetables	**Dark Green** broccoli, collard greens, escarole, kale, lettuce (leaf), mustard greens, spinach, turnip greens	0.49	0.95	210	10,983	8,671
	Orange carrots, pumpkin, squash, sweet potatoes	0.43	0.70	193	10,321	6,323
	Dry Beans & Peas dry edible beans, dry peas and lentils, lima beans	0.03	0.07	62	46,804	34,490
	Starchy green peas, potatoes, sweet corn	0.35	0.47	731	35,672	33,525
	Other Artichokes, asparagus, bell peppers, brussel sprouts, cabbage, cauliflower, celery, cucumbers, eggplant, garlic, lettuce (head), okra, onions, radishes, snap beans, tomatoes, misc. vegetables	0.60	0.83	1,120	56,140	32,406
Fruit	**Tree Fruit** Apples, cherries, figs, peaches, pears, plums	0.28	0.32	470	27,132	24,311
	Grapes	0.20	0.45	102	11,761	5,227
	Berries Blackberries, blueberries, cranberries, raspberries, strawberries	0.20	0.23	94	25,940	7,635
	Melons Cantaloupe, honeydew, watermelon	0.52	0.50	208	9,462	9,551
	Warm weather / Citrus Apricots, avocados, bananas, dates, grapefruit, kiwi, lemons, limes, mangoes, olives, oranges, papaya, pineapple, tangerines	N/A	N/A	886	N/A	N/A
Total				**4,076**	**232,215**	**162,139**

Figure 3. Comparison of average yields from conventional growing methods and "bio-intensive low" growing methods (Urban Design Lab at the Earth Institute, 2012).

The Farming Concrete Project in New York City reported that 87,690 pounds of vegetables were grown on 67 community gardens in 2010 (Farming Concrete, 2010). Several farms and community gardens, such as Added Value Red Hook Farm and Hattie Carthan Community Garden, in the city are offering produce through community-supported agriculture (CSA) programs as well as selling crops at local farmers' markets (Urban Design Lab at the Earth Institute, 2012). These kinds of projects are providing fruits and vegetables that are not usually found in local corner stores and groceries due to lack of storage and refrigeration space. Fruits and

vegetables are easily perishable, limiting their shelf life and increasing their market price; by growing these crops within the city limit, where they can be harvested, transported, and purchased more affordably.

Growing crops locally reduces the carbon footprint. Cuba is a prime example of being forced to reduce the carbon footprint. Beginning in 1989 with the fall of the Soviet Union, one of Cuba's major energy partners, the country re-adjusted its growing practices to survive on lower fuel consumption (Killoran-McKibbin, 2006). Previously, Cuba had grown and exported mainly cash crops such as sugar, coffee, and tobacco; however, with the decrease in available fuel that inversely increased the cost of transporting crops from the countryside to the city, urban residents began to grow their own food. The development of urban agriculture encouraged the opening of farmers' markets throughout Havana, improving food accessibility and impacting the diets of some of the most vulnerable members of the population, who had previously not had the opportunity to purchase fresh food in the city.

Figure 4. Urban agriculture in the center of an apartment complex in Havana, Cuba (Viljoen, 2012).

Community Building

At the most basic level, urban agriculture provides a place for community members to grow and consume vegetables, fruits, and herbs; however, urban farms and community gardens can offer more in the ways of building community. These sites can host numerous social, educational, and cultural events, such as neighborhood gatherings, school tours, health fairs, and voter registration drives (Saldivar-Tanaka & Krasny, 2003). The startup and operation of an urban farm requires the confluence of a diverse number of players: gardeners, site coordinators, professionals, neighbors, and volunteers (Hou, Johnson, & Lawson, 2009). Behind the process of establishing an urban farm or garden are the experiences shared by the different players in writing grant proposals, organizing community meetings, generating local buzz, identifying problems and solutions, and the day-to-day interactions between fellow gardeners. These things, in turn, create a community.

An example of social community associations with a garden is the Danny Woo Community Garden in Seattle, Washington. The garden was initiated by a group of neighborhood activists who wished to rebuild the historic multiethnic community, consisting mainly of Japanese, Chinese, Filipino, and Southeast Asian residents (Hou, Johnson, & Lawson, 2009). Large portions of the Japanese population had been forcefully removed during World War II, and the community never fully recovered its Asian identity. Many of the residents who remained after World War II and up through the 1970s were members of a low-income, elderly population. In the 1970s, neighborhood activists mobilized to turn a vacant lot into a community garden that would help the elderly stay physically active (Hou, Johnson, & Lawson, 2009). The

garden provided a setting where elderly garden members can leave their homes and interact with other members of society. Today, the garden brings together gardeners, students, and community members throughout Seattle.

Urban agriculture can be a valuable educational tool. Just the visual of a farm in the city may increase people's awareness of food production. An even greater impact is experiential learning through urban agriculture. Jones Valley Urban Farm in Birmingham, Alabama provides hands-on, "kinesthetic teaching", where students learn about food production and consumption through actually completing physical tasks (Hanson & Marty, 2012). Nutrition lessons combined with planting and harvesting has a larger effect on children's vegetable preferences than nutrition lessons alone (Morris & Zidenberg-Cherr, 2002). However, the utility of this knowledge is limited because children do not have the capacity to choose their diets at home: their parents make the dietary decisions for them. Fruit and vegetable consumption in children is associated with fruit and vegetable consumption by their parents (Sylvestre, O'Loughlin, Gray-Donald, Hanley, & Paradis, 2006). By offering educational classes through urban farms, parents can not only learn how food is grown but also how to prepare this food in their own homes, promoting healthier eating habits for both themselves and their children.

The urban farm is not just a place but is also an action: "to farm" or "to garden". As people complete the activity, they also interact with other members who share their enjoyment; these people may not share the same background, coming from different neighborhoods, cities, or even countries. Urban farms and community gardens provide opportunities for new immigrants to continue their cultural traditions in regards to food

production, cooking, and socializing (Hou, Johnson, & Lawson, 2009). Gardening creates a level of comfort, allowing people to bring a part of their old home into their new home during an adjustment period. Problems associated with unfamiliar customs do occur in these community spaces. In the case of Thistle P-Patch, a community garden in Seattle, Washington, cultural conflict arose when garden members of Hmong and Mien background, who were unaccustomed to collective labor outside their familial networks, did not comprehend volunteer work days (Hou, Johnson, & Lawson, 2009). This led to some members leaving the garden, which emphasized the importance of reaching across cultural boundaries and coming to a mutual understanding. Urban agriculture projects offer the opportunity for socializing with diverse community members. This is not always an easy task; however, it can be a rewarding one.

Economic Development

"Agriculture is one of the small number of activities where with few resources, such as harvested seeds, soil, rain, shared knowledge and [labor], abundance can be created," (Viljoen, 2012). Baltimore City is facing 10.2 percent unemployment. With the city government constantly working to develop jobs and job training programs, urban agriculture could be one possibility for economic development. Its economic impact on community development is one of the least researched aspects of urban agriculture (Hodgson, Campbell, & Bailkey, 2011). A study conducted in five U.S. cities – Camden and Trenton, New Jersey; Chicago, Illinois; Detroit, Michigan; Milwaukee, Wisconsin; and Philadelphia, Pennsylvania – found that a different kind of economic incentive grew out of urban agriculture projects (Vitiello & Wolf-Powers,

2014). They called it "inside-out community revitalization" in which urban agriculture helped developed human and social capital through social enterprise, supplemental income generation, and job skill training.

Earnings from farm labor in the United States is typically low with little career mobility (Bernick, 2005). Most of the urban farm operations throughout the U.S. are social enterprises that place priority on mission-based incentives over for-profit prospects (Vitiello & Wolf-Powers, 2014). Many of these farms rely on grants and government subsidies to maintain operations and provide their employees with living wages. While some farms may only offer part-time earnings, urban farms can make a small economic impact by offering supplemental income and food from farming, which can be vital to poor households' food and economic security (Sherraden, Sanders, & Sherraden, 2004).

Urban agriculture can be effective in providing job training to many people who are without the necessary skills to successfully integrate into the work force. Many urban agriculture programs like Growing Power, a Milwaukee-based urban farming organization, operate for the purpose of teaching these skills to people who were formerly incarcerated, to refugees and formerly homeless, and to youths living in unstable environments (Vitiello & Wolf-Powers, 2014). While some developed skills are specific to farming, much of the acquired work experience and life skills, including marketing, distribution, and customer service, learned on an urban farm can be applied to other professions and areas of life. The organization Growing Home in Chicago has a job training program, in which 70 percent of their 250 graduates have secured full-time jobs (Vitiello & Wolf-Powers, 2014).

Urban agriculture can have a positive impact on real estate values. A study conducted in 2008 about the effect of New York City community gardens on nearby property values found that the relationship was positive, especially in the poorest neighborhoods (Voicu & Been, 2008). Using a regression model, the study concluded that the opening of a community garden significantly increases the sales prices of properties within 1,000 feet of the garden. A cost-benefit analysis suggested that there was considerable tax revenue generated by the community garden. Urban agriculture can have positive effects on local economies, not only by generating profits, income, and jobs but also by providing job skills and supplemental food.

Chapter 2: Landscape Architecture Precedents

Baltimore is home to 21 urban farms and more than 100 community gardens. Many are members of the Baltimore Farm Alliance, a network of producers working to increase the viability of urban farming and the access to fresh foods (Baltimore Farm Alliance, 2014). They aspire to practice farming principles that are socially, economically, and environmentally just. Three precedents have been chosen to illustrate real-life farming operations in Baltimore and the principles of urban agriculture as community and educational space, and economic incentive.

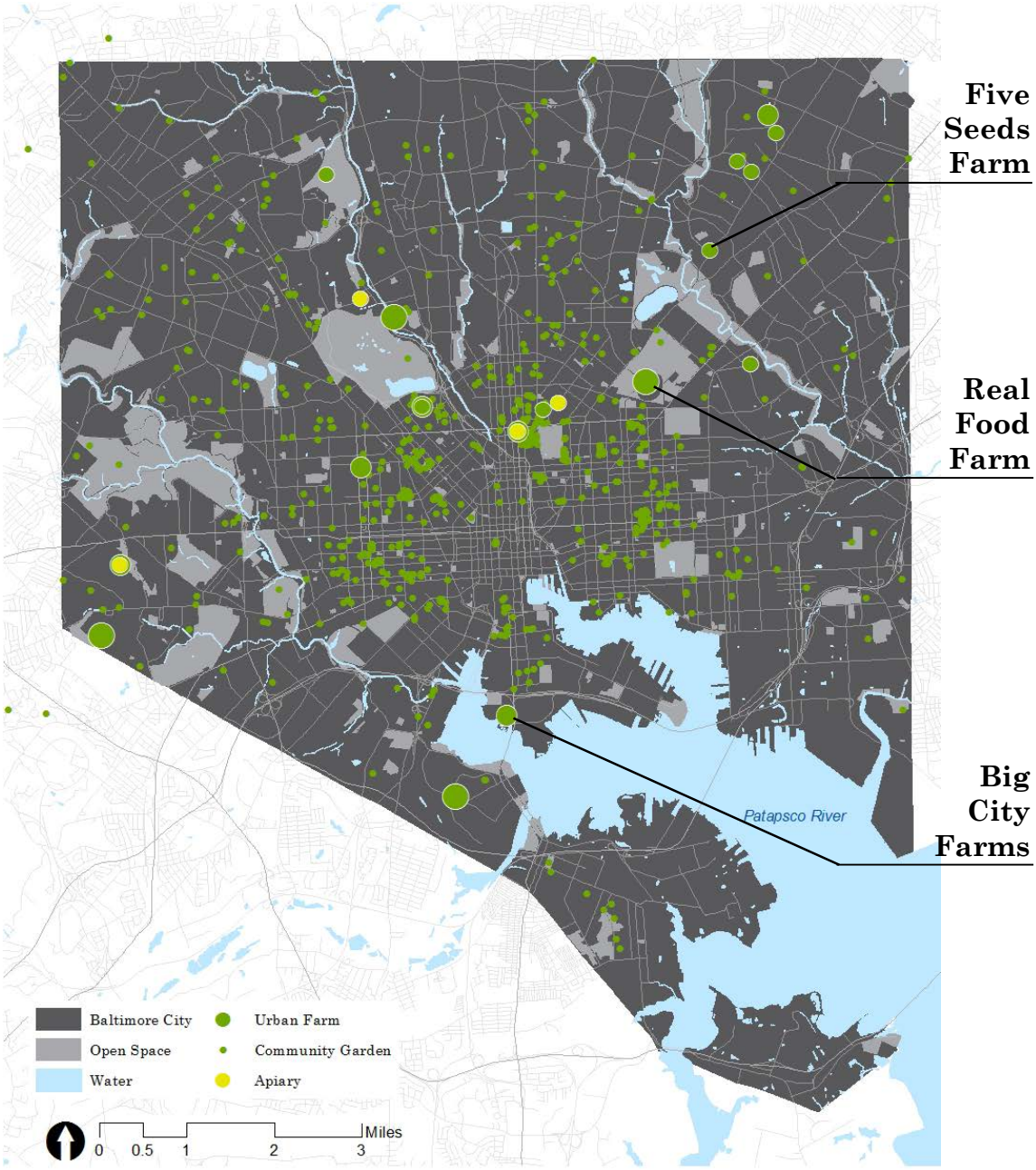

Figure 5. Map of existing urban agricultural entities in Baltimore City.

Baltimore Urban Agriculture

Big City Farms

Big City Farms has two locations within Baltimore City:

1. Middle Branch, which sits atop an asphalt parking lot in an industrial area of the Baltimore Harbor and

2. Sandtown-Winchester, which lies on half an acre of vacant lots in West Baltimore.

The original 0.5 acre site, Middle Branch (pictured below), hosts six hoop houses that are approximately 3,000 square feet, designed by Thomas Handwerker, an associate professor of agriculture at the University of Maryland, Eastern Shore. Big City Farms was initiated by a partnership between Thomas Handwerker, Ted Rouse of Rouse's Grocery Chain, and entrepreneur Brian LeGette to encourage low-cost, high-output, small-plot greenhouse technology (Big City Farms, 2014).

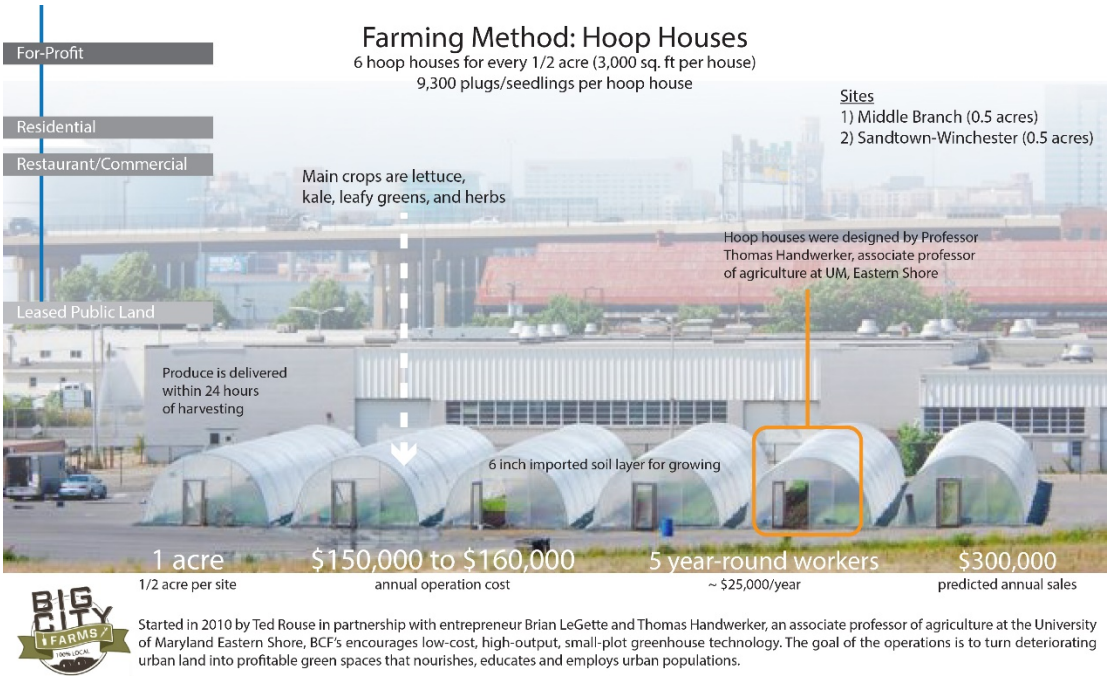

Figure 6. Big City Farms Case Study.

The goal of the organic growing operations is to turn deteriorating urban land into profitable green spaces that nourish, educate, and employ urban populations. "Big City Farms sustainable biological farming methods, solar heating technology, and minimal supply chain minimize pollutant runoff to streams and oceans, rejuvenate blighted urban land, reduce carbon emissions and urban heat-dispersal, and conserve

water." (Big City Farms, 2014) The startup capital for one half acre site ranges between $75,000 and $80,000, and annual operation costs approximately $80,000 (Meehan, 2013). Annual sales of the produce, which is mostly leafy greens, grown on the sites generate $150,000 per half acre site (Meehan, 2013). The farms are for-profit, and are able to generate enough revenue to sustain themselves along with providing a living wage income for five employees (Baltimore City Farms, 2014).

The farms exhibit utilitarian designs in which form follows function: produce high agricultural yields and create job opportunities. The site layout is minimal; hoop houses are arranged in a row and are oriented north-south to receive the greatest amount of sunlight. The cylindrical hoop houses are lined with plastic; each house sits on a plastic tarp, which acts as a barrier between the imported soil and the parking lot's asphalt pavement. Organized by crop, multiple rows of seasonal plants grow in each house. A trailer is located on the property for processing and storing harvested food, which is then transported to retail vendors and customers within 24 hours. The simplistic design grants the farm the flexibility to be set up in many different types of urban environments: parking lots, vacant lots, rooftops, etc.; however, the design limits the farm to being housed on large, flat surfaces, ruling out the possibility of a diverse topography for the farm's landscape.

Figure 7. Rows of crops inside one of Big City Farms' hoop houses (Big City Farms, 2014).

While the farm in Middle Branch is located on city-owned property, it does not display the characteristics of a public open space. A fence lines the edge of the property, making the hoop houses inaccessible to the public except through pre-scheduled tours. While Big City Farms works to achieve beneficial social and economic outcomes, such as providing fresh food and improving job opportunities for urban residents, the local impact of the farm is not visible within the neighborhoods that surround it. All crops harvested on Big City Farms' sites are sold at farmers' markets and restaurants located between three and six miles away. The farm located in the Sandtown-Winchester neighborhood, which is identified as a food desert, does not sell its produce to the local residents.

Real Food Farm

Real Food Farm operates under the mission of improving neighborhood access to healthy food, developing Baltimore's agriculture sector, providing hands-on education to Baltimore students, and protecting the environment and Chesapeake Bay Watershed (Real Food Farm, 2014). Civic Works, a non-profit urban service corps and an AmeriCorps program in Baltimore, started Real Food Farm in 2009; the six acre site

was designed by Civic Works employees along with the help of two landscape architecture students from Morgan State University (Real Food Farm, 2014). The farm is expanding operations to a 1.5 acre site to the south of the current location (Cocke, personal communication, 2013).

Figure 8. Real Food Farm Case Study.

Civic Works developed the program to provide employment and education opportunities for youth, partnering with the Safe Healing House Foundation. The Farm Club, which is an after school program for elementary and middle school students, presents the opportunity for student to cultivate their own garden plots and participate in farming, food, and nutrition activities (Real Food Farm, 2014). Real Food Farm's Education Outreach, Farm Lab, caters to teachers who wish to collaborate on class projects ranging in time from multiple days to weeks. There is an open invitation to the public for volunteering with the farm Wednesday, Friday, and Saturdays to help with maintenance and operation tasks. Annual operation costs approximately $274,000

with annual sales of the produce generating $295,000. The farm is a non-profit, and sustain three full-time salaries and 2 part-time salaries.

Bordering the abandoned soccer field of an existing high school, Real Food Farm is located on a large expanse of land, mostly lawn. Hoop houses and an orchard frame the entrance of the site and funnel people through. In the distance, an old baseball batting cage catches the eye as a billboard sign reading "Building Healthy Soil for Food, Farm and Bay" is the only color visible on winter days. The rusting baseball cage and random football training gear lend the site an air of abandonment; however, the organized rows of prepared beds offer a striking contrast to these derelict, seemingly randomly placed elements. The brightly colored structures on the site, including the tool sheds, picnic areas, and chicken tractors, stand out against the browns and grays of winter. A swale runs through the center of the site, collecting runoff and providing the only non-rectilinear element on the site. Overall, the feeling of the site when it is snowing in winter is hopeful and expectant. Because so much of the land is uncultivated, the area of production seems minimal and small.

Figure 9. Row of hoop houses at the entrance to Real Food Farm.

While there are no physical barriers blocking the general public from walking on to the farm, Real Food Farm does have hours of operation. Their top priority is making produce available and affordable to the neighborhoods immediately surrounding Clifton Park. Real Food Farm is part of the Baltimore Farm Alliance, a co-op of urban farms in the city that get together to sell their harvests at local farmers' markets. Real Food Farm also has a truck, called the Mobile Farmers' Market, that drives through and delivers fresh fruits and vegetables to schools, offices, residential areas, libraries, and other public spaces of northeast Baltimore.

Five Seeds Farm

Five Seeds Farm is located in northeast Baltimore, approximately 1.5 miles to the east of Real Food Farms in the Belair-Edison neighborhood. It was started in 2008, and the size of the site is roughly 23,200 square feet. It was once the main site for the growing operations; however, the founder and farm manager, Denzel Mitchell, moved to a 4 acre site in Sparks, Maryland in Baltimore County. The Baltimore City farm now serves as a teaching site for apprenticeship programs. An intern currently manages the site.

Initially, Mr. Mitchell used guerilla gardening tactics to seed and propagate derelict, city-owned lots adjacent to his home, understanding that these were temporary landscapes. After signing license agreements with Baltimore City's Adopt-a-Lot program, he designed the farm to have rows of crops planted directly into the soil and a separate area designated for fruit trees. The site is nestled between traditional Baltimore rowhomes and provides additional greenery to the largely residential neighborhood. Five Seed Farms expanded to other lots and private yards across the

city, totaling between four and five acres. The farming became less efficient as the distance between the production locations spread further apart. It was a one man operation and much of the day was spent driving in between sites that were between two and five miles away from each other.

Five Seeds Farm wants to revive the idea that farming is essential, artistic, exciting, and champions the notion that true food security is achieved when one controls their own food. When in full operation in Baltimore City, Five Seeds Farm had 25 CSA members, sold to 2 restaurants, and gave away free vegetables to the neighbors in Belair-Edison. The annual operation for the 23,200 square foot site costs approximately $12,000 to $13,000. Annual sales generate $17,000. The farm is for-profit, and generates $4,000 to $5,000 of revenue for the farmer. It does not produce a living wage.

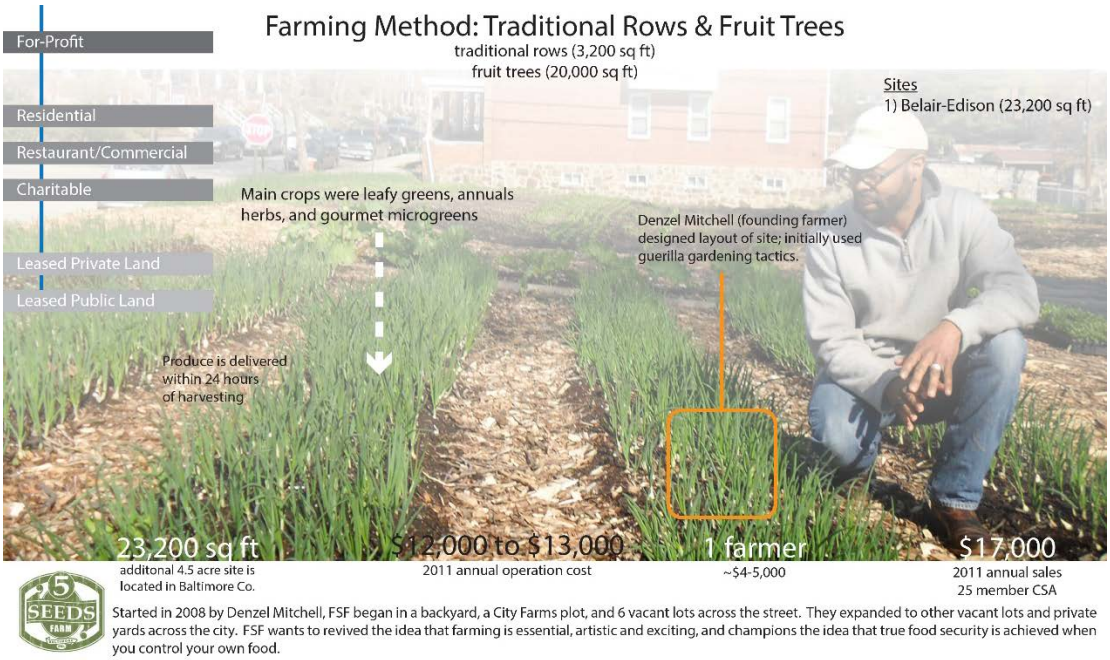

Figure 10. Five Seeds Farm Precedent Study.

The case studies provided valuable lessons regarding beneficial and harmful practices that need to be considered in design an urban agricultural space. The takeaway from Real Food Farm is that the urban farm needs to have a mission that benefits the surrounding community, who will be providing the support and manpower for the operation. Big City Farms provides the example that to increase yields and extend the harvesting season to all year, the farm must be designed to incorporate intensive farming practices. Five Seeds Farm recommends that a marketing plan be developed to advertise the farm and its offered opportunities.

In regards to practices that should be avoided, Five Seeds Farms is an example of why the tracts of land making up the urban farm should be located in close proximity to one another: growing, processing, and selling operations should not be separated by large distances (i.e. 2-3 miles) that make the operations and management difficult, inefficient, and economically unfeasible.

Chapter 3: Methods

Site Selection

Poppleton is approximately 116 acres, located to the west of Martin Luther King Boulevard in west Baltimore (Fig. 10). The neighborhood was chosen as the focus of this investigation for the following reasons:

1. A large portion (98%) of the neighborhood is identified as a food desert.

2. The unemployment rate (15.9%) is above the city average (12.6%).

3. Baltimore's comprehensive master plan identifies the neighborhood as a potential candidate for redevelopment, and the neighborhood is slated for city investment, hosting a proposed Red Line Light Rail station.

4. It houses an existing high school and multiple community centers/religious institutions that could be potential partners/benefactors in an urban farm project, and a hot spot analysis identified nearby meal assistance programs that could become beneficiaries of the farm.

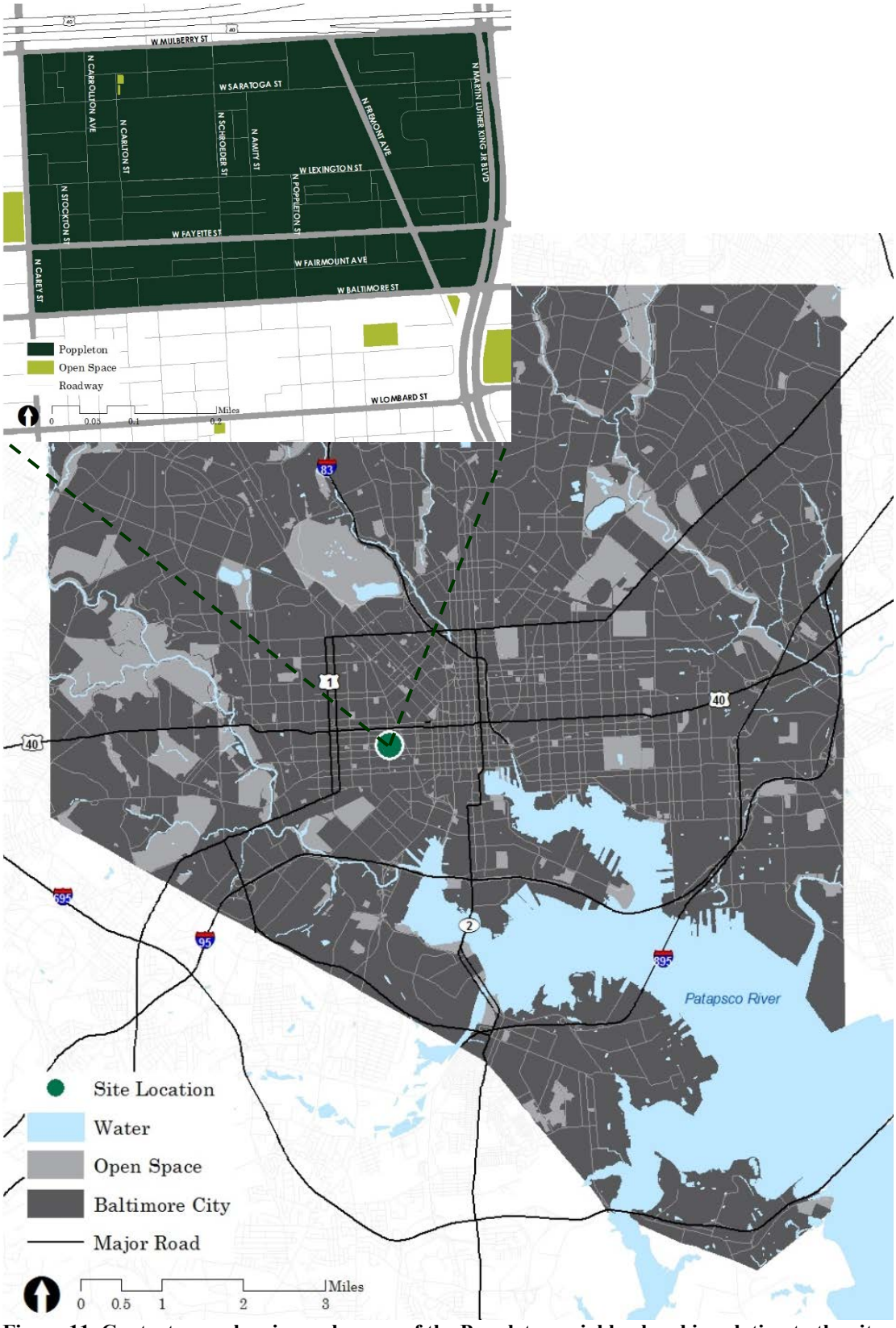

Figure 11. Context map showing a close-up of the Poppleton neighborhood in relation to the city of Baltimore.

Figure 12. Aerial view of downtown Baltimore with the Poppleton neighborhood highlighted in the upper left hand corner.

Within the neighborhood, the proposed site for the urban farm and market is made up of five vacant city blocks and one underused school courtyard. The proposed urban farm site runs north-south through the Poppleton neighborhood (Fig. 13). Sarah Ann Street, North Amity Street, West Fairmount Avenue, and North Schroeder Street border the 175 individual parcels that make up the site. The total area of the parcels plus the area of the school courtyard equals approximately 4.1 acres. Three roadways, running east-west, and six inner block alleyways pass through the site, totaling approximately 0.68 acres of pavement. Baltimore's Proposed Zoning Map designates the land use on the site as residential.

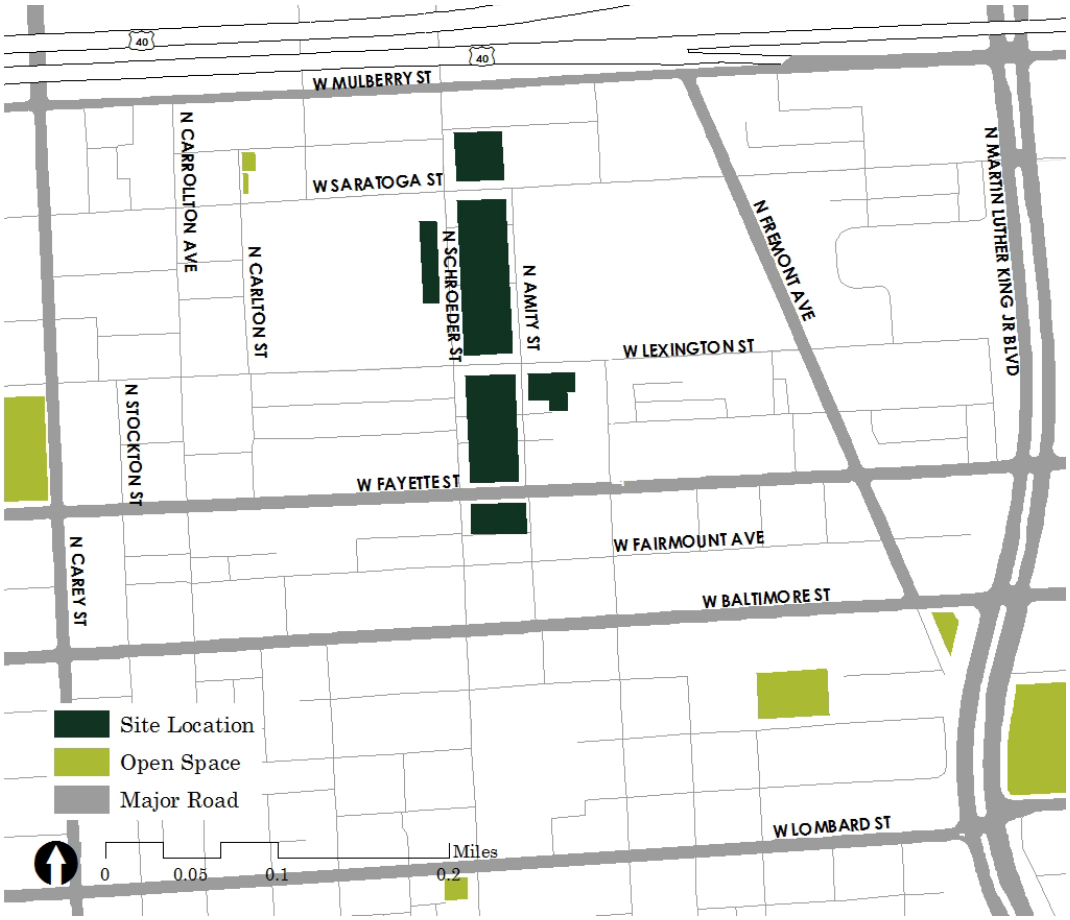

Figure 13. Site selection map identifying the city blocks that make up the 4.1 acre proposed site.

Food Desert

One in five Baltimore City residents or approximately 20 percent of the population live in food deserts (Baltimore Food Policy Initiative, 2014). Nearly one in four of Baltimore's school children live in a food desert (Baltimore Food Policy Initiative, 2014). Multiple food options exist in the city, such as public markets, farmers' markets, and virtual supermarkets; however, due to limited inventory and hours of operation, fresh produce is not often available for purchase within these neighborhood vendors. Neighborhoods facing severe food insecurity in Baltimore include Mosher, Penn North, Boyd-Booth, and Poppleton.

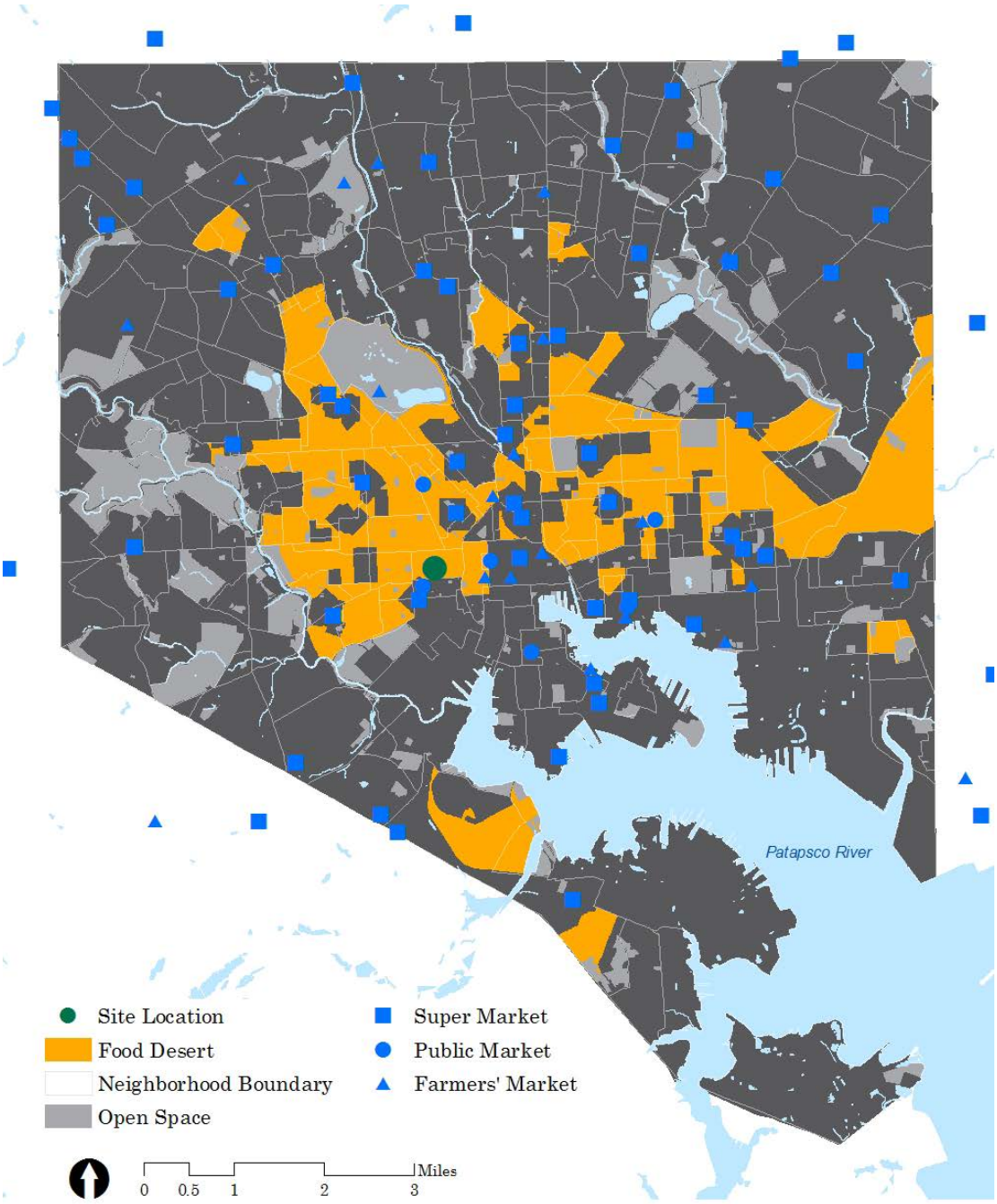

Figure 14. Baltimore Food Desert Map.

Ninety-eight percent of the land area within Poppleton is identified as a food desert (Fig. 15). There are no supermarkets within the neighborhood, although a Price Rite supermarket lies approximately one quarter mile to the south of it. Hollins Market, the oldest public market in the city, is located to the south of Poppleton and operates

from Tuesday to Saturday, 7 a.m. to 6 p.m, offering fresh produce and meat. A few food stores (grocery and deli) offer limited options for fresh vegetables and fruits, although many of the corner stores that once existed are vacant (Fig. 16). Three community gardens are located within the neighborhoods, but only two are for food-producing purposes. There are no virtual supermarkets, which offer residents the opportunity to order groceries online for home delivery, in Poppleton. The Baltimore Neighborhood Indicators Alliance analyzed the fast food outlet density (the concentration of prepared foods such as ready-made, to-go meals, and snacks in one location) within Poppleton. They calculated that the neighborhood collectively had 3.9 fast food outlets per 1,000 residents, ranking the neighborhood as being the 4th densest fast food area in the city (Baltimore Neighborhood Indicators Alliance & Jacob France Institute, 2013).

Figure 15. Map of the current fresh food options within one quarter mile walking distance of Poppleton.

Figure 16. Examples of vacant/closed corner stores in Poppleton, located at the southwest corner of West Lexington Street and North Carlton Street, the southeast corner of West Saratoga Street and North Carrollton Street, and the north side of West Baltimore Street, respectively.

Figure 17. Poppleton Children's and Community Garden located at the northwest corner of West Fairmount Avenue and North Schroeder Street.

Vacancy Rate

Baltimore has approximately 16,000 parcels of vacant land, totaling 2,700 acres (Fig. 18). This equals a 5% vacancy rate for land alone. This does not include the 780 acres of parcels that host vacant structures. Baltimore's Vacants-to-Value Program analyzes neighborhoods to determine their potential for development. It then compares the geography of the market findings with the geography of vacant properties to identify areas for different types of stabilization, rehabilitation, and development incentives and support. The program helps to streamline the dispossession process for city-owned derelict properties. The land-banking program allows Baltimore residents to adopt vacant lots in order to temporarily improve their conditions and contribute to community appeal.

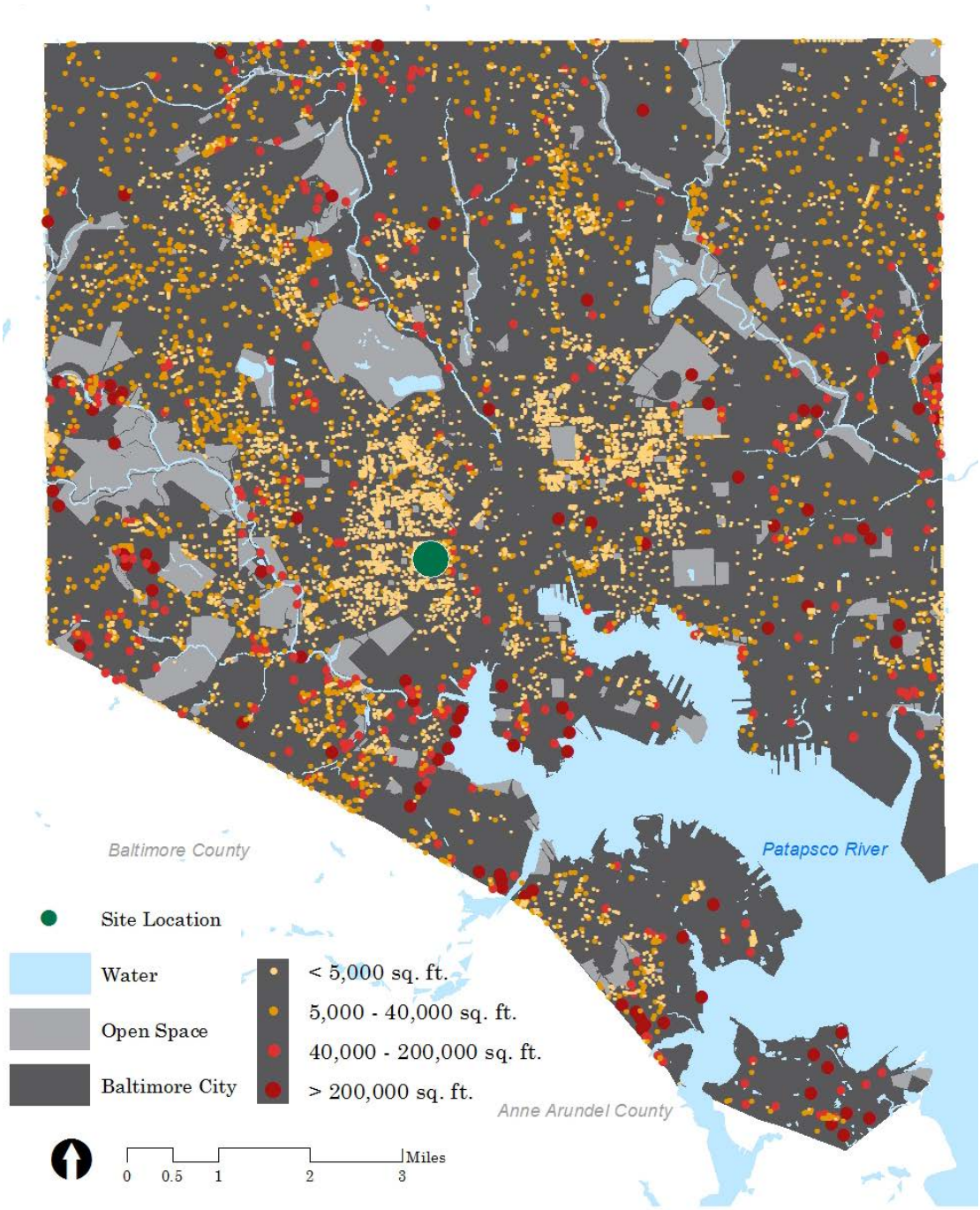

Figure 18. Map of city-owned vacant land in Baltimore, identified by lot size.

Poppleton is ranked number five for percentage of vacant properties owned by the city (Baltimore Neighborhood Indicators Alliance & Jacob France Institute, 2013). There are 486 vacant land parcels, totaling 18.7 acres. The vacancy rate in Poppleton is 16 percent. The neighborhood had the most demolition permits in the city in 2013.

With large tracts of derelict land and more of it being added each year to Poppleton's unused land inventory, the neighborhood stands to benefit from repurposing the lots to build value through an urban agriculture project.

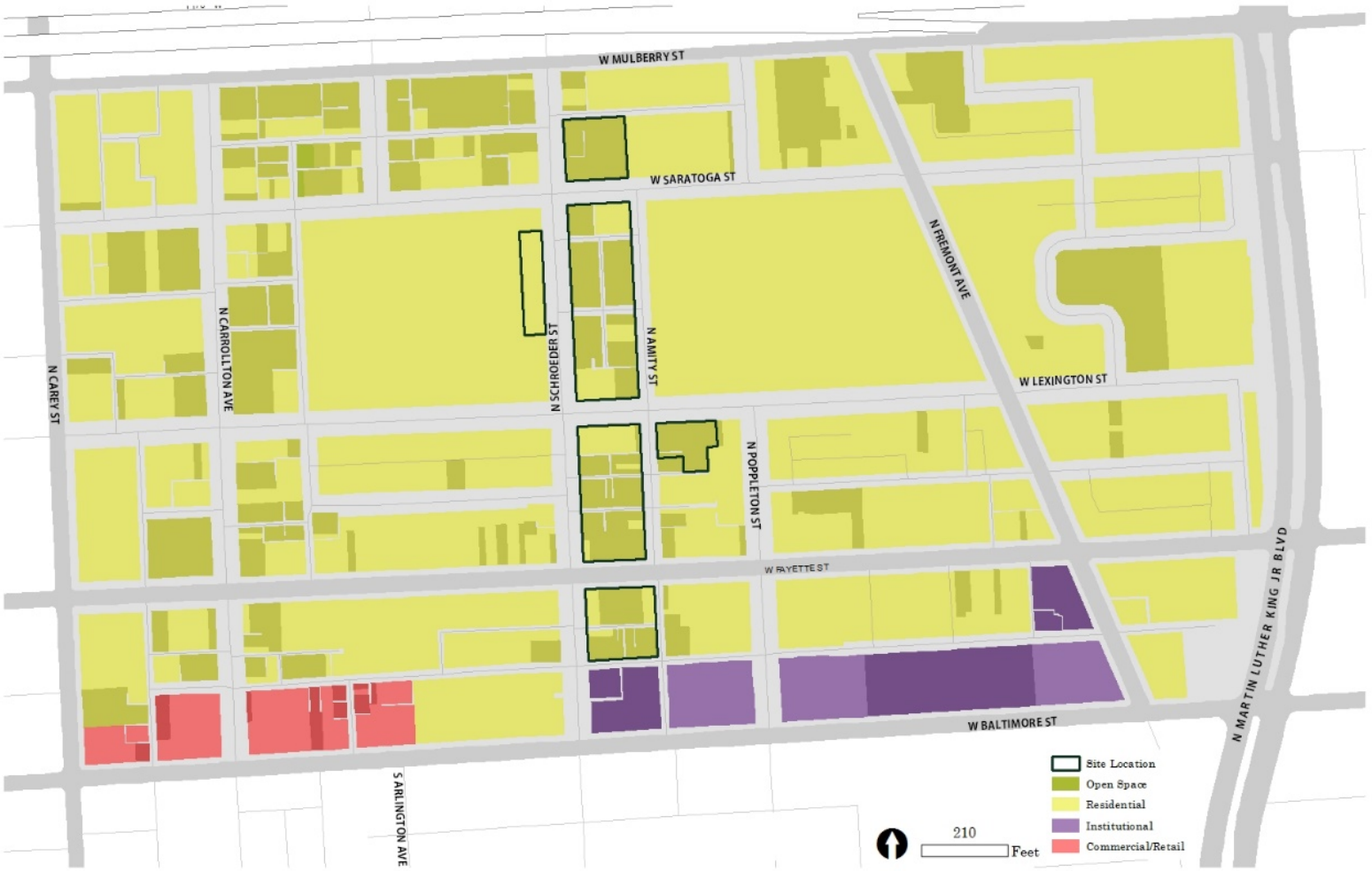

Figure 19. Map of proposed land uses for Poppleton. The darker shades of each land use represents city-owned, vacant lots.

The proposed site parcels (Fig. 20, 21, 22, 23, 24, and 25) are owned by the city of Baltimore and can be categorized into three groups: those that are available for one year licenses through the city's Adopt-a-Lot program, those that are currently adopted by an organization called Root Cause but remain fallow, and those that are not part of the program and are being maintained by the city. In total, 95 percent of the proposed site is vacant.

Figure 20. North portion of site along N. Schroeder St., facing east.

Figure 21. North central portion of site at intersection of N. Amity St. and W. Lexington St., facing northwest.

Figure 22. Central portion of site at intersection of N. Amity St. and W. Fayette St., facing northwest.

Figure 23. South portion of site at intersection of N. Amity St. and W. Fairmont Ave., facing southwest.

Figure 24. East portion of the site at the intersection of N. Amity St. and W. Fayette St., facing southeast.

Figure 25. School courtyard, facing north.

Employment Rate

In December of 2013, the local unemployment rate in Baltimore dipped to 5.9 percent, which was down from November's rate at 6.3 percent (Sharrow, 2014). Approximately 86,100 people are unemployed in the Baltimore area, and the state of Maryland had an unemployment rate of 6.1 percent in December. Many of the central portions of Baltimore experience the lowest median household incomes, ranging from about $9,000 per year to $16,000 per year. The highest concentrations of wealth occur at the outskirts of the city and in the surrounding suburbs (Fig. 26). When large portions

of paychecks must go towards paying for groceries, providing less expensive, healthy food options is necessary in order for people to function as a society. Economic incentives and development from innovative projects such as an urban farm and market will not only provide jobs, but will also spur economic interest in communities.

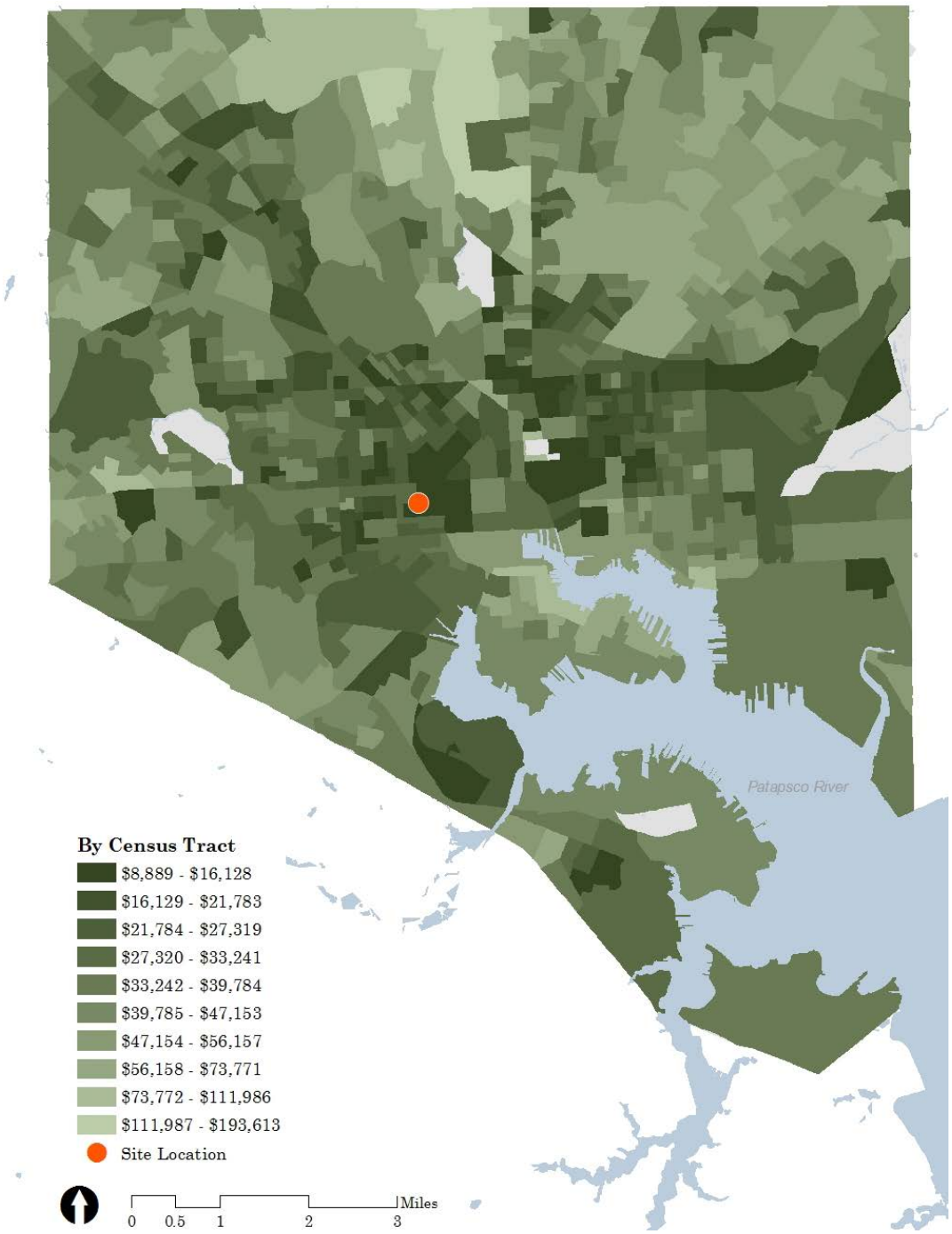

Figure 26. Map of median household incomes in Baltimore.

Within Poppleton, 45.9 percent of the population between the ages of 16 and 64 years old are employed (Baltimore Neighborhood Indicators Alliance & Jacob France Institute, 2013). The neighborhood has an unemployment rate of 15.9 percent. The median household income is $14,945, and about 19.2 percent of families live in poverty. Over half the population has a high school diploma and some college or associate degrees. The neighborhood currently houses a number of small businesses. They consist mostly of fast food restaurants, beauty supply stores, and secondhand shops along West Baltimore Street to the south of the neighborhood, which is seeing business growth in properties to the west of the University of Maryland Bio Park. An urban farm could provide much needed jobs and also include job training programs for neighborhood residents and high school students.

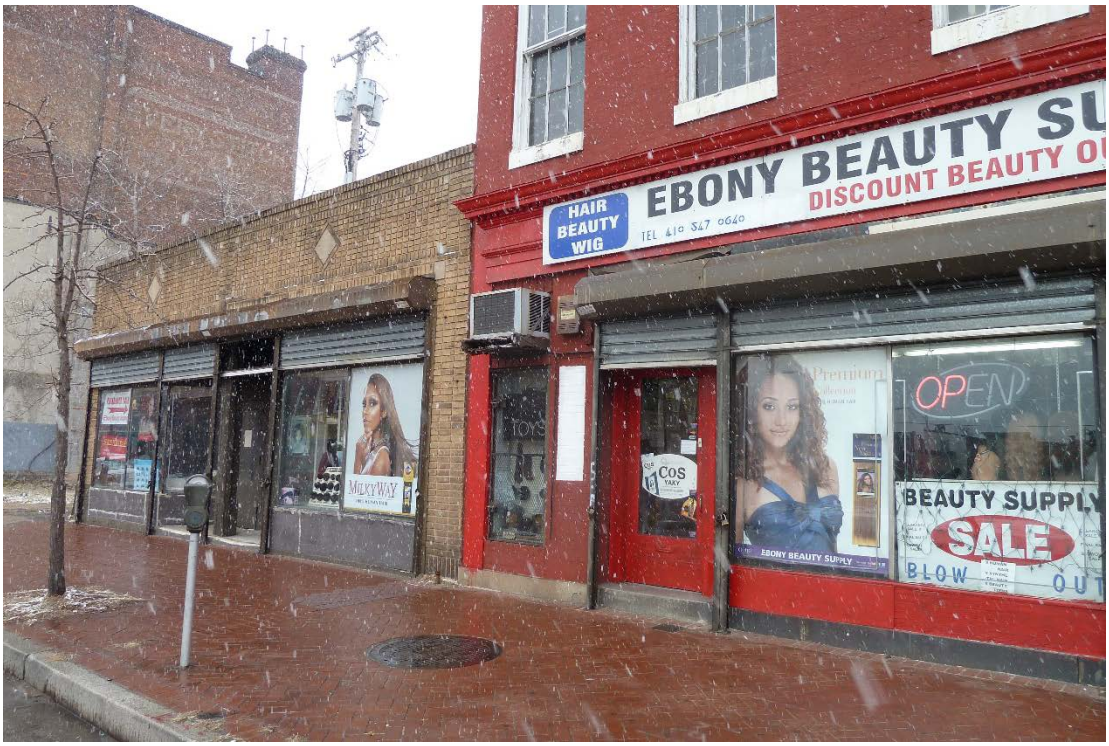

Figure 27. Beauty supply retail in storefronts along the north side of West Baltimore Street.

Baltimore's Live Earn Play Learn Master Plan

Baltimore City's *Live Earn Play Learn Comprehensive Master Plan* identifies the Poppleton neighborhood as a distressed area and potential candidate for a major mixed-income redevelopment project (Baltimore City Master Plan, 2008). Poppleton has also been selected to house one of the city's Red Line light rail stations at the corner of West Baltimore Street and Martin Luther King Jr. Boulevard. The desirability to live in Poppleton will increase with the proposed Red Line station improving public transportation and increasing urban accessibility. Figure 28 displays the areas of high walkability surrounding the proposed stations, including the Poppleton site. The green portions of the map represent areas with high walkability in relation to the Red Line stations. With Poppleton identified as an area with high walkability, the neighborhood becomes desirable as both a place to live and as a destination for other areas in the city to visit.

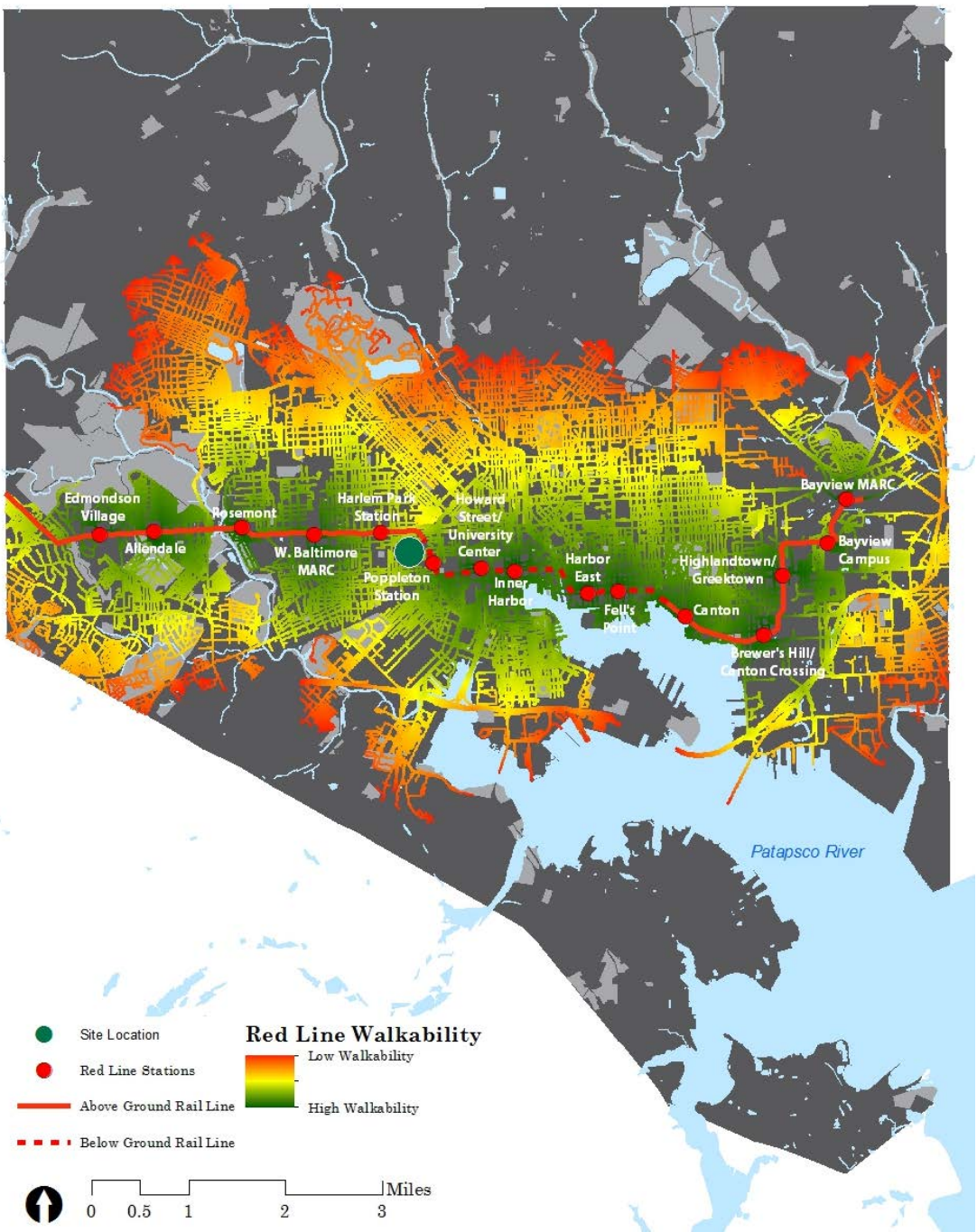

Figure 28. Walkability index map of the future Red Line light rail stations.

Baltimore recognizes Poppleton's potential for being an integral hub for city residents due to its close proximity to downtown and other Baltimore landmarks, indicating that the proposed site has the potential to become another important node for Baltimore residents and tourists to visit. The University of Maryland, Baltimore Bio

Park developed multiple lots along West Baltimore Street for its new biomedical research campus that includes a proton treatment center and a forensic medical center. The city expects that with all of the new office space being built by the Bio Park, employees will look to live within the surrounding neighborhoods. With city funding looking to invest in Poppleton, urban agriculture could help generate buzz for the neighborhood and create a desirable environment that current and future residents will want to live in.

Figure 29. Map of the proximity of Poppleton to Baltimore landmarks. The circles represent quarter mile distance intervals from Poppleton. 0.25 mile buffer represents the mean walking distance, 0.50 mile buffer represents the maximum walking distance, and 1.25 buffer represents the mean biking distance.

Neighborhood Benefactors and Beneficiaries

In order for an urban farm to be successful, community partners that would benefit from its operation should be identified. Organizations that administer meal programs and educational programs, such as schools, after school programs, food banks, food benefit programs (SNAP, WIC, and EBT), etc., are ideal partners. A hot

spot analysis was conducted to identify areas where these entities and organizations are clustering. Areas classified as "hot", where multiple potential beneficiaries are located, are deemed ideal for siting the urban farm. The following entity locations were analyzed:

1. School free and reduced lunch program sites
2. At-risk after school meal program sites
3. Food pantry and free meal sites

Each entity was individually analyzed as to whether its sites were dispersed or clustered (Figure 30). The school free and reduced lunch program sites, at-risk after school meal program sites, and pantry and free meal sites were evaluated, and the results proved their clustering in specific areas of the city. The two areas of high concentration of school free and reduced lunch programs, at-risk after school meal programs, and pantry and free meal sites are located in the western and eastern portions of the city. The larger cluster surrounds the Poppleton neighborhood, indicating that the neighborhood could possibly provide a local food source through an urban farm and market.

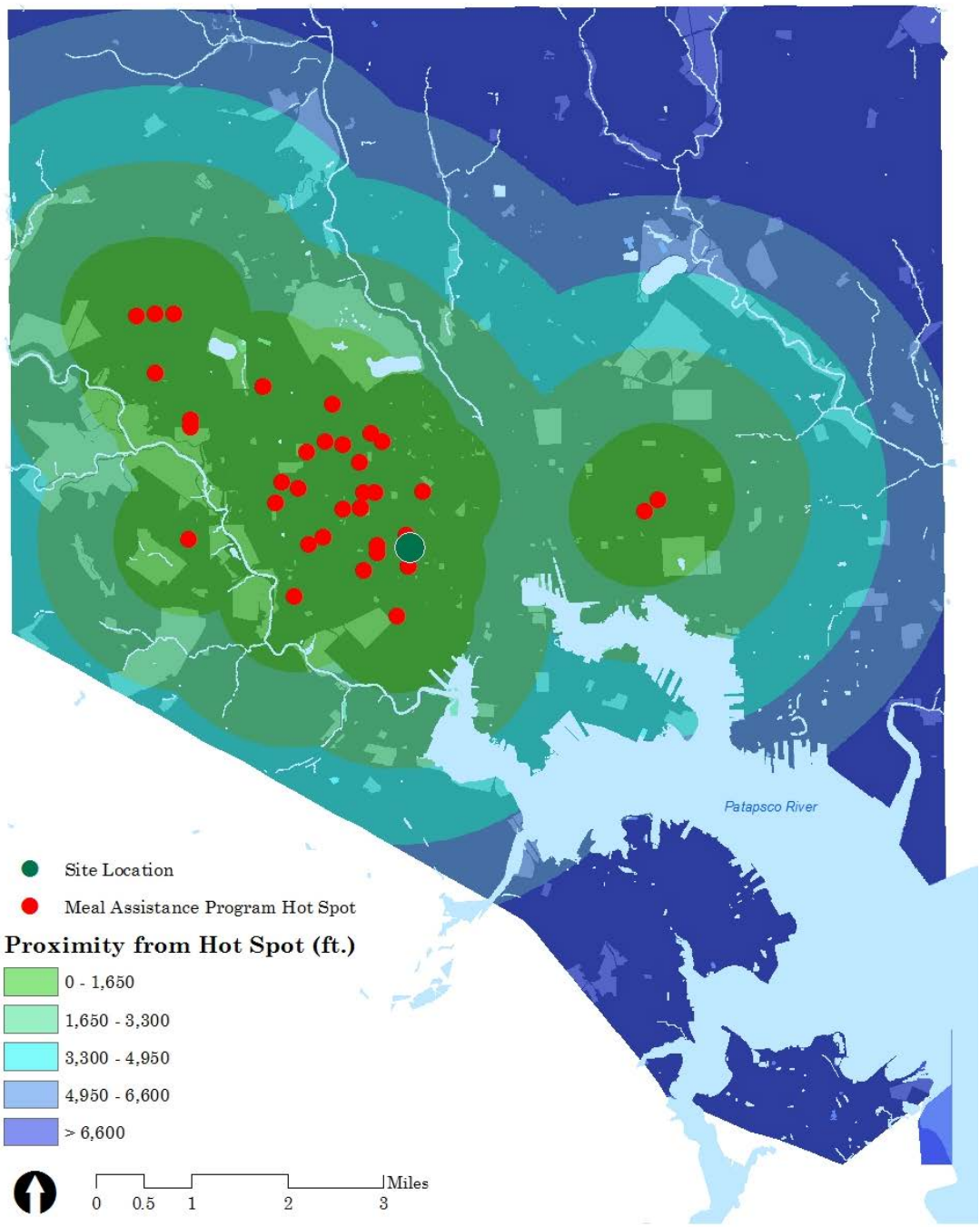

Figure 30. Hot spot and proximity analysis of potential community beneficiaries.

Present neighborhood stakeholders include Excel Academy at Francis M. Wood High School, the Poe Homes public housing development, the Edgar Allen Poe House and Museum, the University of Maryland Bio Park, and religious institutions. Excel

Academy stands out as a partner due to its role as an alternative high school in Baltimore. The nontraditional curriculum provides students aged 16-21 the opportunity to earn their high school diploma through small class sizes, targeted remediation, online learning and a focus on career readiness. The school's job training program requires students to be employed all over the city, aiming to capitalize on learning skills such as responsibility and independence. The school takes a considerable interest in each of its students: the principal holds a meeting with every new student and their parent/guardian, emphasizing the individuality of that student and working to comfortably integrate the new student into their new learning environment. The high school completion rate is 77.4% (Baltimore Neighborhood Indicators Alliance, 2013).

Figure 31. North Exterior Entrance of Excel Academy @ Francis M. Wood High School along West Saratoga Street.

The principal, Tammatha Woodhouse, expressed interest in establishing an environmental curriculum that highlights hands-on learning experiences. She

recognizes the reality that students learn differently and may require different kinds of teaching. By creating a curriculum that centers on different teaching methods, such as hands-on, visual, technological, etc., Ms. Woodhouse hopes to improve performance in and out of the classroom. Students, who are part of work programs, have the freedom to leave campus. These students would be the most suited to work on the farm.

Figure 32. Students have written words of advice, encouragements, and aspirations on the cafeteria wall at Excel Academy @ Francis M. Wood High School.

Ms. Woodhouse also made clear that the school meal program is of high importance at Excel Academy. Many students participate in the breakfast, lunch, and dinner programs. According to the Baltimore Neighborhood Indicators Alliance, 95% of the students in Poppleton are black, and the percentage of students receiving free or reduced meals is 88.7. A "healthy vending machine" in the school cafeteria carries fruit and vegetable packs. The school has a food pantry that allows anyone from off

the street to come and pick up supplies; many parents of students receive food supplies from this pantry on Friday nights.

Figure 33. The Healthy Vending Machine in the cafeteria of Excel Academy @ Francis M. Wood High School. The principal mentioned that the machine has sold out multiple times.

Excel Academy was recently removed from the school closure list and placed onto a list of Baltimore public schools that are set to be renovated in ten years' time. The district also recommends expanding the Excel Academy program to serve overage middle school students in grades 6 to 8 (Baltimore City Public Schools, 2013). This expansion will increase program enrollment, which in turn will increase utilization of the district's Harbor City building that houses Excel Academy. Ms. Woodhouse and the Excel Academy staff are working towards improving the high school and transforming it into a community center for the neighborhood. Other civic centers such as religious institutions and the Edgar Allen Poe Museum and House could also be considered as potential partners for the urban farm project.

Figure 34. Map of Poppleton neighborhood civic centers and potential partners.

Site Inventory and Analysis: Neighborhood Scale

Neighborhood History

Poppleton has a rich history that harkens back to days of the Revolutionary Era: the street names "Lexington" and "Saratoga" are tributes to battles fought during the Revolutionary War, while "Fayette" and "Schroeder" are tributes to civic players during the War of 1812 (Ryon, 1993). It has transformed over the last three centuries from housing mostly white, coal workers associated with the B&O Railroad to predominantly black, steel labor union and civil rights workers. Poe Homes (Figure 35), the oldest public housing project in Baltimore City, and Townes at the Terraces are located in Poppleton.

Figure 35. An interior courtyard of the Poe Homes public housing development.

In the mid-1960s, construction of Expressway I-170 (also known as Route 40) began to the north of Poppleton. The urban planning project was expected to "eliminate the so-called worst bottleneck on the east coast" (Ryon, 1993); however, its upset of the neighborhood demolished one school, over fifty businesses, and almost 1,000 residences. The displaced residents moved to northwest Baltimore. Construction of the 20-foot depressed highway was halted in the late 1970s when opposition from neighborhoods to the west saw the results of the construction: the destruction of neighborhoods. The now termed "Highway to Nowhere" runs the short length of twelve city blocks and can be described as a scar on west Baltimore.

The wide array of architecture within Poppleton consists of Pre-Civil War Era two-story row homes with shallow gables and dormers; and Italianates, flat roofed houses, that were built with brick and detailed ornamentation (Ryon, 1993). The elaborate ironwork representing leave and branches on front facades, fences, and

railings, evokes the styling of art nouveau. Poppleton does not carry the Baltimore tradition of front marble steps, but instead simple wood or concrete. Iron and steel will be used within the design as an homage Poppleton's history with steel labor and the location of the B&O Railroad to the south of the neighborhood. The early art nouveau style of creeping vines, natural botanical forms displayed through iron and metal roofs will play into the more permanent elements of the farmers' market and educational facility. The later, more simplistic art nouveau style, reminiscent of Charles Rennie Mcintosh's chairs, will inspire the layout of the farm.

Figure 36. Iron and brick architectural details found throughout the Poppleton neighborhood (Baltimore Sun Photo Archive, 2013).

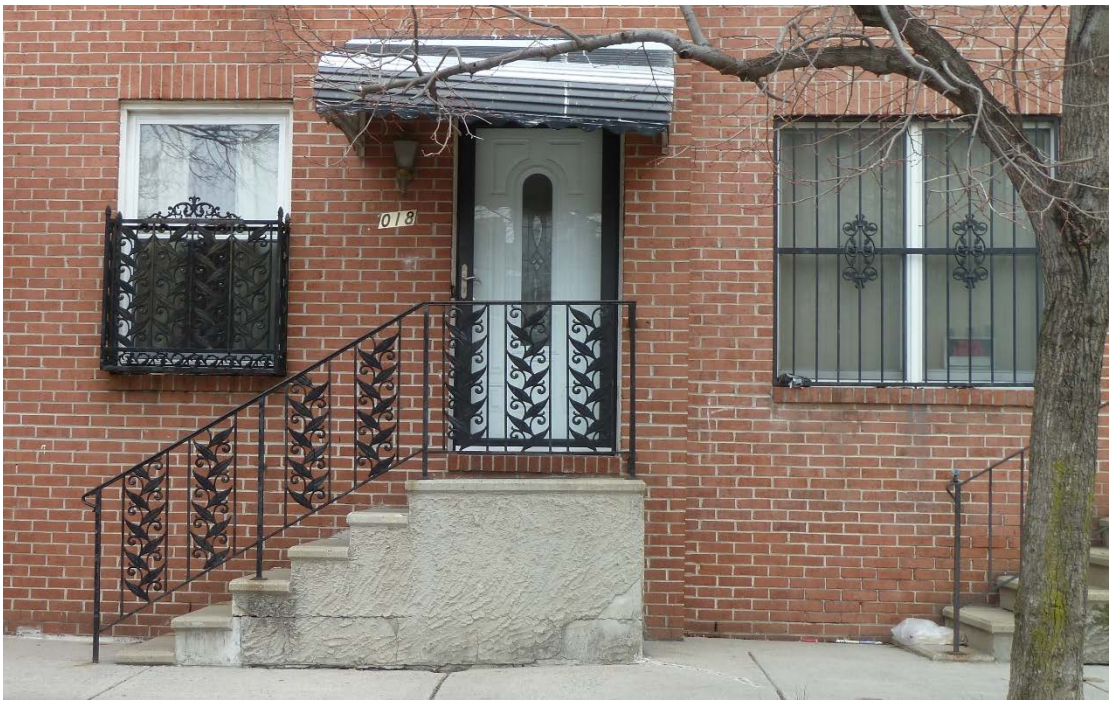

Figure 37. Detailed iron railing and window coverings on a front stoop in the Poppleton neighborhood.

Demographics

The neighborhood is characterized as predominantly black with the average age of residents being between 25 and 64 (Fig. 38). Among the lowest neighborhood population number in the city, 3,087 people live in Poppleton (U.S. Census Bureau, 2010). Of the 1,177 households (Baltimore Neighborhood Indicators Alliance, 2013) 74.8% are headed by females with children under the age of 18. Thirty-seven percent of households live below the federal poverty level, and 54.2% of the children live below the federal poverty level (Baltimore Neighborhood Indicators Alliance, 2013).

Figure 38. Poppleton demographic information.

The life expectancy of someone living in Poppleton is approximately 64 years (Baltimore City Health Department, 2011). The neighborhood ranks 2nd in the city for having low life expectancy at birth (Baltimore City Health Department, 2011) with a percentage of 14.1. The percentage is measured by the number of infant deaths (babies

under one year of age) per 1,000 live births within the area during a five year period. The teen birth rate per 1,000 females (aged 15 – 19) in Poppleton is 89.2% (Maryland Department of Vital Statistics, 2011).

Food Metrics

To calculate the amount of food necessary to feed the neighborhood and the school lunch program at Excel Academy for one year, the following was completed:

1) The number of residents in the neighborhood and the number of students at the school was identified. According to 2010 Census Data, the total number of residents is 3,087. Baltimore City Public Schools determines that Excel Academy has 255 students (2013).
2) The census data was broken down to categorize the ages and sexes of the all the reported residents, i.e. males age 0-5, females age 0-5, etc.

Age Range	Population		
	Male	Female	Total
0 - 4	132	142	274
5 - 11	151	125	276
12 - 14	135	106	241
15 - 17	121	115	236
18 - 24	97	139	236
25 - 34	161	162	323
35 - 44	122	179	301
45 - 64	367	463	830
> 65	146	224	370
Students	-	-	255

Figure 39. Total population of Poppleton's residents and Excel Academy's students according to age and gender (US Census, 2010 and Baltimore City Public Schools, 2013).

3) The weekly diet recommendations for each sex/age group was identified from the USDA My Plate website, for example females, age 25-34 should consume 16 cups of vegetables per week. The weekly lunch recommendations for high school students was identified from the National School Lunch Program Menu. The amount of each food group that should be consumed per week was noted.

Age Range	0 - 4		5 - 11		12 - 14		15 - 17		18 - 24		25 - 34		35 - 44		45 - 64		> 65		Student
Gender	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	-
Population	132	142	151	125	135	106	121	115	97	139	161	162	122	179	367	463	146	224	255
Milk (fluid ounce)	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	40.00
Cheese (ounce)	28.00	28.00	42.00	42.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	10.00
Yogurt (ounce)	28.00	28.00	42.00	42.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	56.00	40.00
Lean Meat (ounce)	9.00	9.00	16.00	16.00	20.00	16.00	24.00	20.00	26.00	22.00	26.00	22.00	25.00	20.00	25.00	20.00	22.00	20.00	10.00
Alternate Protein (ounce)	3.00	3.00	6.00	6.00	8.00	8.00	10.00	8.00	10.00	8.00	10.00	8.00	9.00	8.00	9.00	8.00	8.00	8.00	10.00
Eggs (large egg)	1.00	1.00	3.00	3.00	4.00	4.00	5.00	4.00	5.00	4.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	5.00
Cooked Dry Bean/Peas (cup)	0.50	0.50	0.50	0.50	1.50	1.00	2.00	1.00	2.00	1.50	2.00	1.50	2.00	1.50	2.00	1.50	1.50	1.00	2.50
Vegetables (cup)	6.50	6.50	10.00	10.00	16.00	13.00	19.00	13.00	19.00	16.00	19.00	16.00	19.00	16.00	19.00	16.00	16.00	13.00	5.00
Fruit (cup)	7.00	7.00	10.50	10.50	10.50	10.50	14.00	10.50	14.00	14.00	14.00	14.00	14.00	10.50	14.00	10.50	14.00	10.50	5.00
Peanut Butter or Other Nut or Seed Butter (tablespoon)	7.00	7.00	7.00	7.00	10.50	10.50	14.00	10.50	14.00	14.00	14.00	14.00	14.00	10.50	14.00	10.50	14.00	10.50	20.00
Peanuts, Soybuts, Tree Nuts, or Seeds (ounce)	1.00	1.00	3.00	3.00	4.00	4.00	5.00	4.00	5.00	4.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	5.00

Figure 40. Weekly recommended dietary needs according to age and gender (USDA ChooseMyPlate.gov, 2014 and USDA National School Lunch Program, 2013).

4) The amount recommended per day was calculated from the weekly recommended values. This was completed for all food groups, under all age ranges and genders. As an example:

One female, age 25 to 34, should consume 16 cups of vegetables per week.

$$\frac{16 \text{ cups of vegetables}}{1 \text{ week}} \times \frac{1 \text{ week}}{7 \text{ days}} = \frac{\sim 2.2 \text{ cups of vegetables}}{1 \text{ day}}$$

One female, age 25 to 34, should consume about 2 cups of vegetables per day.

5) The amount recommended per year was calculated. This was done for all food groups, under all age ranges and genders. As an example, continued from Step 4:

$$\frac{\sim 2.2 \text{ cups of vegetables}}{1 \text{ day}} \times \frac{365 \text{ days}}{1 \text{ year}} = \frac{\sim 834 \text{ cups of vegetables}}{1 \text{ year}}$$

One female, age 25 to 34, should consume about 834 cups of vegetables per year.

6) The same was completed for the high school students: the amount of food the high schoolers consumed during one school year (180 days), based on the USDA National School Lunch Program Menu was calculated.

One high school student should consume 1 cup of vegetables for lunch each school day.

$$\frac{1 \text{ cup of vegetables}}{1 \text{ day}} \times \frac{180 \text{ days}}{1 \text{ school year}} = \frac{180 \text{ cups of vegetables}}{1 \text{ school year}}$$

One high school student should consume 180 cups of vegetables per school year.

7) This process was completed to identify the total amount of each food group recommended for one year (total fluid ounces of milk, total number of large eggs, total cups of vegetables, etc.).

		HIGH SCHOOLER (AGE 15-17, 9 MONTHS)	ADULT, (AGE 45-64, 1 YEAR)	CHILD (AGE 5-11, 1 YEAR)
DAIRY	MILK (FLUID OUNCES)	1,440	2,920	2,920
	CHEESE (OUNCES)	360	2,920	2,190
	YOGURT, PLAIN OR FLAVORED, UNSWEETENED OR SWEETENED (OUNCES)	1,440	2,920	2,190
PROTEIN	LEAN MEAT, POULTRY, FISH (OUNCES)	180	1,042	834
	ALTERNATE PROTEIN PRODUCT (OUNCES)	360	417	312
	EGGS (LARGE EGG)	180	208	156
VEGETABLES & FRUITS	COOKED DRY BEANS/PEAS (CUPS)	90	78	26
	VEGETABLE (CUPS)	180	834	521
	FRUIT (CUPS)	180	547	547
OILS & FATS	PEANUT BUTTER OR OTHER NUT OR SEED BUTTER (TABLESPOONS)	720	547	365
	PEANUTS, SOYNUTS, TREE NUTS, OR SEEDS (OUNCES)	180	208	156

Figure 41. Total amount of food needed for one high school student per school year and for one adult (age 45-64) and one child (age 5-11) per year.

8) Once the measured amounts for all Poppleton residents and all high school students were calculated, the totals from each food group were added together to get the amount of food needed to feed all residents and high school students for one year. For example:

There are 162 females, age 25-34, that live in Poppleton.

$$\frac{\textit{~ 834 cups of vegetables}}{\textit{1 female, age 25-34}} \; x \; \frac{\textit{162 females, age 25-34}}{\textit{Poppleton Neighborhood}} = \textit{135,108 cups of vegetables}$$

135,108 cups of vegetables are needed to feed the 162 females, age 25-34, living in Poppleton.

9) The *Essential Urban Farmer* provides the amount of land needed to grow individual plants or to raise livestock, etc. It also gives an estimate of yields per plant in pounds, which meant that the totals needed to be converted from Step 8. *The Farmer's Almanac* supplies estimates of cups to pounds ratios. For example, 5 cups of Swiss chard equals 1 pound. Based on these conversion units, the amount for each food group was converted to pounds.

   135,108 cups of vegetables are needed to feed the 162 females, age 25-34, living in Poppleton.

$$\textit{135,108 cups of vegetables} \; x \; \frac{\textit{1 pound of vegetables}}{\textit{5 cups of vegetables}} = \textit{27,021.6 pounds of vegetables}$$

   27,021.6 pounds of vegetables are needed to feed the 162 females, age 25 to 34, living in Poppleton.

10) The pounds were then converted into square footage in order to generate the area of land needed to produce the food. For example, one square foot of land produces 4 pounds of Swiss chard. Because the land would not be generating this amount all at once, the amount of land was divided by three to represent the three growing seasons per year.

$$\frac{27{,}021.6 \text{ pounds of vegetables}}{1 \text{ year}} \times \frac{1 \text{ square foot}}{4 \text{ pounds of vegetables}} \times \frac{1 \text{ year}}{3 \text{ growing seasons}} \times \frac{1 \text{ acre}}{43{,}560 \text{ square feet}} = 0.05 \text{ acres}$$

0.05 acres of land is needed to grow enough vegetables to sustain 162 females, age 25 to 34, for one year.

11) In the case of all of the females, age 25 to 34, in Poppleton, the total amount of land needed to produce one year's worth of vegetables is 0.05 acres. This method was completed for each of the food groups to calculate the total amount of land needed to sustain the neighborhood and the school for one year.

		TOTAL AREA OF LAND NEEDED TO SUPPORT A DIET FOR 1 YEAR (ACRE)
DAIRY	MILK (FLUID OUNCES)	4.9
	CHEESE (OUNCES)	35.9
	YOGURT, PLAIN OR FLAVORED, UNSWEETENED OR SWEETENED (OUNCES)	18.5
PROTEIN	LEAN MEAT, POULTRY, FISH (OUNCES)	7.7
	ALTERNATE PROTEIN PRODUCT (OUNCES)	0.6
	EGGS (LARGE EGG)	0.6
VEGETABLES & FRUITS	COOKED DRY BEANS/PEAS (CUPS)	0.3
	VEGETABLE (CUPS)	3.1
	FRUIT (CUPS)	4.9
OILS & FATS	PEANUT BUTTER OR OTHER NUT OR SEED BUTTER (TABLESPOONS)	42.4
	PEANUTS, SOYNUTS, TREE NUTS, OR SEEDS (OUNCES)	22.9

Figure 42. Total area of land needed to grow each type of food to support the neighborhood and high school for one year.

The total amount of land needed to completely support the neighborhood and the high school is approximately 158.6 acres. Because so much land is required to fulfill all of the dietary needs of the neighborhood and high school students, the growing goal of the proposed farm is to produce a portion of the daily vegetable requirement for the neighborhood resident and student diets (3.4 acres). To optimize the amount of food grown, bio-intensive growing methods will be used with a crop rotation system that allows for one square foot of land to grow three crops per year (Coleman, 2009).

La Cite Development Proposal, A Critique

The La Cite Development Corporation entered a contract with Baltimore City in 2006 to develop derelict land in Poppleton. Their proposal is to demolish the existing vacant buildings and build low-income, mixed-use housing. As part of their deal, Baltimore City has demolished the rowhomes between North Schroeder Street and North Amity Street to make way for the first phases of the development plan; however, the project has yet to break ground. La Cite has not secured the funding for the development, and as a result, the city tried to break the contract in 2012. The court mandated that the city must honor the contract until the end of 2014, at which time, if La Cite has not secured financing, the contract will become null and void.

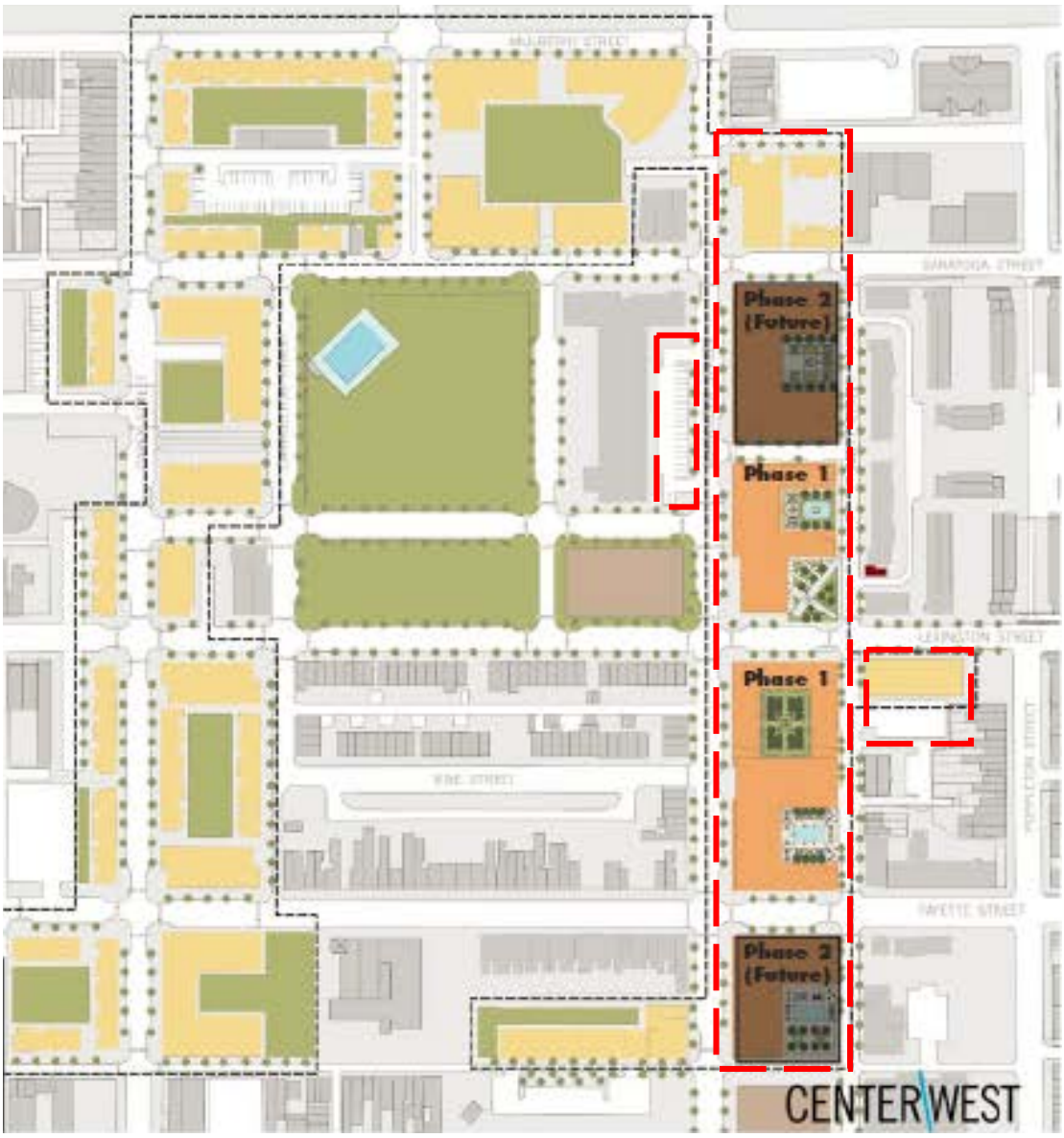

Figure 43. La Cite Development's Poppleton Proposal with the thesis site outlined in red (La Cite Development, 2006).

The proposed project was revealed to the neighborhood in November of 2013. At the neighborhood meeting, the residents seemed hopeful about the benefits that would arise from big investment. Their main concern was a grocery store. Multiple residents asked about the location of a grocery store and type of inventory that would be stocked. The developer made it clear that the option of a grocery store was not finalized. While questions were raised about the aesthetics of the proposed multifamily

housing, most people were more concerned with pollution and soil contamination associated with construction.

Figure 44. Renderings of the proposed La Cite development (La Cite Development, 2006).

La Cite's proposal includes multi-level, multi-family mixed-income housing, similar to the aesthetics seen in east Baltimore's newly developed Harbor East: condominiums representative of a generic city identity. The phasing plan also removes the existing alternative high school and replaces it with a traditional public school and professional tennis facility. The principal of Excel Academy noted that the current school is an anchor for the Poppleton community, and provides a secure learning environment for its students. Displacing the high school would be detrimental to both the community and the attending students.

Even though the first phase of the La Cite project appears to be going ahead, this thesis proposes that the urban farm continue with the sites that are selected. As a way of creating a flexible environment that addresses the food needs of the Poppleton neighborhood while still adjusting to the construction of phase one of the La Cite proposal, parts of the urban farm will be modular. Portions of the farm will move to other sites within Poppleton at the start of construction of La Cite's phase one, while the market and educational facility will remain on their designated block. A modular urban farm encourages local production while also allowing the neighborhood to benefit economically from new development.

Site Inventory and Analysis: Site Scale

Soils

One of the most important elements for producing food is the medium that they are grown in. Healthy soils are extremely critical for providing nutrients for plants and filtration for water. According to the soil survey conducted by the USDA Natural Resources Conservation Service, the soils existing on the proposed Poppleton urban farm site are typical urban land complexes: Sassafras-Urban land complex (29UB) and Urban land-Sassafras complex (31UB). They are made up of B and D hydrologic groups, meaning they are good to poorly draining; however, most likely, the soils in the vacant lots are highly compacted due to their previous history of hosting rowhomes. The risk of lead and copper contamination from previously existing houses must be considered when edible plantings are involved in a design. The best solution to avoid growing in contaminated mediums is to plant the vegetables in raised beds. Using

raised beds also allows for the transporting of healthy soil to other sites when moving the modular farm. This will save the cost of having to purchase new soil every time the farm is moved. Organic material will be needed to be composted on site and used to supplement the soil medium.

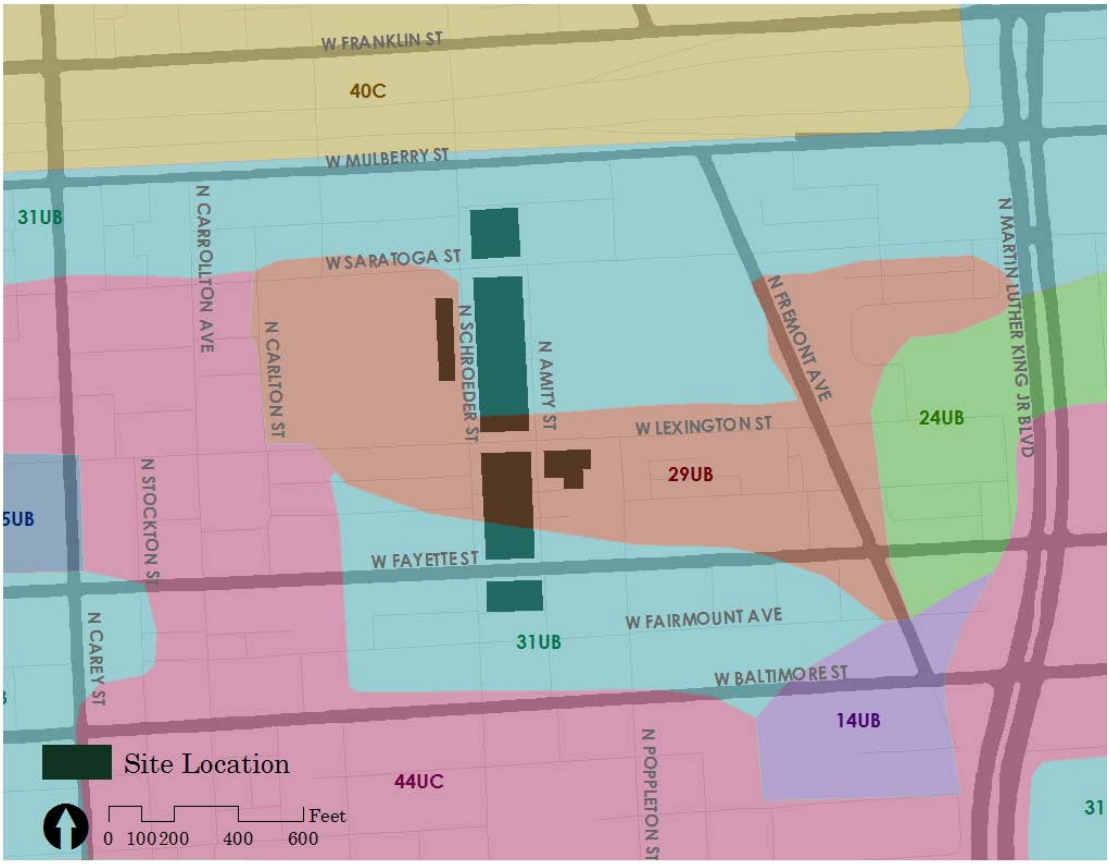

Figure 45. Soil survey displaying Urban Land Complex soils on the site.

Climate

The amount of sunlight and shade determines what can be grown on the site and how much of it. Due to the fact that no structures currently exist on the site, much of it remains unshaded throughout the entire year, except for the southernmost block between North Schroeder Street, North Amity Street, West Fayette Street, and West Fairmount Avenue which becomes completely shaded during peak growing hours of

winter. Because that block of the farm will be modular, those plants can be moved and placed in other areas of the farm to continue production during the winter season.

Figure 46. Sun/shade study identifying optimal areas to place crops during all four seasons.

The summer winds enter the site from the west. By keeping the western portions of the site somewhat open, cool breezes will be able to pass through the site and relieve workers and visitors of the farm during the hotter summer months. The winter winds enter the site from the northwest and will need to be blocked in order to protect crops as well as to keep the site enjoyable during the colder months. The annual rainfall for Baltimore is approximately 41 inches with May, June, and July as the wettest months of the year (NOAA, 2014).

Topography

On most blocks, the site is sloping towards the southwest corners of the blocks, ranging from zero to five percent. The somewhat flat site is ideal for laying out crop

rows. The raised beds will be placed perpendicular to the slope, helping control runoff and reducing erosion. The landform of the site affects sun exposure and wind exposure. Most of the slopes are facing south, allowing crops in these areas to receive the more direct sun during the winter months than other slope orientation. The portions of the site that have north-facing slopes and will receive very little direct sunlight during the winter will house community spaces and be used for other purposes, such as work stations or tool storage. The gentle slope also contributes to the site's meeting ADA requirements and creating an inclusive setting.

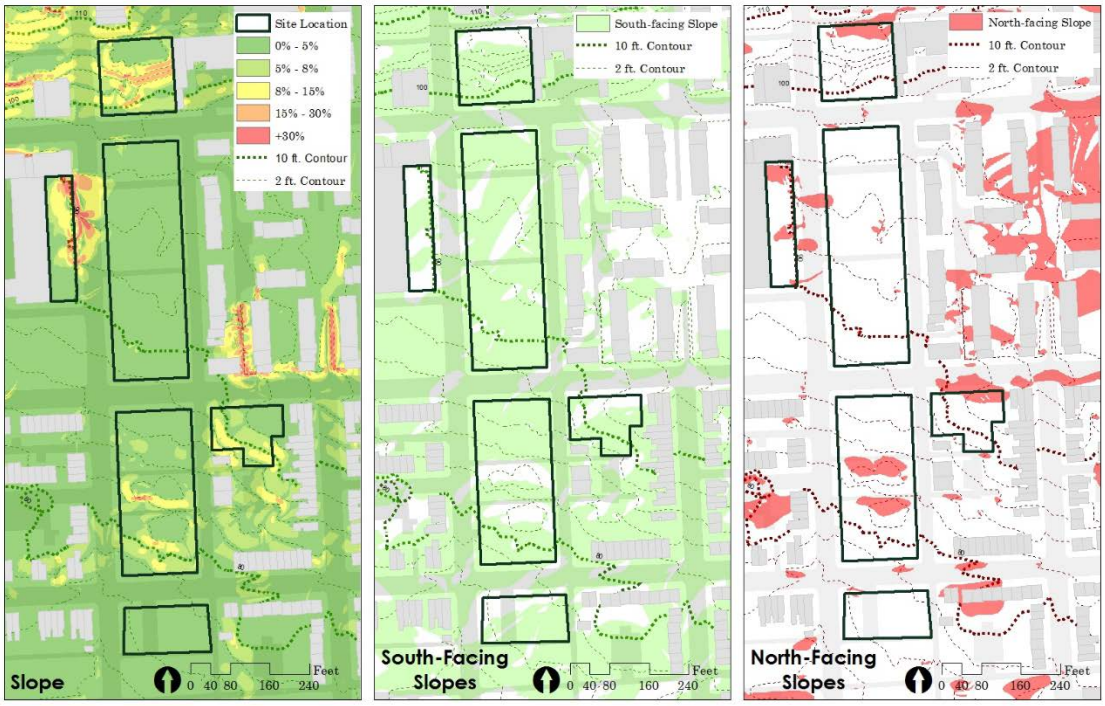

Figure 47. Slope study identifying optimal orientation for raised beds.

Using TR-55, stormwater runoff was calculated for each block as well as the roof tops of the school and the industrial building to the east of the northernmost block. The total area of unpaved, fallow surface is 3.8 acres. The total area of impervious roofscape is 0.8 acres, and the total area of impervious pavement is 0.7 acres. For the 1-Year Storm Event, the site produces 15,000 cubic feet (110,000 gallons) of runoff.

The 10-Year Storm Event produces 44,000 cubic feet (327,000 gallons) of runoff. By harvesting, filtering, and capitalizing on the site's stormwater runoff for crop irrigation, the design will reduce reliance on the city for water and encourage sustainable watering practices. Mitigating stormwater through the design will also reduce pollution and sediment that would eventually end up in the Chesapeake Bay. The stormwater practices should be located along the west and south sides of each block to capture the greatest amount of runoff. The stormwater control applications should also be inexpensive or modular to allow little loss in cost if the farms are moved.

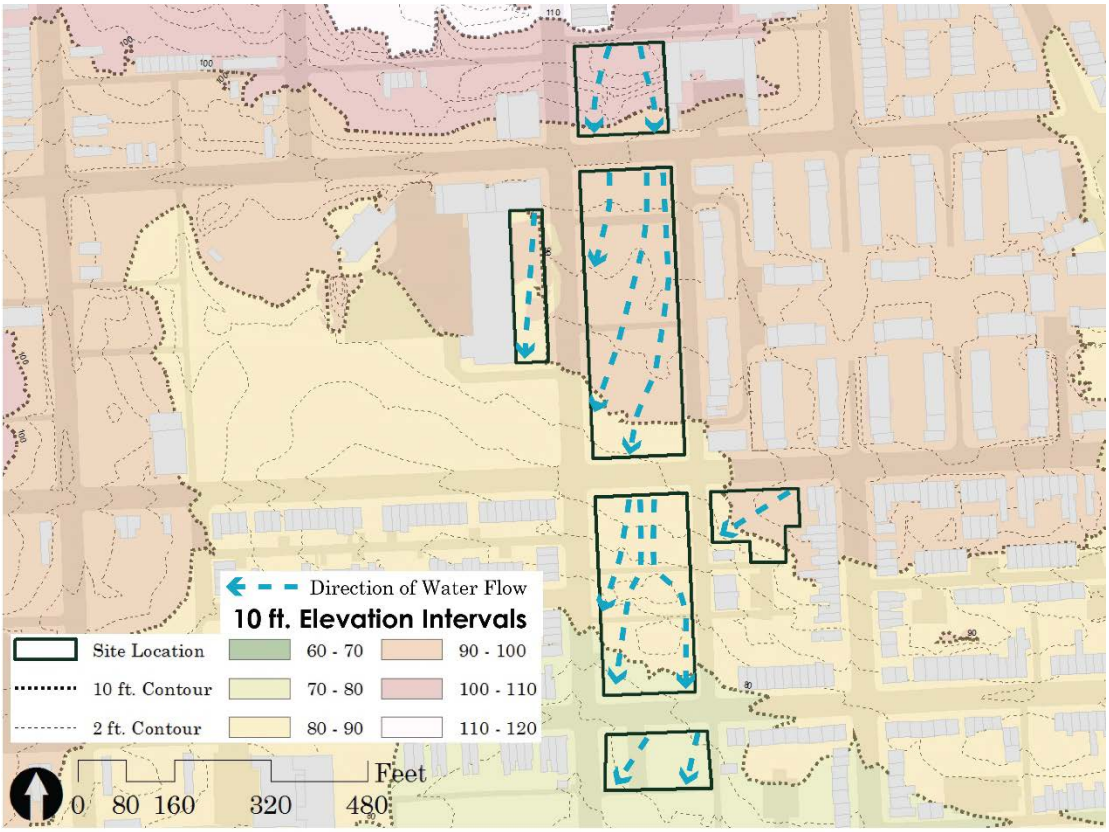

Figure 48. Topography map with hydrology.

Circulation

A vehicular traffic study conducted by the Department of Transportation identified the number of cars that drive along Poppleton's streets over the course of one

week day (reference). The most congested roads are West Saratoga Street and West Fayette Street with between 2,971 and 7,411 cars driving on them each day. By locating the work stations and structures along North Amity Street, a service road, farm workers can avoid these busier streets.

With over 40% of the neighborhood lacking access to a car, many of the residents rely on public transportation. There are two bus stops (Bus Routes 1 and 15) located on the site: 1) in the center of the block on the north side of West Saratoga Street and 2) in the center of the block on the north side of West Fayette Street. The main entrances to the site should cater to these two bus stops, directing people onto the site. While no designated bike lanes currently exist in Poppleton, Baltimore's Bicycle Map suggests that a bike lane should exist along West Saratoga Street and along North Schroeder Street. These two streets are already commonly used by cyclists. In order to encourage street life in Poppleton, activity should be directed towards North Schroeder Street between the site and Excel Academy.

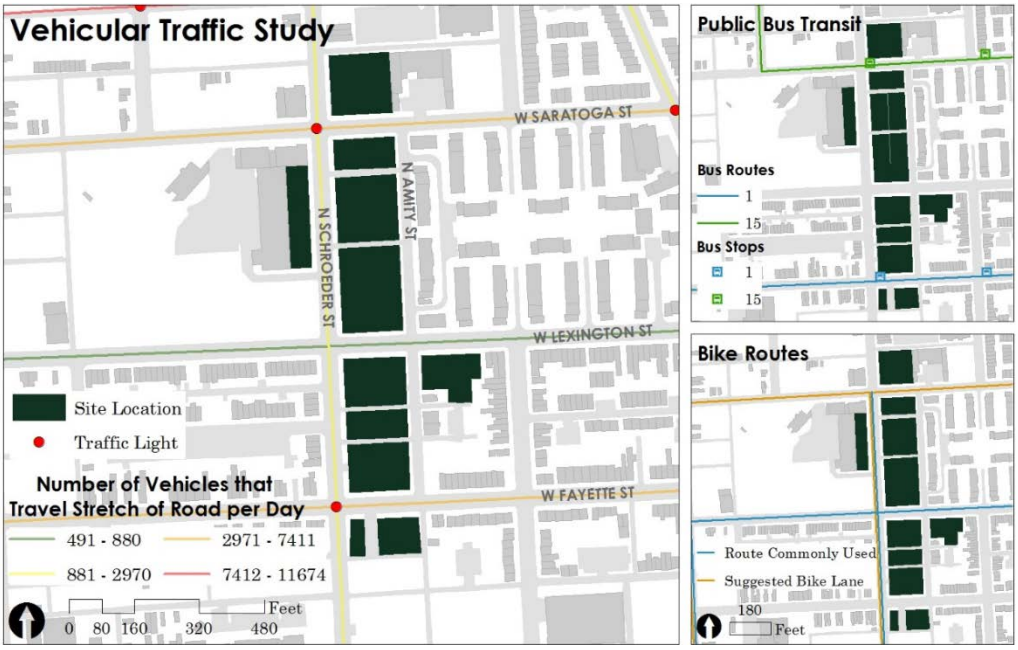

Figure 49. Traffic study and circulation maps identifying most common routes around the site.

Chapter 4: The Program and Design Strategy

Operation Market Garden: Design Concept

The Role of Victory Gardens in the United States during World War II

The United States government promoted victory gardens as a way for citizens to actively participate in the war effort during World War II; citizens gardening at home were portrayed as "fighting" the war every bit as much as Allied Troops overseas. In Baltimore, the Civilian Mobilization Committee was charged with implementing the Victory Garden campaign, and included such partners as the University of Maryland Cooperative Extension Service, the National Seed Trade Association, the State Department of Education, Baltimore City Public Schools, the Children's Playground Association, and the Garden Club of Baltimore (Office of Civilian Defense, 1943). In 1943, there were about 50 community gardens with approximately 3,000 gardeners in Baltimore (Baltimore Sun, 1943). 60,000 families were involved in the war effort (Baltimore Sun, 1947).

Figure 50. The Evening Sun's (Baltimore Sun) Annual Gardening Contest in 1945 marked the 34th year for the event (Baltimore Sun file photo, 2011).

World War II Allied Military Operations

Operation Market Garden was a World War II allied military operation, in which Allied forces parachuted into the Netherlands, fighting from a starting point within the country rather than from the coast. The tactical objective was to secure structural bridges and allow rapid advancement into enemy territory to end the war.

Figure 51. Paratroopers dropping into Holland during Operation Market Garden (Source unknown).

How Historical Concepts Translate into Project Concepts

World War II's Victory Garden food campaign focused on health, exercise, and morale for citizens remaining on the home front. Promotional material catered to the idea of the garden as a place where people from all social, economic, and cultural backgrounds could come together (Lawson, 2012). Given this context, the concept of the thesis carries the idea one step further by grafting WWII Operation Market Garden's imagery and ethos onto the urban farm design: urban agricultural strategies that combat food security issues in food deserts. The use of parachute and bridges imagery reflect this concept through the design and also act as a brand for Poppleton's urban farm. Old parachutes are used as shade canopies that signal to residents that the market and farm are open. The parachutes are raised by lever and pulley systems attached to refurbished street lamp posts and existing wooden electrical poles that run through the center of the site. A steel gateway in the form of a bridge is a landmark at the entrance of the farmers' market, and smaller pedestrian bridges similar in likeness are constructed over the bioswales, connecting the street to the site.

Poppleton's food desert is a public health issue. Poppleton is segregated from downtown Baltimore despite its geographical close proximity. With the future development of Poppleton to include mixed-income housing and the Red Line Light Rail, community spaces need to bring together people who consider themselves to be different.

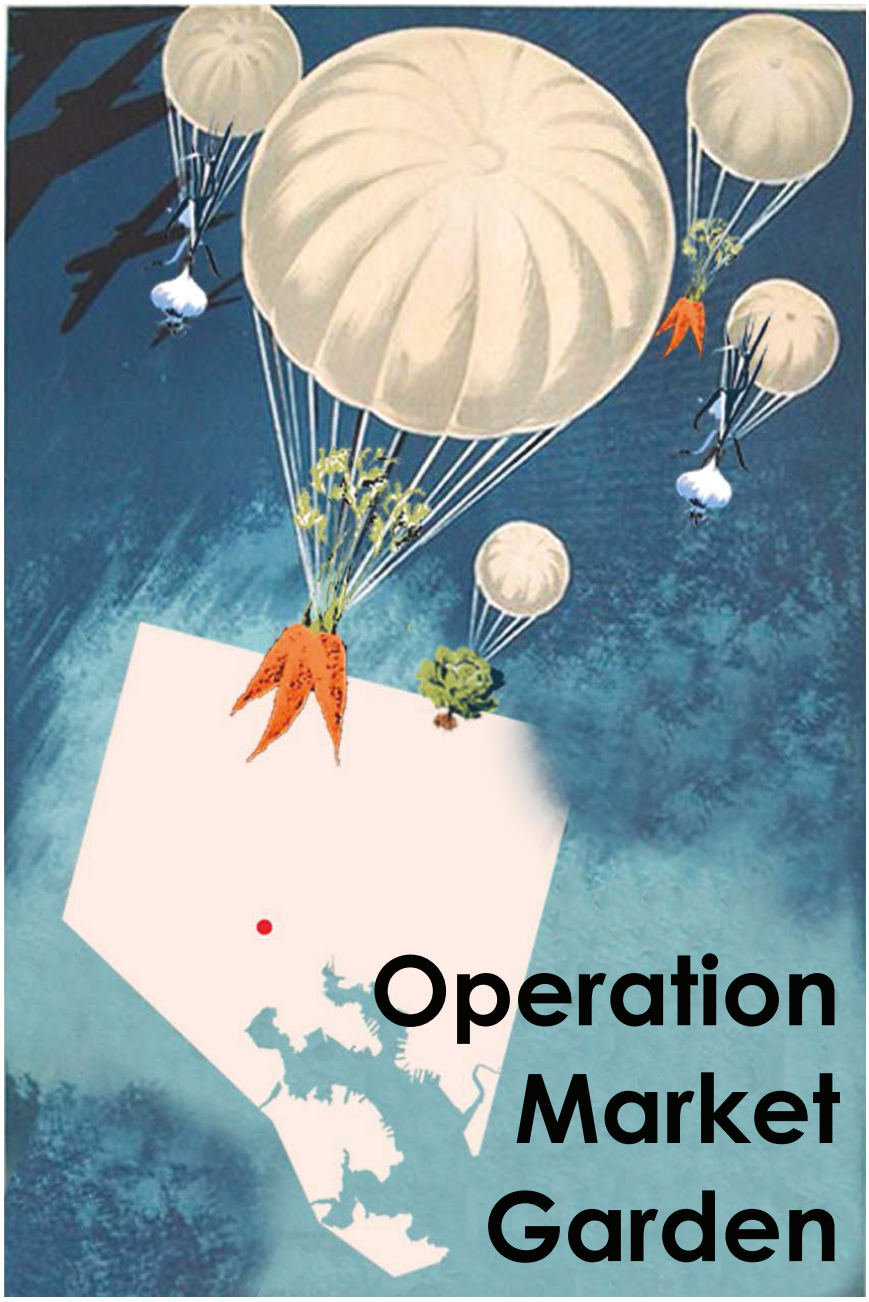

Figure 52. Operation Market Garden campaign poster.

Design Goals and Objectives

The overarching objective for this design project is to establish an urban agricultural food system that provides fresh and local vegetables for Poppleton residents and the students of Excel Academy at Francis M. Wood High School. The following goals emerged in response to the site inventory and analysis, which identified a number of opportunities and constraints for the site.

1. Improve and increase the availability of fresh vegetables in Poppleton

2. Create an educational community center that teaches Poppleton residents and the high school students about food production and nutrition

3. Repurpose Poppleton's vacant land to build value that benefits the community and to practice sustainable approaches to growing food

Chapter 5: The Site Design

The site plan for the Poppleton urban farm site evolved in response to the need for fresh and healthy food options in a neighborhood identified as a food desert that lacks a central community space but has an overabundance of vacant land. The design responds to the Baltimore Food Policy Initiative's focus to redevelop vacant land for agricultural purposes that, in turn, improve the local food environment.

The site plan includes (Fig. 53):

A. Bridge Landmark

B. Farmer's Market

C. Parachute Shade Structure and Outdoor Dining Plaza

D. Outdoor Classroom

E. Farm Management Office

F. Public Restroom

G. Outdoor School Cafeteria

H. Bioretention Pond and Learning Garden

I. Parachute Shade Structure (typ.)

J. Apiary

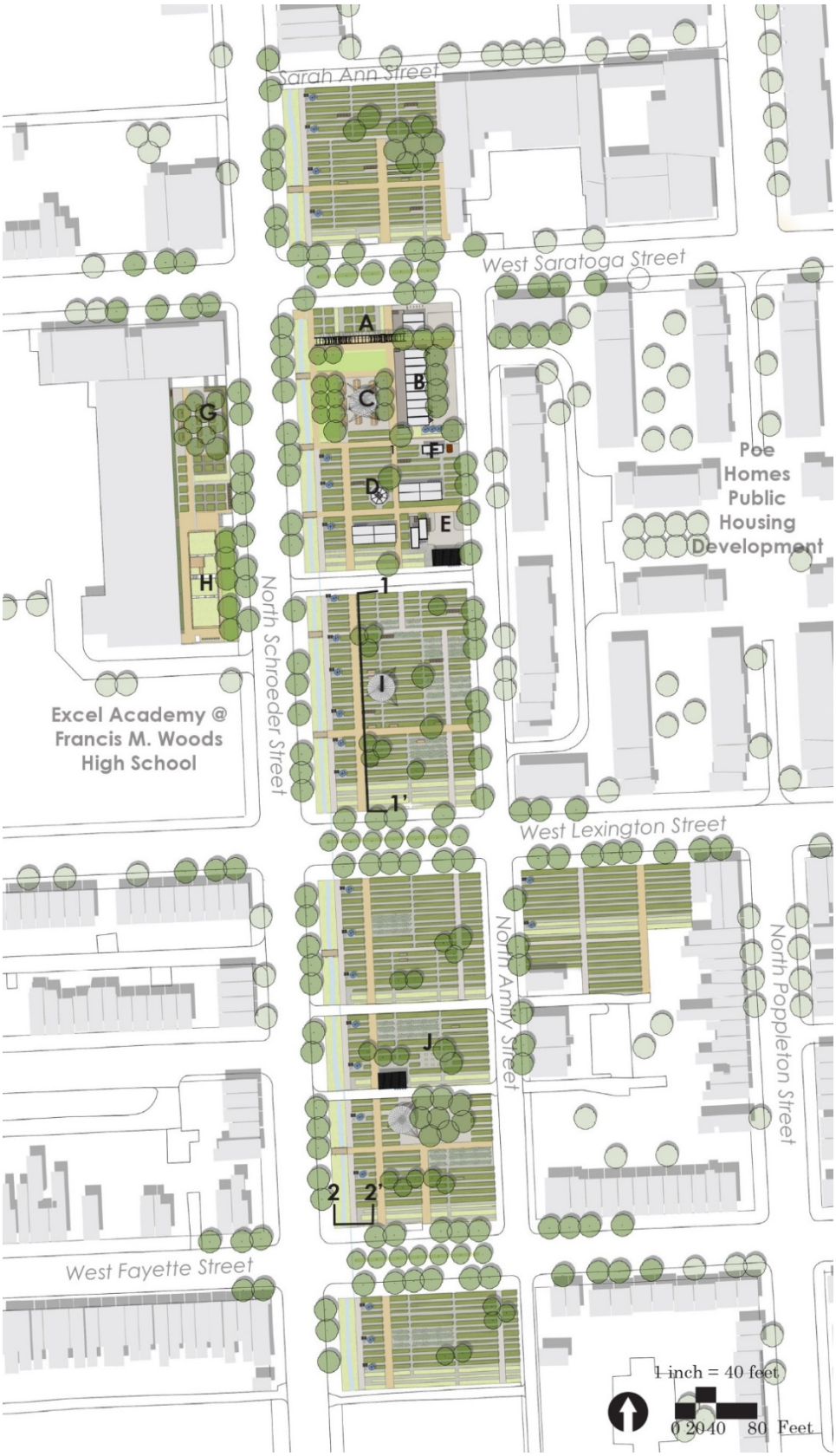

Figure 53. Site plan of Operation Market Garden urban farm and farmers' market.

The site consists of two main areas:

1. The mobile blocks that will support the production areas of the farm

2. The permanent blocks, located between North Schroeder Street, West Saratoga Street, North Amity Street, and Clooney Street, and the school courtyard that will house the community hub made up of the farmers' market, outdoor dining, and educational center

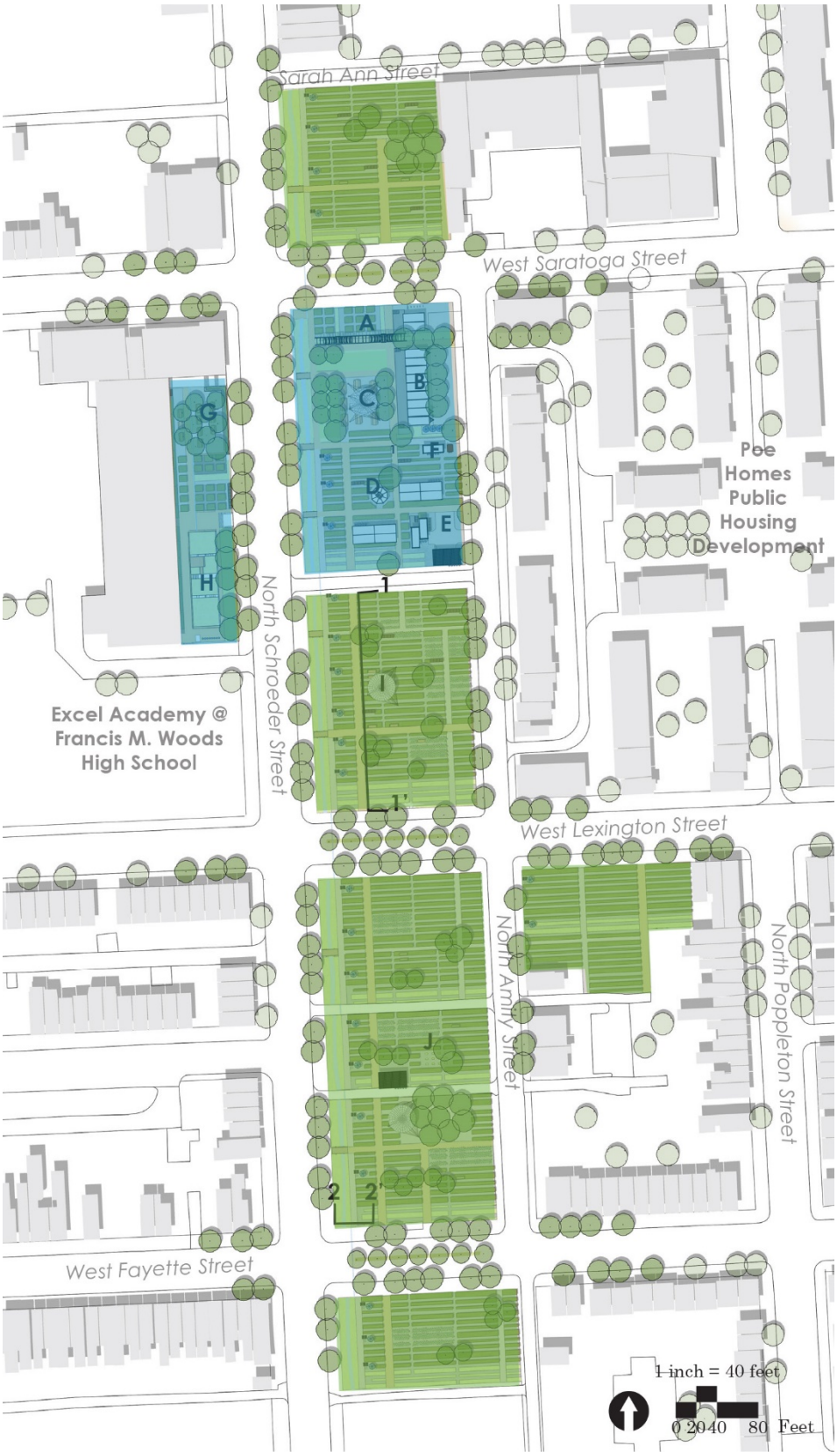

Figure 54. The permanent blocks are highlighted in blue, and the mobile blocks are highlighted in green.

Community Space

The city block between North Schroeder Street, West Saratoga Street, North Amity Street, and Clooney Street houses the community hub, consisting of the farmers' market, outdoor dining plaza, and educational center. While the production blocks of the urban farm will move to another site when city development is introduced, the elements and programming of this site block will remain in place. The permanence of the community-driven block can be a way of demonstrating to residents that the farm is an enduring neighborhood entity and that the improvements to the local food environment will continue.

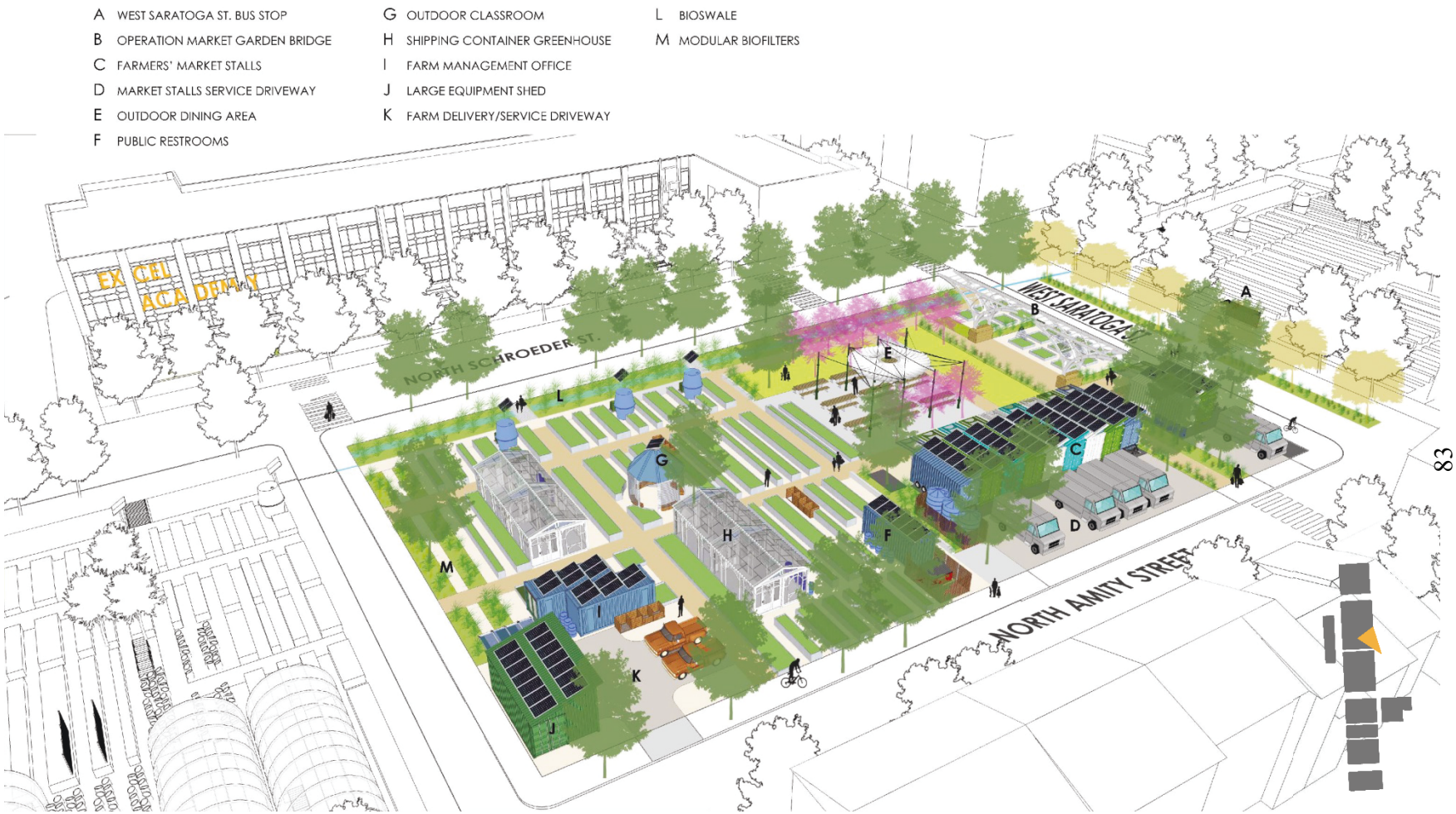

Figure 55. Bird's eye of the farmers' market and educational center city block.

The imagery of bridges and parachutes appear in different areas of the site, highlighting points of convergence in circulation and acting as landmarks for civic event spaces. Circulation and connectivity played a key role in laying out the site plan. The pedestrian circulation system is designed to coincide with public transportation, bringing together activity at the neighborhood street level (Poppleton's "front stoops") with residents and visitors of the urban farm and farmers' market. As shown in Figure 57 new pedestrian pathways and crosswalks lead in to the site from bus stops along city routes 1 and 5 located at the centers of the north sides of West Saratoga Street and West Fayette Street. The crosswalk from the bus stop at West Saratoga Street introduces visitors to the community hub. A bioswale median of trees protects walkers from cars and acts as a traffic calmer along West Saratoga Street. The steel bridge at the entrance frames the view into the site, representing a gateway to the market and farm.

Figure 56. Perspective of the pedestrian view from the West Saratoga Street bus stop, facing south towards the farmers' market and steel bridge.

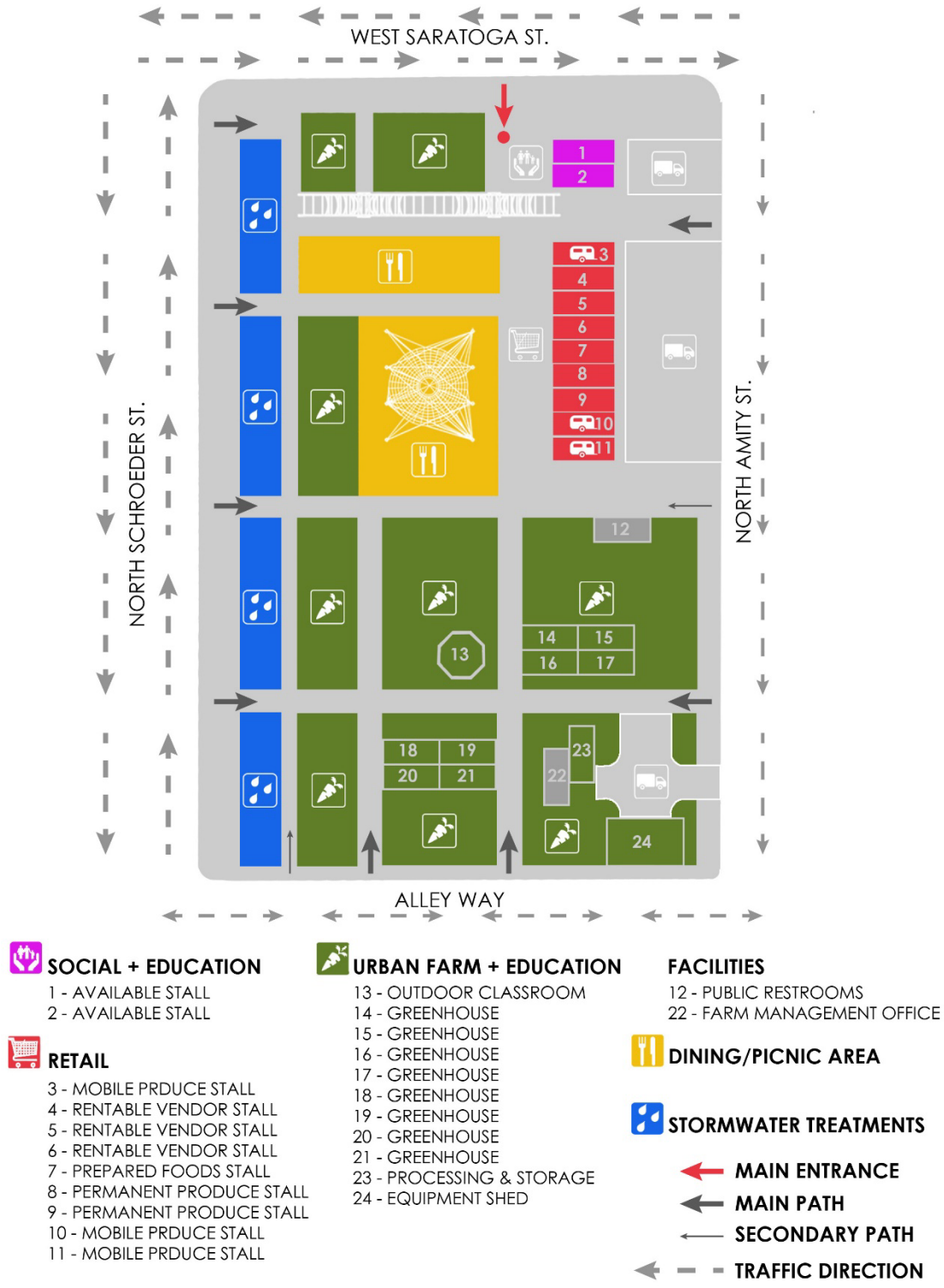

Figure 57. Diagram of site elements and circulation.

Farmers' Market

The row of metal shipping containers along the east side of the site, beginning at the entrance, make up the vendor stalls for the farmers' market. Each stall is 8 feet by 15 feet and can house one vendor. They are modular storage units that have been refurbished as individual store fronts. Each stall is insulated and wired for lighting, fans, and heating. To avoid flooding, the base of the stalls are raised 1 foot above the ground. A wooden walkway sits level with the front entrance of each stall, and ADA accessible ramps are located at the north and south ends. The front awnings act as both sun and rain protection and front doors of the stalls. In the morning, the awning is pulled up and latched into place. At the end of each day, the awning is pulled down and locked to secure the possessions inside.

Figure 58. Perspective of the farmer's market stalls during operating hours.

The two isolated stalls at the northern portion of the row farmers' market are dedicated to social and educational causes. These stalls are available free-of-charge to organizations that provide social or educational services for Poppleton residents. For example, a community legal service can come in one Saturday a month to answer

questions and provide free legal advice, or a tax service can sign out a stall one weekend during tax season to help residents with their tax returns. The stalls will also act as information kiosks for the urban farm and market.

Three shipping containers within the larger row of the farmers' market stalls are mobile. The retrofitted shipping containers each sit on a trailer that can be hitched to the back of vehicle and pulled. During the week, the shipping containers are moved to other vacant lots in the neighborhood, where they act as a small storefront. Three stalls are available for rent to local neighborhood entrepreneurs who are seeking an inexpensive space to host their business. The stalls are also available for lease to other farms that sell products not available from Operation Market Garden, such as grains, meat, and dairy.

Figure 59. Models of the mobile farmers' market stall, whose roof pops-up to allow sunlight and airflow through the metal shipping container when open for business. It provides an ADA accessible ramp for customers.

Two stalls are dedicated to selling the Operation Market Garden-produced vegetables and fruit, and one stall sells food prepared in the teaching kitchen located at the farm management office. Refrigerators are located in each of these stalls to properly store processed vegetables and unsold vegetables at the end of the day. For additional space on market Saturdays, the space beneath the bridge can accommodate tents and tables to include more vendors.

Figure 60. Perspective of the steel bridge landscape during public events.

The farmers' market location changes the food dynamic in the neighborhood. Its hours of operation provide residents with more opportunities to purchase fresh, healthy food. 483 residences (out of 823) are within the quarter mile walking distance to the market. Figure 61 identifies the farmers' market quarter mile service area.

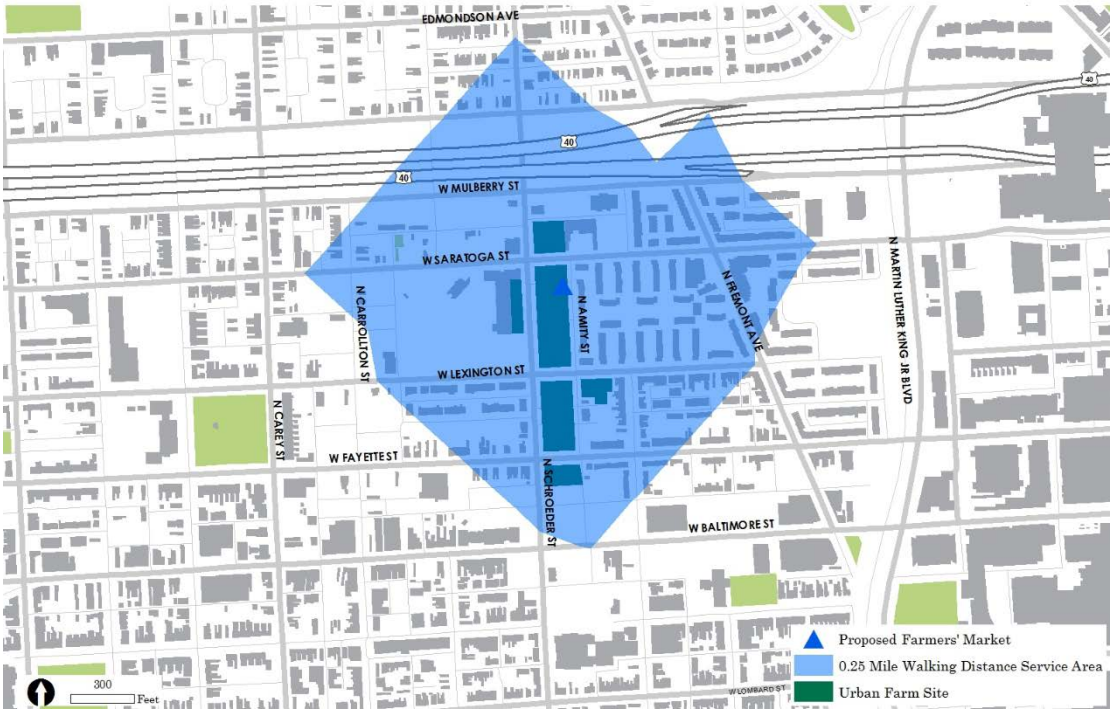

Figure 61. Map of the farmers' market service area, highlighting in blue the 483 residences within the quarter mile walking distance.

The needs of the remaining 340 residences who do not fall within the service area are addressed through the mobile farmers' markets. During the week when the three rentable stalls are not hosting vendors, they are each driven to a location in the neighborhood where they are set up as a vegetable market. They have more limited hours of operation; they will be open Monday through Thursday from 8 a.m. to 7 p.m. and managed by one employee. On Friday, the stalls are brought back to the community hub and parked for Saturday's market. Each mobile farmers' market is restocked on Sunday before being taken out again on Monday.

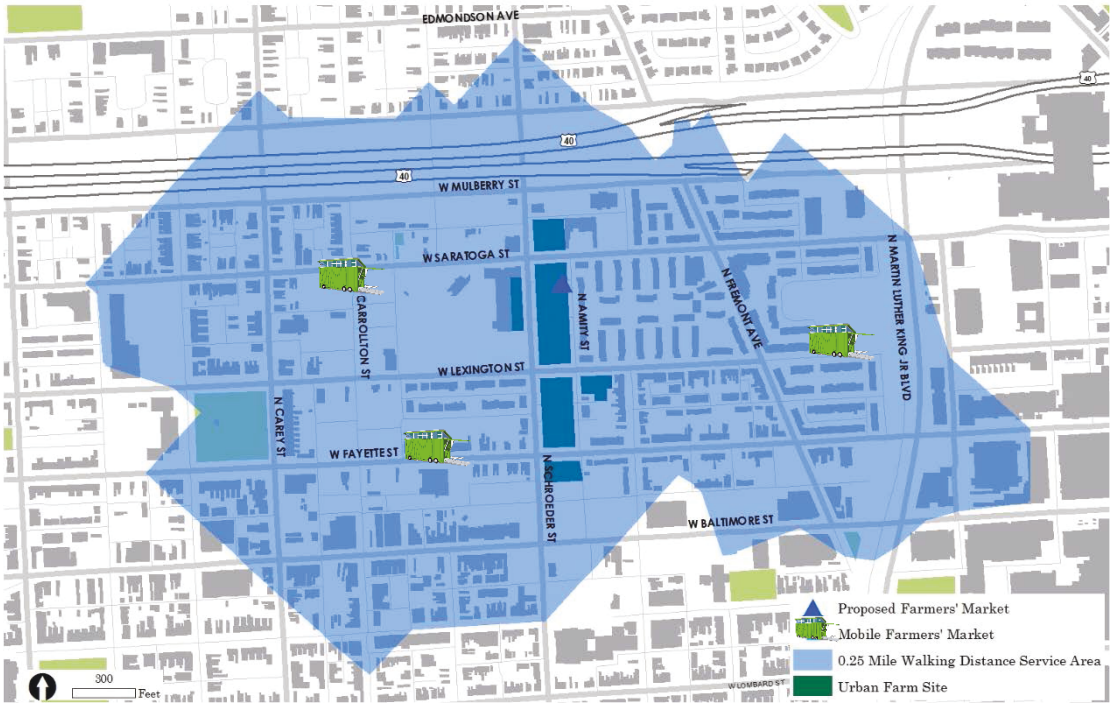

Figure 62. Map of the Operation Market Garden mobile farmers' markets service area. With the expanded service area, all 843 residences in the neighborhood have access to fresh produce five days a week.

During the site selection and suitability analysis, meal assistance programs, such as food pantries, free and reduced lunch programs, were identified as possible beneficiaries of the urban farm. As a follow-up, the meal assistance programs that fall within 1.25 mile radius of the farm management office's processing and storage facility have been located. A bicycle delivery system with mapped out routes can service these entities by delivering farm fresh produce to their doorstep. If the need for grocery deliveries grows within the neighborhood, more bicycle routes can be established. While encouraging safe biking, the delivery system can help to raise awareness to the need for designated bicycle lanes in Poppleton.

Figure 63. Perspective of designated bicycle lanes for produce deliveries.

Figure 64. Bicycle delivery routes from the distribution center (processing and storage facility in the farm management office) to nearby food pantries.

Figure 65. Bicycle delivery routes from the distribution center (processing and storage facility in the farm management office) to nearby school free and reduced lunch programs.

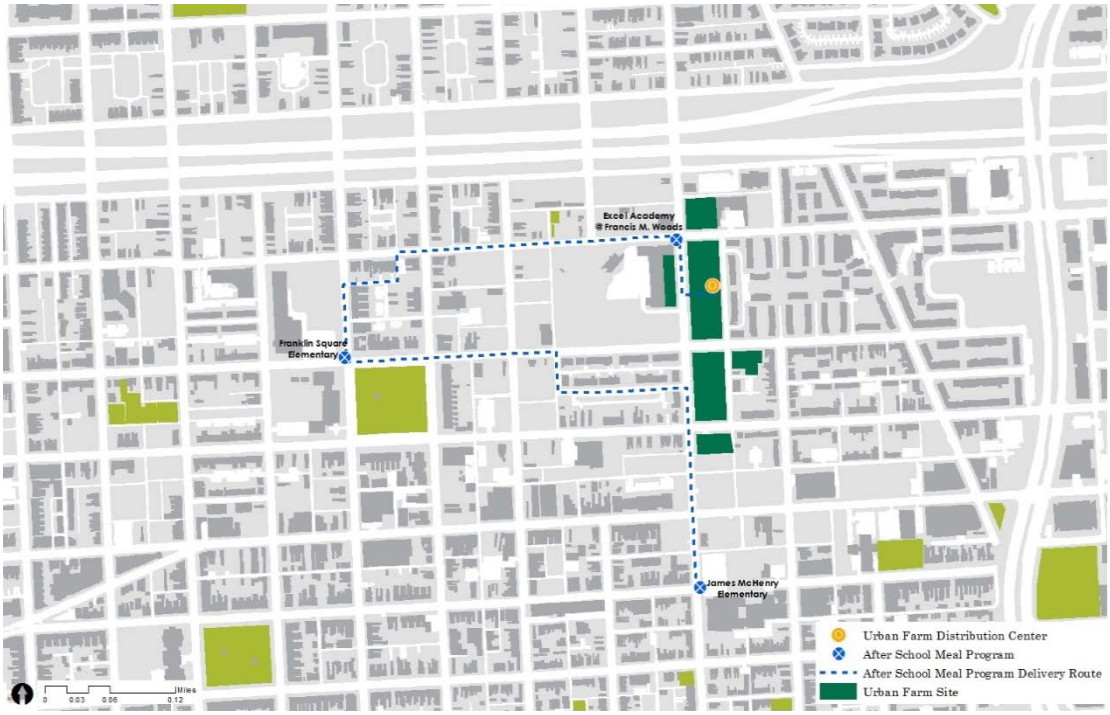

Figure 66. Bicycle delivery routes from the distribution center (processing and storage facility in the farm management office) to nearby after school meal programs

Outdoor Dining

The outdoor dining plaza is adjacent to the farmers' market stalls. It is surrounded by an orchard of small fruit and nut trees. Two rows of refurbished, metal street lamp posts run north-south towards the steel bridge. On big event market days, a parachute canopy can be raised and lowered using a system of levers and pulleys. A raised parachute signals to the neighborhood that the farm and market are open. The parachute provides shade for the diners sitting underneath it. Three rows of tables and benches run parallel to the posts. They are arranged to encourage communal, family-style dining amongst the farmers' market visitors. By situating raised beds next to the tables, diners can begin to associate their food with the surrounding agriculture.

Figure 67. Perspective of the outdoor dining plaza and orchard at dusk.

On nights with neighborhood performances, concerts, or special events, the space beneath the steel bridge becomes a staging area, and the outdoor dining plaza turns into seating for the audience. A lawn surrounding the dining plaza adds room for visitors to picnic in the grass, either in the sun or under the shade of the small fruit trees.

Concrete benches provide additional seating and line rain gardens that collect runoff from the outdoor dinging plaza and raised beds.

Educational Space

To the south of the outdoor dining plaza, the pathways lead into rows of metal raised beds, which are part of the urban agriculture educational center. In partnership with Excel Academy, the educational center has the following facilities:

1. Outdoor classroom
2. Seed starter greenhouses
3. Farm management office
4. Teaching kitchen, processing, and storage facility
5. Large equipment storage shed

Figure 68. Perspective of the urban agriculture educational facility, including the outdoor classroom and shipping container greenhouses.

Excel Academy's environmental science, plant science, and biology courses can be taught in the outdoor classroom. The outdoor classroom's walls are made up of slatted panels to allow cools breezes and natural light during the warmer months of the year. Its trellis-like structure supports vining edible plants and flowers. Both the public and the high school have access to the outdoor classroom, where neighborhood lectures, discussions, and meetings can be held there. Greenhouses made from shipping

containers (Fig. 76) are located to the north and northwest of the farm management office. They house and incubate the seed starter trays that, once mature, are transplanted to raised beds. The educational center is the most interactive space between the neighborhood and high school. During the week, cooking classes can be held in the kitchen and processing facility attached to the rear of the farm management office. In the cooking classes, residents and students are taught how to make healthy meals with ingredients supplied by the farm.

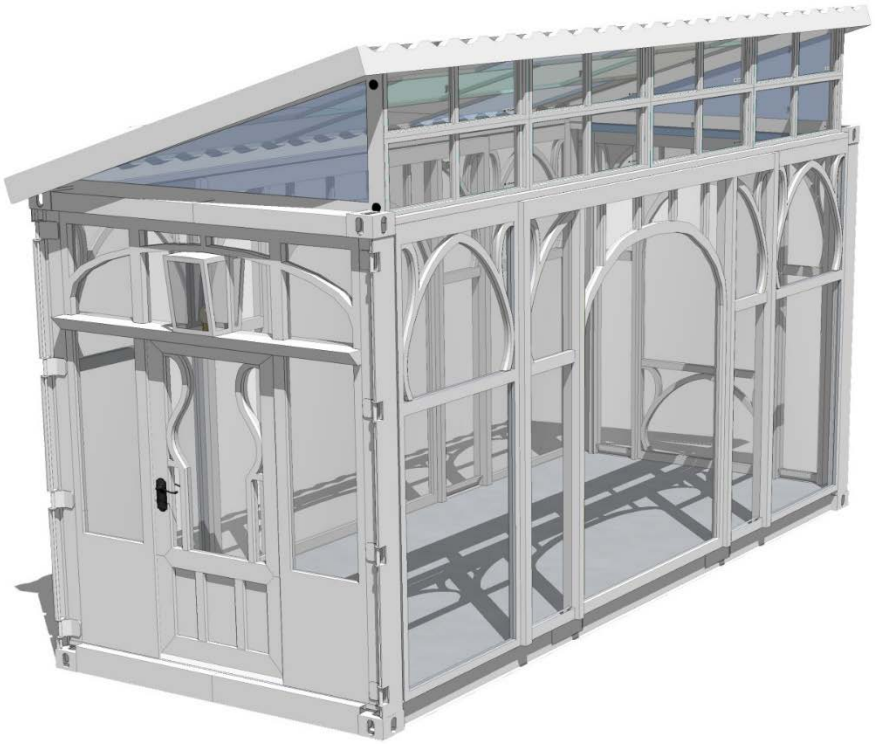

Figure 69. Model of a shipping container greenhouse.

Landscape Metrics

Food Production

The temporary areas of the site support 49,300 square feet (about 1.1 acres) of food production with the expected harvest between 390,000 and 470,000 pounds of vegetables. This meets between 53 and 64 percent of the neighborhood and school need. Vegetables such as spinach, carrots, and Swiss chard are grown on site. Figure 70 displays the crop planting schedule for one year and the estimated amount of each vegetable produced during that year (in pounds). Plants were chosen based on their average yields (pounds per square foot), their growing costs, and variety. Crops with long shelf lives, such as potatoes and turnips, were not chosen because their storage capability. The farm supplies vegetables that have shorter shelf lives and are less likely to be purchased during the once-a-week or once-every-two-weeks trip to the grocery store. The farm is expected to generate a revenue of about $420,000 per year for the produce sold. During each growing season, there are at least ten different kinds of vegetables available to keep customers interested.

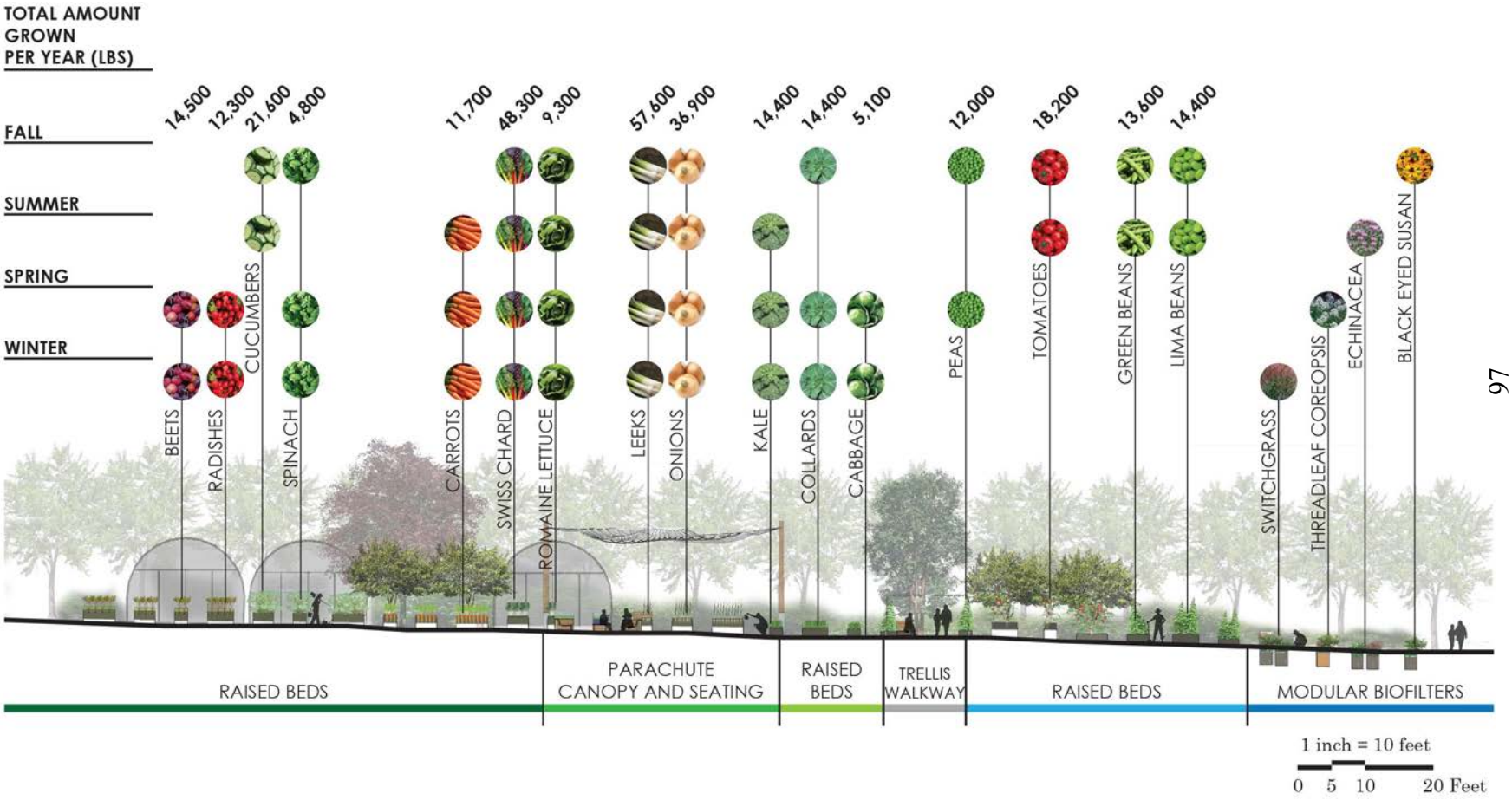

Figure 70. Section 1-1' showcases the vegetables and fruits that will be grown throughout the year and their annual production in pounds

The crops are planted in rectilinear rows, oriented to receive the greatest amount of direct sunlight. Because not every square foot of the farm can be harvested at the same time, succession planting and crop rotation system allow vegetables to be grown all year. With this method, one square foot of land can grow three crops per year (Coleman, 2012). Hoop houses extend the growing season into the cold winter months.

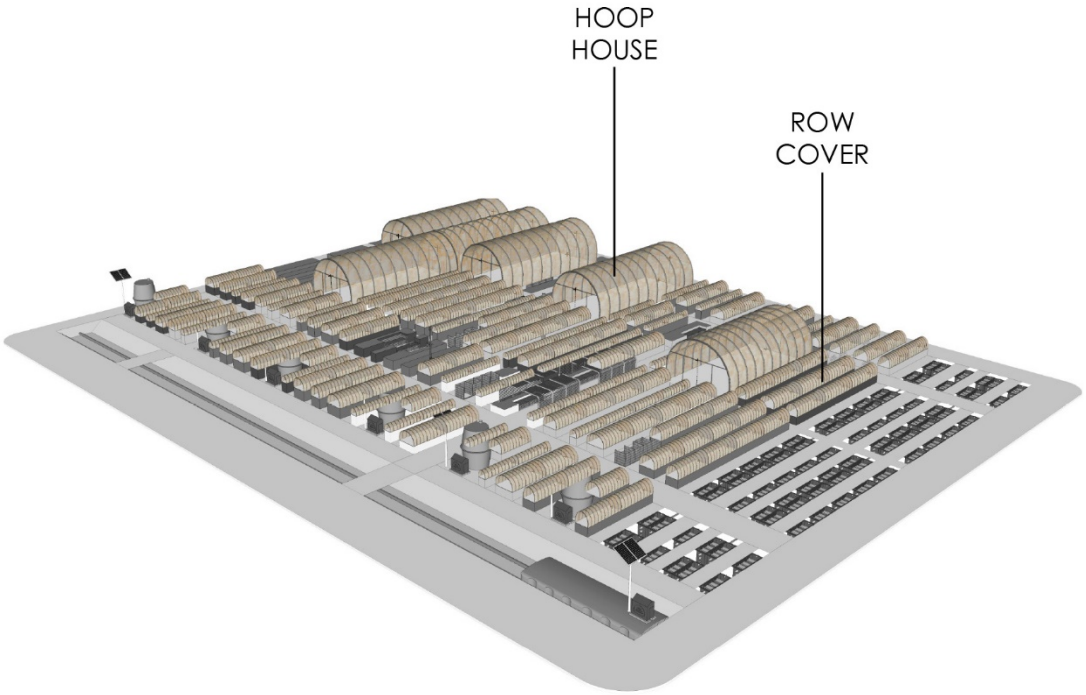

Figure 71. Axonometric diagram of a typical production block, highlighting the hoop houses and row covers for the winter growing season.

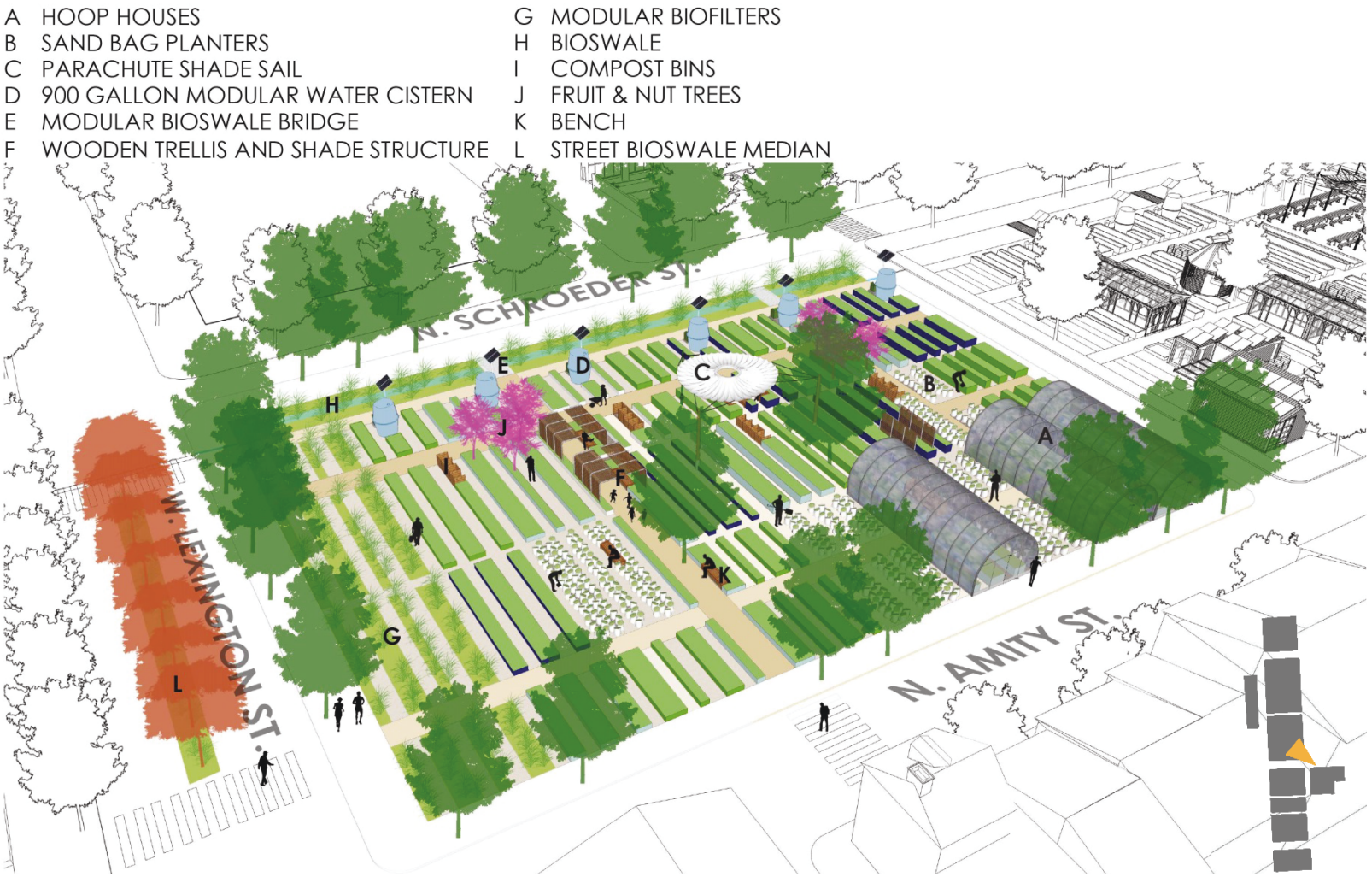

Figure 72. Bird's eye view of the farm production between North Schroeder Street, North Amity Street, and West Lexington Street.

In order to maintain healthy soil, crops will be rotated in the order of a heavy feeder crop (e.g. collards), followed by a light feeder crop (e.g. leeks), and lastly a nitrogen-fixer crop (e.g. peas) before the rotation begins again with a heavy feeder (e.g. kale). The raised beds require about 33,500 cubic feet (1,200 cubic yards) of soil, the seed starting trays require 4,000 cubic feet (150 cubic yards). The amount of growing medium needed for the site far exceeds what can be produced on site. The soil will need to be initially supplemented by an outside source. Composting stations are set up throughout the site for workers to recycle green (grass, food scraps, and manure) and brown (leaves, straw, woody materials) waste matter produced on site. Each composting station has four bins in which the compost can be cycled through before being reintroduced back into the raised beds as fertilizer. Enough compost can be generated to supply the seed starter trays, with all thirty-two bins producing a total of 6,000 cubic feet of soil.

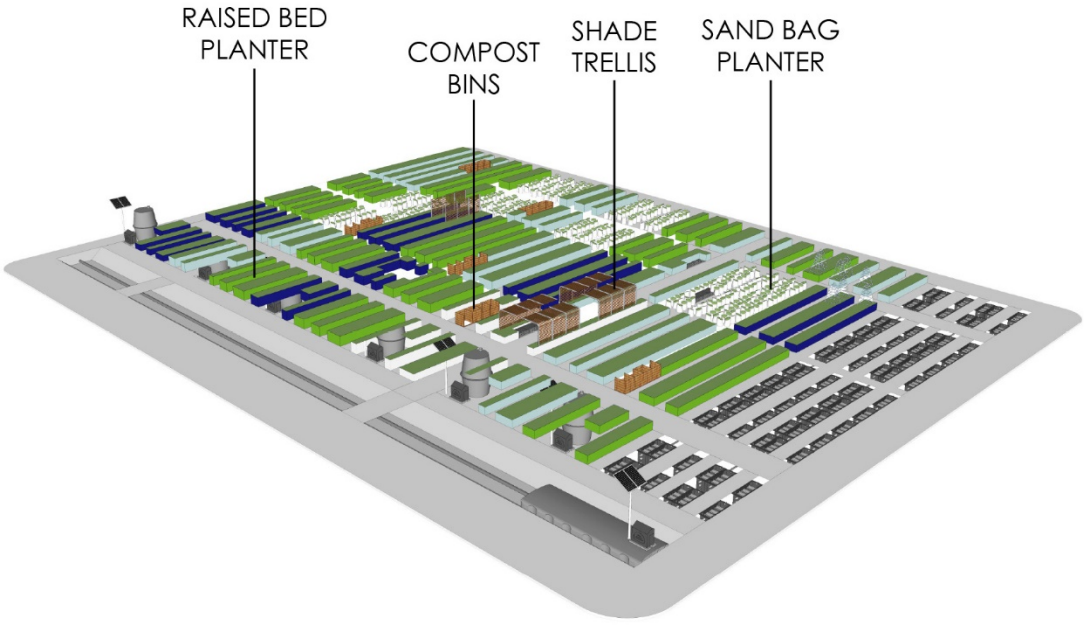

Figure 73. Axonometric diagram of a typical production block, highlighting the growing mediums.

Water Harvesting

The crops require an estimated 1,600,000 gallons of water per year at the rate of 1.5 inches of water per week. The plants receive water every other day through an automatic drip irrigation system. Rain water harvesting supplies most of the watering needs. The water is stored in twenty-five 900 gallon cisterns on the farm and ten 1,800 gallon cisterns located near farm buildings and in Excel Academy's courtyard. In times of drought, water will need to be transported around the site in rain barrels to restock low cisterns. The rain barrels can be filled with the water from storage tanks located next to buildings around the site. In cases of emergency, water spigots are hooked up to the city water line and are located along the edges of the farm, next to the city sidewalks.

Stormwater catchment systems are utilized to harvest runoff from each block and the school roof. Bioswales planted with rice run along the western edge of the site. Modular biofilters are imbedded in rows along the south side of the site. The biofilters are planted with native, drought-tolerant perennials. The stormwater filters through the bioswale and biofilters, which remove particulate matter and sediment. An underdrain collects the water; gravity moves the water to an underground tank, where it is treated. The treated water is then pumped through pipes to each 900 gallon cistern, which is hooked up to the drip irrigation system. A pump attached to each cistern disperses the water through the irrigation system to the raised beds. Due to the potential for contamination from roadway chemicals and vehicle discharge (oil, gasoline, etc.), stormwater from the streets is not directed onto the site for treatment.

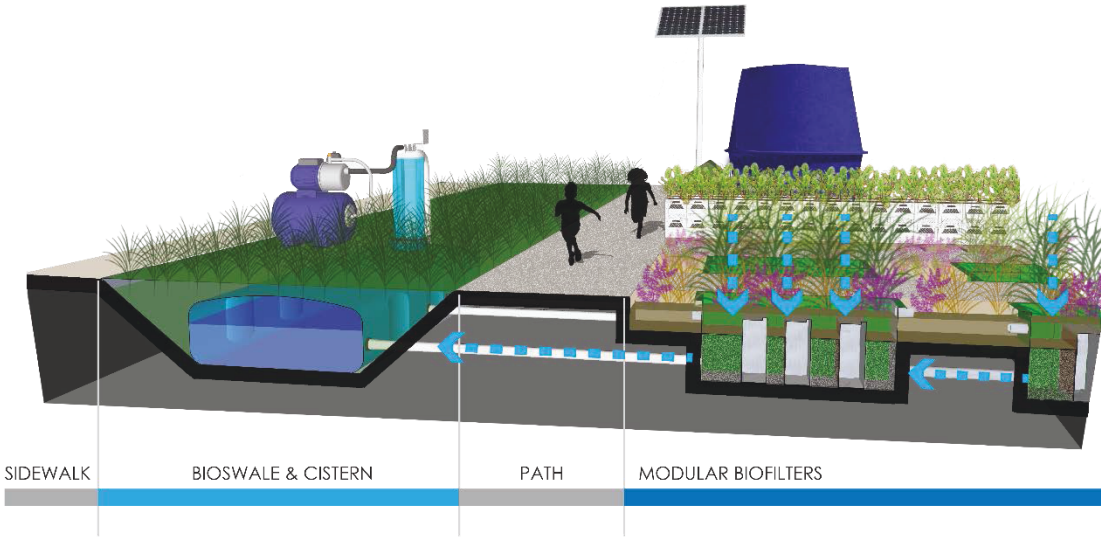

Figure 74. Section 2-2' displays the rain water harvesting system.

The school roof is also utilized as a catchment area for stormwater runoff. Water collected from the roof drains through exposed pipes attached to the east wall of the school building. The pipes empty into planters along the base of the building. The stormwater filters through the planters before entering an underdrain that runs through the base of each planter. The underdrain carries the water to a constructed wetland in the school courtyard. Through a system of small bioretention ponds, the stormwater is filtered and cleaned. When reaching the lowest bioretention chamber, the filtered water is pumped into above ground cisterns where it can be held until needed for crop irrigation.

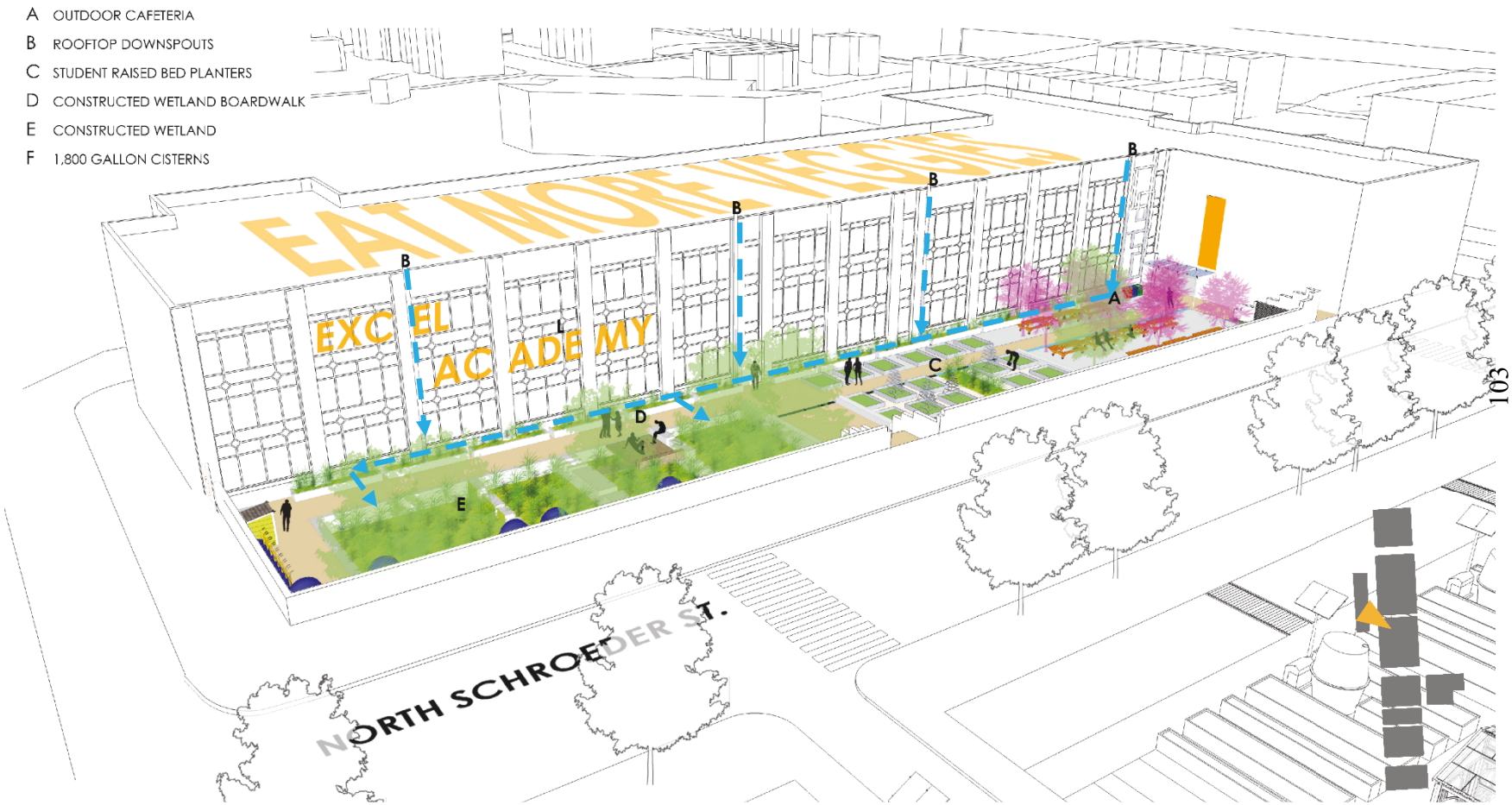

Figure 75. Bird's eye view of the school courtyard with the constructed wetland and rooftop stormwater collection system.

The total amount of rainwater harvested from all stormwater techniques is 43,847.51 cubic feet (about 328,000 gallons). The rainwater harvesting systems cost an estimated $335,000 to install with maintenance costs of $17,000 per year. If the irrigation system were to use only city water, the total cost for the farm would be $21,000 per year.

Energy Supply

Two hundred nineteen solar panels are housed around the farm and market. They are found on several farm building rooftops, above pedestrian lamp posts, and connected to cisterns. They are oriented to receive the most amount of direct sunlight in order to generate energy that sustains the site and to generate extra income for the farm. The panels generate enough energy to power the electricity for electrical outlets, lighting, heating, and fans in the farmers' market stalls, the processing and storage kitchen stall, the public restrooms, the equipment sheds, and the farm management office. They also generate electricity to provide suitable pedestrian lighting in the outdoor dining area, along the market and farm pathways, and in between the raised beds, affording a little extra time at the end of the day to finish farm duties when daylight is not available. The panels deliver energy to the pumps that power the rainwater harvesting system and drip irrigation. Solar power is economically feasible for drip irrigation systems because they have low lifting requirements and use less water (NMSU Extension, 2004).

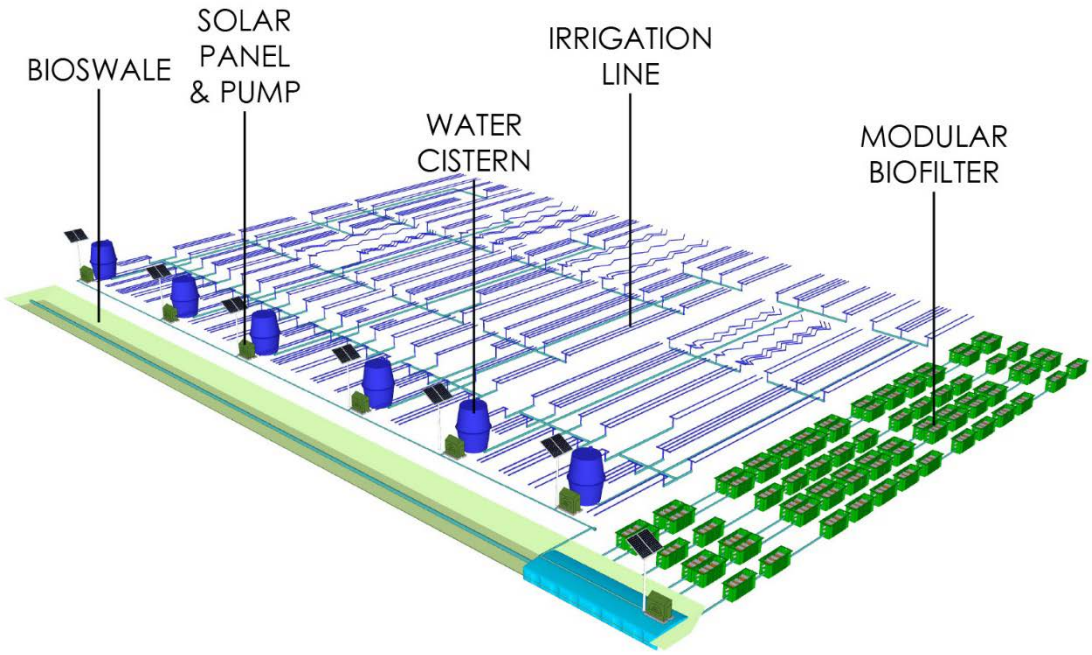

Figure 76. Axonometric diagram of a typical production block, highlighting the irrigation and energy systems.

The total amount of energy spent on the site is 49.395 kilowatt hours (kWh). The cost to install the solar system is about $410,000. If the farm were to operate with a traditional electrical system that connects to the city grid, electricity would cost roughly $6,400 per year. The solar energy system is estimated to generate enough energy to cover all of the farm's electrical needs in addition to earning the farm an additional $6,400 per year with the extra generated energy being sold back to the utility service through Maryland's Net Metering Program.

Giving Purpose to Vacant Lots

The possibility of development is one risk for housing on vacant land. Unless the land can be purchased by the organization, the only option is to move. The La Cite Development proposal (Figure 43) locks in two blocks of the urban farm during their first phase of construction. By transporting the farm to another site within Poppleton,

farming operations can continue to supply a local fresh food source and to publicize urban agriculture as a viable source in the neighborhood. The community hub block between North Schroeder Street, West Saratoga Street, North Amity Street, and Clooney Street will remain where it is. All other production blocks will move to other sites.

Modular Components

Modular components are necessary for the process of moving to remain feasible. Modular farms are not a new concept. The Prinzessinnengärten in Berlin, Germany and the Riverpark Urban Farm in New York, New York have performed the moveable feast multiple times. This accomplishment is achieved largely due to the material makeups of the farms. Each site uses milk crates as planters to easily transport and stack. The size of the milk crate allows it to be carried by an individual. When the farms must vacate a site, the milk crates are loaded into carts, onto shipping pallets, or into trucks and taken to the next site where they continue to grow. The Riverpark Urban Farm has a transportation plan; they can break down, move, and reassemble a site in 24 hours (Riverpark Urban Farm, 2013).

Figure 77. Perspective of the mobile farm production area at the corner of North Schroeder Street and West Fayette Street, facing east. A parachute shade structure is seen behind rows of milk crates and the rice bioswale in the forefront.

The components of modular landscapes must be simple and flexible to ensure the successful execution of a move from one site to another. Following the precedents set by the Prinzessinnengärten and Riverpark Urban Farm, milk crates are the main growing component of Operation Market Garden's mobile urban farm. Sand bags are used as a less expensive planter to supplement the milk crates. Each type of planter sits on top of shipping pallets. All components for shipping and growing will stay together as one piece. This is to minimize the need for storing components elsewhere when not in use. The total cost for 92,000 milk crates, 5,200 wooden shipping pallets, and 92,000 ft^3 of soil is approximately $570,000.

Figure 78. An example of milk crate planters being transported by shipping pallet (Cahenning, 2013).

Figure 79. Rows of sand bag planters (Alperovich, 2011).

Phases I, II, & III

The farm's transition through the neighborhood is choreographed for a ten year plan. The amount of time was chosen to coordinate with Excel Academy's ten year school facility renovation schedule. With each move of the farm, Poppleton residents can become more familiar with urban agriculture as an acceptable urban landscape. As the farm moves around the neighborhood, pieces of it will become incorporated into the residential spaces and the school property.

Phase I of the project includes the proposed Operation Market Garden site plan. This is the initial startup of the farm. During this phase, funding and resources are collected. The production area of the farm starts to accumulate, beginning with the farmers' market block. One or two stalls are constructed. Neighborhood interest builds during this phase. If the farm is able to remain where it is during Phase I, the design can continue to be implemented until it has been completed.

Figure 80. Phase I of Operation Market Garden.

If Phase II becomes necessary, the farm can pick up and move to the next site. It is located between West Saratoga Street and West Mulberry Street. New bioswales are dug along the edges of the blocks where the greatest amount of water is draining off the site. The modular biofilters are removed from the Phase I site and planted in the Phase II sites. They are arranged perpendicular to the bioswale to divert the site's runoff. The pedestrian bridges over the bioswales are removed from Phase I and implemented into the bioswales in Phase II. Mature, existing trees remain untouched; they signify the new civic space or work space. The parachute canopies are hung above

existing neighborhood elements, such as playgrounds, picnic areas, etc. The total area of production, processing, and retail is 4.3 acres in Phase II.

Figure 81. Phase II of Operation Market Garden.

Phase III transports the components to the sites along West Lexington Street. As part of the farm being more incorporated into the community, the portion of Phase II situated at the southwest corner of West Carrollton and West Saratoga Street remains a permanent site. A children's day care associated with St. Luke's Church to the south can integrate the farm into their facility as a children's garden. Part of the farm is incorporated into Excel Academy's renovation plan. The Poe Homes courtyards host portions of the farm. The project is expanded to include more vegetables and fruit in production. The total area of production, processing, and retail is 5.7 acres in Phase III.

Figure 82. Phase III of Operation Market Garden.

Chapter 6: Conclusions

The goal of this thesis project was to explore the roles that landscape architecture and urban agriculture can play in improving food environments for schools, families, and communities located in urban food deserts. The Poppleton neighborhood was chosen as the focus of this investigation because it exhibits many of the socioeconomic characteristics related to living in poor urban environments and food deserts. The neighborhood's high vacancy rate, severe food insecurity, and high unemployment recommend it as a suitable candidate for an urban agricultural operation. Poppleton's status in the city's master plan as a potential investment and future site of a Red Line light rail station creates opportunities for an urban farm and farmers' market to contribute to the neighborhood's identity and future role as a destination in the city. The neighborhood suitability analysis conducted in this project can be applied to other cities facing food security issues to identify communities that can benefit from urban farms and farmers' markets within their neighborhoods.

The design responds to the Baltimore Food Policy Initiative's focus to redevelop vacant land for agricultural purposes that improve the local food environment. The 4.1 acre site meets between 53 and 64 percent of the neighborhood and school vegetable need with its farm-to-table system, allotting 92 pounds of vegetables per person per year. This final number highlights a great improvement for the neighborhood's environment as compared to the initial available amount of 0 pounds of vegetables per person. The design supports environmental stewardship by practicing sustainable methods of stormwater harvesting for irrigation, solar power for energy needs, and onsite composting. The farmers' market, outdoor dining plaza, and

urban agricultural educational center foster social interaction and community education. This complete sustainable system can be imitated in other blighted, urban food deserts to help relieve food security issues and encourage "inside-out community revitalization".

The vacant urban environment poses many challenges for urban agriculture related to soil compaction, site contamination, and unreliable water sources. The risks associated with soil contamination deemed raised beds to be more suitable for the project; however, the milk crates and shipping pallets increased the cost of the project by $460,000. While these elements help ensure a healthy growing medium and the continuation of the farm despite development, they are much more expensive than planting directly in the existing soil and adding only a soil amendment. A soil test would have been appropriate prior to the start of the project to determine whether the additional cost of raised beds was necessary. In the final design, a large portion of the site's land area was designated to ADA accessible pathways, tables and benches, and shade trees; non-production design elements need to be considered in future urban agricultural designs when estimating the amount of land needed to house an urban farm.

The thesis drew inspiration from World War II victory gardens, which focused on health, exercise, and morale for citizens. The concept grafts WWII Operation Market Garden's imagery and ethos onto the urban farm design: urban agricultural strategies that combat food security issues in food deserts. The use of parachute and bridge imagery reflected this concept through the design and also acted as a brand for Poppleton's urban farm. As the farm moves from site to site within Poppleton, the iconic parachute shade structures and the bioswale bridges are landmarks that can help

residents and visitors to easily associate the farmers' market and community hub with the separate production areas. Visual cues in the landscape that are easily decipherable by the general public can be used to associate different community spaces.

While the potential is greater for implementing an urban farm during the revitalization stages of the neighborhood, the risk of development by larger corporations is also a factor to contend with. Against the backdrop of La Cite's development plans for Poppleton, a flexible, mobile farm design was essential to ensuring the urban agriculture project's continued operation and health impact. Simple structural and vegetative elements, such as milk crates and sand bags, can be easily transported and eventually integrated into the neighborhood residences and school property. Mobile design solutions can be used to repurpose large tracts of derelict land in other cities facing similar vacancy rates to Baltimore while supplying a continuous local fresh food source that helps publicize urban agriculture as a viable landscape in the neighborhood.

Over the course of ten years, the Poppleton urban farm's production capacity should increase to supply greater amounts of and more diverse kinds of food. If demographic trends continue as expected, the neighborhood's population will increase as will the need for more fresh food. Desirability to live in cities is increasing, and population trends highlight the growing number of urban residents. Urban agriculture offers one solution to the challenge of supplying fresh, healthy food to urban residents. Establishing sustainable food systems prior to population explosion will help ensure community food security.

Bibliography

Alperovich, A. L. (2011).*Mobile Urban Agriculture in Berlin's* Prinzessinnengärten. Retrieved from http://inhabitat.com/mobile-urban-agriculture-blooms-in-berlins-prinzessinnengarten/

Armar-Klemesu, M. (2000). Urban agriculture and food security, nutrition and health. In N. Bakker, M. Dubbeling, S. Guendel, U. Sabel Koschella, & H. de Zeeuw (Eds.), *Growing Cities, Growing Food, Urban Agriculture on the Policy Agenda* (99-117). DSE, Feldafing.

Ayala, G. X., Baquero, B., Laraia, B. A., Ji, M., & Linnan, L. (2013). Efficacy of a store-based environmental change intervention compared with a delayed treatment control condition on store customers' intake of fruits and vegetables. *Public Health Nutrition*, 16(11), 1-14. DOI:10.1017/S1368980013000955

Bach, A. (2013). A palace, a garden and Germany's politics of culture. *DW*. Retrieved from http://www.dw.de/a-palace-a-garden-and-germanys-politics-of-culture/a-16909368

Baltimore City Food Policy Task Force. (2009). *Final Report and Recommendations*. Baltimore, MD.

Baltimore City Planning Commission. (2009). *Live earn play learn: Baltimore City's comprehensive master plan*. Baltimore City, MD.

Baltimore City Planning Commission. (2009). *The Baltimore Sustainability Plan*. Baltimore City, MD.

Baltimore City Department of Planning. (2012). *City of Baltimore, Council Bill 12-0152*. Land Use and Transportation Committee. Baltimore, MD.

Baltimore City Department of Planning & Department of Housing and Community Development. (2011). *Request for qualifications: urban agriculture in the city of Baltimore*. Baltimore, MD.

Baltimore Food Policy Initiative. (2014). *Planning/Baltimore Food Policy Initiative*. Retrieved from http://www.baltimorecity.gov/Government/AgenciesDepartments/Planning/BaltimoreFoodPolicyInitiative.aspx/

Baltimore Neighborhood Indicators Alliance & Jacob France Institute. (2013). *Vital signs 11: Measuring progress towards a better quality of life in every neighborhood*. Baltimore, MD: University of Baltimore.

Bernick, M. (2005). *Job training that gets results: Ten principles of effective employment programs*. Kalamazoo, MI: W.E. Upjohn Institute for Employement Research.

Big City Farms. (2014). About us. *Big City Farms: Short ride, big taste.* Retrieved from http://bigcityfarms.com/

Broadway, M. J. & Broadway, J. M. (2011). Green dreams: promoting urban agriculture and the availability of locally produced food in the Vancouver metropolitan area. *Focus on Geography*. 54(1). 33-41. DOI: 10.1111/j.1949-8535.2010.00023.x.

Brown, K. H. & Jameton, A. L. (2000). Public health implications of urban agriculture. *Journal of Public Health Policy*. 21(1). 20-39. http://www.jstor.org/stable/3343472

Cahenning. (2013). *Prinzessinnengärten: Mobile Urban Garden*. Retrieved from http://urbanacupunctureblog.wordpress.com/2013/02/10/prinzessinnengarten-mobile-urban-garden/

Census Bureau Homepage. (n.d.). Retrieved from http://www.census.gov/

Chen, S., Florax, R. J., Snyder, S., & Miller, C. C. (2010). Obesity and access to chain grocers. *Economic Geography*. 86(4). 431-452.

CityView. (n.d.). Retrieved from http://cityview.baltimorecity.gov/

Cockrall-King, J. (2012). Food and the city: Urban agriculture and the new food revolution. Amherst, NY: Prometheus Books.

Data | Maryland Food System Map. (n.d.). Johns Hopkins Center for a Livable Future. Retrieved from http://mdfoodsystemmap.org/download-maps-data/data/

Diez Rouz, A. V. & Mair, C. (2010). Neighborhoods and health. *Annals of the New York York Academy of Sciences*. 1186(1). 125-145.

Farming Concrete. (2010). *2010 Harvest Report*. Retrieved from http://farmingconcrete.org/2011/04/19/2010-harvest-report/

Fox, T. J. (2011). Urban farming: Sustainable city living in your backyard, in your community, and in the world. Irvine, CA: Hobby Farm Press/BowTie Press.

Gorgolewski, M., Komisar, J., & Nasr, J. (2011). *Carrot city: Creating places for urban agriculture*. New York, NY: Monacelli Press.

Hanson, D. & Marty, E. (2012). *Breaking through concrete: Building an urban farm revival*. Berkeley, CA: University of California Press.

Hodgson, K., Campbell, M. C., & Bailkey, M. (2011). *Urban agriculture: Growing healthy, sustainable places*. Chicago, IL: American Planning Association.

Hou, J., Johnson, J. M., & Lawson, L. J. (2009). *Greening cities, growing communities: Learning from Seattle's urban community gardens*. Washington, DC: University of Washington Press.

Johns Hopkins Center for a Livable Future. (2012).

Killoran-McKibbin, S. (2006). Cuba's urban agriculture: food security and urban sustainability. *Women and Environments International.* 70(71). 56-57.

Larson, N., Story, M. T., & Nelson, M. C. (2009). Neighborhood environments: disparities in access to healthy foods in the U.S. *American Journal of Preventive Medicine*. 36(1). 74-81.

Lawson, L. J. (2005). *City bountiful: A century of community gardening in America*. Berkeley, CA: University of California Press.

Maryland State Data Center. (n.d.). Department of Planning. Retrieved from http://planning.maryland.gov/msdc/S5_Map_GIS.shtml

Meehan, S. (2013, January 18). Big City Farms plots plenty of growth and lots of green. *Baltimore Business Journal*. Retrieved from http://www.bizjournals.com/baltimore/print-edition/2013/01/18/big-city-farms-plots-plenty-of-growth.html?page=all

Morris, J. L. & Zidenberg-Cherr, S. (2002). Garden-enhanced nutrition curriculum improves fourth-grade school children's knowledge of nutrition and preferences for some vegetables. *Journal of the American Dietetic Association*. 102(1). 91-93.

Pollan, M. (2006). The omnivore's dilemma: A natural history of four meals. New York, NY: Penguin Press.

Nordahl, D. (2009). *Public produce: The new urban agriculture*. Washington, DC: Island Press.

Office of Epidemiology and Planning, Baltimore City Health Department. (2008). Baltimore City Health Status Report, 2008. Baltimore City, MD: Baltimore City Health Department.

Real Food Farm. (2014). About. *Real Food Farm: Connecting Baltimore to real food*. Retrieved from http://www.realfoodfarm.org/about/

Robert Wood Johnson Foundation. (2014). [Graph illustration the Premature Death in Baltimore City, MD March 30, 2014] Retrieved from http://www.countyhealthrankings.org/app/maryland/2014/rankings/baltimore-city/county/factors/overall/snapshot

Saldivar-Tanaka, L. & Krasny, M. E. (2003). Culturing community development, neighborhood open space, and civic agriculture: The case of Latino community gardens in New York City. *Agriculture and Human Values*. 21. 399-412.

Sharow, R. (2014). Baltimore-area unemployment rate improves in December. *Baltimore Business Journal*. Retrieved from http://www.bizjournals.com/baltimore/blog/2014/02/baltimore-area-unemployment-rate.html

Search & Browse | OpenBaltimore / City of Baltimore's Open Data Catalog. (n.d.). Retrieved from https://data.baltimorecity.gov/browse?utf8=%E2%9C%93

Sherraden, M. S., Sanders, C. K., & Sherraden, M. W. (2004). *Kitchen capitalism: Microenterprise in low-income households*. Albany, NY: State University of New York Press.

State Highway Administration GIS Data Download Center. (n.d.). Retrieved from http://www.sha.maryland.gov/Index.aspx?PageId=282

Sylvestre, M., O'Loughlin, J., Gray-Donald, K., Hanley, J., & Paradis, G. (2006). Association between fruit and vegetable consumption in mothers and children in low-incom, urban neighborhoods. *Health Education Behavior*. 34(723). DOI: 10.1177/1090198106290758

United States Department of Agriculture. (2009). *Access to affordable and nutritious food: Measuring and understanding food deserts and their consequences*. Report to Congress. Economic Research Service, the Food and Nutrition Service, and the Cooperative State Research, Education, and Extension Service.

Urban Design Lab at the Earth Institute. (2012). The potential for urban agriculture in New York City: growing capacity, food security, & green infrastructure. Columbia University. New York, New York. www.urbandesignlab.columbia.edu.

Viljoen, André. (2012). *Continuous productive urban landscapes: Designing urban agriculture for sustainable cities*. Burlington, MA: Architectural Press.

Vitiello, D. & Wolf-Powers, L. (2014). Growing food to grow cities? The potential of agriculture for economic and community development in the urban United States. *Community Development Journal*. DOI: 10.1093/cdj/bst087

Voicu, I. & Been, V. (2008). The effect of community gardens on neighboring property values. *Real Estate Economics*. 36(2). 241-283.