

CARROLL COUNTY, MARYLAND HAZARD MITIGATION PLAN

CARROLL COUNTY EMERGENCY MANAGEMENT

CARROLL COUNTY
DEPARTMENT OF PUBLIC SAFETY
225 NORTH CENTER ST.
WESTMINSTER, MD 21157



2022

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Executive Summary

The 2022 Carroll County Hazard Mitigation Plan (the Plan) is intended to be a guide for the implementation of mitigation projects and initiatives within Carroll County. It is comprised of four main sections: background information is included in Chapters 1-4, hazard specific information is found in Chapters 5-11, all-hazard mitigation measures are described in Chapter 12, and information about the plan monitoring and maintenance process is included in Chapter 13. References, a glossary, and several informational appendices are contained at the end of the document.

Chapter 1 discusses mitigation and its relation to the larger emergency management picture. Information about the mitigation programs and funding that are available at the Federal level, background information about the legislation that provides for those programs and the process that must be followed in order to participate in them is also discussed in Chapter 1. Mitigation is only one phase of the four-phase emergency management cycle – preparedness, response and recovery make up the other three. The goal of mitigation is to reduce or eliminate the probability of an emergency or disaster ever occurring; mitigation activities can also include those that are intended to postpone, dissipate or lessen the effects of an emergency or disaster.

Chapter 2 sets forth countywide goals, objectives and strategies that were utilized to complete the Plan. The goals include prevention of emergencies or disasters through protection of life and property, community education, natural resource protection and sustainable development, enhanced provision of emergency services, inter-jurisdictional and community partnerships, and monitoring, maintenance, and implementation of the Plan. Benefits to the County resulting from the development and implementation of the Plan are discussed. Some of those benefits include the ability of Carroll County as well as its municipalities to participate in Federal hazard mitigation funding programs; saving lives and property by reducing vulnerability to disaster events; saving money, since the costs of mitigation are usually less than the costs of recovery; making clear, well-thought out decisions in advance of a disaster; and improving Community Rating System (CRS) classifications which can lower National Flood Insurance Program premiums for residents.

Chapter 3 outlines the process that was undertaken to develop and complete the Plan, the methods utilized to complete the risk assessments included in the Plan, and the process that was used to develop the mitigation strategies outlined in the Plan. The opportunities that were provided for community and municipal participation in Plan development are also discussed in

Chapter 3. Suggestions for changes and additions to the content of the Plan were incorporated into the final draft.

Chapter 4 contains a community profile, with information about Carroll County's geography, physical environment and demographics. The relationship between the County and the municipalities is discussed, as is the relationship between hazard mitigation planning and comprehensive planning.

Chapters 5 through 11 address each hazard for which the County or one of its municipalities is at risk. Each of these chapters includes an analysis of a specific hazard and an assessment of risks and potential damage to critical facilities; population, people and residences; agricultural and natural resources; major employers; and historic resources from that hazard, as well as existing and potential mitigation strategies to address those risks. Potential mitigation strategies are separated into high priority projects and projects that are a lower priority now but will be considered in the future. Projects with the greatest benefits compared to the associated costs of completing the project will be given the first priority for mitigation grant funding requests. Chapter 5 discusses drought, Chapter 6 addresses flooding, Chapter 7 deals with thunderstorms and wind, Chapter 8 addresses tornadoes, Chapter 9 talks about winter storms, Chapter 10 discusses soil movement, and Chapter 11 deals with dam failures. Within each chapter, multiple maps and tables provide additional information about the hazards discussed.

Chapter 12 is devoted to the discussion of those mitigation strategies and initiatives that are more general in nature and that are applicable to most, if not all, of the hazards identified in the Plan. These mitigation strategies are also separated into higher-priority and lower-priority measures in the same manner as the initiatives in each of the risk specific chapters are grouped.

Chapter 13 outlines and discusses the methods by which implementation of the Plan will be monitored and updates of the Plan will be accomplished. The lead agency responsible for both monitoring of plan implementation and updating the Plan is the Department of Public Safety. Other agencies with responsibilities related to the maintenance and update of the Plan, with which the Department of Public Safety works closely, include the Department of Planning and the Department of Land and Resource Management, and the Department of Public Works. The Carroll County Local Emergency Planning Committee (LEPC) serves in an advisory role and assists the Department of Public Safety with mitigation planning updates. The Plan will be updated and reviewed on a five-year cycle.

A glossary of terms and acronyms used in the Plan and a section that lists the reference materials utilized to develop the Plan are included immediately after Chapter 13. Several appendices are included as well. Appendix A contains capability assessment information. Appendix B includes a map depicting the location and types of critical facilities throughout the county. Maps showing the existing use of land in Carroll County can be found in Appendix C. Appendix D includes maps showing the designated future use of land, and Appendix E includes high hazard impact maps by Growth Area. Appendices F and G include additional detail regarding public and municipality involvement in the Plan development process, while Appendix I provides space for inclusion of documentation relating to the adoption of the Plan by participating jurisdictions.

Chapter One: Hazard Mitigation Planning – An Introduction

Mitigation Planning as Part of the Larger Emergency Management Picture

Emergency activities are divided into four phases that require different types of organization and preparation.

In general, mitigation is the initial phase. It should take place long before an emergency occurs. It includes any activities aimed at eliminating or reducing the probability of occurrence of an emergency or disaster. It also includes activities designed to postpone, dissipate, or lessen the effects of a disaster or emergency. The goal of mitigation is to decrease the need for response.

Preparedness is an insurance policy against emergencies since we cannot anticipate every disaster. It is a critical component because mitigation activities alone cannot prevent emergencies. One goal of preparedness is to increase response capability. Preparedness includes planning to ensure the most effective, efficient response as well as efforts to minimize damage. Preparedness measures might include forecasting and warning systems or developing protocols to enable a rapid response, such as stockpiling supplies and readying facilities for disaster response.

Response is the first phase that occurs after the onset of a disaster. It is intended to provide emergency assistance for disaster victims. It includes search and rescue, providing emergency shelters and medical care, as well as anti-looting patrols, sandbagging against impending floodwaters, or any other measures that may enhance future recovery operations.

Recovery activities continue well beyond the initial response immediately following the disaster. Their purpose is to return all systems, both formal and informal, to normal. They can be broken down into short-term and long-term activities. Short-term activities attempt to return vital human systems to minimum operating standards and usually encompass approximately a two-week period. Long-term activities stabilize all systems. These include such functions as redevelopment loans and legal assistance as well as the actual rebuilding of community resources. Long term recovery activities can encompass months to years.

The Federal Emergency Management Agency's (FEMA's) Community Lifelines system enables the continuous operation of critical government and business functions during a natural, technological, or manmade hazard or event. Community lifelines are essential to preserving human health, safety, and/or economic security. They represent "the most fundamental services in a community, that when stabilized, enable all other aspects of society to function." The Community Lifelines program is FEMA's framework for emergency response. It prioritizes the rapid stabilization of community lifelines after a hazard or disaster event. This "integrated

network of assets, services, and capabilities that provide lifeline services are used day-to-day to support the recurring needs of the community and enable all other aspects of society to function.

When disrupted, decisive intervention, rapid re-establishment, or employment of contingency response solutions is required to stabilize the incident.” While the Lifelines were developed to support response planning and operations, the concepts can still be applied through the mitigation and preparedness phases of the emergency management cycle. Efforts to protect lifelines and to prevent and mitigate potential impacts to them will increase the overall resilience of communities. By taking these critical services into consideration when conducting mitigation planning efforts, communities help ensure that these Lifelines are either not interrupted, reduce the amount of time they may be down or out of service, and/or provide support to contingency plans already in place.

FEMA’s seven Community Lifelines are:

1. **Safety and Security** – Law Enforcement/Security, Fire Service, Search and Rescue, Government Service, Community Safety
2. **Food, Water, Shelter** – Food, Water, Shelter, Agriculture
3. **Health and Medical** – Medical Care, Public Health, Patient Movement, Medical Supply Chain, Fatality Management
4. **Energy** – Power Grid, Fuel
5. **Communications** – Infrastructure, Responder Communications, Alerts Warnings and Messages, Finance, 911 and Dispatch
6. **Transportation** – Highway/Roadway/Motor Vehicle, Mass Transit, Railway, Aviation, Maritime
7. **Hazardous Material** – Facilities, HAZMAT, Pollutants, Contaminants



The Lifelines potentially affected by each hazard addressed in this Plan are indicated at the beginning of the Risk Assessment section of each applicable chapter.

Experience shows that the phases of the emergency management process are cyclical rather than linear. All activities and experiences lead individually and cumulatively back to the mitigation phase. We improve our efforts to prevent and diminish future emergencies by applying what we learn during past events. Fortunately, in many cases, these lessons can be learned by simulating an emergency through training and exercises, and then analyzing the results of a planned mitigation or response.

Minimizing Losses & Costs with Mitigation Planning

A hazard is an event or condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss.

Mitigation, as it relates to emergency management, is any action taken to reduce or eliminate risk to people and property from hazards and their effects. Hazard mitigation measures are the collective steps taken by individuals, businesses, governments, or any other community stakeholders to prevent or reduce losses from any type of emergency.

According to FEMA's *Local Hazard Mitigation Planning Handbook*, mitigation is defined as any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event. The goal of mitigation is to decrease the need for response as opposed to simply increasing the response capability. Mitigation can save lives and reduce property damage and is cost-effective and environmentally sound. This, in turn, can reduce the enormous cost of disasters to property owners and all levels of government. In addition, mitigation can protect critical community facilities, reduce exposure to liability, and minimize community disruption.

Mitigation occurs at the local level. Local governments must recognize hazards and initiate mitigation actions. This can be accomplished by enacting and enforcing building codes, zoning ordinances, and other measures to protect life and property. In addition, governments can inform citizens of hazards as well as measures they can take to reduce risks and potential losses. At the federal, state, and local level, regulations are written to reduce disaster costs and preserve and protect natural, historic, and cultural resources. Mitigation can benefit a community by saving lives, reducing damage to buildings and properties, and lowering flood insurance rates. A local mitigation plan helps to identify specific hazard areas and risks while recommending specific projects which will help reduce or prevent impacts from those hazards.

The local mitigation plan demonstrates a jurisdiction's commitment to reduce risks from hazards. Further, it guides decision makers as they commit resources to reducing the effects of

natural or man-made hazards. Local plans also serve as the basis for State-provided technical assistance and to prioritize project funding.

Mitigation planning to prevent disasters is similar for either natural or human-caused hazards. An effective mitigation planning process includes:

- Identifying & organizing resources
- Conducting risk or threat assessments & estimating losses
- Identifying effective mitigation measures to address the hazards & developing a prioritized strategy to implement these measures
- Executing the measures, evaluating the results, and regularly updating the plan

Integration of Mitigation into Overall Planning Efforts

Mostly due to the timing of the ten-year cycle Comprehensive Plan requirement for jurisdictions, the principal planning mechanisms for the jurisdictions have incorporated few hazard mitigation goals and actions since the adoption of the 2014 Carroll County Hazard Mitigation Plan. Mitigation actions taken by the participating municipalities have mostly been the result of some specific circumstance unforeseen during the planning process.

Below is a list of the major plans associated with each jurisdiction within the County boundaries, along with the mitigation integration actions either already incorporated or planned to be incorporated in future updates.

Plan Name	Description	Mitigation Integration
2014 Carroll County Comprehensive Plan – 2019 Amendment	The Comprehensive Plan is the basic foundation for local planning and is required under Article 66 of the Annotated Code of Maryland. It lays out the community vision and priorities and describes, where, how, and in some cases, when development will occur.	Incorporates FEMA floodplain information into Chapter 13: Environmental Resources. In the next Plan, consider a section that specifically addresses current and future development in hazard-prone areas, along with the mitigation goals and actions outlined in the Carroll County HMP.
2018 Freedom Community Comprehensive Plan	The 2018 Freedom Community Comprehensive Plan is the framework for land use, growth management, agricultural policies, economic development, water resources, natural environmental resources, community facilities and services, and recreational resources for the greater Eldersburg/Sykesville area.	Incorporates FEMA floodplain information into Chapter 13: Environmental Resources. In the next Plan, consider a section that specifically addresses current and future development in hazard-prone areas, along with the mitigation goals and actions outlined in the Carroll County HMP.
2013 Finksburg Corridor Plan	The 2013 Finksburg Corridor Plan reflects the desires expressed by residents and business people to enhance their community.	In the next Plan, consider a section that specifically addresses current and future development in hazard-prone areas, along with the mitigation goals and actions outlined in the Carroll County HMP.
2017 Carroll County Water & Sewer Master Plan - Adopted February 2019	The purpose of the Water and Sewer Master Plan is to further the health and welfare of citizens residing or working in Carroll County through the orderly development and expansion of adequate water and sewer systems.	Incorporates stormwater management and floodplains into the Plan. In the next Plan, consider a section that specifically addresses current and future development in hazard-prone areas, along with the mitigation goals and actions outlined in the Carroll County HMP.

Plan Name	Description	Mitigation Integration
Hampstead Community Comprehensive Plan, 2010	The 2010 Hampstead Community Comprehensive Plan is a blueprint for growth in and around the Town of Hampstead.	Incorporates floodplain concerns into Chapter 9: Natural Agricultural Resources. In the next Plan, consider a section that specifically addresses current and future development in hazard-prone areas, along with the mitigation goals and actions outlined in the Carroll County HMP.
2018 Manchester Comprehensive Plan	The comprehensive plan is a collection of goals, objectives, policies, and recommendations that guide the growth and development of the Town of Manchester.	Includes floodplain considerations into mapping goals. In the next Plan, consider a section that specifically addresses current and future development in hazard-prone areas, along with the mitigation goals and actions outlined in the Carroll County HMP.
2013 Mount Airy Master Plan	The Master Plan guides land use decisions made by the Planning Commission and Town Council.	In the next Plan, consider a section that specifically addresses current and future development in hazard-prone areas, along with the mitigation goals and actions outlined in the Carroll County HMP.
2007 New Windsor Community Comprehensive Plan as Amended in 2010	The purpose of the comprehensive plan is to provide a legal framework that guides the growth and development of a community.	Addresses stormwater management systems and floodplain management. In the next Plan, consider a section that specifically addresses current and future development in hazard-prone areas, along with the mitigation goals and actions outlined in the Carroll County HMP.
Vision 2030, Town of Sykesville	The purpose of the comprehensive plan is to provide a legal framework that guides the growth and development of a community. The	Incorporates HMP into Environmental Stewardship section.

Plan Name	Description	Mitigation Integration
Comprehensive Plan	Sykesville Vision 2030 Comprehensive Plan serves as the official policy guide for short-term and long-term decision making relative to priority investments in the Town of Sykesville over the next 10 years.	In the next Plan, consider a section that specifically addresses current and future development in hazard-prone areas, along with the mitigation goals and actions outlined in the Carroll County HMP.
2010 Taneytown Community Comprehensive Plan	The Taneytown Community Comprehensive Plan is a blueprint for growth in and around the City of Taneytown.	Incorporates floodplains into planning of the Greenway and Environmental Resources. In the next Plan, consider a section that specifically addresses current and future development in hazard-prone areas, along with the mitigation goals and actions outlined in the Carroll County HMP.
2008 Union Bridge Community Comprehensive Plan as Amended 2014	The Union Bridge Community Comprehensive Plan is a blueprint for growth in and around the Town of Union Bridge.	Incorporates floodplains into the Plan. In the next Plan, consider a section that specifically addresses current and future development in hazard-prone areas, along with the mitigation goals and actions outlined in the Carroll County HMP.
City of Westminster 2009 Comprehensive Plan	The Comprehensive Plan is the basic foundation for local planning and is required under Article 66 of the Annotated Code of Maryland. It lays out the community vision and priorities and describes, where, how, and in some cases, when development will occur.	Environmental Resources and Protection element incorporates floodplains. In the next Plan, consider a section that specifically addresses current and future development in hazard-prone areas, along with the mitigation goals and actions outlined in the Carroll County HMP.

FEMA Hazard Mitigation Assistance Grant Programs

FEMA provides several Hazard Mitigation Assistance grant programs to help state, local and tribal governments obtain funding for eligible activities that reduce or eliminate long-term risk to people and property from future disasters. Homeowners and business operators cannot apply directly to FEMA for hazard mitigation grant funding.

Hazard Mitigation Grant Program (HMGP)

The HMGP is authorized by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Funding under this program is specifically authorized with a Presidential Major Disaster Declaration. Governors or tribal chief executives may request HMGP funding in conjunction with the submission of a disaster declaration request. If approved, funding is made available to the requesting state that, in turn, provides sub-grants to local jurisdictions for mitigation activities. Federal funding for HMGP projects can account for up to 75% of the project's total eligible costs with the remaining 25% being the required local match, which can be met with cash, in-kind resources, or a combination of both.

Building Resilient Infrastructure and Communities (BRIC)

The BRIC competitive grant program was implemented by FEMA beginning in Federal Fiscal Year 2020. BRIC is authorized by Section 1234, National Public Infrastructure Pre-Disaster Hazard Mitigation, of the Disaster Recovery Reform Act (DRRA) of 2018. The overarching goal of the BRIC program is to foster a shift from reactive disaster response spending to proactive, pre-disaster investments in community resilience. BRIC is a competitive program, and applicants need to apply for project funding on a yearly basis. BRIC encourages public infrastructure projects, projects incorporating nature-based solutions, and the adoption and enforcement of modern building codes. In addition, this includes projects that mitigate the risk to one or more Community Lifelines that enable continuous operation of critical government and business functions that are essential for human health and safety or economic security.

Flood Mitigation Assistance Program (FMA)

FMA grants are intended to assist states and local communities with mitigation of flood-damaged properties, with the overall goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). The FMA is authorized by Section 1366 of the National Flood Insurance Act of 1968.

All mitigation projects funded under any of the programs listed above must be cost-effective, technically feasible and compliant with the National Environmental Policy Act (NEPA) and any

other applicable regulatory and legal requirements contained in federal, state or local laws. All applicants and sub applicants requesting hazard mitigation funding must have a FEMA-approved Hazard Mitigation Plan.

44 Code of Federal Regulations (CFR), Part 201.6

The content requirements for local mitigation plans are contained in section 44 CFR and focus primarily on natural hazards. As with many other civic planning endeavors, opportunities for public involvement and comment are essential to developing a practical and useable document. Further, bona fide and documented public participation is required for plan approval. Every jurisdiction within the plan's geographic area is expected to actively join in drafting and adopting the document. The plan should include both currently developed areas as well as areas planned for future development. The plan should assess the impact of identified hazards for existing development as well as the potential for additional impacts from future development for each hazard.

Chapter Two – Mitigation Plan Foundation

Definitions

For this Hazard Mitigation Plan, the following definitions for the document’s goals and objectives are utilized:

Goals are general guidelines, usually expressed as broad policy statements, which represent desired long-term results. They seek to address problems and situations identified during vulnerability and capability assessments.

Objectives describe implementation steps to attain the identified goals. Objectives are more specific statements than goals. The steps described are usually measurable and can have a defined completion date.

Countywide Hazard Mitigation Plan Goals

Prevention through...

1. Protection of Life and Property

- Implement cost-effective and technically feasible mitigation projects to protect lives by making homes, businesses, infrastructure, historic and cultural resources, and critical facilities more resistant to hazard events.

Objectives:

1. Ensure that critical facilities are protected from effects of hazard events to the maximum extent possible
2. Ensure that impacts from hazard events on public infrastructure are minimized
3. Reduce the potential impact of hazard events on the County’s historic and cultural treasures
4. Improve the resistance of structures against hazard events

2. Community Education

- Protect public health, safety, and welfare by increasing public awareness of existing hazards and mitigation activities that reduce the risk to citizens, public agencies, private property owners, businesses, and schools
- Foster individual responsibility in mitigating risks due to hazard events

Objectives:

1. Work with the Carroll County Board of Education to teach hazard mitigation topics; seek opportunities to integrate mitigation into the curriculum, including science, math, social studies/history, career and technology, or other subjects
2. Educate property owners on the individual mitigation measures that can be taken before the next hazard event
3. Identify, improve, and sustain collaborative programs focusing on the real estate industry, the development community, and public and private sector organizations to avoid activity that increases risk from hazards
4. Identify mechanisms to educate the business community on minimizing the risk of hazard events and implementing mitigation projects

3. *Natural Resource Protection & Sustainable Development*

- Promote growth in a sustainable manner
- Balance watershed planning, natural resource management, and land-use planning with hazard mitigation to protect life, property, and the environment

Objectives:

1. Incorporate hazard mitigation into long-range comprehensive and functional planning activities
2. Promote beneficial uses of hazardous areas while expanding open space and recreational opportunities
3. Protect the community's water supply
4. Utilize regulatory approaches to prevent creation of future hazards to life and property and to minimize risk to environmentally sensitive areas

4. *Emergency Services*

- Improve and enhance the capability of emergency services to prevent or minimize impacts and risks from hazard events

Objective:

1. Coordinate hazard mitigation activities with other public safety and emergency management activities

5. *Interjurisdictional & Community Partnerships*

- Strengthen communication and coordinate participation among and within public agencies, citizens, non-profit organizations, business, and industry to gain a vested interest in implementing and improving emergency operations

- Encourage leadership within public and private sector organizations to prioritize and implement municipal, county, and regional hazard mitigation activities

Objective:

1. Develop public and private partnerships to foster hazard mitigation program coordination and collaboration in Carroll County

6. Plan Monitoring, Maintenance, & Implementation

- Establish a process to monitor, evaluate, and update the hazard mitigation plan based on analysis of implemented prevention measures

Objectives:

1. Enhance the County's ability to collect, maintain, and utilize data that could be useful for mitigation projects, preparedness, response, and/or recovery, as well as to conduct hazard risk assessments and track mitigation activities
2. Establish a sustainable process for implementing, monitoring, and evaluating countywide mitigation activities
3. Identify and pursue funding opportunities to assist with development and implementation of County and municipal mitigation activities

Benefits of the Plan

Development and ongoing monitoring and maintenance of the Hazard Mitigation Plan will benefit the community in many ways, such as:

- Saving lives and property by reducing vulnerability to disaster events;
- Creating opportunities to apply for more pre-disaster mitigation funding;
- Saving money, as the costs of mitigation are usually less than the costs of response and recovery;
- Enhancing existing county and municipal partnerships through sharing resources and developing a unified, countywide mitigation strategy;
- Focusing combined resources on areas specifically identified as hazard-prone;
- Making clear, well-thought out decisions in advance of a disaster; and
- Improving Community Rating System (CRS) classifications by implementing prioritized mitigation initiatives, thereby lowering NFIP premiums

Chapter Three – Planning Process and Content

Plan Development

Development of the CCHMP began in 2019 with the identification of core planning team members. Representatives of the following Carroll County agencies comprised the initial core planning team:

- Department of Public Safety – Emergency Management (Emergency Management Manager; Emergency Management Assistant Manager)
- Department of Planning (Director; Planning Manager; Comprehensive Planning Technicians; GIS Technician)
- Department of Land and Resource Management (Director; Environmental Review Supervisor/Floodplain Management & GIS Specialist; GIS Manager)

The core planning team then reviewed the 2013 Carroll County Hazard Mitigation Plan to identify strengths, opportunities for improvement and expansion, and determination of the status of mitigation measures proposed in that version. These activities were followed by initial plan related research, as well as individual meetings with key municipal staff which were held in the fall of 2019 (see Appendix F for detail regarding dates and participants). After these initial meetings were held, the text of the plan and various maps, charts and graphs were created and incorporated into a working draft.

The onset of the COVID-19 pandemic in early 2020 and the associated ongoing response brought unprecedented challenges to the overall hazard mitigation planning process. However, work on the Plan continued, as time and staffing availability allowed, throughout 2020, 2021 and early 2022. ***Many thanks to all who have persevered to create this document.***

The initial draft of the plan was circulated among various stakeholders for review and input. Stakeholders included representatives from multiple county agencies and departments including the Department of Land and Resource Management, the Department of Public Works, and the Department of Planning; all eight municipalities located within the county; the Carroll County Local Emergency Planning Committee (LEPC); and additional various agencies and organizations.

After receiving comments and suggestions, an updated draft was created that incorporated the appropriate changes. This draft was transmitted to the Maryland Department of Emergency Management for review and subsequent transmittal to FEMA from which approval pending adoption status was requested.

Any changes that were required by FEMA were made, and after receiving approval pending adoption status, the final plan was presented to each municipality as well as the Carroll County Board of Commissioners – adoption by Carroll County and each municipality was requested. Copies of the adoption documentation from each jurisdiction are included in Appendix I.

Hazard Identification and Analysis

Identifying the types of hazards which could likely affect a community is the first step in planning effective prevention measures. There are three general hazard categories typically considered in mitigation planning: natural, technological, or human-caused.

- Natural hazards generally result from weather-related conditions or other natural phenomena. They include severe storms and wind, winter storms, drought, various types of flooding, tornadoes, wildfires, and soil movements.
- Technological hazards include large-scale or catastrophic situations such as significant hazardous materials incidents; dam failures; nuclear or industrial accidents; or transportation incidents such as large-scale traffic collisions, train derailments, and the like.
- Human caused hazards typically result from intentional human activities such as acts of terrorism, school violence, large-scale riots, or other civil disturbances.

Currently, FEMA only requires that natural hazards be addressed in an HMP. However, the HMP becomes an infinitely more valuable resource if it attempts to include all hazards that could potentially affect a community. This approach reflects nationwide trends for local plans to consider the multi-hazard approach.

The various types of hazards, the types of resources affected, as well as the probability of occurrence associated with those hazards are important factors in determining how to mitigate their impacts. For this plan, hazards were defined by typical characteristics, potential effects in the community and extent of impacts, as well as by their occurrence regionally and within Carroll County. A preliminary survey helped to identify the natural, technological, and human caused hazards which pose the greatest threats to the County and its municipalities. The CCHMP addresses all hazards which were assessed by the Carroll County HMP planning team to present a medium or higher level of risk within Carroll County. Future additional hazard chapters pertaining to evolving threats – for example, extreme temperature events and public health emergencies – are planned for development as outlined in Chapter Thirteen – Monitoring and Maintenance.

The sources of information used to help identify and describe the hazards include but are not limited to the following:

- 2021 Maryland State Hazard Mitigation Plan
- History, Knowledge, & Expertise of County Agencies
- History, Knowledge, & Expertise of Municipal Staff
- History, Knowledge, & Expertise of Community Members
- Applicable USGS maps and publications
- National Weather Service (NWS)
- National Oceanic and Atmospheric Administration (NOAA)
- Flood Insurance Rate Maps
- U. S. Army Corps of Engineers National Dam Database
- Maryland Department of the Environment
- County GIS Data Layers

Once the relevant hazards were identified by type and degree of risk, areas of greatest potential impact needed to be defined. For many hazards, the highest impact areas can be easily delineated by using boundaries already known from prior emergency planning efforts or existing data. Examples of previously defined hazard areas include FEMA-mapped floodplains, previously designated dam breach inundation areas and quarry Zones of Influence (ZOIs).

Determining how many people will be affected and in what ways is one of the most critical considerations in specifying hazard impact areas. Factors include defining existing population or occupation centers, areas planned for any type of future development, and locations of more vulnerable populations including anyone requiring additional assistance during a disaster due to issues including age, disability, lack of transportation or language barriers.

Given that the primary goal of the CCHMP is the protection of lives and property, those portions of Carroll County with the highest concentrations of both population and built resources have been determined to be the highest impact areas for many types of hazards. The exception was the risk presented by an extended, severe drought. Impacts from a lack of water would be felt across the entire community due to lost water and drinking water supplies, lost crop production, and businesses or institutions whose operations would be curtailed.

Generally, the highest concentrations of population and buildings are found in the county's designated Growth Areas (GA). These GAs correspond to the planned future limits of all eight of the County's municipalities as well as un-incorporated areas which are long established community and population centers. Each of these areas has a standing community

comprehensive plan. Each of these areas is also addressed in relevant functional plans such as county-wide plans for water and sewerage, mineral resources, environmental resources, or transportation. By utilizing these commonly understood planning areas, the task of planning for hazard mitigation can be more easily translated and incorporated into any existing plan. Maps are included in Appendix C which display the current existing use of land for each GA as well as for the surrounding county; additional maps in Appendix C identify the types and locations of future development described as the designated land use as anticipated on the comprehensive plan map for the county and each GA.

Maps were also created that identified where and how hazards can affect the community. The maps show the areas most at risk for each hazard type. Maps depicting the hazard high impact areas for winter storms, thunderstorms and wind, and tornadoes are included in Appendix D and referenced where appropriate throughout the Plan, while maps depicting the hazard areas for flooding, dam failure and soil movement are incorporated into the specific chapter for each of these hazards. This document seeks to describe that these areas have the highest degree of risk and/or highest level of impact from the particular type of hazard event.

Risk Assessments

A risk assessment is the process of measuring potential loss of life, personal injury, economic injury, and property damage resulting from hazard events.

Vulnerable assets are buildings, structures, facilities, resources, and population centers that will likely sustain the most damage or loss in a hazard event.

A risk assessment defines potential risks and vulnerabilities for each type of hazard which could affect a specific hazard area. Following the identification of hazard areas, assets are inventoried to determine what facilities and resources might be affected. Inventoried resources typically include public and quasi-public facilities, infrastructure, major employers, historic and cultural resources, and residences. Records from previous events and damages were also useful for developing estimates of potential losses. Risks were quantified by assigning potential dollar-loss estimates to vulnerable assets.

Potential injury or loss of lives is an important consideration in estimating vulnerability. Census data, locally adopted comprehensive plans, tax assessment data, and Department of Planning demographic data were used to estimate population in each hazard area.

The Maryland Department of Assessment and Taxation database was queried, and aerial photographs reviewed to identify the location and improved value of private assets/structures within each of the hazard areas. U.S. Census data was also consulted for housing value

information. Valuations assumed current market assessment values for the affected properties which may or may not reflect actual repair or replacement costs. Estimates of potential losses in defined hazard areas with a limited number of developed properties or structural assets were totaled to estimate maximum total loss or average valuations were used and multiplied by the number of properties. In some risk assessments, an entire growth area may be delineated as the hazard area, such as for winter storms and severe storms and wind. Here, the number of developed properties was totaled and then multiplied by an average value unique to that area. This valuation data was factored for the type and number of affected sites to develop damage estimates for other unique or defined hazard areas. Details of calculation methods are explained in the individual hazard chapters.

Critical facilities are those systems or structures that must function during emergency situations or afterwards to enable recovery efforts. They permit public safety officials to provide the continuity of operations expected by affected populations. Critical facilities addressed in this plan include fire stations, hospitals and medical clinics, police stations, emergency operations centers, schools (K-12 and colleges), water treatment and wastewater treatment plants, long term care facilities, regional airports, county and municipal government buildings, and detention centers. These are the facilities that are essential to maintaining basic government functions or to the effective implementation of emergency response and recovery operations. Critical public and quasi-public facilities and infrastructure were identified through several methods.

A review of County GIS data was utilized to identify and map critical facilities. Coordination with the appropriate County agencies and with the municipalities further clarified which facilities are critical to continuity of operations. The asset value of these facilities and infrastructure was also estimated and included where available or appropriate. A combination of assessment data and data from the County Department of Management and Budget was used to estimate values for critical facilities. These resources have been generally identified on the maps. However, for security purposes, some detailed information is omitted from this plan; examples include vulnerability studies of critical infrastructure and data on security plans and systems.

Coordination with the County Department of Economic Development along with reliance on the combined institutional knowledge of staff from County agencies as well as review of the Department of Planning's "existing use of land" data was used to identify major employers. Maryland Assessment and Taxation data, and information from the County Departments of Economic Development and Management and Budget was used to estimate economic injury.

The Planning Team also sought help from appropriate local businesses to identify potential losses and the dollar figures associated with them.

The Maryland Inventory of Historic Properties was used to identify locations of historic structures. The “existing use of land” data and the planners for each geographic area in the county were consulted to identify cultural resources. Assessment data was used to estimate the tangible cost of damages and losses.

Where relevant, Carroll County Agricultural Land Preservation Program staff and the Agricultural specialist from the Department of Economic Development were consulted to identify assets and impacts to the agricultural industry in the county. Sources of information included the Agricultural Census, the Soil Conservation Service, and the local extension service, among others.

The information related to the risk assessment can be found in the relevant section of each hazard chapter.

Development of Mitigation Strategies

Mitigation strategies were developed to provide a blueprint for reducing the potential losses identified in the risk assessment. These recommendations were based on legislated powers, existing operating policies or duties, programs, and available resources, as well as the assessed ability to expand on or improve these existing tools. The overall mitigation strategies and priorities remain unchanged from the previous version of the Carroll County Hazard Mitigation Plan (adopted in 2014), and strive for prevention under one of the following goal categories:

- Protection of life and property
- Community education
- Natural resource protection and sustainable development
- Interjurisdictional and community partnerships
- Plan monitoring, maintenance, and implementation

Several subtasks were pursued to accomplish the overall development of these mitigation strategies:

- Mitigation goals were established.
- Existing mitigation measures and mitigation measures currently underway, including mitigation-related policies, programs, projects, and ordinances, were identified and described.

- A range of recommended specific mitigation actions and projects for each hazard were identified.
- Proposed mitigation measures were prioritized, using the goal categories listed above as a guide and the combined institutional and anecdotal knowledge of the Core Planning Group and municipal planning partners as a valuable resource. While it was not feasible to complete an in-depth benefit-cost analysis for each proposed mitigation measure, a planning level assessment of whether the likely costs for each measure would be reasonable compared to each measure’s probable benefits was conducted. The increased level of protection afforded by each proposed mitigation measure, particularly for those measures directed towards protection of critical facilities and infrastructure, was weighed against the expected overall costs of implementation and ongoing maintenance. Technical feasibility and the administrative and operational capabilities of all involved jurisdictions were also considered.
- Implementation of the proposed mitigation measures was described and identification of the agencies responsible for administering those measures took place.

The LEPC provided feedback and input on mitigation measures. Coordination with the municipalities provided information about mitigation measures already in place, as well as further input on identifying and prioritizing appropriate mitigation strategies.

Plan Monitoring and Maintenance

This task required developing a methodology and schedule for monitoring, evaluating and updating the plan based on a five-year cycle. Beyond simply a schedule to review, amend, or update the HMP, procedures were established to monitor and evaluate the effectiveness of the plan and its implementation measures. Efforts to include HMP mitigation planning and implementation recommendations into existing and future comprehensive plans were also begun.

Plan Adoption

Adopting the Plan does not obligate communities to undertake particular actions. Rather, it demonstrates the community’s support of and commitment to fulfilling the hazard mitigation goals and actions outlined in the Plan. As a multi-jurisdictional plan, the County and each participating municipality adopted the Plan. After the Plan attained “approvable pending adoption” status from FEMA, Department of Public Safety staff presented it to the Carroll County Board of Commissioners, and subsequently the Board of Commissioners formally

adopted the Plan. Written documentation of adoption by each participating jurisdiction and/or municipality was included as part of the adopted plan.

Hazard Mitigation Planning Committee

Representatives of the local municipalities and the County were invited to serve on the Hazard Mitigation Planning Committee, tasked with conducting a compliant hazard mitigation planning process and updating the 2013 Hazard Mitigation Plan. The below table identifies the members of the committee, the agencies they represent, and their participation.

First Name	Last Name	Position/Role	Agency or Municipality	Participation
John	Breeding	Director of Planning and Zoning Town of Mount Airy	Town of Mount Airy	Municipality Meeting – 2019 Municipality Meeting - 2022 PRT Review
Gina	Campanile	Communications	Town of Mount Airy	Municipality Meeting – 2019
Scott	Campbell	Director	Department of Public Safety	Initial Draft Review
Christy	Collins	Project Manager	Town of Hampstead	Municipality Meeting – 2019
Kathleen	Comber	GIS Technician	Carroll County Department of Planning	Workgroup Meeting #1 Workgroup Meeting #3 Workgroup Meeting #5 Workgroup Meeting #6
Joe	Cosentini	Town Manager	Town of Sykesville	Municipality Meeting – 2019 Municipality Meeting – 2022 PRT Review
Daniel	Dennis	Director, Information Technology	City of Taneytown	Municipality Meeting – 2019 Municipality Meeting - 2022
Mark	Depo	Community Planning & Development	City of Westminster	Municipality Meeting - 2022 PRT Review
John	Dick	Public Works	City of Westminster	Municipality Meeting – 2022
Gary	Dye	Town Manager	Town of New Windsor	Municipality Meeting – 2019 Municipality Meeting - 2022

First Name	Last Name	Position/Role	Agency or Municipality	Participation
Jason	Etzler	Chief of Police	City of Taneytown	Municipality Meeting – 2019 Municipality Meeting – 2022
Tiffany	Fossett	Planning Technician	Department of Planning	Municipality Meeting – 2022 (Manchester, New Windsor, Mount Airy, Taneytown, Sykesville, Westminster, Union Bridge) Initial Draft Review PRT Review
Andrea	Gerhard	Planning	City of Westminster	Municipality Meeting – 2019
Richard	Gibson	Major, Police Department	City of Westminster	Municipality Meeting – 2022
Jeff	Glass	Director, Public Works	City of Westminster	Municipality Meeting – 2019
Andrew	Gray	Comprehensive Planner	Carroll County Department of Planning	Municipality Meeting – 2022 (Manchester, Hampstead)
Darryl	Hale	Director, Planning	City of Taneytown	Municipality Meeting – 2022 PRT Review
Kevin	Hann	Superintendent, Public Works	Town of Hampstead	Municipality Meeting – 2019 Municipality Meeting - 2022
Valerie	Hawkins	Emergency Management Manager	Carroll County Department of Public Safety/Emergency Management	Kickoff Meeting Workgroup Meeting #1 Workgroup Meeting #2 Workgroup Meeting #3 Workgroup Meeting #4 Workgroup Meeting #5 Workgroup Meeting #6 Workgroup Meeting #7 Workgroup Meeting #8 Workgroup Meeting #9 Status Update #1 Initial Draft Review PRT Review All Municipality Meetings – 2019 & 2022

First Name	Last Name	Position/Role	Agency or Municipality	Participation
Christopher	Heyn	Director	Carroll County Department of Land and Resource Management	Workgroup Meeting #8 Status Update #1 Initial Draft Review
Jacob	Hill	Emergency Management Planning Associate Emergency Management Assistant Manager	Carroll County Department of Public Safety/Emergency Management	Kickoff Meeting Workgroup Meeting #1 Workgroup Meeting #2 Initial Draft Review PRT Review
Sarah	Imhulse	City Administrator	City of Westminster	Municipality Meeting – 2022
Brian	Johnson	Superintendent, Public Works	Town of Mount Airy	Municipality Meeting – 2019
Perry	Jones, Jr.	Mayor	Town of Union Bridge	Municipality Meeting – 2019 Municipality Meeting – 2022
Rodney	Kuhns	Director, Public Works	Town of Manchester	Municipality Meeting – 2019 Municipality Meeting - 2022 PRT Review
Mary	Lane	Planning Manager	Carroll County Department of Planning	Kickoff Meeting Workgroup Meeting #1 Municipality Meeting – 2019 Municipality Meetings – 2022 (New Windsor, Mount Airy, Sykesville Workgroup Meeting #3 Workgroup Meeting #7 Initial Draft Review PRT Review
Tammi	Ledley	Town Manager	Town of Hampstead	Municipality Meeting – 2019 Municipality Meeting - 2022
Tom	Ledwell	Chief of Police	City of Westminster	Municipality Meeting – 2019
Christopher	Letnaunchyn	Bureau Chief, Engineering	Carroll County Department of Public Works	Initial Draft Review
Barb	Matthews	City Administrator	City of Westminster	Municipality Meeting – 2019

First Name	Last Name	Position/Role	Agency or Municipality	Participation
Dawn	Metcalf	Town Clerk/Treasurer	Town of Union Bridge	Municipality Meeting – 2019 Municipality Meeting - 2022
Steve	Miller	Town Manager	Town of Manchester	Municipality Meeting – 2019
Robert	Mitchell	Major, Police Department	City of Taneytown	Municipality Meeting – 2022
Bobbi	Moser	Planning Manager	Carroll County Department of Planning	Kickoff Meeting Workgroup Meeting #1 Municipality Meeting – 2019 (Westminster) Workgroup Meeting #4 Workgroup Meeting #6
Wayne	Myers	Director, Public Works	Town of New Windsor	Municipality Meeting – 2019 Municipality Meeting – 2022
Anusree	Nair		Carroll County Department of Planning	Kickoff Meeting
Zach	Neal	Hydrogeologist	Carroll County Department of Land and Resource Management	Workgroup Meeting #9
Mark	Onheiser	Special Program Coordinator	Town of Sykesville	Municipality Meeting – 2019
Doug	Reitz	Chief of Police	Town of Mount Airy	Municipality Meeting – 2019
James	Roark	Town of Hampstead	Asst. Zoning Administrator	Municipality Meeting – 2022 PRT Review

First Name	Last Name	Position/Role	Agency or Municipality	Participation
Matthew	Rodriguez	EM Assistant Manager	Carroll County Department of Public Safety/Emergency Management	Kickoff Meeting Workgroup Meeting #1 Workgroup Meeting #2 Municipality Meetings – 2019 (Manchester, Hampstead, Westminster, Sykesville, Mount Airy, Union Bridge) Municipality Meetings – 2022 (Hampstead, New Windsor, Mount Airy, Taneytown, Westminster Workgroup Meeting #3 Workgroup Meeting #4 Workgroup Meeting #6 Workgroup Meeting #7 Workgroup Meeting #8 Workgroup Meeting #9 Initial Draft Review
Sandra	Baber	GIS Manager	Carroll County Department of Land and Resource Management	Kickoff Meeting Workgroup Meeting #1 Workgroup Meeting #2 Workgroup Meeting #3 Workgroup Meeting #4 Workgroup Meeting #5 Workgroup Meeting #6 Workgroup Meeting #7 Workgroup Meeting #8 Workgroup Meeting #9 Status Update #1 Initial Draft Review PRT Review
Arco	Sen		Carroll County Department of Planning	Kickoff Meeting
Derek	Shreves	Director, Public Works	Town of Sykesville	Municipality Meeting – 2019 Municipality Meeting – 2022
Kevin	Smeak	Director, Public Works	City of Taneytown	Municipality Meeting – 2019 Municipality Meeting - 2022

First Name	Last Name	Position/Role	Agency or Municipality	Participation
David	Snyder	Chief of Police	Town of Hampstead	Municipality Meeting – 2019
Curt	Snyder	Police Department	Town of Mount Airy	Municipality Meeting – 2019
Cody	Spaid	Comprehensive Planner	Carroll County Department of Planning	Workgroup Meeting #1 Municipality Meeting – 2019 (Westminster, Taneytown) Workgroup Meeting #3 Workgroup Meeting #5 Workgroup Meeting #6
Michael	Spaulding	Chief of Police	Town of Sykesville	Municipality Meeting – 2019 Municipality Meeting - 2022
Cory	Stauffer		City of Westminster	PRT Review
Clare	Stewart	Comprehensive Planner	Carroll County Department of Planning	Kickoff Meeting Workgroup Meeting #1 Municipality Meeting – 2019 (Sykesville, Union Bridge) Workgroup Meeting #3 Workgroup Meeting #5 Workgroup Meeting #6
Lorena	Vaccare	Asst. Zoning Administrator	Town of Hampstead	Municipality Meeting- 2019
Patrick	Varga	Environmental Review Supervisor Floodplain Management/GIS Specialist	Carroll County Department of Land and Resource Management	Kickoff Meeting Workgroup Meeting #2 Workgroup Meeting #3 Workgroup Meeting #6 Workgroup Meeting #7 Workgroup Meeting #8 Status Update #1 Initial Draft Review PRT Review
Price	Wagoner	Comprehensive Planner	Carroll County Department of Planning	Kickoff Meeting Workgroup Meeting #1 Municipality Meetings – 2019 (Manchester, Hampstead, New Windsor) Workgroup Meeting #3 Workgroup Meeting #5 Workgroup Meeting #6

First Name	Last Name	Position/Role	Agency or Municipality	Participation
David	Warrington	Town Manager	Town of Mount Airy	Municipality Meeting – 2019
Hannah	Weber	Comprehensive Planner	Carroll County Department of Planning	Municipality Meeting – 2019 Workgroup Meeting #3 Workgroup Meeting #4 Workgroup Meeting #5
James	Wieprecht	City Manager	City of Taneytown	Municipality Meeting – 2019 Municipality Meeting - 2022 PRT Review
Michelle	Wilder	Zoning Administrator	Town of Manchester	Municipality Meeting – 2019
Donald	Wilson	Council President	Town of Union Bridge	Municipality Meeting – 2019

Table 1:1 – Hazard Mitigation Planning Committee Members

Public Involvement

Local Emergency Planning Committee (LEPC)

In 1986, Congress passed the Superfund Amendments and Reauthorization Act (SARA). Title III of this legislation requires each community to establish a Local Emergency Planning Committee (LEPC) to develop an emergency plan to prepare for and respond to chemical emergencies in the community.

Because of the experience and diverse knowledge base available within Carroll County’s LEPC, the Planning Team felt it was important to provide an opportunity for LEPC member input and participation while developing this Plan. The CCHMP was discussed by the LEPC at regular quarterly meetings of the group starting in November 2021. Members were briefed on the timeline for plan development and implementation and provided with the opportunity to review and discuss drafts of the Plan throughout its development, as well as to provide feedback on additional mitigation measures to be considered for inclusion in the Plan. The Carroll County LEPC includes but is not limited to representatives from the following:

- Carroll County Department of Public Safety
- Carroll County Department of Fire & EMS
- Carroll County Volunteer Emergency Services Association
- Carroll County Communications Office
- Carroll County Board of Commissioners
- Maryland State Police, Barrack G

- Carroll County Sheriff's Office
- Carroll County Health Dept.
- Carroll Hospital
- Carroll County Department of Public Works
- Carroll County Public Schools
- Carroll Community College
- McDaniel College
- Community Media Center of Carroll County
- Local Elected Officials (Municipalities)
- Local Businesses:
 - S. H. Tevis & Son
 - Ferrellgas
 - Stanley Black and Decker
 - EVAPCO
 - Knorr Brake
 - BGE
 - Performance Food Group
 - Colonial Pipeline
 - C. J. Miller, Inc.

Other Community Participation

Public involvement was also sought following the initial identification of hazards, hazard areas, and risk assessments. County residents were specifically invited to provide feedback on potential issues and remedies based on their local knowledge and experiences as mitigation measures were developed.

An online survey was distributed during the month of November 2020, to allow residents in all areas of the county an opportunity to provide information about what hazards they feel are of greatest concern in their particular area as well as to suggest possible measures to mitigate against those identified hazards. Materials related to the online survey, including a summary of the survey results, are included for reference in Appendix F.

Neighboring Jurisdictions

Five neighboring counties were provided the opportunity to review and comment on the final draft of the Carroll County Hazard Mitigation Plan: Howard County Office of Emergency Management, Baltimore County Office of Emergency Management and Homeland Security, Frederick County Department of Emergency Management, York County Planning Commission, and Adams County Office of Emergency Management. The York County Planning Commission staff reviewed the Carroll County Hazard Mitigation Plan as requested and returned comments related to their review of the Plan. Carroll County would like to thank all the counties for their time in reviewing the Carroll County Hazard Mitigation Plan.

Municipal Coordination

Input and data were incorporated from all the participating municipalities. Coordination with each jurisdiction was essential for accurate hazard identification as well as associated risk assessments. The municipalities participated in identifying mitigation measures as well. The County coordinated with the municipalities to establish and prioritize acceptable mitigation strategies, as well as to identify timelines, funding sources, and responsible agencies. Individual meetings were held with municipal staff members in each municipality that provided them with an opportunity to learn about the Plan, the types of hazards addressed, the risk areas and assessments described, and the mitigation measures outlined. Additional information regarding the municipality meetings is included for reference in Appendix F.

Carroll County and the participating municipalities have a strong track record of interjurisdictional coordination on enforcement, planning, and many other issues. It is important to note that several of the mitigation strategies which specifically identify a county agency as the lead agency cannot be effectively accomplished without coordination with the municipalities. However, the named agency would be responsible to lead the activity for the County as well as to coordinate efforts with and between the municipalities for that project.

The County Commissioners of Carroll County, Maryland and participating municipalities support the implementation of the Carroll County Hazard Mitigation Plan and are committed to fulfilling the hazard mitigation goals and actions outlined in the Plan. The resources necessary for Plan implementation and maintenance, including funding, manpower, and equipment will be provided based on availability. The Carroll County Commissioners and participating municipalities reserve the right to prioritize use of County or municipal resources in accordance with the sound fiscal policy of the relevant local government. In no event shall a failure by the

County or municipality to comply with any provision or aspect of this Plan constitute a material breach nor shall adoption of this Plan provide any rights to any third party for a cause of action. This Plan is intended to be a living document, and each participating jurisdiction has the opportunity at any time to submit information to or request information from the Carroll County Hazard Mitigation Planning Team to ensure that newly identified priorities, capability limitations, additional data, and mitigation project ideas are incorporated appropriately into future updates of the Plan.

Planning Milestones

The Carroll County Hazard Mitigation Plan was developed and managed by County and municipal officials. The Hazard Mitigation Planning Committee, and Local Planning Teams, met several times throughout the hazard mitigation planning process accomplishing many project milestones, as shown in the below chart. The planning process involved seven unique steps that ensures Carroll County remains a safe and resilient community.



Figure 1 – The Hazard Mitigation Planning Process

Planning Milestones				
Milestone	Date(s)	Purpose	# of attendees	Planning Milestone Item
Kickoff Meeting	June 11, 2019	Overview of HM Planning Process Stakeholder identification Establish planning approach Develop initial tasks and timelines	11	Organize Resources
Workgroup Meeting	July 22, 2019	Determine critical facilities criteria Determine municipality reach out approach	10	Collect Data/Analyze Capabilities
Workgroup Meeting	September 16, 2019	Review Chapters 1, 2 and 4 Hazard Identification and Ratings Progress Update – municipality reach out	5	Collect Data/Analyze Capabilities Analyze Hazards
Municipality Meeting – Town of Manchester	October 10, 2019	Overview of CCHMP & Update process Review of Critical infrastructure definition Hazard identification specific to municipality Discussion of existing and proposed mitigation efforts specific to municipality	6	Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy (Manchester)
Municipality Meeting – Town of Hampstead	October 10, 2019	Overview of CCHMP & Update process Review of Critical infrastructure definition Hazard identification specific to municipality Discussion of existing and proposed mitigation efforts specific to municipality	8	Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy (Hampstead)
Municipality Meeting – Town of New Windsor	October 11, 2019	Overview of CCHMP & Update process Review of Critical infrastructure definition Hazard identification specific to municipality Discussion of existing and proposed mitigation efforts specific to municipality	4	Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy (New Windsor)
Municipality Meeting – City of Westminster	October 15, 2019	Overview of CCHMP & Update process	7	Collect Data/Analyze Capabilities

Planning Milestones				
Milestone	Date(s)	Purpose	# of attendees	Planning Milestone Item
		Review of Critical infrastructure definition Hazard identification specific to municipality Discussion of existing and proposed mitigation efforts specific to municipality		Analyze Hazards Develop Mitigation Strategy (Westminster)
Municipality Meeting – City of Taneytown	October 17, 2019	Overview of CCHMP & Update process Review of Critical infrastructure definition Hazard identification specific to municipality Discussion of existing and proposed mitigation efforts specific to municipality	6	Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy (Taneytown)
Municipality Meeting – Town of Sykesville	October 29, 2019	Overview of CCHMP & Update process Review of Critical infrastructure definition Hazard identification specific to municipality Discussion of existing and proposed mitigation efforts specific to municipality	7	Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy (Sykesville)
Municipality Meeting – Town of Mount Airy	November 12, 2019	Overview of CCHMP & Update process Review of Critical infrastructure definition Hazard identification specific to municipality Discussion of existing and proposed mitigation efforts specific to municipality	9	Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy (Mount Airy)
Municipality Meeting – Town of Union Bridge	November 18, 2019	Overview of CCHMP & Update process Review of Critical infrastructure definition Hazard identification specific to municipality Discussion of existing and proposed mitigation efforts specific to municipality	7	Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy (Union Bridge)

Planning Milestones				
Milestone	Date(s)	Purpose	# of attendees	Planning Milestone Item
Workgroup Meeting	January 15, 2020	Updates from municipality meetings Discussion of status of necessary data and table updates Further work on Chapter 5 Set proposed schedule for future meetings	10	Collect Data/Analyze Capabilities Analyze Hazards
Workgroup Meeting	January 29, 2020	Discuss/finalize Chapter 5 updates Discuss approach for Chapter 8	5	Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy
Workgroup Meeting	February 4, 2020	Discuss/finalize Chapter 8 updates Discuss approach for Chapter 9	7	Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy
Workgroup Meeting	February 19, 2020	Discuss/finalize Chapter 9 updates Discuss approach for Chapter 6	9	Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy
Workgroup Meeting	October 8, 2020	Re-visit planning process after hiatus due to COVID-19 pandemic		(Re-) Organize Resources
Workgroup Meeting	October 22, 2020	Discuss/finalize Chapter 6 updates Review Chapter 5 and Chapter 9. Develop approach and questions for Public Participation Survey		Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy

Planning Milestones				
Milestone	Date(s)	Purpose	# of attendees	Planning Milestone Item
				Public Outreach
Workgroup Meeting	November 5, 2020	Finalize Public Participation Survey Develop approach for Chapter 11		Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy Public Outreach
Workgroup Meeting	November 9, 2020	Review results of Public Participation Survey Develop approach for Chapter 10.		Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy Public Outreach
Workgroup Meeting	July 22, 2021	Planning status update		Collect Data/Analyze Capabilities Analyze Hazards Develop Mitigation Strategy
Workgroup Meeting	March 23, 2022	Status update and next steps Plan Draft Review Focused development of proposed mitigation actions	10	Develop Mitigation Strategy Review, Approve and Adopt Plan
Municipality Meeting – City of Taneytown	April 26, 2022	Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding Discussion of CC HMP Initial DRAFT document	9	Develop Mitigation Strategy Review, Approve and Adopt Plan

Planning Milestones				
Milestone	Date(s)	Purpose	# of attendees	Planning Milestone Item
Municipality Meeting – Town of Mount Airy	April 26, 2022	Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding Discussion of CC HMP Initial DRAFT document	5	Develop Mitigation Strategy Review, Approve and Adopt Plan
Municipality Meeting – Town of Sykesville	May 5, 2022	Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding Discussion of CC HMP Initial DRAFT document	6	Develop Mitigation Strategy Review, Approve and Adopt Plan
Municipality Meeting – Town of New Windsor	May 19, 2022	Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding Discussion of CC HMP Initial DRAFT document	6	Develop Mitigation Strategy Review, Approve and Adopt Plan
Municipality Meeting – Town of Manchester	May 20, 2022	Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding Discussion of CC HMP Initial DRAFT document	4	Develop Mitigation Strategy Review, Approve and Adopt Plan
Municipality Meeting – Town of Hampstead	May 24, 2022	Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding Discussion of CC HMP Initial DRAFT document	6	Develop Mitigation Strategy Review, Approve and Adopt Plan
Municipality Meeting – Town of Union Bridge	August 9, 2022	Review of hazard mitigation planning process, plan submission and approval processes, and	4	Develop Mitigation Strategy

Planning Milestones				
Milestone	Date(s)	Purpose	# of attendees	Planning Milestone Item
		general parameters of federal hazard mitigation funding Discussion of CC HMP Initial DRAFT document		Review, Approve and Adopt Plan
Municipality Meeting – City of Westminster	August 11, 2022	Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding Discussion of CC HMP Initial DRAFT document	7	Develop Mitigation Strategy Review, Approve and Adopt Plan
Internal Work Sessions	Early October 2022	Completion of Plan Review Tool and review by Emergency Management staff		Review, Approve and Adopt Plan
Submission of Plan to MDEM/FEMA for initial review	October 21, 2022			Review, Approve and Adopt Plan

Table 1.2 – Planning Milestones

Chapter Four – Community Profile

Carroll County Geography and Physical Environment

Carroll County covers 456 square miles, or approximately 289,000 acres. Eight incorporated towns are located within the County, including Hampstead, Manchester, Mount Airy (partly in Frederick County, as well), New Windsor, Sykesville, Taneytown, Union Bridge, and Westminster. The municipalities are primarily responsible for planning for the areas considered growth areas around each municipality.

Carroll County is in the Piedmont region of north-central Maryland. Parr's Ridge diagonally divides the county into two major drainage basins. Streams to the north and west drain into the Monocacy River and eventually the Potomac River, which flows into the Chesapeake Bay. Streams to the south and east flow into the Patapsco and Gunpowder Rivers towards the Chesapeake Bay. These two major drainage basins contain nearly 1,380 miles of streams in Carroll County. Their uses range from recreational uses, such as fishing and canoeing, to agricultural uses, such as irrigation. These streams eventually feed into the Chesapeake Bay and contribute to its water quality and ecological health. Virtually all the land on the east side of Parr's Ridge drains into a public water supply reservoir.

Based on soil types, more than 54 percent of the County, or about 157,000 acres, can be cultivated regularly. The remaining acreage is divided among those areas that can be cultivated occasionally or not at all or is suitable for pasture.

Carroll County lies near the northernmost extent of the humid subtropical zone near the eastern boundary of the humid continental zone. Regionally, the general atmospheric flow is from west to east, with a continental type of climate and four well-defined seasons.

According to the Maryland State Office of Climatology, statistically the coldest period of the year is late January and early February; the warmest period is the last half of July. The highest recorded temperature is 105 degrees Fahrenheit near Taneytown on July 17, 1900, and the lowest is -22 degrees Fahrenheit near Taneytown on January 14, 1912. Precipitation is evenly distributed throughout the year; typically, May is the wettest month. The heaviest precipitation is generally the result of low-pressure systems moving northeastward along the Atlantic Coast. Rainfall averages 41.76 inches per year, and the county receives an average of 31 inches of snow per year. The greatest one-day precipitation is 9.5 inches of rain at Westminster on June

22, 1972, when the remnants of Hurricane Agnes swept through Maryland. Prevailing surface winds are from west northwest to northwest except during the months of May through September when they become more southerly. The average annual wind speed is between 4.5 to 6 miles per hour.

Carroll County Demographics

In the decade from 2000 to 2010, significant growth occurred in the County. However, in the years from 2010 to the present, growth has slowed considerably. According to data reported by the U. S. Census Bureau, over the past eleven years the County's total population increased only about 0.59 percent; from 167,134 in 2010 to approximately 168,126 in 2021. The incorporated areas of the County (the municipalities) saw a 0.98% increase in total population during that period, from 48,759 in 2010 to 49,240 in 2021. The overall unincorporated area of the County (the areas outside the municipalities) grew in population from 118,375 in 2010 to 118,886 in 2021, an increase of about 0.43 percent.

In June 2021, the population of the County's municipalities was reported to comprise about 29 percent of the total County population compared to about 71 percent in the unincorporated areas of the County. These overall percentages remain unchanged from the 2013 version of this Plan. Table 4.1 shows the population estimates provided by the US Census Bureau for each of the County's municipalities and the population for the remaining unincorporated areas of the County.

<i>Population by Municipality Carroll County, MD 2021</i>		
Municipality	Total Population 2021	% of Carroll County Population
Hampstead	6,334	3.8%
Manchester	4,917	2.9%
Mount Airy (Carroll County portion)	5,574	3.3%
New Windsor	1,428	0.8%
Sykesville	4,483	2.7%
Taneytown	6,810	4.0%
Union Bridge	977	0.6%
Westminster	18,716	11.1%
<i>Incorporated Areas</i>	<i>49,240</i>	<i>29%</i>
<i>Unincorporated Areas</i>	<i>118,886</i>	<i>71%</i>
<i>County Total</i>	<i>168,126</i>	

Table 4.1 – Population by Municipality

According to data provided by the US Census Bureau, as of June 2021 Carroll County had 64,082 households (i.e., occupied housing units) and a total of 66,064 housing units. This was an

increase of about 3,658 housing units since the 2010 Census, for a growth rate of about 0.94 percent. This represents a slower growth rate than what was noted during the time between the 2000 and 2010 Census, when occupied housing units increased by 7,283 units, with a growth rate of 1.4 percent per year. The average household size in the County held almost steady from 2.71 persons per household in 2017 (ACS 2017 Estimates) to 2.8 persons per household in 2021. Table 4.2, “Households by Municipality”, shows the estimated total number of households (occupied housing units) and estimated average number of persons per household for each municipality and for the unincorporated areas of the County. In 2021, 96.99 percent, or 64,082, of the County’s 66,064 housing units were occupied, with about 3% percent, or 1,982 housing units, vacant.

Households by Municipality Carroll County, MD 2021		
Municipality	Total Number of Households	Persons per Household
Hampstead	2,476	2.6
Manchester	1,871	2.6
Mount Airy (Carroll County portion)	2,151	2.6
New Windsor	652	2.2
Taneytown	2,862	2.4
Union Bridge	417	2.3
Sykesville	1,612	2.8
Westminster	7,825	2.4
Unincorporated Areas	44,215	2.7
<i>County</i>	<i>64,082</i>	<i>2.6</i>
<i>Source: Carroll County Department of Planning</i>		

Table 4.2 – Households by Municipality

According to the 2015-2019 American Community Survey 5-Year Estimates, the median value of a home in Carroll County was \$339,600, which is an increase of \$74,500 above the median value in 2010. Only the municipalities of Sykesville (\$379,500) and Mt. Airy (\$371,500) had median home values above the countywide value. Table 4.3, “Home Value by Municipality”, provides additional detail.

Home Value by Municipality Carroll County, MD 2015-2019	
Municipality	Median Home Value
Hampstead	\$245,700
Manchester	\$294,500
Mount Airy	\$371,500
New Windsor	\$264,300
Sykesville	\$379,500
Taneytown	\$252,700
Union Bridge	\$192,700
Westminster	\$242,700
<i>County</i>	<i>\$339,600</i>
Source: 2015-2019 American Community Survey, 5-year Estimate	

Table 4.3 – Home Value by Municipality

Household income represents the sum of incomes for all members of the household. According to the 2015-2019 American Community Survey (ACS) 5-year estimates, the median household income for the entire County was \$96,769. Table 4.4 shows the median annual household income for each of the municipalities and the County as a whole.

Household Income by Municipality Carroll County, MD 2015-2019	
Municipality	Median Household Income
Hampstead	\$77,083
Manchester	\$95,000
Mount Airy	\$125,365
New Windsor	\$90,324
Taneytown	\$73,649
Union Bridge	\$55,750
Sykesville	\$109,393
Westminster	\$60,518
<i>County</i>	<i>\$96,769</i>
<i>Source: American Community Survey, 2015-2019 5-year Estimates</i>	

Table 4.4 – Household Income by Municipality

As with the median house values noted earlier, only the municipalities of Sykesville and Mt. Airy had median household incomes above the County figures. Thus, a correlation between home values and household incomes could be possible.

Table 4.5, “Carroll County Workforce – Firms and Employee Totals by Industry (2021)”, provides data on the businesses that operate, and employees that work, in Carroll County, broken down by industry sector. Carroll County historically has had a strong tradition of cottage industries and small businesses, many of which centered on the agricultural and manufacturing sectors. In recent years, employment in the leisure and hospitality services, education and health services, construction, and the trade-transportation-utilities industries has increased in the number of jobs and percentage of total jobs, while employment in the professional and business services, Information, and manufacturing industries has decreased, according to data provided by the Maryland DLLR (Department of Labor, Licensing and Regulation). This trend is expected to continue as the County’s demographics and the types of industries attracted to the County change.

Carroll County Workforce – Firms and Employee Totals by Industry (2022)				
SECTOR	# OF FIRMS	% OF TOTAL	# OF EMPLOYEES	% OF TOTAL
Total Employment	4,505	100%	55,272	100%
Public Employment	94	2.1%	7,862	14.2%
<i>Federal Gov't</i>	21	0.5%	330	0.6%
<i>State Gov't</i>	11	0.2%	1,182	2.1%
<i>Local Gov't</i>	62	1.4%	6,350	11.5%
Private Employment	4,411	97.9%	47,410	85.8%
<i>Natural Resources & Mining</i>	40	0.9%	454	0.8%
<i>Construction</i>	810	18.0%	5,918	10.7%
<i>Manufacturing</i>	142	3.2%	3,967	7.2%
<i>Trade, Transportation & Utilities</i>	810	18.0%	11,883	21.5%
<i>Information</i>	40	0.9%	251	0.5%
<i>Financial Activities</i>	359	8.0%	1,378	2.5%
<i>Professional & Business Services</i>	936	20.8%	5,786	10.5%
<i>Education & Health Services</i>	506	11.2%	9,735	17.6%
<i>Leisure & Hospitality</i>	333	7.4%	6,048	10.9%
<i>Other Services / Unclassified</i>	435	9.7%	1,990	3.6%
<i>Source: MD Department of Labor Licensing and Regulation (as of September 2022)</i>				

Table 4.5 – Carroll County Workforce – Firms and Employee Totals by Industry (2022)

On average in the first portion of 2022, Carroll County businesses provided approximately 55,000 jobs. As of September 2022, private sector jobs accounted for almost 86 percent of the total workforce in the County, while public sector (government) jobs made up the remaining 14.2 percent.

Table 4.6, “Carroll County: Major Firms-Employers”, provides a list of the major employers located within Carroll County in 2021, as well as information regarding the total number of firms and employees in the County.

Carroll County: Major Firms-Employers 2021	
Employer	Product/Service/Type
Advanced Thermal Batteries	Manufacturing
ARC of Carroll County	Non-Profit Healthcare
BB&T	Banking Services
C.J. Miller	Paving & Excavating Contractor
Carroll Community College	Higher Education
Carroll County Commissioners	Local Government
Carroll County Public Schools	Education (K-12)
Carroll Hospital – Lifebridge Health Center	Healthcare
Carroll Lutheran Village	Retirement/Assisted Living
English American Tailoring Company	Manufacturing (Apparel)
Evapco, Inc.	Manufacturing (Heating & Cooling Equip)
Finch Services, Inc.	Agriculture Equipment
Flowserve Corporation	Industrial Pumping Equipment
FR Conversions	Manufacturing
Fuchs North America	Manufacturing
Integrace – Fairhaven	Retirement/Assisted Living
Knorr Brake Company	Manufacturing (Transportation Equipment)
Lehigh Cement Company	Manufacturing (Cement/Concrete Products)
Longview Nursing Home, Inc.	Nursing Care Facilities
Lorien – Mt. Airy	Nursing Care Facilities
Lorien – Taneytown	Nursing Care Facilities
McDaniel College	Higher Education (Private)
Northrop Grumman	Electronic Manufacturing/Testing
Penguin Random House	Book Warehousing & Distribution
Performance Food Group	Wholesale Foods/Distribution
S. H. Tevis & Son/Modern Comfort	Oil/Fuel, Heating and A/C
Springfield Hospital Center	Mental Health Services
Stanley/Black & Decker, Inc.	Warehousing & Distribution
Taney Corporation	Manufacturing (Wood Products)
Total # of Firms – Carroll County 4,520	
Total Employment – Carroll County 54,237	
<i>Source 1: Carroll County Department of Economic Development</i>	
<i>Source 2: Maryland Department of Labor, Licensing and Regulation</i>	

Table 4.6 – Carroll County: Major Firms-Employers 2021

Relationship between County and Municipalities

Carroll County and its municipalities have a long history of interjurisdictional coordination and cooperation. Since 1977, the Carroll County Board of Commissioners has annually entered into an agreement with each municipality to share funds and coordinate planning and other governmental functions. These agreements are formal documents enumerating the types of services the County provides to each municipality. The agreements are tailored to the needs of each municipality and vary in complexity, depending on the extent and expertise of municipal staff. County services range from simple liaison (e.g., notifying the Town or City of future County development proposals located within one mile of its boundaries) to more direct involvement in various planning matters. The latter includes reviewing municipal development plans, advising municipal planning commissions on planning-related issues, and coordinating with municipal planning staff in the preparation of community comprehensive plans. These agreements provide for cooperative referral by each jurisdiction to the other for review of subdivision plans, site plans, comprehensive plans or comprehensive plan amendments, annexation petitions, and rezoning petitions. This cooperative relationship has worked well. It ensures the open exchange of information regarding plans and development proposals. As a result, many issues are resolved at the staff level, reducing the possibility of problems later in the process. The Board of Commissioners also distributes funds annually to the municipalities upon execution of the agreements.

The County and its eight municipalities have had a history of cooperative planning that has included steps to ensure consistency for future growth in the designated and municipal growth areas. The community comprehensive plan identifies future land-use designations and establishes a blueprint for a wide variety of planning decisions for the areas within the current corporate limits, as well as within the municipal growth areas that extend beyond the town/city limits. The entire area for which a municipal comprehensive plan is developed includes the municipality (all land located within its corporate limits) as well as the Municipal Growth Area (MGA), which extends beyond the town/city limits. The planning area limits are considered the Growth Area Boundary (GAB). The area within the municipality's corporate limits and designated Municipal Growth Area becomes the officially adopted plan for the municipality; however, the area within the corporate limits is the only area over which the municipality has legal authority. For the Municipal Growth Area portion of the municipal plan, its development needs, limitations, and opportunities are examined in detail in a legislatively mandated Municipal Growth Element (MGE). The MGE is a mandatory element of the community comprehensive plan and is required to describe existing conditions and all kinds of future growth. It must also analyze adequacy of all manner of public facilities and infrastructure to

accommodate planned growth regardless of which jurisdiction is responsible for providing these facilities and services within the MGA.

As a provision of the aforementioned agreements, the County provides staff assistance to the towns/cities on planning-related issues. The County planner acts as a liaison to the municipality's Planning Commissions. The County planner's duties may include assisting in obtaining grants and developing the community comprehensive plan; providing research support; and reviewing development plans, annexation proposals, and rezoning requests; among other things. This arrangement not only fosters cooperation between the jurisdictions, but aids in conflict prevention and development of compatible goals and regulations.

The County and all municipalities are enrolled in the National Flood Insurance Program (NFIP). After a thorough review by FEMA and the Maryland Department of the Environment, the County most recently revised its floodplain ordinance in 2015. Most municipalities have adopted the County's Floodplain Management Ordinance. The City of Westminster adopted a separate floodplain ordinance. The County provides review and technical assistance for all the municipalities, except for the City of Westminster, which performs its own review.

Carroll County's fire, rescue, and emergency medical services (EMS) are provided by a combination of volunteer and career staff. In 2018, the Maryland General Assembly passed enabling legislation allowing Carroll County government to establish a department responsible for the full scope of fire prevention, fire suppression, hazardous materials, emergency medical services and other related public safety functions provided to Carroll County residents. Subsequently, on October 1, 2020 the Carroll County Board of Commissioners officially established the first Carroll County Department of Fire and Emergency Medical Services (DFEMS) by adopting the ordinance creating Chapter 37 of the County Code. Currently, fire, rescue and EMS services are provided jointly by DFEMS and the fourteen member companies of the Carroll County Volunteer Emergency Services Association (CCVESA).

The Carroll County Sheriff's Office is the primary law enforcement agency in Carroll County. Maryland State Police (MSP) also provides law enforcement services throughout the county, and six of the eight municipalities – Westminster, Sykesville, Taneytown, Hampstead, Manchester and Mount Airy – maintain municipal police departments to serve their respective populations.

Relationship between Hazard Mitigation Planning and Comprehensive Planning

A clear connection exists between comprehensive planning to envision and enable the most appropriate land uses and hazard mitigation planning to enable the reduction of a community's vulnerability to all types of hazards. Communities that thoughtfully direct the locations, types, and standards for development to avoid hazard areas suffer much less disaster-related damage and impact than do communities that do not consider hazard risks.

Planners who think they are not familiar with hazard mitigation planning do not realize that they are already planning for hazard mitigation when they develop their comprehensive plans. Comprehensive/land use planning is not just about planning where development should go; it is also about planning where development should not go. For example, most jurisdictions do not intentionally plan for concentrated future development to occur within a floodplain or other area known to be a hazard for life or property. Comprehensive planning looks at the relationship between land-use planning and how impacts of development on the environment and reduced environmental sustainability can potentially increase an area's vulnerability to certain hazards. From a hazard mitigation perspective, smart land-use planning results in less disruption to a community's economic, social, and physical structure; less impact on the community's tax base; less impact on the provision of essential services; and less financial impact in terms of local participation in disaster program cost-sharing. Hazard mitigation does not erect a barrier to growth but helps a community to continue to thrive. Comprehensive planning that includes hazard mitigation planning helps to create a sustainable community.

Community planners also provide a pivotal role in guiding recovery and rebuilding after disasters. Comprehensive plan documents have established guidance to help direct community building, regardless of if it is due to post-disaster recovery and reconstruction or due to planned community growth. However, opportunities to strengthen the comprehensive plan as a recovery tool remain. Capitalizing on lessons learned during any recovery helps communities rebuild in ways which result in even greater resistance to future disasters. The incorporation of hazard mitigation planning, as well as planning in a post-disaster recovery, demonstrates a strong illustration of planning's roots in protecting the public health, safety, and welfare.

Appendices C and D contain maps showing two types of information. The first group of maps in Appendix C shows the use of land that exists on property located throughout the County and within the planned growth areas of the same individual communities for which a comprehensive plan has been adopted. The second group of maps in Appendix D indicates the land-use designations as depicted on the County Master Plan map and the individual community comprehensive plan maps.

Capability Assessment

This Plan assesses the current capacity of Carroll County and its municipalities to mitigate the effects of the natural hazards identified in the Hazard Identification and Risk Assessment section of the Plan. The capability assessment is comprised of five (5) sections that detail specific capabilities that are relevant to hazard mitigation. Full results of the Capability Assessment, including recommendations, are contained in Appendix A of this plan update. The primary types of capabilities:

- **Administrative Capability**– describes the forms of government in the County, including the departments that may be involved in hazard mitigation.
- **Technical Capability** – addresses the technical expertise of local government staff.
- **Financial Capability** – examines budgets and currently used funding mechanisms.
- **Education and Public Outreach Capability** – describes the programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information (Ready Carroll Community Preparedness Program, fire safety programs, hazard awareness campaigns).
- **Planning and Regulatory Capability** - the implementation of ordinances, policies, local laws and State statutes, and plans and programs that relate to guiding and managing growth and development (land use plans, capital improvements programs, transportation plans, disaster recovery plans, and emergency preparedness and response plans).

The purpose of conducting the capability assessment is to determine the ability of Carroll County and its municipalities to implement a comprehensive hazard mitigation strategy, and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs, or projects. The capability assessment provides an opportunity to highlight the positive hazard mitigation measures already in place or being implemented throughout the county and which should continue to be supported and enhanced via future mitigation efforts.

National Flood Insurance Program (NFIP)

The National Flood Insurance Program is a program that was created by the Congress of the United States in 1968 through the National Flood Insurance Act of 1968. The National Flood Insurance Program has two purposes: to share the risk of flood losses through flood insurance and to reduce flood damages by restricting floodplain development. The program enables property owners in participating communities to purchase insurance protection, administered by the government, against losses from flooding, and requires flood insurance for all loans or lines of credit that are secured by existing buildings, manufactured homes, or buildings under construction, that are located in the Special Flood Hazard Area in a community that participates in the NFIP. U.S. Congress limits the availability of National Flood Insurance to communities that adopt adequate land use and control measures with effective enforcement provisions to reduce flood damages by restricting development in areas exposed to flooding. The National Flood Insurance Program is managed and administered by the Federal Emergency Management Agency (FEMA). The program is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods.

The current FEMA Flood Insurance Rate Maps and Flood Insurance Study are located in the County Office Building at 225 North Center Street, Westminster, MD, 21157. They are kept in the Bureau of Resource Management. The maps were adopted in October of 2015 and are available online through the [FEMA Map Service Center](#) and [MDfloodmaps.net](#). While effective maps and models exist for the FEMA floodplain, base flood elevations are required for non-FEMA streams impacted by any development. Any proposed changes to the Flood Insurance Rate Maps must be reviewed and approved by Carroll County prior to submittal to FEMA for review. Proposed changes are to be submitted to the Bureau of Resource Management. This includes any changes to hydrology and hydraulics using the effective HEC-RAS models as a starting point. The Bureau also tracks all maps changes in GIS, which are also available through the FEMA Map Service Center.

Chapter 153, Floodplain Management, was updated in 2015 at the time FEMA issued our current FIRMS and FIS. Additional provisions were added in 2022 to increase the discount for flood insurance through the Community Rating System program and further protect residents from flood risk.

Carroll County prohibits new construction within the floodplain but does allow additions in the floodplain. The Bureau of Permits and Inspections and Floodplain Administrator within the Bureau of Resource Management review all permits for compliance with floodplain

requirements. Both agencies also keep records of any elevation certificates that are required as part of construction permitting. Substantially improved or damaged (SI/SD) structures are required to go through the building permit process and at that time the applicant must provide an appraisal of the structure or tax record showing the value of improvements and estimate of proposed improvements. These figures are used to ensure compliance with SI/SD provisions. Substantial improvements and damage are both tracked for rolling 10-year periods. SI/SD violations would require the property owner to comply with the code, including meeting freeboard requirements. While no formal damage assessment plan is in place, the task falls on the Bureau of Permits and Inspections and the Floodplain Administrator. As required by the Community Rating System, the County adopted Construction Certificate Management Procedures which outlines when elevation certificates are required. Any construction within the floodplain requires an Elevation Certificate.

Carroll County has two code chapters which regulate development within the floodplain. Chapter 153, Floodplain Management, regulates development in the floodplain regarding subdivision, and non-residential site plans. Chapter 38, Floodplain Construction, is part of Chapter 170, the Construction Codes. Chapter 38 regulates construction in the floodplain. The Floodplain Administrator reviews all building permits for the unincorporated County and seven municipalities. There has been limited development in or near any floodplains in Carroll County as the County has prohibited development in the floodplain for several decades. The City of Westminster is responsible for their own permitting and code enforcement.

Carroll County enforces many higher regulatory standards including prohibiting new construction within the floodplain, three feet of freeboard, and prohibiting fill without compensatory storage. These requirements and others are located in both Chapter 153 and Chapter 38. Carroll County is a Class 6 jurisdiction within the Community Rating System and has been a participant since 2007.

The most recent Community Assistance Visit (CAV) was performed in 2011. No deficiencies were noted at that time. A CAV is scheduled for spring 2023. For questions regarding floodplain management or floodplain determinations, please contact the Floodplain Management/GIS Specialist, Patrick Varga, CFM, at 410-386-2844 or by email at pvara@carrollcountymd.gov. As the Floodplain Administrator, Patrick is pleased to provide floodplain determinations using mapping software, current statewide LiDAR, US Army Corps of Engineers, and field verifications. He also provides information on flood insurance using Maryland Insurance Administration and National Flood Insurance documentation (NFIP). He has provided a number of publications to the Carroll County Public Library regarding the NFIP

and permitting requirements. Flood insurance information is also available on the County's Floodplain Management website which can be found [here](#).

As part of the County's outreach campaign for floodplain management, flood insurance is promoted in several ways. On the County's Floodplain Management website, [flood insurance information](#) is presented with links to [FEMA](#) and [National Flood Insurance Program](#) websites. Flood Insurance brochures are placed at each public library along with FEMA publications on flood insurance and property protection. As a requirement of annual recertification for the CRS program, letters are sent to owners of repetitive loss structures advising them of the benefits of flood insurance.

While changes to the Flood Insurance Rate Maps are rare, Carroll County most recently went through a map update process in 2012. At that time, the County sent written notification to 2,900 property owners that the FIRMs were being revised. Staff held a meeting at Carroll Community College to present the implications of the map changes. Residents were then given an opportunity to meet with professional staff to ask questions about the map change, flood insurance, and the appeals process.

<i>Communities Participating in the National Flood Program</i>				
Community Name	Initial Flood Hazard Boundary Map Identified (FHBM)	Initial Flood Insurance Rate Map Identified (FIRM)	Current Effective Map Date	Date of NFIP Entry
Carroll County	04/04/75	08/01/78	10/02/15	10/01/07
Town of Hampstead	1/21/77	01/07/83	10/02/15	
Town of Manchester		10/02/15	10/02/15	
Town of Mount Airy		10/02/15	10/02/15	
Town of New Windsor	11/22/74	02/16/79	10/02/15	
Town of Sykesville	11/09/73	09/30/77	10/02/15	
City of Taneytown		10/02/15	10/02/15	
Town of Union Bridge	11/16/73	08/01/77	10/02/15	
City of Westminster	06/25/73	12/01/77	10/02/15	
<i>Source: Community Status Book Report, FEMA, 2023</i>				

Chapter Five- Drought

Hazard Identification

Hazard Characterization

A drought is any extended period of dry weather. There are three different intensities of drought conditions: meteorological drought, which is a period of abnormally dry weather lasting long enough to cause a water imbalance in the affected area; agricultural drought, which is a change in weather and climate patterns that causes conditions dry enough to adversely affect crop or livestock production; and hydrologic drought, which is “a period of below average water content in streams, reservoirs, groundwater aquifers, lakes, and soils as well as precipitation shortfalls that affect bodies of water or groundwater levels.” (Yevjevich et al., 1977)

There are several indexes describing drought severity. The most frequently cited are the Crop Moisture Index (<https://www.drought.gov/data-maps-tools/crop-moisture-index-cmi>) and the Palmer Drought Severity Index (PDSI) (<https://climatedataguide.ucar.edu/climate-data/palmer-drought-severity-index-pdsi>). Monthly PDSI values have been recorded for the eight Maryland climate divisions since 1895. For the PDSI, a monthly value below –2 indicates moderate drought, and a value below –3 indicates severe drought.

Droughts can cause damage not only to crops but also to wildlife and livestock. In addition, during times of prolonged drought, jurisdictions, homeowners, and businesses can be affected when groundwater levels decline, well yields decrease, streamflow decreases, and reservoirs are drawn down.

Regional & Historical Perspectives

An analysis of Maryland drought conditions dating back to the early 20th Century indicates several significant drought periods. The worst statewide event occurred from December 1929 to February 1931. That was a full-fledged agricultural drought; crop losses were estimated at \$40 million in 1930 dollars (USGS, 2012). According to the National Centers for Environmental Information (NCEI), Carroll County experienced 7 drought periods from 1950 to 2022, often spanning months. Between the same years, the County incurred approximately \$5.6 million in reported crop damages. The worst drought conditions experienced in Carroll County were more recent, occurring during part of 1999 and then again from fall 2001 to fall 2002. Since the beginning of drought records, four other well-documented dry periods have occurred in Maryland: 1) 1953-1956, 2) 1958-1971, 3) 1980-1983, and 4) 1984-1988 (USGS, 2012). According to the NCEI, Carroll County is one of the seven counties within Maryland with the highest recorded crop damage due to drought.

Risk Characterization

In the 2021 Maryland State Hazard Mitigation Plan, Carroll County was determined to be at high risk for drought. Within the Central region of the state, Baltimore, Frederick, Harford and Montgomery Counties are also considered to have a high drought risk with the drought risk for Howard County, Anne Arundel County, Prince George’s County and Baltimore City considered to be medium-high (MDEM, 2021).

Extent

The extent (i.e., magnitude or severity) of drought can depend on the duration, intensity, geographic extent, and the regional water supply demands made by human activities and vegetation. The intensity of the impact from drought could be minor to total damage in a localized area or regional damage affecting human health and the economy. Generally, impacts of drought evolve gradually, and regions of maximum intensity change with time. The severity of a drought is determined by areal extent as well as intensity and duration. The frequency of a drought is determined by analyzing the intensity for a given duration, which allows determination of the probability or percent chance of a more severe event occurring in a given mean return period. Table 5.1 summarizes the levels of drought severity and their possible impacts on a community or region.

Category	Description	Possible Impacts
D0	Abnormally dry	Going into a drought: short-term dryness slows planting, growth of crops or pastures; fire risk above average. Coming out of a drought: some lingering water deficits; pastures or crops not fully recovered.
D1	Moderate drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low; some water shortages develop or are imminent; voluntary water use restrictions requested.
D2	Severe drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.
D3	Extreme drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions.

Table 5.1 – Drought Severity Classification and Possible Impact

Probability and Severity of Future Occurrences

Droughts are often unpredictable and may be localized, which makes it difficult to assess the probability. Historical records of drought show that when droughts occur, they have a costly impact on agricultural production of Carroll County. Most droughts in this area are shorter, multi-month droughts, while widespread multiyear droughts are much less common. Based on historical occurrences as reported by NCEI, since 1950, 7 droughts occurred in Carroll County, resulting in an expected annual number of events of 0.097, or drought conditions likely every few years. It is predicted an increase in drought conditions will occur due to climate changes.

Maryland is projected to experience both higher average temperatures and precipitation rates during the winter and spring seasons by the mid-21st century. Despite increased precipitation, the region may experience more severe droughts in the summer and fall as higher air temperatures accelerate soil moisture loss. Both summer and winter temperatures are likely to increase. Precipitation is likely to increase as well, leading to a generally wetter future. Typical climate forecasts tend to suggest that increased temperatures coupled with increased annual precipitation generally correspond to higher intensity storms (greater flood risk) and longer dry periods in the summer months (more frequent and/or intense droughts). It should be noted that small reservoir systems could be very sensitive to such changes.

As Carroll County's economy and population continues to grow, the potential effects of prolonged droughts may negatively hinder the County's future growth trends. The County could lose agricultural and forest land, open spaces, and rural character, while facing increased water needs during drought events.

Hazard High-Impact Areas

Unlike tornadoes and other hazards that may result in the sudden loss of lives and structures, the effects of drought occur over prolonged periods of time and may begin more subtly. In Carroll County, while a drought would affect the entire county, a prolonged drought would most significantly affect public and private water supplies, as well as the County's valuable agricultural industry. The County has been able to withstand a single-season drought in the past. However, multi-season droughts have had significant impacts.

The most recent prolonged drought events have required operators of public water supply systems in the county to alter operations (i.e., pumping cycles), and in some cases, put in place strict water usage restrictions or augment their water supplies. A prolonged drought can also significantly affect homes and businesses on private well water. During the 1999-2002 drought conditions, some individual domestic water supply wells, particularly those with shallow water bearing zones and/or low initial yields, suffered decreased yields, and in specific instances,

ultimately failed. This circumstance left some homes and businesses without water, or in stressful situations in which owners attempted to drill additional or replacement wells. Further, during that same event, Carroll's agricultural industry was severely affected by loss of crops (those produced for sale as well as those used for feed for livestock) and lack of water; many farmers had to purchase and truck in water to be able to care for their livestock.

Significant lands within Carroll County are devoted to active agricultural uses. The U.S. Department of Agriculture's 2017 Census of Agriculture counted 1,174 farms occupying 146,778 acres in the county. This represents approximately 50.6% of the county's overall land area.

Further, due to the County's long-standing commitment to retain its agricultural lands and agribusiness economy, the County has been actively protecting productive lands. As of October 2021, more than 700 farms encompassing over 75,000 acres have been permanently preserved through agricultural land preservation easements.

Since the high-impact areas of the county do not lend themselves well to mapping, the hazard areas for the drought hazard are simply defined in this text as public and private wells, reservoirs and their tributaries along with areas contributing to municipal wellheads, as well as agricultural crops and livestock; different levels of drought severity may be seen in different parts of the county.

Risk Assessment

Lifelines Potentially Affected: Food, Water, Shelter



Critical Facilities

Identification of Vulnerable Assets

Critical facilities, for the purposes of this Plan, include fire stations; hospitals; nursing homes and medical clinics; police stations; emergency operations centers; schools; water treatment and wastewater treatment plants; airports; county and municipal government buildings; detention centers; and bridges.

No significant direct impacts to critical facilities are anticipated because of a drought. However, the operations of many critical facilities are likely to be affected by drought conditions.

Groundwater wells that are stressed and over pumped during a drought can actually experience well collapse, increased turbidity or mineralization, and may require additional maintenance and upkeep or rehabilitation at a later date. For surface water reservoirs and intakes, the quality of the surface water may change as flow decreases, potentially affecting treatment operations, or increasing the cost and maintenance of treatment (i.e., filter replacement).

Estimate of Damages & Losses

Damages or losses to critical facilities anticipated as a result of a drought might include reduction of income or increased costs of operations for facilities such as fire departments, hospitals, nursing homes and assisted living facilities, as well as dialysis centers, all of which rely on uninterrupted water supplies to function safely and effectively. While most of these facilities are served by public water supplies, some do rely on private wells. It is difficult to effectively arrive at an estimate of the costs that would be associated with the response to a severe drought event, but the information included in the “Population, People, & Residences” section below would likely be applicable to critical facilities, as well.

Population, People, & Residences

Identification of Vulnerable Assets

Based on the 2020 Census, the population living within incorporated areas of the county represented 29 percent of the total Carroll County population of 168,126. This percentage has held steady since the 2010 Census. The number of households located within the incorporated areas of the county, according to the 2020 Census, was 19,867. These individuals and households are those that are most reliant on public water supplies.

As of December 2019, the eight public water supply systems in the county were providing water to 82,734 people. The *2019 Carroll County Water and Sewerage Master Plan* projects that the number of people served by the public systems will reach 99,345 once current build-out estimates are achieved and development in the planned service area is completed. During that same build-out period, residential demand for public water supply is projected to rise from 6.083 million gallons daily (MGD) to 7.743 MGD. Tables 5.2 and 5.3, “Current and Future Population and Households Served by Public Water Supply Systems” and “Current and Future Population & Households Served by Community Water Supply Systems,” respectively, identify the current and projected population for each municipality or community that is served and/or planned to be served by public water. The totals at the bottom represent the number of people countywide who would be affected in some way by a prolonged, severe drought, should

public water systems be unable to produce similar quantities of water that are typically available to residents under normal hydrologic conditions.

<i>Current and Future Population & Households Served by Public Water Supply Systems Carroll County, MD - 2019</i>				
Public System	2019 Population Served	Projected Population to be Served by Public Water Service	2019 Households Served	Projected Households to be Served by Public Water Service
Hampstead	5,960	8,021	2,120	2,854
Manchester	5,370	6,884	1,911	2,449
Mount Airy	9,786	10,139	3,262	3,379
New Windsor	1,449	2,054	575	815
Sykesville-Freedom	22,867	31,199	8,108	11,063
Taneytown	7,017	8,781	2,462	3,081
Union Bridge	977	1,803	384	709
Westminster	29,308	30,464	12,632	13,131
Totals	82,734	99,345	31,454	37,481
Source: 2019 Carroll County Water and Sewerage Master Plan				

Table 5.2 – Current and Future Population and Households Served by Public Water Supply Systems

Current and Future Population & Households Served by Community Water Supply Systems Carroll County, MD				
Comm unity Water System	2019 Population Served	Projected Population to be Served by Public Water Service	2019 Households Served	Projected Households to be Served by Public Water Service
Bark Hill	182	189	65	67
Pleasant Valley	135	140	50	52
<i>Source: 2019 Carroll County Water and Sewerage Master Plan</i>				

Table 5.3 – Current and Future Population & Households Served by Community Water Supply Systems

According to the Carroll County Health Department, between 40% and 50% of the residences in Carroll County employ individual wells, far above the number in the other metropolitan counties, which have considerably more homes and businesses on public water systems. However, this figure could approach 70% if one considers that a number of Carroll’s public water systems derive their supply from large production wells.

Estimate of Damages & Losses

Costs associated with drought for public systems are mainly the costs of purchasing additional or supplemental water supplies to serve the population on a short-term basis. When the reservoir level and supporting streamflow declined during the 1999-2002 drought conditions, the City of Westminster trucked in water to supplement dwindling supplies due to a severe reduction in reservoir capacity. For about two weeks, five to six trucks continuously hauled loads of 6,500 gallons each. For another two weeks, two trucks continued hauling in water for about 16 hours per day. The total bill for one month was approximately \$120,000. The water source was located less than five miles from the city. Factors such as hauling distance, inflation, and fuel costs could result in higher costs if a public water supply system needs to truck in water in the future. Additional costs associated with the response by public water systems to drought conditions could potentially include increased costs for treatment of surface water, energy costs to account for the longer pumping cycles that would be required for municipalities utilizing groundwater wells that have lower yields during drought, the costs of attempting to drill additional wells, and the cost of lost revenue if mandatory water restrictions needed to be put into effect.

Costs associated with a drought for private domestic wells are mainly those that result if wells suffer significantly reduced yields or ultimately come to fail. For the individual homeowner on a private well, the cost to drill a new well, if indeed water can be secured by establishing a replacement well, varies depending on the number of attempts, the depth of casing and the depth that must be drilled to secure adequate water. While exact data are not available, local experts agreed that costs would likely range between \$5,000 and \$10,000.

Wells, especially those that are poorly constructed, utilize shallow water bearing zones, have aged appreciably and/or are overdrawn routinely, can exhibit long-term issues and are generally more susceptible to potential failure, though a drought may increase the rate at which these more susceptible wells (and/or others) may fail. If a well ultimately fails and can no longer generate a usable quantity and quality of water, the property owner must apply with the Carroll County Health Department for a permit to drill a replacement well. The Health Department reports that during non-drought years, permit requests generally range between zero and ten per month, though a number of factors may come to influence the exact number generated in a given month. When precipitation totals decline, there is generally a lag before the groundwater table begins to decline, especially to lower levels that may cause shallow and low yielding wells to struggle and/or fail. In the most recent drought, applications were submitted for 367 domestic-use replacement wells during the peak 12 months (September 2001 – August 2002). That averages to just fewer than 31 permit applications per month, but as many as 84 applications were submitted in one month. In other words, during normal periods between 0 and 0.025 percent of wells fail per month, but during the most recent drought the monthly failure rate more than tripled to 0.078 percent and in the worst month it spiked to 0.21 percent, or nearly ten times the normal rate. The number of applications averaged over the peak 12 months (31) was multiplied by the typical well replacement cost figure at the time (\$3,000) to estimate the average cost per month of \$93,000 during that severe drought. Using a current typical well replacement cost of \$5,000 to \$10,000, the estimated cost per month for a comparable event could range from \$155,000 to \$310,000.

Agricultural & Natural Resources

Identification of Vulnerable Assets

Agriculture is the number one industry in Carroll County. According to the 2017 Census of Agriculture, there were 1,174 farms in the county producing products worth more than \$ 110.4 million. This survey reported that 146,778 acres of ground were used in income-producing farming pursuits.

As discussed earlier in this chapter, farms occupied slightly more than one half of the land in the county. The most significant field crops according to acres planted were corn, soybeans

and wheat. Livestock, poultry, and poultry products accounted for 34 percent of the sales value of all agricultural products.

Estimate of Damages & Losses

Complete data across all sectors of the agriculture industry is not available to indicate losses incurred during droughts. However, the Farm Service Agency's disaster assistance program data provides a glimpse of the impact of a drought on certain types of farming. Under the disaster assistance program, farmers can apply for assistance for losses incurred in a drought. Carroll County's most recent drought conditions occurred between 1999 and 2002. During this period of drought conditions, impacts to agriculture increased in severity as the effects of years with insufficient water compounded. In 2002, farmers experienced three-year lows for production levels in most crops. Table 5.4 entitled "*Production Losses for Crop Year 2002*" illustrates that the impacts of a drought are twofold – the farmer plants fewer acres to begin with, and, even in the acres that the farmer does plant, crop yields are as much as 49 percent lower than in a normal year. By extrapolating the decrease in production from the two types of loss and multiplying by the 3-year average price, we can estimate the difference in sales values between 2002 and a normal year for each type of crop in the table. Based on those extrapolations, we estimate losses greater than \$9 million for corn, soybeans, hay, green beans and peas, and alfalfa. The table also indicates that production levels were between 30 and 49 percent below normal-year levels for the crops listed. If yields had been 30 to 49 percent lower in 2007, the value of sales from crops (\$46,717,000) could have been \$14 to nearly \$23 million lower. Impacts to the \$40,689,000 in sales of cattle, calves, hogs, pigs, and their products would be harder to estimate.

Production Losses: Crop Year 2002 (long-term drought effects)							
Disaster Year				Normal Year		Estimated Losses¹	
Major Crops Planted In The Disaster Year (Or Livestock Enterprise)	# Acres Planted / # Units In The Disaster Year	Acres Not Planted In County Due To The Disaster	Disaster Year Yield	Normal Year Yield	3-Year Avg Price Used For Disaster & Normal Year	Revenue Lost Due To Disaster	Percentage Of Normal Harvest Lost Due To Disaster
Corn	35,400	6,700	71 bu/ac	118 bu/ac	\$2.14 / bu	5,252,416	49%
Soybeans	20,332	1,000	23 bu/ac	35 bu/ac	\$4.40 / bu	1,227,530	37%
Hay Crops	12,198	Unknown	1.32 tons/ac	2.4 tons/ac	\$121 / ton	1,594,035	45%
Gr. Beans (proc)			2.02 tons/ac	3.11 tons/ac	\$208 / ton	400,229	48%
Peas	2,104	500	1.35 tons/ac	2.07 tons/ac	\$329 / ton	419,455	47%
Alfalfa	3,675	Unknown	2.34 tons/ac	4.23 tons/ac	\$134 / ton	930,731	45%
Other Fruits and Vegetables (FAV's)	363	Unknown	30% loss on many FAV's			Unknown	30% loss on many FAV's
1) Estimated losses were extrapolated from the data by Carroll County staff. Source: USDA						Total: \$9,824,395	

Table 5.4 – Production Losses: Crop Year 2022

Table 5.5, below, entitled “Select Agricultural Production Statistics, 2017 & 2012” provides additional figures on harvests, yields, and production values for Carroll County. According to the Carroll County Agricultural Land Preservation Program, agricultural products sold in Carroll County are valued at \$110 million annually.

Select Agricultural Production Statistics, 2017 & 2012					
Carroll County, MD					
Crop	Year	Unit	Acreage Harvested	Average Yield	Total Production
Corn for Grain	2017	Bushels	32,627	166.9	5,446,672
	2012		27,409	150.0	4,111,535
Soybeans	2017	Bushels	29,135	49.6	1,445,075
	2012		23,348	49.4	1,153,617
Winter Wheat	2017	Bushels	8,046	78.7	633,013
	2012		7,721	64.1	495,034
Barley	2017	Bushels	2,260	79.7	180,156
	2012		3,691	83.1	306,709
<i>Source: Census of Agriculture, USDA</i>					

Table 5.5 – Select Agricultural Production Statistics, 2017 & 2012)

Major Employers

Identification of Vulnerable Assets

The risk to major employers during a drought would be twofold: lack of water for employee facilities and lack of water for business operations. If a major employer’s water supply were not available, it would have to either curtail operations or truck in water from an outside source.

Most major employers in Carroll County rely on public water supply, as opposed to private wells. The workforces of some major employers, such as certain banks and contractors, cannot be easily apportioned based on type of water supply because much of the workforce is mobile or dispersed among numerous locations.

Thirty-four public schools with over 100 employees and students, combined, and the administrative building are provided public water service. As of 2020, these schools served 26,345 occupants.

Five public schools rely on onsite wells. As of 2020, these schools served 3,572 occupants.

Estimate of Damages & Losses

If a public water supply could not serve a major employer, costs to the employer would derive from obtaining water from an alternate source or curtailing or shutting down operations. We do not have sufficient data to estimate what those costs would be. The logistics, and therefore the cost, of obtaining water would depend upon the use for the water. For example, drinking water could be obtained by purchasing bottled water whereas water used in a manufacturing process might require a makeshift storage and pumping system. The estimated daily cost of shutting down operations is sensitive information that businesses are unwilling to make public. If a private industrial or commercial well could no longer satisfy demand, costs to the employer would derive from trucking in water and/or drilling a replacement well.

Historic Resources

Identification of Vulnerable Assets

No major effects anticipated.

Estimate of Damages & Losses

No significant costs for damages and losses anticipated.

Mitigation Measures

Existing County Mitigation Measures

Existing County Mitigation Measures			
Mitigation Measure	Identified as existing in 2014 HMP	Completed since 2014 HMP	Notes
The Department of Public Works monitors water use and rainfall on a monthly basis in order to determine at what stage water restrictions will be emplaced at facilities which are owned and operated by the County.	X		Ongoing Initiative
The County acquired Hyde's Quarry northwest of Westminster in September 2007 as a potential water supply source.	X		Ongoing Initiative
The City of Westminster and the County continue to partner on efforts to enhance the City's municipal water supply system to benefit both City and County residents and businesses.	X		Ongoing Initiative
The County acquired the Harrison Property adjacent to the Town of Mount Airy and the future Gillis Falls Reservoir in June 2009 for potential development of well fields and recharge areas.	X		Ongoing Initiative
Mandatory water conservation practices are put in place as necessary by the County and each municipality.	X		Ongoing Initiative
The County has a designated drought coordinator as required by the Maryland Department of the Environment (MDE).	X		Ongoing Initiative
The County's Department of Land and Resource Management measures groundwater levels bi-weekly to monitor current status and assess potential drought conditions.	X		Ongoing Initiative
The Water Resource Coordination Council (WRCC) monitors and reviews groundwater levels and water supply conditions on a monthly basis when drought concerns are present.		X	
Operators of the County-owned water supply systems track daily water use to determine supply needs and potential problems.	X		Ongoing Initiative
Water conservation devices and educational materials are distributed through the County's Bureau of Utilities.	X		Ongoing Initiative
The County has adopted an Adequate Public Facilities and Concurrency Management Ordinance that would prevent new development from receiving approval if the demand created by that development would exceed the available capacity of the public water supply systems owned by the County.	X		Ongoing Initiative
Projected or developable water supply is one of the customary criteria considered while developing land-use strategies for all comprehensive plans within Carroll County. The County-wide comprehensive Water Resources Element (WRE) responds to State mandates requiring ever more specific analyses relative to water supply, wastewater capacity, and storm water management capacity. This unified plan addresses these issues	X		Ongoing Initiative

on a watershed basis and governs each of Carroll's municipalities as well as the unincorporated areas of the County.			
Pamphlets on water conservation techniques and several newsletter articles about agricultural drought management strategies have been published and distributed by the County's Bureau of Utilities and the University of Maryland's Agricultural Extension Carroll County Office, respectively.	X		Ongoing Initiative
The Maryland Department of Agriculture has created low-interest loan and aid programs for the agricultural sector.	X		Ongoing Initiative
The County Department of Economic Development has an Agriculture Development Specialist dedicated to helping the agribusiness community. The services offered include research and marketing assistance, promotional activities, aid with policies and programs, and help in acquiring ag-based small business resources; these services could be leveraged by agricultural businesses to assist with response to future droughts.	X		Ongoing Initiative

Existing Municipal Mitigation Measures

<i>Existing Municipal Mitigation Measures</i>			
Mitigation Measure	Identified as existing in 2014 HMP	Completed since 2014 HMP	Notes
Mandatory water conservation practices are put in place as necessary by each municipality.	X		Ongoing Initiative
Operators of the community water supply systems track daily water use to determine supply needs and potential problems.	X		Ongoing Initiative
The Department of Land and Resource Management provides technical assistance to the municipalities in the county for evaluating water quantity and quality from potential new sources: assistance is also provided with optimizing existing well operations as conditions warrant.	X		Ongoing Initiative
City of Westminster completed construction of the Medford Quarry Pipeline in 2009.	X		Ongoing Initiative
The City of Taneytown is evaluating acquisition of recharge acreage for Well #17, which will be linked to well permit increases.	X		Ongoing Initiative
Currently the Town of Hampstead has a 1-million-gallon water storage capacity on a gravity fed-system with opportunity for manual controls in the event of power failures.	X		Ongoing Initiative
The Town of Hampstead has completed a project to develop and bring Super Pump House and generators online and has also acquired three (3) mobile and one (1) fixed emergency generators for well operations.		X	
The Town of Manchester has emergency water supply and water usage plans in place for drought conditions.		X	

The Town of New Windsor has brought Well #2 online and is in the process of determining the yield of the well and a procedure that will allow water from the well to be incorporated into the overall water system.		X	
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High-Priority Proposed County Mitigation Strategies

<i>High-Priority Drought Mitigation Strategies - County</i>				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Continue the planning process and land acquisition for the Gillis Falls and Union Mills Reservoirs should water demand, permitting and/or regulatory environment dictate implementing either or both of these facilities	Department of Land and Resource Management (DLRM)	DLRM DP	Ongoing – currently monitoring water quality, acquiring land	County

High-Priority Proposed Municipal Mitigation Strategies

High-Priority Drought Mitigation Strategies - Municipalities				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Sources(s)
Upgrade of legacy water main within Town limits	Town of New Windsor	State of MD, Town of New Windsor	FY2024	State of MD
Replacement of legacy water mains on Prospect Road and Center Street	Town of Mount Airy		FY2023	Town of Mount Airy
Upgrade of legacy water mains throughout City.	City of Westminster		Ongoing	City of Westminster
Drill additional wells for increased and/or redundant capacity and well outage scenarios	City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead, Town of Manchester Town of Sykesville Town of Union Bridge	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	TBD	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge HMGP BRIC
Investigate the use of quarry discharge waters from the Union Bridge and New Windsor Lehigh Quarries for use during water shortages	Town of New Windsor Town of Union Bridge DLRM	Town of New Windsor Town of Union Bridge DLRM Lehigh Quarries	TBD	County
Develop drought mitigation plans for public water supplies to include source augmentation	City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	DLRM City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	TBD	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge
Continue implementation of water re-use project to augment water supplies	City of Westminster	City of Westminster County	FY2023 and future	City of Westminster HMGP/BRIC

Lower-Priority Proposed County Mitigation Strategies-Future Consideration

Lower-Priority Drought Mitigation Strategies - County				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Develop a reservoir operation plan for Piney Run Reservoir and pursue possible funding sources for developing the plan	DLRM	DLRM MD Dept of the Environment	TBD	County
Work with the towns to improve water conveyance efficiencies through leak detection programs in the towns as well as within the County system	DPW	DPW DPW - City of Westminster DPW - City of Taneytown DPW - Town of New Windsor DPW - Town of Mount Airy DPW - Town of Hampstead DPW - Town of Manchester DPW - Town of Sykesville DPW - Town of Union Bridge	Ongoing	County
Coordinate with hay and/or grain receiving areas to aid in the distribution of emergency feed stocks	DED	DED DPS - EM	TBD	County
Develop and pursue valve replacement projects to reduce leakage	DPW	DPW	TBD	County
Develop plan for ongoing exercising of valves to ensure proper operation during times of drought	DPW	DPW	Ongoing	County

Lower-Priority Proposed Municipal Mitigation Strategies-Future Consideration

Lower-Priority Drought Mitigation Strategies - Municipalities				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Consider installation of remote surveillance at infrastructure locations associated with water systems to ensure safety of water supplies during times of drought	Town of Hampstead	Town of Hampstead State of MD	TBD	Town of Hampstead State of MD
Work with public water systems and community water systems to adopt water conservation measures for use in times of drought	City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	DPW DPW - City of Westminster DPW - City of Taneytown DPW - Town of New Windsor DPW - Town of Mount Airy DPW - Town of Hampstead DPW - Town of Manchester DPW - Town of Sykesville DPW - Town of Union Bridge	TBD	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge

Chapter Six – Flooding (Flash/Riverine)

Hazard Identification

Hazard Characterization

Flooding is the most common natural disaster nationally. Nearly 9 out of 10 presidential disaster declarations result from natural phenomena, of which flooding is a major component. In terms of both loss of life and property or crop damage, it has been recorded that floods account for more losses than any other natural disaster in the nation. FEMA notes several types of inland flooding as:

- **Riverine Flooding:** Also known as overbank flooding, it occurs when channels receive more rain or snowmelt from their watershed than normal, or the channel becomes blocked by an ice jam or debris. Excess water spills out of the channel and into the channel's floodplain area.
- **Flash Flooding:** A rapid rise of water along a water channel or low-lying urban area, usually a result of an unusually large amount of rain and/or high velocity of water flow (particularly in hilly areas) within a very short period of time. Flash floods can occur with limited warning.
- **Shallow Flooding:** Occurs in flat areas where a lack of a water channel results in water being unable to drain away easily. The three types of shallow flooding include:
 - **Sheet Flow:** Water spreads over a large area at uniform depth.
 - **Ponding:** Runoff collects in depressions with no drainage ability.
 - **Urban Flooding:** Occurs when man-made drainage systems are overloaded by a larger amount of water than the system was designed to accommodate.

The two types of flooding associated with rivers and streams are “flash” and “riverine,” which are the types of floodings mostly likely to impact Carroll County.



Roop Branch flooding in New Windsor – May 2019

Flash floods occur suddenly with tremendous force, usually as a result of torrential rainfall over a short period of time. With little or no warning, a peaceful stream can become a raging torrent capable of carrying away large objects such as boulders, trees, houses, trailers, cars, and people. The potential for flash flooding increases dramatically if the ground is already saturated from previous rainfall. Flash floods can also occur from a sudden release of water from a dam failure or breakup of an ice jam. The 1889 Johnstown, Pennsylvania flood that killed 2,200 people is an example of flash flooding caused by failure of a dam.

Riverine flooding is caused by a different set of conditions. Persistent moderate or heavy rain over one or more days, sometimes combined with snowmelt, can cause a river to slowly rise and overflow its banks. It may take several days to even weeks for rivers to rise over their banks, providing enough warning for people to move to higher ground. However, river floods can last for weeks and can inundate very large areas or entire regions. The 1993 Upper Mississippi River Basin flood, affecting nine states with damages around \$14 billion, is a classic example of a river flood affecting a large region.

Regional and Historical Perspectives

Maryland has a long history of significant floods. The greatest flooding from a one-river perspective occurred on the Potomac River in 1936. The flood was the result of a storm dropping heavy rain on soil already saturated from snowmelt and rainfall earlier in the month; it caused \$24 million in damage. The greatest riverine and stream flooding, in terms of geographic extent and duration, occurred in 1972 when the remnants of Hurricane Agnes became nearly stationary over Pennsylvania and New York. Heavy rainfall from June 20 to June 25 caused flooding in excess of the 100-year frequency level in tributaries along the north side of the Potomac River from Conococheague Creek at Fairview, Maryland, down to Rock Creek at Washington, D.C.



Monocacy River flooding – November 2019

Ellicott City saw storms that exceeded the 0.1-percent annual chance storm in both 2016 and 2018. In 2016, the town received 5.96" of rain in two hours and the Patapsco River rose two feet in five minutes (FEMA). The storm in 2018 caused the Tiber River to flood, when the Ellicott City received 6.56" of precipitation over the course of three hours (NOAA). The flooding in both years was devastating to the historic old town. Businesses and residences were uninhabitable for months and three lives were lost, two in 2016 and one in 2018. Since it was founded in 1772, Ellicott City has seen numerous floods.

In 2018, Carroll County saw over 70 inches of rain fall in many parts of the county. Carroll County typically receives about 40 inches of rain each year. Throughout the year, there were numerous road closures and even a partial dam breach.

According to the NCEI, Carroll County has experienced fifty-six (56) Flash Flood events and seventy-five (75) flooding events (riverine or shallow flooding) since 1950. The number of days with a flooding event was forty (40), with only one (1) event with recorded property damage totaling \$5,000. During the same time, Flash Floods were slightly more frequent, with a recorded forty-three (43) events, with thirteen (13) events with recorded property damage totaling \$1.780 million.

There have only been five (5) disaster declarations and (6) Small Business Administration Disaster Declarations related to flooding in Carroll County (Table 6.1 & Table 6.2)

Federal Disaster Declarations for Flooding in Carroll County				
Disaster Number	Incident Type	Incident Date	Declared Date	Program Declared
DR-309-MD	Severe Storms and Flooding	08/17/1971	08/17/1971	N/A
DR-341-MD	Tropical Storm Agnes	06/23/1972	06/23/1972	N/A
DR-489-MD	Heavy Rains and Flooding	10/04/1975	10/04/1975	N/A
DR-522-MD	Severe Storms and Flooding	10/14/1975	10/14/1976	N/A
DR-1094-MD	Severe Storms and Flooding	01/19/1996 – 01/31/1996	01/23/1996	N/A

Table 6.1 – Federally Declared Disasters for Flooding in Carroll County

SBA Disaster Declarations for Flooding in Carroll County						
Disaster Number	Declaration Number	Incident Type	Incident Date	Effective Date	Primary or Contiguous County?	Program Declared
MD-00035	SBA Disaster Declaration #15565 & #15566	Severe Flooding	05/15/2018 – 05/20/2018	06/14/2018	Contiguous County	SBA – Presidential and SBA Agency Declared
MD-00037	SBA Disaster Declaration #15610 & #15611	Severe Flooding	05/27/2018	07/25/2018	Contiguous County	SBA - Presidential and SBA Agency Declared
MD-00039	N/A	Rain and Flooding	05/12/2018 – 05/23/2018	07/18/2018	Contiguous County	SBA – Secretary of Agriculture Declared
PA-00091	SBA Disaster Declaration #15752 & #15753	Flooding	08/31/2018 – 09/01/2018	10/18/2018	Contiguous County	SBA - Presidential and SBA Agency Declared
PA-00095	N/A	Excessive Rain, Flash Flooding and Flooding	07/21/2018 - ongoing	11/29/2018	Contiguous County	SBA – Secretary of Agriculture Declared
PA-00097	N/A	Rain, Flash Flooding, and Flooding	07/21/2018 - ongoing	03/20/2019	Contiguous County	SBA – Secretary of Agriculture Declared

Source: U.S. Small Business Administration, Disaster Loan Assistance, 2023

Table 6.2 – SBA Declared Disasters for Flooding in Carroll County

Risk Characterization

Carroll County is identified in the 2021 MD State Hazard Mitigation Plan as being at medium risk for flooding overall. Flash flooding poses a higher risk for the county than riverine flooding because Carroll County is predominately a headwater stream area, not a river valley system that conveys flows from other counties and states.

Advancing Stormwater Resiliency in Maryland (A-StoRM)

The Maryland Department of the Environment (MDE) was legislated in 2021 by the adopted Maryland State stormwater management law to address flooding issues due to climate change. This will be accomplished by adjusting design storm rainfall amounts, increasing stormwater management treatment requirements, identifying, and studying areas of frequent flooding, and performing watershed studies.

In November 2021, MDE published A-StoRM to outline the plan of action to address these requirements. Carroll County is actively working as a stakeholder with MDE to achieve the goals and will participate in the efforts to identify areas of historic flooding and endeavor to identify capital projects that may mitigate these issues.

Extent

FEMA defines a flood as a “general and temporary condition of partial or complete inundation of 2 or more acres of normally dry land area or of 2 or more properties (at least 1 of which is the policyholder's property) from:

- Overflow of inland or tidal waters; or
- Unusual and rapid accumulation or runoff of surface waters from any source; or
- Mudslides (i.e., mudflows) which are proximately caused by flooding and are akin to a river of liquid and flowing mud on the surfaces of normally dry land areas, as when earth is carried by a current of water and deposited along the path of the current.; or
- Collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above.”

FEMA defines a floodplain as “any land area susceptible to being inundated by floodwaters from any source.” A flood inundates a floodplain. Most floods fall into three major categories: riverine flooding, coastal flooding, and shallow flooding.

While the extent of flooding is largely dependent on the amount and intensity of rainfall, topography, soil saturation and other factors, damage from floods is always based on the presence of manmade improvements. Additional factors that contribute to flood extent and vulnerability include:

- **Flood depth:** The greater the depth of flooding, the higher the potential for significant damages.
- **Flood duration:** The longer duration of time that floodwaters are in contact with building components, such as structural members, interior finishes, and mechanical equipment, the greater the potential for damage. Floodwaters may linger because of the low relief of the area, but the degree varies.
- **Velocity:** Flowing water exerts force on the structural members of a building, increasing the likelihood of significant damage.
- **Elevation:** The lowest possible point where floodwaters may enter a structure is the most significant factor contributing to its vulnerability to damage due to flooding.
- **Construction type:** Certain types of construction are more resistant to the effects of floodwaters than others. Masonry buildings, constructed of brick or concrete blocks, are typically the most resistant to flood damages simply because masonry materials can be in contact with limited depths of water without sustaining significant damage. Wood frame structures are more susceptible to flood damage because the construction materials used are easily damaged when inundated with water.

It's important to note that during a riverine flood, water slowly climbs over the edges of a stream or riverbed and spreads to the surrounding area. Observing this slow rise of water along with an area-wide flood warning usually gives adequate time to evacuate; however, because the rainfall associated with flash flooding is so intense and fast-moving, it is not as easy to predict when a flash flood will occur. The extent of flash flooding is difficult to determine in advance because local terrain, soil conditions, and construction affect how much stormwater can percolate into the soil, be accommodated by waterways, or cause flash flooding.

Probability and Severity of Future Occurrences

FEMA defines the 100-year flood or Base Flood as a flood having a one percent chance of being equaled or exceeded in any given year. The base flood is the national standard used by the National Flood Insurance Program (NFIP) and all Federal agencies for the purposes of requiring the purchase of flood insurance and regulating new development. Base Flood Elevations (BFEs) are typically shown on Flood Insurance Rate Maps (FIRMs). The base flood elevation is the height the water reaches during a 1-percent annual chance storm. The 500-year flood is the

area inundated by water in a 0.2-percent annual chance storm. It is important to note that although a recurrence interval is given for a storm of a certain magnitude, that does not mean this size storm only occurs once in a certain number of years. For example, a 1%-annual-chance flood, or 100-year flood, has a 1% chance of occurring each year. There is always a chance that a storm of the same magnitude can occur in the same year. Table 6.3 shows the flood probability for the region.

Recurrence Interval (year)	Probability of Occurrence in Any Given Year	Chance of Occurrence in Any Given Year
500	1 in 500	0.2%
100	1 in 100	1%
50	1 in 50	2%
25	1 in 25	4%
10	1 in 10	10%
5	1 in 5	20%
2	1 in 2	50%

Source: FEMA, Flood Probabilities for the Region, 2023

Table 6.3 – Flood Probabilities for the Region

Carroll County regulates both mapped FEMA floodplains as well as non-FEMA floodplains in the unincorporated County and all municipalities within the County except the City of Westminster. Carroll County assumes that the water surface elevation in a 1% annual chance storm, or 100-year storm, will never be more than 10 feet above the top of the bank of a non-FEMA stream. We consider this area to be within the floodplain unless a property owner or developer provides an engineered flood study to prove otherwise.

While floodplain management regulations are limited to the 100-year storm, other agencies review more frequent storms such as the 2-year, 10-year, 25-year, and 50-year storms. The Towns of Hampstead, Manchester, Mount Airy, New Windsor, Sykesville, Taneytown, and Union Bridge all adopted the Carroll County Floodplain Management regulations in 2015. All or a portion of 934 structures are within the mapped FEMA floodplain. We track this number in GIS, but we have not added any new structure in many years. This includes structures within municipalities. Carroll County also has one High Hazard Dam, which is Piney Run Dam. Piney Run, along with several smaller dams, have emergency action plans that dictate what should be done to warn the public or keep them safe, should condition at the dam warrant it. Carroll County has not yet pursued FEMA's High Hazard Potential Dam Grant, but it will be considered along with other funding sources when improving Piney Run Dam.

Climate change models predict shifts in precipitation patterns for the Mid-Atlantic region. As warming progresses, precipitation events are expected to increase in intensity with seasonal variations. Changes in precipitation patterns in Maryland are likely to intensify both floods and droughts. This means fewer spring and summer rainstorms, but when they do occur, they are

likely to bring more short duration high-intensity rain events than historically experienced. In addition, precipitation is expected to increase during the winter months. However, due to warming air temperatures, this is expected to fall more frequently as rain or freezing rain versus

Hazard High Impact Areas

The areas at greatest risk of impact from flooding are those that fall within the one percent-annual chance (100-year) floodplain. Since FEMA-mapped floodplains provide an already existing source of data, the effective Flood Insurance Rate Map (FIRM) for Carroll County was used to delineate the hazard areas for riverine and flash flooding. The FIRM is designed to serve FEMA’s needs for disaster response activities, risk assessment, and floodplain management. The FIRM is used for a variety of planning applications, including broad-based review for floodplain management, land-use planning, commercial site analysis, insurance target marketing, natural resource/environmental analyses, and real estate development and targeting. On October 2, 2015 FEMA adopted new FIRMs for Carroll County, including the incorporated towns. The revised product is a Digital Flood Insurance Rate Map which can be used with Geographic Information Systems (GIS) software. This map has provided the first accurate digital depiction of the flood risk within Carroll County.

Each sub-watershed is shown on a separate map. The maps entitled “Hazard High-Impact Area for Riverine/Flash Flooding” found on pages 65-72 show those areas of Carroll County by sub-watershed mapped by FEMA that are at risk for riverine and/or flash flooding and include the locations of structures and critical facilities within those areas. The overall county map shows the location within the county of each watershed, while individual maps of each watershed are also provided to display structures, major employers, critical facilities, and historic sites located in the floodplain. References to the 100-year floodplain throughout the rest of this plan are to the FEMA-mapped floodplains, unless otherwise noted.

Risk Assessment

Lifelines Potentially Affected: Safety & Security; Food, Water, Shelter; Transportation



Critical Facilities

Identification of Vulnerable Assets

Critical facilities, for the purposes of this plan, include fire stations; hospitals, nursing homes and medical clinics; police stations; emergency operations centers; schools; water treatment

and wastewater treatment plants; airports; county and municipal government buildings; detention centers; and bridges.

Table 6.4 entitled “Value of Critical Facilities Located within a 100-Year Floodplain” lists the various facilities located within a floodplain throughout the County. All the structures are public facilities such as wastewater treatment plants and municipal buildings. County owned bridges have been included in the critical facilities listing for this chapter only due to their specific vulnerability to flooding events.

Estimate of Damages and Losses

If every critical facility across the county were to be destroyed due to a flooding event, the replacement cost for all facilities would total \$20,489,200. This estimate assumes that the land value would not be lost; if the value of the land is included in the estimated loss figures the total increases to \$24,947,600. The total replacement cost for 154 county bridges is estimated at \$202,323,794.

<i>Value of Critical Facilities Located within a 100-Year Floodplain - Carroll County, MD</i>			
Critical Facility	Land Value	Improvement Value	Total Value
Pleasant Valley Wastewater Treatment Plant	18,500	42,800	61,300
Union Bridge Wastewater Treatment Plant	616,600	15,000,000	15,616,600
Westminster Wastewater Treatment Plant	852,400	1,855,000	2,707,400
Westminster Utility Maintenance (Old Manchester Rd.)	252,300	300,000	525,300
Westminster Water Treatment Plant	2,745,600	3,291,400	6,037,000
County Bridges ¹	n/a	n/a	202,323,794
¹ Replacement cost is reported under Total Value			
Source: FEMA (100-Year Floodplains) 2015; CC Bureau of Resource Management, 2020			

Table 6.4 – Value of Critical Facilities Located within a 100-Year Floodplain

People and Residences

Identification of Vulnerable Assets

“Repetitive loss structure” is a term that is usually associated with the National Flood Insurance Program (NFIP). For Flood Mitigation Assistance (FMA) program purposes, this is a structure, covered by a contract of flood insurance under the NFIP, that has suffered flood damage on two or more occasions over a 10-year period ending on the date when a second claim is made, in which the cost to repair the flood damage, on average, equals or exceeds 25 percent of the market-value of the structure at the time of each flood loss event. For the Community Rating System (CRS) of the NFIP, a repetitive loss property is any property for which the NFIP has paid two or more flood claims of \$1,000 or more in any given 10-year period since 1978. A repetitive

loss structure is important to the NFIP, since structures that flood frequently put a strain on the flood insurance fund.

The Department of Public Safety’s building-point data were used to identify properties for which the structure itself on a parcel located either all or partially in the floodplain was also located in the floodplain. The data showed that, throughout the county, 162 residential structures are located within 100-year floodplain boundaries. Of these, an estimated two houses are considered repetitive loss structures. The vast majority (153) of the structures are detached, single-family homes. Of the others, seven are residential apartments or condominiums, and two are residential commercial operations where the primary use is residential. To estimate the number of people at risk of losing their homes in a worst-case scenario flood, the number of structures can be multiplied by the countywide occupancy rate of 96.99% percent to estimate that 157 of the residential structures have people living in them. That is, 157 households live within a 100-year floodplain. This equates to 408 people residing in the flood hazard area, based on the countywide average of 2.6 persons per household.

Estimate of Damages and Losses

Based on data reported in the two tables, below, relating to residential structures located within the 100-year floodplain, if every residential structure in the floodplain were destroyed, the value of the lost homes would total an estimated \$22,354,200, or an average of \$137,989 per structure. Those loss estimates assume that the value of the land underneath the structures would not be lost; they are based on the values of the buildings only. However, if a government agency determines that it is necessary to condemn repetitive loss structures, the land would lose all or nearly all its value as well. The estimated total value of all residential properties (including the value of both land and improvements) inside 100-year floodplains is \$53,915,100.

Table 6.5, entitled “Residential Structures Located within the FEMA-Mapped Floodplains by Growth Area” shows the number of structures located in the floodplain by GA. Table 6.6, entitled “Residential Structure Located within FEMA-Mapped Floodplains by County” shows the number of structures located in the floodplain for the remainder of the county.

Residential Structures Located within FEMA-Mapped Floodplains by County (excluding Municipalities & Growth Areas) Carroll County, MD				
Area	# of Structures	Total Land Value of Parcels	Total Improvement Value on Parcels	Total Value
Carroll County	122	27,253,900	17,352,300	44,606,200
<i>Avg. Values</i>		232,393	142,232	365,625
<i>Source: CC Bureau of Resource Management & MD Assessment and Taxation Data, 2020</i>				

Table 6.5 – Residential Structures Located Within FEMA-Mapped Floodplains by County

Residential Structures Located within FEMA-Mapped Floodplains by Growth Area Carroll County, MD				
Growth Area	# of Structures	Total Land Value of Parcels	Total Improvement Value on Parcels	Total Value
Hampstead	0	0	0	0
<i>Average Values</i>	0	0	0	0
Manchester	0	0	0	0
<i>Average Values</i>	0	0	0	0
Mount Airy	0	0	0	0
<i>Average Values</i>	0	0	0	0
New Windsor	1	83,800	128,000	211,800
<i>Average Values</i>		83,300	128,000	211,800
Freedom	7	704,900	711,800	1,416,700
<i>Average Values</i>		100,700	101,686	202,386
Taneytown	4	464,300	383,600	847,000
<i>Average Values</i>		115,850	95,900	211,750
Union Bridge	16	1,669,800	2,224,400	3,894,200
<i>Average Values</i>		104,363	139,025	243,388
Westminster	12	1,384,200	1,554,100	2,938,300
<i>Average Values</i>		115,350	129,508	244,858
Finksburg	0	0	0	0
<i>Average Values</i>		0	0	0
Totals	40	4,307,000	5,0001,900	9,308,900
<i>Source: CC Bureau of Resource Management & MD Assessment and Taxation Data, 2020</i>				

Table 6.6 – Residential Structures Located Within FEMA-Mapped Floodplains by Growth Area

Agricultural & Natural Resources

Identification of Vulnerable Assets

Most of the land in floodplains is used for agriculture. In fact, farms account for 10,768 acres, or 65 percent, of all land in 100-year floodplains in the county. Farmers typically plant grasses within a 20-to 40-foot buffer of a stream, but the 100-year floodplain can be much wider and encompass many types of crop fields as well as pastures for livestock.

Estimate of Damages and Losses

Approximately 6.6 percent of all agricultural land in the county is located in a 100-year floodplain. No one type of agriculture predominates in the floodplains, so to estimate damages and losses we assume that a proportionate amount of each type of agriculture is present. Since flooding destroys crops, we estimate the losses to crop farming in a 100-year flood event by multiplying the value of all crop sales from the 2017 Census of Agriculture by the proportion of croplands that we assume to be in a 100-year floodplain (6.7 percent). In other words, crop losses from a 100-year flood would total approximately \$4,857,031.

Flooding does not necessarily destroy livestock, and, as a result, it is more difficult to estimate the losses to livestock farmers from a 100-year flood event. While it is possible for livestock to be removed from a floodplain, the process is not simple and can be costly. The 2017 Census of Agriculture reports the market value of livestock, poultry and their products that were sold during the census year. For the livestock data reported in the 2017 Census of Agriculture, the market value of livestock and their products sold was \$37,954,000. If we assume that 6.7 percent of these farms are in the 100-year floodplains, we can estimate that \$2,542,918 worth of potential sales product was based in a 100-year floodplain at the time of the 2017 Census of Agriculture. The portion that would be lost would depend on the extent of the warning before the water levels rise, the cost to relocate the livestock, and the availability of substitute pasturelands.

Major Employers

Identification of Vulnerable Assets

There are no major employers located within a 100-year floodplain in Carroll County.

Estimate of Damages and Losses

No significant damages or losses to major employers are anticipated as a result of flooding.

Historic Resources

Identification of Vulnerable Assets

A total of 79 historic sites, those which are listed on the National Register of Historic Sites and/or on the Maryland Historical Trust Inventory of Historic Sites, are located within a hazard area for 100-year floods. Due to the fact that many historic sites are homes, the number and value of many of these structures have been included in the total number of structures indicated in the People, Population and Residences section of this chapter.

Estimate of Damages and Losses

Table 6.7, below, entitled “Historic Sites Located within FEMA-Mapped Floodplains” identifies the number of historic sites found in the identified hazard area for floods for each of the county’s GAs. Total property values were queried from the assessment data to estimate damages and losses. The total value of the historic buildings in the hazard area for floods is estimated to be \$9,289,071. However, no real numerical value can be placed on sites that tell the history of the community and help to preserve its sense of place.

Historic Sites Located within FEMA-Mapped Floodplains Carroll County, MD		
Growth Area	# of Historic Sites	Total Property Value (\$)
Hampstead	0	0
Freedom- Sykesville	1	0
Manchester	0	0
Mount Airy*	0	0
New Windsor	2	5,000
Taneytown	2	0
Union Bridge	2	611,500
Westminster	4	757,800
Totals	11	1,374,300
Remainder of County		
Area Outside Growth Areas	68	7,914,771
Total for Entire County	79	9,289,071
* Mount Airy numbers are for Carroll Co. portion of the municipality Sources: Carroll County Bureau of Resource Management; MD Assessment and Taxation, 2020		

Table 6.7 – Historic Sites Located within FEMA-Mapped Floodplains

Mitigation Measures

Guiding development in the 100-year flood inundation zone presents a straightforward method of preventing flood damage. If structures are properly sited or elevated to prevent flood damage, the amount of hazard risk decreases. Preventative activities attempt to keep flood problems from getting worse by addressing development collectively. Planning, land acquisition, and regulations help to guide the use and development of flood-prone areas. Building, planning, and/or code enforcement offices administer most preventative activities.

Existing County Mitigation Measures

Existing County Mitigation Measures			
Mitigation Measure	Identified as existing in 2014 HMP	Completed since 2014 HMP	Notes
The Floodplain Management Ordinance was adopted to protect human life and health, minimize property damage, encourage appropriate construction practices, and protect water supply, sanitary disposal, and natural drainage. Floodplain impacts are to be avoided and minimized. It also requires a setback area to be preserved in perpetuity with natural vegetation.	X		Ongoing Initiative
Section 505 of the Development Handbook prohibits construction in floodplain and wetland areas for the purposes of reducing losses to life and property from flooding and reducing the need for public expenditures and flood protection.	X		Ongoing Initiative
The Conservation Zoning District of the Carroll County Zoning Ordinance is intended to help limit the damage floods cause by limiting the amount of development within floodplains. In addition to the general purpose of the district, all cluster subdivisions located in a Conservation Zoning District must be located 300 feet from the 100-year planned reservoir flood pool.	X		Ongoing Initiative
The Stormwater Management Ordinance limits the impact of new development on flooding that can occur from 1-year and 10-year storms. This ordinance is in	X		Ongoing Initiative

compliance with the Maryland Stormwater Manual and requires stormwater management plans to be consistent with Flood Hazard Management Act of 1976.			
In 2015, the County adopted a new floodplain management ordinance that increases previous protections by prohibiting, except in very limited circumstances, new development in floodplains where the development would affect flood heights.		X	
The Building Code regulates development of existing lots in floodplains, prohibits activities affecting flood height, and prohibits new sewerage systems in floodplains.	X		Ongoing Initiative
Mitigation Grant Programs	X		Ongoing Initiative
The County participates in the National Flood Insurance Programs (NFIP)	X		<ul style="list-style-type: none"> • Ongoing Initiative • Participation in this program by the county allows citizens to be eligible for flood insurance.
Weather alert radios are available in most government agencies that have responsibility for response or action during a hazard event.	X		Ongoing Initiative
Riparian vegetation, where absent in stream buffers, is restored to provide natural mitigation against storm-related hazards and soil movement, as well as to capture and slow the pace of stormwater. This is accomplished through the Forest Conservation ordinance and the Floodplain Management ordinance that was adopted in April 2004.	X		Ongoing Initiative
Wetlands are currently being preserved in floodplains to protect the functioning of natural systems to mitigate flooding as	X		Ongoing Initiative

new development occurs on individual properties.			
DPW routinely clears debris from the support bracing underneath low-lying bridges to decrease the likelihood that large objects carried by floodwaters will lodge against a bridge and subsequently dam the river course.	X		Ongoing Initiative
The Bureau of Resource Management implements the Stormwater Management chapter of the Carroll County Code of Public Local Laws, which requires the implementation of Best Management Practices to reduce the increased stormwater runoff and flooding effects of land use conversion due to development.	X		Ongoing Initiative
The County floodplain ordinance was updated, and revisions adopted in September 2015, to evaluate and update the requirements to meet or exceed the NFIP standards.		X	
County staff is participating in training on NFIP requirements to help improve the enforcement of existing floodplain regulations. The county has been delegated review and enforcement authority by most municipalities for the Floodplain Management Program. Westminster enforces its own code.	X		Ongoing Initiative
The Floodplain Management Program and requirements put into place in April 2004 for the County require that flood-free access be provided to new developments.	X		Ongoing Initiative
FEMA adopted new FIRMs for Carroll County on October 2, 2015.		X	
All municipalities have adopted a FEMA-approved floodplain ordinance. Westminster has adopted its own code, while the other seven municipalities have adopted Carroll County's Floodplain Management code.		X	

Existing Municipal Mitigation Measures

Existing Municipal Mitigation Measures			
Mitigation Measure	Identified as existing in 2014 HMP	Completed since 2014 HMP	Notes
The Town of Union Bridge has included within its subdivision plan approval of the Jackson Ridge development and pursuant public works agreement, stipulations requiring construction of new box culverts for the MD 75 bridge over Little Pipe Creek, which will mitigate the flood risk in the eastern portion of the town.	X		Ongoing Initiative
Subsequent to significant flooding events in 2018, the City of Westminster has elevated office space and records storage within its Utilities Shop.		X	
The Town of Union Bridge has completed installation of a generator at its water treatment plant using Federal hazard mitigation grant funding.		X	

Proposed High Priority Mitigation Strategies – County and Municipal

High-Priority Flood Mitigation Strategies - County				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Retrofit existing storm water management facilities that do not meet current requirements	Bureau of Resource Management	DLRM DPW	Ongoing	County HMGP BRIC
Identify owners of repetitive loss properties who are interested in participating in future property acquisition and relocation projects with assistance available through the federal Flood Mitigation Assistance (FMA) program, in addition to other flood protection measures.	DPS – EM DLRM	DPS – EM DLRM MDEM FEMA	Continuous	County State of MD Federal (FMA)

High-Priority Flood Mitigation Strategies - County				
Identify owners of properties with structures in the floodplain – other than identified repetitive loss properties -- who are interested in participating in future property acquisition and relocation projects.	DPS – EM DLRM	DPS – EM DLRM MDEM FEMA	Continuous	County State of MD Federal (FMA)
Where relocation is not feasible, educate property owners with structures in the floodplain on elevating those structures to reduce flood damage through dry and wet flood-proofing techniques and the benefits of each. Dry flood- proofing techniques may be applied to non-residential properties only; residential structures must be elevated.	DPS – EM DLRM	DPS – EM DLRM MDEM FEMA	Continuous	County State Federal (FMA)
Coordinate with MDE A-StoRM effort to identify areas of historic flooding, analyze for potential solutions, and formulate plans and projects to address.	DLRM	DLRM MDE	Continuous	County State of MD
Consider installation of flood gauges upstream of vulnerable locations throughout Carroll County.	DPS – EM DLRM	DPS – EM DLRM National Weather Service	FY2025	County State of MD Federal
Consider flood hardening measures for County owned pump station within Town of Sykesville	DPW - Utilities	DPW – Utilities Town of Sykesville	FY2026	County State of MD Federal (FMA, HMGP, BRIC)

High Priority Flood Mitigation Strategies - Municipalities				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Union Bridge suggests that a study of the cumulative stormwater effects for the MD 75 and Bucher John Road corridors in the vicinity of Little Pipe Creek and Cherry Branch be made to aid development of appropriate flood management projects.	Town of Union Bridge DLRM	Town of Union Bridge DLRM MDEM FEMA USACE	FY2025	Federal (FMA, HMGP, BRIC) State of MD County Town of Union Bridge
Union Bridge has proposed a plan to relocate the Town's wastewater treatment plant to a location outside of the floodplain.	Town of Union Bridge	Town of Union Bridge DLRM MDEM FEMA	TBD	Federal (HMGP, BRIC) Town of Union Bridge CIP
Install signage to inform public of flooding risk in Carrie Dorsey Park during flooding events	Town of Sykesville	Town of Sykesville DLRM	TBD	Town of Sykesville Federal (HMGP)
Continue development and implementation of inflow and infiltration project to limit infiltration into sewer system during flooding events.	City of Westminster	DPW - City of Westminster	FY2023 and future	City of Westminster Federal (HMGP/BRIC)

While the mitigation strategies in the plan can and should be implemented regardless of HMGP funding, it should be noted that, in addressing flood hazards, FEMA's primary emphasis under the HMGP is the implementation of non-structural measures. Non-structural measures include the acquisition and demolition, relocation, elevation, or dry flood-proofing (non-residential structures only) of flood damaged or flood-prone properties.

Lower-Priority Mitigation Measures for Future Consideration-County and Municipal

Lower-Priority Drought Mitigation Strategies – County and Municipal				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Preserve and restore floodplains to protect the functioning of natural systems to mitigate flooding on properties that do not go through the development process.	DLRM/BRM	DLRM/BRM City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	TBD	TBD
Investigate the possibility of raising low-lying bridges to decrease the likelihood that large objects carried by floodwaters will lodge against a bridge and subsequently dam the river course.	DPW	DPW DLRM/BRM City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester	TBD	County State of MD Federal (HMGP, BRIC)

		Town of Sykesville Town of Union Bridge		
Identify bridges at risk from flood, identify enhancements, and implement projects needed to reduce the risks.	DPW	DPW DLRM City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	TBD	County State of MD Federal (FMA, HMGP, BRIC)
Review and update building codes to accurately reflect requirements of the National Flood Insurance Program	DLRM/BRM DPW/BPI	DLRM/BRM DPW/BPI City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville	Ongoing	County

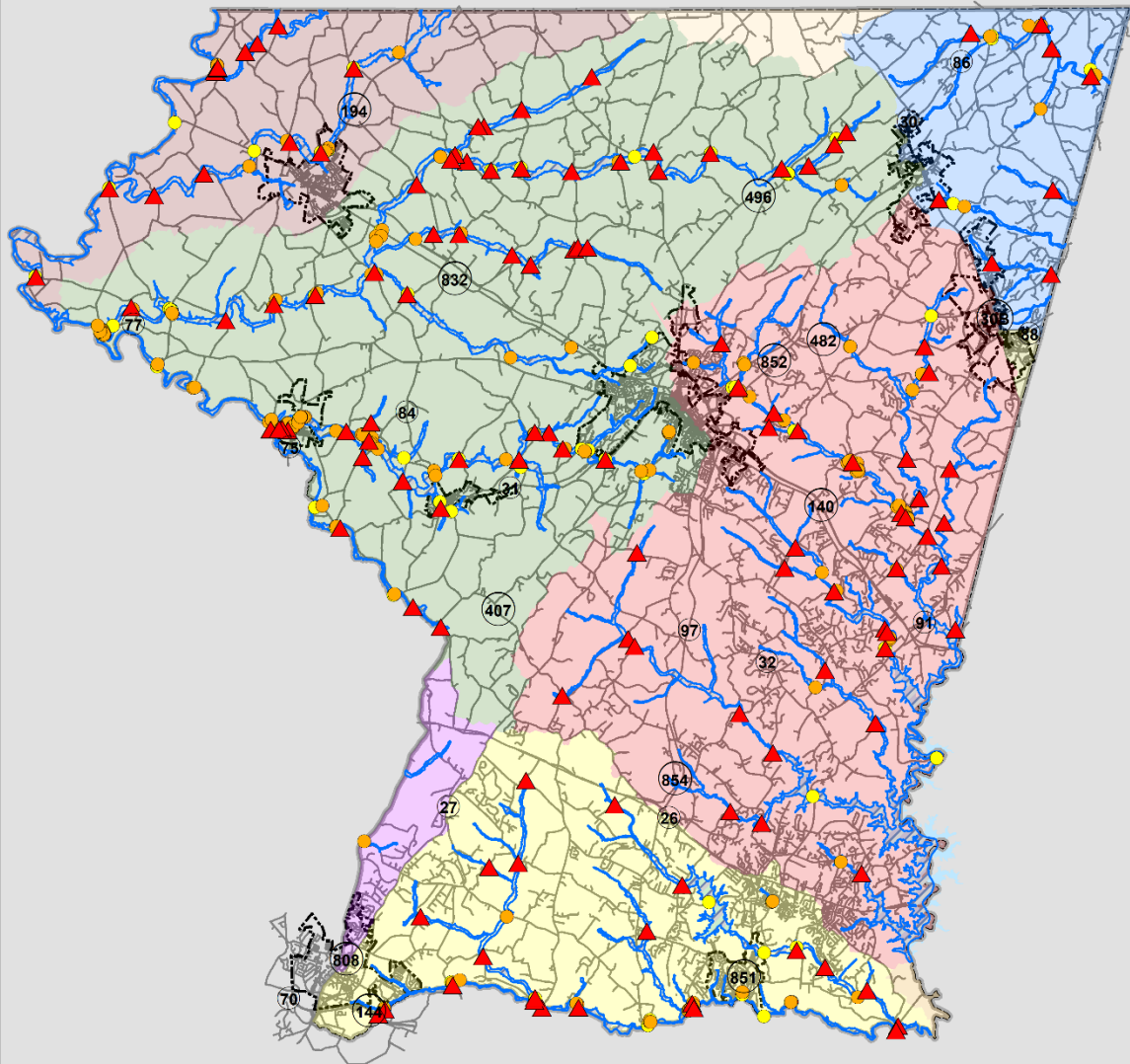
		Town of Union Bridge		
Work with MD SHA to identify areas of frequent roadway flooding and develop mitigation strategies.	DPW	DPW DLRM MD SHA MDEM	Ongoing	County State of MD
Provide additional means of access into existing neighborhoods served by county roads in flood-prone areas to prevent residents from becoming trapped during a flood event.	DPW	DPW DLRM	TBD	County Federal (HMGP, BRIC, FMA)
Construct, where possible, berms around flood-threatened water supplies and water or wastewater treatment plants to avoid inundation of the facilities.	DPW BRM City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville	DPW BRM City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy	TBD	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville

	Town of Union Bridge	Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge		Town of Union Bridge Federal (HMGP, BRIC, FMA)
Relocate, where possible, flood-threatened water or wastewater treatment plants to avoid inundation of the local water or wastewater plant.	DPW City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	DPW City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge MDE	TBD	DPW City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge State of MD Federal (HMGP, BRIC, FMA)
Install watertight covers or inflow guards on sewer manholes, and/or raise manhole openings that are not located within roadways onto	DPW City of Westminster City of Taneytown Town of New Windsor	DPW City of Westminster	TBD	DPW City of Westminster City of Taneytown

concrete pillars to prevent floodwaters from infiltrating sewerage pipes and causing sewer overflow, pipe pressurization, and household surcharge of untreated wastewater.	Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge		Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge Federal (HMGP, BRIC)
Start a database using identified property that has received damage due to flooding. The database should also include a tax account identification number for the property, a description of the property damage, the value of the damage, and links to photographs of the damage. Developing this database will allow the County to easily identify properties at high risk of damage from flooding.	DPS – EM	DPS – EM DPW - BPI DLRM	TBD	County
Investigate whether demolition and removal of decommissioned	City of Taneytown	City of Taneytown	TBD	City of Taneytown State of MD

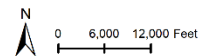
Taneytown water treatment plant building may assist with flood mitigation.		DLRM MDE MDEM		Federal (HMGP, BRIC, FMA)
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Hazard High - Impact Area For Riverine / Flash Flooding 100 - Year Floodplain by Watershed



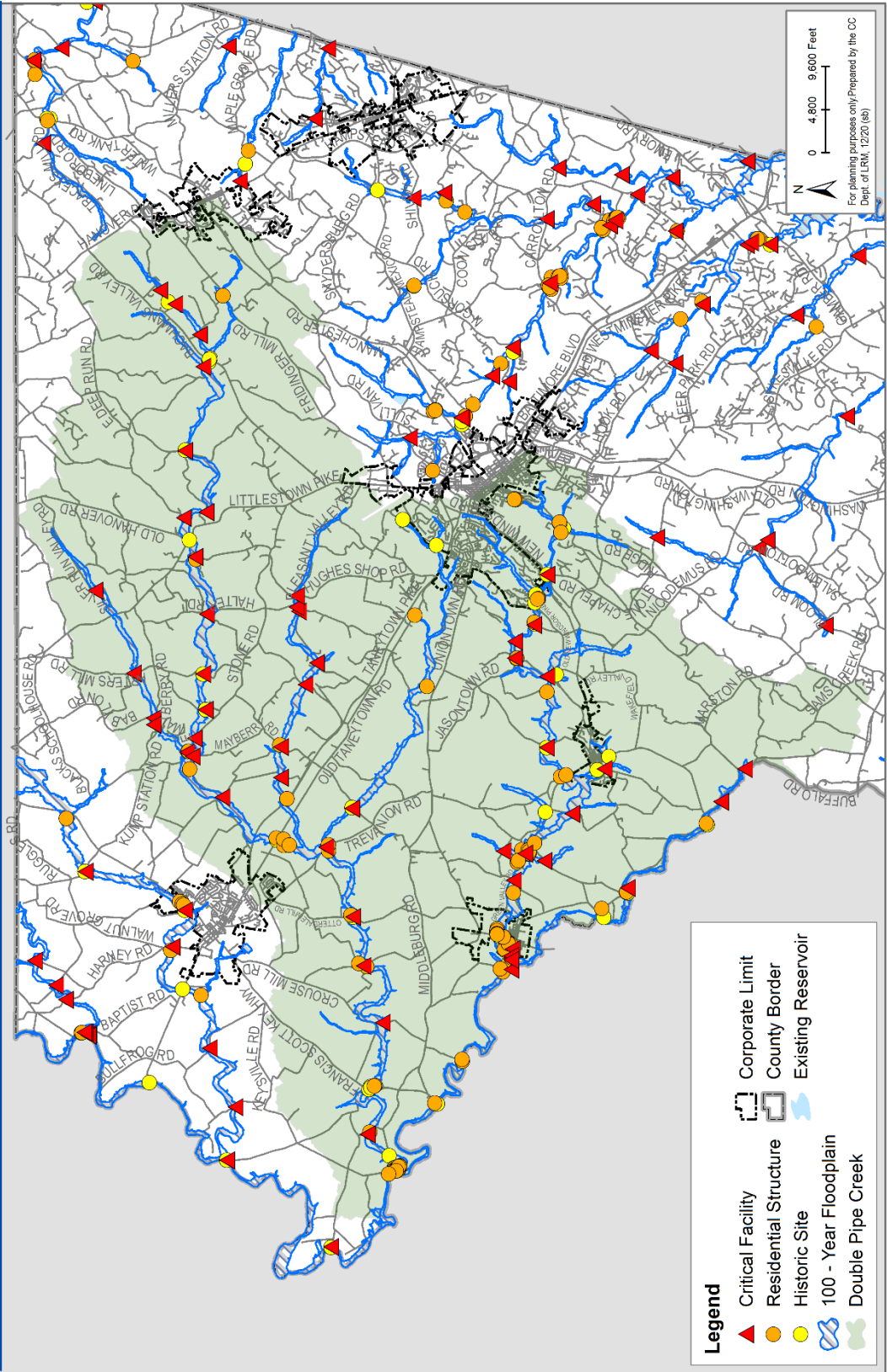
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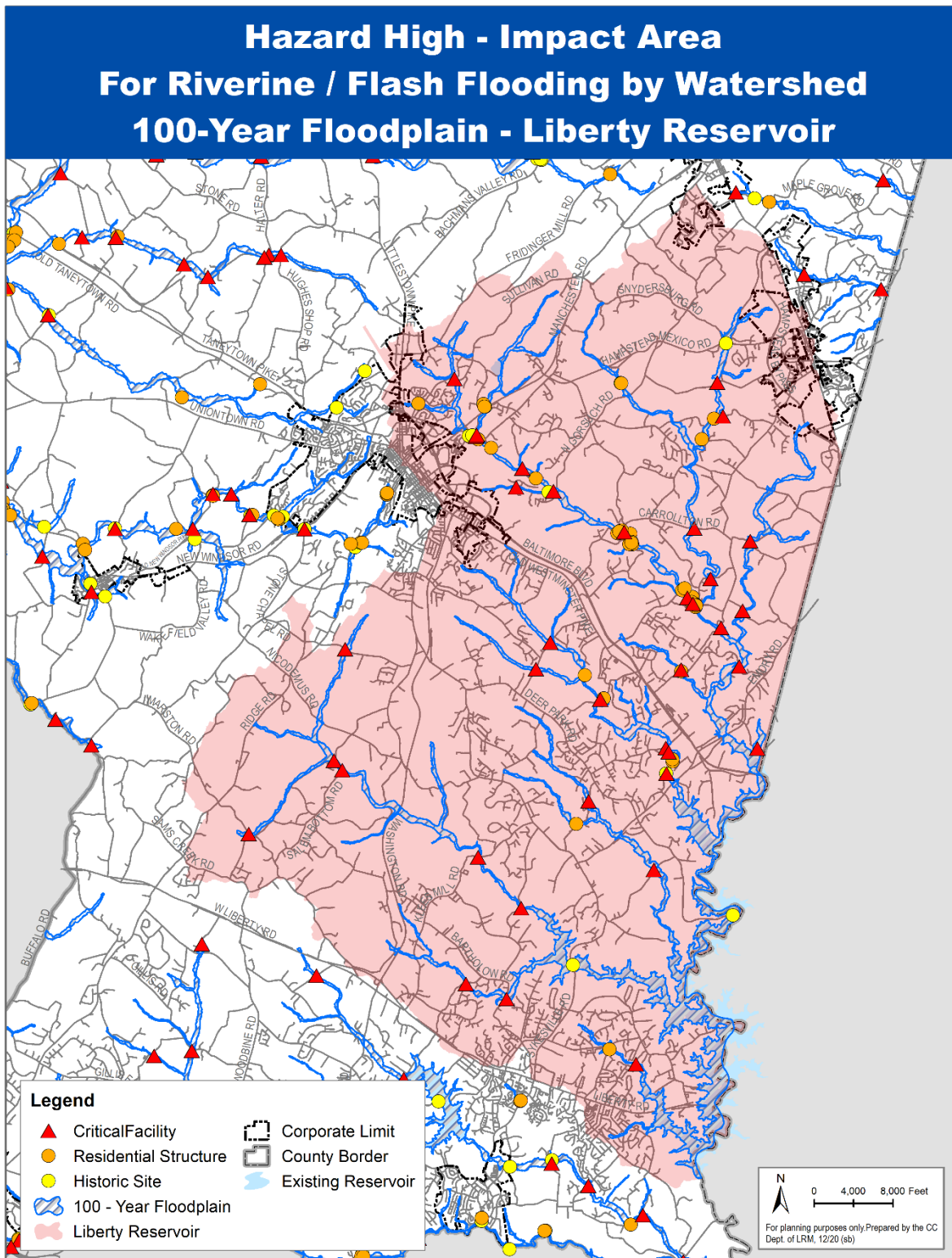
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|-------------------------|---------------------------|------------------------|----------------------|
| ▲ Critical Facility | ☞ Prettyboy Reservoir | ☞ Lower Monocacy River | ⬜ Corporate Limit |
| ● Residential Structure | ☞ Loch Raven Reservoir | ☞ Double Pipe Creek | ⬜ County Border |
| ● Historic Site | ☞ Patapsco River N Branch | ☞ Upper Monocacy River | ☞ Existing Reservoir |
| ☞ 100 - Year Floodplain | ☞ Liberty Reservoir | ☞ Conewago Creek | |
| | ☞ South Branch Patapsco | | |

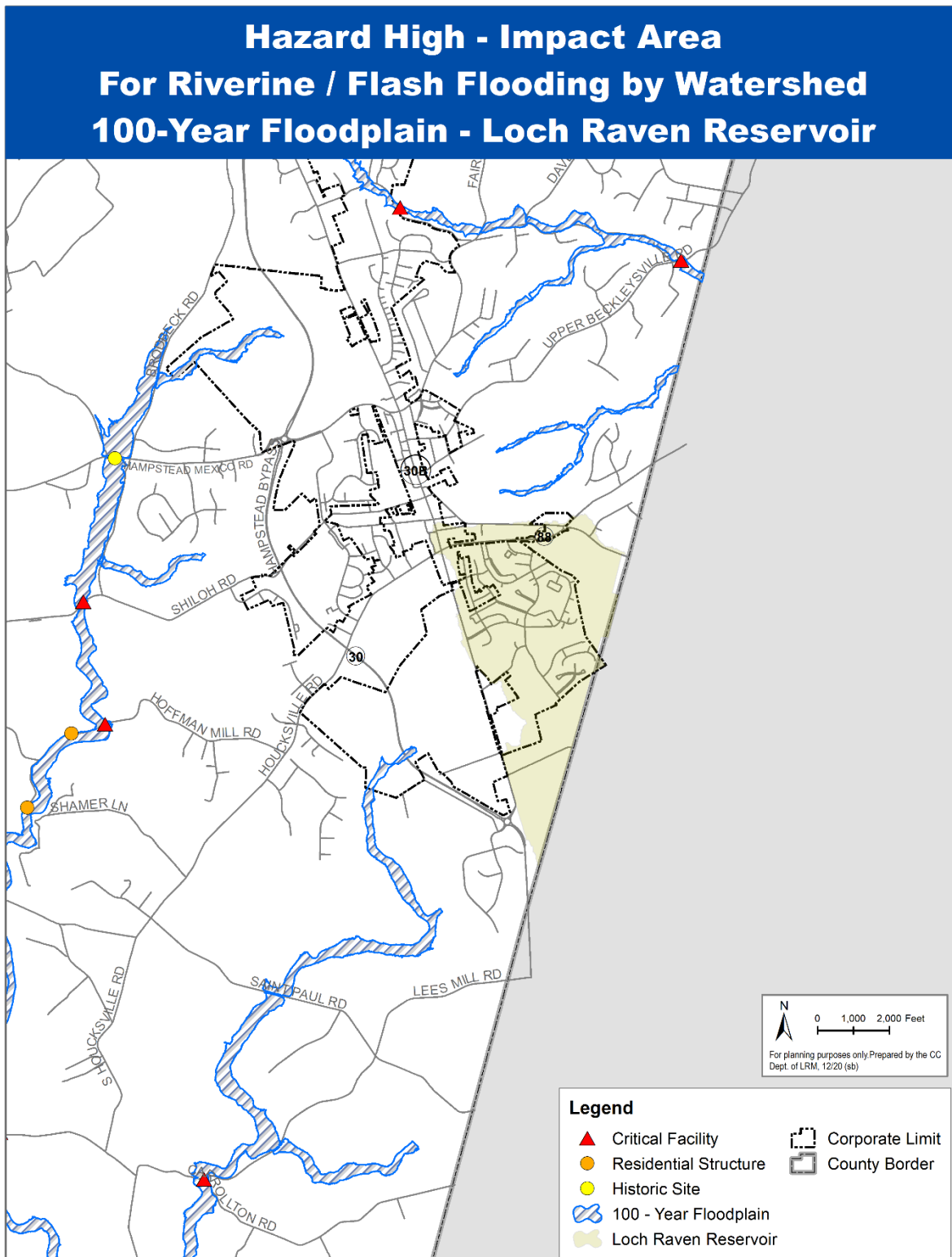


For planning purposes only. Prepared by the CC Dept. of LRM, 12/20 (sb)

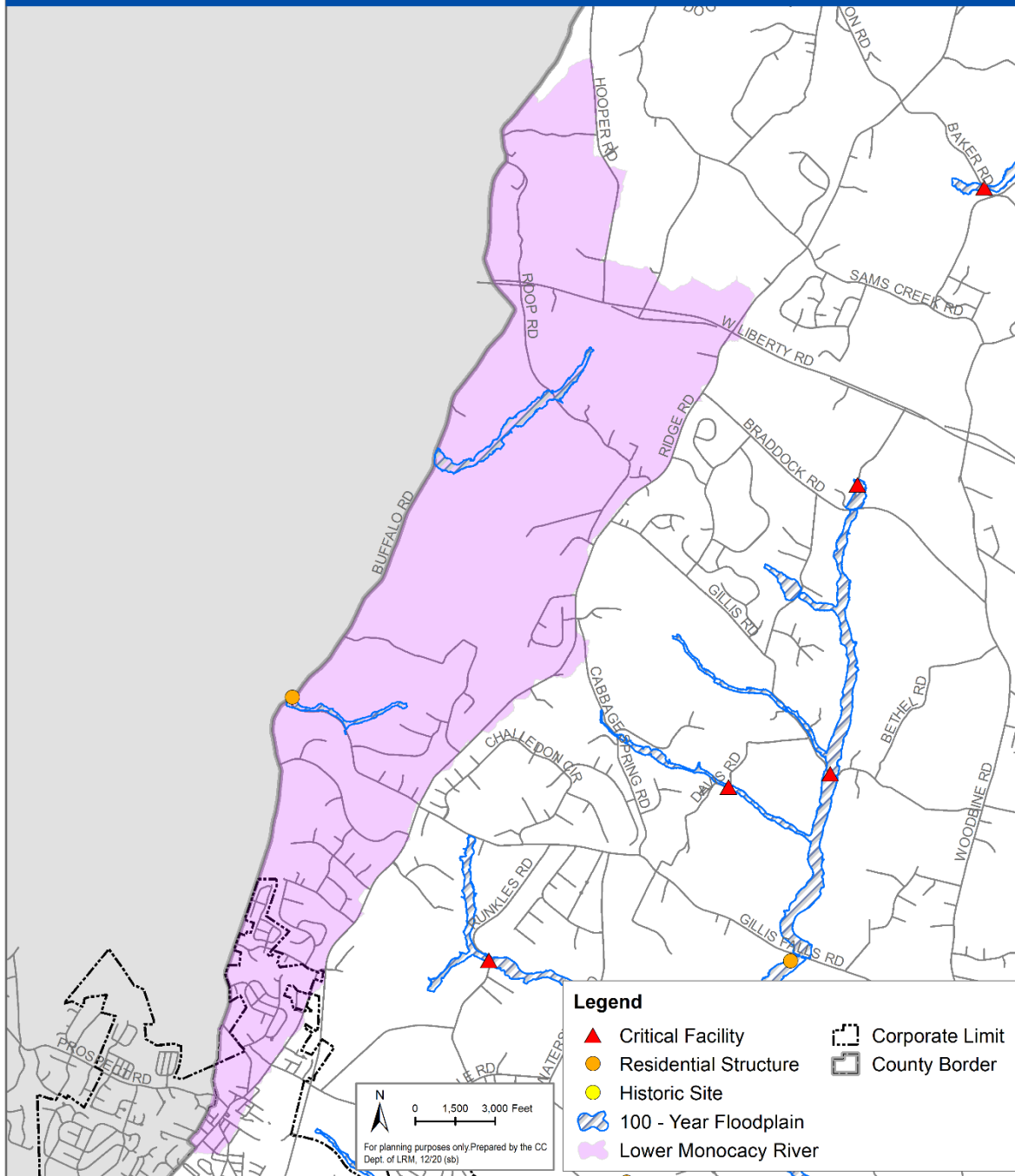
Hazard High - Impact Area For Riverine / Flash Flooding by Watershed 100-Year Floodplain - Double Pipe Creek

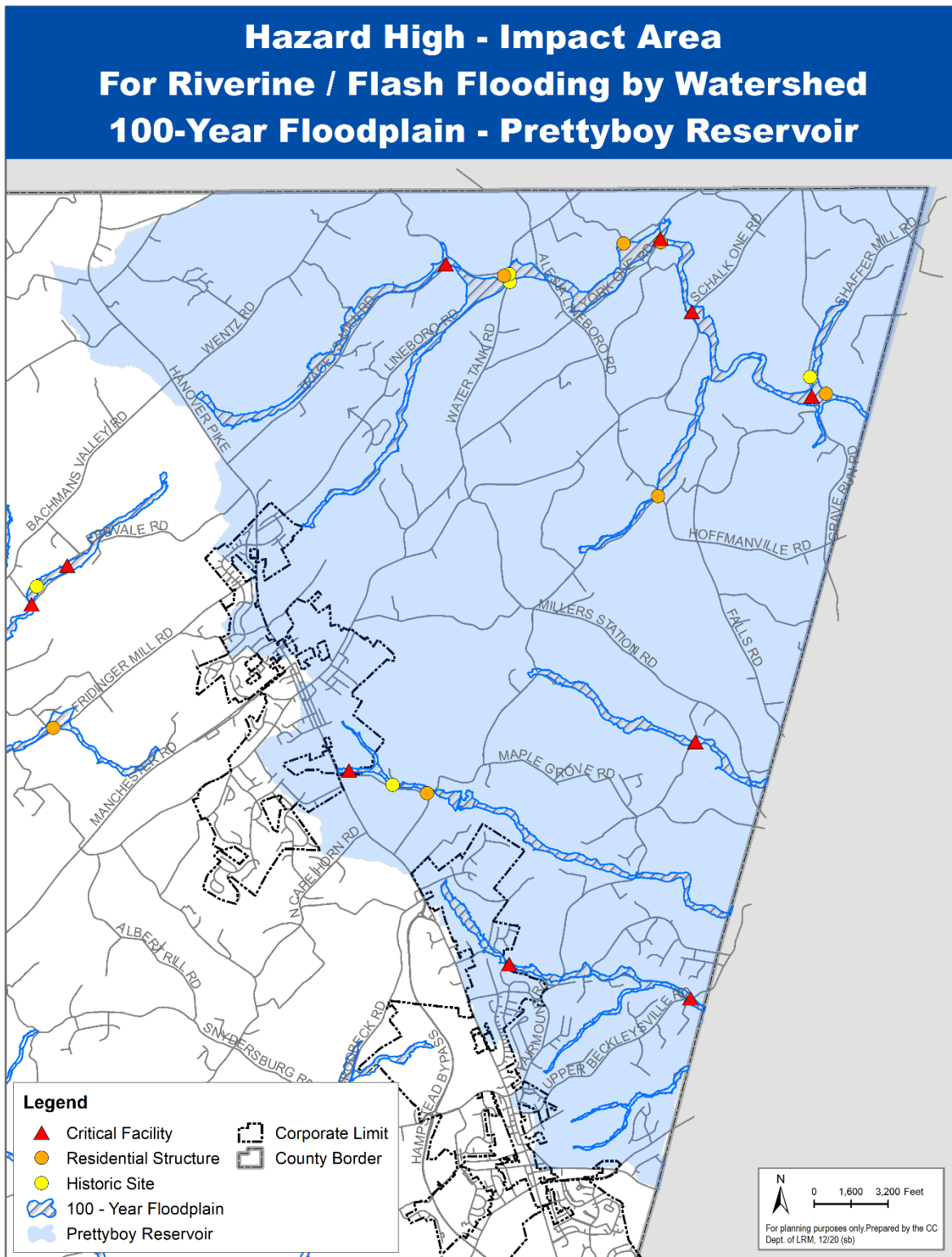






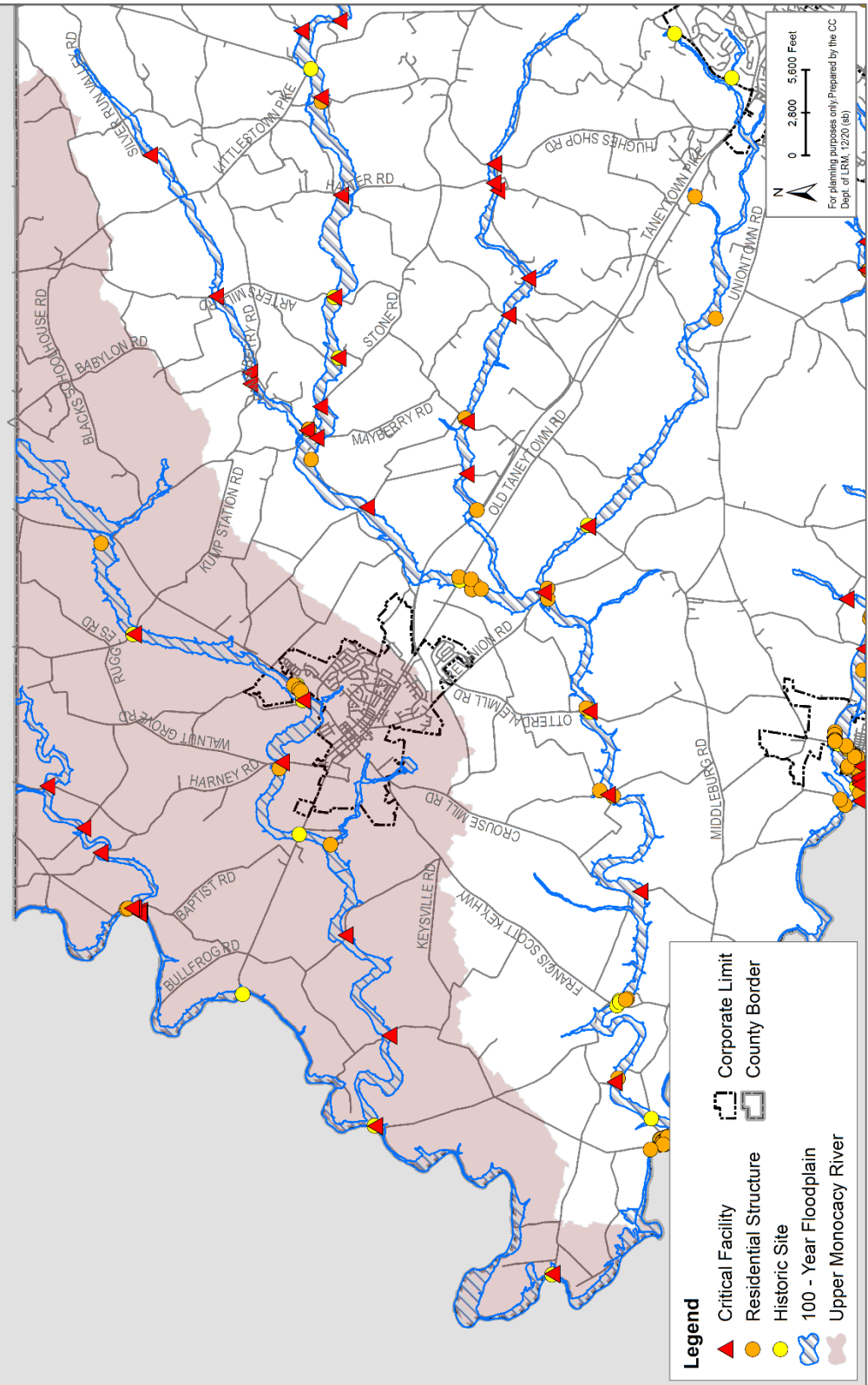
Hazard High - Impact Area For Riverine / Flash Flooding by Watershed 100-Year Floodplain - Lower Monocacy River







Hazard High - Impact Area For Riverine / Flash Flooding by Watershed 100-Year Floodplain - Upper Monocacy

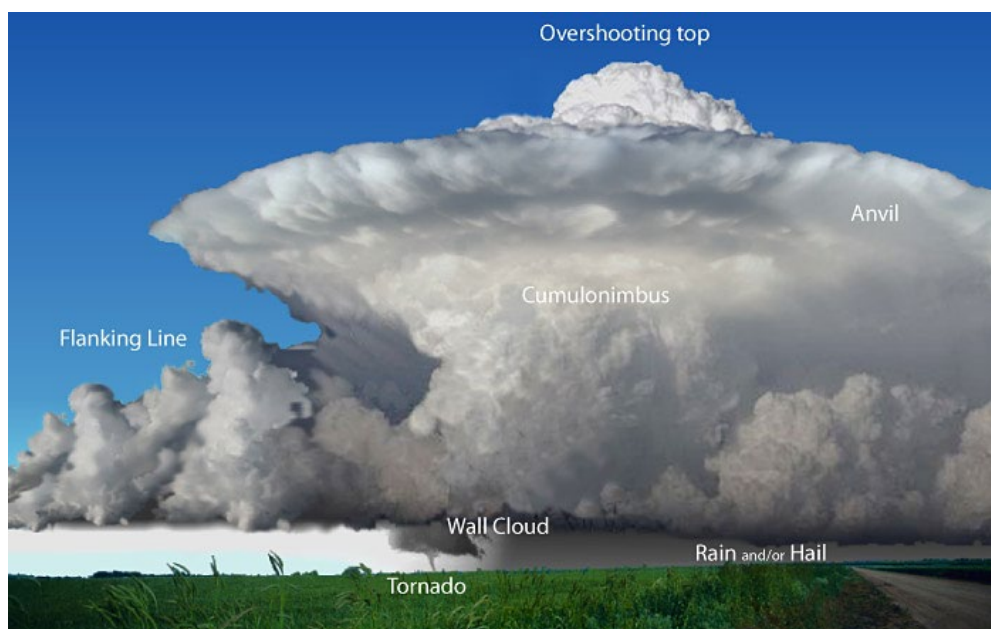


Chapter Seven– Thunderstorm and Wind

Hazard Identification

Hazard Characterization

A thunderstorm is simply defined as a rain-bearing cloud that produces lightning. All thunderstorms have lightning, while not all rain showers do. With multiple hazards, thunderstorms are all dangerous, as they can produce excessive lightning, hail, and damaging winds, which also include tornadoes. Tornadoes are addressed as a separate hazard in Chapter Eight of this document. Thunderstorms can occur as single cells such as supercells, as clusters of cells, and as lines. The four main ‘ingredients’ needed for thunderstorms to become particularly dangerous, and even severe, are instability, which is from daytime heating or dry air being lifted over moist air; changing of wind speed and/or direction with height; a source of lift for the air to rise in the storm such as a cold front; and moisture as larger dewpoints indicate more moisture to fuel the storm.



NOAA National Severe Storms Laboratory Severe Weather 101: Thunderstorm Types

Lightning is one of the primary threats with thunderstorms. It occurs more during the summertime as instability and moisture are greater than in the winter, but that does not mean it cannot occur year-round here in the mid-Atlantic. Storms produce more lightning when their updrafts, or the air rising on its own within the storm, are stronger, allowing the storm cloud to reach below-freezing temperatures where electrical charges can occur between frozen particles. According to the National Oceanic and Atmospheric Administration (NOAA), three hundred people die on average every year from lightning, and eighty are injured. One thing that

makes lightning so dangerous is its unpredictability as it can occur close to ten miles away from the actual storm itself, leading to less warning time.

Hail is a less deadly, but still dangerous threat with thunderstorms. Hail forms when raindrops are kept aloft by the thunderstorm updraft in colder areas of the atmosphere, allowing them to freeze and grow larger; larger hail happens with stronger updrafts. With the speed at which they fall and their size, hail can seriously damage buildings and vehicles, shred crops, and even potentially injure or kill people.

Thunderstorm wind damage is often widespread and can be quite costly. There are multiple types of severe wind that can occur in thunderstorms including: downbursts, macrobursts, microbursts, gust fronts, and derechos. The most common with thunderstorms are gust fronts and microbursts, but the one with the most widespread damage is a derecho, which is much rarer with the most occurring in the Midwest US with around four every three years. Winds can either be straight-line or in the case of downbursts, strong winds can be forced rapidly downwards by thunderstorms.

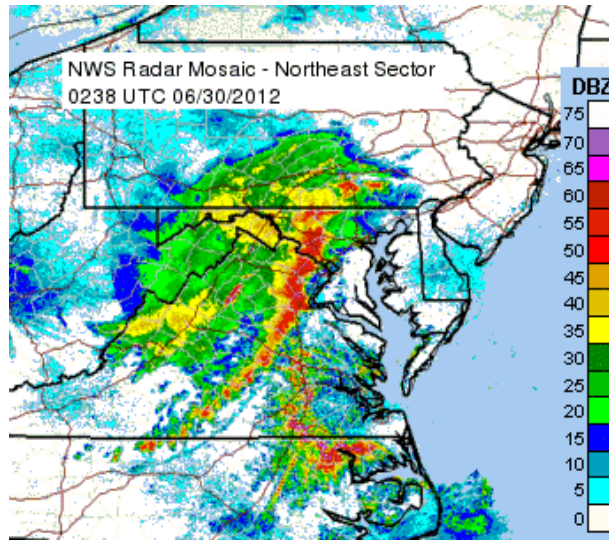
Regional & Historical Perspectives

From 1963 through 2021, according to the National Climatic Data Center (NCDC), Carroll County has had 302 thunderstorm wind reports with 2 deaths, 19 injuries, \$1.257 million in property damage, and \$69,000 in reported crop damages. There have been many more storms outside of these reports that likely also produced damage to trees or other items, but these are the most significant reports through that period. At the same time, there have been 61 hail events with \$68,000 in reported property damage and \$15,500 in reported crop damage, with likely many more sub-severe hail events occurring that went unreported. Finally, although rarer, there have been 13 lightning events reported, with 9 injuries and \$330,000 in property damage.

Most of Carroll County's thunderstorm and wind damage occurs with cold front passages, but warm fronts and cold low-pressure systems also often produce thunderstorms. Thunderstorms generally peak in the late spring into summer, but storms with strong wind, lightning, and hail have occurred year-round. Maryland is typically spared of the severe hail that occurs with supercells in the Midwest, but hail does occur commonly, just at smaller sizes. All types of thunderstorms are known to affect Maryland, but lines of storms associated with fronts, and ordinary pop-up thunderstorms are more common than supercells.

One of the more recent notable thunderstorm events in Carroll County was the widespread severe outbreak that came with the 2012 derecho. The derecho, which is a long track straight-line wind event, travelled from the Midwest and produced widespread wind damage for much of Maryland. Climatologically, derechos are quite rare for Maryland with only one derecho

expected every two years, with only five derechos since 1963: 1980, 1991, two in 2004, and 2012.



National Weather Service - Regional NWS radar mosaic 6/30/2012

There have only been five (5) disaster declarations and only one (1) Small Business Administration Disaster Declaration related to Thunderstorms and Wind in Carroll County (Table 7.1 & 7.2)

Federal Disaster Declarations for Thunderstorms and Wind in Carroll County				
Disaster Number	Incident Type	Incident Date	Declared Date	Program Declared
DR-1492-MD	Hurricane Isabel	09/18/2003 – 09/29/2003	09/19/2003	Individual Assistance (Housing Assistance & Other Needs Assistance) Public Assistance (Categories A-B & C-G)
EM-3251-MD	Hurricane Katrina Evacuation	08/29/2005 – 10/01/2005	09/13/2005	Public Assistance (Categories A-B)
EM-3335-MD	Hurricane Irene	08/26/2011 – 09/05/2011	08/27/2011	Public Assistance (Categories A-B)
EM-3349-MD	Hurricane Sandy	10/26/2012 – 11/08/2012	10/28/2012	N/A
DR-4091-MD	Hurricane Sandy	10/26/2012 – 11/04/2012	11/20/2012	Individual Assistance (Housing Assistance & Other Needs Assistance) Public Assistance (Categories A-B & C-G)

Table 7.1 – Federally Declared Disasters for Thunderstorms and Wind in Carroll County

SBA Disaster Declarations for Thunderstorms and Wind in Carroll County						
Disaster Number	Declaration Number	Incident Type	Incident Date	Effective Date	Primary or Contiguous County?	Program Declared
PA-00113	SBA Disaster Declaration #17165 & #17166	Remnants of Hurricane Ida	08/31/2021 – 09/05/2021	09/10/2021	Contiguous County	SBA – Presidential and SBA Agency Declared
Source: U.S. Small Business Administration, Disaster Loan Assistance, 2023						

Table 7.2 – SBA Declared Disasters for Thunderstorms and Wind in Carroll County






Risk Characterization

The composite risk for thunderstorms, which includes lightning and hail, is shown as medium-high for Carroll County in the 2021 Maryland State Hazard Mitigation Plan. Carroll County is obviously still affected by lightning and hail given the medium-high risk, but it is not deemed as a high-risk issue for the county. However, according to the 2021 Maryland State Hazard Mitigation Plan, Carroll County is one of several counties that are considered to have a high risk for wind hazard, which can be either from larger-scale winds, or from thunderstorms. The larger-scale winds, referred to as synoptic-scale winds, are associated with cold front passages or winter storms and high winds associated with thunderstorms are caused by downbursts.

Extent

The strength of a thunderstorm is typically measured in terms of its effects, namely the speed of the wind, the presence of significant lightning, and the size of hail. In general, thunderstorm winds are less than tropical cyclone speeds, but strong winds associated with downbursts can be extremely hazardous and reach speeds up to 168 mph. NWS Storm Prediction Center issues Day 1, Day 2, and Day 3 Convective Outlooks that depict non-severe thunderstorm areas and severe thunderstorm threats across the contiguous United States. The categorical forecast specifies the level of the overall severe weather threat via numbers (e.g., 5), descriptive labeling (e.g., HIGH), and colors (e.g., magenta). The probabilistic forecast directly expresses the best estimate of a severe weather event occurring within 25 miles of a given point. The text narrative begins with a listing of severe thunderstorm risk areas by state and/or geographic region. This is followed by a concise, plain-language summary of the type(s) of threat along with timing that is focused on the highest-risk areas. The NWS uses the following categories to classify risk from thunderstorms:

Understanding Severe Thunderstorm Risk Categories

THUNDERSTORMS (no label)	1 - MARGINAL (MRGL)	2 - SLIGHT (SLGT)	3 - ENHANCED (ENH)	4 - MODERATE (MDT)	5 - HIGH (HIGH)
No severe* thunderstorms expected	Isolated severe thunderstorms possible	Scattered severe storms possible	Numerous severe storms possible	Widespread severe storms likely	Widespread severe storms expected
Lightning/flooding threats exist with <u>all</u> thunderstorms	Limited in duration and/or coverage and/or intensity	Short-lived and/or not widespread, isolated intense storms possible	More persistent and/or widespread, a few intense	Long-lived, widespread and intense	Long-lived, very widespread and particularly intense
					

* NWS defines a severe thunderstorm as measured wind gusts to at least 58 mph, and/or hail to at least one inch in diameter, and/or a tornado. All thunderstorm categories imply lightning and the potential for flooding. Categories are also tied to the probability of a severe weather event within 25 miles of your location.



National Weather Service
www.spc.noaa.gov



Wind

The NWS issues the following wind alerts:

- **Wind Advisory**—when sustained non-thunderstorm winds range from 25 mph to 39 mph and/or gusts to 57 mph.
- **High Wind Watch**—when there is the potential for non-thunderstorm high wind speeds to develop and pose a hazard, or otherwise be life-threatening.
- **High Wind Warning**—when non-thunderstorm high wind speeds are occurring and may pose a hazard or are life-threatening. For a High Wind Warning to be issued, non-thunderstorm winds either must be sustained at 40 mph or greater for one hour or longer, or 58 mph or greater than 58 mph for any duration.

Wind Speed	Observations
26-38 knots (30-44 mph)	Trees in motion. Light-weight loose objects (i.e. lawn furniture) tossed or toppled.
39-49 knots (45-57 mph)	Large trees bend; twigs, small limbs break, and a few larger dead or weak branches may break. Old/weak structures (e.g. sheds, barns) may sustain minor damage. Buildings partially under construction may be damaged. A few loose shingles removed from houses. Carports may be uplifted; minor cosmetic damage to mobile homes.
50-64 knots (58-74 mph)	Large limbs break; shallow rooted trees pushed over. Semi-trucks overturned. More significant damage to old/weak structures. Shingles, awnings removed from houses; damage to chimneys and antennas; mobile homes, carports incur minor structural damage; large billboard signs may be toppled.

65-77 knots (75-89 mph)	Widespread damage to trees with trees broken/uprooted. Mobile homes may incur more significant structural damage, be pushed off foundations, or overturned. Roofs may be partially peeled off industrial/commercial/warehouse buildings. Some minor roof damage to homes. Weak structures (i.e. farm buildings, airplane hangars) may be severely damaged.
78+ knots (90+ mph)	Many large trees broken and uprooted. Mobile homes severely damaged; moderate roof damage to homes. Roofs partially peeled off homes and buildings. Moving automobiles pushed off dry roads. Barns, sheds demolished.

Table 7.3 – National Weather Service Wind Speed Damage Estimates (2022)

Lightning

While there is no established index for lightning, a lightning strike is of minimum severity when it has limited impacts on the natural and built environment (ex. tree limbs and buildings) and major severity when it causes extensive damage (ex. loss of life, fire, structural damage). The potential damages resulting from lightning strikes are primarily injury, loss of life, power outages, business interruption, fire and minor structural damage. A false sense of security often leads people to believe that they are safe from a lightning strike because it may not appear to be near their location. However, lightning can strike 10 miles away from a rain column, which puts people who are still in clear weather at risk.

Hail

The severity of hail is measured by duration, hail size, and geographic extent. All of these factors are directly related to thunderstorms, which creates hail. There is wide potential variation in these severity components. Using the NWS definition for a severe thunderstorm, dime-sized hail is considered a minimum hazard and quarter-sized hail is considered a major hazard. Quarter-sized hail can cause significant damage to agricultural crops and livestock, as well as property such as automobiles, aircraft, and roofs. Although rare, large hailstones may even cause injury or death. The amount of cover obtained during a hailstorm can greatly reduce the risk to human health during these events. The size of hailstones is a direct function of the severity and size of the storm.

Probability and Severity of Future Occurrences

Thunderstorms are a common occurrence in Maryland and occur on approximately 27 to 36 days each year. Figure 7.1 shows the annual mean thunderstorm days across the Contiguous United States. Thunderstorm occurrences peak in July and August when storms average once every five days.

Annual Mean Thunderstorm Days (1993-2018)

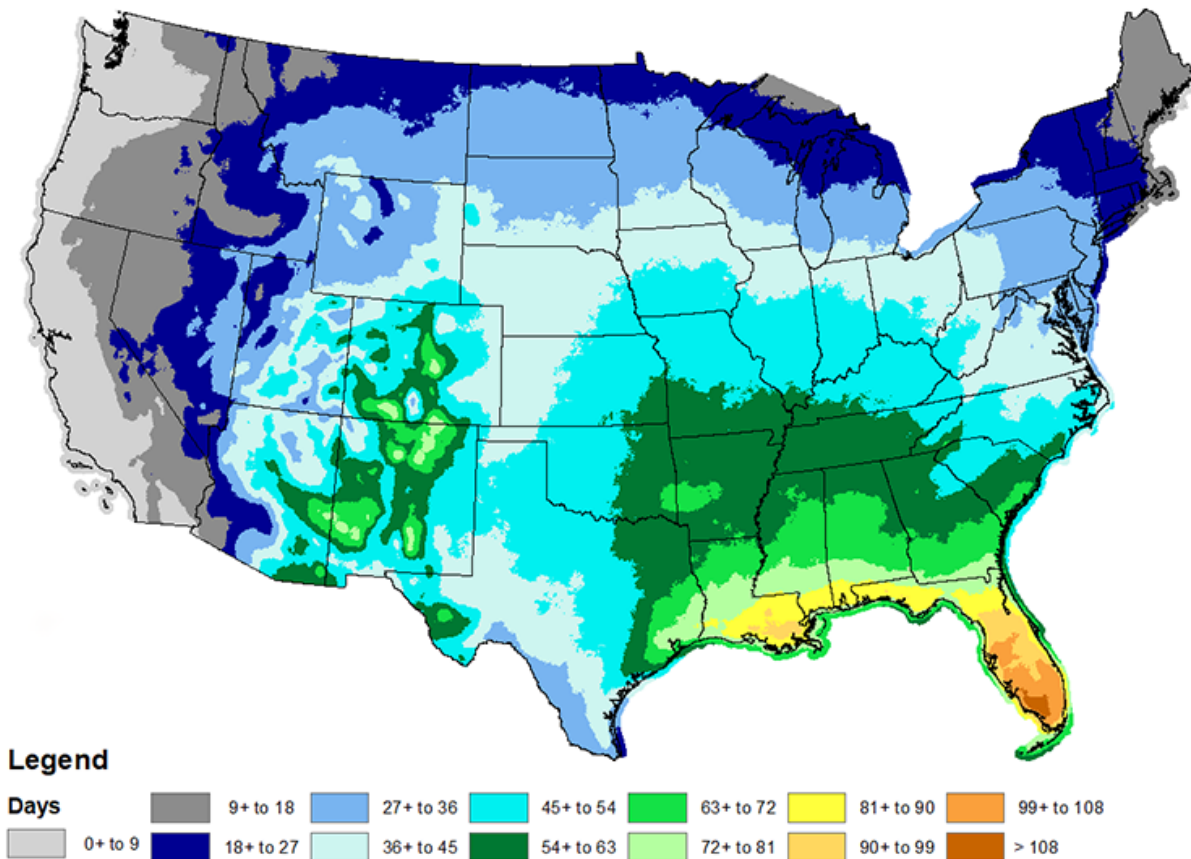


Figure 7.1: Average annual thunderstorm days per year over the Contiguous United States Derived from NLDN Measurements: 1993-2018. Koehler, Thomas L., 2019.

Winds, as mentioned previously, may occur as part of thunderstorms or independently. According to the NWS Storm Prediction Center, the annual severe weather report states that Maryland experienced approximately 321 wind reports in 2022. When winds are sustained at 40-50 mph, isolated wind damage is possible. Widespread significant wind damage can occur with higher wind speeds. During strong thunderstorms, straight line wind speeds can exceed 100 mph. High winds can blow objects around and pose a significant threat to the safety of Carroll County residents. According to the NCEI database, in the past thirty (30) years, Carroll County experienced approximately three (3) days with a wind event that resulted in death or

injury, one-hundred and nine (109) days with an event that resulted in property damage, and thirteen (13) days with an event that resulted in crop damage.

Lightning is a common hazard that affects Carroll County. Lightning strikes the United States about 25 million times a year. Although most lightning occurs in the summer, the County can experience lightning at any time of year. According to the NWS, Lightning kills about 20 people in the United States yearly, and hundreds more are severely injured. According to the NCEI database, in the past thirty (30) years, Carroll County experienced approximately five (5) days with a lightning event that resulted in death or injury and six (6) days with an event that resulted in property damage. The frequency of lightning poses a significant threat to Carroll County's infrastructure, agriculture, and residents. Figure 7.2 indicates that Maryland's risk for lightning is relatively low to relatively moderate, with some small areas rated as relatively high. Please reference, <https://hazards.fema.gov/nri/lightning> for risk category definitions.

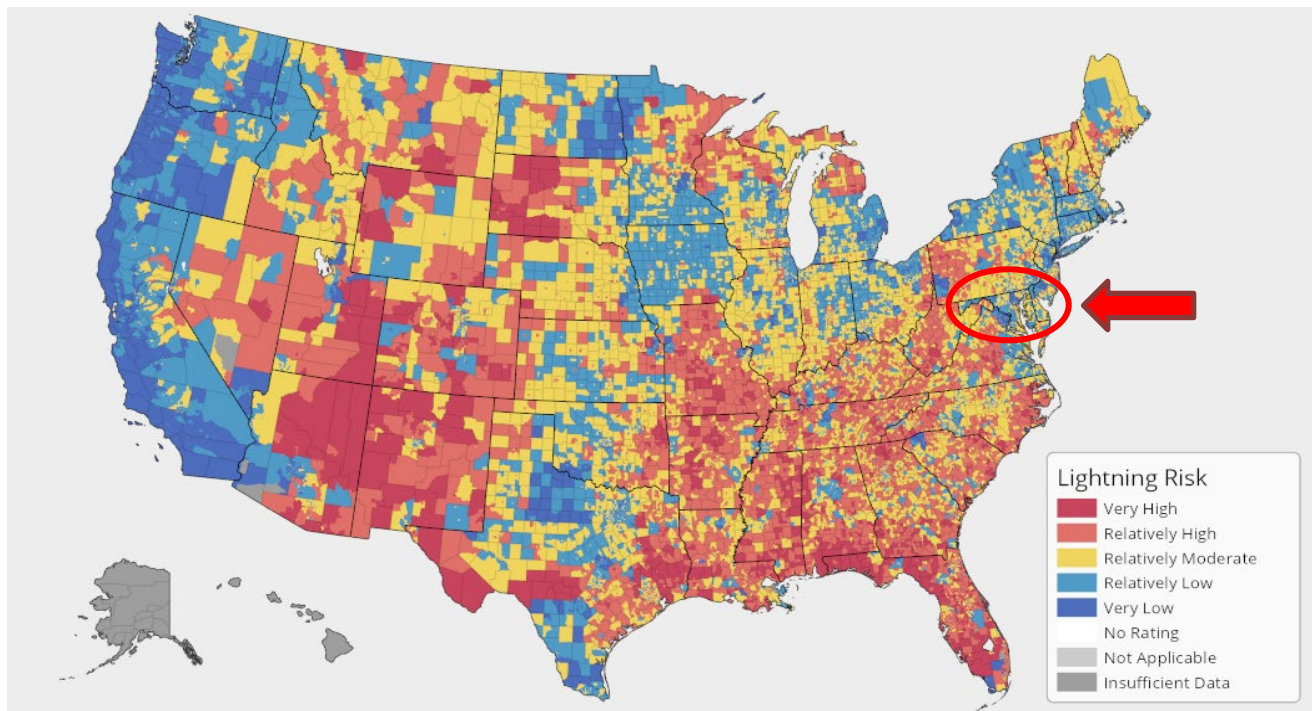


Figure 7.2: National Risk Index for Lightning, FEMA, 2023.

Hail does not occur with every thunderstorm and is not a frequent event in Maryland. However, hail-related insured losses between 2000 and 2019 averaged between \$8 billion to \$14 billion a year, according to Aon. According to State Farm Insurance Company, the company paid over \$3.1 billion in hail claims in 2020. The NWS Storm Prediction Center reports that Maryland experienced approximately 21 hail reports in 2022. According to the NCEI database, in the past thirty (30) years, Carroll County experienced approximately three (3) days with a hail event that resulted in property damage and two (2) days with a hail event that resulted in crop damage.

The severity of crop and property damages significantly threatens Carroll County agriculture and residents. Figure 7.3 indicates that Maryland's risk for hail is very low to relatively moderate. Please reference, <https://hazards.fema.gov/nri/hail> for risk category definitions.

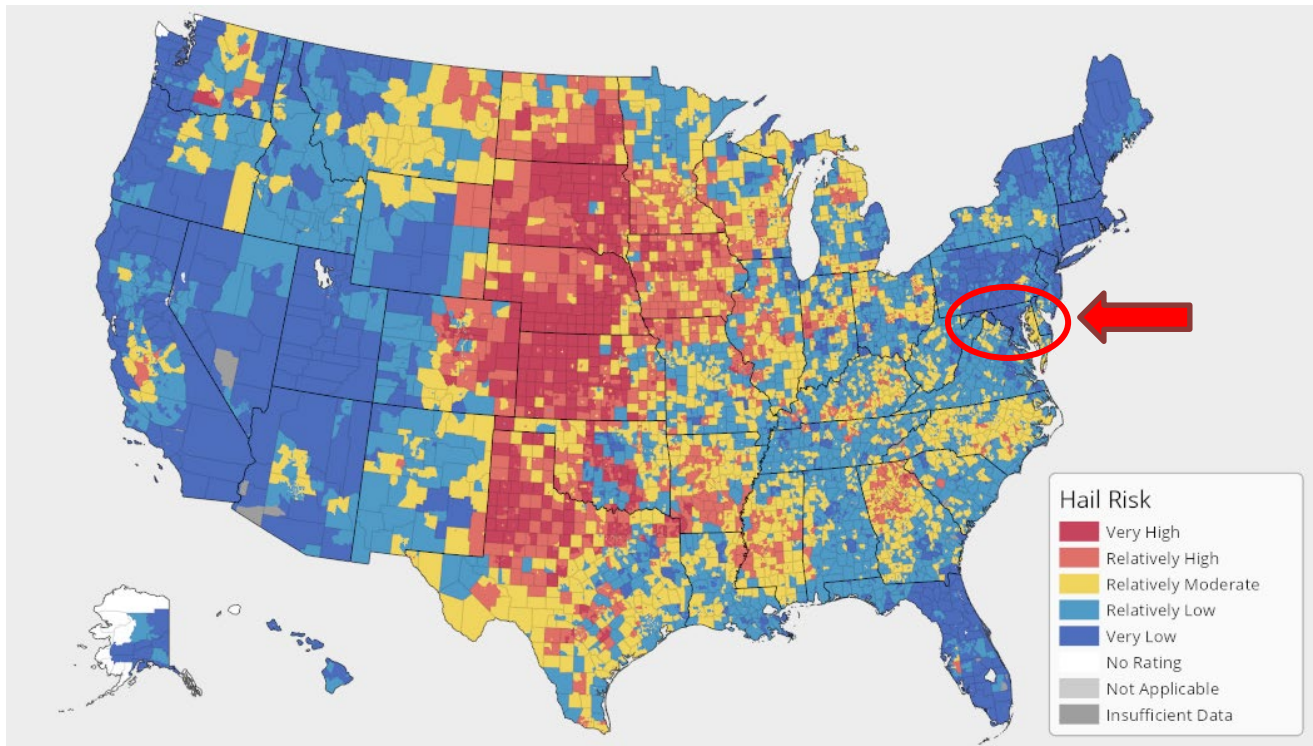


Figure 7.3: National Risk Index for Hail, FEMA, 2023.

The formation of thunderstorms is linked to climate factors, but currently, the understanding of how climate change will affect the future frequency and severity of thunderstorms is still being studied. Some studies suggest that climate change may lead to more intense and frequency severe thunderstorms, but to what extent this will affect Carroll County is unclear. However, based on the NCEI database, Carroll County has a high probability of experiencing thunderstorms and wind events. In the past thirty (30) years, NCEI-recorded thunderstorm wind events happen about ten (10) times a year, a lightning storm event every five (5) years, and a hail event about twice per year. This information is summarized in Table 7.4.

NCEI Probability of Thunderstorms and Wind Events in Carroll County		
Hazard Events	# Of Events	Annualized Events
Thunderstorm Wind	298	9.93
Lightning	14	0.47
Hail	60	2.0
Carroll County Total	372	12.4

Table 7.4 – NCEI Probability of Thunderstorms and Wind Events in Carroll County

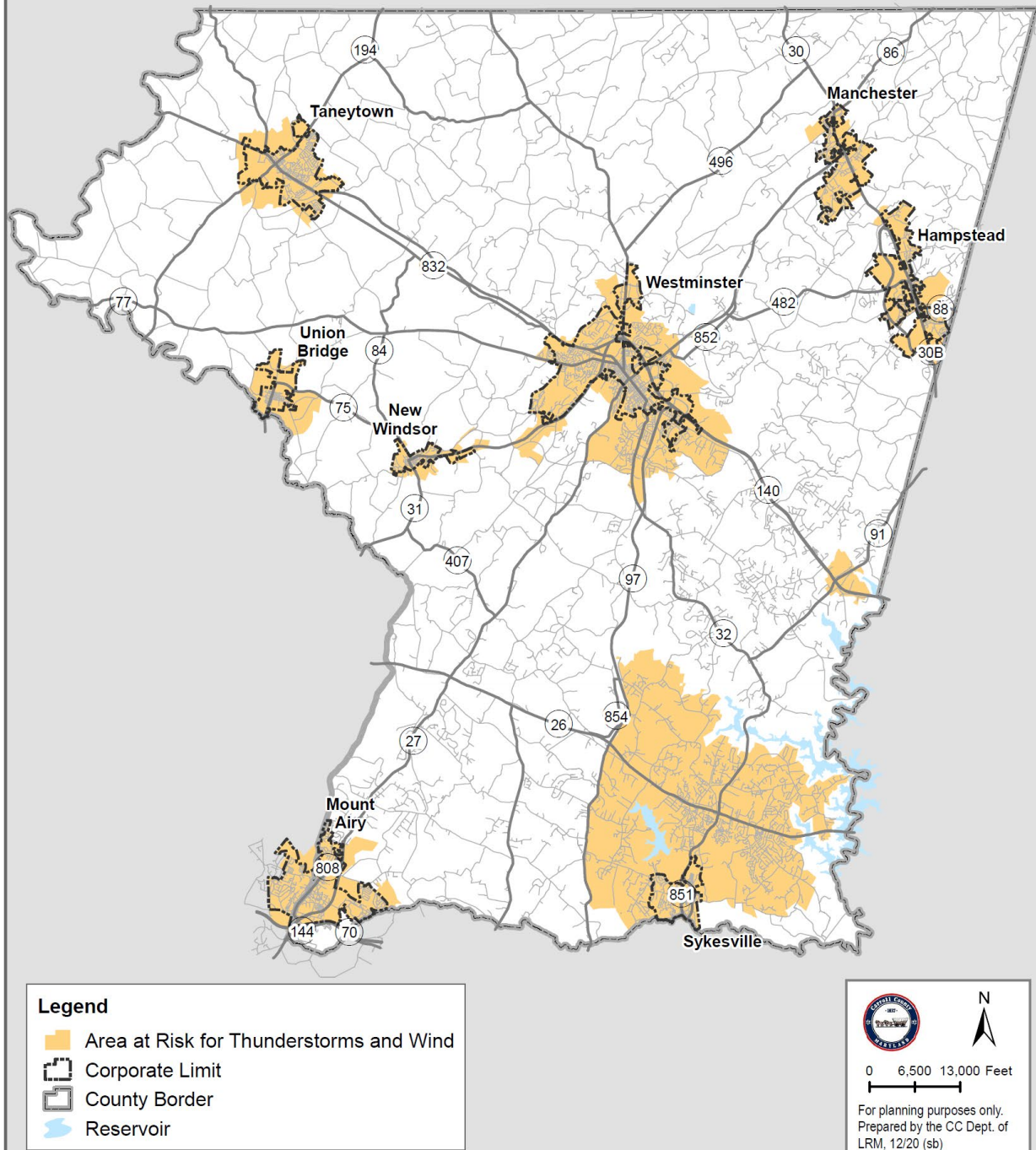
Hazard High-Impact Areas

Of all the hazards associated with thunderstorms and wind, high winds are the most likely to cause the greatest property loss. Detached, one- to two-story houses are more susceptible to wind damage than other types of buildings because they are not built to the same engineering standards as taller and more load-bearing structures.

When severe thunderstorms strike Carroll County, the entire county is at risk for some impact. However, the Growth Areas (GAs), which are the areas within the Growth Area Boundaries (GAB), are those areas which would be at risk for sustaining the most damage and losses, simply because population and the associated infrastructure, houses, and businesses are concentrated in these areas as part of the ongoing effort to promote efficient growth and preserve agricultural and natural resource land. While the probability of occurrence of a thunderstorm is not necessarily higher in these areas, the damages and losses that might be sustained within the GABs would be greater because of this concentration of people and structures. In addition, the people most at risk when a strong or severe thunderstorm hits are also the people most likely to be located in a GA – people in automobiles; people who may not understand a warning due to a language barrier; the elderly and very young; and people with physical or mental disabilities. The GABs provide a logical delineation of areas which will likely incur the most damage.

Each of the eight GAs within the county has been identified on the map entitled “Hazard High-Impact Area for Thunderstorms and Wind” below. Appendix D contains individual maps of each GA showing the location of all structures, major employers, critical facilities, and historic sites. These maps are titled “Hazard High-Impact Area for Winter Storm, Thunderstorms and Wind, Tornado” and are further identified by the name of the specific GA depicted.

Hazard High - Impact Area for Thunderstorms and Wind



Risk Assessment

Lifelines Potentially Affected: All



Critical Facilities

Identification of Vulnerable Assets

Critical facilities, for the purposes of this plan, include fire stations; hospitals, nursing homes and medical clinics; police stations; emergency operations centers; schools; water treatment and wastewater treatment plants; airports; county and municipal government buildings; detention centers; and bridges.

Cumulatively, a total of 184 critical facilities are located in the GAs.

Estimate of Damages & Losses

Table 7.5, entitled “Critical Facilities Most at Risk by Growth Area” breaks down the number of critical facilities by GA and provides the total value of critical facilities in each GA. The total value of the land and improvements for all 184 critical facilities equals more than \$1.6 billion: the critical facilities in the Westminster GA alone account for more than \$800 million.

Critical Facilities Most at Risk By Growth Area Carroll County, MD				
Growth Area	# of Critical Facilities	Land Value (\$)	Improvement Value (\$)	Total Value (\$)
Finksburg	1	983,500	2,380,000	3,363,500
Hampstead	27	13,963,500	73,579,601	88,702,501
Manchester	11	6,744,300	101,044,700	108,289,000
Mount Airy*	12	7,597,800	106,329,400	113,927,200
New Windsor	9	864,200	24,520,101	26,029,101
Freedom/Sykesville	38	80,936,200	279,987,202	374,839,495
Taneytown	13	5,898,200	49,403,801	56,075,792
Union Bridge	7	1,689,900	29,467,700	37,654,657
Westminster	66	101,818,800	774,879,620	882,527,475
Totals	184	219,512,900	1,439,212,125	1,691,408,721
*Does not reflect Critical Facilities in Frederick County County bridge values are reflected in Total Value column only. Source: CC Dept of Land & Resource Mgmt, MD Assessment and Taxation Data, 2020				

Table 7.5 – Critical Facilities Most at Risk by Growth Area

Population, People, & Residences

Identification of Vulnerable Assets

As of November 2021, an estimated 94,897 people, or 55 percent of the county's population, lived in one of the eight GA's.

When discussing thunderstorms and wind, mobile homes deserve added attention because they are particularly vulnerable to damage from high winds. Of the 15 mobile home parks in Carroll County, two are located in the GAs. Between them, there are 25 pads.

Mobile Home Parks Located within the Hazard Area for Thunderstorms and Wind by Growth Area Carroll County, MD				
Mobile Home Park	GA	# of Pads	Typical Replacement Cost/Unit (\$)*	Estimated Cost to Replace all Units (\$)
Twin Arch Mobile Park	Mt. Airy	20	81,500	1,630,000
Wuthering Heights Mobile Home Village	Westminster	5	81,500	407,500
Total		25		2,037,500
Source: CC Dept of Land & Resource Mgmt, 2020 * Typical replacement cost is derived from internet research and includes the unit itself plus charges for hooking up plumbing and electricity for a double-wide mobile home.				

Table 7.6 – Mobile Home Parks Located within the Hazard Area for Thunderstorms and Wind by Growth Area

Estimate of Damages & Losses

Table 7.7, below, entitled “Value of Structures Most at Risk for Thunderstorms and Wind by Growth Area” gives the total land and improvement values by GA as well as the average value of structures within each. The data for the table were derived using a query of residential address points, the property data layer, and the tax assessment data. The results from the query provided information by GA for totals and averages.

Value of Structures Most at Risk for Thunderstorms and Wind by Growth Area Carroll County, MD						
Growth Area	Land Value (\$)		Total Improvement Value (\$)		Total Land & Improvement Value (\$)	
	Total	Average	Total	Average	Total	Average
Hampstead	278,128,200	104,600	563,415,800	214,962	810,855,487	287,231
Freedom-Sykesville	1,911,690,900	147,065	3,285,227,900	279,190	5,068,284,029	389,898
Manchester	205,608,800	99,136	475,429,700	237,003	652,753,830	314,732
Mount Airy*	25,535,600	127,742	389,662,100	194,929	645,018,400	322,670
New Windsor	71,539,100	87,778	152,183,300	181,170	219,942,363	269,868
Taneytown	256,312,400	81,500	495,432,300	161,800	751,744,700	239,028
Union Bridge	43,749,900	95,525	62,446,200	152,310	106,196,100	231,869
Westminster	1,404,095,800	135,964	2,637,177,300	275,366	4,039,821,998	375,867
Totals (Ave)	4,196,660,700	(109,914)	8,060,974,600	(212,091)	12,294,616,907	(303,895)
* Mount Airy numbers are for Carroll County portion of the municipality Sources: CC Dept of Land & Resource Mgmt; Maryland State Department of Assessments and Taxation, 2020						

Table 7.7 – Value of Structures Most at Risk for Thunderstorms and Wind by Growth Area

Mobile home parks are likely to experience greater concentrations of damage during severe thunderstorms and wind events. There are usually more homes per acre in mobile home parks than in residential subdivisions. Table 7.6, entitled “Mobile Home Parks Located within the Hazard Area for Thunderstorms and Wind” lists mobile home parks with pads for anywhere from 5 to 20 homes. If complete replacement were required after a severe thunderstorm or wind event, internet research indicates that the cost for a new double wide trailer including hook-up fees would average \$81,500. Multiplying the \$81,500 figure by the total number of homes from the table yields an estimated \$2,037,500 in damages in mobile home parks in the defined hazard area for thunderstorms and wind.

Agricultural & Natural Resources

Identification of Vulnerable Assets

There are minimal agricultural operations located within the defined hazard high impact area for thunderstorms and wind. Therefore, no significant impacts are anticipated in these areas.

Estimate of Damages & Losses

No significant costs due to damages and losses to agriculture are anticipated within the defined hazard high impact area.

Major Employers

Identification of Vulnerable Assets

For the purposes of this Plan, a major employer is defined as an organization that employs, or is occupied by, 100 or more people at any one location; the county's eight GA's are home to 20 major employers as shown in Table 7.8 below entitled "Major Employers with Workforce Over 100." The largest employer, Carroll County Public Schools, has 100 or more occupants (students and staff) at thirty-seven locations throughout the GAs. Table 7.9, entitled "Board of Education Facilities with 100 or More Occupants and within the Hazard Area by Growth Area" on page 83 lists the facilities that fit the criteria, including the administrative building and many of the schools in the system. The thirty-seven locations are occupied by approximately 25,322 people, or 85% of the school system's total occupants.

With regard to the 20 major employers listed in Table 7.8 entitled "Major Employers with Workforce Over 100", as of spring 2020, over 12,000 people occupied one of the locations listed. Still other large employers, such as certain banks and contractors, cannot be apportioned based on the hazard area because employees are based at numerous locations or because much of the workforce is mobile.

Major Employers with Workforce Over 100 Carroll County, MD 2020				
Company Name	Product/Service Type	Workforce Total	Assessed Value of Buildings	Growth Area
Carroll County Public Schools	Education (K-12)	3,394	464,775,100	See table below
Carroll Hospital Center	Medical Services	1,995	144,767,300	Westminster
McDaniel College	Higher Education (Private)	800	76,874,700	Westminster
Penguin Random House	Book warehousing & distribution	755	33,872,300	Westminster
Integrace	Retirement/Assisted Living	700	57,691,500	Freedom
Carroll County Commissioners	Local Government	587	17,497,800	Westminster
Carroll Community College	Higher Education (Public)	580	56,661,900	Westminster
EVAPCO	Cooling equipment manufacturer	440	17,500,000	Taneytown
Carroll Lutheran Village	Retirement/Assisted Living	425	44,958,300	Westminster
Northrop Grumman	Electronic Manufacturing/Testing	425	4,793,100	Freedom
English American Tailoring	Clothing manufacturer	425	1,788,300	Westminster
C. J. Miller, LLC	Contracting (paving & excavation)	335	1,931,100	N/A
Arc of Carroll County	Medical and Social Services	325	1,770,600	Westminster
Flowserve Corporation	Industrial Pumping Equipment	265	5,218,800	Taneytown
Knorr Brake	Railroad brake manufacturer	265	15,605,200	Westminster
Tevis Energy	Oil/fuel, heating & AC	260	1,704,100	Westminster
PFG/Carroll County Foods	Wholesale foods/distribution	210	8,894,400	Westminster
MT Laney	Grading, paving services	200	521,700	Freedom
Lehigh Cement	Portland cement manufacturer	160	6,783,100	Union Bridge
Fuchs North America	Spices and Extracts	150	20,228,600	Hampstead
Total		12,696	983,837,900	
Source: Carroll County Department of Economic Development, Last Updated: January 2019, MD Assessment and Taxation, 2020				

Table 7.8 – Major Employers with Workforce over 100

Board of Education Facilities with 100 or More Occupants and within the Hazard Area by Growth Area – Carroll County, MD			
Board of Education Facility	Occupants	Value of Buildings (\$)	Growth Area
Century High	1,237	33,261,200	Freedom
Liberty High	1,151	25,117,200	Freedom
Sykesville Middle	863	5,556,800	Freedom
Oklahoma Middle	808	11,465,800	Freedom
Linton Springs Elem	688	11,692,800	Freedom
Carrolltowne Elem	617	6,949,200	Freedom
Eldersburg Elem	492	4,675,500	Freedom
Freedom District Elem	598	4,772,800	Freedom
Piney Ridge Elem	571	10,041,400	Freedom
North Carroll Middle	693	6,295,700	Hampstead
Shiloh Middle	735	14,365,900	Hampstead
Hampstead Elem	452	4,336,100	Hampstead
Spring Garden Elem	490	8,057,900	Hampstead
West Middle & William Winchester Elem	1,631	13,059,200	Westminster
Winters Mill High & Cranberry Station Elem	1,828	37,498,900	Westminster
East Middle	799	7,047,600	Westminster
Westminster High & Career Tech Ctr	2,632	32,521,500	Westminster
Friendship Valley Elem	558	5,276,000	Westminster
Robert Moton Elem	498	6,140,400	Westminster
Westminster Elem	598	5,815,200	Westminster
Carroll Springs	100	3,274,000	Westminster
Gateway	100	4,026,400	Westminster
Administrative Building	296	7,452,400	Westminster
Elmer Wolfe Elem	477	9,188,500	Union Bridge
Taneytown Elem	450	6,659,700	Taneytown
Northwest Middle	695	11,479,600	Taneytown
Mount Airy Middle & Parr's Ridge Elem & Mount Airy Elem	1,835	22,863,300	Mount Airy
North Carroll Middle	695	6,295,700	Manchester
Manchester Elem	715	7,880,100	Manchester
Manchester Valley High	1,433	55,104,900	Manchester
Ebb Valley Elem	587	12,890,900	Manchester
Francis Scott Key High	1,023	24,426,500	N/A
Mechanicsville Elem	555	4,343,300	N/A
Runnymede Elem	695	8,935,700	N/A
Sandymount Elem	512	4,259,900	N/A
South Carroll High	1,135	12,184,800	N/A
Winfield Elem	675	9,562,300	N/A
Totals within Growth Areas	25,322	401,062,600	
All Board of Education Facilities	29,917	464,775,100	
Percent of Total within Growth Areas	85%	86%	

Sources: Carroll County Board of Education, 2020, and MD Assessment and Taxation, 2020

Table 7.9 – Board of Education Facilities with 100 or More Occupants and Within the Hazard Area by Growth Area

Estimate of Damages & Losses

To estimate damages and losses to major employers located within the GAs, tax assessment data were reviewed for the locations of the 20 employers reported in the table entitled “Major Employers with Workforce Over 100”. Where an employer owns property in multiple locations, those locations with fewer than 100 occupants were excluded. In many cases, what appears as one location is made up of multiple properties. Two buildings that appear to be part of the same facility may be on separate properties and assessed separately. Aerial photographs and tax maps were used to identify the property or properties that make up what is, for all intents and purposes, one employment site for each major employer. In some instances, a campus of buildings comprised one employment site.

All told, more than 76 individual properties made up the principal sites of the 20 major employers. The total value of the buildings at the principal sites of these major employers was \$983,837,900.

Thirty-seven school system facilities with 100 or more occupants are located in a GA. The average value of the buildings comprising these thirty-seven facilities was over \$10 million per campus. The losses, should all of these school buildings be destroyed, would total \$401,062,600.

Historic Resources

Identification of Vulnerable Assets

A total of 672 historic sites, those which are listed on the National Register of Historic Places and/or on the Maryland Historical Trust’s Inventory of Historic Properties, are located within the identified hazard area for thunderstorms and wind. Historic sites can comprise numerous historic structures. These sites can be buildings such as houses, structures such as bridges, objects such as Mason-Dixon Line boundary markers, or sites such as entire farms. In addition to historic sites, the National Register and the Maryland Historical Trust also inventory historic districts. Historic district designations recognize collections of historic sites that contribute to a whole that is greater than the sum of its parts. A typical example in Carroll County would be a historic main street along which multiple historic sites collectively convey a sense of the town that existed there 100 to 200 years earlier.

Estimate of Damages & Losses

Table 7.10, entitled “Historic Sites Located within the Hazard Area for Thunderstorms and Wind by Growth Area” lists the number of historic sites found in the identified hazard area for thunderstorms and wind. Property values for individual properties and buildings were queried

from the assessment data to estimate damages and losses. If all of the historic properties in the identified hazard area were destroyed due to a significant thunderstorm or wind event, the quantifiable property losses would total \$295,733,100. However, no real numerical value can be placed on the way the sites tell the history of the community and help to preserve its sense of place. The average value for buildings on a historic site is \$440,079.

<i>Historic Sites Located Within the Hazard Area for Thunderstorms and Wind by Growth Area Carroll County, MD</i>		
GA	# of Historic Sites	Total Property Value (\$)
Finksburg	25	3,729,500
Hampstead	62	11,795,100
Manchester	20	3,824,300
Mount Airy	9	1,797,800
New Windsor	24	10,299,700
Sykesville-Freedom	121	95,098,600
Taneytown	19	4,232,500
Union Bridge	14	2,095,700
Westminster	378	162,859,900
Totals	672	\$295,733,100
Source: CC Dept of Land & Resource Mgmt & MD Assessment and Taxation Data, 2020		

Table 7.10 – Historic Sites Located within the Hazard Area for Thunderstorms and Wind by Growth Area

Table 7.11, entitled “Historic Districts on the National Register of Historic Places” lists the historic districts in Carroll County that are officially recognized by the National Park Service. Six of the eleven are located within a GA and are, therefore, part of the hazard area for thunderstorms and wind. The multiple buildings that make up any given historic district are also inventoried individually as historic sites. As a result, the losses that would result from destruction of property within a historic district are accounted for in the above estimate for historic sites. The losses in a historic district, however, would go beyond the damage to the individual properties. Depending on the extent of the damages, losses could also include whatever greater historic value the district as a whole represented.

Historic Districts on the National Register of Historic Places Carroll County, MD	
Historic District Name	GA Location
Lineboro	None
Linwood	None
McKinstry's Mill	None
Mount Airy	Mount Airy
New Windsor	New Windsor
Sykesville	Sykesville-Freedom
Taneytown	Taneytown
Union Bridge	Union Bridge
Union Mills Homestead	None
Uniontown	None
Westminster	Westminster
Source: CC Department of Planning, 2021	

Table 7.11 – Historic Districts on the National Register of Historic Places

Mitigation Measures

Existing Mitigation Measures – County and Municipal

Existing County and Municipal Mitigation Measures			
Mitigation Measure	Identified as existing in 2014 HMP	Completed since 2014 HMP	Notes
The Bureau of Permits and Inspections currently augments the enforcement of the Maryland Building Performance Standards and related County ordinances by encouraging wind-resistant design techniques for new construction during the County's permit process. (BPI)	X		Ongoing Initiative
Standard tie-downs of propane tanks are mandated to prevent tanks from being lifted by severe winds and becoming ballistic hazards. (BPI)	X		Ongoing Initiative
Trees and branches in public areas at risk of breaking or falling in wind and heavy rainstorms are monitored. Trees or branches that pose an immediate threat to property, utility lines, or other significant structures or critical facilities in the county are pruned and trimmed. (DPW & Towns)	X		Ongoing Initiative
Town Hall and Police Station in Hampstead have identified basement locations that can be used as areas of refuge during severe storm events.		X	

Proposed High-Priority Mitigation Strategies – County and Municipal

High-Priority Thunderstorm and Wind Mitigation Strategies – County and Municipal				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Identify methods for ensuring resiliency of electrical power supply for all critical facilities and implement as appropriate.	DPW – County DPW - City of Westminster DPW - City of Taneytown DPW - Town of New Windsor DPW - Town of Mount Airy DPW - Town of Hampstead DPW - Town of Manchester DPW - Town of Sykesville DPW - Town of Union Bridge	DPW – County DPW - City of Westminster DPW - City of Taneytown DPW - Town of New Windsor DPW - Town of Mount Airy DPW - Town of Hampstead DPW - Town of Manchester DPW - Town of Sykesville DPW - Town of Union Bridge	FY2023 and ongoing	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge State of MD Federal (HMGP, BRIC)
Remove dead or dying trees from public lands adjacent to critical facilities to lessen the risk of tree damage during thunderstorm and wind events.	DPW DPW - City of Westminster DPW - City of Taneytown DPW - Town of New Windsor DPW - Town of Mount Airy DPW - Town of Hampstead DPW - Town of Manchester DPW - Town of Sykesville DPW - Town of Union Bridge	DPW DPW - City of Westminster DPW - City of Taneytown DPW - Town of New Windsor DPW - Town of Mount Airy DPW - Town of Hampstead DPW - Town of Manchester DPW - Town of Sykesville DPW - Town of Union Bridge	Ongoing	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge

Lower-Priority Mitigation Measures for Future Consideration – County and Municipal

Lower-Priority Thunderstorm and Wind Mitigation Strategies – County and Municipal				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Funding Source(s)
Mandate standard tie-downs of mobile homes to prevent mobile homes from being lifted by severe winds and becoming ballistic hazards.	DPW – BPI	DPW - BPI City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	Ongoing	County

Chapter Eight - Tornado

Hazard Identification

Hazard Characterization

A tornado is defined by the National Weather Service as a violently rotating column of air extending from the base of a thunderstorm down to the ground. Tornadoes spawn from thunderstorms; they form when horizontal columns of spinning air get turned vertically by the changing winds with height. This vertical column of air is the funnel itself. The damage from a tornado is a result of the high wind velocity and wind-blown debris; the winds associated with tornadoes can top 200 mph. Tornado season in Maryland is generally March through August, although tornadoes can occur at any time of year. They tend to occur in the afternoons and evenings: most tornadoes strike between 4 pm and 9 pm. While relatively short-lived, tornadoes are intensely focused and are characterized as one of nature's most violent storms.

Tornadoes have the ability to destroy almost everything in their path and can range from several yards to over two miles in width. Although tornadoes normally travel on the ground for relatively short distances, tornado tracks of 200 miles have been reported.

Regional & Historical Perspectives

According to the National Climatic Data Center (NCDC), between 1950 and July 2020, 381 tornado touchdowns were recorded in Maryland for an average of 5.44 per year. Statewide these events caused \$336.5 million in reported property damages, \$563,500 in reported crop damages, nine deaths, and 319 injuries. The most intense tornado ever recorded in Maryland was an F4 that touched down in LaPlata in Charles County in April 2002. It caused three deaths, 122 injuries, and more than \$115 million in damages. Its path was almost half a mile wide at its widest point and its speed was estimated at 58 mph.

Other events of note in Maryland include an F3 tornado that affected College Park in September 2001 and caused two deaths along with more than 50 injuries, an F4 tornado in Frostburg in 1998 which caused approximately \$5 million in damages and five injuries, an F2 in Baltimore County in 1990 that caused 59 injuries, and an F1 in Dorchester County in 1984 and another F1 in Garrett County in 1954.

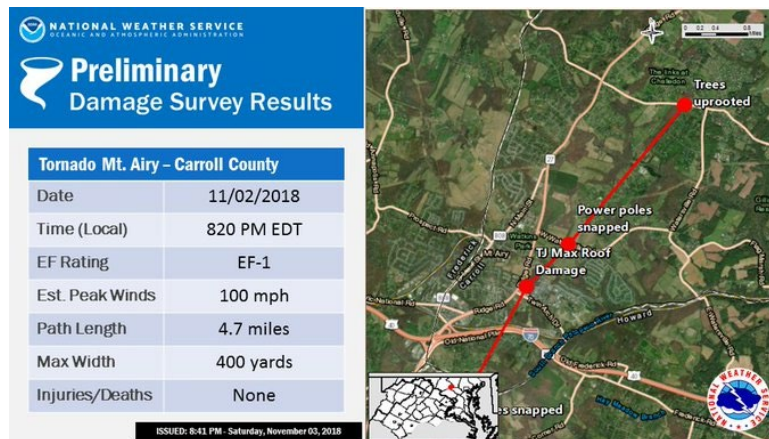
NCDC data shows that Carroll County has experienced twenty-two (22) recorded tornadoes between January 1950 and December 2021. All together these storms caused three injuries and an estimated total of almost \$10 million in reported property and crop damages. The intensity of all but two of them was recorded at F2 or less, with the remaining storms being F3 tornadoes. A strong F3 (almost F4) tornado that occurred just outside of Gamber in Bird Hill in July 1996 is the worst tornado to have occurred in the county. It caused a total of \$5 million in

reported property damage, injured three people, and caused \$20,000 in reported crop damage. The other F3 tornado touched down in May 1983 in northeast Frederick County and traveled about two miles into northwest Carroll County. It caused \$25,000 in reported property damages but no injuries or fatalities.

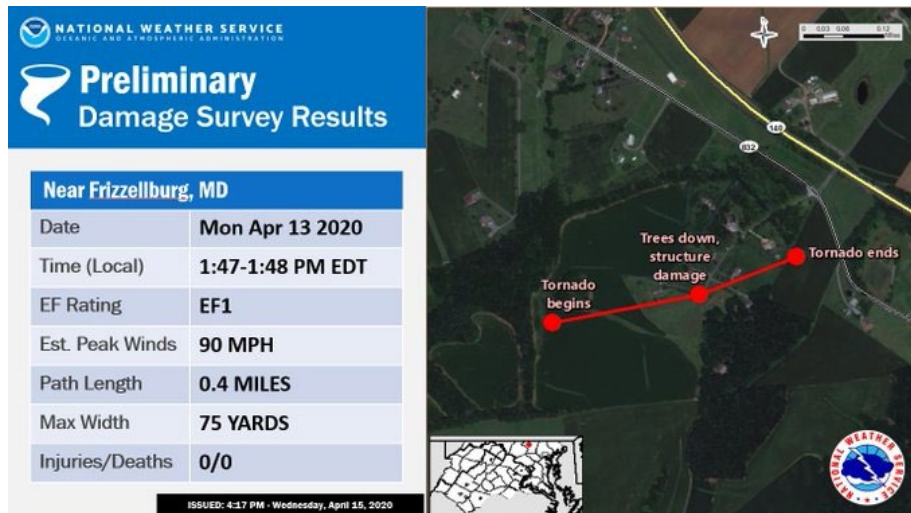
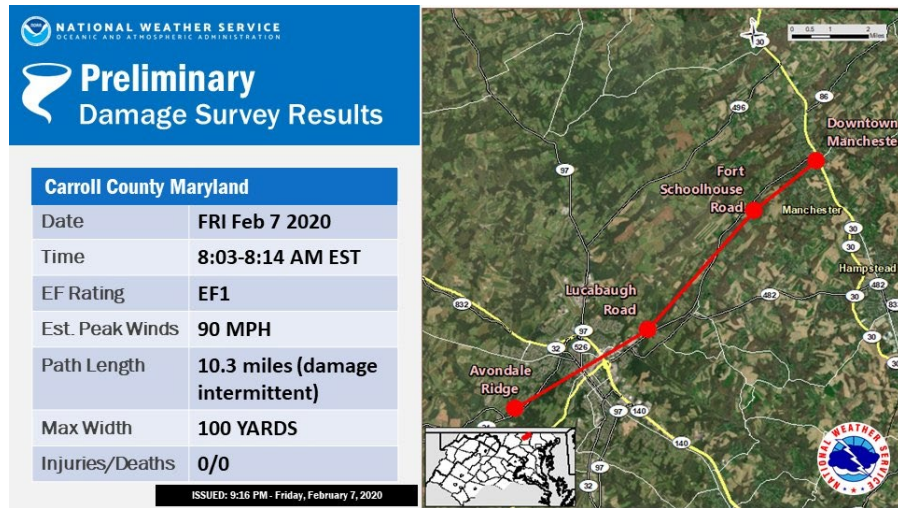


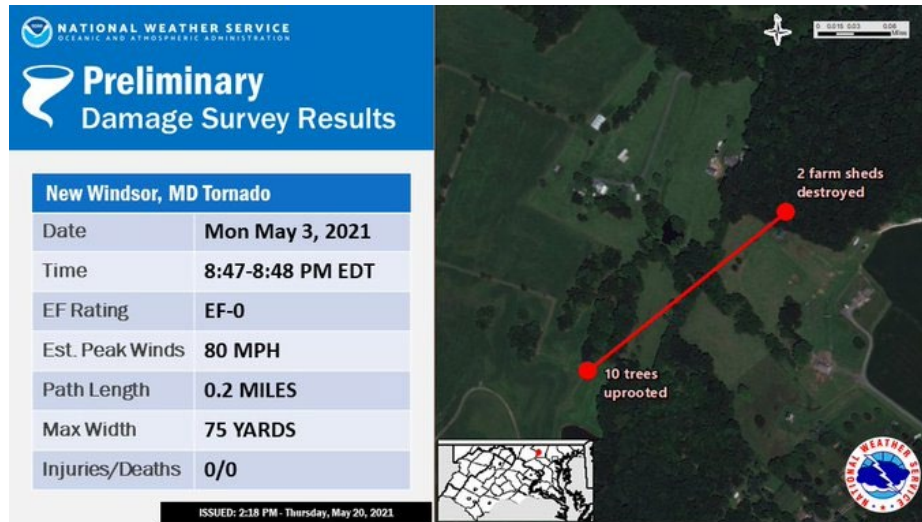
Gamber (Bird Hill) Tornado, July 1996

More recently, an EF2 tornado occurred in Mount Airy in early November 2018. This tornado caused close to \$1 million in reported property damage, along with numerous instances of significant damage to woodland areas and resulted in a Small Business Administration Disaster Declaration for Carroll County. Luckily, there were no injuries or deaths associated with this storm.



Three tornadoes have occurred in Carroll County since the Mount Airy event in late 2018: an EF1 tornado in February 2020 which affected Westminster, an EF1 tornado in April 2020 which touched down in Frizzellburg, and an EF0 tornado in May 2021 which took place near New Windsor. These three events, combined, caused approximately \$900,000 in reported property damage but, thankfully, no injuries.





There have only been one (1) Small Business Administration Disaster Declaration related to Tornadoes in Carroll County (Table 8.1)

SBA Declared Disasters for Tornadoes in Carroll County					
Disaster Number	Declaration Number	Incident Type	Incident Date	Effective Date	Program Declared
MD - 00040	#15829 & #15830	Mt. Airy Tornado	11/02/1018	12/07/2018	SBA

Source: U.S. Small Business Administration, Disaster Loan Assistance, 2023

Table 8.1 – SBA Declared Disasters for Tornadoes in Carroll County

Risk Characterization

The 2021 Maryland State Hazard Mitigation Plan utilizes a risk prioritization method that takes into account several factors including: historical occurrence, vulnerability of the population, historical impact in terms of human lives and property and how local jurisdiction plans rank hazards. Using this methodology, in the overall ranking of hazards across the State of Maryland, the risk of tornadoes in Carroll County is considered medium-high.

Extent

A tornado's destructive power is estimated using the Fujita Damage Scale. The scale was developed to estimate tornado intensity based on associated damages. Tornadoes and their subsequent damage can be classified into six categories using the scale. The scale assigns numerical values for wind speeds inside the tornado according to the type of damage and degree of the tornado. The scale ranges from EF0 (gale – 65-85 mph) to EF5 (incredible – over 200 mph). An Enhanced Fujita Scale (EF Scale) was developed and implemented operationally

in 2007 and is now the standard used to measure the strength of a tornado. The EF Scale was developed to better align tornado wind speeds with associated damages.

Enhanced Fujita (EF) Scale	
EF Number	3 Second Gust (MPH)
0 (Gale)	65-85
1 (Weak)	86-110
2 (Strong)	111-135
3 (Severe)	136-165
4 (Devastating)	166-200
5 (Incredible)	Over 200
Source: National Weather Service, 2021	

Table 8.2 – Enhanced Fujita (EF) Scale

Probability and Severity of Future Occurrences

According to the National Centers for Environmental Information (NCEI), Carroll County has experienced F1 tornadoes the most frequency based off the Fujita Intensity Scale. Approximal 45% of tornado occurrences since 1950 have been EF0/F0 tornadoes, while only 36% of tornadoes were ranked EF1/F1 and 18% for tornadoes ranked EF2/F2 or greater. The unincorporated areas of Carroll County have the largest number of formally reported tornado events on record, which accounts for approximately 77% of the total occurrences. Table 8.3 shows tornado occurrences in Carroll County by Fujita Intensity Scale ranking.

Jurisdiction	EF0/F0	EF1/F1	EF2/F2	EF3/F3	Total
Avondale*	0	1	0	0	1
City of Taneytown	0	0	0	0	0
City of Westminster	2	0	0	0	2
Town of Hampstead	0	0	0	0	0
Town of Manchester	0	0	0	0	0
Town of Mount Airy	1	0	1	0	2
Town of New Windsor	0	0	0	0	0
Town of Sykesville	0	0	0	0	0
Town of Union Bridge	0	0	0	0	0
Unincorporated Areas	7	7	1	2	17
Carroll County Total	10	8	2	2	22
*Avondale is an unincorporated area; however, portions of this tornado's track affected both the City of Westminster and the Town of Manchester on February 7, 2020.					
Source: NOAA, National Centers for Environmental Information, 2023					

Table 8.3 – Tornadoes in Carroll County

A record number of tornadoes hit the State of Maryland in 2020, with 5 tornadoes occurring on February 7, 2020. The impact of climate change to tornado frequency and severity requires further research. This is mostly due to a lack of historic tornado records which presently only date back to the 1950s, so long-term trends are difficult to determine. However, it is probable

that a warming climate will contribute to more frequent variability in the atmosphere, resulting in increased severe storm activity. Additionally, in a changing climate, summer thunderstorms are growing larger, and appearing more frequently. With an increased threat of thunderstorm activity, there will likely be a greater risk of tornadoes impacting Carroll County

Hazard High-Impact Areas

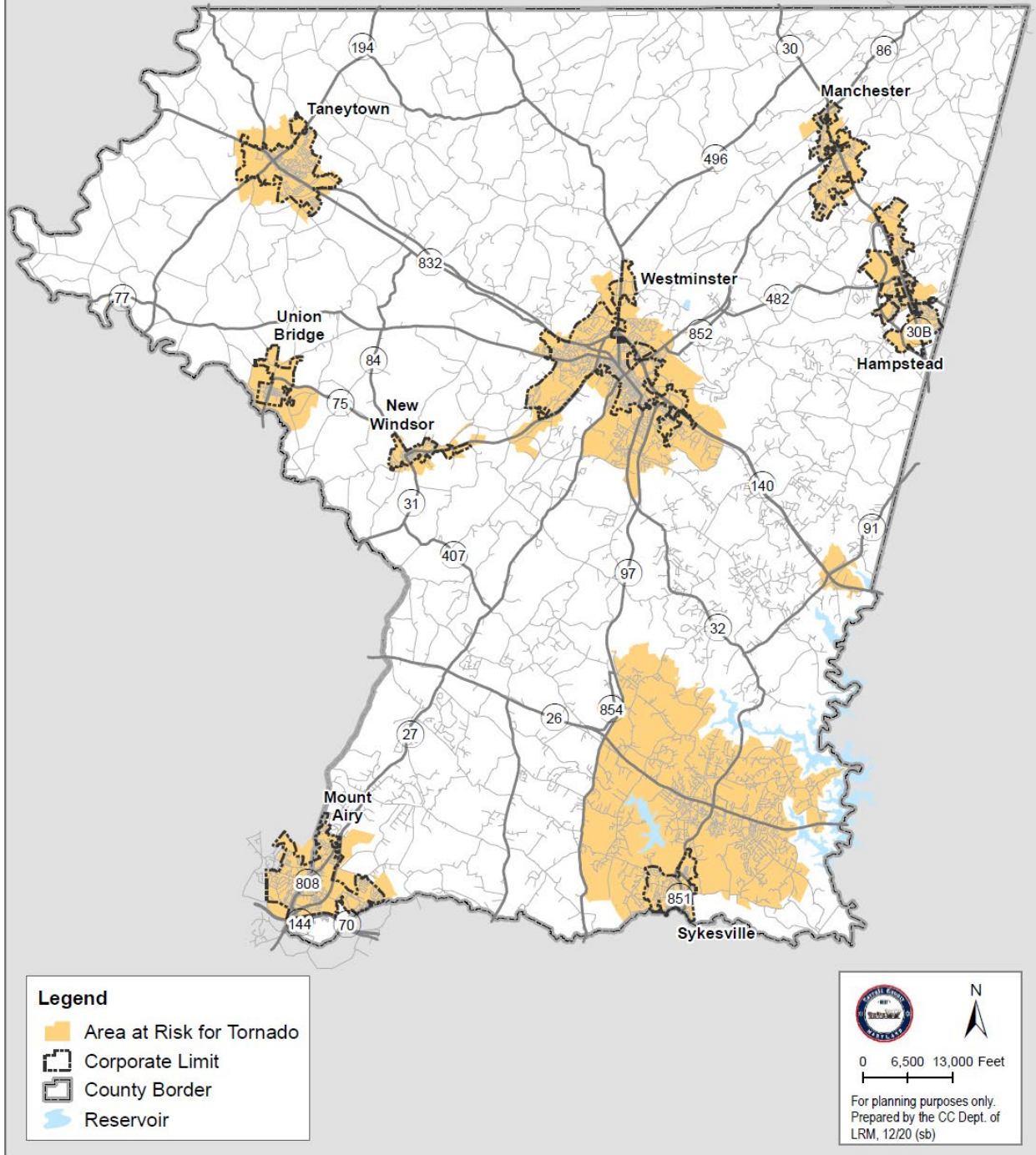
While data are available to indicate when past tornado events have occurred in the county, most of the data do not provide accurate enough locational data to be able to map with any degree of reliability where they are most likely to occur in the future.

The entire county is at risk for a tornado touchdown. However, the Growth Areas (GA), which are the areas within the Growth Area Boundaries (GAB), are those areas which would be at risk for sustaining the most damage and losses, simply because population and the associated infrastructure, houses, and businesses are concentrated in these areas as part of the ongoing effort to promote efficient growth and preserve agricultural and natural resource land. While the probability of occurrence of a tornado is not necessarily higher in these areas, the damages and losses that might be sustained within the GABs would be greater because of this concentration of people and structures. In addition, the people most at risk when a tornado touches down are also most likely to be located in a GA – people in automobiles and mobile homes; people who may not understand a warning due to a language barrier; the elderly and very young; and people with physical or mental disabilities. The GABs provide a logical delineation of areas which will likely incur the most damages.

A tornado can, and most likely will, take a path that is less than the width of most of the GAs in the county. According to NOAA's data for historic tornado events in Carroll County, the median length of the path of tornadoes that have touched down in Carroll County is slightly more than 1.5 miles and the median width is slightly less than 100 feet. This width and distance are equal to approximately eighteen acres of area likely to be affected within a GA if a tornado touched down; which eighteen acres in a GA would be affected is unknown.

Each of the eight GAs within the county has been identified on the map entitled "Hazard High-Impact Area for Tornadoes" below. Appendix D contains individual maps of each GA showing the location of all structures, major employers, critical facilities, and historic sites. These maps are titled "Hazard High-Impact Area for Winter Storm, Thunderstorms and Wind, Tornado" and are further identified by the name of the specific GA depicted.

Hazard High - Impact Area for Tornadoes



Risk Assessment

Lifelines Potentially Affected: All



Critical Facilities

Identification of Vulnerable Assets

Critical facilities, for the purposes of this plan, include fire stations; hospitals, nursing homes and medical clinics; police stations; emergency operations centers; schools; water treatment and wastewater treatment plants; airports; county and municipal government buildings; detention centers; and bridges.

Cumulatively, a total of 184 critical facilities are located in the GAs.

Estimate of Damages & Losses

Table 7.1, entitled “Critical Facilities Most at Risk by Growth Area” on page 78 breaks down the number of critical facilities by GA and provides the total value of critical facilities in each GA. The value of land and improvements for all of the critical facilities at risk in the GAs equals slightly more than \$1.6 billion.

Population, People, & Residences

Identification of Vulnerable Assets

People and residences are more concentrated in the GAs. If a tornado were to touch down in a GA, the property damage and human casualty tolls would likely be higher than anything experienced during a tornado in Carroll County in the past. As of November 2021, although only 18 percent of the land area in the county is in a GA, an estimated 94,897 people, or 55 percent of the population, lived in one of the eight GAs. This reflects a greater concentration of homes within the GAs.

When discussing tornadoes, mobile homes deserve added attention because they are particularly vulnerable to damage from high winds. Of the 15 mobile home parks in Carroll County, two are located in the hazard area for tornadoes. Between them, there are 25 pads.

Estimate of Damages & Losses

Tornadoes in Carroll County are reported in historical records to have resulted in one death, in 1929. Three people suffered injuries during the 1996 ‘Bird Hill’ tornado outside of Gamber. If a tornado were to touch down in a densely populated area, the casualty toll would likely be higher. Table 8.5, entitled “Households and Population in the Path of a Prototype Tornado,” uses the acreage of the prototype tornado defined in Table 8.4, “Residential Structures Most at Risk for Damage by a Hypothetical Tornado,” to estimate the numbers of homes that would be struck if the tornado were to touch down in one of the GAs. Based on the number of homes, the population affected if the tornado struck at a time when everyone was at home was extrapolated. The number of people affected in each GA ranges from 11 to 52 depending on the density of the GA. Injuries and fatalities would depend on numerous factors, including how much warning could be provided and the amount of debris in the tornado.

<i>Residential Structures Most at Risk for Damage by a Hypothetical Tornado</i>							
Growth Area	Swath of Tornado (Acres)*	GA Area (Acres)	% of GA hit by Tornado	# of Residential Structures in GA	# of Residences hit by Tornado	Avg Total Value (\$) for Residential Properties in GA's	Total Cost (\$) of Damage to Residential Properties
Finksburg	18	641	2.8	139	4	218,138	872,552
Hampstead	18	2,579	.70	2,904	20	255,427	5,108,540
Manchester	18	1,882	1.0	1,948	20	327,905	6,558,100
Mount Airy	18	3,660	.5	2,245	11	378,781	4,166,591
New Windsor	18	877	2.0	766	15	265,122	3,976,830
Sykesville/Freedom	18	20,537	.09	12,782	12	392,760	4,713,120
Taneytown	18	3,354	.5	2,913	15	223,153	3,347,295
Union Bridge	18	1,648	1.1	521	6	183,471	1,100,826
Westminster	18	10,835	.2	11,770	24	308,884	7,413,216
Totals		46,013		35,988	127		37,257,070
* Assumes a swath that is 50 yards wide by 1 mile long. Assumption based on historical tornado data for Carroll County Sources: Carroll County Dept of Land & Resource Mgmt, Maryland Dept. of Assessments and Taxation, 2020							

Table 8.4 – Residential Structures Most at Risk for Damage by a Hypothetical Tornado

The ‘Bird Hill’ tornado was a strong F3 storm that touched down in a rural subdivision, Bird Hill. The houses in Bird Hill and the surrounding area are situated on lots of one acre or larger. Approximately \$5 million in damage was reported. The table entitled “Residential Structures Most at Risk for Damage by a Hypothetical Tornado” uses the same prototype tornado used above. By multiplying the estimated number of residential buildings struck by the average assessed value for a residential building, the total cost of the damage if every home were destroyed was extrapolated. Total cost values vary by GA depending on the number of homes hit. Figures range from slightly more than \$870,000 to nearly \$7.5 million.

Households and Population in the Path of a Prototype Tornado									
GA	Swath of Tornado (Acres)*	GA Area (Acres)	% of GA Hit by Tornado	# of Residential Structures in GA	# of Residences Hit by Tornado	Residential Occupancy Rate	# of Households Hit by Tornado	Persons per Household by GA	Pop. Hit by Tornado
Finksburg	18	641	2.8	139	4	96.3	4	2.68	11
Hampstead	18	2,579	.70	2,904	20	96.8	19	2.51	48
Manchester	18	1,882	1.0	1,948	20	96.0	19	2.74	52
Mount Airy	18	3,660	.5	2,245	11	96.7	11	2.69	30
New Windsor	18	877	2.0	766	15	89.2	13	2.46	32
Sykesville/Freedom	18	20,537	.09	12,782	12	96.3	12	2.77	33
Taneytown	18	3,354	.5	2,913	15	93.2	14	2.60	36
Union Bridge	18	1,648	1.1	521	6	85.8	5	2.27	11
Westminster	18	10,835	.2	11,770	24	93.0	22	2.22	49
Totals		46,013		35,988	127		119		302
* Assumes a swath that is 50 yards wide by 1 mile long. Assumption based on historical tornado data for Carroll County Source: Carroll County Dept of Land & Resource Mgmt, Carroll County Dept of Planning, 2020									

Table 8.5 – Households and Population in the Path of a Prototype Tornado

Worse damages are anticipated if a tornado were to strike a mobile home park. There are more homes per acre in mobile home parks than in residential subdivisions. In fact, estimates using aerial photography indicate that the prototypical tornado described above could directly impact up to 80 homes in a large mobile home park. If complete replacement were required after a tornado, internet research indicates that the cost for a new doublewide trailer including hook-up fees would range average \$81,500. Table 8.6, entitled “Mobile Home Parks Located within the Hazard Area for Tornadoes,” lists the number of pad sites at each mobile home park in the hazard area and shows the estimated cost to replace all mobile home units in the GAs, should a tornado destroy all of them.

Mobile Home Parks Located within the Hazard Area for Tornadoes by Growth Area Carroll County, MD				
Mobile Home Park	GA	# of Pads	Typical Replacement Cost/Unit (\$)*	Estimated Cost to Replace all Units (\$)
Twin Arch Mobile Park	Mt. Airy	20	81,500	1,630,000
Wuthering Heights Mobile Home Village	Westminster	5	81,500	407,500
Total		25		2,037,500
Source: CC Dept of Land & Resource Mgmt, 2020				
* Typical replacement cost is derived from internet research and includes the unit itself plus charges for hooking up plumbing and electricity for a double-wide mobile home.				

Table 8.6 – Mobile Home Parks Located within the Hazard Area for Tornadoes by Growth Area

Agricultural & Natural Resources

Identification of Vulnerable Assets

There are minimal agricultural operations located within the defined hazard area for tornadoes. Therefore, no significant impacts are anticipated.

Estimate of Damages & Losses

No significant costs due to damages and losses to agriculture are anticipated within the hazard high impact area.

Major Employers

Identification of Vulnerable Assets

If a major employer is defined as an organization that employs, or is occupied by, 100 or more people at any one location, then the county's eight GA's are home to 20 major employers as shown in Table 7.8 entitled "Major Employers with Workforce Over 100." The largest employer, the Carroll County Public Schools, has 100 or more occupants at thirty-seven locations throughout the GA's. Table 7.9, on page 120, entitled "Board of Education Facilities with 100 or More Occupants and within the Hazard Area by Growth Area," lists the facilities that fit the criteria, including the administrative building and most of the schools in the system. The thirty-seven locations are occupied by approximately 25,322 people, which represents 85% of all employees within the school system.

With regard to the 20 major employers listed in Table 7.8, entitled "Major Employers with Workforce Over 100" on page 119, as of 2020, over 12,000 people occupied one of the locations listed. Still other large employers, such as certain banks and contractors, cannot be apportioned based on the hazard area because employees are based at numerous locations or because much of the workforce is mobile.

Estimate of Damages & Losses

For the purpose of estimating damages and losses to major employers, tax assessment data were reviewed for the locations of the 20 employers reported in Table 7.8 entitled "Major Employers with Workforce Over 100" located on page 119. Where an employer owns property in multiple locations, those locations with fewer than 100 occupants were excluded. In many cases, what appears as one location is actually made up of multiple properties. Two buildings that appear to be part of the same facility may be on separate properties and assessed separately. Aerial photographs and tax maps were used to identify the property or properties

that make up what is, for all intents and purposes, one employment site for each major employer. In some instances, a campus of buildings comprised an employment site.

The total value of the buildings at the principal sites of these major employers was \$983,837,900. In a few parts of the county, the same tornado could destroy the facilities of two or more major employers with multiple buildings each. Under such a scenario, damages could exceed \$50 million.

Thirty-seven school system facilities with 100 or more occupants are located in a GA. The average value of the buildings was over \$10 million per campus. As with the other major employers, clusters of schools exist in the county where one tornado could destroy two or more school sites. The damages in such a scenario could exceed \$30 million.

Historic Resources

Identification of Vulnerable Assets

A total of 672 historic sites, those which are listed on the National Register of Historic Places and/or on the Maryland Historical Trust's Inventory of Historic Properties, are located within a hazard area for tornadoes. Historic sites can comprise numerous historic structures. These sites can be buildings such as houses, structures such as bridges, objects such as Mason-Dixon Line boundary markers, or sites such as entire farms. In addition to historic sites, the National Register and the Maryland Historical Trust also inventory historic districts. Historic district designations recognize collections of historic sites that contribute to a whole that is greater than the sum of its parts. A typical example in Carroll County would be a historic main street along which multiple historic sites collectively convey a sense of the town that existed there 100 to 200 years earlier.

Estimate of Damages & Losses

Table 8.7, entitled “Historic Sites Located within the Hazard Area for Tornadoes” shows the number of sites and the total values within each GA. Property values for individual properties and buildings were queried from the assessment data to estimate damages and losses.

<i>Historic Sites Located Within the Hazard Area for Tornadoes by Growth Area Carroll County, MD</i>		
GA	# of Historic Sites	Total Property Value (\$)
Finksburg	25	3,729,500
Hampstead	62	11,795,100
Manchester	20	3,824,300
Mount Airy	9	1,797,800
New Windsor	24	10,299,700
Sykesville-Freedom	121	95,098,600
Taneytown	19	4,232,500
Union Bridge	14	2,095,700
Westminster	378	162,859,900
Totals	672	\$295,733,100
Source: CC Dept of Land & Resource Mgmt & MD Assessment and Taxation Data, 2020		

Table 8.7 – Historic Sites Located Within the Hazard Area for Tornadoes by Growth Area

Historic sites are dispersed to the extent that the prototypical tornado with its 18-acre swath could strike a GA and nevertheless, often avoid any historic sites. In terms of quantifiable damage to historic properties, the worst-case scenario would occur if a tornado were to strike a cluster of high-value historic building sites, such as at McDaniel College or Springfield State Hospital. In terms of hard-to-quantify historical value, the greatest losses would occur where a tornado could damage or destroy multiple historic sites in proximity to one another. The historic district designation applies to many such concentrations of historic sites.

Table 8.8, entitled “Historic Districts on the National Register of Historic Places,” lists the historic districts in Carroll County that are on the National Register of Historic Places. Six of the eleven are located within a GA and are, therefore, within the hazard area for tornadoes. The losses in a historic district would go beyond the damage to the individual properties to also include whatever greater historic value the district as a whole represented.

<i>Historic Districts on the National Register of Historic Places Carroll County, MD</i>	
Historic District Name	GA Location
Lineboro	None
Linwood	None
McKinstry's Mill	None
Mount Airy	Mount Airy
New Windsor	New Windsor
Sykesville	Sykesville-Freedom
Taneytown	Taneytown
Union Bridge	Union Bridge
Union Mills Homestead	None
Uniontown	None
Westminster	Westminster
Source: CC Department of Planning, 2021	

Table 8.8 – Historic Districts on the National Register of Historic Places

Mitigation Measures

Existing Mitigation Measures – County and Municipalities

Existing County and Municipalities Mitigation Measures			
Mitigation Measure	Identified as existing in 2014 HMP	Completed since 2014 HMP	Notes
The Bureau of Permits and Inspections currently augments the enforcement of the Maryland Building Performance Standards and related County ordinances by encouraging wind-resistant design techniques for new construction during the County's permit process. (BPI)	X		Ongoing Initiative
Standard tie-downs of propane tanks are mandated to prevent tanks and mobile homes from being lifted by winds and becoming ballistic hazards. (BPI)	X		Ongoing Initiative
Trees and branches in public areas at risk of breaking or falling in wind are monitored. Trees or branches that pose an immediate threat to property, significant structures or critical facilities in the county are routinely trimmed. (DPW & Towns)	X		Ongoing Initiative
Carroll County has achieved Storm Ready designation from the National Weather Service.		X	
Some critical facilities have undergone retrofitting of windows to increase resistance to flying debris.		X	
Specific areas within Carroll Community College buildings have been designated as storm shelter locations and directional signage has been installed.		X	
Town Hall and Police Station in Hampstead have identified basement locations that can be used as areas of refuge during severe storm events.		X	

Proposed High-Priority Mitigation Strategies – County and Municipalities

<i>Tornado Mitigation High-Priority Strategies – County & Municipalities</i>				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Continue public education efforts regarding tornado safety, including provision of information outlining installation of safe rooms.	DPS-EM	DPS – EM National Weather Service FEMA	Ongoing	HMGP County
Identify critical facility locations that could benefit from construction of safe rooms as per FEMA P-361 and install.	DPW – Facilities City of Westminster (DPW) City of Taneytown (DPW) Town of New Windsor (DPW) Town of Mount Airy (DPW) Town of Hampstead (DPW) Town of Manchester (DPW) Town of Sykesville (DPW) Town of Union Bridge (DPW)	DPW – Facilities City of Westminster (DPW) City of Taneytown (DPW) Town of New Windsor (DPW) Town of Mount Airy (DPW) Town of Hampstead (DPW) Town of Manchester (DPW) Town of Sykesville (DPW) Town of Union Bridge (DPW) DPS – EM	FY2025 and ongoing	HMGP BRIC County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge
Identify critical facilities that have windows	DPW – Facilities	DPW – Facilities	FY2025 and ongoing	HMGP BRIC

vulnerable to wind driven debris and install hardening measures	<p>City of Westminster (DPW)</p> <p>City of Taneytown (DPW)</p> <p>Town of New Windsor (DPW)</p> <p>Town of Mount Airy (DPW)</p> <p>Town of Hampstead (DPW)</p> <p>Town of Manchester (DPW)</p> <p>Town of Sykesville (DPW)</p> <p>Town of Union Bridge (DPW)</p>	<p>City of Westminster (DPW)</p> <p>City of Taneytown (DPW)</p> <p>Town of New Windsor (DPW)</p> <p>Town of Mount Airy (DPW)</p> <p>Town of Hampstead (DPW)</p> <p>Town of Manchester (DPW)</p> <p>Town of Sykesville (DPW)</p> <p>Town of Union Bridge (DPW)</p> <p>DPS – EM</p>		<p>County</p> <p>City of Westminster</p> <p>City of Taneytown</p> <p>Town of New Windsor</p> <p>Town of Mount Airy</p> <p>Town of Hampstead</p> <p>Town of Manchester</p> <p>Town of Sykesville</p> <p>Town of Union Bridge</p>
Continue to work with utility companies to ensure tree trimming activity occurs regularly.	<p>DPW</p> <p>City of Westminster (DPW)</p> <p>City of Taneytown (DPW)</p> <p>Town of New Windsor (DPW)</p> <p>Town of Mount Airy (DPW)</p> <p>Town of Hampstead (DPW)</p>	<p>DPW</p> <p>City of Westminster (DPW)</p> <p>City of Taneytown (DPW)</p> <p>Town of New Windsor (DPW)</p> <p>Town of Mount Airy (DPW)</p> <p>Town of Hampstead (DPW)</p> <p>Town of Manchester (DPW)</p>	Ongoing	<p>County</p> <p>City of Westminster</p> <p>City of Taneytown</p> <p>Town of New Windsor</p> <p>Town of Mount Airy</p> <p>Town of Hampstead</p> <p>Town of Manchester</p> <p>Town of Sykesville</p> <p>Town of Union Bridge</p>

	Town of Manchester (DPW) Town of Sykesville (DPW) Town of Union Bridge (DPW)	Town of Sykesville (DPW) Town of Union Bridge (DPW) DPS – EM Utility Companies		
Conduct targeted outreach to identified vulnerable populations regarding tornado safety.	DPS – EM	DPS – EM Communications Office	Ongoing	County HMGP BRIC

Lower-Priority Mitigation Measures for Future Consideration – County and Municipalities

Lower-Priority Drought Mitigation Strategies - County				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Funding Source(s)
Recommend that mobile home parks of a given size build a storm shelter for their residents, whose housing is susceptible to destruction by relatively minor high-wind events.	Undetermined	Undetermined	TBD	TBD
Recommend the construction of a “safe room” in new schools, day cares, nursing homes and similar facilities to provide a room, or adequate space, that is capable of withstanding extreme wind forces and the force of collapsing or propelled materials. (undetermined)	Undetermined	Undetermined	TBD	TBD
Mandate standard tie-downs of mobile homes to prevent mobile homes from being lifted by winds and becoming ballistic hazards.	DPW – BPI	DPW – BPI City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	TBD	County

Consider development of plan for the implementation of “power hubs” to assist with the provision of emergency electrical power capacity.	Undetermined	DPS – EM DPW DCS DSS	TBD	County HMGP BRIC
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Chapter Nine – Winter Storm

Hazard Identification

Hazard Characterization

Winter storms produce heavy precipitation including snow, sleet, ice – or combinations of the three – high winds and, potentially, extreme cold. A Winter Storm Warning is issued when a significant combination of hazardous winter weather is occurring or imminent.

Significant and hazardous winter weather is defined as a combination of:

1) 5 inches or more of snow/sleet within a 12-hour period or 7 inches or more of snow/sleet within a 24-hour period

AND/OR

2) Enough ice accumulation to cause damage to trees or powerlines.

AND/OR

3) a life threatening or damaging combination of snow and/or ice accumulation with wind.

Severe winter storms can significantly slow traffic and commerce, disrupt communications, and cause power outages.

One type of major winter storm that can affect Maryland is called a Nor'easter. These storms get their name from the strong northeast winds that occur along the East Coast during their lifespan. Nor'easters can either form in the southern states and Gulf Coast region or in the Ohio River Valley; the storm then transfers its energy off the East Coast, where it rides up along New England. One important factor for these storms is a high-pressure system to the north that supplies the cold air necessary for winter precipitation and helps steer the storm off the coast. The cold air from the high pressure is pooled near the surface against counties to the east of the Appalachians, such as Carroll County. This can keep precipitation as snow for longer times, and can also lead to freezing rain, whereas counties closer to the coast receive plain rain. Meteorologists call this overall process "cold air damming" and it is key to many winter storms in Carroll County.

Many times, the heaviest snow with a Nor'easter will occur in a deformation band, named for the process that produces it, that is just 50-100 miles wide. The band usually is flanked on its southeastern side by an area of freezing rain-sleet and farther east by rain. Counties west of the Chesapeake are most likely to have snow or mixed precipitation.

A “pure ice” storm is rare for Maryland as freezing rain is usually preceded by snow or sleet, and because freezing rain events tend to be short since freezing rain will eventually die out by warming the ground to above freezing.

The wind chill index is an equivalent temperature at which the heat loss from exposed flesh would be the same if the wind were near calm. For example, a wind chill index of -5 indicates that the effects of wind and temperature on exposed skin are the same as if the air temperature were 5 degrees below zero, even though the actual temperature could be much higher. The National Weather Service generally issues a wind-chill advisory for Carroll County when wind-chills are expected to reach -10 to -24 degrees F. Wind-chill warnings are issued when chills are expected to be lower than -25 degrees F.

Regional & Historical Perspectives

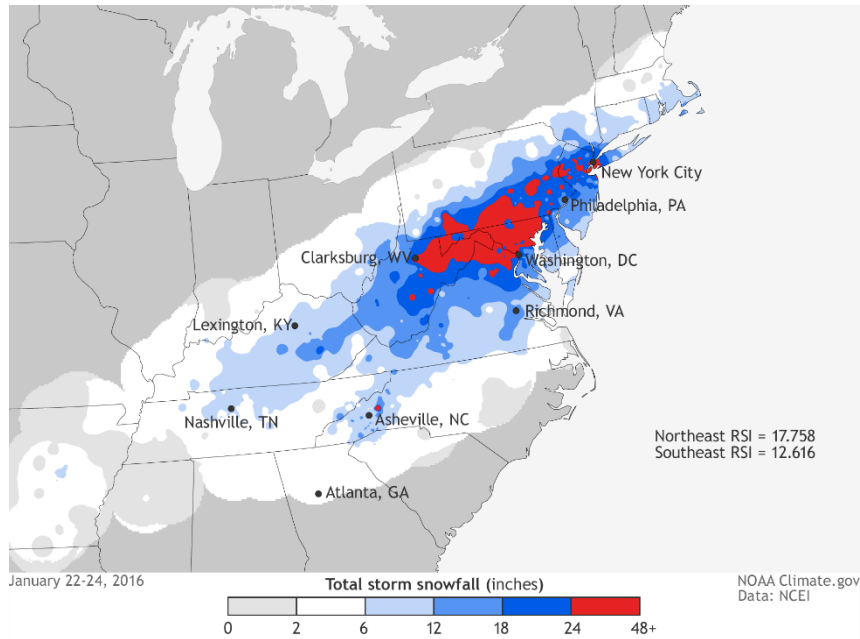
The greatest snowstorms in Maryland history have had associated snowfalls ranging from 12 to 30 inches, and usually have occurred in January or February.

Four significant winter storms that occurred over the winter of 2009-2010 created snowfall totals of over 60 inches throughout much of central and western Maryland and crippled many parts of the state. The winter of 1993-1994 was one of the iciest on record. A January 1994 cold wave produced persistent temperatures near or below freezing, causing rolling blackouts to conserve energy, and repeated storms from January into early March of 1994 produced between 19 and 23 days of icy precipitation over the greater Baltimore metropolitan area.

While the majority of Carroll County averages 21 to 30 inches of snow per year, some areas in the central and northeast portions of the county average 31 to 40 inches per year. Most recently, Winter Storm Jonas in January 2016 dropped more than 32 inches of snow on Carroll County over the course of 48 hours.

Two winter storms in February 2014 that occurred almost back-to-back brought significant ice and snow to Carroll County; two significant winter storms in February 2010 brought heavy snowfall to the county. Snowfall totals from the first storm on February 5 and 6 ranged from 22 inches in Lineboro and Taneytown to 28.5 inches in Mount Airy. The second storm, which

occurred on February 9 and 10, added 21 to 26 more inches of snow to the amount already on the ground.



NOAA graphic – January 2016 snowstorm

There have been six (6) federal disaster declarations related to severe snowfall and winter storms in Carroll County (Table 9.1)

Federal Disaster Declarations for Winter Storms in Carroll County				
Disaster Number	Incident Type	Incident Date	Declared Date	Program Declared
EM-3100-MD	Maryland Severe Snowfall and Winter Storm	03/13/1993 – 03/17/1993	03/16/1993	Public Assistance (Categories A-B & C-G)
DR-1081-MD	Maryland Blizzard	01/06/1996 – 01/12/1996	01/11/1996	N/A
EM-3179-MD	Maryland Snowstorm	02/14/2003 - 02/23/2003	03/14/2003	Public Assistance (Categories A-B)
DR-1910-MD	Maryland Severe Winter Storms and Snowstorms	02/05/2010 – 02/11/2010	05/06/2010	Public Assistance (Categories A-B & C-G)
DR-4170-MD	Maryland Snowstorm	2/12/2014 – 2/13/2014	4/10/2014	Public Assistance (Categories A-B)
DR-4261-MD	Maryland Severe Winter Storm and Snowstorm	1/22/2016 – 1/23/2016	3/4/2016	Public Assistance (Categories A-B & C-G)

Table 9.1 – Federally Declared Disasters for Winter Storms in Carroll County

Risk Characterization

According to the 2021 Maryland State Hazard Mitigation Plan, the composite risk for winter weather across Maryland is highest in the central to western parts of the state. This spatial trend is consistent with the patterns described above for Nor'easter storms. Carroll County is considered to be at high risk for winter storms.

Extent

The severity of a winter storm is often relative to the conditions that the area of focus is accustomed to. There are some standardized tools that can be used to provide estimates on expected storm impacts, such as the National Weather Service's Winter Storm Severity Index. The Winter Storm Severity Index shows extent by communicating how disruptive a storm will be to a community based on the significance of impacts. The relative conditions of the area are considered, such as population, location, and storm characteristics.

Probability and Severity of Future Occurrences

Based on the NCEI database, Carroll County has a high probability of experiencing severe winter storm events. In the past thirty (30) years, NCEI-recorded winter weather events happen about four (4) times a year, winter storms about two (2) times every year, a frost/freeze event once per year, an ice storm a every two (2) years, a heavy snow event every three (3) years, and some sort of cold/wind chill event every two (2) to three (3) years. This information is summarized in Table 9.2.

Potential Winter Storm Impacts	
	Winter Weather Area Expect Winter Weather. • Winter driving conditions. Drive carefully.
	Minor Impacts Expect a few inconveniences to daily life. • Winter driving conditions. Use caution while driving.
	Moderate Impacts Expect disruptions to daily life. • Hazardous driving conditions. Use extra caution while driving. • Closures and disruptions to infrastructure may occur.
	Major Impacts Expect considerable disruptions to daily life. • Dangerous or impossible driving conditions. Avoid travel if possible. • Widespread closures and disruptions to infrastructure may occur.
	Extreme Impacts Expect substantial disruptions to daily life. • Extremely dangerous or impossible driving conditions. Travel is not advised. • Extensive and widespread closures and disruptions to infrastructure may occur. • Life-saving actions may be needed.

NCEI Probability of Severe Winter Storm Events in Carroll County		
Hazard Events	# Of Events	Annualized Events
Blizzard	1	0.03
Cold/Wind Chill	8	0.27
Extreme Cold/Wind Chill	6	0.2
Frost/Freeze	34	1.13
Heavy Snow	8	0.27
Ice Storm	5	0.17
Winter Storm	67	2.23
Winter Weather	127	4.23
Carroll County Total	256	8.53

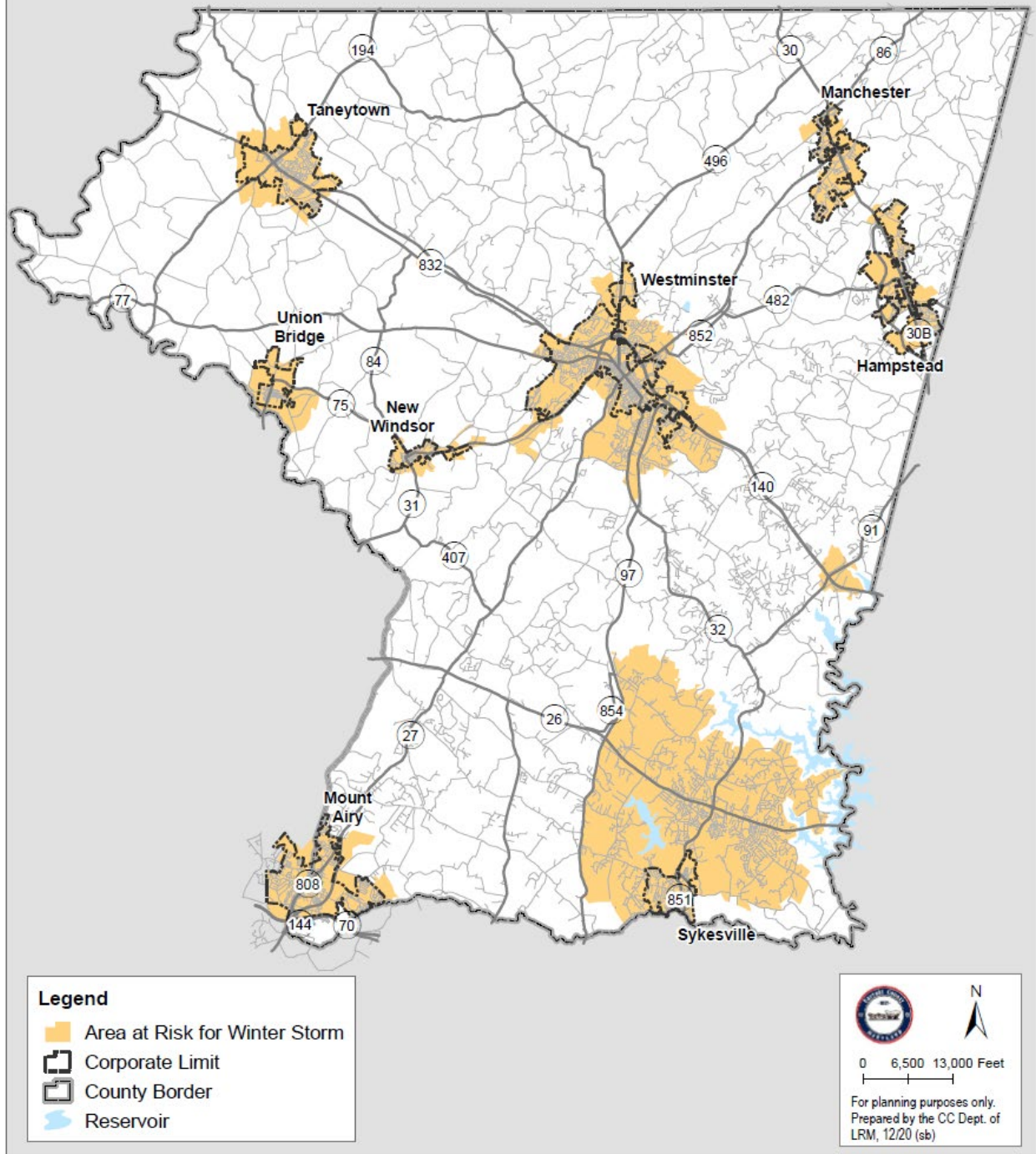
Table 9.2 – NCEI Probability of Severe Winter Storm Events in Carroll County

Hazard High-Impact Areas

When a winter storm strikes Carroll County, the entire county is at risk for some impact. However, the Growth Areas (GA), which are the areas within the Growth Area Boundaries (GAB), are those areas which would be at risk for sustaining the most damage and losses, simply because population and the associated infrastructure, houses, and businesses are concentrated in these areas as part of the ongoing effort to promote efficient growth and preserve agricultural and natural resource land. While the probability of occurrence of a winter storm is not necessarily higher in these areas, the damages and losses that might be sustained within the GAB's would be greater because of this concentration of people and structures. In addition, the people most at risk when a winter storm hits are also most likely to be located in a GA – people in automobiles; people who may not understand a warning due to a language barrier; the elderly and very young; and people with physical or mental disabilities. The GABs provide a logical delineation of areas which will likely incur the most damages.

Each of the eight GAs within the county has been identified on the map entitled “Hazard High-Impact Area for Winter Storms,” below. Appendix D contains individual maps of each GA showing the location of all structures, major employers, critical facilities, and historic sites. These maps are titled “Hazard High-Impact Area for Winter Storm, Thunderstorms & Wind, Tornado” and are further identified by the name of the specific GA depicted.

Hazard High - Impact Area for Winter Storms



Risk Assessment

Lifelines Potentially Affected: Safety & Security; Health and Medical; Energy; Communications; Transportation



Critical Facilities

Identification of Vulnerable Assets

Critical facilities, for the purposes of this plan, include fire stations; hospitals, nursing homes and medical clinics; police stations; emergency operations centers; schools; water treatment and wastewater treatment plants; airports; county and municipal government buildings; detention centers; and bridges.

Cumulatively, a total of 184 critical facilities are located in the GAs.

Estimate of Damages & Losses

The table “Critical Facilities Most at Risk by Growth Area” breaks down the number of critical facilities by GA and provides the total value of critical facilities in each GA. The total value of the critical facilities most at risk from winter storms is more than \$1.6 billion.

Population, People, & Residences

Identification of Vulnerable Assets

During a severe winter storm, the risks to people derive from multiple factors, such as extremely cold temperatures, icy surfaces, and poor visibility, which combine to make activities like shoveling snow and driving dangerous. The risks to people are compounded by the fact that essential systems, such as transportation, utilities, and telecommunications are often disrupted. Most problems will occur in more developed areas where people and homes are concentrated. The county has delineated eight Growth Areas (GA’s) where concentrations of people exist. As of November 2021, an estimated 94,897 people, or 55 percent of the county’s population, lived in one of the eight GA’s.

The risks to homes include roof damage from the weight of snow and indirect damage stemming from loss of heat or electric power.

Estimate of Damages & Losses

As of November 2021, the population in the defined high hazard area for winter storms is 94,897.

The total value of all residential structures within the eight GA's is \$8,060,974,600. In a scenario, for example, where 30 percent of the buildings suffered roof and structural damage totaling 10 percent of the value of the building, costs would exceed \$241 million. Table 9.3, entitled "Value of Structures Most at Risk for Winter Storm by Growth Area," gives the total land and improvement values by GA as well as the average value of structures within each. The data for the table were derived using a query of residential address points, the property data layer, and the tax assessment data. The results from the query provided information by GA for totals and averages.

<i>Value of Structures Most at Risk for Winter Storm by Growth Area Carroll County, MD</i>						
Growth Area	Land Value (\$)		Total Improvement Value (\$)		Total Land & Improvement Value (\$)	
	Total	Average	Total	Average	Total	Average
Hampstead	278,128,200	104,600	563,415,800	214,962	810,855,487	287,231
Freedom-Sykesville	1,911,690,900	147,065	3,285,227,900	279,190	5,068,284,029	389,898
Manchester	205,608,800	99,136	475,429,700	237,003	652,753,830	314,732
Mount Airy*	25,535,600	127,742	389,662,100	194,929	645,018,400	322,670
New Windsor	71,539,100	87,778	152,183,300	181,170	219,942,363	269,868
Taneytown	256,312,400	81,500	495,432,300	161,800	751,744,700	239,028
Union Bridge	43,749,900	95,525	62,446,200	152,310	106,196,100	231,869
Westminster	1,404,095,800	135,964	2,637,177,300	275,366	4,039,821,998	375,867
Totals (Ave)	4,196,660,700	(109,914)	8,060,974,600	(212,091)	12,294,616,907	(303,895)
* Mount Airy numbers are for Carroll County portion of the municipality						
Sources: CC Dept of Land & Resource Mgmt; Maryland State Department of Assessments and Taxation, 2020						

Table 9.3 – Value of Structures Most at Risk for Winter Storm by Growth Area

Agricultural & Natural Resources

Identification of Vulnerable Assets

There are minimal agricultural operations located within the defined hazard area for winter storms. Historically, the most significant damage to these operations has been related to roof collapses on large, flat-roofed farm buildings and to the loss of livestock, all of which are located outside the defined high hazard area.

Estimate of Damages & Losses

No significant costs due to damages and losses to agriculture are anticipated within the hazard high impact area.

Major Employers

Identification of Vulnerable Assets

If a major employer is defined as an organization that employs, or is occupied by, 100 or more people at any one location, then the county's eight GAs are home to 20 major employers as shown in Table 7.8 entitled "Major Employers with Workforce Over 100" on page 119.

The largest employer, Carroll County Public Schools, has 100 or more occupants at thirty-seven locations throughout the GAs. Table 7.9, entitled "Board of Education Facilities with 100 or More Occupants and Within the Hazard Area by Growth Area" on page 120, lists the facilities that fit the criteria, including the administrative building and most of the schools in the system. The thirty-seven locations are occupied by approximately 25,322 people, or 85 percent of the school system's total occupants.

With regard to the 20 major employers listed in Table 7.8 on page 119, as of 2020, over 12,000 people occupied one of the locations listed. Still other large employers, such as certain banks and contractors, cannot be apportioned based on the hazard area because employees are based at numerous locations, or because much of the workforce is mobile.

Estimate of Damages & Losses

To estimate damages and losses to major employers, tax assessment data were reviewed for the locations of the 20 employers reported in Table 7.8, "Major Employers with Workforce Over 100." Where an employer owns property in multiple locations, those locations with fewer than 100 occupants were excluded. In many cases, what appears as one location is actually made up of multiple properties. Two buildings that appear to be part of the same facility may be on separate properties and assessed separately. Aerial photographs and tax maps were used to identify the property or properties that make up what is, for all intents and purposes, one employment site for each major employer. In some instances, a campus of buildings comprised one employment site.

The total assessed value of the buildings at the principal sites of these major employers was \$983,837,900. In a scenario, for example, where 30 percent of the buildings suffered roof and structural damage totaling 10 percent of the value of the building, costs would exceed \$29 million.

Thirty-seven school system facilities with 100 or more occupants are in a GA. The average value of the buildings was over \$10 million per campus. The losses, should all said school buildings be destroyed, would total \$401,062,600.

Historic Resources

Identification of Vulnerable Assets

A total of 672 historic sites, those which are listed on the National Register of Historic Places and/or on the Maryland Historical Trust's Inventory of Historic Properties, are located within a hazard area for winter storms. Historic sites can comprise numerous historic structures. These sites can be buildings such as houses, structures such as bridges, objects such as Mason-Dixon Line boundary markers, or sites such as entire farms.

<i>Historic Sites Located Within the Hazard Area for Winter Storms by Growth Area Carroll County, MD</i>		
GA	# of Historic Sites	Total Property Value (\$)
Finksburg	25	3,729,500
Hampstead	62	11,795,100
Manchester	20	3,824,300
Mount Airy	9	1,797,800
New Windsor	24	10,299,700
Sykesville-Freedom	121	95,098,600
Taneytown	19	4,232,500
Union Bridge	14	2,095,700
Westminster	378	162,859,900
Totals	672	\$295,733,100
Source: CC Dept of Land & Resource Mgmt & MD Assessment and Taxation Data, 2020		

Table 9.4 – Historic Sites Located Within the Hazard Area for Winter Storms by Growth Area

In addition to historic sites, the National Register and the Maryland Historical Trust also inventory historic districts. Historic district designations recognize collections of historic sites that contribute to a whole that is greater than the sum of its parts. A typical example in Carroll County would be a historic Main Street along which multiple historic sites collectively convey a sense of the town that existed there 100 to 200 years earlier.

Historic Districts on the National Register of Historic Places Carroll County, MD	
Historic District Name	GA Location
Lineboro	None
Linwood	None
McKinstry's Mill	None
Mount Airy	Mount Airy
New Windsor	New Windsor
Sykesville	Sykesville-Freedom
Taneytown	Taneytown
Union Bridge	Union Bridge
Union Mills Homestead	None
Uniontown	None
Westminster	Westminster
Source: CC Department of Planning, 2021	

Table 9.5 – Historic Districts on the National Register of Historic Places

Estimate of Damages & Losses

Table 9.4, entitled “Historic Sites Located within the Hazard Area for Winter Storm by Growth Area,” identifies the number of historic sites found in the identified hazard area for winter storms. Property values for individual properties and buildings were queried from the assessment data to estimate damages and losses. If all the historic buildings in the hazard area were destroyed in a winter storm, the quantifiable property losses would total \$295,733,100. However, no real numerical value can be placed on the way the sites tell the history of the community and help to preserve its sense of place. The average value for buildings on a historic site is \$440,079. The average is high because large, expensive buildings at sites such as McDaniel College and Springfield State Hospital are included in the calculation.

Table 9.5, entitled “Historic Districts on the National Register of Historic Places,” lists the historic districts in Carroll County that are on the National Register of Historic Places. Six of the eleven are located within a GA and are, therefore, within the hazard area for winter storms. The losses in a historic district would go beyond the damage to the individual properties to also include whatever greater historic value the district as a whole represented.

Mitigation Measures

Existing Mitigation Measures – County and Municipalities

Existing County and Municipalities Mitigation Measures			
Mitigation Measure	Identified as existing in 2014 HMP	Completed since 2014 HMP	Notes
The Bureau of Roads Operations (under the Department of Public Works) has the county divided into specified snowplow routes, has four permanent salt storage facilities, and two temporary salt storage sites. (DPW)	X		Ongoing Initiative
The emergency generator at the County Maintenance Facility, which is the location from which the majority of winter roadway operations are managed, has been recently upgraded utilizing Hazard Mitigation funding.		X	
The Bureau of Permits and Inspections currently augments the enforcement of the Maryland Building Performance Standards and related County ordinances by encouraging wind-resistant design techniques for new construction during the County's permit process. (BPI)	X		Ongoing Initiative
The Building Code for Carroll County does not permit architects and engineers to reduce snow loads. This is a stricter measure than provided for in the National Building Code. (BPI)	X		Ongoing Initiative
The Department of Public Works has developed and implemented a Salt Management Plan.		X	
The Department of Public Safety implemented an upgraded mass emergency notification system in 2015, which provides a reliable means of notifying residents of impending severe winter storm events.		X	
An emergency preparedness smartphone app, Prepare Me Carroll, is available free of charge to residents and business owners. This app provides information about preparedness and response actions related to winter storms.		X	
The Department of Public Works and municipal public works departments routinely monitor trees and branches in public areas at risk of breaking or falling in wind, ice, and snow storms. Trees or branches that pose an immediate threat to property, utility lines, other significant structures, or critical facilities in the county are pruned or thinned as necessary.	X		Ongoing Initiative



*FEMA-DR-4261-MD-0023 Carroll County Maintenance Center
Generator Project (Interior View)*



*FEMA-DR-4261-MD-0023 Carroll County Maintenance Center
Generator Project (Exterior View)*

Proposed High-Priority Mitigation Strategies – County and Municipalities

Winter Storm Mitigation High-Priority Strategies – County & Municipalities				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Ensure that buildings housing critical facilities are retrofitted as needed to best withstand heavy snow loads.	DPW - BPI City of Westminster (DPW) City of Taneytown (DPW) Town of New Windsor (DPW) Town of Mount Airy (DPW) Town of Hampstead (DPW) Town of Manchester (DPW) Town of Sykesville (DPW) Town of Union Bridge (DPW)	DPW - BPI City of Westminster (DPW) City of Taneytown (DPW) Town of New Windsor (DPW) Town of Mount Airy (DPW) Town of Hampstead (DPW) Town of Manchester (DPW) Town of Sykesville (DPW) Town of Union Bridge (DPW)	FY2025	HMGP BRIC County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge

Continue to work with utility companies to ensure tree trimming activities are accomplished on an ongoing basis.	County DPW City of Westminster (DPW) City of Taneytown (DPW) Town of New Windsor (DPW) Town of Mount Airy (DPW) Town of Hampstead (DPW) Town of Manchester (DPW) Town of Sykesville (DPW) Town of Union Bridge (DPW)	County DPW City of Westminster (DPW) City of Taneytown (DPW) Town of New Windsor (DPW) Town of Mount Airy (DPW) Town of Hampstead (DPW) Town of Manchester (DPW) Town of Sykesville (DPW) Town of Union Bridge (DPW) DPS – EM Utility Companies	Ongoing	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge
Conduct outreach to identified vulnerable populations regarding winter storm safety	DPS – EM	DPS – EM Communications Office	Ongoing	County EMPG HMGP BRIC

Lower-Priority Mitigation Measures for Future Consideration – County and Municipalities

<i>Lower-Priority Winter Storm Mitigation Strategies - County</i>				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Funding Source(s)
Consider installation of Automated Vehicle Locator (AVL) capabilities in DPW vehicles. This capability would provide rapid up to date information on current snow removal response equipment locations so that equipment can be deployed in the most appropriate and effective fashion in response to a winter storm event.	DPW	DPW	TBD	County

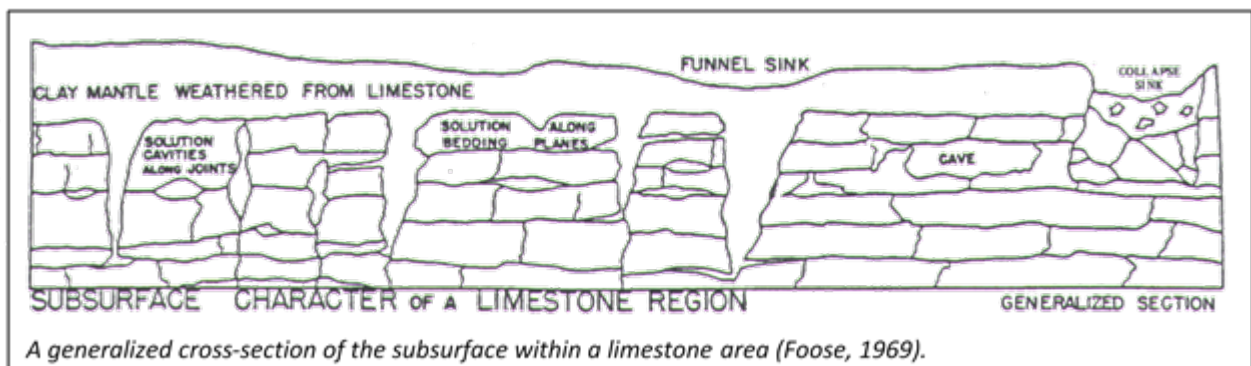
Chapter Ten – Soil Movement

Hazard Identification

Hazard Characterization

This hazard includes earthquake, expansive soil, land subsidence, and mass movement. An earthquake is the sudden shaking of the ground due to a release of energy stored in the earth's crust. Stress builds up where tectonic plates come together along a fault line. Eventually the stress becomes too great and the plates slip along the fault; this causes the release of the built up energy and what we recognize as an earthquake. Vertical and horizontal ground motions are caused by seismic waves that radiate outward from the focus, or hypocenter, of rupture. The surface area directly above the focus is called the epicenter (USGS, 2012).

Soils that undergo volumetric changes due to gain or loss of moisture are known as expansive soils. These volumetric changes can weaken and crack building foundations, cause uneven settlement of structures, and damage highways, streets, and utility lines (Petak and Atkisson, 1982). The potential for volume change is called shrink-swell potential. The effects of expansive soils are most evident in humid areas during periods of drought, as normally moist soils dry, contract, and crack.



Land subsidence is the lowering of the ground surface due to the loss of subsurface support (FEMA, 1997). Subsidence (particularly in the way of sinkhole formation) occurs naturally; it can also be caused or accelerated by man-made activities such as underground mining and pumping of subsurface fluids (Cooke and Doornkamp, 1974). The onset of subsidence may be gradual or sudden, and its real extent ranges from broad, regional reductions in elevation to highly localized, often catastrophic collapses. Localized collapses (sinkholes) are rapid and damaging to buildings, roads, and utilities (Matthews and Kelly, 1997).

Areas underlain by calcareous rock formations affected by dissolution are identified as karst terrain. These calcium carbonate-based rock formations can be very unstable due to the ease

by which water movement can dissolve these rock types (leaving subsurface voids) and mobilize overlying sediment into the underlying subsurface network. Hazards associated with karst terrain include not only physical risks created by surface collapse, but also rapid contamination of significant underground water supplies typically found within these rock formations. Three things need to be present in order for subsidence and/or collapse of sinkholes to occur: 1) there must be an outlet in the underlying bedrock; 2) the soil must be detachable or movable; and 3) there must be a driving mechanism (Magner et. al., 1986). Specific examples of driving mechanisms include surface drainage modifications, land disturbances, and water-table alterations. Carroll County's karst terrain regions coincide with its marble and limestone deposits, including the Wakefield Marble, Silver Run Limestone and other unnamed calcareous formations. In the western and central portions of Carroll County, where areas of karst terrain are found, the land tends to be susceptible to soil movement in the form of sinkholes.

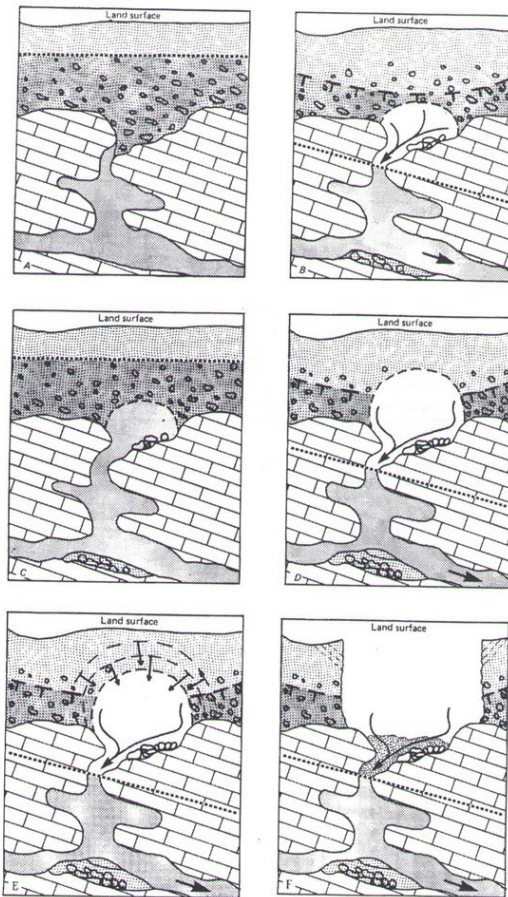


FIGURE 3. Development of a sinkhole due to subsurface erosion caused by water table fluctuations (modified from Newton, 1987).

As the percolating water entering the subsurface slowly dissolves and removes bedrock, the contact between bedrock and surface soils tends to become extremely irregular. This process also enlarges any cracks or fractures in the rock. This leads to the formation of conduits and caves, some of which may be well connected. Because the natural process of bedrock dissolution is extremely slow, typically these processes play an insignificant role in sinkhole development. However, over geologic time, this dissolution process creates the outlets in the rock necessary for failure (sinkhole formation) of overlying cover soils.

When the subsurface soil layer at the contact interface with the bedrock begins eroding, voids often form. This process proceeds rapidly relative to the rate of rock dissolution. As the subsurface erosion increases, the void enlarges. Eventually, the unsupported soil arch above the dissolved bedrock thins, weakens, and collapses. The resulting surface collapse creates what we see as a sinkhole. The time required for this process to occur varies considerably and can be altered significantly by various driving mechanisms.

These mechanisms can be both natural and man induced. A 1987 U.S. Geological Survey publication on the interaction between sinkholes and various types of activities provides an excellent overview of the phenomenon. Natural water-table fluctuations can cause the subsurface erosion which leads to sinkhole development, but the process is typically slow. Under natural conditions, the formation of new sinkholes during a man's lifetime is relatively rare. In contrast, sinkholes induced by man's activities are comparatively abundant (Newton, 1987) and can form at accelerated rates.



Mass movements, commonly called landslides, are spontaneous failures of slopes under the influence of gravity. These down-slope movements range in speed from very slow (soil creep) to very rapid (rock falls and rockslides). Slow mass movements are not usually life threatening but do cause progressive deterioration of structures and infrastructure. Rapid mass movements pose serious threats to life and property and can disrupt traffic and communication. In the U.S. landslides are responsible for damages of more than \$3 billion and more than 25 deaths per year (USGS, 2004).

Regional and Historical Perspectives

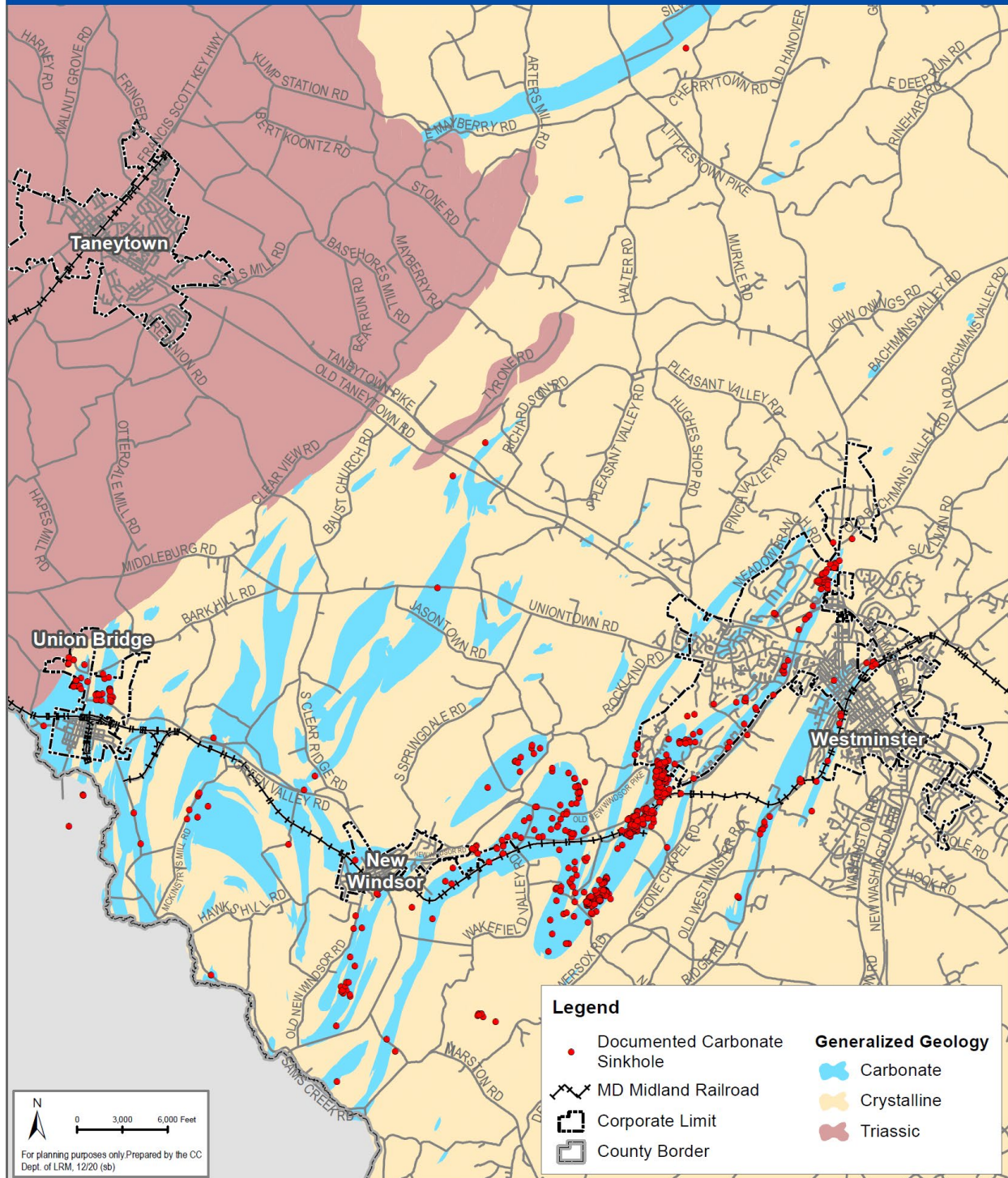
Maryland's geographic regions tend to describe the relative risks for various types of soil movement hazards. In its recorded history, Maryland has experienced several earthquakes; however, to date none have caused widespread or significant damage. FEMA considers that the state has a moderate earthquake risk due to earthquake activity in Howard County (1993 – 1996) and in nearby portions of surrounding states. Maryland was affected by a 5.8 magnitude earthquake with an epicenter located in Mineral, Virginia in August 2011 (USGS, 2012). Expansive soils are found throughout Maryland, but their geographic distributions are uneven and tend to be isolated. This sporadic pattern, coupled with the varying thickness and physical properties of soils, can result in more localized impacts for earthquake events. Maryland, like most eastern states, is rated as having slight-to-moderate clay-swelling potential (FEMA, 1997).

The subsidence area surrounding the Chesapeake Bay does not include Carroll County. Landslide hazards are not typically of significant concern in Maryland. Although most of Maryland is rated as having a high-to-moderate mass soil-movement potential based on various formation types, this risk is primarily linked to past events. Subsidence risks due to various activities, including non-coal mining, exist throughout the state. According to the 2021 Maryland Hazard Mitigation Plan, Maryland has an overall medium probability of damage from soil movement. However, it notes and describes that areas of karst terrain in central Maryland, including Carroll County, are highly susceptible to sinkhole formation.

The greatest potential soil-movement hazard in Carroll County is found in those areas of karst terrain susceptible to sinkholes. Carroll County's geology limits those areas to regions where the Wakefield Marble and Silver Run Limestone are components of the bedrock units. These two carbonate units underlay approximately 2 percent of the 456 square miles which make up Carroll County. Approximately 866 sinkholes, primarily occurring in the west-central portion of the county, have been investigated and documented in a regularly maintained database. Carroll County did experience a catastrophic sinkhole event in March 1994, when a sinkhole collapsed a major section of the MD 31 roadbed between Westminster and New Windsor in the middle of the night. This sudden collapse occurred during the short interval of time required to travel roundtrip between the City of Westminster's wastewater treatment plant and the town

of New Windsor. A vehicle fell into the void, killing the driver. To date, this is the only known sinkhole incident to cause a human fatality in the county, but there have been multiple incidences of livestock or wildlife being killed or injured by sinkholes.

Known/Suspected Carbonate Rock Areas and Documented Carbonate Sinkholes



Risk Characterization

The Maryland Department of Emergency Management Agency (MDEM) characterizes Carroll County with an overall medium risk for soil-movement hazards. However, Carroll County's specific risk for land subsidence, including sinkholes, is rated as high. The risks associated with sinkholes can be separated into two categories: structural integrity and water quality. Specific hazards which can occur within either of these headings include injury or loss of life, disruption of service or use, illness, loss of service or use, economic hardship, and potential land devaluation.

Extent

The severity of soil movement hazards will depend on several factors such as vegetation, rainfall, type of soil, topography, how quickly it forms, and its proximity to existing development. Soil movement that occurs gradually over time may be able to be addressed before damage occurs, whereas one that forms quickly may lead to property damage or service disruptions if roads or utilities are affected. All types of soil movement hazards, small to large, have the potential to incur significant damage to buildings, infrastructure, and people.

Probability and Severity of Future Occurrence

Limited historical data on soil movement incidents in Carroll County makes calculating the probability of future events challenging. However, the role of climate change should also be considered when predicting the probability of future soil movement. As the likelihood and intensity of other influencing hazards, such as drought (with resulting groundwater withdrawals) or rainfall, are expected to increase in Carroll County, future occurrences may be higher than historical projections suggest.

High Risk Hazard Areas

Just as with many other natural hazards, attempting to predict and assess the location-specific risks associated with area-wide events such as earthquakes proves to be of very limited use. Since clearly defined areas of Carroll can be identified as most at risk for sinkhole formation as a high-threat hazard, this Plan will primarily focus on addressing this risk. A set of maps depicting the Hazard High-Impact Area for Soil Movement – State-Identified Zones of Influence Around Quarries, beginning on page 127, identify the specific county locations known to be at risk for soil movement. These maps illustrate the individual Zone of Influence (ZOI) impact boundaries around the carbonate rock quarrying areas in Union Bridge, New Windsor, and Westminster. These boundaries were defined by state permitting agencies as the localized areas where quarry dewatering could be anticipated to lower the water table sufficiently to cause either loss of well water or surface collapse. Following changes to state law, in these ZOI regions, quarry

operators are required to mitigate well failures, provide alternate water supply, and repair sinkholes or similar ground collapses. Zones of influence have been identified for three areas in the county: Medford Quarries, Lehigh-New Windsor Quarry, and the Lehigh-Union Bridge Quarry. There are two active pits at the Medford Quarries location. The ZOI for both Medford operations are displayed on the same map, as they are overlapping and are considered one area for the purpose of the risk assessment in this Plan.

Risk Assessment

Lifelines Potentially Affected: Food, Water, Shelter; Transportation



Critical Facilities

Identification of Vulnerable Assets

Critical facilities, for the purposes of this plan, include fire stations; hospitals, nursing homes and medical clinics; police stations; emergency operations centers; schools; water treatment and wastewater treatment plants; airports; county and municipal government buildings; detention centers; and bridges.

One critical facility, the City of Westminster Wastewater Treatment Plant, is within the Medford Quarries ZOI.

Estimate of Damages and Losses

The City of Westminster Wastewater Treatment Plant is currently undergoing significant renovation through a project worth approximately \$62 million.

Population, People and Residences

Identification of Vulnerable Assets

The primary risks associated with soil movement occur when objects, structures, or people fall into a collapsed sinkhole. According to data from the CC Department of Land and Resource Management along with the MD Assessment and Taxation, there are 13 residential properties in the Medford ZOI and 71 homes in the Lehigh-New Windsor ZOI. There are no residential properties within the Lehigh-Union Bridge ZOI. Although a specific 2020 Census count is not available for the County's ZOI areas, the population can be estimated by multiplying the number of homes by the local occupancy rate, and then multiplying that result by the local

average number of people per household. For Westminster, the 2020 occupancy rate was 97 percent and the persons per household were calculated at 2.4; in New Windsor those values were 97 percent and 2.2, respectively. Based on this method and data, approximately 182 people live within one of County's designated ZOIs.

<i>Residential Properties with Structures in the Zone of Influence Carroll County, MD</i>			
Zone of Influence	# of Properties	Total Value of Improvements	Total Value of Land & Improvements
Medford	13	2,230,700	4,667,800
Lehigh NW	71	8,918,900	17,104,000
Total	84	11,149,600	21,771,800
Sources: CC Dept of Land & Resource Mgmt; MD Assessment and Taxation, 2020			

Table 10.1 – Residential Properties with Structures in the Zone of Influence

Sinkholes also pose an immediate threat to area groundwater supplies. If contaminated surface water flows into a sinkhole, it can infiltrate aquifer systems and degrade groundwater resources that serve both private and public water supply wells. Approximately 72 percent of Carroll County's population receives its water supply from wells (groundwater) only. With the exception of Westminster and the Sykesville-Freedom District, all the GAs in Carroll County rely solely on groundwater from the aquifers in the county (Carroll County Master Plan for Water & Sewerage, p. 47).

Estimate of Damages and Losses

Some risk of injury or loss of life resulting from a sinkhole exists. Carroll County has experienced one sinkhole fatality caused by a collapsed section of state highway which failed suddenly during the night. A sinkhole may cause significant structural damage to buildings located on or near the collapse, requiring costly repairs or even resulting in the total loss of the structure. Insurance policies do not typically cover damage from soil movement or sinkholes. If or when coverage is available, it must be purchased as a separate rider. Both land and buildings damaged by sinkholes may lose their resale value.

The average value of the residential properties (including land and improvements) located in the hazard area is \$259,188.

Agricultural & Natural Resources

Identification of Vulnerable Assets

Portions of several agricultural properties lie within a zone of influence for one of the quarries. Most of the properties are used for crop farming. Farmers in the area primarily rotate the fields between corn and soybeans each year and occasionally vary the rotation by planting hay, wheat, or barley for a year. Sinkholes are a common problem. Farm equipment has been damaged due to sinkholes that have formed in fields.

Estimate of Damages and Losses

When a sinkhole opens up, the crops that fall into the hole are lost. Farmers in the area tell stories of narrow escapes when coming across a sinkhole or causing a collapse while operating a tractor or combine. No injuries to people resulting from a sinkhole on a farm have been reported. When a sinkhole forms in a crop field, farmers either fill the sinkhole in with dirt or simply farm around the depression. Although filling a sinkhole with dirt is a common practice, it is a short-term solution at best.

Typically, sinkhole damage would not impact an entire farm. However, local sinkhole activity has been documented to cause severe impacts on tracts of at least 35 acres as in the Westminster-area case of *Finley v. Teeter Stone* (Court of Appeals of MD, 1968). There is a combined total of 309 acres of agricultural land within the ZOIs: 160 acres within the Lehigh-New Windsor ZOI, and 149 acres within the Medford ZOI; there is no agricultural land located within the Carroll County portion of the Lehigh-Union Bridge ZOI.

According to the Carroll County Agricultural Land Preservation Program, the average fair market value of agricultural land in the county is \$8,300 per acre; therefore, the estimated total land value of the 309 acres of farmland located within the ZOIs is \$2,564,700. Since each of the potentially affected areas represents only a portion of any individual property, damage is not anticipated to impact operations of an entire farm. According to local experts, a typical cost to remediate land damaged by a sinkhole runs in the thousands to tens of thousands of dollars if no structures are involved. If the sinkhole damages an agricultural structure and/or its equipment systems, remediation costs run in the tens of thousands to hundreds of thousands of dollars.

Major Employers

Identification of Vulnerable Assets

Of the 20 major employers identified in Table 7.8 on page 119, only one is located within a ZOI. Performance Food Group (PFG)/Carroll County Foods is located in the Medford ZOI. As of 2020, PFG/Carroll County Foods employed approximately 210 people. Including the PFG/Carroll County Foods property, the Medford ZOI includes 10 commercial or industrial properties, some with multiple buildings. The Lehigh-New Windsor ZOI includes two properties. The Leigh-Union Bridge ZOI does not include any commercial or industrial properties.

<i>Commercial or Industrial Properties with Structures in the Zone of Influence Carroll County, MD</i>			
Zone of Influence	Number of Sites	Total Value of Improvements	Total Value of Land & Improvements
Medford	10	18,027,400	22,642,400
Lehigh NW	2	1,269,000	1,486,100
Total	12	19,296,400	24,128,500
Sources: CC Dept of Land & Resource Mgmt; MD Assessment and Taxation, 2020			

Table 10.2 – Commercial or Industrial Properties with Structures in the Zone of Influence

In the Medford ZOI, the total value of the structures on commercial or industrial property is \$18,027,400 and the total value of the land and improvements on those properties is \$22,642,400.

In the Lehigh-New Windsor ZOI, the total value of the structures on commercial or industrial property is \$1,269,000 and the total value of the land and improvements on those properties is \$1,486,100.

The average value of the commercial or industrial properties across both the Medford and Lehigh-New Windsor ZOIs, including the land and buildings, is \$2,010,708.

There are no commercial or industrial properties within the Lehigh-Union Bridge ZOI.

Historic Resources

Identification of Vulnerable Assets

A total of 16 historic sites, those which are listed on the National Register of Historic Sites and/or on the Maryland Historical Trust Inventory of Historic Sites, are located within the ZOIs.

Estimate of Damages and Losses

Table 10.3 addresses historic sites in each ZOI and summarizes the location and values for the at-risk historic resources. The cumulative total value of the improvements on all of the identified historic sites amounts to \$2,727,600; the value of the land and improvements equals \$8,388,500. However, with historic resources, the value of the cultural assets which would be lost is beyond a numerical value. The importance of these sites in the telling of the community's history and in preserving its sense of place are priceless and would represent an unrecoverable loss.

<i>Historic Sites in Zones of Influence for Soil Movement Carroll County, MD</i>			
Zone of Influence	# of Historic Sites	Total Value of Improvements	Total Value of Land & Improvements
Medford	6	881,600	4,240,700
Lehigh NW	10	1,846,000	4,147,800
Total	16	2,727,600	8,388,500
Sources: CC Dept of Land & Resource Mgmt; MD Assessment and Taxation, 2020			

Table 10.3 – Historic Sites in Zones of Influence for Soil Movement

Mitigation Measures

Existing County Mitigation Measures

Existing County Mitigation Measures			
Mitigation Measure	Identified as existing in 2014 HMP	Completed since 2014 HMP	Notes
County's Department of Land and Resource Management (LRM) reviews all proposed development plans for either subdivision projects or individual site plans within carbonate rock areas to identify existing sinkholes and evaluate the potential for new sinkholes. Reviews are performed in accordance with County Code Chapter 154, utilizing standards identified in the Water Resource Management Manual (https://www.carrollcountymd.gov/media/10326/water-resource-management-manual.pdf). Recommendations are made to the Planning Commission as part of the development plan review and approval process.	X		Ongoing Initiative
The Department of LRM maintains a sinkhole database, performs field investigations and documents areas of the county which are more susceptible to this hazard.	X		Ongoing Initiative
The Department of LRM and the Department of Public Works (DPW) Bureau of Road Operations perform semiannual inspections of karst prone public roadways in and around the ZOI high-risk areas to monitor conditions and initiate repairs as needed.	X		Ongoing Initiative
The Department of LRM has developed a county-wide network of observation wells, many of which are located in and around high risk and ZOI areas of the county. The network monitoring is done on a regular basis at bi-weekly to monthly intervals to track changes in hydraulic support to help predict increasing risk levels in very localized areas.	X		Ongoing Initiative
The county also requires that approved site development plans for quarrying operations include a Local Contingency Plan and special indenture to address the specific processes and actions for ZOI sinkhole repairs, replacements of water supplies, or other related dewatering impacts.	X		Ongoing Initiative

Proposed High-Priority County Mitigation Strategies

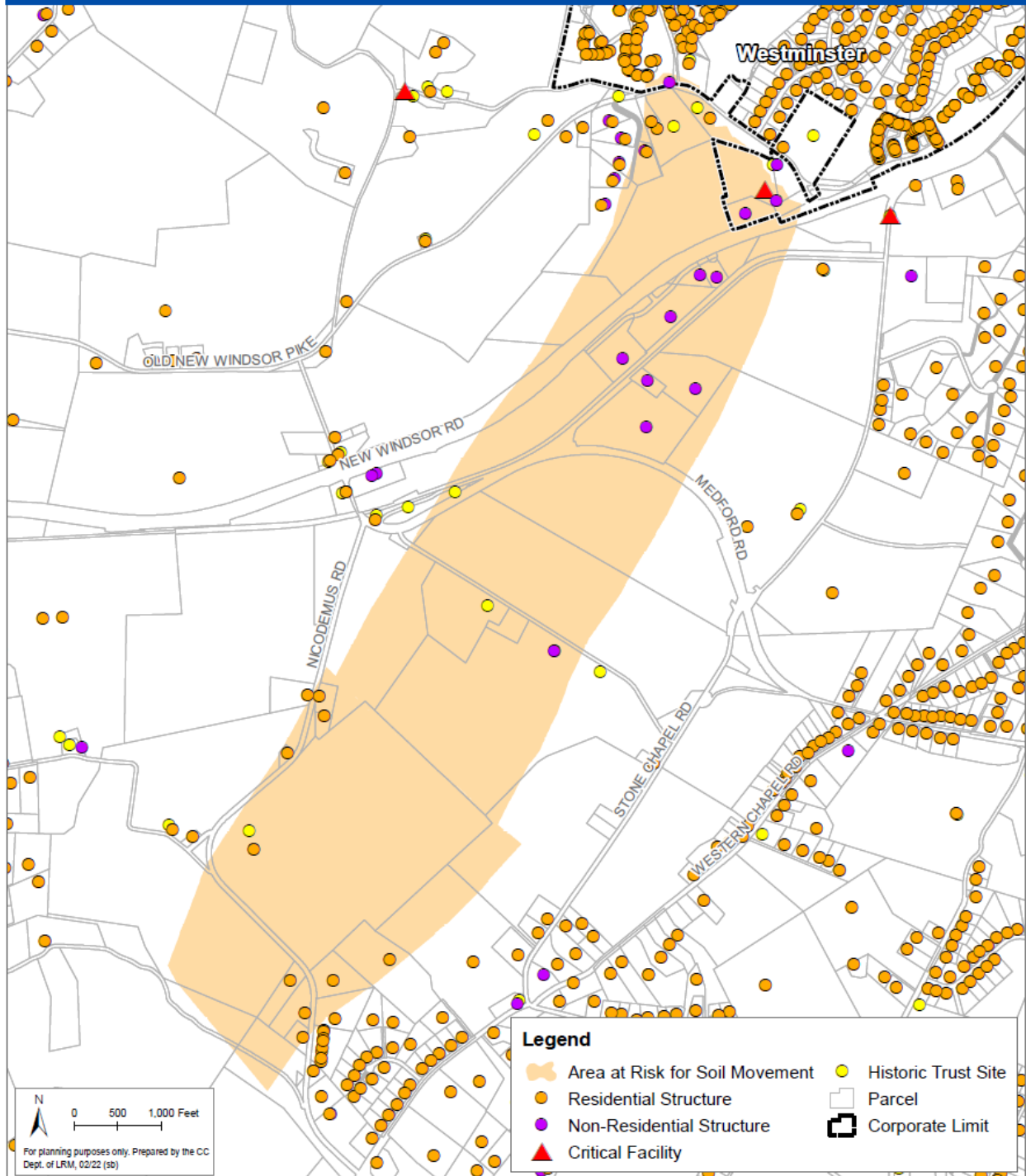
Carroll County is among the most proactive jurisdictions in Maryland relative to monitoring sinkhole activity. Carroll County has provided training and information to other jurisdictions on the topic of sinkholes.

<i>Proposed High Priority Soil Movement Mitigation Strategies – County</i>				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
A baseline geophysical survey was previously performed along the portion of Nicodemus Road underlain by the Wakefield Marble unit mined at Medford Quarry. At that time, suspect areas were filled with grout to prepare for future mining impacts associated with the expansion of Medford Quarry onto and beyond the Reichlin tract. As quarry expansion occurs and dewatering of the expansion area begins, the future stability of Nicodemus Road will need to be assessed and discussed.	DPW DLRM	DPW DLRM Medford Quarry	TBD	County State of MD

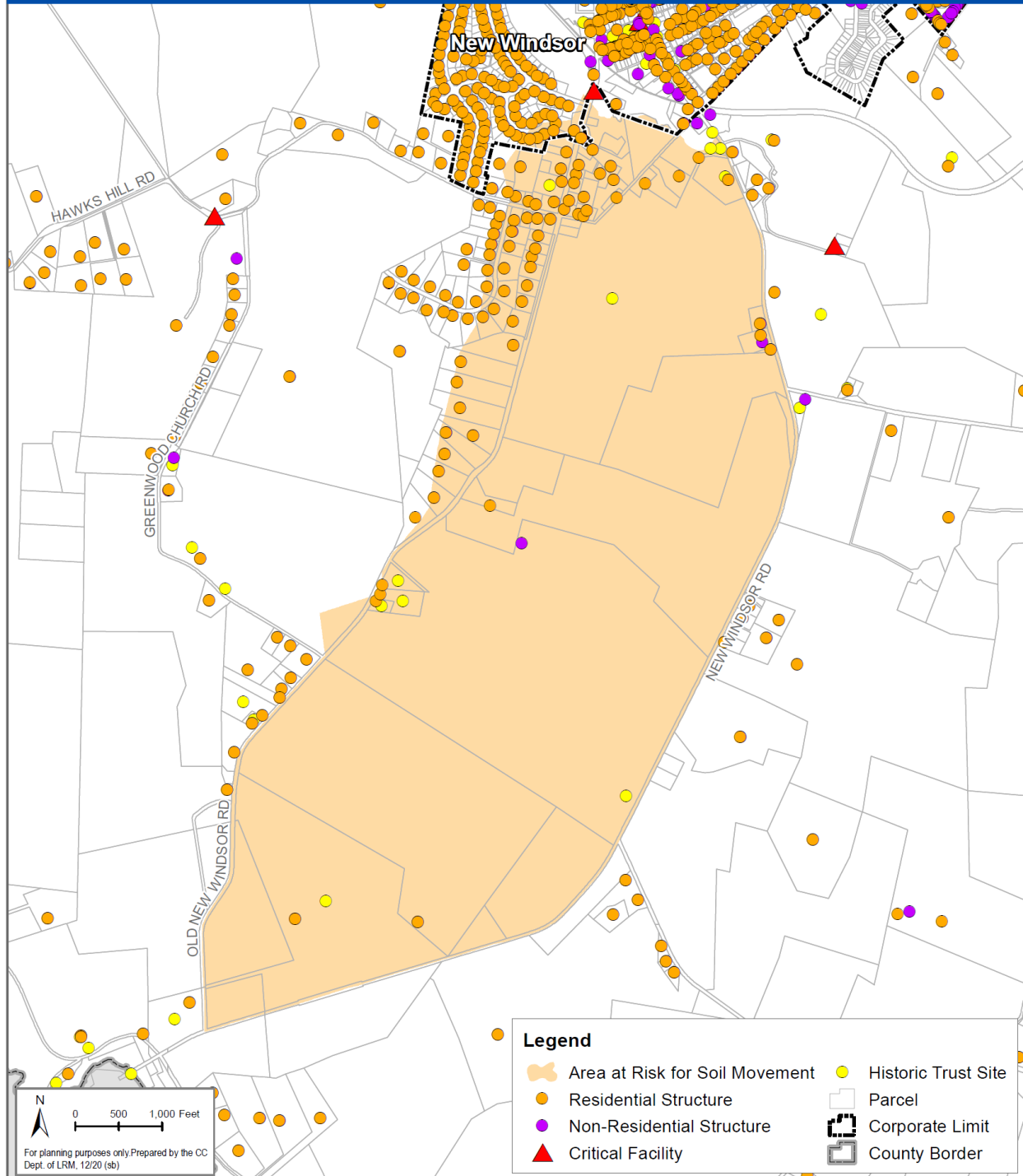
<i>Proposed Lower Priority Soil Movement Mitigation Strategies – County</i>				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Develop and publish a sinkhole resource webpage for Carroll County residents to reference and utilize to understand the processes of sinkhole development, strategies/methods for their proper repair, people they can contact for additional information, etc.	DLRM	DLRM Communications Office	TBD	County

<i>Proposed Lower Priority Soil Movement Mitigation Strategies – Municipal</i>				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Municipal staff should continue to identify and repair sinkholes on municipal properties and in locations proximal to water supply sources as they occur. Municipal staff should continue to work with partnering agencies and private property owners when sinkholes that pose a potential threat to water supply sources form on properties that are not owned or maintained by those municipalities.	City of Westminster - DPW Town of New Windsor – DPW Town of Union Bridge – DPW DLRM	City of Westminster Town of New Windsor Town of Union Bridge DLRM DPW Private property owners	TBD	City of Westminster Town of New Windsor Town of Union Bridge

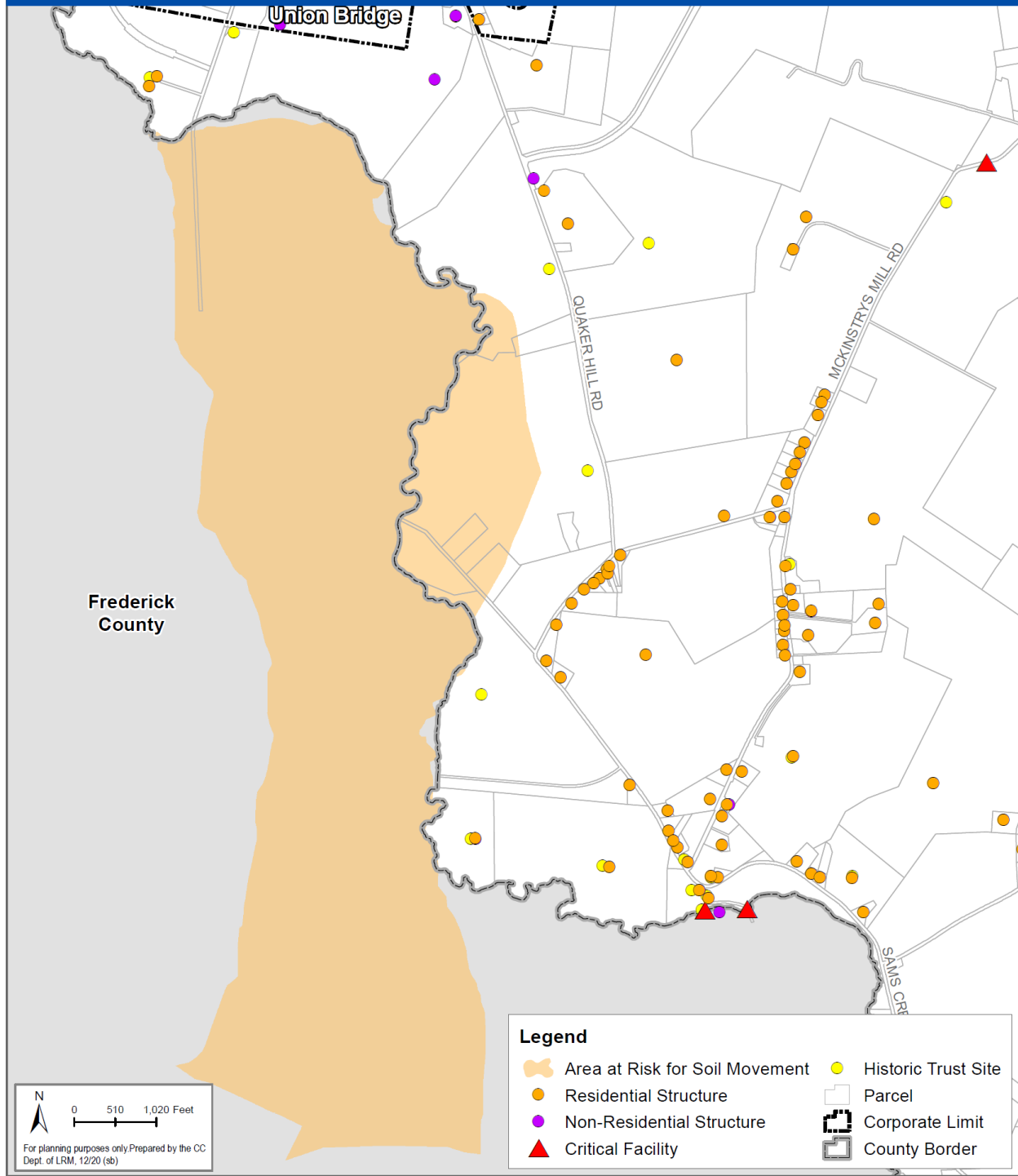
Hazard High - Impact Area For Soil Movement State-Identified Zones of Influence Around Quarries Medford Quarries



Hazard High - Impact Area For Soil Movement State-Identified Zones of Influence Around Quarries Lehigh - New Windsor Quarry



Hazard High - Impact Area For Soil Movement State-Identified Zones of Influence Around Quarries Lehigh - Union Bridge Quarry



Chapter Eleven – Dam Failure

Hazard Identification

Hazard Characterization

A dam is any artificial barrier designed to confine water, wastewater, or any other liquid or semi-liquid material. In Maryland, any surface impoundment structure is also considered a dam if it requires a containment wall of 4 feet or higher and is intended to manage any significant storage capacity (MD Conservation Practice Standard Pond Code 378). Dams are constructed across watercourses to retain and control drinking water supplies, for navigation, flood control, agricultural irrigation, and/or power generation. Reservoirs may also serve as wildlife sanctuaries or support recreational activities, such as fishing and boating. In some areas, dams are employed as flood control structures. It is fairly likely that a given dam will function in several of these capacities simultaneously.

Dams utilize numerous types of construction materials and methods. Inventoried dams include those built from concrete, masonry, rock fill, timber cribs, as well as buttressed walls or arches. However, most structures are earthen dams. Nationwide, roughly 87 percent are constructed of compacted earth.

Numerous factors affect a dam's function, safety, and capacity. The localized vulnerabilities and risks associated with dam failures cannot be underestimated. Age and maintenance of the impoundment structure and/or equipment; changes in the types, locations, and amounts of flows resulting from upstream changes in land use and construction; cycles and patterns of weather and rainfall; and accumulated sedimentation all contribute risk potential to dam hazard assessments.

Dam failure refers to any condition which causes an uncontrolled release of water and downstream flooding. Impacts can range from increased stream flows and minor flooding to catastrophic flash flooding resulting from a complete failure. When a dam collapses, the force and speed of rushing flood waters behind even a small dam can cause loss of life and significant property damage downstream. Resulting damage often includes not only built structures but significant erosion potential. Depending on the material contained within the impoundment, as well as hazards uncovered by erosion, significant and widespread environmental hazards can also result.

Failures can be caused by overtopping, collapse, breaching, or seepage at any point along the structure. Improper maintenance, design or operation all increase the probability that a dam

might fail. The potential severity of a dam failure depends on its storage capacity and the type of land uses downstream (FEMA, 1997).



Cascade Lake Dam failure, July 2018 (Carroll County Government photo)

Regional & Historical Perspectives

Dams are prevalent throughout the U.S. but are more heavily concentrated in central and eastern regions of the country. Maryland has never experienced a catastrophic dam failure, unlike nearby Pennsylvania and West Virginia.

Johnstown, Pennsylvania is among the most notorious dam failure locations in the country. During the course of less than a century, over 2,300 area residents have died during three separate catastrophic flood events. In 1889, a dam failure upstream from Johnstown, Pennsylvania, resulting in 2,209 deaths and is notorious as the nation's deadliest dam disaster. Other lethal floods followed in March 1936 taking 22 lives and another disaster followed on July 20, 1977. This most recent disaster was prompted by stalled thunderstorms dropping 12 inches of rain between July 19-20 overtopping the Johnstown Water Company's Laurel Run and Sandy Run Dams killing 77 residents (National Weather Service, 2012).

Among the nation's other most devastating dam failures was the February 1972 Buffalo Creek Disaster in West Virginia. Following heavy rains and snowmelt, this coal slagheap collapse released approximately 132,000,000 gallons of black wastewater in a flood wave cresting at 15-20 feet in height. Of the cumulative population of roughly 5,000 residents in Buffalo Creek Hollow 125 were killed, 1,100 were injured and more than 4,000 were left homeless. The near complete devastation of these communities destroyed 502 houses and 44 mobile homes, damaged 943 homes and caused an estimated \$50 million in property damage (WV Division of Culture and History, 2013).

Surface storage impoundments are also included within this hazard group. A notable failure occurred in June 1995 in Onslow County, North Carolina, when a 30-foot wide section of an 8-acre agricultural sewage lagoon wall crumbled, allowing 25 million gallons of hog waste to flow over roads, fields, and into nearby rivers (New York Times, 1995).

Impoundment risks can also occur when open storage of non-liquid materials becomes too wet. In December 2008, the breach of a 40-acre wet ash slurry impoundment at the Kingston Fossil Power Plant in Tennessee released 1.1 billion gallons of liquefied ash across surrounding neighborhoods, roadways, a railroad, and then into two rivers (Mansfield, 2009).

In 1972, the U.S. Congress enacted the National Dam Inspection Act, authorizing the U.S. Army Corps of Engineers (USACE) to inventory and inspect all non-federal dams. The first National Inventory of Dams (NID) was published in 1975. This document was most recently revised in 2018. The NID now includes more than 91,000 structures and includes all high- and significant-risk dams, as well as low-risk dams which are 25 feet high or higher or which retain the equivalent of 50 foot-acres of water or more. According to the most recent inventory, there are 400 dams statewide and 13 dams within Carroll County meeting the inventory criteria for the NID. (National Inventory of Dams website, accessed August 16, 2021)

The Maryland Department of the Environment, Dam Safety Division, rates structures according to their downstream flooding potential should a failure occur. Dams are classified as high (MD Class “C”), significant (MD Class “B”), or low (MD Class “A”) hazard. High-hazard dams are those whose failure would probably result in the loss of six or more lives; extensive property damage; and major increases in existing flood levels at houses, buildings, major interstates, and state roads. Dams are assessed as significant hazards when their failure would cause significant increased flood risks to roads and buildings and a possible loss of life, with no more than 2 houses or 6 lives in jeopardy. Low-hazard dams are those where failure likely would not result in deaths and only minor increases to existing flood levels at roads and buildings would result (MD Department of the Environment, n.d.).

According to the NID, statewide across Maryland, 22.75 percent of dams are considered high risk and 33.5 percent are classified as presenting significant risks in the case of breach or complete failure. In contrast, of Carroll’s inventoried dams, only one, equating to 7.69 percent, is considered high risk. However, 53.8 percent of the county’s inventoried dams do fall in the significant-risk category.

Inventoried dams also are rated according to their condition as satisfactory or unsatisfactory along with the date of the most recent assessment and notes of assessment findings. Condition

ratings, based on subjective field inspections, are subject to change and should be considered relative rather than absolute.

As of 2022, there has been only one (1) major dam failure in Carroll County. According to the Maryland Department of the Environment’s Dam Safety Permits Division, there have been a total of four (4) known dam failures in the State since 2011. All four dam failures are shown in the table 11.1.

Year	Dam Name	Jurisdiction	Description
2011	Preference Estates Dam	Charles County	Heavy rains caused the structure to overtop and fail.
2016	Barren Creek Dam	Wicomico County	Heavy rains caused the structure to overtop and fail, leading to flooding on Barren Creek Road.
2016	Big Millpond Dam	Worcester County	Heavy rains caused the structure to overtop and fail, leading to flooding on Sheephouse Road.
2018	Cascade Lake Dam	Carroll County	Heavy rains caused Cascade Lake Dam to overtop and partially fail. Downstream roads closed for two weeks while the owner worked to remove the dam
Sources: MD Department of the Environment; Dam Safety, 2022			

Table 11.1 – Previous Dam Failures in Maryland

Risk Characterization

The potential for dam failures always exists but risks can be minimized through active planning and preparation. Maryland has developed and maintains an aggressive dam safety program which includes detailed composite risk assessments. The Maryland Department of Emergency Management (MDEM) in consultation with the Dam Safety Division and utilizing national level data sources has developed a composite risk assessment system. The risk assessment also consulted the federal inventory for data on dams in adjacent states. Maryland’s inventory and risk assessment includes dams listed in the broader inventory plus several not meeting federal size requirements. It does exclude small impoundments such as farm ponds. Every Maryland jurisdiction, including Carroll County, has at least one high- or significant-hazard dam. All counties with a high composite risk are located in central Maryland. The State of Maryland 2021 Hazard Mitigation Plan shows that Carroll County is considered to have a medium composite risk for dam failure.

Extent

Dam Hazard Classification

Dam failures can threaten significant damage and disruption to nearby communities. They are classified based on the scale of downstream damage that could occur if the structure were to fail. Maryland classifies dams into three hazard categories, as described in Table 11.2., that align with both the National Inventory of Dams (NID). and the U.S. Natural Resources Conservation Service (NRCS) framework.

Hazard Classification	Description	Code of MD Classification	NRCS Classification
High Hazard	Likely loss of human life, extensive property damage, and cause flooding of major highways, such as State roads or interstates.	Category I	Class C
Significant Hazard	Possible loss of life or increased flood risks to roads and structures, and no more than two houses affected and less than six lives in jeopardy.	Category II	Class B
Low Hazard	Unlikely loss of life, and minor increases to existing flood levels at roads and structures	Category III	Class A
Sources: MD Department of the Environment; Dam Safety, 2022			

Table 11.2 – Maryland Dam Hazard Classification

Dam Condition Assessment

The hazard classification of a dam does not account for the structural integrity, condition, or operation status; therefore, dams are also given a condition assessment by the NID. The condition ratings are not absolute, as they are based on subjective field inspections which may change depending on the inspector. Table 11.3. gives a description of each of the condition assessments.

Condition Ratings	Description
Satisfactory	No existing or potential dam safety deficiencies are recognized.
Fair	No existing dam safety deficiencies are recognized for normal loading conditions. Rare or extreme hydrologic and/or seismic events may result in a dam safety deficiency
Poor	One or more dam safety deficiencies are recognized for loading conditions that may realistically occur. Remedial action is necessary.
Unsatisfactory	One or more dam safety deficiencies are recognized that require immediate action or emergency remedial action for problem resolution.
Not Rated	The dam has not been inspected or has been inspected but not rated.
Sources: NID and FEMA; National Dam Safety Program, 2018	

Table 11.3 – NID Condition Assessment Descriptions

Probability and Severity of Future Occurrences

Quantifying the probability of future dam failure is not possible at this time. However, as climate change is increasing the frequency and extent of extreme rainfall, there is an increasing risk of floodwaters overtopping dams and levees. High hazard dams, especially, are at risk of failure that causes severe damages to people and property.

High and Significant Risk Hazard Impact Areas

This assessment considers a total of eight dams within Carroll County: one high-risk and seven significant-risk dams. All of these impoundments are banked earthen dams. Downstream dam inundation areas are defined by an engineering breach analysis to map and model a range of failure scenarios. A dam breach analysis and risk assessment identifying affected downstream properties is required for all high-hazard and significant-hazard dams. These maps include a variety of critical facilities, historic structures, transportation infrastructure, as well as immediately adjacent properties and community resources. This plan uses the most recently reviewed and approved Emergency Action Plan (EAP) risk assessment classification for each included dam.

The only high-hazard dam in Carroll County is Piney Run Dam located northwest of Sykesville. There are seven other dams within the county assessed with a significant-risk classification which would impact either critical infrastructure or public facilities. They are the Medford Quarry Wash Pond, Cranberry Branch Dam, the Carroll County Farm Museum Dam, the Town Mall Stormwater Management Pond, Roberts Field Basin 1 (Northwoods Trail at Boxwood), Roberts Field Basin 2 (Northwoods Trail near Trophy Drive) and Roberts Field Basin 3 (Sycamore Drive). Two of these assessed dam structures (Cranberry Branch Dam and Medford Quarry Wash Pond) are components of the public water supply system for the City of Westminster. The Carroll County Farm Museum Dam inundation area includes public education facilities located in the historic buildings of the former Carroll County Almshouse, now part of the Carroll County Farm Museum. Both Piney Run Dam and the Carroll County Farm Museum Dam are owned and operated by Carroll County Government. The Medford Quarry Wash Pond and Town Mall Stormwater Management Pond are privately owned and managed, while the Cranberry Branch Dam and the Roberts Field Basins 1, 2, and 3 are owned and managed by the City and Westminster and the Town of Hampstead, respectively.

Risk Assessment

Lifelines Potentially Affected: Safety and Security; Food, Water, Shelter; Transportation



The risk assessments that follow apply to the Piney Run, Medford Quarry Wash Pond, Cranberry Branch and Carroll County Farm Museum Dams. Insufficient modeling currently exists to be able to effectively and accurately assess risk to infrastructure and facilities downstream of the Town Mall Stormwater Management Pond and Roberts Field Basin 1, 2 and 3 Dams.

Critical Facilities

Identification of Vulnerable Assets

Critical facilities, for the purposes of this plan, include fire stations; hospitals, nursing homes and medical clinics; police stations; emergency operations centers; schools; water treatment and wastewater treatment plants; airports; county and municipal government buildings; detention centers; and bridges.

Cumulatively, for the inundation areas associated with Piney Run, Medford Quarry, Cranberry Branch and the Carroll County Farm Museum Dams, ten critical facilities or infrastructure assets have been identified as potentially being affected by dam flooding inundation. These assets serve the communities of Eldersburg and Sykesville as well as the Freedom area and the city of Westminster and its environs.

<i>Critical Facilities within Dam Failure Hazard Areas Carroll County, MD</i>		
Dam/Impoundment	# of Critical Facilities	Total Value of Land & Improvements (\$)
Piney Run	8	43,414,594
Medford Quarry Wash Pond	0	0
Cranberry Branch	2	6,187,900
Carroll County Farm Museum	0	0
Total for County	10	49,602,494
Sources: CC Dept of Land & Resource Mgmt; MD Assessment and Taxation, 2021		

Table 11.4 – Critical Facilities within Dam Failure Hazard Areas

Piney Run Dam's inundation area includes eight critical infrastructure assets: the MD 32 Bridge over Piney Run, county bridges over Piney Run at White Rock Road, Slacks Road, Brangles Road, Arrington Road and Marriottsville Road, the county bridge over the South Branch of the Patapsco River at Marriottsville Road, and a box culvert on Slacks Road.

At the Cranberry Branch Dam, two of the City of Westminster's critical facilities are at risk: the first is the water filtration and treatment plant and its associated site improvements and the second is one of the City's maintenance operations buildings.

The Carroll County Farm Museum and Medford Quarry Wash Pond dams do not have any critical infrastructure assets located within their respective inundation areas.

Estimate of Damages & Losses

The following estimates of damages and losses attempt to account for the replacement of the critical facilities identified to be at risk should any of the dams addressed in this section experience failure. The best available data is current market value of land and improvements as reported by the Maryland Department of Assessments and Taxation. However, given the potential of significant erosion or other catastrophic environmental impacts, it is impossible for this discussion to assess recovery costs to restore affected sites to reusable condition. There are too many variables which may affect the need for significant restoration or environmental mitigation to estimate these costs on a generalized basis.

None of the discussed dams are hazardous materials impoundments. However, it is unknown what other environmental hazards may be exposed if a worst-case failure should occur. There is a small potential that these sites may become un-restorable. Should that occur, costs to relocate these facilities would likely be significant.

According to current data from the MD Department of Assessments and Taxation, the total value of the critical facilities structures and site improvements located within the inundation areas of the four dams addressed in this section equals \$49,602,494 as noted in Table 11.4.

Population, People, & Residences

Identification of Vulnerable Assets

The primary risk to life and property within a dam-hazard inundation area results from a sudden and catastrophic failure allowing a massive release of water which can obliterate everything in its path. Using available state tax assessment data and geographic information and analysis tools, there are 154 residential structures in the Piney Run Dam flood inundation area. Although a specific 2020 Census count is not available for the flood area, the population can be estimated by multiplying the number of homes by the local occupancy rate, then multiplying that result by the local average number of people per household. For Freedom and Sykesville, the 2019 occupancy rate was 96 percent and Census.gov Quickfacts data indicated that the persons per household in Carroll County during the 2015-2019 time period was 2.70. Based on that method and data, as of November 2021 approximately 400 people lived within the Piney Run Dam flood inundation area. Were a dam failure to occur, the actual number of lives at risk would depend on the time of day and the extent of warning provided, as well as the nature and extent of the failure, among many variables.

With the use of tax assessment data and aerial photographs, one residentially occupied structure was identified in the inundation area for the Medford Quarry Wash Pond dam. As with Piney Run, in lacking a Census-defined area corresponding to the inundation area, the same methodology was applied. For Westminster, the 2019 occupancy rate was 95 percent and the persons per household were calculated at 2.70, resulting in an estimate of 3 persons being displaced or at risk if the dam were to fail.

For the Cranberry Reservoir Dam the same 2019 Westminster multiplier values would be used. In the case of the Cranberry Branch Dam, three residentially occupied structures could be impacted resulting in approximately 8 citizens at risk.

For the Carroll County Farm Museum Pond Dam, there are no residential structures located within the inundation area. However, the caretaker for the Carroll County Farm Museum resides in a building immediately downstream of the dam.

Estimate of Damages & Losses

The Piney Run dam is classified as a high-hazard dam because its failure would probably result in lost lives. However, as discussed earlier, significant risk dams can also pose potentially fatal hazards. Due to the numerous variables influencing any specific failure event, estimating actual casualties is virtually impossible. However, what can be estimated are the impacts to homes, businesses, critical facilities, agricultural resources, and historic sites within the maximum flood area identified for each dam.

In total for the four dams addressed in this section, 158 residential structures would be at risk across the county. The total estimated value for these structures is \$48,487,000. Greater losses could result if the land beneath these homes were also compromised or lost. For example, contamination or substantial erosion resulting from inundation or the risk of future dam failure might render the properties unsuitable for housing. The total value of these 158 homes plus their land is \$66,282,800. This data is summarized in Table 11.5 below.

<i>Residential Structures within Dam Failure Hazard Areas Carroll County, MD</i>			
Dam/Impoundment	# of Residential Structures	Total Value of Improvements (\$)	Total Value of Land & Improvements (\$)
Piney Run	154	47,797,500	65,142,800
Medford Quarry Wash Pond	1	109,300	205,300
Cranberry Branch	3	580,200	934,700
Carroll County Farm Museum	0	0	0
Total for County	158	48,487,000	66,282,800
Sources: CC Dept of Land & Resource Mgmt; MD Assessment and Taxation, 2021			

Table 11.5 – Residential Structures Within Dam Failure Hazard Areas

If all addressed structures within the inundation areas for Piney Run Dam, Medford Quarry Wash Pond, Cranberry Branch Dam and the Carroll County Farm Museum Dam are considered, a total of 210 structures are considered at risk. The total value of the structures themselves equals \$92,802,800 and the value of the structures plus their associated land is \$144,261,900 as noted in Table 11.6, below.

<i>Addressed Structures within Dam Failure Hazard Areas Carroll County, MD</i>			
Dam/Impoundment	# of Addressed Structures	Total Value of Improvements (\$)	Total Value of Land & Improvements (\$)
Piney Run	202	88,504,000	136,925,500
Medford Quarry Wash Pond	1	109,300	205,300
Cranberry Branch	7	4,189,500	7,131,100
Carroll County Farm Museum	0	0	0
Total for County	210	92,802,800	144,261,900
Sources: CC Dept of Land & Resource Mgmt; MD Assessment and Taxation, 2021			

Table 11.6 – Addressed Structures Within Dam Failure Hazard Areas

Major Employers

Identification of Vulnerable Assets

The only major employer with property located within one of the inundation areas for any of the dams addressed in this section is Carroll County Government. Carroll County Government has 587 employees (see Table 7.8, page 119); however, the affected buildings at each location are only minimally occupied or house equipment and service facilities, so the actual occupancy is only a fraction of 1 percent of those totals.

Estimate of Damages & Losses

The majority of the affected structures are part of the Carroll County Farm Museum property and are documented historic resources; therefore, the estimates of damage and loss are addressed in that section.

Agricultural & Natural Resources

Identification of Vulnerable Assets

Portions of approximately 14 agricultural properties totaling 36 acres lay within an inundation area below one of the four dams addressed in this section. Most of these properties are used for crop farming. Farmers in the area primarily rotate the fields between corn and soybeans each year and occasionally vary the rotation by planting hay, wheat, or barley for a year.

Estimate of Damages & Losses

According to the Carroll County Agricultural Land Preservation Program, the average fair market value of agricultural land in the county is \$8,300 per acre; therefore, the estimated total land value of the 36 acres of farmland located in a dam-hazard inundation area is \$298,800. Since each of the potentially affected areas represents only a portion of any individual property, damage is not anticipated to impact operations of an entire farm.

The costs to remediate land damaged by significant erosion would likely run in the thousands to tens of thousands of dollars if no agricultural structures were involved. If the erosion and flood inundation damaged an agricultural structure and/or its equipment systems, remediation costs may easily run into the tens of thousands to hundreds of thousands of dollars.

Historic Resources

Identification of Vulnerable Assets

More than three dozen identified historic sites are located within the hazard areas for dam failure. The mapped sites are documented resources within either the National Register of Historic Places or the Maryland Inventory of Historic Properties. Undoubtedly, there are other historic resources which have never been inventoried or mapped within these inundation areas. For example, the notable mill complex immediately west of MD 32 situated along Piney Run's northern bank is not shown on this map; the site has never been inventoried or documented.

Estimate of Damages & Losses

Table 11.7, below, identifies the number of at-risk historic resources found within the identified hazard areas for dam failure for the dams addressed in this section. The specific resources were queried from state assessment data to estimate damages and losses. In all, the value of the land and improvements associated with the at-risk historic resources equals \$69,953,312. However, with historic resources, the value of the cultural assets which would be lost is beyond a numerical value. The importance of these sites in the telling the community's history and in preserving its sense of place are priceless and would represent an unrecoverable loss.

Historic Sites Located within Dam Failure Hazard Areas Carroll County, MD		
Dam/Impoundment	# of Historic Sites	Total Value of Land & Improvements (\$)
Piney Run	23	67,789,812
Medford Quarry Wash Pond	1	205,300
Cranberry Branch	2	338,200
Carroll County Farm Museum	13	1,620,000
Total for County	39	69,953,312
Sources: CC Dept of Land & Resource Mgmt; MD Assessment and Taxation, 2020		

Table 11.7 – Historic Sites Located within Dam Failure Hazard Areas

Mitigation Measures

Existing County & Municipal Mitigation Measures

<i>Existing County and Municipal Mitigation Measures</i>			
Mitigation Measure	Identified as existing in 2014 HMP	Completed since 2014 HMP	Notes
<p>Carroll County uses the Piney Run Dam Emergency Action Plan (EAP) and the Carroll County Farm Museum Pond Dam EAP to specifically address this hazard.</p> <ul style="list-style-type: none"> Both EAPs are reviewed and updated annually, in accordance with MDE regulations. The EAPs establish a clear and succinct set of hazard circumstances, risk criteria, and appropriate responses to monitor the dam and to issue warnings or initiate evacuation of at-risk areas. 	X		Ongoing Initiative
As part of the EAP review and update process, tabletop exercises are held at least once every five years. These tabletop exercises are hosted by the Carroll County Department of Public Safety, and include dam owners/operators, MDE Dam Safety, the Maryland Department of Emergency Management, and representatives of other agencies that would be involved in the response to an emergency occurring at any of the dams.		X	
Dam inspections are performed by MDE in conjunction with annual EAP updates and inspection reports from dam owners and/or operators. MDE inspections are made annually for High Hazard dams and triennially for Significant Hazard dams unless a recent signed annual update includes an on-site inspection report.	X		Ongoing Initiative
The Bureau of Resource Management reviews development plans for locations in a dam breach inundation area. Development is not restricted by County Code below Piney Run Dam because it is an approved high hazard dam according to MD Dam Safety	X		Ongoing Initiative
Development plans are required to show inundation areas for all proposed storm water ponds and to acquire easements to restrict development in those areas.	X		Ongoing Initiative

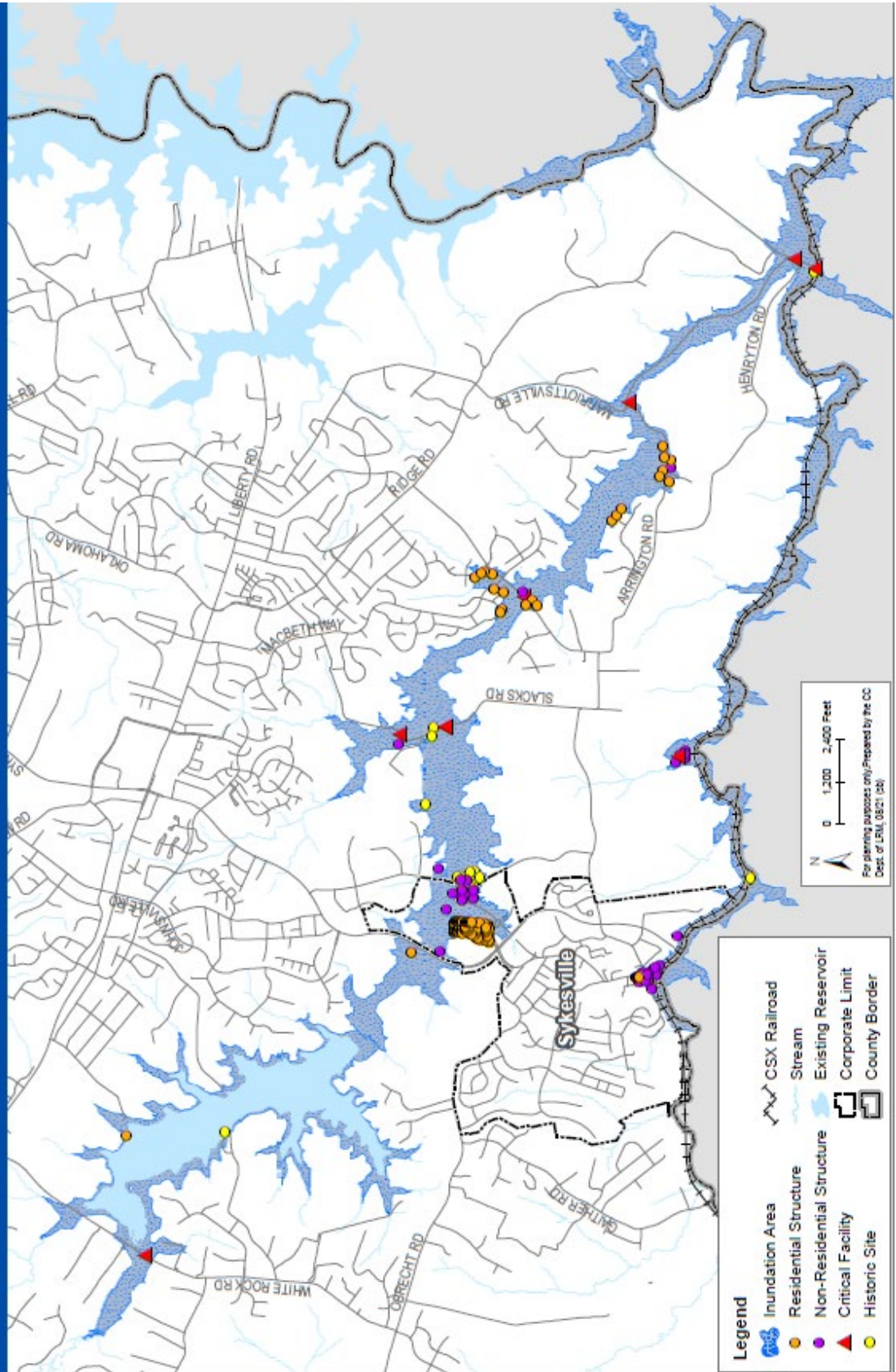
Proposed High Priority Dam Failure Mitigation Strategies – County				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
The County Bureau of Resource Management had a watershed study performed for the Hampstead Valley Watershed, in which there are three significant hazard dams (Roberts Field Basins 1, 2 &3). Part of the purpose of the study was to determine if modification of the dams could result in a reduction in hazard class. The study indicated that there is the potential for reducing the hazard classification on all three dams if all of the work is performed.	DLRM Town of Hampstead	DLRM Town of Hampstead MDE Dam Safety	TBD	County State of MD HMGP BRIC
MDE Dam Safety has indicated concerns related to the capacity and erodibility of the auxiliary spillway at Piney Run Dam which would warrant an “unsatisfactory” rating. However, as long as the County is making progress toward the 2027 deadline of mitigating this concern, MDE will retain the “satisfactory” rating for the dam. The County is currently working with NRCS to address this issue and is currently on schedule to meet this requirement. Carroll County completed an analysis of the auxiliary spillway integrity at Piney Run Dam to determine capability to safely pass the PMF. Implementing the	DLRM	DLRM MDE Dam Safety	FY2024-2027	County State of MD NRCS HMGP BRIC

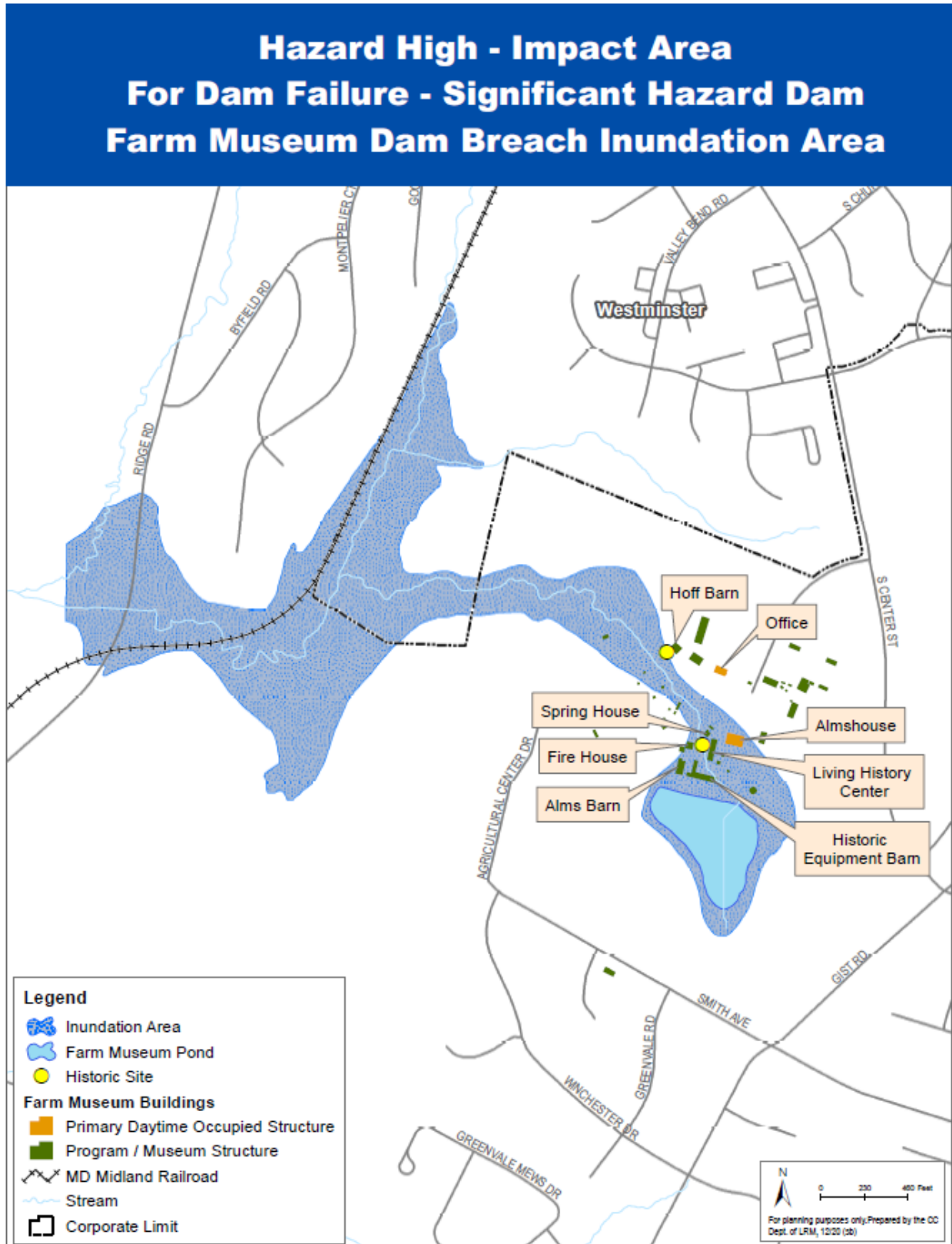
resulting proposed Supplemental Watershed Plan and associated dam improvements would allow Piney Run Dam to provide continued and enhanced flood protection and reduction to downstream areas while serving the recreational needs of the surrounding area.				
Evaluate existing significant hazard dams for retrofit to reduce risk to downstream properties and potentially improve overall environmental impact to the receiving water course.	DLRM	DLRM MDE Dam Safety	TBD	County State of MD HMGP BRIC

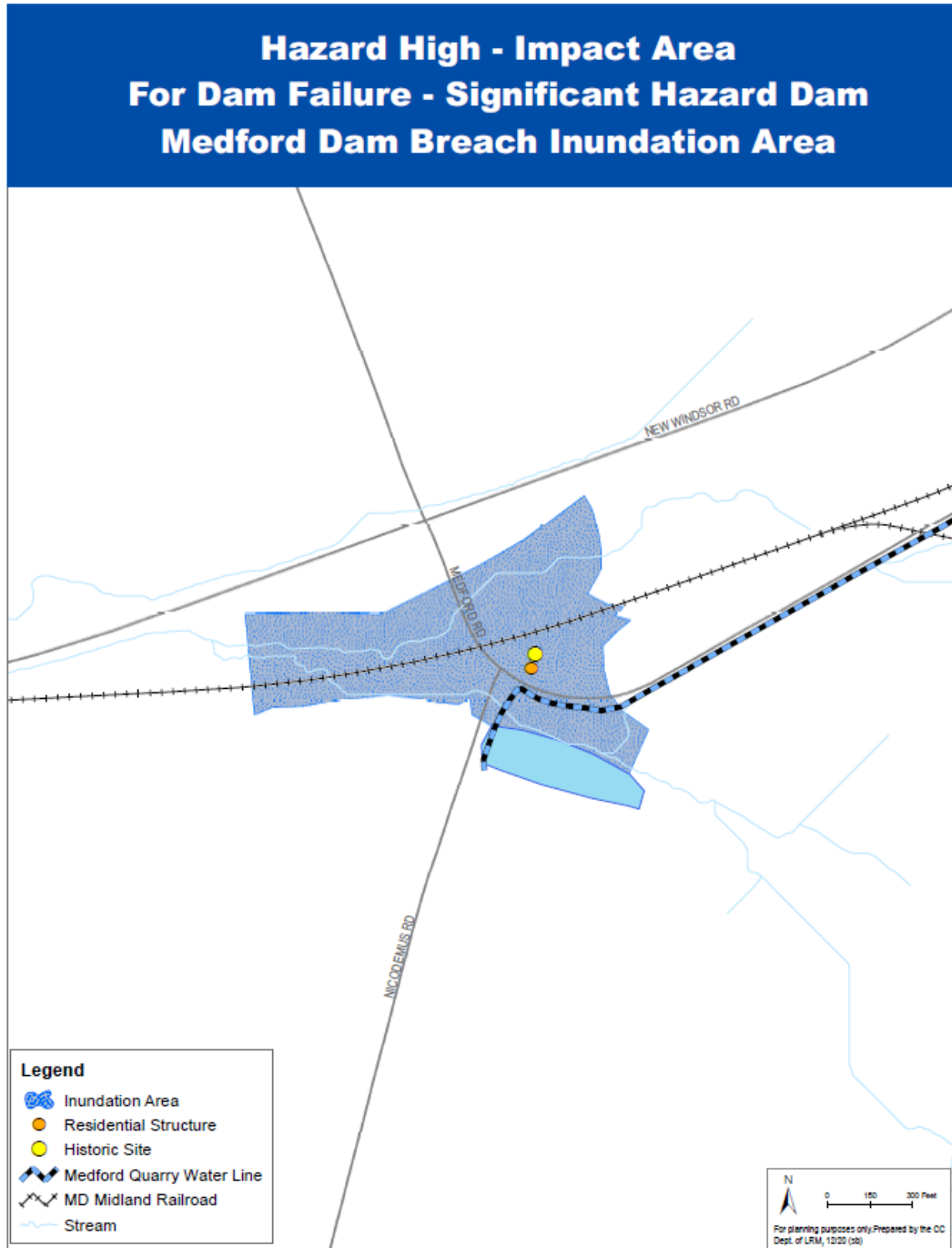
<i>Lower-Priority County and Municipality Mitigation Measures for Future Consideration</i>				
Strategy	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Consider analyzing the intersection of floodplains and dam inundation areas to identify structures requiring further study for the most appropriate code implementation, additional flood proofing measures and potential relocation/acquisition; the County could then monitor real estate sales and if structures that are identified to be at risk come up for sale, consideration could be made for purchase by the County using available grant funding.	DLRM	DLRM DPS – EM DED	TBD	County State of MD FMA

Consider updating data and re-analyzing all current high hazard and significant hazard dams countywide to confirm the accuracy of current risk assessments, potential downstream impacted structures and/or infrastructure and update classification assessments as needed.	DLRM	DLRM DPW – BPI MDE Dam Safety DPS – EM	TBD	County State of MD
Coordinate via MDE Dam Safety to ensure that there are consistent and reasonable EAP protocols in place for privately-owned dams or impoundments determined to pose a significant or high risk. The key goal is to ensure reasonable protections for adjacent public or private structures, roads, or other infrastructure potentially impacted by a failure.)	DPS – EM DLRM	DPS – EM DLRM MDEM MDE Dam Safety DPW Private Dam Owners	TBD	County State of MD

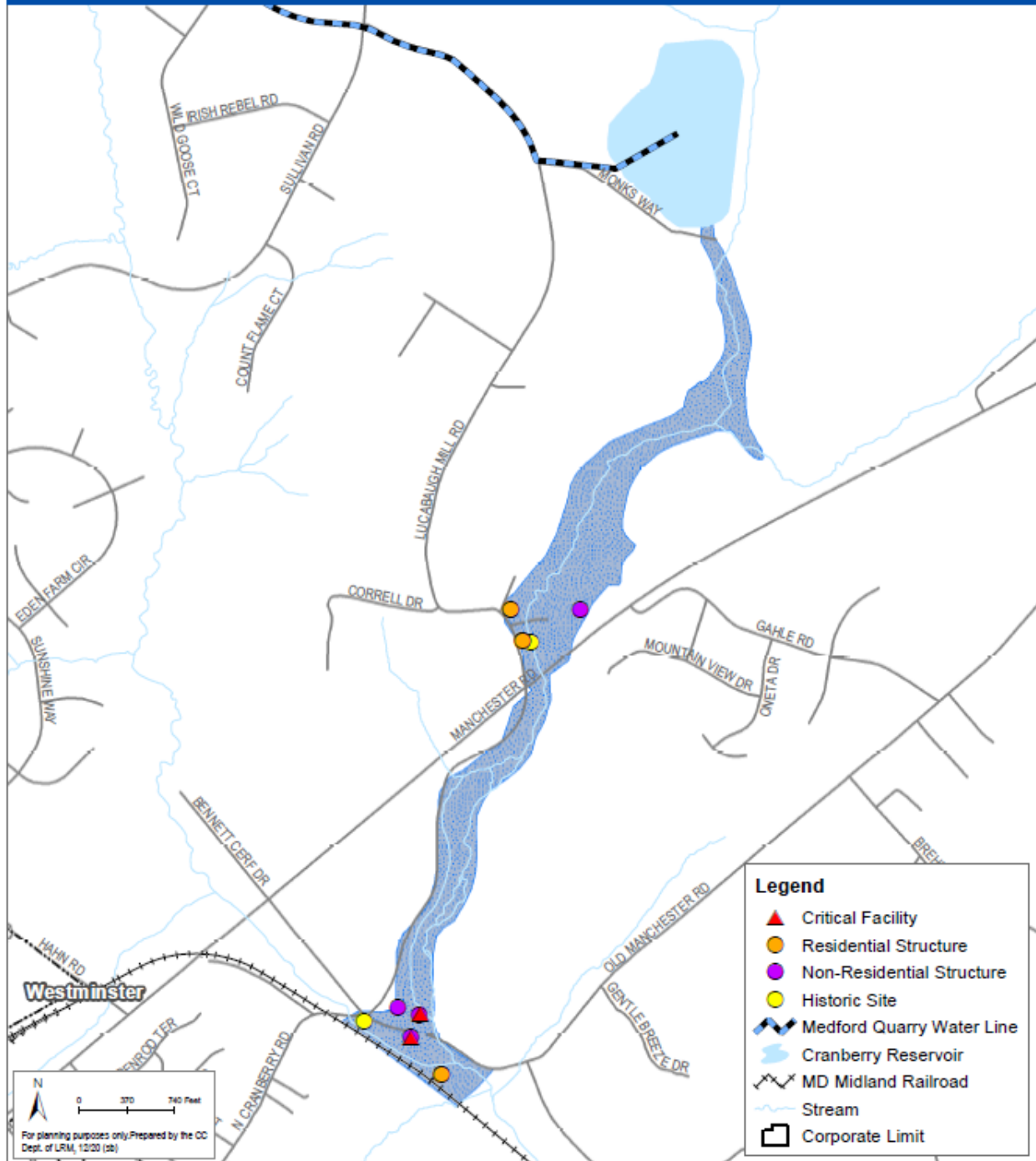
Hazard High - Impact Area For Dam Failure - High Hazard Dam Piney Run Dam Breach Inundation Area







Hazard High - Impact Area For Dam Failure - Significant Hazard Dam Cranberry Dam Breach Inundation Area



Chapter Twelve – All-Hazard Mitigation Measures

Many measures to prevent or minimize the impacts from hazard events exist that are common to all hazards. The following chapter identifies mitigation measures that either are already in place or can be taken to specifically address the stated goals and objectives outlined earlier in the plan, which are applicable to most, if not all, of the identified hazards in the plan.

Existing Mitigation Measures

<i>Existing County and Municipal Mitigation Measures</i>			
Mitigation Measure	Identified as existing in 2014 HMP	Completed since 2014 HMP	Notes
The comprehensive plan provides a legal framework that guides the growth and development of a community. The comprehensive plan sets forth the policies for growth management, including the rate of growth, intensity, form, and quality of physical development. Comprehensive/land use planning is not just about planning where development should go; it is also about planning where development should not go. Carroll County has developed and adopted a countywide master plan. Each municipality has also prepared and adopted a community comprehensive plan, many of which have been created as a cooperative effort with the County to jointly plan for areas that will be annexed in the future to accommodate planned growth.	X		Ongoing Initiative
When updating community comprehensive plans for existing population centers, land use designations for undeveloped land are reviewed to ensure that these properties are not in hazard areas or to ensure that hazards can be mitigated.	X		Ongoing Initiative
The Carroll County Hazard Mitigation Plan available to the public on the County's website.		X	
The Carroll County <i>Emergency Operations Plan (EOP)</i> is an all-hazards plan which is used by the County to minimize the effects of any hazard which may occur within the county. The EOP addresses major hazards, but it is flexible enough to be used for responding to any type of disaster that could occur. The EOP identifies organizations which will be involved in the response and recovery phases of major emergencies and disasters as well as the responsibilities of those organizations when a disaster occurs. The EOP outlines the actions to be taken in the event of an incident; it also assigns responsibilities for notification, response, and support to various departments and agencies within the County.	X		Ongoing Initiative

Most municipalities have recently completed updates of their respective Emergency Response Plans.	X		Ongoing Initiative
The County enforces the International Building Code which is consistent with FEMA recommendations.	X		Ongoing Initiative
The Emergency Communications Center monitors real time weather information and has a link to the National Weather Service Forecast Office in Sterling, VA.	X		Ongoing Initiative
The County partners with the National Weather Service to provide opportunities for storm spotter training to residents.	X		Ongoing Initiative
Watches and warnings are received via weather alert radios in all schools as well as most government offices as well as the county's Senior and Community Centers.	X		Ongoing Initiative
Watch and warning procedures to further alert agencies are carried out by the Emergency Communications Center through email, text and voice.	X		Ongoing Initiative
Differential assessment and taxation practices are used by the State to reduce the tax burden on land that requires fewer public services, thereby discouraging development in areas that have lower allowable densities due to natural or agricultural resources. Lower densities in these areas put fewer lives and properties at risk in a hazard event.	X		Ongoing Initiative
Disaster warning systems are in place, including both the monitoring of local conditions and the broadcasting of pre-event alerts, through use of radio, broadcast television, cable television, social media, Carroll Alert – the county's emergency mass notification.	X		Ongoing Initiative
Many historic sites throughout the county and towns have been inventoried and mapped. These data have been used to identify historic structures that are at risk from hazard events.	X		Ongoing Initiative
The community is periodically informed of local public warning systems.	X		Ongoing Initiative
Measures that provide additional damage resistance for structures for specific hazards to which the communities within the county are at-risk have been identified and incorporated into the Building Code.	X		Ongoing Initiative
Local building inspectors are required to be certified under the National Code Program, which should help them to better recognize building practices that are suspect with regard to hazard resilience.	X		Ongoing Initiative
Evacuation routes have been identified and Carroll County participates in regional evacuation planning as a member jurisdiction of the Baltimore Urban Area Security Initiative (BUASI).	X		Ongoing Initiative
Outreach efforts are in place that focus on protecting natural systems as a mitigation activity. One example is	X		Ongoing Initiative

the bimonthly surveyors' meeting that is held by the County to discuss development issues and requirements.			
The environmental and development-related ordinances that have been adopted put requirements in place that help protect environmental resources and natural systems, including their function as mitigation to natural hazards.	X		Ongoing Initiative
Mitigation measures are incorporated into current capital improvement plans. Examples include projects related to the NPDES permit and stormwater management projects.	X		Ongoing Initiative
A watershed management plan has already been developed for two sub-watersheds in the county to ensure that development does not exceed the carrying capacity of natural systems, to minimize the impact of development on natural systems, and to sustain the natural function of environmental resources to mitigate natural hazards.	X		Ongoing Initiative
Vegetation and restoration practices that assist in enhancing and restoring the natural and beneficial functions of the watershed have been incorporated into new and updated environmental ordinances adopted by the County in spring of 2004.	X		Ongoing Initiative
Surrounding surface water and ecosystems are protected from pollutants often associated with flooding and stormwater runoff through requirements incorporated into the adopted environmental ordinances.	X		Ongoing Initiative
Unifying organizations (i.e., LEPC) are in place to ensure communication and dissemination of natural hazard mitigation information.	X		Ongoing Initiative
The County Building Code currently requires sprinkler systems in certain buildings, including multi-family residences.	X		Ongoing Initiative
The Bureau of Resource Management currently reviews all capital improvement plans to ensure that new critical facilities are not directed toward location-specific hazard areas such as floodplains.	X		Ongoing Initiative
The Emergency Management page of Carroll County's website contains links to all-hazards disaster preparedness and mitigation information for use by all county residents.	X		Ongoing Initiative
The Department of Public Safety Emergency Management Division maintains partnerships with many public and private agencies and organizations throughout the County. These partnerships increase opportunities for coordination of hazard mitigation activities and possible collaboration on mitigation projects. The LEPC fulfills an advisory role in the monitoring, evaluation, and updating of the Hazard Mitigation Plan.	X		Ongoing Initiative

The Department of Public Safety Emergency Management Division regularly participates in community fairs, festivals and other special events to provide mitigation and preparedness information to the public.		X	
In 2004, the County made some major changes to its existing Stormwater Management Code (Chapter 191) and Supplemental Manual; Grading, Erosion and Sediment Control Code (Chapter 121); Forest Conservation Code (Chapter 115) and Manual; and the Landscape Enhancement of Development Code (Chapter 134) and Manual. During that same time, the County adopted new codes and manuals relating to Floodplain Management; Water Resource Management; and Environmental Management of Storm Sewer Systems. Along with the Code changes and additions, the Bureau of Resource Management developed the Water Resource Management Area Guidance Map which helped establish resource protection areas throughout Carroll County. Since 2004, the County has amended these Codes to meet new State requirements or to refine requirements to better serve the County.		X	

Proposed County and Municipal All Hazards Mitigation Strategies

Mitigation Measure	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Higher Priority Mitigation Measures				
Identify methods for ensuring resiliency of electrical power supply for all critical facilities and implement as appropriate.	DPW City of Westminster (DPW) City of Taneytown (DPW) Town of New Windsor (DPW) Town of Mount Airy (DPW) Town of Hampstead (DPW) Town of Manchester (DPW) Town of Sykesville (DPW) Town of Union Bridge (DPW)	DPW City of Westminster (DPW) City of Taneytown (DPW) Town of New Windsor (DPW) Town of Mount Airy (DPW) Town of Hampstead (DPW) Town of Manchester (DPW) Town of Sykesville (DPW) Town of Union Bridge (DPW)	FY2023 and ongoing	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge HMGP BRIC
Identify new and updated publications and materials from FEMA, the American Red Cross and other similar organizations for use in the Carroll County Public Schools curriculum.	DPS – EM	DPS – EM CCPS MDEM	FY2024 and ongoing	County CCPS
Continue to use the County website and social media platforms to provide hazard-related information that is easily accessible to county residents.	DPS – EM Communications Office	DPS – EM Communications Office National Weather Service	Ongoing	County

Mitigation Measure	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Provide owners of properties within identified hazard areas with targeted additional outreach regarding mitigation.	DPS – EM	DPS – EM Communications Office	Ongoing	County
Integrate hazard mitigation into the need analysis and recommendations included in comprehensive plans.	DP DPS – EM	DP DPS – EM City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	FY2024 and ongoing	County
Identify the technological and human caused hazards to which the county and its municipalities are vulnerable, assess the risks from those hazards, and incorporate appropriate chapters and mitigation strategies into future updates of the Hazard Mitigation Plan.	DPS – EM DP	DPS – EM DP City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	Ongoing	County HMGP

Mitigation Measure	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Integrate, through policies and procedures, the goals and mitigation measures from the HMP into existing regulatory documents and programs, where appropriate.	DP and All County Agencies City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	All County Agencies City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	Ongoing	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge
Review the zoning ordinances within the municipalities to ensure that appropriate protections are possible for natural systems, that provisions are made for mitigation in hazard areas, and that appropriate zoning districts are provided that can be applied in the applicable hazard areas.	DP City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	DP City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	FY2024 and ongoing	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge
Evaluate the allowable intensity of development in hazard areas that are not designated growth areas to prevent intense private development within areas delineated as high hazard.	DP DLRM City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	DP DLRM City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	FY2024 and ongoing	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge

Mitigation Measure	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Continue to identify additional organizations within Carroll County that have programs or interests in hazard mitigation.	DPS – EM	All County, City of Westminster, City of Taneytown, Town of New Windsor, Town of Mount Airy, Town of Hampstead, Town of Manchester, Town of Sykesville, Town of Union Bridge Agencies	Ongoing	County
Investigate development of sand storage station	Town of Sykesville	Town of Sykesville DPW	TBD	Town of Sykesville HMGP BRIC
Identify roofs of critical facilities that are in need of modification to effectively withstand severe weather and implement improvement activities.	DPW City of Westminster (DPW) City of Taneytown (DPW) Town of New Windsor (DPW) Town of Mount Airy (DPW) Town of Hampstead (DPW) Town of Manchester (DPW) Town of Sykesville (DPW) Town of Union Bridge (DPW)	DPW City of Westminster (DPW) City of Taneytown (DPW) Town of New Windsor (DPW) Town of Mount Airy (DPW) Town of Hampstead (DPW) Town of Manchester (DPW) Town of Sykesville (DPW) Town of Union Bridge (DPW) DPS – EM	FY2024 and ongoing	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge HMGP BRIC

Mitigation Measure	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Lower Priority Mitigation Measures				
Coordinate mitigation efforts between the Maryland Historical Trust the County and municipalities.	DP	DP MD Historical Trust Local Historical Society City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	Ongoing	County
Prioritize historic structures to target for mitigation measures.	DP	DP City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	Ongoing	County City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge
Distribute existing educational materials on hazard mitigation developed by local, state, and national cultural heritage organizations to members of the community.	DP DPS – EM	DP DPS – EM State of MD Historical Societies City of Westminster City of Taneytown Town of New Windsor Town of Mount Airy Town of Hampstead Town of Manchester Town of Sykesville Town of Union Bridge	FY2024 and ongoing	County State

Mitigation Measure	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Work with CCPS to develop curriculum for school programs and adult education on reducing risk and preventing loss from natural hazards.	DPS – EM	DPS – EM CCPS	FY2024 and ongoing	HMGP County

Mitigation Measure	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Develop a public speaking series on hazard-related topics, such as types of natural disasters and risks, how to develop a family disaster plan, how to develop a family disaster supply kit, how to develop a business continuity plan, and simple types of mitigation projects for homeowners that is available upon request. These speaking engagements will be offered to civic groups such as Rotary, Lions, and Kiwanis Clubs; the Chamber of Commerce; church and interfaith groups; boys and girls clubs; scouting organizations; and other similar groups	DPS – EM	DPS – EM CCHD CCSO Civic Groups Carroll COAD	FY2023 and ongoing	EMPG County
Educate businesses on the benefit of engaging in mitigation activities, such as developing impact analyses.	DPS – EM DED	DPS – EM DED	FY2024 and ongoing	EMPG County

Mitigation Measure	Responsible Agency(ies)	Cooperating Stakeholders	Anticipated Timeline	Possible Funding Source(s)
Offer hazard-susceptibility assessments to local small businesses to lessen the percent of small businesses that are vulnerable and unprepared for hazards.	DPS – EM DED		FY2024 and ongoing	EMPG County
Acquire parcels of land in hazardous areas to conserve or restore as parks to reduce the number of structures and infrastructure elements vulnerable to natural hazards.	DP DLRM	DP DLRM DRP	FY2025 and ongoing	HMGP BRIC County
Coordinate and integrate hazard mitigation activities with emergency operations plans and procedures.	DPS – EM	DPS – EM DFEMS CCSO	Ongoing	County EMPG
Develop improved hazard data for Carroll County and the municipalities	DPS – EM	DPS – EM DTS – GIS	Ongoing	HMGP County EMPG
Identify informational resources related to hazard mitigation for the business community and distribute appropriately.	DPS – EM	DPS – EM DED	FY2024 and ongoing	County EMPG

Chapter Thirteen – Monitoring and Maintenance

For a plan to be effective, it must be implemented. The existing mitigation measures in place must be continued and, ideally, action should be taken on the proposed additional mitigation strategies outlined in the plan. A process should be in place to ensure that this is happening.

FEMA requires that each hazard mitigation plan include a description and method for how the plan will be monitored, evaluated, and updated within a five-year cycle. The plan must also be reviewed and revised, if appropriate, by the local jurisdiction, by the State Hazard Mitigation Officer, and by FEMA. The implementation process should include a description of the process of how the jurisdiction will incorporate the plan's strategies into other planning documents, such as comprehensive or capital improvement plans, where appropriate. Continued public involvement must also be part of the ongoing mitigation planning process.

Participating Agencies

Several local agencies – both County and municipal – have a significant role in the monitoring of plan implementation. While there are many parties that have an interest in the monitoring and implementation and may also have some involvement in the process, a few agencies have the primary responsibilities. The lead agency is the Carroll County Department of Public Safety Emergency Management Division (DPS-EM). The other major agency players are the Department of Planning; the Department of Land and Resource Management; and the Department of Public Works. The Local Emergency Planning Committee (LEPC) serves in an advisory role to the DPS. The responsibilities of each agency are outlined below.

Carroll County Department of Public Safety Emergency Management Division (DPS-EM)

The Emergency Management Division of the Department of Public Safety (DPS - EM) is responsible for the overall coordination of the response to emergencies and disasters that affect Carroll County. The goal of DPS-EM is to create and maintain a coordinated program of mitigation, preparedness, response and recovery activities that allows for an all-hazards approach to any type of emergency event. Through leadership, action, and coordination of the County's public safety resources, the Emergency Management Division strives to enhance the safety and livability of citizens and visitors. The Department of Public Safety (DPS) is dedicated to providing Carroll County residents with protection of life and property through emergency management and fire protection engineering services, as well as effective emergency communications in support of our police, fire, and emergency medical services.

As the agency responsible for emergency management on a daily basis, DPS-EM takes the lead responsibility for monitoring, evaluating, and maintaining this Plan. DPS-EM will be responsible

for production of the text of the print-ready document and will ensure that the edits and changes to the document that result from ongoing monitoring and evaluation are incorporated into the text during subsequent updates. DPS-EM will coordinate with the LEPC, participating County agencies and municipalities to solicit feedback and suggestions. DPS-EM staff currently chair the LEPC and will also participate in a multi-agency subcommittee that will review and evaluate the progress of the implementation of the plan on a regular basis.

Carroll County Department of Planning (DP)

The Department of Planning is responsible for comprehensive, countywide master planning. Land use plans are prepared and implemented working with the Carroll County Planning Commission authorized under the Land Use Article. The several functions within the Department are designed to ensure County projects and programs conform with the County Master Plan, that current and long-range County planning serve to implement the plan, and that land use and policy decisions are in accordance with the plan.

The Department of Planning is responsible for developing and updating comprehensive plans and functional plans for the County and smaller regions within the County. The Department functions as staff to the County Planning and Zoning Commission, which reviews and finalizes the plans prior to adoption. The process and implementation of these comprehensive plans plays a vital role in countywide growth management.

Each staff planner with the Department of Planning is assigned a specific geographic region of the County. Within that area, that planner updates any relevant comprehensive plans and provides liaison-planner services to the municipalities. Individual rezoning petitions, annexations, and review of development plans for consistency with appropriate and relevant comprehensive or functional plans for that area are also handled by the appropriate planner.

In addition to the geographic responsibilities, each planner also has a specific issue or functional area of planning which he or she covers. These include such issues as transportation, mineral resources, demographics, economic development, historic sites, parks and recreation, and concurrency management, among others. Many of the issues have functional plans associated with them.

GIS staff members within the Department of Land and Resource Management are responsible for geographic data, mapping, and analysis associated with projects specific to the Department of Planning. Each GIS staff member is responsible for projects for a specific geographic area, working in conjunction with the comprehensive planners for that area. GIS staff members also work as a team on countywide projects.

Technical support is provided to develop implementation measures for the recommendations contained within the comprehensive plans, such as zoning ordinance amendments, drafting of other ordinances, grant applications, and comprehensive rezoning.

The Department of Planning not only has the knowledge and background for developing plans in general, but also is responsible for developing comprehensive plans for the County and its communities. Consequently, the Department of Planning will participate as a member of the multi-agency subcommittee that will help review and evaluate the progress of the implementation of the Plan on a regular basis. Staff from the Department of Planning will be able to evaluate the progress of the Plan from a perspective of its integration into the Comprehensive Plan, land use planning issues, capital improvement planning and projects, and other planning issues, and will provide a status report outlining the overall progress of integration to the multi-agency subcommittee on a yearly basis.

Carroll County Department of Land and Resource Management (DLRM)

The responsibilities of DLRM touch on many aspects of the Plan.

DLRM is highly engaged with the agricultural community as it manages the Agriculture Preservation program. This program purchases easements on agriculture land to preserve it in perpetuity for agricultural use and thereby helping to maintain food security.

DLRM manages the Development Review process, which guides developers in compliance with all applicable regulations, including zoning and adequate public facilities ordinances. Ensuring this compliance is a key component to mitigating risks that have been addressed through legislation or other requirements.

DLRM is also responsible for enforcement of the County's environmental regulations and chapters of the Carroll County code. This includes the review of proposed development plans, inspection of construction sites, and response to complaints requiring enforcement actions. Adequate enforcement is a factor in maintaining the County's compliance with local, State, and Federal environmental law.

The Maryland Department of Environment enforces Federal Clean Water Act requirements through the issuance of a National Pollutant Discharge Elimination System (NDPES) permit with the County. DLRM is responsible for the administration of the permit and compliance of the permit requirements. Along with many construction activities to improve water quality in the County, this permit includes providing education to the public, internal and external agencies, and appointed and elected officials.

As identified in this Plan, dams are an identified hazard located in the County. DLRM is responsible for plan review, approval, and inspection of stormwater management facilities which sometimes include dam embankments. The Department also includes the Engineers-In-Charge of the Farm Museum and Piney Run Dam, the only significant and high hazard dams owned by the County. The Engineers-In-Charge are responsible for inspection and approval of any activities that may impact the dam embankments.

As a participating agency in the evaluation of the progress of this Plan, DLRM will review the environmental measures and programs existing and proposed to determine whether they are being implemented, to determine timelines for implementation, and to determine how effective they are. This input will help refine the priority of some of the projects as well as assist with grant applications for certain mitigation projects. As projects are completed, other projects currently given a lower priority may be given a higher priority status and recommended for inclusion in the Plan during the five-year update.

Carroll County Department of Public Works (DPW)

The Department of Public Works (DPW) is comprised of several bureaus, including the Bureaus of Engineering, Roads Operations and Permits and Inspections. Through these bureaus, DPW inspects and maintains roads and bridges, manages engineering and environmental projects, and enforces the Carroll County Building Code (Chapter 97 of the Code of Public Local Laws and Ordinances of Carroll County). The Department also procures land needed for construction of roads, bridges, and drains.

As participating agencies in the evaluation of the progress of this plan, the Bureau of Engineering and the Bureau of Roads Operations will review the existing and proposed mitigation measures and programs in the Plan that are related to capital facilities, such as roads and bridges, to determine whether these strategies are being implemented, to determine timelines for implementation, and to determine how effective they are. This input will help with identifying projects that should be proposed for possible mitigation funding. As projects are completed, other projects currently given a lower priority may be given a higher priority status and recommended for inclusion in the Plan during the five-year update.

The Bureau of Permits and Inspections enforces the Carroll County Building Code (Chapter 97 of the Code of Public Local Laws and Ordinances of Carroll County), which includes building, electrical, plumbing, mechanical, ADA, and fire codes. The Bureau processes all applications and inspects all phases of construction. The Bureau issues electrical, plumbing, gas fitters, and utility contractor licenses. Staff reviews site development and subdivision plans for compliance with

applicable codes and regulations. Site Inspectors inspect sites for compliance with approved site plans and for compliance with the Maryland State Building Code for handicapped accessibility. The Bureau enforces the Carroll County Minimum Livability Code, (Chapter 141 of the Code of Public Local Laws and Ordinances of Carroll County), which governs building standards for residential rental housing and also interprets and enforces Chapter 102 of the Code of Public Local Laws and Ordinances of Carroll County, which governs development impact fees.

The Bureau of Permits and Inspections will participate in the review and evaluation of the progress of the Plan through input on the effectiveness of measures currently included in the Building Code. The Bureau of Permits and Inspections will also be able to help craft any additional revisions to the Code that are proposed as mitigation strategies and will be able to then recommend changes in priorities and additional mitigation strategies for the five-year update.

Carroll County Municipalities

As this plan addresses the County as well as each municipality within the county, coordination with the municipalities is an important component of the annual review process (see discussion under “Monitoring and Evaluating” below). Each municipality will be asked to provide a status report on the progress and effectiveness of existing and proposed mitigation measures in place within its respective jurisdiction. Also, each municipality will be asked to provide a summary of how the goals and proposed actions of the CC HMP have been and/or will be incorporated into and coordinated with municipality comprehensive plans, capital improvement plans, and any other appropriate municipality-specific planning mechanisms. DPS-EM will provide this information to the participating agencies and to the LEPC for their consideration in their review and evaluation of the Plan as it relates to how all of the mitigation measures work together for overall benefit. Municipality-specific strategies may be incorporated into the Plan where appropriate.

Local Emergency Planning Committee (LEPC)

The Carroll County LEPC is an active group of emergency responders, planners, business representatives, health-care providers, elected officials, and citizens that work together for the safety of Carroll County residents and businesses as well as the preservation of our environment. Given the nature of the LEPC’s responsibilities and its diverse community representation, and the fact that this Plan is intended to eventually address hazards other than natural hazards, the LEPC will be called upon to act in an advisory role to DPS-EM for the evaluation of the progress of the strategies within this Plan. The LEPC’s diverse representation

and background knowledge will provide an invaluable avenue for feedback and suggestions for this process.

Plan Maintenance Process

Monitoring & Evaluating

DPS-EM will facilitate an annual meeting of the participating agencies to discuss to what extent existing mitigation measures and programs have been implemented, as well as to gauge their effectiveness. The agencies will also review which new mitigation strategies are being pursued or have been put into effect and the status of those projects. Each agency will make recommendations on proposed mitigation measures that can be moved from “proposed” to “existing” upon the next update of the Plan. The agencies will evaluate whether additional efforts need to be made in any areas to ensure improved success for the goals and objectives of the Plan.

As a result of this effort, DPS-EM will prepare a report to the LEPC that provides the status of existing and proposed mitigation strategies and summarizes the recommendations that will be incorporated into the text of the Plan at the five-year update. The LEPC will provide additional input on measures other than government projects that have been taken within the community, including whether these measures are perceived as effective and any associated recommendations. The LEPC will combine that information with their feedback on the staff/agency report and provide comments and recommendations back to the DPS-EM.

DPS-EM will monitor and update the annual report and recommendations to ensure that they are current once the five-year update process to the Plan begins. DPS-EM will coordinate with participating agencies and the LEPC to modify efforts, where needed, to achieve the goals and objectives of the Plan.

Implementation through Existing Programs

Each hazard-specific chapter of the Plan identifies existing measures in place at the local level to mitigate the impacts of the hazards addressed in the Plan. These ongoing measures will continue to be implemented. The review and evaluation provided by each agency and the LEPC each year will include a discussion of the effectiveness of these programs, as well as recommendations to improve their effectiveness and efficiency.

Continued Public Involvement

Because the LEPC encompasses both citizen and private business representation, the LEPC is a vital element of public involvement in the plan maintenance process. It is expected that LEPC

members will represent the interests of the segments of the community for which they sit on the LEPC.

A redacted version of the Plan will be available on the County's website. A forum will be available to allow citizens to provide comment and suggestions on the Plan. This input will be considered at each annual review and suggestions will be appropriately incorporated into the Plan when it is updated.

The process of implementing the education-based strategies of the Plan will provide another opportunity for continued public involvement.

Additional Hazard Chapters

One of the strategies included in this Plan is to add chapters to address hazards, other than natural hazards, for which the County and its municipalities are at risk. These catastrophic events (as opposed to those incidents with which responders deal on a regular basis) include hazardous materials incidents and transportation accidents. Civil/criminal hazards that may be added include terrorism and other civil disturbance incidents.

As annual reviews are conducted, consideration will be given to how the effects of climate change may increase or decrease the risk to Carroll County from various natural hazards.

The Five-Year Update

The Plan will be reviewed and updated on a five-year cycle. The process to update the Plan will start by repeating the annual process to review and evaluate the progress of the Plan and its mitigation measures. The resulting report will then be used to identify which proposed mitigation measures can be moved to the list of existing strategies as well as which of the lower-priority strategies can be moved into a higher-priority status.

The update of the Plan may also include incorporating additional chapters that have been developed to address other hazards from which the County and municipalities are at risk or modifying existing chapters to more appropriately address identified hazards.

Meetings will be held with the municipalities to ensure their input and feedback are incorporated and that the specific needs of individual municipalities are met through the Plan's proposals.

The public will continue to be involved through the LEPC, through forums available on the County's website where citizens can provide comments on proposed changes to the Plan, and through public workshops that will be held to explain the progress of the Plan update and the changes proposed through the LEPC and through coordination with the participating agencies.

MDEM will be asked to review the updated draft. Comments will be addressed as appropriate, and a revised draft sent to FEMA for approval.

Upon completion of an updated draft Plan, the elected officials in each jurisdiction will hold a public hearing on the proposed changes. All comments will be considered, and appropriate changes will be made to the Plan as directed by the elected officials. The elected officials will then adopt the revised Plan.

Authorities and References

American Community Survey/U.S. Census Quick Facts

<https://www.census.gov/quickfacts/carrollcountymaryland>

Carroll County, Maryland Agricultural Preservation Website

<https://www.carrollcountymd.gov/government/directory/land-resource-management/agricultural-land-preservation/>

Carroll County, Maryland Water and Sewer Master Plan

<https://www.carrollcountymd.gov/government/directory/planning/comprehensive-county-plans/functional-plans/water-sewer-master-plan/>

Code of Federal Regulations (CFR) Title 44 <https://www.ecfr.gov/current/title-44>

Cooke, R. and Doornkamp, J. (1974). *Geomorphology in Environmental Management*. New York: Oxford University Press.

Court of Appeals of Maryland. (1968). *Finley vs. Teeter Stone, Inc.* Retrieved from

http://md.findacase.com/research/wfrmDocViewer.aspx/xq/fac.19681119_0040080.md.htm/qx.

Crop Moisture Index <https://www.drought.gov/data-maps-tools/crop-moisture-index-cmi>

Disaster Recovery Reform Act 2018 Section 1234 <https://www.fema.gov/disaster/disaster-recovery-reform-act-2018/provisions-1230-1239>

Emergency Planning and Community Right to Know Act <https://www.epa.gov/epcra>

Enhanced Fujita Scale <https://www.weather.gov/oun/efscale>

Federal Emergency Management Agency. (1977). *Multi-Hazard Identification and Risk Assessment*. Washington, D.C.: FEMA.

FEMA Community Lifelines Fact Sheet <https://www.fema.gov/fact-sheet/community-lifelines>

FEMA Flood Map Service Center <https://msc.fema.gov/portal/home>

FEMA Hazard Mitigation Fact Sheet – Summary of FEMA Hazard Mitigation Grant Programs

https://www.fema.gov/sites/default/files/documents/fema_summary-fema-hazard-mitigation-assistance-grant-programs_032321.pdf

FEMA Local Hazard Mitigation Planning Handbook

https://www.fema.gov/sites/default/files/2020-06/fema-local-mitigation-planning-handbook_03-2013.pdf

Flood Mitigation Assistance (FMA) Grant Program

<https://www.fema.gov/grants/mitigation/floods>

Magner, J., Book, P. and Alexander, Jr., E. (1986). A water treatment/disposal site evaluation process for areas underlain by carbonate aquifers. *Round Water Monitoring Review*, 6:2, pp. 117-121.

Mansfield, D. (2009). Tennessee demands details on TVA coal sludge cleanup. Retrieved from

http://www.huffingtonpost.com/2009/01/14/tennessee-demands-details_n_157773.html.

Maryland Department of the Environment Dam Safety

<https://mde.maryland.gov/programs/water/damsafety/pages/index.aspx>

Maryland Historic Trust National Register of Historic Places

https://mht.maryland.gov/research_nationalregister.shtml

Matthews, R. and Kelly, J. (1997). Crater snarls downtown commute. Retrieved from

http://articles.baltimoresun.com/1997-11-11/news/1997315079_1_franklin-street-sewer-line-balog.

MD State Dept of Assessments and Taxation

<https://sdat.dat.maryland.gov/RealProperty/Pages/default.aspx>

National Climatic Data Center <https://www.ncei.noaa.gov/cdo-web/>

National Flood Insurance Program (NFIP) <https://www.fema.gov/flood-insurance>

National Inventory of Dams <https://nid.usace.army.mil/#/>

National Weather Service <https://www.weather.gov/>

New York Times. (1995). Huge spill of hog waste fuels and old debate in North Carolina.

Retrieved from <http://www.nytimes.com/1995/06/25/us/huge-spill-of-hog-waste-fuels-an-old-debate-in-north-carolina.html>.

Newton, J. (1987). Development of Sinkholes Resulting from Man's Activities in the Eastern United States. *U.S. Geological Survey, Cir. 968*, p. 54.

Palmer Drought Severity Index <https://climatedataguide.ucar.edu/climate-data/palmer-drought-severity-index-pdsi>

Petak, W. and Atkisson, A. (1982). *Natural Hazard Risk Assessment and Public Policy*. New York: Springer-Verlang.

Robert T. Stafford Disaster Relief and Emergency Assistance Act– Section 404

https://www.fema.gov/sites/default/files/documents/fema_stafford_act_2021_vol1.pdf

State of Maryland Hazard Mitigation Plan (2021) <https://aecomviz.com/MEMA-Maryland-360/Doc/MEMA%20HazMitPlan.pdf>

U.S. Census <https://www.census.gov/data.html>

U.S. Census of Agriculture <https://www.nass.usda.gov/AgCensus/>

United States Geological Survey. (2004). Landslide types and processes. Retrieved from <http://pubs.usgs.gov/fs/2004/3072/pdf/fs2004-3072.pdf>.

United States Geological Survey. (2012). Maryland and the District of Columbia: Floods and Droughts. Retrieved from <http://md.water.usgs.gov/publications/wsp-2375/md-dc/md-dc.html.html>.

United States Geological Survey. (2012). Maryland Earthquake Information. Retrieved from <http://earthquake.usgs.gov/earthquakes/states/?region=Maryland>.

United States Geological Survey. (2012). The science of earthquakes. Retrieved from <http://earthquake.usgs.gov/learn/kids/eqscience.php>.

West Virginia Division of Culture and History. (2013). Buffalo Creek disaster. Retrieved from <http://www.wvculture.org/history/buffcreek/bctitle.html>

Yevjevich, Vujica, Hall, W., and Salas, J. eds. (1977). Drought Research Needs, in Proceedings of the Conference on Drought Research Needs, December 12-15, 1977, p. 276. Fort Collins, Colorado: Colorado State University.

Acronym Listing

ACS – American Community Survey

BRIC – Building Resilient Infrastructure and Communities

BRM – Carroll County Bureau of Resource Management

CCPS – Carroll County Public Schools

CCVESA – Carroll County Volunteer Emergency Services Association

CFR – Code of Federal Regulations

CRS – Community Rating System

DFEMS – Carroll County Department of Fire and EMS

DLRM – Carroll County Department of Land and Resource Management

DP – Carroll County Department of Planning

DPS – Carroll County Department of Public Safety

DPS-EM – Carroll County Emergency Management

DPW – Carroll County Department of Public Works

DRRA – Disaster Recovery Reform Act of 2018

EAP – Emergency Action Plan

EF – Enhanced Fujita Scale

EMS – Emergency Medical Services

EOP – Emergency Operations Plan

FEMA – Federal Emergency Management Agency

FIRM – Flood Insurance Rate Map

FMA – Flood Mitigation Assistance

GA – Growth Area

GAB – Growth Area Boundary

HMGP – Hazard Mitigation Grant Program

LEPC – Local Emergency Planning Committee

MDE – Maryland Department of the Environment

MDEM – Maryland Department of Emergency Management

MGA – Municipal Growth Area

MGE – Municipal Growth Element

MSP – Maryland State Police

NCDC – National Climatic Data Center

NEPA – National Environmental Policy Act

NFIP – National Flood Insurance Program

NID – National Inventory of Dams

NOAA – National Oceanic and Atmospheric Administration

NWS – National Weather Service

SHA – Maryland State Highway Administration

USACE – United State Army Corps of Engineers

USDA – United States Department of Agriculture

USGS – United States Geological Survey

ZOI – Zone of Influence

Appendix A – Capability Assessment

ADMINISTRATIVE AND TECHNICAL

Carroll County has identified the following administrative and technical capabilities. These include staff and their skills and tools that can be used for mitigation planning and to implement specific mitigation actions.

Government Department and Staff Resources	
Departments/Agencies	Responsibilities
Department of Public Safety - Emergency Management	The Carroll County Department of Public Safety is responsible for the operation of the Emergency Communications Center (911 services), Emergency Operations Center, Emergency Management, Fire Protection Engineering, and providing liaison with fire and police organizations.
Department of Planning	<p>The Planning Department is responsible for developing and implementing the County Master Plan as envisioned by the citizens. The meetings and activities of the Planning and Zoning Commission are coordinated by the Department Director, who is Secretary to the Commission. Capital Improvement Projects review, site selection, and land banking for future schools, roads, and other public facilities are administrative functions of the Department.</p> <p>The Department is also responsible for comprehensive, county-wide master planning. Land use plans are made and implemented working with the Carroll County Planning & Zoning Commission authorized under the Land Use Article of the Annotated Code of Maryland. Several functions within the Department are designed to assure County projects and programs conform with the County Master Plan, that current and long-range County planning serves to implement the Plan, and that land use and policy decisions are in accordance with the Plan. Among the ways, the Department fulfills this function are water and sewer master planning, comprehensive plans for the County and incorporated towns; major street and road planning; and the town/county liaison planners.</p>
Department of Land and Resource Management	The Department is responsible for the oversight, implementation and Management of programs related to zoning, development review, resource management and agriculture preservation functions including overall program development, code enforcement, environmental compliance, and natural resource evaluation/management. The department provides direct support to numerous boards, councils and committees related to areas of responsibilities.

<p>Department of Public Works</p>	<p>The Department of Public Works is the largest department within County Government. The Department is comprised of the following nine bureaus: Airport, Building Construction, Engineering, Facilities, Fleet Management / Warehouse Operations, Permits and Inspections, Roads Operations, Solid Waste, and Utilities. Through those offices the bureaus handle all the County’s civil and utility engineering needs; enforce public works agreements between the County and developers/contractors; building permitting and inspections; procure land needed for public projects; administer capital construction and maintenance of public improvements; fleet, road and bridge maintenance; domestic water treatment and supply; sanitary sewer and solid waste, including landfills and the recycling program; and the regional airport administration. The Department also assists with the oversight and implementation of the local paratransit system.</p>
<p>All Municipalities</p>	<p>There are a total of eight (8) municipalities within Carroll County. Each municipality possess capabilities through various departments and staff resources such as planning and zoning authority to manage their own comprehensive plans and their participation in the Carroll County Hazard Mitigation Plan. The municipalities of Carroll County are listed below:</p> <ul style="list-style-type: none"> • City of Taneytown • City of Westminster • Town of Hampstead • Town of Manchester • Town of Mount Airy • Tow of New Windsor • Town of Sykesville • Town of Union Bridge

Technical Capabilities	
Resources	Description
Emergency Communications Center (911)	The Emergency Communications Center (ECC) provides 24-hour emergency 911 services to citizens, visitors, and businesses in Carroll County. The Mission of the Emergency Communications Center is to provide dependable, responsive, & proficient Emergency 911 (E911) services for the citizens of, and visitors to Carroll County, as well as reliable, accurate, & interoperable radio communications to all users of the County's 800 MHz Trunked Radio System (including Emergency Services - Fire/Rescue/EMS & Police).
Carroll Alert Mass Notification System via Everbridge	Carroll Alert is Carroll County's mass notification system, used in cases when significant hazards to life and property appear. When signed up, these alerts may be received via text message, phone call, and/or email, instructing the public to shelter-in-place, evacuate, or be aware of incidents nearby that may have an impact on the person receiving the message.
Emergency Alert System (EAS)	The EAS is a national public warning system that requires radio and TV broadcasters, cable TV, wireless cable systems, satellite, and wireline operators to provide the President with capability to address the American people within 10 minutes during a national emergency
Integrated Public Alert and Warning System (IPAWS)	IPAWS is FEMA's national system for local alerting that provides authenticated emergency and life-saving information to the public through mobile phones using Wireless Emergency Alerts, to radio and television via the Emergency Alert System, and on the National Oceanic and Atmospheric Administration's Weather Radio
Geographic Information Systems (GIS)	Carroll County Government's Enterprise GIS Division works in cooperation with County agencies and allied partners to provide; accurate, accessible, and comprehensive GIS data, infrastructure, and services to support the evolving business needs of Carroll County Government and the community. Carroll County Government also operates GIS services within several internal departments (Public Safety, Information Technology, Land & Resource Management, and Planning).
Generators	Many critical facilities within Carroll County are equipped with generators for emergency power; however, there are critical facilities that remain without this resource.
How can these capabilities be expanded and improved to reduce risk?	
1. Install generators at the outstanding critical infrastructure facilities within Carroll County.	

FINANCIAL

Carroll County identified whether it has access to or is eligible to use the following funding resources for hazard mitigation purposes.

Financial Capabilities	
Funding Source	Description
Capital Improvement Project Funding	Funding available through the County's Capital Improvement Plan.
Operating Budget	The Operating Budget covers the costs of running the County. The funding is earmarked to operate each County department & agency. This also includes the Debt Service, the County's annual loan payment for long-term Capital Projects for which the County borrows money.
Hazard Mitigation Grant Program (HMGP)	This program provides funding to state, local, tribal and territorial governments so they can develop hazard mitigation plans and rebuild in a way that reduces, or mitigates, future disaster losses in their communities. When requested by an authorized representative, this grant funding is available after a presidentially declared disaster.
Building Resilient Infrastructure and Communities (BRIC)	Supports states, local communities, tribes, and territories as they undertake hazard mitigation projects, reducing the risks they face from disasters and natural hazards. BRIC is a new FEMA pre-disaster hazard mitigation program that replaces the existing Pre-Disaster Mitigation (PDM) program.
Flood Mitigation Assistance (FMA) Grant	This competitive grant program provides funding to states, local communities, federally recognized tribes, and territories. The fundings can be used for projects that reduce or eliminate the risk of repetitive flood damage to buildings insured by the National Flood Insurance Program. FEMA chooses recipients based on the applicant's ranking of the project and the eligibility and cost-effectiveness of the project. FEMA also requires state, local, tribal, and territorial governments to develop and adopt hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance, including funding for hazard mitigation assistance projects.
How can these capabilities be expanded and improved to reduce risk?	
<ol style="list-style-type: none"> 1. Secure funding for hazard mitigation and climate adaptation projects and initiatives. 2. Future capital improvement plans might consider budgeting for future infrastructure or new construction, rehabilitation, expansion, and/or improvements of facilities in high-hazard areas. 	

EDUCATION AND OUTREACH

Carroll County identified education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information.

Education and Public Outreach Capabilities	
Program/Organization	Description
Ready Carroll Community Preparedness Program	Ready Carroll, sponsored by Carroll County Emergency Management, is a free community preparedness initiative that teaches residents the importance of emergency preparedness, how to prepare effectively, how to identify the emergency resources available to them, and how to get involved with our volunteer agency emergency response partners.
Local Emergency Planning Committee (LEPC)	This planning committee meets quarterly to form partnerships between local government and industry as a resource for enhancing hazardous materials preparedness. The overall goal of the LEPC is to increase the level of emergency planning and preparedness across all sectors of the community.
StormReady Certification	<p>StormReady uses a grassroots approach to help communities develop plans to handle all types of extreme weather—from tornadoes to winter storms. The program encourages communities to take a new, proactive approach to improving local hazardous weather operations by providing emergency managers with clearcut guidelines on how to improve their hazardous weather operations. To be officially StormReady, a community must:</p> <ul style="list-style-type: none"> • Establish a 24-hour warning point and emergency operations center • Have more than one way to receive severe weather warnings and forecasts and to alert the public • Create a system that monitors weather conditions locally • Promote the importance of public readiness through community seminars • Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises
Emergency Management education or public outreach program	Ongoing community outreach efforts via social media, traditional media, county's website, presentations, and by attending community events.
How can these capabilities be expanded and improved to reduce risk?	
<ol style="list-style-type: none"> 1. Carroll County is a StormReady community. It may be worthwhile to include a section about StormReady within the Emergency Management section of the County's website. 2. Continue to engage with the community by attending more community events to highlight preparedness tips and resources. 3. Continue to promote preparedness via social media and other forms of media. 	

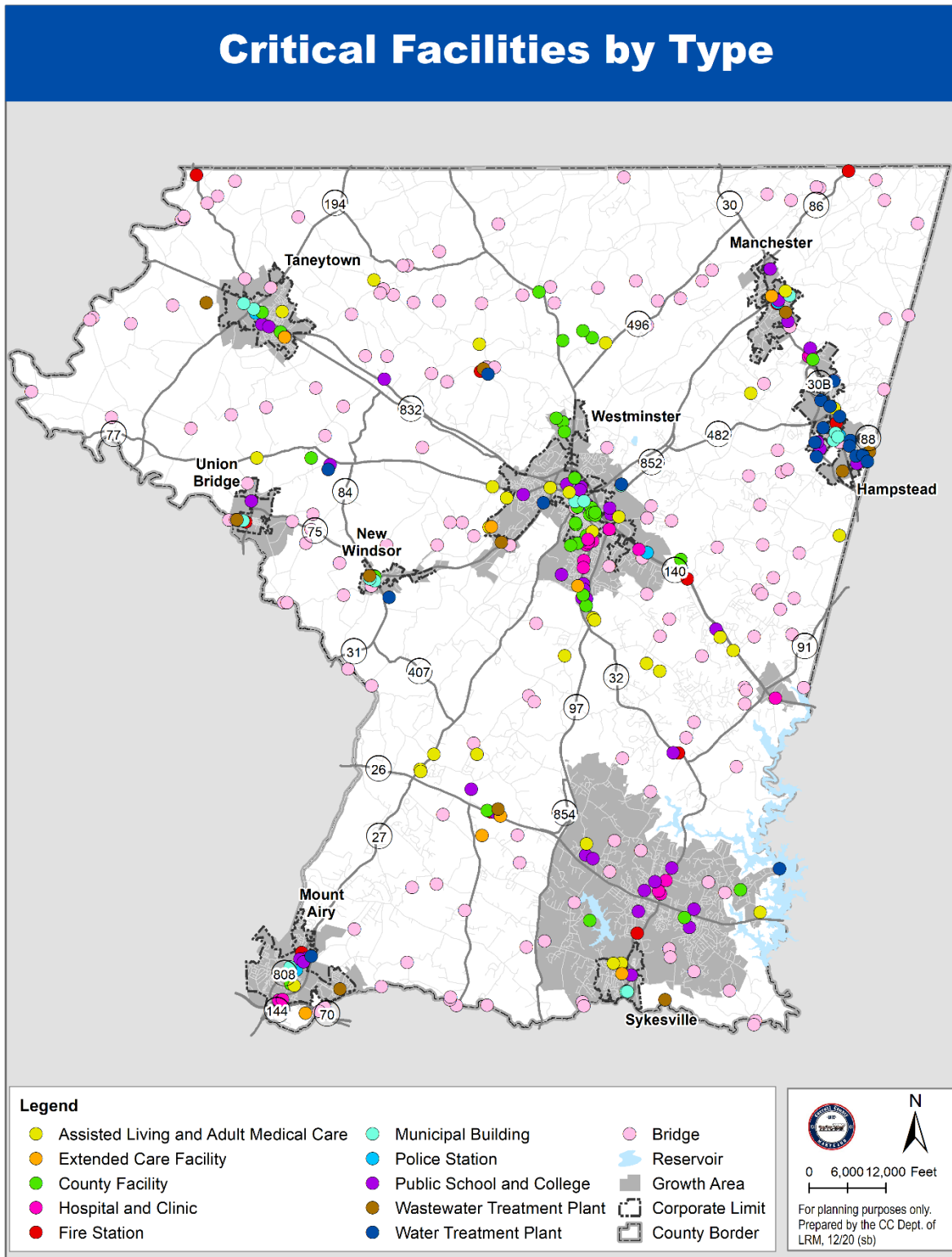
PLANNING AND REGULATORY

Carroll County and its municipalities have identified capabilities for plans, policies, codes, and ordinances that prevent and reduce the impacts of hazards.

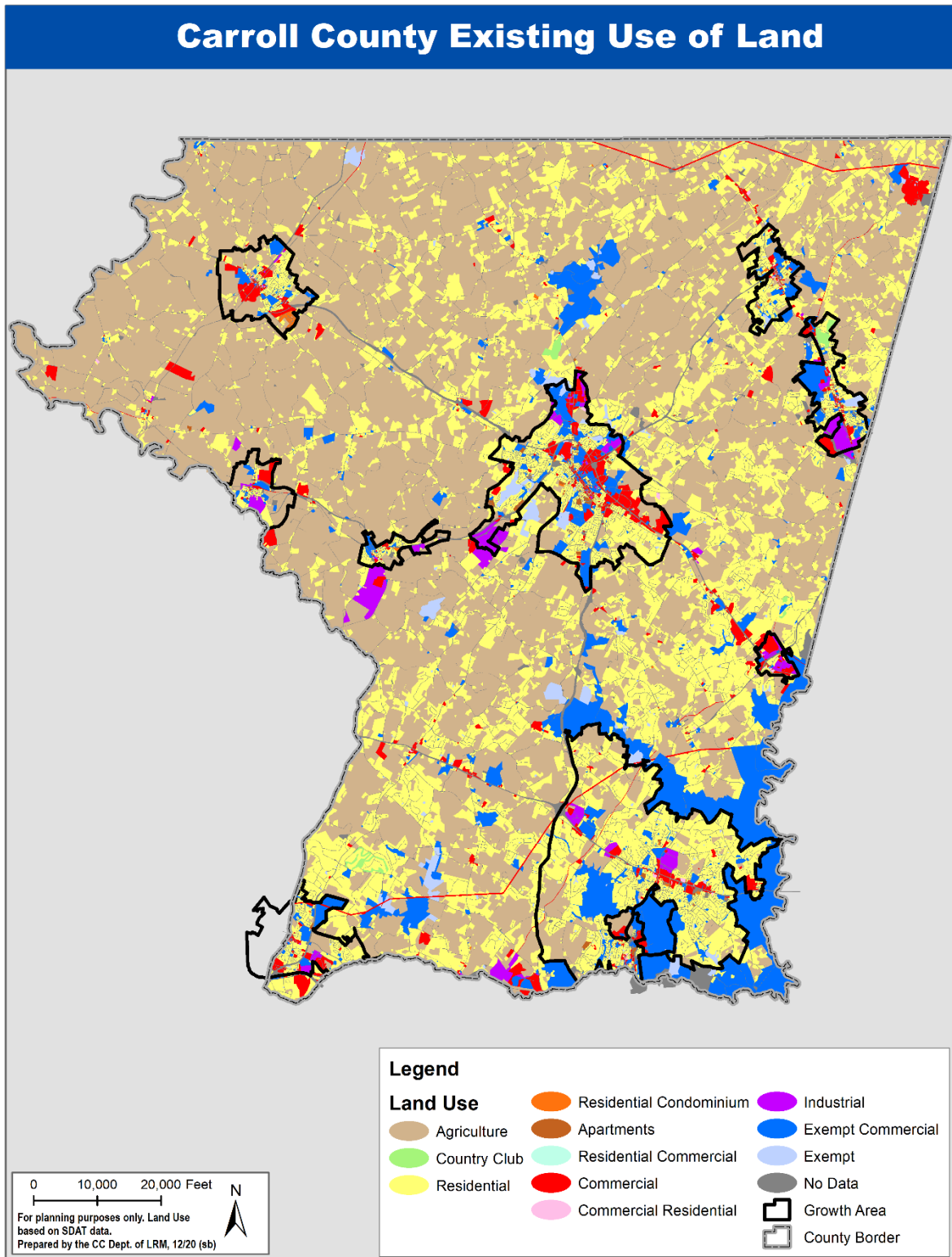
Planning and Regulatory Capabilities	
Plans	Description
Hazard Mitigation Plan (HMP)	The Carroll County HMP is intended to be a guide for the implementation of mitigation projects and initiatives within Carroll County. It is comprised of four main sections: background information is included in Chapters 1-4, hazard specific information is found in Chapters 5-11, all-hazard mitigation measures are described in Chapter 12, and information about the plan monitoring and maintenance process is included in Chapter 13.
Emergency Operations Plan (EOP)	The Carroll County EOP helps to identify the roles and responsibilities of County government and local agencies during emergencies or major disasters, either natural or man-made, and describe the policies and procedures for the response and recovery phases of all emergency activities, assign functional responsibilities to County and local agencies and facilitate coordination between various emergency-essential agencies in their response to emergency and disaster situations within the County.
Comprehensive County Plans (Master Plans, Economic Development and Land Use Plans, Water and Sewer Plans, Land Preservation Plans, etc.)	<p>Comprehensive, General, and Master Plans are all ways of identifying an overall plan for Carroll County.</p> <p>Carroll County Department of Planning will soon be updating the 2014 Master Plan for Fiscal Year 2025. This plan will cover all the Land Use Article Plan preparation requirements as outlined in section 3-102 as well as economic development potential to meet the county's needs now and well into the future. The Economic Development and Land Use Study is currently underway.</p>

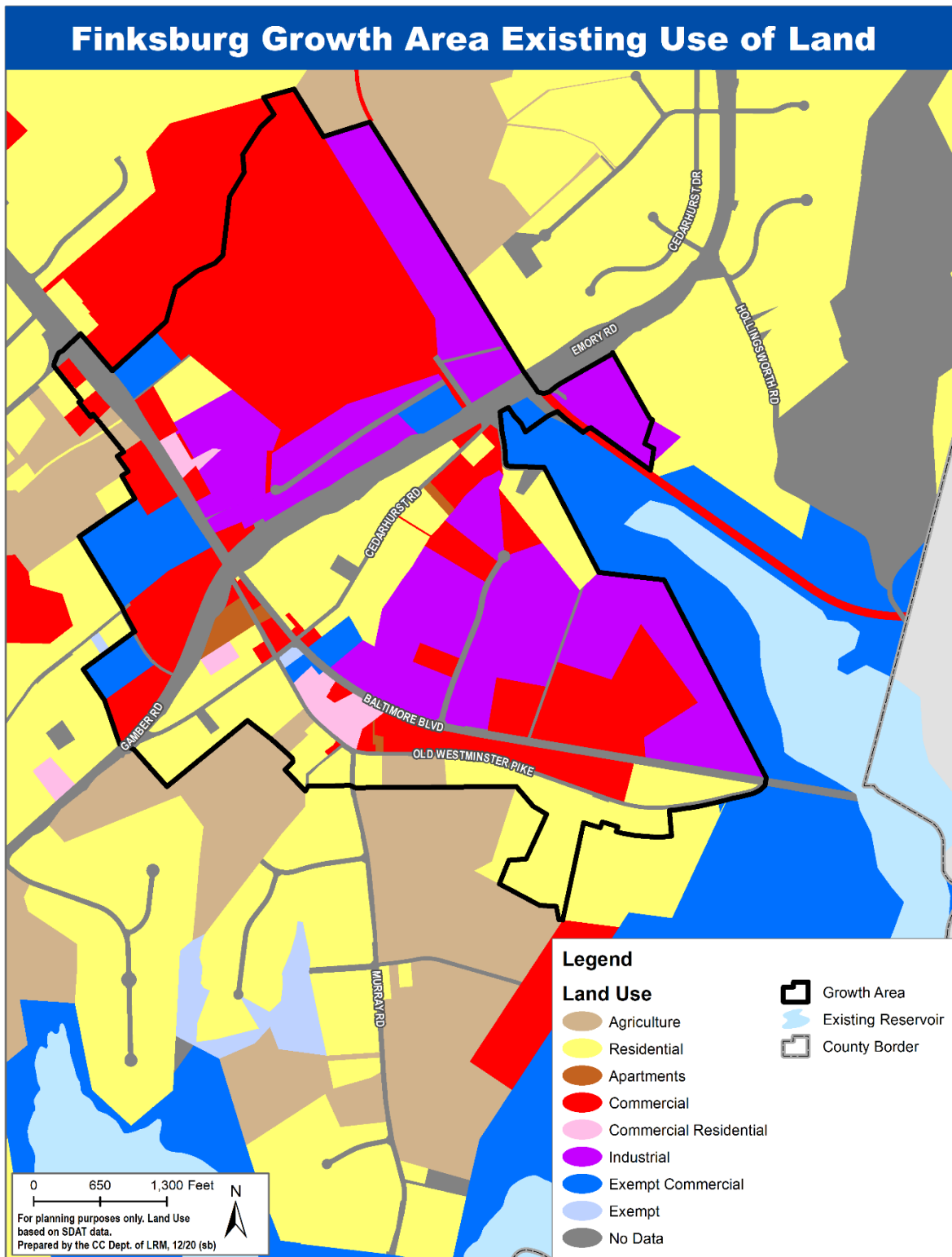
Floodplain Management Ordinance	<p>As part of the Development Review process, all applicable developments must address Carroll County's Floodplain Management Code (Chapter 153). We prohibit new construction in the floodplain, both FEMA and non-FEMA, and prohibit fill in the floodplain.</p> <p>According to the Code, proposed developments are required to convey floodplain easements to the County Commissioners, which serves to protect and preserve the natural characteristics of floodplains, as well as make property owners aware of their location. Restricted activities prohibited by the easements are soil disturbance; storing or dumping of materials; composting or broadcast spreading of yard waste; storing, maintaining, or operating motorized vehicles; housing or otherwise maintaining domestic animals; and burning of vegetation.</p> <p>Code changes are currently proposed that would further reduce flood insurance premiums for County residents while adding additional protection for environmentally sensitive areas. The proposed code changes can be viewed here.</p>
Community Investment Plans	The capital budget is determined annually, and earmarks funding for projects that may help future mitigation projects.
How can these capabilities be expanded and improved to reduce risk?	
<ol style="list-style-type: none"> 1. Consider expanding types of hazards addressed in future planning efforts to include both technological and man-made hazards. 2. Ensure all appropriate stakeholders are included within the planning process 3. Ensure that steps outlined in the Hazard Mitigation Plan regarding integration into other plans are implemented. 	

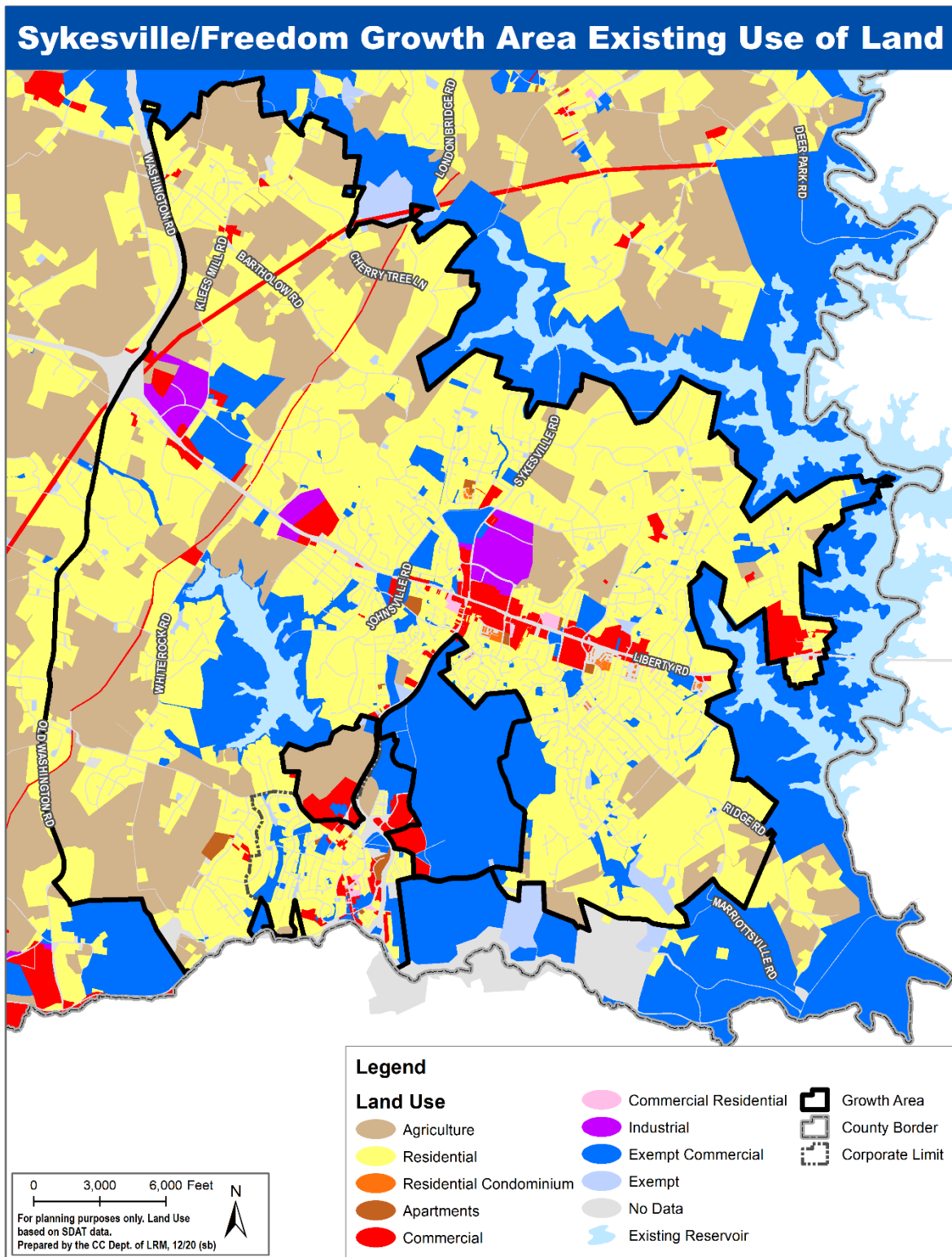
Appendix B – Map of Critical Facilities by Type

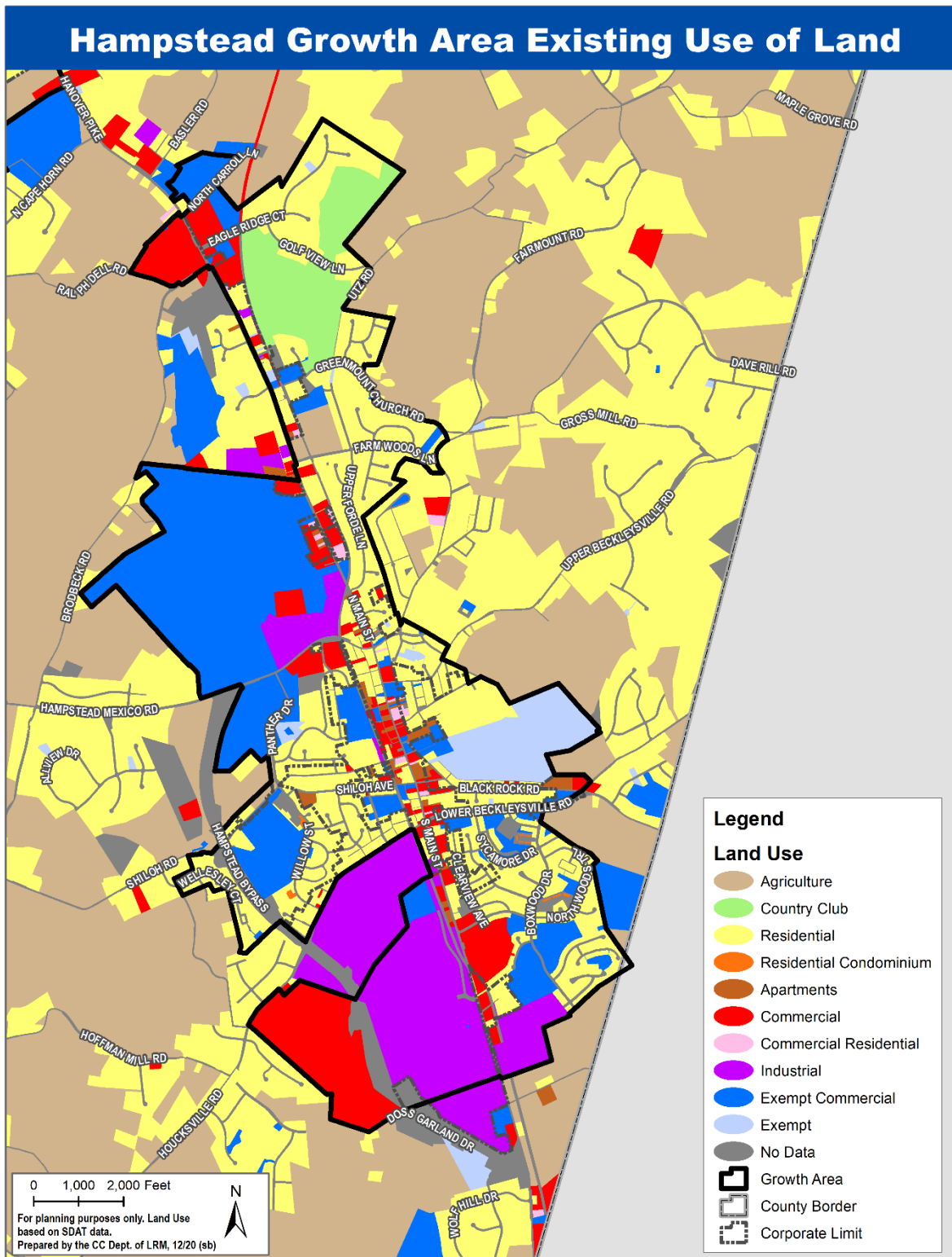


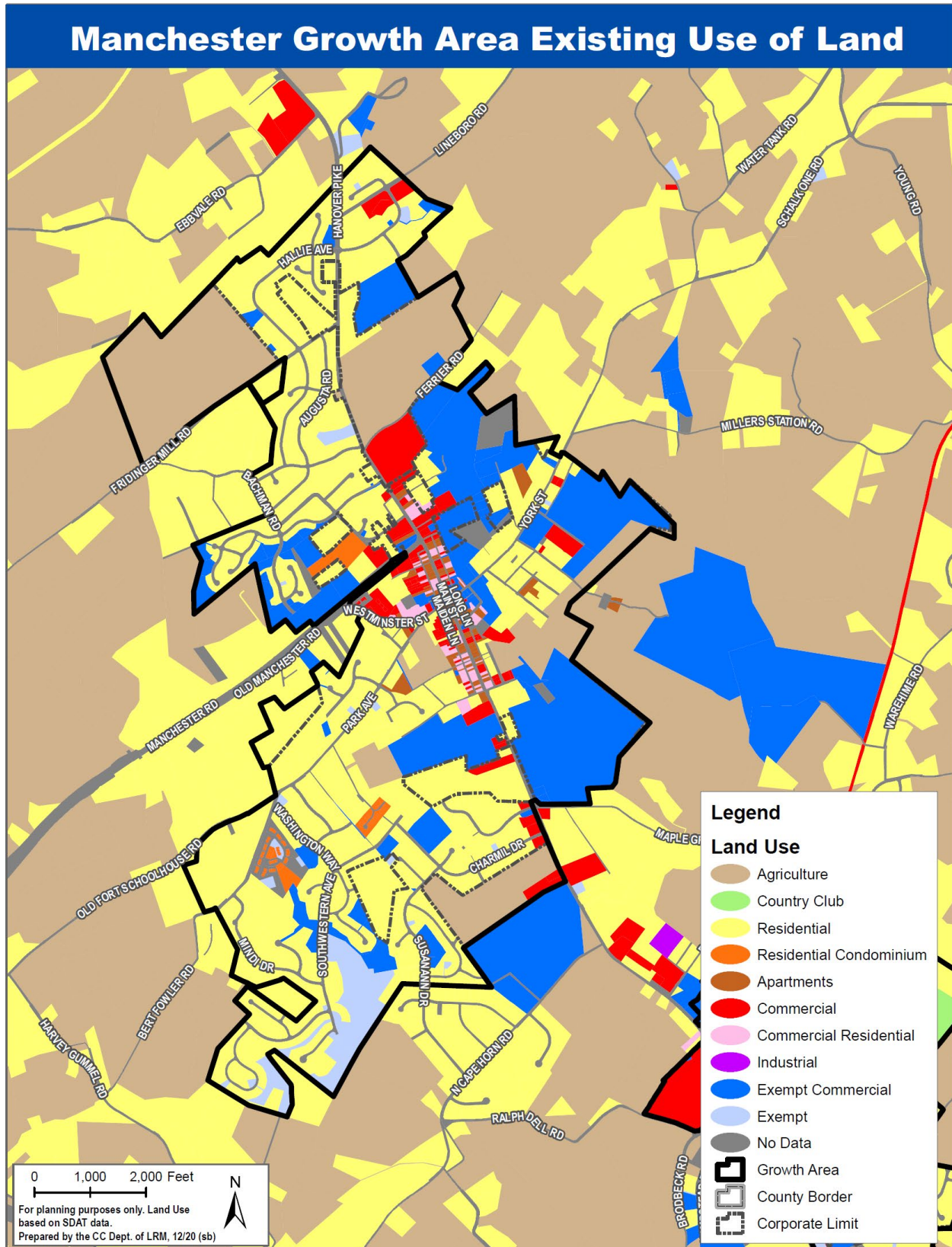
Appendix C – Maps: Existing Use of Land

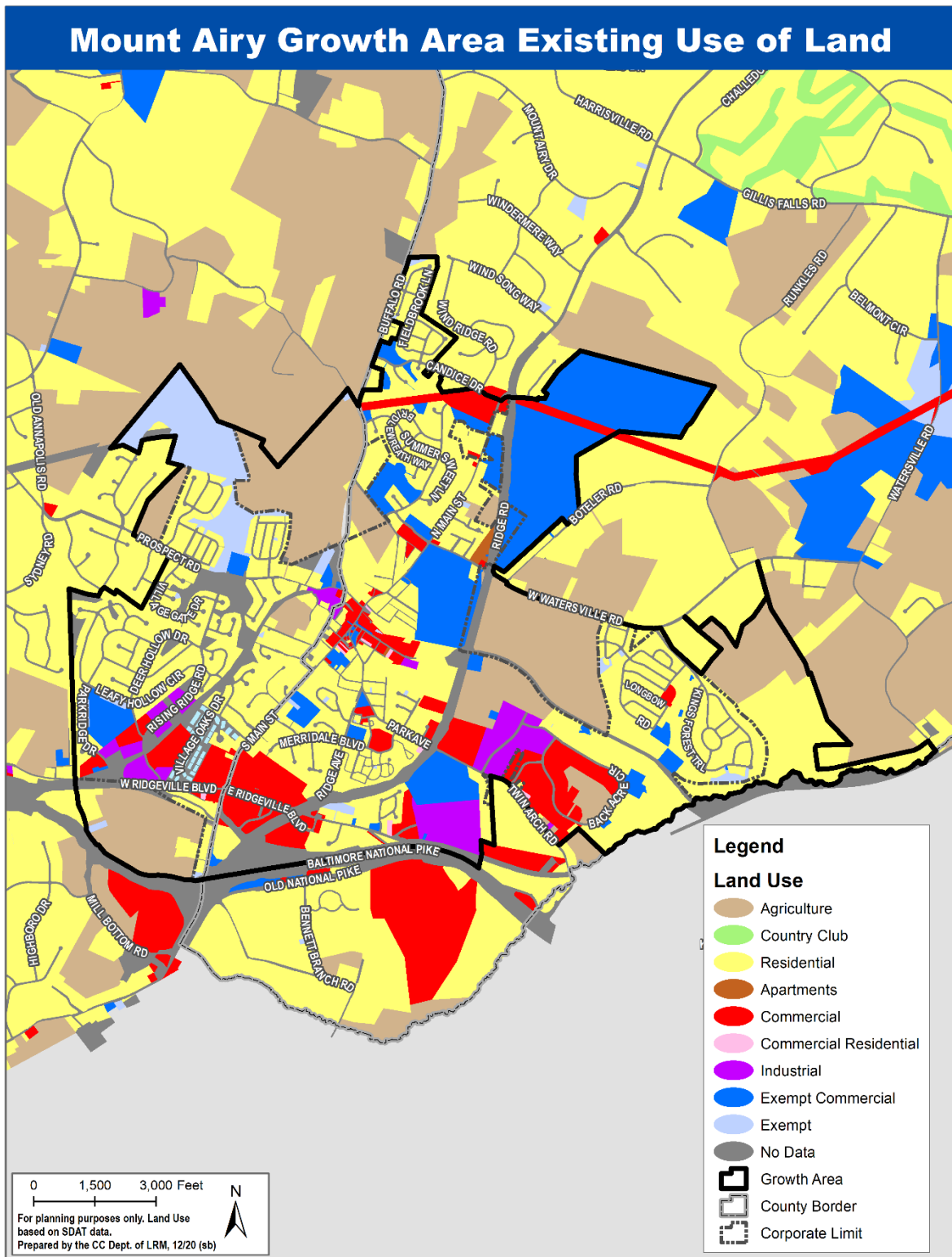


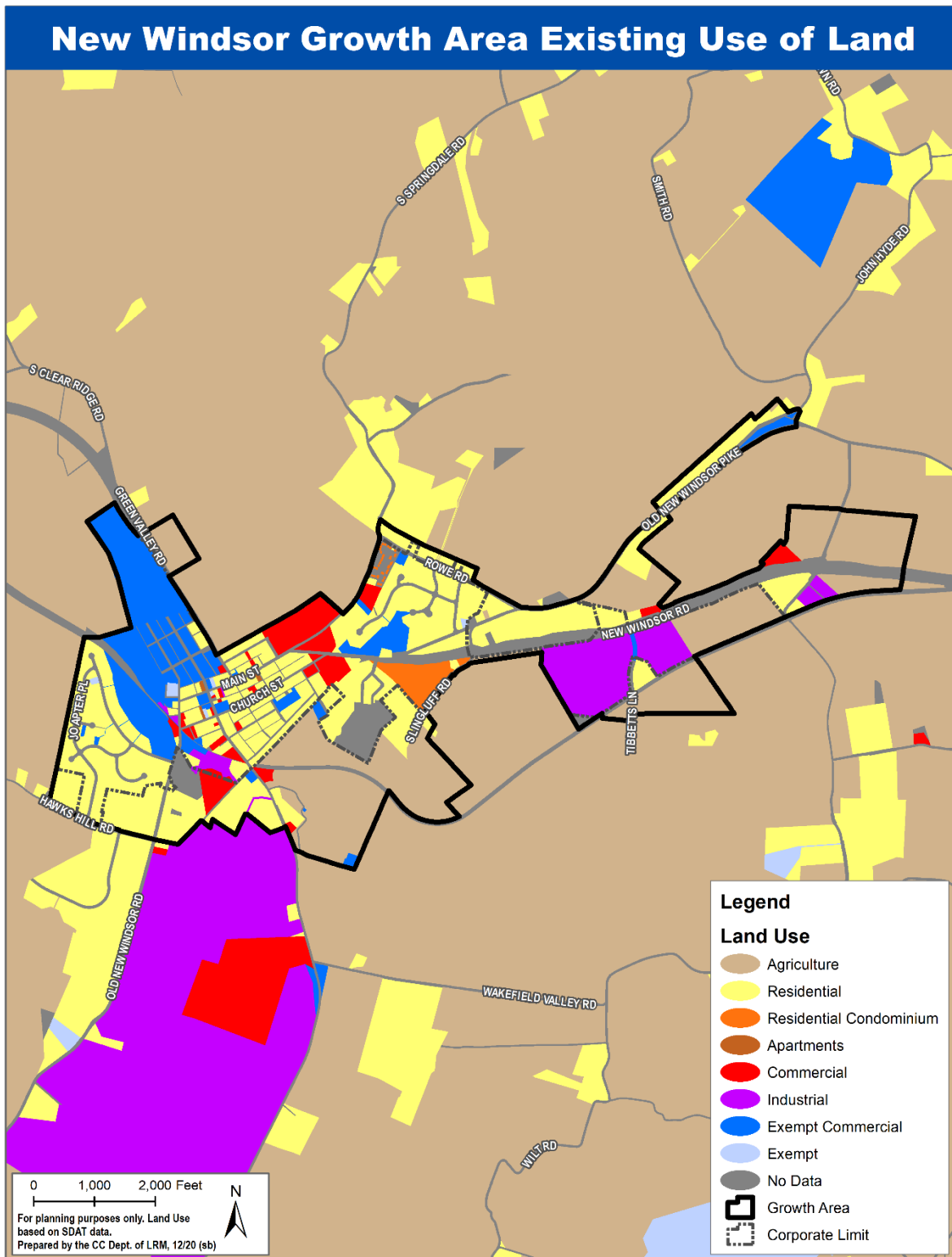


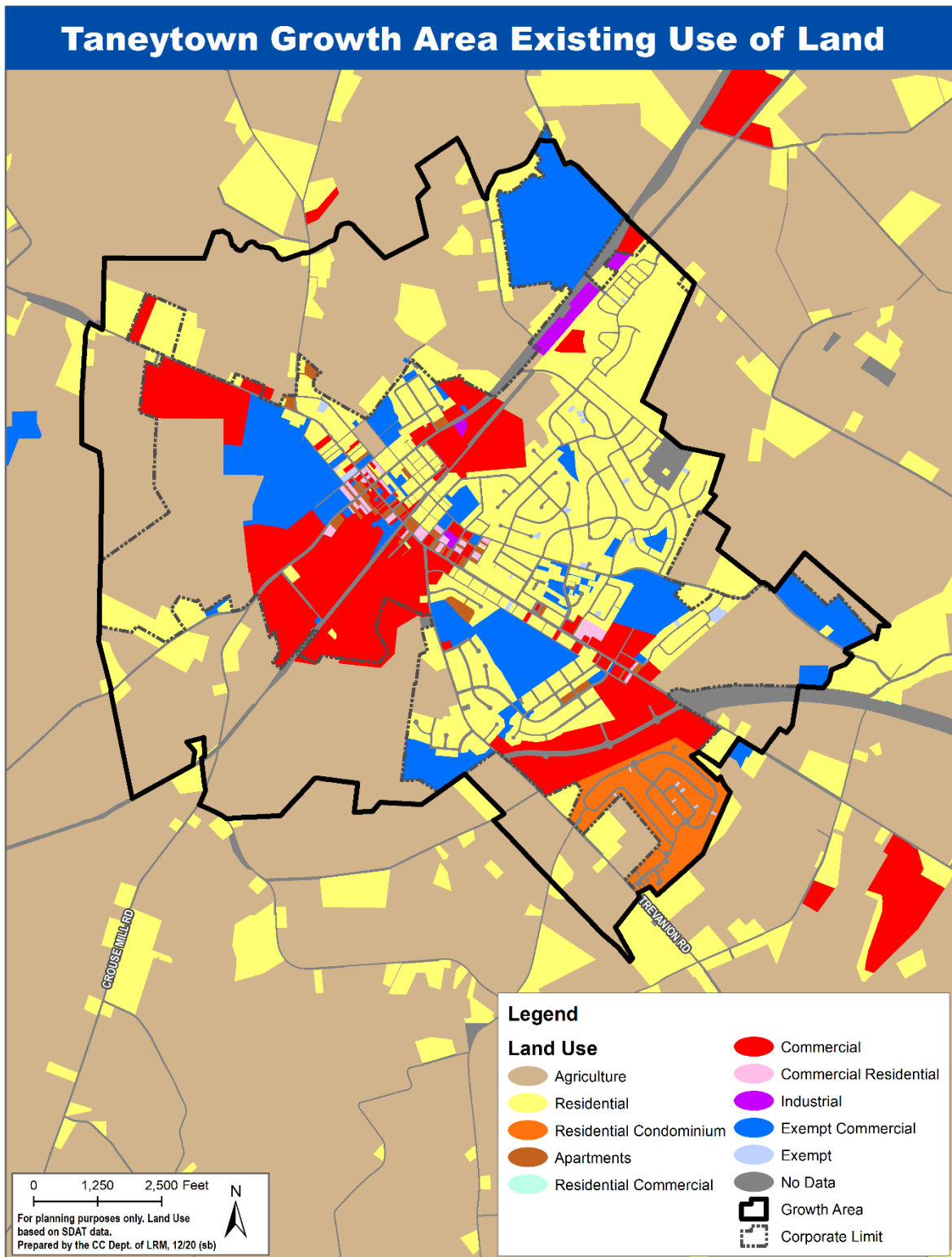


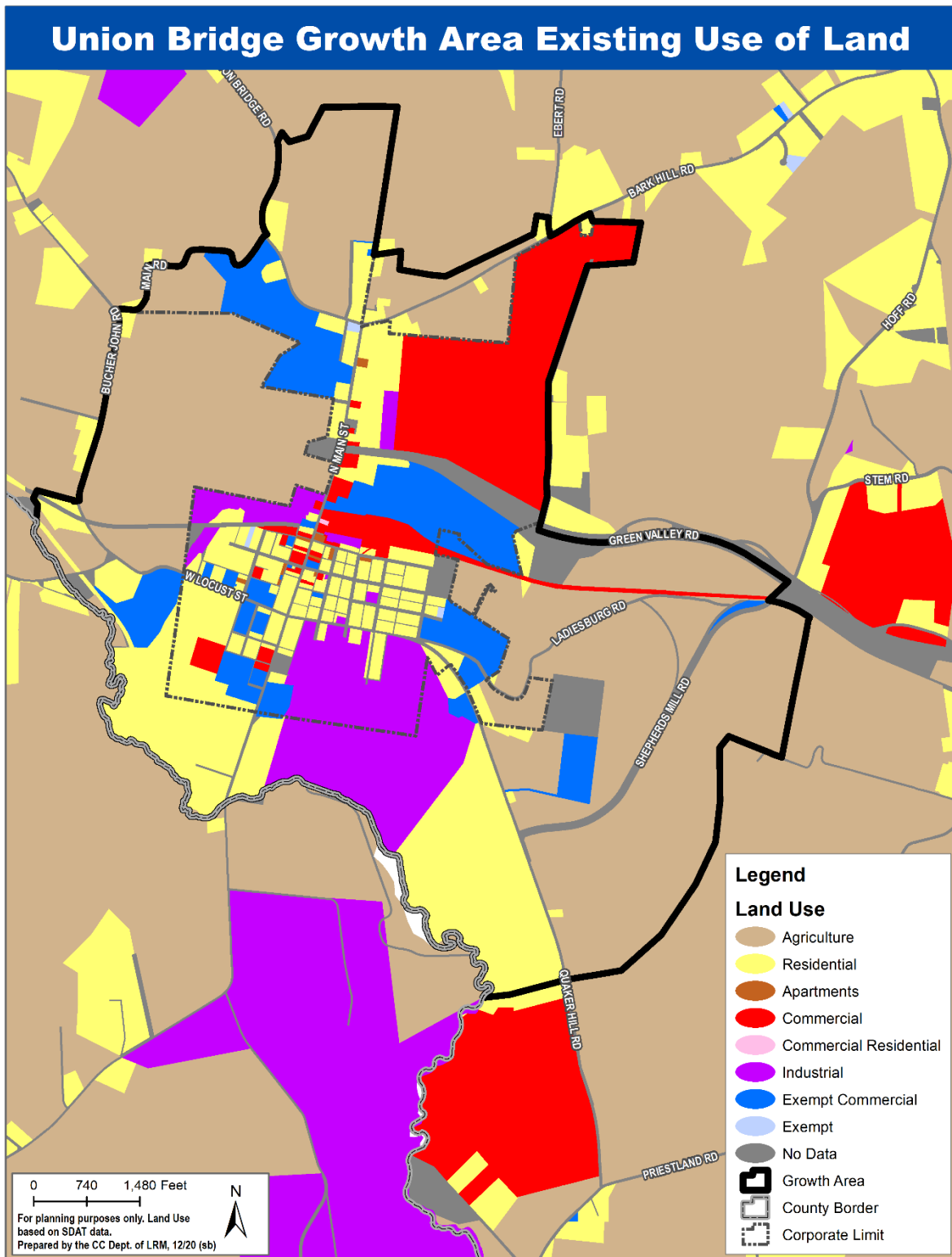


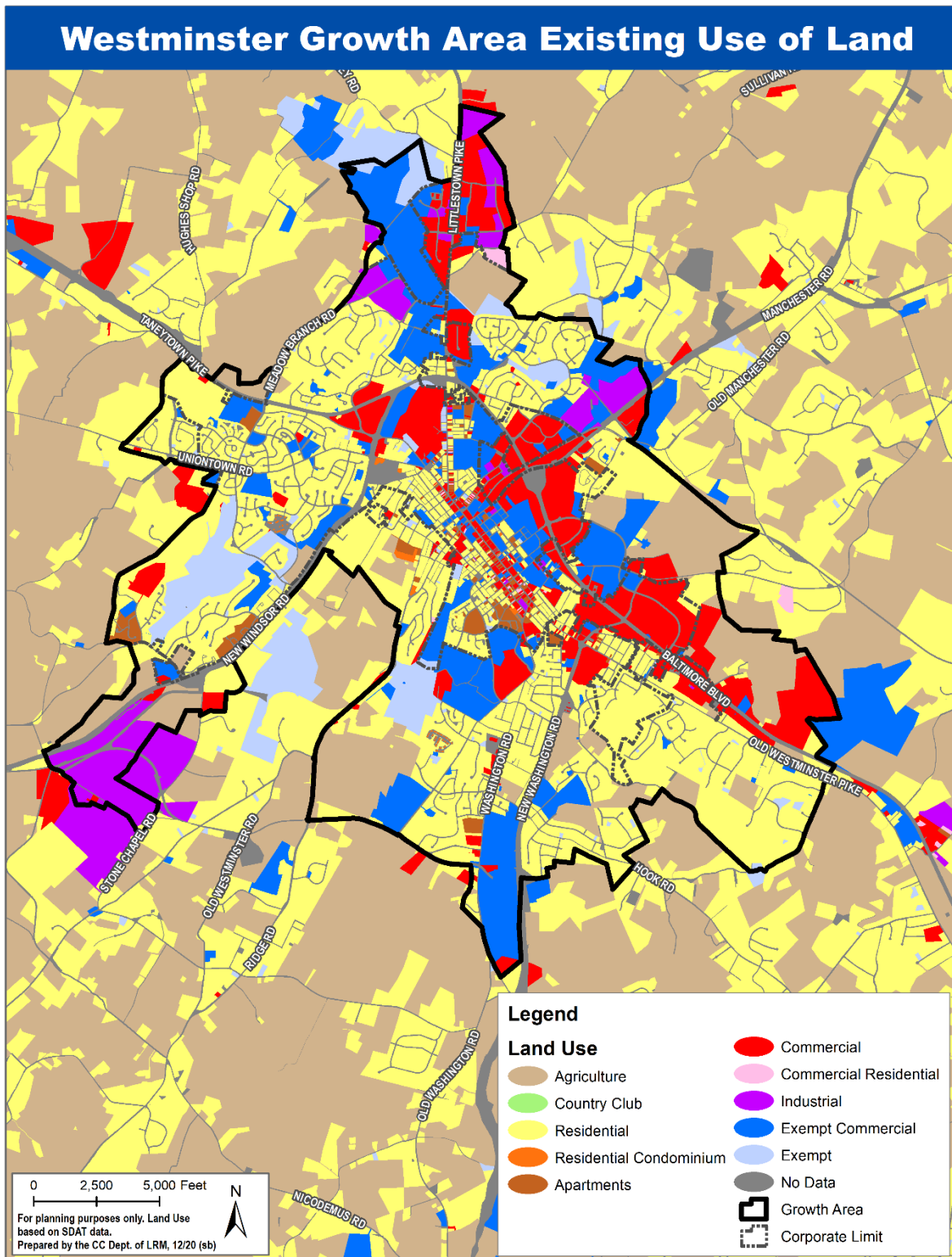




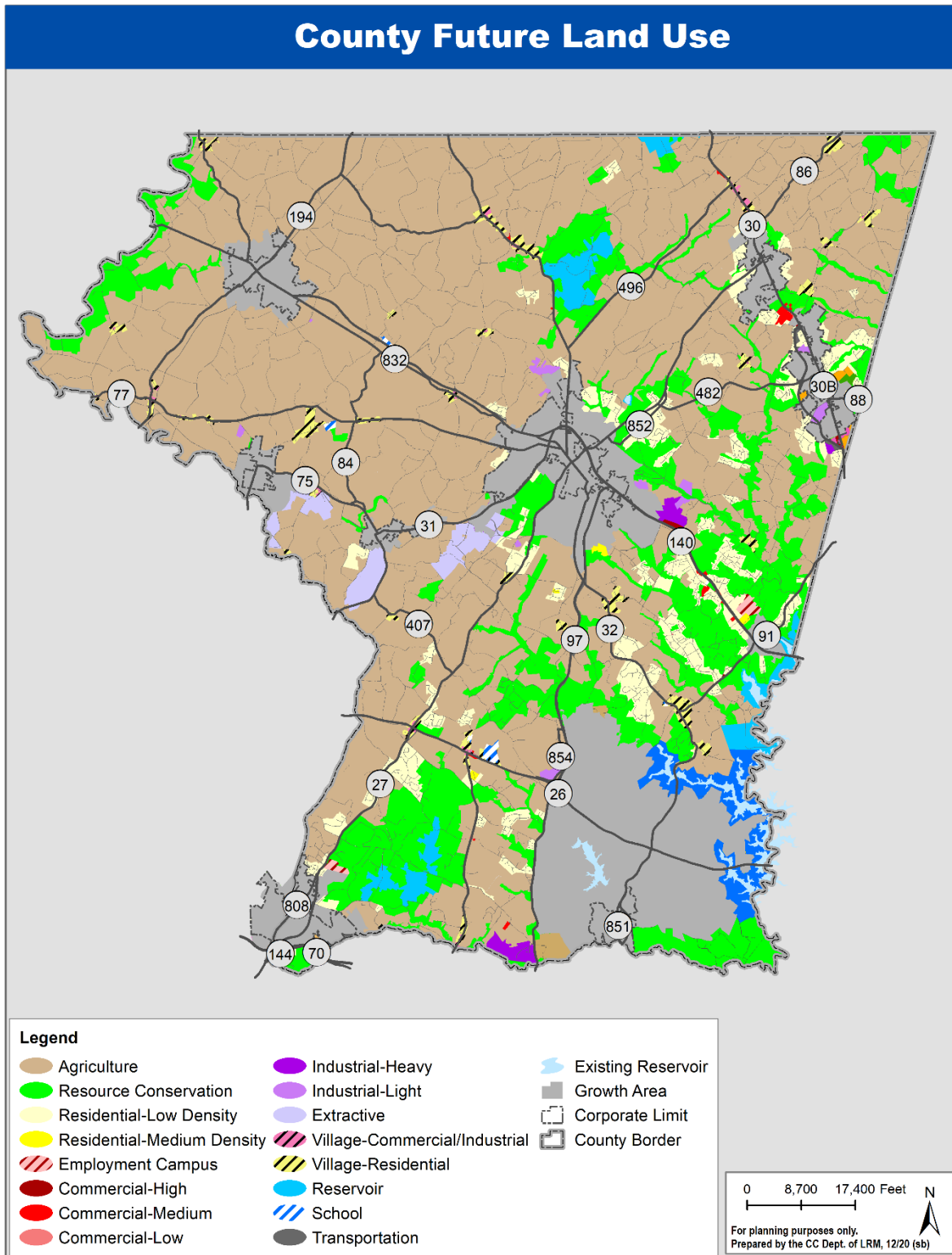


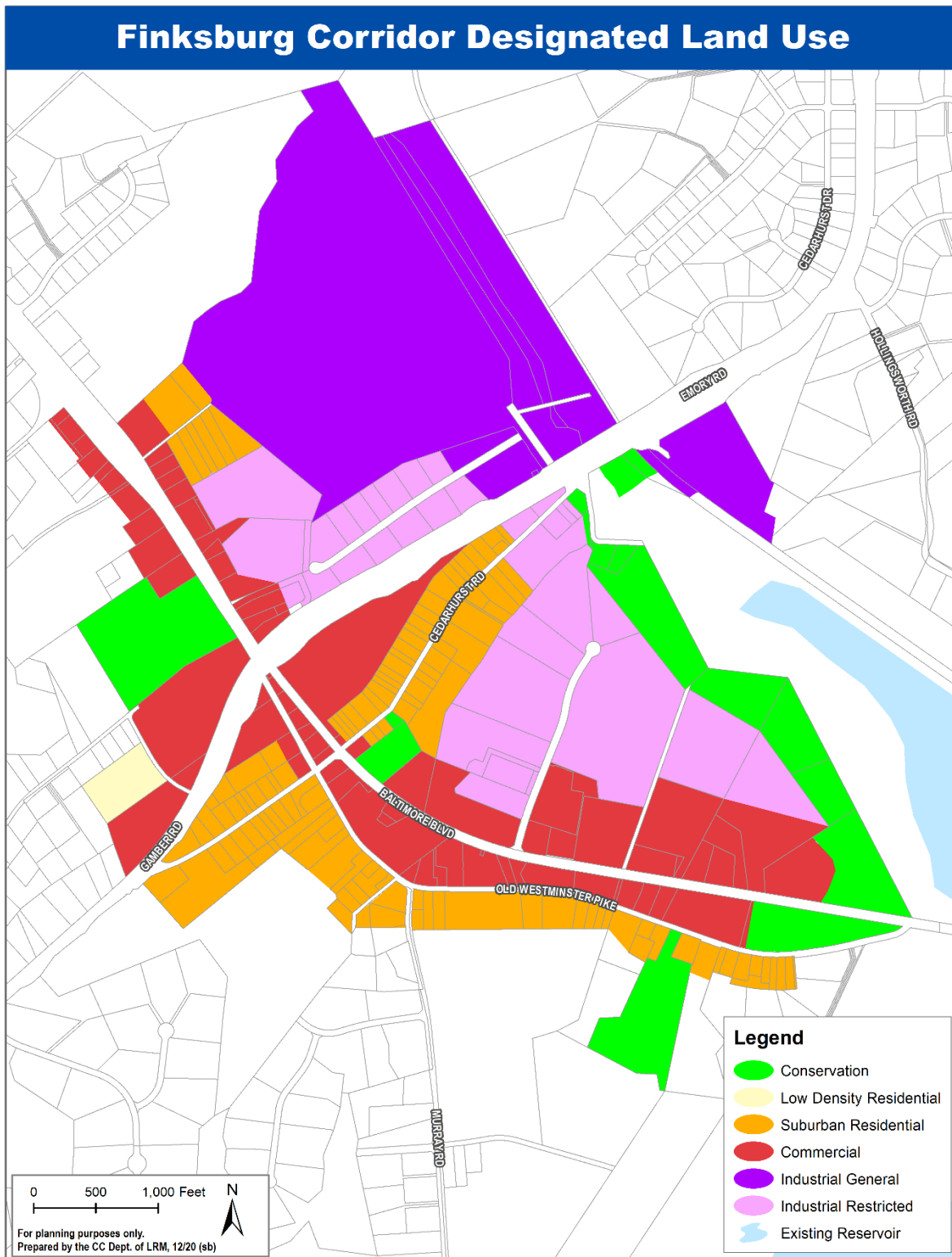


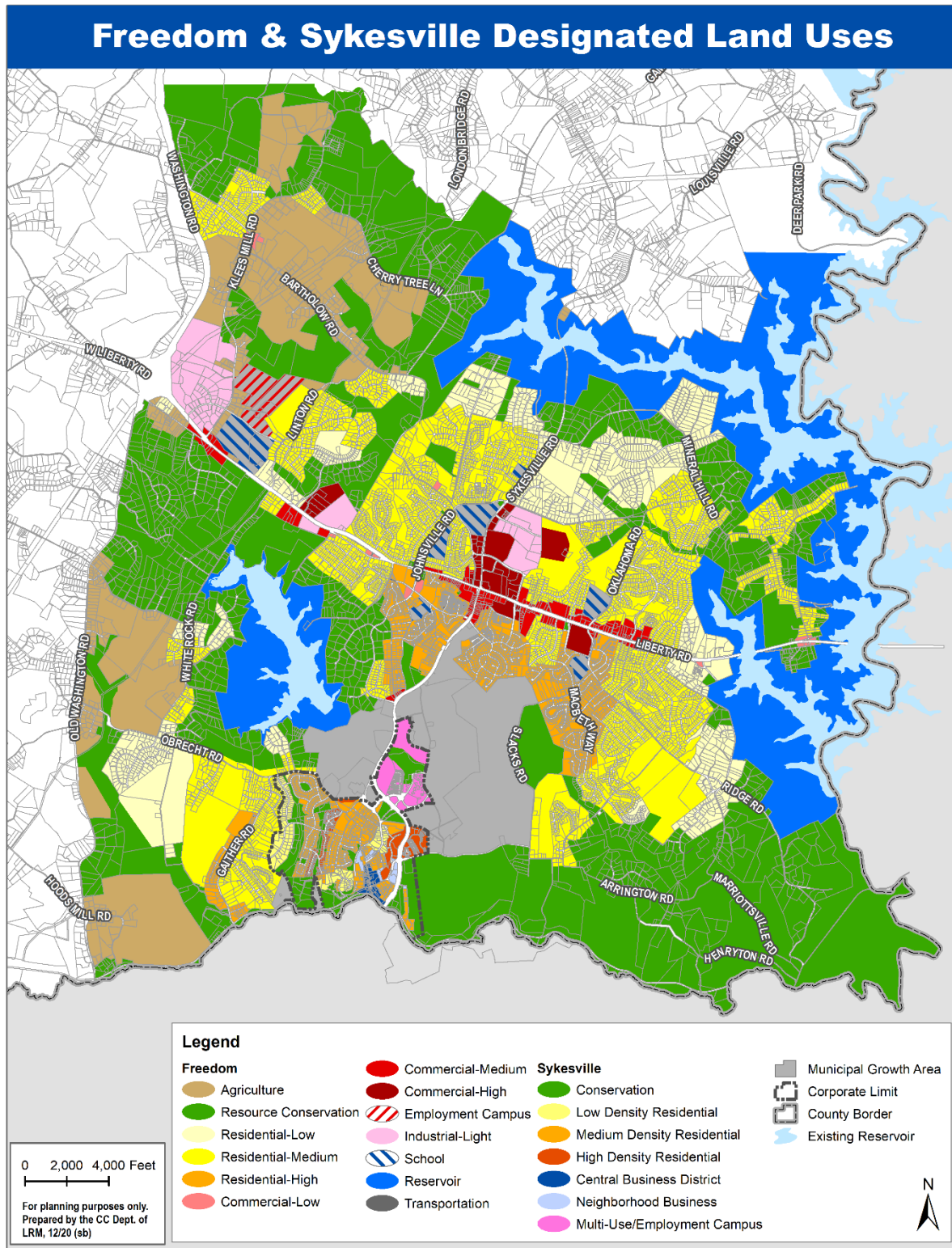


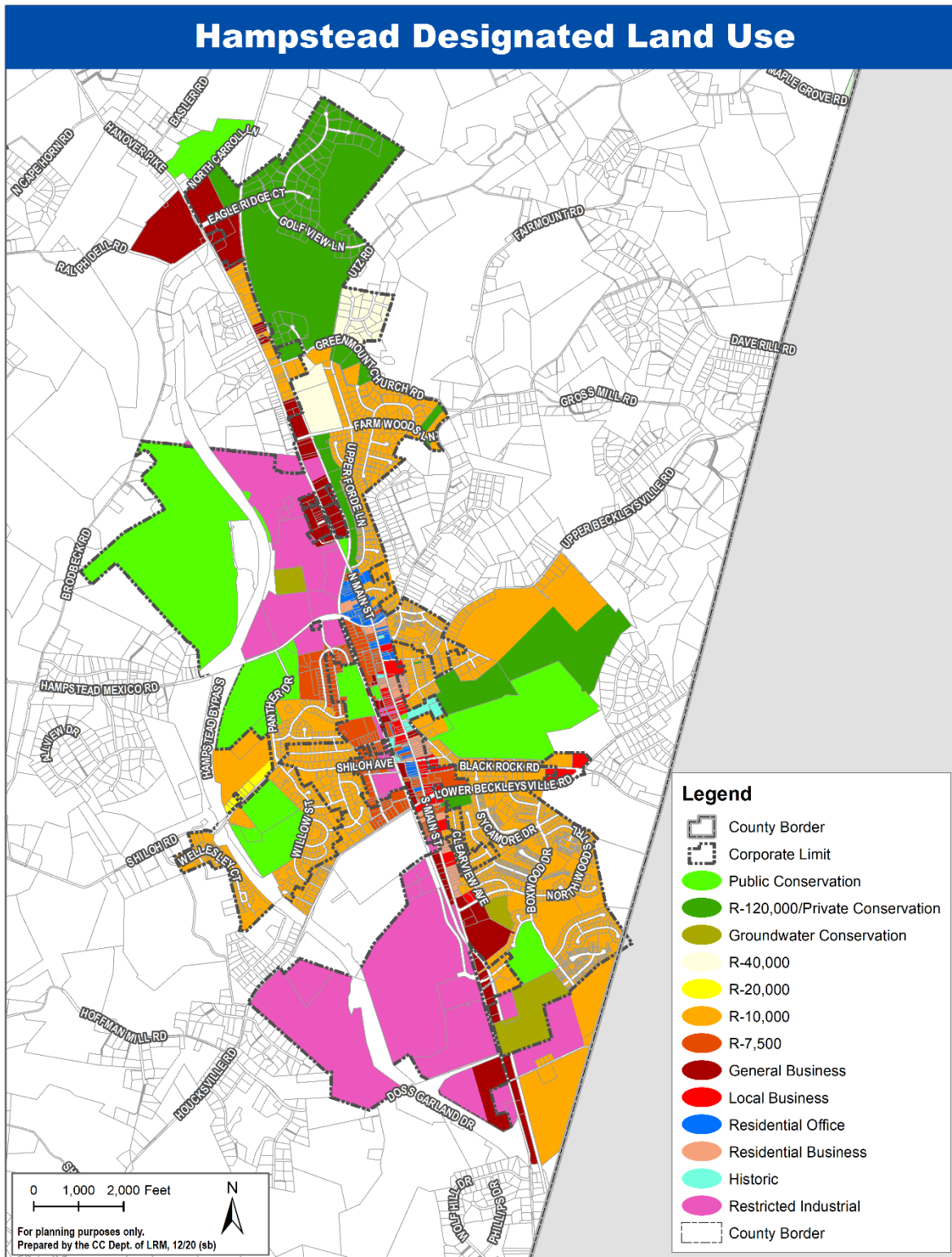


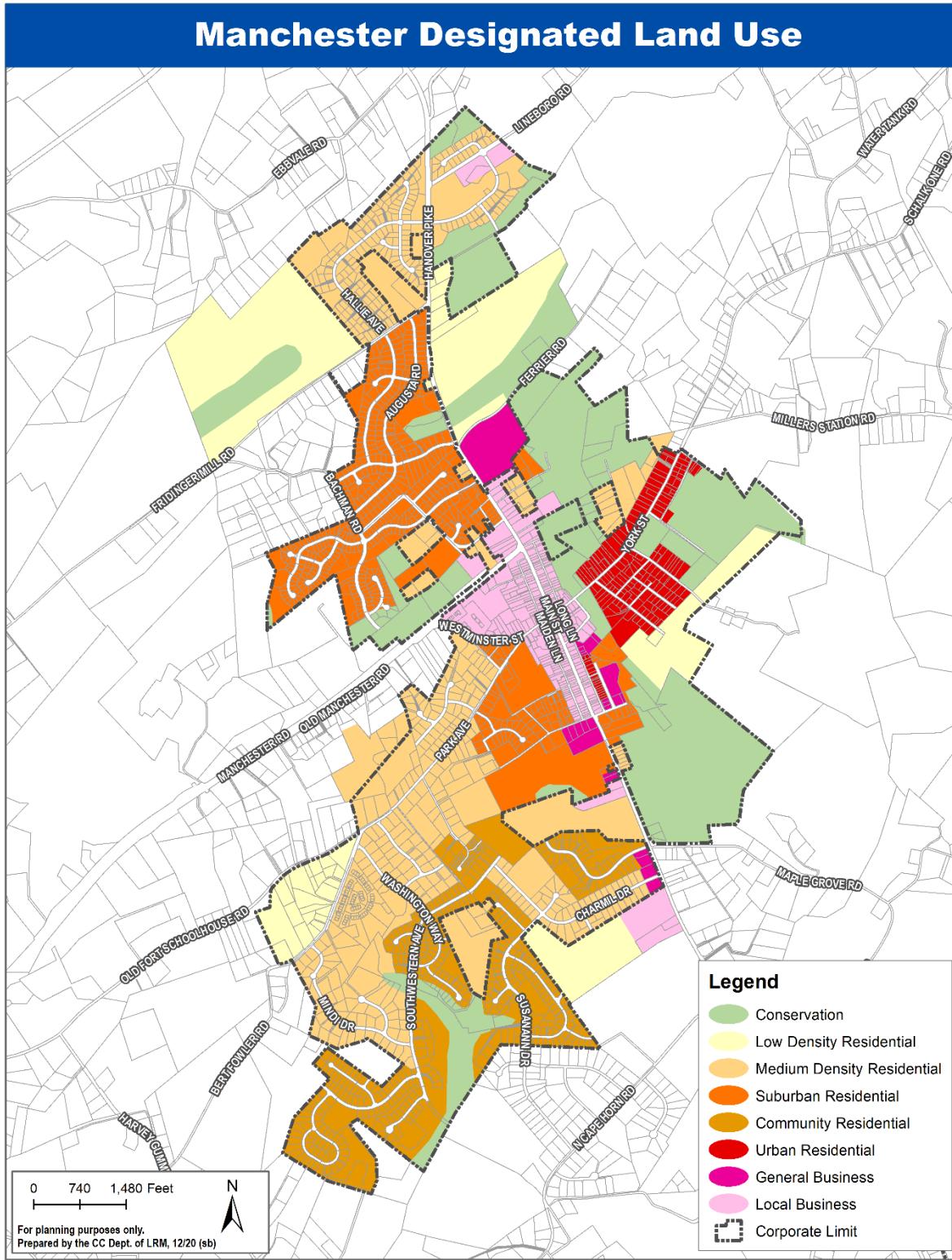
Appendix D – Maps: Designated Land Use

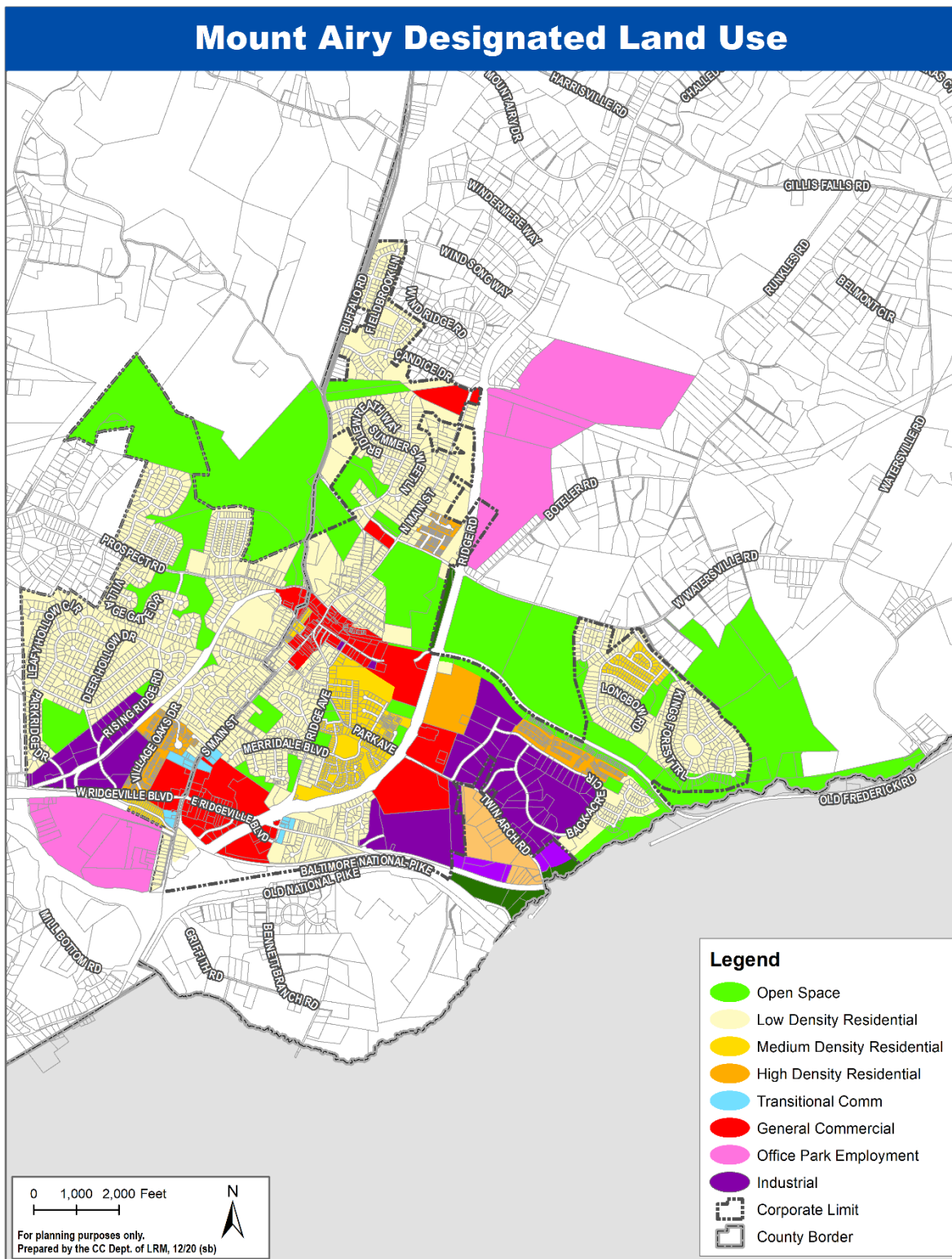


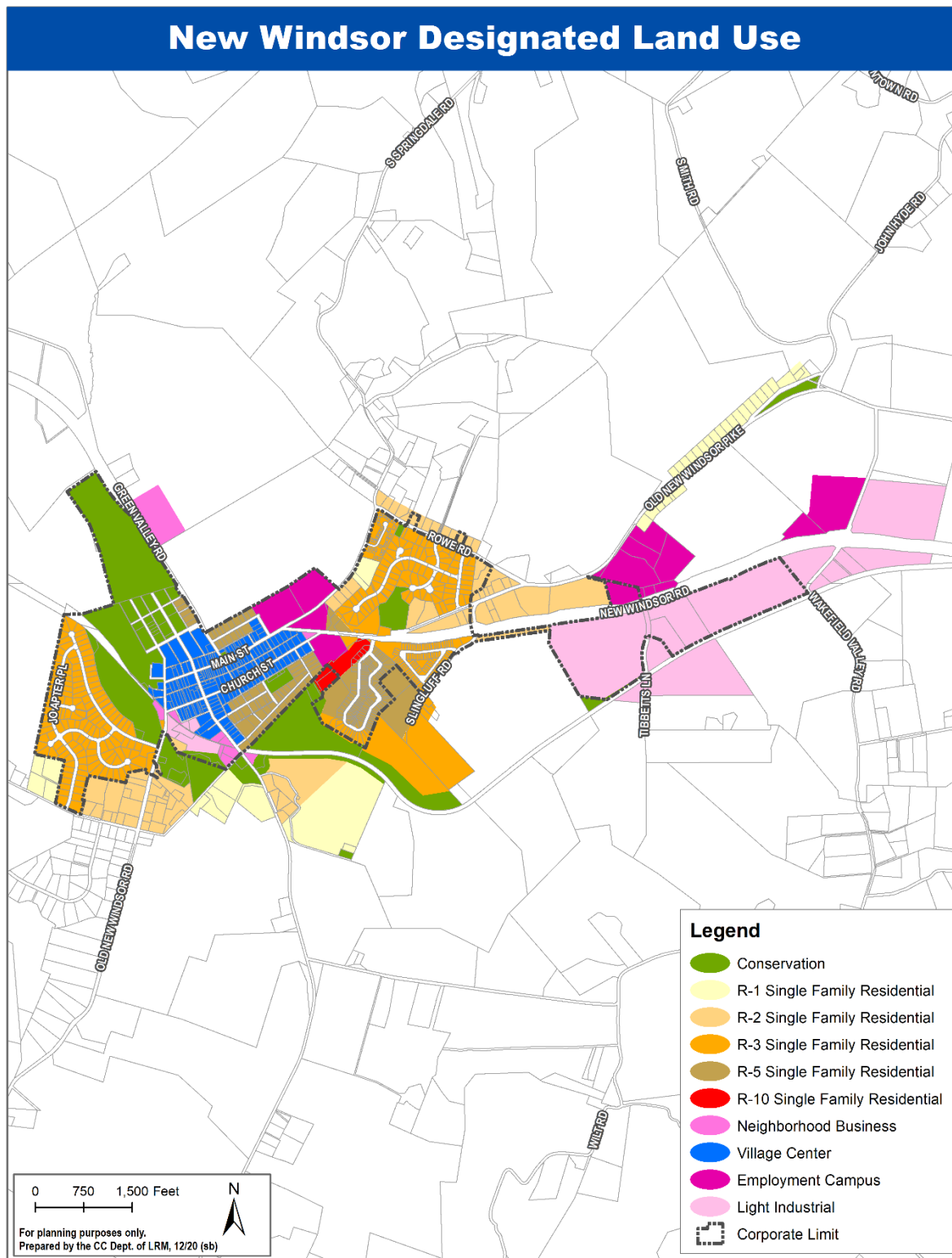


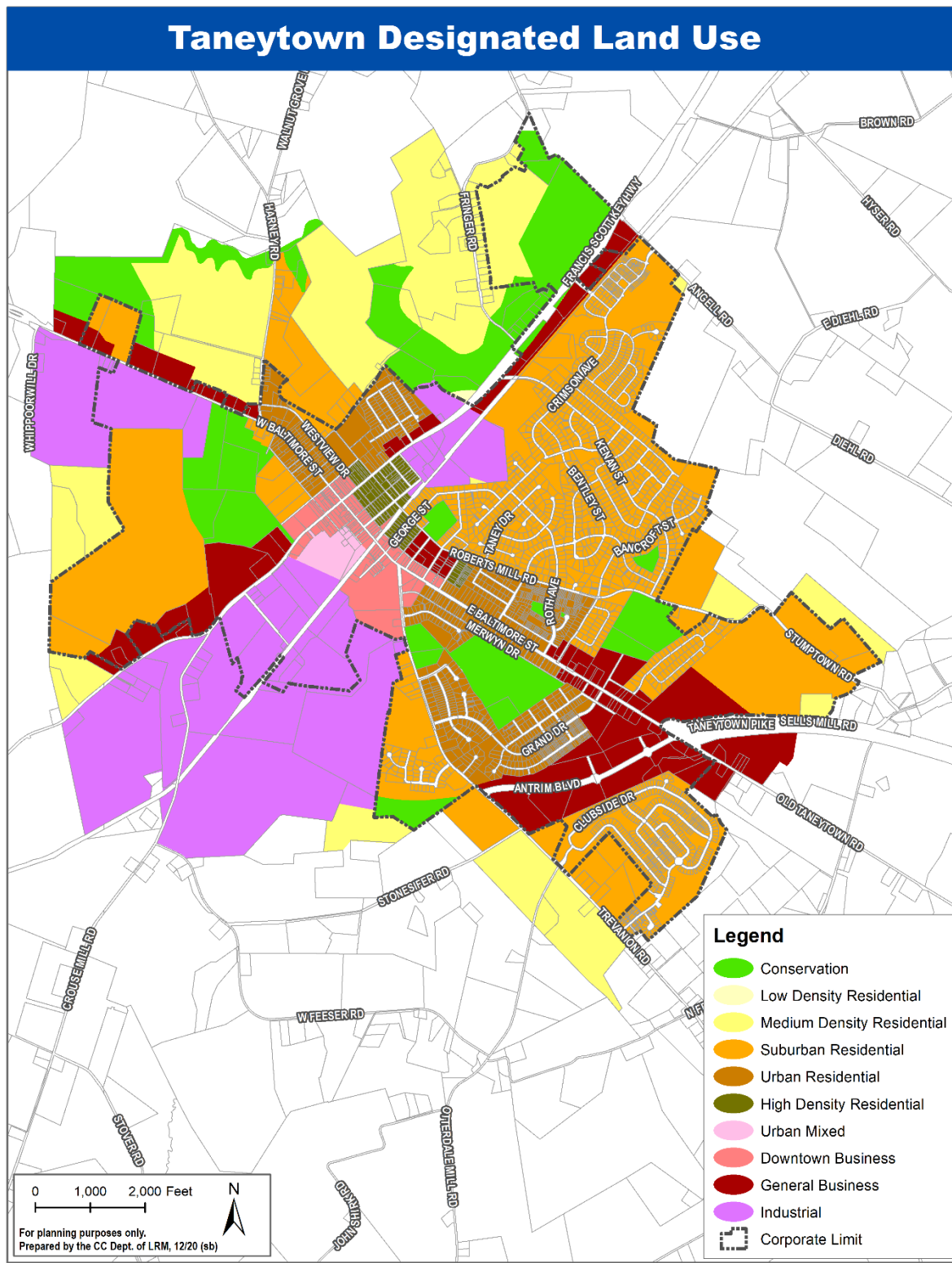


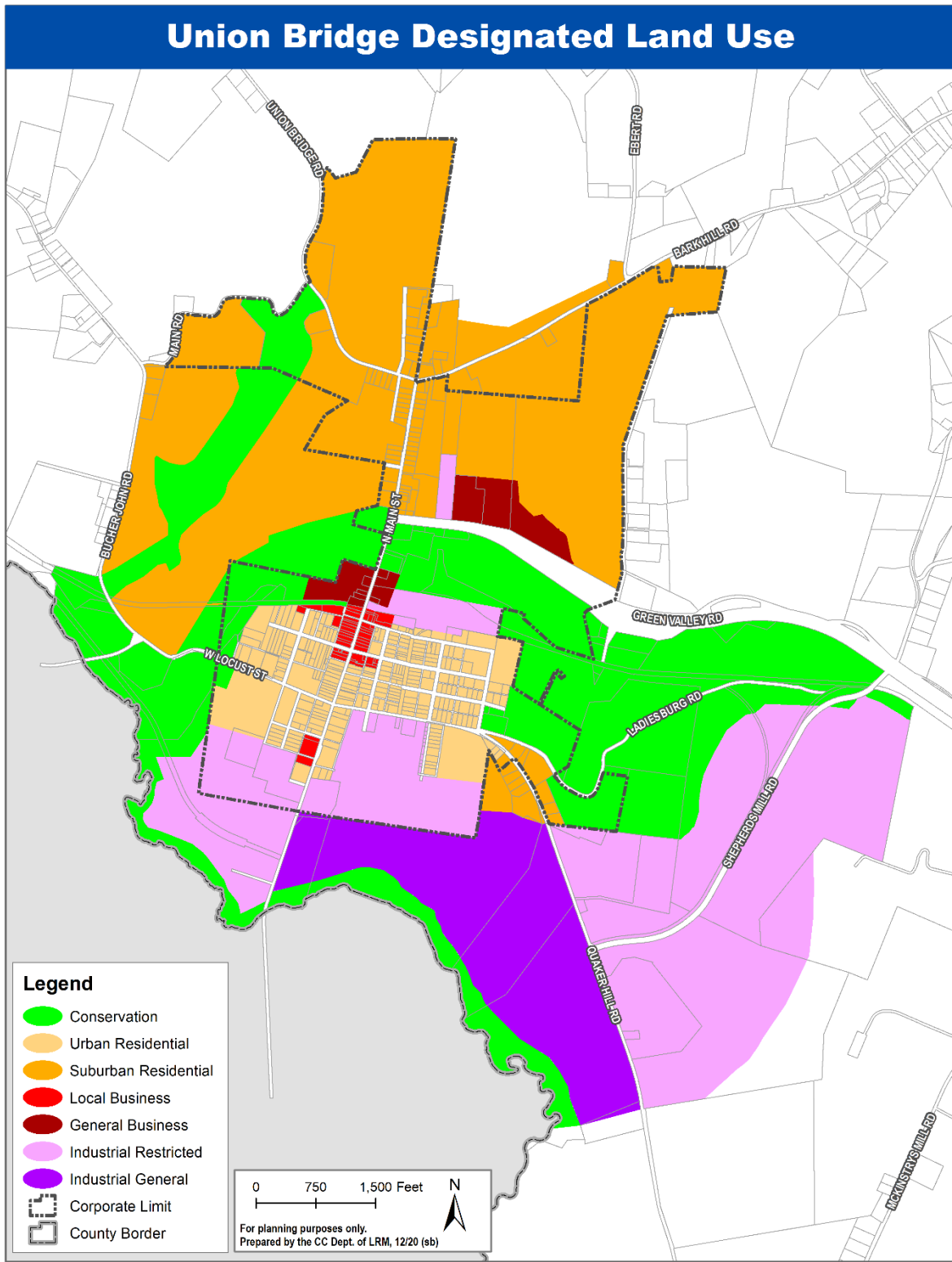


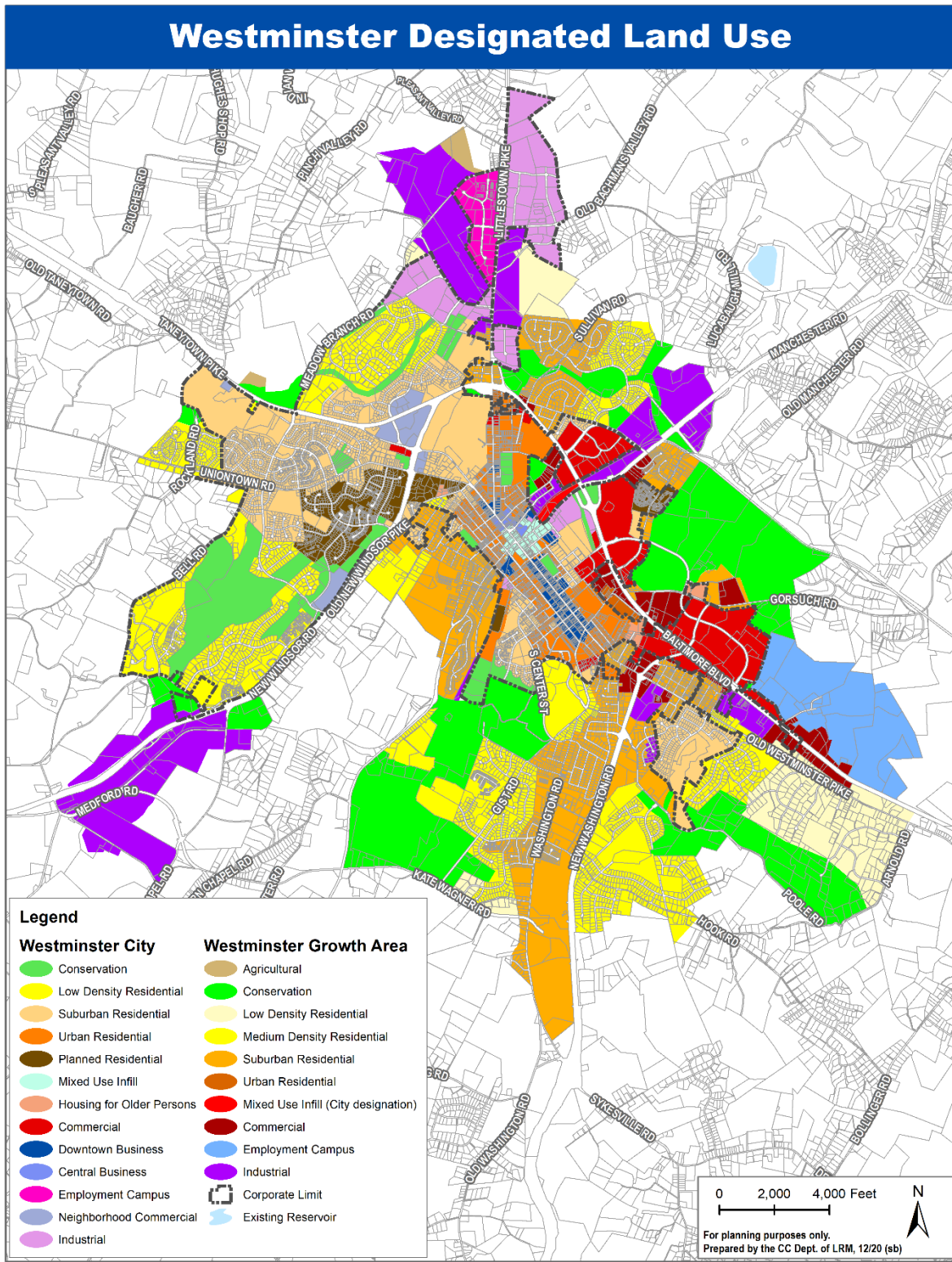




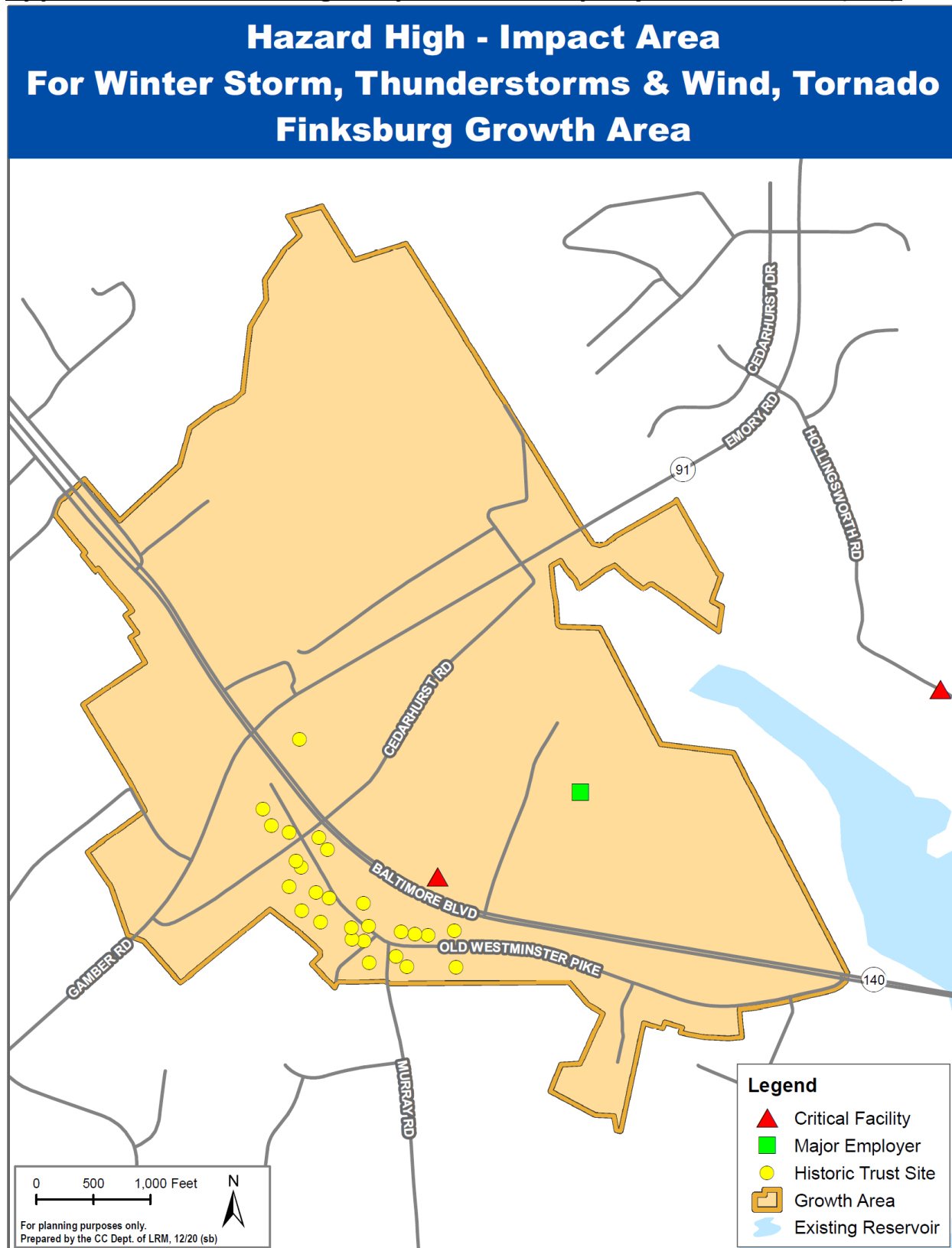




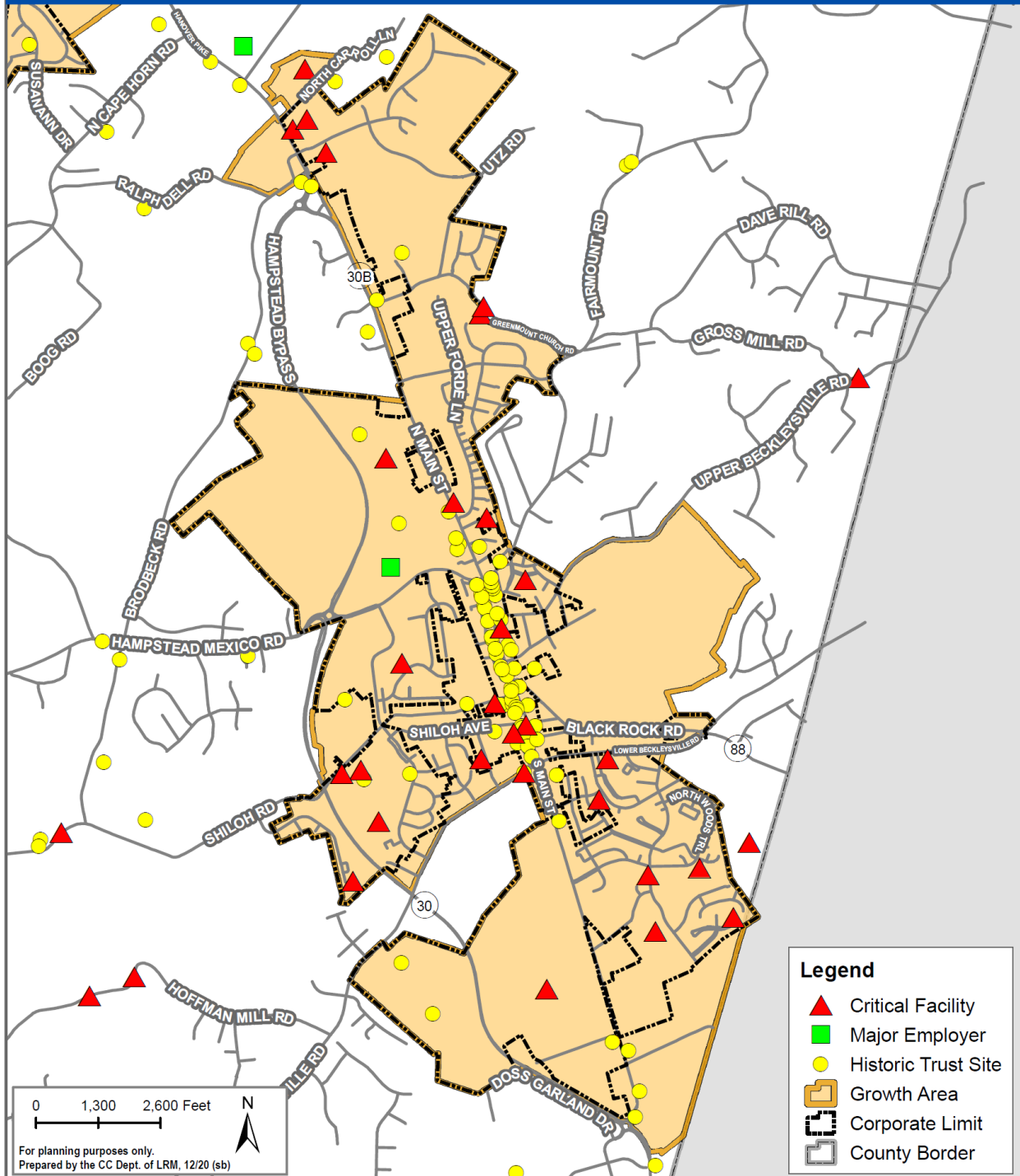


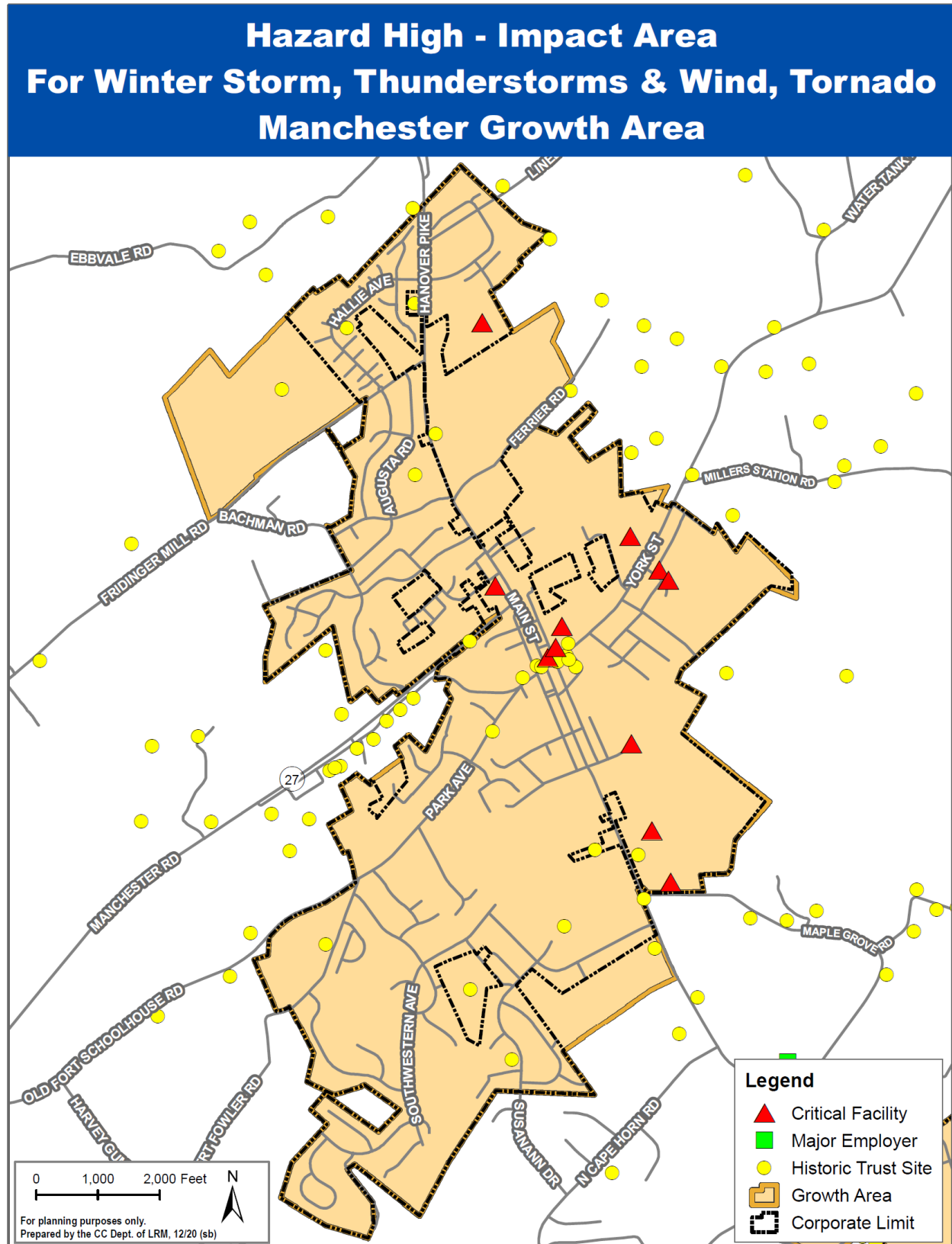


Appendix E – Hazard High Impact Area Maps by Growth Area (GA)

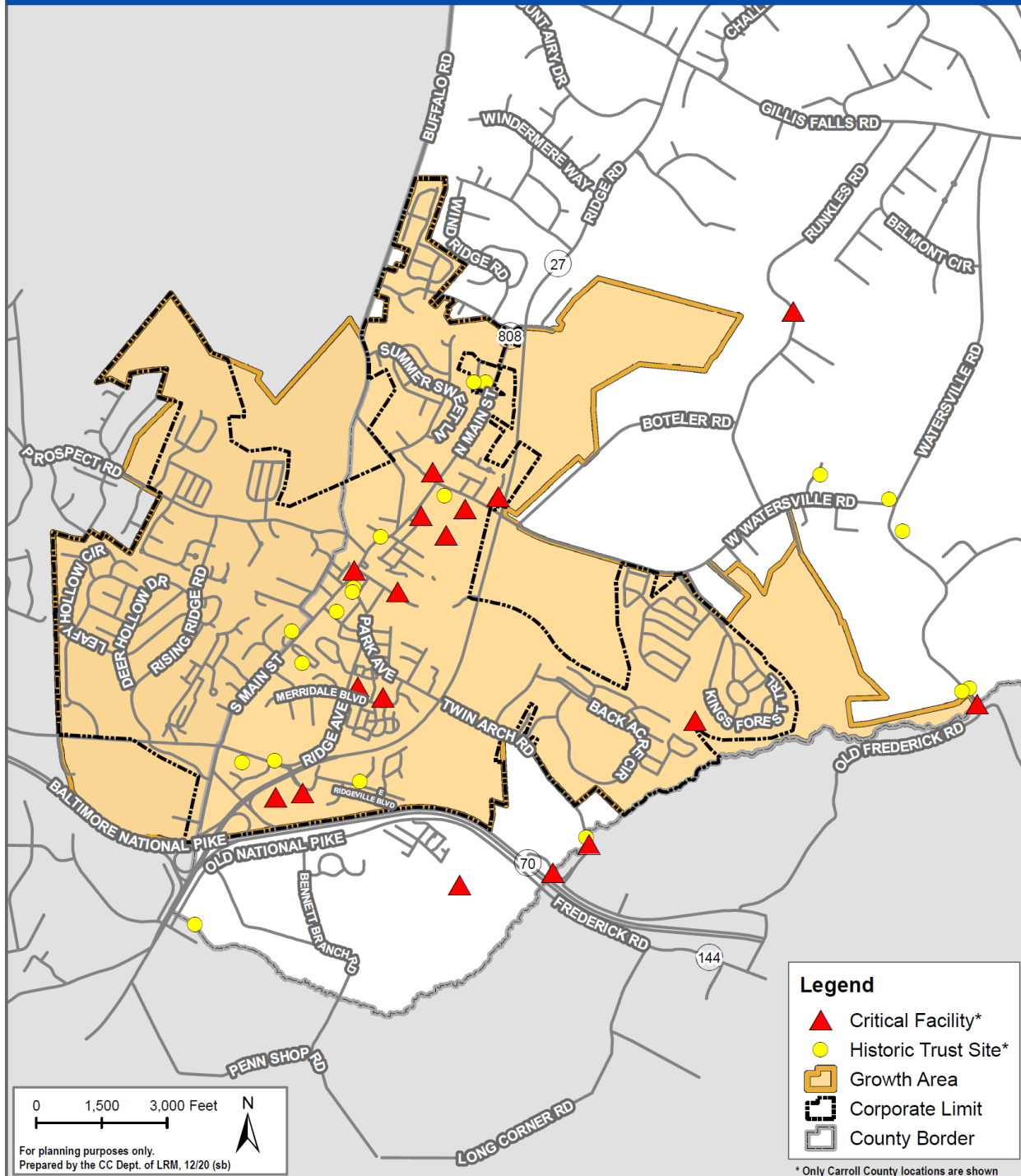


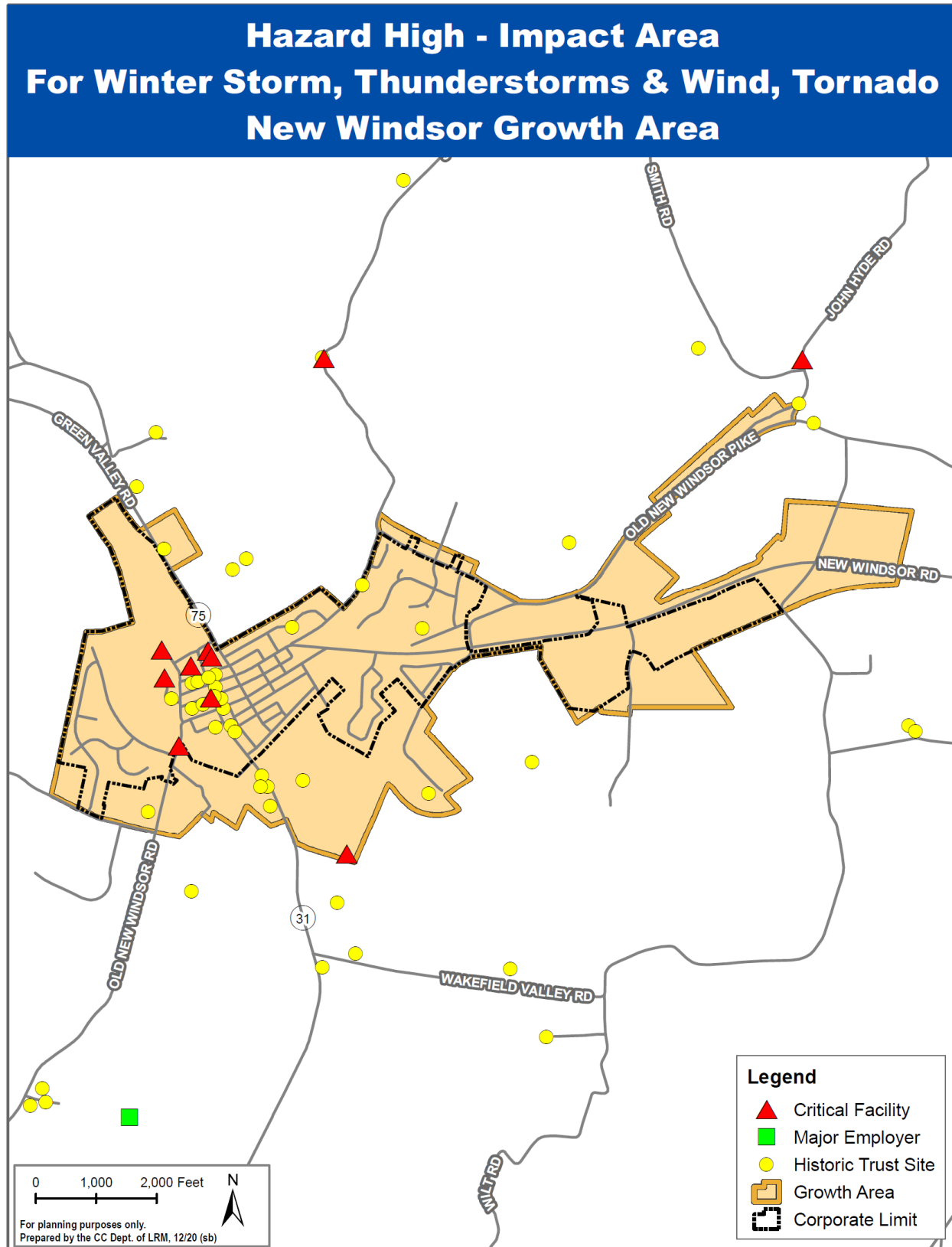
Hazard High - Impact Area For Winter Storm, Thunderstorms & Wind, Tornado Hampstead Growth Area

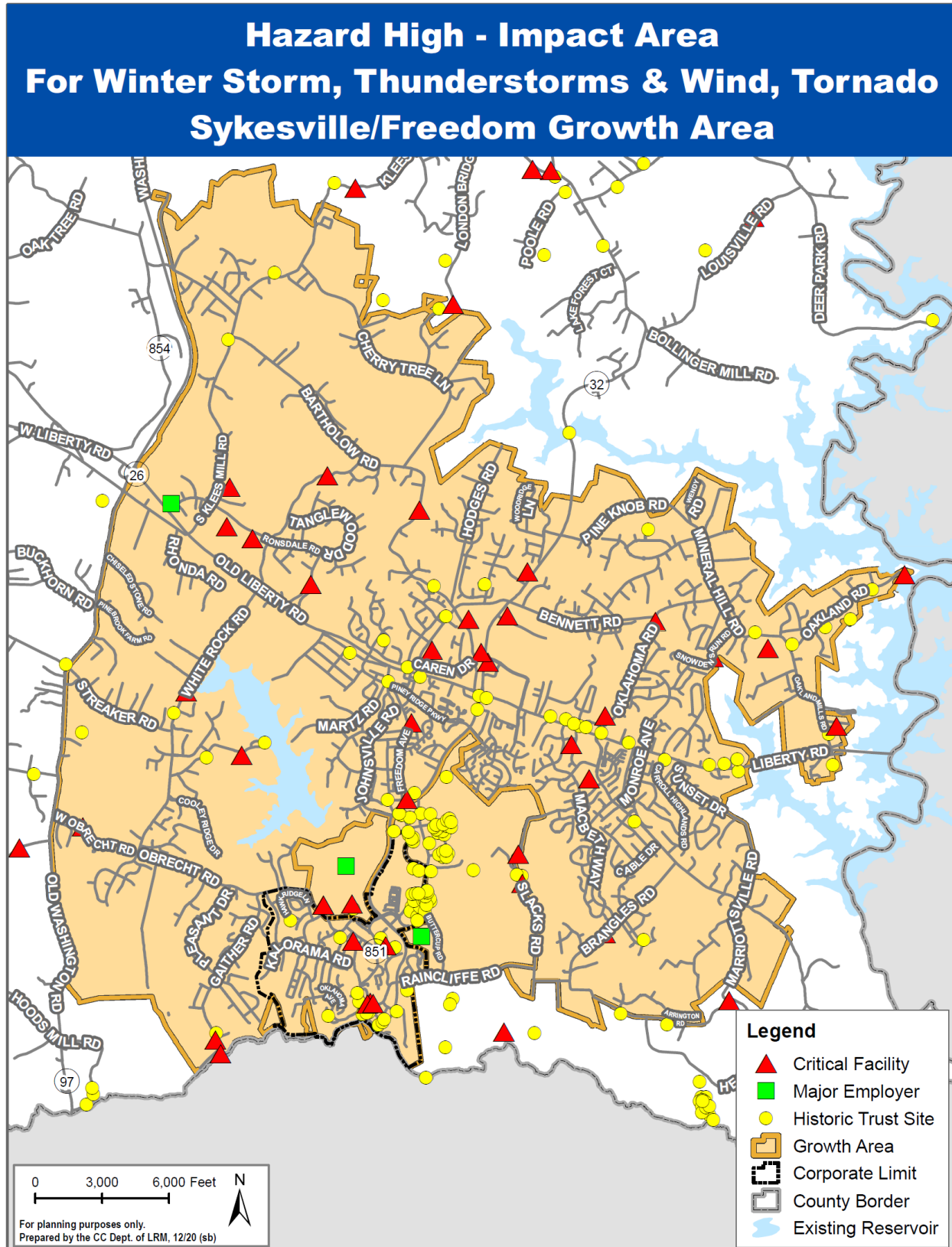




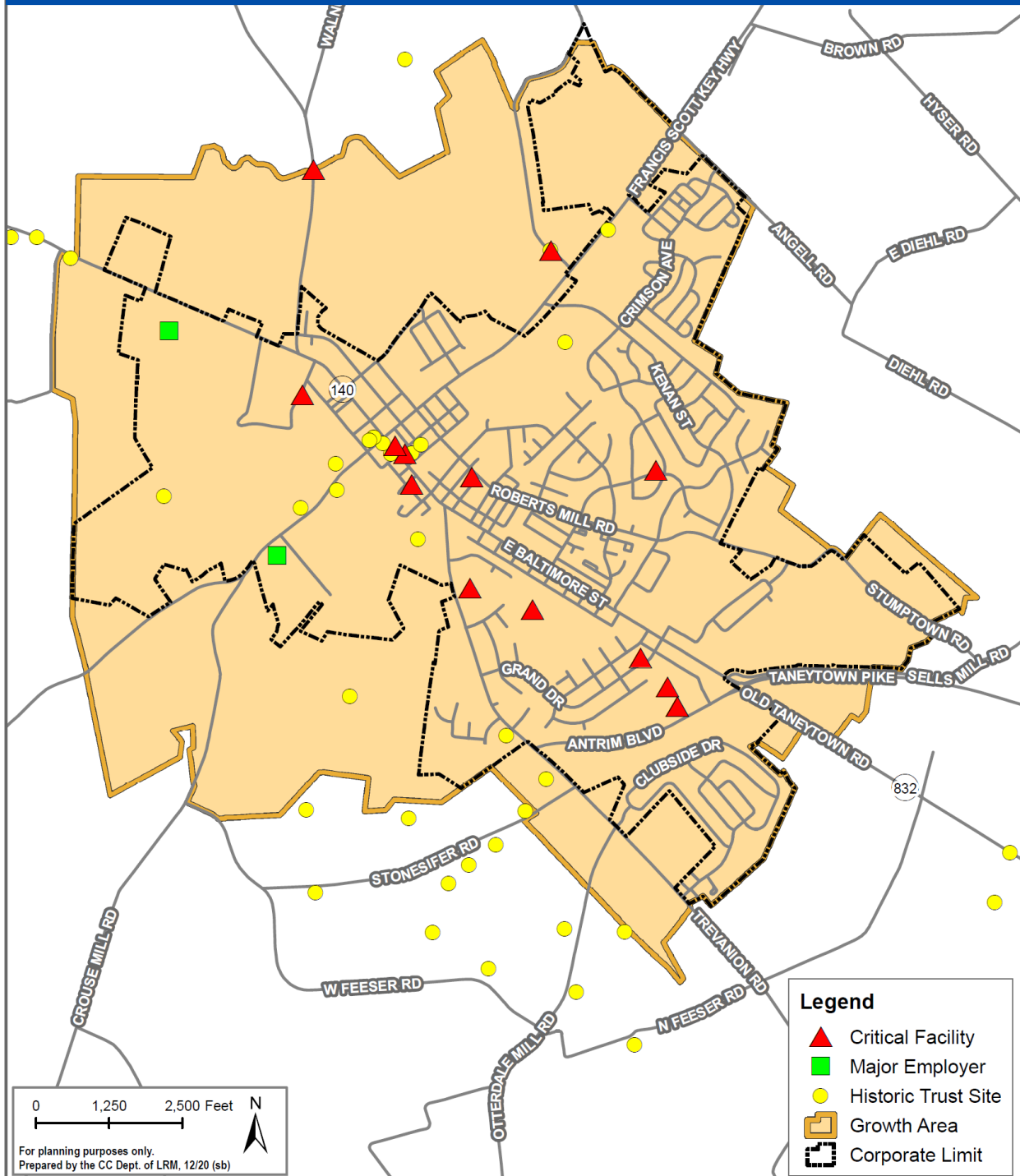
Hazard High - Impact Area For Winter Storm, Thunderstorms & Wind, Tornado Mount Airy Growth Area

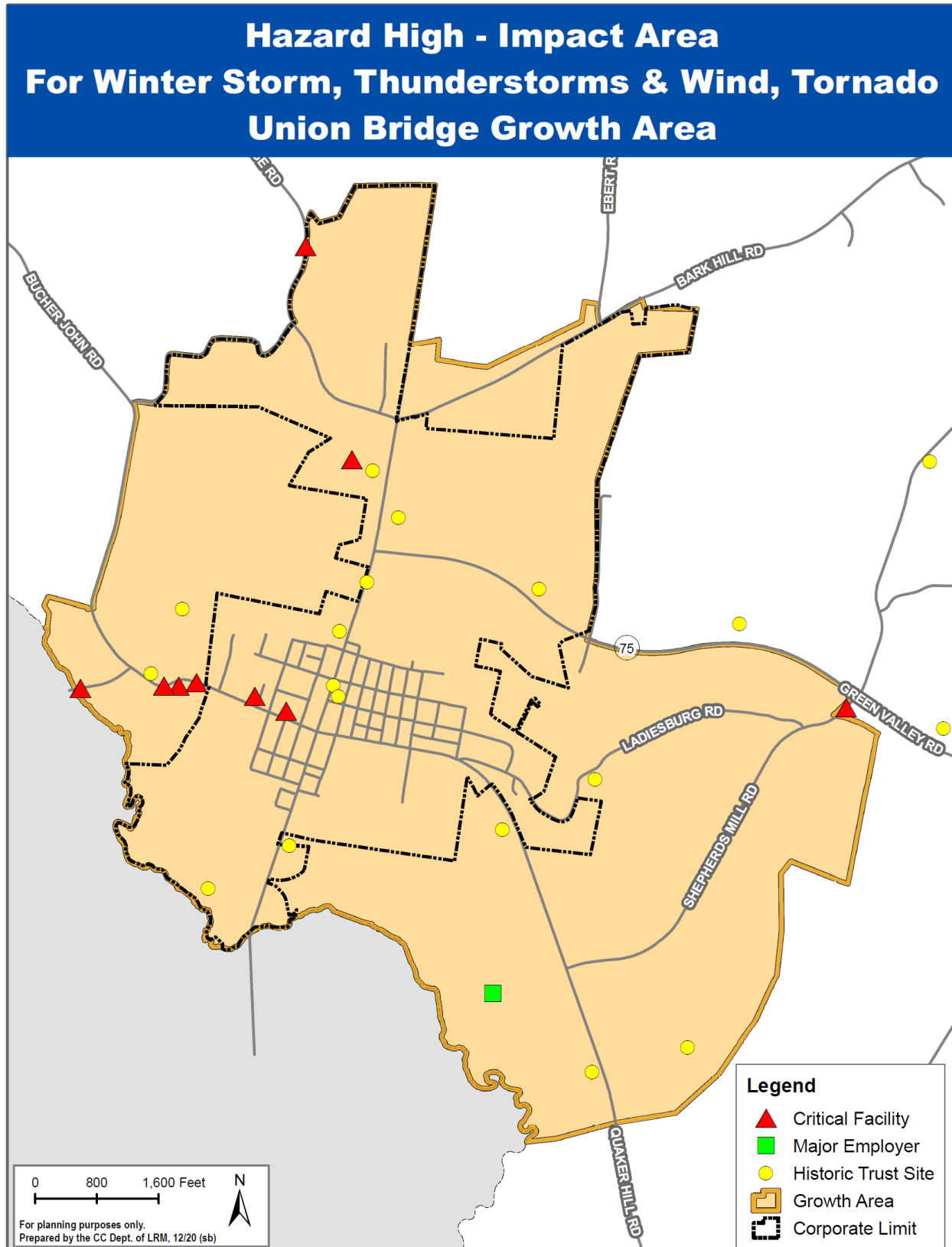


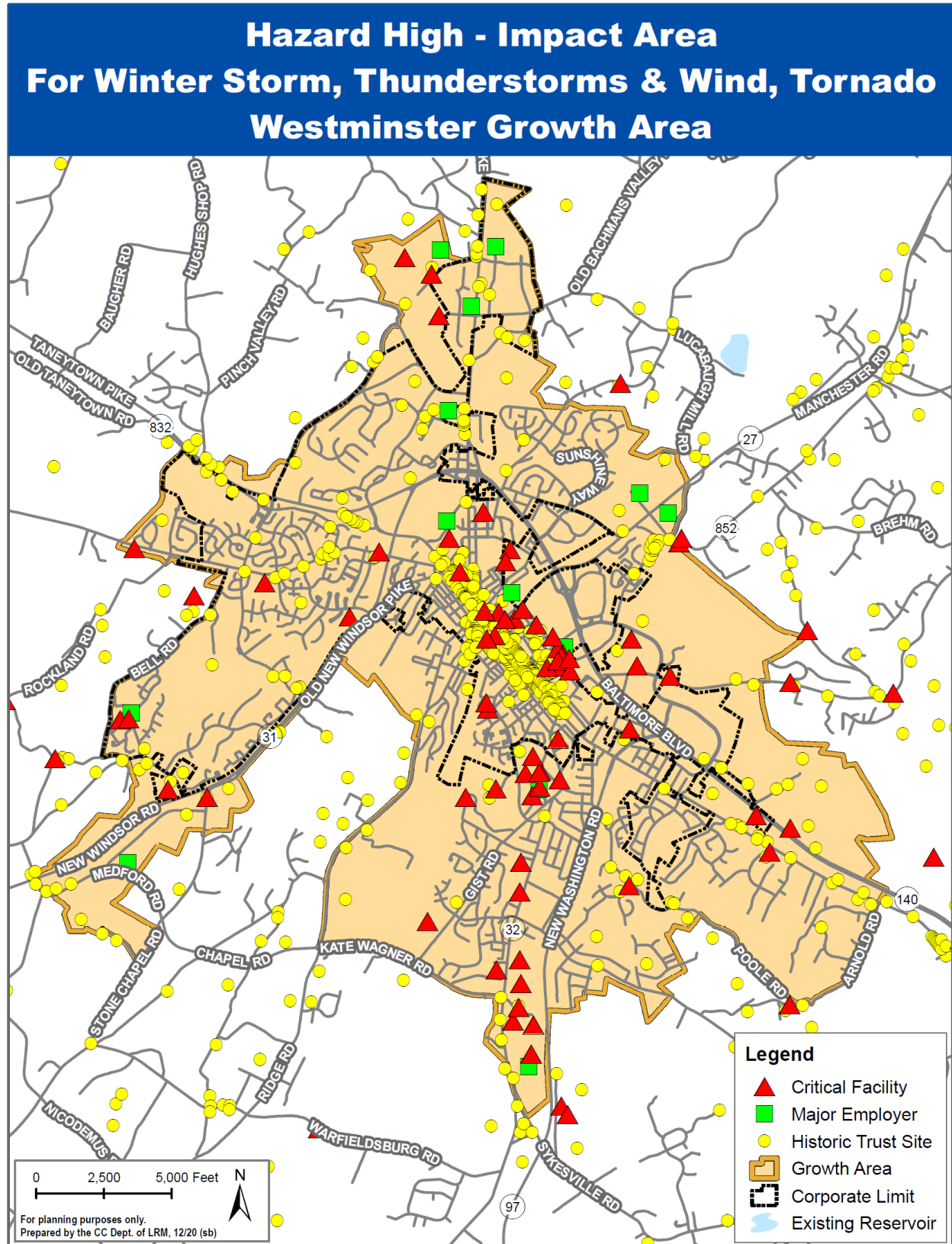




Hazard High - Impact Area For Winter Storm, Thunderstorms & Wind, Tornado Taneytown Growth Area







Appendix F – Public Participation Survey Information

--- PRESS RELEASE ---

For Immediate Release



Public Safety Seeks Resident Feedback on Hazard Survey

Westminster, MD, Monday, November 9, 2020 – Carroll County Emergency Management is reaching out to Carroll County residents to learn more about the types of hazards affecting our area and to help identify ideas for possible mitigation measures that might reduce the risk from those identified hazards. Residents can help the county by participating in this [short survey](#) designed to help inform the Hazard Mitigation Plan update process. Please complete the survey by December 1, 2020.

The Carroll County Department of Public Safety Emergency Management Division, in cooperation with the Carroll County Department of Planning and the Carroll County Department of Land and Resource Management, is currently updating the [Carroll County Hazard Mitigation Plan](#). Mitigation activities eliminate or reduce the probability of a disaster occurrence and are also designed to postpone, dissipate, or lessen the effects of a disaster or emergency, should one occur. Flooding, tornadoes, winter storms and drought are just a few examples of natural hazards that might affect Carroll County.

The Carroll County Hazard Mitigation Plan is developed and maintained both to identify and evaluate the level of risk that is posed by natural hazards and to help identify and prioritize possible mitigation projects and initiatives.

Thank you – your input is appreciated! Questions may be directed to Carroll County Emergency Management at 410-386-2296 or emergencymanagement@carrollcountymd.gov.

FOR IMMEDIATE RELEASE

**Contact: Carroll County Emergency Management
410-386-2296**

The Americans with Disabilities Act applies to the Carroll County Government and its programs, services, activities, and facilities. Anyone requiring an auxiliary aid or service for effective communication or who has a complaint should contact The Department of Citizen Services, 410.386.3600 or 1.888.302.8978 or MD Relay 7-1-1/1.800.735.2258 or email ada@carrollcountymd.gov as soon as possible but no later than 72 hours before the scheduled event.

Carroll County Hazard Mitigation Public Survey

The Carroll County Department of Public Safety, in cooperation with the Carroll County Department of Planning and the Carroll County Department of Land and Resource Management, is in the process of updating the Carroll County Hazard Mitigation Plan.

Please complete this short survey to assist us in learning more about the types of hazards that affect our area, as well as to help us identify ideas for possible mitigation measures that could reduce the risk from those identified hazards. You are not required to provide your name or contact information, but you may do so if you would like to.

1. What natural hazards affect your area most frequently or most severely? (Examples: flooding, severe thunderstorms, winter storms)

2. Have you experienced damage from any of these hazards?

Mark only one oval.

☐ Yes

☐ No

3. If you answered "YES" to Question 2, please provide a short description of the type of damage sustained.

4. What mitigation actions or projects do you feel would be helpful to reduce the risk from the hazards you identified above?

5. Name (optional)

6. Email (optional)

7. Phone (optional)

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Google Forms

Survey Results:

A total of 54 individuals participated in the hazard survey. Respondents identified severe storms and wind (30 mentions); flooding (17 mentions); and winter storms (16 mentions) as the hazards affecting their area most frequently.

Appendix G – Municipality Meetings

Throughout the development of the Plan, participation from all eight (8) municipalities participating in the Plan was encouraged. Carroll County Emergency Management conducted in person meetings and/or virtual meetings with all eight (8) Carroll County municipalities as noted below.

Town of Hampstead

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #1 with Town of Hampstead
October 10, 2019
1:30 p.m.
Hampstead Town Office**

Attendees:

Collins, Christy (Project Manager)
Hann, Kevin (Superintendent, Public Works)
Hawkins, Valerie (CC Emergency Management)
Ledley, Tammi (Town Manager)
Rodriguez, Matthew (CC Emergency Management)
Snyder, David (Chief of Police)
Vaccare, Lorena (Assistant Zoning Administrator)
Wagoner, Price (CC Dept. of Planning)

- Overview of the structure and content of the current Carroll County Hazard Mitigation Plan (CCHMP) and brief overview of the MD State Hazard Mitigation Plan (as it relates to CCHMP and requirements for update)
- Outline of hazard types most likely to affect Carroll County, and discussion regarding the hazards to be addressed in the updated CCHMP
- Definition of critical infrastructure for the CCHMP
- Roundtable discussion of historical and anecdotal information with town staff regarding risk posed to critical infrastructure facilities in relation to specified hazard types
 - Hazards affecting the municipality most frequently or severely
 - Hazards having the greatest impact of the municipality
 - Mitigation efforts intended to address these hazards that have been developed and/or implemented in/by the municipality
 - Any additional mitigation efforts that may be of value moving forward

General concerns from Town staff related to hazard mitigation and emergency response included:

Fire station – spring under building identified during recent sidewalk replacement

Stormwater – new structures in place after MD 30 construction

Police Station – currently housed in old bank building; building structurally sound but has limited space and needs new generator; working on developing COOP to allow department to operate in decentralized fashion if building is rendered unusable

WTP/WWTP – multiple wells in operation, no issues noted during previous storms; multiple water towers create dual capacity; WTP – no surveillance cameras in place, visual inspection of facility each day; well heads are protected but no security or surveillance systems are in place; generators (3 mobile and 1 fixed) are in service

DPW – two buildings, both set up with transfer switches to accept mobile generator

CCHMP Update – Town of Hampstead, continued

No town owned/maintained bridges

Dams – the town owns/maintains three dams classified as Significant Hazard by MDE; EAPs are in place for all three, but additional engineering studies are needed to more effectively identify inundation areas

Railroad traffic through town – concern regarding rail incidents/accidents

Historic sites within the town that could be affected by identified hazards

**Hazard Mitigation Planning
Town of Hampstead
May 24, 2022**

Name	Position	Email	Phone
ANDREW GRAY	CC PLANNER	AGRAY@CARROLLCOUNTYMD.GOV	410-386-5145
Jim Roark	Asst. Zoning Administrator	AGRAY@CARROLLCOUNTYMD.GOV jroark@hampsteadmd.gov	410-234-7408
Thami Ledley	Town Manager	ledley@hampsteadmd.gov	410 239-7408
Kevin Hann	Superintendent of P.W.	Khanne.hann@psmd.gov	410-239-6659
MARTHA ROSS	CEM	AGRAY@CARROLLCOUNTYMD.GOV mross@carrollcountymd.gov	410 386 2577
MARIE HARRIS	CEM	Mharris@carrollcountymd.gov	410 386 2592

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #2 with Town of Hampstead
May 24, 2022
1:00 p.m.
Hampstead Town Office**

Attendees:

Gray, Andrew (CC Dept. of Planning)
Hann, Kevin (Superintendent, Public Works)
Hawkins, Valerie (CC Emergency Management)
Ledley, Tammi (Town Manager)
Roark, Jim (Asst. Zoning Administrator)
Rodriguez, Matthew (CC Emergency Management)

- Hazard Mitigation Planning Overview
 - o Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding
 - o Discussion of CC HMP Initial DRAFT document provided to participants prior to meeting
- Roundtable discussion

Fire station – new fire department building construction project underway

Stormwater – new structures in place after MD 30 construction; Route 30/Main Street doesn't flood like it used to; in general, flooding only seen in highly localized circumstances

Police Station – currently housed in old bank building; building structurally sound but has limited space and needs upgraded generator; has full basement and holding cells that could be utilized as storm shelters

All Town employees have been issued laptops for COOP purposes; Town Hall has basement which could be used for storm shelter; Town Hall has a generator

WTP/WWTP – Hillcrest water tower is now gone....total system capacity is 900,000 gallons (or approximately 3 days) storage; Super Pump house is in service; mobile generators (3 mobile and one fixed) more than enough to sustain water system in storm events; in process of bringing two wells out of service for a decade back online which would bring additional water resources ; well exploration planned to address need for future water resources; WTP surveillance still not in place; Police Dept. looking into camera installation at Route 30 location

DPW – two buildings, both set up with transfer switches to accept mobile generator; no basement in DPW buildings; DPW buildings not storm resilient but would be difficult to harden without complete replacement

Dams – the town owns/maintains three dams classified as Significant Hazard by MDE; EAPs are in place for all three, but additional engineering studies are needed to more effectively identify inundation areas; projects underway to allow for possible downgrading of hazard classification

Town of Manchester

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #1 with Town of Manchester
October 10, 2019
9:30 a.m.
Manchester Town Office**

Attendees:

Hawkins, Valerie (CC Emergency Management)
Kuhns, Rodney (Director, Public Works)
Miller, Steve (Town Manager)
Rodriguez, Matthew (CC Emergency Management)
Wagoner, Price (CC Dept. of Planning)
Wilder, Michelle (Zoning Administrator)

- Overview of the structure and content of the current Carroll County Hazard Mitigation Plan (CCHMP) and brief overview of the MD State Hazard Mitigation Plan (as it relates to CCHMP and requirements for update)
- Outline of hazard types most likely to affect Carroll County, and discussion regarding the hazards to be addressed in the updated CCHMP
- Definition of critical infrastructure for the CCHMP
- Roundtable discussion of historical and anecdotal information with town staff regarding risk posed to critical infrastructure facilities in relation to specified hazard types
 - Hazards affecting the municipality most frequently or severely
 - Hazards having the greatest impact of the municipality
 - Mitigation efforts intended to address these hazards that have been developed and/or implemented in/by the municipality
 - Any additional mitigation efforts that may be of value moving forward

General concerns from Town staff related to hazard mitigation and emergency response included:

- Protection of municipal water supply, specifically well locations in relation to MD Route 30 and incidence of transportation accidents
- High water/street flooding during short duration, high precipitation storms
- Truck traffic/hazardous materials incidents
- Mass casualty events, especially on MD Route 30 and MD Route 27

WTP/WWTP – all major facilities are on generator; robust SOPs are in place to routinely check operation and re-fuel during times of use; WWTP not protected from flooding; wells in flood prone areas are already protected from flooding

AL/NH – large privately held nursing home has EAP in place

Police station/municipal buildings – new building was constructed within the past few years; houses town administrative offices as well as police department offices and provides for town EOC capability with showers, dormitory space; is on generator.

Drought – an emergency water supply plan and water usage plan are in place for drought conditions

[illegible]

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #2 with Town of Manchester
May 20, 2022
9:00 a.m.
Manchester Town Office**

Attendees:

Fossett, Tiffany (CC Dept. of Planning)
Gray, Andrew (CC Dept. of Planning)
Hawkins, Valerie (CC Emergency Management)
Kuhns, Rodney (Director, Public Works)

- Hazard Mitigation Planning Overview
 - o Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding
 - o Discussion of CC HMP Initial DRAFT document provided to participants prior to meeting
- Roundtable discussion
 - o WTP/WWTP – all major facilities are on generator; robust SOPs are in place to routinely check operation and re-fuel during times of use; getting ready for enhanced nutrient removal project – if approved, should be operational within 4 years; WWTP not protected from flooding but not usually flooded in rain events
 - o Police station/municipal buildings – new building was constructed within the past few years; houses town administrative offices as well as police department offices and provides for town EOC capability with showers, dormitory space; is on generator.
 - o Drought – an emergency water supply plan and water usage plan remain in place for drought conditions.
 - o Trees in parks and along Main Street are the most frequent call type during storms; Town trims and removes dead trees as needed
 - o Flooding issues on some streets will be mitigated by stormwater management projects associated with new development; stormwater capacity recently added Charmil Drive facility

Town of Mount Airy

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #1 with Town of Mount Airy
November 12, 2019
10:30 a.m.
Mount Airy Town Offices**

Attendees:

Breeding, John (Planning)
Campanile, Gina (Communications)
Hawkins, Valerie (CC Emergency Management)
Johnson, Brian (Public Works)
Lane, Mary (CC Dept. of Planning)
Reitz, Doug (Chief of Police)
Rodriguez, Matt (CC Emergency Management)
Snyder, Curt (Mt. Airy Police Dept.)
Warrington, David (Town Manager)

- Overview of the structure and content of the current Carroll County Hazard Mitigation Plan (CCHMP) and brief overview of the MD State Hazard Mitigation Plan (as it relates to CCHMP and requirements for update)
- Outline of hazard types most likely to affect Carroll County, and discussion regarding the hazards to be addressed in the updated CCHMP
- Definition of critical infrastructure for the CCHMP
- Roundtable discussion of historical and anecdotal information with town staff regarding risk posed to critical infrastructure facilities in relation to specified hazard types
 - Hazards affecting the municipality most frequently or severely
 - Hazards having the greatest impact of the municipality
 - Mitigation efforts intended to address these hazards that have been developed and/or implemented in/by the municipality
 - Any additional mitigation efforts that may be of value moving forward

General concerns from Town staff related to hazard mitigation and emergency response (specific to Town facilities and infrastructure located within Carroll County) included:

Police department – currently operating out of temporary location until permanent building is constructed; current facility is not equipped with generator

Hospitals/Healthcare facilities – dialysis center and health and wellness pavilion both located within Town limits; dialysis center has emergency plan in place; AL/NH (Lorien) located within Town limits

Municipal Buildings – Town Hall is not equipped with generator; other Town-owned buildings either located in Frederick County, scheduled to be demolished, or had no significant issues identified

Roads/Bridges – no issues identified with Town maintained roads; no bridges located in Town

Twin Arch Road is subject to flooding but is not within Town limits

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #2 with Town of Mount Airy
April 26, 2022
2:00 p.m.
Mount Airy Town Offices**

Attendees:

Breeding, John (Planning)
Fossett, Tiffany (CC Dept. of Planning)
Hawkins, Valerie (CC Emergency Management)
Lane, Mary (CC Dept. of Planning)
Rodriguez, Matt (CC Emergency Management)

- Hazard Mitigation Planning Overview
 - o Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding
 - o Discussion of CC HMP Initial DRAFT document provided to participants prior to meeting
- Roundtable Discussion
 - o Town Hall and Police Department do not currently have generators; Police Department is currently housed in temporary location so generator installation for that facility would need to be incorporated into overall building project for permanent facility. Neither Town Hall or Police Department building have FEMA approved safe rooms.
 - o Municipal Buildings – other Town-owned buildings located in Frederick County, scheduled to be demolished, or have had no significant issues identified
 - o Twin Arch Road is subject to flooding and traffic issues at the railroad underpass but is not within Town limits
 - o Water main on Center Street recently replaced, getting ready to replace water main on Prospect Road (upgrading from 8" to 12" lines); Public Works does I & I study each year; John B. will check on status of any water conservation plans currently in place
 - o WTP and WWTP do not routinely experience any flooding issues
 - o City Hall windows are not currently hardened against wind borne debris
 - o Town of Mt. Airy has an EOP in place

Town of New Windsor

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #1 with Town of New Windsor
October 11, 2019
1:30 p.m.
New Windsor Town Office**

Attendees:

Dye, Gary (Town Manager)
Hawkins, Valerie (CC Emergency Management)
Myers, Wayne (Public Works)
Wagoner, Price (CC Dept. of Planning)

- Overview of the structure and content of the current Carroll County Hazard Mitigation Plan (CCHMP) and brief overview of the MD State Hazard Mitigation Plan (as it relates to CCHMP and requirements for update)
- Outline of hazard types most likely to affect Carroll County, and discussion regarding the hazards to be addressed in the updated CCHMP
- Definition of critical infrastructure for the CCHMP
- Roundtable discussion of historical and anecdotal information with town staff regarding risk posed to critical infrastructure facilities in relation to specified hazard types
 - Hazards affecting the municipality most frequently or severely
 - Hazards having the greatest impact of the municipality
 - Mitigation efforts intended to address these hazards that have been developed and/or implemented in/by the municipality
 - Any additional mitigation efforts that may be of value moving forward

General concerns from Town staff related to hazard mitigation and emergency response included:

Municipal Buildings – renovation/addition to town offices almost complete; no generator; possible EOC space if needed

Schools – Springdale Prep operates on split campus in two separate locations within town; one building is located near but not in floodplain

WTP/WWTP – generators at all facilities including lift stations; upgrades planned for two pump stations (Atlee and Blue Ridge); Coe Drive facility has been upgraded/elevated; WWTP is elevated/protected from flooding; wells protected from flooding reasonably well

DPW –buildings currently not on generator

No town owned/maintained bridges

New development (Snader’s Summit) includes 128 new residences and an additional 7/10 mile of town roads

Upgrade of old water main and additional stormwater management facility planned for future

[illegible]

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #2 with Town of New Windsor
May 19, 2022
11:00 a.m.
New Windsor Town Office**

Attendees:

Dye, Gary (Town Manager)
Fossett, Tiffany (CC Dept. of Planning)
Hawkins, Valerie (CC Emergency Management)
Lane, Mary (CC Dept. of Planning)
Myers, Wayne (Public Works)
Rodriguez, Matt (CC Emergency Management)

- Hazard Mitigation Planning Overview
 - o Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding
 - o Discussion of CC HMP Initial DRAFT document provided to participants prior to meeting
- Roundtable discussion
 - o Municipal Buildings – renovation/addition to town offices is now complete, but there is still no generator in place; the renovated space provides Town EOC location if/as needed; the roof of the Town Hall building may need retrofitting to better withstand snow/wind loads.
 - o WTP/WWTP – generators in place at all facilities including lift stations; upgrades planned for two pump stations (Atlee and Blue Ridge); Coe Drive facility has been upgraded/elevated; WWTP is elevated/protected from flooding; wells protected from flooding reasonably well; there is currently no generator capacity at the Bowersox Spring location; a need has been identified to explore alternative water sources closer to Town limits
 - o DPW – buildings do not have generators; however, these buildings are not seeing heavy use
 - o Upgrade of legacy water main is now in progress, along with additional stormwater management facility
- Town representatives (Dye, Myers) will provide information about additional existing or proposed mitigation measures as it is identified.

Town of Sykesville

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #1 with Town of Sykesville
October 29, 2019
11:00 a.m.
Sykesville Town Offices**

Attendees:

Cosentini, Joe (Town Manager)
Hawkins, Valerie (CC Emergency Management)
Onheiser, Mark (Special Program Coordinator)
Rodriguez, Matt (CC Emergency Management)
Shreves, Derek (Public Works)
Spaulding, Mike (Chief of Police)
Stewart, Clare (CC Dept. of Planning)

- Overview of the structure and content of the current Carroll County Hazard Mitigation Plan (CCHMP) and brief overview of the MD State Hazard Mitigation Plan (as it relates to CCHMP and requirements for update)
- Outline of hazard types most likely to affect Carroll County, and discussion regarding the hazards to be addressed in the updated CCHMP
- Definition of critical infrastructure for the CCHMP
- Roundtable discussion of historical and anecdotal information with town staff regarding risk posed to critical infrastructure facilities in relation to specified hazard types
 - Hazards affecting the municipality most frequently or severely
 - Hazards having the greatest impact of the municipality
 - Mitigation efforts intended to address these hazards that have been developed and/or implemented in/by the municipality
 - Any additional mitigation efforts that may be of value moving forward

General concerns from Town staff related to hazard mitigation and emergency response included:

Police station – greatest risk likely to be from wind or heavy snow loads; access to facilities during flooding events is sometimes restricted; one generator serves both the police station and the Town Hall

WTP/WWTP – pump station at end of Main St and lift station on Schoolhouse Road may be vulnerable to significant flooding events

DPW – building is not equipped with generator; subject to wind events

Town Hall – no fire suppression system in place

Decommissioned train trestle over Spout Hill Road – not well maintained, not town owned

Flooding occurring near Southern States facility (privately owned), Baldwin's Station (town owned building, historic)

Hazard Mitigation Planning
Town of Sykesville
May 5, 2022

Name	Position	Email	Phone
Dave Sines	Public Works Dir.	dsines@sykesville.net	410-787-6615
Joe Cosentino	Town Manager	cosentino@sykesville.net	410-795-8859
Mary Love	Planning MGR.	mlave@carrollcountymd.gov	410-386-5145
Tiffany Foster	Planning Tech-CL	tfoster@carrollcountymd.gov	410-386-2137
Michael Spaulding	Chief of Police	mospaulding@sykesville.net	410-795-0757
Alexie Perkins	Em. Mgr.	xperkins@carrollcountymd.gov	

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #2 with Town of Sykesville
May 5, 2022
10:00 a.m.
Sykesville Town Hall**

Attendees:

Cosentini, Joe (Town Manager)
Fossett, Tiffany (CC Dept. of Planning)
Hawkins, Valerie (CC Emergency Management)
Lane, Mary (CC Dept. of Planning)
Shreves, Derek (Public Works)
Spaulding, Mike (Chief of Police)

- Hazard Mitigation Planning Overview
 - o Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding
 - o Discussion of CC HMP Initial DRAFT document provided to participants prior to meeting
- Roundtable discussion
 - o WTP/WWTP – pump station at end of Main St is still vulnerable to significant flooding events, especially from riverine flooding; all associated infrastructure is County owned; probably would need to harden facility itself as opposed to utilizing an approach involving floodwater diversion
 - o DPW – building is still not equipped with generator; still subject to wind/tree events; snow load is likely not an issue for this building; investigate development of sand storage station at DPW facility for use during flooding and snow events
 - o Flooding is still a concern near Southern States facility (privately owned), Baldwin’s Station (town owned building, historic) at end of Main Street
 - o New Stormwater project – Springfield Avenue NOI
 - Doing small stormwater project in coordination with SHA near Springfield Avenue/Central Avenue to see if any effect on flooding in area; then will know better if larger project would be helpful to reduce flooding risk overall
 - o Carrie Dorsey Park – on Warfield side of Route 32; in flood plain and is public land; consider additional signage to assist with safety of public during flooding events
 - o Open space (Town property) behind residential areas/homes as well as DPW building; possible mitigation action would be to remove dead/dying trees to lessen risk of damage during wind/thunderstorm events
 - o Police station –one generator still serves both the police station and the Town Hall
 - o Town has an adopted EOP
 - o Town of Sykesville vs. Freedom GA – concern expressed regarding possible confusion over presentation of data in HMP; Mary Lane/Planning will work on composition of explanation/text to include in the Plan
 - o Decommissioned train trestle over Spout Hill Road – not well maintained but not currently Town owned; no change in status since 2019 meeting

City of Taneytown

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #1 with City of Taneytown
October 17, 2019
9:00 a.m.
Taneytown City Offices**

Attendees:

Hawkins, Valerie (CC Emergency Management)
Spaid, Cody (CC Dept. of Planning)
Wieprecht, Jim (Acting City Manager, Zoning & Code Enforcement Officer)
Dennis, Daniel (Information Technology)
Smeak, Kevin (Public Works)
Etzler, Jason (Chief of Police)

- Overview of the structure and content of the current Carroll County Hazard Mitigation Plan (CCHMP) and brief overview of the MD State Hazard Mitigation Plan (as it relates to CCHMP and requirements for update)
- Outline of hazard types most likely to affect Carroll County, and discussion regarding the hazards to be addressed in the updated CCHMP
- Definition of critical infrastructure for the CCHMP
- Roundtable discussion of historical and anecdotal information with town staff regarding risk posed to critical infrastructure facilities in relation to specified hazard types
 - Hazards affecting the municipality most frequently or severely
 - Hazards having the greatest impact of the municipality
 - Mitigation efforts intended to address these hazards that have been developed and/or implemented in/by the municipality
 - Any additional mitigation efforts that may be of value moving forward

General concerns from City staff related to hazard mitigation and emergency response included:

Police station – renovated building 4-5 years ago; equipped with generator; limited safe spaces during tornadoes/windstorms; functions as City EOC and police DOC

Schools – two CCPS facilities in City; Head Start program at clubhouse at Roberts Mill Park (City owned facility)

WWTP – plant built in 2000 and is equipped with generator, flood resistant, located outside of 100-year floodplain; 4 of 5 lift stations have generators, remaining 1 has 24 hour capacity and plan in place to pump if necessary

WTP – 4 wells out of 8 can accept portable generator

AL/NH – Lorien facilities located in City

Municipal buildings – City Hall, Annex (24 E. Baltimore Street)

O’Brien Avenue – stormwater management project currently in progress in coordination with CC Bureau of Resource Management; will create first City owned bridge

Roberts Mill Road – Maryland Midland/Genesee Wyoming railroad bridge is undergoing retrofit

Street flooding during heavy rain events at MD 140/RR tracks, also along MD 194 (both state maintained roadways)

Hazard Mitigation Planning
City of Taneytown
April 26, 2022

Name	Position	Email	Phone
DARRE HALE	Director Planning	dhalo@taneytown.org	410-751-1100
Jim Nieprecht	City Manager	jnieprecht@taneytown.org	(410) 751-1100
Bob Hitters	Mayor/Police Dept	hitters@taneytown.org	(410) 751-1150
Heidi Smeek	Director of Public Works	hsmeek@taneytown.org	410 751-1100
Daniel Dennis	IT Director	ddennis@taneytown.org	410-751-1100
SHON ELLER	CHIEF OF POLICE	jecker@taneytown.org	(410) 751-1150
VALERIE HARRIS	Emergency Mgmt	vharris@carrollcountymd.gov	(410) 386-2592
MARTIN BOBBAW	CC Emergency Mgmt	mbobba@carrollcountymd.gov	410-386-2592
Tiffany Fossett	CC Planning	tfossett@carrollcountymd.gov	410-386-2432

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #2 with City of Taneytown
April 26, 2022
10:30 a.m.
Taneytown Police Department**

Attendees:

Dennis, Daniel (Information Technology)
Etzler, Jason (Chief of Police)
Fossett, Tiffany (CC Dept. of Planning)
Hale, Darryl (Director, Planning)
Hawkins, Valerie (CC Emergency Management)
Mitchell, Bob (Major, TPD)
Rodriguez, Matt (CC Emergency Management)
Smeak, Kevin (Public Works)
Wieprecht, Jim (City Manager)

- Hazard Mitigation Planning Overview
 - o Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding
 - o Discussion of CC HMP Initial DRAFT document provided to participants prior to meeting
- Roundtable discussion
 - o Police station –building equipped with generator; limited safe spaces during tornadoes/windstorms – FEMA safe room may be of benefit; investigating the installation of bollards and other physical hardening measures
 - o WWTP – no changes from 2019 meeting
 - o WTP – Installation of generator at Well #8 budgeted this upcoming year; IP based system to monitor well system currently in place; investigate whether demolition of “old” WWTP would be of benefit as a flood mitigation measure
 - o Municipal buildings – City Hall, Annex (24 E. Baltimore Street) – recently completed upgrades to security measures in lobby of City Hall and exterior of City Hall and Annex
 - o O’Brien Avenue – stormwater management project completed in coordination with CC Bureau of Resource Management; created first City-owned bridge
 - o Street flooding still occurs during heavy rain events at MD 140/RR tracks, also along MD 194 (both state-maintained roadways)
 - o A remote IT server location is proposed in City’s CIP for next year; to be located in existing building in same area as Well #8; generator power not currently included in project but could investigate how the generator planned for Well #8 could possibly be incorporated into the server location project; limited HVAC exists at location, so upgrades may be required to ensure consistent operation of server equipment
 - Updated information from D. Hale, 05122022 – Electrician confirmed that the size of the generator will accommodate all the needed power consumption for continuous server use including HVAC.
 - o Flooding is being seen in locations that have not routinely flooded in the past
 - o Tree maintenance around City owned buildings assists with mitigation of damage during thunderstorm and wind events

Town of Union Bridge

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #1 with Town of Union Bridge
November 18, 2019
1:00 p.m.
Union Bridge Town Offices**

Attendees:

Hawkins, Valerie (CC Emergency Management)
Jones, Perry (Mayor)
Metcalf, Dawn (Town Clerk/Treasurer)
Rodriguez, Matt (CC Emergency Management)
Stewart, Clare (CC Dept. of Planning)
Weber, Hannah (CC Dept. of Planning)
Wilson, Donald (Council President)

- Overview of the structure and content of the current Carroll County Hazard Mitigation Plan (CCHMP) and brief overview of the MD State Hazard Mitigation Plan (as it relates to CCHMP and requirements for update)
- Outline of hazard types most likely to affect Carroll County, and discussion regarding the hazards to be addressed in the updated CCHMP
- Definition of critical infrastructure for the CCHMP
- Roundtable discussion of historical and anecdotal information with town staff regarding risk posed to critical infrastructure facilities in relation to specified hazard types
 - Hazards affecting the municipality most frequently or severely
 - Hazards having the greatest impact of the municipality
 - Mitigation efforts intended to address these hazards that have been developed and/or implemented in/by the municipality
 - Any additional mitigation efforts that may be of value moving forward

General concerns from Town staff related to hazard mitigation and emergency response included:

Flooding of areas near Little Pipe Creek/MD 75/MD 31 creates significant challenges (access, damage to structures) during storm events; CC Bureau of Resource Management/USACE researching solutions

Sinkholes occur frequently in areas near but outside of town limits; truck traffic in/out of cement plant along MD 75

Union Bridge Fire Company is utilized as community resource location and Town EOC; equipped with updated generator

Town Buildings – Town Hall is not equipped with generator; Community Center can be used as community resource backup location in addition to Fire Company

WTP – generator installation, current mitigation project funded by FEMA

WWTP – generator is in place; during flooding events, operations not affected but access to facility is restricted

Hazard Mitigation Planning - Town of Union Bridge Attendees				GoToMeeting
Summary				
Meeting Date	Meeting Duration	Number of Attendees	Meeting ID	
August 9, 2022 9:54 AM EDT	40 minutes		4 784-574-453	
Details				
Name	Email Address	Join Time	Leave Time	Time in Session (minutes)
Dawn Melcarf	unionbr@ccarr.org	9:55 AM	10:34 AM	39
Fossell, Tiffany P		9:58 AM	10:34 AM	35
Perry Jones Jr		9:57 AM	10:34 AM	37
Valerie Hawkins	vhawkins@carrollcountymd.gov	9:54 AM	10:34 AM	40

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #2 with Town of Union Bridge
August 9, 2022
10:00 a.m.
Virtual**

Attendees:

Fossett, Tiffany (CC Dept. of Planning)
Hawkins, Valerie (CC Emergency Management)
Jones, Perry (Mayor)
Metcalf, Dawn (Town Clerk/Treasurer)

Hazard Mitigation Planning Overview

- Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding
- Discussion of CC HMP Initial DRAFT document provided to participants prior to meeting

Roundtable discussion

Flooding of areas near Little Pipe Creek/MD 75/MD 31 creates significant challenges (access, damage to structures) during storm events; CC Bureau of Resource Management/USACE have worked cooperatively to research possible solutions; request for Technical Assistance project pending

Town Buildings – Town Hall is not equipped with generator; Community Center can be used as community resource backup location (shelter, feeding, etc.) but is also not currently equipped with generator capability.

WTP – generator installation mitigation project funded by FEMA now complete

WWTP – generator is in place; during flooding events, operations not affected but access to facility is restricted due to location within floodplain; optimally, WWTP should be moved to a new facility outside of the floodplain altogether. Partial funding for this project has been identified through Federal delegation, but additional funding sources will need to be secured before project can proceed.

Stormwater management project currently underway in cooperation with CC Resource Management which should help with flood mitigation within Town limits.

City of Westminster

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #1 with City of Westminster
October 15, 2019
2:00 p.m.
Westminster City Offices**

Attendees:

Gerhard, Andrea (Planning)
Glass, Jeff (Public Works)
Hawkins, Valerie (CC Emergency Management)
Ledwell, Tom (Chief of Police)
Matthews, Barb (City Administrator)
Moser, Bobbi (CC Dept. of Planning)
Spaid, Cody (CC Dept. of Planning)

- Overview of the structure and content of the current Carroll County Hazard Mitigation Plan (CCHMP) and brief overview of the MD State Hazard Mitigation Plan (as it relates to CCHMP and requirements for update)
- Outline of hazard types most likely to affect Carroll County, and discussion regarding the hazards to be addressed in the updated CCHMP
- Definition of critical infrastructure for the CCHMP
- Roundtable discussion of historical and anecdotal information with town staff regarding risk posed to critical infrastructure facilities in relation to specified hazard types
 - Hazards affecting the municipality most frequently or severely
 - Hazards having the greatest impact of the municipality
 - Mitigation efforts intended to address these hazards that have been developed and/or implemented in/by the municipality
 - Any additional mitigation efforts that may be of value moving forward

General concerns from City staff related to hazard mitigation and emergency response included:

Soil movement (Anchor Street sinkhole incident in early 2000s)

Wind and loss of electrical power

Police Department – issues identified with roof, also water/foundation; generator in place but older

DPW – Utilities Shop near WTP recently experienced significant flooding (2018); offices and records storage has since been moved to higher elevation within building; Streets Dept. facility has relatively new generator in place

WWTP – ongoing project to upgrade; facility will meet flood standards

West End Place – residential and non-residential services to elderly population; building owned by City

Roads – no identified City maintained/owned roads with flooding or other issues; flooding is experienced near the WTP and WWTP on state and/or county-maintained roads

Hazard Mitigation Planning
City of Westminster
August 11, 2022

Name	Position	Email	Phone
Richard Cohen	WPD	Richard.Cohen@carrollcountymd.gov	410-848-4444
Jeffrey Fosselt	Planning	JeffF@carrollcountymd.gov	410-846-2137
Matthew Fosselt	CC	Matthew.Fosselt@carrollcountymd.gov	410-848-2572
John Dick	Public Works	JDick@westminstermd.gov	410-848-9000
Mark Deo	Comm. Planning & Dev.	MarkD@westminstermd.gov	410-846-9001
Sara Imholse	City Administrator	Simholse@westminstermd.gov	410-848-9000
Marie Hincus	CC. Eng.	Mhincus@carrollcountymd.gov	410-386-2592

**Carroll County Hazard Mitigation Plan Update
Municipality Meeting #2 with City of Westminster
August 11, 2022
11:00 a.m.
Westminster City Administration Building**

Attendees:

Depo, Mark (Westminster Dept. of Planning)
Dick, John (Westminster Dept. of Public Works)
Fossett, Tiffany (CC Dept. of Planning)
Gibson, Richard (Westminster Police Department)
Hawkins, Valerie (CC Emergency Management)
Imhulse, Sara (City Administrator)
Rodriguez, Matt (CC Emergency Management)

- Hazard Mitigation Planning Overview
 - o Review of hazard mitigation planning process, plan submission and approval processes, and general parameters of federal hazard mitigation funding
 - o Discussion of CC HMP Initial DRAFT document provided to participants prior to meeting
- Roundtable discussion
 - o Police Department – generator replacement needed
 - o DPW – Utilities Shop near WTP recently experienced significant flooding (2018); offices and records storage has since been moved to higher elevation within building and records are in the process of being digitized; Streets Dept. facility has generator in place
 - o Flooding – Capacity at WWTP is a concern due to excessive stormwater runoff infiltration. The city has invested in an Inflow & Infiltration project that includes repairs to stormwater lines. This will help the WWTP to maintain capacity by limiting the amount of stormwater runoff entering the overall system. After the completion of the initial project activities, there will continue to be a need for ongoing maintenance and monitoring moving into the future.
 - o Drought – The city has begun implementation of a water re-use project that will also serve as a new water source. The project is currently in the engineering phase of development; when completed, the recycled water will be an additional water source and will increase resiliency in the face of drought. Funding for this project is being contributed by both the City of Westminster and Carroll County.
 - o The city is slowly repairing legacy water mains.
 - o City staff expressed some concern regarding storm response from BGE during the July 12 storm; also, they noted that a layer of the roof at the Streets Building was damaged during the same storm event.
 - o Ongoing concern with downed trees – Westminster works to trim and maintain trees on city-owned property throughout the year to lessen the chance of blocked roadways and damaged buildings during storm events.

City staff will continue to review the DRAFT HMP and will advise of any additional comments.

Appendix H – Local Mitigation Plan Review Tool (Revised – includes FEMA Comment and Carroll County Revision Notes)

LOCAL MITIGATION PLAN REVIEW TOOL +HHPD

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: Carroll County, MD	Title of Plan: Carroll County Hazard Mitigation Plan	Date of Plan: October 2022
Local Point of Contact: Valerie Hawkins	Address: 225 North Center Street, Westminster, MD 21157	
Title: Emergency Management Manager		
Agency: Carroll County Department of Public Safety		
Phone Number: (410) 386-2296		
E-Mail: vhawkins@carrollcountymd.gov		

State Reviewer: Caitlin Whiteleather	Title: State Hazard Mitigation Officer	Date: Review of Submission #1: November 27, 2022
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FEMA Reviewer: Joshua Norris	Title: Hazard Mitigation Planner (MD FIT)	Date: Review of Submission #1: December 20, 2022 Review of Submission #2: March 15, 2023
Date Received in FEMA Region <i>(insert #)</i>	Submission #1: December 1, 2022 Submission #2: March 1, 2023	

Local Mitigation Plan Review Tool (+HHPD v. 060721)

A-1

Plan Not Approved	
Plan Approvable Pending Adoption	Required revisions addressed.
Plan Approved	

SECTION 1: REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR § 201.6 Local Mitigation Plans)				
ELEMENT A. PLANNING PROCESS				
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))		MDEM: Capter 3, pg 13- Chapter 3 (throughout, but specifically pages 13, 15-18 and 21) Appendix F (pages 202-212)	X	
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))		MDEM: Chap. 3, ppg.19-22; app.f Chapter 3 (throughout, but specifically pages 19-21)	X	
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))		MDEM: Chap. 3, p.19-22; app.E Chapter 3 Pages 19-21	X	

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR § 201.6 Local Mitigation Plans)				
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	MDEM: CH.12, p148 Chapters 5 -11 each include references to studies and reports, along with technical information	X		
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Chapter 13 Pages 159-162	X		
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	MDEM: Ch13 pg 160 Chapter 13 (throughout, but specifically pages 160-162)	X		

ELEMENT A: REQUIRED REVISIONS

FEMA:

A1-c: “The plan must identify who represented each jurisdiction. The Plan must provide, at a minimum, the jurisdiction represented and the person’s position or title and agency within the jurisdiction” (2011 Local Hazard Mitigation Plan Review Guide, page 15). The plan lists the three County Departments that acted as the Core Planning Team and the agencies that were engaged from the Local Emergency Planning Committee (LEPC). However, to address this requirement, add a table or list of the specific individuals that participated in the planning process, including at least their first and last name, position title, agency, and jurisdictional affiliation (for participating jurisdictions) to the main text of the plan. Consider including separate tables for each team that was engaged in the planning process and including this content towards the beginning of the plan.

Carroll County: Added a Hazard Mitigation Planning Committee member list on pages 23 - 29.

FEMA: Addressed.

A1-d: “For each jurisdiction seeking plan approval, the plan must document how they were involved in the planning process” (2011 Local Mitigation Plan Review Guide, page 15). Appendix F states that two municipal meetings were held for the 8 Carroll County jurisdictions during the planning process. However, insufficient supporting documentation has been provided. To meet this requirement, add supporting documentation of plan participation (at least 2 examples of plan participation by each participating jurisdiction in the form of a meeting attended and/or information submission). In addition to the 8 municipalities, two examples of plan participation are needed for Carroll County itself.

Notably, sign in sheets were included in Appendix F for 2022 municipal engagement meetings for the Town of Hampstead, Town of Manchester, Town of Mount Airy, Town of New Windsor, Town of Sykesville, City of Teneytown, Town of Union Bridge, City of Westminster, but no summary of what was discussed during said meetings is included in Appendix F. To meet this requirement, consider adding meeting summaries for each of the 2019 and 2022 municipal meetings identified in Appendix F. Alternatively, consider including submitted survey forms, written transcripts, or email responses from participating jurisdictions that were collected during the planning process.

Carroll County: Addressed planning process/meeting documentation in Appendix G on pages 266 - 298.

FEMA: Addressed.

A1-e: “Plan updates must include documentation of the current planning process undertaken to update the plan” (2011 Local Hazard Mitigation Plan Review Guide, page 15). To address this requirement, add content to the plan (ideally a table) depicting key planning process events (milestones) by date and title.

Carroll County: Addressed HMP planning process and milestones on pages 32 - 38.

FEMA: Addressed.

A2-a: The Plan must “identify all stakeholders involved or given an opportunity to be involved in the planning process...” including “[n]eighboring communities (2011 Local Mitigation Plan Review Guide, page 15). To address this requirement, add content to the plan clearly stating and documenting which neighboring jurisdictions were involved in the planning process.

1. REGULATION CHECKLIST	Location in Plan (section and/or page number)	Met	Not Met
<p>Regulation (44 CFR § 201.6 Local Mitigation Plans)</p> <p>Carroll County: Addressed neighboring jurisdictions on page 31.</p> <p>FEMA: Addressed.</p> <p><u>Formatting/Grammatical Recommended Revisions:</u></p> <ul style="list-style-type: none"> • Capitalize the first word of the bulleted sentences on pages 11 and 12. <p>Carroll County: Fixed capitalization on pages 15.</p> <p>FEMA: Addressed.</p> <p><u>RECOMMENDED REVISIONS</u></p> <p><u>MDEM:</u></p> <p>A1: Cannot locate this information in full</p> <p>A2-c: Provide documentation for how stakeholders and neighboring communities were invited to participate.</p> <p>A5: Can not locate this information</p> <p><u>FEMA:</u></p> <p>A1: Consider updating the executive summary to improve readability by:</p> <ul style="list-style-type: none"> • Reducing (consolidating) the narrative information • Listing the Plan's HMP goals • Including a table of at least the natural hazards identified in the plan and their prioritization ranking <p>Refer to the executive summary of the 2022 Frederick County Hazard Mitigation and Climate Adaptation Plan as an example.</p> <p>A1: Consider expanding the core planning team to include additional whole community partners, or create an additional stakeholder committee that builds on the LEPC members and includes additional partners</p>			
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)		Met	Not Met
Regulation (44 CFR § 201.6 Local Mitigation Plans)					
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))		MDEM: Drought: Ch5 pg.33-44 Flood: Chap. 6, pp. 50-58; Thunderstorm/wind: Ch7 pg. 73-86 Tornado: Ch8 pg. 87-99 Winter Storm: Ch9 pg. 102-112 Soil Management: Ch 10, pg.115-122 Dam failure: Ch11 pg 131-141 Chapters 5-11 Hazard ID section contained in each		X	
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))		Drought: Ch5 pg.33-44 Flood: Chap. 6, pp. 50-58; Thunderstorm/wind: Ch7 pg. 73-86 Tornado: Ch8 pg. 87-99 Winter Storm: Ch9 pg. 102-112 Soil Management: Ch 10, pg.115-122 Dam failure: Ch11 pg 131-141 Chapters 5 -11 "Regional and Historical Perspective" and "Risk Assessment" sections in each		X	

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR § 201.6 Local Mitigation Plans)				
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))		Drought: Ch5 pg.33-44 Flood: Chap. 6, pp. 50-58; Thunderstorm/wind: Ch7 pg. 73-86 Tornado: Ch8 pg. 87-99 Winter Storm: Ch9 pg. 102-112 Soil Management: Ch 10, pg.115-122 Dam failure: Ch11 pg. 131-141 App. D, A Chapters 5-11 "vulnerability" information in each	X	
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))		MDEM: Pg.54-60 Chapter 6 Page 54	X	

ELEMENT B:**REQUIRED REVISIONS****FEMA:**

B1: The Plan "must include information on location, extent, previous occurrences, and future probability for each hazard" (2011 Local Mitigation Plan Review guide, page 19). Add content to at least the natural hazard Chapters of the plan below that clearly describes hazard extent (ideally beneath a subheading titled "extent"). Extent "means the strength or magnitude of the hazard. For example, extent could be described in terms of the specific measurement of an occurrence on a scientific scale (for example, Enhanced Fujita Scale, Saffir-Simpson Hurricane Scale, Richter Scale, flood depth grids) and/or other hazard factors, such as duration and speed of onset" (2011 Local Hazard Mitigation Plan Review Guide, page 19). Refer to the [Frederick County Hazard Mitigation Plan](#) for examples of how to clearly describe extent for the hazards below.

Flood: Extent is not clearly described in Chapter 6.

Thunderstorm and Wind: Extent is not clearly described in Chapter 7.

Winter Storm: Extent is not clearly described in Chapter 9.

Consider adding a visualization to complement the extreme temperatures information expressed in Chapter 9 ("The National Weather Service generally issues a wind-chill advisory for Carroll County when wind-chills are expected to reach -10 to -24 degrees F. Wind-chill warnings are issued when chills are expected to be lower than -25 degrees F.").

Carroll County: Added information to include extent for each hazard listed within plan.

- Drought (Pages 54)
- Flooding (Pages 75-76)
- Thunderstorms & Wind (Pages 107 - 109)
- Tornados (Pages 129 - 130)
- Winter Storm (Pages 149)
- Soil Movement (Pages 168)

FEMA: Addressed.

B2-a,c: The Plan must include the history of previous hazard events for all identified hazards and must identify the hazard events that have occurred since the previous plan update (the last Carroll County HMP was approved on 3/24/2014). To address this requirement, review and integrate at least the information below (for the hazards identified in the Plan) into the appropriate risk assessment chapters of the Plan.

[Disaster Declarations for States and Counties | FEMA.gov](#)

Between 3/24/2014 and 12/14/2022 the following FEMA Presidential Major Disaster Declarations were declared and must be referenced in the plan. Additionally, consider including additional disaster declarations such as any USDA emergency disaster designations since 3/24/2014 ([emergency_disaster_designation_declaration_process-factsheet.pdf \(usda.gov\)](#)).

- 2 Biological (DR-4491, COVID-19 Pandemic, declared 3/26/2020) (EM-3430, COVID-19, Declared 3/13/2020)
- 1 Severe Winter Storm and Snowstorm Declaration (DR-4261, declared 3/4/2016)
- 1 snow storm declaration (DR-4170, declared 4/10/2014)
- [4491 | FEMA.gov](#)
- [3430 | FEMA.gov](#)

- [4261 | FEMA.gov](#)
- [4170 | FEMA.gov](#)

Carroll County: Added a chart of federally declared disasters since 1953 in Carroll County.

- Flooding (Page 74 for both Federal and SBA Declarations)
- Thunderstorms & Wind (Page 106 & Page 107 for SBA Declaration)
- Tornadoes (Page 129 for SBA Declaration)
- Winter Storms (Page 148)

FEMA: Addressed.

B2-b: To meet this requirement, update the Plan to address the following. Ideally, add a subheading to at least each natural hazard chapter (chapter 5 through 10) titled “probability of future occurrence.” If general descriptors such as “highly likely,” “likely,” or “unlikely” are used, then they must be defined.

Drought: Describe the probability of future Drought events in Carroll County.

Flood: The 100 year floodplain is mentioned, but the term is not defined. Define terms such as the 100 and 500 year floodplain and explicitly describe the probability of future flood events in Carroll County. [Base Flood | FEMA.gov](#); [Flood Zones | FEMA.gov](#); [Reducing Risk in the Floodplain \(fema.gov\)](#) (Page 3 includes a visualization defining the 10, 100, and 500 year flood events).

Winter Storm: Describe the probability of future winter storm events in Carroll County.

Thunderstorm and Wind: Describe the probability of future Thunderstorm and Wind events in Carroll County.

Tornado: Describe the probability of future Tornado events in Carroll County.

Carroll County: Added information to include probability and severity of future occurrences for each hazard listed within plan.

- Drought (Pages 55)
- Flooding (Pages 76-78)
- Thunderstorms & Wind (Pages 110 - 112)
- Tornadoes (Pages 130 - 131)
- Winter Storm (Pages 149 - 150)
- Soil Movement (Page 168)

FEMA: Addressed.

RECOMMENDED REVISIONS

FEMA:

B1: To improve clarity, add a Table to the beginning of the Risk Assessment section summarizing the risk ranking of each hazard identified in the Plan.

B1: Include a brief narrative introduction to the Hazard Identification and Risk Assessment (HIRA) portion of the HMP. Currently, the plan moves from a discussion of comprehensive planning in Chapter 4 to the identification and risk assessment of natural and human caused or technological hazards in Chapters 5 through 11.

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR § 201.6 Local Mitigation Plans)				
B1: Consider profiling additional hazards identified in the Maryland State Hazard Mitigation Plan, such as Extreme Temperatures (Medium Risk for Carroll County per the 2021 MD SHMP), Public Health Emergencies (Medium risk for Carroll County per the 2021 MD SHMP), and Human Caused Hazards [Civil Unrest, Cyber-Attack, Terrorism, Active Shooter, Nuclear Incidents, Transportation Accidents] (Medium risk for Carroll County per the 2021 MD SHMP).				
B1: Consider including a visual representation of the Palmer Drought Severity Index in the Hazard Characterization section of Chapter 5.				
B3: Page 39 states "While exact data are not available, local experts agreed that costs would likely range between \$5,000 and \$10,000." Add text the Plan citing the local sources of this information.				
B4: Add information to the Plan stating that there is 1 single family severe repetitive loss (SRL) property in Carroll County as of 12/19/2022.				
ELEMENT C. MITIGATION STRATEGY				
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Chapters 5-12 Existing mitigation measures sections in each; also Pages 29-31	X		
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Chapter 6 Page 59	X		
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Chapter 2	X		
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	MDEM: Ch12 pg 148-151 Chapters 5-13 Within the "Mitigation Measures" section of each chapter	X		
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	<u>MDEM:</u> <u>Prioritization:</u> Pg 61-64 <u>Action Plan:</u> n/a Chapters 5-13	X		
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	MDEM: Pg.149-157 Page 31; page 157	X		

ELEMENT C:
REQUIRED REVISIONS

FEMA:

C1-a: Pages 29 to 31 include notable information pertaining to planning and regulatory capabilities, and there are a number of capabilities expressed in the "Mitigation Measures" section of Chapter 6, 7, 8, 9, 10, and 11. However, the plan does not clearly describe jurisdiction-specific capabilities in terms of Administrative and Technical, Financial, and Education and Outreach. To address this requirement, add text to the Plan that describes each jurisdiction's Administrative and Technical, Financial, and Education and Outreach capabilities.

For examples of the types of the capabilities related information that should be integrated into the plan, refer to the FEMA Region 3 Capability Assessment Worksheets here: [Hazard Mitigation Plan Guidance: Community Capability Assessment Worksheet \(fema.gov\)](#) and Task 4 of the [2013 Local Hazard Mitigation Planning Handbook](#) (beginning on page 4-1).

Consider summarizing jurisdiction-specific capability limitations and including corresponding (proposed) mitigation actions to address identified limitations.

Carroll County: Added information to address Carroll County's capability assessment on pages 49 and Appendix A on pages 226 – 232.

FEMA: Addressed.

C2: "The plan must describe each jurisdiction's participation in the NFIP and describe their floodplain management program for continued compliance" (2011 Local Mitigation Plan Review Guide, page 23). Pages 59 and 60 include notable County-wide NFIP capabilities information, but they do not sufficiently describe jurisdiction specific NFIP capabilities. To address this requirement, add content to the plan that addresses information identified in the three FEMA Region 3 NFIP Community Worksheets (tables) here: [Hazard Mitigation Plan Guidance: Checking In On The NFIP \(fema.gov\)](#) for each participating jurisdiction.

Carroll County: Added information to address Carroll County's participation in the NFIP and floodplain management program on pages 50 -52.

FEMA: Addressed.

C4-b: "Each jurisdiction participating in the Plan must have mitigation actions specific to that jurisdiction that are based on the community's risk and vulnerabilities, as well as community priorities." (2011 Local Mitigation Plan Review Guide, page 24). To address this requirement, ensure that each participating jurisdiction has at least 2 proposed mitigation actions within the Plan, and that each jurisdiction addresses at least 2 of its highest priority hazards through its proposed mitigation actions.

To meet this requirement, address the following:

Town of Mt. Airy:

1 high priority drought mitigation action was proposed in the plan for this jurisdiction. At least 1 additional proposed mitigation action must be added to the plan that addresses a hazard that this jurisdiction is highly vulnerable to (other than drought). This jurisdiction must be a responsible or partner entity for the added action.

Town of New Windsor:

1 high priority drought mitigation action was proposed in the plan for this jurisdiction. At least 1 additional proposed mitigation action must be added to the plan that addresses a hazard that this jurisdiction is highly vulnerable to (other than drought). This jurisdiction must be a responsible or partner entity for the added action.

Town of Sykesville:

1 high priority flood mitigation action was proposed in the plan for this jurisdiction. At least 1 additional proposed mitigation action must be added to the plan that addresses a hazard that this jurisdiction is highly vulnerable to (other than flood). This jurisdiction must be a responsible or partner entity for the added action.

Town of Manchester:

No hazard specific high priority mitigation actions were proposed for this jurisdiction in the plan. Add at least 2 mitigation actions in which this jurisdiction is a responsible or partner entity. The added actions must address at least two different hazards that the jurisdiction is most vulnerable to.

Town of Hamstead:

No hazard specific high priority mitigation actions were proposed for this jurisdiction in the plan. Add at least 2 mitigation actions in which this jurisdiction is a responsible or partner entity. The added actions must address at least two different hazards that the jurisdiction is most vulnerable to.

Carroll County: Added information to ensure that each participating jurisdiction has at least 2 proposed mitigation actions within the Plan, and that each jurisdiction addresses at least 2 of its highest priority hazards on 68, 70, 89, 90, 91, 92, 93, 94, 124, 125, 141, 142, 143, 144, 159, 160, 177, 194, 205, 206, 207, 208, 209.

FEMA: Addressed.

C4-a: For each jurisdiction, the plan must "identify and analyze a comprehensive range of specific mitigation actions and projects" (2011 Local Mitigation Plan Review Guide, Page 24). To meet this requirement, add content to the plan that describes additional mitigation actions for reducing the risk to Thunderstorms and Wind (currently there is only one high priority proposed mitigation action), Tornado (currently there are no jurisdiction-specific high priority mitigation actions— i.e. "Municipal DPW" is identified for several proposed actions but this title does not specify which municipality will advance the action in question), and Winter Storm (no jurisdictions were specifically identified as responsible agencies for the proposed mitigation actions for this hazard). Consider referencing the eligible mitigation activities identified in the [2015 Hazard Mitigation Assistance Guidance](#) and consulting the [Mitigation Action Portfolio \(MAP\)](#) for nationwide best practice examples to draw inspiration from.

Keep in mind that the Plan must include mitigation actions that address each of the following:

- Local plans and regulations,
- Structure and infrastructure projects,
- Natural systems protection, and
- Education and awareness programs.

Carroll County: Added information to ensure that each participating jurisdiction has at least 2 proposed mitigation actions within the Plan, and that each jurisdiction addresses at least 2 of its highest priority hazards on 68, 70, 89, 90, 91, 92, 93, 94, 124, 125, 141, 142, 143, 144, 159, 160, 177, 194, 205, 206, 207, 208, 209.

FEMA: Addressed.

CS-a and b: Add content to the plan describing the criteria (including benefit cost considerations) that the County and its localities used to prioritize the Plan's identified county and jurisdiction-specific mitigation actions.

Carroll County: Text added to clarify the criteria and process used to prioritize mitigation actions (pages 21 - 22).

FEMA: Addressed.

CS-c: "The plan must identify the position, office, department, or agency responsible for implementing and administering the action (for each jurisdiction), and identify potential funding sources and expected timeframes for completion. For all proposed and existing mitigation actions identified in the plan" (2011 Local Mitigation Plan Review Guide, Page 25).

To address this revision:

1. For all proposed mitigation actions, include at least an associated responsible agency, expected implementation timeline, and potential funding source. This information is not clearly provided for the proposed thunderstorm and wind (Chapter 7) and soil movement (Chapter 10) mitigation actions.
2. Align the terminology used throughout the proposed mitigation actions tables in the Plan. Some tables have column titles such as "Responsible Town and Agency/ies," while other tables refer to "Responsible/Coordinating Agencies."
3. Separate the "Responsible" and "Coordinating Agencies" into two separate columns to clarify roles.
4. In the Responsible Agency/Entity and Supporting entity columns for all proposed mitigation actions, replace vague terms such as "town," "municipalities," or "municipal" with the specific jurisdictions (by name) that will be responsible for implementing the proposed action.

Carroll County: Added information to ensure that each participating jurisdiction has at least 2 proposed mitigation actions within the Plan, and that each jurisdiction addresses at least 2 of its highest priority hazards on 68, 70, 89, 90, 91, 92, 93, 94, 124, 125, 141, 142, 143, 144, 159, 160, 177, 194, 205, 206, 207, 208, 209.

FEMA: Addressed.

C6-c and e: "A multi-jurisdictional plan must describe each participating jurisdiction's individual process for integrating hazard mitigation actions applicable to their community into other planning mechanisms" (2011 Local Mitigation Plan Review Guide, page 25).

The "Implementation through Existing Programs" section of the plan on page 160 states that "Each hazard-specific chapter of the Plan identifies existing measures in place at the local level to mitigate the impacts of the hazards addressed in the Plan. These ongoing measures will continue to be implemented. The review and evaluation provided by each agency and the LEPC each year will include a discussion of the effectiveness of these programs, as well as recommendations to improve their effectiveness and efficiency." This is a sound foundation, but keep in mind that planning mechanisms refer to "governance structures that are used to manage local land use development and community decision making, such as comprehensive plans, capital improvement plans, or other long-range plans" (2011 Local Mitigation Plan Review Guide, page 25).

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR § 201.6 Local Mitigation Plans)				
To address this requirement, add text to the plan explaining the process that each jurisdiction will use to ensure that the hazard mitigation plan, <u>at least the mitigation goals and actions</u> , are integrated into jurisdiction-specific comprehensive plans and/or other planning mechanisms going forward.				
Carroll County: Added text to Chapter 13, Department of Planning section that outlines the process to be utilized (page 215, page 217).				
FEMA: Addressed.				
C6-d: The Plan does an excellent job highlighting the value of integrating comprehensive and hazard mitigation planning but does not highlight specific municipal examples in which this has taken place. To address this requirement, add text to the plan that explains "...how the jurisdiction(s) incorporated the mitigation plan, when appropriate, into other planning mechanisms as a demonstration of progress in local hazard mitigation efforts" (2011 Local Mitigation Plan Review Guide, page 25).				
Carroll County: Added text and table to provide detail regarding mitigation integration for the major plans in each participating jurisdiction (pages 7-10).				
FEMA: Addressed.				
RECOMMENDED REVISIONS				
FEMA:				
C3: Number the goals and objectives so that they can be more readily referenced by readers.				
C4: Add nature-based solutions as proposed high priority mitigation actions. Examples of best practice nature-based hazard mitigation projects nationwide can be found here: https://www.fema.gov/sites/default/files/documents/fema_fy-22-mitigation-action-portfolio.pdf				
C4: Add proposed mitigation actions that reduce the hazard risks to the historic sites identified in Table 7.6 (Historic Sites Located within the Hazard Area for Thunderstorms and Wind by Growth Area) and that protect exposed assets within the jurisdiction specific historic districts identified in table 7.7, Historic Districts on the National Register of Historic Places.				
C5-c: To improve clarity and consistency, depict all proposed mitigation actions in a tabular format that includes the following populated columns: Action Number, Action Name, Priority, Responsible Agency, Action Summary/Description, Hazard Addressed, Mitigation Goal(s) Addressed, Potential Funding Source(s), Cost Estimate, Estimated Timeframe To Complete (in months or years). Some of this information ("Strategy Responsible, Agency, Anticipated Timeline, and Possible Funding Sources") is included for a subset of high priority proposed actions in Chapter 5, 6, and 8.				
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)				
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))		Community Profile CH4 pg23-29 App. B, C, D	X	

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)		Met	Not Met
Regulation (44 CFR § 201.6 Local Mitigation Plans)					
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))		Pg148-151		X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))				X	

ELEMENT D:
REQUIRED REVISIONS

FEMA:

D2-a: The plan summarizes a number of "Existing Mitigation Measures" in Chapter 12 and "Existing County Mitigation Measures" in Chapters 5, 6, 7, 8, 9, 10, and 11. However, the Plan does not clearly identify which of these existing measures were included in the previous plan and state which have been "completed or not completed" (2011 Local Mitigation Plan Review Guide, page 27). To address this requirement, the plan must be updated to describe which mitigation actions have been completed or not completed since the previous update. Actions that have not been completed must have their status explained in the Plan or the Plan must explain why the action is no longer relevant.

Consider displaying the existing mitigation actions (which are now in a narrative format) and their status in a tabular format similar to how proposed high priority mitigation strategies are displayed in most of the Plan's risk assessment chapters.

Carroll County: Clarified existing mitigation measures that were included in the 2014 HMP and their status.

- Drought (Pages 65 - 67)
- Flooding (Pages 84 - 87)
- Thunderstorms & Wind (Page 123)
- Tornados (Pages 140)
- Winter storm (Page 157)
- Soil Movement (Page 174)
- Dam Failure (Pages 193)

FEMA: Addressed.

D3-a: Add text to the Plan describing "The plan must describe if and how any priorities changed since the plan was previously approved" (2011 Local Mitigation Plan Review Guide, page 27).

Carroll County: Added text to clarify that the overall mitigation strategies and priorities remain unchanged from the previous version of the HMP (page 21)

FEMA: Addressed.

RECOMMENDED REVISIONS

D1: Add a bookmark in the PDF version of the Plan for "Appendix B."

D1: To provide a clearer visual depiction of the locations with the highest hazard risk and increasing exposure, add maps that overlay hazard areas (for the Plan's profiled hazards) against the detailed maps in Appendix D (the Hazard High Impact Area Maps by Growth Area maps) to depict where critical facilities, major employers, and historic trust site locations intersect with both growth areas and high hazard areas.

D1: Add content to the plan underscoring how current and future development will impact the vulnerability of disadvantaged and underserved communities. Consider utilizing the CDC Social Vulnerability Index ([CDC/ATSDR Social Vulnerability Index \(SVI\)](https://www.cdc.gov/atsdr/social-vulnerability/index.html)) | [Place and Health](https://www.cdc.gov/atsdr/social-vulnerability/index.html) | [ATSDR](https://www.cdc.gov/atsdr/social-vulnerability/index.html) and [Maryland2020 Carroll.pdf \(cdc.gov\)](https://www.cdc.gov/atsdr/social-vulnerability/index.html) to identify locations and populations within Carroll County that are significantly vulnerable to the impacts of the Plan's identified hazards.

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)	Met	Not Met
Regulation (44 CFR § 201.6 Local Mitigation Plans)				
ELEMENT E. PLAN ADOPTION				
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	Appendix H			
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	Appendix H			
ELEMENT E: REQUIRED REVISIONS FEMA: <p>E1: The "Municipal Coordination" section of Chapter 3: Planning Process and Content states "This Plan is established as a guide, and nothing herein shall be deemed legally binding on the corporate authority of the County Commissioners or participating Mayors and Town or City Councils." However, the 2011 Local Mitigation Plan Review Guide underscores that "[a]doption by the local governing body demonstrates the jurisdiction's commitment to fulfilling the hazard mitigation goals and actions outlined in the plan. Adoption legitimizes the plan and authorizes responsible agencies to execute their responsibilities." A key role of the whole community hazard mitigation planning process is to ensure that the content of the Plan reflects the interests and feedback of all participating jurisdictions so that the Plan can become a binding and galvanizing force for reducing community hazard risk. In short, the cited sentence from Chapter 3 conflicts with the intent of Element E, because jurisdictional adoption formally commits participating jurisdictions to advancing the implementation of their FEMA-approved hazard mitigation plan—specifically through their identified mitigation actions.</p> <p>To address this revision, update the Plan to remove or reword the sentence referenced above by clarify that "Adoption by the local governing body demonstrates the jurisdiction's commitment to fulfilling the hazard mitigation goals and actions outlined in the plan. Adoption legitimizes the plan and authorizes responsible agencies to execute their responsibilities" (2011 Local Mitigation Plan Review Guide, page 28). Please reword the sentence in a manner that both reflects Carroll County's voice and conforms with Element E of the 2011 Local Mitigation Plan Review Guide.</p> <p>Consider adding text conveying that the Plan is a living document in which participating jurisdictions can submit a request at any time (to Carroll County, MDEM, and FEMA) in order to update the HMP to reflect new priorities, limitations, capabilities, mitigation actions, data, or additional information.</p> <p>Carroll County: Updated wording to address this required revision (page 31-32)</p> <p>FEMA: Addressed.</p>				
ALL DAM RISKS - ELIGIBLE HIGH HAZARD POTENTIAL DAMS				
HHPD1. Did Element A4 (planning process) describe the incorporation of existing plans, studies, reports, and technical information for eligible high hazard potential dams?	Ch11 pg111-147			X
HHPD2. Did Element B3 (risk assessment) address eligible high hazard potential dams in the risk assessment?	Ch11 pg111-147	X		

Local Mitigation Plan Review Tool (+HHPD v. 060721)

A-17

1. REGULATION CHECKLIST			
Regulation (44 CFR § 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
HHPD3. Did Element C3 (mitigation goals) include mitigation goals to reduce long-term vulnerabilities from eligible high hazard potential dams that pose an unacceptable risk to the public?	Ch11 pg111-147		X
HHPD4. Did Elements C4-C5 (mitigation actions) prioritize mitigation actions to reduce vulnerabilities from eligible high hazard potential dams?	Ch11 pg111-147		X

REQUIRED REVISIONS

FEMA:

HHPD1-a: Update the plan to describe how the local government coordinated with local dam owners and/or the state dam safety agency. When dam safety coordination is limited, explain the limitations.

FEMA: Not met.

HHPD3-b: Link proposed actions for reducing long-term vulnerabilities from HHPDs to (at least 2) HMP goals. To address this revision, one may add narrative briefly explaining how the HMP's mitigation actions that reduce the long-term vulnerabilities from HHPDs advance multiple mitigation goals or long-term strategies.

FEMA: Not met.

HHPD4-b: Update the plan to describe the criteria used for prioritizing actions related to HHPDs.

FEMA: Not met.

HHPD4-c: Update the plan to identify the position, office, department or agency responsible for implementing and administering the actions related to mitigating hazards to or from HHPDs.

FEMA: Not met.

RECOMMENDED REVISIONS

HHPD2: Consider integrating more in-depth analyses of potential community impacts to a dam failure based on a dam breach scenario analysis using [US Army Corps of Engineers Hydrologic Engineering Center's River Analysis System \(HEC-RAS\)](#), [Decision Support System for Water Infrastructure Security Human Consequences Module \(DSS-WISE HCOM\)](#), [DSS-WISE Lite](#), FLO-2D, or other more detailed studies into the Plan.

HHPD2: The plan does not provide a summary description of all dam risk, which consists of incremental, non-breach, and residual risk. To address this recommended revision, add narrative describing non-breach, incremental, and residual risk with respect to at least Carroll County's eligible high hazard potential dam. If insufficient information is available, please add language explaining this limitation and include the definition of the three all dam risk component concepts. Relevant definitions are included below.

Definitions:

Incremental Risk: The risk (likelihood and consequences) to the pool area and downstream floodplain occupants that can be attributed to the presence of the dam should the dam breach prior or subsequent to overtopping, or undergo component malfunction or misoperation, where the consequences considered are over and above those that would occur without dam breach. The consequences typically are due to downstream inundation, but loss of the pool can result in significant consequences in the pool area upstream of the dam.

Non-Breach Risk: The risk in the reservoir pool area and affected downstream floodplain due to 'normal' dam operation of the dam (e.g., large spillway flows within the design capacity

that exceed channel capacity) or 'overtopping of the dam without breaching' scenarios.

Residual Risk: The risk that remains after all mitigation actions and risk reduction actions have been completed. With respect to dams, FEMA defines residual risk as "risk remaining at any time" (FEMA, 2015, p A-2). It is the risk that remains after decisions related to a specific dam safety issue are made and prudent actions have been taken to address the risk. It is the remote risk associated with a condition that was judged to not be a credible dam safety issue.

Source: "Rehabilitation of High Hazard Potential Dams Grant Program Guidance," June 2020

HHPD3: Include at least one goal or objective that more specifically addresses the reduction of vulnerabilities associated with high hazard potential dams.

HHPD4: Consider amending or updating the plan to include mitigation actions designed to rehabilitate and/or remove specific high hazard potential dams that pose a risk to Carroll County lives and property.

To help inform the development and refinement of HHPD mitigation actions, eligible activities from the FEMA FY22 HHPD grant funding opportunity are included below. Consider incorporating mitigation actions with language from the eligible activities below for specific HHPDs within Carroll County.

Eligible Rehabilitation of HHPD Grant Program Activities

- Construction activities such as:
 - Repair or rehabilitation of the dam
 - Dam removal
 - Construction monitoring
 - Installation of early warning systems associated with the eligible dam project
- Planning activities such as:
 - Activities and studies that determine risks associated with eligible dams
 - Environmental studies for NEPA compliance
 - Development of operation and maintenance plans
 - Public education and awareness of flood risks associated with the eligible dam project
 - Dam risk and consequence assessments Feasibility studies
 - Preliminary engineering studies Alternatives analysis
 - Mapping, engineering survey, and inundation modeling
 - Development of evacuation plans, plans for flood fighting, or community response plans to include in the floodplain management plan
 - Coordination of EAP and EOPs for different release conditions
- Design activities such as:
 - Engineering design
 - Development of specifications

Source: Fiscal Year (FY) 2022 Rehabilitation of High Hazard Potential Dams (HHPD) Notice of Funding Opportunity (NOFO)

HHPD4: Depict all proposed HHPD and Dam Failure related mitigation actions in a tabular format that includes the following populated columns: Action Number, Action Name, Responsible Agency, Action Summary/Description, Hazard Addressed, Mitigation Goal(s) Addressed, Potential Funding Source(s), Cost Estimate, Estimated Timeframe To Complete (in months or years).

ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)

1. REGULATION CHECKLIST		Location in Plan (section and/or page number)		Met	Not Met
Regulation (44 CFR § 201.6 Local Mitigation Plans)					
F1.					
F2.					
<u>ELEMENT F: REQUIRED REVISIONS</u>					

SECTION 2: PLAN ASSESSMENT

Plan Strengths

- *Element A (Strength)*: The HMP includes an Authorities and References section that provides direct links to the resources consulted, referenced, and integrated in the Plan.
- *Element A (Strength)*: The Plan integrates information from comprehensive plans to develop the municipal growth area maps in Appendix D.
- *Element B (Best Practice)*: Chapter 6, the Flood portion of the risk assessment includes a map analyzing the 100-year floodplain and critical facility locations across Carroll County at a watershed level.
- *Element B (Best Practice)*: Excellent use of images and narrative to describe the history of Thunderstorm and Wind hazard occurrence in Chapter 7.
- *Element C (Best Practice)*: The Plan clearly articulates the connection and synergies that exist between hazard mitigation and land use and development planning.
- *All Dam Risk (Best Practice)*: The plan includes detailed dam-specific inundation maps that depict the type and location of exposed assets to dam-related flooding including residential structures, non-residential structures, critical facilities, and historic sites. One map (for the Farm Museum Dam) depicts the building footprint of specific structures (such as an Office Building, Fire House, and Living History Center).
- *All Dam Risk (Strength)*: The Plan estimates a population at risk (PAR) of 400 individuals/residents exposed to dam-related inundation (tied to the Piney Run Dam which is Carroll County's only HHPD), a PAR of 8 for the Cranberry Reservoir (Significant Hazard) Dam, and a PAR of 0 for the Farm Museum Pond Dam by using 2019 Census data. Additionally, the Plan includes the number of residential structures and total value of improvements and value of land that are at risk to dam-related flooding, by dam name, identifies specific deficiencies tied to the spillway of the Piney Run Dam, highlights a County assessment of the Piney Run Dam's auxiliary spillway's integrity, and calls attention to ongoing work between Carroll County and the NRCS to implement a Supplemental Watershed Plan to enhance the HHPD's flood protection.
- *All Dam Risk (Strength)*: An assortment of potential and recommended dam failure mitigation actions are proposed in Chapter 11. Additionally, the Plan identifies community lifeline and infrastructure impacts from high and significant hazard potential dams located in Carroll County.
- *Element C (Strength)*: The Plan includes an overview of the county level agencies that play a role in Carroll County's Plan maintenance processes.

Resources

- NOAA/EPA/NASA/USGS/USACE/FEMA/DOD/FIU/Rutgers:
 - [Application Guide for the 2022 Sea Level Rise Technical Report](#)
 - [Technical Report - Global and Regional Sea Level Rise Scenarios for the United States](#)

- FEMA: 2022 Local Mitigation Planning Policy Guide
 - o Note: The latest version will be shared before or following the plan review discussion/technical assistance call.
- FEMA: A Comparison of the 2011 Local Mitigation Plan Review Guide and 2022 Local Mitigation Planning Policy guide
 - o Note: The latest version will be shared before or following the plan review discussion/technical assistance call.
- FEMA/Resilient Nation Partnership Network/NASA: [Building Alliances for Climate Action](#)
- FEMA/Resilient Nation Partnership Network/NOAA: [Building Alliances for Equitable Resilience](#)
- FEMA: [National Risk Index \(NRI\) for Natural Hazards](#)
- FEMA: [Resilience Analysis and Planning Tool \(RAPT\)](#)
- FEMA: [Mitigation Action Portfolio](#)
- FEMA: [Community Lifelines | FEMA.gov](#)
- FEMA: [Region 3 HM Planning Resources](#)
- FEMA: Region 3 Conducting Annual Hazard Mitigation Plan Reviews Resource
- FEMA: Region 3 High Hazard Potential Dams State and Local Mitigation Planning Tips Resource
 - o Note: The latest version will be shared before or following the plan review discussion/technical assistance call.
- FEMA: Region 3 Checking In On The NFIP Resource
 - o Note: This resource includes updated NFIP survey sheets.
- FEMA: [Guides to Expanding Mitigation](#)
- FEMA: Protect Your Home from Flooding, Low Cost Project You Can Do Yourself Resource
 - o Note: This resource will be shared before or following the plan review discussion/technical assistance call.
- FEMA: Protect Your Home from Flooding, Low Cost Project You Can Do Yourself Resource

SECTION 3:
MULTI-JURISDICTION SUMMARY SHEET (OPTIONAL)

INSTRUCTIONS: For multi-jurisdictional plans, a Multi-jurisdiction Summary Spreadsheet may be completed by listing each participating jurisdiction, which required Elements for each jurisdiction were 'Met' or 'Not Met,' and when the adoption resolutions were received. This Summary Sheet does not imply that a mini-plan be developed for each jurisdiction; it should be used as an optional worksheet to ensure that each jurisdiction participating in the Plan has been documented and has met the requirements for those Elements (A through E).

MULTI-JURISDICTION SUMMARY SHEET												
#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	Requirements Met (Y/N) *-HHPO					
							A. Planning Process*	B. Hazard Identification & Risk Assessment*	C. Mitigation Strategy*	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Requirements
1	Hampstead	Town	Ledley, Tammi	1084 S. Carroll Street, Hampstead, MD 21074	ledley.tammi@hamsteadmd.gov	410-239-7400	X	X	X	X		
2	Manchester	Town	Miller, Steve	3337 Victory Street, Manchester, MD 21102	smiller@manchestermd.gov	410-239-3300	X	X	X	X		
3	Mt. Airy	Town	Warrington, David	1105 S. Main Street, P.O. Box 2, Mt. Airy, MD 21771	dwarrington@mtairy.org	301-829-1424	X	X	X	X		
4	New Windsor	Town	Dye, Gary	209 High Street, P.O. Box 609, New Windsor, MD 21778	gdye@newwindsormd.gov	410-635-6575	X	X	X	X		
5	Sykesville	Town	Cosentini, Joe	7547 Main Street, Sykesville, MD 21784	jcosentini@sykesville.net	410-795-8959	X	X	X	X		

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Local Mitigation Plan Review Tool (+HHPD v. 060721)

MULTI-JURISDICTION SUMMARY SHEET												
#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	Requirements Met (Y/N) *HHPD					
							A. Planning Process*	B. Hazard Identification & Risk Assessment*	C. Mitigation Strategy*	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Requirements
6	Taneytown	City	Weiprecht, Jim	17 E. Baltimore Street, Taneytown, MD 21787	jweiprec@taneytown.md.gov	410-751-1100	X	X	X	X		
7	Union Bridge	Town	Jones, Perry	104 W. Locust Street, Union Bridge, MD 21781	pjones@unionbridge.md.gov	410-775-2711	X	X	X	X		
8	Westminster	City	Imhulse, Sara	45 W. Main Street, Westminster, MD 21157	sarah@westminster.md.gov	410-848-9000	X	X	X	X		
9	Carroll County	County	Hawkins, Valerie	1108 Green Valley Road, New Windsor, MD 21776	valh@carrollcountymd.gov	410-386-2296	X	X	X	X		
10												
11												
12												
13												
14												
15												

Appendix I – Resolutions – Carroll County and Municipalities

RESOLUTION NO. 1187-2023

WHEREAS, on April 6, 2023 the Carroll County Department of Public Safety presented to the County Commissioners of Carroll County the proposed “**2022 Carroll County Hazard Mitigation Plan**” for review; and

WHEREAS, on April 13, 2023 the Carroll County Department of Public Safety appeared before the County Commissioners of Carroll County to facilitate deliberation and pending action on the proposed “**2022 Carroll County Hazard Mitigation Plan**” by the County Commissioners of Carroll County; and

WHEREAS, the County Commissioners of Carroll County determined that adoption of the Plan would advance the public health, safety, and welfare.

NOW, THEREFORE, on the 18th day of April, 2023, the County Commissioners of Carroll County **RESOLVED** to **ADOPT** the proposed “**2022 Carroll County Hazard Mitigation Plan**”, **EFFECTIVE** immediately.

THE BOARD OF COUNTY COMMISSIONERS
OF CARROLL COUNTY, MARYLAND,
a body corporate and politic of
the State of Maryland

ATTEST:



Vivian Daly, County Clerk

 (SEAL)

Edward Rothstein, President

 (SEAL)

Kenneth Kiler, Vice President

 (SEAL)

Tom Gordon III, Commissioner

 (SEAL)

Michael Guerin, Commissioner

 (SEAL)

Joseph Vigliotti, Commissioner

Approved for legal sufficiency:



Timothy C. Burke
County Attorney