Section 2. City Profile

Understanding the history and physical setting of a community informs the potential for risk. Discussion of the City's history and governance provides details on how the State of Maryland (the State) has approached hazard mitigation and risk reduction. Risk occurs when hazards impact a community's assets, such as the population, buildings, environment, and economy. The following sections provide an overview of the City's history, government, physical setting, community composition, land use and development, housing, and physical assets. The City Profile informs the Risk Assessment (Section 3) to assess the economic, structural, and population assets at risk and the concerns that may be present related to the hazards analyzed. Vulnerability, and therefore risk, may be increased or decreased based on land use, governance, and allocation and use of resources.

2.1 History

Officially founded in 1729, Baltimore is the most populous city in Maryland and home to one of the largest ports on the East Coast of the United States. Early development focused on the inner basin of the Patapsco River (now the Inner Harbor) and was relatively slow, with only 25 buildings constructed by 1752 (Department of Planning n.d.). Development in the City gained momentum when people decided to use the harbor to ship flour to Ireland. Roads and houses were developed along waterways and reached throughout the County and southern Pennsylvania (Department of Planning n.d.).

Water-related industry quickly developed around the Baltimore Harbor, and when tracks for the nation's first railroad were laid in 1829, the thriving port city increased both its accessibility to other cities and its attractiveness to migrants and investors. Baltimore's Inner Harbor was once the second leading port entry for migrants to the United States and was considered to be a major manufacturing center. After a decline in manufacturing industries in the 1970s and 1980s, Baltimore shifted to a service sector-oriented economy. Now Johns Hopkins University, Johns Hopkins Hospital, and the University of Maryland are the City's largest employers (Maryland Department of Commerce 2022).

Today, Baltimore is one of only two East Coast port facilities that are deep enough to accommodate the substantially larger ships arriving due to the completion of the Panama Canal expansion in 2016. Baltimore's economic activity has largely centered on waterfront development and redevelopment. Baltimore's waterfront includes a wide variety of land uses, including industrial, commercial, recreational, and residential development. The port and waterfront remain extremely important assets in Baltimore, providing an abundance of job opportunities as well as some of the City's strongest property tax base.

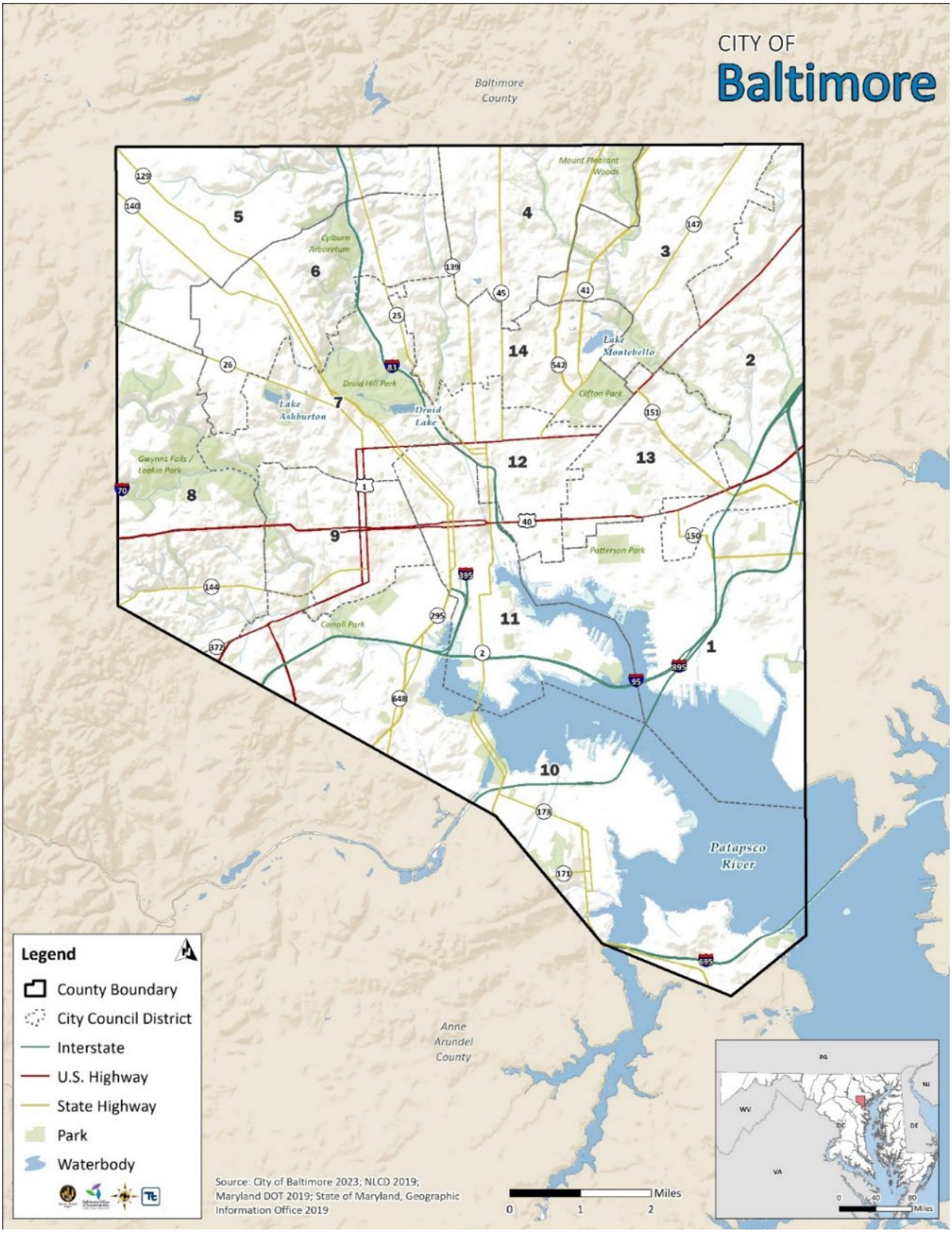
2.2 Government

Baltimore was designated as an independent city by the Constitution of Maryland in 1851. The City's government structure consists of an elected Mayor and elected members of the City Council. The Mayor serves as the chief executive, and the City Council serves as the legislative body. The Mayor is in charge of enforcing City laws and has the power to approve and veto ordinances, resolutions, and bills that are passed by the City Council. The City Council is the

legislative body that has the authority to enact all ordinances and resolutions. The council members are elected from 14 districts, with the President elected at-large by all of the voters of the City. The 15 Council members, along with the Mayor, act by ordinance, resolution, or motion (Baltimore City Council n.d.). Figure 2-1 depicts the 14 City Council districts within the City.

In addition, the City has numerous commissions and departments that contribute to the governance of the City with specific regard to hazard mitigation. The Baltimore Office of Sustainability (BoS), within the Department of Planning, oversees the development, implementation, and maintenance of the Disaster Preparedness and Planning Project (DP3). BoS focuses on integrating the principles of environmental integrity, social equity, and economic prosperity into plans, practices, policies, and partnerships in an innovative way. The Baltimore Office of Emergency Management (OEM) is in charge of maintaining the highest possible level of preparedness in order to protect the City's residents, workers, visitors, and environment. OEM ensures that the City is prepared for emergencies and is in charge of coordinating emergency response and recovery (OEM 2023). The responsibility for implementing mitigation actions is carried out by multiple departments and commissions throughout the City; therefore, the need for strong interagency collaboration is required to successfully reduce risk in the City.

Figure 2-1. City of Baltimore Council Districts



2.3 Physical Setting

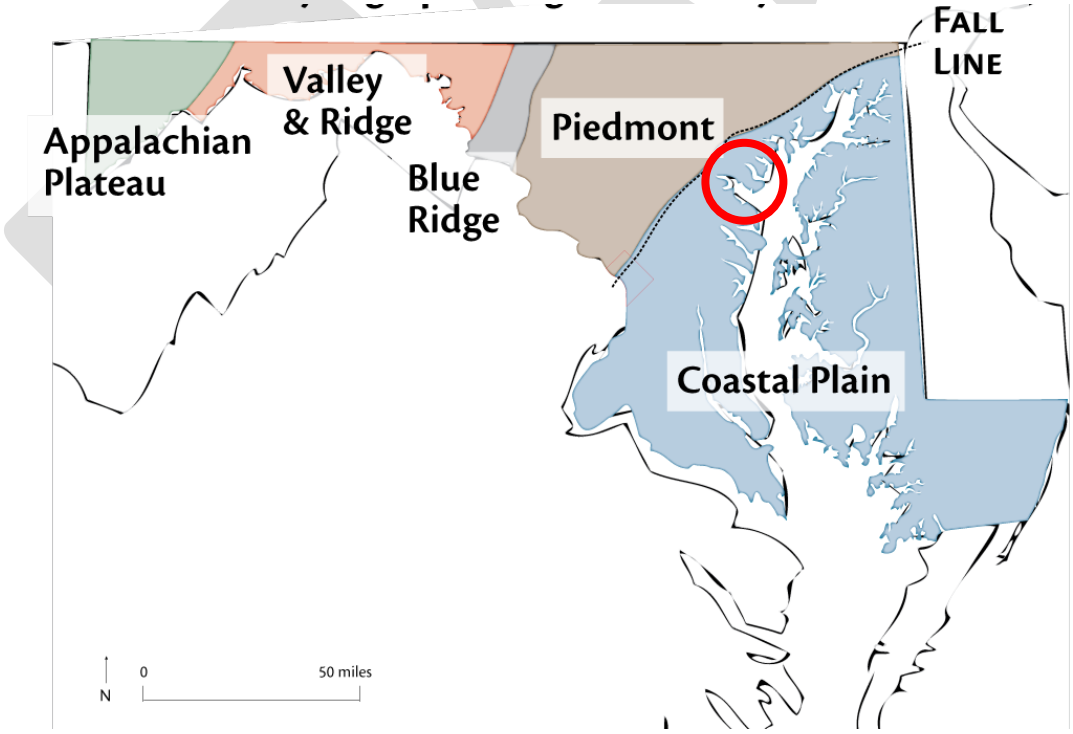
The City is located in north-central Maryland at the head of the Patapsco River, which is a part of the Chesapeake Bay. The City is approximately 92.1 square miles (81 square miles of land and 11.1 square miles of water) and is bordered to the north, east, and west by Baltimore County and to the south by Anne Arundel County.

2.3.1 Geography and Topography

The City is located on the eastern seaboard in the Mid-Atlantic region. The City's 81 square miles of land comprise the most heavily developed area in Maryland. The City's elevation ranges from sea level near the Inner Harbor to nearly 480 feet toward the northwestern corner of the City.

The City is a part of two physiographic provinces. The northwestern area of the City is a part of the Piedmont Plateau Province, and the southeastern area of the City is a part of the Atlantic Coastal Plain Province. The Piedmont Plateau Province consists of crystalline metamorphic and igneous rocks and is made up of a variety of mineral resources. Building stone, slate, gold, iron ore, and sulfides used to be mined in this area, and there is a moderate supply of ground water available throughout the region. The Atlantic Coastal Plain Province has rocks that are overlapped with gravel, sand, silt, and clay, which tend to be used by the construction industry. This province also has a significant supply of ground water available throughout the region (Maryland Geological Survey 2023). Figure 2-2 shows Maryland's physiographic regions and depicts the City's location with a red circle.

Figure 2-2. Physiographic Regions of Maryland



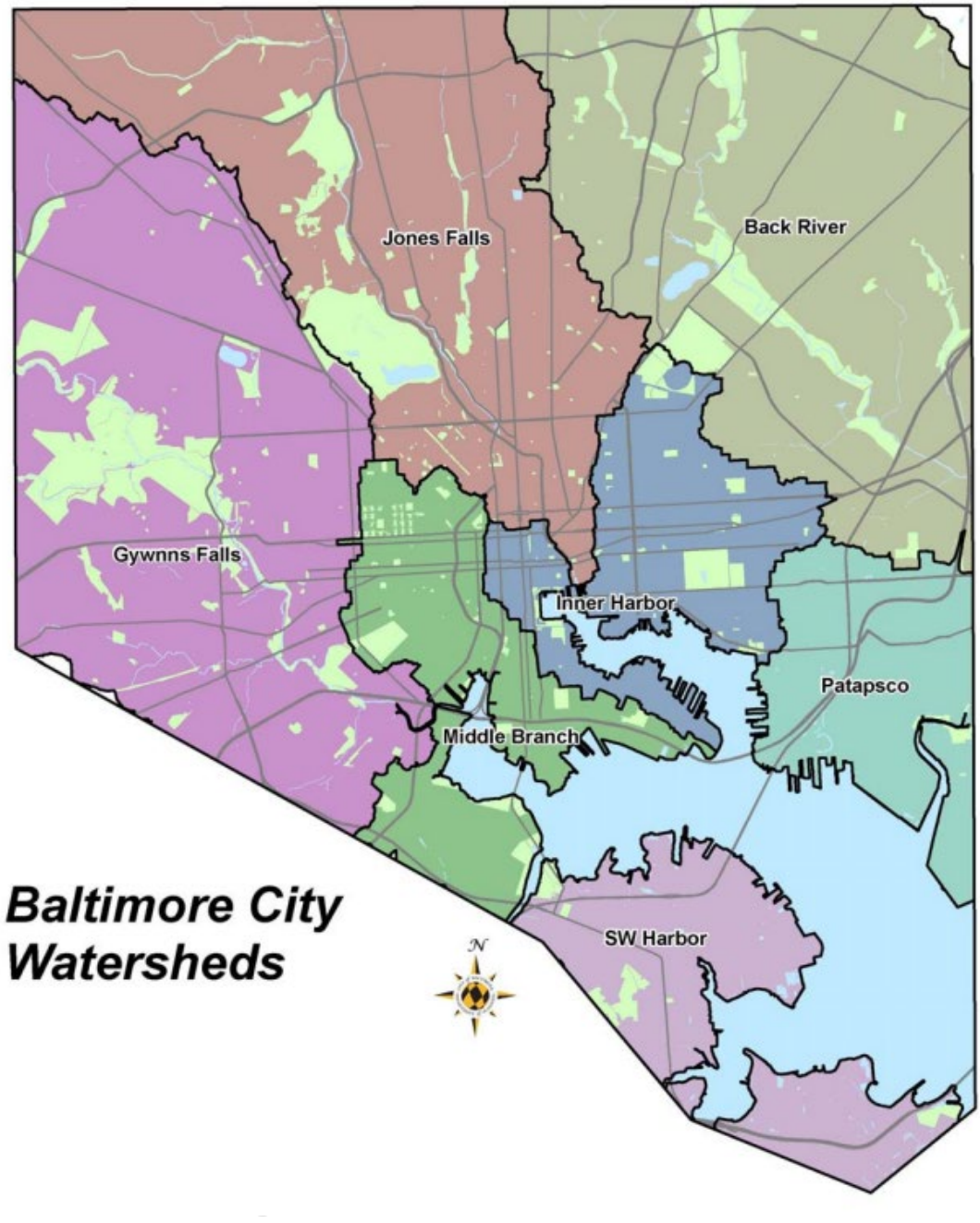
Source: University of Maryland 2008
Note: The red circle shows the approximate location of the City.

2.3.2 Hydrography and Hydrology

The City features 60 miles of waterfront within five local watersheds: Baltimore Harbor (includes the Inner Harbor, Middle Branch and SW Harbor), Gwynns Falls, Jones Falls, Back River, and the Lower North Branch of the Patapsco River (Baltimore Public Works n.d.). Situated within the greater Chesapeake Bay Watershed, Baltimore surrounds a natural harbor near the mouth of the Patapsco River. Figure 2-3 depicts the watershed located throughout the City boundaries.

The Baltimore Harbor watershed is located in the southeastern part of the City and includes Bear Creek, Old Road Bay, Shallow Creek, and small Chesapeake Bay tributaries. The land is highly developed and built out by residential and commercial waterfront communities. The Gwynns Falls watershed encompasses the western and southwestern parts of the City and contains 133 miles of streams and drains to the Middle Branch of the Patapsco River; nearly 75 percent of the watershed is classified as urban with a population of over 350,000 (Baltimore County Government 2023). The Jones Falls watershed encompasses the northwestern areas of the City and is roughly 40 square miles with tributaries that extend through the City until emerging from a tunnel into the Inner Harbor. Back River Watershed encompasses the northeastern parts of the City and has 73 miles of streams, including Herring Run, Red House Run, and Stemmers Run. The Lower North Branch of the Patapsco River watershed dips into the southwestern part of the City, and its tidal area is composed of the Northwest Harbor and Middle Branch, which is crossed by the Baltimore Harbor (Baltimore County Government 2023).

Figure 2-3. Baltimore City Watershed Map

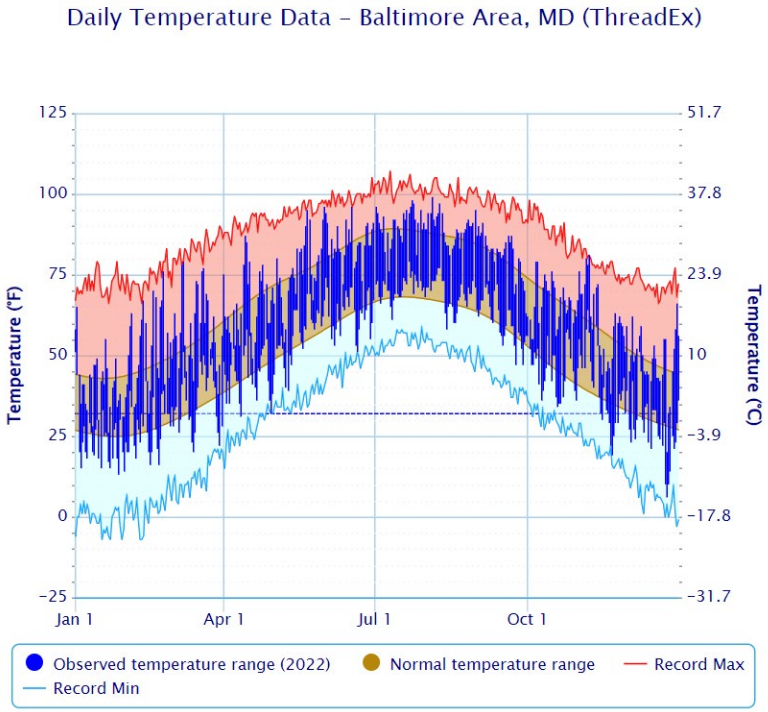


Source: Baltimore City Planning Department 2009

2.3.3 Climate

The City is located within the northern temperate climate zone, which means the City experiences changing seasons with moderate winters and summers (NOAA n.d.). Baltimore experiences summers with high humidity and heat exacerbated by the urban island heat effect. The overall average temperature in Baltimore is 56°F. Winter temperatures average 36.5°F, and summer temperatures average 76°F (NOAA 2023). Figure 2-4 details daily temperatures experienced by Baltimore residents in 2022.

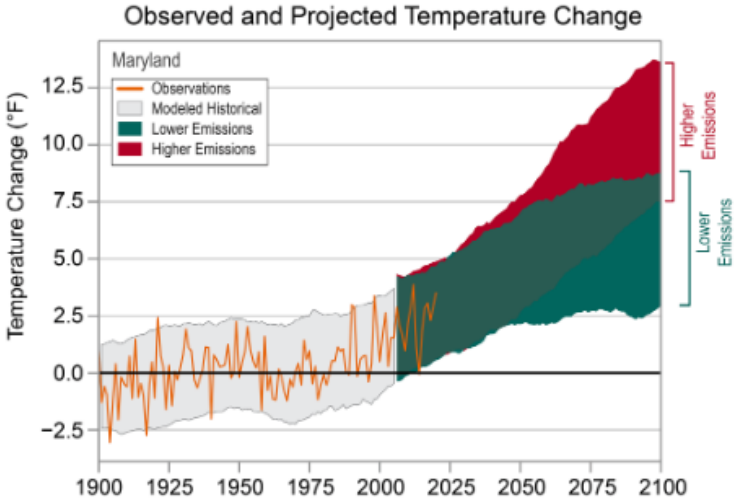
Figure 2-4. Daily Temperature Data for Baltimore (2022)



Source: NOAA 2023

Since the beginning of the 20th century, Maryland's average temperature has risen by approximately 2.5°F and is projected to continue rising (UMD Extension n.d.). These rising temperatures have been accompanied by changes in local weather and climate, including more high-impact weather events, longer and more frequent heat waves, and a rise in relative sea level. Figure 2-5 depicts the observed and projected temperature changes in the City.

Figure 2-5. Observed and Projected Temperature Change in Baltimore City



Source: NOAA 2022

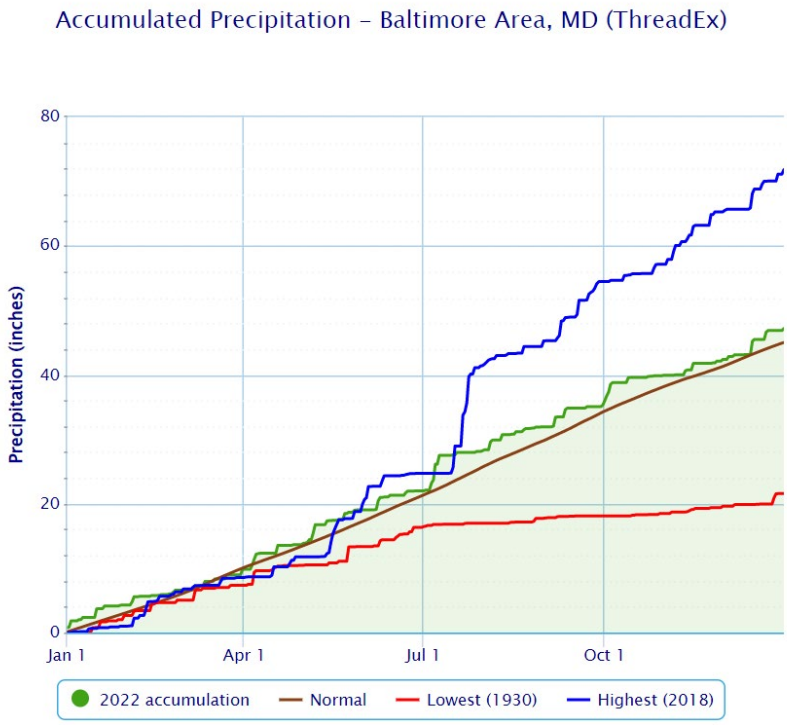
Average precipitation in the City is 45 inches, with the highest precipitation occurring in summer at 12.55 inches (NCEI 2023). This averages to be about 3–4 inches of precipitation per month. In Maryland, annual precipitation is projected to continuously increase due to climate change over this century, accompanied with an increase in frequency and intensity of precipitation events (NCEI 2022). Annual precipitation for 2022 is shown in Figure 2-6 in comparison with the City's highest and lowest annual precipitation events. Table 2-1 shows the annual precipitation in the City from 2000 to 2022.

Table 2-1. Annual Precipitation in Baltimore City (2000-2022)

Year	Inches of Precipitation
2000	41.91
2001	34.57
2002	39.60
2003	62.66
2004	45.67
2005	49.13
2006	43.24
2007	34.97
2008	44.97
2009	55.57
2010	43.47
2011	56.52
2012	37.42
2013	42.93
2014	52.58
2015	51.16
2016	40.52
2017	38.28
2018	71.82
2019	38.13
2020	57.38
2021	40.79
2022	47.18

Source: NOAA 2023

Figure 2-6. Accumulated Precipitation for 2022



Source: NOAA 2023

A changing climate is now affecting many of the natural hazards that influence daily life, causing these events to become more extreme over time (NCEI 2022). Simultaneously, new hazards are emerging, which will introduce additional planning challenges for public safety and policymakers, including sea level rise and urban island heat effect. Urban island heat effect makes cities hotter overall due to the lack of greenery and presence of building materials and impervious surfaces that absorb sunlight. Sea level rise affects all coastal areas and those that are located near major waterways. Impacts associated with climate change may still be reduced or prevented by reducing greenhouse gas (GHG) emissions. Baltimore's *Climate Action Plan* (CAP) is the City's most recent effort to establish policies and programs that focus on this task. The CAP highlights the GHG emission reduction measures that also have adaptation impacts and identifies priority strategies for this and other future adaptation planning efforts. While GHG mitigation initiatives continue to be essential to stabilizing the climate in the long-term, it will take time for our planet to respond to GHG reductions.

2.4 Community Composition

Population trends can provide a basis for making decisions on the type of mitigation approaches to consider and the locations in which these approaches should be applied. This information can also be used to support planning decisions regarding future development in vulnerable areas. Evaluating development trends and population and demographic changes provides insight into how vulnerability may evolve over of time.

2.4.1 Population

Baltimore is the most populous city in Maryland (U.S. Census 2022). The 5-year estimates from the American Community Survey (ACS) show the City's population to be 591,489, a decrease from the 2010 Census population of 620,961 people (ACS 2021). The ACS provides the most current information (conducted monthly and annually) and is based on a sampling whereas the Census is conducted every ten years. City Council District 11 is projected to have the highest population in the City, with just over 48,000 people within the district. Table 2-2 depicts the population values by district and Census data.

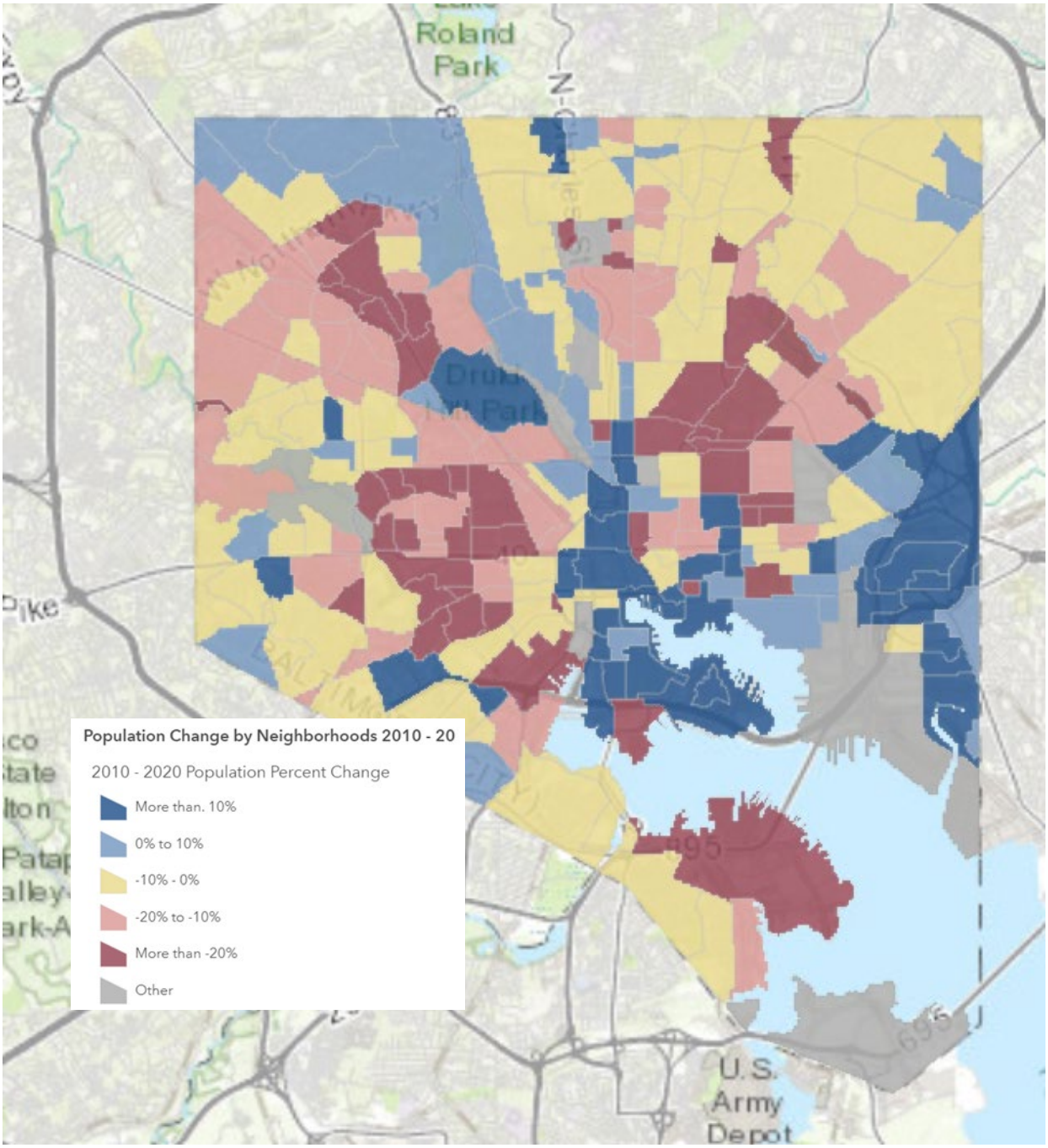
Table 2-2. Population by City Council Districts

City Council District	2016–2021 ACS 5-Year Estimates	Percent of City Total
1	43,739	7.4%
2	45,252	7.7%
3	42,257	7.1%
4	45,027	7.6%
5	43,601	7.4%
6	41,604	7.0%
7	39,638	6.7%
8	46,396	7.8%
9	35,869	6.1%
10	41,521	7.0%
11	48,022	8.1%
12	37,130	6.3%
13	38,768	6.6%
14	42,665	7.2%
Baltimore City Total	**591,489**	**100.0%**

Source: U.S. Census 2023

Population trends can provide a basis for making decisions on the type of mitigation approaches to consider and the locations in which these approaches should be applied. This information can also be used to support planning decisions regarding future development in vulnerable areas. **Error! Reference source not found.** shows the amount of change experienced by different areas of Baltimore City.

Figure 2-7. Population Change in Baltimore City from 2010–2020



Source: Baltimore Department of Planning 2022

According to the Maryland Department of Planning, the City is projected to experience a growth in population in the upcoming years despite seeing a decline in population from 2000 to 2020. This trend is expected to follow suit with Baltimore County as well as the Baltimore metropolitan region, as shown in Table 2-3. As a state, Maryland is also expected to see continuous growth from 2020 through 2050. This means that there will be more people at risk from the hazards of concern present in the City, County, Region, and State. As hazards continue to increase in frequency and intensity due to climate change, these areas will

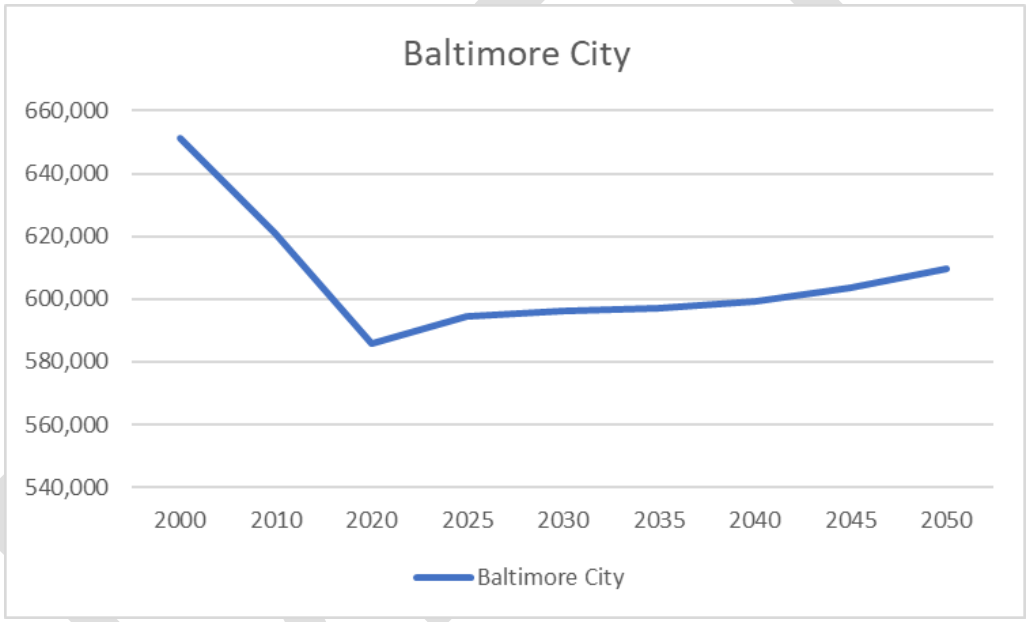
continue to become more vulnerable to natural hazards, making it crucial for these areas to have updated evacuation plans, alert systems, backup power for critical facilities as well as the capacity to protect the increasing population from these hazards. Figure 2-8 shows the trend line of the City's population growth.

Table 2-3. Baltimore Area Population Projections

Area	2000	2010	2020	2030	2040	2050
Baltimore City	651,154	620,961	585,708	596,390	599,220	609,780
Baltimore County	754,292	805,029	854,535	876,730	909,000	934,520
Baltimore Region	2,512,431	2,662,691	2,794,636	2,940,280	3,056,810	3,150,530
Maryland	5,296,486	5,773,552	6,177,224	6,576,840	6,909,050	7,183,020

Source: Maryland Department of Planning 2022

Figure 2-8. Baltimore City Population Projections



Source: Maryland Department of Planning 2022

The City's population density is 7,235.8 people per square mile compared to the national average of 93.8 people per square mile (US Census Bureau 2022). High-density areas pose a greater risk because a larger number of people and structures are concentrated in one area. There is the possibility for diseases to spread quicker in these areas, and structural damage is expected during certain hazard events because of the proximity of buildings. It is likely that the magnitude of an emergency or disaster will increase in more populous areas. However, having a higher concentration of people in the same area will provide an opportunity to quickly disseminate information. Additional focus should be provided for evacuating and sheltering larger populations during emergencies and disasters (Population Reference Bureau 2011).

2.4.2 Demographics

The City is very diverse in terms of characteristics of the population; approximately 8.1 percent of individuals in the City are estimated to be foreign born (U.S. Census 2023). In terms of race, the City has a large Black or African American community, with nearly 61.6 percent of people in the City being Black or African American.

Table 2-4. Racial Diversity Statistics for Baltimore City

Demographics	2016–2021 ACS 5-Year Estimates	Percent of City Total
White	173,079	29.2
Black or African American	364,879	61.6
American Indian and Alaska Native	1,706	0.3
Asian	14,887	2.5
Native Hawaiian and Other Pacific Islander	131	0.0
Other Race	14,438	2.4
Two or more races	23,091	4.0

Source: U.S. Census 2023

According to the Census, while there was an overall shrinking population from 2010 to 2020, the age 65 and over population grew from 72,603 people in 2010 to 83,527 people in 2021. In conjunction, the median age went from 34.5 years in 2010 to 35.7 years in 2021. Most of the other demographic categories decreased from 2010 to 2020. This means that the overall population is decreasing, and the general population of the City is getting older, making the population more vulnerable to hazards due to the known barriers older adults may face such as limited mobility. See Section 2.4.3 for more information on socially vulnerable populations. Table 2-5 breaks down the City's population demographics.

Table 2-5. Population Demographics for Baltimore City

Demographics	2010	2016–2021 ACS 5-Year Estimates
Male	291,392	278,792
Female	329,146	313,419
Median Age (years)	34.5	35.7
Under 5	40,956	36,468
18 Years and Over	481,538	470,655
65 Years and Over	72,603	83,527

Source: U.S. Census 2023 and 2010

The 2020 Census indicates that median household income in the City was $54,124, with the per capita income being $34,378. Approximately 115,625 people were identified as living below the poverty level. The Census Bureau identifies households with two adults and two children with an annual household income below $27,479 per year as living in poverty (U.S. Census 2021).

2.4.3 Vulnerable Populations and Underserved Communities

The ability of an individual or community to withstand and quickly recover from hazards and threats is critical to building City-wide community resilience. The same disaster or emergency can impact different populations in different ways. For example, differences in age, income, disabilities, and English proficiency affect people's ability to cope with the effects of disasters. Individuals may also face compounding barriers because they may fall within multiple categories of vulnerability.

Key Terms

- **Socially Vulnerable Populations**—Populations or groups who have access and functional needs, including but not limited to people without vehicles, people with disabilities, older adults, and people with limited English proficiency (Centers for Disease Control and Prevention n.d.).
- **Underserved Communities**—Populations and geographic communities sharing characteristics that have been systematically denied a full opportunity to participate in aspects of economic, social, or civic life (U.S. President. Executive Order 13985 2021).
- **Underrepresented Communities**—Populations or groups lacking historical or current representation in decision-making or aspects of economic, social, or civic life.
- **Historically Marginalized Communities**—Groups and communities that experience discrimination and exclusion (social, political, and economic) because of unequal power relationships across economic, political, social, and cultural dimensions (National Collaborating Centre for Determinants of Health n.d.).

Identifying concentrations of socially vulnerable and underserved populations can assist communities in targeting preparedness and mitigation actions. Often, populations and communities are categorized based on shared characteristics that create additional barriers to accessing resources leading to increased vulnerability.

The City will need to ensure that considerations for socially vulnerable populations and underserved communities are included in the decision-making process when identifying projects to mitigate risk and build community resilience.

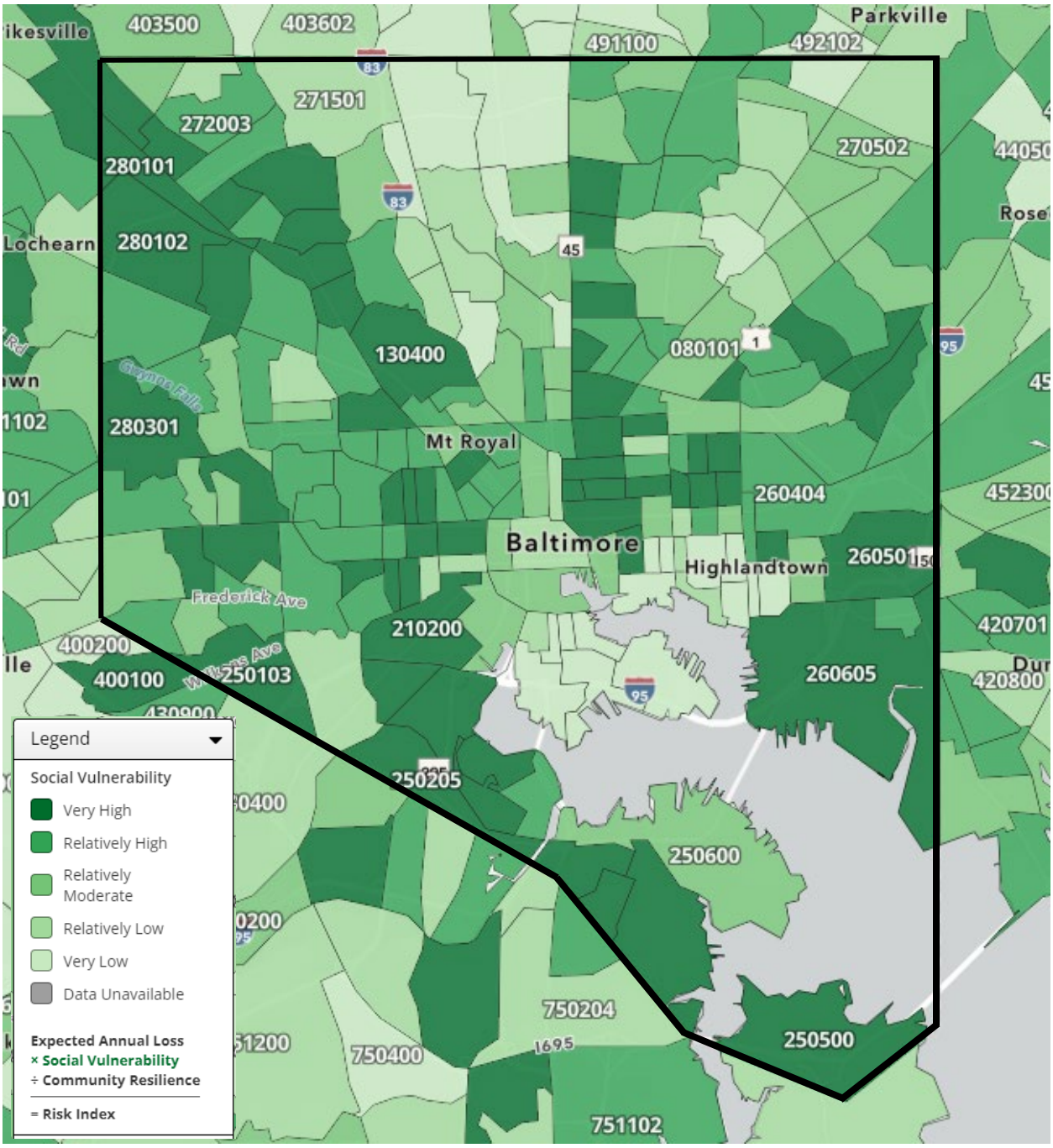
For this plan, information collected through the National Risk Index (NRI), CDC/ATSDR SVI, U.S. Census Bureau, ACS, and other sources is used to provide data on vulnerable populations and barriers contributing to social vulnerability. It is important to note that there are multiple resources available to assess social vulnerability and more specific barriers and challenges.

National Risk Index

The NRI is a resource made available by FEMA to provide data to communities for 18 natural hazards. The NRI defines risk as the potential for negative impacts as a result of a natural hazard. The tool incorporates expected annual loss from natural hazards, social vulnerability, and community resilience. Within the NRI tool, a social vulnerability score and rating represents the relative level of a community's social vulnerability compared to all other communities at the same level; the score is measures on a national percentile starting at 0 and increasing to 100 with 100 being the highest (FEMA n.d.). The City's overall NRI social vulnerability is 86.82, meaning social vulnerability in the City is greater than 86.82 percent of

all U.S. communities. A score is also calculated for each census tract. Figure 2-9 depicts the social vulnerability score for census tracts in Baltimore City; the north-central area and areas surrounding the Patapsco River have a lower score while all other areas have higher rates of social vulnerability.

Figure 2-9. NRI Social Vulnerability Score for Census Tracts in Baltimore City

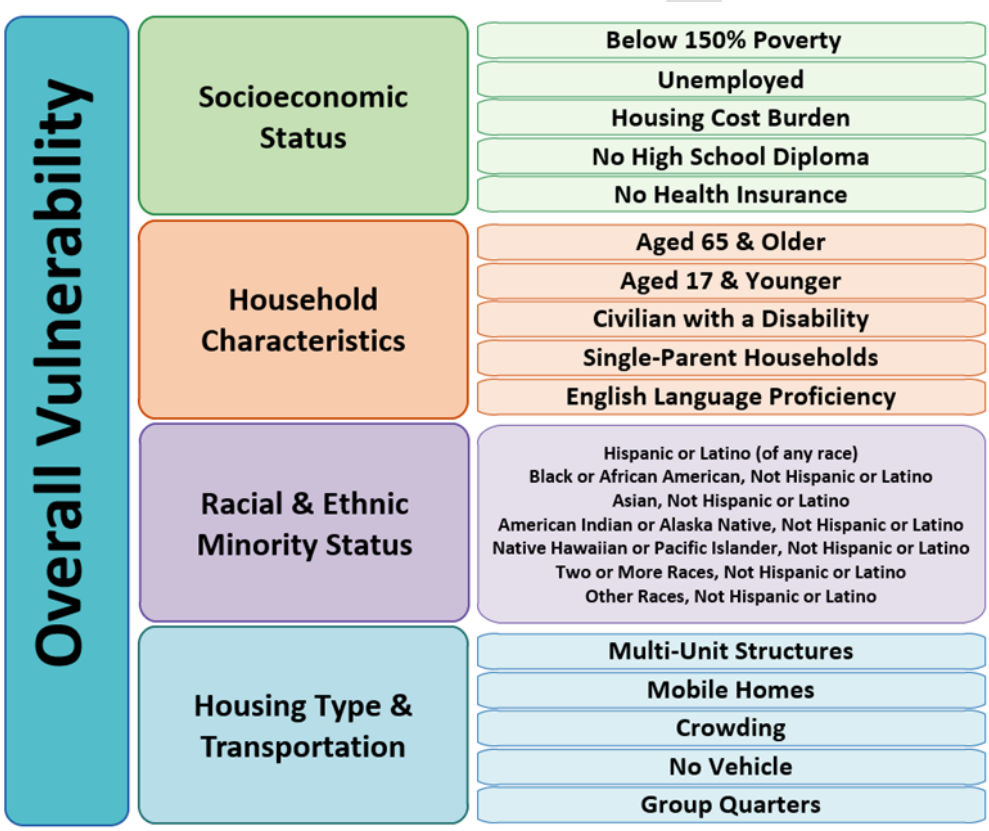


Source: FEMA 2023

Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry Social Vulnerability Index

The CDC/ATSDR SVI is a combination of 16 different social factors that contribute to social vulnerability as shown in Figure 2-10. These social factors are grouped together in four themes to provide an indication of social vulnerability concerning socioeconomic status, household characteristics, racial and ethnic minority status, and housing type and transportation. By combining all factors, a vulnerability index is established. The rankings are based on a percentile ranging from 0 to 1, with higher values indicating greater vulnerability.

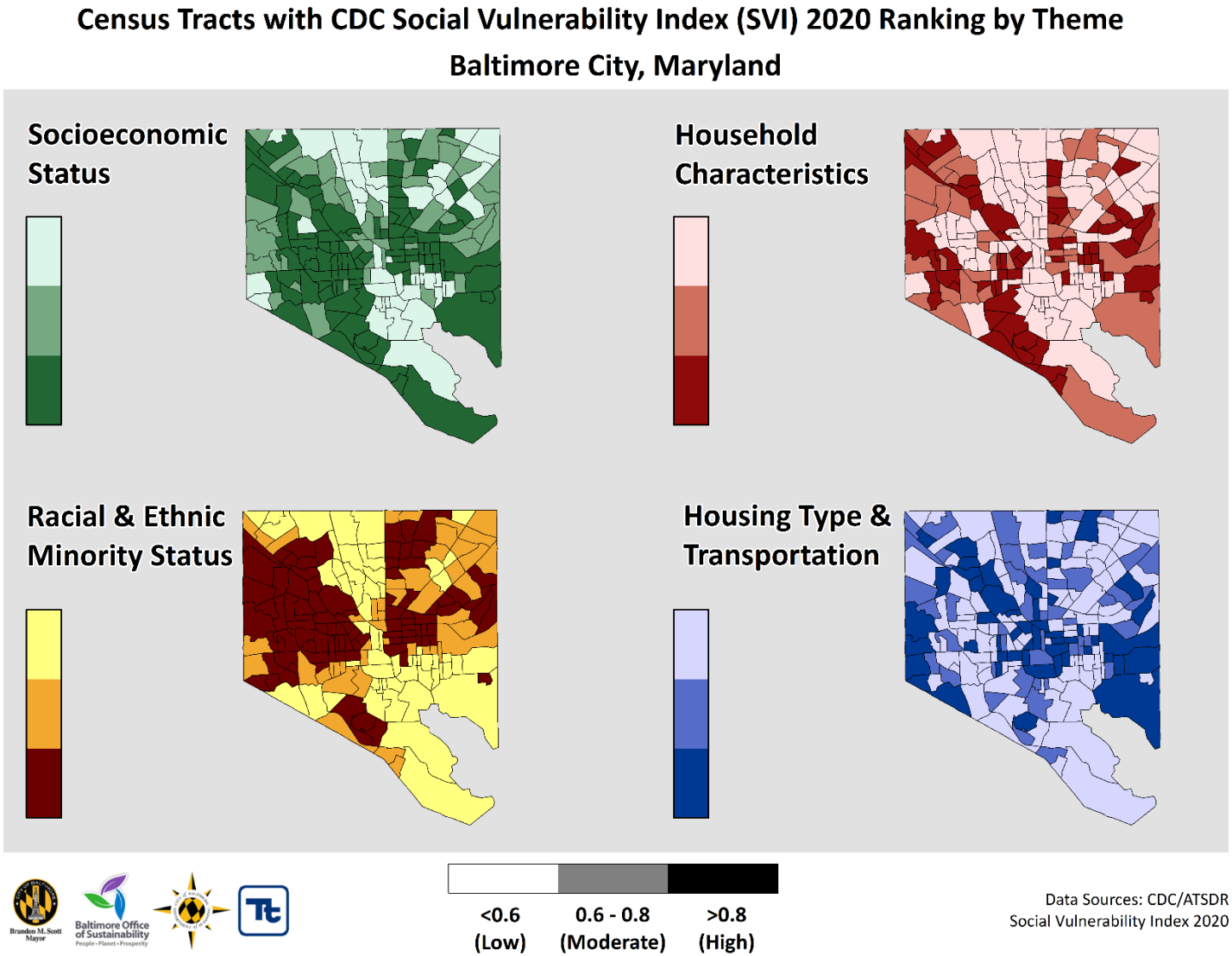
Figure 2-10. CDC/ATSDR SVI Social Factors



Source: CDC/ATSDR 2020

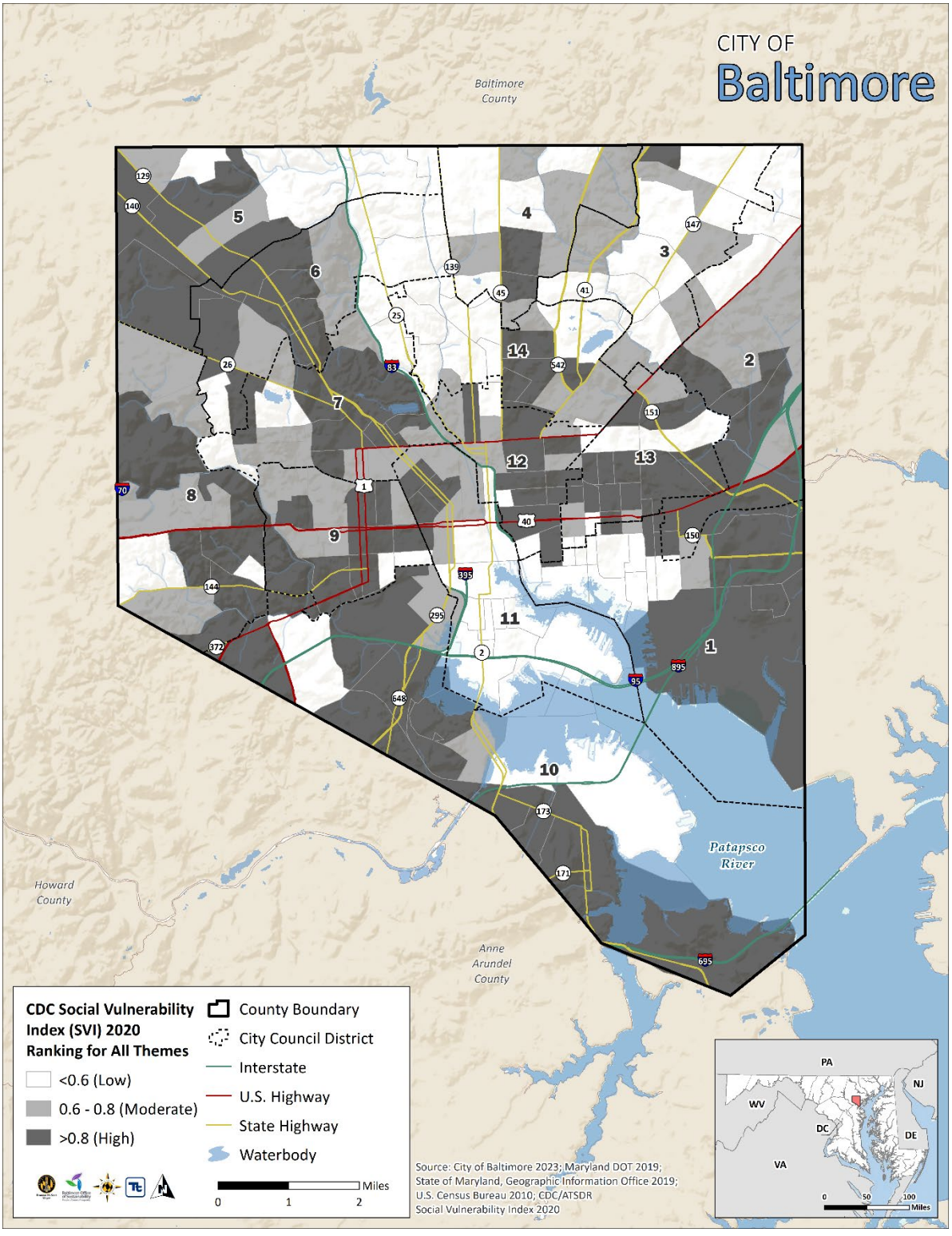
To identify geographic areas in the City experiencing a higher rate of social vulnerability the SVI data was utilized to provide a visualization of geographic areas with higher social vulnerability. Figure 2-11 depicts the ranking for each of the four themes that make up the SVI. In general, most areas within the City have an increased vulnerability with the exception of areas located in the North central portion of the City and around the Patapsco River. Figure 2-12 depicts the SVI (all four themes combined) for census tracts with an SVI of 0.6 or greater. This map demonstrates that most areas within the City have an increased vulnerability the exception of areas located in the north-central, northeast, and areas around the Patapsco River.

Figure 2-11. Baltimore City SVI by Theme



Source: CDC/ATSDR 2020

Figure 2-12. Baltimore City SVI > 0.6



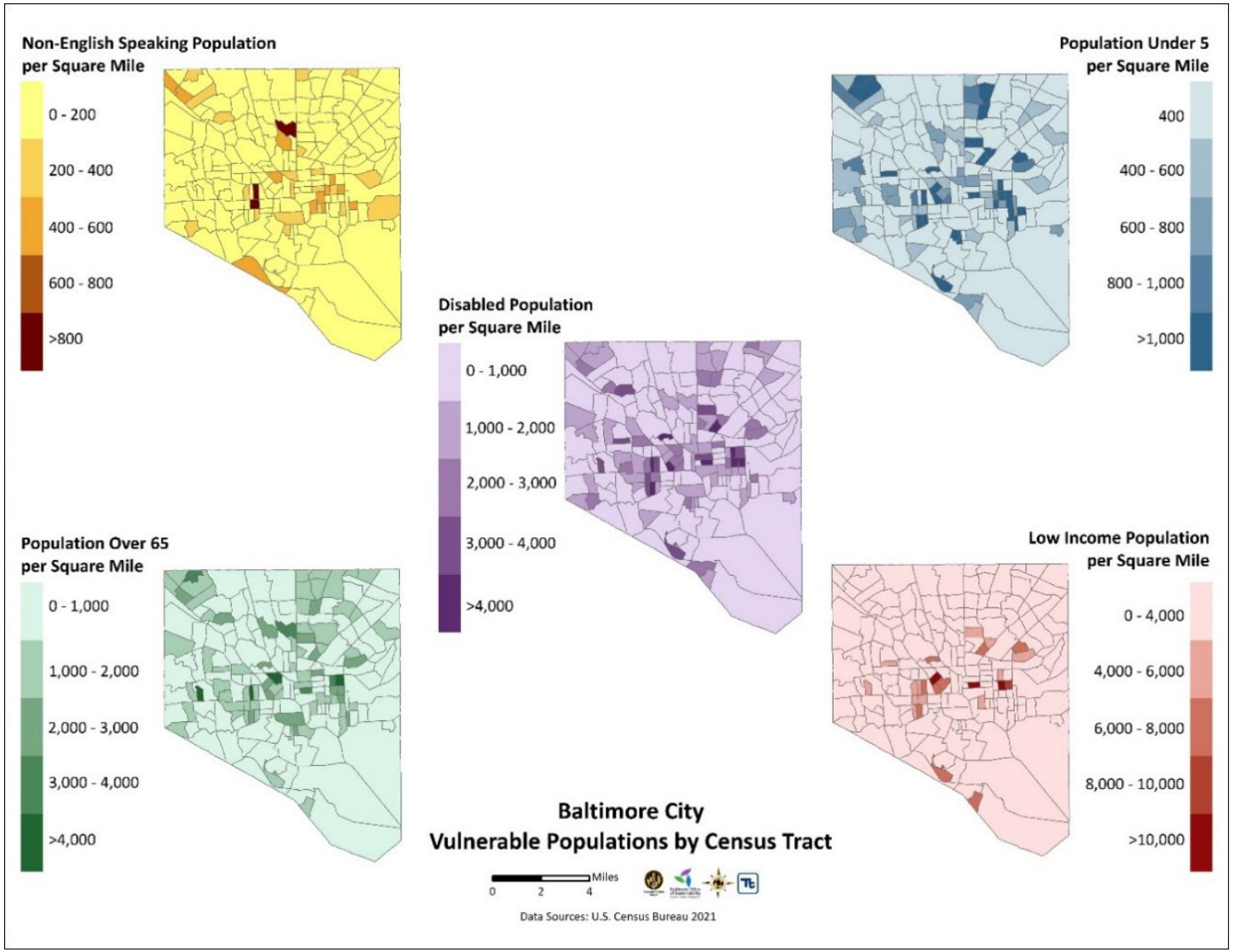
Source: CDC/ATSDR 2020

U.S. Census and American Community Survey

When assessing social vulnerability, an individual may be categorized into one or more populations that experience a disproportionately higher vulnerability to emergencies and disasters. Population figures and percentages provide quantitative data on who is represented within the community and applying a lens of intersectionality provides additional qualitative data on how and why these individuals may be impacted disproportionately by disasters. It is important to recognize that this data only accounts for those individuals who participated and responded to the 2020 U.S. Census and 2017 – 2022 ACS. Census data may be incomplete and not provide a full depiction of the City's population due to multiple factors including distrust of government, immigration status, or other factors.

Within the City, there are a number of individuals and groups who may experience one or more factors that contribute to heightened vulnerability. Approximately 19.5 percent of the City's population is below the poverty line, accounting for 111,625 individuals. The second highest percentage of individuals experiencing heightened social vulnerability are those individuals with a disability, representing 15.7 percent of the City's total population. Figure 2-13 shows the geographic concentration of vulnerable populations by Census tract. Table 2-6 provides a breakdown of vulnerable populations, as identified in the U.S. Census, for the City. The sections that follow provide a brief overview of how social vulnerability contributes to heightened risk to hazards.

Figure 2-13. Vulnerable Populations by Census Tract



Source: U.S. Census 2021

Table 2-6. Vulnerable Population Statistics

City Council District	Over 65	Percent of District Total	Under 5	Percent of District Total	Non-English Speaking	Percent of District Total	Disability	Percent of District Total	Poverty Level	Percent of District Total	Limited Transportation[1]	Percent of District Total	BIPOC	Percent of District Total	Group Quarters	Percent of District Total	LGBTQIA+[2]	Percent of District Total
1	4,481	10.2%	3,344	7.6%	1,141	2.6%	4,200	9.6%	5,851	13.4%	6,044	13.8%	10,613	24.3%	393	0.9%	226	0.5%
2	5,528	12.2%	3,009	6.6%	1,376	3.0%	5,394	11.9%	6,530	14.4%	8,195	18.1%	34,798	76.9%	466	1.0%	222	0.5%
3	5,988	14.2%	1,669	4.0%	470	1.1%	5,485	13.0%	3,539	8.4%	3,828	9.1%	29,033	68.7%	4,246	10.0%	222	0.5%
4	6,401	14.2%	3,113	6.9%	371	0.8%	5,601	12.4%	6,218	13.8%	7,852	17.4%	33,183	73.7%	2,498	5.5%	184	0.4%
5	8,122	18.6%	3,762	8.6%	1,176	2.7%	6,613	15.2%	7,155	16.4%	7,626	17.5%	24,258	55.6%	733	1.7%	150	0.3%
6	8,355	20.1%	2,356	5.7%	546	1.3%	7,741	18.6%	7,910	19.0%	11,043	26.5%	32,354	77.8%	2,566	6.2%	186	0.4%
7	6,177	15.6%	1,895	4.8%	349	0.9%	7,764	19.6%	9,082	22.9%	13,979	35.3%	31,724	80.0%	988	2.5%	244	0.6%
8	7,799	16.8%	2,947	6.4%	392	0.8%	8,376	18.1%	8,014	17.3%	11,365	24.5%	40,489	87.3%	659	1.4%	172	0.4%
9	4,927	13.7%	2,024	5.6%	641	1.8%	8,523	23.8%	11,821	33.0%	17,555	48.9%	31,009	86.5%	421	1.2%	117	0.3%
10	4,755	11.5%	3,468	8.4%	1,054	2.5%	7,685	18.5%	12,283	29.6%	12,544	30.2%	26,654	64.2%	249	0.6%	59	0.1%
11	5,774	12.0%	2,182	4.5%	907	1.9%	6,231	13.0%	8,651	18.0%	17,477	36.4%	20,276	42.2%	2,094	4.4%	296	0.6%
12	4,203	11.3%	1,690	4.6%	575	1.5%	6,388	17.2%	9,816	26.4%	15,493	41.7%	26,663	71.8%	4,722	12.7%	229	0.6%
13	4,701	12.1%	2,684	6.9%	582	1.5%	6,814	17.6%	11,674	30.1%	10,700	27.6%	31,551	81.4%	126	0.3%	255	0.7%
14	6,316	14.8%	2,325	5.4%	703	1.6%	5,892	13.8%	7,091	16.6%	9,560	22.4%	23,022	54.0%	4,028	9.4%	327	0.8%
Baltimore City (Total)	**83,527**	**14.1%**	**36,468**	**6.2%**	**10,283**	**1.7%**	**92,707**	**15.7%**	**115,625**	**19.5%**	**153,259**	**25.9%**	**395,627**	**66.9%**	**24,189**	**4.1%**	**2,889**	**0.5%**

Source: Source: U.S. Census Bureau 2021, ACS

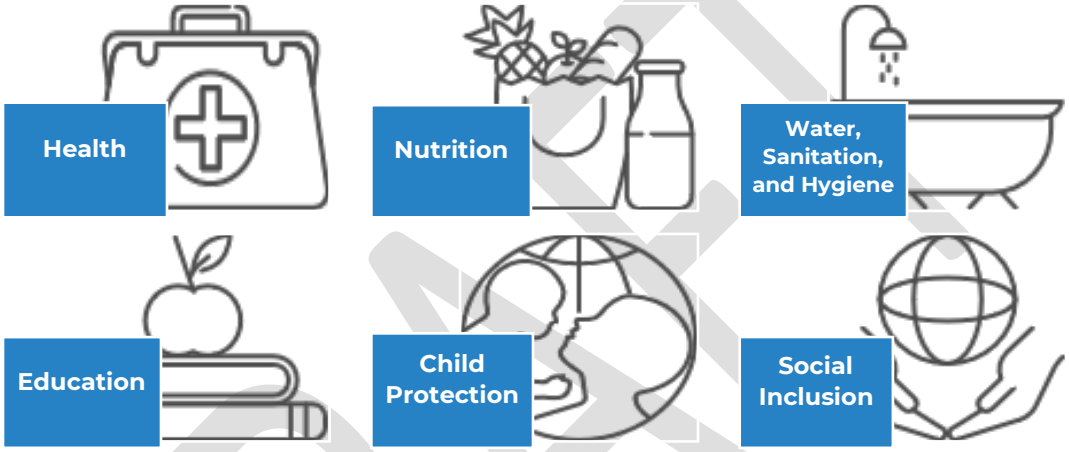
Notes:

[1]: Persons per household = 2.32. Number used to calculate Limited Transportation population.

[2]: Population based upon Same-sex spouses and Same-sex unmarried partners.

2.4.3.1 Children

Risk is disproportionately higher for children due to their dependency on others to safely access resources during emergencies and the potential for long-term impacts of trauma experienced during a crisis. During an emergency, children may not be able to avoid hazards or make critical decisions for their safety; this requires them to depend on others. Extended disruptions in education systems during recovery can have lifelong impacts on the developmental capabilities of children (UNICEF 2016). Additionally, children may often experience increased health risks from exposure to hazards. There are 36,468 children under the age of 5 in the City who may struggle with responding to emergencies and may not be able to use critical thinking skills to prioritize their safety. Strategies such as Child-Centered Disaster Risk Reduction (CCDRR) prioritize preparing and protecting children by focusing on six sectors where children have the highest vulnerabilities (UNICEF 2016).



2.4.3.2 Older Adults

Older adults are susceptible to a myriad of increased risks due to several factors, including health, finances, and mobility. Those living on their own may have more difficulty evacuating their homes, and those living in group quarters, such as senior care and living centers, depend upon facility operators executing emergency preparedness measures. Older adults may face greater limitations with driving and therefore require special evacuation plans. They may also have hearing or vision impairments that could make receiving emergency instructions difficult. The City has a growing population of 83,527 individuals who are age 65 or older, all of whom could experience greater difficulty when dealing with emergencies.

2.4.3.3 Persons with Disabilities

The Centers for Disease Control and Prevention (CDC) defines a disability as a "condition of the body or mind (impairment) that makes it more difficult for the person with the condition to do certain activities (activity limitation) and interact with the world around them (participation restrictions)" (CDC 2020). These impairments may increase the level of difficulty that individuals face during a hazard event. Cognitive impairments may reduce an individual's capacity to receive, process, and respond to emergency information or warnings. Individuals with a physical or sensory disability may face issues of mobility, sight, hearing, or reliance on specialized medical equipment. Table 2-7 shows the population in the City that may be vulnerable due to a disability.

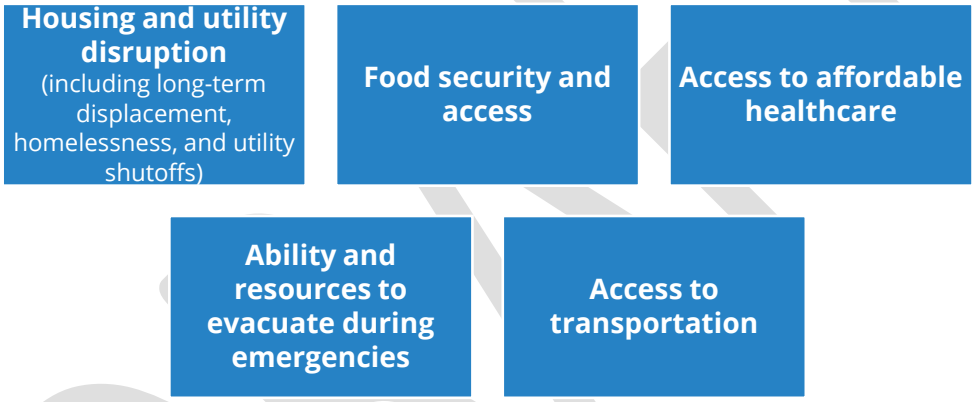
Table 2-7. Disabilities in Baltimore City

Disability	Number of People
Hearing Difficulty	15,936
Vision Difficulty	20,236
Cognitive Difficulty	41,419
Ambulatory Difficulty	51,459
Self-Care Difficulty	17,116
Independent Living Difficulty	31,222

Source: U.S. Census 2020

2.4.3.4 Economically Disadvantaged

Limited finances pose a barrier to obtaining resources and supplies to prepare for emergencies and disasters. Individuals and households facing financial challenges are likely to evaluate their risk and make decisions based on the major economic impact to their family, including determining if they have the financial means to safely evacuate. Economically disadvantaged individuals and households may require additional support and resources in the following areas:



2.4.3.5 Persons with Limited Access to Transportation

Individuals with limited or no access to transportation face a higher risk during emergencies due to the challenges of being unable to move out of harm's way. With people remaining in place during emergencies, first responders may be unable to render assistance due to inaccessible roadways or other conditions present during an emergency or disaster. In total, it is estimated that 40,174 people in the City have no vehicle available for them to use (US Census Bureau 2020).

2.4.3.6 Limited English Proficiency

Individuals who are not fluent or do not possess a working proficiency in English may have difficulty understanding information being conveyed to them. Cultural differences can also add complexity to how information is being conveyed to populations with limited English proficiency (CDC 2021). Table 2-8 shows the breakdown of the 4,239 households that are classified as "limited English-speaking households." Over 1.7 percent of households in the City are classified as limited English-speaking households.

Table 2-8. Limited English-Speaking Households

Limited English-Speaking Households	Total Households
Spanish	1,567
Other Indo-European Languages	925
Asian and Pacific Island Languages	1,114
Other Languages	633
Total Households in Baltimore City	**242,499**

Source: U.S. Census 2020

2.4.3.7 Black, Indigenous, and People of Color (BIPOC)

Often BIPOC populations make up frontline communities. Frontline communities are "neighborhoods or populations of people who are directly affected by climate change [and other natural hazards] and inequity in society at higher rates than people who have more power in society. They are on the frontlines of the problem." (NAACP 2018). This poses a greater risk to BIPOC populations as structural and institutional inequities often create additional barriers that prevent these populations from being adequately prepared to withstand and recover from a disaster or emergency. "Decades of underinvestment and unjust systems have left frontline communities with high levels of poverty and pollution, a lack of quality jobs and education opportunities, outdated and weak critical infrastructure, disproportionately high costs for energy, transportation and basic necessities, and limited access to public services." (The Greenlining Institute 2019).

The social, political, and economic history of a community can have lasting impacts that perpetuate the oppression of BIPOC populations in present day. Discriminatory housing policies, such as redlining, can result in vulnerable BIPOC populations residing in hazard-prone areas and/or with housing options that are lower quality and do not provide adequate physical protection against natural hazards (NAACP 2018). Table 2-9 shows the breakdown of the City population by race.

Table 2-9. Population By Race

Race	Population	Percent of Population
White Alone	163,026	27.8
Black or African American Alone	338,478	57.8
American Indian and Alaska Native Alone	2,312	0.4
Asian Alone	21,210	3.6
Native Hawaiian and Other Pacific Islander Alone	186	.03
Some Other Race Alone	28,046	4.8
Population of Two or More Races	32,450	5.6
Total	**585,708**	**100%**

Source: U.S. Census

2.4.3.8 Individuals Living in Group Quarters

The term "group quarters" refers to people living in communal settings, which can include inmates in a prison, students in a dorm, and older adults or individuals with access and functional needs living in group care facilities. The concentration of multiple individuals within one location compounds the impacts of a disaster should the structure incur damages. In circumstances where the group quarters house individuals with access and functional needs, residents may require additional assistance with evacuating due to mobility and/or cognitive limitations. It is important to ensure that each group quarter facility

has its own emergency plan to account for the unique needs of its residents during a hazard event. In 2020, it was recorded that 18,001 people were living in group quarters. Table 2-10 breaks down the total number of people living in group quarters.

Table 2-10. Baltimore City Population Living in Group Quarters

Facilities	Population
Institutionalized Population	5,865
Correctional Facilities for Adults	2,568
Juvenile Facilities	122
Nursing Facilities	3,067
Other Institutionalized Facilities	108
Noninstitutionalized Population	12,136
College/University Student Housing	10,098
Military Quarters	0
Other Noninstitutionalized Facilities	2,038

Source: U.S. Census 2020

2.4.3.9 Individuals Experiencing Sheltered and Unsheltered Homelessness

Individuals experiencing homeless may face a higher vulnerability to hazard impacts due to inability to evacuate or find appropriate shelter (Substance Abuse and Mental Health Services Administration 2022). Additional factors may contribute to the vulnerability of this group including an increase in exposure to disease in congregate sheltering, traumatization and mental health challenges, and discrimination at sheltering sites.

The Mayor's Office of Homeless Services (MOHS) conducted a Point-in-Time (PIT) count on the evening of February 26, 2022, to assess the number of individuals that were unsheltered, staying in emergency shelters, or in transitional housing for the specific night. Due to the transitional nature of this group, it is challenging to develop longer-term counts. Approximately, 1,600 individuals were counted during the PIT; 56 percent were staying in emergency shelters, 36 percent were staying in transitional housing, and 8 percent were unsheltered (MOHS 2022).

Year	Sheltered	Emergency Shelter	Transitional Housing	Unsheltered	Total
2018	1,962	1,152	810	546[1]	2,508
2019	1,914	1,140	774	380	2,294
2020	1,895	1,147	748	298	2,193
2022	1,473	895	578	124	1,597

Source: MOHS 2022

Notes:

[1]: In 2018, Baltimore did not conduct an unsheltered count. HUD's policy for when CoCs elect to conduct unsheltered counts every other year is to add numbers from the previous year's unsheltered count to approximate the total.

Baltimore did not conduct a PIT Count in 2021 as a safety precaution during the COVID-19 pandemic.

2.4.3.10 Lesbian, Gay, Bisexual, Transgender, Queer or Questioning, Intersex, Asexual or Ally, and Additional Identities (LGBTQIA+)

Historic discriminatory practices and policies towards LGBTQIA+ communities have lasting impacts on present-day efforts to execute the disaster management process. These

communities may be excluded from having safe, affordable housing options and therefore must reside in higher-risk, hazard-prone areas with lower-quality housing options (NAACP 2018). Access to safe and adequate sheltering is also a concern for LGBTQIA+ communities. The NAACP notes that shelters might refuse to accept transgender or gender non-conforming individuals; this may result in these individuals being physically exposed to hazards. In instances where LGBTQIA+ individuals are admitted into a shelter during an emergency, they may face discrimination leading to additional concerns regarding safety and access to medical services. These considerations should be incorporated into City and local sheltering plans.

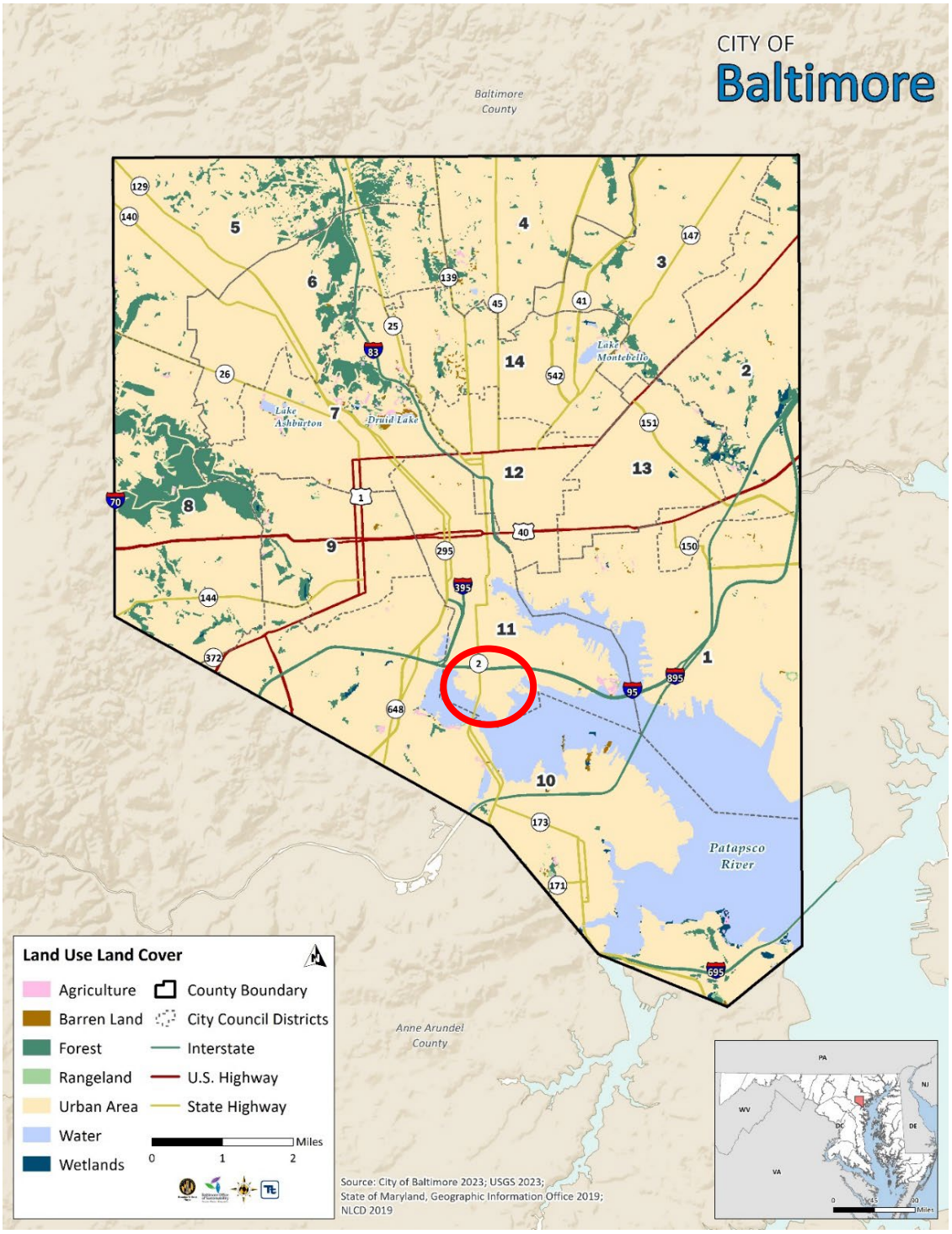
2.5 Land Use and Development

Land use trends can significantly impact exposure and vulnerability to various hazards. For example, significant development in a hazard area increases the building stock and population exposed to that hazard. An understanding of these development trends can assist in planning for further development and ensuring that appropriate mitigation, planning, and preparedness measures are in place to protect human health and community infrastructure. A map of Baltimore's land use and land cover is shown in Figure 2-14.

Since the development of the 2018 DP3, major new developments in the City include activity to develop the Baltimore Peninsula, a 235-acre waterfront neighborhood consisting of commercial and residential land uses located at the mouth of the Patapsco River. The area is partially located within the FEMA-mapped floodplain and subject to adhering to the local floodplain ordinance, Maryland's Critical Area Law, and other hazard-resistant building codes. The Baltimore Peninsula development is circled in red in Figure 2-14. Additional notable developments include the potential redevelopment of Harborplace, two retail pavilions located at the intersection of Light and Pratt Streets bordering the Inner Harbor. Harborplace is also located within the FEMA-mapped floodplain and subject to adhering to the local floodplain ordinance, Maryland's Critical Area Law, and other hazard-resistant building codes.

The Baltimore City Department of Planning maintains an interactive online map depicting ongoing development and infrastructure improvements on southwest Baltimore (Southwest Baltimore Major Attractions, Developments, and Infrastructure) and the Central Maryland Development Tracker provides information on all projects requiring a building permit.

Figure 2-14. Land Use and Land Cover in Baltimore City



The City has historically been composed of urban land development. This land use trend continues, with over 82 percent of land being classified as urban in 2019. The next largest land classification is water, which makes up just over 11 percent of the City and is mainly attributed to the Inner Harbor. Table 2-11 provides information about the City's land use.

Table 2-11. Baltimore City Land Use

Land Use Category	2019		2016		2013	
	Acreage	Percent of City	Acreage	Percent of City	Acreage	Percent of City
Agriculture	172	0.3%	178	0.3%	179	0.3%
Barren	139	0.2%	131	0.2%	123	0.2%
Forest	3,210	5.5%	3,239	5.5%	3,252	5.5%
Rangeland	77	0.1%	64	0.1%	58	0.1%
Urban	48,548	82.5%	48,516	82.5%	48,505	82.4%
Water	6,516	11.1%	6,540	11.1%	6,550	11.1%
Wetland	170	0.3%	164	0.3%	165	0.3%
Baltimore City (Total)	**58,832**	**100.0%**	**58,832**	**100.0%**	**58,832**	**100.0%**

Source: NLCD 2019, 2016, 2013

The City has a total land area of 81 square miles representing 51,826 acres without water bodies. The largest City Council District is District 10, which is 12.8 square miles, and the smallest City Council District is District 12, which is 3 square miles. See Table 2-12 for more information regarding land area excluding water bodies.

Table 2-12. Total City Council Land Area

City Council District	Total Land Area (Excluding Water Bodies)	
	Acres	Square Miles
1	4,666	7.3
2	4,271	6.7
3	3,459	5.4
4	3,044	4.8
5	4,480	7.0
6	3,663	5.7
7	3,295	5.1
8	4,474	7.0
9	2,383	3.7
10	8,188	12.8
11	2,899	4.5
12	1,948	3.0
13	2,248	3.5
14	2,809	4.4
Baltimore City (Total)	**51,827**	**80.9**

Source: State of Maryland 2019; USGS 2023 Note: Excludes areas that are designated as water.

2.6 Housing

The City has seen a decline in the total number of housing units from 2010 to 2020 as well as a decline in owner-occupied houses, vacant housing units, and housing units with a mortgage. In contrast, the City has seen an increase in renter-occupied housing units

meaning that more people in the City are renting versus owning homes in the City. According the 2020 Census Data, 293,249 housing units are located in the City. A household includes all the people who occupy a housing unit as their usual residence. A housing unit is a house, apartment, mobile home or trailer, a group of rooms, or a single room occupied as separate living quarters (or if vacant, intended for occupancy as separate living quarters). According to the 2020 Census, there are 41,770 vacant housing units in the City. Table 2-13 shows how the housing characteristics of the City have changed from 2010 to 2020.

Table 2-13. Housing Characteristics in Baltimore City in 2010 and 2020

Housing Characteristics	2010	2020
Total Housing Units	296,685	293,249
Owner-Occupied Housing Units	118,655	115,747
Renter-Occupied Housing Units	119,737	126,752
Vacant Housing Units	46,782	41,770
Median Value (dollars)	$171,200	$182,500
Housing Units with a mortgage	85,066	79,461

Source: U.S. Census 2020

2.7 Physical Assets

Physical assets such as buildings or facilities, agriculture, and resources are extremely susceptible to natural hazards. Inventorying building stock and facilities is crucial in evaluating what types of facilities should primarily be protected in the event of a hazard. Protecting assets that provide safety and security, energy resources, communication, transportation, and potable water as well as those facilities that are considered to have a high potential loss, such as hazmat facilities, are important aspects to look at when creating a plan on how to lessen hazard impacts.

2.7.1 General Building Stock

For the purposes of this plan, 227,856 structures were identified by the tax data and spatial data available. These structures account for a replacement cost value of approximately $193 billion. Estimated content value is estimated to be $154 billion, for a total replacement cost for the structures and contents of $347 billion. Approximately 93 percent of the total buildings in the City are residential, 6 percent are commercial, and less than 1 percent are industrial. Residential structures account for a total replacement cost (structure and contents) of $100 billion. Table 2-14 provides additional building stock and replacement cost value information for the City.

Table 2-14. Building Stock and Replacement Cost Value in Baltimore City by City Council District

City Council District	All Occupancies				Residential		Commercial		Industrial	
	Building Count	Replacement Cost Value (Structure Only)	Replacement Cost Value (Contents Only)	Total Replacement Cost Value (Structure + Contents)	Building Count	Total Replacement Cost Value (Structure + Contents)	Building Count	Total Replacement Cost Value (Structure + Contents)	Building Count	Total Replacement Cost Value (Structure + Contents)
1	22,781	$23,756,997,616	$18,969,171,602	$42,726,169,218	20,557	$10,760,811,434	1,971	$28,678,275,121	110	$1,117,389,750
2	12,746	$11,071,161,446	$8,701,899,828	$19,773,061,274	11,810	$6,531,761,854	791	$11,028,509,528	54	$548,969,400
3	14,274	$8,203,081,156	$5,992,018,617	$14,195,099,773	13,774	$6,334,242,730	372	$5,836,557,925	4	$40,664,400
4	14,536	$7,530,418,958	$5,156,329,739	$12,686,748,697	14,156	$7,035,424,347	270	$4,134,380,032	1	$10,166,100
5	12,637	$10,467,150,261	$8,108,763,160	$18,575,913,421	11,896	$6,411,355,791	604	$10,196,786,963	28	$284,650,800
6	15,009	$10,621,557,233	$8,538,411,224	$19,159,968,457	14,254	$6,074,974,779	585	$10,682,926,279	21	$213,488,100
7	17,409	$10,134,679,892	$7,872,920,901	$18,007,600,793	16,624	$6,904,496,282	548	$8,051,785,363	49	$507,127,650
8	14,350	$8,263,721,432	$5,944,718,010	$14,208,439,442	13,925	$6,855,468,761	327	$5,985,439,411	4	$40,664,400
9	21,371	$12,521,730,692	$9,469,145,205	$21,990,875,897	20,197	$7,813,683,971	941	$11,183,180,442	49	$498,138,900
10	16,334	$17,941,600,485	$15,679,848,265	$33,621,448,750	14,208	$6,775,625,021	1,658	$20,871,431,136	293	$3,031,277,925
11	17,184	$33,560,081,087	$28,784,593,126	$62,344,674,213	13,909	$9,116,612,794	2,996	$49,210,380,818	36	$374,968,350
12	15,436	$18,091,217,083	$14,950,524,568	$33,041,741,651	13,526	$5,997,395,238	1,637	$24,122,460,941	38	$386,311,800
13	18,095	$11,127,532,410	$8,304,712,985	$19,432,245,395	17,249	$6,981,280,162	668	$10,192,444,059	43	$446,131,050
14	15,694	$10,160,327,242	$7,584,472,338	$17,744,799,580	14,959	$6,773,911,422	602	$8,980,220,313	16	$162,657,600
Baltimore City (Total)	**227,856**	**$193,451,256,993**	**$154,057,529,568**	**$347,508,786,561**	**211,044**	**$100,367,044,586**	**13,970**	**$209,154,778,331**	**746**	**$7,662,606,225**

Source: Maryland Department of Planning 2020, 2022; RS Means 2022

2.7.2 Cultural and Natural Resources

The City is full of cultural and natural resources that tend to draw people from all over to experience its rich history and culture within the City's 91 historic districts (see). Visit Baltimore reports that 27 million people visit the City in a typical year, generating a total of $6 billion in economic impact to the local economy (Visit Baltimore n.d.). In addition, Baltimore's ideal proximity to the waterfront features open spaces for waterfront paths and parklands for residents and tourists to enjoy. Many of these features are within the City's Inner Harbor, which includes museums, historic ships redesigned to be floating museums, paddleboats, shows, and numerous restaurants.

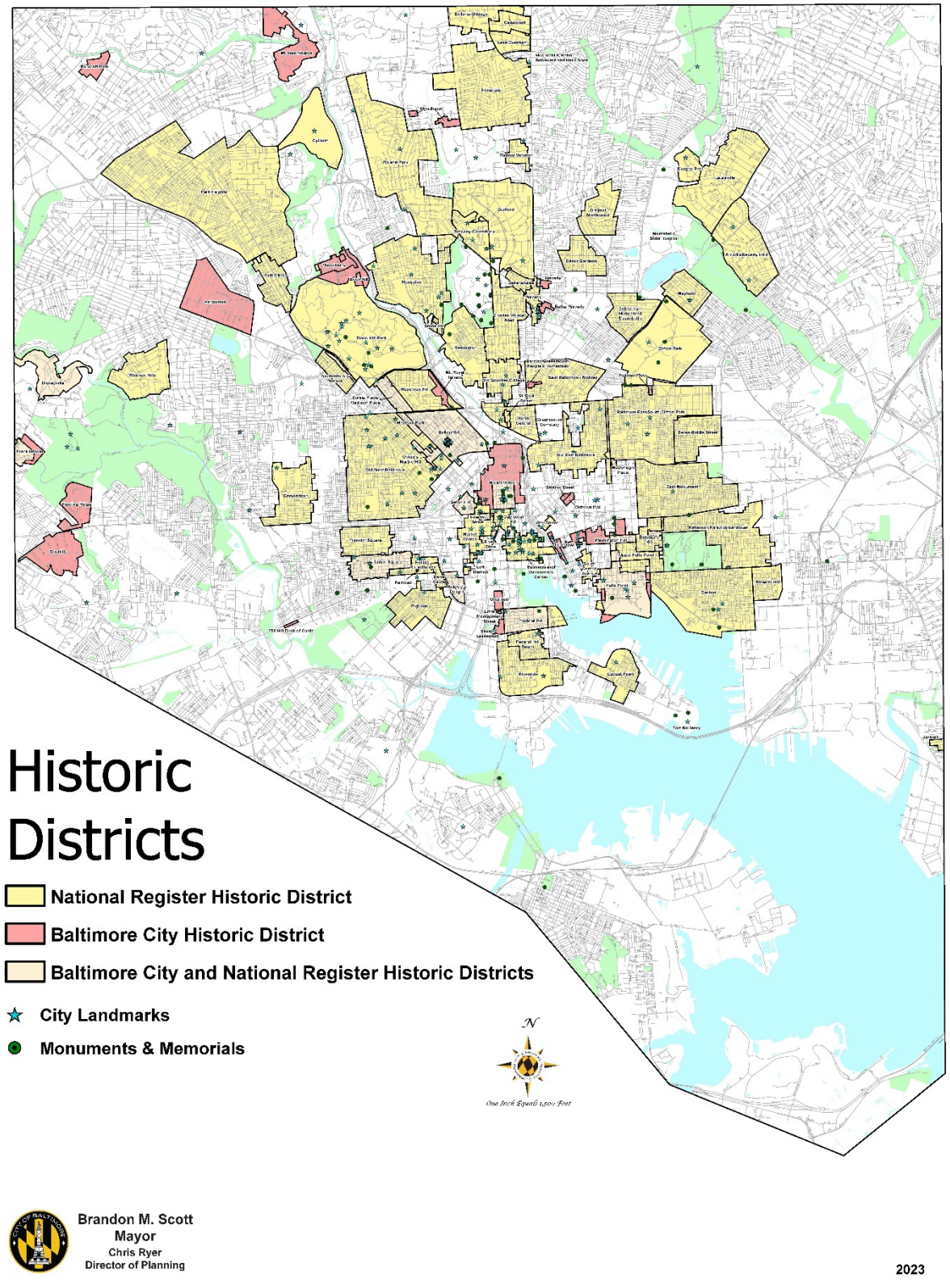
The City has several museums, including Baltimore Museum of Art, which offers a renowned and diverse selection of 19th century, modern, and contemporary art. The Walters Art Museum includes textiles, ancient art, furniture, jewelry, and armor collections from 5,000 BCE to the 21st century and is located in the Mount Vernon Cultural District. The American Visionary Art Museum includes creative pieces from self-taught artists, including farmers, mathematicians, inmates, and those with mental illness. The Reginald F. Lewis Museum includes information and cultural pieces surrounding African American history and has objects dating from 1784 to today to tell the story of the accomplishments and struggles of African Americans in Maryland (Visit Baltimore 2023). Fort McHenry is another culturally rich location where Francis Scott Key wrote the words that became the U.S. National Anthem after becoming inspired by a flag that was sewn and flown over the victorious fort after withstanding a 25-hour British bombardment (NPS 2023).

The City is also known for its National Aquarium that is dedicated to educating people on marine life through immersion films and numerous aquatic habitats. The National Aquarium provides numerous exhibits where guests can pet stingrays, watch dolphins play, be surrounded by sharks, and learn about conservation efforts. The Maryland Zoo spans 135 acres and hosts several rescued and rehabbed animals. The Inner Harbor Promenade is a seven-mile paved waterfront promenade that allows people to enjoy the scenic views of the City.

In addition, the City offers numerous parks and trails that allow residents and tourists to enjoy the local nature that Baltimore has to offer (Visit Baltimore 2023). The Department of Recreation and Parks manages 51 recreation centers, 23 pools, over 4,700 acres of parkland, 262 parks, 32 historic structures, over 25 miles of biking and hiking trails, and numerous athletic fields and playgrounds. These facilities are also used to support the City's educational curriculums and are used as informative centers to educate the public (Department of Recreation and Parks 2023).

All of these resources contribute to the liveliness of the City but face risks posed by the natural and human-caused hazards that threaten the City. Ensuring these resources are integrated into hazard mitigation and resilience measures throughout the City aids in building overall community resilience.

Figure 2-15. Historic Districts in Baltimore City



Source: Department of Planning 2023

2.7.3 Critical Facilities and Infrastructure

Critical infrastructure and facilities are those that are essential to the health and welfare of the population. These facilities are especially important after any hazard event. Critical facilities are those that maintain essential and emergency functions and typically include police and fire stations, schools, and emergency operations centers.

Key Terms

- **Critical Asset**—A resource, system, or facility that is vital for the functioning of a community or organization during and after an emergency or disaster. In can include infrastructure, communication networks, medical facilities, transportation hubs, and more.
- **Community Lifeline**—The most fundamental services in the community that, when stabilized, enable all other aspects of society. A lifeline enables the continuous operation of critical government and business functions and is essential to human health and safety or economic security.

Critical infrastructure can include the roads and bridges that provide ingress and egress and allow emergency vehicles access to those in need and the utilities that provide water, electricity, and communication services to the community. Also included are Tier II facilities (hazardous materials) and rail yards. Rail lines may serve as a means of transportation of significant amounts of hazardous materials, increasing the potential risk posed to public health and welfare during a hazard event. During the 2023 DP3 update process, stakeholders provided additional input on resources and facilities they consider to be critical assets, including resilience hubs, water impoundments and dams, fiber and conduit for communications and broadband, assisted living facilities, senior living facilities, grocery stores, and behavioral healthcare centers. In addition, resources such as informational websites, manufacturing websites, entertainment facilities (e.g., convention centers, stadiums, etc.)

Beginning in 2019, FEMA developed a new concept to increase effectiveness for disaster operations and position response to catastrophic incidents. This concept, known as "community lifelines", represents the most fundamental services in the community that, when stabilized, enable all other aspects of society. Following a disaster event, intervention is required to stabilize community lifelines. The community lifelines concept is applied in hazard mitigation planning to prioritize protecting community lifelines, mitigation potential impacts to them, building back stronger and smarter, and driving community resilience efforts (FEMA 2023). During the development of the DP3, community lifelines consisted of seven categories, which included:

- **Safety and Security** – Includes law enforcement/security, fire services, search and rescue services, government services, and community safety.
- **Food, Water, Shelter** – Includes food, water, shelter, and agriculture.
- **Health and Medical** – Includes medical care, public health, patient movement, medical supply chain, and fatality management.
- **Energy (Power and Fuel)** – Includes the power grid and fuel.
- **Communications** – Includes infrastructure, responder communications, alert warnings and messages, finance, 911, and dispatch.
- **Transportation** – Includes highway/roadway/motor vehicle, mass transit, railway, aviation, and maritime.
- **Hazardous Materials** – Includes facilities, HAZMAT, pollutants, and contaminants.

See Table 2-15 for information regarding lifelines in the City.

Table 2-15. Community Lifelines in Baltimore City

Community Lifelines	Number in Baltimore
Safety and Security	290
Food, Water, Shelter	127
Health and Medical	802
Energy	70
Communication	307
Transportation	446
Hazardous Materials	0

Source: City of Baltimore 2023; Maryland Department of Transportation (MDOT) 2023; Baltimore City Department of Public Works 2023; HILFD 2018, 2021, 2022

A comprehensive inventory of critical assets and community lifelines in the City was developed from various sources, including input from the CPT, HMAC, public, and stakeholders. An inventory of the most current list of critical facilities is provided in the following sections. This inventory was used to conduct the risk assessment.

2.7.3.1 Safety and Security

This section provides information on the Safety and Security lifeline. Components of this lifeline category include law enforcement/security, fire services, search and rescue services, government services, and community safety.

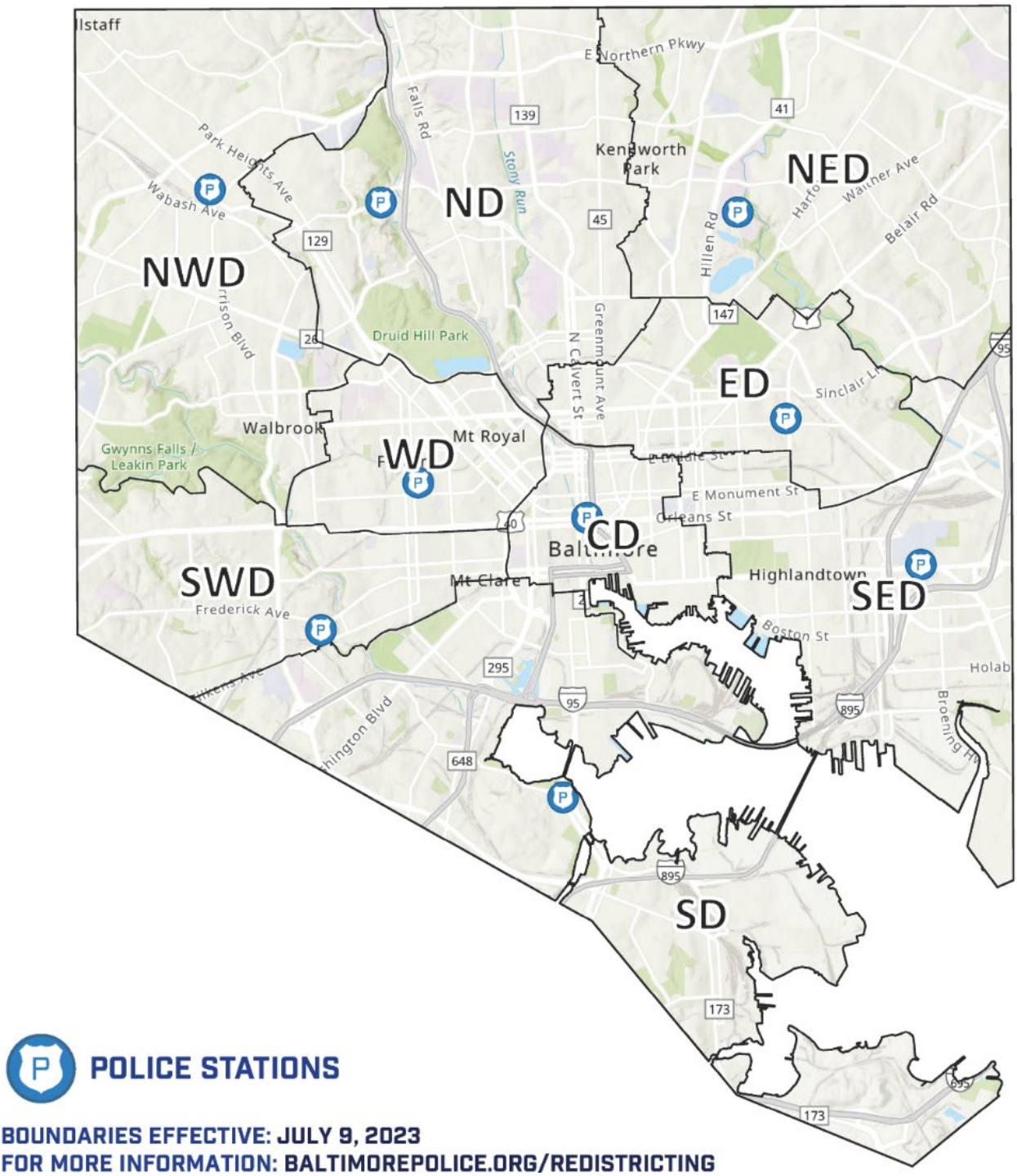
The mission of OEM is to maintain the highest level of preparedness to protect Baltimore City residents, workers, visitors, and the environment from the impact of natural and man-made disasters; the Office also coordinates activities for the City's Emergency Operations Center.

The City Fire Department provides fire protection as well as Emergency Medical Services to the City of Baltimore by using 38 fire stations that are strategically located throughout the City. The Fire Department covers the entire land mass and population of the City and responds to more than 270,000 emergencies annually.

The Baltimore Police Department is divided into nine districts (seen below in Figure 2-16) that serve the entire City population and is the eighth-largest municipal police force in the United States (Baltimore Police Department n.d.).

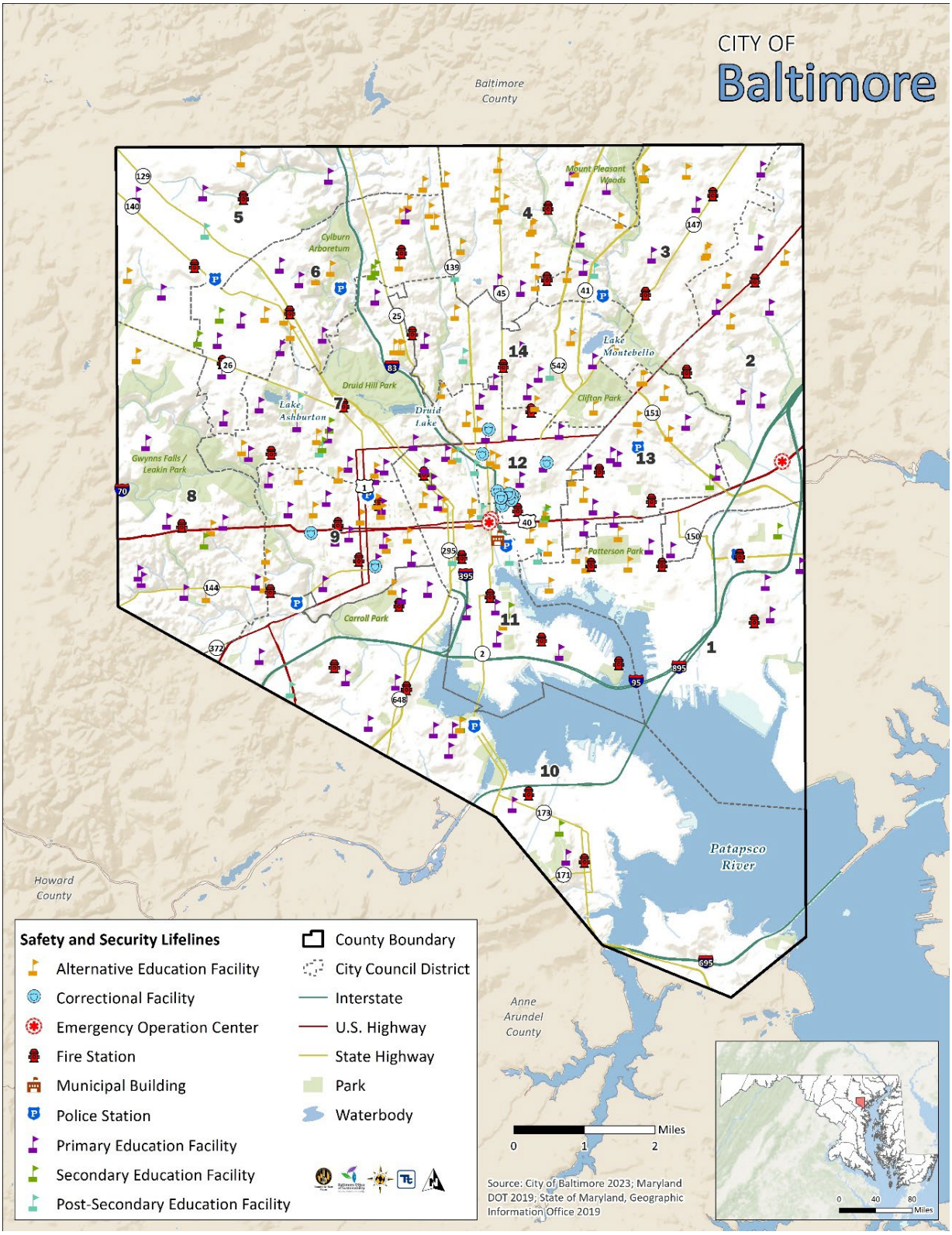
See Figure 2-17 to view the Safety and Security lifelines within the City of Baltimore.

Figure 2-16. Baltimore Police Department District Boundaries



Source: (Baltimore Police Department 2023)

Figure 2-17. Safety and Security Lifeline



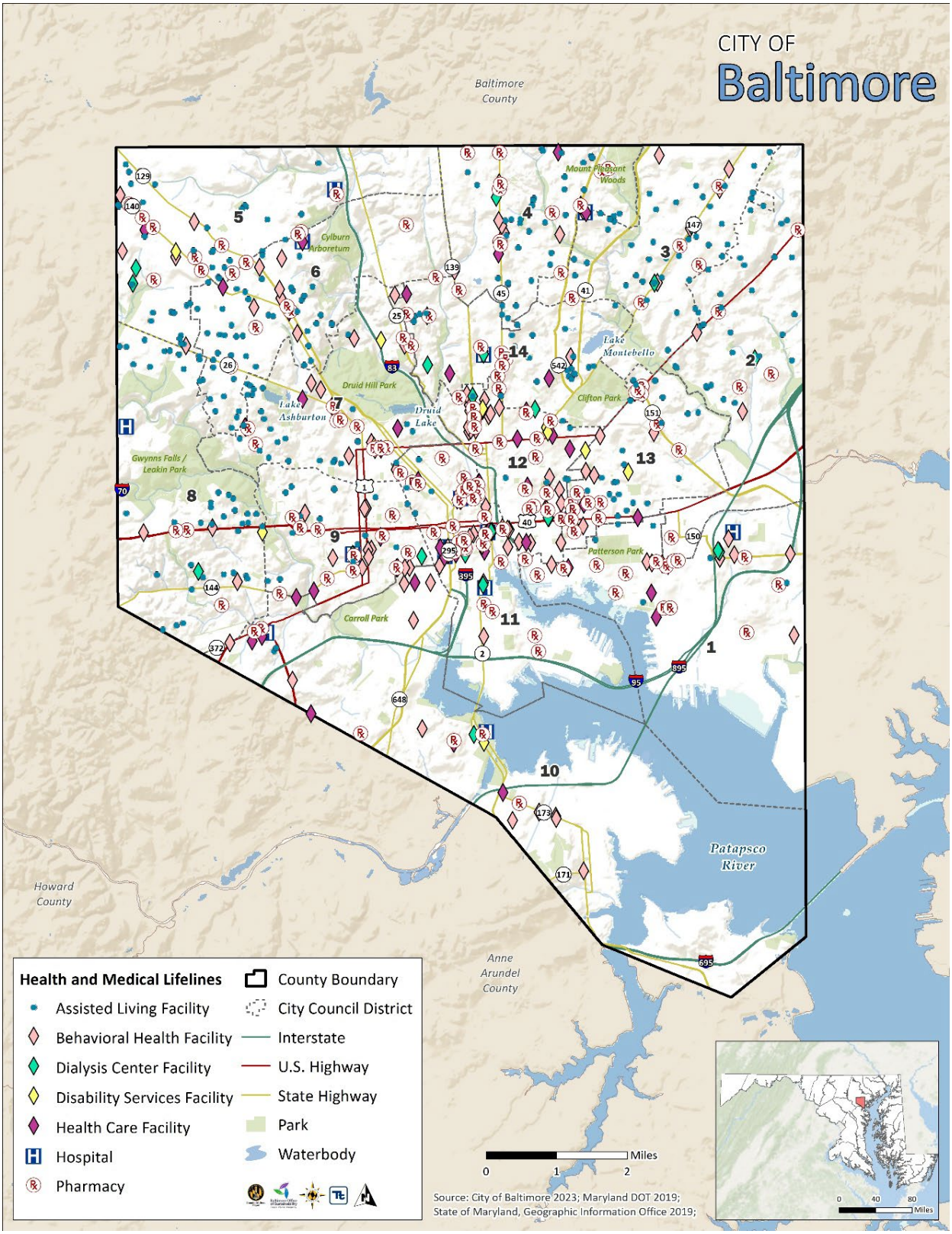
Hospitals and Medical Facilities

The Baltimore City Health Department is the oldest continuously operating health department in the United States, formed in 1793 when the governor appointed the City's first health officers in response to a yellow fever outbreak in the Fells Point neighborhood (Baltimore City Health Department 2018). The Health Department has a wide-ranging area of responsibility, including acute communicable diseases, animal control, chronic disease prevention, emergency preparedness, HIV/STD, maternal-child health, restaurant inspections, school health, senior services, and youth violence issues. The Health Department includes a workforce of approximately 800 employees and has a budget of approximately $126 million (Baltimore City Health Department 2018). The Baltimore City Health Department is organized into four divisions that encompass the City's needs:

- Finance and Administration
- Youth Wellness & Community Health
- Population Health & Disease Prevention
- Aging

Baltimore City is also home to numerous hospital and healthcare facilities ranging in size and primary function. For non-emergency health care needs, a number of urgent care centers are located throughout and outside of the City. Figure 2-18 displays the health and medical lifelines within the City of Baltimore.

Figure 2-18. Health and Medical Lifelines



Schools

Baltimore City Public Schools had a total enrollment of 75,882 kids for the 2022–2023 school year, with 37,343 students in pre-k through grade 5, 16,677 students in grades 6 through 8, and 21,862 students in grades 9 through 12. There are 154 total schools and programs located in the City, including 42 elementary schools, 72 elementary/middle schools, 4 middle schools, 10 middle/high schools, and 26 high schools (Baltimore City Schools 2023).

Senior Care and Living Facilities

Baltimore City has numerous senior care and living facility options, including adult day services, behavioral health services, and home health services as well as retirement communities and assisted living programs. These facilities can be viewed in Figure 2-18 above.

The Baltimore City Health Department also administers a National Family Caregiver Support Program, which provides services to help families under certain circumstances, including help for people who may care for frail, older relatives, and grandparents. In addition, the Health Department provides assistance to Baltimore City caregivers to pay for respite or supplemental services, with assistance limited to $300–$600 per person annually (Baltimore City Health Department 2018).

Shelters

The MOHS operates a Shelter Hotline as a centralized system for individuals experiencing or at risk of homelessness to access Baltimore City-funded emergency shelters. There are currently five City-funded shelters to service single adults, single women, single men, families, and youth ages 18-24. MOHS provides resources for street outreach to spread awareness about the availability of shelters and includes resources for food, healthcare, showers, and treatment services.

Additionally, the City opens heating and cooling centers when official City alerts are issued for extreme temperatures.

Evacuation Routes

All major roads exiting Baltimore City can be used as evacuation routes. The City maintains plans to funnel traffic and allow contra-flow traffic to facilitate evacuation on these routes. During an evacuation, only a limited number of routes will be used based on the incident and severity. Residents can tune into the news (WBAL 1090 AM radio is the primary alerting partner) or check Facebook and Twitter pages to find which evacuation route to use (Baltimore Office of Emergency Management 2018).

2.7.3.2 Transportation Systems

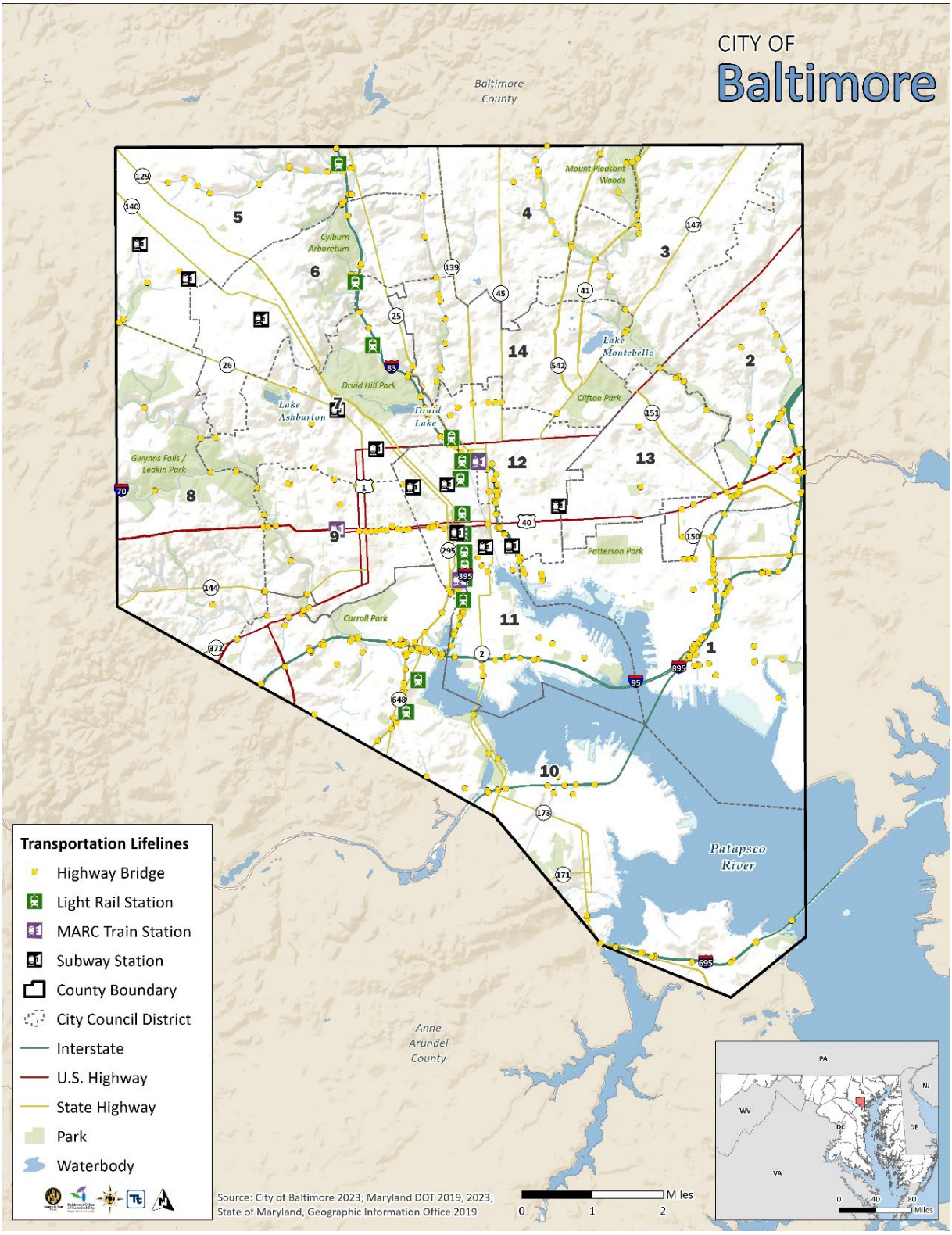
Baltimore City's location and extensive transportation network offer residents and employees various options for transportation throughout the City and the region. The transportation system includes an extensive network of roads, access to national and commuter rail, citywide bus service, airport access providing domestic and international flights, and a commercial shipping port.

Major roads in the City include numerous interstates: I-95, I-70, I-83, I-395, I-695, I-895, US Highways: 1, 2, 25, 26, 40, 41, 45, 129, 134, 139, 140, 144, 147, 150, 151, 173, 295, 372, 395, 542, 648.

Pulaski Highway, Perring Parkway, and University Parkway also pass through the City (GISGeography 2023).

The Baltimore City Department of Transportation is responsible for planning, designing, building, and maintaining 2,000 miles of roadways; 298 bridges and culverts; 3,600 miles of sidewalks, curbing, and gutters; 456 miles of alleys; 72,000 streetlights; 1,300 signalized intersections; and 250,000 traffic and informational signs. The Department of Transportation is also striving to create a safe, multiuse systems that can sustain bicycle, transit, pedestrian, and car transportation throughout the City (Department of Transportation 2018). Figure 2-19 shows the transportation lifelines in the City of Baltimore.

Figure 2-19. Transportation Lifelines

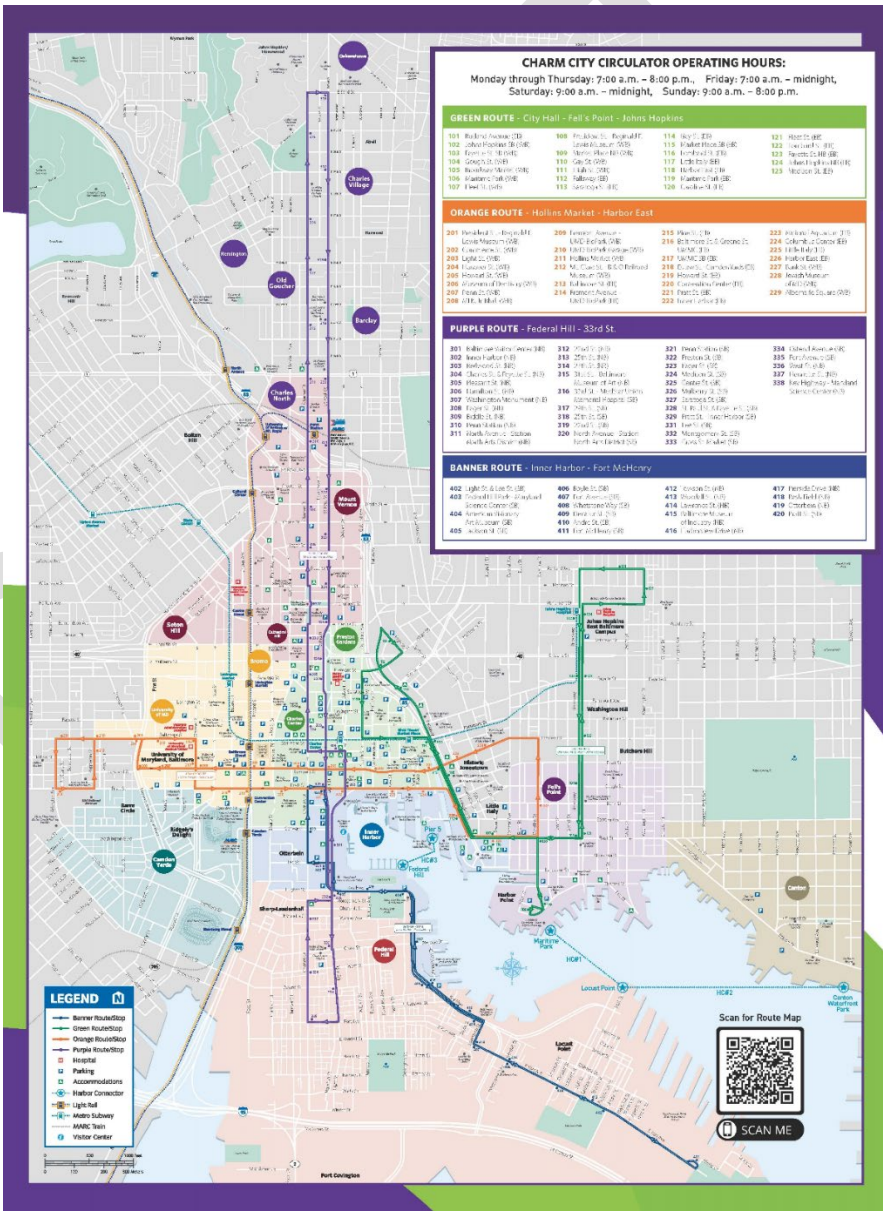


Bus and Other Transit Facilities

The Charm City Circulator (CCC) is a fleet of 24 free shuttles that travel four routes in the central business district of the City. The CCC consists of four separate routes: the Green Route, which runs from City Hall to Fells Point to Johns Hopkins Hospital Campus; the Purple Route, which runs from 33rd Street to Federal Hill; the Orange Route, which runs from Hollins Market to Harbor East; and the Banner Route, which runs from the Inner Harbor to Fort McHenry.

The Harbor Connector (HC) is an extension of the CCC and is the City's free maritime transit service connecting six piers through four vessels. The HC consists of three routes: HC1, which connects Maritime Park to Locust Point; HC2, which connects Canton to Fells Point; and HC3, which connects Pier 5 to Harbor View (Department of Transportation 2018).

Figure 2-20. Charm City Circulator Map



Source: Baltimore City Department of Transportation 2021

Airports

The Baltimore/Washington International Airport is located 9 miles south of downtown Baltimore and 32 miles northeast of Washington D.C. The airport is the busiest in the area, serving over 27 million passengers. A total of 36 airlines serve an average of 51,694 passengers per day. Five cargo airlines fly over 600 million pounds of cargo/freight per year (BWI n.d.).

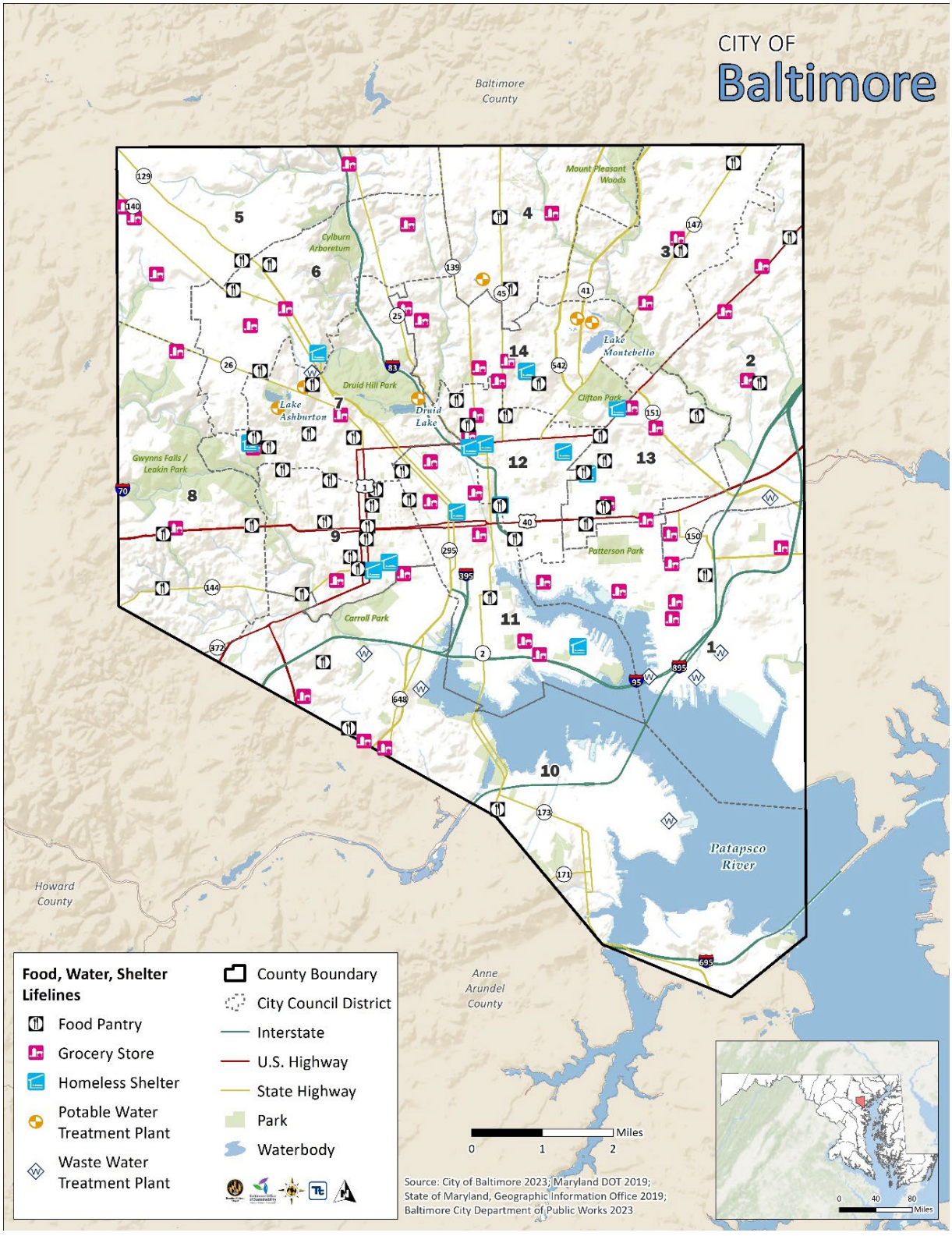
Ferry Service and Ports

In addition to the CCC discussed above, various companies run ferry tours and offer transportation to residents. Cape Clear Ferries operates nearly every day with several departures daily (Cape Clear Ferries n.d.). Baltimore's Water Taxi also offers harbor connection to the City's public transportation system as well as tours and cruises (Baltimore's Water Taxi 2022).

2.7.3.3 Lifeline Utility Systems

This section presents data and information on potable water, wastewater, energy resource, and communication utility systems. Figure 2-21 shows the Food, Water, and Shelter lifelines in the City of Baltimore.

Figure 2-21. Food, Water, and Shelter Lifelines



Potable Water

Baltimore City uses surface water from rainfall and snowmelt as the source of the City's water. The City's supply system is sourced by the Gunpowder Falls, the North Branch of the Patapsco River, and the Susquehanna River. There are three reservoirs located outside of the City limits that collect and store water/

Liberty Reservoir is located between Baltimore and Carroll Counties along the North Branch Patapsco River. It collects water from a 163.4 square mile drainage area. Liberty Dam impounds approximately 43 billion gallons of untreated water (Baltimore City Department of Public Works 2018). Water from the reservoir flows through a 12.7-mile-long tunnel to the Ashburton Water Filtration Plant for water treatment.

Loch Raven Reservoir is north of the City, and the source of the water is Gunpowder Falls. The Loch Raven Reservoir's capacity is approximately 23 billion gallons of water (Baltimore City Department of Public Works 2018). Water from the reservoir flows through a 7.3-mile-long tunnel to the Montebello Filtration Plant for water treatment.

Prettyboy Reservoir is northwest of the City and impounds roughly 19 billion gallons of water. It collects water from an 80 square mile watershed. The reservoir impounds 19 billion gallons of water and covers 1,5000 acres (Baltimore City Department of Public Works 2018). Water from Prettyboy is transferred to Local Raven Reservoir via Gunpower Falls rather than directly to Baltimore.

Water from the Susquehanna River is pumped via the Dear Creek Pumping Station to the Montebello Filtration Plants through the 38-mile-long Susquehanna Conduit. This source is used during times of extreme drought when storage becomes depleted in the reservoirs. The Susquehanna Supply has a present capacity of about 150 million gallons per day with a planned future capacity of 200 million gallons per day (Baltimore City Department of Public Works 2018).

Baltimore City provides drinking water to over 1.8 million people in the Baltimore region (Baltimore City Department of Public Works n.d.). The water system has a current capacity of 360 million gallons per day but is projected to have a capacity of 480 million gallons per day by 2030 (Baltimore City Department of Planning n.d.).

Wastewater Facilities

Baltimore City has two wastewater treatment plants: Back River Wastewater Treatment Plant (BRWWTP) and the Patapsco Wastewater Treatment Plant. There are a total of 3,100 miles of sanitary mains within the whole system which runs throughout the Baltimore region. Approximately 1,400 miles of the sanitary mains are located within Baltimore City limits and maintained by the City (Baltimore City Department of Public Works n.d.). The Patapsco Wastewater Treatment Plant also services portions of Anne Arundel, Baltimore, and Howard Counties, which maintain their portions of the remaining 1,700 miles of sanitary mains (City of Baltimore 2006). The City also collects and treats an average flow of 200 million gallons of wastewater daily and operates 8 major wastewater pumping stations and 10 minor installations (Baltimore City Department of Public Works 2018).

The BRWWTP is owned and operated by the City of Baltimore and is situated on the west shore of the Back River, a tributary of the Chesapeake Bay. The plant occupies a 466-acre site and serves an estimated 1.3 million residents in Baltimore City and Baltimore County. The BRWWTP

currently employs approximately 300 people, including supervisory, operations, maintenance, and laboratory personnel. Twenty-four-hour, year-round plant operation is maintained. The facility has evolved into a tertiary treatment plant and is currently designed to treat 180 million gallons per day (MGD) of wastewater utilizing fine bubbles and air-distributed activated sludge (Baltimore City Department of Public Works 2018).

The Patapsco Wastewater Treatment Plant is a secondary treatment facility with enhanced nutrient removal (ENR), chlorination, and de-chlorination, situated on 69 acres on the Patapsco River at Wagner's Point. The plant has grown from 5 MGD capacity in 1940 to its present-day 63.0 MGD. It serves an area of approximately 184 square miles and an estimated population of approximately 450,000. The plant employs approximately 180 people to treat wastewater generated from Baltimore City as well as Baltimore, Howard, and Anne Arundel Counties. Wastewater treatment at Patapsco consists of grit removal, screening out large solid materials, settling out solids during an hour's retention, and removal of suspended and dissolved materials (Baltimore City Department of Public Works 2018).

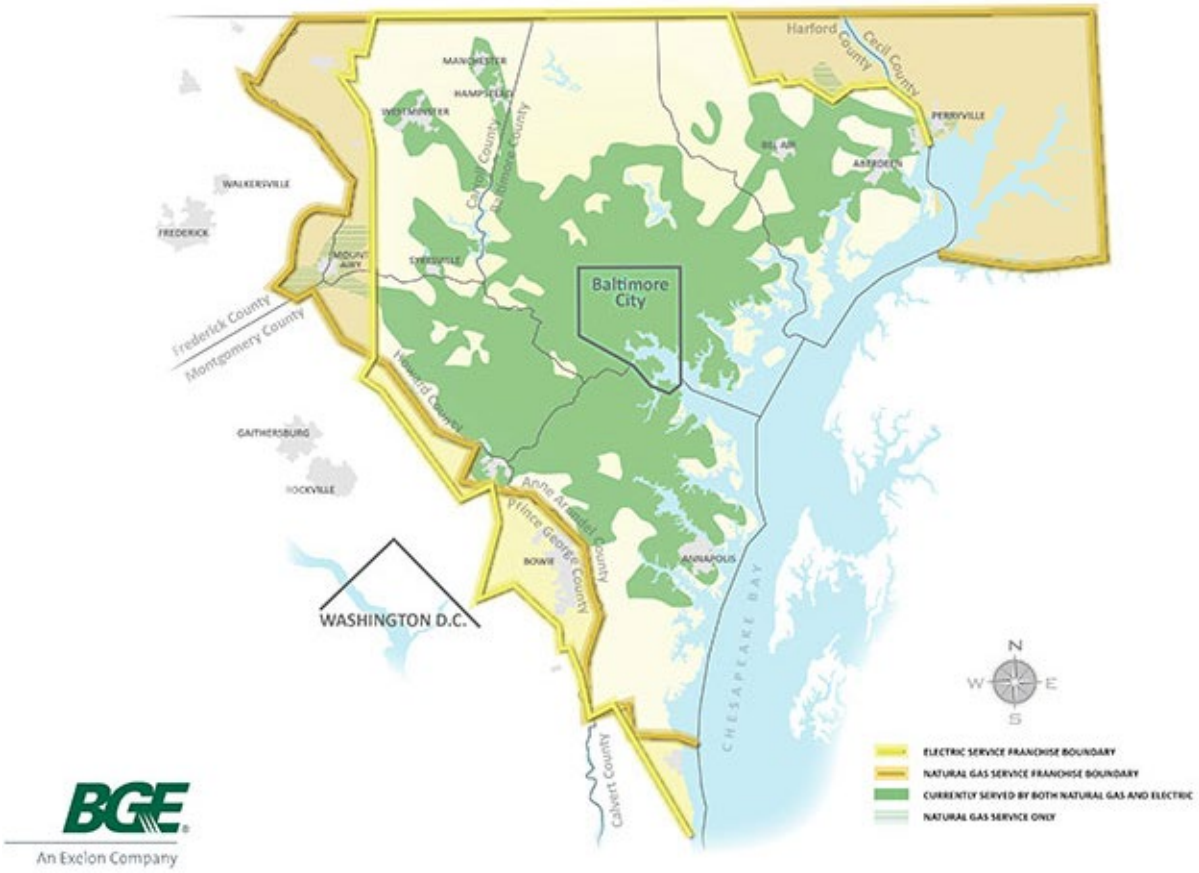
Energy Resources

Baltimore Gas and Electric (BGE) is a subsidiary of Exelon Corporation. The utility provides both electric and gas service in the central Maryland area, including Baltimore City; Baltimore County; Anne Arundel County; most of Howard, Carroll, and Harford Counties; and parts of Prince George's, Montgomery, and Calvert Counties (Baltimore Gas and Electric Company 2022). The service area is shown in Figure 2-22.

BGE serves more than 1.3 million electric customers and more than nearly 700,000 gas customers, including the entirety of the City of Baltimore (see Figure 2-22 for BGE's service area). Overall, BGE has a service area of 2,300 square miles for electric service and 800 square miles for gas service. The company maintains 244 substations, plus an additional 92 located on private property. BGE has 26,600 circuit miles distribution and 1,300 circuit miles transmission. Finally, the company has 7,600 miles of natural gas pipeline, of which 5.76 miles intersect the boundaries of the City of Baltimore (Baltimore Gas and Electric Company 2022).

Renewable energy in the form of biomass is generated in Baltimore City at the Wheelabrator Baltimore, located in the Westport neighborhood of the City. The 61-megawatt facility also produces steam for a downtown piping system that supplies heat to more than 250 businesses (U.S. Energy Information Administration 2022).

Figure 2-22. BGE Service Area Map

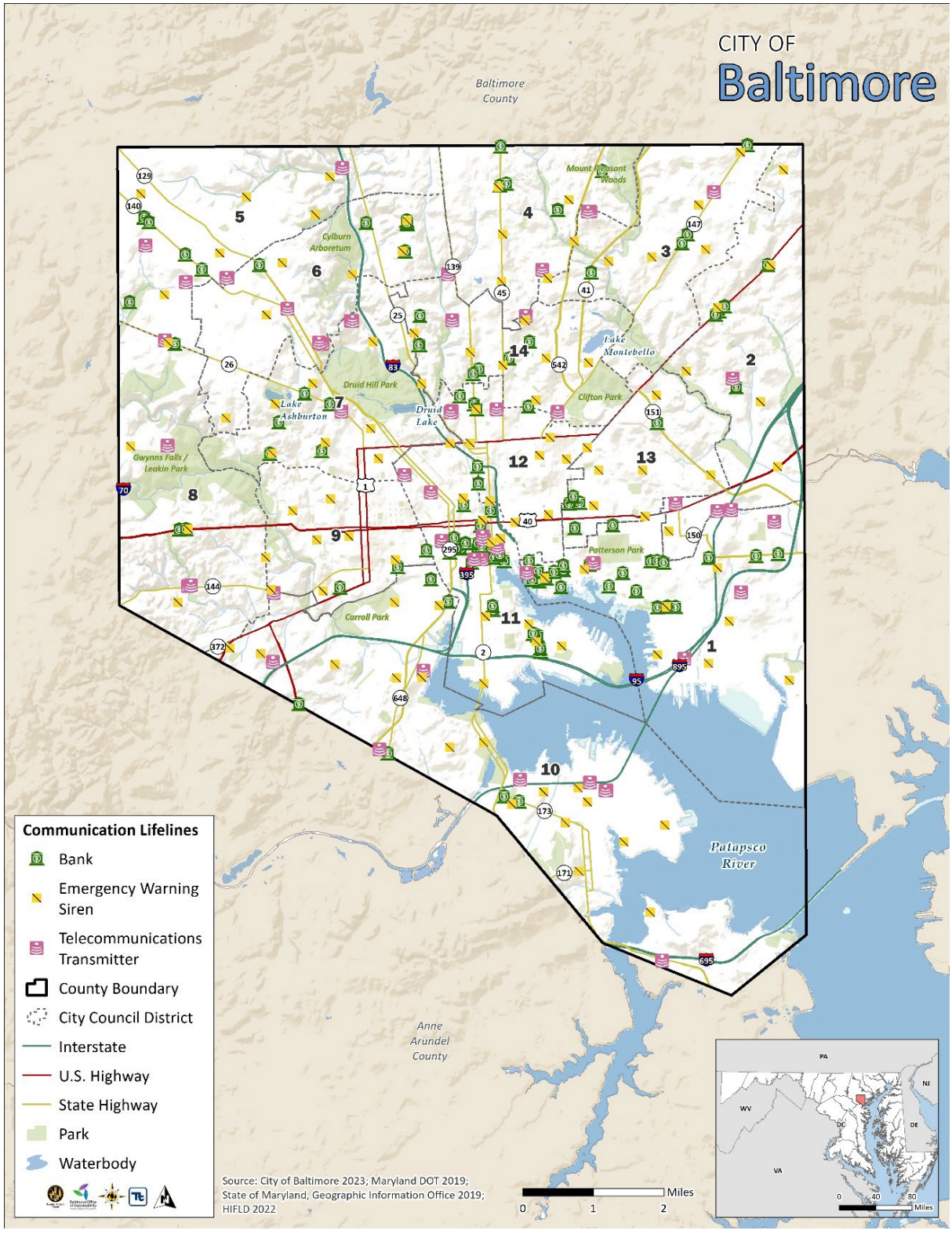


Source: Baltimore Gas and Electric Company 2022

2.7.3.4 Communications

The City is served by a variety of communications systems, including traditional landline, fiber optic, and cellular service provided by multiple companies. Each carrier has individual plans for emergency situations during hazard events and post-disaster recovery efforts. In addition to landline, fiber optic, and cellular communications systems, Baltimore City has an extensive radio communications network that is utilized by emergency services agencies, hospitals, law enforcement, public works, transportation, and other supporting organizations. Figure 2-23 displays the communication lifelines in the City of Baltimore.

Figure 2-23. Communication Lifelines



2.7.3.5 High-Potential Loss Facilities

High-potential loss facilities include hazardous materials (HAZMAT) facilities and dams and levees.

HAZMAT Facilities

The U.S. Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) (Superfund) Public Access Database (CPAD) reports that there are currently two Superfund sites in Baltimore City (USEPA 2023). Superfund sites are polluted locations requiring a long-term response to clean up hazardous material contaminations.

The Chemical Metals Industries (CMI) Site is located on two non-contiguous parcels of land on Annapolis Road in the residential, commercial, and industrial mixed-use area of Westport. At one of the properties, CMI operated a chemical manufacturing facility and recovered precious metals (Site 2). CMI used the other property, an inactive gas station, for storage of waste and scrap metal (Site 1). Site activities and leaking drums on both properties contaminated soil and groundwater with hazardous chemicals, including elevated concentrations of metals and volatile organic compounds. Mass removal of impacted surficial shallow soils was performed under U.S. EPA and Maryland Department of the Environment (MDE) oversight. MDE continues to provide direct regulatory oversight and monitor soil gas and groundwater concentrations of contaminants (EPA 2023).

The Kane & Lombard Street Drums Superfund Site consists of two former waste disposal areas located near the intersection of Kane and Lombard Streets. The two former waste areas are also known as operable units (OU). The groundwater beneath the site and in the vicinity is contaminated with volatile organic compounds (VOC), including trichloroethene, 1,2-dichloroethene, and vinyl chloride as a result of past waste disposal (EPA 2023).

Dams and Levees

Dams are classified in terms of potential for downstream damage if the dam were to fail. Hazard classifications are as follows (Maryland Department of the Environment 2015):

- Low Hazard (Class A) is a dam located in an area where failure is unlikely to result in loss of life, and only minor increases to existing flood levels at roads and buildings is expected. These structures are referred to as “Category III” dams in Code of Maryland Regulations (COMAR 26.17.04.05) and “Class A” ponds by the US Natural Resources Conservation Service (NRCS).
- Significant Hazard (Class B) is a dam located in an area where failure could possibly result in loss of life or increase flood risks to roads and buildings, with no more than two houses impacted and less than six lives in jeopardy. These are referred to as “Category II” dams in COMAR and “Class B” by NRCS.
- High Hazard (Class C) is a dam located in an area where failure would likely result in loss of human life, extensive property damage to homes and other structures, or cause flooding of major highways such as State roads or interstates. High hazard dams are referred to as “Category I” dams in COMAR and “Class C” by NRCS.

According to the United States Army Corps of Engineers (USACE) National Inventory of Dams (NID), there are 10 dams located within Baltimore City with 6 listed as high hazard, 2 listed as significant hazard, and 2 listed as low hazard. Out of the 10 dams present in the City, 7 have

an Emergency Action Plan (EAP) prepared. According to the National Levee Database maintained by USACE, there are no levees in Baltimore City (USACE 2023).