URBAN AGRICULTURE IN THE RIGHT-OF-WAY:

OPPORTUNITIES AND CONSTRAINTS TO UTILIZING LAND IN ATHENS-CLARKE COUNTY, GEORGIA'S ENERGY RIGHT-OF-WAYS TO PRODUCE FOOD

by

ELIZABETH BEAK

(Under the Direction of John Crowley)

ABSTRACT

There is a need for well-designed, innovative approaches that weave healthy food and farming back into the fabric and cultural practices of the 21st Century City. This paper explores the potential of stacking a second land use, urban agriculture, on Athens-Clarke County energy Right-of-Ways (gas and electric), as a means of bringing a marginal urban space to a higher and greater use, while cultivating a more resilient food system and city. The opportunities and constraints for producing food above a pipeline and below transmission line are presented through precedent cases. Health and policy issues are discussed. A suitability analysis of the 1052 acres of land in energy ROWs is performed. A sample ROW farm is designed on the Food Bank of Northeast Georgia property, along a pipeline ROW. Results indicate there is potential to utilize energy ROWs to produce healthy food and scale up urban agriculture.

INDEX WORDS: Urban Agriculture, Community Food System, Right-of-Way, Energy Easement, Suitability Analysis

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A Thesis Submitted to the Graduate Faculty of the University of Georgia in Partial Fulfillment of the Requirements for the Degree

MASTER OF ENVIRONMENTAL PLANNING AND DESIGN

ATHENS, GEORGIA

2016

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August 2016

DEDICATION

This Thesis is dedicate to Mama Betty and Papa Peeler, Grandmother and Grandfather Beak, and Bill and Tater Beak. Thank you for teaching me the power and beauty of cultivating community through food.

ACKNOWLEDGEMENTS

A very special thanks to the remarkable UGA professors on my committee for sharing their time and expertise: Jack Crowley, Dory Franklin, and Rosanna Rivero. I would also like to thank my mentor in the field Jim Pope with the Food Bank of North East Georgia. I would also like to thank the amazing Alison Smith, for teaching me GIS, you did it! Special thanks to the Right-of-Way Specialist Chris Lewis with Georgia Power and ACC Planner Craig Page for sharing extra time and expertise as I tried to navigate the current system. Thank you to my friend Andrew Bailey for all. Thank you Kimdog, I am glad I got to roam the ROWs with you. I would also like to thank the UGA team involved with the National Needs Fellowship for providing the funding for this research. I hope to utilize what I have learned through my experience working with you all to plan, design and grow more nourishing communities in the future.

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CHAPTER 1

INTRODUCTION

Agriculture and cities have co-evolved since the beginning of time, and will continue to do so. One of the most exciting branches of research and practice in the planning, design and agricultural professions involves re-imagining how we will feed the 21st century city in a manner that is “economically efficient, socially just, and ecologically sound” Morgan (2014, 18). Cities throughout the world are assessing the outcomes of the policies and practices that have dominated urban planning and agriculture since WWII, and starting to realize the value in investing in “superbly designed spatial responses to the challenge and opportunity of feeding people that live in cities” (McDonough 2014, viii).

The policies and practices that have dominated industrial agriculture and urban planning since WWII were effective on several fronts. Humanity produced a quantity of food that had been unimaginable in the past, in an incredibly efficient manner. A large sector of the Population became “free” to leave the farm fields and explore new endeavors in the industrial city. Urban planners developed new land use planning policies and zoning to protect the health and welfare of the burgeoning urban population amidst rapid industrial development.

However, this progress also contributed to the spatial and cultural disconnect between people and their food. Generations grew up with little understanding as to where the food

on their plate originated. Residents were separated from the walk-able neighborhood market selling fresh, healthy food. Instead, people lived in a “safe” residentially zoned neighborhood and drove to a separate commercial zone in their city that provided a space for a supermarket. This supermarket was filled with food that had been produced and transported and now marketed through the new global food system. Thanks to this global food system people could enjoy any food item at any time, at a relatively low cost for the first time in human history. These perks anesthetized many cities from the inherent short comings of these policies and practices, for a few decades.

Today, the “hidden costs” of our city planning strategies and industrial agriculture system are apparent (Andre Viljoen and Katrin Bohn 2014, 18). Our soils are depleted, our water is effected by nitrogen runoff and erosion. Clearing the land to produce more food for a growing population has contributed to carbon dioxide emissions and climate change (H. Godfray et. al 2010, 2772). Many rural communities are suffering and many farmers working within this system still struggle to make ends meet. The health and quality of life of those who rely on this food system and live in today’s cities have also been effected. In 2012, the USDA reported that access to healthy fruits and vegetables is a critical issue for those living in approximately 6500 food deserts or “low-income tracts where either a substantial number or share of residents have low access to a grocery store” (Paula Dutko et.al 2012, 1, American Nutrition Association 2015).The Center for Disease Control reported that in 2008, “the U.S spent over 147 billion dollars on obesity, an epidemic that is preventable through diet and exercise” (CDC 2015). Public health studies indicate that

this could be the first generation in U.S history expected to have a shorter life span than the generation before (Policy Link 2012, 16)

It is time to address these issues. The human population is expected to surpass 9 billion by 2050 (United Nations Department of Economic and Social Affairs 2015). Feeding this many people would require a 70% increase in food production (Food and Agriculture Organization of the United Nations 2009). The population continues to shift spatially. For the first time in history, more humans are residing in urban areas than rural. Eight-two percent of North Americans live in cities (United Nations 2014, 1). Access to land to produce food is currently recognized as one of the greatest challenges the new generation of farmers face. (Shute 2011, 4, Policy Link 2012, Food and Agriculture Organization of the United Nations).This challenge will only become more exacerbated as cities develop in circumference and density.

After decades of agriculture being largely absent from the policies and maps of cities in the west, Smit et. all published a report in1996 for the Unite Nations entitled “Urban Agriculture: Food, Jobs and Sustainable Cities.” This was the first of a series of studies by the U.N quantifying the impact of urban and peri-urban agriculture, in terms of mending multiple food and urban issues (Jac Smit 1996). In 2005, a study by the Food and Agriculture Organization reported that urban farmers supplied 25% of the urban populace (approximately 700 million urban dwellers) with food grown in the nooks, crannies, and “wasted spaces” of our cities (Food and Agriculture Organization of the United Nations 2005). Today, the USDA and UN estimate that urban farming is feeding 15-20% or up to

1/5 of the global population (Natural Resource Conservation Service 2013, Royte 2015). As of late, international (ex: United Nations, World Health Organization), national (ex: Whitehouse, USDA , APA), and local (ex: Seattle, Atlanta, Toronto etc.) governments and agencies are recognizing the role urban agriculture can play in feeding the postindustrial city and creating a more healthy, equitable, and green city overall. These groups are allocating resources, expertise and funding to “scale up urban agriculture”. This indicates urban agriculture has the potential to move from a marginal movement to mainstream piece of “urban infrastructure and economies” (McDonough 2014, viii).

Planners and designers are ready to assist. Ecological design, including ecological urbanism, landscape urbanism, agricultural urbanism as well as practitioners of Continuous Productive Urban Landscapes (CPULS) have been exploring urban agriculture’s ability to create better cities. This professions’ skills in spatial analysis, design, zoning, policy and public engagement are contributing to more innovative research in food systems, in concert with the equally innovative research in agriculture. These include: sustainable agriculture, organics, agroecology, spin farming, hydroponics, aquaponics, permaculture and other farming techniques that are beginning to be recognized for their unique contribution to the health and well-being of the planet.

The time is ripe for well-designed, innovative approaches that can help weave healthy food and farming back into the urban fabric and cultural practices of our cities. As we work together to redefine “where and how agriculture will sit on the map” for optimum productivity, health and access. Additional studies are needed to locate underutilized

land in our cities and assess the opportunities and constraints for producing food on them (Andre Viljoen and Katrin Bohn 2014, 2). This paper aims to contribute information which can help.

This research explores the potential of using the eighty-six and a half miles of energy Right-of-Ways (gas and transmission) traversing the forested hills, parks, creeks, farms, as well as commercial, industrial and recreational neighborhoods in Athens-Clarke County Georgia, for urban agriculture. An **energy right-of-way** (ROW) is a permanent right authorizing a person or party the right to use the land or property of another for a particular purpose. In this case, a utility acquires certain rights to build and maintain a transmission or pipeline (Xcelenergy.com 2007). As a student of environmental planning and design with a background in urban agriculture, it is natural to visualize a weedy, underutilized parcel of land in a city as a potential space for urban agriculture and cultivating healthier more resilient cities. These rare, contiguous, undeveloped miles of green space have the potential to increase local food production through linear farms, community gardens, food forests, aviculture and pollinator habitat.

The primary use of the land in this corridor system is to supply energy to the growing number of homes, schools, businesses, industries and institutions. Do these spaces have the potential to serve the over 120,000 residents of Clarke County in additional ways? As Athens, Georgia and other cities become more densely populated, designers are exploring the potential of stacking land uses in ways that both celebrate the cultivation of synergistic relationships, and respect the basic needs and hierarchy of the individual

components. This method has been referred to in the literature as “vertical intensification”. “Increasing the number of activities or uses on a particular piece of land by overlaying one use above the other” could become increasingly prominent in land use planning and design as urban areas grow (Danyluk 2009a, 5). The author also recognizes that there are unique opportunities and constraints inherent to operating linear farms above a pipeline and below a transmission line. These opportunities and constraints will be explored. The next section of this document defines the research question, goal, and methodology used to explore the potential of using ACC’s Energy ROWs for food production.

RESEARCH QUESTION:

Can the vast and underutilized network of land in Athens-Clarke County, Georgia energy ROWs (gas and transmission) be used to grow healthy food and scale up urban agriculture?

- What are the opportunities?
- What are the constraints?

Similar networks of energy ROWs exist in counties throughout Georgia, states throughout the U.S, and countries throughout the world. The **goal** is to deliver a strategy and information that municipalities, utility companies, land owners, designers, urban planners, urban farmers, and eaters can use to determine the potential for utilizing their own energy ROWs to cultivate healthier cities and a healthier population – as both continue to grow.

RESEARCH METHODOLOGY:

Figure 1.0 depicts the process the author used to answer the research questions and work towards the research goal. The triangle in the foreground symbolizes the author's strategy in "linear steps". However the circle in the back recognizes the non-linear process that informed this journey as a whole. (For example, lessons learned in the projective design phase re-informed the health considerations.) The next two pages explains each of these linear steps more thoroughly.

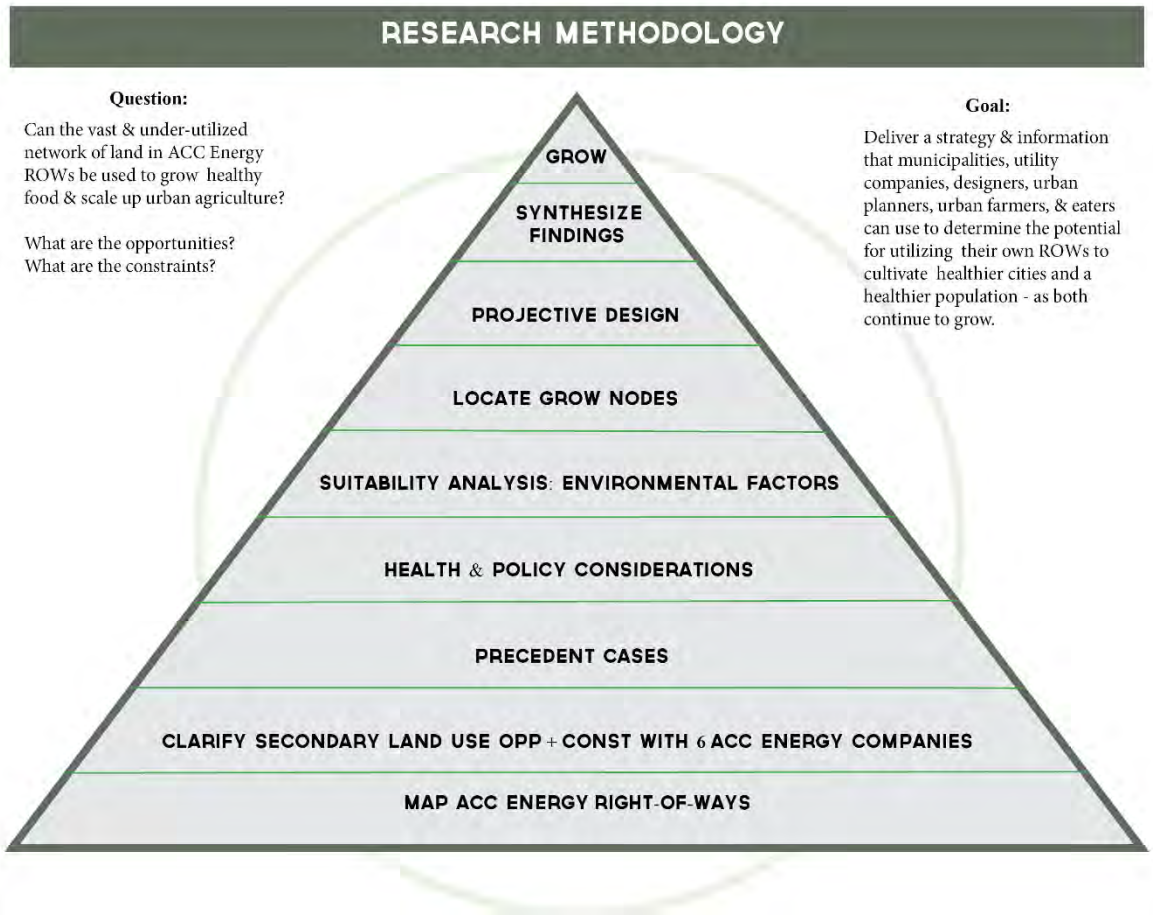

Figure 1.0: Research Methodology
Source: Elizabeth Beak

1. **Map Energy Right-of-Ways (ROWs) in ACC**

    - The Northeast Georgia Regional Commission provided polyline data for transmission and pipeline ROWs in ACC.
    - ArcGIS was utilized to map the location of the ROWs in ACC and compute the total miles of potential space for urban agriculture.
    - The author overlaid the polyline data on a high-resolution aerial photo of Clarke County, GA and digitized the ROWs as polygons so the acreage, slope, soils etc. of the land within the ROWs could be utilized in a suitability analysis later.

2. **Clarify opportunities and constraints of secondary land uses on the ROWs**

    - The author utilized ACC parcel data and the ArcGIS “select by location” tool to generate a list of the owners of parcels intersecting the ROWs.
    - Utility company names were on this list, because these companies own some properties out-right for pumping and transmission stations.
    - The ROW Specialist from each of these companies were contacted to confirm (and fill in the gaps) of the names of the 6 energy companies who hold energy easements in ACC.
    - The author summarized information about secondary land use opportunities and constraints found on company websites and publications.
    - The ROW Specialist for Georgia Power (transmission) and Kinder Morgan (pipeline) companies reviewed the summary chart and answered additional questions that the author had about secondary land uses on the ROWs, including those related to agriculture.

3. **Precedent Cases**

    - A literature review was conducted to identify precedents and better understand the unique opportunities and constraints of ROW farming.
    - Site visits were conducted to 2 ROW farms in California and 1 in ACC.

4. **Health Considerations**

    - A literature review was conducted to clarify the health related opportunities and constraints unique to ROW farming.
    - The author interviewed the managers of a ROW farm in Los Angeles, Toronto and ACC.

5. Policy Considerations

- The author utilized the ACC Planning Department website, publications, and the expertise of planner Craig Page to navigate ACC urban ag policies, and understand opportunities and constraints that could affect ROW farming.
- A literature review was conducted to compile innovative strategies communities are utilizing to remove outdated barriers to urban agriculture.

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6. Suitability Analysis: Environmental Factors

- The team identified environmental factors that would affect the suitability of land within a ROW for urban agriculture. (see figure 7.1)
- A GIS database was created: spatial data for each of these environmental factors were collected, created, and managed.
- This spatial data was rasterized & classified according to its suitability for urban agriculture. Four being the most suitable and one being least suitable.
- This data was then reclassified to a scale of ("1 to 12 by 1") to acknowledge nuances in the standard (high, medium-high, medium, and low) suitability levels for each factor. Again, low suitability was represented by low numbers and higher numbers represented high suitability. Wetlands were restricted from this suitability analysis. (See figure 7.2)
- Weighted overlay analysis: weights were assigned to the model to depict the relative importance of these environmental factors.

  * *Weights were determined according to the authors belief of the influence that factor could have on the siting of urban agriculture. This would be an excellent place to include community stakeholder input in future studies*.

7. Locate Grow Nodes: suitable land + property owner partner = access

- The author recognized that if a ROW farmer did not own the parcel property outright, a relationship with the property owner would be important in terms of accessing some of the environmental factors included in the suitability analysis and to utilize some standard farm infrastructure that is not permitted in the ROWs.
- The author defines a **grow node** as an area on the energy ROW with suitable land + a property owner partner who allows access to farm infrastructure that is not available in the ROW itself. (Ex: well, greenhouse.)
- The author utilized ACC parcel data and the ArcGIS "select by location" feature to generate a list of the owners of properties intersecting the ROWs.
- The author located parcels along the ROWs that had suitable land and are more likely to be supportive of a farm in their ROW. (Ex: ACC public land such as parks, non-profits like the Food Bank, ACC farms, and parcels owned outright by the utility companies, etc.)

8. Projective Design: Sample Grow Node

- The author partnered with one parcel owner and utility company along an ACC pipeline ROW to design a sample grow node.
- The free software Sketch Up was utilized to perform a sun analysis.
- The design process helped clarify additional opportunities and constraints plus the product will be used to help the Food Bank of Northeast Georgia **GROW.**

LIMITATIONS

Through this process it became clear that energy companies permit agriculture as a secondary land use as long as it is does not interfere with the primary use: constructing, maintaining and operating their infrastructure to provide energy to the public in a safe and reliable manner. However companies can interpret this differently in terms of permitting different uses or not – within the same county and country. Also, the author realized that different countries can manage their transmission corridors differently. For example, the provincial government of Ontario owns a lot of the land in their transmission ROWs (and call them hydro-corridors). Whereas in ACC, over a 1000 public and private parcel owners own the actual land and six utility companies hold easements on the ROWs crossing these properties. Therefore the information published in this paper should be used as a guide to asking questions with one's own energy company rather than an answer in and of itself. The same holds true for local policies that could affect urban agriculture. These policies vary and are changing rapidly as local governments, planners, urban farmers and communities work together to remove outdated barriers and effectively re-integrate urban agriculture into the fabric and daily life of the post-industrial city.

DOCUMENT OUTLINE

Chapter One introduces the research question and methodology. Chapter Two defines energy easements and right-of-ways; explores the existing conditions of the ROWs in ACC; as well as potential opportunities and constraints for secondary uses within this space. Chapter Three provides a brief overview of urban agriculture. Chapter Four shares lessons learned from precedents cases of ROW farming. Chapter Five and Six discuss health and policy considerations for farming in the ROWs. Chapter Seven discusses the suitability analysis performed on ROWs in ACC. Chapter 8 is an overview of the projective design of a sample grow node. Chapter 9 synthesizes lessons learned that can be utilized to help others determine if they can use their own energy ROWs to grow.

CHAPTER 2

ENERGY EASEMENTS and RIGHT-OF-WAYS IN ACC

"*…..The awkward, forgotten, interstitial urban spaces where unused capacity is waiting to be harnessed in productive ways. To be sure these leftover spaces are often less glamorous or of little worth to others, but is precisely this fact that makes them excellent places for growing food"(Danyluk 2009b).*

The majority of the 1052 acres of land in Athens-Clarke County right-of-ways (ROWs) appears neglected. (See figure 2.0) Certain aspects of this space feel familiar, not unlike a vacant city lot before the urban farmer removes the litter & weeds; renews the soil with compost and care; and begins to transform it into a nourishing, productive garden, farm, orchard or community gathering place. However, the right-of-way is also unique. Unlike the city lot, rooftop or schoolyard this space extends for miles. Active infrastructure, in the form of large transmission towers, wires and underground pipelines dominate this landscape. These corridors cross diverse private and public properties. Clarifying what energy easements AND right-of-ways are, and how they function, could help communities develop innovative, strategic proposals for using these spaces for urban agriculture and the creation of greener, healthier more equitable community food systems in the 21st century city.

This chapter describes the energy easement corridor system in Athens-Clarke County, GA. It clarifies: 1) what energy easements & right-of-ways are; 2) their primary use; 3) the rights and responsibilities of those who currently share this space; and 4) examples of secondary land uses that are permitted and not permitted. This information can help

planners, designers, farmers and eaters map and navigate their community's energy infrastructure system and better understand the opportunities and constraints that need to be addressed to transform what many consider blighted strips of land in today's urban fabric, into fruitful networks of green space for the cities of tomorrow.

WHAT IS AN ENERGY EASEMENT or RIGHT-OF-WAY?

An easement is a legal "agreement that confers on an individual, company, or municipality the right to use a landowner's property for a specific purpose" (Alberta Land Surveyors Association 2010, 2). One type of easement is an energy easement. In this case, a utility or energy company acquires the right to use a specified portion of a property to construct and maintain a transmission line or underground pipeline to provide gas, fuel or electricity for public use (Georgia Power 2015). In all U.S easements, including energy easements, the property owner retains ownership of the land. The utility company ("holder, grantee, or beneficiary of the easement") has the right to use the specified portion of the property for a specific use (Alberta Land Surveyors Association 2010). Property owners receive a fair, one-time payment for the easement. The landowner can continue to use the land, but there are restrictions. The easement holder's rights and responsibilities as well as all land-use restrictions placed on the property are defined in the easement agreement (Alberta Land Surveyors Association 2010, 3). An easement is legally registered on the property's certificate of title, and remains with that piece of land if the property is sold, or the easement is abandoned.

The terms easement and right-of-way are often used interchangeably, however, there is a technical difference. A **right-of-way** (ROW) is the “physical land area upon which the facilities (transmission line, roadway etc.) are located.” The **easement** is a “land right authorizing a person or party to use the land or property of another for a particular purpose” (Xcelenergy.com 2007).

EXISTING CONDITIONS: ENERGY ROWs IN ATHENS-CLARKE COUNTY, GA.

Athens-Clarke County (ACC) is located in Georgia, sixty-five miles northeast of Atlanta (Athens-Clarke County Unified Government 2016). The city of Athens is home to the University of Georgia and 121,265 residents (Carl Vinson Institute of Government 2015). Clarke County is the smallest county in the state, with an area of 119 square miles or 76,160 acres (United States Census Bureau: State and County Quick facts 2014). As seen in the Figure 2.0: ACC Population Density & Energy Right-of-Ways, ACC’s population is densest in the center of the county. The majority of the eight-six and a half miles, or 1052 acres of land in energy ROWs are located on the fringe of current urban development.

The **primary use** of the land in these ROWs is to supply energy (gas, fuel, electricity) to the homes, businesses, institutions, hospitals, schools, universities, airports (etc.) of a community. The population relies on a “safe, reliable” source of energy for numerous, daily functions including: cooking meals, heating homes, using computers and phones, turning on lights, as well as operating many health, educational, security and emergency

response systems. The demand for energy has increased. For example, in 1960 a customer used an average of 600 watts of electricity, by 2000 this had increased to 2,900 watts per customer, in 2010 it was estimated to be 9,500 MW per customer (Georgia Power a Southern Company 2004). Utility companies are “obligated to provide services to customers in their territory” (Georgia Power a Southern Company 2004).

Any **secondary land** use in a ROW must defer to this primary land use. It cannot interfere with the utility company’s ability to meet federal and state regulations and laws including: the National Electricity Safety Code (NESC), Occupational Safety and Health Administration Regulations, the Pipeline Safety Improvement Act of 2002, the Pipeline Inspection, Protection, Enforcement, and Safety Act of 2006, the GA Utility Facility Protection Act (GUFPA) and the Georgia High Voltage Safety Act” (Company 2015) (Pipeline Safety Trust 2016). For this reason, utility companies have set up rules for secondary land uses in a ROW. A goal of this paper is to explore how urban agriculture could be integrated into an energy ROW in a manner which respects these regulations yet escalates the services this land can provide for a community.

EXISTING ACC PIPELINE ROWs: POTENTIAL SPACE FOR FOOD PRODUCTION

In Google Earth, the ACC pipeline ROWs appear as three relatively straight ribbons of cleared land, traversing the forested hills, parks, creeks, farms, commercial and industrial parcels, as well as residential neighborhoods in western Clarke County. These pipeline

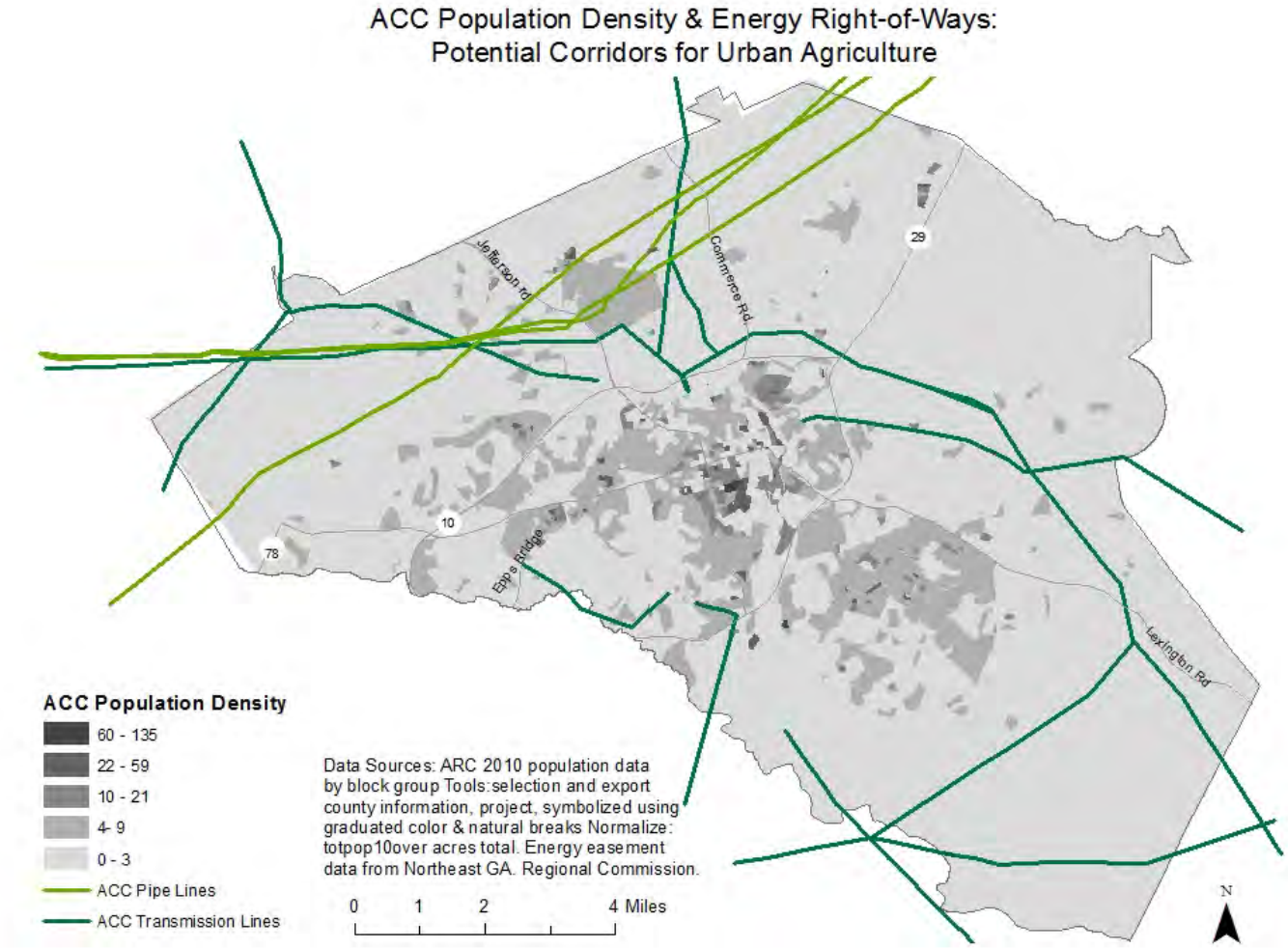

Figure 2.0 ACC Population Density and Energy Right-of-Ways
Data Sources: ARC 2010 population data by block group.Energy Easement data from Northeast GA Regional Commission

corridors run north-south, on a slight angle. They run parallel to each other, and at times intersect. (See Figure 2.0: ACC Population Density & Energy Right-of-Ways.) The width of ACC's pipeline ROWs vary from 40' to 500' (Northeast Georgia Regional Commission 2008). As of 2016, three companies act as holders of the energy easement and operated and maintain the pipelines within these ROWs: 1) Transcontinental – Williams Pipeline 2) Kinder Morgan and 3) Colonial Pipeline. These pipelines transport energy in the form of natural gas, fuel and petroleum in pipes ranging from 2" to 48" inches in diameter**.** The only above ground infrastructure on ACC pipeline ROWs are pumping stations. The Food Bank of Northeast Georgia has a garden behind their distribution site and cultivates food in the pipeline ROW of this property. This site will be discussed more thoroughly in Chapter 8, during the projective design phase.

EXISTING ACC TRANSMISSION ROWs: POTENTIAL SPACE FOR FOOD PRODUCTION

As seen in Figure 2.1, Energy Right-of-Ways & Productive Spaces, ACC transmission ROWs are dispersed throughout the county, on the periphery of development. Four, small segments of this network enter the urban core. From there, the corridors extend into peri-urban, or "urban-fringe area" and rural areas of Clarke County (D.L Laquinta and A.W Drescher 2000). Two organic commercial farms are located on an east-west transmission ROW, Woodland Gardens, LLC and Spring Valley Eco Farm. The width of ACC transmission corridors range from 75' to 150' (Northeast Georgia Regional Commission 2008). The transmission corridors are flagged by towers or "transmission structures" of various sizes. Wires between these structures transport energy between substations

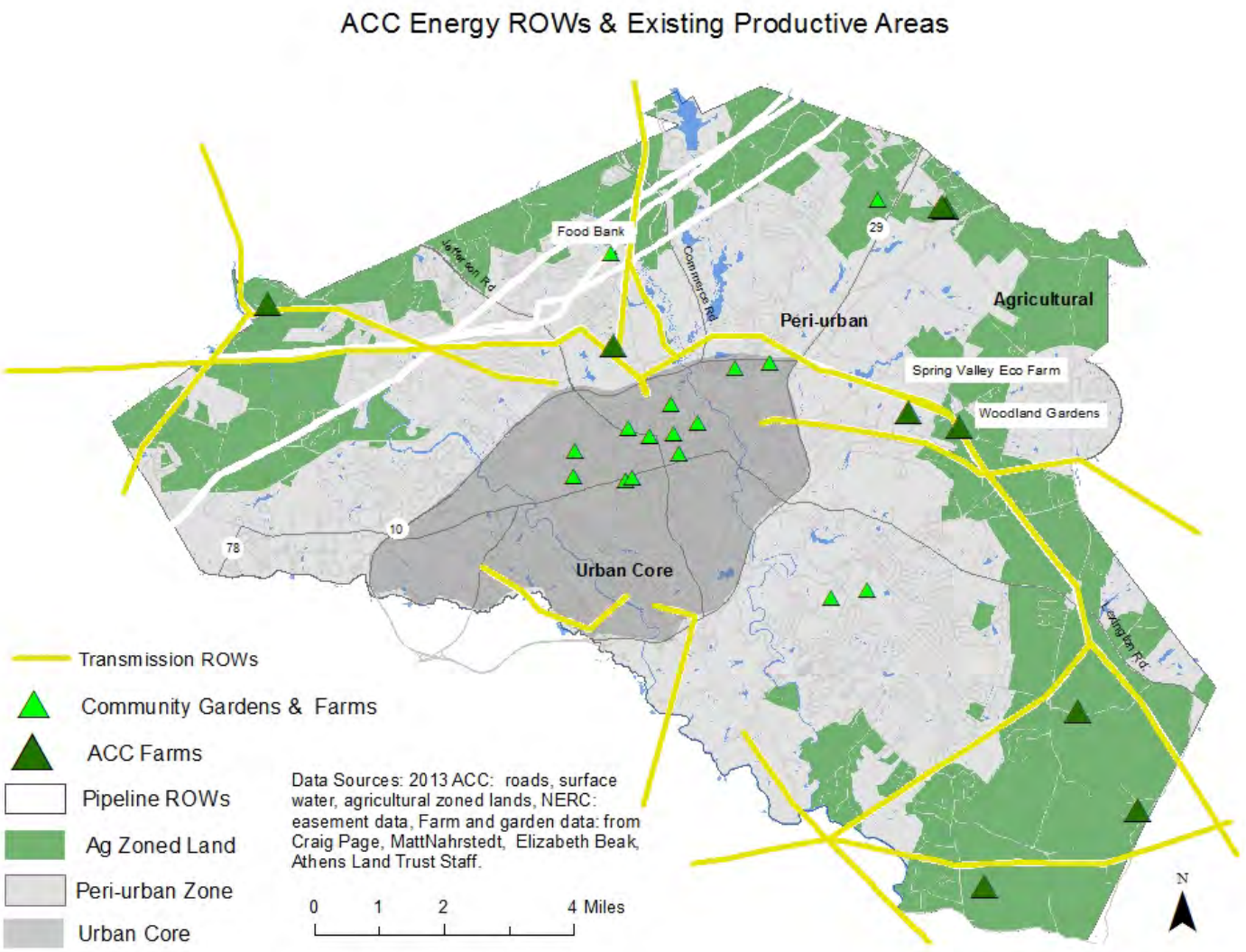

Figure 2.1: Energy Right-of-Ways & Existing Productive Areas. ACC Transmission ROWs are highlighted in yellow. Existing productive areas include 16 community gardens & 8 farms. **Data Sources:** ACC roads, surface water, agricultural zoned land, NERC ROW data, Farm and Garden data from Craig Page, Matt Nahrstedt, Elizabeth Beak and Athens Land Trust Staff

(Lewis 2016). In ACC, the slope of these transmission ROWs undulates far more noticeably than the slope in pipeline ROWs. Three companies serve as “holders” of the ACC transmission easements: 1) Georgia Power 2) Georgia Transmission Corporation and 3) MEAG Power. Georgia Power’s website and employees are the most accessible & informative. According to their website, Georgia Power maintains and operates infrastructure that handles 46 kV, 69 kV, 115 kV, 230 kV, and 500 kV of electricity in Clarke County (Georgia Power 2015). In general, larger towers handle higher voltage and are located in wider ROWs, but this is not always the case. For example, GA Power may construct a wider corridor if they project a need to add a second row of structures in the future (Lewis 2016).

HOW to DETERMINE WHICH UTILITY COMPANY HOLD the EASEMENT of a ROW

At a county or state scale, one can digitize the ROWs using a high quality aerial photo and GIS. In ACC, the author discovered that the Northeast Georgia Regional Commission (NEGRC) had digitized ACC ROWs in 2008 for a “Corridor Feasibility Study for the Evaluation of Potential Greenway Networks” (Northeast Georgia Regional Commission 2008).The author overlaid NEGRC’s polyline data depicting ACC ROWs on a 2013 high resolution aerial photo of Clarke County and calculate the total miles of energy ROWs in Clarke County. Then the author digitized these corridors as polygons so that acreage, slope, soils etc. could be determined and used to analyze the suitability of ACC ROWs for food production.

Next, the author used GIS to review county parcel data, specifically the names of property owners along the ROWs. Utility companies hold easements on the majority of the properties that their infrastructure is on. However, the companies do own some parcels along the corridors for substations, pumping stations etc. The author used parcel ownership data to piece together the names of the six utility companies working in Clarke County. Follow up calls were made to these companies to confirm and fill in gaps. Due to security, all six utility companies that the author spoke with were unable to provide data as to which sections of the 86.5 miles of ACC ROWs they manage. Nor were the energy companies able to share data such as the locations of their 500kV vs. a 230kV towers.

Currently, ACC utility companies are structured to answer questions about a specific property. The best ways to figure out which utility company holds the easement of a specific piece of property is to: 1) look at the title of the property; 2) pay for a survey; or 3) contact the “Right-of-Way Specialist” listed on the website of a major utility provider in the area and ask about that address. If that company does not hold the utility easement on the property they’ll contact the ROW Specialist at other companies in the area and redirect (Lewis 2016). 4) Finally, there may be clues and markers on a site. In the case of the pipelines, yellow markers with the name of the company and a phone number are placed along the right-of-ways. On some transmission poles there may be a small metal badge with the name of the company and year it was last inspected. (See FIGURE 2.2: Pipeline & Transmission Pole Markers in ACC ROWs.) In the author’s experience this is the least reliable method. Utility companies buy each other’s infrastructure and do not update these markers. This was our experience in trying to figure out which company held

the easement of the pipeline ROW of the food bank property. The Georgia Power ROW Specialist also told the author that people should not to rely on these markers.

Figure 2.2: Pipeline & Transmission Pole Markers in ACC ROWS
Photo credit: Elizabeth Beak

Knowing which company holds the easement on a site is important. That utility company's Right-of-Way Specialist will be a key partner in cultivating any secondary use in a ROW, including urban agriculture. It is their job to answer any questions one has about the easement on a property. For example, they can mark the boundary of the easement or location of underground pipelines. They can answer questions about the voltage of an on-site tower; or the type of material flowing through a pipeline on that property. They can answer specific questions about rights and restrictions in terms of land use in that area.

RIGHTS & RESPONSIBILITIES: PROPERTY OWNER vs. UTILITY COMPANY

The easement agreement between the property owner and a utility company describes the rights and responsibilities of each party. Once the easement is signed, it becomes a permanent part of the property record and holds true for all future property owners (Xcelenergy.com 2007). In ACC, the copy of the original easement agreement can be found at the courthouse in the Office of the Clerk of Superior and State Court. In other states information about ownership and any easements on a property can be found at the "local County Recorder" (Southern California Edison Company 2016), or county "Register & Recorders office" (Messersmith 2010). Easement agreements are unique, so the original agreement is the best source for determining the rights and responsibilities of each party for a given property. The utility company's website and Right-of-Way Specialist are also excellent sources. The author contacted all six companies in ACC. Certain utility companies have informative websites and responsive Right-of-Way Specialist, other companies did not. The following section describes "examples" of rights and responsibilities for both the property owner and utility company.

PROPERTY OWNERS RIGHTS & RESPONSIBILITIES:

When the easement process is initiated, the property owner's land is appraised. The property owner will receive a payment "based on fair market value" for the utility company's right to use their private property to provide energy for public use (Xcelenergy.com, 2007). Property owners have the right to continue to use their land for

many activities including “horticulture, farming and grazing” so long as it does not interfere with the utility company’s right “to construct, maintain and operate” their infrastructure & “provide safe and reliable” energy to the public (USDA Natural Resources Conservation Service 2016, Georgia Power a Southern Company 2015b).

A landowner is eligible for payment for any damages that occur to their property during both the original construction and future maintenance of the infrastructure. Under certain conditions, some states give rural property owners the right to ask the utility company to buy the entire parcel (Xcelenergy.com 2007). Easement agreements can be tailored to the needs of a property owner’s unique request. For example, Williams Pipeline could handle the soil removal, storage and replacement more carefully if a new pipeline was installed below a farmer’s fields and they requested special care (The Williams Company Inc 2016). Additional agreements can be negotiated later. For example, the organic farmer of Woodland Garden’s, LLC started growing food on parts of the property outside of the ROW. When she needed to expand production and cultivate a field under the transmission lines she contacted Georgia Power. The utility company agreed to not spray herbicides so long as she maintained the vegetable fields under the transmission lines in a manner that did not interfere with the infrastructure. She said that both parties had held to their part of the bargain and she had experienced no problems in the past 10 years. The property owner still owns the land in the ROW and must pay taxes for it.

Figure 2.3: Field in the Georgia Power ROW at Woodland Gardens, LLC in Athens-Clarke County, Ga.
Photo credit: Elizabeth Beak

Tax credits are available in some states, but not Georgia (Xcelenergy.com 2007). Property owners are responsible for maintaining the land in the ROW. Owners need to check with the Right-of-Way Specialist before they use the portion of their property in the ROW in an additional way. Figure 2.4: Secondary Land Uses in The ROW categorizes examples of secondary land uses in a ROW and how these are most likely to be handled. However, property owners should contact their ROW Specialist to check and only use this chart as a guide.

UTILITY COMPANY'S RIGHTS & RESPONSIBILITIES

A utility or energy company has both the right & responsibility to "construct, maintain and operate" the infrastructure in the ROW in a manner which provides a "safe, reliable" energy source to the public (Georgia Power a Southern Company 2015b). When the ROW is first cleared, the utility company is responsible for paying to stabilize the soil and prevent erosion. Once the infrastructure is in place, utility companies have the right to access their infrastructure 24-7. Companies have the right to be able to see their infrastructure (by foot and plane) to ensure that regular safety monitoring sessions of their infrastructure are effective. To guarantee visibility and access, ACC transmission companies tend to mow their ROWs and trim tree limbs along the corridor every six years(Northeast Georgia Regional Commission 2008). They have the right to spray herbicide to kill plants that could interfere with their ability to safely operate their equipment or visually monitor it for safety. Utility companies have the right to remove anything the property owner places in the ROW without permission, which could obstruct their access to infrastructure. If a property owner builds a fence without consulting with the holder of the easement, and that fence obstructs access, the utility company has the right to remove it - at the owner's expense. The ROW Specialist can assist property owners with how to build a fence that serves both parties. For example: a deer proof fence for the property owner can be designed in a way that includes a gate large enough for company equipment to pass through so utility workers can access infrastructure in the case of an emergency.

ACC pipeline companies tend to mow their ROWs annually and monitor their pipelines via aerial inspections. Pipeline companies monitor their ROWs for signs of leaks, such as patches of dead plants (Northeast Georgia Regional Commission 2008). For this reason a ROW Specialist cares about the height and location of things planted or built in a pipeline ROW. William's Pipeline Company provides a list of responsibilities they have to property owners on their website. These include: "Providing upfront information, fair compensation, prompt payment, advance notice of construction and respect for ownership"(The Williams Company Inc 2016).

SECONDARY LAND USES ON AN ENERGY ROW:

The primary use of a utility ROW is to supply energy to the public. Any additional land use in this space is considered secondary. There are three categories of secondary uses: 1) an acceptable use, 2) a permitted use via an encroachment agreement, and 3) a prohibited use. Figure 2.4 Secondary Land Uses in the ROW summarizes common secondary land uses and how utility companies *tend* to categorize these land uses. *Always check with the local ROW Specialist to double check.*

An **acceptable use** is a low impact activity that will not interfere with the primary use. A property owner is authorized to utilize the right-of-way on their land for acceptable use activities "so long as standards of use are observed" (Georgia Power 2015). For example, horticulture and agriculture are categorized as acceptable uses. A dwarf fruit tree may be planted in the ROW so long it adheres to certain standards. It must stay less than 1

SECONDARY USES: ENERGY RIGHT-OF-WAYS

RIGHT-OF-WAY	ACCEPTABLE USE	ENCROACHMENT PERMIT	PROHIBITED USE
	Agriculture, horticulture, grazing Greenbelts (grass, shrub, trees < than 15' high) Trails (bike, pedestrian, horse) Overflow parking Temporary (lay-down construction, film)	Fences Grading Drainage ditches Streets, roads, driveways Parking Community gardens Lakes, ponds Irrigation Fills Recreation (ex: fields, tennis courts etc). Certain utilities (ex: sewer, solar,water)	Wells Permanent Structures Signboards (Over 15' high) Swimming pools Outdoor Lighting Septic Tanks House Trailers Junkyards, recycling, dumbs Motorbikes
	Agriculture (annual crops) Horticulture, grazing Greenbelts(grass, short/shallow rooted plants) Trails (unpaved bike, pedestrian, horse)	Fences Streets, roads, driveway crossings Drainage ditches Paving and parking Orchards, vineyards (< 10' from pl) Irrigation Heavy equipment Recreation: (ex: fields, tennis courts etc). Certain utilities (ex: sewer, solar,water)	Wells Permanent structures Deep rooted plants or Trees (within 10' of a pipeline) Retaining walls Ponds Signs Swimming pools Sports Courts Gazebos, patios

Figure 2.4 Categories of Secondary Land Uses in the ROW **Sources:** Georgia Power 2015; Southern California Edison 2012; Questar 2016, NW Natural 2016.**Photo credits**: CitizenTimes.com and Youtube.com INGAA pipelines. These are examples from the literature. Always check with ROW Specialist

tall, so as not to interfere with the transmission wires. It should be planted in a location that allows a space for trucks to access the towers. The wise property owner discusses their planting plan with the ROW Specialist before they plant an orchard, so a poorly placed tree is not removed later. Acceptable use activities do not require a formal written agreement. Examples of acceptable uses on a utility ROW can be found in Figure 2.4.

Encroachments are “uses or activities within the ROW that could restrict (in anyway) the full use or purpose for which the right-of-way was established” (Georgia Power a Southern Company 2015a). For example, a fence is considered an encroachment because it could keep utility workers from being able to maintain or operate a transmission tower. However the property owner could work with the ROW Specialist on a permitted encroachment agreement. The fence could be built 25’ from a tower; include a 16’ gate for utility service equipment; and use a lock on the gate supplied by the utility company so employees could access the tower as needed. After a win-win plan has been formulated, the property owner submits the necessary form(s). Some utility companies like Georgia Power and Southern California Edison have clear, easy forms that can be downloaded from their website. Figure 2.5 shows a sample fence application for Georgia Power ROWs. Other companies are more difficult to work with. So long as “standards are observed and an agreement is properly executed” uses listed in the encroachment section of Figure 2.4 should be permitted (Georgia Power a Southern Company 2015c). The farmer at Woodland Gardens, LLC told the author that encroachment agreement process for a deer fence around the vegetable field in the ROW was straightforward.

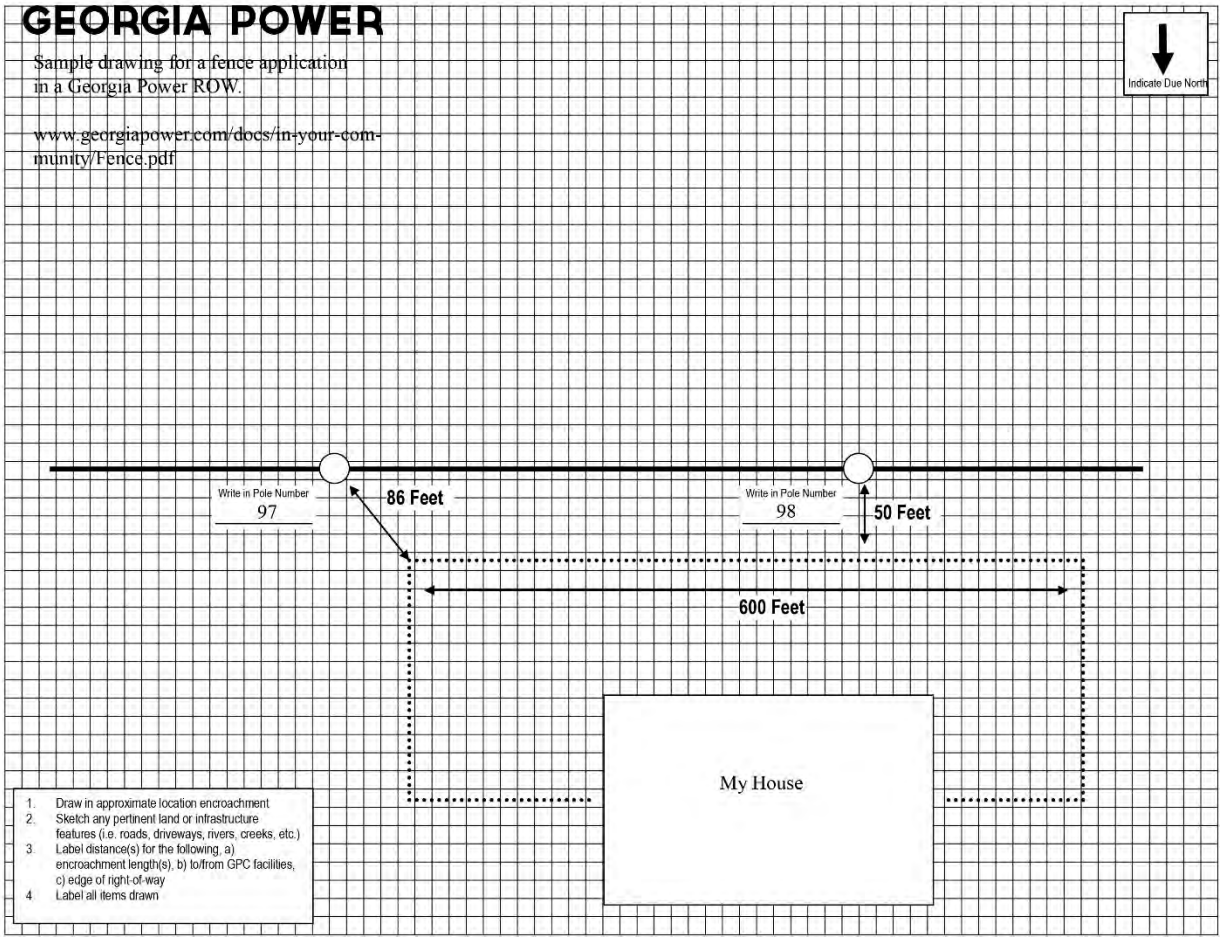

Figure 2.5: Sample Fence Application for Georgia Power ROWs.
Photo credit: Georgia Power

Prohibited uses are not permitted in the right-of-way. Some prohibited uses, such as a well, could create challenges for those trying to produce food in a ROW. Other prohibited uses, such as building permanent structures, make a ROW an enticing space for urban agriculture. Once established, a farm or garden in a ROW is less likely to be developed than a vacant lot in the city. The process is different for non-property owners {Georgia Power a Southern Company, 2015). Chapter 4 discusses systems that might be used for an independent farmer or community garden group.

While many companies seem to share the categories for secondary uses listed in Figure 2.4, there can be differences between companies. For example, Southern California Edison permits high tunnels and greenhouse in their transmission ROWs (Southern California Edison Company 2012b). When the author showed the Georgia Power Row Specialist this, he agreed to run SCE's guidelines by his company team. They reviewed and denied it. Also, different countries may share similar secondary use categories, however the process may work differently. For example, in Ontario, Canada the provincial government owns a lot of the land in the transmission ROWs, so these spaces remain available for the public benefit. If someone wanted to apply for a secondary land use in the ROWs there, they are "subject to planning review by provincial government agencies, technical review by the hydro authority, and municipal land-use regulations" (Danyluk 2009a).

SUMMARY: ACC ENERGY ROWs and SECONDARY LAND USES

In Athens-Clarke County, GA 1052 acres of rare, interconnected greenspace exist in utility right-of-ways. The primary use of this space is to provide energy to the public. There are laws and regulations in place to ensure that this occurs in a safe and reliable manner. However, as seen in Figure 2.4, there are opportunities for secondary land uses in the ROWs. These include sports fields, parks, bike and pedestrian trails, wildlife corridors, tennis courts, spaces for solar panels, and urban agriculture. One of the goals of this research is to explore the potential of overlapping uses on the same space to cultivate great food and cities.

As of 2016, most of the land in the ACC right-of-way network is disregarded and full of weeds. However there are exceptions. For example, grant funding through “Project Wings” was utilized to plant pollinators and wildlife habitat in an area where the ACC greenway passes through a transmission corridor in Sandy Creek Park. Project Wings is a partnership between Georgia Power, Georgia Transmission, MEAG, Atlanta Gas Light, Two Rivers RC&D and the Natural Resource Conservation District that provides micro-grants to plant certain habitat plants in the ROWs. ACC park staff mows a trail through these plantings for pedestrians and hikers to explore (Two Rivers RC&D 2012). University of Georgia and Georgia Power are piloting a project that utilizes a ROW located on the UGA campus for solar panels. ACC ROWs run through several parks. Woodland Gardens, LLC is an organic commercial farm that produces food under Georgia Power transmission lines. The Food Bank of Northeast Georgia’s pipeline ROW garden will be the study site discussed in Chapter 8. This paper focuses on the benefits and challenges of overlapping two land uses: 1) utility ROWs and 2) urban agriculture. However, other secondary allowable uses ought not to be forgotten. For not all ACC’s energy ROWs will be suitable for food production due to slope, soils etc. (The suitability analysis in Chapter 7 will provide details.)

CHAPTER 3

URBAN AGRICULTURE

Urban Agriculture is defined as “an industry that produces, processes and markets food and fuel, largely in response to the daily demand of consumers within a town, city or metropolis, on land and water dispersed throughout the urban and peri-urban area, applying intensive production methods, using and reusing natural resources and urban wastes, to yield a diversity of crop and livestock” (Jac Smit et. al 1996). Producing fiber and materials for shelter might also be included. The American Planning Association defines urban agriculture as: “the production, distribution, and marketing of food and other products within the cores of metropolitan areas and their edges” (University of California Division of Agriculture and Natural Resources 2016). This is an umbrella term which welcomes commercial farmers, community gardeners, and home gardeners. Urban agriculture includes those who produce food in their backyards, front yards, roof tops, vacant lots, school yards, parks, as well as the right-of-ways located between the “city center and the urban fringe” (Katherine Brown et. al 2002).

Athens-Clarke County is the smallest county in the state of Georgia. As of 2016, existing urban agriculture production spaces include: 16 community gardens or community urban farms and 8 farms on the urban-rural fringe. (See Figure 3.0) There are an additional 16 independent growers contributing healthy food to the community food system that are not mapped due to current policy constraints. The University of Georgia (UGA) Geography

Department reports 22 school gardens in ACC which are not included in this map. There are also ACC **home gardens** or “food-producing spaces on private, residential property (multifamily or single family) that are used primarily by the property residents and guest”, which are not mapped (Heather Wooten and Amy Ackerman 2011). The author recognizes the contributions of these spaces but chose to focus on community gardens, urban farms, commercial farms, farmers markets, specialty stores, grocery stores as the productive ACC production areas feeding this community.

ACC defines a **community garden** as: “a principal use of a parcel of land involving the cultivation and harvesting of food crops and or non-food ornamental crops, such as flowers, by an organized neighborhood or non-profit group for personal use, consumption, donation, and occasional sale.” (Page 2015) **Urban farms** are currently not defined in ACC codes. Change Lab Solutions defines and urban farm as: “larger-scale, more intensive sites and may include entrepreneurial opportunities such as growing food for sale”. These tend to include market-gardens or entrepreneurial agriculture that are both non-profit and for profit (Heather Wooten and Amy Ackerman 2011). In ACC a **commercial farm** is a larger-scale agricultural business, which must be located in an agricultural residential zoned area of the county. Limited commercial agriculture is permitted in commercial rural, industrial, employment industrial, industrial and two single family residential neighborhoods with larger lots (RS-40 and RS-25). See Figure 3.0, Existing Production Areas in ACC, illustrates that most community-based productive spaces are located in the urban core & peri-urban area where most of the population resides. Most commercial farms are located in the agricultural zone on the urban fringe.

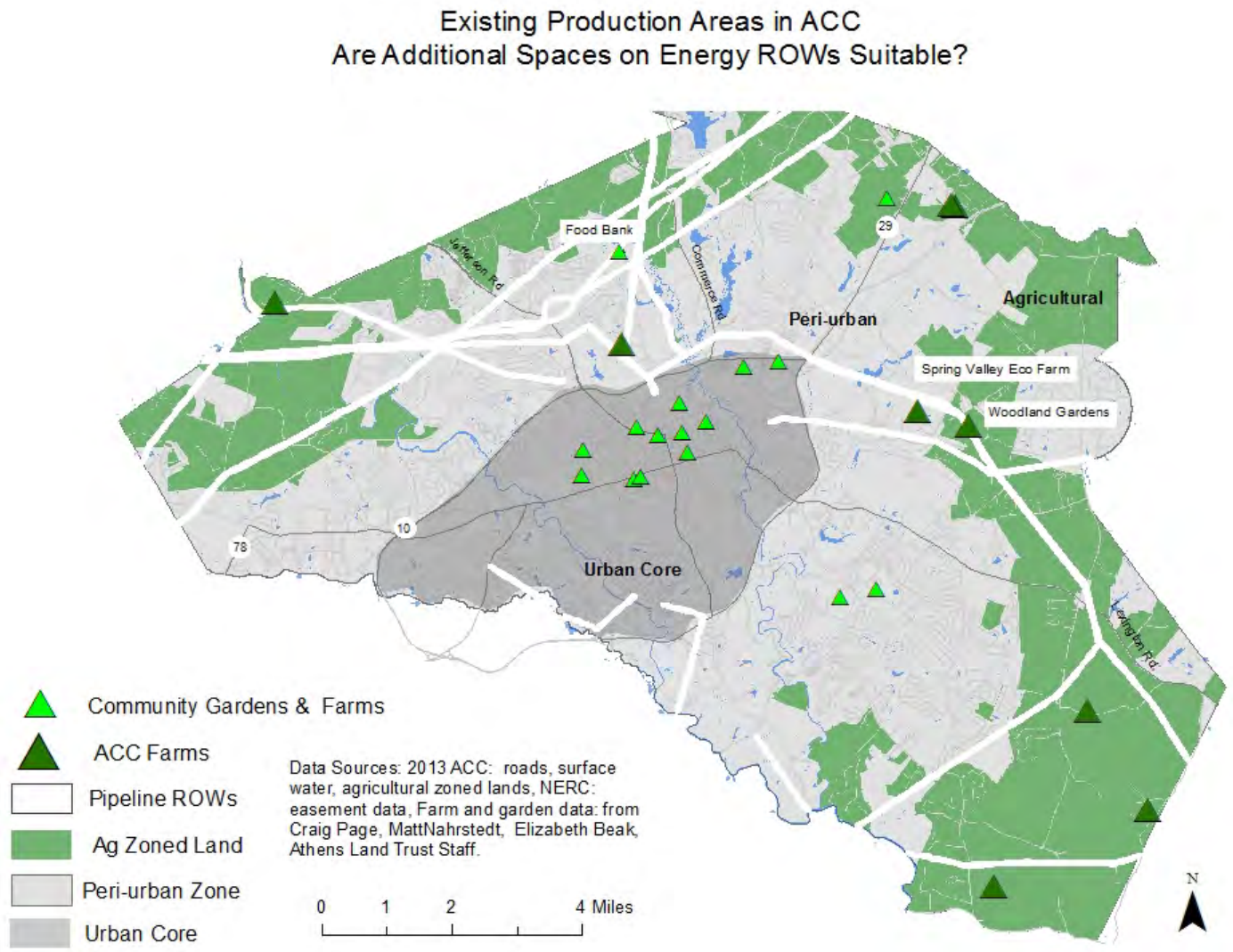

Figure 3.0: Existing Production Areas in ACC in 2016 include: 16 community gardens & 8 farms. Not included: 22 school gardens & home gardens. An additional 16 small, independent growers were not mapped due to policy constraints. **Data Sources**: 2013 ACC roads, surface water, agriculture zones lands, NERC ROW data, Farm and Garden data from Craig Page, Matt Nahrsted, Elizabeth Beak & Athens Land Trust.

(Figure 6.5: The Athens Region Future Land Use shows how ACC's agricultural zone also operates as a barrier between ACC's urban core and the development of neighboring counties.) The business plans, crop plans, operational models of existing production areas are influenced by the needs of urban residents in Athens or nearby cities. Over the past two decades, the benefits of urban agriculture have been documented in the literature. The United Nations (UN) and World Health Organization (WHO) have reported that urban agriculture contributes to food security (Jac Smit 1996, Food and Agriculture Organization of the United Nations 2009, 2005)**.** The USDA defines **food security** as: "access by all people at all times to enough food for an active and healthy lifestyle" (Obadia 2016b). The USDA and World Watch Institute estimate that small urban farmers are utilizing wasted spaces in cities to feed 15 - 20% of the global population (Natural Resource Conservation Service 2013, Nancy Karanja and Mary Njenga 2011).

In both the global south and north, urban agriculture has been utilized as a form of community and economic development. This includes work-skill development, job training and job creation (Hagey et. al 2012). For example: the City of Spartanburg, South Carolina, Northside Redevelopment Corporation, Hub City Farmers Market and Butterfly Foundation created a Healthy Food Hub in a region of their community that was a food desert, or more than 1 mile from a full service grocery store. The city's farmers' market was relocated to this site. The Butterfly Foundation operates the on-site teaching kitchen to train formally incarcerated residents in food service jobs. Program participants run the onsite Monarch Café restaurant & a neighborhood market

Figure 3.1: Urban Agriculture used for job training and economic development. **Photo credits**: Butterfly Foundation, and Chateau Hough in Cleveland, Site Plan: McMillan Pazdan Smith Architecture, Seamon Whiteside Landscape Architecture, Crop Up LLC

with fresh fruits and vegetables. The urban farm across the street from this facility provides as space for healthy food production and garden education. The food produced on the urban farm is sold at the hub and through a mobile market. This project has been a catalyst for attracting funding for the Northside Masterplan and implementation of the first phase of the masterplan. In Cleveland the community chose to create an inner city vineyard. They believe inner city wine can be more lucrative than carrots!

See Figure 3.1 for information about these two urban agriculture economic development projects. The author was part of the design team and launch of the urban farm for Spartanburg's healthy food hub and has been astounded by what the Northside community has accomplished over a 5 year period.

Urban agriculture has also been used as a tool to transform blighted urban areas into vibrant community spaces which foster a sense of community and place (Hagey et. al 2012, 17). Years ago, the construction of an interstate highway dissected neighborhoods in Charleston, SC and created many dead end streets. The New Israel Reformed Episcopal Church, Historic Charleston Foundation, Housing Authority, neighborhood residents and Crop Up, LLC piloted a program to transform blighted "dead ends" full of needles and trash into safe, productive neighborhood gathering spaces. Figure 3.2 displays the change in the pilot site over a one year period.

Urban agriculture is also being utilized as a tool to cultivate a healthier community food environment by creating spaces in cities that support healthy eating and active living. In

Figure 3.2: Urban Ag can transform blighted areas into community assets.
Photo credits: Elizabeth Beak, Katy Quinn, and Historic Charleston Foundation

2012, Margo Wootan, director of nutrition policy at the Center for Science in the Public Interest stated: “Right now, the food environment is almost perfectly designed to make us fat. Eating well is like swimming upstream. You can do it but it takes a lot of effort” (Jones 2012). The John Hopkins Center for a Livable Future defines a **food environment** as **“**all aspects of our surroundings that may influence our diets including physical locations, marketing, media, and online exposure.” Physical locations include: “homes, schools, work places, food stores, restaurants, *gardens*, and emergency food assistant sites” (Neff 2015, 426). Community gardens and farms can contribute to creating a healthy food environment and access (ALTA Planning & Design et. al 2014, 33, Hagey 2012). The

Food Trust conducted a review of food environment research published within the past three years. Seventy-five studies found that access to healthy food impacted diet (Obadia 2016a, Food Bank of Northeast Georgia 2016). Diet can effect the health & welfare of residents. This will be further discussed in Chapter 5.

Urban agriculture can be strategically and safely assimilated into the urban fabric in a manner that make cities more sustainable. For example, food waste accounts for 20% of the municipal solid waste entering landfills, making food waste “the single biggest component” of a city’s waste stream. This organic material decomposes fast and produces methane, a greenhouse gas which contributes to climate change. Landfills in the U.S are the third biggest producers of methane (Golan 2013). However, San Francisco is diverting 70% of its waste from the landfill through a series of innovative tactics including curbside pickup of organic food wastes and composting. The compost generated is used on urban gardens and regional farms & vineyards (RecologySF 2016). When compost is incorporated into compacted, urban soils the soil texture can improve. The space can then help manage and filter water within a mostly concrete, urban jungle. Paved surfaces and buildings absorb and reflect heat. This can create what is called a heat island effect. Urban gardens and trees can help mitigate the heat island effect (Knizhnik 2012, Lehmann 2014, 5). In summary, urban agriculture can be strategically woven into our cities in a manner than can help with climate change, water issues, and other urban planning challenges.

As of 2016, there are many constraints that make it challenging to operate urban farms and gardens to their potential. In both developing and developed countries urban agriculture is often an “informal” arrangement on unused, urban spaces. Common challenges for urban farmers include: lack of secure land tenure, lack of access to water, and lack of access to affordable, comprehensive soil tests addressing urban issues-heavy metals, etc. The tenuous nature of urban farms and gardens can discourage farmers from investing in sustainable practices that require longer-term effort. One example is investing in the health of the soil. Basic infrastructure can enable urban agriculture become more sustainable, economically viable and safe. (Ex: drip irrigation, high tunnels, food safe washing & packing stations, coolers etc.) Again, the lack of secure land makes investment in this infrastructure too risky for many urban farmers. In the author’s experience, startup costs for tapping a city’s water main is often more money than grants for implementing an entire community garden project. Community groups feel obligated to start a new garden that will be challenging to sustain and fulfill both the community’s vision of success, and their funders, over the long term.

Lack of basic technical support for urban farming issues can result in some well-meaning farmers’ growing food in a manner that could raise health and safety concerns (Hagey et. al 2012). Many land grant university extension agents have not developed robust resources for urban agriculture. Business support for urban farm and food entrepreneurs is scarce. Urban farmers struggle with outdated, arbitrary and unclear zoning policies that can be difficult to navigate. These can make even the most sustainable, well-

designed, desperately needed urban farming efforts illegal. Policy constraints for farming ROWs will be discussed in Chapter 6.

Finally, urban agriculture is *not* "a simple transplantation of standard agricultural fields into the city" (Oswalt 2014). City dwellers in the U.S. can be two to three generations removed from their agricultural roots, not to mention cooking or eating fresh food. While some residents pay to live in high-end developments complete with a farm and organic farmer, most do not. There are cultural stigmas associated with agriculture that range from slavery to an associations with an impoverished and hard life. NIMBYS (residents who declare not in my back yard) fear a new urban garden will lead to dust, noise and the devaluation of their private property. Studies have found that citizens view "utility landscapes" such as an urban farm differently than "ornamental landscapes" such as a park or ornamental garden (Katrin Bohn and Andre Viljoen 2014, 33). Including elements from the ornamental landscape, such as ornamental buffers (for beauty, attracting pollinators and capturing runoff) can help city dwellers adjust to urban agriculture in their neighborhood. It is important to consider adjacent uses, hours of operation, and even integrate space for recreation and celebration as both urban culture and the urban landscape shift towards a new paradigm. However, urban agriculture is not actually new.

THE EVOLUTION of URBAN AGRICULTURE

Roots:

Humans have planned and operated farms in cities for centuries. In 3,500 B.C farmers in Mesopotamia strategically set aside land for food production as their cities grew (Green

2012). In colonial cities in North America, food system planning and urban agriculture were an essential part of ensuring food security, attracting settlers, and building the economy (Domenic Vitiello and Catherine Brinkley 2014). For example, when William Penn and his surveyors designed the City of Philadelphia, Pennsylvania they created 1.5 acre city lots suited for a house, garden and small orchard. The city was surrounded by a “belt “of larger farms (Hodgson et. al 2011). Oglethorpe’s plan for Savannah, Georgia provided all new residents: a 60 x 90 city lot, a five acre garden space, a farm of 44.88 acres, and commons for grazing (Reinberger 1997).

Visionaries of the planning & design profession included food in their designs for the “ideal city”. In 1898, Ebenezer Howard’s “Garden Cities of To-morrow” responded to Britain’s overcrowded, industrial city by proposing new “gardens cities”. Each garden city was planned for 30,000 residents. Families would be provided a parcel large enough to grow & feed a family of five. Allotment gardens were sited on the border of each of these planned towns. In 1924, Le Corbusier published “The City of To-Morrow and It’s Planning”. He proposed a 150 square meter communal garden per suburban housing plot. A farmer would be charged with intensive food cultivation on 100 such garden plots for the neighbors. He suggested planting orchards between homes and the farms as a buffer (Danyluk 2009a, 43). See Figure 3.1 for historical examples of urban agriculture in food system planning efforts.

U.S cities have grown and changed over time. The city’s relationship with urban agriculture has also evolved. In the beginning of the 20th century, planners utilized zoning

as a new tool to separate land uses in a rapidly industrializing city. Removing animal production and processing from the city was one example creating cities that promoted public health and food safety. By the mid-20th century the zoning codes of many U.S cities no longer recognized farming as a legitimate urban land use. Meanwhile the industrial food system evolved into a global logistical operation handled by private corporations and large agencies like the USDA (Vitiello 2014, 104). The economy of scale generated by advances in production, coupled with technological advances including refrigeration, storage and transport enabled the efficient, economic flow of food throughout the world which many benefit from today. Food was no longer part of a city or regional planner's domain.

However, during times of crisis urban agriculture reemerged. During the economic crisis of 1893, the Mayor of Detroit established the Potato Patch programs on vacant lots to feed the unemployed. During WWII, 20 million Victory Gardens produced 41% of American's vegetable needs (Kimberley Hodgson et. al 2011). However, for the last century urban agriculture has been an ephemeral urban land use. Once a crisis is over, urban development pressures trump and productive spaces in the urban landscape disappear, for a while.

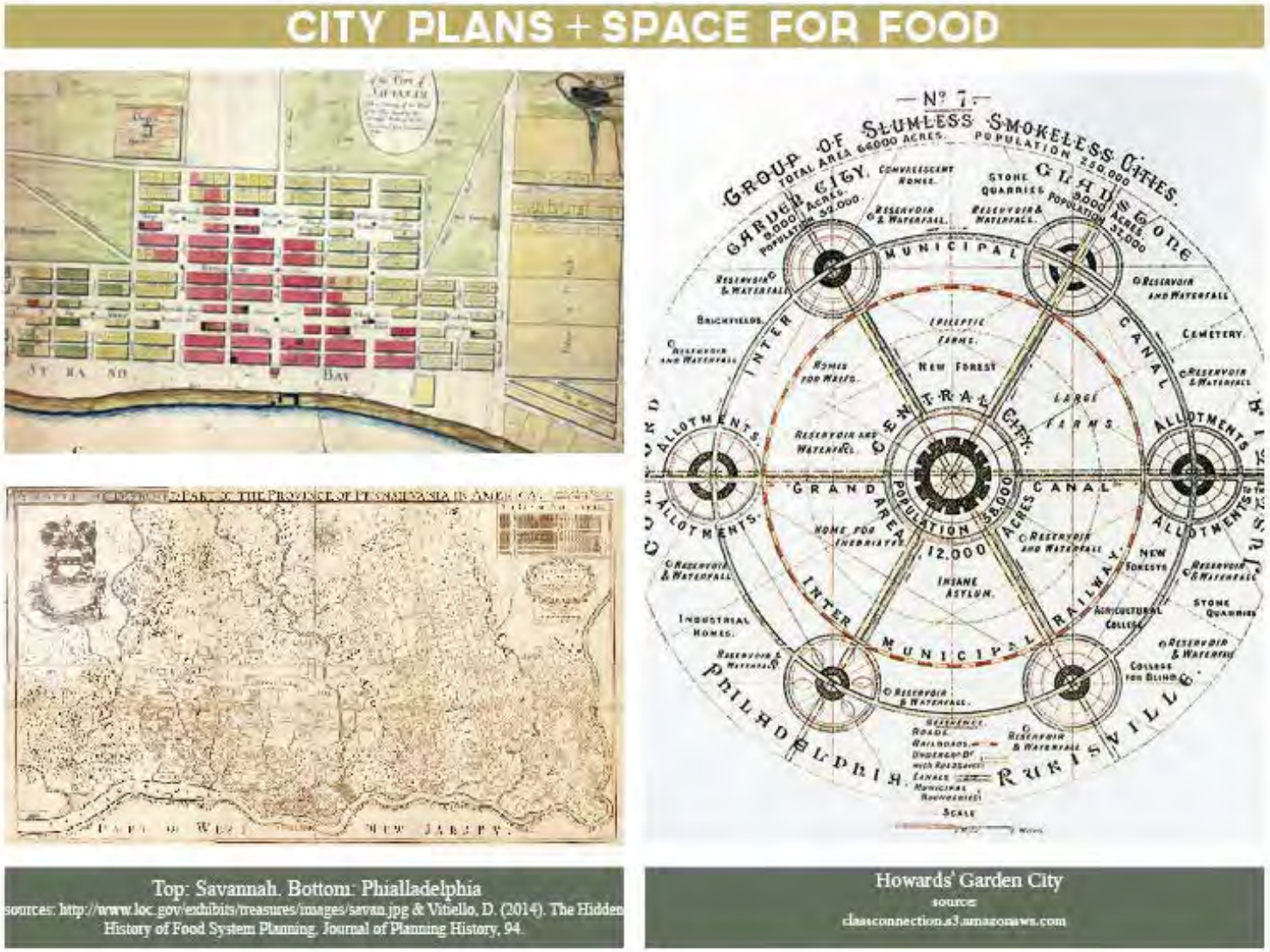

Figure 3.1: Historical Examples of Food Systems Planning: Oglethorpe's Savannah, Penn's Philadelphia and Howard's Garden City.
Photo credits: www/loc.gov/exhibits/treasures/images/savan.jpg; Vitello D. (2014) The Hidden History of Food System Planning page 94. Classconnection.a3.amazon.wc.com

URBAN AGRICULTURE in the 21st CENTURY CITY

Today, the opportunities and constraints associated with urban agriculture are recognized, and cities are re-envisioning ways to integrate urban agriculture as an essential component of infrastructure for a more resilient food system and city. Lessons can be learned from historical food system planning, as well as the advances in rural agriculture today. However, the challenges associated with feeding the 21st century urban population in a safe, sustainable manner necessitate innovation, research, and new partnerships.

Recently, urban agriculture has been a community-based movement. However, there are numerous indications of a combination of bottom up, top down collaborations that could help scale up urban agriculture and embed it into the landscape, policies and plans of the post-industrial city (Morgan 2014). As seen in the summary table at the end of this chapter (Figure 3.3) international, national and state agencies recognize and support urban agriculture. John Hopkins estimates that as of 2015 there are: “278 total Food Policy Councils (FPCs) in North America, with 212 in the United States, 60 in Canada, and 6 in tribal nations”(John Hopkins University Bloomberg School of Public Health Center for a Liveable Future 2015). **Food Policy Councils** (FPCs) are “groups of stakeholders representing various segments of the food system and organized with the goal of addressing strengths and limitations in that system” (Neff 2015). FPCs bridge community movements with government policies and planning efforts to achieve “what they could not hope to achieve alone” (Morgan 2014).

Urban agriculture is being considered as an important layer in a “nested food system model” (Kate Clancy and Kathryn Ruhf 2010). It can help connect and expose urban residents with urban gardens and fresh food. It can encourage urban residents to support the rural farms contributing to their local and regional food supply; and appreciate (and question) the dominant national and global food system. Urban agriculture is *not* trying to fulfill *all* food needs of a city. It can be designed to operate in a manner that fulfills important niches in the current food system, culture, and landscape. The nested food system approach can create a more resilient food system and city. Figure 3.2 provides a visual for the nested food system model. Urban agriculture nested in ACC ROWs could contribute at the community or county level.

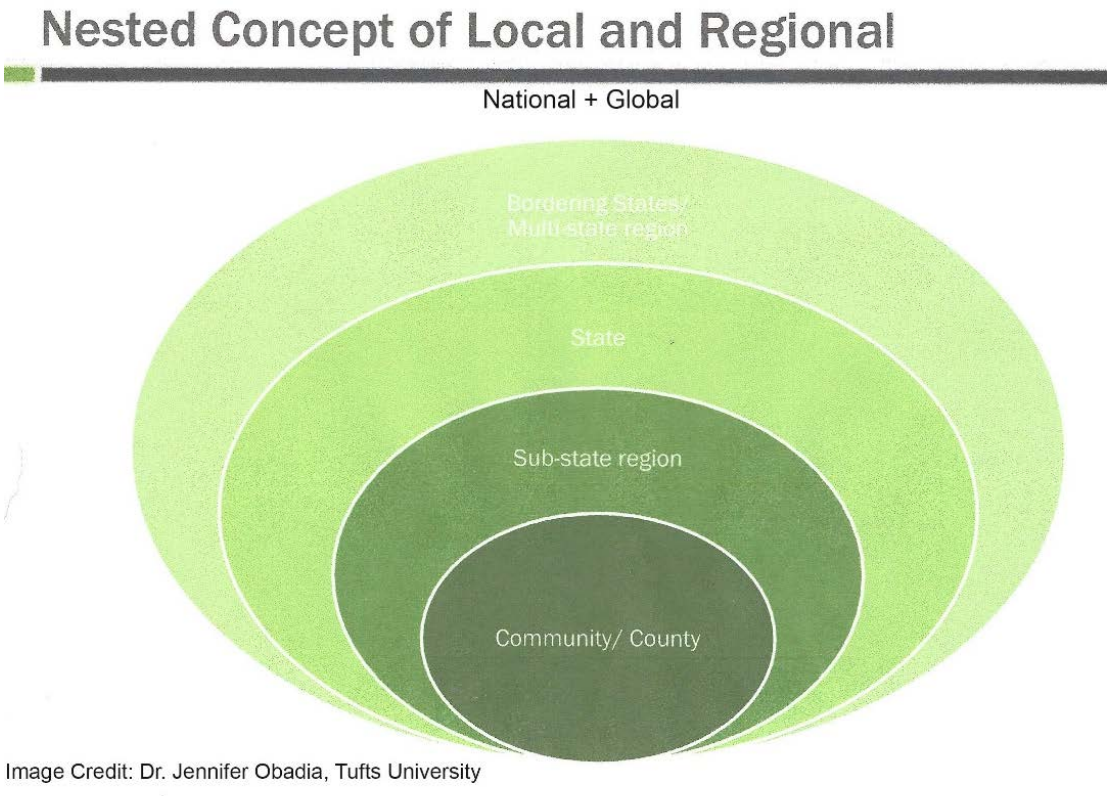

Figure 3.2: Nested concept of local and regional (and national + global) food system. Image credit: Dr. Jennifer Obadia’s lecture on regional food systems at Tufts Universiy

INDICATIONS OF URBAN AG AS A 21st CENTURY CITY ATTRIBUTE

INDICATORS	WHO	HOW	LINKS
Agency Recognition & Support	World Health Organization United Nations USDA American Planning Association American Public Health Ass.	Research + Reports Web pages + Publications Funding	www.fao.org/urban-agriculture/en/ afsic.nal.usda.gov/farms-and-community/urban-agriculture, www.planning.org test.healthiestcities.org
Policy	Cities across the U.S. & Georgia (& other nations)	Food Policy Councils Municipal Urban Ag Policies Addressing Safety + Needs	www.foodpolicynetworks.org/directory/ www.policylink.org
Planning	Cities across the U.S. & Georgia (& other nations)	Food, Health, Economic Assessments, Food Plans + Maps Comprehensive Plans Updating Zoning Food and Urban Ag zones	growingfoodconnections.org
Infrastructure	Cities across the U.S. & Georgia (& other nations)	Land Suitability Assessments Funding for Start-Up Costs	www.changelabsolutions.org/publications/seeding-city City of Cleveland, Baltimore etc.
Sophistication in Growing Training, Design	Cities across the U.S. & Georgia (& other nations)	Spin Farming, Hydroponics, Aquaponics, Incubators, Food Hubs, Shared Processing, Kitchens CPULS, Multi-use& Urban-rural Connections, Staff	www.growingpower.org/ www.ngfn.org www.ryerson.ca/carrotcity/
Collaboration	Cities across the U.S. & Georgia (& other nations)	Farmer Collectives, Tool Kits Conferences/ Websites Regional Connections, Nested Food Systems Non-profit, community, govt	Numerous - see all of above

Figure 3.3: Indications of Urban Agriculture moving from a marginal movement to a mainstream attribute of the 21st Century City.
Source: Elizabeth Beak

CHAPTER 4

PRECEDENT CASES: URBAN AGRICULTURE in ENERGY ROWs

This paper asks if the vast, network of land in Athens-Clarke County energy right-of-ways (gas and transmission) could be used to grow healthy food and scale up urban agriculture. “Right-of-Way Agriculture” or faming along energy ROWs, roadsides, rail systems, canals etc. is practiced throughout the world; most often by low-income farmers without access to land. Studies have found that ROW farming can increase access to land and help ensure food security (Jac Smit et. al 1996). For example, Havana Cuba produces an estimated 490,000 tons of vegetables a year under transmission lines(Danyluk 2009b) (Danyluk 2009b). Thirty-nine hectares of gardens under power lines in Dar Es Salaam Tanzania offer “employment, income and food security for urban farmers and their families” (Dongus 2000). Ampla Transmission provides 1000’s of hectares to farmers, who in turn, help ward of squatters and maintain the transmission ROWs in Rio De Janerio (Danyluk 2009b, 46). These examples demonstrate it is possible to grow food in ROWs. This chapter discusses four unique models and partnerships being used in North American cities that address constraints and cultivate the benefits of farming land in energy ROWs. 1) Private property owners lease land to a ROW farmer. 2) Energy companies lease land to ROW farmers. 3) Energy companies, government and non-profits create spaces for ROW farms. 4) Cities include ROW gardens as part of a Continuous Productive Urban Landscape. 5) The fifth model discusses some of the constraints and barriers one might encounter. The precedent cases described in this

chapter can help residents, farmers, gardeners, non-profits, planners, designers, local government officials and energy companies create the best model for growing food above pipelines and below transmission lines in Athens-Clarke County (ACC).

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Figure 4.0 Farming on Transmission ROWs in Brazil.
Photo credit: Inhabitant 2015

Model # 1: PRIVATE PROPERTY OWNERS LEASE LAND to a FARMER

Precedent: Woodland Gardens, LLC (Athens-Clarke County, GA.)

Woodland Gardens, LLC is a 12-acre USDA certified organic farm in Athens-Clarke County, Georgia that sells over 80 varieties vegetables, fruit and cut flowers to chefs and consumers in Athens and Atlanta. A Georgia Power transmission ROW runs through the middle of this farm. (See Figure 2.3) A YIMBY or "**Yes** In My Back Yard" private property owner realized the hay farm next to their home was for sale. They wanted this land to

remain in agricultural production. They did not want to farm, but recognized that many young farmers do want to farm and cannot afford land with infrastructure. They purchased the hay farm. In 2000, they signed an agreement with Celia Barss to develop and manage Woodland Gardens, LLC (Celia Barss 2013).

When the author visited Woodland Gardens in 2014, Celia Barss shared that initially she only farmed the land outside of the Georgia Power transmission ROW. As the business grew, she decided to grow mixed vegetables under the power lines. She reported a straight forward, good relationship with Georgia Power. For example, Georgia Power agreed not to spray the ROW, so long as she maintained the area. Downloading materials from the website to build a deer fence or run irrigation to the field in the ROW was straight forward.

Common challenges that many ROW farmers wrestle with were not an issue for Celia, including: truck & water access and the ability access basic farm infrastructure. This was due to the fact that she had access to the entire property, not just the land in the ROW. For example, high tunnels (similar to greenhouses see Figure 6.8) on the property enable Celia to produce food year around and deliver products to clients on a reliable basis. However, permanent structures larger than 12'x12' are not allowed in ACC ROWs. If a farmer was constrained to the land in the ROW itself, the business model is more likely to be seasonal, and may not be as profitable.

Celia's top concern was whether farming under a transmission line was healthy for the farm workers and farmers. (Health challenges and opportunities will be discussed in-depth in Chapter 5.) Celia believed the benefit to having the ROW cross the farm, was it made the land less desirable, thus cheaper, yet it still could be farmed.

The costs associated with land can shape both a community's food system, and a farmer's willingness to utilize land on an energy ROW. During the ACC community food system mapping process, the author noted that ACC has zoned a substantial belt of land agriculture residential (AR). However, most farmers selling food at ACC farmers markets have their farm in neighboring counties. (See Figure 3.0) The author asked market vendors why there were so few Clarke County farmers at the markets. The response was: land prices and taxes drop as soon as you leave Clarke County. If ACC's goal is keep AR zoned land productive over time, the author suggests considering incubator farms or incentives. Farmers hoping to grow in Clarke County may want to look for "deals" on land adjacent to or in ACC energy ROWs.

As for this model, all participants have benefited. 1) A farmer was able to lease prime farm land, close to markets at an affordable rate. This helped Celia create a successful farm business. She was proud of being able to provide year-around jobs for 8 people. She liked that she was contributing to the local economy and providing healthy food for residents in Athens and Atlanta. 2) The YIMBY landowners were able to keep the land adjacent to their home in production. 3) Georgia Power saved resources because the farmer helped maintain the ROW.

Numerous resources are available to help replicate this model on other private properties along the ACC energy ROWs. These **resources** include: 1) templates for leases & MOUs between landless farmers and private property owners; 2) non-profits & websites that focus on linking land-less farmers and gardeners with YIMBY property owners/retiring farmers; 3) government policies, such as the Urban Agriculture Incentive Zones Act (AB 551). This allows local governments in CA to establish zones where "land owners can get a substantial property tax break in exchange for dedicating their vacant land to commercial or noncommercial agricultural use for at least five years" (Mazurek 2013). Currently, some states provide tax credits for property owners with a ROW on their land(Xcelenergy.com 2007). Imagine if ACC created an incentive zone for ROW property owners, who leased their ROW to urban farmers (or allow a public bike trail etc.). Perhaps additional YIMBY property owners would step forward. These leases and websites can help create safe, legal, mutually beneficial partnerships. (See "links" in Figure 4.7.)

For example, the author spoke with another YIMBY private property owner, just west of Woodland Gardens, on the same transmission ROW. This YIMBY property owner leases his land to Spring Valley Eco-farm, a productive non-profit farm that sells at the ACC farmers markets. (See the bottom right image in Figure 4.1.) The suitability analysis (discussed in Chapter 7) indicates that the ROW crossing the property is suitable for growing food. The ROW is not being used by the non-profit, currently. Farm infrastructure exists onsite. This could be an ideal site to develop a **grow node.** (Area of a ROW identified as suitable for farming, with a property owner who permits access to infrastructure etc.

Figure 4.1 Examples of successful models and partnerships between private land owners and farmers. 1) Farmer Celia Barss 2) Google Earth image of ROW cutting through Woodland Gardens, LLC. 3) Google Earth Image of Spring Valley Eco Farm, just up the ROW from Woodland Gardens, LLC. Figure 2.1 provides context to where these two farms are located in ACC. 4) Screenshot of Backyard share, one of the many online sites connecting urban property owners with landless farmers and gardeners. **Photo credits:** Southern Foodways Alliance, Google Earth, www.reinet.ca

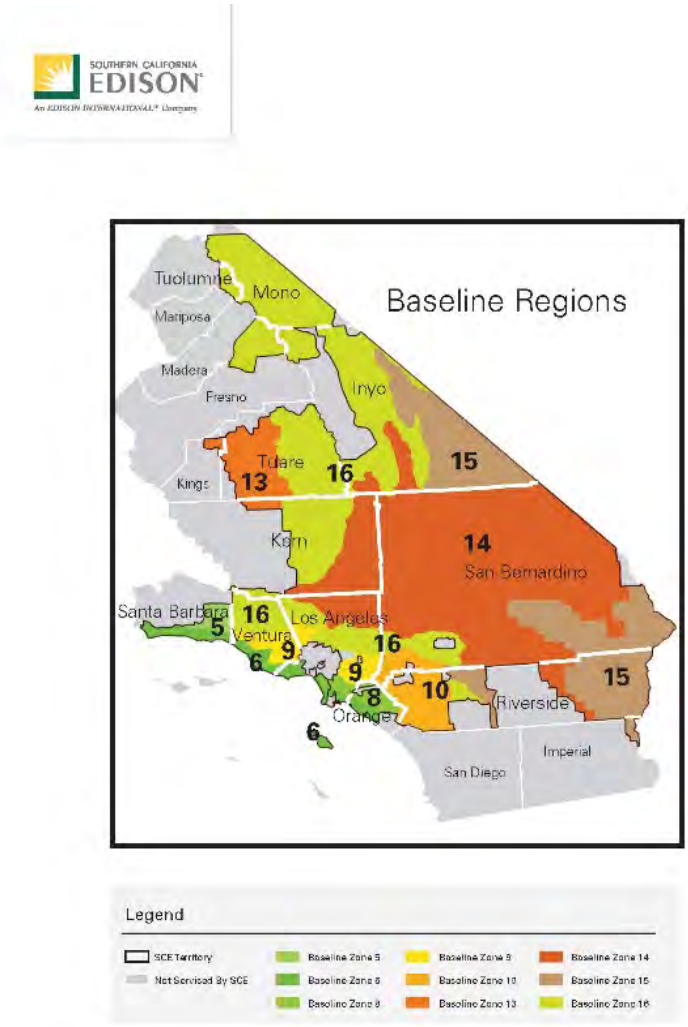


Figure 4.2 Southern California Edison's service area zones. This company has been leasing land to farmers for decades. **Image credit**: SCE website

MODEL # 2: ENERGY COMPANIES LEASE LAND to FARMERS

Precedent: Southern California Edison (Multiple Cities, California)

Southern California Edison (SCE) is a transmission company that provides energy to multiple cities in southern CA. (See Figure 4.2.) SCE also leases land in the transmission ROWs that their company owns outright. They have developed a clear, fine-tuned process for leasing land in ROWs to farmers and gardeners, over several decades. In 1963, the California State Legislature granted utility companies, such as Southern

California Edison, the right to sell licenses for secondary land uses, including agriculture (Christopher Slater et. al 1975, 26). Farmers pay SCE a low rent and liability insurance fee for land most farmers considered more secure and affordable than other spaces in a rapidly developing, expensive region of the U.S(Christopher Slater et. al 1975, 25).

Table 1

Tenants and Acreage in Secondary Use of Southern California Edison Right of Way Lands in Los Angeles County[3]

	Tenants	Acreage
Nursery Stock	144	772
Raw Crops, Turf and Seed	31	378
Christmas Tree Farms	24	132
Landscape and Beautification	77	52
Pasture and Grazing (horse stables)	40	120
Parks (city or county)	15	135
Totals	331	1,589

Figure 4.3 This table is from Slaters 1975 study: “Agrarian Renewal: Farming Under Utility Power Lines in Los Angeles County”. It indicates the number & types of farmers leasing from SCE, decades ago.

All parties can benefit from this model. 1) The utility company spends less money maintaining these spaces and earns some rent through the leases. 2) The farmer is able to access relatively secure land (5-year leases), at a relatively good rate. Sometimes the land is already fenced, with water. 3) Neighbors appreciate seeing a weedy ROW transformed into a Christmas tree farm, ornamental nursery, nursery or oasis of food.

The SCE website is a source for a number of well-developed resources. California utility companies have learned, over decades of experience, what can work and not work in terms of nesting active farming operations beneath their infrastructure. These companies are currently more lenient with what they permit in the ROW than utility companies in

ACC. For example, commercial farmers can position high tunnels, greenhouses, shade structures, trailers for modular offices, etc. in the ROWs, so long as they follow certain height and setback guidelines (Southern California Edison Company 2012a). This can make it easier for a farmer to sustain a business and produce more food. Links to SCE leases and SCE guidelines within a ROW are in figure 4.7.

In ACC, most of the acreage in the energy ROWs is not owned by the utility companies. Companies hold easements to use the space but the property owner still owns the land. However, the six ACC utility companies do own some properties along ACC Energy ROWs for pumping stations, etc. Four parcels owned by energy companies, were identified suitable for agriculture in the suitability analysis. ACC urban farmers or community garden groups could potentially use this model to grow healthy food on these properties.

Figure 4.4 Hydro One ROW in Toronto Canada to become sites for CEED Gardens in the summer of 2016. Photo credit: Jeremy Gilbert with the “Torontoist”

MODEL # 3: ENERGY COMPANIES, GOVERNMENT, NON-PROFITS CREATE SPACES to INCUBATE SMALL SCALE ROW FARMERS.

Precedent: CEED Gardens (Toronto, Canada)

The City of Toronto, Hydro One Transmission Company, and Toronto Urban Gardeners (TUG) will pilot CEED (Community Eco-Economic Development Gardens) on six acres of land in the ROWs in the summer of 2016. These CEED gardens will be used to incubate small-scale commercial urban farmers. The gardens are located in food deserts, or areas of Toronto where residents have low-access to healthy food. On-site sales will be permitted. TUG will help train the farmers & coordinate both onsite farm stands & farmers markets at neighborhood community centers (Sherman 2015).

Governments such as the Province of Ontario and City of Seattle recognize the value of these vast networks of green space. They have signed leases with the utility companies to utilize these spaces for permitted secondary uses that serve the public, including community gardens and farms. They then partner with urban agriculture non-profits or a governmental department (ex: TUG, or P-patch community garden program in Seattle's Department of Neighborhoods) to manage day to day operations, insurance, contracts etc. for community gardens, community orchards, or farms in the ROW. The City of Toronto already has 13 successful community gardens in the ROWs (Danyluk 2009b). The CEED gardens represent their attempt to scale up urban agriculture in the energy ROWs. Resources for creating successful legal agreements between non-profits and governments to produce food on public lands can be found in the summary table in figure 4.7, and maybe helpful if ACC wishes to explore this model.

This model benefits all parties. 1) Hydro One Transmission Company permits agriculture, as a secondary land use, but does not want to manage farmers. 2) The CEED project will help fulfill Toronto's plans for scaling up urban agriculture & making healthy food more accessible for all Toronto residents (Sherman 2015). 3) Farmers do not have to navigate confusing policies and regulations or deal with costly testing and permitting issues. The city, utility company, and TUG have already worked through multiple issues (EMF testing, soil testing, policy issues regarding the right to sell on public land etc.) and farmers can simply lease plots. 4) Residents who live in these food deserts can apply for a plot to earn extra money; or buy healthy food from a ROW farmer. Also, this blighted space will be beautified by productive gardens bordered with ornamental flowers.

Similar partnerships between an energy company, government and non-profit have been used to grow food in the ROWs of Los Angeles, Seattle and Irvine. In ACC, partnerships between the ACC planning department, local non-profits (ex: Athens Land Trust, the Food Bank of Northeast Georgia etc.), the University of Georgia and energy companies could identify areas and lay the ground work to produce healthy food in underutilized ROWs in a manner that could benefit all.

MODEL # 4 UTILIZING ROWs to CULTIVATE CONTIUOUS PRODUCTIVE URBAN LANDSCAPES & HEALTHIER ENVIRONMENTS

Precedent: Chief Sealth Multi-use Path (Seattle, WA)

In "Second Nature Urban Agriculture In "Second Nature Urban Agriculture: Designing Productive Cities" Viljoen &Bohn propose Continuous Productive Urban Landscapes

Figure 4.4 Google Earth image of Chief Sealth multiuse path in Seattle, WA. What could be a vacant, weedy ROW contains bike and pedestrian trails connecting two community gardens operated by the city's P-Patch community garden program. **Photo credit:** Google Earth

(CPUL) or connecting patches of urban agriculture with trails for recreation and exercise, ecological habitat, open space etc. This design method involves: 1) looking at a city map; 2) marking existing open spaces on that map and using green infrastructure to connect them; 3) integrating urban agriculture; and 4) nourishing a city (Katrin Bohn and Andre Viljoen 2014, 13). These designers believe productive urban spaces "gain significance and meaning in the urban landscape" and culture when they become part of a coherent network (Mark Gorgolewsk 2011). If one were to look at an ACC map, the undeveloped network of green space in energy ROWs appears to be an excellent building block for designing CPULS and creating healthier environments in the post-industrial city.

Cities such as Seattle and Toronto are already utilizing the energy ROWs in their cities as CPULs. For example, in 2008 the Seattle City Council asked the Department of Neighborhoods to partner with Seattle Public Utilities and Seattle City Lights to conduct

an inventory of public lands suitable for urban agricultural. The University of Washington published “Growing Green: An Inventory of Public Lands Suitable for Community Gardening in Seattle, Washington” (Horst 2008).

The report documented three successful community gardens (Snoqualmie, Ferdinand and Thistle P-Patches) on the Chief Sealth multi-use path ROW and recommended additional sites along energy ROWs (Horst 2008, 40-43). This model benefits multiple partners. 1) Residents can bike or walk to community gardens coordinated by the city’s P-patch program, or just passively connect with healthy food as they travel to their final destination. 2) The City of Seattle is able to fulfill its policy to provide a community garden for every 2,500 residents & increase the value of a marginal space (Gulick 2007, 71). 3) The energy company gains a public relations makeover. They become active partners in creating a vibrant neighborhood space for Seattle residents to engage in active living and healthy eating activities.

This model could work in some sections of ACC’s energy ROWs. This study analyzed ACC ROWs solely for food production, and 692 acres were found suitable for urban agriculture. However, acres of unsuitable areas separate these potentially productive areas. (Steep slopes, unsuitable soil, etc.) These unproductive areas could be used for trails, bike paths or planting wildlife habitat. They could help connect neighborhood residents with gardens, open space, public parks, public transit and other ACC community amenities. In 2008, the Northeast Georgia Regional Commission completed a “Corridor Feasibility Study for the Evaluation of Potential Greenway Networks in Northeast Georgia”

(Northeast Georgia Regional Commission 2008). These findings, paired with the results from this analysis could be utilized to design CPULS that serve current and future ACC residents. In Chapter 5, Figure 5.7 suggests a section of the ACC ROW to consider.

5 POTENTIAL CONSTRAINTS: LESSONS FROM A PROJECT THAT DID NOT GET OFF THE GROUND

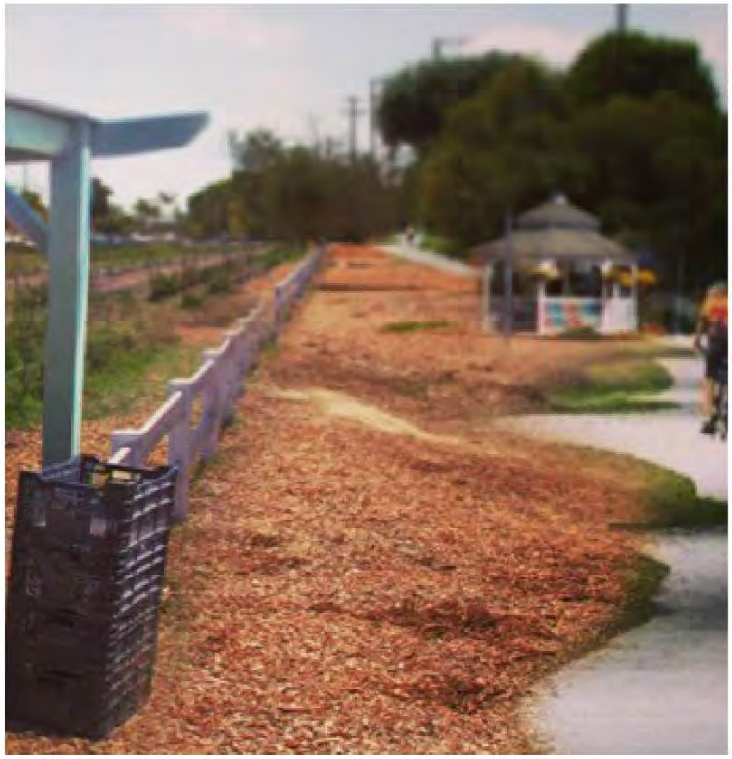
Precedent: Greenbelt Gardens (Long Beach, CA)

In 2014, the food policy council of Long Beach, Long Beach Fresh, held numerous public meetings and created three conceptual designs for the “farmway” or “greenbelt gardens” on a section of their ROW. (Long Beach Fresh 2014). Figure 4.6 shows the proposed “farmway” concept. When the author followed up with Long Beach Fresh about the project, the email response was: “Hello, the Greenbelt Gardens project did not move forward. People in the neighborhood were quite frightened it would hinder access to the area which is being proposed to be a walking path instead” (Smolar 2016). This could indicate: 1) a camouflaged “Not In My Back Yard” (NIMBY) response to urban agriculture; 2) potential tension between secondary land uses sharing a ROW.

ACC energy ROWs traverse both public and private properties. Some land owners along ACC energy ROWs will be NIMBYs and others YIMBYs, in terms of urban agriculture. When the author asked professional designers and greenway planners about how they deal with NIMBY’s they said: 1) sometimes they must reroute around that NIMBY property or neighborhood and start again on the other side. 2) The government lasts longer than the resident, eventually the plan could become a reality. 3.) It is not always possible to

design the ideal. You do what you can, where you can. The NEGRC greenway feasibility study notes places on ACC's energy ROW network where ROWs are close, or even cross. They see these areas as opportunities for re-routing greenway trails if neighbors along one section did not want a trail (or garden) in their backyard. A link to this resource, as well as those for the other models discussed in this chapter can be found in Figure 4.7.

PRECEDENT CASE - LONGBEACH GREENBELT GARDEN CONCEPT



Rendering of what the CPUL on Pacific Electric ROW in Long Beach, CA

One of four concepts for a CPUL on ROW in Long Beach, CA Three gardens proposed but not included due to fears would impede access to walking trails.

Photo 1 credit: http://lbfresh.org/opportunities/farmway/
Photo 2: http://mybelmontheights.org/index.cfm/issues/pacific-electric-right-of-way-greening-project/

Figure 4.6 Concept for the Greenbelt Garden concept in Long beach, CA. It did not succeed.
Photo credits: Long Beach Fresh and mybelmontheights.org

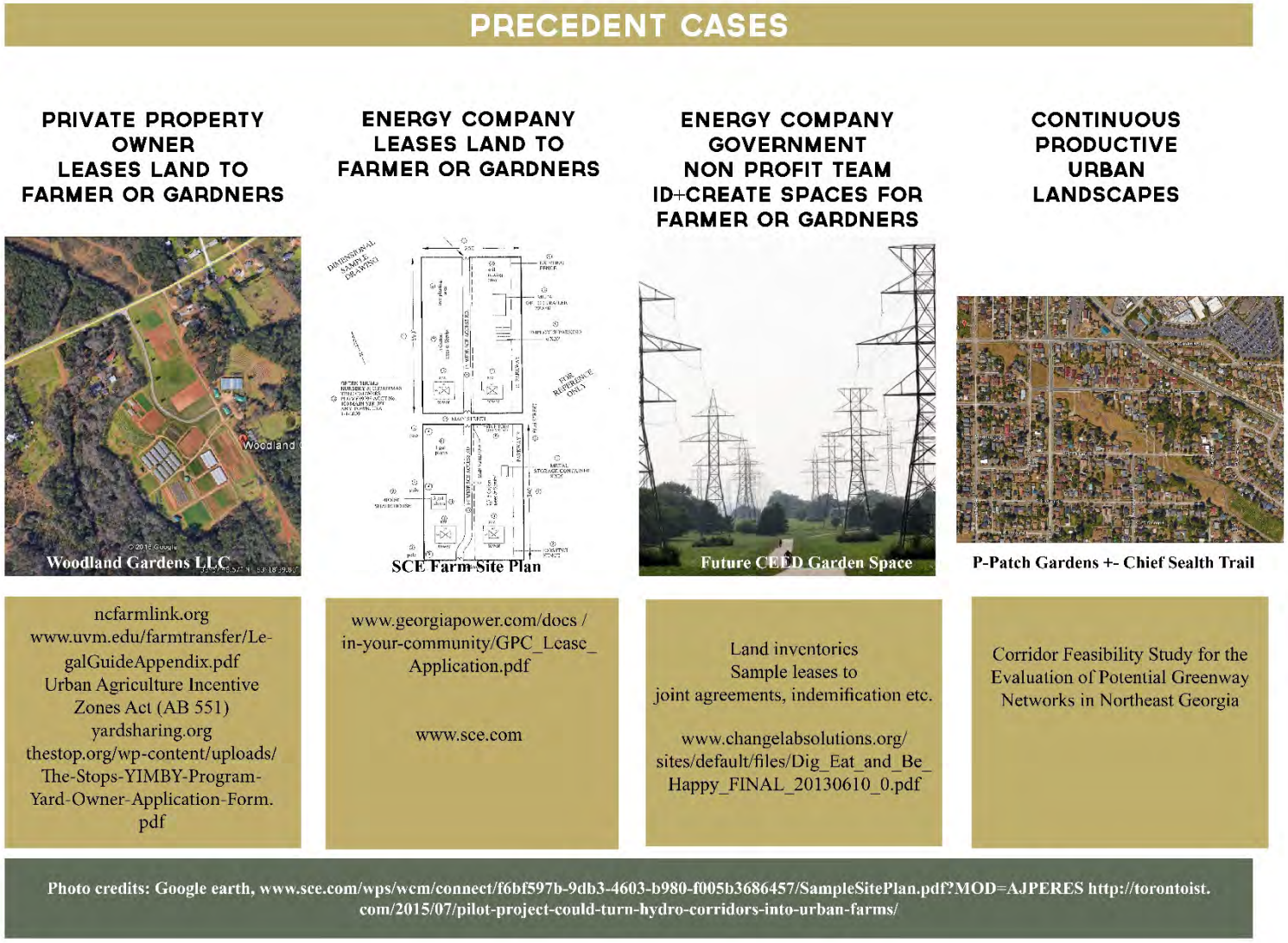


Figure 4.7 Summarizes the four successful models discussed in this chapter and links to resources.
Photo credits: Google Earth, SCE, Torontoist, Google Earth

CHAPTER 5

HEALTH CONSIDERATIONS

In the fall of 2014, the author visited Woodland Gardens, LLC to ask farm manager Ceila Barss about her experience operating a farm with a field in a Georgia Power transmission ROW. Celia reported that the utility company had been relatively straightforward to work with, as an organic farmer. After farming this property for 10 years she had carefully observed, yet noted no difference in the productivity of her crops in the ROW field vs. the other fields on the farm. However, she asked the UGA research team to share whatever they learned about health issues for farmers working under high-voltage power lines. The author of the 2009 study "Cultivating Potential: Planning for Urban Agriculture in Toronto's Hydro Corridors reported: "The most common and pressing concern among the urban agriculture proponents I interviewed was the potential health risks associated with the electromagnetic fields (EMF) generated by high voltage power lines" (Danyluk 2009a, 18). This chapter reviews some important health considerations designers, planners, urban farmers and gardeners should consider as they make decisions about if and how they will utilize energy right-of-ways (land under transmission lines or above pipelines) for food production. These considerations include: 1) EMFs 2) soil 3) and the state of a community's health environment. Then the author will share examples of how some municipalities, planners and farmers are utilizing this information to make informed planning, design and growing decisions about producing food in energy ROWs.

ELECTROMAGNETIC FIELDS (EMFs) & TRANSMISSION ROWs

Electromagnetic Fields (EMF) “are a combination of electric and magnetic fields of energy that surround any electrical device that is plugged in and turned on” (United States Environmental Protection Agency 2016). According to the World Health organization humans are always and have always been exposed to electromagnetic radiation. For example, the ultraviolet radiation from the sun is a source of EMF. However, in the 20th century, numerous new technologies have increased human exposure to EMFs of diverse frequencies including: cell phones, computers, wireless networks, transmission towers, cell towers, GPS, refrigerators, microwaves and other household appliances and devices. As of 2016, some to all of these technologies have been integrated into the culture and environment of almost every community on the planet. Scientist predict exposure to EMFs will continue to escalate as new technologies are introduced or evolve (World Health Organization 2016).

Figure 5.0 Illustrates the electromagnetic spectrum. Transmission lines are low frequency.
Image credit: World Health Organization Website

30 YEARS of RESEARCH on the POTENTIAL LINK BETWEEN EMF and HEALTH CONCERNS

Concern about the potential impact EMFs could have on public health commenced with the 1979 study: “Electrical Wiring Configurations and Childhood Cancer” by Wertheimer and Leeper. This study found a correlation between children living in houses with “an excess of wiring configurations” and childhood leukemia (Wertheimer and Leeper 1979). Public concern and media attention about human health and EMFs have since escalated over time. In 1996, the World Health Organization (WHO) responded by starting the International EMF Project to investigate associations between new technologies emitting EMFs and health risks in a “scientifically sound and objective way” (World Health Organization 2016).

In 2002, the International Agency for Research on Cancer (IRAC) performed an extensive review of all peer-reviewed, scientific research about EMFs and health for the WHO. The IRAC however, reported a “weak correlation” between childhood leukemia and EMF; and therefore classified EMFs as “possibly carcinogenic to humans” (City of Toronto 1998-2016).The IRAC labeled this correlation as weak, because the epidemiological research findings could not be replicated in laboratory studies with animals. Therefore, the relationship between EMFs and childhood leukemia could not be labeled causal (World Health Organization 2008). In 2007, the WHO published an updated review of international EMF research. The IARC’s 2002 classification of EMFs as a possible cause of childhood leukemia was not dismissed. “On balance, the evidence is not strong enough to be considered causal, but sufficiently strong to remain a concern.” The questions that

still remained included: 1) clarity on how cancer could be caused by EMF; 2) the type of exposure that caused harm (low-level long term vs. high-level short term.); or 3) why these results are not found in lab experiments with animals? (Medical Officer of Health City of Toronto 2008).

As of 2016, the World Health Organization's EMF Project website estimates that over 25,000 scientific, peer-reviewed studies have been conducted on the effects of EMFs on public health over the past three decades (World Health Organization 2016). In-depth reviews of studies regarding a potential link between EMFs, radiofrequencies and other public health issues including: adult cancers, depression, suicide, reproductive and developmental issues in pregnant woman, neurodegenerative and cardiovascular disorders, headaches, cataracts (etc.) have generated contradictive findings. Therefore the scientific community has been unable to reach a conclusive judgement (World Health Organization 2008). The **current conclusion** is: "Despite extensive research, to date there is no evidence to conclude that exposure to low-level electromagnetic fields is harmful to human health." The National Institute of Health's National Cancer Institute categorizes **Low to mid-frequency EMFs** as: "static fields, magnetic fields from electric power lines and appliances, radio waves, microwaves, infrared radiation, and visible light found in the non-ionizing radiation part of the electromagnetic spectrum that are not known to damage DNA or cells directly. ELF-EMFs have "frequencies up to 300 cycles per second, or hertz (hz)" (National Institute of Health: National Cancer Institute 2016). In terms of the association between childhood leukemia and EMF, the WHO website reports that numerous large scale investigations are underway in several countries to try to

deliver some clarity to this particular linkage (World Health Organization 2016). A 1998 report by the National Institute of Environmental Health Science reviewed numerous studies on EMF and arrived at the same conclusion as the WHO (National Institute of Environmental Health Sciences 1998). For communities who wish to check for updates on this issue over time, the WHO appears to be the group most actively aggregating and updating international studies on EMF.

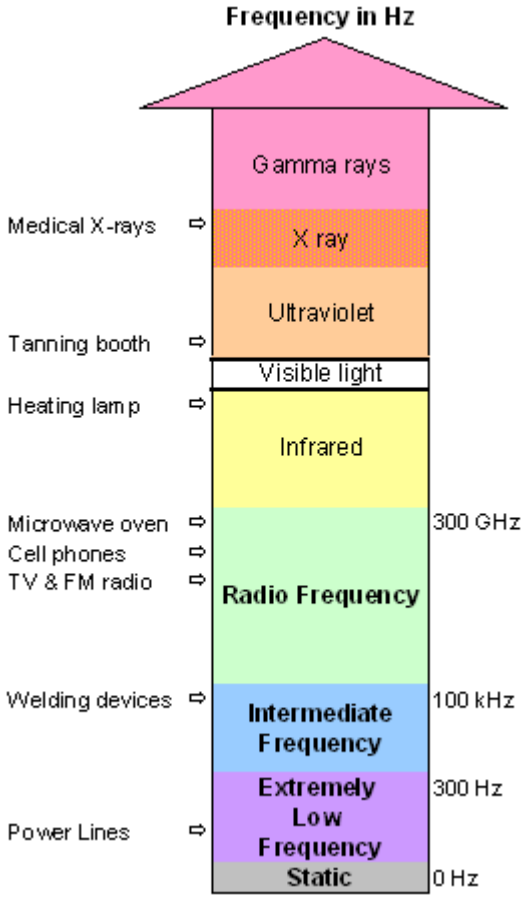


Figure 5.1 ELF-EMFs have frequencies up to 300 Hz
Image credit: greenfacts.org

HOW COMMUNITIES ARE SOURCING & UTILIZING THIS INFORMATION

The rising public concern about EMFs, and inconsistent science-based evidence leaves some governments in a conundrum. The U.S Environmental Protection Agency website states: based on the lack of scientific conclusion about EMFs, there are currently “no federal standards limiting electromagnetic fields and other sources to people at work or home.” For citizens concerned about EMFs effect on their health the EPA only provided this guidance: “the strength of EMFs fades with distance from the source. Limiting the amount of time spent around a source and increasing the distance from a source reduces exposure” (United States Environmental Protection Agency 2016, W&W Radiological and Environmental Consultant Services Inc.). Many utility companies produce formal statements in response to questions citizens have about EMF levels associated with high voltage powerlines. This information tends to echo what is stated by the WHO, NIEH, and American Cancer Society. Figure 5.2 is an example of the company statement that the LA Department of Power and Water provides to all concerned citizens, as well as all urban gardeners and farmers utilizing these spaces (LA Department of Water and Power 2013).

LADWP Position Statement: Electric and Magnetic Fields

The Los Angeles Department of Water and Power (LADWP), a municipal electric utility, shares the public's concern about possible adverse health effects from exposure to lower-frequency electric and magnetic fields (EMF) and, in particular, magnetic fields.

Magnetic fields are present where there is electric current- around appliances and powerlines, and in workplaces, schools and homes. Electricity provides us with many comforts, and we depend on and use it every day for our safety, livelihood and enjoyment.

Given the uncertainty of the issue, the medical and scientific communities have been unable to determine that magnetic fields cause health effects or to establish any standard or level of exposure that is known to be either safe or harmful. There is agreement, however, that this is an important issue that should be resolved.

The LADWP is committed to doing all we can to promote a better understanding of the magnetic field issue by sharing balanced information with our customers, fellow employees, and other stakeholders and addressing their concerns. The LADWP also supports and follows magnetic field research so that we can continue to act responsibly.

LADWP Position on Options

While the scientific information to date does not justify expenditures to modify existing facilities, the LADWP applies no-cost and reasonable low-cost steps to minimize the magnetic field exposure from new or upgraded facilities in accordance with the California Public Utilities Commission Decision 93-11-013. These no-cost and low-cost criteria consider the public concern about magnetic fields, the existing scientific information, and prudent utility practices.

To help our customers, employees, and other stakeholders in their understanding of magnetic fields, the LADWP will continue to provide the up-to-date information and to discuss available field management options. Which options, if any, an individual chooses to implement is a personal decision.

LADWP Activities

The LADWP is involved in the following activities to enhance technical knowledge and public understanding of magnetic fields:

Customer Awareness

- Responding to customers' concerns and questions.
- Conducting magnetic field measurements at customers' homes.
- Providing third-party literature to customers.
- Discussing with customers the various sources of magnetic fields in their environment.

Employee Awareness

- Responding to employees' concerns and questions.
- Providing third-party literature to employees.
- Providing presentations on magnetic fields.
- Conducting magnetic field measurements in the LADWP employee work environments.

Figure 5.2 LA Department of Power and Water Position Statement about EMFs
Source: LA Department of Power and Water

Three international organizations have created guidelines with EMF exposure limits for utility workers and public: the International Commission of Non-Ionizing Radiation (ICNIRP), the Institute of Electrical and Electronic Engineers/International Committee on Electromagnetic Safety (IEEE/ICES), and the American Conference of Industrial Hygienist (ACGIH). Figure 6.3 displays a table of these organization's guidelines. These limits are based on the prevention of short-term, immediate effects, because scientific data on cancer and other potential long-term effects are not conclusive(W&W Radiological and Environmental Consultant Services Inc., 37).

Table C.1.2 Recommended Exposure Limits for 60 Hz Magnetic Fields

Organization	Protected Group	Magnetic Flux Density (mG)
ICNIRP	Workers	4167
	General Public	833
IEEE/ICES	General Public	9040 (632000 for arms and legs)
ACGIH	Workers	10000

ICNIRP: International Commission on Non-Ionizing Radiation
IEEE/ICES: Institute of Electrical and Electronic Engineers/International Committee on Electromagnetic Safety
ACGIH: America Conference of Industrial Hygienists

Figure 5.3: Three International Organizations have Guidelines on EMF Exposure Limits
Source: Guidance Manual for the Preparation of an EMF Management Plan for the City of Toronto p 37

Some jurisdictions in Europe and North America have adopted a proactive, risk management approach for EMFs. Most European countries have adopted the exposure limits published by the ICNIRP. EMF Management Plans or strategies utilized by communities today are based on the **precautionary principle** which states: "when an activity raises threats of harm to human health, or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully

established scientifically." California, Connecticut, as well as the City of Toronto have adopted **prudent avoidance** policies for "taking simple, easily achievable, low-cost measures to minimize exposure, even in the absence of demonstrable risk"(W&W Radiological and Environmental Consultant Services Inc., 37).

For example, in 1993 the City Council of Toronto adopted a prudent avoidance policy for child-based secondary uses, such as daycares & schools, within or adjacent to transmission ROWs. In 2007, public concern over a new transmission corridor catalyzed Toronto to complete an environmental and health assessment of potential public health repercussions of EMFs generated in transmission ROWs (Medical Officer of Health: City of Toronto 2008). In 2008, based on the results of these assessments and a review of current scientific studies, the Toronto City Council renewed their commitment to a prudent avoidance policy. This included "taking simple, easily achievable, low cost measures" to minimize children's exposure to EMFs. However, Toronto decided, that based on current scientific evidence and test results, the many health benefits of city trails, parks and community gardens in the ROWs "outweighed any potential risk from EMF exposure" (Medical Officer of Health: City of Toronto 2008). To assist staff, designers and developers with future projects along the ROW, Toronto Public Health hired a consulting service to create a "Guidance Manual for the Preparation of an EMF Management Plan for the City of Toronto". Any plan or design for a public park, trail, garden etc. within a hydro corridor (transmission line) is now required to use this resource to perform an EMF assessment and management plan which illustrates how the design will reduce EMF exposure for children (W&W Radiological and Environmental Consultant Services Inc.).

Figure 5.4 is an example of an EMF Management Plan for updating a playground in an established park within the transmission corridor system (W&W Radiological and Environmental Consultant Services Inc., 74-78).

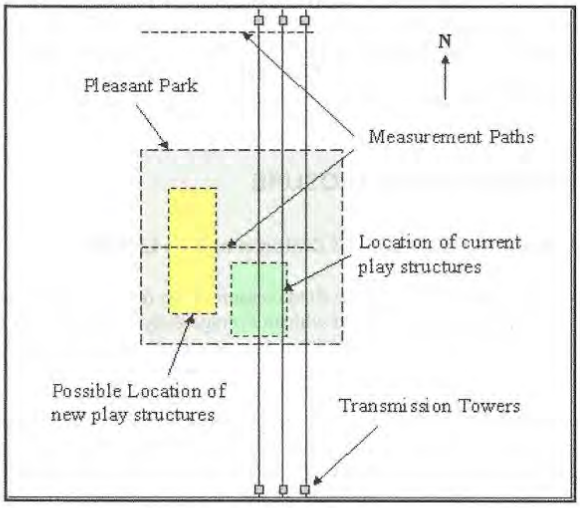


Figure F.1. Schematic of Site

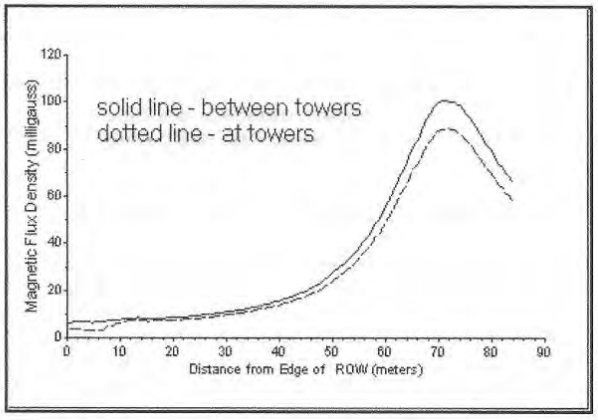


Figure F.2 Magnetic Field Profiles Taken Between Towers (midspan) and Close To The Transmission Towers

Figure 5.4: Example of an EMF Management Plan for updating a playground in an established park.
Source: Guidance Manual for the Preparation of an EMF Management Plan for the City of Toronto

The magnetic field at midspan varies from 6.2 to 58 milligauss over this same distance. The magnetic field in the area of the current play structures varies from 25 mG on the west side to 100 mG on the east side. In the alternative area for the new play structures located west of the lines (yellow area in Figure F.2) the magnetic field ranges from 10.3 mG on the west side of the area to 19.6 mG on the east side. The magnetic field is relatively constant parallel to the lines (north - south).

3. ASSESSMENT OF EXPOSURE

3.1 Magnetic Field Exposure of Children at Two Locations

At the existing play structures magnetic field measurements ranged from 25 to 100 mG, and averaged 55 mG. At these levels a child with an average daily EMF exposure to 2 mG playing for less than an hour each day or 6 hours each week, year round, would increase their average daily exposure to 4 mG.

In the area proposed for locating the new play structures, magnetic field measurements ranged from approximately 10 mG at the furthest distance from the corridor to 20 mG next to the transmission lines. At these levels a child with an average daily magnetic field exposure of 2 mG could play for more than 2 ½ hours each day, or 18 hours per week, year round, before increasing their total daily exposure to the 4 mG level.

Because the magnetic field strength in all areas of the proposed new location is less than the magnetic field strength in all areas of the existing location, the cumulative exposure for children at the proposed location will be less than if the structures are placed in the existing location. Assuming 30 children use the facility 2 hours per day, 5 days a week 30 weeks a year the cumulative exposures for the two locations are:

a. Current site: (2 x 5 x 30 hours/year) x (55 mG) x (30 children) = 495000 person mG hours/year
b. Proposed site: (2 x 5 x 30 hours/year) x (4 mG) x (30 children) = 36000 person mG hours/year

3.2 Location for New Play Structures – Other Considerations

The two possible locations for the new play structures are shown in Figure 1. Both locations have level surfaces and sandy soil with good drainage. There is good access to both locations. The possible new location is closer to the residences west of the park with the distance from the residential fence line to the play area ranging from 18 to 30 meters. Considering the type of equipment being installed and young age of the children for whom it is designed, the difference in distance of the two alternatives to the homes on the west side of the corridor should not be a factor in the site decision. The current play structures are to be removed independent of the site selected. While the costs associated with selecting the new site west of the lines may be greater than for the site of the current play structures the difference is expected to the small relative to the cost overall cost of the project.

Figure 5.4: Example of an EMF Management Plan for updating a playground in an established park. **Source:** Guidance Manual for the Preparation of an EMF Management Plan for the City of Toronto

TORONTO Public Health

EMF MANAGEMENT PLAN CHECKLIST

A checklist of information for inclusion in an EMF Management Plan for developments within or abutting to a ROW.

ITEM TO BE INCLUDED	Y	N	COMMENTS OR JUSTIFICATION
1. The planned development was assessed to determine if children will congregate at the site.	Y		Location of play structures
2. The plan contains a map of the ROW and, if appropriate, the adjoining property showing transmission lines and other electrical facilities?	Y		Figure F1
3. The plan contains the results of a magnetic field survey across the ROW and if appropriate, across the abutting property, encompassing the area where the development is planned? (The area surveyed should include nearby electrical facilities, e.g. distribution lines.)	Y		Measurements perpendicular to transmission lines
4. Data from Hydro One and Toronto Hydro were obtained relating line loadings during measurements to yearly average loadings.*	Y		
5. The survey was performed during a typical load period.	Y		Confirmed by Hydro One data
6. Information has been obtained from Hydro One and Toronto Hydro on planned upgrades, energizing of unused lines, and new lines or equipment*	Y		No changes planned
7. Calculations, extrapolations, substitutions of data from similar situations (e.g. mirror image, shift along the ROW) were performed to characterize locations where measurements were not feasible, and the results noted on the site map.		N	Not required as measurements were taken
8. The survey data are presented on a map (preferable to a spreadsheet).	Y		See Figure F2
9. Alternative designs or types of use been considered to minimize magnetic field exposures.	Y		Current and alternative sites
10. The plan includes expected changes (addition or removal of lines and other electrical equipment) and their expected impacts on magnetic fields levels at the development site.		N	No changes planned by utility
11. A site map/spreadsheet has been prepared showing expected magnetic fields and electrical equipment, following the changes noted in Item 10.		N	No changes
12. Exposure reduction strategies have been considered for each alternative development plan. (Examples are locating areas occupied by children in low-field areas and away from sources.)	Y		Place play structures away from lines
13. The plan includes estimates of exposures for children aged 12 and under, for individual children and in the aggregate (number of children exposed)?	Y		
14. The plan includes estimates of the aggregate and individual exposures avoided through various exposure reduction strategies and the choice of alternative development plans.	Y		
15. The plan includes the choice of the development plans and the exposure reduction measures to be implemented.		N	

*If the EMF Management Plan is complete and TPH has not yet provided this information please submit the plan and make note of the missing information. TPH will take this into account during the management plan review.

Figure 5.4: Example of an EMF Management Plan for updating a playground in an established park.
Source: Guidance Manual for the Preparation of an EMF Management Plan for the City of Toronto

TORONTO Public Health

EMF Management Plan

Summary of Magnetic Field Exposure Reduction Actions

Development Designation: Replace Play Structures at Pleasant Park

Date: _____ **Prepared by:** _____

Authorized by: _____ **Title:** _____

Signature: _____

Reduction of Exposure:

Exposure reduction Option	Accept/Reject	Rationale for Rejecting Option
Place play equipment in city-owned property as far from lines a practical	Accept	
Place walkway from street to play area along edge of park & away from lines	Accept	
Place vegetation to the east of the play structures to discourage children from running under lines	Accept	
Modify ground of existing play area to discourage children's activities	Accept	

Figure 5.4: Example of an EMF Management Plan for updating a playground in an established park. Source: Guidance Manual for the Preparation of an EMF Management Plan for the City of Toronto

As of 2016, Athens Clarke County, Georgia does not have a formal EMF Management Plan nor prudent avoidance policy to guide those who would like to utilize transmission ROWs for permitted secondary land uses such as agriculture. This could be due to the fact that most of the land in ACC ROWs is only being used to supply energy to the public. Whereas in 2008, as Toronto was updating their policies on EMF, there were "22 soccer fields, 5 playgrounds, 6000 meters of trails and 10 garden allotments in hydro corridors." (transmission lines) In addition, the city had identified "double this amount of space" for future recreation and park lands (Medical Officer of Health City of Toronto 2008). Similarly, the state of California has developed policies for EMFs because farmers and municipalities are actively utilizing transmission ROWs for trails, greenways and gardens. Communities such as ACC, which are considering secondary uses in their ROWs, could study other communities EMF policies, management practices, and lessons learned as they decide if or how to move in this direction.

SOIL IN ENERGY ROWs

The USDA assesses the chemical and physical characteristics of the nation's many soil types. These data are fantastic for narrowing down areas most suitable for food production at a state and county wide level. However, once a farmer, planner, designer or municipality pinpoints a potentially suitable space to produce food – it is still important to test the soil. A major challenge for many urban agriculture sites is soil quality (Policy Link 2012). Available city vacant lots maybe contaminated from a prior industrial use. (Ex: polycyclic aromatic hydrocarbons or PAHs, arsenic, lead and mercury) Seemingly,

innocuous paint chips may have peeled off of the white picket fenced - homes built prior to 1940, and now, contain high-levels of lead. As cities grew, former orchards may have been developed. The soil in these now suburban or urban sites could have high-levels of arsenic. It is very important for urban farmers and gardeners to assess the soil for heavy metals and other toxins before planting a seed (Policy Link 2012). This holds true for areas deemed suitable for food production in energy ROWs.

The historic use of a site can be unearthed by inspecting the “chain of title”, or the names of property owners for a specific parcel through the county tax accessor’s office. Additional information can be discovered by speaking to neighbors and asking about the past land use for the general area at the local planning office. If the list of former property owners suggest the space was formally a junkyard, chemical or industrial business it is important to reconsider the safety and costs of farming that particular site. Toronto has developed a excellent guide to help urban farmers assess the soil of a site by: 1) establishing the level of concern; 2) testing the soil; and 3) taking action to reduce risk (Toronto Public Health 2013). For example, if the soil tests reveal a certain level of heavy metals, they require raised beds and provide a list of crops that are less apt to uptake heavy metals-such as fruits (Toronto Public Health 2013, 21). Currently there are no federal standards in the U.S for safe levels of heavy metals in the soil. However, the EPA created soil screening levels (SSLs) of heavy metals to help classify contaminated properties and superfund sites (Novella Carpenter and Winslow Rosenthal 2011). Toronto Public Health also developed an excellent “Urban Gardening Soil Screening Values”

(SSV's) chart depicting different classifications for levels of heavy metals and PAHs (Toronto Public Health 2013).

In the case of energy ROWs, the historical and current use of the property which the ROW crosses through, should be considered, as should any routine treatments by the utility company to that ROW. For example, the 86.5 miles of ACC ROWs overlay pristine farm land, parks, industrial, and residential neighborhoods. The use of a specific property (and adjacent properties) should be taken into consideration when determining the level of concern for a site that one is considering for food production. Then, the practices associated with constructing, maintaining, and operating a utility ROW must be considered.

Toronto's Public Health instructs urban farmers to start this process by categorizing a site as a low, medium or high-level of concern. Toronto has many community gardens in their hydro corridor network (transmission ROWs) and included transmission ROWs in the mid-level of concern category (Toronto Public Health 2013). However, the farmer needs to consider past and adjacent uses. If the site in question was previously used for agriculture; and after walking the site nothing indicated additional hazards (via soil odors, stains, signs of buried garbage etc.); then the farmer can keep this site classified as a medium-level concern. This level requires a soil test for PAHs and heavy metals. The test results can be compared to the SSV chart in the guide. If they fall below the SSV1 level then the ROW can be reclassified as a low-level concern site. If test results indicate a high-level of metals (etc.), the ROW is reclassified as a high-level concern site. The

guide describes best management practices for farming each level (Toronto Public Health 2013, 21). The restrictions and costs associated with the practices at each level can help a farmer decide if that site is suitable for their endeavor. This approach could be very useful for urban farmers in ACC.

Utility companies routinely spray herbicides to keep the ROW clear of vegetation which could interfere with wires. (Or obstruct the view of a pipeline which is crucial for routine aerial safety checks.) Testing for chemical residue from these herbicides is an example of a soil issue that a ROW urban farmer should consider. Generally speaking, if a soil test indicates a certain level of chemicals (or certain level of heavy metals etc.) the following practices are recommended in the urban agriculture field: washing hands; washing & peeling produce; reducing dust by mulching farm pathways and beds; growing food via raised beds, hydroponics or no-till agriculture; incorporating compost and new soil; not growing crops known to accumulate soil contaminates; or only growing fruit and nut trees directly in the soil (Toronto Public Health 2013, 14-17, Novella Carpenter and Winslow Rosenthal 2011, U.S Environmental Protection Agency: Region 5 Superfund Division 2011). Some of these standard urban farming responses could be restricted in a ROW. For example, Georgia Power does not permit electricity in the ROW, thus hydroponic operations are not possible. However, raised beds are permitted so long as the site plan shows that the infrastructure can still be accessed by employees (Lewis 2016). Hydro One in Canada does not permit raised beds, so high-levels of chemicals requires moving on to another site (Teitel-Payne 2016).

Soil tests for heavy metals, pesticide residue and PAHs should be conducted in the pipeline ROWs as well. It is important to confirm the type of product flowing through a pipeline to see if additional tests are needed. In ACC, our team learned that the two pipelines on the food bank property contained petroleum, so we decided to do a petroleum residue test as well. In ACC the total cost for soil tests was less than $300: $65 to test heavy metals, $100 for petroleum residue and $100 for PAHs. It is possible to till and farm the top 12" of soil on a pipeline ROW. However, the food bank decided to invest in raised beds instead for two reasons: 1) the company that manages this pipeline has a history of not maintaining their infrastructure; and 2) the food bank works with many volunteers and felt raised beds were a better option in terms of liability. In Canada, soil tests are far more expensive. TUG spent $1,500 on soil tests per site. The Toronto Health Department suggests skipping soil tests and building raised beds when a garden is small, as a cost-saving measure (Teitel-Payne 2016). Hydro One in Canada does not permit raised beds in the ROW. So, when a soil test result is not promising TUG drops the site (Teitel-Payne 2016).

Many urban agriculture sites have compacted, neglected soils. Some vacant lots have paved areas or old foundations just inches beneath the weeds. In the case of ACC ROWS, most of the soil is already cleared and unpaved making it easier and more cost effective to start a farm. However, even ROWs that have been categorized as prime agricultural land by the USDA, could have been manipulated during the construction of the pipeline or transmission line. Some utility companies may not have been as careful about replacing the original subsoil on the bottom and topsoil above, as others. The ACC

farmer never complained about the soil quality in her ROW field. However, a Canadian farmer reported that the soil in the ROW on her farm was degraded, suffered from weed pressure, and required 8 years to build the fertility to a decent state(Danyluk 2009a, 21). ROWS for safety. Transmission corridors are classified as a medium-level concern (Toronto Public Health 2013). However, an employee of Toronto Urban Growers shared that the public is suspicious about the safety of the food produced in a ROW, thus the food safety bar is set a bit higher. For example, the Danyluck paper noted public concern over corrosion on transmission towers contaminating the soil in a ROW farm (Danyluk 2009a, 21). However, a scientific study found that soil collected at the base of the transmission towers did not have heavy metals at a level to warrant concern (Jones 1983). Toronto Urban Growers mentioned that there is a need to produce a clear message that food grown in the ROWs can be produced safely, if farmers are to generate an income in an already tough field (Teitel-Payne 2016). As of 2016, the author notes a gap in the research on the safety or lack of safety of food produced in utility ROWs. If cities do decide to use these spaces for urban agriculture this will be useful information.

DIET, EXERCISE and HEALTHY COMMUNITY ENVIRONMENTS

The Center for Disease Control reports that obesity rates have significantly increased over the past three decades (Center for Disease Control and Prevention 2009). Thirty-four percent of adults and seventeen percent of children are obese (Ogden et.al 2014). Studies indicate that overweight or obese conditions increase the risk of some cancers, as well as stroke, cardiovascular disease, and type-2 diabetes. “Although diet and

exercise are key determinants of weight, environmental factors beyond the control of the individuals (including lack of access to full-service grocery stores, the high costs of healthy foods, and lack of access to safe places to play and exercise) contribute to increased obesity rates by reducing the likelihood of healthy eating and active living behaviors" (Center for Disease Control and Prevention 2009).

In Georgia, 64.8% of adults are overweight and 29.6% are obese. Children between the ages of 2 years and 5 years old are already showing early signs of developing similar issues. In fact, 15.8% of young Georgians are overweight and 13.5% are obese (National Center for Chronic Disease Prevention and Health Promotion 2012). Research has found that children living in neighborhoods with access to healthy food and places to exercise are 56% less likely to be obese (Policy Link 2012).

Unfortunately, there are families in Georgia living in neighborhoods without access to healthy food. The USDA defines a **food desert** as a low income area with low access to full service grocery stores. If urban residents live beyond 1 mile and rural residents live beyond 10 miles from a full service grocery store, the USDA considers food access to be an issue (American Nutrition Association 2015). In response to the obesity epidemic, many cities are pledging to make sure healthy, affordable food is accessible to all residents. For example, in 2010 the City of Atlanta pledged to create a community environment in which 75% of their residents could access healthy food via a 15 minute walk by 2050. This is roughly a half-mile to a mile walk (Mandy Mahoney et.al 2010, 4).

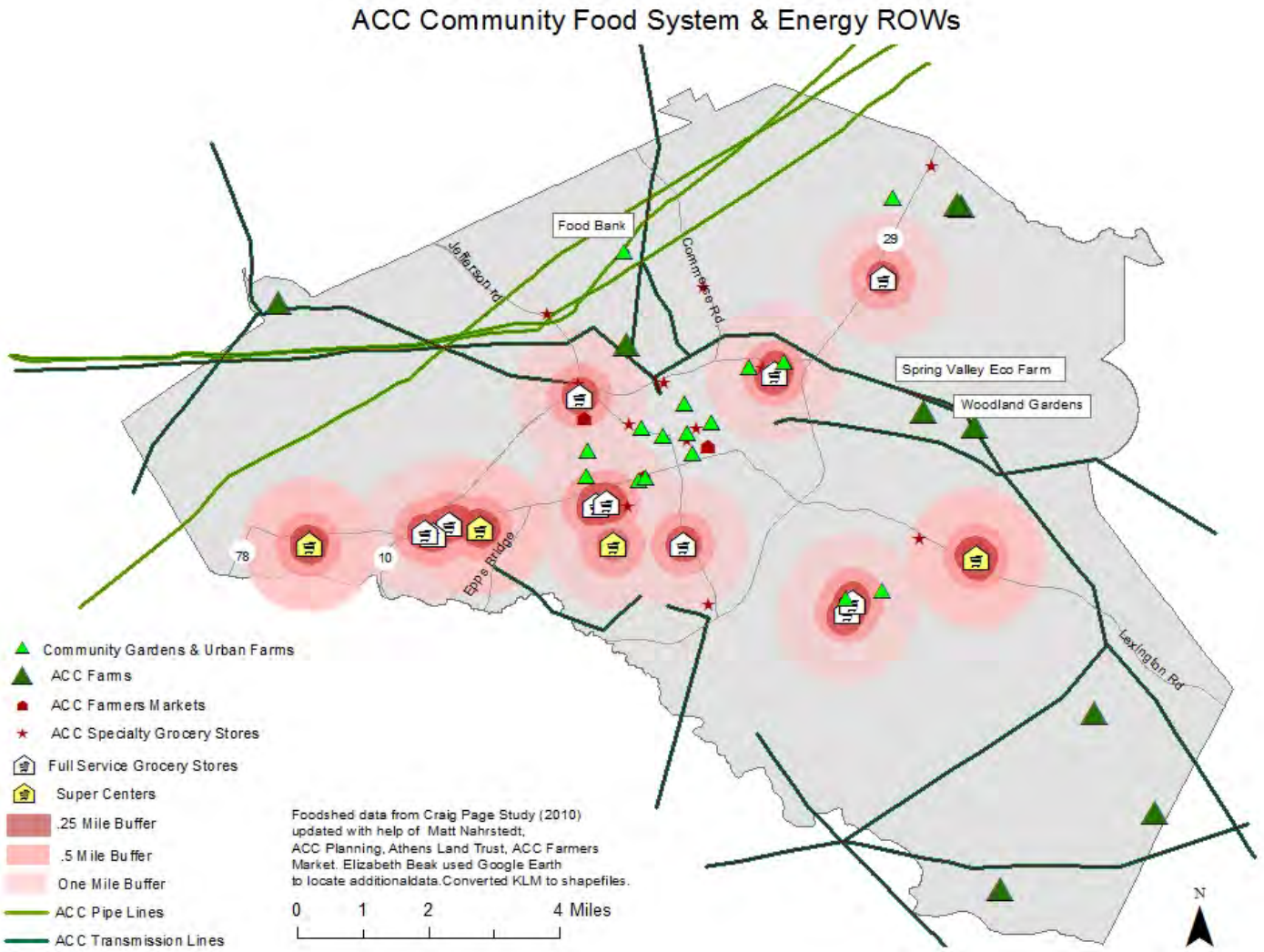


Figure 5.5: A Map of the ACC Community Food System, Energy ROWs, & Access. **Data Source**: Food shed data from Craig Page Study (2010) updated by Matt Nahrstedt, ACC Planning, Athens Land Trust, ACC Farmers Market staff. Elizabeth Beak used Google Earth to locate additional data and converted KLM to shapefiles to create this map.

A Map of the ACC Community Food System can be found in Figure 5.5 The pink buffers represent areas within a half mile and mile distance from a full service grocery store. This map also depicts the current farms, community gardens, specialty grocery stores, and farmers markets which provide healthy food to ACC residents. The Map in Figure 5.6: ACC Population Density, Energy ROWs, & Existing Productive Spaces illustrates that most of ACC's utility ROWs are located just beyond the current urban core. These ROWs are also beyond the pink bubbles of healthy food access seen in Figure 5.5. They represent potential spaces for the county to cultivate healthy eating and active living infrastructure as the ACC population grows.

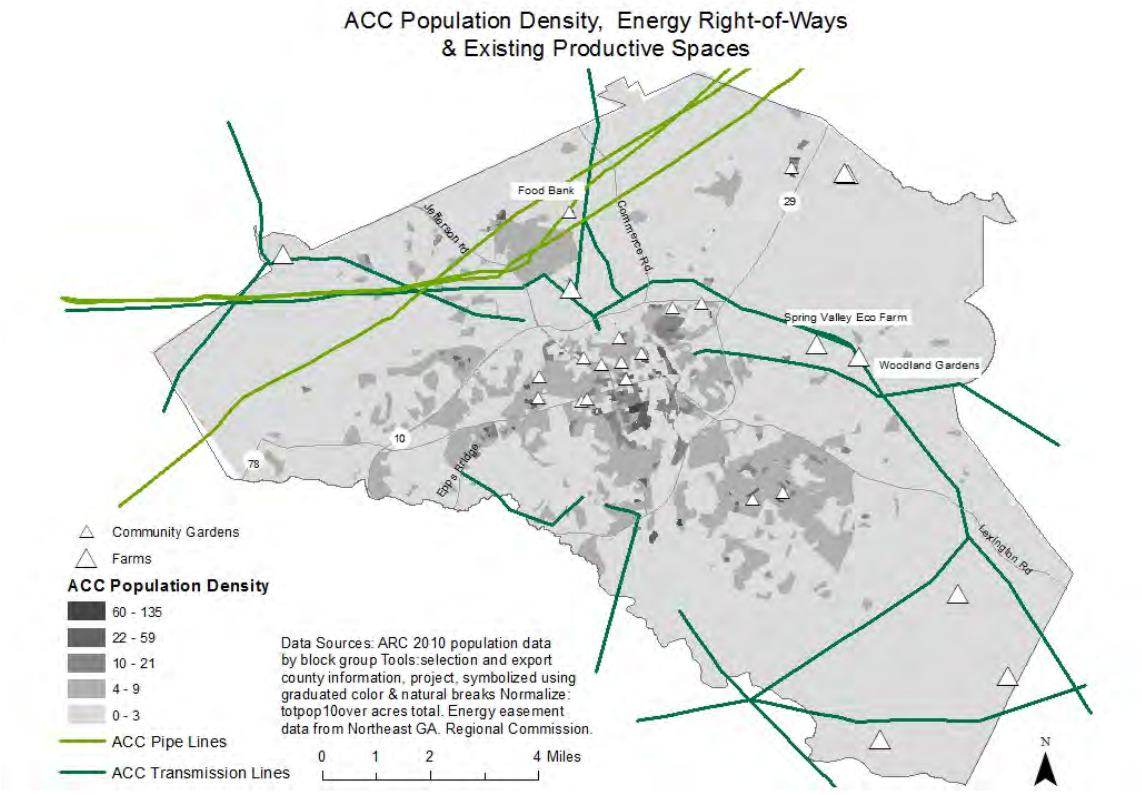


Figure 5.6: Map of Population Density, Energy ROWs & Existing Productive Spaces. **Data Sources:** ARC 2010 population data by block group, easement data by NEGA Regional Commission. Existing growing spaces data from Craig Page, Athens Land Trust Staff. Elizabeth Beak mapped and ground trothed in 2015.

This infrastructure might including urban agriculture and trails connecting neighborhoods with parks and other community resources. For example, Figure 5.7 section B3 of the ACC Map Book displays a picture of several utility ROWs in the northwest corner of the county. These rows connect a mid to low income neighborhood with two parks and public transit. The green spaces in these corridors are suitable for urban agriculture, including the ROW on the Food Bank property, which is the study site for this research project. This is one, very conceptual example of how trails and gardens on these ROWs could be used to create a healthier community environment for future peri-urban residents of ACC.

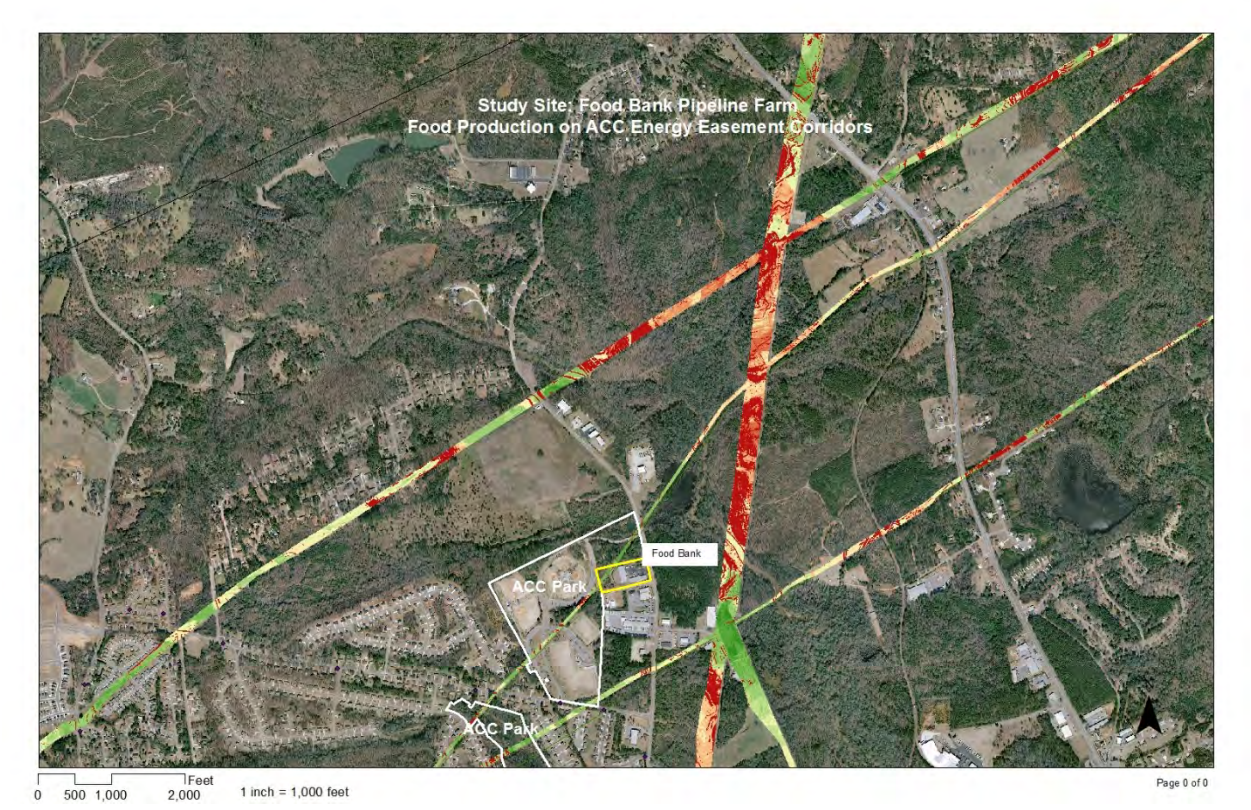


Figure 5.7: Displays section B3 of the ACC Map Book that was generated in the suitability analysis & the potential of utilizing ACC ROWs to connect neighborhoods with parks, public transit & productive spaces.

Urban agriculture can help U.S cities increase access to healthy food. One example is the Food Project. This is an urban agriculture program in Boston. Youth from the suburbs

and inner city work together to produce and sell healthy fruits and vegetables at four farmers markets located in low-income neighborhoods of Boston. These markets accept SNAP (Supplemental Nutrition Assistance Program, or food stamps) and double-bucks incentive coupons. These food assistance benefits enable and encourage residents to invest in healthy food options. The Food Project also contributed 48,668 pounds of food to local anti-hunger non-profits. In 2009, Seattle's P-Patch community gardening programs contributed 25,000 pounds of healthy food to food banks (Policy Link 2012). Some P-Patch gardens are located in utility right-of-ways (Horst 2008, 40-43). In ACC the Food Bank of Northeast Georgia produces healthy food in a garden that is partially located in the right-of-way behind their Athens distribution center. Garden harvests are included in the food donated to the 76,720 food insecure residents in Northeast Georgia(Feeding America 2014a).

LESSONS FROM PRACTICE: HEALTH and FOOD PRODUCTION IN THE ROWs

It is extremely important for municipalities, planners, designers and urban growers to carefully assess & weigh what is known about EMFs, the soil, and the community environment in determining if and how urban agriculture is to be integrated into their utility ROWs as a secondary land use. As of 2016, more conclusive, science-based research is needed. This section will share examples of prudent yet proactive strategies that two cities: Toronto and Los Angeles are using in the interim.

In 2002, Ontario, Canada took ownership of 20,000 hectares of energy ROWs. The utility company (Hydro One) would continue to operate the infrastructure, but the space below these lines was earmarked for public use. This government believes that these "contiguous, linear corridors of undeveloped land are valuable assets, particularly for infrastructure, transportation, and recreation purposes. In an urbanized area it would be extremely costly to assemble a new right-of-way by buying and expropriating individual parcels" (Danyluk 2009a). In 2008, the City of Toronto, Ontario voted to extend their 1993 prudent avoidance policy on properties within and adjacent to the ROWs. They reviewed the scientific literature on EMFs, which still upheld a potential weak link between EMFs and childhood leukemia. They assessed EMF levels in 36 city parks (Medical Officer of Health: City of Toronto 2008). They found that the EMF levels peaked directly under the lines, and dropped as the distance from the source increased (Medical Officer of Health: City of Toronto 2008). The city reviewed studies on the health repercussions of the obesity epidemic, food insecurity, and unhealthy community environments. They concluded there could be ways to use the land in the ROWs in a manner which could improve the public health (ex: gardens, parks, greenway trails, urban farms, community orchard etc.) yet minimize EMF exposure to children. The city created an EMF Risk Management Guide to help ensure and manage the planning and design of spaces in a manner that curtailed a child's exposure to EMFs. Figure 5.4 is an example of the EMF Management Plan of a proposal to upgrade a playground in a ROW city park (W&W Radiological and Environmental Consultant Services Inc., 74-78).

As of 2016, the City of Toronto permits and promotes urban agriculture in the ROWs but requires EMF and soil testing. For example, the City of Toronto, Hydro One, and the Toronto Urban Growers (TUG) organization are piloting CEED (community eco economic development) gardens on 6 acres of land in the ROW. These will be the first plots in Toronto's energy ROWs created to support new urban market gardeners who will sell their produce to the public. These sites passed soil and EMF tests and the team expects to break ground this summer(Sherman 2015, Teitel-Payne 2016). The lease agreement between the farmers and TUG will include wording about minimizing the amount of time children spend on these farms. If children want to come to these gardens for an hour or two, no problem. However, the TUG coordinator stated that she would steer farmers who wish to have their children spend time in the field after school or over a summer to other more suitable spaces (Teitel-Payne 2016). These gardens are located in neighborhoods of Toronto that currently have low access to healthy food. The CEED gardens will include on-site farm stands. TUG is also exploring opportunities for the farmers to sell produce at neighborhood community centers (Sherman 2015). The periphery of all the CEED gardens will be planted with flowers to attract pollinators and beautify a space that has been an eyesore in the community. The city considers this a concrete action step towards fulfilling its commitment to scale up urban agriculture and increase access to healthy food (Sherman 2015).

California energy companies have leased land to farmers, community gardeners, nurseries, Christmas tree growers etc. since the 1970's (Christopher Slater et. al 1975). The state of California is one of the few states in the U.S that has adopted a prudent

avoidance policy (W&W Radiological and Environmental Consultant Services Inc., 37). In the fall of 2015, the author visited the Sanford Avalon community garden which is located on an LA Department of Water and Power ROW, close to Watts in South Central Los Angeles. A major difference that the author noticed during the site visit is that the city of LA has grown and developed around many utility ROWs, unlike ACC ROWs that are still on the fringe of urban development. The Sanford Avalon garden runs 11 city blocks through the heart of some of the city's most food insecure neighborhoods. Figure 5.8 are some photos of the incredibly productive plots located within this ROW.

The Los Angeles Community Garden Council helps coordinate the 180 gardeners using this space. The author exchanged several emails with the garden coordinator asking about any concerns the gardeners or neighbors had about the garden being located in the ROW, and any health protocols they had established for the garden. The garden coordinator shared that their organization performs soil tests with Wallace Laboratories. She also scanned a copy of the statement that LA Department of Water & Power provides the ROW gardeners and the general public about EMFs. The gardeners can read this and decide if they want to farm in the ROW (LA Department of Water and Power 2013). (See figure 5.2)

According to newspaper articles many gardeners have decided that they want to garden on this ROW. Sanford Avalon opened in South Central after a multi-year, highly publicized court battle between the gardeners of the South Central Farm and the property owner who decided that he was ready to end his lease with the farm. When the farm was

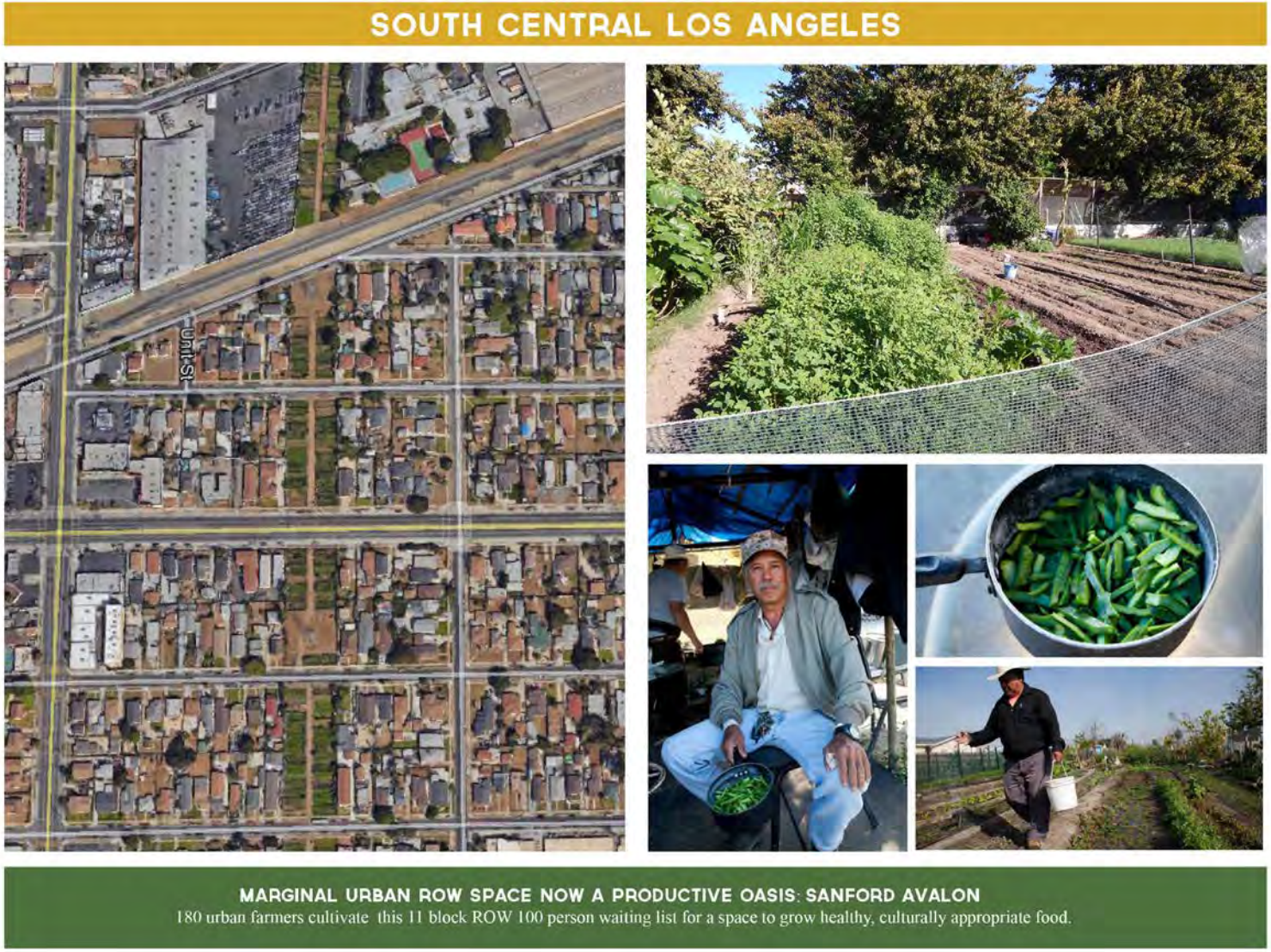


Figure 5.8: Marginal Urban ROW space now a productive oasis in South Central Los Angeles. Photo credits: Google Earth, Elizabeth Beak, Jeff Jeff Spurrier with the LA Times Blog.

bulldozed, 300 families applied to move to the more secure urban space in the ROW. As of 2011, 180 neighborhood farmers secured a space at Sanford Avalon. Over 100 urban farmers remain on the waiting list (Spurrier 2011). These numbers indicate that South Central urban farmers have decided that access to a secure space to produce healthy, culturally appropriate food trumps the lack of conclusive evidence on EMFs. The garden coordinator said that the private property owners adjacent to Sanford on Avalon were thrilled to see a blighted space in their neighborhood transformed into a productive oasis.

In summary, if the author were to respond to Farmer Celia Barrss question about the health of farmers producing food under transmission lines in the ROWs, the author would report that the results of 30 years of in-depth studies have not dismissed the link Wertheimer and Leeper found in 1979 between EMFs and childhood Leukemia. However, three decades of in-depth, peer-reviewed studies on the link between EMFs and all other public health issues have not lead to conclusive findings. The author would direct Celia to the best management practices being used by other farmers and municipalities as scientific research continues. (See figure 5.9 & 10) For example, an EMF test could compliment her soil test and inform her farm management plan. Celia may decide to plant crops that need a smaller amount of human input where the test indicated that the EMFs were highest. Or the results of the test coupled with the information in this section may confirm her initial decision that the benefits of using this land to create a sustainable business, jobs, and healthy food trumps the unclear scientific evidence on EMF health issues.

More research is needed. The author would like to see studies on the effects of EMFs on someone spending 10-20 hours a week, 5-6 months of the year under transmission lines, as this could be the case of a small, urban farmer. The author is also interested in more studies on the effects of EMFs on the crops, as this question has been raised by potential clients during the CEED Garden planning meetings in Toronto. The health issues and best practices discussed in this chapter are important for farmers, gardeners, designers and planners to address if they choose to utilize ACC energy ROWs to cultivate healthy food production and community environments as the population grow

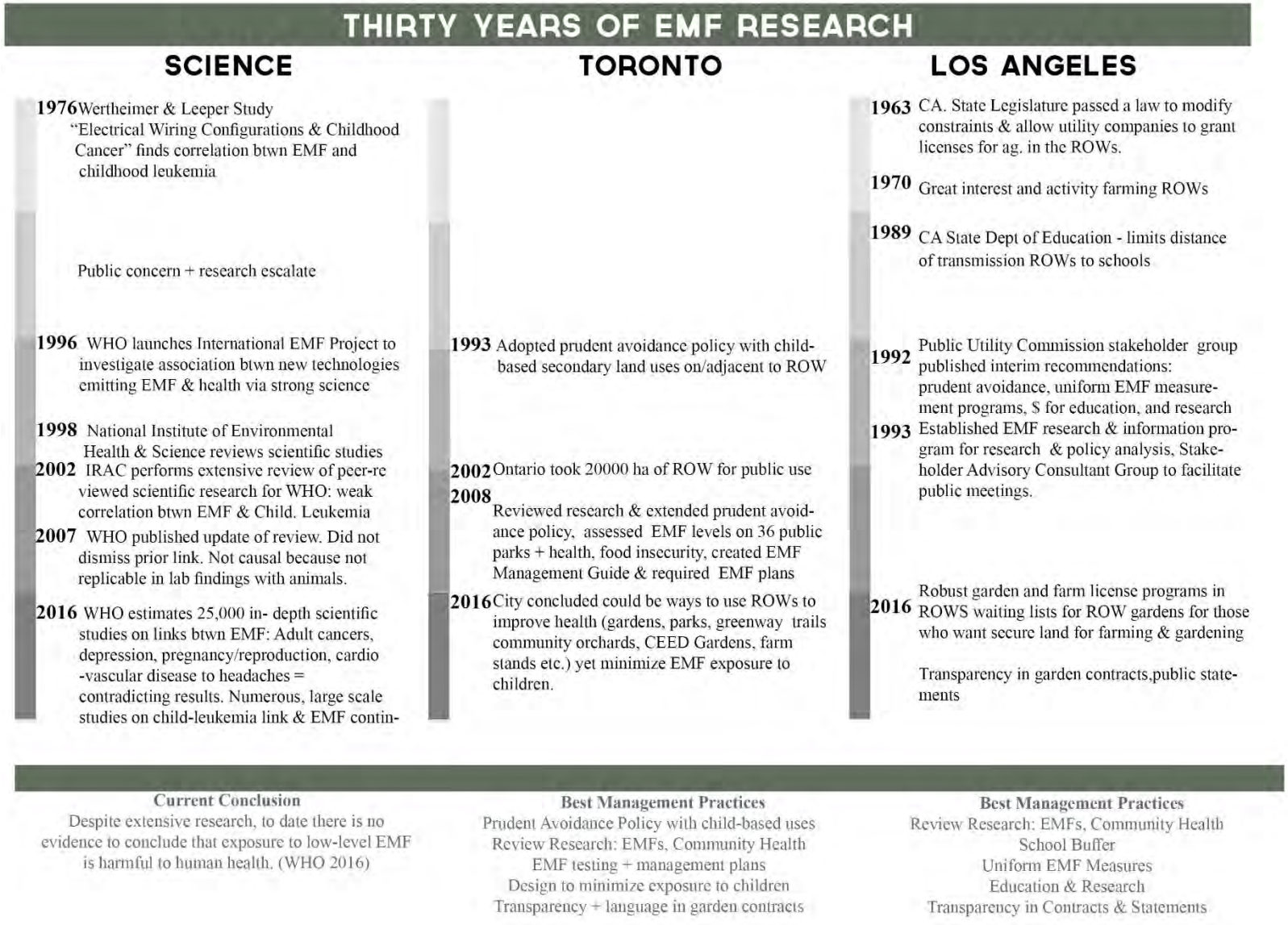


Figure 5.9: Summary of 30 years of EMF research & community practice in Toronto & LA. **Source:** Elizabeth Beak

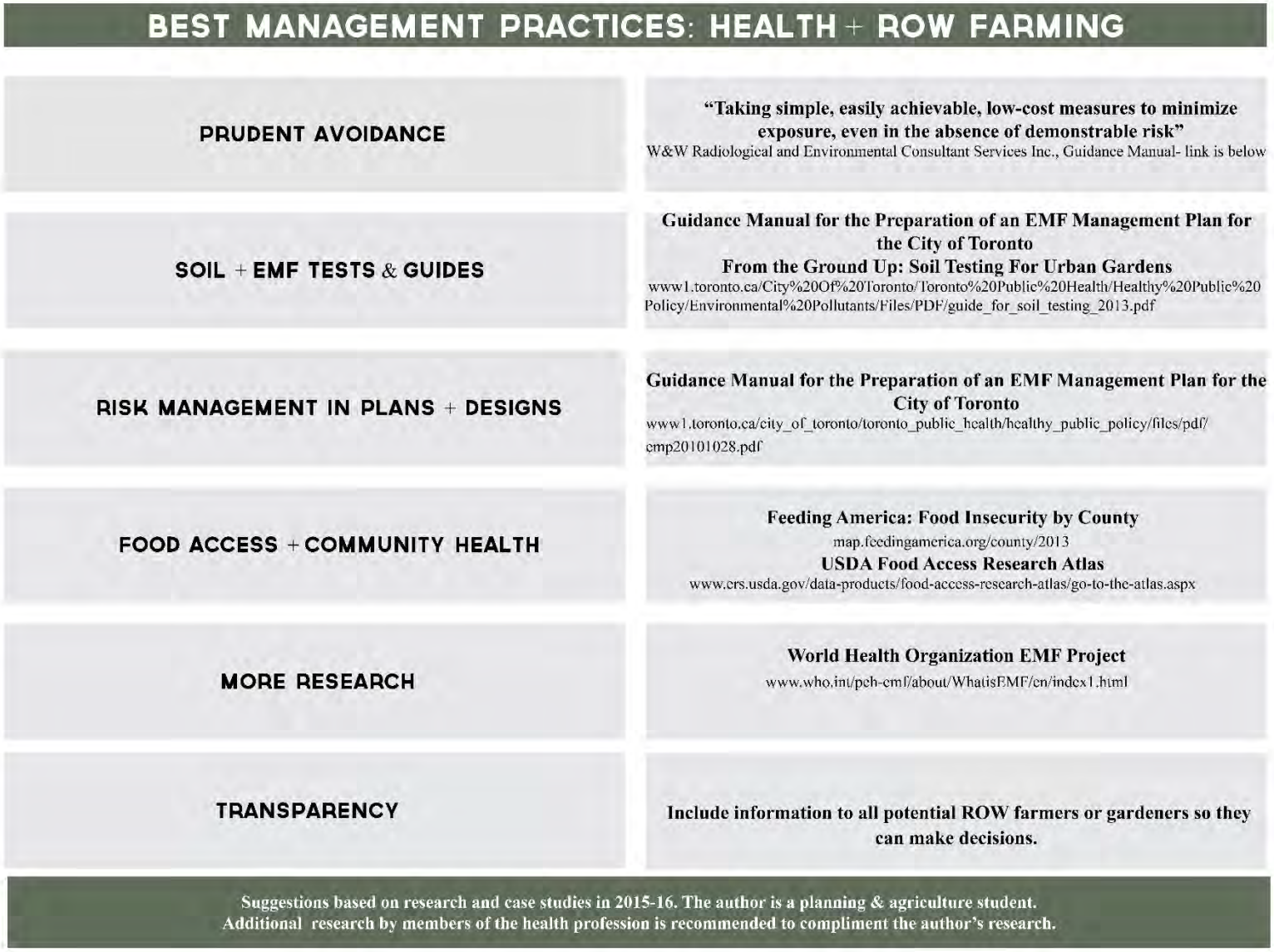


Figure 5.10: Summary of Best Management Practices for Health and ROW farming. Source: Elizabeth Beak

Chapter 6

ACC POLICY CONSIDERATIONS

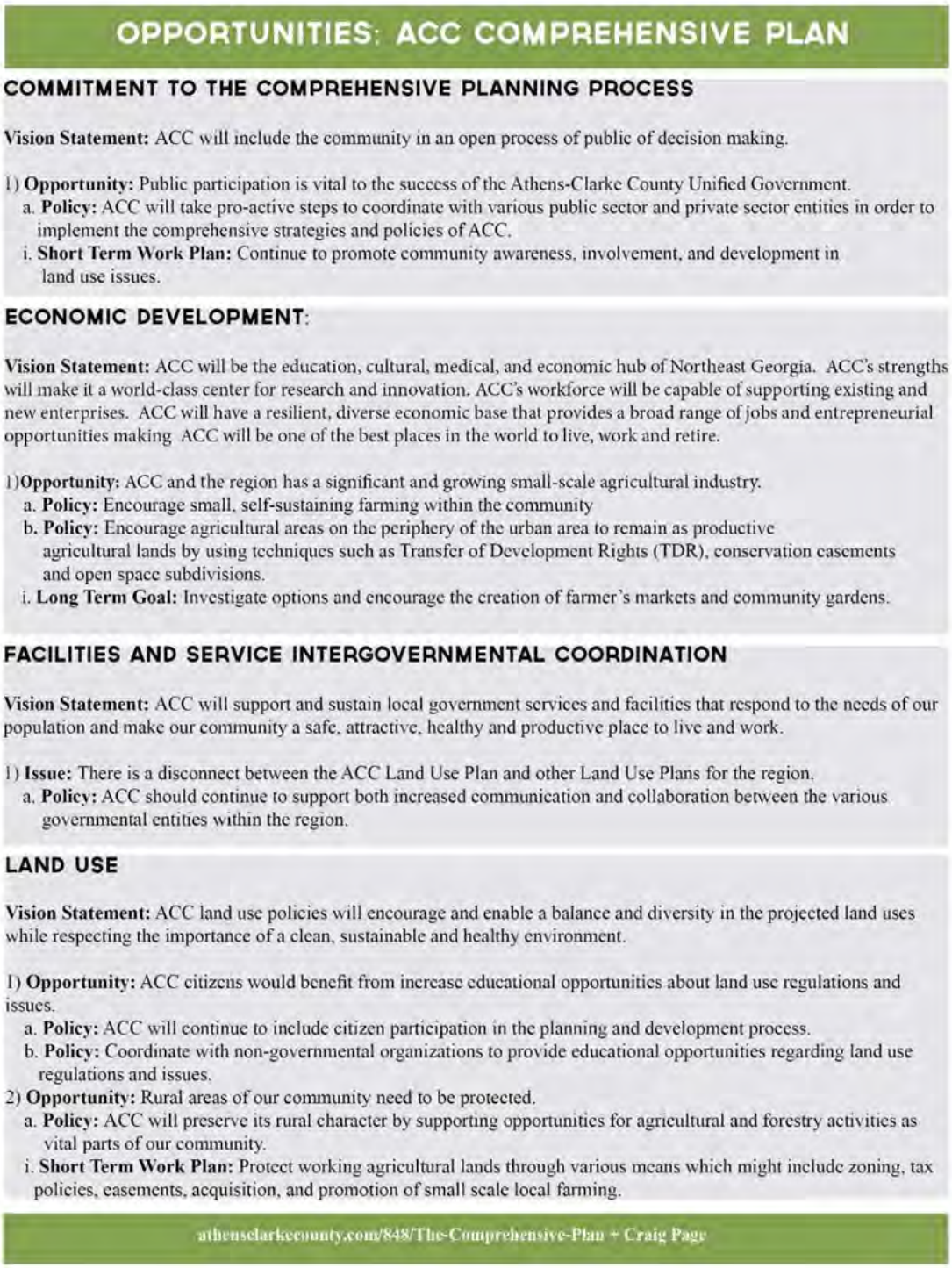
All six companies that hold easements on the 1052 acres of land in Athens-Clarke County energy right-of-ways (gas & transmission) permit food production, so long as secondary use guidelines are followed. Farmers, land owners, energy companies, non-profits and local governments in other states and regions, as described in Chapter 4, have developed creative partnerships and models which have successfully utilized energy right-of-ways for food production, trails and other public uses. In working with the Food Bank of Northeast Georgia to design a sample farm on a portion of the Kinder Morgan pipeline ROW, the author experienced what it is like to navigate current agricultural land use policies in ACC. This chapter: 1) clarifies existing ACC agricultural land use policies; 2) identifies current opportunities and constraints for utilizing the land in energy ROWs for healthy food production; and 3) highlights successful strategies used in other communities to overcome policy challenges and strategically scale up urban agriculture. This information can help ACC planners, farmers and eaters continue to craft policies that create a greener, healthier and more equitable community.

EXISTING ACC POLICIES FOR FOOD PRODUCTION:

The ACC **comprehensive plan** is “a long-range policy document that looks at the future of a community in 20 year increments” (Athens-Clarke County Unified Government 2016b). This document is the guiding force behind responses to requests for zoning and

policy changes that would affect urban agriculture in the ROWs. Until recently, the food system has been largely absent from a local planners scope of work and long-range vision. Today, a growing number of municipalities are including language about health, food and urban agriculture in their comprehensive plans. The American Planning Association is advocating for planners to address the food system in plans and policies (Katrin Bohn and Andre Viljoen 2014, Kameshwari Pothukuchi & Jerome Kaufman 2000). Figure 6.0 summarizes where and how the ACC Comprehensive Plan currently supports agriculture (Athens-Clarke County Unified Government & Craig Page 2016).

Most cities utilize a **zoning ordinance** to "help shape new development into the vision outlined by the comprehensive plan". It is an adopted ordinance "and carries the weight of current law"(Athens-Clarke County Unified Government 2016b, 1-2). Every piece of property in ACC is assigned to a zone for specific land use (ex: single-family residential, industrial, etc.) with specific standards. (Ex: maximum building height, minimum lot size etc.) A zoning ordinance is comprised of two parts: 1) a zoning map and 2) text describing the land uses & standards for development of that zone (Athens-Clarke County Unified Government 2016). Figure 6.1 is a map of the energy ROWs in ACC and the zones these ROWs are part of as they move through the landscape. Every ACC zone has a policy or ordinance regarding agriculture as a land use. It is important for a ROW farmer to: 1) identify the zone of the ROW they hope to grow on; and 2) clarify how they can or cannot utilize that section of the ROW to produce healthy food.



OPPORTUNITIES: ACC COMPREHENSIVE PLAN

COMMITMENT TO THE COMPREHENSIVE PLANNING PROCESS

Vision Statement: ACC will include the community in an open process of public of decision making.

1) **Opportunity:** Public participation is vital to the success of the Athens-Clarke County Unified Government.
   a. **Policy:** ACC will take pro-active steps to coordinate with various public sector and private sector entities in order to implement the comprehensive strategies and policies of ACC.
   i. **Short Term Work Plan:** Continue to promote community awareness, involvement, and development in land use issues.

ECONOMIC DEVELOPMENT:

Vision Statement: ACC will be the education, cultural, medical, and economic hub of Northeast Georgia. ACC's strengths will make it a world-class center for research and innovation. ACC's workforce will be capable of supporting existing and new enterprises. ACC will have a resilient, diverse economic base that provides a broad range of jobs and entrepreneurial opportunities making ACC will be one of the best places in the world to live, work and retire.

1)**Opportunity:** ACC and the region has a significant and growing small-scale agricultural industry.
   a. **Policy:** Encourage small, self-sustaining farming within the community
   b. **Policy:** Encourage agricultural areas on the periphery of the urban area to remain as productive agricultural lands by using techniques such as Transfer of Development Rights (TDR), conservation easements and open space subdivisions.
   i. **Long Term Goal:** Investigate options and encourage the creation of farmer's markets and community gardens.

FACILITIES AND SERVICE INTERGOVERNMENTAL COORDINATION

Vision Statement: ACC will support and sustain local government services and facilities that respond to the needs of our population and make our community a safe, attractive, healthy and productive place to live and work.

1) **Issue:** There is a disconnect between the ACC Land Use Plan and other Land Use Plans for the region.
   a. **Policy:** ACC should continue to support both increased communication and collaboration between the various governmental entities within the region.

LAND USE

Vision Statement: ACC land use policies will encourage and enable a balance and diversity in the projected land uses while respecting the importance of a clean, sustainable and healthy environment.

1) **Opportunity:** ACC citizens would benefit from increase educational opportunities about land use regulations and issues.
   a. **Policy:** ACC will continue to include citizen participation in the planning and development process.
   b. **Policy:** Coordinate with non-governmental organizations to provide educational opportunities regarding land use regulations and issues.
2) **Opportunity:** Rural areas of our community need to be protected.
   a. **Policy:** ACC will preserve its rural character by supporting opportunities for agricultural and forestry activities as vital parts of our community.
   i. **Short Term Work Plan:** Protect working agricultural lands through various means which might include zoning, tax policies, easements, acquisition, and promotion of small scale local farming.

athensclarkecounty.com/848/The-Comprehensive-Plan + Craig Page

Figure 6.0 Summarizes existing language in the ACC Comprehensive Plan supporting Ag.
Source: athensclarkecounty.com/848/The-Comprehensive-Plan

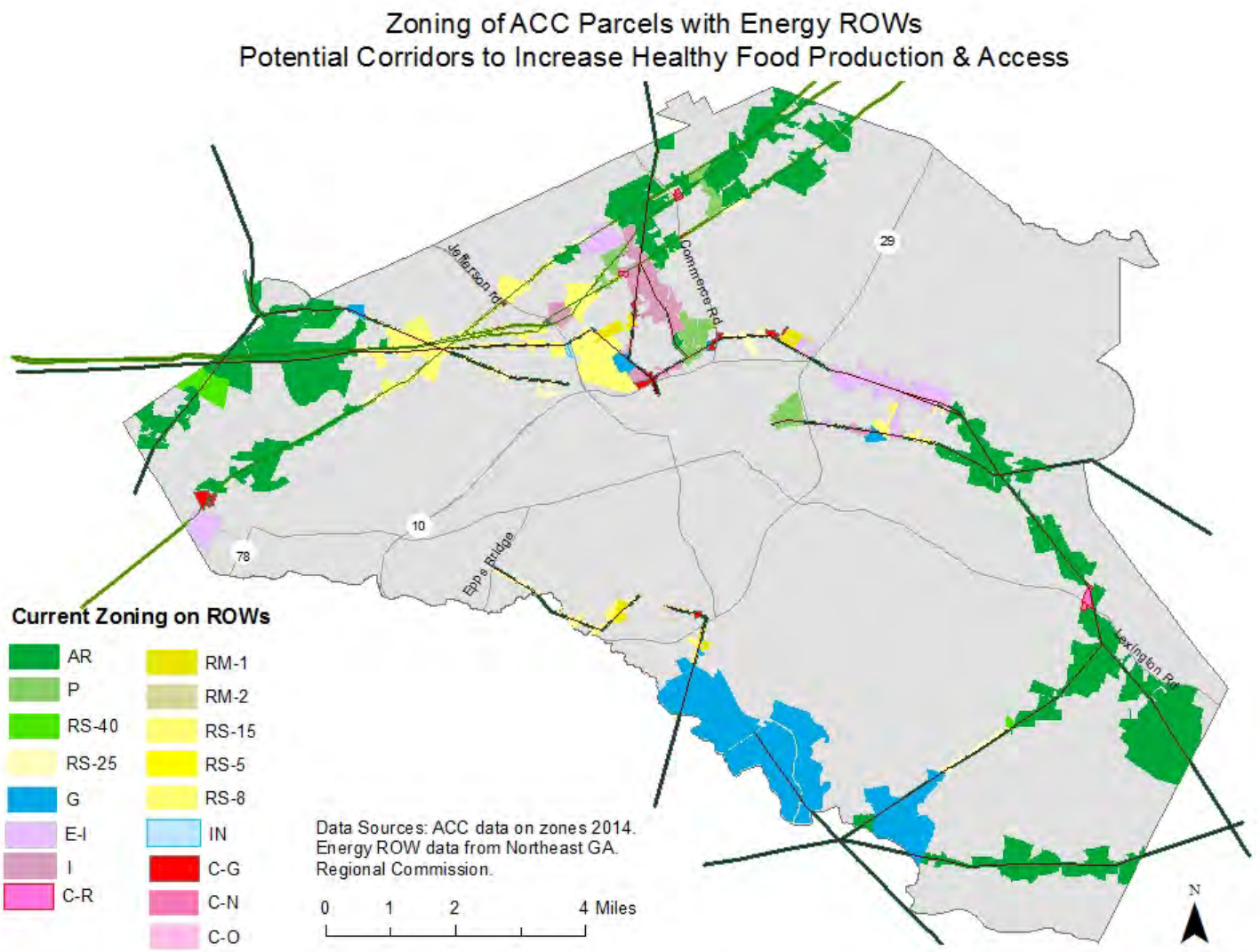


Figure 6.1 Map of the energy ROWs in ACC and the current zones these ROWs become as they cross the landscape. Every zone has specific standards for food production. Zoning ordinances must be considered by an urban farmer as they plan, design and grow on a ROW, in addition to the secondary use policies of the energy company who holds the easement. **Data Source:** ACC Planning Dept. zoning data 2014.

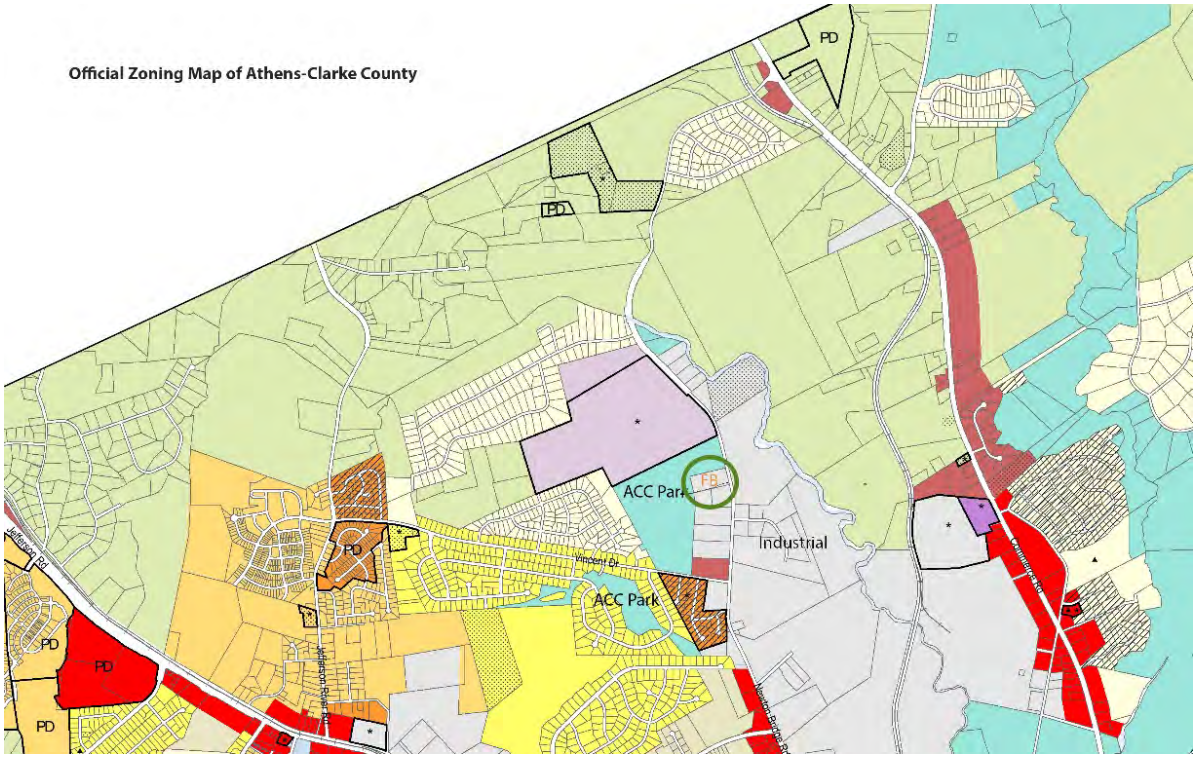
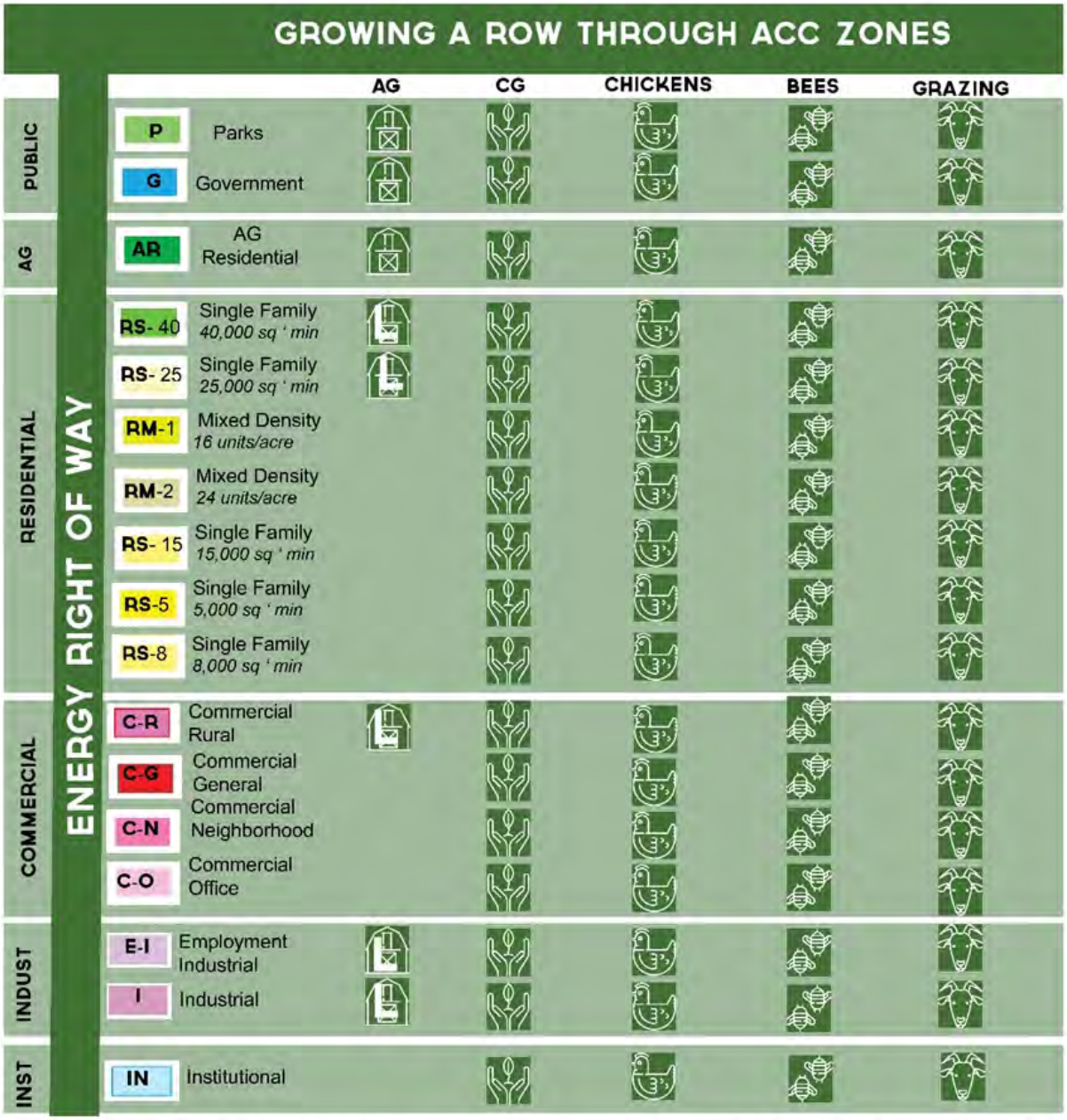


Figure 6.2 The author located the food bank on the official zoning map and determined this property was zoned industrial (I). This step helped the author determine the guidelines for food production.
Sources: ACC Official Zoning Map (2014)

A perspective ROW farmer or gardener can determine which zone their section of the ROW is on by: 1) calling the planning department and asking them to identify the zone of a specific address; or 2) looking at the zoning map on the ACC planning website. Once an urban farmer or community gardener determine zoning, they can review the Athens-Clarke County Code of Ordinances for land use policies on agriculture specific for that zone. Citizens can access this Code of Ordinances online. Under each zone is a table of different land uses, including agriculture. This is where someone can determine if agriculture is: 1) permitted (P), 2) permitted with limitations (L), or 3) prohibited (N) in that particular zone. To help future ROW farmers navigate existing local policies more easily, the author created a one page chart summarizing permitted agriculture uses by zone. (See Figure 6.3.)



Ag in all zones must adhere to best practices of Georgia Soil and Water Conservation Commission, Federal Clean Water Act, Georgia Department of Agriculture, Natural Resources Conservation. Not all zones are along ROWs and included in this chart.

AG - The production, raising, breeding or maintenance of plants and animals, no commercial slaughtering See ACC code 9-15-25.

AG LIMITED: no livestock less than 1 acre lot, 2 heads/acre limit, livestock barns setback from property line.
COMMUNITY GARDEN: permitted, 1 acre max, 3 on-site sales/year, size limits of structures. See Ord. of 2-4-2014, §
CHICKENS:permitted 6 per parcel except in Ag and Limited Ag zones. No roosters. See Ord. of 5-5-2015(2), §
BEES: not limited in ACC code
PRESCRIBED GRAZING permitted: 1 animal/2,500 ft, 30 day max, 2x's a year. See Ord. of 6-3-2014, § 2.

Figure 6.3 This chart clarifies ACC policies for agriculture and urban agriculture by zone in 2016.
Sources: ACC Code of Ordinances and ACC Planning Department

As seen in Figure 6.3, existing ACC policies permit healthy food production, in some form, on *all sections of the energy ROW*. Prior to 2014, this was not the case. The recent passing of three urban agriculture policies: the Community Garden Ordinance, Prescribed Grazing Ordinance and Chicken Ordinance demonstrate that the local government and community have been working diligently to craft the next phase of urban agriculture for this community. The next section of this paper highlights some exciting opportunities for healthy food production above pipelines and below transmission lines.

OPPORTUNITY: COMMUNITY GARDENS PERMITTED IN ROWs OF ALL ACC Zones

The ACC code defines a **community garden** as “a principal use of a parcel of land involving the cultivation and harvesting of food crops and/or non-food ornamental crops, such as flowers, by an organized neighborhood or non-profit group for personal use, consumption, donation, or occasional sale, and meeting the standards outlined in section 9-15-23 of this title”(Unified Government of Athens-Clarke County Georgia 2016). As of 2014, Section 9-2-1 of the general code of ACC was amended to permit outright community gardens in all zones of Athens-Clarke County. (AR, IN, RS-40, RS-25, RS-15, RS-8, RS-5, RM-1, RM-2, R-M 3, C-G, C-D, C-O, C-N, C-R, E-O, E-I, I) There is a $50 fee for the initial permit. A $10 annual renewal fee and permit are required thereafter. Once approved, a group of neighbors or a non-profit could create a community garden in the ROW of any zone in ACC (Unified Government of Athens-Clarke County Georgia 2016).

Figure 6.4: Prescribed grazing by the Chew Crew is permitted on ROWs in all zones.
Photo credit: UGA Today

OPPORTUNITY: ANIMALS PERMITTED IN THE ROWs IN ALL ACC ZONES

Thanks to one of the policies that have been passed in the last two years, a herd of **goats**, locally known as “the Chew Crew”, can be hired to perform prescribed grazing in every zone of ACC. Section 9-15-24 of the Athens-Clark Code of Ordinances has set forth the official guidelines for utilizing these animals to help clear and maintain land. For example, the Chew Crew can work on a site for up to 30 days at a time, no more than twice in a year (Unified Government of Athens-Clarke County Georgia 2016). Currently, many utility companies apply herbicide to keep the ROWs clear. The Chew Crew could be used as an alternative.

Figure 6.5: Section 9-15-25 of the ACC Code permits up to 6 hens in all zones. Moveable chicken tractors could satisfy standards of both Energy Company and ACC policies & produce fresh eggs for residents.
Photo credit: http://www.communitychickens.com/cool-coops-the-egg-roll/

In 2015, ACC passed Ordinance 9-15-25 permitting up to 6 **hens** (no roosters) in all zones of ACC (Unified Government of Athens-Clarke County Georgia 2016). Moveable chicken tractors, no larger than 12 x 12 ‘, could satisfy the standards for both energy easement companies and ACC land use policies. Thus, ACC residents could raise fresh eggs on energy ROWs. Larger flocks could be raised on ROWs in ACC zones that permit agriculture. (Ex: AR, G, P.)

Raising livestock is permitted outright in ACC zones that permit agriculture (AR, P, and G), so long as the site is at least an acre. ACC Zones that permit a “limited agriculture” (RS-40, RS-25, C-R, E-I and I) allow two heads of livestock per acre, but not swine (Unified Government of Athens-Clarke County Georgia 2016). Necessary buildings (etc.) would have to be off of the ROW. Fences (etc.) would need to adhere to ROW guidelines.

The manager of the food bank's current garden, Jim Pope, hopes to raise bees on the pipeline ROW. The ACC planning department states that there are currently no restrictions on bee keeping, thus bees would be considered as a permitted use in all zones along the ROW. Georgia Power has developed guidelines for bee keeping (ex: setbacks, hives clearly marked with emergency contact numbers etc.). The company's goal is to let farmers keep bees in the ROWs, in a manner that allows their employees to safely maintain and operate Georgia Power equipment (Georgia Power a Southern Company). The Right-of-Way Specialist representing the other energy companies seemed more hesitant about bee keeping on their ROWs. They were open to reviewing Georgia Powers' guidelines. Several local energy companies have partnered with the Natural Resource Conservation Service on a program called Project Wings. Land owners with a ROW on their property can apply for a mini grant to plant wildlife and pollinator habitat on the ROW (Project Wings). Strategically placed hives could compliment the Project Wings program. Hives could also be an option for food production on sections of the energy ROWs that are too steep for annual crop production. (Cultivating annual vegetables on steep slopes can cause erosion etc.)

OPPORTUNITY: ZONES THAT PERMIT COMMERCIAL AGRICULTURE ON THE ROW (AR, P, G)

Existing ACC policies also provide some opportunities for ROW farmers that wish to scale up urban agriculture & sell their products. This arrangement requires: 1) land suitable for food production, and 2) a supportive property owner-partner that allow the ROW farmer

to access his/her fields as well as basic infrastructure (water, high tunnel etc.); and 3) the ROW must be located in a zone that permits agriculture or limited agriculture.

According to the ACC Code of Ordinances, agriculture is permitted out-right on properties zoned agriculture residential (AR). Therefore, it is possible to grow food (commercially) on ROWs crossing AR properties in ACC. Section 8-6-2 of the ACC code defines **agriculture** as: "The raising, harvesting, or storing of products of the field or orchard; feeding, breeding or managing livestock or poultry; producing or storing feed for use in the production of livestock, including but not limited to cattle, calves, swine, hogs, goats, sheep, and rabbits or for use in the production of poultry, including but not limited to chickens, hens and turkeys; producing plants, trees, fowl, or animals, the production of aqua culture, horticultural, dairy livestock, poultry, eggs and avian products; farm buildings and farm ponds" (Athens-Clarke County Unified Government 2016a). Onsite sales are permitted. The properties in ACC that have been zoned AR provide a space for these commercial farmers and help retain ACC's rural character. ACC has strategically zoned properties as AR to form a greenbelt. (See Figure 6.5)

As seen in the regional map (Figure 6.5), this greenbelt serves as a buffer between development in ACC and the development of neighboring counties in this region. Energy ROWs weave in and out of this greenbelt. Woodland Gardens, LLC is an example of a successful commercial farm in an AR zone, producing food within an energy ROW. Figure2.3 is a photo of Woodland Gardens' vegetable fields in a Georgia Power ROW.

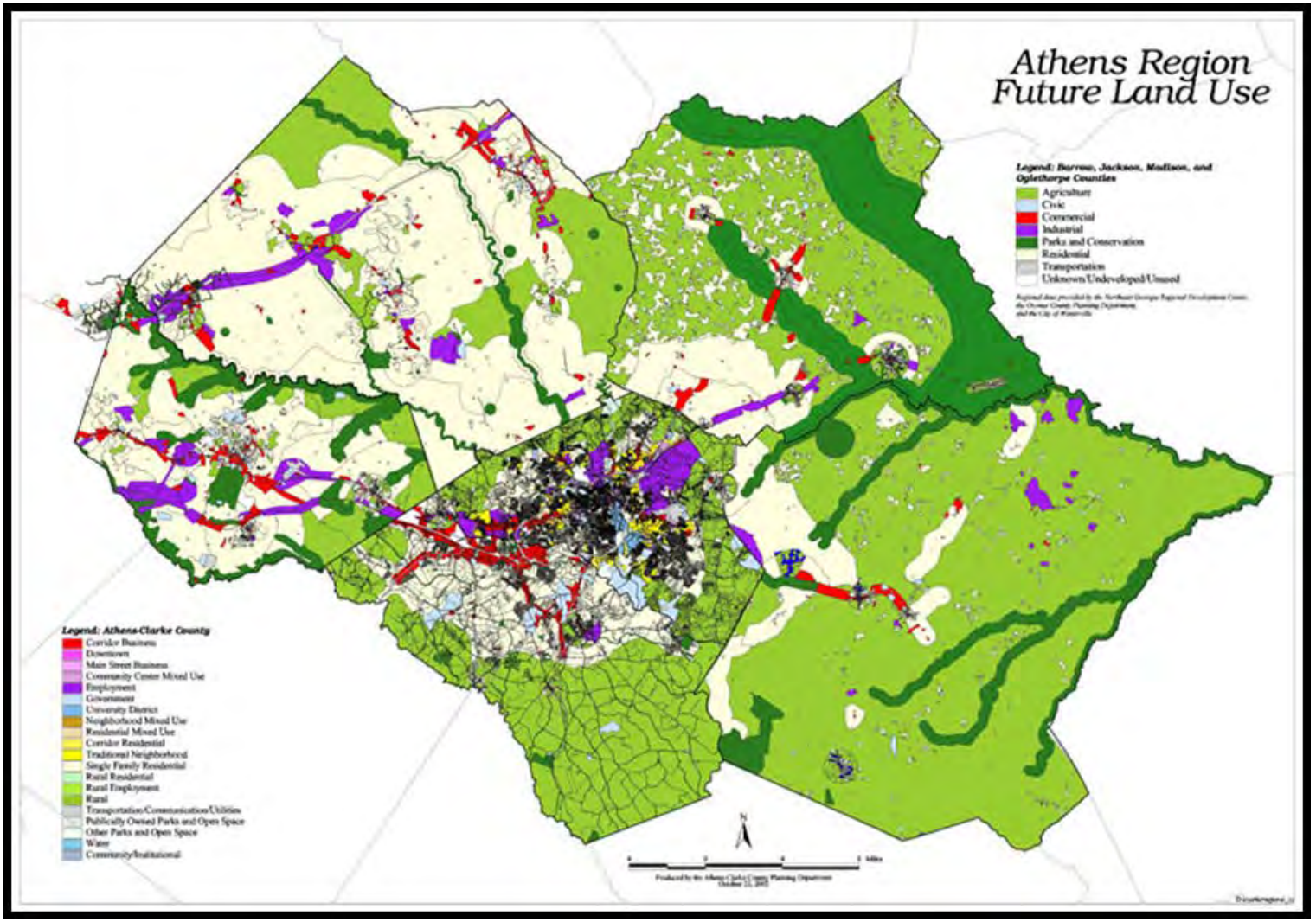


Figure 6.5 ACC has zoned certain areas for agriculture, which also serves as a greenbelt & buffer to development in the region.
Source: Map shared with the author by the ACC Planning Department

Existing ACC policies permit farm infrastructure (high tunnels, greenhouses, packing and washing stations etc.) to be built on AR zoned properties, close to the ROW. Energy companies do not permit these structures in the ROW. Structures of this size are currently only approved in zones that permit agriculture or limited agriculture in ACC.

ACC also permits agriculture on public land or land zoned as Parks (P) and Government (G). This is not specified in the ACC Code, however there are precedents. Athens Land Trust (ALT) wished to find land for a small commercial farm and farmers market in an urban area of Athens where residents lacked access to healthy, affordable food. The West Broad Market Garden and Farmers Market operate on a Government zoned site, owned by the Clarke County School District. Unfortunately, the Clarke County School District recently announced plans to develop this site (Peat 2016). Several parks and government properties are located on energy ROWs. Small farm projects are permitted. Most development is not permitted in a ROW. Thus a ROW farm could be more secure.

Land owned by the University of Georgia (UGA) is also zoned Government (G). The state government can operate outside of local government zoning policies. Initially, the author considered designing a sample farm on the ROWs located on UGA properties. However these ROWs were classified as unsuitable for food production, due to slope, in the suitability analysis. (This analysis will be discussed in depth in Chapter 7.)

OPPORTUNITY: ZONES THAT PERMIT LIMITED AG ON THE ROWs

(RS-40, RS-25, CR, E-I, I)

Agriculture is permitted, with certain limits, on properties zoned Single Residential with a 40,000 square foot minimum lot size (RS-40) and 25,000 square foot minimum lot size (RS-25). Limited agriculture is also permitted on properties zoned Commercial Rural (CR), Industrial (I) and Employment Industrial (EI). This also holds true for the land in the energy ROWs crossing these zones. ACC's **"limits on agriculture"** involve guidelines about raising livestock. The code states: "Agriculture and the keeping of livestock, except swine, is permitted provided that: 1) "no livestock shall be kept on any lot less than one acre in area"; 2) "no more than two head of livestock over the age of six months may be maintained per acre"; and 3) "barns, stables, and other buildings and structures to house said livestock shall not be located closer than 50 feet to any property line" (Athens-Clarke County Code Sec. 9-11-2. - Permitted uses, L (4).) There is still potential for small commercial farms, market gardens in these zones (etc.).

Figure 6.6 is a map of potential **Grow nodes**, or locations on the energy ROWs with: 1) land suitable for food production, and 2) a supportive property owner partner that would allow the ROW farmer to access his/her fields in a ROW & basic infrastructure to support agriculture. The author proposed 18 potential grow node sites along the energy ROWs. The dark green and light green areas represent all ACC zones where existing policies permit agriculture and limited agriculture. (As well as the universally accepted community garden, chicken and prescribed grazing options.) With existing policies, 17 of the 18

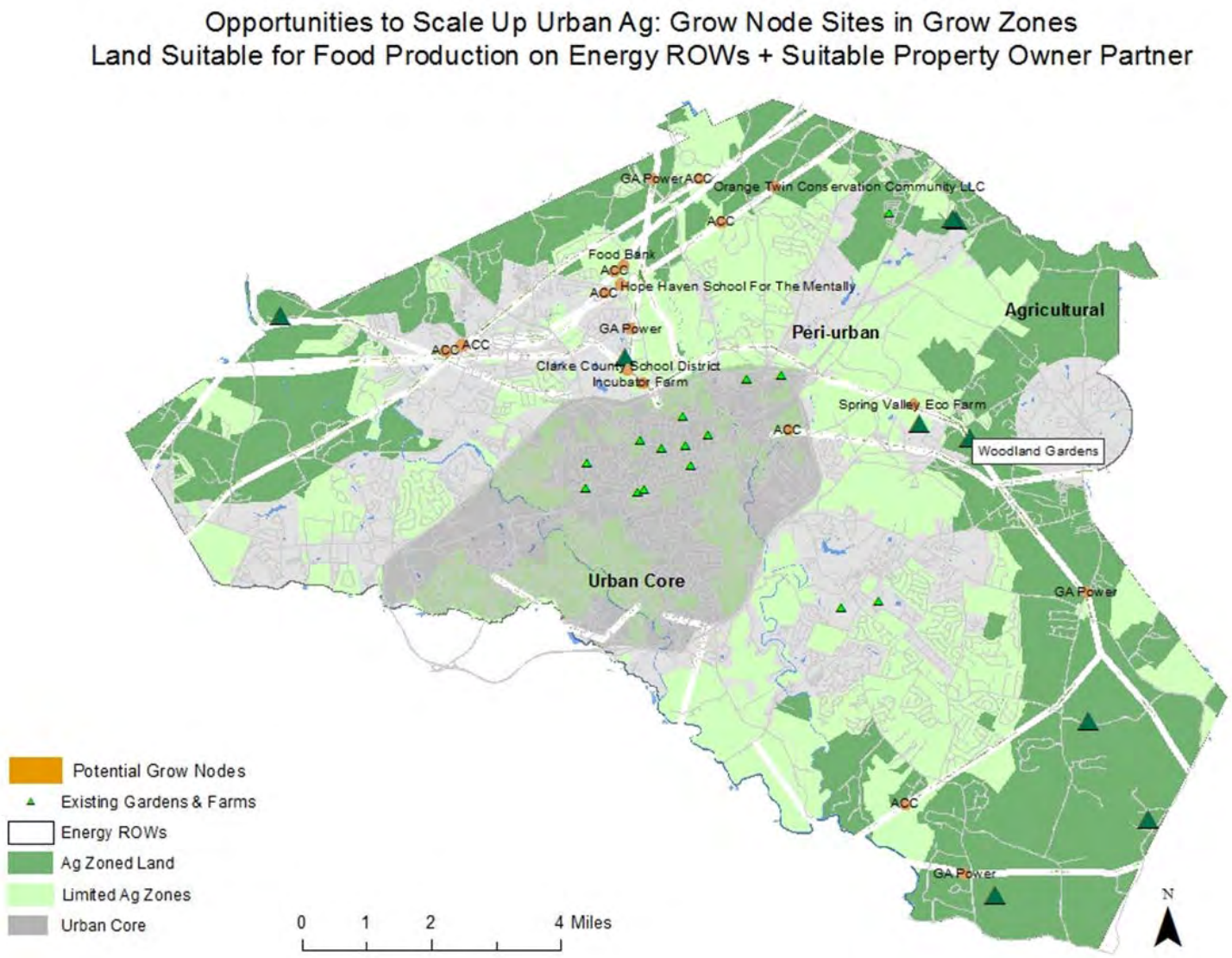


Figure 6.6 There is an opportunity to scale up urban ag on 17 of the 18 proposed grow node sites. **Data sources**: 2013 ACC roads, water, zones, NERC easement data, arms and garden data is Craig Page, Matt Nahrsted, Elizabeth Beak, Athens Land Trust

proposed grow node sites are located in green “grow zones”. In other words, ROW farmers or gardeners would have all of the options for growing healthy food, for themselves or as a business. (See Figure 6.6) These sites have the potential to contribute to the existing community food system, and help transform what is currently an underutilized, weedy, scar in the landscape into something more productive.

The author partnered with the Food Bank of Northeast Georgia during the projective design phase of this research. The goal was to design a sample grow node on an energy ROW. (The design will be covered in depth in Chapter 8.) The author learned more about some of the current policy constraints during the planning and design process of a ROW farm for an actual site.

CURRENT ACC POLICY CONSTRAINTS: HEALTHY FOOD PRODUCTION IN ROWs

The fact that ACC has passed three urban agriculture ordinances in the past two years suggests a new trend in the way the public is thinking about their food system. As new urban agriculture projects are implemented in ACC, new constraints maybe revealed. However, the community and local government can work together to update policies based on lessons learned. Urban agriculture policies are evolving quickly in cities across the country. This section describes some current policy constraints the author experienced while trying to plan and design a ROW farm or grow node at the food bank.

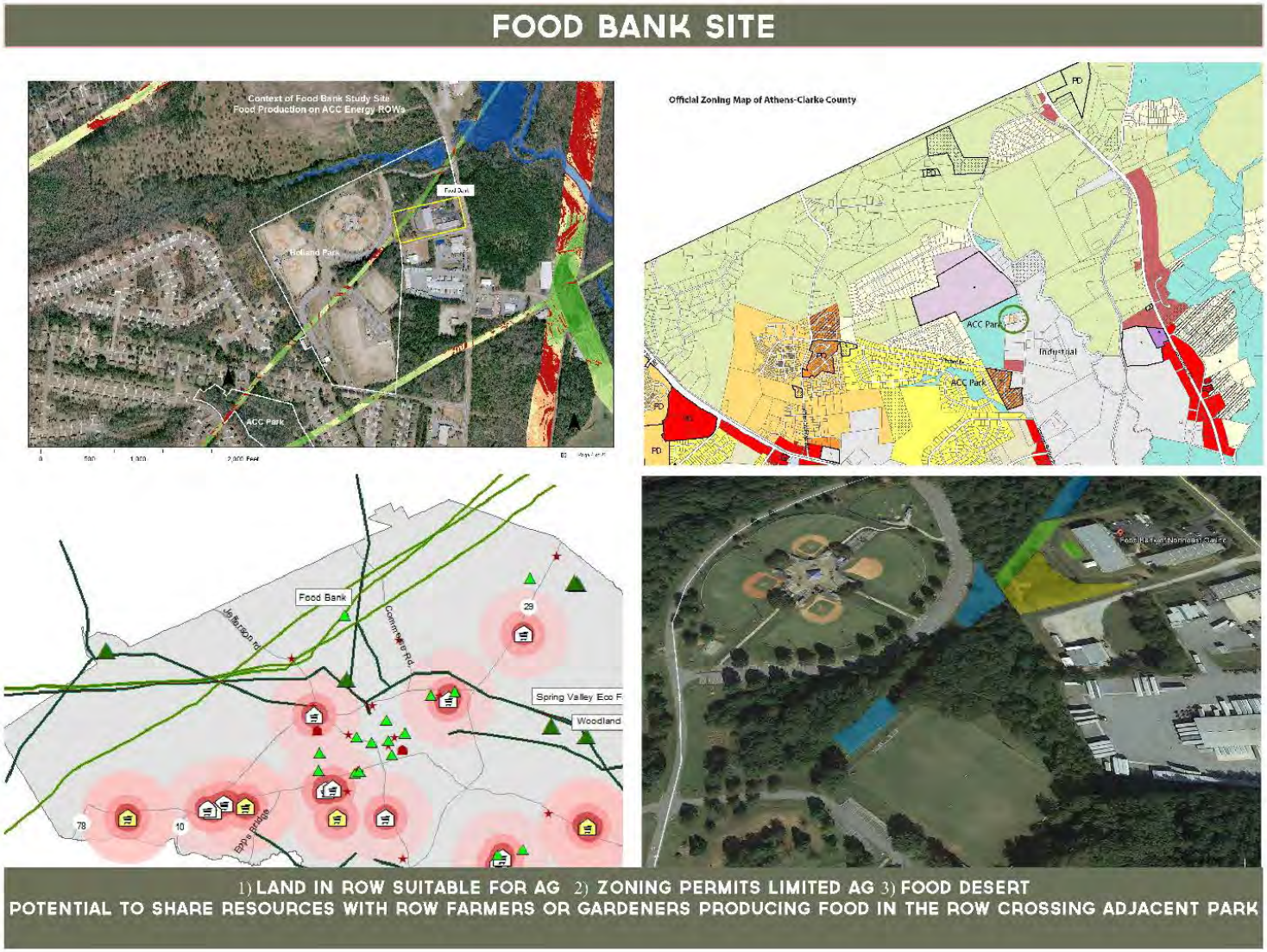


Figure 6.7 The pipeline ROW on the food bank property is suitable for agriculture. The property is zoned industrial (I) and in a food desert. The property adjacent to the food bank is an ACC park with suitable spaces for agriculture. **Sources:** Elizabeth Beak, ACC, Google Earth

CURRENT CONSTRAINT: NAVIGATING ACC'S CODE OF ORDINANCES FOR POLICIES ABOUT FOOD PRODUCTION CAN BE CONFUSING

As in many communities, navigating local ordinances can be confusing and time consuming for well-meaning urban farmers. Determining which agriculture land uses were permitted on the food bank site required checking multiple sections in the code. It is easy to miss something. Planners who work with the local Code of Ordinances on a daily basis can be a great resource. For example, the fact that agriculture is permitted on properties zoned Government (G) and Park (P) is not written anywhere in the code. A professional planner shared this information during another conversation (Page 2016). Some sections of the code may need to be updated. For example, the food bank is zoned industrial (I). When the author read the agricultural limits listed under the industrial zone section of the Code of Ordinances, there was an extra limitation clause which stated that land in the industrial zone areas could follow the standard "limited agriculture" rules, "so long as property has not previously been developed with a use permitted by an underlying zoning classification other than AR" (Unified Government of Athens-Clarke County Georgia 2016). The food bank property was zoned (I), but had been developed into a busy food distribution center. The author assumed that the team had to work within the community garden policies.

Initially, this seemed fine. However, the author soon realized that ACC's current community garden policies constrained the team's ability to design a sample grow node and increase food production. For example, the food bank's priority was getting a high

tunnel for their farm. The high tunnel could extend the growing season, which could help the food bank produce more food for their clients. (See figure 6.8)

Figure 6.8 High tunnel funded by the NRCS for the food bank ROW grow node site.
Photo Credit: Atlas Greenhouse

The team enrolled the food bank site in farm conservation program with the Natural Resource Conservation Service (NRCS). After many months, the food bank learned they had been awarded funding for a 2,140 square ft. high tunnel from the NRCS. UGA agreed to build the food safe wash station. Then, the author realized that the ACC community garden policy limits the total size of farm structures to “250 square feet in floor area or comply with 10% of the minimum lot area per applicable zoning district, whichever is greater”(Unified Government of Athens-Clarke County Georgia 2016).

Later, the planning director reviewed this case and decided that the clause that made the author think that this site was not eligible for “limited agriculture” was outdated. It may have been intended to prevent people from producing food on sites that have been contaminated by industry. He noted that best practices were being used (soil test,

conservation practices, raised beds etc.) and permitted this team to work with limited agriculture standards, moving forward.

CURRENT CONSTRAINT: SOME POLICIES STANDARDS SEEM ARBITRAY OTHERS SEEM TO BE MISSING

These new urban agriculture ordinances have the potential to inspire more people to grow food or support a small farmer who lives and grows food in ACC. The current ordinances include standards about the size of a garden, size of garden structures, signs, setbacks etc. However, policies that encourage best emerging practices such as soil testing, that can truly effect the public's health and welfare, are missing. Some current standards, such as limiting the size of a community garden to one acre seem arbitrary. There are many of examples of successful community gardens that are larger, including some that have been used as precedents for growing on an energy ROW. (Ex. The eleven block Sanford Avalon ROW community garden provides plots for 180 urban farmers in a food insecure area of Los Angeles in Figure.)

CURRENT CONSTRAINT: LOCAL LAND USE ZONES DO NOT CONSIDER OTHER IMPORTANT ZONES IN CURRENT POLICIES (EX: FOOD DESERTS)

Currently, potential growing spaces on energy ROWs in zones RM-1, RM-2, RS-15, RS-5, RS-8, C-G, C-N, C-O, and IN would be constrained to community garden standards such as size limits on structures, limiting the size of a community garden to 1 acre, and

limiting the ability to sell food. Studies indicate that community gardens can help food insecure resident's access healthy food (Alison Hagey et. al 2012). However, when the author met with the Director of the Food Bank of Northeast Georgia, he stated that there are limitations to community gardens. Many food bank clients juggle multiple jobs, etc. or simply do not have the time or the desire to grow their own food.

The author has worked on community-based food projects for over a decade, and experienced how time, employment, cultural perspectives, age of children, marriage status, etc. can make a community garden perfect for aiding in the healthy food needs of one person and not work for another. Diverse, and layered approaches & models are necessary. For example, ACC young adults may be more inspired to enroll in an entrepreneurial farm program while a busy, single mother may prefer to buy healthy food from a neighborhood ROW farmer rather than grow food in a neighborhood plot. Thankfully, urban agriculture thrives on innovation and there are numerous models. However, urban farmers need spaces where they can develop place-based models and access the infrastructure needed to make these ventures succeed.

Today, the areas in the light green and dark green "grow zones" in figure 6.6, and 17 potential grow nodes on the energy ROWs, represent places in the county where there is the flexibility needed to require place-based projects. The author wonders if zones beyond local land use zones, such as the USDA's food desert zones, might also be considered, if and when a resident brings forward a strong project and is wrestling with the policy constraints in a particular zone.

OPPORTUNITIES TO OVERCOME CONSTRAINTS:

The chart in Figure 6.9 proposes potential next steps which have the potential to build on ACC's good work and remove policy constraints. These techniques are being utilized in other cities to scale up urban agriculture in a manner that respects the community's health and welfare, as well as the environment.

As seen in figure 6.0, ACC is committed to supporting agriculture, community gardens and markets in their **comprehensive plan**. However, there is always room to grow. The links column in the first row of Figure 6.9 provides a number of resources that could help ACC integrate additional language to support urban agriculture and cultivate a more vibrant, equitable community food system. In addition to comprehensive plans, cities such as Atlanta, Philadelphia and Baltimore are creating food charters, food plans or incorporating the food system into their sustainability and economic development plans. The South Carolina Department of Health and Environmental Control received a CDC grant to help local municipalities include more language to support food access, healthy eating and active living in their comprehensive planning updates. Community food/ health assessments & and food policy councils can aid such efforts. In ACC, health care institutions such as St. Mary's Hospital could invest community benefit program resources into such efforts. There are professors of planning, geography, public health and agriculture, with classrooms of eager students who can assist. The USDA released a toolkit called "The Economics of Local Food Systems" which ag economics students could work with (USDA 2016). The ACC government has resources which could be tapped to

OPPORTUNITIES TO OVERCOME CONSTRAINTS: ACC URBAN AG

POTENTIAL TOOLS	WHAT	NOTES	LINKS
Comprehensive Plan	Include more language on food access + health	Toronto, Canada able to create market gardens in ROWs on public land because a comprehensive plan goal was to increase access to healthy food for all.	A Planners Guide to Community & Regional Food Planning (APA) catsmartmovemoresc.org/pdf/ SCHealthyToolkit.pdf www.changelabsoultions.org
Create User Friendly Format & Update Ag Policies in Code	Consolidate info in code into a single website or document. Link to resources.	City of Baltimore and Minneapolis have a website City of Somerville publishes A, B, C's of Urban Ag	default/files/SomervillesABCsO-fUrbanAgriculture_5.pdf www.minneapolismn.gov www.baltimarket.org
Encourage Best Emerging Practices	Standards for soil testing & EMF Management Plans	Somerville requires farmers post soil test when selling food, Toronto requires EMF Management Plans for community garden permit	www.somervillema.gov/sites/ http://www.torontourbangrow-ers.org/img/upload/Rexdale%20 KS%20summary.pdf
Create and Urban Farm Ordinance	Permit larger (1-4 acre), more intensive farms in commercial & industrial zones of cities.	Special/conditional Use permit for urban farm in a residential zones (etc.) still needed.	www.changelabsoultions.org growingfoodconnections.org www.minneapolismn.gov
Special/Conditional Use Permit	Ex: Seattle require SUP for an urban farm in residential zone: site plan, farm management plan, erosion management plan, equipment, hrs of operation etc.	ACC Row farmers may have any-way for leases with utility companies/partners, community garden permits, NRCS EQUIP Can be $$ and take 3 months	www.changelabsolutions.org/publi-cations/seeding-city
Overlay Zone/ Urban Garden Zone District	Cities across the U.S. are creating Food Innovation Zones, Urban Ag-riculture / Healthy Food Zones etc. Could this work along ACC ROWs or in ACC food deserts?	Can be strategically placed greenhouse, structures, onsite sales etc. all permitted outright. Cleveland Ec. Development list sites + offers start up funds for U.A	Cleveland, OH: Urban Garden Zone District Flint: Green Innovation Zone Florence, SC: Food Innovation

Figure 6.9 Potential solutions to current policy constraints. **Source:** Elizabeth Beak

help strategically weave more language about urban agriculture & food systems into their long range planning documents and policies.

Integrating language about health and agriculture into planning documents can have a beneficial effect. For example, the City of Toronto committed to scaling up urban agriculture and providing healthy food for all residents in their plans and policies. The city and a non-profit partner secured six acres of ROW on city owned land under transmission lines, located in a Toronto' food desert for CEED (Community Eco Economic Development) gardens with on-site farm stands (Sherman 2015). NIMBYs complained about using public land for these for-profit market garden. However, the team was still able to move forward because: 1) the farmers will work under a non-profit & this is a community economic development project; and 2) it is aligned with Toronto's plans and policies to increase healthy food access for all residents of the city (Teitel-Payne 2016).

Modifying local agriculture policies is common practice. These policies are innovative, and evolving quickly in communities throughout the country. Websites such as growingfoodconnections.org contain a searchable local government food policy database and are updated frequently. Consolidating ACC's agriculture policies into a user friendly **single resource** for residents could lead to less meetings and mistakes. For example, The City of Somerville, MA developed a simple, user-friendly document summarizing their urban agriculture ordinance called: "The ABC's (Ag, Bees, and Chickens) of Urban Agriculture". It focused on best emerging practices for urban agriculture. The 2015 edition was updated based on lessons learned since the 2012 edition (City of Somerville 2015).

This resource links to short videos about the rules and BMP's for raising a chickens etc. Then the resident can download a chicken permit. The links to existing resources and community organizations help residents learn how to grow food safely and successfully.

Most of the language about agriculture is the current ACC comprehensive plan is under economic development, however there is not yet an ordinance for commercial urban farming. Change Lab Solutions defines an **urban farm** as: "larger-scale, more intensive sites where food may be grown by an organization or private enterprise, and often include entrepreneurial opportunities such as growing food for sale" (Heather Wooten and Amy Ackerman 2011). Seattle & Atlanta and many other cities permit urban farms outright in industrial and commercial zoned areas. It could benefit ACC if the confusing language in ACC's current code around limited agriculture in industrial zones were to be replaced with a clear urban farming ordinance for industrial sites and additional commercial zones (Ex: C-N, C-G, and C-O). If ACC decides to continue to update their policies, and include urban farming, Figure 6.9 provides links to successful models that ACC could use to create an urban farm ordinance that works for this community. For example, the City of Minneapolis has developed a sophisticate urban farming ordinance and resources that could serve as a model. City owned vacant lots suitable for agriculture have been mapped and are posted each season. Farmers can search the website and apply for a 5-year lease to farm or garden that space. Licensure, leases, insurance, safety, technical resources etc. are clearly defined (City of Minneapolis 2016). Such a data base could include 7 ACC sites along the ROW network that were found suitable for food production in this project.

ACC defines a **special use permit** (SUP, also called a conditional use permit) as a permit which allows a land use that does not fit in with an existing zone (Athens-Clarke County Unified Government 2016b). For example, Seattle permits urban farms in industrial and commercial zones outright, but requires a SUP for an urban farm in a residential zone. A public hearing is held in front of the commission and mayor. The farmer is required to prepare a site plan, soil and erosion plan, farm management plan (ex: equipment used, hours of operation, chemicals used etc.) These requirements may not be such a challenge for an ACC grow node/ ROW farmer. Site plans are required by many utility companies for secondary land use permits and any farmer hoping to receive funding from the EQUIP conservation program could work with their local NRCS technician on a soil and erosion plan, etc. At one point the author thought the food bank ROW farm team might need to apply for an SUP to move forward with the design. This would be the fastest turn around, (2-3 months) but requires money and more work. (Approximately $750 for a SUP, & may also require paying a surveyor, building permits, etc.) The cost and time required for a SUP could make it challenging for those with fewer resources and clout than the food bank. Currently, fees are not waived for a non-profit, a farmer in a food desert etc.

Some cities are avoiding the constraints associated with SUPs by creating **overlay zones/districts.** This is “a mapped overlay district superimposed on one or more established zoning districts” (John Nolon and Patricia Salkin 2006). Parcels within such a district are subject to both the underlying and overlay requirements. Cities such as Flint, Michigan and Florence, SC are utilizing overlays to create Green Innovation or Food

Innovation Zones to strategically cultivate parts of the city for urban farming, food hubs, and shared commercial kitchens that can add value to products (Houseal Lavigne Associates 2013). Cleveland has created an urban garden district. Cleveland permits urban farms and accessory structures such as high tunnels in this district. (They even grant startup funds for urban Ag infrastructure.) (City of Cleveland 2016). Perhaps ACC could create and overlay zone or district to allow flexibility & encourage creative, place-based solutions in areas of the county that are in food deserts. The author predicts that urban farmers and neighbors could come up with some incredibly innovative ideas for using the land in ROW to create a healthier and more equitable food environment, if they were not only permitted – but encouraged.

In summary, existing ACC policies permit some form of healthy food production on every zone along the energy ROWs. Under existing ACC policies, it is also possible to scale up urban agriculture. (At least, 17 sites on the energy ROW.) Recently, the ACC Planning Department has been working with community partners to create new policies around food and agriculture. Making these policies more user friendly could simplify this process and help more urban farmers and gardeners produce food safely and successfully along the energy ROWs. The chart in Figure 6.9 provides some resources that ACC could utilize if they continue to update and cultivate new food and agricultural policies. Farmers and community partners should continue to collaborate with local government officials on these policies. This partnership and work have the potential to impact the health and welfare of many, as well as a unique slice of space in ACC's landscape.

CHAPTER 7

SUITABILITY ANALYSIS: ATHENS-CLARKE COUNTY Energy ROWs & FARMING

This paper explores the potential of using the vast, network of land in Athens-Clarke County (ACC) energy right-of-ways (ROWs) to grow healthy food and scale up urban agriculture. ESRI ArcGIS 10.3.1 was utilized to map and measure a total of 1052 acres of land in ACC energy ROWs. Not all of this land will be suitable for food production due to slope etc. and other environmental factors. The **goal** of this suitability analysis was to determine the location & amount of land suitable for farming and gardening based on environmental factors.

The **results** determined that: 1) 692 acres of land are moderately to highly suitable for food production; and 2) the locations of these suitable spaces. These ROWs cross public and private property. Access to some of these environmental factors (ex: tapping a water main) would require a supportive property owner partner. Suitability analysis results and parcel data were then used to identify **grow nodes.** Grow nodes are areas on the ROW with suitable land & a potentially supportive property partner. This analysis also helped the author select a study site along an ACC ROW to design as a pilot grow node. The design process would allow the author to analyze opportunities and constraints of producing healthy food on an ACC ROW in more depth. Other communities could perform

a suitability analysis to determine if and where the ROWs in their community could be utilized to grow healthy food and a greener, healthier, more equitable city.

METHODOLOGY

Figure 7.O depicts the methodology used to analyze the suitability of land in ACC ROWs for food production. This chapter focused on the environmental factors and identification of potential grow nodes. Additional analysis continues in Chapter 8, at the site design level.

IDENTIFY CRITERIA:

The author identified four environmental factors that affect the suitability of land within a ROW for urban agriculture. These include: 1) soil type, 2) proximity to water (water mains, surface water and fire hydrants. Data on the location of wells was not available.), 3) proximity to a road, and 4) slope. Sun was not included at this level of the analysis because energy ROWs are clear of the building structures and trees that effect many urban agriculture sites. An in depth sun analysis occurred at the site level. A GIS database was created: spatial data for each of these environmental factors were collected, created, and managed.

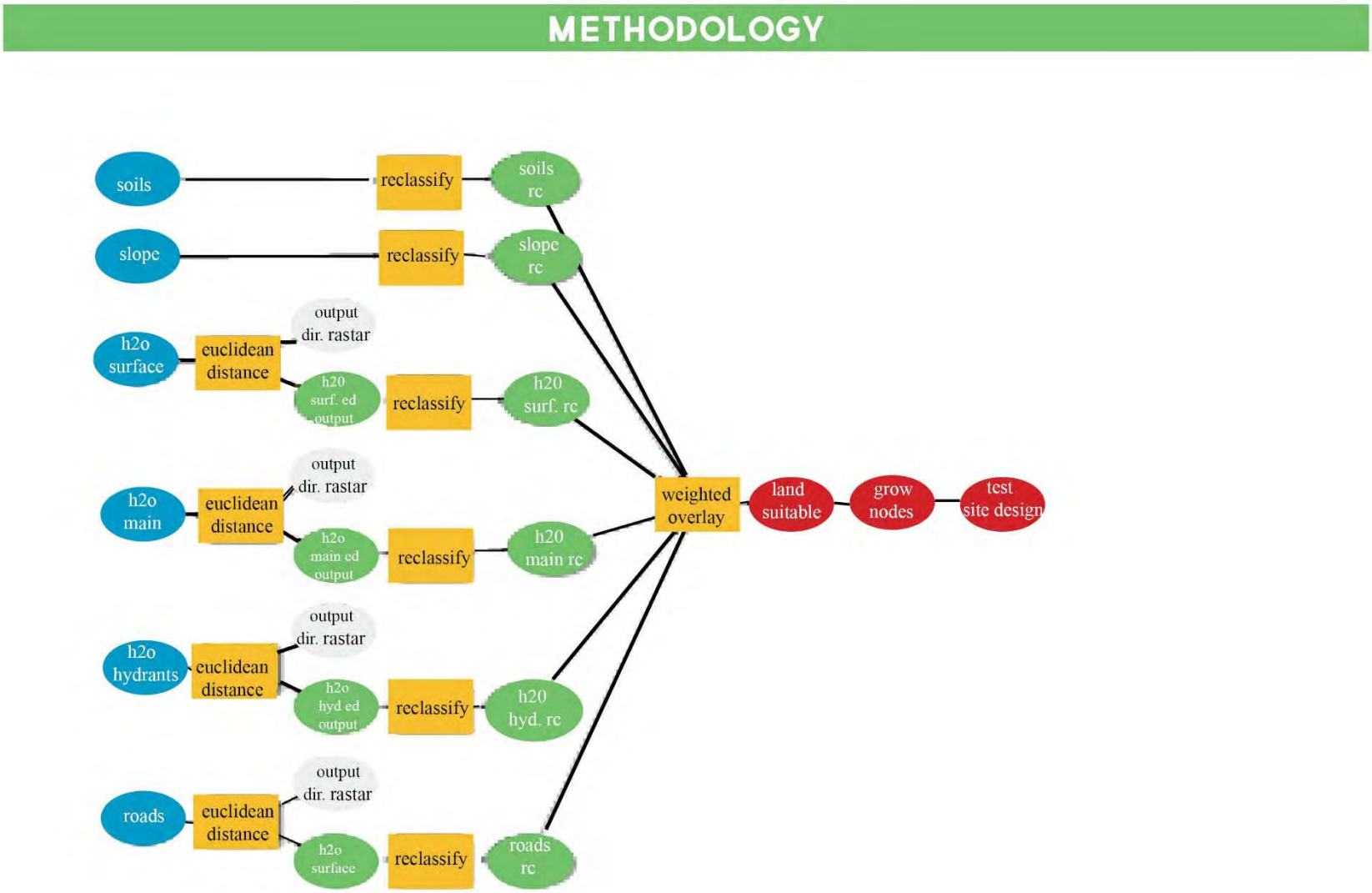


Figure 7.0 Methodology: suitability analysis of ACC energy ROWs (gas and transmission) for food production. Source: Elizabeth Beak

Figure 7.1 Four environmental factors were identified as criteria affecting the suitability of land for farming. Sun analysis occurred at the site level. **Limitations**: data on locations of ACC wells not available**. Lesson Learned:** Even prime farm land soils in a ROW must be tested at the site level to confirm suitability. Once a study site was selected, the author tested the "prime farm land soils" because they were above a petroleum pipeline. Heavy metals were found. Raised beds and new soil will be used. It is unclear if this is due to the pipeline, or the fact that the site is in an industrial zone. More research is needed

RECLASSIFICATION OF DATA:

This spatial data was rasterized & classified according to its suitability for urban agriculture. Four being the most suitable and one being least suitable. For example, areas of the ROW with a 0-3% slope were categorized as a 4, or most suitable for farming. Land with a slope greater than 12% slope was categorized as a 1, or least suitable for food production due to the expense of adding terraces, challenges of operating equipment, and the potential for creating erosion issues. Wetlands were restricted from this suitability analysis. This data was then reclassified to a scale of (“1 to 12 by 1”) to acknowledge nuances in the standard (high, medium, and low) suitability levels for each factor. Again, low suitability was represented by low numbers and higher numbers represented high suitability.

WEIGHTED OVERLAY ANALYSIS OR STAKEHOLDER INPUT:

Weights were assigned to the model to depict the relative importance of these environmental factors. Weights were determined according to the authors belief of the influence that factor could have on the success of urban agriculture in the ROW. This would be an excellent place to include community stakeholder input. For example, if a ROW farmer knew they wanted to use raised beds, the soil criteria could be weighted less, the model could be run once more and the results would reflect these priorities.

RESULTS:

The results of the suitability analysis using these environmental factors, indicated that 359 acres of the land in ACC energy ROWs is unsuitable for food production. However,

372 acres are moderately suitable and 320 acres are highly suitable for food production. Highly suitable land was a 12 and the least suitable land was a 1. The ArcGis map book feature divided the county into 25 sections. A map of each of these sections is included in the appendix.

STUDY AREA SELECTED TO DESIGN: FOOD BANK GROW NODE - ROW FARM

The author realized that if a ROW farmer or gardener does not own the entire property, they will be somewhat reliant on a supportive property owner to permit access to the water source and other environmental factors included in the analysis. Also, infrastructure which can help urban farmers sustain and scale up food production on small spaces (ex: high tunnels), are not permitted in the ROW. A **grow node** is an area on an ACC ROW that is suitable for food production, located on the property of a supportive property owner partner. (Many of the precedent cases discussed in Chapter 4 suggest ways such relationships have been structured successfully in other cities.)

The author utilized ACC parcel data to identify properties on the ROW with owners that could be supportive. These include public properties owned by ACC parks or the school district (administrative school district offices, not a child-based site); properties owned by non-profits such as Hope Haven for developmentally disabled adults, the food bank, existing farms that are not currently using the land in the ROW, and suitable land owned by the energy companies.

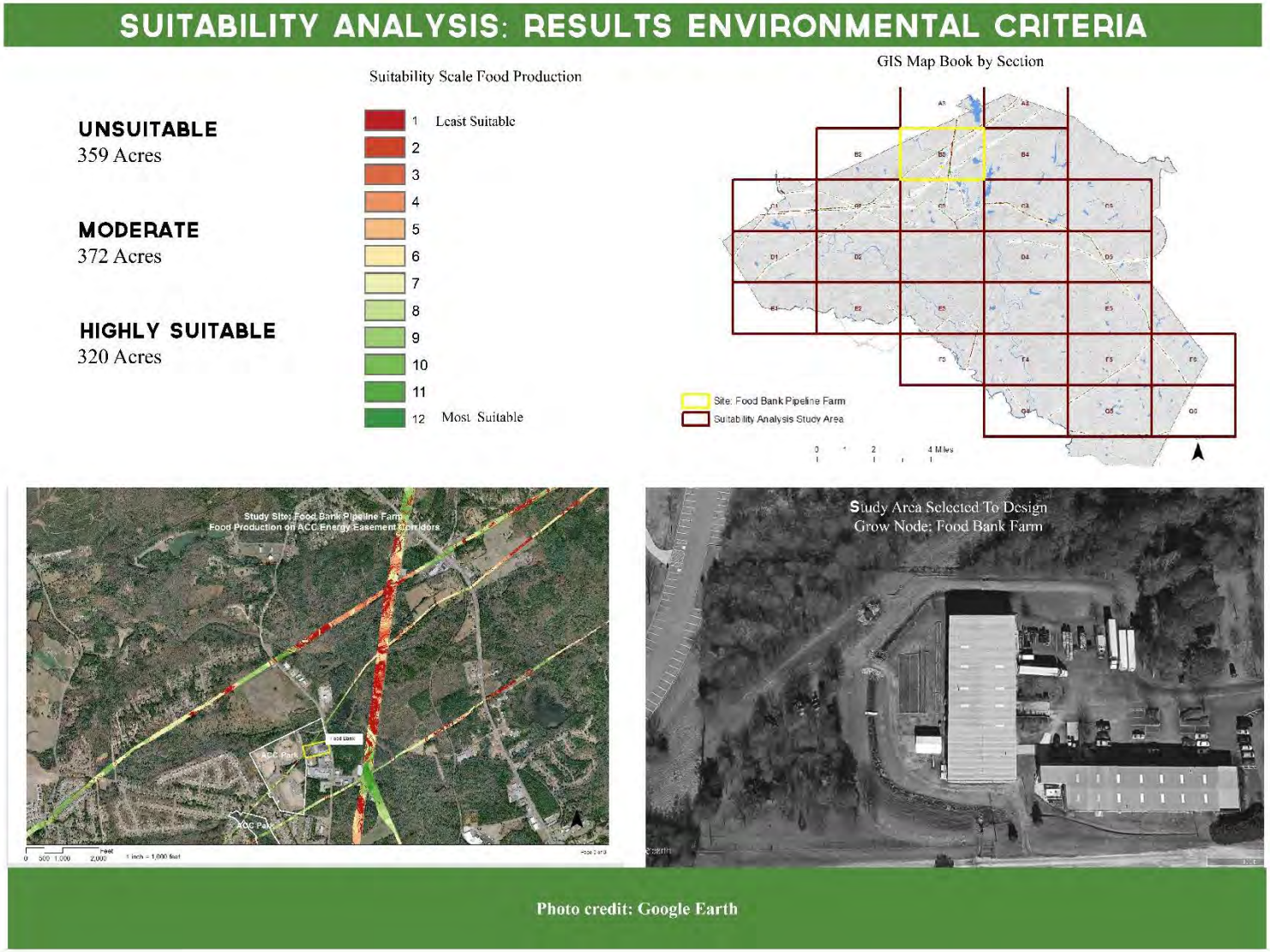


Figure 7.2: Results of the suitability analysis. The food bank in section B3 was selected for a test design. Data sources: soils SSURGO and ACC 2013 soils, roads, surface water, watermains, hydrants. Elevation Lidar derived DEM created by NOAA & GADNR. NERC easements. Google Earth

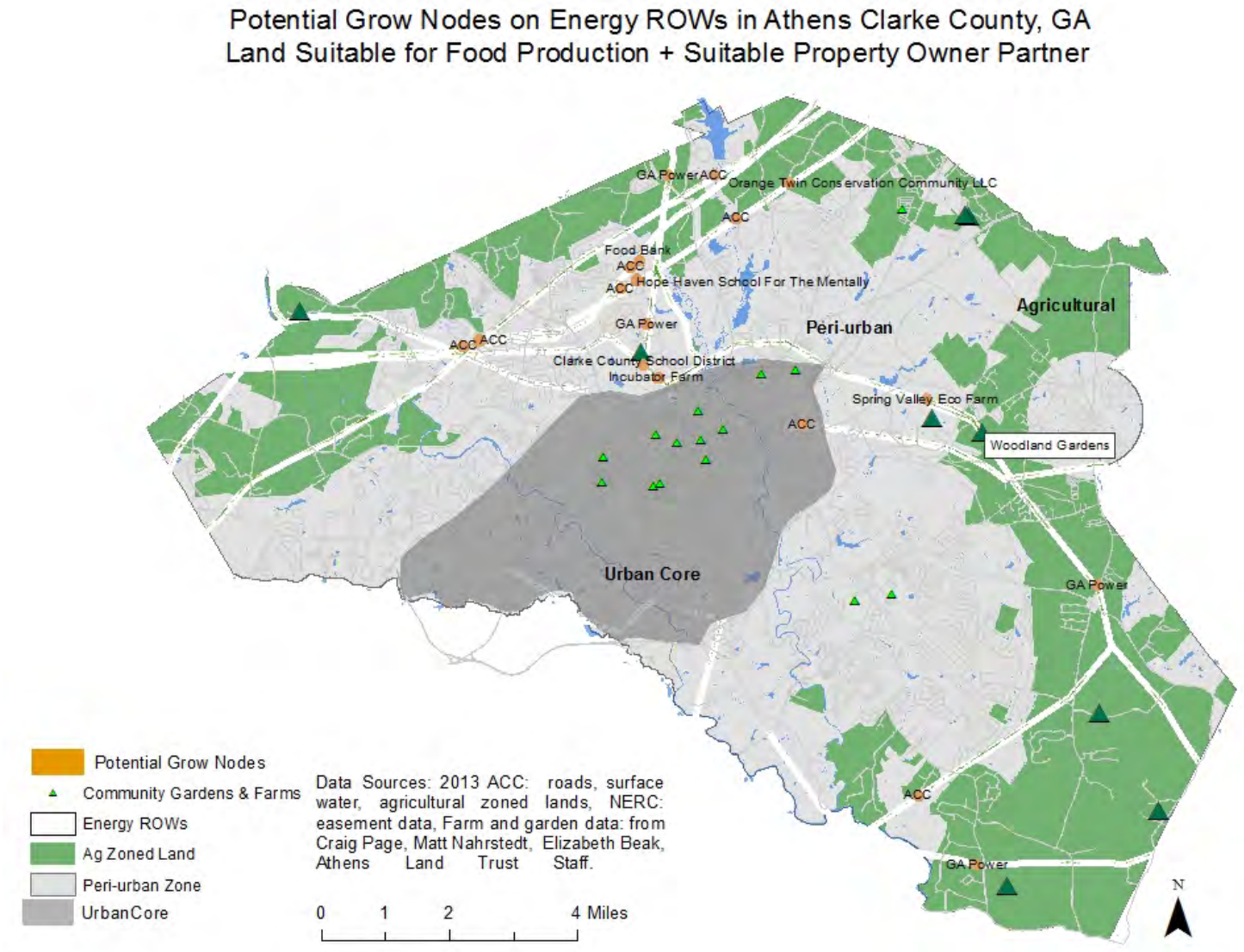


Figure 7.3: The 18 potential grow node sites along the ACC energy ROWs. Data sources: 2013 AC: roads, surface water, agriculture zoned lands, NERC easement data, farm and garden data from Craig Page, Matt Nahrstedt, Elizabeth Beak, Athens Land Trust Staff.

This process represents one strategy a municipality, planners, designers and community partners could utilize as they search to locate the best spaces for healthy food production in their planning efforts. It would be necessary to follow up to see: 1) if these potential partners would be willing to offer the underutilized spaces within their ROW for a garden; and 2) complete a soil test, EMF test, sun analysis etc. Figure 7.3 is a map of 20 potential grow nodes. There could be additional YIMBY (Yes In My Back Yard) private property owners happy welcome a farmer who maintains their ROW & shares a portion of the bounty, so long as water bills, liability insurance (etc.)are agreed upon in writing. Resources for building these relationship can be found in Chapter four, Figure 4.7.

The author wanted to explore the potential opportunities and constraints of this strategy, more deeply. Map book section B3 (See Figure 7.2) was enticing for the following reasons: 1) numerous pipeline and transmission ROWs are located here; 2) these ROWs pass through several peri-urban neighborhood developments; 3) this is a food desert, and 4) there are several potential grow nodes in this section. In the fall of 2015 the author reached out to a potential grown node partner in section B3, the Food Bank of Northeast GA. The author discovered that Jim Pope manages a garden behind the distribution center. He decided to partner with the author to design a sample grow node with the goal of scaling-up healthy food production to provide more delicious, nutrient dense food for the food bank's clients. The lessons learned during the projective design phase of this research helped the author better understand some of the opportunities and constraints associated scaling up urban agriculture on ACC energy ROWs. The lessons learned & sample grow node design will be discussed in Chapter 8.

CHAPTER 8

PROJECTIVE DESIGN: FOOD BANK of NORTHEAST GEORGIA GROW NODE

This research paper has explored the potential opportunities and constraints of using the vast network of land in Athens-Clarke County (ACC) energy right-of-ways (gas & transmission) to grow healthy food and scale up urban agriculture. ACC energy companies allow farming and gardening as a secondary land-use in the right-of-way (ROWs), so long as it does not interfere with operating the infrastructure necessary to supply the population with its energy needs. Successful farms and gardens operate in the ROWs of several North American cities and provide examples of creative partnerships and models that can be used in ACC to navigate legal, health and policy challenges. The results of a suitability analysis of ACC energy ROWs indicated that 692 acres of ACC ROWs are moderately to highly suitable for food production. This suitability analysis also identified the location of areas suitable for farming. The author used these results to identify potential “grow nodes” along the ACC energy ROWs. Grow nodes are areas on the ROW that have: 1) land suitable for farming (Based on soil, proximity to water, proximity to a road for access, and a reasonable slope.) and 2) have a supportive property owner partner, willing to permit access to farm infrastructure. (ex: water source, high tunnel etc.) This chapter explores what a grow node along an ACC energy ROW might look like, and some of the potential opportunities and constraints that municipalities,

planners, farmers, and designers might encounter when these ideas are put into practice at the site-scale.

The author began this projective design process, by contacting a potential grow node site, the Food Bank of Northeast Georgia (FBNEGA), to see if they were interested in partnering. The author learned that Jim Pope was already managing a .5 acre garden behind the food bank's distribution center. Jim Pope and the Executive Director of the FBNEGA, John Becker, decided that they were interest in partnering with UGA on a phase two design to: 1) address existing garden constraints; and 2) increase the amount (lbs.) of fresh, healthy food they grow for clients. The author would be able to design a sample grow node and learn more about the opportunities and constraints inherent in trying to grow food on an ACC pipeline ROW.

The mission of the Food Bank of Northeast Georgia is "to work toward ending hunger as part of an overall community effort to alleviate poverty". The USDA defines **food security** as: "access by all people at all times to enough food for an active and healthy lifestyle" (Obadia 2016b). In 2013, the food bank distributed 12 million pounds of food to 76,720 clients within the 14 county region the FBNEGA serves (Feeding America 2014b) (Food Bank of Northeast Georgia 2016). These clients include 17,950 food insecure residents in Athens-Clarke County, or 14.8% of ACC's population(Feeding America 2014a). Food banks were intended to be short term, emergency responses to food issues. However, food banks recognize that the food that they serve has become a "primary source of nutrition for many families facing chronic poverty and unemployment" (Khokha 2013). For

this reason, the FBNEGA is attempting to increase the fresh, nutrient dense food items in their donations.

EXISTING CONDITIONS

The food bank property is 5 acres. The property is zoned industrial. (See Figure 6.3) The parcels adjacent to the food bank property are Holland Park and industrial warehouses. The current growing space is almost a half-acre. The pipeline ROW is about .35 of an acre. A raised bed area by the warehouse is a .10 of an acre. Figure 8.0 is a recent image from google earth of existing site conditions.

Figure 8.0 Google Earth image of existing conditions at the Food Bank of Northeast Ga site.
Photo credits: Google Earth 2016

The suitability analysis of ACC ROWs symbolized the best areas for food production in green. As seen in Figure 8.1, there are green areas in the ROW adjacent to the food bank property, on the public park property. In future seasons, the food bank farm could expand

into these spaces. Or, neighbors could start a community garden. The food bank would be open to serving as a grow node. This might entail sharing farm infrastructure (ex: the high tunnel, tool shed, wash station, etc.) with neighborhood gardeners.

Figure 8.1 Context of the food bank study site. Green areas in the ROW are suitable for food production. **Source:** Elizabeth Beak used ACC 2013 data to produce this image.

The author worked with the garden manager, Jim Pope, to identify the existing strengths, weaknesses and opportunities of the food bank garden site. These are summarized in Figure 8.2. Jim's priorities are highlighted in green, and therefore considered phase one. The author noted a tension between addressing the current needs of the food bank farm (ex: a well for irrigation) and building towards the broader vision of ACC ROW farms. Jim and the author created a phasing plan that satisfied both. Figure 8.3 is the phasing plan for implementing the design.

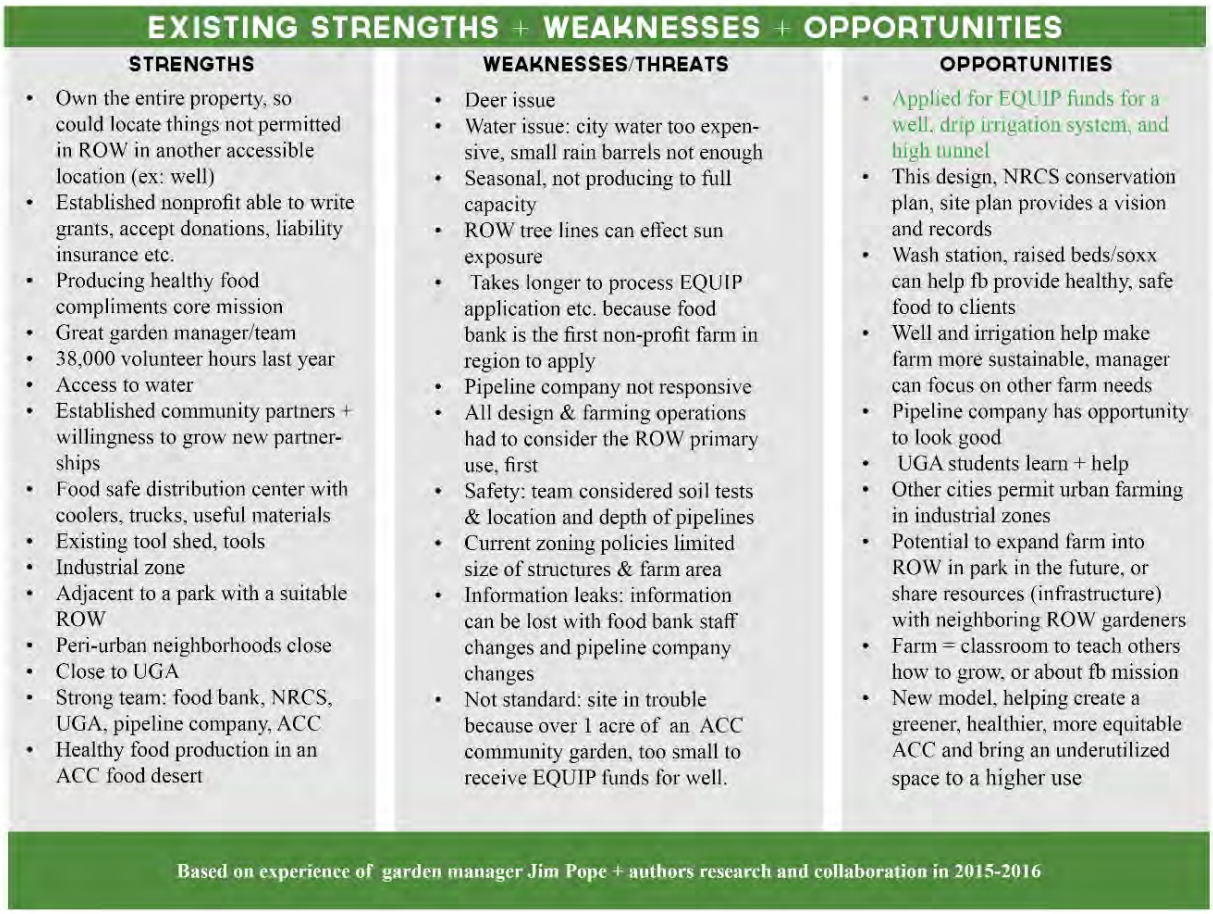


Figure 8.2 Existing strengths, weaknesses and opportunities of food bank site.
Source: Elizabeth Beak and Jim Pope

Figure 8.3 The phasing plan for the food bank site includes: 1) making the existing growing areas, or **green phase one areas** more productive and sustainable by applying for a well, drip irrigation system, and high tunnel from the NRCS EQUIP program; 2) creating a .75 acre food forest in the **phase 2 yellow area**; and 3) the **blue phase 3** areas involve using suitable spaces in the adjacent park for neighborhood gardens or extending the food bank farm. **Source:** Google Earth

LESSONS LEARNED

The team believed that the food bank ROW was suitable for food production because: 1) the food bank had grown food successfully on the ROW in the past, and 2) the suitability analysis indicated that this was a good area to grow food. Figure 8.4 summarizes four lessons learned on site during the design process which influenced the final design for the food bank grow node.

For example, the suitability analysis of ACC energy ROWs indicated that the soils in this section of the ROW were **prime farm land soils** or “land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban built-up land or water)”. Congress identified the following characteristics as the criteria for prime farm land soils: “adequate natural moisture content; specific soil temperature range; pH between 4.5 and 8.4 in the rooting zone; low susceptibility to flooding; low risk to wind and water erosion; minimum permeability rates; and low rock fragment content” (USDA Natural Resources Conservation Service 2016).

However, a ROW soil tests for heavy metals revealed a level of cadmium at the EPA’s threshold for a measure of concern. This could be due to the fact that a petroleum pipeline is running through this prime farm land soil. This section of the ROW is also located in an industrial zone; which could have influenced the soil health over time. (All other soil tests results were fine.) This soil test result and the ROW Specialists site visit influenced Jim’s

Figure 8.4: Lessons learned on site which informed the design. Photo credits: Elizabeth Beak, Gardensoxx.com, Atlas Greenhouses

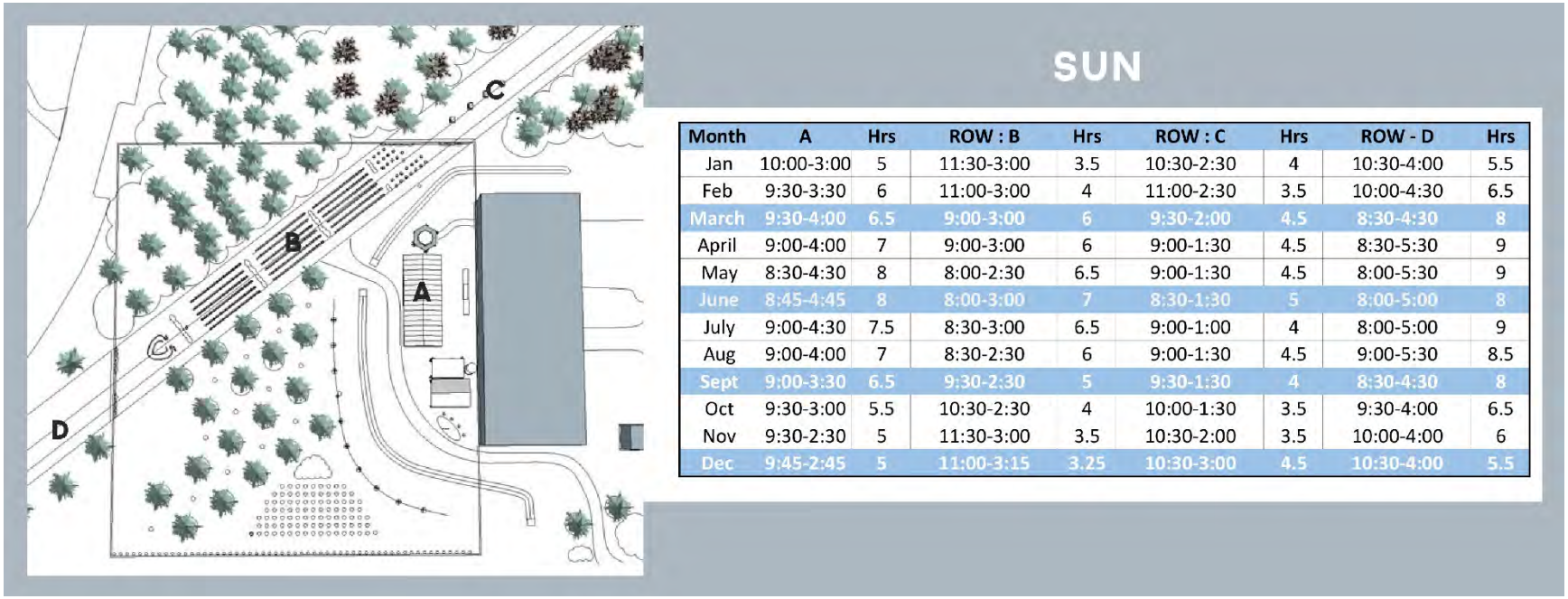
decision to change to raised beds on the ROW. During the site visit, the ROW Specialist marked the location of two petroleum pipelines and permitted tillage to a depth of 12". However, Jim decided to err on the safe side. He works with many volunteers and did not want one to accidentally hit a pipeline under his watch and he wanted to respect the soil test results. The author and Jim are considering several raised bed options, including garden soxx which could be easily moved to accommodate different crop spacing needs, pipeline repairs etc. (See **Figure 8.3** for an image of garden soxx.) Lessons learned from policy constraints are described in depth in Chapter Six.

SUN ANALYSIS:

Energy ROWs are already cleared of the trees & permanent structures that can cause sun issues on many urban agriculture sites. Therefore most energy ROWs can support some form of agriculture, during some months of the year. (Ex: Tomatoes, mushrooms, bees etc.). During a site visit to Woodland Gardens LLC, the farmer mentioned that she adapted her crop plans to accommodate the sun exposure differences in her open fields vs. the ROW field, framed by trees. For example, she planted spring crops in the energy ROW field later in the season than other fields because the tree line blocked the sun for a bit longer. This extra shade actually benefited some of the crops during Georgia's hot summer months.

The author utilized a free software (Sketch Up) to complete a sun analysis at the site scale for the FBNEGA. This helped the team determine the location of the high tunnel, paths, and crop areas. For example, truck & pedestrian access paths are located next to

the tree line and crop areas are located in the center of the ROW to get the most sun. This software could be used by communities to analyze the results of sites deemed most promising for urban agriculture in the suitability analysis results. See Figure 8.5 and 8.6.



SUN

Month	A	Hrs	ROW : B	Hrs	ROW : C	Hrs	ROW - D	Hrs
Jan	10:00-3:00	5	11:30-3:00	3.5	10:30-2:30	4	10:30-4:00	5.5
Feb	9:30-3:30	6	11:00-3:00	4	11:00-2:30	3.5	10:00-4:30	6.5
March	9:30-4:00	6.5	9:00-3:00	6	9:30-2:00	4.5	8:30-4:30	8
April	9:00-4:00	7	9:00-3:00	6	9:00-1:30	4.5	8:30-5:30	9
May	8:30-4:30	8	8:00-2:30	6.5	9:00-1:30	4.5	8:00-5:30	9
June	8:45-4:45	8	8:00-3:00	7	8:30-1:30	5	8:00-5:00	8
July	9:00-4:30	7.5	8:30-3:00	6.5	9:00-1:00	4	8:00-5:00	9
Aug	9:00-4:00	7	8:30-2:30	6	9:00-1:30	4.5	9:00-5:30	8.5
Sept	9:00-3:30	6.5	9:30-2:30	5	9:30-1:30	4	8:30-4:30	8
Oct	9:30-3:00	5.5	10:30-2:30	4	10:00-1:30	3.5	9:30-4:00	6.5
Nov	9:30-2:30	5	11:30-3:00	3.5	10:30-2:00	3.5	10:00-4:00	6
Dec	9:45-2:45	5	11:00-3:15	3.25	10:30-3:00	4.5	10:30-4:00	5.5

Figure 8.5: Sun Analysis Table for food bank farm site. Source: Elizabeth Beak

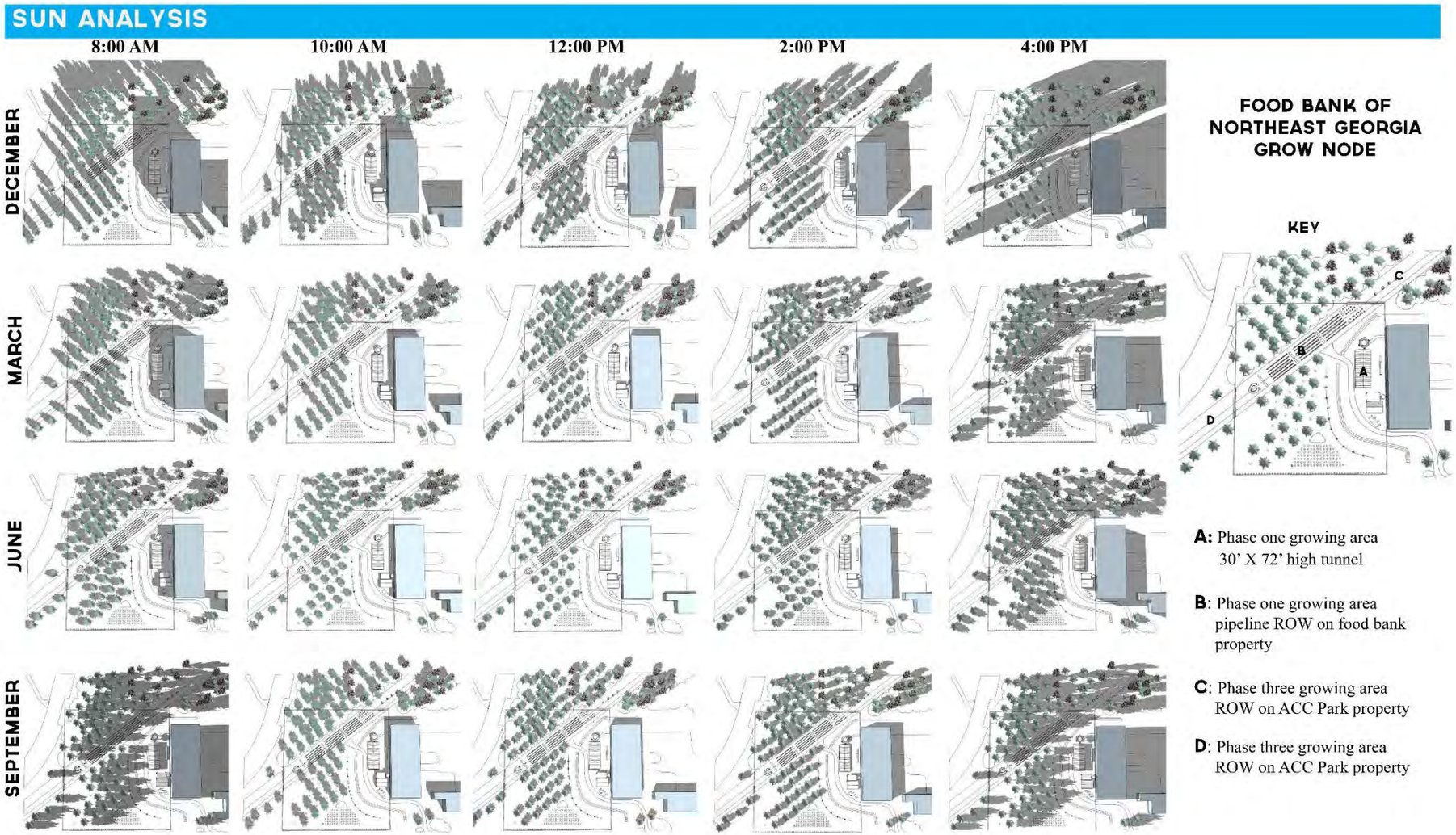


Figure 8.6 Free Sketch Up software can assist ROW farmers with the placement of paths, crops and infrastructure. Source: Elizabeth Beak

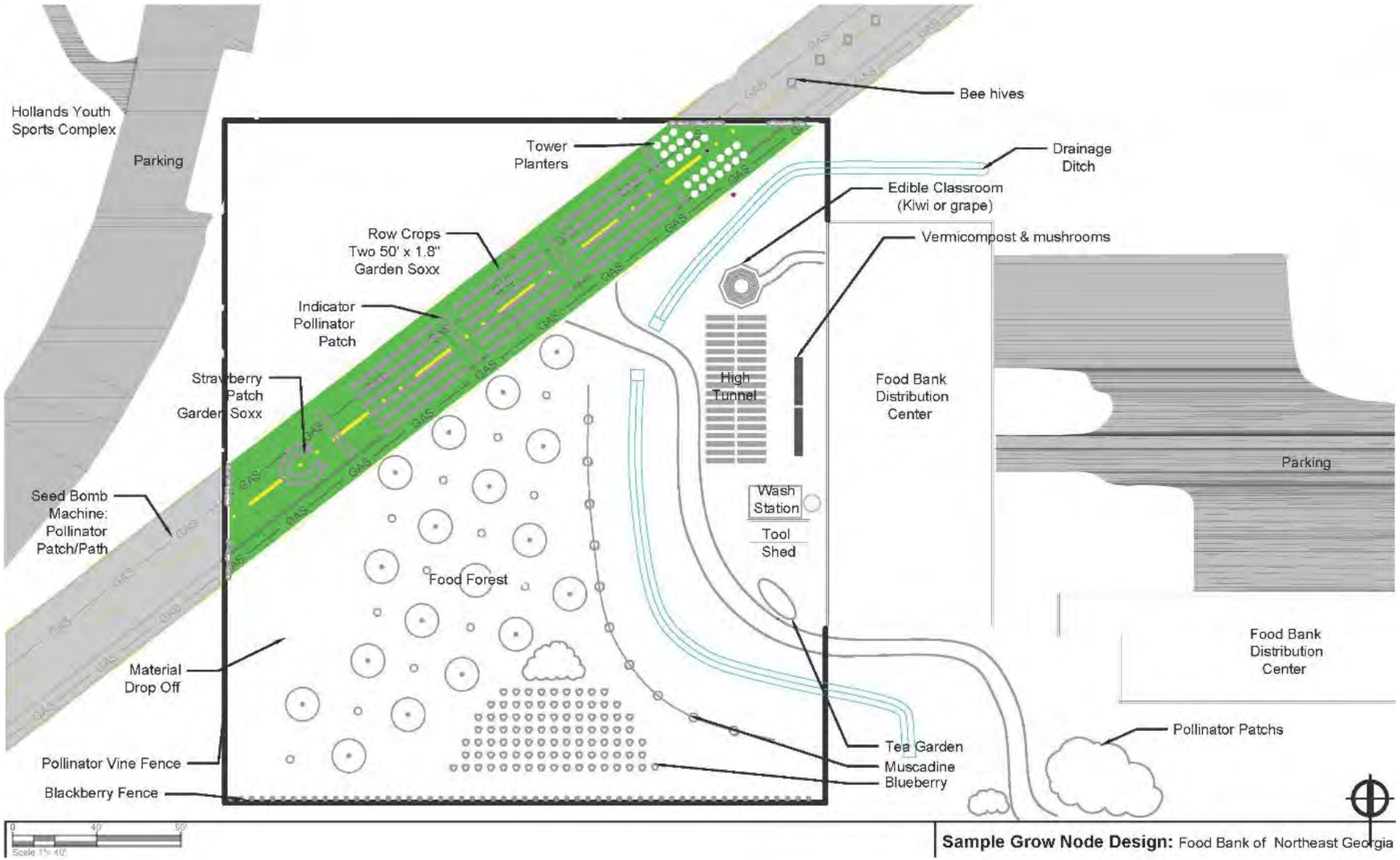


Figure 8.7 Sample Grow Node Design: Food Bank of Northeast Georgia. **Source:** Elizabeth Beak

DESIGN: SAMPLE FOOD BANK GROW NODE

The **phase one** design includes a 72’ x 30’ high tunnel by the warehouse. This can help the food bank extend their growing season & produce more healthy food over the course of a year. A well and drip irrigation system can provide regular water for crops in the existing growing areas, which can also help increase production. This infrastructure can help make the work load more sustainable for a ROW farmer. The ROW contains three no-till row crop areas. Each crop area is comprised of 600’ of Garden Soxx. A “hook bed” labeled strawberry patch (Figure 8.7) is located on the ROW, close to the entrance of the park. Mulch and weed cloth will be spread beneath the soxx and act as a weed & soil barrier. Patches of pollinator plants will be sown directly in the ROW soil, between each crop production area. These plots attract pollinators, add beauty, and serve as “indicator patches” for pipeline companies/ROW farmers. (Pipeline companies fly over their ROWs annually. Dead patches can indicate an issue with their infrastructure.) Gates have been added to the fence, where the ROW of the food bank farm and ROW of the park meet. (Along with a pollinator flower border that can help keep neighbors happy.) Twenty-six tower planters of strawberries and potatoes will be located on the north end of the food bank’s pipeline ROW. These vertical planters will allow Jim to grow more food on a smaller foot print. For example, one strawberry tower can grow 18-20 plants on four sq. feet, which would normally be enough land for just two strawberry plants (Vivian 1996). (See row one of Figure 8.8 for images.) These containers and fencing materials are currently on the food bank site, and could be repurposed for healthy food production.

Phase two will include a food forest comprised of fruit trees, blackberries, blueberries, muscadine grapes, intermixed with smaller pollinator and companion crops. Keep Athens Beautiful is willing to sponsor the fruit trees for this area. The Design Build class of UGA's College of Environmental Design is willing to design and construct the food safe wash station and outdoor, edible classroom structure - covered with kiwi or grape vines. (If the structure size limit can be worked through. See Chapter 6 policy constraints.) Wood garnered from thinning existing trees in the food forest area, will be repurposed to grow mushrooms in the shaded space between the high tunnel and warehouse.

Phase three involves branching into the ROW in the adjacent public park. This could involve partnering with the local Athena Bee Company to produce honey in the ROW north of the food bank property. This ROW is separated from the active park area by trees. (Athena Bee Company maintains bee hives with youth at many ACC schools.) The ROW section close to the Holland Park ball fields could start with a seed bomb machine.(See figure 8.8) Park visitors can buy a seed bomb (pollinator and cover crop seeds) for a quarter donation & throw it at a target in the currently weedy ROW. This could beautify the park ROW, start building the soil, & attract pollinators to help pollinate the crops just on the other side of the fence. (Ex: the giant strawberry or food forest). Hopefully families will become engaged; sign up to volunteer with Jim; and learn how to grow food. Educating residents about their community food system is another service that makes the food bank an ideal pilot partner for an ACC pilot grow node.

Figure 8.8 These are some of the components incorporated in the sample grow node design. **Sources:** Listed above.

Summary Table: Tips for Future ACC ROW Farmers, Gardener & Designers

GROW ON A ROW DESIGN CONSIDERATIONS

URBAN AG ELEMENT	PIPELINE ROW	TRANSMISSION ROW	AGRICULTURE	COMMUNITY GARDEN
ZONE	check zoning	check zoning	check if permitted	permitted all ACC zones
SIZE	NA	NA	NA	1 acre max
SETBACKS	10' unless shallow crops etc.	25' from equipment + truck access	no	10' front property line or by zone
STRUCTURES	no permanent check: raised beds	no permanent OK: 12 x 12 / r .bed	10% lot coverage + setbacks	250 sq. ft.. /10% min. lot in zone
WATER	source = off ROW yes irrigation	source = off ROW yes irrigation	yes	yes
FENCE	yes- permitted access + setbacks	yes permitted access + setbacks	yes- permit	yes- permit rules by zone
SCREENING BUFFERS	NA	NA	No screen, 15' wetland,	Screen piles 200' wetland
STORM WATER/ EROSION/ DRAINAGE	permitted	permitted yes	may be required please check	may be required please check
ANNUAL VEG	yes - equipment depth to 12" OK	yes	yes	yes
FRUIT TREES/ PERENNIALS	trees 10' from PL	less 15' tall, not block access	yes	yes
LIVESTOCK	yes - permit	yes - permit	yes - most types if 1 acre or more	yes chickens + bees with rules
ON SITE SALES	NA	NA	yes	temp use permit 3 X's/ year
SOIL/EMF TEST	NA	NA	NA	NA
EMF MANAGEMENT PLAN	NA	NA	NA	NA
SITE PLAN	yes	yes	maybe	yes
GAPS FOOD SAFETY	may if part of large farm	may if part of large farm	maybe	NA
CONSERVATION MANAGEMENT PLAN	if want EQUIP funds	if want EQUIP funds	if want EQUIP funds	if want EQUIP funds

ALWAYS CHECK FIRST with ROW Specialist + ACC Planning.

sources: co.williams.com, Ga Power Website, ACC Muni Code, Craig Page - ACC Planning Dept., National Sust. Ag Coalition

Figure 8.9 Current design considerations for ROW farms. This is only a guide, ALWAYS CHECK! Source: Elizabeth Beak

SUMMARY: PROJECTIVE DESIGN

This design process was an opportunity for the author to synthesize some of the the guidelines for weaving urban agriculture into ACC's ROWs. The natural elements of the site, must be balanced with property owner's mission, utility company's needs, local government codes, & state and federal food safety regulations. The summary table in Figure 8.9 can help farmers, designers and planners navigate these as they design their own ROW farm site. Different utility companies and local governments can have unique requirements, so check with the ROW Specialist & local planning staff. This table is just one example. Some guidelines make sense, others seem arbitrary, and some seem to be missing. For example, it makes sense to limit the height of fruit trees under power lines. It seems arbitrary to limit the size of a community garden to one acre, when there are numerous examples of successful community gardens larger than 1 acre. Many cities require soil test. The author considers this an example of a valid requirement for ACC ROW farmers and gardeners that is currently missing.

This process also demonstrated that ground-truthing (soil test, EMF tests, sun analysis etc.) are an important follow up step to the suitability analysis. The author also experience the value of creating a site plan for a ROW farm. It helped: a) clarify the vision for the space with project partners, b) work with the energy company & planning departments; c) and engage community partners and funders. The hope is that the food bank's design can assist in its effort to scale up urban agriculture on their property, provide more good food to their clients & cultivate a more equitable, healthy food system and community environment.

CHAPTER 9

CONCLUSIONS & OPPORTUNITIES FOR FUTURE RESEARCH

There is a need for well-designed, innovative approaches that weave healthy food and farming back into the fabric and cultural practices of the 21st century city. This paper has explored the potential of stacking a second–land use, urban agriculture, on Athens-Clarke County (ACC) energy right-of-ways, as a means of bringing a marginal urban space to a higher use, while cultivating a more resilient food system and city. Through the process of: 1) mapping ACC's 86.5 miles of gas and transmission right-of-ways; 2) clarifying secondary land use rights and restrictions with utility companies; 3) exploring precedent cases; 4) researching health & policy issues; 5) identifying suitable lands and potential grow nodes through a suitability analysis; and 6) designing a farm/sample grow node with the Food Bank, the author has answered the research question..

Yes, the vast and underutilized network of land in ACC energy ROWs (gas & transmission) can be used to grow healthy food and scale up urban agriculture. However, not all of the 1052 acres of land are suitable, as there are numerous environmental, health, policy and other constraints. However, there are also numerous opportunities to farming on an energy ROW. Figure 9.1 and 9.2 summarize current **constraints** and **opportunities** to farming below transmission lines and above pipelines. Some are universal to urban agriculture, and others are unique to food production on an energy ROW.

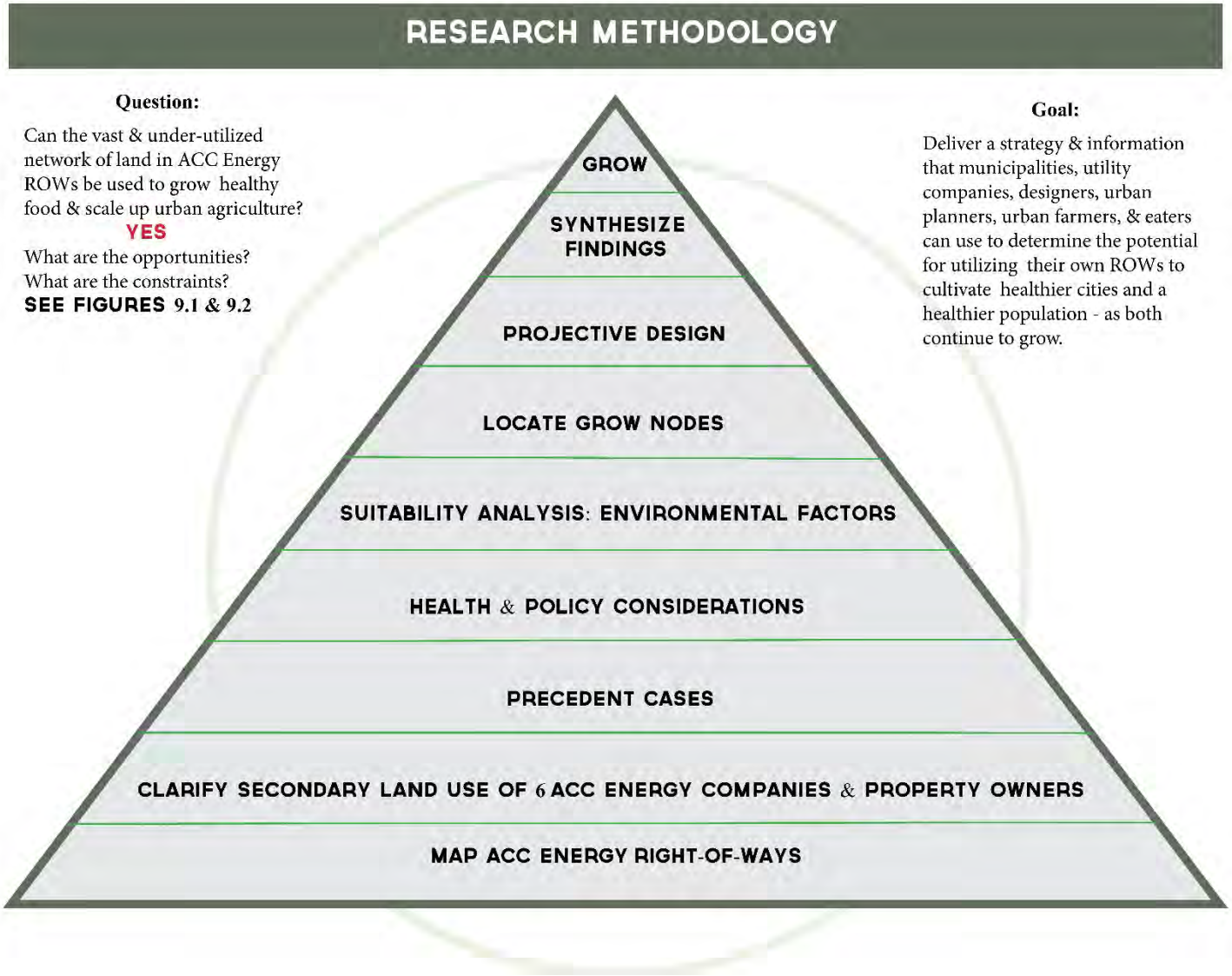


Figure 9.0: Summarizes the strategy used to determine the potential for utilizing ACC Energy ROWs for urban agriculture. **Source:** Elizabeth Beak

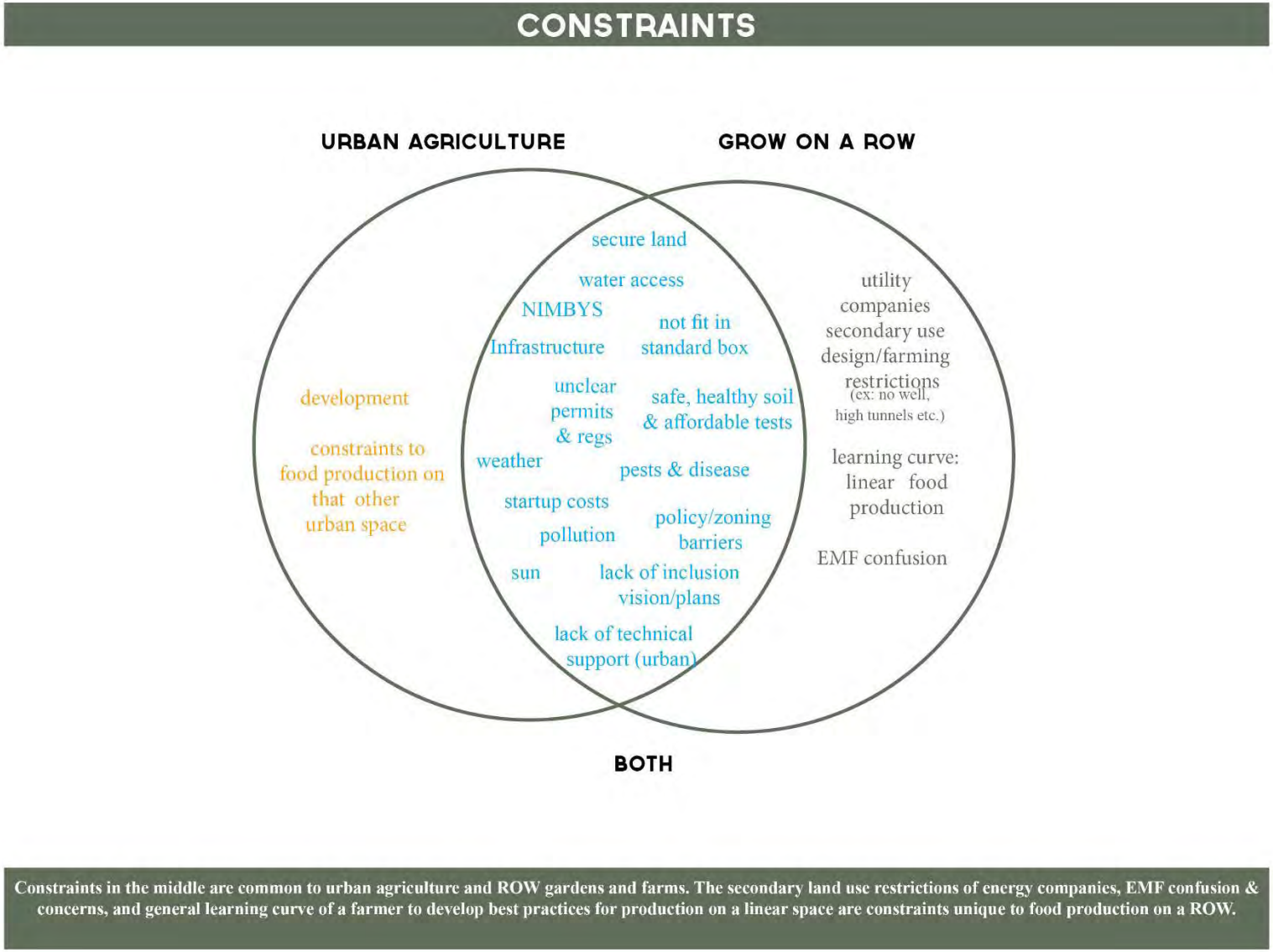


Figure 9.1: Environmental, health, policy and other **constraints** to growing healthy food and scaling up urban agriculture on Athens-Clarke-County energy right-of-ways. Some are universal to urban agriculture and others are unique to growing food above a pipeline or below a transmission line.

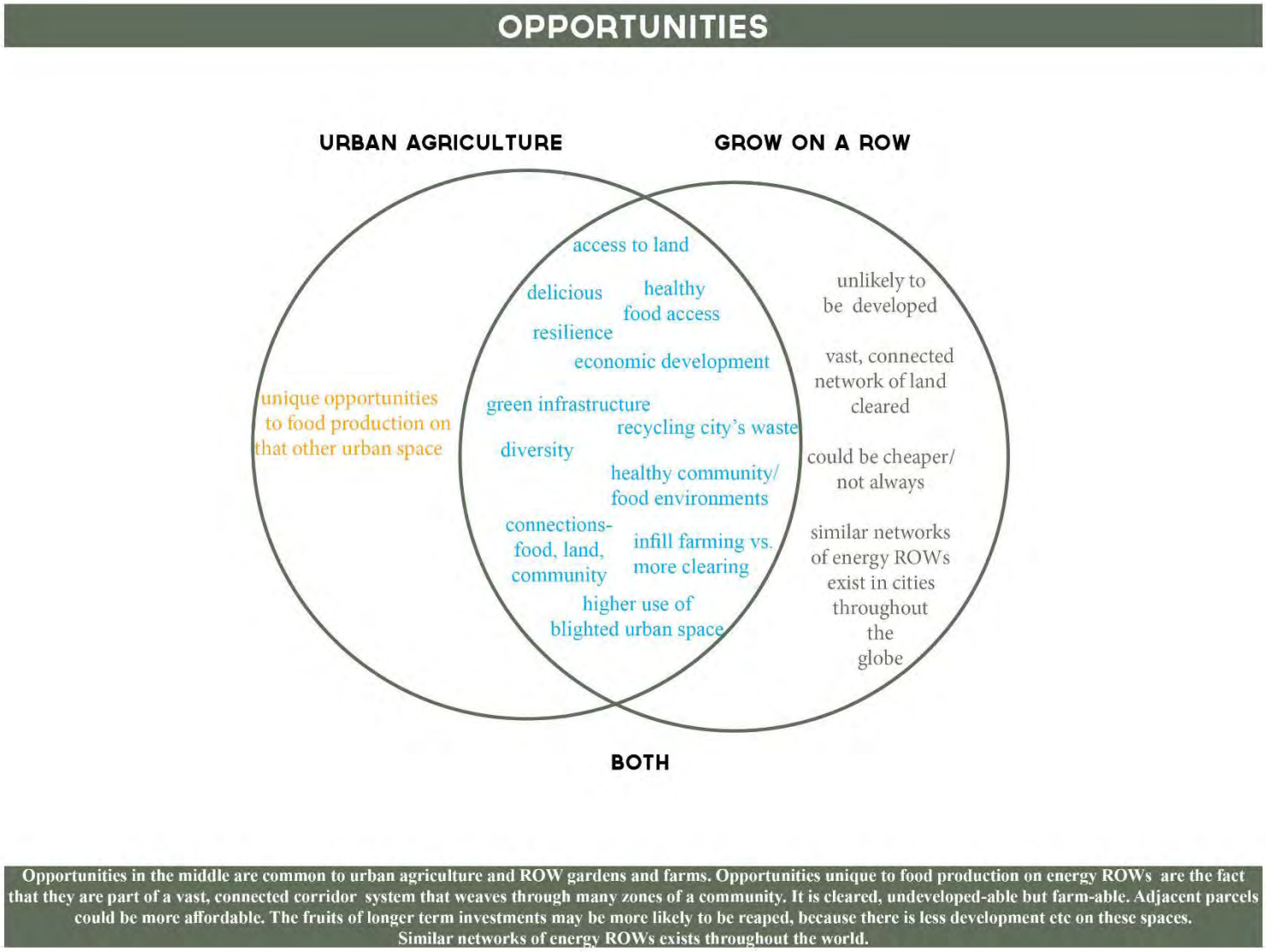


Figure 9.2: Current environmental, health, policy and other **opportunities** to growing healthy food and scaling up urban agriculture on Athens-Clarke-County energy right-of-ways. Some are universal to urban agriculture and others are unique to growing food above a pipeline or below a transmission line.

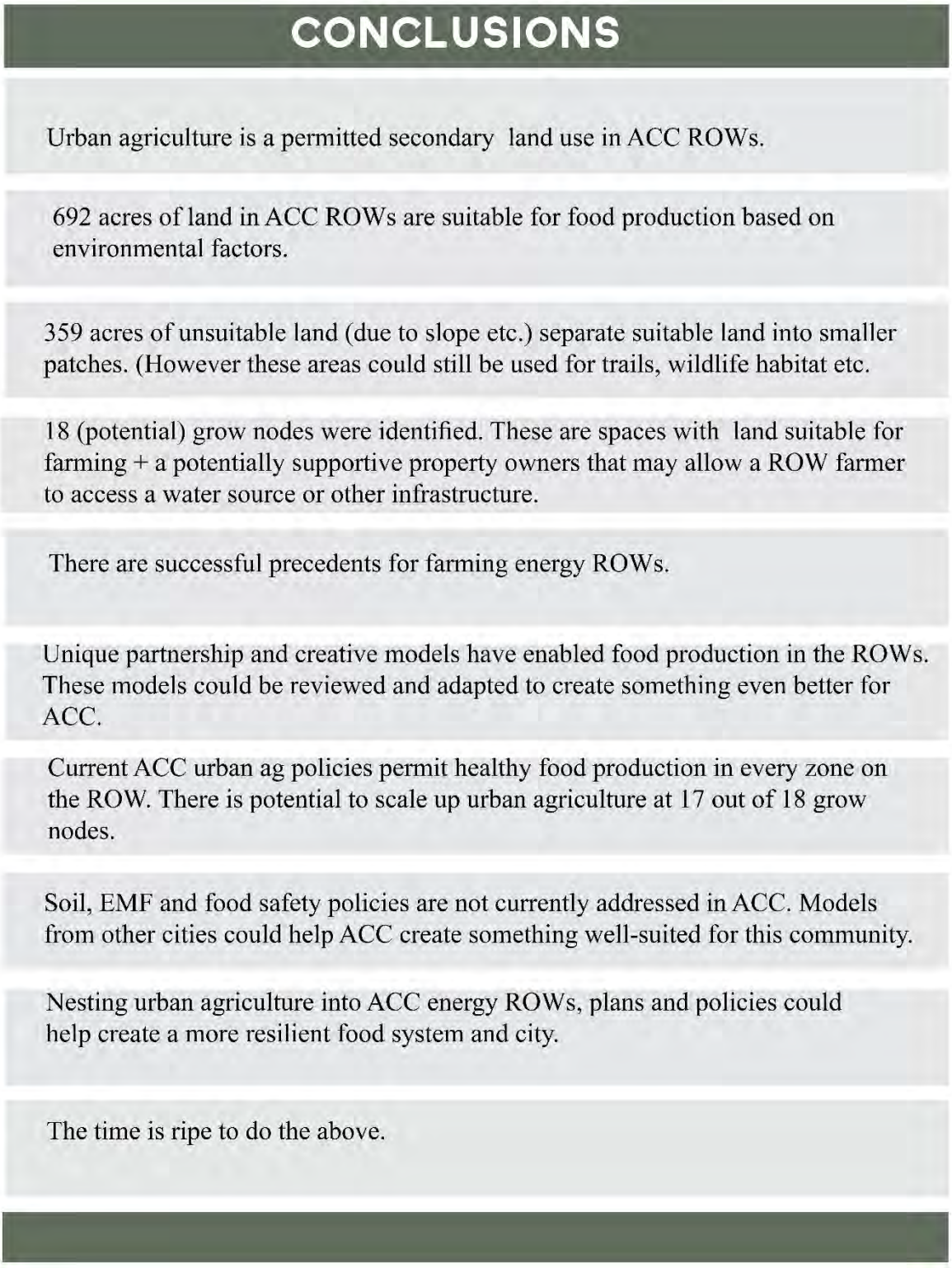


Figure 9.3: Conclusions. **Source:** Elizabeth Beak

There is the potential to cultivate a network of farms, gardens and orchards on ACC energy ROWs. (Ex: Woodland Gardens, Spring Valley Eco Farm, the Food Bank of Northeast Georgia etc.) If policies were updated and grow nodes were developed, it would be possible to scale up urban agriculture. There is growing support for well-planned efforts that reflect both community input and analysis. For example, April 29, 2016 Agriculture Secretary Tom Vilsak announced the release of the USDA's urban agriculture toolkit and a working group to support urban agriculture. The goal is to "help entrepreneurs and community leaders successfully create jobs and increase access to healthy food through urban agriculture." He went on to describe urban agriculture as "rapidly growing into a mature business sector in cities across the country" with the ability to: "strengthen the health and social fabric of communities while creating economic opportunities for farmers and neighborhoods" (USDA 2016b).

During a lunch meeting with the Active Living, Healthy Eating Director of Alta Planning, the author asked why Alta Planning considers energy ROWs in their greenway planning proposals. The planner laughed and commented upon the fact that we no longer have the luxery NOT to consider the ROWs, as these are often some of the last contiguous networks of open space available. After analyzing the information available in 2016, the author believes that land in ACC ROWs should be considered in larger food system and city planning efforts. Figure 9.4 summarizes some recommendations for doing so.

RECOMMENDATIONS: URBAN AG ON THE ROW

Create **best management practices** for food production on the ROW, and all urban ag. areas. (Ex: soil tests, EMF tests, site plan to ROW specialist etc.) **Incentivize** safe, best practices by providing grants etc. for farmers using BMPs.	Cleveland's Ec. Dev. Dept. start up grants for U.A
Create a **database of land** in energy ROWs (and other areas) suitable for Ag. Lease to urban farmers and garden groups.	Ex: Baltimore, Minneapolis, Toronto
Consider **creative partnership structures** to launch & coordinate.	LA garden ngo + Utility company.
Promise ROW farmers **5 year leases** if after 1st year prove using BMPs (Longer leases needed to make this worthwhile for a farmer or gardeners to invest in water building soil, tapping water etc., working with utility companies etc.	Minneapolis 5 year minimum lease.
Continue to build on ACC's Ag and urban Ag policies. Add an **urban farming ordinance in certain zones, create a healthy food + active living zone or district as an overlay.**	Flint, Cleveland etc.
Create an **urban farm tax incentive** to entice YIMBY private property owners to provide 5 year leases for gardeners and farmers to use underutilized land in their ROWs.	California
Permit **on-site sales** on ROW gardens and farms in ACC food deserts, or in local community centers.	CEED Gardens, in Toronto's ROWs
Amend size restriction of community gardens using BMPs. **Amend size limits** of urban farm structures on parcels adjacent to ROW (in specified areas). High tunnels and wash stations help make ROW ag more viable and safe.	Cleveland
Continue to **identify and expand potential grow node partners,** where ROW farmers and gardeners can propagate, wash and aggregate their products. Share tools and infrastructure.	
Encourage **UGA/ land grant universities** to continue to **build technical support & research for urban farmers,** including affordable **soil tests for urban issues.**	University of Massachusetts
Prudent Avoidance Policy on ROW farms and gardens in terms of children. Require transparency and links to current information in transmission ROW gardens.	LA, Toronto
Integrate more wording on planning for the community **food system** and health in **ACC plans, policies and assessments.** Create an ACC **Food Policy Council** to help government work with community and farmers on such matters.	Madison, WI Lawrence, KS
Cultivate urban design connections between productive patches (community gardens, orchards, farms) in ACC ROWs and adjacent spaces. (Trails, habitat, parks etc.)	Seattle, Irvine, CA

Figure 9.4: Recommendations for urban agriculture in ACC energy ROWs. **Source:** Elizabeth Beak

FUTURE RESEARCH

The **goal** of this research paper is to deliver a strategy and information that municipalities, utility companies, designers, urban farmers and eaters can use to determine the potential for utilizing their own energy ROWs to cultivate healthier cities and a healthier population – as both continue to grow. Below are additional questions to pursue by others.

1) Research the potential effects of EMF on people working directly under transmission lines 10-20 hours a week, several months of a year, as small urban farmers and gardeners might. As of 2016, decades of scientific research demonstrate a weak link between EMF and childhood leukemia, but nothing else.

2) Research on the effects of EMF on food produced under transmission lines. This question was brought up at community meetings. Transmission lines cross agricultural fields throughout the world, providing places to study and clarify whether there are issues of not.

3) Research on the potential challenges and opportunities of using ACC ROWs or bike and pedestrian trails as well as urban agriculture.

4) More input from the ACC community about utilizing ACC energy ROWs for urban agriculture and other secondary uses.

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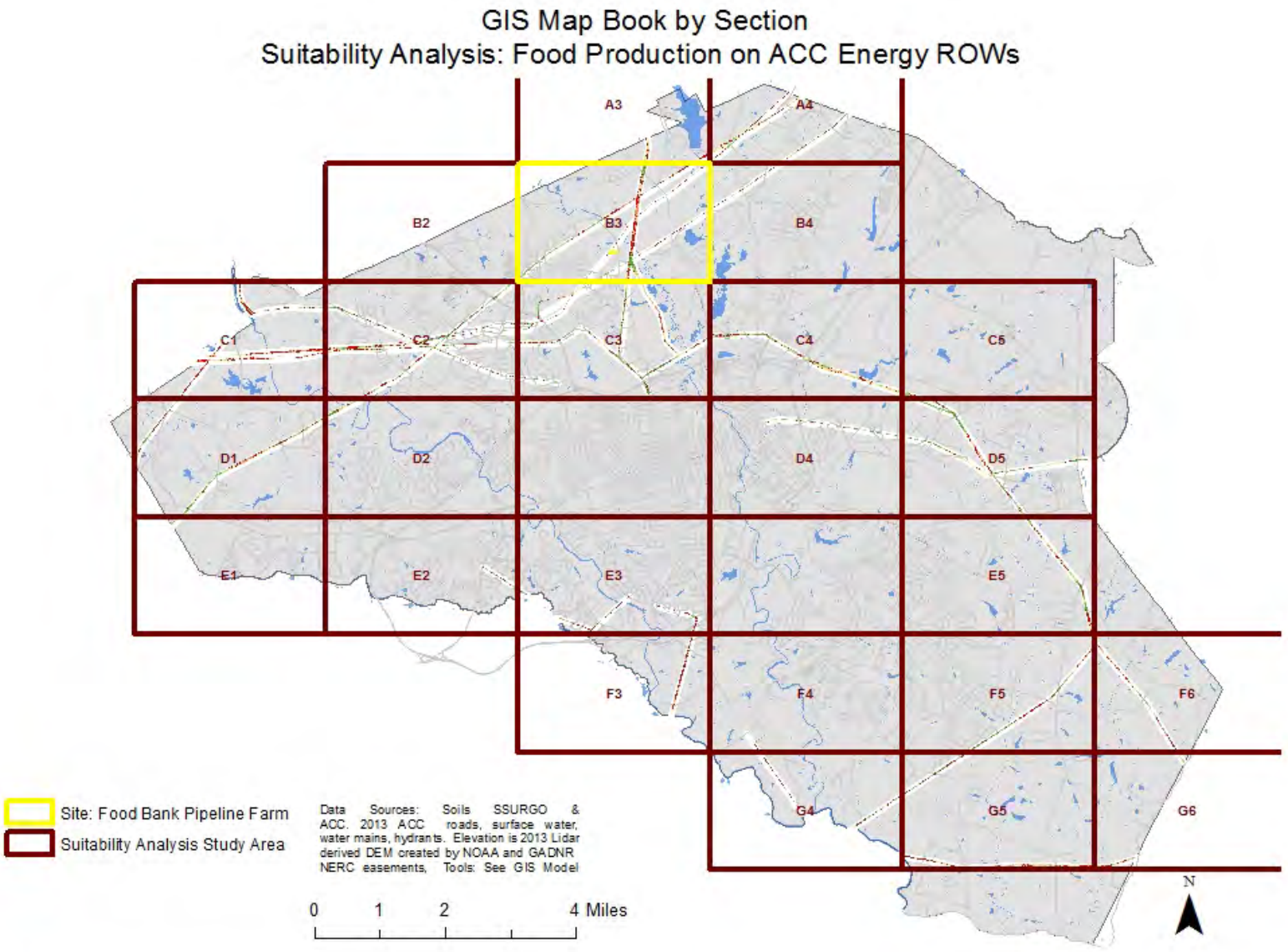

Appendix 1: Map Book Key for Food Production in Energy ROWs Source: Elizabeth Beak


Section A3: Suitability for Food Production
Athens-Clarke County Energy Right-of-Ways
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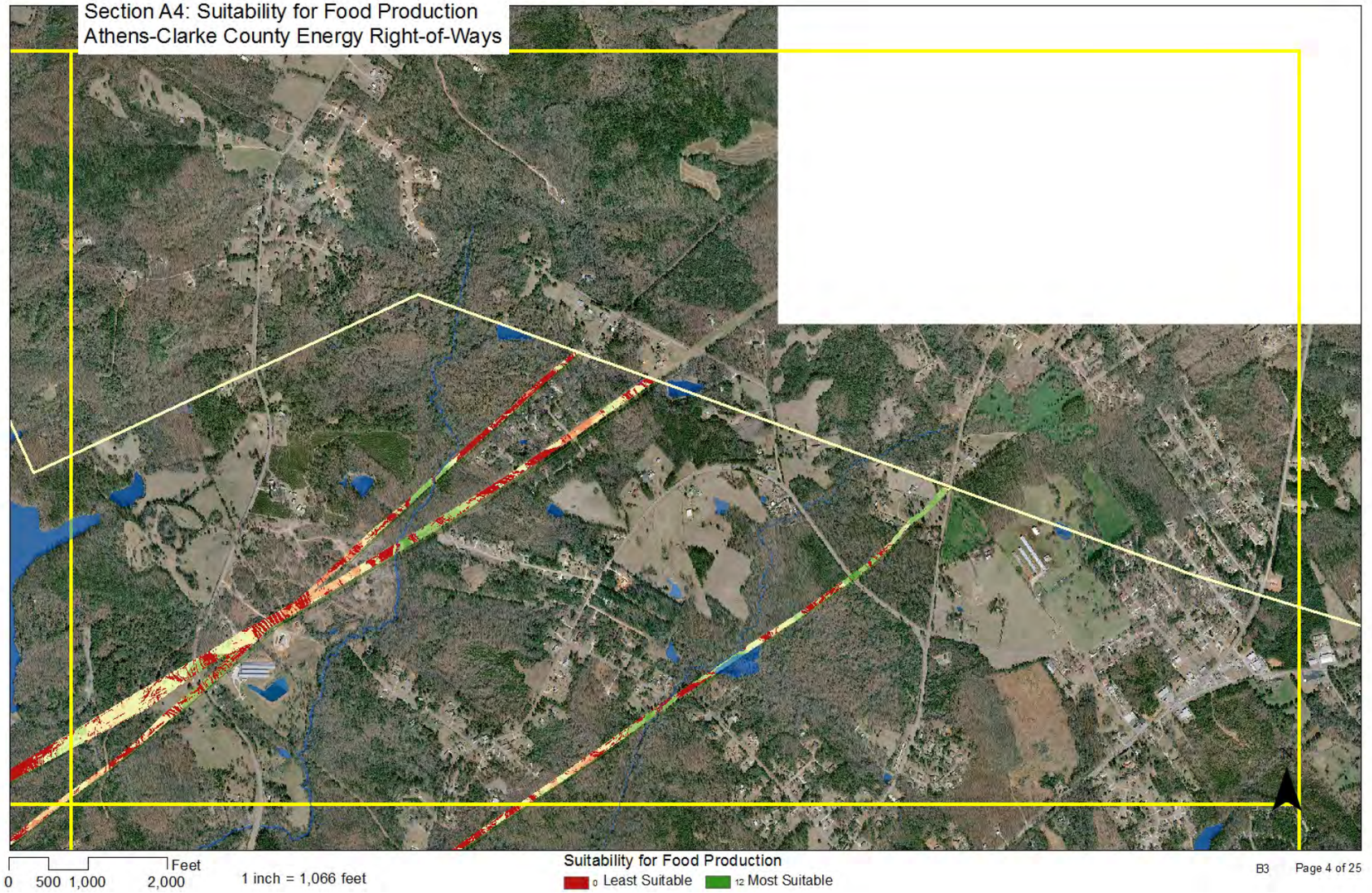
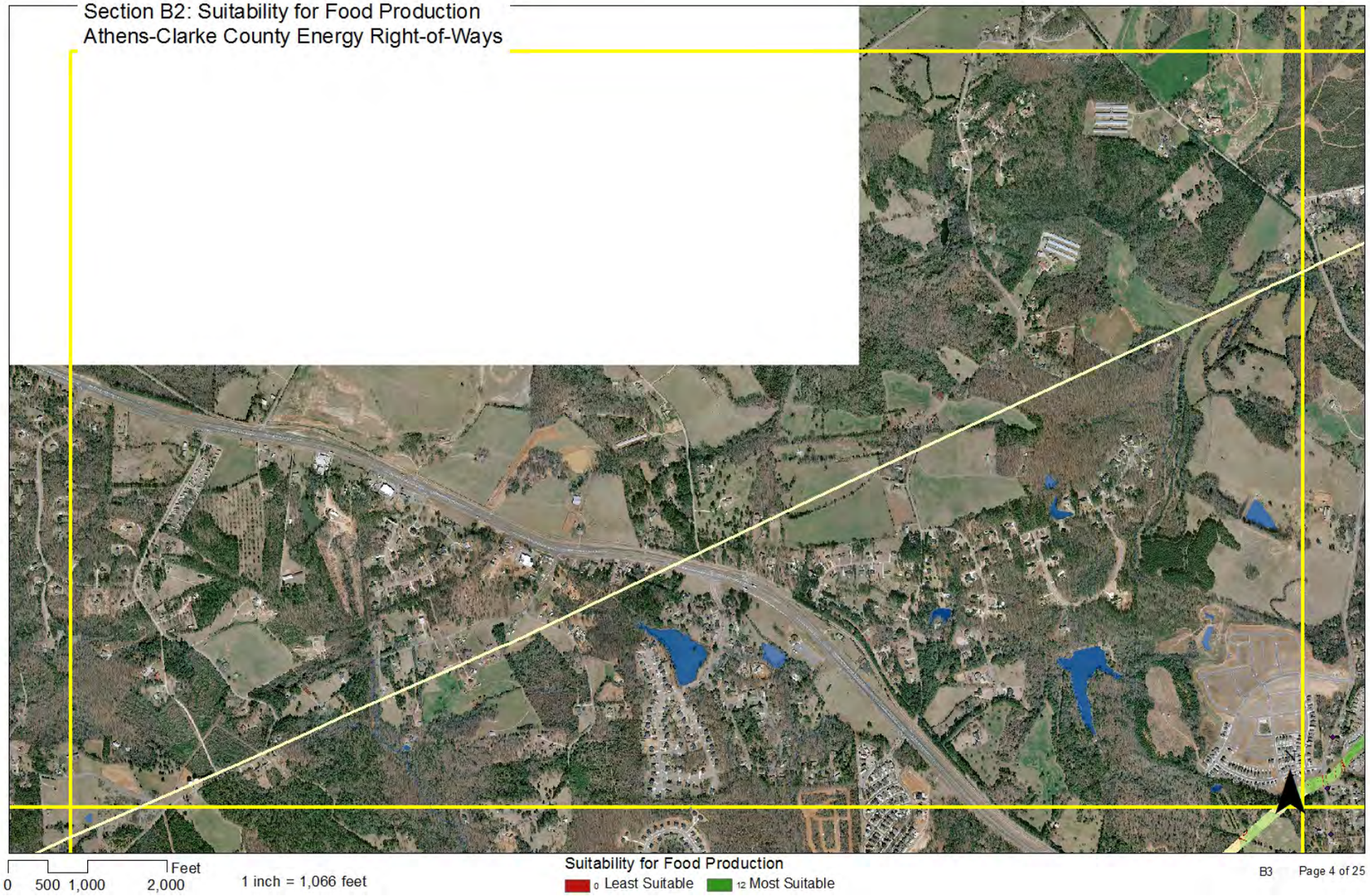
Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
Page 4 of 25


Section A4: Suitability for Food Production
Athens-Clarke County Energy Right-of-Ways
0 500 1,000 2,000
Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
Page 4 of 25


Section B2: Suitability for Food Production
Athens-Clarke County Energy Right-of-Ways
0 500 1,000 2,000 Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
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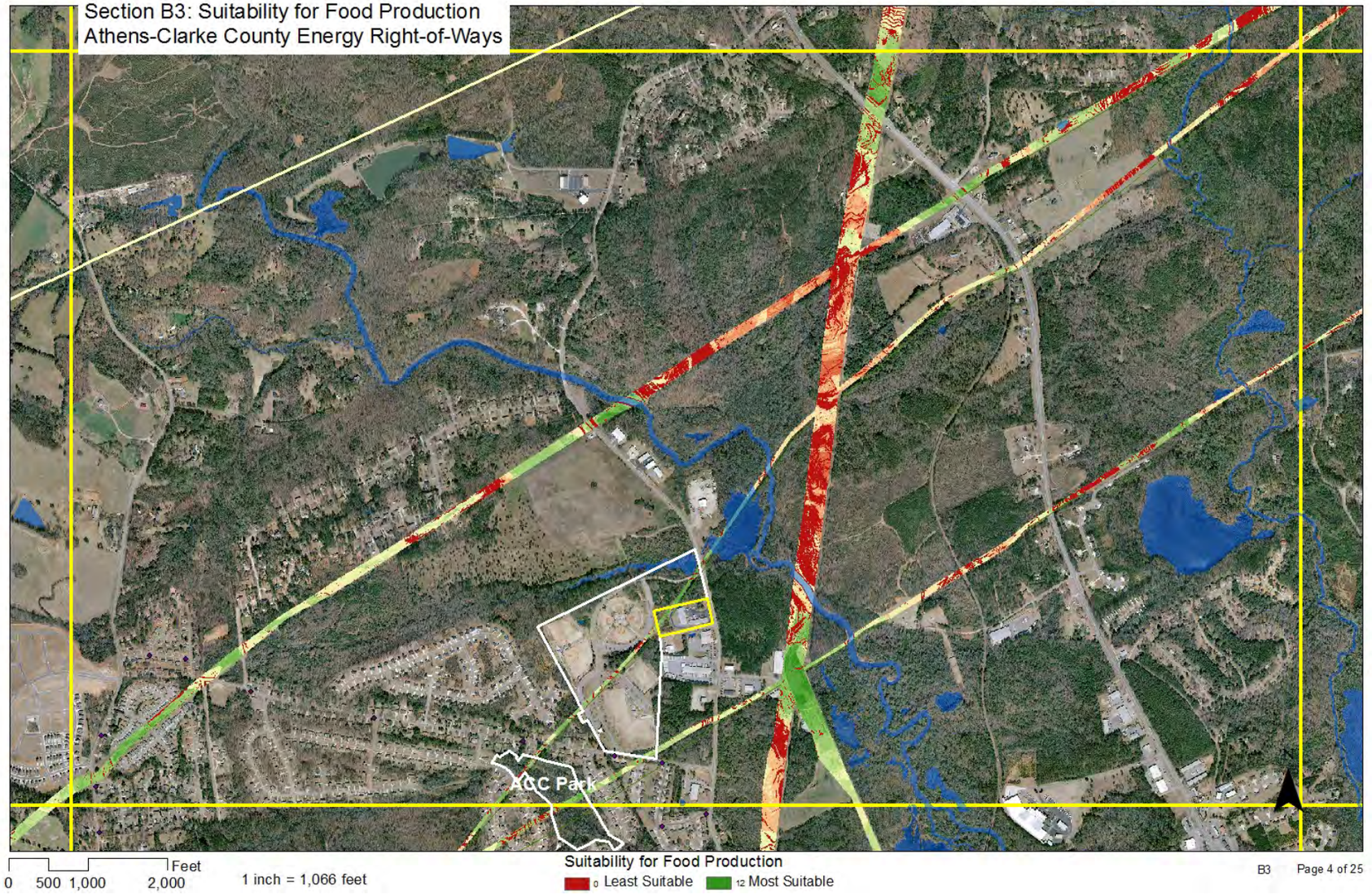
Section B3: Suitability for Food Production
Athens-Clarke County Energy Right-of-Ways
ACC Park
0 500 1,000 2,000 Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
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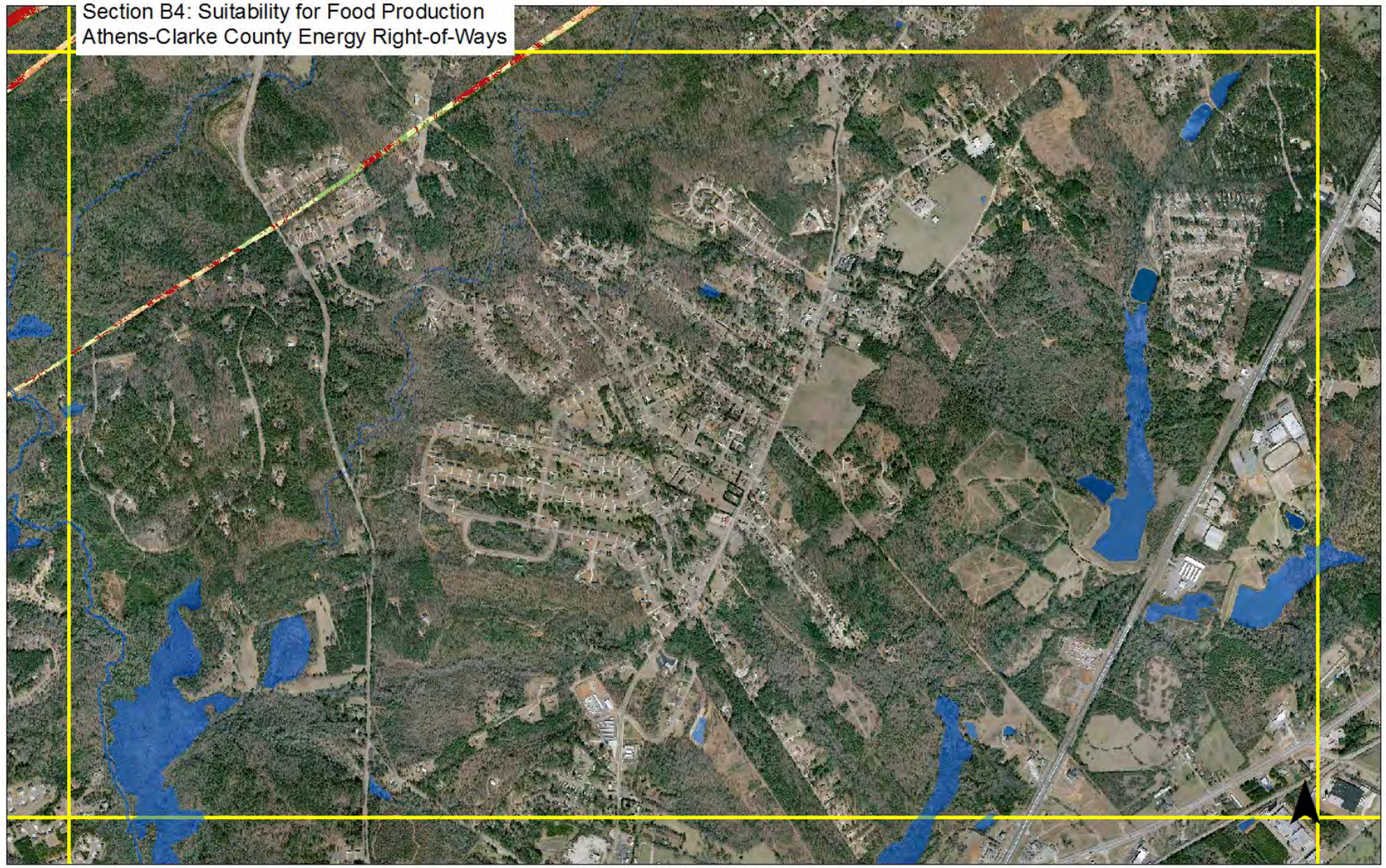
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Athens-Clarke County Energy Right-of-Ways
0 500 1,000 2,000 Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
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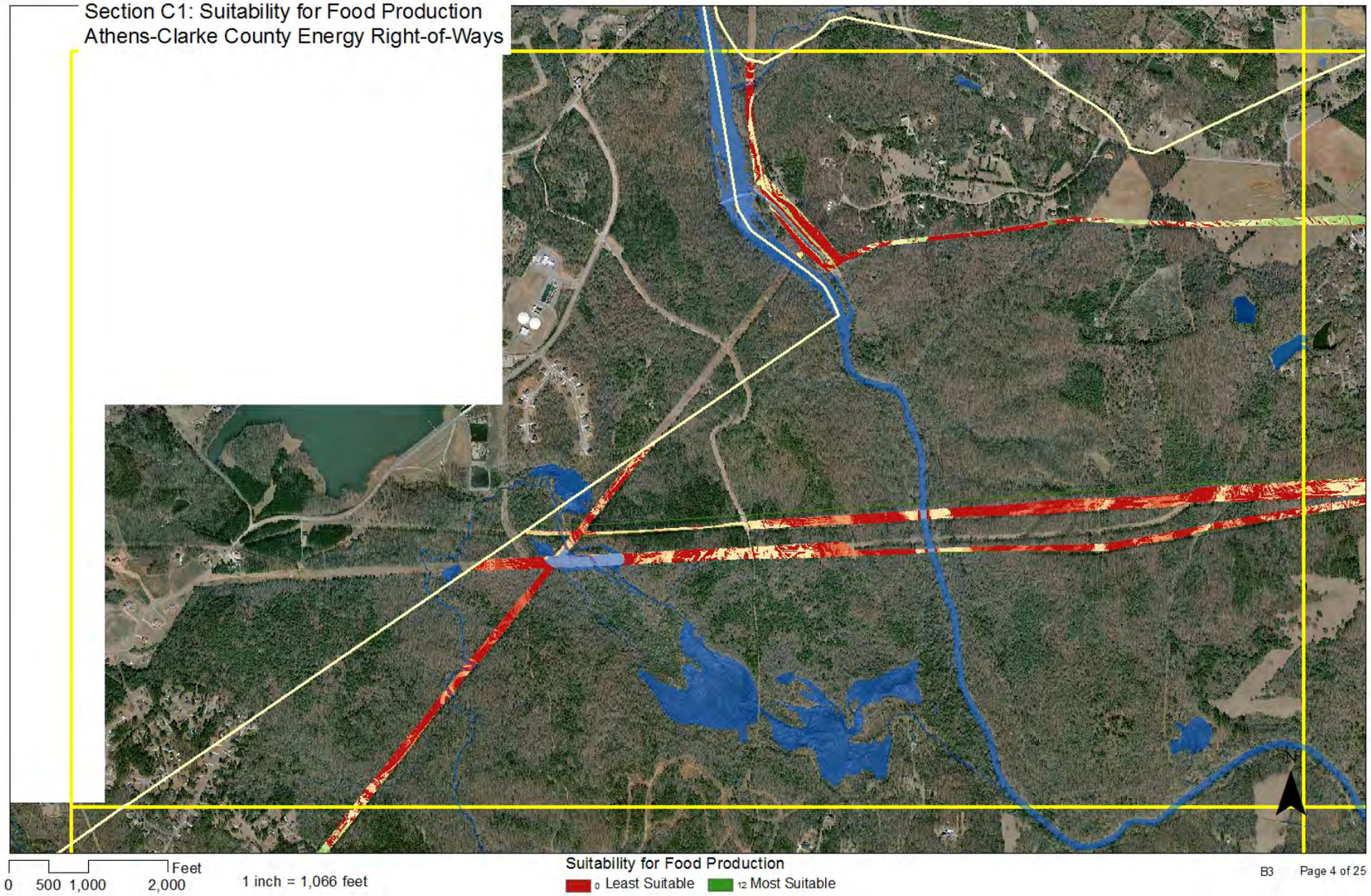
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Athens-Clarke County Energy Right-of-Ways
N
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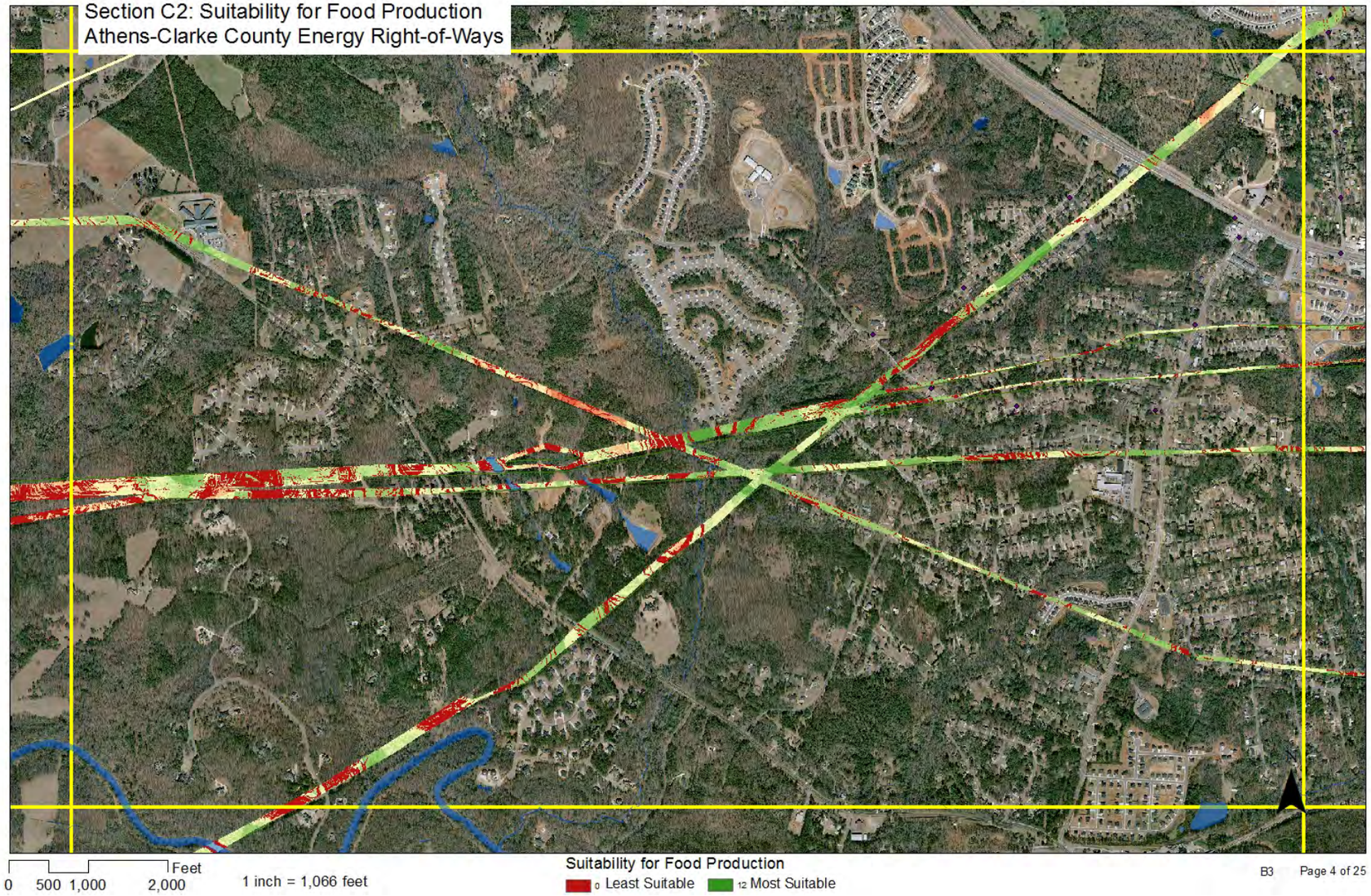
Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
Page 4 of 25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Athens-Clarke County Energy Right-of-Ways
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Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
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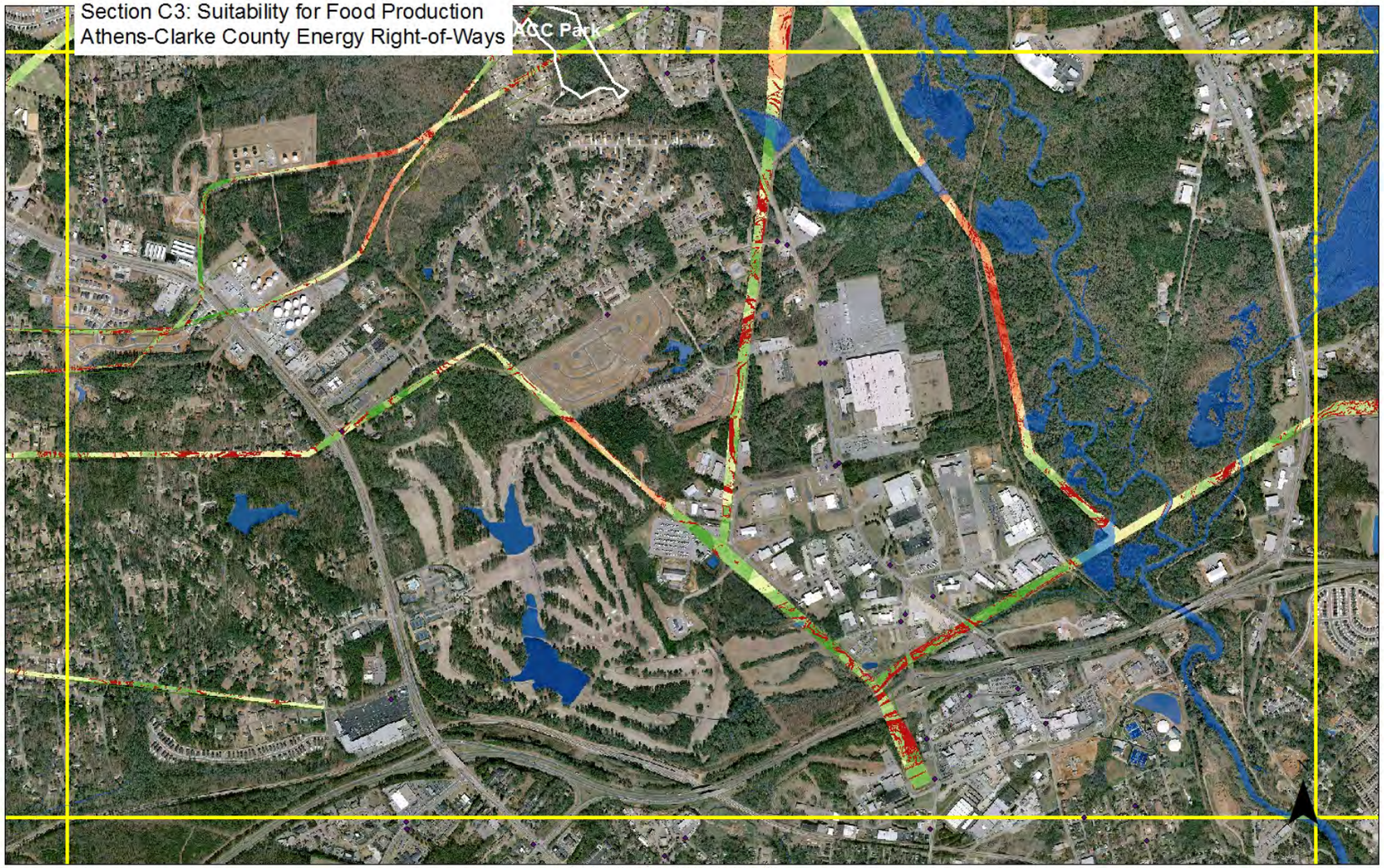
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Athens-Clarke County Energy Right-of-Ways
A&C Park
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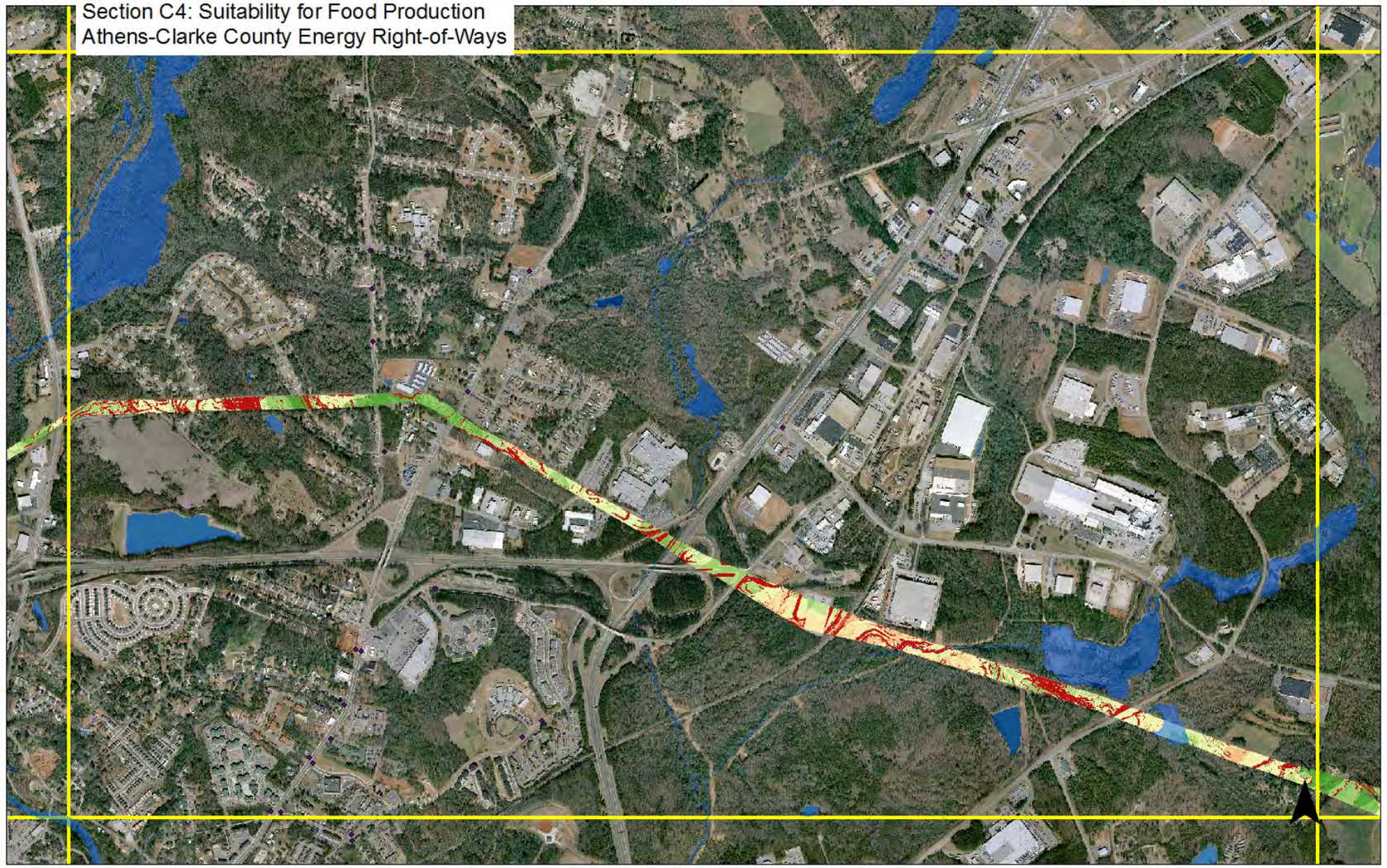
Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
Page 4 of 25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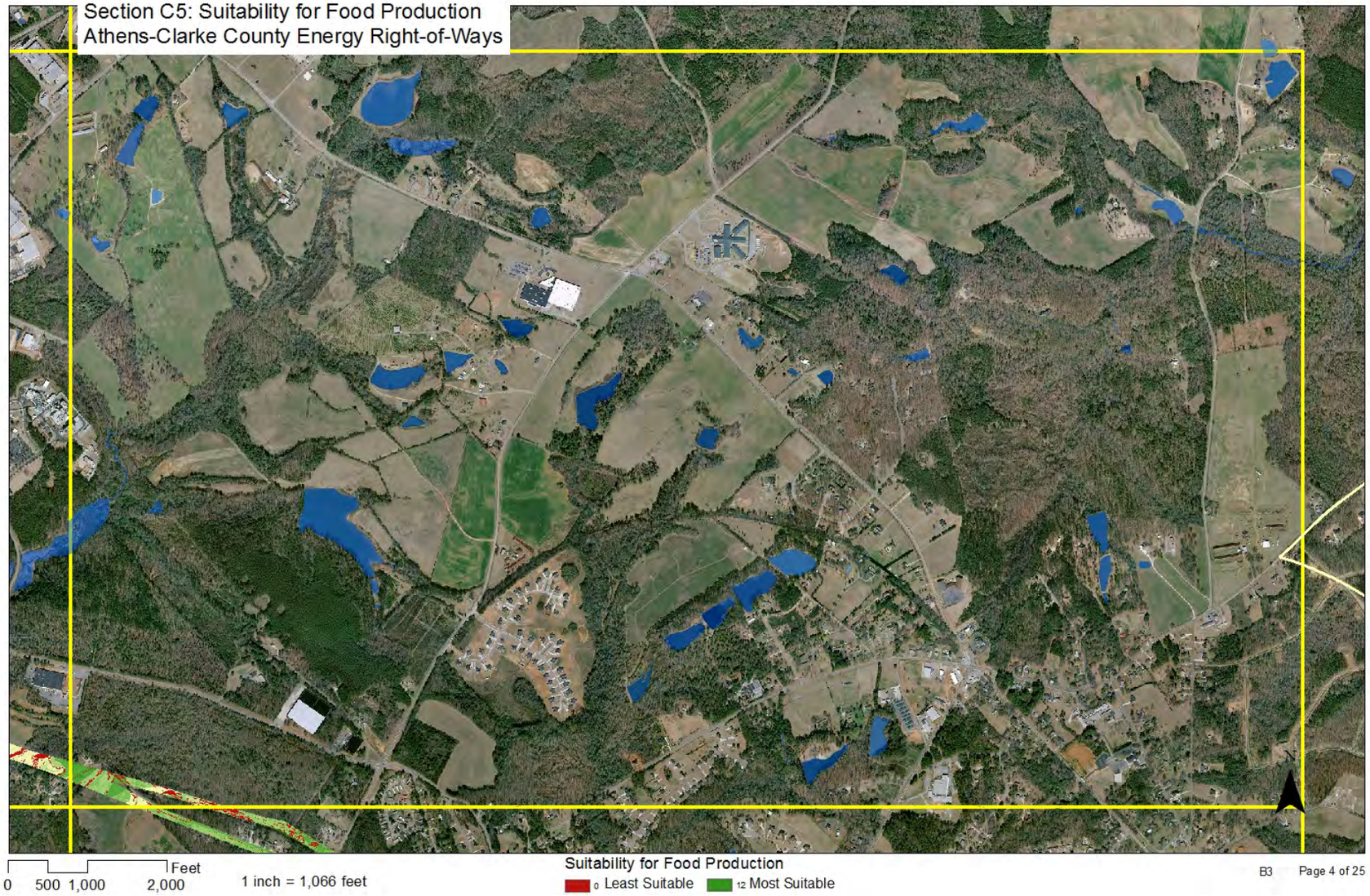
Athens-Clarke County Energy Right-of-Ways
0 500 1,000 2,000 Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3 Page 4 of 25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Athens-Clarke County Energy Right-of-Ways
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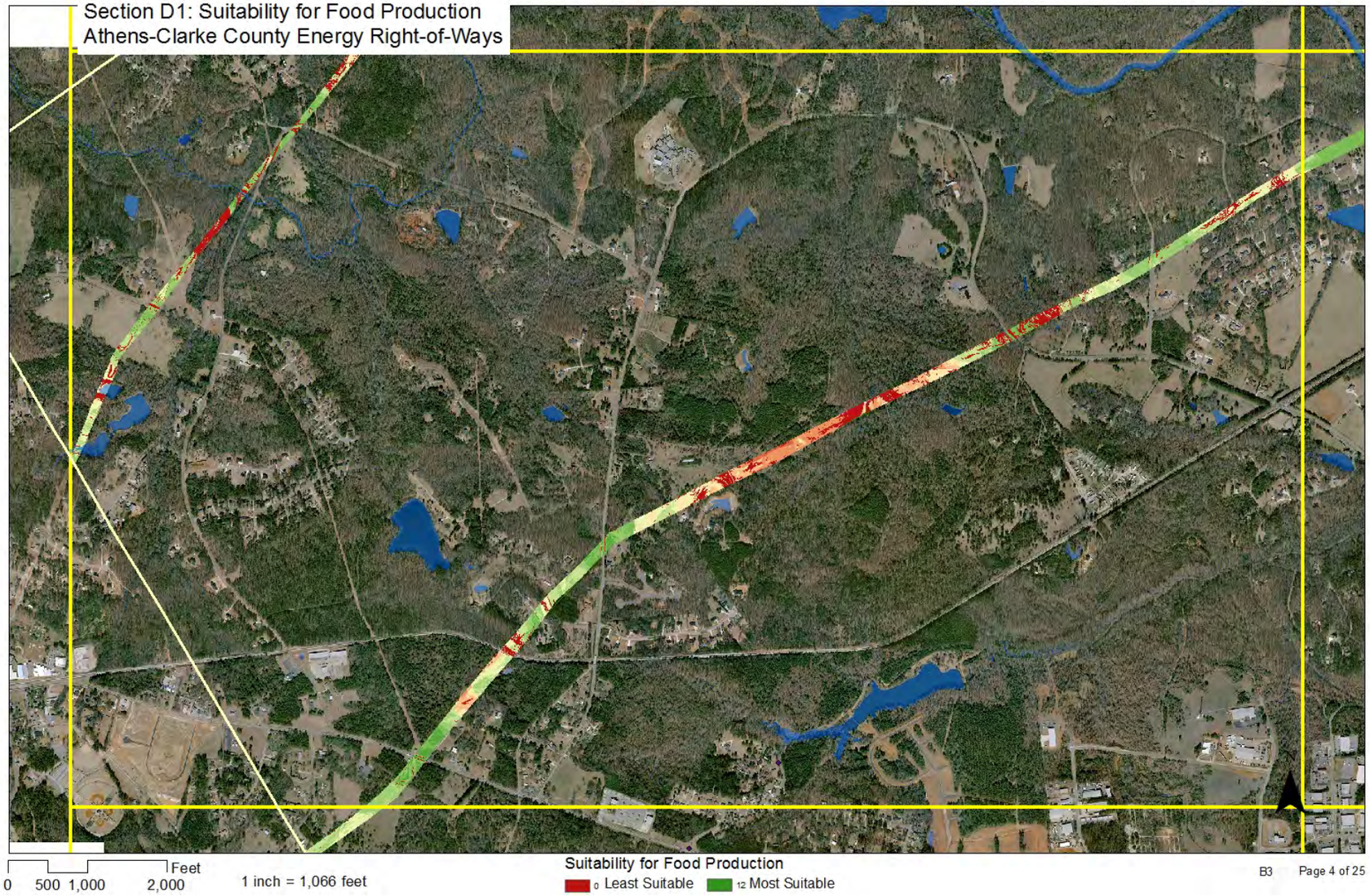
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
Page 4 of 25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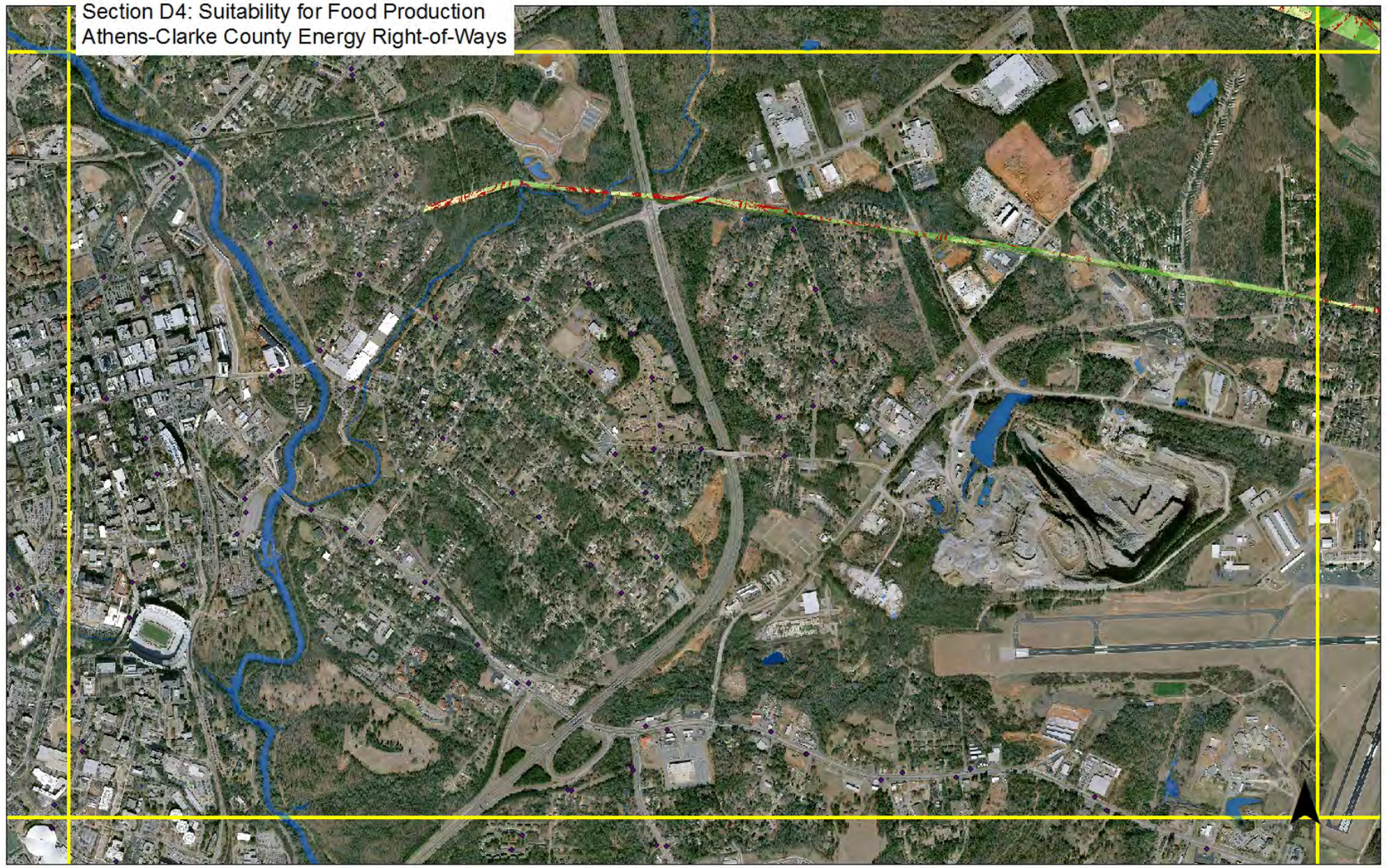
Athens-Clarke County Energy Right-of-Ways
0 500 1,000 2,000
Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
Page 4 of 25


Section D2: Suitability for Food Production
Athens-Clarke County Energy Right-of-Ways
0 500 1,000 2,000
Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
Page 4 of 25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Athens-Clarke County Energy Right-of-Ways
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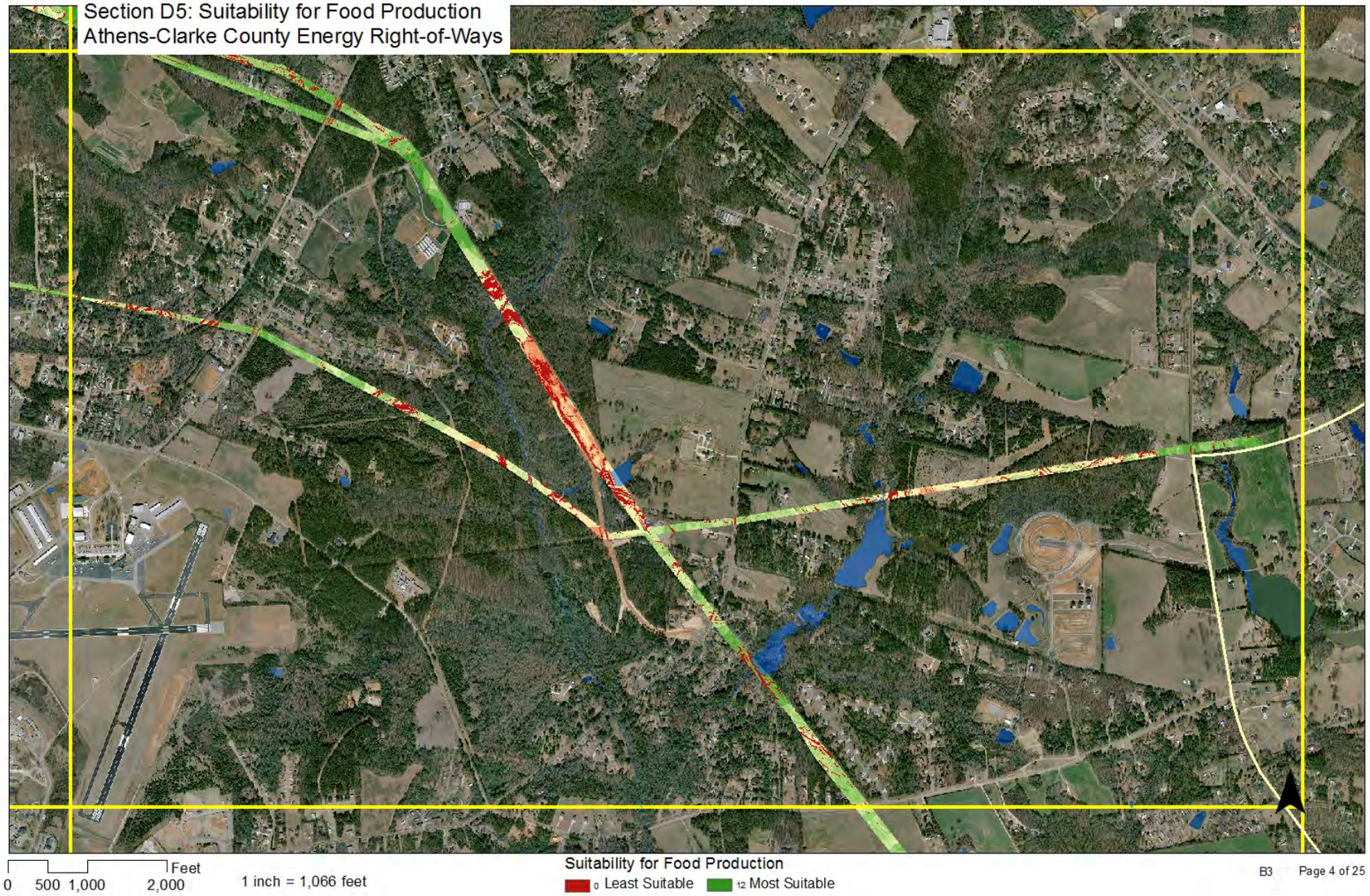
0 500 1,000 2,000 Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3 Page 4 of 25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Athens-Clarke County Energy Right-of-Ways
0 500 1,000 2,000 Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
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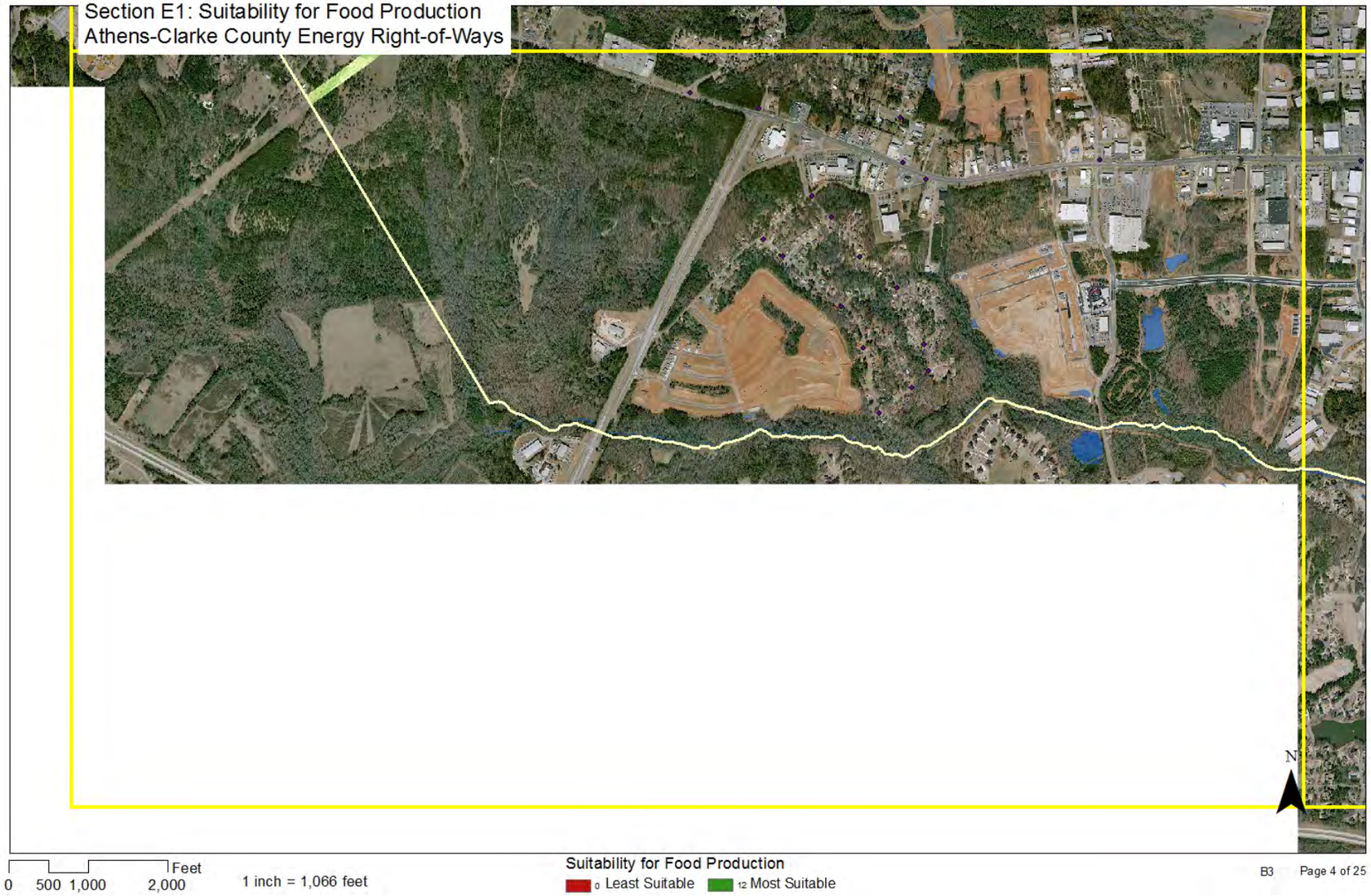
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Athens-Clarke County Energy Right-of-Ways
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0 500 1,000 2,000
Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
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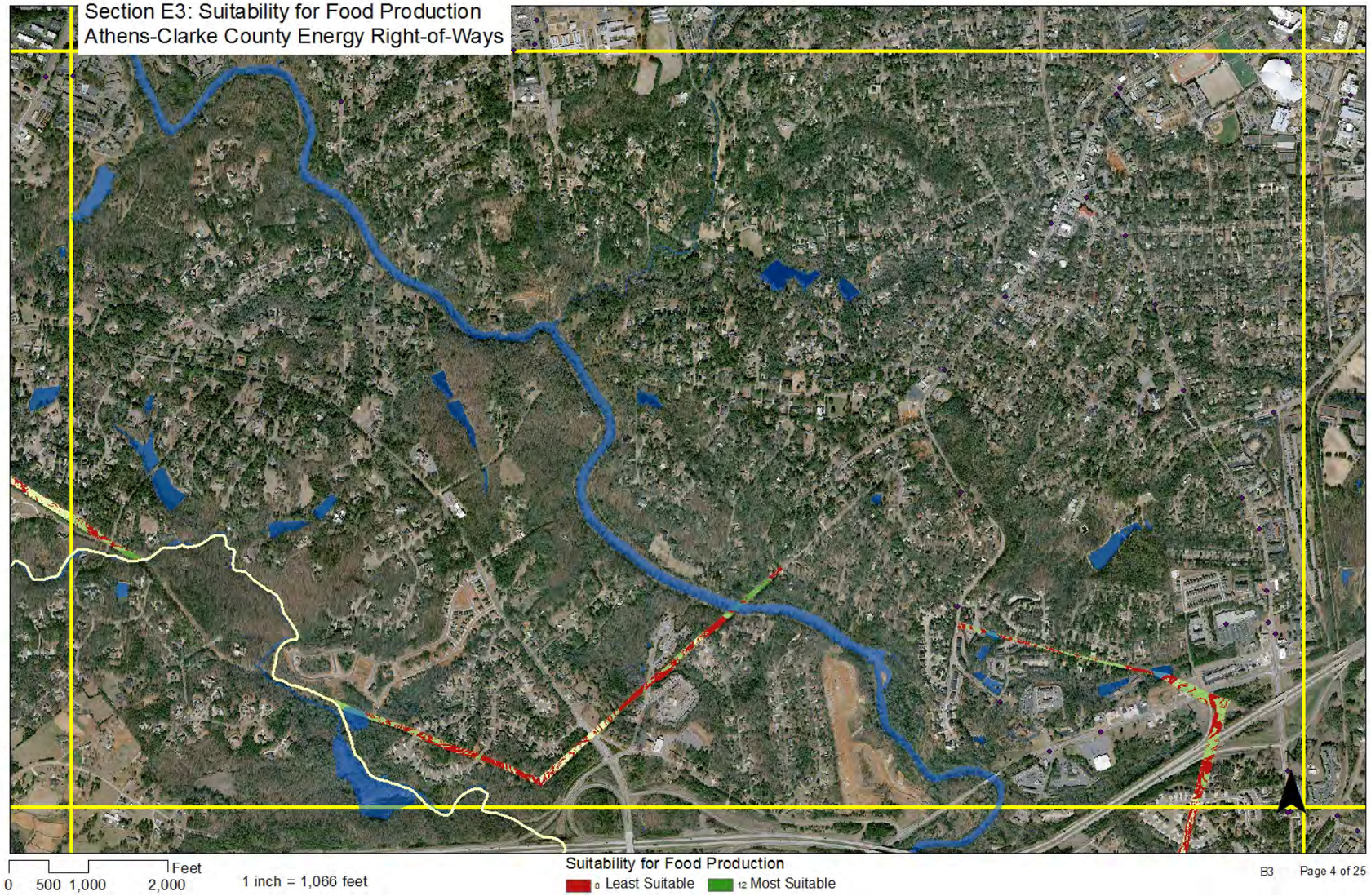
Section E2: Suitability for Food Production
Athens-Clarke County Energy Right-of-Ways
N
0 500 1,000 2,000 Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3 Page 4 of 25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Athens-Clarke County Energy Right-of-Ways
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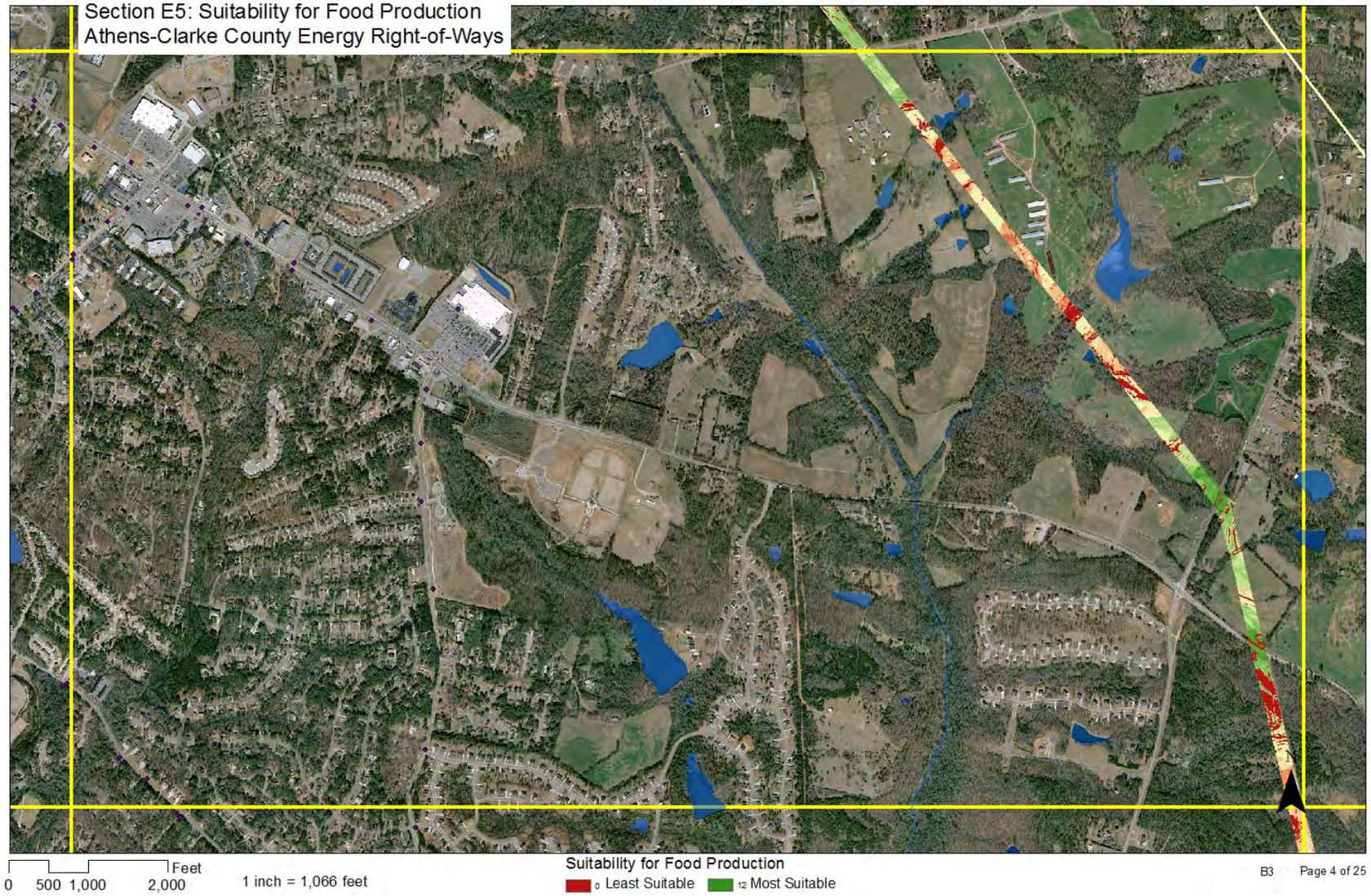
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
Page 4 of 25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Athens-Clarke County Energy Right-of-Ways
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1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
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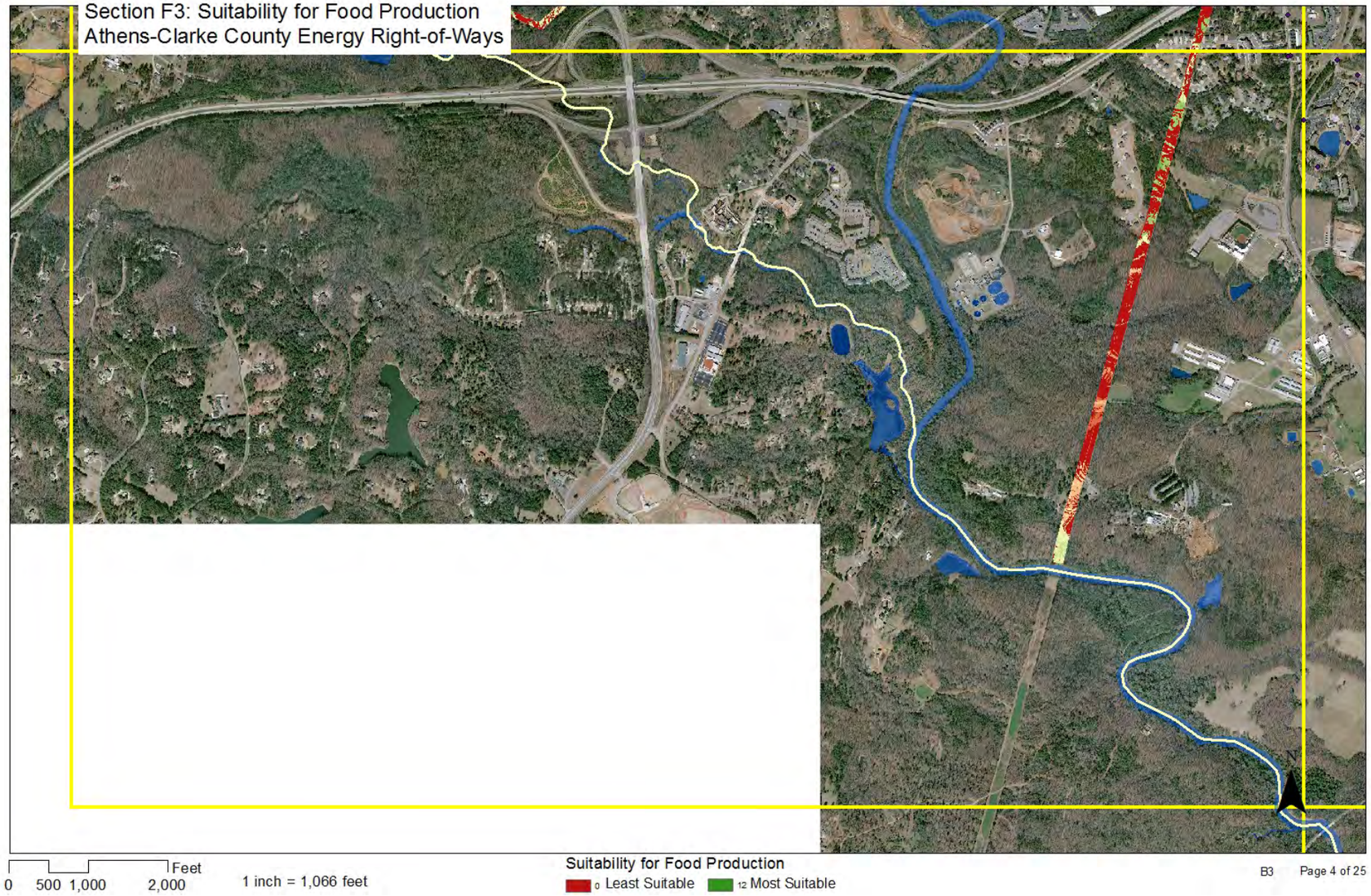
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Athens-Clarke County Energy Right-of-Ways
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1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
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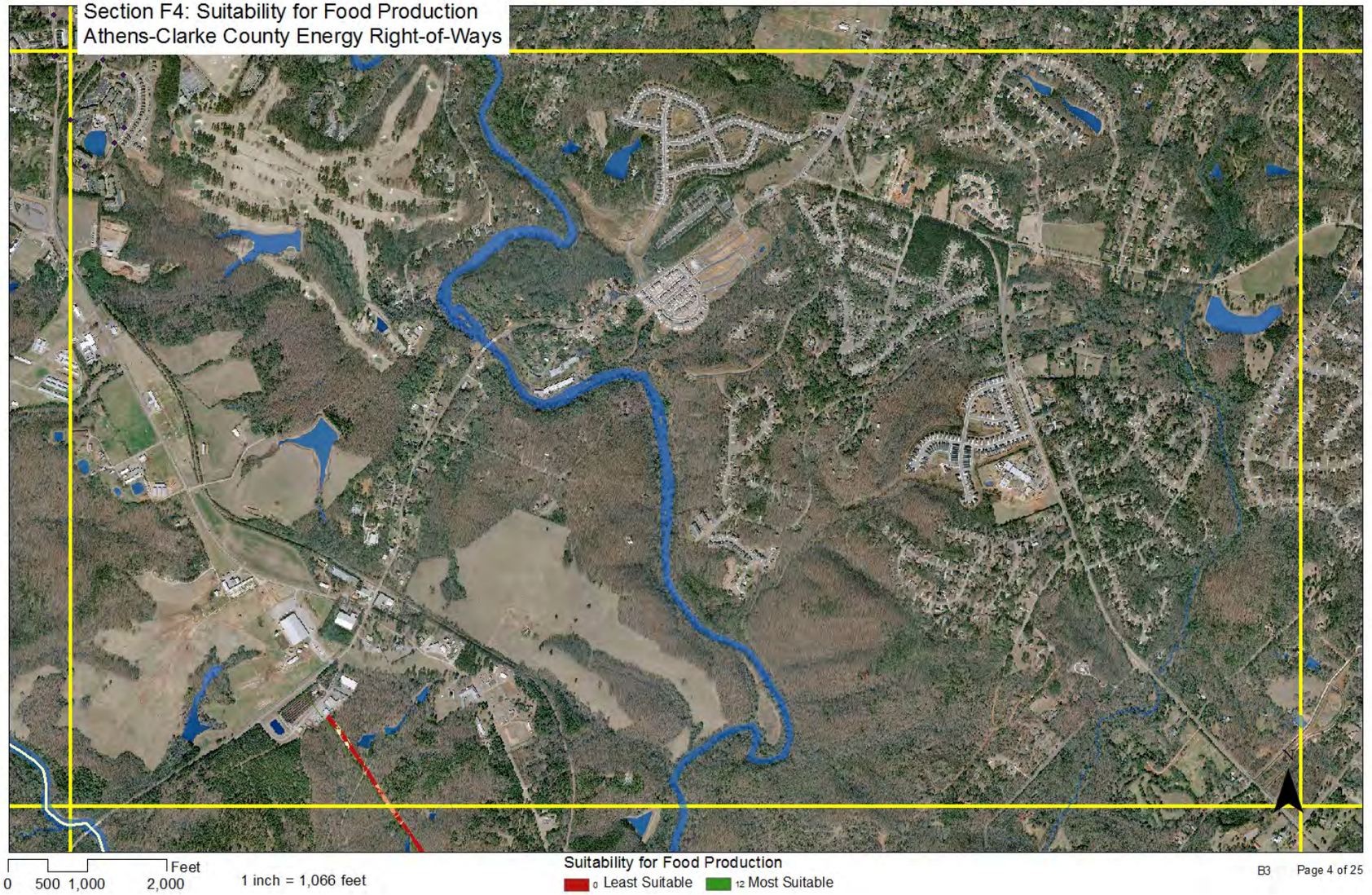
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Athens-Clarke County Energy Right-of-Ways
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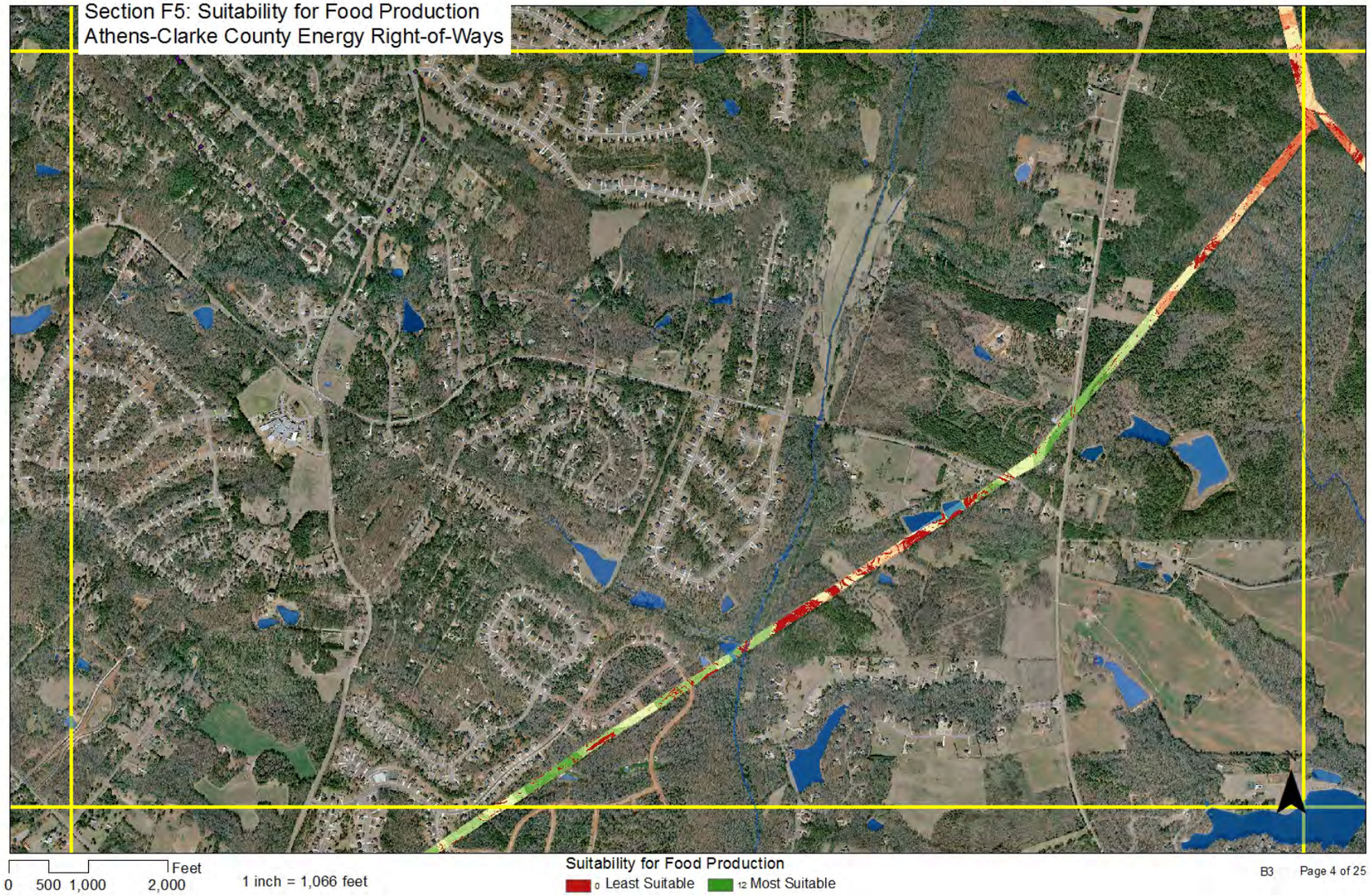
Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
Page 4 of 25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Athens-Clarke County Energy Right-of-Ways
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Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
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B3
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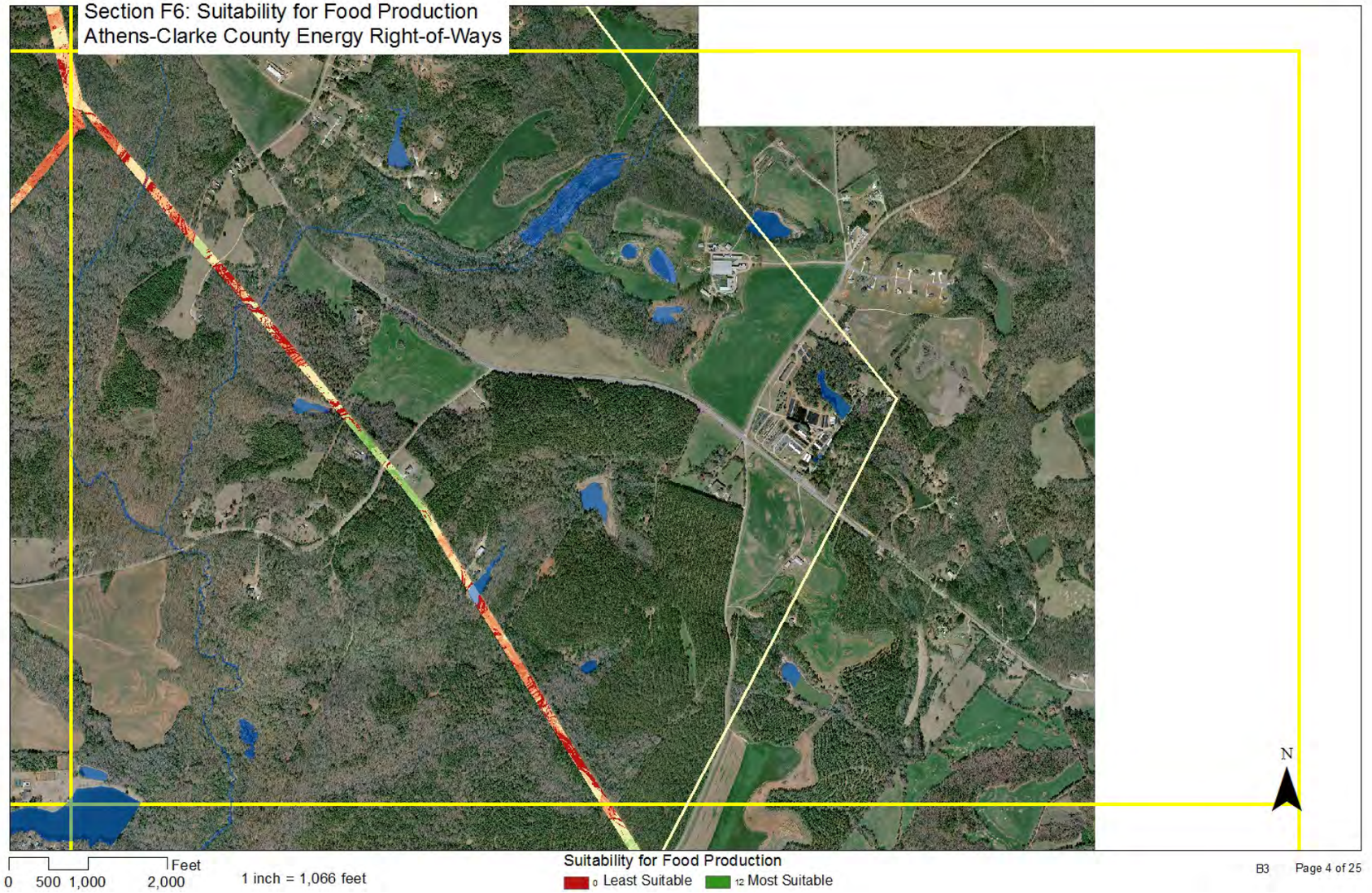
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Athens-Clarke County Energy Right-of-Ways
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Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
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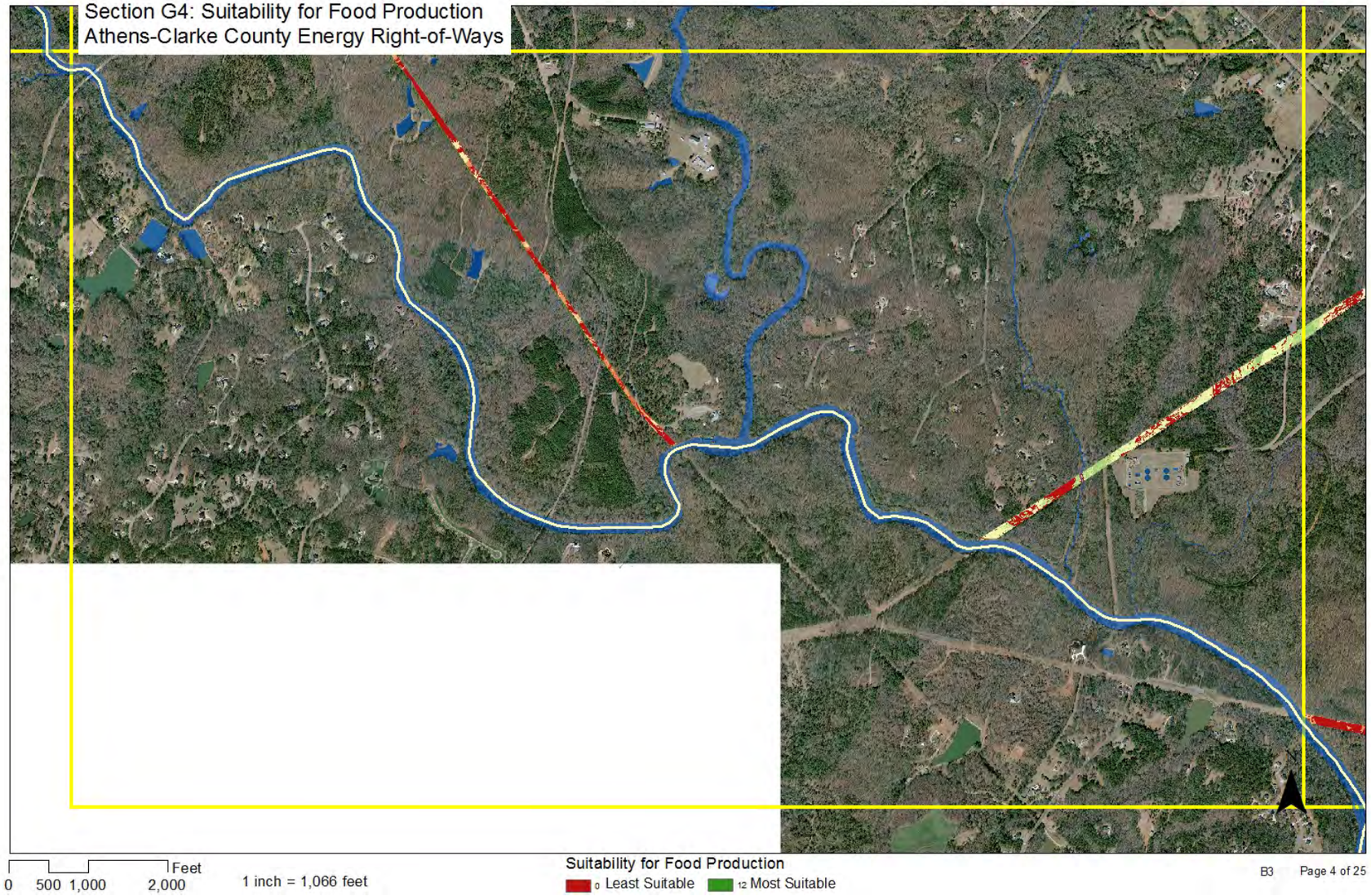
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Athens-Clarke County Energy Right-of-Ways
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Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
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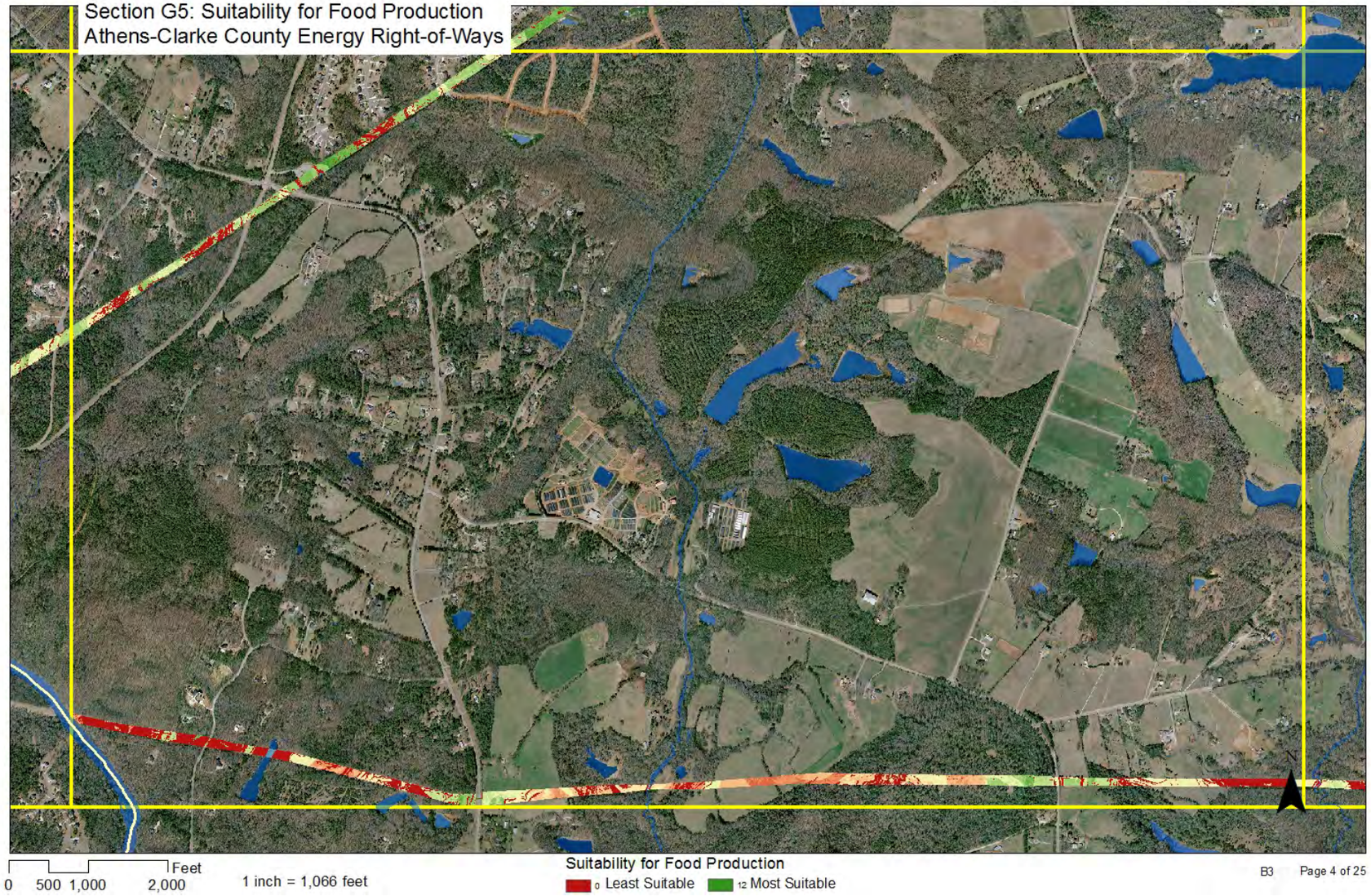
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Athens-Clarke County Energy Right-of-Ways
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Feet
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
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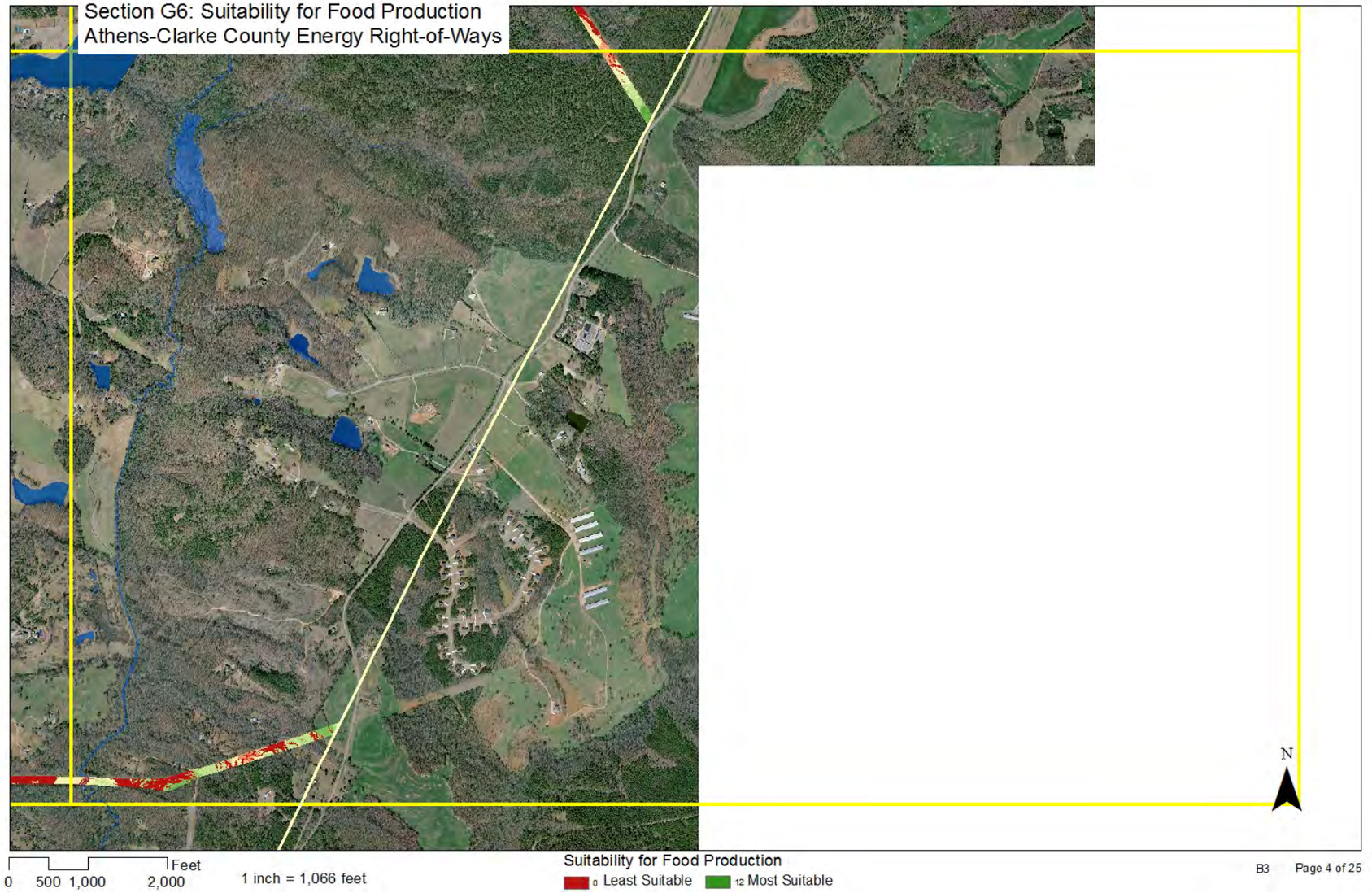
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Athens-Clarke County Energy Right-of-Ways
N
Feet
0 500 1,000 2,000
1 inch = 1,066 feet
Suitability for Food Production
0 Least Suitable
12 Most Suitable
B3
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