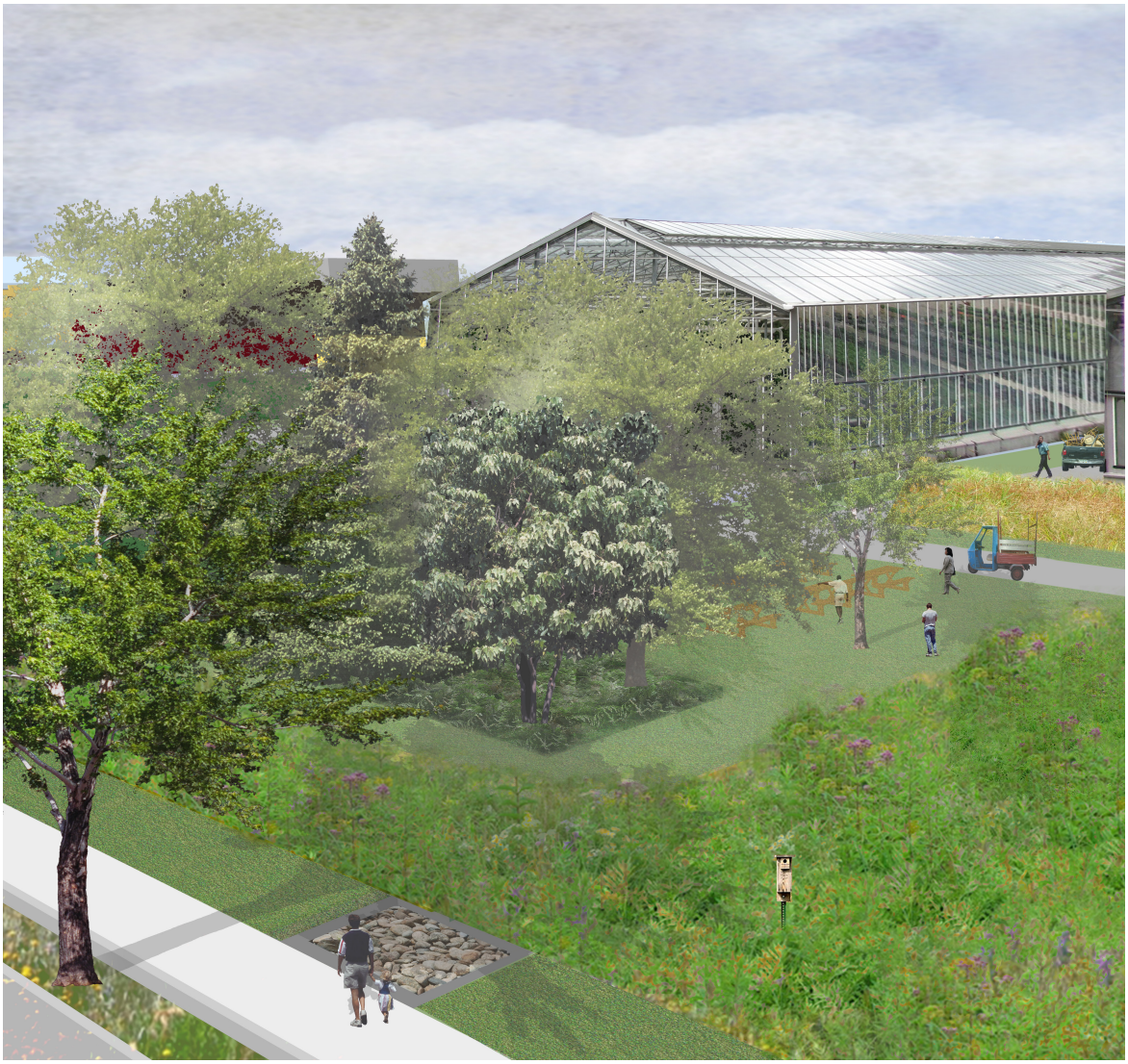

Conceptualizing Multifunctional Green Infrastructure for the RECOVERY PARK URBAN FARM

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ABSTRACT

This study investigates the benefits of green infrastructure in the context of the existing master plan for the Recovery Park Urban Farm. The Recovery Park organization, an independent non-profit, has developed plans to construct The Recovery Park Urban Farm on the Lower East Side of Detroit in Fall of 2015. The current plans, developed by Mannik & Smith Group, feature a combination of rainwater basins and greenhouses, intended to create jobs for members of the Self Help Addiction Rehabilitation (SHAR) program for people with barriers to employment. The 88 acre site contains the historic Chene-Ferry Market, Raven Lounge, Downtown Boxing, and several clusters of occupied residences amidst a largely vacant landscape, which will be transformed as the city develops.

Drawing on a literature review of landscape perception and green infrastructure, as well as the current plans by Mannik & Smith Group, the study proposes a landscape design for The Recovery Park Urban Farm. The design aims to provide the functional ecosystem services of rainwater cleansing and infiltration in addition to creating a stress-reducing environment for the workers on the farm and a cohesive neighborhood aesthetic for the residents. The design proposal includes a site analysis, master plan, and design typologies that focus on the concept of multifunctional green infrastructure.

PROJECT OVERVIEW

This project takes a landscape architecture approach to understanding the social and environmental impacts of green infrastructure on the Recovery Park Urban Farm site and creating design recommendations that could lead to community acceptance and improve stormwater infiltration of on-site runoff. This project strives to understand how the transformation of aggregated vacant properties could change the landscape of a neighborhood, by focusing on design interventions that may enhance community acceptance. Environmental aesthetics play a role in the community perception, and the following research and theory based design interventions may improve community acceptance and functional success of The Recovery Park Urban Farm
The Recovery Park Urban Farm

Founded in 2010, Recovery Park is a 501k nonprofit, focused on creating food related jobs for people with "barriers to employment" (*Recovery Park*). The Recovery Park organization addresses social, environmental, and economic issues in Detroit, which include a large amount of vacant land and high rates of unemployment *(Recovery Park)*. The organization has partnered with a team of architects, engineers, and legal counsel to work on the Recovery Park Urban Farm. The Recovery Park Urban Farm is an 88 acre parcel in the Lower East Side of Detroit slated to be transformed into a commercial urban farming operation.

A one-million dollar Great Lakes Restoration Initiative *(EPA, 2015)* grant from the EPA, which was matched with another combined million dollars from the Erb and Kresge Foundations will be used to fund this project *("News Releases by Date")*. The GLRI funding requires 32 acres of green infrastructure be developed to improve the water quality of the Great Lakes. The EPA hopes this will significantly reduce the flow of stormwater into the cities combined storm-sewerage system by removing approximately 1,000,000 gallons during significant storm events *("EPA GLRI Projects")*. The grant money is expected to go towards bioswales, catch basins, tree plantings, and permeable paving that will collectively manage stormwater.

The long-term business strategy of the Farm includes the production, processing, packaging, and distribution of urban farm goods including vegetables, eggs, honey, fish, and meat to local restaurants and grocery stores (Recovery Park). The initial phase of the project will focus on the creation of greenhouses for the year-round production of vegetables and herbs. Owning the entire segment of the supply network aims to create a chain of connected jobs and loyal customers that benefit from the fresh food. The organization estimates the creation of 128 jobs in the first phase of the farm (*Sands, 2013*). The selected site offers a number of environmental and community benefits and will play a major role in revitalizing the Lower-East Side neighborhood and accepting struggling members back into the community.

Socially, the organization plans to offer farming, processing, packaging, and distribution jobs to recovering drug addicts and ex-convicts through a partnership with nonprofit organization Self Help Addiction Rehabilitation (*Self Help Addiction Rehabilitation*). SHAR has offered programs for people with substance abuse issues and barriers to employment since 1969 (*Self Help Addiction Rehabilitation*). The organization plans to use the Recovery Park Farm as a source of jobs to help members recover and reintegrate in the community. The historic Chene-Ferry Market is scheduled to be revived as a community hub and centerpiece of the development (*Mannik &Smith Group*). The designed and managed Recovery Park Urban Farm will improve the neighborhood aesthetics and quality of life by caring for the land and physically screening off the adjacent highways and industrial businesses.

Environmentally, the development will generate benefits from multiple ecosystem services, including: recreation, stormwater management, and air quality control. The site location has created an opportunity to tie into a citywide network of green spaces through bike trails and stormwater infrastructure. A proposed 32 acres of rain gardens, bioswales, and detention ponds will help to manage on-site stormwater. Additionally, a large amount of stormwater will fall on the roofs of the greenhouses, which could be harvested for irrigation.

The economic strategy of The Recovery Park Urban Farm differs from most farming operations in Detroit, because it is large scale, for profit, and privately run. In addition, the inclusion of processing, packaging, and shipping opens up relationships with local grocery stores and restaurants to extend the seasonal life of the business *(Recovery Park*).

THE PROJECT IN CONTEXT

The Recovery Park Urban Farm comes at a time in Detroit's development, where urban farming is playing a role in reshaping the city. In a city that takes up 139 square miles and currently has over 4800 acres of vacant land, the ground is rich with potential *(Colasanti and Hamm, 2010)*. Currently, there are over 200 urban agriculture locations in the city and the movement continues to grow (*Bear, 2008; The Greening of Detroit, 2010*). Recently, similar scale projects have entered the movement. The Hantz Farm operation planted 15,000 trees as part of a plan to build the largest urban farm business and reforest large sections of Detroit (*Hantz Farms Detroit, 2015*). As businessmen and community organizations begin to transform the abundant cheap land in the city, people have begun to wonder how the changes will benefit the city.

Urban farming in Detroit has emerged as a land use that has brought together communities and started a local foods movement, now centered on Eastern Market. The history of urban farming in Detroit dates back to the first community gardens of the late 18th century and has fluctuated with economic and social trends (*Gopakumar and Hess, 2007*). At that time, Detroit had three main markets, one of which is the Chene-Ferry Market (*Johnson and Thomas, 2005*), which is located on the site of this study. Currently, a number of urban farms have positioned themselves as neighborhood enhancing, community empowering, grassroots organizations.

As the gardens begin to take hold many social and environmental criticisms have arisen, including the permanence of space, feasibility of the business, seasonal use of space, and acceptable urban aesthetic (*Colsanti, 2010*). Recovery Park launches off this moment in time, with a distinctly different approach. The Recovery Park Urban Farm plans to take a commercial approach to urban farming, which will hopefully increase the efficiency of the operation. The park also plans to integrate multifunctional green infrastructure, which may add to the community benefits and acceptance of the project.

The location of the proposed urban farm holds historical significance as well as significant environmental value. Bound by I-94 and I-75, the site sits on the western edge of the Poletown neighborhood, adjacent to a largely vacant industrial zone. The location, at the top of the watershed, means that it serves as the first opportunity to manage stormwater before it affects downstream conditions, including potential combined sewer system overflows into the Detroit River.

The site is located on the Chene Street Corridor, which has a rich commercial history that dates back to the mid 1900's. At the time, the site area was a Polish/Jewish neighborhood with hundreds of thriving businesses and a lively community. The neighborhood consisted of two and three story residential houses lining the secondary streets and dense brick businesses lining Chene Street. The neighborhood was centered on Chene-Ferry Market, which sold food and goods on Wednesdays and Saturdays (*Wylie, 1990*). The market offered foods for ethnic meals and had a meaningful social value for the community. The market operated until 1990 and has recently fallen into disrepair. The memory of the market place is alive in texts, historical reports, and poetry. The historic pattern of houses is still visible in the clusters of remaining houses and street trees that populate the mostly vacant neighborhood.

As Detroit develops, the Recovery Park Urban Farm site has the potential to anchor the Poletown neighborhood and redefine the district. Numerous visionaries and designers have imagined how the location will factor into the larger plans for the city. The Detroit Future Cities Plan prioritizes the Recovery Park Developments as part of their strategy to reuse land and create jobs (*Detroit Future City Strategic Framework*). The Detroit Collaborative Design Center, in collaboration with several design firms, has envisioned the uncovering of the Bloody Run Creek as part of a greenway system that runs from the site down to the water (*Bloody Creek Greenway Redevelopment Plan*). As the city expands its transportation networks, there are plans to include the site as an extension of the Dequindre Cut Bikeway. If the Chene-Ferry Market is restored, the site would become a major node on greenway, just a short bike ride from Eastern Market.

This study analyzes the potential of the site and proposes a design that draws upon the historical context, current city plans, and a review of literature on landscape perception and green infrastructure.

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

The link between landscape function and aesthetics has become increasingly apparent in the field of landscape ecology and architecture *(Nassauer, 1992)*. Theorists understand the perception of landscape function through visual cues and characteristics that define space and send social signals. Understanding what makes places belong and feel right in the landscape, can help designers create places that are contextually appropriate, socially acceptable, mentally restorative, and ecologically functional. By portraying new environmental concepts, such as green infrastructure, in visually acceptable packages, they are more likely to be accepted by communities *(Nassauer, 1995)*. By considering how landscape perception and function impact community acceptance, a design layered with meaning can be created.

PERCEPTION OF LANDSCAPES

The visual characteristics of landscape influence how the landscape is perceived to function (*Nassauer, 1995*). These forms create an aesthetic at the landscape scale, which provides an immersive experience for the viewer (*Nassauer, 2013*). Ecological function and beauty are not necessarily related, so it becomes important to find ways to visually express the value of landscapes (*Nassauer, 2007*). Designers are becoming increasingly more conscious of strategies to incorporate visible signs that make the function of landscapes more apparent and improve community acceptance. Landscape can express care, security, and hazardous environmental conditions, which influence the understanding and response of the surrounding community.

Cues of Care

Landscapes that possess 'cues to care' are often perceived as safer and more acceptable *(Nassauer 2011)*. 'Cues' are expressions that people invest time and thought into maintaining an aesthetic experience. The 'cues' can create a 'halo effect' that causes people to jump to conclusions about the involved community or caretakers *(Nassauer, 2011)*.

Cues of care are particularly important, when trying to get acceptance for new ideas, such as meadows and bioretention ponds in urban environments. Survey responses indicate that people prefer naturalistic meadows with 'cues to care' over lawns and that environmentally "sustainable" designs are becoming more widely accepted *(Snep, Van Ierland and Opdam, 2009; Nassauer, 1993*). As the cultural understanding of these 'sustainable' functions becomes commonplace, designers take on the responsibility of crafting an environmental aesthetic that remains true to function.

Common ‘cues to care’ include:
“-neatness and order (no litter, things are put away, no weeds)
-structures in good repair (e.g., well-painted, unbroken)
-visible, crisp edges of different patch types (including gardens, cropped fields, ecological restorations, fragments of native ecosystems)
-fences, especially between properties or patches with different textures
-trimmed trees and hedges or plants in straight rows
-mown turf in at least a portion of the most publicly visible areas of a site
-colorful flowers
-bird boxes and lawn ornaments
-signs that identify those who occupy the property or suggest ecosystem functions that occur there, especially habitat functions”
(Nassauer, 2011)

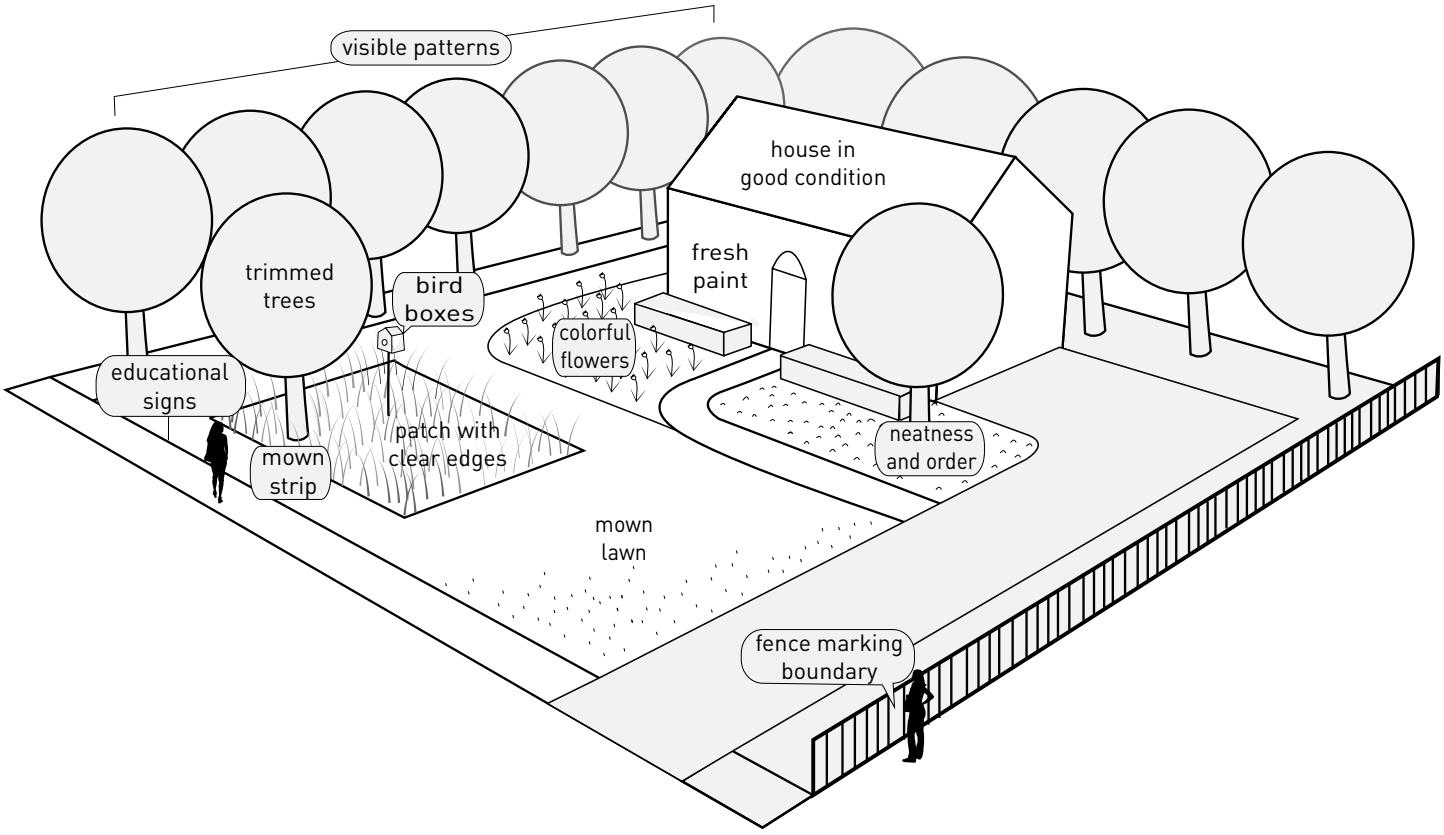


Figure 2.1 Cues to Care indicate that a landscape holds value and may have a responsible caretaker

STRESS RELIEF

Social and psychological functions have great value in the field of landscape design. Although the idea of a park offering mental health benefits was prevalent in the 19th century, as in the design of Central Park and the Emerald Necklace, the idea was largely overlooked for the past century *(Thompson, 2000)*.

A number of studies have recognized the potential for outdoor space to be integrated into the workplace offer a variety of stress relief functions *(Gilchrist et al, 2015)*. For people recovering from drug addictions or time in prison, stress relief may a critical part of the healing process *(Lamon, 1992)*. Work places with visual and physical access to greenspace may reduce stress and anxiety levels and create a higher level of job satisfaction *(Kaplan, et al, 1993*). Environmental stress-reduction theory can be used to design and position outdoor spaces to psychologically benefit the people. Several studies have proven that time in natural settings reduce cortisol, which is a physiological indicator of stress. This reduction of stress may increase peoples focused attention and their ability to solve problems. Studies indicate that the frequency of exposure to a stress relieving environment is much less important than the total time spent (Gilchrist et al).

With a variety of individual preferences and perceptions, an outdoor environment can be designed to offer a diversity of options for recharging environments *(Stiggsdotter and Grahn, 2010)*. Wild and natural seeming places that offered prospect and refuge were identified as preferred stress-reducing environments *(Appleton, 1975; Stiggsdotter, 2003)*. Prospect and refuge describes the quality of a space where people can observe their surroundings, while feeling secure. Studies support that people that have faced personal crisis experience a positive mental restoration from exposure to natural settings, particularly those with opportunities for private individual reflection *(Ottosson, 2008)*. Research also found that individuals recharge from watching vegetation and clouds, which supports the design of gathering spaces that are adjacent to vegetation and maintain a connection to the open sky *(Ottosson, 2008)*. Views of arrangements of trees, lawn, and flowers that resemble a park are related to positive self-evaluations of performance *(Matsuoka and Kaplan, 2008)*, which could be associated with a level of personal satisfaction and fulfillment.

By including access to specifically designed restorative environments, workplaces can add the benefit of stress reduction to their workers daily lives. Many of the qualities of restorative environments can be created with aesthetically pleasing functional stormwater management elements in green infrastructure systems and exemplify the cues to care. By developing an overlap of these goals , a landscape can become multifunctional and may develop investment from a variety of stakeholders from the community, city, and environmental agencies.

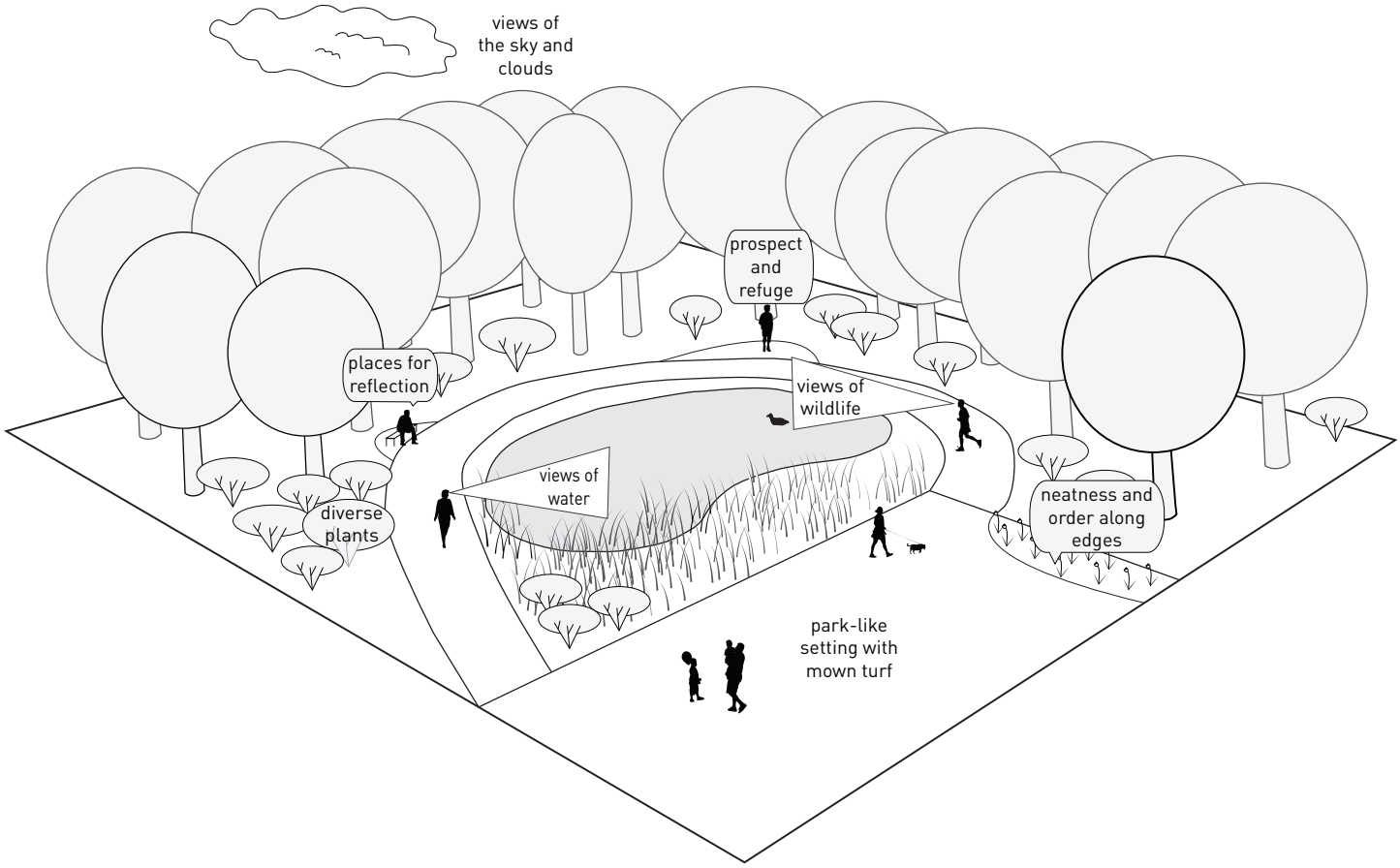


Figure 2.2 Restorative Spaces can use Cues to Care to encourage community acceptance

FUNCTION OF STORMWATER MANAGEMENT SYSTEMS IN GREEN INFRASTRUCTURE

Current problems facing the built environment have been made more severe by climate change and aging stormwater infrastructure *(Novotny, 2010)*. The concept of green infrastructure integrates green spaces and "natural" systems to provide the functions of our traditional grey infrastructure *(Austin, 2014)*. In stormwater management systems, green infrastructure strives to augment the pipes of the combined sewer systems. This approach relieves pressure on the sewer system and can create a visible network of multifunctional green spaces that improve the function of the city.

CONTEXTUAL CONSIDERATIONS

Designing a stormwater management system requires an analysis of the greater context and immediate site conditions to achieve a level of social sustainability, economic feasibility, and environmental functionality. The greater context can be understood by analyzing the position within the watershed, land cover, and an assessment of water quantity and quality *(Burton and Pitt, 2010)*. The immediate site can be assessed for vegetation, hydrology, soil infiltration rates, impervious surfaces, utilities and infrastructure, social and recreational uses, and the economic environment *(Austin, 2014)*.

Watershed Analysis

The watershed should be assessed based on the biology and chemistry of test sites *(Burton and Pitt, 2010)*. By using a list of 18 indicators from the EPA, an integrated assessment will give an accurate interpretation of the health of the watershed in terms of the social, biological, and environmental impacts *(Burton and Pitt, 2010)*. The watershed level analysis allows the site to be placed into a system to understand the upstream and downstream influences and implications. From this point, specific designed components can target the systemic problems. By identifying hazards within the system, control measures can be scaled and put in place to minimize overflows and sustain functional uses *(Burton and Pitt, 2010)*. The outflow from the site will depend largely on the size of the storm event, making the scale of the components critical to the function of the system in the context of the watershed *(Burton and Pitt, 2010)*.

Land Cover

The material properties of the lands' surface impact the rate and quality of the stormwater runoff. Geographic information systems allow for the mapping of land cover patterns to understand how the surroundings will influence the site *(Burton and Pitt, 2010)*. Soil maps can give a good indication of what the infiltration rates will be, but the information is often limited in urban conditions. Analysis of the land cover can reveal suitable areas to infiltrate water and regions likely to erode or flood.

Contaminants

Many urban sites have a legacy of contamination and should be treated with caution. In particular, industrial and agricultural sites may have residual contamination in the groundwater and soil *(Green Infrastructure Implementation, 2014)*. It is particularly important to identify what and where the contaminants are to understand risks *(Kloss, 2008)*. Because contaminants move in the surface and groundwater, air, and sewers, a survey of adjacent areas is important.

Sources of urban water runoff generally include: agriculture, rooftops, parking lots, roadways, industrial areas, construction sites, and other impervious surfaces *(Burton and Pitt, 2010)*. The range of materials in these sources contribute different contaminants. Particular technologies can be used to respond to the differences in water quality from site sources and separate flows to avoid contamination (Green Infrastructure Implementation, 2014). Contaminants likely in the case of The Recovery Park Urban Farm include:

1. Particulates from rubber tires, atmospheric deposition, sand and dust on the pavement and rooftops
2. Nutrients (Nitrogen, Phosphorus, ammonia) from vehicle exhaust, fertilizers, petroleum products, plant materials
3. Pesticides from chemical lawn treatments or tree spraying
4. Petroleum hydrocarbons from oil, gas, asphalt on roads and parking lots
5. Pathogenic microorganisms from new and abandoned septic systems
6. Heavy metals (copper, zinc, lead) from automobiles and paint
7. Salts from winter road treatments and lawn fertilization

(Green Infrastructure Implementation, 2014; Burton and Pitt; Novotny, 2010; Austin, 2014)

Monitoring for contaminants can be difficult, because they are most present during the "first flush" of a rainstorm, which is highly dependent with the time and intensity of the storm *(Burton and Pitt, 2010)*. This variability in contaminant concentration can be mitigated by selecting an appropriate sampling plan that gives an accurate impression of the whole site and surrounding areas *(Burton and Pitt, 2010)*. In general, a basic understanding of probable contaminants, will give a good starting point for developing a design strategy.

Hydrology

The hydrology on the site can be understood in terms of the movement of the fluid, as well as the quality of the water *(Austin, 2014)*. By understanding these factors the system can be sized to fit the amount of expected runoff and use components that target specific contaminants that are likely to be present. Much of the hydrologic movement in cities now occurs in pipes, but an understanding of the historic drainage patterns is often useful. The relationship between water sources and use, is also an important consideration in the analysis of hydrology. Much about the hydrology can be learned from the landform, soil, and vegetation of specific areas.

Social

Social perceptions of green infrastructure relate closely to the aesthetics, programmatic needs, and safety *(Green Infrastructure Implementation)*. These should be considered in the analysis to gain community support and acceptance. The form of the green infrastructure can give the impression of an intentional and functional landscape. Programmatic requirements of the site influence the type and placement of green infrastructure components that can be used. By understanding the vernacular landscape of a place, the design of green infrastructure components can fit into the established landscape.
Safety concerns about green infrastructure are often rooted in standing water, mosquito populations, and low-visibility areas *(Green Infrastructure Implementation)*. By engineering retention basins to infiltrate water in twelve hours, these concerns can be dismissed *(Austin, 2014)*.

Economic

Construction and maintenance costs impact the sustainability of each project. The strategic timing and marketing of green infrastructure is critical. Green infrastructure may be designed as a marginal cost to a larger project or infrastructure improvements or use funding from environmental organizations (*Green Infrastructure Implementation*).
In the case of Recovery Park, the EPA, Kresge Foundation, and Erb Foundation provided two million dollars in funding to support green infrastructure *(EPA GLRI Projects)*.

COMPONENTS OF STORMWATER INFILTRATION SYSTEMS

Components can be paired with the analysis of contaminants and physical site conditions to create an effective design. Bioretention basins, bioswales, street tree stormwater planters, rain barrels and cisterns, green roofs, and permeable pavement all manage water for reuse or infiltration *(Green Infrastructure Implementation)*. Many of these components are new ideas that are being improved with monitoring and experimentation *(Austin, 2014)*. By installing a system that uses components to capture pollutants and sediments close to the source, the maintenance and installation cost can be reduced. Since roadways are one of the leading causes of urban pollution, the creation of "green streets" lined with these connected components is an important part of the transition to green infrastructure *(Green Infrastructure Implementation)*. The understanding of individual components may help designers layout functional and efficient systems to capture and treat stormwater.

Bioretention Basins

Also known as rain gardens, bioretention basins are shallow (6-18") planted depressions that capture runoff and ideally infiltrate it within 12 hours *(Austin, 2014)*. These basins work best when they are located close to the source, so they can prevent the spread of pollutants *(Green Infrastructure Implementation, 2014)*.

The bioretention basins generally include a sediment forebay to capture the water, a basin to allow it to infiltrate, and an outflow to allow for safe overflow *(Austin, 2014)*. The sediment forebay that captures and slows the water, allows suspended solids to fall out and be regularly removed by a maintenance crew. Water is often conveyed into these basins through curb cuts or overland flow.

The soil profile generally consists of a layer of mulch, sandy soil, and a gravel underdrain. The fill of the basin consists of 24-48" of sandy filter material to allow for infiltration and the capture and treatment of contaminants. The proportion of sand is variable across professional specifications, but the current consensus appears to be around 75%, for optimal infiltration and plant growth *(Austin, 2014)*. In soil that drains less than 0.2"/hr., an additional layer of gravel with an underdrain can be installed to ensure that the basin completely empties *(Green Infrastructure Implementation)*.

The basin filters the water through soil and uses biological processes to treat and stop the spread of contaminants *(Austin, 2014)*. Each layer of the soil profile targets the removal of specific contaminants, so it is important to align the design with the analysis of water quality. The suspended solids, which often contain contaminants, can be stopped with the soil filter and broken down by the soil bacteria in the organic layer *(Austin, 2014)*. The creation anaerobic zones, with a gravel layer below or mulch on top, allows for the breakdown of nitrates *(Austin, 2014)*. The drainage of the basin causes the captured pathogenic bacteria to be killed off during dry periods *(Austin, 2014)*.

Plants increase the function of the basin by transpiring water, breaking up soil, and treating contaminants *(Austin, 2014)*. Native plant material can be used to increase the biodiversity and create habitat for wildlife. The layer of plants also provides ground cover, which reduces the number of weeds and invasive plants that are likely to colonize open areas.

Bioswales

Bioswales are linear, shallow, vegetated depressions that are designed to slow, filter, and convey water to a larger infiltration basin *(Green Infrastructure Implementation, 2014)*. Bioswales work well to connect a network of basins and other components. The sediment removal and infiltration of a bioswale can be improved by the addition of traps and check dams, which slow the movement of water and increase the surface contact *(Bioswales for Better Stormwater Management)*.

The profile of bioswales often features a layer of plants in mulch or gravel on top of 6-8" of sandy soil on top of 24" of native soil *(Bioswales for Better Stormwater Management)*. Many bioswales also include a perforated underdrain pipe in a gravel base to increase the capacity and support infiltration (*Bioswales for Better Stormwater Management*).

Bioswales can be planted with trees, shrubs, perennials, and turf grass, although the deeper rooted plants are the most successful at infiltrating water and removing pollutants *(Green Infrastructure Implementation*). The maintenance of the garden involves the care of the plants, so the budget often informs the selection.

Bioretention Planters

Bioretention planters are vegetated depressions that are enclosed with walls or curbs *(Green Infrastructure Implementation)*. They are more compact than bioretention basins, although they use the same approach to capturing water and treating contaminants. Bioretention street planters are commonly used in highly urbanized sites, where there is little room to build large basins. These basins often contain trees that tolerate variable moisture and contaminant levels.

Cisterns and Rain Barrels

Capturing roof runoff for reuse has become more important with raised awareness of climate change and widespread drought epidemics. Cisterns and rain barrels are containers that store rooftop runoff for later use. Cisterns are generally used to hold larger volumes of water at a commercial scale, where rain barrels allow for a lower volume of water to be held at a lower installation cost. Rooftop runoff often contains harmful metals, bacteria, and particulate matter, but it can be reused for toilet flushing and landscape irrigation with little or no treatment *(Burton and Pitt, 2010)*. Cisterns should be sized to hold the water for a short period of time and constantly cycle through new water. An outflow strategy is an essential feature, because the limited capacity of the containers will overflow in large storm events.

Green Roofs

Structures with green roofs capture rainwater and allow it to evaporate or release slowly. Green roofs use layers of drainage material and soil to allow plants to grow. In general, green roofs have layers of foam, waterproof rubber, drainage mat, subsoil, and trays with a growing medium *(Austin, 2014)*. This complex layering varies, based on the plants that are used and bearing capacity of the structure.

Permeable Pavement

A number of pervious pavers, asphalts, and concretes can be substituted for impervious surfaces, where support is required. Permeable pavement allows the water to flow through to a gravel base course and infiltrate into the ground water, which may reduce on-site runoff. These surfaces have limited structural capacities to the impervious alternative, so they should be used in low-traffic scenarios. (*Green Infrastructure Implementation)*. Permeable pavement makes monitoring difficult, which makes the functional success of contaminant removal less clear. Although expensive and maintenance intensive, permeable pavement may be a useful addition to green infrastructure.

CONCLUSIONS

In the case of The Recovery Park Urban Farm, green infrastructure can be designed to manage stormwater, create a restorative work environment, and express 'cues of care'. By understanding how these concepts work together, the design of the landscape may be more likely to have a positive impact on the community and environment.

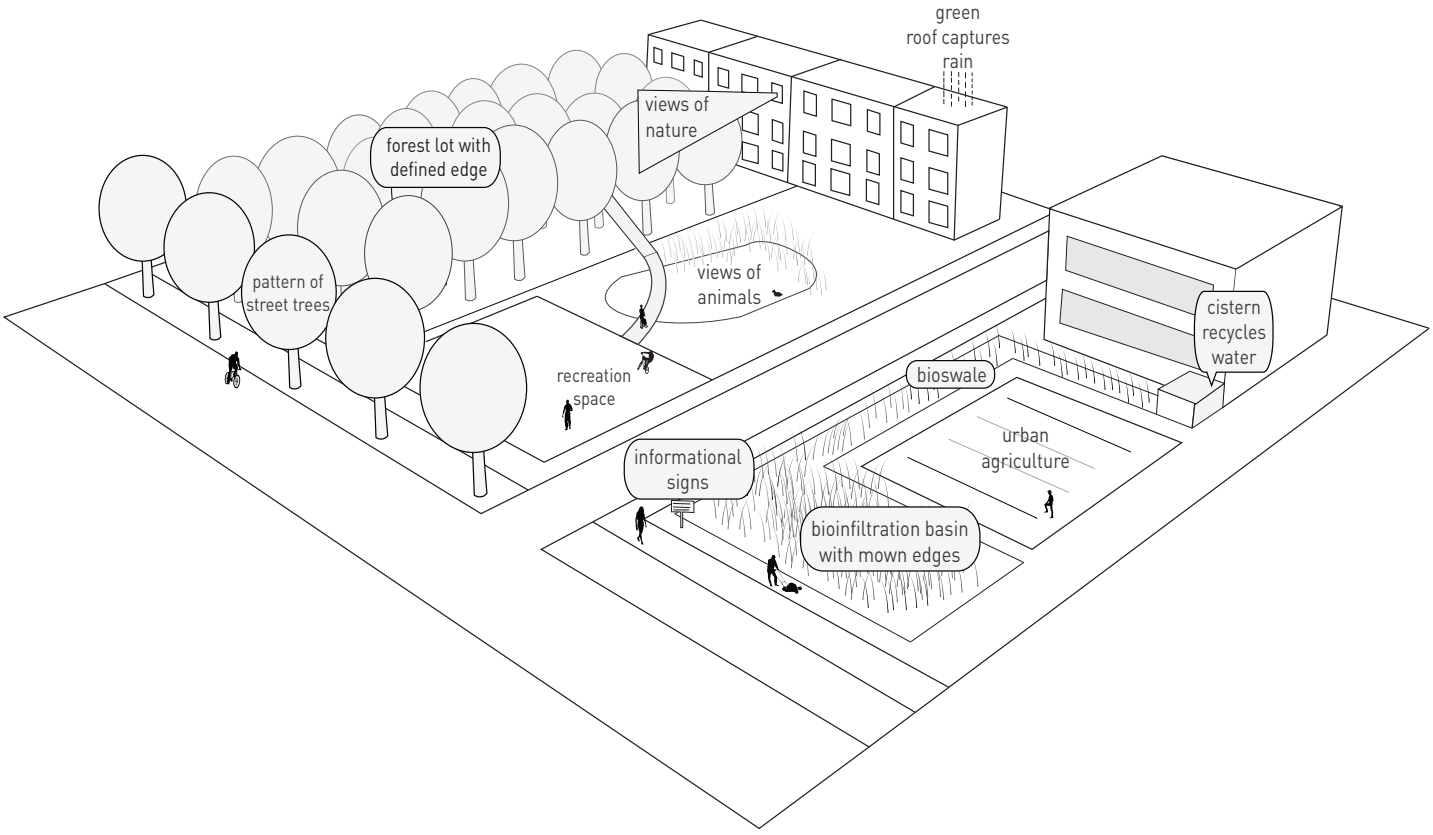


Figure 2.3 Green Infrastructure can be designed to embody the characteristics of restorative spaces and cues to care

DEFINITION OF THE PROBLEM

The November 2015 launch of The Recovery Park Farm may provide a number of community and environmental benefits. Understanding the opportunities and constraints involved will help the project maximize benefits for the involved stakeholders. The design should have the capacity to play a major role in building community support, creating jobs, and enhancing property values and neighborhood character for the immediate surroundings. The approach to this complex project requires a comprehensive analysis of the site, as well as an application of appropriate green infrastructure components that support social and environmental functions. In Detroit, this trends toward low cost solutions that require little maintenance and value the current social and environmental conditions.

SOCIAL

The collaboration with Self Help Addiction Rehabilitation adds to the important community role of The Recovery Park Urban Farm. The recovering drug addicts and ex-convicts may be vulnerable to relapse and recidivism, so it is essential that everything is done to create a positive work environment for them.

Developing a strategy to improve the neighborhood for remaining residents, while maximizing efficiency of the operation was a significant consideration. The current site has been treated as a dumping grounds for construction debris and old tires, and so the new design could create a change in perception that builds support and care for the land. The Recovery Park organization will manage maintenance and operations, but sustainability relies on the acceptance of the existing community.

ENVIRONMENTAL

The environmental impacts of the project primarily relate to water quality and quantity. The stormwater management infrastructure needs to be appropriately located and sized to address the runoff from the site. This requires specific design tactics to separate, treat, and infiltrate storm water, before the contaminants enter the groundwater or combined sewer system. The design had to work with the given information to create a flexible solution that allows for adjustments, based on the post-construction monitoring.

The focus on the existing residents, stormwater infrastructure, and farm community inspired the multidimensional approach to the complex development, in hope of creating jobs and opportunities for people with barriers to employment. The success of the design hinges on the clearly defined objectives and methods that consider social and environmental perspectives.

STATEMENT OF OBJECTIVES AND METHODS

The overarching objective of the project is to provide a site design that integrates multifunctional stormwater management with landscape aesthetics that invite community acceptance. The design methods involve a site analysis, and design solution intended to instigate a conversation on social perception as the development moves forward. The ideas and theories from the readings on landscape perception and green infrastructure are integrated into the design process.

ANALYSIS

The site analysis identified site boundaries, functions, and community needs. Investigation of hydrology, circulation, structure, vegetation, and cues of care begin to illustrate the meaning of the property to the greater landscape. The relationship to the adjacent neighborhood was understood through the lens of landscape aesthetics. The analysis identifies opportunities to engage the surrounding community with cues of care and legible landscape process. The site analysis reflects program goals to harvest stormwater and integrate a greenway component. The analysis was performed on the city scale, neighborhood scale, and site scale, to better understand the relationships. The analysis takes the form of a series of maps that combine the site information in useful overlays that lead to the design concept and master plan.

DESIGN

The design of the site consists of a master plan that addresses the perception of landscape aesthetics in response to the existing proposal and site analysis and a series of diagrams and perspective drawings that support the main concepts. The proposal has a strong focus on the perception of landscape aesthetics discussed in the theoretical framework. The solution is intended to integrate ideas about ‘cues to care’ and restorative landscapes into a multifunctional green infrastructure. The legibility of order, maintenance, and productivity were used as goals for creating a landscape that would gain community support. Visual and physical access to views of trees, stormwater basins, meadows, and plantings were integrated into the greenhouse complex to reduce stress for employees. A 3D digital model was developed to understand the experience of the site and generate an animation that gives an impression of moving through the space.

FOUNDATION OF IDEAS

Primary theories, gathered from research, that drove the design, include ‘cues to care’, ‘attention restoration’, ‘prospect and refuge’, ‘environmental-stress-reduction theory’ and the idea of multifunctional green infrastructure.

The objectives and methods were developed with the knowledge that this is a dynamic project with a number of stakeholders. This study is intended to be used to enhance the existing design, rather than as a complete alternative. This is accomplished by creating a suite of landscape features that support the concept of a restorative work environment by integrating stormwater management and agriculture with an aesthetic that displays care. By developing a multimedia design package, the project is intended to connect with a wide audience that includes designers, ecologists, and community members.

APPLICATION OF THEORY

INTEGRATING AESTHETICS AND FUNCTION

At the scale of The Recovery Park Urban Farm, the landscape creates an immersive experience, which increases the importance of a design that integrates with stormwater management, design aesthetics, and urban agriculture. Landscape perception theories were applied to the site design to create forms that would elicit a positive public response, while creating a restorative work environment and functional stormwater management system.

The 'cues to care' theory provided rationale for many of the design decisions. A visible network of 'cues' of human investment and maintenance on the site was proposed to let people know that the design was intentional, functional, and beautiful. The previously mentioned set of cues was expanded upon to create a design that was specific to the local context and representative of the green infrastructure investigation. This was accomplished through a street-level investigation of present 'cues' on the site and in adjacent neighborhoods, which could be duplicated to target the acceptance of the existing neighborhood members.

The legibility of landscape care can create a 'halo effect' that causes people to make inferences about the involved community or caretakers *(Nassauer, 2011)*. In The Recovery Park Urban Farm, visible 'cues of care' may translate to people's perception of the community member's recovery and the success of the organization. These ideas can be expressed through a landscape that grows over the course of the season and responds to cyclical maintenance routines, such as mowing or annual burning of meadow grasses. Implementing elements along the street frontage and other visible locations can create a public image that expresses the physical and psychological recovery of the workers and the ecological recovery of the site.

Environmental stress-reduction theory was used in the design to position the stormwater systems to create outdoor spaces for the workers that connect green space and sky, while allowing for restful activities. The strategy of positioning vegetated stormwater basins in between public spaces and business spaces was used to provide theoretically beneficial access for the workers and public, while maintaining a separation between the different land uses . Opportunities for social and individual interaction with diverse natural spaces was implemented in the design layout, as was recommended in the literature.

A site analysis, influenced by the review of literature on green infrastructure, pinpointed suitable areas for the site elements to be situated. Bioretention basins, bioswales, cisterns, and tree planters were selected to convey and infiltrate the stormwater runoff, based on their properties described in the literature. These functional stormwater components were integrated with patterns of vegetation that express 'cues to care' and allowed for restorative outdoor spaces. This study of overlapping functions helped to develop design typologies later in the process. As supported by the readings about successful green infrastructure, a multifunctional stormwater system became a core design concept.

Visibility of patterns emerged as a theme in the research on landscape perception, which indicated that the site analysis should locate important internal and external views, as well as landmarks. The main cross streets, Ferry and Warren, were highlighted as corridors to allow views into the site and showcase the success of the project. Internal views from the inhabited houses on the site were studied to improve access to natural areas and green space. This was studied by looking at the existing views from their property and thinking about how desirable views could be provided or preserved, based on the adjacent land use. The identification of existing landmarks on the site was critical to ensuring that the local character was understood and respected. The site analysis revealed several parcels of land that may have significant community value.

1. The historic cultural value of the Chene-Ferry Market place emerged as the social hub of the neighborhood.
2. The lawn space by the Raven Blues Lounge was discovered to be the location of the annual blues festival.
3. Vacant lots with vegetation were valued for the infiltration created by the roots.
4. The repeated pattern of mounds of soil with successional vegetation offered an interesting character that was preserved and integrated into other sections of the design.

By bridging the gap between theory and design, the concepts of green infrastructure, restorative work environments, and cues of care translated into design features which formed the master plan.

DESIGN APPLICATION

A design process of site analysis, opportunity consideration, concept development, and master planning were used to generate a design for The Recovery Park Urban Farm that applied the literature review and considered design plans from Mannik & Smith Group. The multiple phases were used to isolate relevant information about the site and develop them into design perspectives, plans, and diagrams that can be applied to future site design considerations.

SITE INVENTORY AND ANALYSIS

The inventory and analysis of the site was performed to understand the environmental and social conditions that influenced the outcome of the design. Layers of maps were used to isolate variables that contribute to the function of the complex site. The following layers were then integrated into an analysis map that directly supports the conceptual plan:

1. Context
2. Hydrology
3. Vegetation
4. Roads
5. Structures
6. Cues to Care

Base information for the site analysis was collected from a combination of Landsat imagery, site visits, and a map of roads, property boundaries, and structures from Mannick Smith Group. The site visits were conducted by driving on the streets and taking photographs in situations where it was respectful to the residents. The visits occurred in the Fall of 2014 and Winter and Spring of 2015 under various weather conditions.

CONTEXT

The position of the site in the greater context revealed the surrounding Poletown neighborhood and industrial area, as well as the highways that form the western and northern borders. The relationship to the highways makes the site convenient for the transport and delivery of market goods to areas in and out of the city. The downside of this proximity, is that the site may be exposed to poor air and water quality. The planned expansion of the Dequindre cut would connect the site to Eastern Market and the Riverwalk, making it a landmark for the city. The position at the top of the Bloody Run Creek Greenway plan makes the site a critical part of the water quality and connectivity of the greenway. Since the site is in one of the most vacated regions of Detroit, it offers abundant land that is connected and affordable. This aligns with the mission and funding of the Recovery Park organization and makes it a suitable site for the Farm.

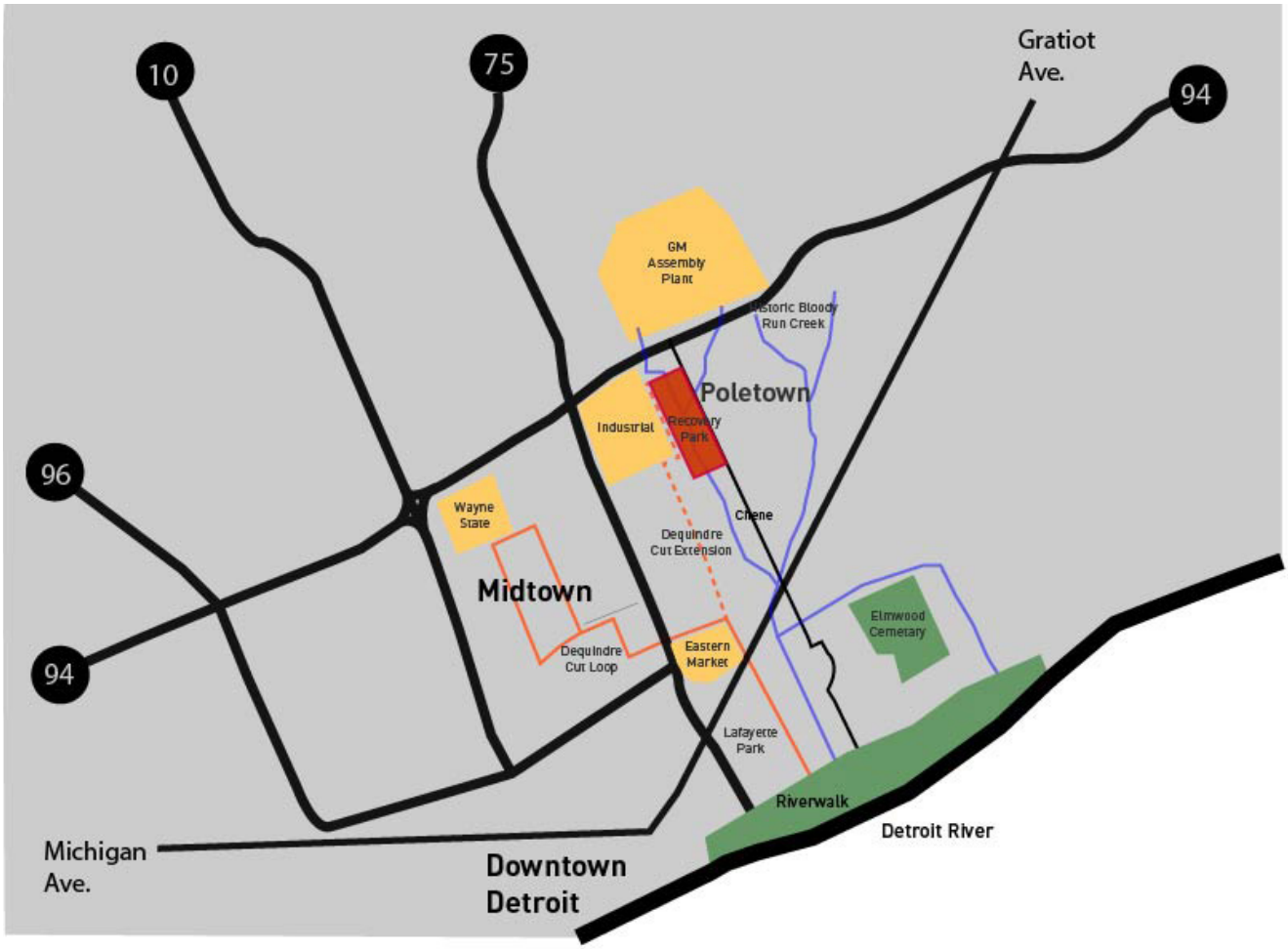


Figure 6 .1 The Recovery Park is at the north end of the Chene Corridor, adjacent to I-75 and I-94

HYDROLOGY

The topography of the site was analyzed to understand the hydrology and identify low points for stormwater collection. In general, the site slopes down to the southeast at 1% and is located at the top of a watershed. Historically, this water drained into the Bloody Run Creek, which only surfaces briefly in the Elmwood Cemetery. The watershed now drains the water to the southeast of I-75 and I-94 toward the Detroit River. The location of the site makes it a suitable to collect water before it moves toward the Detroit River in the combined storm sewer system.

This understanding of the topography was developed through a series of sections cut through a 1-arc-second digital elevation model created by Google, with data from the Shuttle Radar Topography Mission. The site was also visited after storm events to understand where the standing water was collecting on the roadways. This portion of the analysis helped to identify where the infiltration basins and inlets could be located to collect the maximum volume of water.

A portion of the site along Dubois was identified by Mannik & Smith Group as a suitable place for the stormwater detention basins . Identification of low points and pooling water supported the selection of the 32 acre Great Lakes Restoration Initiative (GLRI) zone for stormwater retention seen in figure 6.2.

Water quality testing information was not used in this analysis, but it could be assumed that the runoff contains standard contaminants from roadways and parking lots, old housing lots, and rooftops including: heavy metals, nitrogen, ammonium, phosphorus, copper, lead, iron, and bacteria.

The development of greenhouses on the site made it particularly important to recognize the different sources of runoff and identify which water could be reused for irrigation of food crops. Greenhouse rooftop runoff could be reused in irrigation, while the runoff from paved surfaces would be more difficult to capture and clean, due to the higher concentration of contaminants and particulate matter. This increased cost to clean the water more suitable for watering the plants in the infiltration ponds, which would have plant material that could help remove some of the contaminants, before they reached the groundwater.

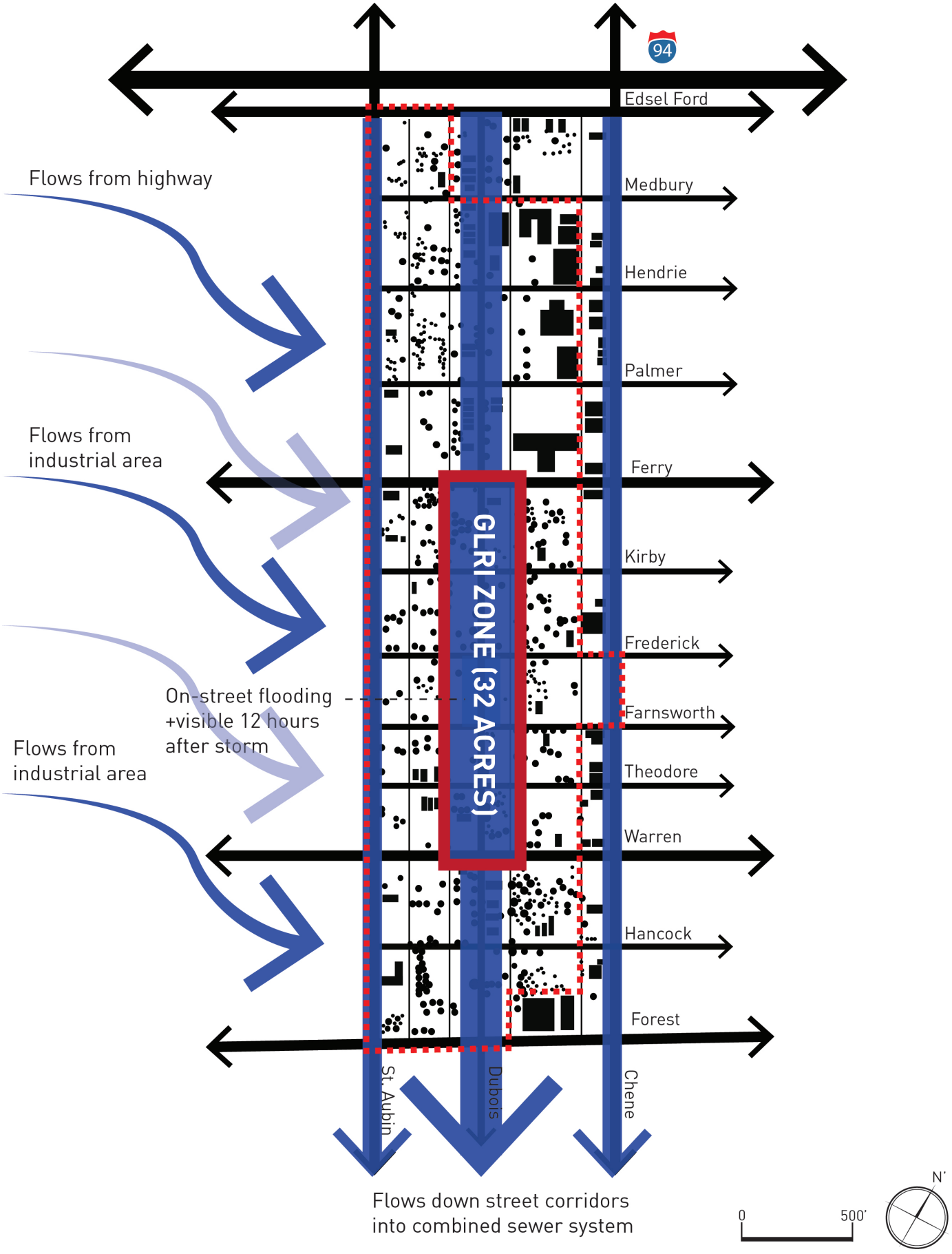


Figure 6.2 The water flows from the west and is captured in the storm sewers

VEGETATION

The vegetation on the site was studied to identify areas of community investment and significant vegetation that would be worth preserving, as well as zones of neglect that could be improved upon. The site currently has successional meadows and forests, street trees, newly planted trees, and mown turf.

The successional vegetation appears on the edges of the residential tracts of land and in parts of the site that are away from structures. Much of the successional growth has occurred on piles of soil that are not level, making mowing difficult. This growth holds value in its ability to screen unwanted views, infiltrate water, clean the air, and shade the roadways. The street trees include a remnant of a pattern of Gleditsia triacanthos (Honeylocust) that appeared to line the east/west streets. The regular spaced trees are present in irregular intervals on these streets with a high presence on the eastern edge of the site. The spacing of the trees adds a cohesive design to the neighborhood that makes it feel cared for and connected. This pattern could be reestablished to connect the streets and stay true to the historic character.

Newly planted trees are present in the mown lawn on the eastern edge of the site. These trees were planted in 2014 and signify that somebody in the neighborhood is invested in making improvements. The trees were planted on the memorial lawn space, which is annually used by the Raven Lounge for the annual music festival.

Many of the successional meadow spaces appear to be mowed annually. The mowing keeps down the woody growth and makes the deposition of trash more obvious. The spaces that were mown during May of 2015 were noted in the analysis to establish an understanding of what the city prioritized as places of maintenance.

Figure 6.3 Patches of mown lawn, successional vegetation, and street trees occur on the site

ROADS

The roadways on and around the site were categorized as alleys, residential, cross streets, and highways. The roadways were in a variety of conditions that ranged from maintained to heavily degraded or gone. The grid pattern of roads and alleyways made the former pathways identifiable, even though many of the alleys have been overgrown. The former alleys contain soil that is likely to be compacted and contain contaminants from the asphalt.

All of the sidewalks on the street are heavily cracked and overgrown, many to the point of invisibility. The city installed detectable warning strips at the intersections, which could potentially be reused, although they currently offer no benefit, since the sidewalks are disconnected. A number of parking surfaces exist on the site and many are fenced off to provide security.

Bus routes are scheduled to run on Chene and Warren, although the regularity is unclear. The cross streets of Ferry and Warren provide access over to midtown, while Chene and St. Aubin lead to Eastern Market and the Riverfront. These main routes create a strong visual connection that will be influential to people's perception of the site.

Interstate 94 allows for easy truck access to the site, while also creating a strong boundary to the north/northwest. Dubois Street is a residential street that divides the site in two, and has been considered for the GLRI corridor and potential connection to the Dequindre Cut Greenway.

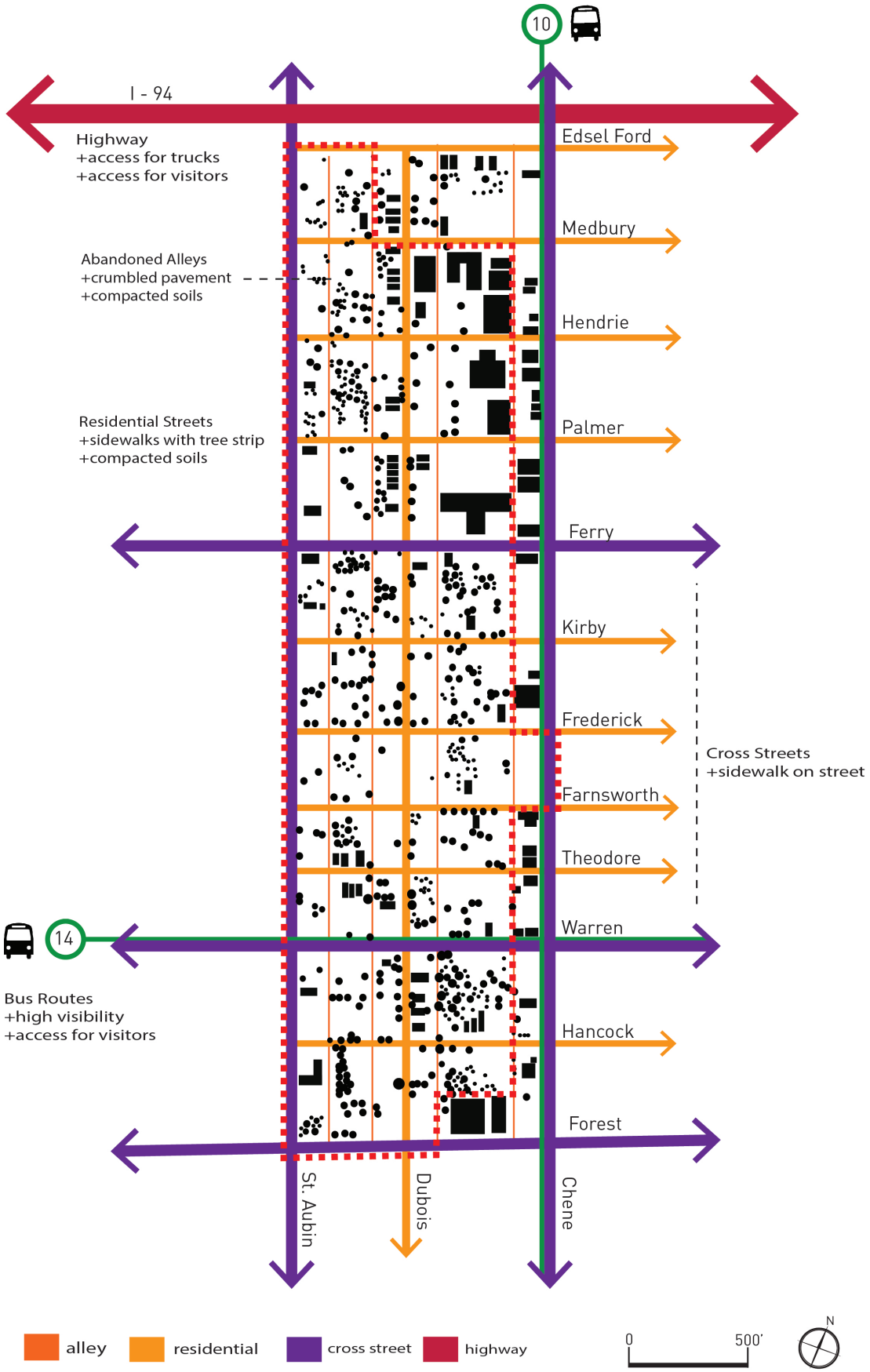


Figure 6.4 The roads that define the site have been heavily degraded over time

STRUCTURES

The distribution of structures on the site was studied to identify clusters of social activity. The existing houses and businesses on and around the property will be retained and respected to maximize community support, as decided by Mannik & Smith Group. Having a neighborhood of people who are invested in The Recovery Park Farm will be helpful to the organization. The existing houses on the site will be included in the master plan, and the design will be laid out to improve their views and protect them from flooding. The clustered businesses along the Chene corridor will share service access with the farm via the existing alleyways out back. This relationship with allow for a shared sense of security and efficient waste removal.

In the analysis, the structures were categorized as "residential", "institutional", "commercial", and "vacant". The condition of the properties was taken into account in the "cues to care" map, later in the report.

This process identified a number of clusters of residential properties scattered throughout the site, which created the feel of micro-neighborhoods. In some cases, a cluster of two to three houses had been bought up and maintained by one land owner.

A line of commercial structures along Chene is all that remains of the once thriving commercial corridor. A number of the buildings have littered interiors and are covered in graffiti, but are structurally sound. Many of the vacant properties have significant fire damage and are suggested for removal by the Motor City Mapping Initiative. The Chene-Ferry Market is in bad shape, but due to the high historical social value that it holds, it was considered a reusable structure worthy of reinvestment. The Raven Lounge & Restaurant is a well-loved bar that holds an annual outdoor music festival.

The site includes several religious, academic, and social institutions. A beautiful Baptist church anchors the northern end of the site and remains in use. The DAAS High School sits adjacent to the church in another yellow brick building. Downtown Boxing Gym on St. Aubin also holds a high social value within the community, so the design considers how this space can be improved and protected. The gym, established in 2007 by Khali Sweeney, offers a safe haven to over sixty youth community members by providing after-school transport, food, computers, tutoring, volunteer opportunities, and boxing workouts. The program boasts a 100% high school graduation rate of its members and has been an uplifting force for many families and children on the East Side of Detroit.

The identification of the structures informed the analysis of the spatial use of the site. The historic land use patterns were useful to identify a strategy to allow the current community to thrive, while integrating new productive uses.

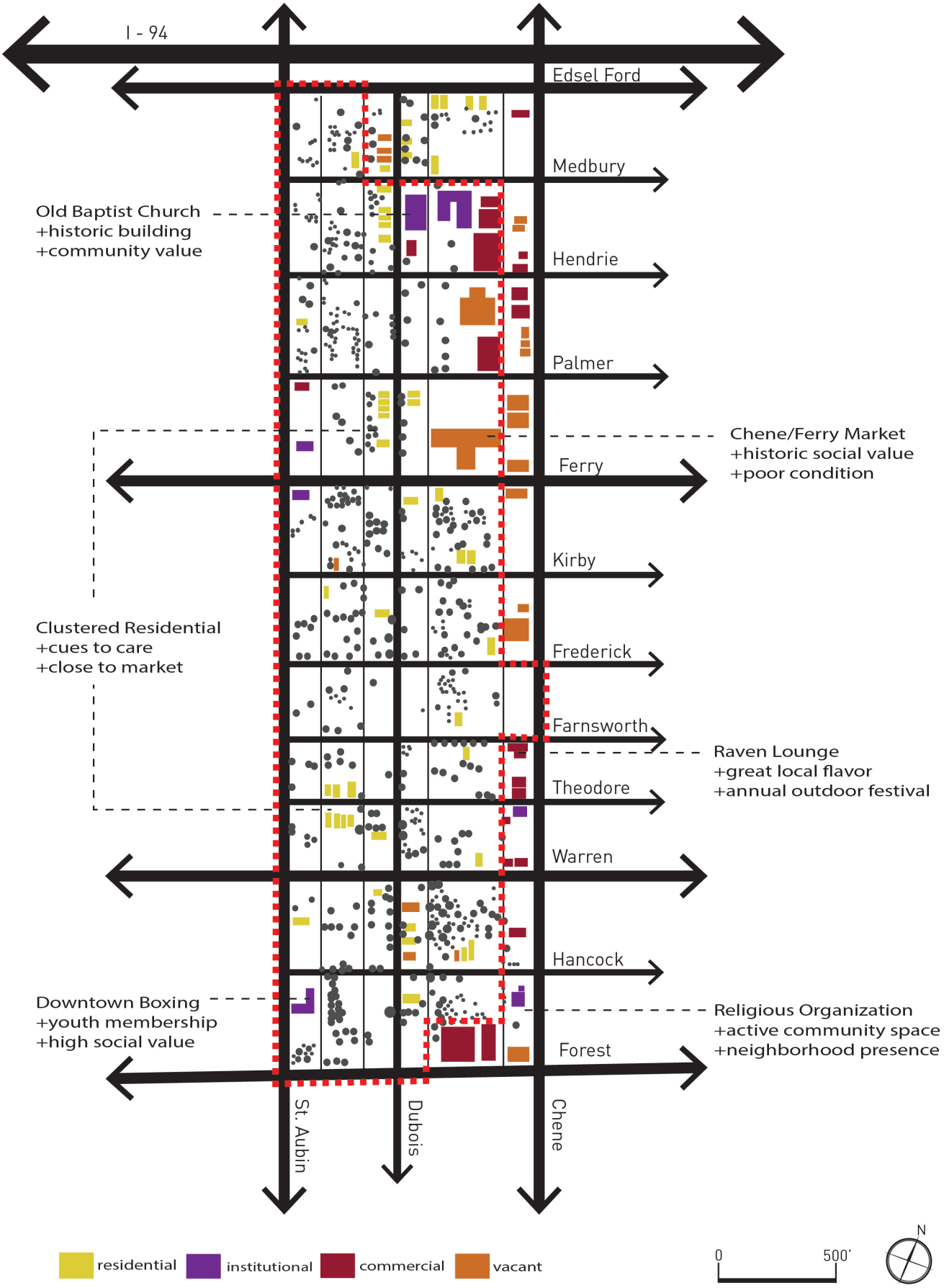


Figure 6.5 The visible structures on the site classified by use and condition

CUES TO CARE

An inventory of the cues to care on the landscape was performed to understand patterns of concentrated maintenance. Each structure was ranked 0-3 on visible care and the surrounding landscape was assessed for signs of maintenance, investment, or neglect. The structures were colored from yellow to red to display the degree of care. Structures with no visible signs of care were left black. The surrounding landscape was colored green to show obvious signs of care and purple for signs of neglect. Signs of care that were noticed most regularly include: mown lawns, trimmed shrubs, fresh paint, and fences. Common signs of neglect include: dumped trash, overgrown vegetation and fallen limbs, graffiti, broken windows, and fire damage.

The analysis indicated that there was a high degree of neglect in the northern commercial section of the site, while the southern section along Chene Street expressed more cues of care, including mown lawns, fresh paint, fences, and security signs.

The institutional properties all displayed many cues of care, including: mown lawns, fresh paint, fences, and potted plants. The boxing gym displays a freshly painted mural and a fenced in parking lot, although the surrounding meadow remained unmowed and disorderly.

Residential properties on the site expressed a range of care. Many types of care that require a high financial investment, such as new roofing and siding, were less prevalent than low-cost upkeeps, like mowing. In some cases, the houses expressed a high degree of care, including mown lawns, trimmed hedges, fresh paint, and seasonal decorations. Location of the cues was useful in laying out connections and new land uses. Zones of neglect were seen to hold high potential for greenhouses or new uses. The zones that currently expressed care, were identified as spaces that could be buffered or enhanced with new plantings.

0 The house is in visibly bad condition and displays signs of neglect including: peeling paint, broken windows, trash, unmowed lawn, overgrown vegetation, and graffitti.

1 The house appears lived in, but has not been well-cared for. The landscapes may display symptoms of neglect, but there is some indication of a property boundary.

2 The house displays cues of care, such as fresh paint and porch furniture. The landscapes may display symptoms of neglect, but there is some indication of a property boundary and sense of order.

3 The house displays active care, with fresh paint, clean windows, and a solid roof. The landscape is orderly, with a mowed lawn and trimmed hedges and plantings.

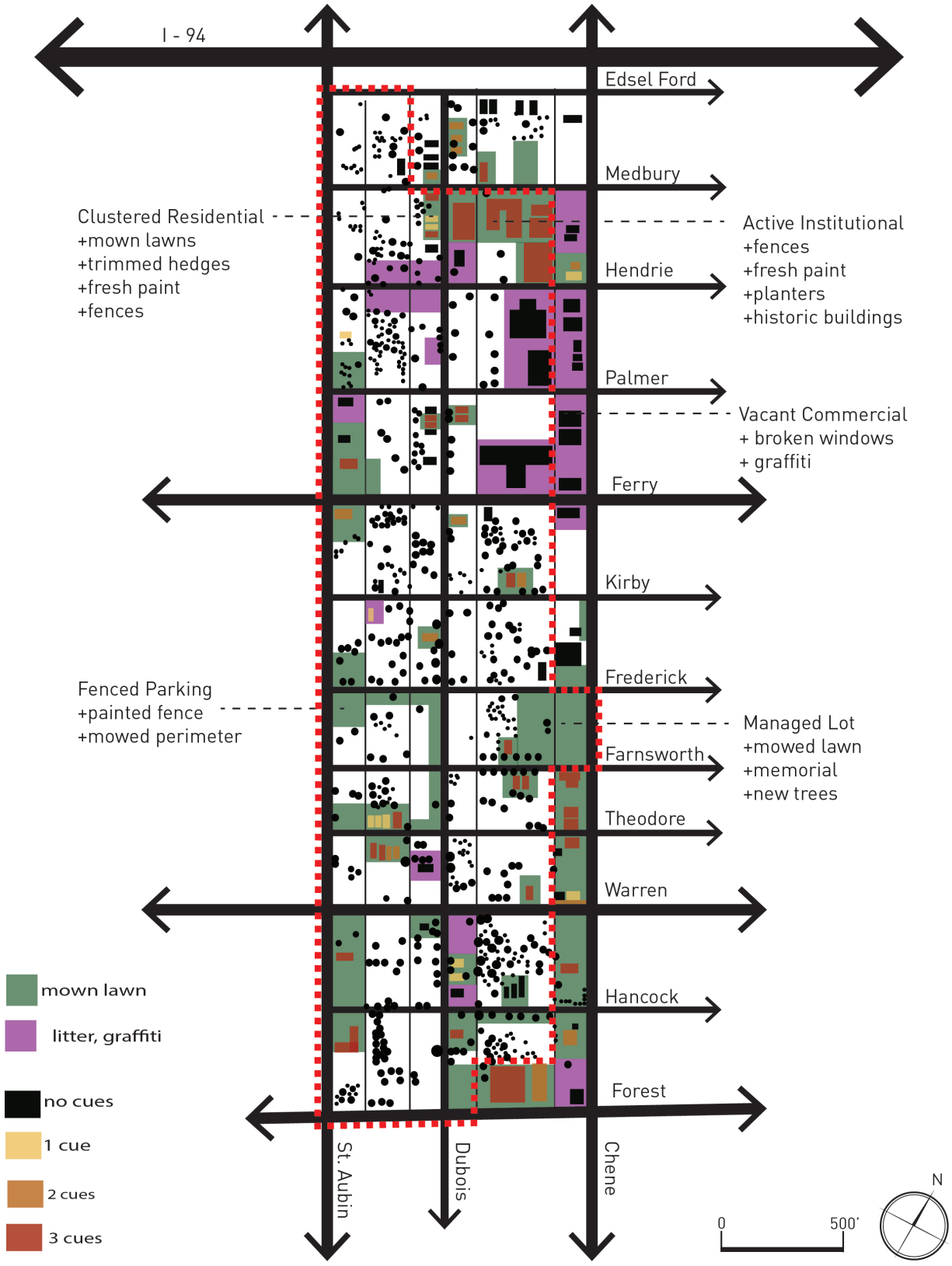


Figure 6.6 Visible signs of care on the site, as defined by Figure 3.8

INTEGRATED ANALYSIS

The site analysis information was compiled into one map that integrates the pieces that should affect the design of the Recovery Park Urban Farm. The overlay of physical and social characteristics of the site identify zones to add grow houses, protect trees, create community destinations, and construct a stormwater infiltration corridor. Through the process of creating an integrated analysis, a list of site opportunities and constraints were formed. This list serves to prioritize design decision and located places of overlap, where functions could be combined.

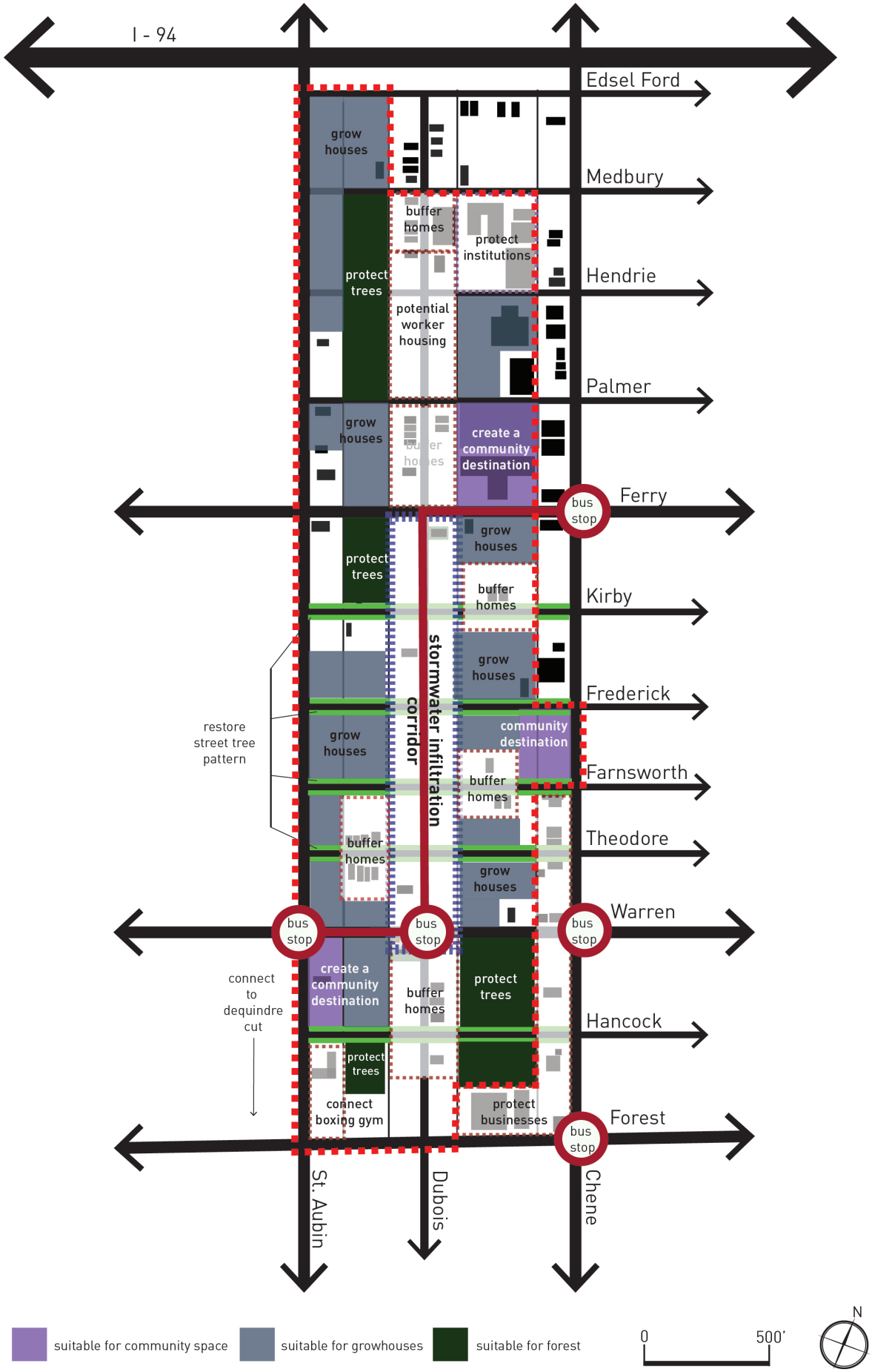


Figure 6.8 Integrated analysis of site features

Transport of Goods

The position of the site, in relation to the city neighborhoods and the highway makes it a valuable space for the delivery and transportation of goods. Separating the movement of trucks from the flow of neighborhood residents was a major consideration. The St. Aubin corridor is already used for trucks deliveries, which created a huge opportunity for overlap. It became clear that the layout of the greenhouses and wooded areas could be used to buffer this truck route from the residential clusters. With the Chene-Ferry Market as the hub of the space, the backside of the structure emerged as an obvious opportunity for pickup and delivery.

Residential Aesthetics

The historic pattern of houses in the neighborhood left clusters of houses, which create opportunities of efficiency and constraints of isolation. The clustering of the houses created an opportunity for efficient buffering from the greenhouse spaces, while making the connection of the entire neighborhood difficult. The remnant street tree patterns and sidewalks were used as corridors to unify the neighborhood and connect to the rest of Poletown, to the east. The design of bioswales and vegetated basins could be laid out to serve multiple houses at once, without creating barriers to pedestrian movement. The density creates an opportunity to use higher cost materials and more developed plant palettes in the highly visible locations near the houses. A break in the residential houses on the northern edge of the site creates an opportunity to add some worker housing. Since the workers will have barriers to transportation and housing, it could be an advantage for the organization to provide on-site housing on a temporary or permanent basis.

Social Spaces

The legacy of the Chene-Ferry Market creates a tremendous opportunity to revive a socially significant neighborhood asset. Although, the population around the market has shifted dramatically, the design and programming of the space could be very successful. With community assets, including the Downtown Boxing Gym, Academy of Arts and Sciences High School, and religious organizations, the market could begin to strategically design events.

Outdoor lawn spaces are abundant in Detroit, due to the prevalent vacant lots, but some vacant properties could be improved by programming of social functions. The lawn along Chene, which is currently used by the Raven Lounge & Restaurant, is used heavily for one weekend of the year. This creates a constraint, because it becomes uneconomical to maintain such a large space for such sparse use. An opportunity lies in the potential for these lawn spaces to be used by other organizations. With flexible programming and minimal management, the lawn spaces could begin to serve the rest of the neighborhood. The Downtown Boxing Gym has no usable outdoor space, so a safe place for people to exercise outside could be a beneficial addition. Trails for dog walkers through safe park spaces could be another function that would help meet the needs of the existing community.

Stormwater Infiltration

Stormwater infiltration components should be laid out as a connected system that fits into the neighborhood aesthetic. This requires the adoption of local materials, styles, and maintenance routines. The openness of the site creates many opportunities for the integration of swales and basins, with minimal disruption to the layout of the architecture or streets. The foundations and rubble from old houses, which could potentially impede water movement can be dealt with by designing a layout that is flexible in both form and function. This means that the water has multiple entrance and exit points in each segment of the system. The large amount of available space will make the installation of these features straightforward, but as the site evolves and the Recovery Park Urban Farm expands, it will be important for the infiltration basins to be flexible. This can be accomplished by developing a growth strategy for the farm based on the essential connectivity of the infiltration system.

The greenhouse workers will have a number of social needs that can be accommodated by the landscape. Spaces for people to sit and eat lunch, sit alone and contemplate, talk in groups, or engage in lawn games were all considered in the formation of the design. The proximity of the stormwater infiltration corridor to the potential grow house locations creates an opportunity for on-site water conservation. The interstitial spaces between the productive grow space and infiltration basins could be used as social gathering space for people on their breaks, or after work. The value of time spend in outdoor green space would be beneficial to everybody involved in the development. Happier and healthier workers will be more productive and have more ownership over the care of the property and surrounding landscape.

CONCEPT PLAN

The concept of 'cues of recovery' is used to develop the perception that the people and landscape are engaged in a restorative process that results in a life of structured growth and personal health. This concept stems from the idea of the 'halo effect' that is associated with the cues to care theory in order to generate a positive perception. 'Cues of care', including: mown strips, regularly spaced trees, educational signage, wildlife feeders, and orderly site furnishings are used to establish a cohesive visual pattern on the site. The arrangement of greenhouses and green infrastructure components responds to the analysis of the site to maximize the function of the space, while buffering the existing houses from potentially undesirable views. The community spaces are positioned near the bus stops and connected to the areas of high social value. The conceptual pattern of corridors of trees, patches of vegetation, and clusters of structures that provide opportunities for people to enjoy the benefits of a stress-reducing landscape that is maintainable and hydrologically functional.

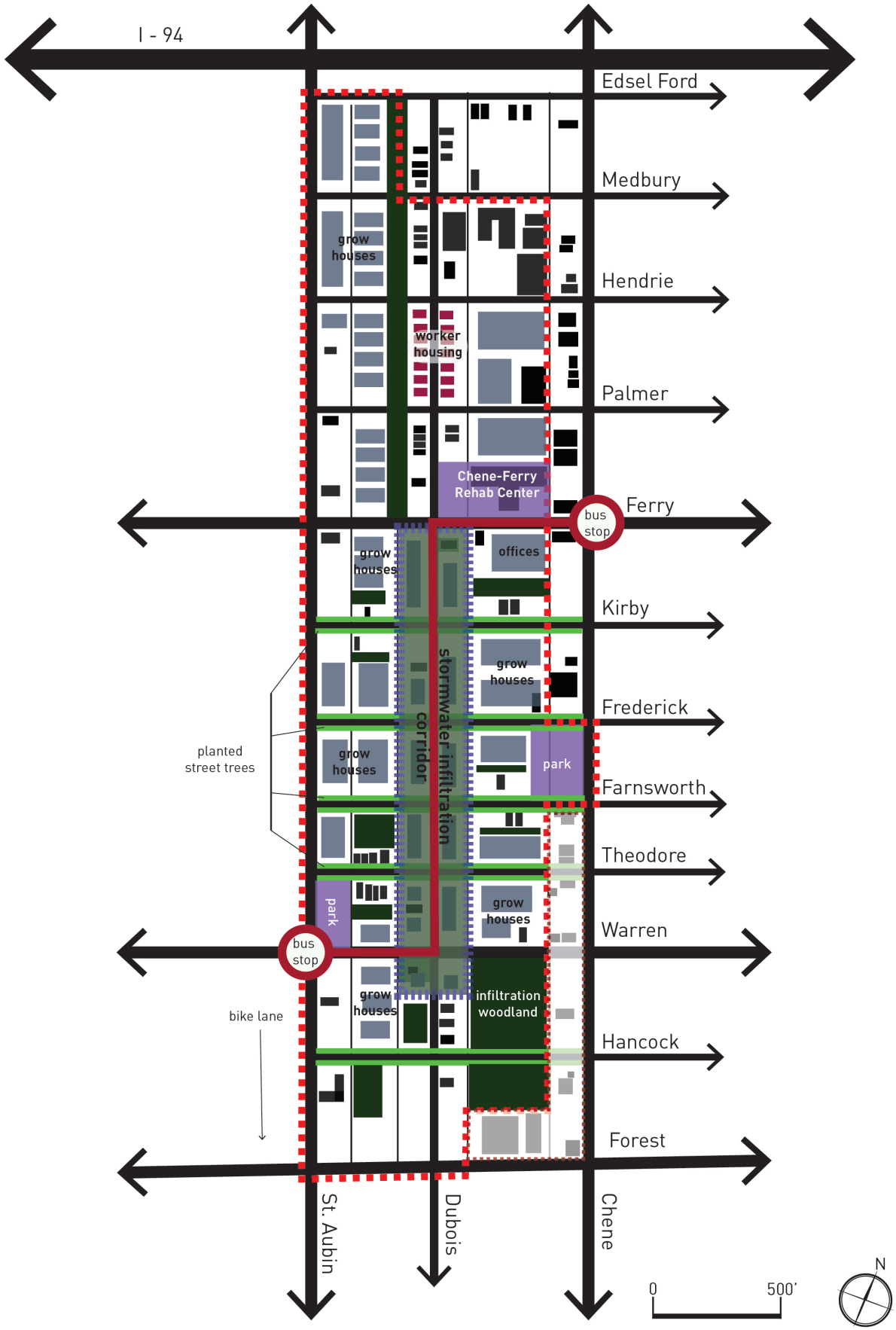


Figure 6.9 Conceptual layout of spaces on the site

MASTER PLAN

The master plan weaves together the Recovery Park Urban Farm, the Stormwater Infiltration Corridor, and the residential clusters to create synergies that allow space for growth and restoration. The main features of the site focus on the application of 'cues to care', restorative work environment, and multifunctional stormwater infrastructure.

The site is connected to the rest of the city by the Dequindre Cut bike lane to the south, a north/south bus line along Chene and an East/ West bus line on Warren. Regular patterns of street trees and sidewalks connect the blocks, which are broken into patches of forest, residential clusters, grow houses, and bioretention meadows and basins. The plan keeps the existing street grid functional, but leaves opportunities for street closure open to future development plans.

A number of typologies of were developed on the site to express these concepts and create a connected plan for the development. The following concepts are detailed in the upcoming pages:

1. Vegetation Patterns
2. Stormwater Infiltration System
3. Recovery Center
4. Restorative Workspace
5. Neighborhood Street

These ideas were developed to inspire community goals founded in well-being, community preservation, and environmental health. Ideally, the supervising design team would adopt the plans and work with SHAR to create an environment that supports their needs and takes an acceptable style, in addition to meeting the stormwater requirements. By including the community in the site programming and design, they may be more likely to approve to the aesthetic and maintain the care of The Recovery Park Urban Farm. Due to this, the master plan serves as a framework to display a number of alternative spatial patterns, edge treatments, and stormwater catchment forms, which can be developed further in the planning process and implementation.

Figure 6.10 Master Plan

VEGETATION PATTERNS

The design creates a multifunctional stormwater infiltration corridor, connected neighborhood, and restorative work environment through a network of vegetated edges that embody the concept of 'cues of recovery'. The vegetated edges are used to visually separate uses, infiltrate water, create restorative spaces, and generate a community aesthetic of care and recovery. The following types of buffers are used to make the site design safe, aesthetically pleasing, and maintainable.

The tree lined edge is used to create a filtered separation of two adjacent elements, such as a roadway and sidewalk. The height of the canopy relates to the need for cars and people to pass underneath. The historic street tree pattern of mid-size trees with open canopies is used to define the cross streets, such as Warren and Ferry, while taller trees are use along St. Aubin and Dubois. This pattern differentiates the flow of traffic based on speed, accommodates for trucks, and minimizes shadows cast over the grow houses. Ideally, the surviving Gleditsia would be preserved, but a diversity of tree types would be filled into the pattern to promote resilience to disease and climate change. Additionally, the tree lined edge is utilized to create an evergreen screen between greenhouses and residences, in areas that are short on space.

The hedge is used in spatially constrained situations to create an abrupt barrier between incompatible land uses. In situations where one well-cared for house makes the addition of multiple greenhouses difficult, a hedge can be used to create a strong visual separation, without infringing on either volume of space. The cost and visual impact of the hedge is less desirable than the alternatives, so it was seen as a last resort. In most cases, an evergreen hedge was chosen to provide year round screening.

Mown strips are used around the edges of spaces that could be perceived as messy or disorderly in order to highlight that they are intentional. The mown strips will be scaled to the adjacent elements to maintain comfortable proportions for human movement. In the case of a meadow, one pass with a ride on mower will create a mown strip that is 48" wide. The forested areas will require two passes with the mower to create a strip that is 96" wide.

The forest is used to create a greater degree of separation between incompatible land uses. Existing successional vegetation will be infilled with native trees to establish forests of trees that require minimal care and provide a strong visual boundary. The terrain on these forests will be altered to expand upon the existing pattern of mounds and create more visual separation. The forest typology is spatially intensive, so it is used in situations that benefit multiple stakeholders, such as separating clustered houses from rows of grow houses. The edges of the forest can be used as gathering spaces or for playful exploration, but the intention is that they are soft barriers that create distance between uses.

Walking woodlands, are forested spaces adjacent to the outdoor gathering spaces. These wooded areas create space for workers to retreat and experience individual contemplation. The understory will be largely cleared, to maintain safety, but the canopy of trees and woodchip groundcover will create the sensation of prospect and refuge, which supports individual restoration.

Meadow plantings are used to allow for views and sunlight to occur on parcels of land. They were designed on lots where potential redevelopment could occur, including gaps in clusters of houses. The seasonal diversity of the meadows creates cyclical patterns that engage people in the landscape. Grasses and wildflowers make up the majority of these meadows, and occasional burnings may be used to reduce any invasive plants that occur.
Infiltration meadow plantings are used in the bioretention basins and swales. These plantings resemble the meadows and use plants that can tolerate periods of intense moisture or saturation.

Vegetated edges embody the 'cues of recovery' concept, which applies a positive community perception to the workers of the farm, the homes in the neighborhood, and the revival of the Chene-Ferry Market. Tree lined streets, forested patches, meadows, and open parks create a variety of spaces for the community to enjoy their neighborhood.

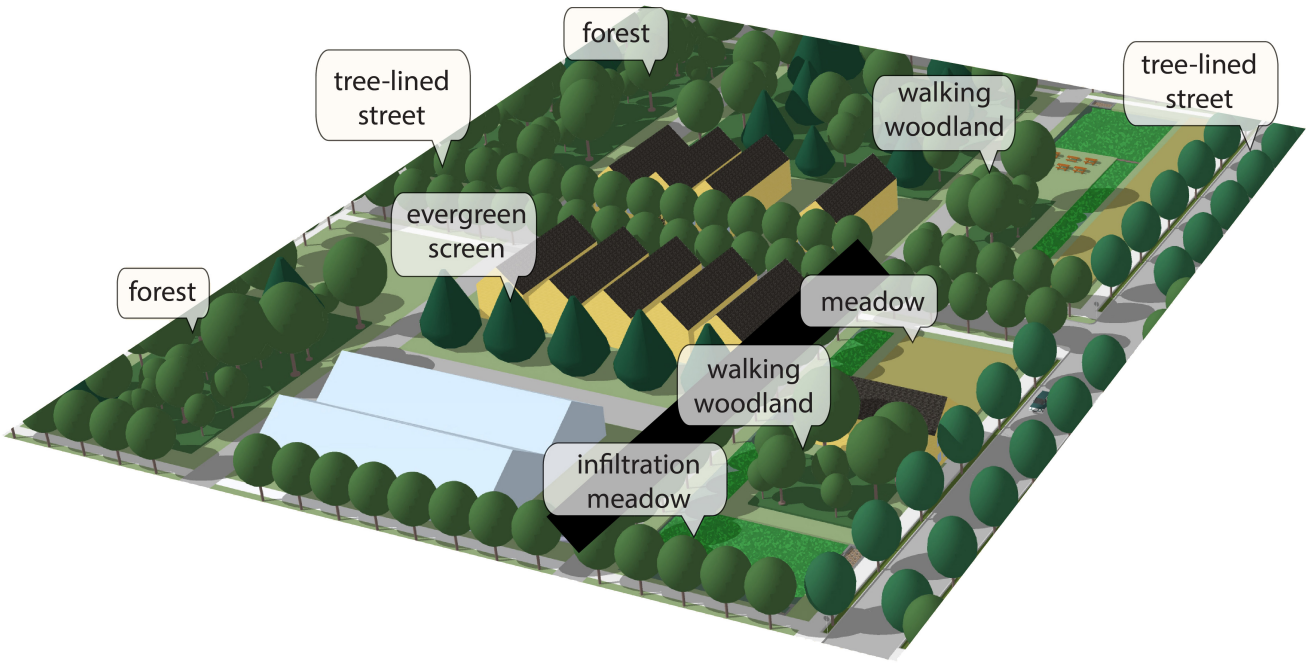


Figure 6.11 Patterns of vegetation serve to create a neighborhood aesthetic, infiltrate water, and direct views

STORMWATER INFILTRATION SYSTEM

The Recovery Park Urban Farm workplace is separated from the neighborhood with views across bioswales and bioretention basins connect the people of the neighborhood with the process of stormwater infiltration. Outdoor gathering spaces are nestled into the stormwater meadows, which provide a restorative and stress-relieving outdoor experience for the workers.

The stormwater infrastructure collects, cleans, reuses, and infiltrates runoff from rooftops, paved surfaces, and lawn areas. The cisterns, swales, and basins are designed as a connected system that allows overflow to move along the corridor to maximize the potential for infiltration.

The water from the greenhouse rooftops is collected in gutters and piped into cisterns for reuse in toilet flushing and irrigation. The cisterns overflow into the bioretention basins, in large storm events.

Runoff from the roads flows through curb cuts, sediment traps, and bioswales to remove suspended solids, before it enters the large vegetated infiltration basins. The infiltration basins are full of perennial grasses, flowers, and shrubs that encourage infiltration and cause the water to infiltrate in under 24 hours. The specific plants used relate to the types of pollutants that are identified in a water quality survey.

Sheet flow from the lawn areas and meadows flows directly into the bioswales and infiltration ponds, although in most cases, it would infiltrate through the permeable surfaces, before reaching the basin

Permeable pavement is used in the parking areas surrounding the greenhouses, which allows for some infiltration and creates visual appeal.

If the large bioretention basins were to fill up, an overflow pipe ties back into the combined sewer system under the road.

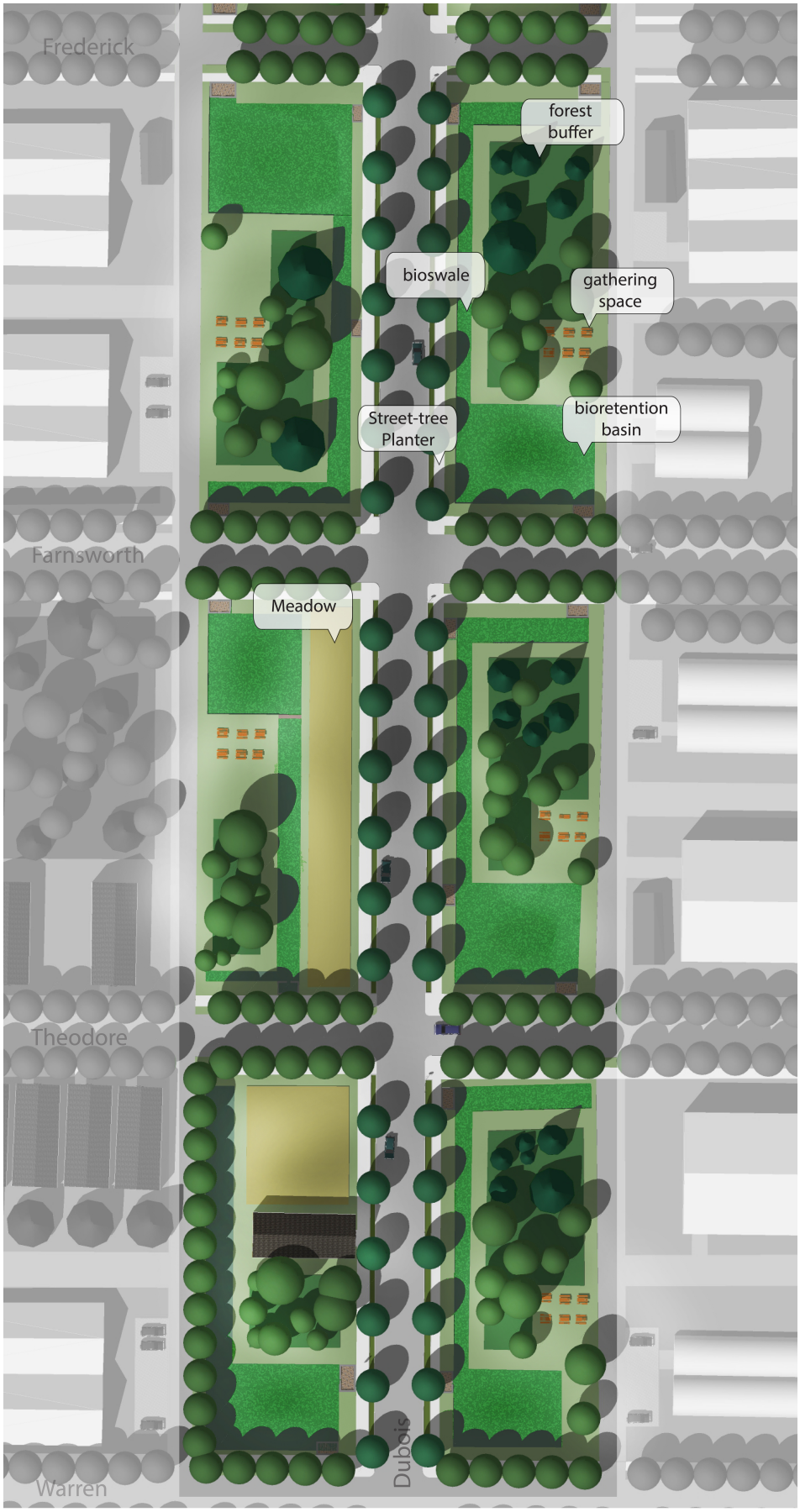


Figure 6.12 Stormwater components form a system that captures and infiltrates site runoff

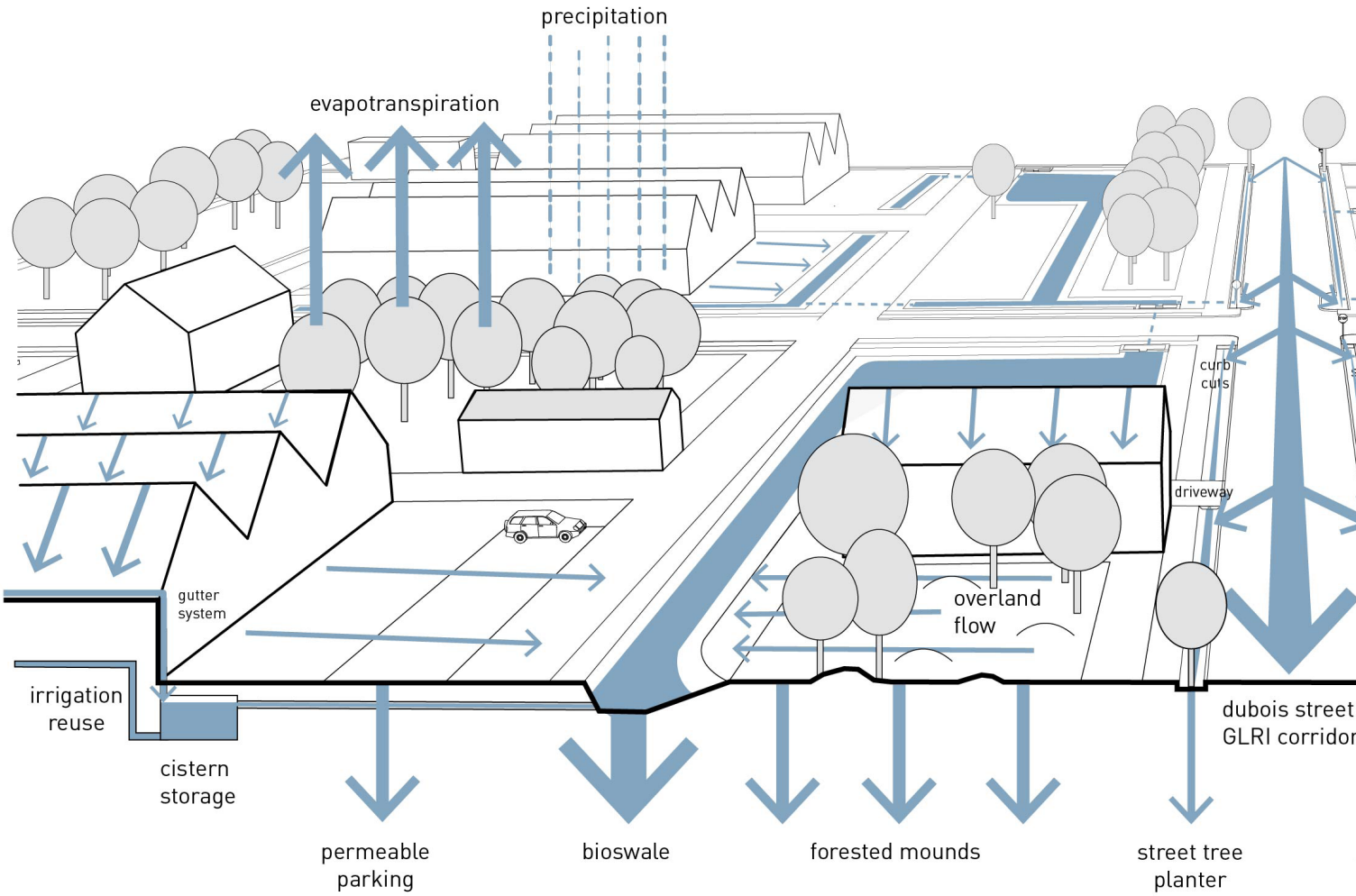
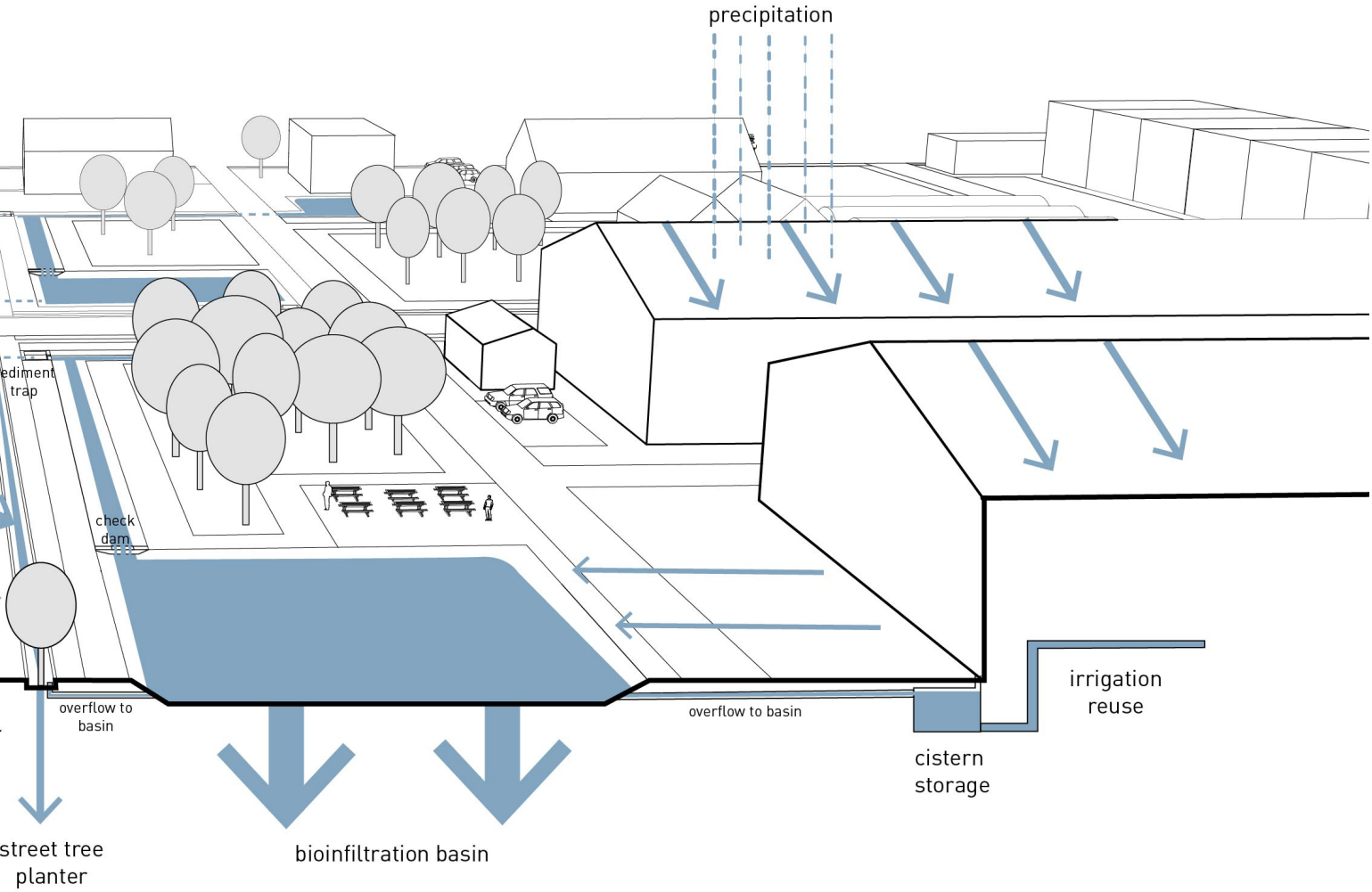


Figure 6.13 The stormwater corridor functions to infiltrate water and provide gathering spaces for the workers and community members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bioinfiltration basin

RECOVERY CENTER

The Chene-Ferry Market is revitalized as a community destination at the top of the Dequindre cut greenway. The restoration of the historic structure creates a strong tie to the culturally significant location of the past, while motioning toward the bright future of the neighborhood. The building and surrounding grounds function as space for the workers to undergo restorative activities and therapy to aid in their recovery. A structure to the south, houses office space for Recovery Park, as well as storage for event and farming supplies. The convenient access to the bus line, proximity to the highway, and adjacency to the grow houses and stormwater corridor make the market feel accessible and connected.

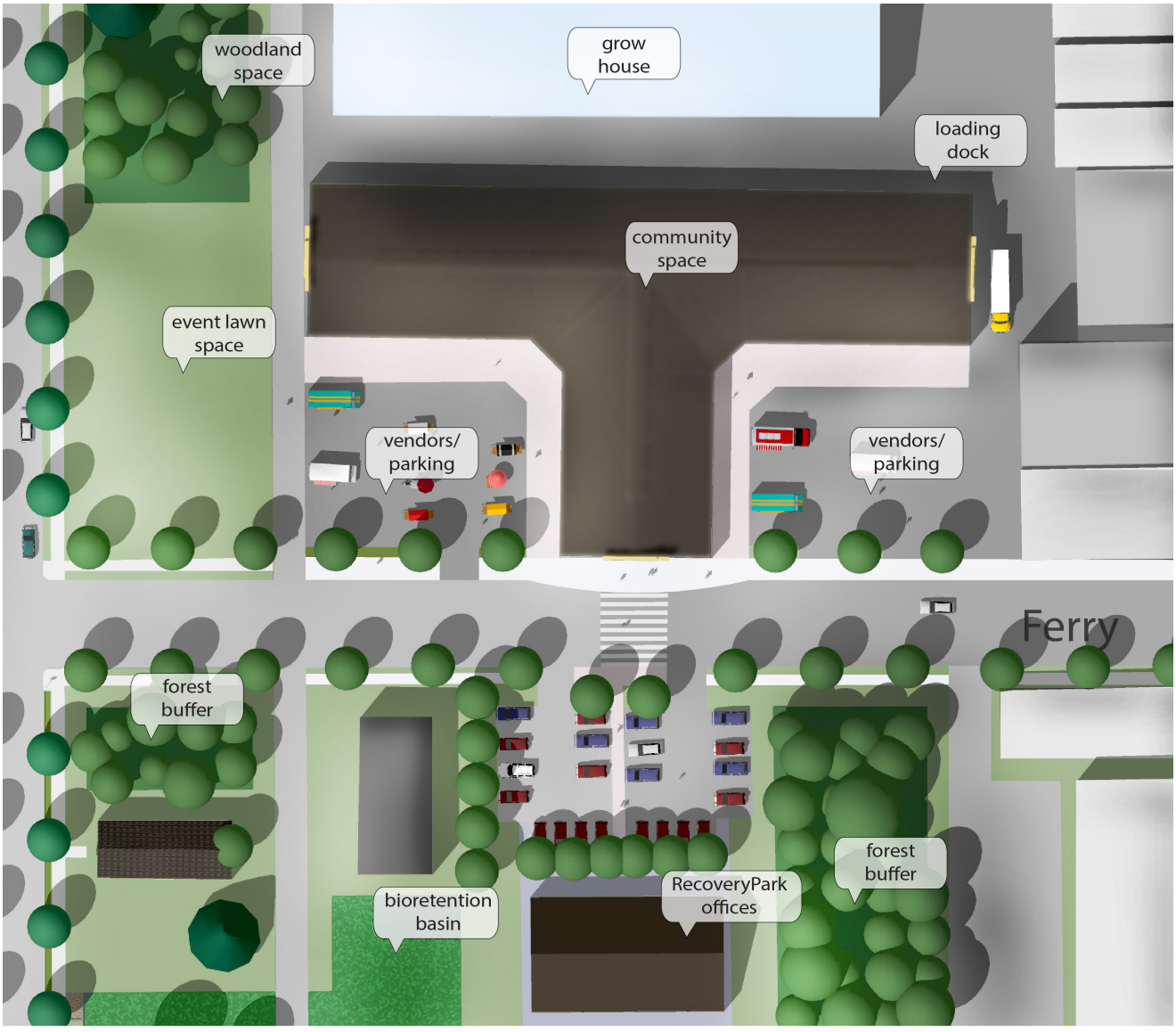

Figure 6.14 The plan of the Chene Ferry Market allows it to function as the hub of the park

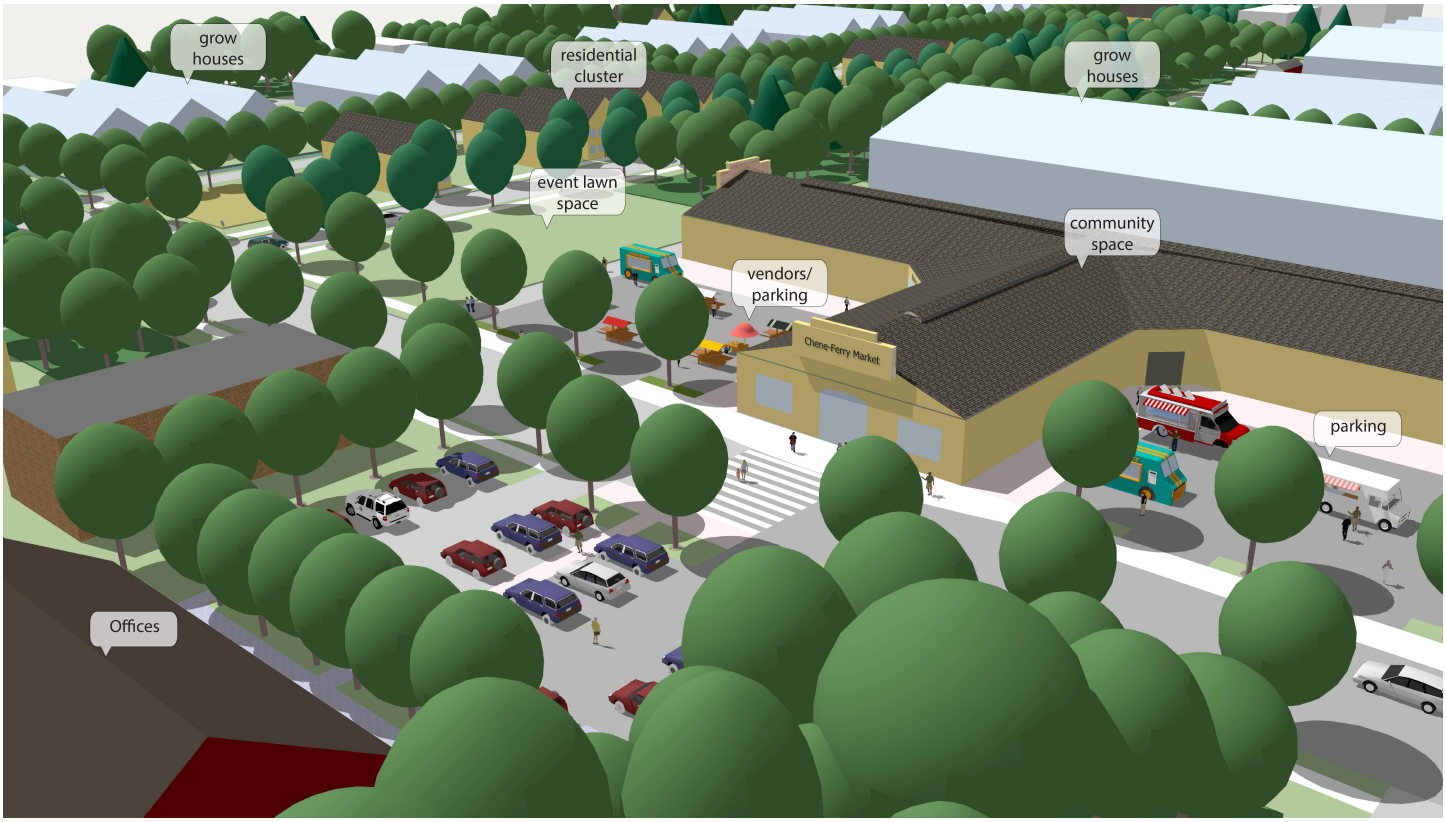

Figure 6.15 A series of multifunctional spaces allow for events, parking, and deliveries to the marketplace, which has been restored and reprogrammed

RESTORATIVE WORKPLACES

The workplaces utilize the green infrastructure corridor to create access to outdoor places to gather, which can contribute to a positive work environment that reduces stress and improves quality of life. The greenhouses each feature:

1. Permeable parking lot
2. Storage shed and bathroom
3. Outdoor picnic space with views of nature
4. Trails through a vegetated woodland for individual reflection

The outdoor gathering spaces were designed by incorporating elements that the research suggested would be positive, including:

1. Views of the sky and natural areas
2. Variable planting patterns that mimic natural settings and encourage wildlife
3. Areas of refuge that allow views out
4. Locations for social interaction and personal reflection

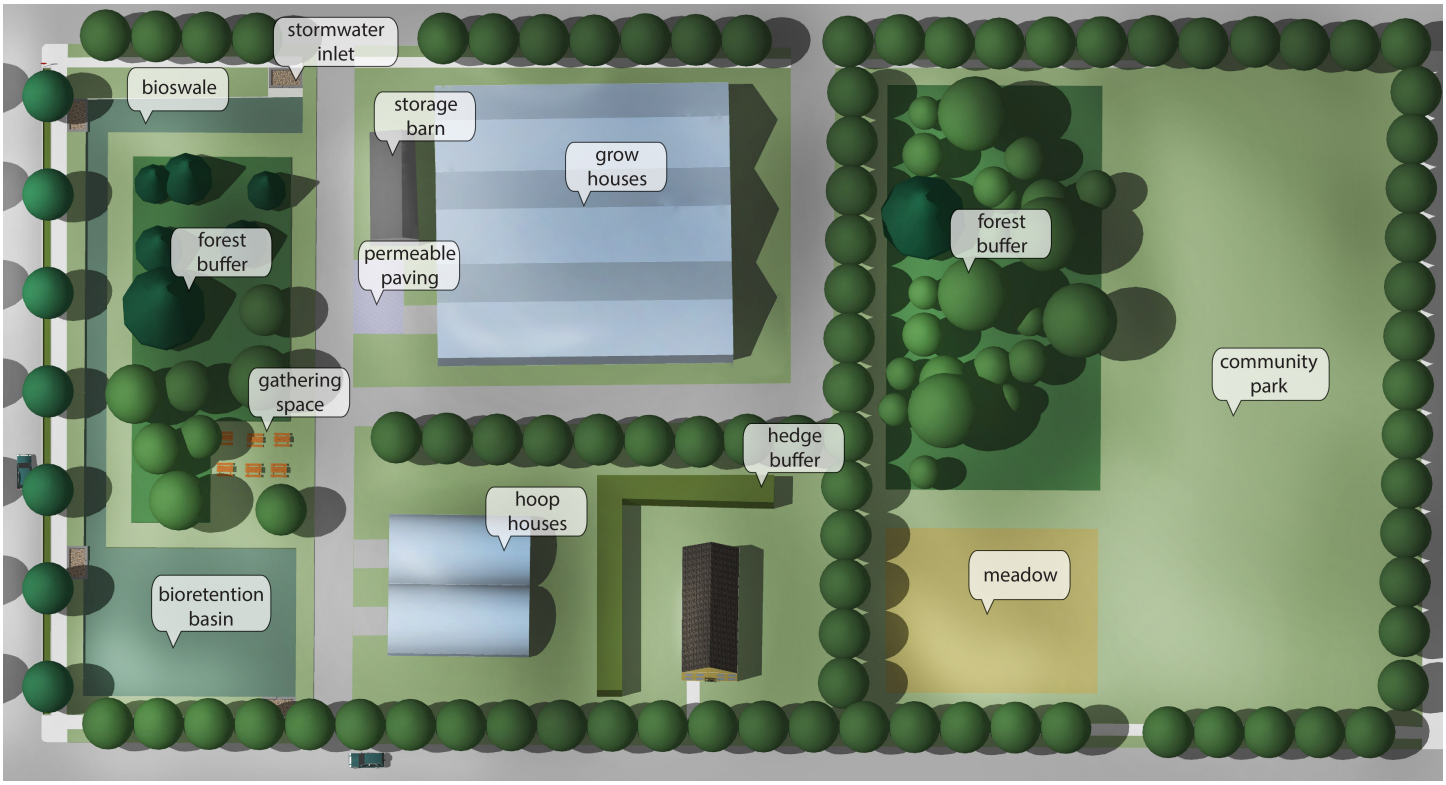

Figure 6.16 The layout of the work environment maximizes opportunities for restorative behavior , while minimizing a negative impact on the surrounding houses

The elements are positioned on the site to minimize negative views of greenhouses from the residential area and roads, while maximizing exposure to sun. The old alleyways are reused to create access to the work spaces. Mown strips, informational signage, and wildlife feeders around the bioretention basins and forest buffers serve as a 'cue to care' that highlight the environmental functions.

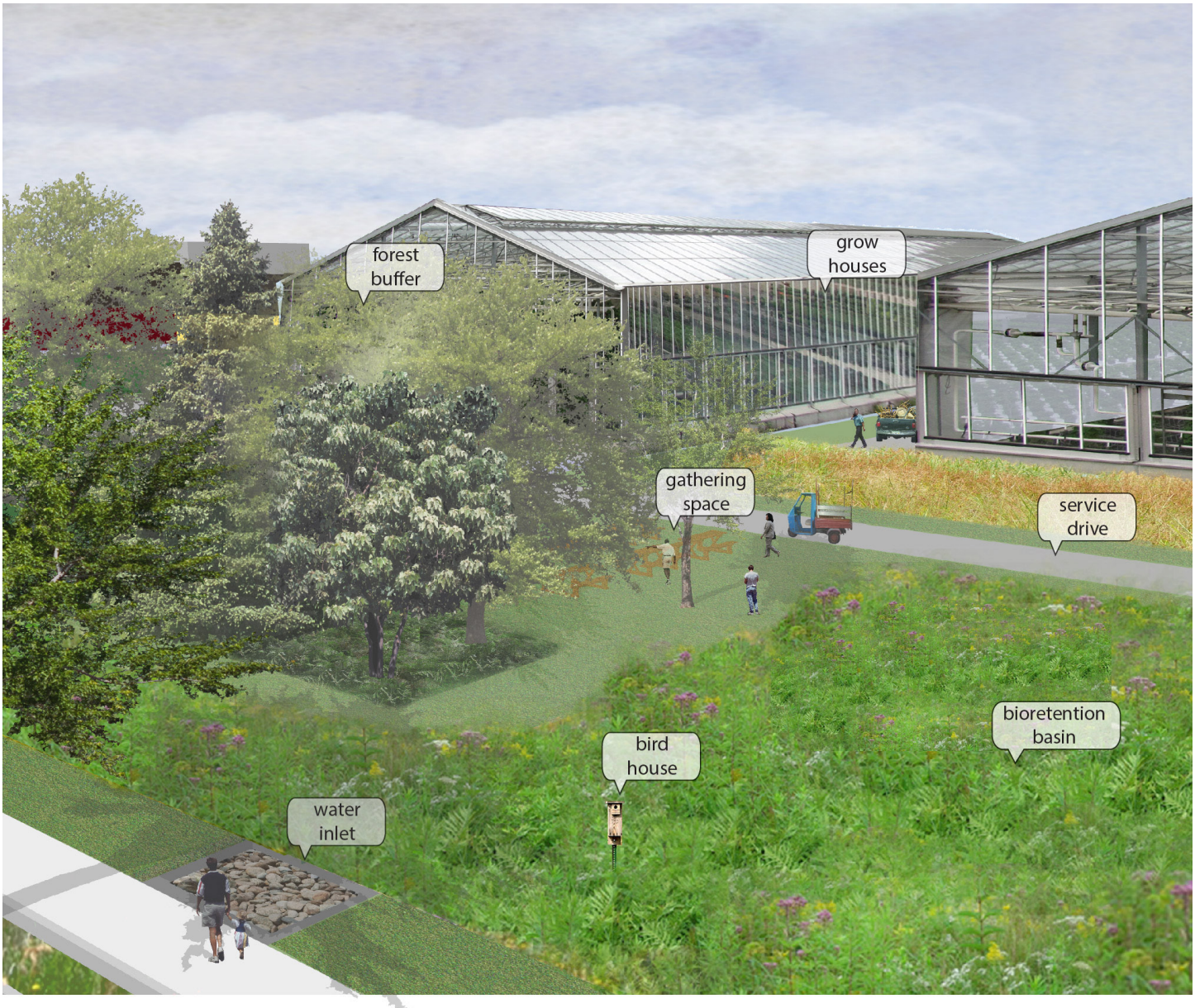

Figure 6.17 The stormwater corridor and the work environment overlap for multiple benefits

Neighborhood Streets

The streetscape includes a variety of different edges that are unified with lines of evenly spaced street trees and mown strips of turf. The greenhouses are separated from the main roads by forest buffers, meadows, and bioretention basins. The mown strips of turf along the sidewalks indicate that the landscape is being intentionally managed. The meadows and forest buffers require minimal maintenance, and create a repeated pattern throughout the neighborhood.

Figure 6.18 The neighborhood streets are lined with trees that separate the sidewalks from the road and create a uniform aesthetic.

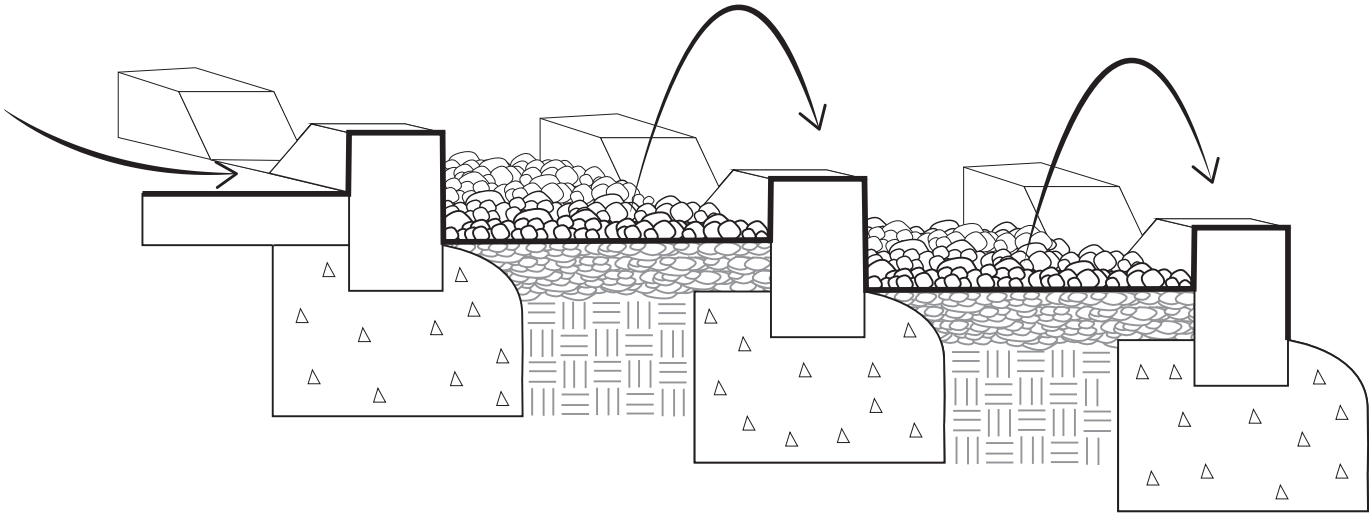

Figure 6.19 A system of check dams and gravel basins slow the runoff and remove sediment at the entry points on some of the bioswales

Figure 6.20 The streets separate people from cars with a line of street trees that unify the neighborhood

CONCLUSIONS

This study of The Recovery Park Urban Farm developed a design that was rooted in concepts of green infrastructure, environmental perception, and restorative environments. This approach worked to integrate the three concepts into a working landscape plan targeting community acceptance and stormwater infiltration. By limiting the design focus to these categories, the concept of multifunctional green infrastructure was achieved and a functional site plan was formed.

The foundational study of literature proved to be useful in the creation of spatial typologies for the site. The readings on restorative environments and 'cues to care' offered the most literal translations from concept to special quality. The background study on green infrastructure gave insight in how to understand a site and select functional components. The scope of the study limited the exploration of other functions of green infrastructure, including: wildlife habitat, clean energy generation, and other possibilities.

The design process was effective in applying a concept rooted in background studies to the site. The methods of representation were able to give a good sense of the patterns occurring on the ground, without a fine scale plan of the entire 88 acres. The use of layered analysis maps and diagrams, allows the work to continue to develop as the design process progresses. It is hoped that the community and workers will be allowed to participate in the remainder of the design process, which may help to customize the spaces and build community acceptance.

The scale of the site limited the detail that could be included in the plan, with the given timeframe and available information. This caused the design to describe a typological approach that could be developed further on a block by block basis, as more site information is collected. More detailed topographic information, water testing, and soil infiltration tests will be useful in the creation of the final construction documents. Due to the relatively flat and open nature of the site, the plan should provide an excellent start to spatial organization of elements to achieve the objective.

The site master plan was developed under the assumption that the existing street grid would be preserved. This constraint limited the form and connectivity of the stormwater system and vegetated green spaces. With the dramatic transformation of the city, it is possible that this constraint could be lifted and the blocks could begin to connect together to create a more contiguous parcel. This is already possible on Farnsworth Street, but all of the other streets would restrict access to houses.

As the Recovery Park Urban Farm Continues to develop, it will be important for it to stay connected to the context and offer multiple benefits for the workers and the surrounding community. Hopefully, many of these benefits will be linked to the qualities of restorative work environments, ‘cues to care’, and multifunctional green infrastructure.

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