

Health Impact Assessment (HIA)

Coastal Region Metropolitan Planning Organization (CORE MPO) Freight Study

November 2016



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Executive Summary

Freight traffic is forecasted to dramatically increase in much of the United States, and particularly in the areas with major freight infrastructure and growing logistics industries such as Chatham, Bryan, and Effingham Counties, Georgia. Population growth and the local industry base are driving freight growth, along with transportation gateways, of which the Port of Savannah is notable on the eastern seaboard. The Port of Savannah makes the region an ideal location for many industries, and attracts logistics facilities that relay goods to the rest of the country, all linked by freight rail and a growing fleet of trucks. Freight activity clearly benefits the region, providing livelihoods for residents and tax revenue to support public goods. At the same time, freight can clash with nearby residential and commercial uses around topics such as air quality, noise, and traffic safety.

This Health Impact Assessment (HIA) evaluates the Coastal Region Metropolitan Planning Organization's (CORE MPO) Freight Study which primarily responds to the freight community's needs and growth. The HIA seeks to understand how the plan and likely increases in freight movement will impact the population's wellbeing, while also providing recommendations for health improvements and economic benefit. Moreover, the HIA also accommodates the region's related planning initiatives, notably the Chatham County Blueprint, which sets forth a community-driven vision with economic, education, health, and quality of life indicators.

The HIA team led by the Center for Quality Growth and Regional Development, and the Georgia Health Policy Center reviewed the CORE MPO's Freight Study in light of literature-derived relationships between health and likely freight impacts on the regional economy, air quality, noise levels, and traffic safety. The research team paid particular attention to environmental justice (EJ) communities defined by low socioeconomic status. The research team grounded the theoretical health relationships in the local context by analyzing land uses adjacent to truck routes, vehicle accident patterns, observed truck routes, and neighborhood-level health data to identify where areas of concern corresponded with likely truck increases or the transportation projects designated in the CORE MPO freight study. The analysis centers on freight and community input through multi-step stakeholder involvement.

The analysis highlights specific areas in Chatham County where forecasted trucking growth may risk adjacent residents' wellbeing through noise, air pollution, or accidents. The report discusses each area individually along with policies that mitigate health risks while maintaining economic opportunity. Recommended policies included vegetative buffers targeted to high-volume truck thoroughfares adjacent to or through residential areas, enhanced pedestrian infrastructure to reduce truck-pedestrian accident risk, and noise barriers between new freight development and residences. Freight movement and the industries that it supports are critical to Chatham County's economy (as well as the southeast), and building a freight industry that provides residents with long-term employment will also potentially increase positive health outcomes. Therefore, the report provides recommendations for accessibility to jobs and workforce development to ensure that economic benefits are widespread. The low socioeconomic status environmental justice areas receive special attention with granular problem identification and recommendations for resolution. The report provides guidance to fine-tune projects and enact complementary policies to both preserve the benefits of the freight industry and secure residents' wellbeing.

1. Introduction

Health Impact Assessments (HIAs) have been used in the United States and internationally to understand how policies and projects in non-health sectors are likely to affect public health. Specifically, an HIA is defined as “a combination of procedures, methods, and tools by which a policy, program, or project may be judged as to its potential positive or negative effects on the health of a population, and the distribution of those effects within the population” (European Centre for Health Policy, 1999). Research over the past decade has investigated, explained, and quantified relationships between social and economic policies and public health across a wide range of issue areas including energy, agriculture, housing, waste, and transportation (WHO, 2016). Often, an HIA can uncover changes to policies or practices that can be implemented to mitigate negative health impacts or to ensure that health benefits are maximized.

The purpose of this HIA is to assess the public health implications of ongoing planning efforts related to freight movement in Chatham County, Georgia. These efforts include an assessment of the “CORE MPO Freight Study” conducted by the Coastal Region Metropolitan Planning Organization (CORE MPO, 2015). Although the CORE MPO Freight Study includes a three county area (Bryan, Effingham, and Chatham), the HIA team narrowed the area of focus to Chatham County only. The Port of Savannah is located in Chatham County, so the impacts of freight movement are greatest there, and it is also the most populous of the three counties. (There are approximately 278,000 people in Chatham compared to a combined population of 30,000 in Bryan and Effingham.)

Community involvement is a vitally important component of a meaningful HIA. Incorporating a community’s voice can help to ensure that both the subject of the HIA and the health effects studied are relevant to the populations likely to experience impacts. When the HIA project team initially targeted the CORE MPO Freight Study as the subject of this HIA, the team realized that this study did not include a very robust community involvement process. As the HIA project team met with local stakeholders, community members, and decision makers, the team learned of the “Chatham Community Blueprint” process, another ongoing planning effort in the county, which included an extensive community involvement process. Therefore, the themes and goals from the Blueprint were taken as a proxy for the community’s voice – especially when these themes overlapped with the topic areas of the freight study.

Through the course of the HIA process, the project team visited Chatham County multiple times to meet with local residents. With each visit, the HIA team gained a better understanding of local initiatives. During one of these visits, the team learned of an ongoing effort to revise and simplify the zoning code for the City of Savannah, and likely eventually other places in the county. The Comprehensive Planning process for Garden City was also underway. Both of these initiatives, as well as many others, provided opportunities for the HIA to speak directly to land use and transportation policy and program changes which could affect health. The team connected these efforts with the freight planning process through the HIA recommendations. Recommendations at both the scale of the overall county and individual neighborhoods are included, so the document can be useful for the widest audience possible.

1.1 Research Objectives and Methodologies

The Center for Quality Growth and Regional Development (CQGRD) at the Georgia Institute of Technology, in partnership with the Georgia Health Policy Center at the Andrew Young School of Policy Studies at Georgia State University conducted this HIA. The research methodology used for this HIA is consistent with the best practices in HIA development defined by the National Academy of Sciences in the document, *Improving Health in the United States: The Role of Health Impact Assessment* (National Research Council, 2011). Figure 1 illustrates the steps that must be undertaken and questions that must be answered in any HIA including:

- **Screening:** Is the particular program, policy or project likely to have significant health impacts and to warrant a full HIA?
- **Scoping:** Which policies and health impacts will be considered, including the geographic extent and impacted populations?
- **Appraisal:** What are the quantitative and qualitative changes in health that can be expected to result from the policy or practice under investigation?
- **Recommendation:** What steps can be taken to mitigate negative public health impacts? How can health benefits be maximized?

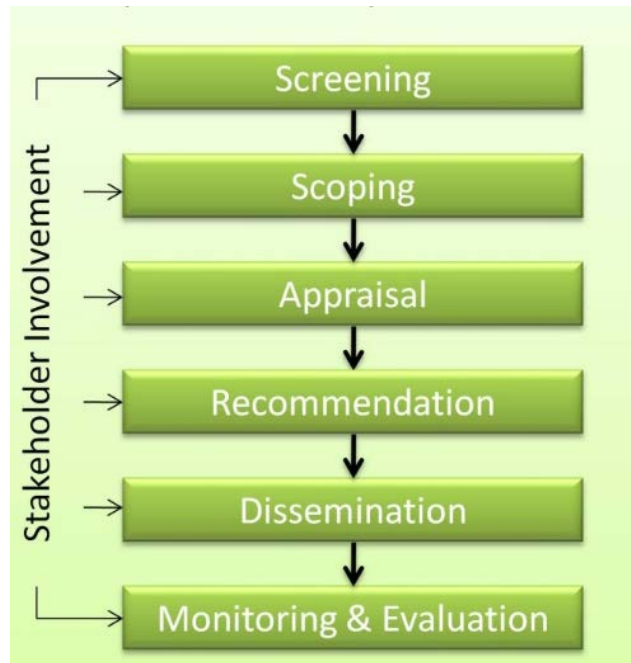


Figure 1: The Health Impact Assessment (HIA) process

- **Dissemination:** Distribute the result widely among members of the public, stakeholders, and decision makers.
- **Monitoring and Evaluation:** Assess progress towards the measures outlined in the HIA.

As illustrated in Figure 1, at each step of the process, stakeholder input and involvement are sought so that the HIA recommendations can accurately address the concerns of the community.

1.2 Report Organization

This HIA report is organized into five sections. Section 2 describes the screening process, including more detail explaining why the CORE MPO Freight Study was selected as a good candidate for an HIA. Section 3 illustrates the geographic scope of the HIA and describes the populations that are potentially affected by the freight study. A brief overview of the health challenges and existing health statistics for Chatham County is included in this section to provide context. Section 4, appraisal, includes a literature review on the major health impacts of freight movement and an analysis of existing spatial conditions in the county that potentially correspond to these health impacts. Findings from stakeholder involvement, supplemented by the issues identified in the Blueprint, are included in this section.

Recommendations drawn from this process comprise Section 5. This set of evidence-based recommendations can inform decision-makers, the general public, and other stakeholders about both changes to policies and the CORE MPO transportation projects that can potentially have a positive impact on health.

2. Screening

In the screening step of an HIA, a policy or planning effort is reviewed to determine if it might have an impact on health. The goal of screening is also to determine whether the potential health effects are of sufficient magnitude to warrant investigation. The screening process provides the HIA practitioner with the rationale for determining public health effects and potential pathways to proceed with subsequent steps.

2.1 Freight Planning and Health

Freight planning requires striking a balance between achieving larger societal and economic goals and minimizing negative impacts on individual communities. Freight infrastructure, (whether high volume truck corridors, rail lines, seaports, or airports) can conflict with surrounding sensitive populations and land uses (such as schools, hospitals, playgrounds, and homes). In some instances, freight supportive land uses and infrastructure are located in areas where low socioeconomic status (SES) populations reside, also known as Environmental Justice (EJ) communities. EJ communities have higher rates of negative health outcomes for a variety of reasons. Therefore, since these areas are already compromised from a health perspective, ideally they should not be further subjected to the negative health impacts of heavy freight movement (such as air pollution from diesel emissions).

Thus, two research questions guided the HIA process: 1) “What is the impact of freight infrastructure and movement, as well as freight related land uses such as truck stops, on public health?” 2) “Where are the greatest negative health impacts from freight movement and land use conflicts located?”

The ongoing “Coastal Region Metropolitan Planning Organization (CORE MPO) Freight Study” which focused on the Georgia coast around the Port of Savannah emerged as a potential candidate for an HIA. Freight planning is critical in this region due to current and projected increases in freight volume moving through this area originating at the Port of Savannah, which is located in Chatham County. The Port of Savannah is one of the largest and fastest growing cargo ports on the east coast. The region’s freight volume is projected to grow along with the port, particularly as the ongoing project to deepen the Savannah River is completed. This improvement will allow for larger vessels to call at the port. (Ross & Lee, 2014).

The CORE MPO freight study provides general policy and guidance on the future of freight movement across a three county area, as well as a list of short, medium, and long term transportation projects that the HIA team could evaluate. The HIA screening matrix shown in Table 1 details the selection process used to determine whether the CORE MPO Freight Study was a good candidate for an HIA.

Table 1: CORE MPO Freight Study Screening Matrix

Proposal	CORE MPO Freight Study
Is there a decision?	Yes, the list of potential transportation projects and policies under consideration need additional and ongoing consideration of health impacts.
Is the decision likely to substantially affect health or health determinants?	Policy direction resulting from the HIA could potentially impact future land use, freight routes, and the eventual design of the freight transportation projects proposed in the freight study. Resulting air pollution and increased accident risk may lead to negative health outcomes like respiratory disease or injuries.
Is the time frame for the decision-making process appropriate?	Yes, decisions and details related to freight movement and transportation projects are ongoing.
Is there enough evidence and data for the analysis?	Yes, there is extensive evidence linking freight transport to health outcomes (e.g. Matsuoka, Hricko, Gottlieb, & DeLara, 2011; THE Impact Project, 2010, 2012; Wargo, Wargo, & Alderman, 2006).
Is there potential to disproportionately affect vulnerable populations?	Yes, some neighborhoods in the study area are majority vulnerable populations (environmental justice neighborhoods).
Does the current decision-making process fail to adequately address health?	Yes, health is not explicitly considered in the freight study.
Does the legal framework allow for health to be factored into the decision?	Yes
Are available staff and resources adequate to complete a successful HIA?	Yes
Is there major public controversy about the decision?	No
Is an HIA likely to produce new findings or recommendations?	Yes, the design of the transportation projects listed in the study could potentially be changed to better consider health impacts. The zoning of land located along the freight routes designated in the study could be changed to discourage sensitive populations from being located in these poor air quality zones.
Is there a risk for major catastrophic health consequences?	No

As Table 1 shows, the majority of questions are answered in the affirmative, making the CORE MPO freight study a good candidate for an HIA. Although the Freight Study includes a three county area (Bryan, Effingham, and Chatham County), the project team chose to focus on the Chatham

County portion of the study for the HIA. The Port of Savannah is located in Chatham County, and the county serves as a critical node in the freight infrastructure for the State of Georgia. Chatham County also has a much greater population than the other two counties.

Since the project list in the freight study provides a clear opportunity for intervention and greater consideration of health impacts, it became a major data input for the HIA and subsequent HIA recommendations. The HIA project team focused on the roadway projects in the list.

During the screening process, the HIA project team also noted that the voice of community members affected by freight movement was lacking in the development of the freight study. Because of this, and for the reasons previously mentioned, the project team decided to include a section specifically focusing on EJ communities located along high volume truck corridors.

3. Scoping

The scoping process of an HIA includes establishing the geographic limits of the study area, the specific health impacts of greatest concern, and the data needed for analysis. The population affected by the program, policy, or project that is the subject of the HIA is also determined. Potential stakeholders are identified.

3.1 HIA Study Area and Structure

The HIA of the CORE MPO Freight Study is limited to Chatham County, which is illustrated in Figure 2. Populations affected by the freight study include the residents of Chatham County. The appraisal has been conducted at two scales: the scale of the county overall, and a series of more detailed vignettes which focus specifically on EJ communities impacted by freight movement. Recommendations follow this same logic, with more general best practices that can be applied to the county first, followed by detailed recommendations that can be implemented on a smaller parcel by parcel basis. This structure ensures that the HIA will be useful for multiple audiences.

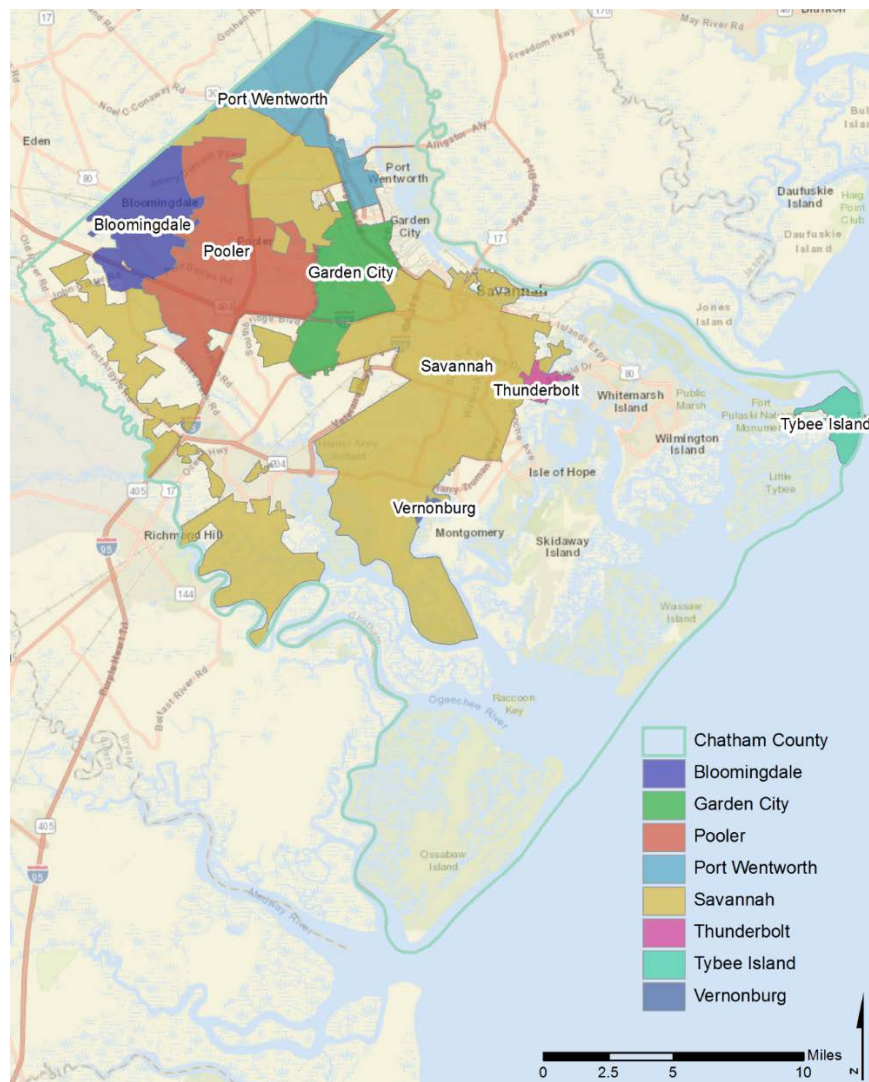


Figure 2: Jurisdictions in Chatham County

Chatham County includes six cities, illustrated in Figure 2. The planning process conducted in the CORE MPO freight study and in this HIA includes consideration of all of these cities as well as Unincorporated Chatham County.

3.2 HIA Context - Chatham County Baseline Information

Chatham County has a population of approximately 283,000 (U.S. Census Bureau's 2010-2014 American Community Survey 5-Year Estimates). The County Health Rankings, which are a public health data source provided by the Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute, offer a benchmark from which the HIA research team could begin to examine existing health conditions. Table 2 details the public health characteristics of the population of Chatham County. Chatham County ranks 44th in terms of overall health outcomes across the state (i.e. 43 out of the 159 Georgia counties have better health outcomes). Poverty is an issue in Chatham County, with 28% of children living in poverty. Chatham County also has an obesity rate of 29% and a physical inactivity rate of 24% (County Health Rankings, 2016).

Table 2: 2016 County Health Rankings, Chatham County, Georgia

	Chatham County	Top US Performers*	Georgia	Rank (out of 159 Georgia Counties)
Health Outcomes				44
Premature death (per 100,000 population)	7,800	5,200	7,300	
Poor or fair health	17%	12%	19%	
Poor physical health days (average in past 30 days)	3.8	2.9	3.9	
Poor mental health days (average in past 30 days)	3.8	2.8	4.0	
Low birthweight	10%	6%	9%	
Health Factors				38
Adult obesity	29%	25%	29%	
Physical inactivity	24%	20%	25%	
Adult Smoking	17%	14%	17%	
Social & Economic Factors				43
High school graduation	70%	93%	73%	
Some college	67%	72%	61%	
Unemployment	7.3%	3.5%	7.2%	
Children in poverty	28%	13%	26%	
Income inequality (ratio of 80 th percentile income to 20 th percentile income)	4.9	3.7	5.0	
Children in single-parent households	44%	21%	37%	
Violent crime rate (per 100,000 population)	396	59	385	
Physical Environment				122

Air pollution-particulate matter (average daily density of PM _{2.5} in micrograms per cubic meter)	12.8	9.5	12.8	
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* 90th percentile, i.e., only 10% are better ^ 10th/90th percentile, i.e., only 10% are better.

Note: Blank values reflect unreliable or missing data.

Data from CountyHealthRankings.org (2016).

3.3 Determinants of Health

The HIA team focused on the following determinants of health, and spatially linked them to health outcomes. The broad categories of social and physical determinants of health were drawn from the Centers for Disease Control and Prevention (CDC) (2014).

1. Social environment
 - a. Demographics and Poverty
2. Physical environment
 - a. Land Use
 - b. Transportation

A literature review was conducted to determine the potential positive and negative health impacts of freight movement - following from the social and physical determinants of health identified above. Four major topic areas connecting freight movement and health emerged from the literature review during the Appraisal phase and provided the framework for the HIA recommendations:

1. Air Pollution
2. Accidents and Safety
3. Noise
4. Economic Impacts

3.4 Stakeholders and Affected Populations

Engaging with a wide variety of stakeholders is a critical component of a successful HIA. In *Guidance and Best Practices for Stakeholder Participation in HIA*, a working group of HIA practitioners defines stakeholders as “individuals or organizations who stand to gain or lose from a decision or process. More specifically, stakeholders can be described as people who:

- Are affected by the prospective change (e.g., health or financial)
- Have an interest in the health impacts of the policy or project under consideration because of their position
- Have an active or passive influence on the decision-making and implementation process of the project or policy under consideration
- Have an economic or business interest in the outcome of the decision” (Stakeholder Participation Working Group of the 2010 HIA in the Americas Workshop, 2011)

All residents of Chatham County would be affected by the policies included in the freight study as well as the list of transportation projects. Residents will both benefit from the economic development, jobs, and distribution and availability of goods made possible by the freight industry, and all will also be subjected to negative externalities such as air pollution and noise. Though ideally a diverse group of community residents would be engaged as stakeholders in the HIA process (and efforts were made to accomplish this), the HIA team had difficulty connecting with local community

stakeholders (specifically residents of the EJ areas located in close proximity to high volume truck routes). Therefore, the HIA appraisal largely relied on the Chatham Community Blueprint (discussed below), demographic, public health, and other publically available data to inform the HIA process.

Chatham Community Blueprint as a Resource

Although the HIA project team struggled to gain access to community stakeholders, the team had a number of productive meetings with local decision makers and leaders of non-profit groups. In these meetings, the HIA team discussed the challenge of engaging community residents in the HIA process. Chatham residents in these meetings described the Chatham Community Blueprint public engagement process and advised the HIA team to leverage this resource to supplement the HIA stakeholder involvement.

The public involvement process conducted for the Blueprint is described below, as well as the topics and goals which overlapped with the issues that were a focus of the HIA.

“In 2014 Chatham County engaged the Coastal Georgia Indicators Coalition (“CGIC”) to lead the development of the Chatham Community Blueprint. The Blueprint is a long-term plan for the Community. It will strategically move the Chatham Community towards the accomplishment of specified Goals in four key theme areas: Economy, Education, Health and Quality of Life. By focusing on the Community’s interests and concerns, the Blueprint serves as a catalyst for improvement.

In 2013, the Coalition hosted sixteen (16) neighborhood forums two in each of the eight county commission districts over a twelve week time span. Events were held at community centers, churches and schools. Through support of community partners, the coalition solicited and trained more than forty (40) individuals to serve as Community Facilitators. These individuals completed a seven hour training session and then agreed to serve as a facilitator for at least two events.” (Coastal Georgia Indicators Coalition, 2015)

This engagement process allowed the HIA team to align the HIA recommendations with major topics identified by community members in the Blueprint, ensuring that the HIA recommendations reflected community values.

The HIA project team did have some success with outreach efforts to stakeholders late in the process. They responded to the HIA appraisal, and provided feedback on the HIA recommendations. These stakeholders included the freight planners developing the CORE MPO study, land use planners, public health professionals, non-profit groups and local residents. Additional details about the stakeholder engagement process are included in the *Appendix 2: Stakeholder Engagement Plan*.

3.5 Equity in HIA Practice

It is important to advance equity in the practice of HIA. Guidelines regarding how to promote equity are provided in the *Equity Metrics for Health Impact Assessment Practice, Version 1*, which focuses on four outcomes:

- The HIA process and products focus on equity.
- The HIA process built the capacity and ability of communities facing health inequities to engage in future HIAs and in decision-making more generally.

- The HIA resulted in a shift in power benefiting communities facing inequities.
- The HIA contributed to changes that reduced health inequities and inequities in the social and environmental determinants of health. (Society of Practitioners of Health Impact Assessment, n.d.)

Accordingly, a successful HIA process requires careful consideration of vulnerable populations and Environmental Justice (EJ) communities that could be affected by the decision under evaluation by the HIA. The Environmental Justice (EJ) movement emerged in the late 1970s to address the disproportionate impact of locally undesirable land uses like solid waste landfills and toxic waste disposal facilities on people of color and low-income (McGurty, 2007). The concept was later expanded to include the distribution of the benefits and burdens of transportation infrastructure (Bullard & Johnson, 1997; Bullard, Johnson, & Torres, 2004). The literature and transportation planning history has demonstrated that people of color and low-income populations are often disproportionately burdened by transportation infrastructure while not receiving a fair share of its benefits (e.g. Golub, Marcantonio, & Sanchez, 2013; Rowangould, 2015).

The achievement of meaningful participation in decision making and an equitable distribution of environmental benefits and burdens is supported by federal guidance. In 1994, President Clinton signed Executive Order 12898, making environmental justice an explicit goal of federal agencies by requiring them to identify and address “disproportionately high and adverse” negative health and environmental effects of federal agency actions on “minority populations and low-income populations” (“Executive Order 12898,” 1994). In the years following the executive order, the federal Interagency Working Group on Environmental Justice (EJ IWG) has promoted and coordinated action by federal agencies without prescribing a definition or structured method of identifying environmental justice concerns. Therefore, there remains substantial flexibility among federal agencies for adapting broad EJ principles to specific circumstances, which is appropriate given the very diverse situations in which federal agencies would encounter environmental justice issues.

As the HIA team worked to identify EJ areas, three of the most useful definitions for Environmental Justice came from the Environmental Protection Agency (EPA), the US Department of Housing and Urban Development (HUD), and the U.S. Department of Transportation (USDOT). The EPA definition is one of the most widely cited and incorporates the notion of meaningful participation in decision making, stating that environmental justice requires the fair treatment and meaningful involvement “of all people regardless of race, color, national origin, or income” in environmental issues (EPA, 2016).

The USDOT applies this concept to transportation by specifying that it refers to both an equitable distribution of harms associated with transportation as well as access to benefits (Federal Highway Administration, 2012). The Georgia Department of Transportation (GDOT) has created guidelines for addressing environmental justice issues, which according to the CORE MPO, define groups of special concern as follows (CORE MPO, 2015).

- **Low-income:** Readily identifiable populations composed of persons whose income is below the median household income and below the federal poverty level.
- **Minority:** Readily identifiable populations composed of persons who are black, Hispanic, Asian American, American Indian or Alaskan Native, or Native Hawaiian or Other Pacific Islander.

- **Elderly:** 65 years of age or older
- **Children:** 10 years of age or younger

The HIA team focused on areas of low-income for the CORE MPO freight study HIA. Poverty is closely correlated with negative health outcomes. The HIA team therefore relied on the EJ guidelines cited by HUD to identify EJ areas in the HIA study area. HUD cites the thresholds of poverty that have been established by Galster (2012). These guidelines state that if 0 - 20% of the population is living below the federal poverty level then there is no effect on the overall character and challenges of the area. Once an area or neighborhood exceeds 20% of the population living below the federal poverty level, there begins to be a negative impact on the overall area. If the percent of the population living in poverty exceeds 40%, then negative effects are fairly significant and uniform. Neither GDOT nor the EPA prescribe thresholds to identify low-income or minority populations, and in general, setting appropriate EJ population thresholds is a challenging issue within transportation planning (Karner, 2016; Karner & Niemeier, 2013).

Therefore, the HIA project team identified the areas which exceed these thresholds of poverty, and focused on these areas in the EJ section of the recommendations and appraisal. This approach is supported by the evidence. Galea et al. (2011) conducted a meta-analysis of 47 studies of all-cause mortality that considered social factors as a contributing cause. They determined that individuals living in poverty experience a 40% to 75% higher risk of mortality compared to those not in poverty. Those living in areas (census tracts) with at least 20% poverty rate experienced a 20% higher risk of mortality. This is consistent with thresholds cited by HUD.

As EJ areas were identified through the course of the HIA process, the HIA project team sought out stakeholders and community leaders from these neighborhoods as a way to bring a more targeted equity and environmental justice perspective to the HIA. As previously discussed, building relationships with these stakeholders proved to be one of the most challenging aspects of the HIA. Since the trust-building process needed to truly engage the EJ communities evolved slowly, efforts to obtain input from these stakeholders continued through the development of HIA recommendations.

4. Appraisal

During the Appraisal phase, the HIA project team drew from the literature to determine the positive and negative impacts of freight movement on health, and identified both mitigation strategies for negative health impacts, and opportunities to reinforce the positive health impacts of freight movement.

The team narrowed the literature review to focus on four specific ways that freight movement affects health. The list of topics included in the literature review was consistent with the topics and policies included in the CORE MPO freight study:

1. Freight Air Pollution Emissions
2. Freight Movement, Crashes and Safety
3. Freight Movement and Noise
4. Economic Impact of Freight Movement

Also during the Appraisal phase, the HIA project team collected, created, documented and analyzed data illustrating the existing conditions in the study area, which also informed HIA recommendations. This data was analyzed according to the following topic areas:

1. Demographics
2. Transportation
3. Land Use
4. Health

Existing conditions were examined at both the scale of Chatham County overall, and through a series of vignettes which detail areas of high poverty in the county. This catalog of vignettes is included as *Appendix 1: Environmental Justice Catalog*. High poverty areas are also ranked, and scores are tabulated to find the “greatest opportunities for improvement.” The HIA recommendations follow this structure and are organized by both countywide recommendations as well as more detailed recommendations, specifically addressing the highest scoring individual high poverty areas. *See Appendix 1 for more detail.*

4.1 Literature Review

The following literature review discusses the primary health issues related to freight movement.

Freight Air Pollution Emissions

Roadways, other transportation facilities, freight logistics, and industry can create “hot spots” of locally elevated air pollution levels, which may impact homes and schools and may inequitably impact some citizens more than others (Karner, Eisinger, & Niemeier, 2010; Rowangould, 2015). These sources also contribute to regional levels of six criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM 2.5 and PM 10), and sulfur dioxide (SO₂). Proximity to high-volume motor vehicle emission sources, such as major highways

and congested areas, appears to significantly influence exposure (Antó, 2012). The following sections detail the air emissions associated with each freight mode or type of freight facility.

Air Pollution Emissions from Trucks

Air pollution severity and profile depends on the fuel type. Ninety percent of trucks burn diesel fuel (“Diesel at Work: Delivering for America,” n.d.). Diesel exhaust contains dozens of particles and chemicals that can harm human health (Wargo et al., 2006). Diesel exhaust contains carcinogenic chemicals including benzene, formaldehyde, and 1,3-butadiene (Wargo et al., 2006). Diesel exhaust particles also exacerbate irritation caused by other allergens, magnifying those particles’ effect on the body (Pandya, Solomon, Kinner, & Balmes, 2002). However, changes in motor vehicle trips, miles, or hours of operation can change rates of vehicle emissions, including carbon monoxide, nitrogen oxides, particulate matter, and hydrocarbons (Samet, 2007; US EPA, 2016).

Air Pollution Emissions from Rail

Freight rail accounts for over 96% of locomotive fuel consumption in the US, because of the country’s limited passenger rail service. The vast majority of fuel consumption goes toward national and regional freight line-haul (88%) while local freight consumes less than 2% of all locomotive fuel (EPA, 2009). Though trains do use internal combustion engines powered by diesel fuel, trains tend to pollute less than trucks per ton-mile. Transporting goods and materials via rail instead of truck can also provide environmental benefits by reducing highway congestion and taking trucks off the roads (Association of American Railroads, 2015b). Furthermore, freight railroads have made great strides in fuel efficiency by moving longer trains over longer distances between interchanges, updated or replaced old machinery, used more innovative materials, and reduced idling time (Federal Railroad Administration, 2015b).

Air Pollution Emissions from Truck Stops

Truck stops, like railyards, are problematic in part because of the tremendous number of trucks idling their engines. Truck idling consumes up to one gallon of diesel per hour; this diesel exhaust produces carbon dioxide, NO_x, particulates, sulfur dioxide, carbon monoxide, hydrocarbons, and other air toxics (US EPA New England, 2002). As previously discussed, idling engines can produce significant amounts of diesel pollutants (Brodrick, Dwyer, Farshchi, Harris, & King Jr, 2002).

Truck idling consumes up to one gallon of diesel per hour; this diesel exhaust produces carbon dioxide, NO_x, particulates, sulfur dioxide, carbon monoxide, hydrocarbons, and other air toxics (US EPA New England, 2002). The exact emissions generated depend on engine model, speed, and load (Brodrick et al., 2002). For example, idling trucks (1050 rpm) with the air conditioning running can produce 16% of the carbon dioxide, 36% as much NO_x, and 132% as much carbon monoxide as the same truck traveling at 55 mph (Brodrick et al., 2002).

Air Pollution Emissions from Seaports

Ships burn bunker fuel in diesel engines. Bunker fuel is dirtier than typical diesel fuel, and its emissions are thought to affect those in and near ports, and even coastal residents (Matsuoka et al., 2011). As an example of the impact of a port on large metro regions, the Ports of Los Angeles and Long Beach are the largest single sources of air pollution in Southern California (THE Impact Project, 2012). The California Air Resources Board estimated that 120 premature deaths were

caused by a single year's worth of PM emissions from these two ports (THE Impact Project, 2010; Tran et al., 2008).

In the case of the Port of Savannah, NO_x emissions are the greatest air quality impact. The U.S. Army Corps of Engineers (2012) examined air emissions from various sources that comprise the Port of Savannah including Georgia Ports Authority's Garden City and Ocean Terminals, private terminals, vessels, tugs, and land-based equipment used to move cargo. While the port currently contributes over 18% of Chatham County's NO_x emissions, the Army Corps concluded that cleaner engine requirements for larger ships will result in decreasing emissions, even with the increased port traffic allowed by the harbor deepening project, and mitigation efforts would not be necessary (US Army Corps of Engineers, 2012).

Air Pollution Emissions and Health

Poor air quality impacts health in a variety of ways. The presence of pollutants in the air reduces lung function, increases asthma and other respiratory illness rates, cancer, irritation of breathing passages, cardiopulmonary disease, premature and low birth weight babies, infant mortality, and premature death rates (US EPA, 2007). Motor vehicle traffic presents a particularly unique public health risk because of the toxicity of its emissions and its presence within communities. The effects of gaseous and particulate pollutants on health have been found in both short- (acute exposure) and long-term studies (chronic exposure) with effects being seen at very low levels of exposure (Brunekreef & Holgate, 2002).

Particulate matter 2.5 (PM 2.5) is often singled out as the most problematic air pollutant for human health. Researchers distinguish types of particulate matter by their size: PM 0.1, PM 2.5, and PM 10 are commonly used. The smaller the number, the smaller the particle. Smaller particles are generally seen to have greater negative effects on health because the body struggles to filter them out and they are small enough to be absorbed through lung tissue into the bloodstream (Health Effects Institute, 1999, 2001; US EPA, 2009).

Both short- and long-term exposure to particulate matter (PM) have been associated with increased rates of cardio-respiratory morbidity and mortality. PM has been specifically linked to increased lung cancer risk, along with short- and long-term non-cancer health effects such as bronchitis, asthma, and reduced lung function. Children and the elderly are also at a higher risk for adverse impacts than the general population (US EPA, 2007). PM 2.5 is seen to have an adverse effect on lung development in adolescents that can lead to lifelong lung deficiency (Gauderman et al., 2000, 2004). Research has also shown that common emission sources for PM have significant associations with elderly cardiovascular hospital admissions and that modest amounts of air pollutants are associated with small changes in cardiac function in the elderly (Barnett et al., 2006; Mar et al., 2005).

Lead (Pb) is a criteria pollutant that can have an adverse effect on human health, especially children. Once it is inhaled, it is distributed through the blood stream, and can affect the oxygen carrying capacity of blood. It can also accumulate in bones. Depending on the level of exposure, lead can adversely affect the functioning of multiple organs and organ systems including the kidney, nervous system, immune system, reproductive and developmental systems and the cardiovascular system. The most commonly encountered effects of lead are neurological in children and cardiovascular (e.g., high blood pressure and heart disease) in adults (US EPA, 2016).

Lead pollution is more dangerous for infants and young children since even low levels may contribute to behavioral problems, learning deficits and lowered intelligence quotient (IQ). Major sources of lead in the air includes: ore and metals processing, piston-engine vehicles and aircraft operating on leaded fuel/aviation fuel, waste incinerators, utilities, lead-acid battery manufacturing and their disposal, and lead smelters (highest air concentrations of lead are usually found near lead smelters). In the past, exhaust from vehicles (internal combustion engines) using leaded fuels used to be significant contributors of lead pollution in USA. However, as a result of EPA's regulatory efforts including the removal of lead from petroleum fuels, levels of lead in the air have decreased significantly (by 98 percent between 1980 and 2014) in the USA (US EPA, 2016). Therefore, although lead is an important pollutant, it was not the focus of this study.

Poor Air Quality and Asthma

Asthma affects 7% of adults and 9% of children in the U.S. (Jackson, 2003). Various factors can cause the development of or contribute to the severity of asthma. Among these are outdoor environmental factors such as air pollution, including ground level ozone (O₃) and respirable particulate matter (PM). Aeroallergens (pollen), Sulfur Dioxide (SO₂), Nitrogen Dioxide (NO₂) and Ozone (O₃) are associated with emergency pediatric hospital admissions whereas PM and O₃ are associated with uncontrolled asthma in adults (Antó, 2012).

Asthma hospitalizations and Emergency Room (ER) visits have a strong correlation with regional vehicle miles traveled (VMT), localized traffic volumes, and industrial emissions (English et al., 1999; Gunier, Hertz, Von Behren, & Reynolds, 2003; Lin, Munsie, Hwang, Fitzgerald, & Cayo, 2002; Weisel, 2002). Several research studies have found that socio-economic status and quality of the built environment (housing conditions; internal and external air quality) have a direct impact on triggering asthma symptoms (Miles & Jacobs, 2008). In Georgia, asthma hospitalizations are most prevalent among children, especially those aged 0-4, black children, and boys (Annor et al., 2015).

Air Pollution and Heart Disease

Heart disease is responsible for about one in four American deaths, or over half a million Americans per year (Centers for Disease Control and Prevention, 2015a), and it is marked by a series of maladies negatively affecting blood flow around the body that can take chronic forms (e.g., plaque buildup in the arteries characteristic of coronary artery disease) and culminate in an acute, oftentimes life-threatening episode such as a heart attack or a stroke (Centers for Disease Control and Prevention, 2015b). The primary risk factors for heart disease include other medical conditions (e.g., diabetes, overweight) and behavior choices (e.g., poor diet, physical inactivity, alcohol use) (Centers for Disease Control and Prevention, 2015a), but many studies have shown that air pollution can also promote the development of heart disease over the long term as well as increase the incidence of acute cardiac attacks due to short-term pollution spikes. Air pollution can include particulate matter, nitrogen oxides, sulfur dioxide, and ozone (Brook, Franklin, Cascio, Hong, Howard, Lipsett, Luepker, Mittleman, Samet, Smith Jr, et al., 2004), and these pollutants are thought to promote heart disease by irritating the lungs. Air pollution promotes the progression of heart disease because lung irritation causes the arteries to harden and plaque to accumulate, ultimately obstructing blood flow (atherosclerosis). At the same time, air pollution can promote immediate cardiac incidents by causing the heart beat to become irregular (arrhythmia) and can cause plaque in the arteries to rupture, resulting in a portion of the heart being deprived of oxygen

(i.e., a heart attack) (Brook et al., 2004). Brunekreef and Holgate (2002) show that air pollution can increase mortality and hospitalization rates, even at low pollution levels.

Mitigation Strategies for Health Impacts: Buffers

The literature on road buffers is very detailed and diverse. The HIA project team selected an ‘ideal buffer’ of 400 meters based on the literature which shows that air pollution only reaches background levels beyond 400 meters from a high volume road (Karner et al., 2010). Thus, ideally, sensitive uses should be located at least 400 meters away from highways and other high volume roads. Particulate matter is most concentrated within 200 meters of high volume roadways, potentially causing cardiac diseases, respiratory diseases, and some cancers. (Fischer et al., 2000; Houston, Wu, Ong, & Winer, 2006; Fischer et al., 2000; Houston, Wu, Ong, & Winer, 2006). The California Air Resources Board and California Environmental Protection Agency (California Air Resources Board & California Environmental Protection Agency, 2005) recommends separating sensitive land uses such as “residences, schools, day care centers, playgrounds, and medical facilities” from major roads and freeways. A Dutch study of children living near major roads also found negative effects linked to particulate matter for children living within 300 meters (984 feet) of roadways. (Brunekreef et al., 1997).

CQGRD recommends a buffer of 500 feet to account for truck stop externalities, particularly idling, noise and light pollution. The literature does not recommend a buffer that is specific to truck stops. Instead, 500 feet corresponds with the buffer recommended in California for some high-traffic roadways, and is half the buffer recommended for large distribution centers, which would have a high volume of truck idling and movements (California Air Resources Board & California Environmental Protection Agency, 2005).

Freight Movement, Crashes and Safety

This section reviews the ways in which injuries and deaths can occur when freight vehicles, equipment, or cargo act in unforeseen ways. Crashes are negative externalities in that an individuals’ or a company’s action cause harm to someone who was not or cannot be compensated for the harm. Therefore, non-freight actors bear some of the freight industry’s costs. Crash costs include loss of life and other human suffering, medical expenses, property damage, and production losses (Lindholm & Blinge, 2014; Matsuoka et al., 2011).

Crashes can be more prevalent and more severe as traffic increases, as residents spend more time in traffic, as travel speeds increase, as travel alternatives for unsafe drivers become less available, and when appropriate bicycle and pedestrian facilities are lacking. Road design also influences crash risk, as it determines where and how traffic movements occur. Further, road design can exacerbate conflicts between two or more road users; set changes in speed or direction; influence safety of at-grade rail crossings; and determine road user speeds, visibility, and attentiveness. Designing a road to control traffic flow as well as to accommodate all of the movements that any user might want to make, safely and without excessive delay, is necessary (Ossenbruggen, Pendharkar, & Ivan, 2001).

According to a study conducted for the National Highway Traffic Safety Administration, speeding is a factor in about one-third of all traffic-related fatalities. (Liu, Chen, Subramanian, & Utter, 2005). Traffic speed is the key determinant for pedestrian injury risk for children (Jacobsen et al., 2000). Speeding has traditionally been addressed through traffic enforcement, but some researchers have

suggested that it is more effective to change the design speed of the road (Donnell, Himes, Mahoney, & Porter, 2009).

Crashes and Safety on Roads

In 2014, crashes involving large trucks killed 3,903 people nationwide, of which 73% were occupants of other vehicles and 10% were non-motorists such as pedestrians or bicyclists. Georgia had 155 truck-involved crashes in 2014, with a nearly identical distribution of accident type (National Highway Traffic Safety Administration, 2014). Importantly, traffic collisions involving trucks are associated with a higher severity of injuries (Chang & Mannering, 1999; Roudsari et al., 2004).

Road accidents' monetary value relative to other freight externalities is subject to some disagreement, due to differing assumptions and contexts. Forkenbrock (1998) found that truck accidents are the majority of truck externalities when they are all monetized, far more than air pollution and noise combined. By contrast, Beuthe et al. (2002) found truck accidents' external cost to be just slightly above and about half of air pollutants.

Crashes and Safety at Truck Stops

Having sufficient parking at truck stops or rest areas is important to allow truck drivers to take mandatory rest periods in areas safe from accidental collision. When there are too few safe truck parking areas or drivers do not feel that they can quickly reach them when they are tired, some truck drivers park on highway shoulders or exit ramps, which have a higher accident risk (Chatterjee & Wegmann, 2000). Therefore, adequately spaced, well designed truck parking facilities that are easy to find and are well lit are critical to keep stopped trucks away from travel lanes (Chatterjee & Wegmann, 2000).

Crashes and Safety on Railroad Lines

The Federal Railroad Administration (FRA) established a goal of zero tolerance for rail safety violations, an initiative requiring collaboration amongst the FRA, the rail workforce, equipment suppliers, contractors, and other government agencies (Federal Railroad Administration, 2012). The FRA categorizes all accidents/incidents into one of the following categories.

- **Train accidents:** Incidents involving on-track rail equipment causing damage that exceeds a specific amount (in 2010, the value was \$9,200)
- **Highway-rail grade crossing incidents:** Collision between rail and a user at a crossing.
- **Other incidents:** A death, injury, or occupational illness of a railroad employee not resulting from either of the above categories.

Collisions at highway-rail grade crossings are the most dangerous accident type (Forkenbrock, 1999). Fortunately, collision incidents and number of fatalities have been reduced by 85% and 77%, respectively, since the late 1970s. However, just over 2,000 collisions in 2011 still resulted in over 250 fatalities (Federal Railroad Administration, 2013).

Crashes and Safety at Seaports

Port accidents occur because of the size and complexity of equipment being used and goods being processed. Many accidents are isolated to the port property, and occur in the water around the port or have effects extending into the surroundings. Of the 471 most frequent accidents occurring at seaports from 1900 to 2002, the most common were loss of contaminant (51%), fires (29%), explosions (17%) and gas clouds (3%). Researchers have concluded that accidents at seaports are almost inevitable given the hazardous materials that pass through and the volume of movement involved in transport (Darbra & Casal, 2004). The most frequent cause of the various accidents types was some impact or collision between objects, whether they be ships, dry land, vehicles, or anything else. Yip (2008) similarly found that 67% of all accidents recorded in 2001-2005 in the Port of Hong Kong and nearby waters were related to some impact between objects.

Freight Movement and Noise

Noise is a potential problem for all freight modes and facilities. Exposure to noise has been associated with a number of negative health effects dating back to the 1960s (Moudon, 2009).

Noise from Vehicles

Researchers have examined the relationship between vehicle traffic and noise. Highway noise increases with higher speeds, higher traffic volumes, and vehicle weights (FHWA, 2011). Therefore, trucks are louder than most personal cars, and increasing the number of vehicles per hour 10 times approximately doubles the sound intensity (Maryland Department of Transportation, 2015). For example, a single truck at 55 miles per hour is approximately as loud as ten passenger cars at that speed. Moreover, double traffic speed approximately doubles volume (Maryland Department of Transportation, 2015).

Traffic immediately before and after rush hour is often the noisiest (Keep San Diego Moving, n.d.). This is because there is a high volume of traffic at these times, moving at high speeds. This combination – high volume and high speeds – generates the most noise. During peak traffic volume periods, traffic speed decreases and noise decreases, even though volume might be slightly higher.

Noise at Truck Stops

Idling trucks and those entering and leaving the truck stop produce noise affecting the immediate vicinity. A team of researchers examined the noise associated with a proposed distribution center in San Jose, California. They measured noise generated by trucks and assigned a typical decibel level to each of the following events: truck passby (68 decibels at 30 feet); truck airbrakes (72 dB at 25 feet); truck backup alarm (79 dB at 30 feet); idle before engine shutoff (70 dB at 25 feet); truck engine ignition plus airbrakes (71 dB at 25 feet); and truck acceleration from stop (74 dB at 25 feet) (Salter & Frederick, 2014). San Jose requires sensitive residential or institutional land uses to have 60 dB or less noise from adjacent uses without special noise reduction measures, up to 75 dB with noise reduction measures, and no more than 75 dB under any circumstances because noise mitigation will be insufficient (City of San Jose, 2013).

Noise from Railroad Lines

The two major sources of noise on a train are the locomotive engine and the wheel/rail interaction (Fath, Blomquist, Heinen, & Tarica, 1974). Other common types of noise generated from rail movement include: wheels squealing on track curves, engine noise from idling trains, engine noise increasing as trains ascend hills, and railcars banging as trains slow down (Transport for New South

Wales, 2014). Noise intensity varies based on the type of cars, presence of track crossovers, track characteristics, frequency of cars, speed, surrounding vegetation, and surrounding urban form (HMMH, 2006). Local authorities and regional planners can use operations data (e.g., train frequency, speed, and size) to obtain rough estimates of the noise that specific line operations generate.

Researchers have completed field studies measuring the general noise levels based on type of car and speed. Measuring 50 feet from the source, a metro train travelling at 50 mph registers an A-weighted sound level of roughly 60 dB(A). Using the same methodology, high speed rail returns a sound level of 40-90 dB(A) (Hanson, Ross, & Towers, 2012). The noise from passing trains is mainly low frequency, ranging from 40-100 Hz with high frequency pitches coming from the friction of the rail against the car wheels (Fath et al., 1974). A joint study with the EPA and the National Standards Bureau found little difference in the low frequency noise from 25 feet from to track to 400 feet to the track (Fath et al., 1974). While passenger and freight trains have different noise profiles, these studies provide a point of departure for understanding freight train noise.

Noise at Seaports

Ports can operate 24 hours a day (THE Impact Project, 2012), making noise throughout. In order to better understand this noise, Khoo and Nguyen (2013) undertook what they considered the first noise mapping study of a major U.S. seaport. They concluded that the single largest contributor to noise at the port were truck movements, followed by cargo handling, and rail. Noise was highest at 8:00 AM and 1:00 PM and lowest at noon. Noise was higher on the weekdays than the weekends.

Health Impacts of Noise

Noise impacts can be understood under three categories: psychological, physiological, and mental health (Matsuoka et al., 2011).

Psychological

Annoyance or disturbance is the most common and most researched psychological effect of noise. Noise annoyance is characterized by feelings of displeasure or discomfort towards a particular sound and results in interference with thoughts, feelings, or activities (Moudon, 2009; Passchier-Vermeer & Passchier, 2000). Noise annoyance can result in psychosocial and psychosomatic health effects. The most common source of noise disturbance is road traffic. The random but usually constant nature of traffic noise contributes to its ability to annoy along with its intermittent sound level variations caused by motorcycles, for example, or peak and off-peak traffic patterns (Alenius, 2001). There are psychosocial responses of which noise annoyance is the main cause.

Physiological

Physiological impacts include hearing loss and high blood pressure (Matsuoka et al., 2011). Hearing loss or impairment can occur both from short-term exposure to high noise levels or long-term exposure to lower levels. Hearing loss can result in difficulties in communicating and feelings of isolation and depression. At 85 dB(A)45, roughly equivalent to the sound of a jack hammer, the risk of damage to the ear is about 10 percent. The odds of damage increases as the decibel level rises. A 24-hour exposure to sound levels of 70 dB(A) or less, roughly equivalent to a food blender, is not anticipated to result in any permanent hearing damage (Fath et al., 1974). Children and

people who have demonstrated hereditary sensitivity to noise are considered to be the at-risk or sensitive groups (Alenius, 2001) and are more vulnerable to hearing loss.

Mental Health

Mental health impacts include anxiety and disrupted sleep (Matsuoka et al., 2011). Sleep disturbance can impair the normal functions performed by sleep such as brain restoration and cardiovascular respite. It also has an effect on mood, fatigue, performance, cognitive abilities, vigilance, and can boost epinephrine levels which contributes to stress and increased risk of injury (Moudon, 2009; Passchier-Vermeer & Passchier, 2000). Groups that are particularly sensitive to these effects include: the elderly, the sick, and shift workers. For all populations, maximum sound levels should not exceed 45 dB(A) (similar to a refrigerator), but sound levels should ideally remain around 30 dB(A) (Alenius, 2001). Included in psychosocial responses are sleep disturbance, disruption of daily activities, and interference with performance—all subjective responses that pertain to well-being and quality of life. Noise also has physical impacts such as hearing loss, tinnitus, hypertension, ischemic heart disease, and some forms of cardiovascular disease (Alenius, 2001; van Kempen et al., 2002). Stress-related health effects brought on by noise exposure can be psychological (feelings of depression, fear, resentment, discomfort, displeasure, anger), behavioral (isolation, aggression, abuse of alcohol, drugs, food, and tobacco), or somatic (cardiovascular, gastrointestinal, respiratory illness), and physical (hearing loss, tinnitus) (Porter, Flindell, & Berry, 1998).

Stress-related health effects of noise can give rise to psychological, behavioral, and somatic disorders. Studies are inconclusive in determining whether health effects of noise-related stress have long-term, chronic impacts or if they are transient or reversible in nature. Research has detected some impacts on blood pressure, clinical hypertension, ischemic heart disease and other cardiovascular disorders, biochemical effects, changes in the immune system, and potential effects on the unborn child although the evidence to support effects on unborn children is limited (Porter et al., 1998).

In conclusion, research indicates there is sufficient evidence for a causal association between noise and the following health effects: annoyance, disruptions in performance by school children, sleep disturbance, mood, heart rate, hearing loss, and ischemic heart disease (Porter et al., 1998). There is limited evidence of a causal relationship for the following health effects, although an association between noise and health has been observed: performance in adults, hormones, forms of cardiovascular disease, biochemical effects, and effects on the immune system. One of the purported vectors for noise's physical manifestations is the body's release of adrenaline in response to stress, which can raise blood pressure, increase heart rate, and damage arterial linings (Berglund, Lindvall, & Nordin, 1990).

Economic Impact of Freight Movement

The movement of freight, and industries supporting this sector, have a number of economic impacts. These industries provide employment opportunities across a range of education levels and abilities. The movement of freight is essential to economic productivity at both a national level as well as a global level. In 2012, spending by the transportation and logistics industry totaled \$1.33 billion across the US, representing approximately 8.5% of the national gross domestic product (Select USA, n.d.).

Economic Impact of Rail

In the US, a rail network of 140,000 miles delivers goods and services to locations throughout the country (Federal Railroad Administration, 2015a). Class I freight rail includes line haul freight railroad companies with 2013 operating revenue of at least \$467 million. The freight companies in this category are BNSF, the Canadian National Railway, Canadian Pacific, CSX, the Kansas City Southern Railway, Norfolk Southern, and Union Pacific (Federal Railroad Administration, 2015a). In addition to Class 1 freight rail, the US freight rail network includes 21 regional railroads and over 500 local railroads. Regional railroads are line-haul railroads operating at least 350 miles of rail and/or earning revenue of \$40 million or more. Local railroads are line-haul railroads that don't meet the regional railroad criteria (Federal Railroad Administration, 2015b).

Regardless of the previously discussed negative externalities, freight rail is recognized globally as an economically critical link in the global supply chain. The rail industry also provides jobs for roughly 180,000 people (Association of American Railroads, 2015a) with an average wage near \$60,000 dollars (Bureau of Labor Statistics, 2015). Class I freight railroads spent about \$27 billion in investment in 2014 (Association of American Railroads, 2015a). Cargo activity is projected to increase threefold by 2030, thus putting strain on existing infrastructure and requiring expansions or new facilities altogether in some places (Vivar & Vallianatos, 2012). Additionally, freight rail can influence the nearby residential housing market by decreasing property value, on average, between 5- 7% (Simons & El Jaouhari, 2004). This means that market forces will push lower-income households to live nearer to freight rail and other potentially polluting disamenities.

In terms of public funding, the Association of American Railroads holds that railroads are favorable over truck transportation because the 140,000 mile network of rail is funded and maintained with private funds instead of public funds. In 2012 and 2013, the railroad network received \$25 billion per year in reinvestment (2015).

Economic Impact of Rail Yards

Rail yards are the activity centers where containers are transferred from incoming trains to outgoing trains, or from one mode to another. They are sometimes referred to as "intermodal facilities" if they move freight between modes (e.g., trucks to trains). Rail yards are essential for rail freight operations. They balance several negative externalities such as accident risk, emissions, and noise against economic benefits. Recent projections predict a steady rise in cargo growth, ultimately tripling the current activity by 2030 (Vivar & Vallianatos, 2012). Rail growth will concentrate activity in existing rail yards and require new yards in some places. Both trends will increase rail's impact on communities.

It is widely recognized that freight rail has major economic benefits that often counterbalance the negative impacts of this mode. Rail yards have a greater impact on the local economy compared to line operations because the activity happens in a concentrated location and provides jobs. Rail yards also draw rail industry employees from other regions who support the service economy (Olson, 2015).

Economic Impact of Trucks

The greatest volume of freight movement occurs on the nation's roadways. Trucks move approximately two thirds of U.S. freight weight (US DOT BTS, 2013), and even for cargo that is moved primarily by another mode, trucks are often responsible for bridging the first or last miles.

Trucking is preferred for most land-based trips since it is flexible, uses an almost omnipresent infrastructure, and moves cargo faster than other land modes. As a result of this, shorter trips especially skew towards trucks (US DOT BTS, 2013). The volume of freight movement via truck in all cities means that it has both a major and a very widespread impact on health.

The trucking industry provides accessible and reasonably well paying jobs. There were over 1.7 million truck drivers in the United States in 2014. This number is expected to grow by 98,800 drivers by 2024, keeping pace with general job growth. Median annual wage for truck drivers was \$39,520, or \$19.00 per hour, in 2014 (Bureau of Labor Statistics, 2014). Most employers of truck drivers do require them to have a high school diploma or GED. Additionally, many require drivers to attend truck-driving schools; these programs (either privately offered or through a community college) typically take between three and six months to complete. Truck drivers must also have a commercial driver's license (CDL), which is granted by individual states (Bureau of Labor Statistics, 2014).

Regulation does limit how much drivers may work and therefore earn. The Federal Motor Carrier Safety Administration heavily regulates driver work schedules. Drivers may work up to 14 hours straight, divided into 11 driving hours and 3 non-driving work hours (e.g., for loading cargo). Drivers must have at least 10 hours off between work shifts. They can drive no more than 60 hours in a 7-day period or 70 hours in an 8-day period; they must then take 34 hours off before starting another 7- or 8-day run. These regulations, however, do nothing to prevent drivers from working nights, weekends, and holidays (Bureau of Labor Statistics, 2014).

Economic Impact of Distribution Centers

Distribution centers are supply chain nodes that centralize and simplify freight flows and provide an inventory buffer between supply and demand. Distribution centers store goods inventory, arrange transportation to and from customers and suppliers, and sometimes provide services like product customization and packaging. Distribution centers matter for health because large amounts of freight activity occur as goods enter and leave the facility.

The Bureau of Labor Statistics estimates that, as of February 2015, over 750,000 Americans are employed in what it considers the warehousing and storage sector (US Bureau of Labor Statistics, 2015). Average hourly earnings in this sector, as of February 2015, were \$18.60, which annualizes to \$38,688 (US Bureau of Labor Statistics, 2015). This average, however, is significantly brought up by manager positions in the sector, which average \$41.91 per hour (US Bureau of Labor Statistics, 2015).

Access is critical for these types of jobs. Warehousing jobs are most available to those who live near warehouses or have transportation to reach them. The Equal Employment Opportunity Commission found that distribution centers, because they require large amounts of space, are frequently built away from downtown locations and instead are found in less populated areas (EEOC, 2004). As population density decreases, the percentage of women and minorities in relevant job groups (such as operatives and laborers) declines. The EEOC compared locations of distribution centers in 1982 to their 2002 location, and found that had the distribution centers remained in their previous locations, there would have been 10 - 14% higher minority representation in the local workforce job groups (EEOC, 2004).

Many distribution center jobs are accessible to low- and medium-skill laborers. Jobs – especially non-managerial jobs – typically require no more education than a high school degree or GED, or not even that. For example, job advertisements for a Kroger order worker require a high school education or GED with one year of work experience (Kroger Co., 2015) and an advertisement with CVS Health (CVS Health, 2015) lists no educational requirements at all.

Economic Impact of Truck Stops

Truck stops provide truck drivers with fuel, food, showers, other goods, and places to rest safely away from traffic and are therefore necessary to the freight industry. The majority of truck stops are privately owned and operated adjacent to highway exits, but many states also provide publicly owned facilities that may have similar facilities. Truck stops need to be located frequently enough for drivers to take rest breaks when required by regulation or when the drivers feel drowsy, and they need to provide enough parking spaces so that drivers do not park on highway shoulders or exit ramps (Bureau of Labor Statistics, 2014).

Economic Impact of Seaports

Residents of communities surrounding ports face a daily parade of ships, trucks, and trains transporting goods and materials to and from the facility. Though this section focuses on accidents and safety, noise, and air emissions, the Organisation for Economic Co-operation and Development (OECD) identified several other significant sources of pollution associated with freight shipping: oil pollution from discharged water ballast or bilge water; discarded plastics; accidental spills; light pollution; and distribution of non-native species and disease (OECD, 1997).

However, a great deal of current commerce relies on ports as gateways for imports and exports. These gateways require massive coordination and logistics planning to succeed. Therefore, ports are significant employers. The Ports of Los Angeles and Long Beach, the busiest and second busiest ports in the country respectively, directly employ 1,498 people and indirectly support a much larger number of people (Martin Associates, 2007).

Looking into the future, cargo activity is projected to increase threefold by 2030, thus putting a strain on both existing port infrastructure and the roadway and rail lines surrounding the port that also facilitate the transport of cargo. This will require port expansions, or new facilities altogether in some places (Vivar & Vallianatos, 2012). These expansions must be executed in a way that does not put an undue burden on surrounding sensitive land uses.

Impact of Low Socio-Economic Status (SES) on Health

In 2002, the Institute of Medicine reported that Americans “are healthier, live longer, and enjoy lives that are less likely to be marked by injuries, ill health, or premature death” compared to their fellow countrymen back in 1900 (Institute of Medicine, 2002). However, these gains are not uniformly distributed through the population. There is mounting evidence to support the assumption that poorer people have poorer health because, in part, they live in places that are unhealthy, although the relationship is complex (Baum & Palmer, 2002; Robert, 1998). One study indicated that residents of high poverty neighborhoods live on average eight years less than non-poverty neighborhoods (Bhatia, Rivard, & Seto, 2006).

In contrast, higher SES individuals, as characterized by higher levels of education, high-paying jobs and stable neighborhoods, have on average lower morbidity and mortality rates. Research has

shown that there is a consistent inverse relationship between SES and premature death. Overall, people with lower socioeconomic status tend to die earlier than people of higher socioeconomic status, and health disparities continue to increase.

Low Socio-Economic Status (SES) and Poor Birth Outcomes

Several studies have also shown that census tracts with low education, high unemployment, low-paying jobs, and high poverty are consistently associated with adverse birth outcomes, including higher rates of pre-term birth and low birth weight babies. Neighborhoods can serve both as a source of support and stress for women of child-bearing age (Messer et al., 2006, 2008).

Low SES is also associated with less healthy infants. Poor health at birth is a leading cause of infant mortality. It is associated with poor health later in life, in both children and adults, and with conditions such as diabetes, obesity, and cardiovascular disease (Grady, 2011; Miranda, Messer, & Kroeger, 2012; Tu, Tedders, & Tian, 2012). Goldenberg et al. (2008) note that pre-term birth occurring before 37 weeks of gestation is a factor in 75% of infant mortality cases (Tu et al., 2012). Tu et al. (2012) note that in Georgia, the 2006 low birth weight rate of 9.6% exceeds the national rate of 8.2%. The most recent data in 2015 shows that low weight births comprise 9.5% of all births in the state, while Chatham County's rate is 10.3% (Georgia Department of Public Health, 2016). Therefore, the issue of low birth weight and associated negative long-term impacts is a significant issue in the HIA study area.

Research has long suggested that neighborhood socioeconomic characteristics influence birth outcomes. Ellen et al. (2001) summarize research findings that poorer neighborhoods are associated with a range of worse outcomes for infant and child health, including more low-birth weight babies, higher infant mortality in the first year, and higher rates of childhood asthma. In two of the studies reviewed, average income level within a census tract was significantly related to the probability of an infant having a low birth weight, while a third study found that low birth weight was correlated with neighborhoods with more residents receiving public assistance (Ellen et al., 2001). Goldenberg et al. (2008) note that preterm birth is associated with stress and exposure to stressful conditions, including issues such as housing instability, poor housing quality, poverty, and deprivation.

Employment Improves Health

Studies have shown that a healthy population supports economic development for a variety of reasons, and that the positive effects are most pronounced when moving from low to moderate levels of health because of decreasing returns (Strauss & Thomas, 1998). Thus, there is a reciprocal relationship between economic development and health. There is also evidence that "employment protects and fosters health" (C. E. Ross & Mirowsky, 1995). The relationship holds up across many types of employment, across genders, and across reasons for unemployment (C. E. Ross & Mirowsky, 1995).

The health of an adult individual and their household significantly improves with satisfying employment at a livable wage relative to the local market (Bhatia & Katz, 2001; Cole et al., 2005). Employment can provide or allow the household to acquire quality housing, nutritious food, education, transportation, medical care or coverage, savings, and many other necessities of a healthful life. Lack of access to employment, under-employment, or jobs which do not pay a living

wage or provide sufficient benefits can contribute to stress, depression, malnourishment or obesity, homelessness, and many other negative outcomes.

Doyle, Kavanagh, Metcalfe, and Lavin (2005) provided a comprehensive review on the impacts of employment and, by extension, unemployment on health. According to their findings, unemployment is a stressful event and can have marked negative effects on one's health. These may include but are not limited to premature mortality; poverty due to long-term unemployment may result in individuals having less healthy lifestyles and being exposed to more unhealthy environments; financial strains may contribute to one being more depression prone; affects psychological well-being which might result in anxiety, self-harm or even suicide; individuals might be more likely to undertake unhealthy practices such as drinking and smoke; increased risk of coronary heart disease due to increased stress; etc.

Land Use Conflicts

Industrial land supports an economic sector that provides employment through physical processing. Parcels with this land use designation house a variety of activities which are of varying levels of compatibility with other uses. In Chatham County, according to stakeholders, industrial land is seen as encroaching on and interfering with established residential areas. Air pollution, noise, heavy truck traffic, and other externalities resulting from industrial land have an adverse effect on the health and quality of life for nearby residents.

Freight activity needs operational freedom to function efficiently and maintain the economic benefits that this sector provides to the economy. Leigh and Hoelzel (2012) argue that planners have struggled to address the problem of industrial displacement. Some cities do see a need to protect industrial land to provide employment opportunities for workers of varying levels of education and skills (Howland, 2010). Another problem is that industrial land policies are often separated from land use planning for other uses, which can cause disjointed or inconsistent action (Leigh & Hoelzel, 2012).

The CORE MPO freight study addresses this conflict in *10.2 Land Use Strategies* as follows:

“The conflict of freight activities (e.g., truck trips, warehousing and rail yard noise pollution), and community activities (e.g., schools, bicycle-pedestrian, and residential needs) may be mitigated in the freight planning process by understanding and potentially segregating these activities through land use designation. For example, planning for route designations between two freight generators, for truck trips, may be influenced by the presence of parcels designated for residential use.”

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4.2 Spatial Data

The HIA team compiled or internally created the spatial data needed for this HIA, (informed by the literature review) then overlaid and analyzed this information comprehensively. Results of this analysis were coordinated with input gathered from stakeholders to craft the HIA recommendations.

Obtained from SAGIS (Savannah Area GIS) and other sources

- Roadway data
- City and county boundaries
- Land parcels

- Census tract boundaries
- Zoning designation
- Land use (future)
- Rail lines

Obtained from Georgia Department of Transportation (GDOT)

- Crash data
 - Pedestrian crash locations
 - Commercial vehicle crash locations

Obtained from American Community Survey (U.S. Census Bureau)

- Demographic data
 - Individuals living below the federal poverty level

Obtained from the Georgia Department of Public Health (DPH)

The following data for the HIA study area was obtained from the Georgia Department of Public Health. These variables were chosen because they are correlated with high rates of diesel emissions, or other health outcomes related to freight movement.

- Mortality (death) incidents:
 - Asthma
 - Chronic Lower Respiratory Disease
 - Leukemia
 - Major Cardiovascular Diseases
 - Malignant Neoplasm of Esophagus
 - Malignant Neoplasms of Lip, Oral Cavity and Pharynx
 - Malignant Neoplasms of Meninges, Brain, and other pts of CNS
 - Malignant Neoplasms of the Trachea, Bronchus and Lung
 - Pneumonia
- Hospital Discharge (number of occurrence):
 - Asthma
 - Chronic Lower Respiratory Disease
 - Leukemia
 - Major Cardiovascular Diseases
 - Malignant Neoplasm of Esophagus
 - Malignant Neoplasms of Lip, Oral Cavity and Pharynx
 - Malignant Neoplasms of Meninges, Brain, and other pts of CNS
 - Malignant Neoplasms of the Trachea, Bronchus and Lung
 - Pneumonia
- ER Visits:
 - Asthma
 - Chronic Lower Respiratory Disease
 - Leukemia
 - Major Cardiovascular Diseases
 - Malignant Neoplasm of Esophagus
 - Malignant Neoplasms of Lip, Oral Cavity and Pharynx
 - Malignant Neoplasms of Meninges, Brain, and other pts of CNS
 - Malignant Neoplasms of the Trachea, Bronchus and Lung
 - Pneumonia
- Percent of Low Birth Weight Births

Created by CQGRD

- Comprehensive high volume truck corridor spatial layer created by merging four datasets:
 - Federally designated Primary Freight Network (PFN) established by the Federal Highway Administration
 - Georgia's statewide designated freight corridors, which were adopted in 2013 following the creation of the Georgia Statewide Freight & Logistics Plan (Georgia Department of Transportation, 2012)
 - Freight Analysis Framework 3 (FAF3) network file, which is derived from National Highway System Version 2009-11 and contains the National Highway System (NHS) and the National Network (NN)
 - The American Transportation Research Institute's (ATRI) database of truck Global Positioning System (GPS) position readings
- High air emission level locations (200 and 400 meter poor air quality zones along high volume truck corridors)
- Land parcels of concern due to high emission levels, incompatible uses, and vulnerable populations
- Truck stop locations (public and private)
- Area of high emission levels around truck stops
- Playground locations (digitized using satellite imagery)
- Bus stop locations (along freight corridors only – digitized using Google and satellite imagery)
- Public housing locations (locations from Housing Authority of Savannah; digitized by CQGRD)
- CORE MPO transportation project locations

4.3 Existing Countywide Conditions

For the purpose of crafting HIA recommendations, the existing conditions data was analyzed by four topic areas. Existing conditions are documented at the overall scale of the county, and by individual EJ area.

1) **Demographics**

- Poverty – 20% or greater living below the Federal poverty threshold
- Environmental justice areas (CORE MPO definition)

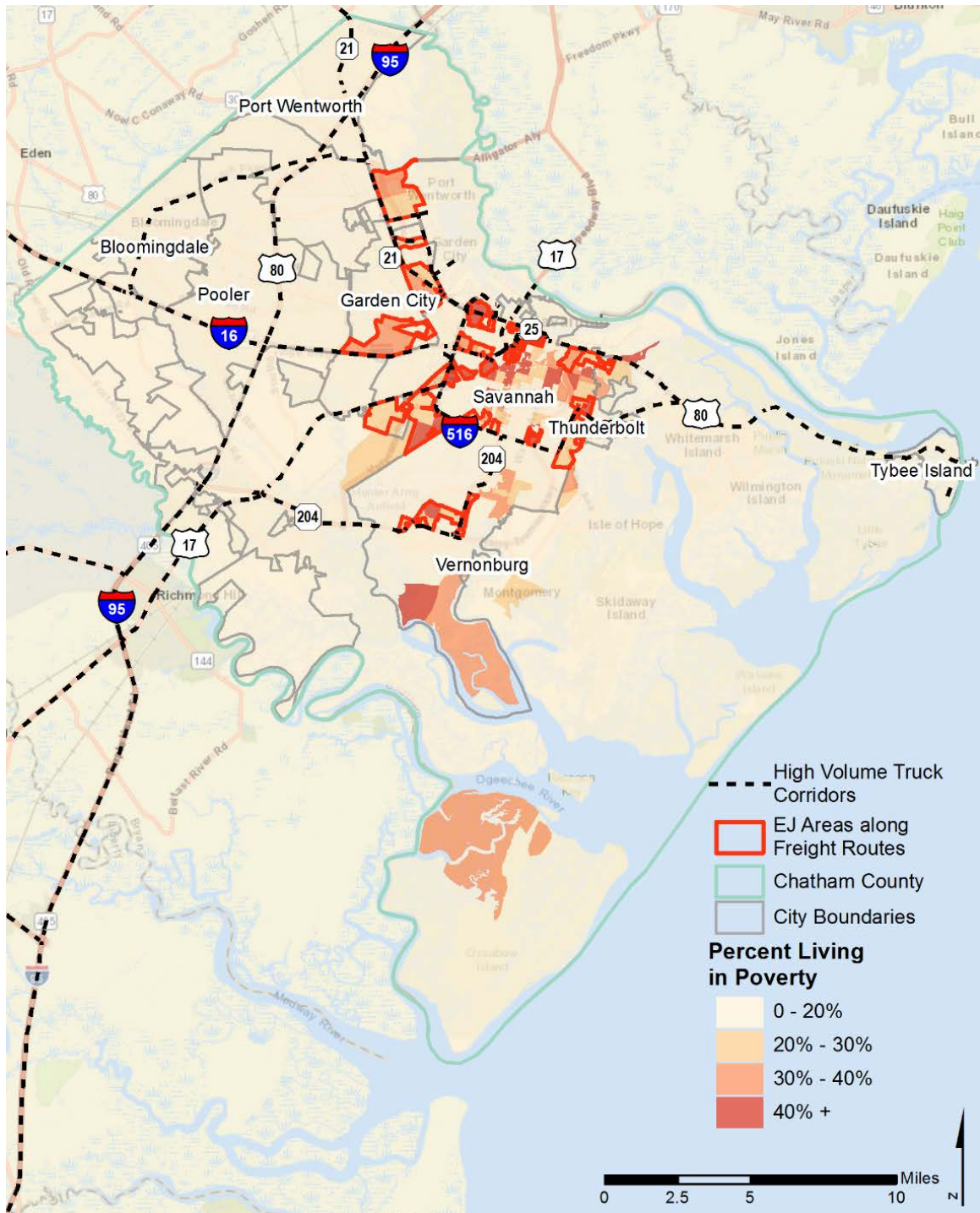


Figure 3: Poverty Rate, High Volume Truck Corridors, and Surrounding EJ Areas

As shown in Figure 4, the HIA project team’s EJ area designations largely align with the “Minority, Poverty and Age” and “Minority and Poverty” EJ areas identified by the CORE MPO.

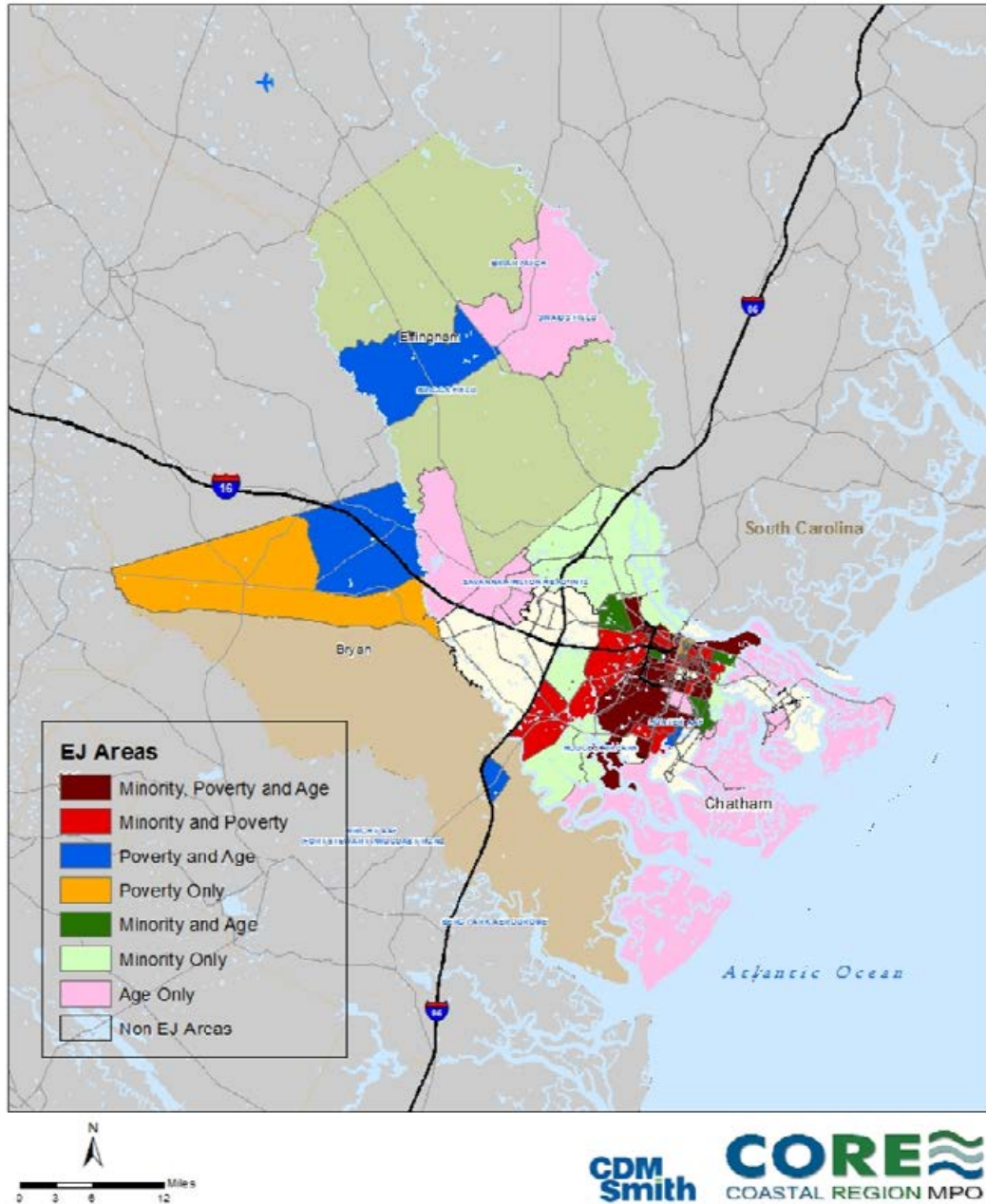


Figure 4: Environmental Justice Areas Identified by the CORE MPO (2015)

2) *Transportation*

To locate areas along freight corridors affected by emissions and poor air quality, the HIA project team placed spatial buffers along the high volume truck freight routes. Buffer distances were derived from the literature and extend 400 meters and 200 meters from the roadway (e.g., Karner et al., 2010). Pollution concentrations can affect the health of the populations located within this distance from the truck routes. Data analyzed included:

- High volume truck corridors
- Poor air quality zones along truck corridors

- CORE MPO project locations (By time horizon: Short-term 0-5 years, Mid-term 6-15 years, Long-term 16-25 years)
- Existing truck stop locations and surrounding areas of poor air quality
- Bus stops along freight corridors and existing pedestrian facilities at these locations
- GDOT crash data (including pedestrian crashes and commercial vehicle crashes)

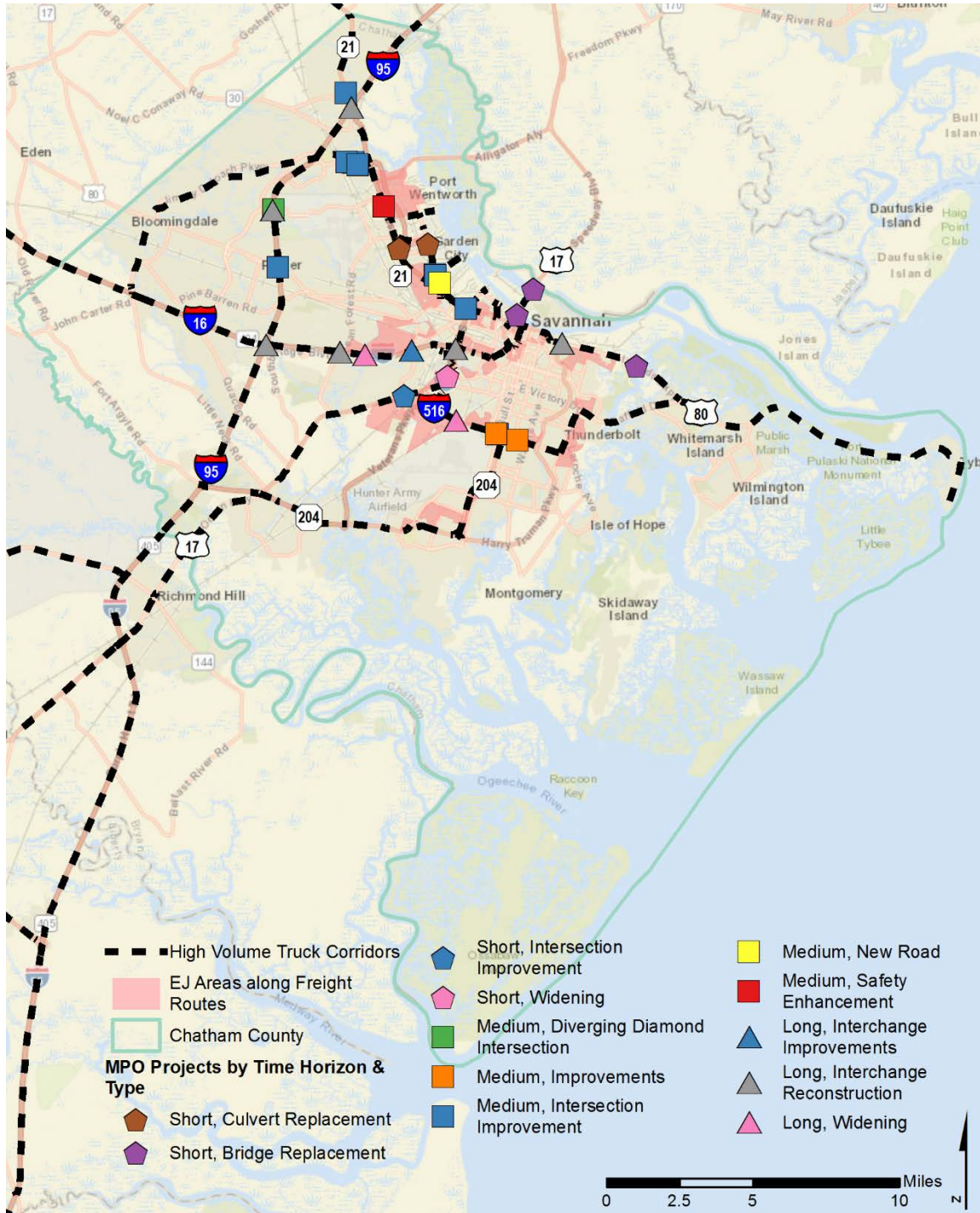


Figure 5: MPO Project Locations along Truck Corridor Routes

Figure 6 shows that a number of bus stops located along freight corridors lack pedestrian facilities to ensure safe crossings for transit users. Chatham Area Transit serves 179 bus stops along major freight corridors. Routes that run largely along freight corridors include 3, 3B, 6, 10, 11, 12, 14, 17, and 31. Routes 5D, 25, and 29 also have a few stops at intersections with freight corridors. Note that Chatham Area Transit does not have readily available spatial data, so data collected from satellite imagery may not accurately reflect current service.

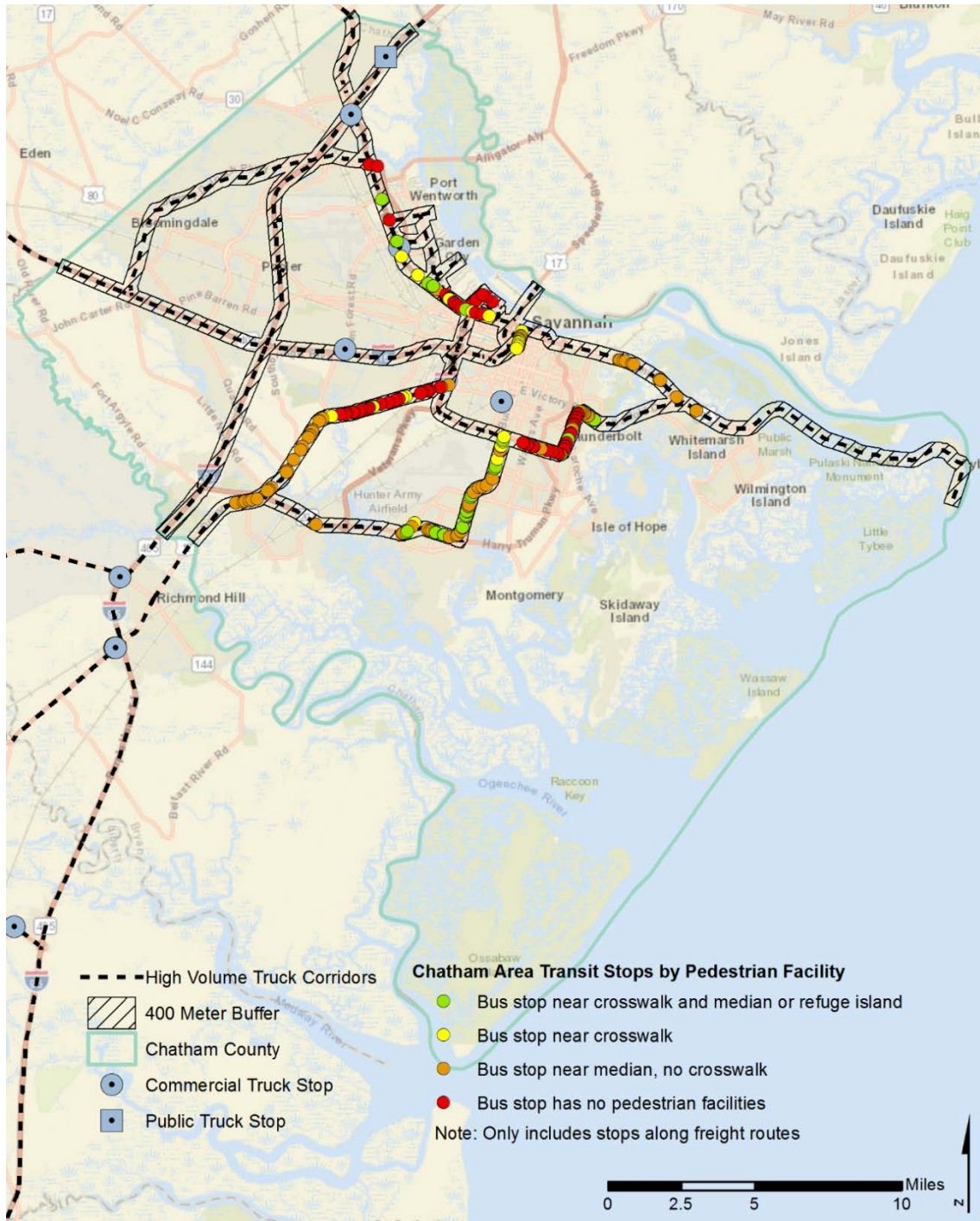


Figure 6: Truck Stops and Public Transit Bus Stops along Freight Routes

Crash data from GDOT showed that often the most severe collisions involving commercial vehicles were off of the high volume freight routes and within the most urbanized parts of Chatham County, as shown in Figure 7 below.

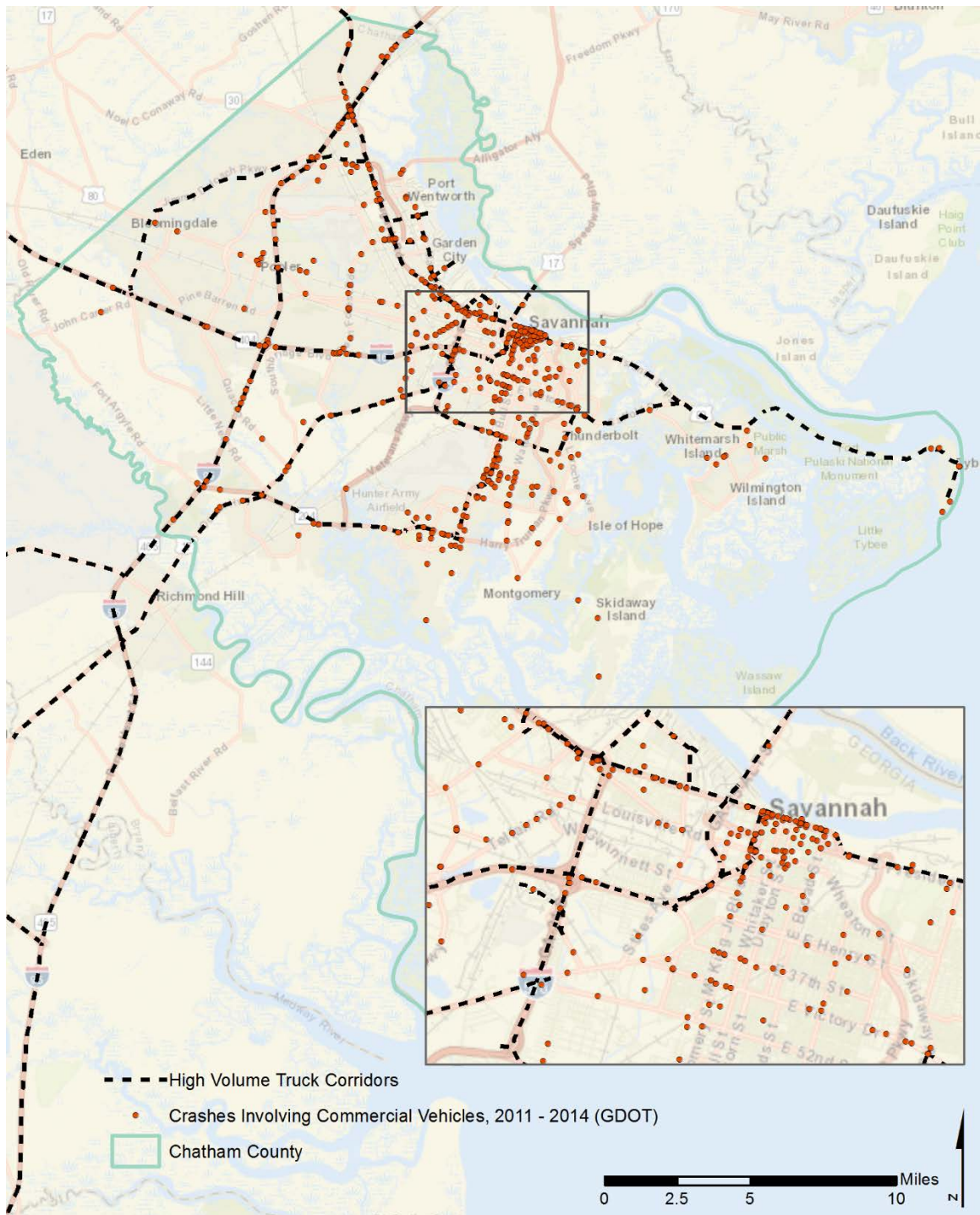


Figure 7: Crash Locations Involving Commercial Vehicles (2011-2014)

As shown in Figure 7, commercial crashes are concentrated in downtown Savannah. The fact that some crashes located far from major freight routes suggests that trucks may cut through residential neighborhoods or use roads that are not intended for moving larger vehicles. Specific corridors where GDOT crash data indicates that a commercial vehicle crash caused death or injury or was the site of a jackknife accident are identified below:

- White Bluff Road between Paradise Drive and Stephenson Avenue
- Waters Avenue between Harry S. Truman Parkway and Stephenson Avenue
- Mall Boulevard between Abercorn Street and Waters Avenue
- Old Louisville Road between Griffin Avenue and Kessler Avenue
- Louisville Road between North Skimmer Avenue and North Dowd Street
- Chatham Parkway between Ogeechee Road and Islands Expressway
- W Victory Drive between Bullock Street and Abercorn Street
- E Derenne Avenue at Skiddaway Road and LaRoche Avenue

In addition to commercial crashes, all crashes involving a pedestrian (whether or not a commercial vehicle was involved) are shown thematically in the map below (Figure 8). The design of high volume roads allow for increased speed and volume of non-commercial vehicles in addition to trucks, which creates a potential conflict with the transit stops located along these roads. Transit stops located along these routes are shown in Figure 6 above.

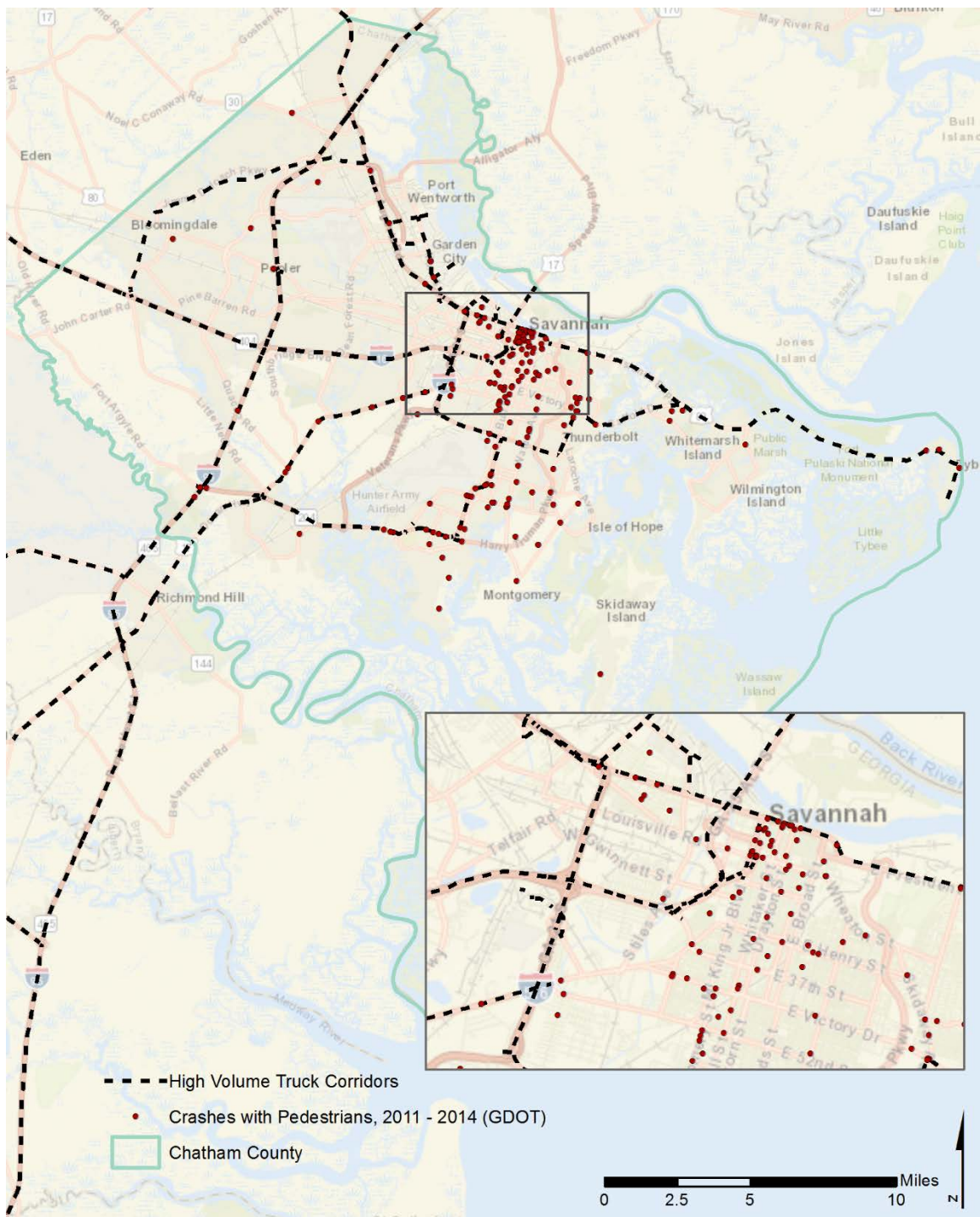


Figure 8: Crashes with Pedestrians (2011-2014)

3) Land Use

The HIA project team reviewed the zoning designations for the county. The goal of the zoning and land use analysis was to examine how current and planned designations may affect vulnerable

populations located along high volume truck routes and to make recommendations for future zoning updates. Additional data related to land use that was also analyzed included:

- Playground locations
- Public housing locations

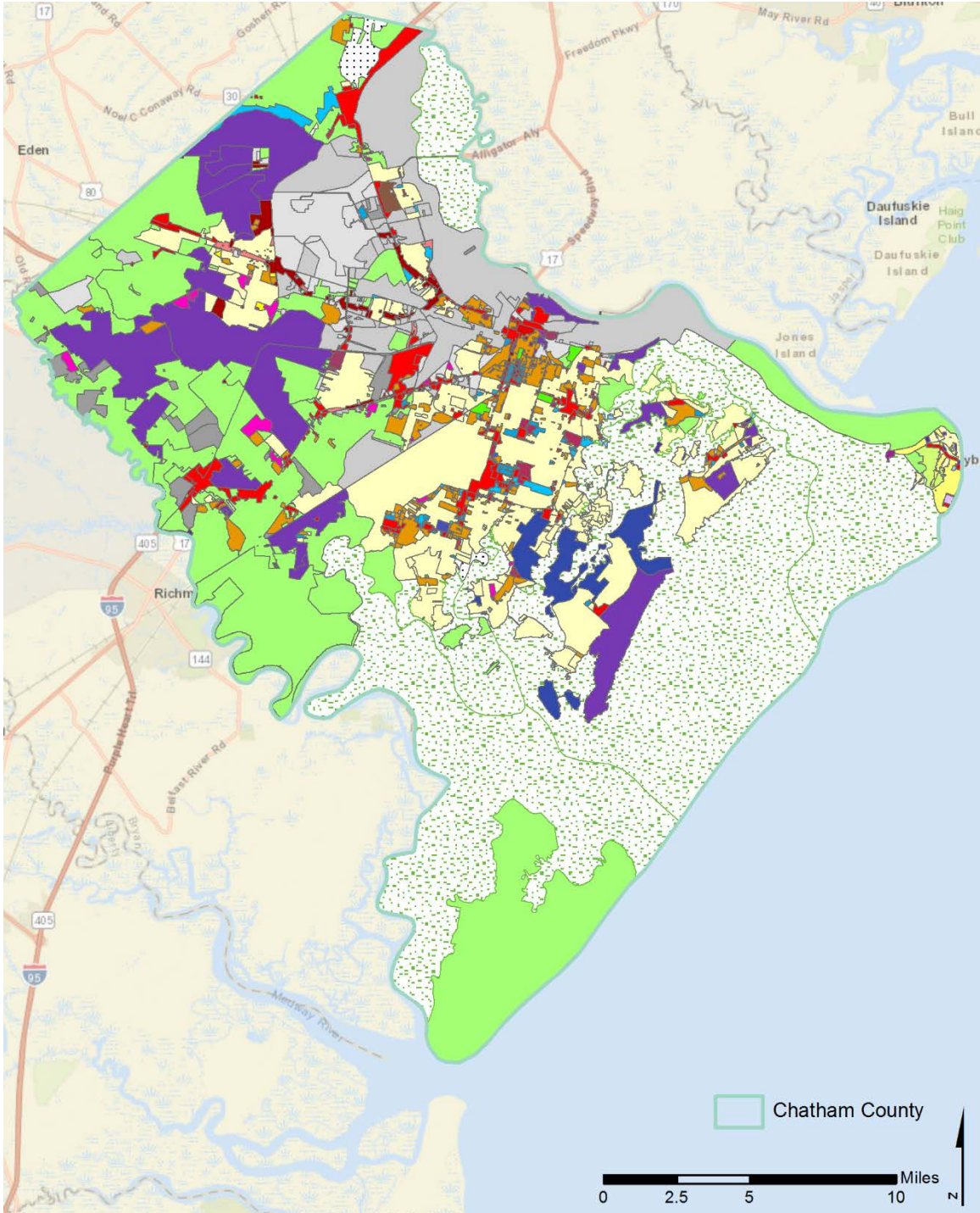


Figure 9: Zoning Designations (see following page for legend)

Zoning Designation



Figure 10: Zoning Designation Legend

The playgrounds shown in Figure 11 are a combination of neighborhood, school, and public park playgrounds. Since this data is not available publicly, the HIA project team assembled this non-exhaustive dataset from satellite imagery. Public housing parcels were mapped using City of Savannah parcel data and information available online from the Housing Authority of Savannah, which maintains eight apartment complexes, several of which are located along high volume truck routes.

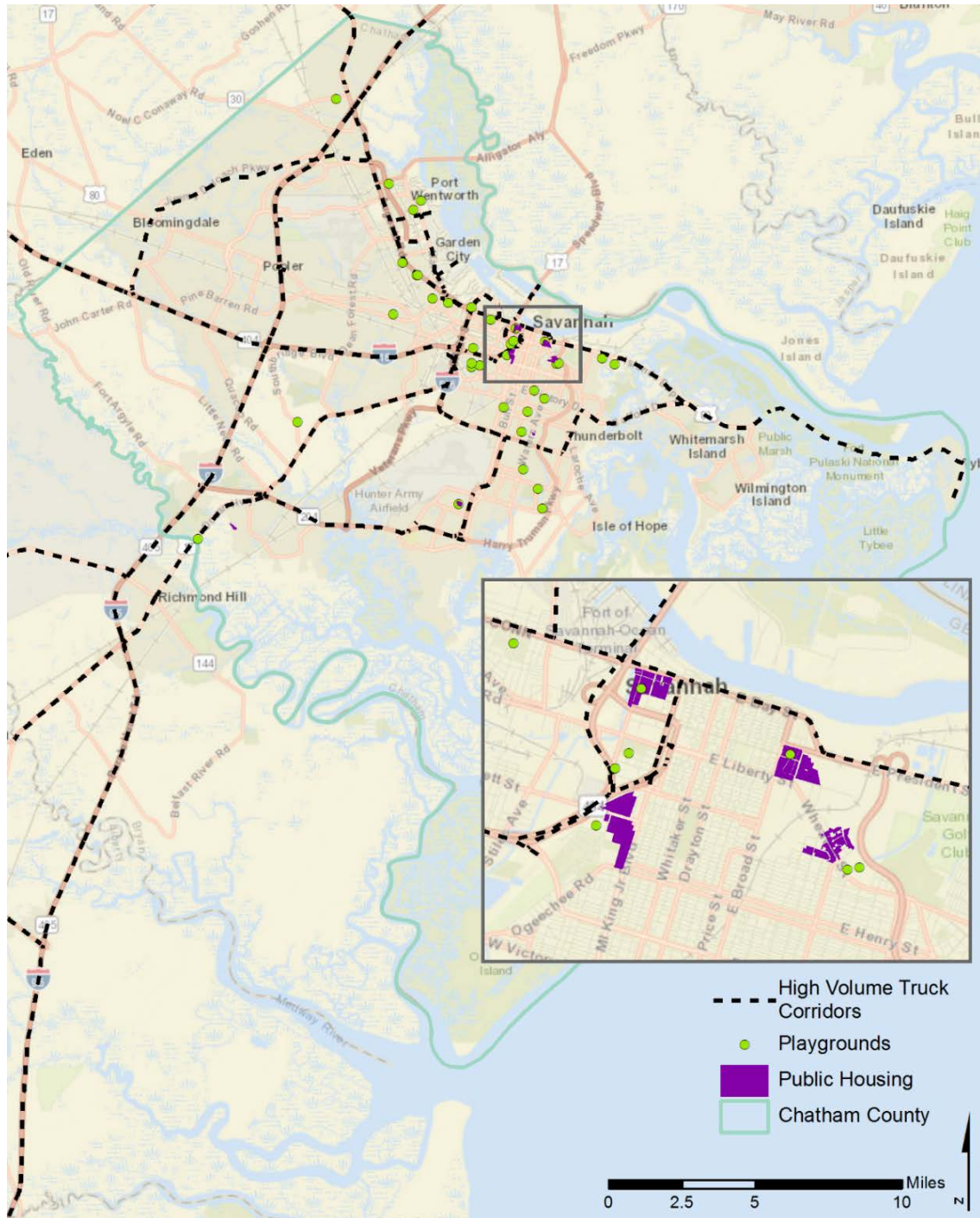


Figure 11: Playground and Public Housing Locations in Chatham County

4) **Health Conditions**

The HIA project team reviewed health data specifically linked to air pollution and low SES, including:

- Number of ER visits due to asthma (county-wide estimated average of 2.6 visits per census block from 2005 to 2014)
- Rate of low birth weight babies (county-wide estimated average of 6.1% of all births from 2005 to 2014, though this appears to be a conservative estimate based on more recent data from DPH, as mentioned in the Literature Review)

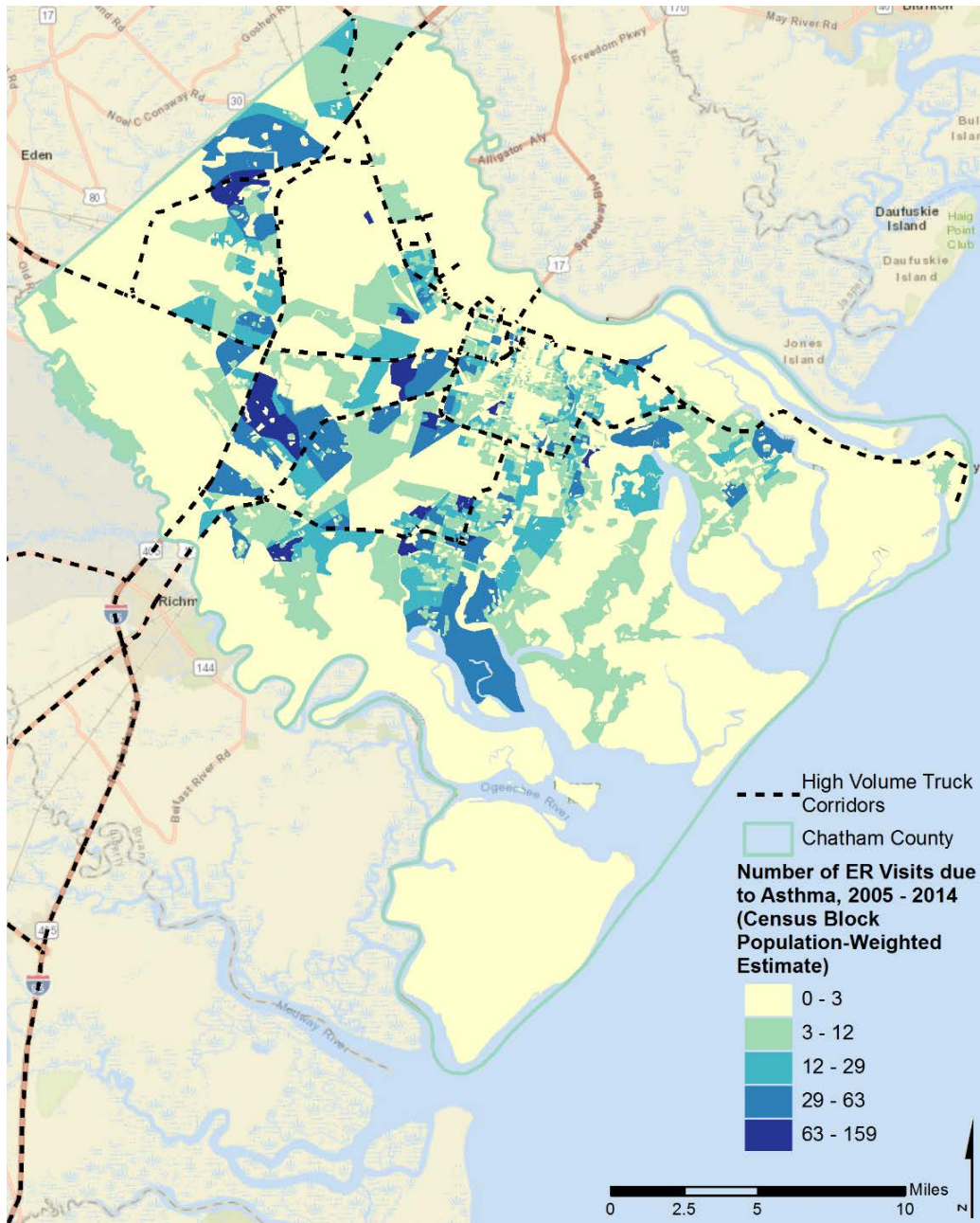


Figure 12: Emergency Room Visits Due to Asthma in Chatham County, Georgia

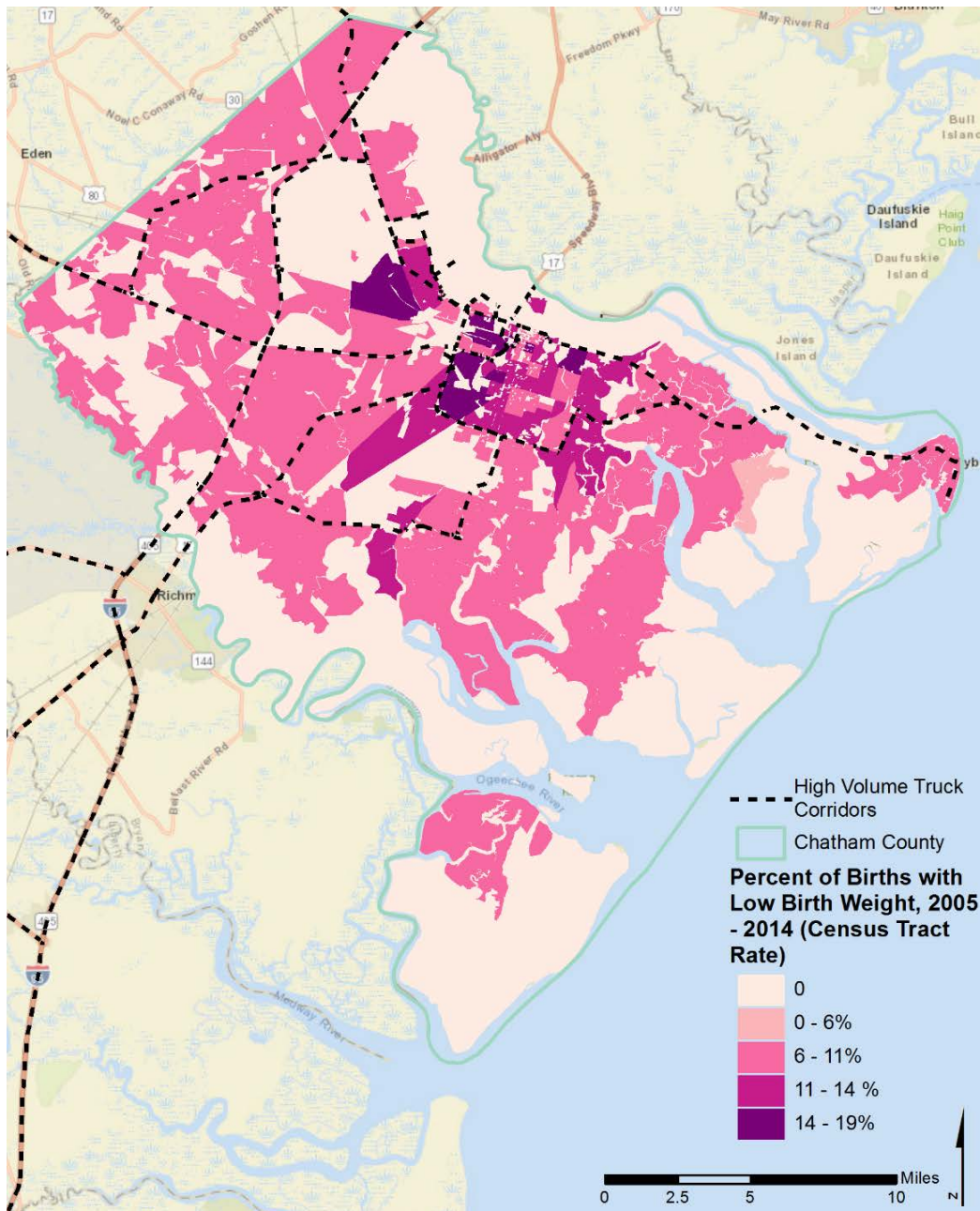


Figure 13: Low Birth Weight Percentages in Chatham County, Georgia

4.4 Environmental Justice (EJ) Focus Areas

The catalog of existing conditions and analysis for the EJ focus areas located in Chatham County is detailed in Appendix 1.

4.5 Stakeholder Input

Stakeholder input was gathered through a number of methods including direct interaction during individual and small group meetings with residents, government officials, and department representatives. An HIA workshop was also held to gather input for stakeholders and decision

makers. A summary of these activities as well as the issues brought forward during these activities is provided in *Appendix 2: Stakeholder Engagement Plan*.

4.6 Conclusion: Major Issues in Chatham County

Through the analysis of the literature, baseline health, demographic, socio-economic, and spatial data of existing conditions, and the stakeholder involvement process, the HIA team identified a range of social, environmental, and economic issues that pose potential health risks along freight corridors in Chatham County. The freight planning process provides an opportunity to incorporate policies and programs that could begin to maximize positive health outcomes while mitigating any potential negative health impacts and provide the framework for the HIA recommendations. These issues are included in Table 3:

Table 3: Health Determinants and Issues Examined

Health Determinant	Specific Issues
Social	Vulnerable populations
	Low socio-economic status (SES) and educational attainment
	Poor female health literacy and birth outcomes
	Asthma
	Heart disease
	Lack of access to employment
Natural Environment	Poor air quality due to the movement of freight
Built Environment	Accidents and safety
	Trucks moving through residential neighborhoods
	Land use conflicts and encroachment
	Preservation of industrial land

5. Recommendations

The following recommendations for the CORE MPO Freight Study have been generated from the review of *Section 10.3 Freight Land Use Policy Recommendations*, and *Section 10.4 Freight Infrastructure Recommendations* from the CORE MPO Freight Study document. The literature and data gathered for this HIA during the appraisal phase also informed these recommendations, along with stakeholder input.

5.1 CORE MPO Projects

The following recommendations are in response to the “Short-Term Freight Infrastructure Improvement Recommendations” (Section 10.5.1 of the CORE MPO Freight Study), and include projects located along the high volume truck routes in the county.

RECOMMENDATION 1: FREIGHT PROJECTS SHOULD CONSIDER SURROUNDINGS COMPREHENSIVELY

When freight projects are planned, surrounding population demographics, existing land use, and population health characteristics should be considered at the earliest stages possible.

If surrounding existing conditions are considered holistically and comprehensively, negative health impacts of potential projects can be more easily mitigated. In addition, the positive economic benefits of the freight and logistics industry can be fully realized – for example, lower skilled job seekers can be matched with and have access to jobs.

RECOMMENDATION 2: FREIGHT PROJECTS SHOULD CONSIDER ALL MODES

Freight supportive infrastructure projects should consider all transport modes in the design process.

When freight routes are located in urbanized settings, adjacent uses and sidewalk connectivity should be considered. Projects designed to improve freight movement where pedestrian and bicycle activity is present should, to the extent possible, be context-appropriate and include sufficient pedestrian and bicycle facilities.

If there is an opportunity during the design phase of a new roadway project, integrate pedestrian facilities where routes are located adjacent to residential neighborhoods or transit stops.

5.2 Countywide Recommendations

Strategies to mitigate potential negative health impacts are described below, organized by topic area.

Freight Air Pollution Emissions, Noise, and Land Use Conflicts

Though air quality and noise have differing effects on health, they can often be addressed simultaneously. Land use conflicts can also be addressed through many of these same strategies. The following recommendations address one, both, or all three of these issues.

RECOMMENDATION 3: RESTRICT TRUCK IDLING

Chatham County should consider adopting regulations that limit idling to 15 minutes for all trucks and buses.

For trucks that are on the road (instead of at a truck stop), there are two general methods to reduce truck idling. The first is technological, and uses anti-idle devices, which automatically turn off the engine after a set length of time (Mika, 2014). The second is through a county or city ordinance requiring drivers to extinguish engines when waiting. An anti-idling policy is preferred, because it would include all freight vehicles, regardless of whether they have technology installed or not.

Sample Anti-Idling Policies

Over 100 jurisdictions ranging from city to county to state have adopted idling regulations. These regulations limit idling to anywhere from 0 to 20 minutes (3, 5, and 10 minutes are common) and levy fines ranging from \$50 to as much as \$10,000. It is typical to define exemptions, such as emergency purposes or mechanical difficulties (American Transportation Research Institute, 2015). Table 4 below provides ordinance details for Atlanta and Macon-Bibb County as an example.

Table 4: Anti-Idling Policies in Georgia

Jurisdiction, Type of Vehicle, and Idling Limit	Exemptions	Fine	Regulation
<p>City of Atlanta</p> <p>Applies to: Trucks and buses</p> <p>Limit: 15 minutes</p>	<ul style="list-style-type: none"> Emergency vehicles; utility company, construction, and maintenance vehicles where the engines must run to perform needed work Truck or bus forced to remain motionless because of traffic conditions Truck or bus is being used to supply heat or air conditioning necessary for passenger safety or comfort...in which idling shall be limited to a maximum of 25 minutes If the ambient temperature is less than 32F, idling shall be limited to a maximum of 25 minutes Any vehicle in which the primary source of fuel is natural gas or electricity shall be exempt from the idling limitations. 	<p>Minimum fine of \$500</p>	<p>Atlanta, Georgia, Code of Ordinances §150-97 (c)</p>
<p>Macon-Bibb County</p> <p>Applies to: County-owned or operated vehicles</p> <p>Limit: 15 minutes</p>	<ul style="list-style-type: none"> Emergency vehicles, construction, and maintenance vehicles where the engine must run to perform needed work Motor vehicle is being used to supply heat or air conditioning necessary for passenger safety or comfort, in which case idling shall be limited to a maximum of 25 minutes If the ambient temperature is less than 32F, idling shall be limited to a maximum of 25 minutes Motor vehicle for which the primary source of energy during idling is natural gas (compressed natural gas) or electricity. 	<p>Fine up to \$500</p>	<p>Macon-Bibb County, Georgia, Code of Ordinances, Part III, Article III, §28-95</p>

Source: US Department of Energy, n.d. and Macon-Bibb County Code of Ordinances.

More examples of idling policies are available through the American Transportation Research Institute’s “Compendium of Idling Regulations” (2015). The United States Department of Energy’s

IdleBox Toolkit provides a downloadable “Database of Idling Regulations” with links to the ordinances or regulations.

RECOMMENDATION 4: PROMOTE ELECTRIFICATION OF TRUCK STOPS

Encourage truck stops to install truck stop electrification equipment to reduce idling while drivers are resting.

Truck stop electrification (TSE) allows drivers to have necessary comforts and amenities such as heating and air conditioning without running their engines. Two ways to provide TSE include single-system electrification and dual-system electrification (“shorepower”). In single-system, truck stops provide off-board equipment that connects through the window via a hose. Dual-system allow trucks to plug into electrical outlets, which requires an electrical on-board HVAC system and other hardware. In both systems, truck stops typically charge fees for the use of off-board equipment or outlets. There are approximately 5,000 truck stops with TSE nationwide, three of which are in Georgia (US Department of Energy, n.d.).

RECOMMENDATION 5: CREATE PHYSICAL SEPARATION

Promote the adoption of buffers around all new noise and pollution-generating infrastructure and create buffers around such existing infrastructure through land use planning, zoning, and permitting.

Buffers spatially separate sensitive land uses from the infrastructure that could potentially contribute to negative health impacts. When residents, playgrounds, schools, nursing homes, and other similar uses are located farther away from noise and air pollution these negative conditions can dissipate and people in the area face significantly less exposure. Buffers are a tested means to mitigate the negative noise and air pollution effects of the freight industry and infrastructure, and are almost universally practiced around airports and adopted locally around many other infrastructure types. Based on the review of health literature, the HIA team recommends the following advisory buffer distances where possible around freight transportation infrastructure and freight facilities (Table 5).

Table 5: Buffer Recommendations around Transportation Infrastructure and Freight Facilities

Infrastructure	Specifications	Buffer	Comments
Rail Corridors	All active	500 feet	Primarily related to noise. Depends on train frequency.
Rail Yards	All active	1,000 feet	Primarily related to air pollution.
Roads and Highways	Major freight corridors	Ideal buffer: 1,312 feet (400 meters) Acute effects buffer: 656 feet (200 meters)	Related to air pollution and noise.
Truck Stops	All active	500 feet	Primarily related to air pollution.
Seaports	All active	1,500 feet	Primarily related to air pollution.
Airports	All active	Dependent on flight patterns (greatest at ends of most heavily trafficked runways)	Related to air pollution and noise.

Sources: California Air Resources Board & California Environmental Protection Agency, 2005; Fath

et al., 1974; Karner, Eisinger, & Niemeier, 2010; THE Impact Project, 2010, 2012; US EPA, 2014

Freight impact buffers are created through separation of sensitive land uses in ways that are often site-specific. Buffers can be created through the combination of general land use planning, zoning, and land use permitting. The HIA project team recommends the following:

- Incorporate non-active green space (as opposed to active, recreational uses) along freight corridors and around freight facilities.
- When new freight facilities are developed, consider requiring conditional use development permits, including larger property setbacks of sensitive uses from freight facilities.
- Proactively ensure in permitting decisions that future sightings of schools, playgrounds, hospitals, nursing homes and other uses housing sensitive populations include adequate distance buffers from high volume roads and freight facilities.

In cases where freight facilities are to be located near sensitive land uses, land use restrictions can be implemented to ensure that negative health impacts are minimized, for example:

“Even if a project is sited properly in a designated zone, a land use agency may require a new source to mitigate potential localized environmental impacts to the surrounding community below what would be required by the local air district. In this case, the land use agency could condition the permit by limiting or prescribing allowable uses including operating hour restrictions, building standards and codes, property setbacks between the business property and the street or other structures, vehicle idling restrictions, or traffic diversion” (California Air Resources Board & California Environmental Protection Agency, 2005)

RECOMMENDATION 6: PLANT URBAN TREES IN BUFFERS TO FILTER AIR

Mitigate freight pollution by planting tree species that are effective at removing pollution and align with local recommended tree lists.

The link between air quality and urban trees has been demonstrated since the 1990s. A study of urban trees in the two-county Chicago metro area by the U.S. Forest Service found that in 1991, Chicago’s estimated 50.8 million trees removed 6,145 tons of air pollutants such as carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, and PM₁₀ (McPherson, Nowak, & Rowntree, 1994). These air quality benefits potentially translate to health benefits. Trees in urban areas may reduce asthma, as Lovasi et al. (2008) found that children exposed to increased density of street trees experienced a lower prevalence of asthma, although hospitalizations for asthma did not decline.

Using urban trees as an air quality mitigation measure requires:

- 1) Consideration of the effectiveness of particular tree species at removing pollution
- 2) Compliance with county and local tree ordinances.

Characteristics such as tree size, canopy texture, leaf surface area, and growth habits influence a tree’s ability to remove pollutants from the air. Yang et al. (2015) used these characteristics to rank the top 100 common urban tree species by their effectiveness at removing PM_{2.5}. Though the study was global in scope, North American tree species were well-represented. They found that conifer species, in particular, were effective at removing PM_{2.5} due to “year round foliage, dense and fine–

textured canopies, and high leaf area index” (Yang et al., 2015). The authors also ranked tree species by their urban suitability and potential negative impacts, such as allergenic pollen. For example, “eastern red cedar (*J. virginiana*) was ranked as a top species in PM_{2.5} removal efficiency but its pollen is also highly allergenic. Therefore, **male trees** of eastern red cedar should be avoided in planting programs in cities [emphasis added]” (Yang et al., 2015).

The HIA project team cross-listed Yang et al.’s PM_{2.5} removal ranking with the City of Savannah’s list of trees that grow well in the southeastern Georgia coastal region. This list comes from Savannah’s Landscape and Tree Ordinance Compliance Manual (2012), which assigns Tree Quality Points based on species quality, size, and drought tolerance. Table 11 shows twenty-six recommended tree species, ranked by Yang et al.’s pollution removal points (higher is better) followed by Savannah’s tree quality points.

Table 6: Best Tree Species for PM 2.5 Pollution Removal in Chatham County

Tree Species Scientific Name	Tree Species Common Name	Pollution Removal Points	Savannah Tree Quality Points
Cupressus sempervirens L.	Italian Cypress	19	15
Juniperus virginiana L.	Eastern Red Cedar / Juniper	19	10
Taxodium distichum (L.) Rieh.	Bald Cypress	16	90
Ulmus americana L.	American Elm	15	90
Metasequoia glyptostroboides Hu and W.C.Cheng	Dawn Redwood	15	40
Acer rubrum L.	Red Maple	15	90
Salix babylonica L.	Weeping Willow	14	15
Platanus acerifolia (Alton) Willd.	London Plane	14	90
Magnolia grandiflora L.	Southern Magnolia	14	90
Platanus occidentalis L.	American Sycamore	14	90
Cedrus deodara (Roxb. ex Lamb.) G.Don	Deodar Cedar	14	40
Fraxinus pennsylvanica Marshall	Green Ash	14	90
Prunus serotina Ehrh.	Black Cherry	14	0.5 (Retention points only)
Gleditsia triacanthos L.	Honey Locust	14	0.5 (Retention points only)
Ginkgo biloba L.	Maidenhair Tree	13	90
Quercus alba L.	White Oak	13	90
Morus alba L.	White Mulberry	13	0.5 (Retention points only)
Ligustrum lucidum W.T.Aiton	Glossy Privet	12	10
Nyssa sylvatica Marshall	Black Tupelo / Black Gum	11	90
Acer palmatum Thunb.	Japanese Maple	11	5
Cornus florida L.	Flowering Dogwood	11	10
Prunus cerasifera Ehrh.	Cherry Plum	11	10
Catalpa bignonioides Walter	Common Catalpa	11	0.5 (Retention points only)

Tree Species Scientific Name	Tree Species Common Name	Pollution Removal Points	Savannah Tree Quality Points
Eriobotrya japonica (Thunb.) Lindl	Loquat	11	5
Lagerstroemia indica L.	Crepe Myrtle	10	10
Phoenix canariensis Cribaud	Canary Date Palm	10	2 pts/foot of height

Sources: City of Savannah, 2012; Yang et al., 2015

Note that because the pollution removal ranking was based on a worldwide study, many of the species on Savannah's preferred tree list were not able to be cross-listed. Species not listed in Table 11 may have similar pollution removal efficiency if they have similar characteristics to those ranked by Yang et al.

In addition to pollution removal efficiency, urban tree planting must adhere to local and county ordinances. The Chatham County Land Disturbing Activities Ordinance (LDAO) includes tree standards, and it is currently being updated by the Chatham County Department of Engineering (Chatham County, n.d.).

RECOMMENDATION 7: REQUIRE NOISE BARRIERS FOR NEW FREIGHT RELATED DEVELOPMENT

Adopt a policy that sets a maximum acceptable level for noise generating infrastructure and development.

Noise barriers reduce the negative health impacts of traffic noise, however, there are no federal noise reduction standards. Federal regulations do contain criteria for assessment of noise impacts, but only require "reasonable effort" to reduce noise. Furthermore, these regulations only apply to projects receiving federal funding. Construction of noise barriers along existing roadways is at the discretion of state and local agencies on a voluntary basis (Code of Federal Regulations, Title 23, Part 772; Federal Highway Administration, 2011). Georgia DOT adopts federal noise abatement criteria in its policy for federal-aid projects and assesses noise reduction measures on the basis of dB(A) reduced and cost effectiveness (Georgia Department of Transportation, 2011). In short, the public health impacts of noise are not explicitly considered.

However, as a case study, the City of Calgary, Canada, has a noise barrier program that uses both a top-down approach in which the city works with developers and a bottom-up approach in which residents can make a noise barrier request through the city's 311 online form. The program is undergirded by the city's Surface Transportation Noise Policy, which sets a noise standard of 60 db(A) $L_{eq}(24)$ for outdoor leisure areas in residential zones. The units dB(A) $L_{eq}(24)$ condense the noise impact over 24 hours into a single measure. Developers are responsible for noise abatement strategies to meet the standard for all new residential developments next to transportation noise sources, including future road facilities that will be built within 10 years. The city is responsible for noise abatement when constructing or upgrading roadways near existing residential developments (City of Calgary, 1988).

Calgary's Noise Barrier Retrofit Program addresses existing residential locations. The City Council allocates about \$900,000 annually to the program, which is enough for one to two projects per year.

The process is initiated by property owners who fill out a traffic noise investigation request form via an online form. Requests are determined eligible based on the following:

- Existing residential area adjacent to major roadway (Canadian functional classes differ slightly)
- Site test shows that traffic noise level is above the design standard in the Surface Transportation Noise Policy. For truck routes, the acceptable noise level is raised to 65 dB(A) L_{eq} (24).

Calgary's program, because of its limited resources, uses a cost-benefit ratio for prioritizing projects and typically builds concrete walls (City of Calgary, 2016). However, it is possible to use vegetation to act as a noise barrier, providing that it is dense and forms a 200 foot buffer to audibly reduce traffic noise (Washington State Department of Transportation, 2015). It is also possible for earthen berms and walls to reduce noise much more substantially than vegetation (Keep San Diego Moving, n.d.).

Freight Movement, Crashes and Safety

RECOMMENDATION 8: DESIGNATE TRUCK ROUTES

Limit through truck traffic to state and federal freight routes, and require local truck traffic to have a local destination. Designated truck routes should strive to avoid residential areas and sensitive uses such as playgrounds and senior care facilities.

The high volume truck routes shown in the appraisal section are a combination of state- and federally-designated freight routes and *de facto* routes tracked by GPS data. While GPS tracking of truck traffic shows that trucks are primarily staying on the preferred truck routes, GDOT's crash data shows that some commercial vehicles are potentially cutting through residential neighborhoods. Although trucks may sometimes leave truck routes to reach their final destination, through traffic should be limited to the extent possible. As freight movement increases along with port activity, cut-through traffic and trucks on neighborhood roads may become a greater problem. At present, neither Chatham County nor the City of Savannah appears to have designated local truck routes or limit truck traffic on local roads. Chatham County can codify local and through truck routes through an ordinance.

Truck Route Sample Ordinances

Table 7 shows two examples of truck route ordinances at the city- and county-level. The City of Columbus has designated through and local truck routes, whereas Gwinnett County regulates truck traffic according to vehicle weight and location (unincorporated areas versus county roads).

Table 7: Local Truck Route Ordinances in Georgia

Jurisdiction	Details	Fine	Regulation
City of Columbus, GA	<ul style="list-style-type: none"> Establishes 2 types of truck routes Through: If not making a pickup, delivery, or getting repaired within city limits, trucks can only travel on designated through truck routes listed in a table Local: Trucks making pickups, deliveries, or having other business within city limits can travel on local routes listed in a table Does not regulate weight and length; these restrictions come from state and federal regulations Exceptions: proof of local business can be shown with bills of lading 	Minimum fine of \$100	Columbus, Georgia, Code of Ordinances §20-9.47, §20-9.48, §20-9.49
Gwinnett County	<ul style="list-style-type: none"> Establishes weight restrictions and routes In unincorporated areas, trucks over 36,000 lbs (Gross Vehicle Weight Rating or Gross Combination Weight Rating) can only travel on designated truck routes On Gwinnett County public roads, trucks over 56,000 lbs gross weight cannot use designated truck routes unless making a pickup or delivery Provides table of designated routes (county government website also provides map of designated routes) Exceptions: driver's log book, weight slips, delivery slips can be shown in a police officer 	Fine set by county board of commissioners	Gwinnett County, Georgia, Code of Ordinances, Chapter 110,, Article II, §110-32, §110-33, §110-36

While avoidance of residential areas and sensitive land uses may not be explicitly stated in the code, Chatham County can create its list of designated route with these considerations in mind.

RECOMMENDATION 9: IMPROVE PEDESTRIAN FACILITIES NEAR TRANSIT

Improve pedestrian facilities along freight routes, especially where bus stops are located.

Safe pedestrian crossings should be available along high volume truck routes, and especially when the route is multi-lane and served by bus stops. As shown in Table 8, seventy percent of bus stops along freight corridors have no designated pedestrian facility, though half of these stops are along a roadway with a raised concrete or grass median that acts as a refuge space. Many of the stops with no crosswalks are along multi-lane roadways. Though in a few cases crosswalks would not be needed because there are no destinations on the other side of the road (for example, corridor segments running along rail lines), the majority of unmarked crossings require pedestrians to run across 5 lanes of traffic to reach commercial destinations on the other side of the road. Appendix 4 provides a pedestrian facility inventory for all 179 bus stops.

Table 8: Pedestrian Facility Inventory for CAT Bus Stops along Freight Corridors

Pedestrian Facilities	Count	Percentage
Has pedestrian facility		
Crosswalk and refuge island	7	4%
Crosswalk and median	22	12%
Crosswalk only	25	14%
SUBTOTAL	54	30%
No designated pedestrian facility		
Median, no crosswalk	63	35%
No pedestrian facilities	62	35%
SUBTOTAL	125	70%

Source: Prepared by CQGRD

In some instances, stops that are near a crosswalk still need additional pedestrian facilities such as refuge islands to ensure safe access. In other instances, restriping is necessary for faded crosswalks and bar crosswalks, which are composed of only two parallel lines as shown in the top of Figure 14. Bar crosswalks should be restriped with diagonal stripes or with closely spaced stripes as shown in the right side and bottom side of the figure, respectively. The diagonally striped (“zebra stripe”) crosswalk maximizes pedestrian visibility.

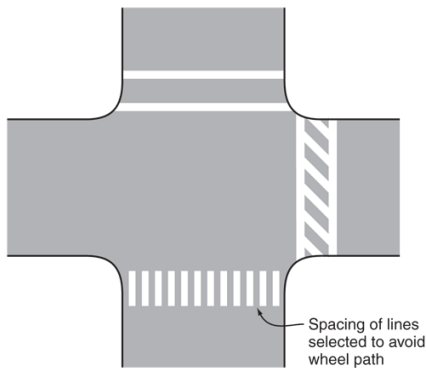


Figure 14: MUTCD Crosswalk Markings
Source: FHWA (2009)

The Ogeechee Road and Dean Forest bus stop is a good example of a successful pedestrian safety improvement. As shown in the left side of Figure 15, pedestrians lacked safe crossing facilities to the bus stop on the south side of Ogeechee Road (image from 2012). Vast improvement is shown in the 2014 satellite imagery on the right side. Three new crosswalks help pedestrians cross five lanes of traffic as well as a channelized right turn. Channelized right turns allow drivers to speed through turns instead of coming to a full stop at a signalized intersection or stop sign, so the crosswalk and refuge island are critical for safe access to the bus stop. Similar improvements should be made throughout Chatham County where possible.



Figure 15: Ogeechee Road and Dean Forest CAT Bus Stop - Before and After
Source: Google Earth

Economic Impact of Freight Movement

Stakeholders identified the need for stable employment, as well as improved transportation access to jobs. Research has shown that having fulfilling employment, with a living wage, is correlated with positive health outcomes.

RECOMMENDATION 10: MAINTAIN INDUSTRIAL TAX BASE WHILE REDUCING CONFLICT

Preserve industrial land and strengthen economic and transportation infrastructure connections to industrial facilities while limiting non-industrial encroachment into industrial areas.

Providing that land use conflicts are managed and mitigated, the presence of industrial facilities and economic development measures that increase employment rates at these facilities have the potential to enhance the health status of Chatham County residents. Leigh and Hoelzel (2012) examined 13 American cities, all of which were focusing on industrial land preservation, and identified the following strategies being used:

- Restrict non-industrial land uses in the area;
- Curtail market-driven overpricing of industrial land by encouraging industrial business climate and limiting other land uses in the area;
- Establish stricter rezoning criteria;
- Create better workforce training and improve the quality of local industrial jobs;
- Redevelop brownfields for industrial use;
- Integrate public capital and infrastructure priorities with industrial protection;
- Address negative perception of urban industry to policymakers and the public.

Lester et al. (2014) created an index aimed at predicting the vulnerability of industrial land to conversion to some other land use, relying on data from Chicago and Charlotte. They found that municipal policies matter. For example, parcels located within a designated industrial corridor (a Chicago industrial protection designation) were significantly less likely to convert than other areas. This was in fact the single most important factor. Other policies designed to support industrial land uses had similar, though less strong, effects: location inside a federal empowerment zone and

location in an “industrial center” in Mecklenburg County were both negatively associated with land conversion.

There are different ways to address industrial-residential land conflicts. Carefully considered zoning code can reduce the occurrence of such land use conflicts. Overlay districts have been employed in several cities to protect industrial land by explicitly banning land uses that might conflict. For example, Baltimore’s maritime industrial zoning overlay district prohibits hotels, offices, restaurants, and other conflicting land uses (*Zoning Code of Baltimore City*, 2015). Changes must ensure that maritime industrial land will be protected (*Zoning Code of Baltimore City*, 2015). The program has generally succeeded in protecting industrial land (RESI, 2008). Similarly, Chicago has a “planned manufacturing district,” which is a zoning overlay severely restricting industrial rezoning when the rezoning would produce incompatible land uses (*Chicago Zoning and Land Use Ordinance*, n.d.). This program has allowed businesses to grow, although its success is mixed since manufacturing’s share of employment has fallen (Rast, 2005).

In addition to zoning and the use of buffers to reduce conflicts, Chatham County can leverage industrial land uses for better health outcomes by:

- Strengthening transportation (particularly transit, vanpool, and carpooling) connections between residential areas and industrial/logistics facilities to facilitate job access
- Continuing to build programs and connections between industrial facilities and community development efforts with economic development approaches (incentives, tax breaks to provide subsidized services) and programmatic efforts (education and job training programs with industry input)

RECOMMENDATION 11: STRENGTHEN WORKFORCE DEVELOPMENT OPPORTUNITIES

Connect employers that will benefit from improved freight transportation with regional workforce development organizations so local residents can be trained to fill new jobs.

Companies that move freight, store freight, or provide ancillary services can strengthen collaboration with workforce development agencies to ensure that the economic benefits of transportation investments translate into local jobs. Transportation improvement projects (and projects to mitigate their impacts) could result, directly and indirectly, to jobs for:

- Construction workers – transportation infrastructure
- Landscaping crews – urban tree planting and green space maintenance
- Traffic signal technicians – as signal timing is coordinated along freight corridors
- Truck drivers
- Logistics and warehousing workers

Training is necessary to allow residents to fill these jobs. For example, most employers of truck drivers require them to have a high school diploma or GED. Additionally, many require drivers to attend truck-driving schools; these programs (either privately offered or through a community college) typically take between three and six months to complete (Bureau of Labor Statistics, 2014).

However, more workforce training is needed in Chatham County. Armstrong Atlantic State University conducted a workforce development analysis for the Savannah Economic Development Authority. A survey of employers (55 responses) found that a majority of respondents, especially

in service, warehousing, and manufacturing industries, agreed that applicants lacked enough formal education or specialized skills. Yet 73% of these employers did *not* work with a workforce development agency to fill entry-level job openings (Armstrong Atlantic State University, Center for Regional Analysis, 2014). Integration of workforce development initiatives with the freight industry and transportation infrastructure improvements requires collaboration between many partners that are not conventional CORE MPO stakeholders, such as:

- Economic Opportunity Authority for Savannah-Chatham County, Inc.: <http://www.eoasga.org/>
- Coastal Workforce Services: <http://www.coastalworkforceservices.org/>
- Coastal Center for Development Services (for adults with developmental disabilities): <http://www.ccdsavannah.org/>
- United Way of the Coastal Empire: <http://www.uwce.org/our-work/economic-independence/employment-stability/>
- Step Up Savannah: <http://stepupsavannah.org/works/>

While the CORE MPO's role is not to run workforce development programs, as part of the Metropolitan Planning Commission, the MPO/MPC is well-positioned to convene discussions among workforce and economic development organizations and the companies that would benefit directly and indirectly from freight transportation improvement projects.

RECOMMENDATION 12: ENSURE TRANSIT ACCESS TO JOBS

Over the long-term, work with Chatham Area Transit (CAT), regional employers, and current employees to assess transit needs and plan for new or adjusted commuter bus routes.

Lack of public transit access is a barrier to employment. Armstrong Atlantic State University's survey of human resource professionals in Chatham County (90 responses) showed that "27% of firms were not accessible by public transportation" and "20% of HR representatives agreed applicants lack adequate transportation." Focus groups with local job-seekers also found that transportation was a barrier to securing a job (Armstrong Atlantic State University, Center for Regional Analysis, 2014).

Further analysis is needed to fill the gaps in transit access to jobs. Previous plans such as Parking Matters have recommended transit service improvements, but these recommendations were largely limited to circulator routes within the City of Savannah (Parking Matters, 2016). To address access to freight-related jobs in other areas of Chatham County, the following actions should be undertaken:

- Business location data should be periodically compared with Chatham Area Transit bus routes and stops to identify where employment growth may necessitate new or additional service.
- Current employees of companies not accessible by transit should be engaged through focus groups to understand their transportation needs. Focus group participants should be limited to employees who have expressed that transportation is a challenge (e.g., through a survey).
- Workforce development organizations should be included in the planning process to understand potential transit needs of the individuals they train and place.

- Any new routes or bus stops (especially those located on high volume truck routes) should be coordinated with pedestrian safety improvements for riders.

RECOMMENDATION 13: MAXIMIZE INTER-AGENCY COLLABORATION IN VISIONING AND PLANNING

Coordinate with agencies, stakeholders, community members, and other planning processes that are traditionally separate from freight planning.

Freight planning's function-specific nature makes it appear detached from traditional planning concerns and partners, including transit agencies, neighborhoods associations, and community groups. While freight planning requires technical analyses and input from freight industry stakeholders, the HIA reveals that freight activity is still connected with the region's quality of life and development trajectory. Therefore, freight planning should use as its foundation the community vision gleaned from community engagement and parallel efforts, such as the Chatham Community Blueprint. Coordinating with transit is important to ensure that the truck routes have adequate pedestrian infrastructure to avoid modal conflicts. Functionally broad collaboration surpassing direct freight and technical concerns can result in a freight plan sensitive to the movement of freight and corresponding impacts for the region.

5.3 Recommendations for EJ Areas of Greatest Opportunity/Concern

This section identifies opportunities based on each EJ area's specific appraisal results. The project team identified five EJ areas that scored highly on the vulnerability scoring assessment using demographics, land use, transportation, and health indicators (Table 9). All of these identified areas have transportation projects either within them or nearby which are listed in the CORE MPO freight study. These projects would also potentially have an impact on the surrounding communities. Based on this scoring methodology, the HIA team further examined the CORE MPO projects located either within or near the EJ areas. These projects are assigned a time frame of short, medium, or long term in the freight study.

Table 9: EJ Areas Identified as Having Highest Health Vulnerabilities

Final EJ Selection Area	Top 5 – Score
Garden City – EJ 1	11
Port Wentworth	10
Savannah – EJ 1	11
Savannah – EJ 3	10
Unincorporated Chatham County – EJ 2	10

Transportation projects from the freight study and existing land use were examined in order to provide recommendations to improve health, safety, and livelihoods for vulnerable populations living in Garden City EJ Area 1, the Port Wentworth EJ Area, Savannah EJ Area 1, Savannah EJ Area 3, and Unincorporated Chatham County EJ Area 2. Through these recommendations, the goal of improving the efficiency of truck movement can be aligned with the goals of the communities that are impacted.

Garden City EJ Area 1: Wheat Hill / Chatham City

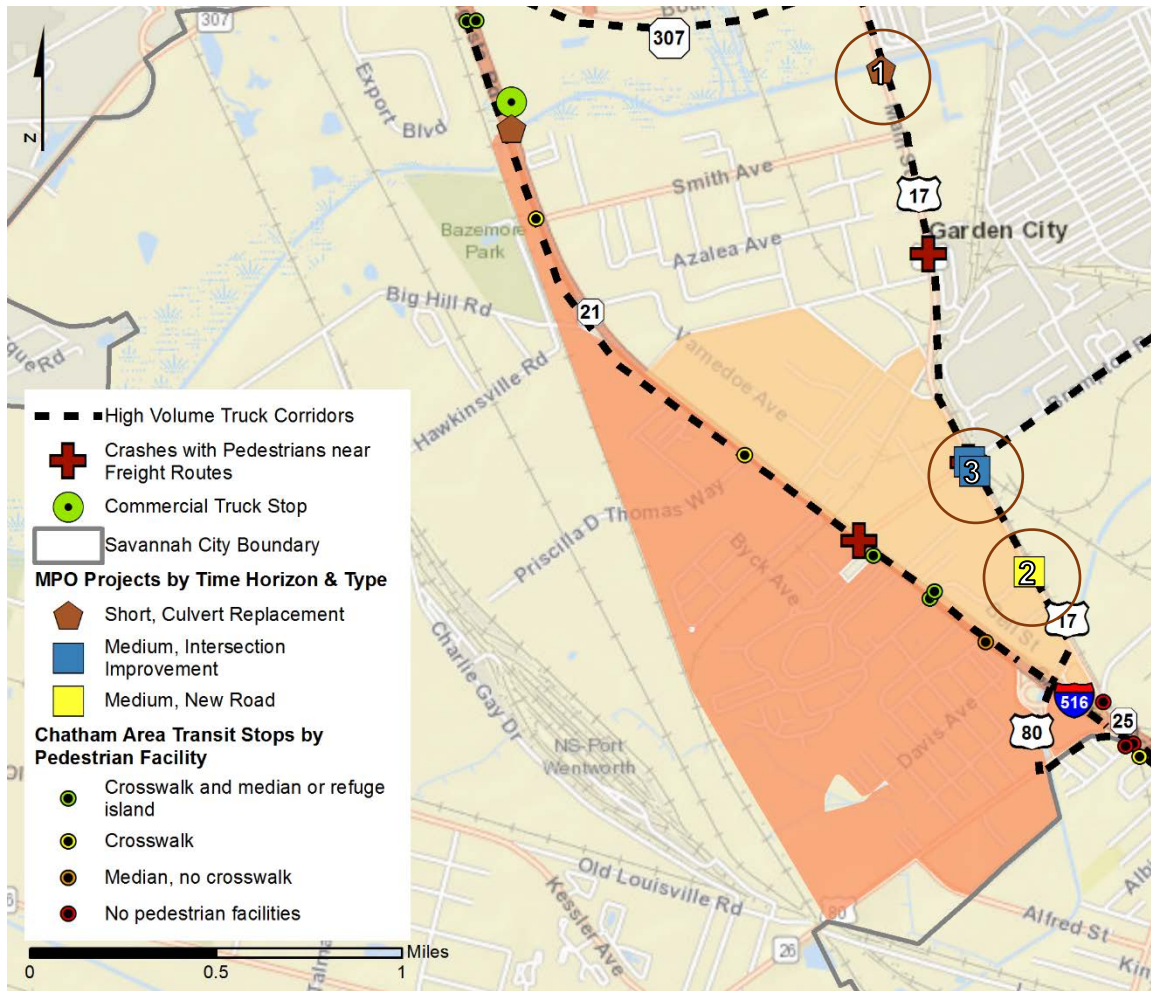


Figure 16: Garden City EJ Area 1 - Transportation Projects

In Garden City, State Route 25 had a culvert replacement project (#1 in map above) listed in the latest CORE MPO FY15-18 TIP at Pipemakers Canal (CORE MPO, 2014). The bridge offers pedestrian accommodation, which can be maintained and improved into a walkway with safer separation from vehicle traffic. The culvert replacement to the west on SR 21, while not yet in the approved TIP, can incorporate tree planting on the side of the high-volume roadway to reduce future noise levels to surrounding neighborhoods.



Figure 17: State Route 25 at Pipemaker Canal
 Source: Google Streetview, 2016

A second project in the area (#2 in the map above), the Brampton Road Connection that extends from State Route 21 Spur across State Route 25 to connect to Brampton Road, Georgia Ports Authority Gate 2, and Foundation Drive will bring increased heavy commercial truck traffic related to the intermodal terminal transfer facilities in the area. While improving the efficiency of goods movement between the port, rail, and interstate highway systems, this proposed 4-lane highway will raise truck traffic loads. In order to reduce negative impacts on the neighboring environmental justice area, the intersection of the new road connection at Burnsed Boulevard and Main Street has a lack of pedestrian amenities, which can be incorporated into the design of the project, particularly on the south-facing side that is the edge of the EJ area.

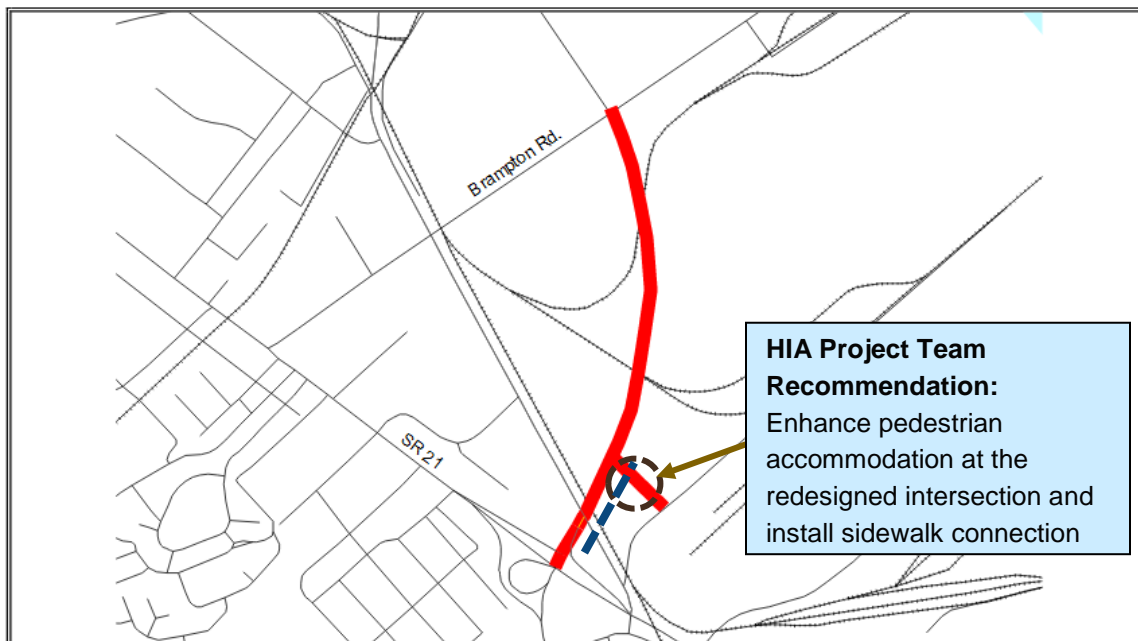


Figure 18: Recommendation for Brampton Road Connection
 Source: CORE MPO TIP FY15-18

Additionally, two intersection operational improvements proposed in the CORE MPO Freight Study over the medium-term (6-15 years) also provide an opportunity to improve pedestrian safety and create an enhanced pedestrian connection for those living in this area. Those two intersection improvements are located further north along State Route 25 at Brampton Road:

- Intersection Operational Improvements – SR 25 at Brampton Road
- Intersection Operational Improvements – SR 25 at SR 21 – Right Turn

Improved pedestrian accommodation is particularly important on the west-facing side of State Route 25. Transportation impacts will also be shared with a medium-term (6-15 years) project in Port Wentworth. The State Route 21 corridor safety improvement project. Specific recommendations for that project are provided in the Port Wentworth EJ Area section below.

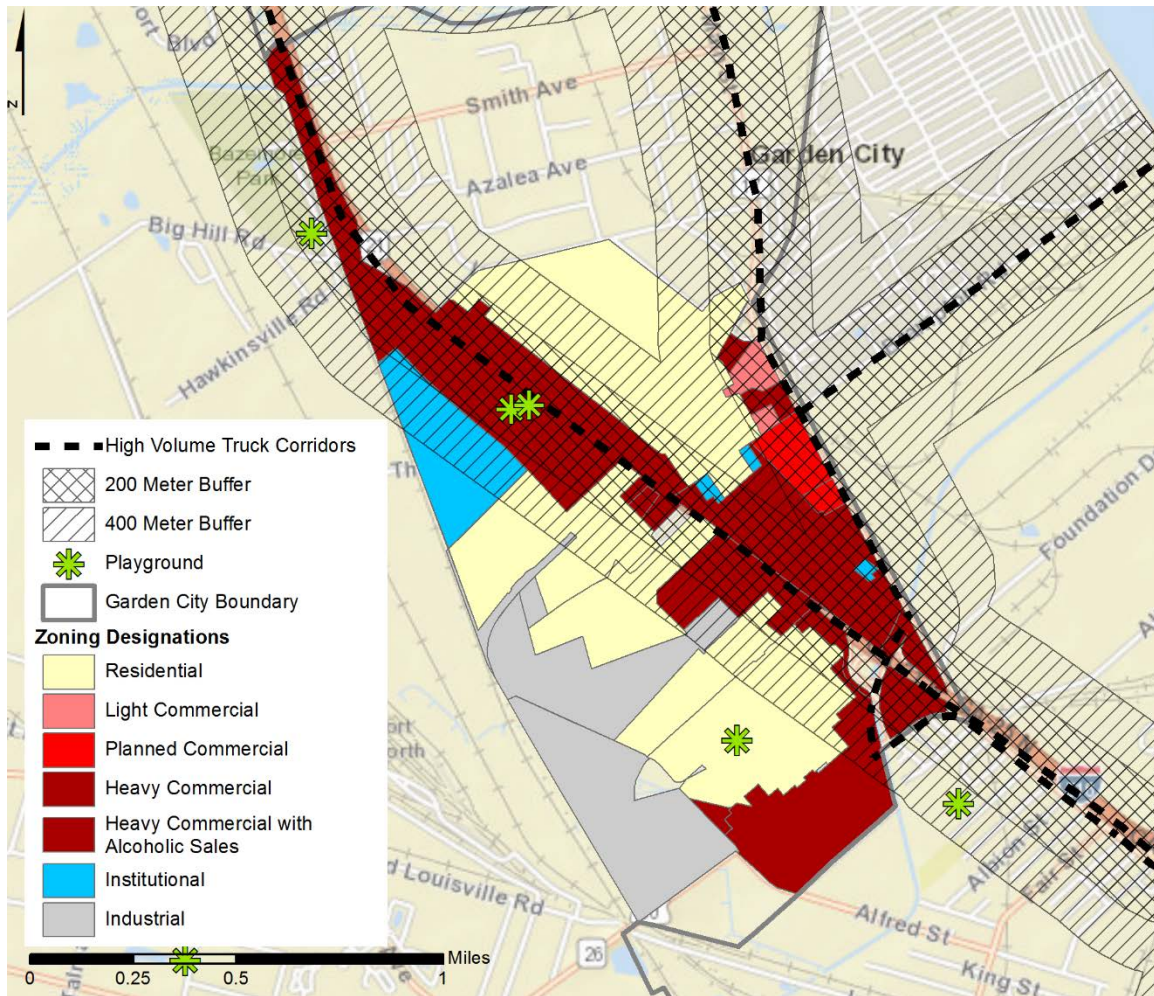


Figure 19: Garden City EJ Area 1 – Zoning

The HIA team recommends additional commercial zoning land use designations along State Route 21. Several playground areas are located along the freight route. The area high school, which contains some of these playground areas, is located along this high volume truck route. The HIA team suggests a wider vegetated buffer along the school property boundary that is adjacent to the truck route (preferably 400 meters).

Figure 20 shows that much of the Wheat Hill and Chatham City areas of Garden City have above average incidences of ER visits due to asthma. The western edge of the EJ area is also bordered by a rail line and close to a rail yard. Though not shown, the 1000 foot advisory buffer around the rail yard would extend to this area, so asthma incidences could also be related to the freight rail activity.

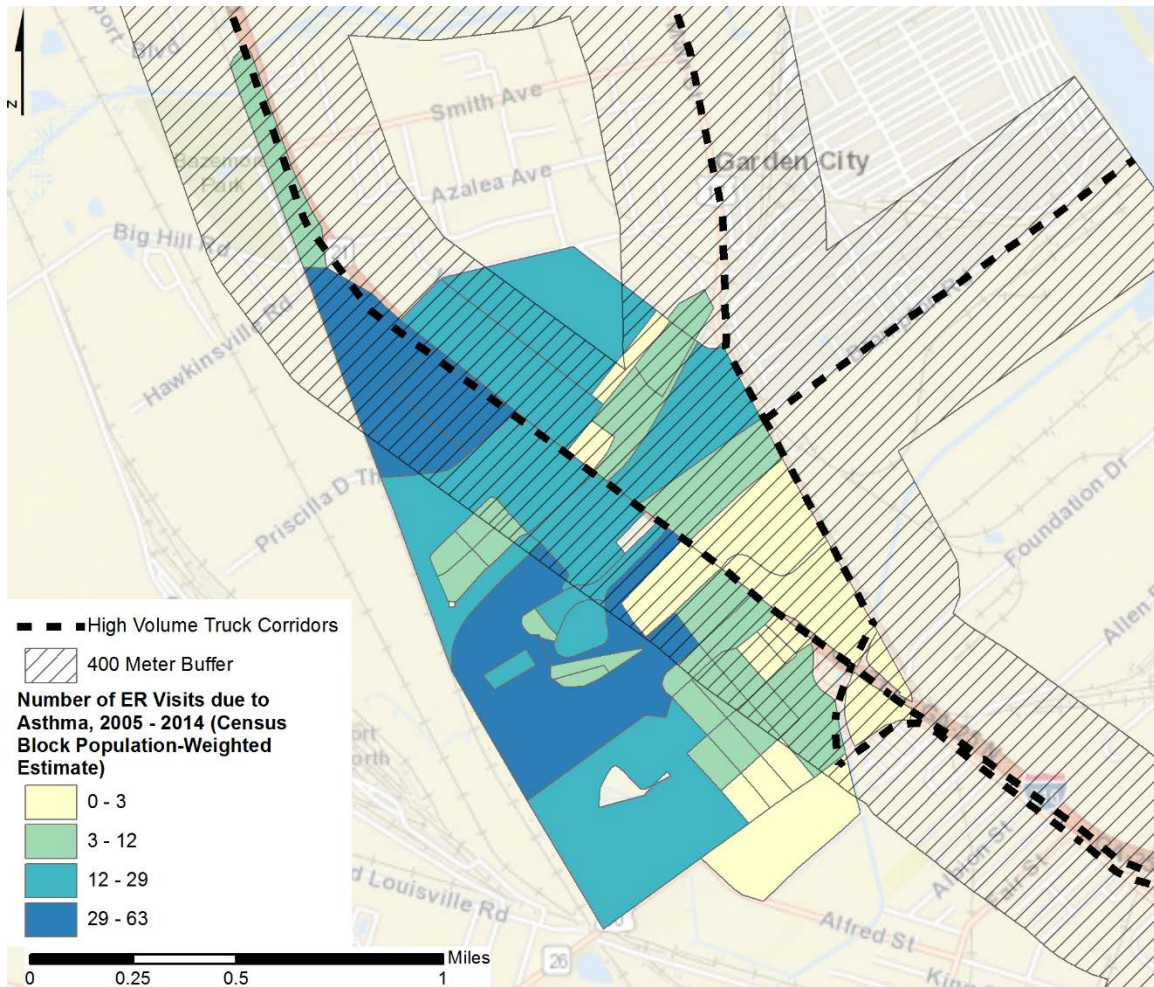


Figure 20: Garden City EJ Area 1 - Health: Asthma ER Visits

The entire EJ area also has higher incidence of low birthweight, as shown in Figure 21. Land use separating residences from heavy truck corridors and vegetative buffers can be implemented to reduce air pollution-related health risks, such as low birthweight.

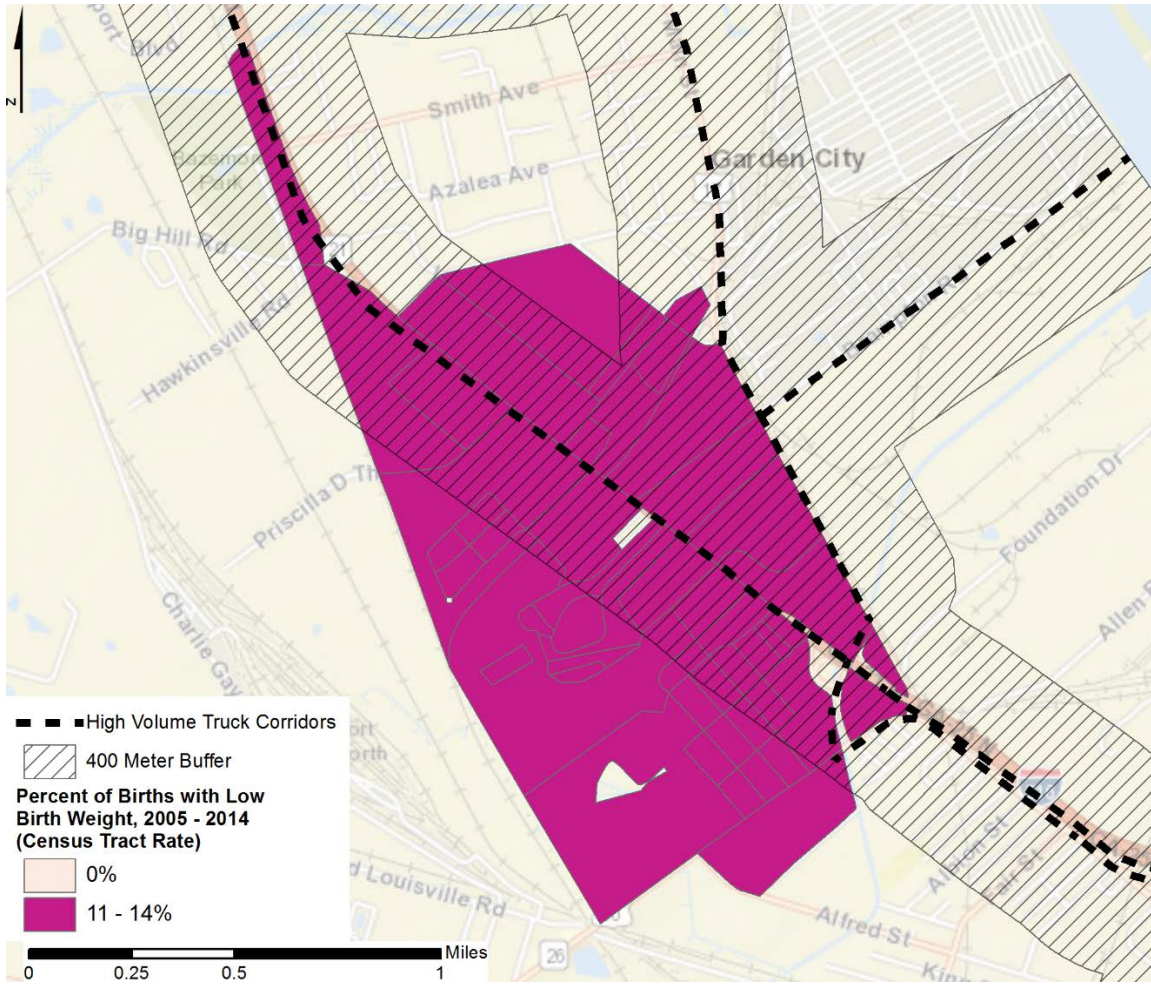


Figure 21: Garden City EJ Area 1 - Health: Low Birth Weights

Port Wentworth

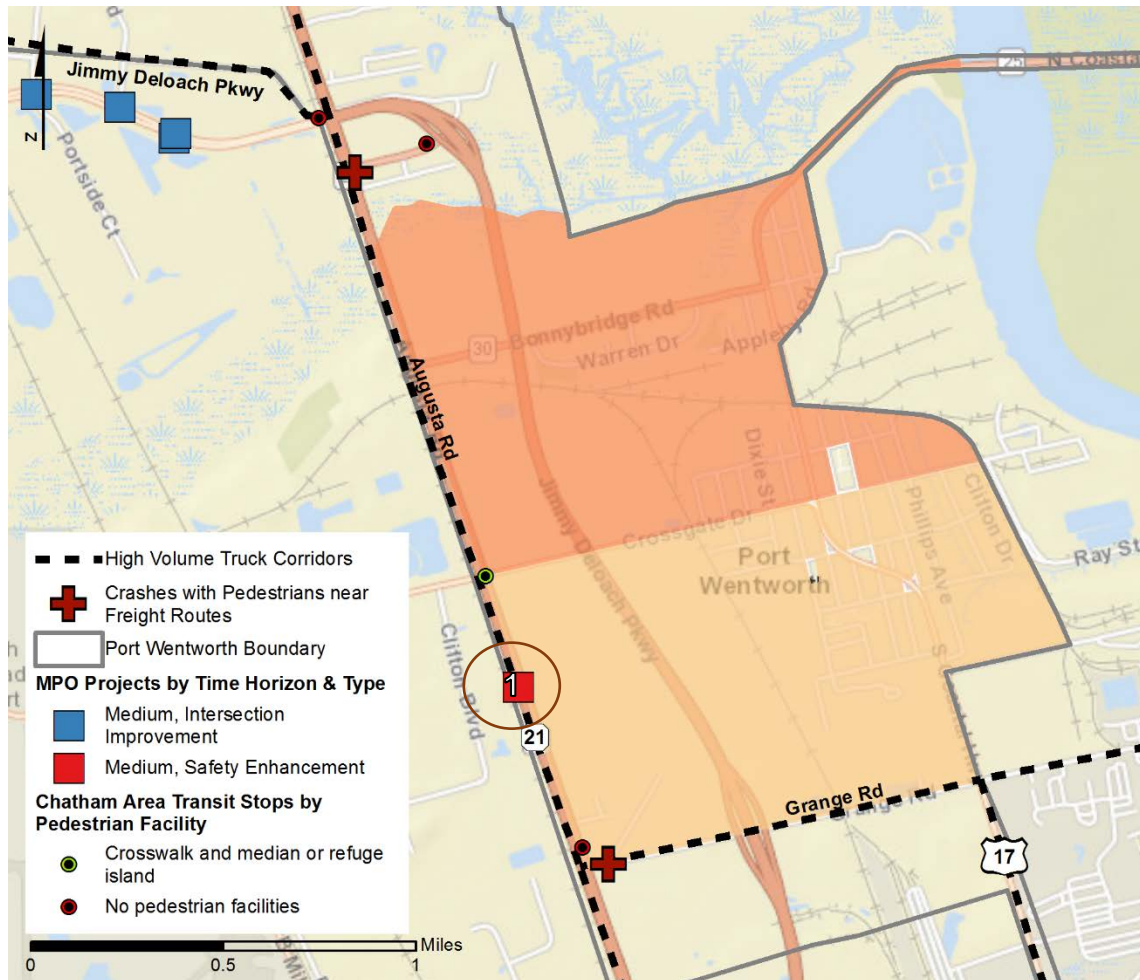


Figure 22: Port Wentworth EJ Area - Transportation Projects

One proposed project has the potential to generate substantial impact in both Port Wentworth and Garden City. The State Route 21 Corridor safety enhancement, which continues through unincorporated Chatham County is near several EJ communities. Those areas can substantially benefit from safety enhancements that improve pedestrian accommodation along the corridor. The 2013 State Route 21 Corridor Study has Alternative 10 (the option for State Route 21 which includes grade separation) presented as the preferred option. Grade separation will remove through truck traffic from surface streets that residents use most frequently, thereby reducing accident risks. This is a potentially a major safety improvement because of the severity of accidents involving large trucks. Moreover, congestion reductions could reduce local emissions. However, there is also a risk of negative health effects on the surrounding EJ communities if the project results in very large increases in truck traffic, which would increase noise and air pollution. The project focuses on reducing congestion along the widely traveled corridor, but benefits to safety, while positive, were minimally mentioned in the corridor study.

To account for the complex health linkages, the HIA team recommends that the corridor study alternative be evaluated to examine the potential health impacts, including changes that might occur in levels of emissions and noise. Elevated lanes in areas where existing communities are

located have the potential to disrupt community activity even if connections are maintained at the surface. As part of the reevaluation the HIA team recommends that the following analysis be completed:

1. Determine the emissions and noise impacts of a proposed improvement, which are currently not included in the corridor study (CORE MPO, n.d.)
2. Amend the project cost-benefit analysis to include environmental, health, and social impacts. Additionally, calculate the long-term 50-year cost of maintaining the new roadway facility in relation to the current facility. The 2013 cost-benefit analysis includes only congestion costs and construction costs (CORE MPO, n.d.);

For examining how to improve safety and travel options for people along the corridor, the improvements happening on West Bay Street provide a best practice that can be used as a considered approach to take for the State Route 21 project.

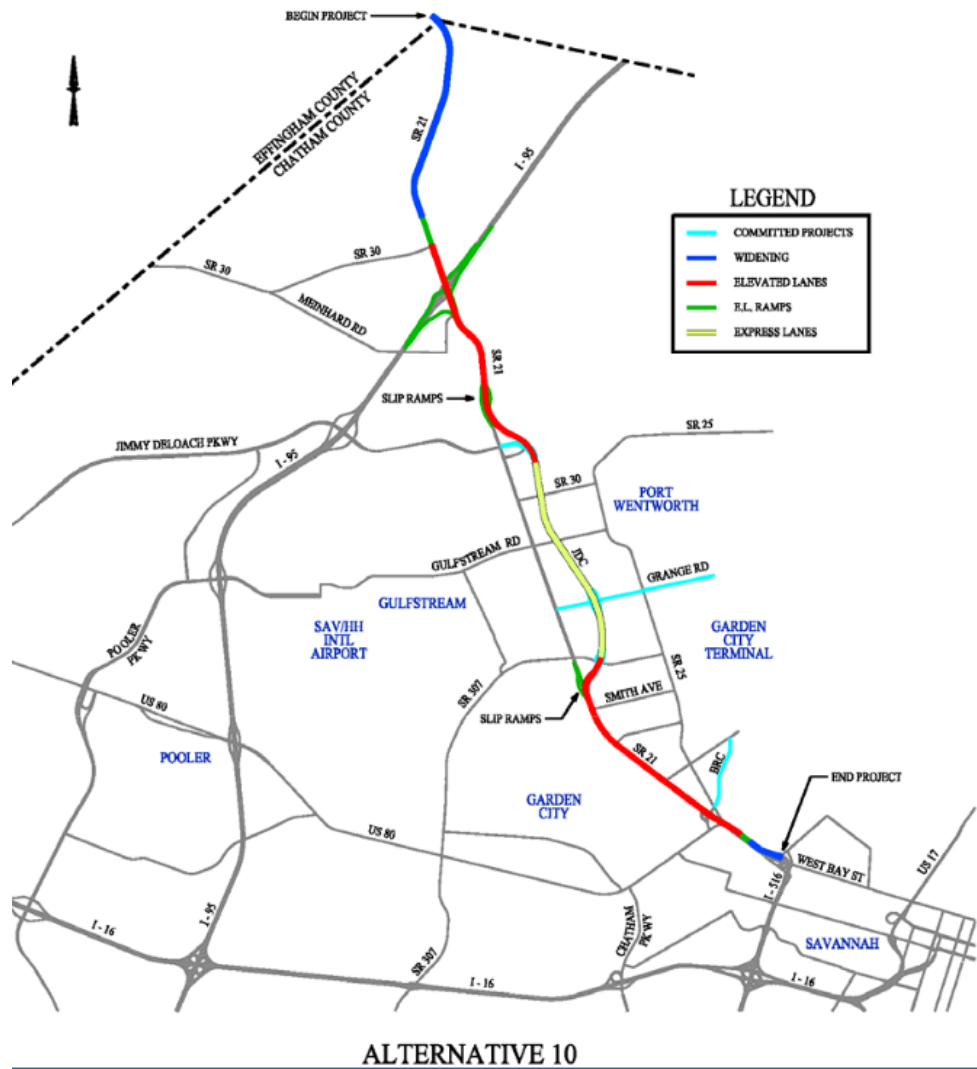


Figure 23: State Route 21 Proposed Improvement - Alternative 10

Source: CORE MPO, n.d.

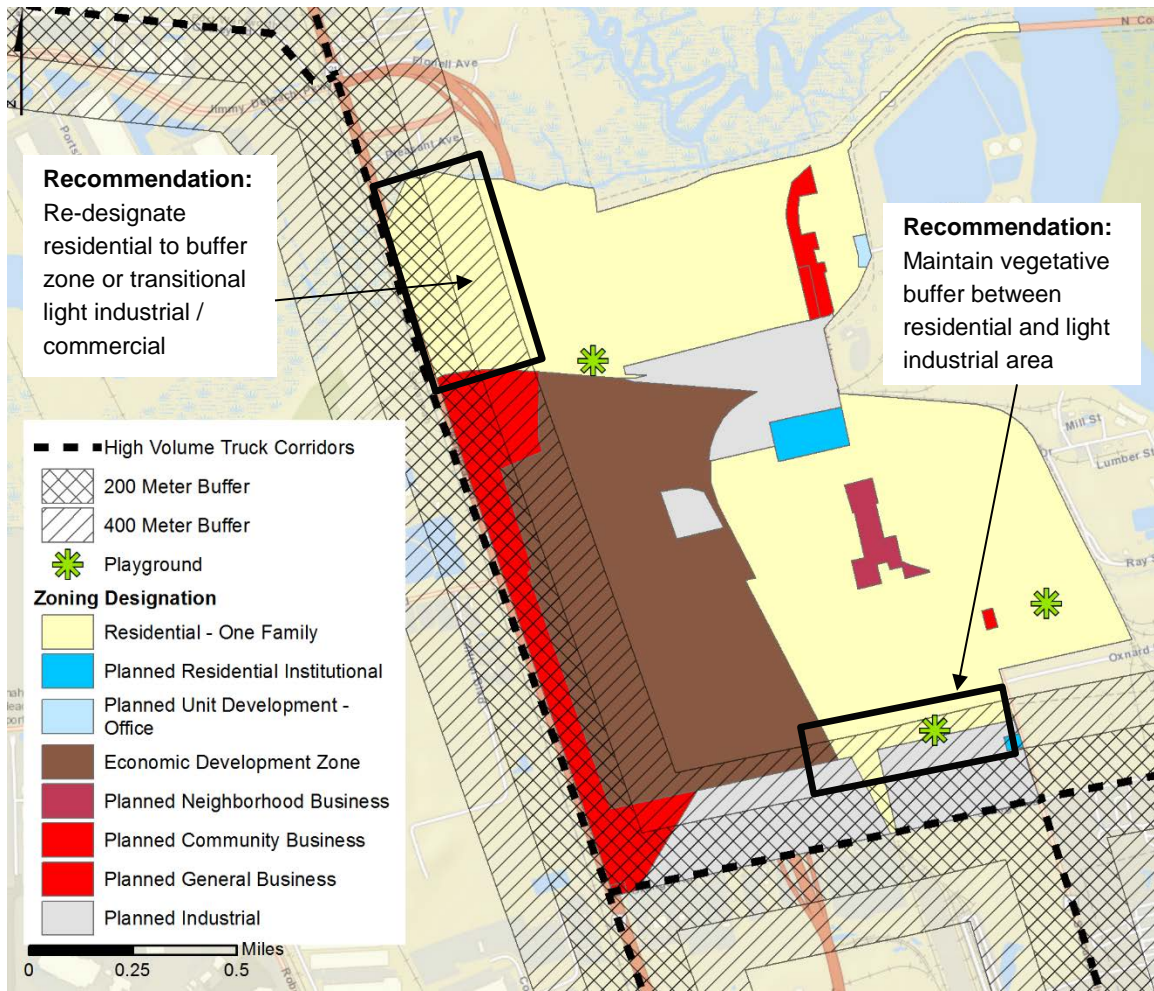


Figure 24: Port Wentworth EJ Area - Zoning

The HIA team provides the following zoning recommendations for the Port Wentworth EJ area:

- Consider the conversion of single-family residential zoning between Highway 21 and Jimmy DeLoach Expressway, which is currently open space (there are a few single family homes to the north along Pleasant Street). The team suggests preserving the 200 meter buffer east of Highway 21. Light industrial or commercial land uses (provided there is sufficient buffer for the homes on Pleasant Street) could be more appropriate.
- Maintain vegetative buffer along Grange Road to the south, especially because Port Wentworth Elementary School is in the southeast corner, and the playground falls within the 400 meter buffer of a high volume truck route.

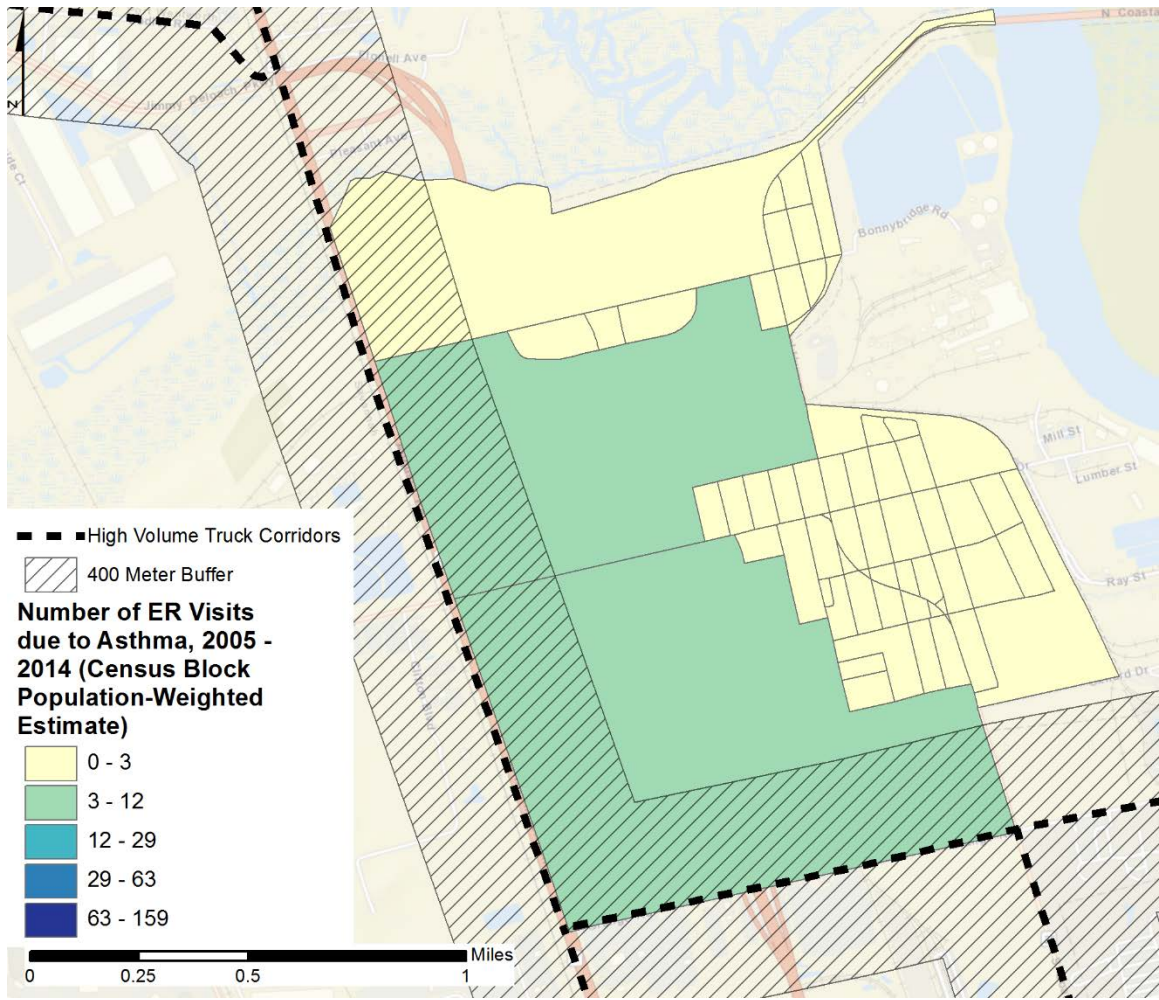


Figure 25: Port Wentworth EJ Area - Health: Asthma ER Visits

In Port Wentworth the number of asthma emergency room visits is greater closer to the high volume truck routes than in surrounding census blocks. Zoning recommendations for establishing residential zoning buffers distancing homes from freight routes can potentially lead to a reduction in asthma emergency room visits. Proposed new residential development should be scrutinized to avoid substantial new populations near the high volume truck routes.

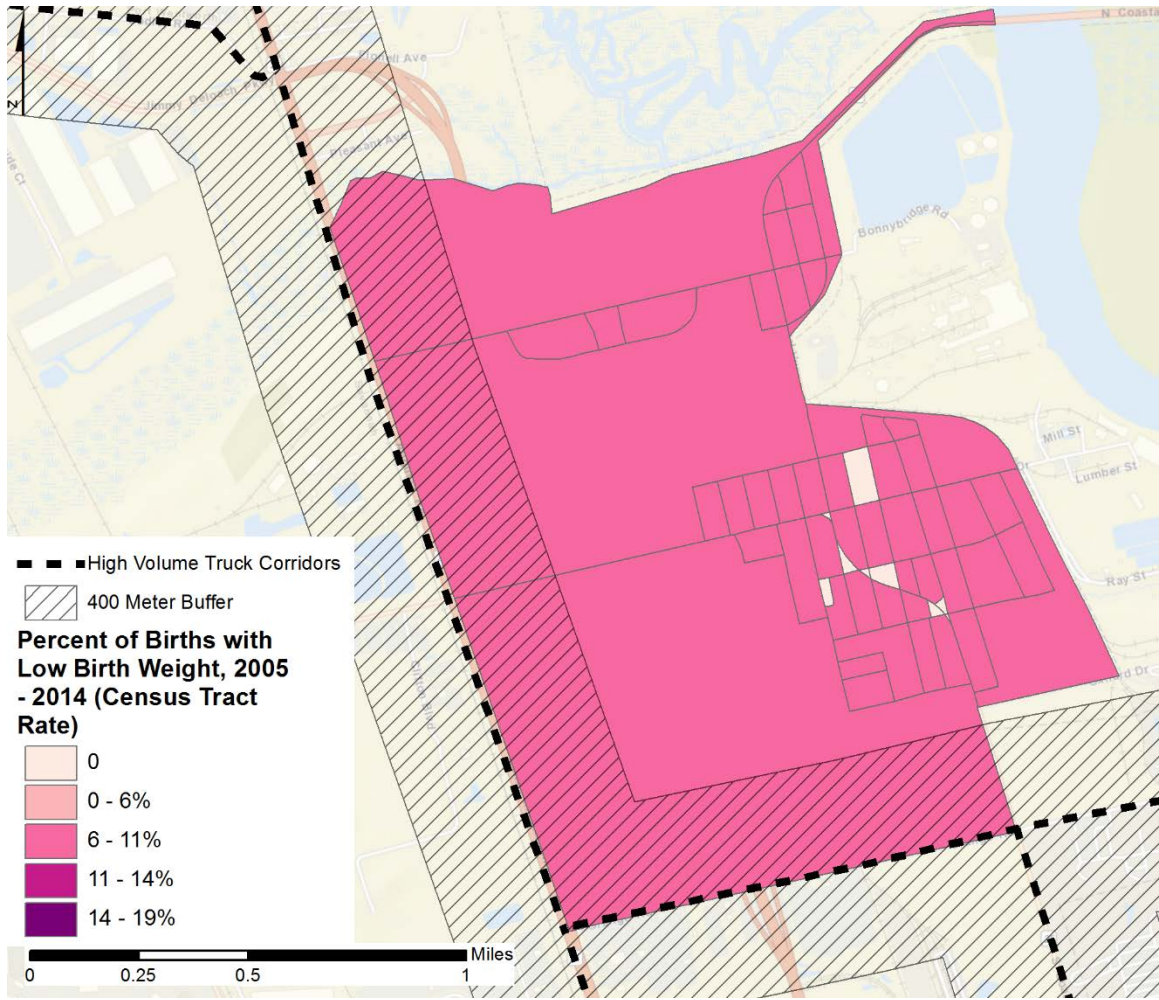


Figure 26: Port Wentworth EJ Area - Health: Low Birth Weights

As shown in Figure 26, the percentage of low birth-weights in this area (8.7%) is higher than the six percent Chatham County average. Heavy truck movement nearby might be one of several components contributing to low birthweight incidence even though the host of third variables precludes causal assertions.

Savannah EJ Area 1: Hudson Hill/Bayview and West Savannah

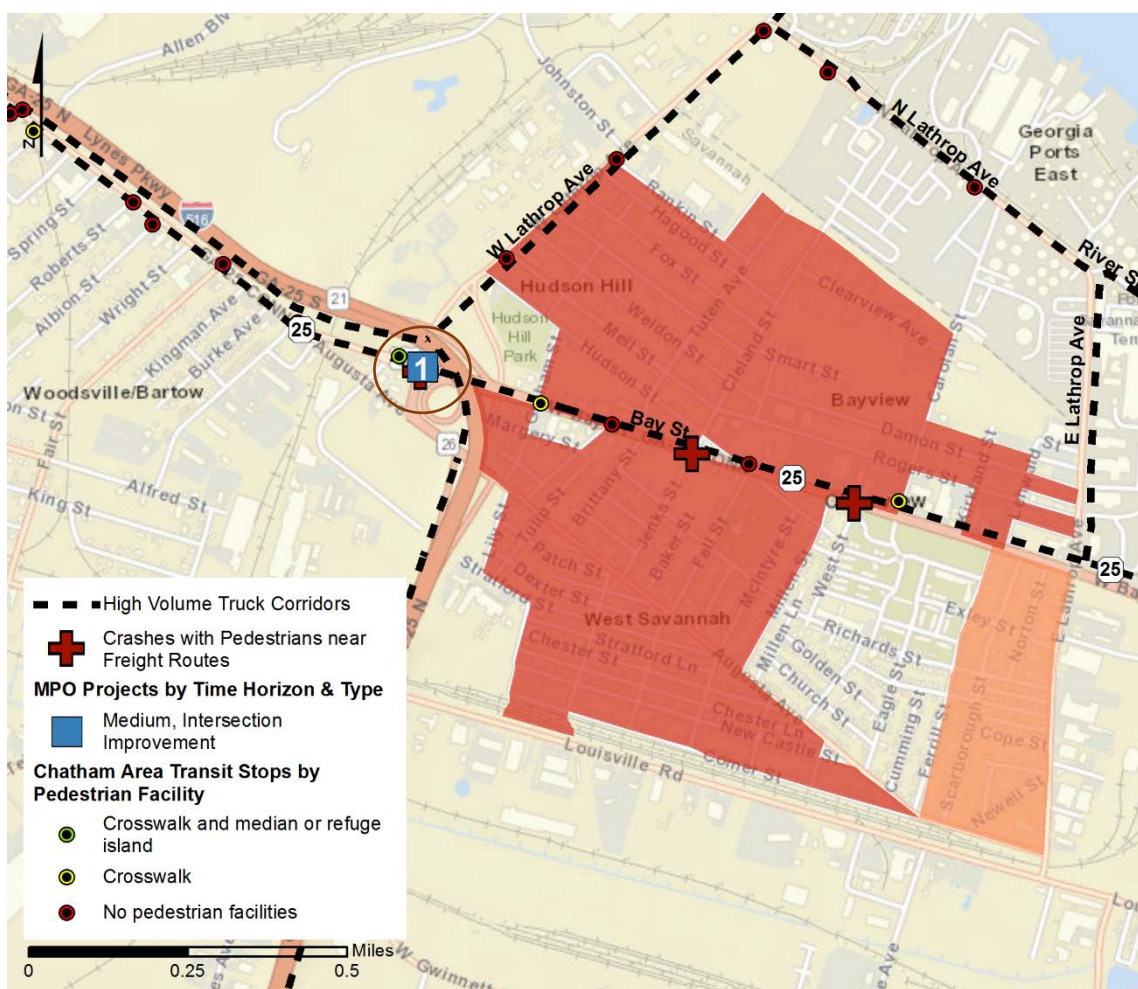


Figure 27: Savannah EJ Area 1 - Transportation Projects

In the Savannah EJ area directly south of the Garden City and Port Wentworth EJ project locations, intersection operational improvements are underway along the State Route 25 Connector, with new pedestrian facilities being added between West Lanthrop Avenue and Collins Street and East Lanthrop Avenue. Chatham County, in collaboration with GDOT, is installing a new pedestrian hybrid beacon that will benefit the population along the West Bay Street corridor. Further pedestrian accommodation is being provided through a raised median and enhanced sidewalk connectivity along the corridor route. Improvements will be made to the corridor through 2018, and with the medium-term (6-15 years) intersection improvement at US 80 at West Lanthrop Avenue, with the right hand turn lane from US 80 southbound at West Lanthrop Avenue (Chatham County, 2016). There is opportunity to use this project (#1 in the map above) to further enhance the pedestrian amenities being added east of the project.



Figure 28: Pedestrian Hybrid Beacon - Installation on State Route 25
 Source: Chatham County Department of Engineering

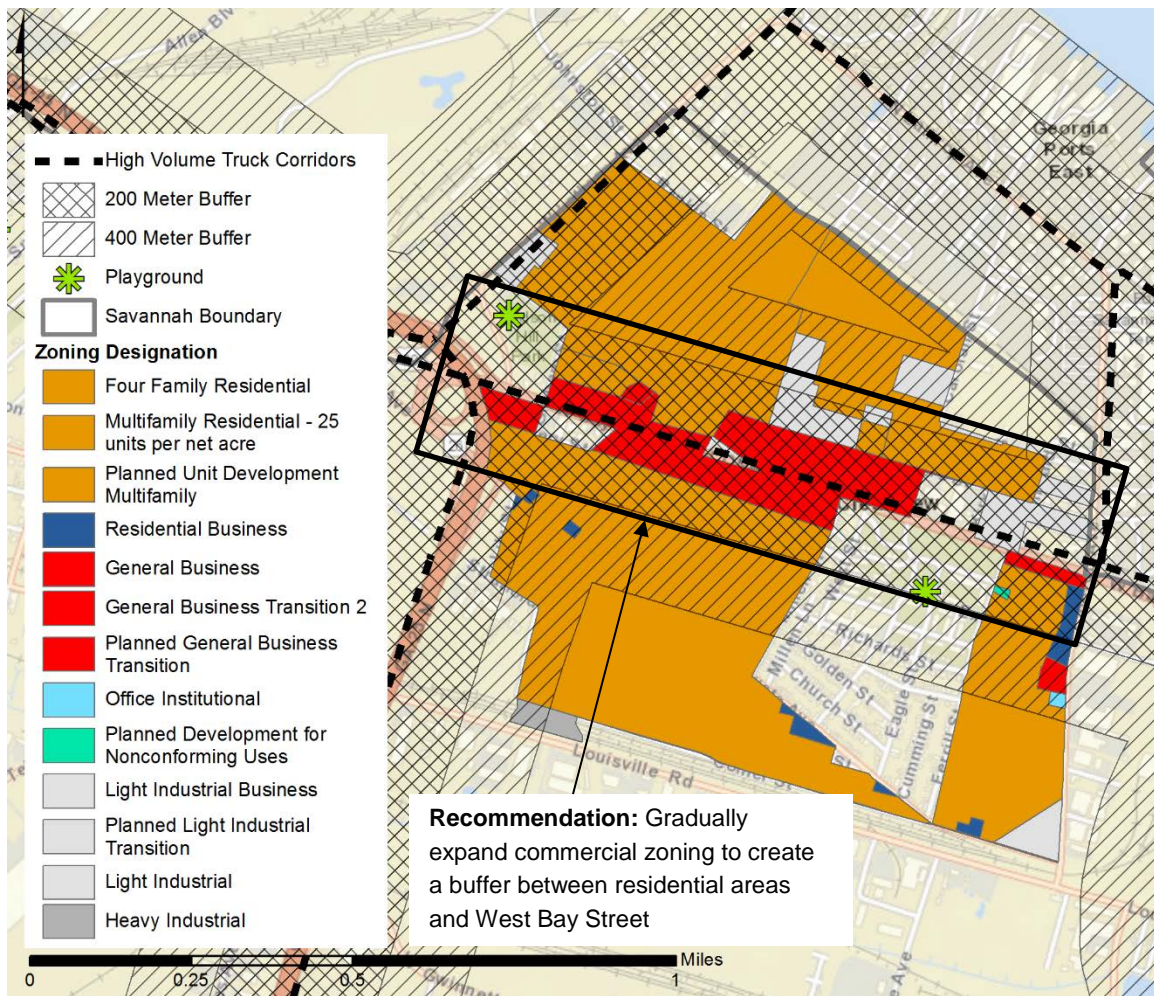


Figure 29: Savannah EJ Area 1 – Zoning

A long-term strategy to reduce health impacts through land use policy may be to rezone areas along high volume truck routes (particularly where multiple routes converge or are located in close proximity to each other) from residential to commercial, industrial, or another non-residential land

use. Savannah EJ Area 1 is a candidate for this long-term strategy because of the number of freight routes, their capacity, and proximity to the port. The HIA team recommends the following:

- Consider urban design strategies in future zoning guidelines, with specific design guidelines for the West Bay Street corridor, to minimize the negative impacts of noise and pollution. Vegetated buffers and enhanced tree coverage could be implemented in the existing areas of high-density residential land use. This is a short- to medium-term strategy.
- Buffer residential land uses on either side of West Bay Street by establishing greater general businesses zoning as a transition along West Bay Street. Businesses should be oriented toward the street with parking in the rear and limited setback from the roadway to create an environment that is safer for pedestrians accessing CAT Route 3B stops and to provide a better pedestrian environment for neighborhood residents accessing these businesses. Gradually expand the buffer zone to extend to 400 meters of the junction of I-516 and West Bay Street, convert future zoning classifications to commercial uses. Land use's permanence makes this a long-term strategy.

Though the playgrounds in Hudson Hill Park and Fellwood Homes are within the 400 meter buffer of the high volume truck route, they are already somewhat shielded from the roadway by vegetated barriers.

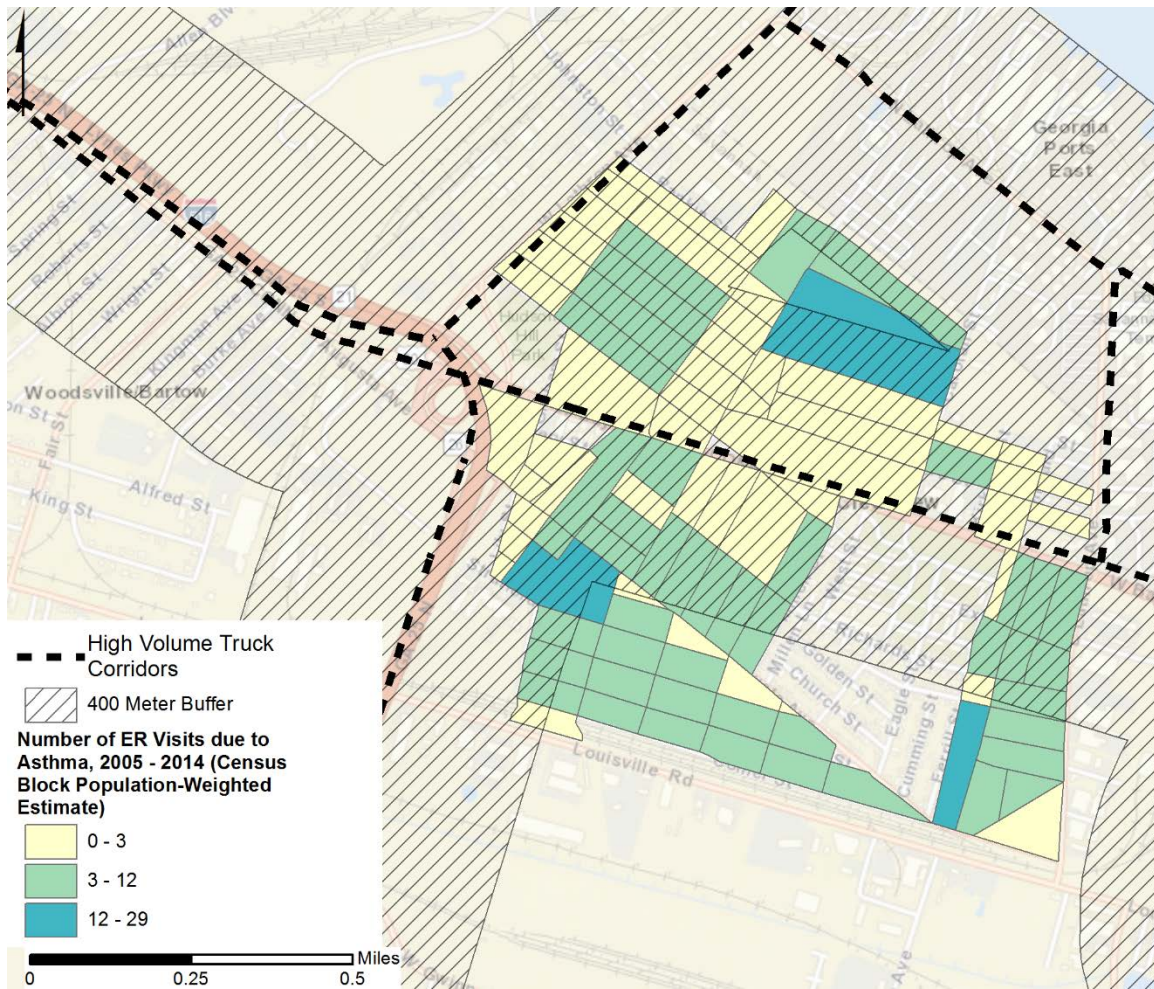


Figure 30: Savannah EJ Area 1 - Health: Asthma ER Visits

Lower numbers of emergency room visits for asthma were noted along the areas of West Bay Street that include a commercial buffer separating the truck route from nearby residences. Although causality cannot be proven, establishing a greater buffer between the roadway and residential land uses through increased commercial zoning may potentially reduce asthma emergency room visits over time. There are also other transportation impacts in this area, given that an active freight rail line is located south of Comer Street which generates noise and emissions. Over the long term, establish a buffer between the rail line and residential areas along Comer Street.

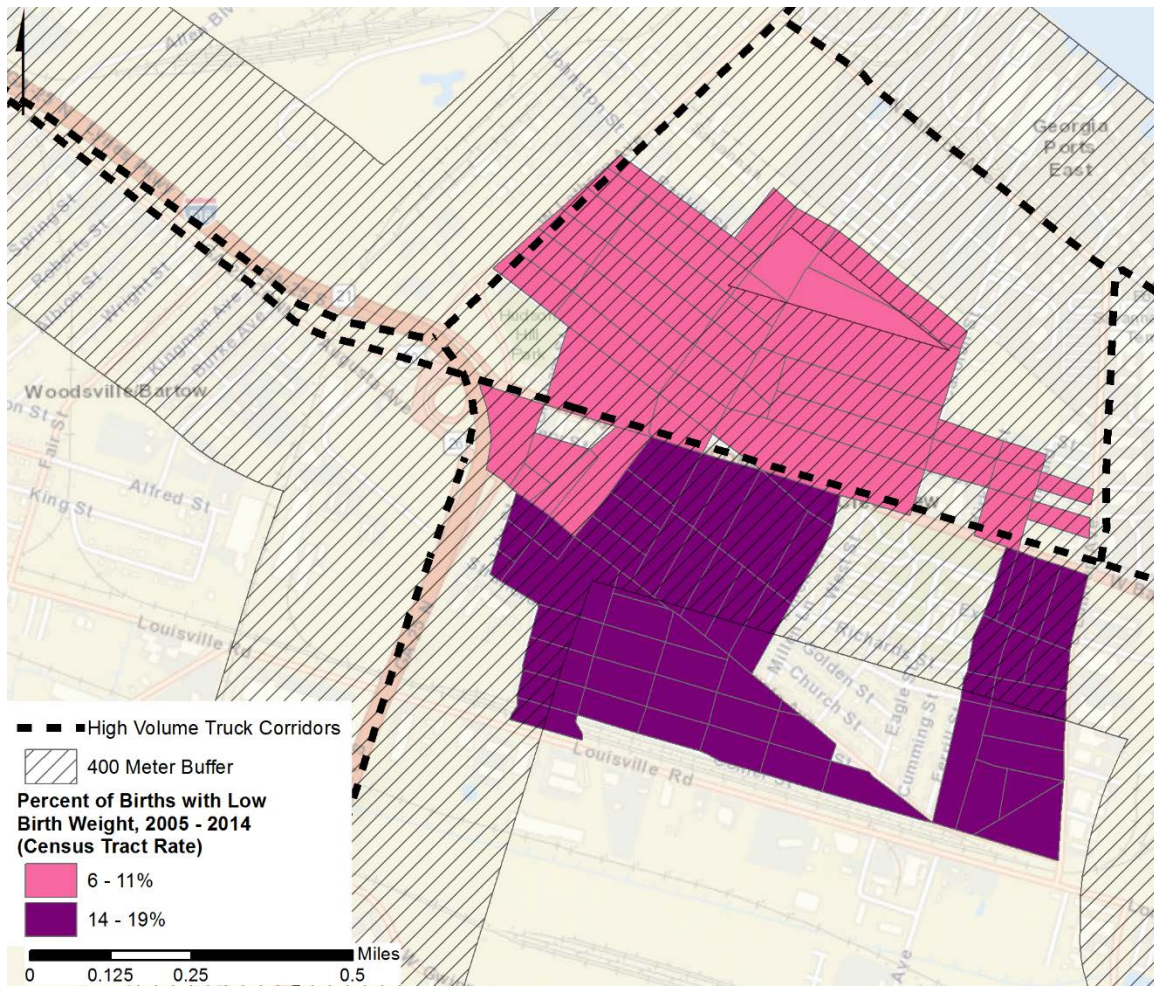


Figure 31: Savannah EJ Area 1 - Health: Low Birth Weights

The percentage of low birthweights is significantly higher south of West Bay Street, but even for census blocks north of the roadway the percentages of low birthweight births are elevated compared to Chatham County. The area south of West Bay Street has significant disruption from several large infrastructure facilities. To the west is I-516, to the south is an operational freight rail line, and to the north is West Bay Street, a high volume truck route. The HIA team recommends buffer enhancements to reduce both noise and air pollutant levels to potentially reduce health problems such as the observed low birth weight births.

Savannah EJ Area 3: Tremont Park / Chatham Parkway

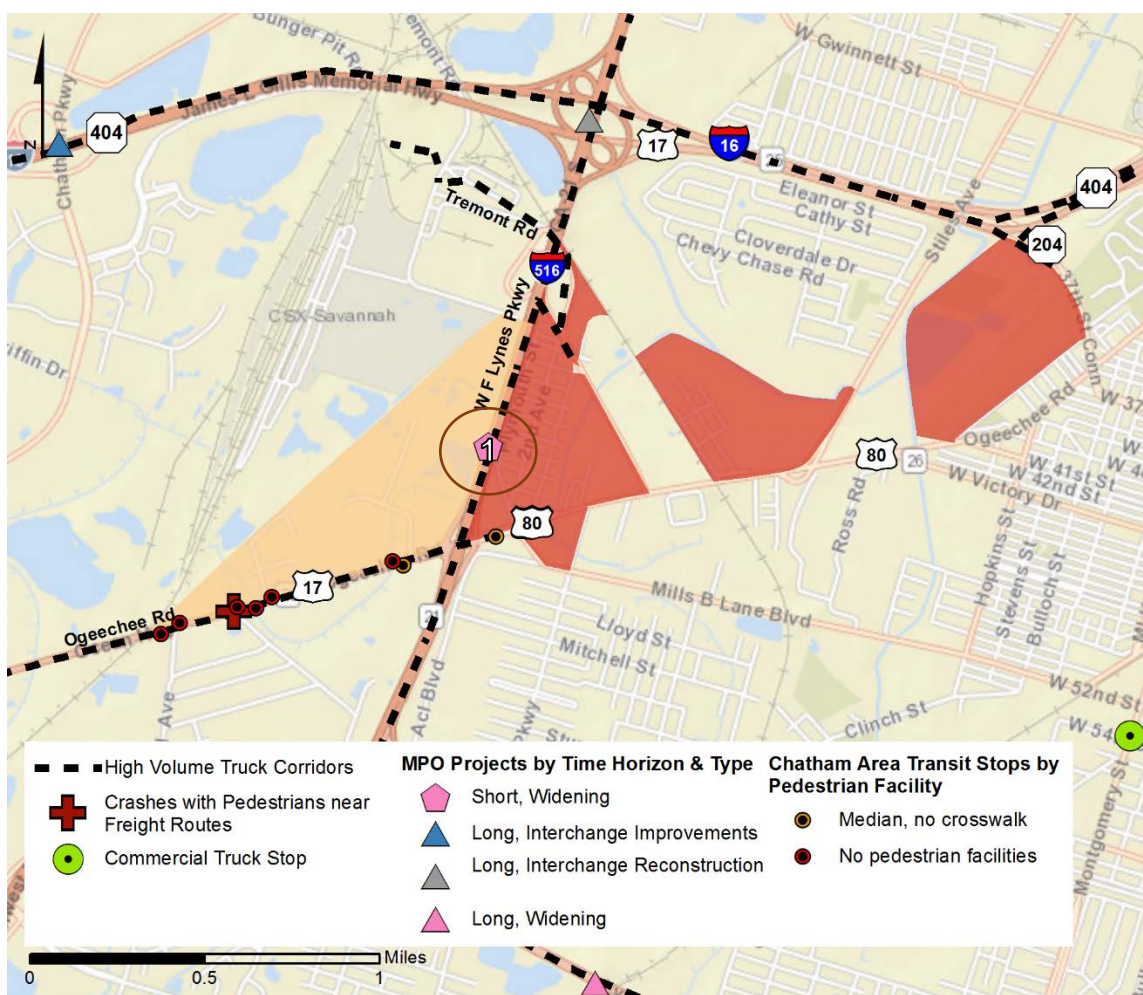


Figure 32: Savannah EJ Area 3 - Transportation Projects

The expansion of I-516 / Lynes Parkway is both a short-term (0-5 years) and long-term (16-25 years) widening priority. The short-term highway widening is occurring between I-16 and Veterans Parkway. This capacity expansion project will likely increase noise levels in the surrounding EJ area. The area directly east of the highway has two residential zoning classifications, single family residential and residential manufactured home. These existing residential neighborhoods are largely within both a 400-meter and 200-meter buffer of the highway. To accommodate the widening and to reduce noise level and emissions impacts, installation of a noise barrier is recommended, or at minimum greater tree coverage along the eastern segment of the highway expansion. Both of these measures can be taken in the short term.

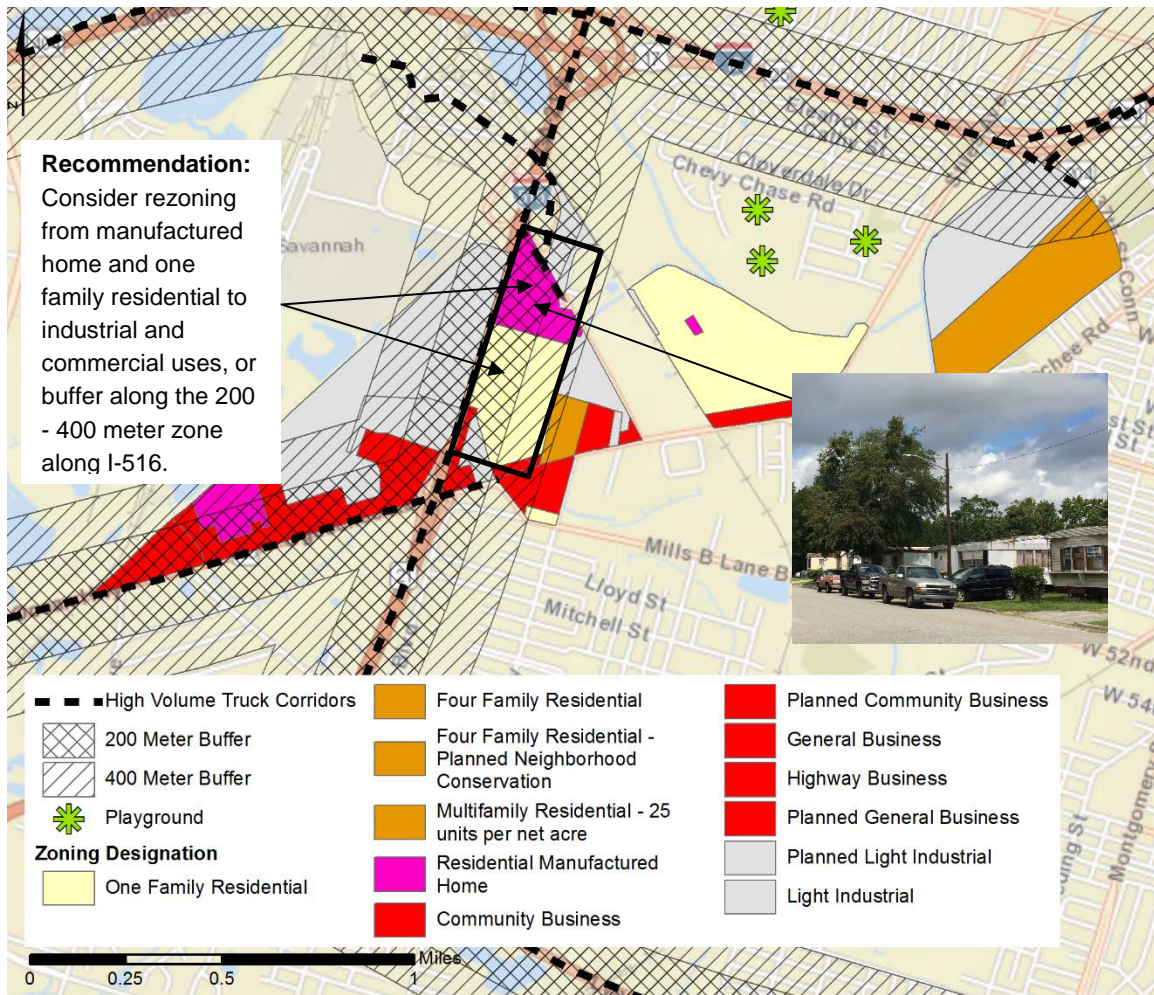


Figure 33: Savannah EJ Area 3 - Zoning

One family residential and residential manufactured home zoning designations are located east of I-516. This area will be highly impacted by the planned I-516 widening project. In the short term, a highway noise barrier along this segment is recommended. For future zoning in the medium and long term, consider restricting uses along I-516 to just industrial and commercial within the 400 meter buffer of I-516, particularly on the east side of the highway where asthma rates are highest.

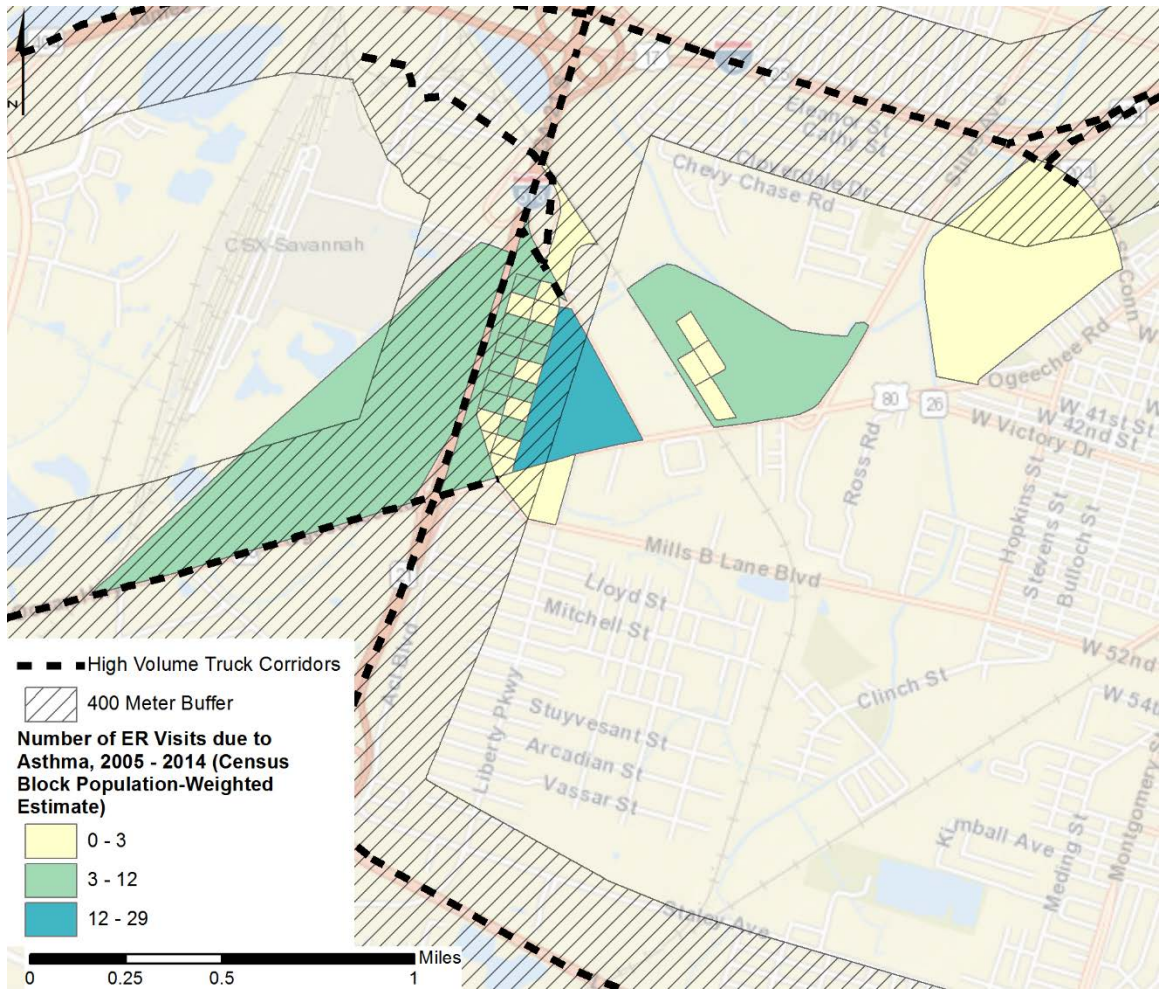


Figure 34: Savannah EJ Area 3 - Health: Asthma ER Visits

The rate of asthma-related emergency room visits is higher east of I-516 than the Chatham County average. Close proximity to the highway and denser concentration of populations leads to elevated incidences. Future zoning strategies and recommended design changes implemented simultaneously with the planned highway improvements can potentially help reduce asthma occurrence over time.

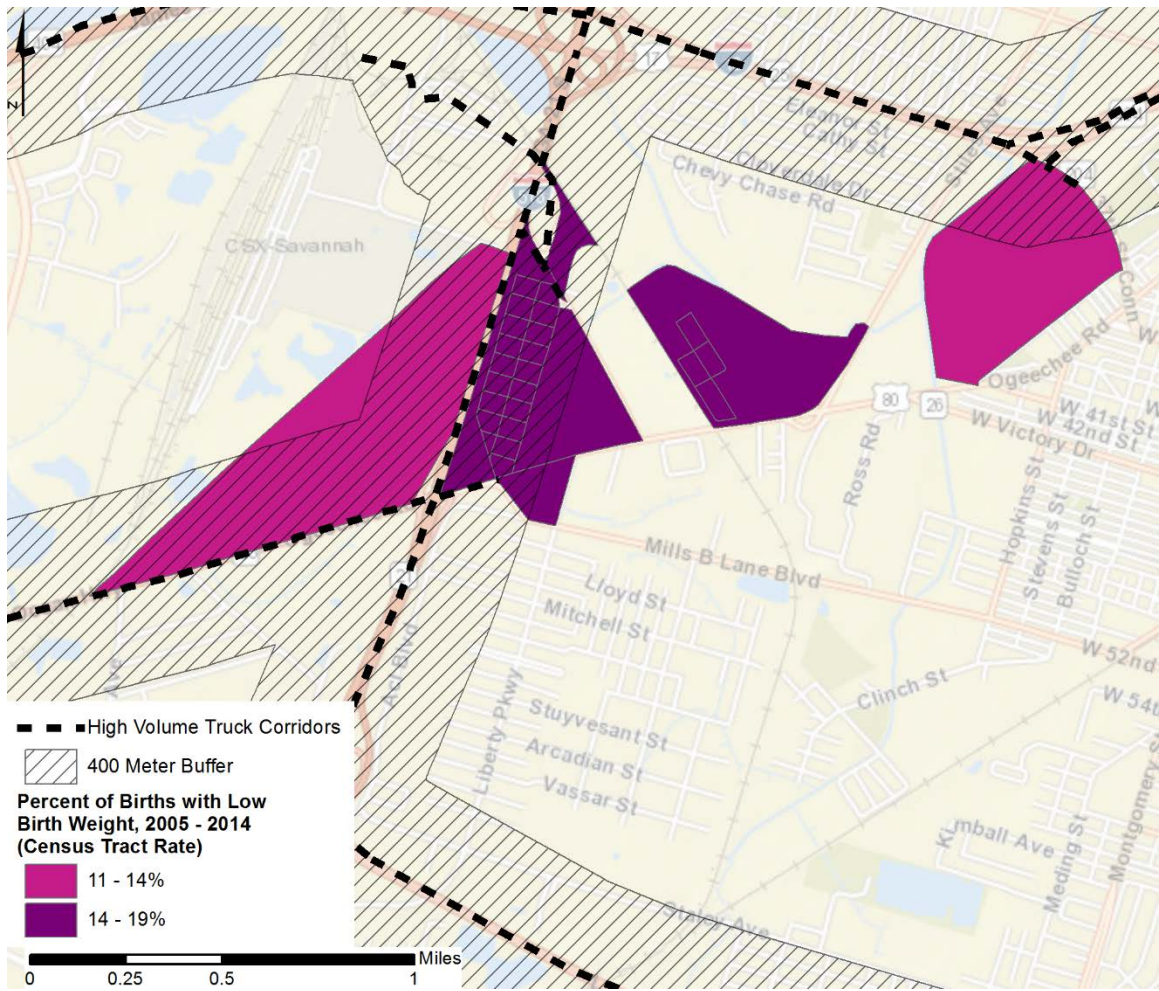


Figure 35: Savannah EJ Area 3 - Health: Low Birth Weights

Low birthweight incidence is more than twice the county average in many of the areas within Savannah EJ Area 3. The area suffers from a higher average rate of low birth weight births than even the other EJ areas. Over time it will be beneficial to establish a buffer of vegetation or more compatible land uses between the corridor and residences.

Unincorporated Chatham County EJ Area 2

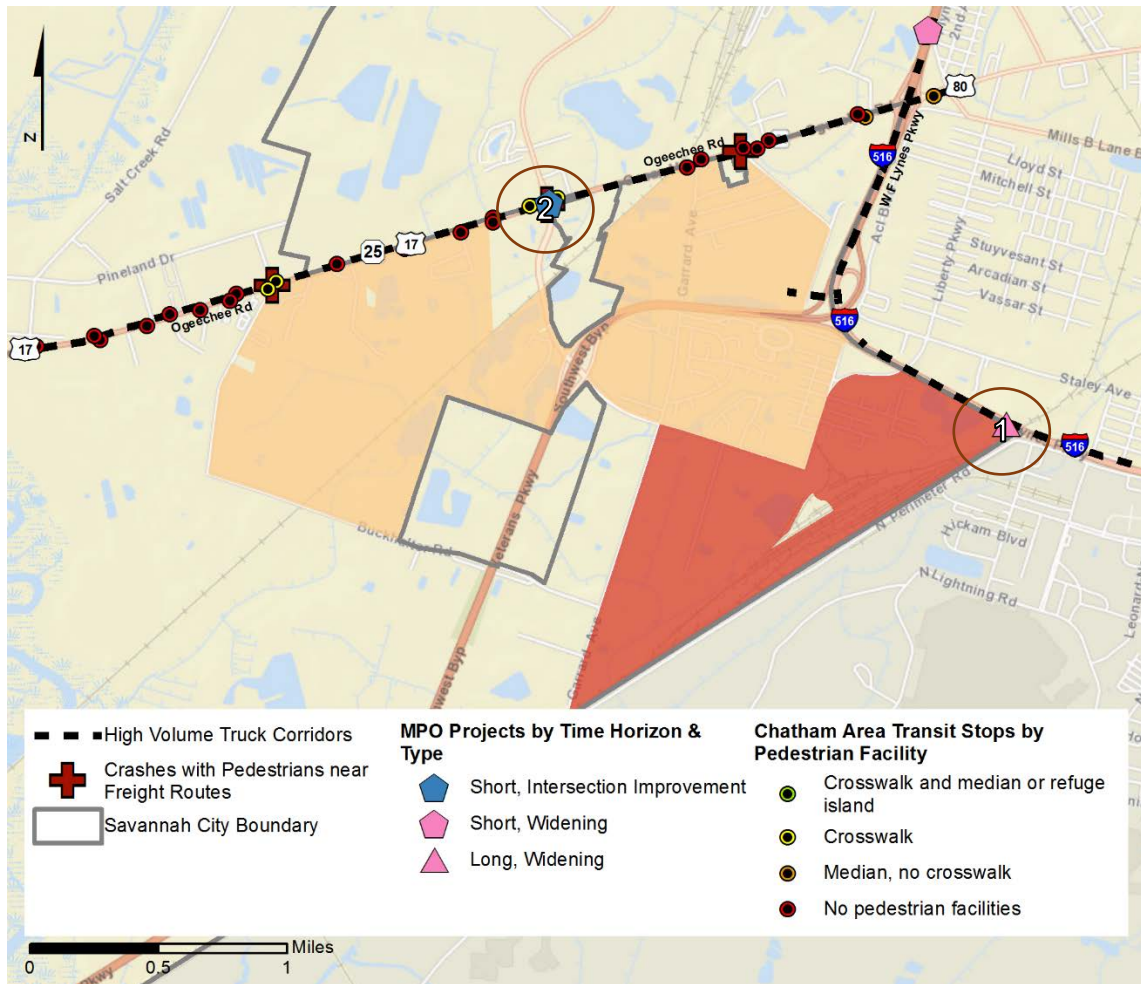


Figure 36: Unincorporated EJ Area 2 - Transportation Projects

The long-term priority of widening Veterans Parkway to Mildred Street will also impact another EJ area in unincorporated Chatham County directly to the south (the project is labeled with a #1 in the map above). That area is zoned for multifamily residential, and contains dense concentrations of housing that is located near the highway. A noise barrier is recommended in the short term to mitigate the noise and emissions impacts from the potential highway expansion.



Figure 37: Noise Barrier that Reduces Noise Impacts to Surrounding Areas
Source: VDOT

There is also the short-term (0-5 year) intersection improvement at Ogeechee Road (US 17/SR 25) and Chatham Parkway (see #2 in the map above). This intersection has two bus stops, one on the south side that has no bus refuge, and one on the north that does provide refuge. Pedestrian crossings exist at all corners of the intersection, but further safety and streetscaping enhancements are recommended as part of this project to increase the visibility of pedestrians entering the intersection.

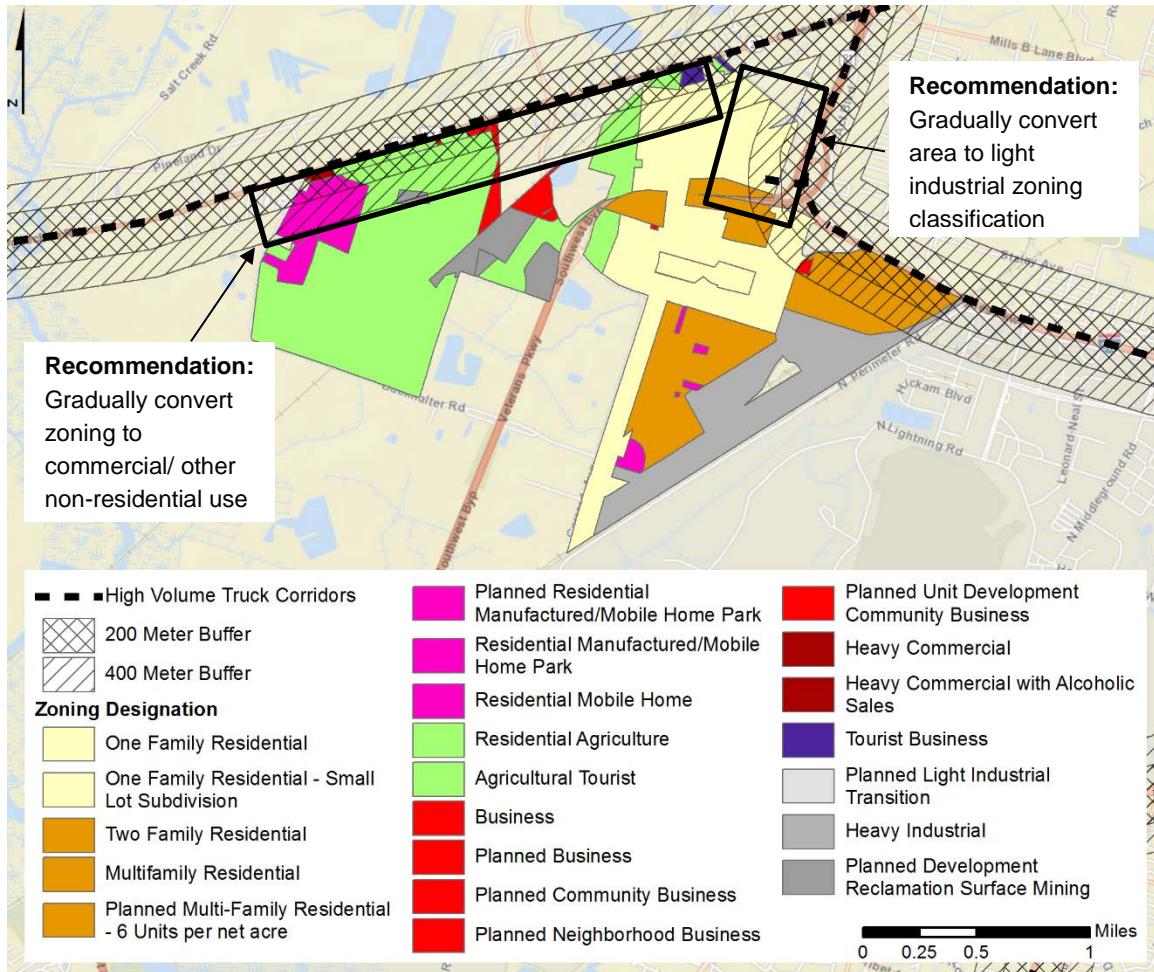


Figure 38: Unincorporated EJ Area 2 – Zoning

Areas to the south of Veterans Parkway and I-516 are already established, but for areas to the west and north of Veterans Parkway within the 400 meter buffer, the HIA team recommends land use changes. The team recommends potentially changing the zoning designation in this area to light industrial. Additionally, the HIA team recommends the conversion over time for areas on the south facing side of Ogeechee road to be zoned commercial business, agricultural or other non-residential designation.

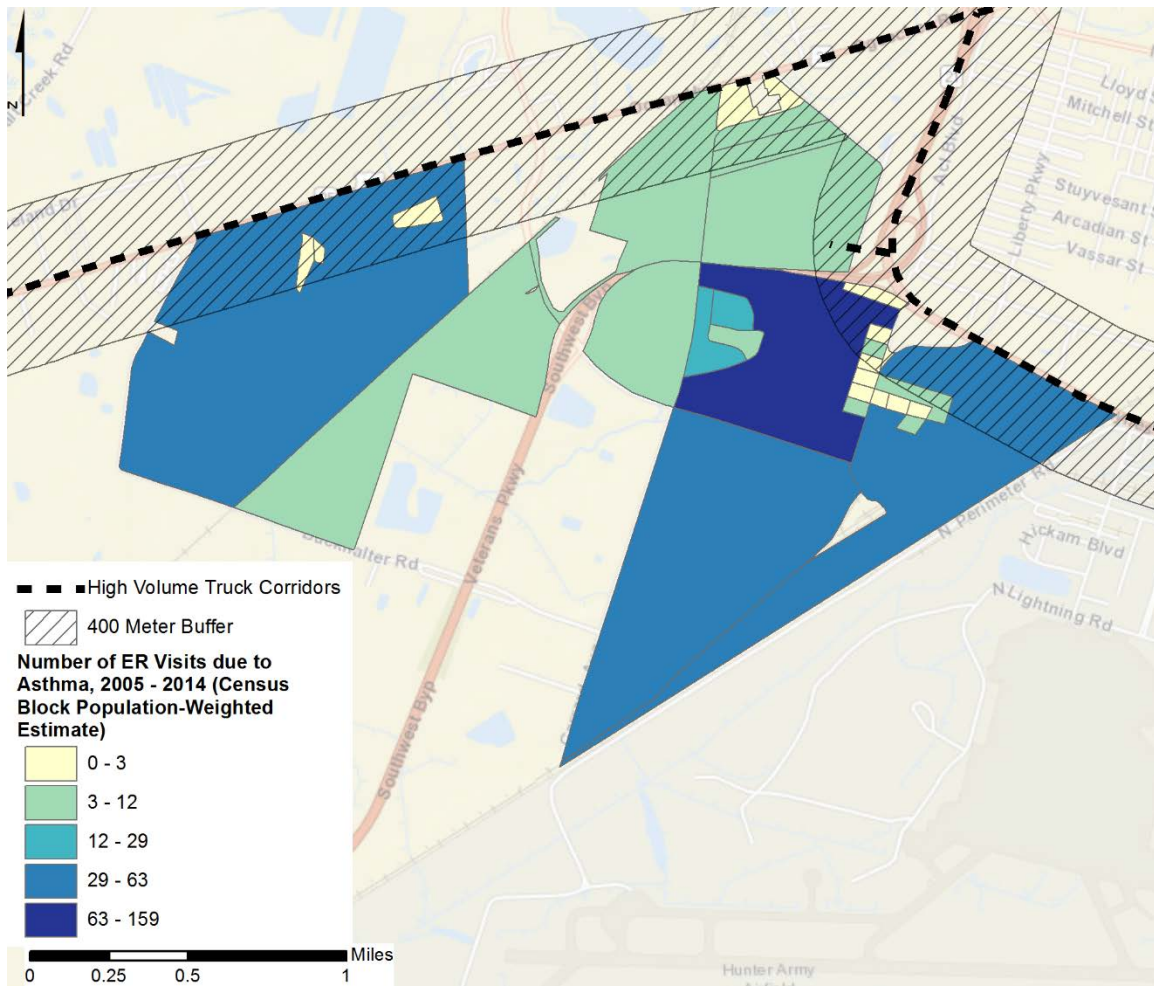


Figure 39: Unincorporated EJ Area 2 - Health: Asthma ER Visits

There is a high rate of incidences of ER visits due to asthma relative to the rest of the county in this EJ area. Asthma incidence may be mitigated over the long-term by considering a 400 foot buffer for new development and zoning modifications.

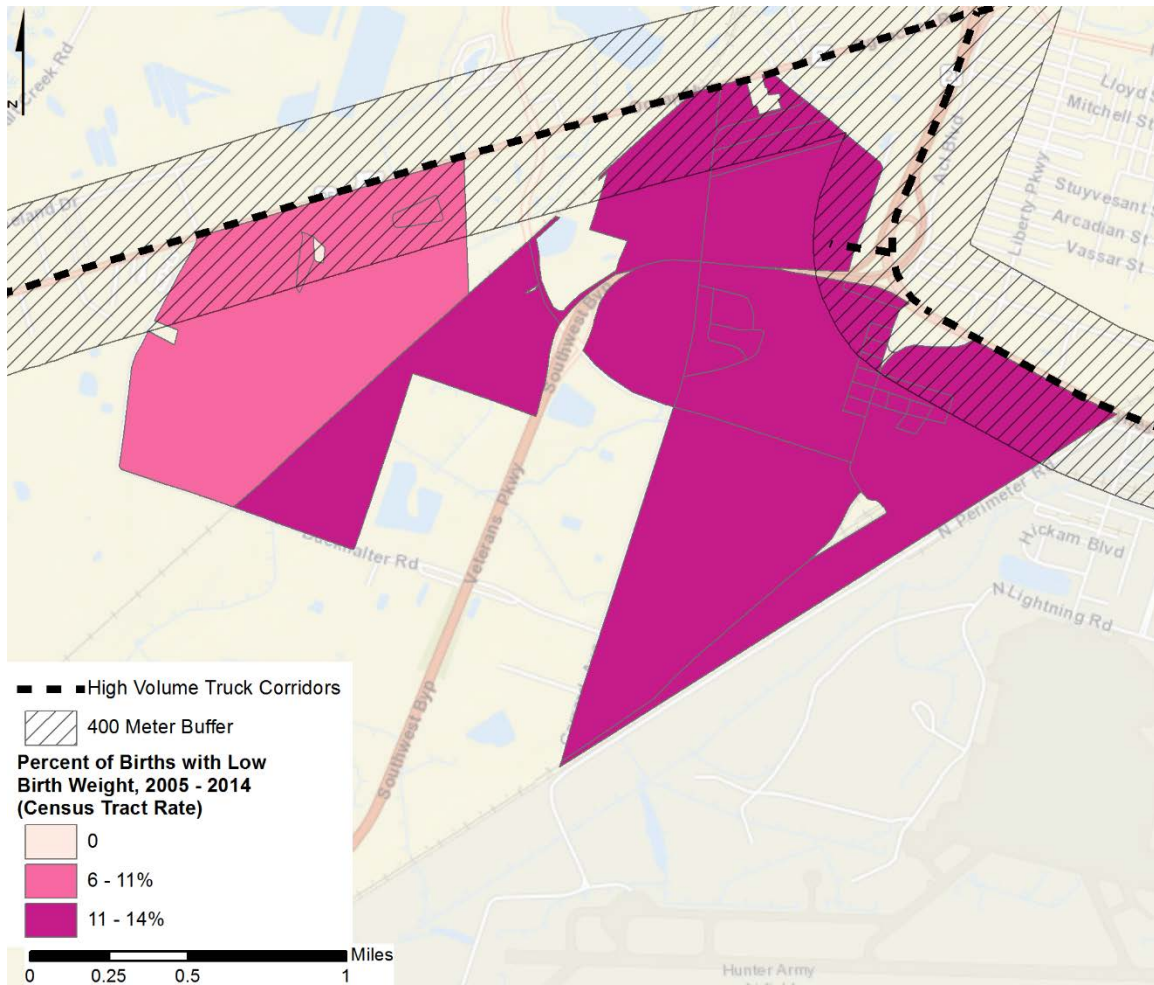


Figure 40: Unincorporated EJ Area 2 - Health: Low Birth Weights

Low birthweight rates are also highest in areas in the eastern part of the EJ area, where several high-volume road facilities exist. I-516 and Veterans Parkway both border the EJ area. Long-term buffer enhancements along I-516 will help to reduce both noise and emissions levels that can contribute to higher percentages of low birthweight births. Short- and medium-term noise barriers may reduce noise-related stress.

6. Conclusion

The CORE MPO Freight Study provides an opportunity for a positive health intervention. Effective redevelopment policies that consider social and environmental risk factors for health conditions could maximize the positive health outcomes for the population. These policies could also help to mitigate any negative impacts resulting from the freight projects recommended in the freight study. This HIA applies the well-documented relationships among freight, health determinants, and health outcomes to the setting and project list of the CORE MPO Freight Study in order to influence project implementation and spur complementary programs to mitigate residual freight impacts. The HIA analyzed health, transportation, economic, and demographic data from numerous sources alongside input from freight stakeholders and public sector planners and professionals.

The HIA shows that truck volume increases associated with the freight study have the potential to exacerbate existing social, environmental, and built environment health determinants. This could also cause increases in the rates of asthma, heart disease, low birthweights, and accidents along the corridors accommodating the highest volume of truck traffic. Many of these corridors feature projects in the freight study, with project types all intended to increase the efficiency and capacity of roadways carrying freight. Some of the current or future freight corridors pass through or are adjacent to high poverty environmental justice (EJ) neighborhoods, which would benefit from interventions to buffer them from the noise, pollution, and accidents that could accompany high and increasing volumes of truck traffic. Therefore, the HIA team recommends vegetative buffers and / or noise barriers along high-volume truck corridors through residential areas and enhanced pedestrian infrastructure to mitigate accident risk. Additional recommendations relate to truck operations and economic development.

The HIA of the CORE MPO Freight Study shows that specific steps can help the region's large and growing freight industry remain a good neighbor, providing jobs and minimizing externalities. Implementing these recommendations will require coordination among the multiple government departments and agencies with jurisdiction over both land use and transportation infrastructure. Implementing health-promoting strategies now can help the region share the benefits of a thriving freight industry most equitably.

7. Dissemination

The findings and recommendations provided in this report will be disseminated to the following entities:

1. Human Impact Partners
2. Coastal Georgia Indicators Coalition (CGIC)
3. The Coastal Region Metropolitan Planning Organization (CORE MPO)
4. The City of Garden City, Office of the City Manager
5. Chatham County - Savannah Metropolitan Planning Commission (MPC)
6. Georgia Department of Public Health – Coastal Health District
7. Georgia Association of Regional Commissions (GARC) and the Coastal Regional Commission of Georgia
8. Georgia Department of Transportation (GDOT)

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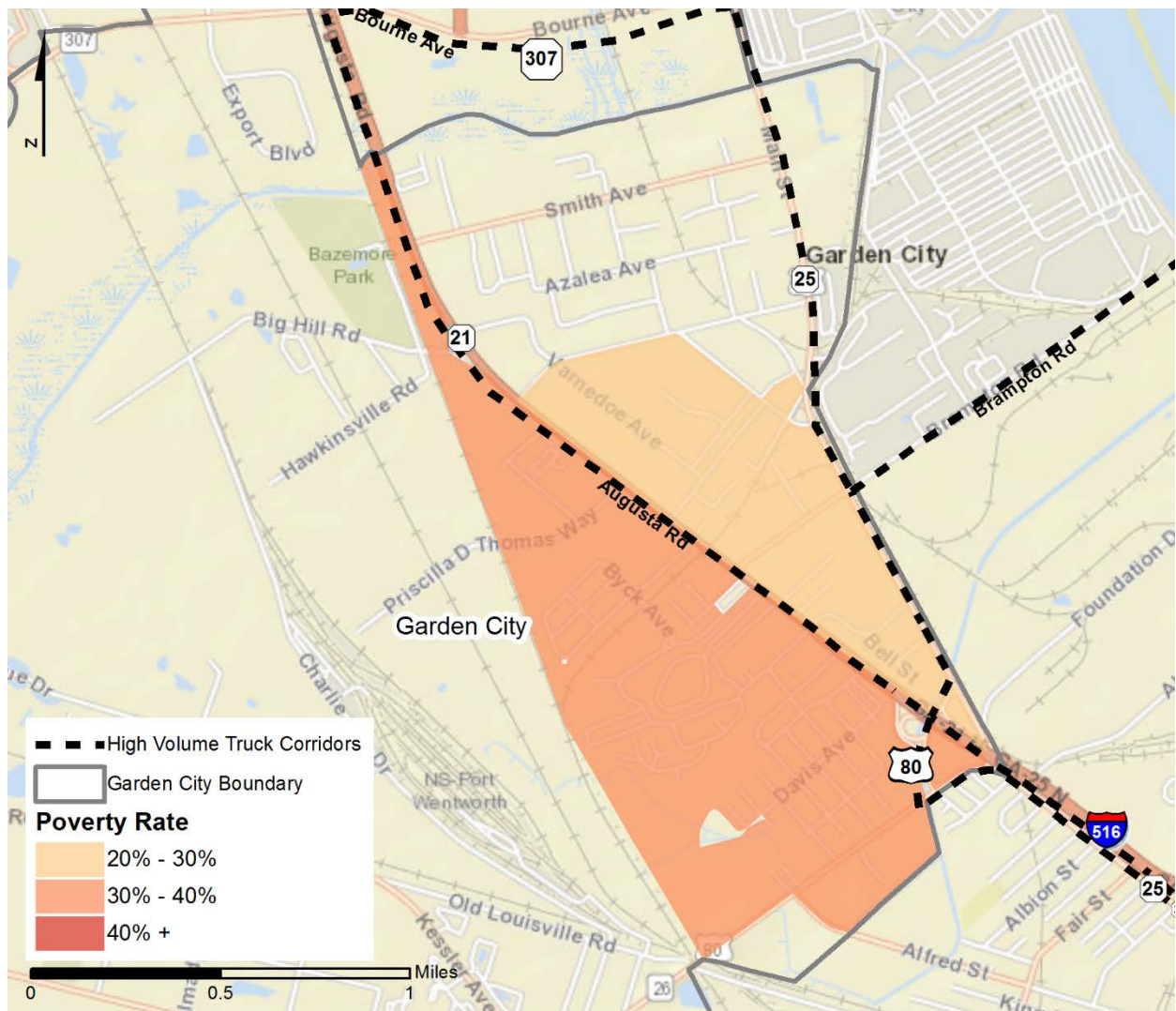
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Appendix

Appendix 1: Environmental Justice Catalog

The following pages detail the demographic, land use, transportation, and health characteristics of eighteen EJ areas in Chatham County. Each EJ area has five maps and scoring table for each map. A final score is provided after the fifth and final map for each EJ area.

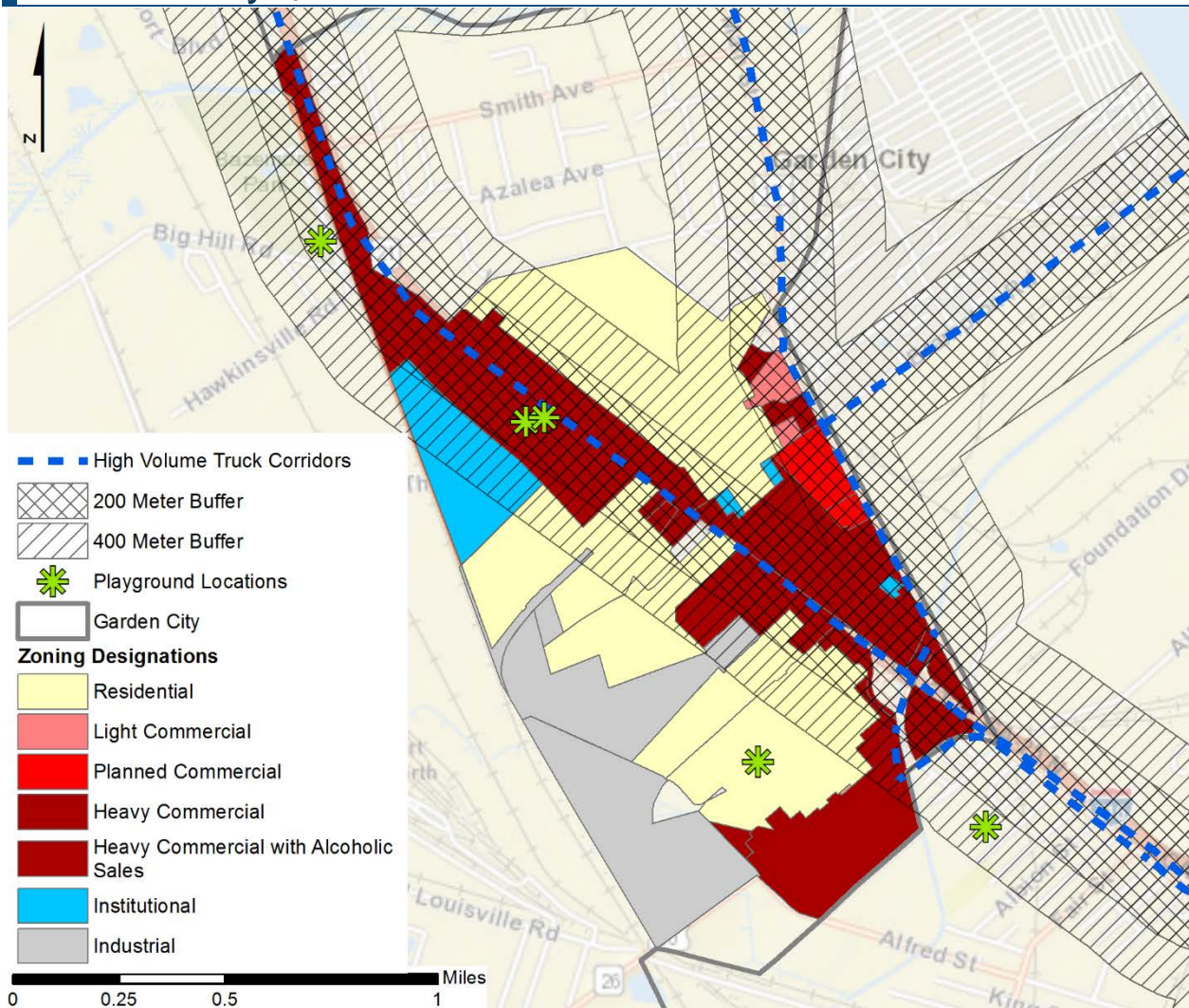
Garden City | EJ Area 1 Demographics



Criteria (✓ = 1 point)	GC – EJ Area 1	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty		
Demographics Total		2

Garden City | EJ Area 1

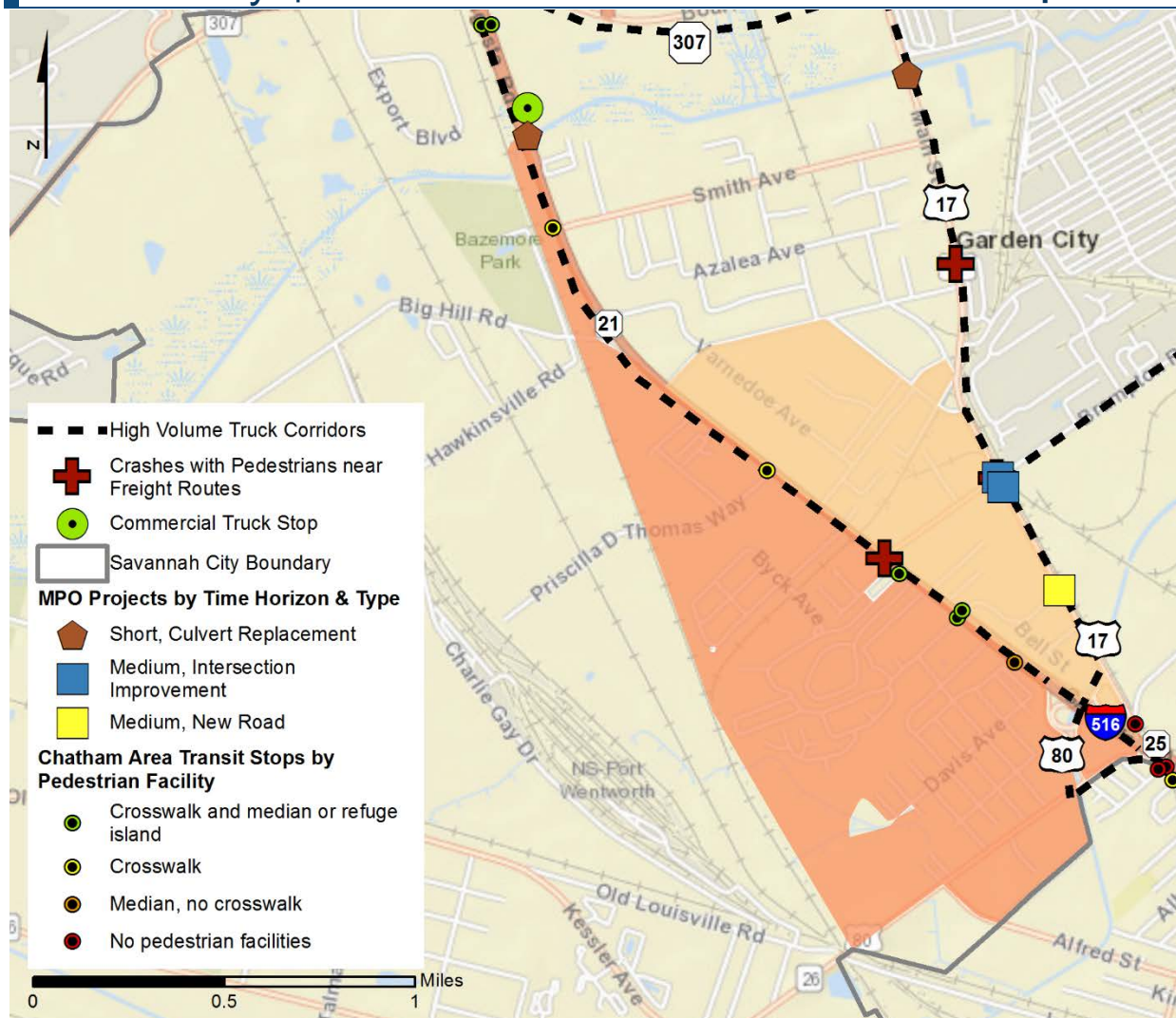
Land Use



Criteria (✓ = 1 point)	GC – EJ Area 1	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?	✓	1
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		2

Garden City | EJ Area 1

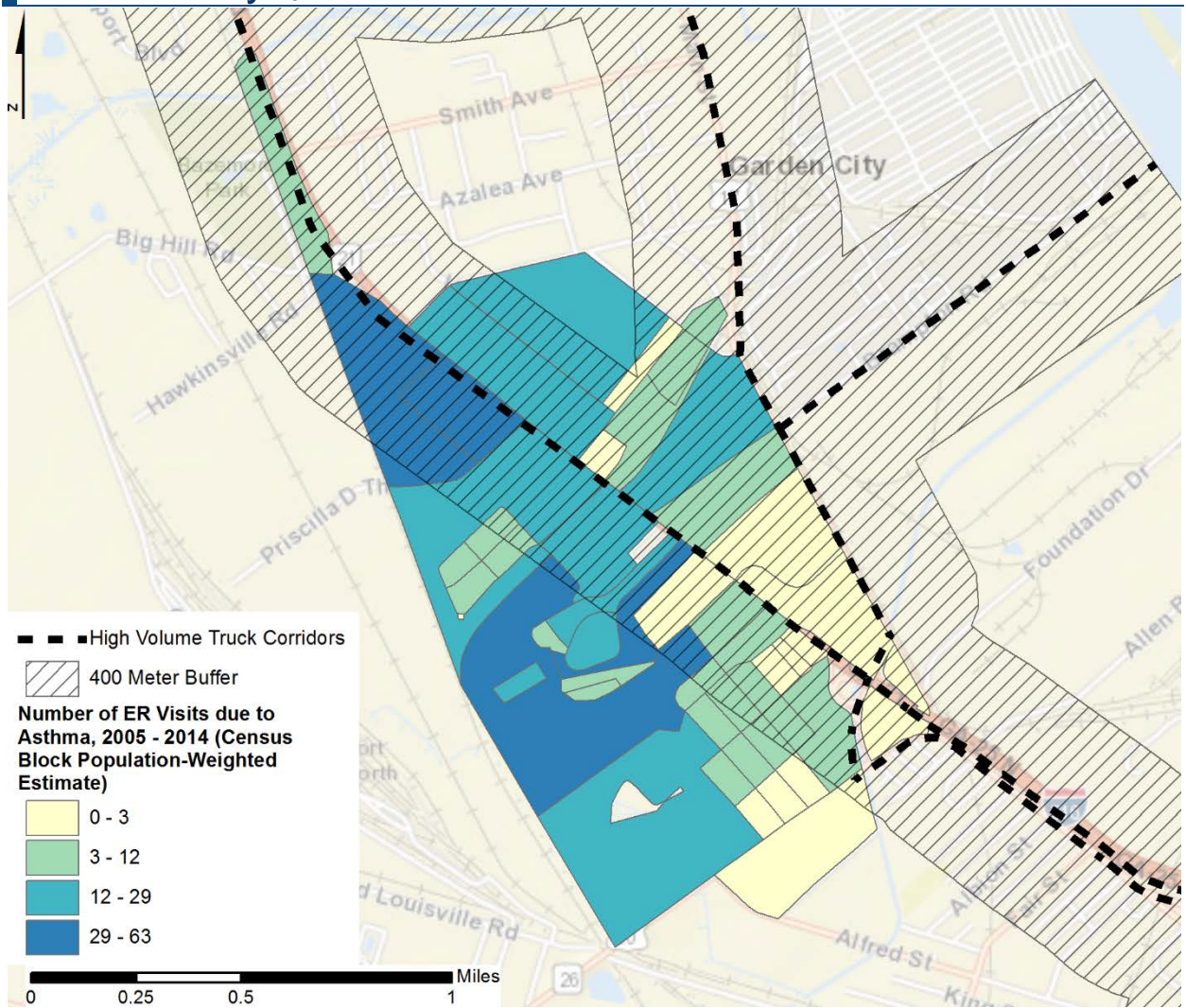
Transportation



Criteria (✓ = 1 point)	GC – EJ Area 1	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)	✓	1
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)	✓	1
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?	✓	1
Transportation Total		5

Garden City | EJ Area 1

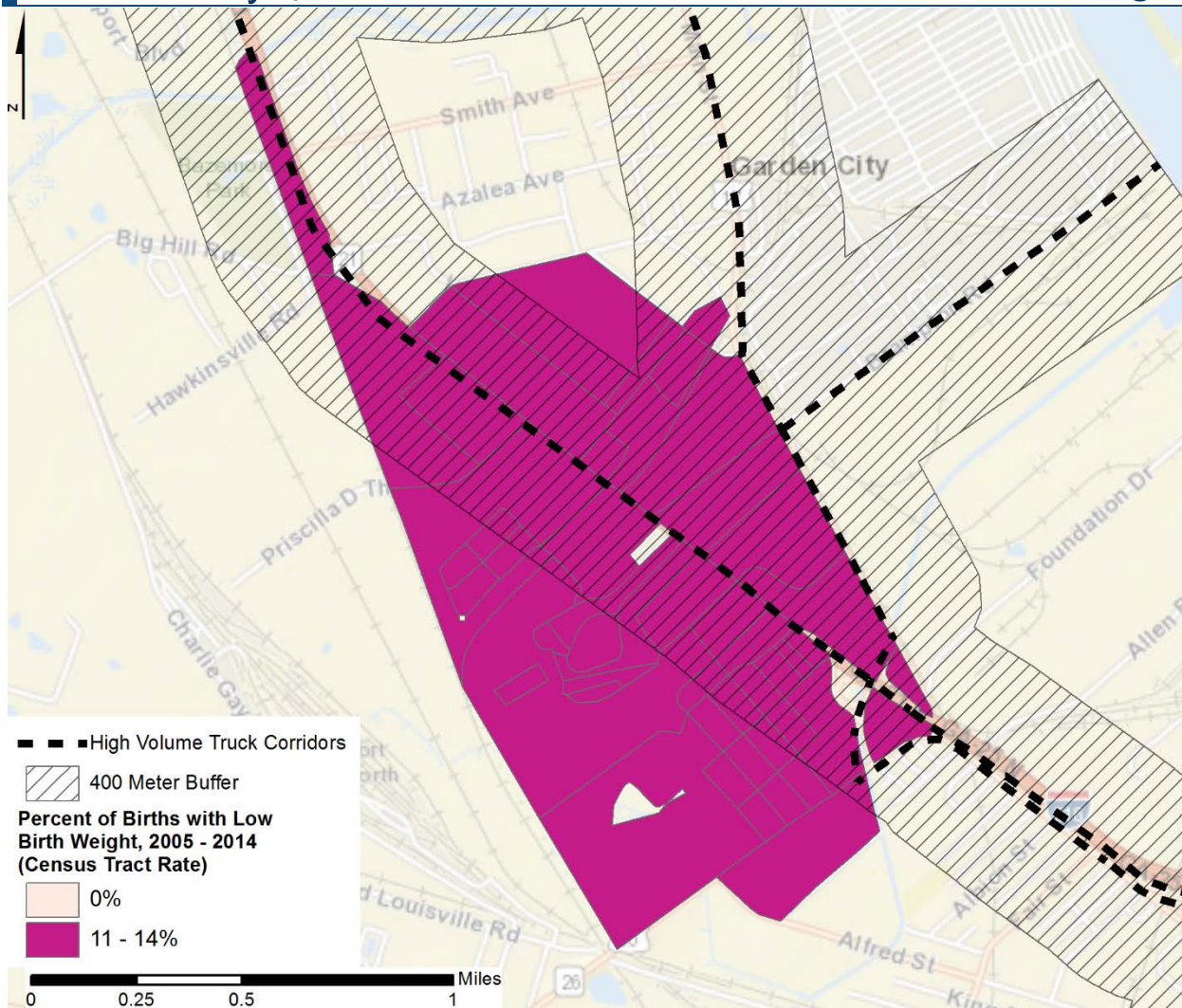
Health – Asthma



Criteria (✓ = 1 point)	GC – EJ Area 1	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Garden City | EJ Area 1

Health – Low Birth Weight



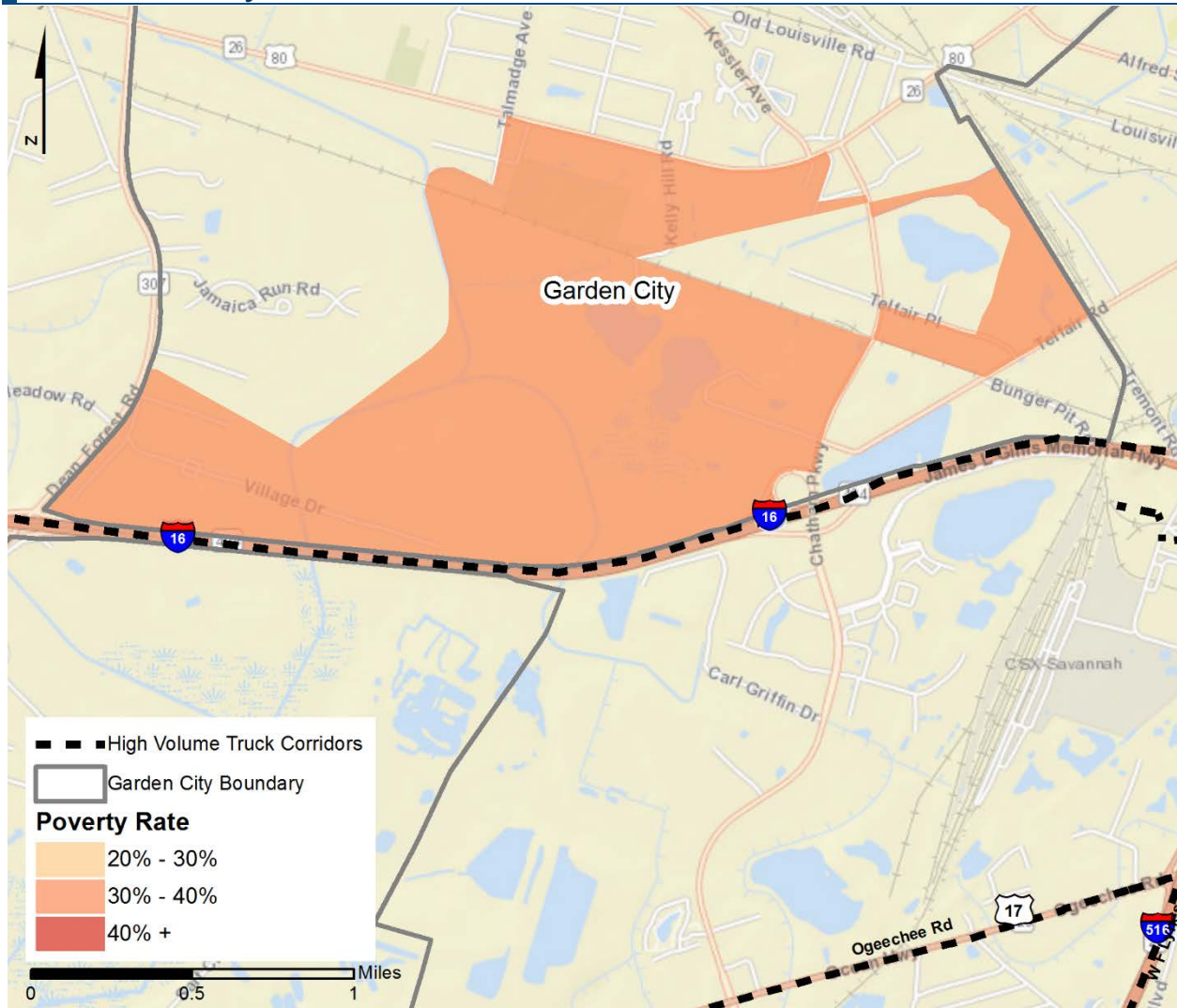
Criteria (✓ = 1 point)	GC – EJ Area 1	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	11
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Garden City | EJ Area 2

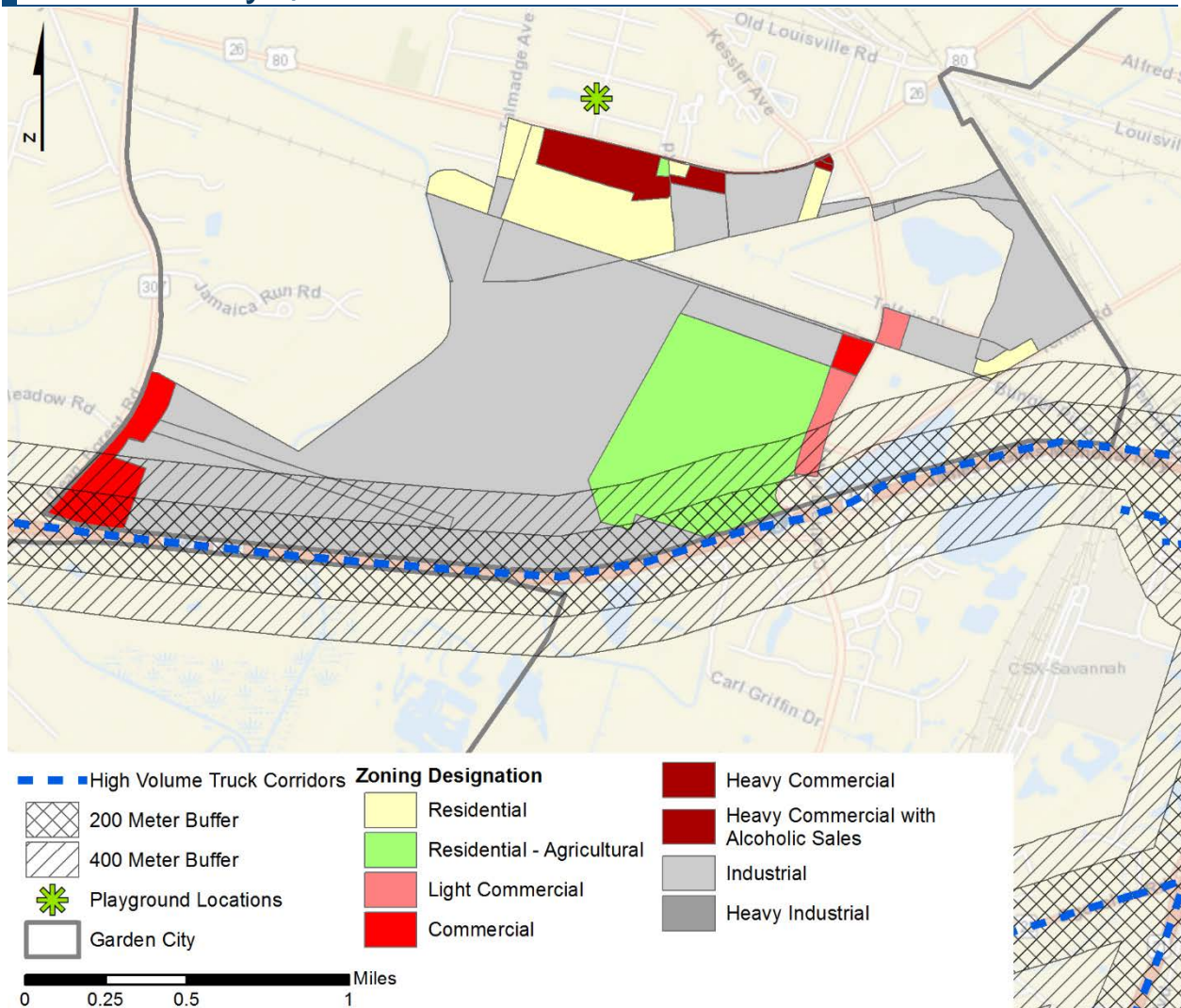
Demographics



Criteria (✓ = 1 point)	GC – EJ Area 2	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty		
Demographics Total		2

Garden City | EJ Area 2

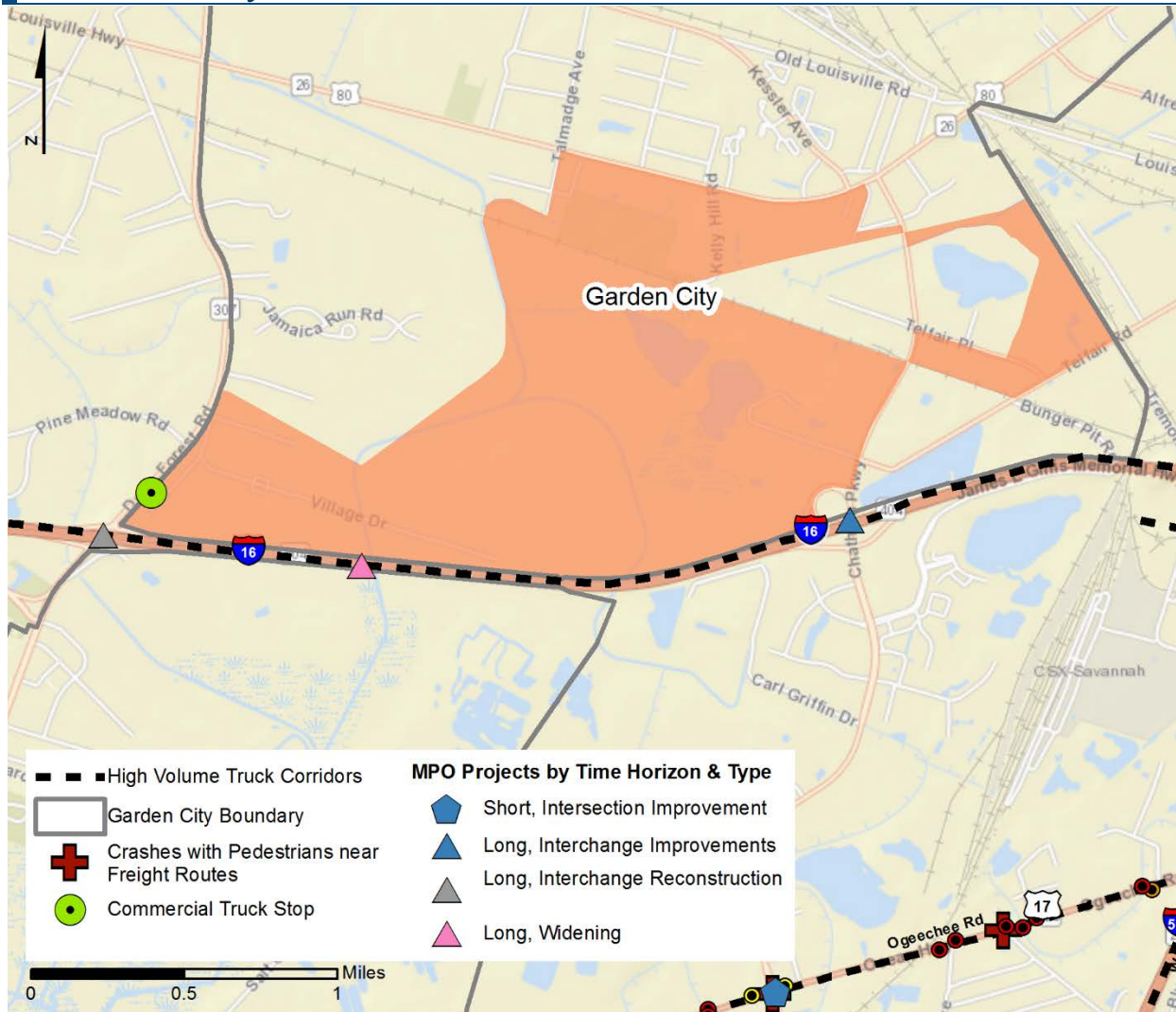
Land Use



Criteria (✓ = 1 point)	GC – EJ Area 2	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?		
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		1

Garden City | EJ Area 2

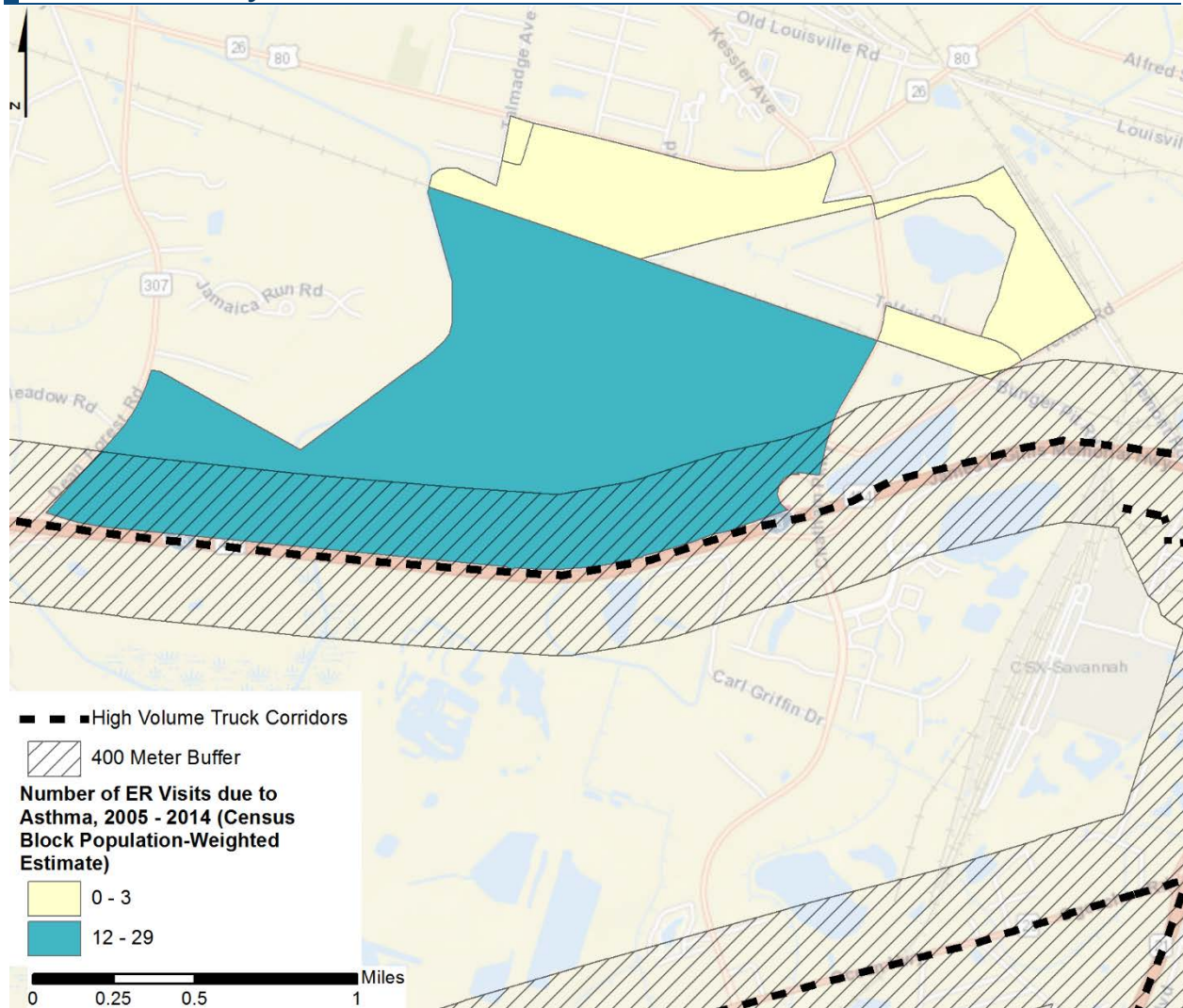
Transportation



Criteria (✓ = 1 point)	GC – EJ Area 2	Score
Is a CORE MPO project located in the area? (<i>Opportunity for roadway design changes.</i>)	✓	1
Is a truck stop located within 500 feet of the EJ area? (<i>Potential poor air quality hot spot.</i>)	✓	1
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?		
Is a bus stop located on a freight route within close proximity to the EJ area?		
If yes, would the bus stop benefit from additional pedestrian facilities?		
Transportation Total		2

Garden City | EJ Area 2

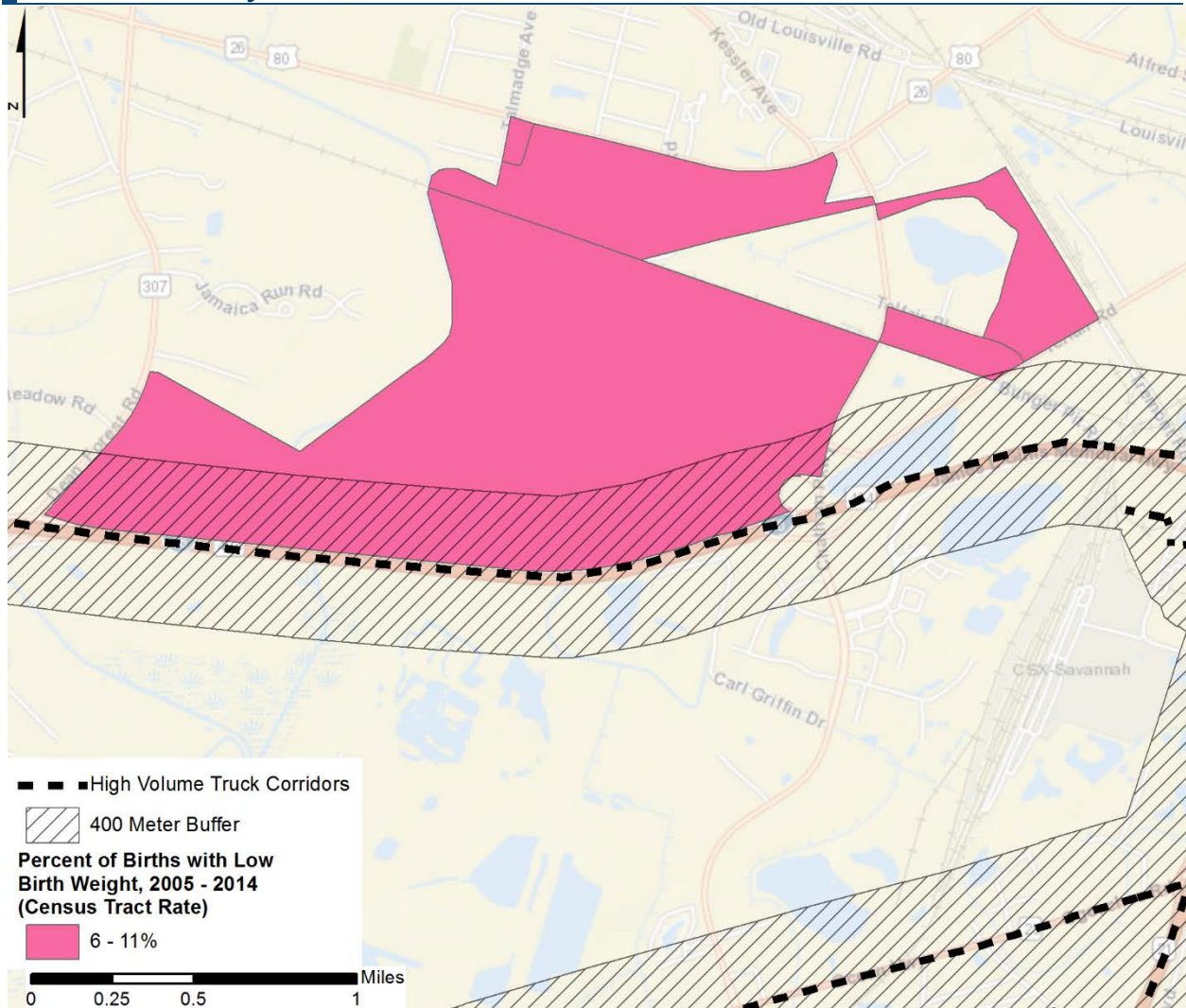
Health – Asthma



Criteria (✓ = 1 point)	GC – EJ Area 2	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Garden City | EJ Area 2

Health – Low Birth Weight



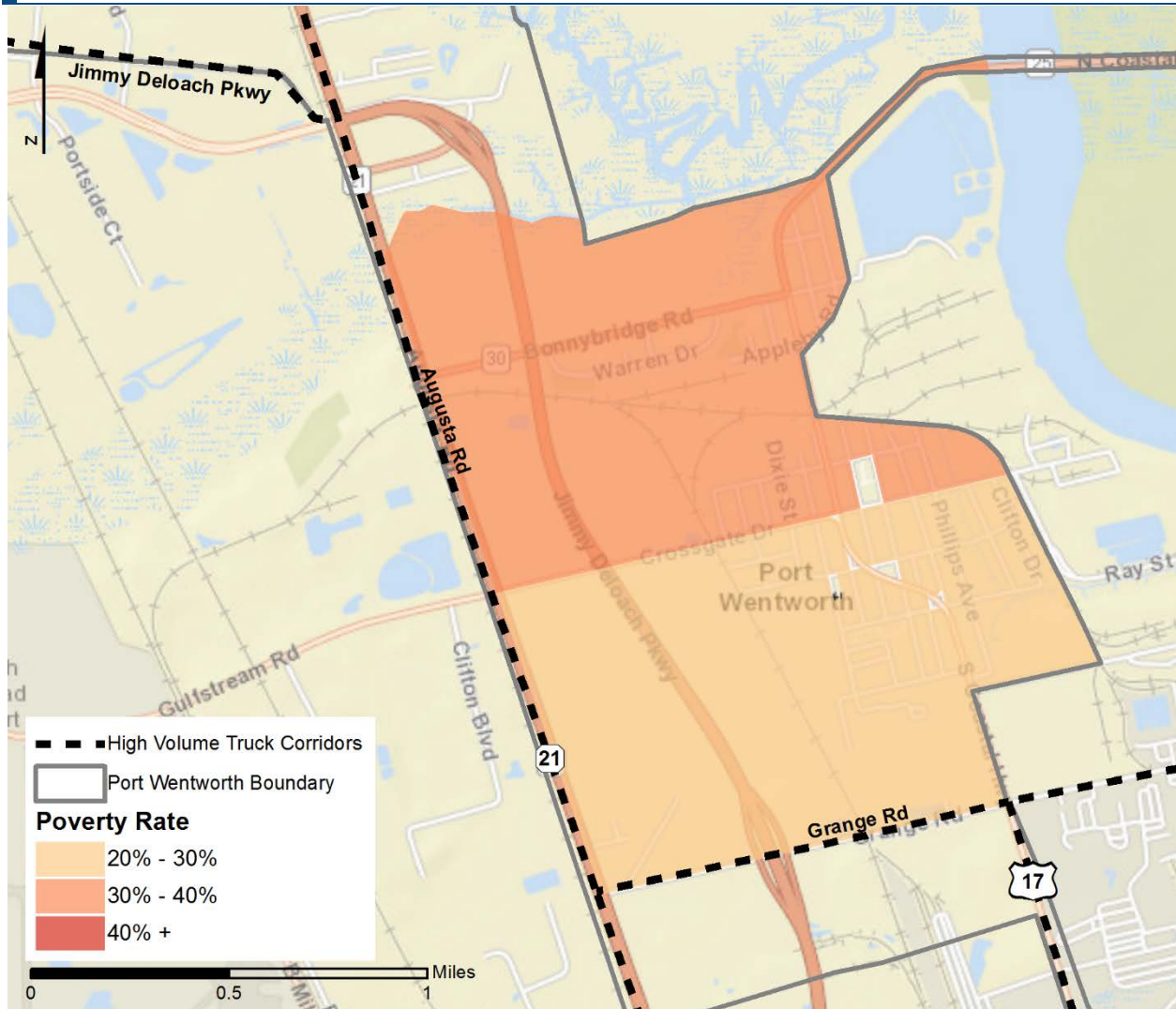
Criteria (✓ = 1 point)	GC – EJ Area 2	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

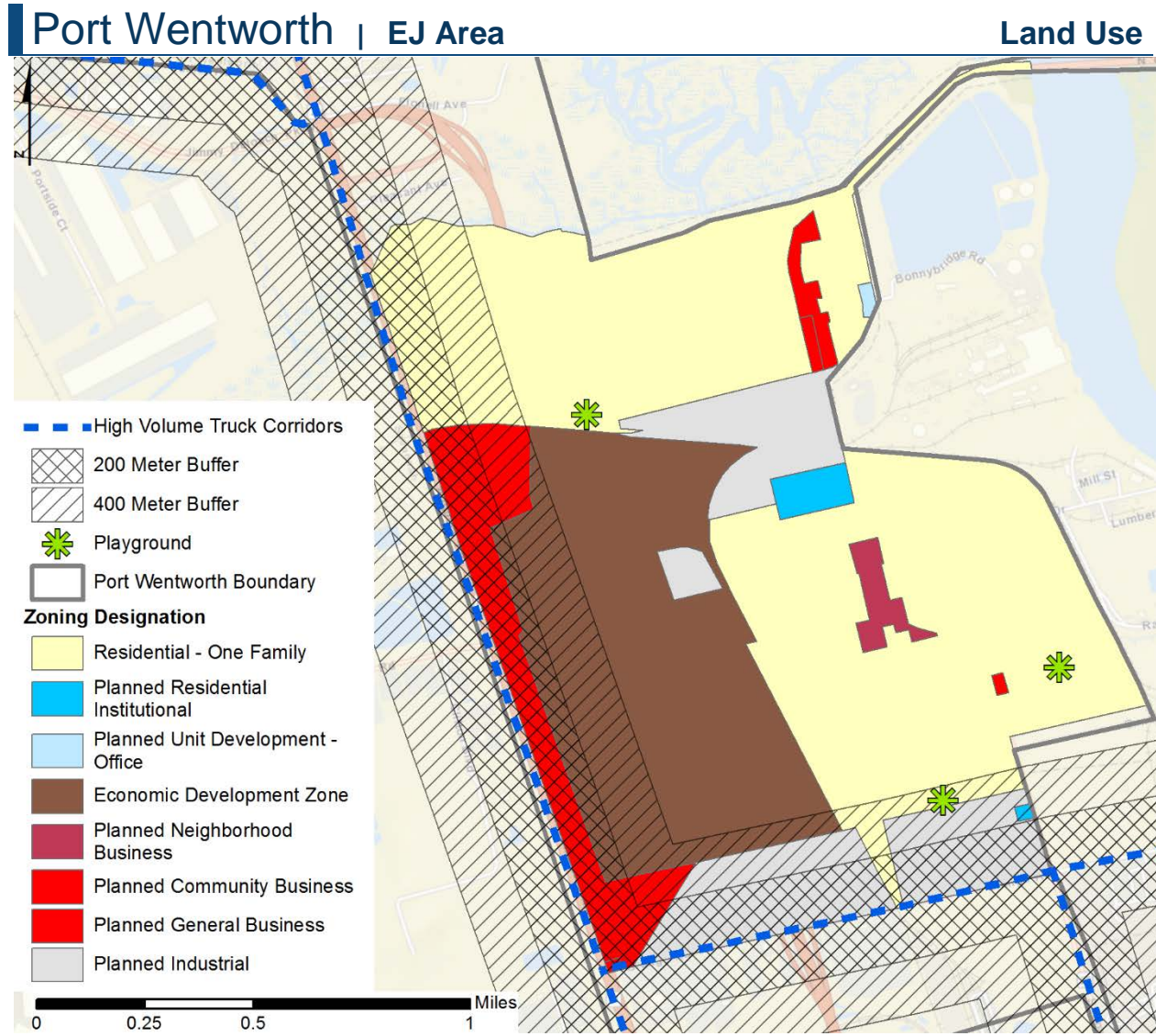
GRAND TOTAL (out of 13 points)	7
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Port Wentworth | EJ Area

Demographics



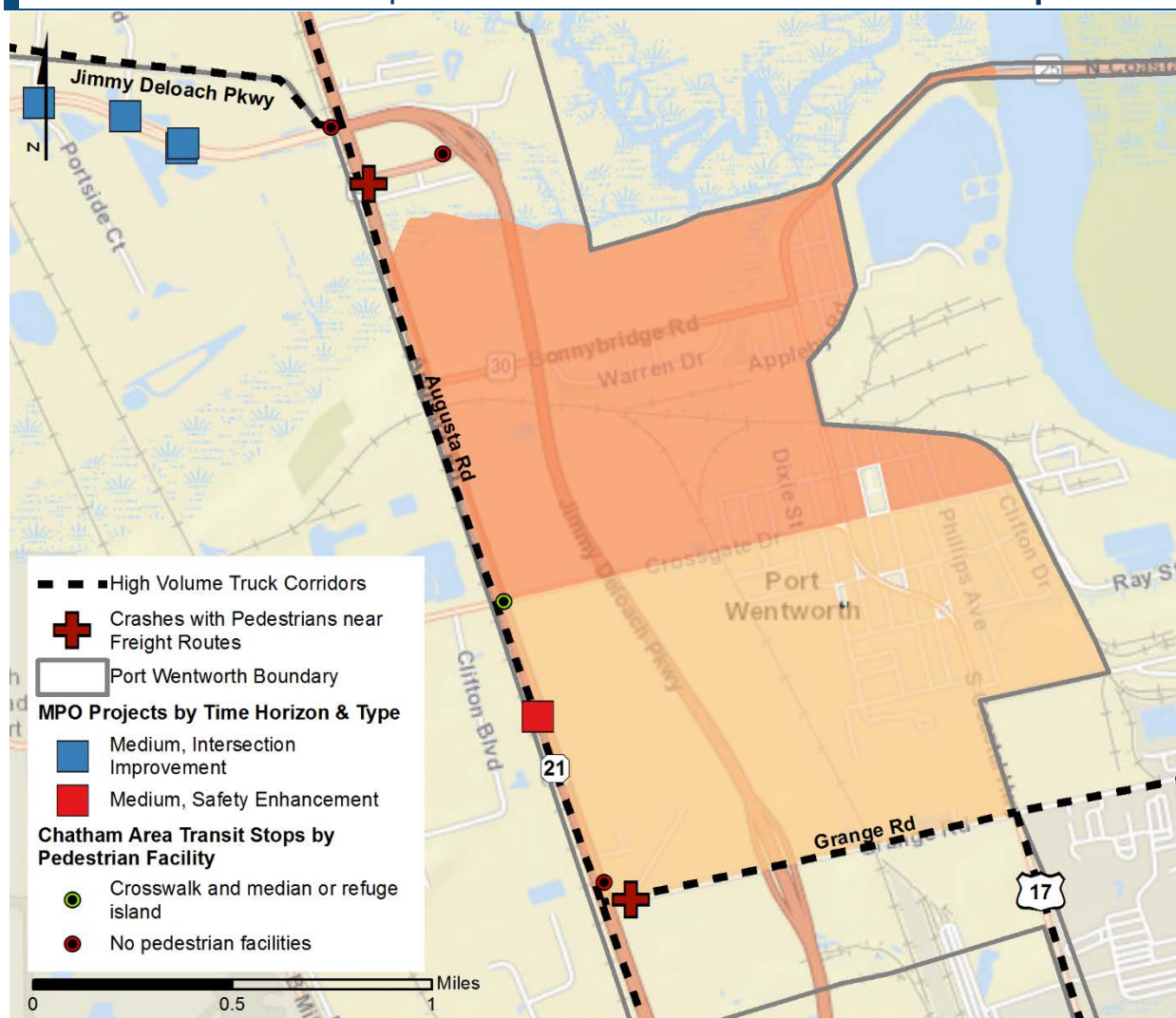
Criteria (✓ = 1 point)	PW – EJ Area	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty		
Demographics Total		2



Criteria (✓ = 1 point)	PW – EJ Area	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?	✓	1
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		2

Port Wentworth | EJ Area

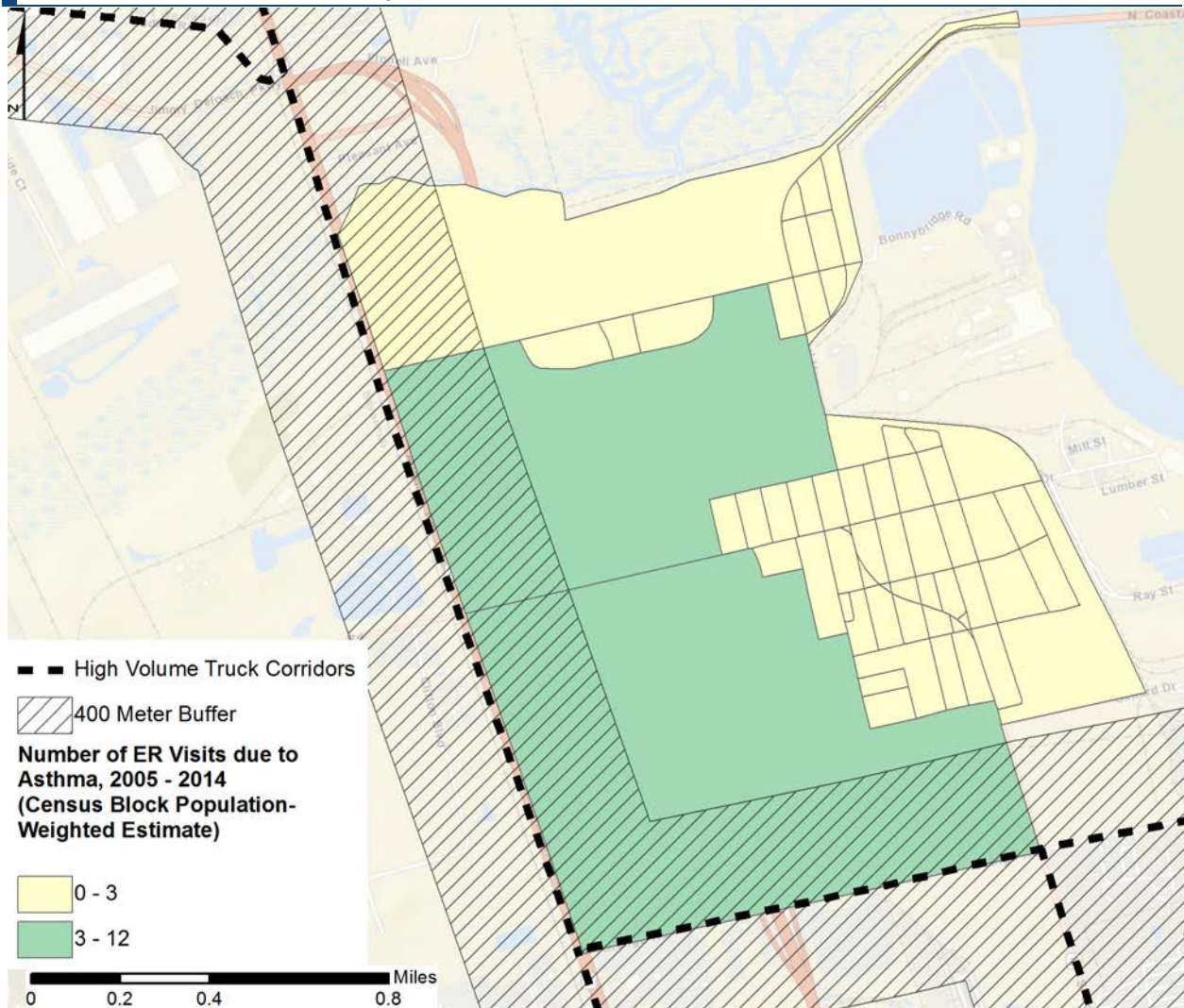
Transportation



Criteria (✓ = 1 point)	PW – EJ Area	Score
Is a CORE MPO project located in the area? (<i>Opportunity for roadway design changes.</i>)	✓	1
Is a truck stop located within 500 feet of the EJ area? (<i>Potential poor air quality hot spot.</i>)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?	✓	1
Transportation Total		4

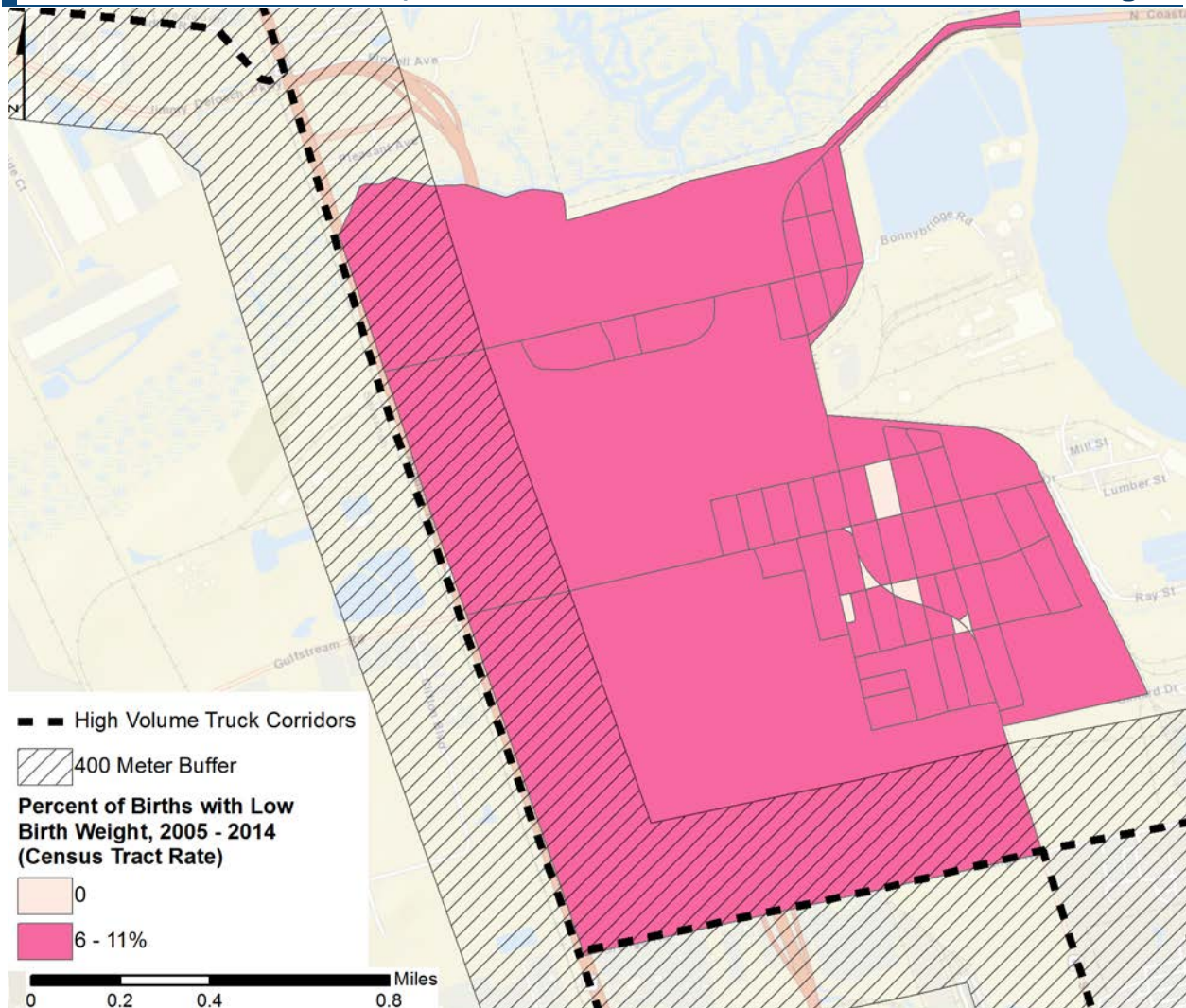
Port Wentworth | EJ Area

Health - Asthma



Criteria (✓ = 1 point)	PW – EJ Area	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Port Wentworth | EJ Area Health – Low Birth Weight



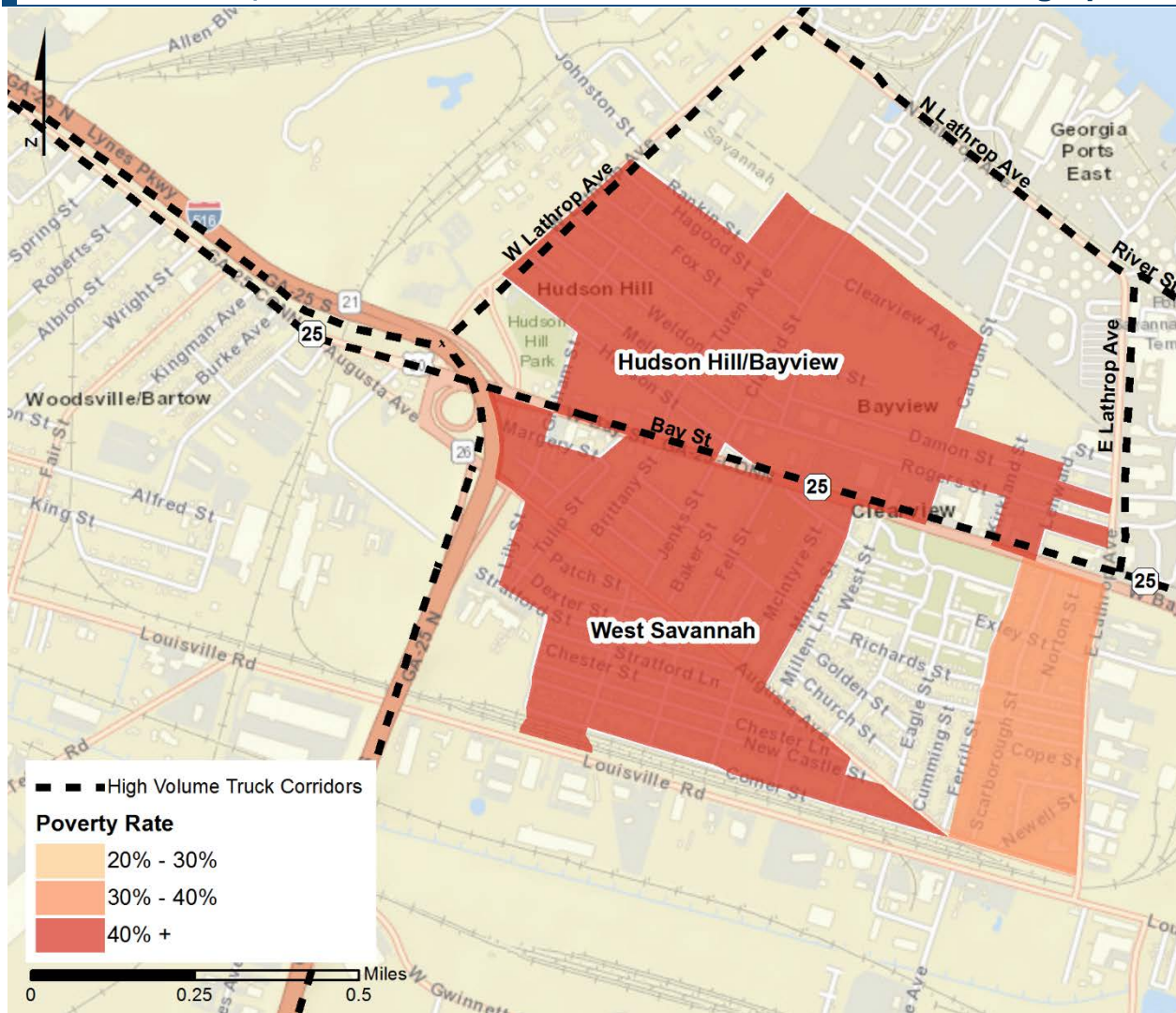
Criteria (✓ = 1 point)	PW – EJ Area	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	10
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Savannah | EJ Area 1

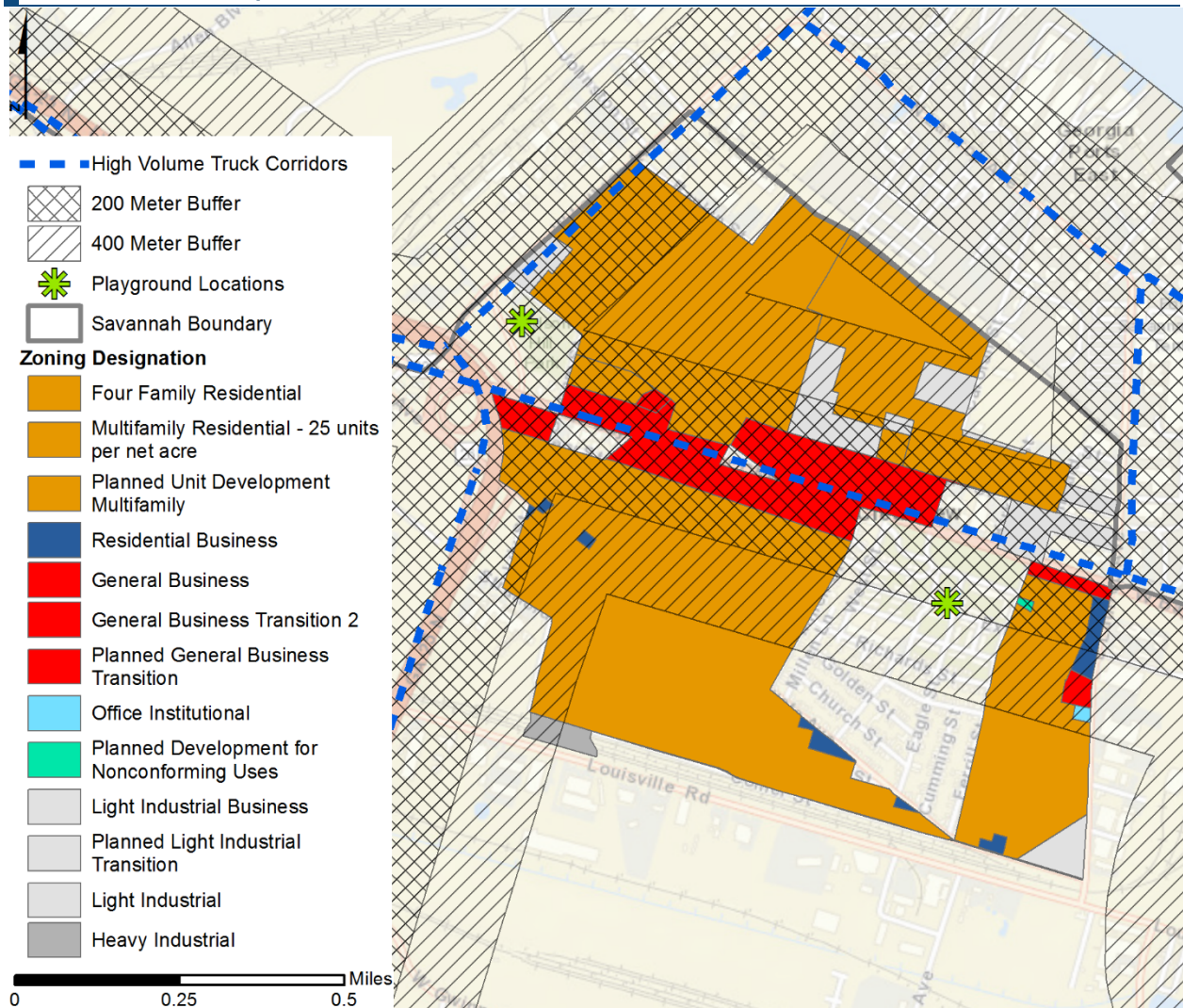
Demographics



Criteria (✓ = 1 point)	SAV – EJ Area 1	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty	✓	1
Demographics Total		3

Savannah | EJ Area 1

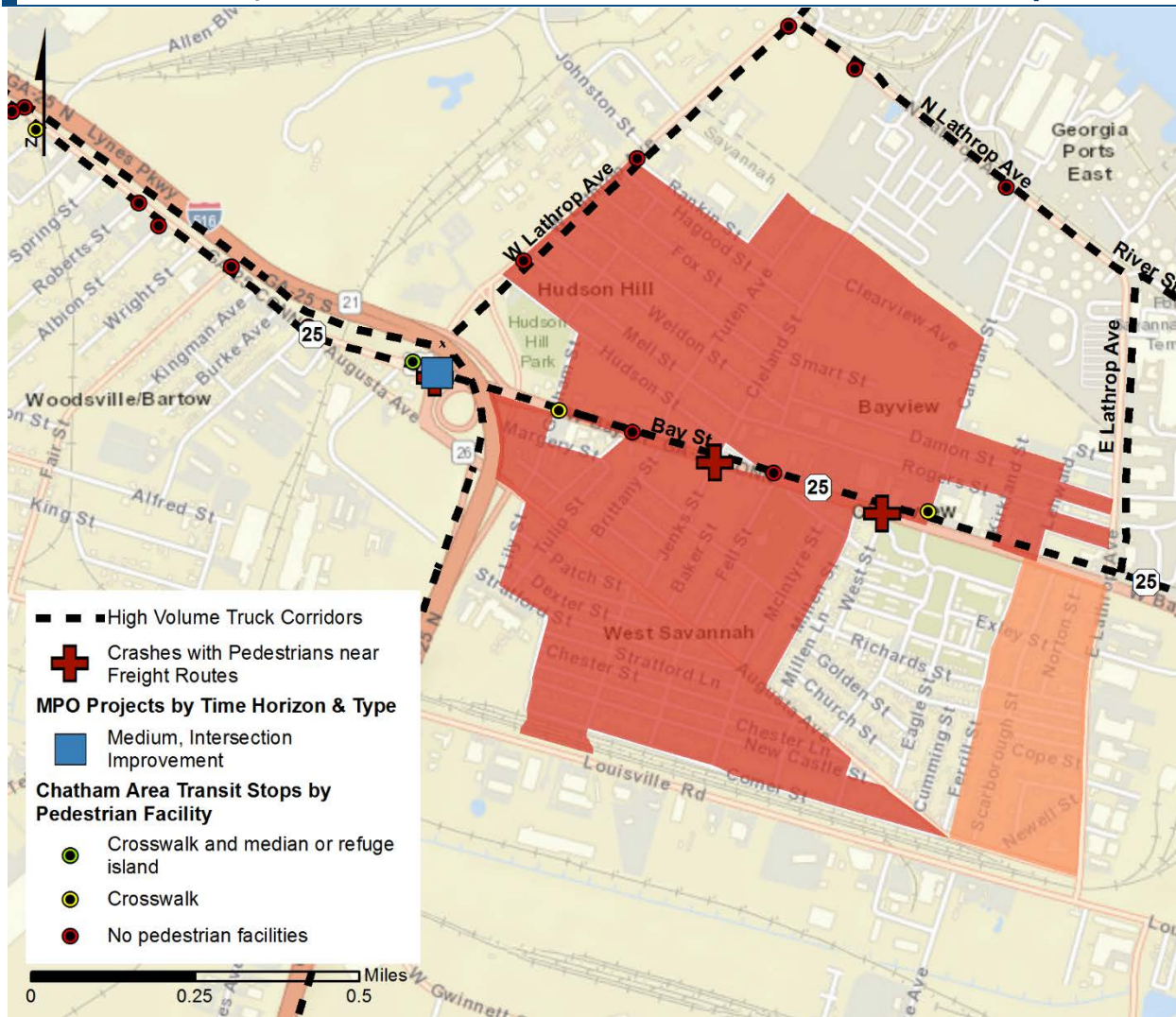
Land Use



Criteria (✓ = 1 point)	SAV – EJ Area 1	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?	✓	1
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		2

Savannah | EJ Area 1

Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 1	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)	✓	1
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?	✓	1
Transportation Total		4

Savannah | EJ Area 1

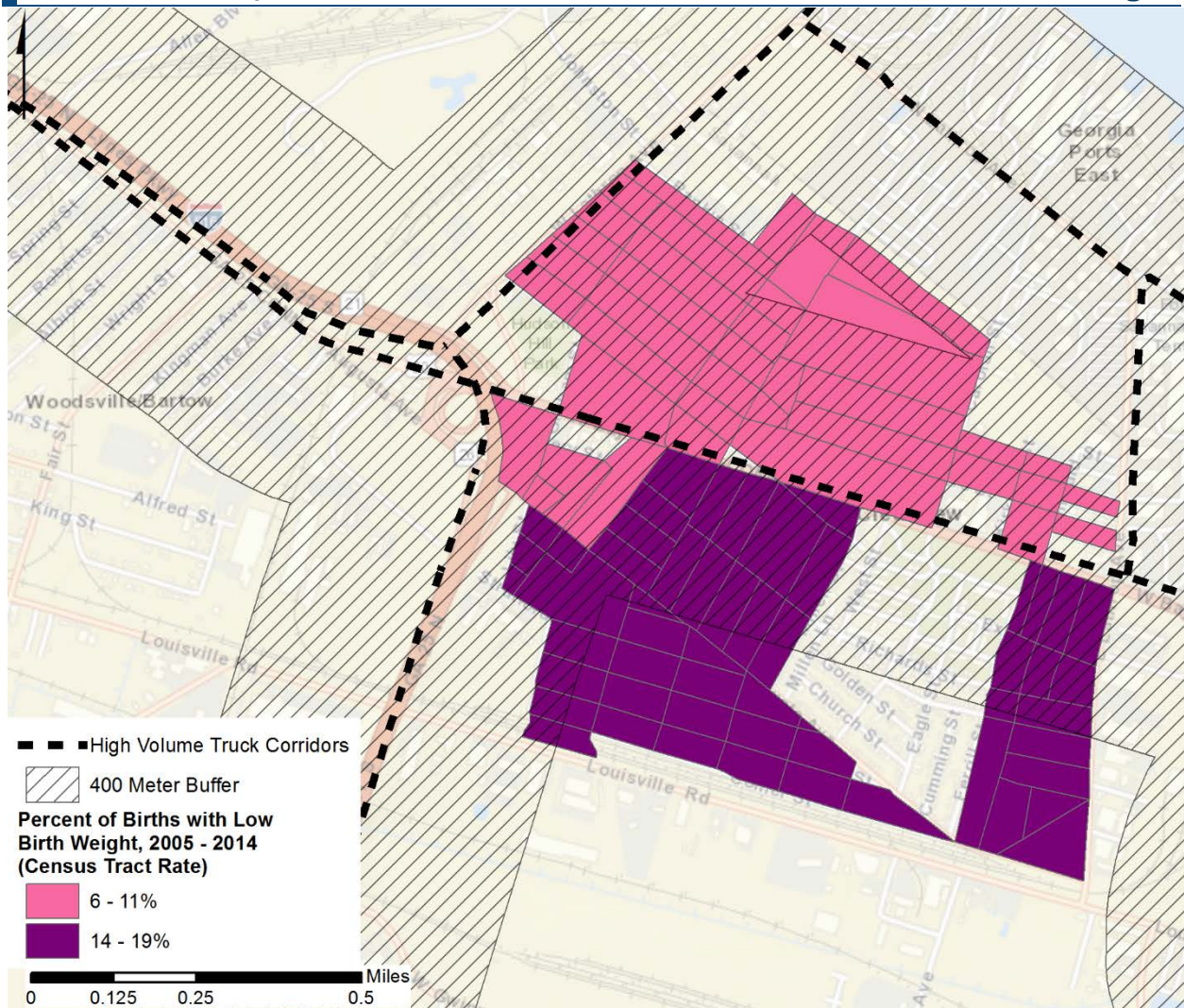
Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 1	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 1

Health – Low Birth Weight



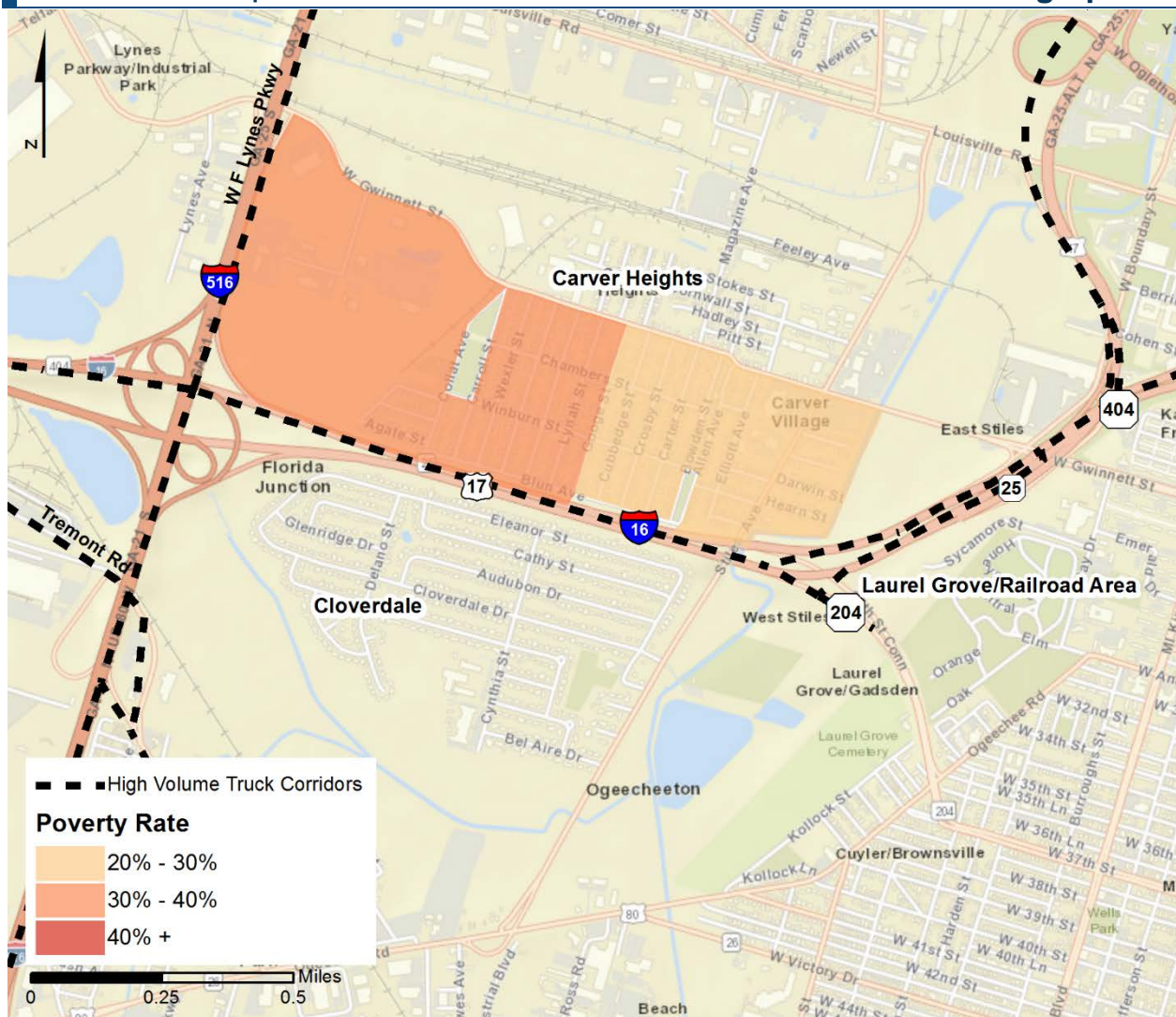
Criteria (✓ = 1 point)	SAV – EJ Area 1	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	11
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Savannah | EJ Area 2

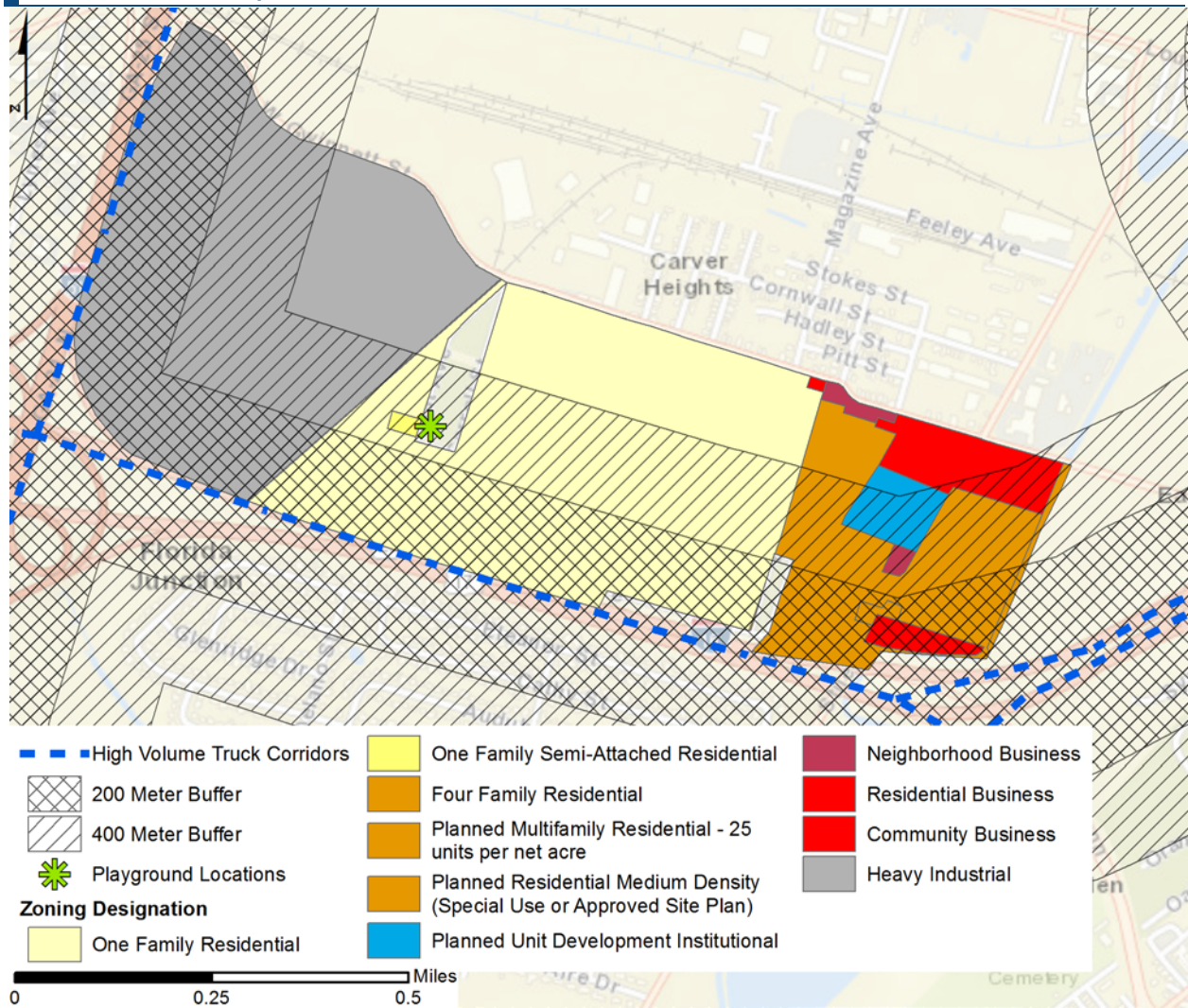
Demographics



Criteria (✓ = 1 point)	SAV – EJ Area 2	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty		
Demographics Total		2

Savannah | EJ Area 2

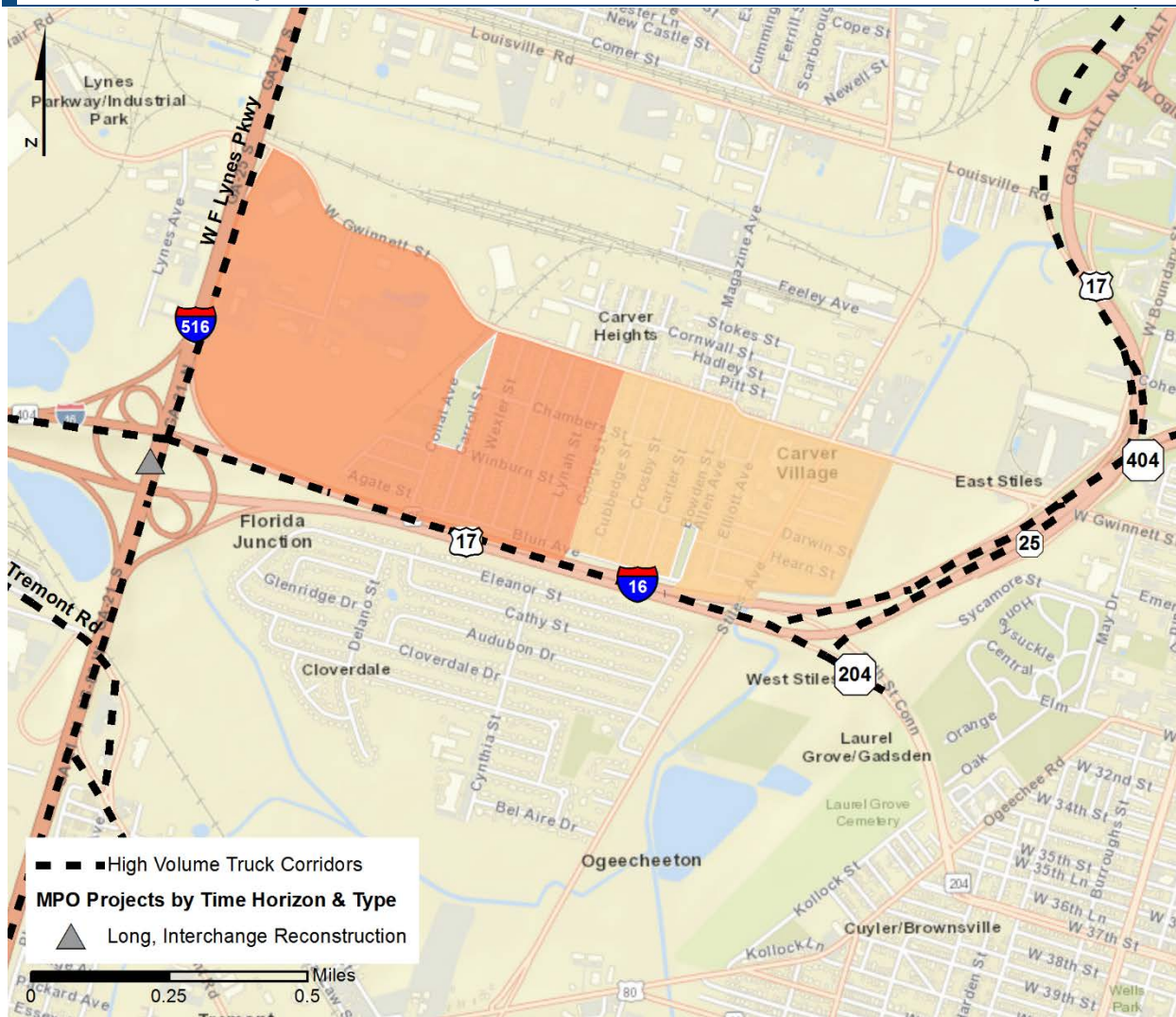
Land Use



Criteria (✓ = 1 point)	SAV – EJ Area 2	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?	✓	1
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		2

Savannah | EJ Area 2

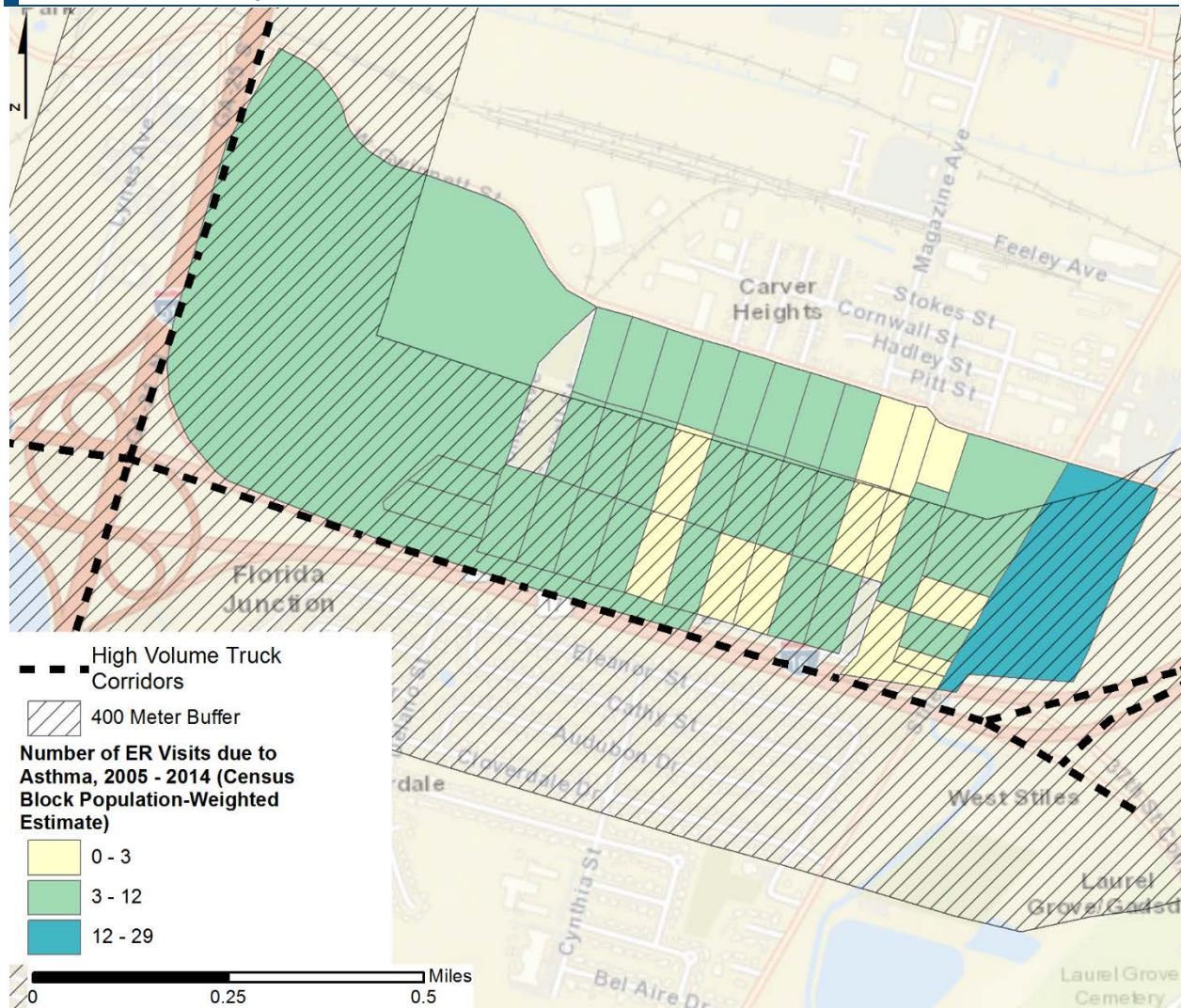
Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 2	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)	✓	1
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?		
Is a bus stop located on a freight route within close proximity to the EJ area?		
If yes, would the bus stop benefit from additional pedestrian facilities?		
Transportation Total		1

Savannah | EJ Area 2

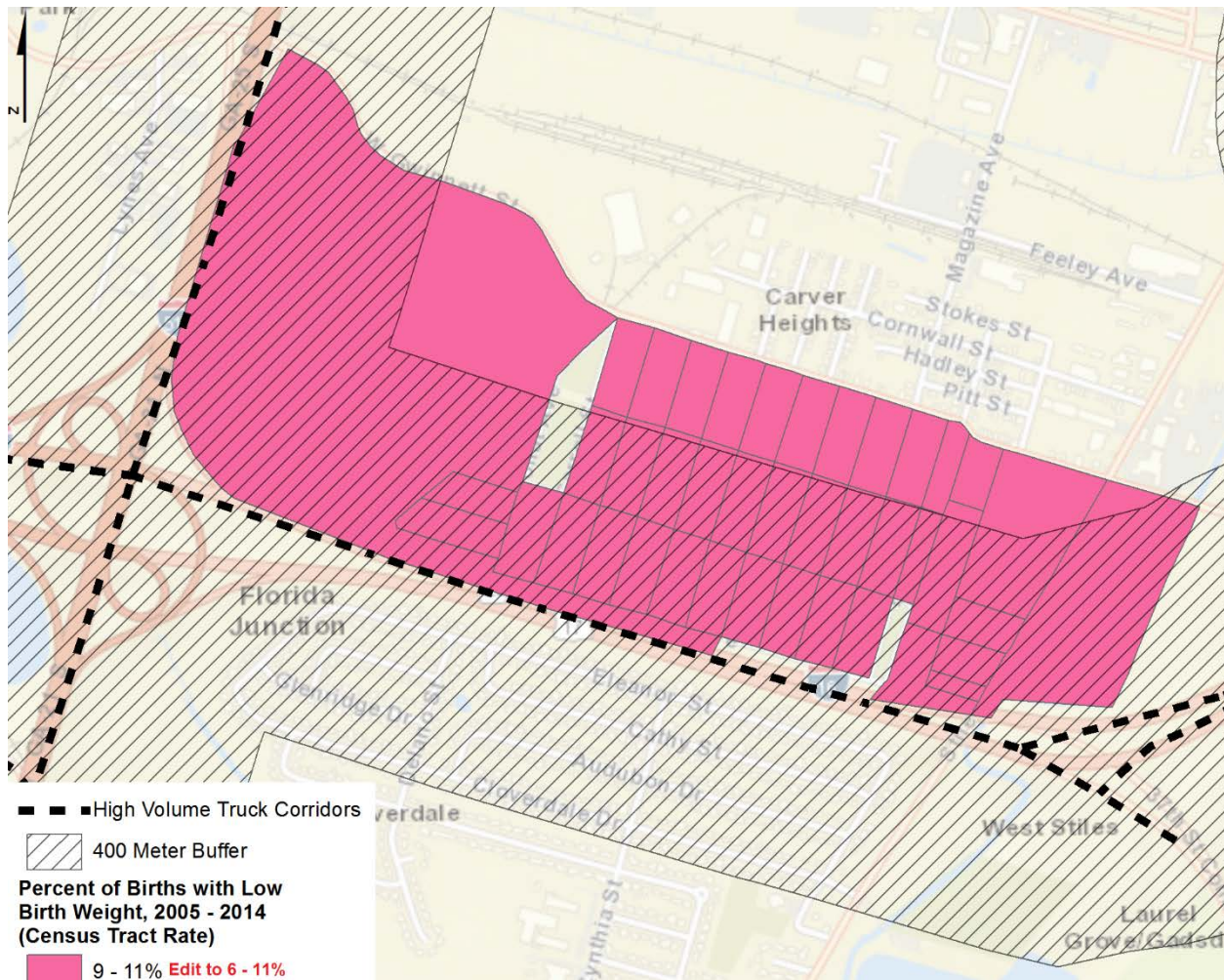
Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 2	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 2

Health – Low Birth Weight



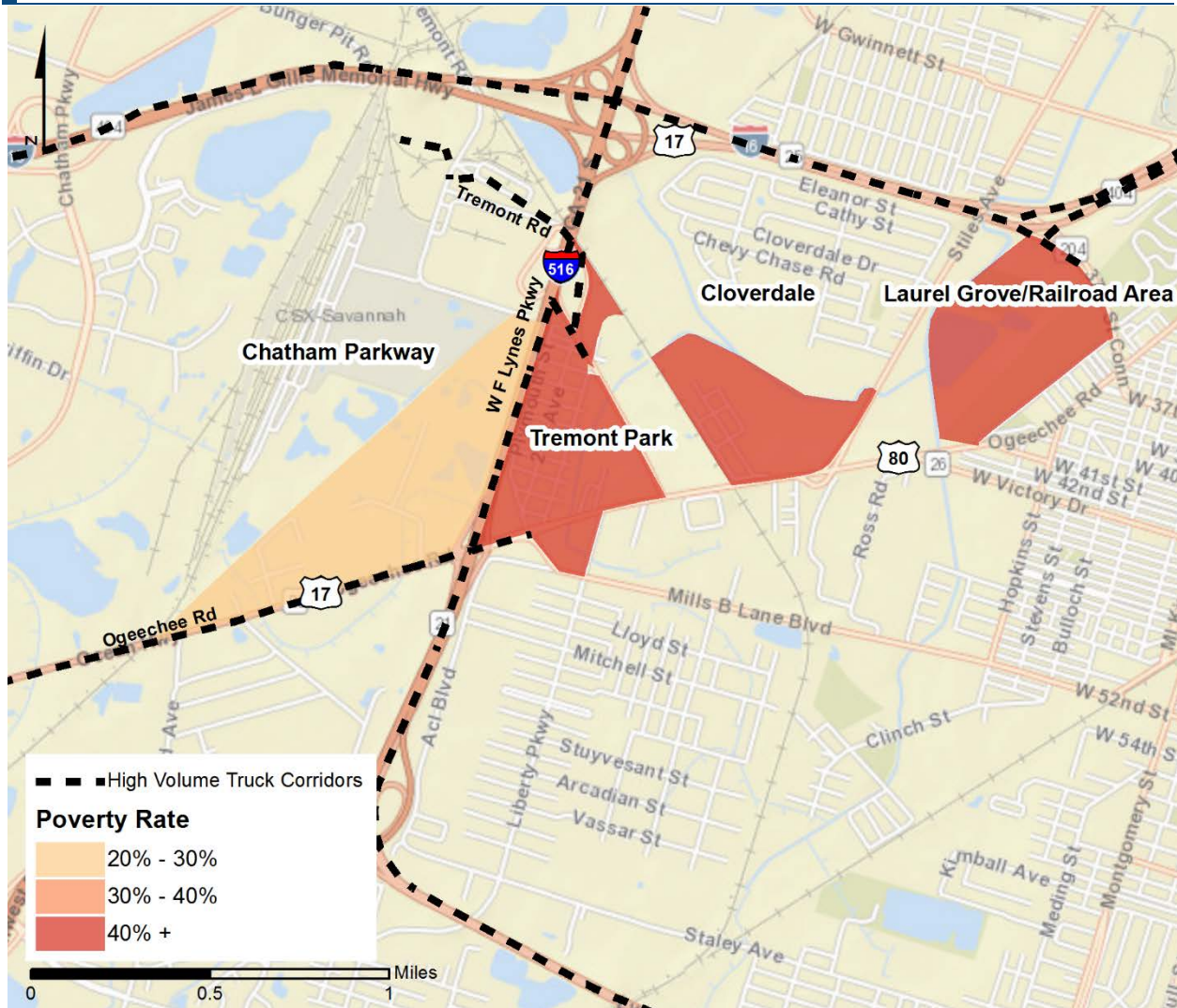
Criteria (✓ = 1 point)	SAV – EJ Area 2	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	7
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Savannah | EJ Area 3

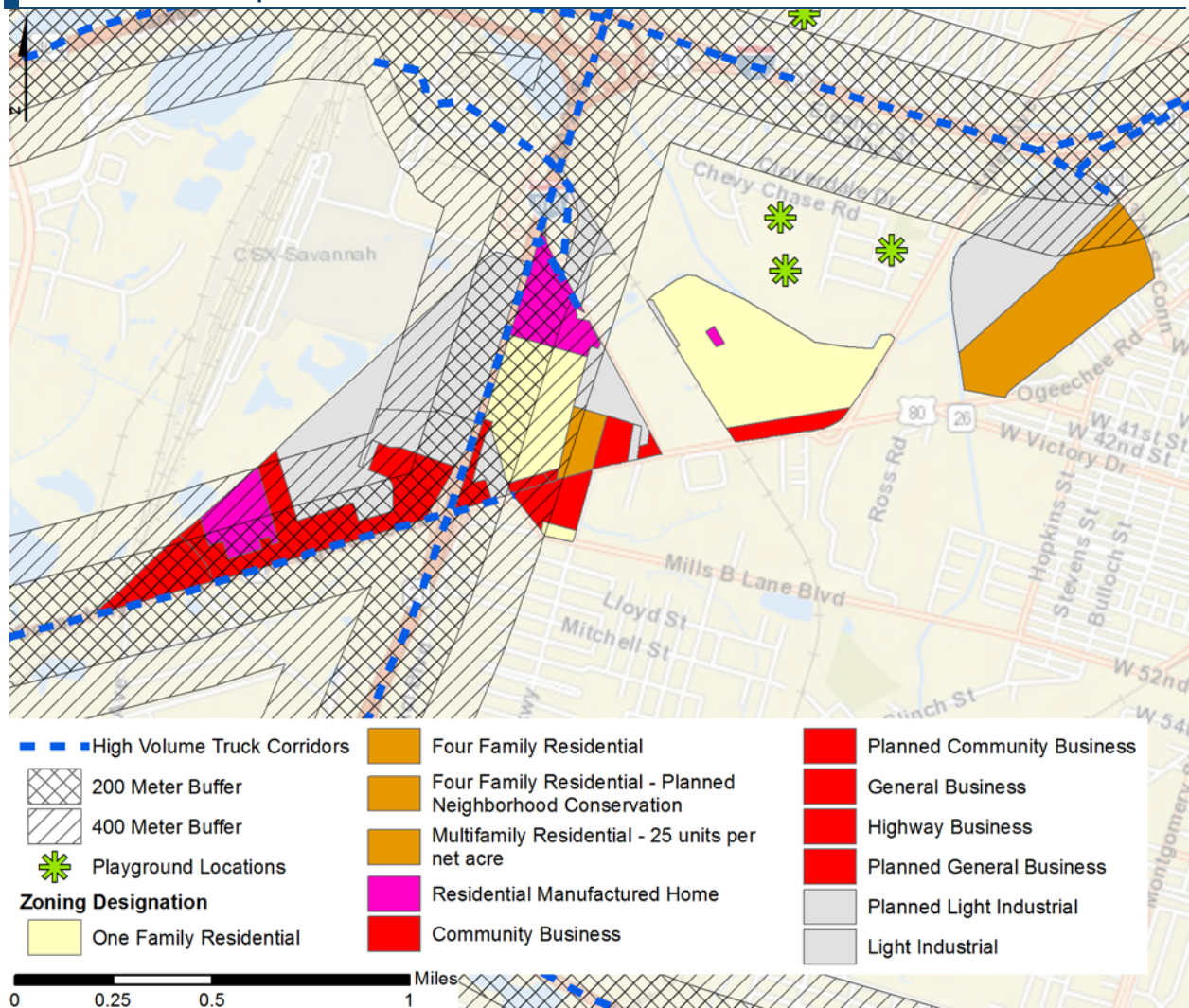
Demographics



Criteria (✓ = 1 point)	SAV – EJ Area 3	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty	✓	1
Demographics Total		3

Savannah | EJ Area 3

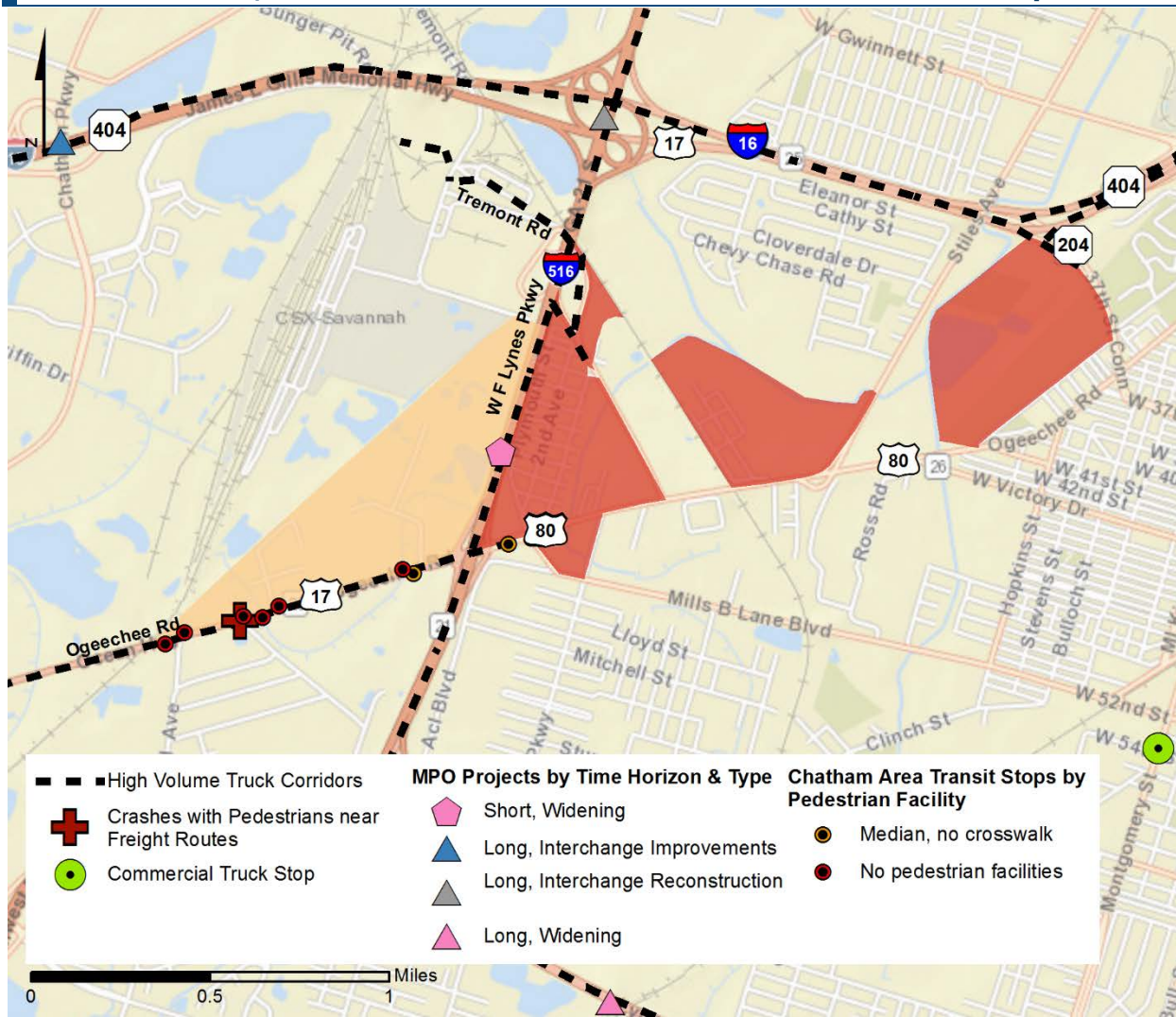
Land Use



Criteria (✓ = 1 point)	SAV – EJ Area 3	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?		
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		1

Savannah | EJ Area 3

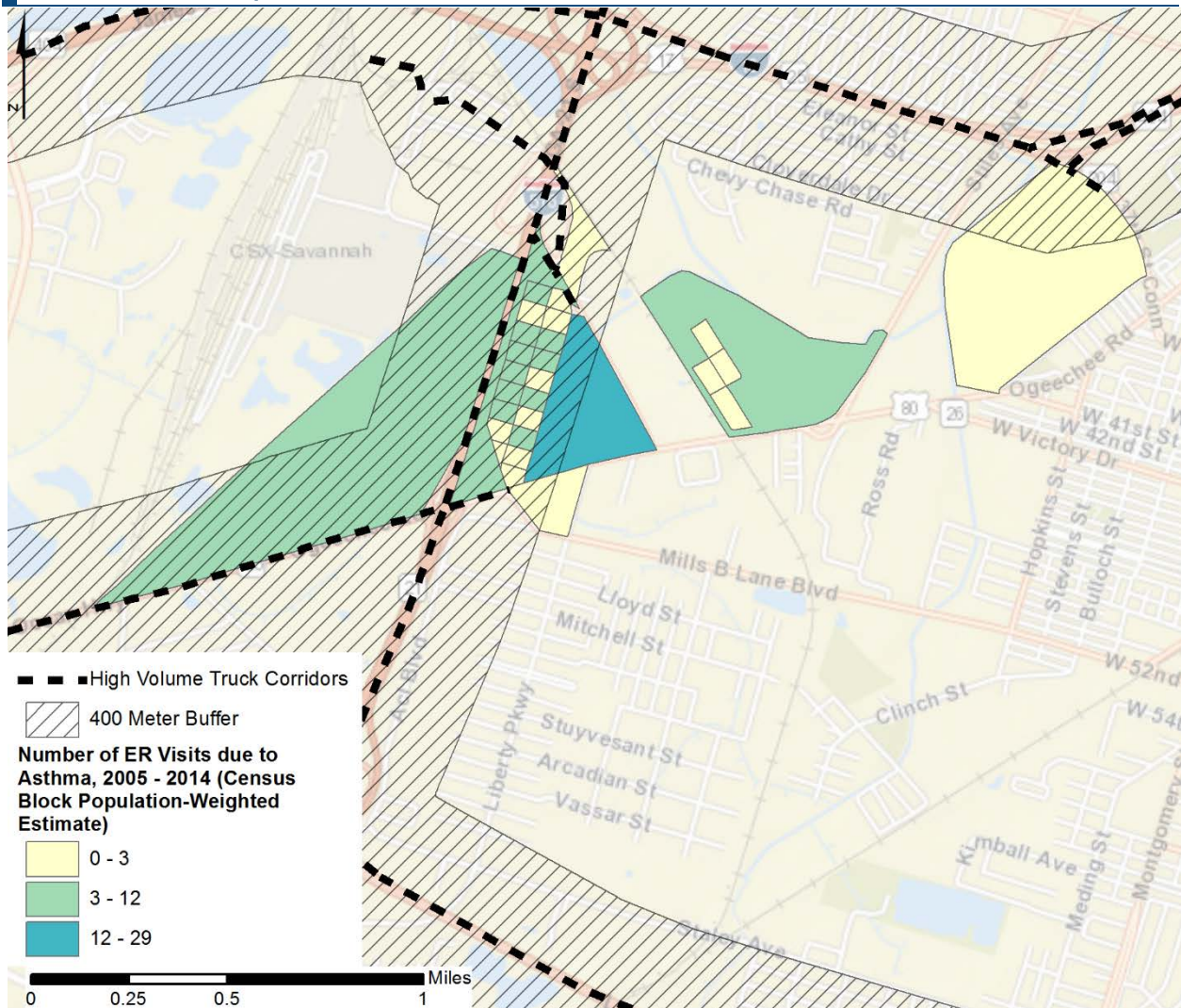
Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 3	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)	✓	1
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?	✓	1
Transportation Total		4

Savannah | EJ Area 3

Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 3	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 3

Health – Low Birth Weight



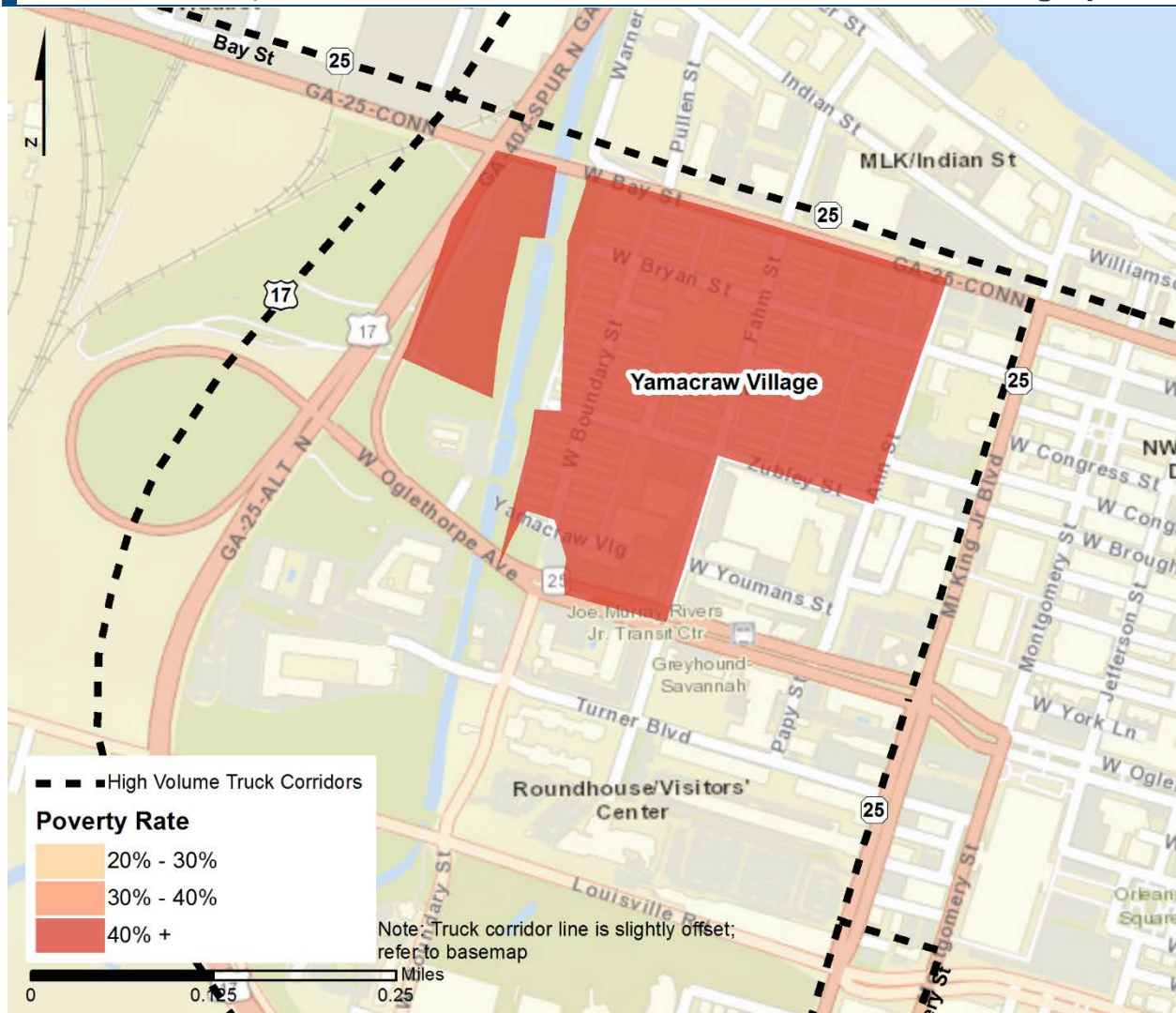
Criteria (✓ = 1 point)	SAV – EJ Area 3	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	10
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Savannah | EJ Area 4

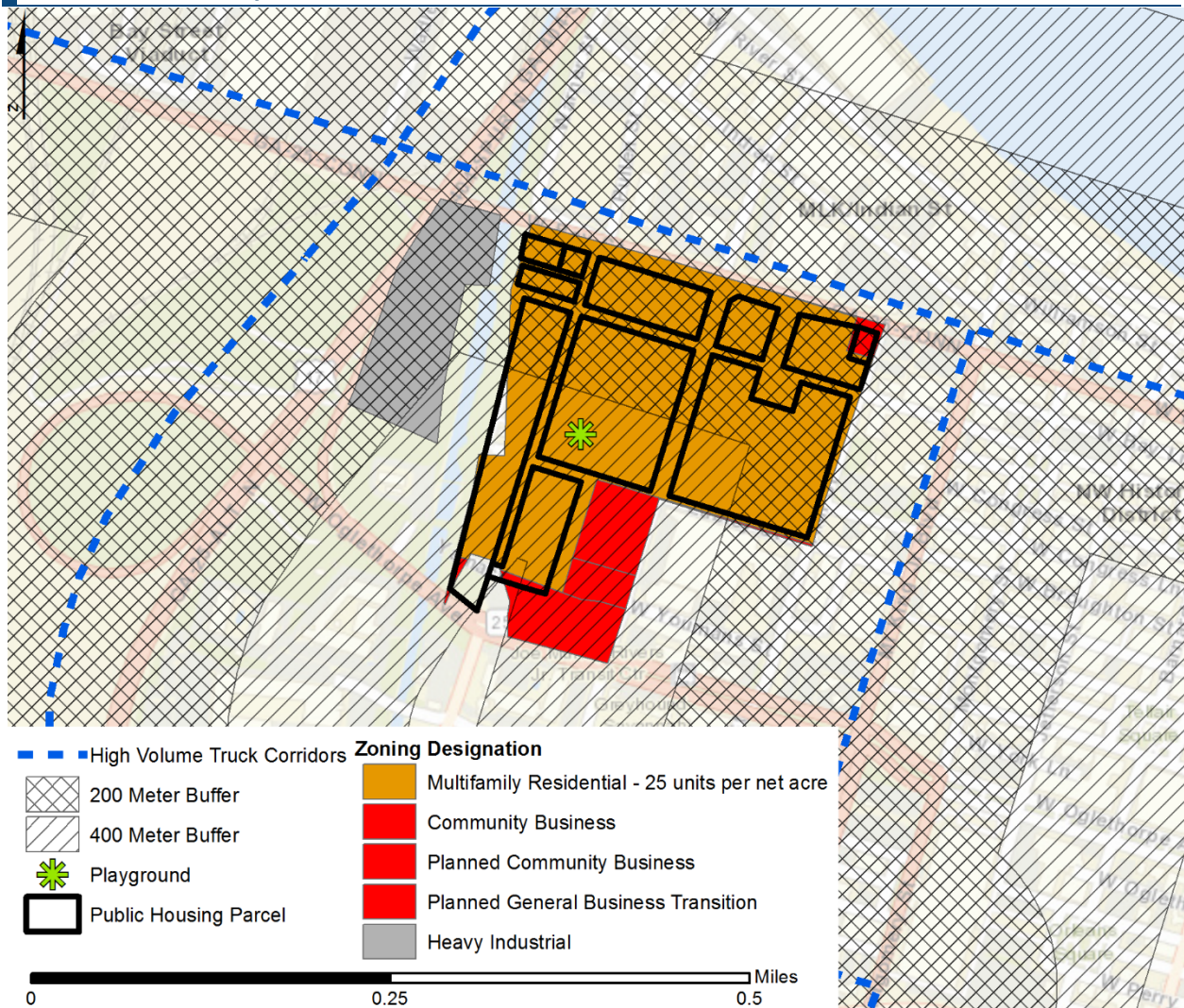
Demographics



Criteria (✓ = 1 point)	SAV – EJ Area 4	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty	✓	1
Demographics Total		3

Savannah | EJ Area 4

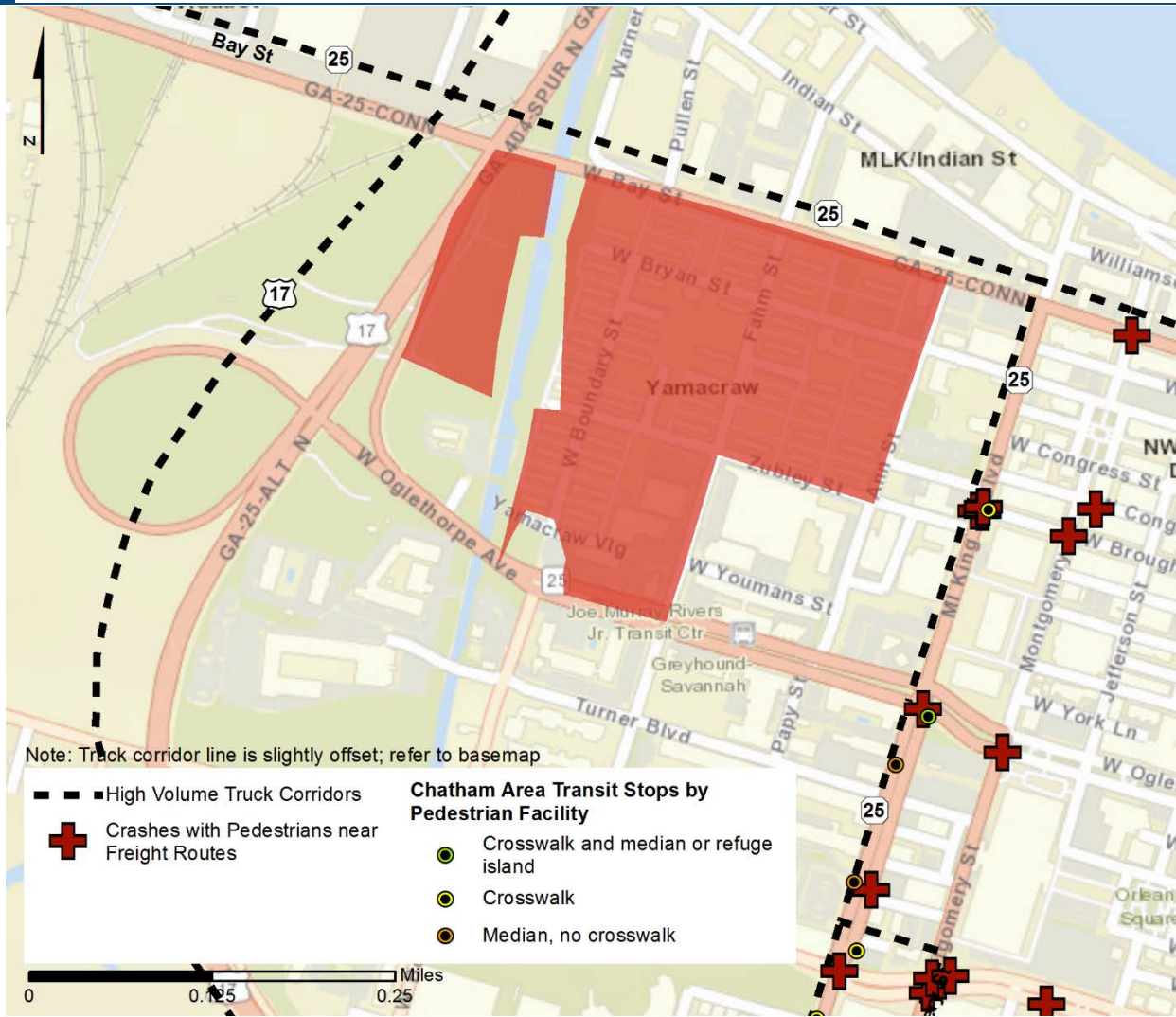
Land Use



Criteria (✓ = 1 point)	SAV – EJ Area 4	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?	✓	1
Is public housing (managed by the Housing Authority of Savannah) located here?	✓	1
Land Use Total		3

Savannah | EJ Area 4

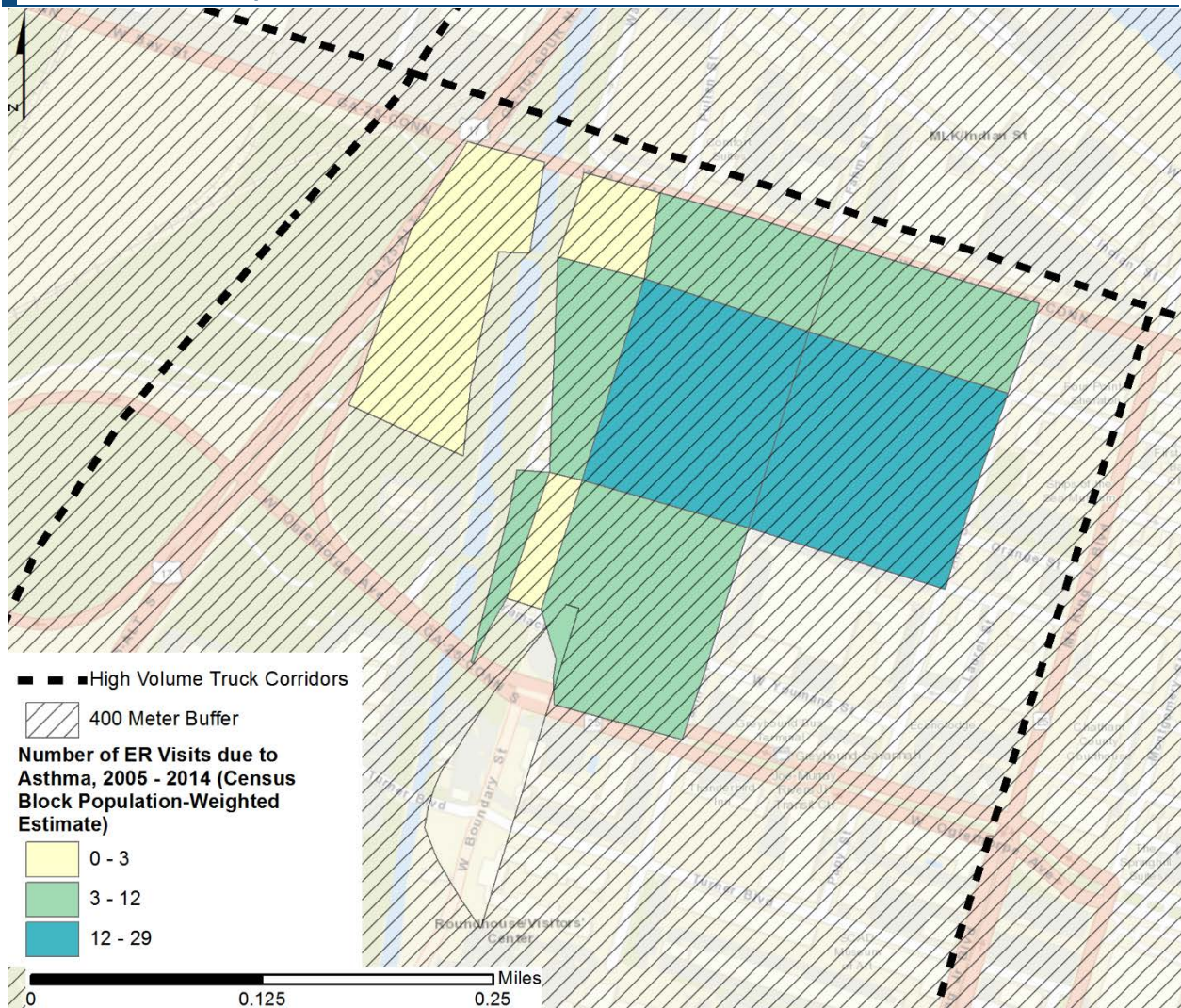
Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 4	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)		
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?	✓	1
Transportation Total		3

Savannah | EJ Area 4

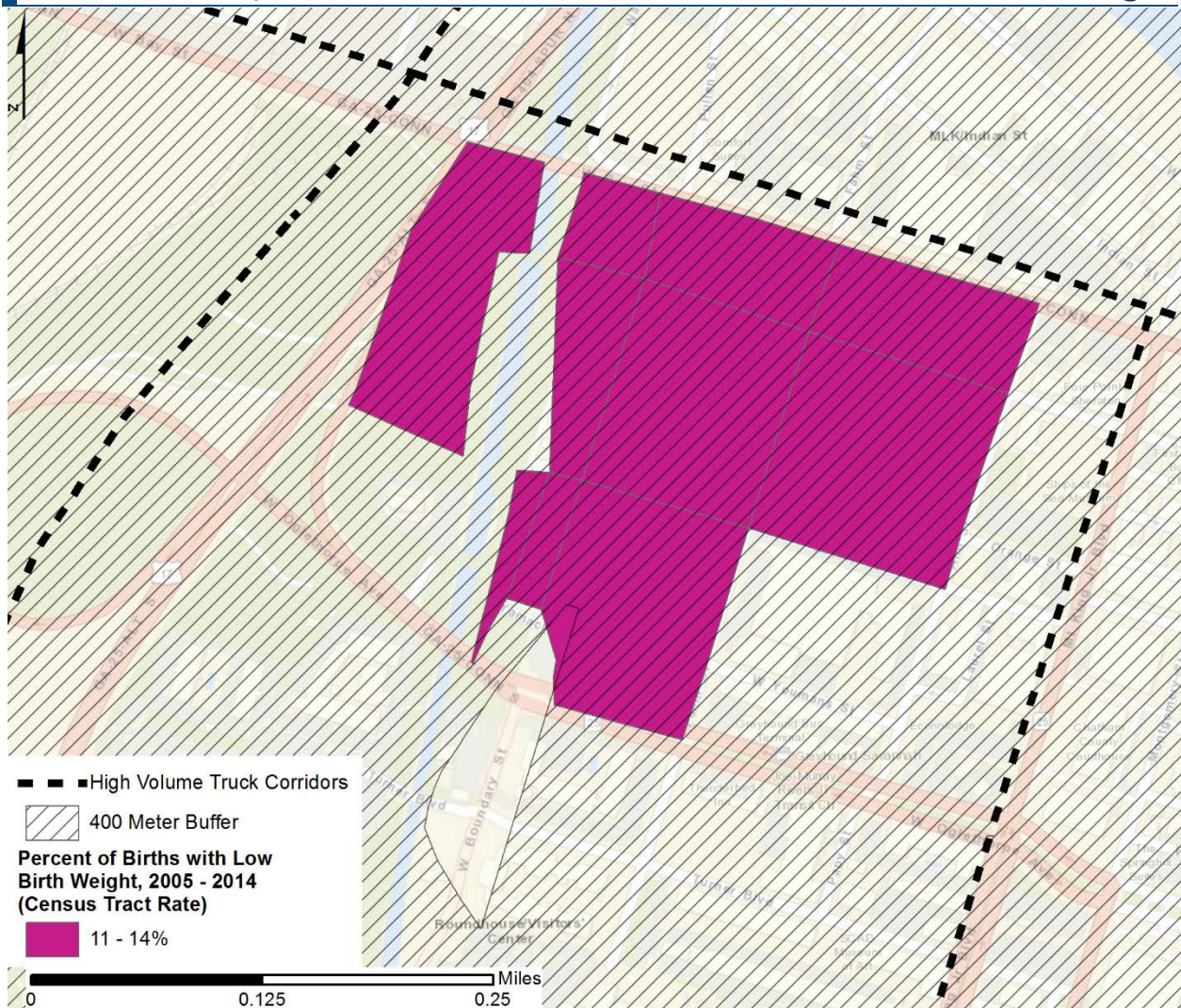
Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 4	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 4

Health – Low Birth Weight



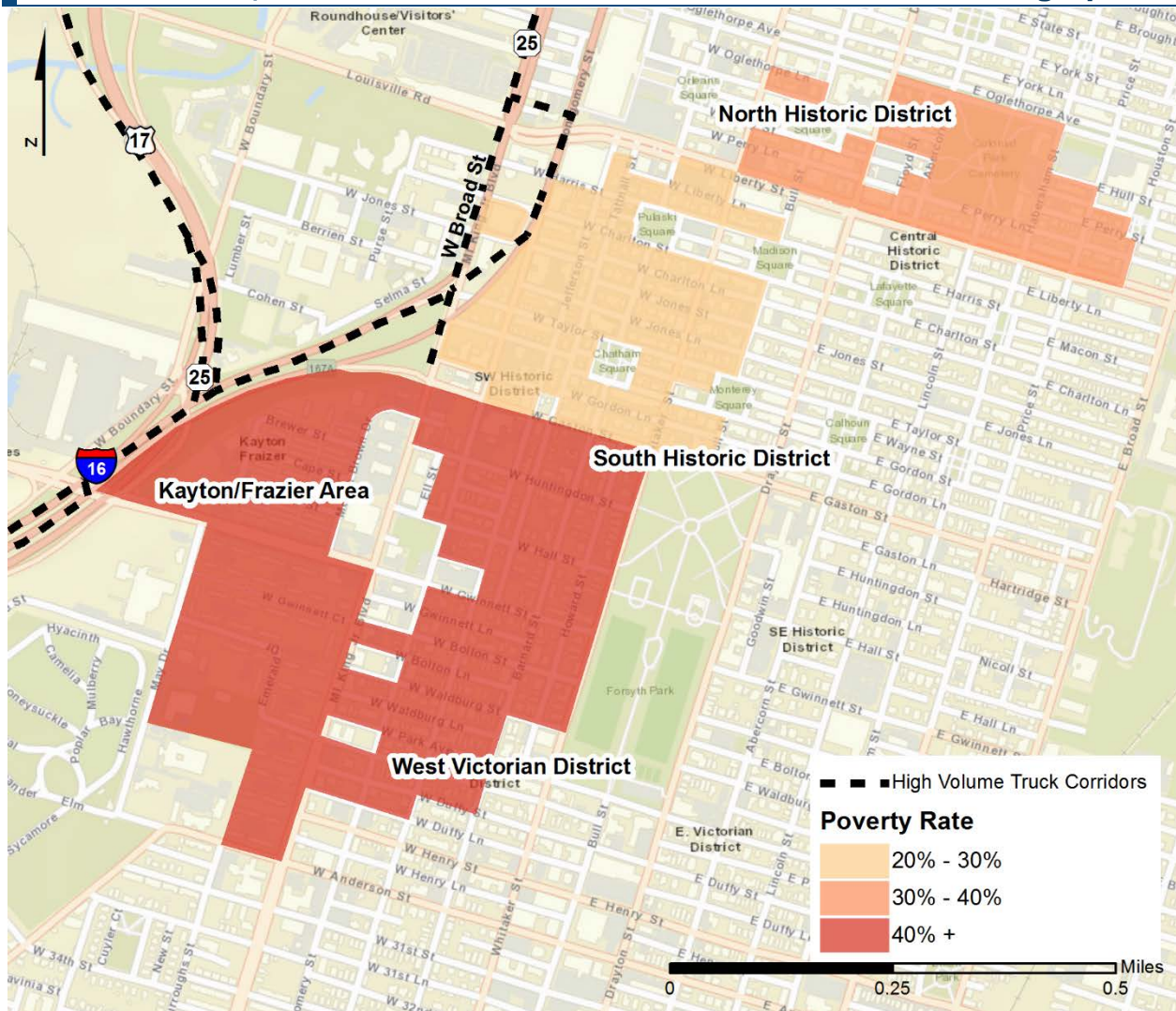
Criteria (✓ = 1 point)	SAV – EJ Area 4	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

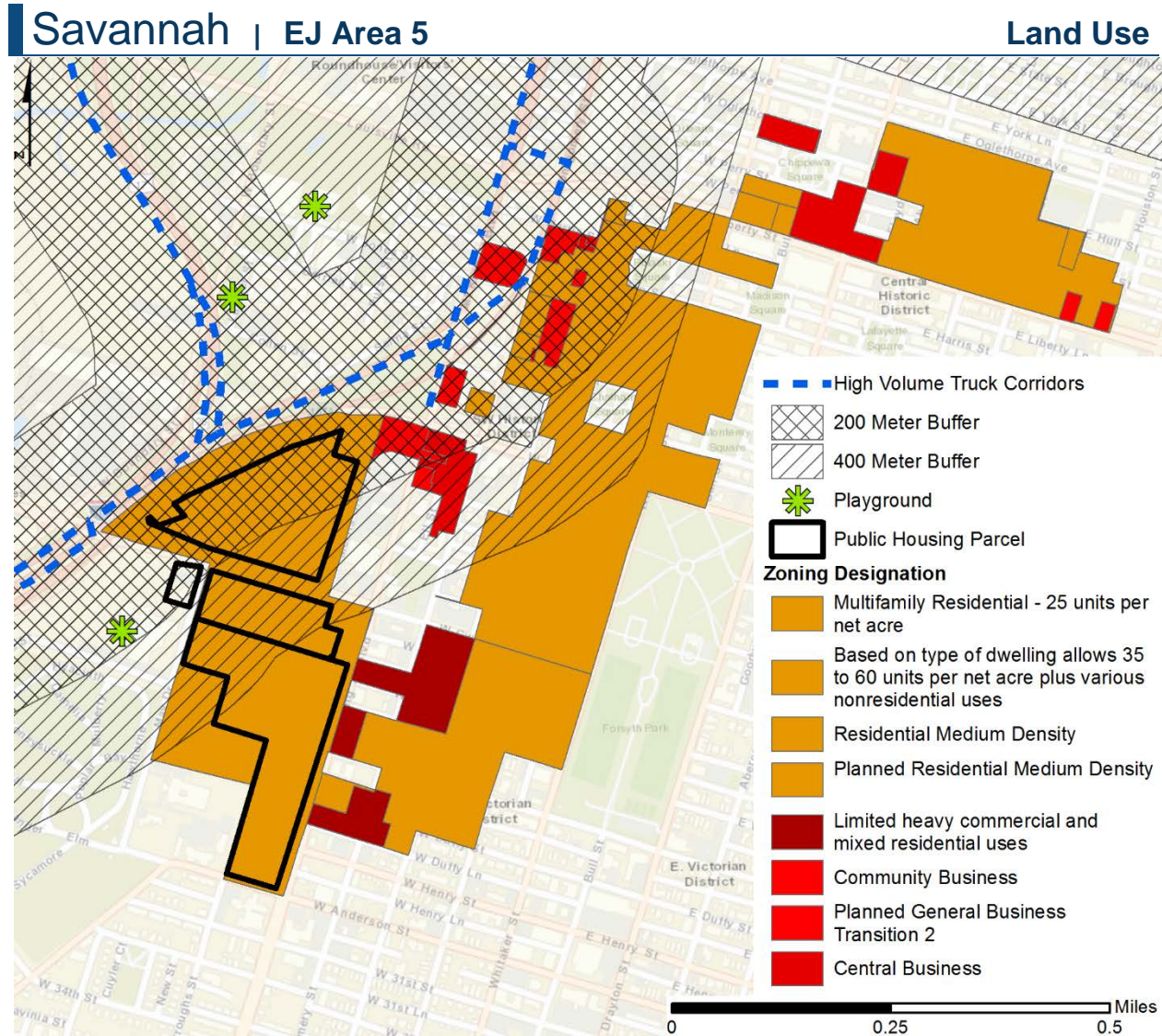
GRAND TOTAL (out of 13 points)	11
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Savannah | EJ Area 5

Demographics



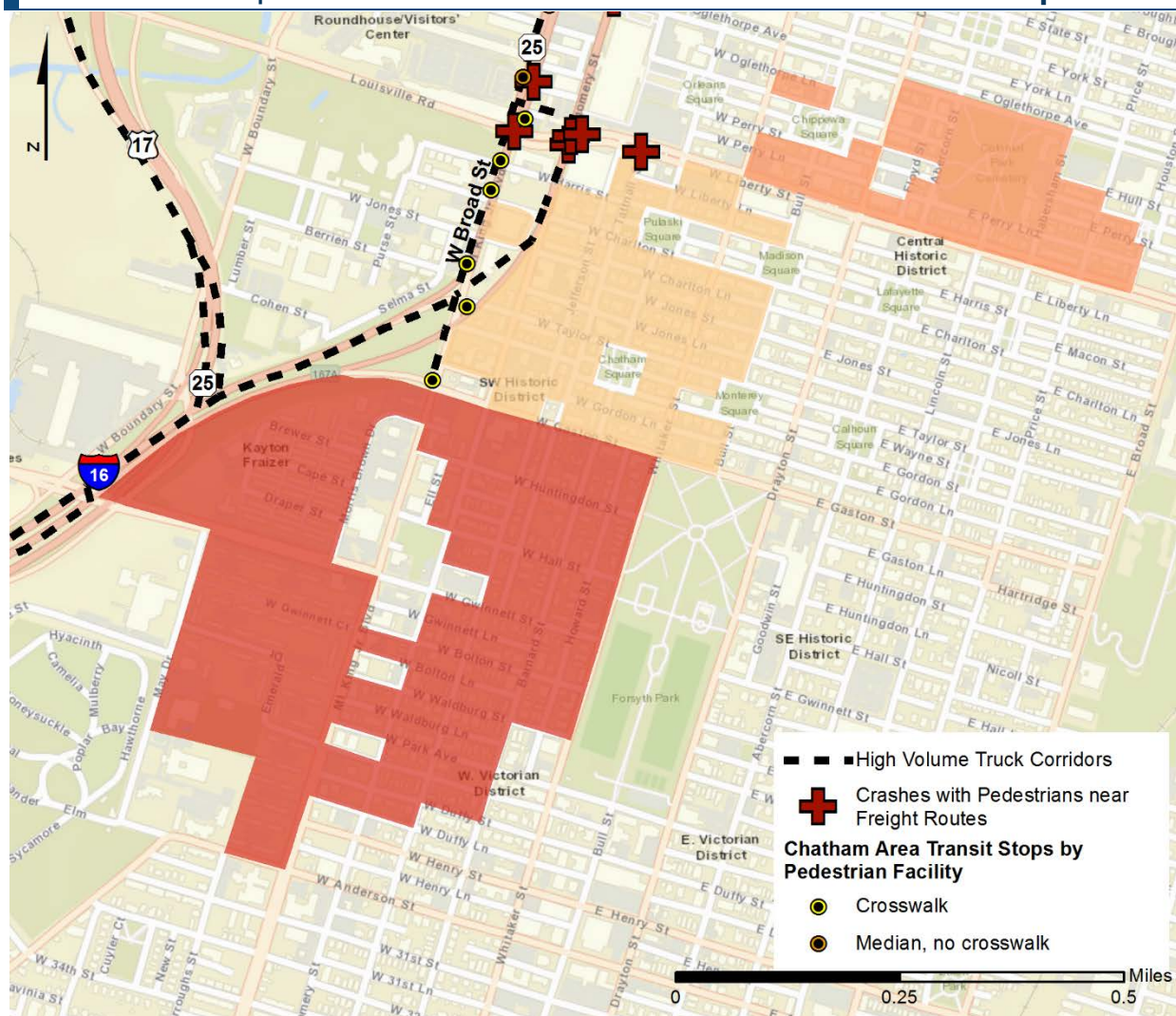
Criteria (✓ = 1 point)	SAV – EJ Area 5	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty	✓	1
Demographics Total		3



Criteria (✓ = 1 point)	SAV – EJ Area 5	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?	✓	1
Is public housing (managed by the Housing Authority of Savannah) located here?	✓	1
Land Use Total		3

Savannah | EJ Area 5

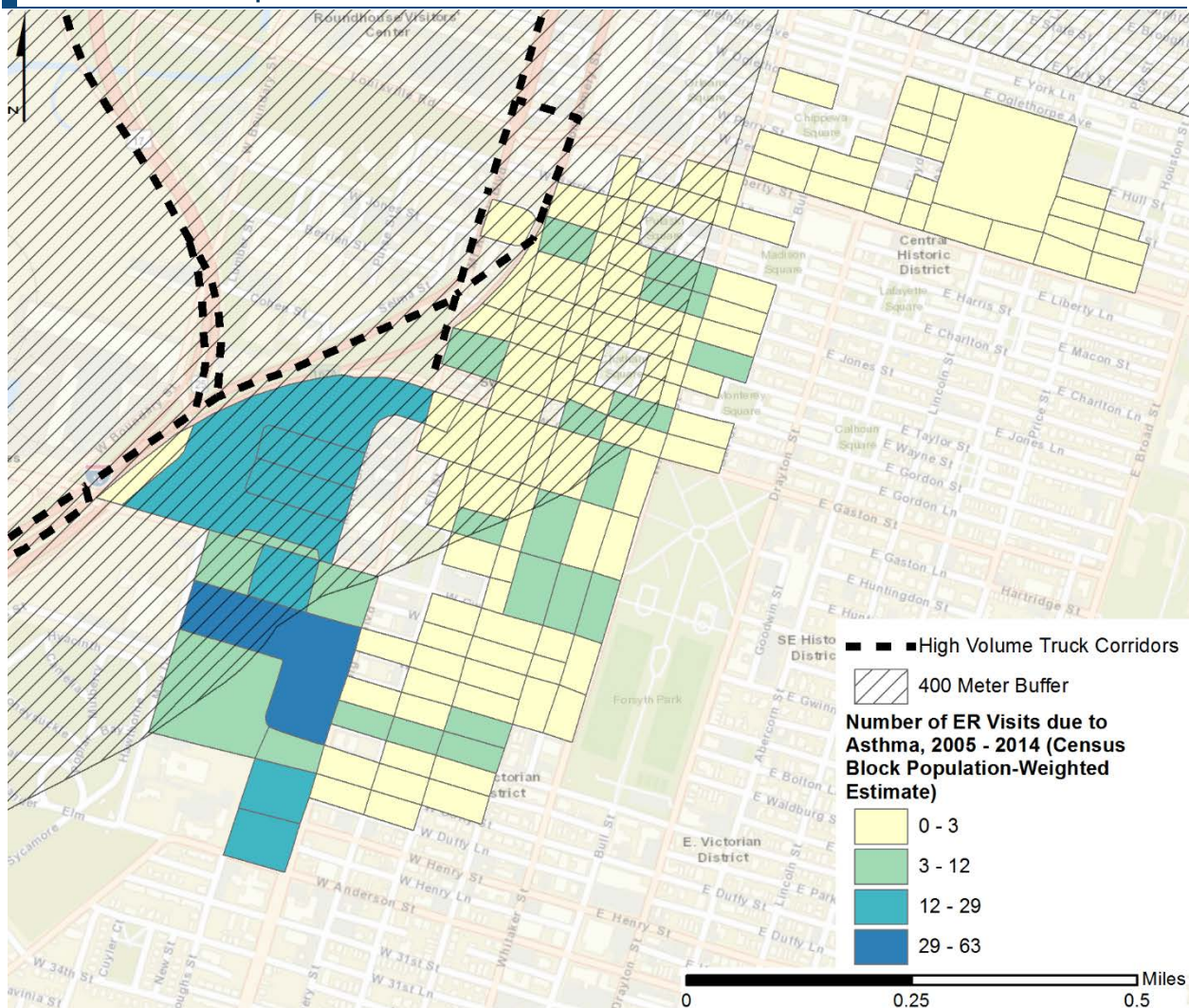
Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 5	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)		
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?		
Transportation Total		2

Savannah | EJ Area 5

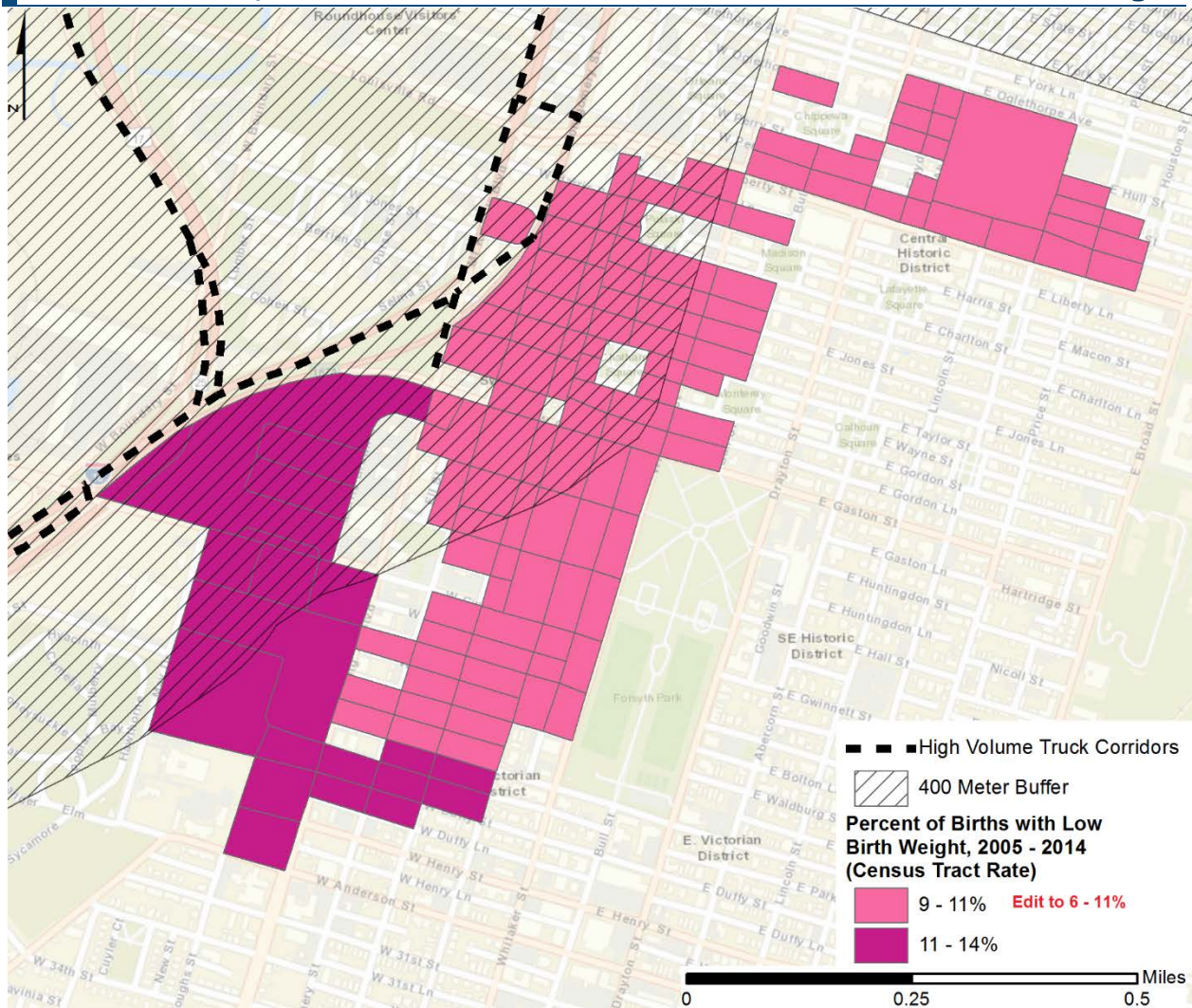
Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 5	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 5

Health – Low Birth Weight



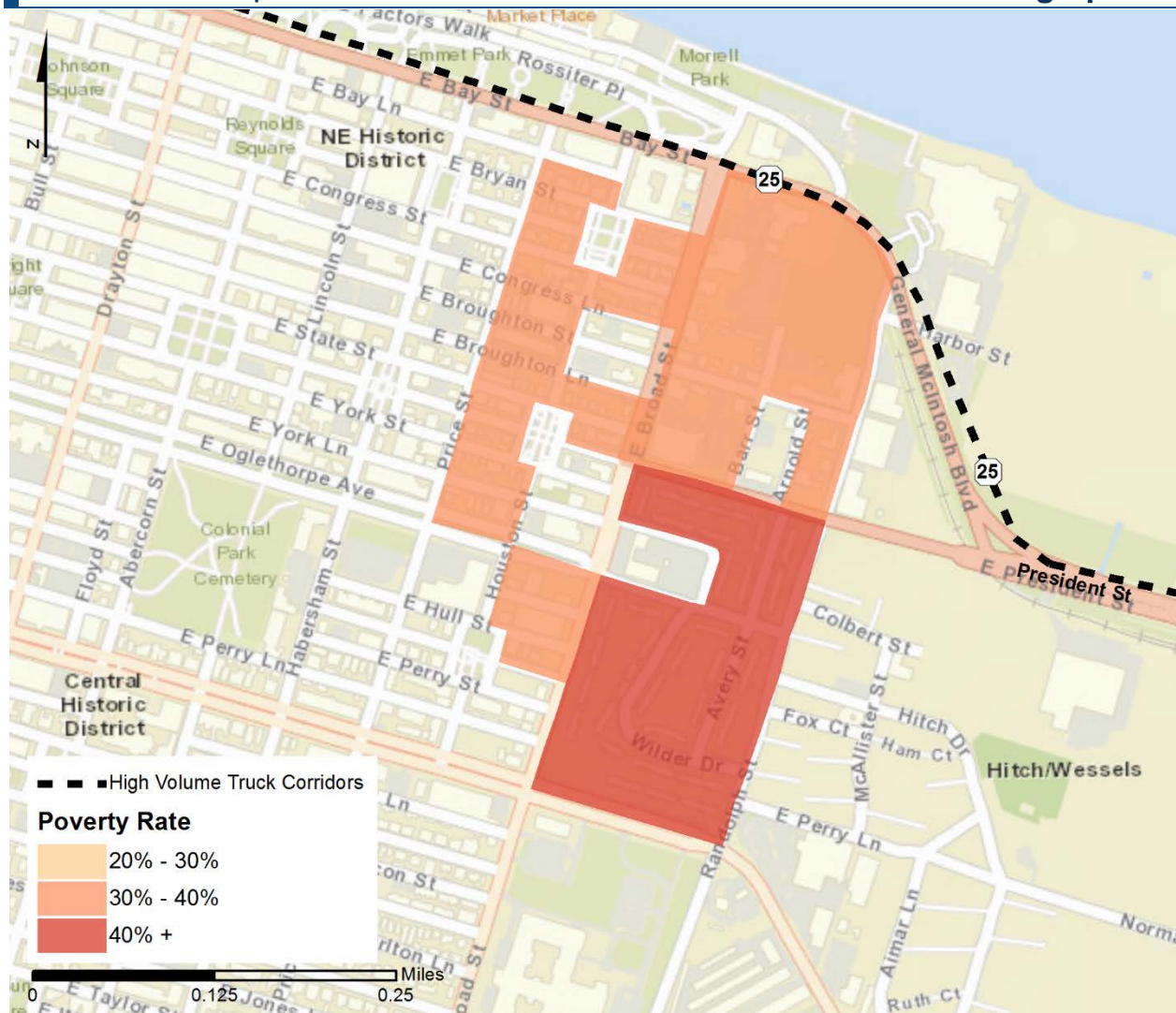
Criteria (✓ = 1 point)	SAV – EJ Area 5	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	10
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Savannah | EJ Area 6

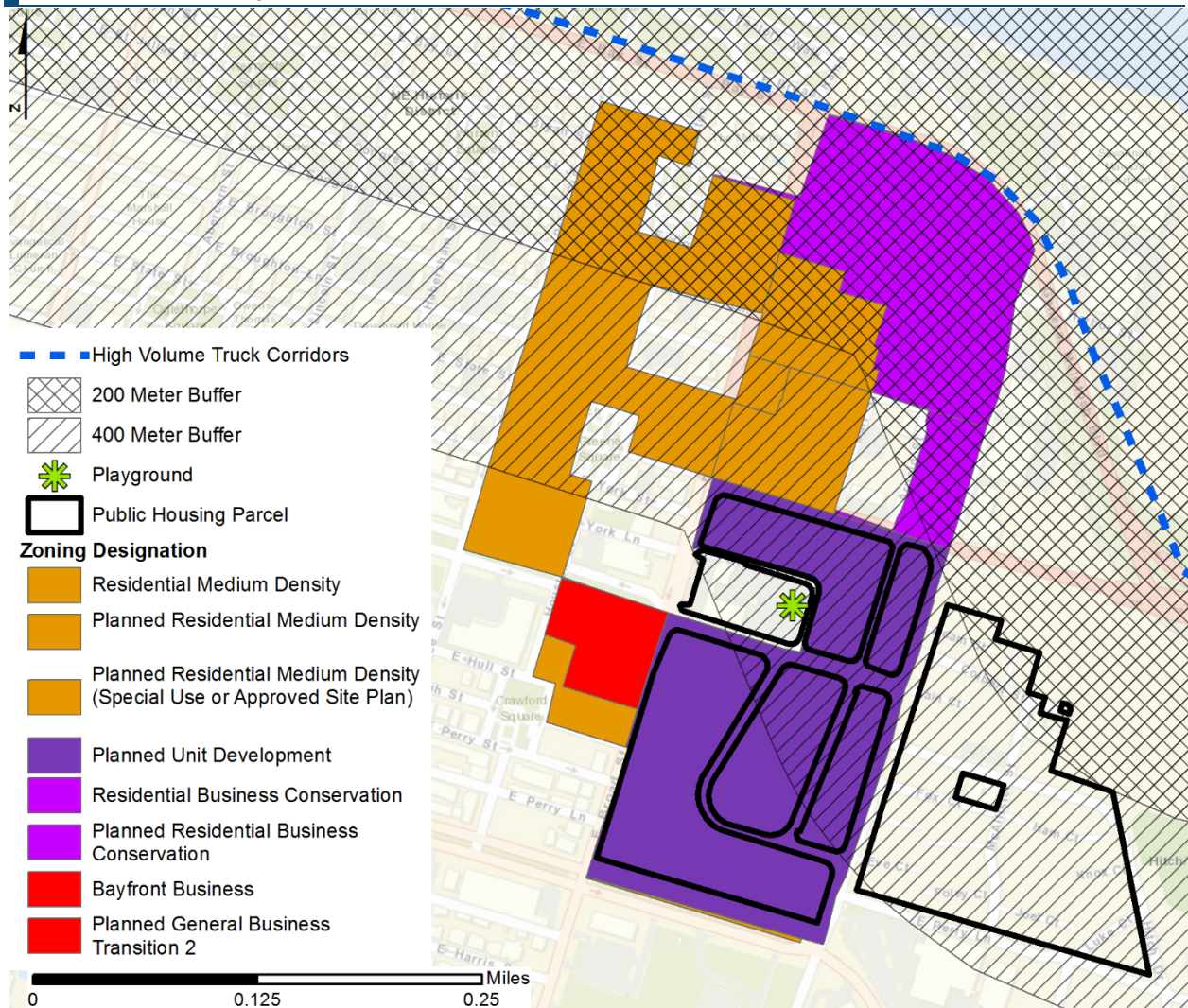
Demographics



Criteria (✓ = 1 point)	SAV – EJ Area 6	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty	✓	1
Demographics Total		3

Savannah | EJ Area 6

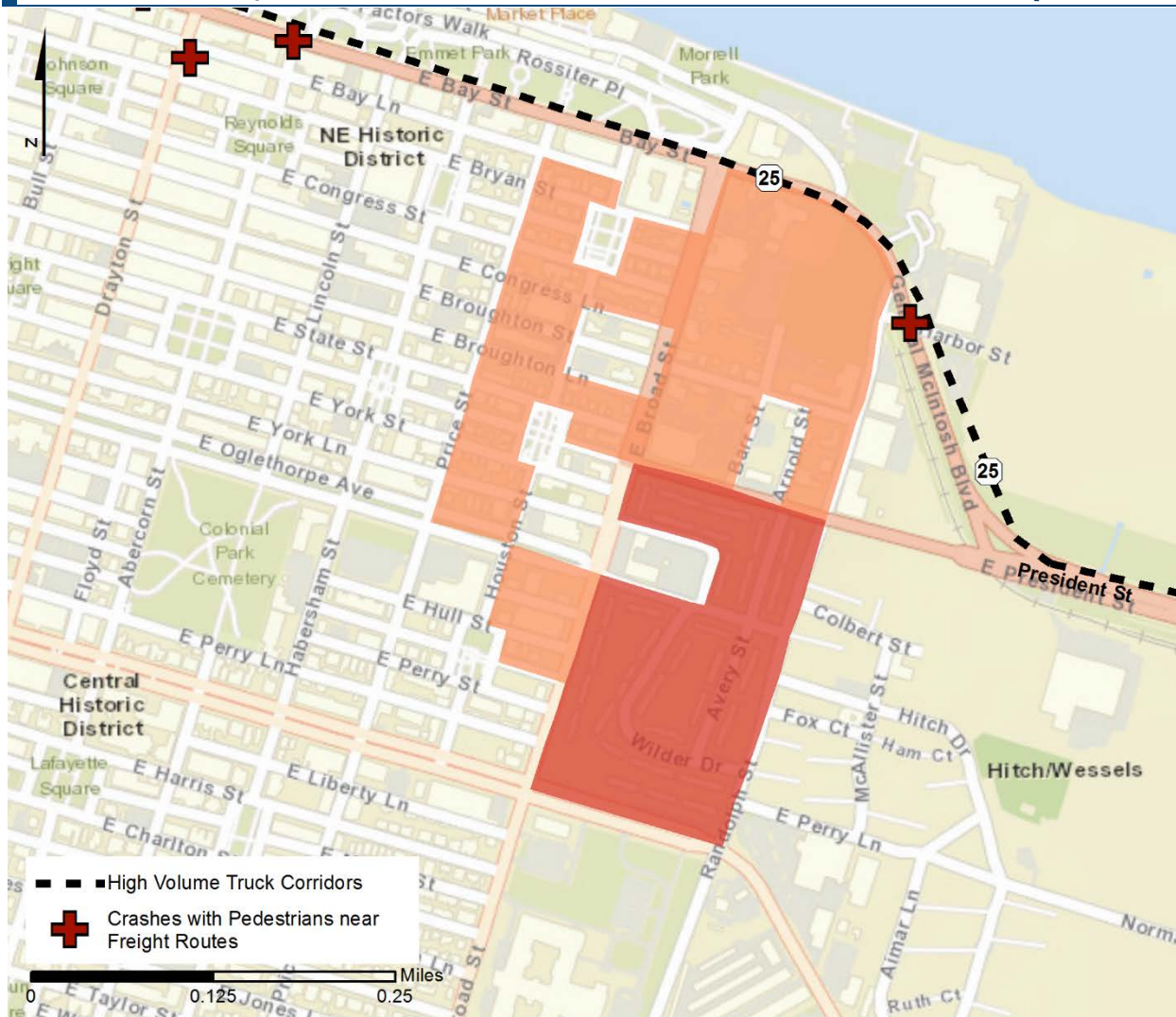
Land Use



Criteria (✓ = 1 point)	SAV – EJ Area 6	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?	✓	1
Is public housing (managed by the Housing Authority of Savannah) located here?	✓	1
Land Use Total		3

Savannah | EJ Area 6

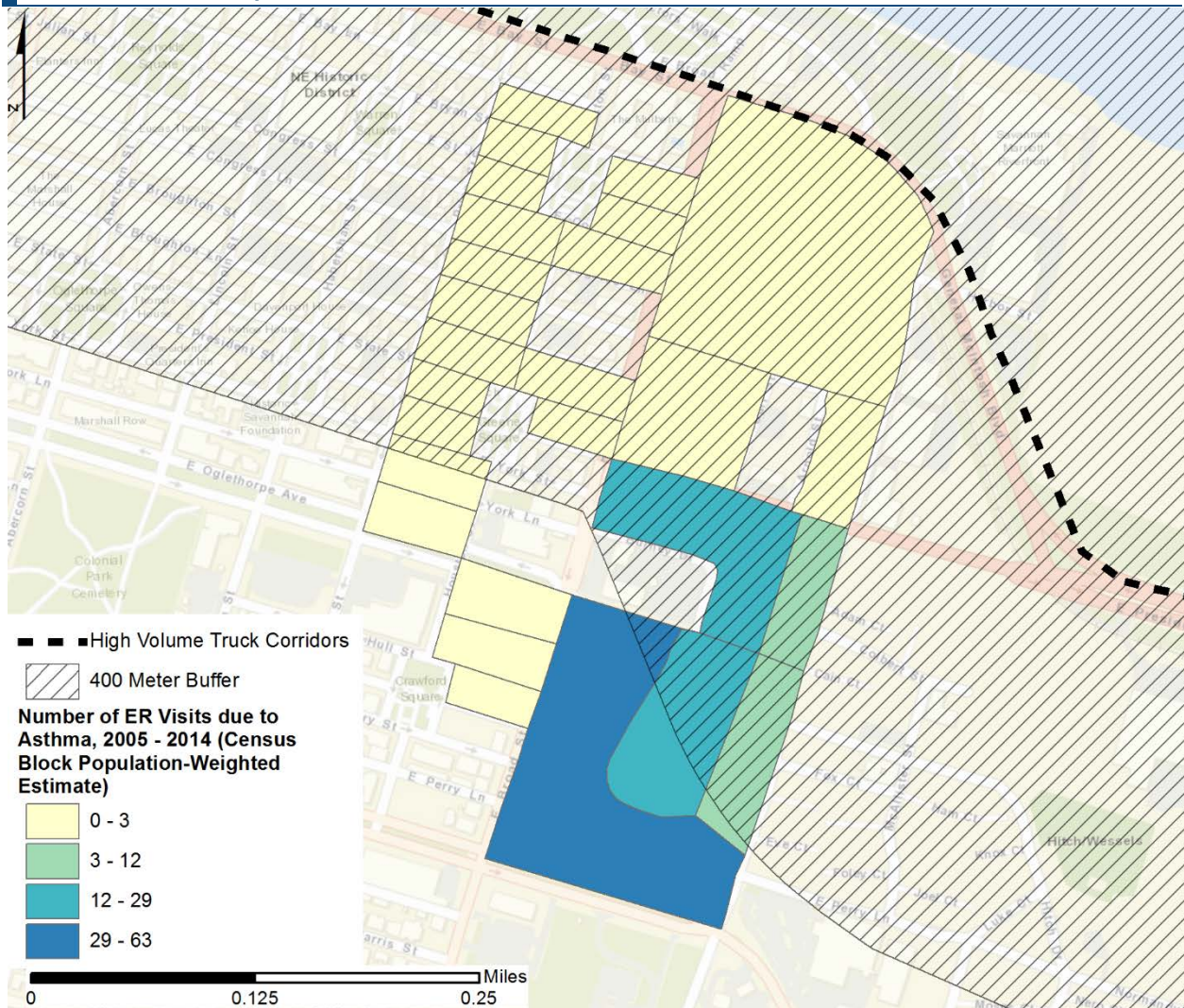
Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 6	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)		
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?		
If yes, would the bus stop benefit from additional pedestrian facilities?		
Transportation Total		1

Savannah | EJ Area 6

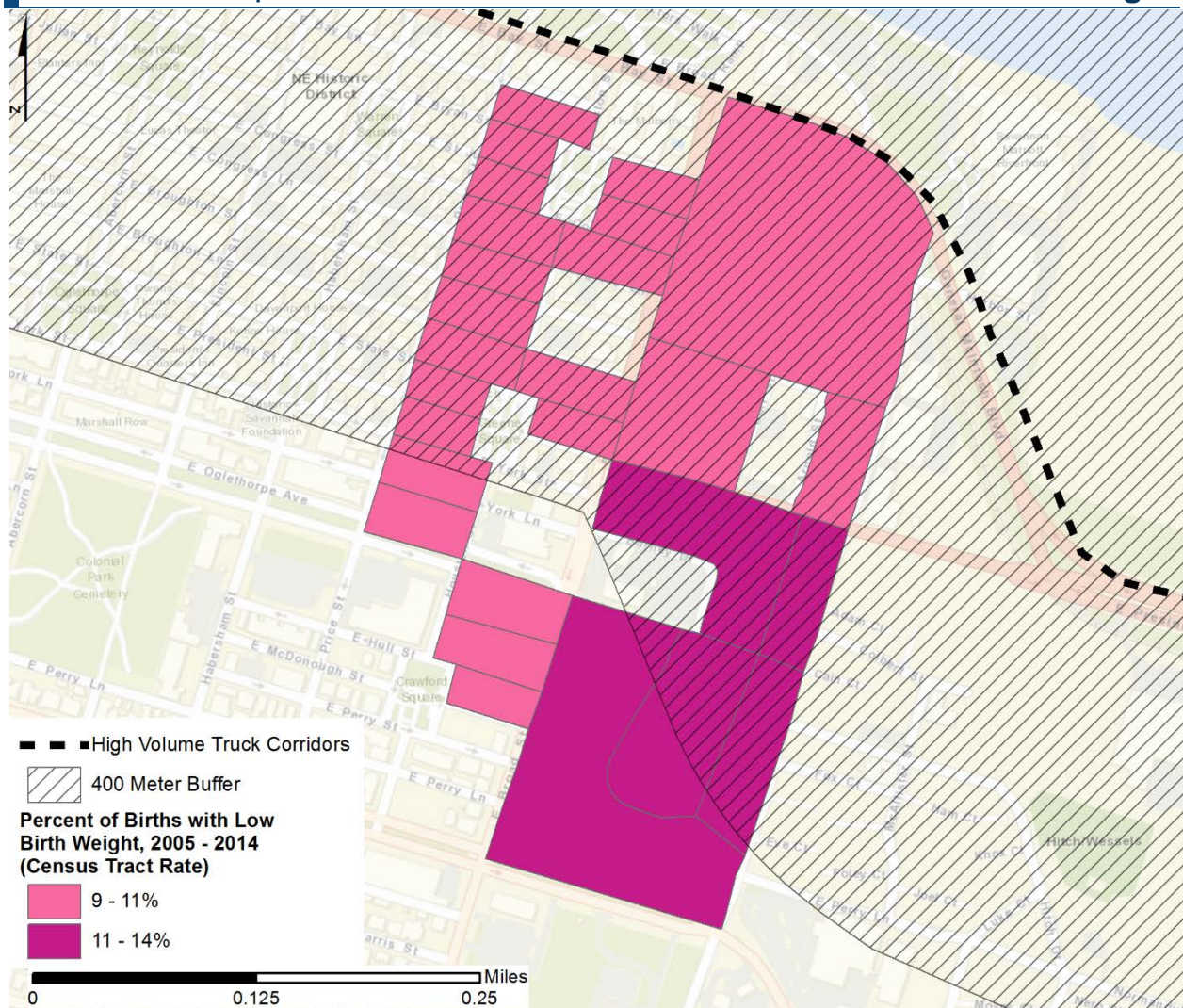
Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 6	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 6

Health – Low Birth Weight



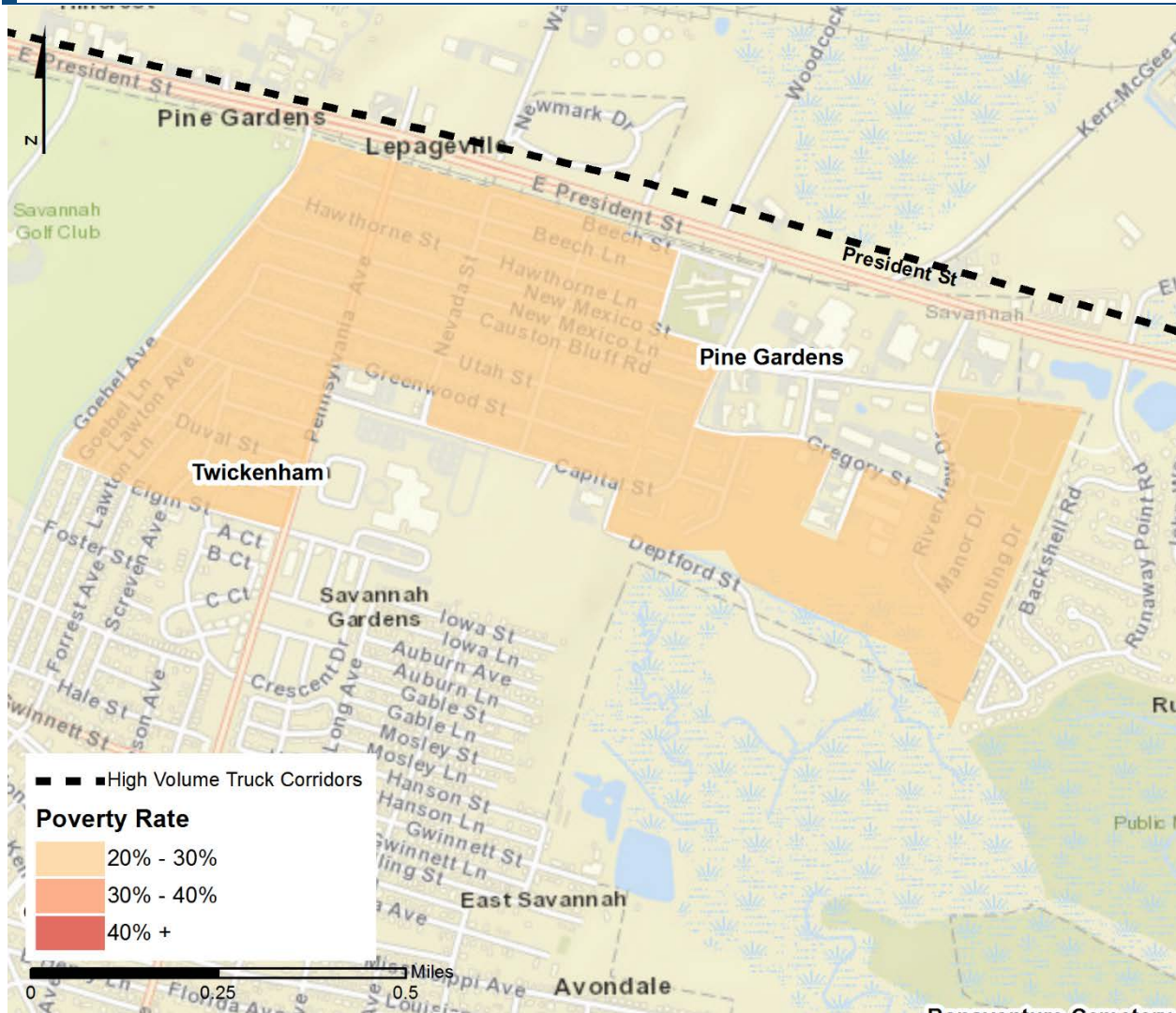
Criteria (✓ = 1 point)	SAV – EJ Area 6	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

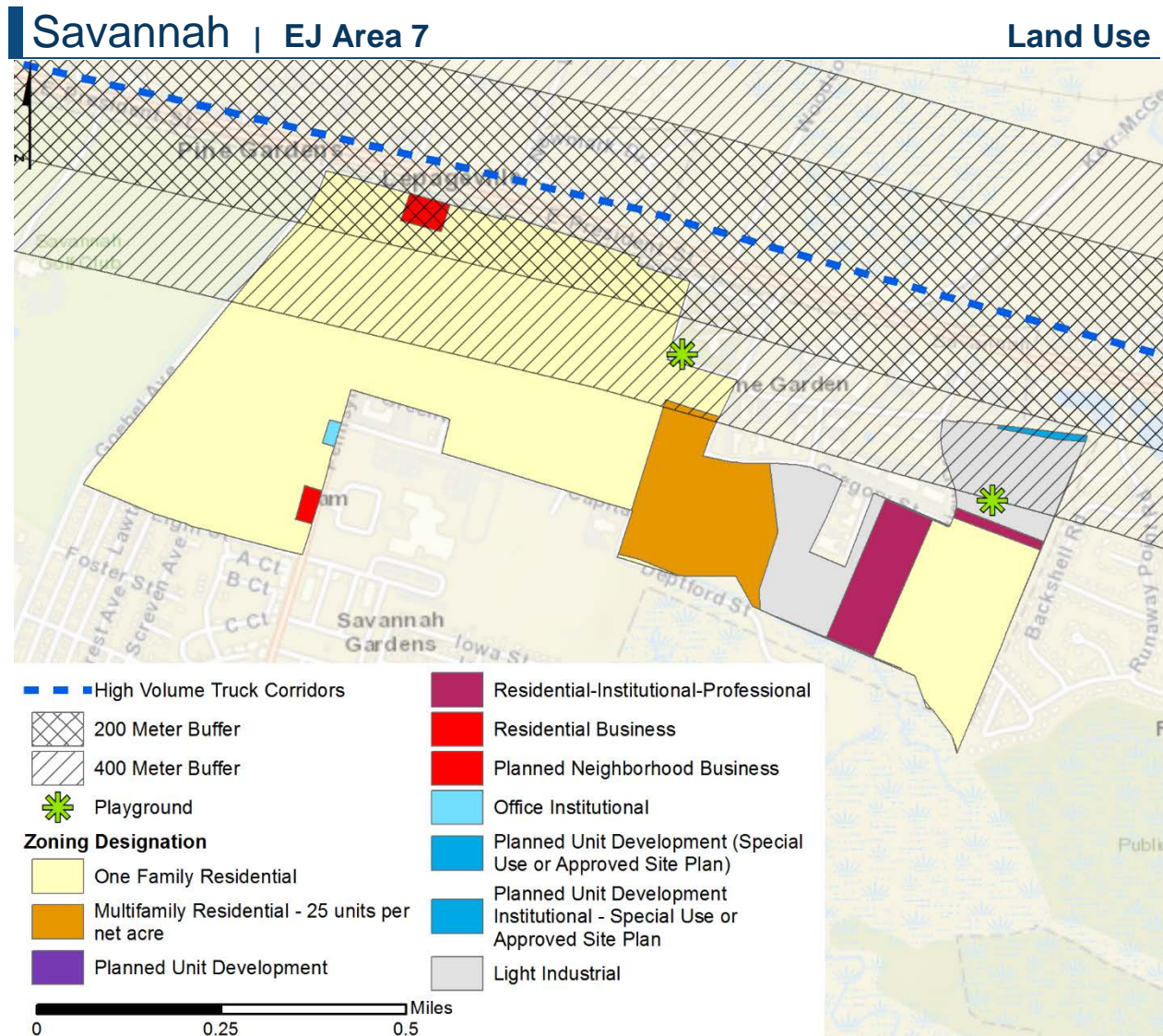
GRAND TOTAL (out of 13 points)	9
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Savannah | EJ Area 7

Demographics



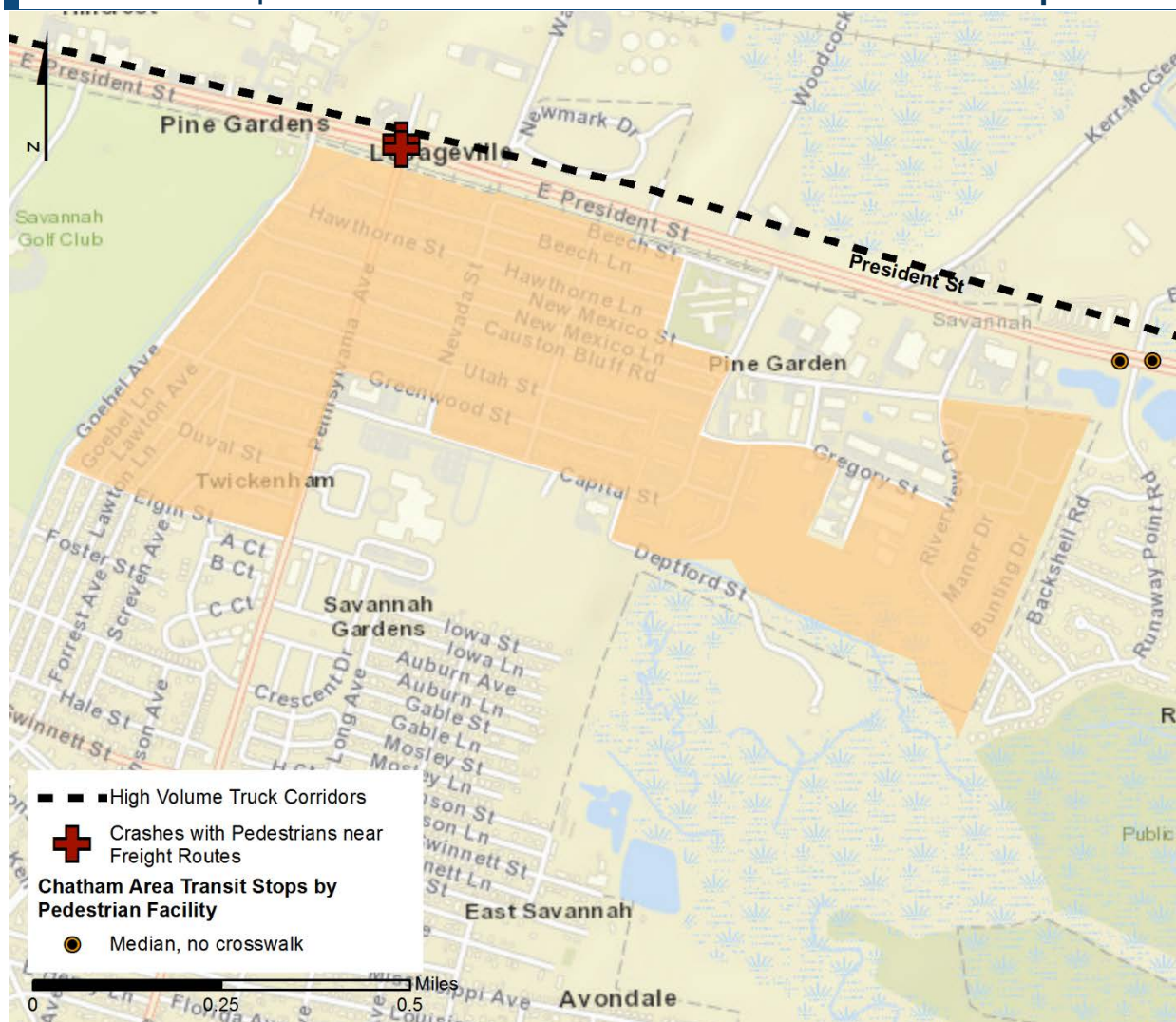
Criteria (✓ = 1 point)	SAV – EJ Area 7	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty		
EJ area contains census blocks with greater than 40% poverty		
Demographics Total		1



Criteria (✓ = 1 point)	SAV – EJ Area 7	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?	✓	1
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		2

Savannah | EJ Area 7

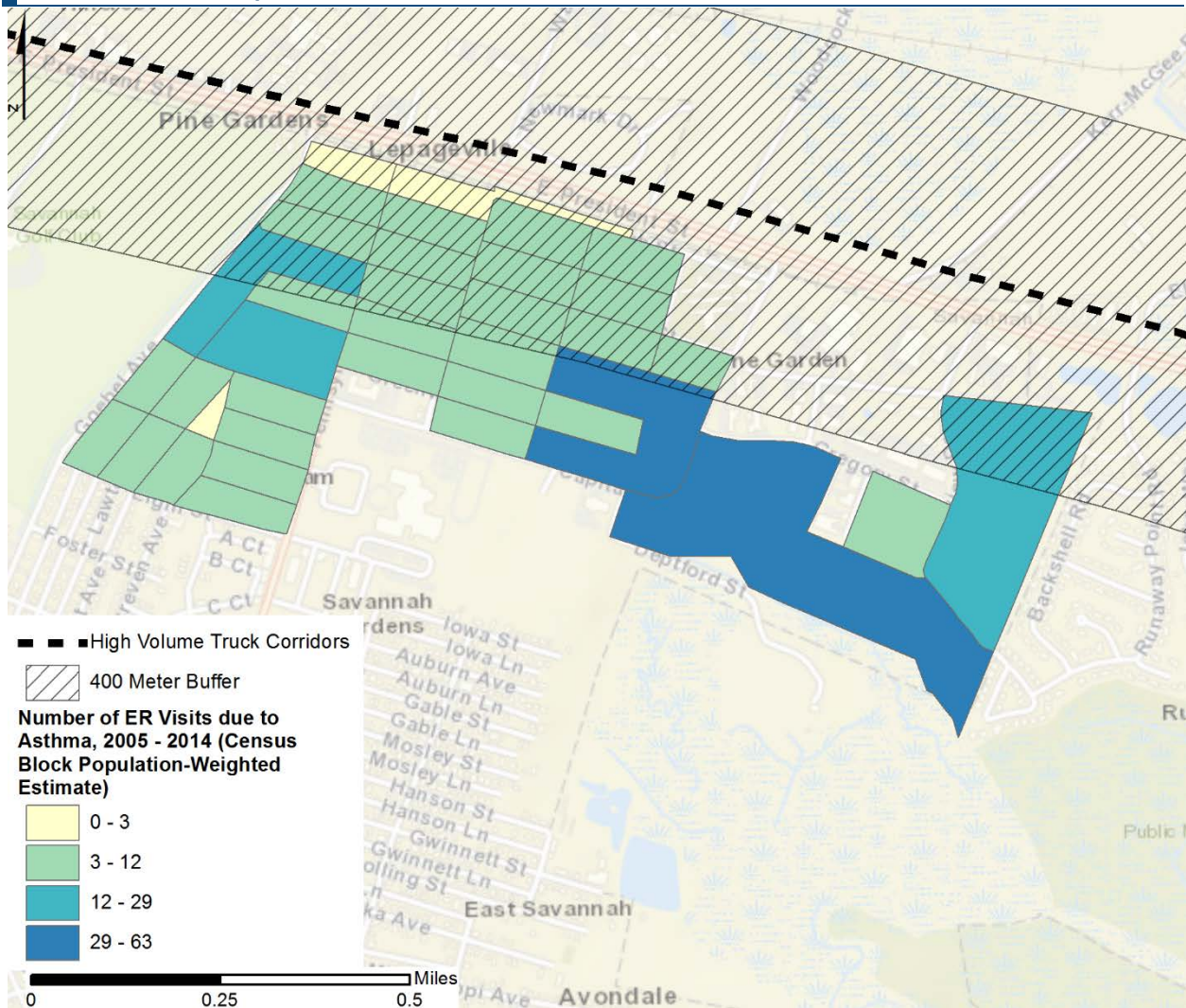
Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 7	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)		
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?	✓	1
Transportation Total		3

Savannah | EJ Area 7

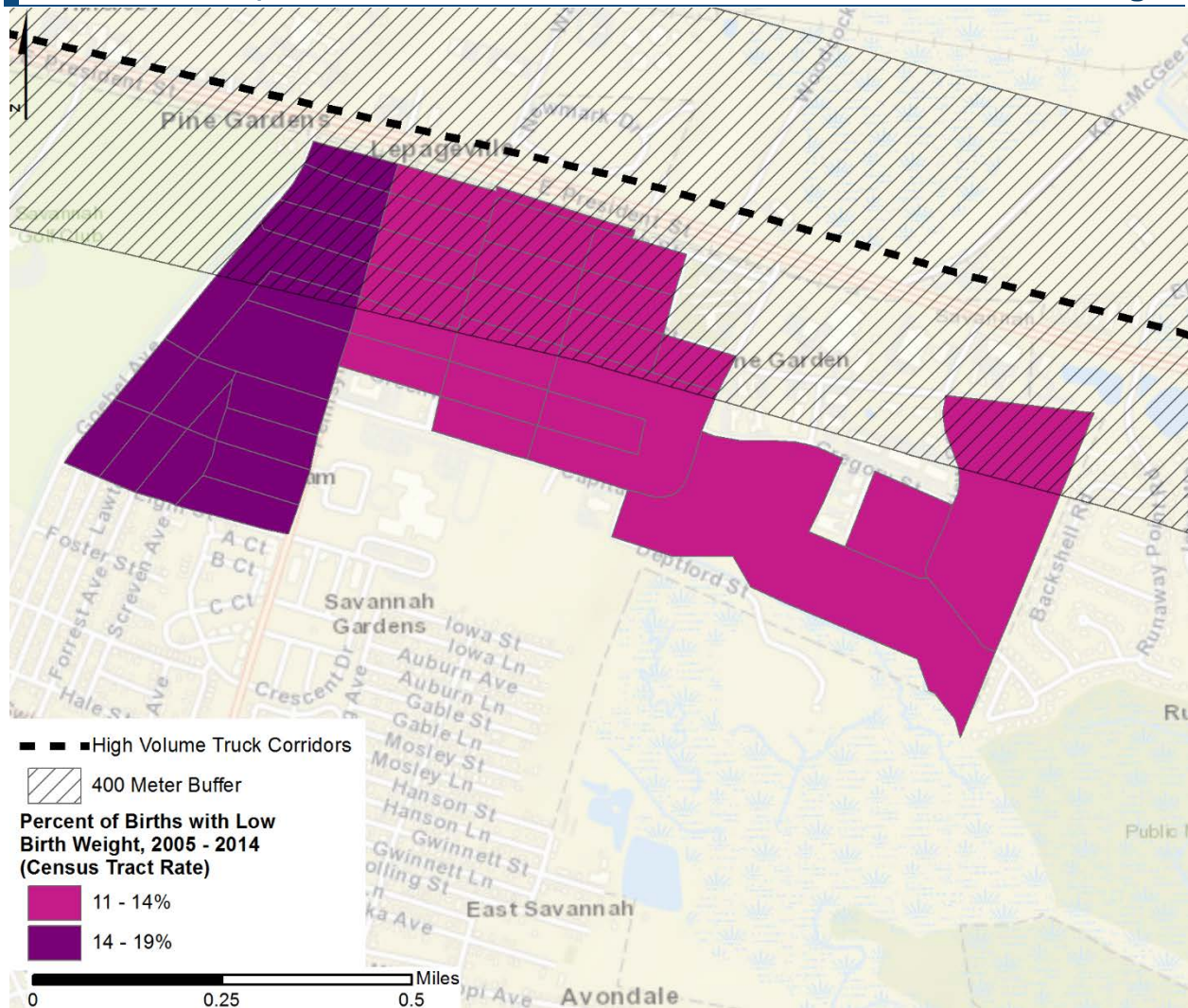
Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 7	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 7

Health – Low Birth Weight



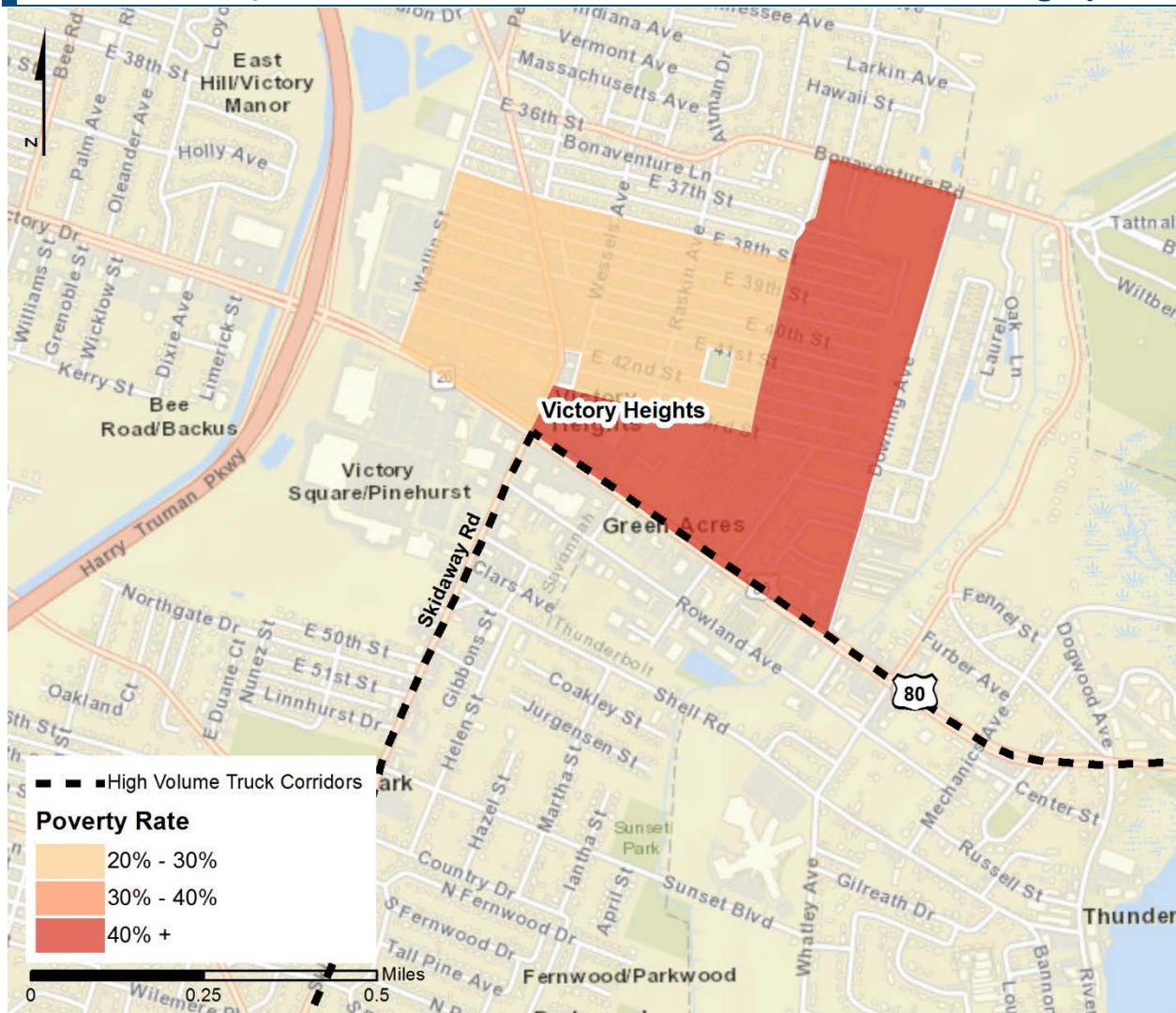
Criteria (✓ = 1 point)	SAV – EJ Area 7	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	8
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Savannah | EJ Area 8

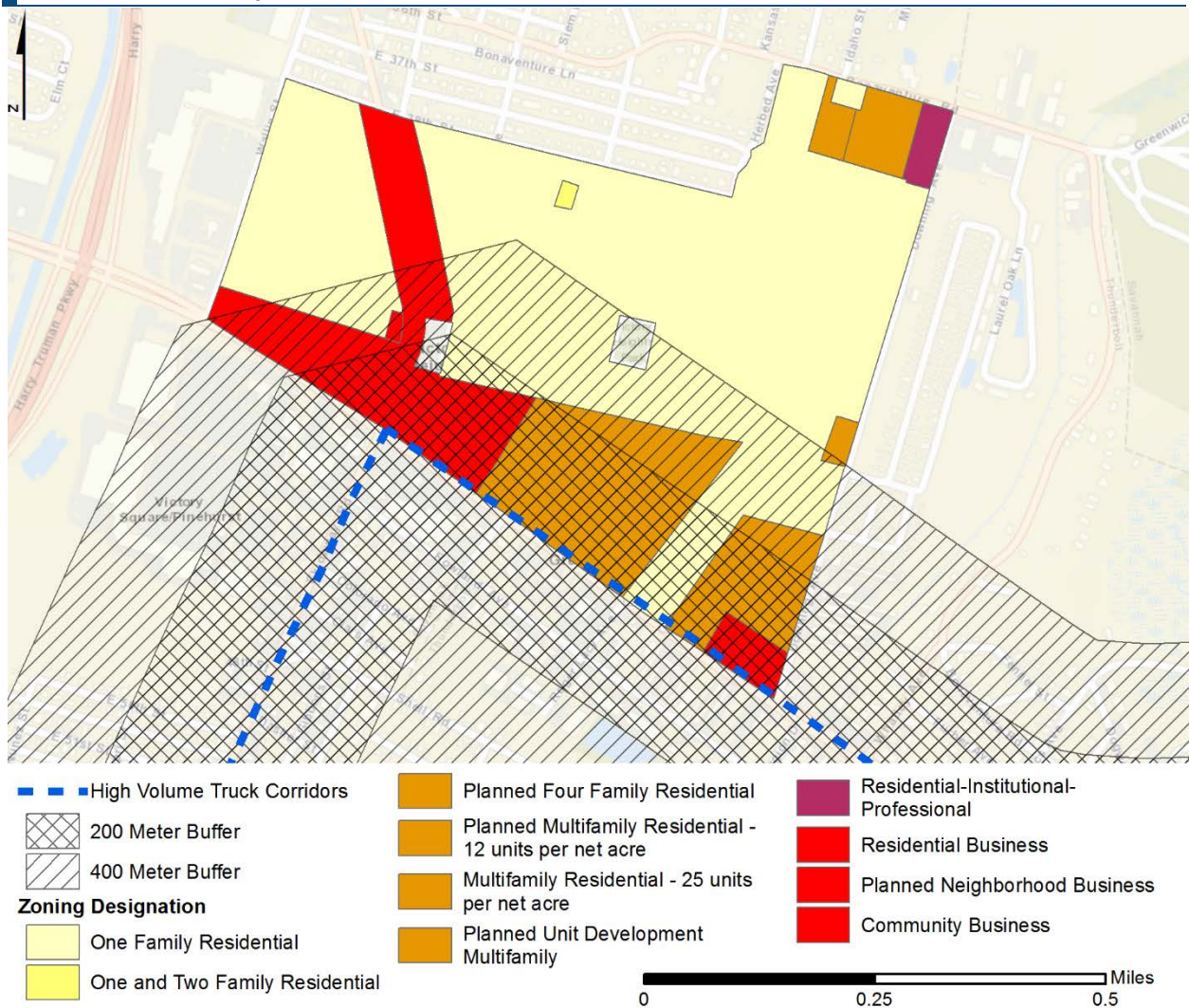
Demographics



Criteria (✓ = 1 point)	SAV – EJ Area 8	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty	✓	3
Demographics Total		3

Savannah | EJ Area 8

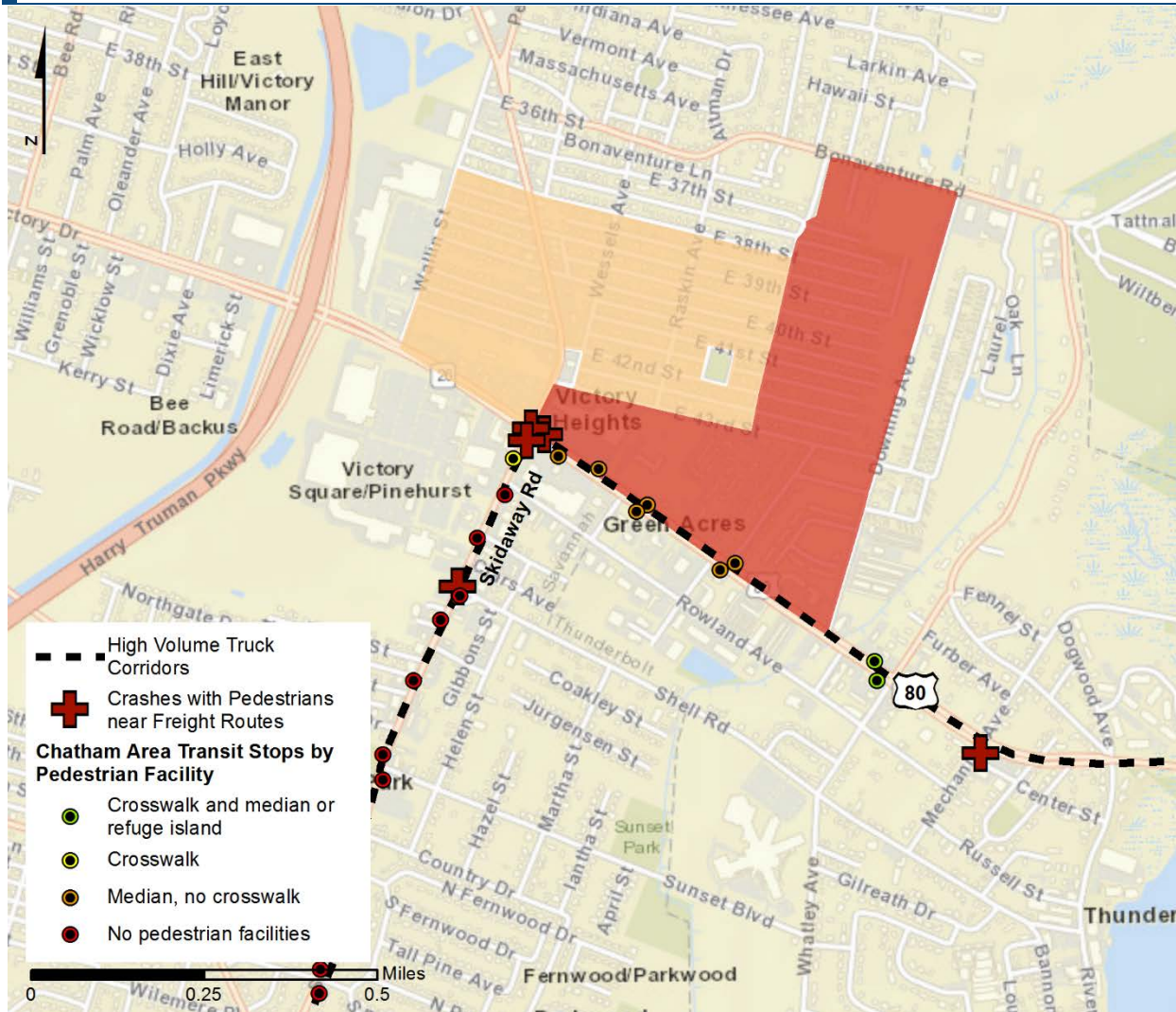
Land Use



Criteria (✓ = 1 point)	SAV – EJ Area 8	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?	✓	1
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		2

Savannah | EJ Area 8

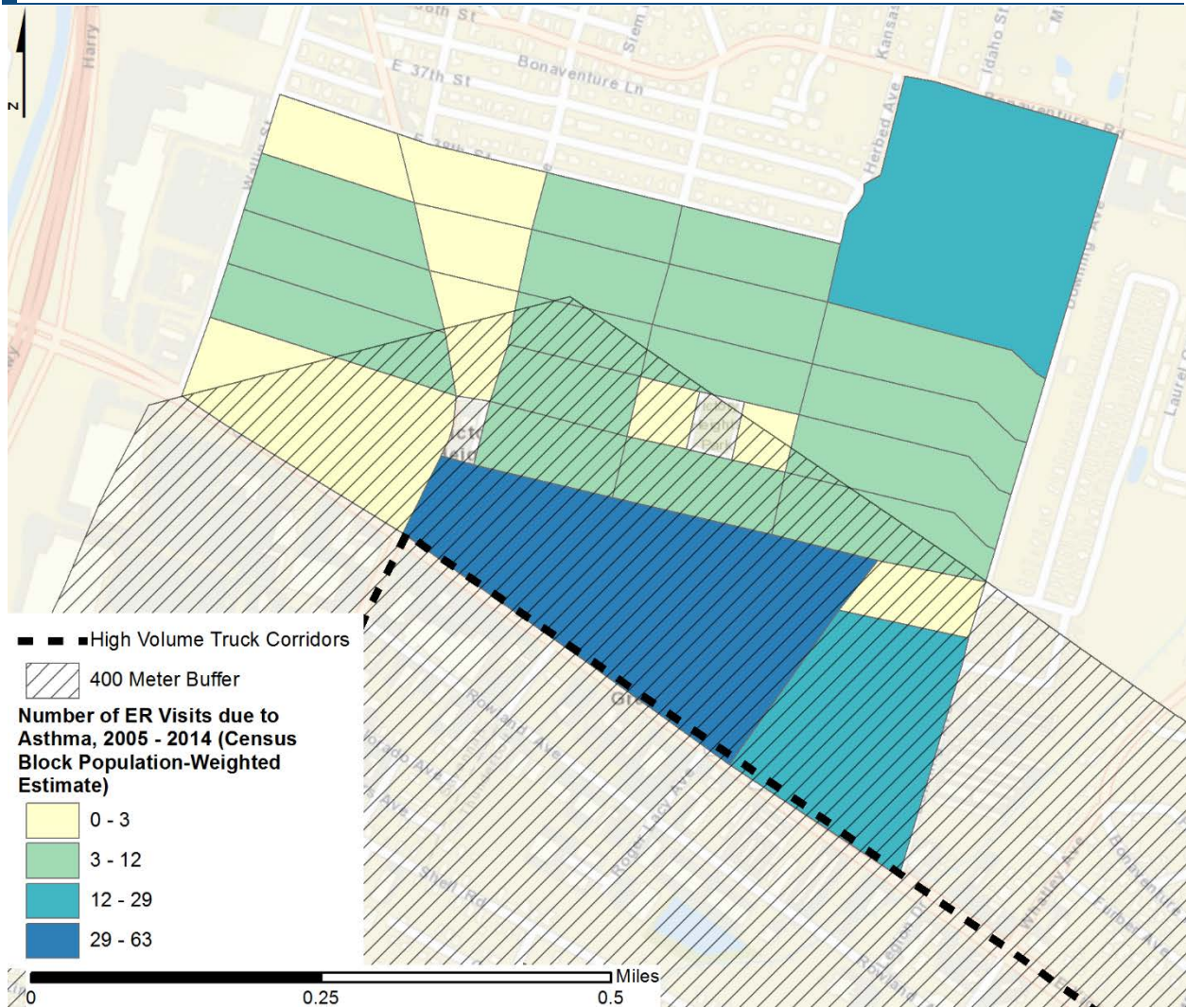
Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 8	Score
Is a CORE MPO project located in the area? (<i>Opportunity for roadway design changes.</i>)		
Is a truck stop located within 500 feet of the EJ area? (<i>Potential poor air quality hot spot.</i>)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?	✓	1
Transportation Total		3

Savannah | EJ Area 8

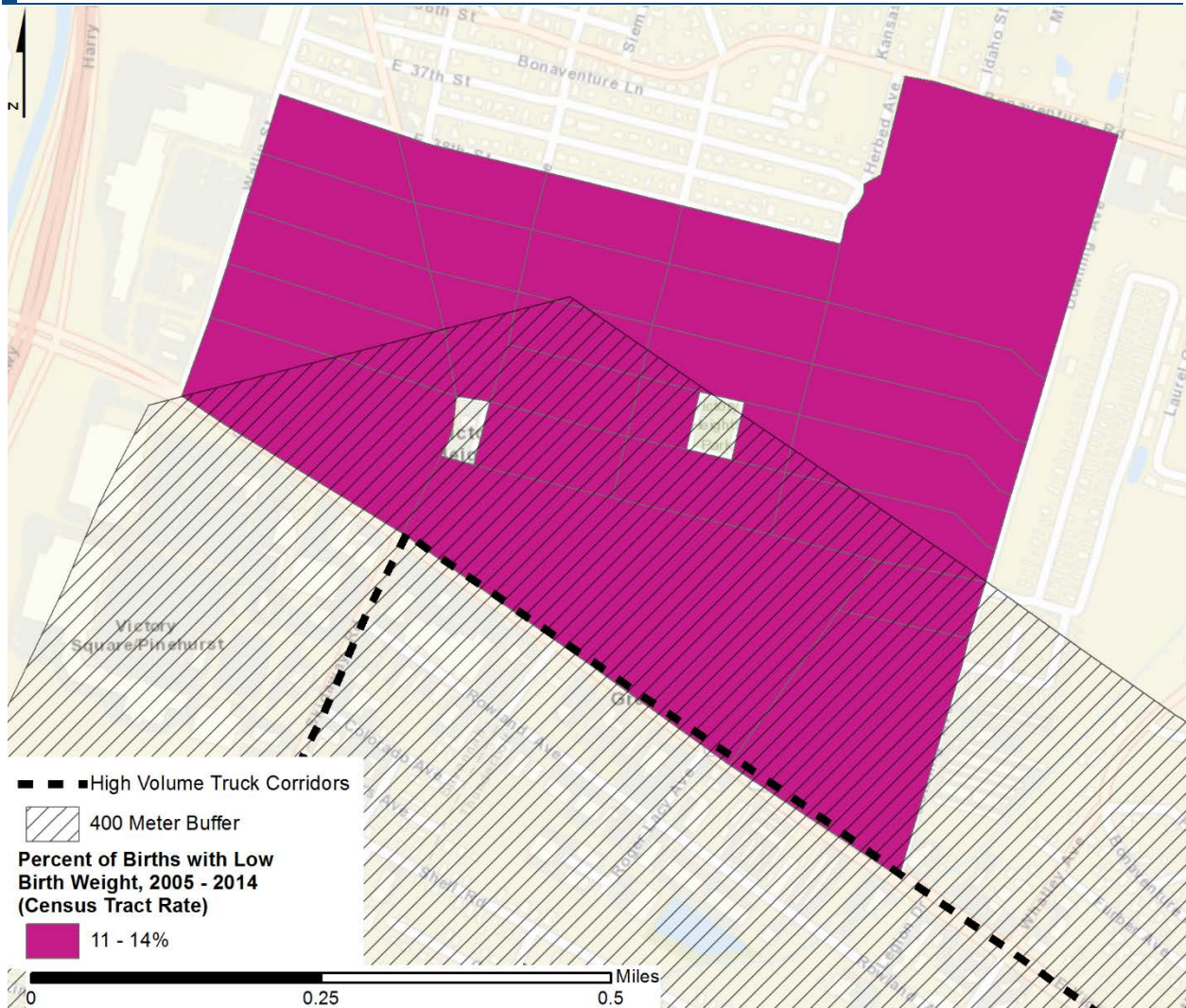
Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 8	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 8

Health – Low Birth Weight



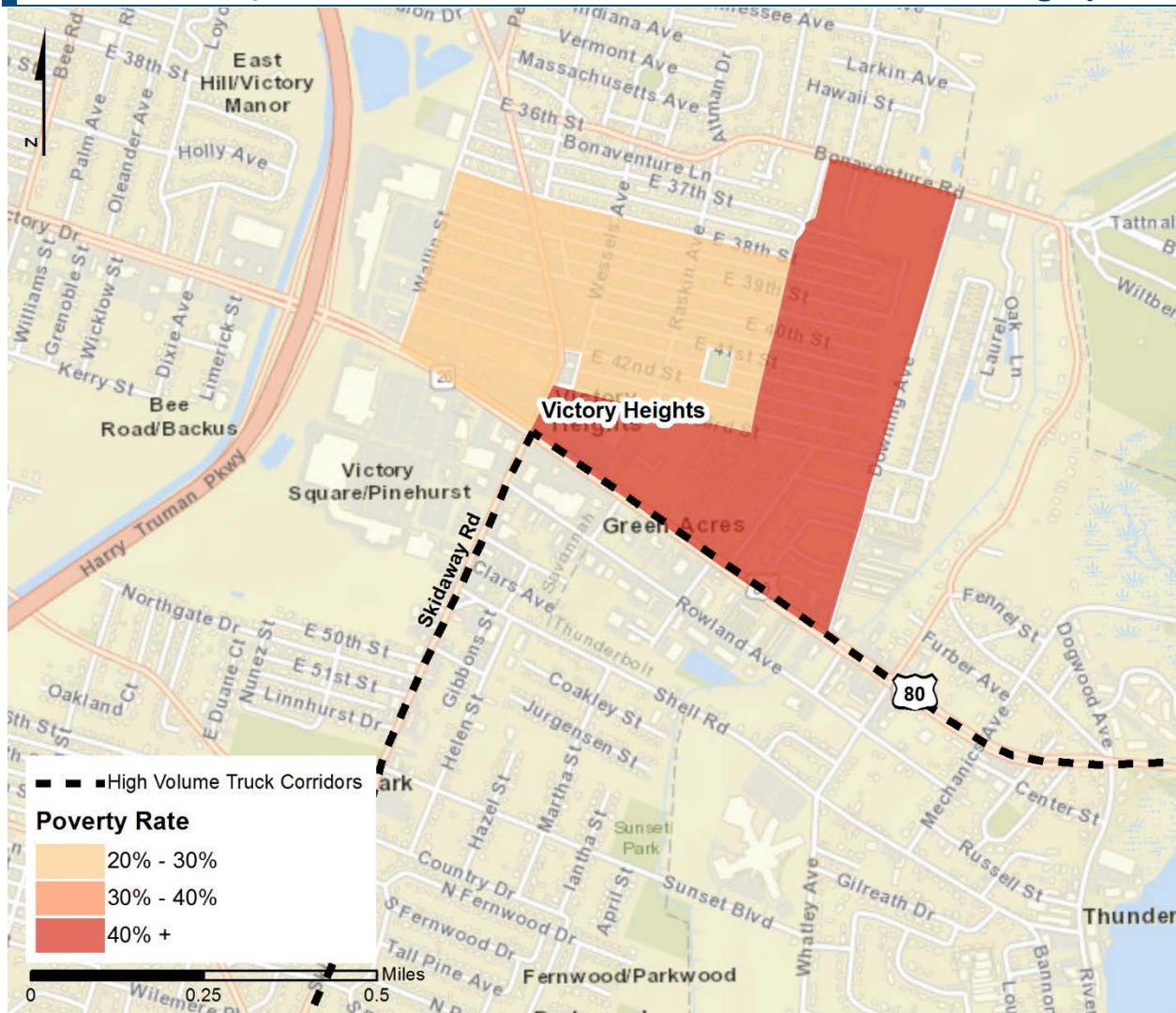
Criteria (✓ = 1 point)	SAV – EJ Area 8	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	10
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Savannah | EJ Area 9

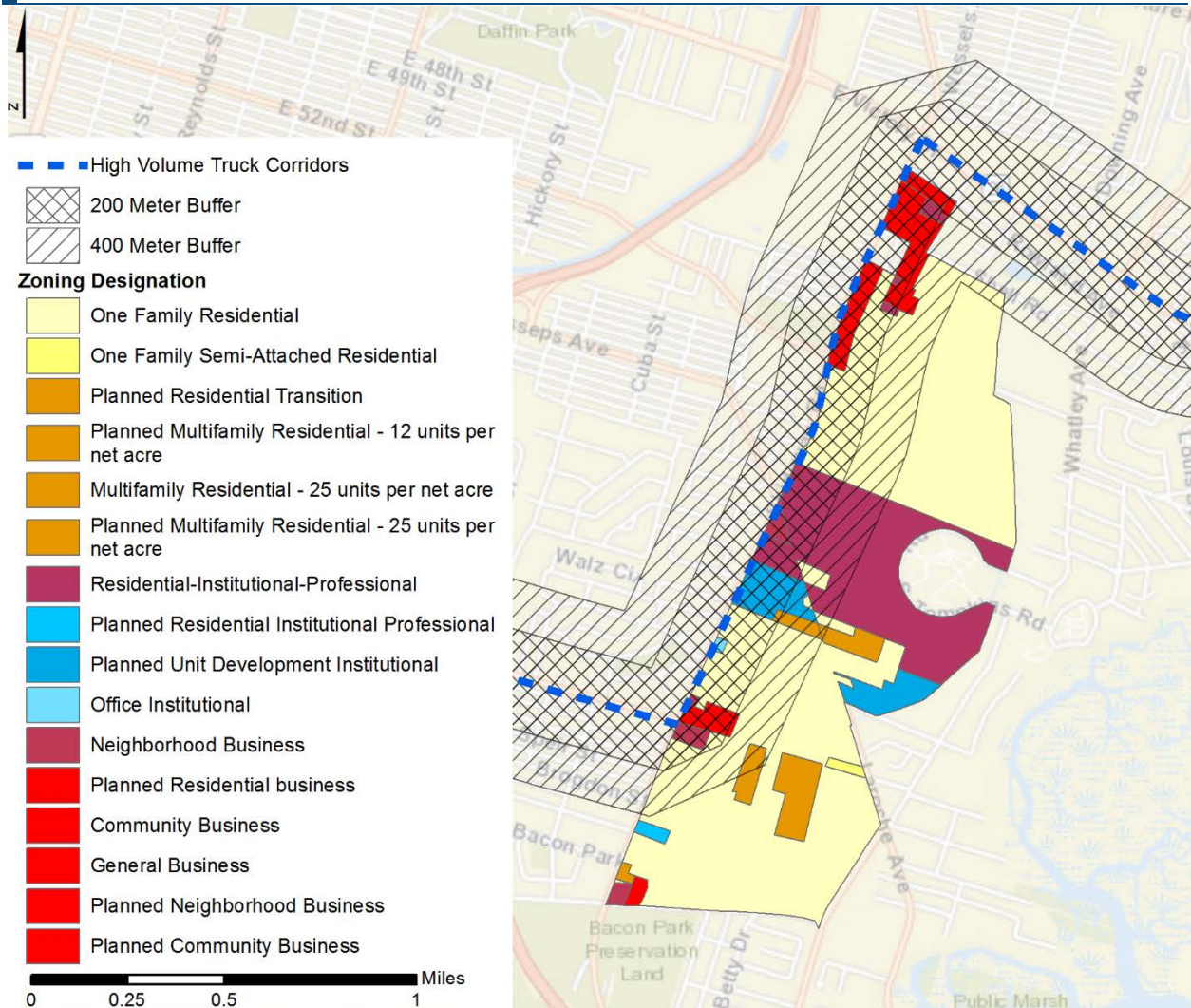
Demographics



Criteria (✓ = 1 point)	SAV – EJ Area 9	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty		
EJ area contains census blocks with greater than 40% poverty		
Demographics Total		1

Savannah | EJ Area 9

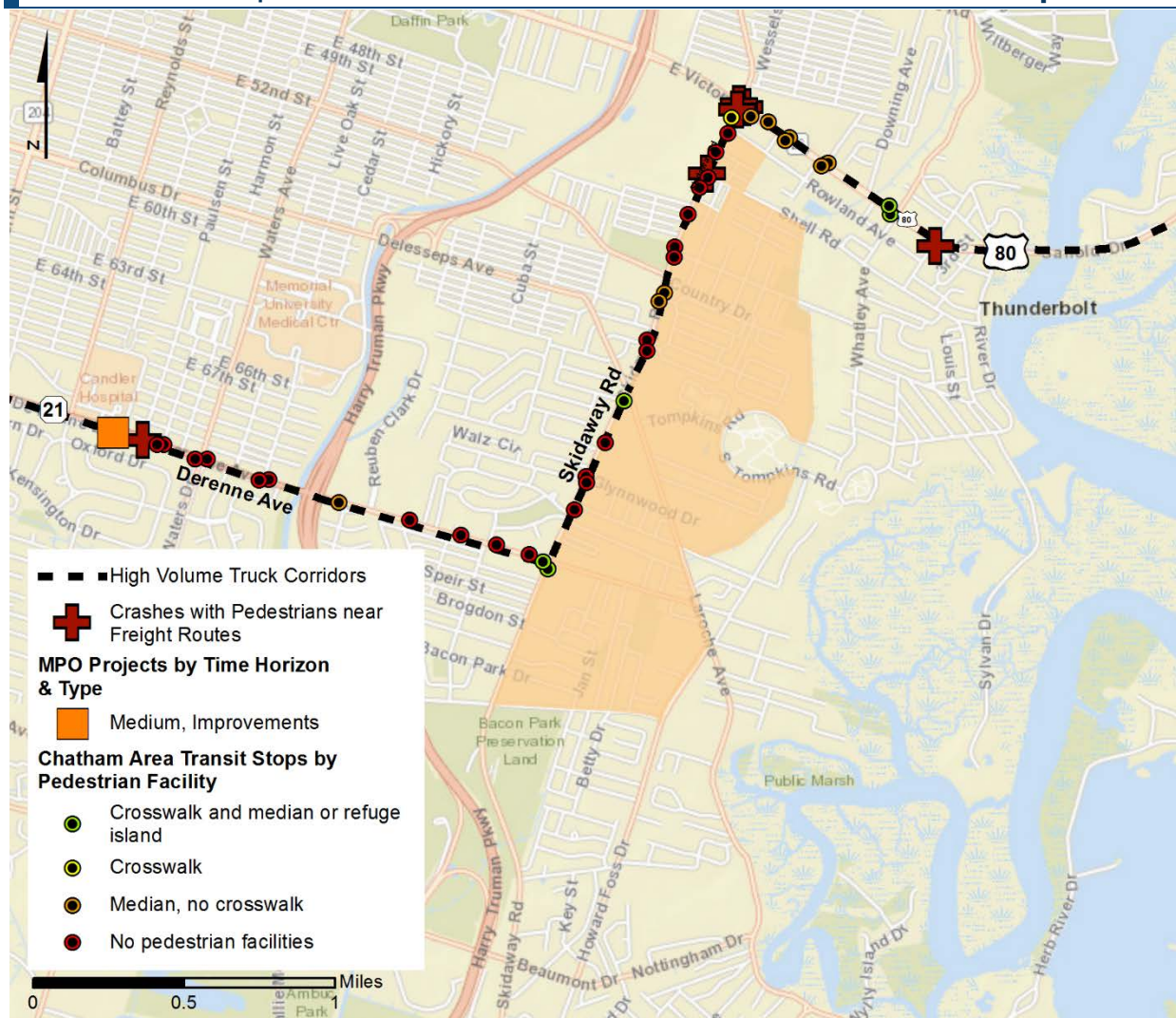
Land Use



Criteria (✓ = 1 point)	SAV – EJ Area 9	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?		
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		1

Savannah | EJ Area 9

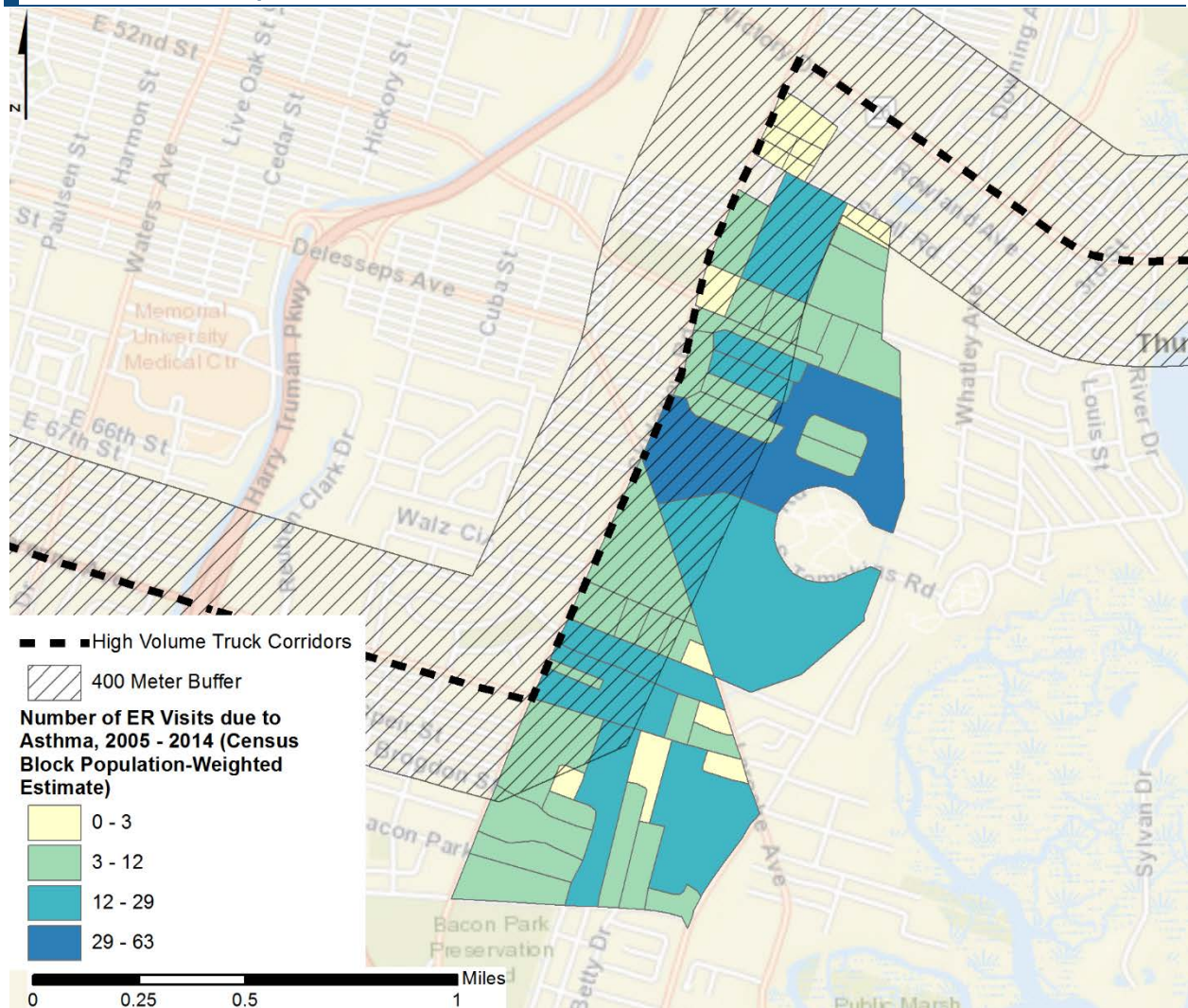
Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 9	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)		
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?	✓	1
Transportation Total		3

Savannah | EJ Area 9

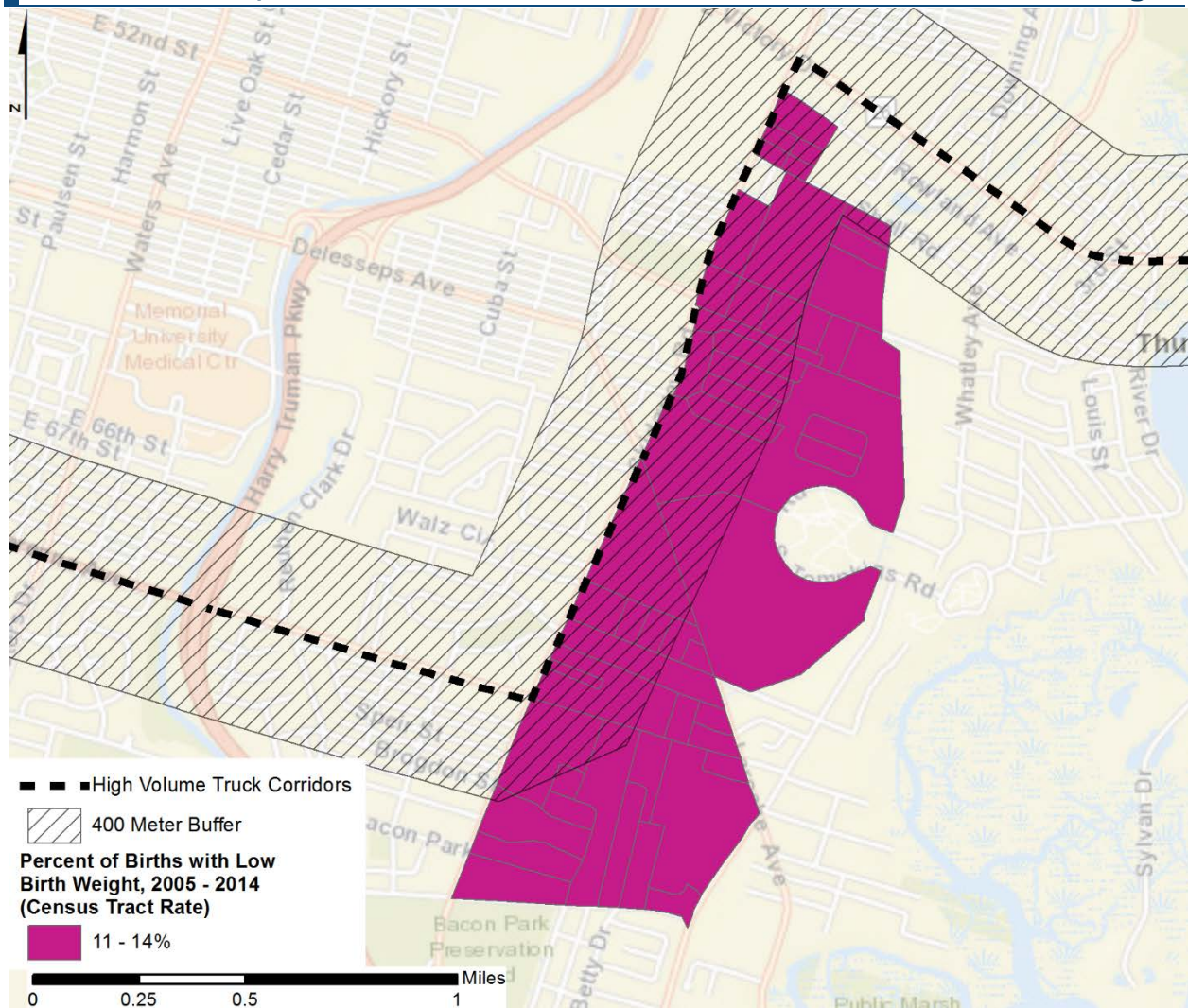
Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 9	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 9

Health – Low Birth Weight



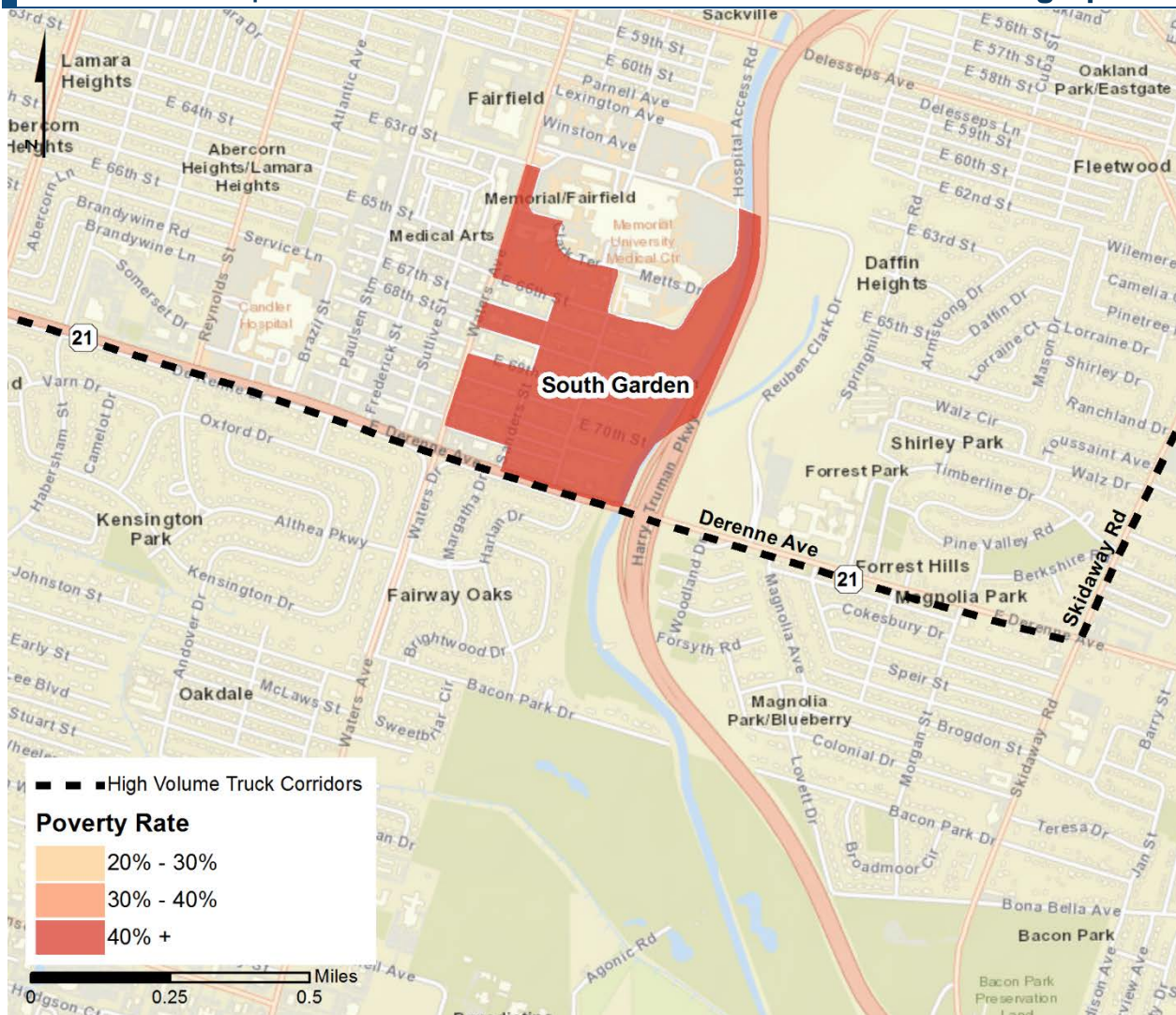
Criteria (✓ = 1 point)	SAV – EJ Area 9	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	7
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Savannah | EJ Area 10

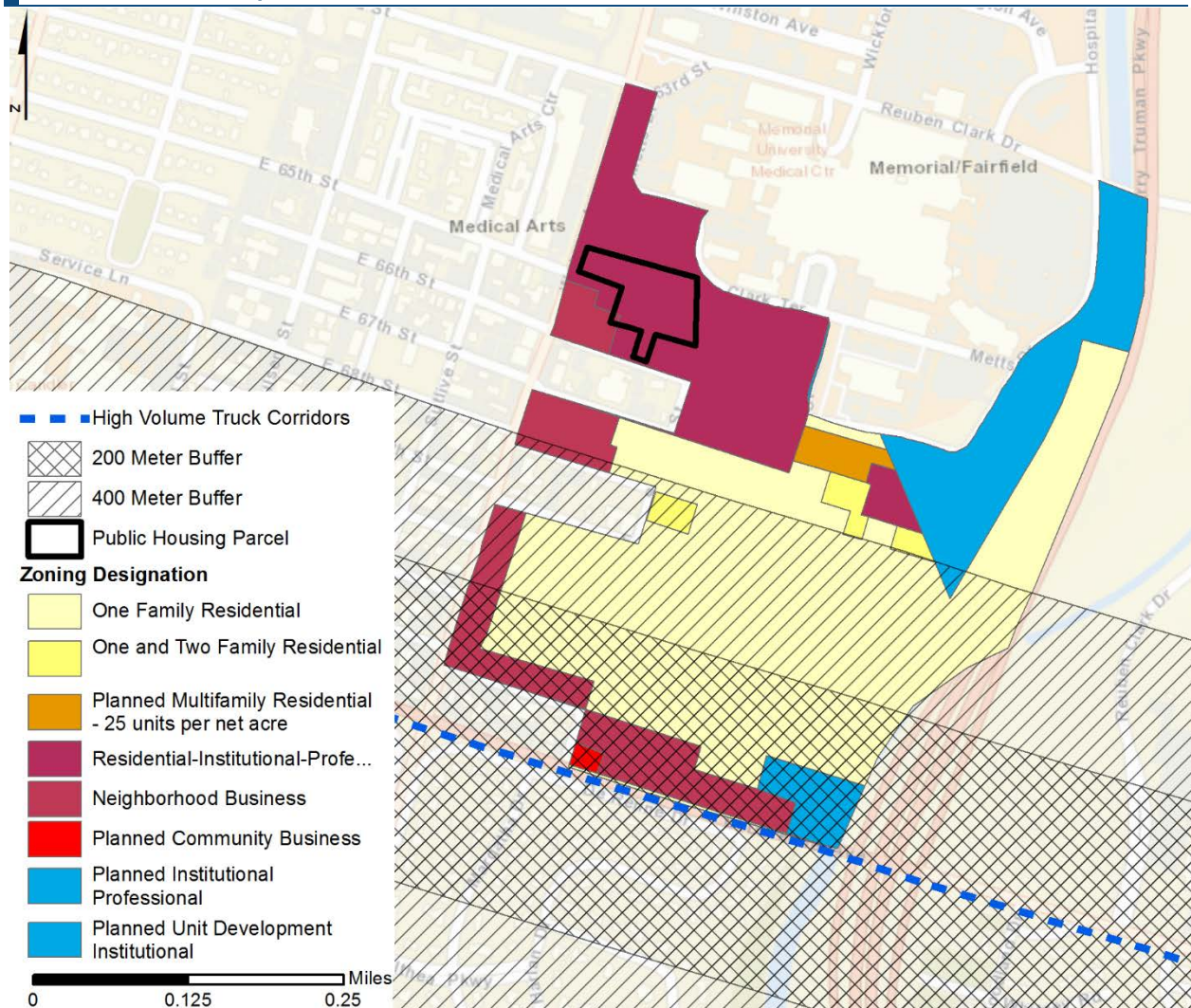
Demographics



Criteria (✓ = 1 point)	SAV – EJ Area 10	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty	✓	1
Demographics Total		3

Savannah | EJ Area 10

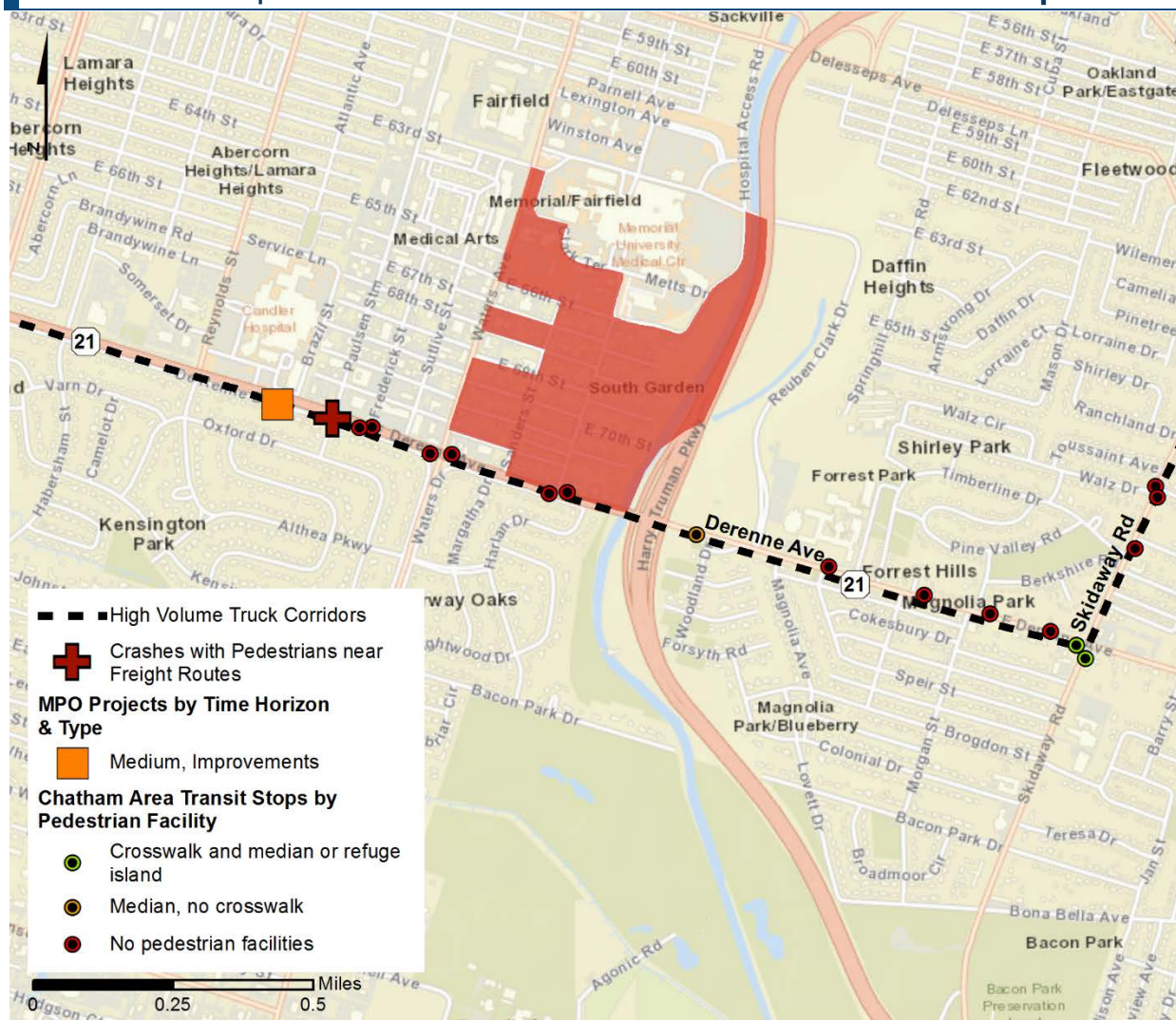
Land Use



Criteria (✓ = 1 point)	SAV – EJ Area 10	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?		
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		1

Savannah | EJ Area 10

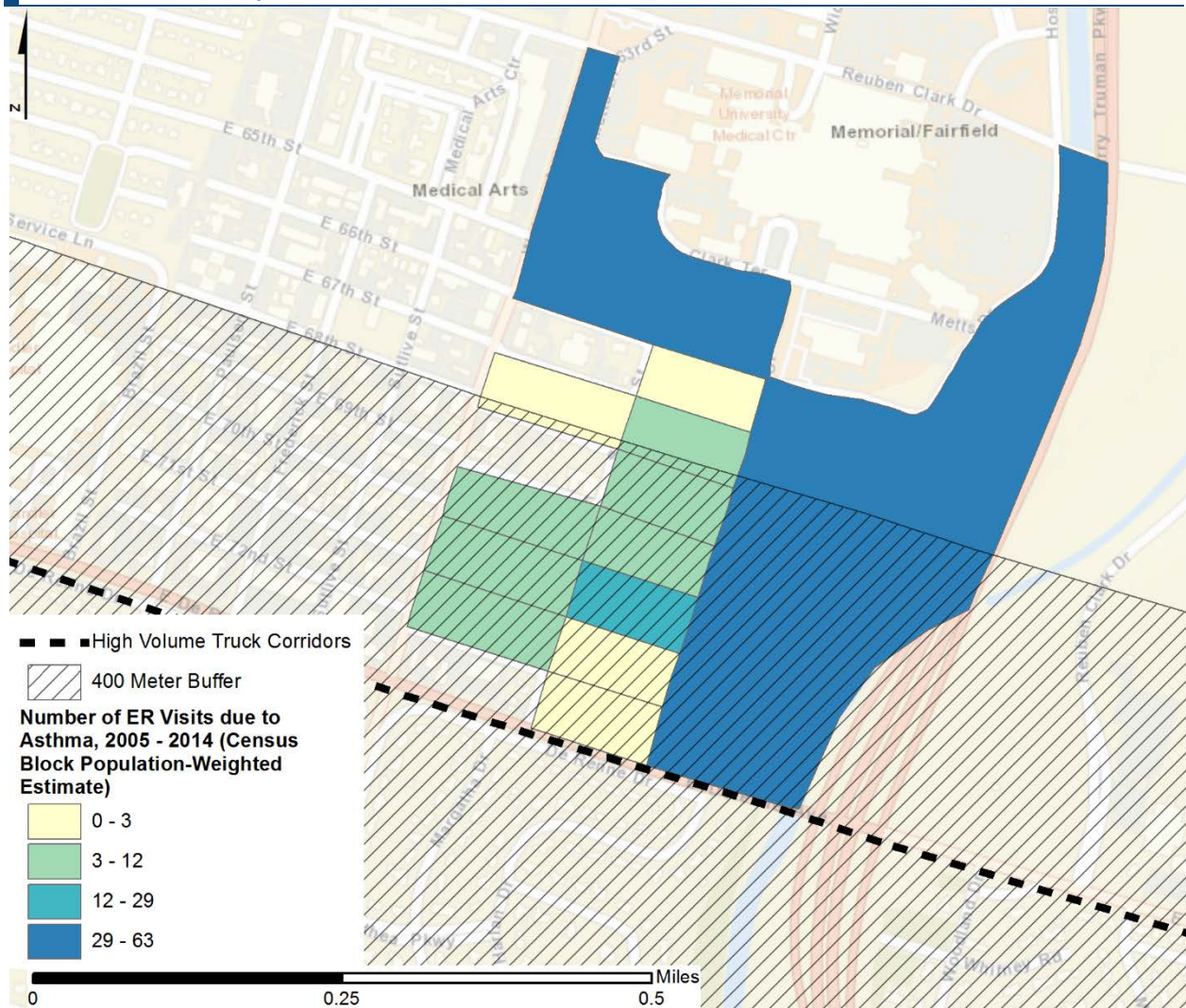
Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 10	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)	✓	1
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?		
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?	✓	1
Transportation Total		3

Savannah | EJ Area 10

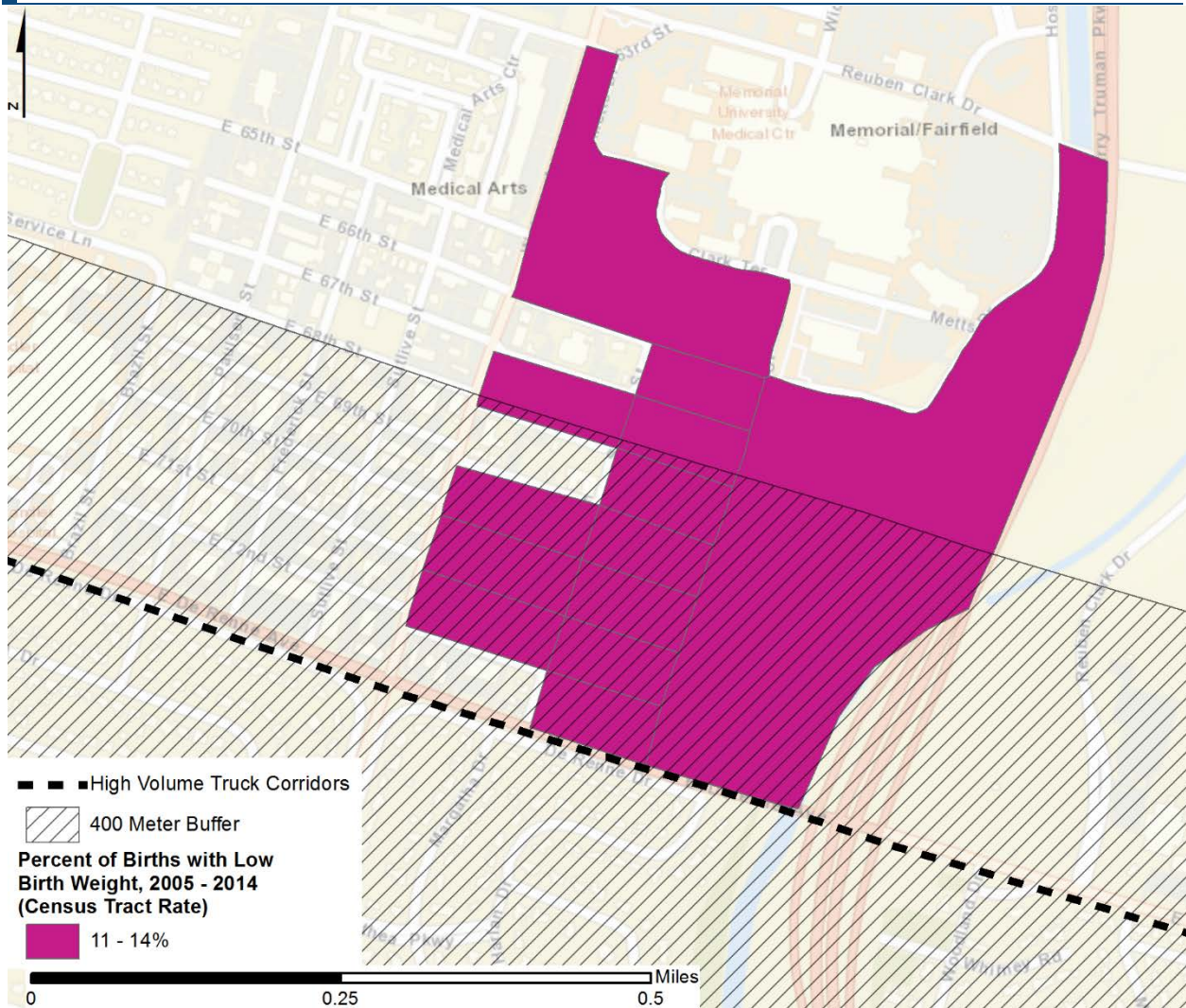
Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 10	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 10

Health – Low Birth Weight



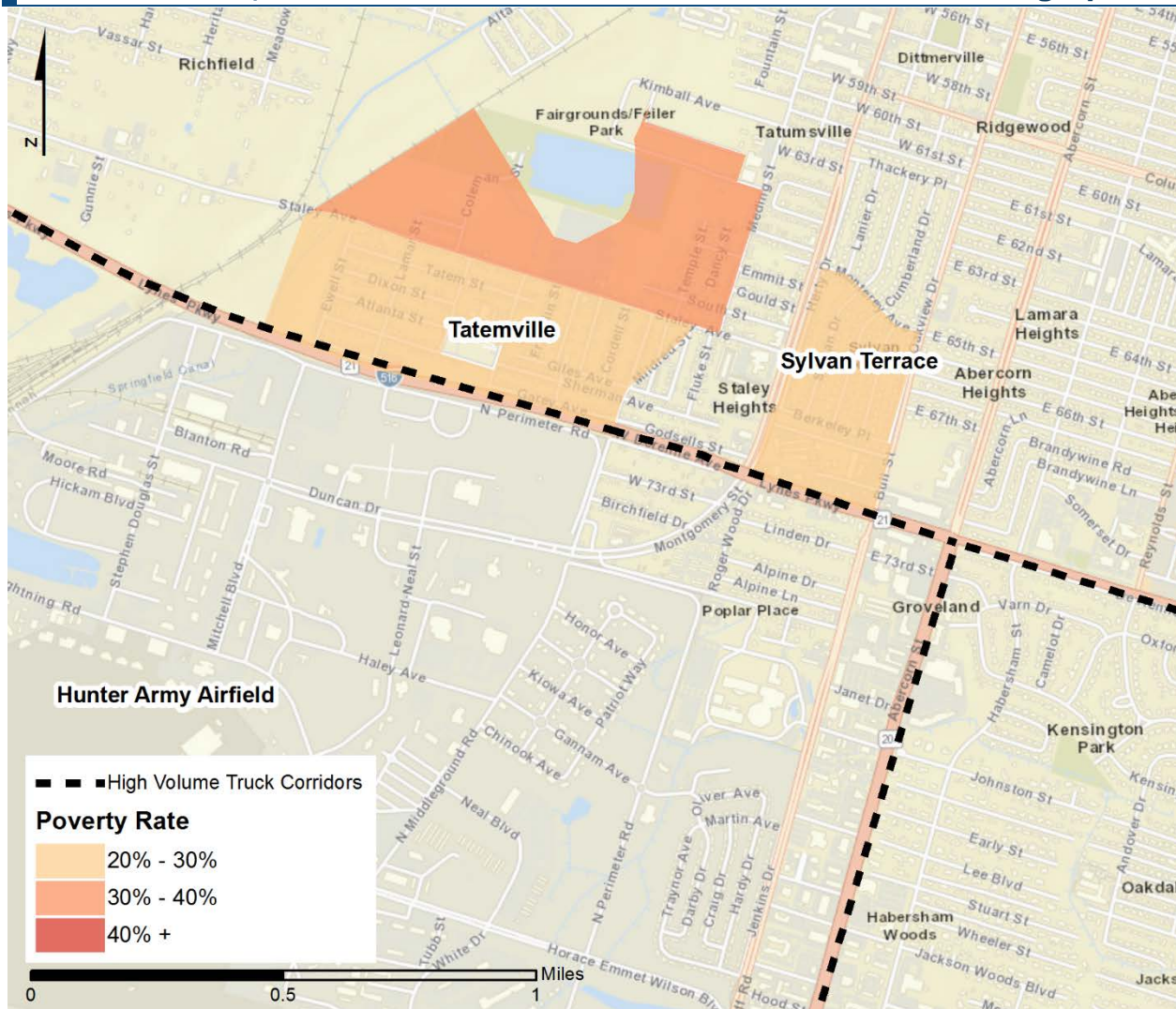
Criteria (✓ = 1 point)	SAV – EJ Area 10	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	9
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Savannah | EJ Area 11

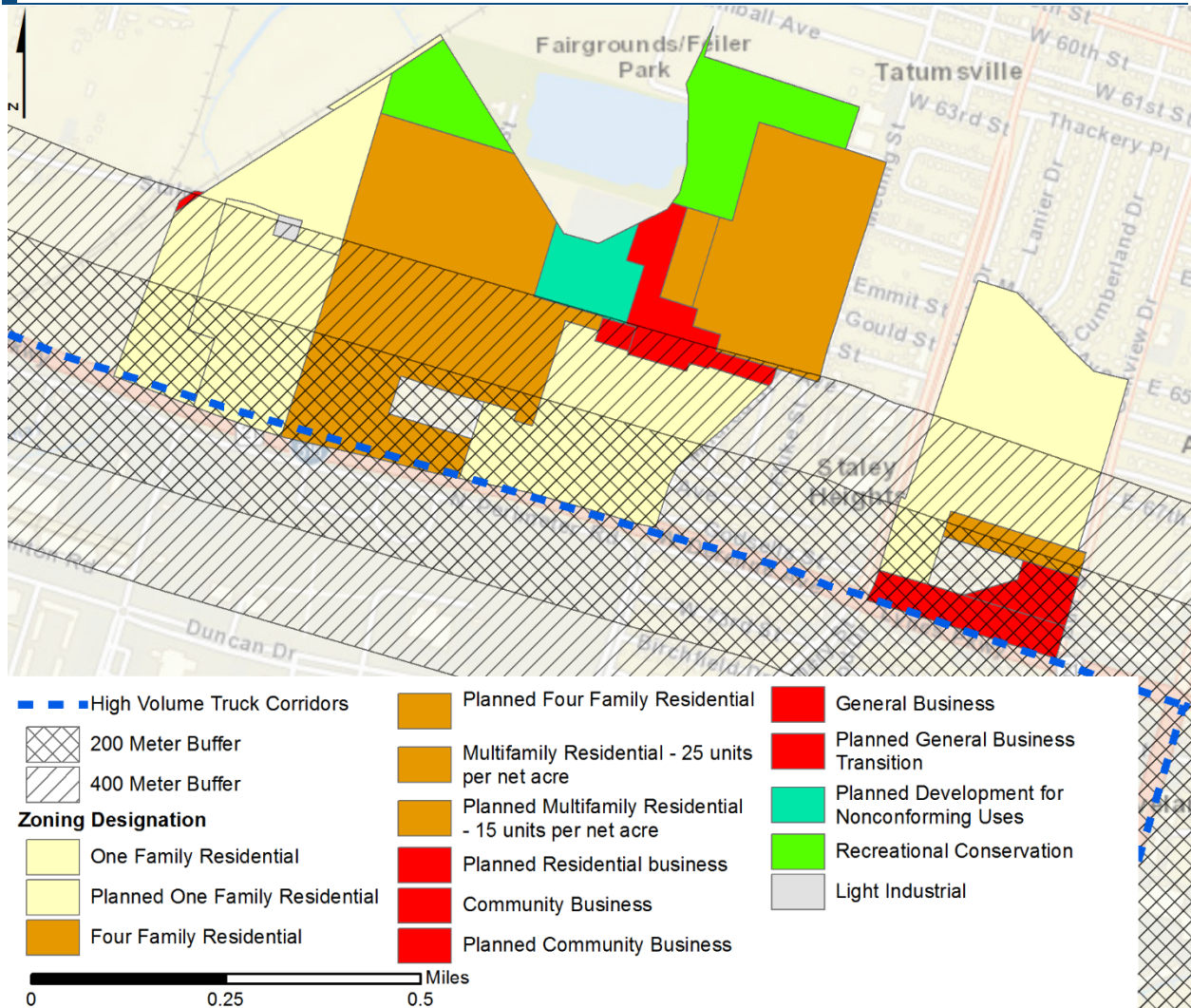
Demographics



Criteria (✓ = 1 point)	SAV – EJ Area 11	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty		
Demographics Total		2

Savannah | EJ Area 11

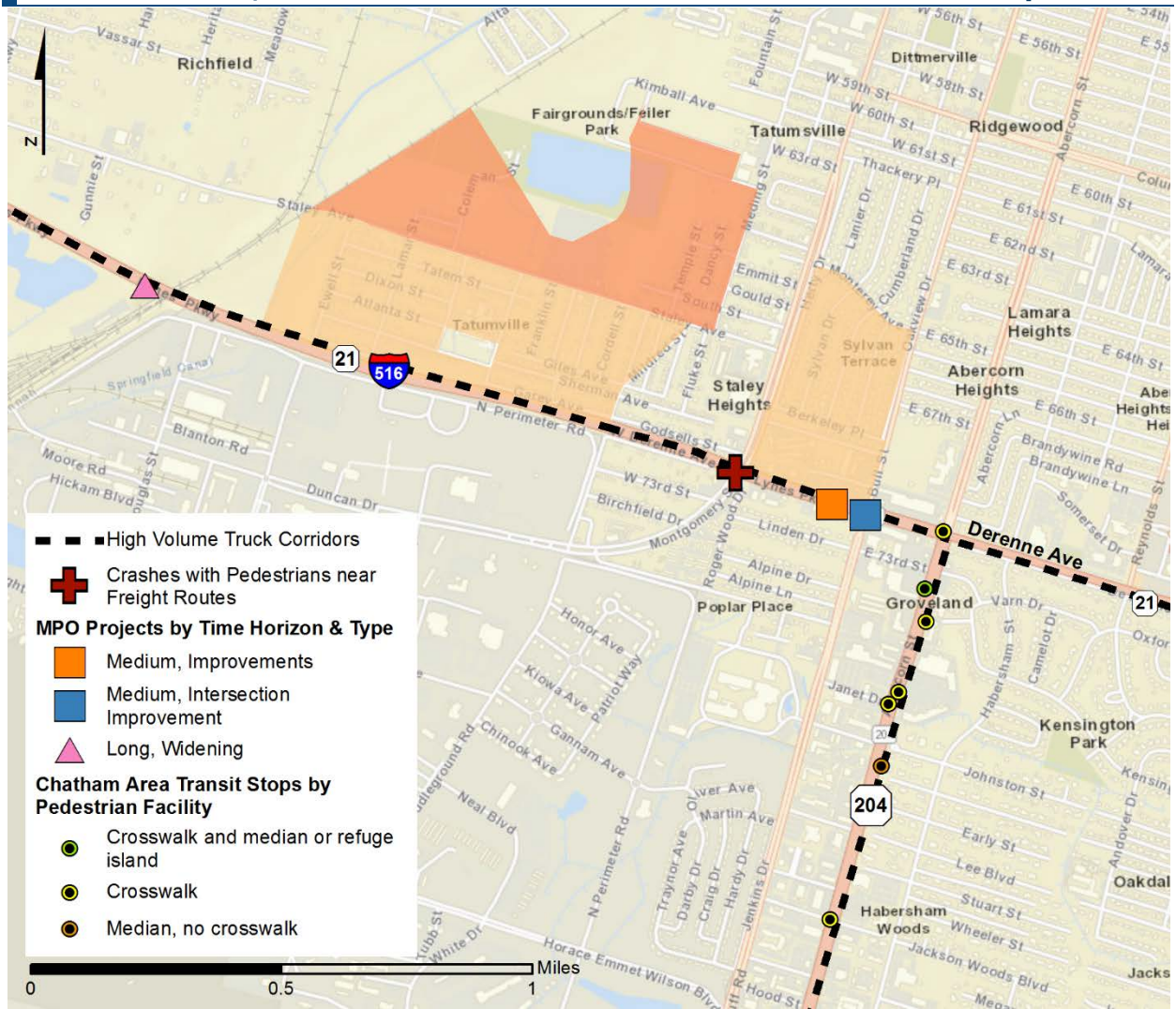
Land Use



Criteria (✓ = 1 point)	SAV – EJ Area 11	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?		
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		1

Savannah | EJ Area 11

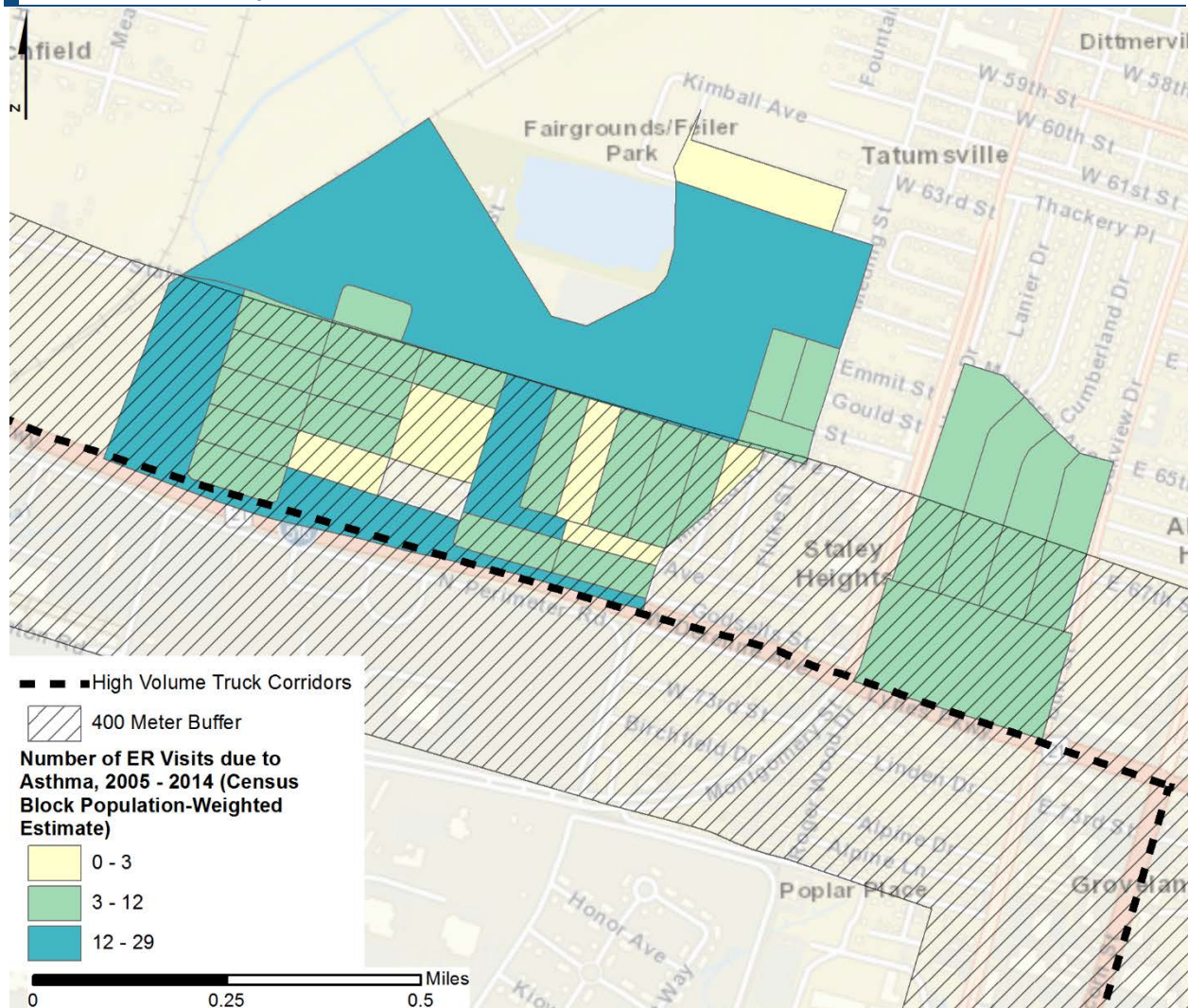
Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 11	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)	✓	1
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?		
If yes, would the bus stop benefit from additional pedestrian facilities?		
Transportation Total		2

Savannah | EJ Area 11

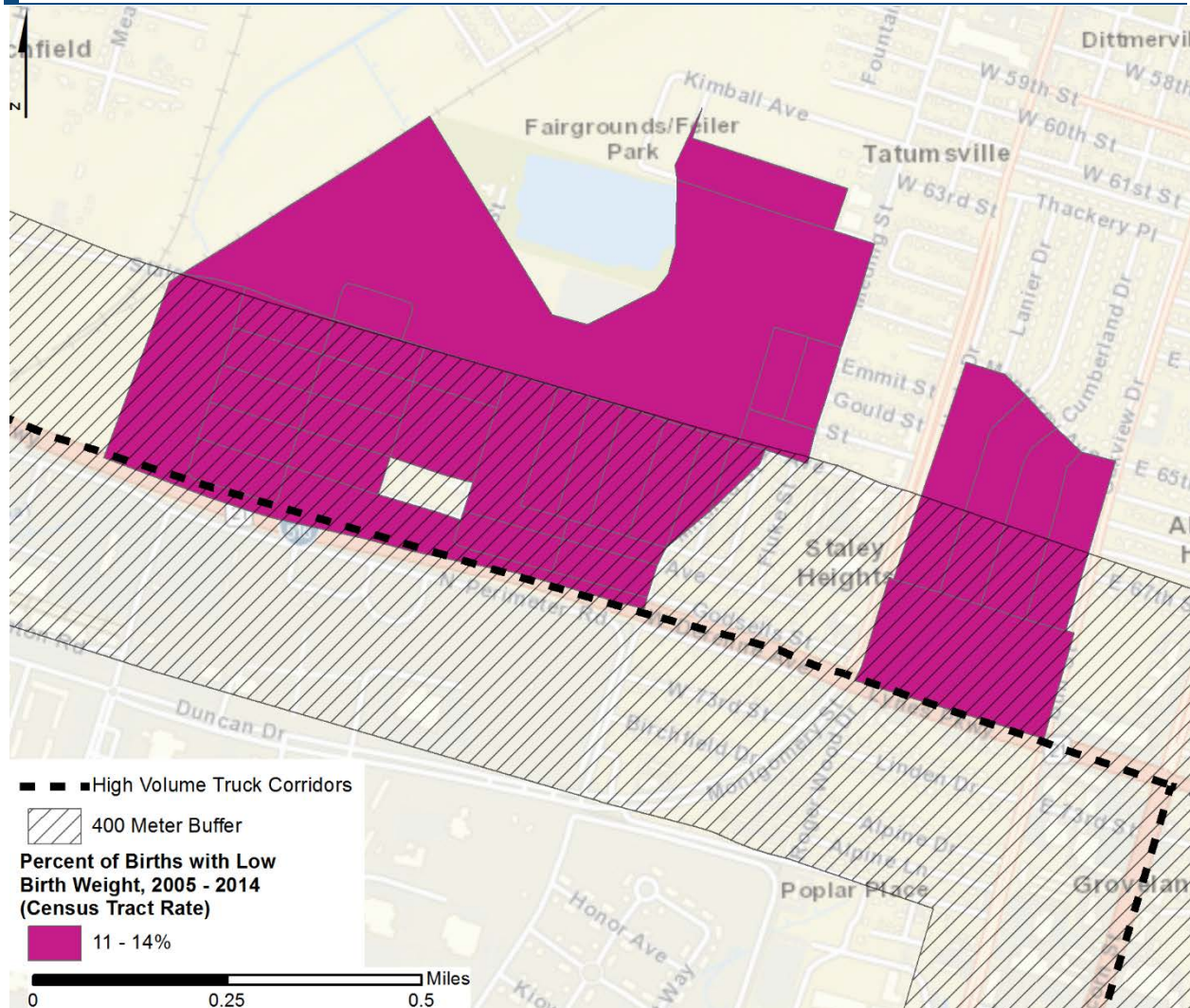
Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 11	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 11

Health – Low Birth Weight



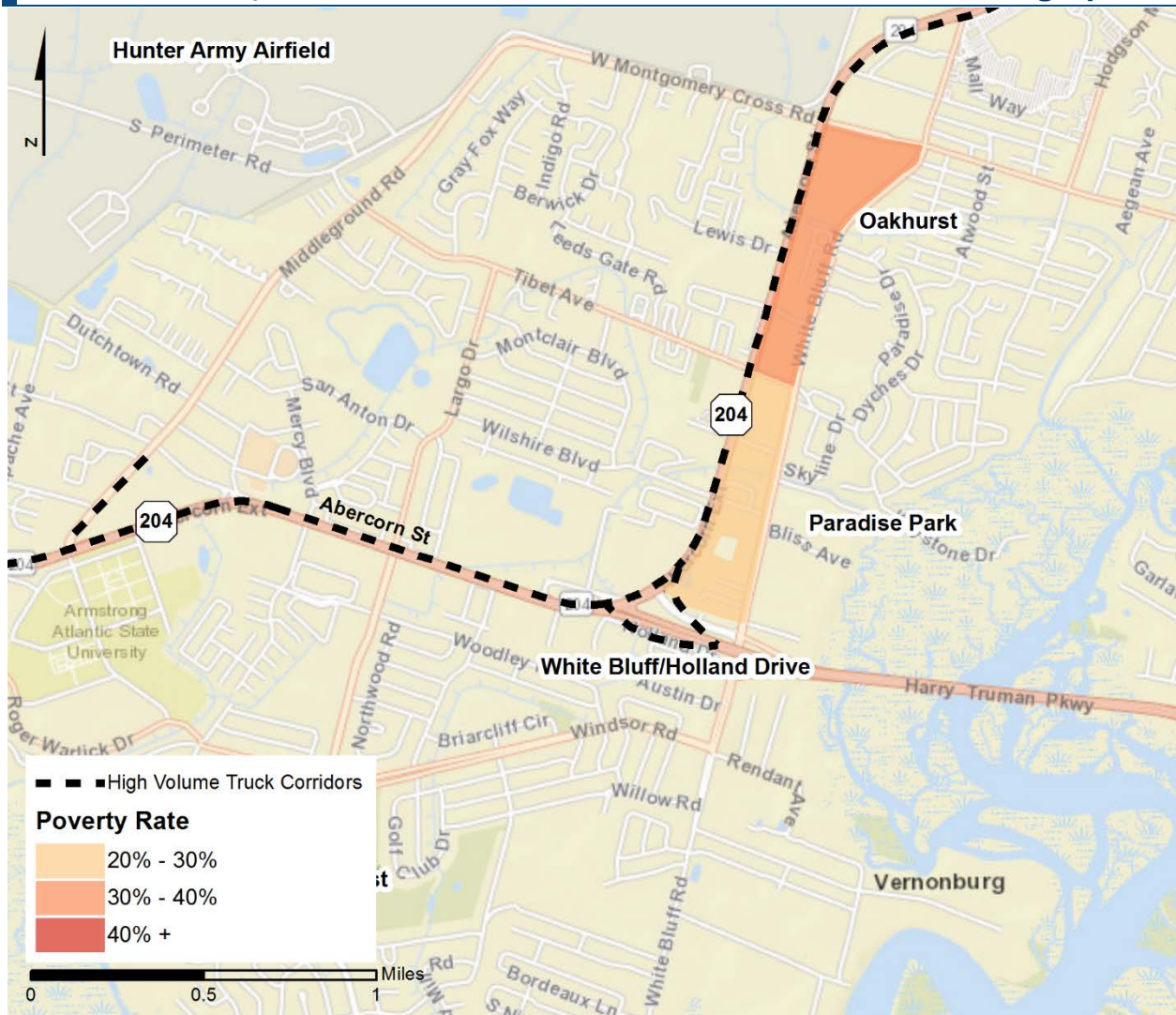
Criteria (✓ = 1 point)	SAV – EJ Area 11	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	7
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Savannah | EJ Area 12

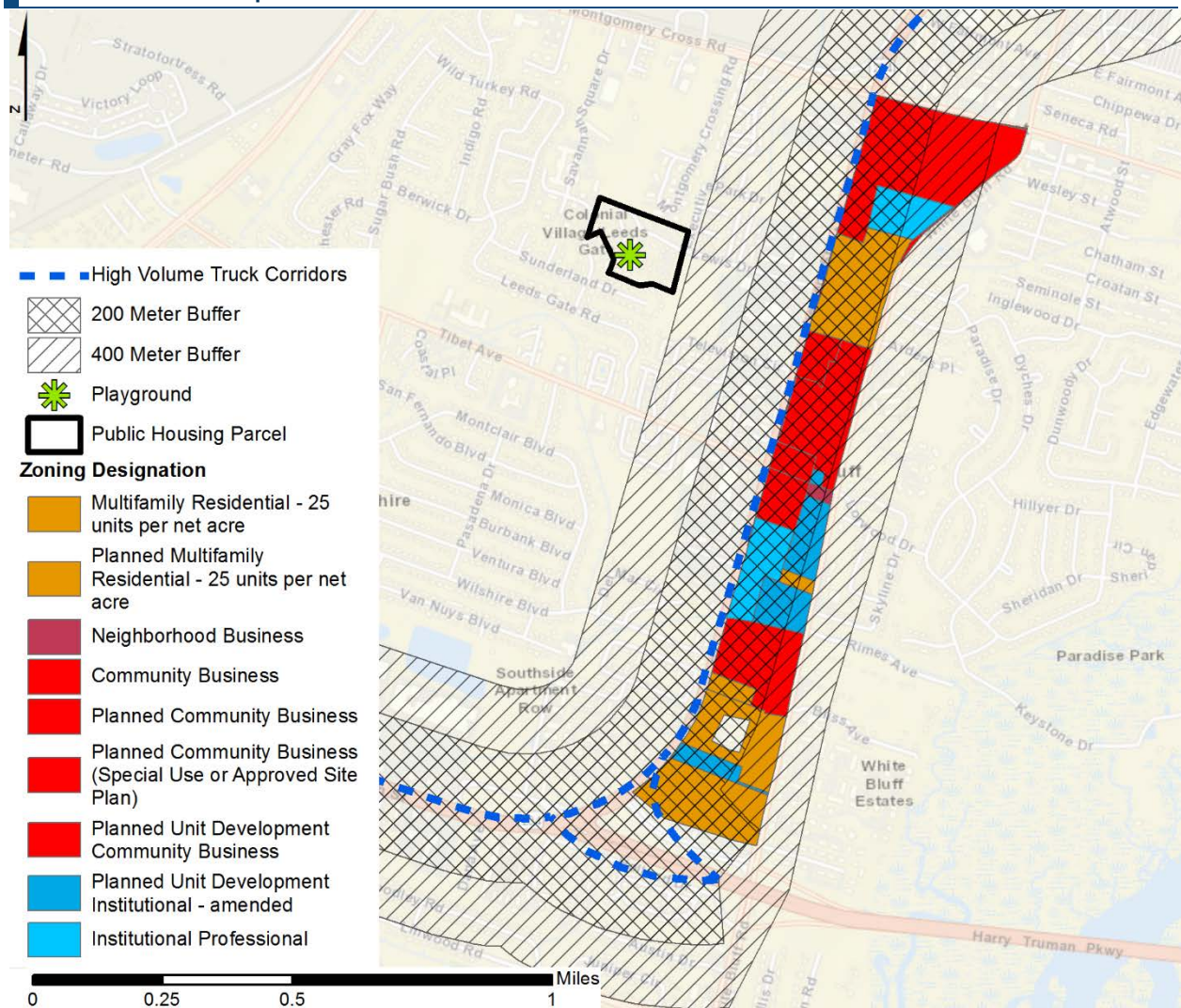
Demographics



Criteria (✓ = 1 point)	SAV – EJ Area 12	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty		
Demographics Total		2

Savannah | EJ Area 12

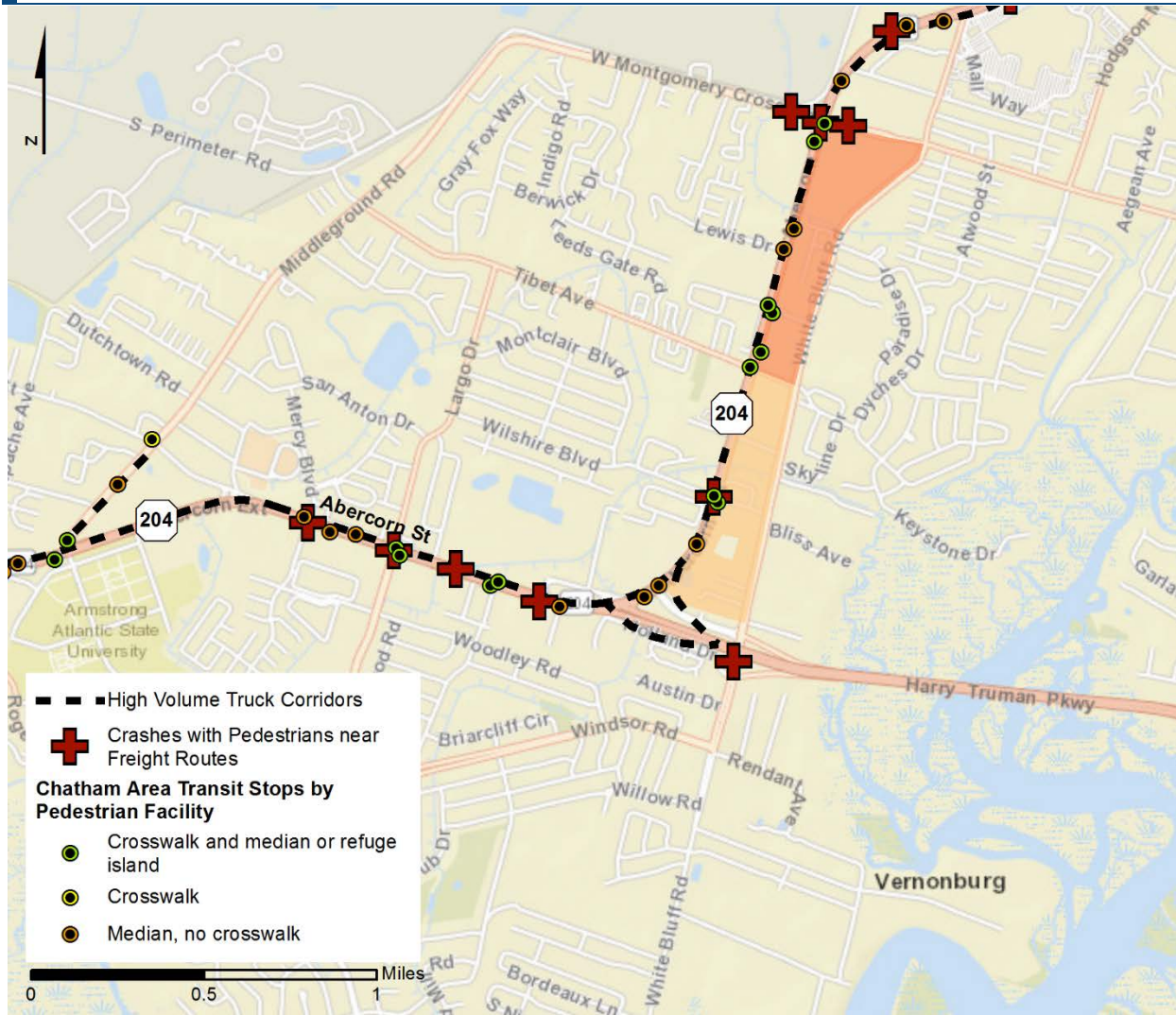
Land Use



Criteria (✓ = 1 point)	SAV – EJ Area 12	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?		
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		1

Savannah | EJ Area 12

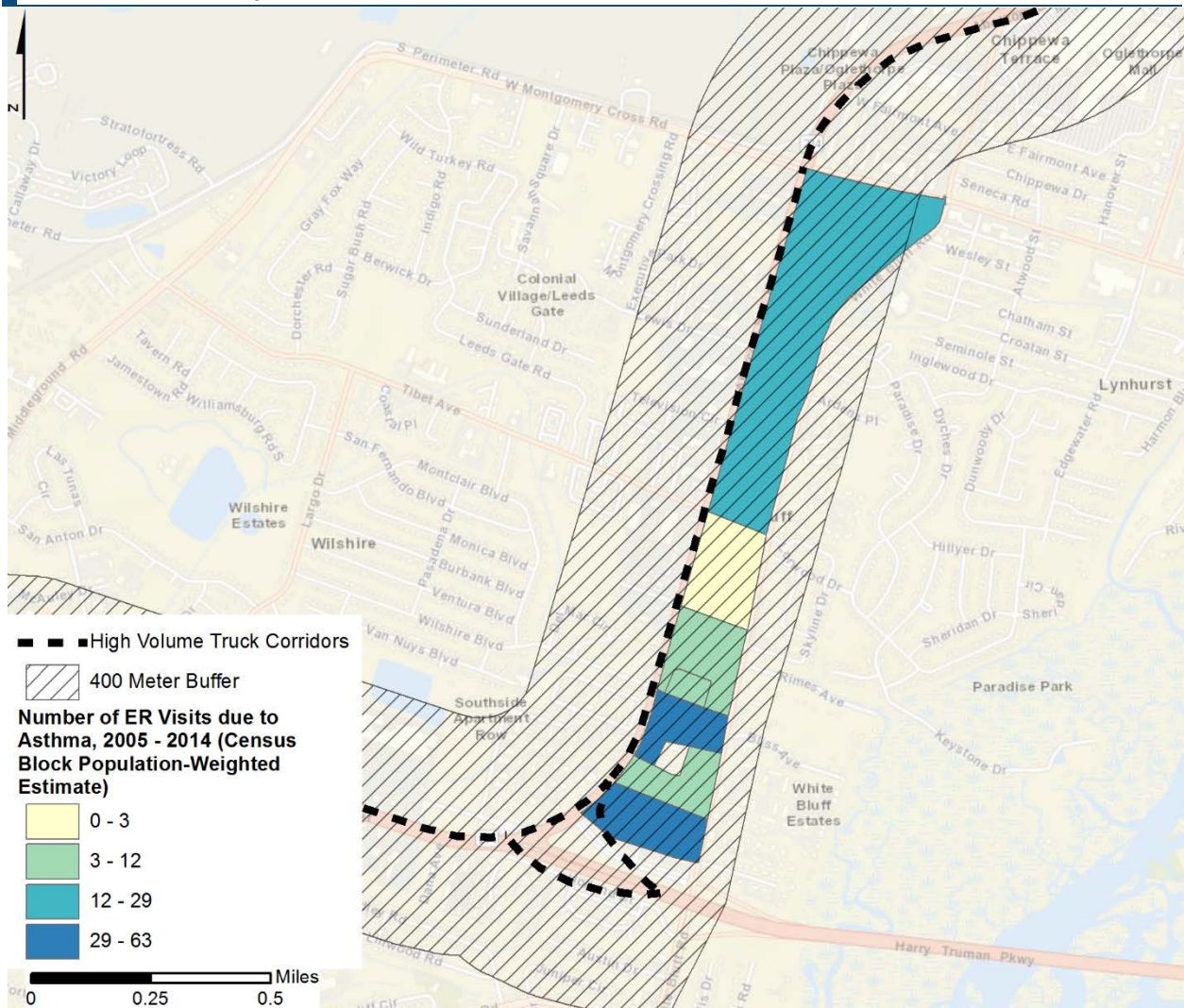
Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 12	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)		
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?	✓	1
Transportation Total		3

Savannah | EJ Area 12

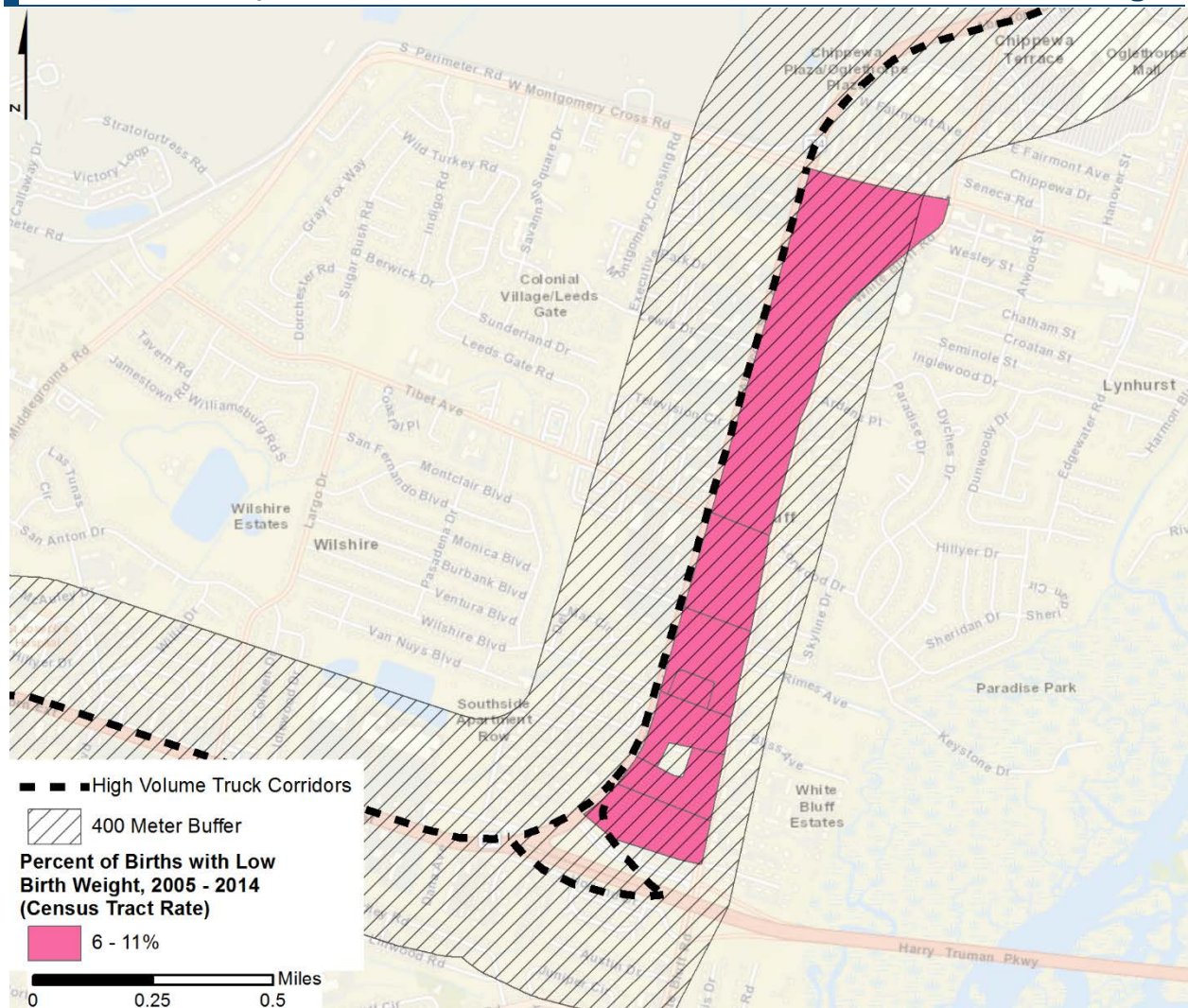
Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 12	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 12

Health – Low Birth Weight



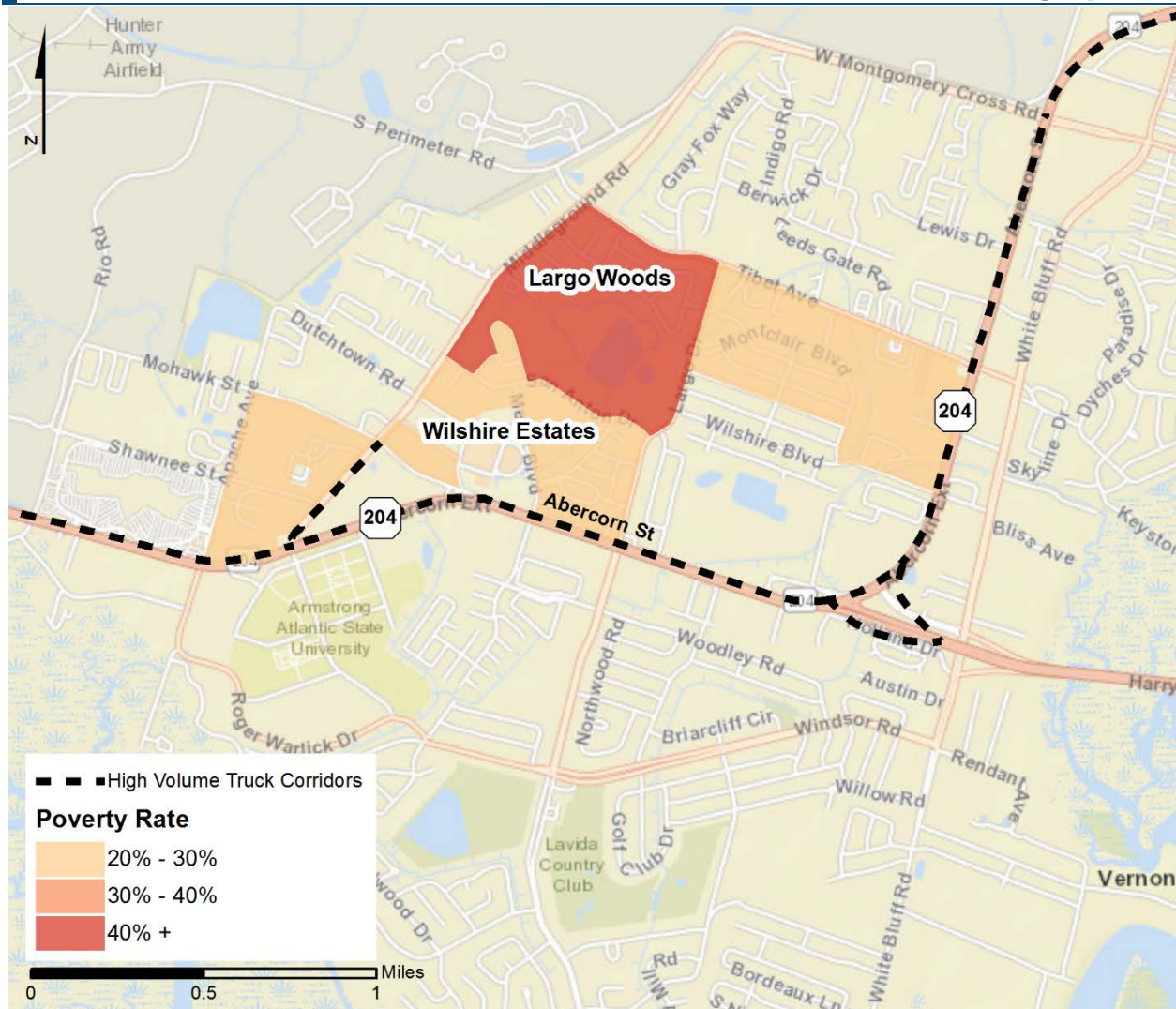
Criteria (✓ = 1 point)	SAV – EJ Area 12	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	8
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Savannah | EJ Area 13

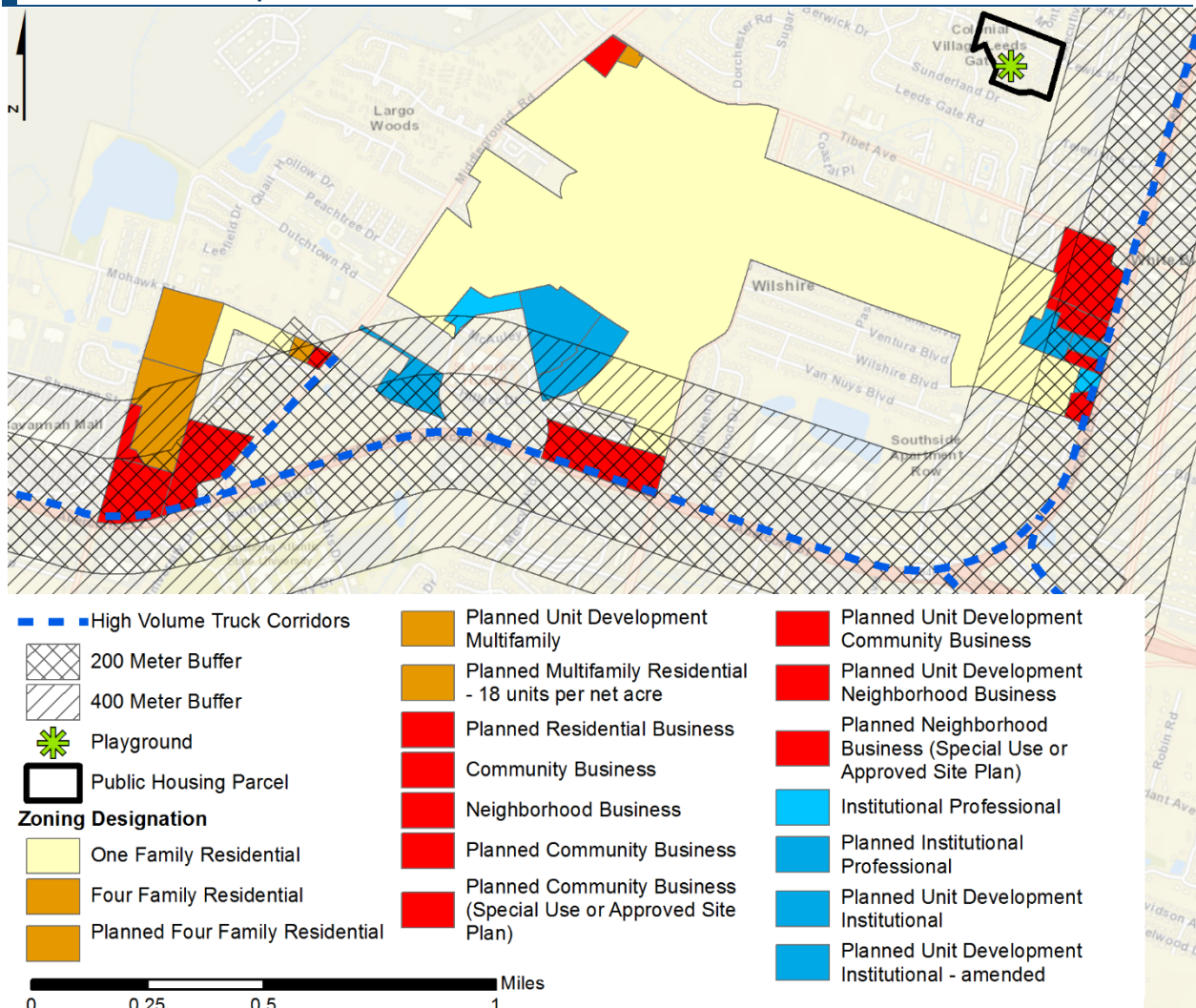
Demographics



Criteria (✓ = 1 point)	SAV – EJ Area 13	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty	✓	1
Demographics Total		3

Savannah | EJ Area 13

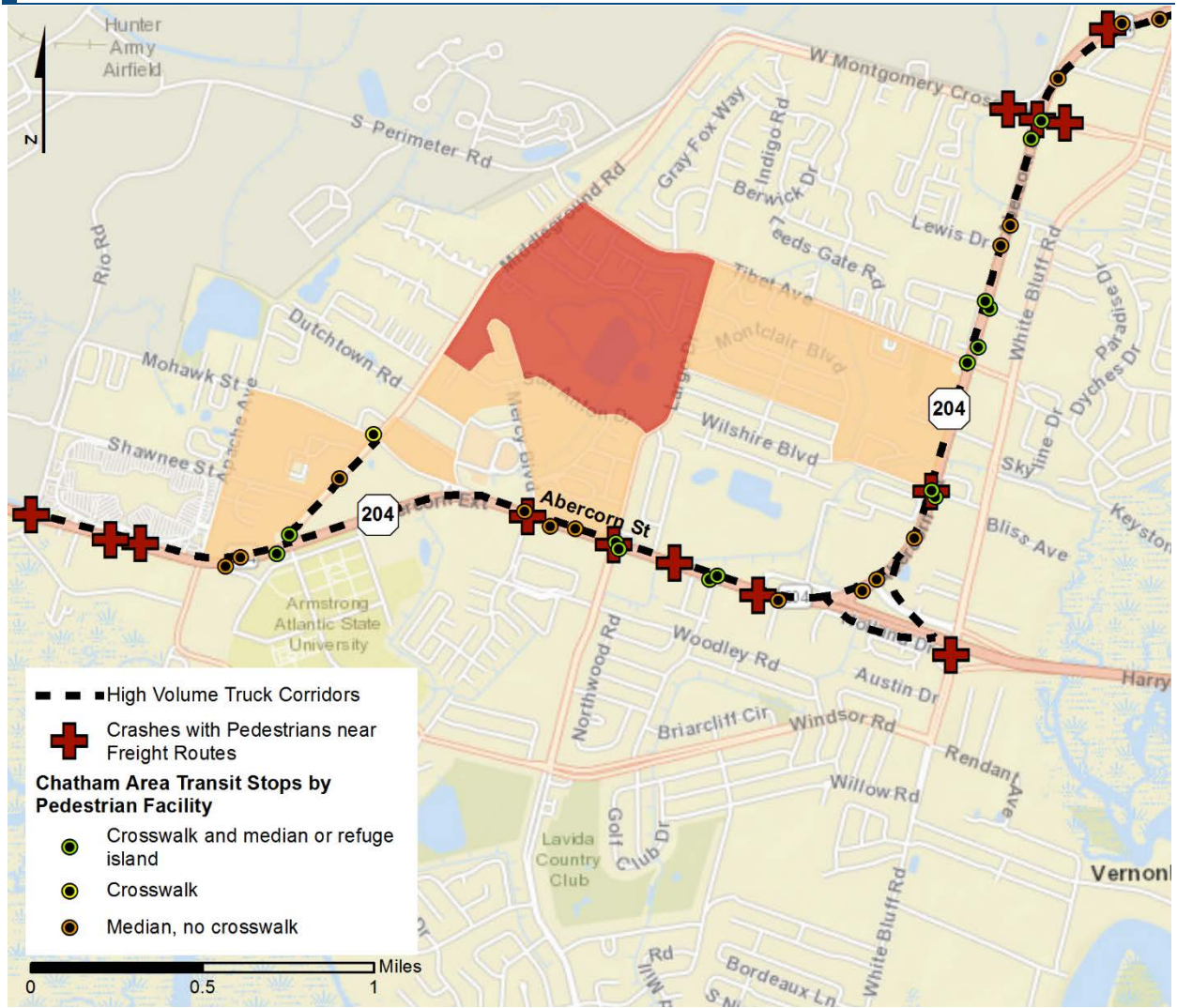
Land Use



Criteria (✓ = 1 point)	SAV – EJ Area 13	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?		
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		1

Savannah | EJ Area 13

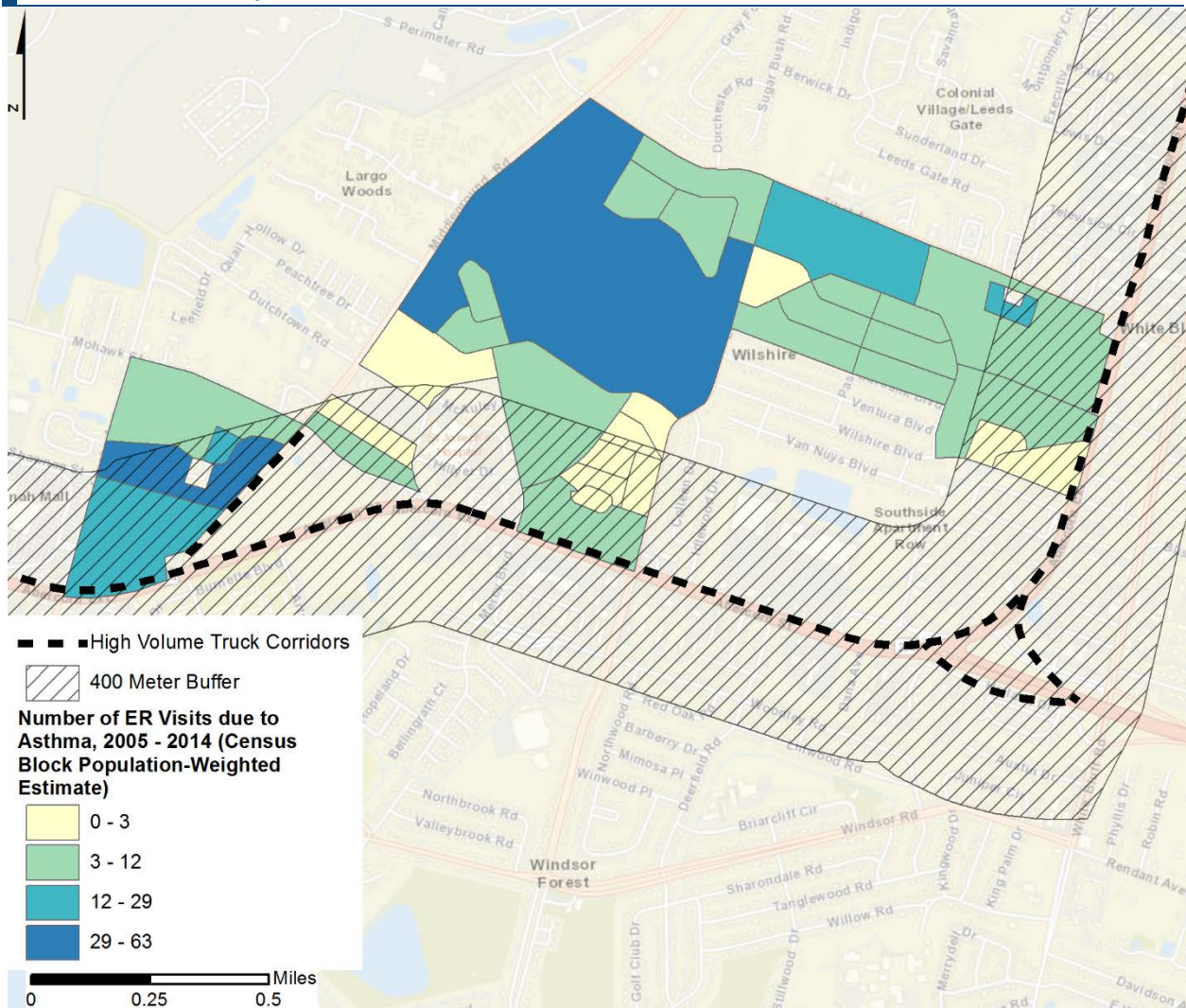
Transportation



Criteria (✓ = 1 point)	SAV – EJ Area 13	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)		
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?	✓	1
Transportation Total		3

Savannah | EJ Area 13

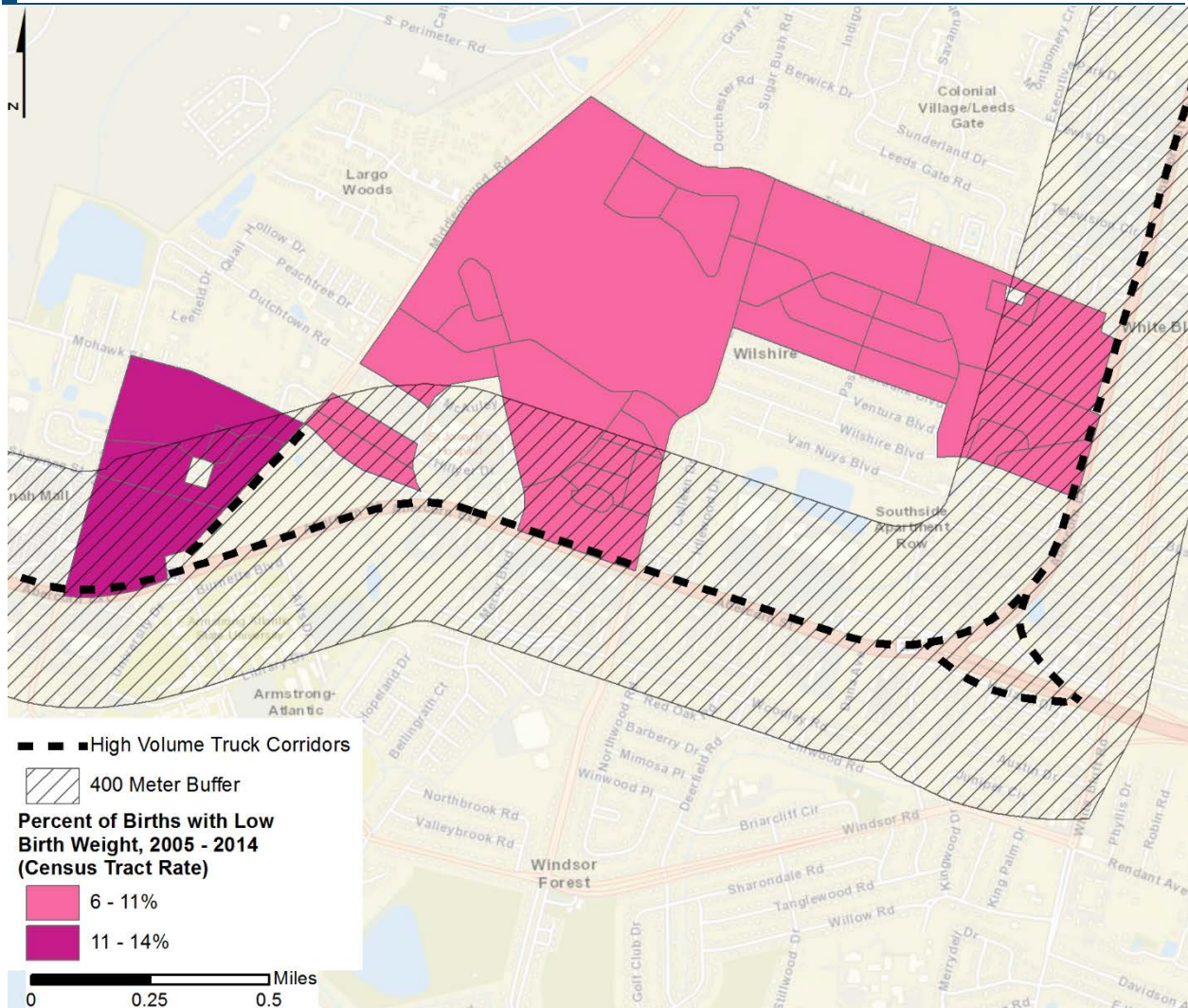
Health – Asthma



Criteria (✓ = 1 point)	SAV – EJ Area 13	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Savannah | EJ Area 13

Health – Low Birth Weight



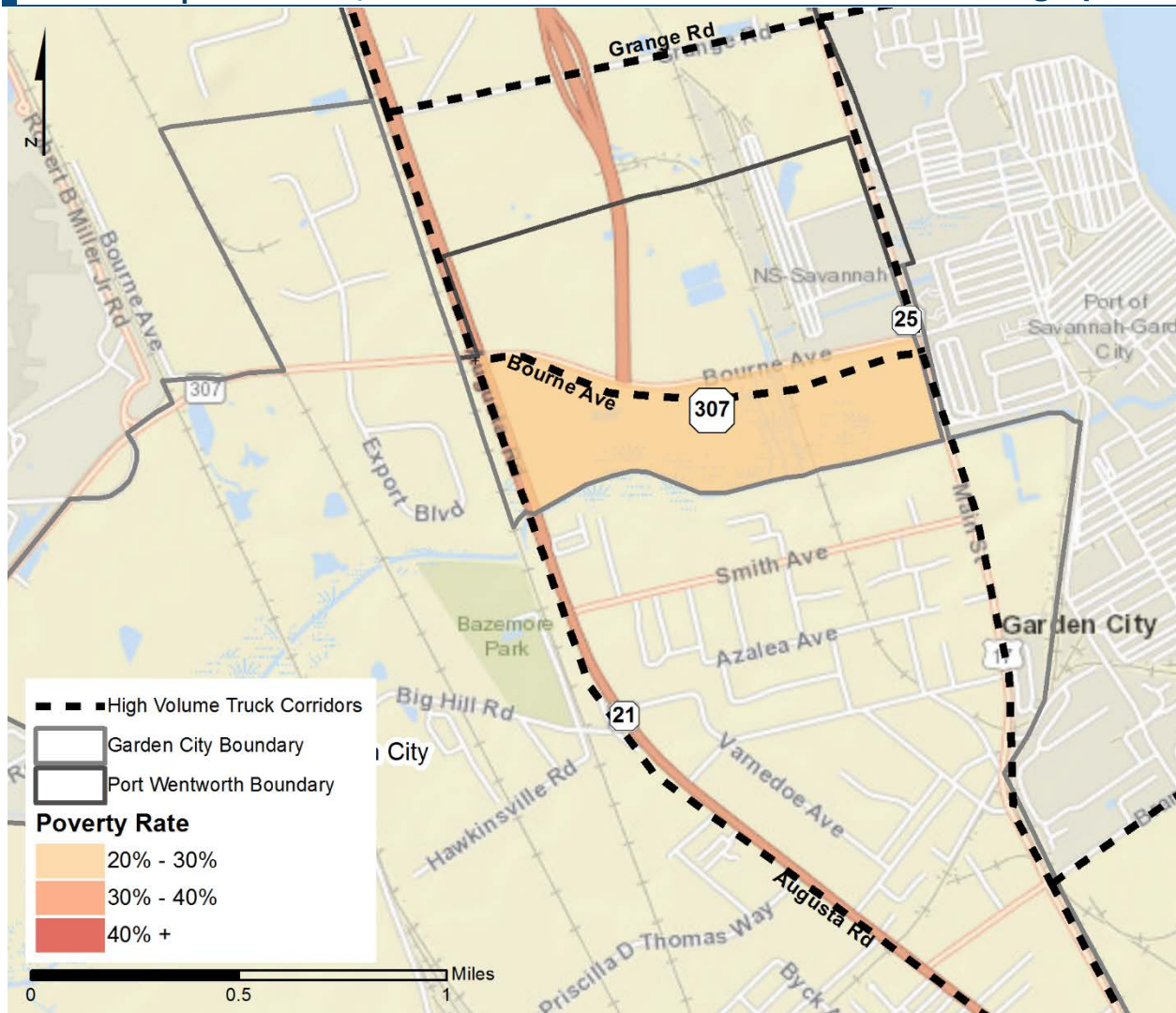
Criteria (✓ = 1 point)	SAV – EJ Area 13	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	9
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Unincorporated | EJ Area 1

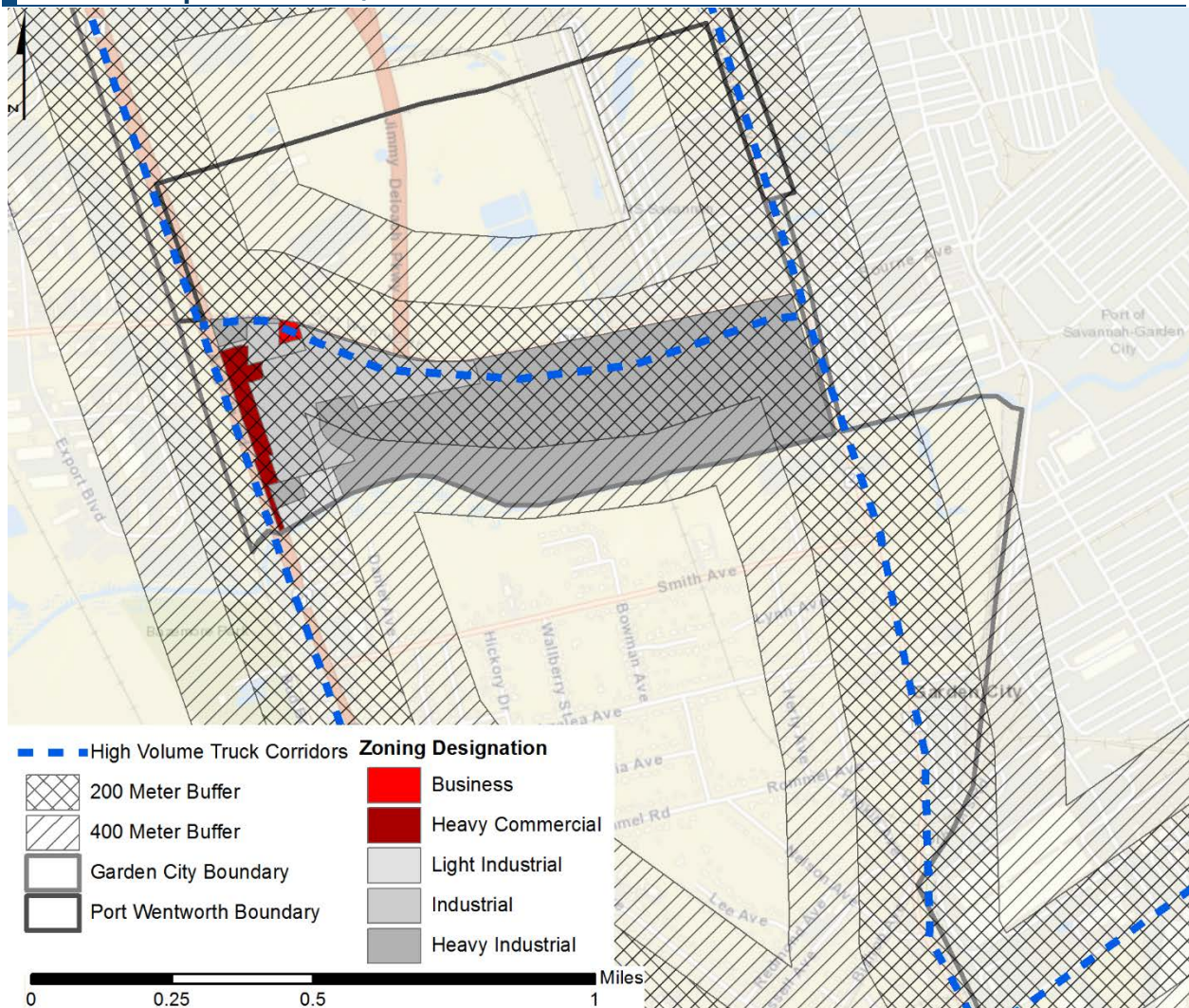
Demographics



Criteria (✓ = 1 point)	UC – EJ Area 1	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty		
EJ area contains census blocks with greater than 40% poverty		
Demographics Total		1

Unincorporated | EJ Area 1

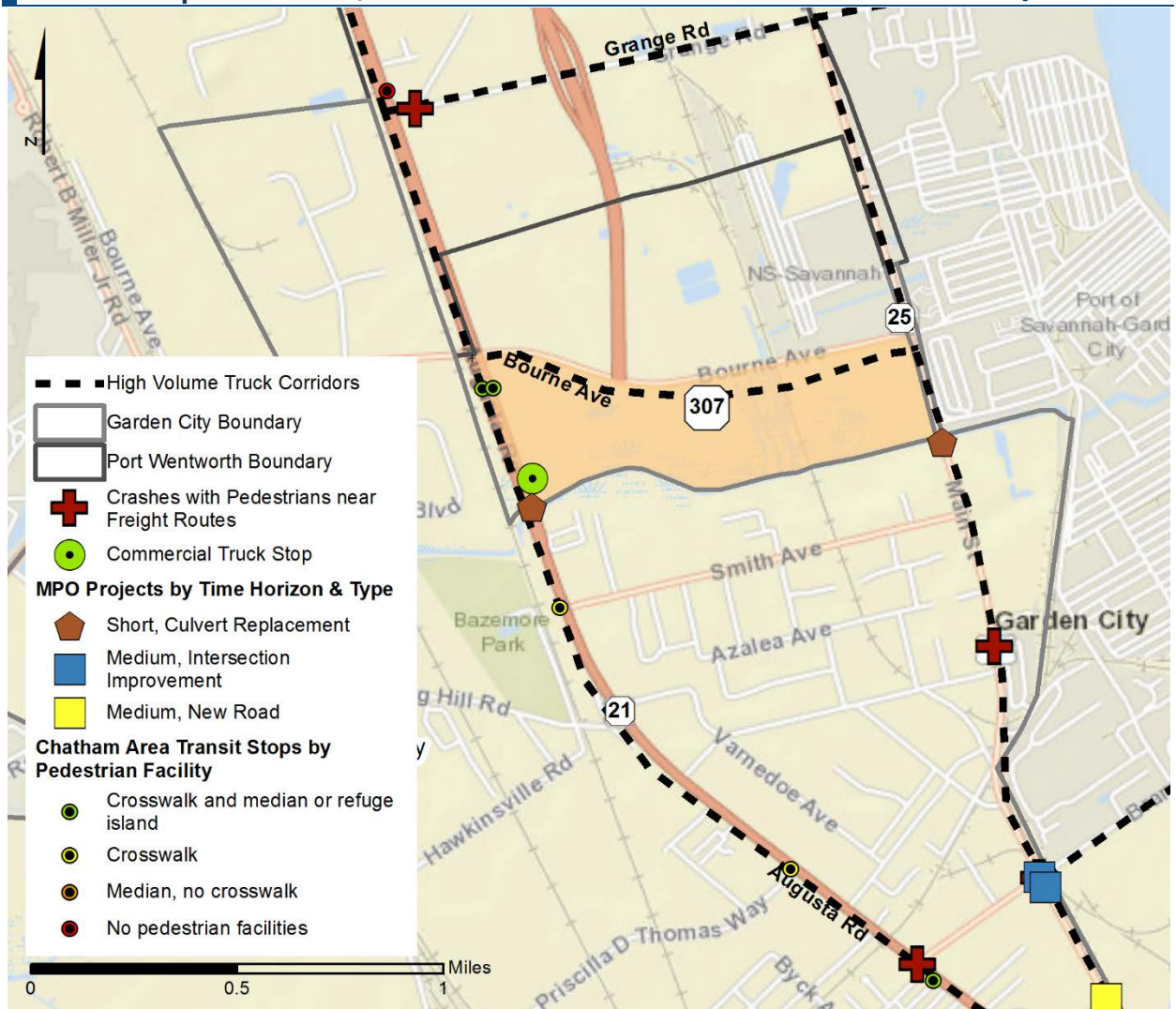
Land Use



Criteria (✓ = 1 point)	GC – EJ Area 1	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)		
Is a playground located here?		
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		0

Unincorporated | EJ Area 1

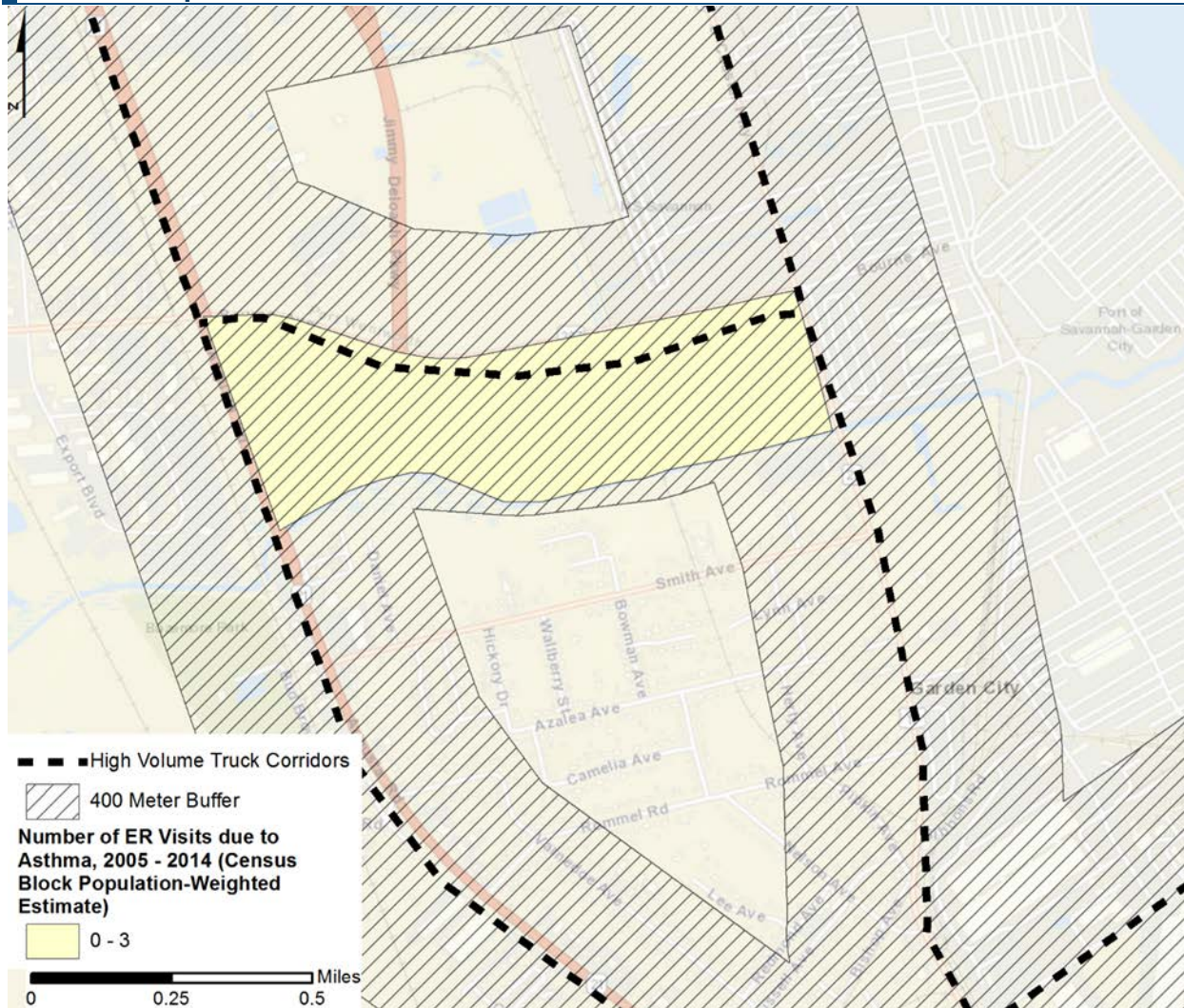
Transportation



Criteria (✓ = 1 point)	GC – EJ Area 1	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)	✓	1
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)	✓	1
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?		
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?		
Transportation Total		3

Unincorporated | EJ Area 1

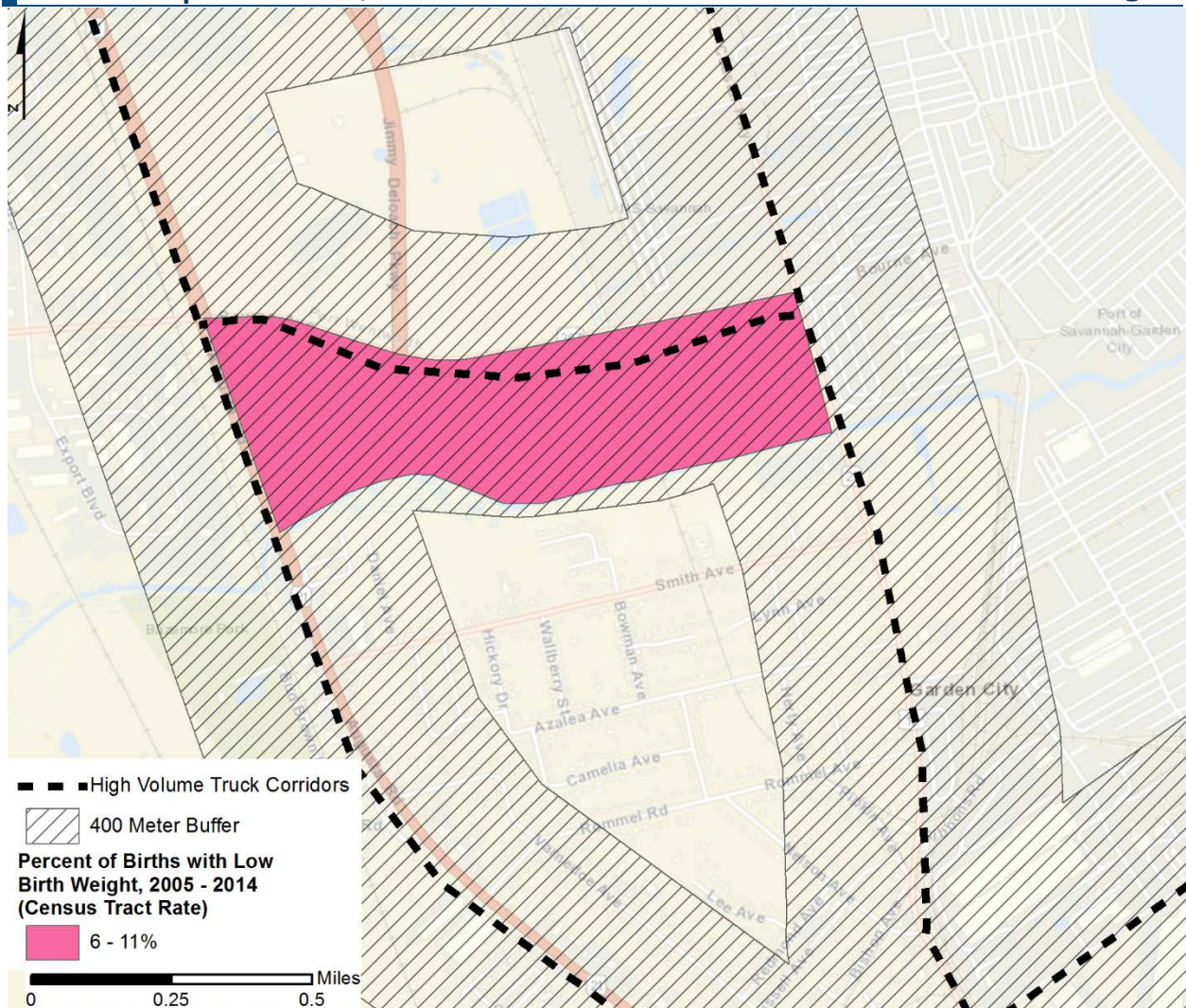
Health – Asthma



Criteria (✓ = 1 point)	GC – EJ Area 1	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?		0
(Health Total on the next page)		

Unincorporated | EJ Area 1

Health – Low Birth Weight



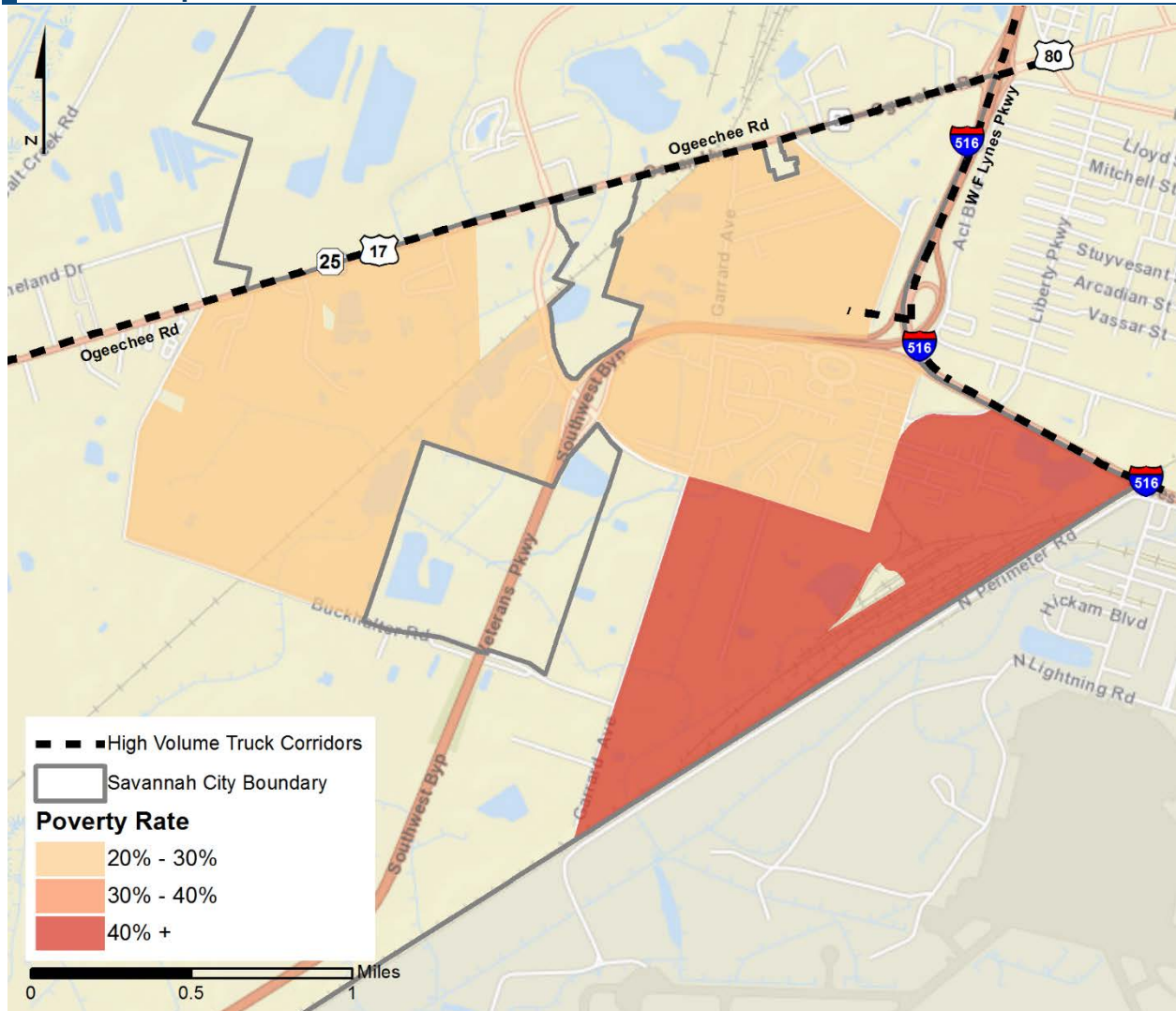
Criteria (✓ = 1 point)	GC – EJ Area 1	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		1

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	5
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Unincorporated | EJ Area 2

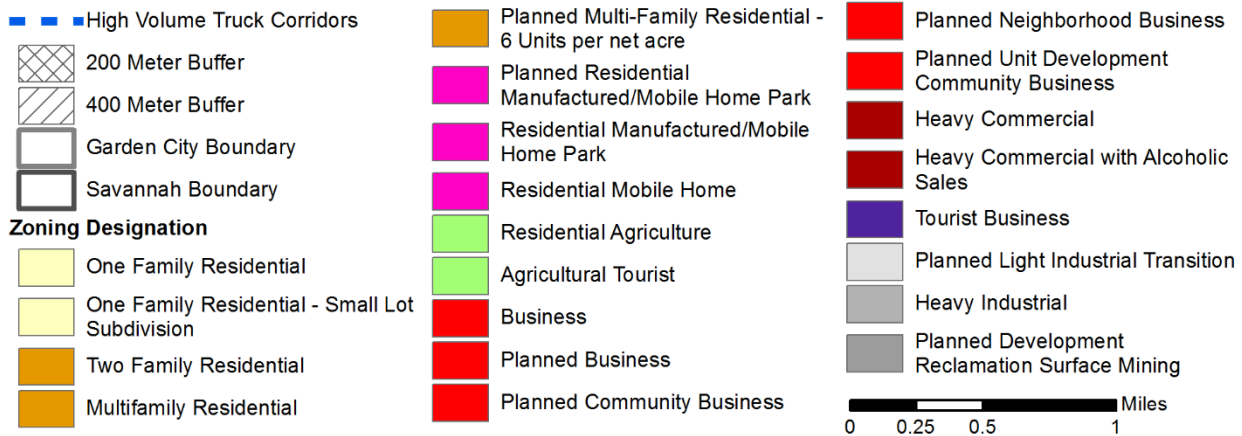
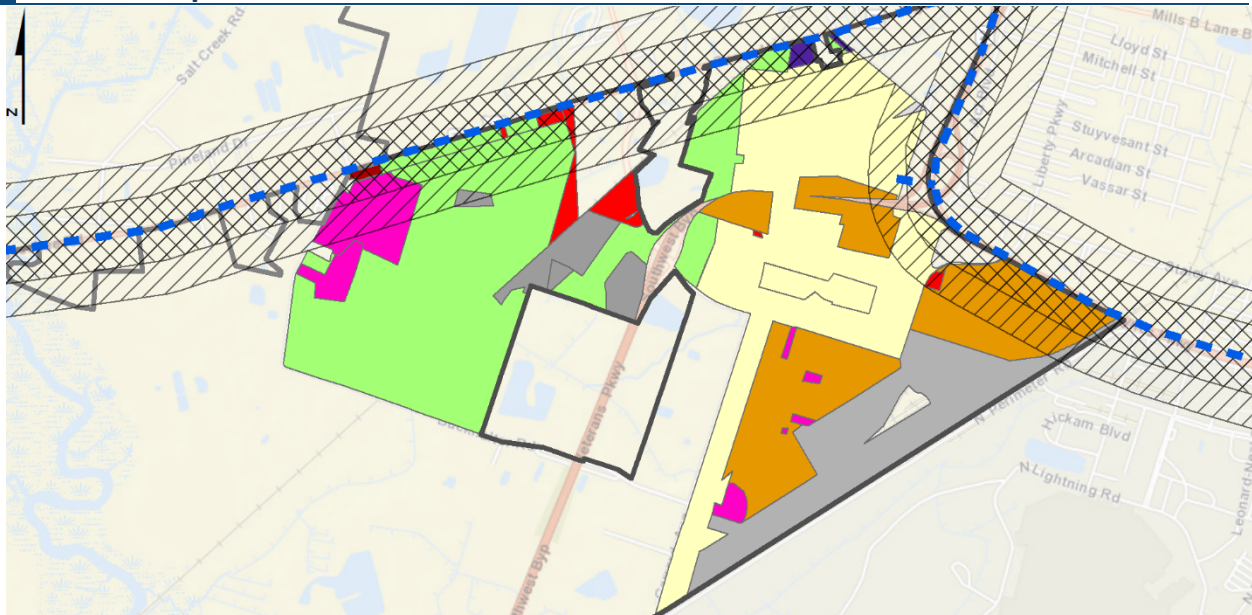
Demographics



Criteria (✓ = 1 point)	UC – EJ Area 2	Score
EJ area contains census blocks with greater than 20% poverty	✓	1
EJ area contains census blocks with greater than 30% poverty	✓	1
EJ area contains census blocks with greater than 40% poverty	✓	1
Demographics Total		3

Unincorporated | EJ Area 2

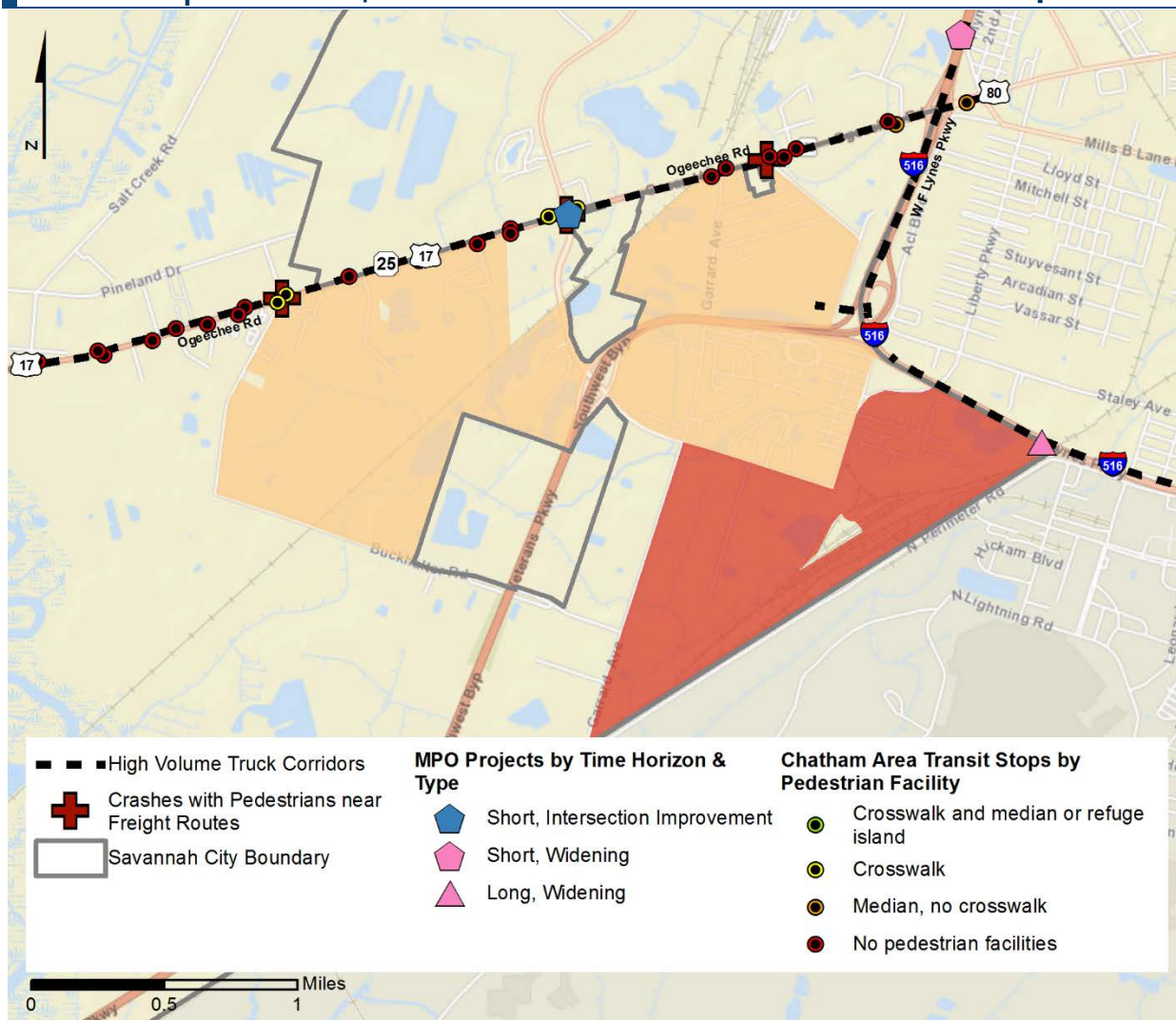
Land Use



Criteria (✓ = 1 point)	UC – EJ Area 2	Score
Are zoning changes recommended? (Are there residential parcels or other sensitive land uses located in the EJ area within the 400 meter potential poor air quality zone?)	✓	1
Is a playground located here?		
Is public housing (managed by the Housing Authority of Savannah) located here?		
Land Use Total		1

Unincorporated | EJ Area 2

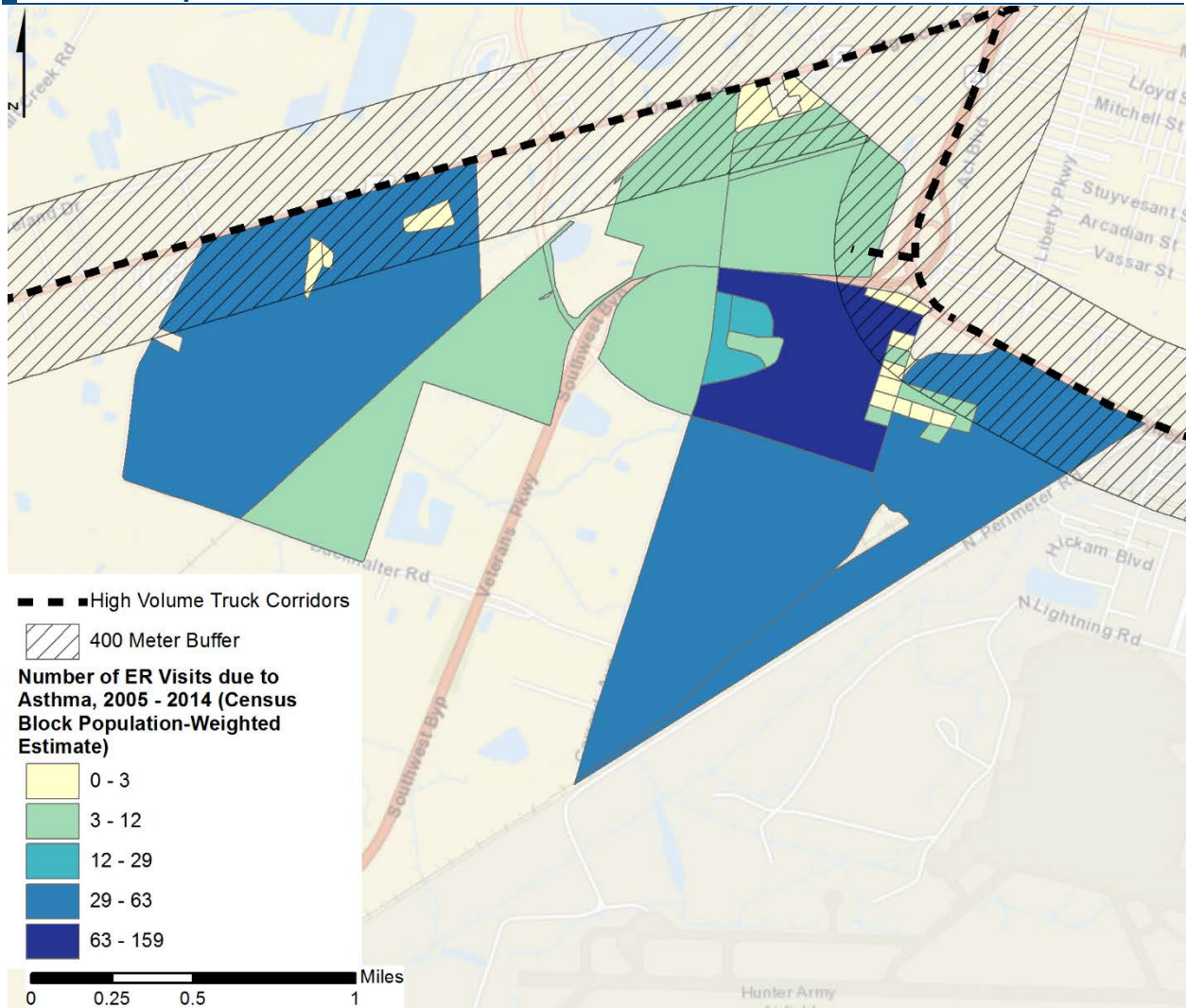
Transportation



Criteria (✓ = 1 point)	UC – EJ Area 2	Score
Is a CORE MPO project located in the area? (Opportunity for roadway design changes.)	✓	1
Is a truck stop located within 500 feet of the EJ area? (Potential poor air quality hot spot.)		
Did at least one crash involving a pedestrian occur on a roadway in or bordering the EJ area, according to the 2011-2014 GDOT data?	✓	1
Is a bus stop located on a freight route within close proximity to the EJ area?	✓	1
If yes, would the bus stop benefit from additional pedestrian facilities?	✓	1
Transportation Total		4

Unincorporated | EJ Area 2

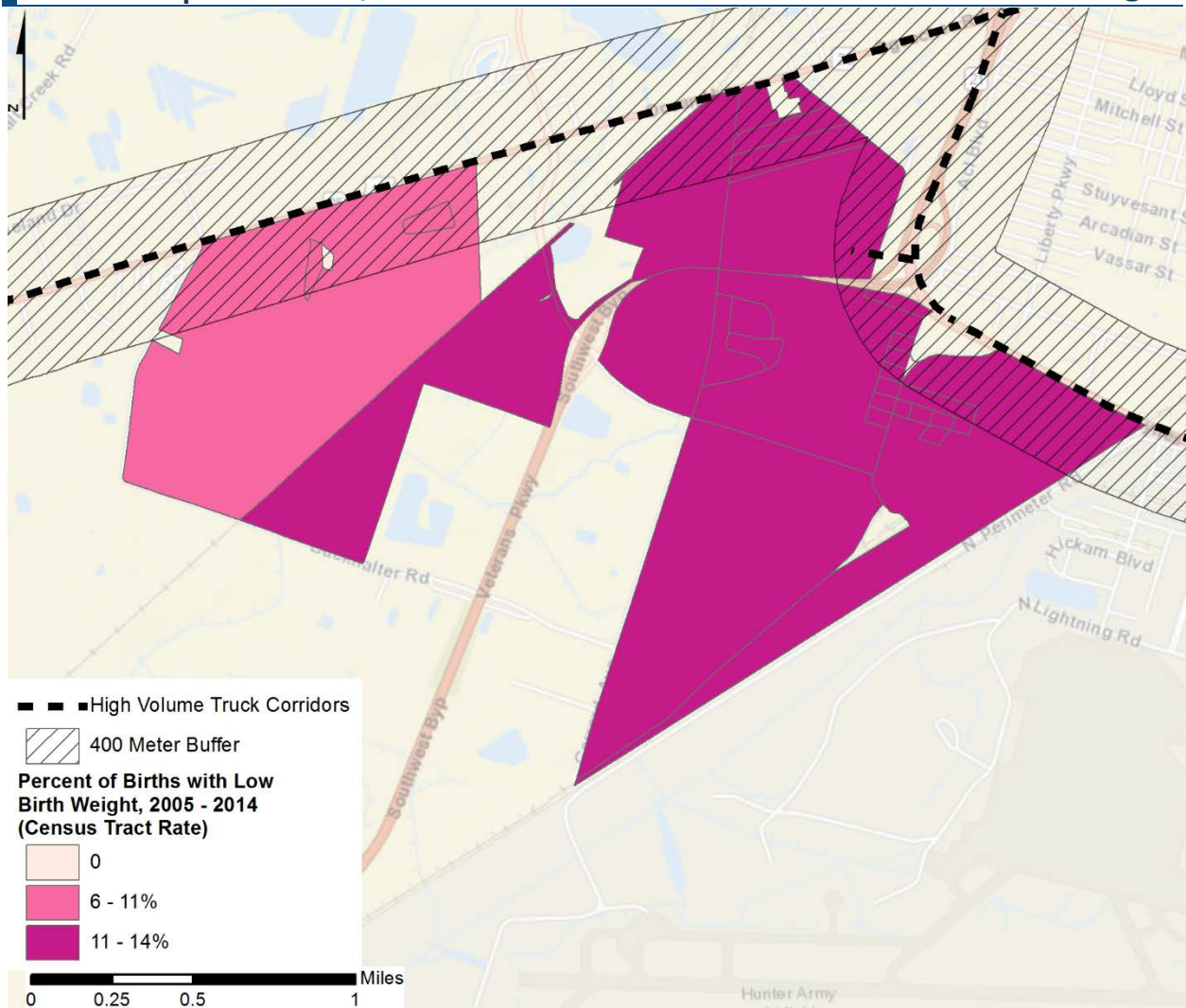
Health – Asthma



Criteria (✓ = 1 point)	UC – EJ Area 2	Score
Do any census blocks in the area have an incidence of ER visits due to asthma greater than the county estimated average of 3 ER visits?	✓	1
(Health Total on the next page)		

Unincorporated | EJ Area 2

Health – Low Birth Weight



Criteria (✓ = 1 point)	UC – EJ Area 2	Score
Do any census blocks in the area have a higher rate of low birth weight births than the county estimated average of 6%?	✓	1
Health Total		2

Existing Conditions Summary

GRAND TOTAL (out of 13 points)	10
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Appendix 2: Stakeholder Engagement Plan

The following describes the stakeholder engagement process conducted as a part of the Health Impact Assessment (HIA) of the CORE MPO Freight Study.

Introduction

Engaging with a wide variety of stakeholders is a defining component of practice in intermediate or comprehensive scale HIAs. In *Guidance and Best Practices for Stakeholder Participation in HIA* (Stakeholder Participation Working Group of the 2010 HIA in the Americas Workshop, 2011), a working group of HIA practitioners defines stakeholders as “individuals or organizations who stand to gain or lose from a decision or process. More specifically, stakeholders can be described as people who:

- are affected by the prospective change (e.g., health or financial),
- have an interest in the health impacts of the policy or project under consideration because of their position,
- have an active or passive influence on the decision-making and implementation process of the project or policy under consideration,
- have an economic or business interest in the outcome of the decision.”

That same guidance notes that stakeholder participation “can improve the efficacy of an HIA by helping to:

- identify important stakeholder concerns,
- bring important reflections of experience, knowledge, and expertise,
- ground truth findings and recommendations by ensuring that the lived reality matches priorities, data, and analysis,
- support the value of equity and democracy within the HIA,
- create more support for the implementation of HIA recommendations,
- shape communication and dissemination methods.”

Each of these are goals for stakeholder engagement for this HIA program and its two component HIAs. In regards to advancing equity through the HIA, stakeholder engagement is also viewed through the lens of the Equity Metrics for Health Impact Assessment Practice, Version 1 (Society of Practitioners of Health Impact Assessment, n.d.), which focuses on four outcomes:

- The HIA process and products focus on equity,
- The HIA process built the capacity and ability of communities facing health inequities to engage in future HIAs and in decision-making more generally,
- The HIA resulted in a shift in power benefiting communities facing inequities,
- The HIA contributed to changes that reduced health inequities and inequities in the social and environmental determinants of health.

CORE MPO Freight Study HIA (Chatham County)

This HIA is built upon content and processes described in the Coastal Region Metropolitan Planning Organization (CORE MPO) Freight Transportation Study. This plan provides “recommendations on how to improve the freight infrastructure and facilitate economic development” in the region. Engagement for this planning process (conducted by the CORE MPO for the freight study) was focused on members of the

freight industry, with minimal community input. Originally intended to inform the freight plan itself, the HIA process revealed that there were other, potentially higher-leverage opportunities to bring a health perspective into the plan's implementation by focusing on decision-making around zoning and comprehensive plan updates in Chatham County and Savannah, a detailed review of the transportation project list in the freight study, as well as the Coastal Georgia Indicators Coalition (CGIC) Chatham Community Blueprint. The goal remains bringing a more collaborative and health-inclusive perspective to issues around freight movement in the region, but ongoing stakeholder engagement has informed shifts in the decision-points targeted by the HIA.

The primary goals of the stakeholder engagement for this HIA are to:

- Contribute additional local perspective to the final scope of the HIA,
- Ground truth findings and recommendations by ensuring that the lived reality matches priorities, data, and analysis,
- Create support for the implementation of HIA recommendations, including monitoring and evaluation,
- Support the values of equity and democracy within the HIA process.

Identification of HIA Stakeholders

Stakeholders contributing to this HIA came from three broad and overlapping categories. First, existing stakeholders involved in the CORE freight planning process helped ground the HIA with a freight-focused perspective. Second, representatives of organizations that focus on issues directly relevant to the health perspective advanced through the HIA process augmented the industry representatives serving as stakeholders for the CORE planning process. Third, individuals or organizations representing residents of affected communities were approached in an effort to enhance a health equity perspective and create links between the institutional planning process and lived experience in the communities most impacted by freight movement.

Existing Stakeholders Involved in the CORE Freight Planning Process

The Economic Development and Freight Advisory Committee (EDFAC) for the CORE planning process met with some regularity through the development of the CORE freight study. For the HIA, select members of this committee were recruited to provide expertise on the freight planning process and the freight study implementation.

Representatives of Organizations that Focus on Issues Directly Relevant to the Health Perspective and HIA

Other HIA stakeholders were engaged to augment the perspectives of those already involved in freight planning. This group was engaged to round out the freight planning/industry perspective with that of individuals involved in environmental, public health, and other community issues in the region. It was through engagement with this group that CGIC, Healthy Savannah, and other local non-profit and government stakeholders were identified as potential decision-makers that could be targets of disseminating HIA recommendations. Stakeholders from this group are included in Table A2.1.

Table A2.1: HIA Stakeholders Representing Relevant Organizational Perspectives

Name	Title	Organization
Christopher Blocker	Senior Program Specialist	Coastal Workforce Services
Shane Corbin	Zoning Administrator, Development Services	City of Savannah
Ron Feldner	City Manager	City of Garden City
Nick Helmholdt	Senior Comprehensive Planner	MPC
Dennis Hutton	Chair / Director of Comprehensive Planning (retired)	Healthy Savannah Initiative / MPC (ret.)
Jackie Jackson	Special Projects Coordinator	City of Garden City
Tara Jennings	Director	CGIC
Kevin Klinkenberg	Executive Director	Savannah Development and Renewal Authority
Paula Kreissler	Director of Healthy Living and Community Development	Healthy Savannah
Jane Love	Transportation Planner	CORE MPO/MPC
Randy McCall	Administrator	Chatham County Health Department
Patty McIntosh	Community Planner	City of Savannah
Mike Pitts	Environmental Health County Manager	Coastal Health District
Stephanie Rossi	Transportation Planner	CORE MPO/MPC
Tom Thomson	Executive Director (retired)	MPC/CORE MPO
Maria Wargovich	Regional Healthy Homes and Lead Coordinator	Coastal Health District
Wykoda Wang	Transportation Administrator	MPC/CORE MPO
Mark Wilkes	Project Manager	CORE MPO/MPC

Individuals or Organizations Representing Residents of Affected Communities

The perspectives of community members directly impacted by goods movement do not appear to be well represented in the existing CORE planning effort. Community leaders and organizations were identified as stakeholders for the HIA as a way to bring a more targeted equity and environmental justice perspective. However, building relationships with these stakeholders proved to be one of the most challenging aspects of the HIA. Due to the slowly evolving trust-building process needed to truly engage, and ultimately

empower, the communities most impacted by freight movement, input from these stakeholders was solicited throughout the development of recommendations with a particular emphasis on identifying opportunities for their participation in implementation. Table A2.2 below lists the HIA stakeholders that were targeted to gain community perspectives.

Table A2.2: HIA Stakeholders Representing Community Perspectives

Name	Title	Organization
Reverend Vernell Cutter	Pastor	Bunn Memorial Baptist Church
Jean Lemon	President	Hudson Hill Neighborhood Association
Van R. Johnson, II	Alderman, District 1	City of Savannah Elected Official
Dr. Mildred McClain	Director	Citizens for Environmental Justice/Harambee House
Samantha Parker	Youth Coordinator	Citizens for Environmental Justice/Harambee House

Stakeholder recruitment was an ongoing process throughout the HIA. As contact was made with individuals, requests for additional contacts that might provide perspectives not represented in the initial lists were made. Only individuals with whom contact was made are included above. The aim was to leverage existing HIA stakeholders to bring in additional perspectives more fully as implementation strategies were considered for recommendations and monitoring processes.

Stakeholder Engagement Activities

Engagement occurred through a series of site visits to Savannah, as well as several one-on-one phone calls between the HIA project team and stakeholders in Savannah. While the initial stakeholder engagement plan for this HIA laid out a general framework for engagement activities, the actual engagement was more adaptive and iterative than initially expected, with each subsequent site visit and series of meetings becoming more and more productive – both in terms of usable input for the HIA process and in terms of relationship and trust building. Community stakeholder discussion questions and site visits are summarized in the following subsections.

Community Stakeholder Discussion Questions

After working with stakeholders at multiple meetings in Savannah it became clear that a more relationship-based approach was needed in order to capture perspectives of community members and other critical stakeholders absent from earlier engagements. To do this, the following questions were developed as a guide for initial conversations with new stakeholders to recruit them into the process directly via phone calls, with the ultimate goal of gaining their in-person participation in subsequent site visits to Savannah in summer and fall 2016. In practice, these questions may have not been answered directly, but generally the feedback received confirmed that the HIA was on the right track in terms of content and decision targets.

1. *Please define the goals for your community or neighborhood. These don't have to be specifically about freight movement. We'd like to know your individual perspective as well as any goals from other planning processes you may be aware of.*

Mostly, community stakeholders indicated that economic goals for the region were beyond their lived experience. They were more concerned with the often dilapidated quality of their neighborhoods and the lack of services and/or opportunities to improve them. Gentrification of lower income areas was also a noted fear. Alleviating crime and safety issues were also mentioned.

2. *Now, thinking about freight movement through your community – which usually means trucks – what are your concerns? Some of the ones we’ve identified are noise, air pollution, traffic, safety, and conflicting land uses – which means having factories or warehouses right next to places where people live.*

Community stakeholders were more familiar with the concept of point source air pollution, which is part of the larger freight landscape, but not the focus of the HIA. Once freight *movement* became the focus, they generally agreed with concerns about safety, noise, and air pollution. Trucks cutting through neighborhoods and idling in neighborhoods came up as issues with both community members and technical stakeholders.

3. *How important is freight planning to you and your community? Is it something you’ve even thought about before? Did you know that the county has a planning process for freight movement in your area?*

Community stakeholders did not seem to be aware of freight movement issues or planning processes. Generally, mentioning freight would elicit a response concerning the port and its expansion activities. Community members had slightly more awareness and previous involvement with neighborhood planning processes or specific environmental justice projects like an EPA CARE grant in the Hudson Hill Neighborhood from 2007, led by Harambee House.

4. *How do you think freight planning could include a more actionable environmental justice perspective? That means, how could they be more considerate of how what they do affects your community?*

In the most basic sense, community stakeholders felt that the people making decisions about freight should talk to the communities they are impacting. There is a perception that the most vulnerable populations are “collateral damage” of freight projects intended to advance economic growth. Another theme that emerged during discussions is the need for job training and skill-building opportunities in the most impacted neighborhoods. This ranged from training on environmental monitoring to specific job training programs which could potentially result in the residents of these communities becoming employed by the industries that are in their neighborhoods.

5. *Would you please provide an example of one positive and one negative effect freight movement has had on your community in the last few years?*

Positive perspectives mostly centered on regional and state-level economic growth and jobs. Negative perspectives mostly considered how noisy trucks were as they moved through residential areas and the general nuisance and unsafe (injury-wise) conditions they cause.

6. *Anyone else we should be talking to?*

Most stakeholders were willing to put the HIA team in touch with additional people, some of whom then provided additional input, but many of whom were unable to be reached. Connections were most successful when an introduction was provided by an existing stakeholder.

Savannah/Chatham County Site Visits

Though much of the work with stakeholders was initially intended to be completed remotely, trips to Savannah and the surrounding region proved to be critical for the HIA team to develop a more nuanced understanding of the context for the CORE MPO Freight Study and the HIA that seeks to inform it. Early trips focused on building relationships with stakeholders and decision makers to inform the HIA scope. Subsequent trips focused on following up with decision makers and engaging with other community stakeholders as well as impacted community members in order to inform both HIA data collection and the appraisal phase of the HIA. Later site visits were used to validate assessment findings, share those findings with local stakeholders, and strategize about recommendations. The following provides a brief summary of activities during each site visit.

Site Visit 1: October 14-15, 2015

- Met with Thomas Thompson, PE, Executive Director, CORE MPO, to secure participation on the Program Advisory Board.
- Met with CORE MPO staff both to introduce the overall concept of the HIA and discuss future stakeholder engagement.

Site Visit 2: April 4-6, 2016

- Initial observation of high freight traffic areas, especially in West Savannah.
- Visit to the Savannah Georgia Tech campus in preparation for the workshop to be conducted during visit 3.
- The HIA team met again with CORE MPO/MPC staff to discuss the progress of the HIA. In this discussion, the Chatham County Blueprint was mentioned as a completed initiative that already included an extensive community engagement process, and the HIA should not try to recreate that. The HIA team was advised to use the existing work as a context for the HIA. Ongoing zoning and comprehensive plan updates were also mentioned as opportunities. Additional stakeholder connections were also provided.
- The HIA team met with representatives of the non-profit group Healthy Savannah, and they indicated that the organization had not done any work directly related to freight planning but were very interested in learning about the connections and any future opportunities to get involved. This conversation also provided a good historical perspective of Savannah's growth, especially as it relates to freight-impacted communities.
- The HIA team attended the regular monthly meeting of CGIC and identified this as a key group of stakeholders to target for participation in future activities. Their subcommittees all have some connection to the perspective of the HIA: Education, Health, Economy, and Quality of Life. Observing this meeting provided a good perspective on how members of the regional community work together and frame issues of concern.
- The HIA team met with environmental health staff representing the regional health district. They are mostly concerned with lead abatement in homes, which is a major issue in the environmental justice communities that are the focus of the HIA. Ultimately this perspective was outside the HIA scope; though the Health District staff were willing to continue participating in the HIA as needed/was relevant.

Site Visit 3: May 26, 2016

- This visit consisted of a workshop at GA Tech Savannah that aimed to inform stakeholders about the ongoing freight planning HIA and engage them to provide input on preliminary findings and translation into actionable recommendations.
- While not well-attended, this workshop provided an excellent opportunity to continue conversations begun during earlier visits in a more structured and HIA-focused environment.
- Land use conflicts and entrenched poverty were the main topics of discussion, and toward the end of the workshop, the HIA concepts were translated into the four relevant topics of the Chatham County Blueprint (Economy, Education, Health, and Quality of Life) in order to demonstrate how the HIA should be able to expand on existing work in the region aimed at promoting both health and economic development.
- Participants in the workshop also provided more possible contacts for community stakeholders to include in the HIA going forward.

Site Visit 4: August 8-10, 2016

- This visit included observations of target communities, as identified by the ongoing assessment process. The focus was on areas noted as having high poverty and located within the 400 meter buffer of high volume truck routes.
- Met with several MPC and Development Services staff to obtain their response to the project generally and to gather feedback on how the emerging results may be used. The team also aimed to gather local knowledge about the site locations visited during this trip. This meeting, which included several stakeholders from previous visits, focused on what types of HIA recommendations should be made. There was consensus that they should be specific and actionable, not general “pie in the sky” type of recommendations to promote health. There was also further discussion of the Savannah and Chatham County zoning and comprehensive plan updates as targets for HIA recommendations.
- Scheduled meeting with community leaders did not take place. They were unable to attend at the last minute.
- The HIA team met again with the CORE MPO freight planning staff to update them on progress and discuss specific sites and projects from the freight plan.
- The HIA team had a very productive, granular discussion with Garden City in which the team explored a specific freight movement project which the city leaders envision as an economic redevelopment catalyst in that community. The City Manager indicated great willingness to participate in any future HIA activities.
- Presented the HIA project to the Healthy Savannah monthly meeting. This group is a very active coalition that and will be a good ally in the implementation of the HIA recommendations. Several connections with existing and new stakeholders were made at this meeting.
- Met briefly with staff at Harambee House, where previous stakeholder input about environmental justice concerns in the affected communities was validated. Also discussed how this organization could be a good partner for future work that might focus on training and skill-building within vulnerable communities.

Site Visit 5: October 17-20, 2016

- This site visit aimed to “close the loop” with stakeholders by sharing close-to-final recommendations and discussing strategies for implementation and dissemination.
- The visit came in the immediate aftermath of Hurricane Matthew, and storm response and recovery activities obviously took precedence over HIA meetings. Regardless, this final site visit was immensely helpful in finalizing the HIA findings and recommendations.
- Presented to the Georgia Municipal Association (GMA) Region 12 fall meeting; the group appeared interested in the concept of HIA and health in all policies. This group was identified as a good target for future dissemination and training opportunities, especially through the GMA training series.
- The HIA team had an in depth meeting with Harambee House to discuss neighborhood and community perspectives. The emerging findings and recommendations from the HIA are consistent with many of their ongoing activities, especially in West Savannah. There, major issues of concern include zoning and safety, both of which are topics examined in the HIA. We also discussed future dissemination opportunities and how to incorporate the results of the current HIA into education and engagement strategies used by the cities and county as they conduct public engagement for comprehensive planning updates and other planning projects. They emphasized that a focus on health – especially for families and children – is a good frame to precipitate engagement in vulnerable communities, as health is one of their top concerns.
- Attended Hudson Hill Community Business Roundtable and shared information on the project. Meeting participants were generally receptive to the HIA and acknowledged its potential value. Of critical importance to this group was understanding how to build true partnerships between communities and industry.
- A meeting with the Savannah Zoning Administrator produced insight into the goals of the zoning update. The city is trying to simplify and streamline the zoning approval process to protect the unique character of Savannah, as well as for the benefit of both city reviewers and developers. They see the information from this HIA as a novel and useful part of this conversation, acknowledging the limits of what it can inform.
- A meeting with the Chatham County Health Department Administrator further validated both the HIA findings and approach. We discussed how the department could use the HIA results to inform implementation of policies like the new complete streets ordinance and the application for future funding. This meeting revealed that another site visit once everything is completed would be valuable, and the department would be happy to help recruit stakeholders.
- The team attended the CGIC Health Committee meeting and had a follow-up conversation with the CGIC Director, focused mainly on how groups like theirs would be able to use the HIA results in their ongoing work. The ability to use the HIA to foster new partnerships was noted. This discussion also echoed an idea from previous meetings that there would likely be value in conducting some neighborhood-level follow-up that investigates some of the smaller geographic areas of concern, than is possible in an analysis that examines the whole county or region.

Conclusion: Achieving Stakeholder Engagement Goals

Based on the definition of stakeholders, the goals of engagement, and the related equity goals included in the introduction, the engagement for this HIA has been successful, but leaves room for improvement, especially in the area of promoting equity through stronger involvement of community members. The extent to which engagement addressed these topics is summarized below.

Definition of “stakeholders” as people who:

- **Are affected by the prospective change (e.g., health or financial)** – Representatives of affected communities were engaged, but mostly toward the end of the process and only in a fairly limited role. This was likely a result of the need to build relationships and trust with other stakeholders able to act as “gate-keepers” to the most impacted communities. In the broad sense, all residents of the Savannah region are impacted by these decisions in some way, so engagement with the various professionals, organizations, and groups met this definition.
- **Have an interest in the health impacts of the policy or project under consideration because of their position** – The HIA engagement was successful in building relationships with and between the stakeholders required to implement the anticipated recommendations and impacted professionally by the contents of the freight plan.
- **Have an active or passive influence on the decision-making and implementation process of the project or policy under consideration** – Several of the stakeholders engaged have direct influence over the content of zoning codes, comprehensive plans, transportation project design, and other decisions targeted by the HIA.
- **Have an economic or business interest in the outcome of the decision** – Similarly, several of the stakeholders engaged have financial interest in freight movement as well as the health of the regional population.

Goals for stakeholder engagement:

- **Identify important stakeholder concerns** – Discussions and site visits led to the final scope of the HIA, which includes topics identified as relevant by stakeholders across all categories. Fortunately, this scope captured issues of importance for the affected communities, as indicated by representative stakeholders in site visits later in the process. As noted elsewhere, building the rapport with local stakeholders took time, which meant that members of the most impacted communities were not directly involved in early scoping discussions.
- **Bring important reflections of experience, knowledge, and expertise** – Stakeholders who have been involved in planning and health promotion efforts in the region were extremely helpful in connecting the HIA team with data sources and policy knowledge. Stakeholders representing environmental justice and community-level concerns also helped bring critical perspective to the findings and recommendations.
- **Ground truth findings and recommendations by ensuring that the lived reality matches priorities, data, and analysis** – Both technical and community stakeholders were invaluable in helping the HIA team understand what the data collected means in the local context. There were no instances where the HIA results were disputed based on discrepancy in technical and community-level interpretations.
- **Support the value of equity and democracy within the HIA** – The engagement strategy offered multiple opportunities for the community members affected by the decisions in the freight study to participate in the HIA process. The spirit of these values was included, but work remains to fully achieve these values. In a broad sense, one of the driving forces behind this HIA is a recognized need to create a more actionable space for community participation in the freight planning process.
- **Create more support for the implementation of HIA recommendations** – Many stakeholders indicated a willingness to assist in the implementation of recommendations as part of their ongoing activities.

- **Shape communication and dissemination methods** – Several of the stakeholder groups, specifically Healthy Savannah and the CGIC indicated willingness to help in the dissemination of the final HIA.

Equity-focused goals for stakeholder engagement:

- **The HIA process and products focus on equity** – The focus of the HIA is on environmental justice communities and the impact of freight movement therein. The technical perspective and process of this HIA may foster necessary policy contexts for more empowerment of the communities of concern.
- **The HIA process built the capacity and ability of communities facing health inequities to engage in future HIAs and in decision-making more generally** – The aim is for a subset of recommendations to help achieve this, but the current HIA process was not able to fully realize this goal.
- **The HIA resulted in a shift in power benefiting communities facing inequities** – It is unclear the extent to which the HIA led to any shifts in power, but if recommendations are adopted that help communities participate more fully in freight planning processes, that would potentially result in the fulfillment of this goal.
- **The HIA contributed to changes that reduced health inequities and inequities in the social and environmental determinants of health** – The impact in this space is unknown at this time, but recommendations aim to mitigate some of the underlying conditions in vulnerable communities directly impacted by freight movement decisions.

Appendix 3: Health Data Processing Method

Analyses in this study were largely conducted at block-level geographies. However, not all variables of interest are available from the Georgia Department of Health at this scale and level of detail. To this end, the HIA team transformed variables not immediately available at block-level to fit into the primary geographic level of interest of this study. This table of variables shows the data transformation. Here it is imperative to mention an important limitation of this study. As the health data (for example Asthma) at block-level is estimated using census tract level absolute data in the study area, the analyses and recommendations of this study are subjected to the limitations of data disaggregation.

Variable	Name	Description	Geographic Level†	Source	Calculation
Pop	Population		Block	2010 Census	
HH	Household		Block		
Rac_Wht	White alone		Block		
Rc_Blck	Black or African American alone		Block		
Rc_IndN	American Indian and Alaska Native alone		Block		
Rac_Asn	Asian alone		Block		
Rac_Hwn	Native Hawaiian and Other Pacific Islander alone		Block		
Rc_OthR	Some Other Race alone		Block		
Rc_TwRC	Two or More Races		Block		
Eth_Ltn	Hispanic or Latino		Block		
AgeVI_15	Under 15 years old	Under 5 years 5 to 9 years 10 to 14 years	Block		
AgeVI_65	65 years and older	65 and 66 years 67 to 69 years 70 to 74 years 75 to 79 years 80 to 84 years 85 years and over	Block		
MedINcm	Median household income in the past 12 months	In 2010 inflation-adjusted dollars	Block group	2010 American Community Survey: 5-Year Data (2006-2010)	
PPvrtRt‡	Population poverty rate -- Ratio of income to poverty level in the past 12 months	Selected ratios: 1) Under .50 and 2) .50 to .99	Block group		Ratio of Income to Poverty Level in the Past 12 Months / Total Population (Block group)

Variable	Name	Description	Geographic Level [†]	Source	Calculation
HHvrtRt[‡]	Households poverty rate – Poverty status in the past 12 months by household		Block group		Poverty Status in the Past 12 Months by Household / Total Households (Block group)
PpPvrtY	Population poverty rate (Block-level)		Block		Total population (block) * PPvrtRt
HHvrtRt	Households poverty rate (Block level)		Block		Total households (block) * HHvrtRt
ABS_Asthma	Absolute # Population with Asthma		Census tract		(ER_Asthma / Total Population 2010 (Census Tract)) * Pop (Block)

Data Source: Minnesota Population Center. National Historical Geographic Information System: Version 2.0. Minneapolis, MN: University of Minnesota 2011. <https://www.nhgis.org/>

†) Geographic level of original data

‡) Procedural variables, not to be used as variables representing block-level data

Appendix 4: Pedestrian-Transit Facility Inventory

The table below details all Chatham Area transit stops along freight corridors, details about existing pedestrian facilities, and some remarks about most pressing needs.

Route	Stop Name	Pedestrian Facility Inventory
3	Jimmy DeLoach & Highway 21	no pedestrian facilities - unclear where this stop is - seems to be an overpass
3	Hwy 21 & Crossgate WB	striped crosswalks, refuge islands
3	Highway 21 & Carey Hilliards	grass median, striped crosswalks ~400 feet away
3	Highway 21 Chatham City / Augusta & Brampton	striped crosswalks and refuge island nearby - consider moving stop closer to intersection
3	US 25 @ Foundation Street	no pedestrian facilities (4 lanes, rail line)
3	West Bay Street & Main Street	no pedestrian facilities (5 lanes, rail line)
3	Bay & Arby's	no pedestrian facilities (5 lanes, rail line)
3	Bay Street & Coach Turner	no pedestrian facilities (2-lane side-street)
3	West Bay Street & West Lathrop	raised median, crosswalks nearby
3	Highway 21 & Dean Forest WB	grass median, striped crosswalks approx. 400 feet away
3	Jimmy DeLoach & Pleasant EB (Sonny Dixon Interchange)	no pedestrian facilities (interchange) - needs pedestrian access from residential area south of it
3	Highway 21 & Grange WB	no pedestrian facilities - destinations on the same side of the road
3	Highway 21 & Smith SB	striped crosswalk
3	Highway 21 & Wheathill SB	striped crosswalk (7 lanes); needs refuge island
3/3B	Highway 21 & Minus SB	striped crosswalks, refuge islands
3/3B	Highway 21 & Pizza Hut	no pedestrian facilities (2-lane sidestreet) - people probably don't cross to the other side of the freight route
3/3B	Albion & West Bay	no pedestrian facilities (2-lane sidestreet)
3/3B	West Bay & Fair	no pedestrian facilities (4 lanes) - destinations on the other side of the road
3/3B	W Bay & Lisner WB	no pedestrian facilities (4 lanes) - destinations on the other side of the road
3/3B	Highway 21 & Minus NB	striped crosswalks, refuge islands
3/3B, 17	MLK Boulevard & Oglethorpe	striped crosswalks, refuge islands
3/3B, 17, 25	MLK & Turner Street	raised median, no crosswalk
3/3B, 17, 25, 29	MLK & Liberty	bar crosswalks nearby need striping
3B	West Lathrop & Mell Street	no pedestrian facilities (2 lanes)
3B	Rankin & West Lathrop	no pedestrian facilities (2 lanes)
3B	North Lathrop & Globalship Sys EB	no pedestrian facilities (2 lanes)
3B	North Lathrop & Great Dane Eastbound	no pedestrian facilities (2 lanes)
3B	North Lathrop & Colonial Eastbound	no pedestrian facilities (2 lanes)
3B	West Bay Coach Turner	striped crosswalks nearby
3B	Bay & Graham Street	striped crosswalks
3B	Bay Street & Kenilworth	no pedestrian facilities (4 lanes)

Route	Stop Name	Pedestrian Facility Inventory
3B	Bay Street & Hudson	no pedestrian facilities (4 lanes)
3B	Carolan & Bay	striped crosswalk nearby
3B, 5D, 25	MLK & Vis Ctr	raised median, midblock crossing nearby needs striping
6	King George & Hwy 204 IB	raised median but crossing north looks challenging
6	Middleground & Mohawk	striped crosswalks
6	Middleground & Forrest Hill Apts	raised median, no crosswalk
6	Abercorn & Savannah Crossing IB	raised median, striped crosswalks nearby
6	Middleground & Savannah Crossing IB	raised median, striped crosswalks nearby
10	Islands Expressway & Run Point	grass median, no crosswalk
10	Islands Expressway & Runaway Point	grass median, no crosswalk
10	Island Expressway & the Bluff	grass median, no crosswalk
10	Islands Expressway & Causton Bluff	grass median, no crosswalk
10	Islands Expressway & FR Spence PK	grass median, no crosswalk
10	Islands Expressway & Frank Spnce PK	grass median, no crosswalk
10	Islands Expressway & East Pines	grass median, no crosswalk
10	Islands Expressway & East Pine Subd	grass median, no crosswalk
10	Oatland Island Ctr. Westbound	grass median, no crosswalk
10	Hwy 80 West & Batterpoint IB	raised median, no crosswalks (9 lanes)
10	Highway 80 & Battery Point Out	raised median, no crosswalks (9 lanes)
11	Skidaway & Cokesbury	bar crosswalks, refuge islands - add striping to crosswalk
11	Derenne & Skidaway	bar crosswalks, refuge islands - add striping to crosswalk
11	Derenne & Resident 2032	no pedestrian facilities (4 lanes)
11	Derenne & Allegheny	no pedestrian facilities (4 lanes)
11	Derenne & Derenne Court	no pedestrian facilities (4 lanes)
11	Derenne & Jenkins High School	no pedestrian facilities - consider moving this stop closer to one of the nearby striped crosswalks
11	Derenne & Woodland Drive	painted median, no crosswalk
11	Derenne & Ranger	no pedestrian facilities (5 lanes)
11	Derenne & Ranger Drive	no pedestrian facilities (5 lanes)
11	Derenne & Waters	no pedestrian facilities (5 lanes) - faded crosswalks should be striped
11	Derenne & Waters	no pedestrian facilities (5 lanes) - faded crosswalks should be striped
11	Derenne & Frederick	no pedestrian facilities (5 lanes)
11	Derenne & Frederick	no pedestrian facilities (5 lanes)
11, 14	Broughton & MLK	striped crosswalks
12	Victory & Whatley East	raised median, striped crosswalk nearby
12	Victory West & Whatley	raised median, striped crosswalk nearby
12	Victory & Evergreen West	raised median, no crosswalk
12	Victory & Downing East Stor N Lock	raised median, no crosswalk
12	Alhambra Apts	raised median, no crosswalk

Route	Stop Name	Pedestrian Facility Inventory
12	Victory & Shuptrine East NBC Bank	raised median, no crosswalk
12	Victory & Skidaway	raised median, no crosswalk
12	Victory & Skidaway	raised median, no crosswalk
14	Abercorn & Armstrong Center NB	raised median, no crosswalk
14	Abercorn & Savannah Crossing Ctr.	raised median, no crosswalk
14	Abercorn & Mercy SB	raised median, no crosswalk
14	Abercorn & Staples NB	raised median, no crosswalk
14	Abercorn & Pizza Hut SB	raised median, no crosswalk
14	Abercorn & Largo SB	raised median, striped crosswalk
14	Abercorn & Largo NB	raised median, striped crosswalk
14	Abercorn & Deerfield NB	raised median, striped crosswalk, refuge island
14	Abercorn & Deerfield SB	raised median, striped crosswalk, refuge island
14	Abercorn & Dana Ave	raised median, no crosswalk
14	Abercorn & Edgewater Terrace	raised median, no crosswalk
14	Abercorn & Plantation Oaks	raised median, no crosswalk
14	Abercorn & Post Office	raised median, no crosswalk
14	Abercorn & Wilshire NB	raised median, striped crosswalk
14	Abercorn & Wilshire SB	raised median, striped crosswalk
14	Abercorn & Tibet SB	raised median, striped crosswalk
14	Abercorn & Tibet NB	raised median, striped crosswalk
14	Abercorn & Television NB	raised median, striped crosswalks require 2 crossings
14	Abercorn & Television SB	raised median, striped crosswalk
14	Abercorn & Lewis SB	raised median, no crosswalk
14	Abercorn & Lewis NB	raised median, no crosswalk
14	Abercorn & Chrysler Jeep Dodge SB	raised median, striped crosswalk nearby
14	Abercorn & Montgomery Cross NB	raised median, striped crosswalk
14	Abercorn & Fairmont NB	raised median, no crosswalk
14	Abercorn & Haverty's SB	raised median, no crosswalk
14	Abercorn & White Bluff NB	raised median, no crosswalks at nearby large intersection
14	Chatham Plaza	raised median, no crosswalks at nearby large intersection
14	Abercorn & Echols NB	raised median, no crosswalk
14	Abercorn & Savannah Dodge	raised median, striped crosswalks nearby
14	Abercorn & Stehphenson NB	raised median, striped crosswalks nearby
14	Abercorn & Jackson SB	striped crosswalks require 2 crossings
14	Abercorn & Homewood Suites	raised median, no crosswalk
14	Abercorn & Janet SB	striped crosswalk
14	Abercorn & Twelve Oaks	striped crosswalk nearby
14	Abercorn & Buckingham	striped crosswalk ~200 feet away
14	Abercorn & 5501 SB	raised median, striped crosswalk

Route	Stop Name	Pedestrian Facility Inventory
14	Abercorn & Derenne SB	striped crosswalks but this intersection should have pedestrian refuge islands
17	Ogeechee Road & Wachovia	raised and striped median, no crosswalk
17	Ogeechee Road & Southwest Middle	raised median, no crosswalk
17	Chevis & Hwy 17 Ob	raised median, no crosswalk
17	Super Walmart & Hwy 17	raised median, no crosswalk
17	Ogeechee Road & Coastal Chevrolet	raised median, no crosswalk
17	Ogeechee Road & Dan Vaden Truckland	raised median, no crosswalk
17	Ogeechee Road & S&S Trailers	raised median, no crosswalk
17	Ogeechee Road & Sams Club	painted median
17	Ogeechee Road & Budget Inn	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Blossom Drive	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Contractors Depot	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Gamble Rd	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Tedder's Motel	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Thunder Bird Hotel	no pedestrian facilities (5 lanes)
17	Ogeechee Road & SunTrust Bank	striped crosswalk ~150 feet away
17	Ogeechee Road & Parkway Cogie	striped crosswalk ~350 feet away
17	Ogeechee Road & Fire Department	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Hernandez Collision	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Heatcote Circle	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Ridge Rd	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Chevron Station	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Fall Avenue	striped crosswalk
17	Ogeechee Road & Burkhalter	striped crosswalk
17	Ogeechee Road & Express Food Market	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Palm Harbor Homes	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Sanddman Hotel	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Plantation Estates	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Tower	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Yong Club	no pedestrian facilities (5 lanes)
17	Ogeechee Road & A1 Buildings	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Salt Creek	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Salt Creek	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Progressive Ctr.	no pedestrian facilities (5 lanes)
17	Ogeechee Road & Dean Forest	striped crosswalk
17	Ogeechee Road & Desoto Shopping Ctr	raised median, no crosswalk
17	Ogeechee Road & Derrick Inn	raised median, no crosswalk
17	Ogeechee Road & Elk Rd	raised median, no crosswalk
17	Ogeechee Road & Elk	raised median, no crosswalk
17	Ogeechee Road & Cottonvale Rd	raised median, no crosswalk

Route	Stop Name	Pedestrian Facility Inventory
17	Ogeechee Road & Cottonvale	raised median, no crosswalk
17	Ogeechee Road & Berwick Rd	raised median, no crosswalk
17	Ogeechee Road & Berwick Plantation	raised median, no crosswalk
17	Ogeechee Road & Larchmont Drive	raised median, no crosswalk
17	Ogeechee Road & Burton Rd Ob	raised median, no crosswalk
17	Ogeechee Road & Burton Rd	raised median, no crosswalk
17	Ogeechee Road & Cohen Street	raised median, no crosswalk
17	Ogeechee Road & Old Grove Point Rd	raised median, no crosswalk
17	Ogeechee Road & Little Neck Rd	raised median, no crosswalk
17, 25, 29	MLK & Charlton	striped crosswalk approx. 200 feet away
17, 25, 29	MLK & Taylor	striped crosswalk approx. 200 feet away
17, 25, 29	MLK & Taylor	striped crosswalk, but additional crosswalks needed
17, 25, 29	MLK Blvd & Gaston	striped crosswalks
25	MLK @ Harris	bar crosswalks nearby need striping
31	Skidaway & Rowland	striped crosswalk approx. 200 feet away
31	Skidaway & Rowland	no pedestrian facilities (4 lanes, many commercial driveways)
31	Skidaway & Colorado	no pedestrian facilities (3 lanes, many commercial driveways)
31	Skidaway & Shell Rd	no pedestrian facilities (3 lanes, many commercial driveways)
31	Skidaway & 49th Street	no pedestrian facilities (2 lanes, many commercial driveways)
31	Skidaway & 51ST Street	no pedestrian facilities (2 lanes, many commercial driveways)
31	Skidaway & Sunset Boulevard	no pedestrian facilities (3 lanes)
31	Skidaway & Sunset Boulevard	no pedestrian facilities (3 lanes)
31	Skidaway & Fernwood	raised median, no crosswalk
31	Skidaway & Fernwood	raised median, no crosswalk
31	Skidaway & Bayberry	no pedestrian facilities (2 lanes)
31	Skidaway & Parkwood Drive	no pedestrian facilities (2 lanes)
31	Skidaway & Laroche	bar crosswalks, refuge islands - add striping to crosswalks
31	Skidaway & Bible Baptist	no pedestrian facilities (2 lanes)
31	Skidaway & Waltz	no pedestrian facilities (2 lanes)
31	Skidaway & Glynnwood Drive	no pedestrian facilities (2 lanes)
31	Skidaway & St Johns	no pedestrian facilities (2 lanes)

Appendix 5: HIA Process and Impact Evaluation

The HIA project team completed a Process and Impact Evaluation for the CORE MPO Freight Study HIA. It's based on the requirements outlined in the Minimum Elements and Practice Standards for Health Impact Assessment, Version 3, originally published by the North American HIA Practice Standards Working Group in April 2009 and revised in November, 2010 (Bhatia et al., 2014).

Process Evaluation

According to the Minimum Elements and Practice Standards,

“Process evaluation attempts to determine the effectiveness of how the HIA was designed and undertaken, including preparation, research, reporting, participation, and follow-up. Process evaluation may be conducted either after the completion of the HIA, or during the course of the HIA to facilitate adaptations that will improve HIA process.”

The process evaluation therefore included a self-assessment of the process of completing the HIA including:

- Analytic methods used,
- Ways in which stakeholders were engaged,
- Challenges and opportunities for improvement,
- Effectiveness of the training and
- Technical assistance and lessons learned.

Analytic Methods Used

The HIA team considered a wide variety of health determinants, drawn from the Centers for Disease Control and Prevention (2014). The HIA team ultimately focused on: the social environment (specifically demographics and poverty) and the physical environment (specifically land use and transportation). A literature review was conducted to determine the potential positive and negative health impacts of freight movement, following from the social and physical determinants of health identified above. The HIA team concentrated on health impacts resulting from air pollution, accidents and safety, noise, and economic impacts. These four major topic areas connecting freight movement and health emerged during the Appraisal phase from the literature review and provided the framework for the HIA recommendations. Health equity is also a guiding thread throughout the analysis, with low socioeconomic-status environmental justice communities receiving additional analysis and subsequent recommendations.

The HIA analysis identified communities with historic disadvantage and/or high poverty rates. Data on the health outcomes and socioeconomic conditions of these populations was also collected and analyzed. The HIA team documented transportation conditions, noting the communities with substandard bus or pedestrian facilities, high truck crash rates, and proximity to MPO transportation projects. Land uses were also noted. The HIA team also profiled the health outcomes most closely linked to air pollution and low socioeconomic status, including emergency room visits due to asthma and low birthweights.

The HIA combines academic literature with data analysis to show how the project will change the social and physical health determinants related to air quality, accident rates, noise, and economic opportunity. It links each health determinant to health outcomes with literature-based community profiles that highlight areas of concern with accompanying recommendations. The separate analysis of environmental justice communities includes detailed recommendations to potentially mitigate the negative health impacts of

freight movement on these populations and to promote health equity. The data sources are numerous and are cited in Section 4.2 of the Appraisal. Appendix 3 (“Health Data Processing Method”) provides additional methodological details. Likely health and equity impacts are documented, along with data sources and analytic methods, while assumptions, limitations, and quality of evidence used are omitted.

Stakeholder Engagement

Stakeholder engagement is central to a successful HIA process. While some HIAs are initiated from stakeholder concerns that emerge during the HIA screening process, the CORE MPO HIA was initiated from knowledge that the project team had from prior research. Specifically, the HIA project team was interested in the impact of freight movement on the health of surrounding populations, particularly on low income communities.

Stakeholder engagement occurred through numerous phone calls and five site visits, and it included meetings and conversations with organizations and leaders from the communities potentially affected by freight movement, such as a pastor, the head of a neighborhood association, and a youth coordinator. Appendix 2 (“Stakeholder Engagement Plan”) fully documents methods used to enlist stakeholders.

Challenges and Opportunities

Stakeholder engagement was a critical component of the HIA. It was necessary to understand what the data collection and analysis meant for the people living in the local communities highlighted in the HIA. Although ultimately fairly successful, it took much longer than anticipated to build trust. This process was very challenging, and the stakeholder engagement effort would possibly have been more effective and fruitful if the timeline of the project was adjusted, with more resources concentrated at the beginning of the project so that in person visits with stakeholders could occur very early in the HIA process. The HIA project team was located in Atlanta, Georgia not in Savannah, and this further required in person visits to build trust with local community members and leaders.

Effectiveness of Training

The HIA process did not include a significant training component. A workshop, “A Collaborative Model for Healthy Freight Planning: City of Savannah and Chatham County Stakeholder Health Impact Assessment (HIA) Workshop,” was held on May 26, 2016 which included an educational component for the participants on the basics of the HIA process as well as an overview of the larger concept of health determinants and incorporating health in all policies. The workshop concluded with direct feedback from participants on the HIA direction and potential recommendations. In addition, numerous meetings were held with planners, other public sector professionals, and community leaders to educate these individuals on the concept of HIA and health in all policies.

Technical Assistance and Lessons Learned

The primary lesson learned was related to the restructuring of the HIA grant process and timeline. Stakeholder engagement was much more resource intensive than originally anticipated and needed to occur earlier in the process. Finding the best local contacts was also often a slower multi-step process than the HIA team anticipated. The project did not include a technical assistance component. However, a number of conversations late in the HIA process focused on HIA implementation and next steps. The HIA project team could potentially serve in a technical assistance role to facilitate the implementation of HIA recommendations in the future.

Impact Evaluation

According to the Minimum Elements and Practice Standards,

“The HIA may also be evaluated in terms of its impact. Impact evaluation seeks to understand the impact of the HIA itself on the decision and the decision-making process. **Impact evaluation assesses the extent to which the HIA influenced various stakeholders and the extent to which the HIA recommendations were accepted and implemented.**”

The impact evaluation therefore included a self-assessment of the process of completing the HIA including:

- an assessment of the success of the HIA according to the stated HIA objectives,
- any additional impact of the HIA beyond the stated HIA objectives, and
- the impact of the HIA on decision making up to the time that the impact evaluation is conducted.

Success of HIA according to stated objectives

The stated objective of the HIA was “to assess the public health implications of ongoing planning efforts related to freight movement in Chatham County, Georgia.” This goal guides the project. The HIA was successful relative to this goal because the HIA brought together land use, transportation, and health data in a new way. The team identified the high volume truck routes, as well as proposed freight related transportation project point locations along those routes, then reviewed the existing land use and development along those routes, and overlaid this information spatially with the population health outcomes. Thus the HIA team was able to analyze these existing conditions through a health lens, which was a new approach. The HIA recommendations were then informed and guided by this analysis.

Additional Impact of the HIA beyond the stated objectives

The HIA report will be publicly available as a model for similar freight planning efforts, and it documents purpose, findings, and recommendations. Ancillary documents (Appendix 2: Stakeholder Engagement Plan) address methods used to elicit stakeholder feedback that could be a useful tool for other entities conducting stakeholder engagement activities. The HIA also facilitated the process of different entities communicating and working together. For example, the HIA provided an opportunity to discuss ways that the local Health Department could become more informed and potentially more active in linking transportation and land use policy to health outcomes. The HIA was also presented at the Georgia Association of Regional Commission’s annual conference. This provided another opportunity to expose a new audience to the concept of health in all policies.

Impact of the HIA on decision making

The CORE MPO Freight Study was completed in December 2015, but the majority of the transportation projects listed in the study have a long time horizon (as of HIA completion in December 2016). Therefore, the HIA recommends project modifications and complementary policies that could still likely be included in the more detailed design of the projects. These project details will potentially result in decisions that could have a positive impact on health as a result of the recommendations proposed in the HIA. The HIA report will also be shared with decision makers, stakeholders, and be made publicly available online which will potentially further the impact of the HIA.