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# Proctor Creek's Boone Boulevard Green Street Project Health Impact Assessment (HIA)

## Atlanta, Georgia


Office of Research and Development and Region 4
U.S. Environmental Protection Agency

# Proctor Creek's Boone Boulevard Green Street Project Health Impact Assessment (HIA)

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**Acronyms**

| *Acronym* | *Description* |
|---|---|
| AADT | Annual Average Daily Traffic |
| ACS | American Community Survey |
| ADD | Attention deficit disorder |
| ADHD | Attention deficit hyperactivity disorder |
| APD | Atlanta Police Department |
| ARC | Atlanta Regional Commission |
| BLS | U.S. Bureau of Labor Statistics |
| BMP | Best management practices |
| CDC | Centers for Disease Control and Prevention |
| CO | Carbon monoxide |
| CPTED | Crime Prevention Through Environmental Design |
| CSO | Combined sewer overflow |
| dB(A) | A-weighted decibels |
| DNA | Deoxyribonucleic acid |
| DOE | U.S. Department of Energy |
| DOT | U.S. Department of Transportation |
| DWM | Department of Watershed Management |
| EPA | U.S. Environmental Protection Agency |
| EJ | Environmental justice |
| ER | Emergency room |
| FC–DHW | Fulton County Department of Health and Wellness |
| FEMA | Federal Emergency Management Agency |
| FHWA | Federal Highway Administration |
| GA | State of Georgia |
| GA─DNR | Georgia Department of Natural Resources |
| GA─DOT | Georgia Department of Transportation |
| GA─DPH | Georgia Department of Public Health |
| GA─EPD | Georgia Environmental Protection Division |
| GIS | Geographic Information System |
| GHPC | Georgia Health Policy Center |
| HIA | Health impact assessment |
| HIA-CLIC | Health impact assessment clearinghouse learning and information center |
| HIPAA | Health Information Portability and Accountability Act |
| HIV | Human immunodeficiency virus |
| HUC | Hydrologic unit code |
| HUD | U.S. Department of Housing and Urban Devleopment |
| IAIA | International Association of Impact Assessment |
| IRB | Internal Review Board |
| LiDAR | Light Detection and Ranging (satellite) |
| MARTA | Metropolitan Atlanta Rapid Transit Authority |
| MPH | Miles per hour |
| MVC | Motor vehicle crashes |
| NACCHO | National Association of County and City Health Officials |
| NAAQS | National Ambient Air Quality Standards |
| NAICS | North American Industry Classification System |
| NCDC | National Climatic Data Center |
| NERL | National Exposure Research Laboratory |
| NHD | National Hydrography Dataset |
| NHTS | National Household Travel Survey |
| NHTSA | National Highway Traffic Safety Administration |
| NLCD | National Land Cover Database |
| $NO_2$ | Nitrogen dioxide |
| NOAA | National Oceanic and Atmospheric Administration |
| NPU | Neighborhood planning unit |
| NRC | National Research Council |
| NY | State of New York |
| $O_3$ | Ozone |

| *Acronym* | *Description* |
|---|---|
| OASIS | Online Analytical Statistical Information System |
| OEJ | Office of Environmental Justice and Sustainability |
| OPM | Office of Policy and Management |
| ORA | Office of the Regional Administrator and Deputy Regional Administrator |
| ORD | Office of Research and Development |
| PM | Particulate matter |
| PNA | Proctor Creek/North Avenue |
| POS | Public, open space |
| RCRA | Resource Conservation and Recovery Act Division |
| RESES | Regional Sustainable Environmental Science Research Program |
| SCI | Strategic Community Investment |
| SHC | Sustainable and Healthy Communities Research Program |
| $SO_2$ | Sulfur dioxide |
| SoVI | Social Vulnerability Index |
| SSO | Sanitary sewer overflow |
| STARS | Sustainable Transportation Analysis and Rating System |
| TMDL | Total Maximum Daily Load |
| TRB | Transportation Research Board |
| TWI | Topographic Wetness Index |
| UCLA | University of California, Los Angeles |
| UHI | Urban heat island |
| UN | United Nations |
| USDA | U.S. Department of Agriculture |
| USGS | U.S. Geological Survey |
| VMT | Vehicle miles traveled |
| VOC | Volatile organic compounds |
| WAWA | West Atlanta Watershed Alliance |
| WERF | Water Environment Research Foundation |
| WHO | World Health Organization |
| WNV | West Nile Virus |

# Executive Summary

## About the Health Impact Assessment (HIA)

Most areas within the City of Atlanta, Georgia use a combined sewer system in which stormwater and sanitary sewer discharge flows together, through an underground conveyance system, to a treatment facility. During periods of heavy rainfall or snow, however, these systems bypass the treatment facility and discharge directly into a nearby waterbody. This event is called a combined sewer overflow (CSO) event. Many rivers and streams in the Atlanta metropolitan area are on the state's impaired waters list due to CSO events and stormwater runoff from urban areas [1]. Proctor Creek is one of the most impaired waters in metro-Atlanta and drains a watershed of approximately 10,198 acres of urban area before discharging into the Chattahoochee River. A watershed is the area of land where all of the water that is under it or drains off it goes into the same place.

The U.S. Environmental Protection Agency (EPA) is evaluating tools and technologies that support communities becoming more sustainable. Implementing green infrastructure, an EPA-supported technology, is an example of using sustainable solutions to an array of environmental issues. In 2012, EPA awarded funding to the City of Atlanta Department of Watershed Management (DWM) for technical assistance to develop a conceptual plan to implement green infrastructure in a distressed neighborhood. The purpose of the technical assistance was to provide support for water quality and revitalization improvement efforts. Tetra Tech, a contractor to the EPA, developed a conceptual plan, titled the Boone Boulevard Green Infrastructure Conceptual Design (i.e., Green Street Project), located in an at-risk community in the headwaters of Proctor Creek [2]. As a demonstration project, the proposed project will convert underutilized roadway into in-ground planter boxes and permeable pavement along Boone Street and redirect stormwater runoff from the roadway into rain gardens prior to entering the combined sewer system.

**Why was a Health Impact Assessment performed?**

EPA's Office of Research and Development (ORD) is considering health impact assessment (HIA) as one of the many tools to provide science-based resources and information for community-driven initiatives. This HIA is informing DWM's decision on implementing the proposed Green Street Project as they move forward in the planning process.

**Who performed this HIA?**

Staff in EPA ORD and Region 4 (Southeast) partnered to lead the HIA. These partners established the HIA Core Project Team, which was made of EPA staff and contractors, an HIA advisor, a staff member from the Fulton County Department of Health and Wellness, two researchers from the Centers for Disease Control and Prevention, and a university student who was also a resident in the community. The HIA Core Project Team conducted the HIA with input and guidance from community residents and an HIA Technical Advisory Group, which was made up of representatives from several stakeholder groups.

**What methods were used in this HIA**

HIA is "a systematic process that uses an array of data sources and analytical methods and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program or project on health of a population and the distribution of those impacts within the population. HIA provides recommendations on monitoring and managing those effects" [3]. HIAs follow a systematic, six-step process– S*creening, Scoping, Assessment, Recommendations, Reporting,* and *Monitoring and Evaluation*.

The assessment utilized:

- ✓ Pre-existing and publically available data (e.g., Census data, crime data, reports, etc.)
- ✓ Standardized and rigorous analysis methods
- ✓ Geographic information systems (GIS) support for modeling, mapping and performing spatial analyses
- ✓ Review of empirical, science-based literature
- ✓ Expertise from local public health professionals, researchers and other stakeholders
- ✓ Measureable (quantitative) and relative (qualitative) characterization of impacts

**What was the scope of this HIA?**

This HIA evaluated how the proposed project would influence twelve determinants of health (i.e., factors that affect health), including water quality; flood management; climate and (surface) temperature; air quality; traffic safety; exposure to greenness; exposure to urban noise; accessibility to goods and services, greenspace and healthcare; crime, including both perceived and actual security; social capital, including both cognitive and structural capital; household economics, specifically cost of living and employment; and community economics, specifically business performance. A half-mile radius around the proposed project site represented the study area in which the health impacts were appraised.

## Main Findings and Recommendations of the HIA

**Who would be affected by the proposed project?**

According to the 2010 Census, there were 13,194 people living within a half-mile radius of the proposed project site- a 15.6% decrease from a decade earlier, indicating movement out of the community. The population was almost exclusively African American (82.3%), with Caucasian being the second most populous (12.4%) [4]. Information on the health status of this population was only available at the county level. According to the Community Health Needs Assessment Dashboard [5], the most common reasons for emergency room visits in Fulton County, Georgia (2008-2012) were related to mental and behavioral disorders (#1), asthma (#2), and assault (#3). For children, ages one to nineteen years, the most common cause for emergency room visits was unintentional injury. The most common causes of death among African Americans in Fulton County were hypertension and related chronic disease (#1), mental and behavior health disorders (#2), and human immunodeficiency virus (HIV; #3). The leading causes of death among African American children in Fulton County were assault and injury from motor vehicle crashes. The leading causes of death among Caucasians in Fulton County were mental health and behavioral disorders (#1), Parkinson's disease (#2), and HIV (#3). The most common causes of death for Caucasian children were motor-vehicle crashes, congenial disease, cancer (i.e., malignant neoplasm of the nervous system), and HIV.

**How would the proposed project affect health in the community?**

The twelve health determinants included in the HIA scope were organized by their sector of impact─ the physical (natural and/or built) environment, social environment, or economic environment. Once the potential impacts were identified, the extent of the effects was evaluated based on six criteria─ likelihood, direction, magnitude, permanence, distribution, and strength of evidence. The *likelihood* that the impact would occur because of the project was evaluated. Whether the impact would improve, detract, or have no net effect on health outcomes was described by the *direction* of impact. How many people the impact would affect and its distribution among sub-groups in the population were described by the *magnitude* and *distribution* of the impact, respectively. *Permanence* was used to refer to how long the effects were expected to be experienced or observed. Lastly, the *strength of evidence* upon which the impact characterization was made was also identified. The following table provides a summary of the potential health impacts of the proposed project.

| Health Determinant | Likelihood | Direction | Magnitude | Permanence | Distribution | Evidence |
|---|---|---|---|---|---|---|
| **Water Quality** | Highly Likely | Positive | Low | Quickly and Easily Reversed | Vulnerable Populations Benefit | Limited |
| **Flood Management** | Highly Likely | Positive | Moderate | Moderate | Vulnerable Populations Benefit | Limited |
| **Climate and Temperature** | Highly Likely | Positive | Moderate | Long Lasting | Vulnerable Populations Benefit | Strong |
| **Air Quality** | Highly Likely | Positive | Moderate | Long Lasting | Vulnerable Populations Benefit | Limited |
| **Traffic Safety** | Highly Likely | Positive | High | Long Lasting | Vulnerable Populations Benefit | Limited |
| **Exposure to Greenness** | Highly Likely | Positive | Moderate | Long Lasting | Vulnerable Populations Benefit | Limited |
| **Exposure to Urban Noise** | Plausible | Positive | Moderate | Long Lasting | Vulnerable Populations Benefit | Strong |
| **Access to Goods and Services, Greenspace, and Healthcare** | Highly Likely | Positive | Moderate | Long Lasting | Vulnerable Populations Benefit | Strong |
| **Crime (Perceived and Actual)** | Plausible | Positive | Moderate | Quickly and Easily Reversed | Vulnerable Populations Benefit | Limited |
| **Social Capital (Cognitive and Structural)** | Plausible | Positive | Moderate | Moderate | Vulnerable Populations Benefit | Limited |
| **Household Economics (Costs of Living and Employment)** | Plausible | Both Positive and Negative | Moderate (Positive) Low (Negative) | Quickly and Easily Reversed | Both Benefits and Harms for Vulnerable Populations | Limited |
| **Community Economics (Business Performance)** | Plausible | Positive | Moderate | Quickly and Easily Reversed | Vulnerable Populations Benefit | Limited |

**What should DWM do to manage these impacts?**

The HIA Core Project Team and community stakeholders identified short-term and long-term recommendations to maximize the potential positive health impacts and mitigate and/or avoid the potential negative health impacts identified in the assessment. There were two overarching themes that

came from stakeholder-identified recommendations: a) keeping the community engaged in the planning, implementation, and monitoring phases of the project; and b) helping support community advocacy groups in addressing the community's needs.

## Conclusion

The HIA Core Project Team and community stakeholders strongly supported the implementation of the project, due to the numerous co-benefits that could be realized as a result of the project's implementation. However, the group warned that these co-benefits would be of little magnitude due to the project's small size. Expanding the project and/or replicating the project throughout the watershed would allow DWM and the community to increase the magnitude of impact and get the most out of those benefits. The HIA Core Project Team strongly encouraged DWM's commitment to follow the HIA's recommendations as they move forward in the decision-making process.

## References


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# Chapter 1. Introduction

Many communities across the United States are facing issues related to aging infrastructure, limited financial resources, and impaired surface and ground waters. The growing population can mean a growing need for development and businesses. However, the accelerated development of land can put a strain on the local ecosystem and surrounding natural resources. Decisions are often resulting in trade-offs between the needs of people and the needs of the environment in which they live. Such trade-offs may yield short-term benefits, but also long-term adverse consequences.

Leaders worldwide are becoming more aware of the need to develop more comprehensive, sustainable solutions to the complex issues facing their communities. At the 1992 Conference on Environment and Development, the United Nations (UN) declared a more comprehensive approach was needed to address development issues to ensure that today's actions do not endanger tomorrow's needs, thus promoting sustainability. In 2005, the UN reaffirmed the commitment to consider all aspects of sustainability─ the environment, society, and economy (United Nations 1992, 2005). Solutions that allow for an equal balance of benefits between these "three pillars" provide a pathway for communities to achieve sustainability.

The U.S. Environmental Protection Agency (EPA) is working to test models, tools, and best practices that enable the shift from trade-off to mutual benefit so that communities can move towards more sustainabile and healthy states. Sustainability is achieved by "creating and maintaining the conditions under which humans and nature can exist in productive harmony, that permit the fulfilling of social, economic and other requirements of present and future generations" (U.S. EPA 2014a). EPA's Sustainable and Healthy Communities (SHC) Research Program, in the Office of Research and Development (ORD), is considering health impact assessment (HIA) as one of the many decision-support tools for providing science-based resources and information to decision-makers.

## 1.1. HIA: A Tool for Sustainable and Healthy Communities

The pursuit of more sustainable solutions has steered public health professionals to promote the use of more comprehensive and integrated approaches to address public health challenges. HIA is one of the many tools used to consider health into traditionally non-health related decision-making processes. HIA has been used to manage potential impacts of a proposed decision to protect the health of individuals and the community.

### 1.1.1. Definition of HIA

The U.S. EPA uses the definition of HIA developed by the National Research Council (NRC) Committee on HIA. The NRC defines HIA as, "A systematic process that uses an array of data sources and analytic methods and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program, or project on the health of a population and the distribution of the effects within the population. HIAs provide recommendations on monitoring and managing those effects" (NRC 2011).

### 1.1.2. HIA Process

There are six major steps in the HIA process— *Screening, Scoping, Assessment, Recommendations, Reporting and Monitoring and Evaluation*— each of which have several tasks involved (North American HIA Practice Standards Working Group 2010, Human Impact Partners 2011, 2012, NRC 2011, R. Bhatia 2011). Table 1 lists the six steps of HIA and provides a brief description for each step.

**Table 1. The Six Major Steps of HIA**

| HIA Step | Description |
|---|---|
| **Screening** | Determines whether HIA is an appropriate approach to evaluate the pending decision and whether the HIA will provide information useful to the stakeholders and decision-makers. The proposal, any decision alternatives and the anticipated added value of the HIA are explicitly identified. |
| **Scoping** | Establishes the purpose, goals and team that will perform the HIA. Boundaries of the assessment are defined, including the geographic area, timeframe the HIA will be completed, health impacts that will be appraised and the population and vulnerable sub-groups that will be impacted by the proposal. |
| **Assessment** | Involves a two-part process that a) describes the existing (baseline) status of health and related factors, and b) forecasts potential impacts that may result from the decision. A variety of data sources and analytical methods are used. |
| **Recommendations** | Identifies actions or strategies to manage the health impacts of the decision, if any are predicted. Recommendations are developed to maximize potential benefits and minimize or avoid potential adverse impacts. |
| **Reporting** | Documents the HIA activities, materials developed and communicates the findings and recommendations of the HIA to stakeholders and the public. |
| **Monitoring and Evaluation** | Involves (or provides a plan for) follow-up activities that track how the HIA was implemented, the result of the decision and impacts of the decision. Evaluations should be included that assess the HIA's impact on the decision and/or decision-making process (i.e., impact evaluation), whether the HIA met its intended goals/objectives and practice standards (i.e., process evaluation), and whether decision affected health (i.e., outcome evaluation). |

### 1.1.3. HIA Core Values

There are five core values of HIA, which guide the implementation of the process:

1. A comprehensive approach to health and well-being
2. Sustainable development for short-term and long-term gain
3. Equity in the opportunity for healthy living
4. Democracy in the decision-making process
5. Ethical use of evidence that ensures transparent and rigorous methods are used

The HIA approach was developed based on the increasing understanding of the variety of conditions that serve as predictors of health and well-being (i.e., health determinants) and uses a more *comprehensive approach* to evaluating impacts to health (CDC 2009). Domains in which impacts may occur include, but are not limited to housing, employment and livelihood, quality of the surrounding environment, access to public services, individual behaviors and attitudes, and policy (R. Bhatia 2011). Using a broader

approach maximizes the ability to discover potentially harmful impacts and/or benefits that may not have been considered otherwise in the decision-making process. HIAs take into consideration short-term and long-term impacts of a proposal to promote *sustainable* solutions.

Furthermore, the HIA process allows for the consideration of how proposals may affect populations more sensitive to changes in conditions where they live, work and play. Without considering the distribution of impacts, a decision may unintentionally result in an unequal distribution of benefits and/or burdens. HIA practitioners recognize the importance of identifying vulnerable populations and develop recommendations to promote *equity*. Involving these groups in the process can help raise awareness of how decisions can lead to health impacts and prevent exclusion of certain stakeholder groups. HIA promotes meaningful involvement of a variety of stakeholders in the HIA process, promoting *democratic* principles, and helping communities build capacity to influence future decision-making.

The HIA process allows for the integration of science-based methods and input from the population affected by the decision so that pragmatic solutions can be developed to address common issues. Often, decision-makers must pass judgment using the information at-hand, even when the evidence is limited or lacking. A lack of openness and transparency in the decision-making process can lead to confusion and/or distrust among stakeholders. The information collected during the HIA may come from a variety of sources and levels of certainty. HIA practitioners use the best available evidence and science-based methods to manage and present the information in an *ethical* and transparent manner.

## 1.2. The City of Atlanta, GA and Stormwater Management

Stormwater management involves both the prevention and mitigation of both the quantity and quality of stormwater runoff and its impacts through a variety of methods and mechanisms (ARC and GA-DNR 2001). Most areas within the City of Atlanta, Georgia use a combined sewer system in which stormwater and sanitary sewer discharge flows together, through an underground conveyance system, to a treatment facility. During periods of heavy rainfall or snow, however, these systems bypass the treatment facility and discharge directly into a nearby waterbody. When the system discharges into a nearby waterbody, the event is called a combined sewer overflow (CSO) event. Figure 1 demonstrates the difference between combined sewer system functions during dry weather and wet weather.

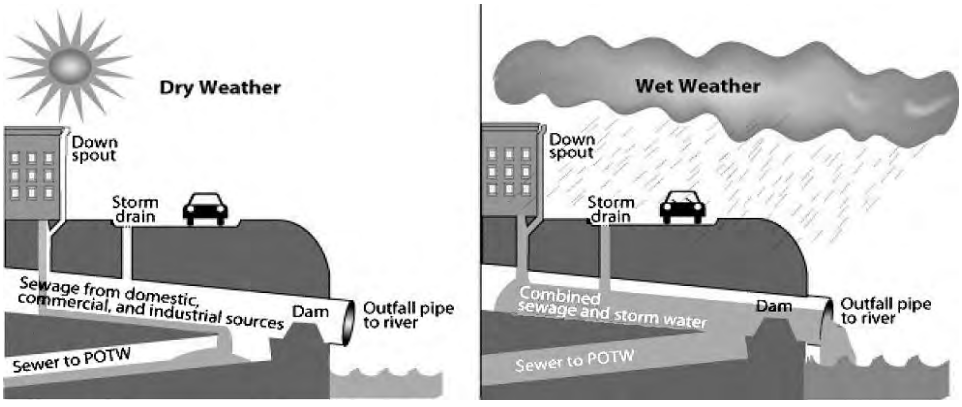


**Figure 1. Combined sewer system function during dry and wet weather. (Source: (U.S. EPA 2003a))**

# Introduction

Many streams and rivers in the Atlanta metropolitan area are on the state's list of impaired waters. In 1998, the City of Atlanta, GA settled a lawsuit with the U.S. EPA, Georgia Environmental Protection Division (GA─EPD), Upper Chattahoochee Riverkeeper Fund, Upper Chattahoochee Riverkeeper, Inc., and a private citizen through a consent decree aimed at improving water quality in the city's streams, headwaters and surrounding river basins[1]. The consent decree required the City of Atlanta to develop and implement activities to eliminate violations to water quality standards that resulted from CSO events (it was amended in 1999 to include sanitary sewer overflow (SSO) events). These affirmations resulted in a comprehensive and long-term plan to ensure clean water in metro-Atlanta, aptly named "Clean Water Atlanta," and the creation of the Department of Watershed Management (DWM)[2]. The DWM manages the city's drinking water, wastewater and stormwater utilities and systems. Since its formation in 2002, the DWM has made vast improvements in utility performance, reduced CSO and SSO events, increased repairs to conveyance systems, and implemented programs and projects aimed at preventing CSO and SSO events.

### 1.2.1. Proctor Creek Watershed

Proctor Creek is one of the most impaired waters in metro-Atlanta and has been on the state's 303(d) impaired waters list since 2002, for not meeting water quality standards to support its designated use – fishing (GA-EPD 2014). Proctor Creek is located entirely within the City of Atlanta and drains a watershed of approximately 10,198 acres of primarily residential and commercial properties to where it discharges into the Chattahoochee River. Stormwater runoff from urban areas (i.e., urban runoff) and CSO events are the suspected causes of the stream's impairment.

Neighborhoods within the Proctor Creek Watershed have experienced multiple environmental and public health issues, including an overburden of blighted and abandoned properties, ageing infrastructure, illegal dumping, persistent flash flooding, impaired water quality, and Brownfields (i.e., a property in which the expansion, redevelopment, or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant). Communities in the headwaters of Proctor Creek are especially vulnerable to flash flooding due to the considerably large area of impervious surfaces known as the "Gulch," which includes the Georgia Dome (Atlanta Falcons Stadium), Georgia World Congress Center, Atlanta Federal Center and CNN Headquarters. The amount of blighted and abandoned properties, as well as crime and insecurity in the area, has contributed to disinvestment and movement out of the area. In addition, neighborhoods in the headwaters face other unique challenges with noise and sporadic traffic congestion as a "stadium community."

EPA's Region 4 (Southeast) Resource Conservation and Recovery Act (RCRA) Division designated the Vine City and Proctor Creek area as an environmental justice (EJ) community of concern, which is defined as a geographic area with a largely minority and/or low-income population that faces a disproportionately high burden of adverse environmental conditions (U.S. EPA 2010). Efforts to revitalize this area have been ongoing for over a decade at the grassroots, city, state, and federal-level. In

[1] The City of Atlanta Consent Decree issued May 26, 1998 by Kilpatrick Stockton, LLP is available on the DWM website at: http://docs.atlantawatershed.org/.
[2] The Clean Water Atlanta, Program Overview is available at: http://www.cleanwateratlanta.org/ConsentDecree/Overview.htm

# Introduction

May 2013, the Proctor Creek Urban Waters Federal Partnership (i.e., the "Partnership"), which includes the U.S. EPA, U.S. ACE Mobile District, Federal Emergency Management Agency (FEMA), U.S. Department of Housing and Urban Development (HUD), and U.S. Department of Transportation (DOT), was established to collaborate, advocate, and support improvements in the watershed. An aerial view of the watershed is provided in Figure 2.

**Figure 2. Aerial view overlooking the Proctor Creek Watershed (Source: EPA Region 4).**

### 1.2.2. Green Infrastructure as a Sustainable Solution

The City of Atlanta adopted green infrastructure as one of many approaches to help address issues with Atlanta's impaired waters. In February 2013, the City Council adopted an amendment to the City of Atlanta Code of Ordinances (Chapter 7, Article 10) aimed at promoting green infrastructure and runoff reduction practices for all new and redevelopment projects in the city[3].

Green infrastructure is an example of EPA-supported technology that is used as an alternative to grey infrastructure (e.g., impervious pavement, concrete and metal) in promoting sustainable solutions to an array of issues (U.S. EPA 2014b). Design elements of green infrastructure include using soil, vegetation, and natural processes to capture and filter stormwater as it moves through a system. Using elements of green infrastructure has been shown to reduce capacity burden on existing infrastructure, improve urban ecosystems, and provide energy and maintenance savings. Examples of green infrastructure include, but are not limited to, rain gardens (i.e., bioretention or biofiltration cells), planter boxes, bioswales, and permeable pavement, just to name a few (Figure 3).

[3] For more information, refer to the "Implementing Green Infrastructure: Atlanta's Post Development Stormwater Management Ordinance Factsheet," available at: http://www.atlantawatershed.org/greeninfrastructure/.


**Figure 3. Examples of green infrastructure (U.S. EPA, 2014b).**

### 1.2.3. Planning for Green Infrastructure in the Proctor Creek Watershed

In 2010, Park Pride led a coalition of community residents and other locally based organizations and developed a plan for implementing green infrastructure in the headwaters of Proctor Creek. The Proctor Creek/North Avenue (PNA) Watershed Basin: A Green Infrastructure Plan (i.e., PNA Vision) proposed a series of green infrastructure demonstration projects in the urban watershed immediately west of downtown Atlanta where communities face an overburden of economic, social, and environmental challenges (Figure 4 is an illustration of the master plan in the PNA Vision) (Park Pride 2010). The Prince's Foundation for the Built Environment performed a similar study earlier in 2010, but funding was

not available at the time to develop that plan further. The City of Atlanta has adopted the PNA Vision as the master plan for implementing green infrastructure in the Proctor Creek Watershed.


**Figure 4. Park Pride's PNA Vision Master Plan (Source: Park Pride 2010).**

In 2012, EPA strengthened its commitment towards helping communities implement green infrastructure by providing funding and technical assistance through its Community Partners Program. The City of Atlanta was one of the seventeen communities awarded funding and technical assistance from EPA to develop a conceptual design for implementing green infrastructure in a distressed neighborhood to help reduce pervasive flooding and prevent CSOs. Tetra Tech, a contractor to the EPA, provided the technical assistance to develop the conceptual design for DWM (EPA contract EP-C-11-009). Tetra Tech

performed a forensic review of historic reports, including the PNA Vision, to identify needs of the watershed. Accompanied by Park Pride staff, Tetra Tech conducted a field assessment and held stakeholder meetings to collect additional information about community priorities. Tetra Tech scored and ranked the proposed sites based on the input from stakeholders (Tetra Tech 2013). DWM could not secure funding at that time to implement the PNA Vision (in its entirety) and for that reason selected the Boone Street site as a starting point to build more support for implementing the rest of the PNA Vision (Figure 5 outlines the Boone Street demonstration project identified in the PNA Vision).


**Figure 5. Park Pride Demonstration Site C: Boone Street East (Source: Park Pride 2010).**

### 1.2.4. About the Boone Street Corridor

Joseph E. Boone Street NW (previously named Simpson Road) is located northwest of downtown Atlanta. The city renamed Simpson Road to Joseph E. Boone Street in 2008 after Joseph E. Boone, a prominent civil rights activist. Boone Street connects two major urban corridors: Northside Drive NW (Highway 19/41/29) to Hamilton E. Holmes Drive NW (Highway 280). Boone Street separates English Avenue neighborhood from Vine City neighborhood. In the early 20th century, Vine City and English Avenue were vibrant neighborhoods with a mix of many small businesses and single-family residences. Currently, the neighborhoods experience high rates of poverty, crime, and boarded up businesses and residences. Residents in this area have raised concerns related to illegal dumping of garbage, flash flooding, mosquitoes, and unhealthy housing conditions.

There are several plans to redevelop along the Boone Street corridor. In 2004, then-mayor Shirley Franklin identified Boone Street as one of six (6) underserved areas in the city that needed physical redevelopment and economic revitalization and called for collaboration between the City Departments and other public agencies to develop an updated plan for the identified areas. The Simpson Road Corridor Redevelopment Plan (updated in 2006) outlines the long-term vision and guidelines for future decision-making and investment in the area over the next 25 years.[4] The Federal Highway Administration (FHWA), through the Regional Transportation Referendum – Local Investment Framework: 2013-2018, also recommended several transportation projects along Boone Street corridor. One of those projects includes a road diet, which simply means a reduction of travel lanes. The Cycle Atlanta Phase 1 Study, led by the Atlanta Regional Commission (ARC) Livable Centers Initiative, plans to convert some of the unused area (left over from the road diet) into designated bike lanes.

[4] The 2006 Update builds on the previously approved 1995 Simpson Redevelopment Plan, Beltline Redevelopment Plan (December 2005), Vine City Redevelopment Plan (2004), Northside Drive Corridor Plan (2005), and Bankhead Metropolitan Atlanta Rapid Transit Authority (MARTA) Station LCI (2005), and the Study of Revitalization Incentives for Underserved Areas (December 2005).

# Chapter 2. Screening the HIA

Screening is the first step in the HIA process in which the proposed decision is clearly defined, including any alternative scenarios, and stakeholders consider whether performing an HIA would add value to the decision-making process.

## 2.1. The Decision to Conduct the HIA

Prior to the conception of this HIA, EPA's ORD sent an invitation to the ten regional offices calling for proposals to conduct an HIA. EPA had been assessing the value of using HIA as a tool to support local decision-making and promote sustainable and healthy communities. ORD would provide funding for the HIA through the Regional Sustainable Environmental Sciences (RESES) program[5] as part of a nation-wide group of HIA case studies led by the EPA.

At that time, Tetra Tech was evaluating the PNA Vision and ranking sites for implementing green infrastructure in the headwaters of Proctor Creek. Because EPA's Region 4 (Southeast) classified the area around Proctor Creek was classified as an EJ community of concern, staff in the Office of Environmental Justice and Sustainability (OEJ) met with an HIA practitioner in ORD and discussed the opportunity to perform an HIA. The purpose of the HIA was to bring health considerations into evaluating the proposed sites for implementing green infrastructure in the watershed. Those individuals also met with staff in DWM and other EPA offices to decide if performing an HIA would help inform the decision-making and help the community. DWM and EPA agreed the HIA would bring valuable information to the decision and supported the HIA moving forward. The following sections document the considerations in screening the HIA.

### 2.1.1. Considerations for Community Health

The primary intent of implementing green infrastructure in the headwaters of Proctor Creek was to address water quality issues and relieve the burden on existing stormwater infrastructure (i.e., address stormwater management needs). In addition to addressing stormwater management needs, there are other potential impacts of implementing green infrastructure. There are an increasing number of studies linking green infrastructure to increased property values and aesthetic value of nearby parcels, higher enjoyment of surroundings, improved safety and sense of well-being and reduced crime (Hastie 2003, Kuo 2003, Wolf 1998, Kuo and Sullivan 2001a, 2001b). These potential impacts may help support revitalization efforts in this community. The neighborhoods in the headwaters of Proctor Creek are experiencing social and economic challenges, which have direct and indirect consequences to health. Thus, the need to investigate a broader scope of consequences, especially to health, was warranted.

The HIA process would bring valuable information and recommendations with a public health focus, to inform the efforts regarding green infrastructure approaches to stormwater management, ecosystem restoration, and community revitalization in an environmental justice community of concern. The HIA would further investigate changes to the physical environment, socio-economic conditions, and other

[5]More information about the RESES program is available at http://www.epa.gov/nerlesd1/reses/reses.html.

environmental factors that influence community and individual health outcomes, a consideration otherwise not accounted for in the decision. In addition, the HIA would identify and recommend strategies that the City could take to maximize benefits and minimize potentially adverse impacts. Furthermore, the educational materials that typically come from performing an HIA would provide another outlet for raising awareness of environmental factors that influence health.

### 2.1.2. Considerations for Stakeholder Engagement and Neutrality

The challenges facing the communities in the Proctor Creek Watershed have been ongoing for many years, as have efforts to address these issues. Many different stakeholder groups have an invested interest in what transpires in the area. Residents in the headwaters of Proctor Creek have repeatedly expressed concerns to EPA about the environmental issues experienced and the lack of involvement in the decision-making regarding efforts in their community. As a federal agency, EPA would provide a neutral platform for different stakeholder groups (e.g., the decision-makers, community residents, investors, etc.) to come together and discuss their interests and/or concerns. The HIA would uphold Agency policies and HIA practice standards for transparency and defensibility of the process by documenting the decisions made, methods used, findings and recommendations. Furthermore, the HIA process could help build community capacity to advocate for and address needs.

### 2.1.3. Considerations for Benefits to EPA and HIA Field of Practice

This HIA would provide another vehicle for EPA to understand community-level decisions, create new partnerships with local community-based groups and improve the awareness of sustainable alternatives. The HIA would provide further insight for EPA's SHC research program on HIA as a tool for promoting sustainability through comprehensive approaches to address local issues and decision-making in an EJ community of concern. As a federal agency, EPA would provide the HIA field of practice with a unique perspective on implementation, challenges and lessons learned while performing a HIA. Adequate personnel and data analysis methods, accessible through EPA could be leveraged to expand the science-based tools and resources used in the HIA community of practice and inform practitioners of tools and methods being developed.

### 2.1.4. Considerations for Resources Available

Between the ORD, its contractors and Region 4, there was sufficient personnel available to conduct the HIA. In addition, EPA has led several initiatives and projects in the area that provided connections to persons with local knowledge about the communities/populations affected, data and sources available, and tools/models that could be used to analyze information. Staff in EPA's ORD and Region 4 (Southeast) OEJ partnered to lead the HIA and submitted a RESES proposal for funding to ORD. In August 2012, ORD approved and awarded funding for the HIA.

*NOTE: While waiting for a response from ORD, DWM informed EPA that funding could not be secured for implementing the PNA Vision in its entirety. However, DWM could support one demonstration project that would serve as a catalyst for gaining support for future efforts to implement green infrastructure in the watershed. DWM selected the Boone Street demonstration project and Tetra Tech began developing the conceptual design. EPA staff met with key stakeholders, including DWM, to decide*

*whether the HIA should proceed, considering the downsized project area. EPA and DWM agreed the HIA would still provide the benefits discussed above and would inform DWM's decision on implementing the proposed Green Street Project as they move forward in the planning process.*

## 2.2. The Proposed Decision: Implementing the Green Street Project

Currently, Boone Street exists as a 44-foot road right-of-way between the inside edge of the sidewalk on either side of the street with four 10-foot travel lanes. The overall vision of the Boone Boulevard Green Infrastructure Conceptual Design (from now on referred to as the proposed Green Street Project) is to implement green infrastructure, specifically stormwater best management practices (BMPs), in collaboration with the planned road diet. Guidance from the City's Transportation Planning Division governed most of the project's layout, considering most of the green street features must fit within the roadway corridor.

The proposed Green Street Project will span 2,200 feet of Boone Street, from Maple Street to James P. Brawley Drive (refer to **Appendix A** for the complete layout of the proposed Green Street Project). After completion, this section of Boone Street will consist of two, 10-foot travel lanes, a 5-foot bike lane on each side of the street, and a 12-foot row of in-ground, planter boxes (Figure 6). A 12-foot left-turn lane will replace the planter boxes at required intersections (i.e., at Boone Street and intersections with Brawley Dr., Sunset Avenue and Vine Street; Figure 7). Bioretention cells (rain gardens) and grass spillways will be placed at the entrance of the planned 16-acre Historic Mims Park (i.e., between Vine Street and Elm Street) to capture and treat stormwater runoff coming from the street before it enters the sewer system.

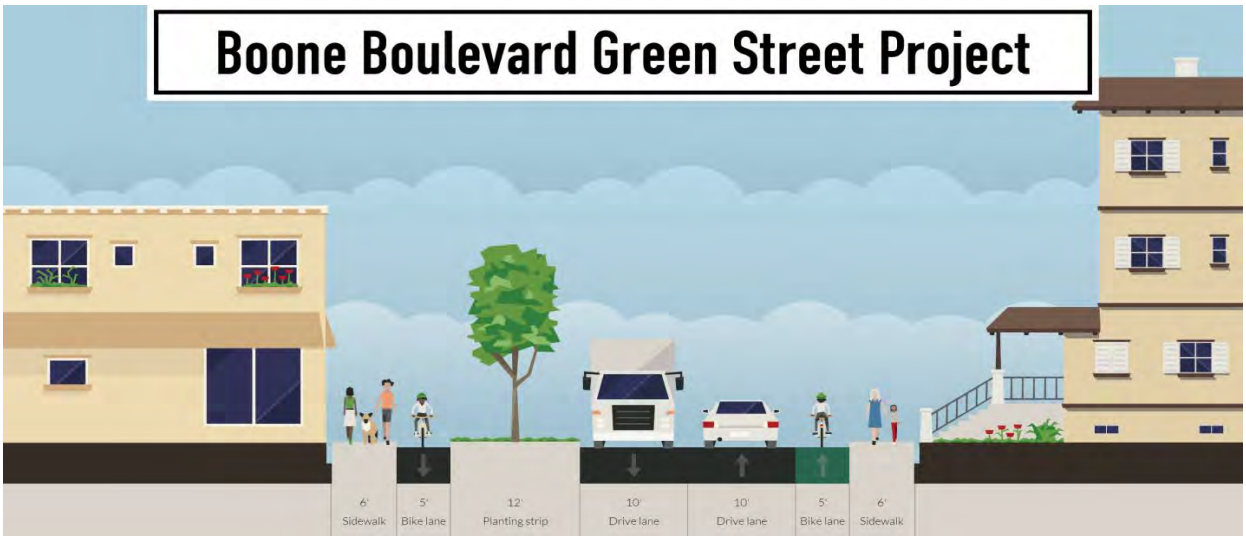


**Figure 6. Cross-section of Boone Street if DWM implements the proposed project as planned. (Source: www.streetmix.net 2013)**

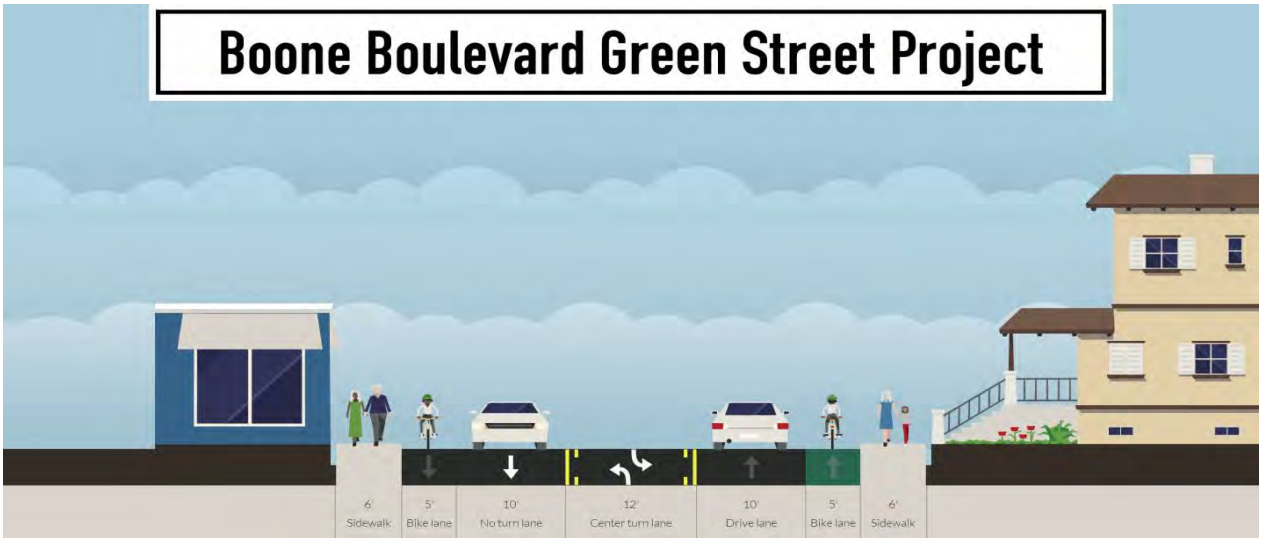


**Figure 7. Cross-section of Joseph E. Boone Street (at the intersections of Brawley Drive, Sunset Avenue, and Vine Street) if DWM implements the proposed project as planned. (Source: www.streetmix.net 2013)**

### 2.1.1. Alternative Decision Scenarios

There are four possible alternative decision scenarios:

1. DWM implements the Green Street Project in conjunction with the planned road diet.
2. The planned road diet is implemented, but the proposed Green Street Project is not.
3. The Green Street Project is implemented, but the planned road diet is not.
4. Neither the Green Street Project nor the road diet are implemented.

The first scenario is the most possible and most expected outcome to occur. DWM has already received some funding for the project through the Clean Water Act Section 319(h) appropriations. Section 319(h) grants are awarded to designated state and tribal agencies to implement their approved nonpoint source water pollution management programs (U.S. EPA 2014c). ARC Livable Centers Initiative also awarded funds to implement projects in the Cycle Atlanta Phase 1 study, which includes resurfacing and restriping Boone Street to include a bike path. The FHWA had already established that Boone Street was serving well below its original planned traffic volume and the cost of maintaining roads is increasing. Implementing the road diet may improve transportation safety along Boone Street and reduce the cost to maintain the road (Highway Safety Information System 2004). The engagement of community residents in the PNA Vision study and other community improvement projects has increased awareness and support among stakeholders to implement green infrastructure in this area.

The second scenario is unlikely, given that the City has already acquired partial funding to implement the project and has expressed its commitment to improve the corridor. Implementing just the road diet fails to address other needs, such as the aesthetic appeal of the corridor, overburden of stormwater on the combined sewer system running under the street, and flash flooding experienced in the area. If support for the proposed project wanes and/or the project become a controversial issue, the City may decide to postpone implementation until the issues can be resolved. Thus, buy-in from community residents and other stakeholders is necessary to ensure the project moves forward.

The third scenario is impractical, considering a large portion of the project is located in the unused space left over from the road diet. If the road diet did not occur, the proposed 12-foot wide planter boxes and designated bike lanes would not be achievable without creating space elsewhere. Other parts of the proposed project, such as converting the road surface into permeable pavement and adding the green infrastructure elements adjacent to Mims Park, could be achieved even if the road diet did not occur.

The last scenario is possible, but very unlikely. Both projects do face the potential for being delayed or postponed. Delays may be inevitable if funding is not sufficient to complete implementation in its entirety and/or other unforeseen challenges arise. Both projects could be postponed if there is enough public opposition to the projects.

### 2.1.2. Expected Benefits of the Proposed Green Street Project

DWM does expect the project to solve issues of flooding in the immediate area surrounding the project site or significantly improve water quality of Proctor Creek. The primary purpose of the project is to demonstrate the use of alternative solutions to stormwater-related issues and help reduce the burden to infrastructure already in place. Reducing the volume and flow of runoff going into the combined sewer system will help prevent further infrastructure damage and CSO events. Furthermore, improved stormwater runoff capture will reduce pooling of water on the street thereby preventing road hazards (i.e., reduce localized or flash flooding).

### 2.1.3. The Decision-makers and Decision-making Process

There are three general planning stages for public projects. The first of which involves developing the overall concept of the project, including its purpose, goals, and general vision. The first stage results in a 30% conceptual design that is submitted to the public for feedback, usually through a series of public hearings. The next planning stage usually involves performing the traditional environmental assessments and testing from engineers/architects, etc. The evaluation findings and recommendations are used to refine the design, yielding a 60% completed plan. Community input received during the open comment period is used to further refine the project plan into the final (90%) project plan.

The DWM contracted Tetra Tech to complete the 30% conceptual design, which was published in March 2014.[6] DWM will present the proposed conceptual design project to the public, followed by an open comment period. Once DWM receives the community input and assessment findings and recommendations, DWM will decide whether to present the project plan to the Mayor for final approval. If the Mayor approves the proposed project, DWM will then initiate the contractor bidding process, solidify a funding vehicle, and choose who will implement the project plan. Once the project is completed, the City will be responsible for maintaining the corridor, which will require annual appropriations approved by the Mayor through the annual budget process. Any additional capital required to complete the project will also require approval from City Council.

[6] The Boone Boulevard Green Infrastructure Conceptual Design is available online at http://water.epa.gov/infrastructure/greeninfrastructure/upload/Boone-Blvd-Report-508-Report.pdf.

# Screening

As planning for the proposed project moves forward, there are opportunities for the HIA to provide science-based and stakeholder input. This input would inform DWM's decisions as they move forward in the planning process for the proposed Green Street Project. Table 2 lists several points that the HIA could inform the decision-making process.

**Table 2. Expected Points of HIA Influence in the Decision-making Process**

| Time Frame | Decision Points | HIA Step | HIA's Intended Influence |
|---|---|---|---|
| **November 2012 to January 2013** | The 30% conceptual design is developed. | Screening | The screening process would inform DWM that there is an opportunity to assess the proposed Green Street Project for other potential impacts, apart from stormwater management and traditional cost analysis. |
| **February 2013** | DWM informs community members and other stakeholders about the proposed project and shares the conceptual plan. | Scoping | Scoping would help stakeholders identify priority issues and/or needs of the community, build consensus around shared values, and outline expectations for the proposed Green Street Project. |
| **April 2013 to March 2014** | The proposed project plan is assessed by architects, engineers, etc. DWM incorporates assessment findings and recommendations into project plan (i.e., 60% design). | Assessment | The HIA would assess the proposed project from a public health perspective and provide input on the potential co-benefits and adverse impacts that may result from implementing the proposed Green Street Project (as planned). The HIA process would also help stakeholders structure responses to the proposed plan and provide feedback. |
| **April 2014 to December 2014** | DWM incorporates community input into the final design of the project (i.e., 90% design). | Recommendations | HIA recommendations would provide science-based and stakeholder-supported strategies that would manage predicted impacts from the proposed Green Street Project. |
| **Spring 2015** | DWM presents project plan to the Mayor for final approval. | Reporting | Information from the HIA could be used to inform the Mayor's decision and/or influence the priority level of the project. |
| **Summer 2015** | If approved and funding is received, DWM will initiate the implementation phase for the project. | Monitoring and Evaluation | DWM and stakeholders could follow the HIA's monitoring plan to follow up on the decision and predicted changes in health and the environment, and make changes (if needed). |

# Chapter 3. Scoping

Scoping in HIA means to determine to what extent a subject matter will be evaluated and defines what is relevant and what is not relevant pertaining to that subject matter. In scoping, the main goals of the HIA are established, along with the timeline for completing the HIA; the population included in the HIA and the study area are determined; investigators elicit stakeholder input and professional expertise to identify all of the potential impacts that may occur as a result of the decision and prioritize which pathways the HIA will investigate further and to what extent.

## 3.1. HIA Timeline

The HIA timeline was first drafted in the Screening step, as part of the requirements of the RESES grant proposal (refer to **Appendix B** for the original HIA timeline); further refined in the Scoping step; and then updated as the process progressed through the last steps. Figure 8 provides the final HIA timeline.

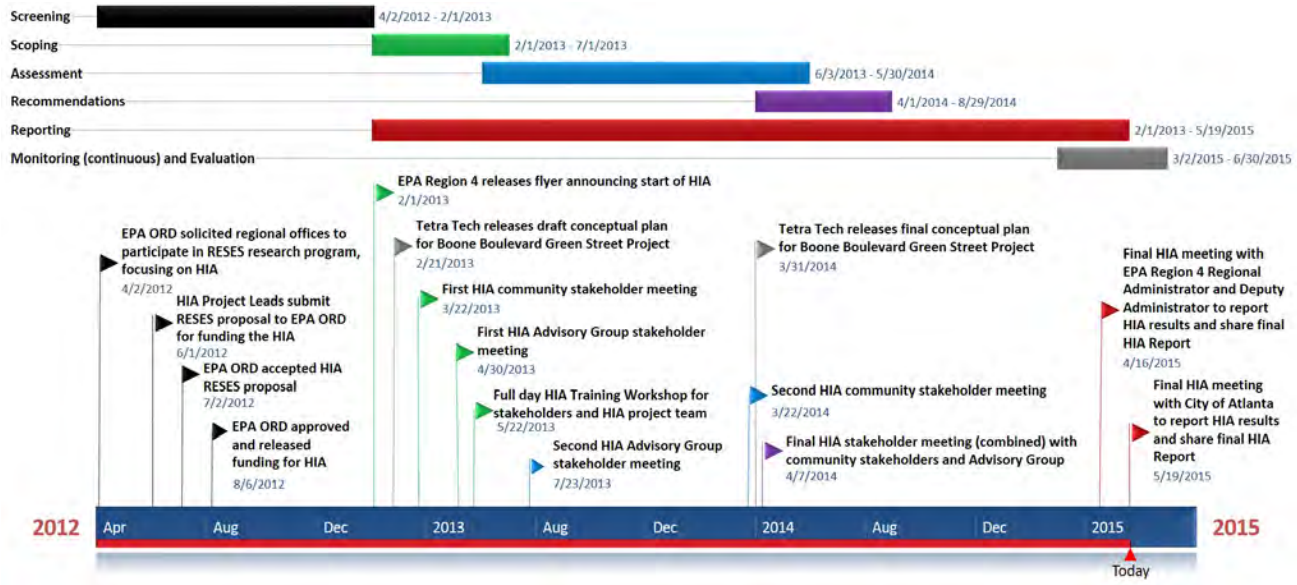


**Figure 8. The Final HIA Timeline.**

*NOTE: There were unforeseen challenges and delays that arose during the HIA that resulted in extending the HIA timeline pas the original completion date. Although the project timeline appears continuous, there were periods when HIA work was delayed or ceased for a short period. For example, all HIA work ceased during the sixteen-day shutdown of the U.S. Federal Government. For more discussion of this issue, see 7.2.3 Challenges Identified by the HIA Core Project Team. It is important to note that the changes to the timeline did not affect the HIA's ability to inform the decision.*

# Scoping

## 3.2. HIA Participants, Roles, and Responsibilities

This HIA was led by staff in EPA's ORD and Region 4 (Southeast) OEJ. Other HIA participants were recruited from the Proctor Creek Urban Waters Federal Partnership and other stakeholder groups. Stakeholders are individuals or groups that would be affected by and/or have an invested interest in the result of the decision. Stakeholder groups invited to participate in this HIA included residents of the study area and representatives from community-based organizations, local universities, local businesses, the City of Atlanta, land and homeowners, and future businesses and investors.

The team leading the HIA recognized that not all HIA participants could be involved to the same extent (e.g., due to scheduling conflicts, time and financial constraints, availability to travel to meetings, etc.). The team leading the HIA outlined a set of roles and their respective responsibilities needed to complete the HIA (see Table 3 for a list of the HIA participant roles and responsibilities). Stakeholders who wanted to actively participate in the HIA and were available to fulfill the responsibilities outlined, were invited to participate on the HIA Core Project Team. Stakeholders who wanted to participate in the HIA, but had limited availability, were invited to serve as a member of the HIA Advisory Group. Stakeholders not wanting to serve in a formal role, but wanted to provide input, were invited to participate in the public, community meetings as a Community Informant.

*NOTE: Some participants served more than one role. For example, the HIA Project Leads were also members of the HIA Core Project Team. Furthermore, some Community Informants were also members of the HIA Advisory Group.*

**Table 3. HIA Roles and Related Levels of Commitment and Responsibilities**

| HIA Role | Level of Commitment | Responsibilities |
|---|---|---|
| **HIA Project Leads** | Intense | • Initiated and managed the HIA process;<br>• Provided strategic oversight for completing tasks and ensuring forward progress of the HIA;<br>• Communicated directly with decision-makers, the community, and other stakeholders;<br>• Initiated, and moderated HIA meetings; and<br>• Acquired personnel and funding resources for the HIA to be completed. |
| **HIA Core Project Team** | Intense | • Conducted the HIA, including data collection and analysis, synthesis of information, recommendation development, and documentation of the HIA process; and<br>• Performed the day-to-day HIA project tasks, including attending project meetings and participating in group discussions. |
| **HIA Advisor** | Intense | • Provided HIA expertise, including best practices, and facilitated interactive HIA training workshop;<br>• Advised and consulted on the selection of relevant scoping pathways, data collection and synthesis of health information;<br>• Guided tasks related to each step and engaging stakeholders. |

# Scoping

| HIA Role | Level of Commitment | Responsibilities |
|---|---|---|
| **HIA Advisory Group** | Moderate | • Provided technical expertise and local knowledge, as well as feedback on the HIA process;<br>• Attended and participated in three (3) HIA Advisory Group meetings and discussions; and<br>• Increased collaboration among agencies and organizations. |
| **Community Informant(s)** | Low | • Acted as a liaison between the HIA Core Project Leads and community residents; and<br>• Provided bi-directional feedback between the groups. |
| **Decision-Maker(s)** | Moderate | • Informed the HIA regarding the decision and decision-making process;<br>• Provided feedback on the assessment findings and HIA recommendations. |

### 3.2.1. Stakeholder Communication and Engagement

Stakeholders were invited to participate in the HIA process via email, phone, and public flyer (refer to **Appendix C** for invitations to participate in the HIA). The primary form of communication between the HIA Core Project Team and other stakeholders was by phone and/or email. The regional HIA Project Lead (Tami Thomas-Burton) acted as the gatekeeper for information sharing and communicating with all stakeholders and HIA Core Project Team members.

The HIA Core Project Team developed many communications materials to support this HIA, including meeting invitations, post-meeting summaries, PowerPoint presentations, factsheets, and documents. At the beginning of the scoping step, the HIA Core Project Team began using a standardized format or "brand," for HIA communication materials. The use of branding helped increase recognition and consistency of HIA materials. Before materials were shared outside the team, several steps had to be followed. First, there had to be consensus among the HIA Core Project Team regarding the content, presentation, and dissemination point for each product. Second, the materials were sent to the Technical Writer/Editor for review. Once comments and edit suggestions were addressed, HIA materials were sent to the project co-leads for final approval before being shared.

The team leading the HIA outlined a plan for engaging stakeholders for each step of the process. The planned stakeholder engagement activities, participants involved, and purpose for each step are outlined in Table 4 to Table 9. The HIA Core Project Team would host two stakeholder meetings (one for the HIA Advisory Group and one for the general public) during the Scoping and Assessment steps. The third stakeholder meeting would be a joint meeting held with the HIA Advisory Group, public, and decision-makers, during the Recommendations step. Hosting a joint meeting provides a forum for recommendations to be discussed openly as a group, with representation from each interested party. A final meeting would be held with the decision-makers to report the HIA main findings and recommendations.

# Scoping

**Table 4. Stakeholder Engagement during the Screening Step**

| Participants Involved | Activities | Purpose |
|---|---|---|
| • **HIA Project Leads** | Review stakeholder input from previous reports documenting engagement. | Identify community needs and issues related to health in the Proctor Creek Watershed. |
| • **HIA Project Leads**<br>• **Decision-makers** | Meet with DWM to discuss opportunity for the HIA to add value to and affect the decision. | Establish benefits and other rationale for conducting HIA. |

**Table 5. Stakeholder Engagement during the Scoping Step**

| Participants Involved | Activities | Purpose |
|---|---|---|
| • **HIA Project Leads**<br>• **HIA Core Project Team**<br>• **Community Informants** | 1st public, community meeting (March 22, 2013) | Share information about the HIA and the proposed project and gather input from the community on what the HIA should address. |
| • **HIA Project Leads**<br>• **HIA Core Project Team**<br>• **HIA Advisor**<br>• **HIA Advisory Group**<br>• **Decision-makers** | 1st HIA Advisory Group meeting (April 30, 2013) | Elicit feedback from stakeholders regarding potential impacts of the proposed project on health and stakeholder viewpoints and opinions on which impacts should be included in the HIA scope. |
| • **HIA Project Leads**<br>• **HIA Core Project Team**<br>• **HIA Advisor**<br>• **HIA Advisory Group**<br>• **Decision-makers**<br>• **Community Informants** | Full-day HIA training (May 23, 2013) | Help building capacity for performing HIA locally and provide HIA participants with more knowledge and experience with the process. Exercises were designed to teach participants how to develop theoretical pathways of impact, characterize the impacts predicted, and develop recommendations. |
| • **HIA Project Leads**<br>• **HIA Core Project Team**<br>• **HIA Advisor** | HIA Core Project Team meetings (periodic) | Develop and refine the HIA scope. |

**Table 6. Stakeholder Engagement during the Assessment Step**

| Participants Involved | Activities (Date) | Purpose |
|---|---|---|
| • **HIA Project Leads**<br>• **HIA Core Project Team**<br>• **HIA Advisor**<br>• **HIA Advisory Group**<br>• **Decision-makers** | 2nd HIA Advisory Group meeting (July 23, 2013) | Gather information on potential data sources and tools available to support the assessment. |
| • **HIA Project Leads**<br>• **HIA Core Project Team**<br>• **Community Informants** | 2nd public, community meeting (March 22, 2014) | Present the initial findings and provide stakeholders an opportunity to express their opinions regarding the findings and discuss any residual issues/concerns left unaddressed. |

## Scoping

| Participants Involved | Activities (Date) | Purpose |
|---|---|---|
| • **HIA Project Leads**<br>• **Decision-makers** | HIA meeting with the City of Atlanta (April 15, 2014) | Present the initial findings from the assessment and elicit feedback. |
| • **HIA Project Leads**<br>• **HIA Core Project Team**<br>• **HIA Advisor** | HIA Core Project Team meetings (periodic) | Conduct the assessment. |

**Table 7. Stakeholder Engagement during the Recommendations Step**

| Participants Involved | Activities | Purpose |
|---|---|---|
| • **HIA Project Leads**<br>• **HIA Core Project Team**<br>• **HIA Advisor**<br>• **Decision-makers**<br>• **HIA Advisory Group**<br>• **Community Informants** | Final HIA stakeholder engagement meeting (combined) (June 5, 2014) | Present all the information gathered as part of the HIA process, including assessment findings and initial recommendations. Discuss together potential solutions to unresolved issues and identified opportunities for improving the proposed project so that stakeholder benefits were maximized. |
| • **HIA Project Leads**<br>• **HIA Core Project Team**<br>• **HIA Advisor** | HIA Core Project Team meetings (periodic) | Develop recommendations and establish priorities. |

**Table 8. Stakeholder Engagement during the Reporting Step**

| Participants Involved | Activities | Purpose |
|---|---|---|
| • **HIA Project Leads**<br>• **Decision-makers** | Final meeting with DWM (March 2015) | Present the main findings from the HIA and the final recommendations to the City. |
| • **HIA Project Leads**<br>• **HIA Core Project Team** | HIA Core Project Team meetings (periodic) | Develop the HIA report, Executive Summary, factsheets, and any other communication materials for sharing information about the HIA. |

**Table 9. Stakeholder Engagement during the Monitoring and Evaluation Step**

| Participants Involved | Activities | Purpose |
|---|---|---|
| • **HIA Project Leads**<br>• **HIA Core Project Team** | HIA Core Project Team meetings (periodic) | Develop a monitoring plan to follow-up on the decision and health impacts of interest. |
| • **HIA Project Leads** | Evaluation of the HIA | Use stakeholder feedback, feedback on the HIA report to evaluate the HIA (i.e., process evaluation). |

## 3.3. HIA Main Goals

Goals serve as the foundation for guiding the direction and implementation of the HIA. The HIA Core Project Team established a set of goals early in the Scoping step to help guide the HIA. These goals would serve as the criteria for judging the success of the HIA. The HIA goals are as followed:

1. Add a vehicle for equitable inclusion of all stakeholders in the decision-making process;

2. Assess the effectiveness of the proposed green infrastructure project and raise awareness of the environmental, economic, and societal impacts of implementing green infrastructure in the designated community;
3. Provide recommendations to the proposed project that incorporate approaches to stormwater management, ecosystem restoration, and community revitalization; and
4. Increase transparency, local accountability, community empowerment, and ownership of the proposed plan through meaningful stakeholder engagement.

*Note: After the Reporting step was completed, the HIA Core Project Team evaluated whether the HIA achieved its stated goals. Section 7.2 Process Evaluation – Evaluating the HIA Design and Implementation provides more discussion on this topic.*

## 3.4. HIA Quality Assurance

Prior to conducting this HIA, EPA conducted a review of over 80 existing HIAs to determine the current state-of-science and to identify best practices and areas for improving HIA implementation (U.S. EPA 2013a). The findings from EPA's review, along with several HIA practice documents, were used to guide the HIA process and quality assurance. The HIA practice documents reviewed included:

- North American Practice Standards Working Group. (2010). Minimum Elements and Practice Standards for Health Impact Assessment, Version 2. Oakland, CA.
- Bhatia, R. (2011). Health Impact Assessment; A Guide for Practice. Oakland, CA: Human Impact Partners.
- National Research Council. (2011). Improving Health in the United States; The Role of Health Impact Assessment. Washington, D.C.: The National Academies Press.
- NACCHO. (2008). Health Impact Assessment: Quick Guide. Washington, D.C.: National Association of City and County Health Officials (NACCHO).
- Quigley, R, et al. (2006). Health Impact Assessment; International Best Practice Principles, Special Series No. 5. Fargo, USA: International Association for Health Impact Assessment (IAIA).
- UCLA. (2008). HIA Training Manual. Los Angeles, CA: University of California (UCLA).
- WHO. (1999). Health Impact Assessment; Main Concepts and Suggested Approach. Gothenburg Consensus Paper. Brussels (Belgium): World Health Organization (WHO), Regional Office for Europe, European Center for Health Policy.

The HIA Core Project Team used these documents to guide the implementation of the HIA. Furthermore, the HIA Advisor continuously monitored and guided the process to ensure the HIA followed the minimum elements and practice standards set forth by the North American HIA Practice Standards Working Group and best practices in the field based on professional expertise.

*Note: This HIA report underwent an external peer-review by three HIA practitioners and an internal administrative review by the EPA. Section 7.2 Process Evaluation – Evaluating the HIA Design and Implementation provides further discussion of the review process and its findings.*

# Scoping

## 3.5. Setting the Scope of the HIA

### 3.5.1. Defining the HIA Study Area

One task in setting the scope of an HIA is to determine the study area where the impacts of the proposed decision will be appraised. Previous HIAs have used proximity (or distance) measures from a quarter-mile to one-mile to define the potential area of impact for different health determinants. For example, a distance of one half-mile was used by many HIAs to determine health impacts related to access to parks, recreational facilities, grocery stores, public transit stops, schools, etc. Due to the scale of the proposed Green Street Project, the HIA Core Project Team decided that a half-mile radius was optimal for designating the potentially impacted community (Figure 9). A quarter-mile radius would not include all of the population affected by the proposed project, and the one-mile radius would not provide a sufficient resolution at which to describe the population affected.

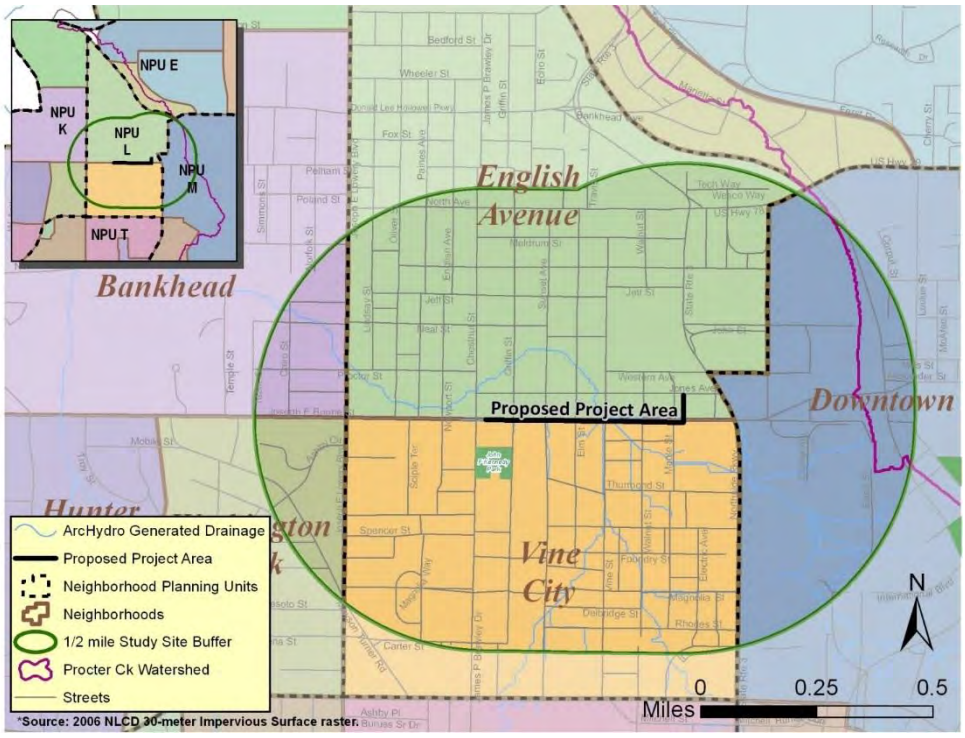


**Figure 9. The HIA study area. The green line represents the half-mile radius around the proposed Green Street Project site.**

The HIA Core Project Team wanted to assess how the changes in the HIA study area would translate to changes in the larger watershed. The geographic information system (GIS) specialists obtained the Proctor Creek Hydrologic Unit Code (HUC; HUC 12 = 031300020101) from the U.S. Geological Survey (USGS 2013) and modified it in ArcHydro (ESRI, Redlands, CA) using topography, elevation, and surface and groundwater flows to generate the watershed boundary. Figure 10 identifies the modeled areas where stormwater would flow across surfaces from the headwaters to a single discharge point in the Chattahoochee River. The HIA Core Project Team also defined the area (upstream) where stormwater would flow to the proposed project site (Figure 11).

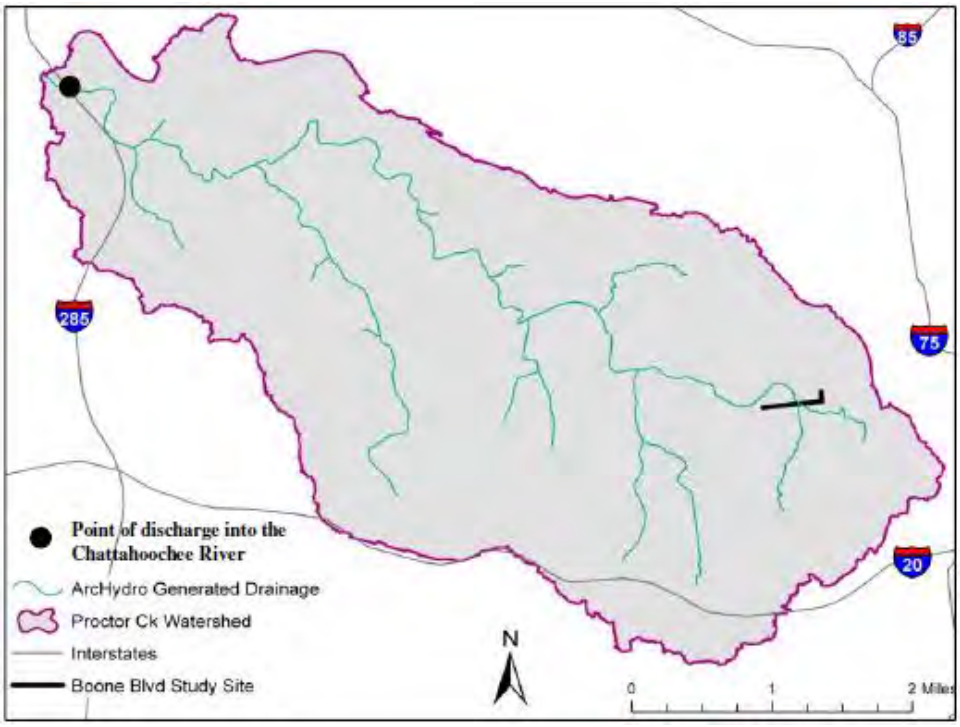


**Figure 10. The modeled area of Proctor Creek Watershed with stormwater flow lines.**

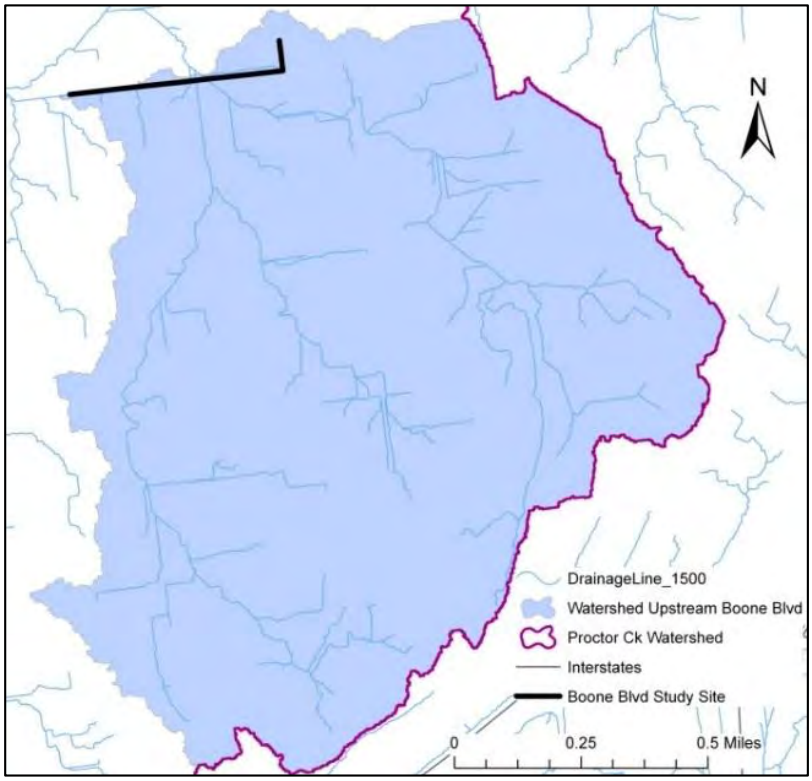


**Figure 11. The modeled area upstream of the proposed project site with modeled stormwater flow lines.**

### 3.5.2. Vulnerable Populations Affected

HIAs assess the distribution of potential impacts within the population affected. This practice helps to determine if there may be unequal sharing of burdens and/or benefits that may result from the proposed decision. Vulnerable populations refers to sub-groups within the population that may be more sensitive to or more affected by changes in the physical and natural environment, social environment, and/or economic environment. The HIA Core Project Team discussed and determined that individuals in low-income households (i.e., at or below the federal poverty level), young children, the elderly and/or physically disabled, and households that are cost-burdened (i.e., spend more than 30% of their income on housing costs) would be more vulnerable to the consequences of the proposed Green Street Project.

Individuals and households that are economically disadvantaged (e.g., low-income, fixed-income, unemployed, etc.) are going to be more sensitive to changes in the economic environment. Housing costs, costs of groceries, and transportation costs are types of living expenses that shape the economic conditions of a community and can predispose vulnerable populations to disproportionate impacts. For example, if housing costs (e.g., rent or property taxes) increase due to community-level improvements, those living in the community at the lower end of the income spectrum would be less likely to be able to accommodate those increased costs and may be obligated to move away. Displacement from gentrification describes the movement of low-income residents out of an area due to an inability to adapt to increases in cost of living.

Youths (ages 5 to 18 years) and young children (under age 5) are highly sensitive to the physical, social, and economic conditions in the community because of their dependency on others. Children are also more susceptible to illness and injury than adults. Environmental conditions, such as poor air quality, greatly increase the risk for respiratory disease (e.g., asthma) among children. Poor social conditions, such as overcrowding and crime, can lead to stress and harmful health behaviors that continue through adulthood. Children living in poverty are more likely to live in crowded housing, have less access to healthy food, and limited access to healthcare, than children not living in poverty.

Elderly and/or physically disabled individuals are more dependent on the accessibility of the built environment, compared to those without physical restrictions. For example, the design and condition of roadways in a neighborhood (e.g., level sidewalks, pedestrian crossings with counters, bicycle lanes, and public transit stops) can either prevent or enable those with physical restrictions to reach destinations, such as health clinics, parks, and recreational space, which affect health and wellness.

The HIA Core Project Team paid particular attention to whether or not the identified vulnerable populations would disproportionally affected by the proposed project.

### 3.5.3. Identifying the Pathways of Impact

The HIA Core Project Team relied on stakeholder input to decide what the HIA would assess (i.e., what health impacts would be included in the assessment). Documentation of the following scoping activities can be found in **Appendix C**.

# Scoping

### *Stakeholder-identified Health Impacts*

On March 22, 2013, the HIA Core Project Team held the first public, community meeting of the HIA. There were eighteen community members who attended the meeting and eleven different organizations represented. The HIA Core Project Team facilitated a group discussion among the meeting attendees to identify what "health" meant to them. Physical well-being remained the most recognizable factor related to health. Stakeholders also recognized overall well-being, including physical, mental, and social aspects, as a contributing factor. Attendees were asked to name and describe concerns in the community and how "quality of life" could be improved. There were ten pre-conceived categories of interest and/or concern identified by the HIA Core Project Team prior to the meeting, and attendees came up with an additional category, titled "Community engagement," which they felt also needed to be included. Community members then identified ways to improve the quality of life in the community within these 11 categories.

This same exercise was conducted at the first HIA Advisory Group meeting on April 30, 2013. The HIA Advisory Group identified additional ways to improve the quality of life in the community within the eleven identified categories and added a twelfth category, titled "Total Investment." The premise of this category was the concern that residents who lived in the community may not be able to stay in the community after improvements were made because the area was no longer affordable (later identified as "gentrification"). Table 10 documents the responses from the attendees at the public, community meeting and HIA Advisory Group meeting.

**Table 10. Interests and/or Concerns Identified by Stakeholders**

| Category of Interest and/or Concern | Ways to Improve Quality of Life (Identified by the community) | Additional Ways to Improve Quality of Life (Identified by the HIA Advisory Group) |
|---|---|---|
| **Community Engagement** | • Opportunities to participate in decision-making<br>• A safe/secure community meeting space<br>• Opportunities for community outreach | • A "greater voice" or unified community voice<br>(internal) institutions for community engagement |
| **Economy / Jobs / Poverty** | • Community-owned asset that is an economic activity generator<br>• Increased local jobs for community residents<br>• Increased "green jobs"<br>• Develop grey-to-green job training pilot<br>• Increased tourism and other economic opportunities | [No input provided.] |

# Scoping

| Category of Interest and/or Concern | Ways to Improve Quality of Life (Identified by the community) | Additional Ways to Improve Quality of Life (Identified by the HIA Advisory Group) |
|---|---|---|
| **Education** | • Capacity building for sustainable jobs<br>• Community outreach that augments existing community knowledge<br>• Environmental health education/training<br>• Environmental health/stewardship program that targets youths<br>• Historically Black College and University (HBCU) kick-start environmental academy | • Training for green infrastructure jobs<br>• Education for 'healthier' living and eating<br>• Education on environmental risks |
| **Environment** | • Improvements to stormwater management<br>• Cleanup of contaminated properties<br>• Restored creek beds and stream health<br>• Invest in green infrastructure<br>• Increased beautification projects<br>• Implement sustainability projects | • More green space<br>• Address deficiencies in the 5 mechanisms of healthy communities (transportation, telecommunications, power, wastewater, water supply)<br>• Improved balance between built environment (development) and environmental hazards<br>• Broader view on green infrastructure implementation<br>• Reduce 'heat stress' (planting trees) |
| **Health** | • Decrease in liquor stores<br>• Address health disparities and serious health threats, e.g., HIV, cardiovascular disease<br>• Sustainable food options/regenerate soils for urban agriculture | • Access to healthy foods<br>• A medical home<br>• Assess and educate for risk factors to health in community, e.g., lead poisoning, asthma, etc.<br>• Reduce disease transmission and (improve) vector control |
| **Housing** | • Reduced vacant buildings<br>• Reduce and eliminate dilapidated housing and flood-prone properties<br>• More affordable housing<br>• Launch a housing status inventory<br>• Increase home/land ownership (home-owners) | • More suitable (healthy) housing<br>• Increase replacement housing (for dilapidated properties) |
| **Politics / Government** | • Equitable distribution of resources (from city)<br>• Change land-use policy<br>• Influence public policy, agencies, etc. with informed community input | • A step-wise approach that looks at short-term, medium, and long-term impacts |

# Scoping

| Category of Interest and/or Concern | Ways to Improve Quality of Life (Identified by the community) | Additional Ways to Improve Quality of Life (Identified by the HIA Advisory Group) |
|---|---|---|
| **Recreational** | • Increase beauty (aesthetics)<br>• Completed Mims Park to enhance historic portion of community/tourist attraction<br>• A Recreation/community center | • (Added) recreational opportunities |
| **Safety** | • Decrease drug sales and crime (police enforcement)<br>• Establish neighborhood watches<br>• Implement beautification projects (to improve social cohesion) | • (Improve) built environment to support safe/civil activities and deter crime |
| **Social / Cultural** | • Talk to long-term residents, address problems, and respond<br>• (Promote) multi-generational and walk-able community | • (Improve) relationships between established community institutions and educational institutions<br>• (Address) social impacts of projects<br>• (Add) opportunity for social/emotional support<br>• Different "branding" of community<br>• (Improved) community cohesion |
| **Transportation** | • (Improve) connectivity with downtown<br>• Add directional signage to lead people to neighborhood goods/services | • (Improved) accessibility/walk-ability/access to basic needs (e.g., laundry, healthy foods, employment, etc.) |
| **Total Investment** | [No input provided.] | • Ensure affordability to live in the community after improvements have been implemented (avoid gentrification) |

[1] The HIA Core Project Team developed the categories *a priori* with the exception of "Community Engagement" (added by the community) and "Total Investment" (added by the HIA Advisory Group).

After identifying interests and/or concerns, the HIA Core Project Team asked participants at each of the meetings to vote on which categories of interest/concern were most important and/or relevant to the community; four votes were given to each participant. Figure 12 highlights community stakeholders voting on which pathways were more important.

**Figure 12. Community stakeholders voting on interests and/or concerns at the first community engagement meeting.**

Votes were tallied at the end of the exercise and compared between the two groups. Figure 13 and Figure 14 identify the number of votes assigned to each category at the community meeting and HIA Advisory Group meeting, respectively. Both groups identified the environment, economy/jobs/poverty, and community engagement as the higher priority items. However, there were differences of opinion between the two groups regarding categories of lesser priority. For example, transportation was considered a higher priority by the HIA Advisory Group, but not among the residents who attended the community meeting. Education and housing were important to community residents, but not as important to the HIA Advisory Group.

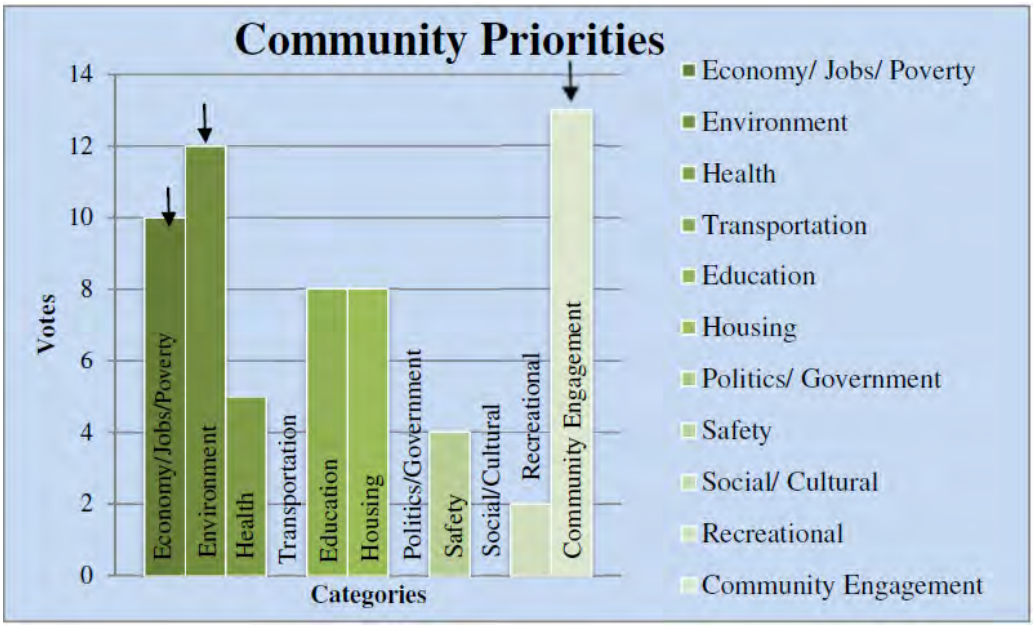


**Figure 13. Results of the voting to prioritize categories of concern/need from the first Community meeting.**

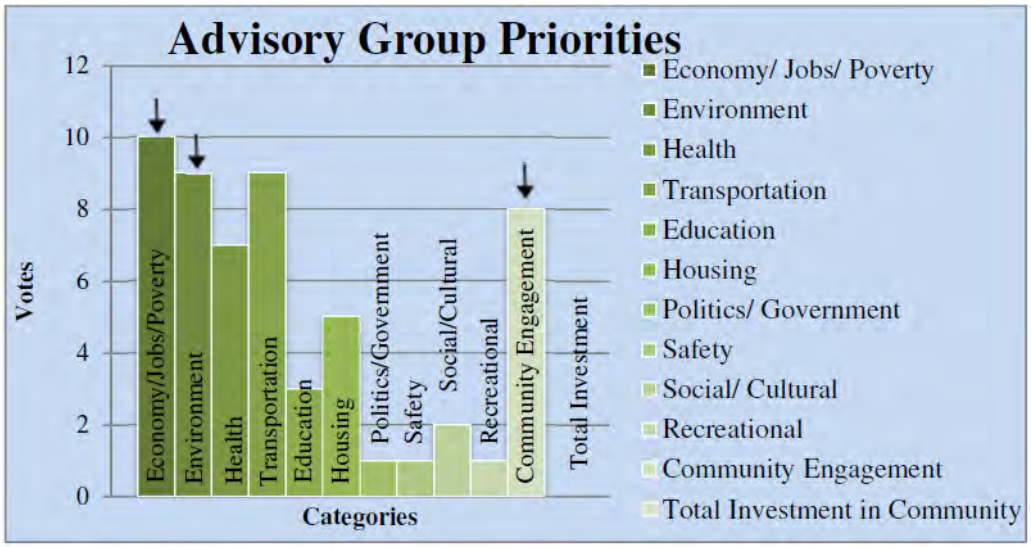


**Figure 14. Results of the voting to prioritize categories of concern/need from the first HIA Advisory Group meeting.**

### *Using an HIA Training Workshop to Build Capacity for HIA and Identify Pathways of Impact*

On Thursday, May 23, 2013, EPA's Region 4 OEJ, in partnership with CDC and GHPC, hosted a full-day HIA training titled "An Introduction to Health Impact Assessment." Several stakeholders were invited to attend the training. A total of 30 participants attended the training and included EPA staff (n=10) other federal agencies (n=7), non-governmental organizations (n=1), universities (n=7), county (n=1) and community organizations (n=4). The training was conducted using small group exercises and PowerPoint presentations that discussed the steps of HIA, the Boone Boulevard Green Street Project case study, health determinants, and information on how the "National Prevention Strategy" and "Health in All Policies" initiative are new science-based tools for improving health outcomes throughout the U.S. Participants were given scenarios related to the Green Street Project, and asked to step through the HIA process using facilitated exercises. Exercises were designed to teach participants how to develop theoretical pathways of impact, characterize the impacts predicted, and develop recommendations for the different scenarios (results of those exercises are documented in Appendix C).

The HIA Core Project Team used the information gained from this training to start identifying pathways in which the proposed project could influence health. Causal pathway diagrams are a tool often used in HIA to frame or illustrate the relationships between actions and their consequences. Several health determinants and health outcomes were identified in this exercise. As the pathways became more complex, it became very evident that the health outcomes affected by the proposed project were not linked to one factor alone, nor were they independent of one another. Thus, the HIA Core Project Team put together an overarching theoretical impact pathway diagram that illustrated the various interconnected pathways through which the proposed project could affect health. The handout with the overarching theoretical impact pathway diagram can be found in **Appendix C** under *Documentation of the Second HIA Advisory Group Meeting, July 23, 2013*.

### *Data Mining and Preliminary Literature Search to Inform Pathway Diagrams*

The HIA Core Project Team took the information provided by stakeholders and compiled it into a list of topics. Then, the team brainstormed what was known and unknown for each topic and where information (i.e., data) could be obtained to fill in the unknowns or (i.e., data gaps). Investigators began mining for information about each of the topics, using data and literature (e.g., peer-reviewed scientific journal articles, agency reports, factsheets, etc.) already available to gather. The team identified commonly-used terminology, key indicators of measurement, methods of analyses, and sources of data. A Master Data Sheet (created in Excel) was used to document the information obtained from these efforts and was kept in a Google Plus© share drive, so that each member of the team could view and/or add information to the file as needed. As more information was gathered, the potential health impacts and their pathways were further refined.

## 3.6 HIA Assessment Work Plan

The HIA Project Leads created a work plan that listed the tasks required to complete the HIA, starting with Assessment (refer to **Appendix D** for the complete HIA Work Plan). Table 11 lists the tasks identified for completing the Assessment Step.

**Table 11. Assessment Step Tasks in the HIA Work Plan**

| Task | Description |
|---|---|
| **Task 1. Access and collect data on existing conditions in the community** | • Collect and analyze data on the current resident population, including demographic, economic, social, and health outcome indicators. Synthesize existing data on identified health determinants and outcomes of interest.<br>• Update/refine the research questions and pathway diagrams as needed. |
| **Task 2. Evaluate and weigh evidence of causal relationships** | • Access and synthesize peer-reviewed literature and agency reports for information explaining the relationships (or lack thereof) between the decision, current conditions, determinants of health, and health outcomes.<br>• Evaluate, based on certainty, whether the evidence demonstrates a cause and effect relationship between factors and assess whether the information gained (based on context and range) can be applied to this project.<br>• Update/refine the research questions and pathway diagrams as needed. |
| **Task 3. Share information gathered with stakeholders and elicit feedback** | • Present information found and data gaps to advisory group and discuss initial findings of existing conditions and elicit stakeholder input to fill in data gaps.<br>• Present preliminary findings to community and elicit feedback. |
| **Task 4. Forecast health effects, quantitatively where feasible** | • Identify and use suitable prediction models (exposure-response, regression equations, etc.), where appropriate, to predict estimated health effects.<br>• Estimate impacts to health and/or health determinants using predictive models, where possible. |
| **Task 4. Characterize expected health effects** | • Characterize the direction of impact, likelihood, magnitude, permanence, distribution, and strength of evidence for the impacts estimated, based on the data/information collected and/or modeled. |
| **Task 5. Evaluate the level of confidence or certainty in health impact characterization** | • Compile the evidence that supports the characterization of impacts and evaluate the level of confidence or certainty. Prepare communication materials that represent the information synthesized and impacts judged.<br>• Present assessment findings to stakeholders and public to elicit input on the predicted/estimated impacts and re-evaluate the confidence and certainty of change based on their input. |

### 3.6.1. Health Impacts Assessed

The proposed project was expected to affect, either directly or indirectly, several health-related factors. For example, the proposed project would result in changes to roadway infrastructure (e.g., lane reductions and restriping) that will directly affect traffic safety. Improving traffic safety may remove potential barriers that limit access to goods and services. Improving accessibility can lead to more people traveling through the area, which increases the opportunity for social interaction and building relationships. Increased traffic to the area will affect the crime rates, either by increasing the number of potential crime victims or by reducing the opportunities for crime by increasing the number of "eyes on the street." Building social relationships is a key component of social capital, which is the presence and strength of social bonds and ties (networks) in a community. Social capital also plays an important role in a community's ability to control crime. Each determinant fits within a sector of sustainability – environment, society, and economy. Thus, the extent to which the proposed project influences these

factors could be used as a performance indicator for promoting sustainability. Figure 15 identifies the twelve determinants of health included in the assessment, by sustainability sector, and the pathways connecting them to the proposed project.

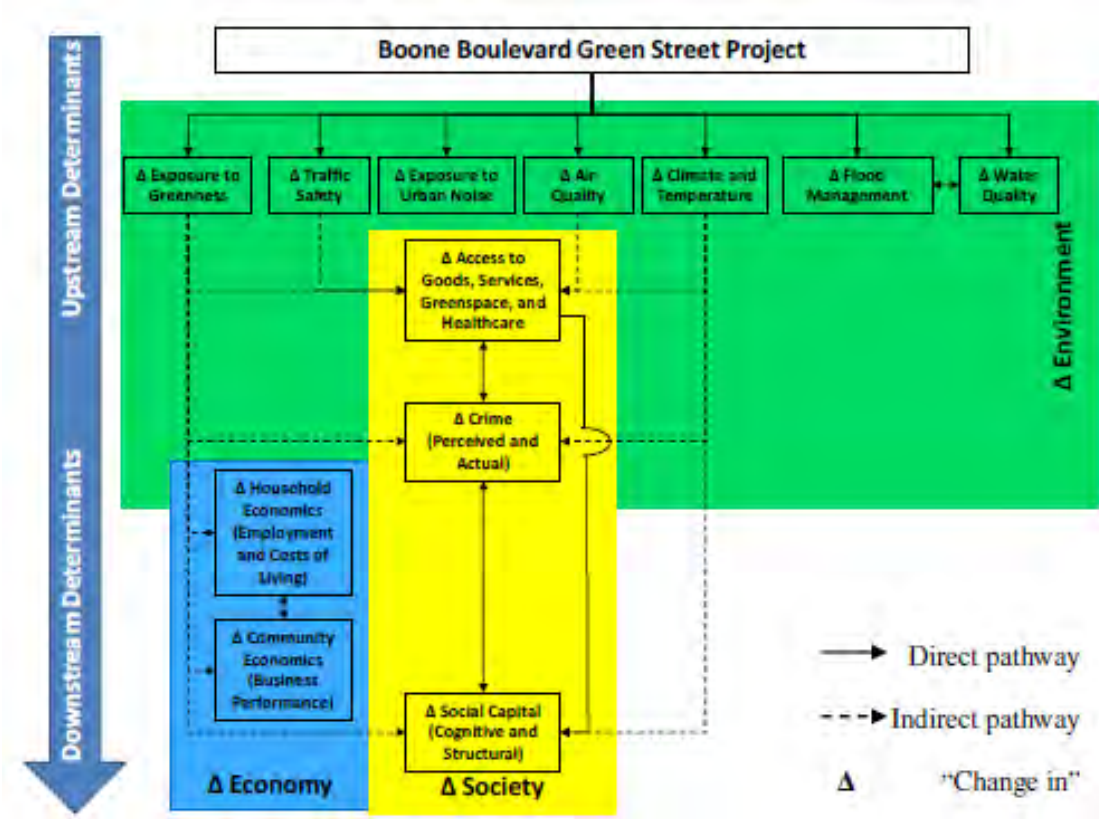


**Figure 15. Final health determinants included in the assessment step.**

### 3.6.2. HIA Study Questions and Data Collection and Analysis

Study questions were developed to address each health determinant in the identified pathways either by providing insight on the existing conditions observed in the community (i.e., existing conditions study questions) or how the proposed project may change those conditions and ultimately influence health (i.e., impact study questions). Once the study questions were identified, the HIA Core Project Team worked to identify the most relevant, reliable data sources, indicators, and analysis methods available to answer those questions. A scoping worksheet, developed by Human Impact Partners (http://www.humanimpact.org/capacity-building/hia-tools-and-resources/), was used to document this process. The study questions were refined as more information was collected.

Pre-existing, publically available data was the most commonly used data in assessment. Standardized and scientifically-rigorous datasets, such as the 2010 Census data files and the 2006 National Land Cover Dataset (NLCD), were given greater consideration. Finding data at the same resolution (i.e., level of data collection) for some of the study questions proved to be difficult. For example, Census data was available for all of the demographic and socio-economic indicators at the tract level, for some indicators at the block group level, and for almost none at the block level. Therefore, the tract level was used for most data analysis resolution.

# Scoping

*Note: As a federal agency, direct collection of information from individuals is restricted by the Paperwork Reduction Act and Information Collection Policy (44 USC 3501-3520) and requires approval from an Agency Internal Review Board (IRB) prior to any direct data collection from the public. The timeframe for this process did not fit within the HIA timeframe and thus restricted the ability to collect information directly from the public.*

### *Modeling and Quantitative Analysis*

Data files from the U.S. Census Bureau were used to extract demographic, structural, and socioeconomic conditions in the community. The HIA Core Research used both the 2000 and 2010 Census datasets (to compare the population over time), and data from the 2006-2010 American Community Survey (ACS) five-year aggregated estimates. The use of aggregate numbers is common in public health, when looking at community health profiles, because it normalizes potential outlier years (i.e., years of abnormally high or low values). The Atlanta Department of Planning and Community Development and the Atlanta Police Department (APD) provided additional social and economic data to conduct analyses related to property values, vacant and derelict properties, and crime. Calculations and mapping of the population-based data were performed using GIS software and methods.

A variety of data sources were used to obtain and analyze data related to the physical (natural and built) environment, including the National Hydrography Dataset (NHD), the NLCD, PRISM Climate Group, local climatological data sources, and www.weather.com. GIS-based mapping tools and analytical models, such as ArcHydro, ArcMap, and EPA's Stormwater Calculator (Version 1.0.0.9) were used to generate watershed boundaries, stormwater flow lines, sites of stormwater flow accumulation, wetness indexes, land cover and land use types, average monthly temperatures and precipitation, and flood prone zones.

### *Literature Review*

The HIA Core Project Team performed literature reviews of the empirical evidence. Team members were given a set of guidelines for conducting the literature review, a list of document types that were acceptable to include in the review, and a worksheet developed to standardize the information collected (provided in **Appendix D)**.

The HIA Core Project Team reviewed over 200 articles and prepared literature review worksheets to track the information collected. Databases, such as Google Scholar, JSTOR, and LexisNexis, EBESCO Academic Search Complete, Web of Science, Science Direct, PubMed, PsychInfo, ProQuest, Social Science Research Network, and PAIS International, were used to search the literature articles. Identifying key search terms (e.g., green infrastructure efficiency, human health, extreme heat event, etc.) and setting exclusion parameters (e.g., sources published after 1995, in English, etc.) helped to expedite the review of the literature. HIA clearinghouses, such as UCLA's HIA Clearinghouse Learning and information Center (HIA-CLIC; http://www.hiaguide.org/) and the Health Impact Project HIA Clearinghouse (http://www.healthimpactproject.org/hia/us) provide free access for searching previous HIA reports. The data from the literature review worksheets were compiled in the Master Data Sheet.

### *Stakeholder Input*

There were instances where the data needed to effectively evaluate the potential impacts to health were not available. The HIA Core Project Team held a second HIA Advisory Group meeting on July 23, 2013 to enlist stakeholders' assistance in identifying potential data, sources, and tools available to address identified data gaps. The team presented the data sources and approaches they had identified for use in the assessment and using posters showcasing each of the various categories (i.e., health determinant groupings) and sub-topics to be addressed, and solicited input from stakeholders. The HIA Advisory Group identified additional sources, contacts, and tools that could be used in the assessment (the input provided by the HIA Advisory Group is documented in **Appendix C** under *Documentation of the Second HIA Advisory Group Meeting, July 23, 2013*).

When data was not available or was lacking in reliability, the HIA Core Project Team relied on professional expertise and best judgment. HIA as a "pragmatic exercise and reflects a balance between scientific rigor and professional judgment" (NRC 2011). The HIA Core Project Team utilized the expertise of local public health professionals, science research professionals, and stakeholders with local knowledge to evaluate potential impacts of the Green Street Project. Caveats and cautions are made explicit in this report to highlight limitations and uncertainties in the data and analysis methods used, along with assumptions made in carrying out the assessment.

### *Characterization and Qualitative Analysis*

Health status information for the community was almost non-existent, given the relatively small size of the HIA study area. However, some health data was provided at the Census tract level by the Georgia Department of Public Health Online Analytical and Statistical Information System (OASIS; available at *http://oasis.state.ga.us/oasis/)*. This information, however, was provided in a non-numeric format─ choropleth maps of quintile (i.e., data was arranged in five ranks equally distributed between the minimum and maximum values) from lowest to highest. Health information was gathered on the aggregate number of emergency room (ER) visits, by cause, for the years 2006 to 2010.

*Note: The availability of health status information is often limited or unavailable due to the privacy standards of the 1996 Health Insurance Portability and Accountability Act (HIPAA). These data gaps can limit the scope of a study and hinder accurate forecasting of impacts in assessment. In this HIA, the lack of health data at a finer resolution than county level made it difficult to forecast the probability and magnitude of predicted health impacts. However, OASIS allowed the HIA Core Project Team to qualitatively characterize health status for reported health outcomes. It is important to note that the population boundaries in the OASIS mapping tool have not been updated and use the 2000 Census tract boundaries.*

Data-based evidence, empirical evidence, and professional expertise were used to characterize the potential health impacts of the proposed project. Once the potential impacts were identified, the extent of the impacts was evaluated based on six criteria – likelihood, direction, magnitude, permanence, distribution, and strength of evidence. The *likelihood* that the impact would occur because of the project was appraised. Whether the impact would improve, detract, or have no net effect on health outcomes was described by the *direction* of impact. *Magnitude* described how many people would be affected by the change. *Permanence* was used to refer to how long the changes to the health determinants were expected

to last. The *distribution* of the impact was judged for how it would affect vulnerable populations. Lastly, the *strength of evidence* upon which the impact characterization was made was also identified. Table 12 explains the rating scales for each criterion.

**Table 12. Impact Characterization Criteria and Rating Scale**

| Criteria | Rating Scale |
|---|---|
| **Direction** | Positive= the potential change to the health determinant will ***benefit*** health<br>Negative= the potential change to the health determinant will ***detract*** from health<br>Both Positive/Negative= Both ***positive and negative*** impacts are expected<br>None= ***no change*** in the health determinant is expected |
| **Likelihood** | Highly Likely= it is ***highly*** **likely** that the change will occur because of the project<br>Plausible= it is ***plausible*** that the change will occur because of the project<br>Not Likely= it is ***not likely*** or not plausible that the change will occur because of the project |
| **Magnitude** | High= the change has the potential to impact ***many people, beyond those on the street***<br>Moderate= the change in the health determinant has the potential to impact ***a moderate number of people, specifically those using the street***<br>Low= the change in the health determinant has the potential to impact ***very few*** **people** |
| **Permanence** | Long Lasting= the change in health may be ***long-lasting*** (for many years)<br>Moderate= the change in the health may be ***medium-lasting*** (for a few years)<br>Quickly and Easily Reversed= the change in the health may be ***short-lasting*** or ***easily and quickly reversible*** |
| **Distribution** | Vulnerable Populations Benefit=the change in the health determinant has the potential to ***benefit vulnerable populations***, or restore equity in the opportunity for healthy living<br>Vulnerable Populations Harmed= the change in the health determinant has the potential to ***harm vulnerable populations***<br>Equal Impact= the impact will be ***distributed equally*** throughout the population |
| **Strength of Evidence** | Strong= causal evidence is ***strong***, there are many consistent studies, or cause-effect pathway is generally accepted<br>Limited= evidence is ***limited***, there are a few good studies showing an association between the factors, but some controversy exists (potential for confounders/mediators)<br>Lacking= evidence is ***lacking***, but the impact(s) predicted follow a logical (theoretical) pathway |

The following tables provide information from the HIA Scoping Worksheet for each of the health determinants, including the study questions, data needed (i.e., indicators), whether the data was publically available, data sources and tools available, and data analysis methods. Table 13 to Table 19 relate to the health determinants in the environmental sustainability sector. Table 20 to Table 22 relate to the health determinants in the social sustainability sector. Table 23 and Table 24 relate to the health determinants in the economic sustainability sector.

# Scoping

**Table 13. HIA Scoping Worksheet for Water Quality**

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| **1. What influences water quality?**<br>**2. How does water quality influence public health?**<br>**3. How efficient is green infrastructure in improving water quality?** | • Exposure to water-borne disease<br>• Percent efficiency of stormwater best management practices (BMPs) | Yes | • Empirical Literature Review | – Review empirical literature to determine factors that contribute to water quality in urban communities and how water quality affects health. |
| **4. What is the status of water quality in the Proctor Creek Watershed?**<br>**5. What is the status of health outcomes in the community related to water quality?** | • Fecal coliform and/or *E. coli* monitoring data<br>• 305(b)/303(d) criterion violated and identified potential causes<br>• ER visits for digestive system diseases (GA—DPH OASIS does not report waterborne diseases) | Yes | • Water quality monitoring reports and list of 305(b)/303(d) impaired rivers and streams (GA—EPD, DWM, and ARC)<br>• GA—DPH, OASIS 2006-2010 dataset | – Review previous reports on water quality surveillance and extract relevant data.<br>– Review available health information related to water-borne illness. |
| **6. Will the elements of the Green Street Project be sufficient to affect water quality and related health outcomes?** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) | – Review evidence and (qualitatively) characterize health impacts related to water quality. |

**Table 14. HIA Scoping Worksheet for Flood Management**

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| **1. What are the risks to human health associated with flooding (i.e., injury from slips/falls, damage to** | • Exposure to injury from flooding<br>• Exposure to poor housing | Yes | • Reports and available data from GA—DPH<br>• Empirical Literature | – Review literature to determine pathways of impact between flooding, housing and infrastructure |

# Scoping

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| **homes, contribution to pest population, etc.)?** | • Exposure to vector-borne disease (i.e., positive West Nile Virus (WNV) sample locations) | | | damage, vector control, and health.<br>– Review literature to identify contributing factors to flooding in an urban watershed. |
| **2. During or after a rain event, where is stormwater (that is not captured and conveyed by the storm sewers) most likely to flow?**<br>**3. Do the areas in the community more prone to flooding also have derelict or vacant properties?**<br>**4. How much stormwater runoff reaches the storm sewer inlets in the proposed project site?**<br>**5. How are the areas upstream, downstream, and in the community interrelated with respect to flooding?**<br>**6. What is the risk of flooding in the community and in other areas of the watershed?** | • Topographic Wetness Index (TWI)<br>• Derelict and vacant properties (land and/or structure)<br>• Percent of all rainfall retained<br>• Days per year with runoff<br>• Percent of wet days retained<br>• Average annual runoff<br>• Land cover (land use)<br>• Plotted monthly average precipitation<br>• Predicted annual peak discharge by volume, magnitude, and reoccurrence intervals<br>• Predicted flood frequency percent | Yes- but requires GIS expertise | • NLCD and NHD (2006)<br>• Atlanta Department of Planning and Community Development, Strategic Community Investment (SCI) Window Survey data<br>• Geospatial analysis using ArcGIS tools, including ArcMap and ArcHydro<br>• Scenario modeling using National Stormwater Calculator (EPA Release 1.0.0.9)<br>• Computations in Microsoft Excel | – Generate flood plains and wetness index to identify flood risk and flood prone areas.<br>– Estimate current and predicted volumes of stormwater runoff flowing through the project area before and after the Green Street Project has been implemented.<br>– Use GIS support to perform spatial analysis of derelict and/or vacant properties and anticipated wet areas.<br>– Calculate and plot average daily precipitation values to determine size and frequency of 81% of storm events. |
| **7. Will the Green Street Project affect flooding and related public health issues?** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) | – Review evidence and (qualitatively) characterize health impacts related to flood management. |

# Scoping

**Table 15. HIA Scoping Worksheet for Climate and Temperature**

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| 1. **What elements of the built and natural environment in an urban community might predispose residents to higher temperatures?**<br>2. **How does exposure to higher temperatures affect health and wellness?** | • Exposure to extreme heat events (heat-related illness not reported in GA—DPH OASIS) | Yes | • Empirical Literature – | Review the literature evidence to identify pathways of impact between exposure to extreme heat events, health, and any mediating factors. |
| 3. **What are the historic temperatures experienced in the community?**<br>4. **Are there areas in the community that may contribute to "hot spots" or higher than average surface temperatures?** | • Monthly average temperatures<br>• Infrared imaging of impervious surfaces | Yes- but requires GIS expertise | • www.weather.com<br>• ArcGIS Mapping Tools – | Geospatially analyze impervious surfaces and use monthly average temperatures to determine areas of significantly higher temperatures. |
| 5. **Is the Green Street Project, as designed, expected to change the microclimate and influence temperature and its related health impacts?** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) – | Review evidence and (qualitatively) characterize health impacts related to climate and temperature. |

**Table 16. HIA Scoping Worksheet for Air Quality**

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| 1. **How does air quality influence health and wellness?**<br>2. **How does the built and natural environment** | • Exposure to ambient air pollutants<br>• Traffic-related air pollution | Yes | • Empirical Literature – | Review the literature evidence to identify pathways of impact between exposure to air |

# Scoping

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| **influence ambient air pollutant concentrations, especially in urban communities?** | • Ecological processes of pollutant capture by vegetation<br>• Pollutant capture efficiencies of BMPs | | | pollutants, health and any mediating factors. |
| **3. What is the existing status of health outcomes related to air quality in the community?** | • ER visits for respiratory diseases<br>• ER Visits for chronic lower respiratory disease<br>• ER Visits for asthma | Yes | • GA—DPH, OASIS 2006-2010 health indicators dataset – | Use the OASIS mapping tool to select and download maps of ER visits related to air quality by Census tract. |
| **4. Will the Green Street Project, as designed, affect local air quality and related health outcomes?** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) – | Review evidence and (qualitatively) characterize health impacts related to air quality. |

**Table 17. HIA Scoping Worksheet for Traffic Safety**

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| **1. What characteristics of the built and natural environment contribute to traffic safety?**<br>**2. Does implementing green infrastructure along a street (i.e., streetscaping) improve traffic safety?** | • Exposure to injury from motor-vehicles | Yes | • Empirical Literature – | Use peer-reviewed literature to qualitatively assess impact of road diet and streetscaping on traffic safety and choosing active modes of transportation (i.e., walking and bicycling). |
| **3. What are the existing traffic conditions and traffic safety practices present along the project site?** | • Speed limit<br>• Average annual daily traffic (AADT)<br>• Safety practices (e.g., speed bumps, | Yes | • GA—DOT, Georgia State Traffic and Report Statistics (STARS)<br>• GA—DPH, OASIS 2006-2010 dataset – | Use direct observations to inventory the traffic safety practices that exist along the proposed project site. |

# Scoping

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| | pedestrian and cycling infrastructure, etc.) | | | – Access traffic data and calculate daily traffic volumes.<br>– Use the OASIS mapping tool to select and download maps of ER visits related to motor-vehicle crashes by Census tract. |
| **4. Is the Green Street Project designed to improve traffic safety** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) | – Review evidence and (qualitatively) characterize health impacts related to traffic safety. |

**Table 18. HIA Scoping Worksheet for Exposure to Greenness**

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| **1. How does the natural environment or amount of greenness in a neighborhood affect residents living in that neighborhood?** | • Exposure to greenness | Yes | • Empirical Literature | – Review available literature and identify mechanisms by which greening of the living environment (or lack of) can impact public health. |
| **2. How green is the community around the proposed project site?**<br>**3. Is mental and behavioral health a concern in the community?** | • Infrared imaging of vegetation (by type)<br>• ER visits for mental and behavioral disorders<br>• Hospitalizations for mental and behavioral disorders | Yes-GIS expertise required | • 2006 NLCD<br>• GA—DPH, OASIS 2006-2010 dataset | – Map the green and grey areas in the community and calculate spatial differences.<br>– Use the OASIS mapping tool to select and download maps of ER visits related to mental and behavioral disorders. |

# Scoping

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| **4. Will the added greenness of the Green Street Project along Boone Street be enough to impact health outcomes related to mental and behavioral health?** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) | – Review evidence and (qualitatively) characterize health impacts related to greening the living environment. |

**Table 19. HIA Scoping Worksheet for Exposure to Urban Noise**

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| **1. How does living near a major urban corridor affect resident health and well-being?**<br>**2. How can the natural environment influence the adverse health impacts of noise generated from an urban street?** | • Exposure to urban (especially traffic-related) noise | Yes | • Empirical Literature | – Review the available literature to identify sources of urban noise and mechanisms in which urban noise impacts public health. |
| **3. What are the current levels of ambient noise generated from Boone Street?**<br>**4. What are the existing conditions of health outcomes that are most related to urban noise exposure?** | • Modeled ambient noise levels from traffic or individual sound level exposure (if available)<br>• Frequency of self-reported annoyance and/or sleep disturbance (if available)<br>• Mortality and morbidity by cause | Noise and Health data available, but limited to county level | • Seong et al (2011) modeled road traffic noise<br>• GA DPH OASIS 2006-2010 dataset<br>• GA DPH Mortality Rate Dashboard by cause | – Collect available data on road-source traffic and related mortality and morbidity data for Fulton County, GA and infer probable observations experienced in the community. |

# Scoping

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| **5. Will the Green Street Project, as designed, be enough to affect how noise from the street travels through the surrounding community and related health outcomes?** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) | – Review evidence and (qualitatively) characterize health impacts related to (traffic-related) urban noise. |

**Table 20. HIA Scoping Worksheet for Access to Goods and Services, Greenspace, and Healthcare**

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| **1. Does implementing green infrastructure along a street corridor influence accessibility?**<br>**2. How does accessibility affect health?** | • Accessibility<br>• Walk-ability<br>• Bike-ability | Yes | • Empirical Literature | – Review the literature evidence available regarding accessibility and related health impacts. |
| **3. How walkable and bikeable is the area along Boone Street?** | • Walk Score®<br>• Bike Score®<br>• Transit Score® | Yes | • www.walkscore.com | – Use the standardized Walk Score® already generated and supplement with anecdotal and observational information. |
| **4. Is the Green Street Project, as designed capable of influencing accessibility for residents and visitors along Boone Street?** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) | – Review evidence and (qualitatively) characterize health impacts related to accessibility. |

# Scoping

**Table 21. HIA Scoping Worksheet for Crime (Perceived and Actual)**

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| 1. **How does crime influence health?**<br>2. **How can implementing green infrastructure influence crime?** | • Perceived and actual safety/security | Yes | • Empirical Literature – | Review the available evidence on crime and health impacts of crime. |
| 3. **Does the area experience a high crime rate?** | • Yearly crime count (by type – aggravated assault, auto theft, homicide, larceny, non-residential burglary, residential burglary, robbery, vehicle larceny) | Yes- by request | • City of Atlanta, GA Police Department Beat 102 and 103<br>• ArcGIS Mapping Tools – | Obtain and spatially analyze crime data to see where there are areas of high crime. |
| 4. **Does the Green Street Project have the potential to influence crime in the community?** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) – | Review evidence and (qualitatively) characterize health impacts related to perceived and actual security/safety. |

**Table 22. HIA Scoping Worksheet for Social Capital (Cognitive and Structural)**

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| 1. **How does streetscaping and revitalization efforts relate to social capital at the neighborhood level?** | • Cognitive social capital<br>• Structural social capital | Yes | • Empirical Literature – | Review the available literature on revitalization/ redevelopment, streetscaping, and social capital. |
| 2. **What assets are available in the community that provide space to build social capital?** | • Location of public facilities, greenspace, churches, etc. | Yes- | • www.googlemaps.com<br>• ArcGIS – | Identify and map the facilities where social capital can be influenced. |

# Scoping

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| 3. **Is the Green Street Project expected to influence social capital in the community surrounding the proposed project site?** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) | – Review evidence and (qualitatively) characterize health impacts related to social capital. |

**Table 23. HIA Scoping Worksheet for Household Economics (Costs of Living and Employment)**

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| 1. **How does streetscaping affect living expenses (e.g., property taxes, rent, etc.,) among nearby properties?** | • Property values<br>• Housing costs<br>• Gentrification | Yes | • Empirical Literature | – Review the available literature evidence on green infrastructure (especially green streets) and individual economic impacts. |
| 2. **What is the existing cost of living in the community and how much of a person's income is going to housing costs?** | • Household income (median and mean by owner-occupied and renter-occupied)<br>• Households on Fixed income (by social security income, public assistance, retirement income)<br>• Monthly housing costs (by owner-occupied and renter-occupied)<br>• Percent imputed of monthly gross rent (by renter-occupied housing units)<br>• Average property value | Yes- GIS expertise is required | • U.S. Census Bureau, 2010 Census data files<br>• 2006-2010 ACS 5-Year Estimates<br>• City of Atlanta, GA Department of Planning and Community Development, Strategic Community Investment (SCI) Survey<br>• HUD Affordability Index (http://www.locationaffordability.info/lai.aspx)<br>• 2013 Atlanta Tax Digest data<br>• ArcGIS Mapping Tools | – Collect and aggregate the Census data regarding housing costs<br>– Map the residential property values and spatially analyze the impact of distance from the street on property values in the community. |

# Scoping

| Study Questions | Data Needed (Indicators) | Publically Available? | Data Sources and/or Tools | Analysis Methods |
|---|---|---|---|---|
| | • Persons living at or below poverty level (by age, race, ethnicity, gender, educational attainment)<br>• Location affordability index<br>• Residential property values | | | |
| **3. Is the total investment in the Green Street Project expected to affect costs of living?** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) | – Review evidence and (qualitatively) characterize health impacts related to cost of living. |
| **4. How does green infrastructure impact employment or the opportunity for employment in disadvantaged communities?**<br>**5. How does employment affect health?** | • Employment | Yes | • Empirical Literature | – Review the available literature evidence on green infrastructure (especially green streets) and individual economic impacts. |
| **6. What is the existing employment level in the community?** | • Population employed/ unemployed (by age, gender, race, ethnicity, educational attainment) | Yes- GIS expertise is required | • U.S. Census Bureau, 2010 Census data files<br>• 2006-2010 ACS 5-Year Estimates | – Collect and aggregate the Census data regarding employment. |
| **7. Is the total investment in the Green Street Project expected to affect employment?** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) | – Review evidence and (qualitatively) characterize health impacts related to employment. |

**Table 24. HIA Scoping Worksheet for Community Economics (Business Performance)**

# Scoping

| Study Questions | Indicators (Markers) | Data Publically Available? | Data Sources and Tools | Analysis Methods |
|---|---|---|---|---|
| 1. **How does streetscaping influence business performance?** | • Demand for goods and services<br>• Business performance | Yes | • Empirical Literature | – Review the literature available on mechanisms in which green infrastructure can affect local business performance. |
| 2. **What are the current property values for businesses in the community?** | • Property costs of non-residential properties | Yes-GIS expertise is required | • 2013 Atlanta Tax Digest data<br>• ArcGIS Mapping Tools | – Map and spatially analyze non-residential property values in the community. |
| 3. **Does the Green Street Project have the potential to impact or influence community-level business performance?** | [Blank] | [Blank] | • Proposed project conceptual design (Tetra Tech 2013) | – Review evidence and (qualitatively) characterize health impacts related to business performance. |

# Chapter 4. Assessment

The assessment step involves two major tasks – 1) creating a profile of the population affected by the decision, including health status and existing conditions in the community; and 2) characterizing the potential health impacts of the decision. Assessment should utilize the best available evidence, including quantitative (if available) and qualitative data from diverse sources, and should draw upon local knowledge as part of the evidence base.

## 4.1. Profile of the Population in the Community

The HIA Core Project Team evaluated the potential impacts of the proposed project using a half-mile radius around the proposed project site. This area constitutes of 1.25 square miles and intersects seven Census tracts (i.e., Census tracts 21, 23, 24, 25, 26, 35, and 118). The City of Atlanta Department of Planning and Community Development also refers to this area as neighborhood planning units (NPUs) K, L, and M. Census data provides the most accurate representation of population counts and estimates in a given geographic area.

### 4.1.1. Population Size and Density

The HIA Core Project Team first looked at the size and density of the population living in the community. According to the 2010 Census, there were 13,914 people living in the HIA study area– 15.6% decrease from a decade earlier, indicating movement out of the community. It is important to note that the large decrease in population from 2000 to 2010 resulted in a change of Census tract boundaries (Census tracts 22 and 8 were combined into Census tract 118 for the 2010 Census).

ArcGIS was used to map the population density data by Census tract, which were grouped into quintiles (i.e., ordinal groups of equal distance between the minimum value and the maximum value). Population density ranged from 2,476 to 7,857 persons per square mile and there were no spatial patterns observed among the Census tracts (Figure 16).

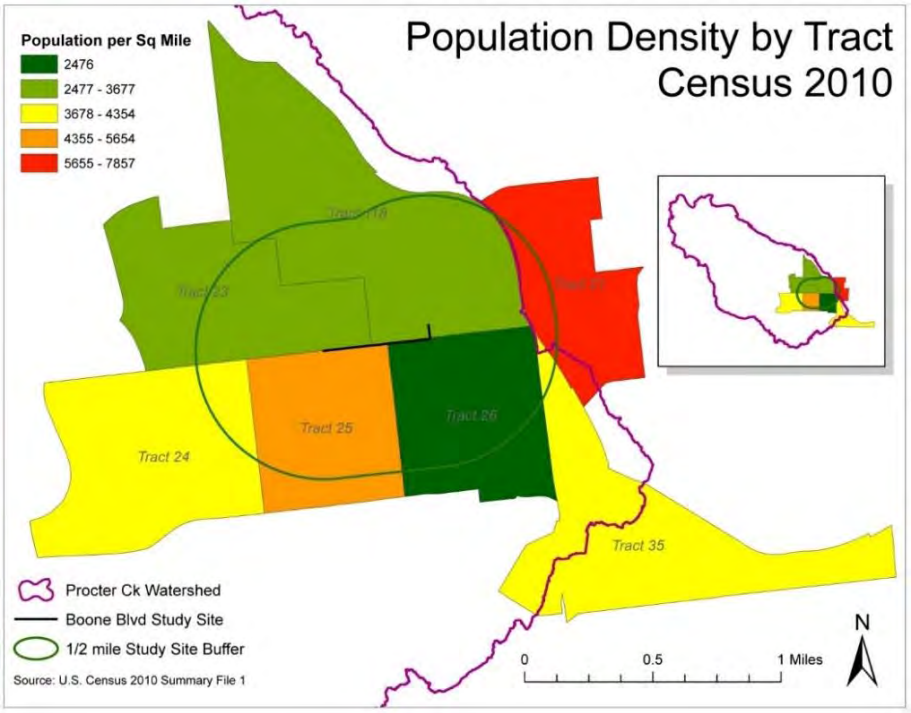


**Figure 16. (Right) Population density in the HIA study area.**

### 4.2.2 Population Demographics

Over two-thirds of the population (67.0%) are between the ages of 22 and 64 and over a quarter of the population (26.7%) are under the age of 22 (U.S. Census Bureau 2010). Men outnumber women, but by a very small margin (6.4%). In 2010, the population was almost exclusively African American (82.3%), with Caucasian being the second most populous (12.4%) (U.S. Census Bureau 2010). Persons of Hispanic ethnicity accounted for 3.4% of the population.

The HIA Core Project Team calculated the Diversity Index for the community study area, which gives a probability that on any given day, two people chosen at random from the same area will belong to different race or ethnic groups; the Index ranges from 0 (i.e., no diversity) to 100 (i.e., complete diversity) (ESRI 2013). The diversity index for the community study area was 30.6, which is considerably lower than the state average of 62.2. Figure 17 shows a distinct increase in diversity as one moves closer towards downtown Atlanta (Census tract 35). This pattern was not seen in the data obtained from the 2000 Census.

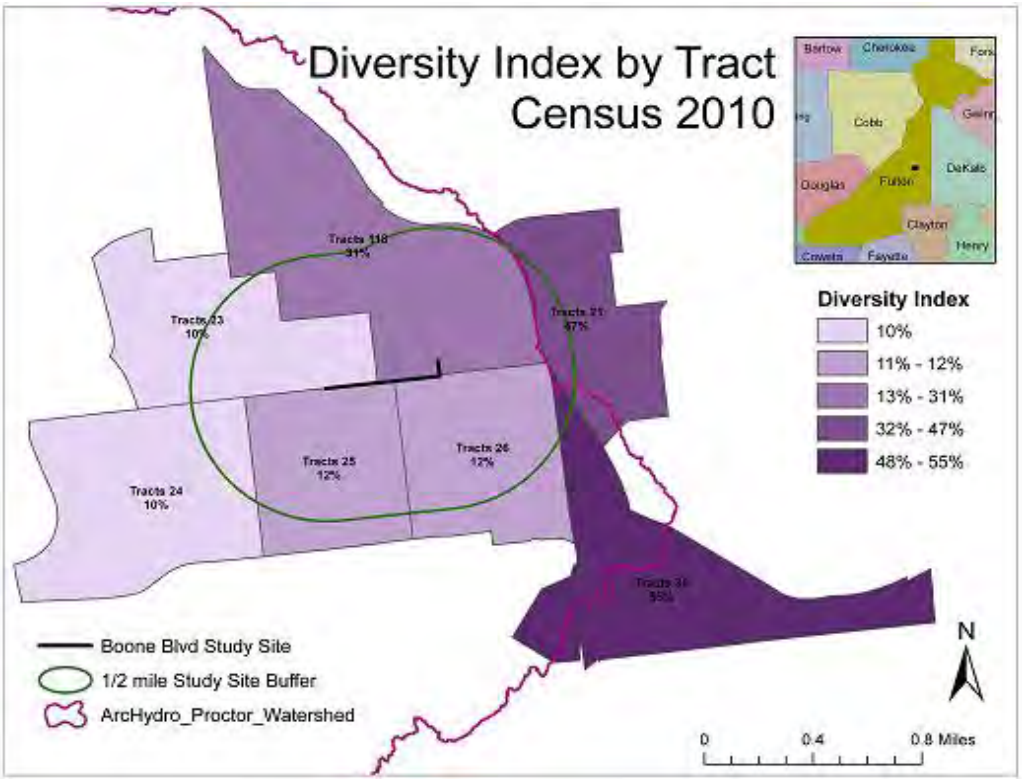


**Figure 17. Diversity in the HIA study area.**

### 4.2.3. Educational Attainment

According to the 2006-2010 ACS data, almost one-third (29.9%) of the individuals over 25 years of age have a college degree. Table 25 indicates that most of the residents over the age of 25 years (83.6%) have

at least a high school degree or general education development (GED) certificate, and very few residents have less than high school education (i.e., less than 9th grade).[7]

**Table 25. Educational Attainment of Residents In The Study Area**

| Level of Education Attained | Percentage of Residents Over 25 Years[1] |
|---|---|
| **Less than High School** | 3.7% |
| **Some High School, No Diploma** | 12.7% |
| **High School Graduate (or GED)** | 31.2% |
| **Some College, No Degree** | 22.5% |
| **Associate Degree, or Higher** | 29.9% |

[1] Source: 2006-2010 ACS, Educational Attainment Estimates (S1501)

### 4.2.4. Health Status

As mentioned before, data on health status in the community was very limited. The most numerous causes of death and emergency room visits in the county were used to infer about the status of health in the study area. According to the Community Health Needs Assessment Dashboard, the most common reasons for emergency room visits in Fulton County, Georgia were related to mental and behavioral disorders (#1), asthma (#2), and assault (#3) (GA-DPH 2013b). In Figure 18, the number of emergency room (ER) visits related to asthma and assault were well above the state average. The most common cause of visiting the emergency room, between 2008 and 2012 among children ages one to nineteen, was unintentional injury (GA-DPH 2013b).

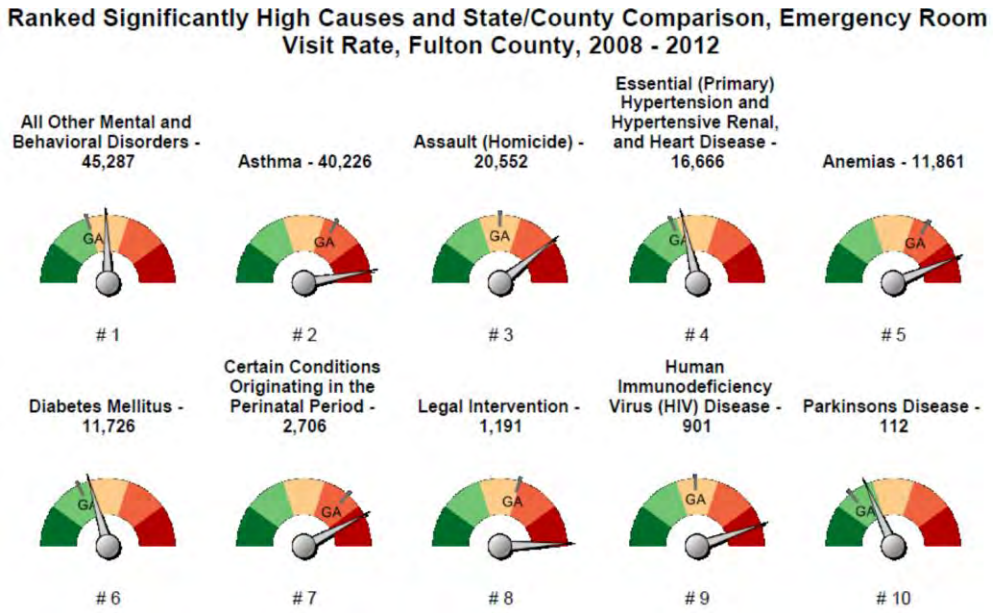


**Figure 18. Top causes for ER visits in Fulton County, Georgia from 2008 to 2012. (Source: GA DPH 2013b)**

[7] The margin of error was calculated for the aggregated Census tract data from the 5-year ACS (2006-2010) population estimates for educational attainment. For all of the indicators, the margin of error was less than +/- 0.04%.

# Assessment

The HIA Core Project Team extracted the top ranked age-adjusted mortality rates, by cause, among African Americans and Caucasians in Fulton County, GA from the OASIS Community Health Needs Assessment Dashboard. The most common causes of death among African Americans in Fulton County from 2008 to 2012 were hypertension and related chronic disease (#1), mental and behavioral disorders (#2), and human immunodeficiency virus (HIV; #3) (GA-DPH 2013b). Each of these health outcomes were well above the state averages, as indicated in Figure 19. The most common cause of death among African American children, ages one to four and ten to nineteen years, was assault (homicide); motor vehicle crashes was the leading cause of death for ages five to nine years (GA-DPH 2013b).

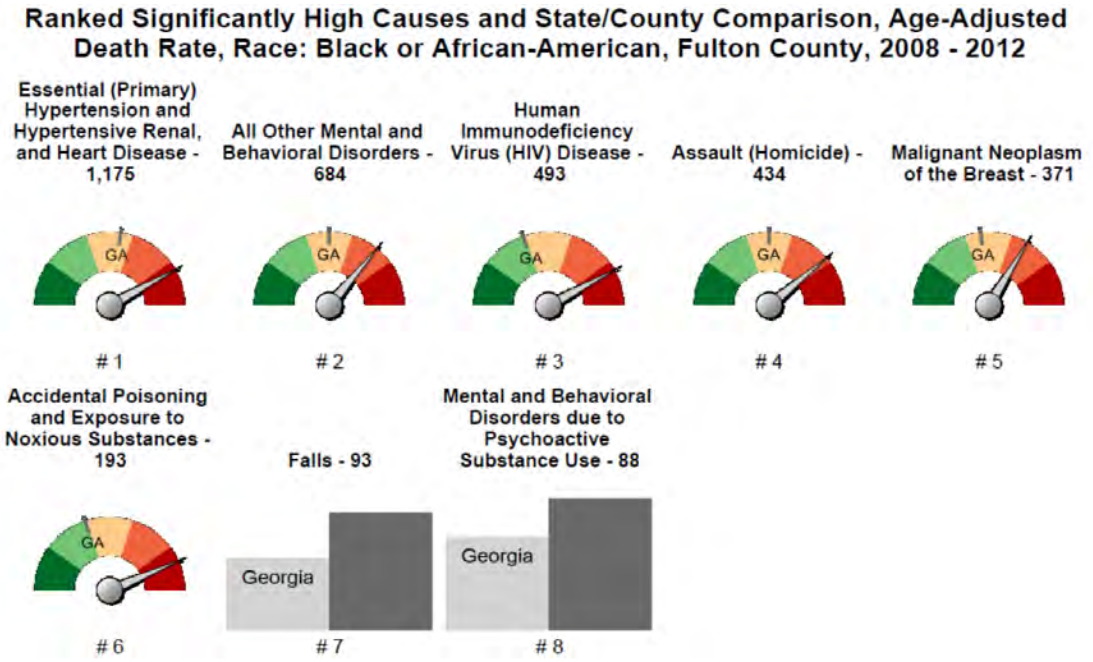


**Figure 19. Top causes of Death for African Americans in Fulton County, 2008 to 2012. (Source: GA DPH 2013b)**

The leading causes of death among Caucasians in Fulton County were mental health and behavioral disorders (#1), Parkinson's Disease (#2), and HIV (#3) (GA-DPH 2013b).[8] Death rates for each of these causes were higher than the state average. The most common causes of death among Caucasian children were motor vehicle crashes (ages fifteen to nineteen years), HIV (ages ten to fourteen years), cancer (malignant neoplasm of the meninges, brain and other parts of the nervous system; ages five to nine years), and congenital disease (malformations, deformations and chromosomal abnormalities; ages one to four years) (GA-DPH 2013b).

From this information, we can gleam that it is likely the health needs of residents in Fulton County, including the study area, are related to reducing hypertension and related chronic disease, addressing mental health and behavioral disorders, and preventing assault and motor vehicle crashes. Addressing these needs may improve health and prevent deaths in Fulton County, GA.

[8] Parkinson's Disease is a chronic degenerative disease of the nervous system. For more information about Parkinson's disease, please visit http://www.parkinson.org/.

## 4.2. Existing Conditions and Health Impacts Related to the Physical Environment

The physical environment includes both natural and built features that can shape the quality of life in a community. Human health is dependent on the quality of the environment in which people live, work, learn and play. There are co-benefits that can be realized when considerations for addressing environmental issues are shared with efforts to improve healthy living. A healthy ecosystem and safely designed community can provide basic health protection measures and move communities forward towards sustainability.

### 4.3.1. Water Quality

Water quality, which was one of the most discussed topics among community residents and HIA participants, was a contributing force behind ranking the physical environment as a top interest/concern in the community. Stakeholders cited the conditions that contributed to the perceived poor water quality in the Proctor Creek Watershed, including stormwater runoff, illegal dumping of trash and tires, and impaired streams. Stakeholders charged the HIA Core Project Team with identifying and characterizing how the proposed project could affect water quality in the community and determine whether the project could significantly change the water quality of Proctor Creek. First, the HIA Core Project Team determined the status of water quality in Proctor Creek and the conditions in the headwater communities that contributed to its current state using previous sampling studies, water quality reports and peer-reviewed literature. Second, the HIA Core Project reviewed the scientific literature on water quality as a health determinant. Then, the HIA Core Project Team appraised the project's conceptual design for its potential to influence water quality in the community and the conditions contributing to the impairment of Proctor Creek.

#### *Results of the Literature Review*

What influences water quality?

Water quality is characterized by its physical, biological, and chemical properties, including the health of organisms living in the water (U.S. EPA 2012b). Factors that influence these properties include precipitation (e.g., volume, intensity, etc.), presence of pollutants, landscape (e.g., land cover, surface permeability, land use, grade, etc.), presence of plants and animals and characteristics of the soil (e.g., composition, type, size and layering). These factors are discussed in more detail, below.

Water that falls from the atmosphere as precipitation (i.e., stormwater) has three general directions of movement: 1) back into the air, via evapotranspiration, 2) into the ground, and 3) across surfaces as runoff (U.S. EPA 2003a). The flow and volume of stormwater runoff can influence the quality of water on the surface by mobilizing pollutants and/or diluting their concentration (Davis, Hunt, et al. 2009). As stormwater runoff moves across a surface, it picks up any solids, chemicals, or organisms that can be suspended in water (e.g., debris, trash, sediment, chemicals, and bacteria).

Sources of water pollution can come from materials used in or emitted from motor vehicles, illegal dumping, and runoff from agriculture, gardening, roofs and other impervious surfaces. Harmful pollutants from motor vehicles include engine oil, grease, rubber particles from tires, and emissions from partial combustion processes. Dumping wastes (e.g., household garbage, furniture, appliances, carpets,

and mattresses, tires, batteries, hazardous materials, etc.) in unpermitted locales can shock the ecosystem by introducing toxic chemicals, pathogens, and other pollutants. Ambient air pollution from automobiles, industry, agriculture, and natural sources can be carried by precipitation or (dry) deposited on the ground. Fertilizers, mulch, compost materials, and pesticides and herbicides used in agriculture and gardening are common sources of chemical contamination and nutrient overloading. Pollutants deposited on the ground's surface from human activities are the leading cause for impairment of surface waters (U.S. EPA 2003b).

Impervious surfaces (e.g., concrete, metal roofs, pavement) reduce the ability for stormwater to infiltrate the ground. A natural event takes place underground where pollutants can be filtered out of stormwater through physically, chemically, and biological processes (Hsieh and Davis 2005). Pollutants deposited on impervious surfaces, however, bypass these processes and move with the stormwater runoff.

Vegetation influences water quality through slowing of surface water flow; trapping of sediment, organic matter, and nutrients, such as phosphorous; absorption of water and heavy metals into the roots and stems; carbon sequestration; and nitrogen fixation (via symbiotic relationships between plants and microscopic organisms living on plant roots).

Characteristics of the soil can affect water quality through multiple mechanisms. Soil type and composition (i.e., the percentage of sand, silt and clay) affects the ability of stormwater to infiltrate and drain through the ground. Soil composition and layering affects the physical filtration of pollutants from stormwater as it moves through the media (Kadam, et al. 2008, Wang, Gerba and Lance 1981). For example, coarse-textured sand has relatively large particles with large spaces between particles (i.e., pores), which allows runoff to pass through easily while larger particles (e.g., oils, grease, suspended solids) are captured (Hsieh and Davis 2005). Free standing phosphorous, a nutrient naturally present in the soil, readily attaches to suspended solids. Thus, when the soil captures solids suspended in stormwater, phosphorous is also captured.

### How does water quality influence public health?

Water quality affects both environmental health and human health (U.S. EPA 2012b). Living and non-living substances in the water, including pathogens (i.e., bacteria, viruses, parasites and other agents that cause disease) and toxic substances (e.g., heavy metals, pesticides, chemicals, etc.) can cause illness in humans via ingestion or contact with the skin.

*Note: The need to protect human and environmental health through water quality control has led to several legislatively controlled actions. At the federal level, Congress passed the Federal Water Pollution Control Act of 1948 and the 1972 amended version, commonly known as the Clean Water Act. These actions established maximum criteria for pollutant discharge (i.e., total maximum daily load (TMDL)) and a framework for regulating the discharge of pollutants into surface waters.*

When there is an introduction of a foreign pathogen or the population of naturally occurring bacteria becomes abnormal, symptoms of illness can develop. Typical symptoms of a waterborne illness manifest as changes in the gastro-intestinal tract (e.g., diarrhea, vomiting, and abdominal pain), but can become more severe and even cause death. Toxic chemicals commonly found in surface water include oils, rubber and hydrocarbons from automobiles, and heavy metals from building materials (e.g., zinc, lead,

copper, aluminum). Exposure to these chemicals usually occurs by ingesting contaminated water or dermal contact through recreational or occupational activities, such as swimming and fishing (Craun, Calderon and Wade 2006). Exposure to contaminated water or poor water quality does not guarantee illness will occur. In some cases, there is a certain level or duration of exposure that must be reached to induce symptoms (i.e., dose response). In other cases, there are factors that predispose an individual to develop illness, which may include age, immune system function, recent surgery or illness, and nutrition (Craun, Calderon and Wade 2006).

How efficient is green infrastructure in improving water quality?

The green infrastructure approach to water quality management utilizes natural processes to protect, restore, and mimic the natural water cycle (American Rivers 2014). Green infrastructure affects water quality by reducing stormwater runoff volume and flow and reducing nutrient and pollutant loading through increased filtration and absorption. Stormwater best management practices (BMPs) includes using elements of green infrastructure (e.g., rain gardens, planter boxes or strips, bioswales, and permeable pavement).

An experimental study in Waterford, Connecticut found that designing a residential neighborhood with several BMPs significantly reduced the volume of stormwater draining from that neighborhood compared to a traditionally designed neighborhood (Bedan and Clausen 2009). A few good studies found that BMPs were highly efficient at reducing the amount of heavy metals (e.g., copper, nickel, lead, etc,), oil, and grease from stormwater runoff (Bedan and Clausen 2009, Davis, Field performance of bioretention: water quality 2007, Hunt, et al. 2006, Hsieh and Davis 2005). The ability for BMPs to reduce solids and nutrient loading, however, has shown mixed results. Researchers found a trade off in pollutant removal and stormwater capture with regards to the selection and design of soil media in BMPs. Generally, BMPs designed to capture stormwater were less effective at removing pollutants and vice versa. For example, soil media chosen to support plant gowth to increase stormwater capture also had high levels of phosphorous and nitrogen, which leached out of the soil causing higher nutrient loading. That being said, streams fed by runoff from BMPs would still benefit from the increase in dissolved oxygen in the water, which supports aquatic life (Kadam, et al. 2008). One thing to note was that newly constructed BMPS sometimes added more suspended solids after a rain event from the loose soil, but removal efficiencies improved overtime once the soil media settled.

There were several studies found that evaluated the effectiveness of BMPs to reduce stormwater runoff capture and pollutant removal. Table 26 lists the results of six key studies that measured the efficiencies of stormwater BMPs to reduce stormwater flow and pollutant loading. The results from the latest National Pollutant Removal Performance Database (version 3, 2007), which statistically analyzed peer-reviewed and published studies that measured the efficiencies of each major type of BMP to remove pollutants and nutrients from stormwater runoff, are provided for the two types of BMPS used in the project's conceptual design.

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**Table 26. Capture and Treatment Efficiencies of Stormwater Form Low Intensity Development/Green Infrastructure Elements**

| Indicators[1] | Percent Change in Stormwater Effluent Post-Implementation[2] | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Study | (Hunt, et al. 2006) | (Bedan and Clausen 2009) | (Hsieh and Davis 2005) Design 1 | (Hsieh and Davis 2005) Design 2 | (Kadam, et al. 2008) Site 1 | (Kadam, et al. 2008) Site 2 | (Kadam, et al. 2008) Site 3 | (Davis 2007) Cell A | (Davis 2007) Cell B | (Fraley-McNeal, Schueler and Winer 2007) Bioretention Cell | (Fraley-McNeal, Schueler and Winer 2007) Permeable Pavement |
| Storm Flow (Volume; cm/wk) | N/A | -42%*** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Peak Discharge ($m^3$/s/wk) | N/A | -26% N.S. | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| NO3N (mg/L) | -75% | +100%* | -31% | -10% | N/A | N/A | N/A | -90% | -95% | -43% | 0% |
| NH3N (mg/L) | +0.99% | -50%* | - >37% | - >44% | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| TKN (mg/L) | +4.9% | +44%** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | -46% | -42% |
| TP (mg/L) | +240% | +939% *** | N/A | N/A | N/A | N/A | N/A | -79% | -77% | -5% | -65% |
| TSS (mg/L) | +170% | +197% *** | +103% | -10% | -96% | -95% | -87% | -59% | -54% | -59% | -89% |
| BOD (mg/L) | N/A | -3% N.S. | N/A | N/A | -94% | -92% | -87% | N/A | N/A | N/A | N/A |
| Fecal coliform (No/100 mL) | N/A | -95%** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Cu (µg/L) | -99% | -25% N.S. | N/A | N/A | N/A | N/A | N/A | -83%** | -77%** | -81% | -86% |
| Pb (µg/L) | -81% | -67%*** | - >94% | - >95% | N/A | N/A | N/A | -88%** | -84%** | N/A | N/A |
| Zn (µg/L) | -98% | -77%*** | N/A | N/A | N/A | N/A | N/A | -27% | -69% | -79% | -66% |
| DO | N/A | N/A | N/A | N/A | +586% | +325% | +400% | N/A | N/A | N/A | N/A |
| Oil/Grease (mg/L) | N/A | N/A | - >99% | - >99% | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

[1] NO3N – Nitrate nitrogen, NH3N – Ammonia nitrogen, TKN – Total kjeldahl nitrogen (ammonia, organic and reduced nitrogen), TP – Total phosphorous, TSS – Total suspended solids, BOD – Biochemical oxygen demand, Cu – Copper , Pb – Lead, Zn – Zinc, DO – Dissolved oxygen

[2] N.S. – not significant, N/A – data not available, (+) – added, (-) – removed, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

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### *Existing Conditions Related to Water Quality*

What is the status of water quality in the Proctor Creek Watershed?

In accordance with the Clean Water Act and state water quality regulations, Proctor Creek must meet the water quality standards for its designated use – fishing (GA-EPD 2013). Since 2002, however, Proctor Creek has not met the fecal coliform water quality standards established for water bodies used for fishing (GA-EPD 2002)[9]. Fecal coliform are bacteria that reside in the intestines of humans and other warm-blooded animals and excreted in feces (Whitlock, Jones and Harwood 2002). At high concentrations (i.e., number of matter by a measured volume), fecal coliform in surface and drinking water has been shown to cause waterborne illness and the impairment of urban waters (Arnone and Walling 2007). While there is not enough evidence to state that higher levels of fecal coliform in surface water is a direct cause of enteric diseases (i.e., intestinal disease), the circumstantial evidence is enough to infer that high levels of fecal coliform can also indicate that there are high levels of other potentially pathogenic organisms present in the water.

There are two suspected causes for the impairment of Proctor Creek and its tributaries – urban stormwater runoff and CSO events (GA-EPD 2013). The stormwater drains located under the proposed project site convey stormwater from Joseph E. Boone Street to the storm sewer main under Vine Street. Depending on the volume of stormwater flowing through the pipe, the contents are either conveyed to the wastewater treatment facility (i.e., during dry weather) or discharged into Proctor Creek at the Proctor Creek/North Avenue combined sewer outflow (i.e., during wet weather). Figure 20 identifies the locations of the underground storm pipes that collect and convey stormwater near the proposed project.

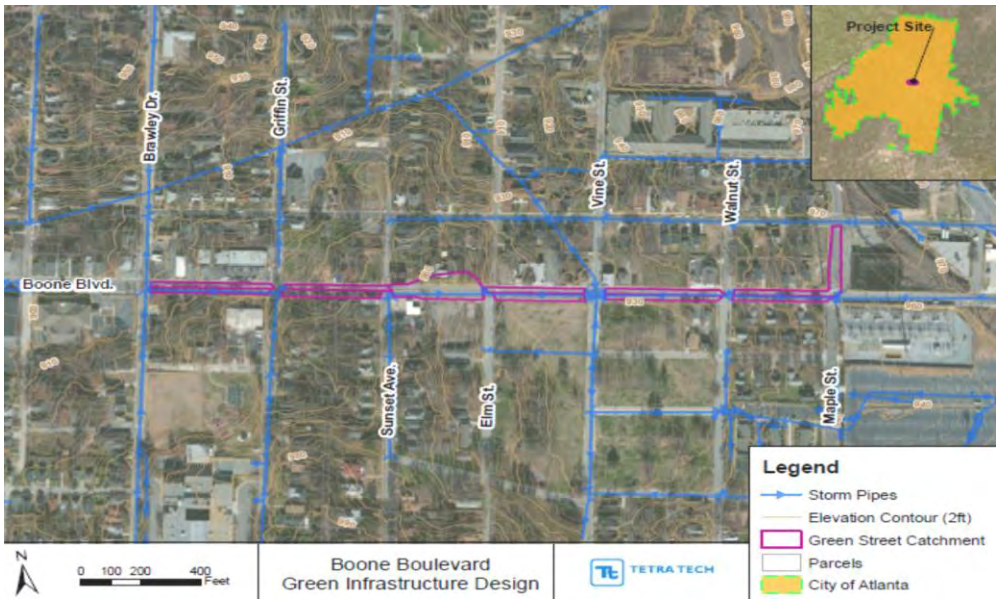


**Figure 20. Map of underground storm pipes around the proposed project site. (Source: Tetra Tech 2013)**

[9] The standard for fecal coliform permissible in a river or stream used for fishing is 1,000 units per 100 mL (30-day geometric mean) between November and April and 20 units per 100 mL from May to October (GA-EPD 2013).

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The inability of Proctor Creek and other urban streams in Atlanta to meet state water quality standards led to the establishment of consent decrees that require the development and implementation of Water Quality Improvement Plans for these streams. Beginning in 2010, the ARC, in a collaborative agreement with EPA, conducted a targeted water quality monitoring study that looked at the presence of *Escherichia coli* (*E. coli*) bacteria in Proctor Creek. *E. coli* is a specific coliform that is often monitored, in addition to or in place of fecal coliform, due to increasing evidence that *E. coli* serves as a better indicator of potentially harmful pathogens in surface water (ARC 2011, Simpson, Santo Domingo and Reasoner 2002). It is important to note that none of the sampled sites in this study was located in the HIA study area. Monitoring activities found that at certain sites along Proctor Creek, levels of *E. coli* were well above the EPA's recommended level in waters used for swimming. Water samples taken immediately downstream of the Proctor Creek/North Avenue outflow stayed relatively low, except on August 19, 2010 when researchers saw values over five times the EPA's recommended limit for swimming.

What is the status of health outcomes in the community related to water quality?

Exposure to waterborne pathogens (i.e., disease causing organisms in the water) can come from multiple sources, such as direct contact with surface water or consumption of contaminated food. Typical symptoms of waterborne illness often take an enteric form (i.e., changes in digestive system). Less severe cases can resolve on their own or can be masked with over-the-counter medications. The higher the severity of the symptoms, the more likely a person will seek care at a clinic, doctor's office, or hospital emergency room. The most severe cases involve admission into the hospital for an extended period.[10] Reported cases of enteric disease caused by a waterborne pathogen are usually confirmed by deoxyribonucleic acid (DNA) testing or culture screening, which is typically not cost efficient and may not change the treatment plan. Less severe cases may be treated without a definitive cause.

Personal behaviors and predisposing factors can contribute to the risk for developing waterborne illness. Individuals with suppressed immune systems, those that are undernourished and those that are more frequently exposed are more likely to develop illness from pollutants or harmful organisms in the water (Craun, Calderon and Wade 2006). Playing in unhealthy streams and washing or irrigating foods with contaminated water will increase risk. Low-income or uninsured individuals may be limited financially in options for treatment or relief and thus experience increased potential for symptoms to become more severe leading to higher ER visits). Since directly surveying residents was not an available option, investigators used ER visits to indicate heath status related to water quality.

The GA DPH does not list waterborne disease in the OASIS mapping tool. Instead, investigators used a proximate diagnosis – digestive system disease –to interpret whether waterborne illness was a concern. Based on the choropleth graph generated in OASIS, one can observe an overall pattern of increasing ER visits for digestive system diseases among residents moving downstream of the headwaters and tributaries (Figure 21).

[10] Hospitals don't always code patients admitted from the ER as inpatient until after a grace period (usually two days). If the patient comes into the ER for care and is discharged within the grace period, the services may be coded as outpatient for billing purposes. Therefore, cases in which individuals sought emergency care, but were quickly treated may not be captured in the hospital discharge data. Thus, using ER visit data may be a better indicator.

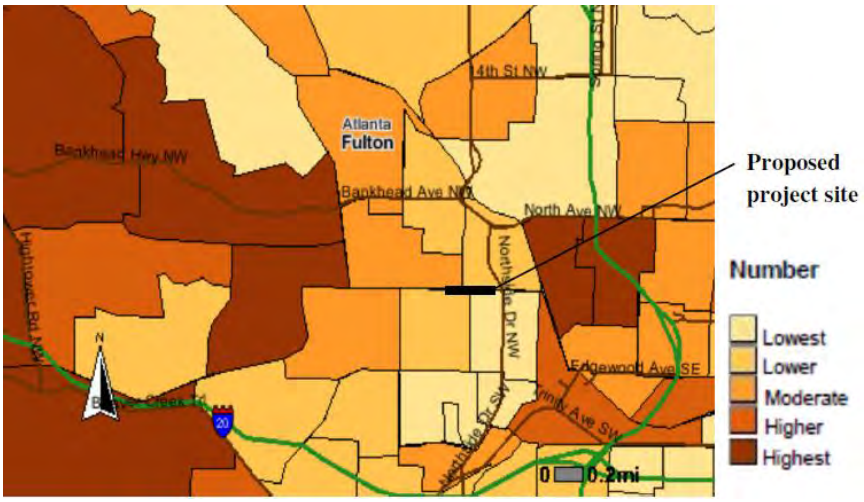


**Figure 21. Choropleth map of the 2006-2010 aggregate number of ER visits for all digestive system diseases, by Census tract. (Source: GA–DPH 2013; 2000 Census)**

*Note: The OASIS mapping tool has not been updated to use the current (2010) Census boundaries. Instead, the 2000 Census tract boundaries are used.*

The HIA Core Project Team looked at the cases of ER visits for digestive system diseases for those who were perceived to be more likely to contact surface waters (i.e., youths under the age of 15), persons who may be immune-compromised (i.e., adults over the age of 65 years), and persons who may have restricted financial access to healthcare (i.e., used Medicaid as a payor). Digestive system disease among youths and older adults were relatively low, except in areas where Proctor Creek flows (Figure 22 and Figure 23). The number of ER visits related to digestive diseases among Medicaid patients was relatively high in the community and throughout the larger watershed (Figure 24).


**Figure 22. Choropleth map of the 2006-2010 aggregate number of ER visits for all digestive system diseases, by Census tract, for children aged one to fourteen years. (Source: GA–DPH 2013; 2000 Census)**

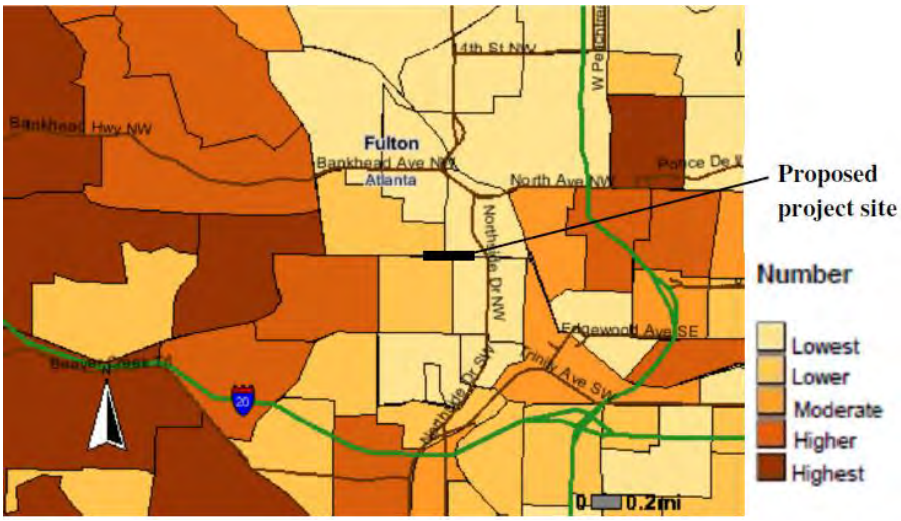


**Figure 23. Choropleth map of the 2006-2010 aggregate number of ER visits for all digestive system diseases, by Census tract among adults over 65 years. (GA—DPH 2013; 2000 Census)**

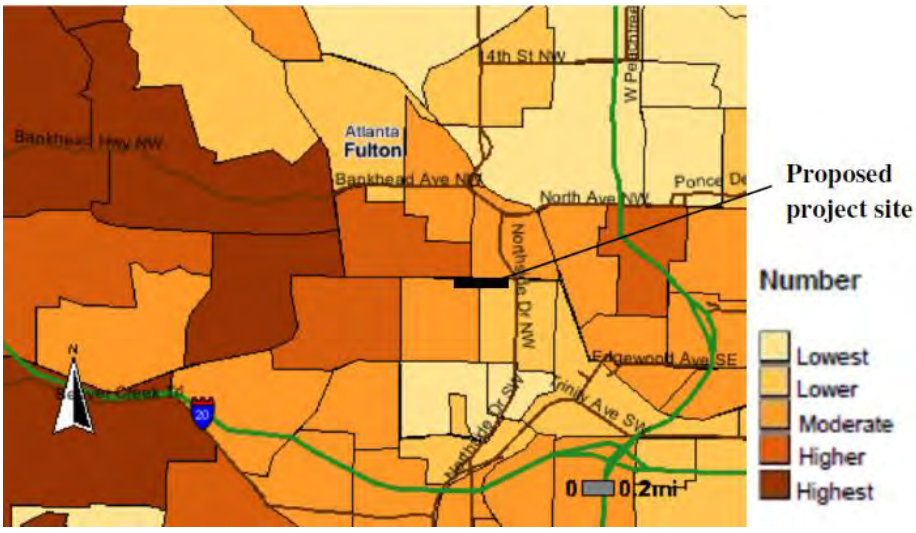


**Figure 24. Choropleth map of the 2006–2010aggregate number of ER visits for all digestive system diseases, by Census tract among Medicaid patients. (Source: GA—DPH, 2013; 2000 Census)**

There was a distinct pattern observed where ER visits increased as the Census tracts moved from the headwaters to the lower watershed, especially among Medicaid patients. Based on this information, the concern for water quality related disease among residents in the community is relatively low, but moderate to high for residents living further downstream and in close proximity to Proctor Creek.

The perceived risk of exposure to waterborne pathogens or disease from poor water quality in the community is low. Aboveground water is not always observed year-round in the headwaters, which lowers the exposure to waterborne pathogens. The risk of exposure to waterborne pathogens increases when a combined sewer overflow (CSO) event occurs. The combined sewer outlet is located outside the designated community, so a CSO event will not affect the population in the community (i.e., half-mile radius around the proposed project site). Overflowing manholes or if the storm and sanitary sewer system breaks or leaks will affect health risk in the community. Populations living downstream of the CSO,

however, have a higher risk of waterborne disease than those in the headwaters, due to the compounding nature of untreated water being funneled into Proctor Creek.

### *How the Green Street Project May Impact Water Quality*

Will the proposed Green Street Project be sufficient to affect water quality and related health outcomes?

It is highly likely that the proposed project will improve the quality of the stormwater entering the conveyance system. The proposed project will increase the capture and treatment of stormwater runoff from the street before it enters the combined sewer system. The natural filtration processes of soil media and plants will reduce the total pathogens and pollutants going into the combined sewer system. Furthermore, this project will help prevent CSO events, which are known to impair urban streams. Poor water quality can affect both ecosystem health and human health. The reduction in pathogens and pollutants entering surface water lowers the risk of a developing waterborne illness, which will protect health. Very few people are expected to be affected by the improvements in water quality, considering the small size of the proposed project. Waterborne illness is more of a concern as one moves further downstream from the Proctor Creek/North Avenue combined sewer outflow. Expanding the project area will increase the potential magnitude of impact. The improvement in water quality can be quickly and easily reversed if the underground pipes exceed capacity (i.e., a CSO event occurs) or if the green infrastructure elements are damaged and/or not maintained properly. Improvements to water quality will benefit vulnerable populations. Persons who are more susceptible to waterborne illness include young children, the elderly, individuals with compromised immune systems (e.g., persons with HIV), and low-income households. The evidence used to support the predicted pathway of impact is limited. There are many strong studies that support the efficiency of stormwater best management practices in improving water quality and the effect water quality has on health. However, the research does not show a cause-effect relationship between implementing stormwater best management practices and the number of cases of waterborne disease. This is partly due to the complex socio-economic factors that influence seeking care and being diagnosed with waterborne illness. Table 27 summarizes the predicted health impacts of the proposed project related to water quality and potential strategies to manage those impacts.

**Table 27. Potential Health Impacts from Changes in Water Quality and Management Strategies**

| Criteria | Scale | Potential Impact Management Strategies |
|---|---|---|
| **Likelihood** | Highly Likely | Expand BMPs (green infrastructure) throughout the community to help to maximize pollutant removal going into storm sewers. This will not only provide capacity relief for the CSO, but may also reduce the number of overflows, which is a major contributor to fecal coliform in surface waters. Increase soil media height of planter boxes from 2 feet to at least 2.5 feet (30 in) to improve pollutant removal efficiency. |
| **Direction** | Positive | None provided. |
| **Magnitude** | Low | Utilize multiple strategies to increase the magnitude of the Green Street Project's impact, such as increasing the community's awareness of urban runoff and impacts on human and environmental health, increasing law enforcement against illegal dumping, and expanding implementation of BMPs throughout the community. |

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| Criteria | Scale | Potential Impact Management Strategies |
|---|---|---|
| **Permanence** | Quickly and Easily Reversed | Strictly adhere to the recommendations outlined in section 6.1 Common Elements of the Green Infrastructure Technical Specifications of the initial project design (Tetra Tech 2013). Selection of soil media, fertilizer, and mulch should be driven by the need to reduce conditions favorable for pathogen growth (i.e., prevention control). This includes selecting soil media with low phosphorous and nitrogen content and avoiding mulch that is manure or compost-based. Add restricted/limited use of fertilizers. |
| **Distribution** | Vulnerable Populations Benefit | Improve water quality hazard warnings for water contact to raise awareness of health risks, especially for those who may be more vulnerable to pathogens and/or toxic properties in the water. |
| **Strength of Evidence** | Limited | Recommend for the City and/or EPA to conduct soil sampling and water quality testing further upstream in the headwaters of Proctor Creek, starting in this community. Also, invite residents to participate in future studies (e.g., community-participatory research) so that data related to health outcomes and/or health determinants can be collected on community level to fill gaps. |

### 4.3.2. Flood Management

Flood management was arguably the second most important health determinant and environmental improvement performance indicator. Stakeholders identified aspects of flood management at the first public meeting and first meeting with the HIA Advisory Group. Residents in the Proctor Creek Watershed were concerned about the pervasive, localized flooding in the area.

*NOTE: It is important to note that this project was not intended to address flooding issues. The primary purpose of the project was to help manage stormwater coming from the street and going into the combined sewer system. However, the HIA Core Project Team believed that identifying the potential impacts to flooding and flood management from the proposed project would at least provide some informative benefit.*

*The absence of health data pertaining to flood events greatly limited the assessment's ability to evaluate health risks related to flooding in the community. Hospitalizations and/or emergency room visit data do not capture health data for this specific cause. Thus, human health risks were qualitatively inferred from the theoretical pathways of impact and the identified floodplains.*

*Exposure to injury from flooding, housing damage from flooding (i.e., Housing Quality) and exposure to vector-borne disease (i.e., Vector Control) were originally identified as stand-alone health determinants; however, upon further review, it was decided that these impacts should be discussed in relation to flooding. Therefore, all three were consolidated into the single health determinant–flood management.*

#### *Review of the Literature Review*

What are the risks to human health associated with flooding?

Urban flooding is typically caused by stormwater runoff that is not captured as it moves across a surface (Jha, Bloch and Amond 2012, Foody, Ghoneim and Arnell 2004). Flash flooding events occur when a large volume of stormwater flows in a localized area over a short amount of time. Flash flooding

increases the risk of injury by creating hazards for slips, falls, and injury from floating debris (Maantay and Maroko 2009). Persons with physical restrictions can be more prone to slipping or falling during flash flood events.

Flooding can damage homes, buildings and infrastructure. Flooding damage to sewer systems can lead to sewer overflow events, which intensifies the release of organic material and pathogens into the ecosystem (Plate 2002). A group of researchers in eastern Germany sampled for microbial pathogens in soil and water after prolonged rains and subsequent flooding in 2002 that caused damage to local sewage systems, resulting in the release of untreated water into the river system (Abraham and Wenderoth 2005). They detected high levels of pathogenic bacteria in the cellars of flooded houses, as well as on playgrounds and streets. High bacteria counts were not observed in samples of open water, suggesting that basements of flooded homes may provide a "special niche for the survival of bacteria." The detection of antibiotic resistant bacteria in homes damaged by flooding was a special concern.

Water damage to a building can permit mold and bacterial growth and make openings for pests that may be harmful within the structure of the home (Taylor, et al. 2011). Rodent infestation can increase the risk of exposure to harmful pathogens, such as Hantavirus and Salmonella. A number of different conditions, including temperature and moisture, allow for biological organisms present in the water to grow and survive in building materials. The growth of microbial pathogens in a household can affect the health of the inhabitants either through direct contact or by inhaling them with the air. In 2005, the WHO published a comprehensive review that identified bacteria, fungi and mold as common pollutants in homes that cause or propagate health issues. The primary health effects associated with exposure to indoor microbial pollutants were increased prevalence of respiratory symptoms, allergies, asthma, and agitation of the immune defense system (WHO 2009a). The presence of mold or moisture in households where children live is a special concern. Researchers in Finland assessed the presence of moisture and mold in 110 Finnish homes. They concluded that exposure to moisture and/or mold was associated with increased risk of upper and lower respiratory symptoms and an increased risk for nausea and difficulty concentrating for both preschool and school-aged children living in the home (Koskinen, et al. 1999). These studies highlighted the importance of the quality of the indoor environment with regard to health.

Severe cases of water damage to a home can cause displacement of persons living in the home, which can lead vacancy or abandonment. The presence of blighted and vacant properties have been associated with poorer perceived health and deteriorated mental health and social capital among residents. Pervasive flooding and property damage can lower perceived safety in an area and increase stress (Few 2003). Efforts to improve/restore vacant or derelict homes may reduce levels of distress among residents and visitors to the area.

Pooling water after a flood event can create a habitat suited for insects and other animals that carry diseases. Calhoun et al. (2007) found that water movement is associated with density of immature mosquitoes, with significantly greater numbers of all stages (except egg rafts) being found in stagnant compared with fast-moving water. In other studies, mosquito population density and mosquito body size was significantly greater near side pools of water and stagnant water of a CSO-affected stream (Calhoun, et al. 2007, Chaves, et al. 2011). A study conducted in Virginia found urban infrastructure was positively correlated with the abundance of two mosquitos (*Culex pipiens L.* and *Culex restuans*) and CSO systems were large contributors to *Culex* vector populations (Deichmeister and Telang 2009). In a study

conducted in Fulton County, GA, West Nile Virus (WNV) infection rates among humans and corvids (i.e.; passerine birds) were positively linked with proximity to CSO-affected streams, the extent of tree cover, and median household income (Vazquez-Prokopec, et al. 2010). In particular, distance to CSO-affected streams was the best predictor of the abundance of house mosquitoes followed by tree canopy coverage. Furthermore, they found that WNV infection in the southern house mosquito (*Culexx quinquefasciatus*) was significantly higher in CSO-affected streams compared with non-CSO streams. Although researchers found an association between median household income and WNV infection rates, the association was not statistically significant.

Populations that live in highly dense, low lying areas (typically low income areas) where there are many sources for insect habitation have an increased risk of exposure to vector borne diseases (e.g., WNV and Hantavirus), compared to residents in less dense, higher elevated areas (typically high income areas). Homes near illegally dumped scrap tires and garbage, which provide habitats for rodents and mosquitoes, are less prevalent in high-income communities compared to low-income communities (Calhoun, et al. 2007, Vazquez-Prokopec, et al. 2010, LaDeau, et al. 2013). In more than one study, it was inferred that people residing in low-income housing were found to be at increased risk of exposure to mosquitoes compared with residents of high-income areas, where air conditioning and protective behaviors such as the use of mosquito repellent or the active avoidance of mosquitoes may be higher.

### *Existing Conditions Related to Flood Management*

The HIA Core Project Team used ground slope, topography, impervious surfaces, and precipitation data to calculate the volume of stormwater runoff moving through the proposed project site and to model the likeliest places for stormwater to flow and eventually pool. Analysis of this data was performed using numerous GIS-based tools and datasets, such as ArcHydro, ArcGIS, NHD, and EPA's Stormwater Calculator (released version 1.0.0.9).[11]

During or after a rain event, where is stormwater most likely to flow?

The HIA Core Project Team analyzed the permeability of the surfaces in the study area and found that over half (53.6%) of the total surface area is impervious or impenetrable for stormwater. When researchers mapped the impervious surface data in the watershed, they found that imperviousness increases as the property moves closer to downtown (Figure 25).

[11] The NHD is a digital vector dataset that represents the drainage network with features such as rivers, streams, canals, lakes, ponds, coastline, dams, and stream gages. For more information, please visit http://nhd.usgs.gov/. The Stormwater Calculator is a desktop application that estimates the annual amount of rainwater and frequency of runoff from a specific site anywhere in the United States. For more information, please visit http://www2.epa.gov/water-research/national-stormwater-calculator.

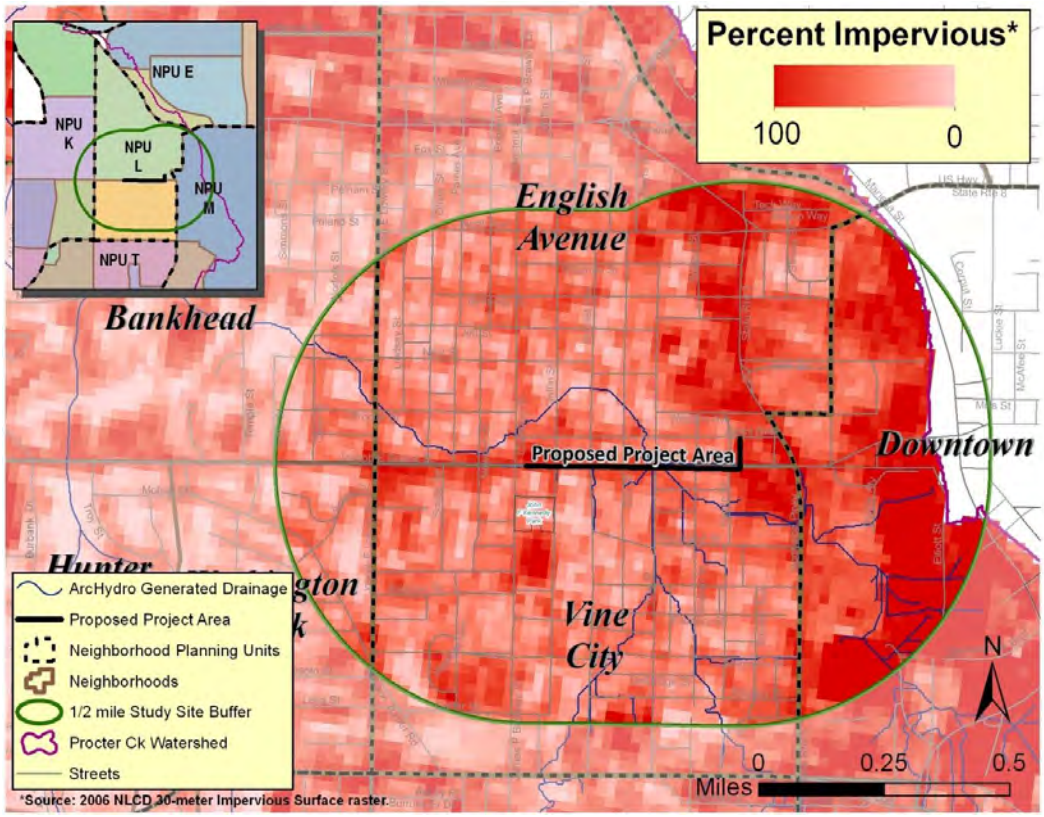


**Figure 25. A map displaying the percent of impervious surfaces in the community for every 30 square meters of land surface.**

Researchers used ArcHydro to model the most likely water pathways for the overland flow of water in the community. Stream, flow accumulation, and topography data was used to generate a topographic wetness index (TWI).[12] The TWI permits investigators to identify areas that may potentially be wet after a rain event. The bands of wetness tracked closely with the ArcHydro modeled stormwater flow lines (Figure 26).

[12] The TWI is generated using the equation TWI= ln(flow accumulation/tan(slope). This equation generates a unit-less relative value that can be used to separate areas that are potentially more wet or dry after a rain event. Generally speaking, a TWI <1 reflects dry areas, whereas a TWI > 20 reflects persistently wet areas. http://arcscripts.esri.com/details.asp?dbid=16750

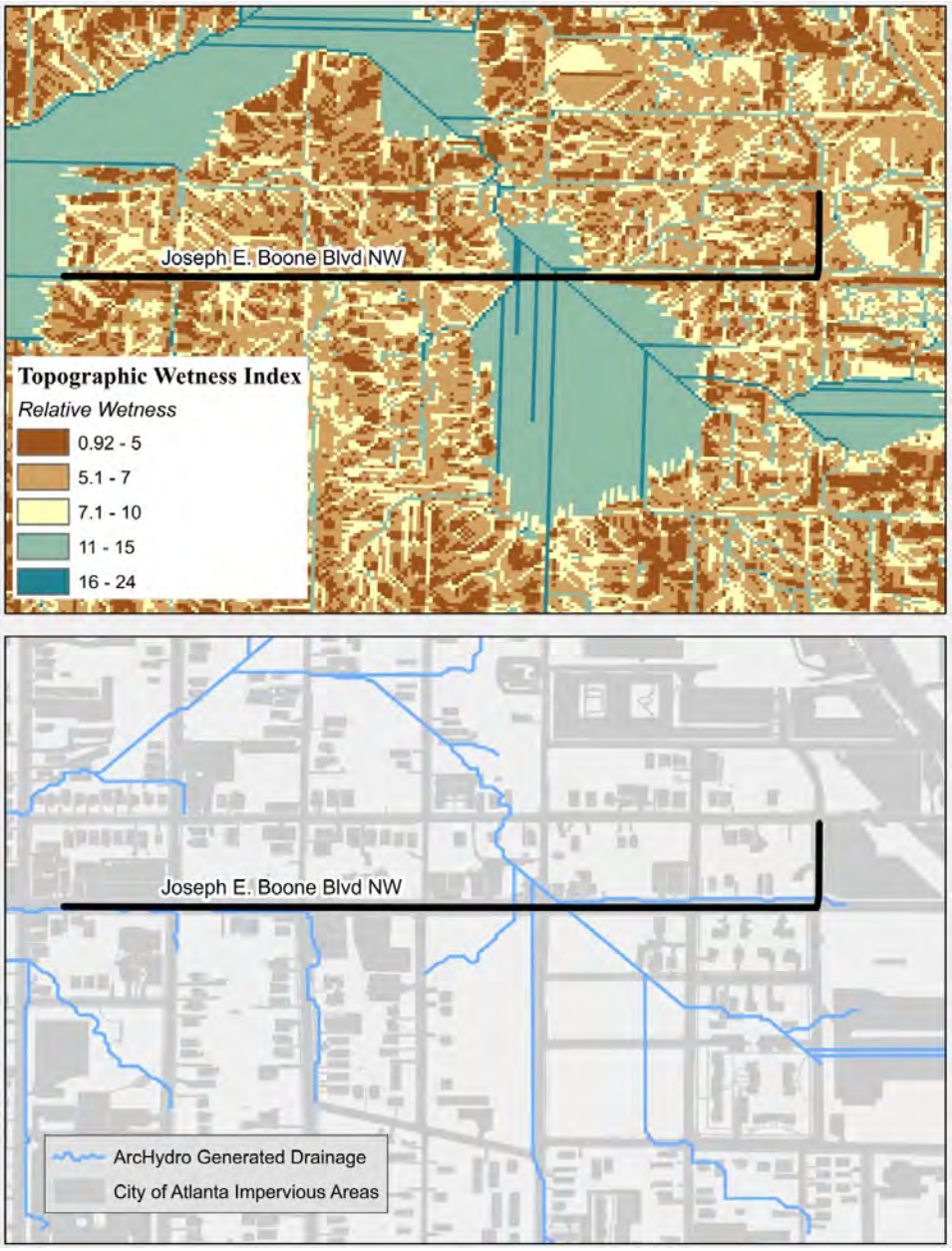


**Figure 26. Maps of the predicted wet areas (TWI) and the modeled stormwater flow lines.**

Based on the modeled TWI and flow lines, stormwater is expected flow from the southeast area, closest to downtown Atlanta, across the proposed project site around Vine Street. There are areas that are expected to remain wet after a rain event (or snow event) at that junction. The stormwater runoff that reaches Boone St. will be directed to the Vine Street junction and the storm drain and conveyance system.

Do the areas in the community more prone to flooding also have derelict or vacant properties?

The presence of deteriorated and vacant properties have been a persistent issue in this community. Of the properties adjacent to the proposed project site, almost half are in deteriorated or poor condition and 43% are vacant and/or abandoned. Conditions in Vine City include only 29% of properties have curb appeal, 44% of properties are vacant, 5% are blighted properties, and 7% have health code issues(Atlanta Office

of Housing 2012). In the neighborhood of English Avenue, only 12% of properties have curb appeal, 59% of properties are vacant and/or abandoned, 17% are blighted properties, and 17% have health code issues (Atlanta Office of Housing 2012)Figure 27 and Figure 28 show the locations of vacant and derelict residential properties and non-residential properties.

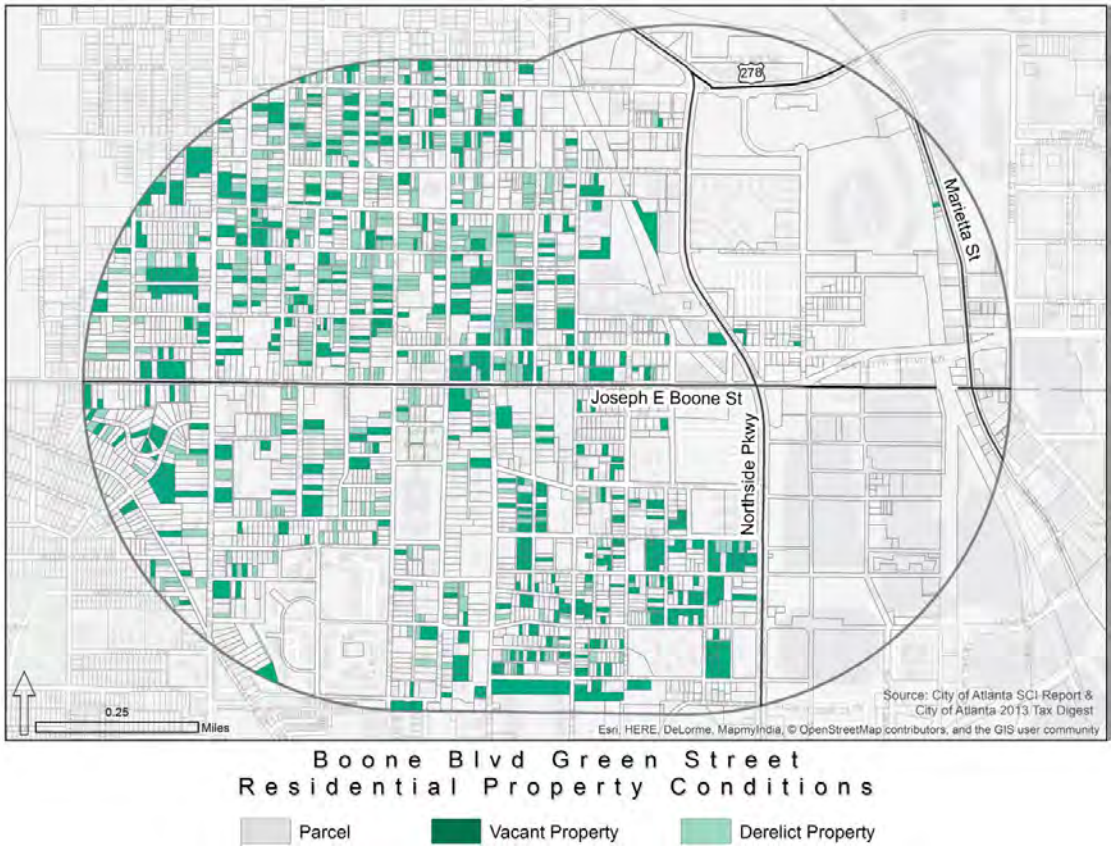


**Figure 27. Vacant and derelict residential properties within a half-mile of the Green Street Project site.**

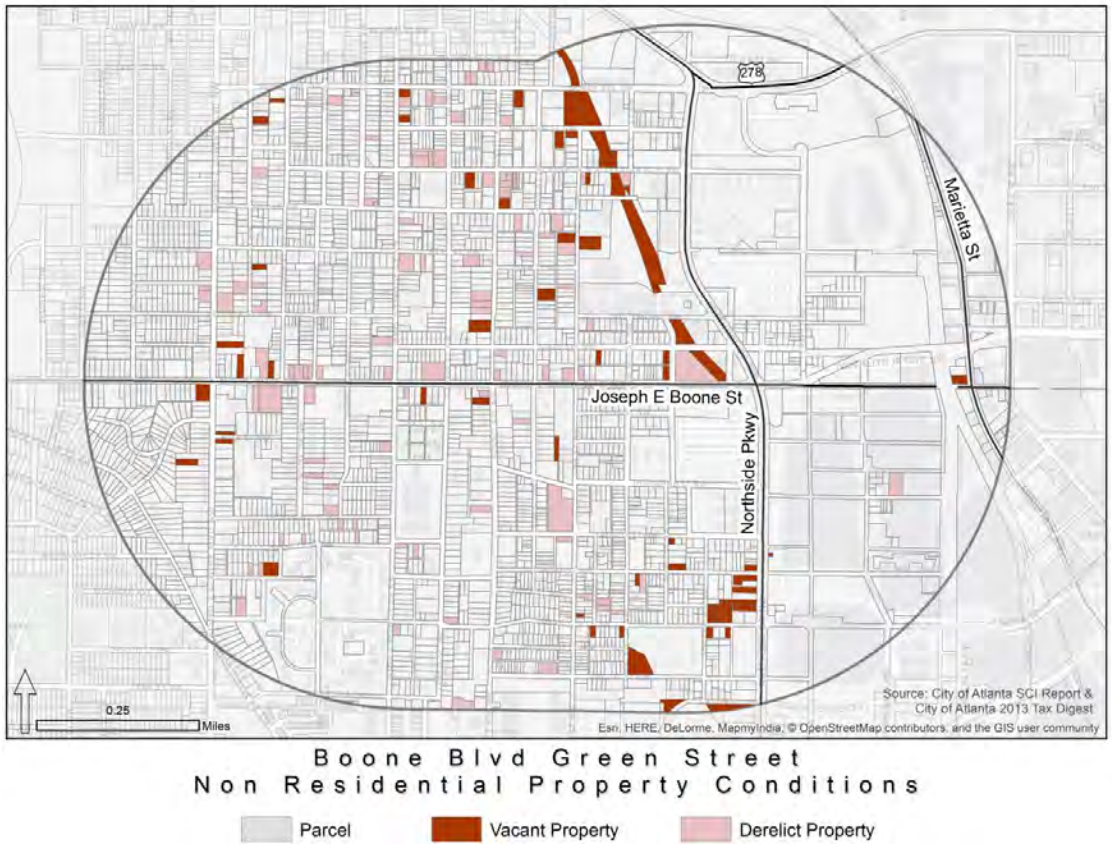


**Figure 28. Vacant and derelict non-residential properties within 1/2 mile of the Green Street Project site.**

There are many derelict properties throughout the community. Although there was some overlap of deteriorated and/or vacant homes and relatively wetter areas, these homes are so numerous that one cannot conclude whether or not they are the result of flooding. Deteriorated and/or vacant non-residential properties (i.e., commercial, industrial, public properties) do not appear to be located in areas predicted to be wet and are scattered throughout the community.

How much stormwater runoff reaches the storm sewer inlets in the proposed project site?

The HIA Core Project Team calculated the amount of stormwater moving through the proposed site using EPA's Stormwater Calculator. Table 28 shows the baseline calculations for the proposed project area. Based on these calculations, the average amount of stormwater runoff coming from the proposed project site is 45.6 inches per year, which goes into the storm sewer conveyance system. In a given year, the expected number of days in which stormwater runoff will come from the site is 69.5 days.

**Table 28. Stormwater Runoff Related Measurements of Proposed Project Site**

| Measurement | Description | Finding |
|---|---|---|
| **Total Area**[a] | Total area where changes are planned. | 117,612 $ft^2$ |
| **Impervious Surface Area**[a] | Total area that is impenetrable by water. | 63,040 $ft^2$ |
| **Percent Impervious**[b] | The percent of area that is impenetrable by water. | 53.6% (63,040 $ft^2$) |

# Assessment

| | | |
|---|---|---|
| **Average Annual Runoff[b]** | Total runoff (in inches) produced by the site divided by the number of years simulated. | 45.6 inches |
| **Percent of All Runoff Retained[b]** | Total rainfall that infiltrates, evaporates, and becomes runoff minus the percent that becomes runoff and evaporates. | 13.1% |
| **Days Per Year with Runoff[b]** | The number of days with measurable runoff divided by the number of years simulated. | 69.5 days per year |
| **Percent of Wet Days Retained[b]** | The percentage of days with measurable rainfall that do not have any measurable runoff generated. | 17.2% |

[a] Source: Tetra Tech (2013)
[b] Source: EPA Stormwater Calculator release 1.0.0.9

How are the areas upstream, downstream, and in the community interrelated with respect to flooding?

The HIA Core Project Team found that 67.9% of area that drains to Boone Street is impervious or does not allow water to infiltrate the ground. Figure 29 shows the area upstream of Boone Street and the proposed project site relative to the rest of the watershed.

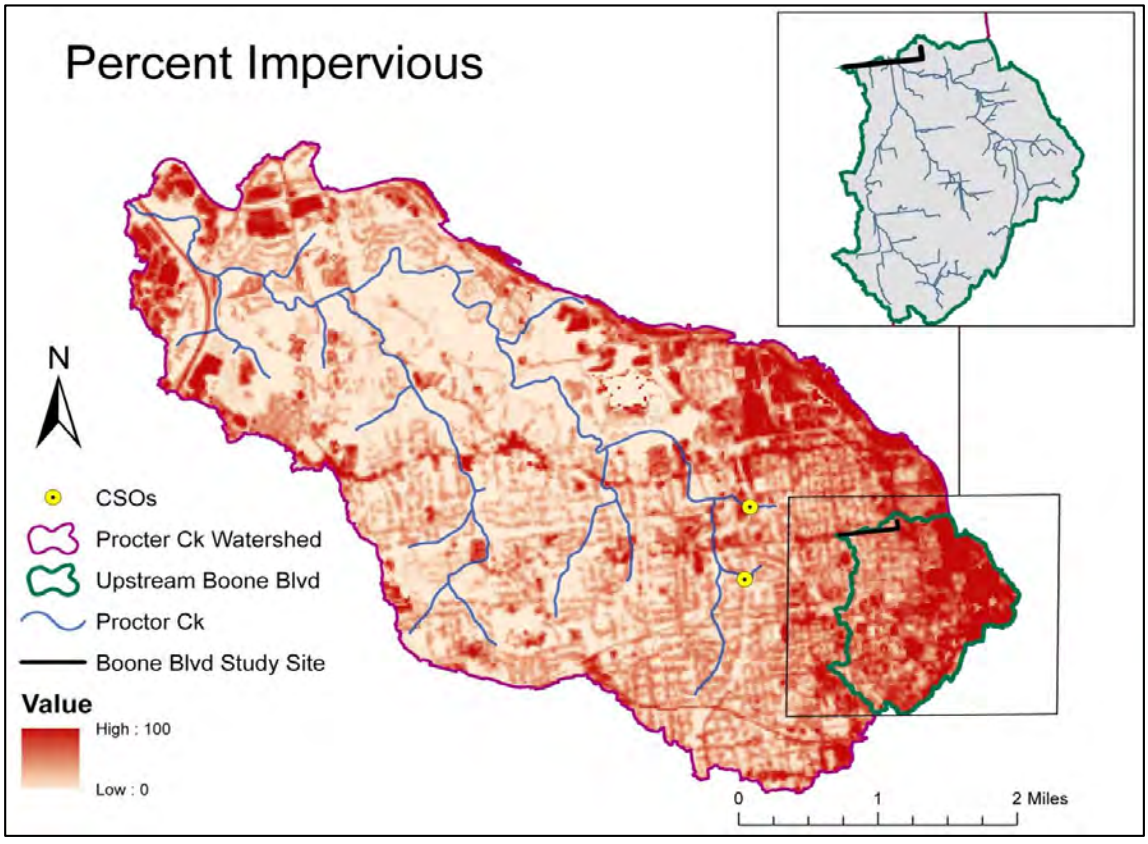


**Figure 29. A map of the impervious surfaces in the Proctor Creek Watershed and the area that drains to the proposed Green Street Project. Modeled flow lines also show from where runoff comes from in the area upstream of Boone Street.**

Impervious headwaters predisposes the areas downstream of the headwaters to flash flooding (i.e., events where a short duration but high volume of water can cause a flood event). Flash flooding is an event of extremely high precipitation (i.e., sustained, extremely high rainfall rate) that causes rapid stream rise or

stormwater flow volume above the usual measurement in a given area (Carpenter, et al. 1999, NOAA 2014a, Doswell, Brooks and Maddox 1996). Even when there is a small rain event, vast impervious areas allow water to increase in volume quickly (i.e., cumulate), which can lead to flash flooding and CSO events. Thus, it takes less time and less volume of stormwater in a more developed area to change an urban stream system (e.g., produce a flood, erode stream banks, etc.) compared to a less developed area (Walsh, et al. 2005, Sheeder, Ross and Carlson 2002). Land use, therefore, can play an intricate role in how an urban stream system may respond to a rain event.

The HIA Core Project Team looked at land use throughout the watershed to gain a better understanding of land use in the Proctor Creek Watershed. Most of Proctor Creek's headwaters are highly developed, with high percentages of developed land and corresponding impervious surfaces (Figure 30). The community, within a half-mile radius of the proposed Green Street Project, is a moderately developed urban area, with 43.5% low intensity development, 33.8% medium intensity development, and 18.2% high intensity development (Multi-Resolution Land Characteristics Consortium 2006). This means that even during a short or small rain event, the stormwater from this area may contribute largely to flooding in the downstream or low-land areas.

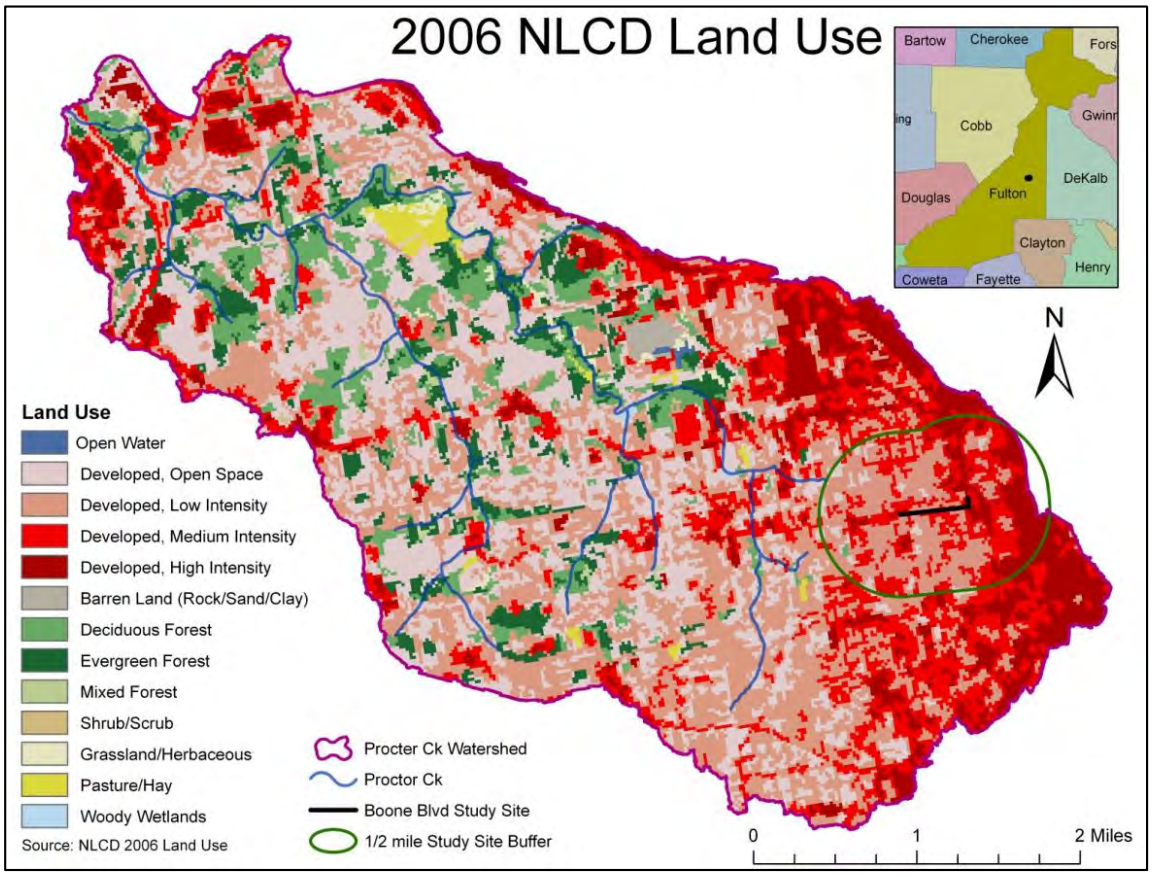


**Figure 30. A Map of the 2006 NLCD Land Use Cover data for Proctor Creek Watershed and the designated community.**

# Assessment

What is the risk of flooding in the community and in other areas of the watershed?

The HIA Core Project Team analyzed historical precipitation data and modeled the probability of flood events. The 30-year average (1981-2010) maximum and minimum monthly precipitation data from PRISIM Climate Group and the annual monthly average precipitation data for Atlanta from www.weather.com were downloaded, analyzed, and graphed. The average monthly precipitation for both the City of Atlanta and the Proctor Creek Watershed stayed between three to five and half inches; the highest occurring in July. Mid-summer (July) and late winter (February-March) are the periods when flooding is more likely to occur due to the high average stormwater volume. Data from three monitoring stations located in and near the Proctor Creek Watershed showed the typical rainfall events occurring in the area. Figure 31 shows the hourly precipitation recorded at each of these stations within the last five years. Individual rain events (i.e., rainfall period separated by four or more hours of no precipitation; (Hamilton and Rowe 1949) were graphed by event size and duration using the National Climatic Data Center (NCDC) Mapper tool, developed by the National Oceanic and Atmospheric Administration (NOAA). Over the past five years, 85% of the rain events were at or below 0.77 inches of stormwater. Approximately 93% of the rain events were at or below 1.2 inches, which is the state's criterion for standard water quality sizing of stormwater BMPs (ARC and GA-DNR 2001).

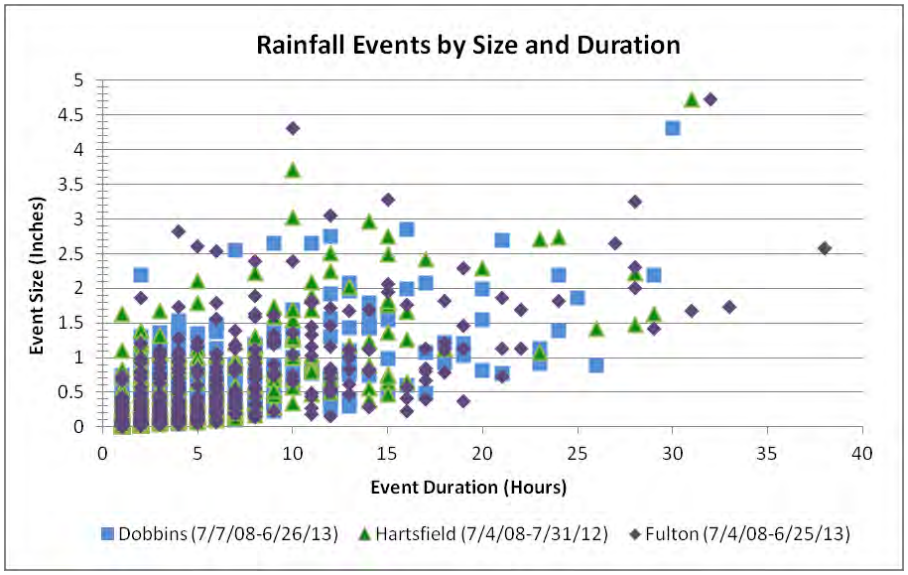


**Figure 31. Graph of the recorded rainfall events by size and duration, from the three surrounding precitipations stations, over the past five years. (Source: NCDC Mapper)**

The estimated flood frequency (i.e., probability of a flood event) for the area upstream of the community was calculated using the previously calculated watershed areas and percent impervious area as inputs (Gotvald and Knaak 2008). The HIA Core Project Team found, that in any given year, there is a 50% chance that there will be a flood event with a peak flow of 918 $ft^3$ per second in the area upstream of the proposed Green Street Project. The peak flow may range from 429 to 1,970 $ft^3$ per second, given the 95% confidence interval.

*NOTE: Because the impervious surface for this area is 67.9%, the results must be interpreted with caution since the U.S. Geological Survey template used to calculate these flood frequencies has an unknown accuracy when impervious surface area is above 35%* (Gotvald and Knaak 2008).

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The HIA Core Project Team also looked at Federal Emergency Management Agency (FEMA) flood hazard maps and data. This data is useful for examining large-scale flood events that tend to be associated with high volume, long duration rainfall events and large runoff and/or melting events. Figure 32 highlights the FEMA Special Flood Hazard Zones (SFHZ), which are areas subject to flooding by the Chance Annual Flood (i.e., the chance that the area will flood in any given year; (FEMA 2013).

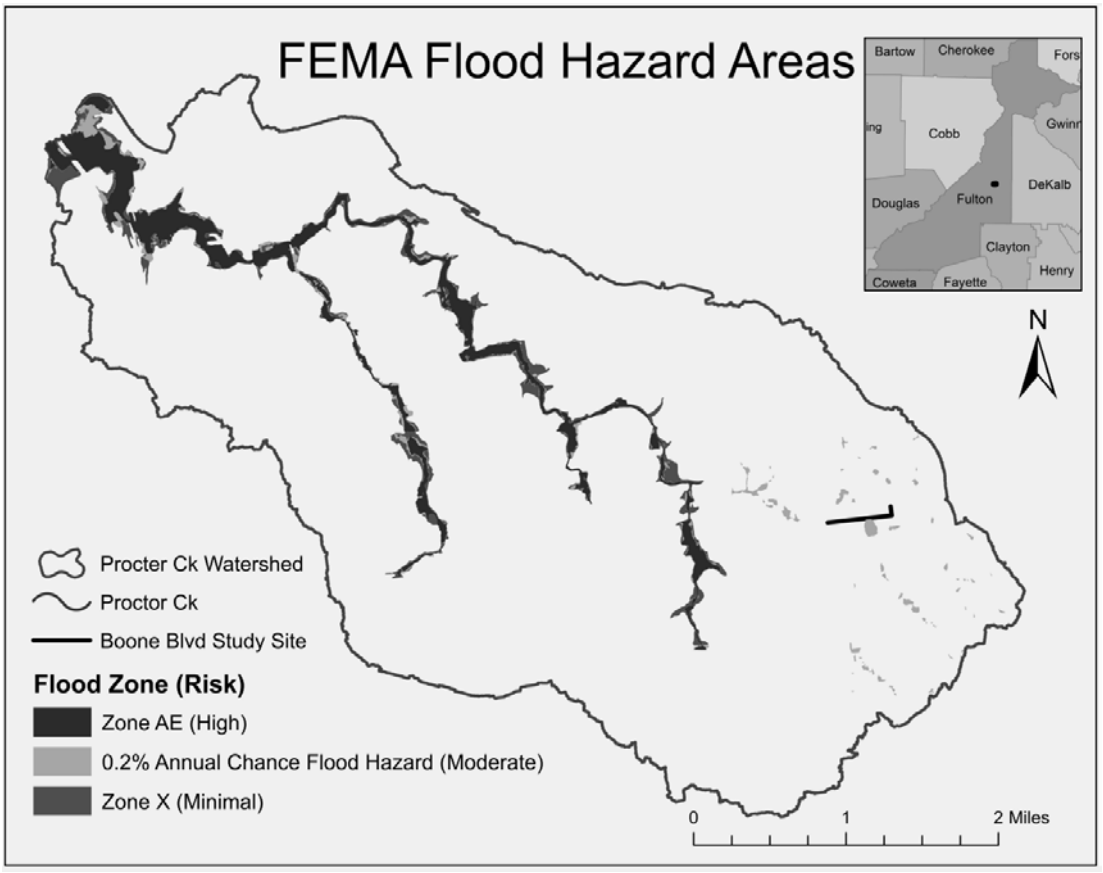



**Figure 32. A map of the FEMA Special Flood Hazard Zones in the Proctor Creek Watershed. Source: (FEMA 2013)**

According to this data, there are some areas around the proposed project site that may see localized flooding, but the probability of that event occurring is one in 500 years (or 0.2% annual chance). The chance of flooding increases greatly as one moves further downstream in the watershed. For a community of this size, the data does not provide enough information to predict flash flood events.

### *How the Green Street Project May Impact Flood Management*

Will the Green Street Project affect flooding and related public health issues?

The proposed project spans 117,612 $ft^2$ (or 2.7 acres), in which approximately 14,788 $ft^2$ of impervious surfaces will be converted to pervious surfaces. In addition, the plan puts into service stormwater BMPs, including different soil and plant components designed to capture and retain runoff before it goes into the combined sewer conveyance system. Tetra Tech designed each element of the BMPs to meet the state's water quality sizing criteria, which requires each element to capture and treat runoff from a 1.2-inch

rainfall event or the first 1.2 inches of rainfall from larger rain events. The sizing criteria represent one part of the recommended measures to meet Georgia's minimum performance requirements for new development or redevelopment sites (ARC and GA-DNR 2001). With this information, the HIA Core Project Team used modeling tools to predict the changes in stormwater retention in the proposed project area. Table 29 lists the measurements calculated and the results of the modeling.

**Table 29. Expected Impacts of the Proposed Green Street Project**

| Measurement | Existing Conditions | Predicted Change | Difference |
|---|---|---|---|
| **Total Project Area**[a] | 117,612 $ft^2$ | - | - |
| **Impervious Surfaces**[a] | 63,040 $ft^2$ | 48,252 $ft^2$ | ↓ by 14,788 $ft^2$ |
| **Percent Impervious**[b] | 53.6% (63,040 $ft^2$) | 41.0% | ↓ by 12.6% |
| **Average Annual Runoff**[b] | 45.6 inches | 36.4 inches | ↓ by 20% |
| **Percent of All Runoff Retained**[b] | 13.1% | 30.7% | ↑ by 17.6% |
| **Days Per Year with Runoff**[b] | 69.5 days per year | 64.6 days | ↓ by 5 days per year |
| **Percent of Wet Days Retained**[b] | 17.2% | 23.2% | ↑ by 5% |

[a] Source: Tetra Tech (2013)
[b] Source: EPA Stormwater Calculator, release 1.0.0.9

The proposed project is expected to reduce the amount of stormwater entering the conveyance system by 20% and reduce the number of days with runoff by 5 days per year. It is highly likely that these benefits will translate into reductions CSO events and slow stormwater runoff peak flow. Increasing the amount of pervious surfaces in this area will help reduce pooling and standing water along the street. Reducing the potential for pooling and standing water on the street are beneficial to health because it removes hazards for injury from slips, falls and floating debris. Reducing the amount of stormwater going into the conveyance system will extend the useful life of the system and may prevent breaks/leaks, which can damage homes and buildings. Reducing CSO events and standing water will help reduce habitats that support pests and disease carrying insects. The improvements in flood management will affect a moderate number of people, including pedestrians, cyclists, drivers and passengers, and property owners in the immediate vicinity. Improvement in flood management is expected to last a moderate length of time, if the green infrastructure elements are properly maintained and functioning as designed. Improving flood management in this area will benefit vulnerable populations by reduced risk of injury and/or illness in a predominantly low-income area overburdened by flash flooding, mosquitoes, and vacant and/or derelict properties. The evidence linking green infrastructure to improved stormwater management is strong. The evidence linking flooding to CSO events and mosquito populations is also strong. However, the evidence linking between flooding and health is limited, with more circumstantial associations. Table 30 summarizes the predicted health impacts of the proposed project related to flood management and potential strategies to manage those impacts.

**Table 30. Potential Health Impacts from Changes in Flood Management and Management Strategies**

| Criteria | Scale | Potential Impact Management Strategies |
|---|---|---|
| **Likelihood** | Highly Likely | None provided. |
| **Direction** | Positive | None provided. |
| **Magnitude** | Moderate | Expand BMPs (green infrastructure) throughout the community to help to maximize flow reduction going into storm sewers. This will not only provide capacity relief for the CSO, but may also reduce the number of overflows, which is a major contributor to fecal coliform in surface waters. Increasing law enforcement of nuisance laws in regards to abandoned properties, property maintenance and upkeep, and illegal dumping. Derelict or damaged homes can provide a dwelling for pests, which can carry diseases that affect humans and pets. Dumped trash and pooling water provide breeding habitats for mosquitoes and other insects. Increase community awareness of environmental factors that can lead to mosquitoes and of preventative measures against vector-borne pathogens in the area. Develop a policy, plan, and/or ordinance to resolve/address the problem of vacant housing. |
| **Permanence** | Moderate | Ensure that the monitoring/maintenance plan for green infrastructure elements is followed as directed. Routine maintenance and monitoring of sites ensures that the cell is performing as intended. Clogging and blockage from debris can slow or stop water moving through the cell, which can lead to pooling at the street level. |
| **Distribution** | Vulnerable Populations Benefit | Improve flood safety hazard warnings in flood-prone areas to raise awareness of health risks, especially for those who may be more at risk. |
| **Strength of Evidence** | Limited | None provided. |

### 4.3.3. Climate and Temperature

At the first HIA Advisory Group meeting, stakeholders identified a need in the community to address heat stress and charged the HIA Core Project Team with evaluating the proposed project's potential for impacting local climate conditions and relief from heat stress. In order to answer this question, the HIA Core Project Team had to first determine what conditions in the local community might predispose residents to higher temperatures and then evaluate how the project's design might mitigate exposure to extreme heat events. The team used the empirical evidence to establish pathways of impact and supplemented predicted impacts to health with observed patterns in climate and temperature.

#### *Results of the Literature Review*

What elements of the physical environment in an urban community might contribute to higher temperatures?

Climatologists have been studying the effects of urban development on climate conditions for several decades. Changing a permeable surface area (i.e., covered with soil and vegetation) to impermeable surface area (i.e., covered with pavement, concrete, or metal) can change the ability of that surface to

absorb, shed, and reflect heat. When a material is exposed to sunlight, the energy from the sun is either absorbed and stored as heat, absorbed and transferred to the air and other surfaces (i.e., thermal emittance) or reflected back to space (i.e., as albedo). Infrastructure, such as concrete, pavement, and metal, typically has lower albedo and higher heat capacity, which means more energy is absorbed in the material and less energy is reflected back to space (U.S. EPA 2013b). These factors combine to create a warmer surface temperature.

Warm surfaces can transmit heat to the surrounding air causing an increase in air temperature. Berdahl and Bretz (1997) conducted a temperature survey of different building roof materials and found that on a dry, summer day, the roof surfaces were 50-90°F (about 10-32°C) higher than the ambient air temperature. As surface temperature rises, air temperature also rises, which can affect local climate conditions (Voogt and Oke 2003). Wind disperses ambient heat lowering surface air temperature (NOAA 2014b). The spacing and dimensions of infrastructure also affect surface temperature by influencing wind flow.

Vegetation (i.e., trees, bushes, and grasses) plays an important role in regulating surface and air temperature. Shaded and/or wet surfaces resist temperature changes. Trees, especially deciduous trees (i.e., trees that grow and shed leaves) provide shading for surfaces, which blocks sun radiation. Seasonal variations, apart from changes in the intensity of the sun on the surface of the earth, influences changes in ground cover (i.e., leaf on or leaf off), which influences surface temperature. Plants release water into the surrounding air via evapotranspiration, which dissipates ambient heat and thereby lowering air temperature (U.S. EPA 2013b). Elliot and Barnard (1990) found that tree size and texture influenced wind flow (e.g., magnitude of wind gusts and wind speed) as air moves around the tree.

Expansive development can lead to a more widespread change in microclimate, a phenomenon otherwise known as the urban heat island (UHI) effect. UHIs occur when urban, developed regions experience warmer temperatures than their rural, less-developed regions (U.S. EPA 2013b). Large cities (i.e., over 1 million people) that are experiencing UHIs can see an annual average air temperature that is 34-37°F (about 1–3°C) higher than surrounding rural areas (Oke 1997). The extent of UHI effect or change in temperatures can be affected by spatial (i.e., dimensions and spacing), temporal (i.e., time of day), seasonal (e.g., summer, winter, etc.,), and weather conditions (e.g., wind and cloud cover). It is important to consider the different types of UHIs. A surface UHIs (i.e., canopy UHIs) refers to the relatively high temperatures in the layer of air from the ground to the top of trees. Whereas, atmospheric UHIs occur when there are relatively high temperatures above the canopy where the effect area is broader. Surface UHIs are present at all times of day and night. The most intense heat (i.e., peak heat intensity) occurs during the day and in the summer (Oke 1997, Voogt and Oke 2003, U.S. EPA 2013b).

### How does exposure to higher temperatures affect health and wellness?

UHI exacerbate the effects of heat waves or relatively long periods of extreme heat. Living in areas that experience UHIs predisposes residents to health impacts of extreme heat events, which include general discomfort, heat-related illnesses, and complications with pre-existing health conditions (e.g. heart disease, behavioral disorder, metabolic disorder, etc.) (Luber and McGeehin 2008). Those more vulnerable to extreme heat are children, older adults, and persons with certain heath conditions that predispose them to heat-sensitivity (Luber and McGeehin 2008). For example, an extreme heat event is

likely to affect a person more if he or she takes a medication that alters their ability to stay hydrated and/or sweat (i.e., reduced ability to relieve body heat). Researchers in Toronto, Canada studied whether there was a relationship between ambulance calls and oppressively hot days. They found that the average number of ambulance calls increased by 10% on the "oppressively hot days," specifically in urban, industrial and recreation areas (Dolney and Sheridan 2006). Based on these findings, heat related illness are likely to occur more often in highly developed areas and places where people play outdoors. Although incidences are rare, extreme heat events can cause death.

### *Existing Conditions Related to Climate and Temperature*

The GA DPH OASIS tool does not report heat-related illnesses. Therefore, any potential changes to health outcomes were inferred based on the empirical evidence and expected changes to the conditions that affect climate and temperature.

What are the historic temperatures experienced in the community?

Boone Street is located in an urban, highly developed area in the southern region of the United States. This region experiences relatively higher average annual temperatures than other regions of the US, with temperatures that usually range from 40–80°F (4 to 26°C) (Figure 33). Although April and October show slightly lower temperatures, the overall temperature pattern in the Proctor Creek Watershed follows the same pattern as the measurements taken in Atlanta, GA (PRISM Climate Group 2014).

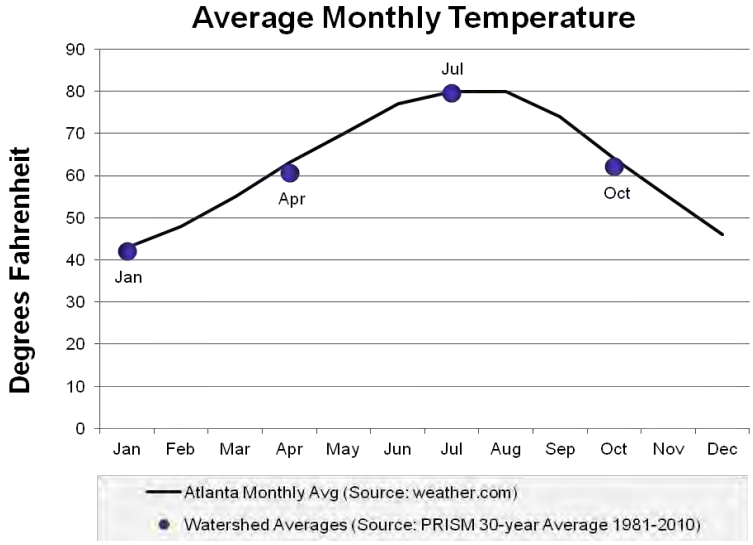



**Figure 33. PRISM monthly temperature and precipitation averages plotted with Atlanta regional averages.**

Are there areas in the community that may by "hot spots" or have higher surface temperatures?

The HIA Core Project Team used satellite infrared imaging to identify impervious surfaces (e.g., buildings, pavement, etc.) in the community. Figure 34 identifies the areas of impervious surfaces in red. Apart from residential housing, the expansive impervious surfaces were mostly located along Boone Street and in the industrial/commercial areas to the east. These areas will have higher than average surface temperatures than areas with pervious surfaces and shading.

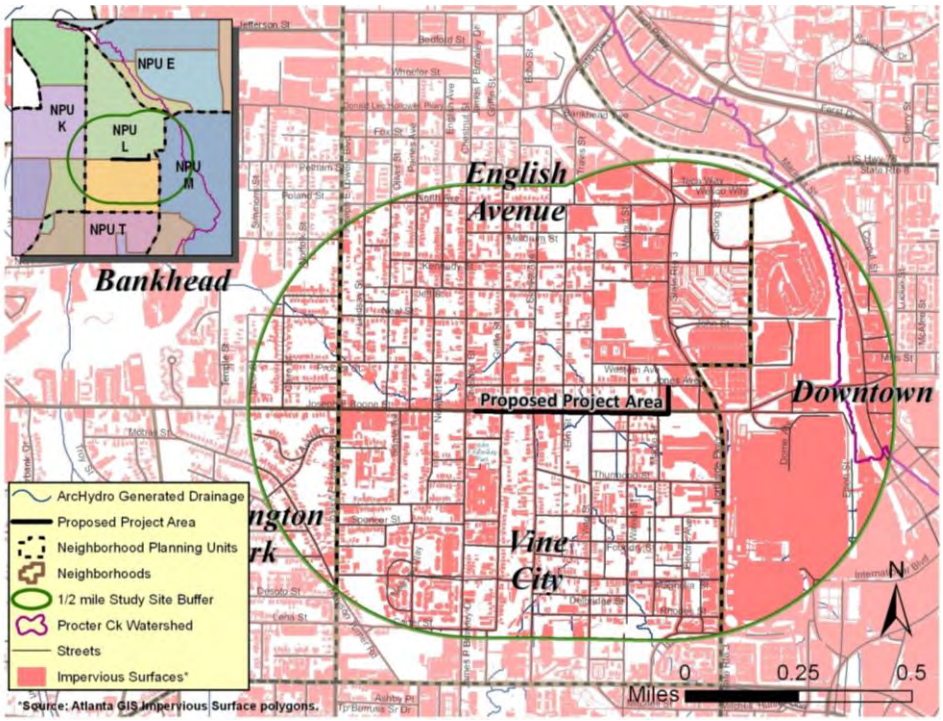



**Figure 34. A map of the impervious surfaces in the HIA study area.**

### *How the Green Street Project May Impact Climate and Temperature*

Is the Green Street Project, as designed, expected to change the microclimate and influence surface temperature and its related health impacts?

It is highly likely that the proposed project will reduce surface temperatures once the planted vegetation has matured and is providing shading. Only one bus stop in the project area provided cover/shade from the sun (at the eastbound intersection of Boone Street and Vine Street). No other areas along the corridor provide sufficient shading of impervious surfaces. Thus, it is also highly likely that the added shading from trees will provide some reprieve from the sun, especially on oppressively hot days. The proposed project will add 14, 788 $ft^2$ of permeable surface area. Impervious surfaces are known to contribute to urban heat island (UHI) effect. surface area will improve the ability of the corridor to absorb, shed and reflect heat. Decreasing impervious surfaces and increasing shading will help reduce surface temperatures, which will provide relief and some protection against heat-related illnesses. Relief from the heat and sun will affect a moderate number of people, specifically those using the sidewalks and traveling in the street. Considering the small size of the project, the impact on UHI effect may not be significant or measureable beyond the street. The benefits of reduced surface temperatures and shaded reprieve from the sunlight will continue for many years, but only during leaf-on seasons for deciduous trees. Vulnerable populations will benefit more from the added shading and lower surface temperatures along the proposed project site. Persons who are more vulnerable to heat related illness include children, older adults, and persons with certain health conditions that predispose them to heat-sensitivity. The causal evidence is strong as to how impervious surfaces and a lack of shading leads to UHIs. Several case studies illustrate the harmful impacts to human health from exposure to oppressively hot days and/or extreme heat events

in an area affected by UHI. Table 31 summarizes the predicted health impacts of the proposed project related to climate and temperature and potential strategies to manage those impacts.

**Table 31. Potential Health Impacts from Changes in Climate and Temperature and Management Strategies**

| Criteria | Scale | Potential Impact Management Strategies |
|---|---|---|
| **Likelihood** | Highly Likely | None provided. |
| **Direction** | Positive | None provided. |
| **Magnitude** | Moderate | Select native tree species that have taller, broad canopies that could increase the shading of surface area, especially impervious surface areas. Place trees with larger canopies near bus stops or other areas where people may congregate to provide relief for people waiting on public transit. |
| **Permanence** | Long Lasting | None provided. |
| **Distribution** | Vulnerable Populations Benefit | None provided. |
| **Strength of Evidence** | Strong | None provided. |

### 4.3.4. Air Quality

Both natural and human activities influence the quality of the outdoor air. Although stakeholders did not identify air quality as a priority health concern, the HIA Core Project Team identified air quality as a health-related impact of the proposed project and looked at different factors that could influence air quality, specifically related to traffic-sources. Vegetation could influence ambient air pollution at the street level via several mechanisms. This review focused on air pollutants caused by motor vehicles.

#### *Results of the Literature Review*

What influences ambient air quality, especially in urban communities?

Air quality is often described by the presence of harmful pollutants. Sources of air pollutants can be natural (e.g., plants releasing pollen/seeds) and/or from human activities (e.g., burning fossil fuels) (U.S. EPA 2012c). Most air pollutants are from human made sources, including mobile sources (e.g., motor vehicles, trains, etc.) and stationary sources (e.g., factories, refineries, power plants, etc.) (U.S. EPA 2014d). The EPA monitors and regulates six harmful air pollutants (i.e., criteria air pollutants) for the protection of public health and the environment. Those pollutants are particulate matter, ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide and lead (U.S. EPA 2014d). Each of these pollutants can come from road sources (e.g., motor vehicle emissions, pavement, tire particles, motor oil, etc.). It is important to note that the presence of lead from road sources has become less of an issue since regulatory action in the 1990s caused lead to be almost completely removed from use in fuel for on-road motor vehicles (U.S. EPA 2014e). Additional monitoring for other air pollutants and sources does occur at the national, regional, state and local levels. However, regulated standards have not yet been established for those pollutants.

# Assessment

Plants, such as grasses, bushes and trees, can influence the levels of ambient air pollutants in multiple ways. Trees are the most efficient at filtering the air, followed by shrubs, then grasses (Givoni 1991). One mechanism, in which plants remove pollutants from the air, is the filtration of the ambient air via gas exchange through leaf stoma. Another mechanism involves small particles falling on to the surface of plants. From there, pollutants can be washed to the ground by precipitation or re-suspended into the air. Plants use carbon from gases in the atmosphere to build mass, a process known as carbon sequestration. Plants can also offer a physical barrier to the dispersal of pollutants in the ambient air. Pollutants are dispersed to different areas by wind and vertical mixing of air columns from temperature changes and air rising/sinking. Trees with dense canopies help to prevent vertical mixing of pollutants (Givoni 1991). Plants can also contribute pollutants to the ambient air. Some plants release volatile organic compounds (VOC), which react with other pollutants to form ozone (Taha 1996). Certain plants release higher levels of VOC than others (Benjamin and Winer 1998).

## How does air quality influence health and wellness?

There is enough evidence worldwide that adequately supports the causal relationship between the quality of the outdoor air and specific health outcomes. In fact, it is possible to measure a person's risk of death and illness based on pollutant levels. For example, daily death rates in Europe rises by 0.3% overall and by 0.4% for deaths related to heart disease per 10 $\mu g/m^3$ increase in ozone exposure (WHO 2006). European cities with high levels of air pollution had higher mortality rates than cities with less air pollution (WHO 2006). Persons most sensitive (vulnerable) to the effects of air pollutants are those with pre-existing respiratory conditions (e.g., persons with asthma and lung disease), the elderly and young children (U.S. EPA 2012c). Health impacts of road source air pollutants are discussed, below.

Particulate matter refers to tiny particles in the air. They are complex compounds of varying size that can come from a variety of sources (e.g., burning matter, plants, chemical reactions in the atmosphere, etc.) (U.S. EPA 2012c). Small particulate matter (i.e., less than 10 microns in diameter; $PM_{10}$) includes dust particles, pollen, and molds (GA-EPD 2012). In comparison, the human hair ranges between 50 and 70 microns in diameter. Ultrafine particulate matter (i.e., less than 2.5 microns in diameter; $PM_{2.5}$) includes combustion source particles, organic compounds, and metals (GA-EPD 2012). To date there are thousands of studies that link exposure to particulate matter to health effects.

Researchers found that prolonged exposure to particulate matter could lead to increased risk of lung cancer, cardiovascular disease, and respiratory disease. The main mechanism in which particulate matter interferes with health occurs when small particulate matter enters the lungs and interferes with gas exchange and causes inflammation (WHO 2006). The U.S. EPA performed an extensive review of the literature as part of their integrated science assessment for particulate matter (U.S. EPA 2009). Researchers found a positive ling between short-term (24-hour) exposure to $PM_{2.5}$ and a number of health outcomes, including cardiovascular disease, respiratory symptoms and pre-mature deaths. Epidemiological studies reported consistent positive associations between exposure to $PM_{2.5}$ and emergency department visits and hospital admissions for respiratory infections and cardiovascular-related symptoms. The levels of impact were not fully consistent across studies; however, the EPA considers the evidence sufficient to monitoring and regulation. Currently, the National Ambient Air Quality Standards (NAAQS) for $PM_{2.5}$ based on long-term and short-term exposures, are annual average 15.0 $\mu g/m^3$ and 24-hour 35 $\mu g/m^3$, respectively (U.S. EPA 2014d).

# Assessment

Ozone ($O_3$) is caused by complex chemical reactions in the atmosphere in the presence of ultraviolet radiation. Ground level ozone (i.e., smog), which is formed by other gases in the air mixing together with sunlight, causes irritation of mucus membranes in the nose, throat, and airways (GA-EPD 2012). Ozone also causes breathing problems and exacerbates symptoms of chronic respiratory diseases and reduced lung function (WHO 2006). Ozone can also affect healthy individuals over a long period. Exposure to ozone for 6 to 7 hours, even at relatively low concentrations, significantly reduces lung function and induces respiratory inflammation in normally healthy people (non-asthmatics) (U.S. EPA 2012c, WHO 2006).

Nitrogen dioxide ($NO_2$) is a normal component of ambient air formed from high temperature combustions and lightning (GA-EPD 2012). As a strong oxidizing agent, $NO_2$ reacts with water molecules in the air to form corrosive nitric acid and toxic organic nitrates, which contribute to acid rain. $NO_2$ is also a precursor or contributing compound in the development of ground level ozone. As a brown gas, $NO_2$ can reduce visibility and even become toxic at levels above 200 $\mu g/m^3$ (U.S. EPA 2014d). A high level of nitrogen dioxide in the air causes significant inflammation of the airways, reduces lung function growth, and can lead to increased trips to the emergency room or hospital for difficulty breathing (U.S. EPA 2014d).

Sulfur dioxide ($SO_2$) is a colorless reactive gas formed from burning sulfur-containing materials (GA-EPD 2012). $SO_2$ affects the respiratory system, mainly through inflammation of lung tissue, and causes eye irritation (U.S. EPA 2012c). This is partly due to the chemical reaction that occurs when sulfur dioxide combines with water yielding sulfuric acid. For example, people with asthma experience changes in pulmonary function and respiratory symptoms after periods of exposure to $SO_2$ as short as 10 minutes (WHO 2006).

Carbon monoxide (CO) is an odorless, tasteless gas produced any time from the burning of fossil fuels (CDC 2014). When inhaled, CO enters the bloodstream where it prevents oxygen from bonding to hemoglobin (GA-EPD 2012). This ultimately reduces oxygen delivery to the rest of the body and vital organs. The loss of oxygenated blood can lead to headaches, dizziness, nausea, and oxygen starved muscles (e.g., the heart). Long term exposure or high exposures over a short amount of time can even cause death (U.S. EPA 2012c). Young infants, pregnant women, elderly, and persons with anemia or emphysema have a higher risk of adverse health effects of CO exposure (GA-EPD 2012). Motor vehicle emissions contribute approximately 56% of total carbon monoxide emissions in the U.S. (U.S. EPA 2012c).

In regards to development, Schweitzer and Zhou (2010) examined neighborhood emissions and exposures in 80 metropolitan areas across the United States to determine whether air quality outcomes are better in compact regions (i.e., urban) or in regions characterized by sprawl (i.e., suburban and rural). They found that ozone concentrations are significantly lower in compact regions, but human exposures to ozone were higher. Individuals who spend a lot of time outdoors are going to have higher exposure levels to pollutants, even if the pollutants are present at relatively low levels. Fine particulate concentrations did not correlate significantly with compactness; but exposures to fine particulates were higher in compact regions. Schweitzer and Zhou (2010) concluded that compact development does not necessarily solve air quality problems for a particular region. Their suggestion was to include considerations of exposure— not just emissions— when planning for new development.

# Assessment

### *Existing Conditions in the Community*

EPA regulates air quality by the authority outlined in the Clean Air Act. However, state and/or local governments perform most air quality monitoring (i.e., air sampling and data analysis). For example, the GA—EPD Air Protection Branch performs yearly air sampling through its Ambient Air Monitoring Program. Results are reported by sampling site and county. Since there were no air-sampling monitors relatively near the community to acquire air quality data, the HIA Core Project Team used the information from the latest air surveillance report by the state and relative health statistics from the OASIS database to characterize existing conditions related to air quality and respiratory health.

What is the existing status of air quality and related health outcomes in the community?

In the state of Georgia, mobile sources accounted for most of the total emissions for CO, $NO_2$, and $O_3$ for the entire 2008 year (i.e., 2.3 million short tons, 292 thousand short tons, and 231 thousand short tons, respectively (GA-EPD 2012)). In 2011, the metro-Atlanta region did not meet the NAAQS for ozone or particulate matter. Atlanta had 44 days in the year when ozone average values exceeded the NAAQS for ozone (GA-EPD 2012). Since 2004, Atlanta was declared a non-attainment area for not meeting particulate matter NAAQS and is currently implementing a plan for reducing particulate matter levels (GA-EPD 2012). All other criteria pollutants remained well below harmful levels. Lead values were almost non-existent, with concentrations staying below 0.01 $\mu g/m^3$ for the entire year (GA-EPD 2012).

Although health status information was limited, the GA—DPH reported ER visits for respiratory diseases and subsequent diagnoses. ER visits related to respiratory diseases for the years 2006-2010 were among the lowest to higher percentiles for the Census tracts surrounding the proposed project area (Figure 35). Chronic lower respiratory disease surrounding the proposed project area appeared to be among the lower in number, except for the upper English Avenue neighborhood (Figure 36). ER visits for asthma among residents appear in the lower to higher quintile (Figure 37). This may be due to the impact of air quality or reflect the difficulty in managing chronic asthma.

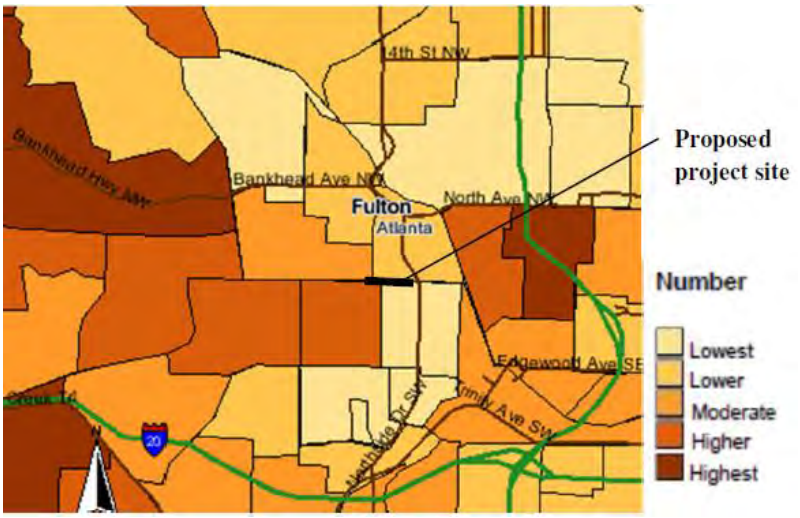



**Figure 35. Choropleth map of the 2006-2010 aggregate number of ER visits for all respiratory diseases, by Census tract. (Source: GA—DPH 2013; 2000 Census)**

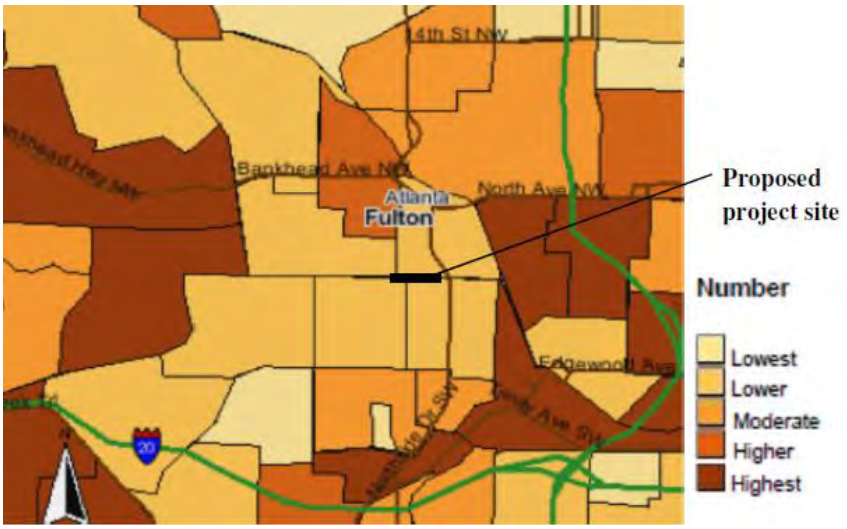



**Figure 36. Choropleth map of the 2006-2010 aggregate number of ER visits for chronic lower respiratory disease, by Census tract. (Source: GA—DPH 2013; 2000 Census)**


**Figure 37. Choropleth map of the 2006 to 2010 aggregate number of ER visits for all asthma, by Census tract. (Source: GA—DPH 2013; 2000 Census)**

***How the Green Street Project May Impact Air Quality***

Will the proposed project, as designed, affect local air quality and related health outcomes?

It is highly likely that the proposed project will be able to reduce ambient air pollutants by adding green infrastructure along an urban corridor. The added trees, bushes and grasses provide natural mechanisms that will filter some air pollutants from the adjacent street. However, the efficiency in removal of air pollutants depends on the species, number, and placement of the plants along the proposed project site. Motor vehicles release harmful gases and particles into the air that travel and react to form other harmful pollutants. Exposure to harmful air pollutants can increase respiratory symptoms, amplify visits to the emergency room or doctor's office for respiratory discomfort and raise a community's overall risk of heart and lung disease. Any measures aimed at reducing air pollutants will help protect health and ensure other efforts to promote healthy living do not have harmful consequences. Due to the proposed project's

small size, the changes to the ambient air will only affect a moderate number of people, especially persons traveling along the street. The ability of the plants to capture and/or filter pollutants form the air will last a long time (for many years), given that vegetation is present and viable. Improving local air quality will benefit vulnerable populations in a predominantly low-income, urban community. Persons more sensitive to the presence of air pollutants, such as asthmatics and those with pre-existing respiratory health conditions, the elderly and youths. There is strong causal evidence on the pathways of impact between the different air pollutants, especially the six criteria pollutants, and health impact. The potential for the proposed project to remove or capture some of those road source pollutants is founded in known natural processes. Table 32 summarizes the predicted health impacts of the proposed project related to air quality and potential strategies to manage those impacts.

**Table 32. Potential Health Impacts from Changes in Air Quality and Management Strategies**

| Criteria | Scale | Potential Impact Management Strategies |
|---|---|---|
| **Likelihood** | Highly Likely | None provided. |
| **Direction** | Positive | None provided. |
| **Magnitude** | Moderate | Select native plant species that have low volatile organic compound VOC emissions and have higher capacity for filtering pollutants out of the air. NOTE: for any planting of vegetation in urban areas, it is recommended that a minimum of three species be selected. Place plants that are lower to the ground (especially grasses and bushes) in areas where vehicles are likely to idle, so they can filter air pollutants from vehicle emissions. Taller trees should be spaced so that vertical mixing of pollutants is minimized. |
| **Permanence** | Long Lasting | None provided. |
| **Distribution** | Vulnerable Populations Benefit | None provided. |
| **Strength of Evidence** | Strong | None provided. |

### 4.3.5. Traffic Safety

At the first HIA Advisory Group meeting, stakeholders informed the HIA Core Project Team that there needed to be a better balance between the design of the built environment and environmental hazards (refer to Table 10). Injury from motor vehicles was one hazard identified in the discussion. The HIA Core Project Team looked at the literature evidence and the design of Boone Street to evaluate whether the proposed project could change traffic safety along the street.

# Assessment

### *Results of the Literature Review*

What characteristics of the physical environment contribute to traffic safety?

Transportation routes are traditionally designed to move people and goods efficiently, which may or may not include the safest measures for pedestrians and cyclists. The National Highway Traffic Safety Administration (NHTSA) conducted a national telephone survey in 2012, which found that poor quality of street facilities was the leading cause of pedestrian injury. There is growing awareness that transit corridors need to meet the needs of all modes of transit. Researchers and city planners are finding that streets can be designed to help minimize adverse impacts to health and safety in addition to meeting transportation needs (CDC 2011).

Implementing a road diet (i.e., reducing the number of traffic lanes) is one of many strategies used to increase traffic safety for drivers, pedestrians and cyclists. Thomas (2013) studied incidences where road diets were implemented in various types of communities and concluded that road diets are one of the transportation sector's greatest success stories. The Federal Highway Administration (FHWA) released a report in 2004 that concluded road diets reduce the overall number of motor vehicle crashes, but may increase the number of angle crashes (Highway Safety Information System 2004). Furthermore, the literature cautioned against implementing road diets in corridors that have an annual average daily traffic (AADT) above 20,000 vehicles, due to the likelihood of increased traffic congestion (Highway Safety Information System 2004). Eliminating excess roadway also helps reduce costs for road maintenance.

Other safety measures can include reduced speed limits, speed bumps, pedestrian crossing infrastructure (e.g., painted crossing zones, crossing counters, street lighting, etc.), separated bike lanes, safety signage, and traffic calming practices (e.g., streetscaping, circular intersections, etc.) (Heath, et al. 2006). In a pedestrian safety study by the New York Department of Transportation (NY DOT), investigators found that serious pedestrian crashes involving unsafe speeds were twice as deadly as crashes with lower speeds (NY DOT 2010). There is some debate as to whether shared lanes or separate bike lanes are safer for cyclists.

### *Existing Conditions Related to Traffic Safety*

What are the existing traffic conditions and traffic safety practices present along the project site?

Boone Street is a four lane, bi-directional roadway that travels east to west. The road functions as a major collector, connecting neighborhood roads with main arterial roads. The Georgia Department of Transportation (GA DOT) uses a portable traffic counter (Short Term Station 1215679) to monitor vehicle miles traveled, AADT volumes, and other data since 1990 (GA Office of Transportation Data 2013, GA-DOT 2013). Traffic volume along Boone Street has been on the decline since the 1990s, when the roadway served an AADT of 10,410 vehicles (GA-DOT 2013). Currently, the road functions well below its designed capacity, which was a contributing factor to the proposal for reducing traffic lanes. In 2013, Boone Street saw an AADT volume of only 5,090 vehicles per day (approximately four cars per minute), which was 7.5% lower than the year before (Figure 38). Traffic volume should be higher on special event days, due to its proximity to major event facilities, but residents at the scoping meetings stated that patrons to these events are not traveling through the community.

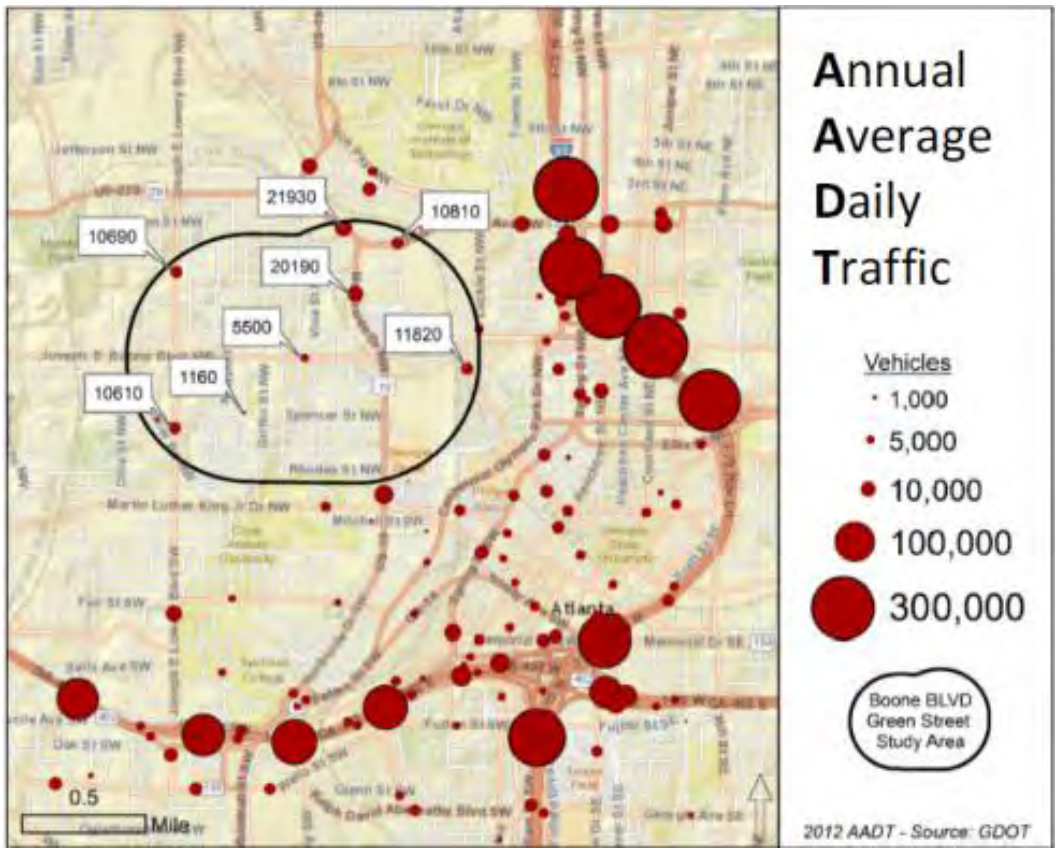



**Figure 38. GIS generated map of traffic data showing AADT in Atlanta. (Source: GA–DOT 2013)**

Several safety measures exist along the proposed project site, including a speed limit of 35 miles per hour (MPH), stoplights and pedestrian crossings at every intersection, and crossing counters at almost all of the intersections. There were no speed humps/bumps present. The outside travel lanes are also shared bicycle lanes. The road surface showed signs of low to moderate pavement wear and areas of degraded pavement and striping. According to the OASIS mapping tool, the Census tracts surrounding Boone Street were among the lowest 20th percentile for emergency room visits related to motor vehicle crashes (MVC). MVC was one of the most common causes of death among children, in Fulton County, GA, as referenced in *4.2.4 Health Status*.

*NOTE: It is important to consider that hospital data is reported by residence, not location of injury.*

### *How the Green Street Project May Impact Traffic Safety*

Is the Green Street Project Designed to Improve Traffic Safety?

The proposed project is very likely to reduce risk of injury from automobiles, because road diets, streetscaping, and adding bicycle infrastructure are effective ways to improve traffic safety; provided that the reduced lanes can handle the traffic volume and not increase congestion. Road diets are one of the most successful strategies used to improve traffic safety. Since the AADT for Boone Street is so low, changes to traffic volume/congestion are not expected. Installing streetscaping can help slow traffic, which helps reduce injury severity from MVCs. Adding bicycling infrastructure and traffic safety measures (i.e., traffic calming landscaping) will improve traffic safety. Improvements in traffic safety

will protect health and support efforts to promote healthy, active living. Boone Street is one of few major roads connecting the community to downtown and destinations in the suburbs west of downtown and serves an average 5,000 automobiles per day. Therefore, the proposed project has the potential to reduce risk of injury for a high number of people. The impacts from the proposed project are expected to last for a long time (many years), since pavement and striping have a long useful life. The improvements to traffic safety will benefit all, but especially vulnerable populations. Populations who are more at risk of injury from a motor vehicle include children (under 18 years old), elderly, and physically disabled. Although there are a few strong studies linking road diets to improve traffic safety, there are only a few studies regarding the outcomes of streetscaping and implementing separated bike lanes. Table 33 summarizes the predicted health impacts of the proposed project related to traffic safety and potential strategies to manage those impacts.

**Table 33. Potential Health Impacts from Changes in Traffic Safety**

| Impact | Scale | Potential Impact Management Strategies |
|---|---|---|
| **Likelihood** | Highly Likely | Add infrastructure that promotes safety for pedestrians and cyclists (e.g., street lighting traffic calming approaches, designated and protected bike lanes, bike traffic signals, cycling greenways, etc.). For more examples, visit the Green Lane Project website at http://www.peopleforbikes.org/green-lane-project). |
| **Direction** | Positive | Ensure that placement or selection of vegetation does not impede or obstruct visibility of pedestrians or other motor vehicles. |
| **Magnitude** | High | None provided. |
| **Permanence** | Long Lasting | None provided. |
| **Distribution** | Vulnerable Populations Benefit | None provided. |
| **Strength of Evidence** | Limited | Continue to monitor traffic volume to ensure the road diet does not lead to more traffic congestion. |

### 4.3.6. Exposure to Greenness

Both the HIA Advisory Group and residents at the first community meeting agreed that the community needed to be more aesthetically pleasing and that streetscaping projects, such as the Boone Boulevard Green Street Project, would help to improve the aesthetic appeal along Boone Street. The HIA Core Project Team took these considerations and looked at how adding natural elements to an urban environment could influence health.

#### *Results of the Literature Review*

How does the amount of greenness in a neighborhood affect residents living in that neighborhood?

The amount of natural environment in a geographic area can be measured by the percentage of vegetation-covered land (greenness). Researchers are finding increasing evidence that the amount of nature or greenness in an area is linked to health status, especially among certain groups.

# Assessment

A study performed in several urban areas of Canada found that individuals who lived in areas that were more green had lower mortality rates over two decades than those living in less green areas (Villevue, et al. 2012). Maas et al. (2009) looked at morbidity data from primary care physicians in the Netherlands for a large population (n= 345,143) and found that those living in an area with a higher percent of greenness had lower prevalence of certain diseases (e.g., coronary heart disease, depression. anxiety disorder, upper respiratory tract infection, asthma, migraine/severe headache, etc.) than those living in less green areas. In their study, they found that increasing greenness by 1 percentage point yielded an effect of 1-year lowered age on physician-assessed morbidity (Maas, van Dillen, et al. 2009). Five year survival for senior citizens (after controlling for age, sex, living arrangement, and living expenses) improved when there was space for taking a stroll near their home and that space had parks and tree lined streets (Takano, Nakamura and Watanabe 2002). Reported populations particularly sensitive to the benefits of the natural environment include those with lower income and lower educational attainment, youth, and the elderly (Lee and Maheswaran 2010).

Views of nature have also been found to affect psychological, emotional, and mental health benefits in college students, hospital patients, inner city girls, public housing residents, and apartment residents (Bedimo-Rung, Mowen and Cohen 2005). A ten year study of patients recovering from surgery showed that patients with a view of trees had statistically significantly shorter hospitalization stays (7.96 days compared to 8.7 days), needed less pain medication, and had fewer negative comments in nurses' notes than did patients with window views of a brick wall (Ulrich 1984). Breast cancer patients studied post-surgery showed an increase in attention capacity when a nature-oriented intervention was used (Cimprich 1991). Another study found that prisoners who had views of rolling farmlands had a 24% lower frequency of sick call visits and a lesser frequency of reported stress symptoms compared to prisoners who had views of the prison courtyard (Moore 1981). Nearby nature has been shown to improve psychological health in children (Taylor, Kuo and Sullivan 2001, Kuo 2001c, 2011). Wells and Evans (2003) suggest that the presence of nearby nature buffers the impact of life stress on children and enhances self-worth. Outdoor activities that involve in a natural environment, such as fishing or soccer, have been shown to reduce symptoms of attention deficit disorder (ADD) and attention deficit hyperactivity disorder (ADHD) in children who had been medically diagnosed (Kuo and Taylor 2004). Greener play areas have also been shown to attenuate ADD symptoms and improve concentration (Taylor, Kuo and Sullivan 2001).

According to Edward O. Wilson's biophilia hypothesis (Wilson 1984), humans' have an innate attraction to nature. Researchers believe that the natural environment provides a form of involuntary attention requiring effortless interest, a sense of escape from one's usual settings, a sense of being part of a greater system, and compatibility with one's individual needs from that environment (Wilson 1984, Frumkin 2001). Aesthetically pleasing urban landscape with trees and greenness encourages social interaction and healthy behaviors and attitudes. The natural environment has been shown to have an independent influence on mental health and health behaviors (Mitchell and Pompham 2008). Natural environments provide a source of "serenity" or peacefulness and provide a space for reprieve from a stressful environment. Mental stress (i.e., psychosocial stress) is a known heath determinant for hypertension and reduced overall mental health and well-being (Pickering 2001). Disparities in mental stress and perceived overall wellness have been reported in numerous studies, especially among African Americans of lower income and lower education (Williams, et al. 1997). A stressful environment at an early stage has been associated with decreased mental and physical health in adulthood (Taylor, et al. 2004).

# Assessment

A higher percent of greenness has been linked to an increased utilization of public space and higher perceived safety and security. In a public housing development in Chicago, where residents were randomly assigned to apartments, researchers found that those living in buildings with more vegetation felt safer and had higher rates of attentional restoration, less overall aggression and psychological aggression, less cases of mild violence and severe violence, and used fewer aggressive actions against their partners and children, than residents living in buildings with less vegetation (Kuo and Sullivan 2001a, 2001b). The use of public space and improved attitudes encourages a social atmosphere of friendliness and being physically active outdoors.

Lachowycz and Jones (2014) wanted to determine if physical activity mediated the relationship between greenness and mortality. They found that the relationship between greenspace and mortality was independent of physical activity levels and hypothesized the relationship was due to psychological factors such as stress reduction and social cohesion (Lachowycz and Jones 2014). Similar results of an independent effect of green space on mortality (i.e., irrespective of physical activity levels) have also been found by other researchers (Groenewegan, et al. 2012, Richardson, et al. 2013). Both running and walking in greener settings has been linked to reduced mental fatigue and increased recovery from mental fatigue (Bodin and Hartig 2003, Hartig, Mang and Evans 1991).

Having natural views in the workplace is related to lower levels of perceived job stress and higher levels of job satisfaction, as well as fewer reported illnesses at work (Kaplan and Kaplan 1989). Intensive care nurses who took breaks in a room with a window and view of trees reported less stress and made 40% fewer errors than did those nurses who took breaks in a room with no windows (Ovitt 1996). University students with nature views scored higher on tests than those with non-natural views (Tennessen and Chimprich 1995).

### *Existing Conditions Related to Greenness*

How green is the community around the proposed Green Street Project?

The HIA Core Project Team used GIS support to investigate the amount of greenness in the community and any extended areas that lacked natural elements. Satellite imagery with light detection and ranging (LiDAR; 2011 NAIP 1-meter) technology was used to identify the vegetated land cover and non-vegetated land-cover and overlaid that data layer with the community boundary area in ArcMap. Figure 39 shows the community with the identified areas of canopy cover, grasses/yards, impervious surfaces (i.e., concrete, pavement, metal, etc.) and bare soil. The impervious surfaces constituted 53.6% of the land, leaving 46.4% as permeable surfaces (e.g., bare soil or vegetated land-cover). The 2006 NLCD was used to calculate the development intensity in the community. Researchers found that the surface area in the community was mostly developed, ranging from medium intensity to high intensity (43.5%, and 33.8%, respectively). Only 4.3% of the land surface was developed open space (2006 NLCD).

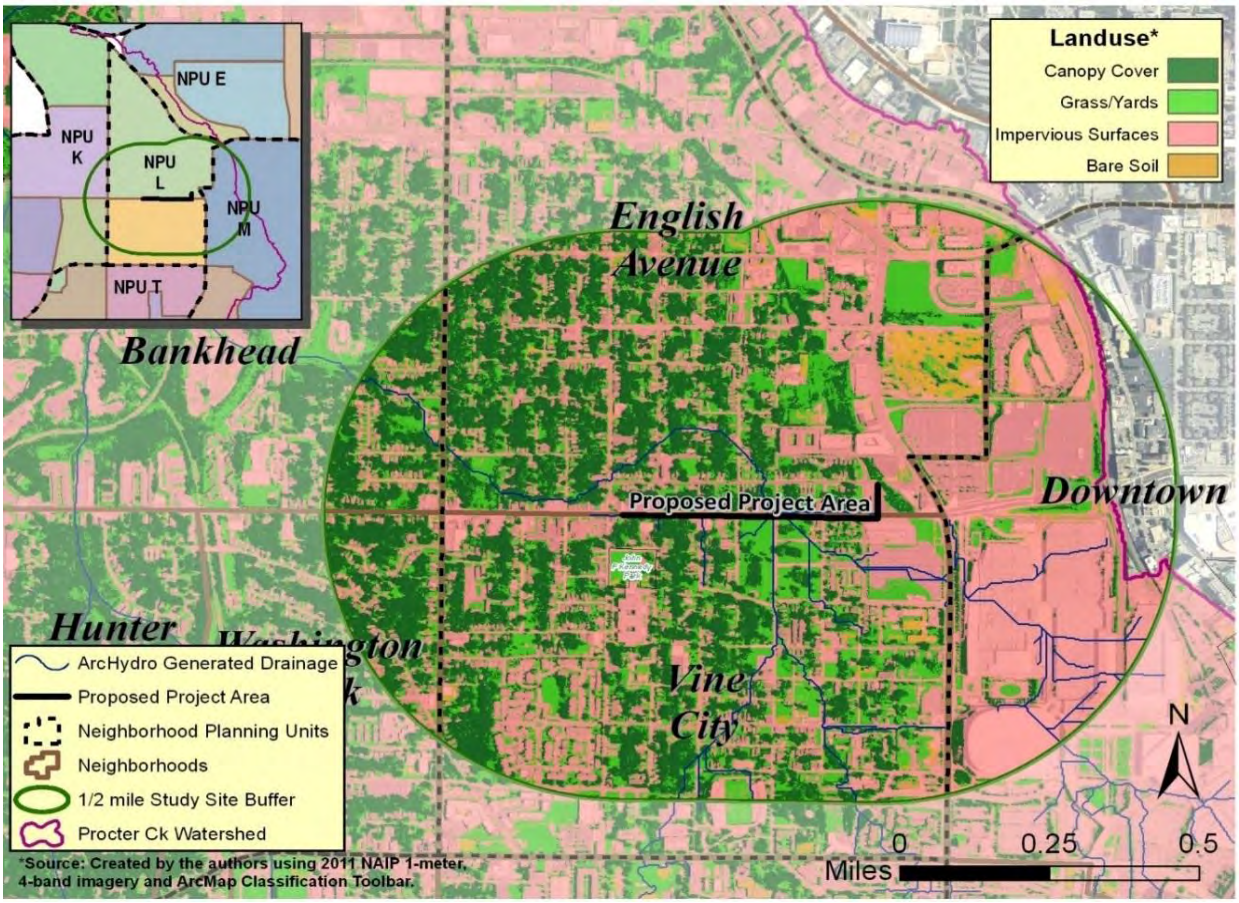



**Figure 39. A map of the vegetation-covered surfaces and impervious surfaces in the HIA study area. (Source: ArcMap, 2011 NAIP 1-meter)**

Are mental and behavioral disorders a concern in the community?

Stress and mental health was the most commonly reported health outcome associated with exposure to greenness and the natural environment. The HIA Core Project Team downloaded and analyzed emergency room visits and hospitalization data for mental and behavioral health disorders at the county and Census tract levels from the OASIS database. Fulton County has a higher rate of hospitalizations for mental and behavioral health disorders than the state average (GA-DPH 2013a). At the county level, mental and behavioral disorders were higher among African Americans, compared to their Caucasian counterparts, and among men compared to women. Interestingly, the age group with the highest rate of hospitalizations related to mental and behavioral health were individuals aged 45–59 years; the age group expected to have higher rates of disease are persons above 60 years. The number of emergency room visits for mental and behavioral disorders for residents living around the proposed Green Street Project were among the lowest to highest in Fulton County (Figure 40). These findings do not suggest the prevalence of mental health, only the number of people who were treated at the emergency room for mental or behavioral disorders.

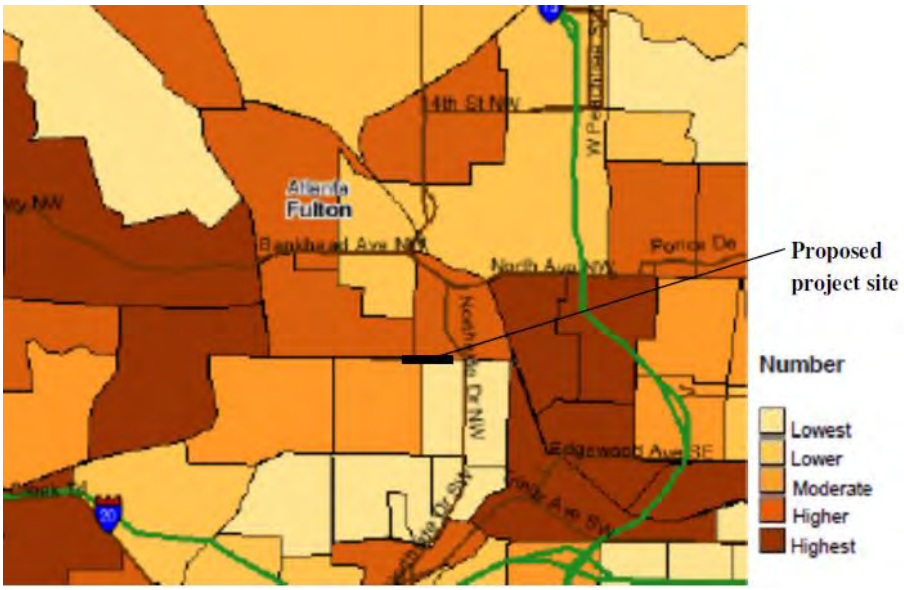



**Figure 40. Choropleth map of the 2006–2010 aggregate number of emergency room visits for all mental and behavioral disorders, by Census tract. (Source: GA—DPH, 2013a; 2000 Census)**

### *How the Green Street Project May Impact Exposure to Greenness*

Will the added greenness of the Green Street Project along Boone Street be enough to impact health outcomes related to mental and behavioral health?

The proposed project will add planter boxes and vegetated strips in areas that are currently pavement. Thus, it is highly likely the proposed project will increase the amount of greenness along the street. Increasing the amount of greenness in a residential area will increase the exposure to the natural environment, which has been associated with reduced prevalence of disease and higher perceived overall health and wellness. Exposure to greenness or a natural environment can enhance recovery from mental fatigue, increase perceived health, and reduce fear, stress, and anxiety. The amount of greenness in an area has been linked to improved cognitive function, increased social cohesion and physical activity, and reduced aggression and violence. Increased greenness in an area has been linked to reduced risk of stroke and other cardiovascular diseases (by reducing stress and increasing outdoor physical activity), reduced deaths (especially among older adults), reduced hospital stays and lower usage of pain medication in patients, increased perceived overall health and well-being from improved neighborhood satisfaction, reduced stress, and increased social interaction. Those who would benefit from the added exposure to greenness would include only those persons who use the street or can view the street from their place of work or residence. The health benefits of the Green Street Project are expected to last the life of the green infrastructure element, which will be more than several years, as long as routine maintenance is performed. Studies have shown that those who may benefit more from increased greenness in their environment include low-income households, persons with low educational attainment, young children, and older adults. Due to the qualitative nature of the non-physical effects, some of the evidence linking exposure to the natural environment and stress is limited. However, many studies support the associations between the amount of greenness (i.e., natural environment) and mental stress, stress-related health outcomes, and adverse social behavior. Table 34 summarizes the predicted health impacts of the proposed project related to exposure to greenness and potential strategies to manage those impacts.

**Table 34. Potential Health Impacts from Changes in Exposure to Greenness and Management Strategies**

| Impact | Scale | Potential Management Strategies |
|---|---|---|
| **Likelihood** | Highly Likely | Ensure a "visible change" takes place that aesthetically improves Boone St. along the proposed project site. |
| **Direction** | Positive | None provided. |
| **Magnitude** | Moderate | Maximize "greenness" for the entire Green Street Project as much as possible. |
| **Permanence** | Long Lasting | None provided. |
| **Distribution** | Vulnerable Populations Benefit | None provided. |
| **Strength of Evidence** | Limited | None provided. |

### 4.3.7. Exposure to Urban Noise

Exposure to urban noise was one of the health determinants identified in the preliminary literature search and impact pathway development processes. Since the proposed project is sited in a residential neighborhood along a major urban street, the HIA Core Project Team wanted to know whether the proposed project could affect the level of noise along the corridor and how public health may be affected. A critical review of the available peer-reviewed literature was performed to answer the question: How does living by a major urban corridor affect resident health and well-being? Next, the HIA Core Project Team reviewed evidence on modeled noise in Fulton County, Georgia and noise-induced health outcomes available at the county level. All of the information gathered is summarized below.

#### *Results of Literature Review*

How does living near a major urban corridor affect resident health and well-being?

The literature suggested that ambient noise in urban residential communities was a growing concern and more public health professionals were including "soundscape" or the acoustic setting in their investigations of environmental factors that influence community health. Most of the current literature on the effects of exposure to traffic-related noise was derived from European countries. According to the Commission of the European Communities (1996), ambient noise levels above 65 decibels dB(A)[13] are considered unacceptable by health experts due to the adverse impacts to behavior and attitudes, sleep disturbance, cardiovascular and psycho-physiological systems (e.g., stress-response pathways) (Commission of the European Communities 1996). Systematic, critical reviews of the available evidence on noise exposure and public health found sufficient evidence that high levels of ambient noise (i.e., above 70 dB(A)) can induce hearing impairment, high blood pressure and changes in the cardiovascular system; interfere with communication and social behavior; increase annoyance and sleep disturbance; and

[13] Decibels are expressed as dB, but measurements of ambient noise levels over a period of time, which take into account variations in sound levels at different points in the day, are expressed as dB(A) or A-weighted decibels.

lower performance and productivity (Passchier-Vermeer and Passchier 2000, Berglund and Lindvall 1995).

Noise exposure throughout the day was found to be higher in urban communities than rural communities. The main contributor to ambient levels of noise in urban communities was road traffic, typically reaching above 55 decibels (Berglund and Lindvall 1995). Traffic noise can also be controlled by permitting the types of vehicles and traffic speeds on the street. Heavier vehicles (i.e., vehicles with more than two axels, such as tractor-trailers), pavement type, traffic speed, and engine types are different factors that can influence traffic source noise. Traffic-related noise has become an increasingly known environmental factor that can affect a person's health and well-being.

Berglund and Lindvall (1995) concluded that "to protect the majority of people from being seriously annoyed," sound pressure from steady, continuous noise in outdoor living areas should not exceed 55 dB(A) during the day and 45 dB(A) at night. Bluhm, Nordling, and Berglind (2004) wanted to estimate the degree of annoyance and sleep disturbance related to traffic noise exposure in an urban, residential community. They issued a questionnaire to 1,000 individuals living in a heavy traffic area of Stockholm, Sweden and estimated individual noise exposure using noise dispersion models and local noise assessments. Their study found that more residents reported frequent annoyance and sometimes/frequent sleep disturbance in areas where traffic noise was greater than 50 dB(A) compared to areas where traffic noise was less than 50 dB(A) (Bluhm, Nordling and Berglind 2004).

In a longitudinal study following the development of hypertension (i.e., high blood pressure) among Swedish men and women exposed to air traffic noise (greater than 50 dB(A)), researchers found a significant increase in risk of developing hypertension among non-tobacco using men who were exposed to air traffic noise compared to those who were not exposed. Differences in noise sensitivity or health related impacts between genders have not been consistently reported; however, impacts on school-aged children have been found.

Lercher, et al. (2002) found a significant association between GIS-modeled noise exposure at home and child reported mental health indicators among those who had pre-existing birth complications (e.g., pre-term and low birth weight). The pre-existing birth complications were provided by parents of the survey respondents (Lercher, et al. 2002). Exposure to constant ambient noise or periodic levels of noise above 55 decibels have been associated with changes in behavioral and mental activities, as well as lowered cognitive performance among school-aged children (Shield and Dockrell 2003, WHO 2009b). Ambient noise has also been linked to the serenity or peacefulness of a community. A lack of that peacefulness or ability to find a quiet place for rest and relaxation has been closely tied to noise-related health problems. Gidlöf-Gunnersson and Öhrström (2007) revealed in their study that residents in urban neighborhoods with higher traffic noise (i.e., above 48 dB(A)) reported that noise frequently disturbed their desire to stay outdoors.

Noise abatement policy has been around in Europe and the United States for decades and can be evidenced by the presence of noise as a public nuisance in municipal ordinances.[14] Sounds from the

[14] To see civil code ordinances related to noise control in the City of Atlanta, refer to the Code of Ordinances 1997-48 Part 1, Chapter 74-Environment, Article 4: Noise Control. Available online at http://www.nonoise.org/lawlib/cities/atlanta.htm.

roadways travel through open space and out into the rest of the community. City and transportation planners are beginning to consider other strategies for controlling the movement of sound in residential communities. Road-side barriers have been used to block traffic noise from intruding into surrounding residential areas. The design and placement of the home has been considered in efforts to reduce the impacts of traffic noise. The prevalence of both annoyance and sleep disturbance was higher in homes with bedroom windows facing the street, whereas residences with a quieter side of the house (i.e., back side with lower sound levels) seemed to be a protective factor against noise related problems (Bluhm, Nordling and Berglind 2004, Gidlöf-Gunnarsson and Öhrström 2007). Simply moving residences back from main roads can reduce the road source sound traveling to the residence. According to Bolund and Hunhammar (1999), doubling the distance can reduce the sound equivalent level by 2 dB(A).

How can the natural environment influence the adverse health impacts of noise generated from an urban street?

Vegetated barriers, such as rows of trees and bushes, offer a unique solution that is aesthetically pleasing and blocks sound waves from moving out through a neighborhood, albeit with varying results (Bolund and Hunhammar 1999). Greening urban areas has been found to influence traffic noise-related health problems among residents. Researchers have found that greener areas had fewer residents who perceived traffic noise as a neighborhood problem (Gidlöf-Gunnarsson and Öhrström 2007). Residents in Sweden who were lived by noisy streets and had no access to a "quieter side" of a residence benefited more from greener areas, reporting less symptoms of being very tired, irritated/angry, and feeling stressed (Gidlöf-Gunnarsson and Öhrström 2007). Designing residences with more grass or lawn between the residence and the street, compared to using pavement or concrete, can reduce the reflection of road sounds towards the residence (SOU 1993).

### *Existing Conditions Related to Exposure to Urban Noise*

What are the current levels of ambient noise generated from Boone Street?

In Europe, planners and public health professionals have used an array of standard methods for measuring sound levels, and GIS-based modeling programs for evaluating individual level exposures. Fortunately, a team of academic researchers, led by Jeong Seong from the University of West Georgia, previously performed noise exposure modeling and analysis of traffic-related data in Fulton County, Georgia that included our designated community. Their study included collecting traffic data, modeling and visualizing noise levels (via Sound Plan Version 7.0), and estimating percent population exposed to noise.

Based on the modeling from Seong, et al. (2011), noise patterns along the proposed project area ranged from 56–67 dB(A) during the day and 51–65 dB(A) at night. The neighborhood area behind Boone Street (i.e., English Avenue and Vine City) shared lower levels of traffic noise (i.e., under 40 dB(A)) (Seong, et al. 2011). Thus, the homes and businesses adjacent to the proposed project site bear the most burden from roadway noise due to their close proximity. There are 29 parcels zoned for residential use and 35 parcels zoned for commercial use along the proposed Green Street Project (City of Atlanta 2013). As a comparison with the other European studies, Seong et al. (2011) found that 40–59% of the population around Boone Street were exposed to sound levels above 55 dB(A).

There are other sources of noise in the community, such as the Georgia Dome and Congress Center, but the amount and reach of the noise coming these sources is unknown. It can be expected that on event days when these buildings are in operation, high levels of noise is generated and may be carried out to the rest of the neighboring communities (i.e., Vine City and English Avenue).

What are the existing conditions of health outcomes that are most related to urban noise exposure?

As identified in the literature review, the prominent health problems associated with noise include hypertension and stress. Unfortunately, hypertension health data were not available lower than county level and only available at the Census tract level in a qualitative form, and stress is not a reported diagnosis in the OASIS. Instead, the HIA Core Project Team examined mortality and morbidity rates of hypertension and hypertension-related cardiovascular disease in Fulton County, Georgia. The HIA Core Project Team looked at a comparison of health outcomes at the county and state levels and found that hypertensive morbidity rates in Fulton County were consistently higher than the state average (GA-DPH 2013a). African Americans had a higher rate of hospitalizations for hypertension and hypertension-related hospital visits than their Caucasian counterparts (GA-DPH 2013a). Hypertensive heart disease was higher over the five year period among women compared to men (GA-DPH 2013a), and as expected, hypertensive hospitalizations were higher among older adults (over 65 years) than younger counterparts (GA-DPH 2013a). It should be noted that hypertension and related chronic diseases have several factors that influence the risk of disease, such as physical activity and nutrition.

### *How the Green Street Project May Impact Exposure to Urban Noise*

Will the Green Street Project, as designed, be enough to influence how noise from the street travels through the surrounding community and related health outcomes?

Traffic or street noise is the most common contributor to urban ambient noise levels. Noise generated at the street can be reflected off buildings and hard surfaces (e.g., pavement and concrete) and projected out into the nearby residential areas. The vegetative plantings and landscaping associated with the proposed Green Street Project can provide a buffering effect against noise traveling from the street out into the community, which may reduce the ambient noise levels around the home. Reducing ambient noise levels in and around the home space may improve public health by increasing serenity or peacefulness in the community, reducing sleep disturbance from noises coming from the street, and reduce long-term changes in physiological functions caused by an increased excited state.

It is plausible that the proposed project will help to reduce ambient noise from the street, considering vegetative barriers buffer sounds from the road and help to prevent noise intrusion into nearby residential areas. However, it is unclear whether noise coming from the street is an issue for residents. It is important to note that noise will be generated from constructing the proposed project. Efforts to reduce traffic noise in urban communities helps to protect against adverse impacts to behaviors and attitudes, sleep disturbances, cognitive function, and long term changes to cardiovascular and psycho-physiological systems. Most of the benefits from the expected noise abatement are anticipated to be felt by those on the street and properties in close proximity to Boone Street. There are 29 residential properties adjacent the proposed project site. The reduction in noise coming from the street is expected to last several years, provided that the planter boxes and planting strips are properly maintained. Persons who are more sensitive to traffic noise, such as young children and those with pre-existing conditions (e.g.,

hypertension), will benefit more from the predicted noise abatement, given that noise is closely linked to stress levels, annoyance, and sleep disturbance. There are many strong epidemiological studies available that show the relationship between chronic exposure to traffic noise and increased risk of health-related issues. Table 35 summarizes the predicted health impacts of the proposed project related to exposure to urban noise and potential strategies to manage those impacts.

**Table 35. Potential Health Impacts from Changes in Exposure to Urban Noise and Management Strategies**

| Criteria | Scale | Potential Impact Management Strategies |
|---|---|---|
| **Likelihood** | Plausible | Place low brush/grasses in planter spaces near residences to block/absorb some of noise from roadway. |
| **Direction** | Positive | Implement best practices during implementation phase to reduce the amount of noise or time of day noise is generated from construction. |
| **Magnitude** | Moderate | None provided. |
| **Permanence** | Long Lasting | None provided. |
| **Distribution** | Vulnerable Populations Benefit | None provided. |
| **Strength of Evidence** | Strong | None provided. |

## 4.4. Existing Conditions and Health Impacts Related to the Social Environment

The HIA Core Project Team reviewed the literature further to better understand how using elements of green infrastructure along a street corridor could influence the social environment and related health determinants in the community around Boone Street. The social environment is independently linked to disparities in overall morbidity and mortality. Social determinants of health included in this assessment were accessibility, crime (actual and perceived), and social capital (cognitive and structural-.

### 4.4.1. Access to Goods, Services, Greenspace, and Healthcare

The HIA Core Project Team strongly felt that the community needed improvement in accessibility for residents and visitors to the area. Thus, accessibility was evaluated with the key destinations of interest being goods, services, greenspace and healthcare.

***Results of the Literature Review***

How can implementing green infrastructure along a street influence accessibility?

Bertolini, le Clercq and Kapoen (2005) defined accessibility as "the amount and the diversity of places of activity that can be reached within a given travel time and/or cost." Barriers to accessibility can be three-fold, including physical barriers that prevent mobility, perceived barriers that reserve a person's utilization of a space, and financial barriers that economically strain or burden a person.

# Assessment

In a systematic review of case studies and other reviews of environment and policy strategies to promote physical activity, researchers found that community-scale and street-scale urban planning and land use policies and practices were the most effective interventions for increasing active transport (i.e., walking and bicycling) (Heath, et al. 2006). Travel burden, both perceived and actual, was found to be a key element in conceptualizing geographic access to goods and services. The time it takes to reach a destination was found to be more influential than the distance between the place of origin and destination.

Those with physical disabilities can be limited in mobility if transport conditions are poor (e.g., broken or uneven sidewalks, obstructions in the sidewalk or bicycle lane, etc.) A study in Europe showed how the majority of urban renewal projects, including improved walk-ability, construction of new public spaces and more community programs, had positive and important effects on the overall well-being of participants (Mehdipanah, et al. 2013). It is assumed that by having a more connected network, improved public transit, and increased safety, access to goods and services (e.g., grocery stores, department stores, schools, workplaces, etc.) will improve.

Active transport is the use of physical activity (e.g., walking and bicycling) to travel from one destination to another. Passive transport, on the other hand, refers to the use of motorized vehicles for travel, which requires little to no physical activity. It is important to note that public transit ridership requires both active and passive modes of transit. Streets designs that are more compact and include infrastructure for pedestrians and cyclists (e.g., wide sidewalks and cycle lanes) encourage walking and bicycling by improving feelings of safety and accessibility, and discourage motorized transport.

How does accessibility affect health?

Greenspace is widely defined as open public space with natural elements that can be used for recreation, relief, or social interaction (Comber, Brunsdon and Green 2008, J. Maas, R. Verheij, et al. 2006, Lee and Maheswaran 2010). Greenspace provides an opportunity to experience nature in a sea of buildings and concrete (Wilson 1984, Frumkin 2001). Access to greenspace has the potential to lead to multiple positive health outcomes, such as increased well-being, fear and anxiety reduction, increased cognitive functioning, increased self-discipline, better impulse control, better mental health, increased stress relief, higher neighborhood satisfaction, increased social cohesion, increased physical activity, lower BMI and violence reduction (Kuo 2001c, Jong, et al. 2012, Ward, et al. 2012, White, et al. 2013, Bell, Wilson and Liu 2008, Sugiyama 2008, van den Berg, et al. 2010, Stigsdotter, et al. 2010, J. Maas, R. Verheij, et al. 2009).

However, equity issues have been found with access to parks and greenspace. The National Housing Federation found that those in less affluent areas only had one-fifth the access to local parks than those in more affluent areas (Wheeler 2011). In addition to access, the quality of greenspace can also influence the utilization of that space (Lee and Maheswaran 2010). This is important since access to green space and health has been found to be stronger in children, the elderly and those with lower incomes, most likely because they spend more time closer to home and in their neighborhoods (Maas, van Dillen, et al. 2009). This is an important issue to address, considering those who would stand to benefit the most from high access to greenspace are typically those who also have the least access (Lachowycz and Jones 2014).

Accessibility, regardless of public versus private transportation, was identified as an influential factor in the behavior to seek and acquire healthcare. After all, patients must have some mode of transit to get

healthcare, unless the patient receives in-home care. Zullig, et al. (2012) sent a questionnaire with validated scales to male cancer patients of the Veterans Affairs hospital. Of the few that reported transportation issues, the two causes were related to experiencing pain and/or not having someone to take them to their doctors' appointments (Zullig, et al. 2012). Another study showed that as travel time increases, health outcomes (e.g., blood pressure, cholesterol levels, etc.) and visits to pharmacies and general practitioners were lower (Hiscock, et al. 2008). Some studies have shown that economically-disadvantaged and ethnic minority populations were disproportionately affected by travel burdens. A national sample from the National Household Travel Survey (NHTS) showed that the average trip for care in the U.S. in 2001 entailed 10.2 road miles and 22.0 minutes of travel, with African Americans spending more time traveling to care than non-African Americans (Probst, et al. 2007). Children have reportedly been impacted by transportation-related access to healthcare in numerous studies (Syed, Gerber and Sharp 2013).

It is assumed that by having a better-connected network, improved public transit, and increased safety; access to healthcare services such as clinics, doctor's offices, and pharmacies will improve. Access to healthcare has been related to all health outcomes, considering it determines the ability for individuals to manage personal health and seek and receive treatment for illness and injury. Accessibility can indicate several different meanings, including financial access (i.e., employment insurance and disposable income), physical access (e.g., proximity to a medical home or health services and ease of transport), and social-related access (e.g., social support for healthy behaviors, policies that support health services for vulnerable groups, Medicaid and/or Medicare). There are very few scientific studies, however, that have found a connection between features of the built environment and access to healthcare and/or a medical home. This is due to the many additional factors that play a role in a person's ability to seek healthcare (e.g., affordability, employment status, network provider, etc.). Studies have been inconsistent as to how much transportation and access play a role in seeking and acquiring healthcare, considering the presence of other equally influential factors (e.g., health insurance, expendable income, etc.) that can modify or negate the effect of having physical access to a healthcare provider.

Poor design and high traffic can make a community seem less accessible for motor vehicles and pedestrians. Norman et al. (2006) found that the amount of intersections in a small space was an indicator of physical activity among girls, aged 6 to 19 years old. Walk-ability is a major predictor for physical activity levels in a community (Saelens, et al. 2003). Walk-ability incorporates the physical design and ease in which residents can walk around their neighborhood (i.e. sidewalks, pedestrian crossings, and traffic safety for pedestrians). Walk-ability is also strongly influenced by social civility and crime.

According to Giles-Corti et al. (2005), "access to attractive, large public open space (POS) is associated with higher levels of walking. To increase walking, thoughtful design and redesign of POS is required that creates large, attractive POS with facilities that encourage active use by multiple users (e.g., walkers, sports participants, picnickers)." Studies that assessed the relationship between the perceived environment and physical activity practices or effectiveness in providing a more inviting and safer outdoor environment for activity found several benefits for health and well-being, including increased sense of community and decreased isolation, reductions in crime and stress, and increased walking and bicycling. Physical activity is helpful in preventing chronic diseases. Even a small increase in daily physical activity may prevent weight gain and could limit health complications associated with obesity, such as high blood pressure, type-2 diabetes, high cholesterol, and asthma (Office of the Surgeon General

2001). Positive health outcomes associated with increased active transport include reduced risk for obesity and cardiovascular disease and improved mental health and perceived overall wellness. Physical activity helps to reduce stress, which is a contributing factor to anxiety and depression.

### *Existing Conditions Related to Accessibility to Goods and Services, Greenspace and Healthcare*

How walkable and bikeable is the area along Boone Street?

Investigators looked at the existing walkability and bike-ability of Boone Street. Joseph E Boone Street NW was ranked by Walkscore® (www.walkscore.com) as being somewhat walkable, meaning that some errands could be accomplished on foot, due to its nearby amenities, pedestrian friendliness, population density, and road metrics. Boone Street was ranked as having good transit for its many nearby public transportation options. Figure 41 shows the close proximity to downtown Atlanta, GA and some of the metrics used to calculate walkability along Joseph E. Boone Street (i.e., sidewalk width, public transit, etc.).

**Figure 41. Joseph E. Boone Street, facing east towards downtown Atlanta. (Source: David Egetter 2014)**

There was a local study that was performed in Atlanta, GA that looked at transportation-related barriers, socio-economic barriers, and other factors among a nonrandom group of people in an emergency room. Rask et al. (1994) performed a cross-sectional survey of disadvantaged and predominantly minority patients presented for emergency care at an urban public hospital in Atlanta, GA. They found that 61.6% of those who participated had no medical home and 48.4% had waited at least two days before coming to the ER for care. Investigators checked the responses against statistical analysis and found that no health insurance, exposure to violence, and living in a supervised home, independently predicted whether a respondent said if they had a medical home (Rask, et al. 1994). Of those who waited to seek care, researchers found that having no insurance, no access to a vehicle, and less than a high school degree were linked to respondents who had waited more than two days to seek care (Rask, et al. 1994). These findings provide some insight on potential barriers to access among a population similar to that in the community.

# Assessment

***How the Green Street Project May Impact Access to Goods, Services, Greenspace, and Healthcare (Active Transport)***

Is the Green Street Project capable of influencing accessibility for residents and visitors along Boone Street?

It is very likely that the design elements in the Green Street Project will address previous perceived and actual barriers to accessibility along the proposed project site and thereby support increased mobility and access to destinations. Based on the literature findings, one could infer that lacking access to a private vehicle, living in a deprived area, and lower educational attainment could be influential factors as to perceived or actual barriers in access to goods and services. One can assume that improved infrastructure and incorporating land use in transportation planning and policies will improve access to all goods and services, including healthcare. Efforts to improve transportation infrastructure, such as improved walk-ability and bike-ability, will help to address the physical barriers to accessibility, especially among persons who are dependent on active transport (i.e., those who do not have access to a vehicle) and increase the opportunity for choosing active transport methods to reach destinations. Those persons who frequently use the current transport features along Boone Street will have greater exposure to the changes and therefore be more likely to be affected by the changes. Persons who are more dependent on public and self-transport mechanisms (i.e., physically disabled and children) are more likely to feel the benefits of improvements to accessibility. The natural elements of the Green Street Project and the infrastructure changes are expected to last for many years, given that adequate maintenance is continued. There are many studies that show the relationships between access/mobility and health. There is some (limited) evidence that supports the benefits to public health by incorporating natural elements and land use policies and practices in transport infrastructure planning. Table 36 summarizes the predicted health impacts of the proposed project related to access to goods, services, greenspace, and healthcare and potential strategies to manage those impacts.

**Table 36. Potential Health Impacts from Changes in Access to Goods, Services, Greenspace, and Healthcare and Management Strategies**

| Criteria | Scale | Potential Impact Management Strategies |
|---|---|---|
| **Likelihood** | Highly Likely | None provided. |
| **Direction** | Positive | None provided. |
| **Magnitude** | Moderate | Work with the Atlanta Department of Planning and Community Development to consider local zoning ordinances and regulations regarding land use (i.e., residential vs. commercial, mixed-use, or private vs. public). Incorporate EPA's Smart Growth Principles in the Green Street Project design. Consider the Smart Growth America – Complete Streets in the Southeast Case Studies. Encourage coordination with Fulton County Department of Health and Wellness (FC-DHW). Provide clear signage and way-finding designs for pedestrians and cyclists (e.g. directions to the Beltline, bike zone, share-the-road, etc.). Consider (in the project design) connecting/expanding the walking and cycling paths to reach broader bike/pedestrian routes (e.g., PATH foundation routes, Atlanta Beltline, etc.). Converse with local active transport groups (e.g., Atlanta Bicycle |

| Criteria | Scale | Potential Impact Management Strategies |
|---|---|---|
| | | Coalition) to ensure that implementing the project does not impede or discourage active transportation (i.e., cycling or walking). |
| **Permanence** | Long Lasting | None provided. |
| **Distribution** | Vulnerable Populations Benefit | None provided. |
| **Strength of Evidence** | Strong | None provided. |

### 4.4.2. Crime, Perceived and Actual

One of the topics discussed as a concern among community residents and other stakeholders is the amount of crime committed in the neighborhood and the perceived safety and/or security that contributes to the community's identity. Apart from gaining awareness of the current crime statistics in the community, the HIA Core Project Team wanted to also gain an understanding of how crime rate translates to the community's perceived identity and health outcomes. Investigators performed a literature review to identify the mechanisms in which crime affects a person's perceived safety and security and how that reflects on the community as a whole. Online search engines and key search terms were used to locate peer-reviewed journal articles and agency reports related to crime.

#### *Results of the Literature Review*

How does crime influence health?

The literature available is abundant on the relationship between crime and perceived security. The primary pathway of impact to health, however, appears to be a more indirect route through human behaviors and attitudes, with inconsistent conclusions. The HIA Core Project Team found that not including considerations for the potential impact to crime and fear of crime in a neighborhood can undermine efforts to increase active living and occupancy in that area (Roman and Chalfin 2008).

Safety refers to the risk of injury or loss by circumstance, accident, or negligence, whereas security refers to the risk of injury or loss by the motives of another individual. Crime levels and insecurity are social factors that can influence mental stress (i.e., psychosocial stress), which affects many physical and mental health outcomes. Higher levels of crime were significantly linked to more people with negative perceptions of neighborhood disorder (Latkin, German, et al. 2009, Kruger, Reischl and Gee 2007). Observations of antisocial behaviors and crime (e.g., public drunkenness, burglary, drug dealing, etc.) and previous victimization were associated with feelings of lower safety/security of the area (Sampson and Raudenbush 1999, Yen, Michael and Perdue 2009, Latkin, German, et al. 2009, Bazargan 1994). Increased social disorder has been linked to increased fear of crime, risk of mental health disorders (e.g. anxiety and depression), and the severity of depression among adults (Ross 2000, Kim 2008). Over time, the stress from crime or fear of crime in a community can cause poor physical health (e.g., hypertension, cardiovascular disease, immune dysfunction) (Latkin and Curry 2003, McEwen 2008, Glaser and Kiecolt-Glaser 2005).

# Assessment

Some researchers suggest that a perceived unsafe living area, either due to perceived or actual high occurrences of crime, impedes physical activity outdoors (Yang, et al. 2012). Physical activity is an important protective factor for good health (Fox 1999). Even when there was a lack of association (i.e., no connection) found between perceived neighborhood problems and physical activity, researchers found strong ties between perceived social disorder in the neighborhood and self-rated health and distress among residents (Steptoe and Feldman 2001). Neighborhood management, which reduces problems of social disorder, was found to be important to people walking in the neighborhood.

It is important to note that neighborhoods with high crime rates do not impact everyone equally. If a resident does not consider high crime rates as a threat, then the crime rate may have no bearing on that person's physical activity levels or perceived safety/security in that neighborhood. Individual-level factors, such as age, gender, and differences in socioeconomic status, were found to influence the levels of perceived fear and/or perceived safety/security (Bracy, et al. 2014, Latkin, German, et al. 2009). For example, Patnode, et al. (2010) found that girls reporting being impacted more by perceived safety than boys. Youth and young children, who are often the recipients of violent crimes, are highly susceptible to the influences of the social environment and stress (Administration on Children, Youth and Families 2012). Many adolescent mental health disorders (e.g., anxiety and depression) that developed from the perceived environment often carry into adulthood (Aneshensel and Sucoff 1996). Persons who have been victims of a crime in the past are more likely to be affected by perceived safety/security and actual crime rates than non-victims.

How can implementing green infrastructure influence crime?

The amount of greenness in an urban community has also been linked to the amount of crime that is committed in that area (Snelgrove, et al. 2004). Research has indicated that the presence of natural elements bring a sense of serenity to a space and aesthetic appeal. Greenness of common spaces has been linked to decreased aggression and violence, lower mental fatigue, higher resiliency to stressful life events and the ability to adjust. Mental fatigue and aggression are precursors to conflict behavior. Preventing or reducing these behaviors may improve perceived safety/security and reduce the amount of crime.

Interestingly, a recent study found that daily mean ambient temperatures were related to the daily rates of crime in a way that during periods of temperature between 80 °F and 90 °F, there was a significant increase in violent crime (Gamble and Hess 2012). However, as soon as the temperature reached above 90°F, the crime rates went back down (Gamble and Hess 2012). This reflects the inter-relationship between hot temperature and increased aggravation and unfriendly behaviors among humans. Implementing green infrastructure and reducing impervious surfaces has been found to reduce the urban heat island effect and low surface temperatures, and thus may prevent aggressive or unfriendly behaviors among people.

The management of natural elements can be an important aspect to crime prevention. One approach is to follow safety measures in the Crime Prevention Through Environmental Design (CPTED), such as designing landscape along the street with a thirty-inch "window" between vegetation at the car-widow level to allow visibility from the road and shops along the street (Carter, Carter and Dannenberg 2003). CPTED is thought to help differentiate between public and private property and enhance the pedestrian environment (Carter, Carter and Dannenberg 2003). Not maintaining natural elements in an urban

community, however, can provide opportunities for crime. Tall, overgrown bushes provide cover for assailants. Low visibility from the road greatly reduces the number of people who can observe pedestrians and businesses on the sidewalk. Routine landscaping can ensure the green infrastructure elements and prevent opportunities for crime.

### *Existing Conditions Related to Crime*

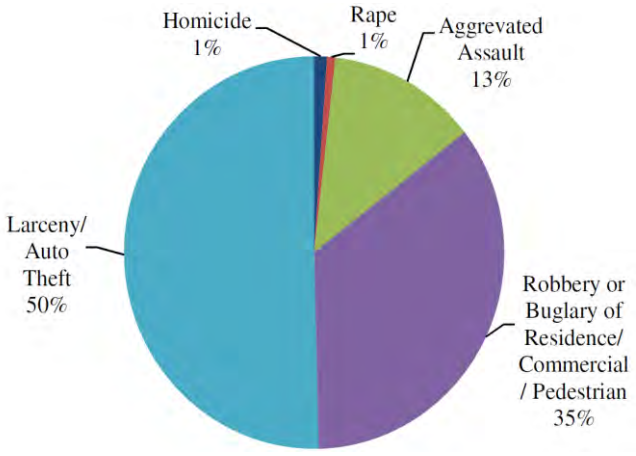
Does the area experience a high crime rate?

In order to assess the actual crime levels in the community, the HIA Core Project Team used a few different venues to obtain information. Raw crime data was downloaded from the Atlanta Police Department website (http://www.atlantapd.org/crimedatadownloads.aspx) and annual reports. Crime data was also requested and obtained from the Atlanta Police Department, Tactical Crime Analysis Unit for the 12 months of August 2012 to August 2013. The Atlanta Police Department organizes neighborhoods by zone and constituent beats. Both English Avenue (beat 103) and Vine City (beat 102) neighborhoods are included in zone 1, which also encompasses all of Proctor Creek Watershed. The data was refined to the half-mile buffer area and quantified into crime rate and type. Crime rate is used to describe the prevalence of crime in a community and can be compared to other communities and benchmarks. Crime rates typically are expressed as observations per 1,000 people per year. The Atlanta Police Department provided crime statistics on felonies (i.e., aggravated assault, auto theft, burglary of a residence and non-residence, homicide, rape, vehicle and non-vehicle related larceny, and robbery of pedestrian and residence). From August 2012 to August 2013, there were 557 reported crimes in the community (Atlanta Police Department 2013). The crime rate was calculated as 40.0 crimes for every 1,000 people per year.

Equation for calculating the crime rate in the community:

$$\frac{Crimes\ Reported\ (n=557)}{Total\ Population\ (n=13{,}914)} \times 1{,}000\ people\ per\ year = 40.0 \text{ crimes (felonies) per 1,000 people per year}$$

The breakdown of the different types of crimes committed in the study area is illustrated in Figure 42. There was no crime-related injury data available below the county level and only homicides were reported. The homicide death rate for Fulton County Health District was 9.3 deaths per 100,000 people in 2011 (GA-DPH 2013a).




The HIA Core Project Team coded the reported crimes into four distinct categories (i.e., homicide, rape, aggravated assault, robbery or burglary of residence/commercial/pedestrian, larceny/auto theft) and mapped out the locations within the community (Figure 43). There seemed to be no distinct spatial pattern observed in the community where crimes were committed.

**Figure 42. (Left) Crimes committed in the study area from August 2012 to August 2013. (Source: Atlanta Police Department 2013)**

Although, there were more crimes reported in the surrounding neighborhoods, such as Washington Park, Hunter Hills, and West Lake, which showed distinct clustering around local businesses and apartment complexes (Atlanta Police Department 2013).

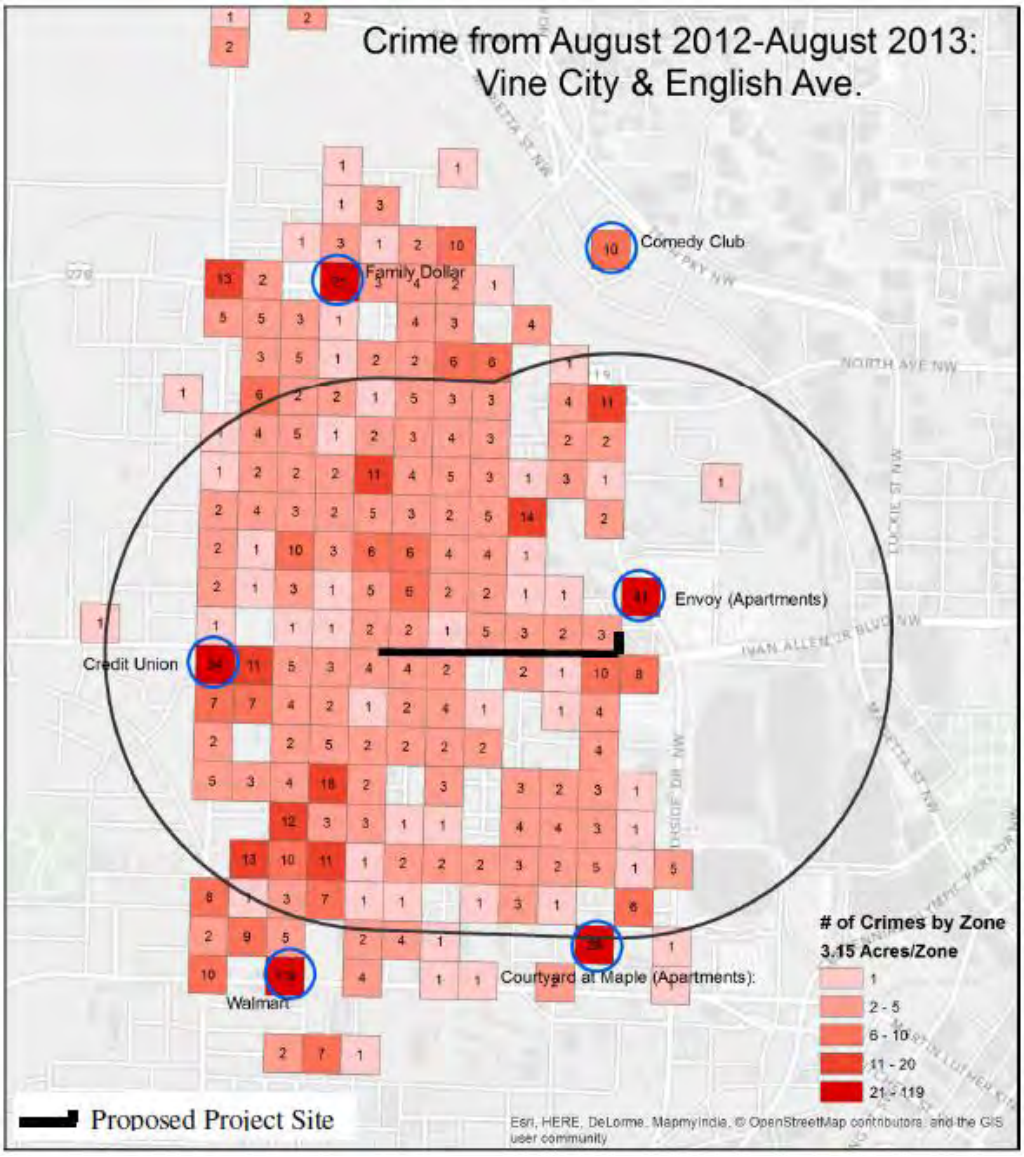



**Figure 43. A map of the Uniform Crime Reporting numbers for felonies committed near the project site from August 2012 to August 2013. The locations of significantly higher crimes reported are circled in blue. (Source: Atlanta Police Department 2013)**

The crimes committed in the community account for only 1.6% of the total felonies committed in the City of Atlanta during the same time period and represents 11.2% of the total crimes in zone 1 during 2013 (n = 4,988) (Atlanta Police Department 2013, Atlanta Police Department 2014a). There were 4,988 felonies committed in zone 1 in the year 2013, which was a 16% decrease from the year before (5,909 felonies) (Atlanta Police Department 2014b). It is important to note that although these counts seem high, zone 1 had the lowest overall crimes than any of the other six zones. Crime throughout the entire city has been declining since 2011. In fact, total felonies in 2013 were 4.4% lower than in 2012 and 8.8% lower than in

2011 (Atlanta Police Department 2014a). The crime rate in neighborhoods of English Avenue and Vine City were reduced between 2007 and 2011, by 45% and 44%, respectively (WSBTV-2 2013).

### *How the Green Street Project May Impact Crime*

Does the Green Street Project have the potential to influence crime in the community?

It is plausible that the proposed project will reduce the risk of crime by improving behaviors and attitudes through improved aesthetics, reducing surface temperatures, and providing an appealing and natural landscape. Implementing measures to prevent crime and improve perceived security will promote health by reducing the risk of injury from crime, reduce stress and stress-related illness from a lack of security, and improve perceived overall wellness. Improvements in actual and perceived crime (security) will affect a moderate number of people, specifically those who pass along Boone Street and can visibly see the changes made to the area. If the plants are allowed to overgrow (not properly maintained) or CPTED measures are not adopted, the benefits of reducing crime can be quickly and easily reversed. Persons who are more vulnerable to crime (e.g., young women, children, and physically disabled) are more likely to benefit from a reduction in crime due to lowered vulnerability and increased "eyes on the street." There is some evidence that supports the benefits to public health by incorporating natural elements and land use policies and practices to prevent crime. Table 37 summarizes the predicted health impacts of the proposed project related to crime and potential strategies to manage those impacts.

**Table 37. Potential Health Impacts from Changes in Crime (Perceived and Actual) and Management Strategies**

| Criteria | Scale | Potential Impact Management Strategies |
|---|---|---|
| **Likelihood** | Plausible | Increase street lighting along the proposed project site. Utilize the CPTED (Crime Prevention through Environmental Design) elements in the Green Street Project design. (e.g., the lowest branches on trees should be taller than 5 feet from the ground and the tallest bushes/grasses should be no taller than 3 feet from the ground to allow for a "window" for onlookers at eye-level. |
| **Direction** | Positive | None provided. |
| **Magnitude** | Moderate | None provided. |
| **Permanence** | Quickly and Easily Reversed | None provided. |
| **Distribution** | Vulnerable Populations Benefit | None provided. |
| **Strength of Evidence** | Limited | None provided. |

### 4.4.3. Social Capital (Cognitive and Structural)

The HIA Core Project Team identified aspects of the social environment (identified later as social capital through the preliminary literature search) that needed improvement in the community, such as improved social cohesion and relationships among residents and more opportunities for developing social/emotional

support. Therefore, the HIA Core Project Team assess the potential impact the proposed project's may have on social capital.

### *Results of the Literature Review*

Social capital refers to "the benefit that individuals and communities derive from having social contacts and networks throughout their communities and is based on the notion that individuals who interact with each other will support each other to the benefit of the entire community" (ENTRIX, Inc. 2010). Social capital has been defined by two categories – structural and cognitive social capital. Structural social capital, also known as bridging capital, is the existence of community linkages. Cognitive social capital, also known as bonding capital, concerns the appreciation of trust, mutual help, and reciprocity in the community (Wind, Fordham and Komproe 2011). There are some contradictions in the literature regarding the effect of social capital on health outcomes. While the literature expresses the need for further research in aspects of social capital, the existing contradictions point to the complexity of social capital and how health outcomes may be dependent upon other variables.

How does streetscaping and revitalization efforts relate to social capital at the neighborhood level?

There is an increase in research that ties economic development, economic inequality, and geopolitics as having direct effects on social capital as it relates to large-scale cooperation (Robbins 2013). It is likely beneficial to weigh impact of economic development decisions on a community so as to increase social capital, which would be important in disenfranchised communities. An increase in social capital can also be attributed to an increase in vegetation and green spaces through the 'high road' approach, which is a scalable economic development strategy to build a society characterized by environmental sustainability, shared prosperity, and democratic governance(ENTRIX, Inc. 2010). High road standards result in substantial, measurable, and long-term economic, environmental, and social benefits (Gordon, et al. 2011). The potential for improved social capital is not likely evident in smaller scaled projects, but there may be a greater magnitude of impact on larger scaled projects. Space can be designated for transport, such as street right-of-ways, sidewalks, and bicycle lanes, as well as private versus public and residential versus commercial. Each designation further defines the territory that can be occupied and by whom.

What assets are available in the community that provide space to build social capital?

The HIA Core Project Team used GoogleMaps® and ArcGIS to identify and map the locations of assets in the community that could provide space to build social capital. The HIA Core Project Team identified a few spaces along Boone Street (mostly churches) and a variety of spaces to build social capital within the half-mile radius around the proposed Green Street Project site (Figure 44). The community is abundant in churches and religion-based organizations where people can congregate and develop social ties and bonds. There are two community centers located along the proposed project site where people can meet and be physically active. Schools, which provide common space for students and their families to interact with other families, be physically active, and engage in social activities and learning, are located both in and immediately outside the half-mile radius. The future site of Mim's Park, which will be a large open green space for recreation and social activities, is sited immediately adjacent to the proposed Green Street Project site. In addition, there are places to seek care for elders and child care within the community.

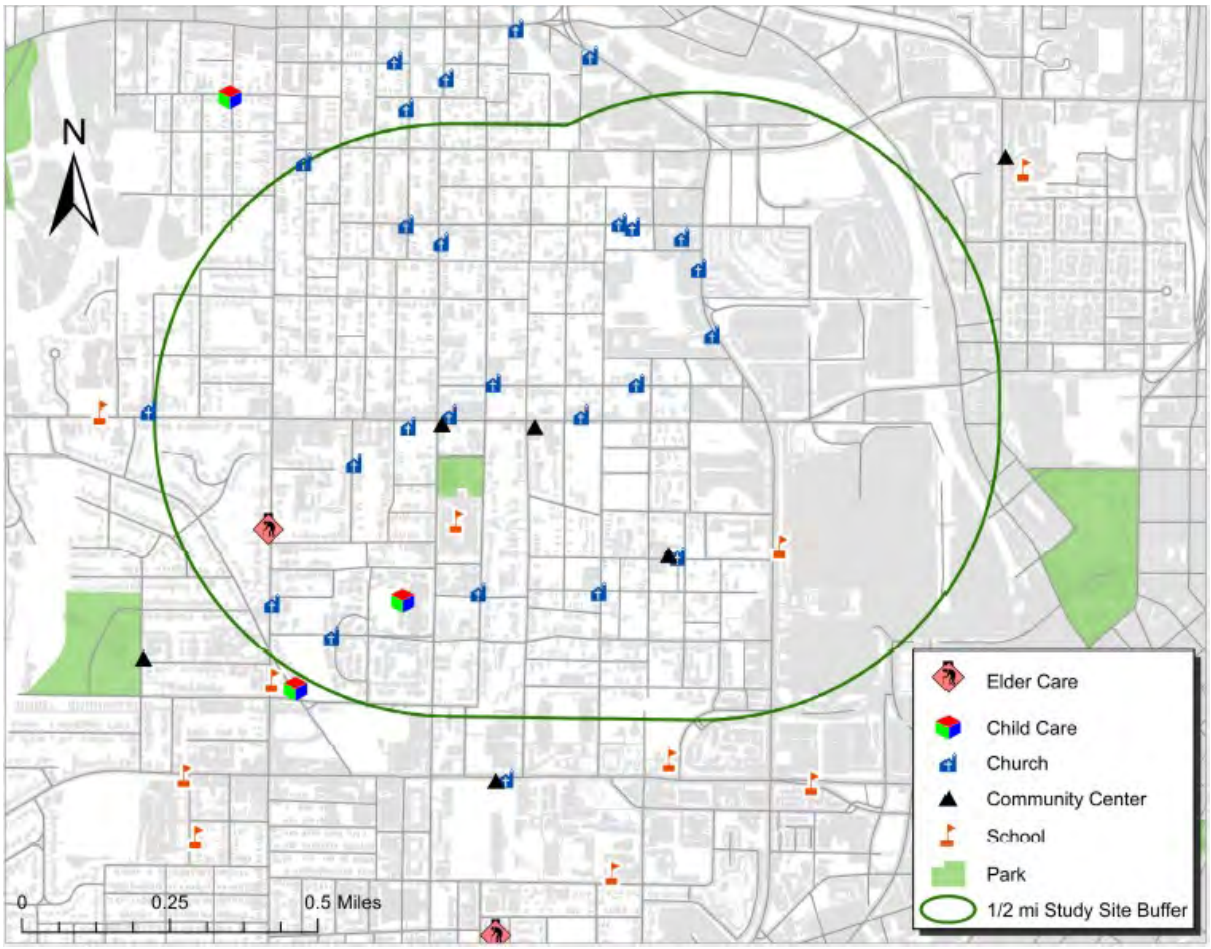



**Figure 44. Map of community assets where social capital can be influenced. (Source: Google Maps 2014)**

How does social capital influence health?

Although there is research that directly links social capital to health outcomes, some research has found that social capital has less direct contribution on health than other variables. For example, when social capital is considered with greening the environment, the changes in health outcomes are more a result of the change in environment (Modie-Moroka 2009). Vegetation is also associated with reduced crime rates, potentially due to increased social capital or potentially due to a direct effect on behavior (ENTRIX, Inc. 2010). Furthermore, physical activity causes a significant reduction to the direct effects of neighborhood social capital on health (Mohnen, et al. 2012). Some research shows that social capital acts as a buffer during economically difficult times regardless of social status of the public, but there is not enough evidence upon which to make predictions. The effect of social capital on health has been repeatedly proposed to be mediated through health behaviors, specifically physical activity (Nieminen, et al. 2013). Nieminen et al. (2013) found "that the direct effect of social capital on health becomes weaker if physical activity is included in the model."

# Assessment

### *How the Green Street Project May Impact Social Capital*

Is the Green Street Project expected to influence social capital in the community

Efforts that supports more sustainable transport modes, including walking and bicycling, increase the opportunity for residents and visitors in the community to interact and develop social ties and bonds and be more physically active outside. Due to the relatively small size of project site, it is plausible, but not likely that the proposed project may improve social capital, by removing barriers to occupy the space along the street. The proposed project is a demonstration project for revitalization, which encourages further investment into the community. Strengthening social capital is a positive health impact because a strong presence of social capital can protect individuals and a collective community against hardships and build capacity to address issues (in some cases). Increasing the opportunity to develop social capital will affect a moderate number of people, specifically those who frequently pass through the proposed project site. The social benefits of the proposed project are expected to last a few years (moderate length of time), but expanded improvements are needed for an impact to be lasting. Vulnerable populations benefit from improved social capital. Persons who are more sensitive to social conditions and connectivity to other people and services, such as children and the elderly. There is some evidence that supports the benefits to public health from incorporating green infrastructure and providing more opportunities for developing social capital. However, case studies of communities whose culture or social norms do not support healthy attitudes and behaviors did not see benefits from such changes. Table 38 summarizes the predicted health impacts of the proposed project related to social capital and potential strategies to manage those impacts.

**Table 38. Potential Health Impacts from Changes in Social Capital (Cognitive and Structural) and Management Strategies**

| Criteria | Scale | Potential Impact Management Strategies |
|---|---|---|
| **Likelihood** | Plausible | Provide meeting space (i.e., open public space) for local community meetings in close proximity of the green street. Install public benches at local hangouts or highly populated areas to increase social interaction. |
| **Direction** | Positive | None provided. |
| **Magnitude** | Moderate | Coordinate with "Atlanta Streets Alive" to host a community festival after completion of the project. Provide other catalyst to increase/enhance outreach to the community. |
| **Permanence** | Moderate | Cultivate and maintain mechanisms in City policy, development, and economic decisions and activities for building trust with the community. |
| **Distribution** | Vulnerable Populations Benefit | None provided. |
| **Strength of Evidence** | Limited | None provided. |

# Assessment

## 4.5. Existing Conditions and Health Impacts Related to the Economic Environment

Economic conditions in a community are closely tied together with the physical conditions of the built and natural environment. For example, constant flooding ages the conveyance system infrastructure causing damage that is expensive to repair and/or replace. Flooding damage to homes can affect insurance premiums, reimbursement (or lack of reimbursement), household repairs and/or maintenance, and property values. The contamination or degradation of water quality from CSOs and SSOs can affect recreation and tourism dependent on the rivers and their tributaries. These impacts to household and community level economic conditions can also have health consequences.

### 4.5.1. Household Economics – Cost of Living and Employment

At the first HIA community meeting, residents stated that there was an overwhelming need for jobs and economic activity in the area. However, community residents wanted job creation to be focused on more "green" jobs or job training that supported sustainability projects. In addition to jobs, stakeholders in the HIA Advisory Group were concerned about the potential impact the proposed project would have on the affordability or financial ability to stay in the area. Thus, the HIA Core Project Team used empirical literature to examine the potential economic impacts of the proposed project on household economies in relation to current cost of living and employment in the community.

***Results of the Literature Review***

How does streetscaping affect living expenses among nearby properties?

The economic impact of some green infrastructure benefits (e.g., exposure to greenness, shade, noise abatement, flood management, social capital, etc.) can be seen in changes to property values in proximity to green infrastructure implementation.

Restoring the natural environment in urban areas has been shown to enhance health and economics. Clemants and colleagues (2006) showed that green redevelopment has been linked with reduced costs related to urban sprawl and infrastructure, increased investment and tourism, higher property values, avoided flood damage, and protected environmental quality.

The implementation of green infrastructure has repeatedly been shown to increase property values in surrounding areas. Many aspects of green infrastructure can impact property value, including aesthetics, home cooling costs, and stormwater control and drainage. Ward et al. (2008) found that the introduction of green infrastructure and low-impact development in Seattle via natural drainage systems (i.e., bioswales, reduced pavement, increased vegetation, and replacement of traditional curbs with sloping edges to encourage water drainage) increased the property values of adjacent property 3.5–5%. Similarly, a survey of single family residential property sales in Atlanta, Georgia showed a 3.5–4.5% increase in sale prices for houses with landscaping that included trees (Anderson, L., and H. Cordell 1988)

A study by Dill et al. (2010) evaluated the economic benefits of green street projects in particular. Controlling for other attributes, the study found that each additional green street treatment within 500 feet of a single family home was associated with a $968 increase in sales price. The green streets were also associated with some higher levels of social interaction and residents living near a green street thought it

was a better place to live than before the green infrastructure installation. In Philadelphia, residents expressed concerns about vacant land, trash, and the condition of their neighborhood. Through the creation of an open space management plan, vacant lots were able to be cleaned up and transformed into community gardens. As a result of the green revitalization plan, the housing market was improved and green collar jobs were created (Karlinsky 2000). Another study in Philadelphia found curbside tree planting attributed 2% of the observed price increase in the intrinsic value of the homes in neighborhoods (Wachter 2008). What is of even greater interest, however, is the price differential observed for the two tree planting programs examined in the study – one focused in low income neighborhoods that involved tree plantings along an entire block and the other that responded to individual requests for tree plantings and had no specific target areas. The former program did not observe any benefit beyond the 2% increase attributed to the intrinsic value; however, the latter program observed an additional 5–9% increase in housing prices (7–11% total price differential) for properties within 4,000 feet of tree plantings. This additional increase was attributed to social capital creation and/or the signaling of positive physical capital changes, suggesting that the economic impacts of tree plantings (and green infrastructure in general) may extend beyond the benefits of the aesthetics.

### How does green infrastructure impact employment or the opportunity for employment in disadvantaged communities?

Green streets and green infrastructure can also stimulate job creation and in particular "green collar jobs." These green collar jobs are defined as well-paid jobs that contribute directly to preserving or enhancing environmental quality. They range from low-skill, entry-level positions to high-skilled positions, and tend to be local and promote sustainable economies (Apollo Alliance and Green for All 2008). Green infrastructure, green policies, smart growth, and sustainability programs are positive drivers for green collar jobs and will result in the potential growth of jobs in this sector during the next decades (Pinderhughes 2006). Smart growth elements such as mixed income developments, provision of affordable housing, and housing development, in combination to access to goods and services, can create jobs by concentrating development. Landscaping improvements can also increase local employment opportunities (Forest Research 2010). According to the advocacy group, Alliance for Community Trees (2014), in some sectors of the economy, such as tree care, there is a job for every trained worker, because companies struggle to find qualified employees.

Increased property value and housing market revitalization is a positive benefit of implementing green infrastructure in the community, but can have adverse impacts on individual household economics and has the potential to lead to gentrification – a pattern of neighborhood change in low-income areas that have experienced revitalization and reinvestment, in which low-income households are displaced by an influx of higher income households (Kennedy and Leonard 2001). With increased property values comes higher property taxes and increased rent, both of which raise the cost of living. While there are some benefits of green infrastructure that could potentially reduce household costs, such as reductions in summer cooling costs with the addition of plantings (Alliance for Community Trees 2014) and cost savings related to effective stormwater management, increased cost of living has the potential to influence the ability of a household to meet basic needs, such as healthy food, clothing, and healthcare; threaten financial security; and lead to the acceptance of overcrowded and substandard living conditions and even displacement (Pollack C, Egerter S, Sadegh-Nobari T, Dekker M, Braveman P 2008). The inability of a household to meet basic needs and overcrowded/substandard living conditions (i.e., poor housing quality)

can increase the risk for chronic disease, such as heart disease, hypertension, and diabetes; infectious disease; poor mental health, and even mortality (Human Impact Partners 2010) (Krieger J, Higgins DL. 2002) (Krieger, Takaro and Rabkin 2011) (Jacobs, D.E.; Wilson, J.; Dixon, S.L.; Smith, J.; Evens, E. 2009). Increased financial instability can lead to displacement, which occurs when residents are forced to move out of an area because the cost of living becomes higher than what they can afford. This movement can result in the loss of jobs, social support and cohesion, and feelings of belonging; childhood development issues; and stress and its associated impacts, such as poor mental health and suppressed immune function (Human Impact Partners 2010) (Keene and Geronimus 2011) (Bhatia and Guzman 2004) (Gilman SE, Kawachi I, Fitzmaurice GM, & Bika SL 2003). Displacement also leads to a shift in the population that inhabits the community.

How does employment and income impact health?

Employment and health have a bidirectional relationship (Hartman n.d.). Employment status may have implications for an individual's health status and vice-versa. Employment status is directly connected to health via income and benefits, such as health insurance. Income and health insurance can increase access to nutritious foods, adequate housing, and healthcare, reducing the risk for chronic disease, communicable disease, and poor mental health (Human Impact Partners 2010).

### *Existing Conditions Related to Cost of Living and Employment*

What is the existing employment level and cost of living in the community and how much if a person's income is going to housing costs?

Economy/Jobs/Poverty was one of the highest priority categories of concern/need identified by stakeholders. The HIA Core Project Team extracted data by Census tract from the 2006-2010 ACS 5-Year Estimates Employment Status (S2301), Financial Characteristics (S2503) and Poverty Status in Past 12 Months (S1701) datasets for indicators related to employment, income, and poverty. The data was compiled in Excel and aggregate estimates were calculated with their associated margin of errors.

As shown in the population profile, approximately 39.1% of the community potentially affected by the Green Street Project is living in poverty, including over half of the individuals under 18 years of age and approximately one-third of individuals over 65 years of age (U.S. Census Bureau 2010). Of the occupied housing units, 46% have an annual household income of less than $25,000, and an additional 28% of those units have annual household incomes of $25,000–$49,000 (U.S. Census Bureau 2010). The majority of these lower income households rent, spending on average of $820 (+/- $314) a month for housing costs (U.S. Census Bureau 2010). Renters in the lowest income bracket spend a significant percentage of their monthly income (approximately 41%) on housing costs, as do home owners in the highest income bracket (>$75,000), who spend approximately 42% of their monthly income on housing costs (U.S. Census Bureau 2010). Households that spend more than 30 percent of their income on housing are considered cost burdened according to HUD (2013) and may have difficulty affording basic needs such as food, clothing, transportation, and healthcare.

The annual living wage (i.e., cost of living) for a 2-person household in Atlanta, Georgia (as calculated by the Living Wage Calculator) is estimated to be $31,511–$39,527, and for a 3-person household, the annual cost of living is estimated to be $37,728–47,078 (Glasmeier, Amy K. and Massachusetts Institute

of Technology 2014). These calculations take into account monthly expenses of food, healthcare, housing, transportation, child care (if applicable), and other necessities.

Of those in the workforce (i.e., civilian labor over 16 years of age), 16.3% are unemployed (U.S. Census Bureau 2010). Of those unemployed, 70% are living below poverty level.

There are an estimated 12,865 individuals (+/-1,371) age16 years and over, of which 61% (+/-0.06%) are in the labor force (U.S. Census Bureau 2010). Of the group in the labor force, 16.3% (+/-0.02%) were unemployed (U.S. Census Bureau 2010). Unemployment was high for both African Americans and Caucasians, at 19.2% and 16.3%, respectively (U.S. Census Bureau 2010). There were more employed women than men, especially women with children under 6 years old (69.6% +/-0.33) (U.S. Census Bureau 2010). Table 39 highlights the employment status of persons in the community by educational attainment. Persons with higher levels of professional education were more employed than persons with less education, and persons with less than a high school degree made up the largest proportion of those unemployed. These findings illustrate the importance of education in relation to employment.

**Table 39. Employment Status by Educational Attainment among Population 25 to 64 Years Old**

| Educational Attainment | Estimated Population Employed | Margin of Error[1] | Estimated Population Unemployed | Margin of Error[1] |
|---|---|---|---|---|
| Total Population 25 to 64 Years Old | 63.0% | +/-0.08 | 12.2% | +/-0.02 |
| Less Than High School Graduate | 29.7% | +/-0.1 | 32.5% | +/-0.14 |
| High School Graduate or GED | 53.6% | +/-0.12 | 9.5% | +/-0.03 |
| Some College | 70.5% | +/-0.12 | 10.2% | +/-0.03 |
| At least a Bachelor's Degree | 82.0% | +/-0.15 | 10.1% | +/-0.04 |

Source: 2006-2010 ACS 5-Year Estimates, Employment Status dataset
[1] Margin of Error was calculated in MS Excel.

Income, which is closely related to employment status, was found to be somewhat widely distributed among the residents in the HIA study area. Approximately 14% of the households had an annual income over $75,000, 12% had an annual income between $50,000 to $75,000, and only 14% had an annual income between $25,000 and $50,000 (U.S. Census Bureau 2010). It should be noted that almost half of the population (46%) was living with a yearly income less than $25,000 (U.S. Census Bureau 2010).

The HIA Core Project Team investigated the severity of poverty in the community. The U.S. Census Bureau uses a set dollar value threshold, which varies by family size and composition, to determine who among the population is living at or below poverty. For example, if a family's total household income is less than the threshold dollar value for poverty (i.e., federal poverty threshold level), then that family and every individual in it are considered to be living in poverty. The poverty threshold values do not vary geographically, but they are updated annually for changes in cost of living and inflation using the Consumer Price Index. Poverty status is determined for all people except those institutionalized, people in military group housing, individuals living in college dormitories, and unrelated individuals under 15 years old (U.S. Census Bureau 2013).

According to the 2006-2010 ACS, Poverty Status in Past 12 Months (S1701) dataset, the largest group living in poverty is children. Over half of the persons under 18 years of age and approximately one-third

of persons over 65 years are living in poverty (54.4% +/-0.12 and 31.2% +/-0.18, respectively). More men are living in poverty than women (40.4% compared to 37.6%). Approximately one-third (36.4%) of Hispanics in the community study area are living in poverty. One in four Caucasians and 40.8% of African Americans in the community study area, for whom poverty status is determined, are living in poverty. It is not surprising that of those unemployed, 70.1% are living below the federal poverty level. (U.S. Census Bureau 2010)

The HIA Core Project Team looked at housing data from the 2000 and 2010 Census data files to better understand the changes that have occurred in housing over the past decade and what the existing conditions were for housing in 2010.

In 2010, there were a total of 5,706 households in the community, with an average household size of 2 individuals (1.9 persons per household). Almost half (44.3%) of the households in the community were families; the average family household size was 3 individuals (U.S. Census Bureau 2010). Total occupied housing units decreased almost 3% from 5,904 in 2000 to 5,751 in 2010. There was very little change, albeit positive, from 2000 to 2010 in the ratio of owner-occupied to renter-occupied housing units (0.31 to 0.33, respectively); this indicated an increase in home owners in the community. The most remarkable change observed was the explosive increase in vacant housing over the decade, rising 167.7% in just ten years. This finding parallels the concern community residents and other stakeholders voiced on the increasing prevalence of vacant and abandoned houses in the community. Interestingly, the number of total housing units in the community study area went up almost 30% from 2000 to 2010. This indicates that a large proportion of the housing units gained in the past decade are standing vacant. Table 40 shows the housing occupancy indicators used and their values.

**Table 40. Differences between 2000 and 2010 Census Housing Occupancy Indicators**

| Housing Indicator | 2000[1] | 2010[1] | Net Change |
|---|---|---|---|
| Total Housing Units | 7,253 | 9,362 | ↑ 29.1% |
| Owner-occupied | 1,396 | 1,411 | ↑ 1.1% |
| Renter-occupied | 4,508 | 4,340 | ↓ 3.7% |
| Owner-occupied to Renter-occupied Ratio | 0.31 | 0.33 | ↑0.02 |
| Total Occupied Units | 5,904 | 5,751 | ↓ 2.8% |
| Total Vacant Units | 1,349 | 3,611 | ↑167.7% |

[1] Data Source: 2000 and 2010 Census Summary File 1

The HIA Core Project Team collected data on financial housing characteristics in the Census tracts intersecting the half-mile buffer from the 2006–2010 ACS 5-Year Estimates, Housing by Financial Characteristics dataset (S2503) and graphically analyzed the data (Figure 45). The findings show that of the total households in the community, almost half (46.2%) live with a combined household income less than $25,000. There are striking differences in household incomes between households who live in a home they own and those households that rent their home space. Over half of the renter-occupied housing units are occupied by households with an average income less than $25,000, whereas those who have the highest household income live in the home they own. There appears to be an inverse relationship between household income and whether a household rents or owns their housing unit, such

that the lower the income bracket – the higher the prevalence of renter-occupied housing units, and the higher the income bracket – the lower the prevalence of renter-occupied housing units.

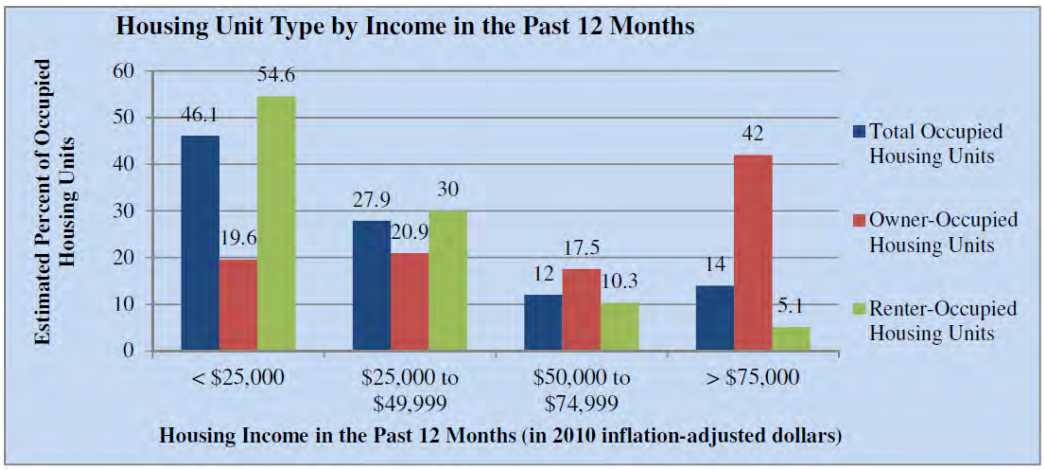



**Figure 45. Graphical analysis of occupied housing units by household income. It should be noted that the margin of error for percentage of occupied housing units by income never went above +/- 0.06%. (Source: 2006–2010 ACS 5-Year Estimates, Housing by Financial Characteristics dataset (S2503))**

The HIA Core Project Team wanted to know how much residents in the community were spending on monthly housing costs. Again, the team used the 2006-2010 ACS 5-Year Estimates, Housing by Financial Characteristics dataset to obtain this information. The average amount spent on monthly housing costs was estimated at an $858 (+/- $335) for all residents, $1,280 (+/- $1,473) for home owners, and $820 (+/- $314) for renters (U.S. Census Bureau 2010). Households spending more than 30% of their income on monthly housing costs were further delineated by housing type and total household income in the past 12 months (Figure 46). Researchers found differences in income spent on housing costs between renter-occupied and owner-occupied housing.

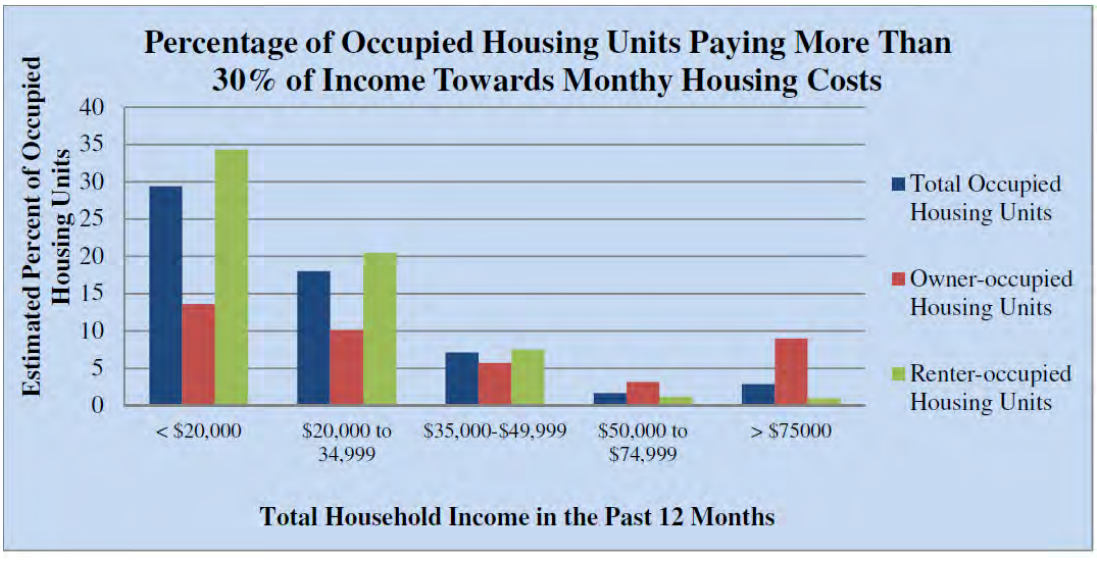



**Figure 46. Graphical analysis of the percentage of occupied housing units paying more than 30% of income for monthly housing costs by housing type. It should be noted that the margin of error for**

**percentage of occupied housing units by income never went above +/-0.03%. (Source: 2006–2010 ACS 5-Year Estimates, Housing by Financial Characteristics dataset (S2503)).**

Of the estimated 5,706 occupied housing units, approximately 3,372 (59.1%) are paying more than 30% of their income for monthly housing costs (U.S. Census Bureau 2010). Households in the lowest income bracket (i.e., less than $20,000 a year) were more likely to pay over 30% of their income towards monthly housing costs than the higher income brackets. There were a higher proportion of renters, compared to home owners, in the lowest income bracket that paid more than 30% of their income towards monthly housing costs. Home-owners in the higher income bracket (i.e., greater than $75,000) were more likely to pay over 30% of their income towards monthly housing costs than renters. Renters were more likely to pay more than 30% of their income towards monthly housing costs if they were lower income than higher income.

As indicated in the literature review results, the implementation of green infrastructure has repeatedly been shown to increase property values in surrounding areas. The median property value of the 36 residential properties abutting the Green Street Project is $16,000 (City of Atlanta 2013). Figure 47 shows the appraised residential property values in parcels surrounding the Green Street Project.

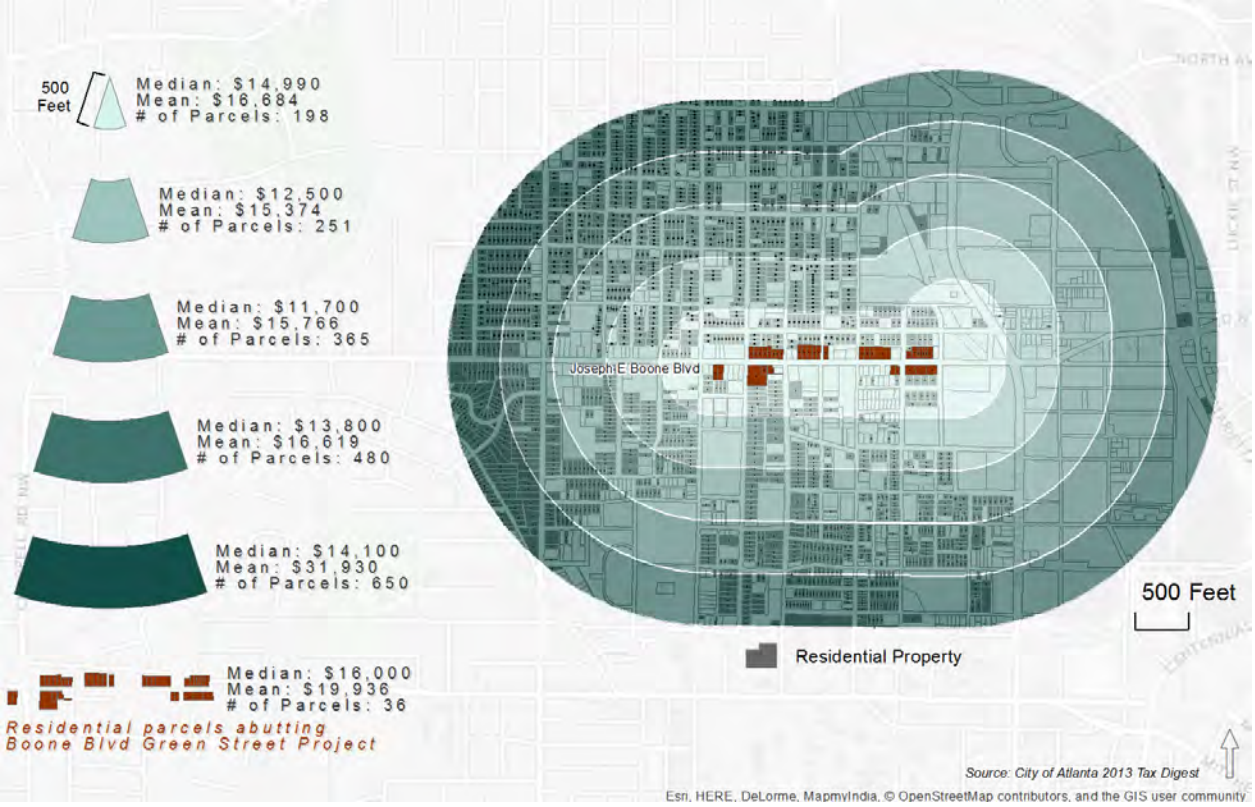



**Figure 47. Appraised value of residential parcel units within one half mile of the Green Street Project.**

# Assessment

***How the Green Street Project May Impact Household Economics (Costs of Living and Employment)***

Is the total investment in the Green Street Project expected to affect costs of living and/or employment?

Based on the evidence reviewed, the HIA Core Project Team judged how the proposed Green Street Project could affect household economics and qualitatively characterized how that impact would affect health. The proposed project design plans to incorporate elements of green infrastructure (i.e., rain gardens, planter boxes, and permeable pavement) to create a streetscape along Boone Street. Planter boxes and rain gardens will include a variety of vegetation, including trees, bushes, grasses, and other plantings. Green infrastructure has been shown to increase property values, which can improve community economy, but detract from household economy via increased costs of living. There are some cost savings anticipated from the green infrastructure implementation (e.g., reduced cooling bills due to shading from vegetation, but increased costs of living via increased rent and taxes can have negative health impacts, especially for those that are already cost burdened (i.e., spending more than 30% of their monthly income on housing). Increased costs of living have the potential to lead to displacement of low-income residents, and should this project signal a revitalization and reinvestment in the neighborhood, gentrification.

Using green infrastructure, as opposed to grey infrastructure (e.g., concrete and pavement), can stimulate job creation due to the increase in required seasonal and continuous maintenance. Maintenance can include pruning, mulching, removing debris, refilling the bioretention media, and watering vegetation, among other things. Green infrastructure is often referred to as a creator of "green collar jobs," or sustainable jobs that are dedicated to environmental work. Landscaping improvements, therefore, are often used as a revitalization strategy in a community to help with local job creation. Due to the size of the Green Street Project, community-wide employment impacts are not expected; however, local job creation has the potential to significantly impact those that are unemployed and those living below the poverty level, assuming local residents are given priority in hiring and funding for maintenance continues.

Those individuals in the community who are at increased risk of experiencing disproportionate (positive or negative) impacts due to changes in household economics, include:

- Persons living on a fixed income, below the federal poverty level;
- Households that are cost burdened (i.e., spending more than 30% of monthly income on housing);
- Persons who are on long-term unemployment or are physically incapable of labor; and
- Persons who are limited by age, such as children under 16 years and older adults (over 67 years).

Predicted increases in property values and cost of living, cost reductions via green infrastructure features, and job creation indicate that the proposed project will likely impact household economics. Cost savings and job creation as a result of the Green Street Project can increase income available to meet basic needs and promote health; however, increases in property values as a result of the project (and with it cost-of-living) can impact the ability to meet basic needs, impact health negatively, and can potentially lead to displacement and gentrification. Impacts to costs of living are expected to be localized and affect some groups in the vicinity of the Green Street Project; due to the size of the project, job creation is expected to be minimal and therefore, impact few. Impacts to household economics and the ability to meet basic needs are reversible, but can substantially affect the well-being and livelihood of individuals. Job creation and costs savings will benefit those that are low income and unemployed, while increases to cost

of living will negatively impact those on a fixed income, living below poverty level; cost burdened households; those on long-term unemployment or incapable of work; and the age limited (under 16 or over 67 years old). Evidence is limited, but a few good studies exist linking green infrastructure to increased property values and job creation.

Table 41 summarizes the predicted health impacts of the proposed project related to household economics and potential strategies to manage those impacts.

**Table 41. Potential Health Impacts from Changes in Household Economics (Cost of Living and Employment) and Management Strategies**

| Criteria | Scale | Potential Impact Management Strategies |
|---|---|---|
| **Likelihood** | Plausible | Incorporate employment opportunities for local residents during maintenance and construction, starting with those in Vine City and English Avenue. Develop and incorporate Green Jobs Training for local residents and community groups. |
| **Direction** | Both Positive and Negative | None provided. |
| **Magnitude** | Moderate (Positive) and Low (Negative) | Provide funding opportunities for local entrepreneurs (e.g., small business grants, foundation matching, matching grants for job creation, etc.) aimed at creating jobs. |
| **Permanence** | Quickly and Easily Reversed (Both) | Develop and implement policies for new development to ensure that a % will be dedicated for mixed income housing. Develop and implement policies that limit renting and encourage more home ownership. |
| **Distribution** | Both Benefits and Harms for Vulnerable Populations | Develop and implement property tax and rent control ordinances/policies to ensure housing costs do not increase as a result of revitalization and/or redevelopment (i.e., gentrification). |
| **Strength of Evidence** | Limited | None provided. |

### 4.5.2. Community Economics (Business Performance)

In scoping, factors related to the local economy were high priority topics of concern/interest among stakeholders. Community stakeholders, in particular, voiced that the area needed a community-owned asset that would generate economic activity. They stressed the importance for local businesses to have enough patronage to stay open and viable. Local businesses should be profiting from the increased traffic during special events due to their proximity to the stadium and convention center. This advantage is not occurring. Instead, businesses have suffered over the years, many of which have closed. For purposes of this HIA, the HIA Core Project Team looked at potential impacts the project may have on local businesses, including business performance (i.e., demand for goods and services) and overall community economics.

# Assessment

### *Results of the Literature Review*

How does streetscaping influence business performance?

In Chicago, an EPA-funded effort to help clean-up and re-green a community (including some brownfields) resulted an improvement in local job opportunities in the area by retaining businesses and attracting new businesses and industry to the area (Clemants, et al. 2006). A study by Dill et al. (2010) evaluated the economic benefits of green street projects in particular and found that residents living near a green street were more likely to be more physically active (walk five times or more a week), interact with their neighbors more, and thought it was a better place to live than before the green street infrastructure was in place. Communities designed to promote walking and cycling have been shown to have more successful businesses than those designed mainly for motorized traffic. The increased foot and bike traffic brings in more regular patronage and attracts new businesses, entrepreneurs, and customers to the area. When businesses do well in a community, it improves economic growth by creating new jobs and increasing access to amenities and services; this, in turn, can improve health in a community (e.g., access to healthcare and nutritious foods, mental health status, and the prevalence of chronic disease).

Walkable commercial districts are a key component of communities that promote active living. Destination is a key predictor of walkable communities; if there are businesses and services within walking distance, people have an excuse to walk to them. There is evidence that green space improves aesthetics, reduces crime, and therefore promotes walking. A recent report by Hack (2013) examines whether there are also economic benefits to businesses in walkable communities. The study consisted of a meta-analysis of 70 studies, with only 15 that addressed economic performance directly. While there is still not much research on this topic, the evidence seems to suggest that walkable retail is on the upswing, and likely to grow over the next several decades. Since 45% of daily trips, on average, are made for shopping and running errands, encouraging walking is an important strategy in reducing obesity and improving health. Additionally, further emerging research (People For Bikes and Alliance for Biking & Walking 2014) shows how bike lanes specifically can improve business performance, as people who arrive by bike to a business spend less money but visit more often (becomes a regular client), resulting in more money spent overall. The use of bike lanes is also important for reducing energy usage and carbon emissions; this is why a green street implemented along with a road diet, bike lanes and more sidewalks can make walkable communities and enhance economic development.

As was mentioned in the household economies discussion, the implementation of green infrastructure can increase property values in surrounding areas. This can have an effect on both property taxes and/or rent for businesses, and therefore, affect the business' bottom line. However increases in property value can also signal improvements in physical capital, which promotes revitalization and ultimately development. Planting trees and vegetation around businesses can also help reduce costs associated with heating, cooling, and stormwater management.

### *Existing Conditions Related to Business Performance*

What are the current property values for businesses in the community?

Based on the U.S. Census Bureau's Zip Code Business Patterns (U.S. Census Bureau 2012), there were a total of 1937 establishments within 1/2 mile of the proposed Green Street Project (i.e., zip codes 30313,

30314, and 30318; see Table 42). Footnotes to the table describe the types of establishments within each of the four main North American Industry Classification System (NAICS) sectors – retail trade; professional, scientific, and technical services; accommodations and food services; and other services (except public administration).

**Table 42. Business Establishments within One Half-Mile Radius of the Green Street Project in 2010**

| Establishments, by NAICS Sector | Total Within Half-mile Buffer |
|---|---|
| **Utilities** | 5 |
| **Construction** | 92 |
| **Manufacturing** | 106 |
| **Wholesale trade** | 165 |
| **Retail trade**[1] | 259 |
| **Transportation and warehousing** | 41 |
| **Information** | 94 |
| **Finance and insurance** | 53 |
| **Real estate and rental and leasing** | 113 |
| **Professional, scientific, and technical services**[2] | 296 |
| **Management of companies and enterprises** | 24 |
| **Administrative and support and waste management and remediation services** | 94 |
| **Educational services** | 31 |
| **Health care and social assistance** | 110 |
| **Arts, entertainment, and recreation** | 52 |
| **Accommodation and food services**[3] | 205 |
| **Other services (except public administration)**[4] | 195 |
| **Industries not classified** | 2 |
| **Total** | 1,937 |

[1] Retail trade includes businesses such as supermarkets, gasoline stations with convenience stores, convenience stores, and beer, wine, and liquor stores.
[2] Professional, scientific, and technical services includes businesses such as lawyer offices, graphic design services, custom computer programming services, and marketing consulting services.
[3] Accommodation and food services includes businesses such as full-service restaurants, limited-service restaurants, and food service contractors.
[4] Other services includes businesses such as religious organizations, civil and social organizations, general automotive repair, and beauty salons.
[5] Zip codes included in the half-mile buffer were 30313, 30314, and 30318.

It should be noted, while the number of businesses in the study area in 2010 is known, nothing is known of the performance of those establishments, nor is the existence and business performance of those same establishments known today. The data does show, however, that there are businesses and services within walking distance in the community.

As noted previously, the implementation of green infrastructure has repeatedly been shown to increase property values in surrounding areas. The median property value of the 31 non-residential properties abutting the Green Street Project is $51,800 (City of Atlanta 2013). Figure 48 shows the appraised non-residential property values in parcels surrounding the Green Street Project.

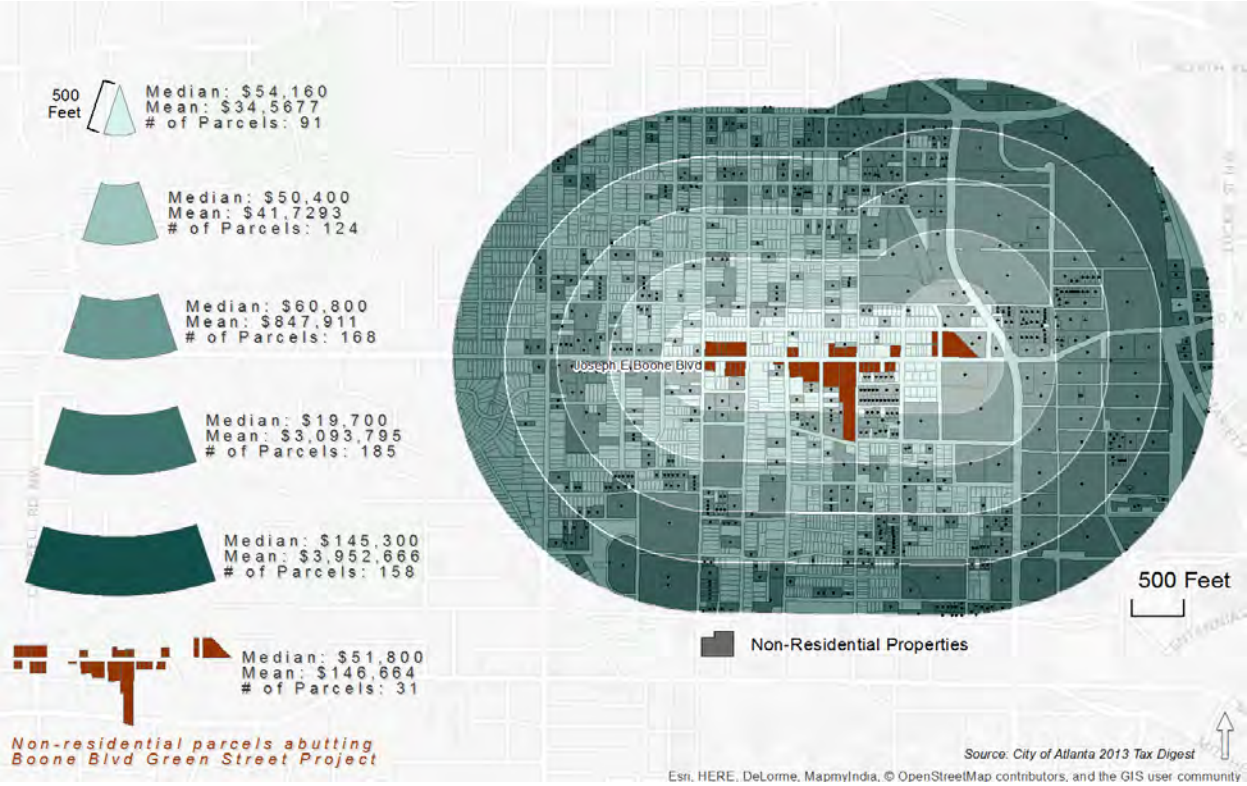



**Figure 48. Appraised value of non-residential parcel units within one half mile of the Green Street Project (City of Atlanta 2013).**

### *How the Green Street Project May Impact Business Performance*

Does the Green Street Project have the potential to impact or influence community-level business performance?

Due to the size of the Green Street Project, direct impacts to community economics are not expected to be far-reaching in the near-term (i.e., the green infrastructure implementation will not eradicate unemployment, nor will it provide a huge boost to economic growth and development in the area), although some of these community benefits could be realized if this project signals reinvestment and revitalization in the area, such as in the case of the Milwaukee River Walk system (Clemants, et al. 2006). Green infrastructure can improve aesthetics, increase investment, attract new businesses, improve economic growth and boost tourism. With care given to planning, management, and community involvement at the landscape, community, and individual site levels, the benefits of green space can become additive and even synergistic, far outreaching the sum of benefits from each individual site (Forest Research 2010). The USDA Forest Service (2014) has developed a tool that shows the cost savings of "greening" a community, through a combination of storm water savings, $CO_2$ reduction, winter and summer savings and increased air quality. According to the advocacy group, Alliance for Community Trees (2014), as a result of the shade afforded by green infrastructure vegetation, an increase in the number of trees and greener streets can also significantly reduce roadway maintenance, saving up to 60% on repaving costs over 30 years.

# Assessment

Based on the evidence reviewed, the HIA Core Project Team judged how the proposed Green Street Project could impact business performance and qualitatively characterized how that impact would affect health. The proposed project design plans to incorporate elements of green infrastructure (i.e., rain gardens, planter boxes, and permeable pavement) to create a streetscape along Boone Street, convert 5 ft. of roadway on each side to a designated bike lane, and add 1-2 spaces for street side parking.

The landscaping, aesthetics, and improved biking and walking infrastructure are expected to positively impact business performance, which in turn can enhance economic growth and development (e.g., by creating jobs and attracting new business and customers). Lowered utility bills and reduced property maintenance and repair costs can also improve the overall performance of a business by reducing costs. Improved business performance can, in turn, improve health in the community.

Predicted improvements in walkability/bike-ability and cost reductions via green infrastructure features will likely improve access to goods and services in the community and improve business performance. Walking/biking infrastructure improvements can improve access to existing businesses and potentially attract new business. This, combined with expected cost reductions (i.e., cooling and property maintenance/repair costs) could improve business performance, lead to increased access to goods and services and job creation, and improve health. Impacts to business performance are expected to be localized and affect some groups in the community. Impacts to business performance are reversible, but can substantially affect the well-being and livelihood of individuals in the community. Job creation will benefit those that are low income and unemployed, while improved access to good and services will positively impact those on a fixed income, living below poverty level; cost burdened households; those on long-term unemployment or incapable of work; and those of age to work. Evidence is limited, but a few good studies exist linking walkability/bike-ability to improved business performance. Table 43 summarizes the predicted health impacts of the proposed project related to community economics and potential strategies to manage those impacts.

**Table 43. Potential Health Impacts from Changes in Community Economics (Business Performance) and Management Strategies**

| Criteria | Scale | Potential Impact Management Strategies |
|---|---|---|
| **Likelihood** | Plausible | Install bike racks in front of businesses along the proposed project site. |
| **Direction** | Positive | None provided |
| **Magnitude** | Moderate | Encourage the implementation of green infrastructure to business owners and residents along the proposed project site (e.g., provide tax incentives for implementing stormwater BMPs). |
| **Permanence** | Quickly and Easily Reversed | Consider zoning ordinances to reduce fast food, cash advance, and alcohol establishments. Consider tax incentives for development of healthy establishments (e.g., small business seed grant). |
| **Distribution** | Vulnerable Populations Benefit | |
| **Strength of Evidence** | Limited | |

# Chapter 5. Recommendations

HIA recommendations aim to manage identified health impacts either by modifying the pending decision or by introducing health-supporting measures that minimize potential adverse impacts and maximize benefits for all.

## 5.1. Developing the HIA Recommendations

The HIA Core Project Team used a step-wise approach to develop and prioritize the recommendations. First, each member of the HIA Core Project Team identified measures to help manage predicted changes to each health determinant assessed so that potential benefits were maximized and potential harms were avoided and/or minimized. Next, the HIA Core Project Team gathered to discuss the main findings and initial recommendations identified. As a group, the team verified whether the proposed mitigation actions were appropriate, based on the assessment findings, and identified additional opportunities for DWM to a) mitigate or avoid potential harmful consequences of the proposed project, and b) maximize co-benefits and ensure equitable impact. The HIA Core Project Team presented the list of initial recommendations at the final stakeholder meeting (see **Appendix C** *Documentation of the Final Stakeholder Engagement Meeting, June 5, 2014*) and solicited feedback from stakeholders. The recommended items were further refined, based on the input received from stakeholders, and scored using the framework provided in Table 44. The combined score was used to rank the items within their implementation phase.

**Table 44. Framework for Prioritizing Recommendations**

| Criteria | Score and Description |
|---|---|
| **Phase of implementation** | 4= Implement immediately (before-construction)<br>3= Implement in the short-term (during construction)<br>2= Implement in the short-term (after construction)<br>1= Implement in the long-term |
| **Intended purpose** | 4= Protect environmental and/or public health<br>3= Promote healthy living<br>2= Encourage collaboration/coordination among stakeholders<br>1= Encourage sustainable development |
| **Correlates with stakeholder-identified priority (from Scoping exercises)** | 4= Received 20 or more votes (Environment, Community Engagement, Economy/Jobs/Poverty)<br>3= Received 10 to 19 votes (Housing, Health, Education)<br>2= Received 5 to 10 votes (Safety and Transportation)<br>1= Received less than 5 votes (Recreation, Social/Cultural, Politics/Government, Total Investment) |
| **Potential for co-benefits** | 1= Yes<br>0= No |

*NOTE: Costs and/or feasibility for implementing the recommendations was not including in developing and/or ranking the recommendations. DWM should consider these criteria should they prevent the recommendations from being implemented. For those recommendations not carried out, the City should provide rationale or reasoning to stakeholders that explains the decision for not implementing the recommendation. This will help to ensure trust and transparency in the decision-making process.*

# Recommendations

## 5.2. Final Recommendations to Decision-Makers

In the following tables, the HIA Core Project Team lists the final recommendations from this HIA that should be adopted and implemented by DWM and the City of Atlanta. The recommendations are grouped by phase of implementation. Table 45 lists the recommendations that should be implemented immediately (before construction). Table 46 lists the recommendations that should be implemented during construction of the proposed project. Table 47 lists the recommendations that should be implemented shortly after construction of the proposed project. Table 48 lists the long-term recommendations that should be adopted implemented in the next several years after project construction. Recommendations are listed with their intended purpose, benefits to health determinants of interest, evidence supporting the recommendation, and the final combined score. Furthermore, the HIA Core Project Team highlighted the recommendations identified by stakeholders at the combined stakeholder engagement meeting that also received support from the community residents. If the list of HIA recommendations cannot be implemented in its entirety, the team recommends that DWM and the City of Atlanta *at a minimum* address and/or adopt these items (shaded in gray).

**Table 45. Short-term HIA Recommendations That Should Be Implemented Immediately (Before Construction)**

| Final Recommendations | Intended Purpose | Health Benefits | Recommendation Supported By | Score |
|---|---|---|---|---|
| 1- **Increase law enforcement of nuisance laws in regards to abandoned properties, illegal dumping, and property maintenance.** | Protect environmental and/or public health | Water Quality and Flood Management | • Quantitative Analysis<br>• Qualitative Analysis<br>• GIS-supported mapping and/or spatial analysis<br>• Empirical Literature<br>• Stakeholder Input | 13 |
| 2- **Improve "flood safety hazard" warnings in flood-prone areas.** | Protect environmental and/or public health | Flood Management | • GIS-supported mapping and/or spatial analysis | 12 |
| 3- **Improve "water quality hazard" warnings for water contact.** | Protect environmental and/or public health | Water Quality | • Qualitative Data Analysis | 12 |

# Recommendations

| Final Recommendations | Intended Purpose | Health Benefits | Recommendation Supported By | Score |
|---|---|---|---|---|
| **4- Strictly follow the recommendations outlined in section 6.1 (Common Elements of the Green Infrastructure Technical Specifications) of the project design regarding selection of soil media, mulch, and fertilizer use (i.e., use soil media low in phosphorous and nitrogen content, avoid manure- or compost-based mulch, and limit the use of fertilizers).** | Protect environmental and/or public health | Water Quality | • Qualitative Data Analysis<br>• Empirical Literature | 12 |
| **5- Select native tree species that have tall, broad canopies that could increase the shading of surface area (especially over impervious surfaces).** | Protect environmental and/or public health | Climate and Temperature | • GIS-supported mapping and/or spatial analysis<br>• Empirical Literature<br>• Stakeholder Input | 12 |
| **6- Select native plant species that have low volatile organic compound (VOC) emissions and have higher capacity for filtering pollutants out of the air. NOTE: for any planting of vegetation in urban areas, it is recommended that a minimum of three species be selected.** | Protect environmental and/or public health | Air Quality | • Empirical Literature | 12 |
| **7- Remove (address) foul (sewage) smell from Proctor Creek/North Avenue combined sewer outflow.** | Protect environmental and/or public health | Water Quality | • Stakeholder Input | 12 |
| **8- Increase soil media height of planter boxes from 2 feet to at least 2.5 feet (30 in) to improve pollutant removal efficiency.** | Protect environmental and/or public health | Water Quality | • Qualitative Data Analysis<br>• Empirical Literature | 12 |
| **9- Increase community awareness of environmental factors that can lead to mosquitoes and preventative measures against vector-borne pathogens in the area.** | Protect environmental and/or public health | Flood Management | • Qualitative Analysis<br>• Empirical Literature<br>• Stakeholder Input | 11 |
| **10- Maximize "greenness" for the proposed project site to increase the potential for psychosocial improvements (e.g., reduced stress, improved mental health, and reduced aggression).** | Promote healthy living | Exposure to Greenness and Crime | • GIS-supported Mapping and Spatial Analysis<br>• Qualitative Data Analysis<br>• Empirical Literature | 11 |

# Recommendations

| Final Recommendations | Intended Purpose | Health Benefits | Recommendation Supported By | Score |
|---|---|---|---|---|
| **11- Incorporate employment opportunities for local residents and businesses during construction and maintenance, starting with those in Vine City and English Avenue.** | Promote healthy living | Household Economics | • Quantitative Data Analysis<br>• Qualitative Data Analysis<br>• Stakeholder Input | 11 |
| **12- Provide funding for local entrepreneurs (e.g., small business grants, foundation, matching grants, etc.) aimed at creating jobs.** | Promote healthy living | Household Economics | • Qualitative Data Analysis | 11 |
| **13- Add infrastructure that promotes safety for pedestrians and cyclists (e.g., street lighting, traffic calming approaches, designated and protected bike lanes, bike traffic signals, cycling greenways, etc.).** | Protect environmental and/or public health | Traffic Safety | • Qualitative Analysis<br>• Empirical Literature<br>• Stakeholder Input | 10 |
| **14- Increase street lighting along the proposed project site.** | Protect environmental and/or public health | Crime | • Qualitative Analysis<br>• Empirical Literature<br>• Stakeholder Input | 10 |
| **15- Utilize the CPTED (Crime Prevention through Environmental Design) elements in the Green Street Project design. For example, the lowest branches on trees should be taller than 5 feet from the ground and the tallest bushes/grasses should be no taller than 3 feet from the ground to allow for a "window" for onlookers at eye-level.** | Protect environmental and/or public health | Crime | • GIS-supported Mapping and Spatial Analysis<br>• Qualitative Data Analysis<br>• Empirical Literature | 10 |
| **16- Increase police presence on the ground (i.e., walking or on bicycles) in the area with a focus on crime "hot spots."** | Protect environmental and/or public health | Crime | • Stakeholder Input | 10 |
| **17- Incorporate EPA's Smart Growth Principles in the Green Street Project design. Refer to the Smart Growth America – Complete Streets in the Southeast Case Studies for examples.** | Promote healthy living | Access to Goods, Services, Greenspace, and Healthcare | • Empirical Literature | 9 |
| **18- Coordinate with local active transport groups (e.g., Atlanta Bicycle Coalition) to ensure that implementing the project does not impede or discourage walking or bicycling.** | Encourage coordination / collaboration among stakeholders | Access to Goods, Services, Greenspace, and Healthcare | • Qualitative Analysis | 8 |

# Recommendations

| Final Recommendations | Intended Purpose | Health Benefits | Recommendation Supported By | Score |
|---|---|---|---|---|
| **19- Consider (in the project design) connecting and/or expanding walking and cycling paths to reach broader bike/pedestrian routes (e.g., PATH foundation, Beltline, etc.).** | Encourage sustainable development | Access to Goods, Services, Greenspace, and Healthcare | • Qualitative Analysis<br>• Empirical Literature | 7 |

**Table 46. Short-term HIA Recommendations That Should Be Implemented During Construction**

| Final Recommendations | Intended Purpose | Health Benefits | Recommendation Supported By | Score |
|---|---|---|---|---|
| **1- Place trees with larger canopies near bus stops or other areas where people may congregate.** | Protect environmental and/or public health | Climate and Temperature | • Empirical Literature<br>• Stakeholder Input | 11 |
| **2- Place plants that are lower to the ground (especially grasses and bushes) in areas where vehicles are likely to idle so they can filter pollutants from vehicle emissions. Taller trees should be spaced so that vertical mixing of pollutants is minimized.** | Protect environmental and/or public health | Air Quality | • Empirical Literature | 11 |
| **3- Install public benches at local hangouts, bus stops, areas often populated to provide infrastructure that supports social interaction.** | Promote healthy living | Social Capital | • Qualitative Analysis<br>• Empirical Literature | 10 |
| **4- Develop and incorporate Green Jobs Training for local residents and community groups** | Promote healthy living | Household Economics | • Quantitative Analysis<br>• Qualitative Analysis<br>• Stakeholder Input | 10 |
| **5- Install bike racks in front of businesses along the proposed project site.** | Promote healthy living | Community Economics | • Qualitative Analysis<br>• Stakeholder Input | 10 |
| **6- Ensure that placement or selection of vegetation does not impede or obstruct visibility of pedestrians for drivers.** | Protect environmental and/or public health | Traffic Safety | • Empirical Literature | 9 |
| **7- Place low brush/grasses in planter spaces near residences to block/absorb some of the noise from the roadway.** | Protect environmental and/or public health | Exposure to Urban Noise | • Empirical Literature | 9 |

# Recommendations

| Final Recommendations | Intended Purpose | Health Benefits | Recommendation Supported By | Score |
|---|---|---|---|---|
| **8- Implement best practices to reduce the amount of noise or time of noise being generated from construction.** | Protect environmental and/or public health | Exposure to Urban Noise | • Empirical Literature<br>• Stakeholder Input | 9 |

**Table 47. Short-term HIA Recommendations That Should Be Implemented After Construction**

| Final Recommendations | Intended Purpose | Health Benefits | Recommendation Supported By | Score |
|---|---|---|---|---|
| **1- Ensure that routine maintenance and monitoring plan for green infrastructure elements are followed as directed.** | Protect environmental and/or public health | Water Quality; Flood Management; Access to Goods and Services, Greenspace, and Healthcare; Crime; and Social Capital | • Qualitative Analysis<br>• Empirical Literature<br>• Stakeholder Input | 10 |
| **2- Utilize multiple strategies to increase the magnitude of the Green Street Project's impact, such as community outreach, policy development, ordinance enforcement.** | Protect environmental and/or public health | Water Quality | • Quantitative Analysis<br>• Qualitative Analysis<br>• GIS-supported mapping and/or spatial analysis<br>• Empirical Literature<br>• Stakeholder Input | 10 |
| **3- Have DWM and/or EPA conduct soil and water quality testing further upstream in the headwaters of Proctor Creek (starting in this community) and invite residents to participate in future studies.** | Protect environmental and/or public health and encourage coordination / collaboration among stakeholders | Water Quality | • Qualitative Analysis<br>• Stakeholder Input | 10 |
| **4- Make clear distinction between private and public space (i.e., define open public areas).** | Promote healthy living | Social Capital | • Qualitative Analysis<br>• Empirical Literature<br>• Stakeholder Input | 9 |

# Recommendations

| Final Recommendations | Intended Purpose | Health Benefits | Recommendation Supported By | Score |
|---|---|---|---|---|
| **5- Coordinate with "Atlanta Streets Alive" to host a community festival after completion of the project.** | Encourage coordination / collaboration among stakeholders | Social Capital | • Qualitative Analysis<br>• Stakeholder Input | 8 |
| **6- Ensure a "visible change" takes place aesthetically improves Boone Street along the proposed project site.** | Promote healthy living | Exposure to Greenness | • Empirical Literature | 8 |
| **7- Provide clear signage and way-finding infrastructure for pedestrians and cyclists (e.g., directions to the Beltline, bike zone, share-the-road, etc.).** | Promote healthy living | Access to Goods, Services, Greenspace, and Healthcare | • Qualitative Analysis<br>• Stakeholder Input | 7 |

**Table 48. Long-term HIA Recommendations That Should Be Implemented In The Next Several Years**

| Final Recommendations | Intended Purpose | Health Benefits | Recommendation Supported By | Score |
|---|---|---|---|---|
| **1- Expand BMPs (green infrastructure) throughout the community to help maximize pollutant removal and flow reduction going into storm sewers.** | Protect environmental and/or public health and encourage sustainable development | All | • Quantitative Analysis<br>• Qualitative Analysis<br>• GIS-supported mapping and/or spatial analysis<br>• Empirical Literature<br>• Stakeholder Input | 11 |
| **2- Encourage the implementation of green infrastructure to business owners and residents along the proposed project site (e.g., provide tax incentives for implementing stormwater BMPs).** | Protect environmental and/or public health | Community Economics | • Qualitative Analysis<br>• Stakeholder Input | 9 |
| **3- Continue to monitor traffic volume to ensure the road diet does not cause an overburden of traffic congestion along the street. If problems arise, coordinate with transportation department to problem-solve and implement counter measures (e.g., measures to divert traffic to nearby corridors, axel restrictions, re-evaluating bus routes, etc.)** | Protect environmental and/or public health | Traffic Safety | • Quantitative Analysis<br>• GIS-supported mapping and/or spatial analysis<br>• Empirical Literature | 8 |

# Recommendations

| Final Recommendations | Intended Purpose | Health Benefits | Recommendation Supported By | Score |
|---|---|---|---|---|
| **4- Develop a policy, plan, and/or ordinance to resolve/address the problem of vacant housing.** | Promote healthy living | Social Capital | • Quantitative Analysis<br>• Qualitative Analysis<br>• GIS-supported mapping and/or spatial analysis<br>• Empirical Literature<br>• Stakeholder Input | 8 |
| **5- Include context for advocacy (e.g., community factsheets/posters/outreach materials) so that residents and organizations can use the materials for addressing the community's needs.** | Promote healthy living and encourage coordination / collaboration among stakeholders | Social Capital | • Stakeholder Input | 8 |
| **6- Consider local zoning ordinances to reduce fast food, cash advance, and alcohol establishments.** | Promote healthy living | Community Economics | • Qualitative Analysis | 8 |
| **7- Consider local tax incentives for development of healthy establishments (e.g., small business seed grant).** | Promote healthy living | Community Economics | • Qualitative Analysis<br>• Stakeholder Input | 8 |
| **8- Cultivate and maintain mechanisms in City policy, development, and economic decisions and activities for building trust with the community.** | Encourage coordination / collaboration among stakeholders | Social Capital | • Qualitative Analysis<br>• Stakeholder Input | 7 |
| **9- Develop and implement property tax and rent control ordinances/policies to ensure housing costs do not increase as a result of revitalization and/or redevelopment (i.e., gentrification).** | Encourage sustainable development | Household Economics | • Quantitative Analysis<br>• Empirical Literature<br>• Stakeholder Input | 6 |
| **10- Develop and implement policies for new development to ensure that a % will be dedicated for mixed income housing and encourage community economic growth.** | Encourage sustainable development | Household Economics | • Qualitative Analysis<br>• Stakeholder Input | 6 |
| **11- Coordinate/collaborate with the Atlanta Department of Planning and Community Development for future activities/efforts in the communities of Proctor Creek.** | Encourage coordination / collaboration among stakeholders | Access to Goods, Services, Greenspace, and Healthcare | • Qualitative Analysis<br>• Stakeholder Input | 6 |

# Recommendations

| Final Recommendations | Intended Purpose | Health Benefits | Recommendation Supported By | Score |
|---|---|---|---|---|
| **12- Coordinate/collaborate with Fulton County Department of Health and Wellness (FC-DHW) for future activity planning.** | Encourage coordination / collaboration among stakeholders | Access to Goods, Services, Greenspace, and Healthcare | • Qualitative Analysis | 6 |
| **13- Develop and implement policies aimed to lower resident turnover, such as encouraging more home ownership in the community.** | Encourage sustainable development | Social Capital | • Quantitative Analysis<br>• Empirical Literature<br>• Stakeholder Input | 6 |
| **14- Consider whether local zoning ordinances and regulations regarding land use (i.e., residential vs. commercial, mixed-use, or private vs. public) are appropriate to protect the environment and public health and support economic and social growth.** | Encourage sustainable development | Access to Goods, Services, Greenspace, and Healthcare | • Qualitative Analysis<br>• Stakeholder Input | 4 |

# 6. Reporting

The overall goal of the reporting step is to develop the HIA report, inform stakeholders on the progress of the HIA, and communicate HIA findings and recommendations to decision-makers, the population affected by the decision, and other stakeholders.

## 6.1. HIA Reporting Activities

Several reporting activities were performed to support this HIA. The HIA Core Project Team were able to implement the reporting activities, as planned in *Chapter 3: Scoping*. The regional HIA Project Lead (Tami Thomas-Burton) served as the primary point of contact between stakeholders and HIA Core Project Team members. The HIA Core Project Team raised awareness about this HIA within the Agency and outside the EPA through many avenues. Before each stakeholder engagement meeting, the regional HIA Project Lead (Tami Thomas-Burton) was required to brief management in the EPA regional office on the purpose of the meetings, progress of the HIA, and any materials that would be shared outside the Agency. In addition, the ORD HIA Project Lead (Florence Fulk) also met with ORD management to report on the HIA's progress and share information about the HIA with fellow colleagues at the EPA. PowerPoint presentations were prepared for those meetings. In addition, several presentations were given by members of the HIA Core Project Team to inform the different communities of practice at the CDC, Proctor Creek Stewardship Council meetings, at the Regional Brownfields Conference meeting (May 15-17, 2013), and at several national conferences. Progress reports were also provided in EPA Region 4 Environmental Justice weekly newsletter.

Examples of the communications materials and documentation from the stakeholder engagement meetings can be found in **Appendix C.** The HIA Core Project Team began using a standardized format or "brand," for almost all of the HIA communication materials. The use of branding helped increase recognition and consistency of HIA materials. Before materials were shared outside the team, several steps were followed. First, the materials were developed and reviewed by the HIA Core Project Team, including the Technical Editor. Once comments and edits were addressed, HIA materials were sent to the HIA Project Leads for final approval. Once cleared, the materials were shared with members of the HIA Advisory Group and general public. In addition to the flyers, factsheets, handouts, and PowerPoint presentations, members of the HIA Core Project Team developed this HIA report as the final reporting outputs of the HIA. The document was reviewed by the Technical Editor, EPA ORD Management, and three external peer-reviewers. A hardcopy of this report was shared with DWM and other stakeholders by request and uploaded to EPA's HIA website (currently under construction).

*Note: The HIA Core Project Team recognized that the HIA report is an extensive document and may not be easy to manage and/or use for advocacy due to the level of detail provided in the report. Therefore, the team provided an executive summary of the full HIA report with separate, one-page factsheets for each health determinant addressed in the HIA. This document was created as a stand-alone document so community stakeholders could use it for advocacy and/or raising awareness.*

Table 49 lists the key reporting activities performed to support this HIA, the date they were performed, their intended purpose, and the primary target audience.

# Reporting

**Table 49. Summary of Key HIA Reporting Activities**

| Reporting Outlet | Date | Purpose | Primary Audience |
|---|---|---|---|
| **1st public, community meeting flyer** | Released February 2013 | This one-page flyer was developed to inform the public and resident stakeholders about the upcoming HIA and invite them to participate in the process by attending the first stakeholder engagement meeting. | Public |
| **1st public, community meeting, Atlanta, GA** | March 22, 2013 | The purpose of this meeting was to inform community residents about the HIA, its intended purpose, and encourage participation in the HIA. Meeting activities were focused on gathering input on residents' interest and/or concerns related to their community, opinions about health, and thoughts on how the quality of life in the community could be improved. The input from this meeting was used to guide the HIA scope. | Community residents |
| **Summary of the 1st public, community meeting** | Released April, 2013 | This three-page handout was developed to provide a summary of the discussions and activities that occurred during the first stakeholder engagement meeting. | All stakeholders |
| **Invitation Letter to Participate in the HIA Advisory Group** | Released April 2013 | The HIA Project Leads prepared an invitation to key stakeholders that provided background information about the HIA and invited interested parties to participate in a major role. | All stakeholders |
| **Proctor Creek Watershed and Community Profile Handout** | Released April 2013 | This two-page handout was developed to help inform the HIA Advisory Group about the conditions in the community study area, including a profile of the population affected. | HIA Advisory Group |
| **Health Determinants and Outcomes Handout** | Released April 2013 | This two-page handout provides an overview of factors that affect health (i.e., determinants of health) and health disparities. | HIA Advisory Group |
| **Proctor Creek Green Street Project Overview** | Released April 2013 (revised July 2013) | This document summarizes the overall purpose and intent of this HIA. The factsheet highlighted the conditions within the Proctor Creek Watershed, a general community profile, green infrastructure basics, the Boone Boulevard Green Street Project Conceptual Design, the overarching theoretical pathway diagram, and the value added by and application of HIA. | All stakeholders |
| **1st HIA Advisory Group meeting, Atlanta, GA** | April 30, 2013 | The purpose of this meeting was to broadly introduce HIA, the HIA process, and intended purpose; as well as gain insight from local businesses and organizations, local government, and federal agencies on ways to improve the quality of life in the community and what the HIA should focus on in the assessment. The input from this meeting was used to guide the HIA scope. | HIA Advisory Group |

# Reporting

| Reporting Outlet | Date | Purpose | Primary Audience |
|---|---|---|---|
| **Summary of the 1st HIA Advisory Group meeting** | Released May 2013 | This five-page handout provided stakeholders with a summary of the discussions and activities that resulted from the first HIA Advisory Group meeting. The meeting activities focused on refining the interests and/or concerns related to the community and what the HIA should focus on in the assessment. | All stakeholders |
| **EPA SHC Partners Webinar titled, "Integration at Communities: Health Impact Assessments and integrating multiple sectors into critical community decisions," webinar** | June 5, 2013 | An HIA Project Leader presented on the HIA in this webinar to showcase how HIA is being used to address a community issue and its future direction in EPA. A brief presentation was given that identified why the community is an environmental justice community of concern, the issues facing the community, and how the HIA plans to address these issues. | Federal Partners in EPA's Sustainable and Healthy Communities Research Program |
| **2nd HIA Advisory Group meeting, Atlanta, GA** | July 23, 2013 | The purpose of this meeting was to inform stakeholders of the HIA's progress and enlist assistance in identifying potential data, sources, and tools available to address identified data gaps. The HIA Core Project Team presented the identified data sources, analysis methods, and preliminary findings. | HIA Advisory Group |
| **Atlanta Federal Executive Board Green Infrastructure Community of Practice Meeting and Poster Presentations, Atlanta, GA** | August 14, 2013 | Members of the HIA Core Project Team presented on this HIA at the meeting to highlight the collaborative efforts and work performed as part of the Boone Boulevard Green Street Project HIA. The presenters also provided background information about why EPA is using HIA to evaluate a green infrastructure project in Atlanta, GA. | Federal Agencies and The City of Atlanta |
| **2nd HIA Annual Meeting, Washington, DC** | September 24, 2013 | This HIA was presented at the National HIA Annual Meeting to inform the HIA community of practice about the HIA and showcase the strategies and tools used to support the HIA activities. | HIA Community of Practice |
| **2nd HIA community meeting, Atlanta, GA** | March 22, 2014 | The purpose of this meeting was to update the community on the HIA's progress, report some of the initial findings, and elicit feedback on how the HIA was progressing and potential data sources to fill data gaps. The second half of the meeting was dedicated to community capacity building. | Community residents |

# Reporting

| Reporting Outlet | Date | Purpose | Primary Audience |
|---|---|---|---|
| **Summary of the 2nd public, community meeting** | Released April 2014 | This four-page handout was developed to provide a summary of the discussions and activities that occurred during the second community meeting. | All stakeholders |
| **HIA Presentation to the City of Atlanta, GA** | April 15, 2014 | The purpose of this meeting was to share with the Atlanta city government (including DWM) the information presented at the community meeting and update DWM on the HIA's progress | Decision-makers (DWM and City of Atlanta) |
| **EPA ORD Sustainability Workshop** | April 16, 2014 | One of the HIA Project Leads presented on this HIA at EPA's ORD Sustainability Workshop to highlight the tools used in the HIA that address sustainability in an assessment to support a community-level decision | EPA and environmental science community of practice |
| **Presidential Advisory Group to the National Prevention Council Meeting, Washington, DC** | April 28, 2014 | The HIA Project Lead was asked to present on the HIA at the Advisory Group meeting. The presented information would be used to inform the National Prevention Council's recommendations regarding HIA and its use to protect and promote health. | National leaders in public health |
| **Final HIA Advisory Group and community stakeholder meeting** | June 5, 2014 | The purpose of this meeting was to update stakeholders and the general public on the HIA's purpose and progress; report the findings and initial recommendations from the HIA activities to the decision-makers, community, and general public; and elicit feedback from those groups on the assessment findings and recommendations. | All stakeholders |
| **International Society of Exposure Science 2014 Symposium: Turning Gray to Green: Exploring the Public Health Benefits of Green Infrastructure, Cincinnati, OH** | October 2014 | At this symposium, two members of the HIA Project Team presented on the work performed and the initial findings from the HIA to fellow environmental scientists and experts in green infrastructure. The presentation helped further inform the scientific community about the HIA and its use to evaluate a green infrastructure project. | Environmental science community of practice |
| **HIA Presentation to the City of Atlanta DWM** | April 16, 2015 | Members of the HIA Core Project Team presented the final HIA findings and recommendations, HIA report, and Executive Summary to the decision-makers. | Decision-makers (DWM and City of Atlanta) |
| **HIA Report** | April 2015 | The final HIA report documents the details of the HIA process, including the methods used, persons involved, and outputs of the HIA. | All stakeholders |
| **HIA Executive Summary of Key Findings and Recommendations**[1] | April 2015 | The executive summary of the HIA report highlights the main findings and recommendations of the HIA. As a supplement to the full report, this factsheet aids in sharing and distributing the results of the HIA. | All stakeholders |

# Reporting

## 6.2. Stakeholder Input from Reporting Activities

### 6.2.1. Stakeholder Participation and Input on Assessment Findings

On June 5, 2014, the HIA Core Project Team presented the HIA findings and initial recommendations to the stakeholders. Meeting attendees included members of the HIA Core Project Team, HIA Advisory Group, Community residents, and the decision-makers. The meeting agenda and presentation materials are provided in **Appendix C** under *Documentation of the Final Stakeholder Engagement Meeting, June 5, 2014*). A short PowerPoint presentation was given at the beginning of the meeting, which provided an overview of the HIA process for new participants, what had been done for this HIA, and a short profile of the existing population in the community. Next, stakeholders were asked to visit each of the posters staged around the room, which contained specific information about each of the health determinants appraised. A member of the HIA Core Project Team stood at each of the posters to answer questions and facilitate discussions about the predicted impacts of the proposed project on that health determinant. The poster presentation strategy allowed for a more individualized discussion about the assessment performed and provided direct access for stakeholders to those who performed the assessment. After the poster presentation was completed, the HIA Core Project Team solicited feedback and comments from stakeholders about the assessment and findings presented.

Stakeholders were asked to respond to the following prompt questions:

- *What are your thoughts on the findings? Did anything "stand out" to you?*
- *Was there anything that was presented today that you had not seen/heard before?*
- *Do you agree with what was observed or what the findings showed?*
- *Do you have any concerns/issues with what was presented?*

The HIA Core Project Team discussed each of the stakeholder responses from the final stakeholder meeting. There were several recommendations that received strong support from both residents and non-residents. However, the team noted several differences in priorities between those stakeholders who were residents in the study area and those who were not residents. Overall, stakeholders strongly supported the recommendation to expand the size of the proposed project as well as look for other opportunities to implement green infrastructure throughout the watershed. The recommendations that were able to gain the most support from residents and other stakeholders included those that asked for more advocacy support, more policing and enforcement of civil ordinances, and more opportunities for employment and job training. Table 50 documents the specific comments from stakeholders at the final stakeholder meeting and responses from the HAI Core Project Team.

**Table 50. List of Stakeholder Comments to Assessment Findings**

| Stakeholder Comments | Responses from HIA Core Project Team |
|---|---|
| **Stakeholders supported HIA's consideration to look at impact of trees (root zone) on water flow/percolation and maintenance of bioswales.** | No response needed. |

# Reporting

| Stakeholder Comments | Responses from HIA Core Project Team |
|---|---|
| **BMPs should be defined in the (findings) posters (i.e., what does BMP stand for?).** | The HIA Core Project Team went through the report and supplemental communication materials (i.e., posters, factsheets, and handouts) to make sure all acronyms were explicitly defined to prevent any unnecessary confusion. |
| **Investigators should consider the impacts of the pilot/demonstration project on a large scale (i.e., if the project was expanded). For example, what would happen if we replicate green infrastructure projects throughout the whole watershed?** | The Core Project Team supported this suggestion and the HIA Project Leads began building support among Agency management and partners to expand the HIA discussion to the broader geographic scope. The HIA Project Leads were able to identify a proposed decision and secure support in developing a second (expanded) HIA in the Proctor Creek Watershed that would evaluate the process of siting green infrastructure projects in the (proposed) Proctor Creek Environmental District. |
| **Investigators could have identified more opportunities for stormwater runoff and flood prevention in the community (e.g., Super Giant Community Garden parking lot). The HIA could look at the first teaching gardens in the U.S. for low-income neighborhoods.** | The purpose of this HIA was to inform the implementation of the proposed Green Street Project along Boone Street. The HIA Core Project Team does want to recognize the opportunity to expand this discussion to other areas in the watershed and work has begun to develop a second (expanded) HIA in Proctor Creek Watershed. |
| **Residents have observed a foul, sewage-like smell coming from the Proctor Creek/North Avenue combined sewer outflow. Residents want the smell addressed and removed.** | A foul, sewage-like smell from the outflow is both a water quality concern and nuisance for residents. This information was incorporated into the observations under *Chapter 5: Assessment*. This stakeholder-identified recommendation received support from other stakeholders, which indicates that this issue should be a priority for DWM. The recommendation was added to the final list of recommendations and ranked. |
| **The proposed Super Giant Food (sited on Moreland Avenue) will have a community meeting room available to the public once renovations are done.** | Moreland Avenue is outside this HIA study area, but the information provided will be transferred to the second (expanded) HIA in the Proctor Creek Watershed. |
| **Several stakeholders pointed out that the HIA lacked a mapping of the community's assets. One person at the stakeholder meeting announced that the Healing Community Health Center (at 2600 Martin Luther King by Hamilton Holmes Dr.) is now a federally-qualified health center. Researchers should inventory existing measures that address crime through asset mapping.** | The HIA Core Project Team recognized this missed opportunity and revisited the section. The team gathered data on existing community centers, schools, and other assets in the community that provides opportunity to build social capital. The assets were mapped using Arc-GIS and verified in Google Maps©. The added information yielded a more informed discussion related to social capital in the study area. The health center mentioned (left) was well-outside the HIA study area, but the information provided will be transferred to the second (expanded) HIA in the Proctor Creek Watershed. |

# Reporting

| Stakeholder Comments | Responses from HIA Core Project Team |
|---|---|
| **The assessment needed to consider the difference between subjective (perceived) safety versus objective (police recorded measures) safety and the residual factors of crime (i.e. fear, lack of policing) in the project area.** | The HIA Core Project Team went back through the assessment on crime (perceived and actual) to ensure the literature review findings were explicit when referring to perceived versus actual safety and/or security. Furthermore, the HIA Core Project Team used GIS-supported modeling to map the crime data, provided by the Atlanta Police Department. This new information was added to the discussion in Chapter 4: Assessment under the health determinant– crime. |
| **Researchers need to be cautious about relevance of relationships, such as the connection between green infrastructure and access to healthcare – neither one affects the other.** | The HIA Core Project Team revisited the discussion regarding access to goods and services, greenspace, and healthcare. The nature of the relationship was made more explicit. For example, the proposed project is expected to remove barriers to accessibility, such as improving traffic safety, reducing surface temperatures, providing shaded relief along the proposed project site, and supporting healthy behaviors. Although these improvements are not directly linked to healthcare, accessibility is one of the many factors that influence healthcare use. |
| **Investigators need to keep in mind size of project and that it is a demonstration project, because of the potential for cumulative impact. There was not enough discussion on the estimated impacts of the project. Researchers needed to recognize that this is a demonstration project and that values (both qualitative and quantitative) would better support community and agency decision-making.** | The HIA Core Project Team recognized and agreed that the small size of the project limited the project's magnitude of impact. The team revisited the characterization of each impact and ensured the characterization reflected this limitation. However, the recommendation to expand the use of green infrastructure and/or replicate the proposed project elsewhere in the watershed still stands due to the potential for stakeholders to benefit from the cumulative nature of the impacts, as suggested in the stakeholder's comment (left). |
| **There was not enough recognition for solid waste and tires as a problem for the community and whether they should be reduced or prevented.** | The HIA Core Project Team recognized and agreed that the illegal dumping activities was a substantial concern in this community and a contributing factor to the water quality in the area (albeit an unknown magnitude of contribution). This issue is discussed in the introduction, scoping, and assessment chapters of the report. The recommendation (identified by the HIA Core Project Team) to "increase law enforcement of nuisance laws in regards to abandoned properties, illegal dumping, and property maintenance" was ranked the first item to be adopted and/or implemented by the City. |
| **More research is needed on impacts of greenness (percent) and access to goods and services.** | The HIA Core Project Team recognized the limited evidence available to directly attribute health status to greenness, although there are many studies that indicate a relationship exists. Investigating these relationships further could add great value to the field of environmental research and public health. Thus, members of the HIA Core Project Team committed to investigating these relationships further after the completion of the HIA. |

# Reporting

| Stakeholder Comments | Responses from HIA Core Project Team |
|---|---|
| **The HIA could include more context/background that could be used by the community to advocate for more efforts to address issues.**<br>**Prompt question for researchers: What can we do to build the capacity for self-determination for communities and organizations?** | The HIA Core Project Team recognized that the posters prepared at the meeting did not provide the necessary detail to portray the conditions in the community required to advocate for needs effectively. The posters were provided to give stakeholders at the meeting a summary of the key findings from the HIA so that feedback on the findings and recommendations could be provided. The full HIA report would be used to fulfill this need by providing more details about the conditions in the study area, history of the community, and stakeholder needs. The team also recognized that the report may be more extensive in some places than what was needed for advocacy. Thus, the team resolved to provide an executive summary of the HIA report, including the main findings and recommendations, that was appropriate in length and detail for community groups to advocate for their needs. |

### 6.2.2. Stakeholder Participation and Input on HIA Recommendations

The core recommendations were presented to the stakeholders by poster presentation at the meeting on June 5, 2014. Nine posters, discussing 1-2 health determinants each, were posted on the walls around the meeting room with a member of the HIA Core Project Team at each poster to facilitate discussion and answer questions. The stakeholders were asked to consider three questions while reviewing each poster:

- *Do you agree with the recommendations made?*
- *Do you think the recommendations are feasible?*
- *Is there anything we may have missed or did not include in the recommendations presented that should be included?*

Stakeholders were then asked to place their comments and additional recommendations on a sticky note and post it to the related health determinant. There were two reoccurring themes in the stakeholder-identified recommendations, which were to a) keep the community engaged in the planning, implementation, and monitoring phases of the project; and b) to help support community advocacy in addressing the community's needs. After the meeting, the posters were documented and summarized. Table 51 lists specific responses from stakeholders regarding the recommendations.

**Table 51. List of Stakeholder Comments to the Initial HIA Recommendations**

| Stakeholder Comments | Responses from HIA Core Project Team |
|---|---|
| **Stakeholders supported the repaving of the street and restriping the road to include a designated bike lane so the road is safer for cyclists, as well as using permeable pavement to treat stormwater runoff.** | No response needed. |
| **Recommendations or proposed changes need to take into account community-specific** | The HIA Core Project Team revisited the recommendations proposed to ensure they were |

# Reporting

| Stakeholder Comments | Responses from HIA Core Project Team |
|---|---|
| **context, because changing something may not necessarily make situations better.** | appropriate for the community. Caveats were provided, where appropriate, to ensure possible negative consequences were avoided and/or mitigated. |
| **Researchers should include Westin Heights and Bankhead neighborhoods in recommendations.** | The areas identified in this comment were outside the study area for this HIA, and thus were not included in the assessment nor recommendations. However, The HIA Core Project Team resolved to ensure the second (expanded) HIA in Proctor Creek included these areas in considerations. |
| **One stakeholder recommended that the HIA involve or connect with local schools to have kids involved in the monitoring and evaluation plan.** | The HIA Core Research Team agreed with this suggestion and resolved to incorporate this recommendation into the monitoring plan. |
| **The Arthur Blank Foundation and the Emory Health Initiative could be solicited as potential resources for assessing/monitoring impacts after the project has been implemented. It would be great to use/publish data from the results of the Green Street Project to establish the effects it had immediately after completion, 1 year after completion, 5 years after completion, etc.** | The HIA Core Research Team agreed with this suggestion and resolved to incorporate this recommendation into the monitoring plan. |
| **The monitoring (plan) should include monitoring impacts of street diet on traffic noise (e.g., loud cars, music boxes, etc.) and (local) air quality.** | The HIA Core Research Team agreed with this suggestion and resolved to incorporate this recommendation into the monitoring plan. |

Stakeholders were asked to vote on the recommendations they supported using red dot stickers. Residents in the community were given red dots with an asterisk (*). The HIA Core Project Team asked each stakeholder to review the recommendations posted for each of the health determinants and cast their votes (using the stickers given) for the recommendations they deemed as their highest priority. The purpose of this exercise was simply to identify which recommendations were of high importance to the stakeholders, especially those who lived in the community. Three stakeholder-identified recommendations received a high number of votes from stakeholders. Those three items were added to the final list of HIA recommendations.

*Note: The team assumed that each stakeholder who attended the meeting also participated in the voting. It was not documented whether each person used all of their votes or whether they voted more than once on a particular recommendation.*

# 7. Monitoring and Evaluation

After the HIA is completed, several follow-up activities should occur. The design and implementation of the HIA should be evaluated (i.e., perform a process evaluation). There should be a follow-up on the result of the decision to determine whether the HIA influenced the decision-making process and/or final decision (i.e., perform an impact evaluation). To some extent, the effect(s) of the final decision on health and/or determinants of health should be included in the follow-up activities (i.e., perform monitoring to inform an outcome evaluation).

## 7.1. Monitoring, Impact and Outcome Evaluation

Monitoring is an important follow-up activity to the HIA process and is performed after the HIA findings and recommendations have been reported. If monitoring is not included in the original HIA work plan, the HIA project team should provide a plan for monitoring the decision and health impact after the HIA is completed. There are two main aspects of monitoring after the HIA— one of which is to follow up on the decision and/or decision-making process, the other involves following up on the health impacts predicted in the HIA. These follow-up activities inform whether the HIA influenced the decision-making process and/or final decision (i.e., informs the impact evaluation) and whether the effect of the final decision on health (i.e., informs the outcome evaluation).

### 7.1.1. Monitoring the Impact(s) of the HIA

The HIA Core Project Team identified several questions that would inform stakeholders whether the HIA influenced the decision-making process and/or final decision (i.e., inform an impact evaluation):

- Was the proposed Green Street Project implemented as outlined in the conceptual design or were there changes made? If so, what were the specific changes and why were they made?
- Did DWM adopt and implement each of the recommendations from the HIA? If not, was there rationale provided for why the recommendations(s) were not adopted?
- Has there been any change to the policies of developing and/or implementing green infrastructure or other community-based projects by the City of Atlanta?
- Does DWM accredit the HIA with

Each of these questions can be answered in a short survey or by interview of a representative from the DWM after the project has been implemented. The questions and responses should be documented in a one-page factsheet or flyer and provided, at minimum, to the list of stakeholders that participated in this HIA, as well as made publically available. If DWM does not implement the proposed project at all, then they should provide a factsheet and/or flyer to the public explaining why this was the final decision and whether information from the HIA was used to make this decision.

### 7.1.2. Monitoring the Impact(s) of the Decision

Monitoring health impacts is not typically done as a part of the HIA, since the HIA is completed to inform the decision and monitoring changes in health outcomes and/or health determinants is a time-

intensive process. It may take years before changes to health are actually observed and reported. Furthermore, it is difficult to attribute a change in health to any specific decision, simply because a person's health is affected by various factors that may or may not have been assessed as part of this HIA. Since the timeframe of this HIA was limited to a year, the HIA Core Project Team provides a plan for monitoring changes to health and/or determinants of health that result from the decision (i.e., inform an outcome evaluation).

*Note: If one or more of the health determinants and/or health outcomes are found to be too impractical to monitor, a proximate health determinant should be considered as a substitute. For example, waterborne illness can be difficult to diagnose and monitor, given that most illness is treated with over-the-counter medications. A more practical and highly recommended option is monitoring water quality, which is already performed by the City of Atlanta, State of Georgia, and EPA.*

Monitoring activities are often determined by the amount of resources available, but should be performed in interval periods (e.g., every 6 months, every year, every other year, etc.) after the proposed project it completed in its entirety. Utilizing members from the community (i.e., citizen-participatory research) in follow-up activities allows for limited resources to be used more efficiently, improves specificity by targeting specific areas of concern, accelerates early detection of pollution and remediation actions, increases community-buy-in for environmental improvement efforts, and increases community outreach and capacity building. One example includes the routine monitoring performed by the Upper Oconee Watershed Network, which monitors water quality northeast of Atlanta, near Athens (Little, et al. 2007).

There are many chronic diseases or cause-specific health outcomes monitored at the county and state levels by the GA─DPH surveillance program. There is an opportunity for partnerships between the City of Atlanta, Fulton County Department of Health and Wellness, and local/regional 501(c)(3) hospitals[15] to conduct periodic community health needs assessments (CHNA) in the community. CHNAs incorporate individual characteristics with community characteristics, including strengths and needs, to investigate the health status of a community and identify intervention opportunities aimed at improving public health. CHNAs are generally performed at the regional or metropolitan statistical area; however, a neighborhood or community level assessment could be incorporated into a larger CHNA dataset.

Regardless of methods or tools used in follow-up activities, the HIA Core Project Team stresses the importance of collaboration between stakeholders to perform monitoring. For this reason, the HIA Core Project Team prepared list of outcomes that should be monitored after the final decision is made and identified potential partners for carrying out those activities (Table 52).

*Note: The purpose of this exercise is to provide a more focused approach for stakeholder collaboration in future monitoring efforts. The HIA Core Project Team did not account for feasibility (i.e., cost, personnel available, timing, etc.) in the proposed monitoring plan because the entities performing the monitoring were not yet identified. The HIA Core Project Team did identify potential partners for monitoring outcomes so that stakeholders could initiate conversations regarding follow-up activities.*

[15] New requirements under the Affordable Care Act (passing in 2010) state that in order for 501(c)(3) hospital organizations to keep their tax-exempt status, they must perform a CHNA, publically report the findings, and adopt an implementation strategy to address identified needs at least once every three years.

**Table 52. Proposed Plan for Monitoring Health Impacts Post-decision**

| Determinant of Health | Potential Indicators | Potential Data Sources | Potential Partners |
|---|---|---|---|
| **Water Quality** | • Fecal coliform and/or *E. coli* (cfu/100mL) in effluent from Proctor Creek/North Avenue combined sewer outflow<br>• Nitrate nitrogen (NO3N; mg/L) Total kjeldahl nitrogen (TKN; ,g/L), Total Phosphorous (TP; mg/L), Total Suspended Solids (TSS; mg/L), Biochemical Oxygen Demand (BOD; mg/L), Copper (Cu; µg/L), Lead (Pb; µg/L), Zinc (Zn; µg/L) and oil/grease (mg/L) in effluent from bioretention cells along Boone Street<br>• Number and location of illegal dump sites (for waste and/or tires)<br>• Number and location of code issues | • GA─EPD Water Quality Monitoring Reports and/or data<br>• City of Atlanta DWM<br>• EPA Region 4 Water Protection Division and/or RCRA Program<br>• FC─DHW Environmental Health Services Division Community- Based Clean-up surveys<br>• City of Atlanta Strategic Community Investment (SCI) Report data and City of Atlanta 2013 Tax Digest (use GIS mapping) | • GA─EPD<br>• DWM<br>• EPA Region 4 Water Protection Division and/or RCRA Program<br>• FC-DHW<br>• City of Atlanta Department of Planning and Community Development<br>• Community residents (use NPUs)<br>• Academia (e.g., Emory University, Spelman University, Georgia Institute of Technology, Georgia State University, Kennesaw State University Department of Geography and Anthropology)<br>• West Atlanta Watershed Alliance<br>• Chattahoochee Riverkeeper<br>• Environmental Planning and Historic Preservation Association |
| **Flood Management** | • Topographic Wetness Index (TWI)<br>• Number and location of vacant and/or derelict properties<br>• Storm flow (cm/wk) and Peak Discharge ($m^3$/L) of effluent from the bioretention cells along Boone Street | • EPA Region 4 Water Protection Division and/or RCRA Program (use GIS mapping)<br>• City of Atlanta SCI Report data and City of Atlanta 2013 Tax Digest (use GIS mapping)<br>• City of Atlanta DWM | • EPA Region 4 Water Protection Division and/or RCRA Program<br>• City of Atlanta Department of Planning and Community Development<br>• City of Atlanta DWM |

| Determinant of Health | Potential Indicators | Potential Data Sources | Potential Partners |
|---|---|---|---|
| | | | • Community residents (use NPUs)<br>• Academia |
| **Climate and Temperature** | • Land surface temperature during summer months<br>• Infrared imaging of impervious surface area | • Earth Explorer Landsat data (cloud free images)<br>• Landsat Thermal Remote Sensing (TRS) Tools for ArcGIS Desktop | • EPA Region 4 GIS Specialists<br>• Academia |
| **Air Quality** | • 1 meter, 4-band, leaf-on imagery from National Agriculture Imagery Program (NAIP)<br>• Number and classification of tree species along corridor | • ArcMap 10.0 Classification Toolbar<br>• City of Atlanta Tree Planting List | • EPA Region 4 GIS Specialist<br>• U.S. DA Farm Service Agency<br>• City of Atlanta Office of Buildings Arborist Division |
| **Traffic Safety** | • AADT<br>• Traffic Crashes along Boone Street (Zone 1) | • Georgia State Traffic and Report Statistics (STARS) Traffic Counter #5679, Fulton County, Boone Street at Elm Street, County Code #121, non-directional<br>• Atlanta Police Department Beat 102 and 103 | • GA─ DOT<br>• City of Atlanta Police Department<br>• Atlanta Bicycle Coalition |
| **Exposure to Greenness** | • 1 meter, 4-band, leaf-on imagery from National Agriculture Imagery Program (NAIP)<br>• Resident-reported mental and behavior health concerns | • ArcMap 10.0 Classification Toolbar<br>• CHNA survey tool | • EPA Region 4 GIS Specialist<br>• U.S. DA Farm Service Agency<br>• City of Atlanta<br>• FC─ DHW<br>• Local/regional 501(c)(3) hospital(s)<br>• Community residents (use NPUs)<br>• Academia |
| **Exposure to Urban Noise** | • Measured and/or modeled (day and night) ambient average noise levels from traffic<br>• Resident-reported annoyance and/or sleep disturbance from urban noise | • Sound level (decibel) meter<br>• CHNA survey tool | • Academia<br>• FC─ DHW<br>• Community residents (use NPUs)<br>• Academia |

| Determinant of Health | Potential Indicators | Potential Data Sources | Potential Partners |
|---|---|---|---|
| **Access to Goods and Services** | • Average Commute<br>• Walkability (walk score)<br>• Bike-ability (bike score)<br>• Transit score | • City of Atlanta SCI Neighborhood Investment Area Wave<br>• www.walkscore.com (2013 Walk Score®)<br>• Walkability survey tool | • FC─ DHW<br>• Community residents (use NPUs)<br>• Academia<br>• Atlanta Bicycle Coalition<br>• Atlanta Beltline, Inc.<br>• Community Improvement Association |
| **Crime** | • Number, location, and type of crime incidences<br>• Resident-reported perceived safety and/or security in home and in neighborhood | • City of Atlanta Police Department Beat 102 and 103 Yearly Crime Count<br>• City of Atlanta SCI Neighborhood Investment Area Wave<br>• CHNA survey tool | • City of Atlanta Police Department<br>• City of Atlanta Department of Planning and Community Development<br>• FC─ DHW<br>• Community residents (use NPUs)<br>• Local/regional 501(c)(3) hospital(s)<br>• Academia<br>• Community Improvement Association |
| **Social Capital** | • Number and location of public benches, bike racks, and covered-bus stops<br>• Population growth and density<br>• Educational attainment (population over 25 years)<br>• Number and location of community assets | • Window (windshield) survey tool<br>• CHNA survey tool<br>• City of Atlanta SCI Report data<br>• U.S. Census Bureau<br>• GIS-based asset mapping | • FC─ DHW<br>• City of Atlanta Department of Planning and Community Development<br>• Community residents (use NPUs)<br>• Local/regional 501(c)(3) hospital(s)<br>• Invest Atlanta<br>• Georgia Trust for Public Lands<br>• Community Improvement Association |

| Determinant of Health | Potential Indicators | Potential Data Sources | Potential Partners |
|---|---|---|---|
| | | | • Academia |
| **Household Economics** | • Employment rate<br>• Households living below federal poverty level<br>• Annual household income<br>• Monthly housing costs (renter and home-owner)<br>• Number of cost –burdened households (paying more than 30% of annual income on monthly housing costs)<br>• Mean and median residential properties values<br>• Location affordability index | • U.S. Census Bureau<br>• City of Atlanta Tax Digest<br>• ArcGIS mapping (parcels located every 500 feet from the project site)<br>• HUD location affordability index (http://www.locationaffordability.info/lai.aspx) | • HUD-Atlanta Regional Office<br>• Atlanta Department of Planning and Community Development |
| **Community Economics** | • Retail Access<br>• Curb Appeal<br>• Real Estate Transaction Value<br>• Mean and median non-residential properties values | • City of Atlanta SCI Neighborhood Investment Area Wave<br>• City of Atlanta Tax Digest<br>• ArcGIS mapping (parcels located every 500 feet from the project site) | • HUD-Atlanta Regional Office<br>• Atlanta Department of Planning and Community Development<br>• Invest Atlanta<br>• Georgia Trust for Public Lands |

## 7.2. Process Evaluation – Evaluating the HIA Design and Implementation

After the HIA was completed, the HIA Core Project Team evaluated the ability of the HIA to meet its stated goals and the *Minimum Elements,* and *Practice Standards of HIA* (North American HIA Practice Standards Working Group 2010). Evaluating the design and execution of the HIA results in valuable information that can be used to help refine methods and approaches used in HIA and advance the HIA community of practice. Early in the HIA process, the HIA Core Project Team developed a plan for evaluating the HIA, which included an Agency administrative review, and an external peer-review by three HIA practitioners. In addition, the HIA Core Project Team identified successes, challenges, and lessons learned.

### 7.2.1. HIA Goals Achieved

At the completion of this HIA, the HIA Core Project Team reviewed the original goals established in the Scoping step and evaluated whether those goals were achieved or not achieved. The results of this evaluation are documented in Table 53.

**Table 53. Evaluation of HIA Goal Achievement**

| HIA Goal | Achieved? | Documentation |
|---|---|---|
| **Add a vehicle for equitable inclusion of all stakeholders in the decision-making process.** | Yes | The HIA Core Project Team strongly agree that this goal was achieved. EPA was able to solicit participation in the HIA from a broad perspective of stakeholders groups, including representatives from the community, decision-makers, business investors, universities, national and state government agencies, and non-government organizations. In addition, the input provided by the stakeholders was incorporated into the HIA findings and recommendations and presented to the decision-makers for consideration. |
| **Assess the effectiveness of the proposed green infrastructure project and raise awareness of the environmental, economic, and societal impacts of implementing green infrastructure in the designated community.** | Yes | The HIA Core Project Team judged this goal achieved because the assessment was able to evaluate the effectiveness of the proposed project to improve stormwater qualtiy and flood management. Those impacts are described in the report. Furthermore, the HIA Core Project Team was able to assess the proposed project for its potential to effect other environmental, social, and economic factors that affect health and reported the main findings to the stakeholders via poster presentation, PowerPoint presentation, and in the HIA report and separate Executive Summary. |
| **Provide recommendations for implementing the proposed project that incorporate approaches to stormwater management, ecosystem restoration, and community revitalization.** | Yes | The HIA final recommendations presented to decision-makers integrated aspects to protect environmental and public health, promote healthy living, encourage stakeholder collaboration and/or coordination, and encourage sustainable development. Furthermore, short-term recommendations focused on strategies DWM could implement that would maximize potential benefits and |

| HIA Goal | Achieved? | Documentation |
|---|---|---|
| | | minimize and/or avoid potential adverse effects from implementing the proposed project. |
| **Increase transparency, local accountability, community empowerment, and ownership of the proposed plan through meaningful stakeholder engagement.** | Yes | Through the HIA process, EPA was able to raise awareness of the proposed project among the different stakeholder groups and engaged those stakeholders in each step of the process, in addition to serving as members of the HIA Core Project Team. The HIA Core Project Team engaged documented the activities in the HIA report and communication materials to ensure transparency. Furthermore, the HIA Core Project Team hosted an HIA training workshop (on May 23, 2013) and capacity building workshop (on March 22, 2014) for local residents and organizations. |

### 7.2.2. Successes Identified by the HIA Core Project Team

The HIA Core Project Team identified successes experienced in carrying out this HIA. Those successes are provided below.

- Branding materials helped to increase recognition of materials coming from the HIA and created a unified format that expedited material production.
- Reviewing previous HIA Reports and practice guidelines helped in the development of this HIA and in ensuring that the HIA achieved the *Minimum Elements and Practice Standards*.
- EPA and GHPC held a full-day HIA training workshop at the beginning of the HIA process for stakeholders. This training helped to provide more background on the HIA process and further acquaint stakeholders with HIA, since the process is unique and different from other commonly used impact assessments.
- As a federal Agency, EPA might appear to be removed from the community in which the assessment occurred. Having the HIA co-led by the EPA regional office, with team members from or familiar with the community, helped to alleviate this challenge.
- Hosting public meetings in the community and at the federal building near the community helped to ensure accessibility for community residents and other stakeholders to become engaged in the HIA process.
- This HIA used a single person as the gatekeeper for sharing information between groups. This strategy helped streamline the sharing of information and the recognition of materials coming from the HIA. Furthermore, this strategy provided a clear point of contact for community-based groups and other stakeholders.
- Stakeholder engagement in this HIA had participation from many community-based organizations, as well as several community residents. Each HIA Advisory Group meeting had a diverse group of stakeholders and representatives from both the community and the decision-makers at the table.

### 7.2.3. Challenges Identified by the HIA Core Project Team

The HIA Core Project Team identified challenges faced during this HIA. The HIA Core Project Team utilized several strategies to counteract unanticipated challenges. Those challenges are provided below.

- Overall, the nature of being a federally led HIA posed some unique challenges regarding expectations about the assessment and its intended purpose. One expectation was that EPA would perform a scientific evaluation of the proposed project. Although the HIA process uses science-based methods, it is not a scientific process. In other words, HIA is a pragmatic exercise that involves using the best available evidence with varying levels of uncertainty and assumptions. The HIA Core Project Team used multiple strategies to manage expectations, such as providing an HIA training workshop, holding one-on-one meetings with individuals functioning under a misconception, and explicitly defining the purpose, scope, and limitations of the HIA for each stakeholder engagement activity.
- As a federally led HIA, the HIA Core Project Team proactively *avoid* the misconception that recommendations from the HIA would have a regulatory component. Although EPA led the HIA, the HIA Core Project Team that included members outside the Agency developed the recommendations. The HIA Core Project Team made it very explicit that the recommendations coming from the HIA were given as guidance. Recommendations were developed under the assumption that they could be adopted or not adopted at the discretion of the decision-makers (i.e., DWM and the City of Atlanta). The recommendations and proposed monitoring plan are not intended in any way to proceed in a regulatory manner and were posed only as a suggestion for future action.
- A reoccurring challenge in the HIA was the misconception about what was involved in the process and how to differentiate HIA from other impact assessments (e.g., environmental impact assessment, community health needs assessment, community needs assessment, impact assessment, etc.). Several of the stakeholders and members of the HIA Core Project Team and HIA Advisory Group were familiar with and had practiced other forms of impact assessment. This often led to preconceived ideas about what the HIA process should entail. The HIA Core Project Team addressed this issue by co-hosting an HIA Training Workshop with the HIA Advisor from the Georgia Health Policy Center at the EPA Region 4 Office, in addition to a brief 3-5 PowerPoint presentation about the HIA process, including a question and answer session, preceding each stakeholder engagement activity.
- An unforeseen obstacle in the planning of this HIA was the actions of Congress that led to sequestration and a 16-day shutdown of the federal government. Sequestration is the action of taking legal possession of assets until a debt or claims have been met. In the case of the U.S. government, this meant budget cuts across the different branches of government, including programs and agencies that are managed through yearly appropriations. The sequestration resulted in periodic mandatory leave of absence for EPA staff and its federal contractors, causing temporary arrest of HIA work. In addition, the federal government shutdown on October 1, 2013 resulted in a mandatory leave from work that lasted sixteen days. Furthermore, scheduling conflicts among the HIA Core Project Team and between the HIA Core Project Team and other stakeholder groups was one of the most common causes of delay in the HIA timeline. Inevitably, these actions resulted in a shifting of the HIA timeline from its original expected completion date (end of October 2013) to its current date of completion (April 2015). Throughout the process, the HIA Core Project Team kept in close contact with community leaders and decision-makers to ensure the change in timeline would not render the HIA irrelevant or its information unusable.

### 7.2.4. Lessons Learned Identified by the HIA Core Project Team

Based on the success and challenges experienced during this HIA, the HIA Core Project Team offers the following list of lessons learned for future HIA practice.

- Consider commitment requirements (e.g., time, personnel, funding, etc.) for both stakeholders and those performing the HIA. One of the EPA contractors that worked on this project from the scoping step to the completion of the HIA reported 1,455 hours dedicated to this HIA, which equates to approximately 182 days or six months of full-time work (i.e., 8 hours per day, 40 hours per week). It should be noted that this HIA was only one of many projects in which the members of the HIA Core Project Team were involved. As such, scheduling conflicts was one of the most common causes of delay in the HIA timeline. Thus, future HIA project managers need to account for the amount of time participants can commit to the HIA when establishing the HIA project team. Furthermore, there needs to be different levels of participation intensity in the HIA for stakeholders who have limited and/or varying levels of resources, but want to participate.
- Incorporate reporting and evaluation aspects of HIA early on in the process (i.e., as early as screening) to ensure documentation of the process is thorough and to avoid too much time lapse between the completion of the HIA and reporting to stakeholders.
- Develop the HIA timeline to allow extra time for potential unexpected delays, scheduling conflicts, or other unexpected complications that may arise during implementation of the HIA.
- The HIA team needs to continue vigilant communications with stakeholders and decision-makers throughout the process to avoid unmet expectations and scheduling conflicts.
- Develop a core team of individuals responsible for performing the HIA that have multiple skills and expertise so that the various tasks in the HIA process can be accomplished. Table 54 provides examples of the various roles and skills that are valuable in the HIA process.

**Table 54. Valuable Roles and Skills in the HIA Process**

| Roles | Skills Needed |
|---|---|
| **Community Liaison** | Team member with knowledge of the community, that has access to the community social and formal networks (e.g., community leader, historian, member of a community representative organization, long-time resident) |
| **Public Health Researcher** | Team member with knowledge of basic public health principles and mediating factors that influence health (e.g., public health professional, physician, health educator) |
| **Project Leader** | Team member who is well versed and has experience managing teams with multiple skills/fields of expertise; leading meetings and discussions; organizing action items; and establishing project goals, frameworks, timelines and communication plans. |
| **HIA Technical Advisor** | Team member or advisor who has extensive knowledge and experience conducting and evaluating HIAs, including best practices and lessons learned (e.g., representative from HIP, GHPC, OPHI, and UCLA-HIA program) |
| **Researcher(s)** | Team member(s) with experience planning and conducting research who can perform literature reviews, risk assessments, and develop and test research questions/hypotheses (e.g., epidemiologist, community health researcher, etc.). |
| **Writer/Editor** | Team member with experience writing and editing scientific papers and producing reports and materials for different agencies. |

| Roles | Skills Needed |
|---|---|
| **Field Expert(s)** | Member(s) with experience and knowledge about the specific fields of interest in the HIA (e.g., housing, transportation, watershed management, ecology, engineering or architecture, public and community health, etc.). These individuals typically serve on the HIA project team and/or an advisory committee. |

### 7.2.5. External Peer-Review of HIA

This HIA Report underwent a review by HIA practitioners external to the HIA effort (i.e., external peer-reviewers) who could provide an experienced perspective outside of those directly involved in the process and/or the decision. The external peer-reviewers were charged with evaluating the HIA against the HIA Minimum Elements and Practice Standards (North American HIA Practice Standards Working Group 2010). Blind invitations were sent through a third party to potential reviewers, inviting them to provide a critical review of this HIA. Three practitioners agreed to provide a critical review and were provided monetary compensation for their time and effort. The three reviewers included Mandy Green, Kitty Richards, and Jonathan Heller.

Mandy Green is the Founder and Principal at Green Health Consulting, LLC in Portland, Oregon. Ms. Green is a public health professional and environmental epidemiologist with 10 years of experience at state and local government agencies and in non-profit organizations, in addition to being a founding member of the Northwest HIA Network. Kitty Richards is a Program Manager at Bernalillo County Environmental Health Department in New Mexico and a member of the New Mexico Environmental Law Center Board of Directors. Ms. Richards has expertise in educating and informing the public about environmental health issues and over 15 years of work in public health with an emphasis on impacts of land use development on community health. Johnathan Heller is the co-Director and co-Founder of Human Impact Partners, one of the organizations leading HIA practice in the U.S. Mr. Heller has worked on over a dozen HIAs, conducted many HIA trainings, and has mentored others on how to conduct HIAs. Mr. Heller currently serves as the Chair of the Provisional Steering Committee for the newly formed Society of Practitioners of Health Impact Assessment (SOPHIA) and as Chair of the Board of the Center for Community Change.

The external peer-reviewers provided comments that fell into four major categories: general, editorial, HIA process, HIA documentation, and stakeholder participation. The HIA Core Project Team responded to each of the reviewer comments and proposed revisions, as appropriate (refer to **Appendix E** for the specific comments from the external peer-reviewers and responses from the authors of the HIA report). The following sections provide a summary of the comments from the external peer-reviewers by category.

#### *General Comments*

Two reviewers commented on EPA's choice to perform an HIA on a project with such a small geographic area of impact. The authors revisited the Screening chapter and recognized that the discussion could benefit from more documentation of how the HIA was screened. The HIA was initially screened to inform the implementation of the PNA Vision. Later, DWM could not secure funding to implement the master plan in its entirety and selected the Boone Street demonstration project as a catalyst for building

support for implementing the rest of the plan. Thus, the HIA was quickly rescreened for the smaller project. The authors resolved to document (more explicitly) how the HIA was screened and the considerations made during the screening process. In addition, the HIA Project Leads committed to expanding the HIA to examine green infrastructure implementation throughout the entire Proctor Creek Watershed, as requested by stakeholders and other participants in the HIA.

One reviewer commented that it would be beneficial to strengthen (i.e., add more text addressing) the discussion of equity in the HIA, including use of equity metrics recently released by a Society of Practitioners of Health Impact Assessment (SOPHIA) working group. The equity metrics were not used for this HIA because they were issued after the HIA was complete, but will be considered in future HIAs. Equity was identified as a core value of HIA up front and identification of vulnerable populations and consideration of impact distribution. The authors acknowledged that the potential for impact inequity identified in the literature could have been further examined and documented for each health determinant. This is a shortcoming of the HIA and perhaps the instructions for the literature reviews. The authors will examine the instructions for the literature reviews and modify them, as necessary, for future HIAs to ensure that equity issues documented in the literature are adequately captured.

### *Editorial Comments*

These comments received from reviewers addressed wording, mechanical errors, formatting issues, and requests for verbiage clarification in the text. The authors addressed all of these issues and made revisions in the report.

### *HIA Process Comments*

Overall, all three reviewers commended the thoroughness, quality, and appropriateness of the HIA process undertaken (including the evidence on which the HIA was based). There were a few comments identifying possible areas of improvement in the HIA process.

One of those areas of improvement regard the length of time it took to complete the HIA and the opportunity for lessons learned in HIA planning. The authors acknowledged this opportunity in the discussion of HIA timeline and resolved to clarified (in the text) the actual time taken to conduct the HIA, accounting for the unavoidable delays due to the sequestration, government shutdown, scheduling conflicts, etc. and the lack of dedicated full-time equivalents for the duration of the HIA.

One reviewer commented on the need to clarify the connections/pathways identified among the health determinants and provide more detail on the particular pathways from health determinant to health outcome. The authors addressed this issue by clarifying in the text the primary and secondary pathways of impact identified and provided an example explanation of the connections between them. The authors referred readers to the stakeholder handout with the overarching theoretical impact pathway diagram that shows how the proposed project was linked to each health determinant and their related health outcomes.

One reviewer commented that it seemed African Americans should have been included as a vulnerable population in the HIA. The authors acknowledged that being a minority race and/or ethnicity can predispose individuals to health inequities. Although African Americans are often identified as a minority and hence a vulnerable population in other study areas. However, in this study area African

Americans are the majority population and the HIA Core Project Team felt it was more appropriate to identify population characteristics that were directly related to the health determinants of interest (e.g., persons living in poverty, young children, elderly, physically disabled, and cost-burdened households).

One reviewer questioned the ratings used for characterizing magnitude of impacts suggesting that the number of individuals affected should be indicated and suggested using severity, rather than permanence, as one of the characterization factors. The authors acknowledged that the number of people potentially affected was not numerically assessed in the HIA, nor was severity of impact. However, the authors revisited the descriptions of the magnitude and permanence ratings and modified them to reflect more accurately the way in which the HIA Core Project Team appraised the impacts. The HIA Core Project Team provided a more accurate account of relative magnitude, since the impacts are expected to be localized due to the size of the project (i.e., changing "impacts to the entire population" to be "impacts to populations beyond the street" and "impacts to some groups" to be "impacts to the population using the street").

Reviewers commented that the profile of existing conditions is appropriate as a baseline against which to assess impacts, and commented on the thoroughness of assessment given the small study area. One reviewer commented on the identified lack of existing conditions for social capital. In response, the HIA Core Project Team performed a desktop asset analysis of the study area and provided a map and text to the authors. The authors added this new information identifying assets available in the community that provide space to build social capital in the HIA report. Reviewers identified additional sources of evidence that could have been used in the assessment (e.g., transit usage, data related to heat related illness, etc.), but overall commended the evidence selection and gathering, including the use of GIS to identify patterns in data when the data were not specifically available for the small study area. Some of the identified data were considered for inclusion, but were unable to be collected (e.g., transit usage) or did not include a sample size appropriate for analysis (e.g., heat-related illness).

All three reviewers commented that the recommendations provided by the HIA were reasonable and supported by the evidence, but that the list of recommendations was too long and lacked any sort of prioritization. The authors acknowledged this shortcoming in the original draft of the HIA report and resolved to include the information regarding prioritization of the recommendations that the HIA Core Project Team provided. Furthermore, the authors related the recommendations back to the predicted impacts in the Assessment chapter under each of the health determinants of interest. One reviewer also commented on the practice of highlighting the recommendations from stakeholders (vs. those developed by the HIA Core Project Team) could be seen as a negative, but the HIA Project Team wanted those recommendations to be highlighted to encourage support of those recommendations by the decision-makers. The authors added text in the HIA report to clarify the intent of highlighting the stakeholder recommendations.

One reviewer commented that the HIA report and factsheet were minimal avenues of communication and there was a lack of detail in the dissemination of communication materials. The authors revisited this discussion in the Reporting chapter and resolved to provide more detail to the reporting activities and dissemination plan. The HIA Core Project Team provided more information presentations given to the public, practitioners, and stakeholders throughout the duration of the HIA and details added about how the communication materials were distributed.

The reviewers commended the inclusion of plans for evaluation and monitoring, but the monitoring plan lacked contingency plans if stakeholders observed negative impacts during monitoring, considerations for feasibility of implementing the plan, and whether there was indication that stakeholders committed to implementing the plan. The authors acknowledged these missed opportunities in the HIA report.

### *HIA Documentation Comments*

All three reviewers commended the clearly written, logical, comprehensive, and transparent nature of the report, but warned that the report was too lengthy and in some areas too detailed and technical. Suggestions included shortening the report, creating an executive summary, and moving some of the more detailed discussions to the Appendices. All of of these suggestions were incorporated. The authors prepared an Executive Summary and made modifications throughout the report to condense text, tables, and figures and move material to the Appendices where appropriate. Primary sections of consolidation included the flood management and air quality sections and a large table identifying captured stakeholder input was moved from under Scoping to the Appendices to help streamline the document.

### *Stakeholder Participation Comments*

Reviewers commended the use of multiple avenues of stakeholder participation and inclusion of methods and materials documenting that participation in Appendices. One reviewer questioned whether community and stakeholders were involved in screening and another asked for clarification of what input was gathered by community organizations and which organizations were represented at each stakeholder meeting. The authors revised the stakeholder engagement plan by separating it out by HIA step and which roles were included, added text clarifying how stakeholders participated in the Screening step, and provided the organization represented next to each participant. However, the authors were unable to identify which participant provided which input because documentation was not available.

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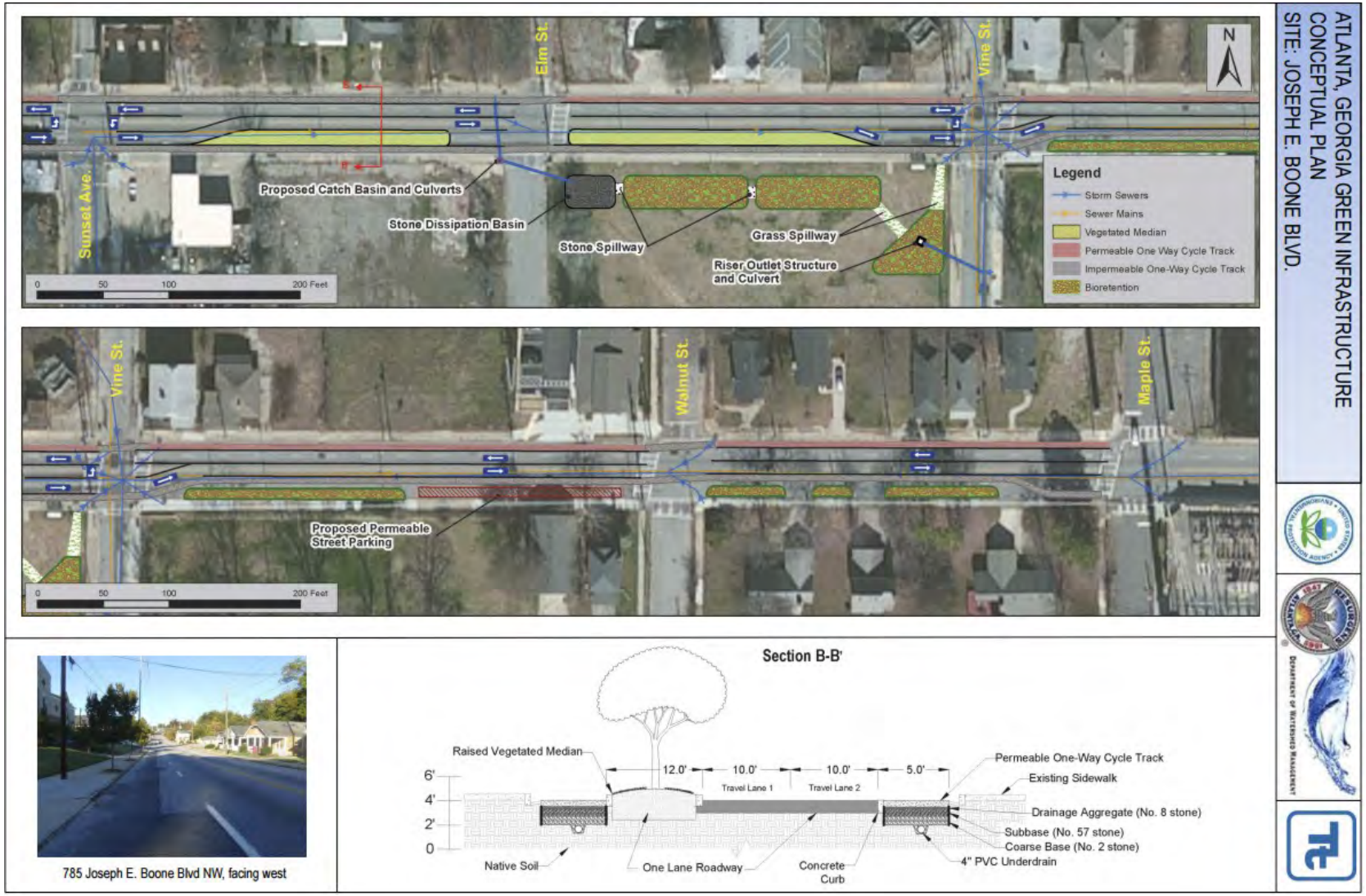
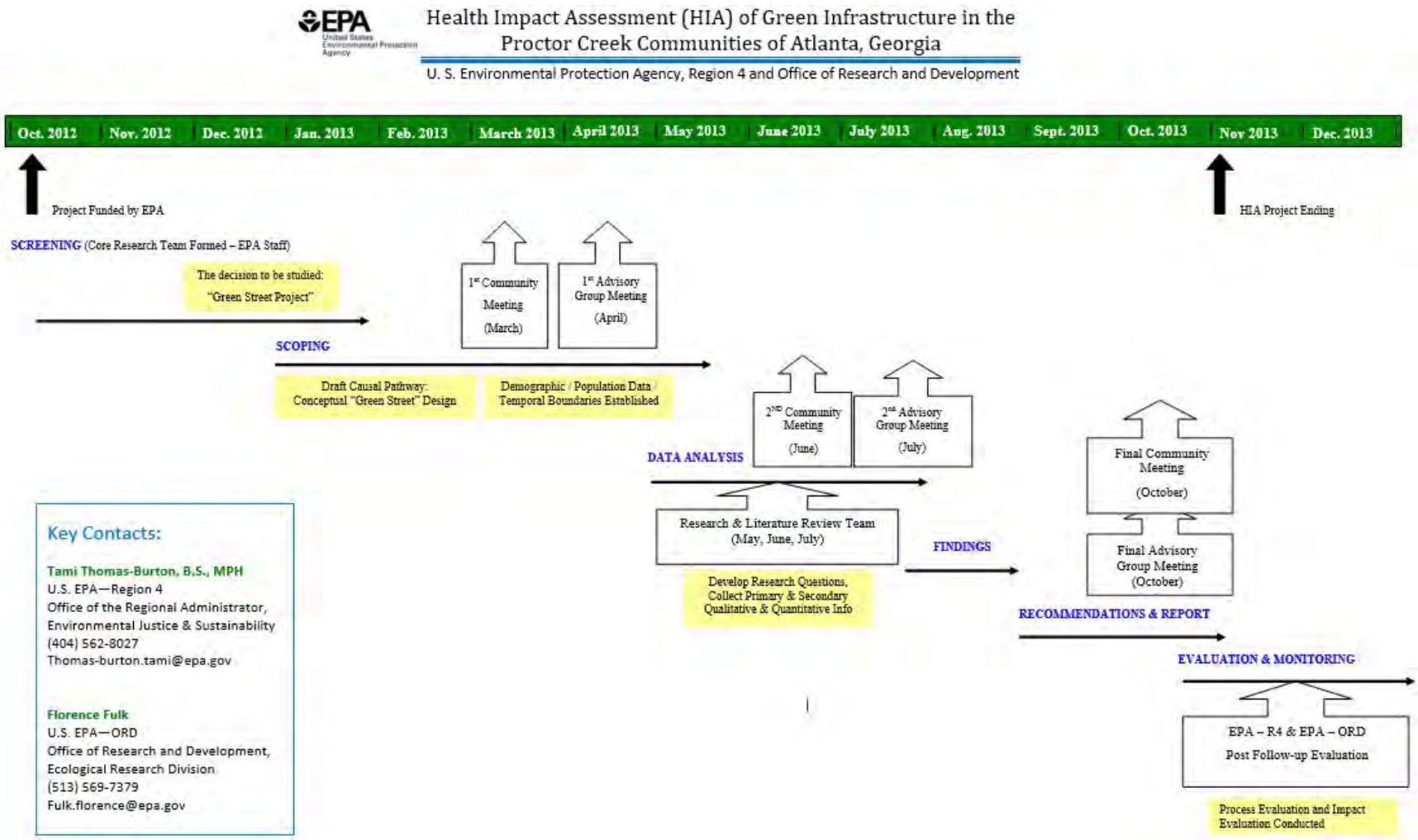
## Appendix A. Tetra Tech's Conceptual Design of Boone Boulevard Green Street Project



## Appendix B. Original HIA Timeline



# Appendix C. Stakeholder Engagement Meeting Documentation

## Documentation of First Community Engagement Meeting, March 22, 2013

### First Community Engagement Meeting Invite (Flyer)

**COMING TO YOUR COMMUNITY !**

# HEALTH IMPACT ASSESSMENT

**U.S. EPA | UNITED STATES ENVIRONMENTAL PROTECTION AGENCY—REGION 4**
**Atlanta, Georgia**

## Health Impact Assessment (HIA) for Green Infrastructure in the Proctor Creek Community of Atlanta, GA

The U.S. EPA is conducting a Health Impact Assessment (HIA) for Green Infrastructure in the Proctor Creek Communities of Atlanta, Georgia. This is the first time EPA—Region 4 will be conducting an HIA. EPA hopes to gain experience that can be used in similar projects in other areas.

EPA and its partners are evaluating solutions for flooding , public health issues, and other deterrents to development and community revitalization. This HIA would inform decisions around Green Infrastructure approaches to Storm Water Management, Ecosystem Restoration, Economic Development, and Community Revitalization. The goal of the HIA is for EPA to provide information to the City of Atlanta on Green Infrastructure projects identified in the PNA (*Proctor Creek/North Avenue*) Study conducted by Park Pride and the Communities of Proctor Creek in 2010.

The Proctor Creek consists of 9 miles of impaired waters and drains an area of approximately 10,198 acres to the Chattahoochee River. This HIA will not focus on the entire 9 miles of the Proctor Creek. The HIA will focus on the Boone Street—Green Street Project.

EPA will conduct the HIA on a conceptual green infrastructure plan identified in the PNA Study for a "green street" on Joseph E. Boone Boulevard NW. A green street is a street designed with a landscape system that can reduce stormwater runoff and improve access for pedestrians and bicycles. The study area will extend to Northside Drive NW (to the east) to James P. Brawley NW (to the west) on Joseph E. Boone Blvd NW. The Vine City community is bounded by Joseph E. Boone Blvd to the south and the English Avenue community to the North.

**HIA Next Steps:**

- On **Friday, March 22, 2013, 5:30 PM—8:00 PM,** EPA will begin the information gathering stage of the HIA with Community Stakeholders.
- We will hold a Community Meeting at the **Neighborhood Union Health Center, 186 Sunset Ave., Atlanta, GA 30314** where we will present our plans for moving forward with the HIA.
- We hope to get feedback and input from the community on this HIA plan. This is your opportunity to share your thoughts!


**What is an HIA?**

A Health Impact Assessment (HIA) is used to evaluate objectively the potential positive and negative health effects of a project or policy before it is built or implemented, and recommends changes to manage those effects.

**Why is an HIA important?**

A Health Impact Assessment (HIA) is a tool to ensure that health and equity are considered in decision-making.

**Key Contacts:**

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**General Info:**

**EPA Toll-Free Customer Service**
1-800-241-1754

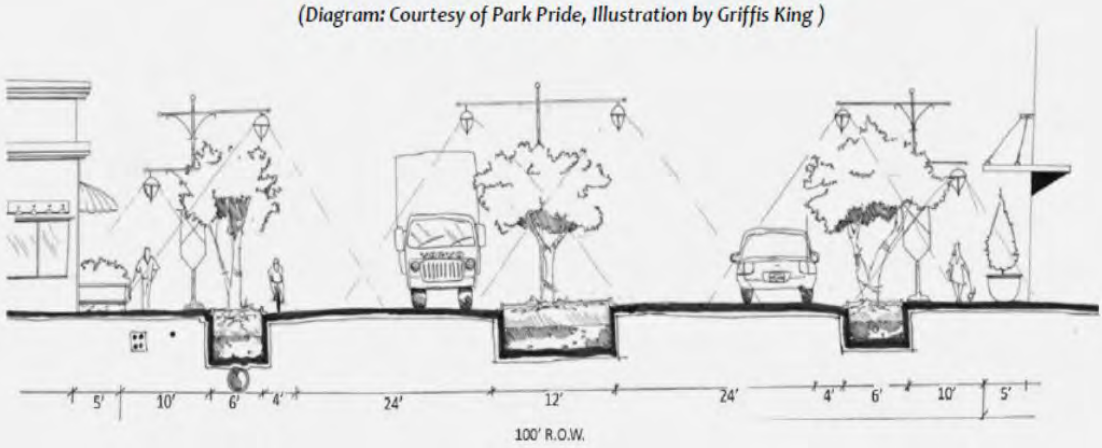
◊ *Light Snacks and Beverages will be Provided* ◊

Side 1

EPA United States Environmental Protection Agency

## *proposed* Boone Street-Green Street Design

*(Diagram: Courtesy of Park Pride, Illustration by Griffis King )*




## Boone Street—Green Street Location (Google Map)


Side 2

## — Partners —

EPA United States Environmental Protection Agency

RESURGENS ATLANTA, GA.

FULTON COUNTY

Georgia Health Policy Center

### Notes from First Community Engagement Meeting

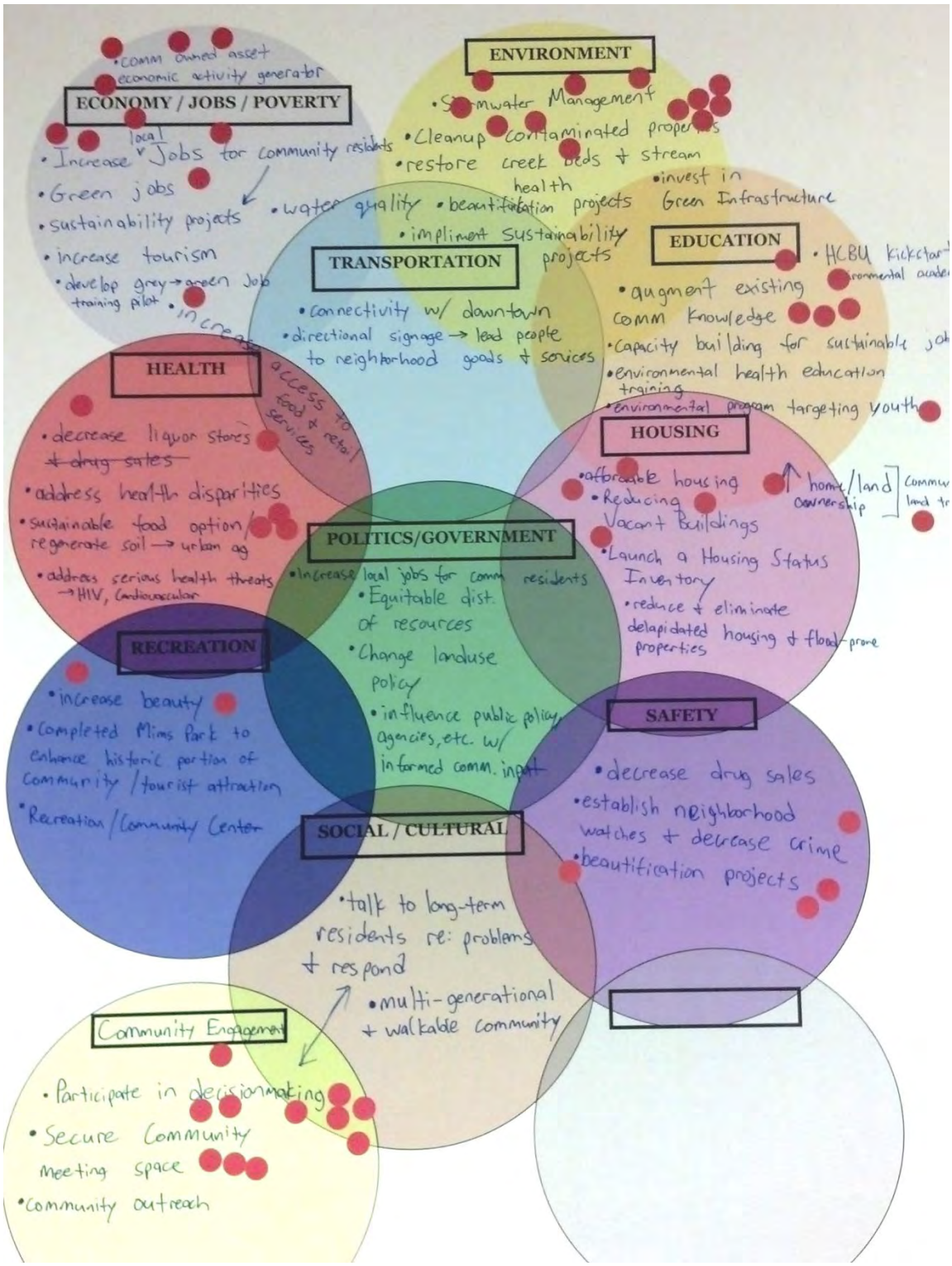
Topic: Question.  What does Health mean to you?

Community's Response:

- Ability to heal
- Wellness
- Absence of sickness
- Condition of your body & life
- Condition allow you to function without disease and discomfort
- Waking up mentally "clear"
- Optimal state of physical, mental, and social well being
- Everything
- Close to what you are created to be
- Things that make you feel good
- Quality of Life
- There's good health & bad health
- State of "upness"

Source: Tami Thomas-Burton, HIA Project co-Lead

## Community Stakeholder-Identified Interests and/or Concerns in the Community (Flipchart)



### Summary of the First Community Engagement Meeting (Handout)

EPA United States Environmental Protection Agency

Health Impact Assessment (HIA) of Green Infrastructure in the Proctor Creek Communities of Atlanta, Georgia

U. S. Environmental Protection Agency, Region 4 and Office of Research and Development

# Community Engagement Meeting

## Green Infrastructure HIA

- The U.S. EPA is conducting a Health Impact Assessment (HIA) of Green Infrastructure in the Proctor Creek Communities of Atlanta, Georgia.
- An HIA is a tool used to objectively evaluate potential positive and negative health impacts of a policy or project before it is implemented and provide recommendations to minimize adverse health impacts and maximize beneficial impacts.
- HIAs ensure that health and equity are considered in the decision-making process and that impacted communities are engaged.

## Community Engagement Meeting

### Summary

- The community engagement meeting took place at the Neighborhood Union Health Center in Atlanta, Georgia on March 22, 2013 from 5:30-8:00pm.
- Community leaders and representatives from neighborhood groups in the study area were invited to attend. Eighteen (18) individuals attended (Figure 1).
- Three exercises were conducted at the meeting in order to capture residents' views on health, primary concerns related to their community, and thoughts on how the quality of life in the community could be improved.

City of Atlanta Dept of Watershed Management (COA-DWM)
Community Improvement Association
C.T. Vivian Leadership Institute (CTVLI)
Delon Hampton and Associates
Eco-Action Incorporated
English Avenue Neighborhood Association
Historic Westside Gardens, Inc
NPU (L), *Chair*
English Avenue Neighborhood Association
Southwest Coalition (SWC3)
Vine City Civic Association

Figure 1. Participating community organizations of NPU-L.

### Large Group Exercise: Defining Health

- Question Prompt: "*What does Health mean to you?*"
- Thirteen (13) of the 18 attendees responded; 72.2% participation.
- Responses were coded and tallied according to 5 potential categories: physical health, mental health, social health, overall wellness (physical, mental, and social), and non-descriptive.

Results:

5 of 13 responses related to physical health
4 of 13 responses related to overall health
2 of 13 responses related to mental health
2 of 13 responses were non-descriptive*

**Responses: "close to what you are created to be" and "there's good health and bad health" were non-descriptive.*

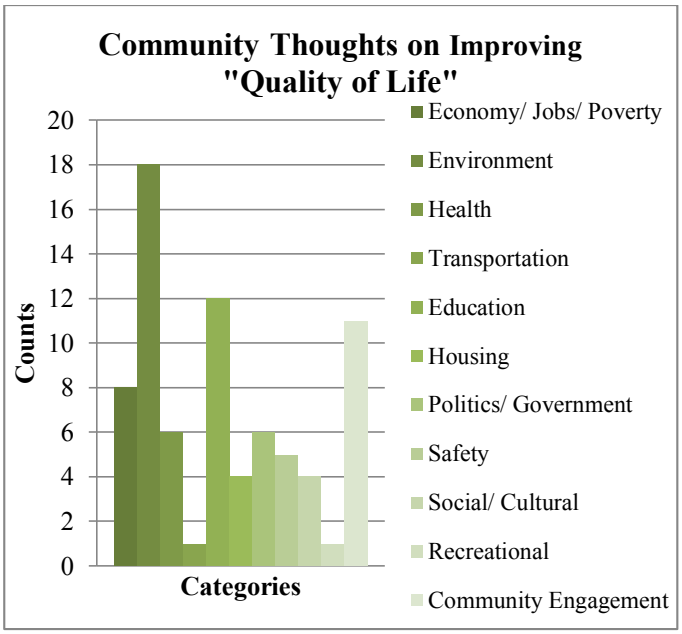
Analysis:

While physical well-being remains the most recognizable determinant of health, overall well-being (including physical, mental, and social determinants) was also recognized as a factor of health.

### Individual Exercise: Improving 'Quality of Life'

- Each attendee was asked to fill out an information card identifying what could be done to improve the 'quality of life' in their community and how to address their community concerns.
- Sixteen (16) of the 18 attendees responded; 88.9% participation.
- Each phrase on the information cards was coded and organized into 1 of 10 pre-determined categories.
- A facilitated group discussion took place to ensure all the input had been adequately captured and organized into the proper categories.
- Community members identified an additional category to capture community engagement needs, making it 11 categories total.

Results:




Graph 1: Total number of times each category was cited on participants' information cards.

Analysis:

The category most cited (referred to) in this activity was the environment. This result is not surprising, considering that community members were asked to identify ways to improve the quality of life and the environment category included items such as stormwater management, clean-up of contaminated properties, beautification, and investment in green infrastructure. Education was the second most cited category that community members thought would improve the overall quality of life. In the discussion, community members explained their belief that expanding career training and education on environment and health concerns would greatly impact the community and create a "unified vision of environmental justice."

## Large Group Exercise: Prioritizing Community Concerns

- Community members were asked to vote on which of the eleven (11) categories captured their top concerns for the community (Figure 2).
- Each individual was given 4 independent votes. The categories with the most votes were considered priority community concerns.
- Out of 72 total votes possible (18X4= 72), 62 points were cast; 86.1% participation.

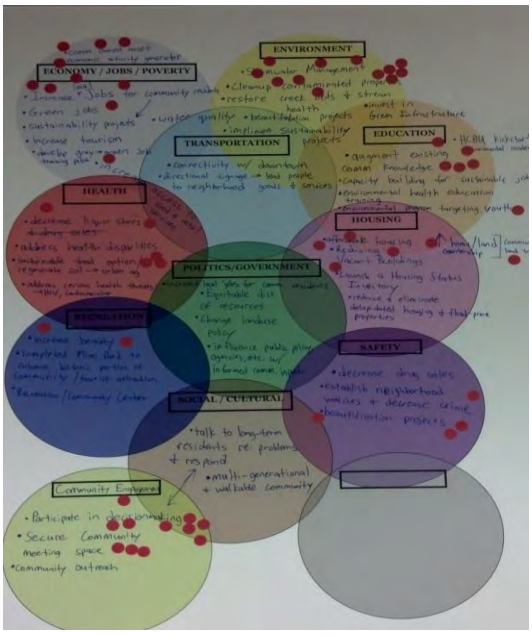
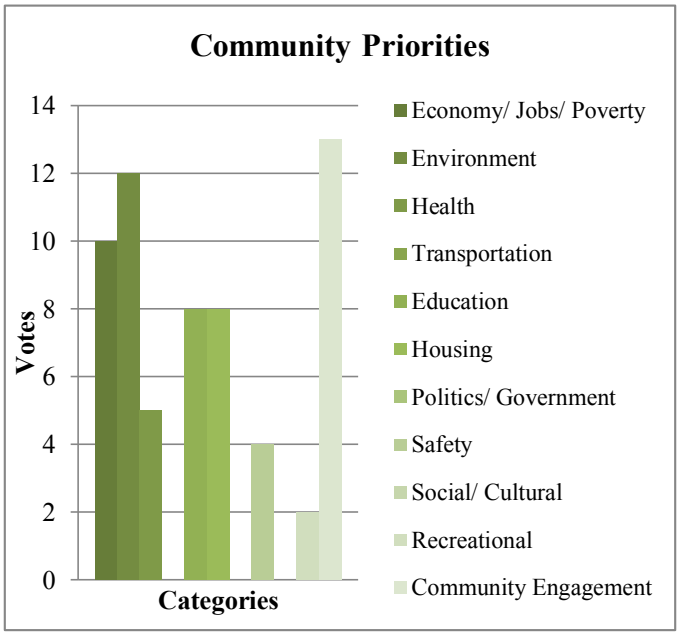



Figure 2. Illustration of categories of concern with associated votes (dot stickers).

Results:




Graph 2: Total votes, by community members, for each category to identify top priorities for the community.

Analysis:

Although the environment was the most discussed way to improve 'quality of life' in the previous activity, community engagement was voted as the top priority concern. This category included the need for involvement in governmental decision-making processes, presence of a community meeting place, and the need for community outreach. It is interesting to note that the second-highest priority concern of the community members is the environment. This category includes, but is not limited to stormwater management, clean-up of contaminated properties, improving water quality, improving city services and code enforcement, and restoring creek beds and stream, all of which are documented hazards in the area.

## Discussion Summary

It is without question that community engagement and improving the environment are the highest priority concerns for this community. Other top priorities for this group are the economy, education, and housing. These issues are not surprising, given the history of the area. The Proctor Creek Watershed has been the focus of environmental justice and community revitalization efforts for over ten years. One of the goals of the Proctor Creek Green Infrastructure HIA is to address these issues and prevent further issues from developing.

The prioritization of concerns for the community is helpful to the final scoping of the HIA by narrowing the focus of the assessment on those impacts with the greatest potential significance. This meeting was instrumental in assessing the community's needs, improving transparency and engaging community members in the HIA process.

## Key Contacts:

**Tami Thomas-Burton, B.S., MPH**
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***- Partners -***

## Documentation of First HIA Advisory Group Meeting, April 30, 2013

### First HIA Advisory Group Meeting Invite (Letter)

April 10, 2013

Name
Title
Company
Address
City, State, zip

Dear _____

You are invited to participate as a member of a new Proctor Creek Health Impact Assessment (HIA) Advisory Group that is being formed by the EPA and its partners. The initial meeting of this group will be Tuesday, April 30, 2013, 9:30 a.m. - 12:00 noon in conference room 10T33.

The EPA and its partners are conducting an HIA of a conceptual green infrastructure plan identified by the City of Atlanta's Department of Watershed Management. An HIA is used to objectively evaluate the potential positive and negative health effects of a project or policy before it is built or implemented and recommends changes to manage those effects. This tool is also used to ensure that health and equity are considered in decision-making.

The green infrastructure plan identified will be for a "green street" on Joseph E. Boone Boulevard, NW. A "green street" is a street designed with a landscape system that can reduce stormwater runoff and improve access for pedestrians and bicycles. The study area will extend from Northside Drive, NW (to the east) to James P. Brawley, NW (to the west) on Joseph E. Boone Blvd, NW. This "green street" has implications for improved health within the entire watershed which is prone to flash flooding and water quality issues. The HIA will consider the impacts of the "green street" as a storm water control and water quality management tool.

The "green street" HIA site is within the Proctor Creek Watershed and its location is considered the headwaters of the watershed. The Watershed is approximately 10,198 acres and drains an area consisting of 9 miles of the Proctor Creek and its tributaries, leading the Chattahoochee River. These waters are designated by the Georgia Environmental Protection Division as impaired waters *(bacterial impairment - E.coli)*. This HIA will not focus on the entire 9 miles of the Proctor Creek, only the "green street" location.

The EPA and its partners are evaluating solutions for flooding, public health issues, and other deterrents that impede development and community revitalization in this stadium community. Also, the EPA hopes to gain experience with this new HIA tool that can be used in similar projects in other areas. This is an exciting project because it is the EPA's first time nationally conducting a health impact assessment.

The HIA advisory group will include federal, state, city, non-governmental organizations, universities, and key community organizations. The advisory group will provide high-level strategic oversight of the

Proctor Creek HIA and will help to facilitate access to information, data, contacts and other resources necessary to ensure its successful completion. It is anticipated that the HIA Advisory Group will meet three more times after the first meeting, before the project end date in October 2013.

The Proctor Creek HIA also has a Core Research Team who oversees the daily execution of the HIA. This team has met regularly since October 2012, to conduct the screening and scoping processes. Moreover, the Proctor Creek HIA will also have a Research-Subject Matter Subcommittee that will help to lay the conceptual and logistical groundwork required to generate the evidence-based findings.

There are six basic steps in the process of an HIA, 1) screening; 2) scoping; 3) assessing risk & benefit; 4) developing recommendations; 5) reporting and 6) monitoring and evaluation and the Proctor Creek HIA is in the Scoping phase of the process.

*For more information about the use of Health Impact Assessments nationally and internationally:*

- Health Impact Project website http://www.healthimpactproject.org/, and the Policy Link website: Promoting Equity through HIA http://www.policylink.org/PromotingEquityThroughHIAPractice

- CDC - Centers for Disease Control Health Impact Assessment http://www.cdc.gov/healthyplaces/hia.htm

- WHO - World Health Organization: Promoting health across all sectors of activities http://www.who.int/hia/en/

We greatly value your involvement and hope you will consider participating as a member of the Advisory Group. You would be a key partner in the Proctor Creek HIA and local capacity building efforts. You will receive this invitation by email and by postal mail. Instructions, directions, a one-pager on HIA and a list of invited Advisory Group members are enclosed.

Please let me know of your availability by April 15, 2013. If you have questions, or cannot participate but would like to recommend someone else from your staff, you may contact me at thomas-burton.tami@epa.gov or 404-562-8027.

We look forward to working with you to make this Green Infrastructure project a catalyst for healthy, sustainable living.

Sincerely,

XXXXXXXX
Tami Thomas-Burton
Office of Environmental Justice

Enclosures
cc: Camilla Warren, Maryjo Bragan, Florence Fulk, EPA, Office of Research and Development

## Invited HIA Advisory Group Members

*(Alphabetical)*

| | | | |
|---|---|---|---|
| 1. | Nikel Bailey | **HUD – Atlanta Regional Office** | *Neighborhood Stabilization Program* |
| 2. | Todd Boatman | **U.S. Army Corps of Engineers (USACE – Mobile District)** | *Chief of Staff* |
| 3. | Dr. Daniel M. Deocampo | **Georgia State University** | *Associate Professor* |
| 4. | Michael Dobbins | **Georgia Tech – College of Architecture** | *Professor of the Practice of Planning* |
| 5. | George Dusenbury | **City of Atlanta – Department of Parks, Recreation & Cultural Affairs** | *Commissioner* |
| 6. | Debra Edelson | **Trust for Public Lands – Georgia** | *Senior Program Director* |
| 7. | Michael Elliott | **Georgia Tech – Center for Quality Growth & Regional Development** | *Associate Director* |
| 8. | Curtis Flake | **U.S. Army Corps of Engineers (USACE – Mobile District)** | *Chief of Planning & Environmental Division* |
| 9. | Stacy Funderburk | **The Conservation Fund – Georgia** | *Real Estate Associate* |
| 10. | Darryl Haddock | **WAWA – West Atlanta Watershed Alliance** | *Environmental Education Director* |
| 11. | Lee Harrop | **Atlanta Beltline Inc.** | *Program Management Officer* |
| 12. | Dudley Hartel *(CUIF)* | **USDA – Forest Service (Southern Research)** | *Center Manager – Urban & Interface Forestry* |
| 13. | Tamaya Huff | **Georgia Department of Transportation** | *State Bicycle and Pedestrian Safety Coordinator* |
| 14. | Na'Taki Osborne-Jelks | **WAWA – West Atlanta Watershed Alliance / Georgia State University** | *WAWA , Chair / PhD Student* |
| 15. | Dr. Cassandra Y. Johnson | **USDA – Forest Service (Southern Research)** | *Station Research Social Scientist* |
| 16. | Yvonne Jones | **Neighborhood Planning Unit – L (Vine City & English Ave)** | *NPU-L , Chair* |
| 17. | Jewelle Kennedy | **City of Atlanta – Office of Planning** | *Urban Planner* |
| 18. | Dr. Eloisa Klementich | **Invest Atlanta** | *Managing Director of Business Development* |
| 19. | Eric Kuehler | **USDA – Forest Service (Urban Forestry South)** | *Technical Transfer Specialist* |
| 20. | Dr. Stephanie Madson | **FEMA – Region IV (Environmental Planning & Historic Preservation)** | *Deputy Regional Environmental Officer* |
| 21. | Kevin Moody | **FHWA – Office of Technical Services** | *Ecologist* |
| 22. | Dr. Yomi Noibi | **Environmental Community Action Inc**. | *Executive Director* |
| 23. | Dr. Mark Patterson | **Kennesaw State University (Department of Geography & Anthropology)** | *Professor, Environmental Studies Coordinator* |
| 24. | Demarcus Peters | **English Avenue Neighborhood Association** | *Director* |
| 25. | Neela Ram | **ARC – Atlanta Regional Commission** | *Senior Environmental Planner* |
| 26. | Walt Ray | **Park Pride** | *Director of Park Visioning* |
| 27. | Monica Robinson | **Fulton County – Department of Health Services** | *Environmental Planner* |
| 28. | Dr. Catherine Ross | **Georgia Tech – Center for Quality Growth and Regional Development** | *Director* |
| 29. | Joe Rozza | **The Coca-Cola Company** | *Sustainability Manager* |
| 30. | James E. Shelby | **City of Atlanta – Department of Planning & Community Development** | *Commissioner* |
| 31. | Jonette Simmons | **HUD – Atlanta Regional Office** | *Neighborhood Stabilization Program* |
| 32. | Julie Todd | **City of Atlanta – Department of Watershed Management** | *Environmental Compliance Manager* |
| 33. | Tony Torrence | **Community Improvement Association, Inc.** | *Director* |
| 34. | Jason Ulseth | **Chattahoochee Riverkeeper** | *Technical Programs Director* |
| 35. | Dr. Latoria Whitehead | **CDC – Office of Minority Health & Health Equity** | *Environmental Justice Officer* |
| 36. | Ellen Wickersham | **Invest Atlanta (Parks and Greenspace Acquisition)** | *Senior Manager* |
| 37. | Dr. Andrea Winquist | **Emory University – Rollins School of Public Health** | *Epidemiologist* |

## HIA Advisory Group-Identified Interests and/or Concerns in the Community (Flipchart)

Health Impact Assessment (HIA) of Green Infrastructure in the Proctor Creek Communities of Atlanta, Georgia

U. S. Environmental Protection Agency, Region 4 and Office of Research and Development

# HIA Advisory Committee Meeting

## Green Infrastructure HIA

- The U.S. EPA is conducting a Health Impact Assessment (HIA) of Green Infrastructure in the Proctor Creek Communities of Atlanta, Georgia.
- An HIA is a tool used to objectively evaluate potential positive and negative health impacts of a policy or project before it is implemented and provide recommendations to minimize adverse health impacts and maximize beneficial impacts.
- HIAs ensure that health and equity are considered in the decision-making process and that impacted communities are engaged.

## HIA Advisory Committee

- The HIA Advisory Committee is a multi-organization group of internal and external stakeholders who have an invested interest in the community around the potential Boone Boulevard Green Street Project.
- The HIA Advisory Committee will provide high-level strategic oversight of the Proctor Creek HIA and will help to facilitate access to information, data, contacts, and other resources necessary to ensure its successful completion.
- Members of the committee represent federal, state, county, and city government; universities; non-governmental organizations; and key community organizations.

Welcome and remarks from EPA R4 Chief of Staff, Javoyne Hicks White, on behalf of R4's Regional Administrator.

## Advisory Committee Meeting

### Summary

- The Advisory Committee meeting took place on Tuesday, April 30, 2013 from 9:30 a.m. – 12:00 noon at the Sam Nunn Federal Center in Atlanta, Georgia.
- Twenty-four (24) of the 37 invited committee members attended, in addition to 17 EPA staff members.
- Background information on the Proctor Creek watershed and community profile, Boone Boulevard Green Street Project, and the HIA process was presented at the meeting. Handouts summarizing this background information were provided prior to and/or during the meeting.
- Three exercises were conducted at the meeting in order to capture Advisory Committee's thoughts on how quality of life in the Proctor Creek community could be improved, their primary concerns for the community, and how priority concerns identified by community members during the community engagement meeting differed from those identified by the Committee.

### Background Information

*Proctor Creek Watershed*

- The Proctor Creek Watershed (HUC 12:031300020101) is located in the municipal jurisdiction of Atlanta, GA and drains over 10,100 acres of primarily urban residential and commercial lands to the Chattahoochee River (Figure 1).

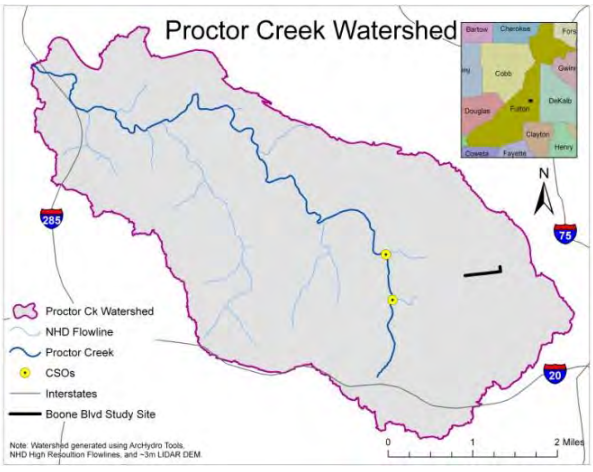



Figure 1. Proctor Creek Watershed in Atlanta, Georgia.

*Community Profile*

- The HIA will examine impacts to the community within a ½-mile radius around the proposed Boone Boulevard Green Street Project – a study area approximately 1.25 sq. miles in size.

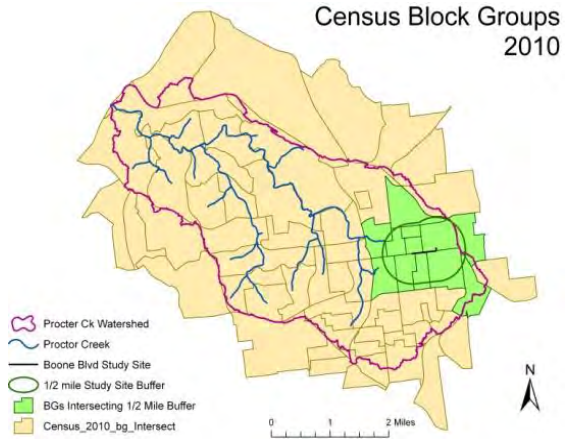



Figure 2. Census block groups within and/or intersecting the ½-mile buffer around the Green Street Project.

HIA Study Population (Figure 2)

- The total population of the study area in 2010 was 12,023, down 21.85% from 2000 (US Census 2010, 2000).
- This community is a predominantly African American community (82.62% according to the 2010 US Census), with ties to historical African American leaders.
- According to the 2011 American Community Survey estimates from the previous 12 months, the estimated median household income is $29,788.

> The EPA Office of Environmental Justice is dedicated to ensuring that minority and low-income communities are not overburdened or left out of decision-making processes.

Environmental Hazards

- Due to the prevalence of impervious surfaces at the headwaters (Figure 3) and a strained combined sewer system, flooding is a major concern for the community and watershed downstream.

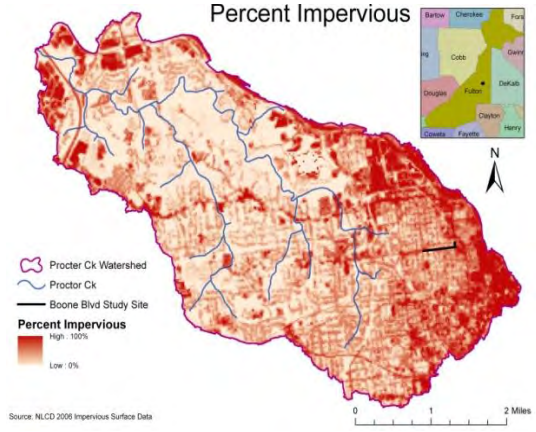



Figure 3. Percent impervious surfaces in the Proctor Creek Watershed.

- Much of Proctor Creek and its tributaries are rated by FEMA as high flood hazards (Figure 4).

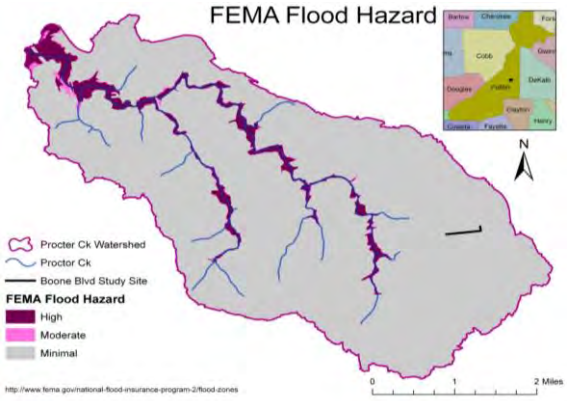



Figure 4. FEMA flood hazard ratings in the Proctor Creek Watershed.

- Pervasive flooding in the Proctor Creek community has created environmental, public health, economic, and redevelopment issues.
- Proctor Creek is on the 303(d) list of impaired waters due to poor water quality and high counts of fecal coliform.
- There are numerous Brownfields sites located in the Proctor Creek Watershed.

*Green Street Project Overview*

- The City of Atlanta's Department of Watershed Management selected a green infrastructure project to implement in the Proctor Creek Watershed in order to address some of the community's concerns of flooding. The overall vision for the Boone Boulevard Green Street Project involves implementing green infrastructure practices along Joseph E. Boone Boulevard between Northside Drive NW (to the east) and James P. Brawley NW (to the west) in collaboration with planned road diet improvements.
- The proposed green street design includes a combination of planter boxes, permeable pavements, bioretention areas, and planting strips.

**Proctor Creek Community Needs**

- Flood reduction and stormwater management to provide capacity relief for the combined sewer system;
- Cleaner surface and ground water;
- Improved streets and sidewalks; and

*HIA Process*

- A brief overview of what an HIA is and the general process for conducting HIAs was presented.
- The specific goals for the Green Infrastructure HIA being conducted by EPA Region 4 Office of Environmental Justice and EPA Office of Research and Development were identified. Goals include:
  - To provide technical assistance in assessing the impacts of implementing the proposed Boone Boulevard Green Street Project.
  - To ensure equity and transparency in the decision-making process.
  - To provide the City of Atlanta, GA recommendations for implementation of the project prior to the project start date.
  - To inform community members of potential health impacts and to ensure that local health concerns are addressed.
  - To provide the EPA and other agencies "Best Practices" for implementing an HIA.

## Large Group Exercise: Improving 'Quality of Life'

- The Advisory Committee was asked to participate in a similar exercise to one conducted with community members at a community engagement meeting in March.
- Attendees were asked to identify what could be done to improve the 'quality of life' in the Proctor Creek community and address the concerns facing that community.
- Responses were recorded for each of the 11 categories from the community engagement meeting (Figure 5).
- The Advisory Committee identified an additional category entitled : Total Investment in Community making a total of 12 categories (Table 1).

Figure 5. Recording of Advisory Committee concerns.

Results:

| Category | Concerns and Ways to Improve Quality of Life |
|---|---|
| Community Engagement | • Community needs a "greater voice"<br>• Need for internal institutions for community engagement (meeting space) |
| Economy / Jobs/ Poverty | • Economic opportunities<br>• Opportunities for 'green spaces' that are maintainable |
| Education | • Capacity building (training for jobs)<br>• Education for 'healthier' living and eating<br>• Education on environmental risks |
| Environment | • More green space<br>• Deficiencies in the 5 mechanisms of healthy communities (transportation, telecommunications, power, wastewater, water supply)<br>• Balanced 'built environment' with environmental hazards<br>• Broader view on green infrastructure implementation<br>• Opportunities to reduce 'heat stress' (trees) |
| Health | • Access to healthy foods<br>• Need for a medical home<br>• Risk factors to health in community (lead-poisoning, asthma, etc.)<br>• Disease transmission (vector control) |
| Housing | • Removal of dilapidated housing<br>• Affordable housing<br>• More suitable housing |
| Politics / Government | • Need for a step-wise approach that looks at short-term, medium-term, and long-term impacts |
| Recreational | • Recreational opportunities |
| Safety | • Built environment that supports safe / civil activities and deters crime |
| Social / Cultural | • Improved relationships between established community institutions and educational institutions<br>• Social impacts<br>• Opportunities for social / emotional support<br>• Different "branding" of community<br>• Community cohesion |
| Transportation | • Access to basic needs (proximity to laundry, healthy foods, etc.)<br>• Access to employment |
| Total Investment in Community | • Ability to live in community after investment is implemented |

Table 1. Advisory Committee thoughts on improving 'Quality of Life'.

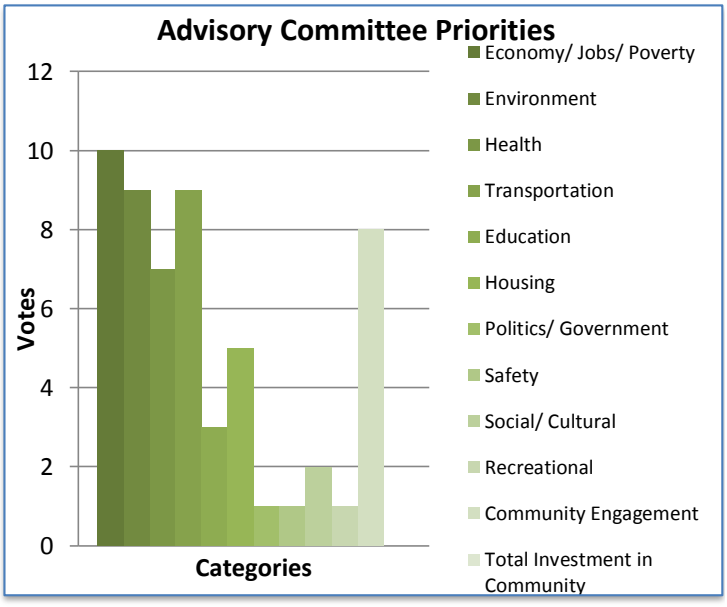
Analysis:

The categories most cited (referred to) in this activity were: Environment and Social/Cultural. These results are not surprising, considering that the Advisory Committee was asked to identify ways to improve the quality of life in the community, included items such as wastewater and water supply, increased green space, and broader green infrastructure implementation. The social/cultural category included items such as increased social cohesion and opportunities for increased social inclusion.

## Large Group Exercise: Prioritizing Committee Concerns

- The Advisory Committee was asked to participate in the same exercise used to prioritize concerns identified by community members at the community engagement meeting in March.
- The Advisory Committee was asked to vote on which of the 12 categories captured their top concerns for the community.
- Each individual was given 4 independent votes. The categories with the most votes were considered priorities for the Advisory Committee (Graph 1).
- Members of the committee, who were also participants in the community engagement exercise, were asked not to discuss the results of the community prioritization exercise until after the voting.

Results:




Graph 1. Total votes, by Advisory Committee members, for each category to identify top priorities for the community.

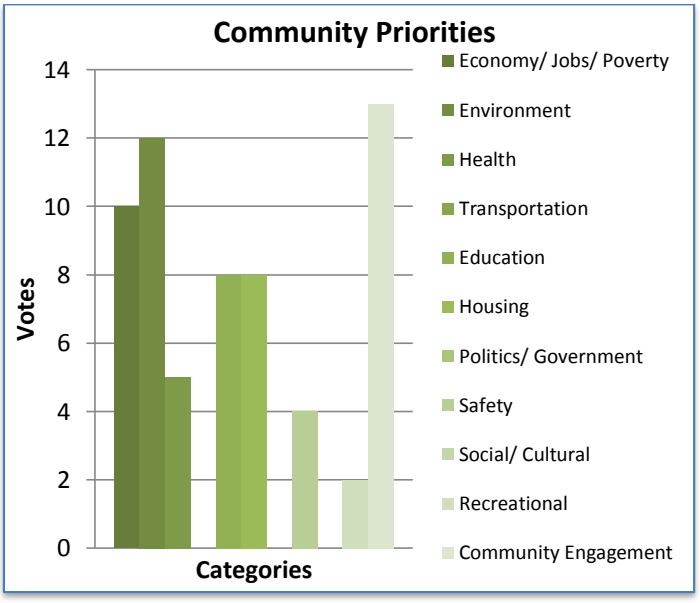
Analysis:

The Advisory Committee voted economy, jobs, and poverty as the top category of concern (10 votes). Specific concerns identified in this category included the need for economic opportunities and the ability to grow and maintain an economy in the community. The environment and transportation were tied for votes as the second-highest priority concerns to the Advisory Committee. Although the Total Investment category received no votes, the committee deemed this an important issue to keep in mind based on past experiences on similar projects.

## Large Group Exercise: Comparing Community and Advisory Committee Concerns

- A summary was presented of the community engagement meeting that was held in March to capture community concerns and provide information to the community on the HIA and Boone Boulevard Green Street Project.
- At that meeting, the 18 representatives in attendance from invited community groups and organizations were asked to identify and prioritize ways to improve the quality of life in the community and address community concerns (just as the Advisory Committee did in this meeting).
- The results of both the community's identification and prioritization exercises (Graph 2) were presented.

Results:




Graph 2. Total votes, by community members, for each category to identify top priorities for the community.

Analysis:

The facilitated discussion comparing the concerns and priorities of the community and Advisory Committee (Figure 6) recognized that both groups identified similar concerns for the community overall, and in some cases even prioritized concerns similarly (Graphs 1 and 2). For instance, both groups identified the environment as the second-highest priority for the Proctor Creek community. This category included the need to increase 'green space' and beautification and improve community services (e.g., transportation, power, telecommunications, wastewater management, and water quality). The need to have a better balance between the built environment and environmental risk and a broader view on implementing green infrastructure was also expressed.

The top priorities identified for the community differed between the groups, however. The top priority identified by community members was community engagement (13 votes), which included items such as a secure community-owned meeting space, more involvement of the community in decision-making processes, and information and outreach to the community. The Advisory Committee, in comparison, rated this as one of the lowest priorities for the community.

The Advisory Committee identified the economy, jobs, and poverty as the top priority for the community, pointing to the need for economic opportunities and revitalization. Community members also acknowledged this as an important need, voting it as one of the top three areas of concern.

Transportation, which was not identified as a top priority for the community, was voted as one of the top three areas of concern by the Advisory Committee. The accessibility to basic needs (healthy foods, laundry, work, etc.) was a common theme throughout the discussion.

Figure 6. Discussion comparing concerns and priorities identified by the community and Advisory Committee.

## Moving Forward and Next Steps

The added value of the HIA process is the ability to engage both the community and the stakeholders and ensure transparency and equity in the decision-making process. The prioritization exercises conducted by both groups were a key element in the scoping process for the HIA. The priority concerns and discussion points of the community and Advisory Committee will both be incorporated into the final scoping to help determine areas of focus for the HIA.

The next steps in the HIA process will be to finalize the scoping phase, develop research questions, and initiate the assessment phase.

## Upcoming Events

- The next Advisory Committee meeting will be held on July 23, 2013 form 9:30 a.m. - 12:00 p.m.
- The next Community Engagement meeting is planned for June 2013 (date: TBD).
- There will be a full day of HIA Training, made available by the CDC, on Thursday, May 23, 2013 from 9:00 a.m. – 4:00 p.m. Please contact Karen Smith at 404-562-9703 for registration.

### Key Contacts:

**Tami Thomas-Burton, B.S., MPH**
U.S. EPA—Region 4
Office of the Regional Administrator,
Environmental Justice & Sustainability
(404) 562-8027
Thomas-burton.tami@epa.gov

**Florence Fulk**
U.S. EPA—ORD
Office of Research and Development,
Ecological Research Division
(513) 569-7379
Fulk.florence@epa.gov

### *Partners -*

## Documentation of HIA Training Workshop, May 23, 2013

**EPA and GHPC Health Impact Assessment Training Workshop**

May 23, 2013

Exercise: Each group will design a causal pathway diagram, based on the scenario/decision given, and recommendations for avoiding/mitigating potentially adverse impacts and maximizing beneficial impacts

| **Scenario 1** | | | |
|---|---|---|---|
| **Decision:** Whether or not to implement permeable pavement | | | |
| Direct Impacts | Changes to Environment | Changes to Exposure/Behavior | Health Outcomes |
| ↓ impervious surface area | ↑ drainage<br>↓ standing water<br>↑ water quality<br>↑ soil quality (via water filtration)<br>↑ groundwater recharge<br>↓ runoff<br>↓ sewer overflow | ↓ mosquitoes<br>↓ exposure to raw sewage<br>↓ exposure to E. coli and other pathogens | ↓ risk of contracting West Nile/mosquito-borne diseases<br>↓ negative health impacts of exposure to raw sewage |
| Recommendations:<br>None | | | |
| **Scenario 2** | | | |
| **Decision:** Whether or not to add more cycling infrastructure (e.g., bike lanes) | | | |
| Direct Impacts | Changes to Environment | Changes to Exposure/Behavior | Health Outcomes |
| Designated bike lanes | ↓ air pollution emitted from motor-vehicles | Less exposure to air pollutants | ↑ respiratory health (↓ risk of developing asthma, lung cancer, respiratory disease, and emergency room visits for respiratory symptoms) |
| | ↑ bike-ability | ↑ active transport/ physical activity (bicycling) | ↑ cardiovascular health<br>↓ diabetes |

| | | | |
|---|---|---|---|
| | | ↓ passive transport (driving)<br>↑ access to food, health, recreation, education, etc.<br>↑ social cohesion<br>Communications<br>Interacting | ↓ blood pressure and heart disease<br>↓ weight and obesity<br>↑ mental health<br>↓in stress levels<br>↓ violence<br>Avoided traffic collision injuries |
| Recommendations:<br>Install cement buffer/strong physical barrier between impermeable bike lane and traffic on Boone Street for safety<br>Install bike lane (for pleasure and transportation) to specified location (1 – Maddox Park, 1.5 – Beltline) | | | |
| **Scenario 3** | | | |
| **Decision:** Whether or not to add planter boxes and/or bioretention cells | | | |
| Direct Impacts | Changes to Environment | Changes to Exposure/Behavior | Health outcomes |
| ↑ greenery<br>↓ pavement (ISA)<br>↑ shading<br>↑ humidity<br>↓ Ambient temperature | ↑ beautification (depending on where and plant selection)<br>↑ ↓ rodent and pests (mosquitoes)- could be offset by increased biodiversity (predators), need more literary evidence<br>↓ Heat island<br>↑ air quality (↓ air pollution/VOCs based on tree selection)<br>↑ maintenance requirements- (depending on plant selection and invasive species) already overgrown vegetation present<br>↑ risk of storm damage<br>↑ Carbon sink<br>↓ runoff<br>↑ property values | ↓ safety- more hiding places<br>↑ urban gardens (need more literary evidence)<br>↓ exposure to nitrites, sulfites, lead, and particulate matter | ↑ allergies (choose the right plants)<br>↑ mental health (↓ stress and ↑ sense of wellbeing)<br>↑ sense of community (social cohesion)<br>↑ physical health<br>↑ cardiovascular health |
| Recommendations:<br>Develop policy or guideline for types of greenery used so that respiratory triggers would not increase for the project area | | | |

| |
|---|
| Plant maximum # of trees in strategic locations that are native and lower likelihood of common allergens (e.g. avoid oaks and Bradford pears). Additional considerations: location/placement of plants, species selection, allergens, existing vegetation, maintenance requirements, job creation, business/stakeholder resident opinions |

Exercise: Based on the causal pathways developed, characterize predicted changes to the health determinants/outcomes identified.

**Impact Characterization Table**

| Health Determinants/Outcomes | Direction | Magnitude | Impact | Significance/ Likelihood | Distribution |
|---|---|---|---|---|---|
| Air pollution | improve health | Low-medium | Medium | Possible | Entire surrounding neighborhood |
| Respiratory health (asthma, bronchitis, chronic respiratory disease, etc.) | improve health | Medium-high | Medium-high | Likely | Vulnerable population (>5, >64) |
| Physical Activity (cycling) | improve health | Medium-high | Medium-high | Likely | Entire surrounding neighborhood |

## Documentation of the Second HIA Advisory Group Meeting, July 23, 2013

### Second HIA Advisory Group Meeting Invite (Email)

Date: June 4, 2013

**Greetings Proctor Creek Health Impact Assessment (HIA) Advisory Group,**

In preparation for our upcoming meeting on Tuesday, 07/23/13, 9:30 am – 12 noon, please see the attached Agenda and pre-reading materials. Also, please reply to this invitation so that we can prepare a "Visitor's List" for our security desk. Our July meeting will be held in Room 9E on the 9th Floor.

Address:
EPA Region 4
Sam Nunn Federal Center
61 Forsyth Street SW
Atlanta, GA 30303

Attachment #1: Agenda – July Meeting
Attachment #2: Summary of Previous Advisory Group Meeting – April 30th
Attachment #3: Theoretical Impact Pathway Diagram
Attachment #4: Example Approach for Assessing Health Risk Factors in HIA Study Population
Attachment #5: Group Exercise: Research – Data sources & tools ***(Note: Please Read & bring your expertise & resource info to the meeting!)***
Attachment #6: Directions to Sam Nunn Building

## Meeting Agenda from the Second HIA Advisory Group Meeting

EPA United States Environmental Protection Agency

# Health Impact Assessment (HIA) for Proctor Creek's Boone Boulevard Green Street in Atlanta, Georgia

U. S. Environmental Protection Agency, Region 4 and Office of Research and Development

## HIA Advisory Group Meeting

Tuesday, July 23, 2013, 9:30 AM – 12:00 noon

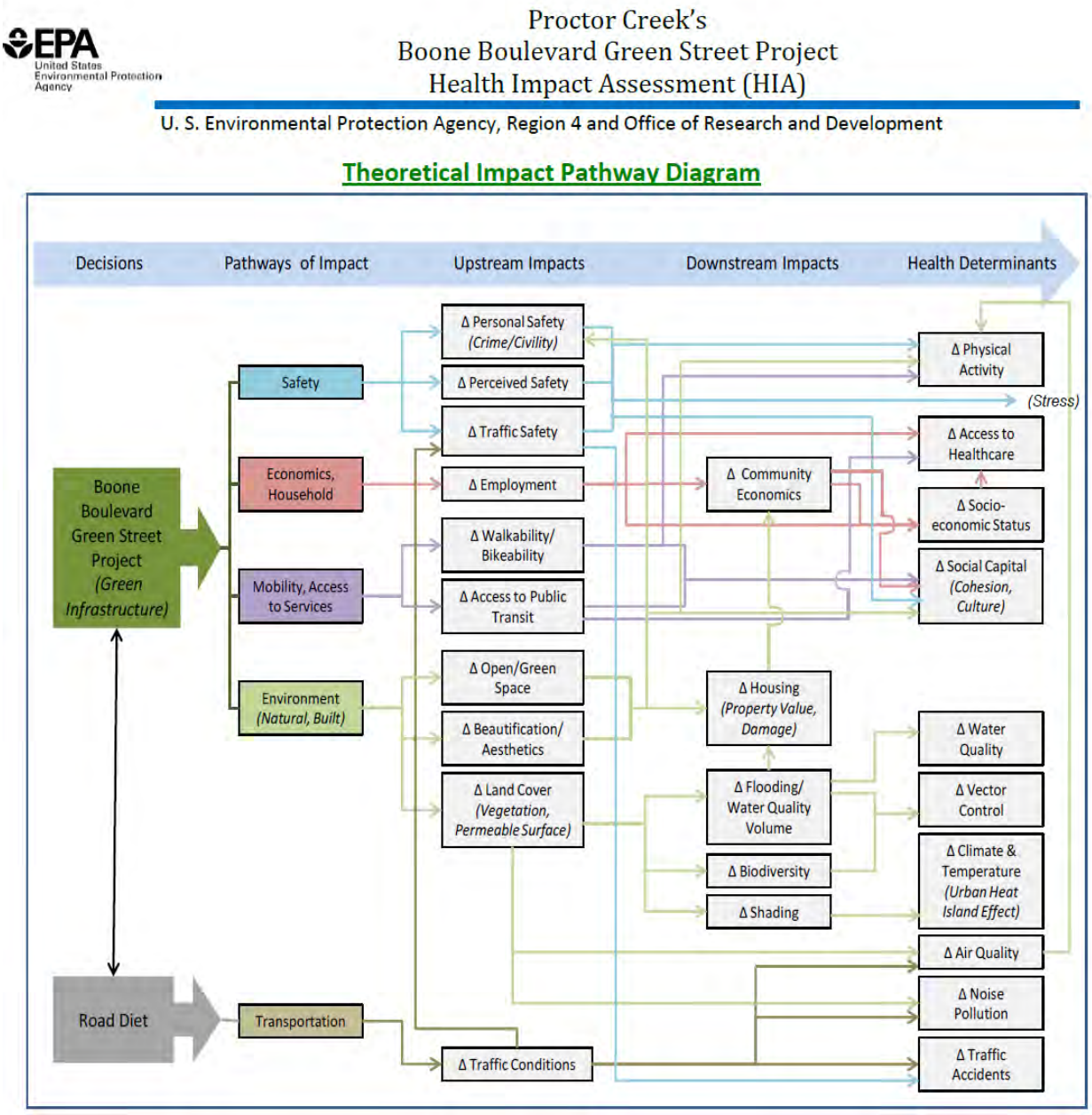
Sam Nunn Federal Center – 61 Forsyth Street SW, Atlanta, GA 30303 * Room # 9E (9th Floor)

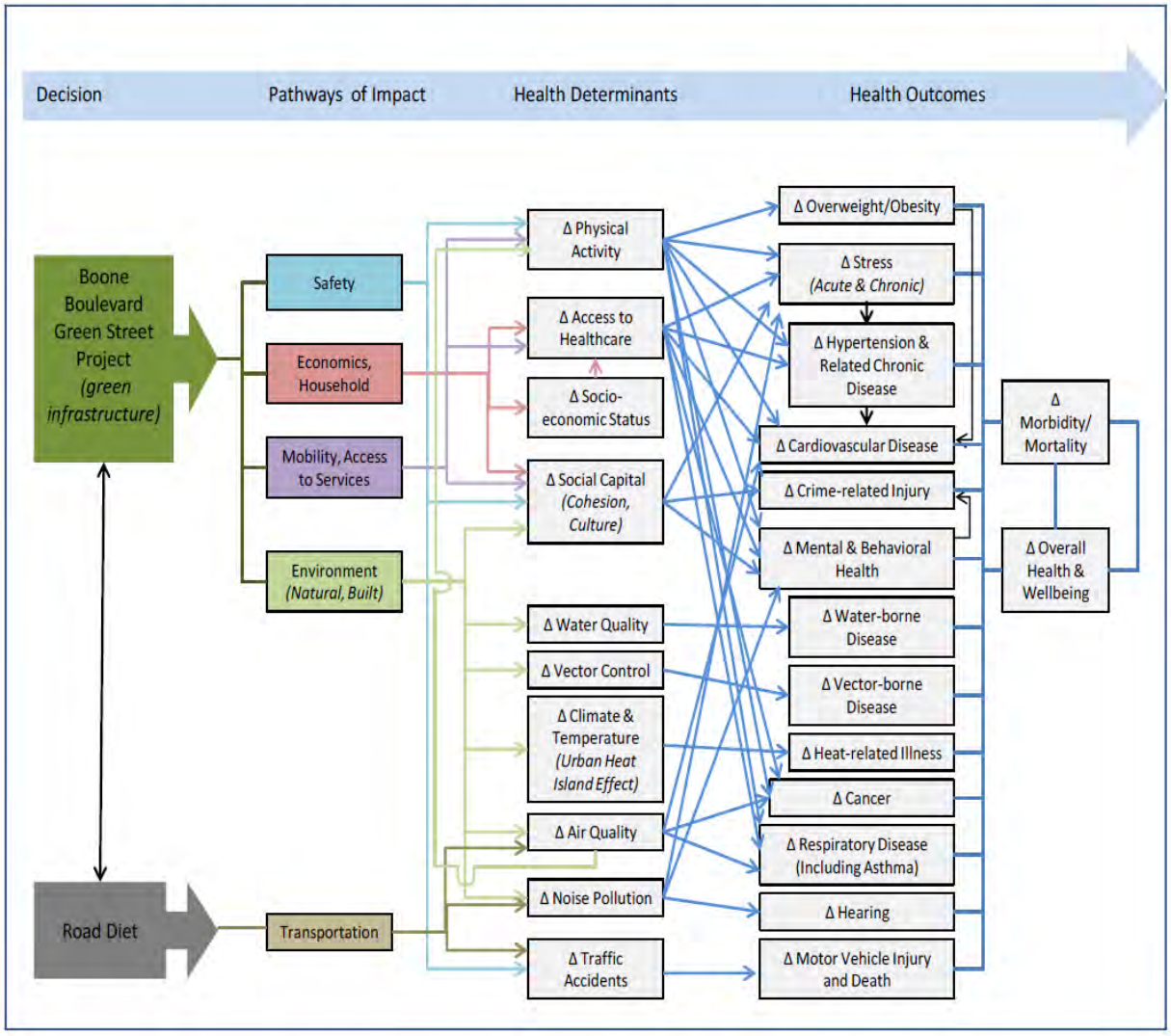
Objectives:

- Review final Scoping Pathway Diagram
- Discuss Assessment Methods & Topics Assignments for Research
- Identify Data gaps and Resources
- Discuss sources of uncertainty and limitations of evidence

| | | |
|---|---|---|
| 9:30 AM – 9:45 AM<br>**15 MINUTES** | Welcome / Introductions | **Tami Thomas-Burton**<br>*EPA Region 4 – Office of Environmental Justice & Sustainability (OEJS), Project Lead* |
| | Overview | **Tami Thomas-Burton** |
| | Update on Boone Blvd Green Street Project | **Julie Todd**<br>*City of Atlanta Department of Watershed Management*<br>*Environmental Compliance Manager* |
| 9:45 AM – 10:30 AM<br>**45 MINUTES** | Recap: Scoping Process & Previous Meeting<br>*(Pre-Reading Material, Quick Overview)* | **Tami Thomas-Burton** |
| | Assessment & Literature Review Process | **Michelle Marcus-Rushing**<br>*Georgia State University Health Policy Center*<br>*HIA Practitioner – Research Associate II* |
| | Theoretical Impact Pathway Diagram<br>*(Pre-Reading Material, Quick Overview)* | **Lauren Adkins**<br>*CSS – Dynamac*<br>*Public Health Specialist* |
| | Assessment Approach<br>*(Pre-Reading Material)* | **Lauren Adkins** |
| 10:30 AM – 10:45 AM | **15 MINUTE BREAK** | |
| 10:45 AM – 11:45 AM<br>**60 MINUTES** | Example Approach | **Lauren Adkins** |
| | Group Exercise: 6 Topics – Identify Resources & Data gaps *(Pre-Reading Materials)* | **Lauren, Tami** |
| | Researcher Report Outs / Group Discussion | **HIA Researcher's by Topic** |
| 11:45 AM – 12:00 Noon<br>**15 MINUTES** | New News: Climate Change Effects on Vulnerable Populations of the Proctor Creek Watershed and Green Infrastructure Solutions | **David Egetter**<br>*EPA – Brownfields*<br>*Ecologist / Brownfields Project Manager* |
| | Next Steps | **Tami Thomas-Burton** |

## Boone Boulevard Green Street Project HIA Theoretical Causal Pathway Diagram (Handout)




Decision
Pathways of Impact
Health Determinants
Health Outcomes
Boone Boulevard Green Street Project (green infrastructure)
Road Diet
Safety
Economics, Household
Mobility, Access to Services
Environment (Natural, Built)
Transportation
Δ Physical Activity
Δ Access to Healthcare
Δ Socio-economic Status
Δ Social Capital (Cohesion, Culture)
Δ Water Quality
Δ Vector Control
Δ Climate & Temperature (Urban Heat Island Effect)
Δ Air Quality
Δ Noise Pollution
Δ Traffic Accidents
Δ Overweight/Obesity
Δ Stress (Acute & Chronic)
Δ Hypertension & Related Chronic Disease
Δ Cardiovascular Disease
Δ Crime-related Injury
Δ Mental & Behavioral Health
Δ Water-borne Disease
Δ Vector-borne Disease
Δ Heat-related Illness
Δ Cancer
Δ Respiratory Disease (Including Asthma)
Δ Hearing
Δ Motor Vehicle Injury and Death
Δ Morbidity/ Mortality
Δ Overall Health & Wellbeing

## Example Approach for Assessment (Handout)

EPA United States Environmental Protection Agency

Proctor Creek's Boone Boulevard Green Street Project
Health Impact Assessment (HIA)

U. S. Environmental Protection Agency, Region 4 and Office of Research and Development

### Example Approach for Assessing Health Risk Factors in the HIA Study Population

#### Purpose

The purpose of this example is to lead the discussion on potential methodologies for data collection, assessment/ analysis, and monitoring of health factors (determinants) in the Boone Boulevard Green Street Project HIA.

#### Example: Green Space as a Health Determinant for Stress

Stress is a known health determinant for hypertension and reduced overall mental health and well-being (Pickering 2001). The relationship between mental stress and environmental factors is a more current research topic. The natural environment and access to green space has been shown to have an independent influence on health and health behaviors (Mitchell and Popham 2008). A stressful environment at an early stage has been associated with decreased mental and physical health in adulthood (Taylor et al. 2004). Disparities in increased stress and lowered perceived overall wellness have been reported in numerous studies, especially among African Americans of lower income and lower education (Williams et al. 1997). Because there is a large portion of the vulnerable population in this community, it is important for this HIA to assess the potential impacts this project will have on stress and related health outcomes.

#### Approach

The proposed approach for this HIA is to 1) identify health outcomes and their risk factors in the community; 2) assess how the proposed green infrastructure project will address/not address risk factors; 3) use evidence-supported relationships between risk factors and health outcomes to infer or predict how health outcomes of the community may change if the decision is implemented. Recommendations can then be distilled from the predicted change and proposed best practices to mitigate negative health factors (risks) in order to optimize positive impact.

#### Method

**Decision:** Boone Boulevard Green Street Project (BBGSP)
**Health Determinant/Outcome:** Green Space/Stress-related Health Outcomes
**Geographic Scope:** ½ mile radius around proposed BBGSP
**Temporal Scope:** Post-implementation of BBGSP*

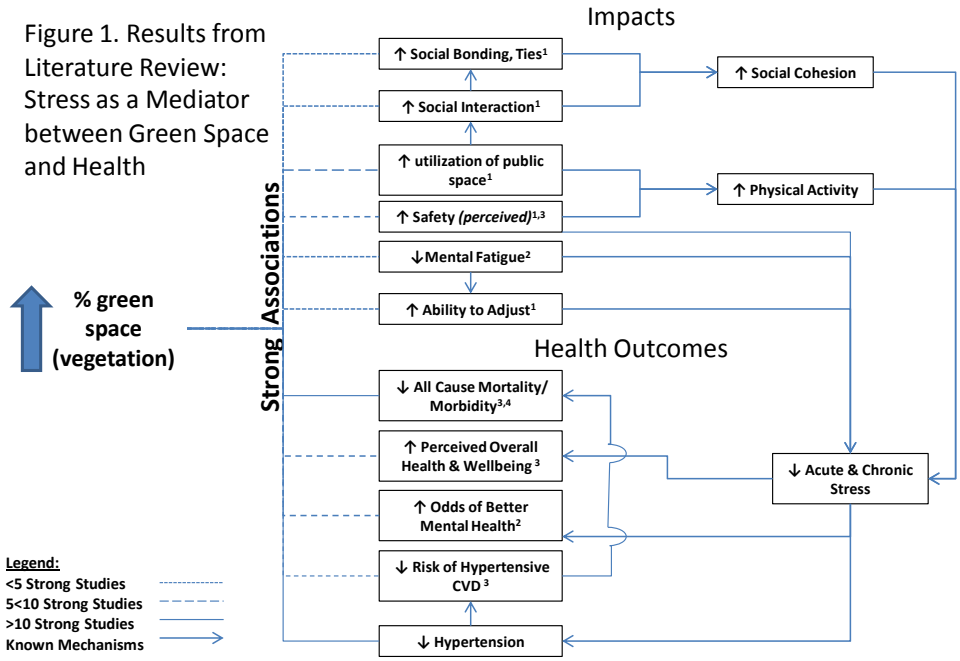
| Baseline Research Question | Impact Research Question | Key Indicators | Data Sources | Analysis Method | Monitoring Method |
|---|---|---|---|---|---|
| **What is the current risk distribution for health outcomes related to stress in this community?** | How will the proposed project impact stress in this community and potential disparities? | Hypertension Rates; Hypertensive Cardiovascular Disease Rates; Mental and Behavioral Disorder Hospitalization Rates | Georgia Department of Public Health; Online Analytical Statistical Information System (OASIS); Literature Review | GIS Mapping; Predictive Data Graphing | Periodic monitoring of indicators using OASIS Mapping Tool; Periodic community surveys via social institutions |

#### Literature Evidence

There is an increasing amount of evidence of the relationships between the natural environment (particularly green space) and health. "One population study found that increasing green space by 1 percentage point yielded an effect of 1-year lowered age on physician-assessed morbidity" (Maas et al. 2009). Due to the qualitative nature

of the non-physical effects, some of the evidence on stress is limited by self-reporting. That being said, mediators have been found that support the associations between green space and stress-related health outcomes. Commonly reported populations particularly sensitive to the benefits of green space include lower income, lower educational attainment, youth and the elderly (Lee, 2010). From the literature, we can hypothesize that after green infrastructure is implemented along Boone Boulevard we may see overall improvements in perceived physical and mental health, as well as a reduction in stress-related chronic diseases and all-cause mortality/morbidity. This hypothesis is also contingent on other additional changes that might occur in the community. Changes that would confound results may include: a significant shift in population demographics or household economics.

Figure 1. Results from Literature Review: Stress as a Mediator between Green Space and Health




Key Articles:
[1]Kuo, FE, WC Sullivan, RL Coley, L Brunson. 1988. Fertile Ground for Community: Inner-City Neighborhood Common Spaces. *American Journal of Community Psychology.*
[2]Sugiyama, T, E Leslie, B Giles-Corti, N Owen. 2008. Associations of neighborhood greenness with physical and mental health: do walking, social coherence and local social interaction explain the relationships? *Journal of Epidemiology for Community Health.*
[3]Maas, J, *et al.* 2009. Morbidity is related to a green living environment. *Journal of Epidemiology for Community Health.*
[4]Mitchell R, Popham F. 2008. Effect of exposure to natural environment on health inequities: an observational population study. *The Lancet.*

We can assume based on previous case studies and measured changes in perceived and physical health indicators that the percent of green space in the neighborhood can act as a risk factor to health. Strong associations have been found between the percent of green space and certain health outcomes, such as all-cause mortality/morbidity, perceived overall health and wellness, odds of better mental health, and stress-related chronic disease. Although strong correlations have been found, there is no evidence that green space directly affects health. The natural environment can influence individual health behavior and the social environment, which directly alter internal stress levels. The health impacts of high stress levels have been extensively studied and generally accepted. Consequently, stress acts as a mediator between the amount of green space and health.

## Baseline Analysis for Stress-Related Health Outcomes

Baseline conditions of stress-related health outcomes were gathered for the study population. Due to the sensitivity of individual health information, only publically-available aggregate data was used. There is an overburden of poor health in the study area. Figures 2 and 3 show death rates for Fulton County, Georgia compared to state averages. For both mental and behavioral disorder death rates and hypertension death rates, Fulton County is well above the state average. Figures 4-6 show the percent of emergency room visits by cause for the study population area. The census tracts that make up the study population stay within the top percentage for each health outcome.

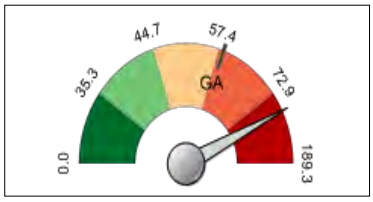



Figure 2. Dashboard for Hypertension Death Rates among African Americans in Fulton County, GA (1,158 per person-year) compared to the state average. The dial shows the Age-Adjusted Death Rate for Fulton County is 76.3. In comparison, the Georgia Age-Adjusted Death Rate is only 57.6. Additional values on the gauge represent percentiles from the lowest county rate to the highest county rate. (GADPH 2013)

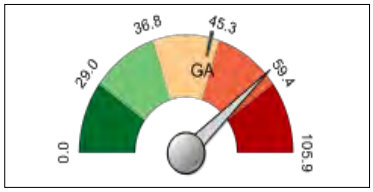



Figure 3. Dashboard for Death Rates from all other mental and behavioral disorders among African Americans in Fulton County, GA (660 per person-year) compared to the state average. The dial shows the Age-Adjusted Death Rate for Fulton County is 57.0. In comparison, the Georgia Age-Adjusted Death Rate is only 44.6. Additional values on the gauge represent percentiles from the lowest county rate to the highest county rate. (GADPH 2013)

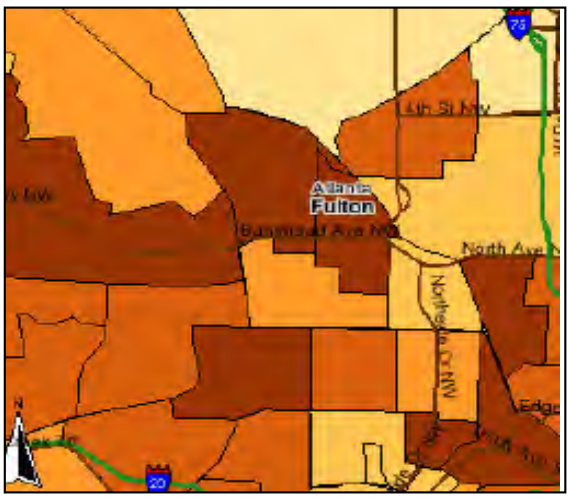
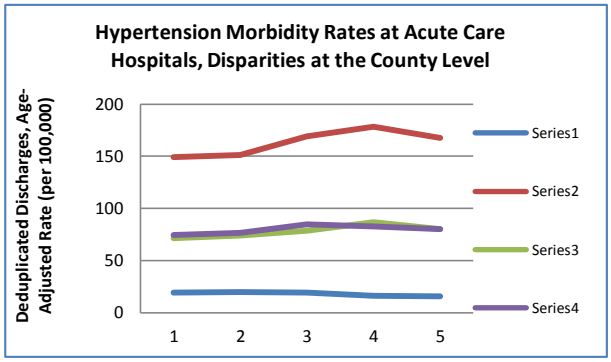



Figure 4-A (left). Percent of emergency room visits for high blood pressure (Hypertension) by census tract in Fulton County (2006-2010). Map created Jul 17, 2013. Data classification method is quartiles. The numbers indicate the seven census tracts (2010) included in our study area.
Figure 4-B (below). Hypertension morbidity rates for Fulton County, 2006-2010 (GADPH 2013).



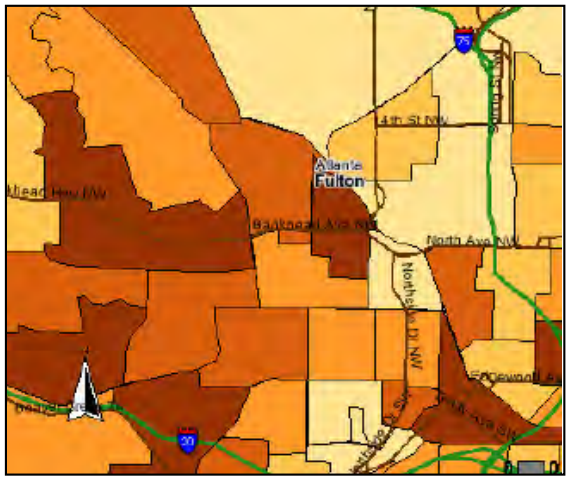
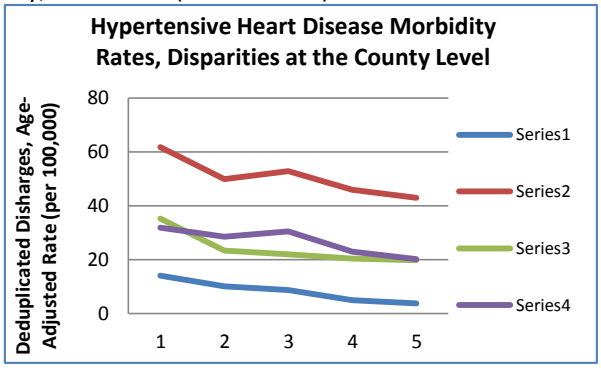




Figure 5-A (left). Percent of emergency room visits for all cardiovascular disease by census tract in Fulton County (2006-2010). Map created Jul 17, 2013. Data classification method is quartiles. The numbers indicate the seven census tracts (2010) included in our study area.
Figure 5-B (below). Hypertensive heart disease rates for Fulton County, 2006-2010 (GADPH 2013).



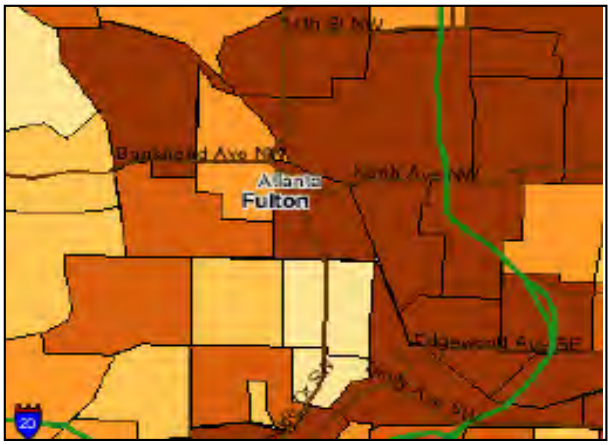
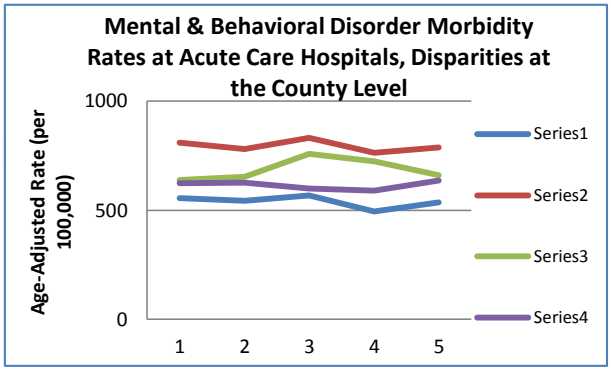



Figure 6-A (left). Percent of emergency room visits for all mental and behavioral disorders by census tract in Fulton County (2006-2010). Map created Jul 17, 2013. Data classification method is quartiles. The numbers indicate the seven census tracts (2010) included in our study area.
Figure 6-B (below). Mental and behavioral disorder morbidity rates, Fulton County, 2006-2010 (GADPH 2013).




## Impact Analysis

By following our theoretical pathway logic model, we can hypothesize where change will be seen and how those changes will impact health. Below is a table illustrating the hypothesized impact the Boone Boulevard Green Street Project will have on residents in the community.

| Health Outcome | Direction | Magnitude | Likelihood | Distribution | Permanence/ Severity | Quality of Evidence |
|---|---|---|---|---|---|---|
| **Overall Stress** | Positive | Low<br>• A 10% increase in greenness= 0.5% of population with better *perceived* health (Mitchell and Popham 2008) | Likely<br>• Stress-related indicators are extremely high for this area | Restorative Equity<br>• Low-income;<br>• Lower educational attainment;<br>• Youth and elderly impacted more | Medium<br>• Long-term effects associated with length of season | Sufficient<br>• Seen consistently across numerous case studies with few "no effect" studies |
| **Hypertension Mortality/ Mortality Rates** | Positive | High<br>• Large percent of residents with hypertension-related ER visits (GADPH 2013) | Likely<br>• Green space exposure significantly associated with mortality rates (Maas et al. 2009) | Disproportionate Benefit<br>• African Americans;<br>• Elderly impacted more | Medium<br>• Hypertension requires extensive management, benefits can be easily reversed | Limited<br>• Consistent but limited qualitative evidence |
| **Hypertensive CVD Morbidity/Mortality Rates** | Positive | High<br>• Large percent of residents with CVD-related ER visits (GADPH 2013) | Likely<br>• Low % of green space yielded a 42.2% increased risk for CVD (Mitchell Popham, 2008)<br>• CVD rates have been decreasing in every group over the past 5 years (GADPH 2013) | Disproportionate Benefit<br>• African Americans have the highest rate of hospitalization for CVD in Fulton Co, GA (GADPH 2013) | High<br>• CVD rates have been declining for past five years and direction not likely to change (GADPH 2013) | Limited<br>• Consistent but limited qualitative evidence |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Mental and Behavioral Disorder Morbidity/ Mortality Rates** | Positive | Medium<br>• Those with neighborhoods perceived as highly green had 1.6 times Odds Ratio of better mental health than less green neighborhoods (Sugiyama et al. 2008) | Possible<br>• Mental health rates have been stagnant over the past 5 years in Fulton Co, GA (GADPH 2013) | Disproportionate Benefit<br>• Lower-income;<br>• Lower educational attainment impacted more | Low<br>• Impact would be easily reversible from confounding genetic factors | Limited<br>• Consistent but limited qualitative evidence |
| **Key** | Positive: changes may improve health<br>Negative: changes may detract from health<br>Uncertain: Unknown how health will be impacted<br>No Effect: No effect on health | High: Causes impacts to many people<br>Medium: Causes impacts to wider number of people<br>Low: Causes impacts to no or very few people (relative to population size) | Very Likely/Certain: Adequate evidence for a causal and general effect<br>Likely: Logically plausible effect with substantial and consistent supporting evidence and substantial uncertainties<br>Possible: Logically plausible effect with limited or uncertain supportive evidence<br>Unlikely/Implausible: Logically implausible effect; substantial evidence against mechanism of effect<br>Insufficient Evidence/Not Evaluated:<br>-- | Equal Impact: The decision will result in equal impacts throughout the population<br>Disproportionate Harms: The decision will result in disproportionate adverse effects to populations defined by demographics, culture or geography<br>Disproportionate Benefits: The decision will result in disproportionate beneficial effects to populations defined by demographics, culture, or geography<br>Restorative Equity: The decision will reverse or undo existing or historical inequitable health-relevant conditions or disparities<br>Insufficient Evidence/Not Evaluated | High: Causes impacts that are chronic, irreversible or fatal<br>Medium: Causes impacts that necessitate treatment or medical management and are reversible<br>Low: Causes impacts that can be quickly and easily managed or do not require treatment | Sufficient Evidence: Many strong studies (>10 studies) with consistent results and conclusions of causal association<br>Limited Evidence: Few studies (2-3) with strong associations, but limited on causal inferences due to potential confounders/ other factors<br>Lacking/Insufficient Evidence: Studies are weak or vary in results<br>Unknown/Not Studied:<br>-- |

## Conclusion

We can conclude from the evidence that our study population has a high risk of stress-related disease. Fortunately, the Boone Boulevard Green Street Project will help address the overburden of disease by increasing green space. This will in turn help to mitigate some causes of stress in the community. In relation to the health indicators, we recognize there are many factors other than green space that influence health. Simply adding more green space will not directly cause change in health outcomes, but the opportunity for change will be more equitable among sub-populations. Further study would involve surveying community residents to measure perceived stress levels and any changes after implementation. Educational outreach can be used to help teach residents to identify causes of stress and ways to cope. Recommendations should be drafted to help further reduce sources of stress in this community to maximize the benefits to health.

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## HIA Advisory Group Exercise (Handout)

Proctor Creek's Boone Boulevard Green Street Project
Health Impact Assessment (HIA)

U. S. Environmental Protection Agency, Region 4 and Office of Research and Development

### Group Exercise

**Purpose:**

The purpose of this group exercise is to help the research team to identify potential tools and sources, including published evidence, local data, and peer-reviewed literature, for the topics below. As a member of the Advisory Group, you may gather information prior to the meeting by filling out this table wherever possible and discuss sources during the group exercise.

| Topics | Baseline Condition | Data Sources | Tool(s) |
|---|---|---|---|
| Environment | Water Pollution | | |
| | Flooding and Storm Water Management | | |
| | Soil and Filtration | | |
| | Air Pollutants (PM, CO, CO2, etc.) | | |
| | Temperature and Humidity (Urban Heat Island Effect) | | |
| | Ecology and Biodiversity | | |
| | Disease Vectors and Transmission | | |
| | Surface Permeability | | |
| | Grey to Green Space (Land Cover) | | |
| Public Space and Recreation | Physical Activity (Opportunity and Actual Activity) | | |
| | Parks and Recreational Space | | |
| Transportation | Traffic Conditions and Road Diet | | |
| | Traffic Calming Practices | | |
| | Traffic Accidents | | |
| | Traffic-related Air Pollution | | |
| | Traffic-related Noise Pollution | | |
| Mobility, Access to Services | Walkability and Bikeability | | |
| | Public Access Points (Bus stops, electric cars, etc.) | | |
| Social Capital | Social Bonding and Ties (Support) | | |
| | Social Cohesion and Social Contract | | |
| | Culture and "Branding" | | |
| | Social Institutions (churches, schools, community groups, etc.) | | |

| | | | |
|---|---|---|---|
| | Public Meeting Space | | |
| | Educational Outreach | | |
| | Capacity Building (Jobs) | | |
| Politics/Government | Stakeholder Involvement In Planning (NPU-L) | | |
| | Resource Allocation | | |
| Vulnerable Populations | Educational Attainment | | |
| | Income | | |
| | Occupation | | |
| | Housing Status | | |
| | Race and Ethnicity | | |
| | Age | | |
| Economics (Household and Community) | Industry in the Community | | |
| | Poverty and Unemployment | | |
| | Property Values | | |
| | Affordable Housing and Housing Costs | | |
| | Vacant and Occupied housing | | |
| | Housing Quality (Damage) | | |
| Safety | Crime and Civility | | |
| | Perceived Safety | | |
| | Traffic Safety | | |
| | Deterring Incivilities | | |

**HIA Advisory Group Input on Potential Data Sources, Methods, and Contacts for the Assessment Step (Posters):**

| Poster Category and Subtopics (Health Determinant Groupings) | Stakeholder Input and Considerations for the Assessment Step |
|---|---|
| **Environment**<br>Topics included, but not limited to:<br>• Water pollution<br>• Flooding and stormwater<br>• Soil and filtration<br>• Air pollution<br>• Evapotranspiration and humidity<br>• Ecology and biodiversity<br>• Surface permeability<br>• Disease vectors and transmission<br>• Gray to green space (including Brownfields) | Leaf-on (tree canopy coverage area) http://datagateway.nrcs.usda.gov/<br>Leaf-off, LiDar (Tree Canapy & tree height) – Class 1 – Used to better evaluate the urban tree (green infrastructure) component of the watershed)<br>Other Multiband, high resolution imagery – I have access to the military clearinghouse for remotely sensed data (satellite & airplane) and check it frequently for any up-to-date imagery that we may be interested in and that could possibly support this HIS assessment and additional work in Proctor Creek Watershed https://warp.nga.mil/<br>Green Health – G.I. (tree canopy) & Human health. Peer-reviewed, 1400 citations. www.greenhealth.washington.edu<br>http://depts.washington.edu/hhwb/ This is Kathy Wolf's work (kwolf@u.washington.edu<br>Hydro (itree) and ECO (itree)<br>Open Tree Map (tree mapping & how it affects Environmental Services) This is open source http://www.azavea.com/products/opentreemap/<br>Community Viz (Planning & Design Scenario's, effects) No longer free, but possibly an HIA scenario builder tool http://placeways.com/communityviz/<br>EPA STORET<br>Atlanta DWM (monitoring data)<br>USGS<br>Green Streets (http://www.epa.gov/owow_keep/podcasts/greenstreetsusa.html)<br>West Nile Study – Auburn University, should have mosquito habitat results (basically old tires & water) by 1st quarter 2014<br>Water Environment Research Fund (WERF)– Green Infrastructure Valuation, several recent EPA funded research projects…An Evaluation of the Functions and Effectiveness of Urban Riparian Zones (WERF 99WSM4)- (Executive summary attached) Tools for Evaluating Green Infrastructure (attached) and…Stormwater to Street Trees – Engineering Urban Forest for Stormwater Management (EPA 841-B-13-001) – Not "ground-breaking" but the basics; (this was not a WERF project)They (EPA) also are funding a current project (with WERF) on Green Infrastructure Asset Management that is scheduled for completion http://www.werf.org/<br>CDC's Environmental Public Health Tracking System. Georgia is not in portal yet. But, other states are there. |
| **Economics** | Beltline – Affordable Housing (Assessment of AH options) |

| Poster Category and Subtopics (Health Determinant Groupings) | Stakeholder Input and Considerations for the Assessment Step |
|---|---|
| Topics included, but not limited to:<br>• Industry in the community<br>• Poverty and unemployment<br>• Property values<br>• Housing quality (damage)<br>• Affordable housing and housing cost<br>• Vacant and occupied housing | Fulton County – Tax Parcel Data Housing Values<br>BLS – Bureau of Labor Statistics (Job Classifications)<br>ACS – Census Income information<br>Economic Development – Industry Information Merchants Association<br>Atlanta Code Enforcement – Vacant & Occupied Housing Information<br>Real Estate Association – Housing cost<br>Insurance Companies – Housing Damage information<br>Atlanta Regional Commission (ARC) – Reports<br>Community Improvement District Associations (Rodney Mullins)<br>Chamber of Commerce |
| **Transportation**<br>Topics included, but not limited to:<br>• Traffic Conditions and road diet<br>• Traffic calming practices<br>• Traffic accidents<br>• Traffic-related air pollution | North South Public Transportation on J.E. Lowery between Marietta Street & Ashby Marta Station<br>Bike riders (sidewalk). Multiuse lanes for bikers & walkers…versus Street bike riders (inclusive of all riders)<br>Should trees & shrubs be planted in the street? …..right of ways obscuring views of traffic (veg. cover?)<br>COA-City of Atlanta /APD-Atlanta Police Department: Accident Survey |
| **Mobility, Access to Services**<br>Topics included, but not limited to:<br>• Public access points (bus stops, electric cars, etc.)<br>• Walkability<br>• Bike-ability | ARC GIS Data (bus routes/stops, sidewalks, bike paths (Cassandra)<br>WalkScore - http://www.walkscore.com/<br>Atlanta Bicycle Coalition, bike counts, http://www.atlantabike.org/BicycleTrafficCounts<br>MARTA<br>Beltline user counts (Lee H.)-<br>PATH traunetwork<br>American Community Survey<br>National Academy TRB (Transportation Research Board) Circa 2008 (Kevin M.) |
| **Politics/Government**<br>Topics included, but not limited to:<br>• Stakeholder involvement in planning (i.e., NPU-L)<br>• Resource allocation | i-Parcs (look-up: Dr. Kathleen Wolf, University of Washington. Database of Parks and Greenspace studies) http://www.naturewithin.info/new.html<br>Atlanta Regional Commission (ARC)<br>ABI/PATH trail (connectivity options to Greenspace) – (Lee H.)<br>Safe Routes to School<br>American Association of Retired People<br>PAR Courses (DPH)<br>URBAN-LAND-INSTITUTE (Walt R.)<br>Project for Public Spaces (Walt R.) |

| Poster Category and Subtopics (Health Determinant Groupings) | Stakeholder Input and Considerations for the Assessment Step |
|---|---|
| | City Parks Alliance (Walt R.)<br>Trust for Public Lands (Park Score) (Walt R.)<br>National Recreation Parks Alliance (Walt R.)<br>Active Net (Sports & Activity) |
| **Public Space and Recreation**<br>Topics included, but not limited to:<br>• Physical Activity (opportunity and actual activity)<br>• Parks<br>• Recreational space | Co-development<br>Churches<br>AUC<br>N-hood events (books & backpacks)<br>Community development corporations (religious & non-religious development)<br>Girls & Boys Club<br>Teach for America College Students<br>Schools (Parent Teacher Associations)<br>AmeriCorp<br>Volunteers of America<br>Resources to engage the community (meeting times & locations to attend, $$ to travel)<br>Stipends to Community for their time. |
| **Safety**<br>Topics included, but not limited to:<br>• Crime/civility<br>• Traffic safety<br>• Perceived safety<br>• Deterring incivilities | Atlanta Police Department<br>City of Atlanta Bike and/or Pedestrian Accident Summaries<br>City of Atlanta Public Works – Traffic Management (signed inventory / maintenance)<br>Crime Prevention through environmental design (CPTED)<br>Department of Energy studies for accelerator in Texas<br>Chicago: Pilsen and Southside studies<br>Community cohesion models |
| **Social Capital**<br>Topics included, but not limited to:<br>• Social bonding and ties (support)<br>• Social cohesion and social contact<br>• Culture and branding<br>• Social institutions (churches, schools, community centers)<br>• Education outreach<br>• Public meeting spaces<br>• Capacity building (jobs) | Concerning Black Clergy<br>AUC (Education & Outreach)<br>State Behavioral Health<br>Neighborhood Planning Unit<br>Neighborhood Associations<br>Garry Harris's Center for Sustainable Communities<br>Fraternities & Sororities<br>Fulton County Human Services Department<br>Churches located in the neighborhood<br>Urban Gardens – Rashid<br>Food Commons – Kwabenna Nkormo |

| Poster Category and Subtopics (Health Determinant Groupings) | Stakeholder Input and Considerations for the Assessment Step |
|---|---|
| | Food Bank<br>New Horizons Senior Center<br>Historical Preservation Department of Labor (Local Jobs) |
| **Vulnerable Populations:**<br>Topics included, but not limited to:<br>• Educational attainment<br>• Income<br>• Age<br>• Race and ethnicity<br>• Housing status<br>• Occupation | (Chris) number of jobs and/or individuals with connections in relation to change in physical activity<br>(Chris) Single parent families with opportunity for physical activity<br>(Cassandra) Census data and/or American Community Survey<br>(Cassandra) Social Vulnerability Index (SoVI), University of South Carolina indicators [Susan Cutter ]<br>(Lucy Wang) Property values (economic balance between income & poverty)<br>(Lucy Wang) Piedmont study<br>(Lucy Wang) Property value – renovation, restoration<br>(Lucy Wang) Youth and lack of educational, involvement of parents (i.e., social support)<br>Monitoring Health-Related Quality of Life (HRQoL)Index<br>Georgia Tech – Quality of life website for City of Atlanta. (professor: Botchwey)<br>U.S. Department of Housing and Urban Design block grant programs (CDBG)<br>Neighborhood stimulus program (e.g., HERA – ARRA)<br>Foreclosed Homes – refurbish and resale for affordable housing |

*Note: There was no scribe a the second HIA Advisory Group meeting and thus no a summary of the meeting was prepared.*

## Documentation of the Second Community Engagement Meeting, March 22, 2014

### Second Community Engagement Meeting Invite (Flyer)

**ANNOUNCEMENT: Upcoming Community Meeting!**

**Proctor Creek's Boone Boulevard Green Street Project – Health Impact Assessment**

During the past year, the U.S. Environmental Protection Agency (EPA) has been conducting a health impact assessment (HIA) on a proposed green infrastructure project in the headwaters of Proctor Creek. The proposed "Boone Boulevard Green Infrastructure Conceptual Design" is under consideration of the City of Atlanta's Department of Watershed Management to be implemented along with the road diet planned for Joseph E. Boone. The proposed green street project was designed as a demonstration project for implementing Green Infrastructure to address local storm water runoff, water quality, and other environmental health issues.

The purpose of this HIA is to evaluate the proposed project for potential impacts on environmental and public health and inform future decisions around green infrastructure approaches to storm water management, ecosystem restoration, economic development, and community revitalization. A presentation will be given on initial findings of the HIA regarding key impacts related to the community. ***Come learn about the HIA process and how your input can improve your community!***

**Headwaters of the Proctor Creek Watershed: Commitments and Capacity Building**

The City of Atlanta and the EPA are preparing for future activities in the communities of Proctor Creek. The director of EPA's Office of Water Protection will be presenting on their organization's commitments in the area and how residents can get involved. A roundtable discussion on how to build capacity for community projects through grant funding and building partnerships will be facilitated by local community leaders and researchers. ***Come and learn how you can empower your organization to make change!***

***~ Light food & beverages will be provided ~***

**MEETING INFORMATION**

**WHEN:**
Saturday, March 22, 2014
from 9:00 AM to 1:00 PM
**Doors Open: 8:30 AM**

**WHERE:**
Central United Methodist Church
501 Central Street SW,
Atlanta, GA 30314

**SPEAKERS:**
Tami Thomas-Burton
*EPA Region 4 –Office of Environmental Justice and Sustainability, HIA Project Co-Lead*

Jim Giattina
*EPA Region 4 –Office of Water Protection, Director*

David Egetter
*EPA Region 4 – Resource Conservation and Recovery Act Program (Brownfields)*

Monica Robinson
*Fulton County – Department of Health & Wellness*

Dr. Yomi Noibi
*Eco-Action Inc.*

Na'Taki Jelks Osborne
*WAWA & Georgia State University*

**MEETING CONTACT:**
Tami Thomas-Burton
Office (404) 562-8027
email:
Thomas-burton.tami@epa.gov

**GENERAL INFORMATION**
EPA Toll-Free Customer
Service # 1-800-241-1754

EPA United States Environmental Protection Agency · Resurgens Atlanta · Fulton County · Georgia Health Policy Center · CDC Centers for Disease Control and Prevention

## Notes from Second Community Engagement Meeting

**Key "Take-aways" we heard from HIA Community Meeting Discussions**

1. After the HIA report is completed, we still need funding for Community-led projects
2. Teach us how to leverage Fed, State, and local funding
3. A need for grants training & proposal writing
4. Conflict Resolution needed for long-term resolutions efforts & capacity building
5. Partnerships with local schools for sustainability
6. Recognition of Community Organizations for their contributions
7. Lack of knowledge concerning local issues, initiatives, and projects happening in the community
8. Create training & train-the-trainer models for
    a. community research,
    b. green Infrastructure,
    c. green jobs,
    d. and water sampling stewards.
9. Empower, train, and employ people in the community on sustainability matters
10. There is a perception outside of the community that the headwater community organizations are not organized. Help us create new ways to build capacity in the community and change perception.

Source: Tami Thomas-Burton, HIA Project co-Lead

## Summary of the Second Community Engagement Meeting (Handout)

# Flip Chart Notes & Powerpoint Highlights from HIA Community Meeting
# Proctor Creek's Boone Blvd Green Street Project
# Saturday, 03/22/2014 (9:00 am – 1:00pm)

**HIA – Health Impact Assessment Meeting Objective, Review & Update**

- *(Tami's Highlights)*
    - Meeting Objective: Engage Community Members in the HIA process, Give update on the HIA's progress - Present initial findings of the HIA, Discuss EPA's Commitment to Proctor Creek, Obtain feedback from Community Members on HIA and path forward for continued Community Capacity Building, Discuss Community-Lead Projects on the horizon.
    - HIA Defined: A Health Impact Assessment is a science tool used to evaluate both the positive & negative health effects of a project or policy before it is implemented.
    - Understanding Health Assessment Terminology: All Health Assessments are not the same. A Health Impact Assessment is different from the following. For more detailed information see: http://www.cdc.gov/healthyplaces/types_health_assessments.htm
        - PHA – Public Health Assessment: The evaluation of data on the release of hazardous substances into the environment in order to assess any past, current, or future impact on public health, ….from this assessment … thus health advisories are developed.
        - HRA – Health Risk Assessment: An assessment to determine the risk of adverse health effects that would be caused by exposure to specific chemicals or other hazards.
        - EIA – Environmental Impact Assessment: provides a systematic, reproducible, evaluation of the potential physical, biological, cultural, and socioeconomic effects of a proposed action and its practical alternatives.
    - What is Health: Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.
    - Social Determinants of Health: are the economic and social conditions that can influence the risk for a disease, or vulnerability to disease or injury.
    - What the Boone Blvd Green Street HIA is about: Evaluate potential positive and negative health impacts of the green street design and inform stakeholders. The green street design in concert with a planned road diet will help manage the flooding, to help in cleaning the surface water and ground water, to improve the streets and sidewalks, and to help in economic revitalization.
- *(Monica R. & David's Highlights)*
    - Recap of previous community & advisory group meetings: Community Group and the Advisory Committee identified issues of interest and areas of concern in the community.
    - Topics Evaluated in HIA
        - Water Quality
        - Air Quality (Outdoor)
        - Flooding
        - Climate and Temperature
        - Ecology and Biodiversity
        - Pollutant and Pathogen Transmission
        - Noise Pollution
        - Transportation and Traffic Safety
        - Vector Control (Mosquitoes)
        - Job Creation / Unemployment
        - Housing and Development
        - Access and Mobility
        - Social Interaction and Cohesion
        - Community Economic Revitalization

        - Physical Activity
        - Healthy Eating / Nutrition
        - Mental and Behavioral Health
        - Morbidity and Mortality
    - Examples of how Stormwater can impact health: Exposure to Injury from Flooding, Exposure to Vector-borne Diseases, Exposure to Waterborne Disease, Exposure to stress from loss / damage of property and self.
    - Next Steps of HIA:
        - Document findings from assessment step of HIA
        - Need to incorporate local business owners in HIA process
        - Input received from community will be incorporated into findings of HIA
            - Nitrogen/Phosphorus prevention vs. treatment → needs to be addressed/revisited in findings.
            - Project (Boone Blvd) Impacts *vs.* Community-wide Impacts *vs.* Watershed-wide Impacts
        - Develop initial recommendations based on findings of HIA
            - Currently planning department at City requires more parking spaces if you expand the capacity of your building (Rev. Bright's example). No mechanism for green infrastructure recommendations here. Atlanta Dept. of Watershed and Planning should discuss this disconnect.
        - Initial recommendations will be presented to community and other stakeholders for input / feedback.
        - Finalize recommendations and present report to the City of Atlanta and public.
        - Timeline: Develop HIA Report and Present HIA Report (June/July 2014)

**Community Discussion**

- *(Dr. Yomi)* Has there been consideration of the community-wide impact not just the ½ mile radius of Boone Blvd.
- *(Tony Torrence*) How much will the proposed Green Street capture in Water? Has that been calculated?
- *(Rev. Bright)* Has the City of Atlanta considered the impacts of more impermeable surfaces and increased traffic as the new stadium goes in?
- *(Deborah Scott, Yvonne Jones, Rep. Able Mable Thomas)* There are many moving parts and too many entities (agencies) working in silo's. We need to find a way to breakdown the wall of transparency and get this information and messages to city council.
- *(Rev. Bright)* Who is looking at the Nitrogen and Phosphorus loads in the headwaters of the Creek? What preventive considerations are taking place? (Tami's clarification notes: Nitrogen & Phosphorus "Nutrients" can be produced by animal and human wastes [pet waste, septic tanks, waste water treatment plants]…too much can cause problems in water bodies)
- *(Rep. Able Mable Thomas)* Sustainability comes from involving community youth/schools/education. Youth/kids then subsequently make the change through educating their parents, family, relatives, friends, etc.

**Highlights from Jim Giattina Discussion**

- One of EPA's priority and commitment is "Making a Visible Difference in Communities."
- Proctor Creek became one of 18 Urban Waters Partnership communities in the country; many community members participated in the December 2013 meeting with the Federal Partners.
- We must constantly learn from the community to create a livable community
- How can we work together? How can we do more with fewer resources?
- Let us focus on issues with structure, hard work, and ongoing discussions.
- How do we engage while keeping the community front & center?
- Charge/Actions/Questions to think about:
    - How do we share leadership?
    - How do we create an accountability structure?
    - How do we communicate our plans with each other better?
    - What resources are available in the community?

# Flip Chart Notes & Powerpoint Highlights from HIA Community Meeting
# Proctor Creek's Boone Blvd Green Street Project
# Saturday, 03/22/2014 (9:00 am – 1:00pm)

**"Capacity Building" facilitated by Dr. Yomi**

- Community Capacity Building (CCB)
    - Generate inclusive process that processes that strengthen trust and build commitment and good relationships
    - Strategic Questions
        - Whose capacity are we trying to build?
        - Capacity to do what and why?
        - When do we need to build these capacities?
        - Who should deliver the capacity building?
        - How will we know if we have succeeded?
    - Assumptions: All communities are perceived as having inherent strengths, skills, and abilities (or assets within them).

**Community discussion from Capacity Building exercise**

- Ways to build capacity in the community
    - Issue: Trust, Dependability, Accountability
        - Potential Intervention: Conflict Resolution
        - Potential Intervention: Create a Shared Process
        - Potential Intervention: Create Transparency among groups
    - Westside Communities should embark on a major green initiatives
    - Build a community park at Lowery Boulevard
    - Green Infrastructure starts with code enforcement
    - We need to partner with schools for sustainability purposes (each one teach one through children)
    - Resources are needed because we have community organizations in place
        - Potential Intervention: Grants Training
    - For the different Group and Community Organizations, they are asking, "What's in it for me?" How do we create the longevity of these organizations in the community?
    - On an ongoing basis, we need to find a way to recognize the contributions made by these community organization
        - Potential Intervention: Awards Recognition
    - Take preventive measures
    - There is a perception outside of this community that the headwater communities do not have capacity.
    - We need an Urban Waters Partnership "Prevention" outlook for Proctor Creek
        - EPA should provide data
        - Train-the-trainer models should be developed concerning EPA data
    - People resources to do some of the work in the community (knowledge of local issues)
    - Need to communicate and involve residential & business more
    - Teach communities how to Leverage Resources
    - Restructuring to support community (specifically on non-point pollution)
    - Shared leadership requires shared power within the community
    - Local, State, and Federal collaboration and how to leverage all funding
    - Always seek out community to help
    - Sustainability always and continues to be a problem:
        - Empower, Employ, and Train people in the community concerning sustainability
        - Poverty and lack of ownership is a problem

**Community-Led Projects & Initiatives in Action**

- **(Na'Taki Osborne Jelks)**
  - ***WAWA – West Atlanta Watershed Alliance***
  - The West Atlanta Watershed Alliance (WAWA) is a community-based non-profit organization whose mission is to improve the quality of life within the West Atlanta Watershed by protecting, preserving and restoring our community's natural resources. WAWA represents African American neighborhoods in Northwest and Southwest Atlanta that are most inundated with environmental stressors, but are least represented at environmental decision-making tables.
  - Identify Hot Spots for Priority Areas
  - 10 Proctor Creek Researchers (to collect Data & Identify gaps)
  - Photo Voice (Inventory history & local knowledge)
  - Create our own community maps
  - Kick-off: May/ June 2014
- **(Tony Torrence)**
  - ***Community Improvement Association & Proctor Creek Stewardship Council (PCSC)***
  - PCSC Mission Statement - " Proctor Creek's people participating to preserve and protect the prosperity of the watershed utilizing local knowledge/skills to improve public health for the people of Proctor Creek."
  - Educate / Train how to test the water (Creating Water Stewards within the Community)
  - Stream Clean-up's (Ongoing)
  - Sustainability Efforts
- **(Deborah Scott & Jackie Treadville-Samuel)**
  - ***Georgia Stand-up / Trade-up / Build-up***
  - Georgia Stand-Up empowers residents to ensure economic development meets the needs of their neighborhoods and uses community benefits agreements and policies to assist communities.
  - Recognizing the contributions of the community
  - Training community with skill sets in construction, apprenticeship programs, and deconstruction
  - Community Service
  - Georgia "Build-up" is a new arm of Georgia Stand-Up and addresses "real-time" events.

Source: Tami Thomas-Burton, HIA Project co-Lead

## Documentation of the Final Stakeholder Engagement Meeting, June 5, 2014

### Final HIA Stakeholder Engagement Meeting Invite (Email)

### Hello Proctor Creek Advisory Group & Community Leaders,

We will be holding our **Final** Proctor Creek combined Advisory Group & Community Stakeholder Meeting on:

Date: **Thursday, June 5, 2014**

Time: 12:30 pm – 3:30 pm

Location: Sam Nunn Federal Center

61 Forsyth Street SW

Atlanta, GA 30303

Room: 9th Floor, Room 9D/9E

Check-in: Please allow extra time to go through Security & obtain a "Visitors Pass." After obtaining your pass, go to the elevator (9-14).

Parking: Parking surrounding the Sam Nunn Building can be expensive. We encourage you to use Marta. We are located Kati corner from the "Five-Points" MARTA stop.

***If Driving, Paid Parking located at:***

145 Lower Alabama Street Parking Lot (approx. $10)

76 Forsyth Street Parking Garage (approx. $7)

55 Spring Street Lower Parking Lot (approx. $5 - $7)

Looking forward to your attendance at this very interactive meeting. Your participation, feedback, and input is valued!

## Meeting Agenda from the Final Stakeholder Engagement Meeting

EPA United States Environmental Protection Agency

# Health Impact Assessment (HIA) for Proctor Creek's Boone Boulevard Green Street in Atlanta, Georgia

U. S. Environmental Protection Agency, Region 4 and Office of Research and Development

## HIA Combined Advisory Group and Community Stakeholder Meeting

Thursday, June 5, 2014, 12:30PM – 3:30PM

Sam Nunn Federal Center – 61 Forsyth Street SW, Atlanta, GA 30303 Room # 9D/9E (9th Floor)

Meeting Objectives:

- Brief overview of HIA progress
- Discuss Initial Research Findings
- Engage for feedback and recommendations
- Prioritize recommendations

| | | |
|---|---|---|
| 12:30 PM – 12:45 PM<br>**15 MINUTES** | Welcome / Introductions / Logistics | **Tami Thomas-Burton**<br>*EPA Region 4 – Office of Environmental Justice & Sustainability, HIA Co-Lead* |
| 12:45 PM – 1:15 PM<br>**30 MINUTES** | Recap HIA and HIA Progress:<br>HIA Progress & Timeline | **Florence Fulk**<br>*EPA Office of Research and Development*<br>*NERL – Molecular Ecology Research, Branch Chief*<br>*HIA Co-Lead* |
| | Boone Blvd. Green Street Project:<br>"Background and Path Forward" | **Todd Hill**<br>*City of Atlanta – Department of Watershed Management*<br>*Watershed Director* |
| 1:15 PM – 1:25 PM | **10 MINUTE BREAK** | |
| 1:25 PM – 2:25 PM<br>**60 MINUTES** | Key Findings of the HIA<br>Group Exercise: 9 – Poster Presentations of Predicted Impacts *(HIA Researchers by Topic)*<br>Group Discussion on Findings | **Lauren Adkins**<br>*EPA Contractor: CSS – Dynamac*<br>*Public Health Specialist* |
| | **10 MINUTE BREAK** | |
| 2:35 AM – 3:05 PM<br>**30 MINUTES** | Developing Recommendations<br>Group Exercise: 9 – Initial Recommendation Posters *(Post-it Edits Exercise)*<br>Group Exercise: Prioritization / Voting | **Lauren Adkins** |
| 3:05 PM – 3:30 PM<br>**25 MINUTES** | New & Upcoming HIA Project :<br>HIA Project #2 – Expanded Scope | **Florence Fulk**<br>**David Egetter**<br>*EPA – Brownfields, Ecologist*<br>*HIA Core Team & Researcher* |
| | Wrap-up and Recognitions | **Tami Thomas-Burton** |

## Assessment Findings Presented to Stakeholders (Posters)

# ENVIRONMENT

# WATER QUALITY & FLOOD MANAGEMENT

| Elements of Project Design | Findings Summary | Health Factors (Determinants) | Health Outcomes | Vulnerable Population Information |
|---|---|---|---|---|
| The project will use elements of green infrastructure (rain gardens, planter boxes, and permeable pavement) to create a streetscape along Joseph E. Boone Street Northwest. The design includes:<br>• Converting 5 ft wide of roadway on each side of the street from a shared travel lane into a designated bike lane;<br>• Converting vacant grassland into bioretention cells (rain gardens), grass spillways, and stormwater catch basins;<br>• Converting 12 ft wide of roadway on one side (eastbound side) of the street into planter boxes;<br>• Converting 12 ft wide of roadway (alternate to the planter box) into a center turn lane at required intersections; and<br>• Adding 1-2 spaces for street side parking.<br>Planter boxes and rain gardens will include different types of vegetation (trees, bushes, grasses, etc) and soil media (mulch, sand, rock, etc). | Stormwater runoff and storm sewer overflows are two of the most common causes of surface water impairment. As stormwater moves over a surface, it picks up substances previously deposited on that surface (e.g., debris, heavy metals, soil, bacteria, etc.). Green infrastructure is commonly used to reduce or slow runoff and capture and/or remove pollutants.<br>Increasing the permeability of the ground and planting vegetation allows stormwater to undergo natural filtration processes. Using different soil medias and vegetation improves the ability to capture and absorb pollutants moving in water. Pollutant removal has been found to improve over time as the structure ages and the soil media settles.<br>Nitrogen and Phosphorous are naturally occurring and human-generated nutrients that occur in soils and surface water. Although these elements are essential for all living organisms, they can become toxic at high levels.<br>The proposed project's design will:<br>• Add 14,788 ft² more of pervious surfaces;<br>• Capture and retain all of the rain from 91% of storms in an average year and up to 1.2 inches of larger storms (57% increase in total rainfall retained);<br>• Reduce the amount of days per year with runoff coming from the street by 5 days ( 20% reduction );<br>• Capture and/or remove up to 99% of substances carried in stormwater runoff, such as suspended sotids, nutrients, heavy metals, oils and grease; and<br>• Reduce up to 70% of disease causing organisms. | • Water Quality<br>Water quality is characterized by the physical properties, chemical properties, and organisms living in the water. Ingestion and/or contact with water contaminated with pathogens (disease causing organisms) and toxic substances (pesticides, chemicals, and heavy metals) can increase the risk of becoming ill, but does not always lead to sickness.<br>• Flood Management<br>Stormwater itself can be harmful in high volumes because it can cause flash flooding, overflows of sewer systems, and damage infrastructure and buildings. Flash flooding increases the risk of injury by creating hazards for slips, falls, and impact with floating debris. | Typical symptoms of waterborne illness manifest as dehydration, changes in the gastro-intestinal tract (e.g., abdominal pain, diarrhea, vomiting and nausea), and (in more severe cases) death.<br>Health outcomes related to flooding include injury, lowered perceived safety, higher stress levels, and in severe cases-death. | Those who are increased risk for water-borne illness include:<br>• Persons with more exposure;<br>• Young children;<br>• Elderly; and<br>• Persons with compromised immune function and/or poor nutrition (ex: HIV, undergoing chemo-therapy, recent organ/tissue transplant, etc.)<br>Those who are increased risk for injury from flooding include:<br>• Elderly; and<br>• Physically handicapped or disabled. |

**Predicted Health Impacts**

| Health Determinant | Direction | Likelihood | Magnitude | Permanence | Distribution | Strength of Evidence | Comments |
|---|---|---|---|---|---|---|---|
| Water Quality | ↑ | *** | * | * | + | ** | |
| Flood Management | ↑ | ** | ** | ** | + | ** | |

**Legend:**
↑ –The change in the health determinant will promote health and wellness
*** – high, ** – moderate, * – low
+ – vulnerable populations may benefit more or equity in the opportunity for healthy living will be restored

# ENVIRONMENT

# CLIMATE, TEMPERATURE & AIR QUALITY

**Elements of Project Design**

The project will use elements of green infrastructure (rain gardens, planter boxes, and permeable pavement) to create a streetscape along Joseph E. Boone Street Northwest. The design includes:

- Converting 5 ft wide of roadway on each side of the street from a shared travel lane into a designated bike lane;
- Converting vacant grassland into bio-retention cells (rain gardens), grass spillways, and stormwater catch basins;
- Converting 12 ft wide of roadway on one side (eastbound side) of the street into planter boxes;
- Converting 12 ft wide of roadway (alternate to the planter box) into a center turn lane at required intersections; and
- Adding 1-2 spaces for street side parking.

Planter boxes and rain gardens will include different types of vegetation (trees, bushes, grasses, etc) and soil media (mulch, sand, rock, etc).

**Findings Summary**

The "urban heat island" refers to the fact that the local temperature in urban areas is a few degrees higher than the surrounding area. Reducing impervious surfaces and increasing tree canopy for shading is widely known to decrease ambient temperatures.

One study indicated that daily mean ambient temperature is related to daily rates of violent crime with a positive and increasing relationship between temperature and aggravated crime that moderates beyond temperatures of 80 °F and then turns negative beyond 90 °F. The Green Street Project should provide lower ambient temperatures due to its suggested reduction in impervious surfaces (street diet), tree planting boxes, and other green features. It may also potentially decrease violent crime occurrences.

Air quality is a term used to describe the presence of pollutants in the air. Pollutants can be naturally occurring (e.g., pollen from plants) or result from human activities (e.g., combustion gases from motor vehicles). Combustion and motor vehicles contribute to air quality as the largest sources of air pollution in the U.S.

There are several ways in which plants contribute to the ambient (surrounding) air quality. Plants absorb gases in the air and use them for nutrients and forming tissue. Plants also filter pollutants from the air by providing surfaces for compounds to be deposited. Some plants release pollutants, such as pollen and volatile organic compounds, which can be harmful to human health at high levels.

**Health Factors (Determinants)**

- Climate and Temperature

Excessive environmental heat could increase the number of heat-related illnesses and deaths.

Increased tree canopy for shading and decreased impervious surfaces (e.g., concrete) can improve health by decreasing emergency room visits and hospitalizations.

- Exposure to Ambient Air Pollutants (Air Quality)

There are six air pollutants monitored by regulatory agencies due to harmful health impacts, including nitrogen dioxide, carbon monoxide, ozone, particulate matter (small particles), lead, and sulfur dioxide. Nitrogen dioxide, a normal component of the ambient air, becomes toxic at levels above 200 $\mu g/m^3$.

Carbon monoxide reduces the ability for blood to carry oxygen. Ozone causes breathing problems, triggers asthma symptoms, and reduces lung function. Inhaled particulate matter impacts health by interfering with gas exchange and causing inflammation in lung tissue. Lead is a heavy metal that Sulfur dioxide at high levels can inflame lung tissue and cause eye irritation. Exercising or spending a lot of time outdoors can increase exposure to air pollutants.

**Health Outcomes**

Climate and Temperature Impacts

- Extreme warm temperatures can lead to heat stroke, dehydration, respiratory difficulties, exhaustion, fatal and non-fatal heat stroke.
- Extreme warm temperatures can influence behaviors and attitudes that contribute to increased crime and mental health impacts, such as depression, physiological disruption, and post-traumatic stress disorder.
- Extreme warm temperatures can exacerbate existing health conditions, such as cardiovascular disease, asthma, diabetes, and psychiatric conditions.

Exposure to ambient air pollutants over time can lead to:

- Increased respiratory symptoms, such as chest pain, trouble breathing, coughing, and congestion;
- More visits to the emergency room or doctor's office for respiratory discomfort; and
- Increased risk of heart and lung disease, cancer, and overall mortality (death).

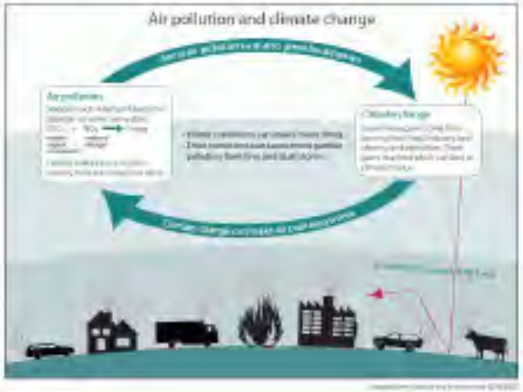
**Vulnerable Population Information**

Climate, Temperature, and Heat Island Effect mostly affect:

- Elderly (ages 65 and above);
- Young children;
- Pregnant Women; and
- Populations with existing medical conditions.

The most sensitive groups to ambient air pollutants include:

- Infants and young children;
- Older adults (elderly); and
- Persons with predisposing conditions (e.g., asthma and lung disease).




**Predicted Health Impacts**

| Health Determinant | Direction | Likelihood | Magnitude | Permanence | Distribution | Strength of Evidence | Comments |
|---|---|---|---|---|---|---|---|
| Exposure to Extreme Heat Events | ↑ | *** | ** | *** | + | *** | |
| Exposure to Ambient Air Pollutants (Air Quality) | ↑ | *** | *** | ** | + | *** | |

**Legend:**
↑ –The change in the health determinant will promote health and wellness
*** – high, ** – moderate, * – low
+ – vulnerable populations may benefit more or equity in the opportunity for healthy living will be restored

# ENVIRONMENT

# TRAFFIC SAFETY & ACTIVE TRANSPORT

| Elements of Project Design | Findings Summary | Health Factors (Determinants) | Health Outcomes | Vulnerable Population Information |
|---|---|---|---|---|
| The project will use elements of green infrastructure (rain gardens, planter boxes, and permeable pavement) to create a streetscape along Joseph E. Boone Street Northwest. The design includes:<br>• Converting 5 ft wide of roadway on each side of the street from a shared travel lane into a designated bike lane;<br>• Converting vacant grassland into bioretention cells (rain gardens), grass spillways, and stormwater catch basins;<br>• Converting 12 ft wide of roadway on one side (eastbound side) of the street into planter boxes;<br>• Converting 12 ft wide of roadway (alternate to the planter box) into a center turn lane at required intersections; and<br>• Adding 1-2 spaces for street side parking.<br>Planter boxes and rain gardens will include different types of vegetation (trees, bushes, grasses, etc) and soil media (mulch, sand, rock, etc). | Transportation systems and design can significantly impact quality of life and health in a community. Improving the availability, safety, and access to a variety of transportation options has the potential to save lives.<br>Design components that can change the environment in a way that promotes traffic safety include street lighting, pedestrian crossing infrastructure, traffic calming approaches (such as speed humps and traffic circles), street landscaping, and reduced speed limits and traffic lanes (road diets). Road diets are one of the most successful strategies used to improve traffic safety. The benefit to safety, however, can diminish at higher traffic volumes since the number of traffic lanes must be able to accommodate the traffic volume.<br>Street designs that are more compact and include infrastructure for pedestrians and cyclists (wide sidewalks and bicycle lanes) encourage more active transportation (walking and cycling) and discourage motorized transport. Convenience plays an important role in the decision of selecting a transport method.<br>Joseph E. Boone Street (Northwest) was ranked by Walkscore® as being somewhat walkable, meaning that some errands could be accomplished on foot, due to its nearby amenities, pedestrian friendliness, population density, and road metrics. Boone Street was ranked as having good transit for its many nearby public transportation options. The average annual daily traffic volume (AADT) was reported as 5,590 vehicles per day, which amounts to an average of about 4 vehicles per minute, and a peak volume time around 6 PM. The speed limit on Boone St. is 35 mph. There are pedestrian crossings and bus stops at every intersection along the project site. | • Traffic Safety<br>Effective design of streetscapes and transportation systems can result in the reduction and prevention of motor vehicle-related injuries and deaths.<br>• Active Transport<br>Active transportation, especially walking and cycling are instrumental in preventing chronic diseases. The health benefits of being physically active must be assessed against the increased risk of injury from a motor vehicle. | Health outcomes associated with motor-vehicle collisions include:<br>• Emergency room visits for traffic-related injuries; and<br>• Motor-vehicle related long-term disability.<br>Positive health outcomes associated with increased active transport may include:<br>• Reduced risk for obesity and cardiovascular disease;<br>• Improved mental health and perceived overall wellness from reduced anxiety, depression, or stress;<br>Negative health outcomes associated with increased active transport may include:<br>• Increased risk for lung disease from increased exposure to traffic-related emissions;<br>• Increased risk for physical injury. | Those who are more at risk for injury with a motorized vehicle include:<br>• Persons who are regular travelers along the street;<br>• Cyclists not wearing adequate protective gear (helmet, reflectors, etc.);<br>• Children; and<br>• Older adults (elderly) and/or persons with physical disabilities. |


**Predicted Health Impacts**

| Health Determinant | Direction | Likelihood | Magnitude | Permanence | Distribution | Strength of Evidence | Comments |
|---|---|---|---|---|---|---|---|
| Traffic Safety | ↑ | *** | *** | *** | + | ** | |
| Active Transport (Physical Activity) | ↑ | *** | ** | ** | + | *** | |

**Legend:**
↑ –The change in the health determinant will promote health and wellness
*** – high, ** – moderate, * – low
+ – vulnerable populations may benefit more or equity in the opportunity for healthy living will be restored

# ENVIRONMENT

# VECTOR CONTROL AND HOUSING QUALITY

| Elements of Project Design | Findings Summary | Health Factors (Determinants) | Health Outcomes | Vulnerable Population Information |
|---|---|---|---|---|
| The project will use elements of green infrastructure (rain gardens, planter boxes, and permeable pavement) to create a streetscape along Joseph E. Boone Street Northwest. The design includes:<br><br>• Converting 5 ft wide of roadway on each side of the street from a shared travel lane into a designated bike lane;<br><br>• Converting vacant grassland into bioretention cells (rain gardens), grass spillways, and stormwater catch basins;<br><br>• Converting 12 ft wide of roadway on one side (eastbound side) of the street into planter boxes;<br><br>• Converting 12 ft wide of roadway (alternate to the planter box) into a center turn lane at required intersections; and<br><br>• Adding 1-2 spaces for street side parking.<br><br>Planter boxes and rain gardens will include different types of vegetation (trees, bushes, grasses, etc) and soil media (mulch, sand, rock, etc). | Vectors are organisms, such as a ticks, rodents and mosquitoes, that transmit disease or a disease causing organism (i.e., pathogen). Biting ticks live in tall grasses and wooded habitats where passing animals provide a food source. Mosquitoes are a unique vector since they require stagnant or slow-flowing water for reproduction. Rodents can pass diseases directly through biting or indirectly from exposure to scat (droppings).<br><br>Regular scheduled maintenance is needed to maintain peak performance of stormwater BMPs and plays a large part in determining that they drain at their designed rate. Inadequate design, installation, and maintenance of stormwater management can lead to unintended mosquito infestation due to the standing and stagnant water. Low-lying areas and impervious surfaces (e.g., tires, bottles, pavement) collect water and provide a suitable habitat for mosquito production.<br><br>People living in low-income housing have been found to be at increased risk of exposure to mosquitoes compared with residents of high-income areas. In higher income areas air conditioning and protective behaviors such as the use of mosquito repellent or the active avoidance of mosquitoes may be higher than in lower income communities. In addition illegally dumped scrap tires and other mosquito habitats are more abundant in lower income communities. This community has a history of illegal dumping including large quantities of scrap tires. Concerns about mosquito density have been expressed at community meetings held during this HIA process.<br><br>Homes provide shelter, protection and private space. When the home is damaged impacts can include displacement of persons living in the home, fungi and bacteria growth, and pests. If issues persist over time, long term impacts could include high percentages of blighted and/or vacant properties in the area. The conditions of homes and neighborhoods can influence socio-emotional health as an environmental stressor. Blight and vacant properties have been historical issues in this community. Of the properties adjacent to the proposed project site (Joseph E. Boone St.), almost half are in deteriorated or poor condition and 43% are vacant/abandoned. Conditions in Vine City include only 29% with curb appeal, 44% properties are vacant, 5% are blighted properties, and 7% have health code issues. Conditions in English Avenue include: only 12% have curb appeal, 59% properties are vacant, 17% are blighted properties, and 17% have health code issues. | • Exposure to Vector-borne Pathogens<br><br>Populations that live in highly-dense, low-lying areas where there are many sources for vector habitation (e.g., illegally dumped tires and garbage) have an increased risk of exposure to vector borne diseases (e.g., West Nile Virus and Hantavirus). Mosquitoes and rodents can also act as an environmental stressor being public nuisances.<br><br>• Exposure to Poor Housing Conditions (Housing Quality)<br><br>Exposure to poor housing conditions can act as an environmental stressor. The presence of blighted, vandalized and vacant properties have been associated with poorer perceived health and deteriorated mental health and social capital among residents. Housing renewal in deprived (low income) areas have resulted in reduced levels of psychological distress. | Common health outcomes associated with exposure to mosquitoes include:<br><br>• Increased risk of West Nile Virus Infection; and<br><br>• Severe allergic reactions.<br><br>Common health outcomes associated with exposure to poor housing conditions include:<br><br>• Lowered perceived health and quality of life (wellness);<br><br>• Lowered socio-emotional health and higher psychological distress;<br><br>• Increased risk of heart disease and premature death; and<br><br>• Increased risk of Hantavirus and Salmonella due to rodent infestation. | Sub-groups affected more by exposure to mosquitoes in the community include:<br><br>• Children and adolescents;<br><br>• The elderly; and<br><br>• People who spend a significant amount of time outside, especially at dawn and during evening hours when mosquitoes are most active.<br><br>Sub-groups affected more by housing conditions in the home and in the community include:<br><br>• Children and adolescents;<br><br>• Girls and young women;<br><br>• Pregnant women; and<br><br>• Persons with pre-existing mental or behavioral conditions (e.g., anxiety, depression, etc). |

**Predicted Health Impacts**

| Health Determinant | Direction | Likelihood | Magnitude | Permanence | Distribution | Strength of Evidence | Comments |
|---|---|---|---|---|---|---|---|
| Exposure to Vector-borne Pathogens: (Vector Control) | ↑ | *** | *** | ** | + | *** | |
| Exposure to Poor Housing Conditions: (Housing Quality) | ↑ | ** | ** | ** | + | *** | |

**Legend:**
↑ =The change in the health determinant will promote health and wellness
*** = high, ** = moderate, * = low
+ = vulnerable populations may benefit more or equity in the opportunity for healthy living will be restored

# ENVIRONMENT

# EXPOSURE TO GREENNESS AND URBAN NOISE

| Elements of Project Design | Findings Summary | Health Factors (Determinants) | Health Outcomes | Vulnerable Population Information |
|---|---|---|---|---|
| The project will use elements of green infrastructure (rain gardens, planter boxes, and permeable pavement) to create a streetscape along Joseph E. Boone Street Northwest. The design includes:<br>• Converting 5 ft wide of roadway on each side of the street from a shared travel lane into a designated bike lane;<br>• Converting vacant grassland into bioretention cells (rain gardens), grass spillways, and stormwater catch basins;<br>• Converting 12 ft wide of roadway on one side (eastbound side) of the street into planter boxes;<br>• Converting 12 ft wide of roadway (alternate to the planter box) into a center turn lane at required intersections; and<br>• Adding 1-2 spaces for street side parking.<br>Planter boxes and rain gardens will include different types of vegetation (trees, bushes, grasses, etc.) and soil media (mulch, sand, rock, etc.). | Humans have an innate affinity for nature and green space. Natural environments provide a source of "serenity" or peacefulness that can form an involuntary attention requiring effortless interest, a sense of escape from one's usual settings, a sense of being part of a greater system, and compatibility between one's individual needs and nature.<br>Research has shown that an aesthetically pleasing urban landscape with trees and greenness encourages social interaction and healthy behaviors and attitudes. A higher percent of greenness has been linked to an increased utilization of public space and higher perceived safety and security. The use of public space and improved attitudes encourages a social atmosphere of friendliness and being physically active outdoors. These results have been reported in the classroom, workplace, public housing, hospitals, universities, and lower income communities.<br>Noise has become an increasingly known environmental factor that can affect a person's health and well-being. Ambient (surrounding) noise has also been linked to the serenity of a community. Urban communities experience a constant level of noise, typically above 55 decibels, the major contributor being road traffic. The homes and businesses adjacent to the proposed project site (29 homes and 35 businesses), bear the most burden from roadway noise. Sounds from the roadways travel through open space and out into the rest of the community.<br>Road-side barriers have been used to block traffic noise from intruding into surrounding residential areas. Vegetated barriers, such as rows of trees and bushes, offer a unique solution that is aesthetically pleasing and blocks sound waves from moving out through a neighborhood. | • Exposure to Greenness<br>Exposure to greenness or a natural environment can enhance recovery from mental fatigue, increase perceived health, and reduce fear, stress, and anxiety. The amount of greenness in an area has been linked to improved cognitive function, increased social cohesion and physical activity, and reduced aggression and violence.<br>• Exposure to Urban Noise<br>Exposure to constant ambient noise or periodic high levels of noise (above 55 decibels) have been associated with changes in behavioral and mental activities, as well as lowered cognitive performance. Exposure to noise levels above 75 decibels is known to cause hearing impairment and induce changes in physiological functions, such as increased stress responses (e.g., increased heart rate), and sensory stimuli (e.g., increased nerve activity). | Increased greenness in an areas has been linked to reduced risk of stroke and other cardiovascular diseases by reducing stress and increasing outdoor physical activity, reduced deaths (especially among older adults), reduced hospital stays and lower usage of pain medication in patients, and increased perceived overall health and well-being from improved neighborhood satisfaction, reduced stress, and increased social interaction.<br>Long term exposure to high levels of ambient noise can lead to higher levels of annoyance and stress, increased risk of high blood pressure and heart disease, increased sleep disorders and mental fatigue, and lowered cognitive (thinking) performance. | Persons that may be more sensitive to the greenness of the environment include:<br>• Inner city girls and young women;<br>• Persons with pre-existing behavioral and/or mental conditions (e.g., Attention Deficit Disorder, anxiety, depression, etc.);<br>• Children and adolescents; and<br>• Older adults (elderly).<br>Sub-groups more sensitive to levels of ambient noise include:<br>• Persons with pre-disposing hearing impairments (e.g., ear infection, noise-induced hearing shifts, age-induced hearing loss);<br>• Children and adolescents; and<br>• Persons with pre-existing mental and behavioral conditions (e.g., Attention Deficit Hyperactivity Disorder, anxiety, depression, etc.) |

**Predicted Health Impacts**

| Health Determinant | Direction | Likelihood | Magnitude | Permanence | Distribution | Strength of Evidence | Comments |
|---|---|---|---|---|---|---|---|
| Exposure to Greenness | ↑ | *** | ** | *** | + | ** | |
| Exposure to Urban Noise | ↑ | ** | ** | *** | + | *** | |

Legend:
↑ =The change in the health determinant will promote health and wellness
*** = high, ** = moderate, * = low
+ = vulnerable populations may benefit more or equity in the opportunity for healthy living will be restored

# SOCIETY

# ACCESS TO GOODS, SERVICES, GREENSPACE & HEALTHCARE

| Elements of Project Design | Findings Summary | Health Factors (Determinants) | Health Outcomes | Vulnerable Population Information |
|---|---|---|---|---|
| The project will use elements of green infrastructure (rain gardens, planter boxes, and permeable pavement) to create a streetscape along Joseph E. Boone Street Northwest. The design includes:<br>• Converting 5 ft wide of roadway on each side of the street from a shared travel lane into a designated bike lane;<br>• Converting vacant grassland into bioretention cells (rain gardens), grass spillways, and stormwater catch basins;<br>• Converting 12 ft wide of roadway on one side (eastbound side) of the street into planter boxes;<br>• Converting 12 ft wide of roadway (alternate to the planter box) into a center turn lane at required intersections; and<br>• Adding 1-2 spaces for street side parking.<br>Planter boxes and rain gardens will include different types of vegetation (trees, bushes, grasses, etc) and soil media (mulch, sand, rock, etc). | Access can be determined in many ways, such as physical access, financial access, and social access.<br>Physical access is the ability for a person to travel to a destination where goods and services (e.g., parks, grocery stores, health clinics, etc) are provided. The built environment has the potential to improve physical access by removing barriers to transportation and thereby improving mobility. Smart growth communities are designed with best practices for development, zoning, public transit, and active transport (walking and cycling) so that a diverse population can reach a variety of destinations. Joseph E. Boone Street (Northwest) was ranked as being somewhat walkable, meaning that some errands could be accomplished on foot, and has good transit for its many nearby public transportation options.<br>One can assume that improved infrastructure and transportation will lead to better access to all goods and services. There are very few scientific studies, however, that found a connection between features of the built environment and access to healthcare and a medical home. This is due to the many additional factors that play a role in a person's ability to seek healthcare. The ability to afford healthcare services can be determined by employment status, income, and benefits, such as health insurance and network provider.<br>It is assumed that having a better connected social network will improve the social support and programs available that promote health and wellness. One study showed that the lack of social support could act as a barrier to seeking healthcare and health promoting services. | • Access to Goods, Services, and Greenspace<br>The ability to reach destinations that support healthy behaviors and attitudes may improve the probability for improving health outcomes. Access to nutritious foods, support services, and open space for recreation (green space) may increase physical activity outdoors, improve healthy eating habits, and improved healthy behaviors and attitudes.<br>• Access to Healthcare<br>A persons access to healthcare can control what services can be obtained and how well health issues can be maintained or prevented. There is not enough evidence to conclude that the project may influence access to healthcare, as there are many independent factors that can determine an individual's accessibility. | Beneficial health outcomes that can be associated with improved access to goods, services, greenspace, and healthcare may include;<br>• Reduced risk for obesity and cardiovascular diseases from improved nutrition and increased physical activity;<br>• Lower mortality (deaths) and chronic diseases.<br>*The Boone Boulevard Green Street Project might have minimal impacts as the project is small.* | Vulnerable populations in terms of lack of access to goods/services and healthcare include:<br>• Persons with pre-existing conditions, such as chronic diseases;<br>• Persons of low income, unemployment, or low socioeconomic status;<br>• Older adults (elderly);<br>• Homeless; and<br>• Racial and ethnic minorities. |


**Predicted Health Impacts**

| Health Determinant | Direction | Likelihood | Magnitude | Permanence | Distribution | Strength of Evidence | Comments |
|---|---|---|---|---|---|---|---|
| Access to Goods, Services, and Greenspace | ↑ | ** | ** | ** | + | ** | |
| Access to Healthcare | ? | ? | ? | ? | ? | * | |

**Legend:**
↑ = The change in the health determinant will promote health and wellness
*** = high, ** = moderate, * = low
+ = vulnerable populations may benefit more or equity in the opportunity for healthy living will be restored

# SOCIETY

# CRIME (PERCEIVED AND ACTUAL)

| Elements of Project Design | Findings Summary | Health Factors (Determinants) | Health Outcomes | Vulnerable Population Information |
|---|---|---|---|---|
| The project will use elements of green infrastructure (rain gardens, planter boxes, and permeable pavement) to create a streetscape along Joseph E. Boone Street Northwest. The design includes:<br>• Converting 5 ft wide of roadway on each side of the street from a shared travel lane into a designated bike lane;<br>• Converting vacant grassland into bioretention cells (rain gardens), grass spillways, and stormwater catch basins;<br>• Converting 12 ft wide of roadway on one side (eastbound side) of the street into planter boxes;<br>• Converting 12 ft wide of roadway (alternate to the planter box) into a center turn lane at required intersections; and<br>• Adding 1-2 spaces for street side parking.<br>Planter boxes and rain gardens will include different types of vegetation (trees, bushes, grasses, etc) and soil media (mulch, sand, rock, etc). | Structural elements linked to the presence of crime in a community include street lighting, visibility of pedestrians on the sidewalk, and the presence of security equipment. The amount of greenness in an urban community has also been linked to the amount of crime that is committed in that area.<br>Research has indicated that the presence of natural elements bring a sense of serenity to a space and aesthetic appeal. Greenness of common spaces has been linked to decreased aggression and violence, lower mental fatigue, higher resiliency to stressful life events and the ability to adjust, and increased social interaction and/or communication. These changes can improve community resiliency, social cohesion, and perceived safety and security.<br>Resiliency and social cohesion are protective factors against crime. Mental fatigue and aggression are precursors to conflict behavior. Preventing or reducing these behaviors can reduce the amount of crime in a community.<br>Some researchers have found an association between higher perceived safety/security and being more physically active outdoors, such as walking for recreation and transportation.<br>According to the City of Atlanta's Police Department (2012—2013) crime data, both Vine City & English Ave (Beat 102 & 103) indicate high levels of less violent crime (burglary, aggravated assault, and robbery) and low levels of more violent crime (rape and homicide). | • Crime<br>Crime (incivility) can be characterized as social (e.g., involving another person) or physical (involving property). When there is physical injury to a person, the crime is considered violent. Less violent or nonviolent crimes include those in which the damages occur to property or piece of mind, but do not lead to physical harm of a person. | Reduced crime or prevented crime can improve health by:<br>• Reducing stress from fear and anxiety;<br>• Decreased aggression and avoidance of violence; and<br>• Increasing outdoor physical activity (leisure & travel).<br>Health outcomes associated with higher crime rates include:<br>• Increased risk of health complications associated with chronic stress and lack of physical activity – obesity, and high blood pressure, and cardiovascular disease;<br>• Chronic mental fatigue;<br>• Lowered health-related quality of life; and<br>• Increased mortality (deaths). | Those who are more at risk of being victims of crime include:<br>• Persons living in highly dense areas;<br>• Older adults (elderly);<br>• Youths; and<br>• Females.<br>Gender, age and socioeconomic status has been found to play a role in perceived safety/security. For example, young females are more likely to be less active outdoors due to lowered perceived security (i.e., more fear) than males.<br>Those who have had historical experiences with crime or being victimized are also more likely to have lower perceived safety/security. |


**Predicted Health Impacts**

| Health Determinant | Direction | Likelihood | Magnitude | Permanence | Distribution | Strength of Evidence | Comments |
|---|---|---|---|---|---|---|---|
| Crime | ↑ | ** | ** | ** | + | ** | |

**Legend:**
↑ =The change in the health determinant will promote health and wellness
*** = high, ** = moderate, * = low
+ = vulnerable populations may benefit more or equity in the opportunity for healthy living will be restored

# SOCIETY

# SOCIAL CAPTIAL (COGNITIVE & STRUCTURAL)

| Elements of Project Design | Findings Summary | Health Factors (Determinants) | Health Outcomes | Vulnerable Population Information |
|---|---|---|---|---|
| The project will use elements of green infrastructure (rain gardens, planter boxes, and permeable pavement) to create a streetscape along Joseph E. Boone Street Northwest. The design includes:<br>• Converting 5 ft wide of roadway on each side of the street from a shared travel lane into a designated bike lane;<br>• Converting vacant grassland into bioretention cells (rain gardens), grass spillways, and stormwater catch basins;<br>• Converting 12 ft wide of roadway on one side (eastbound side) of the street into planter boxes;<br>• Converting 12 ft wide of roadway (alternate to the planter box) into a center turn lane at required intersections; and<br>• Adding 1-2 spaces for street side parking.<br>Planter boxes and rain gardens will include different types of vegetation (trees, bushes, grasses, etc) and soil media (mulch, sand, rock, etc). | Social capital refers to various aspects of relationships in a community and is divided into two features. The first is known as cognitive capital, which is the appreciation of trust, mutual help, and reciprocity in the community. The second is known as structural capital, which is the existence of community linkages within a community.<br>The amount or quality of cognitive capital in the community characterizes how close relationships are among people. For example, a community with high cognitive capital is characterized as being "close-knit" with many individuals that interact with one another in a positive way that is supportive. Higher cognitive capital can lead to higher social cohesion and support for healthy behaviors and attitudes. Community values play an important role in influencing street-level behaviors.<br>Higher structural capital has been associated with improved access to services and support groups, healthcare, and a community's ability to address issues, such as threats to safety or security (e.g., vandalism) and environmental injustices.<br>The social capital of a community has been linked to the amount of vegetation and greenness and economic development, economic inequality, and geopolitics related to large-scale cooperation. Changes to social capital is not likely to be evident in smaller scaled projects, but can be more evident for larger scaled projects. | • Social Capital<br>Social capital can influence healthy behaviors and attitudes through the structure and nature of supportive social networks and relationships. Healthier communities typically have networks and relationships that provide resources that remove financial or social barriers to healthcare, physical activity, nutrition, perceived safety/security, and other health-related factors. | There is some research available that has found social capital contributes to positive health outcomes and can act as a buffer to negative outcomes, regardless of social status. Some of the positive impacts found from high social capital include:<br>• Decreased stress;<br>• Decreased crime-related injuries; and<br>• Improved mental health and behavioral disorders<br>However, there is not enough evidence to justify a causal association between specific outcomes due to other contributing factors. | Populations more likely to be impacted by social capital in the community include:<br>• Persons with low income (disadvantaged); and<br>• Persons disconnected or isolated from the community. |


| Predicted Health Impacts | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Health Determinant** | **Direction** | **Likelihood** | **Magnitude** | **Permanence** | **Distribution** | **Strength of Evidence** | **Comments** |
| **Social Capital (Cognitive and Structural)** | ↑ | ** | ** | ** | + | ** | If recommendations are considered, a positive impact is anticipated. |

**Legend:**
↑ –The change in the health determinant will promote health and wellness
***– high, **– moderate, *– low
+ – vulnerable populations may benefit more or equity in the opportunity for healthy living will be restored

# ECONOMY

# EMPLOYMENT, COST OF LIVING, & BUSINESS PERFORMANCE

| Elements of Project Design | Findings Summary | Health Factors (Determinants) | Health Outcomes | Vulnerable Population Information |
|---|---|---|---|---|

The project will use elements of green infrastructure (rain gardens, planter boxes, and permeable pavement) to create a streetscape along Joseph E. Boone Street Northwest. The design includes:

- Converting 5 ft wide of roadway on each side of the street from a shared travel lane into a designated bike lane;
- Converting vacant grassland into bioretention cells (rain gardens), grass spillways, and stormwater catch basins;
- Converting 12 ft wide of roadway on one side (eastbound side) of the street into planter boxes;
- Converting 12 ft wide of roadway (alternate to the planter box) into a center turn lane at required intersections; and
- Adding 1-2 spaces for street side parking.

Planter boxes and rain gardens will include different types of vegetation (trees, bushes, grasses, etc) and soil media (mulch, sand, rock, etc).

Using green infrastructure (planting strips and rain gardens), as opposed to grey infrastructure (concrete and pavement), can stimulate job creation due to the increased seasonal and continuous maintenance required. Maintenance can include pruning, mulching, removing debris, refilling the bioretention media, among other things. Green infrastructure is often referred to as a creator of "green collar jobs," or sustainable jobs that are dedicated to environmental work. Landscaping improvements, therefore, is often used as a revitalization strategy in a community to help with local job creation.

Landscaping is known to improve the aesthetics of a street, which is closely linked to the property values of adjacent parcels. Improved property value is a positive benefit to implementing green infrastructure. The median property values for residential parcels adjacent to Joseph E. Boone St. is $16,000. The mean of non-residential property values is $51,800. Shading from nearby trees can reduce the amount of energy costs associated with cooling a building, which can lower utility costs. Lowered utility bills can improve the overall performance of a business by reducing costs.

Common adverse impacts of increased property values are higher property taxes and increased rent, which raise the cost of living. Gentrification is a term used to describe the situation when residents move out of an area as due to the cost of living becoming higher than what they can afford. This movement leads to a shift in the population that inhabits the community.

Landscaping improves aesthetics, reduces crime and improves the ability to walk and bike in an area. Communities designed to promote walking and cycling have been shown to have more successful businesses than those designed mainly for motorized traffic. The increased foot and bike traffic brings in more regular patronage and attracts new businesses, entrepreneurs, and customers to the area.

- Employment

Employment status is directly connected to health via income and benefits, such as health insurance. Income and health insurance can control financial access to nutritious foods, adequate housing, and healthcare.

- Cost of Living

Cost of living can also have a financial control on access to healthcare. The funds spent on housing and living costs take expendable income may influence the monies available for nutritious foods and healthcare.

- Business Performance

When businesses do well in a community, it improves economic growth by creating new jobs and increasing access to amenities and services which can in turn improve the health in a community.

Short term impacts from improved employment, *lowered* costs of living, and improved business performance can include increased access to healthcare and nutritious foods.

Long term impacts from increased employment, *lowered* costs of living, and improved business performance can include improvements in mental health and chronic diseases.

A potential negative outcome from *increased* costs of living can be gentrification, or the inability for residents to afford living in the community. City administrators and community agencies need to be mindful of potential gentrification as property values increase, when a redevelopment is planned, so that measures can be taken to avoid unfavorable outcomes.

Those who are at increased risk for experiencing disproportionate unfavorable outcomes of creating green jobs, changes to costs of living include:

- Persons who are on long-term unemployment or are physically incapable of labor;
- Persons who are limited by age, such as children under 16 years and older adults (over 67 years); and
- Persons living on a fixed income that is below the federal poverty level.

**Predicted Health Impacts**

| Health Determinant | Direction | Likelihood | Magnitude | Permanence | Distribution | Strength of Evidence | Comments |
|---|---|---|---|---|---|---|---|
| Employment | ↑ | ** | * | ** | + | ** | Impact predicted, provided that local employees are given priority and funding for maintenance continues. |
| Cost of Living (Total Investment / Gentrification) | ↑ ↓ | ** | ** | ** | +/- | ** | Property values could increase which may improve community economy but detract from individual economies. |
| Demand for Goods and Services (Business Performance) | ↑ | ** | ** | ** | + | ** | Impacts expected if project recommendations are considered. |

**Legend:**
↑ = The change in the health determinant will promote health and wellness, ↓ = the change in the health determinant will detract from health
*** = high, ** = moderate, * = low
+ = vulnerable populations may benefit more or equity in the opportunity for healthy living will be restored, - = vulnerable populations may experience the negative impacts more than others

## Notes from the Final Stakeholder Engagement Meeting

Date: June 5, 2014

After the welcome and introductions, Florence Fulk from the U.S. EPA Office of Research and Development gave a brief presentation of the HIA process and a review of the Boone Boulevard Green Street Project HIA. This presentation served as a refresher course for audience members rejoining the stakeholder engagement process and provided a brief background about the HIA to new audience members. Ms. Fulk answered questions from the audience about HIA and/or the process was used for this project, before turning the presentation over to Todd Hill from the City of Atlanta Department of Watershed Management (DWM).

Todd Hill serves as the newly appointed Watershed Director for the DWM. Mr. Hill presented on a brief history of DWM's efforts in Proctor Creek, including the study that led to the design of the proposed Boone Boulevard Green Street Project. Mr. Hill provided an overview of the green infrastructure elements included in the project's design and the DWM's next steps in planning for implementation.

After a short break in the agenda, Lauren Adkins from CSS-Dynamac provided a brief overview of the designated impact study area, including a profile of the population that would be affected by the proposed project. This part of the presentation aimed to familiarize the audience with the community in which the proposed project was sited for implementation. After the community profile, the audience was referred to the posters placed around the room that shared information about the key findings of the assessment for each of the health determinants appraised. Each poster was accompanied by a member of the HIA Core Project Team who answered questions from the audience about the findings and the methods used to come to the conclusions presented on the poster.

Immediately after the poster presentations, the audience was asked for feedback on what they reviewed in the posters. Key points from the discussions were documented on post-it notes and placed on a flipchart.

Stakeholder Input on Key Findings:

- (From Ms. D. Thomas) It is important to understand how people live in a community and what efforts and/or activities will make the most difference. For example, you can change something in a community (e.g., revitalize) but not necessarily make it better.
- (Also from Ms. D. Thomas) What can we (as leaders in the community) do to build the capacity for self-determination for communities and/or organizations?
- (Mr. Elliot) It is important to keep in mind that the proposed project is a demonstration project. The small size of the project limits its ability to make an impact as a single entity. However, demonstration projects that are successful can lead to further investment and/or more projects in the community. If this project was expanded and/or replicated throughout the headwaters, the impact could be much greater due to a cumulative effect.
- (Ms. Yvonne Jones) I do not agree with the findings related to changes in access to healthcare. If something is not relevant (i.e., if two things are not related), then you should not try to make it (them) relevant. For example, there is no evidence linking green infrastructure to access to

healthcare. There are many other (more influential) factors, other than green infrastructure, that determine a person's access to healthcare. The HIA Core Project Team assumes that by improving accessibility, access to healthcare will also be improved. If a link cannot be found, then the team should not portray a link. Dr. Cassandra Johnson and Michael Elliot also agreed that the HIA Core Project Team should go through the predicted health impacts one more time and weigh each based on relevance to the proposed project (i.e., is the health determinant and/or related health outcomes truly relatable to the implementation of the proposed project).

- (Dr. Yomi Noibi) The Arthur Blank Foundation has more information about the relationship between temperature and crime.
- (L. Martin) The findings (or lack thereof), regarding percent greenness and access to goods and services, illustrates the need for more research in this field of study. I would be more interested to see if there are more sources regarding this relationship.
- (Unknown) There was not enough discussion on what the estimated impacts are of the proposed project. Recognizing that this is a demonstration project, values (both qualitative and quantitative) would better support community and agency decision-making.
- (Dr. Aidman) The HIA Core Project Team could look at and add more resources and/or findings from agencies and organizations in other developed countries, such as transportation ministries, Safety Watch, and the Department of Transportation. There are some transportation ministries that record and monitor how people get healthcare, groceries, laundry, etc. Neighborhood crime watches may also be a good source for information.
- (Dr. Fatemieh S.) One thing the HIA Core Project Team completely missed was the opportunity to mapp assets in the community. This information gleamed from this exercise would better inform the social capital piece of the assessment. For example, asset mapping could tell investigators where and how many spaces are already in the community to develop social capital. Dr. Aidman suggested that Emory Health Initiative has done some asset mapping studies and could provide help if needed.
- (Multiple) The HIA Core Project Team should consider developing and/or including in the report some context (e.g., background information and/or factsheets) the community could use to advocate for identified needs and/or inform fellow residents.
- (Unknown) It would be great to use and/or publish data from the result of the Boone Boulevard Green Street Project (not the HIA) to establish the effect it has in the future [i.e., monitor impacts after the project has been implemented]. For example, someone could perform an impact assessment at a 5-year interval after completion on healthcare, crime, etc., [particularly on] social determinants.

After another scheduled break, Ms. Adkins gave a brief overview about the recommendations step in the HIA process and informed the audience that the HIA Core Project Team had developed initial recommendations based on the findings from the assessment. The audience was (again) directed to posters placed around the room with the initial recommendations for each health determinant. Each poster was accompanied by a member of the HIA Core Project Team who answered questions from the audience and discussed the rationale behind the recommendations presented on the poster. The audience

was requested to document their feedback to the recommendations posed by the team and post them on the related poster.

After the group finished discussing the feedback on the recommendations, the audience was asked how they would like the HIA to be reported (i.e., how should the HIA report be distributed, located, and/or formatted).

Stakeholder Input on Reporting:

- A member of the audience recommended that the HIA Core Project Team look into connecting with the Georgia Department of Natural Resources to ask if the HIA report could be uploaded to their website.
- The HIA Core Project Team should put the HIA report in places where there are handouts and/or webpages on green infrastructure and the Proctor Creek Watershed. For example, the HIA report (or a link to the report) could be placed on the Borwnfields Association website.
- A hard copy of the HIA report should be placed in the local public library.
- The HIA report should also be presented to community-based organizations, such as the Proctor Creek Watershed Stewardship Council, and sent to the Office of the Mayor and Atlanta City Council. Senator Mitchell could also be sent a copy of the report.
- Several members in the audience wondered how the HIA report would be outlined and if there would be an element in the HIA report that the community could use to advocate for interests and/or needs (e.g., factsheets, community advocacy flyers, etc.).
- The HIA Core Project Team should also consider developing a visually simple material, such as a community flyer, that describes how the information gleamed from the HIA is relevant and/or could be used by residents in the community (i.e., a factsheet that answers, "what is it to me").

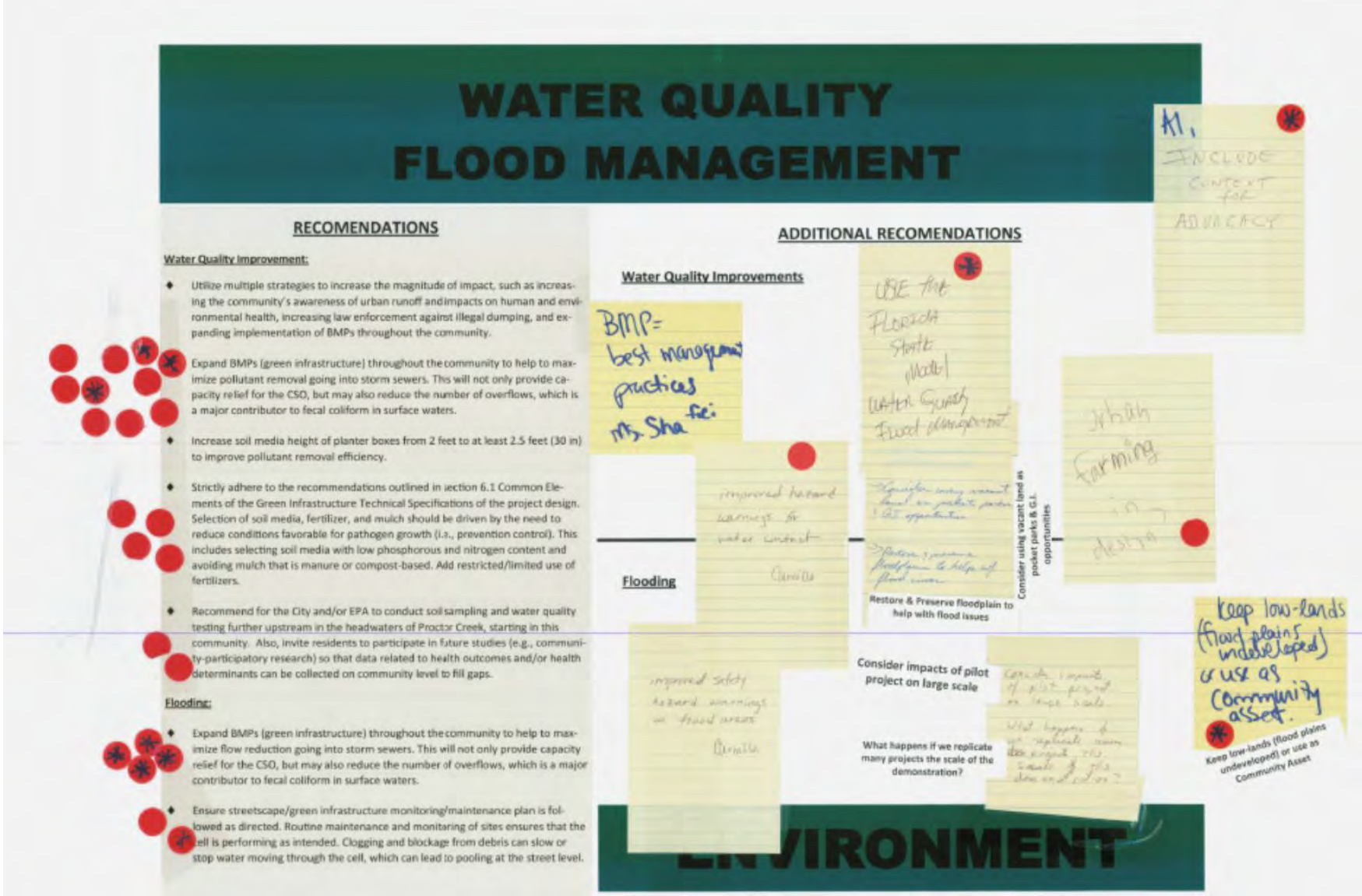
After all of the comments were documented, Florence Fulk and David Egetter gave a brief description of a new and upcoming HIA in the area. The new HIA would expand on the discussions that came from this HIA and evaluate the potential health impacts of implementing green infrastructure across the watershed, focusing on climate and temperature. Stakeholders were charged with keeping an eye out for more upcoming information and materials about the new HIA.

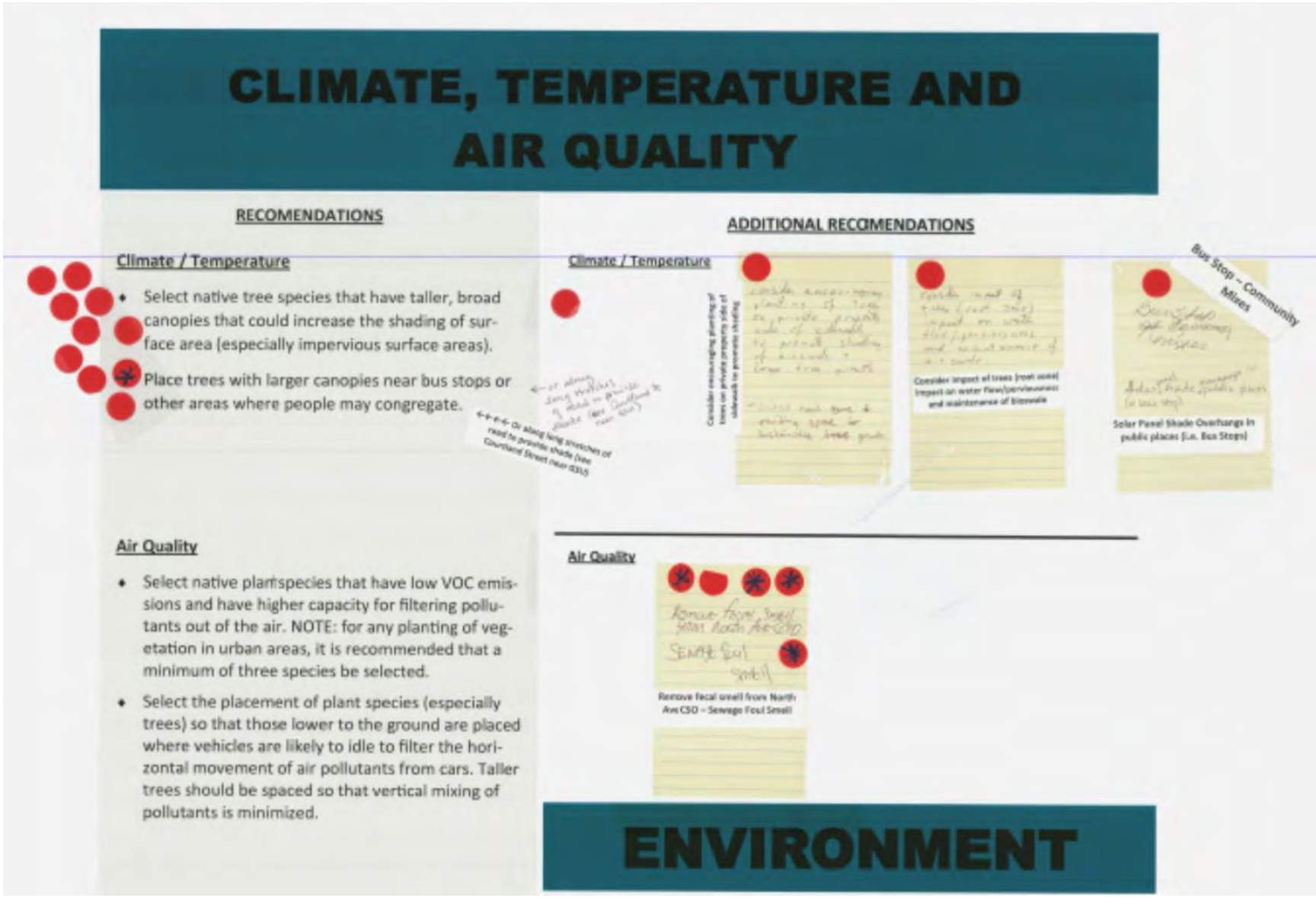
At the conclusion of the meeting, Tami Thomas-Burton from EPA Region 4's Environmental Justice Program acknowledged the participants in the HIA and thanked the audience for coming and contributing to the success of the HIA.

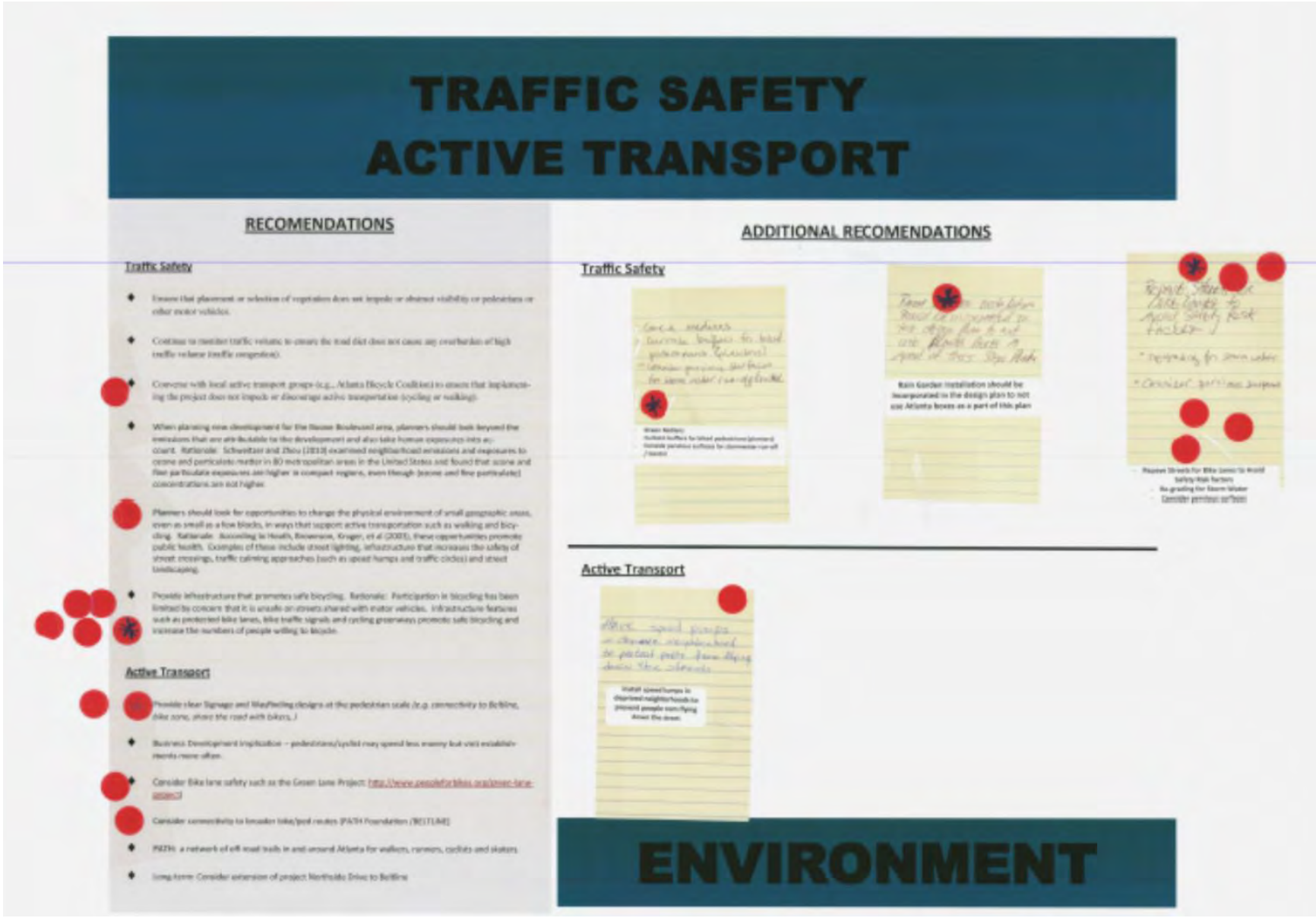
Source: Lauren Adkins, HIA Core Project Team Member

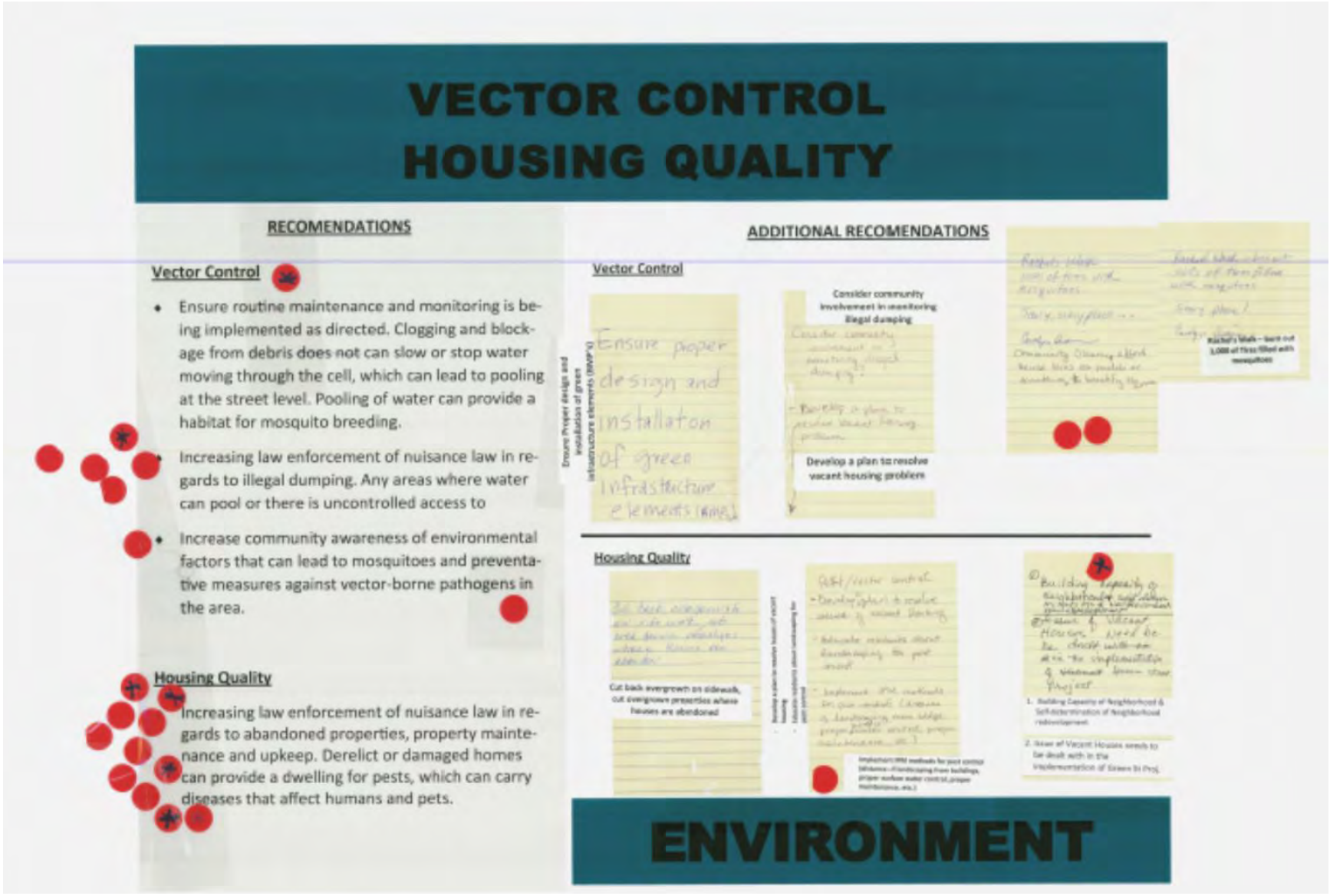
*Note: There was no scribe at the final stakeholder engagement meeting and thus no summary was prepared.*

## Initial HIA Recommendations with Stakeholder Input (Posters)




CLIMATE, TEMPERATURE AND AIR QUALITY
RECOMENDATIONS
Climate / Temperature
Select native tree species that have taller, broad canopies that could increase the shading of surface area (especially impervious surface areas).
Place trees with larger canopies near bus stops or other areas where people may congregate.
Air Quality
Select native plantspecies that have low VOC emissions and have higher capacity for filtering pollutants out of the air. NOTE: for any planting of vegetation in urban areas, it is recommended that a minimum of three species be selected.
Select the placement of plant species (especially trees) so that those lower to the ground are placed where vehicles are likely to idle to filter the horizontal movement of air pollutants from cars. Taller trees should be spaced so that vertical mixing of pollutants is minimized.
ADDITIONAL RECOMENDATIONS
Climate / Temperature
Consider impact of trees (root zone) impact on water flow/permeance and maintenance of bioswale
Bus Stop – Community Mixes
Solar Panel Shade Overhangs in public places (i.e. Bus Stops)
Air Quality
Remove fecal smell from North Ave CSO – Sewage Foul Smell
ENVIRONMENT


TRAFFIC SAFETY
ACTIVE TRANSPORT
RECOMENDATIONS
Traffic Safety
Active Transport
ADDITIONAL RECOMENDATIONS
Traffic Safety
Active Transport
ENVIRONMENT


VECTOR CONTROL
HOUSING QUALITY
RECOMENDATIONS
Vector Control
Ensure routine maintenance and monitoring is being implemented as directed. Clogging and blockage from debris does not can slow or stop water moving through the cell, which can lead to pooling at the street level. Pooling of water can provide a habitat for mosquito breeding.
Increasing law enforcement of nuisance law in regards to illegal dumping. Any areas where water can pool or there is uncontrolled access to
Increase community awareness of environmental factors that can lead to mosquitoes and preventative measures against vector-borne pathogens in the area.
Housing Quality
Increasing law enforcement of nuisance law in regards to abandoned properties, property maintenance and upkeep. Derelict or damaged homes can provide a dwelling for pests, which can carry diseases that affect humans and pets.
ADDITIONAL RECOMENDATIONS
Vector Control
Ensure proper design and installation of green infrastructure elements
Consider community involvement in monitoring illegal dumping
Develop a plan to resolve vacant housing problem
Housing Quality
Cut back overgrowth on sidewalk, cut overgrown properties where houses are abandoned
ENVIRONMENT

# EXPOSURE TO GREENNESS & URBAN NOISE

**RECOMENDATIONS**

**Exposure to Greenness**

- Assuring a "Visible Change" esthetically happens on the green street. (More Green and less concrete)

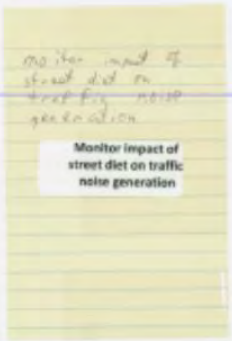
**Urban Noise**

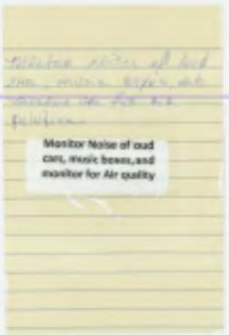
- Select low brush/grasses in planter spaces near residences to block/absorb some of noise from roadway.
- Implement best practices during implementation phase to reduce the amount of noise or time of noise being generated from construction.

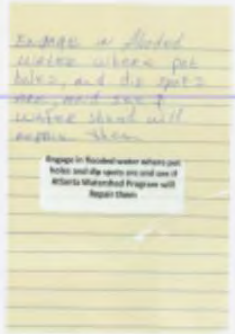
**ADDITIONAL RECOMENDATIONS**

**Exposure to Greenness**


**Urban Noise**

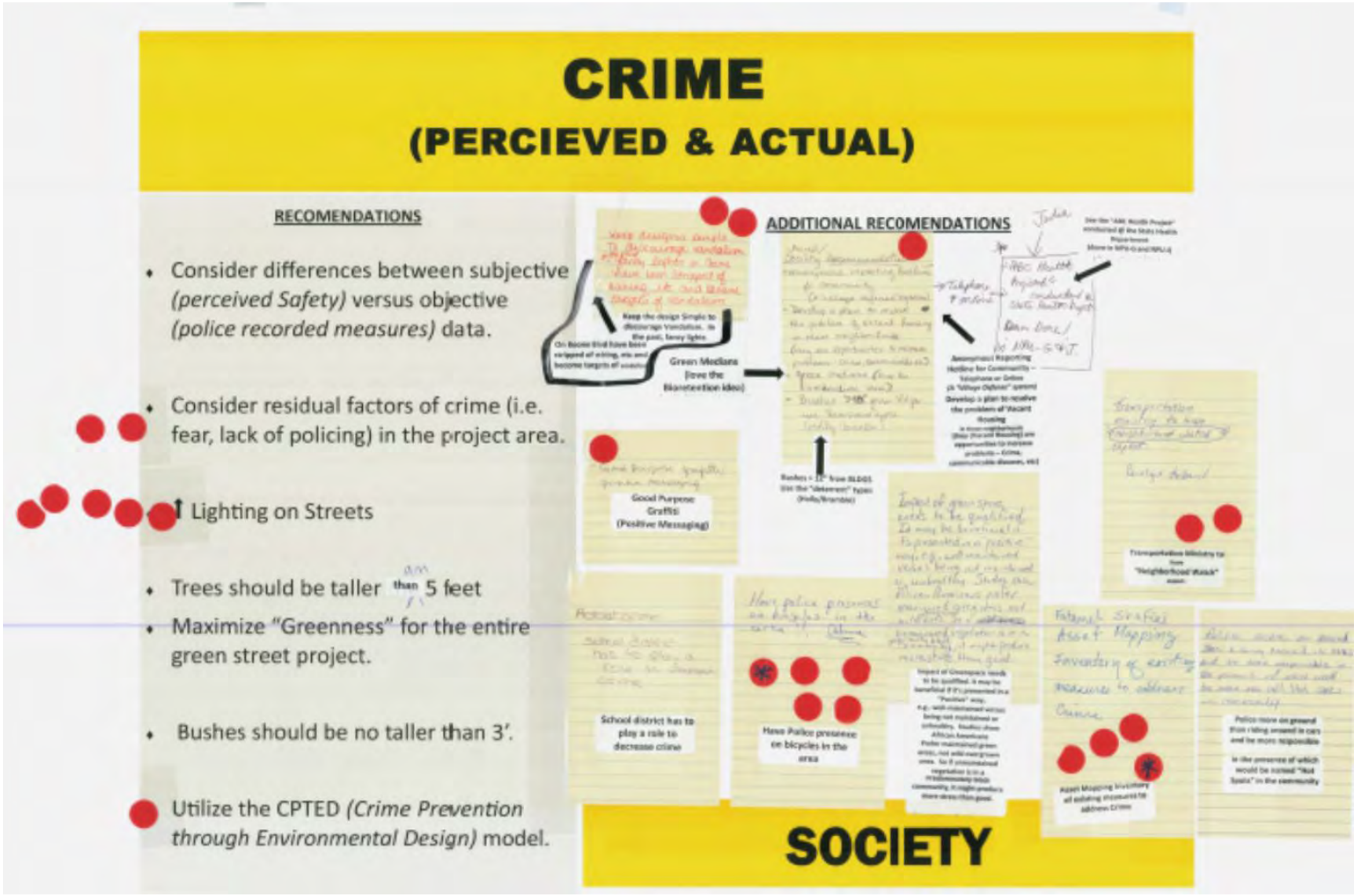


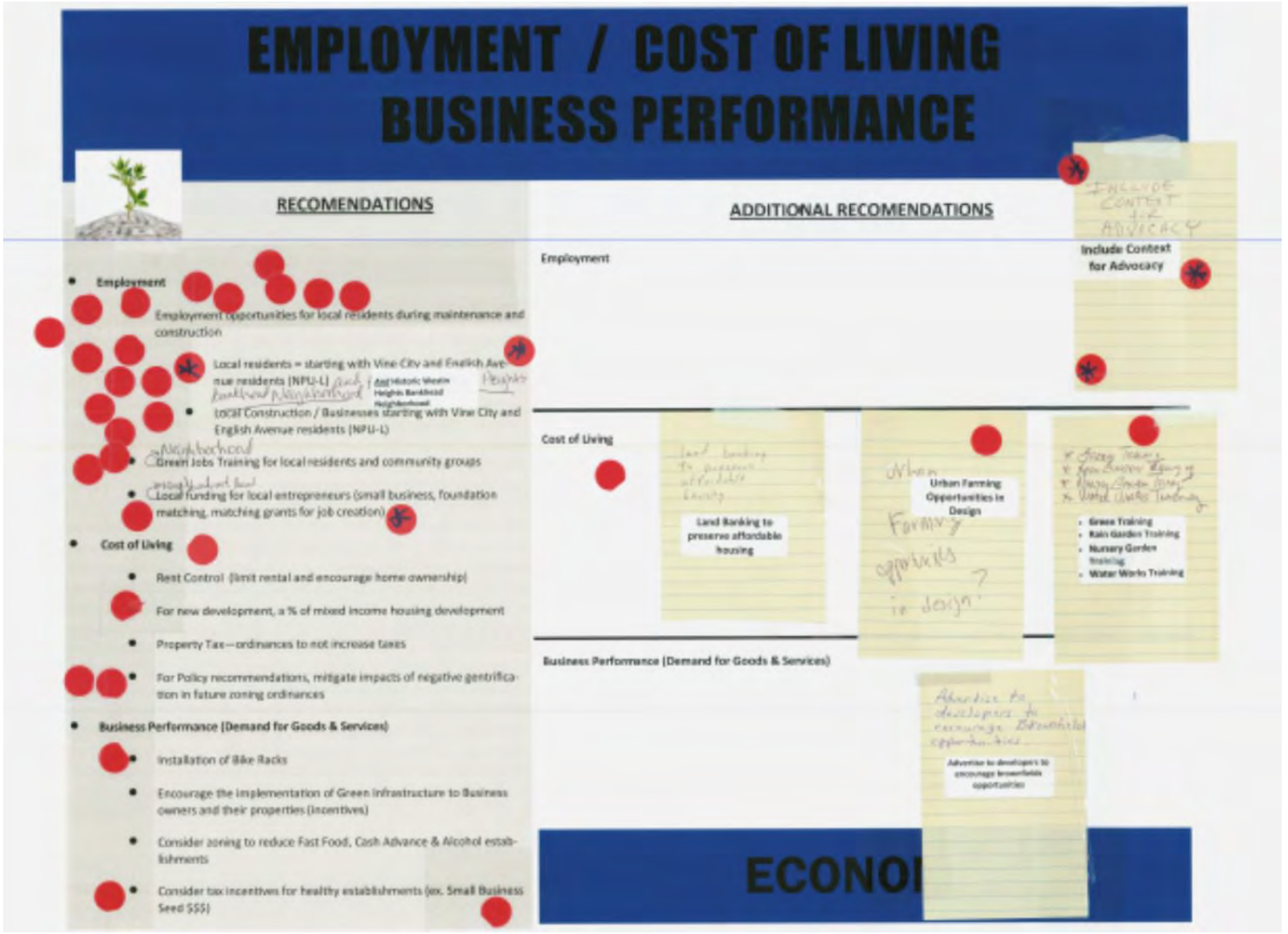



**ENVIRONMENT**


ACCESS TO GOODS / SERVICES / GREENSPACE
ACCESS TO HEALTHCARE
RECOMENDATIONS
Access to Goods / Services / Greenspace
Encourage new Business generation
Consider Local zoning ordinances and regulations (residential versus commercial mixed-use)
Work with the City of Atlanta's Department of Planning and Community Development
Incorporate EPA's Smart Growth Principles (with All the "Bells & Whistles")
Consider Smart Growth America – Complete Streets in the Southeast Case Studies.
Access to Healthcare
Encourage coordination with Fulton County Dept. of Public Health and Wellness.
Many unknown confounding factors. Consider HHS's HRSA – Heath Resource and Services Administration for baseline condition of local health centers
ADDITIONAL RECOMENDATIONS
Access to Goods / Services / Greenspace
ACCESS TO HEALTHY FOODS
URBAN FARMING
INCLUDE CONTEXT FOR ADVOCACY
Access to Healthcare
SOCIETY


CRIME
(PERCIEVED & ACTUAL)
RECOMENDATIONS
Consider differences between subjective (perceived Safety) versus objective (police recorded measures) data.
Consider residual factors of crime (i.e. fear, lack of policing) in the project area.
Lighting on Streets
Trees should be taller than 5 feet
Maximize "Greenness" for the entire green street project.
Bushes should be no taller than 3'.
Utilize the CPTED (Crime Prevention through Environmental Design) model.
ADDITIONAL RECOMENDATIONS
Green Medians (love the Bioretention idea)
Good Purpose Graffiti (Positive Messaging)
School district has to play a role to decrease crime
Have Police presence on bicycles in the area
SOCIETY


SOCIAL CAPITAL
(CONGNITIVE & STRUCTURAL)
Note: Cognitive = Trust, Belief, Bridging & Bonding / Structural = NPU's, Community Organizations, Advancing work together
RECOMENDATIONS
Provide meeting space for local community meetings in close proximity of green street.
Install Public Benches (to increase positive socialization)
Coordinate with "Atlanta Streets Alive' to host a community festival after completion of Green Street installation.
Provide other catalyst to increase / enhance outreach to the community.
Cultivate and maintain mechanisms in policy, development, and economic decisions and activities for building trust.
ADDITIONAL RECOMENDATIONS
Put in Great Playgrounds for Kids
Include Context for Advocacy
Asset Mapping
SuperGiant Food
SOCIETY


EMPLOYMENT / COST OF LIVING
BUSINESS PERFORMANCE
RECOMENDATIONS
Employment
Employment opportunities for local residents during maintenance and construction
Local residents = starting with Vine City and English Avenue residents (NPU-L)
Local Construction / Businesses starting with Vine City and English Avenue residents (NPU-L)
Green Jobs Training for local residents and community groups
Local funding for local entrepreneurs (small business, foundation matching, matching grants for job creation)
Cost of Living
Rent Control (limit rental and encourage home ownership)
For new development, a % of mixed income housing development
Property Tax—ordinances to not increase taxes
For Policy recommendations, mitigate impacts of negative gentrification in future zoning ordinances
Business Performance (Demand for Goods & Services)
Installation of Bike Racks
Encourage the implementation of Green Infrastructure to Business owners and their properties (incentives)
Consider zoning to reduce Fast Food, Cash Advance & Alcohol establishments
Consider tax incentives for healthy establishments (ex. Small Business Seed $$$)
ADDITIONAL RECOMENDATIONS
Employment
Include Context for Advocacy
Cost of Living
Land Banking to preserve affordable housing
Urban Farming Opportunities in Design
Green Training
Rain Garden Training
Nursery Garden
Water Works Training
Business Performance (Demand for Goods & Services)
ECONO

## HIA Recommendations Identified by Stakeholders

The following table lists the recommendations identified by stakeholders at the final stakeholder engagement meeting. Those recommendations that received support from fellow stakeholders are shaded.

| Health Determinant | Recommendation(s)[1, 2, 3] |
|---|---|
| **Water Quality** | Include context for advocacy (e.g., develop informative material for advocating for water quality improvements. |
| **Water Quality** | Use (follow) the Florida State Model for Water Quality (Improvement Plan as a benchmark for improving water quality in the Proctor Creek Watershed) |
| **Water Quality** | Re-grade the road pavement (to ensure stormwater runoff flows where it should) and consider (implementing more) permeable pavement. |
| **Flood Management** | Restore and preserve floodplains to help with flood issues. Consider leaving vacant land in low-land areas as undeveloped or use as a community asset (e.g., pocket park, urban farming, and/or more green infrastructure). |
| **Flood Management** | Rain gardens should be incorporated into the design (plan), not the Atlanta (preferred) boxes. |
| **Flood Management** | See if Atlanta DWM will repair pot holes and slip spots where water floods. |
| **Flood Management** | Cut back overgrowth on sidewalks, cut overgrown properties where houses are abandoned. |
| **Flood Management** | Build capacity of neighborhood and self-determination of neighborhood redevelopment. |
| **Flood Management** | Develop/Incorporate a plan to resolve issues with vacant housing in the Green Street Project design. |
| **Flood Management** | Ensure proper design and implementation of green infrastructure elements (BMPs). |
| **Flood Management** | Consider community involvement in monitoring and illegal dumping. |
| **Flood Management** | Follow example of Rachel's Walk – disposal of tires filled with mosquitoes. |
| **Flood Management** | Educate residents about landscaping for pest control. |
| **Flood Management** | Implement IPM methods for pest control (e.g., distance of landscaping from buildings, proper surface water control, and proper maintenance). |
| **Climate and Temperature** | Place some trees along the long stretches of the road to provide shade, see Courtland Street near GSU as an example. |
| **Climate and Temperature** | Consider policy of encouraging planting of trees on private property-side of sidewalk to promote shading (ensure critical root zone is adequate for sustainable tree growth). |

| Health Determinant | Recommendation(s)[1, 2, 3] |
|---|---|
| **Climate and Temperature** | Implement solar panel shade overhangs in public places where the community interacts (e.g., bus stops). |
| **Air Quality** | (Have City) monitor for air quality (in the community). |
| **Air Quality** | Remove (address) fecal smell from North Avenue CSO- there is a very foul, sewage smell. |
| **Traffic Safety** | Install speed bumps (traffic calming practices) to prevent drivers from (speeding) down the street (i.e., fast drivers affect perceived safety of cycling down street). |
| **Traffic Safety** | Repave street for bike lanes to avoid safety risk factor (e.g., remove pot holes and bumps in road). |
| **Exposure to Greenness** | Restrict the use of any signs used for advertisement. |
| **Exposure to Urban Noise** | Monitor impact of street diet on traffic noise generation and sources of street noise (e.g., loud cars, music boxes, etc.). |
| **Access to Good and Services, Greenspace, and Healthcare** | Consider access to healthy foods, such as urban farming (in the project design). |
| **Access to Good and Services, Greenspace, and Healthcare** | Include context for advocacy (e.g., develop informative material for advocating for better access to goods, services, and Greenspace). |
| **Access to Good and Services, Greenspace, and Healthcare** | (Coordinate/Engage) Transportation Ministry (Department) to get people to goods and services, such as groceries, Laundromat, jobs, WIC, etc. |
| **Crime (Perceived and Actual)** | Increase police presence on the ground (i.e. bicycles) in the area with a focus on "hot spots." |
| **Crime (Perceived and Actual)** | (Engage) school district to play a role in efforts to decrease crime. |
| **Crime (Perceived and Actual)** | Keep the design simple to discourage vandalism. In the past, fancy lights on Boon St. have been stripped of wiring and became targets of vandalism. |
| **Crime (Perceived and Actual)** | Create a "Village Defense" system or neighborhood watch program, including an anonymous reporting hotline. |
| **Crime (Perceived and Actual)** | Place bushes greater than 12 inches from buildings and (select) "deterrent" types, such as holly or bramble. |
| **Crime (Perceived and Actual)** | Ensure green space is well maintained (i.e., unmaintained green spaces may encourage adverse behaviors and stress). |
| **Crime (Perceived and Actual)** | (Allow) good purpose graffiti (i.e., graffiti with positive messaging). |
| **Social Capital (Cognitive and Structural)** | Include context for advocacy (e.g., develop informative material for advocating for improving social capital). |
| **Social Capital (Cognitive and Structural)** | Incorporate art and local artist talent to promote (local) social control and bonding and bridging among the community. |

| Health Determinant | Recommendation(s)[1, 2, 3] |
|---|---|
| **Social Capital (Cognitive and Structural)** | Put in great playgrounds for kids. |
| **Social Capital (Cognitive and Structural)** | Help organize community groups to enhance/maintain bioswales as a community garden (i.e., "adopt" the Boon St.; e.g., local boy scout or girl scout troop) |
| **Social Capital (Cognitive and Structural)** | Work with the community to create capacity to be more responsible of the environment in which they live. |
| **Household Economics (Employment and Costs of Living)** | Include context for advocacy (i.e., develop informative material for advocating for local jobs). |
| **Household Economics (Employment and Costs of Living)** | (Include) training for jobs to help people be more independent. |
| **Household Economics (Employment and Costs of Living)** | Use land banking to preserve affordable housing. |
| **Household Economics (Employment and Costs of Living)** | Incorporate urban farming opportunities in the design (i.e., addresses access to affordable, nutritious foods). |
| **Household Economics (Employment and Costs of Living)** | (Incorporate) Green training (e.g., rain garden training, nursery garden training, water works training). |
| **Community Economics (Business Performance)** | Advertise to developers to encourage Brownfields opportunities. |

[1] Parenthesis "()" were used to provide context or further explanation for the recommendation per the discussion with the stakeholder.
[2] Recommendations that are shaded received support from other stakeholders.
[3] Recommendations are organized by each of the health determinants evaluated in this HIA.

# Appendix D. HIA Work Plan

## Tasks and Timeframe for Completion of the HIA post-Scoping

The approach for assessing health impacts of the BBGSP was adapted from the Health Impact Assessment; A Guide for Practice (Bhatia, 2011). The original language from Bhatia (2011) was modified to fit the needs of this HIA. Tasks were also identified and added for developing recommendations and reporting to final results of the HIA. This work plan includes tasks to be completed and their timeframe for completion.

| Tasks | Description | Timeframe for Completion |
|---|---|---|
| | **Assessment** | |
| Task 1. Access and collect data on existing conditions in the community[1] | • Collect and analyze data on the current resident population, including demographic, economic, social, and health outcome indicators. Synthesize existing data on identified health determinants and outcomes of interest.<br>• Update/refine the research questions and pathway diagrams as needed. | June 2013to December 2013 |
| Task 2. Evaluate and weigh evidence of causal relationships | • Access and synthesize peer-reviewed literature and agency reports for information explaining the relationships (or lack thereof) between the decision, current conditions, determinants of health, and health outcomes.<br>• Evaluate, based on certainty, whether the evidence demonstrates a cause and effect relationship between factors and assess whether the information gained (based on context and range) can be applied to this project.<br>• Update/refine the research questions and pathway diagrams as needed. | August 2013 to March 2014 |
| Task 3. Share information gathered and with stakeholders[2] | • Present information found and data gaps to advisory group and discuss initial findings of existing conditions and elicit stakeholder input to fill in data gaps.<br>• Present preliminary findings to community and elicit feedback. | July 2013 to End of March 2014 |
| Task 4. Forecast health effects, quantitatively where feasible | • Evaluate whether there is enough data/information available to estimate impacts to health and/or health determinants quantitatively (if possible) and/or qualitatively.<br>• Identify and use suitable prediction models (exposure-response, regression equations, etc.), where appropriate, to predict estimated health effects | April 2014 |

| | | |
|---|---|---|
| Task 4. Characterize expected health effects | • Characterize the direction of impact, likelihood, magnitude, permanence, distribution, and strength of evidence for the impacts estimated, based on the data/information collected and/or modeled. *See table below.* | Beginning of May 2014 |
| Task 5. Evaluate the level of confidence or certainty in health impact characterization | • Compile the evidence that supports the characterization of impacts and evaluate the level of confidence or certainty. Prepare communication materials that represent the information synthesized and impacts judged.<br>• Present assessment findings to stakeholders and public to elicit input on the predicted/estimated impacts and re-evaluate the confidence and certainty of change based on their input. | May 2014 to 1st week of June 2014 |
| **Recommendations** | | |
| Task 1. Identify initial recommendations for mitigating negative effects and maximizing benefits to health. | • Identify areas in the project design that have predicted negative health effects or are limited in potential positive effect.<br>• Assign recommendations to the project design that will maximize potential net positive effects and remove/mitigate negative health effects. | May 2014 |
| Task 2. Evaluate the level of appropriateness of recommendations using stakeholder input. | • Host the final public meeting to discuss initial recommendations and elicit input and viewpoints of their practicality. | 1st week of June 2014 |
| Task 3. Finalize recommendations for project design | • Incorporate stakeholder and public input into recommendations. | June 2014 to August 2014 |
| **Reporting** | | |
| Task 1. Develop Final Report | • Document the HIA process, including materials used, rational for decision-making, and other minimum elements. | March 2013 to August 2014 |
| Task 2. Finalize HIA Report and Publish | • Initiate external peer-review and internal Agency administrative review of the HIA process and incorporate final comments. | September 2014 |
| Task 3. Present Final Report to Stakeholders | • Once the HIA report has cleared the review process, publish the report on EPA website and distribute e-copy and hard-copy to stakeholders, as preferred. | October 2014 |

## Literature Review Guidelines

EPA United States Environmental Protection Agency

Proctor Creek's Boone Boulevard Green Street Project
Health Impact Assessment (HIA)

U. S. Environmental Protection Agency, Region 4 and Office of Research and Development

### Literature Review Guidelines

#### Purpose of Literature Review

The goals of this phase are to 1) review the available information (from peer-reviewed articles to grey papers) on green infrastructure (green streets, specifically); 2) identify ways to measure impacts from the implementation of Boone Boulevard Green Street Project; and 3) identify data sources and data gaps for measuring impacts. The Master Data Sheet will serve as a reference document and one of our vehicles for internal communication during the literature review process. Literature review topics can be seen by health determinant in the Topic Sign-up Sheet *(page 2)* of the Master Data Sheet.

#### Instructions for Literature Review

1. This review is aimed at finding comprehensive information relevant to our particular research questions.
    a. Overall, the formulated "Research Questions" per topic will need to be answered as a result of the Literature Review.
    b. Where questions could not be answered by reviewing the literature, primary data will need to be collected.
    c. For each article, a Literature Review Worksheet should be completed.
2. Literature reviews traditionally introduce a topic, summarize the main issues and provide some illustrative examples. The review should be structured to include:
    a. The Baseline Research Question(s)
    b. The Impact Research Questions (s)
    c. Details of Literature search conducted *(publication dates, databases searched, search terms)*
    d. Findings with short summaries of each study
    e. References for all articles and reports
    f. Conclusions *(Since framing the research questions & reviewing the literature are all an iterative process, it will be necessary to describe how you reached your conclusion. The conclusion should be based on the research presented.)*
3. The research questions' *answer* should be related to the overarching decision of implementing green infrastructure (specifically, green streets & road diet).
    a. Each topic may require a number of sub-questions or in other terms "impact questions" to be answered. These questions will typically focus on potential/anticipated changes (Δ) due to the installation of Green Infrastructure (specifically, green streets & road diet).
        i. To frame your baseline research question, you will first ask, "What are the current conditions as related to my topic?" (e.g. Topic – Climate & Temperature: What are the current temperature and humidity conditions in the study area? )
        ii. To frame your impact research question, you will rephrase the initial question and ask, "How will green infrastructure impact baseline conditions?" (e.g. How will green infrastructure impact temperature and humidity in the study area?)
    b. Keep in mind that as your literature review progresses, the initial framing of the question may need to be revised or refined as new information is obtained.
4. For every health determinant, vulnerable population information will need to be considered. Information on the population's demographics and statistics has already been gathered (refer to the Community Profile on page 1 of the Master Data Sheet).
5. To be considered a reliable source of research evidence, the researcher should record how the primary studies were sought and selected and how they were analyzed to produce their conclusions.
    a. Readers need to be able to judge whether all of the relevant literature was likely to have been found, and how the quality of studies was assessed.

b. Reliable information can come from peer-reviewed journal articles and "grey literature" (government documents that went through a rigorous review process).
c. Check key databases, websites and information provided by the Advisory Group during the group exercise should also be considered.

6. Information collected during the literature review process will be summarized and inserted into the Master Data Sheet no later than **Tuesday, August 27th**.
   a. The Master Data Sheet shared location will be determined.
   b. Once the "Literature Review Results" page is completed, we will convene on **Thursday, August 29th** to discuss the results and next steps in the assessment process.

A visual representation of the literature review workflow is shown below:

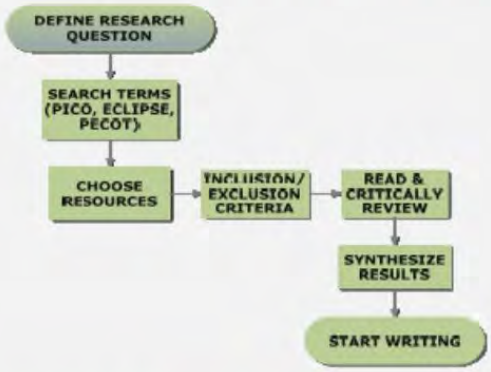
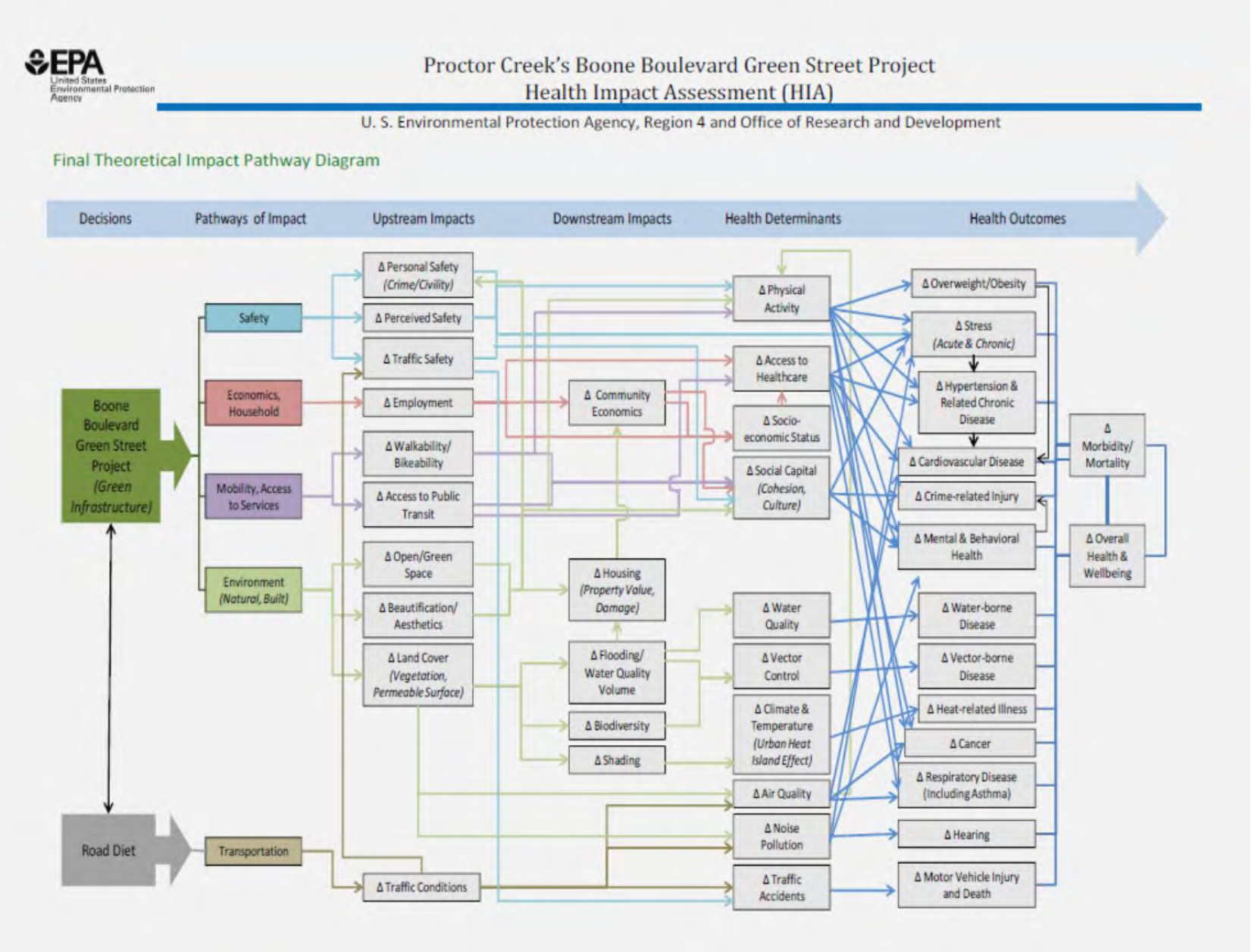



Figure provided by Aoife Lawton at the Health & Social Care Professionals Inaugural Research Conference, February 22, 2013

## Resources for Literature Reviews

Here are just a few of the sources available about HIAs and green infrastructure. Valuable information-gathering tools may include (but are not limited to):

- EPA Website for Green Infrastructure- http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm
- Centers for Disease control and Prevention, Healthy Places-http://www.cdc.gov/healthyplaces/hia.htm
- World Health Organization- http://www.who.int/hia/en/
- Google Scholar- http://scholar.google.com/
- UCLS HIA-CLIC- http://www.hiaguide.org/
- EBSCO Academic Search Complete
- LexisNexis
- JSTOR
- Web of Science
- Social Science Research Network
- PAIS International
- ScienceDirect
- PubMed- http://www.ncbi.nlm.nih.gov/pubmed/
- PsychInfo- http://www.apa.org/pubs/databases/psycinfo/index.aspx
- ProQuest- http://www.proquest.com/en-US/


EPA
United States Environmental Protection Agency
Proctor Creek's Boone Boulevard Green Street Project
Health Impact Assessment (HIA)
U. S. Environmental Protection Agency, Region 4 and Office of Research and Development
Final Theoretical Impact Pathway Diagram
Decisions
Pathways of Impact
Upstream Impacts
Downstream Impacts
Health Determinants
Health Outcomes
Boone Boulevard Green Street Project (Green Infrastructure)
Road Diet
Safety
Economics, Household
Mobility, Access to Services
Environment (Natural, Built)
Transportation
Δ Personal Safety (Crime/Civility)
Δ Perceived Safety
Δ Traffic Safety
Δ Employment
Δ Walkability/ Bikeability
Δ Access to Public Transit
Δ Open/Green Space
Δ Beautification/ Aesthetics
Δ Land Cover (Vegetation, Permeable Surface)
Δ Traffic Conditions
Δ Community Economics
Δ Housing (Property Value, Damage)
Δ Flooding/ Water Quality Volume
Δ Biodiversity
Δ Shading
Δ Physical Activity
Δ Access to Healthcare
Δ Socio-economic Status
Δ Social Capital (Cohesion, Culture)
Δ Water Quality
Δ Vector Control
Δ Climate & Temperature (Urban Heat Island Effect)
Δ Air Quality
Δ Noise Pollution
Δ Traffic Accidents
Δ Overweight/Obesity
Δ Stress (Acute & Chronic)
Δ Hypertension & Related Chronic Disease
Δ Cardiovascular Disease
Δ Crime-related Injury
Δ Mental & Behavioral Health
Δ Water-borne Disease
Δ Vector-borne Disease
Δ Heat-related illness
Δ Cancer
Δ Respiratory Disease (Including Asthma)
Δ Hearing
Δ Motor Vehicle Injury and Death
Δ Morbidity/ Mortality
Δ Overall Health & Wellbeing

## Literature Review Worksheet

Proctor Creek's Boone Boulevard Green Street Project
Health Impact Assessment (HIA)

EPA United States Environmental Protection Agency — U. S. Environmental Protection Agency, Region 4 and Office of Research and Development

Literature Review Worksheet for Tracking Research

| | | | |
|---|---|---|---|
| **REVIEWER'S NAME:** | | **TOPIC:**<br>**SUB-TOPIC:** | |
| **BASIC RESEARCH QUESTION:**<br><br>**IMPACT QUESTION:** | | | |
| **CITATION:** | | | |
| **SUMMARY OF ARTICLE:** | | | |
| **TYPE:** | ☐ Peer-Reviewed | ☐ Federal Agency Reports | ☐ Grey Literature |
| **URL's / DATABASE / LOCATION:** | | | |
| **ASSESSMENT APPROACH USED BY AUTHOR** *(Descriptive; Inferential; Predictive approaches; or combination)* | | | |
| **3 REMINDERS!** | | | |
| ☐ Have population group/demographic factors (including vulnerable populations) been considered? *Refer to Community Profile on Master Data sheet.* | ☐ Has conflicting evidence been identified and weighed? | ☐ Have the caveats/limitations of this article been captured? Consider whether the literature being reviewed has addressed issues of cause and effect. | |
| **SEARCH TERMS USED:** | | | |
| **Results:**<br>*( Key indicators/measurements used by the author)* | | | |
| **RESEARCH CONCLUSIONS:** | | | |

# Appendix E. Process Evaluation Results from External Peer-Reviewers

While all comments were invited, the HIA Core Project Team asked reviewers to specifically address certain aspects of the HIA (i.e., charge questions). The following tables list each response of the reviewer to the charge questions and the response from the authors to the reviewer's comment.

**Table 1. Comments from and Responses to Peer-Reviewer 1 (Mandy Green)**

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 1 (Mandy Green) | Response from Authors |
|---|---|---|
| **1. Context of HIA.** | [Blank] | [Blank] |
| **1a. Was the HIA undertaken to inform a proposed decision (e.g., policy, program, plan, or project) and conducted in advance of that decision being made?** | The Proctor Creek HIA was clearly appropriate in that it was undertaken to inform a proposed decision, and it was carried out in a timely manner (despite unforeseen delays) and completed in advance of the decision. | No response needed. |
| **1b. Were the need for and value and feasibility of performing the HIA assessed and clearly documented?** | The HIA report documents the potential value of this HIA for promoting positive health effects and mitigating negative health impacts of the proposed Green Street, as well as for piloting HIA methodology within EPA and serving as a model for future use of the method for the agency. | No response needed. |
| **1c. Do the authors acknowledge sponsors and/or funding sources for the HIA?** | The authors clearly explain the funding sources, stakeholders, and sponsors of the HIA in the report. | No response needed. |
| **1d. Is the screening process clearly documented in the report?** | The screening process is described in detail in the report, but could be improved by adding information about health impacts, potential impact of HIA findings, and stakeholder interest and capacity that the Project Team considered when deciding to implement this HIA. Specific questions in each of these topic areas are available in the Human Impact Partners Screening Worksheet and were presumably considered by the Project Team. The table (Table 2) listing decision points and this HIA's expected influence is an excellent summary and descriptive tool that future EPA HIA reports should include. | The HIA report authors went back to those involved in the screening process and extrapolated more information about the considerations included in the screening of the HIA. The additional information was organized and reformatted into the report and double-checked for clarity. |
| **2. Scope of HIA.** | [Blank] | [Blank] |
| **2a. Are the goals and/or objectives of the HIA clearly defined?** | The authors of the report clearly explain the goals and scope of the HIA, and go into detail about the scoping process. | No response needed. |
| **2b. Is the scope of the HIA clearly defined (i.e., decision to be studied and its alternatives; potential impacts of the decision on health, social, environmental,** | The report makes clear how priorities differed between groups and how the Team arrived at a final scope for the HIA. Some of the pathways shown in Figure 18 were unclear and it would be helpful to provide explanations of how the authors arrived at these, or to show specific pathways in more detail (even though some of this is done later in the | The authors further explained that the pathways were derived from the stakeholder discussions and preliminary literature searches. In assessment, these pathways were verified (i.e., plausible or not plausible) and further refined, as the author concedes. The line linking extreme heat events to vector-borne |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 1 (Mandy Green) | Response from Authors |
|---|---|---|
| **economic, and other health determinants and their pathways; populations and vulnerable groups likely to be affected by the decision; demographic, geographic, and temporal scope of analysis; health impacts and research questions selected for examination in the HIA and why)?** | report). For example, it would seem that a change in extreme heat events could be directly linked to vector-borne illness, but the line is dashed indicating an indirect effect. The change in climate and temperature is also linked in this pathway diagram to changes in Access to goods and services and Social capital – these links are not immediately obvious and would benefit from explanation in the text. Table 5 is very general, and more specific pathways for each health determinant would be useful to the reader (or referring to specific pathways if provided later in the text or in an appendix). In Table 8, the final scoping worksheet, questions about the design and implementation of the green street (for example, 'Is the Green Street Project designed to improve traffic safety?') could also be guided by the relevant parts of health promoting design and implementation metrics such as the Design for Health checklists (http://designforhealth.net/wp-content/uploads/2012/12/BCBS_TransChapterChecklist__092607.pdf). It is possible that the project's conceptual design already includes such metrics but those are not specifically listed in the report. | illness is not one of our pathways, but a mapping error. This line was eliminated in the updated version. The authors elaborated on the relationships presented in the pathway diagram by following the links between the proposed project, traffic safety, accessibility, crime, and social capital. The authors eliminated table 5 and referred the reader to the handout with the overarching impact pathway diagram. The authors reviewed the checklist recommended, which was developed to support the screening step. The checklist provides one metric for each screening question to help decide whether the HIA should be performed, but does not help identify other metrics or how the data can be obtained. The indicators used in this HIA are provided in the scoping worksheet. |
| **2c. Is the scoping process clearly documented in the report?** | | |
| **2d. Are the participants in the HIA and their roles clearly identified?** | The Project Team should be commended for designing a scoping process that includes community and advisory group input in a meaningful way. | No response needed. |
| **3. Stakeholder Engagement.** | [Blank] | [Blank] |
| **3a. Are stakeholder groups, including decision-makers and vulnerable population groups, clearly identified?** | The stakeholder groups and approach to stakeholder participation are quite clearly described in the HIA report. | No response needed. |
| **3b. Is a stakeholder engagement and participation approach, including plans for stakeholder communications, clearly described in the report?** | The approach is ambitious, with multiple avenues for community participation at time points throughout the HIA process. The methods and materials used for stakeholder communications are included in the appendices. | No response needed. |
| **3c. If so, was input from stakeholders solicited and utilized as planned in the HIA process?** | It appears that stakeholder input was gathered and incorporated into the HIA as originally planned, and that the HIA scope, assessment and findings and recommendations were directly influenced by this input. While members of the Project Team, Advisory Group, and Key Informants are listed by name in the acknowledgements sections, it is less clear who is connected to which community organization and who is giving individual input. It would be helpful to list organizational membership alongside each name. It is also not described in enough detail in the report exactly what input was gathered from key informants and how this was used in the HIA. The appendices could also make clear which community organizations were represented at each stakeholder meeting and also explain how confident the project leads are about how representational these organizations may be of the community as a whole. Overall the stakeholder engagement process appears well-planned and | The authors added the organizations represented to the names at the begging of the report, under "HIA Participants." The notes from the stakeholder engagement meetings (with the input from stakeholders) was added to Appendix C and in a table under the heading "interests and/or concerns identified by stakeholders." The input provided by stakeholders was added to the assessment chapter under each of the related health determinants. The meeting notes from the HIA Project Leads were added to the appendices. |

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| | executed, and hopefully will continue through the monitoring and evaluation phases of this HIA. | |
| **3e. Where stakeholders given the opportunity to review and comment on the findings of the HIA?** | Refer to comment in 3d. | Refer to response in 3d. |
| **4. Evidence and Analysis.** | [Blank] | [Blank] |
| **4a. Are the methods for evidence gathering and analysis clearly described and justified?** | The scope of the assessment is quite ambitious, with many health determinants and impacts analyzed. Clearly the small study area made examination of health outcome data impossible in some cases, however the Project Team was able to include some health outcome information and other analyses, in particular the GIS analysis, demonstrated the potential health effects of specific project elements. The methods for data gathering and analysis were clearly described and justified, and it appears that the Team made the best possible effort to identify and include relevant evidence from the published literature and expert opinion. | No response needed. |
| **4b. Was evidence selection and gathering reasonable and complete (i.e., was the best available evidence obtained)?** | Refer to comment in 4a. | Refer to response in 4a. |
| **4c. Are the existing conditions (e.g., demographics, socio-economic conditions, health determinants and health outcomes, presence of vulnerable groups, etc.) clearly described? Is the profile of existing conditions appropriate as a baseline against which to assess the impacts of the proposed decision?** | The existing conditions are described in detail, and form an appropriate basis for evaluating potential impacts of the proposed decision. | No response needed. |
| **4d. Are the potential health impacts of the proposed decision identified?** | The potential impacts of the proposed decision are identified, however it is not clear if the HIA may be used to advocate for specific design or implementation recommendations beyond simply implementing the green street or not. | There recommendations regarding specific design elements of the project (i.e., incorporating CPTED elements and increasing soil media to at least 2.5 feet or 30 inches). The authors made the intent of the HIA more explicit in the report- the purpose of the HIA was to inform DWM's decisions on implementing the proposed project as they move forward in the planning process. Text was added to link the recommendations to the assessment findings in the assessment chapter. |
| **4e. If so, is the characterization of impacts reasonable and complete (e.g., direction, magnitude, likelihood,** | The characterization of impacts appears reasonable though necessarily incomplete given limitations of the data available for health outcomes and other specifics such as air monitoring data for the small study area. | The authors acknowledged that the lack of available data for health status and to some extent health determinants was a challenge for this HIA. The time and development requirements for engaging in the EPA IRB process was a barrier to collecting |

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| **distribution, and permanence of impacts addressed; affected populations clearly identified; etc.)?** | | new information through surveys and other primary data collection needs. Thus the scale of this HIA was limited to collecting data already available. A countermeasure identified in the lessons learned was the importance of partnerships with local universities/research professionals that could obtain this data for the HIA. |
| **4f. Are the methodologies, data sources, assumptions, limitations, and uncertainties of the assessment clearly identified?** | The authors have clearly described their methodology, data sources, limitations, and assumptions. | No response needed. |
| **4g. Are the conclusions of the analysis based on a transparent and context-specific synthesis of evidence (i.e., are the conclusions reasonable and supported by the evidence)?** | The conclusions appear reasonable and well supported by the evidence presented. Overall, the assessment is thorough and very well done. The use and synthesis of multiple forms of evidence and analysis are excellent. | No response needed. |
| **5. Recommendations.** | [Blank] | [Blank] |
| **5a. Are recommendations, mitigations, and/or alternatives identified that would protect and/or promote health?** | The recommendations and mitigations listed in the report are clear and appear supported by the assessment findings. The list is quite extensive, with some recommendations more feasible and relevant to the decision in question than others (for example, 'develop a policy/plan/ordinance to address the problem of vacant housing' appears out of scope for the green street project). | No response needed. |
| **5b. Are these recommendations reasonable and supported by the evidence?** | Refer to comment in 5a. | Refer to response in 5a. |
| **5c. If prioritization of recommendations took place, was the method of priority-setting documented, reasonable, and appropriate?** | The report describes prioritization of the recommendations with community stakeholder input, and this seems reasonable and appropriate. | No response needed. |
| **5d. Is an implementation plan identified for the developed recommendations (e.g., responsible party for implementation, timeline, link to indicators that can be monitored, etc.)?** | There is some implementation information presented, such as the responsible party, but a timeline for each recommendation is not present and indicators that can be monitored are listed in the monitoring plan but not linked to the specific recommendations. This is a concern given the number of recommendations, that is, it would be easy for some of them to be lost in the shuffle and not followed up on after the HIA project is completed unless there are interested community members with the capacity to pursue them in the long term. | The authors separated the recommendations by phase of implementation (i.e., short-term, including before construction, during construction; after construction, and long-term). The authors also included the ranking criteria in the report and the score given to each recommendations. |
| **6. Documentation.** | [Blank] | [Blank] |
| **6a. Is the layout and format of the report clear and logical, with** | The HIA report is clear and logically organized, though quite extensive and possibly difficult for a community member to navigate. The report is | The authors revisited the text, figures, and tables and simplified those elements to the best extent possible. The authors acknowledged that the report is extensive, in part due to the |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 1 (Mandy Green) | Response from Authors |
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| **information clearly organized in sections that are easy to follow?** | well written with many illustrative examples and graphics used. The maps in particular are very helpful and well designed. | reporting standards as a federal agency, and resolved to develop and include an Executive Summary, which would serve as a supplement to the HIA report (i.e., a more condensed, simplified version of the HIA report). |
| **6b. Is the writing style such that the report is easily read and understood (e.g., clearly written, complex or unfamiliar terms described, examples and graphics used to illustrate text, etc.)?** | Refer to comment in 6a. | Refer to response in 6a. |
| **6c. Is documentation of the overall HIA process transparent (i.e., are the processes, methodologies, sources of data, assumptions, strengths and limitations of evidence, uncertainties, findings, etc. of the HIA clearly documented)?** | The HIA process has been transparently described in detail such that readers can understand how each step was implemented and so that the assumptions and findings are clear. | No response needed. |
| **6d. Does the report identify any other methods to be used for documenting and disseminating the HIA and its findings (e.g., briefings, presentations, factsheets, flyers, newspaper or journal articles, etc.)?** | Chapter 6: Reporting could be strengthened by adding details about report and factsheet dissemination plans. How will the materials be actively disseminated to decision makers, community groups and members? How will the HIA be shared with other public health professionals and promoted as a pilot of this methodology to potentially be replicated within EPA? Will the Project Team or community partners use traditional or social media to disseminate findings and recommendations? | The authors went back and further described the development and dissemination of the communications materials. |
| **7. Monitoring and Evaluation.** | [Blank] | [Blank] |
| **7a. Was an evaluation of the HIA process conducted (e.g., who was involved, strengths and weaknesses of the HIA, successes and challenges, how effective the HIA was in meeting stated objectives, engagement and communication with stakeholders, lessons learned, etc.)?** | It appears that the Project Team has carried out an internal process evaluation, as information regarding successes and challenges and lessons learned is presented in the report. An external review of the HIA report is planned. | No response needed. |
| **7b. Was a plan proposed for monitoring implementation of the decision and the effect the HIA had on the decision-making process (i.e., impact evaluation)?** | There are plans for impact and outcome evaluation described in the report, including responsible parties and monitoring indicators, however it is unclear if the Project Team and Atlanta DWM will be able to commit to implementation of these plans, or if there is community capacity to carry out monitoring and evaluation. | The commitment to the monitoring plan is unknown at this time. The HIA process has been transparently described in detail such that readers can understand how each step was implemented and so that the assumptions and findings are clear. It is unclear for the HIA Core Project Team whether this plan could be carried out by |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 1 (Mandy Green) | Response from Authors |
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| | | stakeholders in the community. This was a short-sight of the HIA. |
| **7c. Was a plan proposed for monitoring the impact of the decision?** | Refer to comment in 7b. | Refer to response in 7b. |
| **8. Overall HIA Process.** | [Blank] | [Blank] |
| **8a. Are the methods and procedures used in the HIA appropriate?** | The Proctor Creek BBGSP HIA was well designed and carried out according to the HIA Minimum Elements. This HIA is an excellent first project for EPA in the use of this methodology. Some of the HIA Practice Standards were met, and this is appropriate as the Standards are aspirational and not intended to be completely achieved by any one project. | No response needed. |
| **8b. What aspects of the HIA process appeared to be implemented effectively or successfully and what aspects of the HIA process could have been strengthened or improved?** | The stakeholder engagement and assessment were successfully implemented and seem very effective. The recommendations could be more carefully prioritized and developed, and the dissemination plan could be more clearly described in this report. This HIA could be strengthened by incorporating more language, measures and analysis related to equity. The first explicit mention of equity does not occur until page 131 of the report. The project team could use the recently released Equity Metrics (http://www.hiasociety.org/documents/EquityMetrics_FINAL.pdf) developed by the Equity Workgroup of the Society of Practitioners of Health Impact Assessment to evaluate and improve the HIA's coverage of these issues. EPA has a strong history of work related to environmental justice, so placing greater emphasis on equity in future HIA reports is recommended and aligns with EPA's values and strategic emphasis. | The issues regarding the recommendations and dissemination plan have been addressed (as mentioned above). The authors went back to the introduction and scoping chapters to incorporate more language regarding environmental justice and communities of concern. The equity measures in the analysis were more explicitly called-out, so that their consideration was more apparent. |
| **8c. To what extent were the goals and/or objectives of the HIA achieved?** | Overall, it appears that the goals of this HIA have been met. | No response needed. |
| **9. General Comments.** | [Blank] | [Blank] |
| **9a. General Comment** | Did the advisory group or community members comment on or agree with the vulnerable populations defined for the study site? | The list of vulnerable populations were derived from the stakeholder discussions in the scoping meetings and literature review. The final list was not verified with the stakeholder group. |
| **9b. General Comment** | Is there the potential in the future for the Green Street Project to connect to other green, bike and pedestrian-friendly infrastructure in the area, thereby magnifying the positive effects of this relatively small improvement? | Yes. One of the recommendations from the HIA Core Project Team was to extend the proposed project and connect it with existing and planned greenways and/or bike paths. The DWM is committed to expanding the proposed project to the planned Atlanta Beltline connection point. |
| **9c. General Comment** | In the Climate and Temperature section, it would have been helpful to see transit usage data because shading of bus stops is listed as a key benefit. This section could be more compelling if ER admissions or ED visit data for heat-related illness could have been obtained. However, the temperature data and infrastructure maps make the case that the Green | The ER admissions data was not available at the time the assessment was performed. However, this data was acquired after the assessment and will be used in the expanded PCW HIA, which was a request from stakeholders at the final stakeholder meeting. |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 1 (Mandy Green) | Response from Authors |
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| | Street Project would positively impact the health determinants and outcomes described. | |
| **9d. General Comment** | In the Air Quality section, it would have been helpful to see the traffic volume data for the street(s) in the study area discussed as it relates to air quality (since the traffic volumes map is included in the Safety section) to better understand the burden of mobile-source air pollution for the site. | The authors went back to the air quality section and added references from the AADT volume data to further solidify this connection (between air quality and automobiles as pollutant sources). |
| **9e. General Comment** | On page 112 in the discussion of potential adverse respiratory effects of biking or walking: while it is of course necessary to point out these adverse effects, several recent studies comparing the overall health impact of active forms of transportation have concluded that the positive impact of regular physical activity outweighs the potential negative air pollution impacts for bikers and walkers. (For example: Woodcock J, et al. Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport. 2009. Lancet. 374(9705). The Project Team should consider inclusion of these studies. | The studies provided were retrieved and reviewed. An additional statement to capture this information was added to this section. |
| **10. Additional revisions and/or comments in the report (excluding mechanical edits)** | No revisions and/or comments provided. | No response needed. |

## Table 2. Comments from and Responses to Peer-Reviewer 2 (Kitty Richards)

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 2 (Kitty Richards) | Response from Authors |
|---|---|---|
| **1. Context of HIA.** | [Blank] | [Blank] |
| **1a. Was the HIA undertaken to inform a proposed decision (e.g., policy, program, plan, or project) and conducted in advance of that decision being made?** | Yes, the HIA was done to inform a decision on whether to implement the proposed green infrastructure project. | No response needed. |
| **1b. Were the need for and value and feasibility of performing the HIA assessed and clearly documented?** | The need for the HIA, value added from the HIA, and feasibility of performing the HIA was assessed and documented. However, while reading the document I wondered how much time and resources were spent conducting the HIA, and weighing that with the possible benefits given the geographically small study area selected, I found myself questioning the resource commitment. It seems that an HIA may not have been necessary to come up with the report's conclusions, particularly if the City of Atlanta, the decision-makers, were already on board with the decision to move forward with the proposed infrastructure project. A cost/benefit assessment as to whether to conduct the HIA may have been helpful beforehand. | In the report, text was added to reflect the changes in screening. Specifically, the HIA was originally screened to evaluate the PNA Vision (as a whole), but the City was restricted to implementing only one of the projects at that time. Therefore, the HIA was quickly rescreened for the smaller Boone Boulevard Green Street Project demonstration site C. DWM and EPA agreed the HIA would still be worth performing on the smaller project site. However, the HIA project leads committed to expanding the HIA to evaluate green infrastructure in the rest of the watershed and began searching for a proposed decision to evaluate. |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 2 (Kitty Richards) | Response from Authors |
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| **1c. Do the authors acknowledge sponsors and/or funding sources for the HIA?** | The authors acknowledged sponsors and funding sources. | No response needed. |
| **1d. Is the screening process clearly documented in the report?** | The screening process was clear, though it could have been more concise. | The authors revisited the screening chapter. Several revisions were made to streamline the screening chapter. However, some of the discussions in the introduction chapter were brought into screening (based on responses from other peer-reviewers). The final page count for the screening chapter remained at six pages. |
| **2. Scope of HIA.** | [Blank] | [Blank] |
| **2a. Were the goals and/or objectives of the HIA clearly defined?** | Yes, although I believe the discussion could have been more concise. | The authors revised the scoping chapter. Several revisions were made and the chapter was reduced to 31 pages (from 40 pages). The bulk of this chapter comes from the 12-page (large table) of the final HIA scoping worksheet. |
| **2b. Is the scope of the HIA clearly defined (i.e., decision to be studied and its alternatives; potential impacts of the decision on health, social, environmental, economic, and other health determinants and their pathways; populations and vulnerable groups likely to be affected by the decision; demographic, geographic, and temporal scope of analysis; health impacts and research questions selected for examination in the HIA and why)?** | No comment. | No response needed. |
| **2b. Is the scoping process clearly documented in the report?** | No comment. | No response needed. |
| **2c. Are the participants in the HIA and their roles clearly identified?** | No comment. | No response needed. |
| **3. Stakeholder Engagement.** | [Blank] | [Blank] |
| **3a. Are stakeholder groups, including decision-makers and vulnerable population groups, clearly identified?** | Yes, although it would have been helpful to have a table showing the meetings by stakeholder group, meeting purpose, and date. The discussion regarding the various meetings with the various HIA groups and dates was difficult to follow. | The authors added new tables under the section heading "stakeholder communication and engagement," that listed the stakeholder groups involved, activities, and purpose of each activity for each step in the HIA process. The individuals who participated in each stakeholder group are identified in the "HIA Participants" section. |
| **3b. Is a stakeholder engagement and participation approach, including plans for stakeholder** | No comment. | No response needed. |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 2 (Kitty Richards) | Response from Authors |
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| **communications, clearly described in the report?** | | |
| **3c. If so, was input from stakeholders solicited and utilized as planned in the HIA process?** | No comment. | No response needed. |
| **3d. Did the HIA utilize community knowledge and experiences as evidence and in what ways?** | No comment. | No response needed. |
| **3e. Where stakeholders given the opportunity to review and comment on the findings of the HIA?** | No comment. | No response needed. |
| **4. Evidence and Analysis.** | [Blank] | [Blank] |
| **4a. Are the methods for evidence gathering and analysis clearly described and justified?** | Yes, there was evidently a lot of work that went into this. | No response needed. |
| **4b. Was evidence selection and gathering reasonable and complete (i.e., was the best available evidence obtained)?** | No comment. | No response needed. |
| **4c. Are the existing conditions (e.g., demographics, socio-economic conditions, health determinants and health outcomes, presence of vulnerable groups, etc.) clearly described? Is the profile of existing conditions appropriate as a baseline against which to assess the impacts of the proposed decision?** | No comment. | No response needed. |
| **4d. Are the potential health impacts of the proposed decision identified?** | No comment. | No response needed. |
| **4e. If so, is the characterization of impacts reasonable and complete (e.g., direction, magnitude, likelihood, distribution, and permanence of impacts addressed; affected** | No comment. | No response needed. |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 2 (Kitty Richards) | Response from Authors |
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| **populations clearly identified; etc.)?** | | |
| **4f. Are the methodologies, data sources, assumptions, limitations, and uncertainties of the assessment clearly identified?** | Again, I think some of the important points may have been lost due to the amount of detail that was presented. Additionally, I believe some of the language was overly technical. For example, I found the section on flooding and slope unnecessarily far too technical and could have been much more simplified; I think people automatically grasp the concept of water flowing to the lowest point, without going into the why and how of it. | The authors went back and revised several sections, specifically the flood management section, and removed some items that were not necessary or too technical for conveying the key message. Furthermore, the sentence on flooding and slope was eliminated. The Assessment chapter was reduced to 75 pages (from 96 pages) in length. |
| **4g. Are the conclusions of the analysis based on a transparent and context-specific synthesis of evidence (i.e., are the conclusions reasonable and supported by the evidence)?** | No comment. | No response needed. |
| **5. Recommendations.** | [Blank] | [Blank] |
| **5a. Are recommendations, mitigations, and/or alternatives identified that would protect and/or promote health?** | Yes, though if I were the government entity responsible for implementing the recommendations, the number of recommendations would be overwhelming and costly. | The authors acknowledged in the report that cost and feasibility was not considered in the recommendations. This was a short-fall of the Recommendations step. However, the authors did try to provide information on phasing the recommendations and ranking so that not all had to be implemented at one time. |
| **5b. Are these recommendations reasonable and supported by the evidence?** | Refer to comment in 5a. | Refer to response in 5a. |
| **5c. If prioritization of recommendations took place, was the method of priority-setting documented, reasonable, and appropriate?** | A clear prioritization scheme might have worked here with no more than three recommendations per pre-construction, during construction and post cost construction phases presented. | The authors revised the explanation of how the recommendations were prioritized. Unfortunately, the HIA Core Team did not select the top three recommendations for each implementation phase. |
| **5d. Is an implementation plan identified for the developed recommendations (e.g., responsible party for implementation, timeline, link to indicators that can be monitored, etc.)?** | No comment provided. | No response needed, |
| **6. Documentation.** | [Blank] | [Blank] |
| **6a. Is the layout and format of the report clear and logical, with information clearly organized in sections that are easy to follow?** | Throughout the report, it was difficult to get at the important nuggets because there was so much detail presented. The flow of the report was good in terms of progression; however, I don't think many people would be willing to wade through all of it. It was very detailed and used a lot of technical jargon. The report could have been much more concise with an executive summary provided at the beginning. The authors should avoid | The authors acknowledged this point in the report and resolved to eliminate superfluous content and remove technical jargon. The report in its entirety has been reduced in length. The authors acknowledge that the report was not written for one audience, but several groups of audience (e.g., community members, the City of Atlanta, HIA practitioners, and EPA Agency Administrators, etc.). |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 2 (Kitty Richards) | Response from Authors |
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| | the jargon in the Fact Sheet and pass it through some of the community members who participated to make sure it is clear prior to distribution to the public. Additionally, it was never clear to me who this report was intended for – I get it was for the decision-makers, but it seems to be written for other technical audiences. It might have been good to put some of the details in the appendices rather than in the main body of the report. If someone were interested in the fine details, they could then access the appendices. | This was a particular challenge for an HIA led by the EPA, because the content had to go through the Agency review process and thus present enough information to support the conclusions made. Thus, the authors resolved to provide a less detailed version of the HIA report for the less technical audience. This document would serve as a stand-alone Executive Summary. |
| **6b. Is the writing style such that the report is easily read and understood (e.g., clearly written, complex or unfamiliar terms described, examples and graphics used to illustrate text, etc.)?** | Refer to comment in 6a. | Refer to response in 6a. |
| **6c. Is documentation of the overall HIA process transparent (i.e., are the processes, methodologies, sources of data, assumptions, strengths and limitations of evidence, uncertainties, findings, etc. of the HIA clearly documented)?** | Refer to comment in 6a. | Refer to response in 6a. |
| **6d. Does the report identify any other methods to be used for documenting and disseminating the HIA and its findings (e.g., briefings, presentations, factsheets, flyers, newspaper or journal articles, etc.)?** | Refer to comment in 6a. | Refer to response in 6a. |
| **7. Monitoring and Evaluation.** | [Blank] | [Blank] |
| **7a. Was an evaluation of the HIA process conducted (e.g., who was involved, strengths and weaknesses of the HIA, successes and challenges, how effective the HIA was in meeting stated objectives, engagement and communication with stakeholders, lessons learned, etc.)?** | Yes, in fact I found the lessons learned and challenges experienced to be the most interesting and straight forward part of the HIA and very instructive for me as a practitioner. I also liked Table 37 showing the skills needed for by role for conducting an HIA. | No response needed. |
| **7b. Was a plan proposed for monitoring implementation of** | I think the piece that talks about what the community can do, and whom they can partner with (agencies) after the HIA Core Team exits, could be | Section 7.2.2. Outcome Monitoring- the challenges faced in this HIA, in regards to the limited health status data available, will be |

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| **the decision and the effect the HIA had on the decision-making process (i.e., impact evaluation)?** | overwhelming for community-based organizations operating on a shoe-string budget with volunteer staff. | difficult to overcome for any one entity. Thus, several potential leads to implement the monitoring plan, in addition to potential partners (for funding and/or extra personnel) were identified by the HIA Core Project Team. |
| **7c. Was a plan proposed for monitoring the impact of the decision?** | Refer to comment in 7b. | Refer to response in 7b. |
| **8. Overall HIA Process.** | [Blank] | [Blank] |
| **8a. Are the methods and procedures used in the HIA appropriate?** | I commend EPA for attempting to work in local community settings and experimenting with HIA as a tool to bring forth community knowledge and scientific evidence. It would be interesting to see how the HIA might have turned out if it were done for a proposed project was more controversial and a little less safe. The pending decision seemed to be a win-win situation with many of the resources already secured, the decision-makers on board, and the community in favor of the proposed project. | Some of the stakeholders who participated in this HIA agreed that the project was a considerably small size for the EPA to be involved. When this HIA was re-screened after DWM notified EPA that only one project could be evaluated at that time, EPA asked stakeholders whether the HIA should proceed. It was agreed that the lessons learned from implementing the HIA process was worth the expenditures. Furthermore, the EPA agreed to expand the HIA to discuss implementing green infrastructure in the larger Proctor Creek Watershed and its potential health impacts. |
| **8b. What aspects of the HIA process appeared to be implemented effectively or successfully and what aspects of the HIA process could have been strengthened or improved?** | No comment. | No response needed. |
| **8c. To what extent were the goals and/or objectives of the HIA achieved?** | Since, as stated in the report, part of this work was done to strengthen EPA's relationships with local communities, the most important project evaluation questions would be, "was the HIA Core Team, consisting of EPA staff, successful in building and maintaining key relationships with the community over a 1, 3, 5-year timeframe", "were the organizations and community members involved in the HIA successful in bringing about positive policies that promote health using HIA as a tool", and "post this HIA, how many other HIAs have the organizations/community members successfully undertaken". | The HIA Core Project Team members can provide further insight as to how the working relationships have changed or not changed. The best way to collect this information would be through a survey-response process. However, the EPA requires IRB approval before such a process could take place. |
| **9. General Comments.** | [Blank] | [Blank] |
| **9a. General Comment** | Painstaking work here and I'm sure the community appreciates the assistance. The challenge is to stay engaged with the community and continue relationship development post HIA. Sometimes a disservice to communities can result when agencies come into a community to help, conduct their work, publish their results, and leave. I'm hopeful that while conducting the HIA, there was a sincere attempt to train community members/organizations on conducting future HIAs and a transfer of knowledge from the community to the HIA Core Team and vice versa. | The participants in this HIA were leveraged from the existing Proctor Creek Urban Federal Partnership. These entities are continuing efforts in the Proctor Creek Watershed and the EPA Region 4 office meets monthly to discuss the community's issues and needs, and coordinate efforts in the area. |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 2 (Kitty Richards) | Response from Authors |
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| **9b. General Comment** | Figure 18 was confusing. Table 7 could have been in the appendix or simplified. I wasn't sure if there was significance to the size of the boxes under the various categories and found that to be equally confusing. | The authors revisited Figure 18, which illustrates the pathways appraised in this HIA. The introductory paragraph for the pathways was revised to better explain the pathways identified. Table 7 was moved to the appendices. |
| **10. Additional revisions and/or comments in the report (excluding mechanical edits)** | [Blank] | [Blank] |
| **10a. Additional revision and/or comment** | Page iv. [Clarify funding vehicle.] "The HIA was supported through a collaborative grant from EPA's SHC Research Program (or was it RESES as stated on page ii.?). | The funding vehicle was through RESES research grant, which is managed through the ORD. The authors revised the text in the report to reflect this clarification. |
| **10b. Additional revision and/or comment** | Page 4. [Suggest] another word to replace "depose." | This sentence was eliminated from revision of the entire paragraph. |
| **10c. Additional revision and/or comment** | Page 10. [Suggest] consistently using "Simpson Rd." or "Boone St." Otherwise, [switching between them] tends to be confusing. | The authors added further clarification, in the background and history of Boone Street, that "Boone Street was previously named Simpson Road." |
| **10d. Additional revision and/or comment** | Page 15. "Each of the BMPs was designed to meet the state's water quality sizing criteria, which requires the element to capture and treat runoff from a 1.2 inch rainfall event or the first 1.2 inches of rainfall from larger rain events." (what element are you referencing? This section is a little confusing since BMPs seem to convey something other than best management practices. | The element(s) refers to the elements of green infrastructure that are also considered stormwater best managment practices (BMPs). The authors revised this section of the report and created a new section describing the design of the proposed project. The overview of green infrastructure elements being used in the design was left here; while the detailed information about the project's design (discussion on the BMPs) was moved under the new section and clarified further. |
| **10e. Additional revision and/or comment** | Page 16. "The second scenario is almost unlikely as scenario 1" (almost unlikely- not sure what this means.) "The third scenario is impractical in nature, considering a large portion of the project is sited in the unused space left over from the road diet. (Option 3 states there will be no road diet so I'm not following this). "The expanding support for the project adds more expectation for the project to be implemented and those managing the project will be held accountable for its completion." (? Not sure why the last part of the sentence is here.) | The authors revised this section to make more clear. "Almost" was removed. Option 3 discusses the impracticality of trying to add green infrastructure elements in a street without creating additional space. The last sentence was meant to reflect the growing support for the project among the residents. If this support wanes or becomes controversial, then this project may face delay and/or indefinite postponement. |
| **10f. Additional revision and/or comment** | Page 21. "Feedback was incorporated, and in early October 2014, the final recommendations of the HIA were sent to the City and stakeholders. (Early October has not yet happened). | Because the report had to be reviewed by the Agency before the final HIA steps were taken, this section was written as if the report were released post October 2014. However, the timeline has changed since the external peer-review. This section has been updated with a new timeline reflecting those changes. |
| **10g. Additional revision and/or comment** | Page 63. "Identifying key search terms helped to expedite the search of the literature." (info. On search terms used, cutoff dates of sources (e.g., post 2000) would be useful here. | The authors added this information to the text. "Identifying key search terms (e.g., green infrastructure, efficiency, human health, extreme heat event, etc.) and setting excursion parameters (e.g., sources published after 1995, in English, etc.) helped to expedite the search of the literature. The authors also added a copy of the literature review guidelines created for the HIA Core Project Team in the appendices-to which the readers were referred. |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 2 (Kitty Richards) | Response from Authors |
|---|---|---|
| **10h. Additional revision and/or comment** | Page 79. Table 17. (no description of this table anywhere) | The authors added a few statements to introduce Table 17. |
| **10i. Additional revision and/or comment** | Page 86. "The combined sewer outlet is located outside the designated community, so a CSO event is not expected to impact the population in the community study area." (It might have been good to include the community impacted by the CSO as well since this was a major concern.) | The authors did not think the project's size was large enough to warrant including the population downstream of the combined sewer outflow. The project will improve water quality going into the combined sewer system, but that volume of water is negligible compared to the total volume of stormwater discharged at that outflow. |
| **10j. Additional revision and/or comment** | Page 90. First paragraph- (difficult paragraph to read- goes back and forth) | The authors revisited this paragraph and revised it for better clarity. |
| **10k. Additional revision and/or comment** | Page 131. "Simply put, accessibility is the integration of considerations for transport and land use facets of the environment that influence or determine what can be reached in a given space and how it can be reached." (anything but simply put-lots of jargon) | The authors revised this statement to improve simplicity and removed the technical jargon. |
| **10(l). Additional revision and/or comment** | Page 162. "This prioritization strategy to designate whether the individual was a resident or nonresident was chosen so that the HIA Core Project Team could identify which recommendations were the preference of those would be most affected by its implementation." (confusing sentence) | The authors revised this sentence to improve clarity and simplicity. |

**Table 3. Comments from and Responses to Peer-Reviewer 3 (Jonathan Heller)**

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 3 (Jonathan Heller) | Response from Authors |
|---|---|---|
| **1. Context of HIA.** | [Blank] | [Blank] |
| **1a. Was the HIA undertaken to inform a proposed decision (e.g., policy, program, plan, or project) and conducted in advance of that decision being made?** | The HIA was undertaken to inform a proposed decision. | No response needed. |
| **1b. Were the need for and value and feasibility of performing the HIA assessed and clearly documented?** | The need for and value and feasibility of performing the HIA was assessed and clearly documented. | No response needed. |
| **1c. Do the authors acknowledge sponsors and/or funding sources for the HIA?** | The authors acknowledge sponsors and/or funding sources for the HIA. | No response needed. |
| **1d. Is the screening process clearly documented in the report?** | After reading this section, I believe you all did a thorough job on screening and documented screening well. The screening process was clearly documented in the report. | No response needed. |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 3 (Jonathan Heller) | Response from Authors |
|---|---|---|
| **2. Scope of HIA.** | [Blank] | [Blank] |
| **2a. Are the goals and/or objectives of the HIA clearly defined?** | The goals of the HIA are clear. Who set these goals? Were these EPA goals or did a broader set of stakeholders set these? The equity and democracy principles would suggest that the community should be involved in setting the project goals. | The goals of the HIA were set by the HIA Core Project Team at the onset of the Scoping step and based on the considerations with DWM and other stakeholders in the Screening step. The authors revisited this section of the report and added text that answered the questions posed by the reviewer. |
| **2b. Is the scope of the HIA clearly defined (i.e., decision to be studied and its alternatives; potential impacts of the decision on health, social, environmental, economic, and other health determinants and their pathways; populations and vulnerable groups likely to be affected by the decision; demographic, geographic, and temporal scope of analysis; health impacts and research questions selected for examination in the HIA and why)?** | The scoping process is clearly described. On page 67 [African Americans represent 82.3% of the population. This makes me think that African Americans should be a vulnerable population. | While African Americans are typically identified as a minority and hence a vulnerable population, African Americans represent the majority population in this community and have for a long time. It is acknowledged that race does present some health vulnerabilities )e.g., higher rates of particular health outcomes among African Americans), but the HIA Core Project Team felt it was more appropriate to identify population characteristics that could potentially contribute to disparities more directly related to the health determinants appraised, given that actual health outcomes within the study area could not be evaluated, but rather had to be approximated based on health outcome data at a larger scale (i.e., county level). In the second (expanded) Proctor Creek Watershed HIA, populations with certain vulnerabilities to the health outcomes expected will be considered for inclusion as a vulnerable population. |
| **2c. Is the scoping process clearly documented in the report?** | After reading this section, I believe you all did a thorough job on scoping and documented scoping well. The scope is clear. | No response needed. |
| **2d. Are the participants in the HIA and their roles clearly identified?** | Participants in the HIA are clearly described. | No response needed. |
| **3. Stakeholder Engagement.** | [Blank] | [Blank] |
| **3a. Are stakeholder groups, including decision-makers and vulnerable population groups, clearly identified?** | Stakeholder groups, including decision-makers and vulnerable population groups, are clearly identified. | No response needed. |
| **3b. Is a stakeholder engagement and participation approach, including plans for stakeholder communications, clearly described in the report?** | The stakeholder engagement and participation approach, including plans for stakeholder communications, is clearly described in the report. | No response needed. |
| **3c. If so, was input from stakeholders solicited and utilized as planned in the HIA process?** | Input from stakeholders was solicited and utilized in scoping and in the recommendations phases. It was not used in screening (see more about that below), based on what I read. And I did not see it used in assessment either. | The authors were able to gather more information from the discussions in the Screening step. The HIA Project Leads stated that both DWM, fellow EPA staff and other stakeholders were consulted in the screening discussions. The authors added the new information into the report under the screening chapter. The authors revisited the text in the assessment chapter and add clarifications where stakeholder input was used (to the best extent |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 3 (Jonathan Heller) | Response from Authors |
|---|---|---|
| | | possible). Also, a section was created regarding stakeholder feedback on the assessment and recommendations and the responses to this feedback was added. |
| **3d. Did the HIA utilize community knowledge and experiences as evidence and in what ways?** | The HIA utilized community knowledge and experiences as evidence in deciding what to study during scoping, but not in the assessment phase. Lived experience was not used as existing conditions data or in predicting impacts. | The authors concede that the stakeholder experiences and/or viewpoints were used for some health determinants, but not all, because input was not available for all of the health determinants included in the assessment. This HIA was limited in ability to collect information directly from the residents, due to IRB compliance requirements, and thus could not fill all of the identified data gaps. The authors further explained the process of receiving feedback at the stakeholder engagement meetings and documented the feedback and the HIA Core Project Team's responses in the report. |
| **3e. Where stakeholders given the opportunity to review and comment on the findings of the HIA?** | Stakeholders were given the opportunity to review and comment on the findings of the HIA, but it seemed like that was done in a very limited way. There was no evidence that stakeholders had much to say about the findings, which makes me think that the way they were asked did not truly elicit feedback. And the little feedback that was received on posters – not sure if that changed the HIA findings at all. | Refer to response in 3d. |
| **4. Evidence and Analysis.** | [Blank] | [Blank] |
| **4a. Are the methods for evidence gathering and analysis clearly described and justified?** | The methods for evidence gathering and analysis were clearly described and justified. | No response needed. |
| **4b. Was evidence selection and gathering reasonable and complete (i.e., was the best available evidence obtained)?** | Evidence selection and gathering was reasonable and complete. | No response needed. |
| **4c. Are the existing conditions (e.g., demographics, socio-economic conditions, health determinants and health outcomes, presence of vulnerable groups, etc.) clearly described? Is the profile of existing conditions appropriate as a baseline against which to assess the impacts of the proposed decision?** | Existing conditions were clearly described except for one health determinant. The profile of existing conditions is appropriate as a baseline against which to assess the impacts of the proposed decision. | The authors went back to the HIA Core Project Team, who resolved to collected further data for the one health determinant (social capital) and expanded on the discussions regarding the predicted impacts based on the new information collected and analyzed. |
| **4d. Are the potential health impacts of the proposed decision identified?** | The potential health impacts of the proposed decision were identified. | No response needed. |
| **4e. If so, is the characterization of impacts reasonable and** | As you'll see below, I often don't agree with the ratings for magnitude. I would use different definitions of magnitude and, instead of permanence, | The HIA Core Project Team was unable to survey the number of people who used the street to better inform the magnitude of |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 3 (Jonathan Heller) | Response from Authors |
|---|---|---|
| **complete (e.g., direction, magnitude, likelihood, distribution, and permanence of impacts addressed; affected populations clearly identified; etc.)?** | use severity. For example, I don't think it is reasonable to say that this project would have a 2 star magnitude (out of 3) impact on crime. While that may be true with the definitions you have, it will be perceived as inaccurate. For magnitude, I think you need to analyze how many people are likely to have their health affected as a result of the change. For crime, while "some groups" may truly be impacted, will putting in the green street project really have a big impact on the level of crime? How many crimes is it likely to eliminate? And how many people would therefore really be impacted. Similarly for traffic safety. While lots of people may walk by there, how many pedestrian collisions are there in that area and how many will be avoided due to the road diet. I would also suggest using severity rather than permanence. Severity takes into account how big a health impact there will be. Will someone die or will someone get a cold? If you do stick with permanence, I'd change the definition to about the permanence of the health outcome not the permanence of the determinant. Will a disease be permanent and irreversible (e.g., death) or will it be short term (e.g., a cold)? | some health impacts. In addition, the HIA Core Project Team could not obtain health data at the resolution of the HIA study area (beyond a qualitative characterization provided by OASIS). Thus, the number of people potentially affected was not assessed for each health impact, nor was severity of impact. Instead, proximity health determinants were evaluated and the health impacts were characterized in a qualitative manner. The authors concede that this was a deficiency in this HIA. The authors did revisit the descriptions of the magnitude and permanence ratings and modified them to more accurately reflect the way in which impacts were assessed and provided a more accurate account of relative magnitude. |
| **4f. Are the methodologies, data sources, assumptions, limitations, and uncertainties of the assessment clearly identified?** | The methodologies, data sources, assumptions, limitations, and uncertainties of the assessment were clearly identified. The discussion on flooding and impervious surfaces] is highly technical and, after reading it, I'm not sure if this is an area that is prone to flooding or not. | See response to K Richards. |
| **4g. Are the conclusions of the analysis based on a transparent and context-specific synthesis of evidence (i.e., are the conclusions reasonable and supported by the evidence)?** | The conclusions of the analysis were based on a transparent and context-specific synthesis of evidence. | No response needed. |
| **5. Recommendations.** | [Blank] | [Blank] |
| **5a. Are recommendations, mitigations, and/or alternatives identified that would protect and/or promote health?** | Recommendations, mitigations, and/or alternatives are identified that would protect and/or promote health. | No response needed. |
| **5b. Are these recommendations reasonable and supported by the evidence?** | Recommendations were reasonable and supported by the evidence, though there is a long list of recommendations and it is not clear which of them is most important. | The HIA Core Project Team believed highlighting the recommendations identified and/or supported by residents and other stakeholders was appropriate because if the list of HIA recommendations could not be implemented in its entirety. the team believed DWM and the City of Atlanta should at a minimum address and/or adopt these items (highlighted in green). Text was added to reflect this discussion. The authors provided more text and documentation regarding the recommendation prioritization process. including the framework used and composite scores of each recommendation. Furthermore, the authors simplified the |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 3 (Jonathan Heller) | Response from Authors |
|---|---|---|
| | | table by separating out the recommendations by implementation phase. |
| **5c. If prioritization of recommendations took place, was the method of priority-setting documented, reasonable, and appropriate?** | The method of priority-setting was documented, reasonable, and appropriate. But some recommendations supported by stakeholders were called out separately and that may influence the reader's opinion about these. Great that you all got good input into the recommendations. The list of recommendations is long and I did not get a clear sense of what are the most important things decisions makers (for the project) should do. In general, the recommendations made sense but there were too many and it was not clear which were most important from a health perspective. | Refer to response in 5b. |
| **5d. Is an implementation plan identified for the developed recommendations (e.g., responsible party for implementation, timeline, link to indicators that can be monitored, etc.)?** | A relatively vague implementation plan was identified for the developed recommendations (e.g., responsible party for implementation, timeline, link to indicators that can be monitored, etc.). | The authors were able to gather more specific information from the HIA Core Project Team for some of the recommendations, but not all. The HIA core project team acknowledged in the report that cost and feasibility was not included in the prioritization of the recommendations. |
| **6. Documentation.** | [Blank] | [Blank] |
| **6a. Is the layout and format of the report clear and logical, with information clearly organized in sections that are easy to follow?** | The layout and format of the report is clear and logical, with information clearly organized in sections that are easy to follow. However, the report is over 250 pages in 11 point font. I doubt almost anyone will read the report. Hopefully the fact sheet will be concise. The length of the report hampers its effectiveness. Interested parties will not spend the time to read it and there is no executive summary (yet?). The report could be streamlined and much of the information could be cut out to make it more effective at reaching some of its goals. | The authors re-reviewed the HIA report and eliminated unnecessary information, where appropriate, and streamlined the text to the best extent possible (without losing valuable information). One thing to consider, is that this assessment evaluated twelve health determinants (originally fifteen, but three were combined into one overarching determinant). The scope of this HIA is considerably more comprehensive than most HIAs in the breadth of impacts assessment. Thus, the report is expectantly longer to accommodate the full scope. Regardless, the authors were able to reduce the report to 156 pages of content, 7 pages of references, and 75+ pages of appendices. |
| **6b. Is the writing style such that the report is easily read and understood (e.g., clearly written, complex or unfamiliar terms described, examples and graphics used to illustrate text, etc.)?** | The writing style is such that the report is easily read and understood. | No response needed. |
| **6c. Is documentation of the overall HIA process transparent (i.e., are the processes, methodologies, sources of data, assumptions, strengths and limitations of evidence,** | Documentation of the overall HIA process is transparent. | No response needed. |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 3 (Jonathan Heller) | Response from Authors |
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| **uncertainties, findings, etc. of the HIA clearly documented)?** | | |
| **6d. Does the report identify any other methods to be used for documenting and disseminating the HIA and its findings (e.g., briefings, presentations, factsheets, flyers, newspaper or journal articles, etc.)?** | The report identifies other methods to be used for documenting and disseminating the HIA and its findings (e.g., briefings, presentations, factsheets, flyers, newspaper or journal articles, etc.). This feels like the minimal amount that is needed for communications. You could consider adding other ways to communicate the findings, including speaking at public events, giving testimony about the HIA, and trying to get media coverage. The stated communications activities are not likely to result in many people seeing the HIA. | The HIA Core Project Team was able to provide more information about the materials developed for the HIA and the different venues where team members presented on the HIA findings and/or process. This information was added to the report under the reporting section. |
| **7. Monitoring and Evaluation.** | [Blank] | [Blank] |
| **7a. Was an evaluation of the HIA process conducted (e.g., who was involved, strengths and weaknesses of the HIA, successes and challenges, how effective the HIA was in meeting stated objectives, engagement and communication with stakeholders, lessons learned, etc.)?** | An evaluation of the HIA process was conducted. However, the evaluation should cover whether the goals were met. | During the report review process, the HIA was evaluated for its ability to meet the goals identified in scoping. This new information was incorporated into the report. |
| **7b. Was a plan proposed for monitoring implementation of the decision and the effect the HIA had on the decision-making process (i.e., impact evaluation)?** | A plan was proposed for monitoring implementation of the decision and the effect the HIA had on the decision-making process. | No response needed. |
| **7c. Was a plan proposed for monitoring the impact of the decision?** | A plan was proposed for monitoring the impact of the decision implementation on health determinants and health outcomes (i.e., outcome evaluation). If negative health impacts are found during monitoring, no plan for action is proposed. | The authors recognized that contingencies for finding negative health outcomes was not included in the management plan. Although this practice was not commonly found in previous HIA reports, this deficiency in developing contingency plans within the monitoring plan was identified as a missed opportunity to provide best practices in HIA. |
| **8. Overall HIA Process.** | [Blank] | [Blank] |
| **8a. Are the methods and procedures used in the HIA appropriate?** | The methods and procedures used in the HIA were appropriate. I did not agree with the predication tables – see comments on that below. | See response above (regarding impact characterization methods). |
| **8b. What aspects of the HIA process appeared to be implemented effectively or successfully and what aspects of the HIA process could have been strengthened or improved?** | The overall report is well done and the process clearly described. The Scoping process seemed very complete. Stakeholders could have been engaged more in the whole process, including deciding the topic of the HIA and giving more substantive feedback about the findings. | See responses above (regarding screening and assessment processes). |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 3 (Jonathan Heller) | Response from Authors |
|---|---|---|
| **8c. To what extent were the goals and/or objectives of the HIA achieved?** | I don't know if the goals were achieved. That is a question that should have been answered in the self-evaluation that was done. I don't know that the HIA process was a route to get more equitable engagement in the decision making process – I did not see evidence of that in the report, but you all may have experiences that were not documented in the report regarding this. There is no discussion of whether the goals for the HIA, as described in Scoping, were achieved in the evaluation section. | See response above (regarding evaluation of HIA goals). |
| **9. General Comments.** | As I say below (just once), the report is very, very long (and in 11 pt.). It could be streamlined significantly by reducing repetition and moving less important content to appendices. As is, it will not be super useful for stakeholders because no one will read it. I know there will be fact sheets, but an exec summary would be nice too. And, really, would be great if future reports were shorter. | See responses above (regarding documentation of the HIA). |
| **10. Additional revisions and/or comments in the report (excluding mechanical edits)** | [Blank] | [Blank] |
| **10a. Additional revisions and/or comments** | Page 4. "In order to avoid these negative outcomes, HIA practitioners must use fact-based evidence and proven methods from a variety of sources to develop an objective opinion regarding the pending decision. An objective opinion is without preconceived notions, prejudices, or personal feelings." (I'd suggest dropping this. It propagates the idea that some people are objective and others are not and that someone is able to approach something without preconceived notions. The science does not support this idea – we all have preconceived notions that influence our ideas. The questions become a) does the HIA practitioner admit to having those biases and preconceived notions and b) how does the practitioner take those into account when conducting the HIA. Just leave out the idea of objectivity.) | The authors revised this section extensively. These two statements were eliminated. |
| **10b. Additional revisions and/or comments** | Page 18. Section 2.3 The Decision to Conduct the HIA. (It sounds like others were not involved in screening this HIA. It would have been nice if the EJ community described above would have had input into whether this was a worthwhile project on which to conduct an HIA. They may have had other ideas about what proposals would be most likely to impact their lives. An opportunity to model democracy and equity was missed. The population is mainly African American and has high levels of poverty and unemployment. If the government is going to try to do something to help them out, shouldn't they be asked what might have a big impact? And would they choose a green infrastructure project along a ½ mile of road as THE thing the EPA should weigh in on to improve their lives? Maybe so, but it would be good to ask them.). However, I'm left still wondering whether an HIA was necessary for this project – was it the best use of resources? Was there any disagreement about the project or controversy? Did the community have concerns about the proposed | The authors revised this section extensively. The screening process was further detailed regarding the initial screening for the implementing the PNA Vision (in its entirety) and then later re-screened for the smaller project. The HIA Project Leads discussed with DWM and other key stakeholders (EPA staff and other Federal Urban Partnership members) the value expected to come from this HIA. The authors explicitly described the considerations included in these discussions. |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 3 (Jonathan Heller) | Response from Authors |
|---|---|---|
| | project? If not, could a proposal that had more potential tradeoffs or more controversy been selected as the topic of an HIA and would that have been a better use of limited resources? I understand that this may have been a good demonstration project for the EPA, but I would hope that resources are focused on the most important equity issues in the future. | |
| **10c. Additional revisions and/or comments** | Page 20. "Add a vehicle for equitable inclusion of all stakeholders in the decision-making process.(Were some stakeholders feeling like they were not being heard? If so, that should be documented in Screening as a reason to do the HIA.) | This information came from the considerations discussed in Screening. The authors were able to provide more information answering the question posed by the reviewer in the Screening chapter. |
| **10d. Additional revisions and/or comments** | Page 20. "Increase transparency, local accountability, community empowerment and ownership of the proposed plan through meaningful stakeholder engagement." (Similar to my comment above: were some stakeholders feeling like the decision-making process was not transparent and that the community was not involved? If so, that should be documented in Screening.) | See response above. |
| **10e. Additional revisions and/or comments** | Page 16. "The second scenario is almost unlikely as scenario 1" (Unclear) | See response to K Richards. |
| **10f. Additional revisions and/or comments** | Page 21. (You may address this below in the evaluation section, but this is a very long timeline. Most decisions take place on shorter timescales and the fact that it took 2 years for a federal agency to conduct this HIA on a relatively small and non-controversial project has implications for the success of future HIAs conducted by a federal agency.) | The authors provided more information regarding the challenges faced during the HIA that led to the sliding timeline. More specifically, the discussion of the HIA timeline was clarified in the text to reflect the actual time taken to conduct the HIA, accounting for the unavoidable delays due to sequestration, government shutdown, schedule conflicts, etc. and the lack of dedicated full-time equivalents during the duration of the HIA. These challenges provided informative "lessons learned" for future HIA practice. |
| **10g. Additional revisions and/or comments** | Page 30. (This section does not mention race/ethnicity at all. You get to this in the existing conditions section below, but race is a huge issue in the area and African Americans face health inequities, even when controlling for income. The definition of vulnerable populations should include African Americans.) | See response above regarding vulnerable populations. |
| **10h. Additional revisions and/or comments** | Page. 36. "It is important for the HIA process that all opinions be considered equally and addressed in some manner. (I'd say "equitably" not "equally". The opinions of vulnerable populations that will be impacted by the proposal may be weighted more than the opinions of the rich who might be able to move away if they want.) | The authors agreed with the rationale provided and accepted the word change to "equitably." |
| **10i. Additional revisions and/or comments** | Page 68. (It would also be helpful to see a map of the % African American by census tract.) | The HIA Core Project Team disagreed with the reviewer, regarding the added value of mapping the percentage of African Americans. The population is almost exclusively African American and mapping the diversity index by Census tract already provided information regarding the areas that are more or less diverse. |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 3 (Jonathan Heller) | Response from Authors |
|---|---|---|
| **10j. Additional revisions and/or comments** | Page 71. (It would be interesting to see what % of the population is paying more than 30% and/or 50% of their income on housing. You have this data, but are not reporting it. This statistic provides a lot of information, especially since one of your vulnerable populations is low-income.) | The authors went back to HIA Core Project Team to obtain this information. The data was collected, analyzed and incorporated into the Household Economics section, which had more information pertaining to this discussion. |
| **10k. Additional revisions and/or comments** | Page 72. "African Americans experienced the highest percentage of unemployment rates among the groups in the population, which may merely be a reflection of the proportion of African Americans in the community. " (Huh? The rates by race/ethnicity do not depend on the proportion of that race/ethnicity in the population.) | This sentence structure was a copy/paste error (two sentences were spliced into one). The sentence was revised to it's original intent- "Of the group in the labor force, 16.3% (+/-0.02%) were unemployed (U.S. Census Bureau 2010). Unemployment was high for both African Americans and Caucasians, at 19.2% and 16.3%, respectively (U.S. Census Bureau 2010)." The highest percentage of unemployment rates among the groups in the population were those without a high school. education (32.5%)." |
| **10(l). Additional revisions and/or comments** | Page 82. (From the diagram below, it looks like the level was about 5X higher at site 6. That seems like a lot and may be worth pointing out.) | The report does not provide the exact level of E. coli cfu, so the authors could not infer as to how much higher the levels were than the EPA recommended critical level. The authors revisited the discussion and removed the images to avoid confusion, because they showed data from sample sites that were all outside the HIA study area. The information gleamed from the figures was converted to text in the report. |
| **10m. Additional revisions and/or comments** | Page 88. "Water like air and pressure, flows down gradients.."(This HIA is very, very long. Because it is so long, very few people are going to read it all. There are many places where it could be streamlined. Here is just one example – probably not necessary to point out that water flows downhill.) | The authors revisited this section and removed superfluous information and redundancies. |
| **10n. Additional revisions and/or comments** | Page 88. "Housing renewal in deprived (low-income) areas has resulted in reduced levels of psychological distress." (Housing renewal sounds too close to "urban renewal" which did NOT reduce psychological distress in low income communities – it increased it by causing displacement. I'd not use the term "housing renewal".) | The authors revised this statement to more specifically outline intended message- "Efforts to improve and/or restore vacant or derelict homes can result in reduced levels of distress among residents and visitors to the area." |
| **10o. Additional revisions and/or comments** | Page 94-95. (Figures 39 and 40 should be combined). | The authors disagreed with this suggestion. The HIA Core Project Team wanted to show the differences between residential and non-residential properties because they have (in some cases) opposite directions of impact in regards to revitalization (i.e., businesses may benefit from revitalization, residences may see adverse impacts from gentrification). In addition, the figure pertaining to the non-residential properties and its related text was moved under its proper heading- Community economics. |
| **10p. Additional revisions and/or comments** | Page 101. (In my opinion, this table is overstating the impact that this project will have on flooding and health outcomes.) | The authors re-evaluated the description of impact criteria and revised them to more clearly qualify the impacts predicted. However, as defined, the magnitude is moderate because the people who use the street (walkers, bicyclers, drivers, passengers) will be impacted by the reduced pooling/standing water and reduced risks for slips, falls, mosquito proliferation, and CSO |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 3 (Jonathan Heller) | Response from Authors |
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| | | events. The authors agree and acknowledge that the proposed project's size limits the magnitude of the impact. Thus, the authors recommend expanding the project's size and/or replicating green infrastructure projects in the rest of the watershed to increase the magnitude of impact. |
| **10q. Additional revisions and/or comments** | Page 107. (Same as for the table above. This seems like an overestimate of the benefits of the project. Maybe this means that it would be a good idea to consider a different scale for magnitude and also include "severity" as another dimension of impact to analyze.) | See previous responses on this issue. |
| **10r. Additional revisions and/or comments** | Page (Same comment as above for the temperature summary table. This is not believable. The local impacts of a project like this are so small compared to the regional AQ situation.) | The authors revisited this discussion and discussions among the HIA Core Project Team and determined that the magnitude should be (as defined above) only moderate (**). The permanence should be high (***). |
| **10s. Additional revisions and/or comments** | Page 116. (Could include a discussion of pedestrian and bike injuries and how they relate to traffic volume and speed.) | The authors were unable to go back and search the literature for more references to this pathway. |
| **10t. Additional revisions and/or comments** | Page 118 and 126. (Again, I read this to say that this project will save many lives and severe injuries, which I do not believe. Yes, many people will walk near this project, but very few would have gotten into a collision with a vehicle. To me, this would be a low magnitude but high severity impact.) | See previous responses on this issue. |
| **10u. Additional revisions and/or comments** | Page 128. (I assume that there are no stationary sources of noise in the project area? May be worth pointing that out.) | The authors added language referring to event days (when the stadium and congress center are in use), but it is unknown how much these sources provide noise and whether those levels disturb nearby residents (or to what extent). |
| **10v. Additional revisions and/or comments** | Page 130. (I think about permanence differently than it is being use here. I think about it as how permanent the health impacts are (e.g., being hit and killed in a car crash is permanent; acquiring a cold has low permanence.) But I prefer the measure of severity to permanence.) | See previous responses on this issue. |
| **10w. Additional revisions and/or comments** | Page 130. (It would be helpful to provide a sense of whether these are high noise levels or not. What do they compare to?) | The authors provided more information from the literature about the ranges of urban noise that impact health. |
| **10x. Additional revisions and/or comments** | Page 131. "This is partly due to the qualitative nature of the data (as much of the data collected is self-reported and susceptible to bias). (I'd suggest dropping this. Well collected qualitative data is not any more susceptible to bias than quant data.) | This statement was removed. |
| **10y. Additional revisions and/or comments** | Page 131. (Part of the instructions to reviewers asked us to comment on whether existing conditions were collected. This is the first instance where they were not. There are some important questions not answered as a result, like: Is there a grocery store that would be made more accessible using active transport? Are there medical facilities that would be more accessible? Is accessibility an issue for people living here? How many people in the area do not own cars?) | The authors recognized this short-sight and went back to the data and used GIS to map the existing assets in the community that could provide space for developing and/or building social capital. This new information was incorporated into the report. |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 3 (Jonathan Heller) | Response from Authors |
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| **10z. Additional revisions and/or comments** | Page 135. (You say above that you don't know how many people have limited access to goods and services, so how can you make a prediction here?) | The authors recognized this limitation in the ability to determine the number of people impacted. Thus, the authors qualitatively defined moderate number of people as those who use the street. Whereas a high number of people would include the population in the whole study area. |
| **10aa. Additional revisions and/or comments** | Page. 141. "The amount of greenness in an urban community has also been linked to the amount of crime that is committed in that area." (This should be part of the lit review above.) | The authors moved this discussion under Review of the Literature. |
| **10bb. Additional revisions and/or comments** | Page 160. (Was anything done with the feedback below? Did the HIA report change in any way?) | The authors went back to this input and provided responses (how the input was used/incorporated into the report) in a table format. |
| **10cc. Additional revisions and/or comments** | Page 160. "Several stakeholders pointed out that the HIA lacked a mapping of the community's assets. (This reflects another concern I have. While community input appears to have been taken into consideration during scoping, community experience was not included in assessment. Do people think the area is walkable currently? Do people walk or bike? Why or why not? How do people use the local rivers, if they do? Is crime in the immediate area of the project a concern? Where do people shop? Etc. Community voice felt like it was missing from the analysis.) | See previous responses on this issue. Also, the authors were unable to obtain this information (they could not conduct surveys of the residents, nor were there previous survey data available) at that time. |
| **10dd. Additional revisions and/or comments** | Page 160. (I find it interesting that no one commented on any of the predictions and whether they agreed with them or not. Was that a question that was asked? We often think of these kinds of meetings as a way to "ground truth" the findings, but not sure that happened in this case.) | The HIA Core Project Team did solicit feedback on the predicted impacts. The authors added verbiage to document what was asked of the stakeholders at the final stakeholder meeting (where the findings and recommendations were provided). |
| **10ee. Additional revisions and/or comments** | Page 168. "Incorporate employment opportunities for local residents and businesses during construction and maintenance , starting with those in Vine City and English Avenue." (This could be more specific. What percent of jobs should be set aside for local hiring?) | The authors were unable to provide any more specificity to the number of jobs that should be set aside for residents. |
| **10ff. Additional revisions and/or comments** | Page 168. "Remove fecal smell… Increase police presence…" (Putting these last and calling them out specifically as being from residents makes them seem separate and maybe not backed by the EPA.) | The authors moved these recommendations higher in list to more accurately reflect the priorities assigned in the scoping process (see figure 16). |
| **10gg. Additional revisions and/or comments** | Page 171. "Work with the AD PCD" (To do what?) | The authors added more specific language to this recommendation. |
| **10hh. Additional revisions and/or comments** | Page 172. "Continue to monitor traffic volume to ensure the road diet does not cause overburden of traffic congestion." (What if traffic volume increases? What then?) | The HIA Core Project Team provided added verbiage to this recommendation- "If problems arise, coordinate with transportation department to problem-solve and implement counter measures (e.g., measures to divert traffic to nearby corridors, axel restrictions, re-evaluating bus routes, etc.)." |
| **10ii. Additional revisions and/or comments** | Page 172. "Consider local zoning ordinances and regulations regarding land use. (This is not specific.) | The HIA Core Project Team provided added verbiage to this recommendation- "Consider whether local zoning ordinances and regulations regarding land use are appropriate to protect the environment and public health and support economic and social growth." |

| Charge Questions to External Peer-Reviewers | Peer-Reviewer 3 (Jonathan Heller) | Response from Authors |
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| **10jj. Additional revisions and/or comments** | Page 173. "Develop and implement policies that limit renting and encourage more home ownership. (Wouldn't this make it harder for people who need to rent? This could be a bad idea.) | The HIA Core Project Team provided added verbiage to this recommendation- "Develop and implement policies aimed to lower resident turnover, such as encouraging more home ownership in the community." |
| **10kk. Additional revisions and/or comments** | Page 173. "Develop and implement policies for new development to ensure a % will be dedicated for mixed income housing." (What %? And shouldn't it be for low income housing? That is what is typically not built.) | The HIA Core Project Team could not provide more specific information to resolve this comment. |
| **10(l)(l). Additional revisions and/or comments** | Page 173. "Consider zoning ordinances to reduce fast food, cash advance, and alcohol establishments." (This feels pretty distant from the project that is the focus of this HIA.) | The authors agree that this recommendation is very distant to this proposed project. However, it was a recommendation from the stakeholders on the HIA Core Project Team. |
| **10mm. Additional revisions and/or comments** | Page 173. There was no recommendation about ensuring upkeep of the project. Many of the findings rely on long term upkeep of the green space. Should $ be dedicated to upkeep? What else could be done? | The authors acknowledge that several of the findings were assuming upkeep of the proposed project site was maintained. There are recommendations related to Water Quality and Flood Management that have this language in them. |
| **10nn. Additional revisions and/or comments** | Page 175. "In addition to this review, external peer-reviewers were solicited to provide an objective, critical review of the HIA." (While I am providing a critical review, I don't claim to be objective. I am biased by my belief that we should be trying to achieve equity with HIA practice, for example. I'd suggest striking the word objective.) | The term objective was removed. |
| **10oo. Additional revisions and/or comments** | Page 176. "Having the HIA co-led by the EPA regional office, with team members from or familiar with the community, helped to alleviate this misconception. (I wonder whether community members would agree with this.) | No response needed. |
| **10pp. Additional revisions and/or comments** | Page 178. "Was the HIA completed in time to inform the decision?" (Do you know the answer to this already?) | The authors revised this chapter and added new information pertaining to the internal and external reviews. The questions posed were answered to the best extent possible. |

**End.**