

Mecklenburg County, North Carolina

MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

TABLE OF CONTENTS

1 INTRODUCTION 1

1.1 Background 1

1.2 Purpose and Authority 2

1.3 Scope 2

1.4 References 3

1.5 Plan Organization 4

2 PLANNING PROCESS 5

2.1 Purpose and Vision 5

2.2 What's Changed in the Plan 6

2.3 Preparing the Plan 7

2.3.1 Phase I – Planning Process 8

2.3.2 Phase II – Risk Assessment 10

2.3.3 Phase III – Mitigation Strategy 10

2.3.4 Phase IV – Plan Maintenance 10

2.4 Hazard Mitigation Planning Committee 11

2.5 Meetings and Workshops 16

2.6 Involving the Public 17

2.7 Outreach Efforts 17

2.8 Involving the Stakeholders 18

2.9 Documentation of Plan Progress 19

3 PLANNING AREA PROFILE 23

3.1 Geography and Environment 23

3.2 Population and Demographics 29

3.3 Historic Properties 31

3.4 Housing 34

3.5 Infrastructure 34

3.5.1 Transportation 34

3.5.2 Utilities 35

3.6 Current and Future Land Use 35

3.7 Employment and Industry 44
3.8 Social Vulnerability 45

4 RISK ASSESSMENT 48
4.1 Overview 48
4.2 Hazard Identification 49
4.3 Risk Assessment Methodology & Assumptions 53
4.4 Asset Inventory 57
4.4.1 Population 57
4.4.2 Buildings 57
4.4.3 Critical Facilities and Infrastructure 58
4.4.4 Agriculture 61
4.5 Hazard Profiles, Analysis, and Vulnerability 62
4.5.1 Dam & Levee Failure 62
4.5.2 Drought 74
4.5.3 Earthquake 81
4.5.4 Excessive Heat 95
4.5.5 Flooding 103
4.5.6 Hurricane and Tropical Storm 126
4.5.7 Infectious Disease 140
4.5.8 Landslide 150
4.5.9 Severe Winter Weather 155
4.5.10 Tornadoes & Thunderstorms 162
4.5.11 Wildfire 192
4.5.12 Cyber Threat 208
4.5.13 Hazardous Substances 214
4.5.14 Radiological Emergency 228
4.6 Conclusions on Hazard Risk 235

5 CAPABILITY ASSESSMENT 237
5.1 Overview 237
5.2 Conducting the Capability Assessment 237
5.3 Capability Assessment Findings 238
5.3.1 Planning and Regulatory Capability 238
5.3.2 Administrative and Technical Capability 245
5.3.3 Fiscal Capability 247
5.3.4 Education and Outreach Capability 248

5.3.5 Mitigation Capability 249
5.3.6 Political Capability 250
5.3.7 Local Self-Assessment Rating 250
5.4 Conclusions on Local Capability 251
6 MITIGATION STRATEGY 252
6.1 Goals and Objectives 252
6.1.1 Coordination with Other Planning Efforts 252
6.1.2 Goal Setting 253
6.1.3 Resulting Goals and Objectives 253
6.2 Identification and Analysis of Mitigation Activities 254
6.2.1 Prioritization Process 254
7 MITIGATION ACTION PLANS 256
8 PLAN MAINTENANCE 285
8.1 Implementation 285
8.1.1 Mitigation action plan implementation 285
8.2 Monitoring, Evaluation, and Enhancement 287
8.2.1 Role of HMPC in Implementation, Monitoring and Maintenance 287
8.2.2 Maintenance Schedule 287
8.2.3 Maintenance Evaluation Process 288
8.3 Continued Public Involvement 289
9 PLAN ADOPTION 291
ANNEX A UNINCORPORATED MECKLENBURG COUNTY 308
A.1 Asset Inventory 308
A.2 Risk Assessment 313
A.2.1 Dam Failure 313
A.2.2 Flooding 315
A.2.3 Wildfire 319
A.3 Mitigation Strategy 324

ANNEX B CITY OF CHARLOTTE 331

B.1 Asset Inventory 331

B.2 Risk Assessment 391

B.2.1 Dam Failure 391

B.2.2 Flooding 393

B.2.3 Wildfire 397

B.3 Mitigation Strategy 402

ANNEX C TOWN OF CORNELIUS 409

C.1 Asset Inventory 409

C.2 Risk Assessment 413

C.2.1 Dam Failure 413

C.2.2 Flooding 415

C.2.3 Wildfire 419

C.3 Mitigation Strategy 424

ANNEX D TOWN OF DAVIDSON 425

D.1 Asset Inventory 425

D.2 Risk Assessment 434

D.2.1 Dam Failure 434

D.2.2 Flooding 436

D.2.3 Wildfire 439

D.3 Mitigation Strategy 445

ANNEX E TOWN OF HUNTERSVILLE 448

E.1 Asset Inventory 448

E.2 Risk Assessment 455

E.2.1 Dam Failure 455

E.2.2 Flooding 457

E.2.3 Wildfire 461

E.3 Mitigation Strategy 466

ANNEX F TOWN OF MATTHEWS 468

F.1 Asset Inventory 468

F.2 Risk Assessment 474

F.2.1 Dam Failure 474

F.2.2 Flooding 476
F.2.3 Wildfire 480
F.3 Mitigation Strategy 485

ANNEX G TOWN OF MINT HILL 488
G.1 Asset Inventory 488
G.2 Risk Assessment 492
G.2.1 Dam Failure 492
G.2.2 Flooding 494
G.2.3 Wildfire 498
G.3 Mitigation Strategy 503

ANNEX H TOWN OF PINEVILLE 505
H.1 Asset Inventory 505
H.2 Risk Assessment 509
H.2.1 Dam Failure 509
H.2.2 Flooding 511
H.2.3 Wildfire 515
H.3 Mitigation Strategy 520

APPENDIX A PLAN REVIEW TOOL A.1

APPENDIX B PLANNING PROCESS DOCUMENTATION B.1

APPENDIX C MITIGATION ALTERNATIVES C.1

APPENDIX D REFERENCES D.1

1 INTRODUCTION

Section 1 provides a general introduction to hazard mitigation and an introduction to the Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan. This section contains the following subsections:

1.1 Background
1.2 Purpose and Authority
1.3 Scope
1.4 References
1.5 Plan Organization

1.1 BACKGROUND

This document comprises a Hazard Mitigation Plan for Mecklenburg County, North Carolina.

Each year in the United States, natural and human-caused hazards take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters because additional expenses incurred by insurance companies and non-governmental organizations are not reimbursed by tax dollars. Many natural hazards are predictable, and much of the damage caused by hazard events can be reduced or even eliminated.

Hazards are a natural part of the environment that will inevitably continue to occur, but there is much we can do to minimize their impacts on our communities and prevent them from resulting in disasters. Every community faces different hazards, has different resources to draw upon in combating problems, and has different interests that influence the solutions to those problems. Because there are many ways to deal with hazards and many agencies that can help, there is no one solution for managing or mitigating their effects. Planning is one of the best ways to develop a customized program that will mitigate the impacts of hazards while accounting for the unique character of a community.

A well-prepared hazard mitigation plan will ensure that all possible activities are reviewed and implemented so that the problem is addressed by the most appropriate and efficient solutions. It can also coordinate activities with each other and with other goals and activities, preventing conflicts and reducing the costs of implementing each individual activity. This plan provides a framework for all interested parties to work together toward mitigation. It establishes the vision and guiding principles for reducing hazard risk and proposes specific mitigation actions to reduce identified vulnerabilities.

In an effort to reduce the nation's mounting natural disaster losses, the U.S. Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) to invoke new and revitalized approaches to mitigation planning. Section 322 of DMA 2000 emphasizes the need for state and local government entities to closely coordinate on mitigation planning activities and makes the development of a hazard mitigation plan a specific eligibility requirement for any local government applying for federal mitigation grant funds. These funds include the Hazard Mitigation Grant Program (HMGP), the Building Resilient Infrastructure & Communities (BRIC) program, and the Flood Mitigation Assistance (FMA) Program, all of which are administered by the Federal Emergency Management Agency (FEMA) under the Department of Homeland Security. Communities with an adopted and federally approved hazard mitigation plan thereby become pre-positioned and more apt to receive available mitigation funds before and after the next disaster strikes.

This plan was prepared in coordination with FEMA Region 4 and the North Carolina Division of Emergency Management (NCEM) to ensure that it meets all applicable federal and state planning

requirements. A Local Mitigation Plan Review Tool, found in Appendix A, provides a summary of FEMA's current minimum standards of acceptability and notes the location within this plan where each planning requirement is met.

1.2 PURPOSE AND AUTHORITY

This plan was developed in a joint and cooperative manner by members of a Hazard Mitigation Planning Committee (HMPC) which included representatives of County, City, and Town departments, federal and state agencies, citizens, and stakeholders. This plan will ensure all jurisdictions in Mecklenburg County remain eligible for federal disaster assistance including FEMA HMGP, BRIC, and FMA programs.

This plan has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), 42 U.S.C. 5165, enacted under Section 104 of DMA 2000, Public Law 106-390 of October 30, 2000, as implemented at CFR 201.6 and 201.7 dated October 2007. Additionally, this plan will be monitored and updated on a routine basis to comply with the above legislation and with the National Flood Insurance Act of 1968, as amended by 42 U.S.C. 4001 et seq, and North Carolina General Statutes, Chapter 166A: North Carolina Emergency Management Act, as amended by Senate Bill 300: An Act to Amend the Laws Regarding Emergency Management as Recommended by the Legislative Disaster Response and Recovery Commission (2001).

This plan will be adopted by each participating jurisdiction in accordance with standard local procedures under the authority and police powers granted to counties as defined by the State of North Carolina (N.C.G.S., Chapter 153A) and the authority granted to cities and towns as defined by the State of North Carolina (N.C.G.S., Chapter 160A). Copies of adoption resolutions are provided in Section 9 Plan Adoption.

1.3 SCOPE

This document comprises a Multi-Jurisdictional Hazard Mitigation Plan for Mecklenburg County. The planning areas includes all incorporated municipalities and unincorporated areas listed in Table 1.1.

Table 1.1 – Participating Jurisdictions in the Mecklenburg County Hazard Mitigation Plan

Mecklenburg County	
City of Charlotte	Town of Matthews
Town of Cornelius	Town of Mint Hill
Town of Davidson	Town of Pineville
Town of Huntersville	

Mecklenburg County followed the planning process prescribed by FEMA, and this plan was developed under the guidance of an HMPC comprised of representatives of County, City, and Town departments; citizens; and other stakeholders. The HMPC conducted a risk assessment that identified and profiled hazards that pose a risk to the planning area, assessed the planning area's vulnerability to these hazards, and examined each participating jurisdiction's capabilities in place to mitigate them.

The plan evaluates and prioritizes hazards for the planning area using a Priority Risk Index, as determined through the risk and vulnerability assessments. Hazards are categorized as "low," "moderate," or "high" priority, however, mitigation strategies are identified for all profiled hazards. The hazards profiled in this plan include:

— Dam & Levee Failure

- Drought
- Earthquake
- Excessive Heat
- Flooding
- Hurricane & Tropical Storm
- Infectious Disease
- Landslide
- Severe Winter Weather
- Tornado & Thunderstorm
- Wildfire
- Cyber Threat
- Hazardous Substances
- Radiological Emergency

1.4 REFERENCES

The following FEMA guides and reference documents were used to prepare this document:

- FEMA 386-1: Getting Started: Building Support for Mitigation Planning. September 2002.
- FEMA 386-2: Understanding Your Risks: Identifying Hazards and Estimating Losses. August 2001.
- FEMA 386-3: Developing the Mitigation Plan. April 2003.
- FEMA 386-4: Bringing the Plan to Life. August 2003.
- FEMA 386-5: Using Benefit-Cost Review in Mitigation Planning. May 2007.
- FEMA 386-6: Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning. May 2005.
- FEMA 386-7: Integrating Manmade Hazards into Mitigation Planning. September 2003.
- FEMA 386-8: Multijurisdictional Mitigation Planning. August 2006.
- FEMA 386-9: Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects. August 2008.
- FEMA. Local Mitigation Plan Review Guide. October 1, 2011.
- FEMA National Fire Incident Reporting System 5.0: Complete Reference Guide. January 2008.
- FEMA. Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials. March 1, 2013.
- FEMA Hazard Mitigation Assistance Program and Policy Guide. July 30, 2024.
- FEMA. Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials. March 1, 2013.
- FEMA. Mitigation Ideas. A Resource for Reducing Risk to Natural Hazards. January 2013.
- FEMA. FP 206-21-0002. Local Mitigation Planning Policy Guide. April 19, 2023.
- FEMA. Local Mitigation Planning Handbook. May 2023.

Additional sources used in the development of this plan, including data compiled for the Hazard Identification and Risk Assessment, are listed in Appendix D.

1.5 PLAN ORGANIZATION

The Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan is organized into the following sections:

- Section 1: Introduction
- Section 2: Planning Process
- Section 3: Planning Area Profile
- Section 4: Risk Assessment
- Section 5: Capability Assessment
- Section 6: Mitigation Strategy
- Section 7: Mitigation Action Plans
- Section 8: Plan Maintenance
- Section 9: Plan Adoption
- Annexes
- Appendix A: Local Plan Review Tool
- Appendix B: Planning Process Documentation
- Appendix C: Mitigation Alternatives
- Appendix D: References

2 PLANNING PROCESS

Requirement §201.6(b): An open public involvement process is essential to the development of an effective plan. To develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:
1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.
Requirement §201.6(c)(1): The plan shall include the following:
1) Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

This section provides a review of the planning process followed for the development of the Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan. It consists of the following subsections:

2.1 Purpose and Vision
2.2 What's Changed in the Plan
2.3 Preparing the Plan
2.4 Hazard Mitigation Planning Committee
2.5 Meetings and Workshops
2.6 Involving the Public
2.7 Outreach Efforts
2.8 Involving the Stakeholders
2.9 Documentation of Plan Progress

2.1 PURPOSE AND VISION

As defined by FEMA, "hazard mitigation" means any sustained action taken to reduce or eliminate the long-term risk to life and property from a hazard event. Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented.

The purpose of the Mecklenburg County Hazard Mitigation Plan is to identify, assess, and mitigate hazard risk to better protect the people and property within the Region from the effects of natural and human-caused hazards. This plan documents progress on existing hazard mitigation planning efforts, updates the previous plan to reflect current conditions in the Region including relevant hazards and vulnerabilities, increases public education and awareness about the plan and planning process, maintains grant eligibility for participating jurisdictions, maintains compliance with state and federal requirements for local hazard mitigation plans, and identifies and outlines strategies the Region's participating jurisdictions will use to decrease vulnerability and increase resiliency.

During the development of the 2020 Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan, the Hazard Mitigation Planning Committee (HMPC) met to discuss their vision for the Region in terms of what the successful implementation of the plan would achieve, what outcomes the plan would generate, and what the Region will look like in five years. This vision statement, presented below, remains relevant to define and guide the planning process for this plan update and the region's approach to hazard mitigation.

Mecklenburg County, along with the City of Charlotte, the Towns of Cornelius, Davidson, Huntersville, Matthews, Mint Hill, and Pineville, and other partners, will manage the community's continued growth by making informed, intentional and planned decisions to create a community more resilient to current and future hazards, implement all future projects in an efficient, sustainable manner through effective coordination, and emphasize education for staff and the public that improves capabilities and understand of risk.

The vision is underpinned by the following key principles which describe how the Mecklenburg County Hazard Mitigation Planning Committee hopes to characterize the future of the community.

Resilience and Managed Growth: When an event occurs, Mecklenburg County will sustain minimal damages and the community will be able to recover quickly. This will be accomplished through a two-pronged approach: 1) mitigating homes, businesses, and infrastructure currently at risk and 2) managing growth by regulating development and promoting the construction of new, resilient infrastructure.

Coordination: Mecklenburg County, in coordination with its partners, will coordinate locally, across jurisdictions, and among departments to ensure that goals and decisions made reinforce one another. Additionally, jurisdictions will work together to address issues that span beyond their boundaries, such as at a watershed or ecosystem level.

Implementation: Mecklenburg County, in coordination with its partners, will take responsibility to implement projects and make measurable progress on plans and projects that will be sustainable.

Education: Mecklenburg County and partner staff will be educated and trained to improve capabilities among and across departments. At the same time, public education will ensure residents understand their responsibilities for hazard mitigation as the county continues to grow.

2.2 WHAT'S CHANGED IN THE PLAN

This plan is an update to the 2020 Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan, which included participation from all jurisdictions involved in this plan update: The previous plan was approved by FEMA on November 30, 2020.

This hazard mitigation plan update involved a comprehensive review and update of each section of the existing plan and an assessment of the success of the Counties and participating municipalities in evaluating, monitoring and implementing the mitigation strategy outlined in their existing plans. Only the information and data still valid from the existing plans was carried forward as applicable into this update. The following requirements were addressed during the development of this regional plan:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to inventories; and
- Incorporate new action recommendations or changes in action prioritization.

Section 4.2 provides a comparison of the hazards addressed in the 2023 State of North Carolina Hazard Mitigation Plan and the 2020 Mecklenburg County Multi-Jurisdictional Plan and provides the final decision made by the HMPC as to which hazards should be included in this 2025 plan update.

In addition to the specific changes in hazard analyses identified in Section 4.2, the following items were also addressed in this 2025 plan update:

- GIS was used, to the extent data allowed, to analyze the priority hazards as part of the vulnerability assessment.
- Assets at risk to identified hazards were identified by property type and values of properties based on North Carolina Emergency Management's IRISK Database.
- A discussion on climate change and its projected effect on specific hazards was included in each hazard profile in the risk assessment.
- The discussion on growth and development trends was enhanced utilizing 2023 American Community Survey data.
- An effort was made to provide underserved communities and vulnerable populations with opportunities to participate in and contribute to the plan update process. Engagement opportunities were provided through the public survey, the plan website, and stakeholder coordination.
- Enhanced public outreach and agency coordination efforts were conducted throughout the plan update process in order to meet the more rigorous requirements of the 2017 CRS Coordinator's Manual, in addition to DMA requirements.

2.3 PREPARING THE PLAN

The planning process for preparing the Mecklenburg Multi-Jurisdictional Hazard Mitigation Plan was based on DMA planning requirements and FEMA's associated guidance. This guidance is structured around a four-phase process:

1. Planning Process;
2. Risk Assessment;
3. Mitigation Strategy; and
4. Plan Maintenance.

Into this process, the planning consultant integrated a more detailed 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance (FMA) programs. Thus, the modified 10-step process used for this plan meets the requirements of six major programs: FEMA's Hazard Mitigation Grant Program (HMGP); Building Resilient Infrastructure & Communities (BRIC) Program; CRS Program; FMA Program; Severe Repetitive Loss Program; and new flood control projects authorized by the U.S. Army Corps of Engineers.

Table 2.1 shows how the 10-step CRS planning process aligns with the four phases of hazard mitigation planning pursuant to the Disaster Mitigation Act of 2000.

Table 2.1 – Mitigation Planning and CRS 10-Step Process Reference Table

DMA Process	CRS Process
Phase I – Planning Process	
§201.6(c)(1)	Step 1. Organize to Prepare the Plan
§201.6(b)(1)	Step 2. Involve the Public
§201.6(b)(2) & (3)	Step 3. Coordinate

DMA Process	CRS Process
Phase II – Risk Assessment	
§201.6(c)(2)(i)	Step 4. Assess the Hazard
§201.6(c)(2)(ii) & (iii)	Step 5. Assess the Problem
Phase III – Mitigation Strategy	
§201.6(c)(3)(i)	Step 6. Set Goals
§201.6(c)(3)(ii)	Step 7. Review Possible Activities
§201.6(c)(3)(iii)	Step 8. Draft an Action Plan
Phase IV – Plan Maintenance	
§201.6(c)(5)	Step 9. Adopt the Plan
§201.6(c)(4)	Step 10. Implement, Evaluate and Revise the Plan

In addition to meeting DMA and CRS requirements, this plan also meets the recommended steps for developing a Community Wildfire Protection Plan (CWPP). Table 2.2 below outlines the recommended CWPP process and the CRS step and sections of this plan that meet each step.

Table 2.2 – Community Wildfire Protection Plan Process Reference

CWPP Process	CRS Step	Fulfilling Plan Section
Convene decision makers	Step 1	Section 2 – HMPC
Involve Federal agencies	Step 3	Section 2 – Involving Stakeholders
Engage interested parties (such as community representatives)	Step 1, 2, and 3	Section 2 – HMPC, Involving the Public, Involving Stakeholders
Establish a community base map		Section 4 – Wildfire
Develop a community risk assessment, including fuel hazards, risk of wildfire occurrence, homes, business and essential infrastructure at risk, other community values at risk, local preparedness, and firefighting capability	Step 4 and 5	Section 4 – Wildfire Section 5 – Capability
Establish community hazard reduction priorities and recommendations to reduce structural ignitability	Step 6, 7, and 8	Section 6 – Mitigation Strategy Section 7 – Mitigation Action Plans
Develop an action plan and assessment strategy	Step 8 and 10	Section 7 – Mitigation Action Plans Section 8 – Plan Maintenance
Finalize the CWPP	Step 9	Section 9 – Plan Adoption

The process followed for the preparation of this plan, as outlined in Table 2.1 above, is as follows:

2.3.1 PHASE I – PLANNING PROCESS

Planning Step 1: Organize to Prepare the Plan

With the Region's commitment to participate in the DMA planning process, community officials worked to establish the framework and organization for development of the plan. An initial meeting was held with key community representatives to discuss the organizational aspects of the plan development process. Charlotte-Mecklenburg Emergency Management led the planning area's effort to reorganize and coordinate for the plan update. Consultants from WSP assisted by leading the County through the planning process and preparing the plan document.

Planning Step 2: Involve the Public

Public involvement in the development of the plan was sought using various methods, as detailed in Section 2.6.

Planning Step 3: Coordinate

The HMPC formed for development of the 2020 Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan was reconvened for this plan update. Membership was updated where necessary to ensure each community had adequate representation from staff and stakeholders. More details on the HMPC are provided in Section 2.4. Stakeholder coordination was incorporated into the formation of the HMPC and was also sought through additional outreach methods. These efforts are detailed in Section 2.8 and documentation of additional stakeholder outreach is provided in Appendix B.

Coordination with Other Community Planning Efforts and Hazard Mitigation Activities

In addition to stakeholder involvement, coordination with other community planning efforts was also seen as paramount to the success of this plan. Mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. Communities in Mecklenburg County use a variety of planning mechanisms, such as comprehensive plans, subdivision regulations, building codes, and ordinances to guide growth and development. Integrating existing planning efforts, mitigation policies, and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. As detailed in Table 2.3, the development of this plan incorporated information from existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

These and other documents were reviewed and considered, as appropriate, during the collection of data to support the planning process and plan development. Data from these sources was incorporated into the risk and vulnerability assessment and was used in determining the capability of each jurisdiction to implement certain mitigation strategies. The Risk Assessment is presented in Section 4 and the Capability Assessment can be found in Section 5.

Table 2.3 – Summary of Existing Studies and Plans Reviewed

Resource Referenced	Use in this Plan
Local Comprehensive Plans	Where available, each community's comprehensive plan was referenced to develop the Planning Area Profile in Section 3, with future land use maps and descriptions incorporated into the profile. Local land use and comprehensive plans were also used to develop Mitigation Action Plans in Section 7 and were referenced in the Capability Assessment in Section 5.
Local Ordinances (Flood Damage Prevention Ordinances, Subdivision Ordinances, Zoning Ordinances, etc.)	Local ordinances were referenced in the Capability Assessment in Section 5 and where applicable for updates or enforcement in Mitigation Action Plans in Section 7.
Mecklenburg County and Incorporated Areas Flood Insurance Study (FIS) Reports	FIS reports were referenced in the preparation of the flood hazard profile in Section 4.
Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan, 2020	The previous plan was referenced in compiling the Hazard Identification and Risk Assessment in Section 4 and in reporting on implementation status and developing the Mitigation Action Plans in Section 2 and Section 7, respectively.

Resource Referenced	Use in this Plan
North Carolina State Hazard Mitigation Plan, 2023	The State plan was referenced in compiling the Hazard Identification and Risk Assessment in Section 4.

2.3.2 PHASE II – RISK ASSESSMENT

Planning Steps 4 and 5: Identify/Assess the Hazard and Assess the Problem

The HMPC completed a comprehensive effort to identify, document, and profile all hazards that have, or could have, an impact on the planning area. Geographic information systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities. A draft of the risk and vulnerability assessment was made available on the plan website for the HMPC, stakeholders, and the public to review and comment.

The HMPC also conducted a capability assessment to review and document the planning area's current capabilities to mitigate risk from and vulnerability to hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC could assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. A more detailed description of the risk assessment process and the results are included in Section 4 Risk Assessment.

2.3.3 PHASE III – MITIGATION STRATEGY

Planning Steps 6 and 7: Set Goals and Review Possible Activities

WSP facilitated a discussion with the HMPC to review and revise the planning goals and objectives and a comprehensive range of mitigation alternatives. The HMPC also discussed a method of selecting and defending recommended mitigation actions using a series of selection criteria. This information is included in Section 6 Mitigation Strategy.

Planning Step 8: Draft an Action Plan

A complete first draft of the plan was prepared based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7. This draft was shared for HMPC, stakeholder, and public review and comment via the plan website. HMPC, public, and stakeholder comments were integrated into the final draft for NCEM and FEMA Region 4 to review and approve, contingent upon final adoption by all participating jurisdictions.

2.3.4 PHASE IV – PLAN MAINTENANCE

Planning Step 9: Adopt the Plan

To secure buy-in and officially implement the plan, the plan will be reviewed and adopted by all participating jurisdictions. Resolutions will be provided in Section 9.

Planning Step 10: Implement, Evaluate and Revise the Plan

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. Up to this point in the planning process, the HMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing mitigation actions. Section 8 Plan Maintenance provides an overview of the strategy for plan implementation and maintenance and outlines

the method and schedule for monitoring, updating, and evaluating the plan. The Section also discusses incorporating the plan into existing planning mechanisms and how to continue public involvement.

2.4 HAZARD MITIGATION PLANNING COMMITTEE

As with the previous plan, this Hazard Mitigation Plan was developed under the guidance of a planning committee comprising representatives of County, City, and Town departments, federal and state agencies, citizens, and stakeholders.

To form the HMPC, the County Emergency Manager coordinated with County, City, and Town officials to designate representatives for each jurisdiction. Each community was asked to designate a primary and secondary contact for the HMPC. Communities were also asked to identify local stakeholder representatives to participate on the HMPC alongside the local staff to improve the integration of stakeholder input into the plan. Table 2.4 lists the membership of the HMPC, the agencies and jurisdictions they represented, and members' attendance at meetings. Many of these representatives were involved in the development of the 2020 Hazard Mitigation Plan and have since participated in regular plan reviews and maintenance. For this plan update, an effort was made to involve additional stakeholders who could represent or coordinate with underserved communities and vulnerable populations.

Table 2.4 – HMPC Members

Jurisdiction	Representative	Agency	Position/Title or *Stakeholder	HMPC Meeting Attendance			
				Mtg.1	Mtg.2	Mtg.3	Mtg.4
Mecklenburg County	Matthew Bixler	County Fire Department	Deputy Chief Fire Marshal		✓		
Mecklenburg County	Jonathan Beller	CMSWS	Project Manager	✓	✓		✓
Mecklenburg County	Don Ceccarelli	CMSWS	Director	✓	✓		
Mecklenburg County	Josh McSwain	CMSWS	Project Manager	✓	✓	✓	
Mecklenburg County	Matthew Hornack	CMSWS	Project Manager	✓	✓		✓
Mecklenburg County	James Scanlon	CMSWS	GIS Systems Analyst	✓	✓	✓	✓
Mecklenburg County	Alex Moore	CMSWS	Communications Specialist			✓	✓
Mecklenburg County	Lee Jackson	Duke Energy	Emergency Preparedness Specialist*	✓	✓		
Mecklenburg County	Neal Banerjee	FNI	Citizen/Stakeholder*	✓	✓	✓	
City of Charlotte	Tony Bateman	CMEMO	REP Coordinator	✓	✓	✓	✓
City of Charlotte	Robert Graham	CMEMO	Deputy Director	✓	✓	✓	✓
City of Charlotte	Scott Hudson	CMSWS	Operations Division Manager	✓	✓		✓
City of Charlotte	Rebecca Deal	CMSWS	Stewardship Program Supervisor	✓	✓	✓	✓
City of Charlotte	Andrew DeCristofaro	CMSWS	Water Quality Program Specialist	✓	✓	✓	✓
City of Charlotte	Scott Hess	Charlotte Water	Safety Coordinator-Senior	✓	✓	✓	✓
City of Charlotte	Jerry Winkles	Charlotte Fire Department	Deputy Fire Chief		✓	✓	
City of Charlotte	Jeremy Monteith	Fire Department	Battalion Fire Chief		✓		
City of Charlotte	Ashley Riggins	CMEMO	Planner			✓	
City of Charlotte	Robyn Byers	Office of Sustainability & Resilience	Sustainability & Resiliency Manager			✓	
City of Charlotte	Gidget Dennehy	Lake Wiley Community	Citizen/Stakeholder*			✓	
City of Charlotte	Jane Baker	N/A	Citizen/Stakeholder*			✓	
City of Charlotte	Rachel Bradshaw Roberts	N/A	Citizen/Stakeholder*				
City of Charlotte	Ron Cheves	LEPC Member	Citizen/Stakeholder*	✓	✓		
City of Charlotte	Mike Croke	JCI Jones Chemical	Citizen/Stakeholder*	✓	✓	✓	✓
City of Charlotte	Kevin Martin	UNC Charlotte	Emergency Preparedness Coordinator*	✓	✓		✓
City of Charlotte	Kyle Lanasa	UNC Charlotte	Operations Coordinator*			✓	

Jurisdiction	Representative	Agency	Position/Title or *Stakeholder	HMPC Meeting Attendance			
				Mtg.1	Mtg.2	Mtg.3	Mtg.4
City of Charlotte	Tiffani Bowser	UNC Charlotte	Emergency Training & Exercise Coordinator*				
City of Charlotte	Katherine Idziorek	UNC Charlotte	Assistant Professor				✓
City of Charlotte	Brandon Jones	Catawba Riverkeeper Foundation	Catawba Riverkeeper*		✓	✓	✓
City of Charlotte	Christina Danis	Centralina Regional Council	Director of Community Economic Development*		✓	✓	✓
City of Charlotte	Chris Hardin	Sale Creek VFD	Citizen/Stakeholder*				
City of Charlotte	Greg Hildreth	Idlewild VFD	Citizen/Stakeholder*				
Town of Cornelius	Heather Barfield[1]	Planning Department	Planner	✓	✓		
Town of Cornelius	Aaron Tucker[1]	Planning Department	Senior Planner			✓	✓
Town of Cornelius	Vaughn Griffin	Police Dept.	Lieutenant		✓		
Town of Cornelius	Andrew Bridges	Fire Department	Deputy Chief		✓		✓
Town of Cornelius	Lin Snowa	N/A	Citizen/Stakeholder*		✓		
Town of Cornelius	Jason Happe	N/A	Citizen/Stakeholder*		✓		
Town of Davidson	J. Ryan Monteith	Fire Department	Fire Chief	✓			✓
Town of Davidson	Steve Sonnenberg	N/A	Citizen/Stakeholder*		✓	✓	✓
Town of Davidson	Brad Johnson	Davidson College	Citizen/Stakeholder*				
Town of Huntersville	David Moore	Huntersville Human Resources	Safety and Risk Coordinator	✓	✓	✓	
Town of Huntersville	Steve Robbins	Public Works	Assistant Director	✓	✓	✓	✓
Town of Huntersville	Jonathan Bradshaw	N/A	Citizen/Stakeholder*		✓		
Town of Huntersville	Varona Wynn	N/A	Citizen/Stakeholder*		✓		
Town of Matthews	CJ O'Neill	Public Works	Public Works Director	✓	✓		✓
Town of Matthews	Lief Fitzpatrick	Public Works	Assistant Public Works Director	✓	✓		
Town of Mint Hill	John Phillips	Mint Hill Fire	Deputy Chief		✓		✓
Town of Mint Hill	Joseph Hatley	Mint Hill Police	Chief of Police	✓			
Town of Pineville	Corey Copley	Police Dept	Captain	✓			
Town of Pineville	Brian Elgort	Planning Department	Planner				
Town of Pineville	Randy Smith	N/A	Citizen/Stakeholder*	✓			
-	Chris Crew	NCEM	Mitigation Plans Manager*	✓			
-	Carl Baker	NCEM	Mitigation Plans Manager*		✓	✓	✓

Jurisdiction	Representative	Agency	Position/Title or *Stakeholder	HMPC Meeting Attendance			
				Mtg.1	Mtg.2	Mtg.3	Mtg.4
-	John Mello	NCEM	Hazard Mitigation Planner*	✓	✓	✓	✓
-	Eric Wiseman	NCEM	Area 13 Coordinator*	✓			
-	Emily Walmsley	NCEM	Multi-Hazard Field Planner*		✓		
-	Andrea Webster	NCORR	Resilience Policy Advisor*		✓		
-	Kymberly Kudla	FEMA Region IV	Community Planner*	✓	✓		
-	Kimberly Hailey	FEMA	Supervisory Program Analyst*		✓		

*Asterisk indicates that the representative is a citizen or outside stakeholder not affiliated with the local government

CMSWS: Charlotte-Mecklenburg Storm Water Services

CMEMO: Charlotte-Mecklenburg Emergency Management Office

[1]Heather Barfield vacated her position during the planning process and was replaced on the HMPC by Aaron Tucker.

The HMPC led the planning and decision-making efforts throughout the planning process; however, other staff from the participating communities were involved in an advisory role to provide input and local data, review plan drafts, update the status of their respective mitigation actions, and otherwise support the HMPC in this plan update. These were not members of the HMPC. Additional local staff that supported the HMPC are recognized in Table 2.5 below.

Table 2.5 – Additional Staff Supporting the Planning Process

Jurisdiction	Representative	Agency	Position/Title
Mecklenburg County	David Kroening	CMSWS	Project Manager
Mecklenburg County	Ryan Spidel	CMSWS	Environmental Supervisor
Mecklenburg County	Elaine Powell	Board of County Commissioners	Commissioner
Mecklenburg County	Erin Stanforth	County Manager's Office	Sustainability & Resiliency Manager
Mecklenburg County	Karli Godfrey	County Manager's Office	Senior Assistant to County Manager
Mecklenburg County	KC Bernesser	Mecklenburg Co. Public Health	Health Program Manager
Mecklenburg County	Jenna Hoagland	Mecklenburg Co. Public Health	Preparedness Coordinator
City of Charlotte	Bob Jarzemsky	CMSWS	Storm Water Division Manager
City of Charlotte	William Suthard	Charlotte Fire Department	Communications
City of Charlotte	Stephanie Kelly	City of Charlotte	City Clerk
City of Charlotte	Paige Grande	CMEMO	Community Preparedness Coordinator
Town of Huntersville	Bobby Williams	Town of Huntersville	Assistant Town Manager
Town of Huntersville	Jim Dotoli	Fire Department	Fire Chief
Town of Matthews	Rob Kinniburgh	Fire Department	Fire & EMS Chief
Town of Matthews	Roy Sisk	Police Department	Police Chief
Town of Mint Hill	Billy Gilman	Mint Hill Police	Major

The formal HMPC meetings followed the 10 CRS Planning Steps. Agendas, minutes, and sign-in sheets for the HMPC meetings are included in Appendix B. The meeting dates and topics discussed are summarized in Section 2.5 Meetings and Workshops. All HMPC meetings were open to the public.

The DMA planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the HMPC;
- Detail where within the planning area the risk differs from that facing the entire area;
- Identify potential mitigation actions; and
- Formally adopt the plan.

For the Mecklenburg County HMPC, "participation" meant the following:

- Providing facilities for meetings;
- Attending and participating in the HMPC meetings;
- Collecting and providing requested data (as available);
- Providing an update on previously adopted mitigation actions;
- Managing administrative details;
- Making decisions on plan process and content;

- Identifying mitigation actions for the plan;
- Reviewing and providing comments on plan drafts;
- Informing the public, local officials, and other interested parties about the planning process and providing opportunity for them to comment on the plan;
- Coordinating and participating in the public input process; and
- Coordinating the formal adoption of the plan by local governing bodies.

Detailed summaries of HMPC meetings are provided under Section 2.5 Meetings and Workshops, including meeting dates, locations, and topics discussed. During the planning process, the HMPC members communicated through face-to-face meetings, email, and phone conversations. This continued communication ensured that coordination was ongoing throughout the entire planning process even though not all HMPC members could be present at every meeting. Additionally, draft documents were distributed via the plan website so that the HMPC members could easily access and review them and provide comments.

2.5 MEETINGS AND WORKSHOPS

The preparation of this plan required a series of meetings and workshops for facilitating discussion, gaining consensus, and initiating data collection efforts with local government staff, community officials, and other identified stakeholders. More importantly, the meetings and workshops prompted continuous input and feedback from relevant participants throughout the drafting stages of the plan.

Table 2.6 summarizes the key meetings and workshops held by the HMPC during the development of the plan. In many cases, routine discussions and additional meetings were held by local staff to accomplish planning tasks specific to their department or agency such as reporting on changes to local capabilities, updating the status of mitigation actions, and identifying new actions. These meetings were informal and are not documented here.

Public meetings are summarized in subsection 2.6.

Table 2.6 – Summary of HMPC Meetings

Meeting Title	Meeting Topic	Meeting Date	Meeting Location
HMPC Mtg. #1 – Project Kick-Off	1) Introduction to DMA and CRS requirements and the planning process 2) Review of HMPC responsibilities and the project schedule	December 3, 2024 9am	Charlotte Fire Dept HQ 500 Dalton Ave Charlotte, NC & Microsoft Teams
HMPC Mtg. #2	1) Review the draft Hazard Identification & Risk Assessment 2) Discuss updates to local capabilities 3) Review problem statements and mitigation action ideas	February 24, 2025 11am	Charlotte Fire Dept HQ 500 Dalton Ave Charlotte, NC & Microsoft Teams
HMPC Mtg. #3	1) Review draft goals and objectives 2) Review mitigation alternatives and draft mitigation strategies	April 17, 2025 11am	Charlotte Fire Dept HQ 500 Dalton Ave Charlotte, NC & Microsoft Teams
HMPC Mtg. #4	1) Review the draft Hazard Mitigation Plan 2) Solicit comments and feedback	May 15, 2025 3pm	Charlotte Fire Dept HQ 500 Dalton Ave Charlotte, NC & Microsoft Teams

2.6 INVOLVING THE PUBLIC

An important component of any mitigation planning process is public participation. Individual citizen and community-based input provides the entire planning team with a greater understanding of local concerns and increases the likelihood of successfully implementing mitigation actions by developing community "buy-in" from those directly affected by the decisions of public officials. As citizens become more involved in decisions that affect their safety, they are more likely to gain a greater appreciation of the hazards present in their community and take the steps necessary to reduce their impact. Public awareness is a key component of any community's overall mitigation strategy aimed at making a home, neighborhood, school, business, or entire planning area safer from the potential effects of hazards.

Public involvement in the development of the plan was sought using various methods including open public meetings, an interactive plan website, a public participation survey, and by making copies of draft plan documents available for public review online and at government offices. Additionally, all HMPC meetings were made open to the public.

All public meetings were advertised on the plan website, which was shared on local community websites. Where possible, advertisements were also posted on community websites and social media. Copies of meeting announcements are provided in Appendix B. The public meetings held during the planning process are summarized in Table 2.7.

Table 2.7 – Summary of Public Meetings

Meeting Title	Meeting Topic	Meeting Date	Meeting Location
Public Meeting #1	1) Introduction to the planning process and project schedule 2) Explanation of mitigation 3) Review of hazard identification	January 9, 2025 5pm	Microsoft Teams
Public Meeting #2	1) Review draft Hazard Mitigation Plan 2) Solicit comments and feedback	May 15, 2025 5pm	Charlotte Fire Dept HQ 500 Dalton Ave Charlotte, NC & Microsoft Teams

2.7 OUTREACH EFFORTS

The HMPC agreed to employ a variety of public outreach methods including established public information mechanisms and resources, such as press releases, creation of a website for the plan, a public survey, and the collection of public and stakeholder comments on the draft plan. Table 2.8 details public outreach efforts employed during the preparation of this plan.

Table 2.8 – Public Outreach Efforts

Location	Date	Event/Message
Plan website	Ongoing	Meeting announcements, meeting materials, and description of hazards; contact information provided to request additional information and/or provide comments
Community websites and social media	December 2024 – March 2025	Link to the plan website and public survey shared; posted with information about the planning process
Local News	December 2024	Public meeting 1 advertised with information about the plan, public survey, and the plan website

Location	Date	Event/Message
Community websites and social media	January 2025	Public meeting 1 announcements posted with information about the planning process and the public survey
Local News	January 2025	Public meeting 1 advertised with information about the plan, public survey, and the plan website
Community websites and social media	May 2025	Public meeting 2 announcements posted with information about the draft plan and requests for feedback
Public survey	May 2024 – April 2025	Survey hosted online and made available via shareable link
Plan website – Draft HIRA	April 2025	Draft Hazard Identification & Risk Assessment (HIRA) made available for review and comment online
Plan website – Draft Plan	May 2025	Full draft plan made available for review and comment online

As detailed above, public involvement activities for this plan update included press releases, creation of a website for the plan, a public survey, and the collection of public and stakeholder comments on the draft plan. Documentation of these activities is provided in Appendix B.

A public outreach survey was made available in May 2024 and remained open for response until April 2025. The public survey requested public input into the hazards, perception of risk, past experiences, completed mitigation, and the identification of new mitigation activities to lessen the risk and impact of future hazard events. The survey is shown in Appendix B. The survey was available online on the plan website. In total, 91 responses were received. The following is a high-level summary of responses:

- Flood was rated as the highest risk hazard.
- Hazardous materials and electromagnetic pulse were rated as the lowest risk hazards.
- About 35% of respondents have taken actions to protect their home and neighborhood from hazards. Several of the respondents who reported property protection measures mentioned elevating their home. Others reported preparedness actions such as raising HVAC systems, having a backup generator, and trimming trees.
- Respondents favored prevention, emergency services, and public education projects for mitigation. Specific recommendations included enhancing tree canopy, improving urban cooling, proactive clearing of ditches, limiting development of impervious surface coverage, inspecting dams, working with Duke Energy on managing water levels, providing a cooling center, and supporting emergency preparedness with planning, mutual aid agreements, and public warning and notification.

Detailed survey results are provided in Appendix B.

2.8 INVOLVING THE STAKEHOLDERS

In addition to representatives of each participating jurisdiction, the HMPC included a variety of stakeholders. Stakeholders on the HMPC included residents and business owners as well as representatives from North Carolina Emergency Management (NCEM) and North Carolina Office of Recovery and Resiliency (NCORR). Input from additional stakeholders, including neighboring communities, non-profits, and other state and federal agencies, was solicited through invitations to the open public meetings and distribution of the public survey. However, if any additional stakeholders representing other agencies and organizations participated through the public survey, that information is unknown due to the anonymous nature of the survey.

2.9 DOCUMENTATION OF PLAN PROGRESS

Progress on the mitigation strategy developed in the previous plan is documented in this plan update. Table 2.9 below details the status of mitigation actions from the previous plan. More detail on actions being carried forward is provided in Section 7 Mitigation Action Plans.

Table 2.9 – Status of Previous Mitigation Actions

Jurisdiction	Completed	Deleted	Carried Forward
Mecklenburg County	2	0	6
Charlotte	1	3	22
Cornelius	1	1	3
Davidson	0	0	8
Huntersville	1	1	3
Matthews	0	2	13
Mint Hill	0	0	9
Pineville	2	0	11

Table 2.10 on the following pages details all completed and deleted actions from the 2020 plan.

It should be noted that although some communities have no completed actions removed from their mitigation action plans, this does not convey that mitigation has not been completed. Many actions that have been carried forward into this plan update reflect ongoing implementation and progress achieved. See Section 7: Mitigation Action Plans for status updates on carried forward mitigation actions.

Community capability continues to improve with the implementation of new plans, policies, and programs that help to promote hazard mitigation at the local level. The current state of local capabilities for the participating jurisdictions is captured in Section 5: Capability Assessment. The participating jurisdictions continue to demonstrate their commitment to hazard mitigation and have proven this by reconvening the HMPC to update this multi-jurisdictional plan and by continuing to involve the public in the hazard mitigation planning process.

Moving forward, information in this plan will be used to help guide and coordinate mitigation activities and decisions for local plans and policies in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. This plan identifies activities that can be undertaken by both the public and the private sectors to reduce safety hazards, health hazards, and property damage.

Table 2.10 – Completed and Deleted Actions from the 2020 Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan

2020 Action #	Description	2025 Status	2025 Status Comments/Explanation
Mecklenburg County			
Mecklenburg-3	Continue participation in the NFIP Community Rating System (CRS) with the goal of increasing CRS credit points to become a Class 5 community or better within five years.	Completed	Mecklenburg County has maintained participation in the CRS and improved from a Class 6 to a Class 5 rating effective April 1, 2021.
Mecklenburg-8	Install back-up emergency generators at the following critical facilities/emergency shelters: Tuckaseegee Recreation Center, Grady Cole Center, Naomi Drennan Recreation Center	Completed	Achieved. All Tier 1 shelters have back-up generators.
Charlotte			
Charlotte-4	Continue participation in the NFIP Community Rating System (CRS) with the goal of increasing CRS credit points to become a Class 4 community or better within five years.	Completed	In 2025, FEMA's Community Rating System (CRS) has recognized the City of Charlotte as a Class 2 community, a designation that will save residents an estimated $1 million or more in annual flood insurance premiums. A new Action Item (Charlotte-30) was created to continue the work with the CRS since the verbiage in the action item would have to change.
Charlotte-19	Identify and map known areas/streets subject to flooding that are outside of currently mapped floodplain areas based on: (1) drainage concerns reported through 311; and (2) past incident reports from the Fire Department and the Charlotte-Mecklenburg Police Department for flooding calls, road closings, swift water rescues, etc.	Deleted	Not all referenced data sources are actively maintained by relevant stakeholders. Charlotte Storm Water Services continues to leverage 311 data, investigate reported drainage concerns, and conduct proactive drainage asset inspections.
Charlotte-20	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standards (in addition to basic required compliance actions): a) Implement updates in methodology to Community Floodplain (Future Conditions) b) Additional 1-foot freeboard in the interim before Community Floodplains are updated	Deleted	This action item is duplicative of Charlotte-3.

2020 Action #	Description	2025 Status	2025 Status Comments/Explanation
Charlotte-21	Strive to have all other NFIP Community Rating System (CRS) municipalities in Mecklenburg County reach a Class 5 rating or better.	Deleted	This Action Item does not reside with Charlotte Storm Water Services. Charlotte willingly engages with other communities but does not have the authority to directly impact their CRS status.
Cornelius			
Cornelius-3	Review the peninsula evacuation plan that was completed in 2014.	Deleted	No longer a priority. Infrastructure and development is relatively unchanged, so the existing plan remains relevant.
Cornelius-5	Update the Town's Land Use Plan and integrate the risk assessment findings and the mitigation goals and objectives into the plan.	Completed	Land Use Plan was updated in 2023.
Davidson			
	No completed or deleted actions.		
Huntersville			
Huntersville-1	Seek grant funding to retrofit critical facilities and Town-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, 320 or 361 compliant safe rooms, lightning protection, hail resistant roofing, and anchoring fixed building equipment.	Completed	All critical infrastructures have back-up generators. With the new town hall/ admin building coming online in November 2025 the remainder of the actions items in this category will be met.
Huntersville 5	Provide and maintain NIMS training for town employees and government officials likely to be involved with hazard mitigation or emergency response.	Deleted	Action was combined with Huntersville-3. The plan is to train manager level staff in NIMS and then conclude with a tabletop exercise.
Matthews			
Matthews-3	Paint the bonnets on all fire hydrants in the Town Limits to match the NFPA flow color so that all arriving units will be able to visually see the tested flow of the hydrant.	Deleted	Not a priority since GIS Mapping provides same capability to identify flow.
Matthews-11	Routinely inspect the functioning of fire hydrants and report findings to CMU for repair.	Deleted	This is an established task as part of regular operations.

2020 Action #	Description	2025 Status	2025 Status Comments/Explanation
Matthews-15	Increase Public Works Debris Removal Capability - Increase debris collection and removal capability by purchasing a grapple attachment for backhoe & skidsteer. The equipment could be used proactively to prevent storm drainage-related flooding, as well aid in as post-event clean-up.	Completed	Grapple attachments for backhoe and skidsteer have been purchased and implemented.
Mint Hill			
	No completed or deleted actions.		
Pineville			
Pineville-4	In coordination with CMSWS, continue participation in the NFIP Community Rating System (CRS) with the goal of increasing CRS credit points to become a Class 5 community of better within five years.	Completed	This goal is achieved. The Town of Pineville has maintained participation in the CRS program and improved from CRS class 6 to a class 5 rating during the most recent CRS audit.
Pineville-13	Develop early warning system for hazard events.	Completed	In April 2021, Mecklenburg County in partnership with the Department of Homeland Security – Science and Technology Directorate implemented a real-time flood inundation mapping system utilizing real-time stream height data transmitted from low-cost flood sensors and USGS stream gauges. This effort complemented the existing early Flood Information & Notification System (FINS). The inundation mapping system is based on data developed from the hydrologic & hydraulic (H&H) models, elevation certificate information and topography. The system provides real-time flood intelligence that can be shared with CMEMO and other agencies to improve early flood warning, flood disaster response, and recovery. In addition to a local USGS stream gauge, two flood sensors were installed in the town of Pineville to warn town staff when flood waters are threating two of the town's critical facilities.
Pineville-14	Develop traffic response plan addressing how to deal with traffic in a commercial area for ingress/egress in the event of a disaster or emergency.	Completed	The Police Department has traffic control measures in place. The Town also re-aligned a traffic light for better and more efficient traffic flow.

3 PLANNING AREA PROFILE

This section provides a general overview of the current conditions in the Mecklenburg County. It consists of the following subsections:

3.1 Geography and Environment
3.2 Population and Demographics
3.3 Historic Properties
3.4 Housing
3.5 Infrastructure
3.6 Current and Future Land Use
3.7 Employment and Industry

3.1 GEOGRAPHY AND ENVIRONMENT

Mecklenburg County is located in the south-central portion of North Carolina along the border with South Carolina. It is surrounded by Iredell County to the north, Catawba and Lincoln Counties to the northwest, the Catawba River and Gaston County to the west, South Carolina to the south, Union County to the southeast, and Cabarrus County to the northeast. The planning area includes Mecklenburg County unincorporated areas, City of Charlotte, Town of Cornelius, Town of Davidson, Town of Huntersville, Town of Matthews, Town of Mint Hill, and Town of Pineville.

The following table, Table 3.1, provides the area in square miles for all participating jurisdictions in Mecklenburg County.

Table 3.1 – Total Land Area of Participating Jurisdictions

Jurisdiction	Total Land Area (Square Miles)
Mecklenburg County	**523.84 sq. mi.**
City of Charlotte	297.68 sq. mi.
Town of Cornelius	12.08 sq. mi.
Town of Davidson	5.75 sq. mi.
Town of Huntersville	39.61 sq. mi.
Town of Matthews	17.11 sq. mi.
Town of Mint Hill	23.92 sq. mi.
Town of Pineville	6.62 sq. mi.
Unincorporated areas	121.07 sq. mi.

Source: US Census Bureau, www.data.census.gov

Figure 3.1 – Mecklenburg County Map

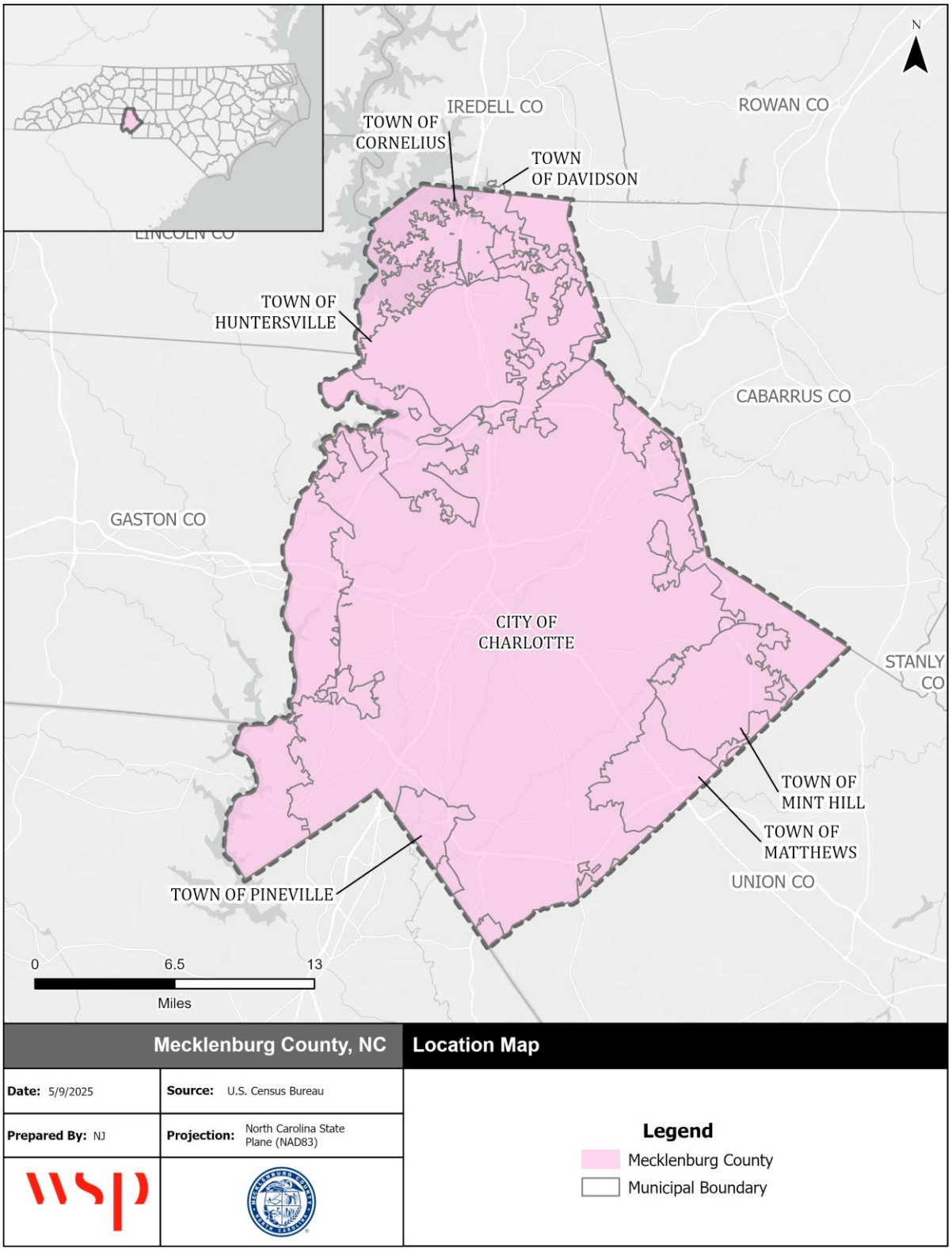
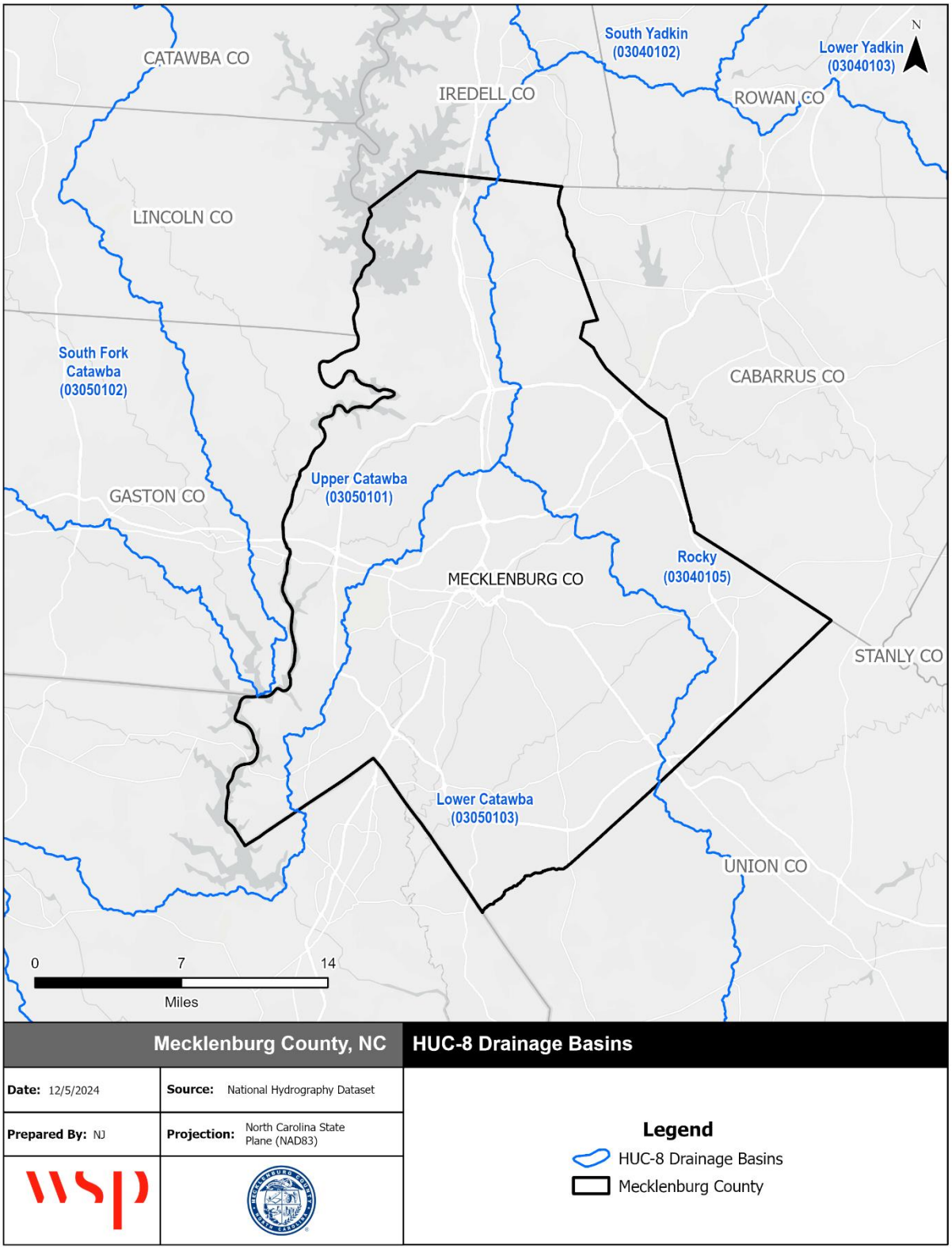
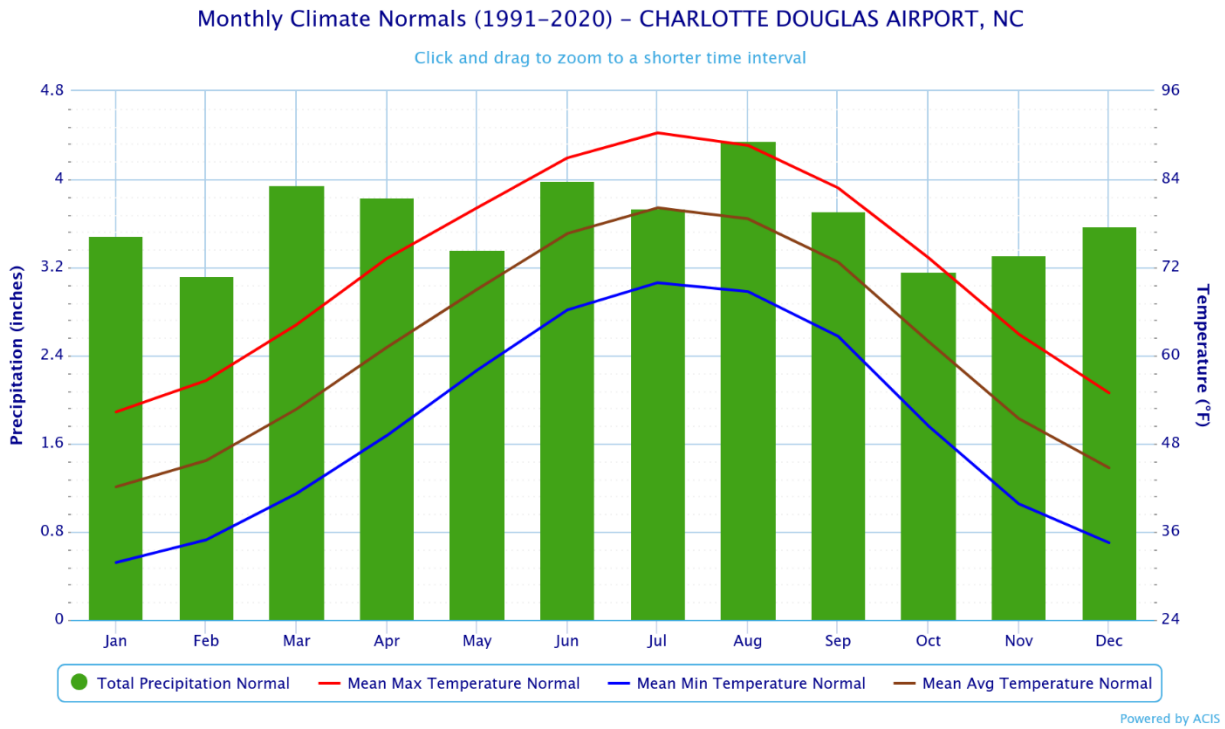


Figure 3.2 – Mecklenburg County Region, HUC-8 Drainage Basins



According to the Koppen climate classification system, Mecklenburg County has a humid subtropical climate characterized by mild winters and hot humid summers with significant precipitation even during the driest month. Based on the data from 1991 through 2020, the region experiences an average annual high temperature of 80.6°F and an average annual low temperature of 42.1°F. Average total rainfall is 43.6. Figure 3.3 shows the average monthly precipitation for weather station at the Charlotte airport.

Figure 3.3 – Average Monthly Temperature and Precipitation



Source: Northeast RCC CLIMOD 2

THREATENED AND ENDANGERED SPECIES

The U.S. Fish and Wildlife Service maintains a regular listing of threatened species, endangered species, species of concern, and candidate species for counties across the United States. There are a range of species that are listed throughout Mecklenburg County. Table 3.2 provides the status of threatened or endangered species within Mecklenburg County.

Table 3.2 – Mecklenburg County, Threatened and Endangered Species

Group	Common Name	Scientific Name	Federal Status
Clams	Carolina heelsplitter	Lasmigona decorata	Endangered
Clams	Atlantic pigtoe	Fusconaia masoni	Threatened
Flowering Plants	Smooth coneflower	Echinacea laevigata	Threatened
Flowering Plants	Schweinitz's sunflower	Helianthus schweinitzii	Endangered
Flowering Plants	Michaux's sumac	Rhus michauxii	Endangered
Flowering Plants	Piedmont Aster	*Eurybia mirabilis*	Species of concern
Mammals	Little brown bat	*Myotis lucifugus*	Under review
Mammals	Tricololored bat	*Permimyotis subflavus*	Proposed endangered
Insects	Monarch butterfly	*Danaus Plexippus*	Proposed threatened

Source: U.S. Fish & Wildlife Service

PARKS, PRESERVE, AND CONSERVATION

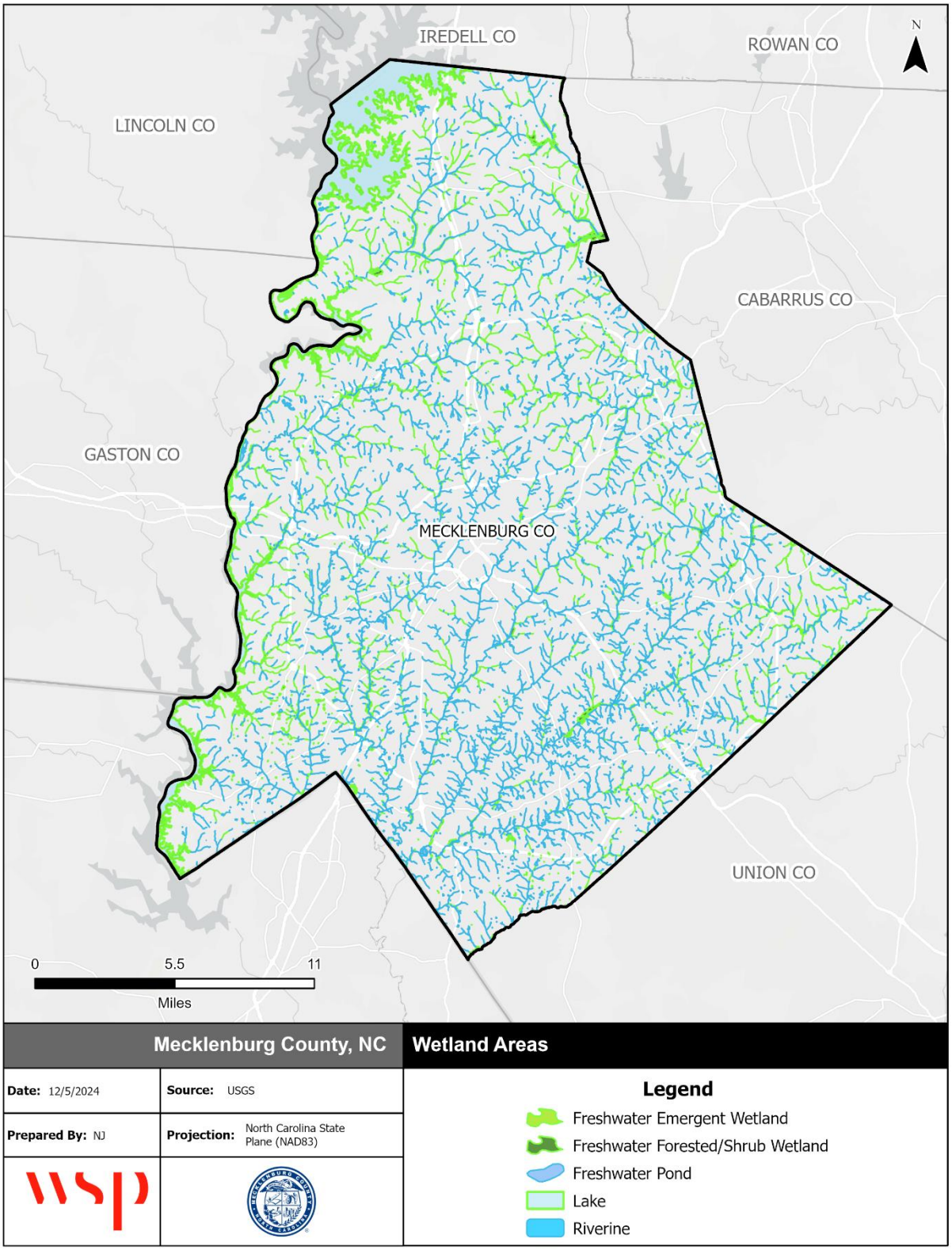
Mecklenburg County Park & Recreation Department manages over 200 parks and facilities and facilities covering over 21,000 acres throughout the County. Of these park areas, over 7,578 acres are designated as nature preserves and managed by the County's Division of Nature Preserves and Natural Resources. The County's nature preserves provide recreation and environmental education space while also serving to protect biological resources and natural areas. The County also has 55 miles of developed greenway trails and a Park and Recreation Master Plan with additional greenway trails planned for future construction.

WETLANDS

According to data from the U.S. Fish and Wildlife Service's National Wetlands Inventory, there are approximately 58,456 acres of wetlands in the County. Wetland areas and hydrologic features are shown by type in Figure 3.4.

The benefits of wetlands are hard to overestimate. They provide a critical habitat for many plant and animal species that could not survive in other habitats. They are also critical for water management as they absorb and store vast quantities of storm water, helping reduce floods and recharge aquifers. Not only do wetlands store water like sponges, they also filter and clean water, absorbing toxins and other pollutants.

Figure 3.4 – Wetlands in Mecklenburg County



3.2 POPULATION AND DEMOGRAPHICS

Mecklenburg County and its municipalities have grown substantially over the past two decades. Mecklenburg County had 919.628 residents at the time of the 2010 U.S. Census and an estimated population of 1,130,906, a 23% increase in population. Each of Mecklenburg's municipalities have grown since 2010. The Town of Davidson experienced the largest percentage increase in population at 41.8%, and the Town of Matthews experienced the least at 8.2%.

Table 3.3 provides population counts from 2010, 2020, and 2023 for each of the participating jurisdictions. Figure 3.5 on the following page shows 2020 population density by Census tract in persons per square mile.

Table 3.3 – Mecklenburg County Population Counts

Jurisdiction	2010 Census Population	2020 Census Population	2023 ACS Population Estimate	Total Change 2010-2023	% Change 2010-2023
City of Charlotte	731,424	874,579	886,283	143,155	19.6%
Town of Cornelius	24,866	31,412	32,009	6,546	26.3%
Town of Davidson	10,944	15,106	14,852	4,162	38.0%
Town of Huntersville	46,773	61,376	62,458	14,603	31.2%
Town of Matthews	27,198	29,435	29,959	2,237	8.2%
Town of Mint Hill	22,722	26,450	26,954	3,728	16.4%
Town of Pineville	7,479	10,602	10,780	3,123	41.8%
Unincorporated areas	48,222	66,522	67,611	19,389	40.2%
Mecklenburg County Total	**919,628**	**1,115,482**	**1,130,906**	**211,278**	**23.0%**

Source: Decennial Census 2010; Decennial Census 2020; American Community Survey 2019-2023 5-Year Estimates

POPULATION PROJECTIONS

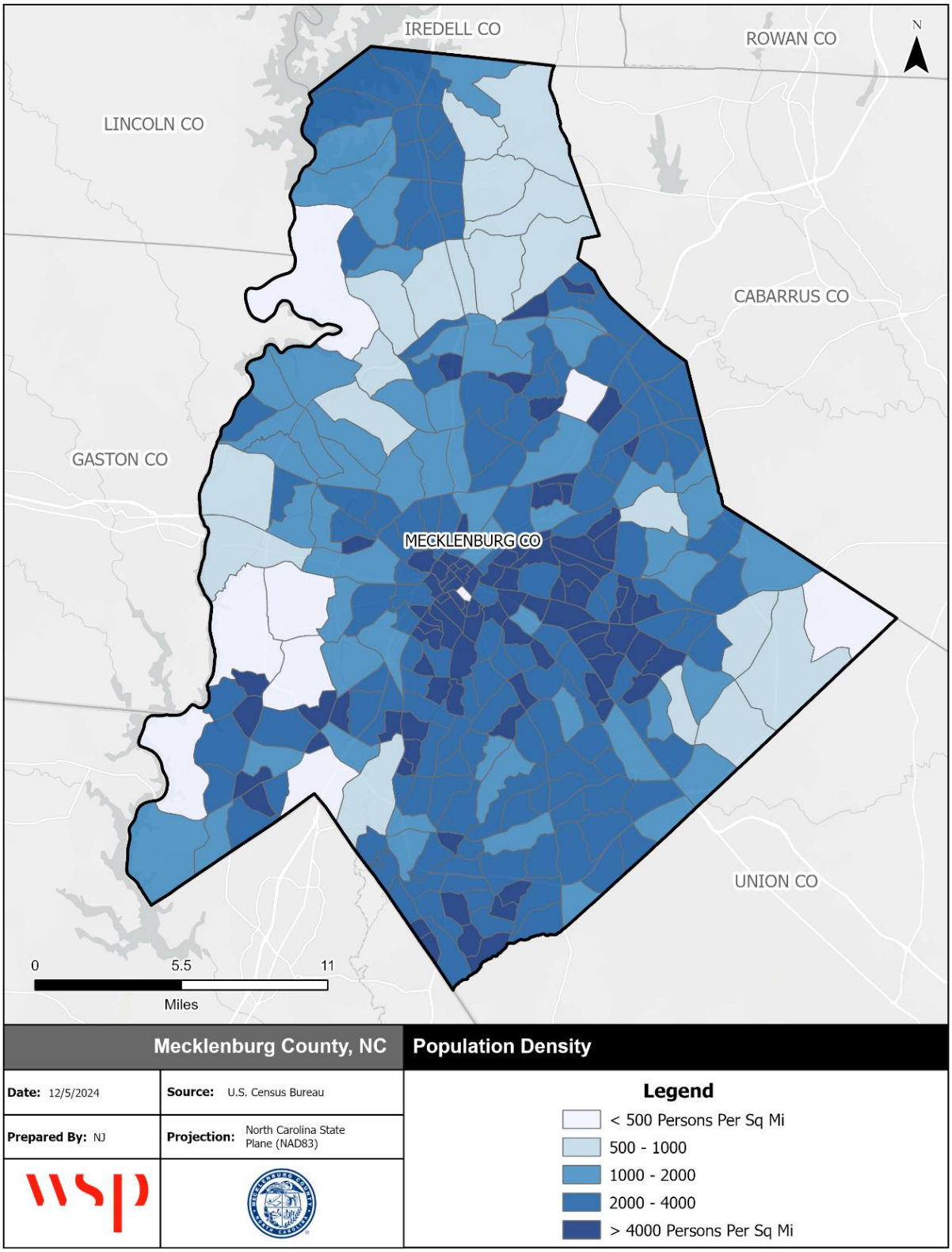
According to the North Carolina Office of State Budget and Management (OSBM), Mecklenburg County is expected to grow 68% in the 40 years between 2020 and 2060. Growth projections by decade are detailed in Table 3.4.

Table 3.4 – Mecklenburg County Population Estimate and Projections

Jurisdiction	2020 (Census)	2030	2040	2050	2060
Mecklenburg County	1,115,482	1,293,761	1,486,855	1,680,076	1,873,298

Source: North Carolina Office of State Budget and Management

Figure 3.5 – Population Density



According to the 2023 American Community Survey 5-Year Estimates, the median age in Mecklenburg County was 35.4. Of the population 25 years and over, 32.4% of Mecklenburg County's population has a bachelor's degree or higher. Approximately 21.6% of Mecklenburg County speaks a language other than English at home; of those, 9.8% speak English less than "very well." The racial characteristics of the participating jurisdictions are presented in Table 3.5. While white people make up the majority overall in the county and in each respective jurisdiction, the black population is also substantial and makes up approximately 33% of the entire county.

Table 3.5 – Racial Demographics of Mecklenburg County, 2023

Jurisdiction	White	Black	Asian	American Indian or Alaskan Native	Other Race	Hispanic or Latino*
City of Charlotte	49.3%	36.8%	7.5%	1.3%	14.5%	17.0%
Town of Cornelius	91.1%	5.9%	3.2%	1.7%	5.0%	6.1%
Town of Davidson	86.7%	10.7%	3.6%	1.5%	3.7%	4.1%
Town of Huntersville	77.4%	16.1%	6.6%	0.8%	6.6%	7.4%
Town of Matthews	77.2%	15.6%	6.7%	1.1%	6.3%	6.1%
Town of Mint Hill	75.8%	16.0%	5.1%	1.0%	10.4%	11.4%
Town of Pineville	65.5%	25.7%	6.9%	3.3%	19.2%	21.5%
Mecklenburg County Total	**54.2%**	**33.1%**	**7.3%**	**1.3%**	**13.3%**	**15.4%**

Source: American Community Survey 2019-2023 5-Year Estimates

*Hispanic or Latino, of any race

3.3 HISTORIC PROPERTIES

As of April 2025, Mecklenburg County had 108 listings on the National Register of Historic Places, 22 of which are Historic Districts. Listing on the National Register signifies that these structures and districts have been determined to be worthy of preservation for their historical or cultural value.

Table 3.6 – National Register of Historic Places Listings in the Mecklenburg County

Ref#	Property Name	Listed Date	Type
70000461	Alexander, Hezekiah, House	4/17/1970	Building
72000973	Rosedale	9/11/1972	Building
73001359	Victoria	4/11/1973	Building
75001281	Biddle Memorial Hall, Johnson C. Smith University	10/14/1975	Building
75001282	Latta Arcade	10/29/1975	Building
76001330	Liddell-McNinch House	12/12/1976	Building
78001963	Duke, James Buchanan, House	1/20/1978	Building
78001966	White Oak Plantation	2/7/1978	Building
78001965	Jonas, Charles R., Federal Building	6/7/1978	Building
78001964	Independence Building	9/18/1978	Building
79001734	Mecklenburg County Courthouse	5/10/1979	Building
79003344	Hotel Charlotte	7/2/1979	Building
80002885	Carr, John Price, House	10/22/1980	Building
80002886	Fire Station No. 2	10/22/1980	Building
80002887	Seaboard Air Line Railroad Passenger Station	10/24/1980	Building
82003486	Mecklenburg Investment Company Building	8/19/1982	Building
82001300	First Presbyterian Church	11/12/1982	Building

Ref#	Property Name	Listed Date	Type
83001896	Overcarsh House	7/21/1983	Building
83003971	VanLandingham Estate	10/13/1983	Building
83003970	Morrocroft	11/28/1983	Building
84002344	Merchants and Farmers National Bank Building	3/1/1984	Building
84002348	Charlotte Supply Company Building	3/1/1984	Building
84002408	Carey, Philip, Building	3/1/1984	Building
87000610	Dilworth Historic District	4/9/1987	District
87000655	Myers Park Historic District	8/10/1987	District
88001702	Hoskins Mill	10/5/1988	Building
88001855	Highland Park Manufacturing Company Mill No. 3	10/20/1988	District
88003003	Elizabeth Historic District	1/3/1989	District
90000367	North Charlotte Historic District	3/16/1990	District
90001314	Addison Apartments	8/23/1990	Building
90002186	Hayes--Byrum Store and House	1/31/1991	District
90002187	Craven, Dr. Walter Pharr, House	1/31/1991	Building
91000077	Hodges, Eugene Wilson, Farm	2/21/1991	District
91000079	McKinney, John Washington, House	2/21/1991	Building
91000080	Morris, Green, Farm	2/21/1991	District
91000082	Steele Creek Presbyterian Church and Cemetery	2/211991	District
91001376	Nebel Knitting Mill, Former	9/5/1991	Building
92001615	Commercial Building at 500 North Tryon Street	11/20/1992	Building
93000735	Mayes House	8/5/1993	Building
94000146	Parks--Cramer Company Complex, Former	3/7/1994	Building
94001049	Thrift Mill, Former	8/26/1994	District
95001397	Wesley Heights Historic District	11/29/1995	District
98000157	Charlotte Coca-Cola Bottling Company Plant, Former	2/26/1998	Building
99000091	Textile Mill Supply Company Building	2/5/1999	Building
99000670	McNinch, Frank Ramsay, House	6/3/1999	Building
99000699	Croft Historic District	6/10/1999	District
99001366	Billingsville School	11/12/1999	Building
99001447	Carolina Transfer and Storage Company Building, (Former)	11/30/1999	Building
00001495	Dilworth Historic District (Boundary Increase)	12/7/2000	District
00001640	Union Storage and Warehouse Company Building	1/11/2001	Building
01000341	Frederick Apartments	4/5/2001	Building
01000374	Carolina School Supply Company Building (Former)	4/12/2001	Building
01000422	Tompkins, Daniel A., Company Machine Shop, Former	5/8/2001	Building
01000423	Crane Company Building (Former)	5/8/2001	Building
02000057	Pharrsdale Historic District	2/20/2002	District
02000439	Jones III, Hamilton C., House	5/2/2002	Building
02001718	Alexander, William T., House	1/15/2003	Building
03000343	Sykes, Joseph, Brothers Company Building	5/1/2003	Building
03001275	Grinnell Company--General Fire Extinguisher Company Complex	12/10/2003	Building
04000906	Palmer Fire School	8/25/2004	Building
04001523	East Avenue Tabernacle Associated Reformed Presbyterian Church	1/20/2005	Building
04001530	Rozzell, Edward M., House	1/20/2005	Building

Ref#	Property Name	Listed Date	Type
06000721	Orient Manufacturing Company--Chadwick--Hoskins No. 3	8/15/2006	Building
06000724	Grier, Sidney and Ethel, House	8/23/2006	Building
06000866	Lawrence, Elizabeth, House and Garden	9/14/2006	Building
06001141	Seifart, Fritz, House	12/20/2006	Building
07001011	Siloam School	9/28/2007	Building
07001499	Home Federal Building	1/30/2008	Building
07001500	Southern Asbestos Company Mills	1/30/2008	Building
08000381	Alexander, Neal Somers, House	5/7/2008	Building
08000412	Grace A.M.E. Zion Church	5/15/2008	Building
08001364	Kilgo, Bishop John C., House	1/22/2009	Building
08001365	Robinson Rock House Ruin and Plantation Site	1/22/2009	Site
10000603	Grier-Rea House	8/30/2010	Building
11000637	Barringer Hotel	8/29/2011	Building
13001027	Louise Cotton Mill	12/31/2013	Building
14000989	Savona Mill	12/2/2014	Building
15000530	Speas Vinegar Company	8/12/2015	Building
16000879	Charlotte Fire Station No. 4	12/22/2016	Building
100001632	Highland Park Mill No. 1	9/21/2017	Building
97001561	Potts Plantation	1/5/1998	District
72000974	Eumenean Hall, Davidson College	4/13/1972	Building
72000975	Philanthropic Hall, Davidson College	4/13/1972	Building
79001735	Beaver Dam Plantation House	3/19/1979	Building
04000905	Blake, Chairman, House	8/25/2004	Building
09000381	Davidson Historic District	6/1/2009	District
72000976	Cedar Grove	2/1/1972	Building
72000978	Latta House	3/16/1972	Building
72000977	Holly Bend	3/24/1972	Building
76001331	Davidson, Benjamin W., House	4/26/1976	Building
84002410	St. Mark's Episcopal Church	3/1/1984	Building
91000023	Ewart, John F., Farm	2/4/1991	District
91000076	St. Mark's Episcopal Church (Boundary Increase)	2/21/1991	Building
91000078	McElroy, Samuel J., House	2/21/1991	Building
91000081	Ramah Presbyterian Church and Cemetery	2/21/1991	Building
96000198	Hopewell Presbyterian Church and Cemetery	3/1/1996	District
00001291	McCoy, Albert, Farm	11/2/2000	District
01000725	Gluyas, Thomas and Latitia, House	7/11/2001	Building
09000636	Huntersville Colored High School	8/20/2009	Building
82003487	Providence Presbyterian Church and Cemetery	6/1/1982	Building
96000928	Matthews Commercial Historic District	8/22/1996	District
15000183	Outen, R.F., Pottery	4/24/2015	Building
11000510	Pineville Commercial Historic District	8/5/2011	District
11000511	Pineville Mill Village Historic District	8/8/2011	District
98000706	Blakeney, James A., House	6/18/1998	Building
100009619	Ervin Building	12/15/2023	building
100005958	Ingleside	12/21/2020	building

Ref#	Property Name	Listed Date	Type
100007968	Kimberlee Apartments	7/29/2022	building

Source: National Parks Service, National Register of Historic Places, April 2025
*National Historic Landmarks

3.4 HOUSING

According to the 2019-2023 ACS estimates, there are 491,721 housing units in Mecklenburg County, of which 90.9% are occupied. Approximately 30.2% of occupied units are renter-occupied. A high percentage of renters is an indicator of higher pre- and post-disaster vulnerability because, according to Cutter, et al. (2003), renters often do not have the financial resources of homeowners, are more transient, are less likely to have information about or access to recovery aid following a disaster and are more likely to require temporary shelter following a disaster.

Nearly 57.4% of housing units in Mecklenburg County are detached single family homes. The next most common housing type is 10 or more apartments, which make up 23.8% of all housing units. Mobile homes make up 1.5% of the housing stock across the county. Mobile homes can be more vulnerable to certain hazards, such as tornadoes and windstorms, especially if they aren't secured with tie downs.

25.6% of Mecklenburg County's housing was built prior to 1980. It can be assumed that most housing built prior to 1980 was not built to floodplain standards because Mecklenburg County and Charlotte, its largest jurisdiction, entered the NFIP in 1978 and 1981, respectively. Table 3.7 provides further detail on housing in the region.

Table 3.7 – Mecklenburg County, Housing Characteristics, 2023

Jurisdiction[1]	Housing Units (2010)	Housing Units (2023)	Housing Units Percent Change (2010-2023)	Owner-Occupied, (2023)	Vacant Unit (2023)	Median Home Value (2023)
City of Charlotte	319,918	390,835	22.2%	186,045	29,735	$351,500
Town of Cornelius	11,947	14,777	23.7%	9,488	1,159	$512,400
Town of Davidson	4,253	6,043	42.1%	4,210	716	$626,000
Town of Huntersville	18477	24,643	33.4%	17,166	939	$439,300
Town of Matthews	11,021	11,945	8.4%	7,378	685	$406,800
Town of Mint Hill	9,149	10,888	19.0%	8,413	694	$386,900
Town of Pineville	4,051	5,062	25.0%	2,185	462	$344,700
Unincorporated areas	19,694	27,528	39.8%	17,930	1,837	-
Total	**398,510**	**491,721**	**23.4%**	**252,815**	**36,227**	**$371,200**

Source: U.S. Census Bureau 2010 Decennial Census, American Community Survey 2019-2023 5-Year Estimates
Note: County totals include unincorporated county area and cities/towns within the county.

3.5 INFRASTRUCTURE

3.5.1 TRANSPORTATION

Mecklenburg County is served by the Charlotte Douglas International Airport in Charlotte. The County is situated along the Norfolk Southern Railway, which has made it a major transportation and shipping center; the rail line receives twenty-five freight trains a day. The County is also a hub for the trucking

industry due to the convergence of several major highways within the county. Major roadways that run through the county include interstate highways I-77, I-85, I-277, and I-485; US Highways US 21, US 29, US 74, and US 512; and state highways NC 16, NC 24, NC 27, NC 49, NC 51, NC 73, NC 115, NC 160, NC 218, and Route 4.

Passenger rail is also available via three Amtrak routes: the Crescent line, the Carolinian line, and the Piedmont line. Charlotte is also proposed as the southern terminus for the Southeast High Speed Rail Corridor to Washington D.C. Mass transit options within the county include the LYNX rapid transit light rail system as well as the Charlotte Area Transit System (CATS) buses, which run throughout the County.

3.5.2 UTILITIES

Electric power for the county is provided by Duke Energy. Water and sewer service is provided by the Charlotte-Mecklenburg Utility Department. Natural gas is provided by Piedmont Natural Gas and PSNC Energy.

3.6 CURRENT AND FUTURE LAND USE

Land use in Mecklenburg County is managed by the Land Use & Environmental Services Agency (LUESA), an umbrella organization whose responsibilities include building and zoning code enforcement and natural resource management. Within LUESA, the Storm Water Services group is responsible land development, including reviewing plans for development, conducting erosion and water quality inspections, enforcing development ordinances, and managing floodplain mapping, floodplain development, flood mitigation, and drainage and maintenance. Mecklenburg County land development reviews site development plans and enforces development ordinances for the unincorporated county as well as the County's six incorporated Towns and their extra-territorial jurisdictions. However, each of the towns oversees their own zoning ordinance. The City of Charlotte performs code enforcement and land development reviews independently.

Future land use planning for the City of Charlotte and the unincorporated county is done by the Charlotte-Mecklenburg Planning Department. The incorporated Towns manage their future land use planning independently.

Table 3.8 summarizes the developed and undeveloped parcels within Mecklenburg County and each of the incorporated communities.

Table 3.8 – Mecklenburg County Developed and Undeveloped Parcels Count

Jurisdiction	Developed Parcels*	Undeveloped Parcels	Total Parcels	% Developed
City of Charlotte	293,095	24,434	317,529	92.3%
Town of Cornelius	13,717	1,294	15,011	91.4%
Town of Davidson	5,994	853	6,847	87.5%
Town of Huntersville	23,074	3,551	26,625	86.7%
Town of Matthews	10,611	821	11,432	92.8%
Town of Mint Hill	10,845	1,459	12,304	88.1%
Town of Pineville	3,836	426	4,262	90.0%
Mecklenburg County unincorporated	30,963	8,143	39,106	79.2%
Total	**392,135**	**40,981**	**433,116**	**90.5%**

Source: Mecklenburg County parcel data, 2024

*Parcel polygons data were filtered for Improved Value greater than $0 and these were considered developed. Parcels that intersect county address points are considered developed as well.

CITY OF CHARLOTTE

Charlotte adopted its latest comprehensive plan, Charlotte Future 2040, in 2021. Charlotte had not updated its comprehensive plan since 1975 prior to the adoption of Charlotte Future 2040. The plan was crafted through a lens of equity and with a commitment of thinking of the city's most vulnerable populations first. The plan also centers on making Charlotte's neighborhoods complete communities, where residents can live, work, and play. Currently, many of Charlotte's neighborhoods are single-use areas with no nearby goods, services, or employment opportunities. In 2022, Charlotte passed its Unified Development Ordinance to codify the goals and policies of the comprehensive plan.

An interactive version of Charlotte's future land use map can be found here.

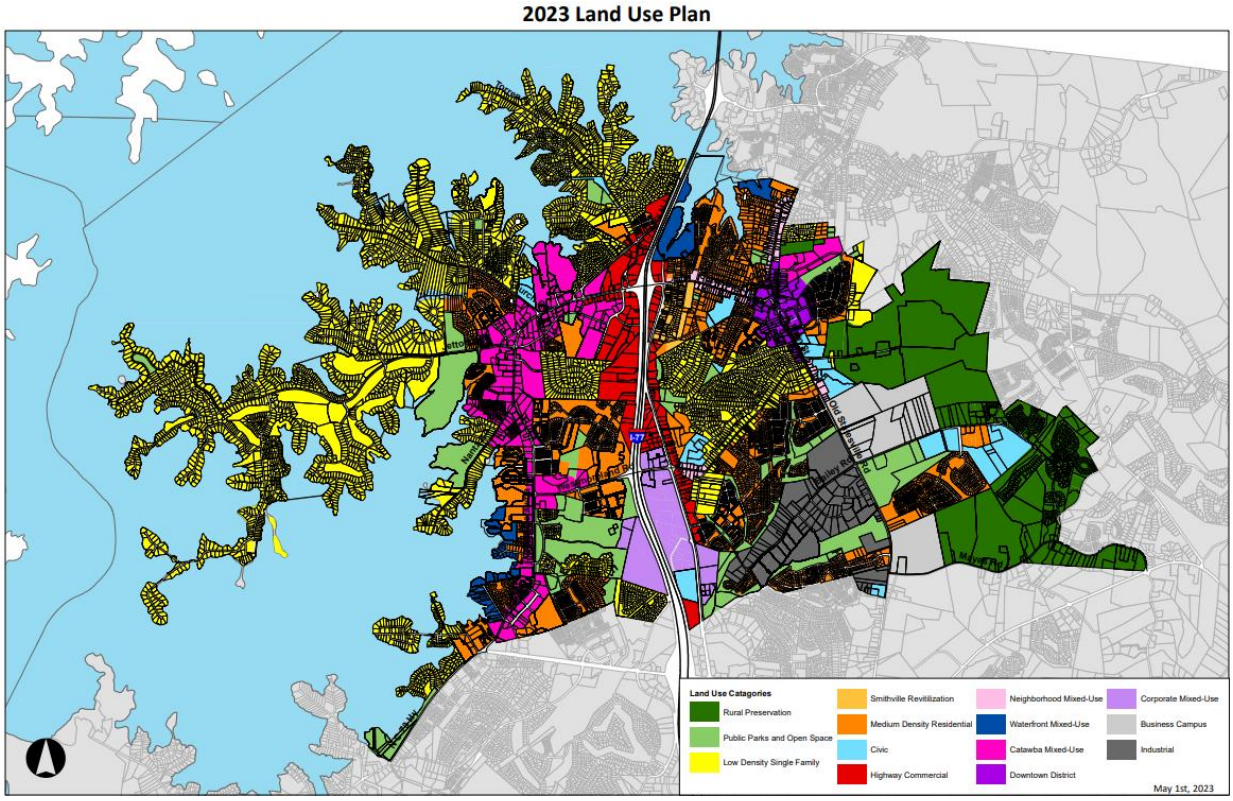
TOWN OF CORNELIUS

Cornelius updated its Land Use Plan in 2023. The Land Use Plan includes the following land uses:

- Rural Preservation
- Public Parks and Open Space
- Low Density Single Family
- Smithville Revitalization
- Medium Density Residential
- Civic
- Highway Commercial
- Neighborhood Mixed-Use
- Waterfront Mixed-Use
- Catawba Mixed-Use
- Downtown District
- Corporate Mixed-Use
- Business Campus
- Industrial

The Town's land use map is shown in Figure 3.6.

Figure 3.6 – Town of Cornelius Land Use Map, 2023



Source: Town of Cornelius Land Use Plan, 2023

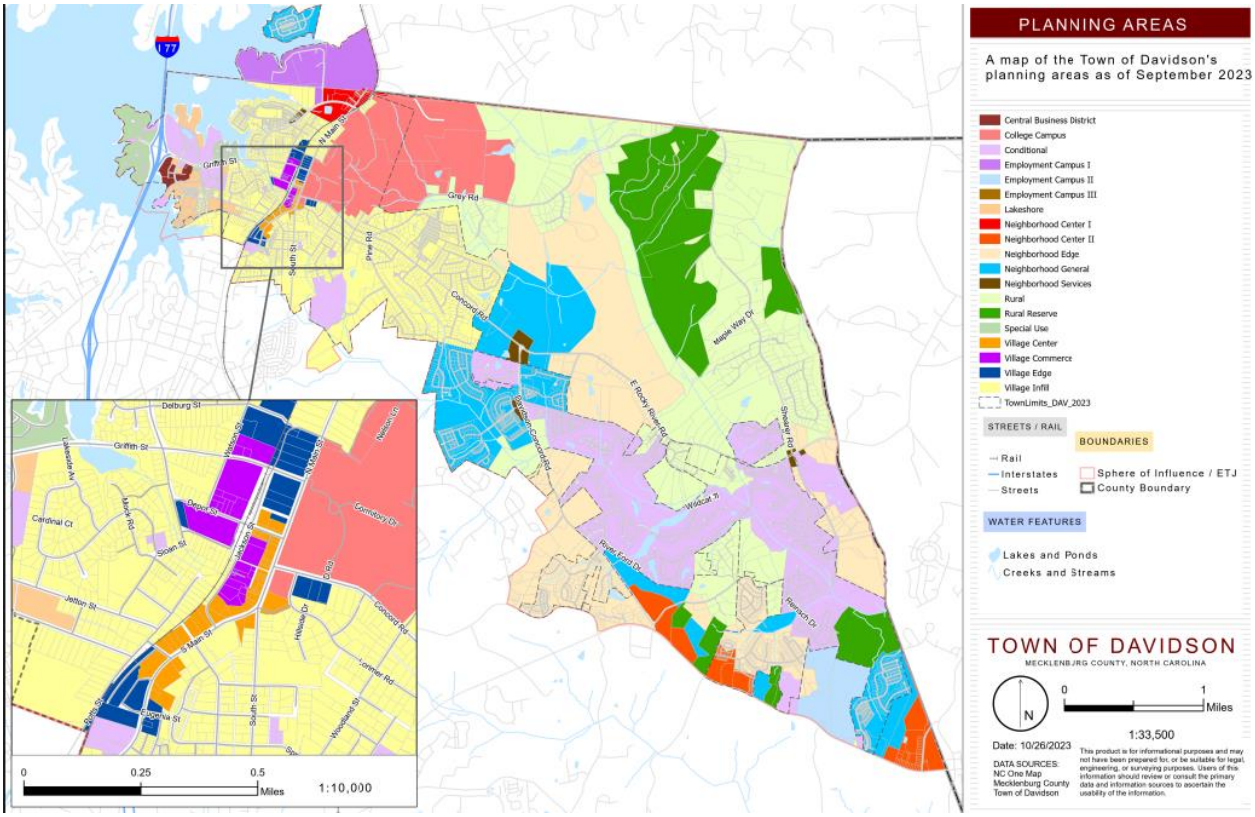
TOWN OF DAVIDSON

The Town of Davidson adopted its most recent comprehensive plan in 2020, which includes the following planning principles:

- We must preserve Davidson's character and sense of community.
- We must preserve and enhance Davidson's unique, historic downtown and neighborhoods.
- We must provide a safe and efficient transportation network for all users by supporting active transportation, transit, and new mobility options.
- We must wisely manage the finite land and natural resources in the town's planning area.
- We must manage growth and support appropriate economic development so the town can provide public facilities and services at pace with development.
- We must maintain the town's unique sense of place through quality architecture and design.
- We must consider the town's fiscal health when making decisions.
- We must support our institutional and nonprofit community partners that contribute to our quality of life.
- We must create an environment that maintains and enhances community diversity and inclusivity.

Figure 3.7 shows the town's future land use map.

Figure 3.7 – Town of Davidson Planning Areas

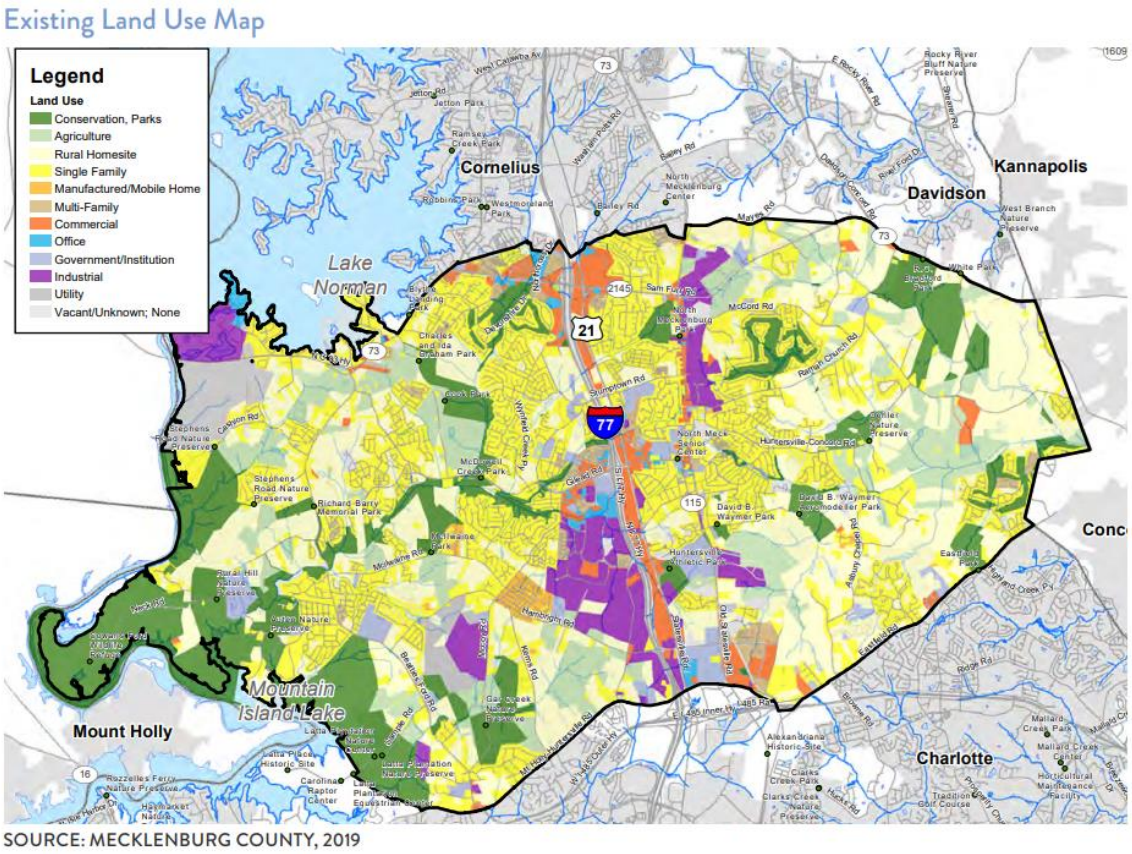


Source: Town of Davidson Comprehensive Plan, 2020

TOWN OF HUNTERSVILLE

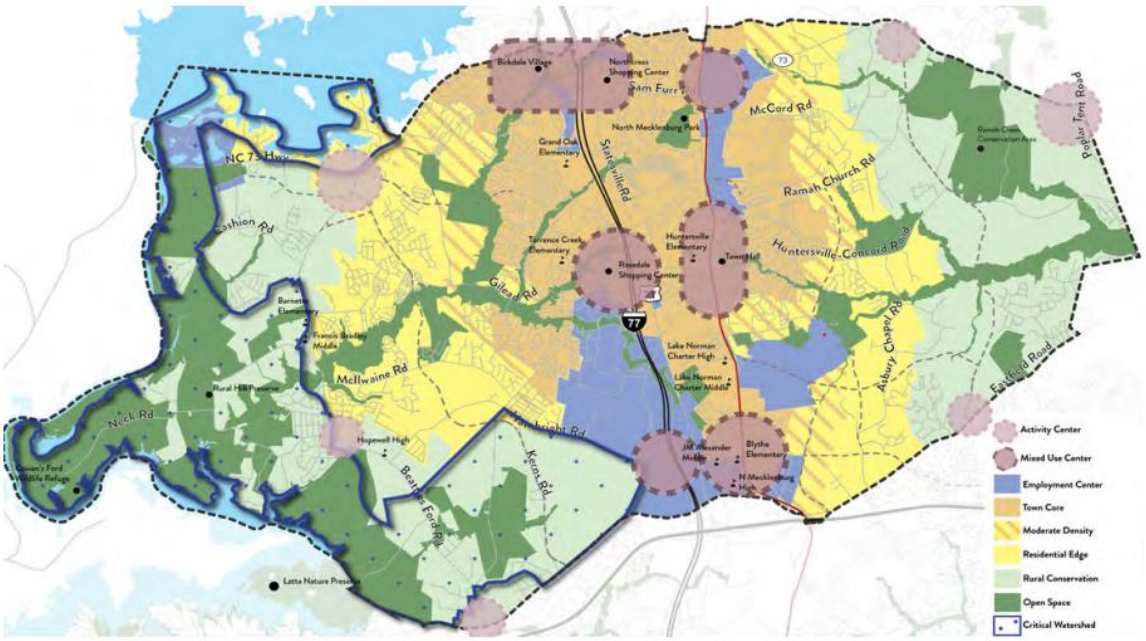
The Town of Huntersville adopted its most recent comprehensive plan, Huntersville 2040 Community Plan, in 2020. The comprehensive plan emphasizes concentrated activity in mixed use centers, the town core and activity centers; reservation of land for future employment; emphasis on respecting historic structures and the scale of existing neighborhoods; managed growth and improved design on the edges to protect natural resources and rural character; and limiting development in the Critical Watershed. Its existing land use map is shown in Figure 3.8 and its future land use map is shown in Figure 3.9.

Figure 3.8 – Town of Huntersville Existing Land Use Map, 2019



Source: Town of Huntersville Community Plan, 2020

Figure 3.9 – Town of Huntersville Future Land Use Map, 2020



Source: Town of Huntersville Community Plan, 2020

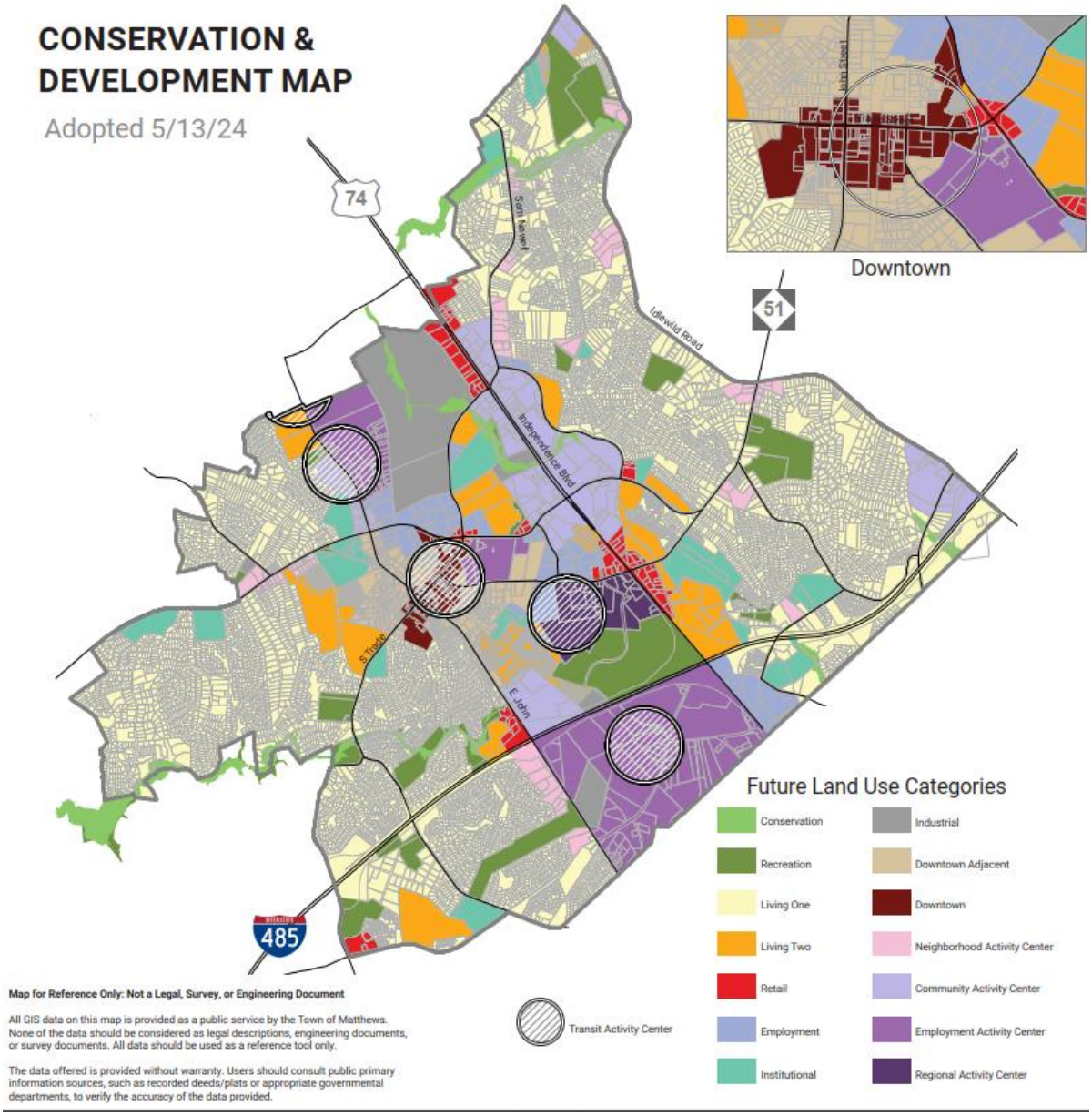
TOWN OF MATTHEWS

The Town of Matthews adopted its most recent comprehensive plan, Envision Matthews, in 2024. The plan sets out 12 key visions:

- Well-planned, multi-modal transportation system
- Vibrant, pedestrian friendly downtown
- Walkable and bikeable community
- Small town feeling and identity
- Expanded park and open space system
- Destination for arts and culture
- Quality community-serving schools
- Properly managed growth and development
- Diverse community
- Community dedicated to public safety
- Transparent governance and engagement
- Healthy, sustainable environment

The town's future land use map is shown in Figure 3.10.

Figure 3.10 – Town of Matthews Future Land Use Map, 2024

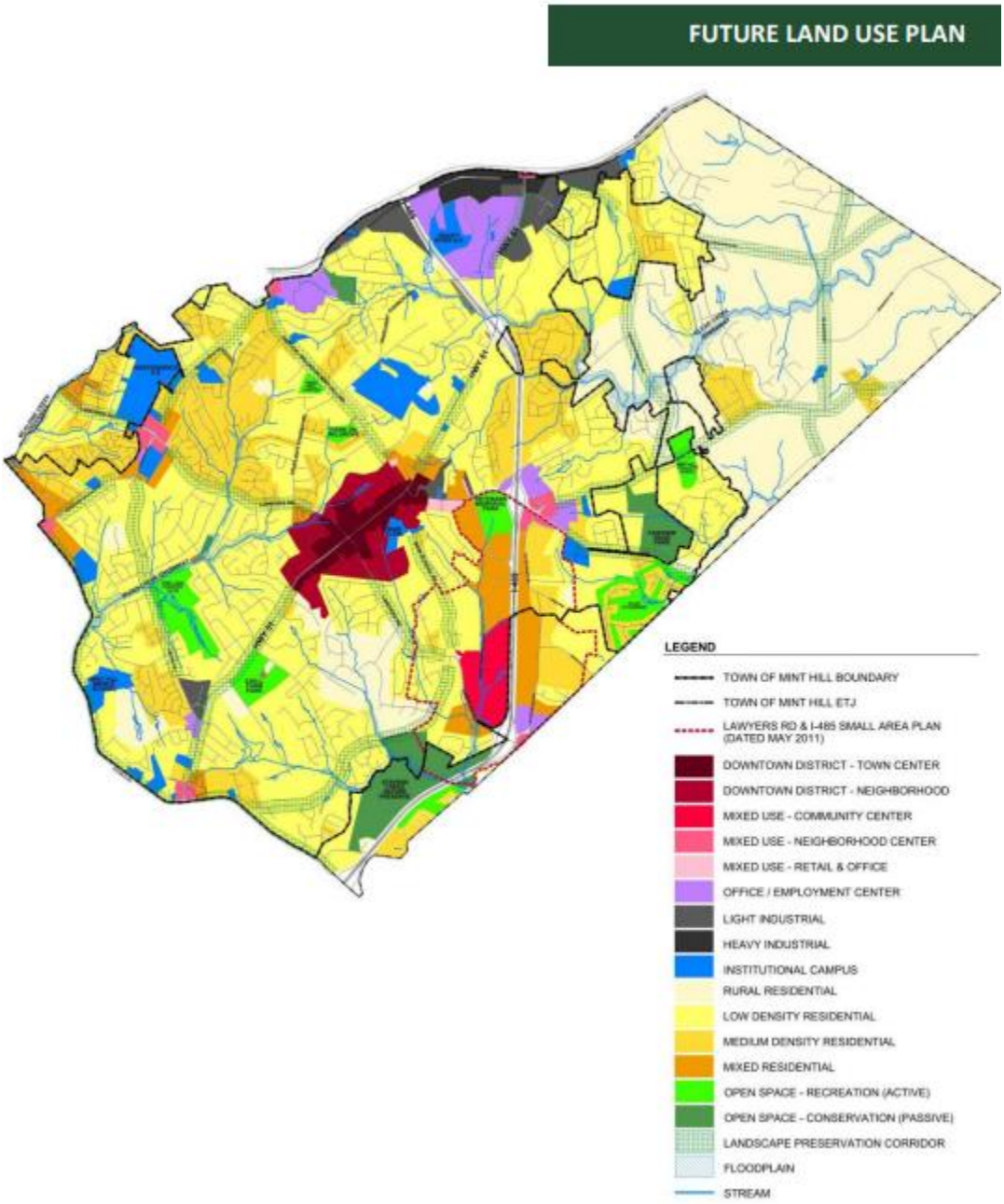


Source: Envision Matthews, 2024

TOWN OF MINT HILL

Though many agricultural operations have continued on the east side of Mint Hill, regional growth has expedited the shift away from a predominately rural pattern of development in Mint Hill over the last two decades. The emerging suburban pattern of development is generally auto-oriented and consists primarily of low-density, residential neighborhoods. The town's most recent comprehensive plan, passed in 2022, aims to maintain the town's "small town feel" and develop mixed-use activity centers. The Town of Mint Hill's future land use map is shown in Figure 3.11.

Figure 3.11 – Town of Mint Hill Future Land Use Map, 2022



Source: The Town of Mint Hill Comprehensive Plan Update, 2022

TOWN OF PINEVILLE

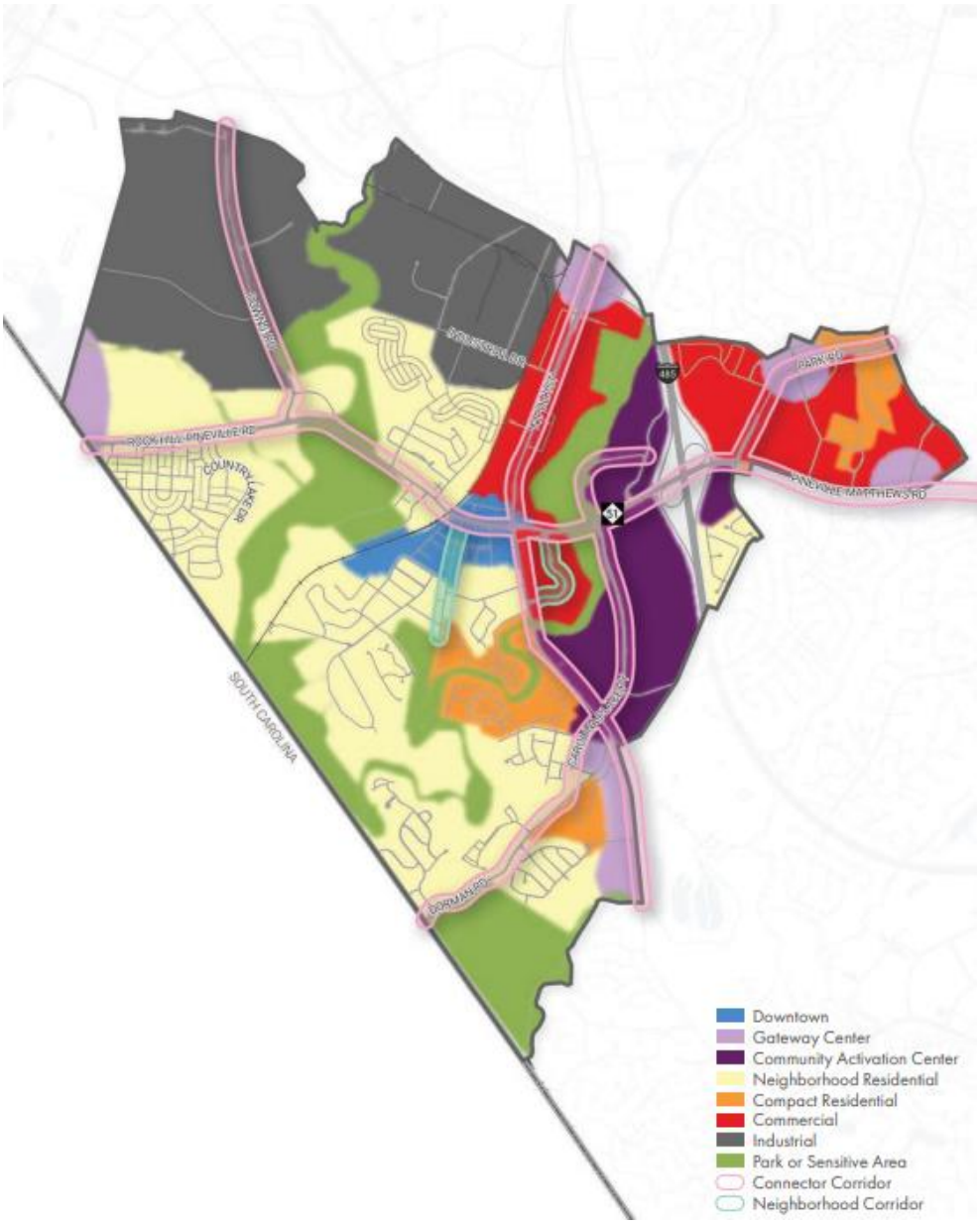
The Town of Pineville adopted its most recent comprehensive plan in 2022, which outlines the following goals:

- Pineville will foster a vibrant downtown and pulses of economic activity by continuing to capture market opportunities through programs, policies, and investments.

- Pineville will continue to be a town of charming and distinctive neighborhoods that offer a diversity of housing types that support different resident and family needs.
- Pineville will enhance mobility through a multimodal transportation system that is safe, easy and efficient for all users.
- Pineville will preserve its history and culture as defining characteristics that contribute to what makes our community unique and desirable.
- Pineville will strengthen the health and quality of life in town through an integrated systems of parks and open spaces.

The Town of Pineville's future land use map is shown in Figure 3.12.

Figure 3.12 – Town of Pineville Future Land Use Map, 2022



Source: The Town of Mint Hill Comprehensive Plan, 2022

3.7 EMPLOYMENT AND INDUSTRY

The City of Charlotte is the center of economic development in Mecklenburg County and predominately drives the economies of Mecklenburg's towns and the county overall.

WAGES AND EMPLOYMENT

Per the 2019-2023 American Community Survey 5-Year Estimates, the median household income in Mecklenburg County ranges from $64,257 in the Town of Pineville to $152,969 in the Town of Davidson.

Table 3.9 shows employment statistics for participating jurisdictions. Table 3.10 shows occupation statistics for all participating jurisdictions.

Table 3.9 – Employment Statistics for Mecklenburg County, 2019-2023

Jurisdiction	Population in Labor Force	Unemployment Rate (%)	Median Household Income
City of Charlotte	510,856	4.4%	$78,438
Town of Cornelius	16,999	3.6%	$114,688
Town of Davidson	7,533	3.9%	$152,969
Town of Huntersville	35,842	3.6%	$119,951
Town of Matthews	15,805	2.2%	$105,579
Town of Mint Hill	14,608	4.8%	$99,272
Town of Pineville	5,475	4.2%	$64,257
Mecklenburg County*	**645,090**	**4.2%**	**$83,765**

Source: American Community Survey 2019-2023 5-Year Estimates

*Mecklenburg County is inclusive of all jurisdictions and unincorporated areas.

Table 3.10 – Percent of Employed Population by Occupation for Mecklenburg County, 2023

Industry	Percent Employed
Agriculture, forestry, fishing and hunting, and mining	0.2%
Construction	6.7%
Manufacturing	7.8%
Wholesale trade	1.8%
Retail trade	9.6%
Transportation and warehousing, and utilities	7.3%
Information	2.1%
Finance and insurance, and real estate and rental and leasing	13.8%
Professional, scientific, and management, and administrative and waste management services	17.4%
Educational services, and health care and social assistance	18.0%
Arts, entertainment, and recreation, and accommodation and food services	8.3%
Other services, except public administration	4.9%
Public administration	2.1%

Source: American Community Survey 2019-2023 5-Year Estimates

Across the region, major industry sectors in 2023 included educational services, and health care and social assistance (18.0%), professional, scientific, management, and administrative and waste management services (17.4%), and finance and insurance, and real estate and rental and leasing (13.8%).

Table 3.11 summarizes the major employers in Mecklenburg County from AccessNC as of the 3rd quarter of 2024.

Table 3.11 – Major Employers, Mecklenburg County

Employer	Sector	Employment Range
Charlotte Mecklenburg Hospital Auth	Health Care and Social Assistance	1000+
Wells Fargo Bank Na (A Corp)	Finance and Insurance	1000+
Charlotte-Mecklenburg Bd Education	Educational Services	1000+
Bank of America Na	Finance and Insurance	1000+
Amazoncom Services Inc	Transportation and Warehousing	1000+
American Airlines Inc	Transportation and Warehousing	1000+
City Of Charlotte	Public Administration	1000+
Novant Medical Group Inc	Health Care and Social Assistance	1000+
Charter Communications LLC	Information	1000+
Presbyterian Hospital	Health Care and Social Assistance	1000+
Mecklenburg County Human Resources	Public Administration	1000+
Universal Protection Service LLC	Administrative and Support and Waste Management and Remediation Services	1000+
Compass Group Usa Inc	Accommodation and Food Services	1000+
Harris Teeter LLC	Retail Trade	1000+
University Of North Carolina at Charlotte	Educational Services	1000+
Wal-Mart Associates Inc	Retail Trade	1000+
Teachers Insurance & Annuity Associ	Finance and Insurance	1000+
Duke Energy Carolinas LLC	Management of Companies and Enterprises	1000+
Duke Energy Business Services LLC	Management of Companies and Enterprises	1000+
Piedmont Airlines Inc	Transportation and Warehousing	1000+
Truist Bank	Finance and Insurance	1000+
Insperity Peo Services LP	Professional Scientific and Technical Services	1000+
Federal Express Corp	Transportation and Warehousing	1000+
Ally Bank Floor 19-069	Finance and Insurance	1000+
The Vanguard Group Inc	Finance and Insurance	1000+

Source: ACCESSNC Employer Profile

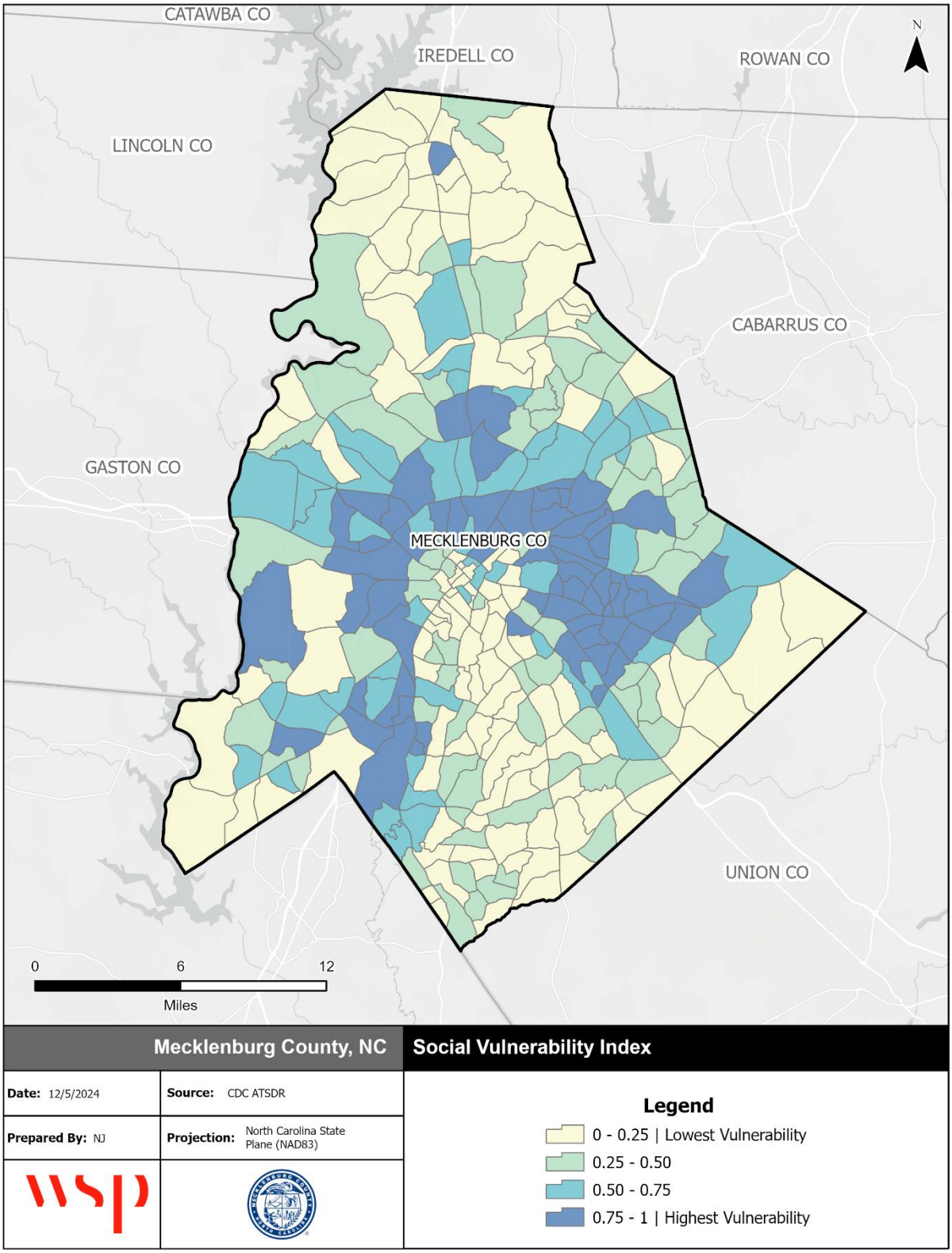
3.8 SOCIAL VULNERABILITY

Social vulnerability refers to a community's capacity to prepare for and respond to the stress of hazardous events ranging from natural disasters, such as tornadoes or disease outbreaks, to human caused threats, such as toxic chemical spills. That is to say that even if different groups share similar exposure to a

hazard, some groups may have a greater capacity to anticipate, cope, and recover from a disaster than others. Social vulnerability often refers to the population characteristics that have historically put certain groups of people at varying risk when they are exposed to the impacts of a hazard event (Cutter, 2003; Berke et al., 2019). Common and determining characteristics include age, gender, income, race, and ethnicity, and language capacity (Cutter et al., 2003; Berke et al., 2015). However, additional characteristics can include social networks, education, cultural knowledge, and political power (Otto et al., 2017). Social vulnerability considerations were included in this plan update to identify areas across the County that might be more vulnerable to hazard impacts based on a number of factors.

The Centers for Disease Control and Prevention (CDC) has developed a social vulnerability index (SVI) to measure the resilience of communities when confronted by external stresses such as natural or human-caused disasters or disease outbreaks. The CDC's SVI indicates the relative vulnerability within census tracts based on 15 social factors: poverty, unemployment, income, education, age, disability, household composition, minority status, language, housing type, and transportation access. Higher social vulnerability is an indicator that a community may be limited in its ability to respond to and recover from hazard events. Therefore, using this SVI information can help the Region and jurisdictions to prioritize pre-disaster aid, allocate emergency preparedness and response resources, and plan for the provision of recovery support. Results are presented via a score ranging from 0 (lowest vulnerability) to 1 (highest vulnerability). Figure 3.13 displays CDC SVI data for Mecklenburg County by Census tract.

Figure 3.13 – Social Vulnerability Index by Census Tract, 2023



4 RISK ASSESSMENT

Requirement §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.
Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type…of all natural hazards that can affect the jurisdiction.

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

44 CFR Subsection D §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. Plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:
A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;
(B): An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; and
(C): Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

4.1 OVERVIEW

This section describes the Hazard Identification and Risk Assessment process for the development of this plan. It documents how the County met the following requirements from the 10-step planning process:

- Planning Step 4: Assess the Hazard
- Planning Step 5: Assess the Problem

As defined by FEMA, risk is a combination of hazard, vulnerability, and exposure. Risk is "the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage." This hazard risk assessment covers all of unincorporated Mecklenburg County and the incorporated jurisdictions participating in this plan.

The risk assessment process identifies and profiles relevant hazards and assesses the exposure of lives, property, and infrastructure to these hazards. The process allows for a better understanding of the potential risk to natural hazards in the county and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events. This risk assessment followed the methodology described in the FEMA publication Understanding Your Risks—Identifying Hazards and Estimating Losses (FEMA 386-2, 2002), which breaks the assessment down to a four-step process:



Data collected through this process has been incorporated into the following sections of this plan:

- **Section 4.2**: **Hazard Identification** identifies the natural and human-caused hazards that threaten the planning area.
- **Section 4.3: Risk Assessment Methodology and Assumptions** describes how the risk and vulnerability assessment was conducted and presented.
- **Section 4.4: Asset Inventory** details the population, buildings, and critical facilities at risk within the planning area.
- **Section 4.5**: **Hazard Profiles, Analysis, and Vulnerability** discusses the threat to the planning area, describes previous occurrences of hazard events and the likelihood of future occurrences, and assesses the planning area's exposure to each hazard profiled; considering assets at risk, critical facilities, and future development trends.
- **Section 4.6: Conclusions on Hazard Risk** summarizes the results of the Priority Risk Index and defines each hazard as a Low, Moderate, or High Risk hazard.

4.2 HAZARD IDENTIFICATION

To identify the full range of hazards relevant to the planning area, the HMPC began with a review of the list of hazards identified in the 2023 State Hazard Mitigation Plan and the 2020 Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan as summarized in Table 4.1. The HMPC used this process to ensure consistency across hazard mitigation planning efforts. All hazards on the below list were evaluated for inclusion in this plan update, and, where appropriate, the hazard list in this plan was updated to be consistent with the State Hazard Mitigation Plan.

Table 4.1 – Full Range of Hazards Evaluated

Hazard	Included in 2023 State HMP?	Included in 2020 Mecklenburg County HMP?
Flooding	Yes	Yes
Hurricanes and Coastal Hazards	Yes	Yes (Hurricanes)
Severe Winter Weather	Yes	Yes
Excessive Heat	Yes	Yes
Earthquakes	Yes	Yes
Wildfire	Yes	Yes
Dam Failure	Yes	Yes
Levee Failure	No	Yes (evaluated with Dam Failure)
Drought	Yes	Yes
Tornadoes and Thunderstorms	Yes	Yes (evaluated separately)
Landslide	Yes	Yes
Sinkholes	Yes	Yes
Infectious Disease	Yes	No
Hazardous Substances	Yes	Yes
Radiological Emergency	Yes	Yes
Terrorism	Yes	No
Civil Disturbance	Yes	No
Cyber Threat	Yes	Yes
Electromagnetic Pulse	Yes	Yes
Food Emergency	Yes	No

The HMPC evaluated the above list of hazards using existing hazard data, past disaster declarations, local knowledge, and information from the 2023 State Plan and the 2020 Mecklenburg County Plan to determine the significance of these hazards to the planning area. Significance was measured in general terms and focused on key criteria such as frequency and resulting damage, which includes deaths and injuries, as well as property and economic damage.

One significant resource in this effort was the National Oceanic and Atmospheric Administration's (NOAA) National Center for Environmental Information (NCEI) Storm Events Database, which contains an archive by county of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce. The database also provides a partial record of other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occurs in connection with another event. The database contains records of tornado events since 1950, thunderstorm wind and hail events since 1955, and all other tracked event types since 1996. NCEI receives storm data from the National Weather Service (NWS), which receives their information from a variety of sources, which include but are not limited to county, state and federal emergency management officials, local law enforcement officials, SkyWarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry and the general public, among others.

The NCEI database contains 738 records of severe weather events that occurred in Mecklenburg County in the 25-year period from 1999 through 2023. Table 4.2 summarizes these events.

Table 4.2 – NCEI Severe Weather Reports for Mecklenburg County, 1999 – 2023

Type	# of Events	Property Damage	Crop Damage	Deaths	Injuries
Cold/Wind Chill	5	$0	$0	1	0
Drought	30	$0	$0	0	0
Extreme Cold/Wind Chill	1	$0	$0	0	0
Excessive Heat	0	$0	$0	0	0
Flash Flood	78	$13,459,000	$10,000	3	0
Flood	25	$2,195,500	$0	0	3
Frost/Freeze	3	$0	$1,000,000	0	0
Hail	151	$0	$0	0	0
Heat	3	$0	$0	0	0
Heavy Rain	21	$1,151,000	$0	0	0
Heavy Snow	11	$2,500,000	$0	0	0
High Wind	10	$675,000	$0	2	3
Hurricane	0	$0	$0	0	0
Ice Storm	3	$40,100,000	$0	0	0
Lightning	43	$2,395,000	$0	3	11
Strong Wind	9	$95,000	$0	1	0
Thunderstorm Wind	293	$2,673,500	$0	1	9
Tornado	10	$2,350,000	$0	0	4
Tropical Storm	3	$100,000	$0	0	0
Wildfire	0	$0	$0	0	0
Winter Storm	10	$0	$0	0	0
Winter Weather	29	$0	$0	0	0
Total:	**738**	**$67,694,000**	**$1,010,000**	**11**	**30**

Source: National Center for Environmental Information Events Database, February 2025

Note: Losses reflect totals for all impacted areas for each event.

The HMPC also researched past events that resulted in a federal and/or state emergency or disaster declaration for Mecklenburg County in order to identify significant hazards. Federal and/or state disaster declarations may be granted when the Governor certifies that the combined local, county and state resources are insufficient and that the situation is beyond their recovery capabilities. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the

provision of state assistance. If the disaster is so severe that both the local and state government capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance.

Records of designated counties for FEMA major disaster declarations start in 1964. Since then, Mecklenburg County has been designated in seven major disaster declarations, as detailed in Table 4.3.

Table 4.3 – FEMA Major Disaster Declarations, Mecklenburg County

Disaster #	Dec. Date	Incident Type	Event Title
844	9/25/1989	Hurricane	Hurricane Hugo
1087	1/13/1996	Snow	Blizzard of 96
1312	1/31/2000	Severe Storm(s)	Severe Winter Storm
1448	12/12/2002	Severe Ice Storm	Severe Ice Storm
1546	9/10/2004	Hurricane	Tropical Storm Frances
4487	3/25/2020	Biological	COVID-19 Pandemic
4827	9/28/2024	Tropical Storm	Tropical Storm Helene

Source: FEMA Disaster Declarations Summary, February 20, 2025

Using the above information and additional discussion, the HMPC evaluated each hazard's significance to the planning area in order to decide which hazards to include in this plan update. Some hazard titles have been updated either to focus in on a single hazard or to assess closely related hazards together. Table 4.4 summaries the determination made for each hazard.

Table 4.4 – Hazard Evaluation Results

Hazard	Included in this plan update?	Explanation for Decision
Flooding	Yes	The 2023 State HMP and 2020 Mecklenburg County plan addressed this hazard. NCEI reports 124 flood-related events between January 1999 and December 2023.
Hurricane & Tropical Storm	Yes	Mecklenburg County is not exposed to coastal hazards; therefore, storm surge, coastal flooding, and coastal erosion will not be assessed. However, past disaster declarations indicate that hurricane wind and rain are still a significant hazard for the County. The 2023 State HMP and 2020 Mecklenburg County plan addressed this hazard.
Severe Winter Weather	Yes	The 2020 Mecklenburg County plan addressed this hazard. NCEI reports 62 winter weather related storm events since 1999. The County has received three disaster declarations and one emergency declaration related to winter weather.
Excessive Heat	Yes	The 2023 State HMP addressed this hazard. NCEI reports 3 heat events for Mecklenburg County.
Earthquake	Yes	The 2020 Mecklenburg County plan and the 2023 State HMP addressed this hazard. Mecklenburg County could be impacted by the New Madrid fault and the Charleston fault.
Wildfire	Yes	The 2020 Mecklenburg County plan and The State HMP addressed this hazard. There are critical fireshed and direct exposure areas of Wildland Urban Interface in the planning area.

Hazard	Included in this plan update?	Explanation for Decision
Dam & Levee Failure	Yes	The 2020 Mecklenburg County plan addressed this hazard. There are multiple high hazard dams in the County. The USACE's National Levee Database identifies one non-USACE levee in the County, though there are no historical failures reported.
Drought	Yes	The 2023 State HMP and 2020 Mecklenburg County plan both addressed drought. NCEI reports 30 occurrences of drought over the past 25 years. The County has previously received emergency declarations for drought.
Tornadoes & Thunderstorms	Yes	The 2020 Mecklenburg County plan addressed this hazard. NCEI reports 10 tornado events, 312 wind events, 43 lightning events, and 151 hail events in the past 25 years. Given this frequency, analysis is warranted.
Landslide	Yes	The 2023 State HMP and 2020 Mecklenburg County plan addressed this hazard.
Sinkholes	No	The 2023 State HMP and 2020 Mecklenburg County plan addressed this hazard. However, sinkholes in the planning area are related to infrastructure issues and are not geologically based.
Infectious Disease	Yes	The 2023 State HMP addressed this hazard but the 2020 Mecklenburg County plan did not. The County feels that infectious diseases poses a substantial risk and opted to assess vulnerability to the extent possible through this effort.
Hazardous Substances	Yes	The 2023 State HMP and 2020 Mecklenburg County plan addressed this hazard. In addition to fixed facilities and transport of substances, the public raised concerns about groundwater contamination.
Radiological Emergency	Yes	The 2023 State HMP and 2020 Mecklenburg County plan addressed this hazard. The County may face risks associated with the McGuire Nuclear Station in the county and the Catawba Nuclear Station in South Carolina.
Terrorism	No	The 2023 State HMP addressed this hazard but the 2020 Mecklenburg County plan did not. The HMPC considers this hazard better addressed by the State and through emergency response planning.
Cyber Threat	Yes	The 2023 State HMP and 2020 Mecklenburg County plan addressed this hazard. Mecklenburg County has experienced a significant cyber attack.
Electromagnetic Pulse	No	The 2023 State HMP and 2020 Mecklenburg County plan addressed this hazard but no mitigation projects were developed. The HMPC considers this hazard better addressed by the State and through emergency response planning.
Food Emergency	No	The 2023 State HMP addresses this hazard, but the 2020 Mecklenburg County plan did not. The HMPC considers this hazard better addressed by the State and through emergency response planning.

The final list of hazards included in this plan are as follows:

- Dam & Levee Failure
- Drought
- Earthquake
- Excessive Heat
- Flooding
- Hurricane & Tropical Storm
- Infectious Disease
- Landslide
- Tornadoes & Thunderstorms
- Severe Winter Weather
- Wildfire
- Cyber Threat
- Hazardous Substances
- Radiological Emergency

4.3 RISK ASSESSMENT METHODOLOGY AND ASSUMPTIONS

The Disaster Mitigation Act of 2000 requires that the HMPC evaluate the risks associated with each of the hazards identified in the planning process. Each hazard was evaluated to determine its probability of future occurrence and potential impact. A vulnerability assessment was conducted for each hazard using either quantitative or qualitative methods depending on the available data, to determine its potential to cause significant human and/or monetary losses. A consequence analysis was also completed for each hazard.

Each hazard is profiled in the following format:

HAZARD DESCRIPTION

This section provides a description of the hazard, including discussion of its speed of onset and duration, as well as any secondary effects followed by details specific to the Mecklenburg County planning area.

LOCATION

This section includes information on the hazard's physical extent, with mapped boundaries where applicable.

EXTENT

This section includes information on the hazard extent in terms of magnitude, describe how the severity of the hazard can be measured. Where available, the most severe event on record used as a frame of reference.

HISTORICAL OCCURRENCES

This section contains information on historical events, including the location and consequences of all past events on record within or near the Mecklenburg County planning area.

PROBABILITY OF FUTURE OCCURRENCE

This section gauges the likelihood of future occurrences based on past events and existing data. The frequency is determined by dividing the number of events observed by the number of years on record and multiplying by 100. This provides the percent chance of the event happening in any given year according to historical occurrence (e.g. 10 winter storm events over a 30-year period equates to a 33 percent chance of experiencing a severe winter storm in any given year).

CLIMATE CHANGE

Where applicable, this section discusses how climate change may or may not influence the risk posed by the hazard on the planning area in the future. Resources on climate change projections and potential impacts include the Fourth National Climate Assessment, the Fifth National Climate Assessment, and the North Carolina State Climate Office.

VULNERABILITY ASSESSMENT

This section quantifies, to the extent feasible using best available data, assets at risk to natural hazards and potential loss estimates. People, properties and critical facilities, and environmental assets that are vulnerable to the hazard are identified. Future development is also discussed in this section, including how exposure to the hazard may change in the future or how development may affect hazard risk.

The vulnerability assessments followed the methodology described in the FEMA publication Understanding Your Risks—Identifying Hazards and Estimating Losses (August 2001). The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard. Note that time and resource constraints prevented physical visits to assessed critical facilities. Data used to support this assessment included the following:

- Geographic Information System (GIS) datasets, including building footprints, topography, aerial photography, and transportation layers;
- Hazard layer GIS datasets from state and federal agencies;
- Written descriptions of inventory and risks provided by the State Hazard Mitigation Plan; and
- Written descriptions of inventory and risks provided by the previous Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan.
- Exposure and vulnerability estimates provided by the NCEM IRISK database via the NCEM Risk Management Tool (RMT).
- Crop insurance claims by cause from USDA's Risk Management Agency

Two distinct risk assessment methodologies were used in the formation of the vulnerability assessment: a quantitative analysis that relies upon best available data and technology and a qualitative analysis that relies on local knowledge and rational decision making.

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Where hazard risk cannot be distinctly quantified and modeled, other information can be collected in regard to the hazard area, such as the location of critical facilities, historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat). Together, this information conveys the vulnerability of that area to that hazard. The quantitative analysis for this plan update involved the use of NCEM's IRISK database, which provides modeled damage estimates for earthquake, flood, wind, and wildfire hazards.

NCEM's IRISK database incorporates county building footprint and parcel data. Footprints with an area less than 500 square feet were excluded from the analysis. To determine if a building is in a hazard area, the building footprints were intersected with each of the mapped hazard areas. If a building intersects two

or more hazard areas (such as the 1-percent-annual-chance flood zone and the 0.2-percent-annual-chance flood zone), it is counted as being in the hazard area of highest risk. The parcel data provided building value and year built. Building value was used to determine the value of buildings at risk. Year built was used to determine if the building was constructed prior to or after the community had joined the NFIP and had an effective FIRM and building codes enforced.

Census blocks and Summary File 1 from the 2020 Census were used to determine population at risk. This included the total population, as well as the vulnerable elderly and children age groups. To determine population at risk, the census blocks were intersected with the hazard area. To better determine the actual number of people at risk, the intersecting area of the census block was calculated and divided by the total area of the census block to determine a ratio of area at risk. This ratio was applied to the population of the census block. For example, a census block has a population of 400 people. Five percent of the census block intersects the 1-percent-annual-chance flood hazard area. The ratio estimates that 20 people are then at risk within the 1-percent-annual-chance flood hazard area (5% of the total population for that census block).

Certain assumptions are inherent in any risk assessment. For the Mecklenburg County Multi-Jurisdictional HMP, three primary assumptions were discussed by the HMPC from the beginning of the risk assessment process: (1) that the best readily available data would be used, (2) that the hazard data selected for use is reasonably accurate for mitigation planning purposes, and (3) that the risk assessment will be regional in nature with local, municipal-level data provided where appropriate and practical.

Key methodologies and assumptions for specific hazards analysis are described in their respective profiles.

PRIORITY RISK INDEX

The conclusions drawn from the hazard profiling and vulnerability assessment process can be used to prioritize all potential hazards to the Mecklenburg County planning area. The Priority Risk Index (PRI) was applied for this purpose because it provides a standardized numerical value so that hazards can be compared against one another (the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard (probability, impact, spatial extent, warning time, and duration). Each degree of risk was assigned a value (1 to 4) and a weighting factor as summarized in Table 4.5.

The sum of all five risk assessment categories equals the final PRI value, demonstrated in the equation below (the highest possible PRI value is 4.0).

PRI = [(PROBABILITY x .30) + (IMPACT x .30) + (SPATIAL EXTENT x .20) + (WARNING TIME x .10) + (DURATION x .10)]

The purpose of the PRI is to categorize and prioritize all potential hazards for the Mecklenburg County planning area as high, moderate, or low risk. The summary hazard classifications generated through the use of the PRI allows for the prioritization of those high and moderate hazard risks for mitigation planning purposes.

The results of the risk assessment and PRI scoring are provided in Section 4.6 Conclusions on Hazard Risk.

Table 4.5 – Priority Risk Index

RISK ASSESSMENT CATEGORY	LEVEL	DEGREE OF RISK CRITERIA	INDEX	WEIGHT
PROBABILITY What is the likelihood of a hazard event occurring in a given year?	**UNLIKELY**	LESS THAN 1% ANNUAL PROBABILITY	**1**	**30%**
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	**2**	
	LIKELY	BETWEEN 10 & 100% ANNUAL PROBABILITY	**3**	
	HIGHLY LIKELY	100% ANNUAL PROBABILTY	**4**	
IMPACT In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?	**MINOR**	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	**1**	**30%**
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR > 1 DAY	**2**	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR > 1 WEEK.	**3**	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES > 30 DAYS.	**4**	
SPATIAL EXTENT How large of an area could be impacted by a hazard event? Are impacts localized or regional?	**NEGLIGIBLE**	LESS THAN 1% OF AREA AFFECTED	**1**	**20%**
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	**2**	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	**3**	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	**4**	
WARNING TIME Is there usually some lead time associated with the hazard event? Have warning measures been implemented?	**MORE THAN 24 HRS**	SELF DEFINED	**1**	**10%**
	12 TO 24 HRS	SELF DEFINED	**2**	
	6 TO 12 HRS	SELF DEFINED	**3**	
	LESS THAN 6 HRS	SELF DEFINED	**4**	
DURATION How long does the hazard event usually last?	**LESS THAN 6 HRS**	SELF DEFINED	**1**	**10%**
	LESS THAN 24 HRS	SELF DEFINED	**2**	
	LESS THAN 1 WEEK	SELF DEFINED	**3**	
	MORE THAN 1 WEEK	SELF DEFINED	**4**	

4.4 ASSET INVENTORY

4.4.1 POPULATION

NCEM's IRISK database and Risk Management Tool (RMT) provided the asset inventory used for this vulnerability assessment. Population data in IRISK is derived from the 2020 Census and includes a breakdown of population into two subpopulations considered to be a greater risk than the general population, the elderly and children. Table 4.6 details the population counts by jurisdiction used for the vulnerability assessment.

It should be noted that the NCEM RMT uses community ETJ boundaries to determine population, as such there will be variances when comparing U.S. Census statistics to those provided by RMT. The RMT values for incorporated areas will be slightly higher than those provided by the Census.

Table 4.6 – Population Counts by Jurisdiction, 2020

Jurisdiction	2020 Census Population	Elderly (Age 65 and Over)	Children (Age 5 and Under)
City of Charlotte	933,045	97,297	62,456
Town of Cornelius	52,414	9,213	1,891
Town of Davidson	16,621	2,502	749
Town of Huntersville	67,005	9,037	4,465
Town of Matthews	32,211	5,080	2,181
Town of Mint Hill	33,142	6,218	1,798
Town of Pineville	16,047	2,464	1,102
Total	**1,150,485**	**131,811**	**74,642**

Source: NCEM IRISK Database; 2020 Decennial Census

4.4.2 BUILDINGS

Building counts were also provided by the IRISK database via the RMT and are detailed in Table 4.7. These values were generated using locally-provided building footprint and parcel data as well as data generated by NCEM. The methodology for generating the building asset inventory is described in greater detail in Section 4.3. The IRISK building inventory reflects a less than 1% decrease in total building count and in total exposed building value since the development of the 2020 plan. The Planning Area Profile in Section 3 describes recent growth and development and provides context for understanding the degree to which exposure and vulnerability may have increased.

Table 4.7 – Building Counts and Values by Jurisdiction

Jurisdiction	Building Count	Building Value
Unincorporated Mecklenburg County	24,067	$5,873,064,030
City of Charlotte	246,090	$77,710,484,895
Town of Cornelius	10,558	$3,186,097,055
Town of Davidson	3,871	$1,476,802,476
Town of Huntersville	19,554	$5,227,608,045

Jurisdiction	Building Count	Building Value
Town of Matthews	10,007	$2,970,684,966
Town of Mint Hill	9,880	$1,959,267,364
Town of Pineville	2,731	$1,454,204,073
Total	**326,758**	**$99,858,212,904**

Source: NCEM IRISK Database

4.4.3 CRITICAL FACILITIES AND INFRASTRUCTURE

The IRISK database also identifies Critical Infrastructure and Key Resources (CIKR) buildings as well as High Potential Loss Properties. These properties are detailed in Table 4.8 and Table 4.9, respectively.

Table 4.8 – Critical Infrastructure and Key Resources by Type and Jurisdiction

Jurisdiction	Food and Agriculture	Banking and Finance	Chemical & Hazardous	Commercial	Communications	Critical Manufacturing	EM	Government Facilities	Healthcare	Transportation Systems	Energy	Emergency Services	Water	Total
Unincorporated Mecklenburg County	14	3	0	670	0	395	0	181	24	284	4	0	0	1,575
Charlotte	2	215	2	7,780	2	4,466	0	1,841	502	2,888	12	0	1	17,711
Cornelius	0	17	0	406	0	111	0	44	10	128	0	0	0	716
Davidson	0	3	0	101	1	35	0	35	9	137	0	0	0	321
Huntersville	1	19	0	586	0	205	0	146	50	176	6	0	6	1,195
Matthews	0	12	0	434	0	122	0	59	34	137	0	0	0	798
Mint Hill	0	9	0	282	0	73	0	48	17	81	0	0	0	510
Pineville	0	4	0	335	0	136	0	23	23	69	0	0	0	590
Total	**17**	**282**	**2**	**10,594**	**3**	**5,543**	**0**	**2,377**	**669**	**3,900**	**22**	**0**	**7**	**23,416**

Source: NCEM Risk Management Tool

Table 4.9 – High Potential Loss Properties by Use and Jurisdiction

Jurisdiction	Residential	Commercial	Industrial	Government	Agricultural	Religious	Utilities	Total
Unincorporated Mecklenburg County	80	198	86	24	2	65	3	**458**
Charlotte	2,723	2,570	1,430	476	0	363	5	**7,567**

Jurisdiction	Residential	Commercial	Industrial	Government	Agricultural	Religious	Utilities	Total
Cornelius	248	137	18	9	0	17	0	**429**
Davidson	71	52	7	10	0	4	0	**144**
Huntersville	81	213	39	39	0	33	1	**406**
Matthews	47	122	35	14	0	28	0	**246**
Mint Hill	8	61	13	10	0	14	0	**106**
Pineville	81	90	42	3	0	5	0	**221**
Total	**3,339**	**3,443**	**1,670**	**585**	**2**	**529**	**9**	**9,577**

Source: NCEM Risk Management Tool

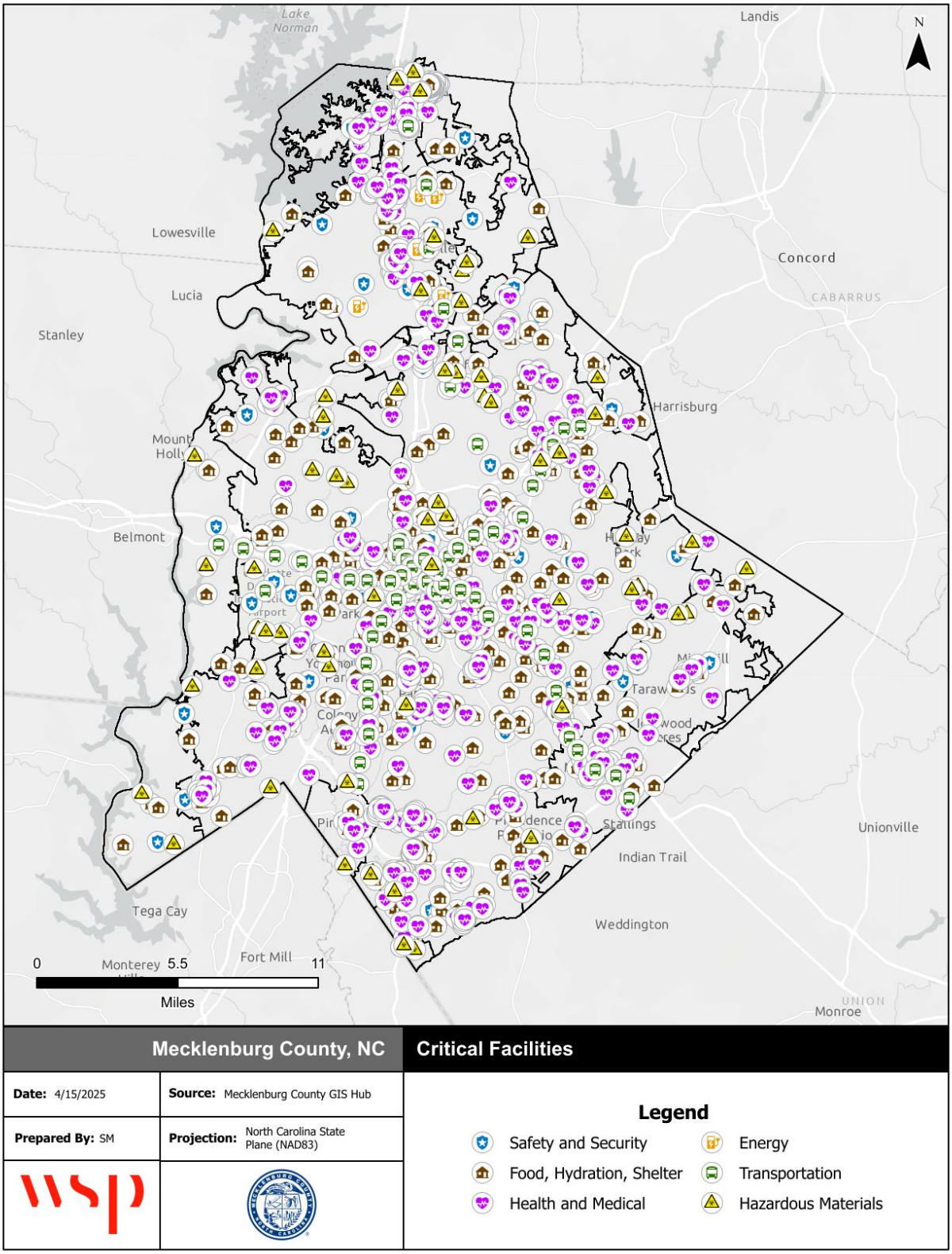
Using the existing CIKR inventory and local data, the HMPC and community staff refined and supplemented the IRISK asset inventory with a current list of critical facilities. These assets are considered community lifelines, which are defined by FEMA as the buildings and infrastructure that enable the continuous operation of critical business and government functions and are essential to human health and safety or economic security. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. These critical facilities are a priority for mitigation planning and were examined against known hazard areas, where possible, in this risk assessment.

Critical facilities are summarized in Table 4.10 and shown in Figure 4.1. More details on critical facilities are provided in the jurisdictional annexes.

Table 4.10 – Critical Facilities

Jurisdiction	FEMA Lifeline Type								Total
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Water Systems	
Unincorporated Mecklenburg County	0	1	19	20	15	9	2	0	**66**
City of Charlotte	0	0	265	37	677	79	69	0	**1,127**
Town of Cornelius	0	0	7	0	39	3	1	0	**50**
Town of Davidson	0	0	133	3	15	7	1	0	**159**
Town of Huntersville	0	6	23	4	82	10	3	0	**128**
Town of Matthews	0	0	11	0	67	4	4	0	**86**
Town of Mint Hill	0	0	9	2	12	6	0	0	**29**
Town of Pineville	0	0	4	1	47	2	0	0	**54**
Mecklenburg County Total	**0**	**7**	**471**	**67**	**954**	**120**	**80**	**0**	**1,699**

Figure 4.1 – Critical Asset Locations



4.4.4 AGRICULTURE

The agricultural industry is also highly vulnerable to natural hazards, which can cause both crop and livestock losses. The exposure of agriculture in the region was measured using the USDA's 2022 Census of Agriculture. Table 4.11 below summarizes the agricultural exposure in the County.

Table 4.11 – Summary of Agriculture Exposure

Number of Farms	Acreage in Farms	Proportion of Total Land Area in Farms	Acreage with Crop Insurance	Estimated Market Value of Land & Buildings
165	7,704	2.3%	6 (3.6%)	$208,744,000

Source: USDA 2022 Census of Agriculture

4.5 HAZARD PROFILES, ANALYSIS, AND VULNERABILITY

4.5.1 DAM & LEVEE FAILURE

HAZARD BACKGROUND

DAM FAILURE

A dam is a barrier constructed across a watercourse that stores, controls, or diverts water. Dams are usually constructed of earth, rock, concrete, or mine tailings. The water impounded behind a dam is referred to as the reservoir and is measured in acre-feet. One acre-foot is the volume of water that covers one acre of land to a depth of one foot. Dams can benefit farmland, provide recreation areas, generate electrical power, and help control erosion and flooding issues. A dam failure is the collapse or breach of a dam that causes downstream flooding. Dam failures may be caused by natural events, manmade events, or a combination. Due to the lack of advance warning, failures resulting from natural events, such as earthquakes or landslides, may be particularly severe. Prolonged rainfall and subsequent flooding is the most common cause of dam failure.

Dam failures usually occur when the spillway capacity is inadequate, and water overtops the dam or when internal erosion in dam foundation occurs (also known as piping). If internal erosion or overtopping causes a full structural breach, a high-velocity, debris-laden wall of water is released and rushes downstream, damaging or destroying anything in its path. Overtopping is the primary cause of earthen dam failure in the United States.

Dam failures can also result from any one or a combination of the following:

- Prolonged periods of rainfall and flooding;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross-section of the dam and abutments, or maintain gates, valves, and other operational components;
- Improper design, including the use of improper construction materials and construction practices;
- Negligent operation, including the failure to remove or open gates or valves during high flow periods;
- Failure of upstream dams on the same waterway; or
- High winds, which can cause significant wave action and result in substantial erosion.

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. Dam failures are generally catastrophic if the structure is breached or significantly damaged. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major casualties and loss of life could result, as well as water quality and health issues. Potentially catastrophic effects to roads, bridges, and homes are also of major concern. Associated water quality and health concerns could also be issues. Dam failures also have the potential to create a water shortage for nearby communities when the impounded lake is lost, which can affect drinking water supply, power generation, or result in crop losses due to lack of water for irrigation. Factors that influence the potential severity of a full or partial dam failure are the amount of water

impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

Dam failure can occur with little warning. Intense storms may produce a flood in a few hours or even minutes for upstream locations. Flash floods occur within six hours of the beginning of heavy rainfall, and dam failure may occur within hours of the first signs of breaching. Other failures and breaches can take much longer to occur, from days to weeks, as a result of debris jams or the accumulation of melting snow.

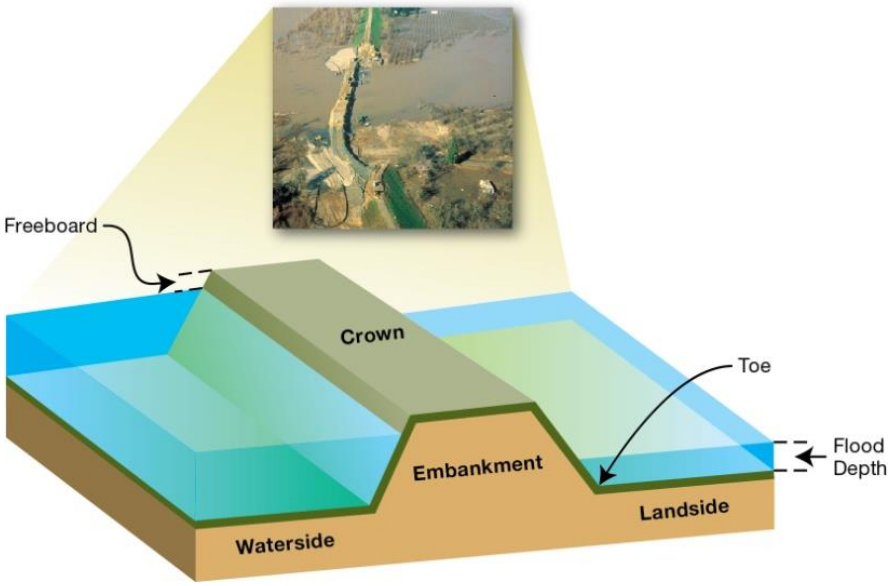
Dam failures are of particular concern because the failure of a large dam has the potential to cause more death and destruction than the failure of any other manmade structure. This is because of the destructive power of the flood wave that would be released by the sudden collapse of a large dam. Dams are innately hazardous structures. Failure or poor operation can result in the release of the reservoir contents—this can include water, mine wastes, or agricultural refuse–causing negative impacts upstream or downstream or at locations far from the dam. Negative impacts of primary concern are loss of human life, property damage, lifeline disruption, and environmental damage.

LEVEE FAILURE

FEMA defines a levee as "a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water in order to reduce the risk from temporary flooding." Levee systems consist of levees, floodwalls, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices. Levees often have "interior drainage" systems that work in conjunction with the levees to take water from the landward side to the water side. An interior drainage system may include culverts, canals, ditches, storm sewers, and/or pumps.

Levees and floodwalls are constructed from the earth, compacted soil or artificial materials, such as concrete or steel. To protect against erosion and scouring, earthen levees can be covered with grass and gravel or hard surfaces like stone, asphalt, or concrete. Levees and floodwalls are typically built parallel to a waterway, most often a river, in order to reduce the risk of flooding to the area behind it. Figure 4.2 shows the components of a typical levee.

Figure 4.2 – Components of a Typical Levee



Source: FEMA, What is a Levee Fact Sheet, August 2011

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events. Levees reduce, not eliminate, the risk to individuals and structures behind them. A levee system failure or overtopping can create severe flooding and high water velocities. It is important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

For both dam and levee failure events, there is generally very little warning time. A failure may result from heavy rains and flash flooding and occur within hours of the first signs of breaching. The duration of the resulting flood will vary but may last as long as a week, though the impacts of a dam or levee failure can last much longer.

Warning Time: 4 – Less than six hours

Duration: 3 – Less than one week

LOCATION

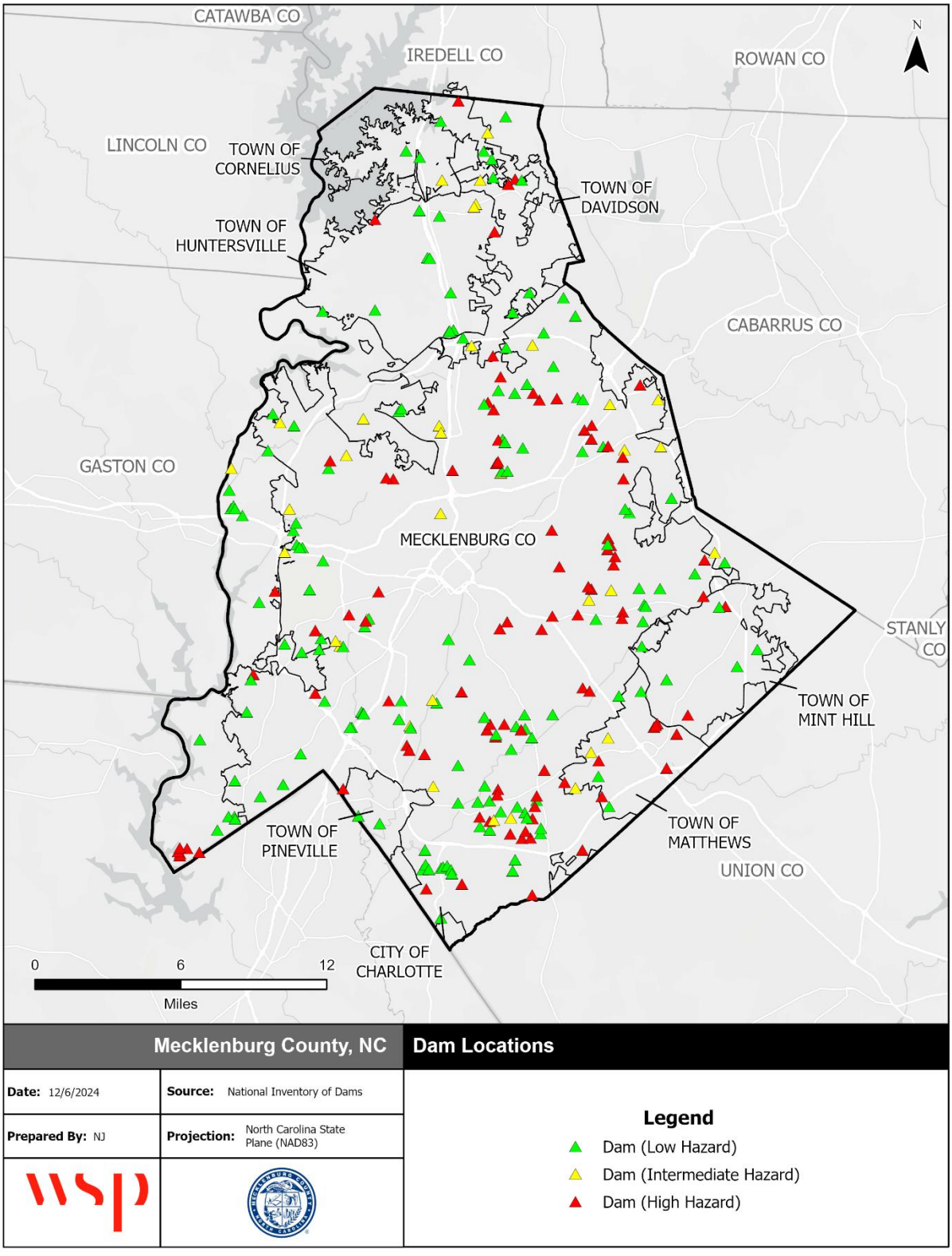
DAM FAILURE

The North Carolina Dam Inventory, maintained by North Carolina Department of Environmental Quality, provides a detailed inventory of dams in the state. As of December 2024, the NC Dam Inventory contains records of 276 dams in Mecklenburg County, of which 145 are rated low hazard, 35 are rated intermediate hazard, and 96 are rated high hazard. Figure 4.3 shows the location of these dams in Mecklenburg County. Table 4.12 lists all identified dams with high hazard potential in the county.

It should be noted that the NC Dam Inventory is not a comprehensive catalog of all dams in the planning area. HMPC members from the City of Charlotte note that the City has identified hundreds of additional dams through aerial imagery, topographic data, and other GIS resources. While these structures may only be minor impoundments, they nonetheless may pose some additional dam failure risk. Therefore, while the NC Dam Inventory was the best available resource for cataloging dams in the planning area, it underestimates the number of dams and thus also provides an underestimate of the locations potentially at risk to dam failure in the planning area.

Additionally, while the hazard ratings identified by the NC Dam Inventory may be accurate as of the last date of evaluation, the criteria that dictate hazard ratings are subject to change. Development downstream of a dam may increase exposure of property and lives. Therefore, it is possible that some dams that are rated low or moderate hazard may actually fit the criteria for high hazard classification as a result of development since the dam was last evaluated. Again, this delay in reclassification may produce an underestimate of overall risk in the planning area.

Figure 4.3 – Dam Locations in Mecklenburg County



Source: North Carolina Dam Inventory, December 2024

Table 4.12 – High Hazard Dams in Mecklenburg County

Dam Name	NID ID	Condition Assessment	Max Capacity (Ac-Ft)	River or Stream Name
1516 Glenn Valley Dam	NC06222	Fair	11	
Ardrey Park Dam	NC03414	Fair	16	UT to Clems Branch
Arnold Palmer Dam	NC04881	Fair	9	Briar Creek
Arrowood Quarry Dam	NC01217	Fair	365	Mccullough Branch
Ballantrae At Piper Glen Dam	NC05315	Fair	8	Fourmile Creek
Baucom Lake Dam	NC03459	Fair	48	Back Creek
Beaty Dam	NC05328	Poor	12	Davidson Creek
Berewick Farm Pond Dam #2	NC05678	Fair	15	UT to Beaverdam Creek
Beverly Crest Dam	NC03486	Fair	460	McAlpine Creek
Billingsley Dam	NC03400	Fair	13	Brier Creek
BMP 1 Dam	NC07747	Not Rated		
BMP 2 Dam	NC07754	Not Rated		
BMP 3 Dam	NC07755	Not Rated		
BMP 4 Dam	NC07756	Not Rated		
BMP 5 Dam	NC07757	Not Rated		
BMP 6 Dam	NC07758	Not Rated		
Camp Stewart Dam	NC07603	Not Rated		UT to McKee Creek
Carmel Hills Pond Dam	NC07140	Fair	1	
Carolina Golf and Country Club Irrigation Dam	NC05830	Fair	110	Irwin Creek
Carson Pond Dam	NC05332	Fair	18	McAlpine Creek
Clarks Creek Subdivision Dam	NC05059	Fair	228	N. Prong Clarks Creek
Clearwater Lake Dam At Runaway Bay	NC03462	Fair	25	McAlpine Creek
Cobblestone Dam	NC04821	Fair	17	McAlpine Creek
Coffey Creek Dam	NC06497	Satisfactory	174	Coffey Creek
Col. Francis J. Beatty Park Dam	NC04819	Fair	67	Six Mile Creek
Cornwell Dam	NC00328	Fair	358	Stevens Creek
Cottonwood Dam	NC04825	Fair	8	McAlpine Creek
Danga Lake Dam	NC00417	Fair	59	Little Paw Creek
Davis Lake Subdivision Dam	NC03460	Satisfactory	173	Clarks Creek
Delta Lake Dam	NC01692	Satisfactory	68	Reedy Creek
Devore Dam	NC06590	Poor		
Devore Dam #1	NC06591	Poor		
Devore Dam #2	NC06593	Poor		
Eastfield Station Dam	NC05851	Fair	17	UT to Clarks Creek
Fernhill Pond Dam	NC04818	Fair	54	Kings Branch

Dam Name	NID ID	Condition Assessment	Max Capacity (Ac-Ft)	River or Stream Name
Forest Lake Dam	NC01691	Fair	60	McAlpine Creek
Franklin Treatment Plant 250 Mg Raw Water Reservoir Dam	NC04816	Fair	777	Stewart Creek
Franklin Treatment Plant Raw Water Reservoir Dam	NC05333	Fair	917	Stewart Creek
Giverney Dam	NC03423	Fair	27	McMullen Creek
Griffith Dam #1	NC03399	Fair	234	Mallard Creek
Griffith Dam #2	NC00381	Fair	19	Mallard Creek
Harris Pond Dam	NC03465	Satisfactory	4	Clarks Creek
Hechenbleikner Dam	NC05961	Fair	16	UT to Toby Creek
Hicks Crossroads Dike	NC06431	Not Rated		Catawba River
Hidden Landing Dam	NC03467	Fair	36	McAlpine Creek
Hideaway Bay Dam	NC03448	Poor	42	McAlpine Creek
Hunter Acres Pond Dam	NC05881	Fair	27	UT to Mallard Creek
Irwin Creek Flood Protection Dam	NC05344	Fair	0	Irwin Creek
Ivey's Pond Dam	NC03449	Fair	63	Rocky Branch
Jordan Dam	NC05317	Fair	16	Gum Branch
Lake Plaza Dam	NC03419	Satisfactory	30	Briar Creek
Lake Providence Dam	NC03447	Fair	40	Fourmile Creek
Lake Shenandoah Dam	NC07106	Fair		
Lakepointe Corporate Center Dam	NC05349	Fair	10	King's Branch
Lakeside Drive Dam	NC03432	Fair	52	Reedy Creek
Lakeview Dam At Faires Farm	NC05337	Fair	11	Back Creek
Landtec Pond Dam	NC06177	Fair	5	UT to 4 Mile Creek
Linda Lake Dam	NC03403	Fair	45	Reedy Creek
Lock Lane Dam	NC03415	Fair	14	McMullen Creek
Maplecroft Dam	NC03479	Fair	30	S. Prong West Branch
Marglyn Townhomes Dam	NC07287	Not Rated		N. Fork Crooked Creek
McDonald Dam	NC05988	Fair	10	UT to Irwin Creek
Methodist Home Dam	NC03425	Fair	78	Briar Creek
Moody Pond Dam	NC03402	Fair	50	Coffey Creek
Oakwood Lane Dam	NC03410	Fair	46	Reedy Creek
O'Dillon Lake Dam	NC03434	Satisfactory	76	Stewart Creek
Page's Pond Dam	NC05351	Fair	26	
Pellynwood Lake Dam	NC03421	Fair	73	McAlpine Creek
Peter's Lake Dam At The Villas	NC05329	Fair	26	Sixmile Creek
Pierson Pond Dam	NC05348	Fair	9	Brier Creek
Piper Glen Dam B	NC04814	Fair	36	Four Mile Creek

Dam Name	NID ID	Condition Assessment	Max Capacity (Ac-Ft)	River or Stream Name
Quail Acres Dam	NC00218	Poor	85	Four Mile Creek
Quail Hollow West Dam	NC03443	Fair	23	Little Sugar Creek
Radbourne Subdivision Dam	NC03474	Satisfactory	46	Clarks Creek
Raintree Dam #0	NC03468	Fair	31	Fourmile Creek
Raintree Dam #2	NC03469	Fair	43	Fourmile Creek
Raintree Dam #4	NC03470	Poor	11	Fourmile Creek
Raintree Dam #7	NC03471	Poor	72	Fourmile Creek
Reddmans Pier Dam	NC03431	Fair	16	UT to Campbell Creek
Reformed Theological Seminary Dam	NC06477	Not Rated	0	UT to McAlpine Creek
Resource Square WQ Pond Dam	NC05849	Fair	25	Mallard Creek
Samonds Dam	NC05992	Fair	21	UT to Irwin Creek
Shade Valley Pond Dam	NC07677	Not Rated		
Sharon Lake Lower Dam	NC03444	Fair	24	Little Sugar Creek
Sharon Lake Upper Dam	NC01696	Fair	29	Little Sugar Creek
Symphony Park Dam	NC05566	Fair	23	Brier Creek
University Place Dam	NC03453	Fair	193	Mallard Creek
University Place On The Green Dam	NC05326	Fair	12	Mallard Creek
University Pond Dam	NC07029	Fair		
Village Lake Dam	NC03445	Fair	43	McAlpine Creek
Walden Two Dam	NC06144	Fair	32	UT to McKee Creek
Windrow Dam	NC03484	Fair	17	Crooked Creek
Winery Lane Dam	NC05616	Poor	7	McAlpine Creek
Winterbrooke Dam	NC03488	Fair	20	Fourmile Creek
Withrow Dam	NC03455	Fair	48	Mallard Creek
Woodrow Allen Dam	NC03483	Poor	51	Clear Creek

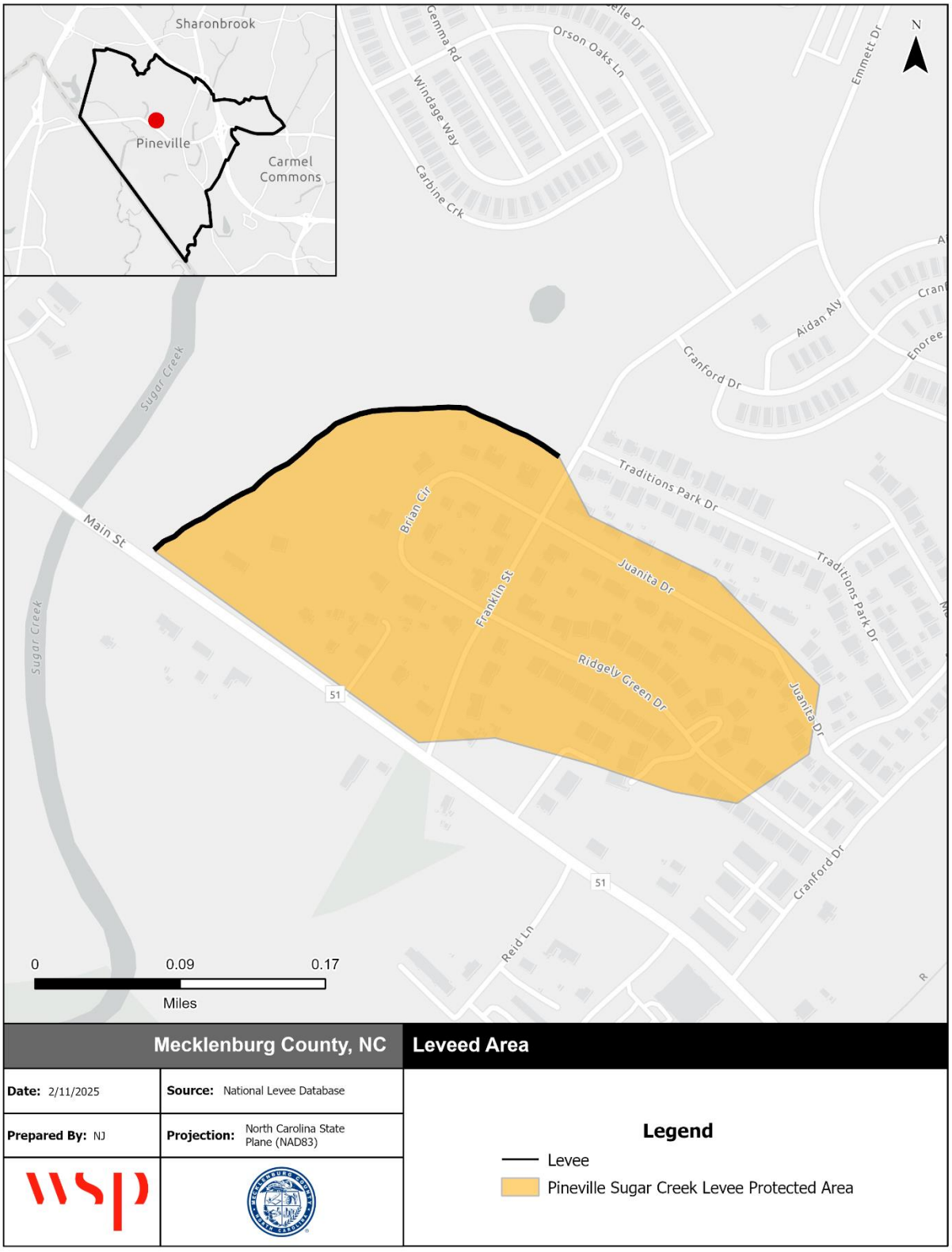
Source: North Carolina Dam Inventory, December 2024

According to the US Army Corps of Engineers' (USACE) National Levee Database (NLD), there is one recognized levee in the planning area, located in Pineville. The Pineville Sugar Creek Levee is 0.27 miles long and protects 131 people and 31 structures valued at approximately $13 million. This levee has not been screened to determine a Levee Safety Action Classification. The levee and leveed area are shown in Figure 4.4.

The spatial extent of any single dam or levee failure is expected to affect less than one percent of the total planning area.

Spatial Extent: 1 – Negligible

Figure 4.4 – Pineville Sugar Creek Levee, Protected Area



Source: National Levee Database

EXTENT

Each state has definitions and methods to determine the hazard potential of a dam. In North Carolina, dams are regulated by the state if they are 25 feet or more in height and impound 50 acre-feet or more. Dams and impoundments smaller than that may fall under state regulation if it is determined that failure of the dam could result in loss of human life or significant damage to property. The height of a dam is from the highest point on the crest of the dam to the lowest point on the downstream toe, and the storage capacity is the volume impounded at the elevation of the highest point on the crest of the dam.

Dam Safety Program engineers determine the "hazard potential" of a dam, meaning the probable damage that would occur if the structure failed, in terms of loss of human life and economic loss or environmental damage. Dams are assigned one of three classes based on the nature of their hazard potential:

- Class A (Low Hazard) includes dams located where failure may damage uninhabited low value non-residential buildings, agricultural land, or low volume roads.
- Class B (Intermediate Hazard) includes dams located where failure may damage highways or secondary railroads, cause interruption of use or service of public utilities, cause minor damage to isolated homes, or cause minor damage to commercial and industrial buildings. Damage to these structures will be considered minor only when they are located in backwater areas not subjected to the direct path of the breach flood wave; and they will experience no more than 1.5 feet of flood rise due to breaching above the lowest ground elevation adjacent to the outside foundation walls or no more than 1.5 feet of flood rise due to breaching above the lowest floor elevation of the structure.
- Class C (High Hazard) includes dams located where failure will likely cause loss of life or serious damage to homes, industrial and commercial buildings, important public utilities, primary highways, or major railroads.

Table 4.13 – Dam Hazard Classifications

Hazard Classification	Description	Quantitative Guidelines
Low	Interruption of road service, low volume roads	Less than 25 vehicles per day
	Economic damage	Less than $30,000
Intermediate	Damage to highways, interruption of service	25 to less than 250 vehicles per day
	Economic damage	$30,000 to less than $200,000
High	Loss of human life*	Probable loss of 1 or more human lives
	Economic damage	More than $200,000
	Damage to highways, interruption of service	250 or more vehicles per day

*Probable loss of human life due to breached roadway or bridge on or below the dam

Source: NCDEQ

Impact: 3 – Critical

HISTORICAL OCCURRENCES

There are no records of damages, deaths or injuries associated with dam or levee failure in Mecklenburg County. However, as reported in the 2020 plan, torrential rains in September 2004 the from the combined effects of hurricanes Ivan and Frances forced Duke Energy to release flows through the Cowans Ford Dam, resulting in the overtopping of the Mountain Island Dam further downstream. There is no controlled spillway for the Mountain Island dam). This overtopping caused flooding of areas immediately below the dam, including approximately 50-70 homes near Riverside and Lake Drives.

Additionally, during Hurricane Helene in September 2024, catastrophic flooding damaged approximately 170 structures downstream of Cowan's Ford Dam when Duke Energy opened the dam's flood gates due to Lake Norman reaching its maximum capacity. Similar flooding occurred in 2019 downstream of Mountain Island Lake when the flood gates of the Mountain Island Dam were opened.

PROBABILITY OF FUTURE OCCURRENCE

While there is a significant presence of high hazard dams in Mecklenburg County, the probability of failure of a dam is also contingent upon the condition and ongoing maintenance of the dam. A high hazard dam that is well maintain and in good condition may be very unlikely to fail, whereas a dam with maintenance issues or poor overall condition may be at greater risk of failure. Of the 96 high hazard dams identified by the NC Dam Inventory in Mecklenburg County, 10 (10% of the total) were rated in poor condition at the time of their last inspection report. These dams are listed in table.

Table 4.14 - High Hazard Dams in Mecklenburg County with Condition Assessment of "Poor"

Dam Name	NID ID	Inspection Date	Nearest Downstream City & Distance (mi.)	EAP in Place
Beaty Dam	NC05328	9/20/2023	No data	Yes
Devore Dam	NC06590	8/9/2024	No data	No
Devore Dam #1	NC06591	9/12/2024	No data	Yes
Devore Dam #2	NC06593	9/12/2024	No data	Yes
Hideaway Bay Dam	NC03448	1/31/2024	No data	Yes
Quail Acres Dam	NC00218	5/21/2024	Matthews, 7 mi.	Yes
Raintree Dam #4	NC03470	4/12/2023	No data	Yes
Raintree Dam #7	NC03471	6/4/2024	No data	Yes
Winery Lane Dam	NC05616	5/18/2023	No data	No
Woodrow Allen Dam	NC03483	9/20/2023	No data	Yes

Source: National Inventory of Dams

There are no records of dam failure in the county, which could suggest that dam failure is unlikely. However, historical events alone do not provide an adequate estimate of potential future occurrence. The past overtopping of the Mountain Island Dam as well as releases from Cowans Ford Dam and Mountain Island Dam, while not dam failures, still resulted in damaging flooding. Similarly, though there are no records of levee failure, future failure is possible. With heavy rain events becoming more frequent and intense, conditions conducive to dam or levee failure may occur more frequently as well. Dam or levee failure is considered possible in the planning area.

Probability: 2 – Possible

CLIMATE CHANGE

Studies have been conducted to investigate the impact of climate change scenarios on dam safety. The safety of dams for the future climate can be based on an evaluation of changes in design floods and the freeboard available to accommodate an increase in flood levels. The results from the studies indicate that the design floods with the corresponding outflow floods and flood water levels will increase in the future, and this increase will affect the safety of the dams in the future. Studies concluded that the total hydrological failure probability of a dam will increase in the future climate and that the extent and depth of flood waters will increase by the future dam break scenario. These changes would likely produce similar impacts on levees.

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

Dam inundation areas were not available for the identified dams; therefore, a quantitative vulnerability assessment could not be completed. Vulnerability discussed below is based on anecdotal evidence and theoretical understanding of potential risks.

PEOPLE

A person's immediate vulnerability to a dam failure is directly associated with the person's distance downstream of the dam as well as proximity to the stream carrying the floodwater from the failure. For dams that have an Emergency Action Plan (EAP), the vulnerability of loss of life for persons in their homes or on their property may be mitigated by following the EAP evacuation procedures; however, the displaced persons may still incur sheltering costs. For persons located on the river (e.g. for recreation) the vulnerability of loss of life is significant.

People are also vulnerable to the loss of the uses of the lake upstream of a dam following failure. Several uses are minor, such as aesthetics or recreational use. However, some lakes serve as drinking water supplies and their loss could disrupt the drinking water supply and present a public health problem.

PROPERTY

Vulnerability of the built environment includes damage to the dam itself and any man-made feature located within the inundation area caused by the dam failure. Downstream of the dam, vulnerability includes potential damage to homes, personal property, commercial buildings and property, and government owned buildings and property; destruction of bridge or culvert crossings; weakening of bridge supports through scour; and damage or destruction of public or private infrastructure that cross the stream such as water and sewer lines, gas lines and power lines. Water dependent structures on the lake upstream of the dam, such as docks/piers, floating structures or water intake structures, may be damaged by the rapid reduction in water level during the failure.

Similarly, levee failures can result in inundation and damages to buildings, personal property, and infrastructure. If a levee fails or is overtopped, the resulting flooding may be severe, as the levee then acts as a barrier, preventing drainage of the flood waters.

ENVIRONMENT

Aquatic species within the lake will either be displaced or destroyed. The velocity of the flood wave will likely destroy riparian and instream vegetation and destroy wetland function. The flood wave will like cause erosion within and adjacent to the stream. Deposition of eroded deposits may choke instream habitat or disrupt riparian areas. Sediments within the lake bottom and any low oxygen water from within the lake will be dispersed, potentially causing fish kills or releasing heavy metals found in the lake sediment layers.

CONSEQUENCE ANALYSIS

Table 4.15 summarizes the potential negative consequences of dam and levee failure.

Table 4.15 – Consequence Analysis – Dam & Levee Failure

Category	Consequences
Public	Localized impact expected to be severe for inundation area and moderate to light for other adversely affected areas.
Responders	Localized impact expected to limit damage to personnel in the inundation area at the time of the incident.
Continuity of Operations (including Continued Delivery of Services)	Damage to facilities/personnel in the area of the incident may require temporary relocation of some operations. Localized disruption of roads and/or utilities may postpone delivery of some services. Regulatory waivers may be needed locally. Fulfillment of some contracts may be difficult. Impact may reduce deliveries.
Property, Facilities and Infrastructure	Localized impact to facilities and infrastructure in the inundation area of the incident. Some severe damage possible.
Environment	Localized impact expected to be severe for inundation area and moderate to light for other adversely affected areas. Consequences include erosion, water quality degradation, wildlife displacement or destruction, and habitat destruction.
Economic Condition of the Jurisdiction	Local economy and finances adversely affected, possibly for an extended period of time, depending on damage and length of investigation.
Public Confidence in the Jurisdiction's Governance	Localized impact expected to primarily adversely affect only the dam owner and local entities.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes dam failure hazard risk by jurisdiction. Warning time and duration are inherent to the hazard and remain constant across jurisdictions. Spatial extent of any dam failure will be negligible relative to the planning area. Jurisdictions with high hazard dams or a levee within their boundaries or that are listed as downstream from a high hazard dam were assigned a probability rating of possible and an impact score of critical. Jurisdictions with no high hazard dams or levees were assigned a probability rating of unlikely and an impact rating of limited.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Charlotte	2	3	1	4	3	2.4	M
Cornelius	1	2	1	4	3	1.8	L
Davidson	2	3	1	4	3	2.4	M
Huntersville	2	3	1	4	3	2.4	M
Matthews	2	3	1	4	3	2.4	M
Mint Hill	2	3	1	4	3	2.4	M
Pineville	2	3	1	4	3	2.4	M
Mecklenburg County	2	3	1	4	3	2.4	M

4.5.2 DROUGHT

HAZARD BACKGROUND

Drought is a deficiency in precipitation over an extended period. It is a normal, recurrent feature of climate that occurs in virtually all climate zones. The duration of a drought varies widely. There are cases when drought develops relatively quickly and lasts a very short period of time, exacerbated by extreme heat and/or wind, and there are other cases when drought spans multiple years, or even decades. Studying the paleoclimate record is often helpful in identifying when long-lasting droughts have occurred. Common types of drought are detailed below in Table 4.16.

Table 4.16 – Drought Classifications

Type	Details
Meteorological Drought	Meteorological Drought is based on the degree of dryness (rainfall deficit) and the length of the dry period.
Agricultural Drought	Agricultural Drought is based on the impacts to agriculture by factors such as rainfall deficits, soil water deficits, reduced ground water, or reservoir levels needed for irrigation.
Hydrological Drought	Hydrological Drought is based on the impact of rainfall deficits on the water supply such as stream flow, reservoir and lake levels, and ground water table decline.
Socioeconomic Drought	Socioeconomic drought is based on the impact of drought conditions (meteorological, agricultural, or hydrological drought) on supply and demand of some economic goods. Socioeconomic drought occurs when the demand for an economic good exceeds supply as a result of a weather-related deficit in water supply.

Source: National Drought Mitigation Center

The wide variety of disciplines affected by drought, its diverse geographical and temporal distribution, and the many scales drought operates on make it difficult to develop both a definition to describe drought and an index to measure it. Many quantitative measures of drought have been developed in the United States, depending on the discipline affected, the region being considered, and the particular application. Several indices developed by Wayne Palmer, as well as the Standardized Precipitation Index, are useful for describing the many scales of drought.

The U.S. Drought Monitor provides a summary of drought conditions across the United States and Puerto Rico. Often described as a blend of art and science, the Drought Monitor map is updated weekly by combining a variety of data-based drought indices and indicators and local expert input into a single composite drought indicator.

The **Palmer Drought Severity Index** (PDSI) devised in 1965, was the first drought indicator to assess moisture status comprehensively. It uses temperature and precipitation data to calculate water supply and demand, incorporates soil moisture, and is considered most effective for unirrigated cropland. It primarily reflects long-term drought and has been used extensively to initiate drought relief. It is more complex than the Standardized Precipitation Index (SPI) and the Drought Monitor.

The **Standardized Precipitation Index** (SPI) is a way of measuring drought that is different from the Palmer Drought Severity Index (PDSI). Like the PDSI, this index is negative for drought, and positive for wet conditions. But the SPI is a probability index that considers only precipitation, while Palmer's indices are water balance indices that consider water supply (precipitation), demand (evapotranspiration) and loss (runoff).

In addition to the calculated indices, the North Carolina Drought Management Advisory Council's (DMAC) Technical Drought Advisory Team compiles drought-related information each week including stream flows, groundwater and reservoir levels, wildfire activity, and crop conditions and send recommendations to the U.S. Drought Monitor for North Carolina's drought conditions.

The State of North Carolina has a Drought Assessment and Response Plan as an Annex to its Emergency Operations Plan. This plan provides the framework to coordinate statewide response to a drought incident.

Warning Time: 1 – More than 24 hours

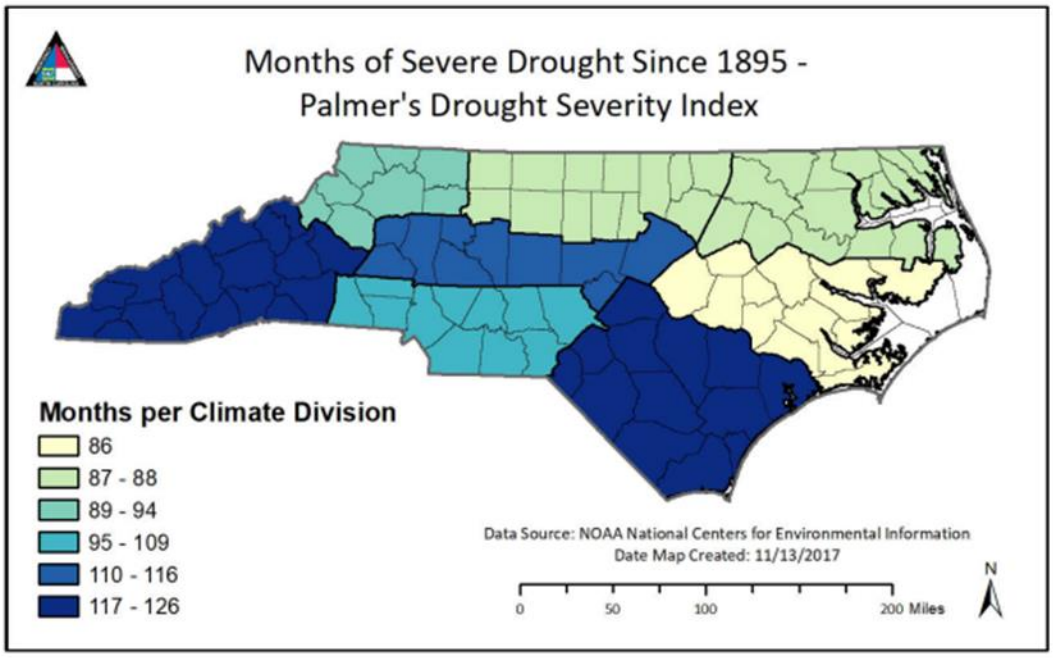
Duration: 4 – More than one week

LOCATION

Typically, the National Weather Service looks at drought and extreme heat as episodes that impact a widespread forecast "zone," and therefore it is not common to pinpoint a specific location within a planning area that is more susceptible to these hazards than others. From this viewpoint, each county is considered uniformly at risk to drought and extreme heat. However, the most significant financial losses are likely to occur in areas that are primarily agricultural. Areas with water-dependent recreational economies are also at higher risk.

Figure 4.5 shows the Palmer Drought Severity Index (PDSI) summary map for North Carolina since 1895. PDSI drought classifications are based on observed drought conditions and range from -0.5 (incipient dry spell) to -4.0 (extreme drought). As can be seen, central North Carolina has historically not seen as many significant long-term droughts as the western and southeastern regions of the state. Specifically, Mecklenburg was in severe drought for 89-94 months during the identified timeframe.

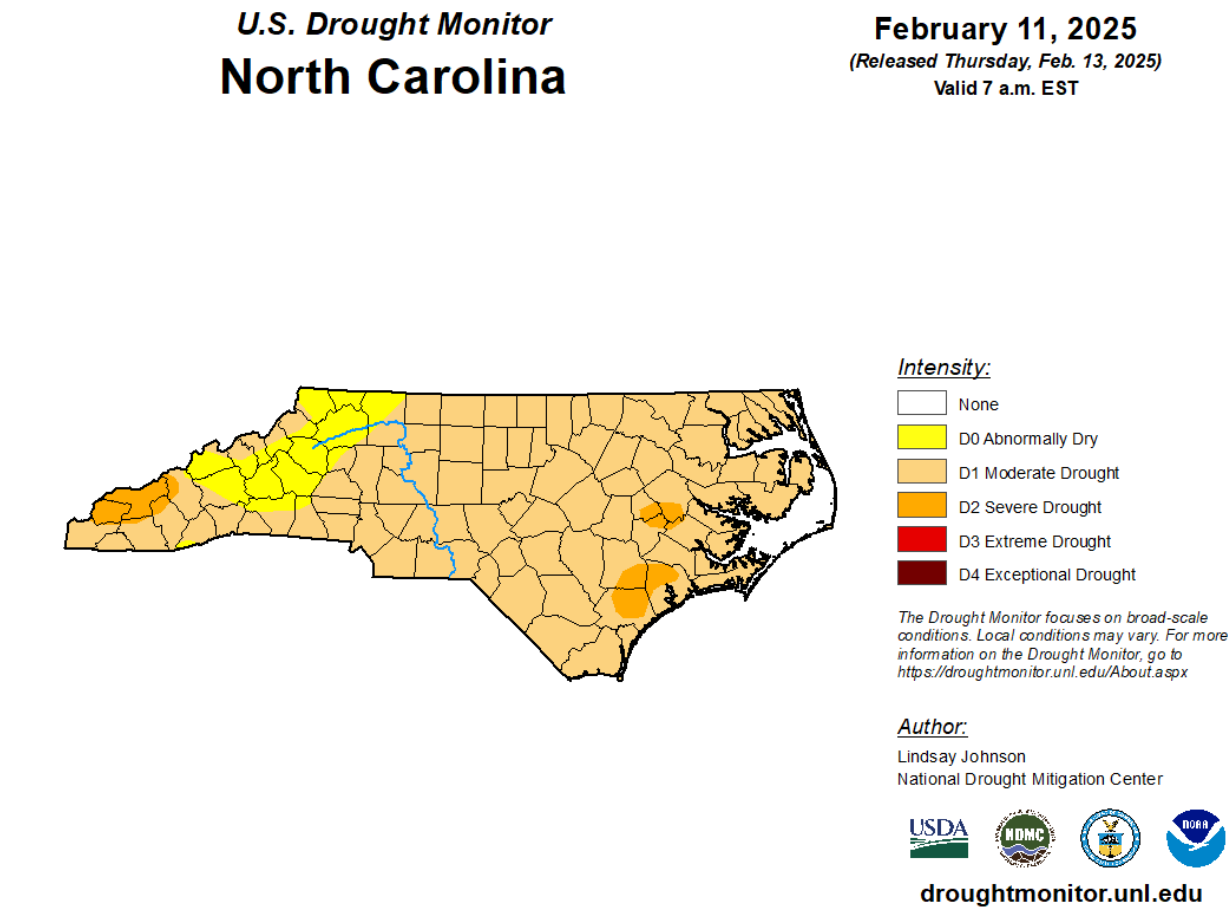
Figure 4.5 – PDSI Months of Severe Drought Since 1895



Source: State of North Carolina 2023 Hazard Mitigation Plan

Figure 4.6 shows the U.S. Drought Monitor's drought ratings for North Carolina as of February 13, 2025; as of that date, Mecklenburg County was experiencing moderate drought (D1) conditions. This map illustrates the regional nature of drought when it occurs.

Figure 4.6 – US Drought Monitor for Week of February 11, 2025



Source: U.S. Drought Monitor

Spatial Extent: 4 – Large

EXTENT

Drought extent can be defined in terms of intensity, using the U.S. Drought Monitor scale. The Drought Monitor Scale measures drought episodes with input from the Palmer Drought Severity Index, the Standardized Precipitation Index, the Keetch-Byram Drought Index, soil moisture indicators, and other inputs as well as information on how drought is affecting people. Figure 4.7 details the classifications used by the U.S. Drought Monitor. A category of D2 (severe) or higher on the U.S. Drought Monitor Scale can typically result in crop or pasture losses, water shortages, and the need to institute water restrictions.

The Mecklenburg region is susceptible to any of the levels of drought on the U.S. Drought Monitor scale. The most severe periods of drought since 2000 occurred in the summer of 2002 and reached extreme drought across 19% - 100% of the county and in fall of 2007 across 100% of the County.

Impact: 1 – Minor

Figure 4.7 – US Drought Monitor Classifications

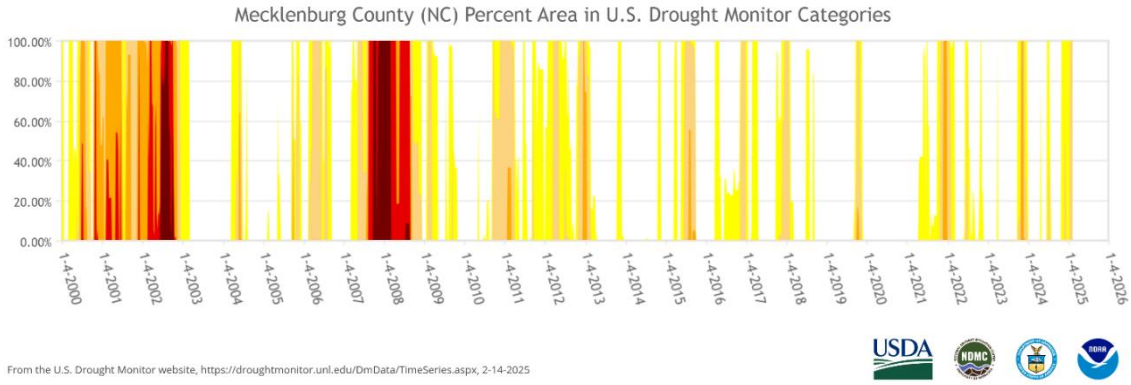
			Ranges				
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: ▪ short-term dryness slowing planting, growth of crops or pastures Coming out of drought: ▪ some lingering water deficits ▪ pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	▪ Some damage to crops, pastures ▪ Streams, reservoirs, or wells low, some water shortages developing or imminent ▪ Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	▪ Crop or pasture losses likely ▪ Water shortages common ▪ Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	▪ Major crop/pasture losses ▪ Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	▪ Exceptional and widespread crop/pasture losses ▪ Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Source: US Drought Monitor

HISTORICAL OCCURRENCES

The U.S. Drought Monitor provides historical data on droughts in Mecklenburg County. The following figure shows historical periods where the County was considered in some level of drought condition. The color key shown in Figure 4.7 indicates the intensity of the drought. According to the U.S. Drought Monitor, between January 4, 2000 and February 11, 2025, Mecklenburg County was in some level of drought condition 57% of the time, or 742 of 1,311 weeks. Most this time was spent in "abnormally dry" or "moderate" drought conditions; Mecklenburg County recorded 86 weeks in "extreme" drought.

Figure 4.8 – Drought Conditions in Mecklenburg County – 2000-2025



Source: US Drought Monitor

The National Drought Mitigation Center's Drought Impact Reporter Dashboard summarizes drought-related media reports starting in 2005. The following narratives were compiled from the Dashboard search results for Mecklenburg County:

— In April 2012, the North Carolina Drought Management Advisory Council urged people in Mecklenburg County and others in areas of moderate drought to conserve water as much as possible. The council also urged local governments to implement drought response plans.

- In November 2012, a long period of drought caused northern dusky salamander and two lined salamander larvae to disappear in 30% of 30 stream sites, including streams in Mecklenburg County.
- A burn ban in North Carolina was expanded to include Mecklenburg County in November 2023. Wildfire activity had been increasing due to dry conditions, additionally several wildfires were burning in western North Carolina diminishing air quality.

PROBABILITY OF FUTURE OCCURRENCE

Based on historical occurrences, the probability that the Region will experience some level of drought is likely, with Mecklenburg County in drought 57 percent of the time during the period from 2000 through 2025. However, the probability of extreme drought is lower, with seven instances of extreme drought in Mecklenburg County. Overall, drought in the Mecklenburg County can be considered likely.

Probability: 3 – Likely

CLIMATE CHANGE

The Fourth National Climate Assessment reports that average and extreme temperatures are increasing across the country and average annual precipitation is decreasing in the Southeast. Heavy precipitation events are becoming more frequent, meaning that as more rain falls on fewer days there will likely be an increase in the average number of consecutive dry days. As temperature is projected to continue rising, evaporation rates are expected to increase, resulting in decreased surface soil moisture levels. Together, these factors suggest that drought will increase in intensity and duration in the Southeast.

The Fifth National Climate Assessment upholds the climate trends reported in the Fourth Assessment and presents additional patterns in the Southeast that exacerbate climate risk and impacts. These patterns include population growth, high proportion of the population with health issues or underlying health conditions, and a large, climate-dependent agricultural sector.

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

Vulnerability to drought in Mecklenburg County is based on historical occurrences of drought in the planning area and generalized concerns regarding potential drought consequences. Agricultural vulnerability was estimated using data from the USDA Risk Management Agency crop insurance claims, specifically past claims related to drought.

PEOPLE

Drought can affect people's physical and mental health. For those economically dependent on a reliable water supply, drought may cause anxiety or depression about economic losses, reduced incomes, and other employment impacts. Conflicts may arise over water shortages. People may be forced to pay more for water, food, and utilities affected by increased water costs.

Drought may also cause health problems due to poorer water quality from lower water levels. If accompanied by extreme heat, drought can also result in higher incidents of heat stroke and even loss of human life.

PROPERTY

Drought is unlikely to cause damages to the built environment. However, in areas with shrinking and expansive soils, drought may lead to structural damages. Drought may cause severe property loss for the agricultural industry in terms of crop and livestock losses. The USDA's Risk Management Agency

(RMA) maintains a database of all paid crop insurance claims. Between 2007-2023, the sum of claims paid for crop damage as a result of drought in Mecklenburg County was $486,971, or an average of roughly $30,435 in losses every year. Table 4.17 summarizes the crop losses due to drought in reported in the RMA system.

Table 4.17 – Crop Losses Resulting from Drought in Mecklenburg County, 2007-2023

Year	Determined Acres	Indemnity Amount
2007	1,448.70	$71,830.00
2008	172.60	$8,166.00
2009	303.60	$13,427.00
2010	134.90	$3,308.00
2014	7.00	$642.60
2015	1,151.67	$168,510.40
2016	976.05	$33,556.00
2017	3.82	$530.20
2018	977.92	$89,778.95
2019	809.42	$55,353.80
2020	48.99	$3,556.80
2021	163.21	$2,654.00
2022	3,379.50	$30,811.10
2023	785.00	$4,846.70
Total	**10,362.38**	**$486,971.55**

Source: USDA Risk Management Agency

ENVIRONMENT

Drought can affect local wildlife by shrinking food supplies and damaging habitats. Sometimes this damage is only temporary, and other times it is irreversible. Wildlife may face increased disease rates due to limited access to food and water. Increased stress on endangered species could cause extinction.

Drought conditions can also provide a substantial increase in wildfire risk. As plants and trees die from a lack of precipitation, increased insect infestations, and diseases—all of which are associated with drought—they become fuel for wildfire. Long periods of drought can result in more intense wildfires, which bring additional consequences for the economy, the environment, and society. Drought may also increase likelihood of wind and water erosion of soils.

CONSEQUENCE ANALYSIS

Table 4.18 summarizes the potential negative consequences of drought.

Table 4.18 – Consequence Analysis - Drought

Category	Consequences
Public	Can cause anxiety or depression about economic losses, conflicts over water shortages, reduced incomes, fewer recreational activities, higher incidents of heat stroke, and fatality.
Responders	Impacts to responders are unlikely. Exceptional drought conditions may impact the amount of water immediately available to respond to wildfires.

Category	Consequences
Continuity of Operations (including Continued Delivery of Services)	Drought would have minimal impacts on continuity of operations due to the relatively long warning time that would allow for plans to be made to maintain continuity of operations.
Property, Facilities and Infrastructure	Drought has the potential to affect water supply for residential, commercial, institutional, industrial, and government-owned areas. Drought can reduce water supply in wells and reservoirs. Utilities may be forced to increase rates.
Environment	Environmental impacts include strain on local plant and wildlife; increased probability of erosion and wildfire.
Economic Condition of the Jurisdiction	Farmers may face crop losses or increased livestock costs. Businesses that depend on farming may experience secondary impacts. Extreme drought has the potential to impact local businesses in landscaping, recreation and tourism, and public utilities.
Public Confidence in the Jurisdiction's Governance	When drought conditions persist with no relief, local or State governments must often institute water restrictions, which may impact public confidence.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes drought hazard risk by jurisdiction. Drought risk is uniform across the planning area. Probability, warning time, duration, and spatial extent are inherent to the hazard and remain constant across jurisdictions. Most damages that result from drought are to crops and other agriculture-related activities as well as water-dependent recreation industries; therefore, the magnitude of impacts is typically greater in unincorporated areas. In developed areas, the magnitude of drought is less severe, with lawns and local gardens affected and potential impacts on local water supplies during severe, prolonged drought.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Charlotte	3	1	4	1	4	2.5	M
Cornelius	3	1	4	1	4	2.5	M
Davidson	3	1	4	1	4	2.5	M
Huntersville	3	1	4	1	4	2.5	M
Matthews	3	1	4	1	4	2.5	M
Mint Hill	3	1	4	1	4	2.5	M
Pineville	3	1	4	1	4	2.5	M
Mecklenburg County	3	2	4	1	4	2.8	H

4.5.3 EARTHQUAKE

HAZARD BACKGROUND

An earthquake is a movement or shaking of the ground. Most earthquakes are caused by the release of stresses accumulated as a result of the rupture of rocks along opposing fault planes in the Earth's outer crust. These fault planes are typically found along borders of the Earth's 10 tectonic plates. The areas of greatest tectonic instability occur at the perimeters of the slowly moving plates, as these locations are subjected to the greatest strains from plates traveling in opposite directions and at different speeds. Deformation along plate boundaries causes strain in the rock and the consequent buildup of stored energy. When the built-up stress exceeds the rocks' strength a rupture occurs. The rock on both sides of the fracture is snapped, releasing the stored energy and producing seismic waves, generating an earthquake.

Warning Time: 4 – Less than six hours

Duration: 1 – Less than six hours

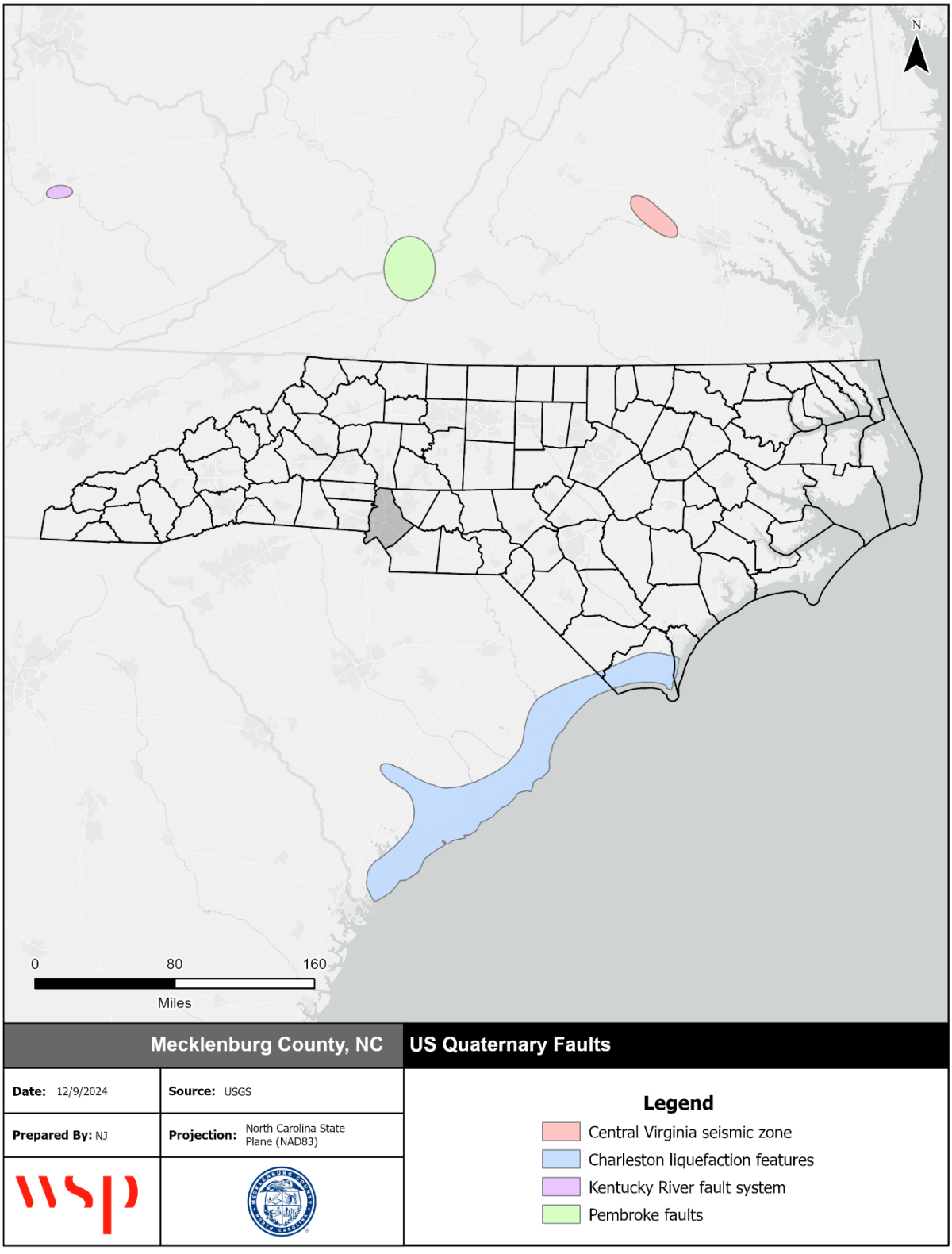
LOCATION

Figure 4.9 reflects the Quaternary faults that present an earthquake hazard for the Mecklenburg County planning area based on data from the USGS Earthquake Hazards Program.

All of North Carolina is subject to earthquakes, with the western and southern region most vulnerable to a damaging earthquake. The Charleston Fault in South Carolina and New Madrid Fault in Tennessee affect the state. Both faults have generated earthquakes measuring greater than 8.0 on the Richter Scale during the last 200 years. In addition, there are several smaller fault lines in eastern Tennessee and throughout North Carolina that could produce less severe shaking.

Spatial Extent: 4 – Large

Figure 4.9 – US Quaternary Faults



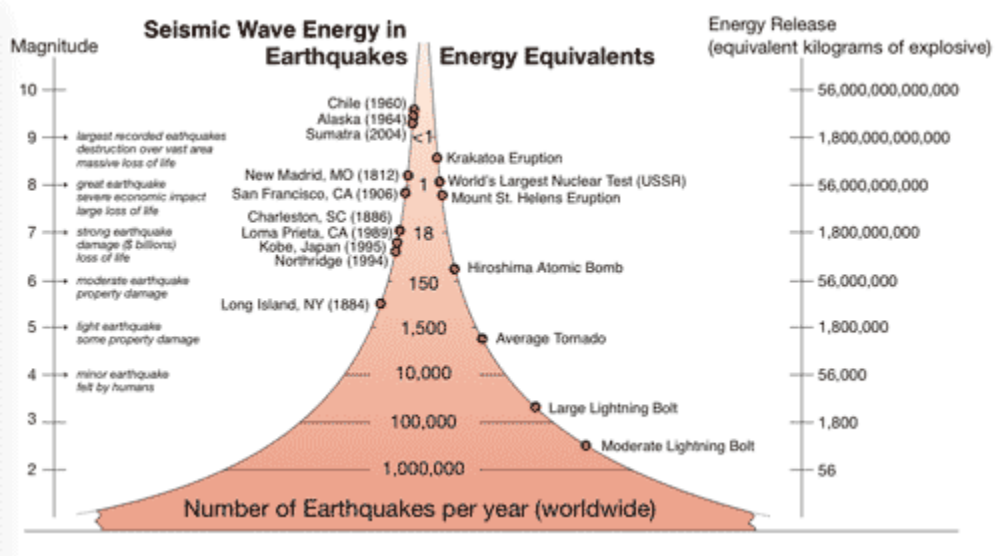
Source: USGS Earthquake Hazards Program

EXTENT

Earthquakes are measured in terms of their magnitude and intensity. The Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude is usually used by the news media when reporting the intensity of earthquakes and is the scale most familiar to the public. However, the USGS now uses moment magnitude, which is an extension of the Richter Scale and is based on physical properties of the earthquake derived from an analysis of all the waveforms recorded from the shaking. Earthquake magnitude is described in Figure 4.10.

A more meaningful measurement is an earthquake's intensity. The intensity scale used by the scientific community in the United States is called the Modified Mercalli Intensity (MMI) scale. The MMI scale is an arbitrary ranking based on observed effects. Table 4.19 shows descriptions for levels of earthquake intensity on the MMI scale compared to the Richter scale. Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Figure 4.10 – Earthquake Magnitude and Energy Release



Source: USGS Earthquake Hazards Program

Table 4.19 –Modified Mercalli Intensity (MMI) Scale

MMI	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt by a few persons at rest, especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.

MMI	Shaking	Description/Damage
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some will-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS Earthquake Hazards Program

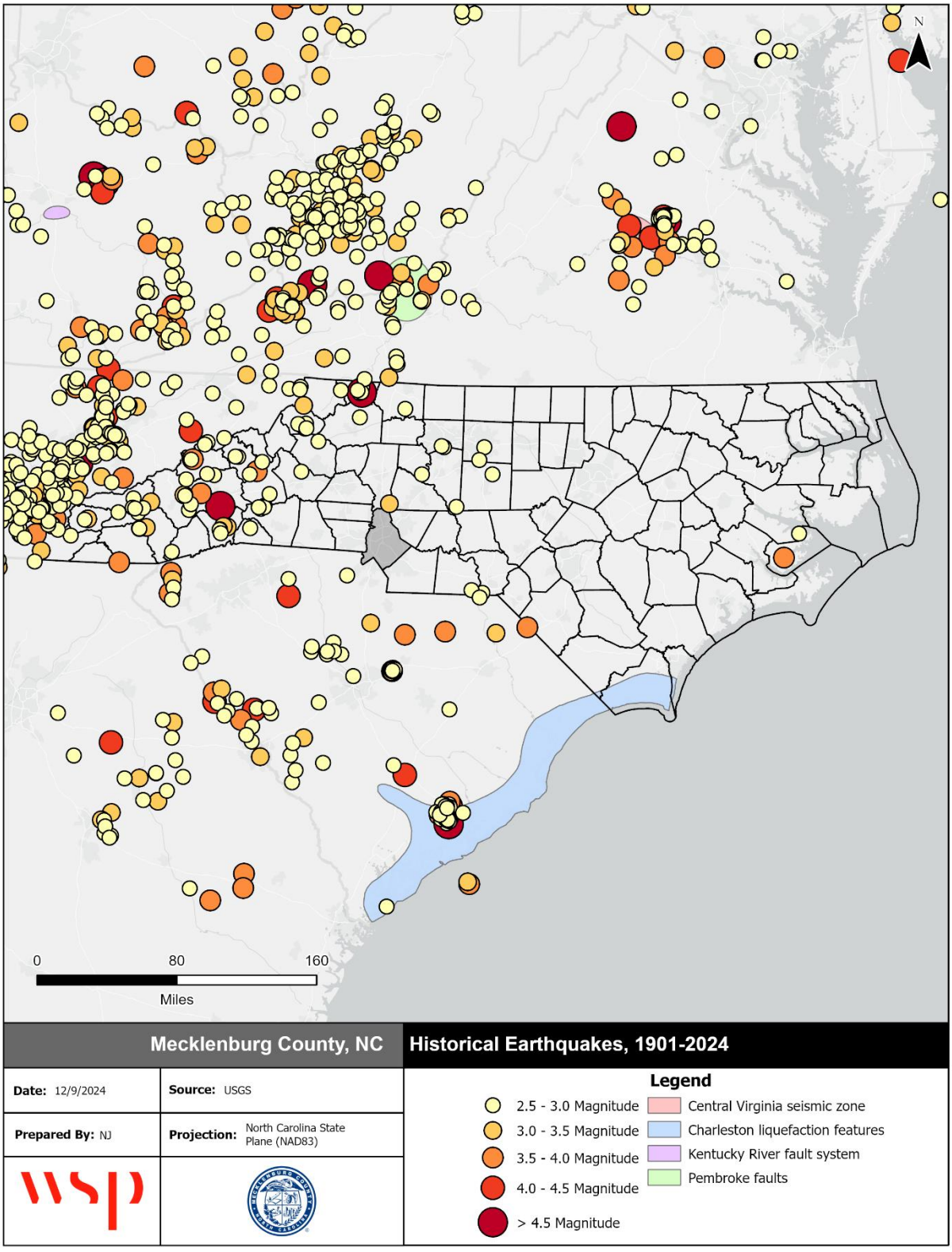
The most severe earthquake to impact the Mecklenburg County area was the Charleston earthquake of 1886. It is estimated to have been felt as an 8 on the MMI Scale.

Impact: 1 – Minor

HISTORICAL OCCURRENCES

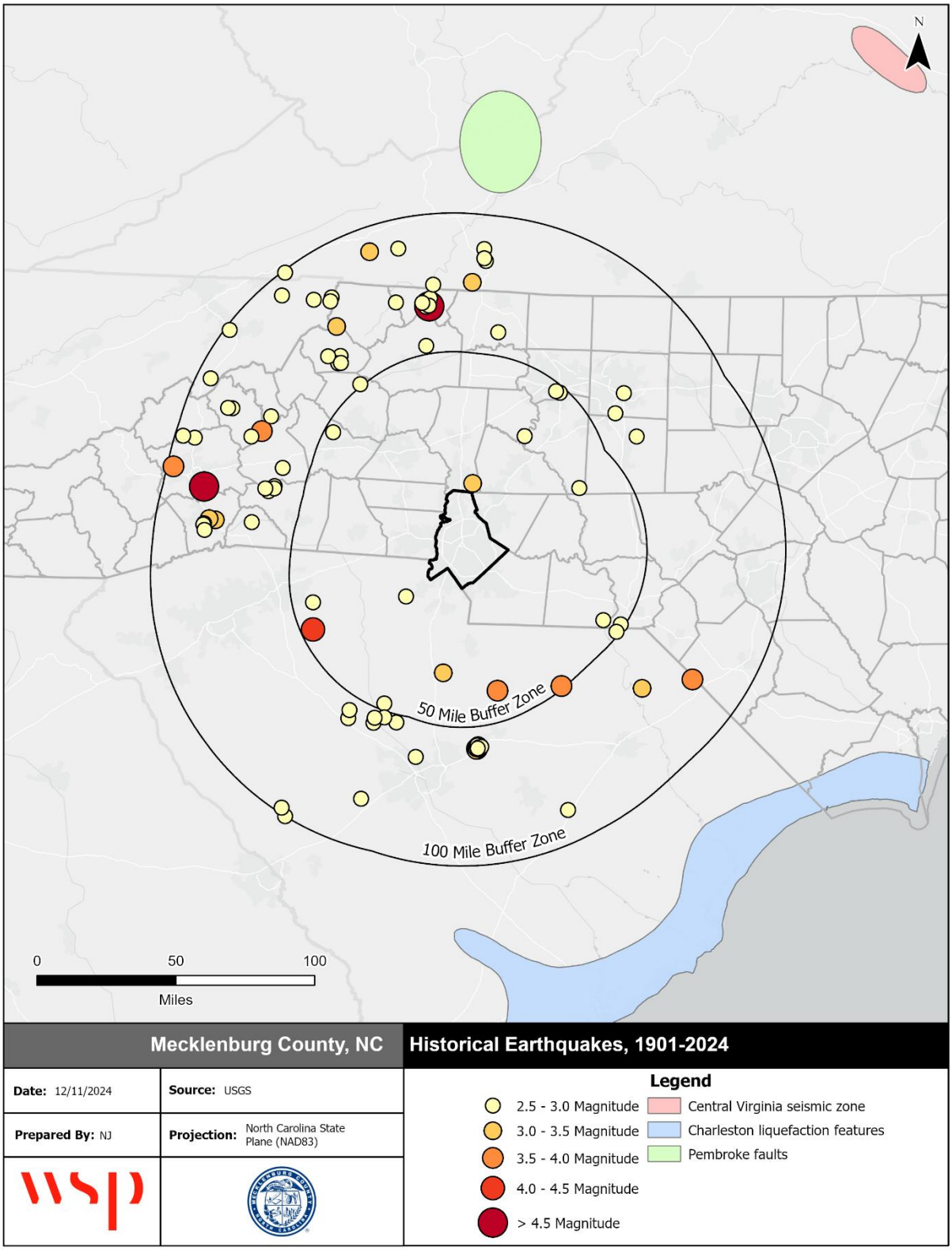
The USGS Earthquake Hazards Program maintains a database of all historical earthquakes of a magnitude 2.5 and greater. These events are illustrated in the following pages. Figure 4.11 and Figure 4.12 show historical earthquakes by magnitude in relation to North Carolina and Mecklenburg County and major fault zones identified by USGS. This includes events from 1973 to 2024.

Figure 4.11 – Historical Earthquakes by Magnitude, 1973-2024



Source: USGS Earthquakes Hazard Program

Figure 4.12 – Historical Earthquakes by Magnitude with 50-100 Mile Buffer to Mecklenburg County



Source: USGS Earthquakes Hazard Program

The above map documents all earthquakes that have occurred within North Carolina; however, given the long distances across which earthquake impacts can be felt, these events do not encompass all earthquakes that have affected North Carolina. The 2020 Mecklenburg County Plan lists the following significant seismic events impacting Mecklenburg County from 1638 to 1985.

Table 4.20 – Historical Earthquake Impacts in Mecklenburg County, 1638-1985

Date of Occurrence	Location	MMI (Intensity)	Distance from Epicenter (Miles)
Charlotte	12/13/1879	5	4
Pineville	12/13/1879	5	14
Charlotte	09/01/1886	8	270
Pineville	09/01/1886	4	256
Charlotte	11/25/1898	4	N/A
Charlotte	02/21/1916	5	153
Charlotte	10/20/1924	2	162
Charlotte	11/03/1928	4	180
Charlotte	12/23/1928	3	N/A
Charlotte	07/26/1945	4	101
Charlotte	11/20/1969	5	241
Cornelius	11/20/1969	3	213
Matthews	11/20/1969	3	254
Pineville	11/20/1969	3	257
Davidson	11/22/1974	4	296
Charlotte	09/13/1976	2	152

Source: National Geophysical Data Center; 2020 Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan

The 2020 plan noted no additional earthquakes between 1985 and 2020. The National Geophysical Data Center (NGDC) Significant Earthquake Database does not report any additional records between 2020 and 2024 in the planning area.

PROBABILITY OF FUTURE OCCURRENCE

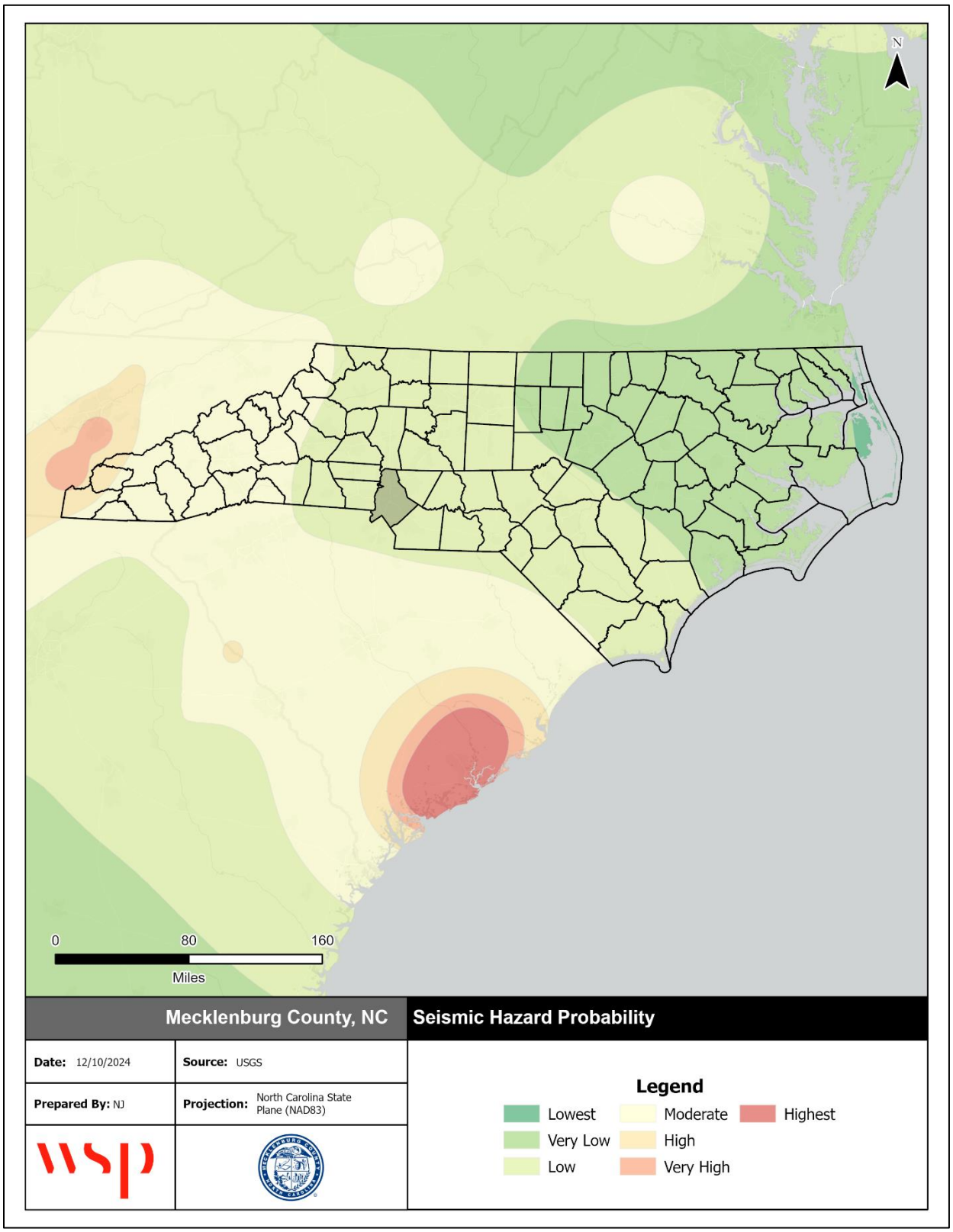
Ground motion is the movement of the earth's surface due to earthquakes or explosions. It is produced by waves generated by a sudden slip on a fault or sudden pressure at the explosive source and travels through the earth and along its surface. Ground motion is amplified when surface waves of unconsolidated materials bounce off of or are refracted by adjacent solid bedrock. The probability of ground motion is depicted in USGS earthquake hazard maps by showing, by contour values, the earthquake ground motions (of a particular frequency) that have a common given probability of being exceeded in 50 years.

Figure 4.13 reflects the seismic hazard for Mecklenburg County based on the national USGS map of peak acceleration with two percent probability of exceedance in 50 years, which USGS simplifies into risk ratings from "very low" to "highest". To produce these estimates, the ground motions being considered at a given location are those from all future possible earthquake magnitudes at all possible distances from that location. The ground motion coming from a particular magnitude and distance is assigned an annual probability equal to the annual probability of occurrence of the causative magnitude and distance. The method assumes a reasonable future catalog of earthquakes, based upon historical earthquake locations and geological information on the recurrence rate of fault ruptures. When all the possible earthquakes and magnitudes have been considered, a ground motion value is determined such that the annual rate of its being exceeded has a certain value. Therefore, for the given probability of exceedance, two percent, the locations shaken more frequently will have larger ground motions.

As shown in the map below, the majority of Mecklenburg County is located within the lighter green zone which represents “low” seismic hazard risk. Based on this data, it can be reasonably assumed that an earthquake event affecting Mecklenburg County is unlikely.

Probability: 1 – Unlikely

Figure 4.13 – Seismic Hazard Information for North Carolina



Source: USGS Earthquake Hazards Program

CLIMATE CHANGE

Scientists are beginning to believe there may be a connection between climate change and earthquakes. Changing ice caps and sea-level redistribute weight over fault lines, which could potentially have an influence on earthquake occurrences. However, currently no studies quantify the relationship to a high level of detail, so recent earthquakes should not be linked with climate change.

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

Population and property at risk to flooding was estimated using data from the North Carolina Emergency Management (NCEM) IRISK database, which was compiled in NCEM's Risk Management Tool.

PEOPLE

Earthquake events in Mecklenburg County are unlikely to produce more than mild ground shaking; therefore, injury or death is unlikely. Objects falling from shelves generally pose the greatest threat to safety.

Table 4.21 and Table 4.22 detail the population estimated to be at risk from a 250-year earthquake and a 500-year earthquake, respectively, according to the NCEM IRISK database.

Table 4.21 – Estimated Population Impacted by 250-Year Earthquake

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Charlotte	933,045	933,045	100	97,297	97,297	100	62,456	62,456	100
Cornelius	52,414	52,414	100	9,213	9,213	100	1,891	1,891	100
Davidson	16,621	16,621	100	2,502	2,502	100	749	749	100
Huntersville	67,005	67,005	100	9,037	9,037	100	4,465	4,465	100
Matthews	32,211	32,211	100	5,080	5,080	100	2,181	2,181	100
Mint Hill	33,142	33,142	100	6,218	6,218	100	1,798	1,798	100
Pineville	16,047	16,047	100	2,464	2,464	100	1,102	1,102	100
County Total	**1,150,485**	**1,150,485**	**100**	**131811**	**131811**	**100**	**74642**	**74642**	**100**

Source: NCEM Risk Management Tool

Table 4.22 – Estimated Population Impacted by 500-Year Earthquake

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Charlotte	933,045	933,045	100	97,297	97,297	100	62,456	62,456	100
Cornelius	52,414	52,414	100	9,213	9,213	100	1,891	1,891	100
Davidson	16,621	16,621	100	2,502	2,502	100	749	749	100
Huntersville	67,005	67,005	100	9,037	9,037	100	4,465	4,465	100
Matthews	32,211	32,211	100	5,080	5,080	100	2,181	2,181	100
Mint Hill	33,142	33,142	100	6,218	6,218	100	1,798	1,798	100
Pineville	16,047	16,047	100	2,464	2,464	100	1,102	1,102	100
County Total	**1,150,485**	**1,150,485**	**100**	**131811**	**131811**	**100**	**74642**	**74642**	**100**

Source: NCEM Risk Management Tool

PROPERTY

In a severe earthquake event, buildings can be damaged by the shaking itself or by the ground beneath them settling to a different level than it was before the earthquake (subsidence). Buildings can even sink into the ground if soil liquefaction occurs. If a structure (a building, road, etc.) is built across a fault, the ground displacement during an earthquake could seriously damage that structure.

Earthquakes can also cause damages to infrastructure, resulting in secondary hazards. Damages to dams or levees could cause failures and subsequent flooding. Fires can be started by broken gas lines and power lines. Fires can be a serious problem, especially if the water lines that feed the fire hydrants have been damaged as well.

Table 4.23 through Table 4.24 detail the estimated buildings impacted from varying magnitudes of earthquake events.

Table 4.23 – Estimated Buildings Impacted by 250-Year Earthquake Event

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,487	93	$648,585	1,208	5	$1,012,317	369	2	$183,876	24,064	100	$1,844,778
Charlotte	246,090	228,371	93	$10,868,470	14,819	6	$18,026,534	2,894	1	$2,516,279	246,084	100	$31,411,282
Cornelius	10,558	9,841	93	$520,739	630	6	$361,792	87	1	$47,784	10,558	100	$930,316
Davidson	3,871	3,545	92	$186,741	270	7	$198,887	56	1	$47,225	3,871	100	$432,854
Huntersville	19,554	18,353	94	$551,474	966	5	$758,161	223	1	$169,825	19,542	100	$1,479,460
Matthews	10,007	9,209	92	$329,672	665	7	$623,213	133	1	$111,751	10,007	100	$1,064,635
Mint Hill	9,880	9,369	95	$235,059	417	4	$153,735	94	1	$56,615	9,880	100	$445,409
Pineville	2,731	2,037	75	$156,632	552	20	$559,141	142	5	$28,943	2,731	100	$744,716
Total	**326,758**	**303,212**	**93**	**$13,497,372**	**19,527**	**6**	**$21,693,780**	**3,998**	**1**	**$3,162,298**	**326,737**	**100**	**$38,353,450**

Source: NCEM Risk Management Tool

Table 4.24 – Estimated Buildings Impacted by 500-Year Earthquake Event

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,487	93	$4,938,123	1,208	5	$5,180,669	369	2	$930,130	24,064	100	$11,048,921
Charlotte	246,090	228,371	93	$78,724,465	14,819	6	$91,326,042	2,894	1	$13,504,772	246,084	100	$183,555,278
Cornelius	10,558	9,841	93	$3,209,775	630	6	$1,587,681	87	1	$262,416	10,558	100	$5,059,871
Davidson	3,871	3,545	92	$1,183,962	270	7	$1,036,842	56	1	$219,622	3,871	100	$2,440,426
Huntersville	19,554	18,353	94	$3,906,940	966	5	$3,663,647	223	1	$884,468	19,542	100	$8,455,055
Matthews	10,007	9,209	92	$2,676,410	665	7	$3,186,567	133	1	$738,680	10,007	100	$6,601,657
Mint Hill	9,880	9,369	95	$2,049,161	417	4	$856,153	94	1	$319,754	9,880	100	$3,225,069
Pineville	2,731	2,037	75	$1,159,254	552	20	$2,949,874	142	5	$173,587	2,731	100	$4,282,714
Total	**326,758**	**303,212**	**93**	**$97,848,090**	**19,527**	**6**	**$109,787,475**	**3,998**	**1**	**$17,033,429**	**326,737**	**100**	**$224,668,991**

Source: NCEM Risk Management Tool

ENVIRONMENT

An earthquake is unlikely to cause substantial impacts to the natural environment in Mecklenburg County. Impacts to the built environment (e.g. ruptured gas line) could damage the surrounding environment. However, this type damage is unlikely based on historical occurrences.

CONSEQUENCE ANALYSIS

Table 4.25 summarizes the potential negative consequences of earthquake.

Table 4.25 – Consequence Analysis - Earthquake

Category	Consequences
Public	Impact expected to be severe for people who are unprotected or unable to take shelter; moderate to light impacts are expected for those who are protected.
Responders	Responders may be required to enter unstable structures or compromised infrastructure. Adverse impacts are expected to be severe for unprotected personnel and moderate to light for protected personnel.
Continuity of Operations (including Continued Delivery of Services)	Damage to facilities/personnel in the area of the incident may require relocation of operations and lines of succession execution. Disruption of lines of communication and destruction of facilities may extensively postpone delivery of services.
Property, Facilities and Infrastructure	Damage to facilities and infrastructure in the area of the incident may be extensive for facilities, people, infrastructure, and HazMat.
Environment	May cause extensive damage, creating denial or delays in the use of some areas. Remediation may be needed.
Economic Condition of the Jurisdiction	Local economy and finances expected to be adversely affected, possibly for an extended period of time.
Public Confidence in the Jurisdiction's Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery are not timely and effective.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes earthquake hazard risk by jurisdiction. Earthquake risk is uniform across the planning area.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
All Jurisdictions	1	1	4	4	1	1.9	L

4.5.4 EXCESSIVE HEAT

HAZARD BACKGROUND

Per information provided by Ready.gov, in most of the United States extreme heat is defined as a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees. As temperatures rise, our bodies naturally cool down by sweating. In extreme heat, the body must work extra hard to maintain a normal temperature and sweating might not be enough to cool down. When this happens, a person's body temperature rises faster than it can cool itself. Additionally, when the humidity is high, as is common during extreme heat events in North Carolina, evaporative cooling through sweating becomes less effective. Heat-related illnesses occur when the body overheats from exposure to high temperatures and in severe cases can cause damage to the brain and other vital organs[1]. Heat-related illnesses can also arise from moderate to vigorous physical activity in hot situations.

Extreme heat often results in the highest annual number of deaths among all weather-related disasters. On average, the number of extreme heat days has been increasing each year, putting residents at a higher risk of heat-related illnesses. In 2023, more people in the United States died of heat-related illness than any year on record[2]. Per Ready.gov, older adults, children, and people with certain illnesses and chronic conditions are at greater risk from extreme heat; and humidity increases the feeling of heat.

The National Weather Service (NWS) uses the heat index, also known as apparent temperature, to determine when to issue health alerts. The heat index is a measure of how hot it really feels when the relative humidity is considered along with the actual air temperature. In most areas of the country, the NWS generally issues alerts "when the heat index is expected to exceed 105°F -110°F for at least two consecutive days," but they also work with local partners to determine the most appropriate conditions for a specific geography[3,4].

In North Carolina, the Department of Health and Human Services (DHHS) uses regional temperature thresholds to activate its Heat Health Alert System. The regional thresholds recognize that an area's typical climate conditions and relevant local factors, such as the proportion of the population engaged in outdoor work, can impact how heat affects the local population. DHHS sends heat alerts to county health departments and Heat Health Alert System subscribers when the daily maximum heat index is forecasted to meet or exceed the heat index threshold for their region. In Mecklenburg County, the heat index threshold is 101°F, as shown in Figure 4.14.

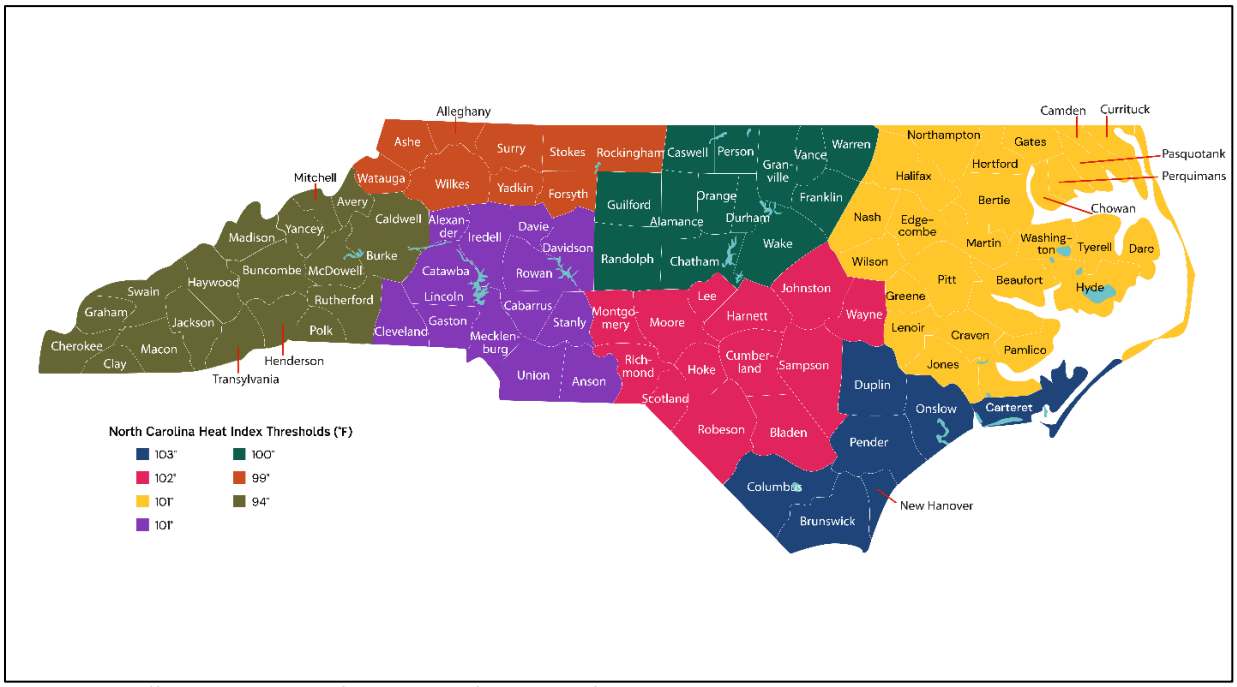
[1] www.cdc.gov/disasters/extremeheat/heat_guide.html.

[2] https://apnews.com/article/record-heat-deadly-climate-change-humidity-south-11de21a526e1cbe7e306c47c2f12438d

[3] https://www.weather.gov/safety/heat-index

[4] https://www.weather.gov/safety/heat-ww

Figure 4.14 – North Carolina Heat Index Thresholds



Source: https://climate.ncsu.edu/heat_toolkit/thresholds/

The most dangerous place to be during an extreme heat incident is in a permanent home, with little or no air conditioning. Those at greatest risk for heat-related illness include people 65 years of age and older, young children, people with chronic health problems such as heart disease, people who are obese, people who are socially isolated, and people who are on certain medications, such as tranquilizers, antidepressants, sleeping pills, or drugs for Parkinson's disease. However, even young and healthy individuals are susceptible if they participate in strenuous physical activities during hot weather or are not acclimated to hot weather. Table 4.26 lists typical symptoms and health impacts of exposure to extreme heat.

Table 4.26 – Typical Health Impacts of Extreme Heat

Heat Index (HI)	Disorder
80-90° F (HI)	Fatigue possible with prolonged exposure and/or physical activity
90-105° F (HI)	Heatstroke, heat cramps, or heat exhaustion possible with prolonged exposure and/or physical activity
105-130° F (HI)	Heat cramps or heat exhaustion likely, and heat stroke possible with prolonged exposure and/or physical activity

Source: National Weather Service Heat Index Program, www.weather.gov/os/heat/index.shtml

The National Weather Service has a system in place to initiate alert procedures (advisories or warnings) when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for issuing excessive heat alerts is when the maximum daytime Heat Index is expected to equal or exceed 105 degrees Fahrenheit (°F) and the nighttime minimum Heat Index is 80°F or above for two or more consecutive days. A heat advisory is issued when temperatures reach 105 degrees and a warning is issued at 115 degrees.

Impacts of extreme heat are not only focused on human health, as prolonged heat exposure can have devastating impacts on infrastructure as well. Prolonged high heat exposure increases the risk of pavement deterioration, as well as railroad warping or buckling. High heat also puts a strain on energy systems and consumption, as air conditioners are run at a higher rate and for longer; extreme heat can also reduce transmission capacity over electric systems.

Warning Time: 1 – More than 24 hours

Duration: 3 – Less than one week

LOCATION

The entire planning area is susceptible to high temperatures and incidents of extreme heat.

Spatial Extent: 4 – Large

EXTENT

The extent of extreme heat can be defined by the maximum apparent temperature reached. Apparent temperature is a function of ambient air temperature and relative humidity and is reported as the heat index. The National Weather Service Forecast Office in Raleigh sets the following criteria for heat advisory and excessive heat warning:

- **Heat Advisory** – Heat Index of 105°F to 109°F for 3 hours or more. Can also be issued for lower values 100ºF to 104ºF for heat lasting several consecutive days
- **Excessive Heat Watch** – Potential for heat index values of 110°F or hotter within 24 to 48 hours. Also issued during prolonged heat waves when the heat index is near 110°F
- **Excessive Heat Warning** – Heat Index of 110°F or greater for any duration

Based on data from the "Charlotte Douglas Airport" weather station from 1939 through 2024, the highest temperature recorded in Mecklenburg County was 104°F and occurred in August 2007, June 2012, and July 2012.

Impact: 3 – Critical

HISTORICAL OCCURRENCES

According to the National Oceanic and Atmospheric Administration (NOAA), 2019 was North Carolina's hottest year on record; that record stretches back 123 years to 1895.

The following heat-related incident was reported by NCEI for Mecklenburg County; this incident caused two fatalities.

June 29, 1998 – A string of several days in the upper 90s to near 100 degrees resulted in the death of an elderly couple when their home's air conditioning failed. The date and time of death was estimated. Severe thunderstorms brought damaging winds to the southern piedmont in the late afternoon and early evening. Numerous trees and power lines were downed across the north and east side of Charlotte, some damaging homes. Power was out for a couple of days in that area. Elsewhere, scattered trees and power lines were blown down with about 7500 people left without power in Mooresville.

July 8, 2012 – Oppressive heat continued the first day of July, with Charlotte-Douglas International Airport having an all time record high temperature of 104 degrees for a 3rd consecutive day. The ASOS at Monroe reported a high temperature of 105 degrees with a max heat index of at least 111 degrees. Once again, Hickory in the foothills failed to reach even heat advisory criteria. Widespread thunderstorms developed during the afternoon hours, bringing a few days of relief from the heat.

Heat index records maintained by the North Carolina Climate Office indicate that the Region regularly experiences heat index temperatures above 100°F. Table 4.27 provide counts of heat index values by threshold recorded from 1999-2024 at the Douglas International Airport weather station (KCLT), used as an indicator for county overall. Counts are provided as the number of hours in a given year where the heat index reached or exceeded 100°F.

Table 4.27 – Historical Heat Index Counts, Douglas International Airport Station (KCLT), 1999-2024

Year	Heat Index Value				Total
	100-104˚F	105-109˚F	110-114˚F	≥115˚F	
1999	50	21	1	0	72
2000	10	0	0	0	10
2001	17	1	0	0	18
2002	22	0	0	0	22
2003	9	0	0	0	9
2004	0	0	0	0	0
2005	26	0	0	0	26
2006	20	0	0	0	20
2007	34	0	1	0	35
2008	4	0	0	0	4
2009	3	0	0	0	3
2010	74	6	0	0	80
2011	68	7	0	0	75
2012	33	8	0	0	41
2013	3	0	0	0	3
2014	0	0	0	0	0
2015	8	0	0	0	8
2016	35	0	0	0	35
2017	32	1	0	0	33
2018	30	1	0	0	31
2019	26	0	0	0	26
2020	18	0	0	0	18
2021	20	0	0	0	20
2022	35	6	0	0	41
2023	19	2	0	0	21
2024	45	3	0	0	48
Sum	**641**	**56**	**2**	**0**	**699**
Average	**25**	**2**	**0**	**0**	**27**

Source: North Carolina Climate Office, Heat Index Climatology Tool

PROBABILITY OF FUTURE OCCURRENCE

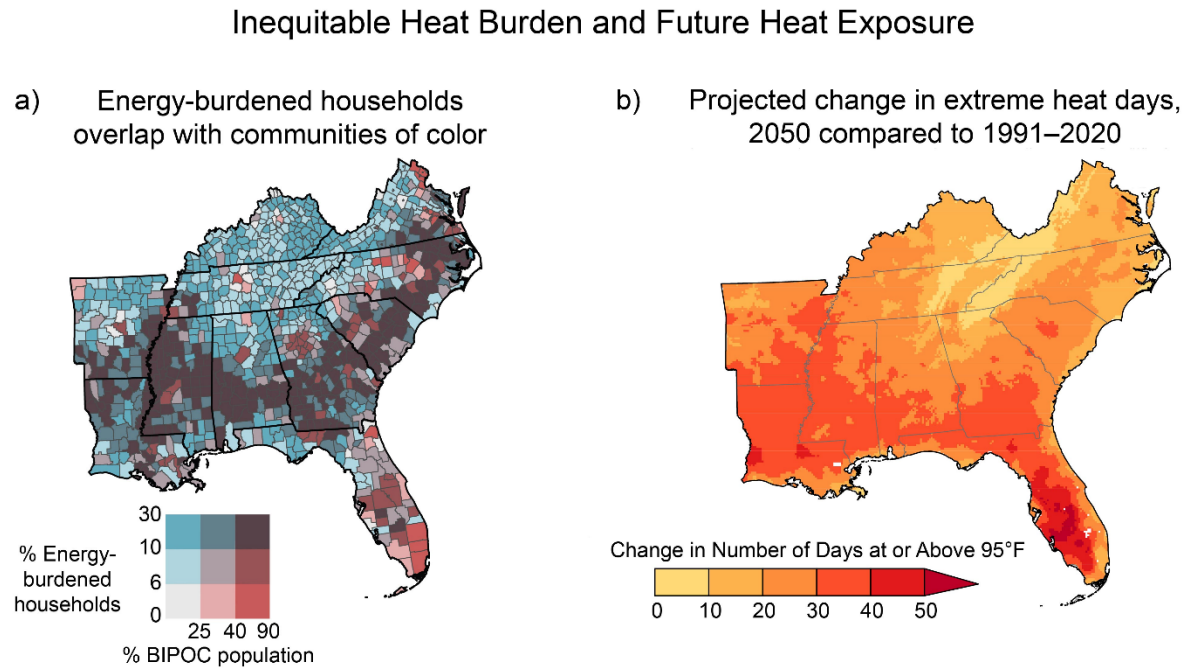
Data was gathered from the North Carolina State Climate Office's Heat Index Climatology Tool using the Douglas International Airport weather station as an approximation for Mecklenburg County. During the 25-year period from 1999 through 2024, Mecklenburg County experienced 699 hours with high temperatures above 100°F, or an average of 27 hours per year.

Probability: 4 – Highly Likely

CLIMATE CHANGE

Research shows that average temperatures will continue to rise in the Southeast United States and globally, directly affecting Mecklenburg County in North Carolina. Per the Fifth National Climate Assessment, "The number of extreme warm days (above 95°F) is expected to continue increasing with every increment of global warming" and that "heatwaves in the Southeast are happening more frequently and are occurring during a longer heat season, with some cities also showing increasing trends in their duration and intensity." Additional heat stresses can be attributed to the urban heat island effect which can increase the temperature of those living in urban environments compared to rural areas. The number of days over 95°F in Mecklenburg County is expected to increase by between 20 and 30 days annually, as shown in Figure 4.15.

Figure 4.15 - Projected Change in Number of Days Over 95˚F



Source: USGCRP, 2023: Fifth National Climate Assessment

The Fifth National Climate Assessment also notes that warm nights (minimum temperatures at or above 70°F) in the southeast have increased the most compared to all other continental U.S. regions.

The State Climate Office of North Carolina's County-specific climate projections, which are based on the Fifth National Climate Assessment. This data indicates that extreme heat days in the region could more than quadruple. The historical average from 1983 to 2014 was 11 days annually with maximum temperatures over 95°F. By the 2060s, the projected best-case scenario for these conditions is 34 days annually and the worst-case scenario is 95 days. Days with nighttime temperatures above 70°F are expected to more than double from a historical average of 34 days annually to a projected best-case scenario of 72 days annually or a worst-case of 89 days annually by the 2060s.

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

Vulnerability to heat was assessed qualitatively. Data was not available to quantify populations or property vulnerability to extreme heat or to estimate potential losses from extreme heat events.

PEOPLE

Figure 4.16 – Annual Counts of Heat-Related Illness Emergency Department Visits

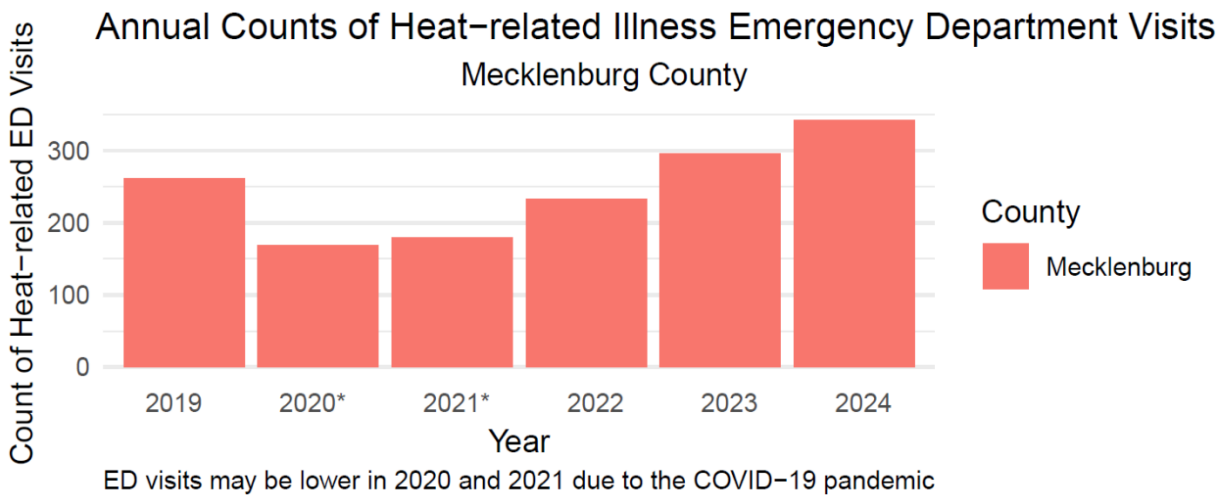


Figure 4.16 shows the annual count of emergency department visits for heat-related illness in Mecklenburg County using public health syndromic surveillance system data from NC DETECT. The annual count of emergency department visits for heat-related illness in Mecklenburg County ranged from 169 visits in 2001 to 296 visits in 2023.

Extreme heat can cause heat stroke and even loss of human life. The elderly and the very young are most at risk to the effects of heat. People who are isolated, people who work outdoors and/or do strenuous labor, people with chronic health problems such as heart disease or asthma, people who are obese, and people who are on certain medications that interfere with heat regulation and/or fluid balance, including diuretics, some antipsychotic medications, some antidepressants, and some antihypertensive agents, are also more vulnerable to extreme heat.[5]

Extreme heat can cause heat stroke and even loss of human life. The elderly and the very young are most at risk to the effects of heat. People who are isolated are also more vulnerable to extreme heat. Fatalities and injuries recorded across the state of North Carolina also note multiple incidents of persons overexerting themselves in the heat. Charlotte-Mecklenburg Emergency Management has designated cooling stations to help residents remain safe and seek relief from the heat. These facilities include day services centers available to people who are living unsheltered, park and recreation facilities including recreation and senior centers, “spraygrounds,” and pools that are available to residents seeking relief from heat, and public libraries. Mecklenburg County also has a Fan Initiative, proving a free box fan to eligible

[5] Centers for Disease Control and Prevention. https://www.cdc.gov/heat-health/hcp/clinical-guidance/heat-and-medications-guidance-for-clinicians.html

residents, and energy bill assistance to help eligible individuals and families experiencing a cooling energy bill-related crisis.

PROPERTY

Extreme heat is unlikely to cause significant damages to the built environment. However, road surfaces can be damaged as asphalt softens, and concrete sections may buckle under expansion caused by heat. Train rails may also distort or buckle under the stress of head induced expansion. Power transmission lines may sag from expansion and if contact is made with vegetation the line may short out causing power outages. Additional power demand for cooling also increases power line temperature adding to heat impacts.

Extreme heat can also cause significant agricultural losses, though this fact doesn't have as much of an impact on Mecklenburg County due to its more metropolitan nature. Between 2007-2023, the sum of claims paid for crop damage due to heat in the county was $21,934, or an average of $1,290 in losses every year. Table 4.28 summarizes the crop losses due to drought in reported in the RMA system.

Table 4.28 – Crop Losses Resulting from Heat, 2007-2023

Year	Indemnity Amount
2010	$3,970.00
2015	$11,705.10
2016	$1,716.00
2019	$4,543.00
Total	**$21,934.10**

Source: USDA Risk Management Agency

ENVIRONMENT

Wild animals are vulnerable to heat disorders similar to humans, including mortality. Vegetation growth will be stunted or plants may be killed if temperatures rise above their tolerance extremes. This could negatively impact agriculture, recreation lands, and native species and their habitats.

CONSEQUENCE ANALYSIS

Table 4.29 summarizes the potential negative consequences of excessive heat.

Table 4.29 – Consequence Analysis – Excessive Heat

Category	Consequences
Public	Extreme heat may cause illness and/or death.
Responders	Consequences may be greater for responders if their work requires exertion and/or wearing heavy protective gear.
Continuity of Operations (including Continued Delivery of Services)	Continuity of operations is not expected to be impacted by extreme heat because warning time for these events is long.
Property, Facilities and Infrastructure	Minor impacts may occur, including possible damages to road surfaces and power lines.
Environment	Environmental impacts include strain on local plant and wildlife, including potential for illness or death.

Category	Consequences
Economic Condition of the Jurisdiction	Farmers may face crop losses or increased livestock costs.
Public Confidence in the Jurisdiction's Governance	Extreme heat is unlikely to impact public confidence.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes extreme heat hazard risk by jurisdiction. Extreme heat risk does not vary significantly by jurisdiction.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
All Jurisdictions	4	3	4	1	3	3.3	H

4.5.5 FLOODING

HAZARD BACKGROUND

Flooding is defined by the rising and overflowing of water onto normally dry land. As defined by FEMA, a flood is a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties. Flooding can result from an overflow of inland waters or an unusual accumulation or runoff of surface waters from any source.

Flooding causes more damage in the United States than any other severe weather-related event, an average of $5 billion a year. According to the National Weather Service, a total of 1,392 flood fatalities occurred in the United States from 2010 to 2023. Of those fatalities, 62 or 4% occurred in the State of North Carolina. Approximately 90 percent of presidentially declared disasters result from flood-related natural hazard events. Taken as a whole, more frequent, localized flooding problems that do not meet federal disaster declaration thresholds ultimately cause the majority of damages across the United States.

SOURCES AND TYPES OF FLOODING

Mecklenburg County can experience riverine and localized flooding. Each of these types of flooding are described below, based on data from the Flood Insurance Study (FIS) report, Flood Insurance Rate Maps (FIRMs), NOAA, and the HMPC.

RIVERINE FLOODING

Mecklenburg County has an Effective FIRM dated November 16, 2018 and a Revised Flood Insurance Study (FIS) dated November 16, 2018. The FIS summarizes the principal flood problems in the county as follows:

“Low-lying areas of Mecklenburg County are subject to periodic flooding caused by excess runoff from various streams and creeks and their tributaries. Flooding also occurs along the Catawba River, mainly along the area just below the Mountain Island Dam. Approximately 10% of the land area in the County is within a mapped floodplain. The most severe flooding has been caused by tropical systems moving up from the Gulf or Atlantic coast. Flooding also occurs in spring or early summer because of heavy rains caused by stationary frontal systems. Thunderstorms occurring also account for some flooding. Damage to structures in the floodplains has occurred during floods in 1916, 1928, 1936, 1942, 1958, 1962, 1973, 1975, 1976, 1995, 1997, 2003, 2004, 2008, 2011, 2013, and 2014.”

FLASH FLOODING

A flash flood occurs when water levels rise at an extremely fast rate as a result of intense rainfall over a brief period, possibly from slow-moving intense thunderstorms and sometimes combined with rapid snowmelt, ice jam release, frozen ground, saturated soil, or impermeable surfaces. Ice jam flooding is a form of flash flooding that occurs when ice breaks up in moving waterways, and then stacks on itself where channels narrow. This creates a natural dam, often causing flooding within minutes of the dam formation.

Flash flooding can happen in Special Flood Hazard Areas (SFHAs) as delineated by the National Flood Insurance Program (NFIP) and can also happen in areas not associated with floodplains. Flash flood hazards caused by surface water runoff are most common in urbanized areas, where greater population density generally equates to more impervious surface (e.g., pavement and buildings) which alters natural drainage patterns and increases the amount of surface water generated.

Flash flooding is a dangerous form of flooding which can reach full peak in only a few minutes. Rapid onset allows little or no time for protective measures. Flash flood waters move at very fast speeds and

can move boulders, tear out trees, scour channels, destroy buildings, and obliterate bridges. Flash flooding can result in higher loss of life, both human and animal, than slower developing river and stream flooding.

In certain areas, aging storm sewer systems are not designed to carry the capacity currently needed to handle the increased storm runoff. Typically, the result is water backing into basements, which damages mechanical systems and can create serious public health and safety concerns.

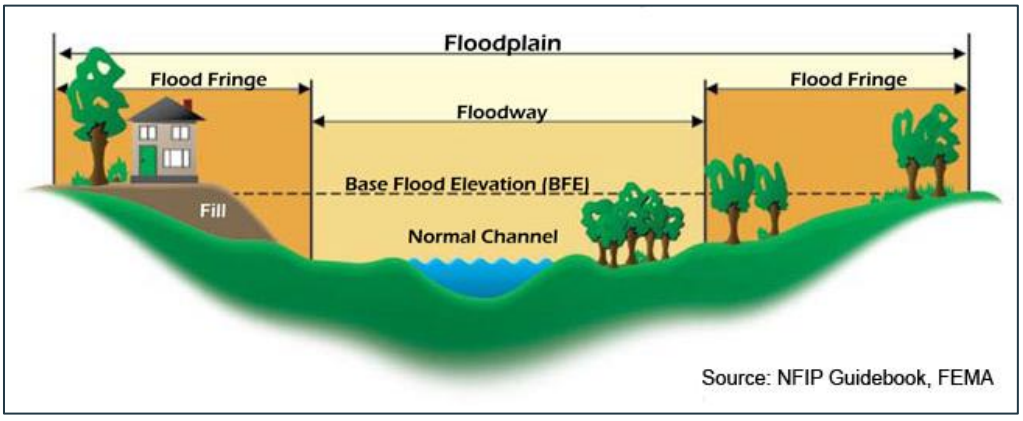
Localized flooding may be caused by the following issues:

- **Inadequate Capacity –** An undersized/under capacity pipe system can cause water to back-up behind a structure which can lead to areas of ponded water and/or overtopping of banks.
- **Clogged Inlets** – Debris covering the asphalt apron and the top of grate at catch basin inlets may contribute to an inadequate flow of stormwater into the system. Debris within the basin itself may also reduce the efficiency of the system by reducing the carrying capacity.
- **Blocked Drainage Outfalls** – Debris blockage or structural damage at drainage outfalls may prevent the system from discharging runoff, which may lead to a back-up of stormwater within the system.
- **Improper Grade** – Poorly graded asphalt around catch basin inlets may prevent stormwater from entering the catch basin as designed. Areas of settled asphalt may create low spots within the roadway that allow for areas of ponded water.

FLOODING AND FLOODPLAINS

In the case of riverine flooding, the area adjacent to a channel is the floodplain, as shown in Figure 4.17. A floodplain is flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current. Floodplains are made when floodwaters exceed the capacity of the main channel or escape the channel by eroding its banks. When this occurs, sediments (including rocks and debris) are deposited that gradually build up over time to create the floor of the floodplain. Floodplains generally contain unconsolidated sediments, often extending below the bed of the stream.

Figure 4.17 – Characteristics of a Floodplain



In its common usage, the floodplain most often refers to that area that is inundated by the "100-year flood," which is the flood that has a 1 percent chance in any given year of being equaled or exceeded. The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. The potential for flooding can change and increase through various land use changes and changes to land surface, which result in a change to the floodplain. A change in environment can create localized

flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

The 100-year flood, which is the minimum standard used by most federal and state agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management and to determine the need for flood insurance. Participation in the NFIP requires adoption and enforcement of a local floodplain management ordinance which is intended to prevent unsafe development in the floodplain, thereby reducing future flood damages. Participation in the NFIP allows for the federal government to make flood insurance available within the community as a financial protection against flood losses. Since floods have an annual probability of occurrence, have a known magnitude, depth and velocity for each event, and in most cases, have a map indicating where they will likely occur, they are in many ways often the most predictable and manageable hazard.

Warning Time: 3 – 6 to 12 hours

Duration: 3 – Less than 1 week

LOCATION

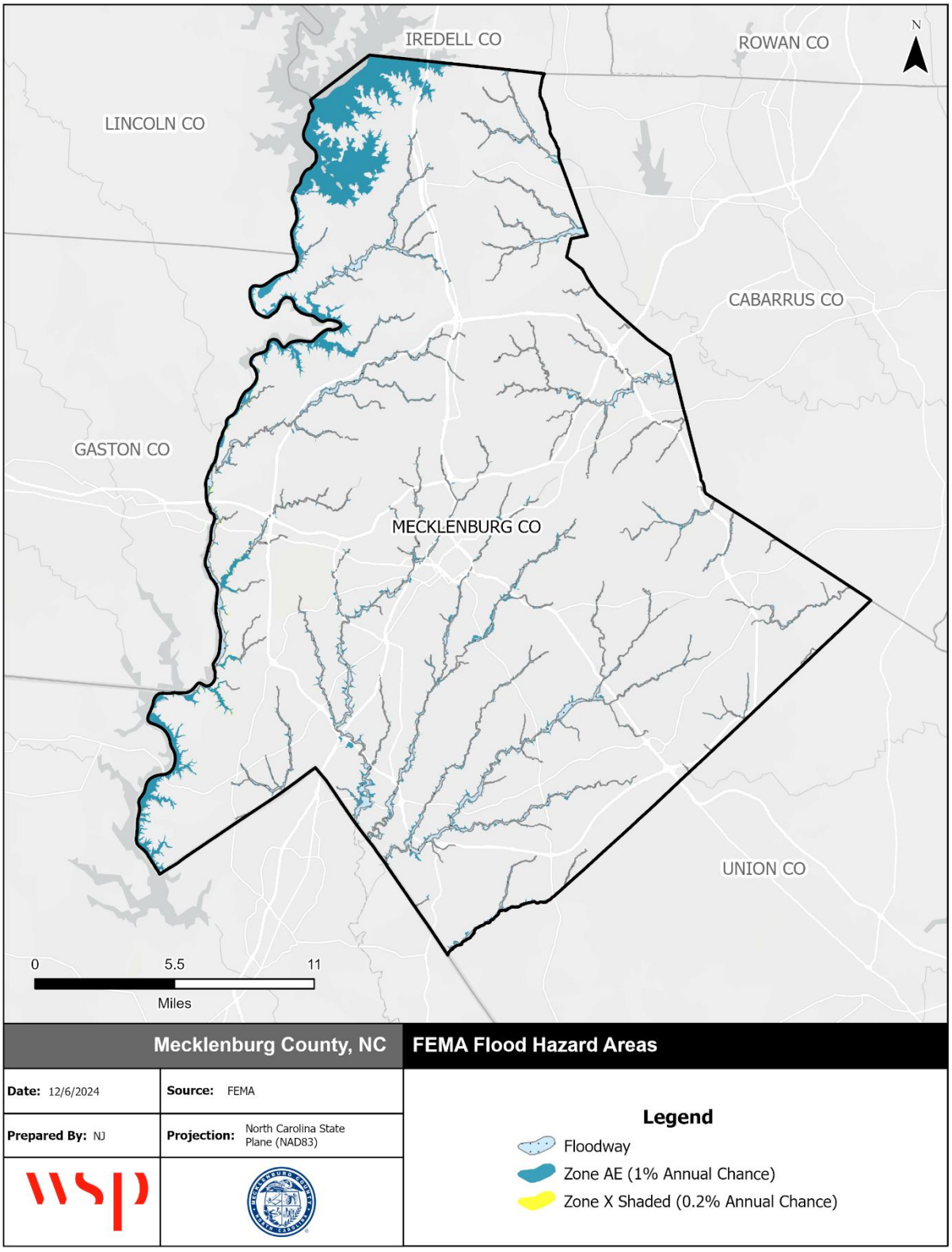
Regulated floodplains are illustrated on inundation maps called Flood Insurance Rate Maps (FIRMs). It is the official map for a community on which FEMA has delineated both the Special Flood Hazard Areas (SFHAs) and the risk premium zones applicable to the community. SFHAs represent the areas subject to inundation by the 100-year flood event. Structures located within the SFHA have a 26-percent chance of flooding during the life of a standard 30-year mortgage. Flood prone areas were identified within Mecklenburg County using the Effective FIRMs retrieved from NC Flood Risk Information System (FRIS). The current Flood Insurance Study report was revised on November 16, 2018. Figure 4.18 reflects the effective mapped flood insurance zones for Mecklenburg County.

Flooding can also occur outside the defined SFHA on smaller tributaries that were not studied by FEMA but that nonetheless may be vulnerable to the 1-percent-annual-chance flood. Additionally, localized stormwater flooding can occur anywhere along stormwater system pipes, channels, culverts, and other infrastructure where inadequate capacity, blocked inlets or outfalls, or improper grade prevent sufficient drainage. This type of flooding is more common in the urbanized areas of the county and extends well beyond the limits of the SFHA.

In addition to regulating FEMA floodplains, Charlotte-Mecklenburg Storm Water Services maps and regulates future floodplains, also called community floodplains, which show where flooding is likely to occur in the future based on expected upstream development.

Spatial Extent: 3 – Moderate

Figure 4.18 – FEMA Flood Hazard Areas in Mecklenburg County



Source: FEMA Effective DFIRM

EXTENT

Flood extent for riverine flooding can be defined by the amount of land in the floodplain and the potential magnitude of flooding as measured by flood depth and velocity.

The Flood Insurance Study (FIS) defines the probability of flooding as flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 100-year period (recurrence intervals). Or considered another way, properties within a 100-year flood zone have a one percent probability of being equaled or exceeded during any given year. Mortgage lenders require that owners of properties with federally backed mortgages located within SFHAs purchase and maintain flood insurance policies on their properties. Consequently, newer and recently purchased properties in the community are typically insured against flooding.

Table 4.30 summarizes the flood insurance zones identified by the Digital FIRM (DFIRM).

Table 4.30 – Mapped Flood Insurance Zones within Mecklenburg County

Zone	Description
AE	Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
0.2% Annual Chance (shaded Zone X)	Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones. (Zone X (shaded) is used on new and revised maps in place of Zone B.)
Zone X (unshaded)	Minimal risk areas outside the 1-percent and 0.2-percent-annual-chance floodplains. No BFEs or base flood depths are shown within these zones. Zone X (unshaded) is used on new and revised maps in place of Zone C.

Nearly nine percent of the county falls within the SFHA. Unincorporated Mecklenburg County, Davidson, and Pineville all have more than 10 percent of their area in the SFHA. Table 4.31 below summarizes acreage of the county's total area by flood zone on the effective DFIRM.

Table 4.31 – Flood Zone Acreage in Mecklenburg County

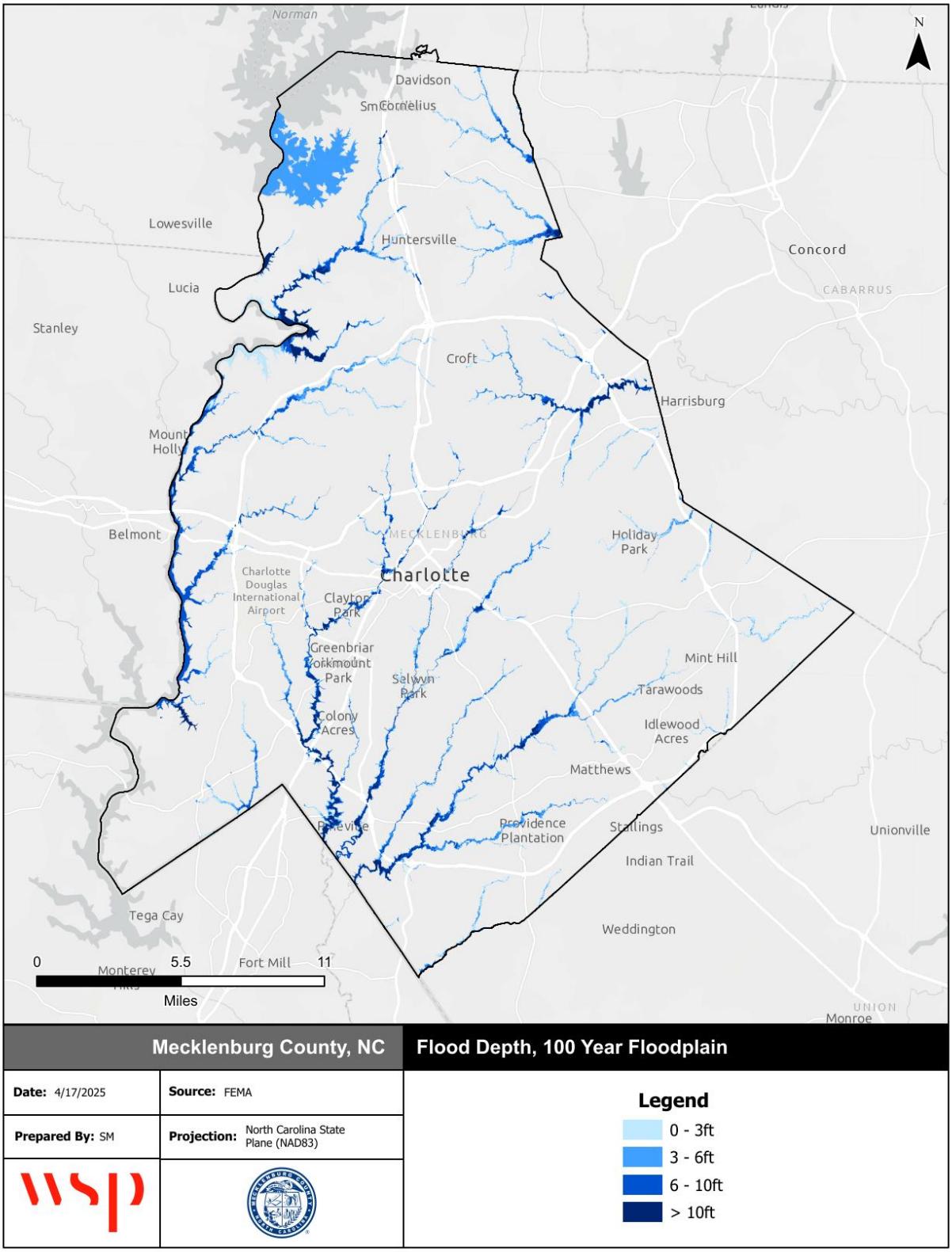
Flood Zone	Acreage	Percent of Total (%)
Zone AE	30,382.70	8.71%
Zone X (500-year)	141.80	0.04%
Zone X Unshaded	318,450.50	91.25%
Total	**348,975.01**	--

Source: FEMA Effective DFIRM; Mecklenburg County Open Data

Property damages correlate to the depth of flooding that impacts a property. Data is not available to measure flood depth beyond the SFHA, but it is important to note that damaging floods can and do occur outside the SFHA. Figure 4.19 shows the depth of flooding predicted to result from a 1% annual chance flood.

Impact: 3 – Critical

Figure 4.19 – Flood Depth, 100-Year Floodplain



Source: FEMA Effective DFIRM

HISTORICAL OCCURRENCES

Flood and flash flood statistics for the Mecklenburg County region were pulled from the NCEI. Table 4.32 details the 109 historical occurrences of flash flooding identified from 1999 through 2024 by the NCEI Storm Events database. It should be noted that only those historical occurrences listed in the NCEI database are shown here and that other, unrecorded or unreported events may have occurred within the planning area during this timeframe.

Table 4.32 – NCEI Records of Flash Flooding, 1999-2024

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
CHARLOTTE	1/23/1999	Flash Flood	1	0	$0	0
CHARLOTTE	6/10/1999	Flood	0	0	$0	0
CHARLOTTE	7/12/2000	Flood	0	3	$0	0
CHARLOTTE	8/4/2000	Flash Flood	0	0	$0	0
CHARLOTTE	8/18/2000	Flood	0	0	$0	0
MECKLENBURG (ZONE)	9/4/2000	Flood	0	0	$0	0
CHARLOTTE	5/30/2002	Flood	0	0	$0	0
PINEVILLE	7/1/2002	Flash Flood	0	0	$0	0
CHARLOTTE	7/14/2002	Flood	0	0	$0	0
CHARLOTTE	10/13/2002	Flash Flood	0	0	$0	0
COUNTYWIDE	3/20/2003	Flash Flood	0	0	$0	0
MECKLENBURG (ZONE)	3/20/2003	Flood	0	0	$2,000,000	0
MECKLENBURG (ZONE)	4/10/2003	Flood	0	0	$0	0
MECKLENBURG (ZONE)	5/22/2003	Flood	0	0	$0	0
CHARLOTTE	6/7/2003	Flash Flood	0	0	$1,000,000	0
CHARLOTTE	6/16/2003	Flash Flood	0	0	$0	0
MATTHEWS	6/16/2003	Flash Flood	0	0	$50,000	0
CHARLOTTE	6/18/2003	Flash Flood	0	0	$0	0
CHARLOTTE	7/29/2003	Flash Flood	0	0	$0	0
CHARLOTTE	8/14/2003	Flash Flood	0	0	$0	0
CHARLOTTE	7/17/2004	Flash Flood	0	0	$25,000	0
MECKLENBURG (ZONE)	9/7/2004	Flood	0	0	$0	0
MECKLENBURG (ZONE)	9/8/2004	Flood	0	0	$75,000	0
CHARLOTTE	9/27/2004	Flash Flood	0	0	$0	0
CHARLOTTE	5/10/2005	Flash Flood	0	0	$10,000	0
CHARLOTTE	5/12/2005	Flash Flood	0	0	$4,000	0
CHARLOTTE	6/7/2005	Flash Flood	0	0	$10,000	0
CHARLOTTE	6/9/2005	Flash Flood	0	0	$0	0
CHARLOTTE	7/1/2005	Flash Flood	0	0	$0	0
CHARLOTTE	7/22/2006	Flash Flood	0	0	$100,000	0
CHARLOTTE	8/15/2006	Flash Flood	0	0	$100,000	0
CHARLOTTE	8/31/2006	Flash Flood	0	0	$0	0
CHARLOTTE	7/9/2007	Flash Flood	0	0	$10,000	0
CHARLOTTE	6/21/2008	Flash Flood	0	0	$0	0
NORTH CHARLOTTE	8/27/2008	Flash Flood	0	0	$8,500,000	0
NORTH CHARLOTTE	9/10/2008	Flash Flood	0	0	$100,000	0

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
CHARLOTTE	5/5/2009	Flash Flood	0	0	$50,000	0
CHARLOTTE	5/5/2009	Flood	0	0	$0	0
HAHN	6/5/2009	Flash Flood	0	0	$0	0
HASKINGS MILLS	7/9/2009	Flash Flood	0	0	$0	0
GRIFFITH	7/28/2009	Flash Flood	0	0	$0	0
CHARLOTTE	8/16/2009	Flash Flood	0	0	$50,000	0
STONEHAVEN	12/25/2009	Flash Flood	0	0	$0	0
PINEVILLE	1/25/2010	Flash Flood	0	0	$40,000	0
PINEVILLE	1/26/2010	Flood	0	0	$0	0
CHARLOTTE	5/31/2010	Flash Flood	0	0	$0	0
CHARLOTTE	6/1/2010	Flash Flood	0	0	$0	0
STONEHAVEN	6/2/2010	Flash Flood	0	0	$0	0
STONEHAVEN	6/30/2010	Flash Flood	0	0	$0	0
OAKHURST	7/12/2010	Flash Flood	0	0	$0	10000
CHARLOTTE	7/27/2010	Flash Flood	0	0	$0	0
HASKINGS MILLS	8/6/2010	Flash Flood	0	0	$20,000	0
THOMASBORO	8/19/2010	Flash Flood	0	0	$50,000	0
THRIFT	8/5/2011	Flash Flood	0	0	$1,500,000	0
MATTHEWS	8/5/2011	Flash Flood	0	0	$0	0
MATTHEWS	8/5/2011	Flash Flood	2	0	$0	0
STONEHAVEN	9/23/2011	Flash Flood	0	0	$0	0
IDLEWILD	9/23/2011	Flash Flood	0	0	$0	0
STONEHAVEN	7/20/2012	Flash Flood	0	0	$0	0
STONEHAVEN	7/20/2012	Flash Flood	0	0	$40,000	0
PINEVILLE	8/7/2012	Flash Flood	0	0	$0	0
THOMASBORO	8/7/2012	Flash Flood	0	0	$20,000	0
STONEHAVEN	9/8/2012	Flash Flood	0	0	$0	0
MATTHEWS	6/2/2013	Flash Flood	0	0	$5,000	0
HAHN	6/3/2013	Flash Flood	0	0	$10,000	0
HOODS	6/7/2013	Flash Flood	0	0	$0	0
CORNELIUS	6/28/2013	Flash Flood	0	0	$0	0
SMITHVILLE	6/28/2013	Flash Flood	0	0	$250,000	0
CHADWICK	7/11/2013	Flash Flood	0	0	$20,000	0
CHARLOTTE	7/11/2013	Flash Flood	0	0	$0	0
RAMA	7/21/2013	Flash Flood	0	0	$90,000	0
GRIFFITH	7/24/2013	Flash Flood	0	0	$0	0
DOUGLAS MUNI ARPT	7/3/2014	Flash Flood	0	0	$10,000	0
MATTHEWS	7/15/2014	Flash Flood	0	0	$100,000	0
STONEHAVEN	4/19/2015	Flash Flood	0	0	$10,000	0
HAHN	4/19/2015	Flash Flood	0	0	$1,000	0
HAHN	10/3/2015	Flash Flood	0	0	$1,000	0
NEWELL	11/2/2015	Flood	0	0	$500	0
SHOPTON	11/2/2015	Flood	0	0	$500	0
STONEHAVEN	12/22/2015	Flash Flood	0	0	$500	0

Location	Date	Type	Deaths	Injuries	Property Damage	Crop Damage
HUNTERSVILLE	12/30/2015	Flash Flood	0	0	$10,000	0
HUNTERSVILLE	12/30/2015	Flood	0	0	$500	0
CHARLOTTE	9/26/2016	Flash Flood	0	0	$1,000	0
HAHN	4/24/2017	Flood	0	0	$500	0
STONEHAVEN	6/13/2017	Flash Flood	0	0	$1,000	0
SMITHVILLE	9/1/2017	Flash Flood	0	0	$1,000	0
HAHN	9/16/2018	Flash Flood	0	0	$10,000	0
HAHN	9/16/2018	Flood	0	0	$1,000	0
HAHN	11/15/2018	Flood	0	0	$500	0
THRIFT	6/9/2019	Flood	0	0	$50,000	0
PINEVILLE	7/13/2019	Flash Flood	0	0	$1,000	0
HAHN	2/6/2020	Flash Flood	0	0	$50,000	0
HAHN	2/6/2020	Flood	0	0	$5,000	0
STONEHAVEN	4/30/2020	Flash Flood	0	0	$200,000	0
HAHN	4/30/2020	Flood	0	0	$50,000	0
NORTH CHARLOTTE	5/21/2020	Flood	0	0	$1,000	0
STONEHAVEN	5/27/2020	Flash Flood	0	0	$5,000	0
HAHN	5/27/2020	Flood	0	0	$1,000	0
STONEHAVEN	8/9/2020	Flash Flood	0	0	$500	0
PINEVILLE	11/12/2020	Flash Flood	0	0	$1,000,000	0
PINEVILLE	11/12/2020	Flood	0	0	$10,000	0
STONEHAVEN	6/6/2021	Flash Flood	0	0	$2,000	0
NORTH CHARLOTTE	8/11/2021	Flash Flood	0	0	$1,000	0
PINEVILLE	1/9/2024	Flash Flood	0	0	$10,000	0
PINEVILLE	1/9/2024	Flood	0	0	$1,000	0
HASKINGS MILLS	7/21/2024	Flash Flood	0	0	$500	0
DIXIE	8/8/2024	Flash Flood	0	0	$25,000	0
THRIFT	9/27/2024	Flash Flood	0	0	$25,000,000	0
HAHN	9/27/2024	Flash Flood	0	0	$150,000	0
Total			**3**	**3**	**$40,841,000**	**$10,000**

Source: NCEI

The NCEI records 77 total flash flood and flood incidents occurring in Mecklenburg County between 1999 and 2024. The incidents resulted in three recorded fatalities, over $40 million in property damage and $10,000 in recorded crop damage.

Table 4.33 provides a summary of this historical information by participating jurisdiction. It is important to note that many of the events attributed to the county are countywide or cover large portions of the county. The individual counts by jurisdiction are for those events that are only attributed to that one jurisdiction.

Table 4.33 – Summary of Historical Flood Occurrences by Participating Jurisdiction, 1999-2024

Jurisdiction	Event Count	Deaths	Injuries	Property Damage	Crop Damage
Charlotte	33	1	3	$1,360,000	$0
Cornelius	1	0	0	$0	$0

Jurisdiction	Event Count	Deaths	Injuries	Property Damage	Crop Damage
Davidson	0	0	0	$0	$0
Huntersville	2	0	0	$10,500	$0
Matthews	5	2	0	$155,000	$0
Mint Hill	0	0	0	$0	$0
Pineville	9	0	0	$1,062,000	$0
Mecklenburg County (unincorporated)	59	0	0	$38,253,500	$10,000
Total	**109**	**3**	**3**	**40,841,000**	**$10,000**

Source: NCEI

The following historical flood events reported in the 2018 Revised FIS for Mecklenburg County, the NCEI database, and other sources illustrate the potential for flooding throughout the county:

September 2004 – Hurricane Frances had rainfall totals of 18 inches with 5 million dollars in damage in Mecklenburg County.

August 2011 – A thunderstorm stalled over central Mecklenburg County on August 5th dropping nearly seven inches of rain in less than four hours. More than 150 homes and businesses flooded - mostly northwest and west of uptown Charlotte. Emergency responders assisted nearly 90 people caught in flooded vehicles and flooded buildings. Damage was more than $2 million, mostly in the Irwin, Stewart and "big" Sugar Creek Watersheds. Two people drowned in Irvins Creek in southeast Charlotte.

2013 – Heavy rain in the mountains caused flooding May 7 and 8 along the Catawba River and its reservoirs, including Mountain Island Lake. Nearly 100 homes in the County were affected. On June 28, northern portions of the County got close to six inches of rain in four hours. With the ground already saturated, several houses flooded near McDowell Creek and Gilead Road. Intense rain on July 11 flooded parts of west Charlotte. About four inches of rain fell in less than three hours. Many streets were flooded along with six homes and several apartments.

June 2014 – In June of 2014 a cluster of slow-moving thunderstorms produced 3.5 to 5 inches of rain in less than two hours near the Mecklenburg/ Union County line. Severe urban flooding occurred in the Matthews area, with water up to the windows of some vehicles. Stream flooding included a tributary of McAlpine Creek which flooded a part of Sam Newell Road. Multiple roads were closed throughout the Town. In a separate event, 2 – 3 inches of rain fell in a couple hours near the airport, resulting in closure of multiple roads including Freedom Drive.

June 2019 – During the development of this plan update, northwestern Mecklenburg County experienced heavy rains and substantial flooding along the Catawba River and Mountain Island Lake, with the Catawba River reaching nearly seven feet above full pond. The County estimated as many as 100 homes sustained damages. The event was the worst flooding to hit Mountain Island Lake since at least 2004, when the Catawba River went four feet over full pond.

November 2020 – Stream gauges indicated flash flooding developed along numerous creeks throughout the Charlotte area after 3.5 to 4.5 inches of rain fell across much of the city, with the bulk of that falling in about a 3-hour period. The most significant flooding occurred along the Sugar Creek and Little Sugar Creek basins, where several gauges reported moderate to even major flooding. Water from Sugar Creek inundated multiple buildings, and Little Sugar Creek overflowed and impacted several homes in the Parkstone neighborhood as well as several structures along Highway 51 in Pineville. Long Creek also flooded roads near Mountain Island Lake, while Clarks Creek overflowed and flooded multiple vehicles in the far north part of the city. Overall, 23 people were rescued from homes and 12 people from vehicles throughout the city.

June 2021 – Scattered thunderstorms developed across western North Carolina during the afternoon and evening. Slow movement of the storms resulted in localized very heavy rainfall, causing flash flooding to develop in south Charlotte. At least one of the storms also produced hail.

September 2024 – Flash flooding developed in the Mountain Island Lake area after extremely heavy rainfall associated with tropical storm Helene occurred across the headwaters of the Catawba River in the mountains and foothills over a three day period. More than a hundred homes and numerous roads downstream of the dam were inundated and damaged, especially on Lake Dr, Riverside Dr, and Riverhaven Dr. The stream level gauge at the dam crested more than a foot above the record (August 1940).

PROBABILITY OF FUTURE OCCURRENCE

By definition, SFHAs are those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in the SFHA have a 26 percent chance of flooding over the life of a 30-year mortgage. The Shaded X Zone indicates areas that are estimated to be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year. The SFHA and the Shaded X zone indicate areas of high and moderate risk according to FEMA guidelines; however, this does not mean that flood risk is limited to these areas. There is also potential for other magnitudes of flood events to impact these and other areas in the region.

While exposure to flood hazards vary across jurisdictions, all jurisdictions have at least some area of land in FEMA flood hazard areas. Additionally, much of the planning area is subject to urban stormwater flooding and smaller flash flood events. While potentially less severe than the 1%-annual-chance flood, these events can still cause significant damage. Taken as a whole, the probability of flooding is considered likely (greater than 10% probability) for all jurisdictions.

Probability: 3 – Likely

CLIMATE CHANGE

Per the Fifth National Climate Assessment, frequency and intensity of heavy precipitation events is expected to increase across the country. Additionally, increased levels of rainfall, temperatures, and land cover change can exacerbate flood risks and are expected to occur throughout the southeast. Therefore, with more rainfall falling in more intense incidents, the region may experience more frequent flash flooding. Increased flooding may also result from more intense tropical cyclone; researchers have noted the occurrence of more intense storms bringing greater rainfall totals, a trend that is expected to continue as ocean and air temperatures rise.

Per the 2023 North Carolina Hazard Mitigation Plan, changing climate and weather patterns, environmental conditions, and urban and rural development may affect the frequency and intensity of flooding. Historical data and climate projections provided by the State Climate Office of North Carolina on the North Carolina Resilience Exchange website indicate that days with extreme precipitation (2 inches or more of precipitation) are expected to increase in Mecklenburg County. Mecklenburg County averages 9 days per decade of extreme precipitation and this number is likely to increase to 12 days per decade by the 2060s. This increased likelihood of extreme precipitation events due to climate change will result in greater risks of flash flooding and impacts from stormwater runoff.

Various land use and land surface changes can also result in changes to the floodplain and flood prone areas. For example, an increase in impervious surface can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are often created by human activity. However, changes in precipitation frequency and intensity can also result in changes to flood magnitudes and probabilities. For example, what we currently define as the 1-percent-annual-chance flood may occur more frequently in the future.

VULNERABILITY ASSESSMENT

The following section provides an assessment of vulnerability to flooding by jurisdiction and flood return period.

METHODOLOGIES AND ASSUMPTIONS

Population and property at risk to flooding was estimated using data from the North Carolina Emergency Management (NCEM) IRISK database, which was compiled in NCEM's Risk Management Tool.

As a subset of the building vulnerability analysis, exposure of pre-FIRM structures was also estimated. Table 4.34 below provides the NFIP entry date for each participating jurisdiction, which was used to determine which buildings were constructed pre-FIRM. Pre-FIRM structures were built prior to the adoption of flood protection building standards and are therefore assumed to be at greater risk to the flood hazard.

Table 4.34 – NFIP Entry Dates

Jurisdiction	NFIP Entry Date
City of Charlotte	08/15/78
Town of Cornelius	09/30/97
Town of Davidson	10/16/97
Town of Huntersville	02/04/04
Town of Matthews	02/04/04
Town of Mint Hill	12/21/07
Town of Pineville	03/18/87
Mecklenburg County (Unincorporated Area)	06/01/81

Source: Federal Emergency Management Agency Community Status Book Report: Communities Participating in the National Flood Program, May 2025

Pre-FIRM structures are those built before a community's NFIP entry date, while those built after the entry date are post-FIRM. If the NFIP entry date for a given community is between January and June, buildings constructed the same year as the entry date are considered to be post-FIRM (e.g., if the NFIP entry date is 02/01/1991, buildings constructed in 1990 and before are pre-FIRM. Buildings constructed from 1991 to the present are post-FIRM.). If the NFIP entry date is between July and December, then the following year applies for the year built cut-off (e.g., if the NFIP entry date is 12/18/2007, buildings constructed in the year 2007 and before are pre-FIRM, 2008 and newer are post-FIRM).

Effective FEMA DFIRM data was used to determine the flood hazard areas for all IRISK flood vulnerability estimates. Flood zones used in the analysis consist of Zone AE (1-percent-annual-chance flood), Zone AE Floodway, and the 0.2-percent-annual-chance flood hazard area.

PEOPLE

Flood events pose many threats to public health and safety. While such problems are often not reported, three general types of health hazards accompany floods: physical hazards from the water itself, environmental hazards in the aftermath of the flood, and long-term psychological hazards. These common health and safety hazards are detailed below:

- **Contaminated water**: Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where farm animals are kept or where their wastes are stored can contribute polluted waters to

the receiving streams. Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines, or wastewater treatment plants may be flooded or over loaded. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as E.coli and other disease causing agents. Private sewer and septic systems may also introduce pollutants into floodwaters. Private wells may become contaminated through infiltration of polluted water. Given the many potential sources of contamination, direct or indirect contact with floodwaters poses a significant health risk for contraction of infectious disease.

- **Debris**: During a flood, debris carried by floodwaters can cause physical injury from impact. During the recovery process, people may often need to clear debris out of their properties but may encounter dangers such as sharp materials or rusty nails that pose a risk of tetanus.
- **Unsafe food**: If floodwaters come into contact with food items, that food may no longer be safe for consumption due to the potential contaminants in the floodwaters. Foods stored in cardboard, plastic bags, jars, bottles, and paper packaging may all be subject to contamination. Even if foods don't come into direct contact with floodwaters, the introduction of mold and mildew from flooding may cause foods to spoil faster. Additionally, power outages may cause refrigerated and frozen foods to spoil.
- **Mosquitos and animals**: After most of the water has receded, stagnant pools can become breeding grounds for mosquitoes, which may carry infectious diseases such as West Nile virus or St. Louis encephalitis. Wild animals such as snakes or rodents may carried by floodwaters or lose their habitat and seek shelter in buildings. Snakes may also be swimming in floodwaters seeking higher ground. People may be at risk for bites or disease if they come in contact with these animals or animal carcasses.
- **Mold and mildew**: Areas of a building that were exposed to excessive moisture can breed mold and mildew. Molds can start to grow in only 24 to 48 hours and will continue to grow without steps to dry out and disinfect the affected surface. Some molds are allergens, while others can produce harmful mycotoxins. Exposure to mold can cause respiratory problems; nasal and sinus congestion; eye, nose, and throat irritation; aches and pains; and effects on the nervous system. Infants, children, immunocompromised individuals, elderly adults, pregnant women, and individuals with respiratory conditions are all at higher risk.
- **Reentering a flooded building**: Health hazards may occur when heating ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants. If the public water systems lose pressure, public water supplies may be contaminated, and a boil order may be issued to protect people and animals from contaminated water.
- **Mental stress**: Long-term psychological impacts can result after having been through a flood and seeing one's home damaged and personal belongings destroyed. The cost and labor needed to repair a flood-damaged home can also put a severe strain on people, especially individuals who were unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

Floods can also result in injuries and fatalities. Individuals face particularly high risk when driving through flooded streets, or from being washed away by floodwaters on foot. NCEI reports three deaths and three injuries in Mecklenburg County caused by flood events.

Table 4.35 details the estimated population at risk from various flood events, according to data from the NCEM IRISK database. Note that development and population growth have occurred since the analysis for the IRISK dataset was performed. Therefore, actual population at risk is likely higher.

Table 4.35 – Population Impacted by the 10 Year Flood Event

Jurisdiction	Total Population	Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Charlotte	933,045	1,297	0.14%	97,297	135	0.14%	62,456	87	0.14%
Cornelius	52,414	0	0%	9,213	0	0%	1,891	0	0%
Davidson	16,621	0	0%	2,502	0	0%	749	0	0%
Huntersville	67,005	15	0.02%	9,037	2	0.02%	4,465	1	0.02%
Matthews	32,211	0	0%	5,080	0	0%	2,181	0	0%
Mint Hill	33,142	7	0.02%	6,218	1	0.02%	1,798	0	0%
Pineville	16,047	89	0.55%	2,464	14	0.57%	1,102	6	0.54%
Total	**1,150,485**	**1,408**	**0.12%**	**131,811**	**152**	**0.12%**	**74,642**	**94**	**0.13%**

Source: NCEM Risk Management Tool

Table 4.36 – Population Impacted by the 25 Year Flood Event

Jurisdiction	Total Population	Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Charlotte	933,045	2,313	0.25%	97,297	241	0.25%	62,456	155	0.25%
Cornelius	52,414	0	0%	9,213	0	0.00%	1,891	0	0.00%
Davidson	16,621	0	0%	2,502	0	0.00%	749	0	0.00%
Huntersville	67,005	22	0.03%	9,037	3	0.03%	4,465	1	0.02%
Matthews	32,211	7	0.02%	5,080	1	0.02%	2,181	0	0.00%
Mint Hill	33,142	25	0.08%	6,218	5	0.08%	1,798	1	0.06%
Pineville	16,047	104	0.65%	2,464	16	0.65%	1,102	7	0.64%
Total	**1,150,485**	**2,471**	**0.21%**	**131,811**	**266**	**0.20%**	**74,642**	**164**	**0.22%**

Source: NCEM Risk Management Tool

Table 4.37 – Population Impacted by the 50 Year Flood Event

Jurisdiction	Total Population	Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Charlotte	933,045	3,227	0.35%	97,297	336	0.35%	62,456	216	0.35%
Cornelius	52,414	0	0.00%	9,213	0	0.00%	1,891	0	0.00%
Davidson	16,621	0	0.00%	2,502	0	0.00%	749	0	0.00%
Huntersville	67,005	22	0.03%	9,037	3	0.03%	4,465	1	0.02%
Matthews	32,211	17	0.05%	5,080	3	0.06%	2,181	1	0.05%
Mint Hill	33,142	35	0.11%	6,218	7	0.11%	1,798	2	0.11%
Pineville	16,047	164	1.02%	2,464	25	1.01%	1,102	11	1.00%
Total	**1,150,485**	**3,465**	**0.30%**	**131,811**	**374**	**0.28%**	**74642**	**231**	**0.31%**

Source: NCEM Risk Management Tool

Table 4.38 – Population Impacted by the 100 Year Flood Event

Jurisdiction	Total Population	Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Charlotte	933,045	4,320	0.46%	97,297	450	0.46%	62,456	289	0.46%
Cornelius	52,414	122	0.23%	9,213	22	0.24%	1,891	4	0.21%
Davidson	16,621	0	0.00%	2,502	0	0.00%	749	0	0.00%
Huntersville	67,005	44	0.07%	9,037	6	0.07%	4,465	3	0.07%
Matthews	32,211	31	0.10%	5,080	5	0.10%	2,181	2	0.09%
Mint Hill	33,142	57	0.17%	6,218	11	0.18%	1,798	3	0.17%
Pineville	16,047	194	1.21%	2,464	30	1.22%	1,102	13	1.18%
Total	**1,150,485**	**4,768**	**0.41%**	**131,811**	**524**	**0.40%**	**74,642**	**314**	**0.42%**

Source: NCEM Risk Management Tool

Table 4.39 – Population Impacted by the 500 Year Flood Event

Jurisdiction	Total Population	Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Charlotte	933,045	8,725	0.94%	97,297	910	0.94%	62,456	584	0.94%
Cornelius	52,414	11	0.02%	9,213	2	0.02%	1,891	0	0.00%
Davidson	16,621	28	0.17%	2,502	4	0.16%	749	1	0.13%
Huntersville	67,005	222	0.33%	9,037	30	0.33%	4,465	15	0.34%
Matthews	32,211	84	0.26%	5,080	13	0.26%	2,181	6	0.28%
Mint Hill	33,142	102	0.31%	6,218	19	0.31%	1,798	6	0.33%
Pineville	16,047	395	2.46%	2,464	61	2.48%	1,102	27	2.45%
Total	**1,150,485**	**9,567**	**0.83%**	**131,811**	**1,039**	**0.79%**	**74,642**	**639**	**0.86%**

Source: NCEM Risk Management Tool

PROPERTY

Residential, commercial, and public buildings, as well as critical infrastructure such as transportation, water, energy, and communication systems may be damaged or destroyed by flood waters. The increased number of flood days will likely cause additional flood-related property damage, although it is unclear exactly what this will look like. Homes, businesses, and vehicles will be susceptible to increased water damage.

Properties within the SFHA are estimated to have a one percent probability of being exposed to flooding equaling or exceeding the base flood during any given year. Mortgage lenders require that owners of properties with federally backed mortgages located within SFHAs purchase and maintain flood insurance policies on their properties. Consequently, newer and recently purchased properties in the community are typically insured against flooding. Regardless of insurance status, pre-FIRM properties, those built before the community's first FIRM, may be more vulnerable to flood damage because they were built prior to the enforcement of flood damage prevention regulations. These properties may be a priority for mitigation.

Table 4.40 through Table 4.44 detail the property at risk and loss estimates from various flood events, according to data from the NCEM IRISK database. Actual property at risk is likely higher due to the amount of development that has occurred since the original analysis for the IRISK dataset was performed.

The damage estimates for the 1% annual chance flood event total $52,106,740, which equates to a loss ratio of less than 1 percent. The loss ratio is the damage estimate divided by the total potential exposure (i.e., total value of all buildings in the planning area), displayed as a percentage of value at risk. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Critical facility exposure to the 1% annual chance flood was also evaluated. Based on a comparison of critical facility locations to the FEMA flood hazard areas, only one critical facility is exposed to the 1% annual chance flood or the 0.2% annual chance flood—a medical office in the City of Charlotte. All other identified critical facilities are located in the unshaded Zone X, which reflects low flood risk.

Table 4.40 – Buildings Impacted by the 10-Year Flood Event

Jurisdiction	All Buildings	Number of Pre-FIRM Buildings at Risk		Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	9	0.04%	10	0.04%	$31,394	0	0%	$0	0	0%	$0	10	0.04%	$31,394
Charlotte	246,090	275	0.11%	318	0.13%	$2,702,860	45	0.02%	$2,938,493	2	0%	$71,013	365	0.15%	$5,712,366
Cornelius	10,558	0	0%	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Davidson	3,871	0	0%	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Huntersville	19,554	4	0.02%	4	0.02%	$5,115	0	0%	$0	0	0%	$0	4	0.02%	$5,115
Matthews	10,007	0	0%	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Mint Hill	9,880	2	0.02%	2	0.02%	$14,352	0	0%	$0	0	0%	$0	2	0.02%	$14,352
Pineville	2,731	18	0.66%	12	0.44%	$237,576	11	0.40%	$409,697	0	0%	$0	23	0.84%	$647,273
Total	**326,758**	**308**	**0.09%**	**346**	**0.11%**	**$2,991,297**	**56**	**0.02%**	**$3,348,190**	**2**	**0%**	**$71,013**	**406**	**0.12%**	**$6,410,500**

Source: NCEM Risk Management Tool

Table 4.41 – Buildings Impacted by the 25-Year Flood Event

Jurisdiction	All Buildings	Number of Pre-FIRM Buildings at Risk		Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	500	2.08%	12	0.05%	$104,017	0	0%	$0	0	0%	$0	12	0.05%	$104,017
Charlotte	246,090	10	0%	567	0.23%	$6,175,254	88	0.04%	$6,420,285	4	0%	$180,700	659	0.27%	$12,776,239
Cornelius	10,558	0	0%	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Davidson	3,871	0	0%	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Huntersville	19,554	6	0.03%	6	0.03%	$15,661	0	0%	$0	0	0%	$0	6	0.03%	$15,661
Matthews	10,007	2	0.02%	2	0.02%	$783	0	0%	$0	0	0%	$0	2	0.02%	$783
Mint Hill	9,880	7	0.07%	7	0.07%	$42,689	0	0%	$0	0	0%	$0	7	0.07%	$42,689
Pineville	2,731	21	0.77%	14	0.51%	$549,050	14	0.51%	$559,940	0	0%	$0	28	1.03%	$1,108,989
Total	**326,758**	**546**	**0.17%**	**608**	**0.19%**	**$6,887,454**	**102**	**0.03%**	**$6,980,225**	**4**	**0%**	**$180,700**	**714**	**0.22%**	**$14,048,378**

Source: NCEM Risk Management Tool

Table 4.42 – Buildings Impacted by the 50-Year Flood Event

Jurisdiction	All Buildings	Number of Pre-FIRM Buildings at Risk		Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	11	0.05%	13	0.05%	$175,303	0	0%	$0	0	0%	$0	13	0.05%	$175,303
Charlotte	246,090	701	0.28%	790	0.32%	$14,447,205	130	0.05%	$8,823,898	6	0%	$320,123	926	0.38%	$23,591,225
Cornelius	10,558	0	0%	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Davidson	3,871	0	0%	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Huntersville	19,554	6	0.03%	6	0.03%	$26,235	0	0%	$0	0	0%	$0	6	0.03%	$26,235
Matthews	10,007	5	0.05%	5	0.05%	$3,173	0	0%	$0	0	0%	$0	5	0.05%	$3,173
Mint Hill	9,880	10	0.10%	10	0.10%	$65,311	0	0%	$0	0	0%	$0	10	0.10%	$65,311
Pineville	2,731	42	1.54%	22	0.81%	$820,532	29	1.06%	$1,019,777	0	0%	$0	51	1.87%	$1,840,309
Total	**326,758**	**775**	**0.24%**	**846**	**0.26%**	**$15,537,759**	**159**	**0.05%**	**$9,843,675**	**6**	**0%**	**$320,123**	**1,011**	**0.31%**	**$25,701,556**

Source: NCEM Risk Management Tool

Table 4.43 – Buildings Impacted by the 100-Year Flood Event

Jurisdiction	All Buildings	Number of Pre-FIRM Buildings at Risk		Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	59	0.25%	111	0.46%	$1,250,372	23	0.10%	$563,493	3	0.01%	$88,485	137	0.57%	$1,902,350
Charlotte	246,090	900	0.37%	1,058	0.43%	$33,630,989	190	0.08%	$13,239,633	11	0%	$550,207	1,259	0.51%	$47,420,829
Cornelius	10,558	5	0.05%	23	0.22%	$59,886	0	0%	$0	0	0%	$0	23	0.22%	$59,886
Davidson	3,871	0	0.00%	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Huntersville	19,554	12	0.06%	12	0.06%	$76,629	0	0%	$0	0	0%	$0	12	0.06%	$76,629
Matthews	10,007	9	0.09%	9	0.09%	$40,709	0	0%	$0	0	0%	$0	9	0.09%	$40,709
Mint Hill	9,880	16	0.16%	16	0.16%	$106,661	0	0%	$0	0	0%	$0	16	0.16%	$106,661
Pineville	2,731	46	1.68%	25	0.92%	$962,114	34	1.24%	$1,537,562	0	0%	$0	59	2.16%	$2,499,676
Total	**326,758**	**1,047**	**0.32%**	**1,254**	**0.38%**	**$36,127,360**	**247**	**0.08%**	**$15,340,688**	**14**	**0%**	**$638,692**	**1,515**	**0.46%**	**$52,106,740**

Source: NCEM Risk Management Tool

Table 4.44 – Buildings Impacted by the 500-Year Flood Event

Jurisdiction	All Buildings	Number of Pre-FIRM Buildings at Risk		Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	25	0.10%	40	0.17%	$355,649	2	0.01%	$86,501	0	0%	$0	42	0.17%	$442,150
Charlotte	246,090	1,397	0.57%	2,136	0.87%	$104,405,174	305	0.12%	$35,279,106	26	0.01%	$1,894,568	2,467	1.00%	$141,578,849
Cornelius	10,558	0	0%	2	0.02%	$44,421	0	0%	$0	0	0%	$0	2	0.02%	$44,421
Davidson	3,871	0	0%	6	0.15%	$29,447	0	0%	$0	0	0%	$0	6	0.15%	$29,447
Huntersville	19,554	61	0.31%	61	0.31%	$499,179	1	0.01%	$1,119	0	0%	$0	62	0.32%	$500,298
Matthews	10,007	23	0.23%	24	0.24%	$216,187	0	0%	$0	0	0%	$0	24	0.24%	$216,187
Mint Hill	9,880	29	0.29%	29	0.29%	$297,707	0	0%	$0	0	0%	$0	29	0.29%	$297,707
Pineville	2,731	59	2.16%	51	1.87%	$1,748,271	47	1.72%	$4,040,859	2	0.07%	$6,877	100	3.66%	$5,796,007
Total	**326,758**	**1,594**	**0.49%**	**2,349**	**0.72%**	**$107,596,035**	**355**	**0.11%**	**$39,407,585**	**28**	**0.01%**	**$1,901,445**	**2,732**	**0.84%**	**$148,905,066**

Source: NCEM Risk Management Tool

REPETITIVE LOSS ANALYSIS

A repetitive loss property is a property for which two or more flood insurance claims of more than $1,000 have been paid by the NFIP within any 10-year period since 1978. A severe repetitive loss property is classified as such if it has four or more separate claim payments of more than $5,000 each (including building and contents payments) or two or more separate claim payments (building only) where the total of the payments exceeds the current value of the property. Repetitive loss properties and severe repetitive loss properties are a priority for mitigation because they have a known flood risk and are a drain on the NFIP.

According to 2024 NFIP records, there are a total of 288 repetitive loss properties within Mecklenburg County, of which 271 are residential and 17 are commercial or non-residential.

Only 117 repetitive loss properties, less than 40% of the total in the region, are insured. The number of insured repetitive loss properties has increased in the last five years, which could be attributed to the new FIRMs which reduced the SFHA acreage in the region and potentially removed the mandatory purchase requirement for some property owners. There are 48 properties on the list classified as severe repetitive loss properties.

Table 4.45 summarizes repetitive loss properties by jurisdiction as identified by FEMA through the NFIP.

Table 4.45 – Repetitive Loss Properties by Jurisdiction

Jurisdiction	Total Number of RL Properties	Total Number of SRL Properties	Total Number of Losses
Unincorporated Mecklenburg County	10	0	10
Charlotte	228	48	276
Cornelius	0	--	--
Davidson	0	--	--
Huntersville	0	--	--
Matthews	2	0	2
Mint Hill	0	--	--
Pineville	0	--	--
Total	**240**	**48**	**288**

Source: FEMA Open Source Data, retrieved February 2025

ENVIRONMENT

During a flood event, chemicals and other hazardous substances may end up contaminating local water bodies. Flooding kills animals and in general disrupts the ecosystem. Snakes and insects may also make their way to the flooded areas.

Floods can also cause significant erosion, which can alter streambanks and deposit sediment, changing the flow of streams and rivers and potentially reducing the drainage capacity of those waterbodies.

CONSEQUENCE ANALYSIS

Table 4.46 summarizes the potential detrimental consequences of flood.

Table 4.46 – Consequence Analysis - Flood

Category	Consequences
Public	Localized impact expected to be severe for incident areas and moderate to light for other adversely affected areas.
Responders	First responders are at risk when attempting to rescue people. They are subject to the same health hazards as the public. Flood waters may prevent access to areas in need of response or the flood may prevent access to the critical facilities themselves which may prolong response time.
Continuity of Operations (including Continued Delivery of Services)	Floods can severely disrupt normal operations, especially when there is a loss of power. Damage to facilities in the affected area may require temporary relocation of some operations. Localized disruption of roads, facilities, and/or utilities caused by incident may postpone delivery of some services.
Property, Facilities and Infrastructure	Buildings and infrastructure, including transportation and utility infrastructure, may be damaged or destroyed. Impacts are expected to be localized to the area of the incident. Severe damage is possible.
Environment	Chemicals and other hazardous substances may contaminate local water bodies. Wildlife and livestock deaths possible. The localized impact is expected to be severe for incident areas and moderate to light for other areas affected by the flood or associate hazardous materials spills.
Economic Condition of the Jurisdiction	Local economy and finances will be adversely affected, possibly for an extended period. Roads, bridges, farms, houses and automobiles can be destroyed. The local government must deploy emergency response personnel and equipment to help the affected area. It may take years for the affected communities to be re-built and business to return to normal.
Public Confidence in the Jurisdiction's Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery are not timely and effective.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes flood hazard risk by jurisdiction. Communities without historical flood events in the last 20 years were assigned a probability rating of 2; those with between 1 and 20 flood events were assigned a probability rating of 3, and those with more than 20 past occurrences in the past 20 years were assigned a probability rating of 4. Communities with 10% or more of their land area in the SFHA were assigned a spatial extent of 3; those with less than 10% land area in the SFHA were given a spatial extent rating of 2. All other factors do not vary by jurisdiction.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Charlotte	4	3	2	3	3	3.1	H
Cornelius	3	3	2	3	3	2.8	H
Davidson	2	3	3	3	3	2.7	H
Huntersville	3	3	2	3	3	2.8	H
Matthews	3	3	2	3	3	2.8	H
Mint Hill	2	3	2	3	3	2.5	M
Pineville	3	3	3	3	3	3.0	H
Mecklenburg County	4	3	3	3	3	3.3	H

4.5.6 HURRICANE AND TROPICAL STORM

HAZARD BACKGROUND

Hurricanes and tropical storms are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. A tropical cyclone refers to any such circulation that develops over tropical waters. Tropical cyclones act as a "safety-valve," limiting the continued build-up of heat and energy in tropical regions by maintaining the atmospheric heat and moisture balance between the tropics and the pole-ward latitudes. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation, and tornadoes.

The key energy source for a tropical cyclone is the release of latent heat from the condensation of warm water. Their formation requires a low-pressure disturbance, warm sea surface temperature, rotational force from the spinning of the earth, and the absence of wind shear in the lowest 50,000 feet of the atmosphere. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season, which encompasses the months of June through November. The peak of the Atlantic hurricane season is in early to mid-September and the average number of storms that reach hurricane intensity per year in the Atlantic basin is about six.

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane.

Warning Time: 1 – More than 24 hours

Duration: 2 – Less than 24 hours

LOCATION

Hurricanes and tropical storms can occur anywhere within the Mecklenburg County planning area. While coastal areas are most vulnerable to hurricanes, their wind and rain impacts can be felt hundreds of miles inland.

Spatial Extent: 4 – Large

EXTENT

Hurricane intensity is classified by the Saffir-Simpson Scale, shown in Table 4.47, which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense.

Table 4.47 – Saffir-Simpson Scale

Category	Maximum Sustained Wind Speed (MPH)	Types of Damage
1	74–95	Very dangerous winds will produce some damage; Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96–110	Extremely dangerous winds will cause extensive damage; Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111–129	Devastating damage will occur; Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	130–156	Catastrophic damage will occur; Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	157 +	Catastrophic damage will occur; A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: National Hurricane Center

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds and barometric pressure, which are combined to estimate potential damage. Categories 3, 4, and 5 are classified as "major" hurricanes and, while hurricanes within this range comprise only 20 percent of total tropical cyclone landfalls, they account for over 70 percent of the damage in the United States. Table 4.48 describes the damage that could be expected for each category of hurricane. Damage during hurricanes may also result from spawned tornadoes and inland flooding associated with heavy rainfall that usually accompanies these storms.

Table 4.48 – Hurricane Damage Classifications

Storm Category	Damage Level	Description of Damages	Photo Example
1	MINIMAL	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage.	
2	MODERATE	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings.	
3	EXTENSIVE	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland.	
4	EXTREME	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.	
5	CATASTROPHIC	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.	

Source: National Hurricane Center; Federal Emergency Management Agency

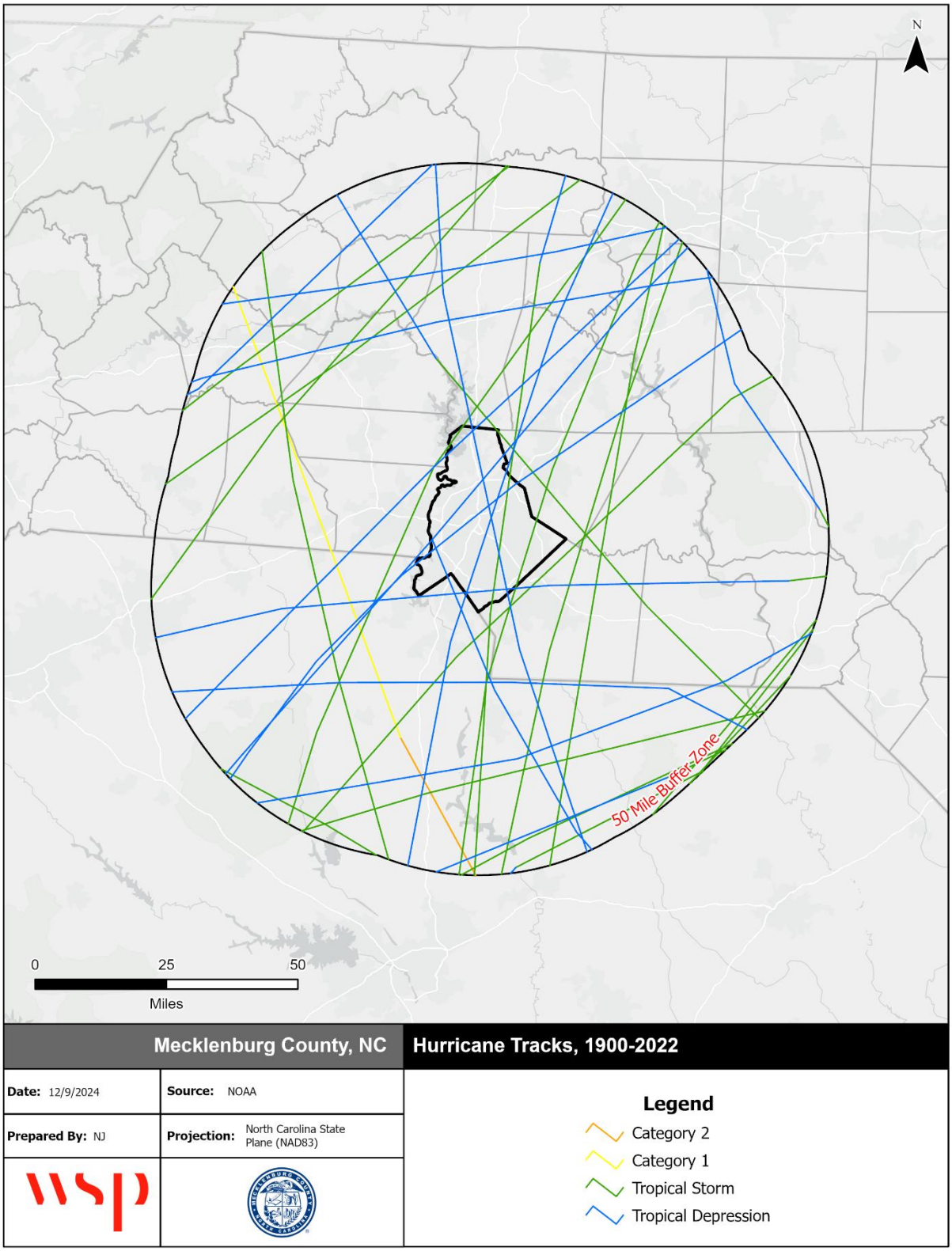
Tropical cyclones weaken relatively quickly after making landfall; therefore, Mecklenburg County will not typically experience major hurricane force winds, though these occurrences are possible. Based on past occurrences, Mecklenburg County is unlikely to experience a Category 4 or Category 5 storm, but a Category 3 storm is possible and could cause limited damages.

Impact: 2 – Limited

HISTORICAL OCCURRENCES

According to the Office of Coastal Management's Tropical Cyclone Storm Segments data, which is a subset of the International Best Track Archive for Climate Stewardship (IBTrACS) dataset, 23 hurricanes and tropical storms passed within 50 miles of Mecklenburg County from 1900-2022. These storms tracks are shown in Figure 4.20. The date, storm name, storm category, and maximum wind speed of each event are detailed in Table 4.49.

Figure 4.20 – Hurricane and Tropical Storm Tracks within 50 miles of Mecklenburg County, 1900-2022



Source: NOAA Office of Coastal Management

Table 4.49 – Hurricane and Tropical Storm Tracks within 50 Miles of Mecklenburg County, 1900-2022

Date	Storm Name	Max Storm Category*	Max Wind Speed (mph)
7/13/1901	Unnamed	Tropical Storm	40
6/16/1902	Unnamed	Tropical Storm	40
10/11/1902	Unnamed	Extratropical Storm	40
9/23/1907	Unnamed	Extratropical Storm	40
6/14/1912	Unnamed	Extratropical Storm	40
9/3/1913	Unnamed	Tropical Storm	46
8/3/1915	Unnamed	Tropical Storm	40
7/15/1916	Unnamed	Tropical Storm	58
10/3/1927	Unnamed	Tropical Storm	46
10/2/1929	Unnamed	Extratropical Storm	58
8/28/1949	Unnamed	Tropical Storm	58
8/31/1952	Able	Tropical Storm	52
8/28/1952	Unnamed	Tropical Storm	46
9/30/1959	Gracie	Category 1	75
9/5/1979	David	Tropical Storm	63
7/25/1985	Bob	Tropical Storm	63
9/22/1989	Hugo	Category 2	98
6/14/2006	Alberto	Extratropical Storm	40
10/11/2018	Michael	Tropical Storm	52
5/27/2020	Bertha	Tropical Depression	31
6/21/2021	Claudett	Tropical Storm	40
7/8/2021	Elsa	Tropical Storm	46
10/1/2022	Ian	Tropical Storm	46

*Reports the most intense category that occurred within 50 miles of Mecklenburg County, not for the storm event overall.

Source: Office of Coastal Management, 2019. https://marinecadastre.gov/data/

From 1999 through 2023, only three storms with hurricane or tropical storm force winds, Tropical Cyclone Michael, Tropical Storm Zeta, and Tropical Cyclone Ian was recorded in NCEI with impacts in Mecklenburg County, as detailed below:

October 11, 2018 – Tropical cyclone Michael gradually weakened as it tracked from the South Carolina Midlands through portions of the South Carolina and North Carolina Piedmont throughout the 11th. Gusty winds increased during the daylight hours on the east side of the storm track, with numerous trees blown, especially across the Piedmont. There were $5,000 in reported property damages.

October 29, 2020 – Tropical moisture and heavy rain overspread western North Carolina throughout the 28th through the morning of the 29th as the center of Tropical Storm Zeta moved quickly from the mouth of the Mississippi River into the southern Appalachians. Strong winds developed across portions of western North Carolina during the morning, downing hundreds of trees across the area. Multiple trees fell on structures and vehicles. Upslope flow into the Blue Ridge escarpment enhanced rainfall rates such that widespread totals of 3 to 5 with locally higher amounts inches occurred over about a 24 hour period. This resulted in development of flash flooding across portions of the southern mountains and northern foothills.

September 30, 2022 – Very gusty winds developed over the North Carolina Piedmont as Tropical Cyclone Ian made a second landfall as a minimal hurricane near Myrtle Beach during the afternoon of the

30th. Frequent wind gusts of 35 to 45 mph, with occasional gusts as high as 50 mph resulted in dozens of trees blown down throughout the area. Multiple trees fell on structures and vehicles, especially in the Charlotte area, where a mobile home was destroyed by a falling tree.

The most significant storm to impact Mecklenburg County was Hurricane Hugo in September 1989. Mecklenburg County was included in the Presidential Disaster Declaration for Hurricane Hugo in 1989 and is known to have sustained a significant portion of the estimated statewide total of $1 billion in property damages caused by the storm. The following excerpt from *North Carolina's Hurricane History* by Jay Barnes was provided in the previous plan:

"As the center of the storm rolled past Charlotte, wind gusts of over 85 mph buffeted the region. Trees crashed into homes, cars, and power lines and utility poles snapped. Charlotte lost more than eighty thousand trees to the storm, many of which were more than seventy years old. Ninety eight percent of the city's residents lost power, and for some, repairs were not made for more than two weeks. Power outages caused large amounts of raw sewage to bypass treatment plants and flow into streams throughout Mecklenburg County. North Carolina's largest metropolitan area was brought to its knees by the storm...

…The people of Mecklenburg County thought they were immune to hurricanes prior to this storm's arrival. Most had believed that tropical cyclones were strictly a coastal phenomenon, but Hugo proved to be an exception." (Barnes, 1998)

PROBABILITY OF FUTURE OCCURRENCE

Probability: 3 – Likely

Per NCEI records, in the 25-year period from 1999 through 2023, three tropical storms impacted the Mecklenburg County area which equates to a 12 percent annual probability of hurricane winds impacting the County. It should be noted that secondary impacts of hurricanes and tropical storms (i.e. flooding or flash flooding) may be recorded by the NCEI as separate events. Nonetheless, the probability of a hurricane or tropical storm impacting Mecklenburg County is possible.

CLIMATE CHANGE

NOAA reports that extremes will likely cause more frequent, stronger storms in the future due to rising surface temperatures. That is to say, NOAA models predict that while there may be less frequent low-category storm events (Tropical Storms, Category 1 Hurricanes), there will be more high-category storm events (Category 5 and 5 Hurricanes) in the future. This means that there may be fewer hurricanes overall in any given year, but when hurricanes do form, it is more likely that they will become larger storms that can create massive damage.

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

Property at risk to hurricanes was estimated using data from the North Carolina Emergency Management (NCEM) IRISK database, which was compiled in NCEM's Risk Management Tool. The vulnerability data displayed below is for wind-related damages. Hurricanes may also cause substantial damages from heavy rains and subsequent flooding, which is addressed in Section 4.5.5 Flood.

PEOPLE

The very young, the elderly and the handicapped are especially vulnerable to harm from hurricanes. For those who are unable to evacuate for medical reasons, there should be provision to take care of special-needs patients and those in hospitals and nursing homes. Many of these patients are either oxygen-

dependent, insulin-dependent, or in need of intensive medical care. There is a need to provide ongoing treatment for these vulnerable citizens, either on the coast or by air evacuation to upland hospitals. The stress from disasters such as a hurricane can result in immediate and long-term physical and emotional health problems among victims.

PROPERTY

Hurricanes can cause catastrophic damage to coastlines and several hundred miles inland. Hurricanes can produce winds exceeding 157 mph as well as tornadoes and microbursts. Additionally, hurricanes often bring intense rainfall that can result in flash flooding. Floods and flying debris from winds are often the deadly and most destructive results of hurricanes. Agriculture damages are also common impacts, though the USDA RMA reports no agricultural damages in Mecklenburg County due to hurricane.

The damage estimates for the 100-year hurricane wind event total $151,157,841, which equates to a loss ratio of less than 1 percent. These damage estimates account for only wind impacts and actual damages would likely be higher due to flooding. Therefore, the county would likely experience a higher overall loss ratio from the 100-year hurricane event and face difficulty recovering from such an event.

Table 4.50 through Table 4.54 detail the estimated building damages from varying magnitudes of hurricane events.

Table 4.50 – Estimated Buildings Impacted by 25-Year Hurricane Wind Event

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,132	92	$1,629,604	1,207	5	$538,523	369	2	$78,508	23,708	99	$2,246,635
Charlotte	246,090	225,409	92	$21,862,599	14,770	6	$6,762,393	2,894	1	$1,216,950	243,073	99	$29,841,942
Cornelius	10,558	9,797	93	$1,535,568	630	6	$141,061	87	1	$21,099	10,514	100	$1,697,728
Davidson	3,871	3,506	91	$449,724	270	7	$56,392	56	1	$18,512	3,832	99	$524,627
Huntersville	19,554	18,219	93	$1,804,946	966	5	$265,964	223	1	$198,862	19,408	99	$2,269,771
Matthews	10,007	9,132	91	$874,395	665	7	$109,123	133	1	$79,052	9,930	99	$1,062,571
Mint Hill	9,880	9,256	94	$737,691	417	4	$49,275	94	1	$14,581	9,767	99	$801,548
Pineville	2,731	2,018	74	$133,142	552	20	$79,842	142	5	$6,340	2,712	99	$219,323
Total	**326,758**	**299,469**	**92**	**$29,027,669**	**19,477**	**6**	**$8,002,573**	**3,998**	**1**	**$1,633,904**	**322,944**	**99**	**$38,664,145**

Source: NCEM Risk Management Tool

Table 4.51 – Estimated Buildings Impacted by 50-Year Hurricane Wind Event

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,132	92	$1,629,604	1,207	5	$538,523	369	2	$78,508	23,708	99	$2,246,635
Charlotte	246,090	225,409	92	$21,862,599	14,770	6	$6,762,393	2,894	1	$1,216,950	243,073	99	$29,841,942
Cornelius	10,558	9,797	93	$1,535,568	630	6	$141,061	87	1	$21,099	10,514	100	$1,697,728
Davidson	3,871	3,506	91	$449,724	270	7	$58,180	56	1	$18,512	3,832	99	$526,416
Huntersville	19,554	18,219	93	$1,804,946	966	5	$265,964	223	1	$198,862	19,408	99	$2,269,771
Matthews	10,007	9,132	91	$874,395	665	7	$109,123	133	1	$79,052	9,930	99	$1,062,571
Mint Hill	9,880	9,256	94	$737,691	417	4	$49,275	94	1	$14,581	9,767	99	$801,548
Pineville	2,731	2,018	74	$133,142	552	20	$79,842	142	5	$6,340	2,712	99	$219,323
Total	**326,758**	**299,469**	**92**	**$29,027,669**	**19,477**	**6**	**$8,004,361**	**3,998**	**1**	**$1,633,904**	**322,944**	**99**	**$38,665,934**

Source: NCEM Risk Management Tool

Table 4.52 – Estimated Buildings Impacted by 100-Year Hurricane Wind Event

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,400	93	$6,476,783	1,207	5	$2,553,327	369	2	$344,357	23,976	100	$9,374,467
Charlotte	246,090	228,237	93	$84,236,655	14,770	6	$27,688,016	2,894	1	$4,678,392	245,901	100	$116,603,064
Cornelius	10,558	9,841	93	$5,566,212	630	6	$634,746	87	1	$103,243	10,558	100	$6,304,201
Davidson	3,871	3,545	92	$1,798,420	270	7	$211,951	56	1	$83,429	3,871	100	$2,093,800
Huntersville	19,554	18,353	94	$6,932,190	966	5	$1,010,379	223	1	$620,262	19,542	100	$8,562,831
Matthews	10,007	9,209	92	$3,299,657	665	7	$389,531	133	1	$378,085	10,007	100	$4,067,273
Mint Hill	9,880	9,369	95	$2,930,713	417	4	$219,216	94	1	$56,508	9,880	100	$3,206,436
Pineville	2,731	2,037	75	$603,767	552	20	$318,820	142	5	$23,182	2,731	100	$945,769
Total	**326,758**	**302,991**	**93**	**$111,844,397**	**19,477**	**6**	**$33,025,986**	**3,998**	**1**	**$6,287,458**	**326,466**	**100**	**$151,157,841**

Source: NCEM Risk Management Tool

Table 4.53 – Estimated Buildings Impacted by 300-Year Hurricane Wind Event

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,400	93	$38,630,054	1,207	5	$20,645,018	369	2	$2,999,707	23,976	100	$62,274,779
Charlotte	246,090	228,237	93	$578,140,625	14,770	6	$242,141,342	2,894	1	$41,620,125	245,901	100	$861,902,092
Cornelius	10,558	9,841	93	$46,264,250	630	6	$6,433,509	87	1	$1,273,428	10,558	100	$53,971,186
Davidson	3,871	3,545	92	$11,783,873	270	7	$2,603,768	56	1	$1,105,714	3,871	100	$15,493,355
Huntersville	19,554	18,353	94	$47,893,839	966	5	$10,686,839	223	1	$4,885,841	19,542	100	$63,466,519
Matthews	10,007	9,209	92	$21,500,240	665	7	$4,578,910	133	1	$3,575,055	10,007	100	$29,654,206
Mint Hill	9,880	9,369	95	$16,828,561	417	4	$2,147,229	94	1	$555,094	9,880	100	$19,530,883
Pineville	2,731	2,037	75	$5,525,416	552	20	$4,612,656	142	5	$307,532	2,731	100	$10,445,605
Total	**326,758**	**302,991**	**93**	**$766,566,858**	**19,477**	**6**	**$293,849,271**	**3,998**	**1**	**$56,322,496**	**326,466**	**100**	**$1,116,738,625**

Source: NCEM Risk Management Tool

Table 4.54 – Estimated Buildings Impacted by 700-Year Hurricane Wind Event

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,400	93	$113,396,028	1,207	5	$41,621,114	369	2	$7,015,313	23,976	100	$162,032,454
Charlotte	246,090	228,237	93	$1,708,750,699	14,770	6	$606,551,734	2,894	1	$111,565,655	245,901	100	$2,426,868,088
Cornelius	10,558	9,841	93	$145,931,559	630	6	$17,138,498	87	1	$3,508,330	10,558	100	$166,578,387
Davidson	3,871	3,545	92	$36,158,453	270	7	$8,007,111	56	1	$3,531,024	3,871	100	$47,696,589
Huntersville	19,554	18,353	94	$159,644,047	966	5	$31,161,469	223	1	$11,303,979	19,542	100	$202,109,495
Matthews	10,007	9,209	92	$68,327,732	665	7	$13,357,789	133	1	$7,283,850	10,007	100	$88,969,372
Mint Hill	9,880	9,369	95	$48,252,417	417	4	$4,984,750	94	1	$1,430,361	9,880	100	$54,667,528
Pineville	2,731	2,037	75	$16,143,307	552	20	$14,999,121	142	5	$969,441	2,731	100	$32,111,868
Total	**326,758**	**302,991**	**93**	**$2,296,604,242**	**19,477**	**6**	**$737,821,586**	**3,998**	**1**	**$146,607,953**	**326,466**	**100**	**$3,181,033,781**

Source: NCEM Risk Management Tool

ENVIRONMENT

Hurricane winds can cause massive damage to the natural environment, uprooting trees and other debris within the storm's path. Animals can either be killed directly by the storm or impacted indirectly through changes in habitat and food availability caused by high winds and intense rainfall. Endangered species can be dramatically impacted. Forests can be completely defoliated by strong winds.

CONSEQUENCE ANALYSIS

Table 4.55 summarizes the potential negative consequences of hurricanes and tropical storms.

Table 4.55 – Consequence Analysis – Hurricane and Tropical Storm

Category	Consequences
Public	Impacts include injury or death, loss of property, outbreak of diseases, mental trauma and loss of livelihoods. Power outages and flooding are likely to displace people from their homes. Water can become polluted such that if consumed, diseases and infection can be easily spread. Residential, commercial, and public buildings, as well as critical infrastructure such as transportation, water, energy, and communication systems may be damaged or destroyed, resulting in cascading impacts on the public.
Responders	Localized impact expected to limit damage to personnel in the inundation area at the time of the incident. Potential impacts to response capabilities due to storm impacts
Continuity of Operations (including Continued Delivery of Services)	Damage to facilities/personnel from flooding or wind may require temporary relocation of some operations. Operations may be interrupted by power outages. Disruption of roads and/or utilities may postpone delivery of some services. Regulatory waivers may be needed locally. Fulfillment of some contracts may be difficult. Impact may reduce deliveries.
Property, Facilities and Infrastructure	Structural damage to buildings may occur; loss of glass windows and doors by high winds and debris; loss of roof coverings, partial wall collapses, and other damages requiring significant repairs are possible in a major (category 3 to 5) hurricane.
Environment	Hurricanes can devastate wooded ecosystems and remove all the foliation from forest canopies, and they can change habitats so drastically that the indigenous animal populations suffer as a result. Specific foods can be taken away as high winds will often strip fruits, seeds and berries from bushes and trees. Secondary impacts may occur; for example, high winds and debris may result in damage to an above-ground fuel tank, resulting in a significant chemical spill.
Economic Condition of the Jurisdiction	Local economy and finances adversely affected, possibly for an extended period of time, depending on damages. Intangible impacts also likely, including business interruption and additional living expenses.
Public Confidence in the Jurisdiction's Governance	Likely to impact public confidence due to possibility of major event requiring substantial response and long-term recovery effort.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes hurricane and tropical storm hazard risk by jurisdiction. Most aspects of hurricane risk do not vary substantially by jurisdiction; however, impacts may be greater in more highly developed areas with greater amounts of impervious surface and higher exposure in terms of both property and population density. Additionally, mobile home units are more vulnerable to wind damage. While mobile home units do not comprise a significant proportion of any jurisdictions housing mix, Mecklenburg County and Charlotte each have over 5,000 mobile home units in their jurisdiction and therefore may face more severe impacts from wind.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Charlotte	3	3	4	1	2	2.9	M
Cornelius	3	2	4	1	2	2.6	M
Davidson	3	2	4	1	2	2.6	M
Huntersville	3	2	4	1	2	2.6	M
Matthews	3	2	4	1	2	2.6	M
Mint Hill	3	2	4	1	2	2.6	M
Pineville	3	2	4	1	2	2.6	M
Mecklenburg County	3	3	4	1	2	2.9	M

4.5.7 INFECTIOUS DISEASE

Public health emergencies can take many forms—disease epidemics, large-scale incidents of food or water contamination, or extended periods without adequate water and sewer services. There can also be harmful exposure to chemical, radiological, or biological agents, and largescale infestations of disease-carrying insects or rodents. The first part of this section focuses on emerging public health concerns and potential pandemics, while the second part addresses natural and human-caused air and water pollution.

Public health emergencies can occur as primary events by themselves, or they may be secondary to another disaster or emergency, such as tornado, flood, or hazardous material incident. For more information on those particular incidents, see Sections 4.5.10 (Tornado and Thunderstorms), 4.5.5 (Flooding), and 4.5.13 (Hazardous Substances). The common characteristic of most public health emergencies is that they adversely impact, or have the potential to adversely impact, a large number of people. Public health emergencies can be worldwide or localized in scope and magnitude.

The primary communicable, or infectious, disease addressed within this plan is influenza:

Influenza - Whether natural or manmade, health officials say the threat of a dangerous new strain of influenza (flu) virus in pandemic proportions is a very real possibility in the years ahead. Unlike most illnesses, the flu is especially dangerous because it is spread through the air. A classic definition of influenza is a respiratory infection with fever. Each year, flu infects humans and spreads around the globe. There are three types of influenza virus: Types A, B, and C. Type A is the most common, most severe, and the primary cause of flu epidemics. Type B cases occur sporadically and sometimes as regional or widespread epidemics. Type C cases are quite rare and hence sporadic, but localized outbreaks have occurred. Seasonal influenza usually is treatable, and the mortality rate remains low. Each year, scientists estimate which particular strain of flu is likely to spread, and they create a vaccine to combat it. A flu pandemic occurs when the virus suddenly changes or mutates and undergoes an ―antigenic shift, permitting it to attach to a person's respiratory system and leave the body's immune system defenseless against the invader.

Additional diseases of public health concern include tuberculosis, Smallpox, St. Louis Encephalitis, Meningitis, Lyme disease, West Nile, Coronavirus, SARS, Zika, and Ebola. These communicable diseases are introduced within this plan, but full vulnerability analyses are not included at this time.

Tuberculosis - Tuberculosis, or TB, is the leading cause of infectious disease worldwide. It is caused by a bacteria called Mycobacterium tuberculosis that most often affects the lungs. TB is an airborne disease spread by coughing or sneezing from one person to another. The World Health Organization (WHO) estimates that one-third of the world's population, approximately two billion people, has latent TB, which means people have been infected by TB bacteria but are not yet ill with the disease and cannot transmit the disease. In 2022, an estimated 10.6 million people fell ill with TB and 1.3 million died from the disease (including 167,000 people with HIV). Over 80% of TB deaths occur in low- and middle- income countries.

Smallpox - Smallpox is a contagious, sometimes fatal, infectious disease. There is no specific treatment for smallpox disease, and the only prevention is vaccination. Smallpox is caused by the variola virus that emerged in human populations thousands of years ago. It is generally spread by face- to-face contact or by direct contact with infected bodily fluids or contaminated objects (such as bedding or clothing). A person with smallpox is sometimes contagious with onset of fever, but the person becomes most contagious with the onset of rash. The rash typically develops into sores that spread over all parts of the body. The infected person remains contagious until the last smallpox scab is gone. Smallpox outbreaks have occurred periodically for thousands of years, but the disease is now largely eradicated after a worldwide vaccination program was implemented. After the disease was eliminated, routine vaccination among the general public was stopped. The last case of smallpox in the United States was in 1949.

St. Louis Encephalitis - In the United States, the leading type of epidemic flaviviral Encephalitis is St. Louis encephalitis, which is transmitted by mosquitoes that become infected by feeding on birds infected with the virus. There is no evidence to suggest that the virus can be spread from person to person.

Meningitis - Meningitis is an infection of fluid that surrounds a person's spinal cord and brain. High fever, headache, and stiff neck are common symptoms of meningitis, which can develop between several hours to one to two days after exposure. Meningitis can be caused by either a viral or bacterial infection; however, a correct diagnosis is critically important, because treatments for the two varieties differ. Meningitis is transmitted through direct contact with respiratory secretions from an infected carrier. Primary risk groups include infants and young children, household contact with patients, and refugees. In the United States, periodic outbreaks continue to occur, particularly among adolescents and young adults. About 2,600 people in the United States get the disease each year. Generally, 10 to 14 percent of cases are fatal, and 11 to 19 percent of those who recover suffer from permanent hearing loss, mental retardation, loss of limbs, or other serious effects. Two vaccines are available in the United States.

Lyme Disease - Lyme disease was named after the town of Lyme, Connecticut, where an unusually large frequency of arthritis-like symptoms was observed in children in 1977. It was later found that the problem was caused by bacteria transmitted to humans by infected deer ticks, causing an average of more than 16,000 reported infections in the United States each year (however, the disease is greatly under-reported). Lyme disease bacteria are not transmitted from person to person. Following a tick bite, 80 percent of patients develop a red ―bullseye rash accompanied by tiredness, fever, headache, stiff neck, muscle aches, and joint pain. If untreated, some patients may develop arthritis, neurological abnormalities, and cardiac problems, weeks to months later. Lyme disease is rarely fatal. During early stages of the disease, oral antibiotic treatment is generally effective, while intravenous treatment may be required in more severe cases.

West Nile Virus - West Nile virus is a flavivirus spread by infected mosquitoes and is commonly found in Africa, West Asia, and the Middle East. It was first documented in the United States in 1999. Although it is not known where the U.S. virus originated, it most closely resembles strains found in the Middle East. It is closely related to St. Louis encephalitis and can infect humans, birds, mosquitoes, horses, and other mammals. West Nile is one of the most common mosquito-borne diseases in the United States.

Most people who become infected with West Nile virus will have either no symptoms or only mild effects. However, on rare occasions, the infection can result in severe and sometimes fatal illness. There is no evidence to suggest that the virus can be spread from person to person.

An abundance of dead birds in an area may indicate that West Nile virus is circulating between the birds and mosquitoes in that area. Although birds are particularly susceptible to the virus, most infected birds survive. The continued expansion of West Nile virus in the United States indicates that it is permanently established in the Western Hemisphere.

Coronaviruses - Coronaviruses are a large family of viruses found in both animals and humans and are known to cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS), Severe Acute Respiratory Syndrome (SARS), and Novel Coronavirus (COVID- 19). Coronaviruses can cause respiratory infections and can lead to serious illnesses, like pneumonia, and can be deadly. Typical coronavirus symptoms include fever, cough, headache, runny nose, and sore throat. MERS was first reported in 2012 in Saudi Arabia and spread to more than 25 countries. It produced symptoms that often progressed to pneumonia and 30-40 percent of cases were fatal. SARS emerged in 2002 and spread to more than two dozen countries. It caused acute respiratory distress and had a mortality rate of about 10 percent.

The most significant recent coronavirus, COVID-19, first emerged in Wuhan, China in 2019 and rapidly spread across the world. According to CDC data, as of February 2022, there had been over 78.5 million cases of COVID-19 reported in the United States. COVID-19 spreads when an infected person breathes

out droplets and very small particles that contain the virus. These droplets and particles can be breathed in by other people or land on their eyes, noses, or mouth. Symptoms include fever, cough, shortness of breath, fatigue, loss of taste and smell, and more. Symptoms range from mild to severe illness and typically appear between 2-14 days after exposure to the virus.

Severe Acute Respiratory Syndrome - Severe acute respiratory syndrome (SARS) is a respiratory illness that has recently been reported in Asia, North America, and Europe. Although the cause of SARS is currently unknown, scientists have detected in SARS patients a previously unrecognized coronavirus that appears to be a likely source of the illness. In general, humans infected with SARS exhibit fevers greater than 100.4 F, headaches, an overall feeling of discomfort, and body aches. Some people also experience mild respiratory symptoms. After two to seven days, SARS patients may develop a dry cough and have trouble breathing. The primary way that SARS appears to spread is by close person-to-person contact; particularly by an infected person coughing or sneezing contaminated droplets onto another person, with a transfer of those droplets to the victim's eyes, nose, or mouth.

Zika Virus - Discovered in the Zika forest of Uganda in 1947, the Zika virus is a member of the flavivirus family. It is transmitted to humans through the bite of an infected Aedes species mosquito (Ae. aegypti and Ae. albopictus). Zika virus can also be transmitted from an infected pregnant woman to her baby during pregnancy and can result in serious birth defects, including microcephaly. Less commonly, the virus can be spread through intercourse or blood transfusion. However, most people infected with the Zika virus do not become sick.

Ebola - Previously known as Ebola hemorrhagic fever, is a rare and deadly disease caused by infection with one of the Ebola virus species. It was first discovered in 1976 near the Ebola River in what is now the Democratic Republic of the Congo. Since then, outbreaks have appeared sporadically in Africa.

Warning Time: 1 – More than 24 hours

Duration: 4 – More than one week

LOCATION

Infectious disease outbreaks can occur anywhere in the planning area, especially where there are groups of people in close quarters.

Spatial Extent: 4 – Large

EXTENT

When on an epidemic scale, diseases can lead to high infection rates in the population causing isolation, quarantine, and potential mass fatalities. An especially severe influenza pandemic or other major disease outbreak could lead to high levels of illness, death, social disruption, and economic loss. Impacts could range from school and business closings to the interruption of basic services such as public transportation, health care, and the delivery of food and essential medicines.

Impact: 3 – Critical

Table 4.56 describes the World Health Organization's six main phases to a pandemic flu as part of their planning guidance.

Table 4.56 – World Health Organization's Pandemic Flu Phases

Phase	Description
1	No animal influenza virus circulating among animals have been reported to cause infection in humans.

Phase	Description
2	An animal influenza virus circulating in domesticated or wild animals is known to have caused infection in humans and is therefore considered a specific potential pandemic threat.
3	An animal or human-animal influenza reassortant virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level breakouts.
4	Human-to-human transmission of an animal or human-animal influenza reassortant virus able to sustain community-level breakouts has been verified.
5	The same identified virus has caused sustained community-level outbreaks in two or more countries in one WHO region.
6	In addition to the criteria defined in Phase 5, the same virus has caused sustained community-level outbreaks in at least one other country in another WHO region.
Post-Peak Period	Levels of pandemic influenza in most countries with adequate surveillance have dropped below peak levels.
Post-Pandemic Period	Levels of influenza activity have returned to levels seen for seasonal influenza in most countries with adequate surveillance.

Source: World Health Organization

HISTORICAL OCCURRENCES

PUBLIC HEALTH EMERGENCIES – INFLUENZA PANDEMICS

Since the early 1900s, four lethal pandemics have swept the globe: Spanish Flu of 1918-1919; Asian Flu of 1957-1958; Hong Kong Flu of 1968-1969; and Swine Flu of 2009-2010. The Spanish Flu was the most severe pandemic in recent history. The number of deaths was estimated to be 50-100 million worldwide and 675,000 in the United States. Its primary victims were mostly young, healthy adults. The 1957 Asian Flu pandemic killed about 70,000 people in the United States, mostly the elderly and chronically ill. The 1968 Hong Kong Flu pandemic killed 34,000 Americans. The 2009 Swine Flu caused 12,469 deaths in the United States. These historic pandemics are further defined in the following paragraphs along with several "pandemic scares".

SPANISH FLU (H1N1 VIRUS) OF 1918-1919

In 1918, when World War I was in its fourth year, another threat began that rivaled the war itself as the greatest killer in human history. The Spanish Flu swept the world in three waves during a two-year period, beginning in March 1918 with a relatively mild assault.

The first reported case occurred at Camp Funston (Fort Riley), Kansas, where 60,000 soldiers trained to be deployed overseas. Within four months, the virus traversed the globe, as American soldiers brought the virus to Europe. The first wave sickened thousands of people and caused many deaths (46 died at Camp Funston), but it was considered mild compared to what was to come. The second and deadliest wave struck in the autumn of 1918 and killed millions. At Camp Funston alone, there were 14,000 cases and 861 deaths reported during the first three weeks of October 1918.

Outbreaks caused by a new variant exploded almost simultaneously in many locations including France, Sierra Leone, Boston, and New York City, where more than 20,000 people died that fall. The flu gained its name from Spain, which was one of the hardest hit countries. From there, the flu went through the Middle East and around the world, eventually returning to the United States along with the troops.

Of the 57,000 Americans who died in World War I, 43,000 died as a result of the Spanish Flu. At one point, more than 10 percent of the American workforce was bedridden. By a conservative estimate, a fifth of the human race suffered the fever and aches of influenza between 1918 and 1919 and 20 million people died. At the height of the flu outbreak during the winter of 1918-1919, at least 20% of North Carolinians were infected by the disease. Ultimately, 10,000 citizens of the state succumbed to this disease.

ASIAN FLU (H2N2 VIRUS) OF 1957-1958

This influenza pandemic was first identified in February 1957 in the Far East. Unlike the Spanish Flu, the 1957 virus was quickly identified, and vaccine production began in May 1957. A number of small outbreaks occurred in the United States during the summer of 1957, with infection rates highest among school children, young adults, and pregnant women; however, the elderly had the highest rates of death. A second wave of infections occurred early the following year, which is typical of many pandemics.

HONG KONG FLU (H3N2 VIRUS) OF 1968-1969

This influenza pandemic was first detected in early 1968 in Hong Kong. The first cases in the United States were detected in September 1968, although widespread illness did not occur until December. This became the mildest pandemic of the twentieth century, with those over the age of 65 the most likely to die. People infected earlier by the Asian Flu virus may have developed some immunity against the Hong Kong Flu virus. Also, this pandemic peaked during school holidays in December, limiting student-related infections.

PANDEMIC FLU THREATS: SWINE FLU OF 1976, RUSSIAN FLU OF 1977, AND AVIAN FLU OF 1997 AND 1999

Three notable flu scares occurred in the twentieth century. In 1976, a swine-type influenza virus appeared in a U.S. military barracks (Fort Dix, New Jersey). Scientists determined it was an antigenically drifted variant of the feared 1918 virus. Fortunately, a pandemic never materialized, although the news media made a significant argument about the need for a Swine Flu vaccine.

In May 1977, influenza viruses in northern China spread rapidly and caused epidemic disease in children and young adults. By January 1978, the virus, subsequently known as the Russian Flu, had spread around the world, including the United States. A vaccine was developed for the virus for the 1978–1979 flu season. Because illness occurred primarily in children, this was not considered a true pandemic.

In March 1997, scores of chickens in Hong Kong‘s rural New Territories began to die—6,800 on three farms alone. The Avian Flu virus was especially virulent, and made an unusual jump from chickens to humans. At least 18 people were infected, and six died in the outbreak. Chinese authorities acted quickly to exterminate over one million chickens and successfully prevented further spread of the disease. In 1999, a new avian flu virus appeared. The new virus caused illness in two children in Hong Kong. Neither of these avian flu viruses started pandemics.

SWINE FLU (H1N1 VIRUS) OF 2009–2010

This influenza pandemic emerged from Mexico in 2009. The first U.S. case of H1N1, or Swine Flu, was diagnosed on April 15, 2009. The U.S. government declared H1N1 a public health emergency on April 26. By June, approximately 18,000 cases of H1N1 had been reported in the United States. A total of 74 countries were affected by the pandemic.

The CDC estimates that 43 million to 89 million people were infected with H1N1 between April 2009 and April 2010. There were an estimated 8,870 to 18,300 H1N1 related deaths. On August 10, 2010, the World Health Organization (WHO) declared an end to the global H1N1 flu pandemic.

CORONAVIRUS DISEASE (COVID-19), 2019-2024

COVID-19 was caused by severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2). First identified in Wuhan, China in December 2019, the virus quickly spread throughout China and then globally. In the United States, COVID-19 was first identified in late January in Washington State and

rapidly spread throughout the Country, with large epicenters on both the east and west coasts. On March 13, 2020 the U.S. enters a nationwide emergency and by March 15, 2020 U.S. states begin to shut down to prevent the spread of COVID-19. Almost a year later the U.S. has administered over 100 million vaccinations. In June 2021 the first major variant, the Delta variant, becomes dominant in the U.S. which kicks off a third wave of infections during the summer of 2021. By December 20, 2021, Omicron, the second and most dominant variant in the U.S., had been detected in most U.S. states and territories. The Omicron variant spread more easily than the original virus that caused COVID-19 and the Delta variant.

According to the Johns Hopkins Coronavirus Resource Center, from the start of the pandemic to March 2023, there were over 103 million confirmed cases of COVID-19 in the U.S. resulting in over 1.1 million deaths. In North Carolina, there were over 3.4 million confirmed cases and 28,432 deaths due to COVID-19. Johns Hopkins stopped collecting data as of March 10, 2023. The COVID-19 virus has transitioned to endemic but maintains dual seasonality, with cases peaking twice a year.

PUBLIC HEALTH EMERGENCIES – OTHER EPIDEMICS AND DISEASE OUTBREAKS

ST. LOUIS ENCEPHALITIS, 1964-2005

Between 1964 and 2005, there were 4,651 confirmed cases of St. Louis encephalitis in the United States. It should be noted, however, that less than 1 percent of St. Louis encephalitis infections are clinically apparent, so the vast majority of infections remain undiagnosed. Illnesses range from mild headaches and fever to convulsions, coma, and paralysis. The last major outbreak of St. Louis encephalitis occurred in the Midwest from 1974 to 1977, when over 2,500 cases were reported in 35 states. The most recent outbreak of St. Louis encephalitis was in 1999 in New Orleans, Louisiana, with 20 reported cases. The disease is generally milder in children than in adults, with the elderly at highest risk for severe illness and death. Approximately 3 to 30 percent of cases are fatal; no vaccine against St. Louis encephalitis exists. In 2014, two U.S. cases were reported and were the first human cases since 2002.

MENINGITIS, 1996-1997, 2005

During 1996 and 1997, 213,658 cases of meningitis were reported, with 21,830 deaths, in Africa. According to the North Carolina Division of Public Health, an average of 20 reported cases of Meningitis occurred annually between 2005-2013 following the initial outbreak. In 2023, the CDC confirmed 438 cases of meningitis across the U.S. which is the largest number of cases reported since 2013.

LYME DISEASE, 2015

In the United States, Lyme disease is mostly found in the northeastern, mid-Atlantic, and upper north-central regions, and in several counties in northwestern California. In 2019, 93-percent of confirmed Lyme Disease cases were reported from 14 states: Connecticut, Delaware, Maine, Maryland, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, West Virginia, and Wisconsin. Lyme disease is the most commonly reported vector-borne illness in the United States. According to the CDC, recent estimates based on insurance records suggest that approximately 476,000 Americans are diagnosed and treated with Lyme disease each year. This disease does not occur nationwide and is concentrated heavily in the northeast and upper Midwest. Between 2018 to 2022 the average incidence rate of Lyme disease in North Carolina was 2.82 confirmed and probable cases per 100,000 residents, which is significantly lower than the national average. In 2023, Mecklenburg County had 14 two confirmed cases of Lyme disease according to data collected from the CDC.

SEVERE ACUTE RESPIRATORY SYNDROME, 2003

During November 2002-July 2003, a total of 8,098 probable SARS cases were reported to the World Health Organization (WHO) from 29 countries. In the United States, only 8 cases had laboratory evidence of infection. Since July 2003, when SARS transmission was declared contained, active global surveillance for SARS disease has detected no person-to-person transmission. CDC has therefore archived the case

report summaries for the 2003 outbreak. Across North Carolina, there was one confirmed SARS case – a man in Orange County tested positive in June 2003.

ZIKA VIRUS, 2015

In May 2015, the Pan American Health Organization issued an alert noting the first confirmed case of a Zika virus infection in Brazil. Since that time, Brazil and other Central and South America countries and territories, as well as the Caribbean, Puerto Rico, and the U.S. Virgin Islands have experienced ongoing Zika virus transmission. In August 2016, the Centers for Disease Control and Prevention (CDC) issued guidance for people living in or traveling to a 1-square-mile area Miami, Florida, identified by the Florida Department of Health as having mosquito-borne spread of Zika. In October 2016, the transmission area was expanded to include a 4.5-square-mile area of Miami Beach and a 1-squre mile area of Miami-Dade County. In addition, all of Miami-Dade County was identified as a cautionary area with an unspecified level of risk. As of the end of 2018, the CDC reported 74 cases of Zika across the United States. As of November 2024, there are no current local transmission of Zika virus in the continental U.S. or territories. The last cases of local Zika transmission by mosquitos in the continental U.S. were in Florida and Texas in 2016-17 and no reported cases from U.S. territories since 2019.

EBOLA, 2014-2016

Most recently, in March 2014, West Africa experienced the largest outbreak of Ebola in history. Widespread transmission was found in Liberia, Sierra Leone, and Guinea with the number of cases totaling 28,616 and the number of deaths totaling 11,310. In the United States, four cases of Ebola were confirmed in 2014 including a medical aid worker returning to New York from Guinea, two healthcare workers at Texas Presbyterian Hospital who provided care for a diagnosed patient, and the diagnosed patient who traveled to Dallas, Texas from Liberia. All three healthcare workers recovered. The diagnosed patient passed away in October 2014. In March 2016, the WHO terminated the public health emergency for the Ebola outbreak in West Africa.

PROBABILITY OF FUTURE OCCURRENCE

It is impossible to predict when the next pandemic, epidemic, or disease outbreak will occur or its impact. The CDC continually monitors and assesses pandemic threats and prepares for an influenza pandemic. Novel influenza A viruses with pandemic potential include Asian lineage avian influenza A (H5N1) and (H7N9) viruses. These viruses have all been evaluated using the Influenza Risk Assessment Tool (IRAT) to assess their potential pandemic risk. Because the CDC cannot predict how severe a future pandemic will be, advance planning is needed at the national, state and local level; this planning is done through public health partnerships at the national, state and local level.

Today, a much larger percentage of the world's population is clustered in cities, making them ideal breeding grounds for epidemics. Additionally, the explosive growth in air travel means the virus could literally be spread around the globe within hours. Under such conditions, there may be very little warning time. Most experts believe we will have just one to six months between the time that a dangerous new influenza strain is identified and the time that outbreaks begin to occur in the United States. Outbreaks are expected to occur simultaneously throughout much of the nation, preventing shifts in human and material resources that normally occur with other natural disasters. These and many other aspects make influenza pandemic unlike any other public health emergency or community disaster.

Probability: 2 – Possible

CLIMATE CHANGE

According to the U.S. Global Change Research Program, the influences of climate change on public health is significant and varied. The influences range from the clear threats of temperature

extremes and severe storms to less obvious connections related to insects. Climate and weather can also affect water and food quality in particular areas, with implications for public health.

Hot days can be unhealthy—even dangerous. High air temperatures can cause heat stroke and dehydration, and affect people's cardiovascular and nervous systems. Midwestern cities like St. Louis are vulnerable to heat waves, because many houses and apartments lack air conditioning, and urban areas are typically warmer than their rural surroundings. In recent decades, severe heat waves have killed hundreds of people across the Midwest. Heat stress is expected to increase as climate change brings hotter summer temperatures and more humidity. Certain people are especially vulnerable, including children, the elderly, the sick, and the poor.

Higher temperatures and wetter conditions tend to increase mosquito and tick activity, leading to an increased risk of zoonotic diseases. Mosquitos are known to carry diseases such as West Nile virus (WNV), La Crosse/California encephalitis, Jamestown Canyon virus, St. Louis encephalitis, and Eastern equine encephalitis. The two major concerns associated with warmer and wetter conditions are that the mosquito species already found in North Carolina and the diseases that they carry will become more prevalent, and that new species carrying unfamiliar diseases will start to appear for the first time.

Warmer winters with fewer hard freezes in areas that already see WNV-carrying mosquitos are likely to observe both a higher incidence of WNV and a longer WNV season, ultimately leading to an increase in human cases. Non-native mosquito species may move into North Carolina if the climate becomes more suitable for them, bringing with them diseases such as Jamestown Canyon virus, Chikungunya, and Dengue Fever.

Ticks are also well-known disease vectors in North Carolina, carrying pathogens such as Lyme disease, anaplasmosis, Ehrlichiosis, Powassan virus, and Babesiosis. Warmer, wetter weather can lead to an increase in algal blooms and declining beach health. An increase in flood events may also be associated with an increased incidence of mold problems in homes and businesses, as well as contamination of wells and surface waters due to sewer overflows and private septic system failures.

If these predictions come true, communities must contend with the human health impacts related to the increased prevalence of infectious diseases, heat waves, and changes in air and water quality. Public health officials will need to focus on spreading information and enacting pest and disease reduction. Floodprone communities will need to focus on continuously improving flood controls and mitigation strategies, including restricting building and chemical storage in floodplains, upgrading well and septic requirements, and providing water testing kits to residents.

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

Vulnerability to infectious disease was assessed based on past occurrences nationally and internationally as well as publicly available information on these vulnerabilities, as well as attacks occurring in the region.

PEOPLE

Disease spread and mortality is affected by a variety of factors, including virulence, ease of spread, aggressiveness of the virus and its symptoms, resistance to known antibiotics and environmental factors. While every pathogen is different, diseases normally have the highest mortality rate among the very young, the elderly or those with compromised immune systems. As an example, the unusually deadly 1918 H1N1 influenza pandemic had a mortality rate of 20%. If an influenza pandemic does occur, it is likely that many age groups would be seriously affected. The greatest risks of hospitalization and death—

as seen during the last two pandemics in 1957 and 1968 as well as during annual outbreaks of influenza—will be to infants, the elderly, and those with underlying health conditions. However, in the 1918 pandemic, most deaths occurred in young adults. Few people, if any, would have immunity to a new virus.

Approximately twenty percent of people exposed to West Nile Virus through a mosquito bite develop symptoms related to the virus; it is not transmissible from one person to another. Preventive steps can be taken to reduce exposure to mosquitos carrying the virus; these include insect repellent, covering exposed skin with clothing and avoiding the outdoors during twilight periods of dawn and dusk, or in the evening when the mosquitos are most active.

PROPERTY

For the most part, property itself would not be impacted by a human disease epidemic or pandemic. However, as concerns about contamination increase, property may be quarantined or destroyed as a precaution against spreading illness. Furthermore, staffing shortages could affect the function of critical facilities.

ENVIRONMENT

A widespread pandemic would not have an impact on the natural environment unless the disease was transmissible between humans and animals. However, affected areas could result in denial or delays in the use of some areas, and may require remediation.

CONSEQUENCE ANALYSIS

Table 4.57 summarizes the potential consequences of infectious disease.

Table 4.57 – Consequence Analysis – Infectious Disease

Category	Consequences
Public	Adverse impact expected to be severe for unprotected personnel and moderate to light for protected personnel.
Responders	Adverse impact expected to be severe for unprotected personnel and uncertain for trained and protected personnel, depending on the nature of the incident.
Continuity of Operations (including Continued Delivery of Services)	Danger to personnel in the area of the incident may require relocation of operations and lines of succession execution. Disruption of lines of communication and destruction of facilities may extensively postpone delivery of services.
Property, Facilities and Infrastructure	Access to facilities and infrastructure in the area of the incident may be denied until decontamination completed.
Environment	Incident may cause denial or delays in the use of some areas. Remediation needed.
Economic Condition of the Jurisdiction	Local economy and finances adversely affected, possibly for an extended period of time.
Public Confidence in the Jurisdiction's Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes infectious disease hazard risk by jurisdiction. Infectious disease risk is uniform across the planning area; there is no variation in risk by jurisdiction.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
All Jurisdictions	2	3	4	1	4	2.8	M

4.5.8 LANDSLIDE

HAZARD BACKGROUND

A landslide is the downhill movement of masses of soil and rock, driven by gravity. Landslides occur when susceptible rock, earth, or debris moves down a slope under the force of gravity and water. They can be triggered by natural changes, such as heavy rains, snow melt, fires, and earthquakes; and human-caused changes, such as slope or drainage modifications. Landslides may be very small or very large and can move at slow to very high speeds.

There are several types of landslides: rock falls, rock topple, slides, and flows. Rock falls are rapid movements of bedrock, which result in bouncing or rolling. A topple is a section or block of rock that rotates or tilts before falling to the slope below. Slides are movements of soil or rock along a distinct surface of rupture, which separates the slide material from the more stable underlying material. Mudflows, sometimes referred to as mudslides, mudflows, lahars or debris avalanches, are fast-moving rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, such as heavy rainfall or rapid snowmelt, changing the soil into a flowing river of mud or "slurry." Slurry can flow rapidly down slopes or through channels and can strike with little or no warning at avalanche speeds. Slurry can travel several miles from its source, growing in size as it picks up trees, cars, and other materials along the way. As the flows reach flatter ground, the mudflow spreads over a broad area where it can accumulate in thick deposits.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly.

Areas that are generally prone to landslide hazards include previous landslide areas, the bases of steep slopes, the bases of drainage channels, and developed hillsides where leach-field septic systems are used. Areas that are typically considered safe from landslides include areas that have not moved in the past, relatively flat-lying areas away from sudden changes in slope, and areas at the top or along ridges set back from the tops of slopes.

Warning Time: 3 – 6 to 12 hours

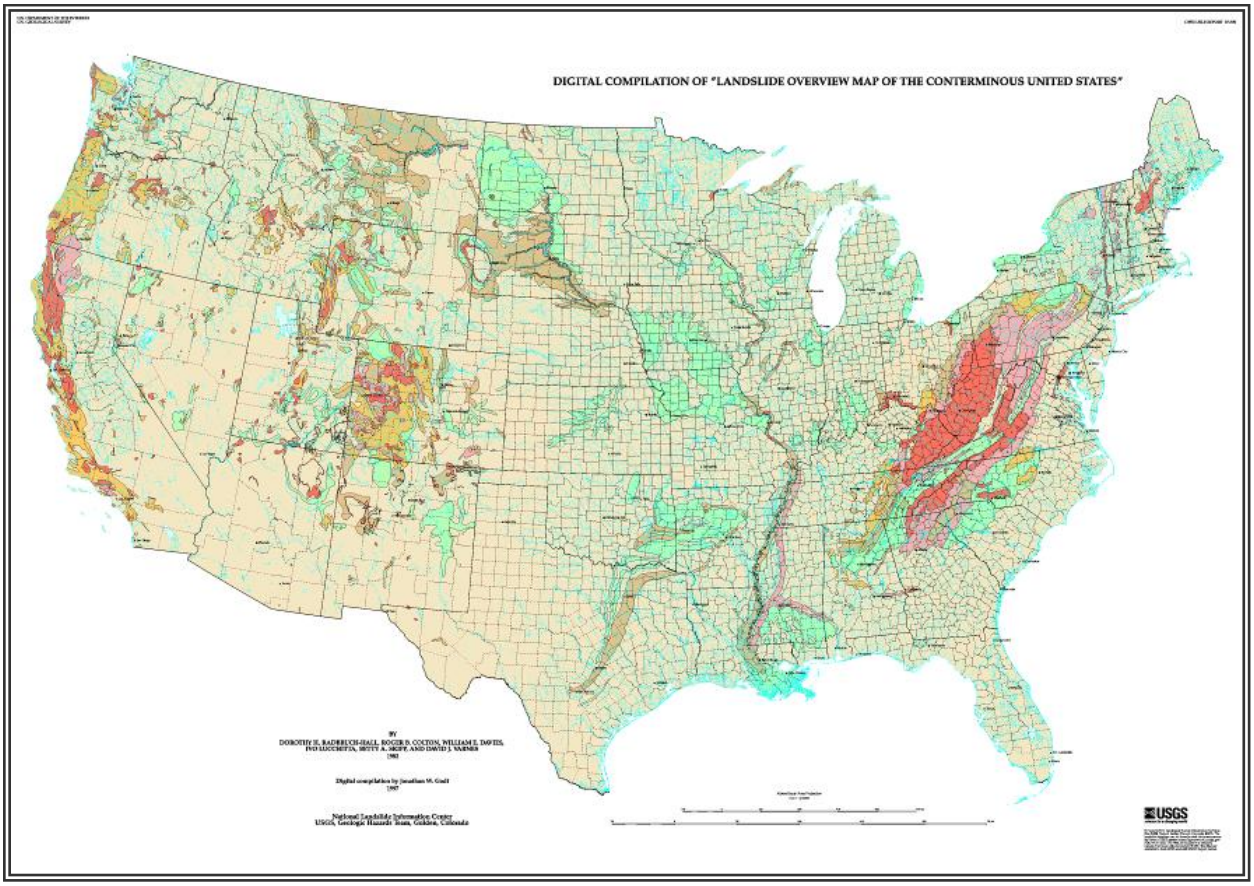
Duration: 1 – Less than six hours

LOCATION

The U.S. Geological Survey (USGS) has produced landslide susceptibility and incidence mapping of the U.S., as shown in Figure 4.21. The USGS determines susceptibility based on the probable degree of response to cutting or loading of slopes or to anomalously high precipitation. Incidence is measured by the rate of past occurrences. According to the USGS definition and mapping, most of Mecklenburg County faces low susceptibility and incidence of landslide. However, areas along the north central areas of county are at a significantly elevated risk of this hazard occurring, although there are no historical incidents to cite.

Spatial Extent: 1 – Negligible

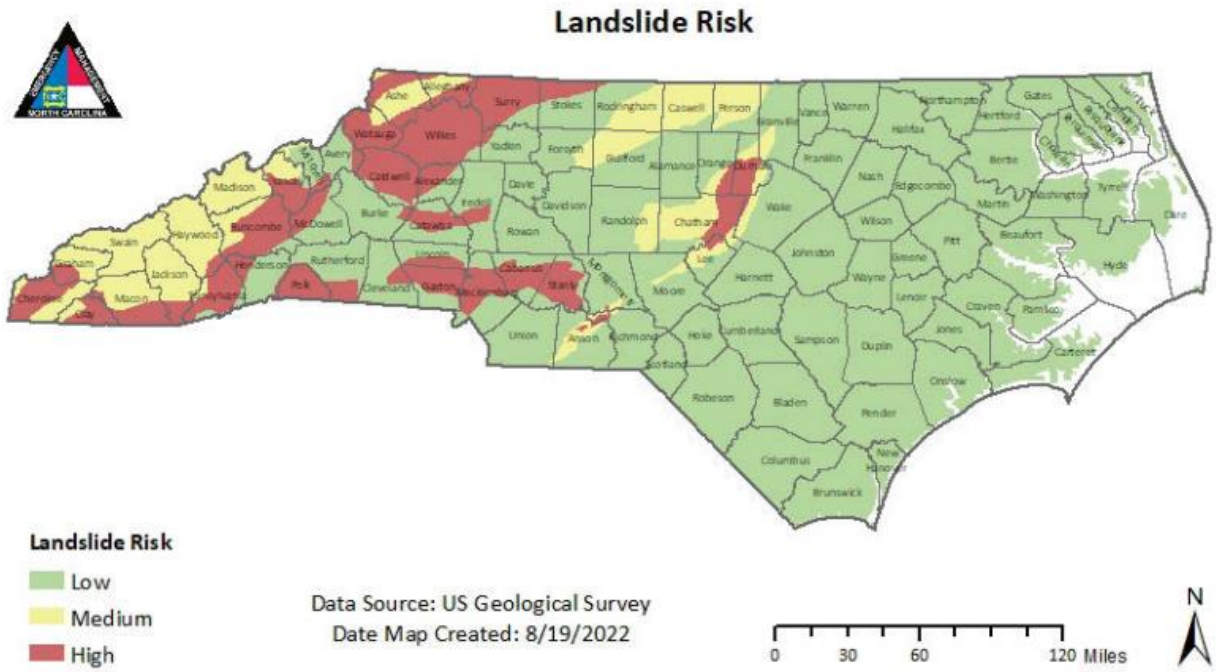
Figure 4.21 – Landslide Incidence and Susceptibility



Source: USGS

The 2023 North Carolina Hazard Mitigation Plan assesses landslide risk across the State. Per the state plan, areas through the central portion of the county are at very high risk from landslides; the rest of the county has low risk. Figure 4.22 shows areas of very high, high and low risk across the county and state.

Figure 4.22 – North Carolina Landslide Risk Areas



Source: 2023 North Carolina Hazard Mitigation Plan

EXTENT

Landslide extent can be defined by susceptibility and incidence, which are defined and depicted in Figure 4.21 and Figure 4.22. Event magnitude is also dependent on topography; landslide risk is higher in areas with steeper slopes.

There are no historical records of landslides in the county to extrapolate an extent of damages, nor has much specific analysis been done on potential impacts. Landslides would have impacts on infrastructure above and below the slide area.

Impact: 1 – Minor

HISTORICAL OCCURRENCES

According to the North Carolina Department of Environmental Quality (NC DEQ), the 2020 Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan and the North Carolina Hazard Mitigation Plan, no recent landslides of record have occurred anywhere in Mecklenburg County.

PROBABILITY OF FUTURE OCCURRENCE

Due to the lack of recorded landslide incidents in the county, probability of occurrence in the future can be extrapolated to be unlikely. However, areas of elevated landslide risk exist in the county, so there is still a low likelihood in these areas that a landslide incident may occur in the future.

Probability: 1 – Unlikely

CLIMATE CHANGE

Water triggers landslides, and per the Fifth National Climate Assessment, frequency and intensity of heavy precipitation events is expected to increase across the country. Additionally, increases in temperatures and precipitation totals are expected in the Southeast. Increased flooding may also result

from more intense tropical cyclone; researchers have noted the occurrence of more intense storms bringing greater rainfall totals, a trend that is expected to continue as ocean and air temperatures rise. More rainfall falling in more intense incidents could contribute to an increase in landslide events.

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

This assessment of vulnerability to landslide in Mecklenburg County is based solely on a hypothetical incident scenario due to no recorded instances. Data on susceptibility is limited for the planning area and only available in an area-wide aggregate.

PEOPLE

People are unlikely to sustain serious physical harm as a result of landslides in Mecklenburg County. Impacts would be relatively minor and highly localized. An individual using an impacted structure or infrastructure at the time of a landslide event may sustain minor injuries.

PROPERTY

Landslides are infrequent in Mecklenburg County and are most likely to occur in small, highly localized instances relative to the general area of risk. Additionally, these events are generally small scale in terms of the magnitude of impacts. As a result, it is difficult to estimate the property at risk to landslide. A potential landslide event in the planning area may cause minor to moderate property damage to one or more buildings or cause localized damage to infrastructure. A landslide event may also result in the need for debris removal.

ENVIRONMENT

Because landslides are essentially a mass movement of sediment, they may result in changes to terrain, damage to trees in the slide area, changes to drainage patterns, and increases in sediment loads in nearby waterways.

CONSEQUENCE ANALYSIS

Table 4.58 summarizes the potential negative consequences of landslide.

Table 4.58 – Consequence Analysis - Landslide

Category	Consequences
Public	Any impacts to the public are expected to be minor. Individuals may sustain injuries if they are in an affected structure or using affected infrastructure when the event occurs.
Responders	Impacts to responders are unlikely. Personnel responsible for debris cleanup or roadway closures may face increased risk.
Continuity of Operations (including Continued Delivery of Services)	Landslide is unlikely to affect continuity of operations in Mecklenburg County.
Property, Facilities and Infrastructure	Buildings and infrastructure may incur minor damages as a result of landslide; however, vulnerability in Mecklenburg County is low.

Category	Consequences
Environment	Environmental impacts are expected to be minimal. Landslide may cause terrain and drainage changes and may temporarily increase sediment loads in nearby waterways.
Economic Condition of the Jurisdiction	Economic impacts are not expected.
Public Confidence in the Jurisdiction's Governance	Any landslide occurring in Mecklenburg County is unlikely to be severe and would not be expected to affect public confidence.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes landslide hazard risk by jurisdiction. Probability was determined to be slightly higher for jurisdictions in the central portions of Mecklenburg County where USGS mapping indicates very high risk. It should be noted that this probability rating reflects a low-consequence event and that the probability of a significant landslide is unlikely across the entire county. All other factors do not vary across jurisdictions.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Charlotte	2	1	1	3	1	1.5	L
Cornelius	1	1	1	3	1	1.2	L
Davidson	1	1	1	3	1	1.2	L
Huntersville	2	1	1	3	1	1.5	L
Matthews	1	1	1	3	1	1.2	L
Mint Hill	1	1	1	3	1	1.2	L
Pineville	1	1	1	3	1	1.2	L
Mecklenburg County	2	1	1	3	1	1.5	L

4.5.9 SEVERE WINTER WEATHER

HAZARD BACKGROUND

A winter storm can range from a moderate snow over a period of a few hours to blizzard conditions with blinding wind-driven snow that lasts for several days. Events may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Some winter storms might be large enough to affect several states, while others might affect only localized areas. Occasionally, heavy snow might also cause significant property damages, such as roof collapses on older buildings.

All winter storm events have the potential to present dangerous conditions to the affected area. Larger snowfalls pose a greater risk, reducing visibility due to blowing snow and making driving conditions treacherous. A heavy snow event is defined by the National Weather Service as an accumulation of 4 of more inches in 12 hours or less. A blizzard is the most severe form of winter storm. It combines low temperatures, heavy snow, and winds of 35 miles per hour or more, which reduces visibility to a quarter mile or less for at least 3 hours. Winter storms are often accompanied by sleet, freezing rain, or an ice storm. Such freeze events are particularly hazardous as they create treacherous surfaces.

Ice storms are defined as storms with significant amounts of freezing rain and are a result of cold air damming (CAD). CAD is a shallow, surface-based layer of relatively cold, stably-stratified air entrenched against the eastern slopes of the Appalachian Mountains. With warmer air above, falling precipitation in the form of snow melts, then becomes either super-cooled (liquid below the melting point of water) or re-freezes. In the former case, super-cooled droplets can freeze on impact (freezing rain), while in the latter case, the re-frozen water particles are ice pellets (or sleet). Sleet is defined as partially frozen raindrops or refrozen snowflakes that form into small ice pellets before reaching the ground. They typically bounce when they hit the ground and do not stick to the surface. However, it does accumulate like snow, posing similar problems and has the potential to accumulate into a layer of ice on surfaces. Freezing rain, conversely, usually sticks to the ground, creating a sheet of ice on the roadways and other surfaces. All of the winter storm elements – snow, low temperatures, sleet, ice, etc. – have the potential to cause significant hazard to a community. Even small accumulations can down power lines and trees limbs and create hazardous driving conditions. Furthermore, communication and power may be disrupted for days.

Advancements in meteorology and forecasting usually allow for mostly accurate forecasting a few days in advance of an impending storm. Most storms have a duration of a few hours; however, impacts can last a few days after the initial incident until cleanup is completed.

Warning Time: 1 – More than 24 hours

Duration: 3 – Less than one week

LOCATION

Severe winter storms are usually a countywide or regional hazard, impacting the entire county at the same time. Some ice storms and winter storms may be large enough to affect several states, while others might affect limited, localized areas. The degree of exposure typically depends on the normal expected severity of local winter weather. The risk of a severe winter storm occurring is uniform across the county. Mecklenburg County is accustomed to smaller scale severe winter weather conditions and often receives winter weather during the winter months. Given the atmospheric nature of the hazard, the entire County has uniform exposure to a winter storm.

Spatial Extent: 4 – Large

EXTENT

The National Oceanic and Atmospheric Administration (NOAA) uses the Regional Snowfall Index (RSI) to assess the societal impact of winter storms in the six easternmost regions in the United States. The index makes use of population and regional differences to assess the impact of snowfall. For example, areas which receive very little snowfall on average may be more adversely affected than other regions, resulting in a higher severity. The Region may experience any level on the RSI scale.

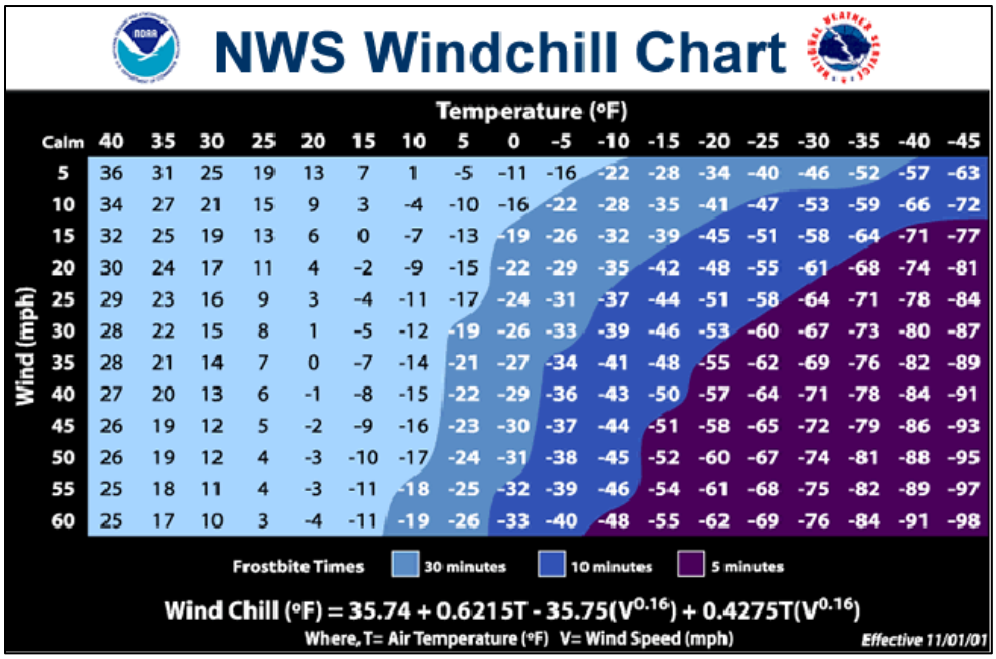
Table 4.59 – Regional Snowfall Index (RSI) Values

Category	RSI Value	Description
1	1-3	Notable
2	3-6	Significant
3	6-10	Major
4	10-18	Crippling
5	18+	Extreme

Source: NOAA

Severe winter storms often involve a mix of hazardous weather conditions. The magnitude of an event can be defined based on the severity of each of the involved factors, including precipitation type, precipitation accumulation amounts, temperature, and wind. The NWS Wind Chill Temperature Index, shown in Figure 4.23, provides a formula for calculating the dangers of winter winds and freezing temperatures.

Figure 4.23 – NWS Wind Chill Temperature Index



Source: http://www.nws.noaa.gov/om/winter/windchill.shtml

The greatest one-day snowfall amount recorded in the past 25 years in the Mecklenburg County planning area was 11.6 inches, recorded on February 26, 2004 at the Charlotte Douglas Airport weather station.

Impact: 2 – Limited

HISTORICAL OCCURRENCES

To get a full picture of the range of impacts of a severe winter storm, data for the following weather types as defined by the National Weather Service (NWS) Raleigh Forecast Office and tracked by NCEI were collected:

- **Blizzard** – A winter storm which produces the following conditions for 3 consecutive hours or longer: (1) sustained winds or frequent gusts 30 knots (35 mph) or greater, and (2) falling and/or blowing snow reducing visibility frequently to less than 1/4 mile.
- **Cold/Wind Chill** – Period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory conditions of 0°F to -14°F with wind speeds 10 mph (9 kt) or greater.
- **Extreme Cold/Wind Chill** – A period of extremely low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined warning criteria, defined as wind chill -15°F or lower with wind speeds 10 mph (9 kt) or greater.
- **Frost/Freeze** – A surface air temperature of 32°F or lower, or the formation of ice crystals on the ground or other surfaces, for a period of time long enough to cause human or economic impact, during the locally defined growing season.
- **Heavy Snow** – Snow accumulation meeting or exceeding 12 and/or 24 hour warning criteria of 3 and 4 inches, respectively.
- **Ice Storm** – Ice accretion meeting or exceeding locally/regionally defined warning criteria of ¼ inch or greater resulting in significant, widespread power outages, tree damage and dangerous travel. Issued only in those rare instances where just heavy freezing rain is expected and there will be no "mixed bag" precipitation meaning no snow, sleet or rain.
- **Sleet** – Sleet accumulations meeting or exceeding locally/regionally defined warning criteria of ½ inch or more.
- **Winter Storm** – A winter weather event that has more than one significant hazard and meets or exceeds locally/regionally defined 12 and/or 24 hour warning criteria for at least one of the precipitation elements. Defined by NWS Raleigh Forecast Office as snow accumulations 3 inches or greater in 12 hours (4 inches or more in 24 hours); Freezing rain accumulations ¼ inch (6 mm) or greater; Sleet accumulations ½ inch (13 mm) or more. Issued when there is at least a 60% forecast confidence of any one of the three criteria being met.
- **Winter Weather** – A winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation, but does not meet locally/regionally defined warning criteria.

Summarized impacts from data collected for the years 1999 through 2024 are included in Table 4.60. Cumulatively, severe winter storms caused $42.6 million in property damage, $1 million in crop damage, and one fatality. In this timeframe, the County experienced no injuries from the impacts of severe winter storm, though these types of impacts are possible in future events. No blizzard events were recorded.

Table 4.60 – Total Severe Winter Weather Events in Mecklenburg County, 1999-2024

Event Type	Number of Recorded Incidents	Total Fatalities	Total Injuries	Total Property Damage	Total Crop Damage
Cold/Wind Chill	5	1	0	$0	$0
Extreme Cold/Wind Chill	1	0	0	$0	$0
Frost/Freeze	3	0	0	$0	$1,000,000
Heavy Snow	11	0	0	$2,500,000	$0
Ice Storm	3	0	0	$40,100,000	$0

Event Type	Number of Recorded Incidents	Total Fatalities	Total Injuries	Total Property Damage	Total Crop Damage
Sleet	2	0	0	$0	$0
Winter Storm	10	0	0	$0	$0
Winter Weather	29	0	0	$0	$0
Total	**64**	**1**	**0**	**$42,600,000**	**$1,000,000**

Source: NCEI

Specific events with recorded injuries, property damage, or crap damage in Mecklenburg County are detailed in Table 4.61.

Table 4.61 – Events with Recorded Severe Winter Weather Impacts in Mecklenburg County, 1999-2024

Date	Event Type	Fatalities	Injuries	Property Damage	Crop Damage
12/4/2002	Ice Storm	0	0	$40,000,000	0
2/26/2004	Heavy Snow	0	0	$2,500,000	0
12/15/2005	Ice Storm	0	0	$100,000	0
4/8/2007	Frost/Freeze	0	0	0	$1,000,000
1/20/2008	Cold/Wind Chill	1	0	0	0
Total		**1**	**0**	**$42,600,000**	**$1,000,000**

Source: NCEI

Several storm impacts from NCEI are summarized below:

December 4, 2002 – Freezing rain began over the extreme southern mountains of North Carolina during the early afternoon on the 4th and had spread into the southwest piedmont by mid-afternoon. Resultant damage due to ice accumulation began during the mid-to-late afternoon. The intensity of the freezing rain increased after midnight, and by sunrise on the 5th, devastating ice accumulations of 1/2 to 1 1/2 inches were observed. The hardest hit area was Charlotte metro. Hundreds of thousands lost power, and the outages lasted for as long as 2 weeks in some areas. Altogether, the storm caused almost $100 million in property damage across the region.

February 26, 2004 – Heavy snow began to fall across the foothills, piedmont, and northern mountains of North Carolina during the late morning. Although snowfall intensity decreased dramatically during the early-to-middle portion of the afternoon, heavy snow redeveloped during the late afternoon, and continued into the evening and overnight hours. Scattered thunderstorms contributed to intense snowfall rates of 2 to 3 inches per hour from time to time, especially in the piedmont, where total snowfall of 12-22 inches occurred. The heaviest amounts occurred in the southwest piedmont, particularly in southern portions of Charlotte metro. Thousands of people were stranded on I-77 during the early afternoon, and some required rescue. The weight of the snowfall caused damage to numerous roofs, while some roofs completely collapsed. Across the foothills and northern mountains, accumulations were considerably lighter, generally in the 4-8 inch range, although amounts of 10-16 inches fell along the Blue Ridge north of I-40. The storm caused $2.5 million in property damage in Mecklenburg County.

April 8, 2007 – An early spring hard freeze saw temperatures fall to the upper teens and lower 20s across much of the western Carolinas and northeast Georgia on the morning of the 8th. This resulted in massive agricultural losses across the region. It was estimated that 90 percent of the apple and peach crop across the area was destroyed. As much as 50 percent of the berry crop was lost, while more than 50 percent of the grape crop across western North Carolina was damaged. NCDC recorded $1,000,000 crop damage to the Mecklenburg County region.

January 20, 2008 – Cold weather was blamed for the death of a homeless man in northwest Charlotte. The low temperature on the 20th was 23 degrees, while the high the previous day was only 36.

January 16, 2022 – Moisture overspread the North Carolina Piedmont early on the 16th as strengthening low pressure moved across the Deep South. Strong northeast winds supplied ample cold air for the precipitation to begin as light snow across much of the area, resulting in light snow accumulations of up to a couple of inches during the pre-dawn hours. Slight warming of the air aloft resulted in snow changing to sleet across much of this area by sunrise. By late morning, total snow and sleet accumulations of 2 to 5 inches were reported, with locations north of I-40 seeing more snow than sleet, and locations south of I-85 seeing more sleet. Further warming aloft resulted in precipitation briefly changing to freezing rain before tapering off by early afternoon, with light ice accretion reported on top of the sleet and snow. However, scattered snow showers redeveloped during the afternoon and evening, producing spotty additional light accumulations.

December 23, 2022 – An arctic cold front swept across the foothills and Piedmont of western North Carolina during the morning of the 23rd and introduced the coldest air mass in more than 5 years. Temperatures in the single digits and lower teens combined with 10 to 20 mph winds to produce wind chill values in the 0 to -15 range from the evening of the 23rd through Christmas Eve morning. While winds abated throughout Christmas Eve into Christmas Day, unseasonably cold weather persisted for the better part of four days. There were numerous reports of frozen and burst pipes along with mostly minor damage to infrastructure throughout the area.

Mecklenburg County received one emergency management declaration and three presidential disaster declarations since 1968 for incidents related to severe winter storms. As a state, North Carolina received eight disaster declarations related to severe winter storms during this timeframe.

Table 4.62 – Emergency & Disaster Declarations in Mecklenburg County due to Severe Winter Weather

Number	Date	Disaster Type	Incident Start	Incident End
EM 3033	3/2/1977	Drought and Freezing	3/2/1977	3/2/1977
DR 1087	1/13/1996	Blizzard	1/6/1996	1/12/1996
DR 1312	1/31/2000	Severe Winter Storm	1/24/2000	2/1/2000
DR 1448	12/12/2002	Severe Ice Storm	12/4/2002	12/6/2002

Source: FEMA, December 20, 2018

PROBABILITY OF FUTURE OCCURRENCE

NCEI records 64 severe winter storm related events during the 25-year period from 1999 through 2024, which equates to an average of 2.5 events per year, or more than 100 percent likelihood of an occurrence in any given year.

Probability: 4 – Highly Likely

CLIMATE CHANGE

Per the 2023 North Carolina Hazard Mitigation Plan, there is uncertainty associated with climate change impacts on future severe winter storms. Global temperature rise could cause shorter and warmer winters in many areas; however, the potential for dangerously low temperatures may increase due to continuing trends of temperature extremes. Warmer winters, however, mean that precipitation that would normally fall as snow may begin to fall as rain or freezing rain instead.

VULNERABILITY ASSESSMENT

PEOPLE

Winter storms are considered deceptive killers because most deaths are indirectly related to the storm event. The leading cause of death during winter storms is from automobile or other transportation

accidents due to poor visibility and/or slippery roads. Additionally, exhaustion and heart attacks caused by overexertion may result from winter storms.

Power outages during very cold winter storm conditions can also create potentially dangerous situations. Elderly people account for the largest percentage of hypothermia victims. In addition, if the power is out for an extended period, residents are forced to find alternative means to heat their homes. The danger arises from carbon monoxide released from improperly ventilated heating sources such as space or kerosene heaters, furnaces, and blocked chimneys. House fires also occur more frequently in the winter due to lack of proper safety precautions when using an alternative heating source. Those without shelter are also especially vulnerability to the impacts of winter weather; extreme cold took the life of one homeless person in 2008.

PROPERTY

According to reported data of storm impacts recorded by the NCEI, between 1999 and 2024 Mecklenburg County experienced $42.6 million in property damage related to the impacts of severe winter storm, and $1 million in crop damage. Of these impacts, $40 million in property damages occurred during one storm, and all $1 million in crop damage occurred in a single storm as well.

ENVIRONMENT

Winter weather events may include ice or snow accumulation on trees which can cause large limbs, or even whole trees, to snap and potentially fall on buildings, cars, or power lines. This potential for winter debris creates a dangerous environment to be outside in; significant injury or fatality may occur if a large limb snaps while a local resident is out driving or walking underneath it.

CONSEQUENCE ANALYSIS

Table 4.63 summarizes the potential negative consequences of severe winter weather.

Table 4.63 – Consequence Analysis – Severe Winter Weather

Category	Consequences
Public	Localized impact expected to be severe for affected areas and moderate to light for other less affected areas.
Responders	Adverse impact expected to be severe for unprotected personnel and moderate to light for trained, equipped, and protected personnel.
Continuity of Operations (including Continued Delivery of Services)	Localized disruption of roads and/or utilities caused by incident may postpone delivery of some services.
Property, Facilities and Infrastructure	Localized impact to facilities and infrastructure in the areas of the incident. Power lines and roads most adversely affected.
Environment	Environmental damage to trees, bushes, etc.
Economic Condition of the Jurisdiction	Local economy and finances may be adversely affected, depending on damage.
Public Confidence in the Jurisdiction's Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes severe winter storm hazard risk by jurisdiction. Severe winter weather risk does not vary substantially by jurisdiction because these events are typically regional in nature.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
All jurisdictions	*4*	*2*	*4*	*1*	*3*	*3.0*	*H*

4.5.10 TORNADOES & THUNDERSTORMS

HAZARD BACKGROUND

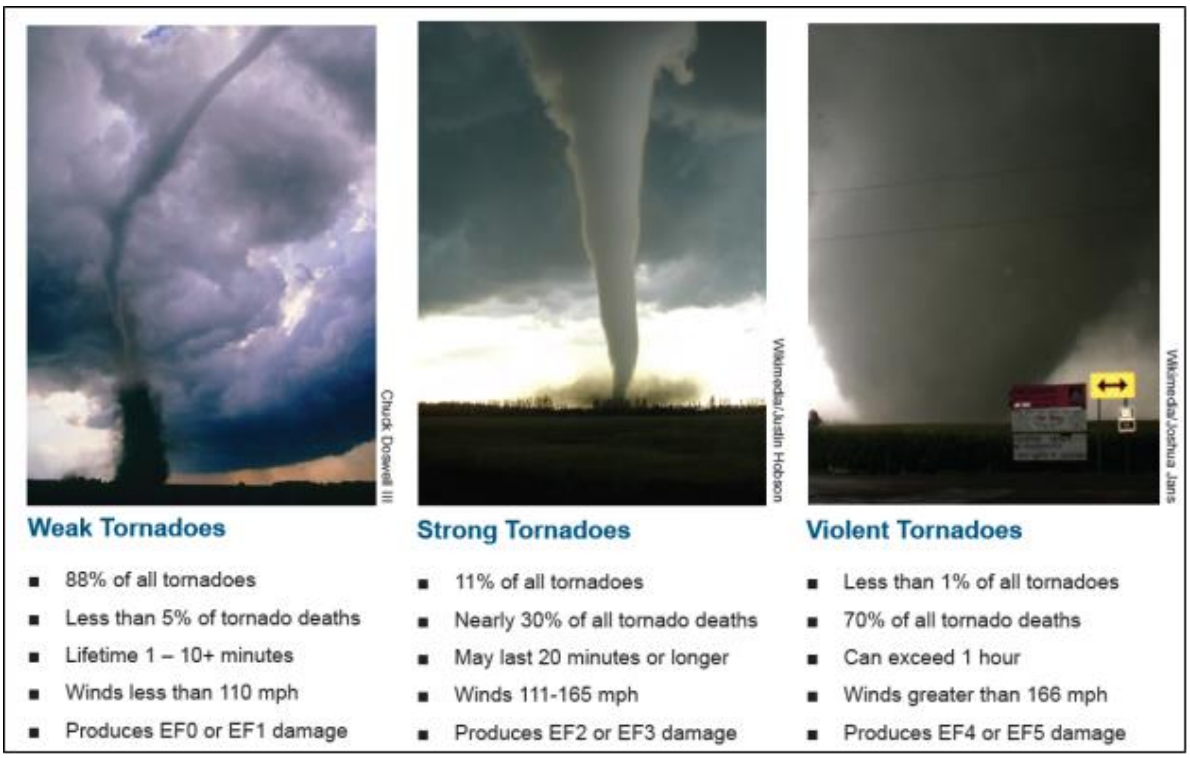
TORNADOES

According to the Glossary of Meteorology (AMS 2000), a tornado is "a violently rotating column of air, pendant from a cumuliform cloud or underneath a cumuliform cloud, and often (but not always) visible as a funnel cloud." Tornadoes can appear from any direction. Most move from southwest to northeast, or west to east. Some tornadoes have changed direction or even backtracked.

Tornadoes are commonly produced by land falling tropical cyclones. Those making landfall along the Gulf coast traditionally produce more tornadoes than those making landfall along the Atlantic coast. Tornadoes that form within hurricanes are more common in the right front quadrant with respect to the forward direction but can occur in other areas as well. According to the NHC, about 10% of the tropical cyclone-related fatalities are caused by tornadoes. Tornadoes are more likely to be spawned within 24 hours of landfall and are usually within 30 miles of the tropical cyclone's center.

Tornadoes have the potential to produce winds in excess of 200 mph (EF5 on the Enhanced Fujita Scale) and can be very expansive – some in the Great Plains have exceeded two miles in width. Tornadoes associated with tropical cyclones, however, tend to be of lower intensity (EF0 to EF2) and much smaller in size than ones that form in the Great Plains. Figure 4.24 provides a description and breakdown of tornadoes by severity. Violent tornadoes, as described below, are unlikely in Mecklenburg County.

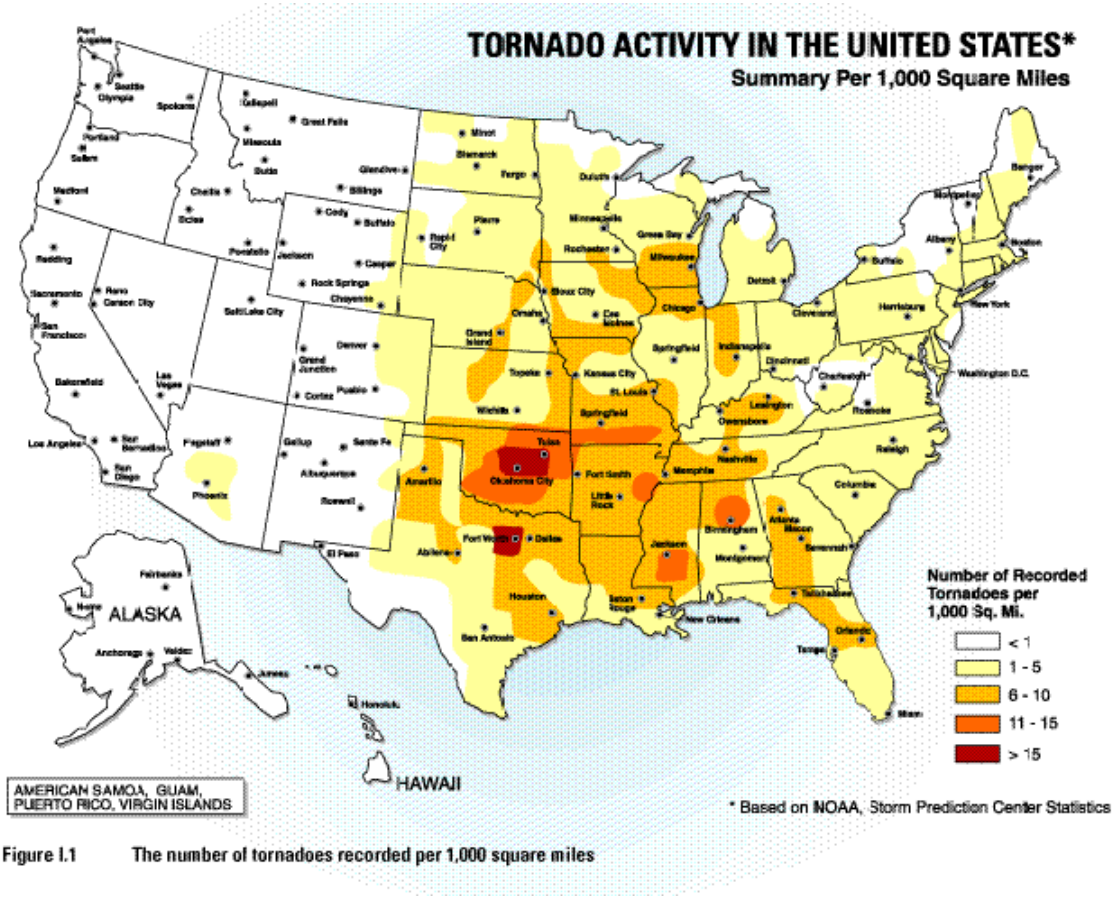
Figure 4.24 – Tornado by Severity



Source: NOAA National Weather Service

Figure 4.25 shows tornado activity in the United States based on the number of recorded tornadoes per 1,000 square miles. North Carolina has averaged 1 to 5 tornadoes per 1,000 square miles.

Figure 4.25 – Tornado Activity in the U.S.



Source: American Society of Civil Engineers

Warning Time: 4 – Less than 6 hours

Duration: 1 – Less than 6 hours

THUNDERSTORM WINDS

Thunderstorms result from the rapid upward movement of warm, moist air. They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that can reach heights of greater than 35,000 ft. As the rising air reaches its dew point, water droplets and ice form and begin falling the long distance through the clouds towards earth's surface. As the droplets fall, they collide with other droplets and become larger. The falling droplets create a downdraft of air that spreads out at earth's surface and causes strong winds associated with thunderstorms.

There are four ways in which thunderstorms can organize: single cell, multi-cell cluster, multi-cell lines (squall lines), and supercells. Even though supercell thunderstorms are most frequently associated with severe weather phenomena, thunderstorms most frequently organize into clusters or lines. Warm, humid conditions are favorable for the development of thunderstorms. The average single cell thunderstorm is approximately 15 miles in diameter and lasts less than 30 minutes at a single location. However,

thunderstorms, especially when organized into clusters or lines, can travel intact for distances exceeding 600 miles.

Thunderstorms are responsible for the development and formation of many severe weather phenomena, posing great hazards to the population and landscape. Damage that results from thunderstorms is mainly inflicted by downburst winds, large hailstones, and flash flooding caused by heavy precipitation. Stronger thunderstorms are capable of producing tornadoes and waterspouts. While conditions for thunderstorm conditions may be anticipated within a few hours, severe conditions are difficult to predict. Regardless of severity, storms generally pass within a few hours.

Warning Time: 4 – Less than six hours

Duration: 1 – Less than six hours

LIGHTNING

Lightning is a sudden electrical discharge released from the atmosphere that follows a course from cloud to ground, cloud to cloud, or cloud to surrounding air, with light illuminating its path. Lightning's unpredictable nature causes it to be one of the most feared weather elements.

All thunderstorms produce lightning, which often strikes outside of the area where it is raining and is known to fall more than 10 miles away from the rainfall area. When lightning strikes, electricity shoots through the air and causes vibrations creating the sound of thunder. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. According to the National Weather Service, lightning kills an average of 20 people nationwide each year. Lightning strikes can also start building fires and wildland fires, and damage electrical systems and equipment.

The watch/warning time for a given storm is usually a few hours. There is no warning time for any given lightning strike. Lightning strikes are instantaneous. Storms that cause lightning usually pass within a few hours.

Warning Time: 4 – Less than six hours

Duration: 1 – Less than six hours

HAIL

According to the National Oceanic and Atmospheric Administration (NOAA), hail is precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere causing them to freeze. The raindrops form into small frozen droplets and then continue to grow as they come into contact with super-cooled water which will freeze on contact with the frozen rain droplet. This frozen rain droplet can continue to grow and form hail. As long as the updraft forces can support or suspend the weight of the hailstone, hail can continue to grow.

At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼" diameter or pea sized hail requires updrafts of 24 mph, while a 2 ¾" diameter or baseball sized hail requires an updraft of 81 mph. The largest hailstone recorded in the United States was found in Vivian, South Dakota on July 23, 2010; it measured eight inches in diameter, almost the size of a soccer ball. While soccer-ball-sized hail is the exception, even small pea sized hail can do damage.

Hailstorms in North Carolina cause damage to property, crops, and the environment, and kill and injure livestock. In the United States, hail causes more than $1 billion in damage to property and crops each year. Much of the damage inflicted by hail is to crops. Even relatively small hail can shred plants to ribbons in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are the other

things most commonly damaged by hail. Hail has been known to cause injury to humans; occasionally, these injuries can be fatal.

The onset of thunderstorms with hail is generally rapid. However, advancements in meteorological forecasting allow for some warning. Storms usually pass in a few hours.

Warning Time: 4 – Less than six hours

Duration: 1 – Less than six hours

LOCATION

TORNADOES

Tornadoes and thunderstorms can occur anywhere in the region and do not have a defined vulnerability zone. Tornadoes typically impact a small area, but damage may be extensive. Tornado locations are completely random, meaning risk to tornado isn't increased in one area of the county versus another. Tornadoes can be spawned by tropical cyclones; however, these tornadoes typically occur up to 2 days before and as many as 3 days after landfall of the tropical cyclone.

Spatial Extent: 2 – Small

THUNDERSTORM WINDS

Thunderstorm wind, lightning, and hail events do not have a defined vulnerability zone. The scope of wind, lightning and hail is generally defined to the footprint of its associated thunderstorm. Given the general size and movement of thunderstorm events, thunderstorm winds from one event may impact a large portion of the planning area. The entirety of Mecklenburg County shares equal risk to the threat of severe weather.

Spatial Extent: 3 – Moderate

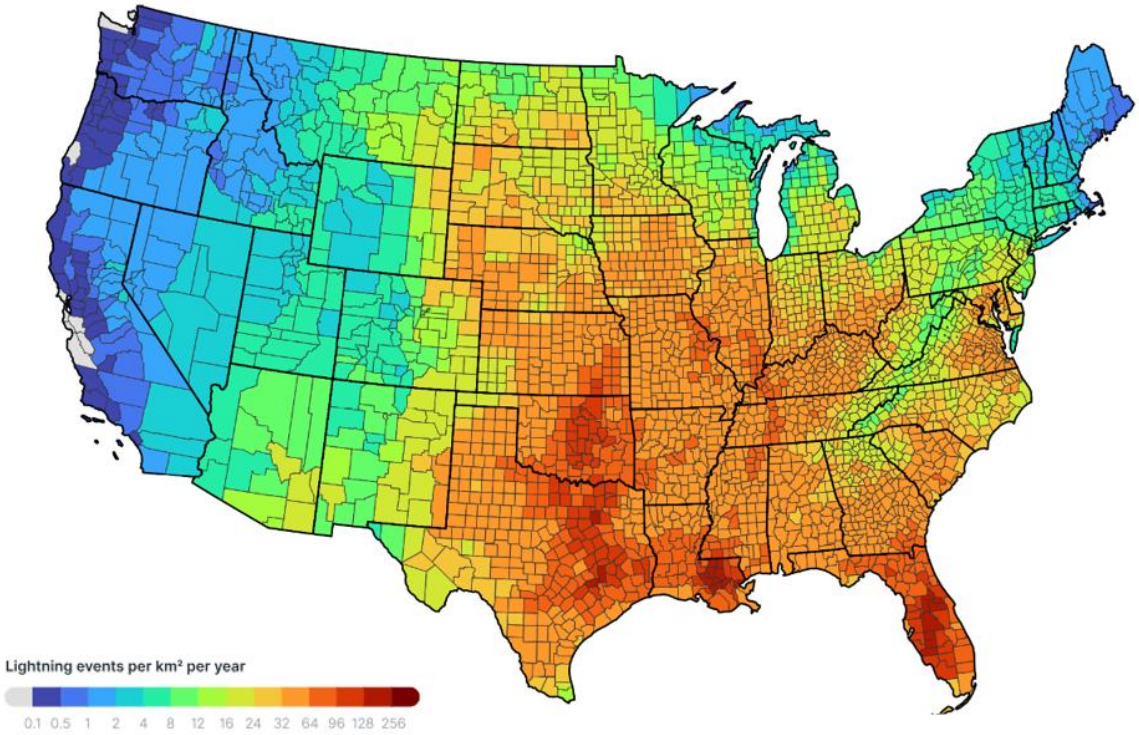
LIGHTNING AND HAIL

The scope of lightning and hail is generally defined to the footprint of its associated thunderstorm. However, large-scale hail tends to occur in a more localized area within the storm, and lightning strikes and associated damages are highly localized and occur randomly. It should be noted that while lightning is most often affiliated with severe thunderstorms, it may also strike outside of heavy rain and might occur as far as 10 miles away from any rainfall. The entirety of Mecklenburg County is uniformly exposed to each of these hazards.

According to the Vaisala flash density map, shown in Figure 4.26, Mecklenburg County experiences 32 to 64 lightning flashes per square km per year. The entire planning area is uniformly exposed to the threat of lightning.

Spatial Extent: 1 – Negligible

Figure 4.26 – Total Lightning Density by County (2016-2022)



EXTENT

TORNADOES

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita (EF) scale. Both scales are sets of wind estimates (not measurements) based on damage. The new scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis, better correlation between damage and wind speed. It is also more precise because it takes into account the materials affected and the construction of structures damaged by a tornado. Table 4.64 shows the wind speeds associated with the enhanced Fujita scale ratings and the damage that could result at different levels of intensity.

Table 4.64 – Enhanced Fujita Scale

EF Number	3 Second Gust (mph)	Damage
0	65-85	**Light damage.** Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
1	96-110	**Moderate damage.** Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.

EF Number	3 Second Gust (mph)	Damage
2	111-135	**Considerable damage.** Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
3	136-165	**Severe damage.** Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
4	166-200	**Devastating damage.** Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.
5	Over 200	**Incredible damage.** Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m; high-rise buildings have significant structural deformation; incredible phenomena will occur.

Source: NWS Storm Prediction Center

Historically, the highest rated tornadoes to pass through Mecklenburg County were rated F2; F2 tornadoes were recorded in 1965, 1968, 1973, 1992 and 2004, causing a combined $2.95 million in property damage; an F2 tornado in March 1992 caused 18 injuries and $2.5 million in property damage.

Impact: 3 – Critical

THUNDERSTORM WINDS

The magnitude of a thunderstorm event can be defined by the storm's maximum wind speed and its impacts. NCEI divides wind events into several types including High Wind, Strong Wind, Thunderstorm Wind, Tornado and Hurricane. For this severe weather risk assessment, High Wind, Strong Wind and Thunderstorm Wind data was collected. Hurricane Wind and Tornadoes are addressed as individual hazards. The following definitions come from the NCEI Storm Data Preparation document.

- **High Wind** – Sustained non-convective winds of 40mph or greater lasting for one hour or longer or winds (sustained or gusts) of 58 mph for any duration on a widespread or localized basis.
- **Strong Wind** – Non-convective winds gusting less than 58 mph, or sustained winds less than 40 mph, resulting in a fatality, injury, or damage.
- **Thunderstorm Wind** – Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 58 mph, or winds of any speed (non-severe thunderstorm winds below 58 mph) producing a fatality, injury or damage.

The Beaufort Wind Force Scale shown in Table 4.65 is an empirical measure that relates wind speed to observed conditions at sea or on land. In the United States, winds of force 6 to 7 are designated as "strong;" 8 to 9 "gale force;" 10 to 11 "usually results in a storm warning or tropical storm warning; and force 12 results in a hurricane warning.

Table 4.65 – Beaufort Wind Force Scale

Rating	(MPH)	Name	Appearance of Wind Effects	
			On Water	On Land
0	<1	Calm	Sea surface smooth and mirror-like	Calm, smoke rises vertically
1	1-3	Light Air	Scaly ripples, no foam crests	Smoke drift indicates wind direction, still wind vanes
2	4-7	Light Breeze	Small wavelets, crests glassy, no breaking	Wind felt on face, leaves rustle, vanes begin to move
3	8-12	Gentle Breeze	Large wavelets, crests begin to break, scattered whitecaps	Leaves and small twigs constantly moving, light flags extended
4	13-18	Moderate Breeze	Small waves 1-4 ft, becoming longer, numerous whitecaps	Dust, leaves, and loose paper lifted, small tree branches move
5	19-24	Fresh Breeze	Moderate waves 4-8 ft taking longer to form, many whitecaps, some spray	Small trees in leaf begin to sway
6	25-31	Strong Breeze	Larger waves 8-13 ft, whitecaps common, more spray	Larger tree branches moving, whistling in wires
7	32-38	Near Gale	Sea heaps up, waves 13-19 ft, white foam streaks of breakers	Whole trees moving, resistance felt walking against wind
8	39-46	Gale	Moderately high (18-25 ft) waves of greater length, edges of crests begin to break into spindrift, foam blown in streaks	Twigs breaking off trees, generally impedes progress
9	47-54	Strong Gale	High waves (23-32 ft), sea begins to roll, dense streaks of foam, spray may reduce visibility	Slight structural damage occurs, slate blows off roofs
10	55-63	Storm	Very high waves (29-41 ft) with overhanging crests, sea white with densely blown foam, heavy rolling, lowered visibility	Seldom experienced on land, trees broken or uprooted, “considerable structural damage”
11	64-72	Violent Storm	Exceptionally high (37-52 ft) waves, foam patches cover sea, visibility more reduced	Very rarely experienced; widespread damage
12	73+	Hurricane	Air filled with foam, waves over 45 ft, sea completely white with driving spray, visibility greatly reduced	Devastation

Source: NOAA Storm Prediction Center

The strongest recorded thunderstorm wind event in the county occurred on July 23, 1962 with a measured gust of 92 mph, though the NCEI recorded no location or impact data.

Impact: 2 – Limited

LIGHTNING

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the National Weather Service to define lightning activity into a specific categorical scale. The LAL is a common parameter that is part of fire weather forecasts nationwide.

Table 4.66 – Lightning Activity Level Scale

Lightning Activity Level Scale	
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground lightning strikes in a five-minute period
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a five-minute period
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a five-minute period
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a five-minute period
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag warning

Source: National Weather Service

With the right conditions in place, the entire county is susceptible to each lightning activity level as defined by the LAL. Most lightning strikes cause limited damage to specific structures in a limited area, and cause very few injuries or fatalities, and minimal disruption on quality of life.

Impact: 1 – Minor

HAIL

The NWS classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4.67 indicates the hailstone measurements utilized by the NWS.

Table 4.67 – Hailstone Measurement Comparison Chart

Average Diameter	Corresponding Household Object
.25 inch	Pea
.5 inch	Marble/Mothball
.75 inch	Dime/Penny
.875 inch	Nickel
1.0 inch	Quarter
1.5 inch	Ping-pong ball
1.75 inch	Golf ball
2.0 inch	Hen egg
2.5 inch	Tennis ball
2.75 inch	Baseball
3.00 inch	Teacup
4.00 inch	Grapefruit
4.5 inch	Softball

Source: National Weather Service

The Tornado and Storm Research Organization (TORRO) has further described hail sizes by their typical damage impacts. Table 4.68 describes typical intensity and damage impacts of the various sizes of hail.

Table 4.68 – Tornado and Storm Research Organization Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Hard Hail	5-9	0.2-0.4	Pea	No damage
Potentially Damaging	10-15	0.4-0.6	Mothball	Slight general damage to plants, crops
Significant	16-20	0.6-0.8	Marble, grape	Significant damage to fruit, crops, vegetation
Severe	21-30	0.8-1.2	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
Severe	31-40	1.2-1.6	Pigeon's egg > squash ball	Widespread glass damage, vehicle bodywork damage
Destructive	41-50	1.6-2.0	Golf ball > Pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
Destructive	51-60	2.0-2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
Destructive	61-75	2.4-3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
Destructive	76-90	3.0-3.5	Large orange > softball	Severe damage to aircraft bodywork
Super Hailstorms	91-100	3.6-3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
Super Hailstorms	>100	4.0+	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: Tornado and Storm Research Organization (TORRO), Department of Geography, Oxford Brookes University
Notes: In addition to hail diameter, factors including number and density of hailstones, hail fall speed and surface wind speeds affect severity.

The average hailstone size recorded between 1999 and 2023 in Mecklenburg County was a little under 1" in diameter; the largest hailstone recorded was 2", recorded on both April 9, 2011 and May 10, 2011. Despite the large hail size, these storms resulted in no deaths, injuries, or property and crop damages per NCEI.

Impact: 1 – Minor

HISTORICAL OCCURRENCES

TORNADOES

NCEI storm reports were reviewed from 1999 through 2023 to assess whether recent trends varied from the longer historical record. According to NCEI, Mecklenburg County experienced 10 tornado incidents between 1999 and 2023, causing no fatalities, 4 injuries, over $2.3 million in property damage and no crop damage. Table 4.69 shows historical tornadoes in Mecklenburg County during this time period. Figure 4.27 reflects the tracks of past tornadoes that passed through the Region from 1950 through 2022 according to data from the NOAA/NWS Storm Prediction Center.

Table 4.69 – Recorded Tornadoes in Mecklenburg County, 1999-2023

Location	Date	Time	Magnitude	Deaths	Injuries	Property Damage
Pineville	8/1/1999	1935	F0	0	0	$0
Charlotte	9/7/2004	1045	F2	0	0	$150,000
Charlotte	3/8/2005	740	F1	0	0	$50,000
Paw Creek	5/9/2008	123	EF1	0	0	$0
Wilgrove	3/3/2012	235	EF2	0	4	$1,500,000
Charlotte	5/15/2014	546	EF0	0	0	$10,000
Shopton	11/30/2016	1826	EF1	0	0	$100,000
Pineville	2/6/2020	1216	EF1	0	0	$500,000
Hickory Grove	5/23/2022	1236	EF1	0	0	$20,000
Huntersville	8/7/2023	1607	EF0	0	0	$20,000
Total				**0**	**4**	**$2,350,000**

Source: NCEI

Specific incidents with some level of impact include:

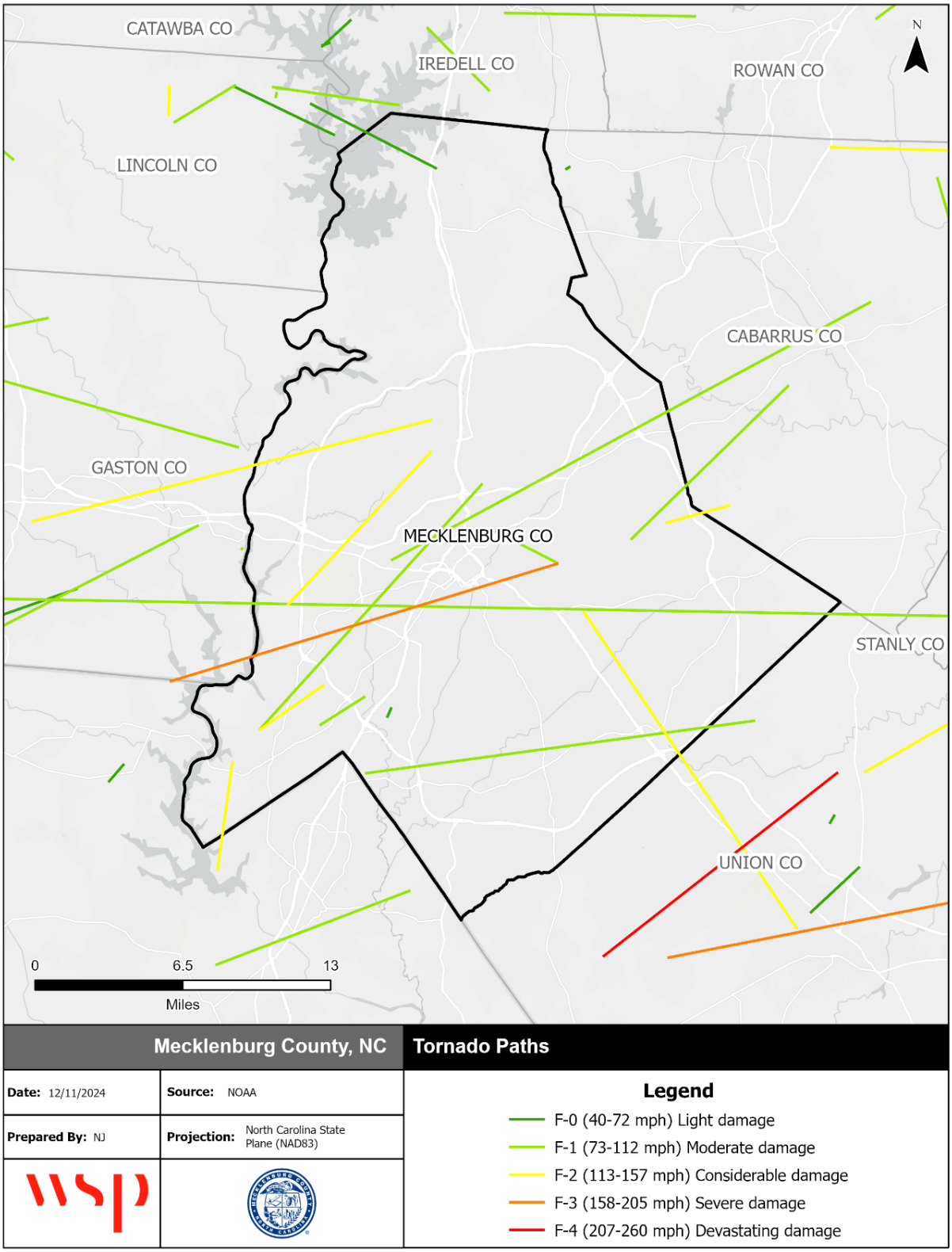
September 7, 2004 – This tornado moved north from South Carolina, and produced widespread damage to trees and power lines along its 2-mile path across the southwest corner of Mecklenburg County. The roof of a well-constructed home was blown off, and several other homes incurred shingle damage. A sheet of wallboard was torn off a garage wall and blown away. There was additional damage to automobiles and homes due to fallen trees.

March 3, 2012 – A NWS Storm Survey found the path of a strong tornado that developed rapidly over eastern portions of the Charlotte metro area during the early morning hours of March 3rd. The tornado touched down near the intersection of Dulin Creek Rd and Little Whiteoak Rd, moving just south of Plaza Rd extension. The tornado affected two subdivisions in Mecklenburg County. Four homes slid off their foundations and were completely destroyed. Twenty-nine homes were rendered uninhabitable from collapsed exterior walls. A total of 162 homes were damaged in the county. Four people were injured in this area. The tornado crossed I-485, just south of Plaza Rd Extension before moving into Cabarrus County. The total path length in Mecklenburg County was a little over 1.5 miles, while the maximum width was 200 yards. $1.5 million in property damages were recorded for this storm.

February 6, 2020 – NWS storm survey found a tornado damage path that began almost exactly on the NC/SC line along Nations Ford Rd west of Pineville. Trees were snapped or uprooted along its path until it reached an industrial area west of I-485 where several large buildings suffered roof damage and a wall collapsed at a building under construction. The damage in this area suggests winds of 90 to 95 mph which were the strongest winds of the event. The tornado maintained strength as it crossed I-485 and traveled across largely residential areas of southern Mecklenburg County causing scattered tree damage. At least one tree fell on a house in this area. More damage to large trees occurred along Highway 51 in Matthews east of Elizabeth Lane Elementary. The tornado weakened from there but caused more tree damage on West John St closer to the city center. Tree damage continued in scattered locations after the tornado crossed Independence Blvd and again I-485 before entering Union County.

August 7, 2023 – NWS storm survey confirmed an EF0 tornado touched down just south of Lake Norman. Damage consisted of numerous tree branches torn off, some trees uprooted, and some minor damage to building exteriors.

Figure 4.27 – Tornado Paths Through Mecklenburg County, 1950-2022



Source: NOAA/NWS Storm Prediction Center

THUNDERSTORM WINDS

Between January 1, 1999 and December 31, 2023, the NCEI recorded 293 separate incidents of thunderstorm winds, occurring on 226 separate days. These events caused $2.67 million in recorded property damage, 9 injuries and one fatality. The recorded gusts averaged 58.7 mph, with the highest gusts recorded at 86.3 mph in Charlotte during a storm on August 18, 2000. Wind gusts with property damage recorded averaged over $40,000 in damage per event, with five gusts accounting for $1,450,000 property damage alone. All 66 incidents with recorded damages are detailed in Table 4.70:

Table 4.70 – Thunderstorm Winds with Property Damages in Mecklenburg County, 1999-2023

Location	Date	Time	Wind Speed (mph)	Fatalities	Injuries	Property Damage
Charlotte	8/18/2000	1630	86.3	0	0	$250,000
Cornelius	5/13/2002	1635	63.3	0	0	$3,000
Charlotte	5/13/2002	1705	69.0	0	0	$50,000
Matthews	5/13/2002	1720	59.8	0	0	$50,000
Pineville	7/1/2002	1749	57.5	0	0	$1,000
Paw Creek	7/2/2002	1710	69.0	0	0	$3,000
Charlotte	7/3/2002	1656	57.5	0	0	$7,500
Charlotte	7/3/2002	1707	57.5	0	0	$20,000
Charlotte	7/3/2002	1815	63.3	0	0	$3,000
Charlotte	8/16/2002	1900	57.5	0	0	$1,000
Cornelius	8/24/2002	1730	63.3	0	0	$3,000
Charlotte	5/2/2003	1619	74.8	0	2	$100,000
Huntersville	5/2/2003	1630	69.0	0	3	$25,000
Charlotte	7/9/2003	1550	57.5	0	0	$1,000
Huntersville	7/11/2003	1605	57.5	0	0	$1,000
Huntersville	7/12/2003	2235	57.5	0	0	$5,000
Charlotte	8/5/2003	1628	57.5	0	0	$5,000
Charlotte	8/22/2003	1659	62.1	0	0	$1,000
Huntersville	11/19/2003	750	57.5	0	0	$1,000
Charlotte	11/19/2003	800	57.5	0	0	$1,000
Charlotte	5/31/2004	700	57.5	0	0	$1,000
Charlotte	1/14/2005	30	57.5	0	0	$4,000
Charlotte	1/14/2005	51	57.5	0	0	$5,000
Charlotte	3/8/2005	726	69.0	0	0	$50,000
Pineville	3/8/2005	737	69.0	0	0	$20,000
Davidson	7/28/2005	1731	63.3	0	0	$10,000
Charlotte	2/4/2006	1330	57.5	0	0	$10,000
Charlotte	6/11/2006	1700	69.0	0	0	$100,000
Charlotte	8/26/2007	1658	69.0	0	0	$50,000
North Charlotte	4/19/2013	1500	46.0	0	0	$5,000
Shopton	6/10/2013	1358	57.5	0	0	$10,000
Charlotte	6/26/2015	2054	57.5	0	0	$2,000
Charlotte	7/8/2015	1640	57.5	0	0	$10,000

Location	Date	Time	Wind Speed (mph)	Fatalities	Injuries	Property Damage
Derita	8/11/2015	1454	46.0	0	0	$100,000
Griffith	8/19/2015	1515	46.0	0	0	$20,000
Davidson	9/10/2015	1630	57.5	0	0	$5,000
Clt Wilgrove Arpk Ar	9/10/2015	1805	46.0	0	0	$20,000
Douglas Muni Arpt	2/24/2016	1227	57.5	0	0	$25,000
Chadwick	7/8/2016	1931	57.5	0	0	$20,000
Charlotte	7/21/2016	1353	57.5	0	0	$50,000
Charlotte	8/17/2016	1638	57.5	0	0	$40,000
Shopton	3/1/2017	1916	57.5	0	0	$5,000
Charlotte	3/1/2017	1928	57.5	0	0	$10,000
North Charlotte	5/5/2017	10	46.0	0	0	$1,000
Clt Brockenbrough Ar	6/4/2017	1520	46.0	0	1	$5,000
Huntersville	7/6/2017	1608	63.3	0	0	$2,000
Croft	7/8/2017	1710	46.0	0	0	$1,000
Charlotte	7/18/2017	1938	57.5	0	0	$200,000
Homestead	7/28/2017	1546	57.5	0	0	$25,000
Charlotte	8/7/2017	2142	57.5	0	0	$100,000
(Clt)Charlotte/Dougl	4/15/2018	1413	69.0	0	0	$5,000
Griffith	7/24/2018	1830	46.0	0	0	$10,000
Homestead	6/30/2019	1927	57.5	0	0	$1,000
Caldwell	8/17/2019	1607	63.3	0	0	$10,000
Clt Brockenbrough Ar	8/17/2019	1631	57.5	0	0	$10,000
Pineville	1/11/2020	2208	57.5	0	0	$10,000
(CLT) Charlotte/Dougl	4/13/2020	404	58.6	0	1	$50,000
Griffith	5/22/2020	1510	63.3	1	1	$500,000
Stonehaven	7/22/2020	2118	57.5	0	0	$50,000
Alexanders Store	6/9/2022	1305	57.5	0	0	$10,000
Charlotte	7/16/2022	1315	46.0	0	0	$5,000
Huntersville	7/26/2022	1325	46.0	0	0	$5,000
Dixie	8/12/2022	1705	63.3	0	0	$50,000
Griffith	1/12/2023	1855	46.0	0	0	$10,000
Charlotte	3/3/2023	2031	57.5	0	0	$10,000
Thrift	8/7/2023	1617	57.5	0	1	$500,000
			Total	**1**	**9**	**$2,673,500**

Source: NCEI

In addition to recorded thunderstorm wind events, NCEI reports 19 high wind and strong wind events during this same period that caused $770,000 in property damage. Of all wind events recorded by NCEI, 10 directly caused deaths or injuries. Those incidents are recorded below:

Table 4.71 – Recorded Wind Events with Injuries and/or Fatalities, 1999-2023

Location	Event Type	Date	Wind Speed (mph)	Fatalities	Injuries	Property Damage
Huntersville	Thunderstorm Wind	5/2/2003	69	0	3	$25,000
Charlotte	Thunderstorm Wind	5/2/2003	74.8	0	2	$100,000
Mecklenburg County	High Wind	3/7/2004	74.8	1	2	$75,000
Mecklenburg County	High Wind	3/28/2000	57.5	0	1	$0
Mecklenburg County	High Wind	4/17/2001	57.5	1	0	$0
Mecklenburg County	Strong Wind	3/9/2008	51.8	1	0	$0
Clt Brockenbrough Ar	Thunderstorm Wind	6/4/2017	46.0	0	1	$5,000
(CLT) Charlotte/Dougl	Thunderstorm Wind	4/13/2020	58.7	0	1	$50,000
Griffith	Thunderstorm Wind	5/22/2020	63.3	1	1	$500,000
Thrift	Thunderstorm Wind	8/7/2023	57.5	0	1	$500,000
			Total	**4**	**12**	**$ 1,255,000**

Source: NCEI

LIGHTNING

According to NCEI data, there were 43 lightning strikes reported between 1999 and 2023. Of these, 31 events recorded property damage totaling over $2.395 million. These events directly caused 11 injuries and 3 fatalities. Event narratives indicate in some cases that property damage occurred but was not estimated; therefore, actual property damage amounts are higher. No crop damage was recorded by these strikes. NCEI has had no new reports of lightning strikes since 2017 in the planning area. It should be noted that lightning events recorded by the NCEI are only those that are reported; it is certain that additional lightning incidents have occurred in Mecklenburg County. Table 4.72 details NCEI-recorded lightning strikes from 1999 through 2023.

Table 4.72 – Recorded Lightning Strikes in Mecklenburg County, 1999-2023

Location	Date	Time	Fatalities	Injuries	Property Damage
Charlotte	7/31/1999	100	0	0	$0
Charlotte	6/14/2000	1330	0	1	$0
Charlotte	7/7/2000	230	0	0	$100,000
Charlotte	7/3/2002	1707	0	0	$20,000
Charlotte	7/3/2002	1725	0	0	$10,000
Charlotte	7/4/2002	1400	0	0	$260,000
Huntersville	5/2/2003	1630	0	1	$0
Charlotte	6/16/2003	1820	0	0	$250,000
Charlotte	7/19/2003	1800	0	0	$30,000
Charlotte	7/21/2003	1859	0	1	$0
Matthews	7/29/2003	1536	3	1	$30,000

Location	Date	Time	Fatalities	Injuries	Property Damage
Charlotte	7/29/2003	1730	0	1	$0
Charlotte	8/14/2003	1745	0	0	$0
Charlotte	5/23/2004	1600	0	0	$250,000
South Portion	6/8/2004	1800	0	0	$5,000
Charlotte	7/5/2004	1940	0	0	$20,000
Charlotte	5/10/2005	1830	0	0	$50,000
Charlotte	6/7/2005	1700	0	0	$25,000
Charlotte	7/1/2005	2030	0	0	$60,000
Matthews	7/18/2005	1900	0	0	$0
Huntersville	7/28/2005	1800	0	0	$20,000
Douglas Airport	4/3/2006	1800	0	0	$15,000
Charlotte	6/23/2006	1430	0	1	$0
Charlotte	7/22/2006	2100	0	0	$150,000
Huntersville	6/24/2007	1900	0	0	$20,000
Charlotte	7/7/2007	1515	0	0	$20,000
Charlotte	7/22/2008	1940	0	0	$50,000
Derita	5/2/2009	1630	0	0	$0
Pineville	6/13/2010	1620	0	0	$50,000
Alexanders Store	6/13/2010	1645	0	0	$150,000
Matthews	7/13/2010	1600	0	0	$100,000
Oakhurst	7/27/2010	1800	0	0	$100,000
Matthews	7/27/2010	1800	0	0	$100,000
Pineville	6/21/2011	2130	0	0	$200,000
Pineville	8/7/2011	1900	0	0	$150,000
Smithville	3/20/2012	2130	0	0	$50,000
Griffith	5/22/2012	2130	0	0	$50,000
Croft	7/1/2012	1730	0	0	$25,000
Griffith	7/16/2012	1630	0	0	$5,000
Charlotte	6/25/2014	1500	0	1	$0
Huntersville	8/19/2015	1700	0	1	$30,000
Yorkmont Park	9/10/2015	1825	0	2	$0
Thomasboro	6/15/2017	1930	0	1	$0
Total			**3**	**11**	**$2,395,000**

Source: NCEI

The following are a selection of narrative descriptions recorded in NCEI for lightning events that occurred in Mecklenburg County:

June 14, 2000 – Thunderstorms developed in the foothills and piedmont during the early afternoon. One became severe and produced dime size hail in the Greenlee community, outside of Marion. Another severe thunderstorm produced several small microbursts in the Sturdivants area. A brick well house was destroyed, several trees were downed, some fell on houses, tin was torn off of barns, and one barn had additional light structural damage. A woman hanging clothes out to dry was shocked and injured by lightning which struck nearby her Charlotte home.

July 7, 2002 – At least 3 major fires were ignited by lightning in Charlotte, some at apartments and houses.

June 16, 2003 – Lightning stuck the roof a condominium in Charlotte, resulting in a fire which caused significant damage.

July 29, 2003 – Three people were killed and another injured when lightning struck a large oak tree in Matthews, which then fell on and crushed the vehicle they were sitting in. Two other vehicles were damaged by the fallen tree, causing $30,000 in property damage.

June 25, 2014 – A small area of showers intensified slightly, producing occasional lightning strikes as it moved over the Charlotte metro area during late afternoon. One of these strikes hit a 9-year-old boy near Johnson C. Smith University, causing serious injuries.

HAIL

NCEI records 151 separate hail incidents across 102 days between January 1, 1999 and December 31, 2023 in Mecklenburg County. The largest diameter hail recorded in the County during this period was two inches, recorded two separate times; the average hail size in all storms was a little under one inch in diameter. No injuries, fatalities, property damage or crop damages were recorded by NCEI for these incidents, though it should be noted that as insured loss, hail damage numbers are not reliably reported and are usually orders of magnitude higher than available reports.

The following are a selection of narrative descriptions recorded in NCEI for lightning events that occurred in Mecklenburg County:

May 10, 2000 – A severe thunderstorm blew down numerous trees, with at least 4 falling across houses, in a 4 block area in Mount Holly. Approximately 1000 people were without power. An airport weather observer and trained spotter in the same area reported quarter size hail at the Charlotte Douglas International Airport. The hail lasted for some time and winds gusted between 40 and 50 mph, causing some limbs to fall.

June 24, 2007 – Numerous severe storms affected western North Carolina beginning in the early afternoon and lasting well into the night. Reported at the intersection of I-77 and Harris Blvd. Car windshields were reportedly broken in this area.

April 25, 2020 – Isolated thunderstorms developed in the vicinity of a warm front across the mountains of southwest North Carolina and the northern foothills during the evening. In addition, a couple of supercell thunderstorms moved into the southern Piedmont from upstate South Carolina. Several of these storms produced large hail and brief damaging winds. Public reported (via Social Media) quarter size hail in the Oakdale area.

June 26, 2023 – Scattered thunderstorms moved across the Piedmont during the late afternoon and evening. Several of these storms became severe, producing hail up to 2-inch diameter along with localized damaging wind gusts.

PROBABILITY OF FUTURE OCCURRENCE

Based on historical occurrences recorded by NCEI for the 25-year period from 1999 through 2023, Mecklenburg County averages 9 days with thunderstorm wind events per year. Over this same period, 39 lightning events were reported as having caused death, injury, or property damage, which equates to an average of 1.56 damaging lightning strikes per year.

Over the 25-year period from 1999 through 2023, Mecklenburg County experienced 151 reported hail incidents; this averages to over 6 reported incidents per year somewhere in the planning area. Over this same period, 10 tornado incidents were reported, which equates to 40 percent annual probability.

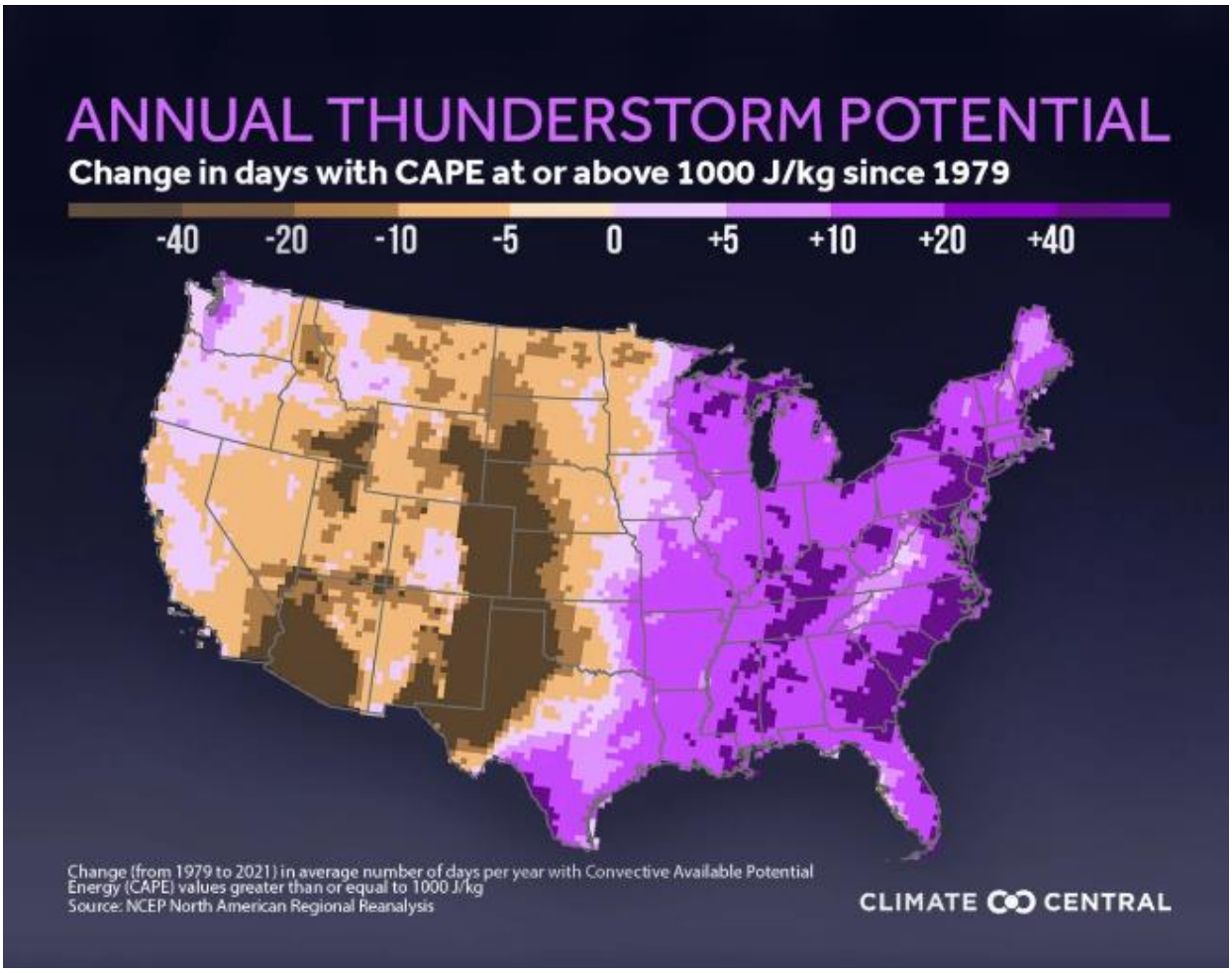
Based on these historical occurrences, there is a 100% chance that the County will experience severe weather each year. The probability of a damaging impacts is highly likely.

Probability: 4 – Highly Likely

CLIMATE CHANGE

According to the National Aeronautics and Space Administration (NASA), thunderstorm events in the future are likely to become more frequent in the southeast as a result of weather extremes. Thunderstorm potential is measured by an index that NASA created called the Convective Available Potential Energy (CAPE) index. This measures how warm and moist the air is, which is a major contributing factor in thunderstorm/tornado formation. Between 1979 and 2021, Mecklenburg County experienced 10-20 more days on average with CAPE at or above 1000 J/kg, which is considered a high cape value. Figure 4.28 below shows the change in days with high potential for thunderstorms nationwide.

Figure 4.28 – Change in Days with High Thunderstorm Potential from 1979 to 2021



Source: NCEP North American Regional Reanalysis, Climate Central 2022

NASA projects that by the period of 2072-2099, the CAPE in the southeastern United States will increase dramatically. Parts of North Carolina are in an area that will likely experience the greatest increase in CAPE in the United States, and the entire state is likely to experience at least some increase.

For a thunderstorm to become a supercell event, meaning that it produces more severe weather like large hail, damaging winds, and tornadoes, it relies on not only warm moist air, but also wind at different levels moving in different directions at different speed (wind shear). As the planet warms, wind shear, unlike

warm, moist air, is expected to decrease. Therefore, it is difficult to predict if more supercell thunderstorm events and the tornadoes they can bring with them are more likely to occur.

Additionally, while supercell events are associated with tornadoes, only about 20% of supercell thunderstorms produce tornadoes. To complicate things further, no one fully understands how tornadoes are formed. Therefore, there is no identified conclusion on how climate change will impact tornadoes.

The relationship between hail and climate change is also unclear, however, a 2022 study shows that climate change could increase severe and/or significant spring hailstorms within the Central U.S. (Fan, et.al, 2022). Lightning has a more direct correlation with increasing temperatures as it occurs more frequently when the temperature is hotter than when it is colder. Romps, et. al postulate that lightning will increase by 12% for every degree of rise global average air temperature.

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

Population and property at risk to wind events was estimated using data from the North Carolina Emergency Management (NCEM) IRISK database, which was compiled in NCEM's Risk Management Tool.

PEOPLE

People and populations exposed to the elements are most vulnerable to severe weather. A common hazard associated with wind events is falling trees and branches. Risk of being struck by lightning is greater in open areas, at higher elevations, and on the water. Lightning can also cause cascading hazards, including power loss. Loss of power could critically impact those relying on energy to service, including those that need powered medical devices. Additionally, the ignition of fires is always a concern with lightning strikes.

The availability of sheltered locations such as basements, buildings constructed using hail-resistant materials and methods, and public storm shelters, all reduce the exposure of the population. Individuals who work outdoors may face increased risk. Residents living in mobile homes are also more vulnerable to hail events due to the lack of shelter locations and the vulnerability of the housing unit to damages.

According to the 2023 American Community Survey (ACS), 7,218 occupied housing units (1.5%) in Mecklenburg County are classified as "mobile homes or other types of housing." Based on an estimated average of 2.6 persons per household from the 2023 ACS, there are approximately 18,766 people in the County living in mobile home. Individuals who work outdoors may also face increased risk; data on outdoor workers is limited.

Between 1999 and 2023, the NCEI record three fatalities and 11 injuries attributed to lightning in Mecklenburg County. NCEI records one fatality and nine injuries attributed to thunderstorm wind events in Mecklenburg County. There are no injuries or fatalities attributed to hail. NCEI records zero fatalities and four injuries attributed to Tornadoes during this same time period.

PROPERTY

Property damage caused by lightning usually occurs in one of two ways – either by direct damages through fires ignited by lightning, or by secondary impacts due to power loss. According to data collected on lightning strikes in Mecklenburg County, the vast majority of recorded property damage was due to structure fires. Lightning protection systems, such as building and equipment grounding and surge protectors, can minimize damages to property from lightning.

NCEI records lightning impacts over 25 years (1999-2023), with $2,395,000 in property damage recorded. Historically, this has resulted in $95,800 in property impacts annually in Mecklenburg County. The average impact from lightning per incident in Mecklenburg County is almost $56,000.

General damages to property from hail are direct, including destroyed windows, dented cars, and building, roof and siding damage in areas exposed to hail. Hail can also cause enough damage to cars to cause them to be totaled. The level of damage is commensurate with both a material's ability to withstand hail impacts, and the size of the hailstones that are falling. Construction practices and building codes can help maximize the resistance of the structures to damage. Large amounts of hail may need to be physically cleared from roadways and sidewalks, depending on accumulation. Hail can cause other cascading impacts, including power loss.

During a 25-year span between January 1, 1999 and December 31, 2023 in Mecklenburg County, NCEI reported no property or crop damages due to hail.

According to PolicyGenius, North Carolina had one of the highest number of hail loss claims (25,026) in the U.S. in 2019. It should be noted that property damage due to hail is usually insured loss, with damages covered under most major comprehensive insurance plans. Because of this, hail losses are notoriously underreported by the NCEI. It is difficult to find an accurate repository of hail damages in Mecklenburg, thus the NCEI is still used to form a baseline.

When strong enough, wind events can cause significant direct damage to buildings and infrastructure. NCEI reports $3,443,500 in property losses due to wind events over 25 years (1999-2023). The average impact from wind per incident in Mecklenburg County is $45,309. NCEM's IRISK database estimates damages from increasing magnitudes of wind events, detailed in Table 4.73 through Table 4.76. Note that these tables sum the total estimated damage should every exposed property in each jurisdiction be impacted by an event of the given magnitude. Therefore, these tables are not an approximation of the total damages that would occur from an event of each magnitude because a thunderstorm wind event would not uniformly impact the entire Region. These tables should only be used to understand potential damages relative to storms of varying degrees of severity.

General damages to property are both direct (what the tornado physically destroys) and indirect (additional costs, damages, and losses attributed to secondary hazards spawned by the tornado or due to the damages caused by the tornado). Depending on its size and path, a tornado is capable of damaging and eventually destroying almost anything. Construction practices and building codes can help maximize the resistance of the structures to damage. Estimated building damages for different tornado magnitudes are detailed in Table 4.77 through Table 4.81.

Table 4.73 – Estimated Buildings Impacted by 50-Year Thunderstorm Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,400	93	$6,476,783	1,207	5	$2,553,327	369	2	$344,357	23,976	100	$9,374,467
Charlotte	246,090	228,237	93	$84,236,655	14,770	6	$27,688,016	2,894	1	$4,678,392	245,901	100	$116,603,064
Cornelius	10,558	9,841	93	$5,566,212	630	6	$634,746	87	1	$103,243	10,558	100	$6,304,201
Davidson	3,871	3,545	92	$1,798,420	270	7	$213,282	56	1	$83,429	3,871	100	$2,095,131
Huntersville	19,554	18,353	94	$6,932,190	966	5	$1,010,379	223	1	$620,262	19,542	100	$8,562,831
Matthews	10,007	9,209	92	$3,299,657	665	7	$389,531	133	1	$378,085	10,007	100	$4,067,273
Mint Hill	9,880	9,369	95	$2,930,713	417	4	$219,216	94	1	$56,508	9,880	100	$3,206,436
Pineville	2,731	2,037	75	$603,767	552	20	$318,820	142	5	$23,182	2,731	100	$945,769
Total	**326,758**	**302,991**	**93**	**$111,844,397**	**19,477**	**6**	**$33,027,317**	**3,998**	**1**	**$6,287,458**	**326,466**	**100**	**$151,159,172**

Source: NCEM Risk Management Tool

Table 4.74 – Estimated Buildings Impacted by 100-Year Thunderstorm Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,400	93	$10,592,689	1,207	5	$4,952,813	369	2	$668,114	23,976	100	$16,213,617
Charlotte	246,090	228,237	93	$140,641,602	14,770	6	$52,475,885	2,894	1	$8,711,280	245,901	100	$201,828,766
Cornelius	10,558	9,841	93	$9,268,846	630	6	$1,259,184	87	1	$216,595	10,558	100	$10,744,625
Davidson	3,871	3,545	92	$2,963,072	270	7	$422,325	56	1	$169,627	3,871	100	$3,555,024
Huntersville	19,554	18,353	94	$11,225,559	966	5	$1,944,887	223	1	$1,105,324	19,542	100	$14,275,770
Matthews	10,007	9,209	92	$5,365,638	665	7	$759,783	133	1	$782,325	10,007	100	$6,907,746
Mint Hill	9,880	9,369	95	$4,795,135	417	4	$439,658	94	1	$110,115	9,880	100	$5,344,909
Pineville	2,731	2,037	75	$1,096,072	552	20	$658,145	142	5	$45,630	2,731	100	$1,799,847
Total	**326,758**	**302,991**	**93**	**$185,948,613**	**19,477**	**6**	**$62,912,680**	**3,998**	**1**	**$11,809,010**	**326,466**	**100**	**$260,670,304**

Source: NCEM Risk Management Tool

Table 4.75 – Estimated Buildings Impacted by 300-Year Thunderstorm Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,400	93	$24,595,501	1,207	5	$13,972,253	369	2	$1,953,368	23,976	100	$40,521,123
Charlotte	246,090	228,237	93	$355,663,261	14,770	6	$153,679,455	2,894	1	$25,781,686	245,901	100	$535,124,402
Cornelius	10,558	9,841	93	$26,275,857	630	6	$3,960,868	87	1	$754,385	10,558	100	$30,991,110
Davidson	3,871	3,545	92	$7,233,552	270	7	$1,491,337	56	1	$610,676	3,871	100	$9,335,565
Huntersville	19,554	18,353	94	$28,067,522	966	5	$6,316,253	223	1	$3,135,463	19,542	100	$37,519,238
Matthews	10,007	9,209	92	$13,043,575	665	7	$2,632,044	133	1	$2,377,242	10,007	100	$18,052,862
Mint Hill	9,880	9,369	95	$10,918,940	417	4	$1,366,903	94	1	$344,117	9,880	100	$12,629,959
Pineville	2,731	2,037	75	$3,253,976	552	20	$2,533,436	142	5	$168,278	2,731	100	$5,955,690
Total	**326,758**	**302,991**	**93**	**$469,052,184**	**19,477**	**6**	**$185,952,549**	**3,998**	**1**	**$35,125,215**	**326,466**	**100**	**$690,129,949**

Source: NCEM Risk Management Tool

Table 4.76 – Estimated Buildings Impacted by 700-Year Thunderstorm Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,400	93	$38,630,054	1,207	5	$20,645,018	369	2	$2,999,707	23,976	100	$62,274,779
Charlotte	246,090	228,237	93	$578,140,625	14,770	6	$242,141,342	2,894	1	$41,620,125	245,901	100	$861,902,092
Cornelius	10,558	9,841	93	$46,264,250	630	6	$6,433,509	87	1	$1,273,428	10,558	100	$53,971,186
Davidson	3,871	3,545	92	$11,783,873	270	7	$2,603,736	56	1	$1,105,714	3,871	100	$15,493,323
Huntersville	19,554	18,353	94	$47,893,839	966	5	$10,686,839	223	1	$4,885,841	19,542	100	$63,466,519
Matthews	10,007	9,209	92	$21,500,240	665	7	$4,578,910	133	1	$3,575,055	10,007	100	$29,654,206
Mint Hill	9,880	9,369	95	$16,828,561	417	4	$2,147,229	94	1	$555,094	9,880	100	$19,530,883
Pineville	2,731	2,037	75	$5,525,416	552	20	$4,612,656	142	5	$307,532	2,731	100	$10,445,605
Total	**326,758**	**302,991**	**93**	**$766,566,858**	**19,477**	**6**	**$293,849,239**	**3,998**	**1**	**$56,322,496**	**326,466**	**100**	**$1,116,738,593**

Source: NCEM Risk Management Tool

Table 4.77 – Estimated Buildings Impacted by EF0 Tornado

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,487	93	$212,091,778	1,208	5	$102,796,595	369	2	$12,503,940	24,064	100	$327,392,313
Charlotte	246,090	228,371	93	$2,422,643,873	14,819	6	$1,400,609,695	2,894	1	$174,694,233	246,084	100	$3,997,947,801
Cornelius	10,558	9,841	93	$137,876,648	630	6	$30,745,991	87	1	$5,385,539	10,558	100	$174,008,178
Davidson	3,871	3,545	92	$56,435,292	270	7	$20,968,032	56	1	$3,914,663	3,871	100	$81,317,987
Huntersville	19,554	18,353	94	$203,727,717	966	5	$63,880,290	223	1	$15,115,967	19,542	100	$282,723,975
Matthews	10,007	9,209	92	$98,783,286	665	7	$43,486,705	133	1	$11,353,964	10,007	100	$153,623,955
Mint Hill	9,880	9,369	95	$94,107,669	417	4	$14,601,431	94	1	$4,827,170	9,880	100	$113,536,271
Pineville	2,731	2,037	75	$23,246,191	552	20	$37,849,384	142	5	$1,594,248	2,731	100	$62,689,822
Total	**326,758**	**303,212**	**93**	**$3,248,912,454**	**19,527**	**6**	**$1,714,938,123**	**3,998**	**1**	**$229,389,724**	**326,737**	**100**	**$5,193,240,302**

Source: NCEM Risk Management Tool

Table 4.78 – Estimated Buildings Impacted by EF1 Tornado

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,487	93	$1,548,148,376	1,208	5	$668,712,961	369	2	$70,272,104	24,064	100	$2,287,133,441
Charlotte	246,090	228,371	93	$17,231,243,654	14,819	6	$9,077,251,722	2,894	1	$998,652,054	246,084	100	$27,307,147,430
Cornelius	10,558	9,841	93	$991,662,021	630	6	$195,876,903	87	1	$29,667,229	10,558	100	$1,217,206,154
Davidson	3,871	3,545	92	$408,131,536	270	7	$126,216,683	56	1	$23,092,295	3,871	100	$557,440,514
Huntersville	19,554	18,353	94	$1,489,279,269	966	5	$425,699,782	223	1	$81,895,613	19,542	100	$1,996,874,664
Matthews	10,007	9,209	92	$718,868,445	665	7	$270,452,863	133	1	$59,240,548	10,007	100	$1,048,561,855
Mint Hill	9,880	9,369	95	$690,941,095	417	4	$92,527,716	94	1	$24,445,968	9,880	100	$807,914,779
Pineville	2,731	2,037	75	$158,181,364	552	20	$240,939,791	142	5	$11,085,695	2,731	100	$410,206,850
Total	**326,758**	**303,212**	**93**	**$23,236,455,760**	**19,527**	**6**	**$11,097,678,421**	**3,998**	**1**	**$1,298,351,506**	**326,737**	**100**	**$35,632,485,687**

Source: NCEM Risk Management Tool

Table 4.79 – Estimated Buildings Impacted by EF2 Tornado

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,487	93	$2,952,376,977	1,208	5	$1,413,341,602	369	2	$222,761,896	24,064	100	$4,588,480,475
Charlotte	246,090	228,371	93	$35,301,683,220	14,819	6	$20,858,144,592	2,894	1	$3,190,721,211	246,084	100	$59,350,549,023
Cornelius	10,558	9,841	93	$1,988,214,902	630	6	$461,011,993	87	1	$93,156,388	10,558	100	$2,542,383,284
Davidson	3,871	3,545	92	$807,844,283	270	7	$277,663,584	56	1	$74,820,576	3,871	100	$1,160,328,443
Huntersville	19,554	18,353	94	$2,872,699,365	966	5	$984,012,877	223	1	$255,079,139	19,542	100	$4,111,791,380
Matthews	10,007	9,209	92	$1,406,417,628	665	7	$666,482,907	133	1	$181,021,070	10,007	100	$2,253,921,604
Mint Hill	9,880	9,369	95	$1,323,274,306	417	4	$215,174,767	94	1	$73,517,646	9,880	100	$1,611,966,720
Pineville	2,731	2,037	75	$353,903,518	552	20	$608,206,400	142	5	$38,292,363	2,731	100	$1,000,402,282
Total	**326,758**	**303,212**	**93**	**$47,006,414,199**	**19,527**	**6**	**$25,484,038,722**	**3,998**	**1**	**$4,129,370,289**	**326,737**	**100**	**$76,619,823,211**

Source: NCEM Risk Management Tool

Table 4.80 – Estimated Buildings Impacted by EF3 Tornado

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,487	93	$3,563,175,892	1,208	5	$1,743,987,139	369	2	$347,279,205	24,064	100	$5,654,442,236
Charlotte	246,090	228,371	93	$47,884,879,567	14,819	6	$26,733,819,856	2,894	1	$4,980,636,110	246,084	100	$79,599,335,533
Cornelius	10,558	9,841	93	$2,593,875,424	630	6	$588,308,855	87	1	$145,000,777	10,558	100	$3,327,185,055
Davidson	3,871	3,545	92	$1,030,819,096	270	7	$381,557,436	56	1	$117,057,027	3,871	100	$1,529,433,560
Huntersville	19,554	18,353	94	$3,497,824,647	966	5	$1,261,579,500	223	1	$396,502,208	19,542	100	$5,155,906,354
Matthews	10,007	9,209	92	$1,753,003,502	665	7	$874,700,329	133	1	$280,474,405	10,007	100	$2,908,178,235
Mint Hill	9,880	9,369	95	$1,584,837,658	417	4	$278,945,027	94	1	$113,594,763	9,880	100	$1,977,377,448
Pineville	2,731	2,037	75	$548,873,678	552	20	$787,632,884	142	5	$60,502,682	2,731	100	$1,397,009,243
Total	**326,758**	**303,212**	**93**	**$62,457,289,464**	**19,527**	**6**	**$32,650,531,026**	**3,998**	**1**	**$6,441,047,177**	**326,737**	**100**	**$101,548,867,664**

Source: NCEM Risk Management Tool

Table 4.81 – Estimated Buildings Impacted by EF4 Tornado

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	22,487	93	$3,592,043,399	1,208	5	$1,797,005,267	369	2	$372,588,583	24,064	100	$5,761,637,250
Charlotte	246,090	228,371	93	$49,443,852,446	14,819	6	$27,590,985,595	2,894	1	$5,331,745,585	246,084	100	$82,366,583,625
Cornelius	10,558	9,841	93	$2,657,408,752	630	6	$613,043,536	87	1	$155,990,229	10,558	100	$3,426,442,518
Davidson	3,871	3,545	92	$1,051,258,192	270	7	$395,985,006	56	1	$124,819,518	3,871	100	$1,572,062,716
Huntersville	19,554	18,353	94	$3,531,519,261	966	5	$1,307,351,108	223	1	$427,549,873	19,542	100	$5,266,420,243
Matthews	10,007	9,209	92	$1,778,753,422	665	7	$911,750,745	133	1	$304,130,701	10,007	100	$2,994,634,868
Mint Hill	9,880	9,369	95	$1,594,064,437	417	4	$289,316,343	94	1	$123,761,617	9,880	100	$2,007,142,396
Pineville	2,731	2,037	75	$580,650,008	552	20	$822,007,680	142	5	$63,415,696	2,731	100	$1,466,073,385
Total	**326,758**	**303,212**	**93**	**$64,229,549,917**	**19,527**	**6**	**$33,727,445,280**	**3,998**	**1**	**$6,904,001,802**	**326,737**	**100**	**$104,860,997,001**

Source: NCEM Risk Management Tool

ENVIRONMENT

The main environmental impact from wind is damage to trees or crops. Wind events can also bring down power lines, which could cause a fire and result in even greater environmental impacts. Tornadoes can cause massive damage to the natural environment, uprooting trees and other debris within the tornado's path. This is part of a natural process, however, and the environment will return to its original state in time. Lightning may also result in the ignition of wildfires. Hail can cause extensive damage to the natural environment, pelting animals, trees and vegetation with hailstones. Melting hail can also increase both river and flash flood risk.

CONSEQUENCE ANALYSIS

Table 4.82 summarizes the potential negative consequences of severe weather.

Table 4.82 – Consequence Analysis – Tornadoes and Thunderstorm

Category	Consequences
Public	Injuries and fatalities are possible. Individuals who cannot take shelter are most vulnerable as well as those in unsecured buildings like mobile homes. Injury may also result from debris or damaged buildings.
Responders	Responders may be hindered by storm impacts; damages may block access to affected areas or make it dangerous to enter affected buildings or areas.
Continuity of Operations (including Continued Delivery of Services)	Potential impacts to continuity of operations may result if personnel are harmed or if critical systems or resources are damaged. Delays in providing services may result.
Property, Facilities and Infrastructure	Possibility of structure fire ignition; potential for disruptions in power and communications infrastructure; destruction and/or damage to any exposed property, especially windows, cars and siding; mobile homes see increased risk. The weakest tornadoes, EF0, can cause minor roof damage, while strong tornadoes can destroy frame buildings and even badly damage steel reinforced concrete structures. Buildings are vulnerable to direct impact from tornado winds and wind-borne debris.
Environment	Potential fire ignition from lightning; hail damage to wildlife and foliage; Downed trees and damages to vegetation are likely during tornadoes. Debris may be thrown great distances and end up in natural areas, with potential impacts on habitats. If hazardous materials facilities are impacted, chemical releases may occur and would require remediation.
Economic Condition of the Jurisdiction	Lightning damage contingent on target; can severely impact/destroy critical infrastructure and other economic drivers. Economic impacts are contingent on tornado's path, but a tornado can severely impact/destroy critical infrastructure and other economic drivers, halt economic activity, or cause direct losses to businesses.
Public Confidence in the Jurisdiction's Governance	Public confidence is not generally affected by thunderstorm events, however public confidence in the jurisdiction's governance may be influenced by severe tornado events if response and recovery are not timely and effective.

HAZARD SUMMARY BY JURISDICTION

The following tables summarize tornadoes and thunderstorm risk by jurisdiction. Most aspects of tornadoes and thunderstorm risk do not vary substantially by jurisdiction; however, wind and hail impacts may be greater in more highly developed areas with higher exposure in terms of both property and population density. Additionally, mobile home units are more vulnerable to wind damage. While mobile home units do not comprise a significant proportion of any jurisdictions housing mix, Mecklenburg County and Charlotte each have over 5,000 mobile home units in their jurisdiction and therefore may face more severe impacts from wind. Where priority ratings vary between thunderstorm wind, lightning, and hail for impact and spatial extent, these scores represent an average rating with greater weight given to thunderstorm wind because it occurs much more frequently.

TORNADOES

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
All Jurisdictions	3	3	2	4	1	2.7	M

THUNDERSTORM WIND

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Charlotte	4	2	3	4	1	2.9	M
Cornelius	4	1	3	4	1	2.6	M
Davidson	4	1	3	4	1	2.6	M
Huntersville	4	1	3	4	1	2.6	M
Matthews	4	1	3	4	1	2.6	M
Mint Hill	4	1	3	4	1	2.6	M
Pineville	4	1	3	4	1	2.6	M
Mecklenburg County	4	2	3	4	1	2.9	M

LIGHTNING AND HAIL

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
All Jurisdictions	4	1	1	4	1	2.2	M

4.5.11 WILDFIRE

HAZARD BACKGROUND

A wildfire is an uncontained fire that spreads through the environment. Wildfires have the ability to consume large areas, including infrastructure, property, and resources. When massive fires, or conflagrations, develop near populated areas, evacuations possibly ensue. Not only do the flames impact the environment, but the massive volumes of smoke spread by certain atmospheric conditions also impact the health of nearby populations. There are three general types of fire spread that are recognized.

- **Ground fires** – burn organic matter in the soil beneath surface litter and are sustained by glowing combustion.
- **Surface fires** – spread with a flaming front and burn leaf litter, fallen branches and other fuels located at ground level.
- **Crown fires** – burn through the top layer of foliage on a tree, known as the canopy or crown fires. Crown fires, the most intense type of fire and often the most difficult to contain, need strong winds, steep slopes and a heavy fuel load to continue burning.

Fuels to wildfires are subject to a variety of ignition sources, both natural and human caused. Generally, wildfires are started by humans, either through arson or carelessness. Fire intensity is controlled by both short-term weather conditions and longer-term vegetation conditions. During intense fires, understory vegetation, such as leaves, small branches, and other organic materials that accumulate on the ground, can become additional fuel for the fire. The most explosive conditions occur when dry, gusty winds blow across dry vegetation. Historically, fire starts have been contained quickly with minimal loss to property and structures.

Weather plays a major role in the birth, growth and death of a wildfire. Weather conditions favorable to wildfire include drought, which increases flammability of surface fuels, and winds, which aid a wildfire ‘s progress. The combination of wind, temperature, and humidity affects how fast wildland fires can spread. Rapid response can contain wildfires and limit their threat to property. In support of forecasting for fire weather, the National Weather Service Fire Weather Program emerged. This service is provided to federal and state land management agencies for the prevention, suppression, and management of forest and rangeland fires.

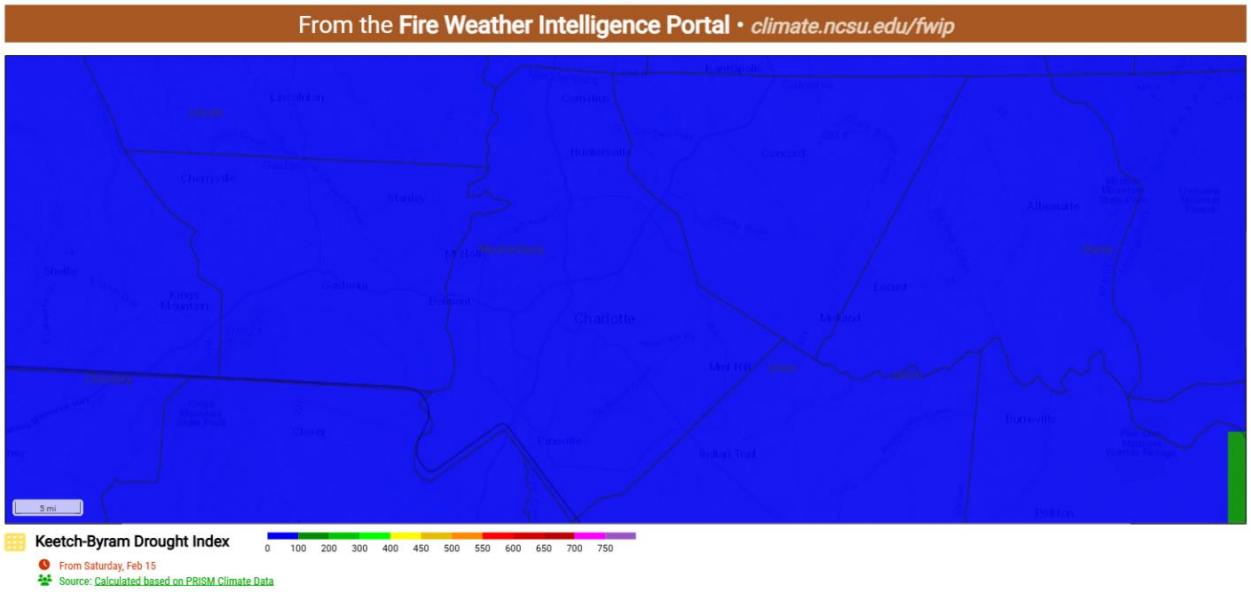
Mecklenburg County experiences a variety of wildfire conditions found in the Keetch-Byram Drought Index, which is described in Table 4.83. The Keetch-Byram Drought Index (KBDI) for February 15, 2025 is shown in Figure 4.29 The KBDI for Mecklenburg County at this time was below 100.

Table 4.83 – Keetch-Byram Index Fire Danger Rating System

KBDI	Description
0-200	Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in sports and patches.
200-400	Fires more readily burn and will carry across an area with no gaps. Heavier fuels will still not readily ignite and burn. Also, expect smoldering and the resulting smoke to carry into and possibly through the night.
400-600	Fire intensity begins to significantly increase. Fires will readily burn in all directions exposing mineral soils in some locations. Larger fuels may burn or smolder for several days creating possible smoke and control problems.

KBDI	Description
600-800	Fires will burn to mineral soil. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire intensity.

Figure 4.29 – Keetch-Byram Drought Index, February 2025



Source: North Carolina State Climate Office

Warning Time: 4 – Less than six hours

Duration: 3 – Less than one week

LOCATION

The location of wildfire risk can be defined by the acreage of Functional Wildland Urban Interface (WUI). The Functional WUI is described as the classification of the land near buildings into zones that describe the wildfire risk mitigation activities appropriate for each zone. Buildings used in producing the Functional WUI are defined as greater than 40 square meters. There are five Functional WUI categories recognized. There are five Functional WUI categories recognized.

- **Direct Exposure:** Burnable land cover within 75 m of a building. Buildings in this zone are exposed to ignition from convective and radiative heat from a wildfire, embers, and adjacent burning structures/outbuildings.
- **Indirect Exposure:** Nonburnable land cover within 75 m of a building and less than 1530 m from a 500-ha contiguous block of wildland fuel. Buildings in this zone are exposed to ignition from embers and/or adjacent burning structures
- **Critical Fireshed:** The burnable land cover from which a wildfire can reach a significant number of buildings within a single burning period.
- **Little-to-no Exposure:** Nonburnable land cover within 75 m of a building and more than 1530 m from a 500-ha contiguous block of wildland fuel. Buildings in this zone are relatively safe from ember ignition and building-to-building spread.

- **Sources of Ember Load to Buildings:** Burnable land cover more than 75 m from a building that produces embers capable of reaching nearby buildings. Ember production is a function of fire type and intensity; ember travel is a function of wind speed and direction. Ember modeling is based on fire modeling based on gridded historical climatology.

The Southern Wildfire Risk Assessment (SWRA) estimates that 21 percent of the Mecklenburg County's population lives within the critical fireshed and 24 percent live in direct exposure to the Functional WUI. The expansion of residential development from urban centers out into rural landscapes increases the potential for wildland fire threat to public safety and the potential for damage to forest resources and dependent industries. Population growth within the WUI substantially increases the risk of wildfire.

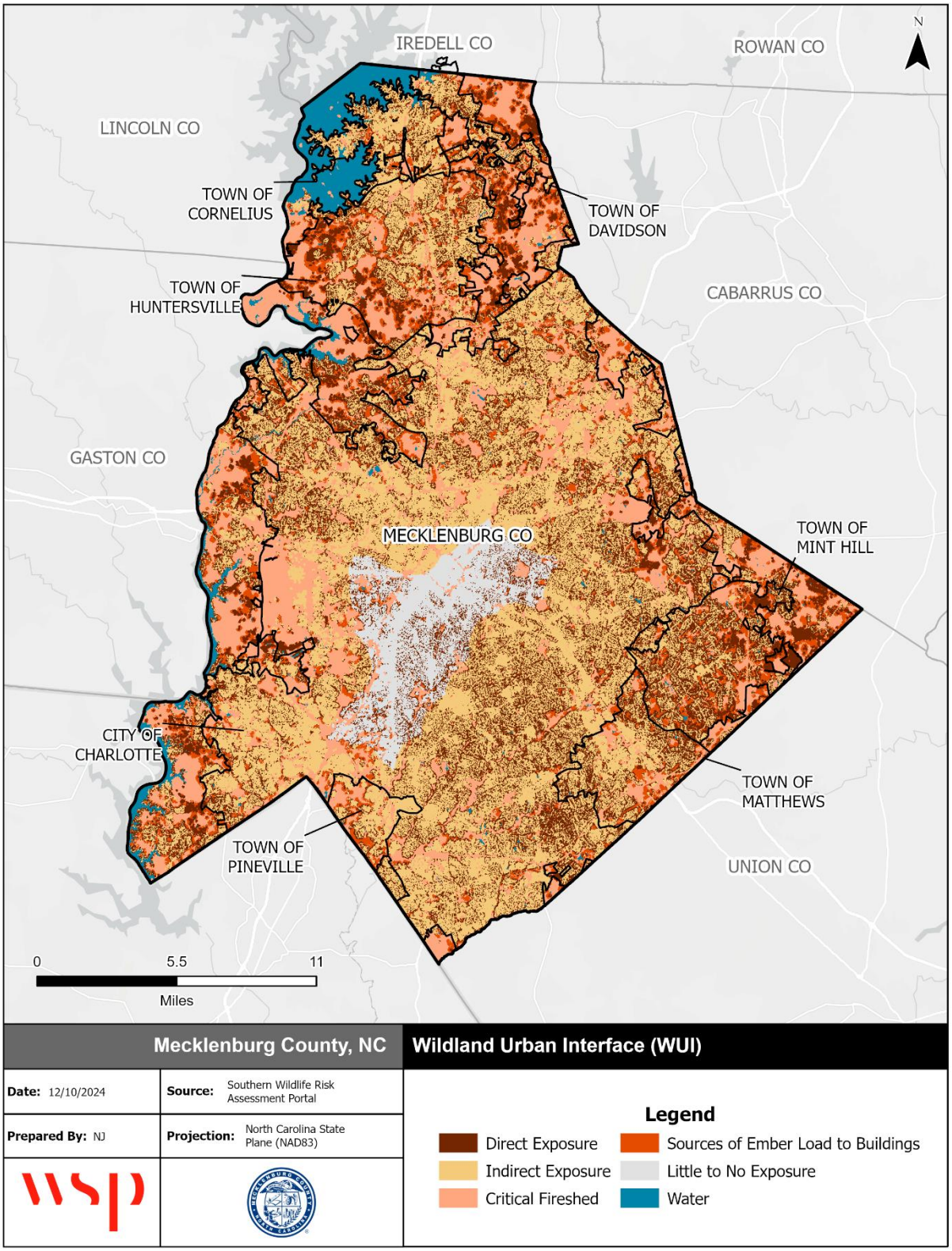
Spatial Extent: 3 – Moderate

Table 4.84 details the extent of the Functional WUI in the N.E.W. Region, and Figure 4.30 maps the functional WUI in Mecklenburg County.

Table 4.84 – Functional Wildland Urban Interface, Mecklenburg County

	Functional Wildland Urban Interface (WUI) Category	Acres	Percent
	Direct Exposure	83,704	24%
	Indirect Exposure	133,494	38%
	Critical Fireshed	73,366	21%
	Sources of Ember Load to Buildings	28,405	8%
	Little to No Exposure	17,917	5%
	Water	12,604	4%
	Total	**349,490**	**100%**

Figure 4.30 – Functional Wildland Urban Interface, Mecklenburg County



Source: Southern Wildfire Risk Assessment

EXTENT

Wildfire extent can be defined by the fire's intensity and measured by the Characteristic Fire Intensity Scale, which identifies areas where significant fuel hazards which could produce dangerous fires exist. Fire Intensity ratings identify where significant fuel hazards and dangerous fire behavior potential exist based on fuels, topography, and a weighted average of four percentile weather categories. The Fire Intensity Scale consists of five classes, as defined by Southern Wildfire Risk Assessment. Table 4.85 shows the potential fire intensity within the WUI across Mecklenburg County. Detailed maps of fire intensity by jurisdiction are provided in each community's annex.

Table 4.85 – Fire Intensity Scale

Class	Description
1, Very Low	Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
2, Low	Small flames, usually less than two feet long; small amount of very short range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
3, Moderate	Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
4, High	Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
5, Very High	Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

1,450 (3%) acres of Mecklenburg County may experience up to a Class 4 Fire Intensity, which poses significant harm or damage to life and property. 4 percent of the county may experience Class 3 Fire Intensity, which has potential for harm to life and property but is easier to suppress with dozer and plows. The remainder of the county is either non-burnable (55%) or would face a Class 1 or Class 2 Fire Intensity, which are easily suppressed.

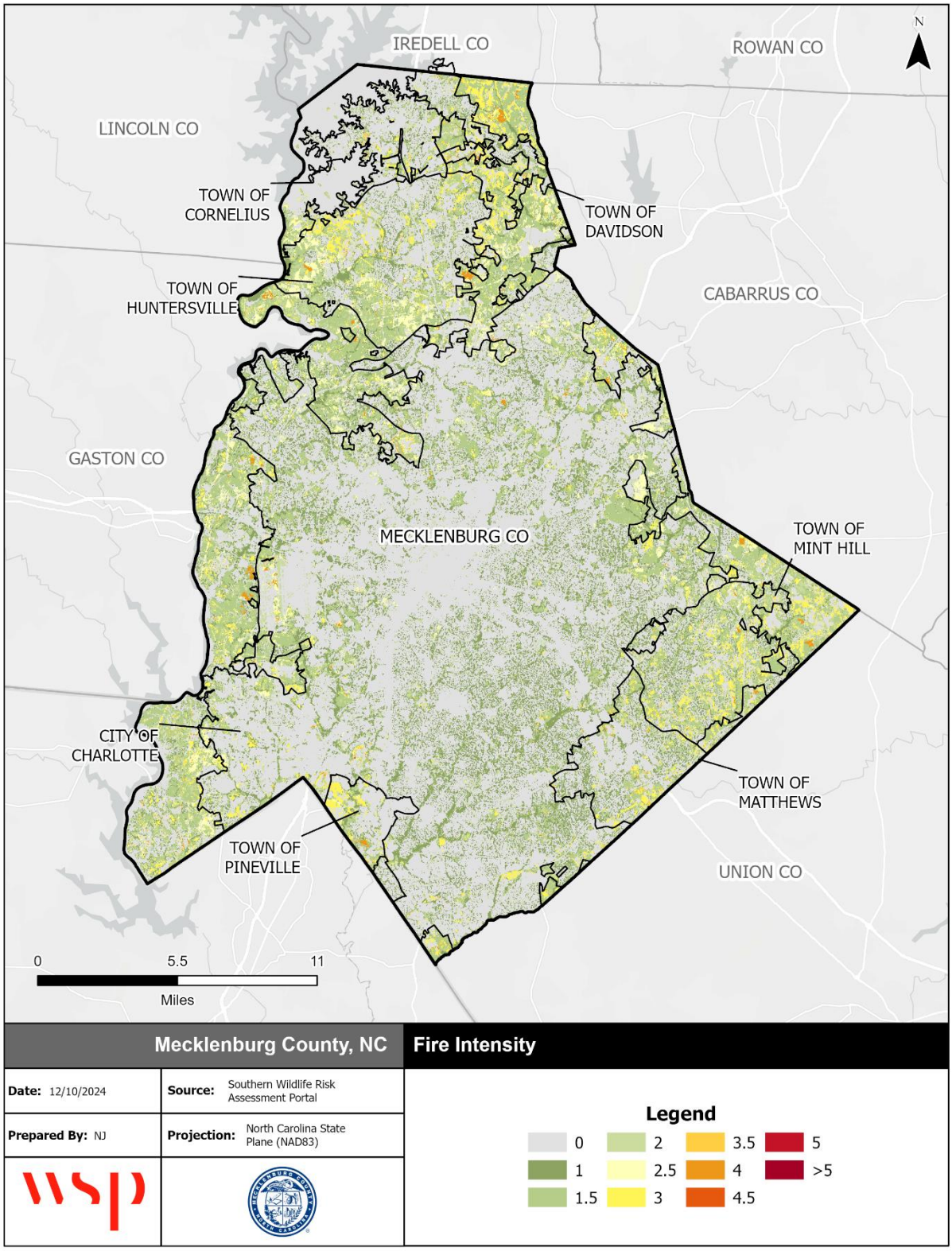
Impact: 1 – Minor

Table 4.86 – Characteristic Fire Intensity, Mecklenburg County

	Characteristic Fire Intensity Scale Category	Acres	Percent
	Non-burnable	191,462	55%
	1 Lowest Intensity	54,064	15%
	1.5	45,735	13%
	2 Low	32,356	9%
	2.5	11,221	3%
	3 Moderate	12,544	4%
	3.5	655	0%
	4 High	1,450	0%
	4.5	3	0%
	5 Highest Intensity	0	0%
	> 5	0	0%
	Total	349,491	100%

Source: Southern Wildfire Risk Assessment

Figure 4.31 – Characteristic Fire Intensity, Mecklenburg County



Source: Southern Wildfire Risk Assessment

HISTORICAL OCCURRENCES

The North Carolina Forest Service (NCFS) began keeping records of fire occurrence on private and state-owned lands in 1928. Since this time, there has been an average of approximately 4,000 fires burning more than 104,000 acres annually. Recently, within the last 10 years, the State has averaged closer to 4,300 fires per year and 14,000 acres burned annually.

Table 4.87 lists past occurrences of wildfire in Mecklenburg County since 1999 as provided by the North Carolina Forest Service in February 2024. This data only accounts for occurrences within unincorporated Mecklenburg County, which fall under the NCFS jurisdiction, as well as larger events in incorporated areas where local fire departments requested NCFS support for fire suppression. Actual number of fires and acreage burned are higher than what can be reported here.

Table 4.87 – Records for Wildfire in Mecklenburg County, 1999-2024

Year	Number of Fires	Acreage Burned	Homes/Structures Protected	Value of Protected Homes/Structures
1999	133	69.9	n/a	n/a
2000	45	40.6	n/a	n/a
2001	47	94.4	n/a	n/a
2002	43	40.6	n/a	n/a
2003	17	6.9	n/a	n/a
2004	17	9.6	n/a	n/a
2005	13	8.1	n/a	n/a
2006	25	14.8	n/a	n/a
2007	59	61.5	n/a	n/a
2008	72	51.8	n/a	n/a
2009	49	17.0	88	$8,851,000
2010	49	26.1	43	$7,799,580
2011	62	37.8	200	$32,807,000
2012	50	23.9	62	$9,300,100
2013	26	9.8	10	$1,878,000
2014	25	8.2	33	$4,252,900
2015	20	8.6	17	$2,305,000
2016	33	8.0	17	$2,675,000
2017	21	8.6	4	$386,400
2018	13	25.0	8	$681,000
2019	17	4.2	3	$800,000
2020	9	16.2	n/a	n/a
2021	3	.02	2	$805,000
2022	6	67.5	n/a	n/a
2023	15	6.4	5	$24,000
2024	15	29.3	1	$20,000
Total	**884**	**694.82**	**493**	**$72,584,980**

Source: NC Forest Service

On average, Mecklenburg County experiences 34 fires and 26.7 acres burned annually from fires that require the North Carolina Forest Service to respond. Actual number of fires and acreage burned is likely higher because smaller fires within jurisdictional boundaries are managed by local fire departments.

PROBABILITY OF FUTURE OCCURRENCE

The Southern Wildfire Risk Assessment provides a Burn Probability analysis which predicts the probability of an area burning based on landscape conditions, weather, historical ignition patterns, and historical fire prevention and suppression efforts. Burn Probability data is generated by simulating fires under different weather, fire intensity, and other conditions. Values in the Burn Probability (BP) data layer indicate, for each pixel, the number of times that cell was burned by a modeled fire, divided by the total number of annual weather scenarios simulated. The simulations are calibrated to historical fire size distributions. The Burn Probability for Mecklenburg County is presented in Table 4.88 and illustrated in Figure 4.32.

Mecklenburg County has a low burn probability as do each of its respective jurisdictions.

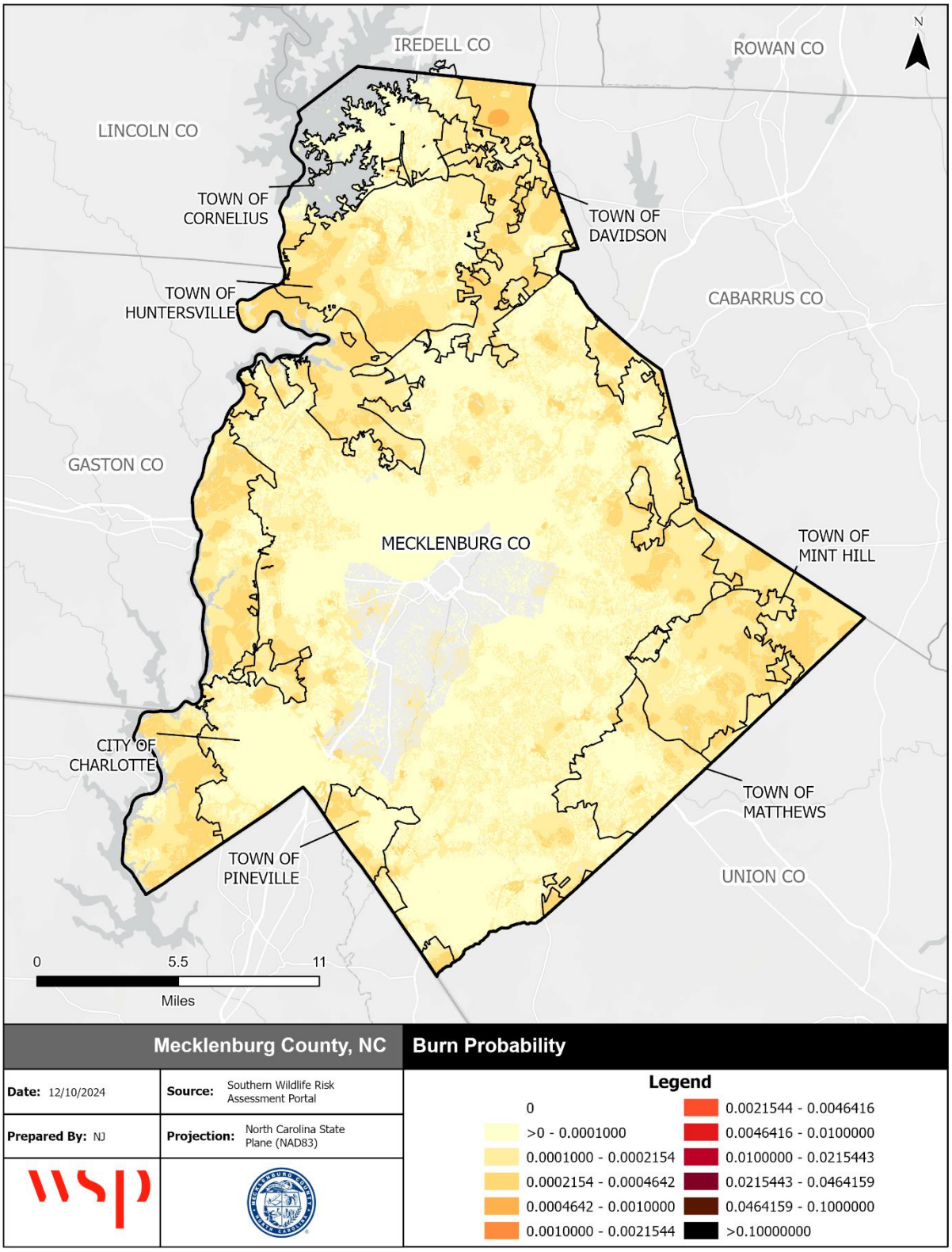
Probability: 2 – Possible

Table 4.88 – Burn Probability, Mecklenburg County

	Burn Probability Category	Acres	Percent
	0	32,900	9%
	>0 - 0.0001000	146,489	42%
	0.0001000 - 0.0002154	122,307	35%
	0.0002154 - 0.0004642	47,484	14%
	0.0004642 - 0.0010000	311	0%
	0.0010000 - 0.0021544	0	0%
	0.0021544 - 0.0046416	0	0%
	0.0046416 - 0.0100000	0	0%
	0.0100000 - 0.0215443	0	0%
	0.0215443 - 0.0464159	0	0%
	0.0464159 - 0.1000000	0	0%
	>0.10000000	0	0%
	Total	**349,490**	**100%**

Source: Southern Wildfire Risk Assessment

Figure 4.32 – Burn Probability, Mecklenburg County



Source: Southern Wildfire Risk Assessment

CLIMATE CHANGE

The North Carolina Climate Science Report predicts that conditions conducive to wildfire occurrence will likely increase in the future due to future increases in annual and seasonal average temperatures and associated increases in drying rates. Additionally, future droughts are very likely to be warmer, increasing the drying rate of fuels and leading to higher wildfire likelihood. However, changes in other climate elements that affect wildfire likelihood are uncertain.

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

Population and property at risk to wildfire was estimated using data from the North Carolina Emergency Management (NCEM) IRISK database, which was compiled in NCEM's Risk Management Tool.

Within IRISK, wildfire hazard areas were determined using the Wildland Fire Susceptibility Index (WFSI). The following parameters were applied:

- Areas with a WFSI value of 0.01 – 0.05 were considered to be at moderate risk.
- Areas with a WFSI value greater than 0.05 were considered to be at high risk.
- Areas with a WFSI value less than 0.01 were considered to not be at risk.

The WFSI integrates the probability of an acre igniting and the expected final fire size based on the rate of spread in four weather percentile categories into a single measure of wildland fire susceptibility. Due to some necessary assumptions, mainly fuel homogeneity, it is not the true probability. But since all areas of the state have this value determined consistently, it allows for comparison and ordination of areas of the state as to the likelihood of an acre burning.

PEOPLE

Wildfire poses significant risks to human life and health, causing fatalities, injuries, and long-term health complications such as respiratory issues due to smoke inhalation. To mitigate these dangers, it is crucial to implement comprehensive procedures for rapid warning and evacuation. Developing reliable early warning systems that utilize satellite monitoring, drones, and weather forecasts can help alert communities to emerging threats. Local authorities should communicate through various channels, including SMS alerts, social media and community radio, to ensure that messages everyone effectively. Table 4.89 details the population estimated to be at risk to wildfire according to the NCEM IRISK database.

Table 4.89 – Estimated Population Impacted by Wildfire

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Charlotte	933,045	33,523	4	97,297	3,496	4	62,456	2,244	4
Cornelius	52,414	10,424	20	9,213	1,832	20	1,891	376	20
Davidson	16,621	636	4	2,502	96	4	749	29	4
Huntersville	67,005	11,916	18	9,037	1,607	18	4,465	794	18
Matthews	32,211	5,770	18	5,080	910	18	2,181	391	18

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Mint Hill	33,142	11,124	34	6,218	2,087	34	1,798	603	34
Pineville	16,047	2,050	13	2,464	315	13	1,102	141	13
Total	**1,150,485**	**75,443**	**7**	**131811**	**10343**	**8**	**74642**	**4578**	**6**

Source: NCEM Risk Management Tool

PROPERTY

Wildfire can cause direct property losses, including damage to buildings, vehicles, landscaped areas, agricultural lands, and livestock. Construction practices and building codes can increase fire resistance and fire safety of structures. Techniques for reducing vulnerability to wildfire include using street design to ensure accessibility to fire trucks, incorporating fire resistant materials in building construction, and using landscaping practices to reduce flammability and the ability for fire to spread.

The sectors facing the greatest risk to wildfire in Mecklenburg County are commercial facilities, transportation systems, government facilities, and critical manufacturing.

Table 4.90 details the buildings at risk to wildfire in Mecklenburg County, and Table 4.91 shows critical facilities exposed to wildfire by sector.

Table 4.90 – Estimated Buildings Impacted by Wildfire

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Unincorporated Mecklenburg County	24,067	2,391	10	$373,227,121	109	0	$252,518,490	72	0	$110,422,265	2,572	11	$736,167,876
Charlotte	246,090	8,215	3	$1,508,242,651	297	0	$899,409,882	60	0	$156,717,985	8,572	3	$2,564,370,517
Cornelius	10,558	1,957	19	$478,779,604	153	1	$155,345,713	28	0	$47,787,095	2,138	20	$681,912,413
Davidson	3,871	136	4	$39,664,085	13	0	$11,759,223	3	0	$13,832,902	152	4	$65,256,210
Huntersville	19,554	3,264	17	$640,838,450	208	1	$343,100,015	51	0	$182,654,114	3,523	18	$1,166,592,578
Matthews	10,007	1,650	16	$260,744,563	70	1	$75,274,011	33	0	$159,130,946	1,753	18	$495,149,520
Mint Hill	9,880	3,144	32	$514,830,062	174	2	$131,056,357	44	0	$54,495,793	3,362	34	$700,382,212
Pineville	2,731	274	10	$50,633,109	44	2	$38,539,584	1	0	$3,351,878	319	12	$92,524,571
Total	**326,758**	**21,031**	**6**	**$3,866,959,645**	**1,068**	**0**	**$1,907,003,275**	**292**	**0**	**$728,392,978**	**22,391**	**7**	**$6,502,355,897**

Source: NCEM Risk Management Tool

Table 4.91 – Estimated Buildings Impacted by Wildfire by Sector

Sector	Number of Buildings at Risk	Estimated Damages
Banking and Finance	22	$16,449,941
Commercial Facilities	737	$1,124,496,549
Critical Manufacturing	184	$294,424,612
Energy	2	$35,490
Food and Agriculture	5	$117,133,851
Government Facilities	156	$487,403,658
Healthcare and Public Health	56	$100,439,315
Transportation Systems	200	$495,048,322
All Sectors	**1,362**	**$2,635,431,738**

Source: NCEM Risk Management Tool

ENVIRONMENT

Wildfires have the potential to destroy forest and forage resources and damage natural habitats. Wildfire can also damage agricultural crops on private land. Wildfire is part of a natural process, however, and the environment will return to its original state in time.

CONSEQUENCE ANALYSIS

Table 4.92 summarizes the potential detrimental consequences of wildfire.

Table 4.92 – Consequence Analysis - Wildfire

Category	Consequences
Public	In addition to the potential for fatalities, wildfire and the resulting diminished air quality pose health risks. Exposure to wildfire smoke can cause serious health problems within a community, including asthma attacks and pneumonia, and can worsen chronic heart and lung diseases. Vulnerable populations include children, the elderly, people with respiratory problems or with heart disease. Even healthy citizens may experience minor symptoms, such as sore throats and itchy eyes.
Responders	Public and firefighter safety is the first priority in all wildland fire management activities. Wildfires are a real threat to the health and safety of the emergency services. Most fire-fighters in rural areas are 'retained'. This means that they are part-time and can be called away from their normal work to attend to fires.
Continuity of Operations (including Continued Delivery of Services)	Wildfire events can result in a loss of power which may impact operations. Downed trees, power lines and damaged road conditions may prevent access to critical facilities and/or emergency equipment.

Category	Consequences
Property, Facilities and Infrastructure	Wildfires frequently damage community infrastructure, including roadways, communication networks and facilities, power lines, and water distribution systems. Restoring basic services is critical and a top priority. Efforts to restore roadways include the costs of maintenance and damage assessment teams, field data collection, and replacement or repair costs. Direct impacts to municipal water supply may occur through contamination of ash and debris during the fire, destruction of aboveground distribution lines, and soil erosion or debris deposits into waterways after the fire. Utilities and communications repairs are also necessary for equipment damaged by a fire. This includes power lines, transformers, cell phone towers, and phone lines.
Environment	Wildfires cause damage to the natural environment, killing vegetation and animals. The risk of floods and debris flows increases after wildfires due to the exposure of bare ground and the loss of vegetation. In addition, the secondary effects of wildfires, including erosion, landslides, introduction of invasive species, and changes in water quality, are often more disastrous than the fire itself.
Economic Condition of the Jurisdiction	Wildfires can have significant short-term and long-term effects on the local economy. Wildfires, and extreme fire danger, may reduce recreation and tourism in and near the fires. If aesthetics are impaired, local property values can decline. Extensive fire damage to trees can significantly alter the timber supply, both through a short-term surplus from timber salvage and a longer-term decline while the trees regrow. Water supplies can be degraded by post-fire erosion and stream sedimentation. Wildfires can also have positive effects on local economies. Positive effects come from economic activity generated in the community during fire suppression and post-fire rebuilding. These may include forestry support work, such as building fire lines and performing other defenses, or providing firefighting teams with food, ice, and amenities such as temporary shelters and washing machines.
Public Confidence in the Jurisdiction's Governance	Wildfire events may cause issues with public confidence because they have very visible impacts on the community. Public confidence in the jurisdiction's governance may be influenced by: • The jurisdiction's actions taken pre-disaster to mitigate and prepare for impacts, including the amount of public education provided • The jurisdiction's efforts to provide warning to residents • The jurisdiction's actions taken to respond to the event • The jurisdiction's actions taken to recover from the impacts and return impacted communities to the same or better state before the wildfire occurred

HAZARD SUMMARY BY JURISDICTION

The following table summarizes wildfire hazard risk by jurisdiction. Wildfire warning time and duration do not vary by jurisdiction. Spatial extent ratings were based on the proportion of area within the WUI. Impact ratings were based on fire intensity data from SWRA; there are no clusters of significant fire intensity risk in any jurisdictions. Probability ratings were determined based on burn probability data from SWRA, which is low across all jurisdictions.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Charlotte	2	1	2	4	3	2.0	M
Cornelius	2	1	2	4	3	2.0	M
Davidson	2	1	2	4	3	2.0	M
Huntersville	2	1	2	4	3	2.0	M
Matthews	2	1	2	4	3	2.0	M
Mint Hill	2	1	2	4	3	2.0	M
Pineville	2	1	2	4	3	2.0	M
Mecklenburg County	2	1	2	4	3	2.0	M

4.5.12 CYBER THREAT

HAZARD BACKGROUND

The State of North Carolina Hazard Mitigation Plan defines cyber-attacks as "deliberate attacks on information technology systems in an attempt to gain illegal access to a computer, or purposely cause damage." Cyber-attacks use malicious code to alter computer operations or data. The vulnerability of computer systems to attacks is a growing concern as people and institutions become more dependent upon networked technologies. The Federal Bureau of Investigation (FBI) reports that "cyber intrusions are becoming more commonplace, more dangerous, and more sophisticated," with implications for private- and public-sector networks.

There are many types of cyber-attacks. Among the most common is a direct denial of service, or DDoS attack. This is when a server or website will be queried or pinged rapidly with information requests, overloading the system and causing it to crash.

Malware, or malicious software, can cause numerous problems once on a computer or network, from taking control of users' machines to discreetly sending out confidential information. Ransomware is a specific type of malware that blocks access to digital files and demands a payment to release them. Hospitals, school districts, state and local governments, law enforcement agencies, businesses, and even individuals can be targeted by ransomware.

Cyber spying or espionage is the act of illicitly obtaining intellectual property, government secrets, or other confidential digital information, and often is associated with attacks carried out by professional agents working on behalf of a foreign government or corporation. According to cybersecurity firm Symantec, in 2016 "…the world of cyber espionage experienced a notable shift towards more overt activity, designed to destabilize and disrupt targeted organizations and countries."

Major data breaches - when hackers gain access to large amounts of personal, sensitive, or confidential information - have become increasingly common. The Symantec report says more than seven billion identities have been exposed in data breaches over the last eight years. In addition to networked systems, data breaches can occur due to the mishandling of external drives, as has been the case with losses of some state employee data.

Cybercrime can refer to any of the above incidents when motivated primarily by financial gain or other criminal intent.

The most severe type of attack is cyber terrorism, which aims to disrupt or damage systems in order to cause fear, injury, and loss to advance a political agenda.

The North Carolina State Bureau of Investigation's Computer Crime Unit helps law enforcement across North Carolina solve sophisticated crimes involving digital evidence.

Warning Time: 4 – Less than six hours

Duration: 4 – More than one week

LOCATION

Cyber disruption events can occur and/or impact virtually any location where computing devices are used. Incidents may involve a single location or multiple geographic areas. A disruption can have far-reaching effects beyond the location of the targeted system; disruptions that occur far outside the state can still impact people, businesses, and institutions within Mecklenburg County.

Spatial Extent: 2 – Small

EXTENT

The extent or magnitude/severity of a cyber disruption event is variable depending on the nature of the event. A disruption affecting a small, isolated system could impact only a few functions/processes. Disruptions of large, integrated systems could impact many functions/processes, as well as many individuals that rely on those systems.

There is no universally accepted scale to quantify the severity of cyber-attacks. The strength of a DDoS attack is sometimes explained in terms of a data transmission rate. One of the largest DDoS disruptions ever, which brought down some of the internet's most popular sites on October 21, 2016, peaked at 1.2 terabytes per second.

Data breaches are often described in terms of the number of records or identities exposed.

Impact: 2 – Limited

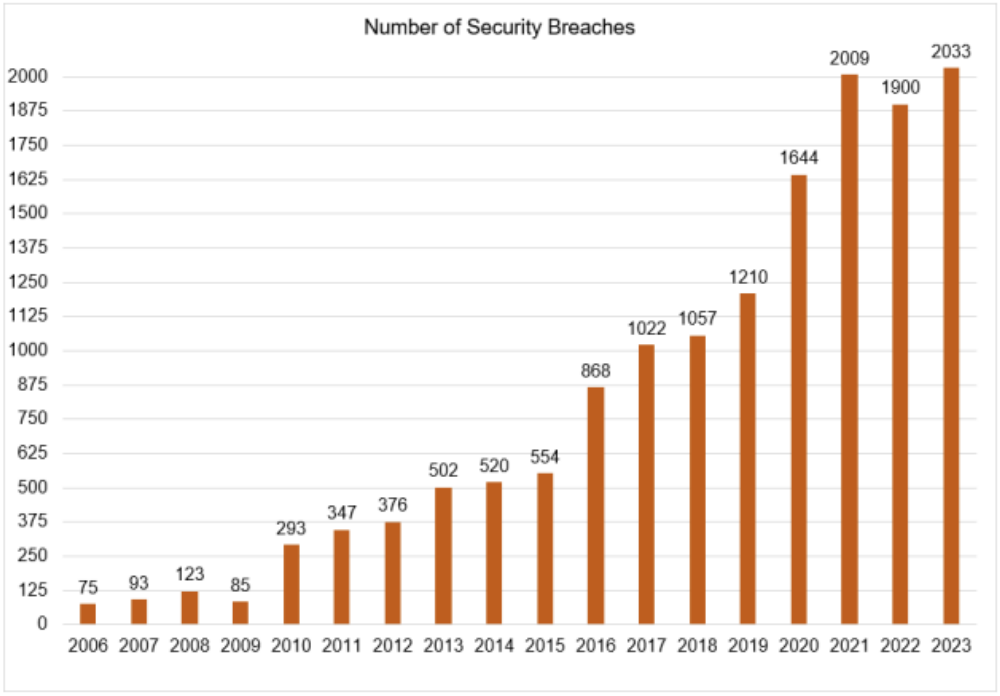
HISTORICAL OCCURRENCES

Mecklenburg County government was hit with a ransomware attack in December 2017 when an employee inadvertently opened a phishing email. Nearly 200 systems were infected, requiring several weeks to restore. Recovery costs were estimated at $10,000, less than the requested $25,000 ransom.

In July 2023, a police officer in the Town of Cornelius inadvertently interacted with a computer virus during an investigation. The Town's Technology Operations Departments located the virus and immediately severed all on-site technology and devices to proactively contain the malware threat. Town functions and services were restored the following day.

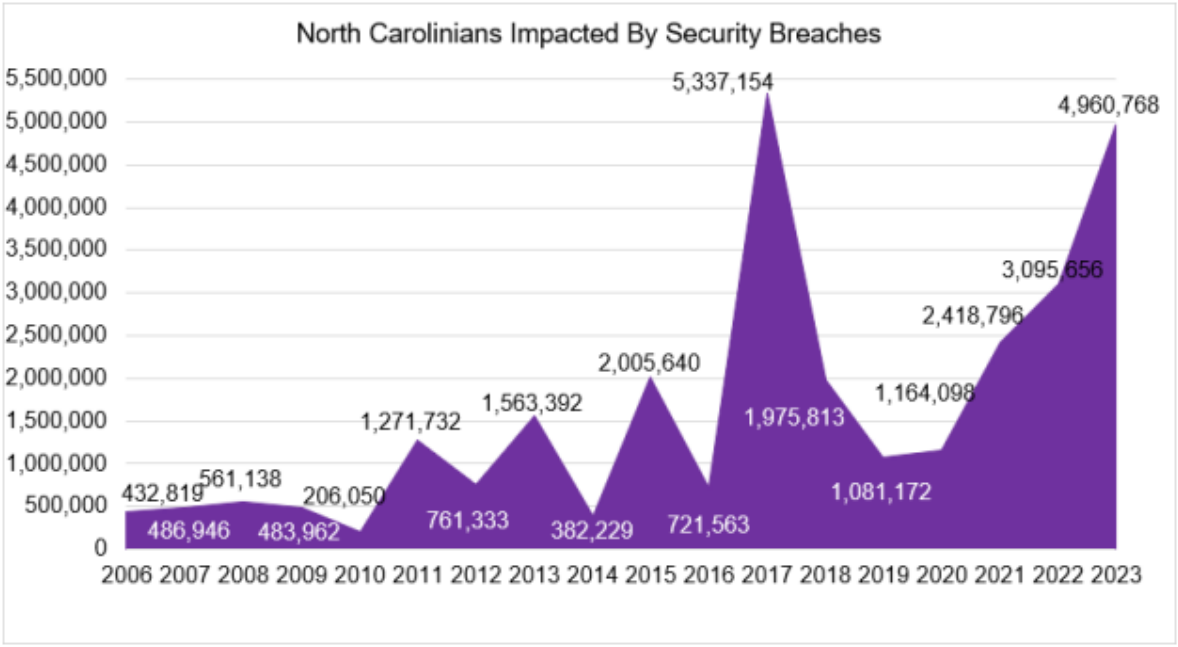
In North Carolina, businesses and organizations that experience data breaches are required to report the breach and the information that was compromised to the NC Department of Justice (DOJ). In 2023, the DOJ received 2,033 data breach notices from organizations according to their annual Data Breach Report. These breaches impacted more than 4.9 million North Carolinians – the second highest number of people impacted in a single year. Additionally, in 2023, hacking-related breaches were at a record high, causing 80 percent of all reported breaches. The report noted that most security breaches impacted general businesses (50%), healthcare industries (14%), and financial services/insurance (23%). It is common for these types of industries to collect many kinds of personal information, making them prime targets for hacking.

Figure 4.33 – Number of Security Breaches in North Carolina



Source: North Carolina Department of Justice

Figure 4.34 – North Carolinians Impacted by Security Breaches



Note: In 2017, Equifax experienced the largest-ever data breach in history affecting nearly 5 million North Carolinians, resulting in a high number of people having their information compromised that year.

Source: North Carolina Department of Justice

The Privacy Rights Clearinghouse, a nonprofit organization based in San Diego, maintains a timeline of 17,552 unique data breaches resulting from computer hacking incidents in the United States from 2002-2023. The database lists 359 data breaches on file in North Carolina, totaling 16,588,348 records breached since 2005. The only reported cyberattack on local government in the N.E.W. Region occurred in December of 2022 and affected Nash and Edgecombe counties. These counties experienced a cyber-attack on their public records software, Cott Systems. The ransomware attack left each county locked out of their online records and unable to issue marriage licenses or conduct real estate recordings for several days.

PROBABILITY OF FUTURE OCCURRENCE

Cyber-attacks occur daily, but most have negligible impacts at the county level. The possibility of a larger disruption affecting the county exists at all times, but it is difficult to quantify the exact probability due to such highly variable factors as the type of attack and intent of the attacker. Minor attacks against business and government systems have become commonplace occurrences, but are usually stopped with minimal impact. Similarly data breaches impacting the information of Mecklenburg County residents are almost certain to happen in coming years. Major attacks or breaches specifically targeting systems in the county are less likely, but cannot be ruled out.

Probability: 2 – Possible

CLIMATE CHANGE

Climate change is not expected to affect incidence of cyber-attacks.

VULNERABILITY ASSESSMENT

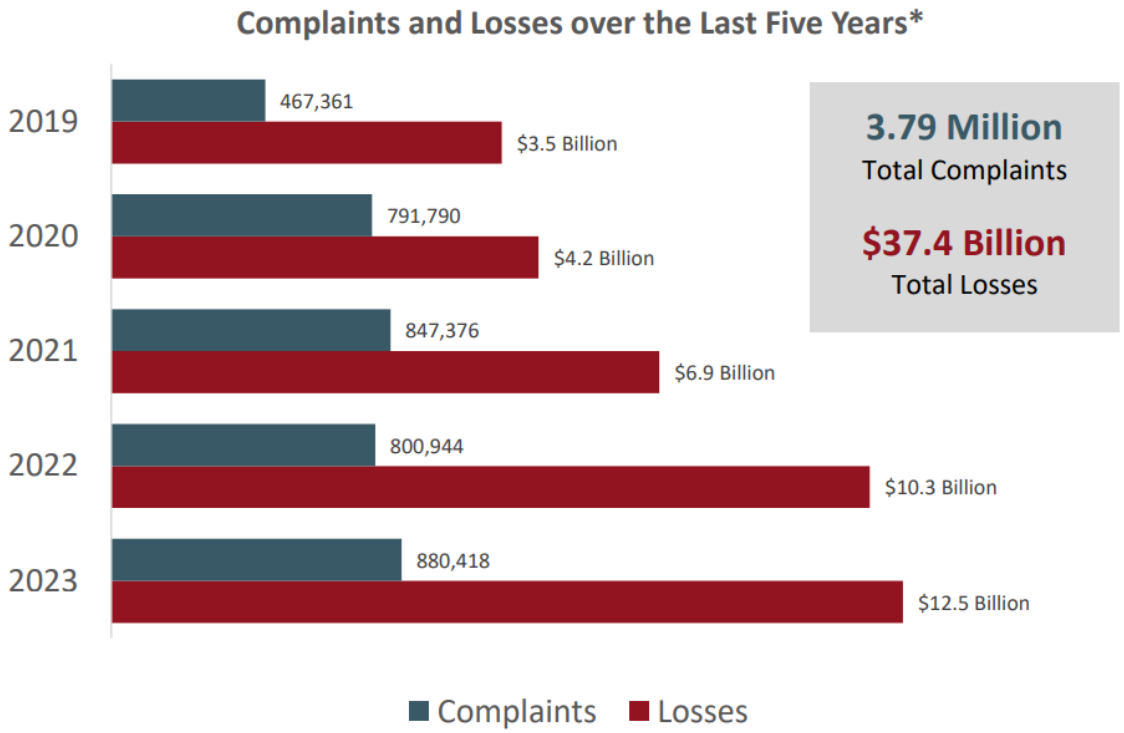
METHODOLOGIES AND ASSUMPTIONS

Vulnerability to cyber-attacks was assessed based on past occurrences nationally and internationally as well as publicly available information on these vulnerabilities.

PEOPLE

Cyber-attacks can have a significant cumulative economic impact. According to the Internet Crime Complaint Center run by the Federal Bureau of Investigation, the U.S. experienced a loss of $37.4 billion between the years 2019 to 2023. Economic losses associated with cybercrime increased every year during this five-year period as shown in Figure 4.35.

Figure 4.35 – 2019-2023 Complaints and Losses due to Cybercrime in the U.S.



Businesses continue to use evolving technologies to improve operations, and increasingly, personal and financial information is stored and transferred online. Phishing scams have reached an all-time high in 2022, up 60 percent from 2020 with over 1 million attacks in the first quarter of 2022 alone.

Consumers continued usage of online services, such as banking and shopping, increase vulnerability to personal and financial information theft or manipulation. Between 2016 and 2021, Americans lost more than $9 billion to lost or stolen financial information.

In recent years, cyber criminals have begun to target hospitals, which create a significant health and safety concern. For example, in 2024, a ransomware attack targeted Ascension, the third largest health system in the U.S. that provides care to over 6 million people each year. This ransomware attack took down Ascension's computer system, and nurses were left scrambling to find paper backups of medical history and prescribed medications. This attack undoubtedly slowed down the hospital system and forced Ascension facilities to redirect patients to other providers. The Ascension computer system was down for 37 days, and the hospital spent $130 million in response to the attack.

It should be noted that direct injuries or fatalities from cyber-attacks would generally only be possible from a major cyber terrorist attack against critical infrastructure.

PROPERTY

Short of a major cyber terrorist attack against critical infrastructure, property damage from cyber-attacks is typically limited to computer systems. However, infrastructure attacks using social engineering temporarily disabled the Colonial Pipeline, risking access to oil products across the East Coast.

ENVIRONMENT

The vast majority of cyber incidents have little to no environmental impact. A major cyber terrorism attack could potentially impact the environment by triggering a release of a hazardous materials, or by causing an accident involving hazardous materials by disrupting traffic-control devices.

CONSEQUENCE ANALYSIS

Table 4.93 summarizes the potential consequences of a cyber-attack.

Table 4.93 – Consequence Analysis – Cyber Threat

Category	Consequences
Public	Cyber-attacks can impact personal data and accounts. Injuries or fatalities could potentially result from a cyber attack against critical infrastructure.
Responders	Cyber-attacks can impact personal data and accounts. Injuries or fatalities could potentially result from a major cyber attack against critical infrastructure.
Continuity of Operations (including Continued Delivery of Services)	Agencies that rely on electronic backup of critical files are vulnerable. The delivery of services can be impacted since governments rely, to a great extent, upon electronic delivery of services.
Property, Facilities and Infrastructure	Rare. Most attacks affect only data and computer systems. Sabotage of utilities and infrastructure from a cyber attack could potentially result in system failures that damage property on a scale equal with natural disasters. A cyber attack may render facilities and infrastructure unusable.
Environment	Rare. A major attack could theoretically result in a hazardous materials release.
Economic Condition of the Jurisdiction	Could greatly affect the economy. In an electronic-based commerce society, any disruption to daily activities can have disastrous impacts to the economy. It is difficult to measure the true extent of the impact.
Public Confidence in the Jurisdiction's Governance	The government's inability to protect critical systems or confidential personal data could impact public confidence. An attack could raise questions regarding the security of using electronic systems for government services.

HAZARD SUMMARY BY JURISDICTION

The table below summarizes cyber threat risk by jurisdiction. Risk does not vary across the planning area.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
All jurisdictions	*2*	*2*	*2*	*4*	*4*	*2.4*	*M*

4.5.13 HAZARDOUS SUBSTANCES

HAZARD BACKGROUND

Generally, a hazardous material is a substance or combination of substances which, because of quantity, concentration, or physical, chemical, or infectious characteristics, may either cause or significantly contribute to an increase in mortality or serious illness. Hazardous materials may also pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Hazardous material incidents can occur while a hazardous substance is stored at a fixed facility, or while the substance is being transported along a road corridor or railroad line or via an enclosed pipeline or other linear infrastructure.

The U.S. Department of Transportation (DOT), U.S. Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) all have responsibilities relating to the transportation, storage, and use of hazardous materials and waste. The Right to Know Network (RTK NET), maintained by the EPA's National Response Center (NRC), is a primary source of information on the use and storage of hazardous materials, as well as data regarding spills and releases.

Hazardous materials are typically divided into the following classes:

- Explosives
- Compressed gases: flammable, non-flammable compressed, poisonous
- Flammable or combustible liquids
- Flammable solids: spontaneously combustible, dangerous when wet
- Oxidizers and organic peroxides
- Toxic materials: poisonous material, infectious agents
- Radioactive material
- Corrosive material: destruction of human skin, corrodes steel

It is common to see hazardous materials releases as escalating incidents resulting from other hazards such as floods, wildfires, and earthquakes that may cause containment systems to fail or affect transportation infrastructure. The release of hazardous materials can greatly complicate or even eclipse the response to the natural hazards disaster that caused the spill.

FIXED HAZARDOUS MATERIALS INCIDENT

A fixed hazardous materials incident is the accidental release of chemical substances or mixtures during production or handling at a fixed facility. While these incidents can sometimes involve large quantities of materials, their locations can be more easily predicted and monitored.

TRANSPORTATION HAZARDOUS MATERIALS INCIDENT

A transportation hazardous materials incident is the accidental release of chemical substances or mixtures during transport. Transportation hazardous materials incidents can occur during highway or air transport. Highway accidents involving hazardous materials pose a great potential for public exposures. Both nearby populations and motorists can be impacted and become exposed by accidents and releases. If airplanes carrying hazardous cargo crash or otherwise leak contaminated cargo, populations and the environment in the impacted area can become exposed.

PIPELINE INCIDENT

A pipeline transportation incident occurs when a break in a pipeline creates the potential for an explosion or leak of a dangerous substance (oil, gas, etc.) possibly requiring evacuation. An underground pipeline incident can be caused by environmental disruption, accidental damage, or sabotage. Incidents can range from a small, slow leak to a large rupture where an explosion is possible. Inspection and maintenance of the pipeline system along with marked gas line locations and an early warning and response procedure can lessen the risk to those near the pipelines.

Warning Time Score: 4 – Less than six hours

Duration Score: 2 – Less than 24 hours

LOCATION

The Toxic Release Inventory (TRI) Program run by the U.S. Environmental Protection Agency (EPA) maintains a database of industrial facilities across the country and the type and quantity of toxic chemicals they release. The program also tracks pollution prevention activities and which facilities are reducing toxic releases. The Toxic Release Inventory reports 60 sites with hazardous materials in the county. Additionally, there are 1,028 Tier II facilities in the county that report storage of hazardous materials. TRI sites are listed in Table 4.94 and both TRI and Tier II facilities are shown in Figure 4.36.

The U.S. Department of Transportation (USDOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) maintains an inventory of the location of all gas transmission and hazardous liquid pipelines as well as liquid natural gas plants and hazardous liquid breakout tanks. The location of pipelines and pipeline infrastructure in Mecklenburg County are shown in Figure 4.37.

Spatial Extent: 2 – Small

Table 4.94 – Toxic Release Inventory Sites, Mecklenburg County

Facility Name	Jurisdiction	Industry Sector	Chemicals Present
ADAMS AN OLDCASTLE CO-CHARLOTTE	Charlotte	Nonmetallic Mineral Product	Lead, Mercury
AIRGAS NATIONAL WELDERS	Charlotte	Chemical Wholesalers	Propylene
AMERICH CORP	Charlotte	Plastics and Rubber	Styrene
ARGOS HEBRON RD CONCRETE PLANT	Charlotte	Nonmetallic Mineral Product	Lead
BENDEL TANK & HEAT EXCHANGER LLC	Charlotte	Fabricated Metals	Copper, Chromium, Nickel, Manganese
BLANCHARD TERMINAL CO - CHARLOTTE EAST NC TERMINAL	Charlotte	Petroleum Bulk Terminals	Cyclohexane, Cumene, Toluene, n-Hexane, Benzo[g,h,i]perylene, Xylene (mixed isomers), Ethylbenzene, Benzene, Polycyclic aromatic compounds, 1,2,4-Trimethylbenzene, Naphthalene
BLUEDOT-READI-MIX-EXCHANGE (PLANT #104)	Charlotte	Nonmetallic Mineral Product	Nitrate compounds (water dissociable; reportable only when in aqueous solution), Lead And Lead Compounds
BLUEDOT-READI-MIX-PINEVILLE (PLANT #108)	Charlotte	Nonmetallic Mineral Product	Lead And Lead Compounds
BLYTHE	Charlotte	Petroleum	Polycyclic aromatic compounds, Benzo[g,h,i]perylene
BOSCH REXROTH CORP	Charlotte	Machinery	Lead
BRADDOCK METALLURGICAL - CHARLOTTE INC.	Charlotte	Fabricated Metals	Ammonia

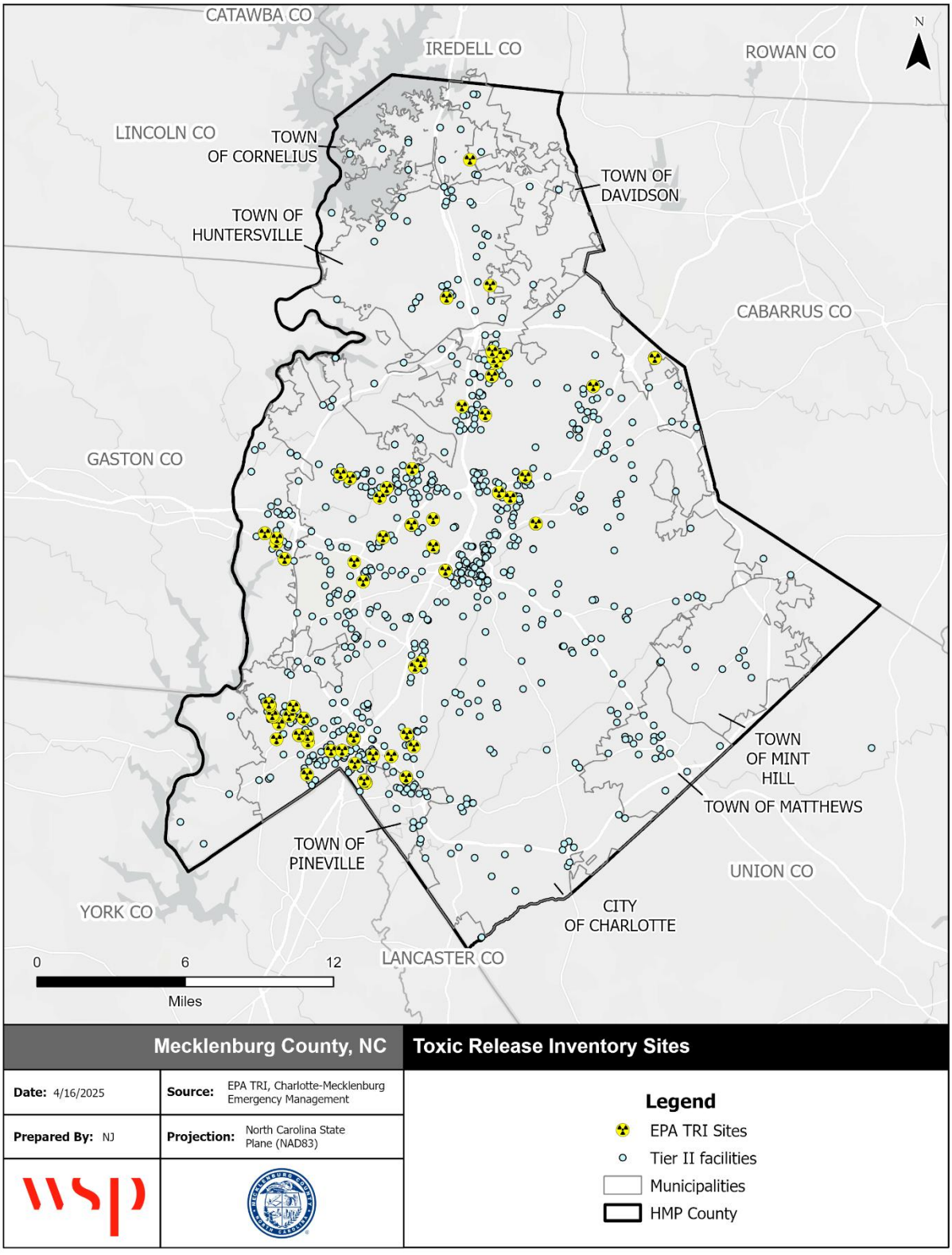
Facility Name	Jurisdiction	Industry Sector	Chemicals Present
BRENNTAG MID-SOUTH	Charlotte	Chemical Wholesalers	Sodium nitrite, n-Butyl alcohol, 1,2,4-Trimethylbenzene, Cyclohexane, Diethanolamine, Nonylphenol Ethoxylates, Ethylbenzene, Certain glycol ethers, Xylene (mixed isomers), Di(2-ethylhexyl) phthalate, Toluene
CARGILL INC.	Charlotte	Food	Nickel
CARRIER CORP - CHARLOTTE	Charlotte	Machinery	Propylene
CHARLOTTE PIPE & FOUNDRY CO	Charlotte	Primary Metals	Ammonia, Manganese compounds, Diisocyanates, Lead, Zinc (fume or dust)
CMC REBAR NC CHARLOTTE	Charlotte	Fabricated Metals	Nickel compounds
COLONIAL CHEMICAL SOLUTIONS INC.	Pineville	Chemical Wholesalers	Ammonia
COMMERCIAL MERCHANDISING CORP	Charlotte	Chemicals	N-Methyl-2-pyrrolidone, Certain glycol ethers, Ethylene glycol, Nitrate compounds (water dissociable; reportable only when in aqueous solution)
CONCRETE SUPPLY CO - SOUTH PLANT	Charlotte	Nonmetallic Mineral Product	Lead And Lead Compounds, Nitrate compounds (water dissociable; reportable only when in aqueous solution)
CONCRETE SUPPLY CO LLC-REAMES RD	Charlotte	Nonmetallic Mineral Product	Lead And Lead Compounds
CONCRETE SUPPLY CO NORTH PLANT	Charlotte	Nonmetallic Mineral Product	Lead And Lead Compounds, Nitrate compounds (water dissociable; reportable only when in aqueous solution), Mercury And Mercury Compounds
CONCRETE SUPPLY CO. LLC - ARROWOOD	Charlotte	Nonmetallic Mineral Product	Mercury And Mercury Compounds, Lead And Lead Compounds
CONCRETE SUPPLY WEST	Charlotte	Nonmetallic Mineral Product	Lead And Lead Compounds, Mercury And Mercury Compounds
CONTROLS SOUTHEAST INC.	Pineville	Fabricated Metals	Manganese, Nickel, Chromium
DYSTAR CAROLINA CHEMICAL CORP	Charlotte	Chemicals	Ethylene glycol, Formaldehyde
FRITO-LAY	Charlotte	Food	Peracetic acid, Nitric acid
FXI INC. - CORNELIUS	Cornelius	Plastics and Rubber	Toluene diisocyanate (mixed isomers)
GERDAU LONG STEEL NA-CHARLOTTE MILL	Charlotte	Primary Metals	Copper compounds, Manganese compounds, Lead compounds, Nickel compounds, Mercury compounds, Zinc compounds, Chromium compounds (except for chromite ore mined in the Transvaal Region), Dioxin and dioxin-like compounds
GLOBAL CHARLOTTE NORTH & SOUTH TERMINALS	Charlotte	Petroleum Bulk Terminals	1,2,4-Trimethylbenzene, Ethylbenzene, Styrene, Lead compounds, Naphthalene, Polycyclic aromatic compounds, Cumene, Benzo[g,h,i]perylene, Benzene, Xylene (mixed isomers), Toluene, n-Hexane
HARPER CORP OF AMERICA	Charlotte	Machinery	Chromium and Chromium Compounds(except for chromite ore mined in the Transvaal Region)

Facility Name	Jurisdiction	Industry Sector	Chemicals Present
HARPER/LOVE ADHESIVES CORP	Charlotte	Chemicals	Formaldehyde
IGM RESINS USA INC	Charlotte	Chemicals	Nitric acid, Acrylic acid, Phthalic anhydride, Toluene
INOLEX	Charlotte	Chemicals	Ethylene glycol
INX INTERNATIONAL INK CO.	Charlotte	Chemicals	Barium And Barium Compounds, Copper And Copper Compounds, Chromium compounds (except for chromite ore mined in the Transvaal Region)
ITW CCNA PNA CONSTRUCTION TECHNOLOGIES	Charlotte	Fabricated Metals	Nickel, Manganese, Lead, Chromium
ITW COOKING EQUIPMENT	Charlotte	Machinery	Chromium, Manganese, Nickel
JCI JONES CHEMICALS INC.	Charlotte	Chemical Wholesalers	Chlorine
JIM MYERS & SONS INC	Charlotte	Fabricated Metals	Nickel, Chromium, Aluminum (fume or dust), Manganese, Copper
KURZ TRANSFER PRODUCTS LP	Charlotte	Printing	Mixture, Mixture, Mixture, Mixture, n-Butyl alcohol, Toluene
KURZ TRANSFER PRODUCTS. L.P. HUNTERSVILLE	Huntersville	Printing	Xylene (mixed isomers), Toluene, n-Butyl alcohol
MALLARD CREEK POLYMERS	Charlotte	Chemicals	Butyl acrylate, 1,3-Butadiene, Methyl methacrylate, N-Methylolacrylamide, Styrene, Acrylamide, Acrylic acid, Ammonia
MASONITE CHARLOTTE NC EXTERIOR DOOR	Charlotte	Fabricated Metals	Diisocyanates
MEXICHEM SPECIALTY COMPOUNDS	Pineville	Chemicals	Zinc compounds, Antimony compounds, Di(2-ethylhexyl) phthalate, Barium compounds (except for barium sulfate (CAS No. 7727-43-7)), Lead And Lead Compounds
NEXEO SOLUTIONS LLC	Charlotte	Chemical Wholesalers	n-Hexane, Methanol, Toluene, Methanol, Methyl isobutyl ketone, N-Methyl-2-pyrrolidone, n-Hexane, Certain glycol ethers, N-Methyl-2-pyrrolidone, n-Butyl alcohol, Xylene (mixed isomers), Methyl isobutyl ketone, Xylene (mixed isomers), n-Butyl alcohol, Toluene, Certain glycol ethers
PAVESTONE - CHARLOTTE NC PLANT	Charlotte	Nonmetallic Mineral Product	Lead
QUANTUM COATINGS INC	Charlotte	Chemicals	Certain glycol ethers, Diethanolamine, Zinc compounds, Ammonia
REAGENTS HOLDINGS LLC	Charlotte	Chemicals	Nitric acid, Mercury, Methanol
REAMES RD CONCRETE PLANT	Charlotte	Nonmetallic Mineral Product	Lead
SAFETY-KLEEN SYSTEMS INC	Charlotte	Hazardous Waste	Zinc compounds, Ethylene glycol, Benzo[g,h,i]perylene, Polycyclic aromatic compounds
SHERWIN-WILLIAMS CO	Charlotte	Chemicals	Zinc compounds, 4,4'-Isopropylidenediphenol, Triglycidyl isocyanurate
SIEMENS CHARLOTTE TURBINE GENERATOR SERVICE CENTER	Charlotte	Machinery	Copper, Nickel, Ammonia, Chromium

Facility Name	Jurisdiction	Industry Sector	Chemicals Present
SNYDER'S-LANCE INC.	Charlotte	Food	Ammonia
SOUTHWIRE CO HUNTERSVILLE PLANT	Huntersville	Electrical Equipment	Copper
STEELFAB INC	Charlotte	Fabricated Metals	Chromium, Lead, Propylene, Manganese, Copper, Nickel
STERIGENICS US LLC-CHARLOTTE NC FACILITY	Charlotte	Other	Ethylene oxide, Ethylene glycol
SWS CONCRETE-MAIN PLANT	Charlotte	Nonmetallic Mineral Product	Lead And Lead Compounds
SWS CONCRETE-WESTINGHOUSE PLANT	Charlotte	Nonmetallic Mineral Product	Lead And Lead Compounds, Nitrate compounds (water dissociable; reportable only when in aqueous solution)
THOMAS CONCRETE	Charlotte	Nonmetallic Mineral Product	Nitrate compounds (water dissociable; reportable only when in aqueous solution)
TRANE US INC.	Charlotte	Machinery	Copper
VERITIV OPERATING CO - NC310 CHARLOTTE	Charlotte	Other	Diisocyanates
Region Total: 60			

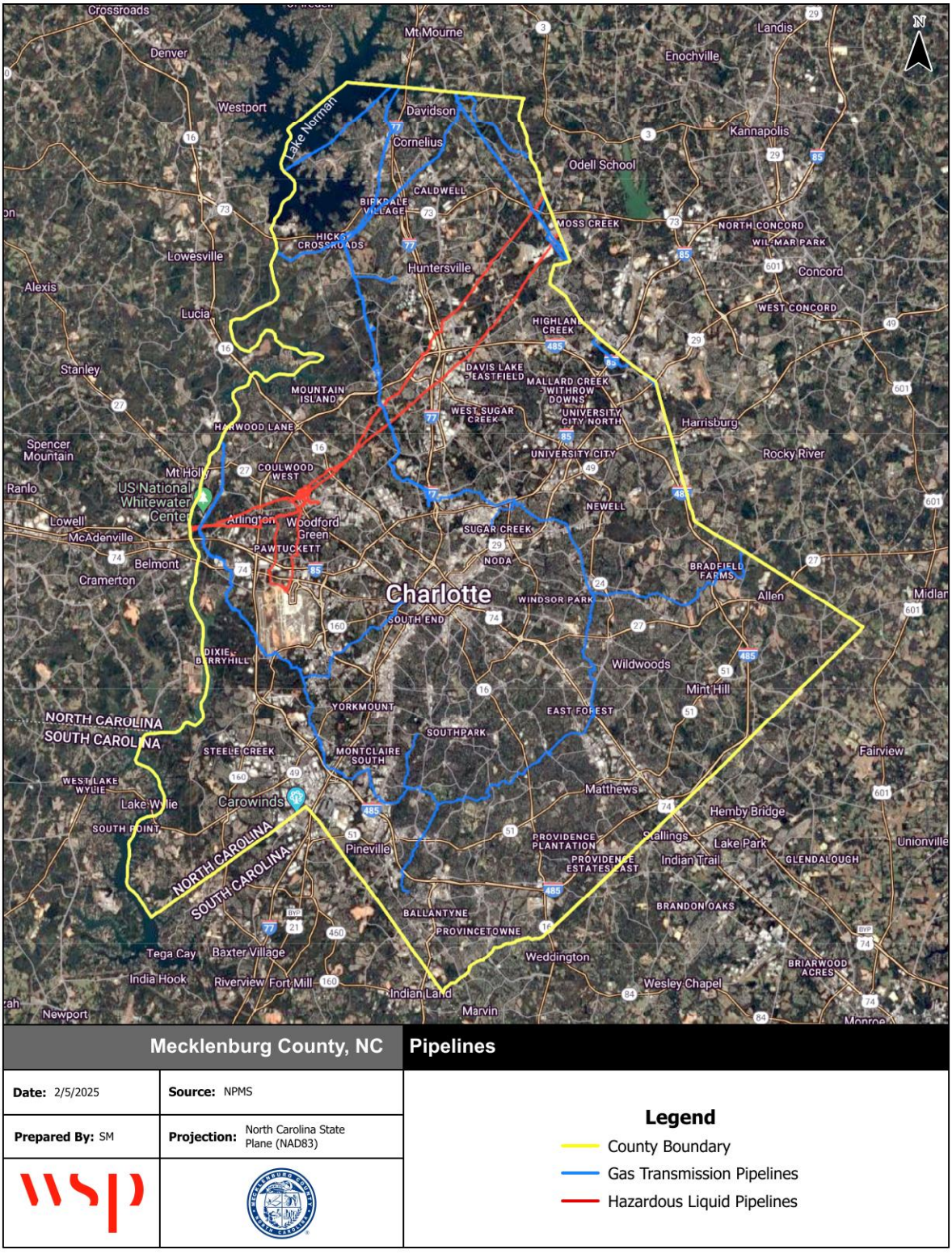
Source: US EPA Toxic Release Inventory

Figure 4.36 – Major Hazardous Materials Facilities in Mecklenburg County



Source: EPA Toxic Release Inventory

Figure 4.37 – Pipelines and Pipeline Infrastructure in Mecklenburg County



Source: US Department of Transportation, Pipeline and Hazardous Materials Safety Administration, National Pipeline Mapping System

HISTORICAL OCCURRENCES

Multiple hazardous materials incidents take place in Mecklenburg County every year. The USDOT's PHMSA maintains a database of reported hazardous materials incidents since 1989. According to PHSMA records, there were 6,435 recorded releases in Mecklenburg County from 1990 to 2023. These releases are listed in Table 4.95. Of these events, 91 (1.4%) were flagged as serious incidents, shown in Table 4.96. Of the total incidents to occur in Mecklenburg County, these events caused an estimated $7,284,058 in damages with over 96 percent of all incidents occurring on highways and roads.

Table 4.95 – Annual Reported Hazardous Materials Incidents, 1990-2023, Mecklenburg County

Year	Total Incidents
1990	172
1991	145
1992	123
1993	150
1994	214
1995	238
1996	161
1997	169
1998	221
1999	482
2000	370
2001	287
2002	268
2003	154
2004	184
2005	151
2006	177
2007	150
2008	203
2009	170
2010	198
2011	177
2012	141
2013	129
2014	146
2015	125
2016	144
2017	130
2018	134
2019	147
2020	150
2021	220
2022	209
2023	196
Total	**6,435**
Avg/Year	**189.2**

Source: PHMSA Incident Reports, Office of Hazardous Materials Safety, Incident Reports Database Search

Table 4.96 – Hazardous Materials Incidents Classified as Serious 1990-2023, Mecklenburg County

Report Number	Date Of Incident	Hazardous Class	Mode Of Transportation	Causes of Failure	Total Damages
I-1990040692	4/17/1990	2	Highway	Rollover Accident; Vehicular Crash or Accident Damage	$276,900
I-1991020455	8/24/1990	8	Highway	Defective Component or Device	$8,015
I-1990090538	8/24/1990	8	Rail		-
I-1990090629	9/7/1990	2	Rail	Defective Component or Device	-
I-1990120370	11/29/1990	3	Highway		$2,730
I-1991070516	6/26/1991	3	Highway	Improper Preparation for Transportation; Vehicular Crash or Accident Damage	$95,000
I-1991070516	6/26/1991	3	Highway	Improper Preparation for Transportation; Vehicular Crash or Accident Damage	$95,000
I-1992050527	4/30/1992	3	Highway		$12,175
I-1992070397	6/22/1992	8	Rail		$3,300
I-1992090150	7/24/1992	8	Highway		$30,000
I-1992120324	11/14/1992	2	Highway	Vandalism	$31,700
I-1994101400	9/16/1994	3	Highway		$150
I-1996010007	12/27/1995	3	Highway	Defective Component or Device	$13,000
I-1996051110	5/3/1996	8	Highway	Loose Closure, Component, or Device	-
I-1996060856	6/4/1996	3	Highway	Improper Preparation for Transportation; Inadequate Blocking and Bracing	$1,300
I-1997020509	1/30/1997	8	Rail		$2,740
I-1997050666	4/10/1997	3	Highway	Defective Component or Device	$340
I-1997060546	5/25/1997	2.2	Highway	Over-pressurized	$1,000
I-1997060554	5/25/1997	2.2	Highway		$1,350
I-1997080954	8/14/1997	3	Highway	Vehicular Crash or Accident Damage	$22,100
I-1998030277	3/12/1998	8	Highway		$2,300
I-1998050486	4/10/1998	3	Highway	Rollover Accident; Vehicular Crash or Accident Damage	$124,000
I-1998060865	5/21/1998	8	Highway	Improper Preparation for Transportation	$7,000
I-1998060458	5/25/1998	8	Rail	Loose Closure, Component, or Device	-
I-1999020361	1/22/1999	3	Highway	Overfilled	$272
I-1999070049	6/23/1999	2	Highway	Overfilled	$100
I-1999111307	9/24/1999	2.1	Highway	Dropped; Fire, Temperature, or Heat	$309,000
I-1999111307	9/24/1999	2.1	Highway	Dropped; Fire, Temperature, or Heat	$309,000
I-1999111048	11/10/1999	5.1	Highway	Rollover Accident; Vehicular Crash or Accident Damage; Water Damage	$68,834
I-1999111048	11/10/1999	8	Highway	Overfilled; Rollover Accident; Vehicular Crash or Accident Damage	$68,834
I-1999111048	11/10/1999	8	Highway	Rollover Accident; Vehicular Crash or Accident Damage	$68,834
I-2001051196	12/8/1999	3	Highway		$3,000
I-2000051145	5/11/2000	8	Highway		-
I-2000060123	5/20/2000	8	Rail	Loose Closure, Component, or Device	$350

Report Number	Date Of Incident	Hazardous Class	Mode Of Transportation	Causes of Failure	Total Damages
I-2000080773	7/18/2000	3	Rail		$200
I-2000120724	11/29/2000	3	Highway	Overfilled	$200
I-2002050668	7/26/2001	3	Highway	Rollover Accident; Vehicular Crash or Accident Damage	$65,309
I-2002111006	8/17/2001	8	Highway	Defective Component or Device; Abrasion	$2,950
I-2002030356	1/25/2002	3	Highway	Overfilled	$3,250
I-2003020466	6/14/2002	3	Highway	Rollover Accident; Vehicular Crash or Accident Damage	$201,600
I-2004010996	6/3/2003	3	Highway	Rollover Accident; Vehicular Crash or Accident Damage	$72,625
I-2003091427	9/17/2003	3	Highway		$64,000
I-2003120208	11/21/2003	3	Highway	Rollover Accident; Vehicular Crash or Accident Damage	$5,200
I-2004041229	3/27/2004	9	Rail	Loose Closure, Component, or Device	$500
I-2004071113	6/17/2004	8	Highway	Improper Preparation for Transportation	$2,698
I-2004080961	7/8/2004	8	Highway	Defective Component or Device	$4,579
I-2005030050	2/18/2005	8	Highway	Impact with Sharp or Protruding Object (e.g., nails)	-
E-2005030217	3/18/2005	8	Highway	Defective Component or Device	$10,000
I-2006100741	8/20/2005	3	Highway	Vehicular Crash or Accident Damage	$68,693
I-2010080149	4/22/2006	3	Highway	Rollover Accident	$129,000
X-2008030004	3/3/2008	8	Rail	Loose Closure, Component, or Device	$8,300
I-2008110046	10/2/2008	3	Highway	Rollover Accident	$80,400
E-2010110236	11/12/2010	3	Water		$103,000
X-2011010256	1/19/2011	3	Highway	Improper Preparation for Transportation	-
E-2011070388	6/28/2011	2	Highway	Deterioration or Aging	$49,688
E-2012020284	2/17/2012	8	Highway	Forklift Accident	-
E-2012050120	5/5/2012	3	Highway		$61,000
E-2012080466	8/2/2012	3	Highway	Overfilled	-
E-2013010399	12/25/2012	8	Highway	Vandalism	$282,000
I-2013070311	3/9/2013	3	Highway	Rollover Accident	$200,403
E-2013050048	5/1/2013	3	Highway		-
X-2013100315	10/1/2013	9	Highway	Forklift Accident	$2,000
E-2014010325	1/6/2014	3	Highway	Vehicular Crash or Accident Damage	$25,000
E-2014080102	7/17/2014	8	Highway	Broken Component or Device	-
E-2014080395	7/24/2014	3	Highway	Human Error	$15,000
I-2015030329	12/26/2014	3	Highway	Deterioration or Aging	$18,585
E-2015070099	6/15/2015	8	Highway	Incompatible Product	$112,500
I-2016090136	7/20/2016	9	Highway	Fire, Temperature, or Heat	$150,000
I-2017020152	2/9/2017	8	Highway	Forklift Accident	$6,300
E-2017115103	11/1/2017	3	Highway	Human Error	$9,500
E-2018090501	6/29/2018	3	Highway	Improper Preparation for Transportation	$7,500

Report Number	Date Of Incident	Hazardous Class	Mode Of Transportation	Causes of Failure	Total Damages
E-2018090775	9/19/2018	8	Highway	Forklift Accident	$4,500
E-2019010239	12/13/2018	8	Highway	Overfilled	-
E-2019010068	1/2/2019	8	Highway		$5,200
E-2019010198	1/2/2019	8	Highway		$5,200
I-2020020240	1/26/2020	3	Highway	Rollover Accident	$934,000
E-2020040485	4/22/2020	3	Highway	Forklift Accident	$5,000
E-2020050059	5/6/2020	3	Highway	Vehicular Crash or Accident Damage	$17,090
E-2020070071	6/11/2020	8	Highway	Rollover Accident	$134,000
E-2020070071	6/11/2020	2	Highway	Rollover Accident	$134,000
E-2020070071	6/11/2020	5.1	Highway	Rollover Accident	$134,000
E-2020070071	6/11/2020	5.1	Highway	Rollover Accident	$134,000
E-2020100410	9/23/2020	8	Highway		$58,000
I-2022020130	12/3/2020	9	Air	Fire, Temperature, or Heat	-
E-2021070615	7/6/2021	3	Highway	Improper Preparation for Transportation	-
I-2022080493	10/1/2021	4.2	Rail	Defective Component or Device	$26,000
E-2021110385	10/20/2021	8	Highway	Forklift Accident	$15,000
I-2022070269	10/27/2021	8	Highway	Forklift Accident	$20,000
I-2022070630	12/20/2021	9	Air	Fire, Temperature, or Heat	-
E-2022100575	9/20/2022	8	Highway	Forklift Accident	$7,000
E-2024040278	9/17/2023	3	Highway	Human Error	$316,549

Source: PHMSA Incident Reports, Office of Hazardous Materials Safety, Incident Reports Database Search

The most common materials spilled in the planning area are Class 3 (Flammable Combustible Liquids) and Class 8 (Corrosive). Figure 4.38 describes all nine hazard classes.

Figure 4.38 – Hazardous Materials Classes



Source: U.S. Department of Transportation

The above list does not include the Colonial Pipeline spill, which occurred from July 27 to August 14, 2020. A crack in the wall of an underground pipeline resulted in the release of two million gallons of gasoline into Mecklenburg County's Oehler Nature Preserve near Huntersville. This spill was the largest onshore fuel spill in the nation according to NC Department of Environmental Quality and resulted in groundwater contamination and the need for extensive remediation.

EXTENT

The magnitude of a hazardous materials incident can be defined by the material type, the amount released, and the location of the release. The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA), which records hazardous material incidents across the country, defines a "serious incident" as a hazardous materials incident that involves:

- a fatality or major injury caused by the release of a hazardous material,
- the evacuation of 25 or more persons as a result of release of a hazardous material or exposure to fire,
- a release or exposure to fire which results in the closure of a major transportation artery,
- the alteration of an aircraft flight plan or operation,
- the release of radioactive materials from Type B packaging,
- the release of over 11.9 galls or 88.2 pounds of a severe marine pollutant, or
- the release of a bulk quantity (over 199 gallons or 882 pounds) of a hazardous material.

The release or spill of hazardous materials can also require different emergency responses depending on the amount, type, and location of the spill incident. Potential losses can vary greatly for hazardous material incidents. For even a small incident, there are cleanup and disposal costs. In a larger scale incident, cleanup can be extensive and protracted. There can be deaths or injuries requiring doctor's visits and hospitalization, disabling chronic injuries, soil and water contamination can occur, necessitating costly remediation. Evacuations can disrupt home and business activities. Large-scale incidents can easily reach $1 million or more in direct damages, with clean-ups that can last for years.

Impact: 3 – Critical

PROBABILITY OF FUTURE OCCURRENCE

Based on historical occurrences, there have been 6,435 hazardous materials release in the 34-year period from 1990 through 2023. While the number of incidents varies from year to year, the overall trend shows no increase or decrease in the number. Thus, the planning area can expect approximately 189 hazardous materials incident a year, or roughly 15.7 per month. The majority of these incidents will be in or near Charlotte.

However, the number of serious incidents is significantly lower: only 91 in 34 years or an average of 2.6 serious incidents per year. This means that based on historical data, there is a 100 percent annual chance of the planning area experiencing a damaging hazardous materials incident.

Probability: 4 – Highly Likely

CLIMATE CHANGE

Climate change is not expected to impact hazardous materials incidents.

VULNERABILITY ASSESSMENT

The impacts of a hazardous materials incident vary based on the type and quantity of material released, as well as the location, time of day, and weather conditions.

METHODOLOGIES AND ASSUMPTIONS

Vulnerability to hazardous materials incidents was assessed based on past occurrences in the region and nationally and the known behavior of these materials.

PEOPLE

Hazardous materials incidents can cause injuries, hospitalizations, and even death to people nearby. People living near hazardous facilities and along transportation routes may be at a higher risk of exposure, particularly those living or working downstream and downwind from such facilities. For example, a toxic spill or a release of an airborne chemical near a populated area can lead to significant evacuations and have a high potential for loss of life. Individuals working with or transporting hazardous materials are also at heightened risk.

In addition to the immediate health impacts of releases, a handful of studies have found long term health impacts such as increased incidence of certain cancers and birth defects among people living near certain chemical facilities. However there has not been sufficient research done on the subject to allow detailed analysis.

The primary economic impact of hazardous material incidents results from lost business, delayed deliveries, property damage, and potential contamination. Large and publicized hazardous material-related events can deter tourists and could potentially discourage residents and businesses. Economic effects from major transportation corridor closures can be significant.

PROPERTY

The property impacts of a fixed hazardous facility, such as a chemical processing facility is typically localized to the property where the incident occurs. The impact of a small spill (i.e. liquid spill) may also be limited to the extent of the spill and remediated if needed. While cleanup costs from major spills can be significant, they do not typically cause significant long-term impacts to property.

Impacts of hazardous material incidents on critical facilities are most often limited to the area or facility where they occurred, such as at a transit station, airport, fire station, hospital, or railroad. However, they can cause long-term traffic delays and road closures resulting in major delays in the movement of goods and services. These impacts can spread beyond the planning area to affect neighboring counties, or vice-versa. While cleanup costs from major spills can be significant, they do not typically cause significant long-term impacts to critical facilities.

ENVIRONMENT

Hazardous material incidents may affect a small area at a regulated facility or cover a large area outside such a facility. Widespread effects occur when hazardous materials contaminate the groundwater and eventually the municipal water supply, or they migrate to a major waterway or aquifer. Groundwater contamination was raised as a concern by stakeholders participating in this plan update, especially for areas in north Mecklenburg County that rely on well water. Impacts on wildlife and natural resources can also be significant.

CONSEQUENCE ANALYSIS

Table 4.97 summarizes the potential detrimental consequences of hazardous materials incident.

Table 4.97 – Consequence Analysis – Hazardous Materials Incident

Category	Consequences
Public	Contact with hazardous materials could cause serious illness or death. Those living and working closest to hazardous materials sites face the greatest risk of exposure. Exposure may also occur through contamination of food or water supplies.
Responders	Responders face similar risks as the general public but a heightened potential for exposure to hazardous materials.
Continuity of Operations (including Continued Delivery of Services)	A hazardous materials incident may cause temporary road closures or other localized impacts but is unlikely to affect continuity of operations.
Property, Facilities and Infrastructure	Some hazardous materials are flammable, explosive, and/or corrosive, which could result in structural damages to property. Impacts would be highly localized.
Environment	Consequences depend on the type of material released. Possible ecological impacts include loss of wildlife, loss of habitat, and degradation of air and/or water quality.
Economic Condition of the Jurisdiction	Clean up, remediation, and/or litigation costs may apply. Long-term economic damage is unlikely.
Public Confidence in the Jurisdiction's Governance	A hazardous materials incident may affect public confidence if the environmental or health impacts are enduring.

HAZARD SUMMARY BY JURISDICTION

The table below summarizes hazardous materials incident risk by jurisdiction. Probability was determined based on past incidents. All other factors do not vary by jurisdiction.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Charlotte	4	3	2	4	2	3.1	H
Cornelius	3	3	2	4	2	2.8	M
Davidson	3	3	2	4	2	2.8	M
Huntersville	3	3	2	4	2	2.8	M
Matthews	3	3	2	4	2	2.8	M
Mint Hill	3	3	2	4	2	2.8	M
Pineville	3	3	2	4	2	2.8	M
Mecklenburg County	3	3	2	4	2	2.8	M

4.5.14 RADIOLOGICAL EMERGENCY

HAZARD BACKGROUND

A radiological incident is an occurrence resulting in the release of radiological material at a fixed facility (such as power plants, hospitals, laboratories, etc.) or in transit.

Radiological incidents related to transportation are described as incidents resulting in a release of radioactive material during transportation. Transportation of radioactive materials through North Carolina over the interstate highway system is considered a radiological hazard. The transportation of radioactive material by any means of transport is licensed and regulated by the federal government. As a rule, there are two categories of radioactive materials that are shipped over the interstate highways:

- Low level waste consists of primarily of materials that have been contaminated by low level radioactive substances but pose no serious threat except through long-term exposure. These materials are shipped in sealed drums within placarded trailers. The danger to the public is no more than a wide array of other hazardous materials.
- High level waste, usually in the form of spent fuel from nuclear power plants, is transported in specially constructed casks that are built to withstand a direct hit from a locomotive.

Radiological emergencies at nuclear power plants are divided into classifications. Table 4.98 shows these classifications, as well as descriptions of each.

Table 4.98 – Radiological Emergency Classifications

Emergency Classification	Description
Notification of Unusual Event (NOUE)	Events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.
Alert	Events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life-threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the Environmental Protection Agency (EPA) Protective Action Guides (PAGs)
Site Area Emergency (SAE)	Events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or hostile action that results in intentional damage or malicious acts; 1) toward site personnel or equipment that could lead to the likely failure of or; 2) that prevent effective access to, equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA PAG exposure levels beyond the site boundary.
General Emergency	Events are in progress or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity or hostile action that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA PAG exposure levels offsite for more than the immediate site area.

Warning Time: 4 – Less than six hours

Duration: 4 – More than one week

LOCATION

The McGuire Nuclear Station is located on Lake Norman in Mecklenburg County, about 17 miles north of Charlotte. Lake Norman was built by Duke Energy in 1963 and is the state's largest man-made lake. The first unit of the station commenced operation in 1981, and the second in 1984. It has a capacity to produce 2,316 megawatts of power and employs more than 1,200 employees.

The plant lies in between North Carolina's largest city, Charlotte, and the Hickory/Statesville area. These highly populated nearby cities are home to many universities, big industries, and airports. In Charlotte population and employment are continuing to increase. As more people move to the surrounding area, the population is therefore more vulnerable to potential emergencies at the McGuire Nuclear Station.

The Catawba Nuclear Station is located on Lake Wylie in York County, South Carolina; however, it is jointly owned by North Carolina Municipal Power Agency Number One. Its first unit began operating in 1985, followed by the next unit in 1986. It has a capacity for 2,310 megawatts of power and is only 11 miles southwest of Charlotte.

The Nuclear Regulatory Commission defines two emergency planning zones around nuclear plants:

- **Emergency Planning Zone (EPZ)** – The EPZ is a 10-mile radius around nuclear facilities. It is also known as the Plume Exposure Pathway. Areas located within this zone are considered to be at highest risk of exposure to radioactive materials. Within this zone, the primary concern is exposure to and inhalation of radioactive contamination. Predetermined action plans within the EPZ are designed to avoid or reduce dose from such exposure. Residents within this zone would be expected to evacuate in the event of an emergency. Other actions such as sheltering, evacuation, and the use of potassium-iodide must be taken to avoid or reduce exposure in the event of a nuclear incident.
- **Ingestion Pathway Zone (IPZ)** – The IPZ is delineated by a 50-mile radius around nuclear facilities as defined by the federal government. Also known as the Ingestion Exposure Pathway, the IPZ has been designated to mitigate contamination in the human food change resulting from a radiological accident at a nuclear power facility. Contamination to fresh produce, water supplies, and other food produce may occur when radionuclides are deposited on surfaces.

Figure 44.39 and Figure 44.40 show the location of McGuire Nuclear Station and Catawba Nuclear Station and the EPZ and IPZ areas around each plant. Unincorporated Mecklenburg County, Charlotte, Cornelius, Davidson, Huntersville, and Pineville are all within the EPZ for these plants.

Spatial Extent: 4 – Large

Figure 44.39 – McGuire Nuclear Station EPZ and IPZ Range

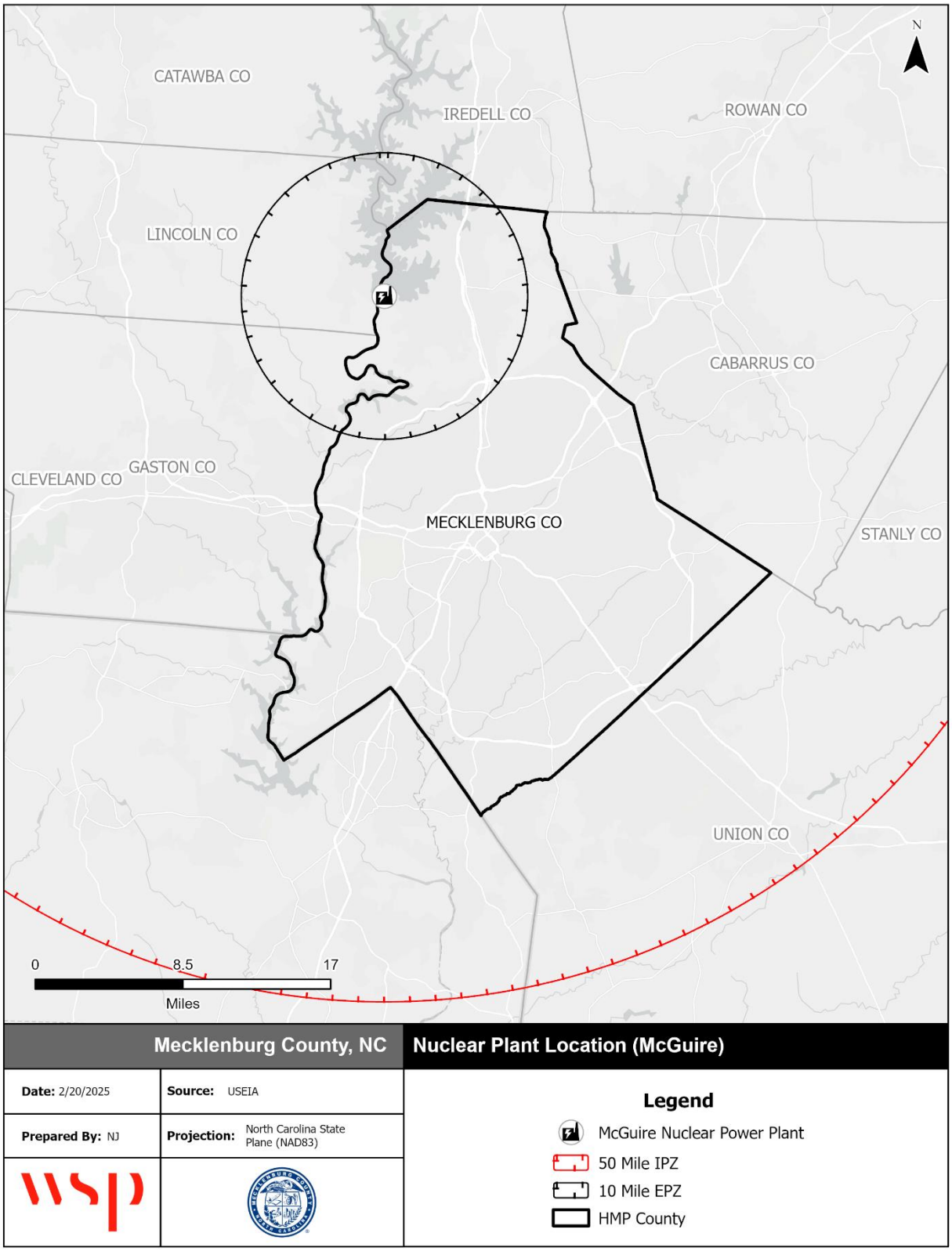
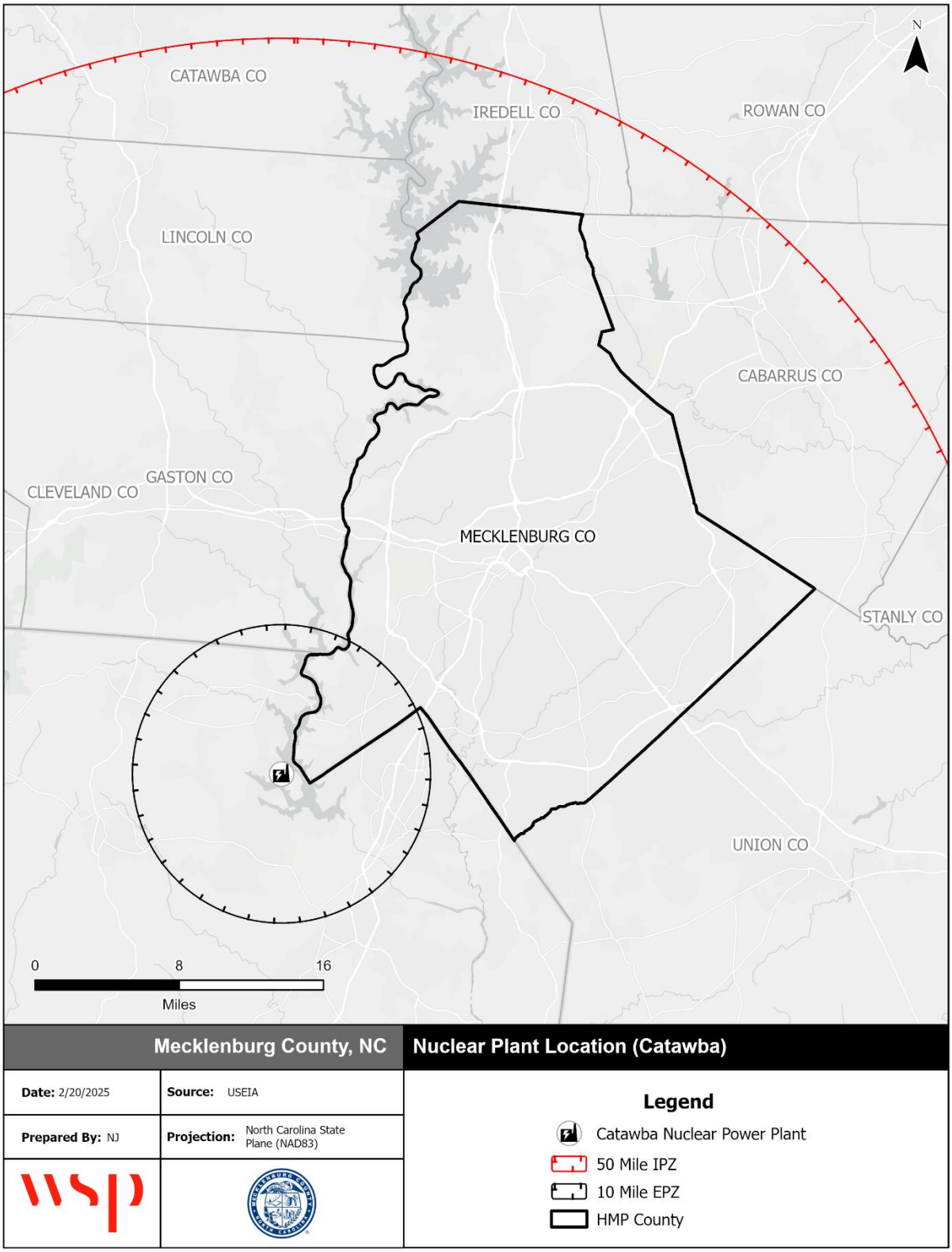


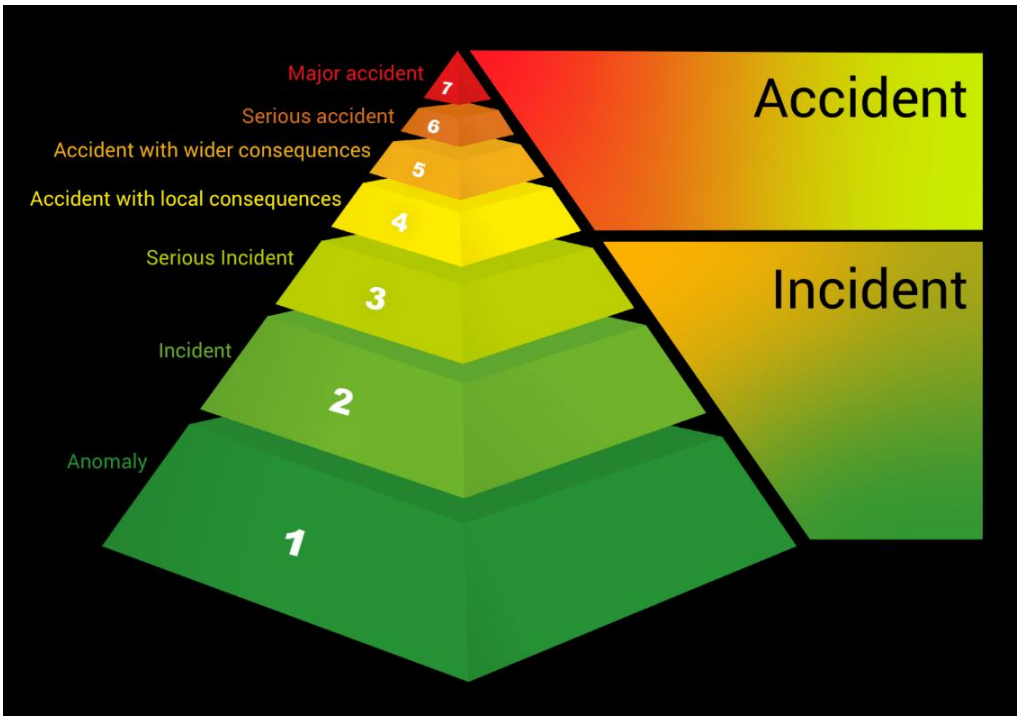
Figure 44.40 – Catawba Nuclear Station EPZ and IPZ Range



EXTENT

The International Atomic Energy Association (IAEA) developed the International Nuclear and Radiological Event Scale to quantify the magnitude of radiological events. This scale is logarithmic, meaning each increasing level represents a 10-fold increase in severity compared to the previous level.

Figure 4.41 – International Nuclear and Radiological Event Scale



Source: International Atomic Energy Association

Impact: 3 – Critical

HISTORICAL OCCURRENCES

As reported in the 2023 State Hazard Mitigation Plan, there have been no major release events in North Carolina nuclear facilities; there was one situation in 2008 where the nuclear material was being monitored for criticality that occurred within the fuel rod fabrication facility.

PROBABILITY OF FUTURE OCCURRENCE

Radiological hazards are highly unpredictable. Nuclear reactors present the possibility of catastrophic damages, yet the industry is highly regulated and historical precedence suggests an incident is unlikely.

Probability: 1 – Unlikely

CLIMATE CHANGE

Climate change is not projected to have any impact on a potential radiological incident.

VULNERABILITY ASSESSMENT

PEOPLE

People within the 10-mile EPZ are at risk of direct exposure to radioactive material. People located within the 50-mile IPZ are at risk of exposure through ingestion of contaminated food and water, but generally do not require evacuation. Low levels of radiation are not considered harmful, but a high exposure to radiation can cause serious illness or death.

PROPERTY

A radiological incident could cause severe damage to the power station itself but would not cause direct property damage outside the station. However, property values could drop substantially if a radiological incident resulted in contamination of nearby areas.

ENVIRONMENT

A radiological incident could result in the spread of radioactive material into the environment, which could contaminate water and food sources and harm animal and plant life.

CONSEQUENCE ANALYSIS

Table 4.99 summarizes the potential detrimental consequences of radiological incident.

Table 4.99 – Consequence Analysis – Radiological Emergency

Category	Consequences
Public	High levels of radiation could cause serious illness or death. Those living and working closest to the nuclear station would face the greatest risk.
Responders	Responders face potential for heightened exposure to radiation, which could cause severe chronic illness and death.
Continuity of Operations (including Continued Delivery of Services)	An incident at the nuclear station could interrupt power generation and cause power shortages. Regular operations would likely be affected by the response effort an event would require.
Property, Facilities and Infrastructure	The plant itself could be damaged by a radiological incident. Nearby property and facilities could be affected by contamination.
Environment	Water supplies, food crops, and livestock within 50 miles of the nuclear station could be contaminated by radioactive material in the event of a major incident.
Economic Condition of the Jurisdiction	The local economy could be affected by a radiological incident. Property values and economic activity could decline as a result.
Public Confidence in the Jurisdiction's Governance	A radiological incident would likely cause severe loss of public confidence given that the hazard is human-caused and highly regulated. Public confidence can also be affected by false alarms.

HAZARD SUMMARY BY JURISDICTION

The table below summarizes radiological emergency risk by jurisdiction. Impact is rated higher for those jurisdictions within the EPZ. Otherwise, risk does not vary by jurisdiction.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score	Priority
Charlotte	1	4	4	4	4	3.1	H
Cornelius	1	4	4	4	4	3.1	H
Davidson	1	4	4	4	4	3.1	H
Huntersville	1	4	4	4	4	3.1	H
Matthews	1	3	4	4	4	2.8	M
Mint Hill	1	3	4	4	4	2.8	M
Pineville	1	4	4	4	4	3.1	H
Mecklenburg County	1	4	4	4	4	3.1	H

4.6 CONCLUSIONS ON HAZARD RISK

PRIORITY RISK INDEX

As discussed in Section 4.3 Risk Assessment Methodology and Assumptions, the Priority Risk Index was used to rate each hazard on a set of risk criteria and determine an overall standardized score for each hazard. The conclusions drawn from this process are summarized below by classifying hazards into three categories—high, moderate, or low risk—based on the assigned risk value. For some hazards, PRI ratings vary by jurisdiction. In these cases, the overall PRI rating reflects the highest risk that applies to the region.

General assumptions for high, moderate, and low risk hazards are described below, and hazard risk ratings are summarized in Table 4.100:

- **High Risk** – Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.
- **Moderate Risk** – Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **Low Risk** – Minimal potential impact. The occurrence and potential cost of damage to life and property is negligible or nonexistent. This is not a priority hazard for mitigation projects.

Table 4.100 – Summary of Hazard Risk Classification

High Risk (> 3.0)	Excessive Heat Flooding Severe Winter Weather Hazardous Substances Radiological Emergency
Moderate Risk (2.0 – 2.9)	Dam & Levee Failure Drought Hurricane & Tropical Storm Tornadoes & Thunderstorms Cyber Threat Wildfire Infectious Disease
Low Risk (< 2.0)	Earthquake Landslide

Table 4.101 summarizes the degree of risk assigned to each identified hazard using the PRI method. Where PRI ratings varied by jurisdiction, the range is shown. Additionally, where a hazard encompasses several sub-hazards, the PRI rating for each sub-hazard is provided.

Table 4.101 – Summary of PRI Results

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam & Levee Failure[1]	Unlikely-Possible	Limited-Critical	Negligible	Less than 6 hrs	Less than 1 week	1.8-2.4
Drought[1]	Likely	Minor-Limited	Large	More than 24 hrs	More than 1 week	2.5-2.8
Earthquake	Unlikely	Minor	Large	Less than 6 hrs	Less than 6 hrs	1.9
Excessive Heat	Highly Likely	Critical	Large	More than 24 hrs	Less than 1 week	3.3
Flooding[1]	Possible-Highly Likely	Critical	Small-Moderate	6 to 12 hours	Less than 1 week	2.7-3.3
Hurricane & Tropical Storm[1]	Likely	Limited-Critical	Large	More than 24 hrs	Less than 24 hrs	2.6-2.9
Infectious Disease	Possible	Critical	Large	More than 24 hrs	More than 1 week	2.8
Landslide[1]	Unlikely-Possible	Minor	Negligible	6 to 12 hours	Less than 6 hrs	1.2-1.5
Severe Winter Weather	Highly Likely	Limited	Large	More than 24 hrs	Less than 1 week	3.0
Tornadoes[2]	Likely	Critical	Small	Less than 6 hrs	Less than 6 hrs	2.7
Thunderstorm Winds[1,2]	Highly Likely	Minor-Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.6-2.9
Lightning and Hail[2]	Highly Likely	Minor	Negligible	Less than 6 hrs	Less than 6 hrs	2.2
Wildfire	Possible	Minor	Small	Less than 6 hrs	Less than 1 week	2.0
Cyber Threat	Possible	Limited	Small	Less than 6 hrs	More than 1 week	2.4
Hazardous Substances[1]	Likely-Highly Likely	Critical	Small	Less than 6 hrs	Less than 24 hrs	2.8-3.1
Radiological Emergency[1]	Unlikely	Critical-Catastrophic	Large	Less than 6 hrs	More than 1 week	2.8-3.1

[1]Note: PRI ratings for this hazard vary by jurisdiction. The range of ratings are shown here.

[2]Note: This is a sub-hazard of the Tornadoes & Thunderstorms hazard. The overall hazard rating is an average of these sub-hazards.

5 CAPABILITY ASSESSMENT

This section discusses the capability of Mecklenburg County to implement hazard mitigation activities. It consists of the following four subsections:

5.1 Overview
5.2 Conducting the Capability Assessment
5.3 Capability Assessment Findings
5.4 Conclusions on Local Capability

5.1 OVERVIEW

The purpose of conducting a capability assessment is to determine the ability of a local jurisdiction to implement a comprehensive mitigation strategy and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs, or projects. As in any planning process, it is important to try to establish which goals, objectives, and actions are feasible, based on an understanding of the organizational capacity of those agencies or departments tasked with their implementation. A capability assessment helps to determine which mitigation actions are practical and likely to be implemented over time given a local government's planning and regulatory framework, level of administrative and technical support, fiscal resources, and current political climate.

A capability assessment has two primary components: 1) an inventory of a local jurisdiction's relevant plans, ordinances, and programs already in place; and 2) an analysis of its capacity to carry them out. Careful examination of local capabilities will detect any existing gaps, shortfalls, or weaknesses with ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. The capability assessment also highlights the positive mitigation measures already in place or being implemented at the local government level, which should continue to be supported and enhanced through future mitigation efforts.

The capability assessment completed for Mecklenburg County serves as a critical planning step toward developing an effective mitigation strategy. Coupled with the risk assessment, the capability assessment helps identify and target effective goals, objectives, and mitigation actions that are realistically achievable under given local conditions.

5.2 CONDUCTING THE CAPABILITY ASSESSMENT

This capability assessment was originally developed using feedback from the HMPC in 2020 through a detailed Local Capability Self-Assessment worksheet and updated based on best available data in 2025. The self-assessment requested information on a variety of "capability indicators" such as existing local plans, policies, programs, or ordinances that contribute to and/or hinder the region's ability to implement hazard mitigation actions. Other indicators included information related to the region's fiscal, administrative, and technical capabilities, such as access to local budgetary and personnel resources for mitigation purposes, and existing education and outreach programs that can be used to promote mitigation. Communities were also asked to comment on the current political climate with respect to hazard mitigation, an important consideration for any local planning or decision-making process.

The survey results provide an extensive and consolidated inventory of existing local plans, ordinances, programs, and resources in place or under development. With this information, inferences can be made about the overall effect on hazard loss reduction in each community. In completing the survey, local

officials were also asked to rate their jurisdiction's specific capabilities. The survey instrument thereby not only helps accurately assess the degree of local capability, but it also serves as a good source of introspection for counties and local jurisdictions that want to improve their capabilities. Identified gaps, weaknesses, or conflicts can be recast as opportunities for specific actions to be proposed as part of the mitigation strategy.

The information provided in response to the survey questionnaire was incorporated into a database for further analysis. A general scoring methodology was then applied to quantify each jurisdiction's overall capability. According to the scoring system, each capability indicator was assigned a point value based on its relevance to hazard mitigation. Additional points were added based on the jurisdiction's self-assessment of their own planning and regulatory capability, administrative and technical capability, fiscal capability, education and outreach capability, and political capability.

Using this scoring methodology, a total score and an overall capability rating of "High," "Moderate," or "Limited" could be determined according to the total number of points received. These classifications are designed to provide nothing more than a general assessment of local government capability. In combination with the narrative responses provided by local officials, the results of this capability assessment provide critical information for developing an effective and meaningful mitigation strategy.

5.3 CAPABILITY ASSESSMENT FINDINGS

The findings of the capability assessment are summarized in this plan to provide insight into the relevant capacity of Mecklenburg County to implement hazard mitigation activities. All information is based upon the input provided by local government officials through the Local Capability Self-Assessment and subsequent updates by the planning team and the HMPC.

5.3.1 PLANNING AND REGULATORY CAPABILITY

Planning and regulatory capability is based on the implementation of plans, ordinances, and programs that demonstrate a local jurisdiction's commitment to guiding and managing growth, development, and redevelopment in a responsible manner, while maintaining the general welfare of the community. It includes emergency response and mitigation planning, comprehensive land use planning, and transportation planning. Regulatory capability also includes the enforcement of zoning or subdivision ordinances and building codes that regulate how land is developed, and structures are built, as well as protecting environmental, historic, and cultural resources in the community. Although some conflicts can arise, these planning initiatives generally present significant opportunities to integrate hazard mitigation principles and practices into the local decision-making process.

Table 5.1 provides a summary of the relevant local plans, ordinances, and programs already in place or under development for Mecklenburg County. A checkmark (✓) indicates that the given item is currently in place and being implemented. A plus sign (+) indicates that a jurisdiction is covered for that item under a county-implemented version. An asterisk (*) indicates that the given item is currently under development. Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Hazard Mitigation Plan. This information will help identify opportunities to address gaps, weaknesses, or conflicts with other initiatives and integrate the implementation of this plan with existing planning mechanisms where appropriate.

Table 5.1 – Relevant Plans, Ordinances, and Programs

Jurisdiction	Hazard Mitigation Plan	Comprehensive Land Use Plan	Floodplain Management Plan	Open Space Management Plan	Stormwater Management Plan	Emergency Operations Plan	SARA Title III Plan	Radiological Emergency Plan	Continuity of Operations Plan	Evacuation Plan	Disaster Recovery Plan	Capital Improvements Plan	Economic Development Plan	Historic Preservation Plan	Transportation Plan	Flood Damage Prevention Ordinance	Zoning Ordinance	Subdivision Ordinance	Site Plan Review Requirements	Unified Development Ordinance	Post-Disaster Redevelopment Ordinance	Building Code	Fire Code	Community Wildfire Protection Plan	National Flood Insurance Program	Community Rating System
Mecklenburg County	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓		✓	✓
Charlotte	✓	✓	+	+	✓	+	+	✓	+	✓		✓	✓	+	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓
Cornelius	✓	✓	+	✓	+	+	+	+	+	✓		✓	✓	✓	✓	✓	✓	✓	✓			✓	+		✓	
Davidson	✓	✓	+	✓	+	+	+	+	+			✓	✓	✓	✓	✓	✓	✓	✓			✓	+		✓	
Huntersville	✓	✓	+		✓	+	+	+	+			✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	+		✓	✓
Matthews	✓	✓	+	✓	✓	+	+	+	+			✓		✓	✓	✓	✓	✓	✓	✓		✓	+		✓	
Mint Hill	✓	✓	+	✓	+	+	+	+	+					✓	✓	✓	✓	✓	✓	✓		✓	+		✓	
Pineville	✓	✓	+	✓	+	+	+	+	+			✓	✓	✓	✓		✓	✓	✓			✓	+		✓	✓

Source: Local Capability Assessment Survey

A more detailed discussion on the region's planning and regulatory capability follows, along with the incorporation of additional information based on the narrative comments provided by local officials in response to the survey questionnaire.

5.3.1.1 EMERGENCY MANAGEMENT

Hazard mitigation is widely recognized as one of the four primary phases of emergency management, as is shown in Figure 5.1. In reality, mitigation is interconnected with all other phases and is an essential component of effective preparedness, response, and recovery. Opportunities to reduce potential losses through mitigation practices are most often implemented before a disaster event, such as through the elevation of flood-prone structures or by regular enforcement of policies that regulate development. However, mitigation opportunities can also be identified during immediate preparedness or response activities, such as installing storm shutters in advance of a hurricane. Furthermore, incorporating mitigation during the long-term recovery and redevelopment process following a disaster event is what enables a community to become more resilient over time.

Figure 5.1 – The Four Phases of Emergency Management



Planning for each phase is a critical part of a comprehensive emergency management program and a key to the successful implementation of hazard mitigation actions.

HAZARD MITIGATION PLAN

A hazard mitigation plan is a community's blueprint for how it intends to reduce the impact of natural and human-caused hazards on people and the built environment. The essential elements of a hazard mitigation plan include a risk assessment, capability assessment, and mitigation strategy.

- All participating jurisdictions in this regional planning effort participated in and adopted the 2020 Mecklenburg County Hazard Mitigation Plan.

DISASTER RECOVERY PLAN

A disaster recovery plan serves to guide the physical, social, environmental, and economic recovery and reconstruction process following a disaster event. In many instances, hazard mitigation principles and practices are incorporated into local disaster recovery plans with the intent of capitalizing on opportunities to break the cycle of repetitive disaster losses. Disaster recovery plans can also lead to the preparation of disaster redevelopment policies and ordinances to be enacted following a hazard event.

— Mecklenburg County received funding from the Centralina Regional Council to develop a recovery and resiliency plan. They have developed a plan and scorecard template that can be shared with other communities.

EMERGENCY OPERATIONS PLAN

An emergency operations plan outlines responsibilities and how resources will be deployed during and following an emergency or disaster.

— All participating jurisdictions have an emergency operations plan in place. The City and Towns are covered under a county plan.

CONTINUITY OF OPERATIONS PLAN

A continuity of operations plan establishes a chain of command, line of succession, and plans for backup or alternate emergency facilities in case of an extreme emergency or disaster event.

— All participating jurisdictions have a continuity of operations plan in place. The City and Towns are covered under a county plan.

5.3.1.2 GENERAL PLANNING

The implementation of hazard mitigation activities involves agencies and individuals beyond the emergency management profession. Stakeholders may include local planners, public works officials, economic development specialists, and others. In many instances, concurrent local planning efforts will help to achieve or complement hazard mitigation goals.

COMPREHENSIVE/LAND USE PLAN

A comprehensive or land use plan establishes the overall vision for what a community wants to be and serves as a guide for future governmental decision making. Typically, a comprehensive plan contains sections on demographic conditions, land use, transportation elements, and community facilities. Given the broad nature of the plan and its regulatory standing in many communities, the integration of hazard mitigation measures into the comprehensive plan can enhance the likelihood of achieving risk reduction goals, objectives, and actions.

— All participating jurisdictions have updated their comprehensive plans since the last plan update.

CAPITAL IMPROVEMENTS PLAN

A capital improvements plan guides the scheduling of spending on public improvements. A capital improvements plan can serve as an important mechanism for guiding future development away from identified hazard areas. Limiting public spending in hazardous areas is one of the most effective long-term mitigation actions available to local governments.

— 7 of the 8 participating jurisdictions have a capital improvements plan in place.

HISTORIC PRESERVATION PLAN

A historic preservation plan is intended to preserve historic structures or districts within a community. An often-overlooked aspect of the historic preservation plan is the assessment of buildings and sites located in areas subject to natural hazards, and the identification of ways to reduce future damages. This may involve retrofitting or relocation techniques that account for the need to protect buildings that do not meet current building standards or are within a historic district that cannot easily be relocated out of harm's way.

— 7 of 8 participating jurisdictions have a historic preservation plan in place or under development.

ZONING ORDINANCE

Zoning represents the primary means by which land use is controlled by local governments. As part of a community's police power, zoning is used to protect the public health, safety, and welfare of those in a given jurisdiction that maintains zoning authority. A zoning ordinance is the mechanism through which zoning is typically implemented. Since zoning regulations enable municipal governments to limit the type and density of development, a zoning ordinance can serve as a powerful tool when applied in identified hazard areas.

— All participating jurisdictions have a zoning ordinance in place and enforce zoning regulations.

SUBDIVISION ORDINANCE

A subdivision ordinance is intended to regulate the development of residential, commercial, industrial, or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Subdivision design that accounts for natural hazards can dramatically reduce the exposure of future development.

— All participating jurisdictions have a subdivision ordinance in place and enforce subdivision regulations.

BUILDING CODES, PERMITTING, AND INSPECTIONS

Building codes regulate construction standards. In many communities, permits and inspections are required for new construction. Decisions regarding the adoption of building codes (that account for hazard risk), the type of permitting process required both before and after a disaster, and the enforcement of inspection protocols all affect the level of hazard risk faced by a community.

— All participating jurisdictions have building codes in place and enforce building code requirements.

The adoption and enforcement of building codes by local jurisdictions is routinely assessed through the Building Code Effectiveness Grading Schedule (BCEGS) program, developed by the Insurance Services Office, Inc. (ISO). In North Carolina, the North Carolina Department of Insurance assesses the building codes in effect in a particular community and how the community enforces its building codes, with special emphasis on mitigation of losses from natural hazards. North Carolina has limitations regarding building codes and mandates statewide code enforcement.

The results of BCEGS assessments are routinely provided to ISO's member private insurance companies, which in turn may offer ratings credits for new buildings constructed in communities with strong BCEGS classifications. The expectation is that communities with well-enforced, up-to-date codes should experience fewer disaster-related losses, and as a result should have lower insurance rates.

In conducting the assessment, ISO collects information related to personnel qualification and continuing education, as well as number of inspections performed per day. This type of information combined with local building codes is used to determine a grade for that jurisdiction. The grades range from 1 to 10, with a BCEGS grade of 1 representing exemplary commitment to building code enforcement, and a grade of 10 indicating less than minimum recognized protection. In North Carolina, the average BCEGS grade is 4 for both commercial and residential building.

5.3.1.3 FLOODPLAIN MANAGEMENT

Flooding represents the greatest natural hazard facing the nation, yet the tools available to reduce the impacts associated with flooding are among the most developed when compared to other hazard-specific mitigation techniques. In addition to approaches that cut across hazards such as education, outreach, and the training of local officials, the National Flood Insurance Program (NFIP) contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood

hazards. Participation in the NFIP is voluntary for local governments; however, program participation is strongly encouraged by FEMA as a first step for implementing and sustaining an effective hazard mitigation program. It is therefore used as part of this capability assessment as a key indicator for measuring local capability.

In order for a county or municipality to participate in the NFIP, they must adopt a local flood damage prevention ordinance that requires jurisdictions to follow established minimum building standards in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings be protected from damage by a 100-year flood event, and that new development in the floodplain not exacerbate existing flood problems or increase damage to other properties.

A key service provided by the NFIP is the mapping of identified flood hazard areas. Once completed, the Flood Insurance Rate Maps (FIRMs) are used to assess flood hazard risk, regulate construction practices, and set flood insurance rates. FIRMs are an important source of information to educate residents, government officials, and the private sector about the likelihood of flooding in their community.

Table 5.2 provides NFIP and CRS class information (see CRS section below) for each participating jurisdiction in Mecklenburg County. Detailed policy and claim information for each participating jurisdiction can be found in the jurisdictional annexes.

Floodplain management is managed through zoning ordinances, building code restrictions, and community and county building inspection programs. The jurisdictions will coordinate with NCEM and FEMA to develop maps and regulations related to Special Flood Hazard Areas within their jurisdictional boundaries and, through a consistent monitoring process, will design and improve their floodplain management programs in a way that reduces the risk of flooding to people and property.

FLOOD DAMAGE PREVENTION ORDINANCE

A flood damage prevention ordinance establishes minimum building standards in the floodplain with the intent to minimize public and private losses due to flood conditions.

- All communities participating in the NFIP are required to adopt a local flood damage prevention ordinance. Mecklenburg County and its incorporated communities participating in this hazard mitigation plan also participate in the NFIP and they all have adopted flood damage prevention regulations and have appointed floodplain managers to oversee enforcement and implementation of the ordinance.
- Since the last plan, Charlotte has increased freeboard requirements.

COMMUNITY RATING SYSTEM

An additional indicator of floodplain management capability is active participation in the CRS. The CRS is an incentive-based program that encourages communities to undertake defined flood mitigation activities that go beyond the minimum requirements of the NFIP. Each of the CRS mitigation activities is assigned a point value. As a community earns points and reaches identified thresholds, they can apply for an improved CRS class. Class ratings, which range from 10 to 1 and increase on 500-point increments, are tied to flood insurance premium reductions. Every class improvement earns an additional 5 percent discount for NFIP policyholders, with a starting discount of 5 percent for Class 9 communities and a maximum possible discount of 45 percent for Class 1 communities.

Community participation in the CRS is voluntary. Any community that is in full compliance with the rules and regulations of the NFIP may apply to FEMA for a CRS classification better than class 10. The CRS application process has been greatly simplified over the past several years, based on community comments intended to make the CRS more user friendly, and extensive technical assistance is available for communities who request it.

— 4 of 8 participating jurisdictions in Mecklenburg County participate in the Community Rating System. Each community's CRS Class is shown in Table 5.2

— Since the last plan, Charlotte, Mecklenburg County, Pineville, and Huntersville have all improved their CRS class ratings.

Table 5.2 – NFIP and CRS Information

Jurisdiction	Date of Initial FIRM/FHBM	NFIP Entry Date	Current CRS Class	Current Effective Map Date
Mecklenburg County	10/22/1976	06/01/1981	5	11/16/2018
Charlotte	06/28/1974	08/15/1978	2	11/16/2018
Cornelius	10/22/1976	09/30/1997	-	11/16/2018
Davidson	10/22/1976	05/01/1980	-	11/16/2018
Huntersville	02/04/2004	02/04/2004	5	11/16/2018
Matthews	02/04/2004	02/04/2004	-	02/19/2014
Mint Hill	02/04/2004	12/21/2007	-	11/16/2018
Pineville	06/21/1974	03/18/1987	5	09/02/2015

Source: FEMA Community Status Book

FLOODPLAIN MANAGEMENT PLAN

A floodplain management plan (or a flood mitigation plan) provides a framework for action regarding corrective and preventative measures to reduce flood-related impacts.

— All participating jurisdictions have a floodplain management plan in place.

SUBSTANTIAL DAMAGE PROCEDURES

The NFIP requires that participating communities regulate and enforce substantial damage and substantial improvement procedures such that, at a minimum, buildings that are damaged to 50 percent or more of their market value or improved by 50 percent or more of their market value are required to be brought into compliance with flood damage prevention regulations for new development, such as being elevated to the freeboard requirement. Determination of substantial damage is a coordinated effort between emergency management, police and fire departments, and permitting departments such as planning and building inspections departments.

In Mecklenburg County, substantial damage and substantial improvement requirements for the county and all incorporated jurisdictions are managed by Mecklenburg County through the Land Use and Environmental Services Agency (LUESA).

After a flood event, LUESA staff conduct a desktop analysis to initially predict where potential damage occurred. Trained field staff visit these locations to validate damage and damage estimates. This validated information is logged into a system that produces substantial damage estimates. Property owners are notified of substantial damage determinations via a letter and are required to bring their structure into compliance with current regulations when completing repairs. Permit holds are put in place for homes that are determined to be substantially damaged. Mecklenburg County LUESA also is responsible for implementing and enforcing flood damage prevention regulations and conducting floodplain permitting for the entire county, including incorporated areas.

OPEN SPACE MANAGEMENT PLAN

An open space management plan is designed to preserve, protect, and restore largely undeveloped lands in their natural state, and to expand or connect areas in the public domain such as parks, greenways, and

other outdoor recreation areas. In many instances open space management practices are consistent with the goals of reducing hazard losses, such as the preservation of wetlands or other flood-prone areas in their natural state in perpetuity.

— 6 of the 8 participating jurisdictions have an open space management plan in place or under development.

STORMWATER MANAGEMENT PLAN

A stormwater management plan is designed to address flooding associated with stormwater runoff. The stormwater management plan is typically focused on design and construction measures that are intended to reduce the impact of more frequently occurring minor urban flooding.

— All participating jurisdictions have a stormwater management plan in place.

5.3.2 ADMINISTRATIVE AND TECHNICAL CAPABILITY

The ability of a local government to develop and implement mitigation projects, policies, and programs is directly tied to its ability to direct staff time and resources for that purpose. Administrative capability can be evaluated by determining how mitigation-related activities are assigned to local departments and if there are adequate personnel resources to complete these activities. The degree of intergovernmental coordination among departments will also affect administrative capability for the implementation and success of proposed mitigation activities.

Technical capability can generally be evaluated by assessing the level of knowledge and technical expertise of local government employees, such as personnel skilled in using GIS to analyze and assess community hazard vulnerability. The Local Capability Self-Assessment was used to capture information on administrative and technical capability through the identification of available staff and personnel resources.

Table 5.3 provides a summary of the Local Capability Self-Assessment results for the region with regard to relevant staff and personnel resources. A checkmark indicates the presence of a staff member(s) in that jurisdiction with the specified knowledge or skill.

Table 5.3 – Relevant Staff/Personnel Resources

Jurisdiction	Planners with knowledge of land development and land management practices	Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Planners or engineers with an understanding of natural and/or human-caused hazards	Building Official	Emergency Manager	Floodplain Manager	Land surveyors	Scientist familiar with the hazards of the community	Staff with education or expertise to assess the community vulnerability to hazards	Personnel skilled in Geographic Information Systems (GIS) and/or HAZUS	Resource development staff or grant writers	Maintenance programs to reduce risk	Warning systems/services	Mutual Aid Agreements
Mecklenburg County	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Charlotte	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cornelius	✓		✓							✓			✓	✓
Davidson	✓		✓		✓				✓	✓	✓	✓	✓	✓
Huntersville	✓	✓	✓				✓		✓	✓	✓	✓	✓	✓
Matthews	✓	✓	✓	✓	✓	✓			✓	✓		✓	✓	✓
Mint Hill	✓	✓								✓	✓	✓	✓	✓
Pineville	✓	✓	✓		✓	✓				✓		✓	✓	

Source: Local Capability Assessment Survey

Administrative capability has increased since the last plan update. The Town of Huntersville added a new communication department staff member in the last year and plans to add another in the next year. Additionally, the Town of Davidson noted that while engineering and land surveying resources are not on staff, the Town has the ability to contract out these services as needed.

Within the last five years, the Town of Huntersville adopted a routine maintenance plan for stormwater and drainage infrastructure. The Town now performs the following maintenance on the right-of-way of Town maintained streets and recorded public storm drainage easements:

- Inspect drainage or flooding problems to determine if they are caused by stormwater runoff from a public street and are a qualifying problem, as described by Charlotte-Mecklenburg Storm Water Services
- Work to resolve or reduce flooding problems. The highest priority are those with flooding of living space, damage or imminent damage to buildings where people live or work, or flooding that poses a threat to the traveling public
- Remove fallen trees and large debris from creeks when those obstructions create a qualifying drainage problem
- Clean storm drain pipes, catch basins and culverts
- Repair or replace broken storm drainage pipes
- Control severe creek bank erosion, when necessary, to protect water quality and adjacent properties
- Repair sinkholes that occur over a drainage pipe system

Additionally, countywide emergency warning and notification systems have been improved, including with new stream gages and improvements to the Flood Information and Notification System (FINS) which provides real-time monitoring and notifications. Pineville also installed flood sensors at critical facilities which provide notifications to Town staff.

5.3.3 FISCAL CAPABILITY

The ability of a local government to implement mitigation actions is often dependent on the amount of money available. This may take the form of outside grant funding awards or locally based revenue and financing. The costs associated with mitigation policy and project implementation vary widely. In some cases, policies are tied primarily to staff time or administrative costs associated with the creation and monitoring of a given program. In other cases, direct expenses are linked to an actual project such as the acquisition of flood-prone houses, which can require a substantial commitment from local, state, and federal funding sources.

The Local Capability Self-Assessment was used to capture information on the region's fiscal capability through the identification of locally available financial resources.

Table 5.4 provides a summary of the results for the region with regard to relevant fiscal resources. A checkmark indicates that the given fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds).

Table 5.4 – Relevant Fiscal Resources

Jurisdiction	Capital Improvement Programming	Community Development Block Grants (CDBG)	Special Purpose Taxes	Gas/Electric Utility Fees	Water/Sewer Fees	Stormwater Utility Fees	Development Impact Fees	General Obligation Bonds	Revenue Bonds	Special Tax Bonds	Other
Mecklenburg County	✓	✓	✓		✓	✓		✓	✓		✓
Charlotte	✓	✓	✓		✓	✓	✓		✓	✓	
Cornelius	✓	✓		✓				✓			
Davidson	✓	✓	✓			✓		✓			
Huntersville	✓	✓	✓	✓		✓		✓	✓	✓	✓
Matthews	✓	✓	✓			✓		✓	✓	✓	✓
Mint Hill						✓		✓			
Pineville	✓	✓		✓	✓	✓	✓	✓	✓	✓	

Source: Local Capability Assessment Survey

5.3.4 EDUCATION AND OUTREACH CAPABILITY

This type of local capability refers to education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information. Examples include natural disaster or safety related school programs; participation in community programs such as Firewise or StormReady; and activities conducted as part of hazard awareness campaigns such as a Tornado Awareness Month.

Table 5.5 provides a summary of the results for the region with regard to relevant education and outreach resources. A checkmark indicates that the given resource is locally available for hazard mitigation purposes.

Table 5.5 – Education and Outreach Resources

Jurisdiction	Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Natural disaster or safety related school programs	StormReady certification	NFPA Firewise USA Site Recognition	Public-private partnership initiatives addressing disaster-related issues
Mecklenburg County	✓	✓	✓	✓		
Charlotte	✓	✓	✓			✓
Cornelius		✓				✓
Davidson	✓	✓	✓			✓
Huntersville		✓				
Matthews	✓	✓	✓			
Mint Hill		✓				
Pineville		✓				✓

Source: Local Capability Assessment Survey

Several stakeholders in the planning area are also certified as Storm Ready sites: UNC Charlotte, Queens University of Charlotte, Carowinds, and Charlotte Douglas International Airport.

5.3.5 MITIGATION CAPABILITY

This type of local capability refers to the mitigation strategies and actions that are developed by the communities in this plan.

Table 5.6 provides a summary of the results for the planning area with regard to relevant mitigation resources. A checkmark (✓) indicates that the given resource is locally available for hazard mitigation purposes.

Table 5.6 – Mitigation Resources

Jurisdiction	Do you apply for mitigation grant funding?	Do you perform reconstruction projects?	Do you perform building elevations?	Do you perform acquisitions?
Mecklenburg County	✓	✓	✓	✓
Charlotte	✓	✓		✓
Cornelius				
Davidson				
Huntersville	✓		✓	✓
Matthews				✓
Mint Hill				
Pineville	✓			✓

Since the last plan update, Mecklenburg County has continued to perform acquisitions and elevations. Although only a few communities reported in their self-assessment that they perform these property protection projects, the capability exists in all communities because Mecklenburg County implements these projects countywide through HMGP funding as well as local programs. Overall, over 490 homes have been purchased since 1999 resulting in over $50 million in estimated losses avoided.

5.3.6 POLITICAL CAPABILITY

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to reduce the impact of future hazard events. Hazard mitigation may not be a local priority, or it may conflict with or be seen as an impediment to other goals of the community, such as growth and economic development. Therefore, the local political climate must be considered in designing mitigation strategies, as it could be the most difficult hurdle to overcome in accomplishing their adoption and implementation.

The Local Capability Self-Assessment was used to capture information on political capability of the region. Survey respondents were asked to rate political support as they perceive it and identify general examples of local political capability, such as guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (e.g., building codes, floodplain management, etc.).

5.3.7 LOCAL SELF-ASSESSMENT RATING

Staff representatives from each of the participating communities rated their community's perceived capability across each of the capability categories and overall, as either "limited," "moderate," or "high." Table 5.7 summarizes the results of the self-assessment ratings for each community in Mecklenburg County.

Table 5.7 – Self-Assessment of Capability

Jurisdiction	Plans, Ordinances, Codes and Programs	Administrative and Technical Capability	Fiscal Capability	Education and Outreach Capability	Mitigation Capability	Political Capability	Overall Capability
Mecklenburg County	High	High	High	Moderate	High	High	Moderate
Charlotte	High	High	High	High	High	High	High
Cornelius	Moderate	Moderate	High	Moderate	High	Moderate	Limited
Davidson	Moderate	High	Moderate	High	High	High	Moderate
Huntersville	Moderate	Moderate	Moderate	Limited	Moderate	Moderate	Limited
Matthews	High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Mint Hill	High	High	High	Moderate	Moderate	Moderate	Limited
Pineville	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

Source: Local Capability Assessment Survey

5.4 CONCLUSIONS ON LOCAL CAPABILITY

To form meaningful conclusions on the assessment of local capability, a quantitative scoring methodology was designed and applied to results of the Local Capability Assessment Survey. This methodology attempts to assess the overall level of capability of Mecklenburg County to implement hazard mitigation actions.

Table 5.8 shows the results of the capability assessment using the designed scoring methodology. The capability score is based solely on the information provided by local officials in response to the Local Capability Self-Assessment. According to the assessment, the average local capability score for all responding jurisdictions is 95, which falls into the Moderate capability ranking and reflects a slight increase in overall capability across the planning area.

Table 5.8 – Capability Assessment Results

Jurisdiction	Overall Capability Score	Overall Capability Rating
Mecklenburg County	119	High
Charlotte	117	High
Cornelius	82	Moderate
Davidson	89	Moderate
Huntersville	92	Moderate
Matthews	93	Moderate
Mint Hill	76	Moderate
Pineville	93	Moderate

Source: Local Capability Assessment Survey, NCEM Risk Management Tool

As previously discussed, one of the reasons for conducting a capability assessment is to examine local capabilities to detect any existing gaps or weaknesses within ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. These gaps or weaknesses have been identified, for each jurisdiction, in the tables found throughout this section. The participating jurisdictions used the capability assessment as part of the basis for the mitigation actions that are identified in Section 7; therefore, each jurisdiction addresses their ability to expand on and improve their existing capabilities through the identification of their mitigation actions.

6 MITIGATION STRATEGY

Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section describes the process for developing the mitigation strategy for the Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan. It describes how the communities met the requirements for Planning Step 6 (Set Goals), Planning Step 7 (Review Possible Activities), and Planning Step 8 (Draft an Action Plan). This section includes the following subsections:

6.1 Goals and Objectives
6.2 Identification & Analysis of Mitigation Activities

6.1 GOALS AND OBJECTIVES

Requirement §201.6(c)(3)(i): [The mitigation strategy section shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

Goal setting builds upon the findings of Section 4, which documents the hazards and associated risks that threaten the planning area, and Section 5, which evaluates each jurisdiction's capacity of the to reduce the impact of hazards. The intent of goal setting is to identify areas where feasible actions can be taken or improvements to existing capabilities can be made so that community vulnerability to hazards is reduced. Goals also guide the review of possible mitigation measures. This plan needs to make sure that recommended actions are consistent with what is appropriate for the participating communities. Mitigation goals need to reflect community priorities and should be consistent with other local plans.

- **Goals** are general guidelines that explain what is to be achieved. They are usually broad-based policy type statements, long term and represent global visions. Goals help define the benefits that the plan is trying to achieve.
- **Objectives** are short term aims that, when combined, form a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

6.1.1 COORDINATION WITH OTHER PLANNING EFFORTS

The goals of this plan need to be consistent with and complement the goals of other local planning efforts. The primary planning documents that the goals of this plan should complement and be consistent with are the participating jurisdictions' comprehensive plans. Comprehensive plans are important because they are developed and designed to guide future growth within their communities so they encompass long-term strategies and can be critical to reducing long term vulnerabilities. Keeping the Hazard Mitigation Plan and Comprehensive Plans consistent ensures that land development is done with awareness and understanding of hazard risk and that mitigation projects complement rather than contradict community development objectives.

6.1.2 GOAL SETTING

At the third planning meeting, held on April 17, 2025, the HMPC reviewed and discussed the goals from the 2020 plan. There were several comments on the goals and objectives that resulted in minor revisions and additional objectives. Discussion points are summarized below:

- One HMPC member recommended adding language about improving online access and digital literacy to Goal 2, since this goal promotes web and social media outreach. Another HMPC member suggested changing the word "people" to make clear that the intention is to provide outreach more broadly and include outreach to businesses.
- The HMPC debated removing Objective 3.2, which is to improve hazard notification capabilities, because Mecklenburg County has achieved this over the pasts five years and has a robust notification system and process for informing residents. However, additional efforts for warning and notification improvements were discussed, leading the HMPC to propose updating the objective language to reflect this as an ongoing effort. Additionally, there was discussion about dissemination of information in multiple languages, which was noted as one of the ongoing efforts that will continue to be improved upon.
- One HMPC member recommended expanding language about enforcement in Goal 4 to emphasize the need to the communities to put adopted plans and policies into action. It was noted that communities' enforcement capabilities may be limited by changes in State law. Another HMPC member suggested adding language about incentivizing certain policies as an alternative approach.

The revised and reaffirmed goals and objectives of this plan update are detailed below in Section 6.1.3.

6.1.3 RESULTING GOALS AND OBJECTIVES

The HMPC agreed upon four general goals for this planning effort and included specific objectives in support of each goal. The refined goals and objectives are as follows:

Goal 1 – Identify and implement hazard mitigation projects designed to reduce the impact of future hazard events on existing critical facilities and infrastructure as well as public and private property.

Objective 1.1: Acquire or retrofit buildings and infrastructure to protect against damage from hazards.

Objective 1.2: Implement natural, infrastructure, and structural projects to avert hazards and reduce future damage.

Objective 1.3: Ensure critical facilities can maintain operations during hazard events.

Goal 2 – Conduct education and outreach activities intended to better inform the public about hazards and encourage personal responsibility for preparedness and mitigation.

Objective 2.1: Conduct awareness activities in person and via web and social media.

Objective 2.2: Assist vulnerable populations through targeted outreach and improved online access and digital literacy.

Objective 2.3: Promote and incentivize private mitigation activities.

Goal 3 – Improve emergency preparedness and response capabilities.

Objective 3.1: Conduct training and exercises intended to better prepare government officials to respond to, mitigate against and recover from emergencies and disasters.

Objective 3.2: Continue to improve ability to notify people of impending hazards and disasters.

Objective 3.3: Establish traffic control procedures intended to reduce injuries and the loss of life before, during, and after emergencies and disasters.

Goal 4 – Enact and enforce or incentivize planning and policy measures to reduce the impacts of identified hazards and make future development more resilient to hazards.

Objective 4.1: Adopt development regulations to limit or prevent development in hazard areas.

Objective 4.2: Enforce building codes and development regulations.

Objective 4.3: Provide incentives to encourage implementation of preferred development techniques that minimize hazard risks and/or protect natural resources.

6.2 IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIVITIES

Requirement §201.6(c)(3)(ii): [The mitigation strategy section shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

To identify and select mitigation projects that support the mitigation goals, the risks and vulnerabilities associated with all hazards identified and evaluated in Section 4 Risk Assessment were evaluated for mitigation opportunities. The identification of mitigation actions for technological and human-caused hazards was left to the discretion of each jurisdiction. The HMPC analyzed viable mitigation options that supported the identified goals and objectives, addressed key problems, risks, or vulnerabilities, and aligned with other local plans and efforts.

The HMPC was provided with the following list of mitigation categories which are utilized as part of the CRS planning process but are also applicable to multi-hazard mitigation.

- Prevention
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Projects
- Public Education and Awareness

The HMPC was also provided with examples of potential mitigation actions for each of the above categories. The HMPC was instructed to consider both future and existing buildings in evaluating possible mitigation actions. Facilitated discussions took place to examine and analyze the options. The HMPC also considered which actions from the previous plan that were not already completed should be continued in this action plan.

More details on mitigation alternatives considered by the HMPC are provided in Appendix C.

6.2.1 PRIORITIZATION PROCESS

In the process of identifying continuing and new mitigation actions, the HMPC was provided with a set of prioritization criteria to assist in deciding why one recommended action might be more important, more

effective, or more likely to be implemented than another. HMPC members were asked to evaluate each action on a set of criteria, which were grouped into three categories: Suitability, Risk Reduction, and Cost. The criteria for the prioritization process included the following:

- **Suitability**
  - Appropriateness of Action
  - Community Acceptance
  - Technical and Administrative Feasibility
  - Environmental Impact
  - Legal Conformance
  - Consistency with Existing Plans and Other Community Goals
- **Risk Reduction**
  - Scope of Benefits
  - Potential to Save Lives
  - Importance of Benefits
  - Level of Inconvenience or Unintended Consequence
  - Losses Avoided
  - Number of People to Benefit
- **Cost**
  - Estimate of Upfront Cost
  - Estimate of Ongoing Cost
  - Benefit to Cost Ratio
  - Financing Availability
  - Affordability
  - Elimination of Repetitive Damages

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority, as reflected in the prioritization criteria above. For each action, the HMPC considered the benefit-cost analysis in terms of:

- Ability of the action to address the problem
- Contribution of the action to save life or property
- Available technical and administrative resources for implementation
- Availability of funding and perceived cost-effectiveness

The consideration of these criteria helped to prioritize and refine mitigation actions but did not constitute a full benefit-cost analysis. The cost-effectiveness of any mitigation alternative will be considered in greater detail through performing benefit-cost project analyses when seeking FEMA mitigation grant funding for eligible actions associated with this plan.

Using these prioritization criteria, the HMPC either assigned each action a ranking of High, Medium, or Low priority or their ratings for the prioritization criteria were input into NCEM's Risk Management Tool (RMT), which provided a ranking. The prioritization ranking for each mitigation action considered by the HMPC is provided in Section 7 Mitigation Action Plans.

7 MITIGATION ACTION PLANS

Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include an] action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This section provides the mitigation action plans for each participating jurisdiction, which are organized as follows:

- Table 7.1 – Mitigation Action Plan, Mecklenburg County
- Table 7.2 – Mitigation Action Plan, City of Charlotte
- Table 7.3 – Mitigation Action Plan, Town of Cornelius
- Table 7.4 – Mitigation Action Plan, Town of Davidson
- Table 7.5 – Mitigation Action Plan, Town of Huntersville

Table 7.6 – Mitigation Action Plan, Town of Matthews

- Table 7.7 – Mitigation Action Plan, Town of Mint Hill
- Table 7.8 – Mitigation Action Plan, Town of Pineville

Although each jurisdiction has their own action plan, many jurisdictions are pursuing similar or complimentary activities. Additionally, some activities are proposed for multiple jurisdictions but are led or supported by a County entity, such as Charlotte Mecklenburg Emergency Management Office or Mecklenburg County Stormwater Services. Below is a summary of actions that are being pursued by or on behalf of multiple jurisdictions; see mitigation action plans for more details:

- Seek grant funding to retrofit critical facilities and County/City/Town-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology.
- Seek grant funding to install backup generators or quick connect hook ups for mobile generators at critical facilities.
- Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of higher regulatory standards.
- Enhance early warning system for hazard events.
- On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity.
- Create or Update Community Wildfire Protection Plans in each fire district.
- Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.
- Pursue the acquisition and/or elevation of high-risk flood prone properties.
- Implement drainage improvement projects to reduce stormwater flooding.

Table 7.1 – Mitigation Action Plan, Mecklenburg County

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mecklenburg-1	Seek grant funding to retrofit critical facilities and County-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, 320 or 361 compliant safe rooms, lightning protection, hail resistant roofing, and anchoring fixed building equipment.	All Hazards	1.3	Medium	Property Protection	Mecklenburg County Code Enforcement & Mecklenburg County Fire Marshal's Office	To be determined	Local, State, Federal	2025-2030	Carry Forward	Identified specific locations for improvements. Retrofits not yet completed due to competing priorities.
Mecklenburg-2	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standards (in addition to basic required compliance actions): a) Development standards linked to Community Floodplain (Future Conditions) b) Require critical facilities protection to 500-year flood levels c) Require parking lots to be elevated (no more than six inches deep in any parking space during Community Flood event) d) Require dry land access for new or substantially improved buildings (above Community Flood BFE) e) Levee restrictions f) Cumulative substantial damage improvement provision g) Prohibit basements below flood level on filled lots	Flooding	4.1	High	Prevention	Mecklenburg County / Storm Water	To be determined	SWS Operating budget / grant	2025-2030	Carry Forward	Higher standards maintained. No ordinance updates or revisions made during the previous reporting period.
Mecklenburg-3	Maintain a Class 5 rating in the CRS Program.	Flooding	4.1	High	Prevention	Mecklenburg County Storm Water Services	To be determined	SWS Operating budget	2025-2030	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mecklenburg-4	Update Flood Insurance Rate Maps to provide most accurate depiction of flood risk.	Flooding	4.1	High	Public Education & Awareness	Mecklenburg County / Storm Water	To be determined	Storm Water Services Capital Fund / CTP grant	2025-2030	Carry Forward	Mecklenburg County, as current Cooperating Technical Partner with FEMA, maintains a LOMC processing agreement so that revision requests are processed locally and so that local standards for floodplain management are upheld. Charlotte-Mecklenburg Storm Water Services is exploring the use of 2D hydraulic modeling for future Countywide FIRM updates as well as regulatory floodway modeling. A pilot 2D flood modeling study of Little Sugar and Briar Creek watersheds started at the beginning of 2023 and is currently underway.
Mecklenburg-5	Identify, fund, and implement eligible flood mitigation projects. FEMA-defined and locally verified "repetitive loss properties" to receive high priority.	Flooding	1.1	High	Property Protection	Mecklenburg County / Storm Water	Variable	FEMA Unified Hazard Mitigation Assistance / Storm Water Services capital fund	2025-2030	Carry Forward	Mecklenburg County continues to implement mitigation actions identified in the Flood Risk Assessment and Risk reduction Plan. From July 2022 to September 2023, (ten) 10 flood-prone buildings were acquired and demolished at a cost of $4.3 M (75.1% local / 18.8% federal / 6.1% state funding). Three (3) elevation projects were completed at a cost of $403.7k (100% local / 0% federal / 0% state funding). There are two (2) active FEMA grants open and two (2) FEMA grants pending.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mecklenburg-6	Research possibility of using new H&H models to provide flood forecasting in the Flood Information Notification System (FINS). Research possibility of FINS system to provide inundation mapping based on results of new H&H models and explore alternate methods and expansion into other locations.	Flooding	3.2	Medium	Prevention	Mecklenburg County Storm Water	To be determined	TBD	2025-2030	Carry Forward	Mecklenburg County in partnership with the Department of Homeland Security – Science and Technology Directorate implemented a real-time flood inundation mapping system to complement the existing Flood Information Notification System (FINS). The inundation mapping system is based on data developed from the hydrologic & hydraulic models and a network of lower-cost flood sensors deployed to nearly 90 new locations along creeks. As the system is refined, it will improve flood disaster response and recovery. Storm Water Services is exploring forecasting options for the inundation mapping to provide added lead time in deploying resources and evacuating citizens.
Mecklenburg-7	As determined necessary and upon request from municipal jurisdictions, provide informative presentations and/or work sessions for newly elected officials and new appointees to planning commissions and appeals/variance boards to provide an overview of floodplain management, the importance of participating in the NFIP, and the implications of failing to enforce the requirements of the program or failing to properly handle variance requests. On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for mitigating and preventing damages from hazardous conditions and how to respond when an imminent hazard threatens. On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management to provide information on all natural hazards facing the area to local planning staff and elected officials. This should be combined with an annual progress report on the status of local mitigation actions as identified in the Multijurisdictional Hazard Mitigation Plan.	All Hazards	2.1	Medium	Public Education & Awareness	CMEMO/ Mecklenburg County Storm Water	Staff time	Local	2025-2030	Carry Forward	Charlotte-Mecklenburg Emergency Management hosted a meeting on September 21, 2023 for Emergency Management staff, Storm Water Services Staff, Local Community Representatives, and other emergency services parties. Agenda included Situation Reports, Emergency Management Updates, FINS updates, and CRS-related Hazard Mitigation Plan updates.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mecklenburg-8	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	In 2025, Mecklenburg County contracted with an engineering firm (Woolpert) to implement flood forecasting capability for the Flood Information & Notification System (FINS). This enhancement to FINS will provide emergency personnel and support staff with a 12-hour forecast of stream stage (peak rise) throughout the County. In 2021, FINS implemented real-time flood inundation mapping utilizing real-time stream height data, now forecasted stage data will be used to improve inundation maps. The inundation mapping system provides real-time flood intelligence that is shared with Emergency Management and other agencies to improve early flood warning, flood disaster response, and recovery.
Mecklenburg-9	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.1	Moderate	Public Education & Awareness	In coordination with CMEMO (Lead)	Staff time and resources	N/A	2025-2030	New	Charlotte-Mecklenburg Storm Water Services (CMSWS) staff meets quarterly with Fire Chiefs and Emergency Management leaders from all municipalities in Mecklenburg County. During these meetings, CMSWS staff provide a debrief of flood related activities as well as the most recent Flood Information & Notification System (FINS) technology enhancements.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mecklenburg-10	**Comprehensive Relicensing Agreement for the Catawba-Wateree Hydro Project, FERC Project NO. 2232** • Leverage power of **Federal Emergency Management Agency** to ensure **Federal Energy Regulatory Commission** for quick movement on high intake agreement revisions request based on event • Request agreement revision to ensure **high inflow protocol documentation** that minimizes impact of damage and ensures safe release to reduce loss of life ○ Contact and communicate with **Appendix B key stakeholders** (FERC, Duke Energy, Storm Water, and Catawba-Wateree Relicensing Council) to request quick and efficient support. Develop project and communication plans ASAP ○ Path and communications identified to alert **Appendix B additional stakeholders** (70+) to get prior buy-in for a revision is being addressed and expect support ○ Request experts to define hydrologic calculations, prevention lowering for containment and relevant necessary data, develop detailed protocols for high intake policies and procedures (see 2) ○ Update agreement with high inflow (flooding) procedures for Duke Energy ○ Reduce highest impactful flooding during night for safety	Flooding, Dam & Levee Failure	3.2	High	Prevention	Charlotte-Mecklenburg Emergency Management Office/ Mecklenburg County Storm Water Catawba-Wateree Management Group	$0	Mecklenburg County, Duke Energy, Federal Energy Regulations Commission, Catawba-Wateree Management Group	2 years	New	
Mecklenburg-11	**Proactive Water Release Management** • A better defined, published plan to manage lake levels to **minimize** damage to structures, infrastructure and potential injury and loss of life. ○ Plan should include "trigger points" - when to activate • Request a **transparent, data-driven water release plan** before, during, and after major storms to prevent catastrophic downstream flooding. • Implement **early drawdowns of lake levels** before forecasted hurricanes or major rain events. • Improve and proactive **response to weather events** to adjust dam operations based on real-time storm projections.	Flooding, Dam & Levee Failure	3.2	High	Prevention, Emergency Services	Charlotte-Mecklenburg Emergency Management Office/ Mecklenburg County Storm Water Catawba-Wateree Management Group	$0	Mecklenburg County	1 year	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments

Mecklenburg-12	**Emergency Notification & Communication**
	• Establish additional **real-time flood warning system** with automated alerts via text, phone, AND email for residents in flood-prone areas.
	• Require Duke Energy to **publish actual real-time water level data and all lake release schedules** and update accordingly so homeowners can prepare accordingly.
	• Improve **coordination with local emergency management agencies and community** for response planning
	  ○ Time is of the essence in these scenarios. Where do gaps in communication occur between Duke Energy and the Emergency Response Team, and our community.
	  ○ All agencies supporting these requests have periodic community progress updates.
		Flooding, Dam & Levee Failure	3.1, 3.2	High	Emergency Services	CMEMO/ Mecklenburg County Storm Water Catawba-Wateree Management Group	$0	Mecklenburg County	1 year	New	

Mecklenburg-13	**Infrastructure Upgrades & Dam Reinforcement** • Review of the Cowans Nuclear facility flood protection and prevention - by experts in the field with any necessary action taken • Assess whether the **Mountain Island Lake Dam can be structurally reinforced** or modernized to improve water flow control. ○ Request study to identify if gates added to dam will assist in deducing damaging water flood during flood events (Similar at Lake Wateree) • Increase the **capacity and efficiency of reservoirs** to handle excess water more safely. • Conduct **third-party safety audits** on the dam and flood management systems.	Flooding, Dam & Levee Failure	1.2	High	Structural Projects	CMEMO	To be determined	Mecklenburg County	1 year	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mecklenburg-14	**Floodplain & Property Protection Measures** • Open land acquired from 2019 and 2025 events require wetland engineer and native landscaping for saturation and current control • Expand **flood control projects where possible**, such as levees, retention ponds, and reinforced embankments along the river. ○ Hire appropriate expertise (McAdams) to provide strong insight and recommendations • Ensure **stormwater drainage improvements** are implemented to reduce localized flooding from tributaries and key creeks. Riverhaven Drive drainage pipe reengineered to reduce flow from river during event.	Flooding, Dam & Levee Failure	1.1, 1.2	High	Natural Resource Protection, Structural Projects	County Storm Water	To be determined	Mecklenburg County	1 year	New	
Mecklenburg-15	**Policy & Accountability** • Require **Duke Energy and state regulators to create an updated flood mitigation plan** for the Catawba-Wateree River basin. • Advocate for **state and federal funding for flood resilience projects** in vulnerable areas. • Mandate **annual and timely reporting with community** on dam safety inspections, water management policies, and emergency response readiness/drills.	Flooding, Dam & Levee Failure	2.1	High	Prevention	CMEMO/ Mecklenburg County Storm Water Catawba-Wateree Management Group	To be determined	Mecklenburg County, Duke Energy, Federal Energy Regulations Commission	1 year	New	
Mecklenburg-16	Create or Update Community Wildfire Protection Plans in each fire district.	Wildfire	1.1, 2.1, 3.1	Medium	Prevention	CMEMO, NC Forest Service	To be determined	Grant funds	2030	New	
Mecklenburg-17	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	

Table 7.2 – Mitigation Action Plan, City of Charlotte

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-1	Consider the need to add or revise existing policies or regulations to more thoroughly address natural hazards during the update of the City's Zoning Ordinance.	All Hazards	4.1	Medium	Prevention	City of Charlotte Planning Department, in coordination with Emergency Management and Storm Water Division	Local Staff time	Planning Department budget	2025-2030	Carry Forward	Regulations for natural hazards are addressed in the Charlotte 2040 UDO, effective June 1, 2023.
Charlotte-2	Enhance area planning activities to better address potential natural hazards.	All Hazards	4.1	Medium	Prevention	City of Charlotte Planning Department, in coordination with Emergency Management and Storm Water Division	Local Staff time	Planning Department budget	2025-2030	Carry Forward	Future area planning efforts continue. The Charlotte 2040 Comprehensive Plan (effective June 1, 2023) incorporates regulations to address potential natural hazards.
Charlotte-3	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standards (in addition to basic required compliance actions): a) Development standards linked to Community Floodplain (Future Conditions); b) Require critical facilities protection to 500-year flood levels; c) Require parking lots to be elevated (no more than six inches deep in any parking space during Community Flood event); d) Require dry land access for new or substantially improved buildings (above Community Flood BFE); e) Levee restrictions; f) Cumulative substantial damage improvement provision; g) Prohibit basements below flood level on filled lots.	Flooding	4.1	High	Prevention, Public Education	Charlotte Storm Water Services in coordination with Mecklenburg County Storm Water Services	Local staff time	N/A	2025-2030	Carry Forward	Continue implementation of the City of Charlotte Unified Development Ordinance (UDO), meeting these goals through Articles 23-27. Charlotte-Mecklenburg Storm Water Services has completed a 2D pilot flood modeling study of Little Sugar and Briar Creek watersheds and is currently evaluating the next steps towards future Countywide FIRM updates.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-5	Seek opportunities to provide information and education to Planning staff regarding risks associated with natural hazards and potential prevention/mitigation planning strategies.	All Hazards	2.1	Medium	Prevention	City of Charlotte Planning Department, in coordination with Emergency Management and Storm Water Division	Local staff time	Emergency Management and/or other staff to provide training and/or utilize resources made available through the American Planning Association (including PAS Report: Integrating Hazard Mitigation into Local Planning)	2025-2030	Carry Forward	Planning staff will continue to seek American Planning Association (APA) related training in conjunction with American Institute of Certified Planners (AICP) Certification Maintenance (CM) credits.
Charlotte-6	On an annual basis, coordinate with municipalities on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for mitigating and preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.3	Medium	Public Education & Awareness	Emergency Management	Local staff time and resources	Emergency Management budget/EMPG	2025-2030	Carry Forward	Ongoing All Hazards Advisory Committee (AHAC) and Local Emergency Planning Committee (LEPC) meetings held on a quarterly basis. Joint Information System (JIS) utilized to coordinate public information across municipalities to communicate important information during an imminent hazard event.
Charlotte-7	On an annual basis, coordinate with municipalities to provide information on all natural hazards facing the area to local planning staff and elected officials. This should be combined with an annual progress report on the status of local mitigation actions as identified in the Multi-jurisdictional Hazard Mitigation Plan.	All Hazards	3.1	Medium	Public Education & Awareness	Emergency Management	Local staff time and resources	Emergency Management budget/EMPG	2025-2030	Carry Forward	All Hazards Advisory Committee (AHAC) meetings held quarterly.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-8	Implement spring public information campaign aimed at tornado and severe weather awareness to include information on safe rooms.	Tornadoes & Thunderstorms	2.1	Medium	Public Education & Awareness	Emergency Management	$3,000	Storm Water Services budget, FEMA and American Red Cross materials free of charge (see FEMA Publication 320—Taking Shelter from the Storm: Building a Safe Room Inside Your House), Department of Homeland Security—Citizen Corps	2025-2030	Carry Forward	Severe Weather Preparedness Week outreach conducted annually. Statewide Tornado Drill held annually Charlotte-Mecklenburg Emergency Management and Charlotte-Mecklenburg Storm Water Services held a joint media availability during Severe Weather Preparedness Week. Hurricane Preparedness Week outreach conducted in May annually; produced public awareness video. Charlotte is a designated Storm Ready Community by the National Weather Service.
Charlotte-9	Train emergency responders and managers for flood emergencies.	Flooding	3.1	Medium	Emergency Services	City of Charlotte Fire Department	$50,000	Emergency Management Performance Grants (EMPG), Emergency Management Institute, Department of Justice— State and Local Domestic Preparedness Exercise Support, Department of Homeland Security—Citizen Corps	2025-2030	Carry Forward	CMEMO conducted annual training during the two-day, May 9-10, 2023, NCEM Statewide Hurricane Preparedness Exercise including EOC operations, command and control, flood operations, evacuation/sheltering operations, and public messaging. External partners included FEMA, CISA, NCEM, NCDHHS, NCDSS, Local Jurisdictions, and others.
Charlotte-10	Equip emergency responders and managers for flood emergencies, including swift water rescue.	Flooding	3.1	Medium	Emergency Services	City of Charlotte Fire Department	$100,000	Hazard Mitigation Grant Program (7% set aside), Emergency Management Performance Grants (EMPG)	2025-2030	Carry Forward	Continuous water rescue equipment evaluation, six (6) new forcible entry equipment caches purchased and placed on the six (6) swift water rescue boats to aid emergency responders in entry to structures surrounded by flood waters enhancing life-safety operations.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-11	Conduct disaster drills for division managers.	All Hazards	3.1	Medium	Emergency Services	City of Charlotte Fire Department	$25,000	Department of Justice—State and Local Domestic Preparedness Exercise Support, Department of Justice— State and Local Domestic Preparedness Training Program, FEMA—First Responder Counter-Terrorism Training assistance, Department of Homeland Security—Citizen Corps	2025-2030	Carry Forward	Exercises held regularly for McGuire Nuclear Station
Charlotte-12	Provide and maintain NIMS training for all KBE's, division heads and key government officials.	All Hazards	3.1	Medium	Emergency Services	City of Charlotte Fire Department	$25,000	Emergency Management Institute, Department of Homeland Security—Citizen Corps	2025-2030	Carry Forward	On-going ICS/NIMS training programs have been established to support the local Incident Management Team (IMT).
Charlotte-13	Develop evacuation routes that are not adversely affected by flooding.	All Hazards	3.3	Medium	Emergency Services	City of Charlotte Department of Transportation	Local staff time and resources	N/A	2025-2030	Carry Forward	Coordinating with 83rd Civil Affairs Battalion, US Army, in ongoing planning and consultation.
Charlotte-14	Improve the dissemination of hazard information, including maps, broadcasts, Internet Web site(s) and listservs.	All Hazards	2.1	Medium	Public Education & Awareness	Emergency Management	Local staff time and resources	N/A, FEMA and American Red Cross materials free of charge, Department of Homeland Security—Citizenship Education and Training	2025-2030	Carry Forward	CharMeck Alerts continues to be advertised as an important method of receiving emergency notifications with approximately 300,000 contacts. CharMeck Alert is an "opt-in" system, however, there is also the ability to send wireless emergency alerts (WEAs) in the case of severe emergencies. CMEMO supported joint regional WEA continuity capability.
Charlotte-15	Provide information regarding encroachments, abandonments, new construction, and leases.	All Hazards	2.1	Medium	Public Education & Awareness	Code Enforcement, Planning	Local staff time and resources	N/A	2025-2030	Carry Forward	City zoning and planning provide ongoing outreach, updated as required.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-16	Inspect the condition of the critical assets (culverts greater than 48 inches that are under City-maintained streets) on a regular schedule (every 5 years).	Flooding, Dam/Levee Failure	1.3	High	Prevention, Structural Projects and Natural Resource Protection	Charlotte Storm Water Services	Local staff time	Storm Water Services budget	2025-2030	Carry Forward	The goal of inspecting 50% of the critical assets was achieved during the last cycle. This is a carry forward item that will continue to be performed year after year. The language for the action description is being updated to remove the 50% requirement. The mitigation categories are being modified to include Prevention, Structural Projects & Property Protection as this work is being performed to identify project needs.
Charlotte-17	Identify, rank and prioritize capital improvement projects. Revising current criteria to strategically prioritize work by managing our assets.	Flooding, Dam/Levee Failure	1.1	High	Prevention, Structural Projects and Natural Resource Protection	Charlotte Storm Water Services	Local staff time	Storm Water Services budget	2025-2030	Carry Forward	Charlotte Storm Water continues to expand on its risk-based asset prioritization program. System Assets are proactively inspected and ranked based on the inspection finding. The mitigation category is Prevention but there are also components of Structural and Natural Resource Protection that are being included.
Charlotte-18	Initiate (plan, design and construct) capital improvement projects to improve 20 linear miles of system between 2020 and 2025.	Flooding, Dam/Levee Failure	1.1	High	Prevention, Structural Projects and Natural Resource Protection	Charlotte Storm Water Services	To be determined	Storm Water Services budget	2025-2030	Carry Forward	During this cycle, Charlotte Storm Water Services completed in excess of 20 miles of system improvements. This goal will continue into the new program cycle.
Charlotte-22	Create media campaign/message to relay to local media and the general public prior to forecasted severe storm events.	Flooding, Hurricane & Tropical Storm, Tornadoes & Thunderstorms, Dam & Levee Failure	3.2	Medium	Public Education & Awareness	Charlotte Storm Water Services, in coordination with Mecklenburg County Storm Water Services, Charlotte Communications & Marketing and Mecklenburg County Public Information	Local staff time and resources	Storm Water Services budget	2025-2030	Carry Forward	Campaign messaging provided through social media, digital ads, utility bill inserts, and traditional broadcast. Charlotte-Mecklenburg Storm Water Services social media followers: 8,820 Facebook, 1,570 X (formerly Twitter), 1,840 Instagram.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-23	Conduct annual inspections on ponds/dams that City of Charlotte Storm Water Services has accepted maintenance responsibility.	Flooding, Dam & Levee Failure	1.3	Medium	Prevention, Natural Resource Protection	Charlotte Storm Water Services	Local staff time and resources	Storm Water Services budget	2025-2030	Carry Forward	Conducted annual inspections on dams that Charlotte Storm Water Services maintains as part of their pond retrofit program. Completed inspections for High (10), Intermediate (5), and Low (10) Hazard dams annually (April-May) and prior to hurricane season (July-August).
Charlotte-24	Retrofit critical facilities and City-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, lightning protection, hail resistant roofing, and anchoring fixed building equipment.	All Hazards	1.1	Medium	Property Protection	City of Charlotte	To be determined on a case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	CFD Fire Station #30 re-location on Beam Road is still planned. This will incorporate an all-electric "green" design. The fire station will be solar powered with no natural gas. Back-up generation will be battery powered, and there is no fuel to be stored on site.
Charlotte-25	Install and maintain backup generators or quick connect hook ups for mobile generators on any newly constructed City-owned critical facilities.	All Hazards	1.3	Medium	Property Protection	City of Charlotte	To be determined on a case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	Backup generators have been provided at critical facilities.
Charlotte-26	Develop a plan to identify and map fueling sites with underground storage tanks and either install backup generators or quick connect hook ups for mobile generators.	All Hazards	1.3	Medium	Emergency Services	City of Charlotte	To be determined on a case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	Ongoing at Fire Station #11 and planned River District Fire Station.
Charlotte-27	Continued capital investment in surface water quality enhancement. Goal is to treat runoff from 150 acres every 3 years.	Flooding, Dam & Levee Failure	1.2	High	Natural Resource Protection	Charlotte Storm Water Services	To be determined.	Storm Water Services Budget	2025-2030	New	
Charlotte-28	Pursue the acquisition and/or elevation of high-risk flood prone properties in accordance with applicable policies, regulations, and statutes.	Flooding	1.1	Medium	Property Protection	Charlotte Storm Water Services in coordination with Mecklenburg County Storm Water Services	To be determined.	Storm Water Services Budget	2025-2030	New	Recommended by WSP as a "catch all" to allow for the potential of future grant opportunities. The activities would likely be coordinated with Mecklenburg County Storm Water Services who have a more traditionally buy-out flood retrofit program.
Charlotte-29	Conduct pre- and post-event inspection of 18 regulated and non-regulated dams as specified in the Severe Storm Response Plan (SSRP)	Flooding, Dam & Levee Failure, Hurricane and Tropical Storms	1.3	High	Prevention, Natural Resource Protection	Charlotte Storm Water Services	Local Staff Time	Storm Water Services Budget	2025-2030	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-30	Continue participation in the NFIP Community Rating System (CRS) with the goal of maintaining or increasing our CRS Class 2 status.	Flooding, Dam & Levee Failure	4.1	High	Prevention	Charlotte Storm Water Services in coordination with Mecklenburg County Storm Water Services	Local staff time	N/A	2025-2030	New	Charlotte-04 is marked completed as Charlotte achieved a Class 2 Status during the current cycle. The new goal takes its place in our continued commitment in the CRS system.
Charlotte-31	Continue to expand awareness and availability of cooling centers throughout Charlotte.	Excessive Heat	2.2	High	Emergency Services, Public Education & Awareness	Charlotte-Mecklenburg Emergency Management Office	To be determined	Local, State Grants, Federal Grants	2025-2030	New	
Charlotte-32	Enhance public alert system with multi-lingual capabilities to improve resident safety by providing timely notifications before, during, and after emergencies, enabling effective response.	All Hazards	2.1, 3.2	Medium	Emergency Services, Public Education & Awareness	Charlotte-Mecklenburg Emergency Management Office	To be determined	Local, State Grants, Federal Grants	2025-2030	New	
Charlotte-33	Invest in community preparedness through outreach and training programs to empower residents and encourage proactive preparation for emergencies.	All Hazards	2.2, 3.1	Medium	Emergency Services, Public Education & Awareness	Charlotte-Mecklenburg Emergency Management Office	To be determined	Local, State Grants, Federal Grants	2025-2030	New	
Charlotte-34	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.
Charlotte-35	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.1	Medium	Public Education & Awareness	In coordination with CMEMO (Lead)	Staff time and resources	N/A	2025-2030	New	See Mecklenburg-9 for additional details.
Charlotte-36	Create or Update Community Wildfire Protection Plans in each fire district.	Wildfire	1.1, 2.1, 3.1	Medium	Prevention	CMEMO, NC Forest Service	To be determined	Grant funds	2030	New	

Table 7.3 – Mitigation Action Plan, Town of Cornelius

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Cornelius-1	Implement storm water mitigation projects, including the grading of ditches and replacing failing/potentially failing storm water structures.	Flooding	1.2	High	Structural Projects	Town of Cornelius Public Works Department	$70,000	CMSWS funds, Grant funds	2025-2030	Carry Forward	Public Works identifies, prioritizes, and implements improvements annually.
Cornelius-2	Conduct an annual tabletop exercise addressing potential hazards faced by Town. This exercise would bring together representatives from all Town departments that would work together creating and implementing a plan to effectively deal with the hazard.	All Hazards	3.1	High	Emergency Services	Town of Cornelius Police Department and Public Works Department	$0	N/A	2025-2030	Carry Forward	No progress made due to limited staff availability and competing priorities.
Cornelius-3	Monitor utility companies, local, state, and federal websites and social media accounts, and push out information on the Town's website and social media platforms	All Hazards	2.1	High	Public Education & Awareness	Town of Cornelius Public Information Office	$0	N/A	2025-2030	Carry Forward	
Cornelius-4	Create or Update Community Wildfire Protection Plans in each fire district.	Wildfire	1.1, 2.1, 3.1	Medium	Prevention	Town of Cornelius Fire Department, NC Forest Service	TBD	Grant funds	2030	New	
Cornelius-5	Pursue the acquisition and/or elevation of high-risk flood prone properties.	Flooding	1.1	Medium	Property Protection	Charlotte-Mecklenburg Storm Water Services, Town of Cornelius Administration	TBD	Grant funds	2025-2030	New	
Cornelius-6	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	
Cornelius-7	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.

Table 7.4 – Mitigation Action Plan, Town of Davidson

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Davidson-1	Seek grant funding to retrofit critical facilities and Town-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, 320 or 361 compliant safe rooms, lightning protection, hail resistant roofing, and anchoring fixed building equipment.	All Hazards	1.3	Medium	Property Protection	Town of Davidson	To be determined on a case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	All Public Safety Facilities in town are equipped with back-up generator service. Design will be starting on new Fire Station #1 which will include resilience design and building features.
Davidson-2	Seek grant funding to install backup generators or quick connect hook ups for mobile generators on any newly constructed county/town critical facilities.	All Hazards	1.3	Medium	Property Protection	Town of Davidson	To be determined on a case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	Grant money is being pursued to upfit Town Hall with generator service.
Davidson-3	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standards (in addition to basic required compliance actions): a) Require critical facilities protection to 500-year flood levels b) Require parking lots to be elevated (no more than six inches deep in any parking space during Community Flood event) c) Require dry land access for new or substantially improved buildings (above Community Base Flood Elevation) d) Levee restrictions e) Floors of new or substantially improved buildings allowed by variance in the floodplain must be elevated at least one (1) foot above the Community (future) Base Flood Elevation. f) Prohibit basements below flood level on filled lots	Flooding	4.1	High	Prevention	Planning Department, Public Works Department, in coordination with CMEMO	Staff time	N/A	2025-2030	Carry Forward	The Town has maintained compliance with the NFIP.
Davidson-4	Implement recommendations of the 2006 Tree Canopy Inventory including pruning and removal of branches and trees that threaten public utilities and structures	Hurricane & Tropical Storm, Tornadoes & Thunderstorms, Severe Winter Weather, Wildfire	1.2	Medium	Prevention	Planning Department, Public Works Department	Staff time and resources	N/A	2025-2030	Carry Forward	Town has increased tree budget again and has completed another tree inventory. Started removals of most dangerous trees first. Continue tree pruning yearly. Hired a full-time arborist on staff to manage inventory and create a canopy management plan.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Davidson-5	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for mitigating and preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.1	Medium	Public Education & Awareness	Planning Department, Public Works Department, in coordination with CMEMO	Staff time and resources	N/A	2025-2030	Carry Forward	The town has made significant strides in enhancing the local Emergency Management capabilities. Town staff coordinates with CMEMO on a regular basis for messaging and programming.
Davidson-6	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management to provide information on all natural hazards facing the area to local planning staff and elected officials. This should be combined with an annual progress report on the status of local mitigation actions as identified in the Multi-jurisdictional Hazard Mitigation Plan.	All Hazards	3.1	Medium	Public Education & Awareness	Planning Department, in coordination with CMEMO	Staff time and resources	N/A	2025-2030	Carry Forward	The town has made significant strides in enhancing the local Emergency Management capabilities. Town staff coordinates with CMEMO on a regular basis for messaging and programming
Davidson-7	Develop growth policies that account for identified hazard areas	Flooding, Tornadoes & Thunderstorms	4.1	High	Prevention	Planning Department	Staff time and resources	N/A	2025-2030	Carry Forward	A new comprehensive plan is current and regularly updated. Tree budget has increased, and pruning/removals are continuing as needed.
Davidson-8	Implement stormwater management plan.	Flooding	4.1	High	Prevention	Public Works Department	$50,000	NRCS-Watershed Protection and Flood Prevention Program, NRCS-Watershed Surveys and Planning, USACE-Floodplain Management Services, HMGP	2025-2030	Carry Forward	Stormwater Management Plan was approved and implementation of recommended projects is underway. Beatty Dam has another leak since the repairs made in 2014. Engineers are currently working on solutions.
Davidson-9	Develop and publish town specific Comprehensive Emergency Management Plan (CEMP)	All Hazards	3.1	High	Prevention, Emergency Services	Fire Department, town Emergency Management personnel, in coordination with CMEMO and community partners	$48,000	UASI has covered a portion and the town will supplement with FY26 budget allocation	2026	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Davidson-10	Develop and publish town specific Continuity of Operations Plan (COOP)	All Hazards	3.1	High	Prevention, Emergency Services	Town Emergency Management personnel in coordination with all town departments	$40,000	State, federal grant funding. Town allocated funding as part of FY27 budget process	2027	New	
Davidson-11	Establish an annual tabletop exercise/training for town staff with the implementation of the CEMP and COOP	All Hazards	3.1	High	Prevention, Emergency Services	Town Emergency Management personnel in coordination with all town departments	$5,000 to $10,000 if contracted out. Staff time if conducted internally	State, federal grant funding. Allocation of town funding with future budget processes.	2028	New	
Davidson-12	Study feasibility of establishing and implementing a Community Emergency Response Team (CERT) for the Davidson Community	All Hazards	3.1	Medium	Prevention, Emergency Services	Town Emergency Management personnel in coordination with CMEMO	Unknown at this time	State and federal funding. Potential town funding with annual budget process.	2025-2030	New	
Davidson-13	Create or Update Community Wildfire Protection Plans in each fire district.	Wildfire	1.1, 2.1, 3.1	Medium	Prevention	Town of Davidson Fire Department, NC Forest Service	To be determined	Grant funds	2030	New	
Davidson-14	Pursue the acquisition and/or elevation of high-risk flood prone properties.	Flooding	1.1	Medium	Property Protection	Charlotte-Mecklenburg Storm Water Services, Town of Davidson Administration	To be determined	Grant funds	2025-2030	New	
Davidson-15	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	
Davidson-16	Implement drainage improvement projects to reduce stormwater flooding.	Flooding	1.2	Medium	Structural Projects	Davidson Public Works	To be determined	Local funds, Grant funds	2025-2030	New	
Davidson-17	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.

Table 7.5 – Mitigation Action Plan, Town of Huntersville

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Huntersville-1	Coordinate with CMEMO and Duke Energy and review the evacuation routes for the town's citizens in the event of an Incident at Mcguire Nuclear Power Plant.	Radiological Emergency	3.1, 3.3	Medium	Emergency Services	Town of Huntersville	$0	N/A	2030	New	
Huntersville-2	Implement storm water mitigation projects, including the grading of ditches and replacing failing/potentially failing storm water structures	Flooding	1.2	High	Structural Projects	Town of Huntersville Public Works Department	To be determined	CMSWS funds, Grant funds	2025-2030	Carry Forward	A Request for Proposal has been published, and a contractor has been named to perform a "Down Town" Storm Water Study and Mitigation Recommendation. The town has also adopted a routine maintenance plan that tasks the town within the right-of-way of Town maintained streets and recorded public storm drainage easements. Tasks are detailed in Section 5 Capability Assessment.
Huntersville-3	Provide and maintain NIMS training for town employees and government officials likely to be involved with hazard mitigation or emergency response and conduct an annual tabletop exercise addressing potential hazards faced by Town. This exercise would bring together representatives from all Town departments that would work together creating and implementing a plan to effectively deal with the hazard.	All Hazards	3.1	High	Emergency Services	Huntersville Police Department	$0	N/A	2025-2030	Carry Forward	This exercise is in the initial planning stages. Action was revised to incorporate NIMS training for town employees.
Huntersville-4	Coordinate with Char-Meck EM to relay critical information on the Towns Social Media Sites regarding potential hazards, localized emergencies, preparedness, and property protection options.	All Hazards	2.1	High	Public Education & Awareness	Town of Huntersville /HPD PIO	$0	N/A	2025-2030	Carry Forward	The Town's Communication Department continues to grow, adding an additional employee last fiscal year and plans to add a third this next fiscal year. The town continues to enhance its public awareness communication through multiple communication mediums prior to, during and after any event that pose a hazard to our citizens. The town also utilizes CMEMO's Everbridge system as an alerting system for the town employees.
Huntersville-5	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Huntersville-6	Maintain a Class 5 rating in the CRS Program.	Flooding	4.1	High	Prevention	Mecklenburg County Storm Water Services	To be determined	SWS Operating budget	2025-2030	New	
Huntersville-7	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.
Huntersville-8	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.1	Medium	Public Education & Awareness	In coordination with CMEMO (Lead)	Staff time and resources	N/A	2025-2030	New	See Mecklenburg-9 for additional details.

Table 7.6 – Mitigation Action Plan, Town of Matthews

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Matthews-1	Develop a second full-function Emergency Operations Center (EOC) at the Fire Department as a backup to the current EOC at the Police Department.	All Hazards	1.3	Medium	Emergency Services	Matthews Police and Fire	$16,000	Town Funds, FEMA	5 years	Carry Forward	Backup police communication ability available at Fire Station 1.
Matthews-2	Prepare and maintain a map of areas that flood frequently, particularly those areas outside of FEMA floodplains. Digitize and add to County GIS.	Flooding	2.1	High	Prevention	Public Works in coordination with Planning GIS	$10,000	Town Storm Water Fees	2025-2030	Carry Forward	Continual update, mapping reviewed annually and updated as new data is available.
Matthews-4	Seek grant funding to retrofit critical facilities and Town-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, 320 or 361 compliant safe rooms, lightning protection, hail resistant roofing, and anchoring fixed building equipment.	All Hazards	1.3	Medium	Property Protection	Town of Matthews Public Works Department	To be determined case by case	Local, State Grants, UHMA Grants, other federal grants	5 years	Carry Forward	Resiliency will be assessed and retrofits will be evaluated as renovations take place and funding is made available.
Matthews-5	Seek grant funding to install backup generators or quick connect hook ups for mobile generators on any newly constructed county/town critical facilities.	All Hazards	1.3	Medium	Property Protection	Town of Matthews Public Works Department	To be determined case by case	Local, State Grants, UHMA Grants, other federal grants	5 years	Carry Forward	The need for emergency generators will be assessed as new town facilities are constructed.
Matthews-6	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standards (in addition to basic required compliance actions): a) Development standards linked to Community Floodplain (Future Conditions) b) Require critical facilities protection to 500-year flood levels c) Require parking lots to be elevated (no more than six inches deep in any parking space during Community Flood event) d) Require dry land access for new or substantially improved buildings (above Community Flood BFE) e) Levee restrictions f) Cumulative substantial damage improvement provision g) Prohibit basements below flood level on filled lots	Flooding	4.1	High	Prevention	Public Works in coordination with CMSWS	Local staff time	N/A	2025-2030	Carry Forward	Town has maintained compliance with NFIP requirements in coordination with Mecklenburg County.
Matthews-7	Coordinate with Mecklenburg County Storm Water Services to consider applying for and joining FEMA's Community Rating System (CRS).	Flooding	4.1	Medium	Prevention	Public Works in coordination with CMSWS	Local staff time	N/A	3-5 years	Carry Forward	Deferred. Town will reconsider application to the CRS Program.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Matthews-8	Mitigate localized flooding caused by existing road and railroad structures by means of increasing the dimensions of drainage culverts in problem areas.	Flooding, Severe Winter Weather	1.2	Medium	Structural Projects	Public Works	$500,000+	Bonds, power bill revenues, Army Corps project funding, Watershed Protection & flood protection funds, etc.	2025-2030	Carry Forward	In Progress. Working with NCDOT to replace the Sam Newell Road culvert with bridge as part of the U-2509 widening project on US74.
Matthews-10	Provide and maintain NIMS training for all department supervisors and appropriate line employees. Review and revise the Town Emergency operating Plan as necessary. Exercise the plan annually.	All Hazards	3.1	High	Emergency Services	Matthews Fire & EMS	$1,000 annually	General Fund	2025-2030	Carry Forward	Completed and ongoing. Annual exercise of Town EOP and refresher NIMS training.
Matthews-12	Train staff to educate themselves and the public regarding hazards and the steps that can be taken to reduce their impact.	All Hazards	3.1	Medium	Public Education & Awareness	Matthews PIO Office and Mecklenburg County	$10,000	General tax revenues, FEMA Emergency Management Institute courses, FEMA and American Red Cross materials are free of charge, Hazard Mitigation Grant Program (HMGP), Department of Homeland Security—Citizenship Education and Training	2025-2030	Carry Forward	Training has been conducted with staff using County and online resources. FireCorps Volunteers conducted basic CERT program every other year.
Matthews-13	Relocate Town EOC to Police Department	All Hazards	1.3	Medium	Emergency Services	Matthews Police / Matthews Emergency Management	$10,000	General fund	2030	Carry Forward	No progress to report. Install additional phone and computer connections, install large display monitors to track incident status, weather, CAD, and resources. Provide breakout rooms for critical decision making, analysis, and planning. Provide for a greater degree of security.
Matthews-14	Provide Information and Educate the Public about strategies for and actions to promote self-reliance during weather-related events. Provide timely information to the public via social media. Provide education to citizens based on the Community Emergency Response Training.	All Hazards	2.3	High	Public Education & Awareness	Matthews Communications Director, Fire & EMS / Fire Corps	$5,000 annually	General fund	2025-2030	Carry Forward	In progress. Will coordinate with CMEMO on outreach.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Matthews-16	"South Towns" Public Safety Answering Point (PSAP): Explore the benefits and costs associated with moving the 'South Towns' (Mint Hill, Matthews, Pineville) PSAP to Pineville Police Dept, with Matthews serving as the back-up PSAP.	All Hazards	3.1	High	Emergency Services	Town of Matthews, Department TBD	To be determined	To be determined	2025-2030	Carry Forward	No progress to report. Implementation deferred.
Matthews-17	Create or Update Community Wildfire Protection Plans in each fire district.	Wildfire	1.1, 2.1, 3.1	Medium	Prevention	Town of Matthews Fire Department, NC Forest Service	To be determined	Grant funds	2030	New	
Matthews-18	Pursue the acquisition and/or elevation of high-risk flood prone properties.	Flooding	1.1	Medium	Property Protection	Mecklenburg County Storm Water Services, Town of Matthews Administration	To be determined	Grant funds	2025-2030	New	
Matthews-19	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	
Matthews-20	Implement drainage improvement projects to reduce stormwater flooding	Flooding	1.2	Medium	Structural Projects	Matthews Public Works	To be determined	Local funds, Grant funds	2025-2030	New	
Matthews-21	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.

Table 7.7 – Mitigation Action Plan, Town of Mint Hill

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mint Hill-1	Seek funding to retrofit critical facilities and Town-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, 320 or 361 compliant safe rooms, lightning protection, hail resistant roofing, and anchoring fixed building equipment.	All Hazards	1.3	Medium	Property Protection	Mecklenburg County Buildings and Inspections Department; Town of Mint Hill Emergency Services	To be determined on a case by case basis	Local, State Grants, UHMA grants, other federal grants	2030	Carry Forward	New Public Services Facility constructed. Resiliency of other facilities will be assessed, and retrofits will be evaluated as renovations take place and funding becomes available.
Mint Hill-2	Seek funding to install backup generators or quick connect hook ups for mobile generators on any newly constructed county/town critical facilities.	All Hazards	1.3	Medium	Property Protection	Mecklenburg County Buildings and Inspections Department; Town of Mint Hill Emergency Services	To be determined on a case by case basis	Local, State Grants, UHMA grants, other federal grants	2030	Carry Forward	The need for more emergency generators will be assessed as new town facilities are constructed.
Mint Hill-3	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standards (in addition to basic required compliance actions): a) Development standards linked to Community Floodplain (Future Conditions) b) Require critical facilities protection to 500-year flood levels c) Require parking lots to be elevated (no more than six inches deep in any parking space during Community Flood event) d) Require dry land access for new or substantially improved buildings (above Community Flood BFE) e) Levee restrictions f) Cumulative substantial damage improvement provision g) Prohibit basements below flood level on filled lots	Flooding	4.1	High	Prevention	Town of Mint Hill in coordination with CMSWS	Local staff time	Local	2025-2030	Carry Forward	The Town has maintained compliance with NFIP.
Mint Hill-4	Prepare and conduct a survey for critical facilities to help identify structural and/or non-structural deficiencies that may lead to increased vulnerability to natural hazards. Include recommended corrective actions in local capital improvements program.	All Hazards	1.3	Medium	Prevention	Town of Mint Hill Public Works Department	$20,000	Local	2030	Carry Forward	Critical facilities have been reevaluated on a yearly basis to identify any deficiencies.
Mint Hill-5	Prepare and maintain a map of areas that flood frequently, particularly those areas outside of FEMA floodplains.	Flooding	2.1	Medium	Prevention	In coordination with CMSWS	$5,000	N/A	2030	Carry Forward	Mapping review completed annually. Updated as new data is available.
Mint Hill-6	Coordinate with the North Carolina Division of Forest Resources (NCDFR) to prepare Community Wildfire Protection Plans (CWWPs) for identified high risk communities.	Wildfire	4.1	Medium	Prevention	Town of Mint Hill Voluntary Fire Department; in coordination with NCFS	$5,000	NCDFR grants; FEMA PDM or HMGP	2030	Carry Forward	This action is the responsibility of the NCFS. The Town of Mint Hill will continue to assist with this action as needed, however it is being monitored and maintained by NCFS.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mint Hill-7	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for mitigating and preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.1	Medium	Public Education & Awareness	Town of Mint Hill in coordination with CMEMO (Lead)	Local staff time and resources	Local	2025-2030	Carry Forward	Charlotte-Mecklenburg Storm Water Services (CMSWS) staff meets quarterly with Fire Chiefs and Emergency Management leaders from all municipalities in Mecklenburg County. During these meetings, CMSWS staff provide a debrief of flood related activities as well as the most recent Flood Information & Notification System (FINS) technology enhancements.
Mint Hill-8	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management to provide information on all natural hazards facing the area to local planning staff and elected officials. This should be combined with an annual progress report on the status of local mitigation actions as identified in the Multi-jurisdictional Hazard Mitigation Plan.	All Hazards	3.1	Medium	Public Education & Awareness	Town of Mint Hill in coordination with CMEMO (Lead)	Local staff time and resources	Local	2025-2030	Carry Forward	No progress made due to limited staff and competing priorities.
Mint Hill-9	Improve growth management procedures in identified flood hazard areas.	Flooding	4.1	High	Prevention	Town of Mint Hill Planning Department	Staff time and resources	Local	2030	Carry Forward	No procedure changes made, but this is an ongoing procedure. Town will continue to consider improvements.
Mint Hill-10	Pursue the acquisition and/or elevation of high-risk flood prone properties.	Flooding	1.1	Medium	Property Protection	Charlotte-Mecklenburg Storm Water Services, Town of Mint Hill Administration	To be determined	Grant funds	2025-2030	New	
Mint Hill-11	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	
Mint Hill-12	Implement drainage improvement projects to reduce stormwater flooding.	Flooding	1.2	Medium	Structural Projects	Mint Hill Public Works	To be determined	Local funds, Grant funds	2025-2030	New	
Mint Hill-13	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.

Table 7.8 – Mitigation Action Plan, Town of Pineville

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Pineville-1	Seek grant funding to retrofit critical facilities and Town-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, 320 or 361 compliant safe rooms, lightning protection, hail-resistant roofing, and anchoring fixed building equipment.	All Hazards	1.3	Medium	Property Protection	Town of Pineville	Determined on case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	In progress: Mecklenburg County retroFIT flood hazard mitigation grant program identifies and partially funds various mitigation projects using techniques such as floodproofing.
Pineville-2	Seek grant funding to install backup generators or quick connect hook ups for mobile generators on any newly constructed county/town critical facilities.	All Hazards	1.3	Medium	Property Protection	Town of Pineville	Determined on case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	New Town Hall facility has backup generator installed and operational.
Pineville-3	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standard (in addition to basic required compliance actions): a) Development standards linked to Community Floodplain (Future Conditions) b) Require critical facilities protection to 500-year flood levels c) Require parking lots to be elevated (no more than six inches deep in any parking space during Community Flood event) d) Require dry land access for new or substantially improved buildings (above Community Flood BFE) e) Levee restrictions f) Cumulative substantial damage improvement provision g) Prohibit basements below flood level on filled lots	Flooding	4.1	High	Prevention	Town of Pineville in coordination with CMSWS	Local staff time	N/A	2025-2030	Carry Forward	Higher standards maintained. No ordinance updates or revisions made. Charlotte-Mecklenburg Storm Water Services is exploring the use of 2D hydraulic modeling for future Countywide FIRM updates as well as regulatory floodway modeling. A pilot 2D flood modeling study of Little Sugar and Briar Creek watersheds started at the beginning of 2023 and is currently underway.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Pineville-5	Advertise and promote the availability of flood insurance.	Flooding	2.3	High	Public Education & Awareness	Town of Pineville	No extra cost - the Town of Pineville maintains a bi-monthly newsletter that can support this action	Local budget	2025-2030	Carry Forward	Annual "Floodplain Flash" newsletter distributed by USPS in December 2022. NFIP information is also presented through traditional media and social media throughout the year. NFIP information including Floodsmart.gov website, CRS discounts and Risk Rating 2.0 update are also posted on the CMSWS website.
Pineville-6	Preserve lands subject to repetitive flooding, including through acquisition of property.	Flooding	1.2	Medium	Prevention	Town of Pineville	Unknown - value of land	Land Trust, Hazard Mitigation Grant Program (HMGP), Clean Water Management Trust Fund	2025-2030	Carry Forward	The Mecklenburg County Flood Risk Assessment and Risk Reduction Tool (RARRT) is used to guide local mitigation program actions. Flood risk scores, mitigation priority scores and planning level mitigation techniques are used to identify properties for acquisition or in-place mitigation. Mitigation has been attempted on several properties with limited success.
Pineville-7	Continue to limit future development in identified flood hazard areas and prohibit new critical facilities from being located with the 500-year floodplain as required in the Town's flood damage prevention ordinance.	Flooding	4.1	Medium	Prevention	Planning and Zoning/ Mecklenburg County LUESA	Staff time and resources	N/A	2025-2030	Carry Forward	Town maintains Zoning and Subdivision Ordinances in partnership with Mecklenburg County to attain this goal.
Pineville-8	Conduct cumulative impact analysis/studies for multiple development projects within the same watershed.	Flooding	4.1	Medium	Prevention	Mecklenburg County Storm Water Services, Public Works, GIS Department	Staff time and resources	NRCS—Watershed Protection and Flood Prevention Program, NRCS—Watershed Surveys and Planning, USACE—Floodplain Management Services, HMGP	2025-2030	Carry Forward	Staff continues to require extensive studies for development projects within watersheds.
Pineville-9	Continue to coordinate with CMEMO on enhancements to the Town's early warning system and procedures for imminent hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	To be determined	FEMA—All Hazards Operational Planning, HMGP	2025-2030	Carry Forward	In Progress. Flood sensors were installed in the town of Pineville to warn town staff when flood waters are threating two of the town's critical facilities. Town continues to coordinate with CMEMO on an ongoing basis.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Pineville-10	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.1	Medium	Public Education & Awareness	In coordination with CMEMO (Lead)	Staff time and resources	N/A	2025-2030	Carry Forward	Charlotte-Mecklenburg Storm Water Services (CMSWS) staff meets quarterly with Fire Chiefs and Emergency Management leaders from all municipalities in Mecklenburg County. During these meetings, CMSWS staff provide a debrief of flood related activities as well as the most recent Flood Information & Notification System (FINS) technology enhancements.
Pineville-11	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management to provide information on all natural hazards facing the area to local planning staff and elected officials. This should be combined with an annual progress report on the status of local mitigation actions as identified in the Multi-jurisdictional Hazard Mitigation Plan.	All Hazards	3.1	Medium	Public Education & Awareness	In coordination with CMEMO (Lead)	Staff time and resources	N/A	2025-2030	Carry Forward	All Hazards Advisory Committee (AHAC) meetings held quarterly.
Pineville-12	Acquire safe sites for public facilities, including schools, police and fire stations, etc.	All Hazards	1.3	High	Prevention	Town Manager	Dependent on land values, existing ownership of property	Town budget	2025-2030	Carry Forward	Belle Johnston Community Center can function as a safe site and any other current or future public facilities that qualify.
Pineville-13	Create or Update Community Wildfire Protection Plans in each fire district.	Wildfire	1.1, 2.1, 3.1	Medium	Prevention	Town of Pineville Fire Department, NC Forest Service	To be determined	Grant funds	2030	New	
Pineville-14	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	
Pineville-15	Implement drainage improvement projects to reduce stormwater flooding.	Flooding	1.2	Medium	Structural Projects	Pineville Public Works	To be determined	Local funds, Grant funds	2025-2030	New	
Pineville-16	Maintain a Class 5 rating in the CRS Program.	Flooding	4.1	High	Prevention	Mecklenburg County Storm Water Services	To be determined	SWS Operating budget	2025-2030	New	
Pineville-17	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.

8 PLAN MAINTENANCE

Requirement §201.6(c)(4): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This section discusses how the Mitigation Action Plans will be implemented by participating jurisdictions and outlines the method and schedule for monitoring, updating, and evaluating the plan. This section also discusses incorporating the plan into existing planning mechanisms and how the public will continue to be involved in the planning process. It consists of the following three subsections:

8.1 Implementation
8.2 Monitoring, Evaluation, and Enhancement
8.3 Continued Public Involvement

8.1 IMPLEMENTATION

Each jurisdiction participating in this plan update is responsible for implementing specific mitigation actions as prescribed in their Mitigation Action Plan (found in Section 7). In each Mitigation Action Plan, every proposed action is assigned to a specific local department or agency to ensure responsibility and accountability and increase the likelihood of subsequent implementation. This approach enables individual jurisdictions to update their own unique mitigation action list as needed without altering the broader focus of the regional plan.

In addition to the assignment of a local lead department or agency, an implementation timeline or a specific implementation date or window has been assigned to each mitigation action to help assess whether reasonable progress is being made toward implementation. The participating jurisdictions will seek outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. When applicable, potential funding sources have been identified for proposed actions listed in the Mitigation Action Plan.

8.1.1 MITIGATION ACTION PLAN IMPLEMENTATION

Another important implementation mechanism that is highly effective and low-cost is incorporation of the Hazard Mitigation Plan (HMP) recommendations and their underlying principles into other plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement the Mitigation Action Plan. It will be the responsibility of the HMPC representatives from each participating jurisdiction to determine and pursue opportunities for integrating the requirements of this plan with other local planning documents and ensure that the goals and strategies of new and updated local planning documents for their jurisdictions or agencies are consistent with the goals and actions of the HMP and will not contribute to increased hazard vulnerability in the county. Methods for integration may include:

- Monitoring other planning/program agendas;
- Attending other planning/program meetings;
- Participating in other planning processes; and
- Monitoring community budget meetings for other community program opportunities.

Table 8.1 summarizes if and how plan integration occurred or may occur in the future in each participating jurisdiction.

Table 8.1 – Plan Integration Efforts by Jurisdiction

Jurisdiction	Integration of 2020 plan	Intended integration of this plan update
Mecklenburg County	Mecklenburg County is part of Charlotte's comprehensive plan – see integration summary below. Mecklenburg County also used the 2020 plan to inform development of a recovery and resiliency plan.	The hazard mitigation plan will be used to support implementation of the County's Community Rating System (CRS) program. Additional integration opportunities will be pursued as they arise.
City of Charlotte	As part of its policy framework in its 2021 comprehensive plan update, Charlotte included a goal of integrated natural and built environments. This goal included objectives/potential projects such as reducing the number of flood prone areas through mitigation efforts, increasing sustainable and resilient building standards, etc.	The hazard mitigation plan will be used to support implementation of the City's CRS program. Additional integration opportunities will be pursued as they arise.
Town of Cornelius	Hazard mitigation was incorporated into the Town's land use plan update, which included designating flood prone areas for parks and open space in the future land use map.	Integration will be pursued as opportunities arise.
Town of Davidson	The Town of Davidson's 2020 comprehensive plan notes that stream protection should serve to foster a resilient built environment and avoid hazards from slopes and flooding.	The Town will integrate the HMP into upcoming development of a Comprehensive Emergency Management Plan and Continuity of Operations Plan. Additional integration will be pursued as opportunities arise.
Town of Huntersville	The Town of Huntersville's 2020 comprehensive plan includes policies related to watersheds and restricting development in the floodplain.	The hazard mitigation plan will be used to support implementation of the Town's CRS program. Additional integration opportunities will be pursued as they arise.
Town of Matthews	The Town of Matthews 2024 comprehensive plan includes implementing the Mecklenburg County HMP as an implementation project.	Integration will be pursued as opportunities arise.
Town of Mint Hill	The 2022 Mint Hill comprehensive plan recommends that the Town ensures adequate buffers to protect streams and floodplains.	Integration will be pursued as opportunities arise.
Town of Pineville	The Town of Pineville's 2022 comprehensive plan uses an environmental screening tool, which identifies flood hazards areas, to determine appropriate land uses.	The hazard mitigation plan will be used to support implementation of the Town's CRS program. Additional integration opportunities will be pursued as they arise.

8.2 MONITORING, EVALUATION, AND ENHANCEMENT

8.2.1 ROLE OF HMPC IN IMPLEMENTATION, MONITORING AND MAINTENANCE

With adoption of this plan, each jurisdiction will be responsible for the implementation and maintenance of their mitigation actions. The Charlotte-Mecklenburg Emergency Management Office (CMEMO) will take the lead in all plan monitoring and update procedures. As such, CMEMO agrees to continue their relationship with the HMPC and:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Ensure hazard mitigation remains a consideration for community decision makers;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the communities implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended revisions to their County Boards of Commissioners;
- Support local jurisdictions in reporting on plan progress and recommended revisions to their local governing bodies; and
- Inform and solicit input from the public.

The HMPC's primary duty moving forward is to see the plan successfully carried out and report to the individual County Boards of Commissioners, City and Town Councils, NCEM, FEMA, and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about flood mitigation, passing concerns on to appropriate entities, and providing relevant information for posting on local community website (and others as appropriate).

Simultaneous to these efforts, it will be important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the costlier recommended actions. This task will include creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available, the participating jurisdictions will be positioned to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

8.2.2 MAINTENANCE SCHEDULE

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized. CMEMO will reconvene the HMPC quarterly for regular reviews and plan maintenance. These meetings may be held in-person or via conference call or webinar. The HMPC will also convene to review the plan after significant hazard events. If determined appropriate or as requested, an annual report on the plan will be developed and presented to local governing bodies of participating jurisdictions to report on implementation progress and recommended changes.

The five-year written update to this plan will be submitted to NCEM and FEMA Region 4, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. With this plan update anticipated to be adopted and fully approved in 2025, the next plan update for Mecklenburg County will be completed by 2030.

8.2.3 MAINTENANCE EVALUATION PROCESS

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions; and/or
- Increased vulnerability as a result of new development (and/or annexation).

Updates to this plan will:

- Consider changes in vulnerability due to project implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to countywide inventories; and
- Incorporate new project recommendations or changes in project prioritization.

In order to best evaluate any changes in vulnerability as a result of plan implementation, the HMPC will follow the following process:

- The HMPC representatives from each jurisdiction will be responsible for tracking and reporting on their mitigation actions. Representatives should provide input on whether the action as implemented met the defined objectives and/or is likely to successfully reduce vulnerabilities.
- If the action does not meet identified objectives, the jurisdictional representatives will determine what additional measures may be implemented and will make any required modifications to the plan.
- All monitoring and implementation information will be reported to the full HMPC, led by CMEMO, during quarterly meetings. An annual plan maintenance report may be drafted as deemed necessary.

Changes will be made to the plan as needed to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the mitigation action plans will be by written changes and submissions, as is appropriate and necessary, and as approved by the appropriate jurisdiction's local governing body.

Following a disaster declaration, the plan will be revised as necessary to reflect lessons learned, or to address specific issues and circumstances arising from the event. It will be the responsibility of CMEMO to reconvene the HMPC and ensure the appropriate stakeholders are invited to participate in the plan revision and update process following declared disaster events.

CRITERIA FOR QUARTERLY REVIEWS IN PREPARATION FOR 5-YEAR UPDATE

The criteria recommended in 44 CFR 201 and 206 will be utilized in reviewing and updating the plan. More specifically, quarterly reviews will monitor changes to the following information:

- Community growth or change in the past quarter.
- The number of substantially damaged or substantially improved structures by flood zone.
- The renovations to public infrastructure including water, sewer, drainage, roads, bridges, gas lines, and buildings.
- Natural hazard occurrences that required activation of the Emergency Operations Center (EOC) and whether the event resulted in a presidential disaster declaration.
- Natural hazard occurrences that were not of a magnitude to warrant activation of the EOC or a federal disaster declaration but were severe enough to cause damage in the community or closure of businesses, schools, or public services.
- The dates of hazard events descriptions.
- Documented damages due to the event.
- Closures of places of employment or schools and the number of days closed.
- Road or bridge closures due to the hazard and the length of time closed.
- Assessment of the number of private and public buildings damaged and whether the damage was minor, substantial, major, or if buildings were destroyed. The assessment will include residences, mobile homes, commercial structures, industrial structures, and public buildings, such as schools and public safety buildings.
- Review of any changes in federal, state, and local policies to determine the impact of these policies on the community and how and if the policy changes can or should be incorporated into the Hazard Mitigation Plan. Review of the status of implementation of mitigation actions including projects completed will be noted. Projects behind schedule will include a reason for delay of implementation.

8.3 CONTINUED PUBLIC INVOLVEMENT

Continued public involvement is imperative to the overall success of the plan's implementation. The quarterly review process will provide an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. Efforts to involve the public in the maintenance, evaluation, and revision process may include:

- Advertising HMPC meetings in the local newspaper, public bulletin boards and/or City and County office buildings;
- Designating willing citizens and private sector representatives as official members of the HMPC;
- Utilizing local media to update the public of any maintenance and/or review activities;
- Utilizing City, Town, and County websites to advertise any maintenance and/or review activities;
- Maintaining copies of the plan in public libraries or other appropriate venues;
- Posting annual progress reports on the Plan to County, City, and Town websites;
- Heavy publicity of the plan and potential ways for the public to be involved after significant hazard events, tailored to the event that has just happened;
- Keeping websites, social media outlets, etc. updated;
- Drafting articles for the local community newspapers/newsletters;
- Utilizing social media accounts (e.g. Twitter, Facebook).

PUBLIC INVOLVEMENT FOR FIVE-YEAR UPDATE

When the HMPC reconvenes for the five-year update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. In reconvening, the HMPC will be responsible for coordinating the activities necessary to involve the greater public, including disseminating information through a variety of media channels detailing the plan update process. As part of this effort, public meetings will be held, and public comments will be solicited on the plan update draft.

9 PLAN ADOPTION

Requirement §201.6(c)(5): [The plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).

The purpose of formally adopting this plan is to secure buy-in, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 (Adopt the Plan) of the 10-step planning process, in accordance with the requirements of DMA 2000. FEMA Approval Letters and community adoption resolutions are provided on the following pages.

Placeholder

ANNEX A UNINCORPORATED MECKLENBURG COUNTY

A.1 ASSET INVENTORY

Mecklenburg County and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table A.1 provides a count of critical facilities by FEMA lifeline category in unincorporated Mecklenburg County. Figure A.1 shows the locations of all critical facilities by jurisdiction in unincorporated Mecklenburg County.

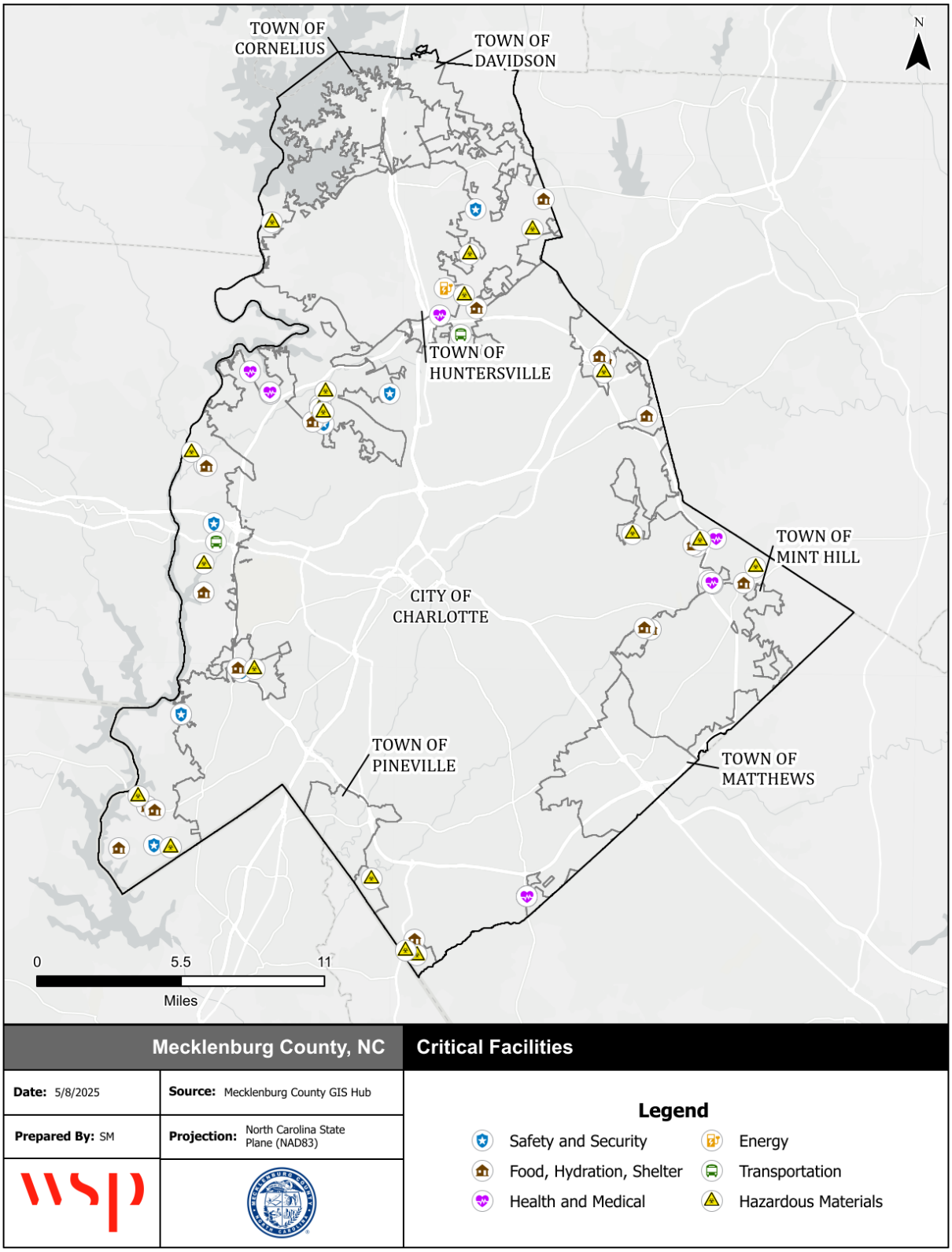
Table A.2 provides a detailed inventory of the critical facilities in unincorporated Mecklenburg County, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table A.1 – Critical Facilities by Type, Unincorporated Mecklenburg County

Facility Type	Count of Facility Type	Structure Value
Communications	0	$-
Energy	1	$-
Food, Hydration, Shelter	19	$342,297,500
Hazardous Materials	20	$7,526,600
Health and Medical	15	$102,368,700
Safety and Security	9	$4,629,100
Transportation	2	$2,792,400
Water Systems	0	$-
Total	**66**	**$459,614,300**

Source: Mecklenburg County, HMPC

Figure A.1 – Critical Facilities, Unincorporated Mecklenburg County



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table A.2 – Critical Facilities Inventory, Unincorporated Mecklenburg County

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Safety and Security	Fire Station	13409 Ramah Church Rd	-	0.1	X Unshaded	Direct Exposure	3
Energy	Energy	12040 Old Statesville Rd	-	0.1	X Unshaded	Sources of Ember Load to Buildings	2
Hazardous Materials	Landfill	16400 HUNTERSVILLE-CONCORD RD	$4,062,300	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	5101 AMOS SMITH RD	$379,000	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	3015 KELLY RD	-	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Landfill	2905 KELLY RD	$520,400	0.1	X Unshaded	Direct Exposure	2.5
Hazardous Materials	Landfill	16309 AUTUMN CREEK CT	-	0.1	X Unshaded	Direct Exposure	2
Hazardous Materials	Landfill	4316 SHOPTON RD	-	0.1	X Unshaded	Direct Exposure	2
Hazardous Materials	Landfill	14129 ALBEMARLE RD	$231,700	0.1	X Unshaded	Critical Fireshed	2.5
Hazardous Materials	Landfill	3000 KELLY RD	-	0.1	X Unshaded	Critical Fireshed	1.5
Hazardous Materials	Landfill	11898 EVERETT KEITH RD	-	0.1	X Unshaded	Critical Fireshed	2.5
Hazardous Materials	Landfill	13531 HIGHWAY 521 SOUTH	-	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	2323 SALOME CHURCH RD	-	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Landfill	302 HOLBROOKS RD	$10,300	0.1	X Unshaded	Critical Fireshed	2.5
Hazardous Materials	Landfill	16901 LANCASTER HY	-	0.1	X Unshaded	Critical Fireshed	2
Hazardous Materials	Landfill	14816 THOMAS RD	$388,100	0.1	X Unshaded	Critical Fireshed	2
Hazardous Materials	Landfill	4109 OAKDALE RD	-	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Landfill	13568 N.C. 73 HY	$1,254,000	0.1	X Unshaded	Critical Fireshed	2.5
Hazardous Materials	Landfill	11701 MT HOLLY RD NC 27	$37,100	0.1	X Unshaded	Sources of Ember Load to Buildings	1.5
Hazardous Materials	Landfill	9400 PLAZA RD	$241,500	0.1	X Unshaded	Critical Fireshed	1.5
Hazardous Materials	Landfill	10412 HARRISBURG RD	-	0.1	X Unshaded	Sources of Ember Load to Buildings	2.5
Safety and Security	Fire Station	6741 Pleasant Grove Rd	$743,100	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	12100 Shopton Rd West	$1,513,800	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	6809 BEATTIES FORD RD	-	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	3100 SAM WILSON RD	$369,300	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	5304 MECKLENBURG SHRINE CLUB RD	$224,300	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Safety and Security	Fire Station	8700 STEELE CREEK RD	$264,800	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	12100 SHOPTON RD W	$1,513,800	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	16315 YOUNGBLOOD RD	-	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Solid Waste Facility	19131 Lancaster Highway	$402,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	10132 Harrisburg Rd.	$1,203,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	11431 University City Boulevard	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1100 Elliott Rd	$275,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	13120 Grand Palisades Parkway	$1,286,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2502 Salome Church Rd	$22,153,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	10700 Asbury Chapel Road	$11,401,400	0.1	X Unshaded	Sources of Ember Load to Buildings	2.5
Food, Hydration, Shelter	School	5203 Shopton Rd	$11,504,300	0.1	X Unshaded	Direct Exposure	3
Food, Hydration, Shelter	School	16115 Poplar Tent Road	$28,570,100	0.1	X Unshaded	Critical Fireshed	3
Health and Medical	Medical Facilities	8201 Healthcare Loop	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	11835 Southmore Dr	$2,545,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10816 Black Dog Ln	$897,600	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11835 Southmore Dr	$2,545,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11840 Southmore Dr	$4,950,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10917 Black Dog Ct	$897,600	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10210 Couloak Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10220 Couloak Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8201 Healthcare Loop	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	7129 Scuppernong Ct	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11925 SAM ROPER DR	$874,100	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11840 Southmore Dr	$4,950,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8201 HEALTHCARE LP	$79,758,400	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	10310 Couloak Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11840 Southmore Dr	$4,950,200	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	10501 Windy Grove Road	$7,301,600	0.1	X Unshaded	Direct Exposure	0
Food, Hydration, Shelter	School	10501 Windy Grove Road	$7,301,600	0.1	X Unshaded	Direct Exposure	0
Food, Hydration, Shelter	School	13501 Albemarle Road	$6,861,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	11425 Ardrey Kell Road	$13,665,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1967 Patriot Drive	$79,826,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5960 Brickstone Drive	$79,826,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	15321 York Road	$11,686,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	14015 Mallard Roost Road	$9,238,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	10201 Running Rapids Road	$25,097,100	0.1	X Unshaded	Direct Exposure	0
Food, Hydration, Shelter	School	11600 White Rapids Road	$25,097,100	0.1	X Unshaded	Direct Exposure	0
Food, Hydration, Shelter	School	14947 York Road	-	0.1	X Unshaded	Direct Exposure	1
Transportation	LYNX Station		-	0.1	X Unshaded	Critical Fireshed	2
Transportation	LYNX Station		$2,792,400	0.1	X Unshaded	Indirect Exposure	0

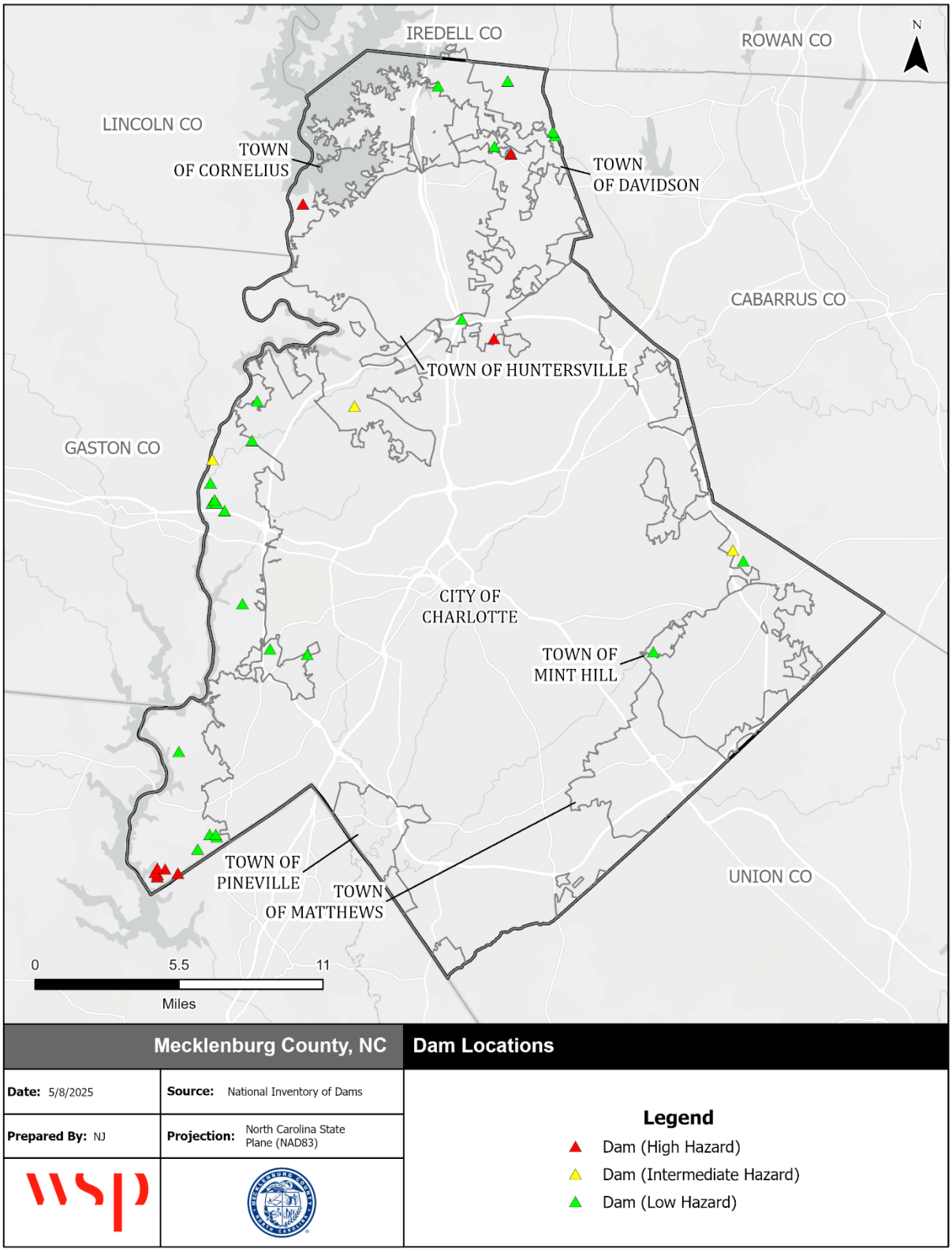
A.2 RISK ASSESSMENT

This section contains a summary of the County's asset inventory as well as hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Dam Failure, Flood and Wildfire.

A.2.1 DAM FAILURE

Currently, unincorporated Mecklenburg County has no high hazard dams that have been identified by the North Carolina Dam Inventory with a condition assessment of "fair" or "poor." Figure A.2 shows the location of all dams in unincorporated Mecklenburg County.

Figure A.2 – Dam Inventory, Unincorporated Mecklenburg County



Source: NC Dam Inventory, December 2024

A.2.2 FLOODING

Table A.3 details the acreage of unincorporated Mecklenburg County's total area by flood zone on the effective DFIRM. Per this assessment, over 19 percent of the unincorporated area in the County falls within the mapped 1%-annual-chance floodplains.

Table A.3 – Flood Zone Acreage in Unincorporated Mecklenburg County

Flood Zone	Acreage	Percent of Total (%)
Zone AE	16,036.3	19.4
Zone X (500-year)	113.1	0.1
Zone X Unshaded	66,415.1	80.4
Total	**82,564.6**	**100.0**

Source: FEMA Effective DFIRM

Figure A.3 reflects the effective mapped flood hazard zones in unincorporated Mecklenburg County, and Figure A.4 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

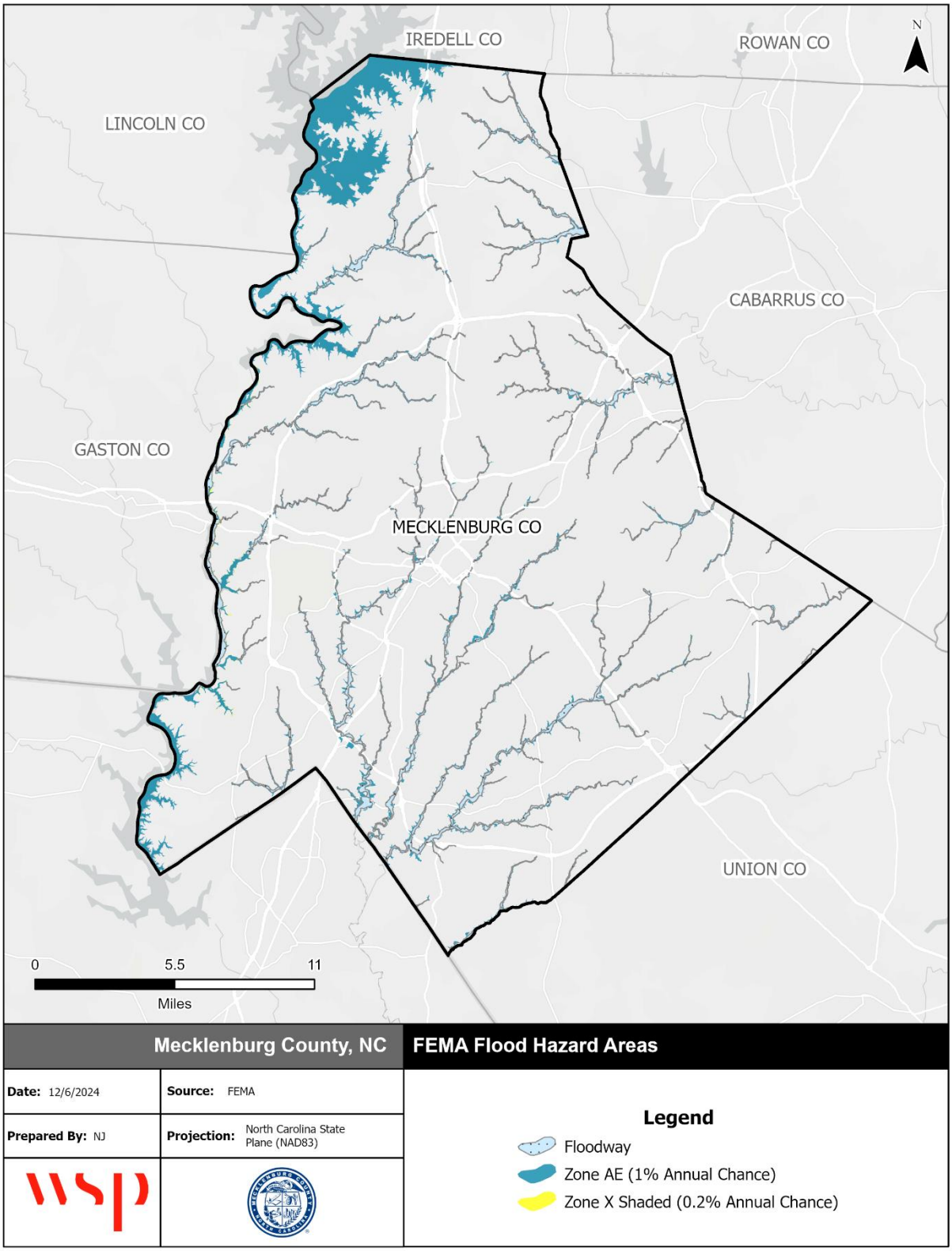
Table A.4 provides building counts and values for critical facilities by flood zone in unincorporated Mecklenburg County.

Table A.4 – Critical Facilities Exposed to Flooding, Unincorporated Mecklenburg County

Flood Zone	Critical Facility Count	Structure Value
Zone AE	0	$0
Zone X (500-year)	0	$0
Zone X Unshaded	66	$459,614,300
Total	**66**	**$459,614,300**

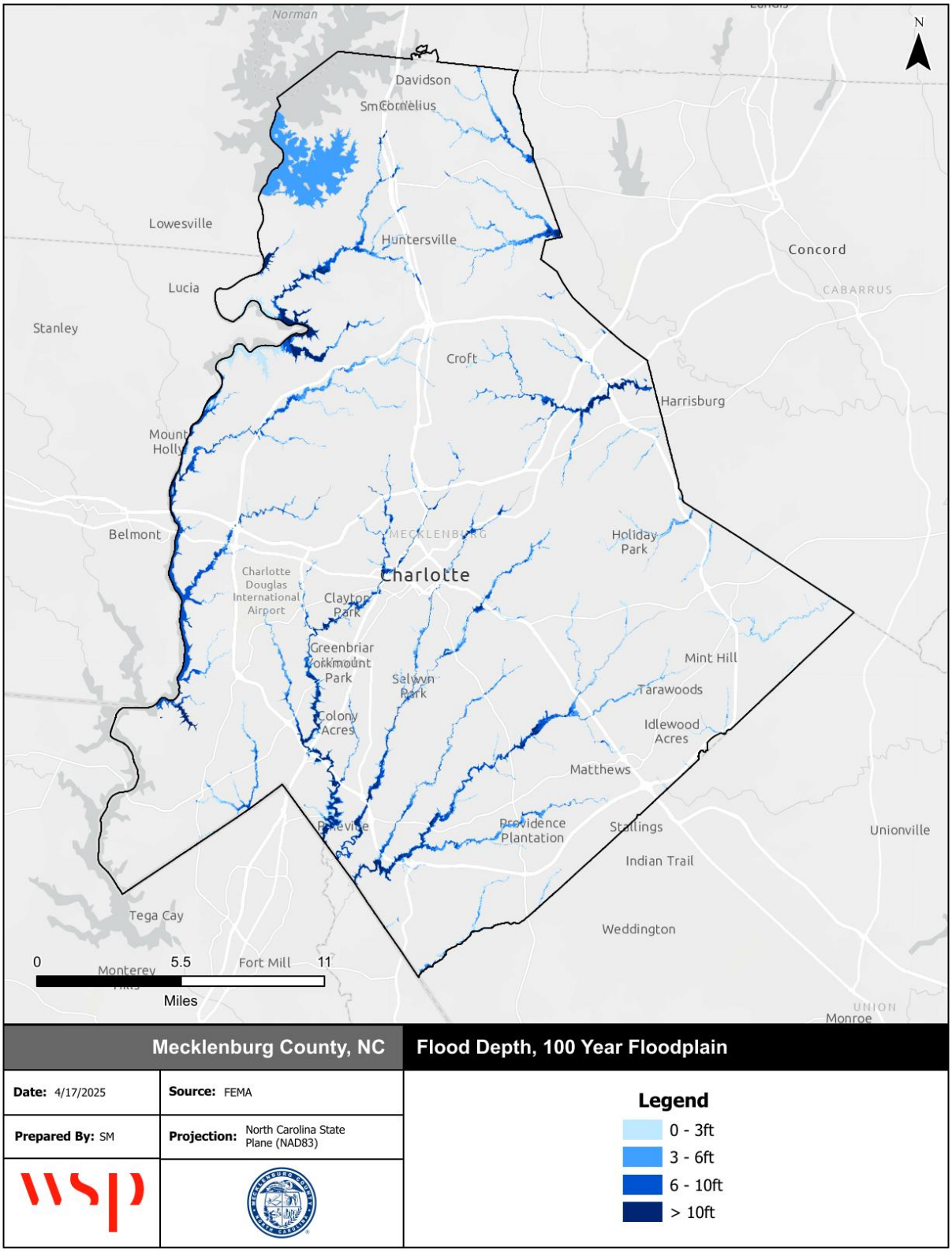
Source: FEMA Effective DFIRM, HMPC

Figure A.3 – FEMA Flood Hazard Areas, Unincorporated Mecklenburg County



Source: FEMA Effective DFIRM

Figure A.4 – Flood Depth, 1%-Annual-Chance Floodplain, Unincorporated Mecklenburg County



Source: FEMA Effective DFIRM

FLOOD INSURANCE DATA

Mecklenburg County joined the NFIP emergency program in 1973 and has been a regular participant in the NFIP since June 1981. Mecklenburg County participates in the Community Rating System and is currently a Class 5 community. The following tables reflect NFIP policy and claims data for the County categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table A.5 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	100	$88,247	$30,044,000	202	$7,345,516.71
2-4 Family	0	$0	$0	2	$1,045.63
All Other Residential	31	$8,707	$4,384,000	7	$66,116.00
Non-Residential	4	$14,539	$2,449,000	10	$937,788.64
Total	**135**	**$111,493**	**$36,877,000**	**221**	**$8,350,466.98**

Source: FEMA Community Information System, accessed May 2025

Table A.6 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	50	$59,986	$14,034,000	104	$5,910,455.37
A Zones	34	$11,476	$4,935,000	47	$1,066,148.08
B, C & X Zone					
Standard	51	$40,031	$17,908,000	43	$1,202,836.15
Preferred	0	$0	$0	21	$173,671.61
Total	**135**	**$111,493**	**$36,877,000**	**215**	**$8,353,111.21**

Source: FEMA Community Information System, accessed May 2025

Table A.7 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	18	$26,776	$4,504,000	59	$3,499,993.33
A Zones	0	$0	$0	38	$439,409.74
B, C & X Zone	6	$5,372	$2,000,000	38	$1,210,064.35
Standard	6	$5,372	$2,000,000	29	$1,098,636.85
Preferred	0	$0	$0	10	$117,442.11
Total	**24**	**$32,148**	**$6,504,000**	**135**	**$5,149,467.42**

Source: FEMA Community Information System, accessed May 2025

Table A.8 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	32	$33,210	$9,530,000	45	$2,410,462.04
A Zones	34	$11,476	$4,935,000	9	$626,738.34
B, C & X Zone	45	$34,659	$15,908,000	25	$160,428.80
Standard	45	$34,659	$15,908,000	14	$104,199.30
Preferred	0	$0	$0	11	$56,229.50
Total	**111**	**$79,345**	**$30,373,000**	**79**	**$3,197,629.18**

Source: FEMA Community Information System, accessed May 2025

A.2.3 WILDFIRE

Table A.9 summarizes the acreage in Mecklenburg County that falls within the Functional Wildland Urban Interface (WUI), categorized into zones that describe the wildfire risk mitigation activities appropriate for each zone. Areas in the Functional WUI are those areas where development and building structures may intermix with burnable land cover. Approximately, 22 percent of unincorporated Mecklenburg County is categorized as having direct exposure to wildfire risk within the Functional WUI.

Table A.9 – Functional Wildland Urban Interface, Unincorporated Mecklenburg County

	Functional Wildland Urban Interface (WUI) Category	Acres	Percent
	Direct Exposure	18,603	22%
	Indirect Exposure	10,431	13%
	Critical Fireshed	30,161	36%
	Sources of Ember Load to Buildings	12,457	15%
	Little to No Exposure	13	0%
	Water	11,282	14%
	Total	**82,947**	**100%**

Source: Southern Wildfire Risk Assessment

Figure A.5 depicts the Functional WUI for unincorporated Mecklenburg County, including incorporated areas. Figure A.6 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure A.7 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Functional WUI areas are distributed throughout the county with limited gaps, although there are areas within the City of Charlotte and nearby suburbs outside of the Functional WUI. Areas of direct exposure are mostly seen outside the City of Charlotte. Burn probability is low throughout most of the county with the highest burn probability occurring in the northern side of the County. Fire Intensity is also low throughout the County with only a few clusters of moderate fire intensity found near the northern and western edges of the County.

Table A.10 provides the count and estimated value of all structures that intersect with areas of unincorporated Mecklenburg County and participating jurisdictions that are rated moderate to high on the WUI Risk Index.

Table A.11 provides building counts and values for critical facilities by FEMA lifeline that are located in areas categorized with direct exposure to wildfire risk on the Functional WUI scale.

Table A.10 – Structures at Risk to Moderate-High WUI Risk Index, Unincorporated Mecklenburg County

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	5	$587,575.00	$587,575.00	$1,175,150.00
Commercial	189	$113,903,532.00	$113,903,532.00	$227,807,064.00
Education	30	$34,851,580.00	$34,851,580.00	$69,703,160.00
Government	23	$2,074,313.00	$2,074,313.00	$4,148,626.00
Industrial	69	$22,748,362.00	$34,122,543.00	$56,870,905.00
Religious	55	$43,119,133.00	$43,119,133.00	$86,238,266.00
Residential	8,465	$1,044,712,933.00	$522,356,466.50	$1,567,069,399.50
Total	**8,836**	**$1,261,997,428.00**	**$751,015,142.50**	**$2,013,012,570.50**

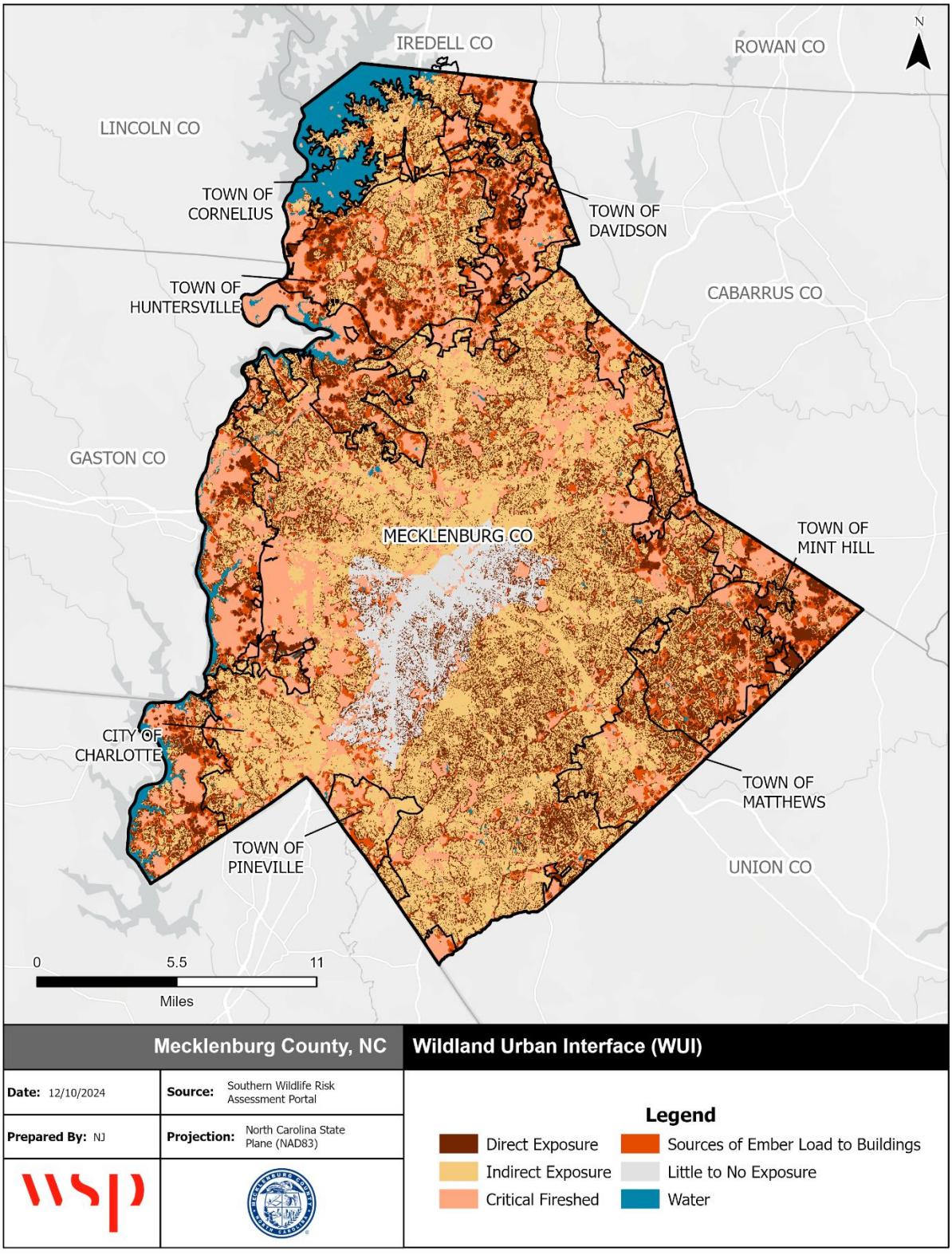
Source: Southern Wildfire Risk Assessment

Table A.11 – Critical Facilities Exposed to Wildfire, Unincorporated Mecklenburg County

Type	Critical Facility Count	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	7	104,871,800
Hazardous Materials	14	2,646,000
Health and Medical	3	79,758,400
Safety and Security	1	$-
Transportation	1	$-
Water Systems	0	$-
Total	**26**	**187,276,200**

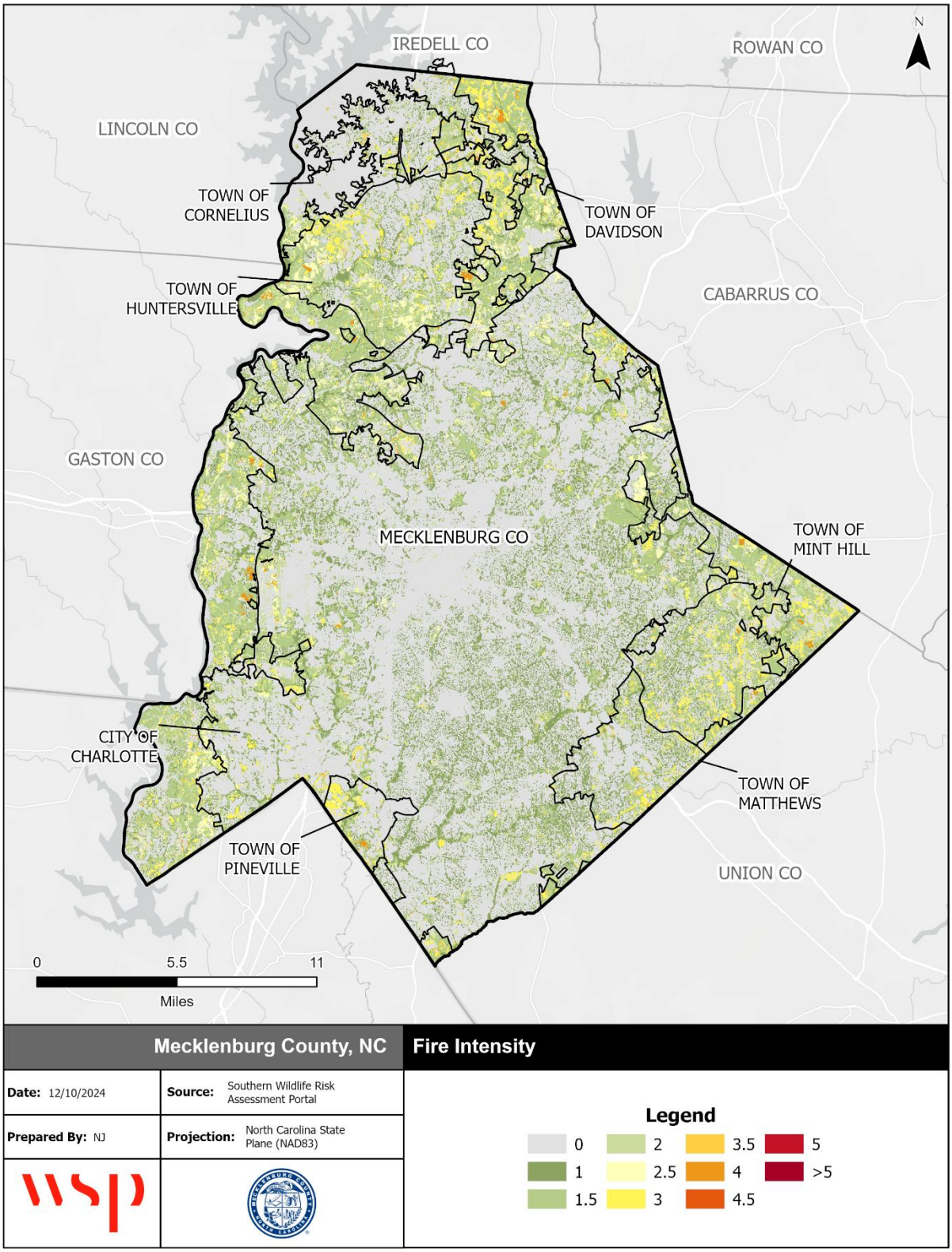
Source: Southern Wildfire Risk Assessment

Figure A.5 – Functional Wildland Urban Interface, Unincorporated Mecklenburg County



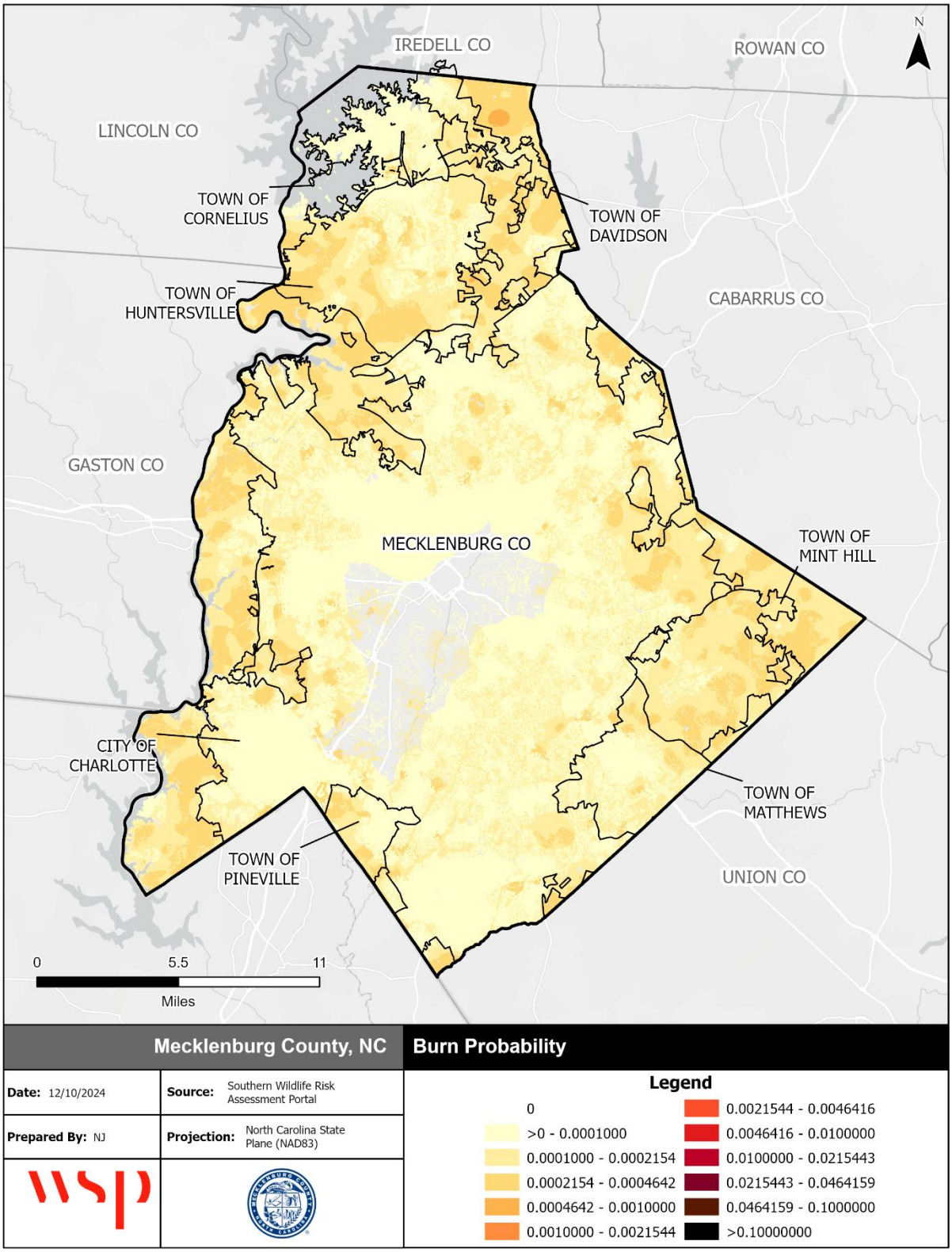
Source: Southern Wildfire Risk Assessment

Figure A.6 – Characteristic Fire Intensity, Unincorporated Mecklenburg County



Source: Southern Wildfire Risk Assessment

Figure A.7 – Burn Probability, Unincorporated Mecklenburg County



Source: Southern Wildfire Risk Assessment

A.3 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mecklenburg-1	Seek grant funding to retrofit critical facilities and County-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, 320 or 361 compliant safe rooms, lightning protection, hail resistant roofing, and anchoring fixed building equipment.	All Hazards	1.3	Medium	Property Protection	Mecklenburg County Code Enforcement & Mecklenburg County Fire Marshal's Office	TBD	Local, State, Federal	2025-2030	Carry Forward	Identified specific locations for improvements. Retrofits not yet completed due to competing priorities.
Mecklenburg-2	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standards (in addition to basic required compliance actions): a) Development standards linked to Community Floodplain (Future Conditions) b) Require critical facilities protection to 500-year flood levels c) Require parking lots to be elevated (no more than six inches deep in any parking space during Community Flood event) d) Require dry land access for new or substantially improved buildings (above Community Flood BFE) e) Levee restrictions f) Cumulative substantial damage improvement provision g) Prohibit basements below flood level on filled lots	Flooding	4.1	High	Prevention	Mecklenburg County / Storm Water	TBD	SWS Operating budget / grant	2025-2030	Carry Forward	Higher standards maintained. No ordinance updates or revisions made during the previous reporting period.
Mecklenburg-3	Maintain a Class 5 rating in the CRS Program.	Flooding	4.1	High	Prevention	Mecklenburg County Storm Water Services	TBD	SWS Operating budget	2025-2030	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mecklenburg-4	Update Flood Insurance Rate Maps to provide most accurate depiction of flood risk.	Flooding	4.1	High	Public Education & Awareness	Mecklenburg County / Storm Water	TBD	Storm Water Services Capital Fund / CTP grant	2025-2030	Carry Forward	Mecklenburg County, as current Cooperating Technical Partner with FEMA, maintains a LOMC processing agreement so that revision requests are processed locally and so that local standards for floodplain management are upheld. Charlotte-Mecklenburg Storm Water Services is exploring the use of 2D hydraulic modeling for future Countywide FIRM updates as well as regulatory floodway modeling. A pilot 2D flood modeling study of Little Sugar and Briar Creek watersheds started at the beginning of 2023 and is currently underway.
Mecklenburg-5	Identify, fund, and implement eligible flood mitigation projects. FEMA-defined and locally verified “repetitive loss properties” to receive high priority.	Flooding	1.1	High	Property Protection	Mecklenburg County / Storm Water	Variable	FEMA Unified Hazard Mitigation Assistance / Storm Water Services capital fund	2025-2030	Carry Forward	Mecklenburg County continues to implement mitigation actions identified in the Flood Risk Assessment and Risk reduction Plan. From July 2022 to September 2023, (ten) 10 flood-prone buildings were acquired and demolished at a cost of $4.3 M (75.1% local / 18.8% federal / 6.1% state funding). Three (3) elevation projects were completed at a cost of $403.7k (100% local / 0% federal / 0% state funding). There are two (2) active FEMA grants open and two (2) FEMA grants pending.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mecklenburg-6	Research possibility of using new H&H models to provide flood forecasting in the Flood Information Notification System (FINS). Research possibility of FINS system to provide inundation mapping based on results of new H&H models and explore alternate methods and expansion into other locations.	Flooding	3.2	Medium	Prevention	Mecklenburg County Storm Water	TBD	TBD	2025-2030	Carry Forward	Mecklenburg County in partnership with the Department of Homeland Security – Science and Technology Directorate implemented a real-time flood inundation mapping system to complement the existing Flood Information Notification System (FINS). The inundation mapping system is based on data developed from the hydrologic & hydraulic models and a network of lower-cost flood sensors deployed to nearly 90 new locations along creeks. As the system is refined, it will improve flood disaster response and recovery. Storm Water Services is exploring forecasting options for the inundation mapping to provide added lead time in deploying resources and evacuating citizens.
Mecklenburg-7	As determined necessary and upon request from municipal jurisdictions, provide informative presentations and/or work sessions for newly elected officials and new appointees to planning commissions and appeals/variance boards to provide an overview of floodplain management, the importance of participating in the NFIP, and the implications of failing to enforce the requirements of the program or failing to properly handle variance requests. On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for mitigating and preventing damages from hazardous conditions and how to respond when an imminent hazard threatens. On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management to provide information on all natural hazards facing the area to local planning staff and elected officials. This should be combined with an annual progress report on the status of local mitigation actions as identified in the Multijurisdictional Hazard Mitigation Plan.	All Hazards	2.1	Medium	Public Education & Awareness	CMEMO/ Mecklenburg County Storm Water	Staff time	Local	2025-2030	Carry Forward	Charlotte-Mecklenburg Emergency Management hosted a meeting on September 21, 2023 for Emergency Management staff, Storm Water Services Staff, Local Community Representatives, and other emergency services parties. Agenda included Situation Reports, Emergency Management Updates, FINS updates, and CRS-related Hazard Mitigation Plan updates.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mecklenburg-8	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	In 2025, Mecklenburg County contracted with an engineering firm (Woolpert) to implement flood forecasting capability for the Flood Information & Notification System (FINS). This enhancement to FINS will provide emergency personnel and support staff with a 12-hour forecast of stream stage (peak rise) throughout the County. In 2021, FINS implemented real-time flood inundation mapping utilizing real-time stream height data, now forecasted stage data will be used to improve inundation maps. The inundation mapping system provides real-time flood intelligence that is shared with Emergency Management and other agencies to improve early flood warning, flood disaster response, and recovery.
Mecklenburg-9	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.1	Moderate	Public Education & Awareness	In coordination with CMEMO (Lead)	Staff time and resources	N/A	2025-2030	New	Charlotte-Mecklenburg Storm Water Services (CMSWS) staff meets quarterly with Fire Chiefs and Emergency Management leaders from all municipalities in Mecklenburg County. During these meetings, CMSWS staff provide a debrief of flood related activities as well as the most recent Flood Information & Notification System (FINS) technology enhancements.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mecklenburg-10	**Comprehensive Relicensing Agreement for the Catawba-Wateree Hydro Project, FERC Project NO. 2232** • Leverage power of **Federal Emergency Management Agency** to ensure **Federal Energy Regulatory Commission** for quick movement on high intake agreement revisions request based on event • Request agreement revision to ensure **high inflow protocol documentation** that minimizes impact of damage and ensures safe release to reduce loss of life ○ Contact and communicate with **Appendix B key stakeholders** (FERC, Duke Energy, Storm Water, and Catawba-Wateree Relicensing Council) to request quick and efficient support. Develop project and communication plans ASAP ○ Path and communications identified to alert **Appendix B additional stakeholders** (70+) to get prior buy-in for a revision is being addressed and expect support ○ Request experts to define hydrologic calculations, prevention lowering for containment and relevant necessary data, develop detailed protocols for high intake policies and procedures (see 2) ○ Update agreement with high inflow (flooding) procedures for Duke Energy ○ Reduce highest impactful flooding during night for safety	Flooding, Dam & Levee Failure	3.2	High	Prevention	Charlotte-Mecklenburg Emergency Management Office/ Mecklenburg County Storm Water Catawba-Wateree Management Group	$0	Mecklenburg County, Duke Energy, Federal Energy Regulations Commission, Catawba-Wateree Management Group	2 years	New	
Mecklenburg-11	**Proactive Water Release Management** • A better defined, published plan to manage lake levels to **minimize** damage to structures, infrastructure and potential injury and loss of life. ○ Plan should include "trigger points" - when to activate • Request a **transparent, data-driven water release plan** before, during, and after major storms to prevent catastrophic downstream flooding. • Implement **early drawdowns of lake levels** before forecasted hurricanes or major rain events. • Improve and proactive **response to weather events** to adjust dam operations based on real-time storm projections.	Flooding, Dam & Levee Failure	3.2	High	Prevention, Emergency Services	Charlotte-Mecklenburg Emergency Management Office/ Mecklenburg County Storm Water Catawba-Wateree Management Group	$0	Mecklenburg County	1 year	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments

Mecklenburg-12	**Emergency Notification & Communication**
	• Establish additional **real-time flood warning system** with automated alerts via text, phone, AND email for residents in flood-prone areas.
	• Require Duke Energy to **publish actual real-time water level data and all lake release schedules** and update accordingly so homeowners can prepare accordingly.
	• Improve **coordination with local emergency management agencies and community** for response planning
	  ○ Time is of the essence in these scenarios. Where do gaps in communication occur between Duke Energy and the Emergency Response Team, and our community.
	  ○ All agencies supporting these requests have periodic community progress updates.
		Flooding, Dam & Levee Failure	3.1, 3.2	High	Emergency Services	CMEMO/ Mecklenburg County Storm Water Catawba-Wateree Management Group	$0	Mecklenburg County	1 year	New	

Mecklenburg-13	**Infrastructure Upgrades & Dam Reinforcement** • Review of the Cowans Nuclear facility flood protection and prevention - by experts in the field with any necessary action taken • Assess whether the **Mountain Island Lake Dam can be structurally reinforced** or modernized to improve water flow control. ○ Request study to identify if gates added to dam will assist in deducing damaging water flood during flood events (Similar at Lake Wateree) • Increase the **capacity and efficiency of reservoirs** to handle excess water more safely. • Conduct **third-party safety audits** on the dam and flood management systems.	Flooding, Dam & Levee Failure	1.2	High	Structural Projects	CMEMO	To be determined	Mecklenburg County	1 year	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mecklenburg-14	**Floodplain & Property Protection Measures** • Open land acquired from 2019 and 2025 events require wetland engineer and native landscaping for saturation and current control • Expand **flood control projects where possible**, such as levees, retention ponds, and reinforced embankments along the river. ○ Hire appropriate expertise (McAdams) to provide strong insight and recommendations • Ensure **stormwater drainage improvements** are implemented to reduce localized flooding from tributaries and key creeks. Riverhaven Drive drainage pipe reengineered to reduce flow from river during event.	Flooding, Dam & Levee Failure	1.1, 1.2	High	Natural Resource Protection, Structural Projects	County Storm Water	To be determined	Mecklenburg County	1 year	New	
Mecklenburg-15	**Policy & Accountability** • Require **Duke Energy and state regulators to create an updated flood mitigation plan** for the Catawba-Wateree River basin. • Advocate for **state and federal funding for flood resilience projects** in vulnerable areas. • Mandate **annual and timely reporting with community** on dam safety inspections, water management policies, and emergency response readiness/drills.	Flooding, Dam & Levee Failure	2.1	High	Prevention	CMEMO/ Mecklenburg County Storm Water Catawba-Wateree Management Group	To be determined	Mecklenburg County, Duke Energy, Federal Energy Regulations Commission	1 year	New	
Mecklenburg-16	Create or Update Community Wildfire Protection Plans in each fire district.	Wildfire	1.1, 2.1, 3.1	Medium	Prevention	CMEMO, NC Forest Service	To be determined	Grant funds	2030	New	
Mecklenburg-17	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	

ANNEX B CITY OF CHARLOTTE

B.1 ASSET INVENTORY

The City of Charlotte and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table B.1 provides a count of critical facilities by FEMA lifeline category in the City of Charlotte. Figure B.1 through Figure B.11 show the locations of all critical facilities in the City of Charlotte.

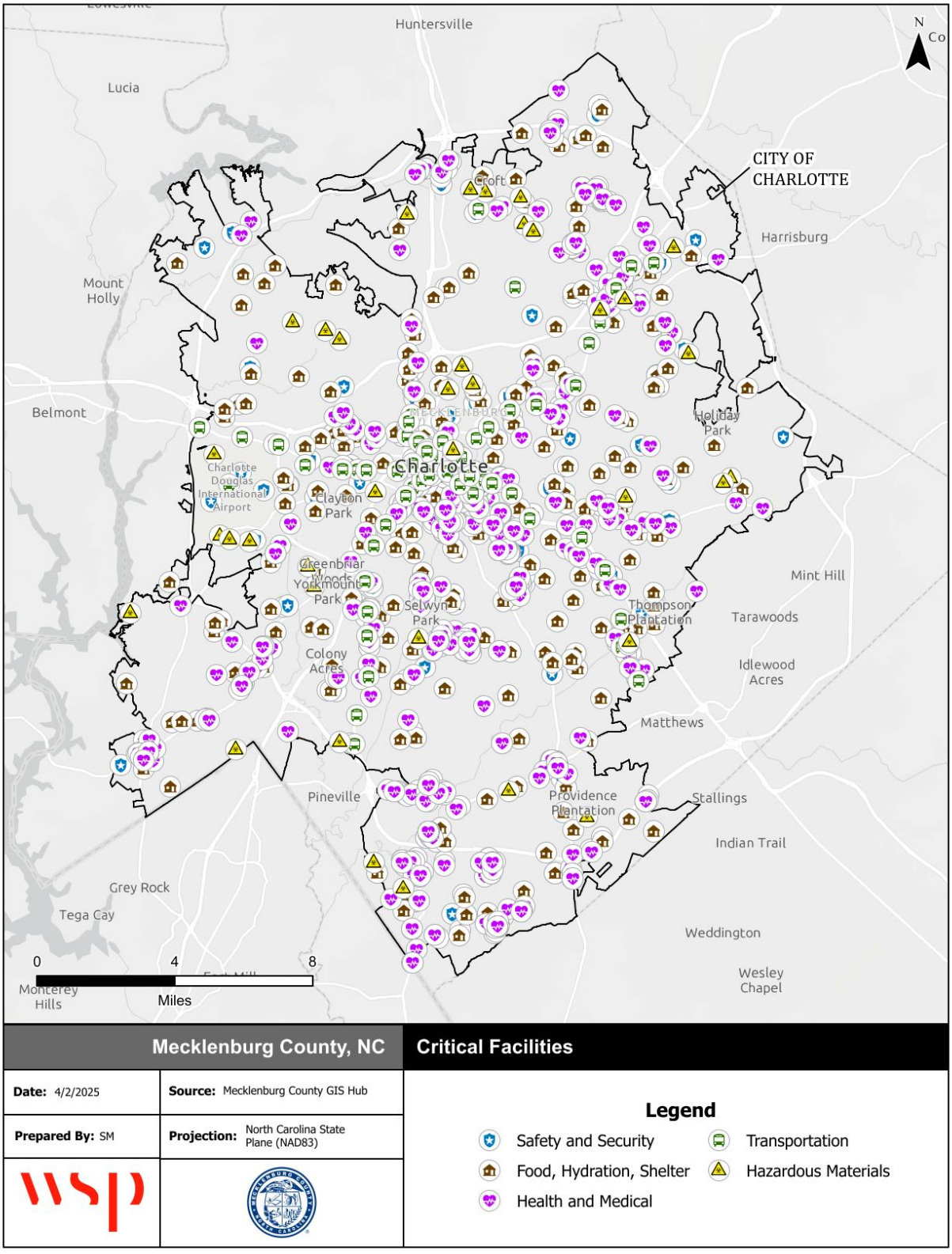
Table B.2 provides a detailed inventory of the critical facilities in the City of Charlotte, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table B.1 – Critical Facilities by Type, City of Charlotte

Facility Type	Count of Facility Type	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	265	$4,533,467,500
Hazardous Materials	37	$128,303,040
Health and Medical	677	$5,488,146,085
Safety and Security	79	$945,574,200
Transportation	69	$244,016,600
Water Systems	0	$-
Total	**1,127**	**$11,339,507,425**

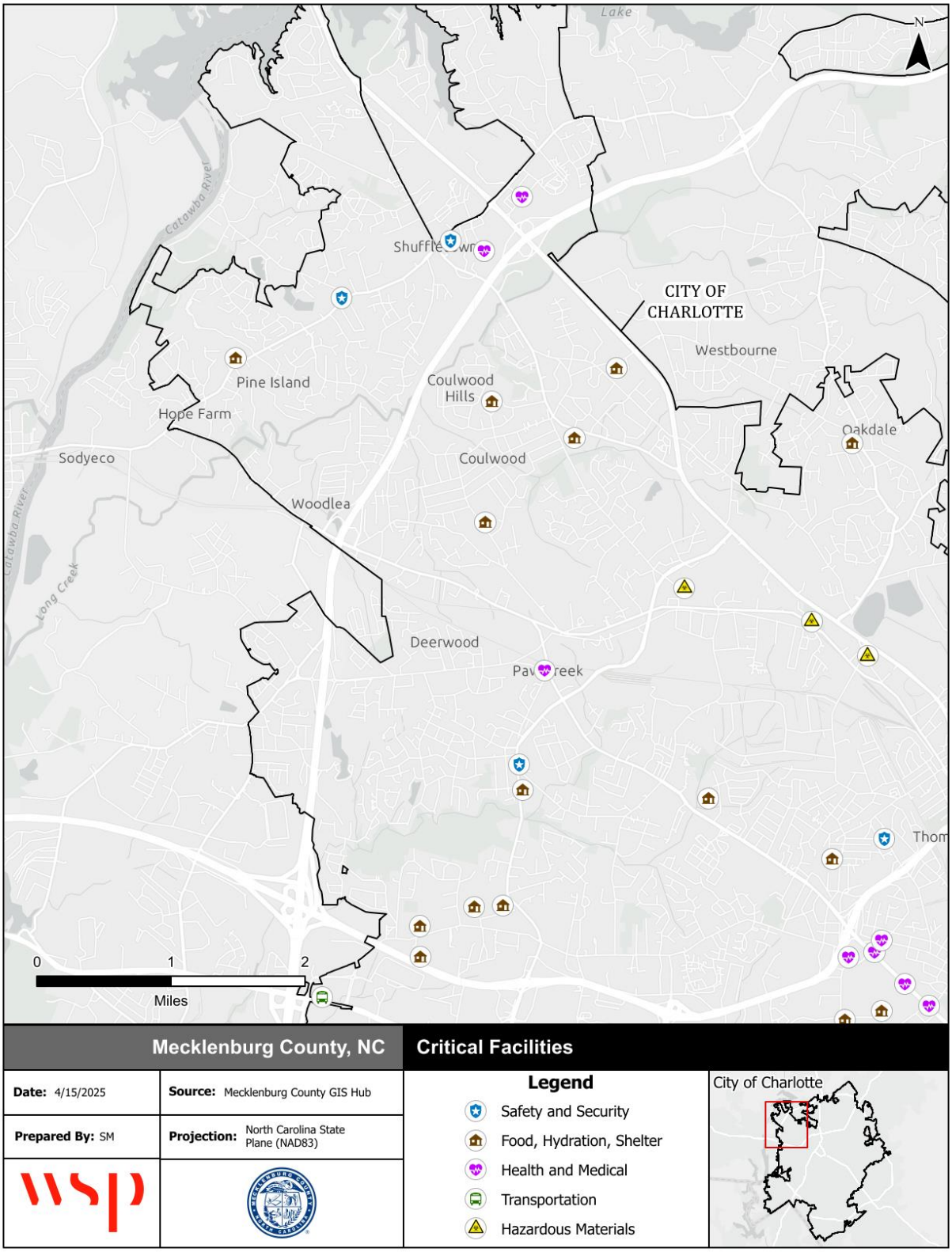
Source: Mecklenburg County, HMPC

Figure B.1 – Critical Facilities, City of Charlotte



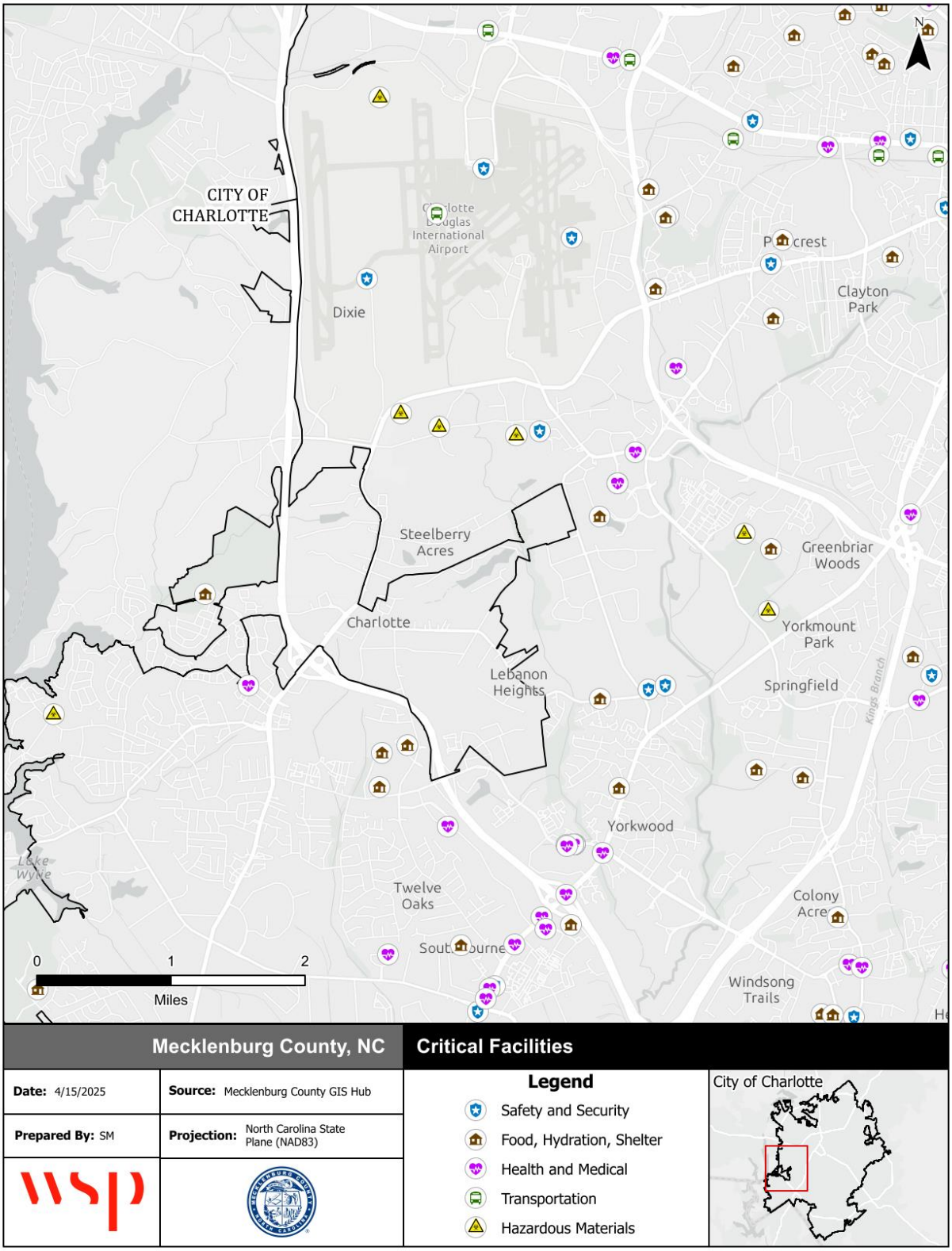
Source: NCEM IRISK Database, HMPC input, GIS Analysis

Figure B.2 – Critical Facilities, City of Charlotte, Inset 1



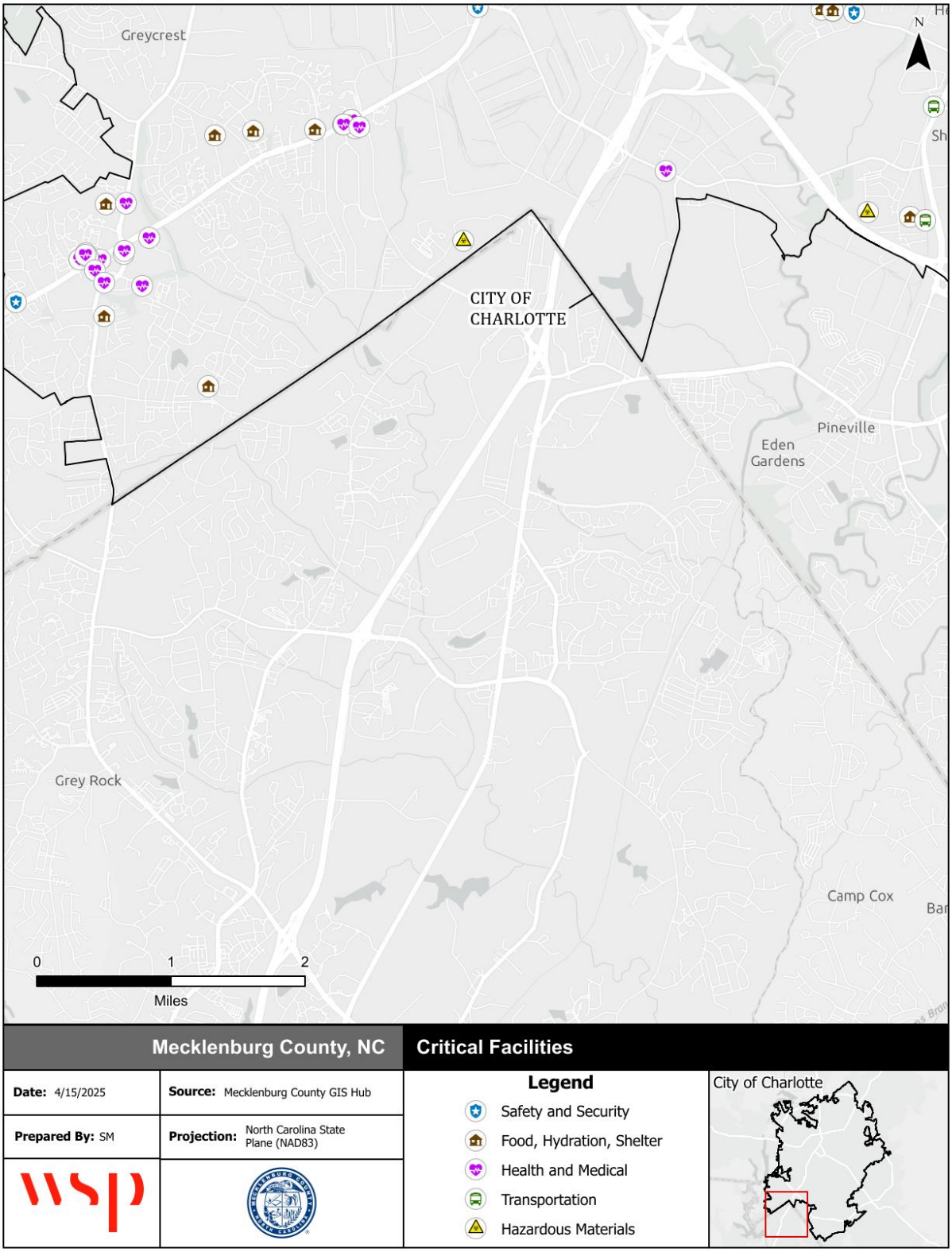
Source: NCEM IRISK Database, HMPC input, GIS Analysis

Figure B.3 – Critical Facilities, City of Charlotte, Inset 2



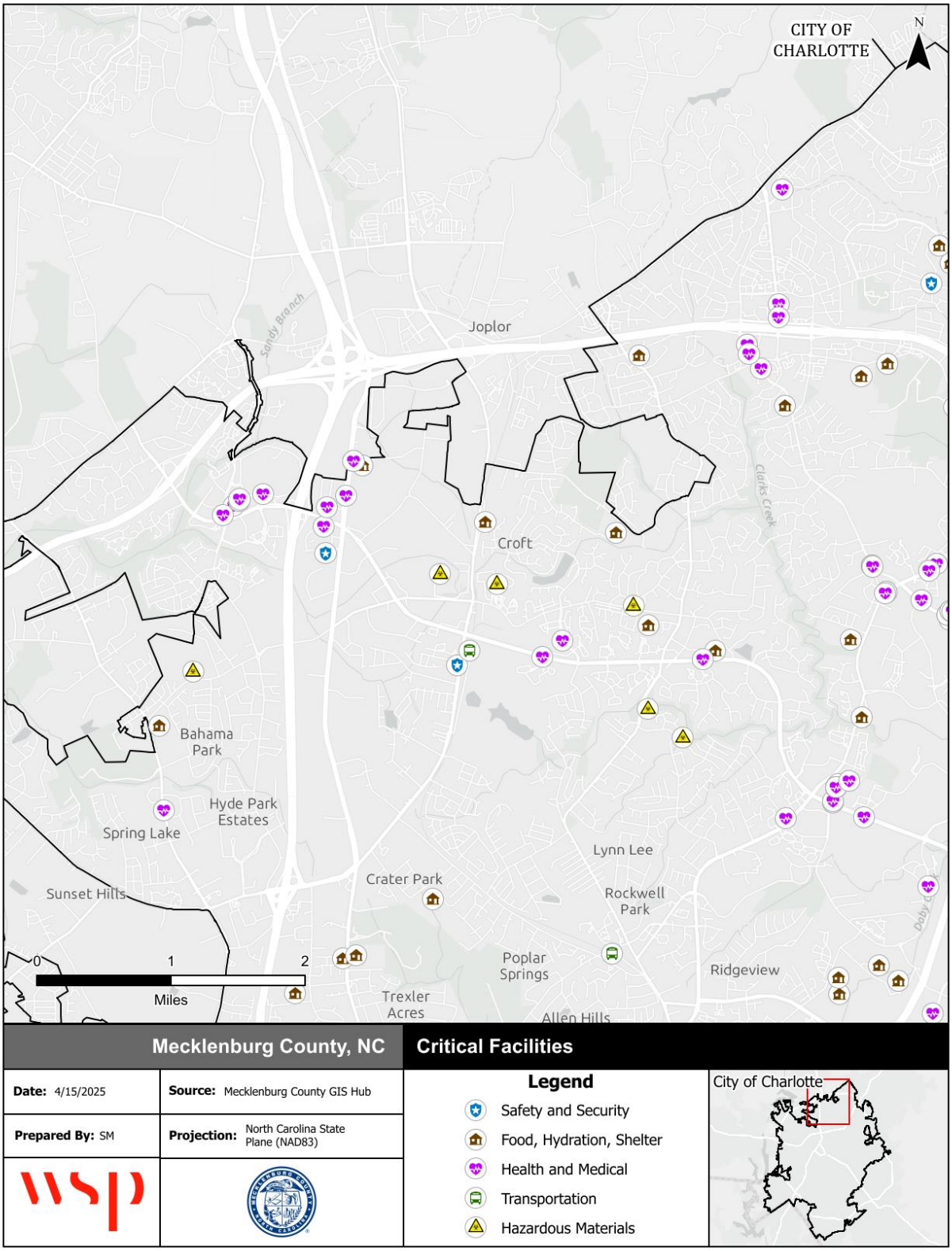
Source: NCEM IRISK Database, HMPC input, GIS Analysis

Figure B.4 – Critical Facilities, City of Charlotte, Inset 3



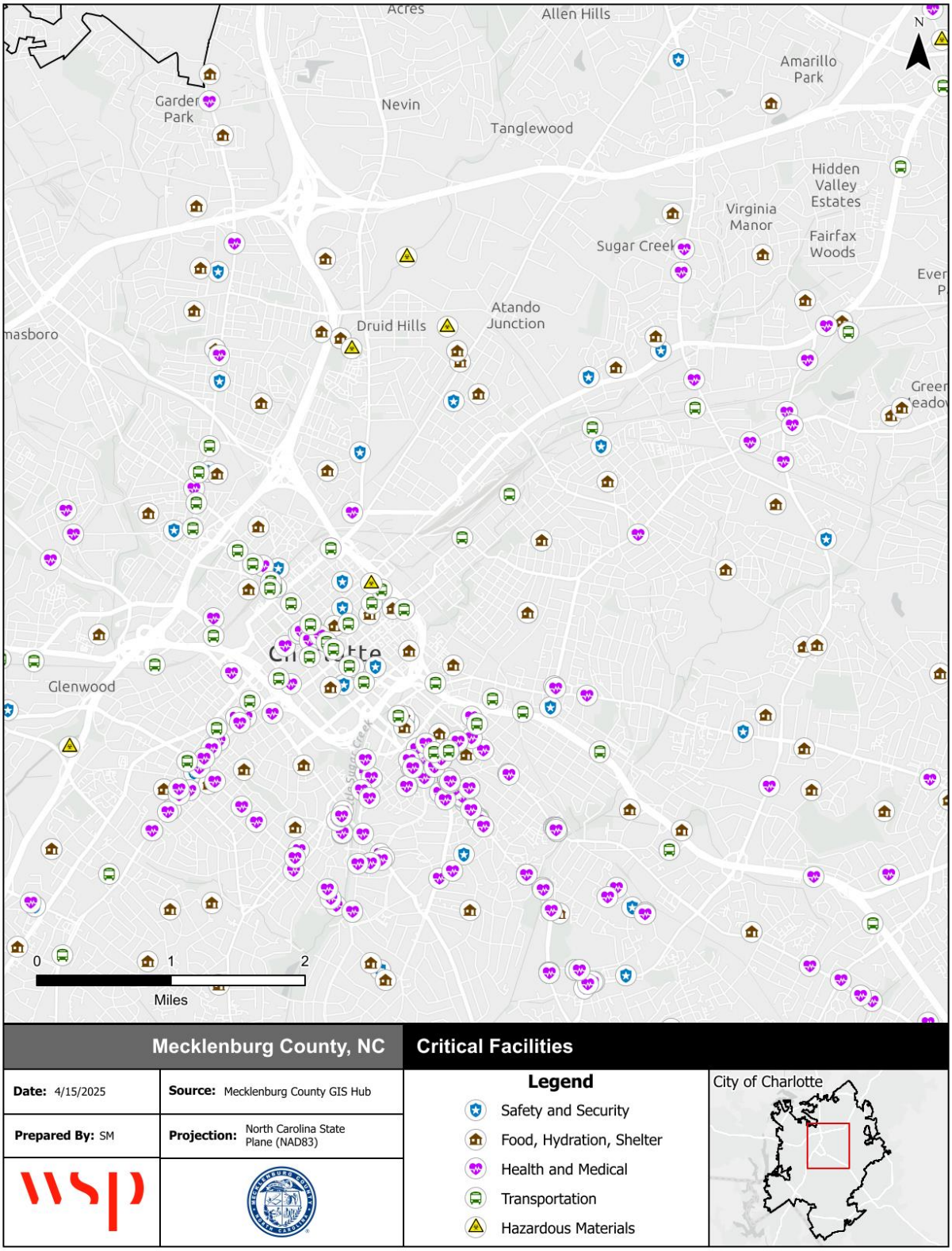
Source: NCEM IRISK Database, HMPC input, GIS Analysis

Figure B.5 – Critical Facilities, City of Charlotte, Inset 4



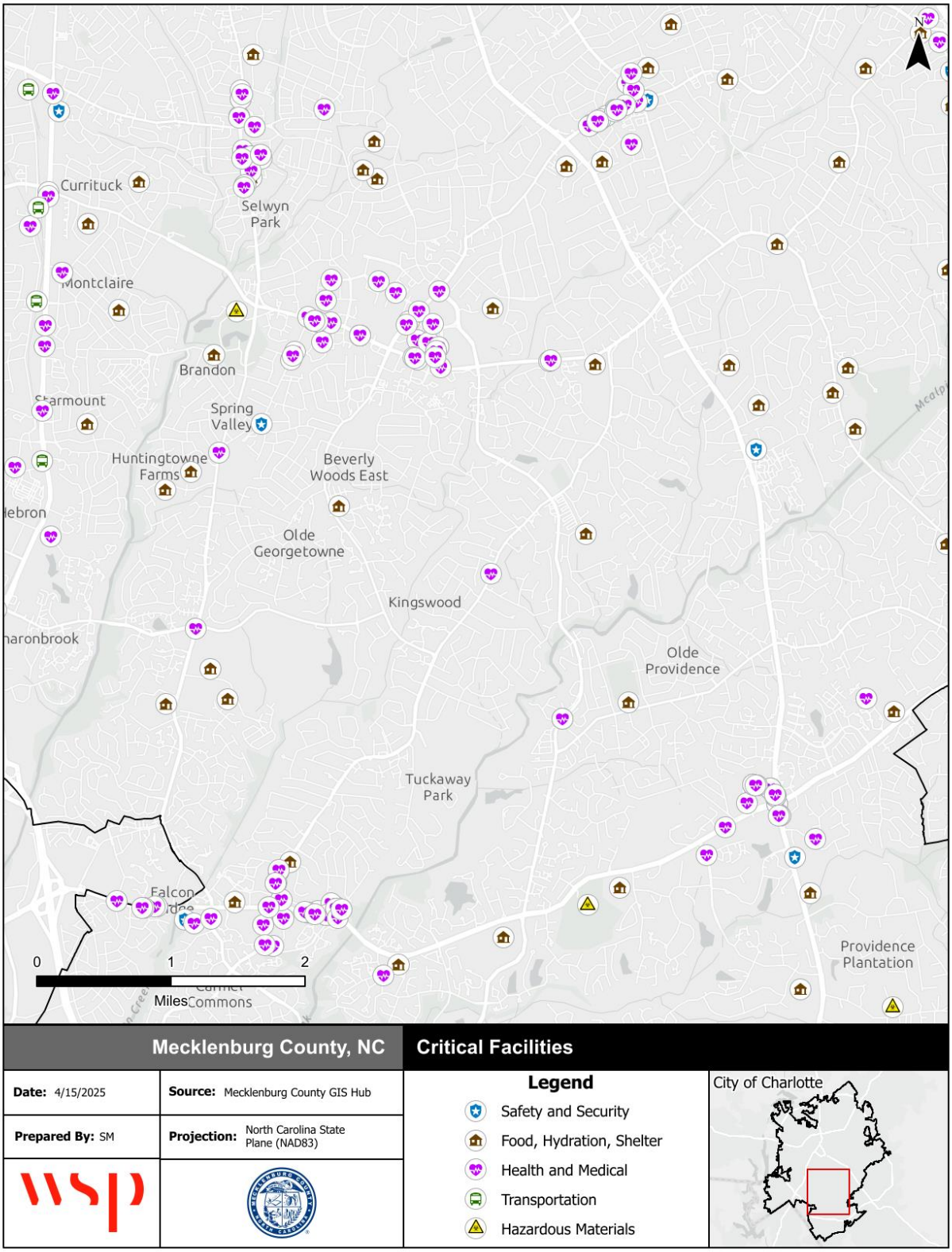
Source: NCEM IRISK Database, HMPC input, GIS Analysis

Figure B.6 – Critical Facilities, City of Charlotte, Inset 5



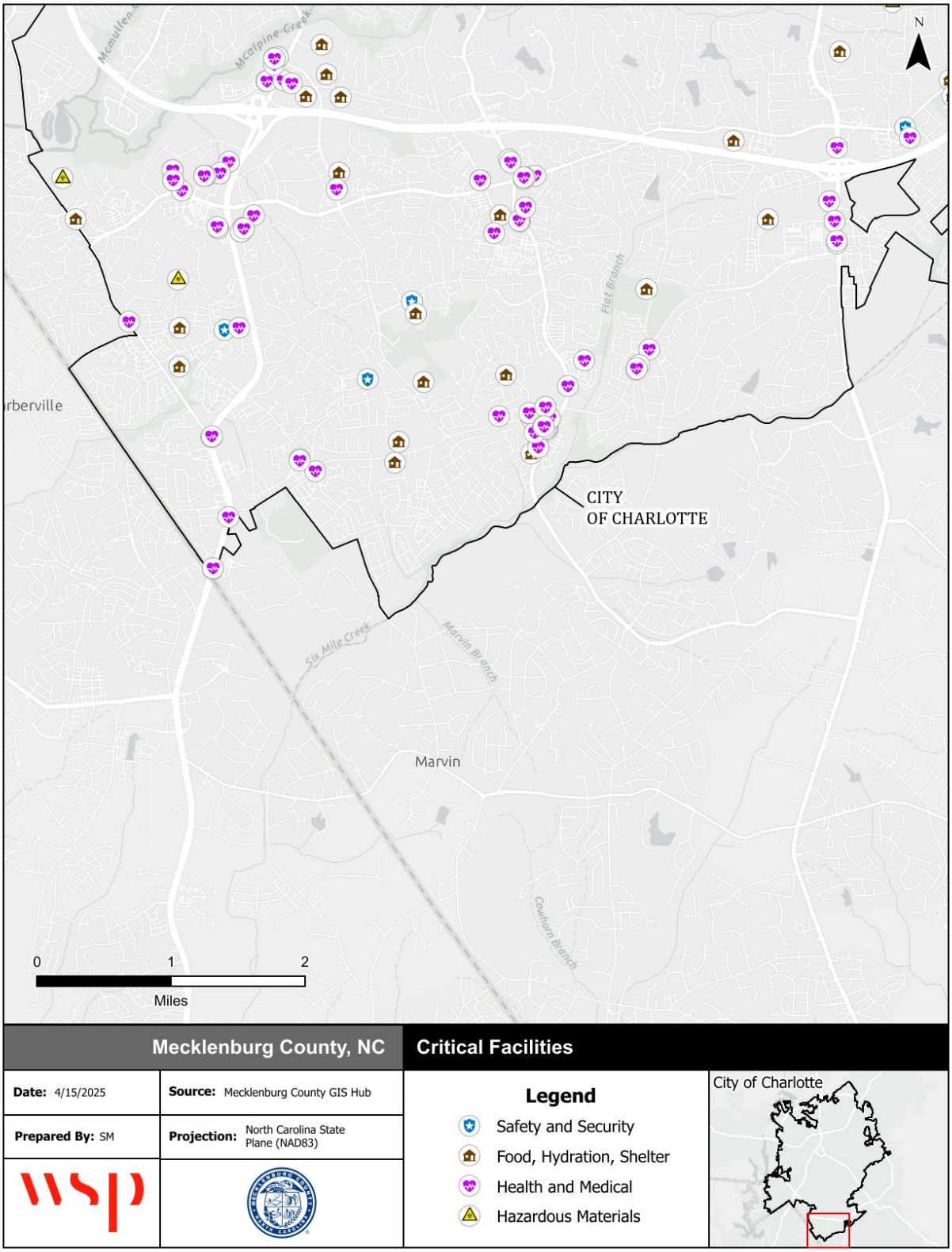
Source: NCEM IRISK Database, HMPC input, GIS Analysis

Figure B.7 – Critical Facilities, City of Charlotte, Inset 6



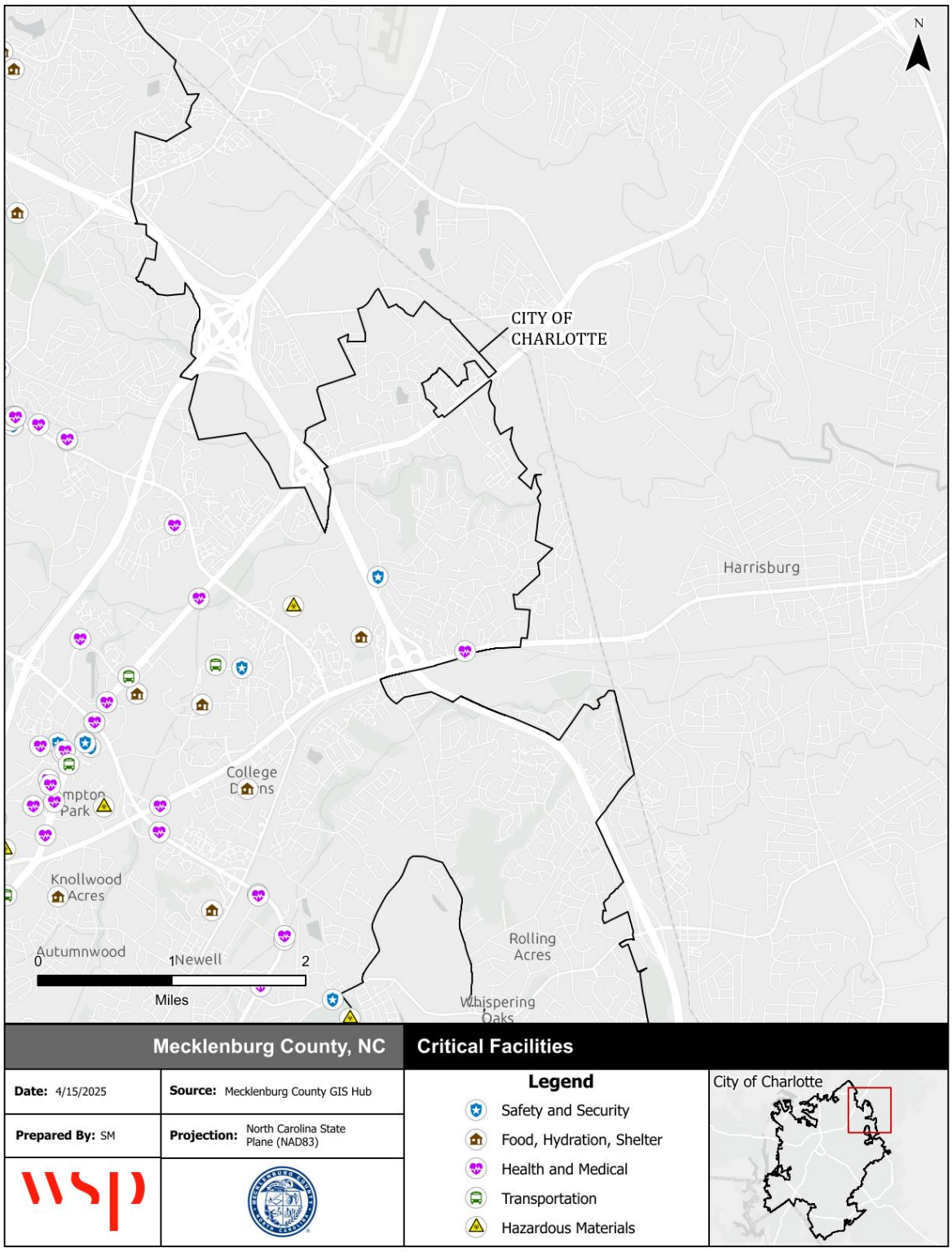
Source: NCEM IRISK Database, HMPC input, GIS Analysis

Figure B.8 – Critical Facilities, City of Charlotte, Inset 7



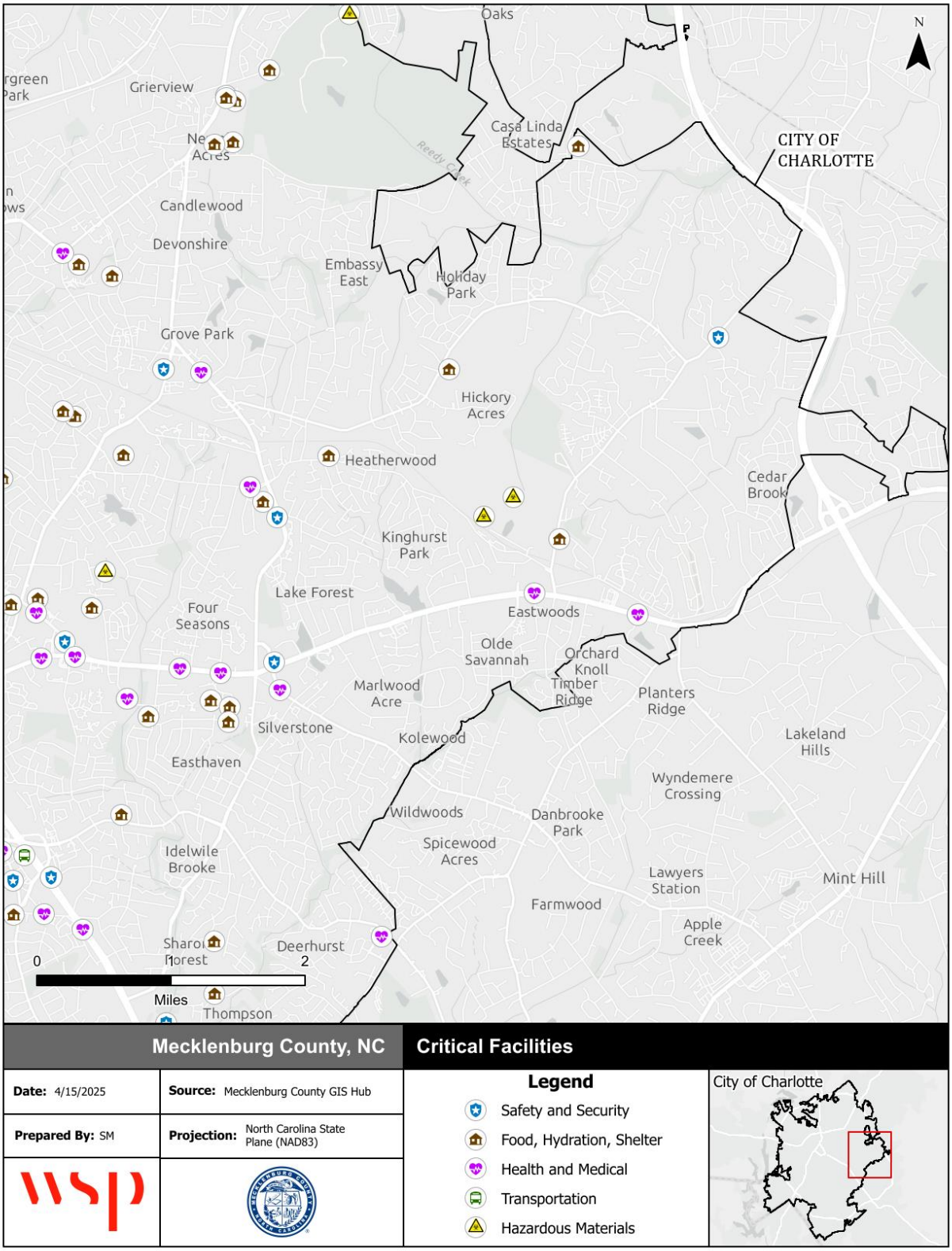
Source: NCEM IRISK Database, HMPC input, GIS Analysis

Figure B.9 – Critical Facilities, City of Charlotte, Inset 8



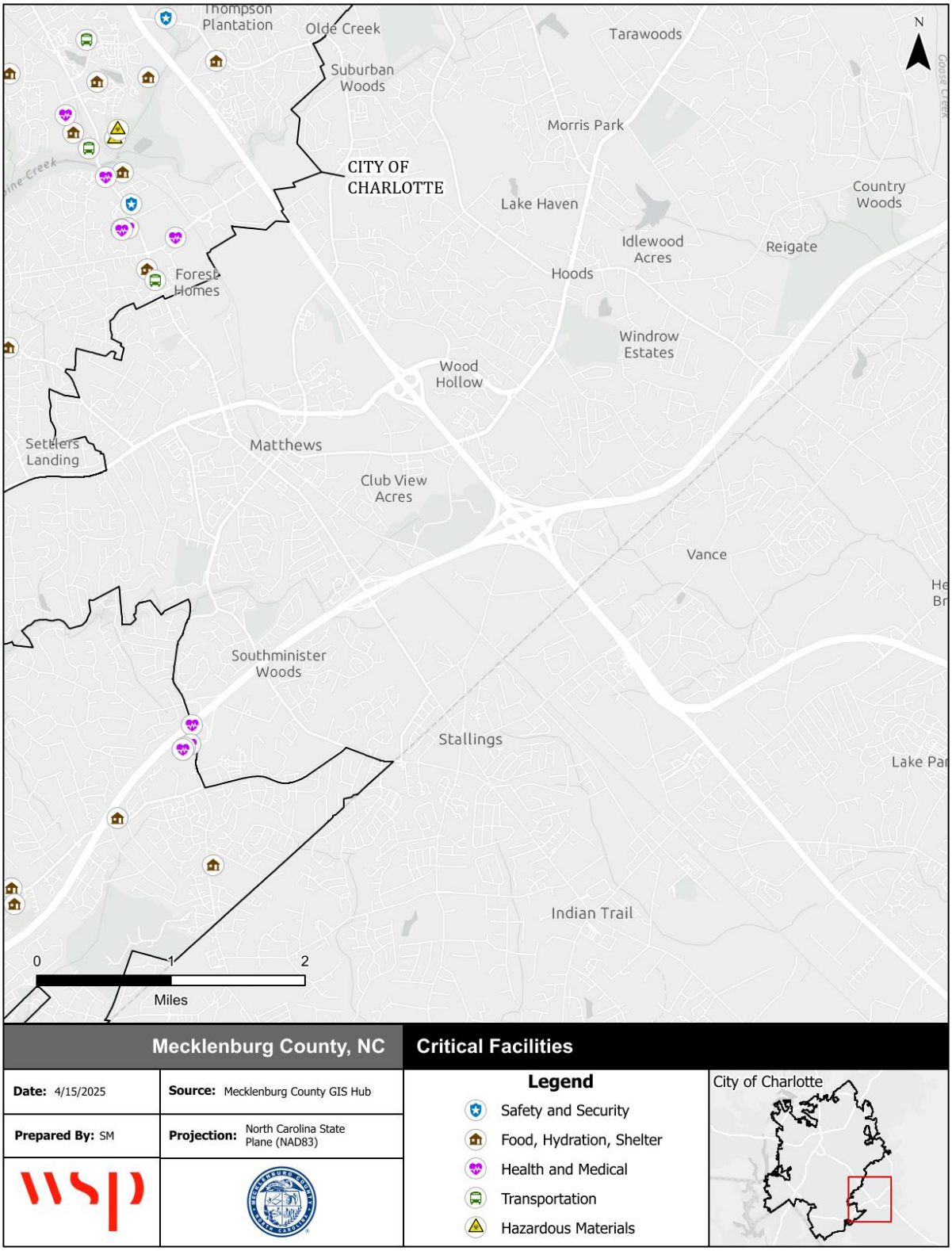
Source: NCEM IRISK Database, HMPC input, GIS Analysis

Figure B.10 – Critical Facilities, City of Charlotte, Inset 9



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Figure B.11 – Critical Facilities, City of Charlotte, Inset 10



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table B.2 – Critical Facilities Inventory, City of Charlotte

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Transportation	Airport	5501 Josh Birmingham Pkwy	$637,000	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Landfill	7120 ROCK ISLAND RD	$484,700	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	4627 LAKEVIEW RD	-	0.1	X Unshaded	Direct Exposure	2
Hazardous Materials	Landfill	5600 DAVID COX RD	$18,852,500	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	14523 CAROWINDS BV	$20,178,500	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	6700 PALMER DR	$430,900	0.1	X Unshaded	Direct Exposure	1
Hazardous Materials	Landfill	5318 SALEM CHURCH ROAD	$1,883,000	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	1520 W TYVOLA RD	$132,800	0.1	X Unshaded	Direct Exposure	1
Hazardous Materials	Landfill	5710 CHESHIRE RD	-	0.1	X Unshaded	Direct Exposure	4
Hazardous Materials	Landfill	11644 PROVIDENCE ROAD WEST	-	0.1	X Unshaded	Critical Fireshed	2
Hazardous Materials	Landfill	4300 DAVID COX RD	$246,000	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	500 W. T. HARRIS BV	$25,562,400	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	13531 HIGHWAY 521 SOUTH	$3,629,500	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	6601 LAKEVIEW RD	$13,706,200	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	1337 SAMUEL ST	-	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Landfill	4124 HUBBARD RD	-	0.1	X Unshaded	Sources of Ember Load to Buildings	2.5
Hazardous Materials	Landfill	2911 N GRAHAM ST	$2,788,400	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	7601 N TRYON ST	$13,058,400	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	7819 HARRISBURG RD	$2,285,420	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Landfill	3200 NORTHERLY RD	$37,300	0.1	X Unshaded	Critical Fireshed	1.5
Hazardous Materials	Landfill	8711 MONROE RD	$285,100	0.1	X Unshaded	Critical Fireshed	1
Hazardous Materials	Landfill	4638 TIMBERLY PL	-	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Landfill	9524 WHITE HEMLOCK RD	$433,000	0.1	X Unshaded	Direct Exposure	1
Hazardous Materials	Landfill	7200 OLD DOWD RD	-	0.1	X Unshaded	Critical Fireshed	1
Hazardous Materials	Landfill	1016 REMOUNT RD	-	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Hazardous Materials	Landfill	1499 ERVIN LN	-	0.1	X Unshaded	Sources of Ember Load to Buildings	1.5
Hazardous Materials	Landfill	901 E Mallard Creek RD	-	0.1	X Unshaded	Critical Fireshed	1
Safety and Security	Fire Station	221 N Myers St	$1,657,500	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Fire Station	1817 South Bv	$789,300	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Fire Station	6512 Monroe Rd	$1,304,300	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	525 N Church St	$993,900	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Fire Station	224 Wesley Heights Wy	$367,400	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	249 S Laurel Av	$768,600	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Fire Station	3210 N Davidson St	$351,700	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Fire Station	1201 The Plaza	$601,500	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Fire Station	4529 McKee Rd	$763,400	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	2810 Wilkinson Bv	$2,290,100	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Fire Station	620 W 28th St	$1,393,300	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	420 Inwood Dr	$1,018,000	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Fire Station	4337 Glenwood Dr	$631,500	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	114 N Sharon Amity Rd	$692,200	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	3617 Frontenac Av	$502,600	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	6623 Park South Dr	$515,300	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	5308 Morris Field Dr	$5,069,400	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	2337 Dr Webber Av	$474,100	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	1016 Sardis Ln	$607,000	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	9400 Nations Ford Rd	$862,200	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Safety and Security	Fire Station	1023 Little Rock Rd	$595,500	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	1917 W Sugar Creek Rd	$368,200	0.1	X Unshaded	Direct Exposure	2
Safety and Security	Fire Station	7400 E W T Harris Bv	$687,700	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	7132 Pineville-Matthews Rd	$1,082,300	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	9231 S Tryon St	$784,100	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	111 Ken Hoffman Dr	$5,135,000	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	8031 Old Statesville Rd	$1,166,000	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	2121 Margaret Wallace Rd	$952,900	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	4707 Belle-Oaks Dr	$181,700	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	3820 Ridge Rd	$1,329,000	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	9225 Bryant Farms Rd	$1,645,000	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	2001 Mt Holly-Huntersville Rd	$1,171,400	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	2824 Rocky River Rd	$1,290,100	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	1120 Pavilion Bv	$1,151,300	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	2325 W Mallard Creek Church Rd	$1,531,900	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	13828 S Tryon St	$1,488,500	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	8325 Providence Rd	$1,718,000	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	9720 Harrisburg Rd	$1,758,700	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	5740 West Bv	$3,944,400	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	5620 Central Av	$1,814,500	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	421 Clanton Rd	$1,998,800	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Police Station	2227 WESTINGHOUSE BV	$1,767,900	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	715 WENDOVER RD	$2,099,600	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	1770 SHOPTON RD	$23,344,700	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	1118 BEATTIES FORD RD	$1,407,400	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	2550 WEST BV	$3,517,900	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Safety and Security	Police Station	7025 ALBEMARLE RD	$2,245,700	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	700 W 5TH ST	$15,818,700	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	8452 N TRYON ST	$5,135,000	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	11217 PROVIDENCE RD WEST	-	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	6711 CITY VIEW DR	$3,921,500	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	3122 MT HOLLY-HUNTERSVILLE RD	$352,500	0.1	X Unshaded	Direct Exposure	1
Safety and Security	Fire Station	9937 PROVIDENCE RD	$10,558,700	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Solid Waste Facility	8007 Pence Road	$2,285,420	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Solid Waste Facility	5631 West Blvd	$122,700	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Solid Waste Facility	5300 Closeburn Rd.	$1,213,400	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Solid Waste Facility	11th St.	$13,694,300	0.1	X Unshaded	Little to No Exposure	0
Hazardous Materials	Solid Waste Facility	8711 Monroe Rd.	$285,100	0.1	X Unshaded	Critical Fireshed	2
Hazardous Materials	Solid Waste Facility	5800 Rozzelles Ferrry Rd.	$2,781,900	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Solid Waste Facility	2900 Rocky River Rd.	$595,600	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Solid Waste Facility	4635 Pineville Matthews Rd	-	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Solid Waste Facility	4635 Tyvola Rd	$117,200	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Solid Waste Facility	140 Valleydale Rd	$3,090,600	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Solid Waste Facility	8440 Byrum Dr	$122,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3509 David cox rd	$1,966,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6220 Thermal Road	$9,176,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2901 Archdale Drive	$335,400	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	3748 N. Beatties Ford Road	$656,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	13925 Erwin RD	$3,052,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5901 Statesville Road	$227,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7000 Endhaven Lane	$5,441,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	301 S. Davidson St.	$10,872,200	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	5801 Pineville-Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7702 Pineville-Matthews Road	$47,852,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7301 Sardis Road	$32,692,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1440 Carmel Rd.	$64,129,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5500 North Tryon St.	$2,020,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5007 Providence Road	$14,623,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9502 Providence Rd	$26,405,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2723 N. Graham Street	$236,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1337 Samuel Street	$1,032,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	212 Boyce Road	$6,748,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4601 Emory Lane	$1,298,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	943 W Sugar Creek Road	$1,224,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9111 Monroe Rd	$11,818,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7022 Sardis Road	$583,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4012 Central Avenue	$2,814,200	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	4000 Wiestling Street	$73,000	0.1	X Unshaded	Direct Exposure	1
Food, Hydration, Shelter	School	2017 Bentley Place	$99,600	0.1	X Unshaded	Direct Exposure	1
Food, Hydration, Shelter	School	1000 E. Morehead St.	$16,736,900	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	2600 Elmin Street	$2,031,700	0.1	X Unshaded	Direct Exposure	1
Food, Hydration, Shelter	School	8500 Sardis Road	$7,475,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3400 Beatties Ford Road	$26,024,200	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	3540 Toringdon Way	$48,972,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3200 McKee Road	$1,065,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	13110 Moss Rd	$9,751,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7200 E. WT Harris Blvd	$39,763,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3100 Park Road	$8,576,200	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	6203 Carmel Road	$533,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4301 Shamrock Drive	$3,646,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1814 Euclid Ave	$224,600	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	6250 Blakeney Park Drive	$1,800,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9310 Blakeney Center Drive	$1,426,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2312 Orton Street	$136,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2801 East Independence Boulevard	$919,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2724 Margaret Wallace Road	$3,261,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9908 Monroe Road	$458,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1337 Samuel Street	$1,032,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	333 Jeremiah Blvd	$13,491,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9536 Blakeney Heath Road	$1,981,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4225 Shamrock Drive	$8,777,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2223 Eastway Dr.	$1,501,800	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	3115 Providence Road	$5,636,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	10624 Metromont PY	$478,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4755 Prosperity Church Road	$1,926,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5800 Sardis Road	$22,741,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7300 South Tryon Street	$772,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6800 Saint Peters Lane	$7,905,600	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	2830 Dorchester Place	$2,038,500	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	14115 Lancaster Highway	$1,400,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3028 Providence Road	$13,109,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	600 Hillside Avenue	$9,601,800	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	11525 Elm Lane	$11,223,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5146 Parkway Plaza Blvd.	$5,149,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1125 Buchanan Street	$9,210,700	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	11625 Providence Road West	$1,177,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6824 Democracy Drive	$3,776,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	750 East 9th Street	$14,407,900	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	8617 Providence Road	$780,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7516 East Independence Blvd	$815,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1501 Carrier Drive	$2,533,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6100 Monroe Road	$1,301,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3909 Weddington Rd	$17,762,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4101 N Tryon Street	$13,717,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	8601 McAlpine Park Dr	$5,589,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5225 Seventy-Seven Center Dr	$6,560,100	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	931 Wilann Dr	$2,604,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	8000 Robinson Church Road	$3,186,700	0.1	X Unshaded	Direct Exposure	1.5
Food, Hydration, Shelter	School	4041 Johnston Oehler Road	$16,087,800	0.1	X Unshaded	Direct Exposure	1.5
Food, Hydration, Shelter	School	1406 Suther Road	$3,290,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9232 Bob Beatty Rd.	$288,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2701-F Freedom Dr	$863,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9108 Mallard Creek Rd.	$2,375,000	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	5112 Central Ave	$100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2045 Suttle Avenue	$9,661,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2600 Grimes Street	$2,628,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2701-B Freedom Dr	$863,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9142 Browne Rd	$12,877,200	0.1	X Unshaded	Sources of Ember Load to Buildings	2
Food, Hydration, Shelter	School	14613 Steele Creek Rd.	$13,034,900	0.1	X Unshaded	Direct Exposure	1.5
Food, Hydration, Shelter	School	2200 Shopton Road	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1209 Little Rock Rd	$18,371,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7429 Tuckaseegee Rd.	$3,175,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4150 McKee Rd	$12,090,900	0.1	X Unshaded	Direct Exposure	1.5
Food, Hydration, Shelter	School	8015 Bellhaven Boulevard	$1,091,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5249 Central Avenue	$16,108,600	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2015 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1951 Old Steele Creek Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3541 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1319 The Plz	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	10955 Winds Crossing Dr	$426,800	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2215 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	5306 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	6025 Blakeney Park Dr	$424,900	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4108 Park Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	501 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1010 Edgehill Rd N	-	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	15640 Don Lochman Ln	$2,586,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3030 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7108 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5800 OLD PINEVILLE RD	$2,572,800	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1801 Rozzelles Ferry Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9848 N Tryon St	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	7903 Providence Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	7100 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1525 W W T Harris Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1208 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1718 E 4th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	400 Clarice Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7920 Moores Chapel Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14135 Ballantyne Corporate Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8401 University Exec Park Dr	$7,122,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4539 Hedgemore Dr	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8401 Medical Plaza Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10210 Prosperity Park Dr	$419,900	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16139 Lancaster Hwy	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	1339 Baxter St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3104 Weddington Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	11530 PROVIDENCE RD	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	15830 Ballantyne Medical Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2801 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	2630 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	9908 Couloak Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	101 E W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	6407 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	12610 N Community House Rd	$6,123,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2115 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	431 N Wendover Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1308 THE PLAZA	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	9335 Blakeney Centre Dr	$10,219,300	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1300 Baxter St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	485 N Wendover Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9216 Ardrey Kell Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	401 S Tryon St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	226 Baldwin Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7615 Colony Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	15640 Don Lochman Ln	$2,586,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2435 Plantation Center Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5330 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	14835 Ballantyne Village Way	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	429 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	300 Billingsley Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1001 Blythe Blvd	$719,542,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2540 W Arrowood Rd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	309 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1016 S Church St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3315 Springbank Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9332 S Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3230 Prosperity Church Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6060 Piedmont Row Dr S	$14,760,300	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5933 Blakeney Park Dr	$3,478,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4012 Park Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	11301 Carmel Commons Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	330 Billingsley Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6525 Morrison Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	12311 Copper Way	$60,342,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	12610 N Community House Rd	$6,123,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2424 W Mallard Creek Church Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4525 Cameron Valley Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	725 Providence Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1401 Beatties Ford Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8310 Medical Plaza Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8811 Blakeney Professional Dr	$613,000	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2540 W Arrowood Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2711 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2015 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	4705 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	504 Eastway Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8420 University Exec Park Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	15830 Ballantyne Medical Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10320 Mallard Creek Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	114 S Tryon St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2305 E W T Harris Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1710 Kenilworth Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1520 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2809 Coltsgate Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1614 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	4525 Cameron Valley Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4938 Central Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1025 Morehead Medical Dr	$56,051,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1900 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1025 Morehead Medical Dr	$56,051,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	11010 David Taylor Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	228 East Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	101 E W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	2711 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8728 Arbor Creek Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7868 Rea Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2860 Freedom Dr	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	1900 Scott Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	4500 S Tryon St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	9101 Monroe Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3030 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6235 Blakeney Park Dr	$1,020,700	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11301 Golf Links Dr N	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1000 Blythe Blvd	$719,542,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3535 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2435 Plantation Center Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8524 University City Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	2711 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	14214 Ballantyne Lake Rd	$82,760,100	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	301 E Tremont Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1718 E 4th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	12312 Copper Way	$60,342,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3025 Springbank Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1025 Morehead Medical Dr	$56,051,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3025 Springbank Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1915 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	15825 Ballantyne Medical Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11318 N Community House Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1523 Elizabeth Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	9510 Riverbend Village Dr	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	8035 Providence Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16817 Marvin Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	15033 Ballancroft Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	9848 Rea Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6324 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8335 Ibm Dr	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	100 N Tryon St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8310 Medical Plaza Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1315 East Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2001 Vail Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7006 Shannon Willow Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3025 Springbank Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4425 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9908 Couloak Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3604 Hampton Manor Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7903 Providence Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	14135 Ballantyne Corporate Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2820 Selwyn Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3627 Beatties Ford Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5700 University Pointe Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	326 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	8401 Medical Plaza Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7940 Williams Pond Ln	-	0.1	X Unshaded	Direct Exposure	2
Health and Medical	Medical Facilities	4523 Park Rd	$222,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1000 Queens Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2040 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	5940 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1001 Blythe Blvd	$719,542,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	6965 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	401 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2225 Freedom Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8316 Medical Plaza Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	251 Eastway Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2225 E W T Harris Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8634 Camfield St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	15720 Brixham Hill Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1025 Morehead Medical Dr	$56,051,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	13113 S Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6701 Carmel Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	7810 Providence Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4300 Park Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7810 Ballantyne Commons Pkwy	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	301 Hawthorne Ln	-	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	7005 Wallace Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	12610 N Community House Rd	$6,123,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3125 Springbank Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	517 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8420 Park Rd	-	0.1	X Unshaded	Critical Fireshed	2
Health and Medical	Medical Facilities	1718 E 4th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	6115 Park South Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5107 Monroe Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7800 Providence Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6401 Morrison Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3006 Baucom Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4501 Cameron Valley Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	300 Billingsley Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2001 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	13527 Steelecroft Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1025 Morehead Medical Dr	$56,051,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8912 Blakeney Professional Dr	$691,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2711 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8811 Blakeney Professional Dr	$613,000	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4601 Park Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	537 W Sugar Creek Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16928 Lancaster Hwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1601 Abbey Pl	-	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	2720 E W T Harris Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1515 Mockingbird Ln	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8035 Providence Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2407 Plantation Center Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14135 Ballantyne Corporate Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14214 Ballantyne Lake Rd	$82,760,100	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	200 S College St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	800 W Hill St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3101 Latrobe Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	501 E Morehead St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	9401 Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	101 E W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	12105 Copper Way	$6,123,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5818 Prosperity Church Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	401 East Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2709 Water Ridge Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2600 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1433 Emerywood Dr	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1719 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8420 Medical Plaza Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	459 N Wendover Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7804 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2630 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	2001 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	12611 N Community House Rd	$6,123,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4400 Sharon Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	17232 Lancaster Hwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7725 Ballantyne Commons Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10230 Berkeley Place Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3230 Prosperity Church Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1000 Blythe Blvd	$719,542,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3430 Toringdon Way	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2325 W Arbors Dr	$505,900	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	624 Tyvola Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2540 W Arrowood Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	15105 John J Delaney Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8045 Providence Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3135 Springbank Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6300 E Independence Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	12311 Copper Way	$6,123,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10616 Metromont Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9330 Center Lake Dr	$10,542,000	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	12830 Walker Branch Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	6801 Northlake Mall Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8810 Blakeney Professional Dr	$424,900	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2600 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	101 E W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	5301 Wilkinson Blvd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	4444 The Plz	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11530 Providence Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	7808 S Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8840 Blakeney Professional Dr	$444,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6207 Park South Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2501 Beatties Ford Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8401 Medical Plaza Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	200 Hawthorne Ln	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	8800 N Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5801 Executive Center Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4525 Cameron Valley Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	353 Clement Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8019 Ardrey Kell Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1001 E W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	9200 Harris Corners Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6404 Albemarle Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2510 Vista Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	12611 N Community House Rd	$6,123,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	108 Providence Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7110 Lawyers Rd	-	0.1	X Unshaded	Direct Exposure	2
Health and Medical	Medical Facilities	8506 S Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	721 W Sugar Creek Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	325 Hawthorne Ln	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	9929 Albemarle Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3125 Springbank Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	101 E W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	6005 Hickory Grove Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2620 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	200 Hawthorne Ln	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	9325 Center Lake Dr	$10,542,000	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	319 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2001 Vail Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	135 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3541 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8821 University East Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16131 Lancaster Hwy	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	14142 Rivergate Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8316 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1500 Orchard Lake Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6817 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5717 Albemarle Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14215 Ballantyne Corporate Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	13557 Steelecroft Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1001 Blythe Blvd	$719,542,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	125 Baldwin Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2401 Tuckaseegee Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	300 Billingsley Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5821 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11301 Golf Links Dr N	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	110 N Torrence St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	11220 Elm Ln	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	1600 E Woodlawn Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1915 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	10810 Mallard Creek Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	13731 Steele Creek Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3135 Springbank Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4525 Cameron Valley Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6853 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	325 Hawthorne Ln	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8220 University Exec Park Dr	$6,381,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1726 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	14215 Ballantyne Corporate Pl	$9,595,700	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7825 Ballantyne Commons Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1300 Baxter St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1900 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	5950 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1900 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	423 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4600 Park Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	15235 John J Delaney Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2015 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2300 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	3900 Colony Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2121 E Arbors Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9217 Baybrook Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11220 Elm Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14135 Ballantyne Corporate Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	523 Fenton Pl	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7510 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	100 N Tryon St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	5815 Blakeney Park Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	309 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1718 E 4th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1901 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3535 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10844 Providence Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8332 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8505 Davis Lake Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7221 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5801 Executive Center Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7922 Rea Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2300 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	15825 Ballantyne Medical Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2630 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2315 W Arbors Dr	$505,900	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2915 Coltsgate Rd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	8401 Medical Plaza Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9101 Albemarle Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	12105 Copper Way	$6,123,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1833 Nantuckett Ln	$81,439,000	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	13557 Steelecroft Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1339 Baxter St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1902 East Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	11220 Elm Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3735 Glenlake Dr	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	2801 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4456 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	231 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11030 Golf Links Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	534 Spratt St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5627 Monroe Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3111 Springbank Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5727 Prosperity Church Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11535 Carmel Commons Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4501 Cameron Valley Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1524 E Morehead St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2200 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2424 W Mallard Creek Church Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1718 E 4th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	11030 Golf Links Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6010 Carnegie Blvd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	6035 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8415 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	824 Eastway Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7615 Colony Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1820 East Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8401 Medical Plaza Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8029 Corporate Center Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8440 Rea Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11220 Elm Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8401 Medical Plaza Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	101 E W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	416 McCullough Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14215 Ballantyne Corporate Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2550 W Arrowood Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8821 Blakeney Professional Dr	$613,000	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	497 N Wendover Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1928 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	5727 Prosperity Crossing Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	719 East Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1823 E Arbors Dr	$901,100	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6406 Carmel Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16607 Riverstone Way	$468,000	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7108 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10926 S Tryon St	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	230 Baldwin Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7245 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3716 W W T Harris Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3541 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7918 Rea Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6429 Bannington Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2550 W Arrowood Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5933 Blakeney Park Dr	$3,478,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8430 Rea Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	300 Billingsley Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	15720 Brixham Hill Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	9848 N Tryon St	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	1341 E Morehead St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	402 E Sugar Creek Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2122 N Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11220 Elm Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2007 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8840 Blakeney Professional Dr	$444,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1350 S Kings Dr	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2001 Vail Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8179 Ardrey Kell Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7825 Ballantyne Commons Pkwy	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	2826 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8210 University Exec Park Dr	$6,381,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7108 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8814 Rachel Freeman Way	$1,616,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6831 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8220 University Exec Park Dr	$6,381,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4108 Park Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3623 Latrobe Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11530 Providence Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	325 Arlington Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	15110 John J Delaney Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5534 Albemarle Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2709 Water Ridge Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3600 Arco Corporate Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7810 Providence Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2711 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1724 East Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	4525 Cameron Valley Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4805 Park Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2607 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1518 E 3rd St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2400 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	15830 Ballantyne Medical Pl	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	10218 Jacobs Creek Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1700 Abbey Pl	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	526 Oakland Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	11010 S Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6324 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	439 N Wendover Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9010 Glenwater Dr	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	201 S College St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	200 Queens Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	15825 Ballantyne Medical Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2630 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2610 W Arrowood Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14035 Grandiflora Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	101 E W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	3120 Wilkinson Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7810 Ballantyne Commons Pkwy	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	120 N Cedar St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14154 Steele Creek Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	447 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4525 Cameron Valley Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	416 McCullough Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1718 E 4th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	9320 Center Lake Dr	$10,542,000	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8700 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	6401 Carmel Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2201 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	309 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2135 Ayrsley Town Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1433 Emerywood Dr	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7945 N Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2607 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3053 Freedom Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	400 E Stonewall St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	6253 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7034 Blakeney Greens Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7421 Carmel Executive Park Dr	$3,889,100	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2041 South Blvd	$8,204,700	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8133 Ardrey Kell Rd	-	0.1	X Unshaded	Direct Exposure	2
Health and Medical	Medical Facilities	6311 Carmel Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	8816 University East Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1001 E W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	1421 Orchard Lake Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	212 S Tryon St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2550 W Arrowood Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	15015 LANCASTER HY	$5,383,600	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11040 S Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	300 Billingsley Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3429 Toringdon WY	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	4832 Park Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	10801 Johnston Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9301 Forsyth Park Dr	$1,656,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3850 E Independence Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	421 N Wendover Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8930 Blakeney Professional Dr	$691,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7510 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1805 Milton Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3121 Springbank Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1960 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	10922 S Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4310 Sharon Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9739 Northlake Centre Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	320 Lillington Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2427 Plantation Center Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	200 S Tryon St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	6324 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8045 Providence Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1409 Pierson Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8210 University Exec Park Dr	$6,381,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3623 Latrobe Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4421 Sharon Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	411 N Wendover Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	130 Providence Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3230 Prosperity Church Rd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	8170 S Tryon St	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	330 Billingsley Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1001 Blythe Blvd	$719,542,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	485 N Wendover Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10320 Mallard Creek Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3419 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2200 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	5344 Central Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7005 Shannon Willow Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7940 Williams Pond Ln	-	0.1	X Unshaded	Direct Exposure	2
Health and Medical	Medical Facilities	3626 Latrobe Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8510 McAlpine Park Dr	$13,665,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1023 Edgehill Rd S	$191,000	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	449 N Wendover Rd	-	0.1	X Unshaded	Direct Exposure	1
Health and Medical	Medical Facilities	309 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7631 Sharon Lakes Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	5727 Prosperity Crossing Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	13557 Steelecroft Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	15830 Ballantyne Medical Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16618 Riverstone Way	$250,300	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3250 FREEDOM DR	$904,000	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2607 W Arrowood Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2615 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	101 E W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	8429 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	1518 E 3rd St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2938 The Plz	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7704 England St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1230 Chandler Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2711 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2315 W Arbors Dr	$505,900	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11030 S Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4243 PARK RD	$167,900	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3030 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8001 Raintree Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	12610 N Community House Rd	$6,123,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2908 Oak Lake Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	4014 Connection Point Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	200 S College St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	4115 The Plaza	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	301 Hawthorne Ln	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1700 Abbey Pl	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	13532 Steelecroft Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8943 S Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6135 Park South Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	101 E W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	6324 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	537 W Sugar Creek Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5410 N Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	12105 Copper Way	$6,123,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	210 E Trade St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7812 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2017 Central Ave	$15,014,600	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	9336 Blakeney Centre Dr	$1,426,800	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7810 Providence Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	900 East Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	5950 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	601 S Kings Dr	-	0.5	AE	Little to No Exposure	0
Health and Medical	Medical Facilities	1718 E 4th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1300 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1350 S Kings Dr	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	332 Lillington Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	8936 Blakeney Professional Dr	$691,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4221 Tuckaseegee Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	2001 Vail Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2300 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	6823 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	4016 Triangle Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	201 W Arrowood Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	4625 PIEDMONT ROW DR	$14,267,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2325 W Arbors Dr	$505,900	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3220 Prosperity Church Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	325 Hawthorne Ln	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	225 Baldwin Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1523 Elizabeth Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2620 E 7th St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	10935 Winds Crossing Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	12611 N Community House Rd	$6,123,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8204 Ikea Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	15830 Ballantyne Medical Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10818 MALLARD CREEK RD	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1025 MOREHEAD MEDICAL DR	$56,051,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	5815 Blakeney Park Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4310 Park Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	12611 N Community House Rd	$6,123,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1600 E Woodlawn Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	200 Hawthorne Ln	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	7800 Providence Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9422 S Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	447 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	2435 Plantation Center Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7030 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14214 Ballantyne Lake Rd	$82,760,100	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1025 Morehead Medical Dr	$56,051,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	101 E W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	5035 W W T Harris Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	200 Greenwich Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2001 Vail Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	11230 Carmel Commons Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2104 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	5716 Wyalong Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2315 W Arbors Dr	$505,900	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4525 CAMERON VALLEY PY	$5,438,300	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	717 S Torrence St	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	3535 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6700 Albemarle Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6917 Shannon Willow Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1811 Sardis Rd N	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1111 Metropolitan Ave	$232,585	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	13640 Steelecroft Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	224 Westinghouse Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14825 Ballantyne Village Way	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	330 Billingsley Rd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	1704 Harris Houston Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1900 Brunswick Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	6836 Morrison Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7221 Pineville-Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3541 Randolph Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2709 Water Ridge Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14215 Ballantyne Corporate Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	515 Clanton Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1918 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	15110 John J Delaney Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9040 Nations Ford Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	7004 Smith Corners Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1915 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	309 S Sharon Amity Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7735 N Tryon St	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	1824 E Arbors Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8840 Blakeney Professional Dr	$444,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8832 Blakeney Professional Dr	$444,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2613 Winding Oak Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6303 Carmel Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1901 Brunswick Ave	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1152 S Kings Dr	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1422 Orchard Lake Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3303 Latrobe Dr	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	3211 Eastway Dr	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2711 Randolph Rd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2040 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	2222 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	6010 E W T Harris Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7820 Ballantyne Commons Pkwy	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	8169 Ardrey Kell Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10310 Mallard Creek Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5970 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8040 Providence Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	17228 Lancaster Hwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14135 Steele Creek Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	2620 Tuckaseegee Rd	$210,900	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6023 Beatties Ford Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2400 South Blvd	-	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	1021 Morehead Medical Dr	$56,051,100	0.1	X Unshaded	Little to No Exposure	0
Health and Medical	Medical Facilities	10616 Metromont Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1905 J N Pease Pl	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9350 Benfield Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	13425 Hoover Creek Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	5527 Monroe Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5950 Fairview Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6406 Carmel Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	5700 University Pointe Blvd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	Colleges	2151 Hawkins St Suite 800	$107,098,900	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	Colleges	200 N College St	$7,224,200	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	Colleges	160 Beatties Ford Rd	$34,712,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	1900 Selwyn Ave	$88,631,400	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	Colleges	3210 CPCC West Campus Dr	$22,744,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	320 E 9th St	$36,279,800	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	Colleges	4701 Park Rd	$95,669,100	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	Colleges	2110 Water Ridge Pkwy	$21,252,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	725 W 4th St	$43,812,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	9201 University City Blvd	$144,634,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	322 Lamar Ave	$515,600	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	Colleges	9101 Kings Parade Blvd	$6,086,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	11430 N Community House Rd	$13,478,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	4800 Airport Center Pkwy	$5,592,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	8120 Grier Rd	$32,115,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	7224 Park Rd	$49,163,400	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	Colleges	315 W Hebron St	$41,036,700	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	Colleges	1201 Elizabeth Ave	$190,842,200	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	Colleges	1609 Alleghany Rd	$1,211,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6900 Democracy Drive	$21,556,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7800 Riding Trail Road	$21,556,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1800 Runnymede Lane	$23,971,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1430 Allenbrook Drive	$5,966,200	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	10220 Ardrey Kell Road	$48,278,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2401 Belfast Drive	$11,307,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2401 Belfast Drive	$11,307,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	15425 Scholastic Drive	$11,992,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1546 Walton Road	$10,418,200	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	5910 Dixie River Road	$9,882,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6001 Quail Hollow Road	$8,658,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	124 Skyland Avenue	$10,141,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1001 Wilann Drive	$19,733,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5001 Camilla Drive	$13,487,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	701 Briar Creek Road	$6,105,900	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	9000 Robert D. Snyder Road	$2,015,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	8120 Grier Road	$32,115,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1430 Alleghany Street	$44,791,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	501 South Bruns Avenue	$6,590,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6200 Starhaven Drive	$18,750,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5621 Flagstaff Drive	$33,596,400	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	5621 Flagstaff Drive	$33,596,400	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	9500 Community House Road	$29,733,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	300 Greenwich Road	$9,531,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	500 Kentberry Drive	$4,264,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4911 Hucks Road	$9,034,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4215 David Cox Road	$7,800,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6500 Barrington Drive	$18,750,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2801 Lucena Street	$11,866,500	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	2801 Lucena Street	$11,866,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7050 Nations Ford Road	$14,568,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6800 Monroe Road	$36,623,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	500 Cherokee Road	$4,329,100	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	1501 Norland Road	$14,564,800	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	1601 Park Drive	$11,823,300	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	6815 Endhaven Lane	$14,624,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1100 Eastway Drive	$27,893,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	715 North Caldwell Street	$18,761,600	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	8301 Monroe Road	$11,639,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2001 Alleghany Street	$28,112,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9201 Bryant Farms Road	$13,485,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1411 Hawthorne Lane	$10,728,100	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	6709 Pence Road	$9,387,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5100 Snow White Lane	$8,944,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7242 Highland Creek Parkway	$30,502,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3201 Clemson Avenue	$6,445,900	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	125 W. Craighead Road	$10,417,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6700 Beatties Ford Road	$7,803,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2520 Huntingtowne Farms Lane	$7,176,900	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	7101 Idlewild Road	$3,187,200	0.1	X Unshaded	Critical Fireshed	0
Food, Hydration, Shelter	School	329 N. Irwin Avenue	$14,049,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7400 Harrisburg Road	$13,651,000	0.1	X Unshaded	Critical Fireshed	0
Food, Hydration, Shelter	School	8330 Grier Road	$9,074,800	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	7020 Tuckaseegee Road	$14,535,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6301 University Pointe Boulevard	$86,967,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5925 Ballantyne Commons Parkway	$23,842,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7810 Neal Road	$86,967,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2400 Carmine Street	$11,289,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2400 Carmine Street	$11,289,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4000 Gallant Lane	$708,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	13620 Erwin Road	$7,066,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4835 Shamrock Drive	$20,863,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3825 Johnston Oehler Road	$41,350,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9801 Mallard Creek Road	$6,205,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1411 Hawthorne Lane	$10,728,100	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	3351 Griffith Street	$20,300,800	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	3351 Griffith Street	$20,300,800	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	500 Bilmark Avenue	$19,135,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9100 Carswell Lane	$9,119,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1925 Rama Road	$21,233,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4101 McKee Road	$8,104,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3508 Draper Avenue	$9,805,400	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	5801 Farmbrook Drive	$13,545,100	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	7905 Pleasant Grove Road	$19,397,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7905 Pleasant Grove Road	$19,397,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2400 Colony Road	$46,289,500	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	2132 Radcliffe Avenue	$8,117,800	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	7910 Neal Road	$86,967,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	8300 Nations Ford Road	$27,997,200	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	325 W Rocky River Road	$12,066,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	315 W Hebron Street	$41,036,700	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	7601 The Plaza	$47,050,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1415 Beatties Ford Road	$13,820,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1825 Oakdale Road	$6,628,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4511 Monroe Road	$9,591,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1810 Oaklawn Avenue	$5,905,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1810 Oaklawn Avenue	$5,905,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3800 Rea Road	$9,158,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4301 Sandy Porter Road	$43,217,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1300 Cathey Road	$4,172,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1241 East 10th Street	$11,518,900	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	805 Seneca Place	$14,496,200	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	8801 Eaglewind Drive	$7,489,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	11830 Tom Short Road	$8,206,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1800 Pineville-Matthews Road	$26,584,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	10045 Providence Church Lane	$15,588,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2901 Smithfield Church Road	$16,023,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1035 Rama Road	$6,062,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4400 Water Oak Road	$13,391,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	5850 Statesville Road	$15,876,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	10801 Plaza Road Extension	$7,071,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4108 West Tyvola Road	$13,812,000	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	3241 New Renaissance Way	$17,044,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7260 Highland Creek Parkway	$30,502,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	15340 Smith Road	$10,109,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1015 Mt. Holly-Huntersville Road	$11,195,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1415 Beatties Ford Road	$13,820,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2945 Johnston-Oehler Road	$2,940,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2700 Dorchester Place	$8,945,800	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	2840 Colony Road	$23,971,900	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	3301 Country Club Drive	$21,160,600	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	4330 Foxcroft Road	$8,772,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3200 Smithfield Church Road	$11,582,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	8040 Strawberry Lane	$16,071,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	8900 Park Road	$33,394,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	13624 Steele Creek Road	$14,982,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1600 Brookdale Avenue	$5,927,400	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	5521 Milhaven Lane	$12,548,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4100 Gallant Lane	$43,217,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9601 China Grove Church Road	$23,808,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	538 Bradford Drive	$5,038,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	538 Bradford Drive	$5,038,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1900 New Castle Street	$13,806,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2028 Little Rock Road	$14,535,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1600 Pavilion Boulevard	$10,433,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2400 Hildebrand Street	$5,547,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	800 Everett Place	$2,273,500	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	1415 Hamilton Street	$8,145,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1415 Hamilton Street	$8,145,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2219 Senior Drive	$44,804,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7400 Tuckaseegee Road	$28,052,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	4420 Denver Avenue	$9,362,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6601 Horace Mann Road	$14,382,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3910 Sudbury Road	$8,667,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	12235 Winget Road	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3100 Winterfield Place	$6,842,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7600 IBM Drive	$86,967,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6200 Starhaven Drive	$18,750,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3241 New Renaissance Way	$17,044,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2541 Sandy Porter Road	$20,830,800	0.1	X Unshaded	Sources of Ember Load to Buildings	2.5
Food, Hydration, Shelter	School	5932 Farm Pond Lane	$15,279,100	0.1	X Unshaded	Critical Fireshed	0
Food, Hydration, Shelter	School	7515 The Plaza	$47,050,000	0.1	X Unshaded	Critical Fireshed	0
Food, Hydration, Shelter	School	7030 Nations Ford Road	$37,563,000	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	11532 Golf Links Drive	$28,084,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	11532 Golf Links Drive	$28,084,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9000 Robert D. Snyder Road	$2,015,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1228 Elizabeth Avenue	$83,024,000	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	7030 Nations Ford Road	$37,563,000	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	11000 Beau Riley Road	$7,634,100	0.1	X Unshaded	Direct Exposure	1
Food, Hydration, Shelter	School	4004 Toringdon Way	$37,151,500	0.1	X Unshaded	Critical Fireshed	3
Food, Hydration, Shelter	School	6108 Wilora Lake Road	$23,097,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7200 Folger Drive	$18,084,100	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	405 E Park Avenue	$8,865,200	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	715 Hartford Avenue	$10,612,800	0.1	X Unshaded	Little to No Exposure	0
Food, Hydration, Shelter	School	8601 Old Concord Road	$2,738,100	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station	6230 South Bv	-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	7201 N Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station	401 Parkwood Ave	-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	3750 South Bv	-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	239 E 9th St	-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	2215 N Brevard St	$4,326,100	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	303 E. Trade St	-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	5600 Old Concord Rd	-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station	9101 N Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station	1511 Camden Rd	-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	8815 Crump Rd	-	0.1	X Unshaded	Critical Fireshed	0
Transportation	LYNX Station	129 New Bern St	$603,400	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	218 E. Carson Bv	$1,800	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	9025 Cameron Blvd	$144,634,800	0.1	X Unshaded	Critical Fireshed	0
Transportation	LYNX Station	9508 South Bv	$36,800	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station	5703 Old Pineville Rd	-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	260 E. 7th St	-	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Transportation	LYNX Station	7717 England St	-	0.1	X Unshaded	Critical Fireshed	0
Transportation	LYNX Station	305 E. 3rd St	-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	400 E 36th St	$1,347,400	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	6501 N Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station	260 Brooklyn Village Way	$1,200,500	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	1821 Camden St	-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station	700 E Sugar Creek Rd	-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station	4756 Old Pineville Rd	-	0.1	X Unshaded	Critical Fireshed	0
Transportation	LYNX Station	8315 N Tryon St	-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		$74,700	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Direct Exposure	2
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		$235,800	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		$58,719,400	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		$4,352,100	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		$5,777,300	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		$18,201,600	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		$1,316,700	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Critical Fireshed	0
Transportation	LYNX Station		-	0.1	X Unshaded	Critical Fireshed	2
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		$400	0.1	X Unshaded	Direct Exposure	2

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		$161,800	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		$2,389,000	0.1	X Unshaded	Little to No Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	601 EAST TRADE STREET	$24,529,700	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Police Station	9201 UNIVERSITY CITY BOULEVARD, PUBLIC SAFETY BUILDING SUITE 152	$144,634,800	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	700 EAST FOURTH STREET	$151,756,300	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Police Station	1900 SELWYN AVENUE, STULTZ BUILDING ROOM 106	$88,631,400	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Police Station	8120 GRIER ROAD	$32,115,100	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	1750 SHOPTON ROAD	$23,344,700	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	8446 NORTH TRYON STREET	$5,135,000	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	3210 CENTRAL PIEDMONT COMMUNITY COLLEGE HARRIS CAMPUS DRIVE, HARRIS 1 BUILDING	$22,744,800	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	1231 ELIZABETH AVENUE, VAN EVARY BUILDING ROOM 121	$190,842,200	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Police Station	315 WEST HEBRON STREET, ROOM 305	$41,036,700	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Police Station	812 OAKLAWN AVENUE	$409,100	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	119 EAST 7TH STREET, SUITE 2B	$637,000	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Police Station	5727 NORTH SHARON AMITY ROAD, SUITE A	$1,871,100	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	9315 MONROE ROAD, SUITE G	$16,571,500	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Safety and Security	Police Station	10430 HARRIS OAK BOULEVARD, SUITE R	$10,181,400	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	3500 LATROBE DRIVE, SUITE 400	$1,039,800	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	1540 WEST BOULEVARD	$2,939,700	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Police Station	100 BEATTIES FORD ROAD	$34,712,200	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	8401 UNIVERSITY EXECUTIVE PARK DRIVE, SUITE 120	$5,434,200	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	5501 ROBERT C JOSH BIRMINGHAM PARKWAY	$637,000	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	8050 CORPORATE CENTER DRIVE, SUITE 100	$528,700	0.1	X Unshaded	Critical Fireshed	0
Safety and Security	Police Station	4150 WILKINSON BOULEVARD	$5,563,000	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	3505 CENTRAL AVE	$3,375,000	0.1	X Unshaded	Little to No Exposure	0
Safety and Security	Police Station	4045 NORTH TRYON STREET, SUITE B	$3,574,800	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	3333 NORTH TRYON STREET	$5,334,100	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	5501 SEVENTY-SEVEN CENTER DRIVE, SUITE 150	$4,377,000	0.1	X Unshaded	Little to No Exposure	0

B.2 RISK ASSESSMENT

This section contains a summary of the City's asset inventory as well as hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in in this section are: Dam Failure, Flood, and Wildfire.

B.2.1 DAM FAILURE

Table B.3Currently, unincorporated Mecklenburg County has no high hazard dams that have been identified by the North Carolina Dam Inventory with a condition assessment of "fair" or "poor." Figure A.2 shows the location of all dams in unincorporated Mecklenburg County.

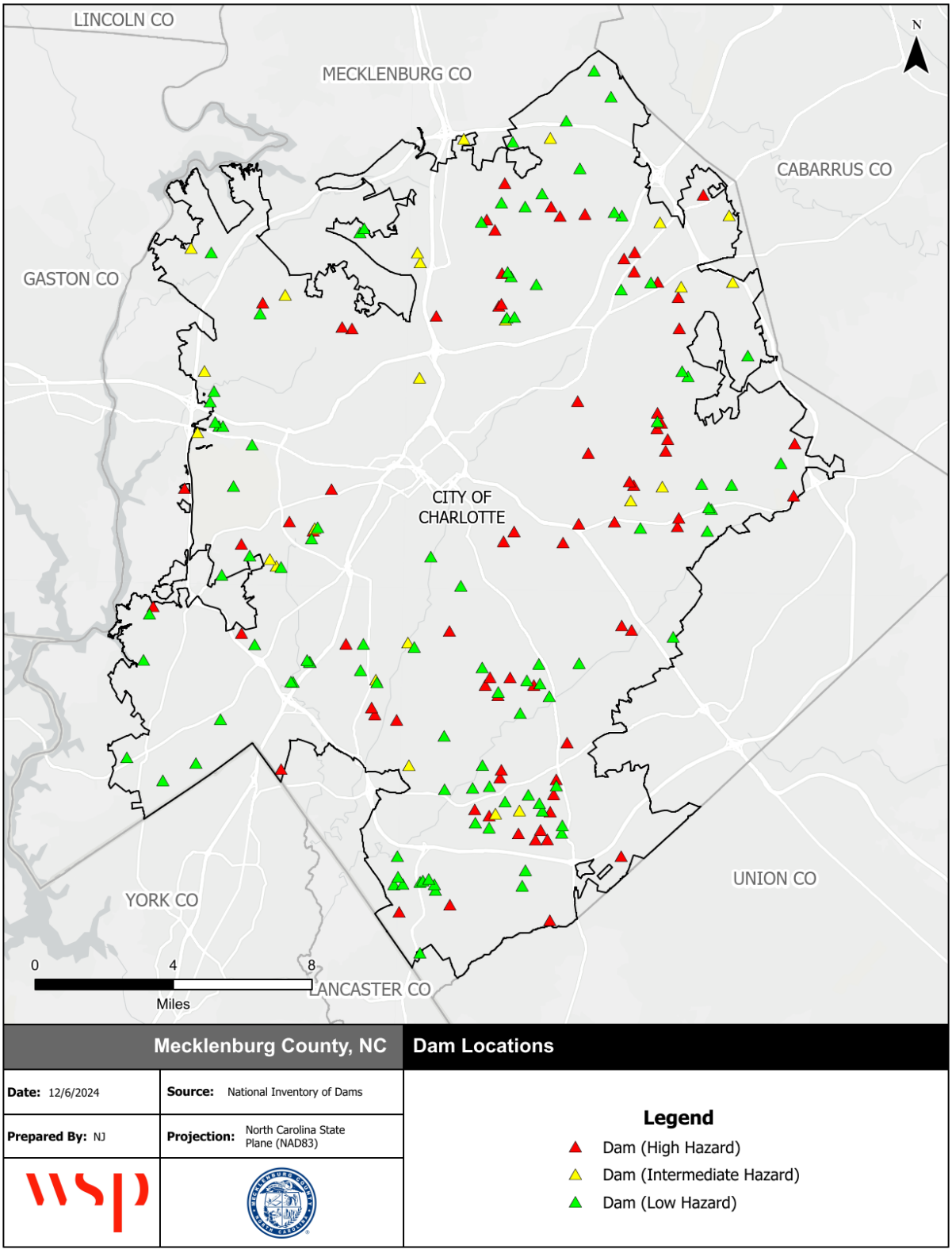
lists all high hazard dams located in the City of Charlotte that have been identified by the North Carolina Dam Inventory with a condition assessment of "fair" or "poor." Figure B.12 shows the location of all dams by jurisdiction in City of Charlotte.

Table B.3 – High Hazard Dams in City of Charlotte

Dam Name	NID ID	Condition as of Last Inspection	Max Capacity (Ac-Ft)	Nearest Downstream Location
Symphony Park Dam	NC05566	Fair	23	Charlotte
Lakeview Dam at Faires Farm	NC05337	Fair	11	Charlotte
Carson Pond Dam	NC05332	Fair	18	Charlotte
Cottonwood Dam	NC04825	Fair	8	Charlotte
Clearwater Lake Dam at Runaway Bay	NC03462	Fair	25	Charlotte
Griffith Dam #1	NC03399	Fair	234	Derita
Sharon Lake Lower Dam	NC03444	Fair	24	Charlotte
Quail Acres Dam	NC00218	Poor	85	Matthews
Sharon Lake Upper Dam	NC01696	Fair	29	Charlotte
Forest Lake Dam	NC01691	Fair	60	Charlotte
Arrowood Quarry Dam	NC01217	Fair	365	Pineville
Danga Lake Dam	NC00417	Fair	59	Red River, SC

Source: NC Dam Inventory, December 2024

Figure B.12 – Dam Inventory, City of Charlotte



Source: NC Dam Inventory, December 2024

B.2.2 FLOODING

Table B.4 details the acreage of the City of Charlotte's total area by flood zone on the effective DFIRM. Per this assessment, over 5 percent of the City's total area falls within the mapped 1%-annual-chance floodplains.

Table B.4 – Flood Zone Acreage in the City of Charlotte

Flood Zone	Acreage	Percent of Total (%)
Zone AE	10406.9	5.3
Zone X (500-year)	28.7	0.0
Zone X Unshaded	186,994.7	94.7
Total	**197,430.3**	**100.0**

Source: FEMA Effective DFIRM

Figure B.13 reflects the effective mapped flood hazard zones for the City of Charlotte, and Figure B.14 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

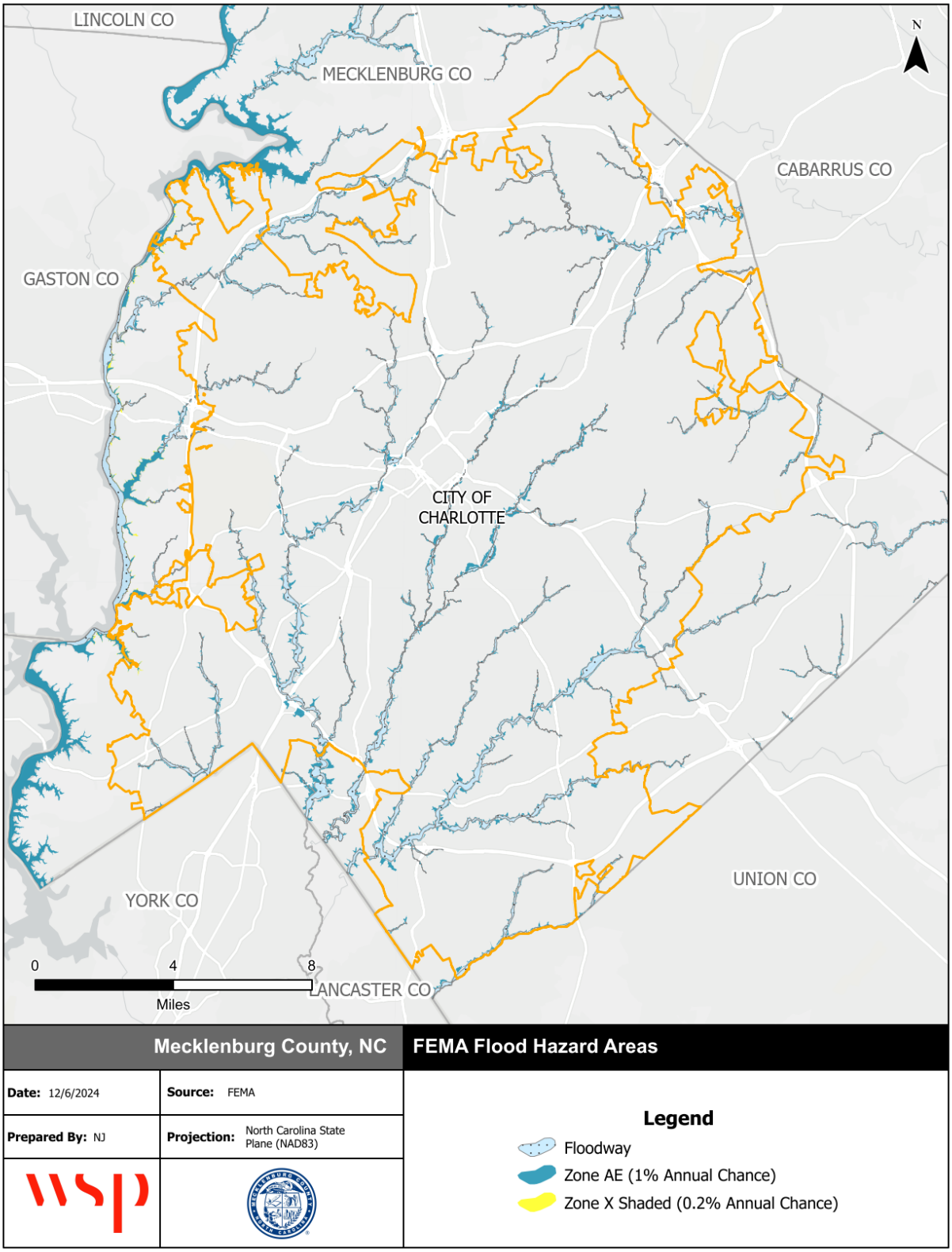
Table B.5 provides building counts and values for critical facilities by flood zone in the City of Charlotte.

Table B.5 – Critical Facilities Exposed to Flooding, City of Charlotte

Flood Zone	Critical Facility Count	Structure Value
Zone AE	1	$0
Zone X (500-year)	0	$0
Zone X Unshaded	1,126	$11,339,507,425
Total	**1,127**	**$11,339,507,425**

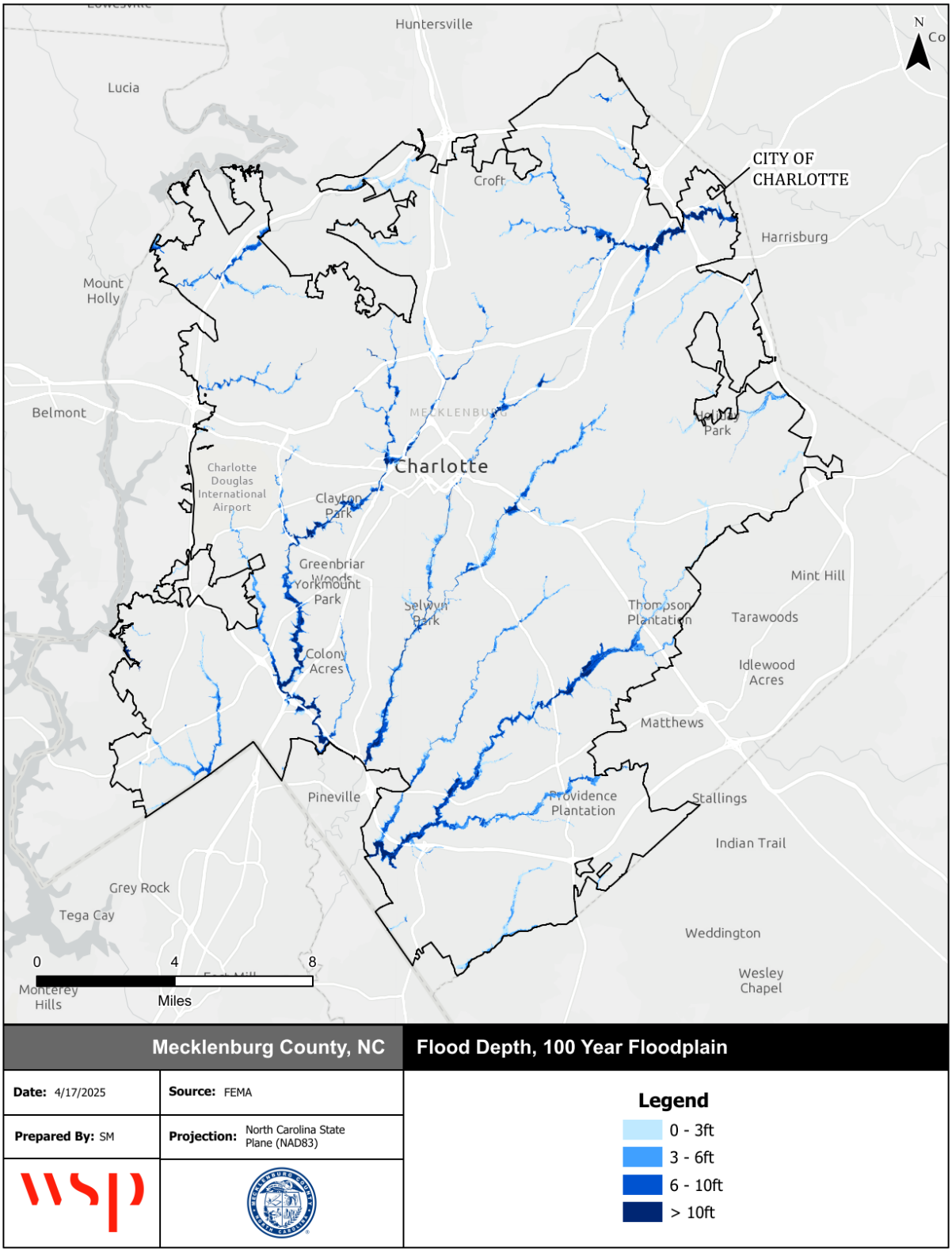
Source: FEMA Effective DFIRM, HMPC

Figure B.13 – FEMA Flood Hazard Areas, City of Charlotte



Source: FEMA Effective DFIRM

Figure B.14 – Flood Depth, 1%-Annual Chance Floodplain, City of Charlotte



Source: FEMA Effective DFIRM

FLOOD INSURANCE DATA

The City of Charlotte joined the NFIP emergency program in 1973 and has been a regular participant in the NFIP since August 1978. The City is a participant in the Community Rating System and is a Class 2 community. The following tables reflect NFIP policy and claims data for the City categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table B.6 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	1,218	$914,781	$356,241,000	1,703	$22,475,267.85
2-4 Family	43	$36,739	$6,587,000	124	$2,543,246.10
All Other Residential	338	$284,398	$93,042,000	521	$15,385,632.81
Non-Residential	85	$213,324	$41,503,000	172	$8,882,279.81
Total	**1,684**	**$1,449,242**	**$497,373,000**	**2,520**	**$49,286,426.57**

Source: FEMA Community Information System, accessed May 2025

Table B.7 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	763	$750,376	$200,930,000	1,739	$39,773,251.35
A Zones	1	$1,667	$350,000	25	$1,006,032.25
B, C & X Zone					
Standard	920	$697,199	$296,093,000	501	$6,044,305.69
Preferred	0	$0	$0	232	$2,493,525.69
Total	**1,684**	**$1,449,242**	**$497,373,000**	**2,497**	**$49,317,114.98**

Source: FEMA Community Information System, accessed May 2025

Table B.8 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	396	$387,959	$83,140,000	1,419	$35,660,307.45
A Zones	1	$1,667	$350,000	19	$485,655.00
B, C & X Zone	315	$271,058	$104,768,000	615	$6,698,964.23
Standard	315	$271,058	$104,768,000	463	$5,390,379.32
Preferred	0	$0	$0	154	$1,359,714.19
Total	**712**	**$660,684**	**$188,258,000**	**2,053**	**$42,844,926.68**

Source: FEMA Community Information System, accessed May 2025

Table B.9 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	367	$362,417	$117,790,000	320	$4,112,943.90
A Zones	0	$0	$0	6	$520,377.25
B, C & X Zone	605	$426,141	$191,325,000	114	$1,783,286.32
Standard	605	$426,141	$191,325,000	38	$653,926.37
Preferred	0	$0	$0	78	$1,133,811.50
Total	**972**	**$788,558**	**$309,115,000**	**440**	**$6,416,607.47**

Source: FEMA Community Information System, accessed May 2025

B.2.3 WILDFIRE

Table B.10 summarizes the acreage in the City of Charlotte that falls within the Functional Wildland Urban Interface (WUI), categorized into zones that describe the wildfire risk mitigation activities appropriate for each zone. Areas in the Functional WUI are those areas where development and building structures may intermix with burnable land cover. Approximately, 22 percent of the City of Charlotte is categorized as having direct exposure to wildfire risk within the Functional WUI.

Table B.10 – Functional Wildland Urban Interface, City of Charlotte

	Functional Wildland Urban Interface (WUI) Category	Acres	Percent
	Direct Exposure	44,132	22%
	Indirect Exposure	96,487	49%
	Critical Fireshed	30,967	16%
	Sources of Ember Load to Buildings	7,335	4%
	Little to No Exposure	17,930	9%
	Water	625	0%
	Total	**197,476**	**100%**

Source: Southern Wildfire Risk Assessment

Figure B.15 depicts the Functional WUI for the City of Charlotte, including incorporated areas. Figure B.16 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure B.17 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

The Functional WUI has several gaps throughout the central portion of the City and has areas of direst exposure spread evenly throughout. Over half of the City is non-burnable, however there are some small clusters of moderate potential fire intensity along the edges of the city and in the north central portion of Charlotte.

Table B.11 provides the count and estimated value of all structures that intersect with areas of the City of Charlotte and participating jurisdictions that are rated moderate to high on the WUI Risk Index.

Table B.12 provides building counts and values for critical facilities by FEMA lifeline that are located in areas categorized with direct exposure to wildfire risk on the Functional WUI scale.

Table B.11 – Structures at Risk to Moderate-High WUI Risk Index, City of Charlotte

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	471	$267,950,575.00	$267,950,575.00	$535,901,150.00
Education	128	$47,420,851.00	$47,420,851.00	$94,841,702.00
Government	31	$17,567,785.00	$17,567,785.00	$35,135,570.00
Industrial	148	$48,317,250.00	$72,475,875.00	$120,793,125.00
Religious	105	$61,935,865.00	$61,935,865.00	$123,871,730.00
Residential	44,641	$6,852,921,291.00	$3,426,460,645.50	$10,279,381,936.50
Total	**45,524**	**$7,296,113,617.00**	**$3,893,811,596.50**	**$11,189,925,213.50**

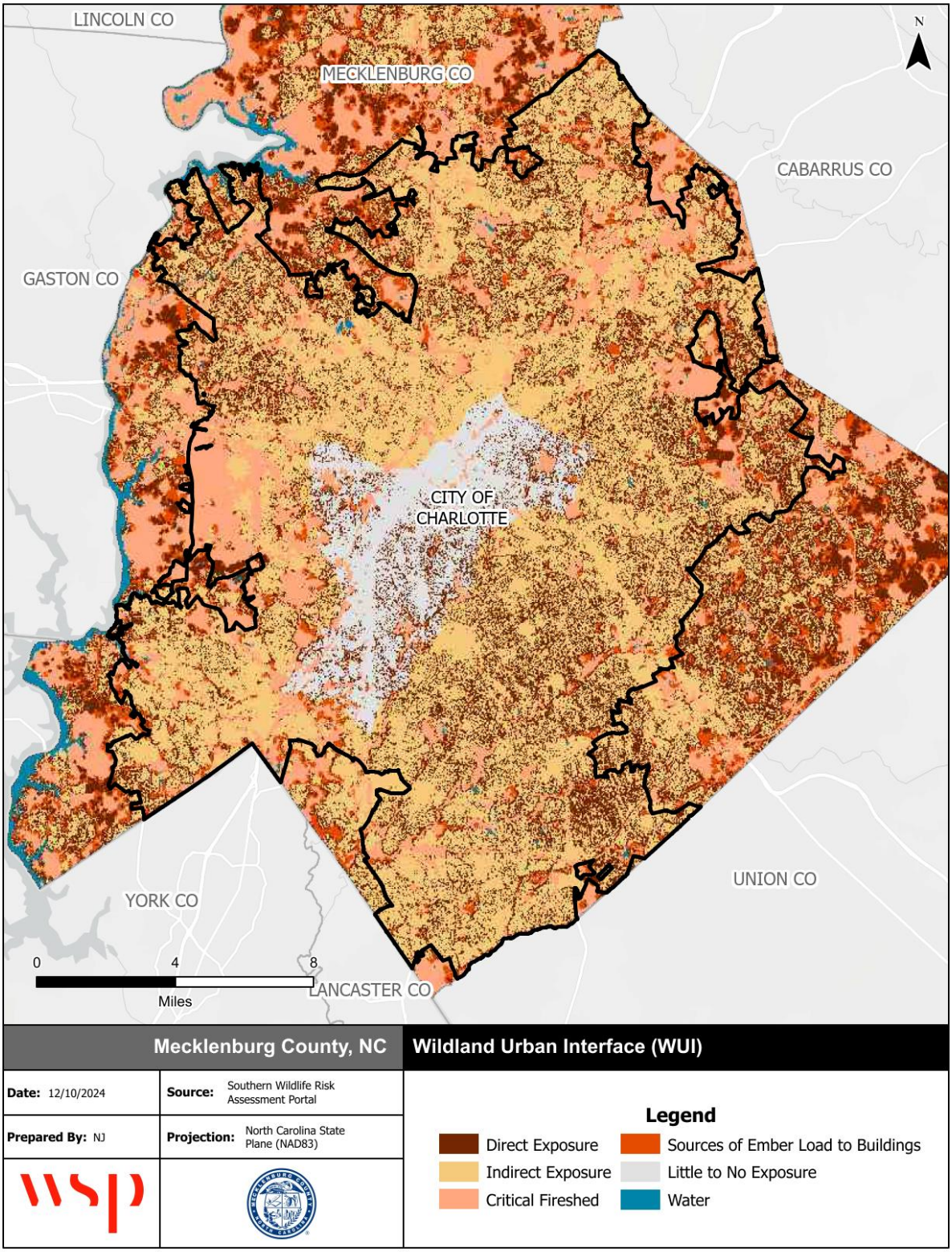
Source: Southern Wildfire Risk Assessment

Table B.12 – Critical Facilities Exposed to Wildfire, City of Charlotte

Type	Critical Facility Count	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	13	$170,557,500
Hazardous Materials	19	$8,597,720
Health and Medical	51	$-
Safety and Security	3	$1,249,400
Transportation	9	$145,272,200
Water Systems	0	$-
Total	**95**	**$325,676,820**

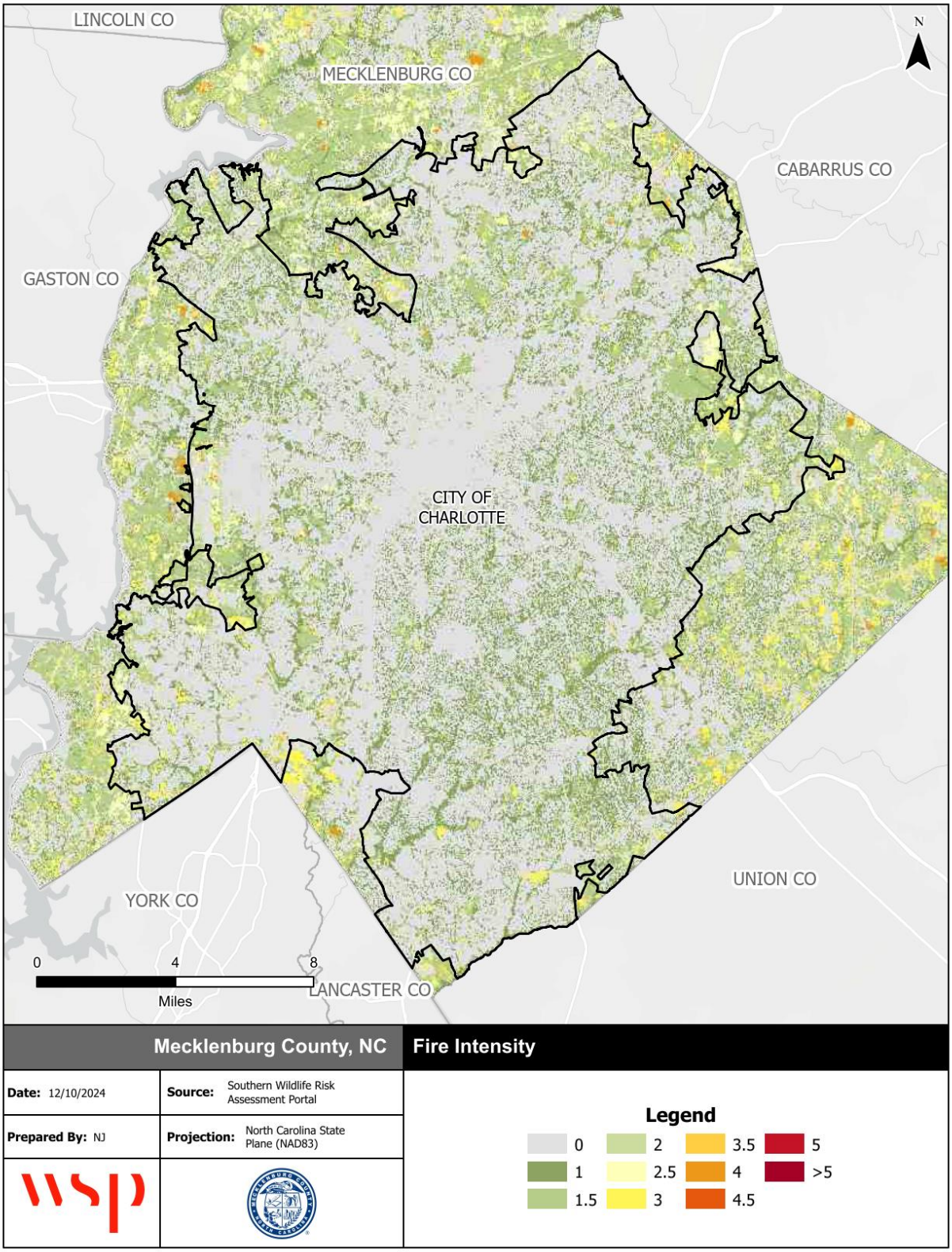
Source: Southern Wildfire Risk Assessment

Figure B.15 – Functional Wildland Urban Interface, City of Charlotte



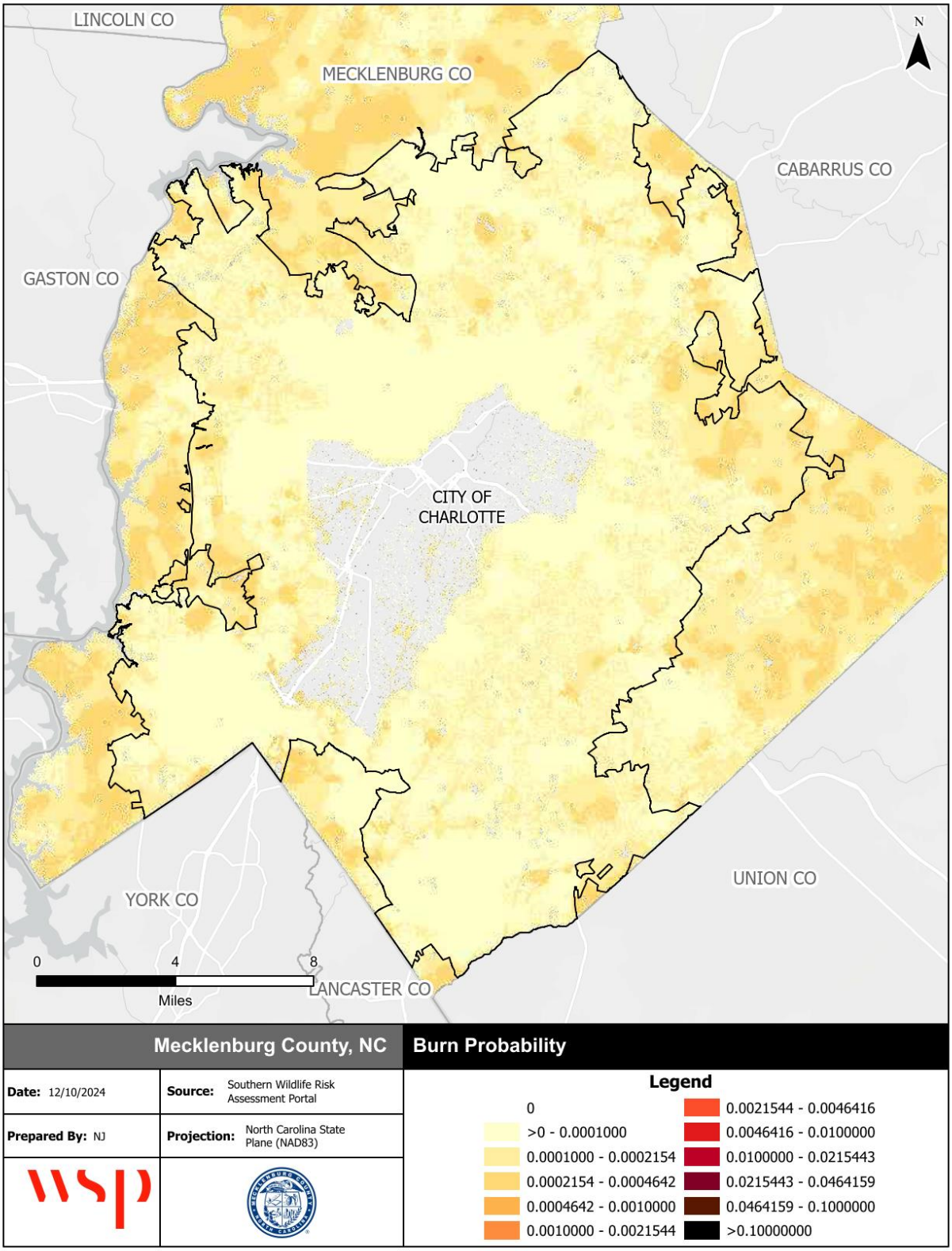
Source: Southern Wildfire Risk Assessment

Figure B.16 – Characteristic Fire Intensity, City of Charlotte



Source: Southern Wildfire Risk Assessment

Figure B.17 – Burn Probability, City of Charlotte



Source: Southern Wildfire Risk Assessment

B.3 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-1	Consider the need to add or revise existing policies or regulations to more thoroughly address natural hazards during the update of the City's Zoning Ordinance.	All Hazards	4.1	Medium	Prevention	City of Charlotte Planning Department, in coordination with Emergency Management and Storm Water Division	Local Staff time	Planning Department budget	2025-2030	Carry Forward	Regulations for natural hazards are addressed in the Charlotte 2040 UDO, effective June 1, 2023.
Charlotte-2	Enhance area planning activities to better address potential natural hazards.	All Hazards	4.1	Medium	Prevention	City of Charlotte Planning Department, in coordination with Emergency Management and Storm Water Division	Local Staff time	Planning Department budget	2025-2030	Carry Forward	Future area planning efforts continue. The Charlotte 2040 Comprehensive Plan (effective June 1, 2023) incorporates regulations to address potential natural hazards.
Charlotte-3	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standards (in addition to basic required compliance actions): a) Development standards linked to Community Floodplain (Future Conditions); b) Require critical facilities protection to 500-year flood levels; c) Require parking lots to be elevated (no more than six inches deep in any parking space during Community Flood event); d) Require dry land access for new or substantially improved buildings (above Community Flood BFE); e) Levee restrictions; f) Cumulative substantial damage improvement provision; g) Prohibit basements below flood level on filled lots.	Flooding	4.1	High	Prevention, Public Education	Charlotte Storm Water Services in coordination with Mecklenburg County Storm Water Services	Local staff time	N/A	2025-2030	Carry Forward	Continue implementation of the City of Charlotte Unified Development Ordinance (UDO), meeting these goals through Articles 23-27. Charlotte-Mecklenburg Storm Water Services has completed a 2D pilot flood modeling study of Little Sugar and Briar Creek watersheds and is currently evaluating the next steps towards future Countywide FIRM updates.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-5	Seek opportunities to provide information and education to Planning staff regarding risks associated with natural hazards and potential prevention/mitigation planning strategies.	All Hazards	2.1	Medium	Prevention	City of Charlotte Planning Department, in coordination with Emergency Management and Storm Water Division	Local staff time	Emergency Management and/or other staff to provide training and/or utilize resources made available through the American Planning Association (including PAS Report: Integrating Hazard Mitigation into Local Planning)	2025-2030	Carry Forward	Planning staff will continue to seek American Planning Association (APA) related training in conjunction with American Institute of Certified Planners (AICP) Certification Maintenance (CM) credits.
Charlotte-6	On an annual basis, coordinate with municipalities on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for mitigating and preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.3	Medium	Public Education & Awareness	Emergency Management	Local staff time and resources	Emergency Management budget/EMPG	2025-2030	Carry Forward	Ongoing All Hazards Advisory Committee (AHAC) and Local Emergency Planning Committee (LEPC) meetings held on a quarterly basis. Joint Information System (JIS) utilized to coordinate public information across municipalities to communicate important information during an imminent hazard event.
Charlotte-7	On an annual basis, coordinate with municipalities to provide information on all natural hazards facing the area to local planning staff and elected officials. This should be combined with an annual progress report on the status of local mitigation actions as identified in the Multi-jurisdictional Hazard Mitigation Plan.	All Hazards	3.1	Medium	Public Education & Awareness	Emergency Management	Local staff time and resources	Emergency Management budget/EMPG	2025-2030	Carry Forward	All Hazards Advisory Committee (AHAC) meetings held quarterly.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-8	Implement spring public information campaign aimed at tornado and severe weather awareness to include information on safe rooms.	Tornadoes & Thunderstorms	2.1	Medium	Public Education & Awareness	Emergency Management	$3,000	Storm Water Services budget, FEMA and American Red Cross materials free of charge (see FEMA Publication 320—Taking Shelter from the Storm: Building a Safe Room Inside Your House), Department of Homeland Security—Citizen Corps	2025-2030	Carry Forward	Severe Weather Preparedness Week outreach conducted annually. Statewide Tornado Drill held annually Charlotte-Mecklenburg Emergency Management and Charlotte-Mecklenburg Storm Water Services held a joint media availability during Severe Weather Preparedness Week. Hurricane Preparedness Week outreach conducted in May annually; produced public awareness video. Charlotte is a designated Storm Ready Community by the National Weather Service.
Charlotte-9	Train emergency responders and managers for flood emergencies.	Flooding	3.1	Medium	Emergency Services	City of Charlotte Fire Department	$50,000	Emergency Management Performance Grants (EMPG), Emergency Management Institute, Department of Justice— State and Local Domestic Preparedness Exercise Support, Department of Homeland Security—Citizen Corps	2025-2030	Carry Forward	CMEMO conducted annual training during the two-day, May 9-10, 2023, NCEM Statewide Hurricane Preparedness Exercise including EOC operations, command and control, flood operations, evacuation/sheltering operations, and public messaging. External partners included FEMA, CISA, NCEM, NCDHHS, NCDSS, Local Jurisdictions, and others.
Charlotte-10	Equip emergency responders and managers for flood emergencies, including swift water rescue.	Flooding	3.1	Medium	Emergency Services	City of Charlotte Fire Department	$100,000	Hazard Mitigation Grant Program (7% set aside), Emergency Management Performance Grants (EMPG)	2025-2030	Carry Forward	Continuous water rescue equipment evaluation, six (6) new forcible entry equipment caches purchased and placed on the six (6) swift water rescue boats to aid emergency responders in entry to structures surrounded by flood waters enhancing life-safety operations.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-11	Conduct disaster drills for division managers.	All Hazards	3.1	Medium	Emergency Services	City of Charlotte Fire Department	$25,000	Department of Justice—State and Local Domestic Preparedness Exercise Support, Department of Justice— State and Local Domestic Preparedness Training Program, FEMA—First Responder Counter-Terrorism Training assistance, Department of Homeland Security—Citizen Corps	2025-2030	Carry Forward	Exercises held regularly for McGuire Nuclear Station
Charlotte-12	Provide and maintain NIMS training for all KBE's, division heads and key government officials.	All Hazards	3.1	Medium	Emergency Services	City of Charlotte Fire Department	$25,000	Emergency Management Institute, Department of Homeland Security—Citizen Corps	2025-2030	Carry Forward	On-going ICS/NIMS training programs have been established to support the local Incident Management Team (IMT).
Charlotte-13	Develop evacuation routes that are not adversely affected by flooding.	All Hazards	3.3	Medium	Emergency Services	City of Charlotte Department of Transportation	Local staff time and resources	N/A	2025-2030	Carry Forward	Coordinating with 83rd Civil Affairs Battalion, US Army, in ongoing planning and consultation.
Charlotte-14	Improve the dissemination of hazard information, including maps, broadcasts, Internet Web site(s) and listservs.	All Hazards	2.1	Medium	Public Education & Awareness	Emergency Management	Local staff time and resources	N/A, FEMA and American Red Cross materials free of charge, Department of Homeland Security—Citizenship Education and Training	2025-2030	Carry Forward	CharMeck Alerts continues to be advertised as an important method of receiving emergency notifications with approximately 300,000 contacts. CharMeck Alert is an "opt-in" system, however, there is also the ability to send wireless emergency alerts (WEAs) in the case of severe emergencies. CMEMO supported joint regional WEA continuity capability.
Charlotte-15	Provide information regarding encroachments, abandonments, new construction, and leases.	All Hazards	2.1	Medium	Public Education & Awareness	Code Enforcement, Planning	Local staff time and resources	N/A	2025-2030	Carry Forward	City zoning and planning provide ongoing outreach, updated as required.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-16	Inspect the condition of the critical assets (culverts greater than 48 inches that are under City-maintained streets) on a regular schedule (every 5 years).	Flooding, Dam/Levee Failure	1.3	High	Prevention, Structural Projects and Natural Resource Protection	Charlotte Storm Water Services	Local staff time	Storm Water Services budget	2025-2030	Carry Forward	The goal of inspecting 50% of the critical assets was achieved during the last cycle. This is a carry forward item that will continue to be performed year after year. The language for the action description is being updated to remove the 50% requirement. The mitigation categories are being modified to include Prevention, Structural Projects & Property Protection as this work is being performed to identify project needs.
Charlotte-17	Identify, rank and prioritize capital improvement projects. Revising current criteria to strategically prioritize work by managing our assets.	Flooding, Dam/Levee Failure	1.1	High	Prevention, Structural Projects and Natural Resource Protection	Charlotte Storm Water Services	Local staff time	Storm Water Services budget	2025-2030	Carry Forward	Charlotte Storm Water continues to expand on its risk-based asset prioritization program. System Assets are proactively inspected and ranked based on the inspection finding. The mitigation category is Prevention but there are also components of Structural and Natural Resource Protection that are being included.
Charlotte-18	Initiate (plan, design and construct) capital improvement projects to improve 20 linear miles of system between 2020 and 2025.	Flooding, Dam/Levee Failure	1.1	High	Prevention, Structural Projects and Natural Resource Protection	Charlotte Storm Water Services	To be determined	Storm Water Services budget	2025-2030	Carry Forward	During this cycle, Charlotte Storm Water Services completed in excess of 20 miles of system improvements. This goal will continue into the new program cycle.
Charlotte-22	Create media campaign/message to relay to local media and the general public prior to forecasted severe storm events.	Flooding, Hurricane & Tropical Storm, Tornadoes & Thunderstorms, Dam & Levee Failure	3.2	Medium	Public Education & Awareness	Charlotte Storm Water Services, in coordination with Mecklenburg County Storm Water Services, Charlotte Communications & Marketing and Mecklenburg County Public Information	Local staff time and resources	Storm Water Services budget	2025-2030	Carry Forward	Campaign messaging provided through social media, digital ads, utility bill inserts, and traditional broadcast. Charlotte-Mecklenburg Storm Water Services social media followers: 8,820 Facebook, 1,570 X (formerly Twitter), 1,840 Instagram.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-23	Conduct annual inspections on ponds/dams that City of Charlotte Storm Water Services has accepted maintenance responsibility.	Flooding, Dam & Levee Failure	1.3	Medium	Prevention, Natural Resource Protection	Charlotte Storm Water Services	Local staff time and resources	Storm Water Services budget	2025-2030	Carry Forward	Conducted annual inspections on dams that Charlotte Storm Water Services maintains as part of their pond retrofit program. Completed inspections for High (10), Intermediate (5), and Low (10) Hazard dams annually (April-May) and prior to hurricane season (July-August).
Charlotte-24	Retrofit critical facilities and City-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, lightning protection, hail resistant roofing, and anchoring fixed building equipment.	All Hazards	1.1	Medium	Property Protection	City of Charlotte	To be determined on a case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	CFD Fire Station #30 re-location on Beam Road is still planned. This will incorporate an all-electric "green" design. The fire station will be solar powered with no natural gas. Back-up generation will be battery powered, and there is no fuel to be stored on site.
Charlotte-25	Install and maintain backup generators or quick connect hook ups for mobile generators on any newly constructed City-owned critical facilities.	All Hazards	1.3	Medium	Property Protection	City of Charlotte	To be determined on a case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	Backup generators have been provided at critical facilities.
Charlotte-26	Develop a plan to identify and map fueling sites with underground storage tanks and either install backup generators or quick connect hook ups for mobile generators.	All Hazards	1.3	Medium	Emergency Services	City of Charlotte	To be determined on a case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	Ongoing at Fire Station #11 and planned River District Fire Station.
Charlotte-27	Continued capital investment in surface water quality enhancement. Goal is to treat runoff from 150 acres every 3 years.	Flooding, Dam & Levee Failure	1.2	High	Natural Resource Protection	Charlotte Storm Water Services	To be determined.	Storm Water Services Budget	2025-2030	New	
Charlotte-28	Pursue the acquisition and/or elevation of high-risk flood prone properties in accordance with applicable policies, regulations, and statutes.	Flooding	1.1	Medium	Property Protection	Charlotte Storm Water Services in coordination with Mecklenburg County Storm Water Services	To be determined.	Storm Water Services Budget	2025-2030	New	Recommended by WSP as a "catch all" to allow for the potential of future grant opportunities. The activities would likely be coordinated with Mecklenburg County Storm Water Services who have a more traditionally buy-out flood retrofit program.
Charlotte-29	Conduct pre- and post-event inspection of 18 regulated and non-regulated dams as specified in the Severe Storm Response Plan (SSRP)	Flooding, Dam & Levee Failure, Hurricane and Tropical Storms	1.3	High	Prevention, Natural Resource Protection	Charlotte Storm Water Services	Local Staff Time	Storm Water Services Budget	2025-2030	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Charlotte-30	Continue participation in the NFIP Community Rating System (CRS) with the goal of maintaining or increasing our CRS Class 2 status.	Flooding, Dam & Levee Failure	4.1	High	Prevention	Charlotte Storm Water Services in coordination with Mecklenburg County Storm Water Services	Local staff time	N/A	2025-2030	New	Charlotte-04 is marked completed as Charlotte achieved a Class 2 Status during the current cycle. The new goal takes its place in our continued commitment in the CRS system.
Charlotte-31	Continue to expand awareness and availability of cooling centers throughout Charlotte.	Excessive Heat	2.2	High	Emergency Services, Public Education & Awareness	Charlotte-Mecklenburg Emergency Management Office	To be determined	Local, State Grants, Federal Grants	2025-2030	New	
Charlotte-32	Enhance public alert system with multi-lingual capabilities to improve resident safety by providing timely notifications before, during, and after emergencies, enabling effective response.	All Hazards	2.1, 3.2	Medium	Emergency Services, Public Education & Awareness	Charlotte-Mecklenburg Emergency Management Office	To be determined	Local, State Grants, Federal Grants	2025-2030	New	
Charlotte-33	Invest in community preparedness through outreach and training programs to empower residents and encourage proactive preparation for emergencies.	All Hazards	2.2, 3.1	Medium	Emergency Services, Public Education & Awareness	Charlotte-Mecklenburg Emergency Management Office	To be determined	Local, State Grants, Federal Grants	2025-2030	New	
Charlotte-34	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.
Charlotte-35	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.1	Medium	Public Education & Awareness	In coordination with CMEMO (Lead)	Staff time and resources	N/A	2025-2030	New	See Mecklenburg-9 for additional details.
Charlotte-36	Create or Update Community Wildfire Protection Plans in each fire district.	Wildfire	1.1, 2.1, 3.1	Medium	Prevention	CMEMO, NC Forest Service	To be determined	Grant funds	2030	New	

ANNEX C TOWN OF CORNELIUS

C.1 ASSET INVENTORY

The Town of Cornelius and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table C.1 provides a count of critical facilities by FEMA lifeline category in the Town of Cornelius. Figure C.1 shows the locations of all critical facilities in the Town of Cornelius.

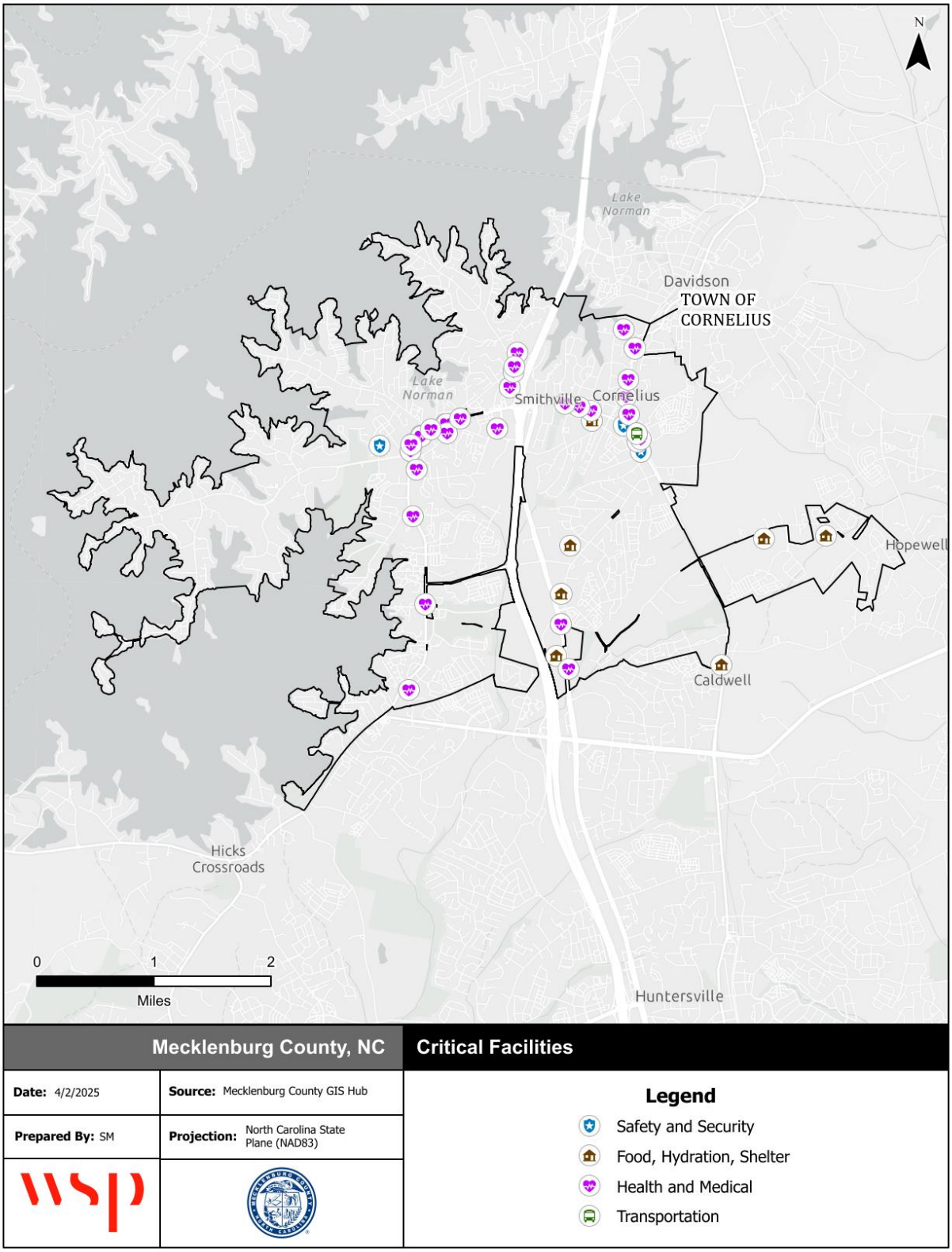
Table C.2 provides a detailed inventory of the critical facilities in the Town of Cornelius, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table C.1 – Critical Facilities, Town of Cornelius

Facility Type	Count of Facility Type	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	7	$95,427,400
Hazardous Materials	0	$-
Health and Medical	39	$10,299,200
Safety and Security	3	$6,725,700
Transportation	1	$1,078,900
Water Systems	0	$-
Total	**50**	**$113,531,200**

Source: Mecklenburg County, HMPC

Figure C.1 – Critical Facilities, Town of Cornelius



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table C.2 – Critical Facilities Inventory, Town of Cornelius

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	1130 Tree of Life Way, Cornelius	-	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	19230 CHARLES TOWN LN	$1,383,200	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	19729 S MAIN ST	$2,160,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	17301 Statesville Road	$27,449,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	18120 Statesville Road	$3,921,200	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	School	17609 Old Statesville Rd	$2,565,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	20905 Torrence Chapel Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19810 W Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19485 Old Jetton Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	20723 Torrence Chapel Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19615 Liverpool Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19453 W Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	17810 Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	20265 Harroway Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19607 W Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	21121 Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	21316 Davidson St	$9,445,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	21031 Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19600 W Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	17039 Kenton Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19824 W Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	20844 Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19615 Liverpool Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	18805 West Catawba Av	$495,300	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	17810 Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19900 W Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	18047 W Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	20723 Torrence Chapel Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19824 W Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	20901 Torrence Chapel Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19837 S Main St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8301 Magnolia Estates Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19830 Zion Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9605 Caldwell Commons Cir	$358,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	20121 N Main St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19924 Jetton Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19453 W Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8301 Magnolia Estates Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19701 W Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19900 W Catawba Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	20808 N Main St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	20501 N Main St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	19475 Old Jetton Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	21000 Torrence Chapel Rd	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	11900 Bailey Road	$22,413,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	21126 Catawba Avenue	$9,652,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9611 Westmoreland Road	-	0.1	X Unshaded	Direct Exposure	1.5
Food, Hydration, Shelter	School	12420 Bailey Road	$29,426,000	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		$1,078,900	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	21440 CATAWBA AVENUE	$3,181,800	0.1	X Unshaded	Indirect Exposure	0

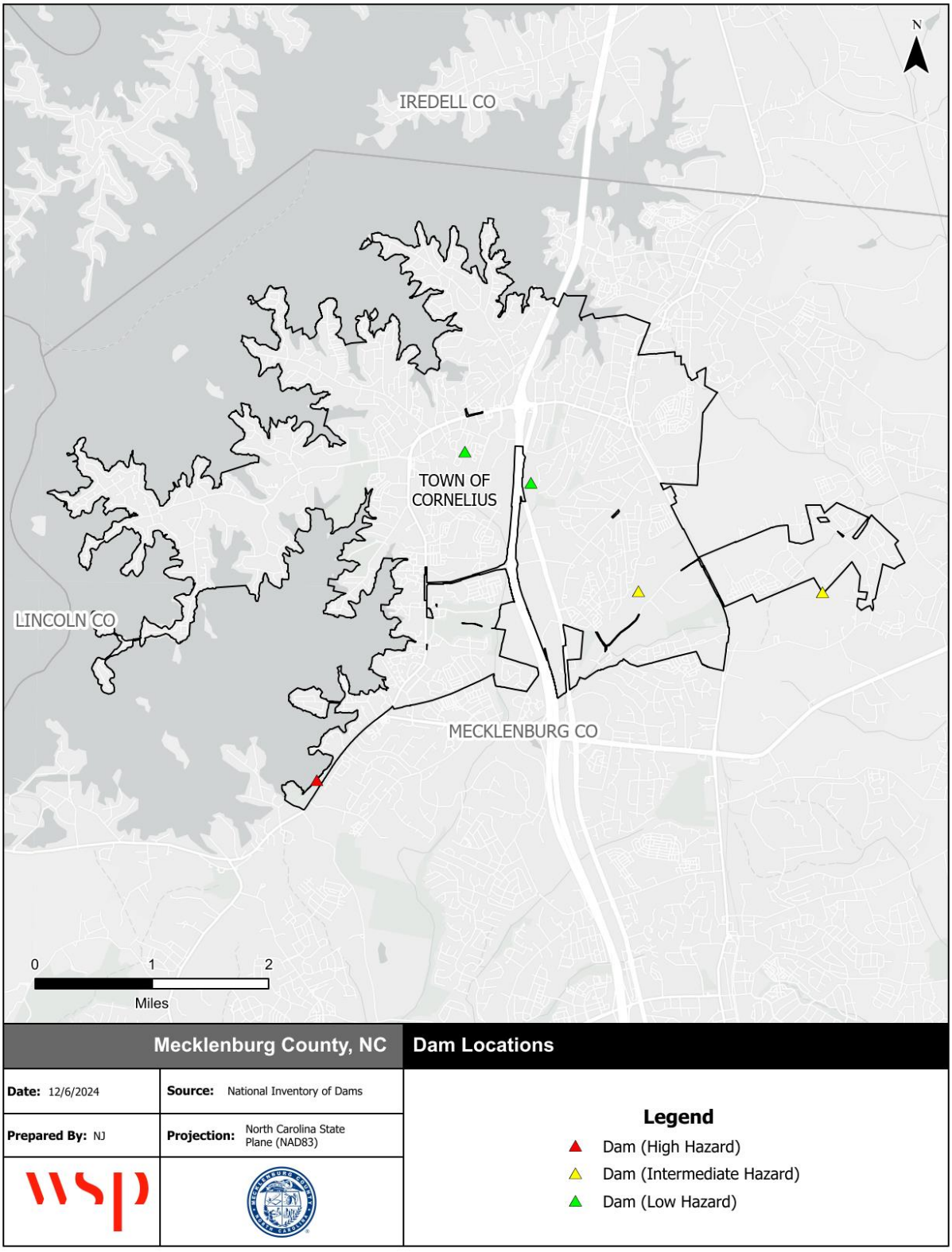
C.2 RISK ASSESSMENT

This section contains a summary of the Towns's asset inventory as well as hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in in this section are: Dam Failure, Flood, and Wildfire.

C.2.1 DAM FAILURE

Currently, the Town of Cornelius has no high hazard dams that have been identified by the North Carolina Dam Inventory with a condition assessment of "fair" or "poor." Figure C.2 shows the location of all dams in the Town of Cornelius.

Figure C.2 – Dam Inventory, Town of Cornelius



Source: NC Dam Inventory, December 2024

C.2.2 FLOODING

Table C.3 details the acreage of the Town of Cornelius' total area by flood zone on the effective DFIRM. Per this assessment, over 5 percent of Cornelius falls within the mapped 1%-annual-chance floodplains.

Table C.3 – Flood Zone Acreage in the Town of Cornelius

Flood Zone	Acreage	Percent of Total (%)
Zone AE	467.0	5.7
Zone X (500-year)	0.00	0.0
Zone X Unshaded	7,785.6	94.3
Total	**8,252.6**	**100.0**

Source: FEMA Effective DFIRM

Figure C.3 reflects the effective mapped flood hazard zones for the Town of Cornelius, and Figure C.4 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

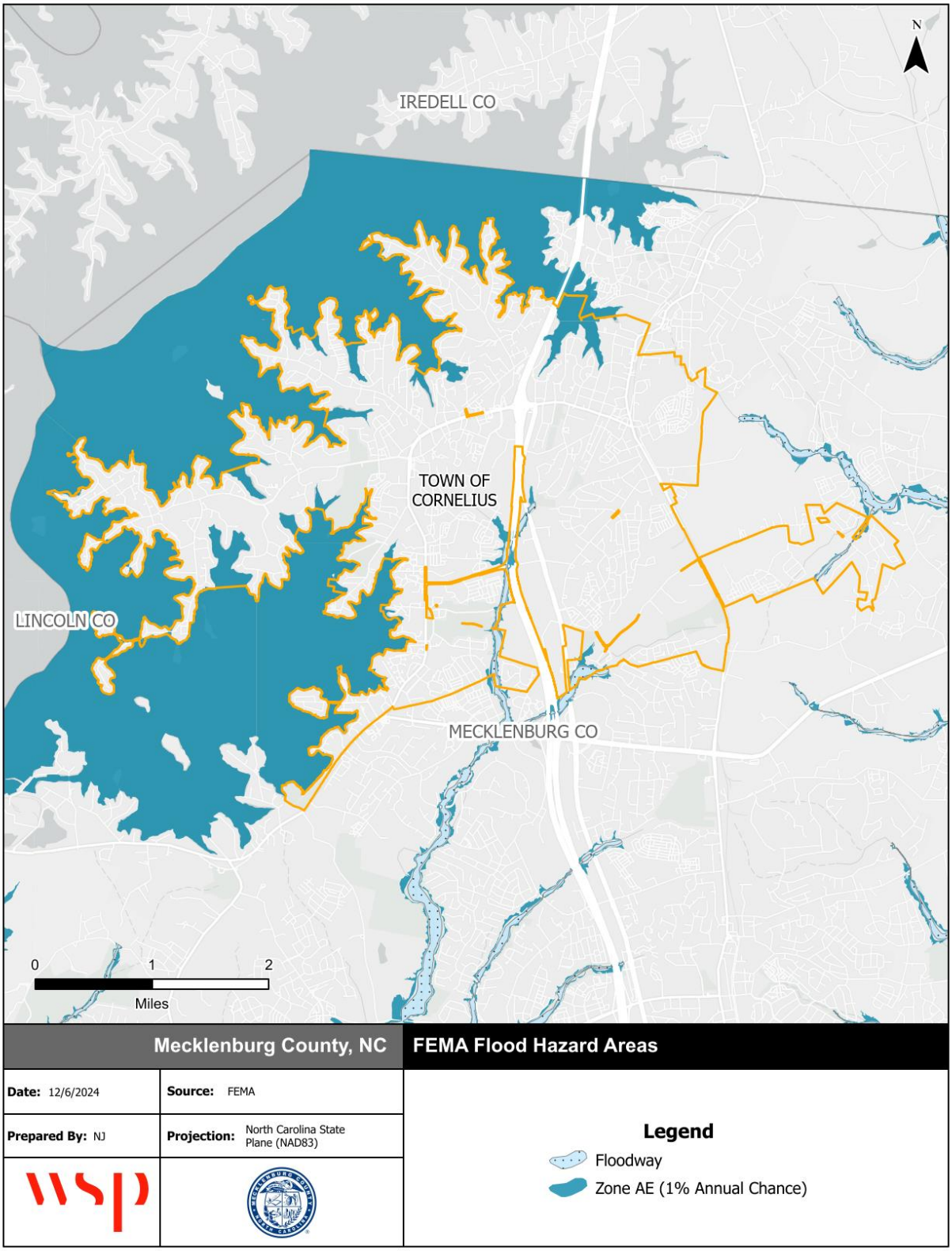
Table C.4 provides building counts and values for critical facilities by flood zone in the Town of Cornelius.

Table C.4 – Critical Facilities Exposed to Flooding, Town of Cornelius

Flood Zone	Critical Facility Count	Structure Value
Zone AE	0	$0
Zone X (500-year)	0	$0
Zone X Unshaded	50	$113,531,200
Total	**50**	**$113,531,200**

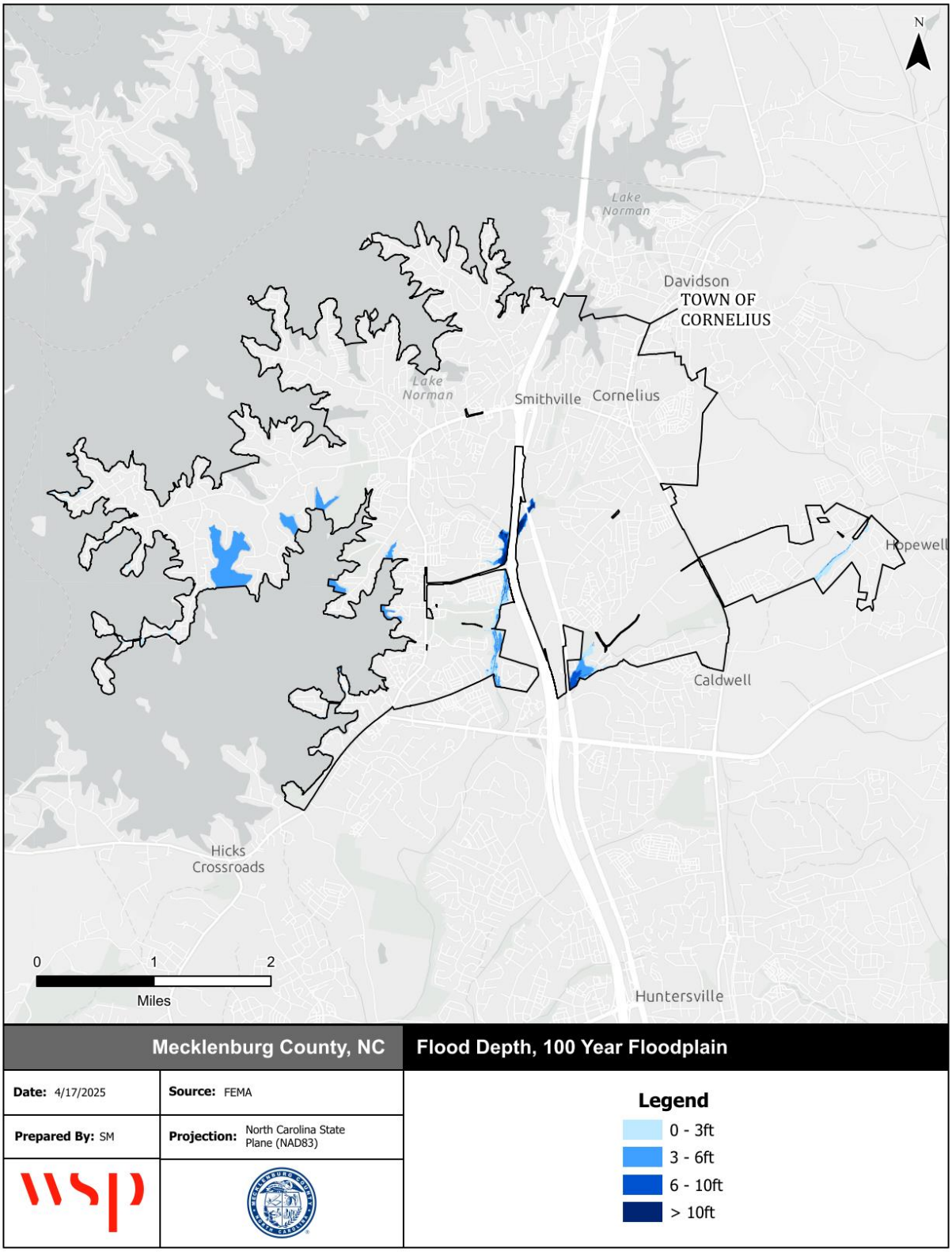
Source: FEMA Effective DFIRM, HMPC

Figure C.3 – FEMA Flood Hazard Areas, Town of Cornelius



Source: FEMA Effective DFIRM

Figure C.4 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Cornelius



Source: FEMA Effective DFIRM

FLOOD INSURANCE DATA

The Town of Cornelius joined the NFIP through regular entry in September 1997 and has been a regular participant since. The following tables reflect NFIP policy and claims data for the City categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table C.5 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	62	$41,088	$20,132,000	8	$87,213.19
2-4 Family	1	$515	$208,000	0	$0.00
All Other Residential	2	$720	$501,000	2	$17,994.28
Non Residential	3	$1,526	$843,000	1	$5,193.04
Total	**68**	**$43,849**	**$21,684,000**	**11**	**$110,400.51**

Source: FEMA Community Information System, accessed May 2025

Table C.6 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	16	$9,445	$4,403,000	2	$5,193.04
B, C & X Zone					
Standard	52	$34,404	$17,281,000	3	$4,125.35
Preferred	0	$0	$0	6	$101,082.12
Total	**68**	**$43,849**	**$21,684,000**	**11**	**$110,400.51**

Source: FEMA Community Information System, accessed May 2025

Table C.7 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	0	$0	$0	1	$0.00
B, C & X Zone	3	$2,579	$1,050,000	1	$0.00
Standard	3	$2,579	$1,050,000	1	$0.00
Total	**3**	**$2,579**	**$1,050,000**	**2**	**$0.00**

Source: FEMA Community Information System, accessed May 2025

Table C.8 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	16	$9,445	$4,403,000	1	$5,193.04
B, C & X Zone	49	$31,825	$16,231,000	8	$105,207.47
Standard	49	$31,825	$16,231,000	2	$4,125.35
Preferred	0	$0	$0	6	$101,082.12
Total	**65**	**$41,270**	**$20,634,000**	**9**	**$110,400.51**

Source: FEMA Community Information System, accessed May 2025

C.2.3 WILDFIRE

Table C.9 summarizes the acreage in the Town of Cornelius that falls within the Functional Wildland Urban Interface (WUI), categorized into zones that describe the wildfire risk mitigation activities appropriate for each zone. Areas in the Functional WUI are those areas where development and building structures may intermix with burnable land cover. Approximately, 23 percent of the Town of Cornelius is categorized as having direct exposure to wildfire risk within the Functional WUI.

Table C.9 – Functional Wildland Urban Interface, Town of Cornelius

	Functional Wildland Urban Interface (WUI) Category	Acres	Percent
	Direct Exposure	1,885	23%
	Indirect Exposure	4,916	60%
	Critical Fireshed	527	6%
	Sources of Ember Load to Buildings	592	7%
	Little to No Exposure	0	0%
	Water	334	4%
	Total	**8,255**	**100%**

Source: Southern Wildfire Risk Assessment

Figure C.5 depicts the Functional WUI for the Town of Cornelius, including incorporated areas. Figure C.6 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure C.7 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Several clusters of direct exposure within the Functional WUI are found throughout the entirety of the Town. There are clusters of moderate and high potential fire intensity in eastern and central- and south-western Cornelius. Overall, the Town has a very low burn probability with moderate areas being found to the eastern and southern regions.

Table C.10 provides the count and estimated value of all structures that intersect with areas of the Town of Cornelius and participating jurisdictions that are rated moderate to high on the WUI Risk Index.

Table C.11 provides building counts and values for critical facilities by FEMA lifeline that are located in areas categorized with direct exposure to wildfire risk on the Functional WUI scale.

Table C.10 – Structures at Risk to Moderate-High WUI Risk Index, Town of Cornelius

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	43	$28,114,565.00	$28,114,565.00	$56,229,130.00
Education	6	$489,164.00	$489,164.00	$978,328.00
Government	3	$276,070.00	$276,070.00	$552,140.00
Industrial	14	$7,287,126.00	$10,930,689.00	$18,217,815.00
Religious	2	$731,427.00	$731,427.00	$1,462,854.00
Residential	1,544	$323,032,221.00	$161,516,110.50	$484,548,331.50
Total	**1,612**	**$359,930,573.00**	**$202,058,025.50**	**$561,988,598.50**

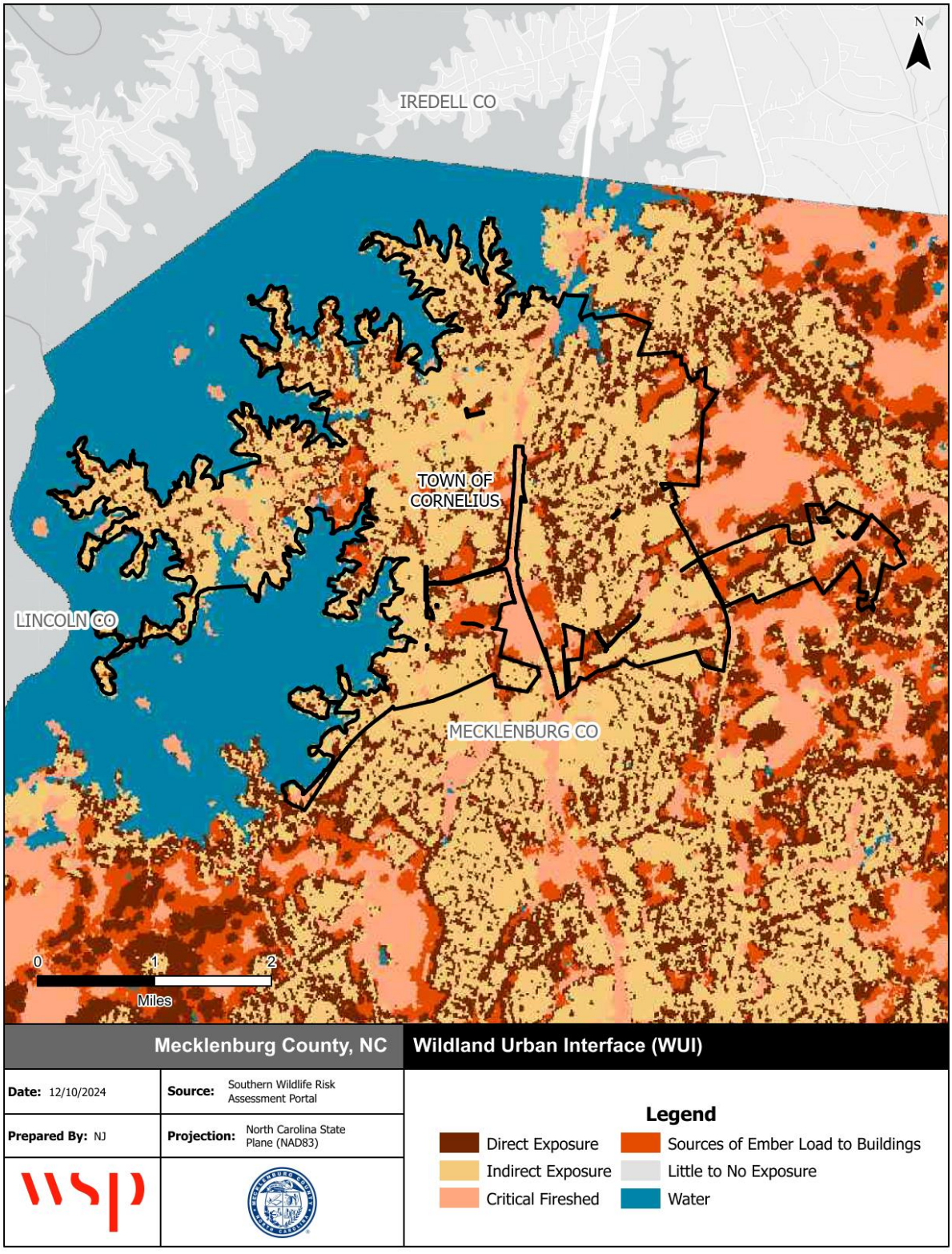
Source: Southern Wildfire Risk Assessment

Table C.11 – Critical Facilities Exposed to Wildfire, Town of Cornelius

Type	Critical Facility Count	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	2	$3,921,200
Hazardous Materials	0	$-
Health and Medical	0	$-
Safety and Security	0	$-
Transportation	0	$-
Water Systems	0	$-
Total	**2**	**$3,921,200**

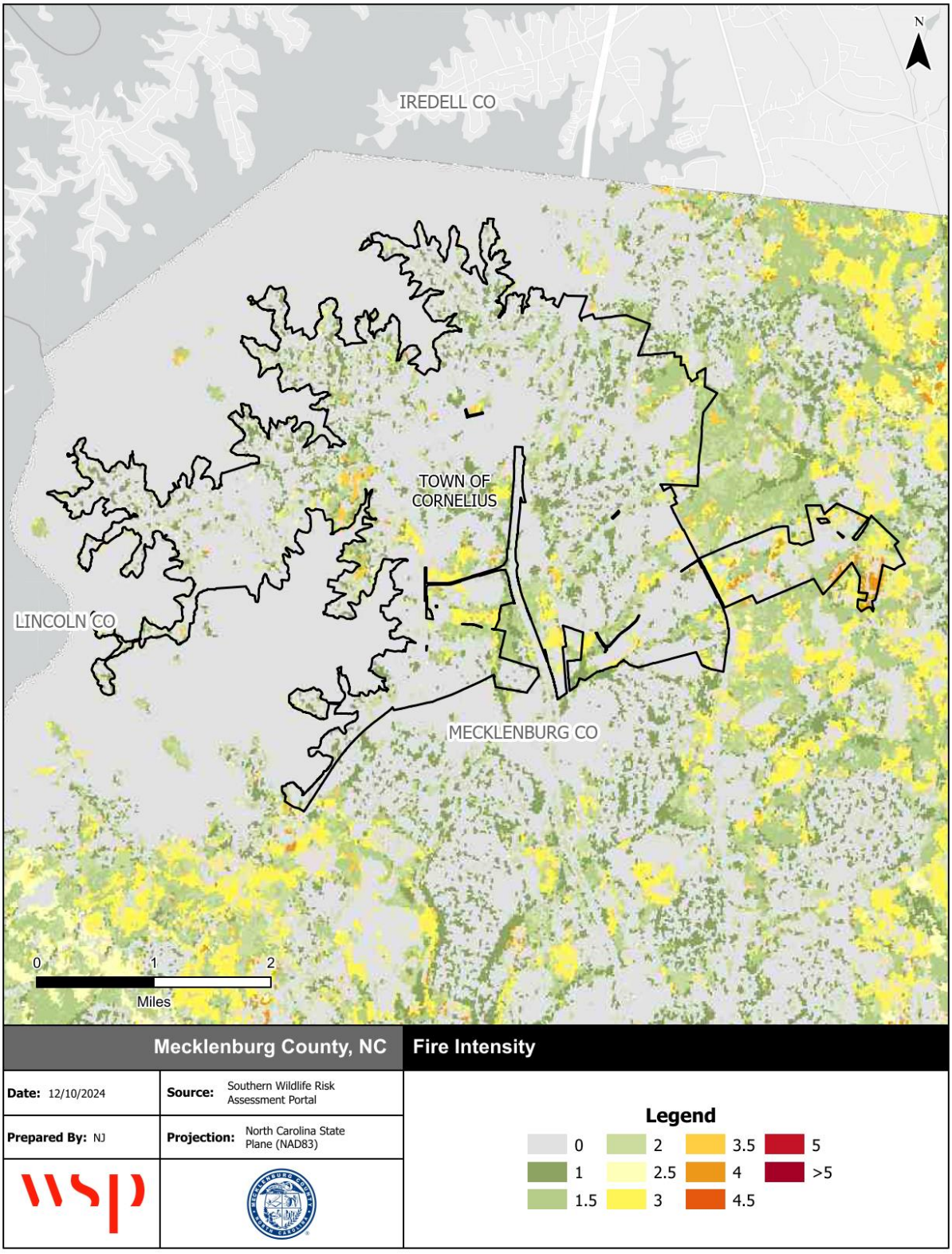
Source: Southern Wildfire Risk Assessment

Figure C.5 – Functional Wildland Urban Interface, Town of Cornelius



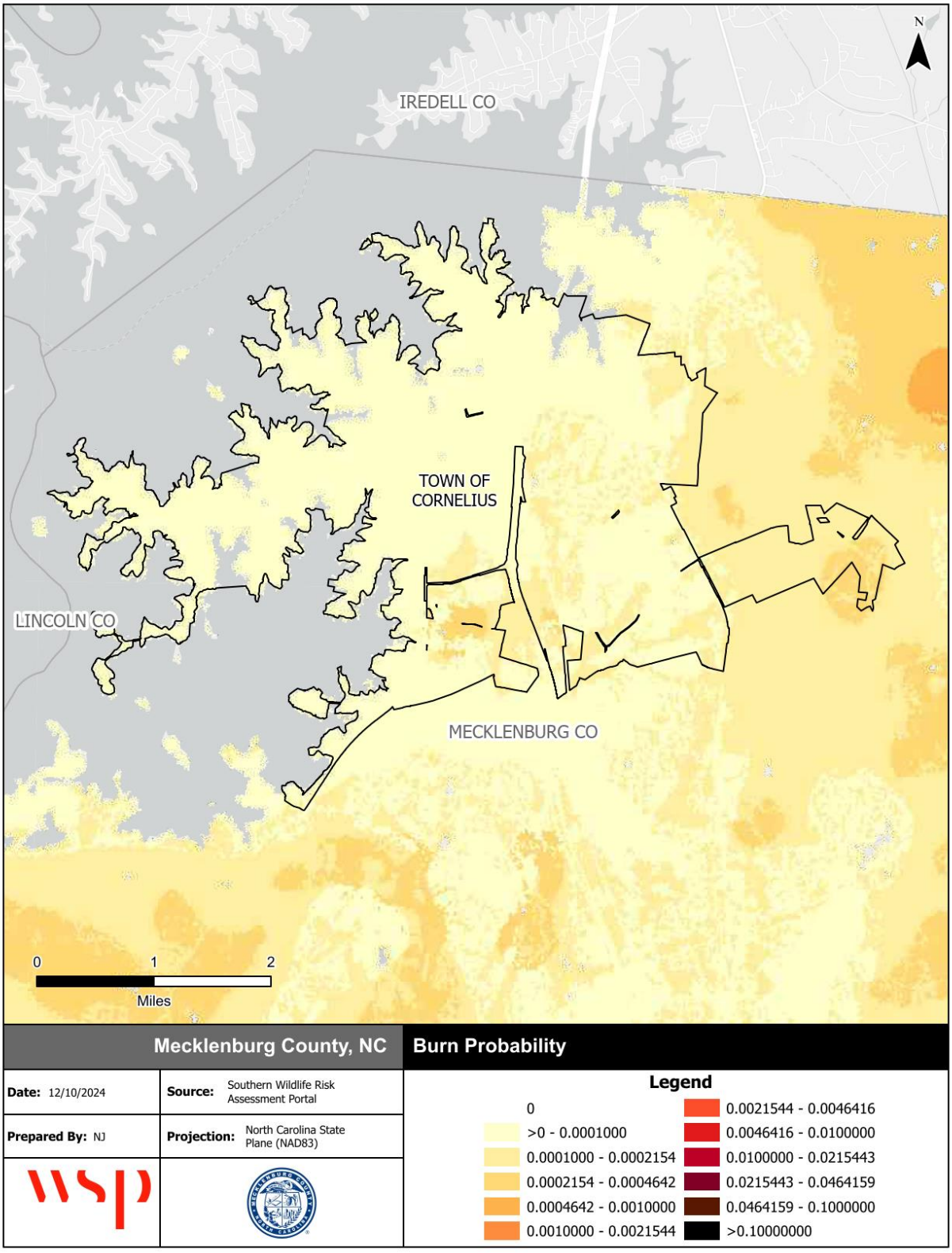
Source: Southern Wildfire Risk Assessment

Figure C.6 – Characteristic Fire Intensity, Town of Cornelius



Source: Southern Wildfire Risk Assessment

Figure C.7 – Burn Probability, Town of Cornelius



Source: Southern Wildfire Risk Assessment

C.3 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Cornelius-1	Implement storm water mitigation projects, including the grading of ditches and replacing failing/potentially failing storm water structures.	Flooding	1.2	High	Structural Projects	Town of Cornelius Public Works Department	$70,000	CMSWS funds, Grant funds	2025-2030	Carry Forward	Public Works identifies, prioritizes, and implements improvements annually.
Cornelius-2	Conduct an annual tabletop exercise addressing potential hazards faced by Town. This exercise would bring together representatives from all Town departments that would work together creating and implementing a plan to effectively deal with the hazard.	All Hazards	3.1	High	Emergency Services	Town of Cornelius Police Department and Public Works Department	$0	N/A	2025-2030	Carry Forward	No progress made due to limited staff availability and competing priorities.
Cornelius-3	Monitor utility companies, local, state, and federal websites and social media accounts, and push out information on the Town's website and social media platforms	All Hazards	2.1	High	Public Education & Awareness	Town of Cornelius Public Information Office	$0	N/A	2025-2030	Carry Forward	
Cornelius-4	Create or Update Community Wildfire Protection Plans in each fire district.	Wildfire	1.1, 2.1, 3.1	Medium	Prevention	Town of Cornelius Fire Department, NC Forest Service	TBD	Grant funds	2030	New	
Cornelius-5	Pursue the acquisition and/or elevation of high-risk flood prone properties.	Flooding	1.1	Medium	Property Protection	Charlotte-Mecklenburg Storm Water Services, Town of Cornelius Administration	TBD	Grant funds	2025-2030	New	
Cornelius-6	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	
Cornelius-7	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.

ANNEX D TOWN OF DAVIDSON

D.1 ASSET INVENTORY

The Town of Davidson and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table D.1 provides a count of critical facilities by FEMA lifeline category in the Town of Davidson. Figure D.1 shows the locations of all critical facilities in the Town of Davidson.

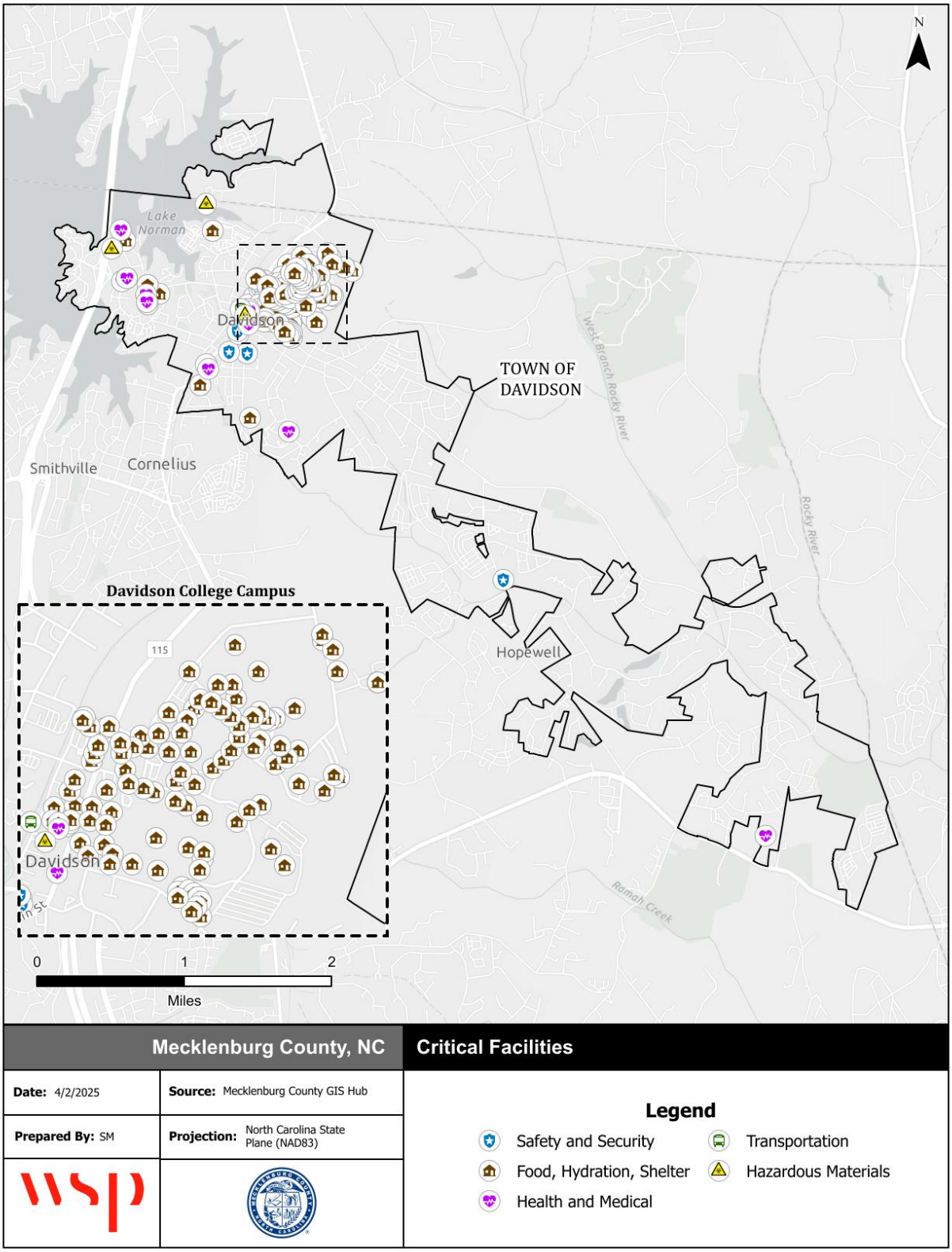
Table D.2 provides a detailed inventory of the critical facilities in the Town of Davidson, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table D.1 – Critical Facilities, Town of Davidson

Facility Type	Count of Facility Type	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	133	$19,844,005,900
Hazardous Materials	3	$26,628,800
Health and Medical	15	$24,663,300
Safety and Security	7	$16,912,100
Transportation	1	$-
Water Systems	0	$-
Total	**159**	**$19,912,210,100**

Source: Mecklenburg County, HMPC

Figure D.1 – Critical Facilities, Town of Davidson



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table D.2 – Critical Facilities Inventory, Town of Davidson

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Safety and Security	Local Government	251 South Street, Davidson NC 28036	$4,234,500	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Local Government	206 Walnut Street, Davidson NC 28036	-	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police/Fire/Emergency Operations Center	216 South Main Street, Davidson NC 28036	$2,804,300	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Health Care	400 Avinger Lane, Davidson NC 28036	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Health Care	635 Peninsula Drive, Davidson NC 28036	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Education	565 Griffith Street, Davidson NC 28036	$4,577,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Education	404 Armour Street, Davidson NC 28036	$8,320,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Education	750 Jetton Street, Davidson NC 28036	$13,806,600	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Manufacturing	800 Beatty Street, Davidson NC 28036	-	0.1	X Unshaded	Sources of Ember Load to Buildings	3.5
Food, Hydration, Shelter	Education	511 South Main Street, Davidson NC 28036	$506,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Health Care	16740 Davidson Concord Road, Davidson NC 28036	$24,307,900	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Manufacturing	525 Harbour Place Drive, Davidson NC 28036	$25,913,500	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	216 S MAIN ST	$2,804,300	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	19436 Davidson-Concord Rd	$921,200	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Solid Waste Facility	156 Jackson St.	$715,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	452 S. Main Street	$542,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	750 Jetton Street	$13,806,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	511 South Main Street	$506,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	709 Northeast Drive	$355,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	404 Armour Street	$8,320,400	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	624 JETTON ST	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	705 Griffith St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	705 Griffith St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	108 S Main St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	130 Harbour Place Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	903 Northeast Dr	$355,400	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	610 Jetton St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	130 Harbour Place Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	104 Knox Ct	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	130 Harbour Place Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	610 Jetton St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	460 S Main St	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	635 South Street	$17,283,500	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	133 GLASGOW STREET	$6,147,800	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	216 SOUTH MAIN STREET	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	405 N MAIN ST	$1,291,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	201 N MAIN ST	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	225 N MAIN ST	$365,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	215 RIDGE RD	$904,800	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	107 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Sources of Ember Load to Buildings	2
Food, Hydration, Shelter	Colleges	106 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	305 N MAIN ST	$70,700	0.1	X Unshaded	Direct Exposure	1
Food, Hydration, Shelter	Colleges	309 N MAIN ST	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	315 N MAIN ST	$6,489,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	206 JACKSON ST	$604,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	209 RIDGE RD	$904,800	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	Colleges	116 DEPOT ST	$143,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	213 N MAIN ST	$406,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	215 N MAIN ST	$406,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	413 N MAIN ST	$241,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	431 N MAIN ST	$302,100	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	439 N MAIN ST	$229,000	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	102 N MAIN ST	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	100 N MAIN ST	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	423 N MAIN ST	$966,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	103 MARTIN COURT DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	155 D RD	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	209 RIDGE RD D	$904,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	209 RIDGE RD C	$904,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	209 RIDGE RD B	$904,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	209 RIDGE RD A	$904,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	200 MARTIN COURT DR B	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	200 MARTIN COURT DR A	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	202 BAKER DR D	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	441 N MAIN ST	$229,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	109 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Sources of Ember Load to Buildings	1.5
Food, Hydration, Shelter	Colleges	100 NELSON LN 4	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	100 NELSON LN 3	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	100 NELSON LN 100	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	100 NELSON LN 2	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	100 NELSON LN 1	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	206 RIDGE RD	$214,690,500	0.1	X Unshaded	Direct Exposure	1
Food, Hydration, Shelter	Colleges	310 N MAIN ST	$214,690,500	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	Colleges	306 N MAIN ST	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	203 RIDGE RD	$904,800	0.1	X Unshaded	Sources of Ember Load to Buildings	1.5
Food, Hydration, Shelter	Colleges	308 N MAIN ST	$214,690,500	0.1	X Unshaded	Direct Exposure	2.5
Food, Hydration, Shelter	Colleges	214 N MAIN ST	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	216 N MAIN ST	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	202 D RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	225 BAKER DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	203 FACULTY DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	205 FACULTY DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	201 FACULTY DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	108 NELSON LN	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	135 GLASGOW ST	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	106 NELSON LN	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	109 ARCHER LN	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	125 DELBURG ST	$229,000	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	129 DELBURG ST	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	112 DEPOT ST	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	205 RIDGE RD	-	0.1	X Unshaded	Direct Exposure	1
Food, Hydration, Shelter	Colleges	133 DELBURG ST	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	161 RIDGE RD	-	0.1	X Unshaded	Sources of Ember Load to Buildings	1.5
Food, Hydration, Shelter	Colleges	506 N MAIN ST	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	133 GLASGOW ST	$6,147,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	104 NELSON LN	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	102 NELSON LN	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	100 NELSON LN	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	202 BAKER DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	Colleges	104 FACULTY DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	200 BAKER DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	323 CONCORD RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	200 D RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	433 CONCORD RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	102 FACULTY DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	120 GLASGOW ST	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	225 CONCORD RD	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	408 N MAIN ST	$214,690,500	0.1	X Unshaded	Direct Exposure	1
Food, Hydration, Shelter	Colleges	420 N MAIN ST	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	421 CONCORD RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	423 CONCORD RD	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	425 CONCORD RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	427 CONCORD RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	429 CONCORD RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	430 N MAIN ST	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	431 CONCORD RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	217 CONCORD RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	325 CONCORD RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	100 FACULTY DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	113 DORMITORY DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	111 DORMITORY DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	109 DORMITORY DR	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	105 DORMITORY DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	103 DORMITORY DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	101 DORMITORY DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	107 DORMITORY DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	302 BAKER DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	Colleges	300 BAKER DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	304 BAKER DR	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	207 RIDGE RD	$214,690,500	0.1	X Unshaded	Direct Exposure	3
Food, Hydration, Shelter	Colleges	407 RIDGE RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	403 RIDGE RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	405 RIDGE RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	409 RIDGE RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	410 RIDGE RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	406 RIDGE RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	408 RIDGE RD	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	204 BAKER DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	110 NELSON LN	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	101 MARTIN COURT DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	104 MARTIN COURT DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	200 MARTIN COURT DR	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	201 MARTIN COURT DR	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	202 MARTIN COURT DR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	203 MARTIN COURT DR	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	205 MARTIN COURT DR	$214,690,500	0.1	X Unshaded	Direct Exposure	2
Food, Hydration, Shelter	Colleges	119 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	115 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	113 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	111 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	126 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	124 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	122 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	120 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	118 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	Colleges	116 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	114 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	112 PATTERSON COURT CR	$214,690,500	0.1	X Unshaded	Indirect Exposure	0

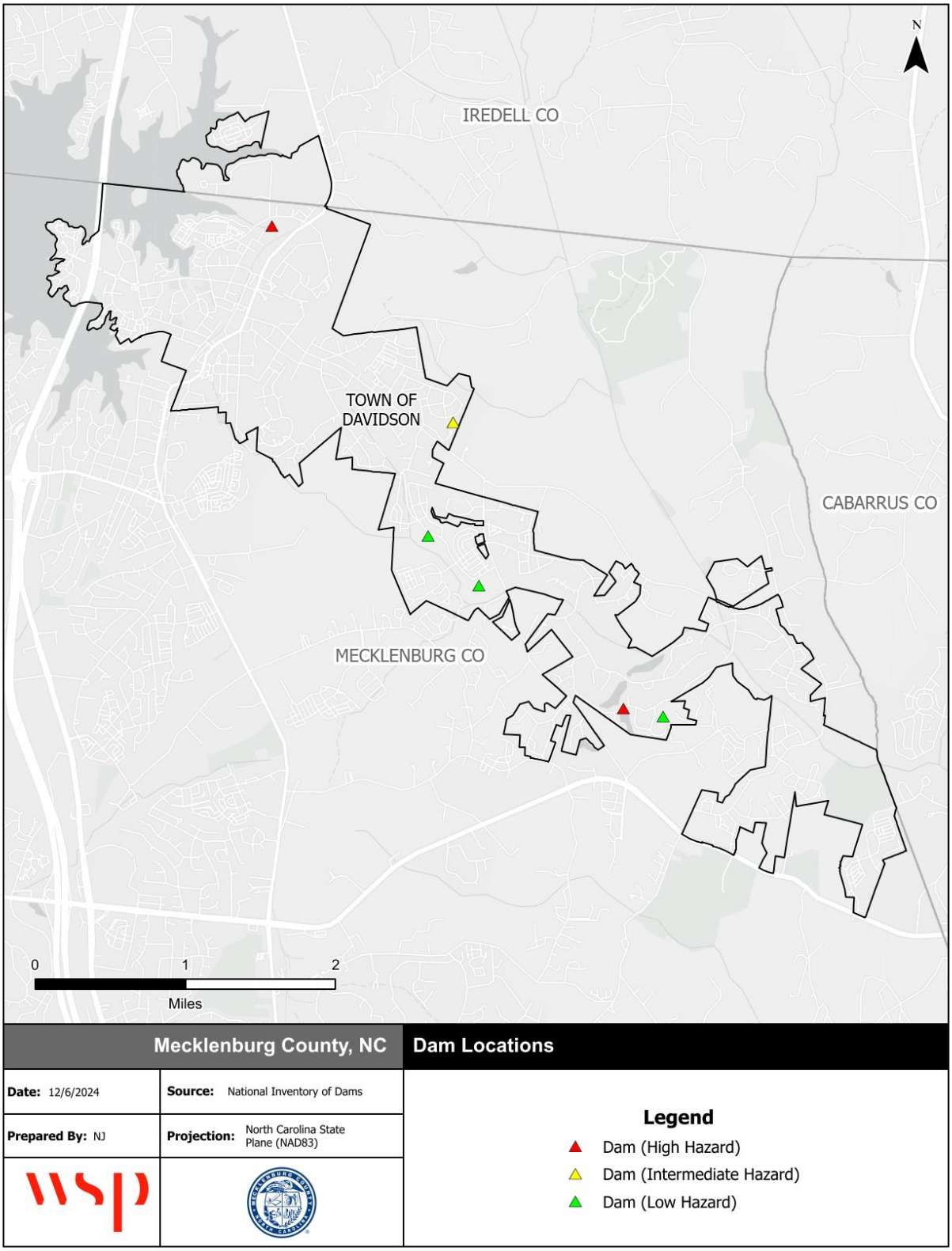
D.2 RISK ASSESSMENT

This section contains a summary of the Town's asset inventory as well as hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Dam Failure, Flood, and Wildfire.

D.2.1 DAM FAILURE

Currently, the Town of Davidson has no high hazard dams that have been identified by the North Carolina Dam Inventory with a condition assessment of "fair" or "poor." Figure D.2 shows the location of all dams in the Town of Davidson.

Figure D.2 – Dam Inventory, Town of Davidson



Source: NC Dam Inventory, December 2024

D.2.2 FLOODING

Table D.3 details the acreage of the Town of Davidson's total area by flood zone on the effective DFIRM. Per this assessment, over 12 percent of the Davidson falls within the mapped 1%-annual-chance floodplains.

Table D.3 – Flood Zone Acreage in the Town of Davidson

Flood Zone	Acreage	Percent of Total (%)
Zone AE	494.3	12.3
Zone X (500-year)	0.00	0.0
Zone X Unshaded	3,518.4	87.7
Total	**4,012.7**	**100.0**

Source: FEMA Effective DFIRM

Figure D.3 reflects the effective mapped flood hazard zones for the Town of Davidson, and Figure D.4 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

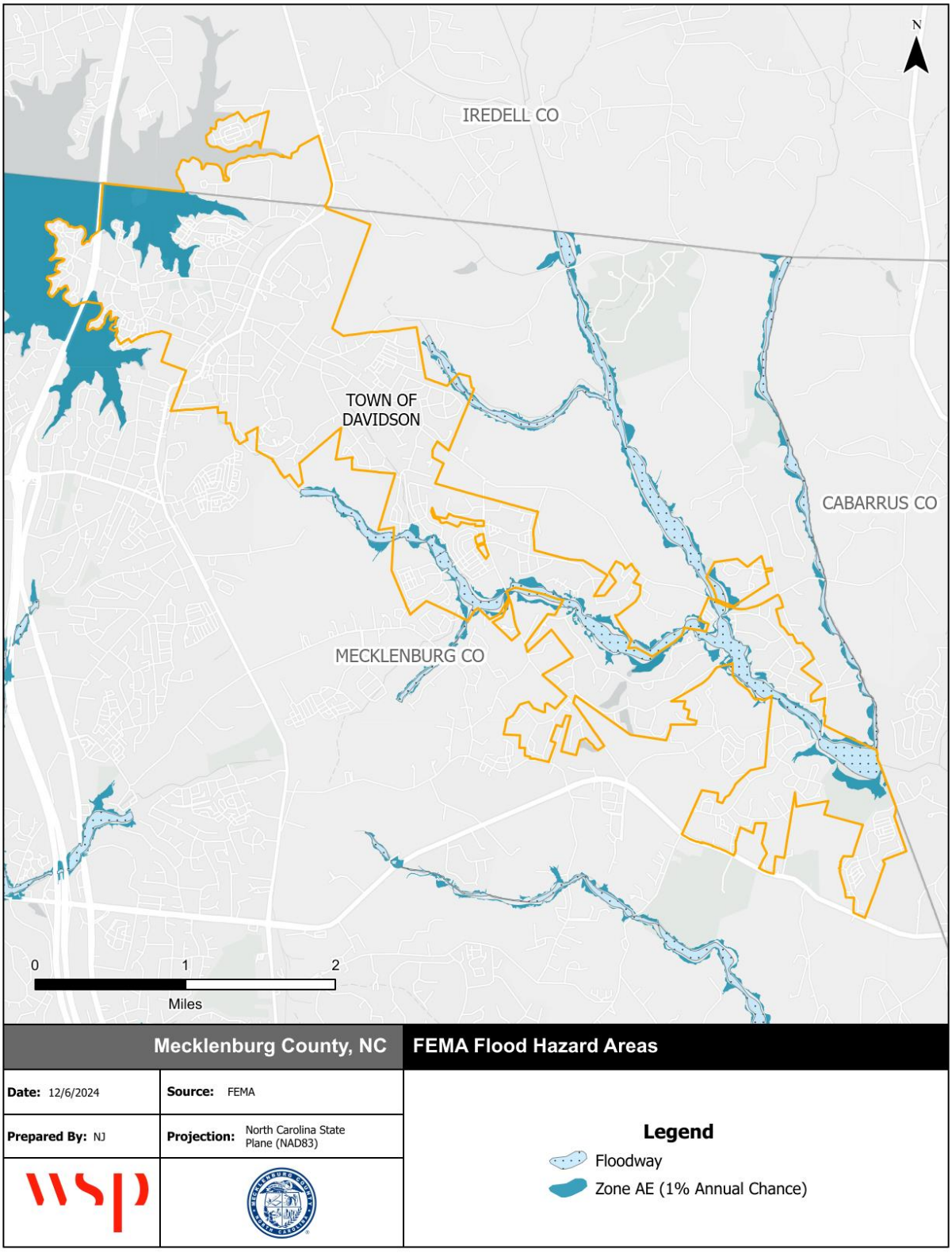
Table D.4 provides building counts and values for critical facilities by flood zone in the Town of Davidson.

Table D.4 – Critical Facilities Exposed to Flooding, Town of Davidson

Flood Zone	Critical Facility Count	Structure Value
Zone AE	0	$0
Zone X (500-year)	0	$0
Zone X Unshaded	159	$19,912,210,100
Total	**159**	**$19,912,210,100**

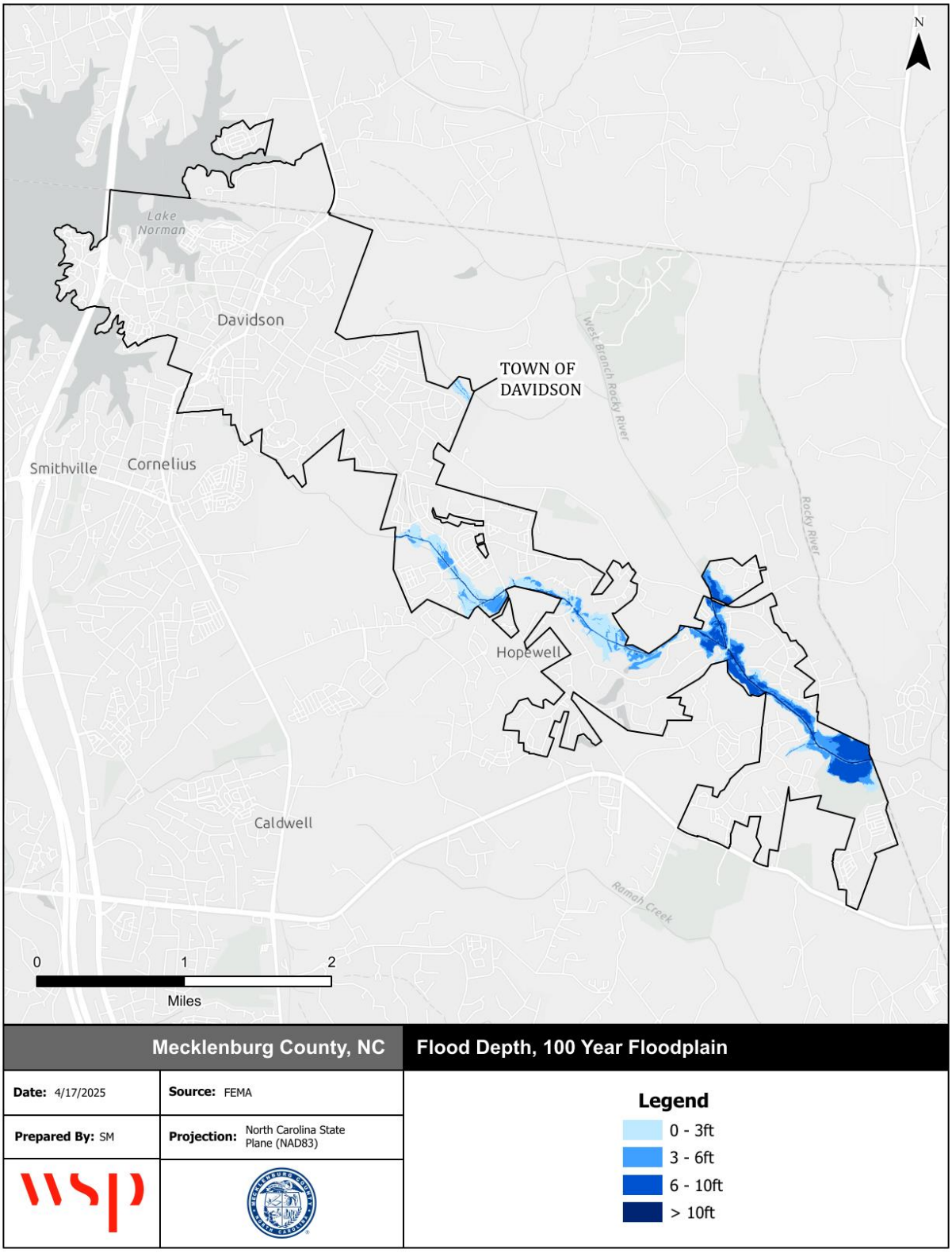
Source: FEMA Effective DFIRM, HMPC

Figure D.3 – FEMA Flood Hazard Areas, Town of Davidson



Source: FEMA Effective DFIRM

Figure D.4 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Davidson



Source: FEMA Effective DFIRM

FLOOD INSURANCE DATA

The Town of Davidson joined the NFIP through regular entry in October 1997 and has been a regular participant since. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table D.5 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	35	$22,263	$11,409,000	2	$4,942.45
All Other Residential	2	$956	$592,000	1	$19,648.36
Total	**37**	**$23,219**	**$12,001,000**	**3**	**$24,590.81**

Source: FEMA Community Information System, accessed May 2025

Table D.6 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	9	$6,145	$2,892,000	0	$0.00
B, C & X Zone					
Standard	28	$17,074	$9,109,000	0	$0.00
Preferred	0	$0	$0	3	$24,590.81
Total	**37**	**$23,219**	**$12,001,000**	**3**	**$24,590.81**

Source: FEMA Community Information System, accessed May 2025

Table D.7 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	9	$6,145	$2,892,000	0	$0.00
B, C & X Zone	28	$17,074	$9,109,000	3	$24,590.81
Standard	28	$17,074	$9,109,000	0	$0.00
Preferred	0	$0	$0	3	$24,590.81
Total	**37**	**$23,219**	**$12,001,000**	**3**	**$24,590.81**

Source: FEMA Community Information System, accessed May 2025

D.2.3 WILDFIRE

Table D.8 summarizes the acreage in the Town of Davidson that falls within the Functional Wildland Urban Interface (WUI), categorized into zones that describe the wildfire risk mitigation activities appropriate for each zone. Areas in the Functional WUI are those areas where development and building structures may intermix with burnable land cover. Approximately, 28 percent of the Town of Davidson is categorized as having direct exposure to wildfire risk within the Functional WUI.

Table D.8 – Functional Wildland Urban Interface, Town of Davidson

	Functional Wildland Urban Interface (WUI) Category	Acres	Percent
	Direct Exposure	1,131	28%
	Indirect Exposure	1,843	45%
	Critical Fireshed	589	14%
	Sources of Ember Load to Buildings	402	10%
	Little to No Exposure	0	0%
	Water	146	4%
	Total	**4,111**	**100%**

Source: Southern Wildfire Risk Assessment

Figure D.5 depicts the Functional WUI for the Town of Davidson, including incorporated areas. Figure D.6 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure D.7 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Areas of direct exposure to wildfire can be found scattered throughout the town with some larger clusters occurring in the central and southern regions. There are clusters of high to moderate potential fire intensity throughout Davidson, primarily in the northern and southeastern edges of the Town. Overall, the Town has a very low burn probability with the largest area of moderate burn probability occurring northeast of the Town limits.

Table D.9 provides the count and estimated value of all structures that intersect with areas of the Town of Davidson and participating jurisdictions that are rated moderate to high on the WUI Risk Index.

Table D.10 provides building counts and values for critical facilities by FEMA lifeline that are located in areas categorized with direct exposure to wildfire risk on the Functional WUI scale.

Table D.9 – Structures at Risk to Moderate-High WUI Risk Index, Town of Davidson

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	32	$16,896,419.00	$16,896,419.00	$33,792,838.00
Education	6	$4,559,693.00	$4,559,693.00	$9,119,386.00
Government	5	$693,353.00	$693,353.00	$1,386,706.00
Industrial	3	$1,210,878.00	$1,816,317.00	$3,027,195.00
Religious	2	$2,575,967.00	$2,575,967.00	$5,151,934.00
Residential	778	$207,760,921.00	$103,880,460.50	$311,641,381.50
Total	**826**	**$233,697,231.00**	**$130,422,209.50**	**$364,119,440.50**

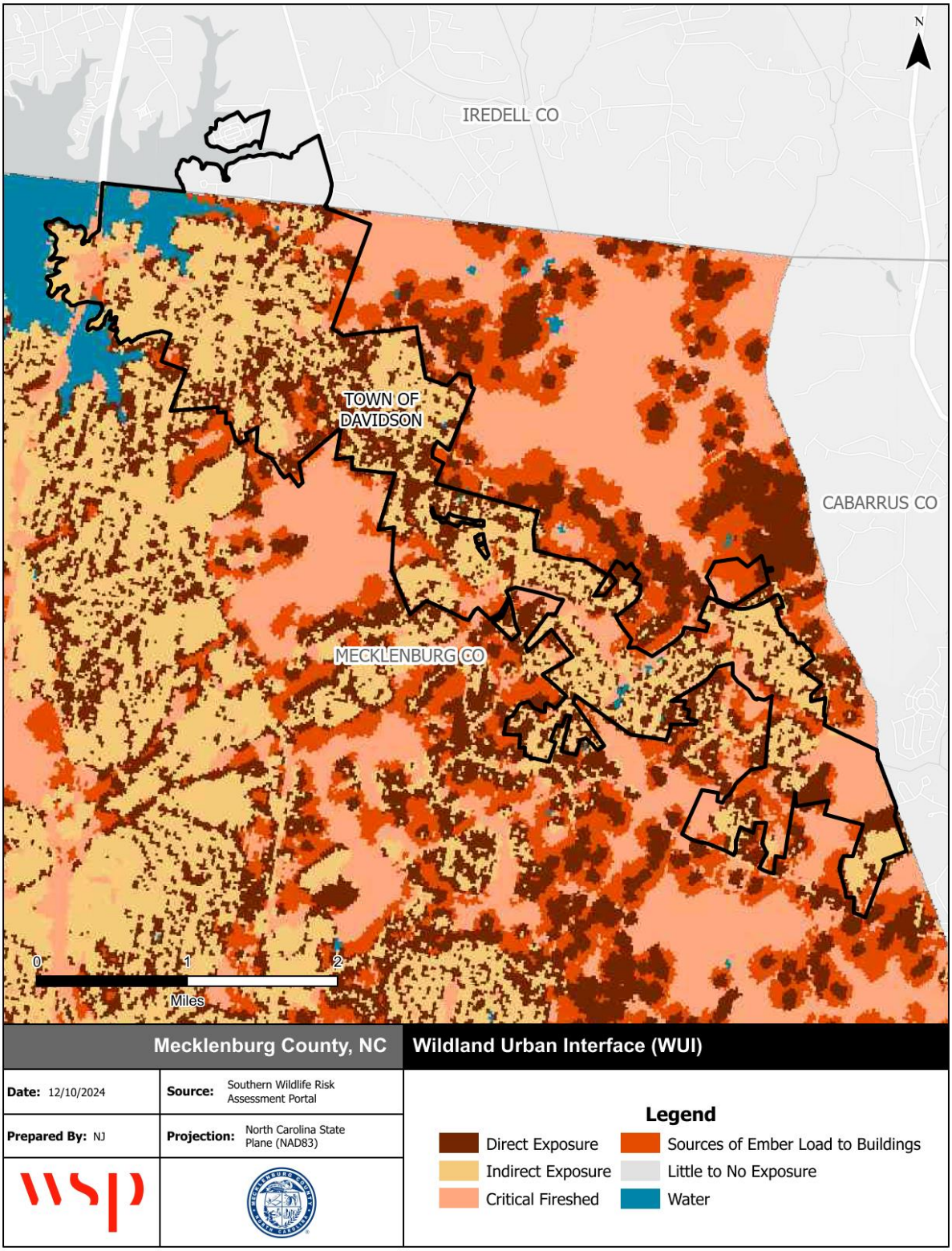
Source: Southern Wildfire Risk Assessment

Table D.10 – Critical Facilities Exposed to Wildfire, Town of Davidson

Type	Critical Facility Count	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	25	$4,080,855,100
Hazardous Materials	0	$-
Health and Medical	0	$-
Safety and Security	0	$-
Transportation	0	$-
Water Systems	0	$-
Total	**25**	**$4,080,855,100**

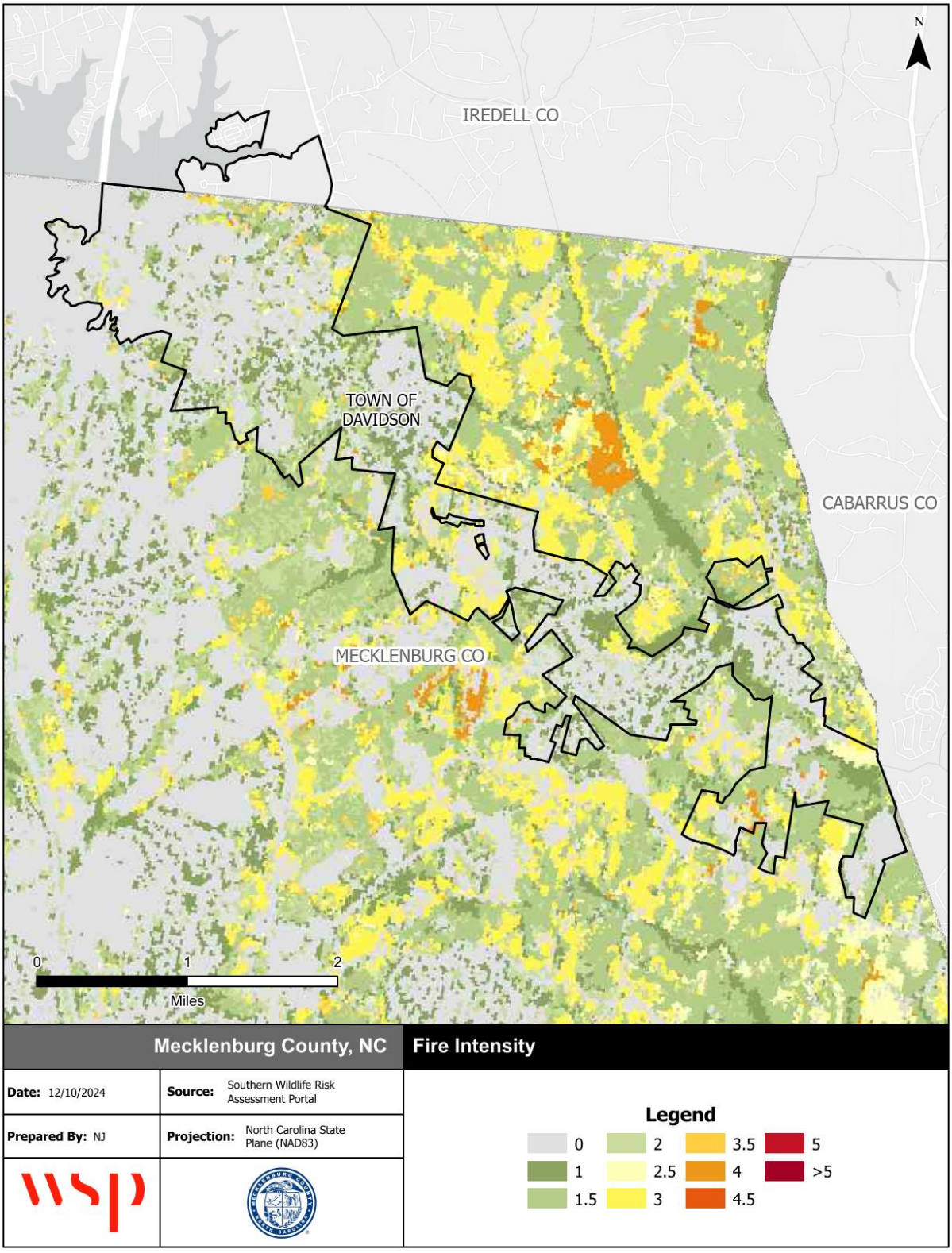
Source: Southern Wildfire Risk Assessment

Figure D.5 – Functional Wildland Urban Interface, Town of Davidson



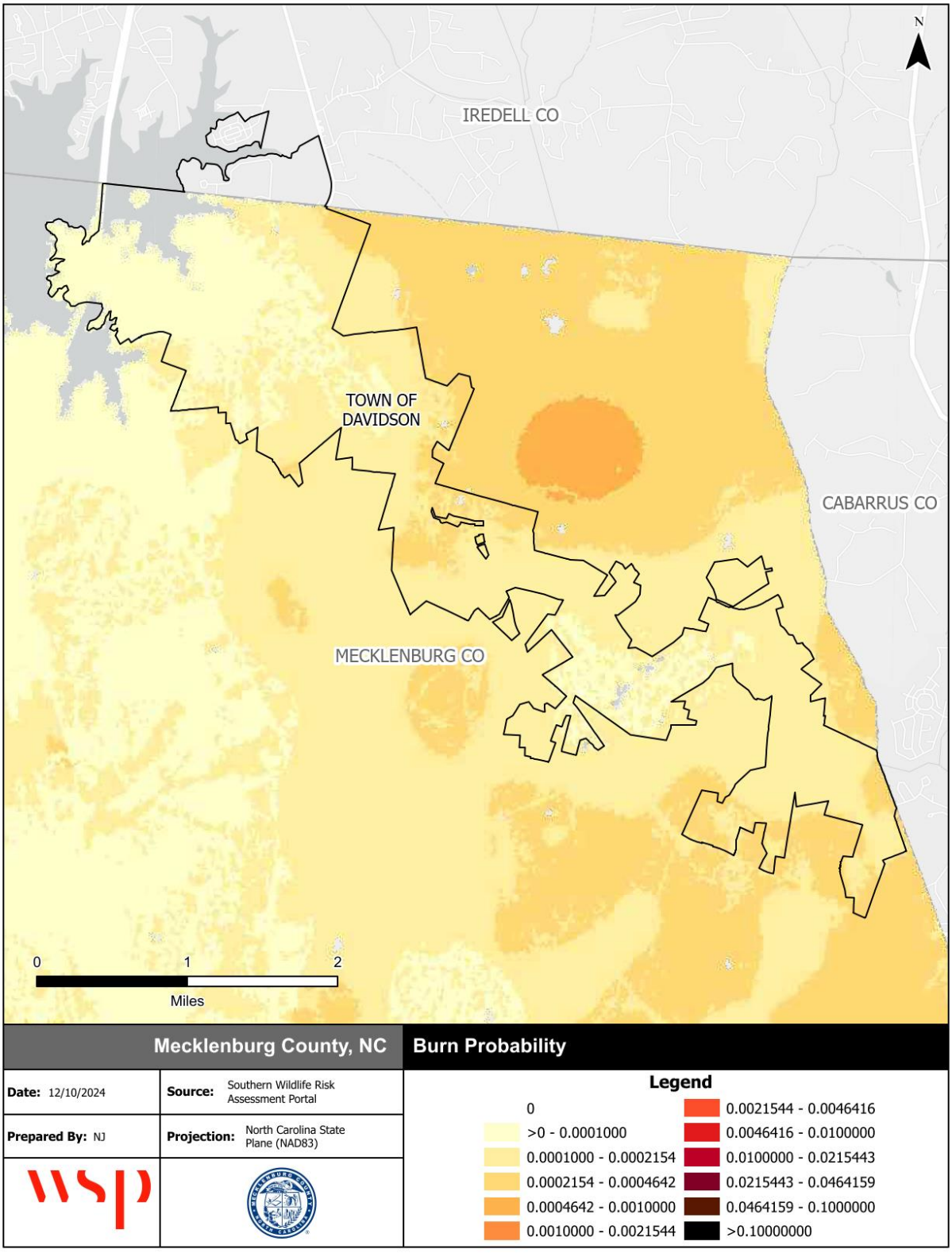
Source: Southern Wildfire Risk Assessment

Figure D.6 – Characteristic Fire Intensity, Town of Davidson



Source: Southern Wildfire Risk Assessment

Figure D.7 – Burn Probability, Town of Davidson



Source: Southern Wildfire Risk Assessment

D.3 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Davidson-1	Seek grant funding to retrofit critical facilities and Town-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, 320 or 361 compliant safe rooms, lightning protection, hail resistant roofing, and anchoring fixed building equipment.	All Hazards	1.3	Medium	Property Protection	Town of Davidson	To be determined on a case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	All Public Safety Facilities in town are equipped with back-up generator service. Design will be starting on new Fire Station #1 which will include resilience design and building features.
Davidson-2	Seek grant funding to install backup generators or quick connect hook ups for mobile generators on any newly constructed county/town critical facilities.	All Hazards	1.3	Medium	Property Protection	Town of Davidson	To be determined on a case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	Grant money is being pursued to upfit Town Hall with generator service.
Davidson-3	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standards (in addition to basic required compliance actions): a) Require critical facilities protection to 500-year flood levels b) Require parking lots to be elevated (no more than six inches deep in any parking space during Community Flood event) c) Require dry land access for new or substantially improved buildings (above Community Base Flood Elevation) d) Levee restrictions e) Floors of new or substantially improved buildings allowed by variance in the floodplain must be elevated at least one (1) foot above the Community (future) Base Flood Elevation. f) Prohibit basements below flood level on filled lots	Flooding	4.1	High	Prevention	Planning Department, Public Works Department, in coordination with CMEMO	Staff time	N/A	2025-2030	Carry Forward	The Town has maintained compliance with the NFIP.
Davidson-4	Implement recommendations of the 2006 Tree Canopy Inventory including pruning and removal of branches and trees that threaten public utilities and structures	Hurricane & Tropical Storm, Tornadoes & Thunderstorms, Severe Winter Weather, Wildfire	1.2	Medium	Prevention	Planning Department, Public Works Department	Staff time and resources	N/A	2025-2030	Carry Forward	Town has increased tree budget again and has completed another tree inventory. Started removals of most dangerous trees first. Continue tree pruning yearly. Hired a full-time arborist on staff to manage inventory and create a canopy management plan.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Davidson-5	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for mitigating and preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.1	Medium	Public Education & Awareness	Planning Department, Public Works Department, in coordination with CMEMO	Staff time and resources	N/A	2025-2030	Carry Forward	The town has made significant strides in enhancing the local Emergency Management capabilities. Town staff coordinates with CMEMO on a regular basis for messaging and programming.
Davidson-6	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management to provide information on all natural hazards facing the area to local planning staff and elected officials. This should be combined with an annual progress report on the status of local mitigation actions as identified in the Multi-jurisdictional Hazard Mitigation Plan.	All Hazards	3.1	Medium	Public Education & Awareness	Planning Department, in coordination with CMEMO	Staff time and resources	N/A	2025-2030	Carry Forward	The town has made significant strides in enhancing the local Emergency Management capabilities. Town staff coordinates with CMEMO on a regular basis for messaging and programming
Davidson-7	Develop growth policies that account for identified hazard areas	Flooding, Tornadoes & Thunderstorms	4.1	High	Prevention	Planning Department	Staff time and resources	N/A	2025-2030	Carry Forward	A new comprehensive plan is current and regularly updated. Tree budget has increased, and pruning/removals are continuing as needed.
Davidson-8	Implement stormwater management plan.	Flooding	4.1	High	Prevention	Public Works Department	$50,000	NRCS-Watershed Protection and Flood Prevention Program, NRCS-Watershed Surveys and Planning, USACE-Floodplain Management Services, HMGP	2025-2030	Carry Forward	Stormwater Management Plan was approved and implementation of recommended projects is underway. Beatty Dam has another leak since the repairs made in 2014. Engineers are currently working on solutions.
Davidson-9	Develop and publish town specific Comprehensive Emergency Management Plan (CEMP)	All Hazards	3.1	High	Prevention, Emergency Services	Fire Department, town Emergency Management personnel, in coordination with CMEMO and community partners	$48,000	UASI has covered a portion and the town will supplement with FY26 budget allocation	2026	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Davidson-10	Develop and publish town specific Continuity of Operations Plan (COOP)	All Hazards	3.1	High	Prevention, Emergency Services	Town Emergency Management personnel in coordination with all town departments	$40,000	State, federal grant funding. Town allocated funding as part of FY27 budget process	2027	New	
Davidson-11	Establish an annual tabletop exercise/training for town staff with the implementation of the CEMP and COOP	All Hazards	3.1	High	Prevention, Emergency Services	Town Emergency Management personnel in coordination with all town departments	$5,000 to $10,000 if contracted out. Staff time if conducted internally	State, federal grant funding. Allocation of town funding with future budget processes.	2028	New	
Davidson-12	Study feasibility of establishing and implementing a Community Emergency Response Team (CERT) for the Davidson Community	All Hazards	3.1	Medium	Prevention, Emergency Services	Town Emergency Management personnel in coordination with CMEMO	Unknown at this time	State and federal funding. Potential town funding with annual budget process.	2025-2030	New	
Davidson-13	Create or Update Community Wildfire Protection Plans in each fire district.	Wildfire	1.1, 2.1, 3.1	Medium	Prevention	Town of Davidson Fire Department, NC Forest Service	To be determined	Grant funds	2030	New	
Davidson-14	Pursue the acquisition and/or elevation of high-risk flood prone properties.	Flooding	1.1	Medium	Property Protection	Charlotte-Mecklenburg Storm Water Services, Town of Davidson Administration	To be determined	Grant funds	2025-2030	New	
Davidson-15	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	
Davidson-16	Implement drainage improvement projects to reduce stormwater flooding.	Flooding	1.2	Medium	Structural Projects	Davidson Public Works	To be determined	Local funds, Grant funds	2025-2030	New	
Davidson-17	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.

ANNEX E TOWN OF HUNTERSVILLE

E.1 ASSET INVENTORY

The Town of Huntersville and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table E.1 provides a count of critical facilities by FEMA lifeline category in the Town of Huntersville. Figure E.1 shows the locations of all critical facilities in the Town of Huntersville.

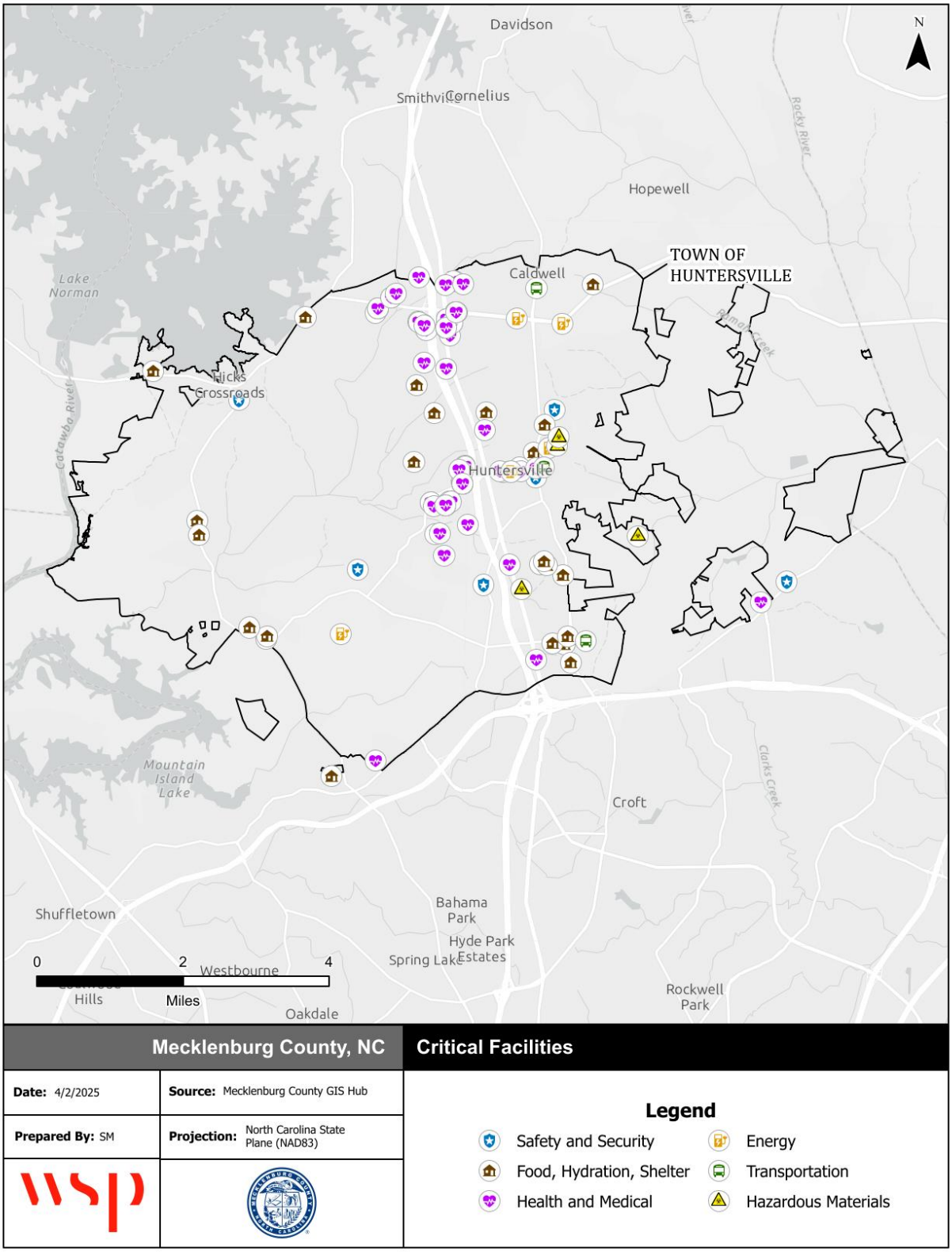
Table E.2 provides a detailed inventory of the critical facilities in the Town of Huntersville, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table E.1 – Critical Facilities, Town of Huntersville

Facility Type	Count of Facility Type	Structure Value
Communications	0	$-
Energy	6	$2,786,800
Food, Hydration, Shelter	23	$404,754,400
Hazardous Materials	4	$267,500
Health and Medical	82	$5,229,200
Safety and Security	10	$71,770,500
Transportation	3	$-
Water Systems	0	$-
Total	**128**	**$484,808,400**

Source: Mecklenburg County, HMPC

Figure E.1 – Critical Facilities, Town of Huntersville



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table E.2 – Critical Facilities Inventory, Town of Huntersville

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Safety and Security	Government Office	416 Seagle Street	$604,300	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Government Office	105 Gilead Rd	$18,399,800	0.1	X Unshaded	Indirect Exposure	0
Energy	Energy	10626 Sam Furr Rd	-	0.1	X Unshaded	Sources of Ember Load to Buildings	3
Energy	Energy	11001 McCoy Rd	$2,249,700	0.1	X Unshaded	Direct Exposure	0
Safety and Security	Government Office	14704 N. Old Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Energy	Energy	103 3rd Street	-	0.1	X Unshaded	Indirect Exposure	0
Energy	Energy	01931117 Parcel Number	-	0.1	X Unshaded	Indirect Exposure	0
Energy	Energy	11316 Sam Furr Rd	$537,100	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	12101 Mt Holly Huntersville	$5,563,100	0.1	X Unshaded	Indirect Exposure	0
Energy	Energy	00902201 Parcel Number	-	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Landfill	15330 Holbrooks Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	12717 Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14230 Hunters Rd	$474,600	0.1	X Unshaded	Direct Exposure	1
Food, Hydration, Shelter	Soup Kitchen	15106 N Old Statesville Rd	$137,600	0.1	X Unshaded	Direct Exposure	2
Hazardous Materials	Landfill	11644 PROVIDENCE RD	-	0.1	X Unshaded	Sources of Ember Load to Buildings	2
Hazardous Materials	Landfill	11644 PROVIDENCE RD	-	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	15600 BEATTIES FORD RD	$211,600	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	110 S OLD STATESVILLE RD	$1,513,100	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	13423 EASTFIELD RD	$2,946,900	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	8826 MCILWAINE RD	$1,654,000	0.1	X Unshaded	Indirect Exposure	0
Hazardous Materials	Solid Waste Facility	12300 N. Statesville Road	$267,500	0.1	X Unshaded	Critical Fireshed	0
Food, Hydration, Shelter	School	2520 Ambassador Christi	$7,963,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	14101 Stumptown Road	$1,266,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	15115 Norman View Lane	$2,529,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	14813 N. Old Statesville Rd.	$5,494,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	13820 Hagers Ferry Rd.	$7,484,200	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	14750 Stumptown Road	$13,065,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	11414 Beatties Ford Road	$621,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	12435 Old Statesville Road	$14,346,500	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7125 Hambright Rd	$9,409,900	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	17220 Northcross Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	6909 Prosperity Church Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10030 Gilead Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16525 Holly Crest Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9727 Northcross Center Ct	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16455 Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16419 Northcross Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9713 Northcross Center Ct	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	15419 Hodges Cir	-	0.1	X Unshaded	Direct Exposure	2
Health and Medical	Medical Facilities	10305 Hamptons Park Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9710 Sam Furr Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9630 Sherrill Estates Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9710 Sam Furr Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10030 Gilead Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9800 Kincey Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10225 Hickorywood Hill Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16405 Northcross Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	13808 Professional Center Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	215 Gilead Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16511 Northcross Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	12905 ROSEDALE HILL AV	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16525 Birkdale Commons Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9801 Kincey Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10030 Gilead Rd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	10215 Hickorywood Hill Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9601 Holly Point Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11208 STATESVILLE RD	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14330 Oakhill Park Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	403 Gilead Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10030 Gilead Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9625 Northcross Center Ct	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9735 Kincey Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9604 Holly Point Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16455 Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16455 Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9601 Holly Point Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10030 Gilead Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14311 Reese Blvd W	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	9735 Kincey Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16455 Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10030 Gilead Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9735 Kincey Av	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10305 Hamptons Park Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9735 Kincey Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16325 Northcross Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10030 Gilead Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9710 Sam Furr Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16455 Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9800 Kincey Av	$4,754,600	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16455 Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9718 Sam Furr Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	15419 Hodges Cir	-	0.1	X Unshaded	Direct Exposure	2

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	8712 Lindholm Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9820 Northcross Center Ct	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14330 Oakhill Park Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9615 Kincey Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8801 Mercia Ave	-	0.1	X Unshaded	Direct Exposure	1.5
Health and Medical	Medical Facilities	13620 Reese Blvd E	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	9726 Sam Furr Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	15806 Brookway Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9601 Holly Point Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16610 Birkdale Commons Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16610 Birkdale Commons Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16610 Birkdale Commons Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16455 Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16525 Holly Crest Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16455 Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	103 Commerce Centre Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	14330 Oakhill Park Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9735 Kincey Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16419 Northcross Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16501 Northcross Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9735 Kincey Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	13220 Rosedale Hill Ave	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	102 N Statesville Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9718 Sam Furr Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16405 Northcross Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	8712 Lindholm Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10030 Gilead Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	16735 Cranlyn Rd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	Colleges	11930 Verhoeff Dr	$36,358,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	13659 Beatties Ford Road	$23,940,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	12202 Hambright Road	$39,413,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	13345 Beatties Ford Road	$23,940,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	15410 Stumptown Road	$14,152,000	0.1	X Unshaded	Critical Fireshed	0
Food, Hydration, Shelter	School	11530 Beatties Ford Road	$43,977,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	200 Gilead Road	$9,109,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	12010 Hambright Road	$39,413,800	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9213 Beatties Ford Road	$13,384,600	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	11201 Old Statesville Road	$15,520,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	14550 Ranson Road	$12,745,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	11930 Verhoeff Drive	$36,358,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	12201 Hambright Rd	$34,119,900	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		-	0.1	X Unshaded	Critical Fireshed	0
Safety and Security	Police Station	11930 VERHOEFF DRIVE, CRIMINAL JUSTICE BUILDING	$36,358,300	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	9630 JULIAN CLARK AVENUE	$4,519,400	0.1	X Unshaded	Indirect Exposure	0

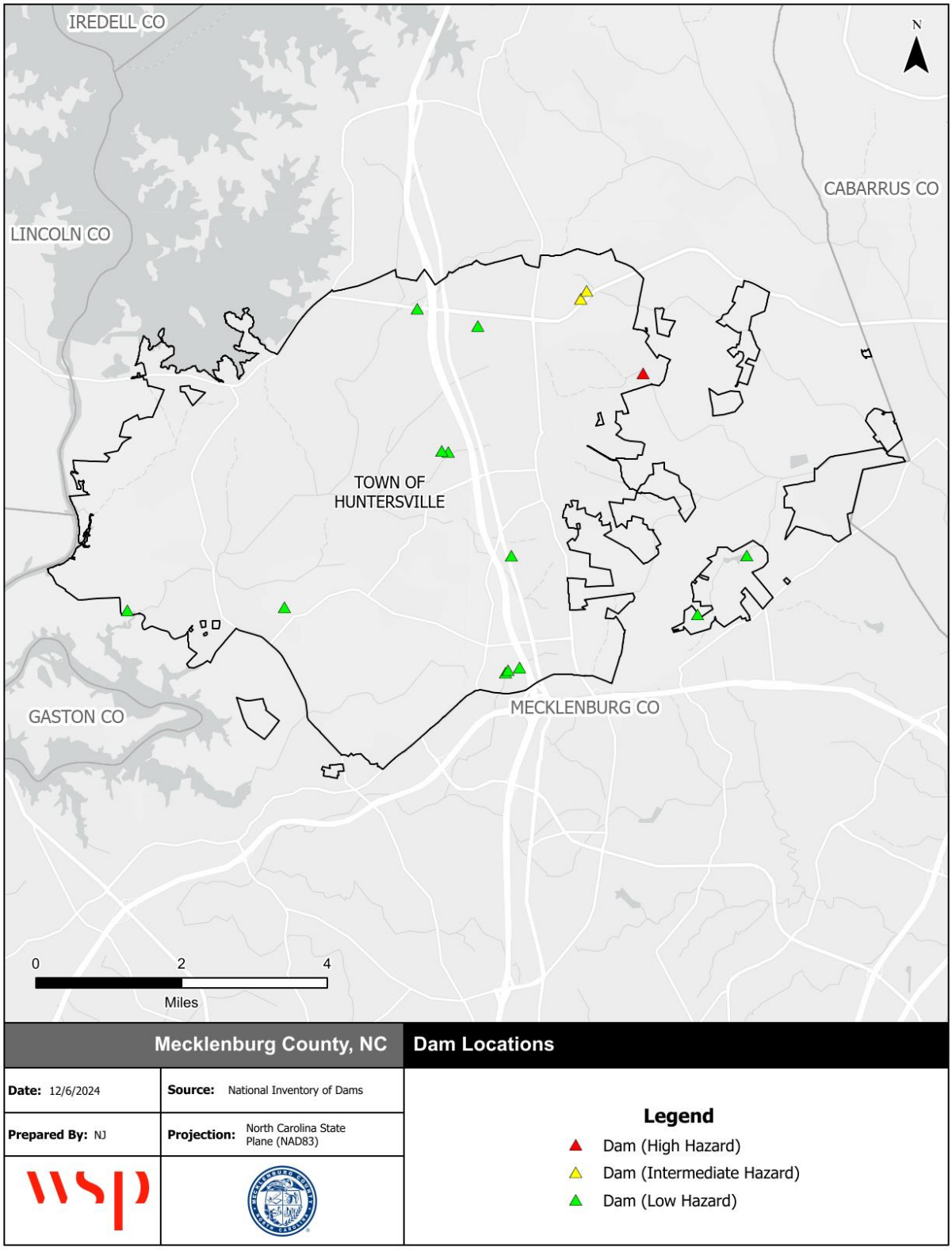
E.2 RISK ASSESSMENT

This section contains a summary of the Town's asset inventory as well as hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Dam Failure, Flood, and Wildfire.

E.2.1 DAM FAILURE

Currently, the Town of Huntersville has no high hazard dams that have been identified by the North Carolina Dam Inventory with a condition assessment of "fair" or "poor." Figure E.2 shows the location of all dams in the Town of Huntersville.

Figure E.2 – Dam Inventory, Town of Huntersville



Source: NC Dam Inventory, December 2024

E.2.2 FLOODING

Table E.3 details the acreage of the Town of Huntersville by flood zone on the effective DFIRM. Per this assessment, over 6 percent of the Huntersville falls within the mapped 1%-annual-chance floodplains.

Table E.3 – Flood Zone Acreage in the Town of Huntersville

Flood Zone	Acreage	Percent of Total (%)
Zone AE	1,621.6	6.2
Zone X (500-year)	0.0	0.0
Zone X Unshaded	24,381.7	93.8
Total	**26,003.3**	**100.0**

Source: FEMA Effective DFIRM

Figure E.3 reflects the effective mapped flood hazard zones for the Town of Huntersville, and Figure E.4 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

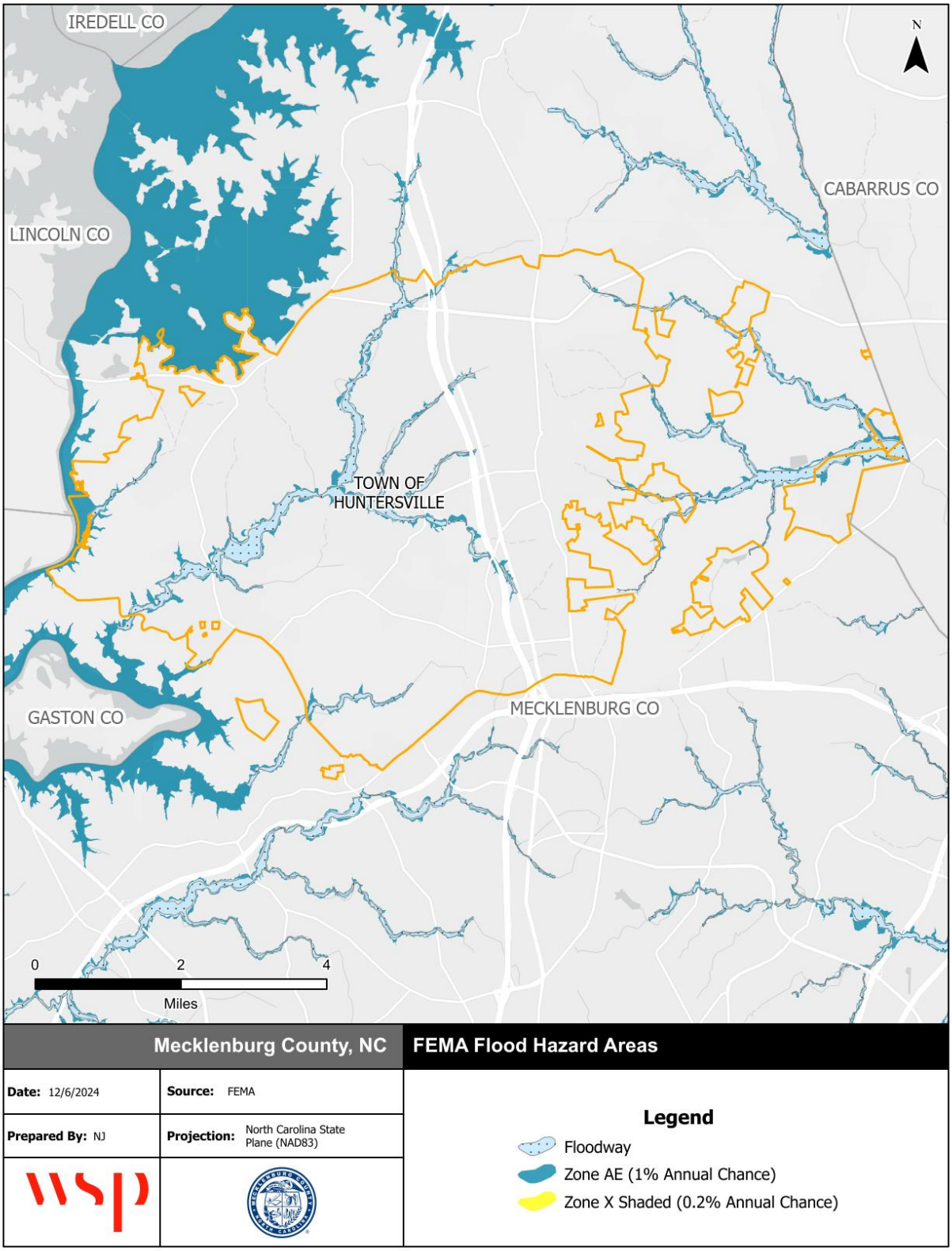
Table E.4 provides building counts and values for critical facilities by flood zone in the Town of Huntersville.

Table E.4 – Critical Facilities Exposed to Flooding, Town of Huntersville

Flood Zone	Critical Facility Count	Structure Value
Zone AE	0	$0
Zone X (500-year)	0	$0
Zone X Unshaded	128	$484,808,400
Total	**128**	**$484,808,400**

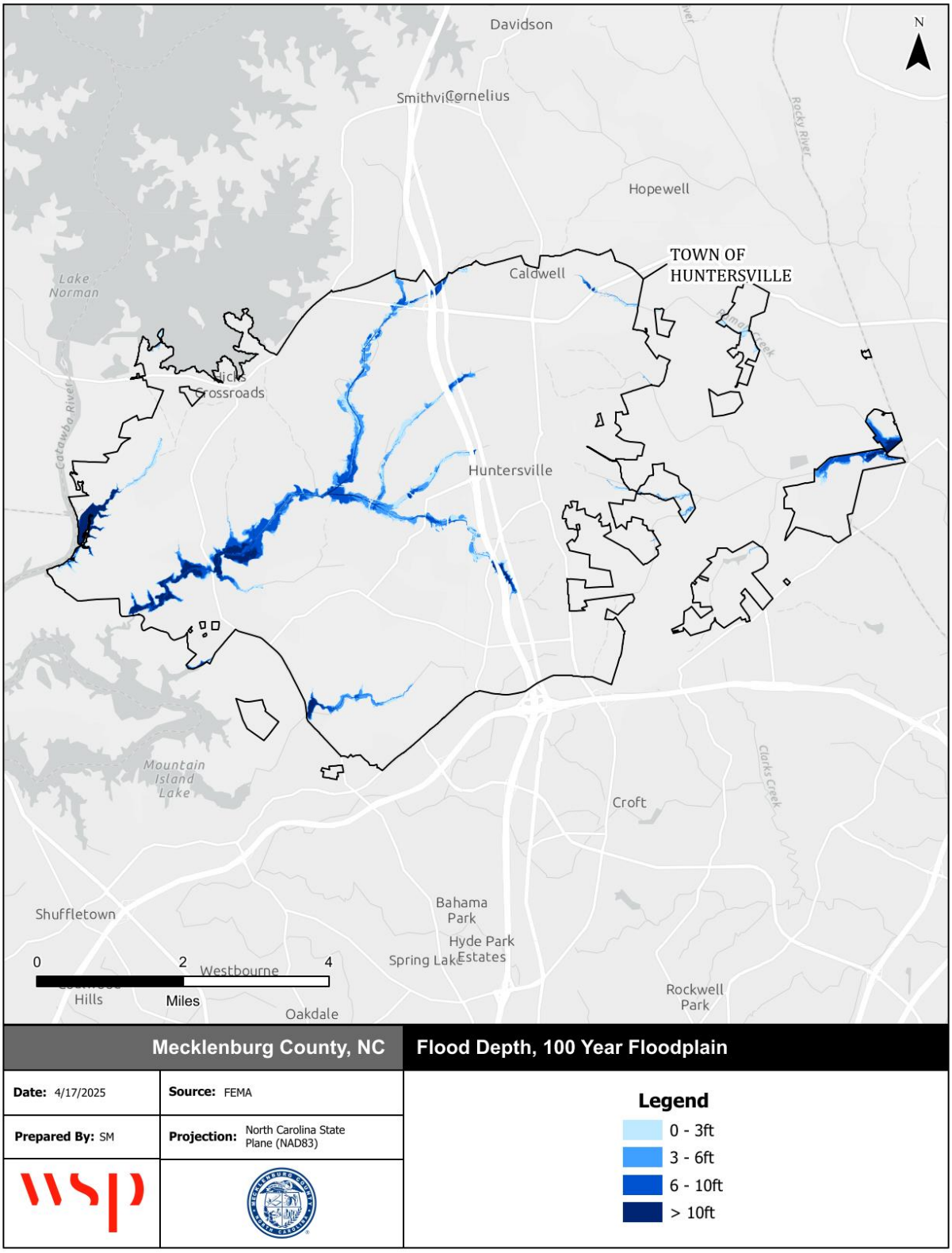
Source: FEMA Effective DFIRM, HMPC

Figure E.3 – FEMA Flood Hazard Areas, Town of Huntersville



Source: FEMA Effective DFIRM

Figure E.4 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Huntersville



Source: FEMA Effective DFIRM

FLOOD INSURANCE DATA

The Town of Huntersville joined the NFIP through emergency entry in 1995 and has been a regular participant since February 2004. Huntersville participates in the Community Rating System and is a Class 5 community. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table E.5 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	72	$44,639	$22,338,000	3	$16,289.86
Non-Residential	4	$8,381	$1,611,000	0	$0.00
Total	**76**	**$53,020**	**$23,949,000**	**3**	**$16,289.86**

Source: FEMA Community Information System, accessed May 2025

Table E.6 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	9	$6,718	$2,862,000	1	$11,432.05
B, C & X Zone					
Standard	67	$46,302	$21,087,000	1	$0.00
Preferred	0	$0	$0	1	$4,857.81
Total	**76**	**$53,020**	**$23,949,000**	**3**	**$16,289.86**

Source: FEMA Community Information System, accessed May 2025

Table E.7 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	7	$4,317	$2,031,000	1	$11,432.05
B, C & X Zone	36	$25,807	$11,920,000	1	$4,857.81
Standard	36	$25,807	$11,920,000	0	$0.00
Preferred	0	$0	$0	1	$4,857.81
Total	**43**	**$30,124**	**$13,951,000**	**2**	**$16,289.86**

Source: FEMA Community Information System, accessed May 2025

Table E.8 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	2	$2,401	$831,000	0	$0.00
B, C & X Zone	31	$20,495	$9,167,000	1	$0.00
Standard	31	$20,495	$9,167,000	1	$0.00
Total	**33**	**$22,896**	**$9,998,000**	**1**	**$0.00**

Source: FEMA Community Information System, accessed May 2025

E.2.3 WILDFIRE

Table E.9 summarizes the acreage in the Town of Huntersville that falls within the Functional Wildland Urban Interface (WUI), categorized into zones that describe the wildfire risk mitigation activities appropriate for each zone. Areas in the Functional WUI are those areas where development and building structures may intermix with burnable land cover. Approximately, 28 percent of the Town of Huntersville is categorized as having direct exposure to wildfire risk within the Functional WUI.

Table E.9 – Functional Wildland Urban Interface, Town of Huntersville

	Functional Wildland Urban Interface (WUI) Category	Acres	Percent
	Direct Exposure	7,186	28%
	Indirect Exposure	8,367	32%
	Critical Fireshed	6,577	25%
	Sources of Ember Load to Buildings	3,766	14%
	Little to No Exposure	0	0%
	Water	113	0%
	Total	**26,009**	**100%**

Source: Southern Wildfire Risk Assessment

Figure E.5 depicts the Functional WUI for the Town of Huntersville, including incorporated areas. Figure E.6 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure E.7 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Large clusters of direct exposure to wildfire can be found on the western and southern regions of the Town. Overall fire intensity is moderate to low with the highest fire intensity occurring on the western side. Large portions of the southern, western, and eastern portions of Huntersville have a moderate burn probability.

Table E.10 provides the count and estimated value of all structures that intersect with areas of the Town of Huntersville and participating jurisdictions that are rated moderate to high on the WUI Risk Index.

Table E.11 provides building counts and values for critical facilities by FEMA lifeline that are located in areas categorized with direct exposure to wildfire risk on the Functional WUI scale.

Table E.10 – Structures at Risk to Moderate-High WUI Risk Index, Town of Huntersville

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	126	$90,127,483.00	$90,127,483.00	$180,254,966.00
Education	11	$1,213,842.00	$1,213,842.00	$2,427,684.00
Government	41	$18,718,523.00	$18,718,523.00	$37,437,046.00
Industrial	31	$10,652,194.00	$15,978,291.00	$26,630,485.00
Religious	25	$16,077,793.00	$16,077,793.00	$32,155,586.00
Residential	4,675	$752,767,493.00	$376,383,746.50	$1,129,151,239.50
Total	**4,909**	**$889,557,328.00**	**$518,499,678.50**	**$1,408,057,006.50**

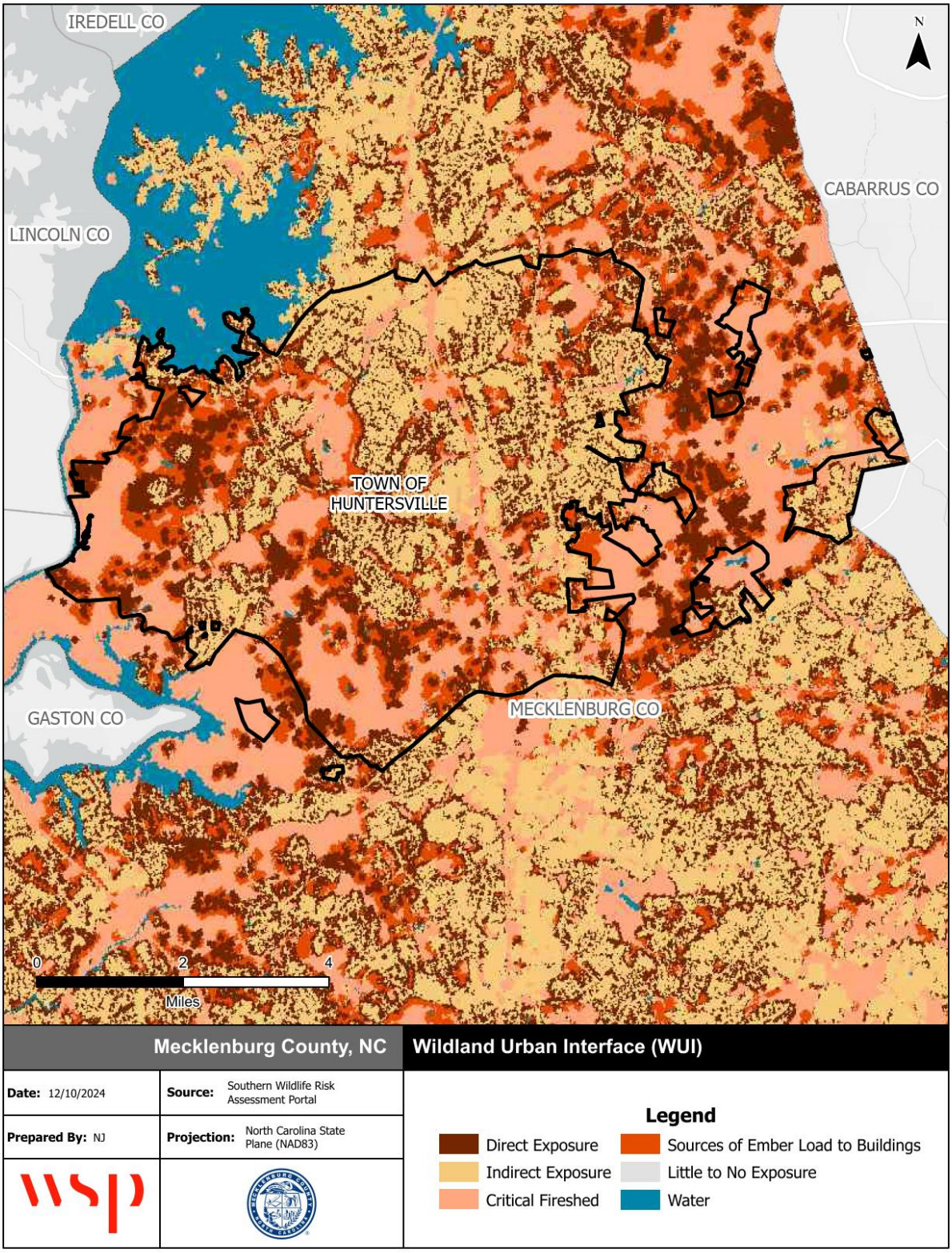
Source: Southern Wildfire Risk Assessment

Table E.11 – Critical Facilities Exposed to Wildfire, Town of Huntersville

Type	Critical Facility Count	Structure Value
Communications	0	$-
Energy	1	$2,249,700
Food, Hydration, Shelter	3	$23,699,500
Hazardous Materials	2	$267,500
Health and Medical	6	$474,600
Safety and Security	0	$-
Transportation	1	$-
Water Systems	0	$-
Total	**13**	**$26,691,300**

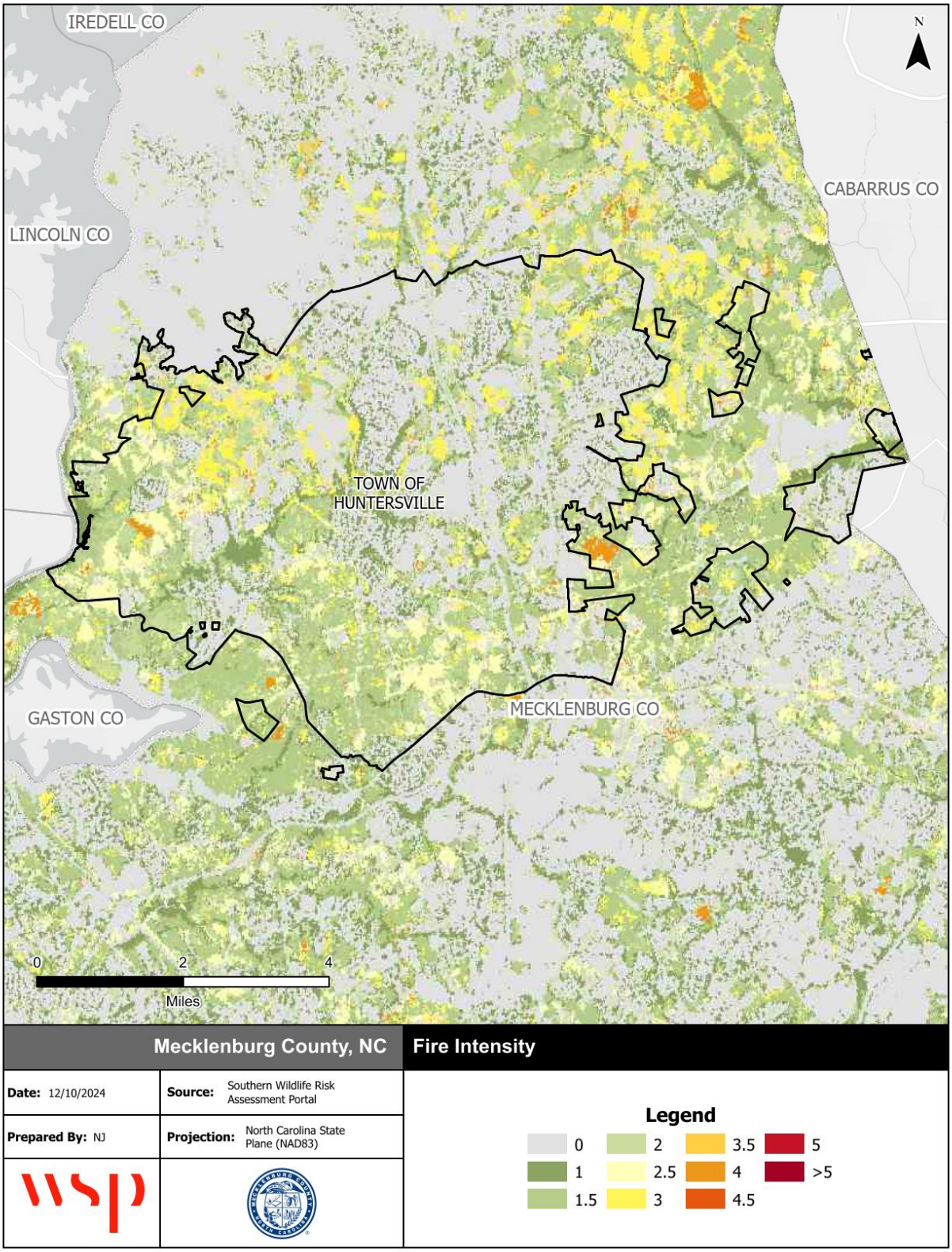
Source: Southern Wildfire Risk Assessment

Figure E.5 – Functional Wildland Urban Interface, Town of Huntersville



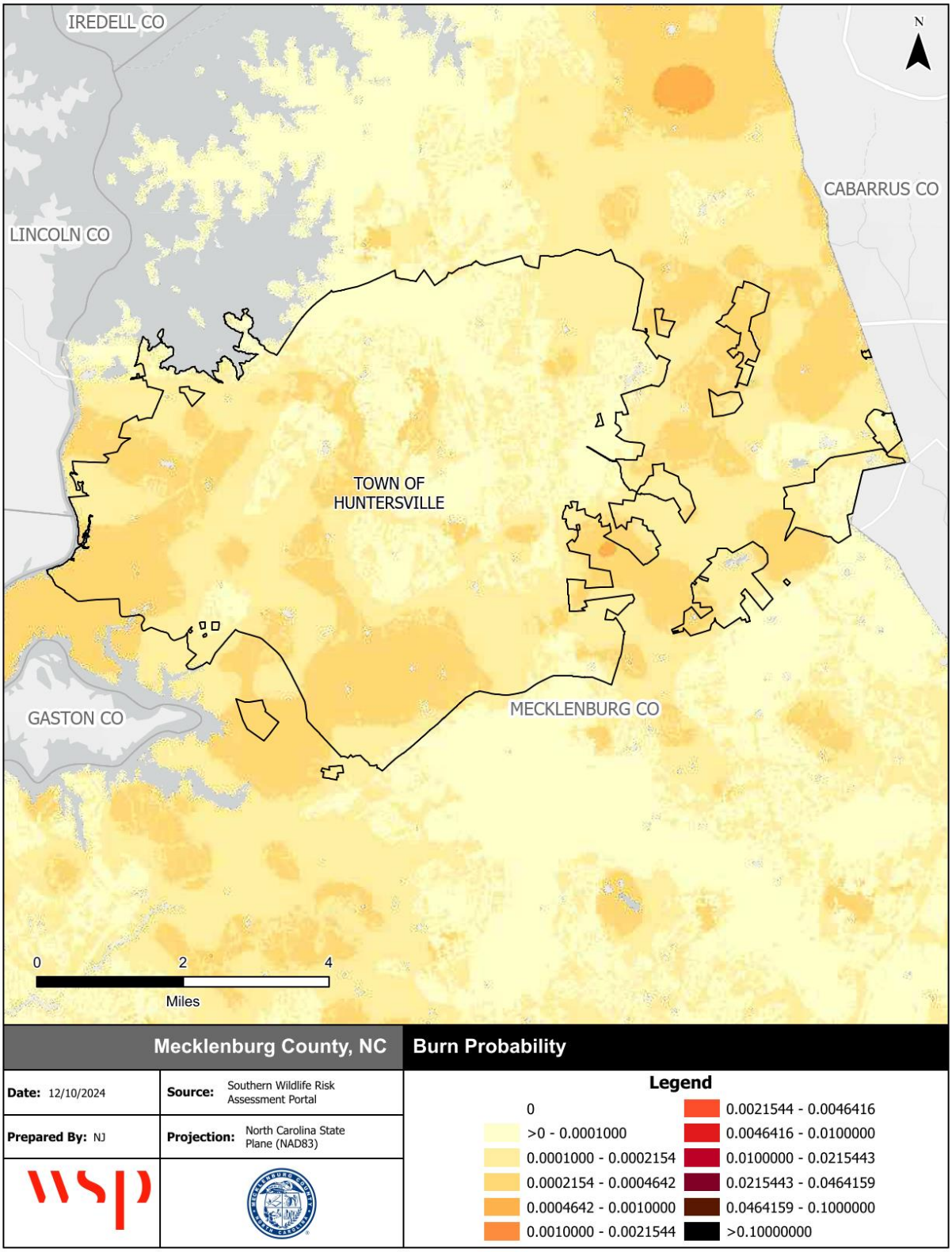
Source: Southern Wildfire Risk Assessment

Figure E.6 – Characteristic Fire Intensity, Town of Huntersville



Source: Southern Wildfire Risk Assessment

Figure E.7 – Burn Probability, Town of Huntersville



Source: Southern Wildfire Risk Assessment

E.3 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Huntersville-1	Coordinate with CMEMO and Duke Energy and review the evacuation routes for the town's citizens in the event of an Incident at Mcguire Nuclear Power Plant.	Radiological Emergency	3.1, 3.3	Medium	Emergency Services	Town of Huntersville	$0	N/A	2030	New	
Huntersville-2	Implement storm water mitigation projects, including the grading of ditches and replacing failing/potentially failing storm water structures	Flooding	1.2	High	Structural Projects	Town of Huntersville Public Works Department	To be determined	CMSWS funds, Grant funds	2025-2030	Carry Forward	A Request for Proposal has been published, and a contractor has been named to perform a "Down Town" Storm Water Study and Mitigation Recommendation. The town has also adopted a routine maintenance plan that tasks the town within the right-of-way of Town maintained streets and recorded public storm drainage easements. Tasks are detailed in Section 5 Capability Assessment.
Huntersville-3	Provide and maintain NIMS training for town employees and government officials likely to be involved with hazard mitigation or emergency response and conduct an annual tabletop exercise addressing potential hazards faced by Town. This exercise would bring together representatives from all Town departments that would work together creating and implementing a plan to effectively deal with the hazard.	All Hazards	3.1	High	Emergency Services	Huntersville Police Department	$0	N/A	2025-2030	Carry Forward	This exercise is in the initial planning stages. Action was revised to incorporate NIMS training for town employees.
Huntersville-4	Coordinate with Char-Meck EM to relay critical information on the Towns Social Media Sites regarding potential hazards, localized emergencies, preparedness, and property protection options.	All Hazards	2.1	High	Public Education & Awareness	Town of Huntersville /HPD PIO	$0	N/A	2025-2030	Carry Forward	The Town's Communication Department continues to grow, adding an additional employee last fiscal year and plans to add a third this next fiscal year. The town continues to enhance its public awareness communication through multiple communication mediums prior to, during and after any event that pose a hazard to our citizens. The town also utilizes CMEMO's Everbridge system as an alerting system for the town employees.
Huntersville-5	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Huntersville-6	Maintain a Class 5 rating in the CRS Program.	Flooding	4.1	High	Prevention	Mecklenburg County Storm Water Services	To be determined	SWS Operating budget	2025-2030	New	
Huntersville-7	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.
Huntersville-8	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.1	Medium	Public Education & Awareness	In coordination with CMEMO (Lead)	Staff time and resources	N/A	2025-2030	New	See Mecklenburg-9 for additional details.

ANNEX FTOWN OF MATTHEWS

F.1 ASSET INVENTORY

The Town of Matthews and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table F.1 provides a count of critical facilities by FEMA lifeline category in the Town of Matthews. Figure F.1 shows the locations of all critical facilities in the Town of Matthews.

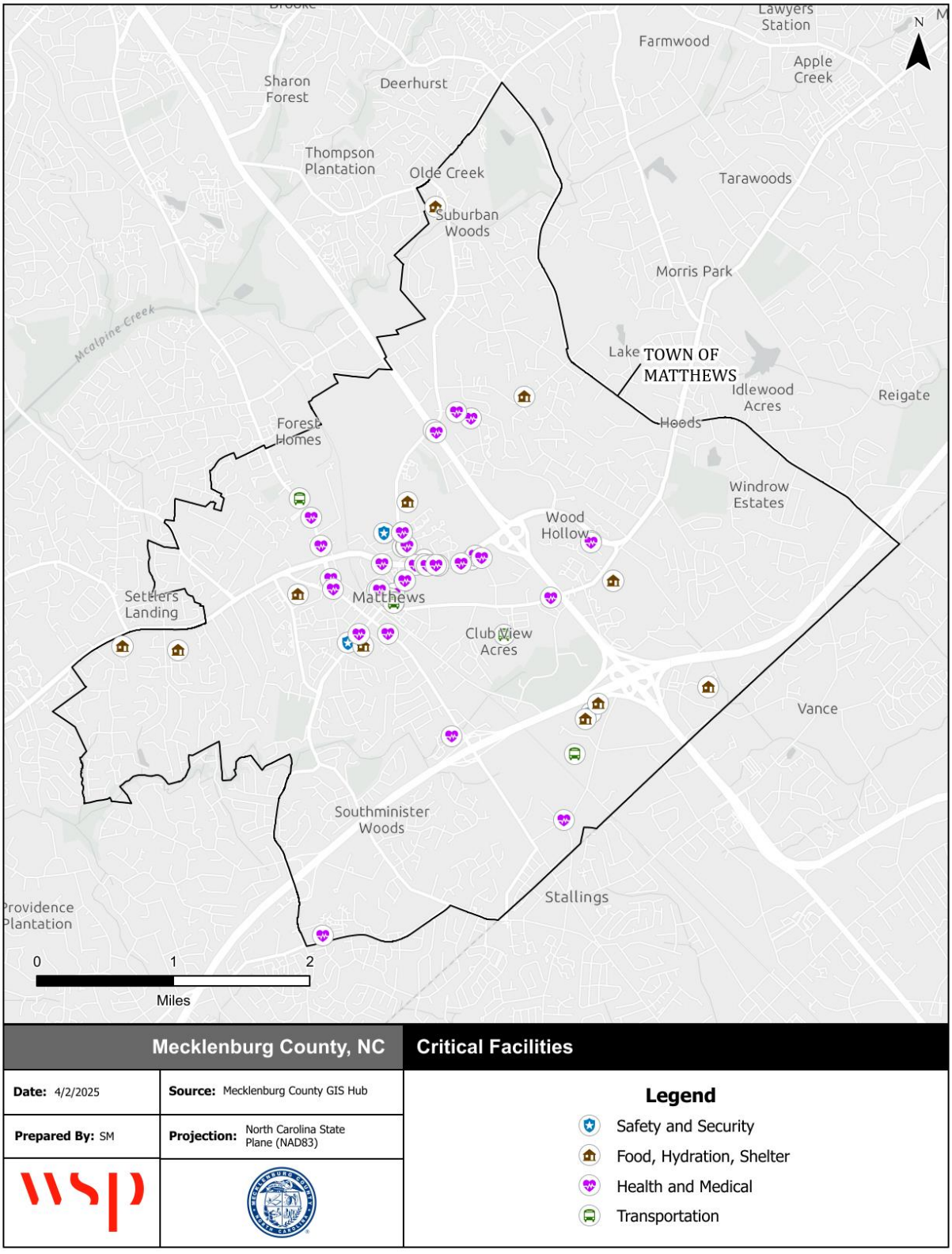
Table F.2 provides a detailed inventory of the critical facilities in the Town of Matthews, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table F.1 – Critical Facilities, Town of Matthews

Facility Type	Count of Facility Type	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	11	$247,793,400
Hazardous Materials	0	$-
Health and Medical	67	$42,888,800
Safety and Security	4	$79,044,200
Transportation	4	$1,507,900
Water Systems	0	$-
Total	**86**	**$371,234,300**

Source: Mecklenburg County, HMPC

Figure F.1 – Critical Facilities, Town of Matthews



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table F.2 – Critical Facilities Inventory, Town of Matthews

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Safety and Security	Fire Station	236 S TRADE ST	$1,526,300	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	1201 CREWS RD	$9,238,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1145 Pineville-Matthews Road	$53,007,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	800 Fullwood Lane	$17,005,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2701 Rice Road	$2,006,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2332 Mount Harmony Church Rd.	$8,263,800	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1500 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1400 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1401 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9808 Northeast Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	434 N Trade St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1401 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1401 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10806 Monroe Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4101 Campus Ridge Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	1401 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	534 W John St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1401 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11025 Monroe Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	455 W John St	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	724 Aubrey Bell Dr	$20,680,100	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1401 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1700 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1401 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	2940 Senna Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	332 N Trade St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1340 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	211 W Matthews St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9600 E Independence Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1500 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3330 Siskey Pkwy	$17,877,700	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	101 E MATTHEWS ST	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1730 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1238 Mann Dr	$339,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10550 Independence Pointe Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	428 N Trade St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	855 Sam Newell Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	101 E MATTHEWS ST	$1,542,600	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9705 Northeast Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	300 E John St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7928 Council Pl	$1,769,900	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	710 Park Center Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1254 Mann Dr	$339,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9623 E Independence Blvd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	2950 Senna Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	332 N Trade St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	855 Sam Newell Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1340 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	101 E Matthews St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	134 W Matthews St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1635 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1401 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	434 N Trade St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	710 Park Center Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	196 S Trade St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	201 E Matthews St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1258 Mann Dr	$339,500	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	855 Sam Newell Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 Matthews Township Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1400 MATTHEWS TOWNSHIP PY	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1450 MATTHEWS TOWNSHIP PY	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	1419 Matthews Mint Hill Rd	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	Colleges	2800 Campus Ridge Rd	$59,041,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	1810 Matthews-Mint Hill Rd	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	940 Sam Newell Road	$19,290,100	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	3335 Sam Newell Road	$10,389,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	121 Elizabeth Lane	$13,054,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	200 E. McDowell Street	$6,693,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	2728 Campus Ridge Road	$59,041,300	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		$13,500	0.1	X Unshaded	Sources of Ember Load to Buildings	1.5

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Transportation	LYNX Station		-	0.1	X Unshaded	Sources of Ember Load to Buildings	3
Transportation	LYNX Station		-	0.1	X Unshaded	Indirect Exposure	0
Transportation	LYNX Station		$1,494,400	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	1201 CREWS ROAD	$9,238,300	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	2800 CAMPUS RIDGE ROAD, HARRIS 1 BUILDING	$59,041,300	0.1	X Unshaded	Indirect Exposure	0

F.2 RISK ASSESSMENT

This section contains a summary of the Town's asset inventory as well as hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Dam Failure, Flood and Wildfire.

F.2.1 DAM FAILURE

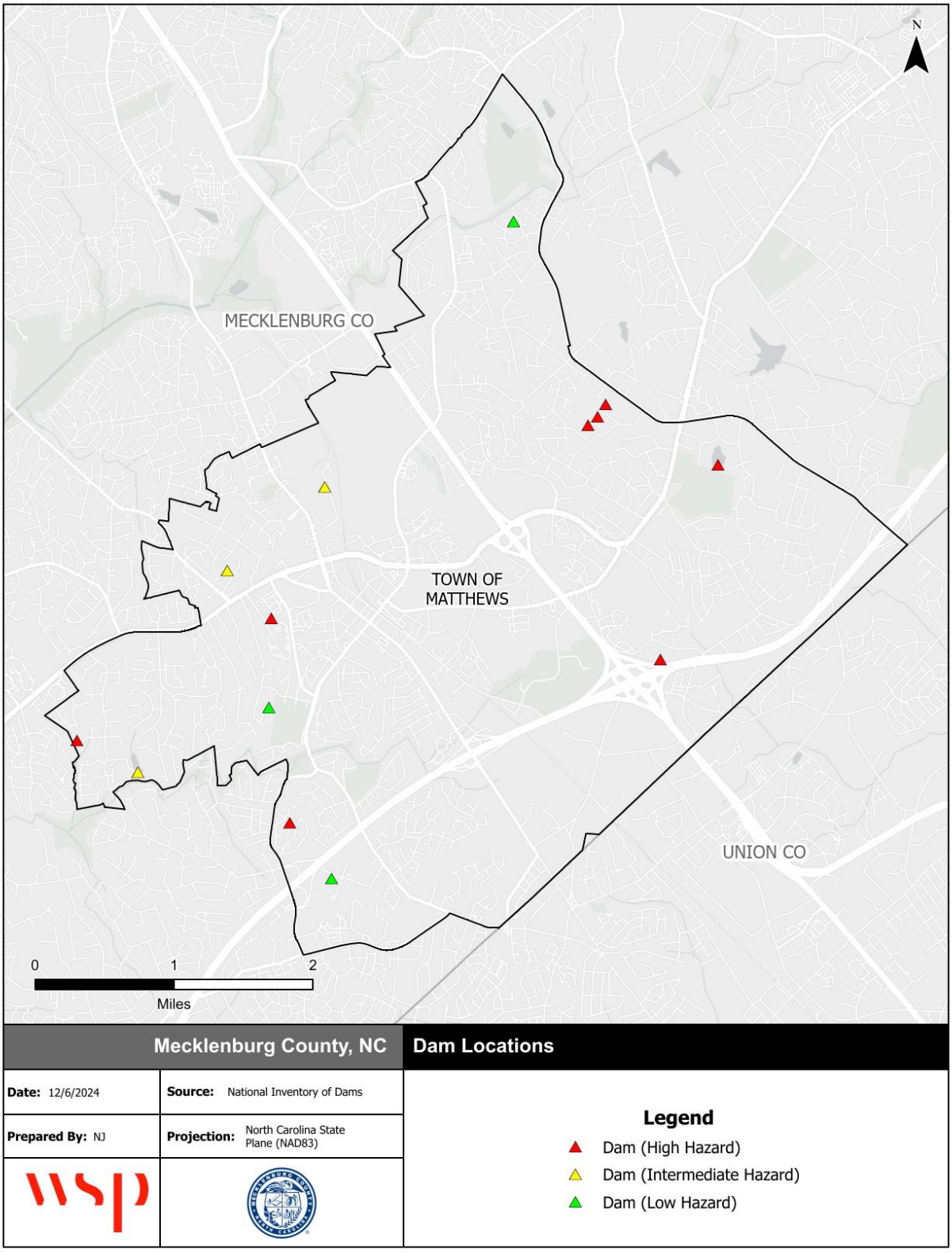
Table F.3 lists all high hazard dams located in the Town of Matthews that have been identified by the North Carolina Dam Inventory with a condition assessment of "fair" or "poor." Figure F.2 shows the location of all dams by jurisdiction in Town of Matthews.

Table F.3 – High Hazard Dams in Town of Matthews

Dam Name	NID ID	Condition as of Last Inspection	Max Capacity (Ac-Ft)	Nearest Downstream Location
Landtec Pond Dam	NC06177	Fair	5	Matthews

Source: NC Dam Inventory, December 2024

Figure F.2 – Dam Inventory, Town of Matthews



Source: NC Dam Inventory, December 2024

F.2.2 FLOODING

Table F.4 details the acreage of the Town of Matthews by flood zone on the effective DFIRM. Per this assessment, 2 percent of Matthews falls within the mapped 1%-annual-chance floodplains.

Table F.4 – Flood Zone Acreage in the Town of Matthews

Flood Zone	Acreage	Percent of Total (%)
Zone AE	222.1	2.0
Zone X (500-year)	0.00	0.0
Zone X Unshaded	10,756.2	98.0
Total	**10,978.3**	**100.0**

Source: FEMA Effective DFIRM

Figure F.3 reflects the effective mapped flood hazard zones for the Town of Matthews, and Figure F.4 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

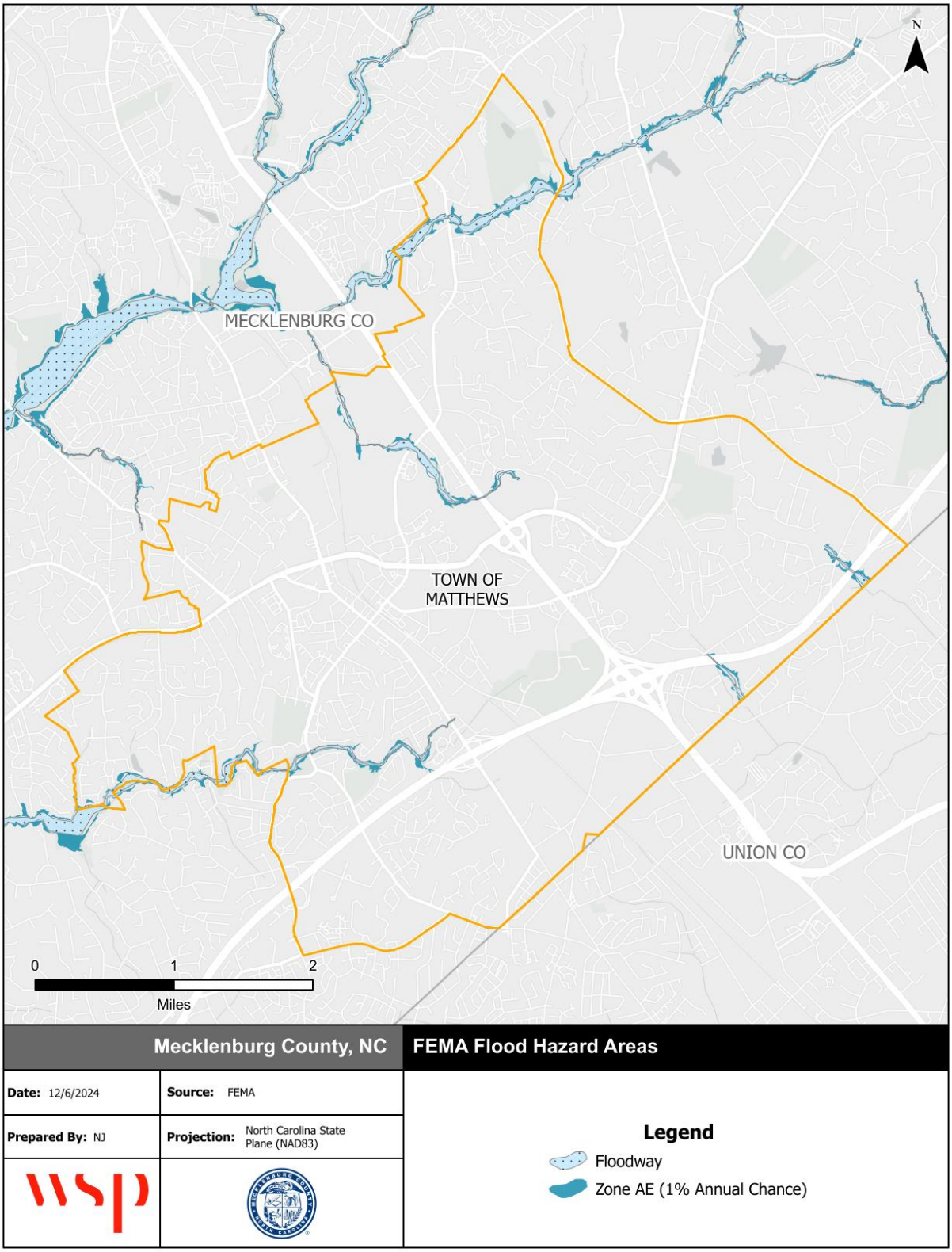
Table F.5 provides building counts and values for critical facilities by flood zone in the Town of Matthews.

Table F.5 – Critical Facilities Exposed to Flooding, Town of Matthews

Flood Zone	Critical Facility Count	Structure Value
Zone AE	0	$0
Zone X (500-year)	0	$0
Zone X Unshaded	86	$371,234,300
Total	**86**	**$371,234,300**

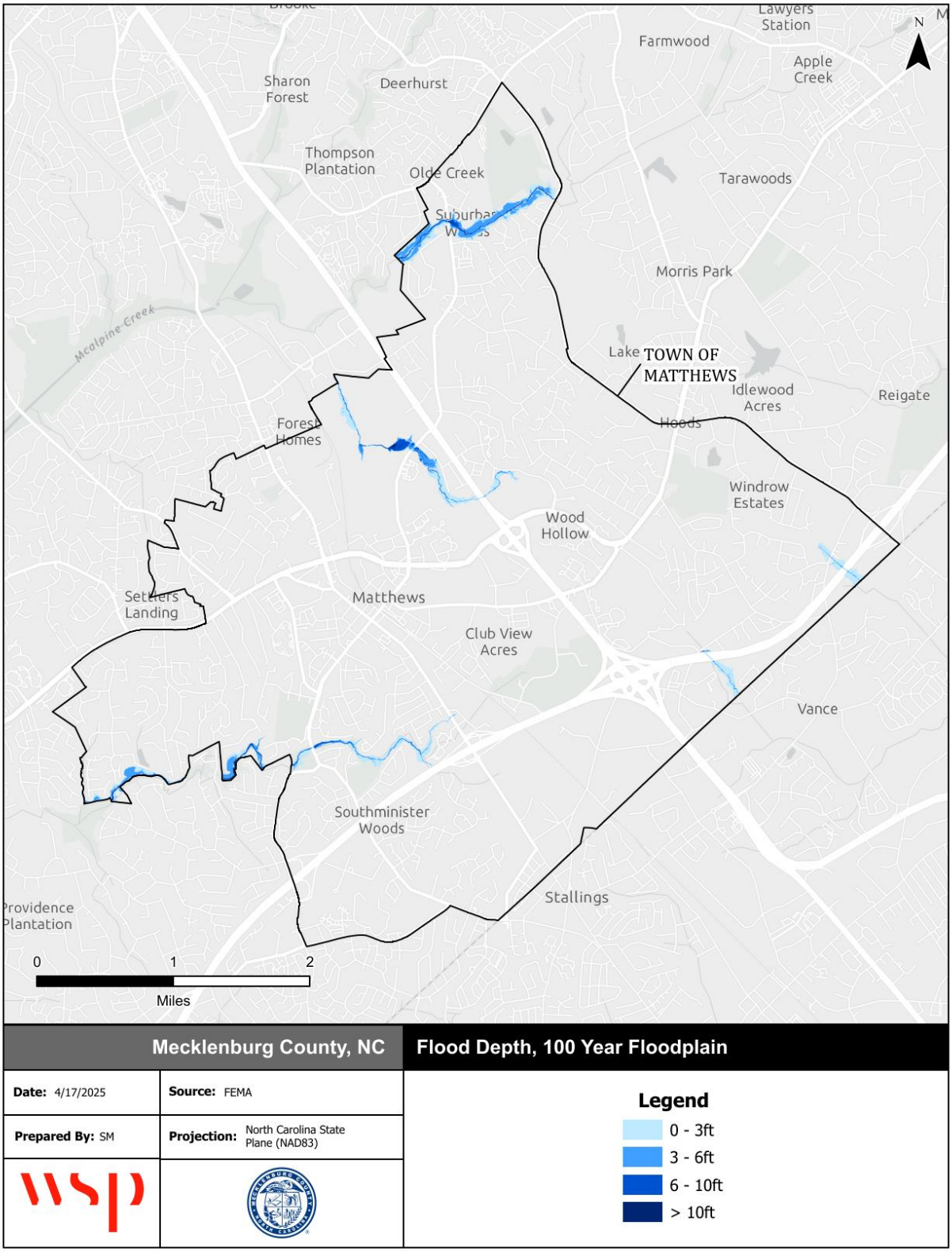
Source: FEMA Effective DFIRM, HMPC

Figure F.3 – FEMA Flood Hazard Areas, Town of Matthews



Source: FEMA Effective DFIRM

Figure F.4 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Matthews



Source: FEMA Effective DFIRM

FLOOD INSURANCE DATA

The Town of Matthews joined the NFIP through emergency entry in 1995 and has been a regular participant since February 2004. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table F.6 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	34	$26,800	$11,042,000	15	$169,603.18
2-4 Family	2	$775	$700,000	0	$0.00
All Other Residential	1	$41	$21,000	0	$0.00
Non-Residential	3	$5,479	$2,000,000	0	$0.00
Total	**40**	**$33,095**	**$13,763,000**	**15**	**$169,603.18**

Source: FEMA Community Information System, accessed May 2025

Table F.7 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	3	$5,299	$634,000	1	$0.00
B, C & X Zone					
Standard	37	$27,796	$13,129,000	1	$24,570.92
Preferred	0	$0	$0	13	$145,032.26
Total	**40**	**$33,095**	**$13,763,000**	**15**	**$169,603.18**

Source: FEMA Community Information System, accessed May 2025

Table F.8 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	3	$5,299	$634,000	1	$0.00
B, C & X Zone	30	$21,645	$10,152,000	7	$60,721.60
Standard	30	$21,645	$10,152,000	1	$24,570.92
Preferred	0	$0	$0	6	$36,150.68
Total	**33**	**$26,944**	**$10,786,000**	**8**	**$60,721.60**

Source: FEMA Community Information System, accessed May 2025

Table F.9 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
B, C & X Zone	7	$6,151	$2,977,000	7	$108,881.58
Standard	7	$6,151	$2,977,000	0	$0.00
Preferred	0	$0	$0	7	$108,881.58
Total	**7**	**$6,151**	**$2,977,000**	**7**	**$108,881.58**

Source: FEMA Community Information System, accessed May 2025

F.2.3 WILDFIRE

Table F.10 summarizes the acreage in the Town of Matthews that falls within the Functional Wildland Urban Interface (WUI), categorized into zones that describe the wildfire risk mitigation activities appropriate for each zone. Areas in the Functional WUI are those areas where development and building structures may intermix with burnable land cover. Approximately, 30 percent of the Town of Matthews is categorized as having direct exposure to wildfire risk within the Functional WUI.

Table F.10 – Functional Wildland Urban Interface, Town of Matthews

	Functional Wildland Urban Interface (WUI) Category	Acres	Percent
	Direct Exposure	3,312	30%
	Indirect Exposure	5,025	46%
	Critical Fireshed	1,626	15%
	Sources of Ember Load to Buildings	999	9%
	Little to No Exposure	0	0%
	Water	19	0%
	Total	**10,981**	**100%**

Source: Southern Wildfire Risk Assessment

Figure F.5 depicts the Functional WUI for the Town of Matthews, including incorporated areas. Figure F.6 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure F.7 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

The central region of the Town of Matthews has mostly indirect exposure to wildfire while the northeastern and southwestern regions have large clusters of direct exposure. There are areas of moderate to high potential fire intensity spread throughout the Town, particularly in the north and along the eastern edges of the Town. Overall, burn probability is low with some moderate clusters occurring in the north and east sides of the Town.

Table F.11 provides the count and estimated value of all structures that intersect with areas of the Town of Matthews and participating jurisdictions that are rated moderate to high on the WUI Risk Index.

Table F.12 provides building counts and values for critical facilities by FEMA lifeline that are located in areas categorized with direct exposure to wildfire risk on the Functional WUI scale.

Table F.11 – Structures at Risk to Moderate-High WUI Risk Index, Town of Matthews

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	37	$22,931,470.00	$22,931,470.00	$45,862,940.00
Education	2	$6,140,371.00	$6,140,371.00	$12,280,742.00
Government	3	$533,443.00	$533,443.00	$1,066,886.00
Industrial	5	$1,215,913.00	$1,823,869.50	$3,039,782.50
Religious	11	$2,546,154.00	$2,546,154.00	$5,092,308.00
Residential	2,667	$422,113,083.00	$211,056,541.50	$633,169,624.50
Total	**2,725**	**$455,480,434.00**	**$245,031,849.00**	**$700,512,283.00**

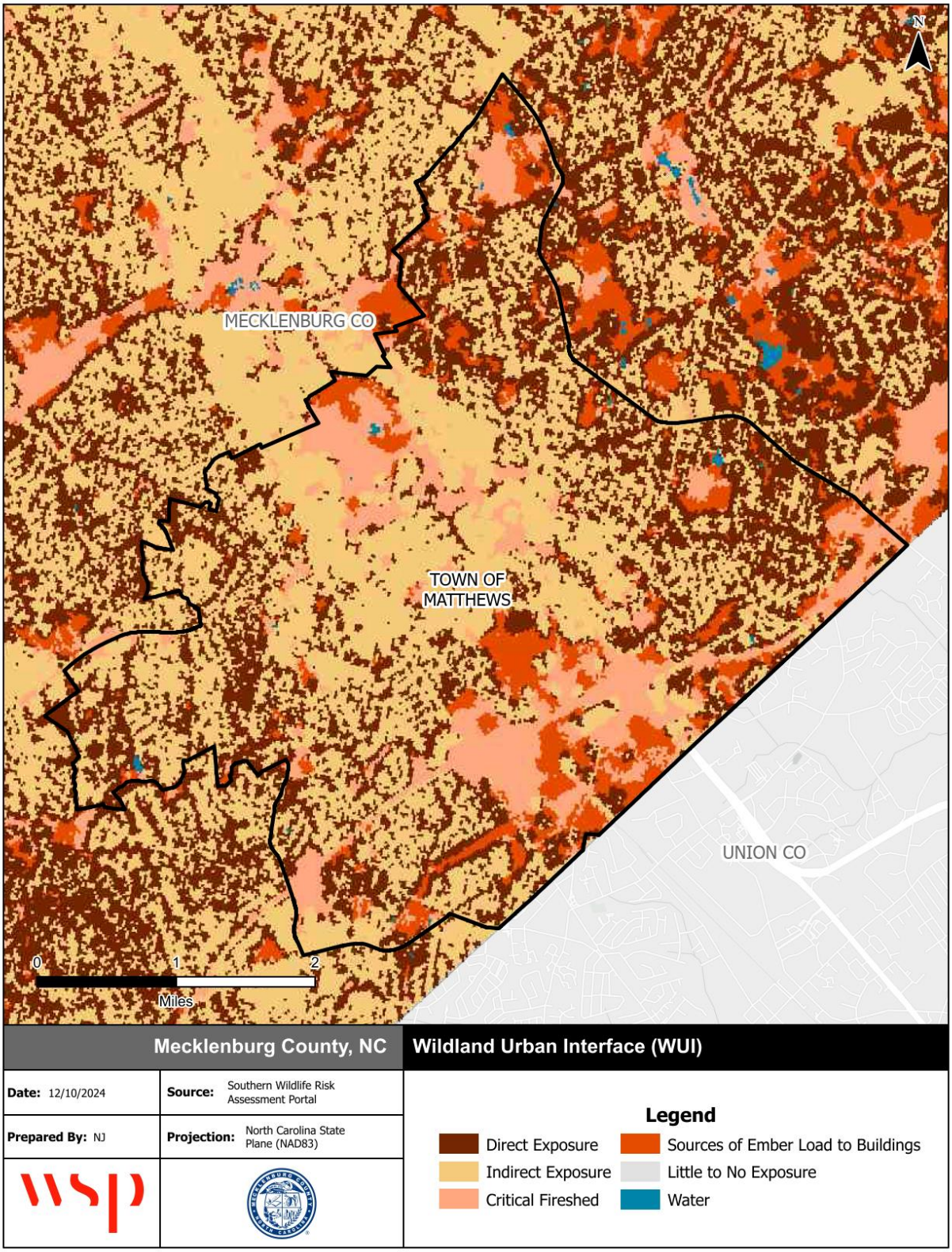
Source: Southern Wildfire Risk Assessment

Table F.12 – Critical Facilities Exposed to Wildfire, Town of Matthews

Type	Critical Facility Count	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	0	$-
Hazardous Materials	0	$-
Health and Medical	2	$-
Safety and Security	0	$-
Transportation	0	$-
Water Systems	0	$-
Total	**2**	**$-**

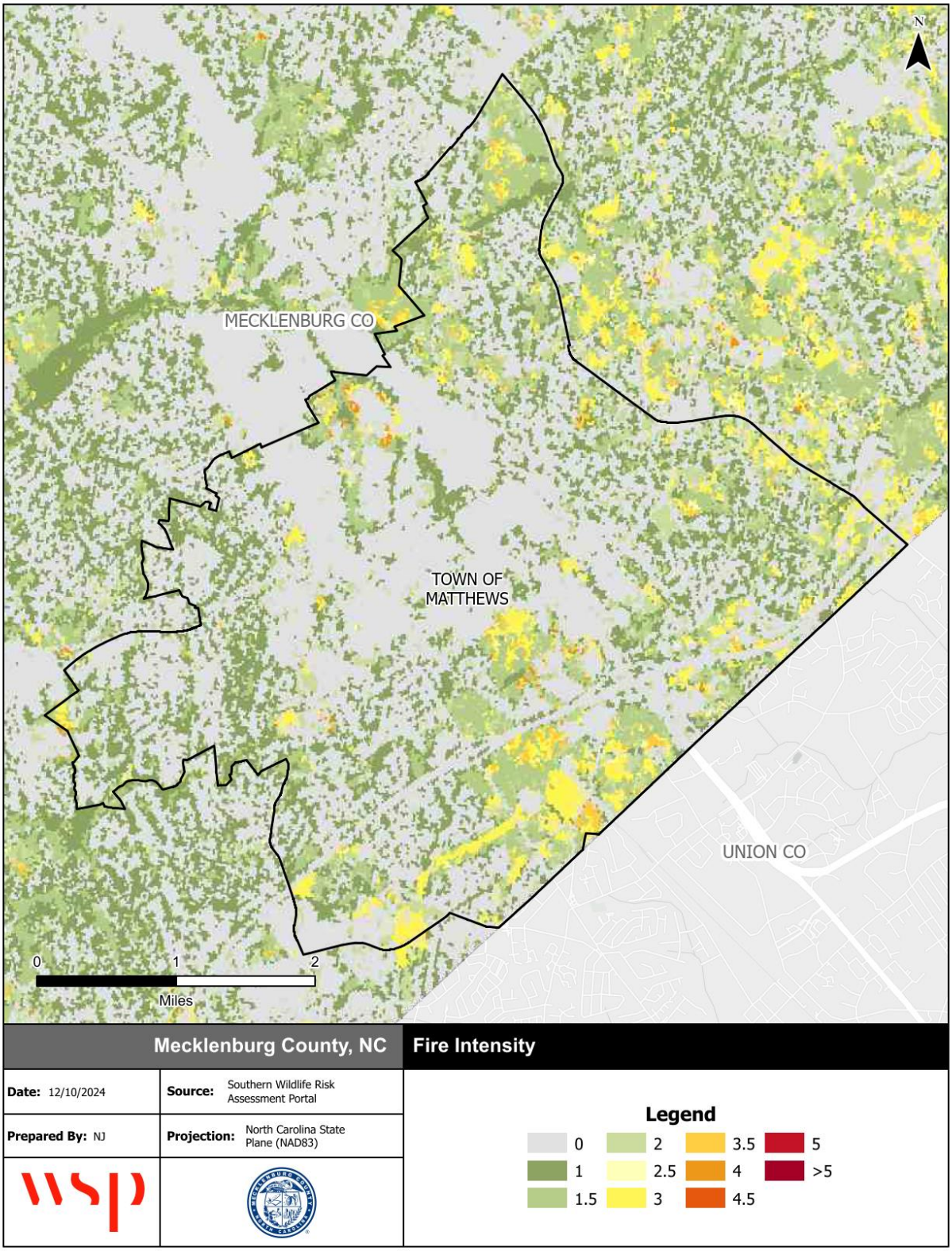
Source: Southern Wildfire Risk Assessment

Figure F.5 – Functional Wildland Urban Interface, Town of Matthews



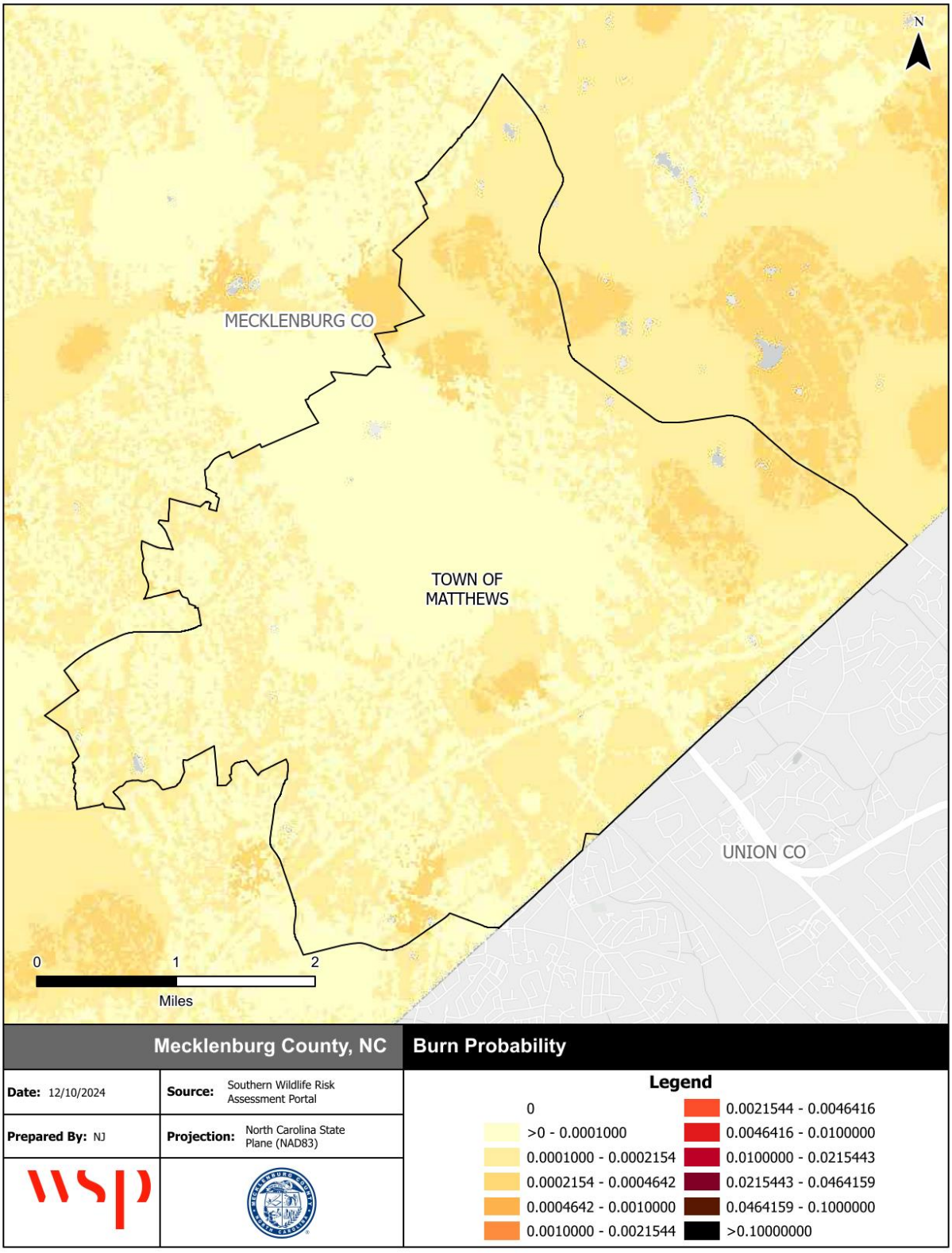
Source: Southern Wildfire Risk Assessment

Figure F.6 – Characteristic Fire Intensity, Town of Matthews



Source: Southern Wildfire Risk Assessment

Figure F.7 – Burn Probability, Town of Matthews



Source: Southern Wildfire Risk Assessment

F.3 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Matthews-1	Develop a second full-function Emergency Operations Center (EOC) at the Fire Department as a backup to the current EOC at the Police Department.	All Hazards	1.3	Medium	Emergency Services	Matthews Police and Fire	$16,000	Town Funds, FEMA	5 years	Carry Forward	Backup police communication ability available at Fire Station 1.
Matthews-2	Prepare and maintain a map of areas that flood frequently, particularly those areas outside of FEMA floodplains. Digitize and add to County GIS.	Flooding	2.1	High	Prevention	Public Works in coordination with Planning GIS	$10,000	Town Storm Water Fees	2025-2030	Carry Forward	Continual update, mapping reviewed annually and updated as new data is available.
Matthews-4	Seek grant funding to retrofit critical facilities and Town-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, 320 or 361 compliant safe rooms, lightning protection, hail resistant roofing, and anchoring fixed building equipment.	All Hazards	1.3	Medium	Property Protection	Town of Matthews Public Works Department	To be determined case by case	Local, State Grants, UHMA Grants, other federal grants	5 years	Carry Forward	Resiliency will be assessed and retrofits will be evaluated as renovations take place and funding is made available.
Matthews-5	Seek grant funding to install backup generators or quick connect hook ups for mobile generators on any newly constructed county/town critical facilities.	All Hazards	1.3	Medium	Property Protection	Town of Matthews Public Works Department	To be determined case by case	Local, State Grants, UHMA Grants, other federal grants	5 years	Carry Forward	The need for emergency generators will be assessed as new town facilities are constructed.
Matthews-6	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standards (in addition to basic required compliance actions): a) Development standards linked to Community Floodplain (Future Conditions) b) Require critical facilities protection to 500-year flood levels c) Require parking lots to be elevated (no more than six inches deep in any parking space during Community Flood event) d) Require dry land access for new or substantially improved buildings (above Community Flood BFE) e) Levee restrictions f) Cumulative substantial damage improvement provision g) Prohibit basements below flood level on filled lots	Flooding	4.1	High	Prevention	Public Works in coordination with CMSWS	Local staff time	N/A	2025-2030	Carry Forward	Town has maintained compliance with NFIP requirements in coordination with Mecklenburg County.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Matthews-7	Coordinate with Mecklenburg County Storm Water Services to consider applying for and joining FEMA's Community Rating System (CRS).	Flooding	4.1	Medium	Prevention	Public Works in coordination with CMSWS	Local staff time	N/A	3-5 years	Carry Forward	Deferred. Town will reconsider application to the CRS Program.
Matthews-8	Mitigate localized flooding caused by existing road and railroad structures by means of increasing the dimensions of drainage culverts in problem areas.	Flooding, Severe Winter Weather	1.2	Medium	Structural Projects	Public Works	$500,000+	Bonds, power bill revenues, Army Corps project funding, Watershed Protection & flood protection funds, etc.	2025-2030	Carry Forward	In Progress. Working with NCDOT to replace the Sam Newell Road culvert with bridge as part of the U-2509 widening project on US74.
Matthews-10	Provide and maintain NIMS training for all department supervisors and appropriate line employees. Review and revise the Town Emergency operating Plan as necessary. Exercise the plan annually.	All Hazards	3.1	High	Emergency Services	Matthews Fire & EMS	$1,000 annually	General Fund	2025-2030	Carry Forward	Completed and ongoing. Annual exercise of Town EOP and refresher NIMS training.
Matthews-12	Train staff to educate themselves and the public regarding hazards and the steps that can be taken to reduce their impact.	All Hazards	3.1	Medium	Public Education & Awareness	Matthews PIO Office and Mecklenburg County	$10,000	General tax revenues, FEMA Emergency Management Institute courses, FEMA and American Red Cross materials are free of charge, Hazard Mitigation Grant Program (HMGP), Department of Homeland Security—Citizenship Education and Training	2025-2030	Carry Forward	Training has been conducted with staff using County and online resources. FireCorps Volunteers conducted basic CERT program every other year.
Matthews-13	Relocate Town EOC to Police Department	All Hazards	1.3	Medium	Emergency Services	Matthews Police / Matthews Emergency Management	$10,000	General fund	2030	Carry Forward	No progress to report. Install additional phone and computer connections, install large display monitors to track incident status, weather, CAD, and resources. Provide breakout rooms for critical decision making, analysis, and planning. Provide for a greater degree of security.
Matthews-14	Provide Information and Educate the Public about strategies for and actions to promote self-reliance during weather-related events. Provide timely information to the public via social media. Provide education to citizens based on the Community Emergency Response Training.	All Hazards	2.3	High	Public Education & Awareness	Matthews Communications Director, Fire & EMS / Fire Corps	$5,000 annually	General fund	2025-2030	Carry Forward	In progress. Will coordinate with CMEMO on outreach.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Matthews-16	"South Towns" PSAP: Explore the benefits and costs associated with moving the 'South Towns' (Mint Hill, Matthews, Pineville) PSAP to Pineville Police Dept, with Matthews serving as the back-up PSAP.	All Hazards	3.1	High	Emergency Services	Town of Matthews, Department TBD	To be determined	To be determined	2025-2030	Carry Forward	No progress to report. Implementation deferred.
Matthews-17	Create or Update Community Wildfire Protection Plans in each fire district.	Wildfire	1.1, 2.1, 3.1	Medium	Prevention	Town of Matthews Fire Department, NC Forest Service	To be determined	Grant funds	2030	New	
Matthews-18	Pursue the acquisition and/or elevation of high-risk flood prone properties.	Flooding	1.1	Medium	Property Protection	Mecklenburg County Storm Water Services, Town of Matthews Administration	To be determined	Grant funds	2025-2030	New	
Matthews-19	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	
Matthews-20	Implement drainage improvement projects to reduce stormwater flooding	Flooding	1.2	Medium	Structural Projects	Matthews Public Works	To be determined	Local funds, Grant funds	2025-2030	New	
Matthews-21	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.

ANNEX G TOWN OF MINT HILL

G.1 ASSET INVENTORY

The Town of Matthews and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table G.1 provides a count of critical facilities by FEMA lifeline category in the Town of Matthews. Figure G.1 shows the locations of all critical facilities in the Town of Matthews.

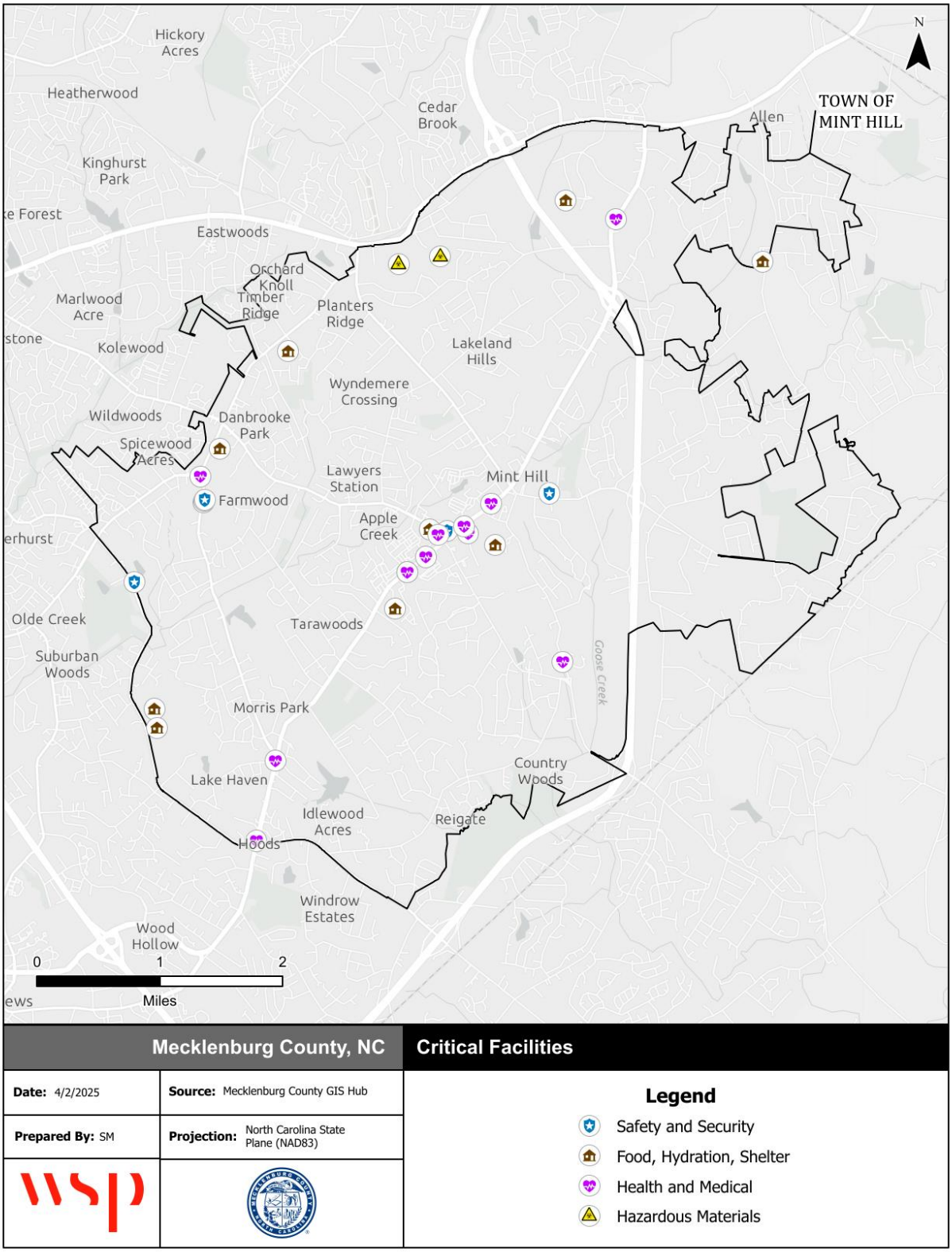
Table G.2 provides a detailed inventory of the critical facilities in the Town of Matthews, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table G.1 – Critical Facilities, Town of Mint Hill

Facility Type	Count of Facility Type	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	9	$132,294,000
Hazardous Materials	2	$-
Health and Medical	12	$2,665,600
Safety and Security	6	$4,197,900
Transportation	0	$-
Water Systems	0	$-
Total	**29**	**$139,157,500**

Source: Mecklenburg County, HMPC

Figure G.1 – Critical Facilities, Town of Mint Hill



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table G.2 – Critical Facilities Inventory, Town of Mint Hill

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Safety and Security	Fire Station	6773 Lebanon Rd	-	0.1	X Unshaded	Critical Fireshed	0
Safety and Security	Emergency Operations	6783 Lebanon Rd	-	0.1	X Unshaded	Critical Fireshed	0
Safety and Security	Government Office	6793 Lebanon Rd	-	0.1	X Unshaded	Sources of Ember Load to Buildings	3
Hazardous Materials	Landfill	10900 PINE GROVE AV	-	0.1	X Unshaded	Critical Fireshed	0
Hazardous Materials	Landfill	10600 Albemarle Rd	-	0.1	X Unshaded	Sources of Ember Load to Buildings	2.5
Safety and Security	Fire Station	10241 IDLEWILD RD	$336,700	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Fire Station	8313 FAIRVIEW RD	$2,268,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	9801 Arlington Church Road	$3,610,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	11120 Lawyers Road	$398,600	0.1	X Unshaded	Direct Exposure	1
Food, Hydration, Shelter	School	6840 Wilson Grove Road	$2,041,700	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	6400 Matthews Mint Hill Road	$5,416,200	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7215 Lebanon Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	12900 Bain School Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11300 CRESTHILL DR	$2,665,600	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11235 Lawyers Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11304 Hawthorne Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7749 Matthews Mint Hill Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10545 Blair Rd	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	6820 Matthews Mint Hill Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	7316 Matthews Mint Hill Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11304 Hawthorne Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	4213 Matthews Mint Hill Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	3525 Matthews Mint Hill Rd	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	11540 Bain School Road	$15,714,400	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	7300 Lebanon Road	$9,316,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	11501 Idlewild Road	$31,101,700	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Food, Hydration, Shelter	School	10505 Clear Creek Commerce Drive	$33,593,000	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	11615 Idlewild Road	$31,101,700	0.1	X Unshaded	Direct Exposure	1
Safety and Security	Police Station	7151 MATTHEWS-MINT HILL RD.	$1,592,300	0.1	X Unshaded	Indirect Exposure	0

G.2 RISK ASSESSMENT

This section contains a summary of the Town's asset inventory as well as hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Dam Failure, Flood, and Wildfire.

G.2.1 DAM FAILURE

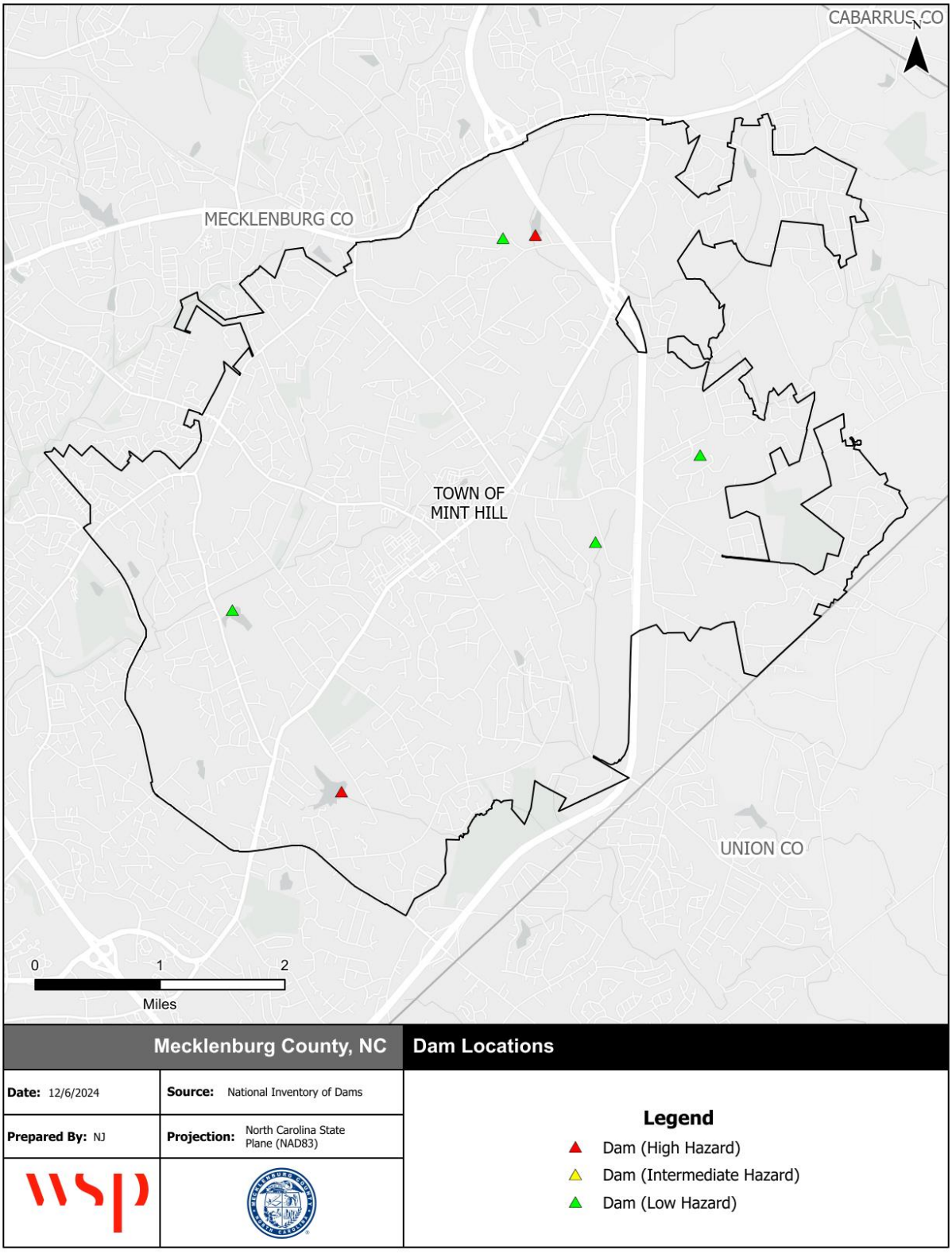
Table G.3 lists all high hazard dams located in the Town of Mint Hill that have been identified by the North Carolina Dam Inventory with a condition assessment of "fair" or "poor." Figure G.2 shows the location of all dams by jurisdiction in Town of Mint Hill.

Table G.3 – High Hazard Dams in Town of Mint Hill

Dam Name	NID ID	Condition as of Last Inspection	Max Capacity (Ac-Ft)	Nearest Downstream Location
Cornwell Dam	NC00328	Fair	358	Fairview

Source: NC Dam Inventory, December 2024

Figure G.2 – Dam Inventory, Town of Mint Hill



Source: NC Dam Inventory, December 2024

G.2.2 FLOODING

Table G.4 details the acreage of the Town of Mint Hill by flood zone on the effective DFIRM. Per this assessment, just under 2 percent of Mint Hill falls within the mapped 1%-annual-chance floodplains.

Table G.4 – Flood Zone Acreage in the Town of Mint Hill

Flood Zone	Acreage	Percent of Total (%)
Zone AE	282.8	1.8
Zone X (500-year)	0.00	0.0
Zone X Unshaded	15,200.6	98.2
Total	**15,483.4**	**100.0**

Source: FEMA Effective DFIRM

Figure G.3 reflects the effective mapped flood hazard zones for the Town of Mint Hill, and Figure G.4 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

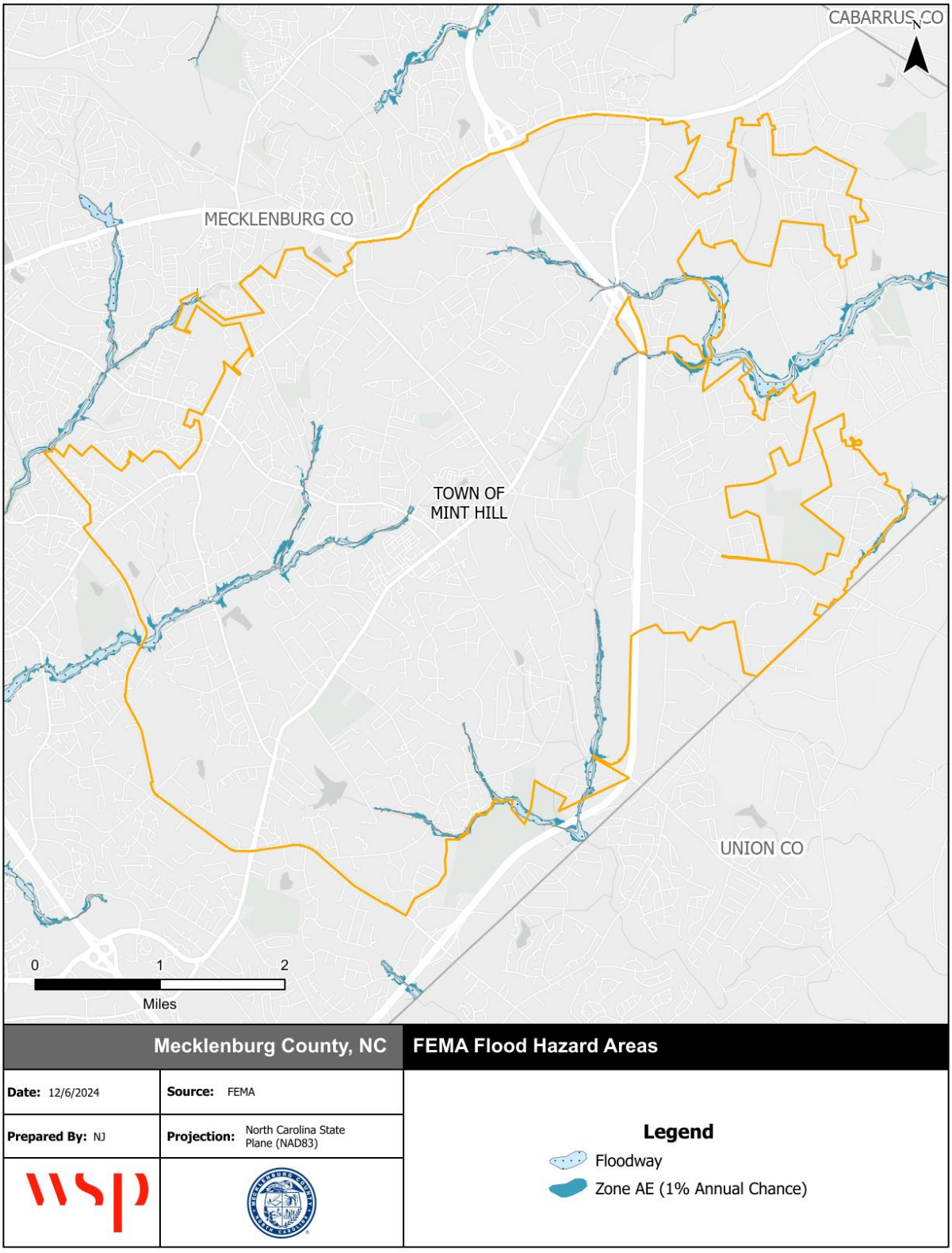
Table G.5 provides building counts and values for critical facilities by flood zone in the Town of Mint Hill.

Table G.5 – Critical Facilities Exposed to Flooding, Town of Mint Hill

Flood Zone	Critical Facility Count	Structure Value
Zone AE	0	$0
Zone X (500-year)	0	$0
Zone X Unshaded	29	$139,157,500
Total	**29**	**$139,157,500**

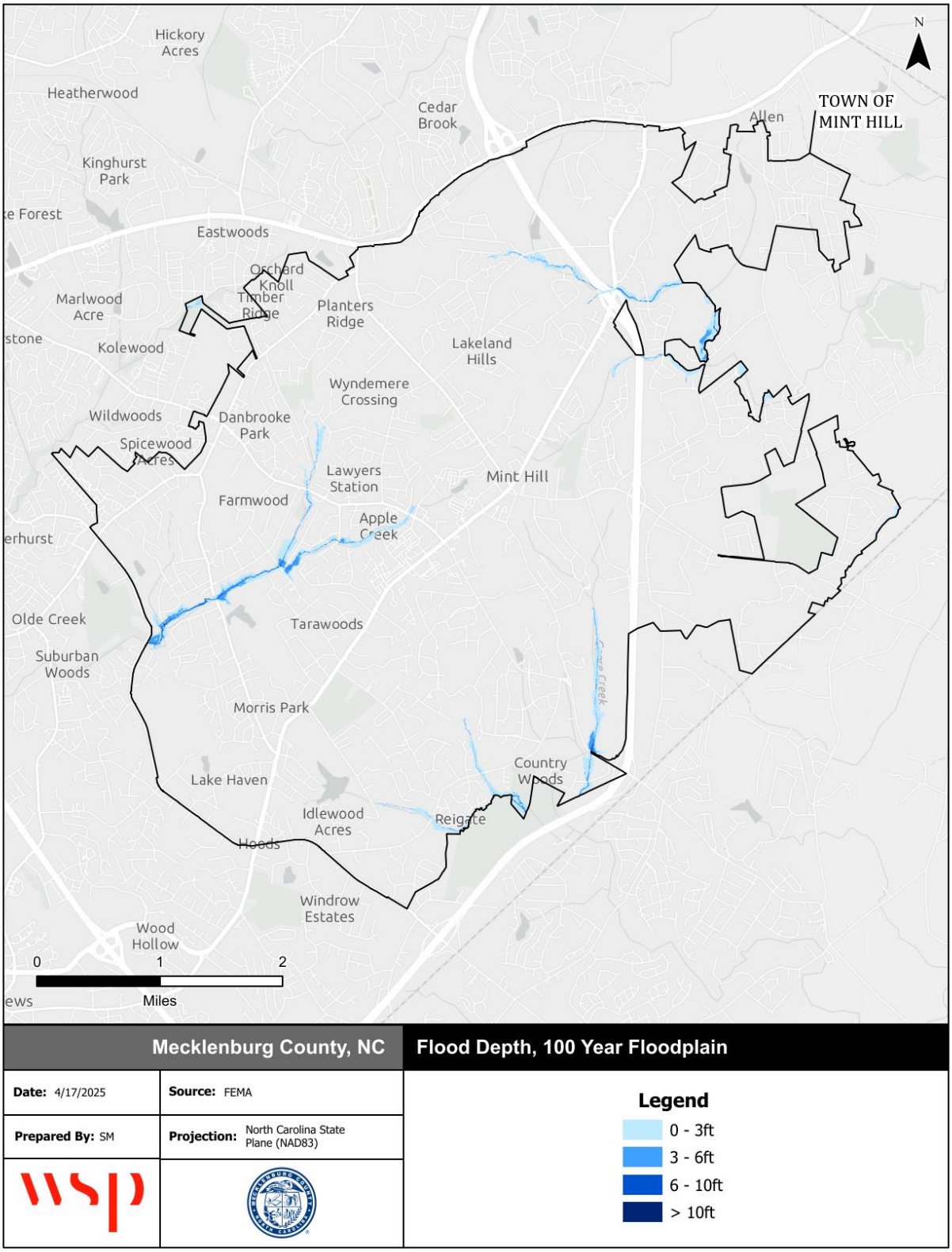
Source: FEMA Effective DFIRM, HMPC

Figure G.3 – FEMA Flood Hazard Areas, Town of Mint Hill



Source: FEMA Effective DFIRM

Figure G.4 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Mint Hill



Source: FEMA Effective DFIRM

FLOOD INSURANCE DATA

The Town of Mint Hill joined the NFIP through regular entry in December 2007. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table G.6 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	32	$24,013	$9,372,000	8	$105,251.01
Total	**32**	**$24,013**	**$9,372,000**	**8**	**$105,251.01**

Source: FEMA Community Information System, accessed May 2025

Table G.7 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	9	$10,261	$2,673,000	3	$40,396.09
B, C & X Zone					
Standard	23	$13,752	$6,699,000	3	$37,393.74
Preferred	0	$0	$0	2	$27,461.18
Total	**32**	**$24,013**	**$9,372,000**	**8**	**$105,251.01**

Source: FEMA Community Information System, accessed May 2025

Table G.8 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	8	$9,808	$2,423,000	3	$40,396.09
B, C & X Zone	13	$8,249	$3,582,000	4	$55,498.56
Standard	13	$8,249	$3,582,000	3	$37,393.74
Preferred	0	$0	$0	1	$18,104.82
Total	21	$18,057	$6,005,000	7	$95,894.65

Source: FEMA Community Information System, accessed May 2025

Table G.9 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	1	$453	$250,000	0	$0.00
B, C & X Zone	10	$5,503	$3,117,000	1	$9,356.36
Standard	10	$5,503	$3,117,000	0	$0.00
Preferred	0	$0	$0	1	$9,356.36
Total	**11**	**$5,956**	**$3,367,000**	**1**	**$9,356.36**

Source: FEMA Community Information System, accessed May 2025

G.2.3 WILDFIRE

Table G.10 summarizes the acreage in the Town of Mint Hill that falls within the Functional Wildland Urban Interface (WUI), categorized into zones that describe the wildfire risk mitigation activities appropriate for each zone. Areas in the Functional WUI are those areas where development and building structures may intermix with burnable land cover. Approximately, 45 percent of the Town of Mint Hill is categorized as having direct exposure to wildfire risk within the Functional WUI.

Table G.10 – Functional Wildland Urban Interface, Town of Mint Hill

	Functional Wildland Urban Interface (WUI) Category	Acres	Percent
	Direct Exposure	6,910	45%
	Indirect Exposure	4,361	28%
	Critical Fireshed	1,908	12%
	Sources of Ember Load to Buildings	2,231	14%
	Little to No Exposure	0	0%
	Water	77	0%
	Total	**15,487**	**100%**

Source: Southern Wildfire Risk Assessment

Figure G.5 depicts the Functional WUI for the Town of Mint Hill, including incorporated areas. Figure G.6 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure G.7 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Large clusters of direct exposure to wildfire can be found through out the Town of Mint Hill. There are pockets of moderate burn probability, especially on the eastern half of Mint Hill. Overall fire intensity is low with some clusters of moderate to high fire intensity occurring in the northeastern sides of the Town.

Table G.11 provides the count and estimated value of all structures that intersect with areas of the Town of Mint Hill and participating jurisdictions that are rated moderate to high on the WUI Risk Index.

Table G.12 provides building counts and values for critical facilities by FEMA lifeline that are located in areas categorized with direct exposure to wildfire risk on the Functional WUI scale.

Table G.11 – Structures at Risk to Moderate-High WUI Risk Index, Town of Mint Hill

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	83	$47,572,408.00	$47,572,408.00	$95,144,816.00
Education	5	$4,840,565.00	$4,840,565.00	$9,681,130.00
Government	1	$1,721,446.00	$1,721,446.00	$3,442,892.00
Industrial	24	$11,325,067.00	$16,987,600.50	$28,312,667.50
Religious	25	$17,266,546.00	$17,266,546.00	$34,533,092.00
Residential	4,465	$691,333,107.00	$345,666,553.50	$1,036,999,660.50
Total	**4,603**	**$774,059,139.00**	**$434,055,119.00**	**$1,208,114,258.00**

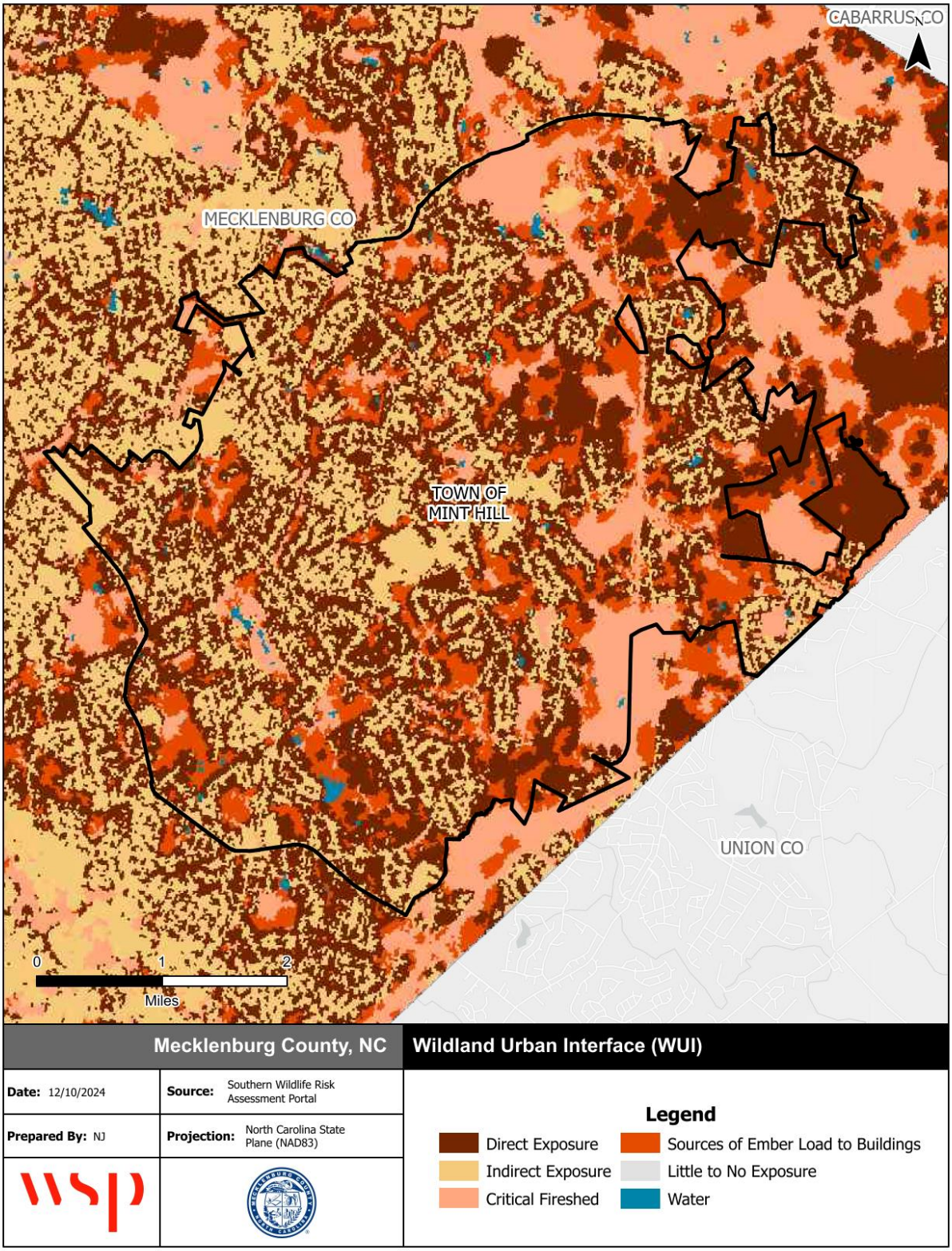
Source: Southern Wildfire Risk Assessment

Table G.12 – Critical Facilities Exposed to Wildfire, Town of Mint Hill

Type	Critical Facility Count	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	2	$31,500,300
Hazardous Materials	1	$-
Health and Medical	1	$-
Safety and Security	2	$-
Transportation	0	$-
Water Systems	0	$-
Total	**6**	**$31,500,300**

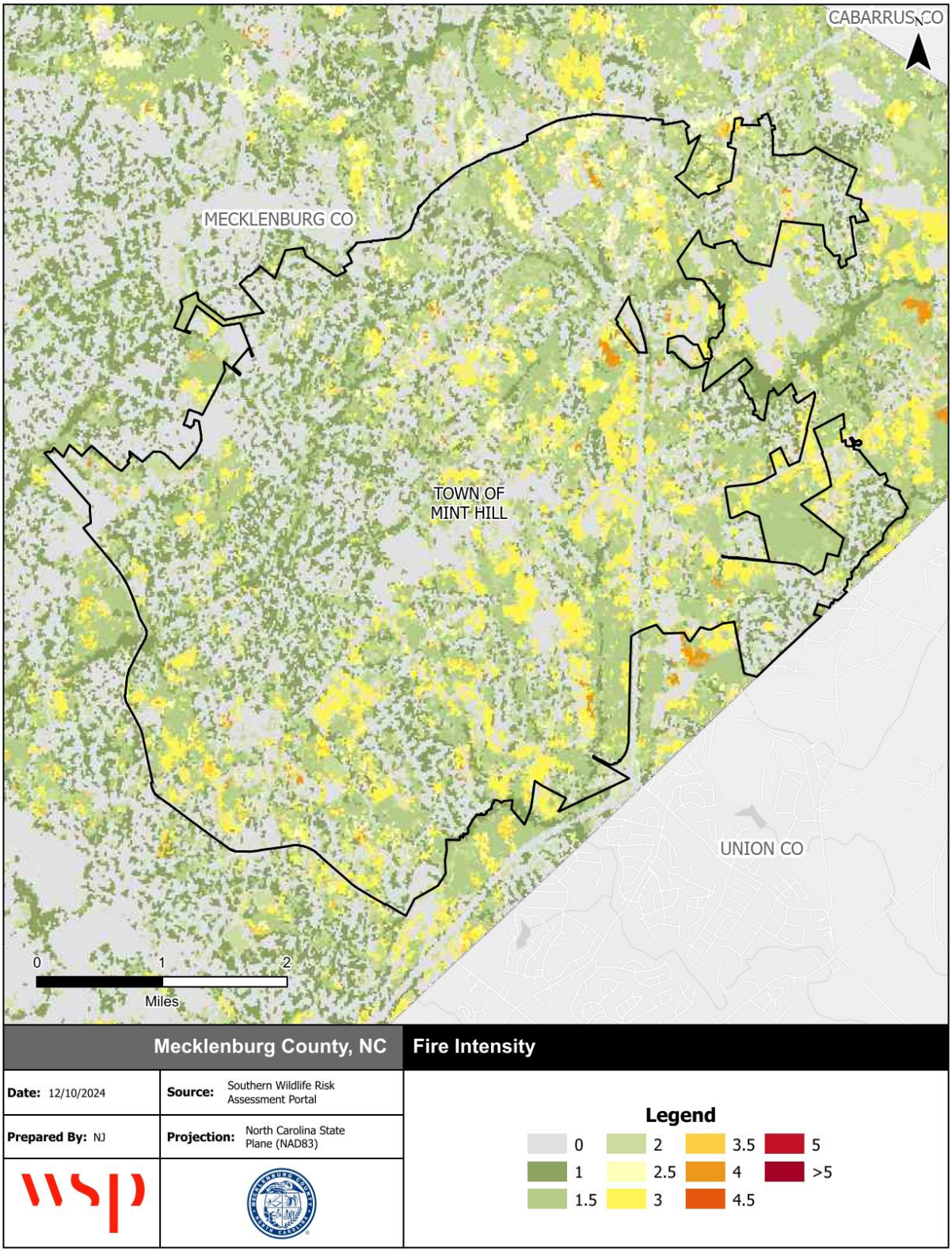
Source: Southern Wildfire Risk Assessment

Figure G.5 – Functional Wildland Urban Interface, Town of Mint Hill



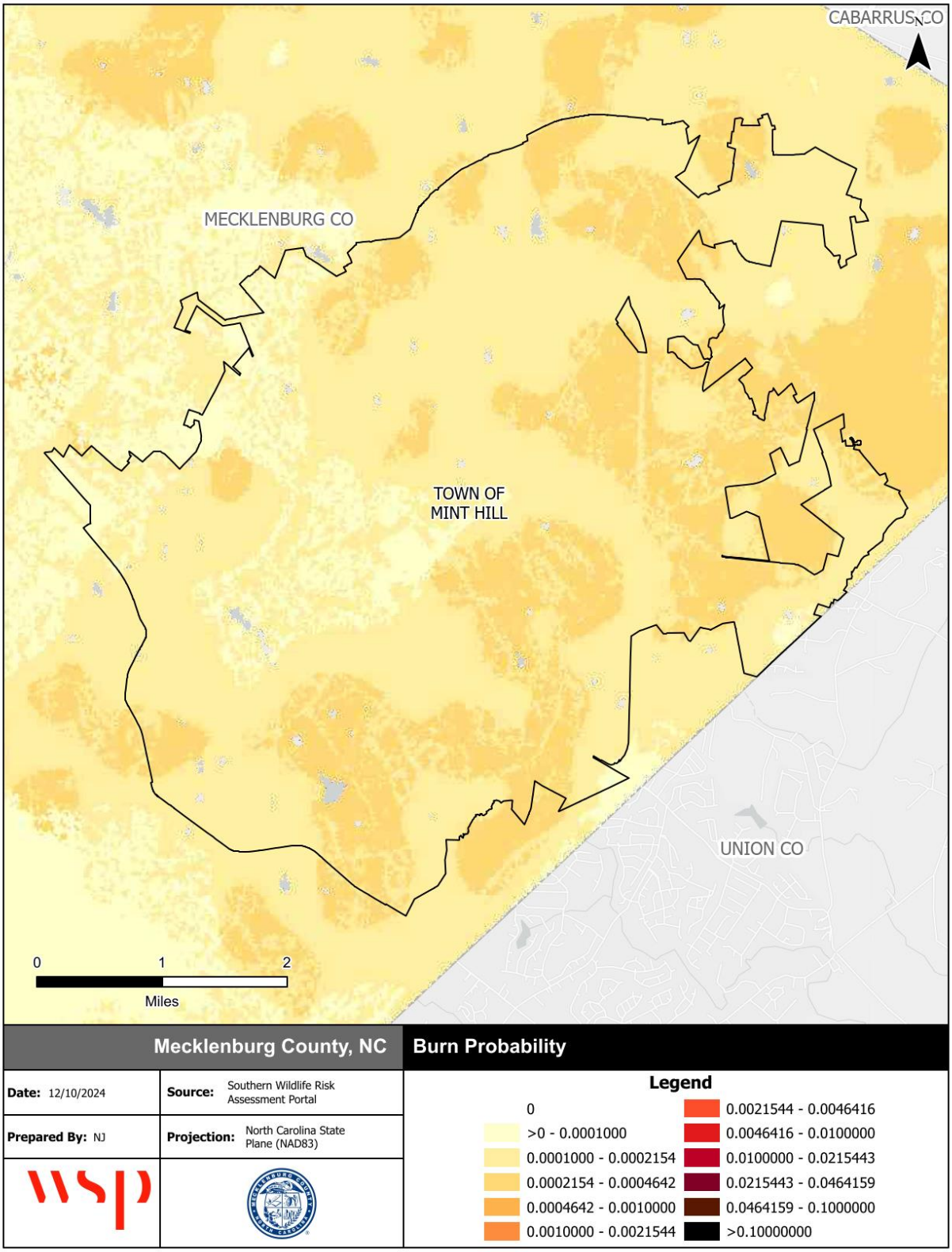
Source: Southern Wildfire Risk Assessment

Figure G.6 – Characteristic Fire Intensity, Town of Mint Hill



Source: Southern Wildfire Risk Assessment

Figure G.7 – Burn Probability, Town of Mint Hill



Source: Southern Wildfire Risk Assessment

G.3 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mint Hill-1	Seek funding to retrofit critical facilities and Town-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, 320 or 361 compliant safe rooms, lightning protection, hail resistant roofing, and anchoring fixed building equipment.	All Hazards	1.3	Medium	Property Protection	Mecklenburg County Buildings and Inspections Department; Town of Mint Hill Emergency Services	To be determined on a case by case basis	Local, State Grants, UHMA grants, other federal grants	2030	Carry Forward	New Public Services Facility constructed. Resiliency of other facilities will be assessed, and retrofits will be evaluated as renovations take place and funding becomes available.
Mint Hill-2	Seek funding to install backup generators or quick connect hook ups for mobile generators on any newly constructed county/town critical facilities.	All Hazards	1.3	Medium	Property Protection	Mecklenburg County Buildings and Inspections Department; Town of Mint Hill Emergency Services	To be determined on a case by case basis	Local, State Grants, UHMA grants, other federal grants	2030	Carry Forward	The need for more emergency generators will be assessed as new town facilities are constructed.
Mint Hill-3	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standards (in addition to basic required compliance actions): a) Development standards linked to Community Floodplain (Future Conditions) b) Require critical facilities protection to 500-year flood levels c) Require parking lots to be elevated (no more than six inches deep in any parking space during Community Flood event) d) Require dry land access for new or substantially improved buildings (above Community Flood BFE) e) Levee restrictions f) Cumulative substantial damage improvement provision g) Prohibit basements below flood level on filled lots	Flooding	4.1	High	Prevention	Town of Mint Hill in coordination with CMSWS	Local staff time	Local	2025-2030	Carry Forward	The Town has maintained compliance with NFIP.
Mint Hill-4	Prepare and conduct a survey for critical facilities to help identify structural and/or non-structural deficiencies that may lead to increased vulnerability to natural hazards. Include recommended corrective actions in local capital improvements program.	All Hazards	1.3	Medium	Prevention	Town of Mint Hill Public Works Department	$20,000	Local	2030	Carry Forward	Critical facilities have been reevaluated on a yearly basis to identify any deficiencies.
Mint Hill-5	Prepare and maintain a map of areas that flood frequently, particularly those areas outside of FEMA floodplains.	Flooding	2.1	Medium	Prevention	In coordination with CMSWS	$5,000	N/A	2030	Carry Forward	Mapping review completed annually. Updated as new data is available.
Mint Hill-6	Coordinate with the North Carolina Division of Forest Resources (NCDFR) to prepare Community Wildfire Protection Plans (CWWPs) for identified high risk communities.	Wildfire	4.1	Medium	Prevention	Town of Mint Hill Voluntary Fire Department; in coordination with NCFS	$5,000	NCDFR grants; FEMA PDM or HMGP	2030	Carry Forward	This action is the responsibility of the NCFS. The Town of Mint Hill will continue to assist with this action as needed, however it is being monitored and maintained by NCFS.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Mint Hill-7	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for mitigating and preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.1	Medium	Public Education & Awareness	Town of Mint Hill in coordination with CMEMO (Lead)	Local staff time and resources	Local	2025-2030	Carry Forward	Charlotte-Mecklenburg Storm Water Services (CMSWS) staff meets quarterly with Fire Chiefs and Emergency Management leaders from all municipalities in Mecklenburg County. During these meetings, CMSWS staff provide a debrief of flood related activities as well as the most recent Flood Information & Notification System (FINS) technology enhancements.
Mint Hill-8	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management to provide information on all natural hazards facing the area to local planning staff and elected officials. This should be combined with an annual progress report on the status of local mitigation actions as identified in the Multi-jurisdictional Hazard Mitigation Plan.	All Hazards	3.1	Medium	Public Education & Awareness	Town of Mint Hill in coordination with CMEMO (Lead)	Local staff time and resources	Local	2025-2030	Carry Forward	No progress made due to limited staff and competing priorities.
Mint Hill-9	Improve growth management procedures in identified flood hazard areas.	Flooding	4.1	High	Prevention	Town of Mint Hill Planning Department	Staff time and resources	Local	2030	Carry Forward	No procedure changes made, but this is an ongoing procedure. Town will continue to consider improvements.
Mint Hill-10	Pursue the acquisition and/or elevation of high-risk flood prone properties.	Flooding	1.1	Medium	Property Protection	Charlotte-Mecklenburg Storm Water Services, Town of Mint Hill Administration	To be determined	Grant funds	2025-2030	New	
Mint Hill-11	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	
Mint Hill-12	Implement drainage improvement projects to reduce stormwater flooding.	Flooding	1.2	Medium	Structural Projects	Mint Hill Public Works	To be determined	Local funds, Grant funds	2025-2030	New	
Mint Hill-13	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.

ANNEX H TOWN OF PINEVILLE

H.1 ASSET INVENTORY

The Town of Pineville and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table H.1 provides a count of critical facilities by FEMA lifeline category in the Town of Pineville. Figure H.1 shows the locations of all critical facilities in the Town of Pineville.

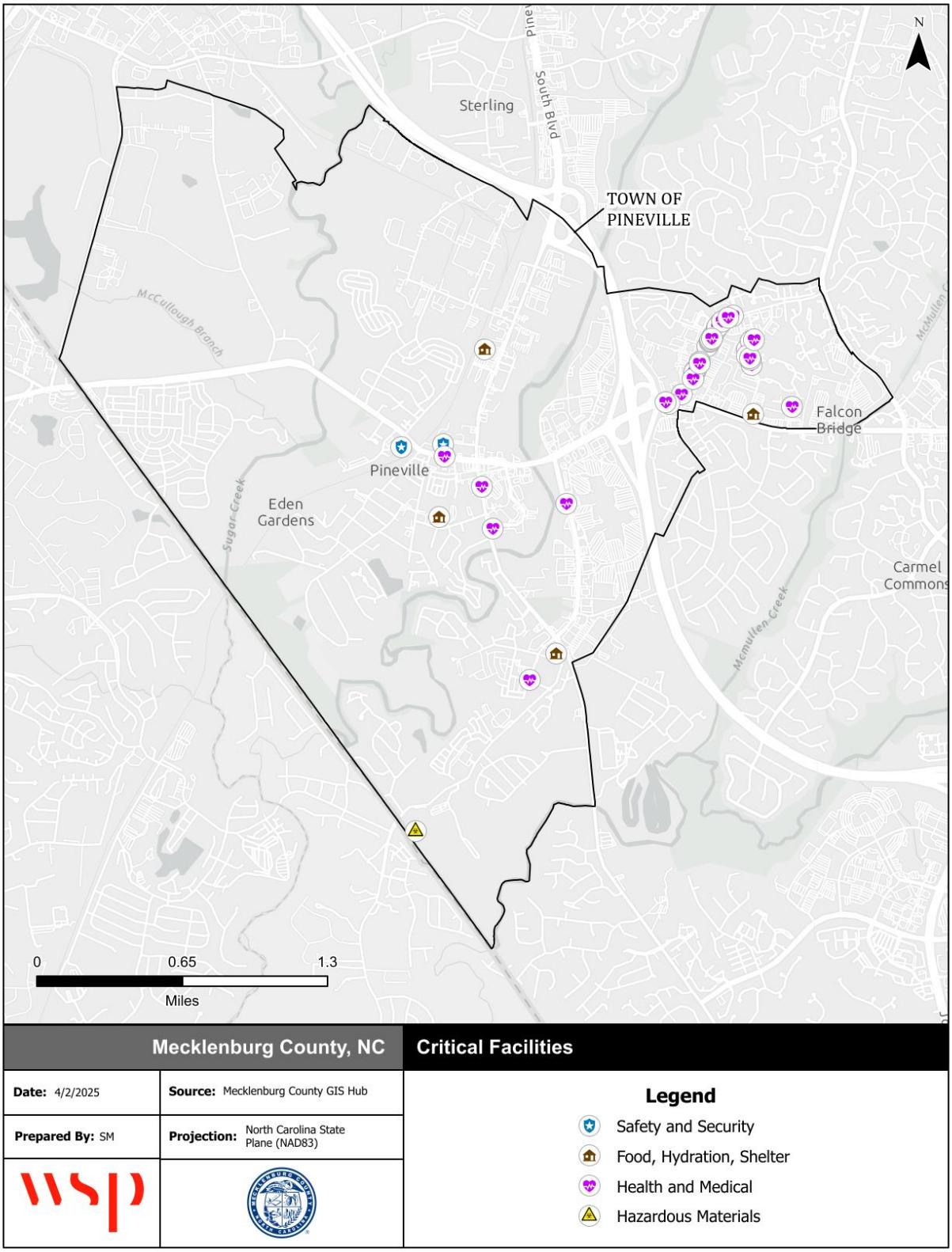
Table H.2 provides a detailed inventory of the critical facilities in the Town of Pineville, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table H.1 – Critical Facilities, Town of Pineville

Facility Type	Count of Facility Type	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	4	$33,448,700
Hazardous Materials	1	$-
Health and Medical	47	$59,954,000
Safety and Security	2	$7,129,100
Transportation	0	$-
Water Systems	0	$-
Total	**54**	**$100,531,800**

Source: Mecklenburg County, HMPC

Figure H.1 – Critical Facilities, Town of Pineville



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table H.2 – Critical Facilities Inventory, Town of Pineville

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Hazardous Materials	Landfill	13615 DORMAN DR	-	0.1	X Unshaded	Sources of Ember Load to Buildings	1.5
Safety and Security	Fire Station	107 CHURCH ST	$667,900	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	601 N Polk St	$11,471,300	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	8614 Pineville Matthews Rd	$5,299,200	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	12416 Lancaster Highway	$2,730,600	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	321 S Polk St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10650 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10660 PARK RD	$59,954,000	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10520 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10320 Feld Farm Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10009 PARK CEDAR DR	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10700 Kettering Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10502 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10512 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9101 PINEVILLE-MATTHEWS RD	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10042 Park Cedar Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10320 Feld Farm Ln	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10430 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	216 Main St	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10700 Kettering Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10520 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10620 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10512 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10660 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10648 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10660 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0

FEMA Lifeline	Facility Type	Address	Structure Value	Flood Depth	Flood Zone	High WUI Exposure	Fire Intensity
Health and Medical	Medical Facilities	10512 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11025 Carolina Place Pkwy	-	0.1	X Unshaded	Critical Fireshed	0
Health and Medical	Medical Facilities	10370 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10650 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10410 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10512 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10027 Park Cedar Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10430 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10460 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10660 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	11940 Carolina Place Pkwy	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10450 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10370 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10650 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10340 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10370 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	9101 Pineville Matthews Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10701 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10514 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10620 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	600 Towne Centre Blvd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10628 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10030 Park Cedar Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10508 Park Rd	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10021 Park Cedar Dr	-	0.1	X Unshaded	Indirect Exposure	0
Health and Medical	Medical Facilities	10310 Feld Farm Ln	-	0.1	X Unshaded	Indirect Exposure	0
Food, Hydration, Shelter	School	210 Lowery Street	$13,947,600	0.1	X Unshaded	Indirect Exposure	0
Safety and Security	Police Station	427 MAIN STREET	$6,461,200	0.1	X Unshaded	Indirect Exposure	0

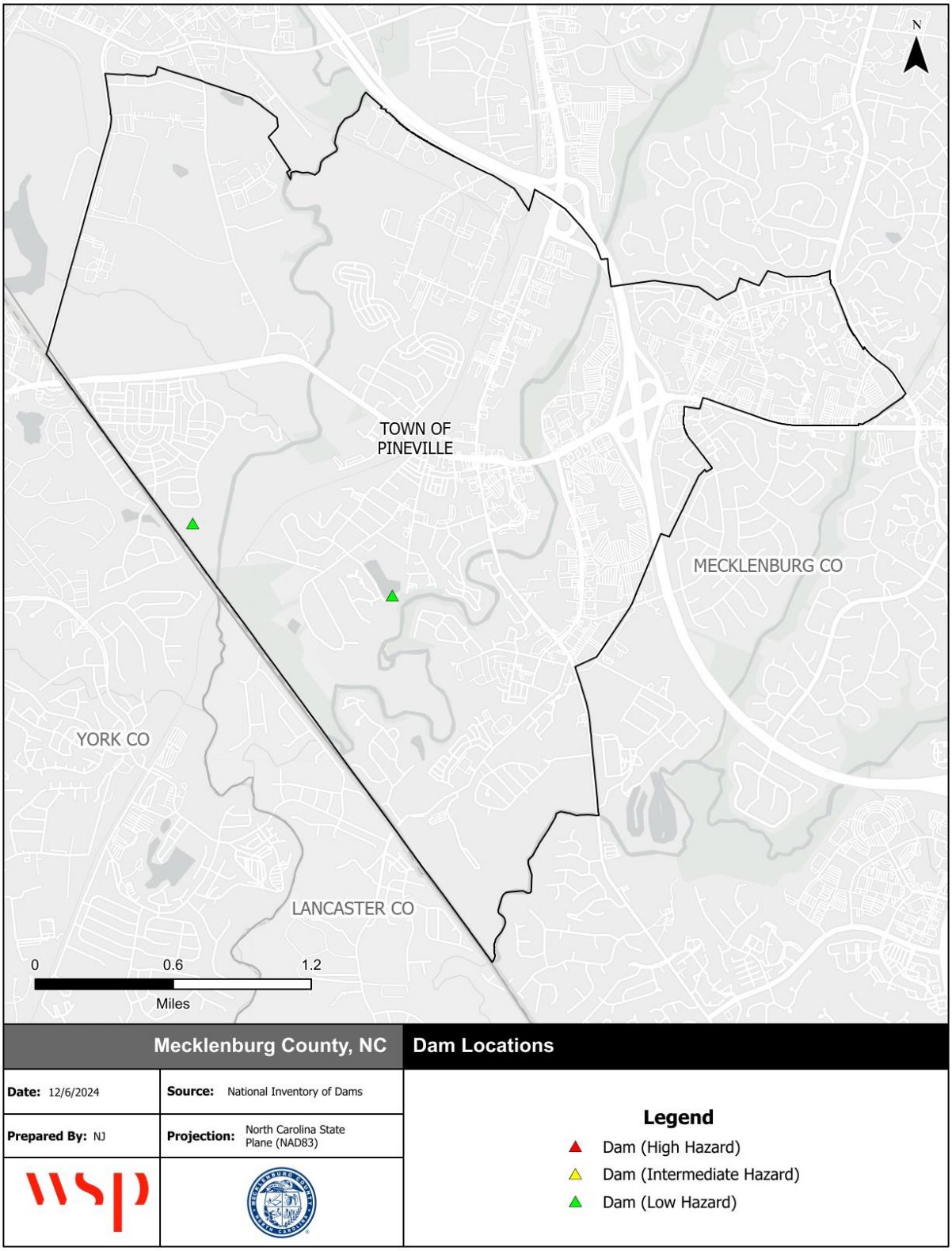
H.2 RISK ASSESSMENT

This section contains a summary of the Town's asset inventory as well as hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level. The hazards included in this section are: Dam Failure, Flood and Wildfire.

H.2.1 DAM FAILURE

Currently, the Town of Pineville has no high hazard dams that have been identified by the North Carolina Dam Inventory with a condition assessment of "fair" or "poor." Figure H.2 shows the location of all dams in the Town of Pineville.

Figure H.2 – Dam Inventory, Town of Pineville



Source: NC Dam Inventory, December 2024

H.2.2 FLOODING

Table H.3 details the acreage of the Town of Pineville by flood zone on the effective DFIRM. Per this assessment, 20 percent of Pineville falls within the mapped 1%-annual-chance floodplains.

Table H.3 – FEMA Flood Hazard Areas, Town of Pineville

Flood Zone	Acreage	Percent of Total (%)
Zone AE	851.6	20.0
Zone X (500-year)	0.00	0.0
Zone X Unshaded	3,398.2	80.0
Total	**4,249.8**	**100.0**

Source: FEMA Effective DFIRM

Figure H.3 reflects the effective mapped flood hazard zones for the Town of Pineville, and Figure H.4 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

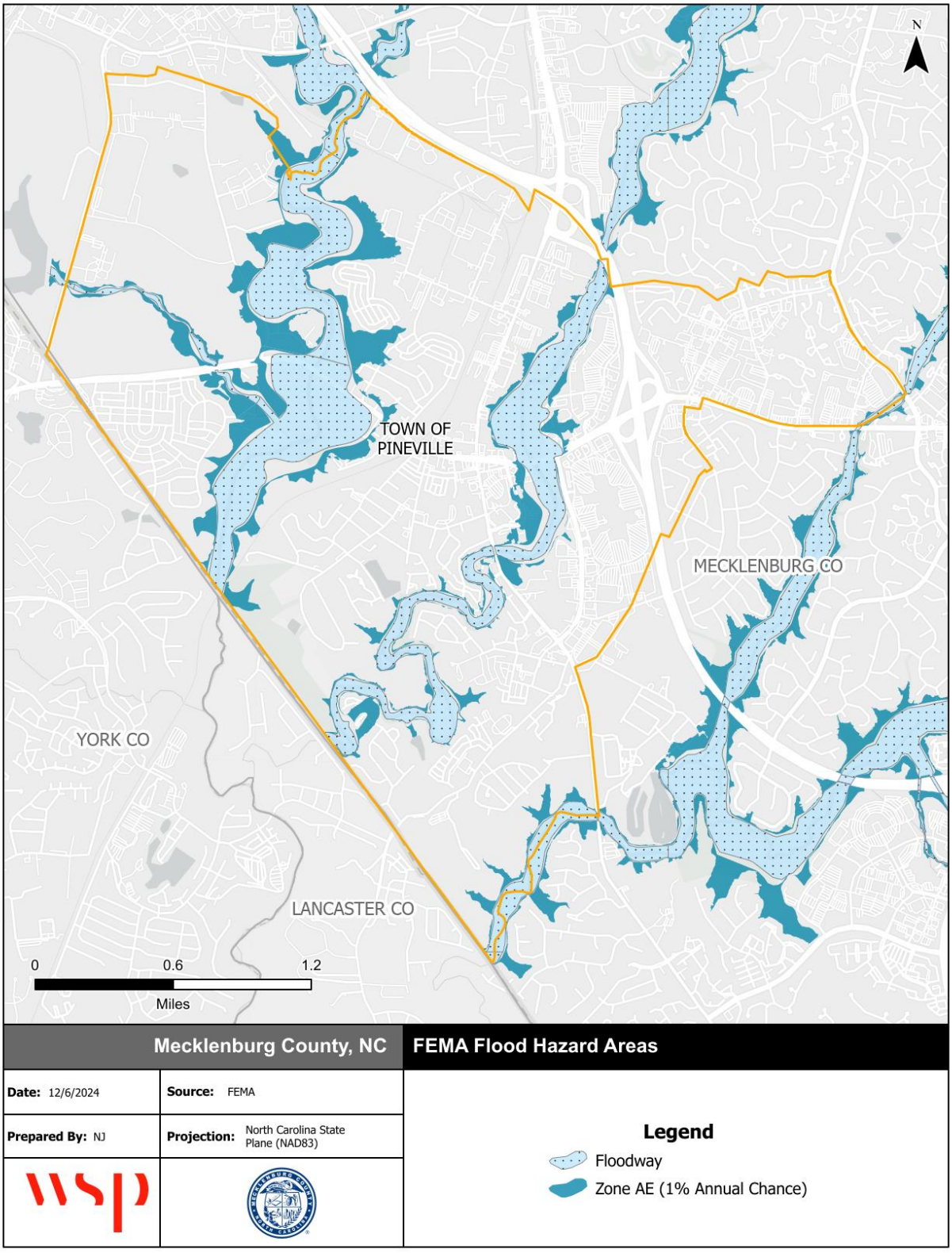
Table H.4 provides building counts and values for critical facilities by flood zone in the Town of Pineville.

Table H.4 – Critical Facilities Exposed to Flooding, Town of Pineville

Flood Zone	Critical Facility Count	Structure Value
Zone AE	0	$0
Zone X (500-year)	0	$0
Zone X Unshaded	54	$100,531,800
Total	**54**	**$100,531,800**

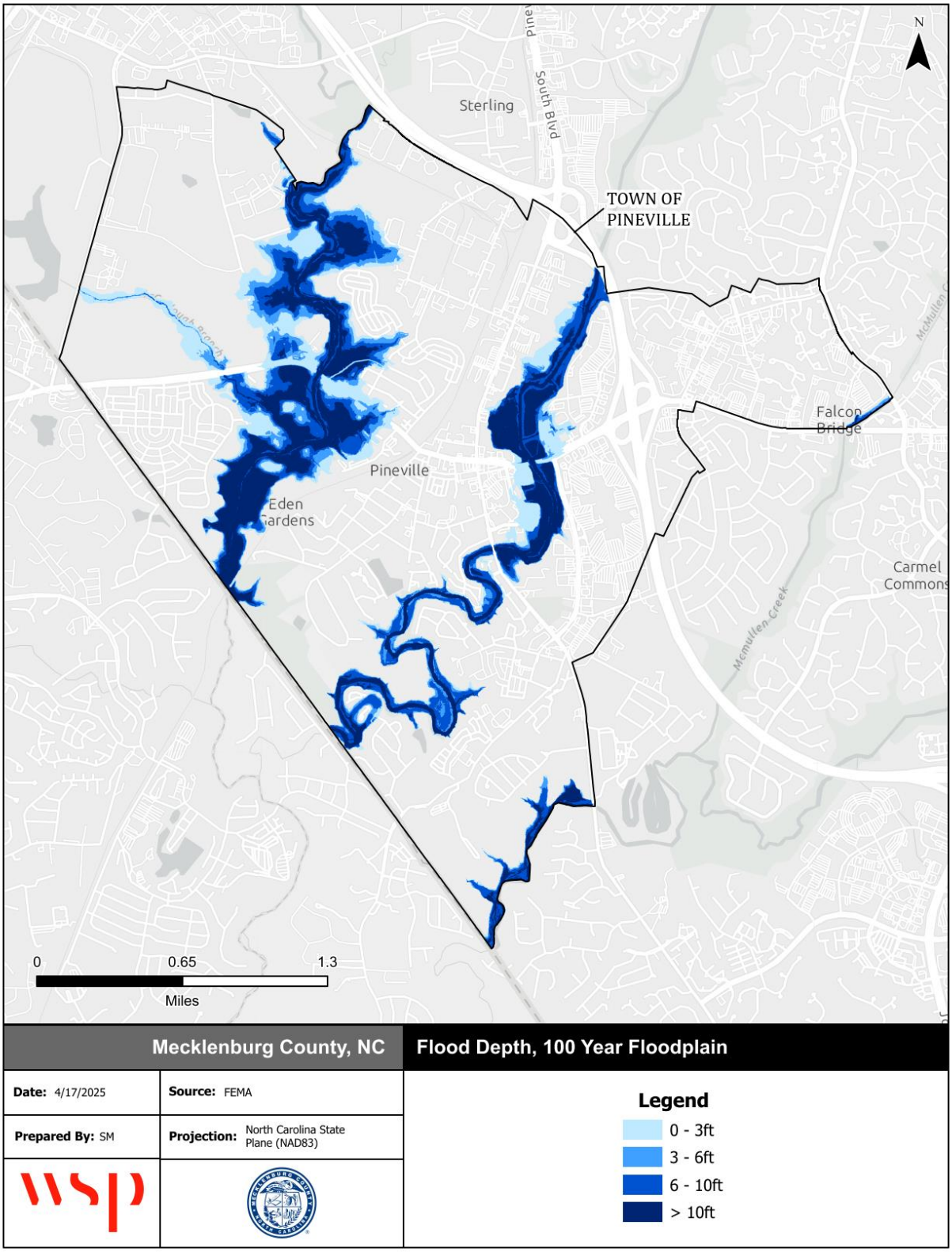
Source: FEMA Effective DFIRM, HMPC

Figure H.3 – FEMA Flood Hazard Areas, Town of Pineville



Source: FEMA Effective DFIRM

Figure H.4 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Pineville



Source: FEMA Effective DFIRM

FLOOD INSURANCE DATA

The Town of Pineville joined the NFIP through emergency in 1975 and have been a regular participant since March 1987. Pineville participates in the Community Rating System and is a Class 5 community. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table H.5 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	15	$10,278	$4,194,000	3	$1,718.13
2-4 Family	2	$589	$282,000	0	$0.00
All Other Residential	5	$1,412	$609,000	0	$0.00
Non-Residential	16	$37,695	$6,105,000	2	$18,000.00
Total	**38**	**$49,974**	**$11,190,000**	**5**	**$19,718.13**

Source: FEMA Community Information System, accessed May 2025

Table H.6 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	26	$33,399	$6,729,000	4	$19,718.13
B, C & X Zone					
Standard	12	$16,575	$4,461,000	0	$0.00
Preferred	0	$0	$0	1	$0.00
Total	**38**	**$49,974**	**$11,190,000**	**5**	**$19,718.13**

Source: FEMA Community Information System, accessed May 2025

Table H.7 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	10	$17,014	$1,748,000	4	$19,718.13
B, C & X Zone	5	$10,520	$2,131,000	0	$0.00
Standard	5	$10,520	$2,131,000	0	$0.00
Total	**15**	**$27,534**	**$3,879,000**	**4**	**$19,718.13**

Source: FEMA Community Information System, accessed May 2025

Table H.8 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	16	$16,385	$4,981,000	0	$0.00
B, C & X Zone	7	$6,055	$2,330,000	1	$0.00
Standard	7	$6,055	$2,330,000	0	$0.00
Preferred	0	$0	$0	1	$0.00
Total	**23**	**$22,440**	**$7,311,000**	**1**	**$0.00**

Source: FEMA Community Information System, accessed May 2025

H.2.3 WILDFIRE

Table H.9 summarizes the acreage in the Town of Pineville that falls within the Functional Wildland Urban Interface (WUI), categorized into zones that describe the wildfire risk mitigation activities appropriate for each zone. Areas in the Functional WUI are those areas where development and building structures may intermix with burnable land cover. Approximately, 13 percent of the Town of Pineville is categorized as having direct exposure to wildfire risk within the Functional WUI.

Table H.9 – Functional Wildland Urban Interface, Town of Pineville

	Functional Wildland Urban Interface (WUI) Category	Acres	Percent
	Direct Exposure	545	13%
	Indirect Exposure	2,064	49%
	Critical Fireshed	1,011	24%
	Sources of Ember Load to Buildings	623	15%
	Little to No Exposure	0	0%
	Water	8	0%
	Total	**4,251**	**100%**

Source: Southern Wildfire Risk Assessment

Figure H.5 depicts the Functional WUI for the Town of Pineville, including incorporated areas. Figure H.6 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure H.7 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Direct exposure to wildfire is mostly found in the southern and northern regions of Pineville. Moderate to high potential fire intensity is spread throughout the Town, especially in the western area. Overall, the Town has a very low burn probability, with moderate pockets occurring in the south and northwestern regions of the Town.

Table H.10 provides the count and estimated value of all structures that intersect with areas of Town of Pineville and participating jurisdictions that are rated moderate to high on the WUI Risk Index.

Table H.11 provides building counts and values for critical facilities by FEMA lifeline that are located in areas categorized with direct exposure to wildfire risk on the Functional WUI scale.

Table H.10 – Structures at Risk to Moderate-High WUI Risk Index, Town of Pineville

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	12	$4,429,726.00	$4,429,726.00	$8,859,452.00
Education	0	$0	$0	$0
Government	4	$449,389.00	$449,389.00	$898,778.00
Industrial	8	$1,755,138.00	$2,632,707.00	$4,387,845.00
Religious	2	$449,987.00	$449,987.00	$899,974.00
Residential	245	$38,087,697.00	$19,043,848.50	$57,131,545.50
Total	**271**	**$45,171,937.00**	**$27,005,657.50**	**$72,177,594.50**

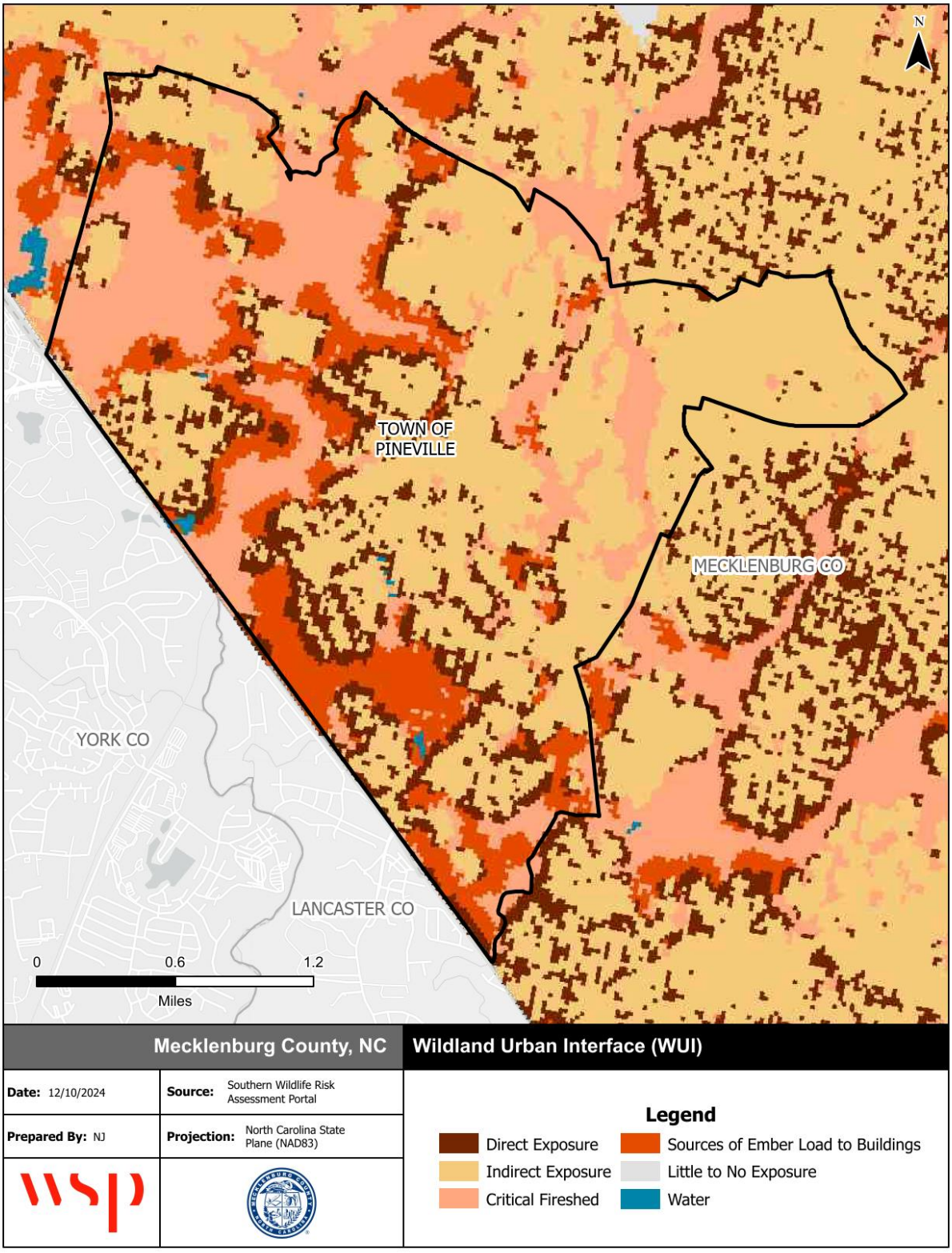
Source: Southern Wildfire Risk Assessment

Table H.11 – Critical Facilities Exposed to Wildfire, Town of Pineville

Type	Critical Facility Count	Structure Value
Communications	0	$-
Energy	0	$-
Food, Hydration, Shelter	0	$-
Hazardous Materials	0	$-
Health and Medical	1	$-
Safety and Security	0	$-
Transportation	0	$-
Water Systems	0	$-
Total	**1**	**$-**

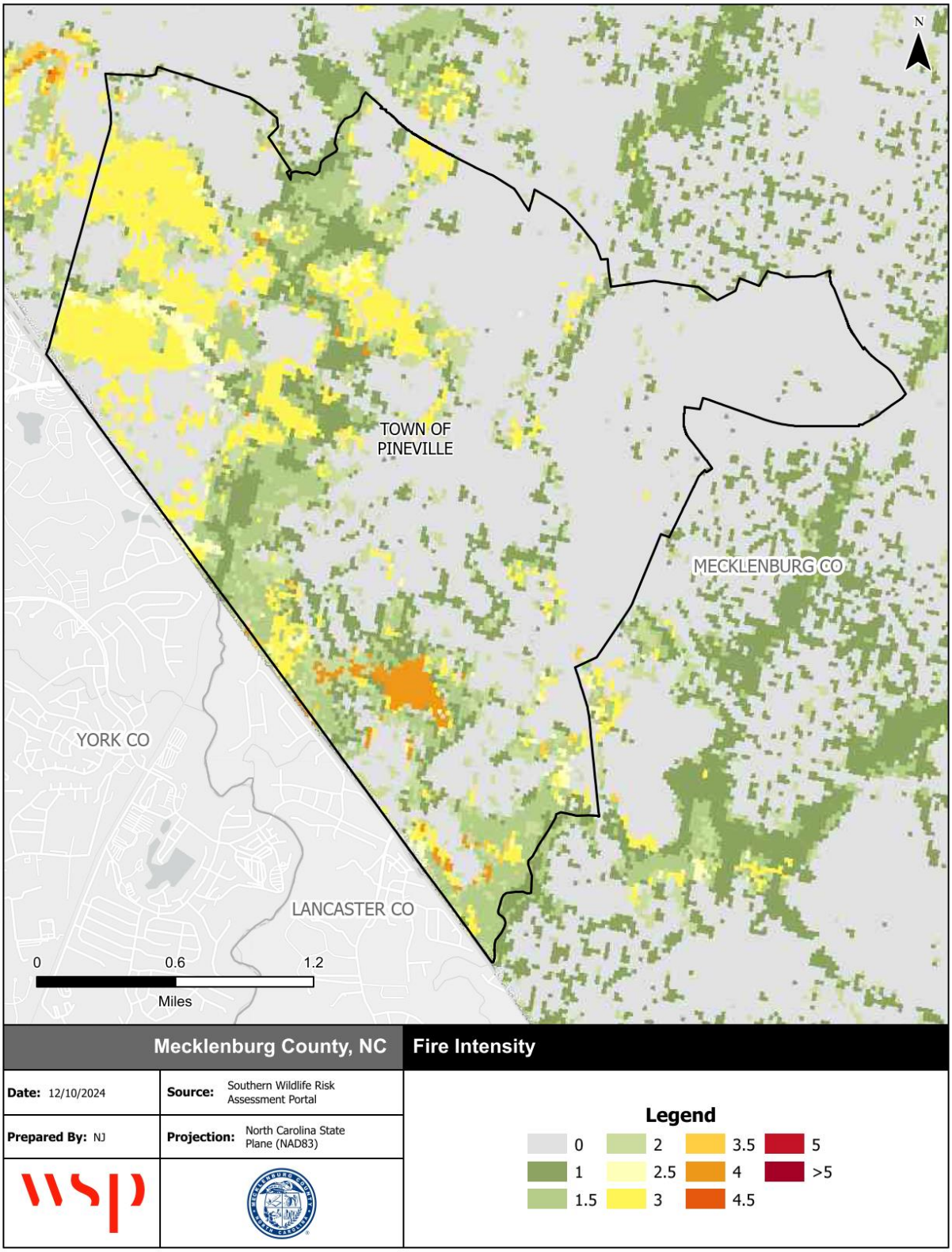
Source: Southern Wildfire Risk Assessment

Figure H.5 – Functional Wildland Urban Interface, Town of Pineville



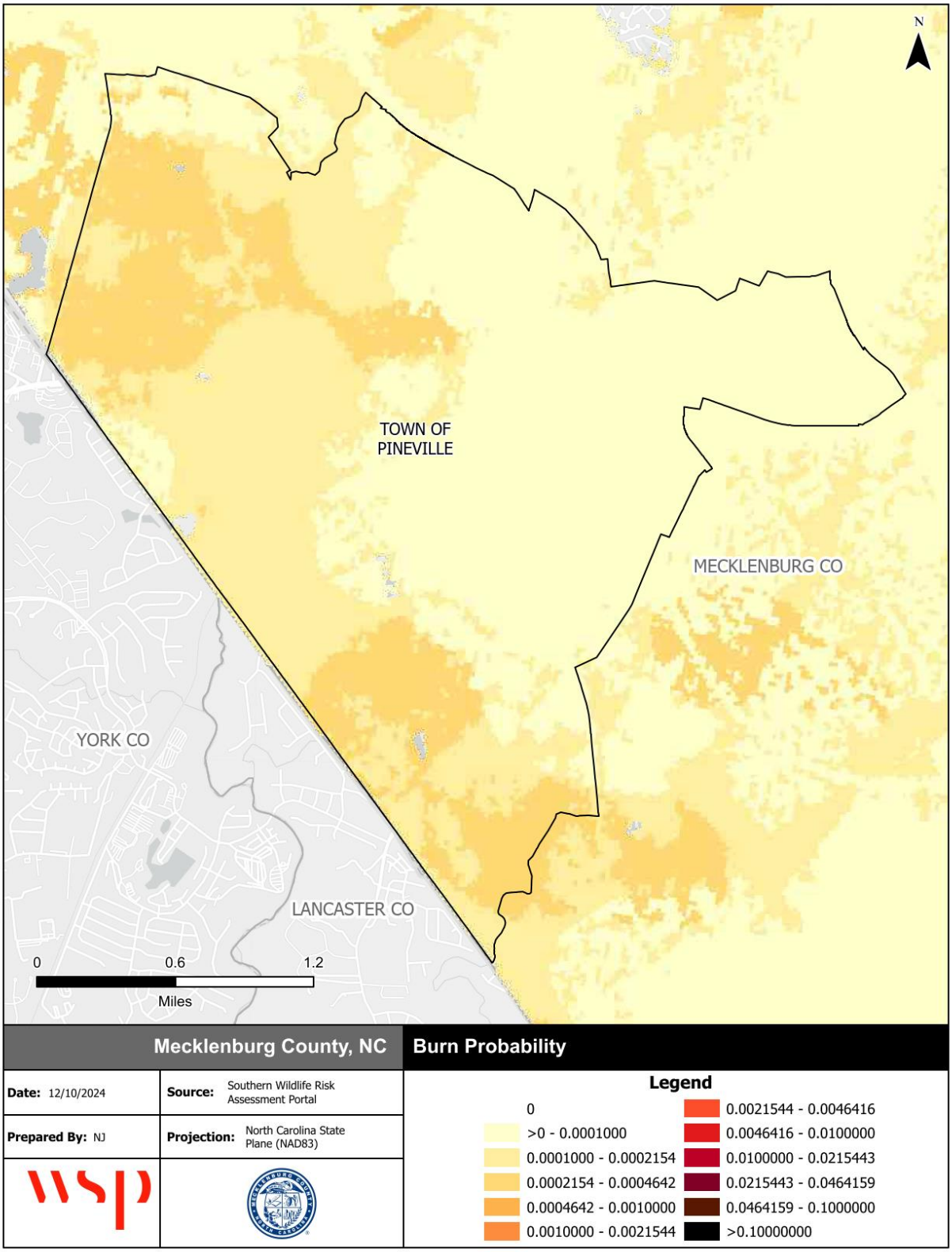
Source: Southern Wildfire Risk Assessment

Figure H.6 – Characteristic Fire Intensity, Town of Pineville



Source: Southern Wildfire Risk Assessment

Figure H.7 – Burn Probability, Town of Pineville



Source: Southern Wildfire Risk Assessment

H.3 MITIGATION STRATEGY

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Pineville-1	Seek grant funding to retrofit critical facilities and Town-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, 320 or 361 compliant safe rooms, lightning protection, hail-resistant roofing, and anchoring fixed building equipment.	All Hazards	1.3	Medium	Property Protection	Town of Pineville	Determined on case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	In progress: Mecklenburg County retroFIT flood hazard mitigation grant program identifies and partially funds various mitigation projects using techniques such as floodproofing.
Pineville-2	Seek grant funding to install backup generators or quick connect hook ups for mobile generators on any newly constructed county/town critical facilities.	All Hazards	1.3	Medium	Property Protection	Town of Pineville	Determined on case-by-case basis	Local, State Grants, UHMA Grants, other federal grants	2025-2030	Carry Forward	New Town Hall facility has backup generator installed and operational.
Pineville-3	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of the following higher regulatory standard (in addition to basic required compliance actions): a) Development standards linked to Community Floodplain (Future Conditions) b) Require critical facilities protection to 500-year flood levels c) Require parking lots to be elevated (no more than six inches deep in any parking space during Community Flood event) d) Require dry land access for new or substantially improved buildings (above Community Flood BFE) e) Levee restrictions f) Cumulative substantial damage improvement provision g) Prohibit basements below flood level on filled lots	Flooding	4.1	High	Prevention	Town of Pineville in coordination with CMSWS	Local staff time	N/A	2025-2030	Carry Forward	Higher standards maintained. No ordinance updates or revisions made. Charlotte-Mecklenburg Storm Water Services is exploring the use of 2D hydraulic modeling for future Countywide FIRM updates as well as regulatory floodway modeling. A pilot 2D flood modeling study of Little Sugar and Briar Creek watersheds started at the beginning of 2023 and is currently underway.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Pineville-5	Advertise and promote the availability of flood insurance.	Flooding	2.3	High	Public Education & Awareness	Town of Pineville	No extra cost - the Town of Pineville maintains a bi-monthly newsletter that can support this action	Local budget	2025-2030	Carry Forward	Annual "Floodplain Flash" newsletter distributed by USPS in December 2022. NFIP information is also presented through traditional media and social media throughout the year. NFIP information including Floodsmart.gov website, CRS discounts and Risk Rating 2.0 update are also posted on the CMSWS website.
Pineville-6	Preserve lands subject to repetitive flooding, including through acquisition of property.	Flooding	1.2	Medium	Prevention	Town of Pineville	Unknown - value of land	Land Trust, Hazard Mitigation Grant Program (HMGP), Clean Water Management Trust Fund	2025-2030	Carry Forward	The Mecklenburg County Flood Risk Assessment and Risk Reduction Tool (RARRT) is used to guide local mitigation program actions. Flood risk scores, mitigation priority scores and planning level mitigation techniques are used to identify properties for acquisition or in-place mitigation. Mitigation has been attempted on several properties with limited success.
Pineville-7	Continue to limit future development in identified flood hazard areas and prohibit new critical facilities from being located with the 500-year floodplain as required in the Town's flood damage prevention ordinance.	Flooding	4.1	Medium	Prevention	Planning and Zoning/ Mecklenburg County LUESA	Staff time and resources	N/A	2025-2030	Carry Forward	Town maintains Zoning and Subdivision Ordinances in partnership with Mecklenburg County to attain this goal.
Pineville-8	Conduct cumulative impact analysis/studies for multiple development projects within the same watershed.	Flooding	4.1	Medium	Prevention	Mecklenburg County Storm Water Services, Public Works, GIS Department	Staff time and resources	NRCS—Watershed Protection and Flood Prevention Program, NRCS—Watershed Surveys and Planning, USACE—Floodplain Management Services, HMGP	2025-2030	Carry Forward	Staff continues to require extensive studies for development projects within watersheds.
Pineville-9	Continue to coordinate with CMEMO on enhancements to the Town's early warning system and procedures for imminent hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	To be determined	FEMA—All Hazards Operational Planning, HMGP	2025-2030	Carry Forward	In Progress. Flood sensors were installed in the town of Pineville to warn town staff when flood waters are threating two of the town's critical facilities. Town continues to coordinate with CMEMO on an ongoing basis.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Cost Estimate	Potential Funding Source	Implementation Timeline	2025 Status	2025 Implementation Status Comments
Pineville-10	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management on a widespread public outreach activity to provide information on all natural hazards facing the area to local residents, including methods for preventing damages from hazardous conditions and how to respond when an imminent hazard threatens.	All Hazards	2.1	Medium	Public Education & Awareness	In coordination with CMEMO (Lead)	Staff time and resources	N/A	2025-2030	Carry Forward	Charlotte-Mecklenburg Storm Water Services (CMSWS) staff meets quarterly with Fire Chiefs and Emergency Management leaders from all municipalities in Mecklenburg County. During these meetings, CMSWS staff provide a debrief of flood related activities as well as the most recent Flood Information & Notification System (FINS) technology enhancements.
Pineville-11	On an annual basis, coordinate with Charlotte-Mecklenburg Emergency Management to provide information on all natural hazards facing the area to local planning staff and elected officials. This should be combined with an annual progress report on the status of local mitigation actions as identified in the Multi-jurisdictional Hazard Mitigation Plan.	All Hazards	3.1	Medium	Public Education & Awareness	In coordination with CMEMO (Lead)	Staff time and resources	N/A	2025-2030	Carry Forward	All Hazards Advisory Committee (AHAC) meetings held quarterly.
Pineville-12	Acquire safe sites for public facilities, including schools, police and fire stations, etc.	All Hazards	1.3	High	Prevention	Town Manager	Dependent on land values, existing ownership of property	Town budget	2025-2030	Carry Forward	Belle Johnston Community Center can function as a safe site and any other current or future public facilities that qualify.
Pineville-13	Create or Update Community Wildfire Protection Plans in each fire district.	Wildfire	1.1, 2.1, 3.1	Medium	Prevention	Town of Pineville Fire Department, NC Forest Service	To be determined	Grant funds	2030	New	
Pineville-14	Mecklenburg County Storm Water has a goal-driven CIP program that focuses on stream restoration to achieve water quality improvements. Over the next five years, Storm Water will improve over 25 miles of stream throughout the County.	Flooding	1.2	Medium	Natural Resource Protection	Mecklenburg County Storm Water Services	To be determined	Grant funds	2025-2030	New	
Pineville-15	Implement drainage improvement projects to reduce stormwater flooding.	Flooding	1.2	Medium	Structural Projects	Pineville Public Works	To be determined	Local funds, Grant funds	2025-2030	New	
Pineville-16	Maintain a Class 5 rating in the CRS Program.	Flooding	4.1	High	Prevention	Mecklenburg County Storm Water Services	To be determined	SWS Operating budget	2025-2030	New	
Pineville-17	Enhance early warning system for hazard events.	All Hazards	3.2	High	Emergency Services	Police and Town Manager	$275,000	FEMA—All Hazards Operational Planning, HMGP	2025-2030	New	See Mecklenburg-8 for additional details.

APPENDIX A PLAN REVIEW TOOL

This page intentionally left blank

Local Mitigation Plan Review Tool

Cover Page

The Local Mitigation Plan Review Tool (PRT) 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 local governments, including special districts.

1. The Multi-Jurisdictional Summary Sheet is a worksheet that is used to document how each jurisdiction met the requirements of the plan elements (Planning Process; Risk Assessment; Mitigation Strategy; Plan Maintenance; Plan Update; and Plan Adoption).
2. The Plan Review Checklist summarizes FEMA's evaluation of whether the plan has addressed all requirements.

For greater clarification of the elements in the Plan Review Checklist, please see Section 4 of this guide. Definitions of the terms and phrases used in the PRT can be found in Appendix E of this guide.

Plan Information	
Jurisdiction(s)	Mecklenburg County and incorporated jurisdictions
Title of Plan	Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan
New Plan or Update	Update
Single- or Multi-Jurisdiction	Multi-jurisdiction
Date of Plan	5/22/2025
Local Point of Contact	
Title	Anthony Bateman, Emergency Management REP Coordinator
Agency	Charlotte-Mecklenburg Emergency Management Office
Address	500 Dalton Avenue, Charlotte, NC 28206
Phone Number	704-336-2412
Email	Anthony.Bateman@charlottenc.gov

Additional Point of Contact	
Title	David Stroud
Agency	WSP
Address	4021 Stirrup Creek Drive, Suite 100, Durham, NC 27703
Phone Number	919-325-6497
Email	david.stroud@wsp.com

Review Information	
State Review	
State Reviewer(s) and Title	Click or tap here to enter text.
State Review Date	Click or tap to enter a date.
FEMA Review	
FEMA Reviewer(s) and Title	Click or tap here to enter text.
Date Received in FEMA Region	Click or tap to enter a date.
Plan Not Approved	Click or tap to enter a date.
Plan Approvable Pending Adoption	Click or tap to enter a date.
Plan Approved	Click or tap to enter a date.

Multi-Jurisdictional Summary Sheet

In the boxes for each element, mark if the element is met (Y) or not met (N).

#	Jurisdiction Name	A. Planning Process	B. Risk Assessment	C. Mitigation Strategy	D. Plan Maintenance	E. Plan Update	F. Plan Adoption	G. HHPD Requirements	H. State Requirements
1	Mecklenburg County								
2	Charlotte								
3	Cornelius								
4	Davidson								
5	Huntersville								
6	Matthews								
7	Mint Hill								
8	Pineville								
9									
10									

Plan Review Checklist

The Plan Review Checklist is completed by FEMA. States and local governments are encouraged, but not required, to use the PRT as a checklist to ensure all requirements have been met prior to submitting the plan for review and approval. 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." FEMA completes the "required revisions" summary at the bottom of each element to clearly explain the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is "not met." Sub-elements in each summary should be referenced using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each element and sub-element are described in detail in Section 4: Local Plan Requirements of this guide.

Plan updates must include information from the current planning process.

If some elements of the plan do not require an update, due to minimal or no changes between updates, the plan must document the reasons for that.

Multi-jurisdictional elements must cover information unique to all participating jurisdictions.

Element A: Planning Process

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))		
A1-a. Does the plan document how the plan was prepared, including the schedule or time frame and activities that made up the plan's development, as well as who was involved?	Section 2, p.7-18; Appendix B	Choose an item.
A1-b. Does the plan list the jurisdiction(s) participating in the plan that seek approval, and describe how they participated in the planning process?	Section 1.3, p.2; Section 2.3-2.9, p.7-22; Appendix B	Choose an item.

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A2. Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process? (Requirement 44 CFR § 201.6(b)(2))		
A2-a. Does the plan identify all stakeholders involved or given an opportunity to be involved in the planning process, and how each stakeholder was presented with this opportunity?	Section 2.4, p.11-16; Section 2.5, p.16; Section 2.7-2.8, p.17-18, Appendix B	Choose an item.
A3. Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (Requirement 44 CFR § 201.6(b)(1))		
A3-a. Does the plan document how the public was given the opportunity to be involved in the planning process and how their feedback was included in the plan?	Section 2.4-2.7, p.11-18;	Choose an item.
A4. Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement 44 CFR § 201.6(b)(3))		
A4-a. Does the plan document what existing plans, studies, reports and technical information were reviewed for the development of the plan, as well as how they were incorporated into the document?	Section 2.3.1, p.9-10	Choose an item.
ELEMENT A REQUIRED REVISIONS		
Required Revision: Click or tap here to enter text.		

Element B: Risk Assessment

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (Requirement 44 CFR § 201.6(c)(2)(i))		
B1-a. Does the plan describe all natural hazards that can affect the jurisdiction(s) in the planning area, and does it provide the rationale if omitting any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area?	Section 4.2, p.49-53, Section 4.5, p.62-235 (Hazard Description, Location, Extent, Hazard Summary by Jurisdiction)	Choose an item.
B1-b. Does the plan include information on the location of each identified hazard?	Section 4.5, p.62-235 ("Location" subheadings)	Choose an item.
B1-c. Does the plan describe the extent for each identified hazard?	Section 4.5, p.62-235 ("Extent" subheadings)	Choose an item.
B1-d. Does the plan include the history of previous hazard events for each identified hazard?	Section 4.5, p.62-235 ("Historical Occurrences" subheadings)	Choose an item.
B1-e. Does the plan include the probability of future events for each identified hazard, including the type, location and range of anticipated intensities?	Section 4.5, p.62-235 ("Probability of Future Occurrence" subheadings)	Choose an item.
B1-f. For participating jurisdictions in a multi-jurisdictional plan, does the plan describe any hazards that are unique to and/or vary from those affecting the overall planning area?	Section 4.5, p.62-235 ("Hazard Summary by Jurisdiction" subheadings); Annexes, p.308-520	Choose an item.

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
B2. Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods? (Requirement 44 CFR § 201.6(c)(2)(ii))		
B2-a. Does the plan provide an overall summary of each jurisdiction's vulnerability to the identified hazards?	Section 4.3, p.53-56; Section 4.4, p.57-61; Section 4.5, p.62-235 ("Vulnerability Assessment" subheadings); Annexes, p.308-520	Choose an item.
B2-b. For each participating jurisdiction, does the plan describe the potential impacts of each of the identified hazards on each participating jurisdiction?	Section 4.5, p.62-235; Annexes, p.308-520	Choose an item.
B2-c. Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?	Section 4.5.5, p.124	Choose an item.
ELEMENT B REQUIRED REVISIONS		
Required Revision: Click or tap here to enter text.		

Element C: Mitigation Strategy

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C1. Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement 44 CFR § 201.6(c)(3))		
C1-a. Does the plan describe how the existing capabilities of each participant are available to support the mitigation strategy? Does this include a discussion of the existing building codes and land use and development ordinances or regulations?	Section 5, p.237-251	Choose an item.

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C1-b. Does the plan describe each participant's ability to expand and improve the identified capabilities to achieve mitigation?	Section 5, p.237-251	Choose an item.
C2. Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement 44 CFR § 201.6(c)(3)(ii))		
C2-a. Does the plan contain a narrative description or a table/list of their participation activities?	Section 5.3.1.3, p.242-244	Choose an item.
C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 44 CFR § 201.6(c)(3)(i))		
C3-a. Does the plan include goals to reduce the risk from the hazards identified in the plan?	Section 6.1, p.252-253	Choose an item.
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 44 CFR § 201.6(c)(3)(ii))		
C4-a. Does the plan include an analysis of a comprehensive range of actions/projects that each jurisdiction considered to reduce the impacts of hazards identified in the risk assessment?	Section 7, p.256-284; Appendix C	Choose an item.
C4-b. Does the plan include one or more action(s) per jurisdiction for each of the hazards as identified within the plan's risk assessment?	Section 7, p.256-284	Choose an item.
C5. Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction? (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))		
C5-a. Does the plan describe the criteria used for prioritizing actions?	Section 6.2, p. 254-255	Choose an item.
C5-b. Does the plan provide the position, office, department or agency responsible for implementing/administrating the identified mitigation actions, as well as potential funding sources and expected time frame?	Section 7, p.256-284	Choose an item.

ELEMENT C REQUIRED REVISIONS
Required Revision: Click or tap here to enter text.

Element D: Plan Maintenance

Element D Requirements	Location in Plan (section and/or page number)	Met / Not Met
D1. Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))		
D1-a. Does the plan describe how communities will continue to seek future public participation after the plan has been approved?	Section 8.3, p.289	Choose an item.
D2. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)? (Requirement 44 CFR § 201.6(c)(4)(i))		
D2-a. Does the plan describe the process that will be followed to track the progress/status of the mitigation actions identified within the Mitigation Strategy, along with when this process will occur and who will be responsible for the process?	Section 8.2, p.287-288	Choose an item.
D2-b. Does the plan describe the process that will be followed to evaluate the plan for effectiveness? This process must identify the criteria that will be used to evaluate the information in the plan, along with when this process will occur and who will be responsible.	Section 8.2, p.287-288	Choose an item.
D2-c. Does the plan describe the process that will be followed to update the plan, along with when this process will occur and who will be responsible for the process?	Section 8.2, p.287-288	Choose an item.
D3. Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement 44 CFR § 201.6(c)(4)(ii))		
D3-a. Does the plan describe the process the community will follow to integrate the ideas, information and strategy of the mitigation plan into other planning mechanisms?	Section 8.1, p. 285-286; Section 8.2, p.287-288	Choose an item.

Element D Requirements	Location in Plan (section and/or page number)	Met / Not Met
D3-b. Does the plan identify the planning mechanisms for each plan participant into which the ideas, information and strategy from the mitigation plan may be integrated?	Section 8.1, p. 285-286; Section 8.2, p.287-288	Choose an item.
D3-c. For multi-jurisdictional plans, does the plan describe each participant's individual process for integrating information from the mitigation strategy into their identified planning mechanisms?	Section 8.1, p. 285-286; Section 8.2, p.287-288	Choose an item.
ELEMENT D REQUIRED REVISIONS		
Required Revision**:** Click or tap here to enter text.		

Element E: Plan Update

Element E Requirements	Location in Plan (section and/or page number)	Met / Not Met
E1. Was the plan revised to reflect changes in development? (Requirement 44 CFR § 201.6(d)(3))		
E1-a. Does the plan describe the changes in development that have occurred in hazard-prone areas that have increased or decreased each community's vulnerability since the previous plan was approved?	Section 3, p.23-47	Choose an item.
E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))		
E2-a. Does the plan describe how it was revised due to changes in community priorities?	Section 2.1-2.2, p.5-7; Section 6, p.252-255, Section 7, p.256-284	Choose an item.
E2-b. Does the plan include a status update for all mitigation actions identified in the previous mitigation plan?	Section 7, p.256-284; Section 2.9, p.19-22	Choose an item.
E2-c. Does the plan describe how jurisdictions integrated the mitigation plan, when appropriate, into other planning mechanisms?	Section 8.1, p.285-286	Choose an item.

ELEMENT E REQUIRED REVISIONS
Required Revision: Click or tap here to enter text.

Element F: Plan Adoption

Element F Requirements	Location in Plan (section and/or page number)	Met / Not Met
F1. For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F1-a. Does the participant include documentation of adoption?	Section 9, p.291-307	Choose an item.
F2. For multi-jurisdictional plans, has the governing body of each jurisdiction officially adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F2-a. Did each participant adopt the plan and provide documentation of that adoption?	Section 9, p.291-307	Choose an item.
ELEMENT F REQUIRED REVISIONS		
Required Revision: Click or tap here to enter text.		

Element G: High Hazard Potential Dams (Optional)

HHPD Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD1. Did the plan describe the incorporation of existing plans, studies, reports and technical information for HHPDs?		
HHPD1-a. Does the plan describe how the local government worked with local dam owners and/or the state dam safety agency?	N/A	Choose an item.
HHPD1-b. Does the plan incorporate information shared by the state and/or local dam owners?	N/A	Choose an item.

HHPD Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD2. Did the plan address HHPDs in the risk assessment?		
HHPD2-a. Does the plan describe the risks and vulnerabilities to and from HHPDs?	N/A	Choose an item.
HHPD2-b. Does the plan document the limitations and describe how to address deficiencies?	N/A	Choose an item.
HHPD3. Did the plan include mitigation goals to reduce long-term vulnerabilities from HHPDs?		
HHPD3-a. Does the plan address how to reduce vulnerabilities to and from HHPDs as part of its own goals or with other long-term strategies?	N/A	Choose an item.
HHPD3-b. Does the plan link proposed actions to reducing long-term vulnerabilities that are consistent with its goals?	N/A	Choose an item.
HHPD4-a. Did the plan include actions that address HHPDs and prioritize mitigation actions to reduce vulnerabilities from HHPDs?		
HHPD4-a. Does the plan describe specific actions to address HHPDs?	N/A	Choose an item.
HHPD4-b. Does the plan describe the criteria used to prioritize actions related to HHPDs?	N/A	Choose an item.
HHPD4-c. Does the plan identify the position, office, department or agency responsible for implementing and administering the action to mitigate hazards to or from HHPDs?	N/A	Choose an item.
HHPD Required Revisions		
Required Revision**:** Click or tap here to enter text.		

Element H: Additional State Requirements (Optional)

Element H Requirements	Location in Plan (section and/or page number)	Met / Not Met
This space is for the State to include additional requirements.		
Click or tap here to enter text.	Click or tap here to enter text.	Choose an item.

Plan Assessment

These comments can be used to help guide your annual/regularly scheduled updates and the next plan update.

Element A. Planning Process

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element B. Risk Assessment

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element C. Mitigation Strategy

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element D. Plan Maintenance

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element E. Plan Update

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element G. HHPD Requirements (Optional)

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element H. Additional State Requirements (Optional)

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

APPENDIX B PLANNING PROCESS DOCUMENTATION

B.1 PLANNING STEP 1: ORGANIZE TO PREPARE THE PLAN

Table B.1 – HMPC Meeting Topics, Dates, and Locations

Meeting Title	Meeting Topic	Meeting Date	Meeting Location
HMPC Mtg. #1 – Project Kick-Off	1) Introduction to DMA and CRS requirements and the planning process 1) Review of HMPC responsibilities and the project schedule	December 3, 2024	Charlotte Fire Department Headquarters & Microsoft Teams 500 Dalton Ave Charlotte, NC
HMPC Mtg. #2	1) Review the draft Hazard Identification & Risk Assessment 2) Discuss updates to local capabilities 1) Review problem statements and mitigation action ideas	February 24, 2025	Charlotte Fire Department Headquarters & Microsoft Teams 500 Dalton Ave Charlotte, NC
HMPC Mtg. #3	1) Review draft goals and objectives 2) Review mitigation alternatives and draft mitigation strategies	April 17, 2025	Charlotte Fire Department Headquarters & Microsoft Teams 500 Dalton Ave Charlotte, NC
HMPC Mtg. #4	1) Review the draft Hazard Mitigation Plan 1) Solicit comments and feedback	May 12, 2025	Charlotte Fire Department Headquarters & Microsoft Teams 500 Dalton Ave Charlotte, NC

Note: All HMPC Meetings were open to the public.

HMPC MEETING AGENDAS, MINUTES, AND SIGN-IN SHEETS

HMPC MEETING 1: DECEMBER 3, 2024

MECKLENBURG COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE

HAZARD MITIGATION PLANNING COMMITTEE MEETING #1

December 3, 2024, 9am, Charlotte Fire Department Headquarters & Microsoft Teams

ATTENDANCE

There were 12 attendees in person and 26 online. The following individuals were in attendance:
Jonathan Beller - Charlotte Stormwater Buyout Program
Don Ceccarelli - Meck County Stormwater Director
Billy Gilman - Mint Hill Police
Jim Dotoli - Huntersville Fire Dept Chief
CJ O'Neill - Matthews Public Works
Corey Copley - Pineville Police Dept
Chris Crew - NCEM
John Mello - NCEM
Eric Wiseman - NCEM
David Moore - Huntersville Safety & Risk Coordinator
Heather Barfield - Cornelius Planner
Bob Jarzemsky - CMSWS
Joseph Hatley - Mint Hill Police Chief
Kevin Martin - UNC Charlotte
Kymberly Kudla - FEMA R4 Community Planner
Roy Sisk - Matthews Police Department
Mike Croke - JCI Jones Chemical
James Scanlon - Mecklenburg County GIS
Steve Robbins - Huntersville Public Works
Ron Cheves - LEPC member
Joshua McSwain - CMSWS, Flood Warning System
Stephanie Kelly - Charlotte City Clerk
Heather Barfield - Cornelius Planner
Randy Smith - Resident
Tony Bateman - CMEMO
Andrew DiCristofaro - CMSWS
Beca Deal - CMSWS, Dam Safety
Mathew Hornack - CMSWS
Neal Banerjee - FNI, engineer
Lief Fitzpatrick - Matthews Public Works
Ryan Monteith - Davidson
Scott Hudson - CMSWS Operations Manager
Scott Hess - Charlotte Water
Ryan Spidel - CMSWS
Robert Graham - CMEMO
Lee Jackson - Duke Energy
David Stroud, WSP
Abby Moore, WSP

AGENDA

— Introductions
— Why Plan?

- Project Overview
- Planning Process
- Project Schedule
- Next Steps
- Q & A

INTRODUCTIONS

CMEMO Chief Wike Graham kicked off the meeting with an introduction to the plan update, the importance of hazard mitigation, and mitigation successes in Mecklenburg County. He explained how the State of North Carolina has contracted planners to conduct hazard mitigation planning for all of North Carolina, which is a major benefit to North Carolina communities. He noted that despite a lot of effective mitigation there is still more to do, and many hazard risks, particularly from flooding and ice storms. Mitigation has to occur pre- and post-event, smart growth is important, and using data effectively will be key to future mitigation efforts. There is a lot of mitigation funding available, and this plan will help the communities in Mecklenburg County implement projects with grant funding.

David Stroud and Abby Moore with WSP facilitated the rest of the meeting following the agenda above.

WHY PLAN?

David began the presentation with why we plan in the first place. David discussed the Disaster Mitigation Act (DMA) of 2000, which is codified in 44 CFR 201.6 and requires local government to update their hazard mitigation plans every five years to be eligible for pre- and post-disaster grant funding through FEMA's Hazard Mitigation Assistance programs. Mitigation funding available through FEMA includes the Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure & Communities (BRIC) program, and Flood Mitigation Assistance (FMA) program. David noted that every community in the state is eligible for HMGP funding whenever a disaster is declared in the state of North Carolina as there is often funding left over after projects have been completed in affected areas.

David reviewed some trends in disasters that support the need for mitigation planning. In 2023 there were 28 billion-dollar disasters, more than any prior year, and in 2024 there have been 24 billion-dollar disasters. There's an increasing trend in recent years in the number of billion-dollar disasters. This may be in part because we now have more frequent and intense hazard events and greater exposure to risk (people, property and critical infrastructure). Hazard mitigation is a priority for multiple reasons, including that the cost of doing nothing is too high, many events are predictable and repetitive, loss reduction can be effective, cost-beneficial, and environmentally-sound, there are legal and moral responsibilities to prevent disasters, and there are federal funds available to support mitigation. The average benefit-cost ratio (BCR) for federally funded projects is 6:1; for flood mitigation the average BCR is 7:1.

PROJECT OVERVIEW

David explained that we must follow the DMA planning process and we integrate Community Rating System (CRS) Activity 510 planning steps into the DMA four-phase planning process to meet the requirements of both programs. The DMA process provides continued eligibility for mitigation funding, guides mitigation activities in a coordinated and economical manner, integrates hazard mitigation with other planning mechanisms, directs future development in a safe manner, and helps make communities more disaster resistant. The CRS program is flood specific and provides flood insurance policy holders in participating communities with discounts based on the number of CRS points they communities earn. The flood insurance premium reductions are communitywide. Mecklenburg County, Charlotte, Huntersville, and Pineville participate in the CRS program.

Tony mentioned that NCEM is running a two-day workshop on the CRS in Wake County. He is working on bringing a similar workshop to Mecklenburg County.

Overall, the WSP planning team will ensure that the updated hazard mitigation plan meets all FEMA planning requirements, coordinates with the natural hazards in the updated State Hazard Mitigation Plan, includes natural and human-caused hazards as identified by the HMPC, incorporates local climate change data and findings, and addresses equitable outcomes. David noted the need for involving stakeholders that represent underserved and socially vulnerable populations. Wike emphasized that environmental protection and equity are current priorities in FEMA's strategic plan. These priorities may change during the next five-year update, but regardless, emergency management serves people who are affected by a hazard and these populations are often socially vulnerable. For example, places that flood are often where low-income individuals live.

PLANNING PROCESS

PHASE 1

Abby described the planning process in more detail. Phase 1 is already underway. After an initial meeting in May, this kickoff to the planning process was postponed to allow time to ensure that the HMPC could be reconvened and new staff members and stakeholders were identified for involvement. Each jurisdiction should have two staff representatives and two citizen/stakeholder representatives who are not affiliated with local government to have a 50/50 split of staff and stakeholders.

The HMPC will be asked to attend four meetings (including this one), provide input on risk and capability, update mitigation actions, and review plan drafts. HMPC members, especially staff, will also be asked to support public involvement efforts throughout the planning process.

Abby noted that more stakeholders can still join the HMPC. We can also invite additional stakeholders to provide data and input without having to commit to participating on the HMPC. In particular, we should look to involve stakeholders that may be able to represent underserved communities and/or vulnerable populations.

PHASE 2

Phase 2 covers the risk assessment, which includes the hazard identification and the vulnerability assessment. In the initial discussion in May, HMPC members suggested adding infectious disease, removing sinkhole, and removing EMP from the list of identified hazards. All of the hazards that were addressed in the previous plan and the risk ratings for those hazards were presented for the planning committee to review. There were no additional changes recommended. The hazards will be updated to align with the State Hazard Mitigation Plan.

To conduct the vulnerability assessment, NCEM iRisk data will be used to provide loss estimates for several hazards. Additional qualitative, quantitative, and spatial analysis will be used as appropriate. Community representatives will be asked to review and update their critical facility list, and critical facilities will be categorized by FEMA lifeline in the plan update, which may be helpful to communities when preparing FEMA grant applications.

Chris Crew noted there are high hazard dams in poor condition identified by NC Dam Safety Program in Mecklenburg County. With Mecklenburg County's capabilities there is an opportunity to pursue mitigation through the High Hazard Dam Program. Beca noted that Mecklenburg County has just under 100 high hazard dams and City of Charlotte Stormwater has 10 high hazard dams. Charlotte is looking at a few projects that could meet the HHPD requirements, but the requirements are very strict. Meeting the planning requirements is difficult but can be integrated with the Hazard Mitigation Plan. Chris offered to provide assistance in coordinating with NCDEQ on HHPD requirements and dam mitigation.

PHASE 3

The capability assessment bridges the risk assessment and the mitigation strategy by helping us identify what type of mitigation each community is capable of pursuing based on current policies, tools, staff, funding, political and public support, and other resources.

The remainder of Phase 3 involves developing a mitigation strategy by reviewing and updating the plan goals and objectives, evaluating mitigation alternatives including existing and new projects, and drafting an action plan with prioritized projects. The action plan will identify criteria to support monitoring and implementation, including the responsible department or agency, timeline for completion, and potential funding sources.

Abby reviewed different approaches to mitigation, the six FEMA/CRS mitigation categories, and the count of actions by category for each jurisdiction in the existing HMP. Abby emphasized that there were no natural resource protection projects in the last plan and very few structural projects; communities should look to identify new mitigation actions in these categories for this plan update. Nature-based solutions and green infrastructure projects are prioritized for BRIC funding and other grant programs. Projects must be in the hazard mitigation plan to be eligible for FEMA HMA funding.

PHASE 4

Phase 4 is where the communities must adopt and implement the plan. The communities and HMPC should meet quarterly to review the action plan and look for funding and opportunities to implement projects. The plan will continue to be updated every five years.

PROJECT SCHEDULE

Abby presented the updated schedule for the planning process. The HMPC will meet again in February, March, and April 2025. Public meetings will be held in January and April 2025. The draft plan is due to NCEM in May 2025. The plan must be approved by NCEM and FEMA and adopted by all communities before the current plan expires in November 2025.

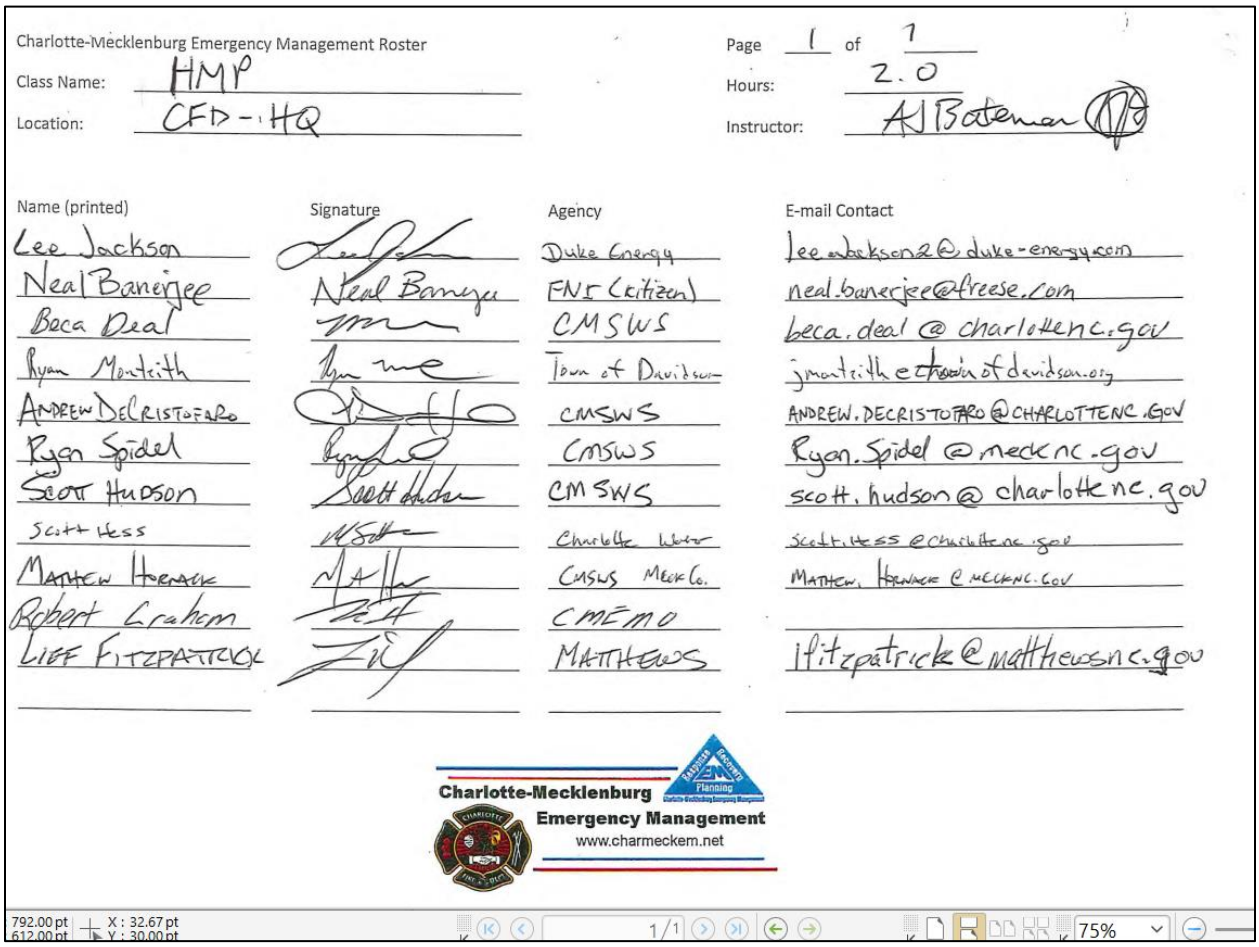
NEXT STEPS

Abby discussed public outreach efforts which include public meetings facilitated by WSP, a public survey, and a plan website. Community staff will be asked to post outreach on local websites and social media, consider ways to advertise the plan or bring the survey and flyer to community events, and to think about options for stakeholders to involve in the planning process.

WSP is working on the risk and vulnerability assessment update and will reach out to community representatives on the HMPC for updates on local capability.

The HMPC was asked to review the existing mitigation strategy to provide action status updates and to look for opportunities to support public engagement.

HMPC MEETING 1 – IN-PERSON ATTENDANCE LIST



Charlotte-Mecklenburg Emergency Management Roster

Class Name: HMP

Location: CFD - HQ

Page 1 of 1

Hours: 2.0

Instructor: AJ Bateman

Name (printed)	Signature	Agency	E-mail Contact
Lee Jackson		Duke Energy	lee.ajackson2@duke-energy.com
Neal Banerjee	Neal Banerjee	FNF (Citizen)	neal.banerjee@fnf.com
Beca Deal		CMSWS	beca.deal@charlottenc.gov
Ryan Monteith		Town of Davidson	jmonteith@townofdavidson.org
Andrew DeCristofaro		CMSWS	ANDREW.DECRISTOFARO@CHARLOTTENC.GOV
Ryan Spidel		CMSWS	Ryan.Spidel@mecknc.gov
Scott Hudson		CMSWS	scott.hudson@charlottenc.gov
Scott Hess		Charlotte Water	Scott.Hess@charlottenc.gov
Mathew Hornack		CMSWS Meck Co.	MATHEW.HORNACK@MECKNC.GOV
Robert Graham		CMEMO	
Liff Fitzpatrick		Matthews	lfitzpatrick@matthewsnc.gov

Charlotte-Mecklenburg Emergency Management
www.charmeckem.net

HMPC MEETING 1 – ONLINE ATTENDEES

	A	B	C	D	E	F	G
1	2. Participants						
2	Name	First Join	Last Leave	In-Meeting Durati	Email	Participant ID (UI	Role
3	Moore, Abigail	12/03/24, 8:38:44 AM	12/03/24, 10:19:58 AM	1h 41m 14s	abigail.moore@wsp.com	abigail.moore@w	Organizer
4	Stroud, David	12/03/24, 8:37:26 AM	12/03/24, 10:19:58 AM	1h 42m 32s	david.stroud@wsp.com	david.stroud@ws	Presenter
5	Joseph Hatley	12/03/24, 8:48:13 AM	12/03/24, 10:19:58 AM	1h 31m 45s	jhatley@police.minthill.com	jhatley@police.m	Presenter
6	Ron J Cheves (Unverified)	12/03/24, 8:48:13 AM	12/03/24, 10:19:52 AM	1h 31m 38s			Presenter
7	Major Roy Sisk (Guest) (Ur	12/03/24, 8:51:17 AM	12/03/24, 10:19:58 AM	1h 28m 41s			Presenter
8	Crew, John (NCEM)	12/03/24, 8:53:06 AM	12/03/24, 10:19:35 AM	1h 26m 29s	John.Crew@ncdps.gov	John.Crew@ncd	Presenter
9	Mike Croke	12/03/24, 8:53:39 AM	12/03/24, 10:19:53 AM	1h 26m 13s	mcroke@jcichem.com	mcroke@jcichem	Presenter
10	McSwain, Joshua	12/03/24, 8:55:19 AM	12/03/24, 10:19:43 AM	1h 24m 23s	Joshua.McSwain@mecklenbu	Joshua.McSwair	Presenter
11	Billy Gilman	12/03/24, 8:55:34 AM	12/03/24, 10:19:58 AM	1h 24m 24s	bgilman@police.minthill.com	bgilman@police.	Presenter
12	Corey Copley	12/03/24, 8:56:23 AM	12/03/24, 10:19:35 AM	1h 23m 11s	ccopley@pinevillenc.gov	ccopley@pinevil	Presenter
13	David Moore - Huntersville (	12/03/24, 8:56:33 AM	12/03/24, 10:14:19 AM	1h 17m 46s			Presenter
14	read.ai meeting notes (Unve	12/03/24, 8:58:28 AM	12/03/24, 10:05:03 AM	1h 6m 34s			Presenter
15	Mello, John (NCEM)	12/03/24, 8:58:30 AM	12/03/24, 10:19:51 AM	1h 21m 21s	John.Mello@ncdps.gov	John.Mello@ncc	Presenter
16	Beller, Jonathan	12/03/24, 8:58:49 AM	12/03/24, 10:19:58 AM	1h 21m 8s	Jonathan.Beller@mecklenbur	Jonathan.Beller@	Presenter
17	Kudla, Kymberly (External)	12/03/24, 8:59:00 AM	12/03/24, 10:19:43 AM	1h 20m 43s	kymberly.kudla@fema.dhs.g	0323751063@FEI	Presenter
18	Steve Robbins (Unverified)	12/03/24, 8:59:15 AM	12/03/24, 10:19:17 AM	1h 20m 2s			Presenter
19	Kevin Martin - UNC Charlott	12/03/24, 8:59:27 AM	12/03/24, 10:09:49 AM	1h 10m 22s			Presenter
20	Chief Dotoli-Huntersville Fir	12/03/24, 8:59:31 AM	12/03/24, 9:09:46 AM	10m 14s			Presenter
21	Jarzemsky, Robert	12/03/24, 9:00:07 AM	12/03/24, 10:19:58 AM	1h 19m 50s	Robert.Jarzemsky@charlotter	Robert.Jarzemsk	Presenter
22	Scanlon, James P.	12/03/24, 9:00:21 AM	12/03/24, 10:19:58 AM	1h 19m 37s	James.Scanlon@mecklenbur	James.Scanlon@	Presenter
23	Kelly, Stephanie	12/03/24, 9:01:30 AM	12/03/24, 9:11:47 AM	10m 17s	Stephanie.Kelly@charlottenc.	Stephanie.Kelly@	Presenter
24	Wiseman, Eric (NCEM)	12/03/24, 9:02:27 AM	12/03/24, 9:57:03 AM	54m 35s	eric.wiseman@ncdps.gov	eric.wiseman@n	Presenter
25	Heather Barfield (Unverifiec	12/03/24, 9:04:13 AM	12/03/24, 10:19:54 AM	1h 15m 41s			Presenter
26	Ceccarelli, Don	12/03/24, 9:05:02 AM	12/03/24, 10:11:51 AM	1h 6m 49s	Don.Ceccarelli@mecklenburg	Don.Ceccarelli@	Presenter
27	Bateman, Anthony	12/03/24, 9:06:48 AM	12/03/24, 10:19:58 AM	1h 13m 10s	Anthony.Bateman@charlotter	Anthony.Batema	Presenter
28	Chief Jim Dotoli-Huntersvill	12/03/24, 9:09:31 AM	12/03/24, 10:19:58 AM	1h 10m 27s			Presenter
29	CJ ONeill (Matthews) (Unve	12/03/24, 9:10:50 AM	12/03/24, 10:19:38 AM	1h 8m 48s			Presenter
30	Randy Smith (Unverified)	12/03/24, 9:19:36 AM	12/03/24, 10:19:58 AM	1h 22s			Presenter
31	Hamby, Karen (NCEM)	12/03/24, 9:55:39 AM	12/03/24, 9:56:55 AM	1m 15s	Karen.Hamby@ncdps.gov	Karen.Hamby@r	Presenter

HMPC MEETING 2: FEBRUARY 24, 2025

MECKLENBURG COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE

HAZARD MITIGATION PLANNING COMMITTEE MEETING #2

February 24, 2025, 11am, Charlotte Fire Department Headquarters & Microsoft Teams

Abby Moore and David Stroud from WSP, facilitated a meeting with the Hazard Mitigation Planning Committee to cover the topics outlined in the following agenda:

1. Introductions
2. Planning Process Recap
3. Hazard Identification
4. Asset Inventory
   a. iRisk inventory: People and Property
5. Hazard Profiles
   a. Summary of high & moderate risk natural hazards
   b. Excessive Heat presentation by Andrea Webster, NCORR
6. Discussion
7. Project Schedule
8. Next Steps

ATTENDANCE

There were 21 attendees in person and 30 online. The full list of attendees is as follows:

Tony Bateman – CMEMO, Emergency Management Planner
Robert Wike Graham – CMEMO, Division Chief/Deputy Director
Paige Grande – Charlotte, Community Preparedness Coordinator
Kimberly Hailey – FEMA
Steve Sonnenberg – Davidson, Citizen
Lief Fitzpatrick – Town of Matthews, Assistant Public Works Director
Scott Hess – Charlotte Water, Safety Coordinator
David Moore – Huntersville Human Resources, Safety and Risk Coordinator
Steve Robbins – Public Works, Assistant Director
Bobby Williams – Town of Huntersville, Assistant Town Manager
Josh McSwain – Mecklenburg County Stormwater, Project Manager
James Scanlon – Mecklenburg County GIS
Matthew Hornack – Mecklenburg County Stormwater, Construction Project Manager
William Suthard – Charlotte Fire Department, Communications
Jerry Winkles – Charlotte Fire Department, Deputy Fire Chief
Scott Hudson – Charlotte Stormwater, Operations Division Manager
Rebecca Deal – CMSWS, Stewardship Program Supervisor
Brandon Jones – Catawba Riverkeeper Foundation
Elaine Powell – Mecklenburg Board of County Commissioners

Andrew Bridges – Cornelius, Lemley Fire & Rescue
Matthew Bixler – Mecklenburg County Deputy Fire Marshal
Christina Danis – Centralina Regional Resilience Collaborative
Jeremy Monteith – Charlotte, Battalion Fire Chief
John Phillips – Mint Hill Fire, Deputy Chief
Jonathan Bradshaw – Huntersville, Citizen
David Kroening – Mecklenburg County Stormwater
Lin Snowa – Cornelius, Citizen
Rob Kinniburgh – Matthews, Fire Department & Emergency Management Chief
Erin Stanforth – Mecklenburg County, Sustainability & Resiliency Manager
Varona Wynn – Huntersville, Citizen
Vaughn Griffin – Cornelius, Police Department Lieutenant
Jason Happe – Cornelius, Citizen
Jonathan Beller – Charlott Stormwater Buyout Program
Don Ceccarelli – Mecklenburg County Stormwater Director
CJ O'Neill – Matthews Public Works
Carl Baker – NCEM
John Mello – NCEM
Emily Walmsley – NCEM
Kevin Martin – UNC Charlotte
Kymberly Kudla – FEMA R4 Community Planner
Mike Croke – JCI Jones Chemical
Ron Cheves – LEPC member
Heather Barfield – Cornelius Planner
Andrew DiCristofaro – CMSWS
Neal Banerjee – FNI, Engineer
Kariena KC Bernesser – Mecklenburg County Public Health, Health Program Manager
Lee Jackson – Duke Energy, Emergency Preparedness Specialist
Andrea Webster – NCORR, Resilience Policy Advisor
David Stroud – WSP
Abby Moore – WSP
Ranger Ruffins – WSP
Kimmy Hansen – WSP

INTRODUCTIONS

CMEMO Planner Tony Bateman and CMEMO Deputy Director Chief Wike Graham kicked off the meeting with an introduction to the plan update and the importance of hazard mitigation in Mecklenburg County. Chief Graham explained how the State has contracted planners to conduct hazard mitigation planning for all of North Carolina, which is a major benefit to North Carolina communities.

David Stroud and Abby Moore with WSP facilitated the rest of the meeting following the agenda above.

PROJECT OVERVIEW

David began the presentation by explaining where we are in the planning process. Currently, the plan update is in Phase 2 of the four-phase planning process which includes identifying hazards and assessing the problems. David proceeded to describe the steps taken during the Hazard Identification & Risk Assessment (HIRA) process which are shown to the right. David noted that a Hazard Mitigation Plan is required to maintain eligibility for FEMA mitigation funding and that the plan must include the projects that the community plans to apply for funding to



implement. Currently, the plan is in steps 4 and 5 of the 10-step CRS planning process which coordinates with the federal planning process.

HAZARD IDENTIFICATION

David presented a list of the hazards that were included in the 2020 Mecklenburg County Plan and the 2023 State Hazard Mitigation Plan. All existing hazards except Sinkhole and Electromagnetic Pulse have been carried forward and reevaluated in the plan update. Infectious Disease has been added as a new hazard. David noted that past sinkhole issues were not due to geologic issues but rather from construction and infrastructure issues. The severe weather and tornado hazards were combined into a single tornadoes & thunderstorms hazard profile for this plan update to align with the hazards in the State Hazard Mitigation Plan.

Past disaster declarations and records of hazard events indicate the wide variety of events that can have a significant impact in the County. Mecklenburg County has received 7 disaster declarations, including for hurricanes, severe storms, ice storms, tropical storm, snow, and Covid-19. Impacts of past hazard events reported by NOAA's National Centers for Environmental Information (NCEI) Storm Events Database include over $67.6 million in property damage, 11 deaths, and 30 injuries.

The natural and technological/human-caused hazards in the plan are listed below:

Natural Hazards

- Dam & Levee Failure
- Drought
- Earthquake
- Excessive Heat
- Flooding
- Landslide
- Hurricane & Tropical Storm
- Tornadoes & Thunderstorms
- Severe Winter Weather
- Wildfire

Technological/Human-Caused Hazards:

- Cyber Threat
- Hazardous Substances
- Infectious Disease
- Radiological Emergency

ASSET INVENTORY

David briefly reviewed the asset inventory of people and buildings as identified through iRisk data in the State's Risk Management Tool (RMT).

The population inventory uses 2020 Census data compiled by block group using municipal boundaries, including extra-territorial jurisdictions. The building inventory uses building footprints for buildings larger than 500 square feet. Updates to the iRisk building inventory are underway but will not be completed for this plan update. To provide context for the iRisk building inventory, WSP compiled an asset inventory using current parcel data. This analysis identified a total of 326,758 buildings in the region, including 46,011 buildings not included in the iRisk inventory.

The last piece of the asset inventory to be updated is the critical facility inventory. Community staff on the HMPC are asked to update the critical facility inventory using a web map provided by WSP, which includes all critical facilities from the previous HMP. The web map can be used to edit existing facilities or add new facilities. Staff should contact Abby with any questions or issues when using the web map. If preferred, communities can alternatively send a GIS with critical facility information for WSP to use in place of the existing inventory. Staff are asked to provide critical facility updates by February 26th.

HAZARD PROFILES

Abby presented a summary of the risk assessment findings according to each hazard's Priority Risk Index (PRI) score. The PRI is a scoring system for ranking hazards as high, medium, or low priority based on five weighted categories: probability, impact, spatial extent, warning time, and duration. PRI rankings are shown below, and a detailed summary is provided on slide 22.

High Risk (> 3.0)	Excessive Heat Flooding Severe Winter Weather Hazardous Substances Radiological Emergency
Moderate Risk (2.0 - 2.9)	Dam & Levee Failure Drought Hurricane & Tropical Storm Tornadoes & Thunderstorms Wildfire Cyber Attack Infectious Disease
Low Risk (< 2.0)	Earthquake Landslide

Abby presented a summary of findings for each of the natural hazards rated moderate to high risk in the plan, summarized below. (See slides 23-35 for more details)

- **Dam & Levee Failure:** There are a total of 276 dams in Mecklenburg County. The National Inventory of Dams shows that currently, 145 dams are rated low hazard, 35 as intermediate hazard, and 96 as high hazard dams. There are 10 high hazard dams in the County that were found to be in "poor" condition based on latest inspection. Pineville Sugar Creek Levee is the only levee located in the county. One committee member asked what actions the State takes with dams that are found in "poor" condition upon inspection. David noted that if the dam is privately owned then it is the owner's responsibility to address any issues with these high hazard dams. Beca Deal explained that the State is limited to sending notice of violations. Carl Baker with NCEM noted the HHPD Grant Program through FEMA that helps address high hazard dams.
- **Drought:** The region has spent about 57% of the last 25 years in some level of drought, 6.5% of that time in extreme drought. The most severe impacts are on agriculture and recreational industries. Since 2007, the region averaged $30,435 in crop insurance claims annually due to drought. Drought can also impact water supply and increase wildfire risk. Climate change is expected to make drought more frequent and severe.
- **Flooding:** Risk was evaluated using effective FIRMs in Mecklenburg County. Abby noted that one of the primary sources of flooding in the County comes from the Catawba River and low-lying areas are subject to periodic flooding from various streams, creeks, and their tributaries. Urban flooding is also a major problem. About 9% of the County is within a Special Flood Hazard Area (1% annual chance floodplain), but more than 10% of Davidson, Pineville, and Unincorporated Mecklenburg County are in the SFHA. The regionwide loss estimate for the 1% annual chance flood event is over $52 million. Public survey responses note concerns with building damage, flooded roads, scattered debris, and flight delays at the Charlotte Airport.
- **Hurricane & Tropical Storm:** From 1999 through 2024, only four storms with hurricane or tropical storm force winds were recorded in NCEI with impacts to the County with the most recent storm, Hurricane Helene, causing two deaths and $3 million in property damages. These storms can cause widespread wind and flood damage. Most storms have tropical storm or tropical depression level winds by the time they reach the region. Impacts include downed trees and power lines, wind damage

to buildings (especially mobile homes), and crop damage. Damage estimates for a 100-year hurricane wind event could cause over $151 million in building damages. The public noted concerns about extended power outages, road closures, riverine flooding, and downed trees.

- **Severe Winter Weather:** The region has received three disaster declarations and one emergency declaration for snow and ice. Winter weather has caused a reported $42 million in property damage and one fatality since 1999. Winter weather can cause dangerous travel conditions, downed trees, and extended power outages, which can be particularly harmful when paired with extreme cold temperatures.
- **Tornado & Thunderstorm:** From 1999 to 2023, Mecklenburg County experienced 4 injuries and $2.3 million in property damage caused by tornadoes. Though lower magnitude (EF0 to EF2), these events have still caused considerable damage. Mecklenburg County averages 11.7 thunderstorm wind events, 1.7 damaging lightning events, and 6 hail events per year. In total these hazards have caused over $7 million in property damages since 1999. Impacts include downed trees, wind damage, wind-borne debris damages, power outages, and crop damages.
- **Wildfire:** Over 24% of the region has direct exposure to wildfire. Wildfire probability is low regionwide, but the impacts could be severe. The iRisk loss estimate for the region is $6.5 billion. According to data from the NC Forest Service, between 1999 and 2024, Mecklenburg County experienced 884 fires that required state support. These fires burned nearly 700 acres.
- **Excessive Heat:** Andrea Webster, Resilience Policy Advisor with North Carolina Office of Recovery and Resiliency (NCORR) presented information on heat vulnerability for the region. She shared historical data and projected trends for heat from the Climate Projections tool on www.resilienceexchaange.nc.gov which indicate that the number of hot days and extreme heat days will increase substantially, as will the number of hot nights. Andrea shared data on heat related illnesses and the connection between emergency department visits and heat index above 100°F. She also shared imagery of urban heat islands within the region, which can occur in small areas with impervious surface and limited tree cover. She concluded with a review of the impacts of extreme heat and a list of suggested mitigation measures. See slides 36-48 for details.

PROJECT SCHEDULE

Abby presented the updated schedule for the planning process. The HMPC will meet again in March and April 2025. Public meetings will be held in April 2025. The draft plan is due to NCEM in May 2025. The plan must be approved by NCEM and FEMA and adopted by all communities before the current plan expires in November 2025.

NEXT STEPS

Abby presented next steps and action items for WSP and the HMPC. WSP will share the draft HIRA for the committee and public to review and provide feedback. WSP will also be reaching out to collect capability assessment updates and mitigation action status updates.

Community staff on the HMPC are asked to support continued public engagement. The survey has about 34 responses so far. Abby requested another round of outreach about the survey to encourage additional public input. The public survey link and website link were shared, along with a QR code for the survey, below.



Community staff are also asked to provide critical facility updates and mitigation action status updates. Critical facility updates can be provided through the web map and are due by February 26th.

Critical Facility Web Map:
https://experience.arcgis.com/template/d350fd8e52ae4e6b89c559dfb649177e/page/Page/

Plan Website: www.MecklenburgHMP.com

Survey Link: https://forms.office.com/e/tqQW9G45Q0

HMPC MEETING 2 – IN-PERSON ATTENDANCE LIST

Charlotte-Mecklenburg Emergency Management Roster

Class Name: 2025 Hazard Mitigation

Location: CFD + HQ

Page 1 of 2

Hours: 2.0

Instructor: AJ Stolen

Name (printed)	Signature	Agency	E-mail Contact
DAVID STROUD		WSP	david.stroud@wsp.com
Abby Moore	Abigail Moore	WSP	abigail.moore@wsp.com
Kimberly Hailey		FEMA	kimberly.hailey@fema.dhs.gov
Steve Sonnenberg	SBS	Davidson Resident	sonnens1@me.com
Jeff Fitzpatrick		Town of Matthews	jfitzpatrick@matthewsnc.gov
Scott Hess		Charlotte Water	scott.hess@charlottenc.gov
David Moore		Town of Huntersville	dmoore@huntersville.org
Steve Robbins		Town of Huntersville	SRobbins@huntersville.org
Bobby Williams		Town of Huntersville	bwilliams@huntersville.org
Josh McSwain		County SWS	Joshua.mcswain@mecklenburgcountync.gov
James Scanlon		Meck Co	james.scanlon@mecklenburgcountync.gov
Matthew Hamack		Meck Co SWS	Matthew.Hamack@mecklenburgcountync.gov

Charlotte-Mecklenburg Emergency Management
www.charmeckem.net

Charlotte-Mecklenburg Emergency Management Roster

Class Name: 2025 Hazard Mitigation

Location: CFD HQ

Page 2 of 2

Hours: 20

Instructor: [signature]

Name (printed)	Signature	Agency	E-mail Contact
WILLIAM SUTHARD	[signature]	CFD	wsutherd@charlottenc.gov
Jerry Winkler	[signature]	CFD	jerry.winkler@charlottenc.gov
Scott Hudson	[signature]	Charlotte Stormwater	scott.hudson@charlottenc.ga
Beca Deal	[signature]	Charlotte SW	beca.deal@charlottenc.gov
Brandon Jones	[signature]	Riverkeeper	brandon@catawbariverkeeper.org
Elaine Powell	E Powell	BOCC	on file w/ Bateman

Charlotte-Mecklenburg Emergency Management
www.charmeckem.net

HMPC MEETING 2 – ONLINE ATTENDEES



HMPC MEETING 3: APRIL 17, 2025

MECKLENBURG COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE

HAZARD MITIGATION PLANNING COMMITTEE MEETING #3

April 17, 2025, 11am, Charlotte Fire Department Headquarters & Microsoft Teams

Abby Moore and David Stroud from WSP, facilitated a meeting with the Hazard Mitigation Planning Committee to cover the topics outlined in the following agenda:

1. Project Overview & Where we are in the planning process
2. Capability Assessment
   a. New Capabilities
   b. Substantial Damage Estimate Procedures
3. Mitigation Strategy
   a. Review Goals and Objectives
   b. Mitigation Action Updates
4. Discussion
5. Next Steps

ATTENDANCE

There were 11 attendees in person and 19 online. The full list of attendees is as follows:

Tony Bateman – CMEMO, Emergency Management Planner
Rebecca Deal – CMSWS, Stewardship Program Supervisor
James Scanlon – Mecklenburg County GIS
Andrew DiCristofaro – CMSWS
Aaron Tucker, Cornelious Planning Department, Senior Coordinator
Jenna Hoagland, Mecklenburg County Public Health , Preparedness Coordinator
David Moore – Huntersville Human Resources, Safety and Risk Coordinator
Karli Godfrey, Mecklenburg County Mangers Office
Brandon Jones – Catawba Riverkeeper Foundation
Christina Danis – Centralina Regional Resilience Collaborative
Gidget Dennehy, Charlotte Citizen
Robyn Byers, City of Charlotte, Office of Sustainability & Resilience, Sustainability & Resiliency Manager
Jane Baker, Charlotte, Citizen
Kyle Lanasa, Operations Coordinator, UNC Charlotte
Alex Moore, Mecklenburg County Stormwater, Communications Specialist
Ashley Riggins, City of Charlotte Emergency Management, Emergency Management Planner
Steve Sonnenberg – Davidson, Citizen
Scott Hess – Charlotte Water, Safety Coordinator
Steve Robbins – Public Works, Assistant Director
Josh McSwain – Mecklenburg County Stormwater, Project Manager
James Scanlon – Mecklenburg County GIS

Jerry Winkles – Charlotte Fire Department, Deputy Fire Chief
Carl Baker – NCEM
John Mello – NCEM
Mike Croke – JCI Jones Chemical
Neal Banerjee – FNI, Engineer
David Stroud – WSP
Abby Moore – WSP
Ranger Ruffins – WSP
Kimmy Hansen – WSP

PROJECT OVERVIEW

David Stroud kicked off the meeting with a review of the four phases of FEMA disaster mitigation planning process and the 10 steps of the CRS planning process. We are currently working through Phase 3: Mitigation Strategy, which aligns with Step 6 (Set Goals), Step 7 (Review Possible Activities), and Step 8 (Draft an Action Plan) of the CRS planning process. David reminded the committee that there will be one more committee meeting and one more public meeting where WSP will present the draft plan. Afterwards, the plan will be sent to the State for review.

CAPABILITY ASSESSMENT

A capability assessment measures local resources and tools available to support or implement mitigation projects. It identifies gaps, conflicts, and opportunities in existing local plans, policies, and programs. Additionally, a capability assessment identifies mitigation measures already in place or underway.

Indicators of capability in this plan update include the following:

- Plans and Regulatory – plans, programs, ordinances
- Administrative & Technical – staff, training, expertise
- Fiscal Resources – bonds, fees, taxes, CIP, grants
- Education and Resources – engaged stakeholders, public outreach, warning & notification
- Mitigation Resources – grants, past mitigation projects performance
- Political Will – public and leadership support for mitigation, investments, regulation enforcement

Previous Capability Self-Assessment Results

David reviewed the previous capability self-assessment results which can be found in the table below. David asked if these ratings should be changed and reminded the committee that all comments or revisions about the capability self-assessment results can be emailed directly to the consulting team.

It was noted that Charlotte's early warning system has been upgraded and the City is piloting a new Dam monitoring program.

Mecklenburg County has received funding from Centralina Regional Countil to develop a recovery and resilience plan. They have developed a plan and scorecard template that can be shared with the other communities.

Robyn Byers noted that the City of Charlotte updated its Strategic Energy Action Plan (SEAP+) which includes a climate risk assessment, and a strategy focused on climate change. The draft plan is currently up for review and public comment.

Jurisdiction	Plans, Ordinances, Codes and Programs	Administrative and Technical	Fiscal	Education and Outreach	Mitigation	Political	Overall
Mecklenburg County	High	High	High	Moderate	High	High	Moderate
Charlotte	High	High	High	High	High	High	High
Cornelius	Moderate	Moderate	High	Moderate	High	Moderate	Limited
Davidson	Moderate	High	Moderate	High	High	High	Moderate
Huntersville	Moderate	Moderate	Moderate	Limited	Moderate	Moderate	Limited
Matthews	High	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Mint Hill	High	High	High	Moderate	Moderate	Moderate	Limited
Pineville	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

Changes Since the Last Plan Update

David reviewed the changes in capability that have occurred since the last plan update and mentioned other new resources such as Comprehensive/Land Use Plan updates for all communities, BRIC and FMA funding for Mecklenburg County, and Huntersville, CRS class improvements for Charlotte, Mecklenburg County, Pineville, and Huntersville, increased freeboard requirements in charlotte and acquisitions and elevations in Mecklenburg.

David suggested communities think about the following changes and updates over the past five years when updating their capability results:

- Additional funding
- New or updated plans
- New staff
- Updated flood or open space regulations
- New emergency warning systems or strategies
- Completed mitigation projects

New FEMA Requirements

David briefly noted that there is a new FEMA requirement for substantial damage estimate procedures. The plan must include information on how participating communities use the NFIP to reduce risk after a disaster through substantial damage and substantial improvement (SD/SI) procedures.

He noted that substantial damage procedures can be found in a communities' floodplain prevention ordinance.

Mecklenburg is responsible for SD determinations for all communities. When an event occurs, a desktop analysis is done to initially predict where potential damage occurred. Trained field staff visits these locations to validate estimates and damage. This validated information is logged into a system that produces substantial damage estimates. Homeowners are then notified via a letter. Mecklenburg also is responsible for permitting in the floodplain. Permit holds are put in place for homes that have validated damage and SD estimates have been established.

Capability Vs. Mitigation

David emphasized the difference between capability and mitigation actions and gave examples of different scenarios found on slide 14. Mitigation actions should be applicable to the next five years and should be specific actions that help achieve the plans goals and objectives. It is important to focus on projects that reduce risk and vulnerability. Abby noted that status updates need to be reported for each individual action and to remove actions that speak to the regular duties of departments.

MITIGATION STRATEGY

A mitigation strategy is meant to reduce the impact of hazards on existing development and ensure future development occurs in a way that minimizes vulnerability.

Goals & Objectives

David reviewed the existing goals and objectives from the previous plan update and discussed potential revisions to implement with the committee for the current plan update.

Goal 1: Identify and implement hazard mitigation projects designed to reduce the impact of future hazard events on existing critical facilities and infrastructure as well as public and private property.

- Objective 1.1: Acquire or retrofit buildings and infrastructure to protect against damage from hazards.
- Objective 1.2: Implement natural, infrastructure, and structural projects to avert hazards and reduce future damage.
- Objective 1.3: Ensure critical facilities can maintain operations during hazard events.

Goal 2: Conduct education and outreach activities intended to better inform people about hazards and encourage personal responsibility for preparedness and mitigation.

- Objective 2.1: Conduct awareness activities in person and via web and social media.
- Objective 2.2: Assist vulnerable populations through targeted outreach.
- Objective 2.3: Promote and incentivize private mitigation activities.

Goal 3: Improve emergency preparedness and response capabilities.

- Objective 3.1: Conduct training and exercises intended to better prepare government officials to respond to, mitigate against and recover from emergencies and disasters.
- Objective 3.2: Improve ability to notify people of impending hazards and disasters.
- Objective 3.3: Establish traffic control procedures intended to reduce injuries and the loss of life before, during, and after emergencies and disasters.

Goal 4: Enact planning and policy measures to reduce the impacts of identified hazards and make future development more resilient to hazards.

- Objective 4.1: Adopt development regulations to limit or prevent development in hazard areas.
- Objective 4.2: Enforce building codes and development regulations.

Regarding goal two, it was suggested that some language be added about online access and digital literacy. Steve Sonnenberg also noted that for goal two language be changes from *people* to *public* to make clear that the intention is to broadly conduct outreach to people, business, and other stakeholders.

Objective 3.2 aims to improve hazard notification, however, it was noted that Mecklenburg County has a robust notification system and process for informing residents. Robyn suggested updating this language to "continue to notify people…". Others were in agreement.

Kyle asked how the County intends to disseminate warnings in other languages now that the National Weather Service no longer provides its notifications in multiple languages. It was noted that the County is

working with the office of inclusion and language to get notifications in multiple languages although they believe they reach a high number of residents with English and Spanish notifications.

Steve noted that goal four is overall a good goal but that it should speak to the need for enforcement. Robyn noted that we could also expand language to include incentivizing certain policy. WSP will revisit this goal and objective and provide updates based on this feedback.

Mitigation Action Requirements

Abby informed the committee that FEMA requires at least one mitigation action for each identified hazard in the plan update. All mitigation actions will need to be organized into the categories found below. Abby noted that to maximize CRS credit they should include flood-related actions in at least five of the six mitigation categories. The HMPC was reminded that they do not have to have mitigation actions for the man-made hazards but to still look for opportunities to include some if applicable.

1. Prevention (land development plans & zoning, freeboard requirements)
2. Property Protection (acquisition, elevation, floodproofing, backup generators)
3. Structural Projects (floodwalls, stormwater improvements, harden critical infrastructure)
4. Emergency Services (warning systems, response capacity & capability improvements)
5. Natural Resource Protection (dune or wetland restoration, vegetative management, open space preservation)
6. Public Education (mailings, websites, social media campaigns, interactive map tools, hazard disclosure requirements, targeted outreach and engagement)

Current Action Plans

Abby reviewed a summary of the current action plans in terms of what mitigation categories they cover and what hazards they address – slides 21 and 22. Abby noted to the HMPC that there are currently a lot of mitigation actions that are addressing "All Hazards" and none that cover excessive heat or severe winter weather. Communities should consider more hazard specific actions in the future. Similarly, there are no actions that cover natural resource protection. Project examples can be found in this FEMA publication. WSP will send a list of the mitigation strategies for communities to review and provide status updates.

PRI Summary Results

Abby briefly reviewed the PRI summary results with the committee. Flood, excessive heat, severe winter weather, hazardous substances, and radiological emergency are the only hazard profiles to be rated a "High Risk" for Mecklenburg County. Abby reminded the committee that it is important to consider adding more mitigation actions for the high priority hazards. However, FEMA only requires actions for natural hazards and will not review actions for human caused and technical hazards (i.e. radiological emergency and hazardous substances).

High Risk (> 3.0)	Excessive Heat Flooding Severe Winter Weather Hazardous Substances Radiological Emergency
Moderate Risk (2.0 - 2.9)	Dam & Levee Failure Drought Hurricane & Tropical Storm Tornadoes & Thunderstorms Wildfire Cyber Attack Infectious Disease
Low Risk (< 2.0)	Earthquake Landslide

New Mitigation Action Ideas

David discussed potential new mitigation action ideas that could be added into the plan update. He reminded the committee that these are only ideas to help them think of new actions and have not been added to the plan update. The action ideas presented can be found on slides 24-37. Note that WSP will add a drainage improvement action, an elevation and acquisition action, and a mitigation action recommended by NC Forest Service for wildfire mitigation to all communities' action plans unless there are any objections.

David encouraged the committee to look for plan integration opportunities by incorporating actions from their comprehensive plans or capital improvement plans and to include any actions they want to pursue for grant funding in the next five years. NCORR's Resilience Exchange Actions Database was recommended as a resource for new mitigation action ideas.

Survey Results

Abby reviewed results of the public survey which received a total of 91 responses. Abby will send a copy of the survey responses, which can be sorted by jurisdiction to help give specific feedback to the different communities regarding proposed mitigation action ideas.

Next Steps

Project Scheule

Abby presented an update on the schedule for the planning process, which includes additional HMPC and public meetings in May. The draft plan is due to NCEM by the end of May. The plan must be approved by NCEM and FEMA and adopted by all communities before the current plan expires in November 2025.

Next Steps & Discussion

Abby presented next steps and action items for WSP and the HMPC. WSP will send the existing mitigation action plans to the committee; the HMPC were asked to send mitigation action status updates and new mitigation actions to Abby Moore at abigail.moore@wsp.com as soon as possible. Please also send capability assessment updates to Abby.

A draft plan is now available on the plan website for the committee and public to review and provide feedback. The final HMPC and Public meeting will be held on May 12th. Communities were asked to help advertise the final public meeting.

Plan Website: www.MecklenburgHMP.com

HMPC MEETING 3: IN PERSON ATTENDANCE LIST

Charlotte-Mecklenburg Emergency Management Roster

Page ____ of ____

Class Name: MECKLENBURG, NC HMP

Hours: ____

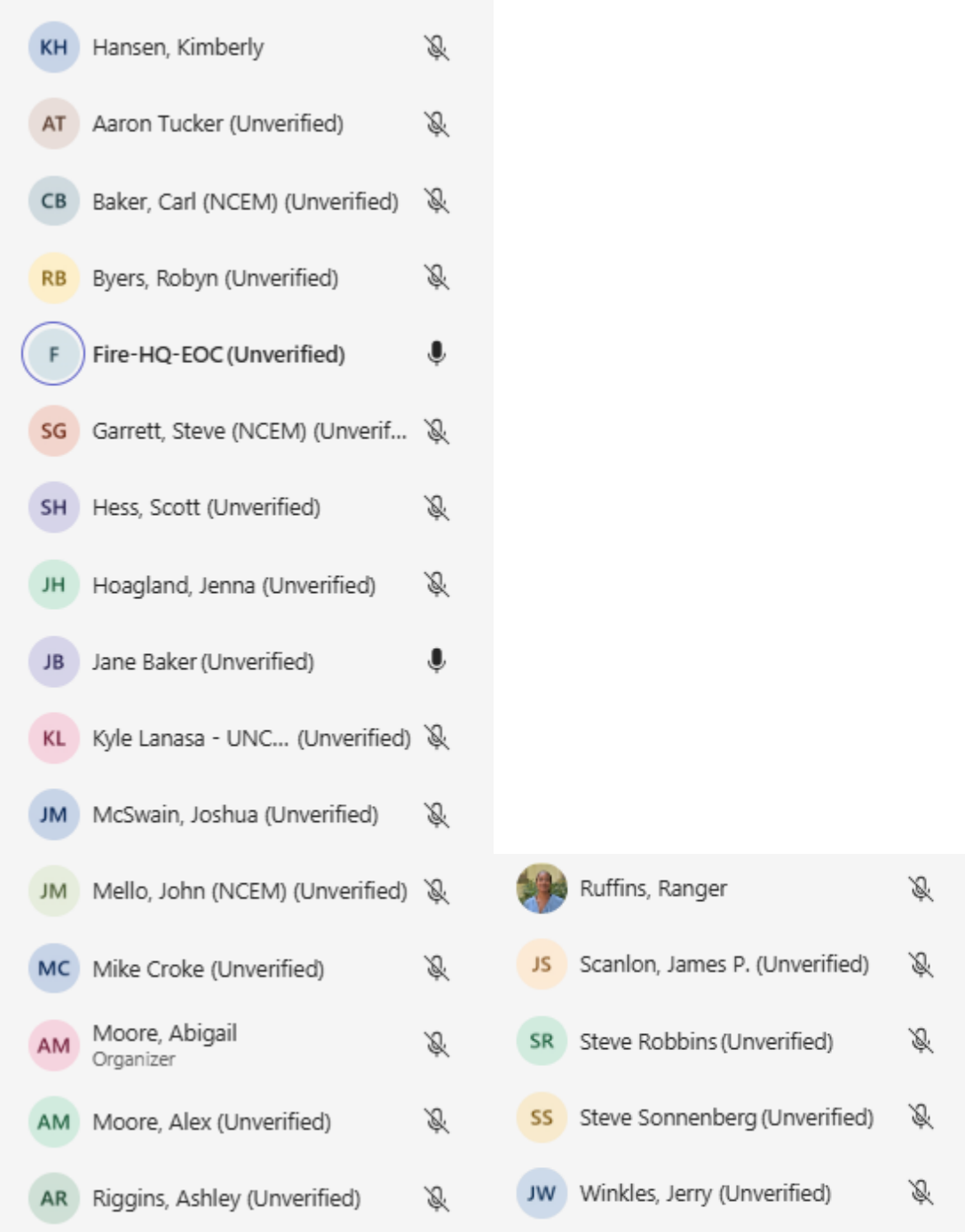
Location: ____

Instructor: ____

Name (printed)	Signature	Agency	E-mail Contact
David Stroud		WSP	david.Stroud@wsp.com
Abby Moore		WSP	ABIGAIL.MOORE@WSP.COM
Becca Deal		City SW	becca.deal@charlottenc.gov
James Scanlon		County STW	james.scanlon@mecknc.gov
ANDREW DECRISTOFARO		CHARLOTTE STW	ANDREW.DECRISTOFARO@CHARLOTTENC.GOV
DANIEL MOORE		Town of Huntersville	dmoore@huntersville.org
Karli Godfrey		County Manager's Office	Karli.godfrey@mecknc.gov
Brandon Jones		Riverkeeper	brandon@catawbariverkeeper.org
Christina Danis	Christina Danis	Centralina Regional Council	cdanis@centralina.org
Gidget Dennehy		Lake Wylie Comm	gidget.dennehy@gmail.com
Tony Bateman		CMEMO	anthony.bateman@charlottenc.gov

Charlotte-Mecklenburg Emergency Management
www.charmeckem.net

HMPC MEETING 3: ONLINE ATTENDEES



HMPC MEETING 4: MAY 12, 2025

MECKLENBURG COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE

HAZARD MITIGATION PLANNING COMMITTEE MEETING #4

May 12, 2025, 3:00pm, Charlotte Fire Department Headquarters & Microsoft Teams

Abby Moore and David Stroud from WSP, facilitated a meeting with the Hazard Mitigation Planning Committee to cover the topics outlined in the following agenda:

1. Planning Process Update
2. Structure of the Plan
3. Review of Key Plan Components
   a. Planning Process
   b. Risk Assessment
   c. Mitigation Strategy
4. Plan Adoption & Implementation
5. Next Steps
6. Discussion / Feedback on Draft Plan

ATTENDANCE

There were 6 attendees in person and 22 online. The full list of attendees is as follows:

Tony Bateman – CMEMO, Emergency Management Planner
Rebecca Deal – CMSWS, Stewardship Program Supervisor
James Scanlon – Mecklenburg County GIS
Andrew DiCristofaro – CMSWS
Aaron Tucker, Cornelious Planning Department, Senior Coordinator
Andrew Bridges, Deputy Fire Chief, Town of Cornelius
Jonathan Beller, Charlotte-Mecklenburg Storm Water Services, Construction Project Manager
CJ O'Neill, Public Works Director, Town of Matthews
Mathew Hornack, Construction Project Manager II, Mecklenburg County
Ryan Monteith, Fire Chief, Town of Davidson
John Phillips, Deputy Chief, Mint Hill Fire
Kevin Martin, Interim Director, UNC Charlotte Office of Emergency Management
David Kroening, Charlotte Mecklenburg Storm Water, Construction Project Manager 3
Scott Hudson, Charlotte Stormwater
Robert Graham, Deputy Director, CMEMO
Brandon Jones – Catawba Riverkeeper Foundation
Christina Danis – Centralina Regional Resilience Collaborative
Alex Moore, Mecklenburg County Stormwater, Communications Specialist
Steve Sonnenberg – Davidson, Citizen
Scott Hess – Charlotte Water, Safety Coordinator
Steve Robbins – Public Works, Assistant Director
Carl Baker – NCEM

John Mello – NCEM
Mike Croke – JCI Jones Chemical
David Stroud – WSP
Abby Moore – WSP
Ranger Ruffins – WSP
Kimmy Hansen – WSP

PLANNING PROCESS UPDATE

David Stroud with WSP began the presentation by explaining where we are in the planning process. We are nearing the end of the planning process as we have drafted the plan and now need to finalize it with any new mitigation actions that the communities wish to add. The plan will then need to be adopted and the HMPC and communities will work on implementation for the next five years.

STRUCTURE OF THE PLAN

David provided an overview of the structure of the draft plan including a summary of each section of the plan, as follows.

- **Section 1: Introduction** provides background information on the plan, including context and justification for planning and the scope of the plan.
- **Section 2: Planning Process** summarizes how the planning process was conducted and how all planning requirements were met, including how the communities, public, and stakeholders were involved in the plan. This section also documents implementation progress of the last plan in terms of completed and deleted mitigation actions.
- **Section 3: Planning Area Profile** for summary information on the region and participating communities, including geographic, climate, demographic, and economic characteristics of the region.
- **Section 4: Risk Assessment** contains the bulk of the plan. This section presents the hazard identification and profiles each hazard with information on the location at risk, past occurrences, probability of future occurrence, and vulnerability of people, property, and critical facilities.
- **Section 5: Capability Assessment** summarizes each community's existing tools, staff, and other resources that can support the implementation of mitigation projects.
- **Section 6: Mitigation Strategy** reviews the goals and objectives of the plan and details how mitigation actions were identified and prioritized. David explained that existing mitigation actions from the previous plan were reviewed, and project status updates are reported in the plan. Some projects were carried forward. The HMPC will send new mitigation projects to WSP to include in this plan update.
- **Section 7: Mitigation Action Plans** presents the action plan tables for each community.
- **Section 8: Plan Maintenance** describes past plan integration, opportunities for future plan integration, and the process for regular monitoring, maintenance, and implementation of the plan, including ongoing responsibilities of the HMPC.
- **Section 9: Plan Adoption** will document each community's adoption of the plan update.
- **Annexes** are provided for each participating community. The annexes provide an asset inventory with a full critical facility list, risk assessment data with vulnerability assessment results specific to the community for spatially defined hazards, and the mitigation action plan.
- **Appendix A** provides the Local Mitigation Plan Review Tool, which documents for the plan reviewers where the planning requirements were met.

- **Appendix B** provides planning process documentation demonstrating how the HMPC, public, and stakeholders were involved and engaged in the planning process.
- **Appendix C** provides mitigation alternatives analysis, documenting the review of mitigation action options, which is important for the CRS program planning requirements.
- **Appendix D** lists data and resources that were referenced in the plan.

KEY PLAN COMPONENTS

Abby reviewed key parts of the planning process, including the HMPC meetings, the public meetings, and all the participating communities' public outreach efforts.

Abby reviewed some high-level survey results, which were previously presented to the HMPC. There were 91 responses overall. Regarding past hazard experiences, many responses reference past hurricanes, flooding, thunderstorms, and severe winter storms. Regarding recommended steps local governments could take to reduce hazard impacts, responses include suggestions for drainage improvements, increased education on emergency preparedness, maintain regular maintenance and trimming of trees, and using sandbags during flood events.

Abby presented the Priority Risk Index results as a summary of the risk and vulnerability assessment. She explained that the PRI is a methodology for comparing the hazards based on five categories: probability, severity, spatial extent, warning time, and duration. Excessive Heat, Flood, Severe Winter Weather, Hazardous Substances, and Radiological Emergency were rated as "High Risk" for Mecklenburg County.

Goals & Objectives

Abby presented the goals and objectives which were carried forward from the previous plan with slight edits based on the feedback received at the previous HMPC meeting and the addition of Objective 4.3. The plan goals are as follows:

***Goal 1*: Identify and implement hazard mitigation projects designed to reduce the impact of future hazard events on existing critical facilities and infrastructure as well as public and private property.**

— Objective 1.1: Acquire or retrofit buildings and infrastructure to protect against damage from hazards.
— Objective 1.2: Implement natural, infrastructure, and structural projects to avert hazards and reduce future damage.
— Objective 1.3: Ensure critical facilities can maintain operations during hazard events.

***Goal 2:* Conduct education and outreach activities intended to better inform the public about hazards and encourage personal responsibility for preparedness and mitigation.**

— Objective 2.1: Conduct awareness activities in person and via web and social media.
— Objective 2.2: Assist vulnerable populations through targeted outreach and improved online access and digital literacy.
— Objective 2.3: Promote and incentivize private mitigation activities.

***Goal 3:* Improve emergency preparedness and response capabilities.**

— Objective 3.1: Conduct training and exercises intended to better prepare government officials to respond to, mitigate against and recover from emergencies and disasters.
— Objective 3.2: Continue to improve ability to notify people of impending hazards and disasters.
— Objective 3.3: Establish traffic control procedures intended to reduce injuries and the loss of life before, during, and after emergencies and disasters.

***Goal 4:* Enact and enforce or incentivize planning and policy measures to reduce the impacts of identified hazards and make future development more resilient to hazards.**

- Objective 4.1: Adopt development regulations to limit or prevent development in hazard areas.
- Objective 4.2: Enforce building codes and development regulations.
- Objective 4.3: Provide incentives to encourage implementation of preferred development techniques that minimize hazard risks and/or protect natural resources.

Mitigation Strategy

Abby reviewed a sample of the mitigation action plan to explain the organization of the table and the information included for each project, such as the lead agency, timeline for implementation, and potential funding sources.

Abby noted that at a minimum, every community in the county will have a general elevation and acquisition project, a drainage improvement project, a storm restoration project, and an action to create or update a Community Wildfire Protection plan. These actions will be added to the actions plans unless a community has identified that they want a project removed.

Abby asked the committee to submit final mitigation actions to her by Wednesday, May 21st. This includes mitigation action updates and new mitigation actions. She remined the committee to include any actions that communities may want to pursue for grant funding in the next five years. In order to receive federal funding projects need to be included in this mitigation action plan.

Rebecca noted that Charlotte Stormwater Services would like to add a water quality stormwater project and asked if the project was too broad to be included. David and Carl noted that the project would be a good addition and has enough information to be considered for future funding.

Carl informed communities that NCEM is exploring options to fund projects now that BRIC funding has been cut. You can reach out to Carl if you have any questions.

PLAN ADOPTION AND IMPLEMENTATION

Abby explained that every community will need to adopt the plan. A template for adoption resolution from NCEM will be provided to all communities. Once NCEM approves the plan, communities can adopt the plan.

Moving forward, the HMPC should meet quarterly to report on progress toward implementation and monitor funding opportunities and implementation of mitigation actions. At minimum, annual HMPC meetings should be held. The plan will continue to be updated every five years

NEXT STEPS

The HMPC was asked to send any final mitigation actions updates or new actions to Abby by Wednesday, May 21st. WSP will submit the draft plan to NCEM for review and approval on May 22nd.

A final public meeting is scheduled for tonight, May 12th at 5pm.

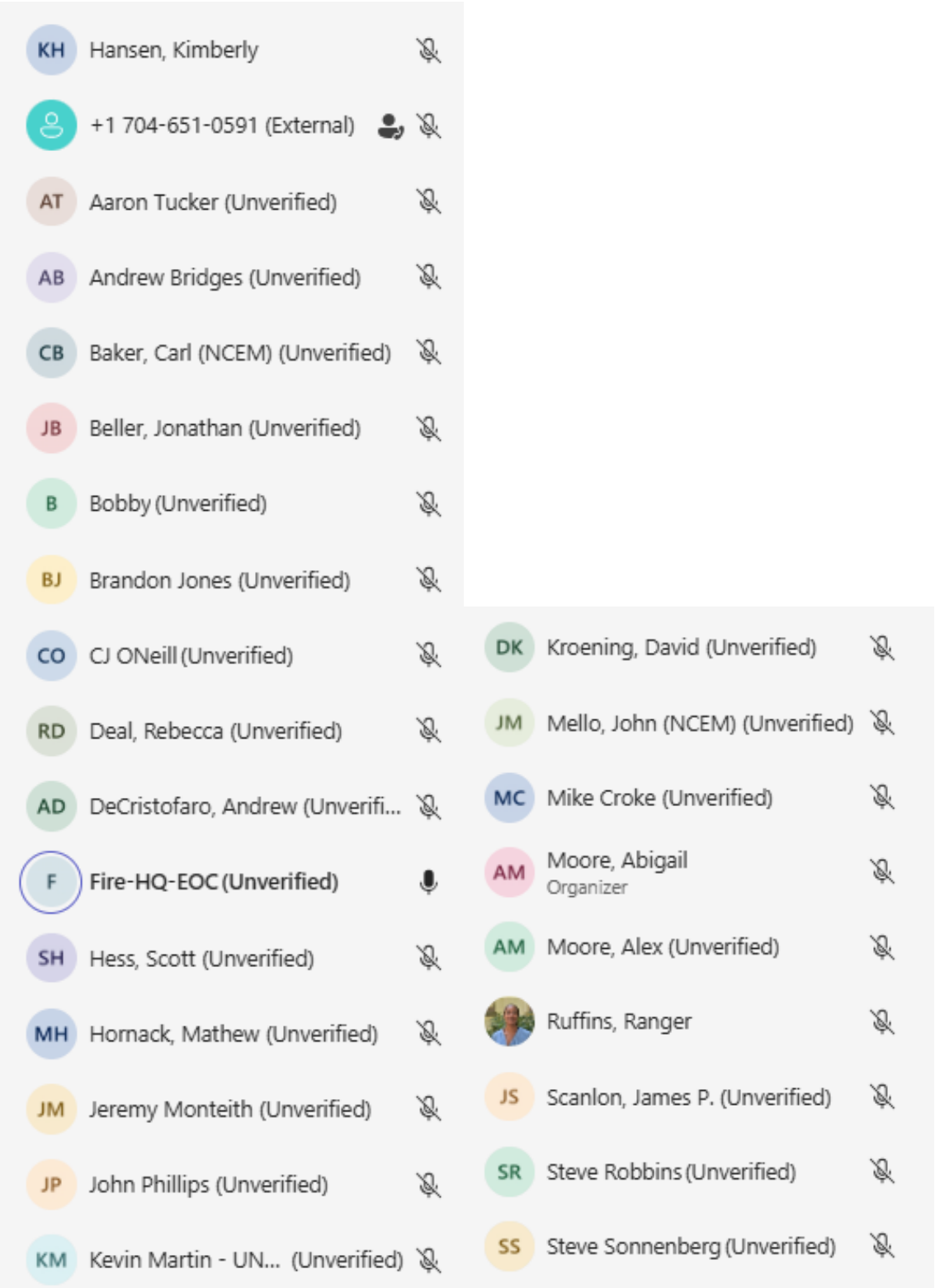
Any other draft plan comments should be sent by Wednesday 21st. Comments will be incorporated into the final approved version of the plan.

HMPC MEETING 4: IN-PERSON ATTENDANCE LIST

Mecklenburg County, NC
Hazard Mitigation Planning Committee - Meeting #4
Monday, May 12, 2025, 3pm

	Name	Jurisdiction	Department/Agency/Organization	Email
1.	ABBY MOORE	—	WSP	abigail.moore@wsp.com
2.	DAVID STROUD	—	WSP	david.stroud@wsp.com
3.	Scott Hudson	Charlotte Storm Water	CSWS	scott.Hudson@charlotte nc.gov
4.	Robert Graham	CMEMO		robert.graham@
5.	Christina Davis	Centralina Regional	Centralina RPC Tech	cdavis@centralina.org
6.	Anthony Bateman	CMEMO	CMEMO	anthony.bateman@ch
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				

HMPC MEETING 4: ONLINE ATTENDEES



B.2 PLANNING STEP 2: INVOLVE THE PUBLIC

Table B.2 – Public Meeting Topics, Dates, Locations

Meeting Title	Meeting Topic	Meeting Date	Meeting Location
Public Meeting #1	1) Introduction to the planning process and project schedule 2) Explanation of mitigation 3) Review of hazard identification	January 9, 2025	Microsoft Teams
Public Meeting #2	1) Review draft Hazard Mitigation Plan 2) Solicit comments and feedback	May 12, 2025	Charlotte Fire Department Headquarters & Microsoft Teams 500 Dalton Ave Charlotte, NC

PUBLIC MEETING AGENDAS, MINUTES, SIGN-IN SHEETS, AND ANNOUNCEMENTS

PUBLIC MEETING 1: JANUARY 9, 2025

MECKLENBURG COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE

PUBLIC MEETING #1

January 9, 2025, 5pm, Microsoft Teams

AGENDA

- Introductions
- Why Plan?
- Project Overview
- Planning Process
- Project Schedule
- Next Steps
- Q & A

INTRODUCTIONS

David Stroud with WSP, the County's contractor, kicked off the meeting with an introduction to the plan update process and the importance of hazard mitigation. David and Abby Moore, also with WSP, facilitated the rest of the meeting following the agenda above.

WHY PLAN?

David began the presentation with why we plan in the first place. David explained that plan updates ensure preparedness and continued eligibility for FEMA grant funding through programs like the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, and the Building Resilient Infrastructure & Communities Program. Additionally, the plan update is an opportunity to identify and understand changes in risk due to greater exposure, new or changing populations, changes to hazards from development, and the impacts of climate change. The plan update is an opportunity to increase resilience through mitigation.

David discussed that the Disaster Mitigation Act (DMA) of 2000 which is codified in 44 CFR 201.6 requires local governments to update their hazard mitigation plans every five years to receive FEMA pre- and post-disaster mitigation funding through the Hazard Mitigation Assistance funding programs. David reviewed some trends in disasters including that we now have more frequent and intense hazard events and greater exposure to risk (people, property and critical infrastructure). In 2023 there were 28 billion-dollar disasters, more than any prior year. Hazard mitigation is a priority for multiple reasons, including that the cost of doing nothing is too high, many events are predictable and repetitive, loss reduction can be effective, cost-beneficial, and environmentally-sound, there are legal and moral responsibilities to prevent disasters, and there are federal funds available to support mitigation. The average benefit-cost ratio for federally funded projects is 6:1. Mitigation is sustained action taken to reduce risk and break the damage/rebuild cycle. Approaches to mitigation include altering, averting, adapting to, or avoiding the hazard.

PROJECT OVERVIEW

David explained that we must follow the DMA planning process and we will integrate Community Rating System (CRS) Activity 510 planning steps into the DMA four-phase planning process to meet the requirements of both programs. The DMA process provides continued eligibility for mitigation funding, guides mitigation activities in a coordinated and economical manner, integrates hazard mitigation with other planning mechanisms, directs future development in a safe manner, and helps make communities more disaster resistant. The CRS program provides policy holders in participating communities with flood insurance discounts based on the number of CRS points the communities earn. The flood insurance

premium reductions are community-wide. Mecklenburg County, Charlotte, Huntersville, and Pineville participate in the CRS program.

Overall, the WSP team will ensure that the updated hazard mitigation plan meets all FEMA planning requirements, coordinates with the natural hazards in the updated State Hazard Mitigation Plan, includes natural and human-caused hazards as identified by the HMPC, incorporates local climate change data and findings, and addresses equitable outcomes.

PLANNING PROCESS

Abby described the planning process in more detail. Phase 1 is already underway and involves reconvening the planning committee, planning for public involvement, and coordinating with stakeholders. A priority is to identify stakeholders that should be invited to participate in the planning process, especially those that may be able to represent underserved communities and/or vulnerable populations.

Phase 2 covers the risk assessment, which includes the hazard identification, the vulnerability assessment, and the capability assessment. The hazards that were addressed in the previous plan were presented. Abby noted three changes from the previous plan – infectious disease has been added and sinkhole and EMP has been removed.

Phase 3 involves developing a mitigation strategy by reviewing and updating the plan goals and objectives, evaluating mitigation alternatives, including existing and new projects, and drafting an action plan with prioritized projects. Actions will fall within the six FEMA/CRS mitigation categories: Prevention, Property Protection, Structural Projects, Emergency Services, Natural Resource Protection, and Public Education. In the plan update communities must have at least one action for each natural hazard to meet FEMA requirements. WSP will also conduct a capability assessment to examen what resources, tools, and policies are available to each community to help implement mitigation.

Phase 4 is where the communities must adopt and implement the plan. The communities and HMPC will meet quarterly to review the action plan and look for funding and opportunities to implement projects. The plan will continue to be updated every five years.

PROJECT SCHEDULE

Abby presented a tentative schedule for the planning process, which includes an additional public meeting around April. A risk assessment draft will be available for review in February followed by a full draft plan for review in April. The draft plan is due to NCEM in May. The plan must be approved by NCEM and FEMA and adopted by all communities before the current plan expires in November 2025.

NEXT STEPS

Abby discussed public outreach efforts which include public meetings facilitated by WSP, a public survey, and meeting minutes. Meeting materials, draft plans, and more information will be posted to the plan website www.MecklenburgHMP.com.

QUESTIONS/ANSWERS

Commissioner Steve Justus from Davidson noted that extreme heat has been ranked one of the most concerning hazards for the Town and wanted to know if there was any opportunity to integrate this plan with local work and vice versa. He shared that the Town will be working with NASA to map areas of high heat vulnerability. Abby noted the Town can share any relevant information, data, or potential mitigation actions with WSP or the HMPC to be integrated into the plan. David also noted that the North Carolian Office of Resilience and Recovery (NCORR) has information on extreme heat and preparing a heat mitigation plan. He also suggested that they attend the HMPC in February where a representative from NCORR will present on extreme heat in NC and mitigation opportunities.

Steve Sonnenberg asked if the transition of presidential administrations would impact the planning process or requirements of the HMP update. David responded that he expects no changes to occur as any requirements would take years to complete. Plan requirements were updated in 2023 and took a long time to receive approval.

Steve Sonnenberg asked if the list of identified hazards has been finalized and who made the decision on what to include. Abby explained that the selected hazards were drawn from the previous plan and the state HMP and were discussed and decided upon by the HMPC made up of community representatives and stakeholders.

Steve Sonnenberg asked if the assessed critical facilities would be shared with the public and how the list of facilities in iRisk were established. Abby explained that she was unsure who was responsible for uploading the inventory into iRisk, but that WSP is working with the communities to revise and update the list of facilities in iRisk and the inventory that was included in the last plan. Each community is reviewing a map of existing facilities and will refine that list to identify what is most important. Abby noted that anyone from the public can submit suggestions to her or via the public survey. David also explained that there will be an opportunity for the public to review the draft risk assessment with the asset inventory in and provide any additional feedback or information on what may be missing. Steve was also curious how facilities are evaluated for vulnerability when they are not visited in person. Abby explained that this plan assesses vulnerability spatially and at a higher level rather than conducting in depth field assessments. This plan can estimate potential exposure, like the estimated flood depth a specific hazard may experience.

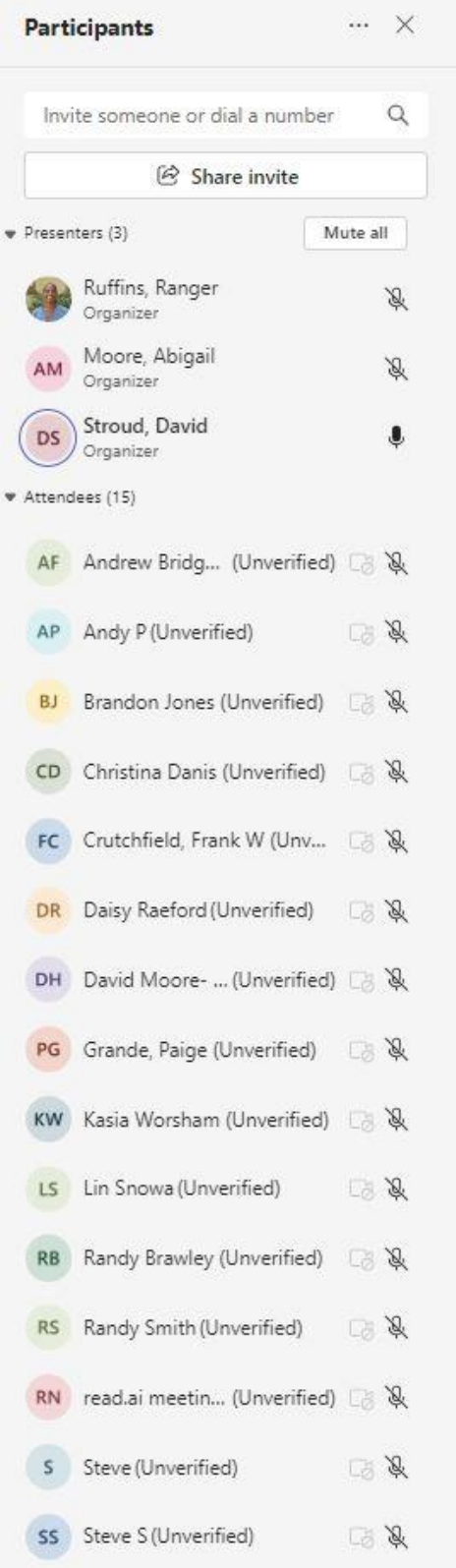
Steve Sonnenberg asked how comments from the public are integrated into the plan. Abby explained that feedback can be given directly to her or through the public survey. The public will also be able to review the draft risk assessment and full plan and provide feedback before the plan is finalized. Steve noted that he provided comments about the plan to his fire chief, Tony, WSP will follow up with Tony.

Randy Brawley shared that he has been working with Charlotte-Mecklenburg County on their Threat and Hazard Identification and Risk Assessment (THIRA) update and will share data from that assessment with WSP for integration into the Hazard Mitigation Plan risk assessment.

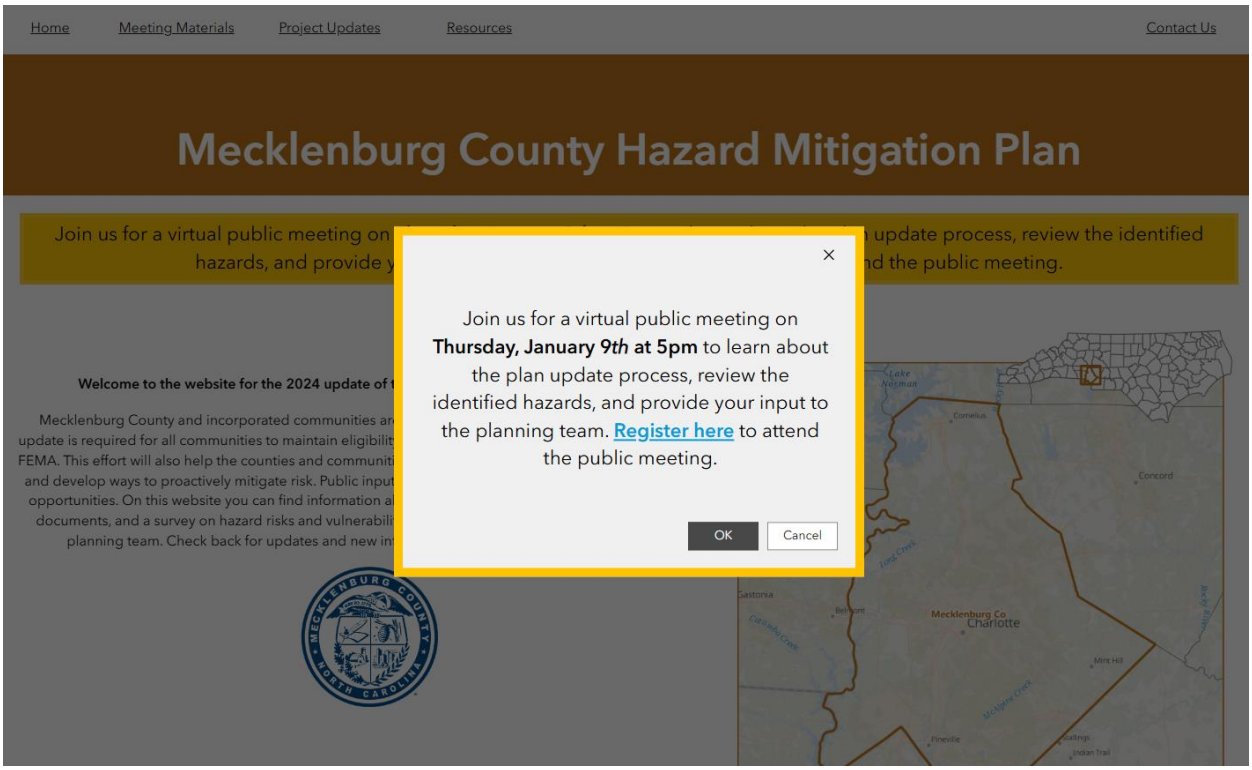
Brandon Jones noted that the Mecklenburg area has experienced two of the largest floods in recent years with the flooding of the Catawba River. He asked what kind of mapping would be included in this plan and if these floods would be taken into consideration. David noted that the plan will use the current effective FEMA FIRM map and could consult any preliminary mapping. The current effective FIRM likely has not been updated in the last five years when the previous plan was developed, however, the plan will discuss recent flood events that have impacted the area.

Kasia Worsham noted that only a few communities participate in the CRS program and asked if this plan intends to get more communities involved in the program. David explained that the CRS program is voluntary and that it would be up to communities to decide if they want to enter the program. It is possible for communities to include a mitigation action to join the program.

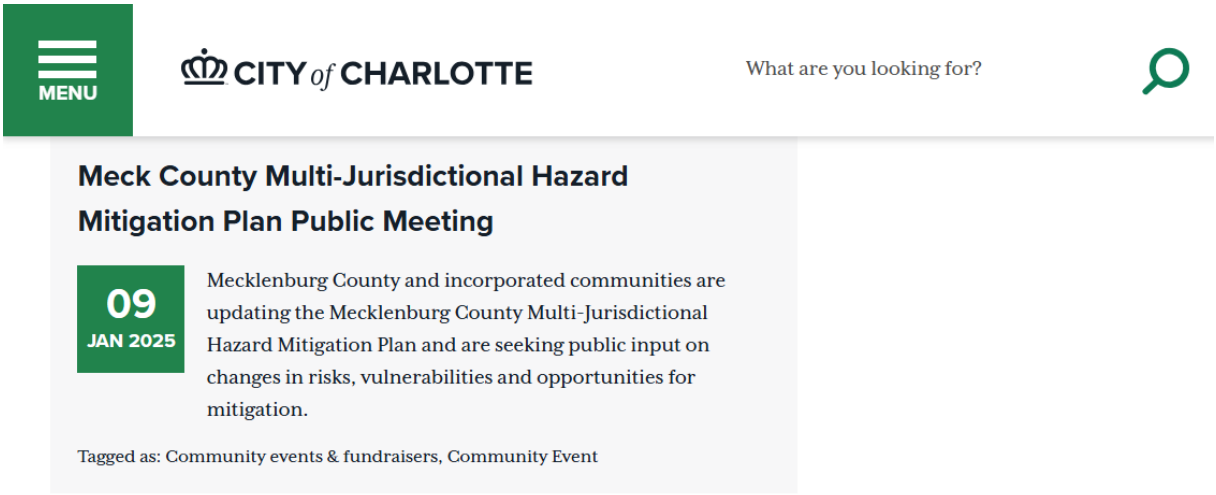
PUBLIC MEETING 1: ONLINE ATTENDEES



PUBLIC MEETING 1 ADVERTISEMENTS:




MENU
CITY of CHARLOTTE
What are you looking for?
Home / Meck County Multi-Jurisdictional Hazard Mitigation Plan Public Meeting
Meck County Multi-Jurisdictional Hazard Mitigation Plan Public Meeting
Mecklenburg County and incorporated communities are updating the Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan and are seeking public input on changes in risks, vulnerabilities and opportunities for mitigation.
Virtual Public Meeting, January 9 at 5 p.m.
Join us for a virtual public meeting on Thursday, January 9 at 5 p.m. to learn about the plan update process, review the identified hazards, and provide your input to the planning team.
Register here to attend the public meeting.
Public input is critical to the planning process. If you are unable to attend the public meeting but still want to be involved in the planning process, please take a few minutes to complete a brief public survey to provide your input on hazard risks and mitigation options.
Additional Information
· This plan update is required for all communities to maintain eligibility for pre- and post-disaster mitigation funding from FEMA. This effort will also help our communities understand vulnerability and develop ways to proactively reduce risk.
· For more information about the plan update, visit www.MecklenburgHMP.com.
· Questions? Please contact Abby Moore at abigail.moore@wsp.com. Questions specifically for Storm Water Services may be directed to Scott Hudson at scott.hudson@charlottenc.gov.
Learn More
Charlotte-Mecklenburg STORM WATER Services
Storm Water Services


MENU
CITY of CHARLOTTE
What are you looking for?
Meck County Multi-Jurisdictional Hazard Mitigation Plan Public Meeting
09
JAN 2025
Mecklenburg County and incorporated communities are updating the Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan and are seeking public input on changes in risks, vulnerabilities and opportunities for mitigation.
Tagged as: Community events & fundraisers, Community Event

Charlotte-Mecklenburg Storm Water Services
December 15, 2024 at 11:59 AM ·

The Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan update is underway. Public input is encouraged during a virtual meeting on January 9th at 5pm. Register at https://bit.ly/49xTnxj At this meeting you can learn about the plan update process, review the identified hazards, and provide your input to the planning team. For more information and to share your input through the public survey, visit https://bit.ly/3Do6qFq.



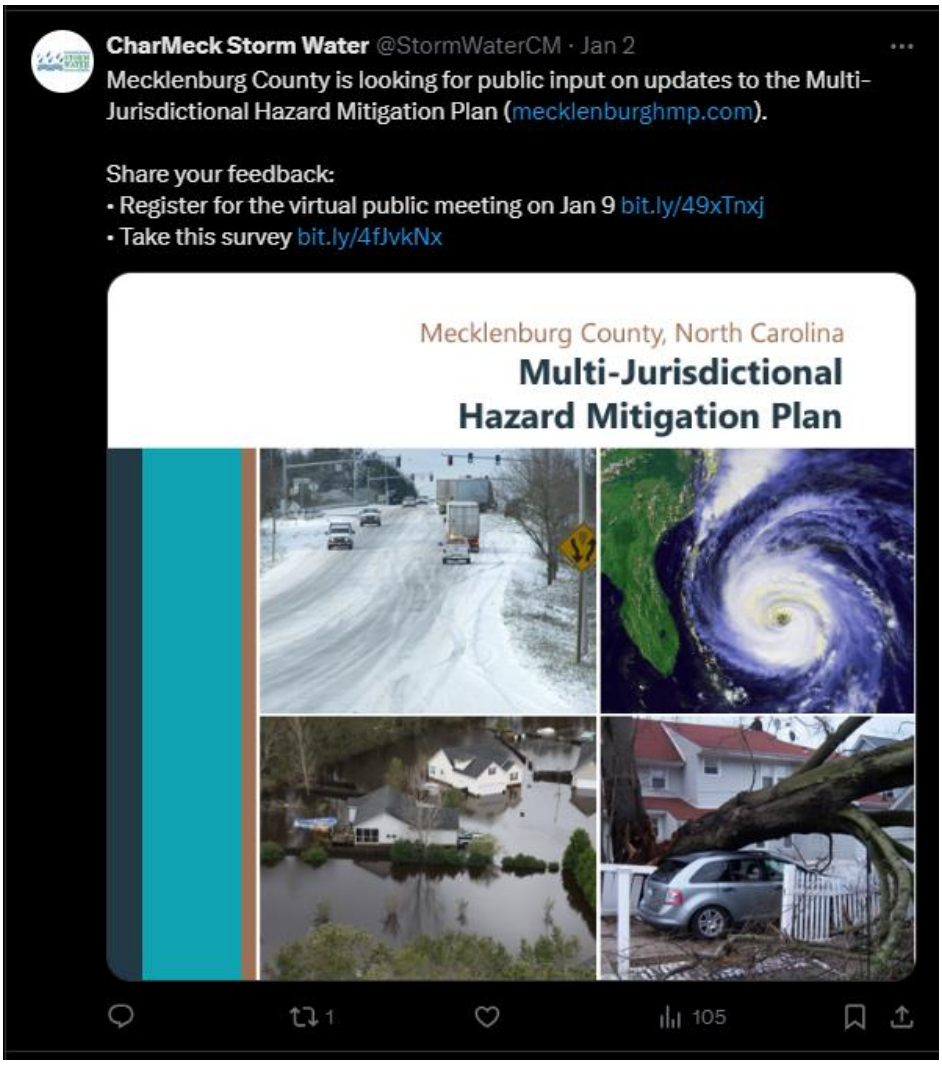
Like Comment Share

Charlotte-Mecklenburg Storm Water Services
January 2 at 4:31 PM ·

Mecklenburg County and incorporated communities are seeking public input as they update the Multi-Jurisdictional Hazard Mitigation Plan. The plan establishes the vision and guiding principles to reduce hazard risk in our community and proposes specific mitigation actions to eliminate or reduce identified vulnerabilities.

There are two ways to share feedback:
• A virtual public meeting on Thursday, Jan. 9, at 5 p.m., where residents can learn about the plan update process, review the identified hazards, and provide input to the planning team. Register to attend: https://bit.ly/49xTnxj
• This brief public survey, where residents can provide input on hazard risks and mitigation options. https://bit.ly/4fJvkNx





Today < > January 2025

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
5	6	7 Hazard Mitigatio...	8 Hazard Mitigatio...	9 Hazard Mitigatio... Meck County Mul...	10	11 2nd Saturday - Tr...
12	13	14	15	16 Storm Water Advi...	17	18
19	20	21	22	23	24	25
26	27	28	29	30 Volunthursday - ...	31	



Town of Cornelius
December 27, 2024 at 4:00 PM ·

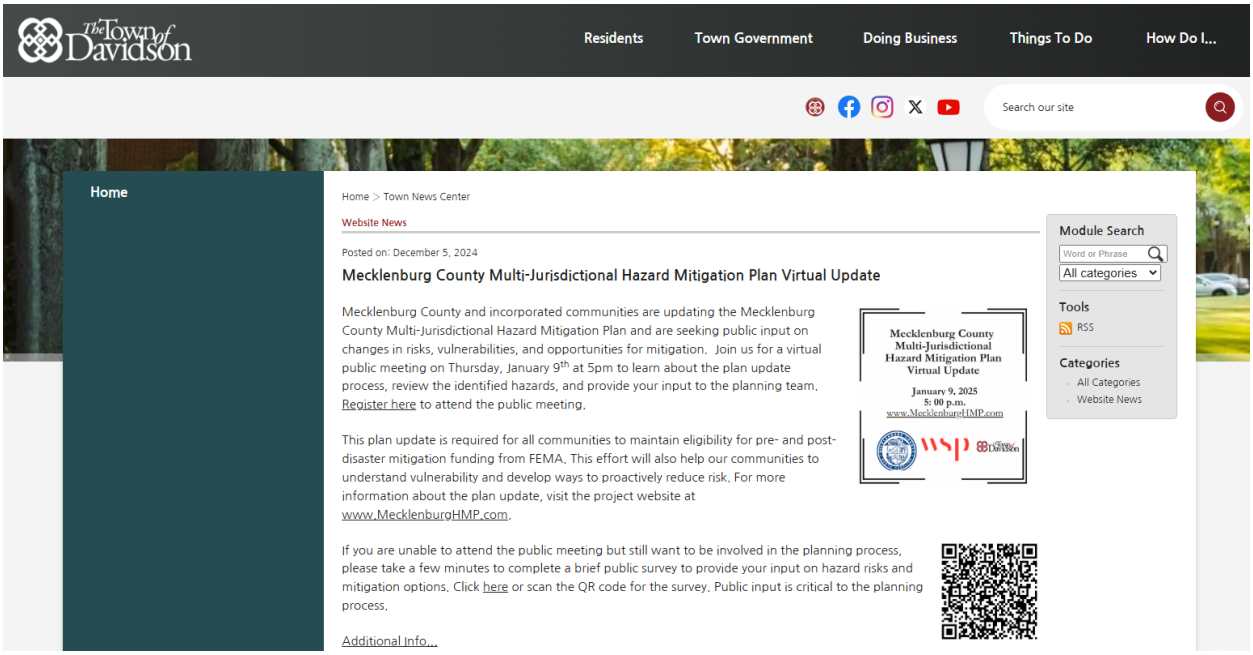
The Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan update is underway!

Register here to attend a virtual public meeting on January 9th at 5 p.m. At this meeting, you can learn about the plan update process, review the identified hazards, and provide your input to the planning team. For more information and to share your input through the public survey, visit www.MecklenburgHMP.com.

--

Survey link: https://forms.office.com/e/tqQW9G45Q0
Public meeting registration link: https://events.teams.microsoft.com/.../25dd8668-3005-4644...

FORMS.OFFICE.COM
forms.office.com



The Town of Davidson

Residents | Town Government | Doing Business | Things To Do | How Do I...

Search our site

Home

Home > Town News Center

Website News

Posted on: December 5, 2024

Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan Virtual Update

Mecklenburg County and incorporated communities are updating the Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan and are seeking public input on changes in risks, vulnerabilities, and opportunities for mitigation. Join us for a virtual public meeting on Thursday, January 9th at 5pm to learn about the plan update process, review the identified hazards, and provide your input to the planning team. Register here to attend the public meeting.

This plan update is required for all communities to maintain eligibility for pre- and post-disaster mitigation funding from FEMA. This effort will also help our communities to understand vulnerability and develop ways to proactively reduce risk. For more information about the plan update, visit the project website at www.MecklenburgHMP.com.

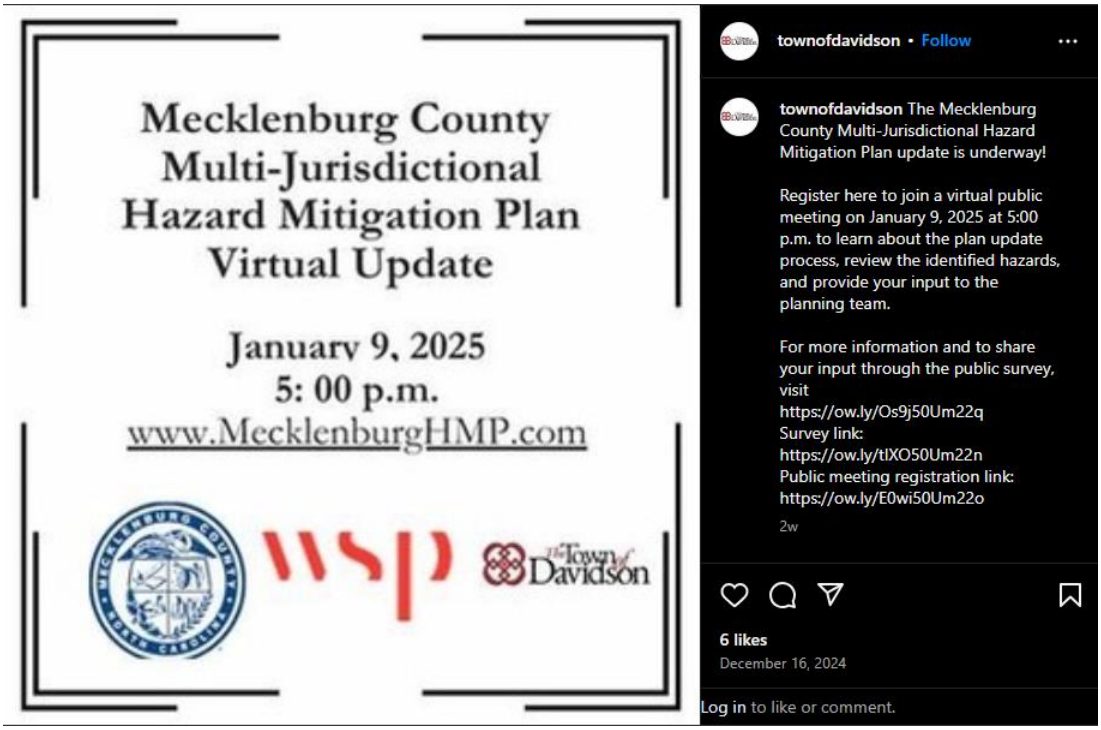
If you are unable to attend the public meeting but still want to be involved in the planning process, please take a few minutes to complete a brief public survey to provide your input on hazard risks and mitigation options. Click here or scan the QR code for the survey. Public input is critical to the planning process.

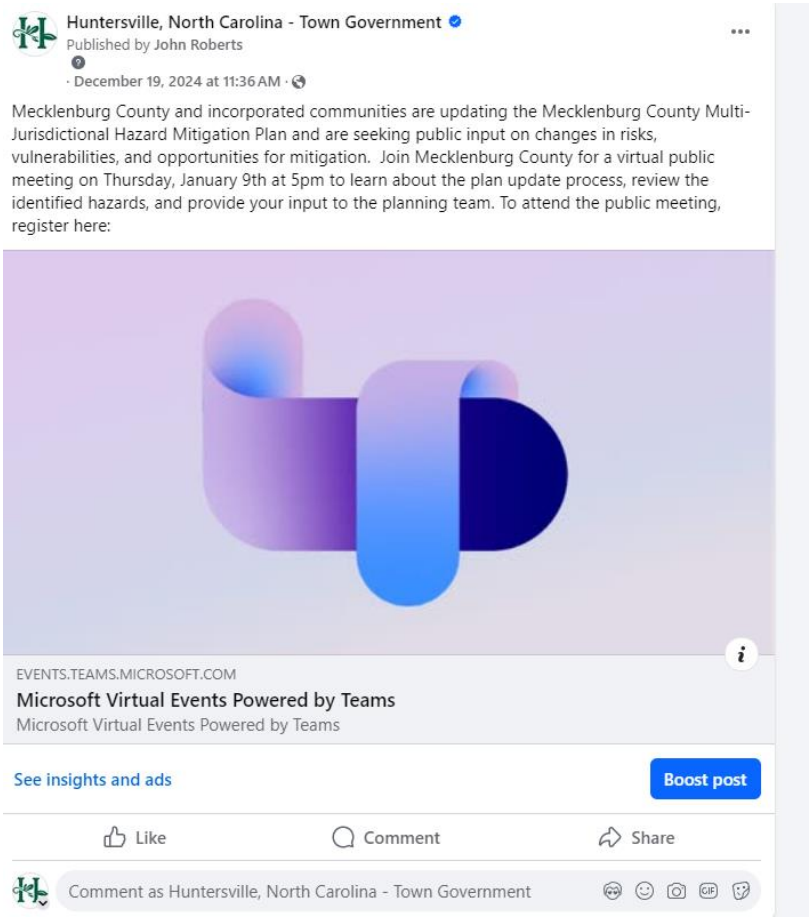
Additional Info...

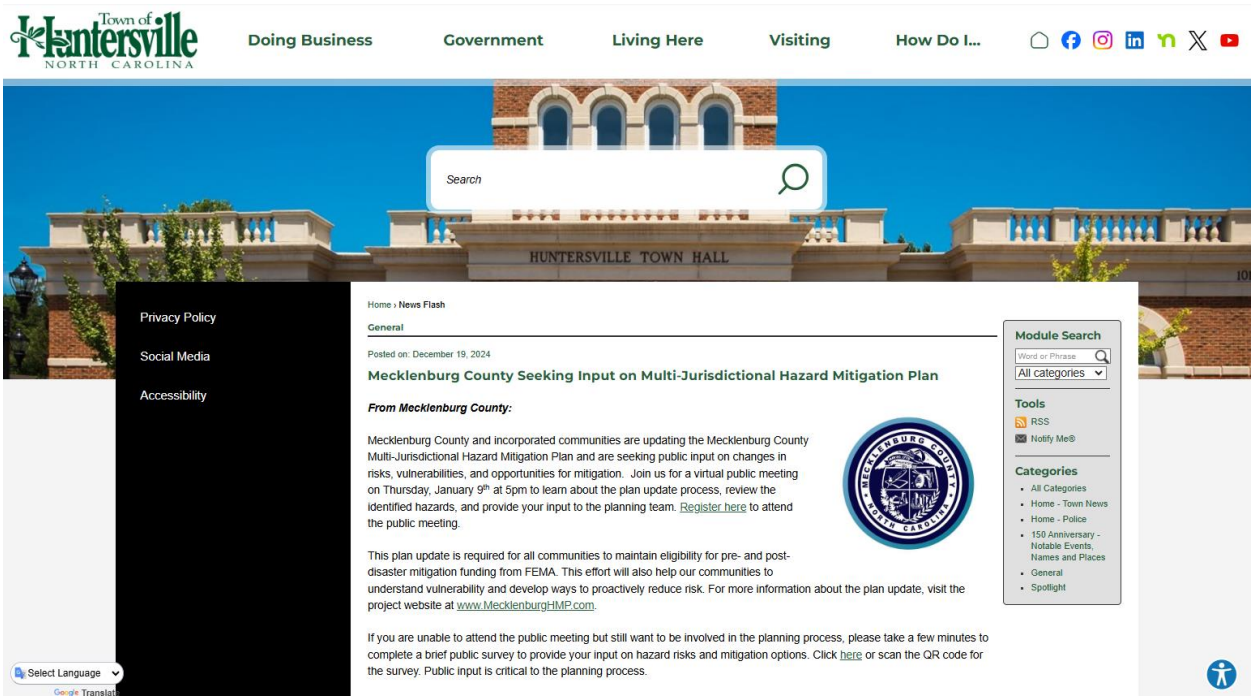
Module Search
Word or Phrase
All categories

Tools
RSS

Categories
All Categories
Website News


Mecklenburg County
Multi-Jurisdictional
Hazard Mitigation Plan
Virtual Update
January 9, 2025
5: 00 p.m.
www.MecklenburgHMP.com
wsp
Town of Davidson
townofdavidson • Follow
townofdavidson The Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan update is underway!
Register here to join a virtual public meeting on January 9, 2025 at 5:00 p.m. to learn about the plan update process, review the identified hazards, and provide your input to the planning team.
For more information and to share your input through the public survey, visit
https://ow.ly/Os9j50Um22q
Survey link:
https://ow.ly/tIXO50Um22n
Public meeting registration link:
https://ow.ly/E0wi50Um22o
2w
6 likes
December 16, 2024
Log in to like or comment.


Huntersville, North Carolina - Town Government
Published by John Roberts
· December 19, 2024 at 11:36 AM ·
Mecklenburg County and incorporated communities are updating the Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan and are seeking public input on changes in risks, vulnerabilities, and opportunities for mitigation. Join Mecklenburg County for a virtual public meeting on Thursday, January 9th at 5pm to learn about the plan update process, review the identified hazards, and provide your input to the planning team. To attend the public meeting, register here:
EVENTS.TEAMS.MICROSOFT.COM
Microsoft Virtual Events Powered by Teams
Microsoft Virtual Events Powered by Teams
See insights and ads
Boost post
Like
Comment
Share
Comment as Huntersville, North Carolina - Town Government


Town of Huntersville
NORTH CAROLINA
Doing Business
Government
Living Here
Visiting
How Do I...
Search
HUNTERSVILLE TOWN HALL
Privacy Policy
Social Media
Accessibility
Home › News Flash
General
Posted on: December 19, 2024
Mecklenburg County Seeking Input on Multi-Jurisdictional Hazard Mitigation Plan
From Mecklenburg County:
Mecklenburg County and incorporated communities are updating the Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan and are seeking public input on changes in risks, vulnerabilities, and opportunities for mitigation. Join us for a virtual public meeting on Thursday, January 9th at 5pm to learn about the plan update process, review the identified hazards, and provide your input to the planning team. Register here to attend the public meeting.
This plan update is required for all communities to maintain eligibility for pre- and post-disaster mitigation funding from FEMA. This effort will also help our communities to understand vulnerability and develop ways to proactively reduce risk. For more information about the plan update, visit the project website at www.MecklenburgHMP.com.
If you are unable to attend the public meeting but still want to be involved in the planning process, please take a few minutes to complete a brief public survey to provide your input on hazard risks and mitigation options. Click here or scan the QR code for the survey. Public input is critical to the planning process.
Module Search
Word or Phrase
All categories
Tools
RSS
Notify Me®
Categories
All Categories
Home - Town News
Home - Police
150 Anniversary - Notable Events, Names and Places
General
Spotlight
Select Language

Charlotte-Mecklenburg Storm Water Services
Sent Post
Thu, Jan 2, 2025 4:31 pm

Mecklenburg County and incorporated communities are seeking public input as they update the Multi-Jurisdictional Hazard Mitigation Plan. The plan establishes the vision and guiding principles to reduce hazard risk in our community and proposes specific mitigation actions to eliminate or reduce identified vulnerabilities.

There are two ways to share feedback:
• A virtual public meeting on Thursday, Jan. 9, at 5 p.m., where residents can learn about the plan update process, review the identified hazards, and provide input to the planning team. Register to attend: https://bit.ly/49xTnxj
• This brief public survey, where residents can provide input on hazard risks and mitigation options. https://bit.ly/4fJvkNx

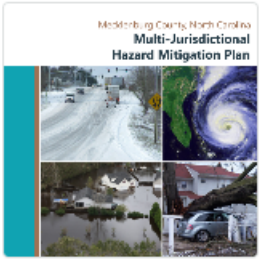


by Ashley S.

CharMeck Storm Water @StormWaterCM
Sent Post
Thu, Jan 2, 2025 7:13 pm

Mecklenburg County is looking for public input on updates to the Multi-Jurisdictional Hazard Mitigation Plan (mecklenburghmp.com).

Share your feedback:
• Register for the virtual public meeting on Jan 9 bit.ly/49xTnxj
• Take this survey bit.ly/4fJvkNx



by Ashley S.

Charlotte-Mecklenburg Storm Water Services
Sent Post
Thu, Jan 9, 2025 11:02 am

Reminder about tonight's meeting!

The Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan update is underway! Register to join us for a virtual public meeting on January 9th at 5pm: https://bit.ly/49xTnxj

At this meeting you can learn about the plan update process, review the identified hazards, and provide your input to the planning team. For more information and to share your input through the public survey, visit https://bit.ly/3Do6qFq.



AS by Ashley S.

CharMeck Storm Water Services stormwatercm
Sent Post
Thu, Jan 9, 2025 11:02 am

Reminder about tonight's meeting!

The Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan update is underway! Register to join us for a virtual public meeting on January 9th at 5pm: https://bit.ly/49xTnxj

At this meeting you can learn about the plan update process, review the identified hazards, and provide your input to the planning team. For more information and to share your input through the public survey, visit https://bit.ly/3Do6qFq.



CharMeck Storm Water @StormWaterCM
Scheduled Post

Thu, Jan 9, 2025 11:08 am

The Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan update is underway!

Join us for a virtual public meeting on Jan 9 at 5pm: https://bit.ly/49xTnxj

At this meeting you can learn about the process, review identified hazards, and provide your input.



AS by Ashley S.

PUBLIC MEETING 2: MAY 12, 2025

MECKLENBURG COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE

PUBLIC MEETING #2

May 12, 2025, 5:00pm, Charlotte Fire Department Headquarters & Microsoft Teams

Abby Moore and David Stroud from WSP, facilitated a meeting with the Hazard Mitigation Planning Committee to cover the topics outlined in the following agenda:

1. Planning Process Update
2. Structure of the Plan
3. Review of Key Plan Components
   a. Planning Process
   b. Risk Assessment
   c. Mitigation Strategy
4. Plan Adoption & Implementation
5. Next Steps
6. Discussion / Feedback on Draft Plan

PLANNING PROCESS UPDATE

David Stroud with WSP began the presentation by explaining where we are in the planning process. We are nearing the end of the planning process as we have drafted the plan and now need to finalize it with any new mitigation actions. The plan will be adopted by the communities and will be implemented over the next five years.

STRUCTURE OF THE PLAN

David provided an overview of the structure of the draft plan including a summary of each section of the plan, as follows.

- **Section 1: Introduction** provides background information on the plan, including context and justification for planning and the scope of the plan.
- **Section 2: Planning Process** summarizes how the planning process was conducted and how all planning requirements were met, including how the communities, public, and stakeholders were involved in the plan. This section also documents implementation progress of the last plan in terms of completed and deleted mitigation actions.
- **Section 3: Planning Area Profile** for summary information on the region and participating communities, including geographic, climate, demographic, and economic characteristics of the region.
- **Section 4: Risk Assessment** contains the bulk of the plan. This section presents the hazard identification and profiles each hazard with information on the location at risk, past occurrences, probability of future occurrence, and vulnerability of people, property, and critical facilities.
- **Section 5: Capability Assessment** summarizes each community's existing tools, staff, and other resources that can support the implementation of mitigation projects.
- **Section 6: Mitigation Strategy** reviews the goals and objectives of the plan and details how mitigation actions were identified and prioritized. David explained that existing mitigation actions from the previous plan were reviewed, and project status updates are reported in the plan. Some projects were carried forward. The Hazard Mitigation Planning Committee (HMPC) will send new mitigation projects to WSP to include in this plan update.
- **Section 7: Mitigation Action Plans** presents the action plan tables for each community.

- **Section 8: Plan Maintenance** describes past plan integration, opportunities for future plan integration, and the process for regular monitoring, maintenance, and implementation of the plan, including ongoing responsibilities of the HMPC.
- **Section 9: Plan Adoption** will document each community's adoption of the plan update.
- **Annexes** are provided for each participating community. The annexes provide an asset inventory with a full critical facility list, risk assessment data with vulnerability assessment results specific to the community for spatially defined hazards, and the mitigation action plan.
- **Appendix A** provides the Local Mitigation Plan Review Tool, which documents for the plan reviewers where the planning requirements were met.
- **Appendix B** provides planning process documentation demonstrating how the HMPC, public, and stakeholders were involved and engaged in the planning process.
- **Appendix C** provides mitigation alternatives analysis, documenting the review of mitigation action options, which is important for the Community Rating Systems (CRS) program planning requirements.
- **Appendix D** lists data and resources that were referenced in the plan.

KEY PLAN COMPONENTS

Abby reviewed key parts of the planning process, including the HMPC meetings, the public meetings, and all the participating communities' public outreach efforts.

Abby reviewed some high-level survey results. There were 91 responses overall. Regarding past hazard experiences, many responses reference past hurricanes, flooding, thunderstorms, and severe winter storms. Regarding recommended steps local governments could take to reduce hazard impacts, responses include suggestions for drainage improvements, increased education on emergency preparedness, maintain regular maintenance and trimming of trees, and using sandbags during flood events.

Abby presented the Priority Risk Index results as a summary of the risk and vulnerability assessment. She explained that the PRI is a methodology for comparing the hazards based on five categories: probability, severity, spatial extent, warning time, and duration. Excessive Heat, Flood, Severe Winter Weather, Hazardous Substances, and Radiological Emergency were rated as "High Risk" for Mecklenburg County.

Katherin Idziorek, a meeting participant from the University of North Carolina, Charlotte, noted that excessive heat is the highest rated hazard, but there was little feedback from the public on the heat concerns. She was curious if there is insight on what the disconnect may be. Abby noted that residents tend to be less concerned with heat as they are used to living in a part of the county that regularly experiences high temperatures. Residents may be less aware of how extreme heat is changing and impacting the region. Abby also explained that the planning team collaborated with NCORR on reginal heat data and incorporate information from the toolkit they created. Katherine will follow up with cooling center locations in the Charlotte-Mecklenburg region to be included in the plan.

Goals & Objectives

Abby presented the goals and objectives which were carried forward from the previous plan with the addition of Objective 4.3 and slight edits based on the feedback received from the public and HMPC. The plan goals are as follows:

***Goal 1*: Identify and implement hazard mitigation projects designed to reduce the impact of future hazard events on existing critical facilities and infrastructure as well as public and private property.**

— Objective 1.1: Acquire or retrofit buildings and infrastructure to protect against damage from hazards.

- Objective 1.2: Implement natural, infrastructure, and structural projects to avert hazards and reduce future damage.
- Objective 1.3: Ensure critical facilities can maintain operations during hazard events.

Goal 2: **Conduct education and outreach activities intended to better inform the public about hazards and encourage personal responsibility for preparedness and mitigation.**

- Objective 2.1: Conduct awareness activities in person and via web and social media.
- Objective 2.2: Assist vulnerable populations through targeted outreach and improved online access and digital literacy.
- Objective 2.3: Promote and incentivize private mitigation activities.

Goal 3: **Improve emergency preparedness and response capabilities.**

- Objective 3.1: Conduct training and exercises intended to better prepare government officials to respond to, mitigate against and recover from emergencies and disasters.
- Objective 3.2: Continue to improve ability to notify people of impending hazards and disasters.
- Objective 3.3: Establish traffic control procedures intended to reduce injuries and the loss of life before, during, and after emergencies and disasters.

Goal 4: **Enact and enforce or incentivize planning and policy measures to reduce the impacts of identified hazards and make future development more resilient to hazards.**

- Objective 4.1: Adopt development regulations to limit or prevent development in hazard areas.
- Objective 4.2: Enforce building codes and development regulations.
- Objective 4.3: Provide incentives to encourage implementation of preferred development techniques that minimize hazard risks and/or protect natural resources.

Mitigation Strategy

Abby reviewed a sample of the mitigation action plan to explain the organization of the table and the information included for each project, such as the lead agency, timeline for implementation, and potential funding sources.

Plan Adoption and Implementation

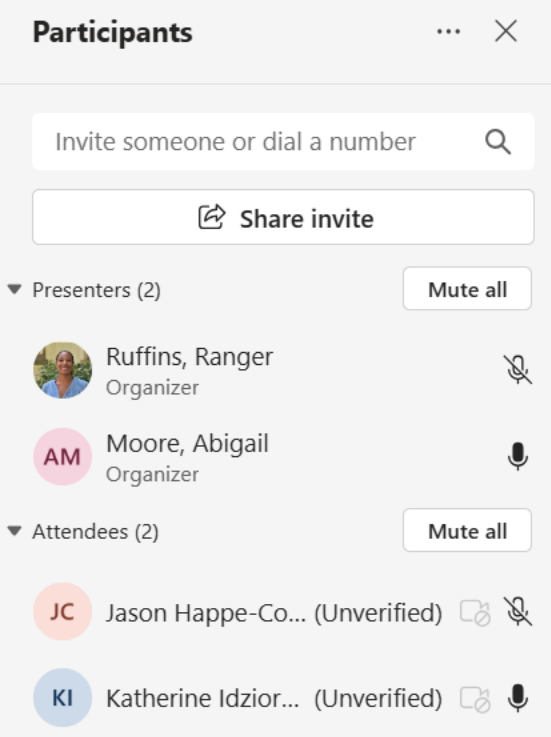
Abby explained that every community will adopt the plan once the plan is approved by NCEM. Moving forward, the HMPC will meet regularly to report on progress toward implementation and monitor funding opportunities and implementation of mitigation actions. At minimum, annual HMPC meetings should be held. The plan will continue to be updated every five years.

Katherine noted that Charlotte Heat Mappers are hoping to do events about excessive heat throughout the summer and asked if there would be other HMP events later this year. Abby noted that the planning process is ending over the next month. David noted that communities participating in the CRS program would meet quarterly and suggested that Katherine attend those meetings so she can stay informed of plan progress and find opportunities for future collaboration.

NEXT STEPS

The draft plan is posted online at www.MecklenburgHMP.com and is ready for public comment. Please submit any comments by Wednesday, May 21st. Comments will be incorporated into the final approved version of the plan.

PUBLIC MEETING 2: ONLINE ATTENDEES



PUBLIC MEETING 2 ADVERTISEMENTS

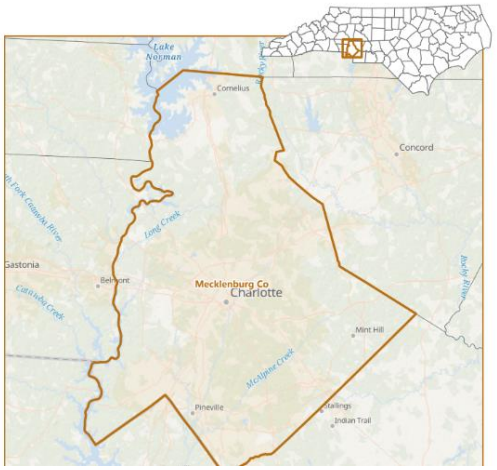
Home Meeting Materials Project Updates Resources Contact Us

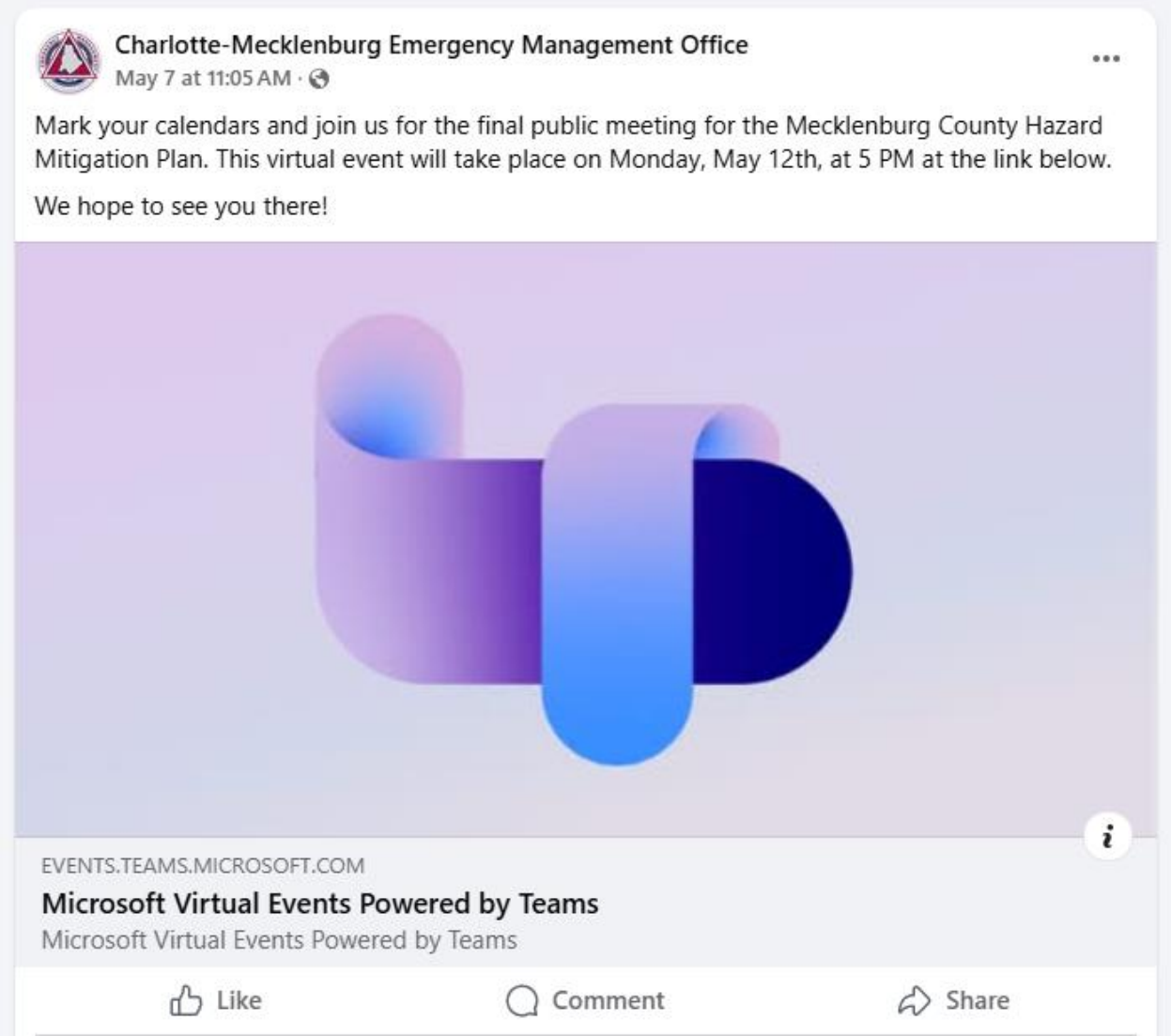
Mecklenburg County Hazard Mitigation Plan

Join us for a public meeting on **Monday, May 12th at 5pm** to learn about the plan update and share your input on the draft plan. Attend in person at Charlotte Fire Department Headquarters (500 Dalton Ave, Charlotte, NC) or *register here* to join online.

Welcome to the website for the 2024 update of the Mecklenburg Hazard Mitigation Plan.

Mecklenburg County and incorporated communities are updating this Hazard Mitigation Plan. This plan update is required for all communities to maintain eligibility for pre- and post-disaster mitigation funding from FEMA. This effort will also help the counties and communities to identify hazard risks, understand vulnerability, and develop ways to proactively mitigate risk. Public input is vital to understanding local risks and mitigation opportunities. On this website you can find information about past and upcoming planning meetings, draft documents, and a survey on hazard risks and vulnerabilities, as well as a way to provide comments to the planning team. Check back for updates and new information throughout the planning process.




Charlotte-Mecklenburg Emergency Management Office
May 7 at 11:05 AM ·
Mark your calendars and join us for the final public meeting for the Mecklenburg County Hazard Mitigation Plan. This virtual event will take place on Monday, May 12th, at 5 PM at the link below.
We hope to see you there!
EVENTS.TEAMS.MICROSOFT.COM
Microsoft Virtual Events Powered by Teams
Microsoft Virtual Events Powered by Teams
Like
Comment
Share

MEETING MATERIALS POSTED ON PLAN WEBSITE



Meeting Materials

Check here for meeting announcements, presentation, and meeting notes.

Committee Meeting #1 - 12/03/2024

Presentation | Meeting Minutes

Public Meeting #1 - 01/09/2025

Presentation | Meeting Minutes

Committee Meeting #2 - 02/20/2025

Presentation | Meeting Minutes

Committee Meeting #3 - 04/17/2025

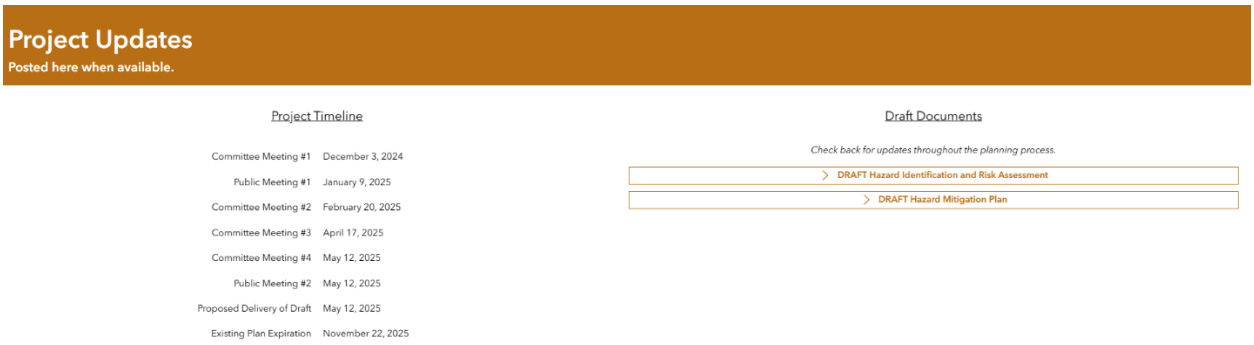
Presentation | Meeting Minutes

Committee Meeting #4 - 05/12/2025

Presentation | Meeting Minutes

Public Meeting #2 - 05/12/2025

DRAFT RISK ASSESSMENT & DRAFT PLAN POSTED FOR PUBLIC REVIEW



Project Updates

Posted here when available.

Project Timeline

Committee Meeting #1	December 3, 2024
Public Meeting #1	January 9, 2025
Committee Meeting #2	February 20, 2025
Committee Meeting #3	April 17, 2025
Committee Meeting #4	May 12, 2025
Public Meeting #2	May 12, 2025
Proposed Delivery of Draft	May 12, 2025
Existing Plan Expiration	November 22, 2025

Draft Documents

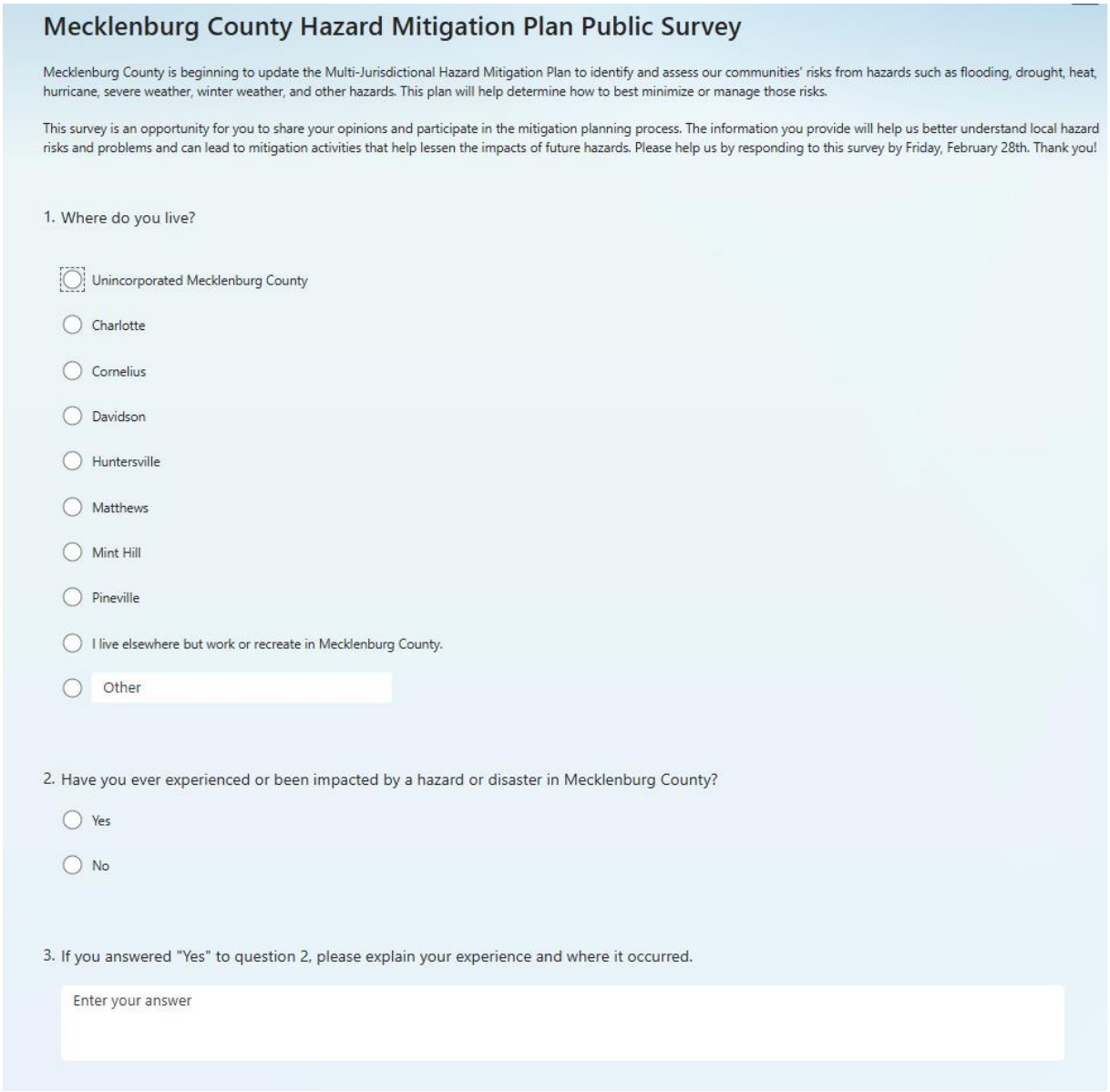
Check back for updates throughout the planning process.

DRAFT Hazard Identification and Risk Assessment

DRAFT Hazard Mitigation Plan

PUBLIC SURVEY

Mecklenburg County distributed a public survey, shown below, that requested public input into the Hazard Mitigation Plan planning process and the identification of mitigation activities that could lessen the risk and impact of future flood hazard events. The survey was announced at the first public meeting, provided via a link on participating jurisdictions web and social media accounts, and made available online on the plan website.



Mecklenburg County Hazard Mitigation Plan Public Survey

Mecklenburg County is beginning to update the Multi-Jurisdictional Hazard Mitigation Plan to identify and assess our communities' risks from hazards such as flooding, drought, heat, hurricane, severe weather, winter weather, and other hazards. This plan will help determine how to best minimize or manage those risks.

This survey is an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand local hazard risks and problems and can lead to mitigation activities that help lessen the impacts of future hazards. Please help us by responding to this survey by Friday, February 28th. Thank you!

1. Where do you live?

- ◯ Unincorporated Mecklenburg County
- ◯ Charlotte
- ◯ Cornelius
- ◯ Davidson
- ◯ Huntersville
- ◯ Matthews
- ◯ Mint Hill
- ◯ Pineville
- ◯ I live elsewhere but work or recreate in Mecklenburg County.
- ◯ Other

2. Have you ever experienced or been impacted by a hazard or disaster in Mecklenburg County?

- ◯ Yes
- ◯ No

3. If you answered "Yes" to question 2, please explain your experience and where it occurred.

Enter your answer

4. On a scale of 1-5, how concerned are you about the possibility of your community being impacted by a hazard event?

1	2	3	4	5
Not at all concerned				Very concerned

5. Please review the list of hazards below and rate each hazard based on how much risk you think it poses to your community.

	No risk	Low risk	Moderate risk	High risk
Dam & Levee Failure	○	○	○	○
Drought	○	○	○	○
Earthquake	○	○	○	○
Extreme Heat	○	○	○	○
Flood	○	○	○	○
Hurricane	○	○	○	○
Landslide	○	○	○	○
Severe Weather (Thunder-storm, lightning, hail)	○	○	○	○
Winter Storm	○	○	○	○
Sinkhole	○	○	○	○
Tornado	○	○	○	○
Wildfire	○	○	○	○
Cyber Threat	○	○	○	○
Hazardous Materials Incident	○	○	○	○
Radiological Emergency	○	○	○	○
Electro-magnetic Pulse	○	○	○	○

6. Is your home located in a floodplain?

- ◯ Yes
- ◯ No
- ◯ No, but I still experience flooding
- ◯ I don't know

7. Do you have flood insurance for your home and/or personal property?

- ◯ Yes
- ◯ No
- ◯ I don't know

8. If you do NOT have flood insurance, what is the reason?

- ◯ It's too expensive
- ◯ I never really considered it
- ◯ I don't need it because my home is elevated or otherwise protected
- ◯ Other

9. Have you taken any actions to protect your home or neighborhood from hazards?

- ◯ Yes
- ◯ No

10. If you answered "Yes" to question 9, what actions have you implemented?

Enter your answer

11. Do you know what government office to contact to learn more about your hazard risks and how to reduce vulnerability in your area?

- ◯ Yes
- ◯ No

12. What are some steps your local government could take to reduce the risk of future hazard damages in your neighborhood?

Enter your answer

13. Many community-wide activities can reduce our risk from hazards. These activities generally fall into one of the following six broad categories:

- **Prevention:** administrative and regulatory actions, plans, policies, and ordinances that influence how land is developed and buildings are built. *Examples include planning and zoning, building codes, open space preservation, land use, and floodplain regulations.*
- **Property Protection**: actions that involve the modification of existing buildings to protect them from a hazard or remove them from a hazardous area. *Examples include acquisition, relocation, elevation, structural retrofits, and storm shutters.*
- **Natural Resource Protection**: actions that minimize hazard losses and preserve or restore the functions of natural systems. *Examples include floodplain protection, habitat preservation, slope stabilization, stream buffers, wetland and marsh protection, and forest management.*
- **Structural Projects**: actions that lessen the impact of a hazard by modifying the natural progression of a hazard. *Examples include dams, levees, floodwalls, berms, drainage infrastructure, detention/retention basins, channel modifications, retaining walls, and storm sewers.*
- **Emergency Services**: actions that protect people and property during and immediately after a hazard event. *Examples include warning systems, evacuation planning, emergency response training, and protection of critical emergency facilities or systems.*
- **Public Education and Awareness**: actions to inform the public about hazards and techniques they can use to protect themselves and their property. *Examples include outreach projects, school education programs, library materials, and demonstration events.*

Please rank these categories by how important you think each one is for your community to consider pursuing.

	1 - Most Important	2	3	4	5	6 - Least Important
Prevention	◯	◯	◯	◯	◯	◯
Property Protection	◯	◯	◯	◯	◯	◯
Natural Resource Protection	◯	◯	◯	◯	◯	◯
Structural Projects	◯	◯	◯	◯	◯	◯
Emergency Services	◯	◯	◯	◯	◯	◯
Public Education	◯	◯	◯	◯	◯	◯

14. What is the best way for you to receive information about how to make your home or neighborhood more resistant to flood damage? Please select your top three choices.

Please select 3 options.

- [ ] Newspaper
- [ ] TV Ads/Programming
- [ ] Radio Ads/Programming
- [ ] Public library
- [ ] Public workshop/meetings
- [ ] School meetings
- [ ] Mail
- [ ] Email
- [ ] Text message
- [ ] Local government website
- [ ] Local government social media
- [ ] Other

Submit

Never give out your password. Report abuse

The County received 91 responses to the survey. Questions and response data are detailed in Figure B.1 through Figure B.14.

Figure B.1 – Survey Response, Place of Residence

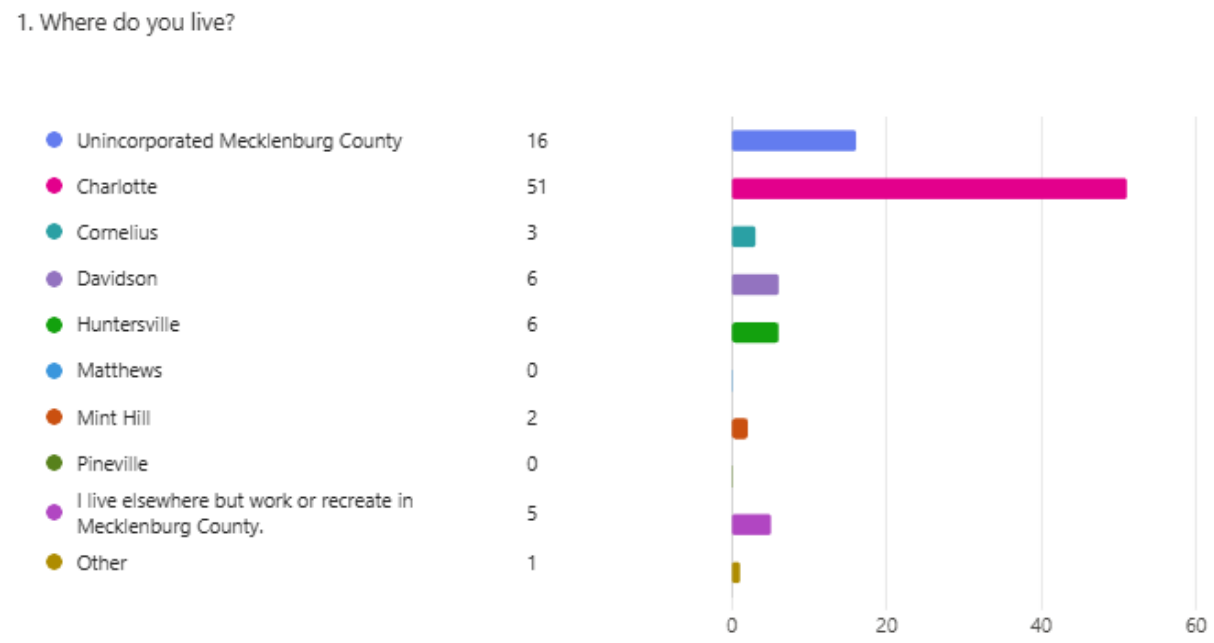


Figure B.2 – Survey Response, Past Hazard Experience

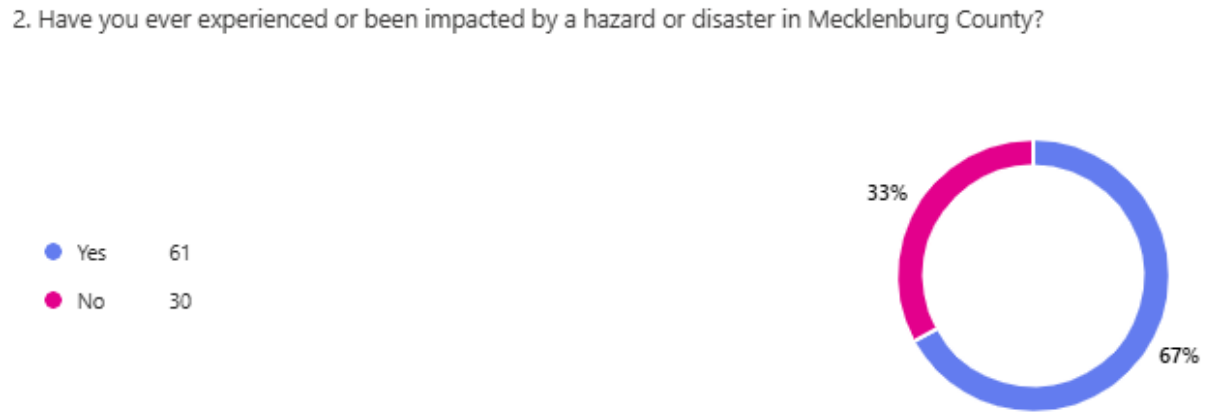


Figure B.3 – Survey Response, Past Hazard Experience Explanation

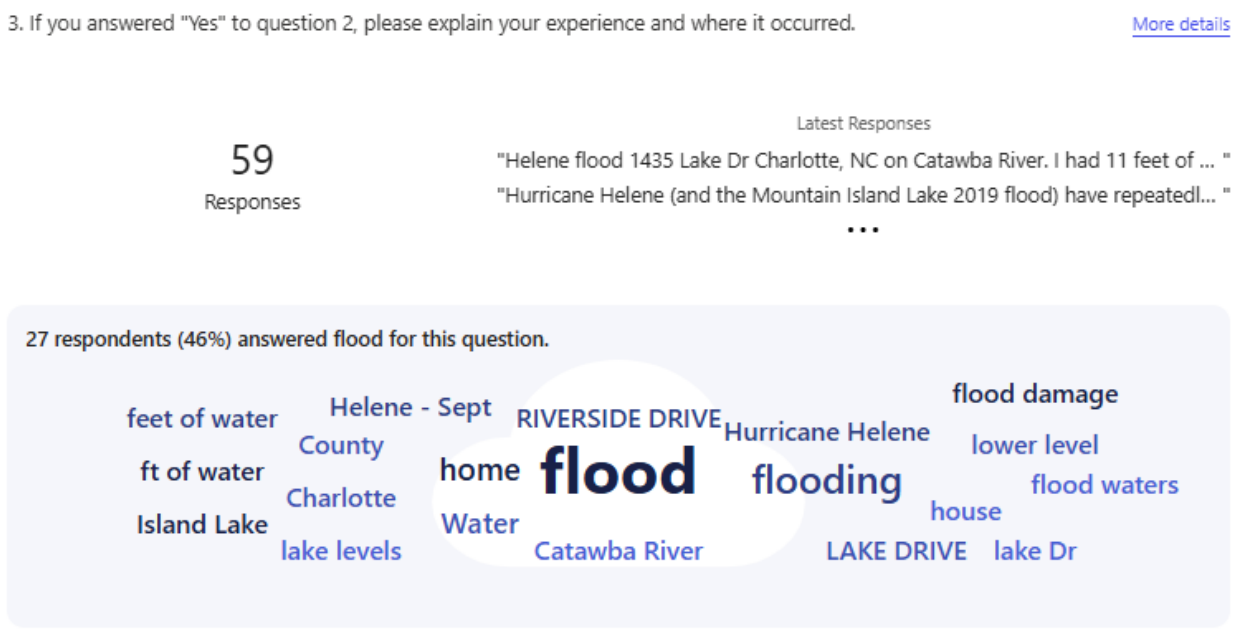


Figure B.4 – Survey Response, Concern About Hazards



Figure B.5 – Survey Response, Hazard Risk Ratings

5. Please review the list of hazards below and rate each hazard based on how much risk you think it poses to your comm unity. More details

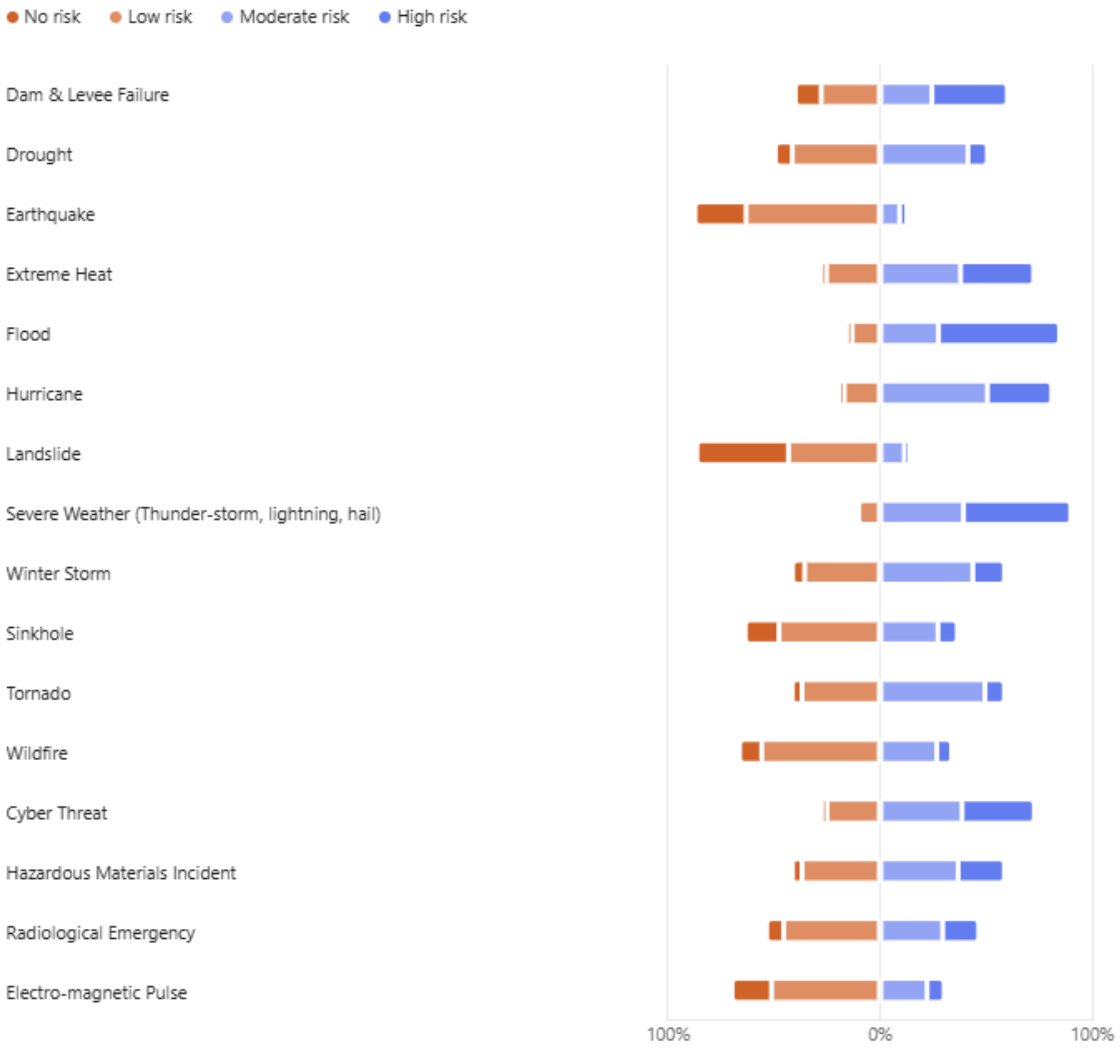


Figure B.6 – Survey Response, Home in Floodplain

6. Is your home located in a floodplain?

Yes	34
No	45
No, but I still experience flooding	7
I don't know	5

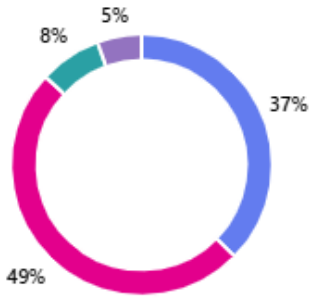


Figure B.7 – Survey Response, Flood Insurance

7. Do you have flood insurance for your home and/or personal property?

Yes	32
No	54
I don't know	5

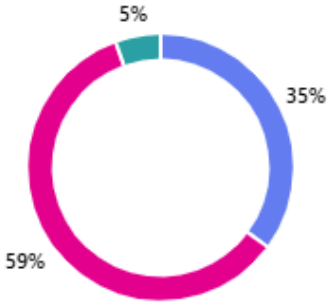


Figure B.8 – Survey Response, Reason for Not Having Flood Insurance

8. If you do NOT have flood insurance, what is the reason?

It's too expensive	15
I never really considered it	11
I don't need it because my home is elevated or otherwise protected	24
Other	12

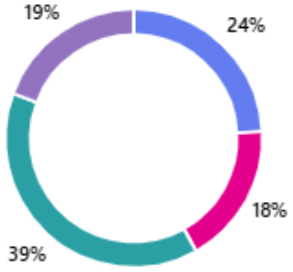


Figure B.9 – Survey Response, Personal Actions Taken for Mitigation

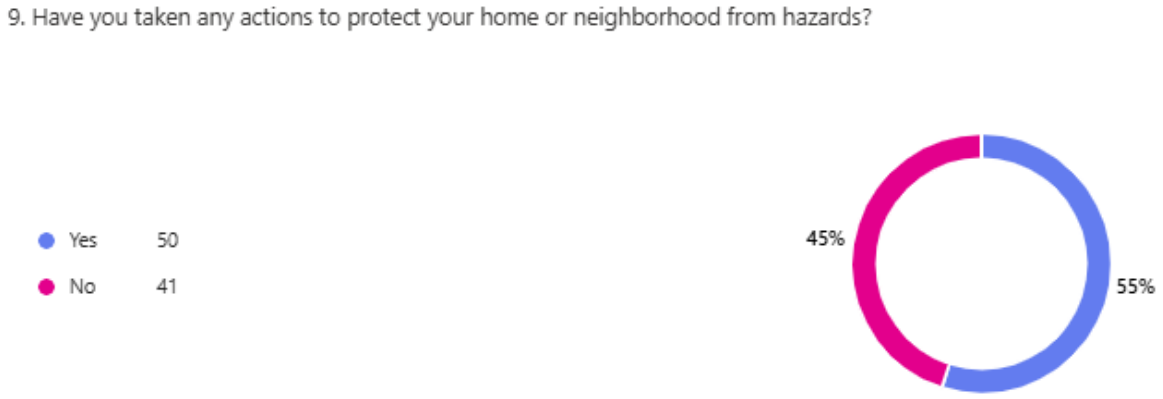


Figure B.10 – Survey Response, Personal Actions Taken for Mitigation, Explained

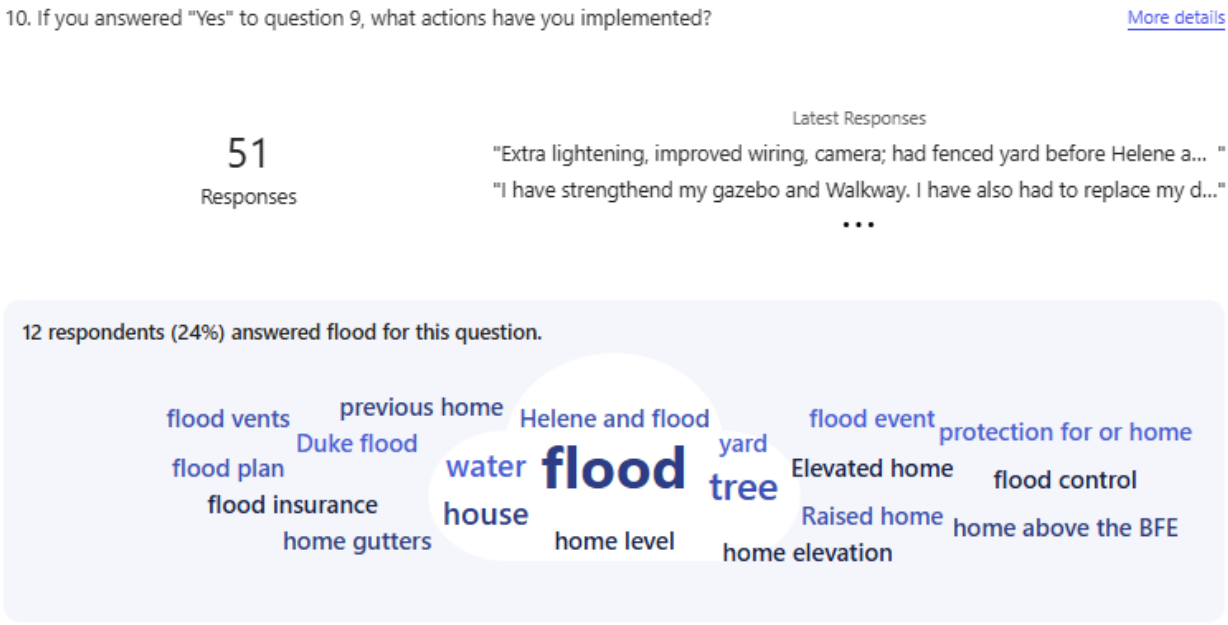


Figure B.11 – Survey Response, Knowledge of Who to Contact for More Information

11. Do you know what government office to contact to learn more about your hazard risks and how to reduce vulnerability in your area? More details



Figure B.12 – Survey Response, Suggested Mitigation

12. What are some steps your local government could take to reduce the risk of future hazard damages in your neighborhood? More details

71
Responses

Latest Responses
"Monitor river level and dam control."
"Required Duke Power to actively and thoughtfully manage the lake levels on..."
...

17 respondents (24%) answered water for this question.



Figure B.13 – Survey Response, Preferred Mitigation Categories

13. Many community-wide activities can reduce our risk from hazards. These activities generally fall into one of the follo wing six broad categories:

- **Prevention:** administrative and regulatory actions, plans, policies, and ordinances that influence how land is de veloped and buildings are built. *Examples include planning and zoning, building codes, open space preservation, land use, and floodplain regulations.*
- **Property Protection**: actions that involve the modification of existing buildings to protect them from a hazard or remove them from a hazardous area. *Examples include acquisition, relocation, elevation, structural retrofits, a nd storm shutters.*
- **Natural Resource Protection**: actions that minimize hazard losses and preserve or restore the functions of nat ural systems. *Examples include floodplain protection, habitat preservation, slope stabilization, stream buffers, wet land and marsh protection, and forest management.*
- **Structural Projects**: actions that lessen the impact of a hazard by modifying the natural progression of a hazar d. *Examples include dams, levees, floodwalls, berms, drainage infrastructure, detention/retention basins, channel modifications, retaining walls, and storm sewers.*
- **Emergency Services**: actions that protect people and property during and immediately after a hazard event. *E xamples include warning systems, evacuation planning, emergency response training, and protection of critical e mergency facilities or systems.*
- **Public Education and Awareness**: actions to inform the public about hazards and techniques they can use to protect themselves and their property. *Examples include outreach projects, school education programs, library m aterials, and demonstration events.*

Please rank these categories by how important you think each one is for your community to consider pursuing.

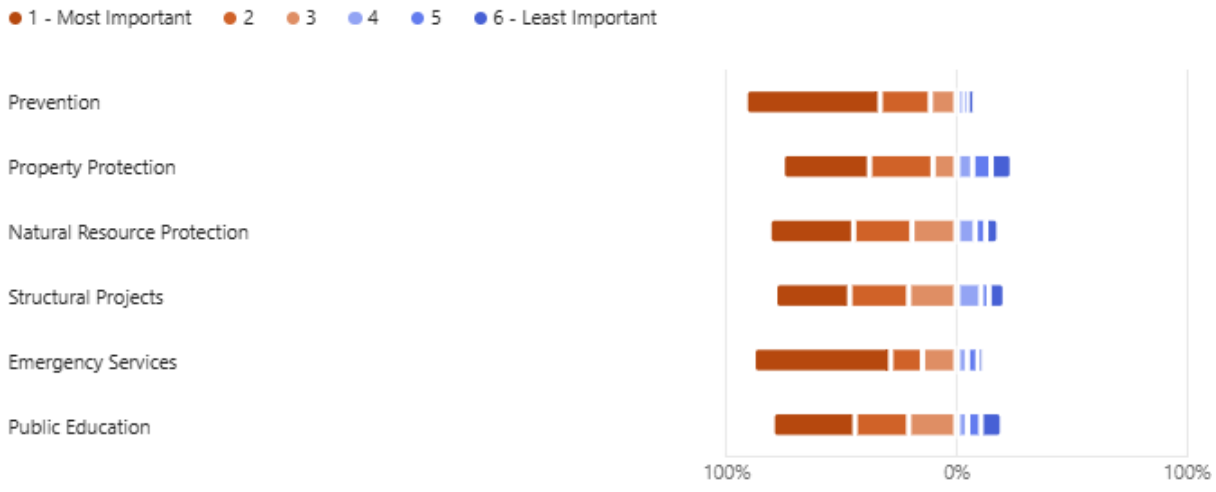
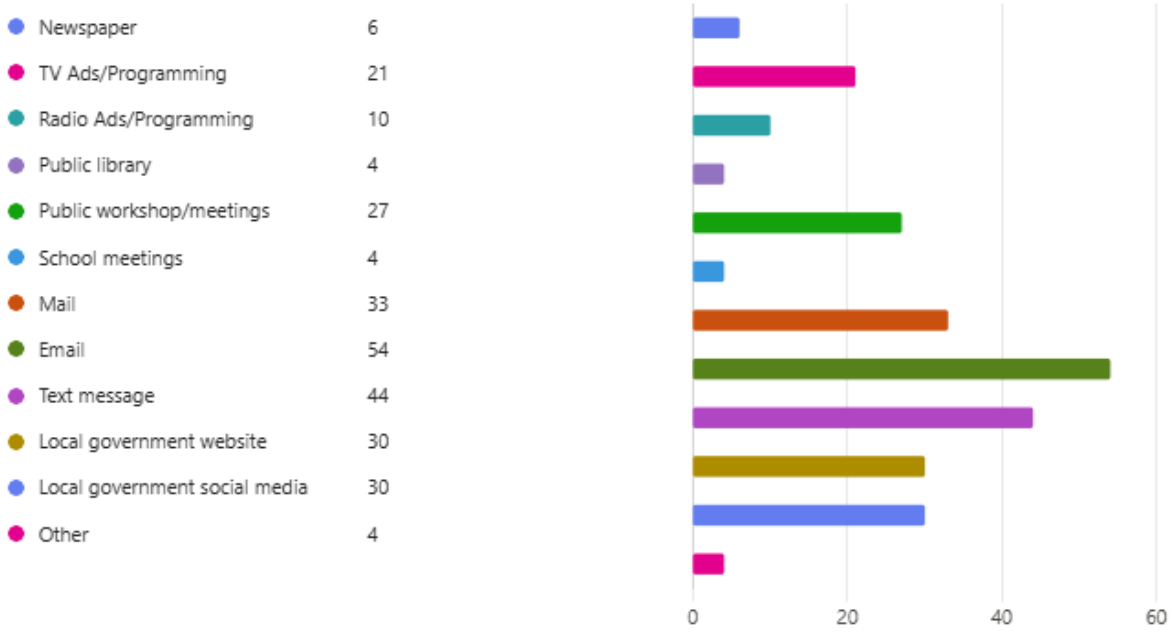


Figure B.14 – Survey Response, Preferred Methods of Community Outreach

14. What is the best way for you to receive information about how to make your home or neighborhood more resistant t o flood damage? Please select your top three choices.



B.3 PLANNING STEP 3: COORDINATE

This planning step credits the incorporation of other plans and other agencies' efforts into the development of the Hazard Mitigation Plan. Other agencies and organizations must be contacted to determine if they have studies, plans and information pertinent to the Hazard Mitigation Plan, to determine if their programs or initiatives may affect the community's program, and to see if they could support the community's efforts. To incorporate stakeholder input into the plan, a variety of stakeholders were identified by the HMPC and sent an email inviting them to attend a public meeting, review the draft plan, and provide feedback and comments. The coordination letter sent via email is provided below. A list of stakeholders detailing their involvement is provided in Table B.3.

Stakeholders were also involved through specific requests for data to support the development of the plan.

From: Moore, Abigail
Sent: Thursday, May 22, 2025 4:07 PM
Subject: Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan - Stakeholder Notice

Good afternoon,

Mecklenburg County and its incorporated jurisdictions have updated the Multi-Jurisdictional Hazard Mitigation Plan and are seeking stakeholder input on the draft plan. You are receiving this email because the plan participants identified you as a stakeholder of this plan. This plan update is required for all communities to maintain eligibility for pre- and post-disaster mitigation funding from FEMA, and it will also help the participating communities to understand vulnerabilities and proactively mitigate risk.

To learn more about the plan update and to review the draft plan, please visit www.MecklenburgHMP.com. If you would like to share any information or feedback that might be relevant to the plan and local mitigation efforts, please send it to me at abigail.moore@wsp.com by Friday, May 30, 2025 or submit your comments via the plan website.

We appreciate any input you may wish to share and thank you for your assistance with this planning effort!

Abby Moore, AICP, CFM
Hazard Mitigation & Resilience Planner
She/Her

T +1 919-767-1112

WSP
4021 Stirrup Creek Drive, Suite 100
Durham, NC 27703

wsp.com

Table B.3 – Stakeholder List

First Name	Last Name	Organization
		Non-Profit Organizations
Jason	Gudzunas	American Red Cross Charlotte Metro Chapter, Executive Director
Kathryn	Firmin-Sellers	United Way of Greater Charlotte, President & Chief Executive Officer
Laura	Clark	Foundation for the Carolinas, President
Bart	Landess	Catawba Land Conservancy, Executive Director
June	Blotnick	Clean Air Carolina, Executive Director
Laura	Belcher	Habitat for Humanity of Charlotte, President and CEO
		Educational Institutions
Dr. Crystal	Hill	Charlotte-Mecklenburg Schools, Superintendent
Christopher	Gonyar	UNC Charlotte Emergency Management, Director
Julian	Coaxum	Davidson College Director of Public Safety
Lesia	Finney	Public Safety & Campus Police, Assistant Vice President
Dr. Kandi	Deitemeyer	Central Piedmont Community College, President
		Surrounding Municipalities
Scott	Hunter	Gaston County Office of Emergency Management, Director
Carr	Boyd	Lincoln County Emergency Management, Director
Kent	Greene	Iredell Emergency Management, Director
Allen	Cress	Rowan County Emergency Services, Chief
Jason	Burnett	Cabarrus County Emergency Management, Director
Ansley	Andrew	Union County Emergency Management, Director
		Federal Government
Jason	Hunter	FEMA Region IV, Chief, Floodplain Management & Insurance Branch
Valerie	Anderson	FEMA Region IV, Natural Hazards Program Specialist
Dewana	Davis	FEMA Region IV, Insurance Specialist
Roy	McClure	FEMA NFIP/CRS Specialist
Kymberly	Kudla	FEMA Mitigation Planning Specialist
David	Holcomb	ISO/CRS Specialist
Mike	Bratcher	ISO/CRS Specialist
Sherry	Harper	ISO/CRS Technical Coordinator
Katherine	Smith	USGS Climate Adaptation Science Center
		State Government
Steve	Garrett	State NFIP Coordinator
Steve	McGugan	State Hazard Mitigation Officer
Linda	Culpepper	DEQ Division of Water Resources, Director
Brett	Canipe	NCDOT Division 10, Division Engineer
Hannah	Thompson-Welch	NC Forest Service, Wildfire Mitigation Specialist
		Business Community
Nate	Hogan	Charlotte Regional Business Alliance Foundation, President
Cathay	Dawkins	Charlotte Mecklenburg Black Chamber of Commerce, President and Chairman

APPENDIX C MITIGATION ALTERNATIVES

44 CFR Subsection D §201.6(c)(3)(ii): [The mitigation strategy section shall include] a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

As part of the process of developing the mitigation action plans found in Section 7, the HMPC reviewed and considered a comprehensive range of mitigation options before selecting the actions identified for implementation. This section summarizes the full range of mitigation measures evaluated and considered by the HMPC, including a review of the categories of mitigation measures outlined in the 2017 CRS Coordinator's Manual, a discussion of current local implementation and CRS credits earned for those measures, and a list of the specific mitigation projects considered and recommended for implementation.

Mitigation alternatives identified for implementation by the HMPC were evaluated and prioritized using the criteria discussed in Section 6 of this plan.

C.1 CATEGORIES OF MITIGATION MEASURES CONSIDERED

Once it was determined which flood hazards warranted the development of specific mitigation actions, the HMPC analyzed viable mitigation options that supported the identified goals and objectives. The HMPC was provided with the following list of mitigation categories which are utilized as part of the CRS planning process.

- Prevention
- Property Protection
- Natural Resource Protection
- Structural Projects
- Emergency Services
- Public Education and Awareness

Action ideas within each of these categories were discussed and considered for inclusion in the plan. The HMPC was encouraged to select actions to pursue within most if not all of these categories so as to develop a comprehensive approach to hazard mitigation.

C.2 ALTERNATIVE MITIGATION MEASURES PER CATEGORY

This section presents a summary review of the mitigation measures that were considered by the HMPC. The CRS Credit Sections are based on the 2017 CRS Coordinator's Manual and the 2021 Addendum.

C.2.1 PREVENTATIVE AND REGULATORY MEASURES

Preventative measures are designed to keep a problem - such as flooding - from occurring or from getting worse. The objective of preventative measures is to ensure that future development is not exposed to damage and does not cause an increase in damages to other properties. Building, zoning, planning and code enforcement offices usually administer preventative measures. Some examples of types of preventative measures include:

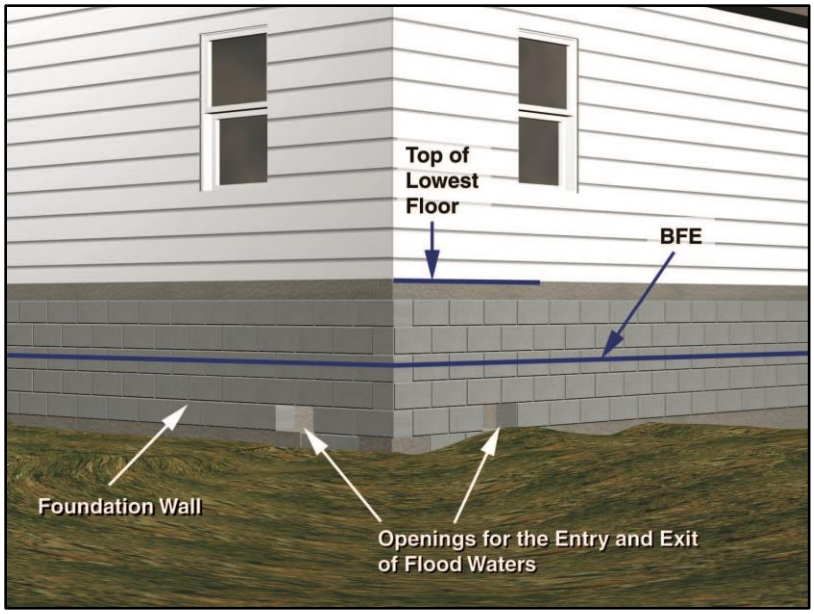
- Building codes
- Zoning ordinance
- Comprehensive or land use plan
- Open space preservation
- Floodplain regulations
- Subdivision regulations
- Stormwater management regulations

BUILDING CODES

Building codes provide one of the best methods for addressing natural hazards. When properly designed and constructed according to code, the average building can withstand many of the impacts of natural hazards. Hazard protection standards for all new and improved or repaired buildings can be incorporated into the local building code. Building codes can ensure that the first floors of new buildings are constructed to be higher than the elevation of the 100-year flood (the flood that is expected to have a one percent chance of occurring in any given year). This is shown in Figure C.1

Just as important as having code standards is the enforcement of the code. Adequate inspections are needed during the course of construction to ensure that the builder understands the requirements and is following them. Making sure a structure is properly elevated and anchored requires site inspections at each step.

Figure C.1 – Building Codes and Flood Elevations



Source: FEMA Publication: *Above the Flood: Elevating Your Floodprone House, 2000*

ASCE 24 is a referenced standard in the International Building Code. Any building or structure that falls within the scope of the IBC that is proposed in a flood hazard area is to be designed in accordance with ASCE 24. Freeboard is required as a function of the nature of occupancy and the flood zone. Dwellings and most other buildings have 1-foot of freeboard; certain essential facilities have 2-3 feet; only agricultural facilities, temporary facilities and minor storage facilities are allowed to have their lowest floors at the BFE.

COMPREHENSIVE OR LAND USE PLAN

Building codes provide guidance on how to build in hazardous areas. Planning and zoning activities direct development away from these areas, particularly floodplains and wetlands. They do this by designating land uses that are compatible with the natural conditions of land that is prone to flooding, such as open space or recreation.

OPEN SPACE PRESERVATION

Keeping the floodplain and other hazardous areas open and free from development is the best approach to preventing damage to new developments. Open space can be maintained in agricultural use or can serve as parks, greenway corridors and golf courses.

Comprehensive and capital improvement plans should identify areas to be preserved by acquisition and other means, such as purchasing an easement. With an easement, the owner is free to develop and use private property, but property taxes are reduced or a payment is made to the owner if the owner agrees to not build on the part set aside in the easement.

Although there are some federal programs that can help acquire or reserve open lands, open space lands and easements do not always have to be purchased. Developers can be encouraged to dedicate park land and required to dedicate easements for drainage and maintenance purposes.

ZONING ORDINANCE

Zoning enables a community to designate what uses are acceptable on a given parcel. Zoning can ensure compatibility of land use with the land's level of suitability for development. Planning and zoning activities can also provide benefits by allowing developers more flexibility in arranging improvements on a parcel of land through the planned development approach. Zoning regulations describe what type of land use and specific activities are permitted in each district, and how to regulate how buildings, signs, parking, and other construction may be placed on a lot. Zoning regulations also provide procedures for rezoning and other planning applications. The zoning map and zoning regulations provide properties with certain rights to development.

FLOODPLAIN REGULATIONS

A Flood Damage Prevention Ordinance sets development standards for Special Flood Hazard Areas (SFHAs). Communities participating in the National Flood Insurance Program (NFIP) are required to adopt a flood damage prevention ordinance that meets at least the minimum standards of the NFIP; however, a community can incorporate higher standards for increased protection. For example, communities can adopt higher regulatory freeboard requirements, cumulative substantial damage definitions, fill restrictions, and other standards.

Another important consideration in floodplain regulations is the protection of natural and beneficial functions and the preservation of natural barriers such as vegetation. Vegetation along a stream bank is extremely beneficial for the health of the stream. Trees and other plants have an extensive root system that strengthen stream banks and help prevent erosion. Vegetation that has sprouted up near streams should remain undisturbed unless removing it will significantly reduce a threat of flooding or further destruction of the stream channel.

STORMWATER MANAGEMENT REGULATIONS

Stormwater runoff is increased when natural ground cover is replaced by urban development. Development in the watershed that drains to a river can aggravate downstream flooding, overload the community's drainage system, cause erosion, and impair water quality. There are three ways to prevent flooding problems caused by stormwater runoff:

1. Regulating development in the floodplain to ensure that it will be protected from flooding and that it won't divert floodwaters onto other properties;
2. Regulating all development to ensure that the post-development peak runoff will not be greater than it was under pre-development conditions; and
3. Set construction standards so buildings are protected from shallow water.

REDUCING FUTURE FLOOD LOSSES

Zoning and comprehensive planning can work together to reduce future flood losses by directing development away from hazard prone areas. Creating or maintaining open space is the primary way to reduce future flood losses.

Planning for open space must also be supplemented with development regulations to ensure that stormwater runoff is managed and that development is protected from flooding. Enforcement of the flood damage prevention ordinance and the flood protection elevation requirement provides an extra level of protection for buildings constructed in the planning area.

Stormwater management and the requirement that post-development runoff cannot exceed pre-development conditions is one way to prevent future flood losses. Retention and detention requirements also help to reduce future flood losses.

CRS CREDIT

The CRS encourages strong building codes. It provides credit in two ways: points are awarded based on the community's Building Code Effectiveness Grading Schedule (BCEGS) classification and points are awarded for adopting the International Code series. In North Carolina, communities are limited by the State Building Code Council which has not implemented the most current version of the International Building Code.

CRS credits are available for regulations that encourage developers to preserve floodplains or other hazardous areas away from development. There is no credit for a plan, only for the enforceable regulations that are adopted pursuant to a plan. Communities in Mecklenburg County could receive credit for Activity 430 – Higher Regulatory Standards and for Activity 420 – Open Space Preservation for preserving parcels within the SFHA as open space. Preserving flood prone areas as open space is one of the highest priorities of the Community Rating System. The credits in the 2017 manual have doubled for OSP (Open Space Preservation). The participating communities could also receive credit for Activity 450 – Stormwater Management for enforcing regulations for stormwater management and soil and erosion control. Several prevention actions considered by the HMPC are detailed below.

Table C.1 – Prevention Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Prevention Measures Considered by HMPC and Not Recommended			
-	Continue enforcement of state building codes and more stringent local building requirements	The City and County has established this as an ongoing policy and does not need to commit additional resources through this plan update process to complete this activity.	n/a
Prevention Measures and Funding Recommended for Implementation			
Mecklenburg-2	Maintain continued compliance with the National Flood Insurance Program (NFIP) through implementation and periodic evaluation of higher regulatory standards (in addition to basic required compliance actions).	Improving the County's CRS class will require enhanced floodplain management activities to reduce risk and will also provide financial benefits to policyholders.	SWS Operating budget
Mecklenburg-6	Research possibility of using new H&H models to provide flood forecasting in the Flood Information Notification System (FINS). Research possibility of FINS system to provide inundation mapping based on results of new H&H models and explore alternate methods and expansion into other locations.	Improved modeling can assist the county in planning for additional floodplain management activities.	TBD
Charlotte-1	Consider the need to add or revise existing policies or regulations to more thoroughly address natural hazards during the update of the City's Zoning Ordinance.	Managing development through zoning will allow the city to protect existing and future development by managing stormwater and floodplains.	Local staff time

C.2.2 PROPERTY PROTECTION MEASURES

Property protection measures are used to modify buildings or property subject to damage. Property protection measures fall under three approaches:

- Modify the site to keep the hazard from reaching the building;
- Modify the building (retrofit) so it can withstand the impacts of the hazard; and
- Insure the property to provide financial relief after the damage occurs.

Property protection measures are normally implemented by the property owner, although in many cases technical and financial assistance can be provided by a government agency.

KEEPING THE HAZARD AWAY

Generally, natural hazards do not damage vacant areas. As noted earlier, the major impact of hazards is to people and improved property. In some cases, properties can be modified so the hazard does not reach the damage-prone improvements. For example, a berm can be built to prevent floodwaters from reaching a house.



This low floodwall has landscaping to minimize the adverse impact on the property's appearance.



Small, wood frame buildings are the easiest to relocate

Source: Kennedy House Movers, Huntsville, AL

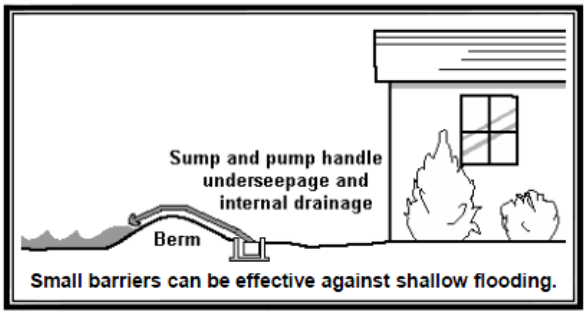
FLOODING

There are five common methods to keep a flood from reaching and damaging a building:

- Erect a barrier between the building and the source of the flooding.
- Move the building out of the flood-prone area.
- Elevate the building above the flood level.
- Demolish the building.
- Replace the building with a new one that is elevated above the flood level.

The latter three approaches are the most effective types to consider for the planning area.

BARRIERS



Small barriers can be effective against shallow flooding.

A flood protection barrier can be built of dirt or soil (a "berm") or concrete or steel (a "floodwall"). Careful design is needed so as not to create flooding or drainage problems on neighboring properties. Depending on how porous the ground is, if floodwaters will stay up for more than an hour or two, the design needs to account for leaks, seepage of water underneath, and rainwater that will fall inside the perimeter. This is usually done with a sump or drain to collect the internal groundwater and surface water and a pump and pipe to pump the internal drainage over the barrier. Barriers can only be built so high. They can be overtopped by a flood higher than expected. Barriers made of earth are susceptible to erosion from rain and floodwaters if not properly sloped, covered with grass, and properly maintained.

RELOCATION

Moving a building out of a flood prone area to higher ground is the surest and safest way to protect it from flooding. While almost any building can be moved, the cost increases for heavier structures, such as those with exterior brick and stone walls, and for large or irregularly shaped buildings. Relocation is also preferred for large lots that include buildable areas outside the floodplain or where the owner has a new flood-free lot (or portion of the existing lot) available.

BUILDING ELEVATION

Raising a building above the flood level can be almost as effective as moving it out of the floodplain. Water flows under the building, causing little or no damage to the structure or its contents. Raising a building above the flood level is cheaper than moving it and can be less disruptive to a neighborhood. Elevation has proven to be an acceptable and reasonable means of complying with floodplain regulations that require new, substantially improved, and substantially damaged buildings to be elevated above the base flood elevation.

DEMOLITION

Some buildings, especially heavily damaged or repetitively flooded ones, are not worth the expense to protect them from future damages. It is cheaper to demolish them and either replace them with new, flood protected structures, or relocate the occupants to a safer site. Demolition is also appropriate for buildings that are difficult to move – such as larger, slab foundation or masonry structures – and for dilapidated structures that are not cost-beneficial to protect.



Demolishing a repetitively flooded home

PILOT RECONSTRUCTION

If a building is not in good shape, elevating it may not be worthwhile or it may even be dangerous. An alternative is to demolish the structure and build a new one on the site that meets or exceeds all flood protection codes. FEMA funding programs refer to this approach as "pilot reconstruction." It is still a pilot program, and not a regularly funded option. Certain rules must be followed to qualify for federal funds for pilot reconstruction.

RETROFITTING

An alternative to keeping the hazard away from a building is to modify or retrofit the site or building to minimize or prevent damage. There are a variety of techniques to do this, as described below.

Dry Floodproofing

Dry floodproofing means making all areas below the flood protection level watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings, such as doors, windows and vents, are closed, either permanently, with removable shields, or with sandbags. Dry floodproofing of new and existing nonresidential buildings in the regulatory floodplain is permitted under state, FEMA and local regulations. Dry floodproofing of existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. Owners of buildings located outside the regulatory floodplain can always use dry floodproofing techniques.

Dry floodproofing is only effective for shallow flooding, such as repetitive drainage problems. It does not protect from the deep flooding along lakes and larger rivers caused by hurricanes or other storms.

Wet Floodproofing

The alternative to dry floodproofing is wet floodproofing: water is let in and everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls

are used instead of wooden studs and gypsum wallboard. The furnace, water heater and laundry facilities are permanently relocated to a higher floor. Where the flooding is not deep, these appliances can be raised on blocks or platforms.

INSURANCE

Technically, insurance does not mitigate damage caused by a natural hazard. However, it does help the owner repair, rebuild, and hopefully afford to incorporate some of the other property protection measures in the process. Insurance offers the advantage of protecting the property, so long as the policy is in force, without requiring human intervention for the measure to work.

Private Property

Although most homeowner's insurance policies do not cover a property for flood damage, an owner can insure a building for damage by surface flooding through the NFIP. Flood insurance coverage is provided for buildings and their contents damaged by a "general condition of surface flooding" in the area. Most people purchase flood insurance because it is required by the bank when they get a mortgage or home improvement loan. Usually these policies just cover the building's structure and not the contents. Contents coverage can be purchased separately. Renters can buy contents coverage, even if the owner does not buy structural coverage on the building. Most people don't realize that there is a 30-day waiting period to purchase a flood insurance policy and there are limits on coverage.

Public Property

Governments can purchase commercial insurance policies. Larger local governments often self-insure and absorb the cost of damage to one facility, but if many properties are exposed to damage, self-insurance can drain the government's budget. Communities cannot expect federal disaster assistance to make up the difference after a flood.

LOCAL IMPLEMENTATION/CRS CREDIT

The CRS provides the most credit points for acquisition and relocation under Activity 520, because this measure permanently removes insurable buildings from the floodplain. Communities in Mecklenburg County could receive credit for Activity 520 – Acquisition and Relocation, for acquiring and relocating buildings from the SFHA. The HMPC recommended that communities pursue the purchase of repetitive loss buildings and other buildings which are subject to flood damage in order to return this land to open space.

The CRS also credits barriers and elevating existing buildings under Activity 530. The credit for Activity 530 is based on the combination of flood protection techniques used and the level of flood protection provided. Points are calculated for each protected building. Bonus points are provided for the protection of repetitive loss buildings and critical facilities. Communities could receive credit for Activity 360 – Flood Protection Assistance by providing advice and assistance to homeowners who may want to flood proof their home or business. Advice is provided both on property protection techniques and on financial assistance programs to help fund mitigation.

Flood insurance information for each community is provided in Section 5 and in greater detail in each community’s annex. There is no credit for purchasing flood insurance, but the CRS does provide credit for local public information programs that, among other topics, explain flood insurance to property owners. The CRS also reduces the premiums for those people who do buy NFIP coverage. Communities in the Pamlico Sound Region could receive credit for Activity 330 – Outreach Projects. Property protection mitigation options considered by the HMPC are described below.

Table C.2 – Property Protection Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Property Protection Measures Considered by HMPC and Not Recommended			
-	Develop flood barriers in high risk areas.	These structural projects may worsen flood impacts elsewhere. The planning committee opted to pursue projects that adapt to flooding and reduce risk on a regional level.	n/a
Property Protection Measures and Funding Recommended for Implementation			
Mint Hill-2	Seek funding to install backup generators or quick connect hook ups for mobile generators on any newly constructed county/town critical facilities.	Protecting shelters will ensure individuals have a safe location to go to during hazard events. The need for more emergency generators will be assessed as new town Facilities are constructed.	Local, State Grants, UHMA grants, other federal grants
Pineville-1	Seek grant funding to retrofit critical facilities and Town-owned facilities for improved resilience to all hazards with the use of the latest building materials and technology. This could include, but is not limited to: wind retrofits, low water consumption fixtures, leak detectors, backup generators, ignition-resistant materials, 320 or 361 compliant safe rooms, lightning protection, hail-resistant roofing, and anchoring fixed building equipment.	Critical facility improvements can ensure continuity of critical operations during hazard events, which can potentially save lives. Additionally these projects are cost beneficial due to available grant funding.	Local, State Grants, UHMA Grants, other federal grants

C.2.3 NATURAL RESOURCE PROTECTION

Resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. These activities enable the naturally beneficial functions of fields, floodplains, wetlands, and other natural lands to operate more effectively. Natural and beneficial functions of watersheds, floodplains and wetlands include:

- Reduction in runoff from rainwater and stormwater in pervious areas
- Infiltration that absorbs overland flood flow
- Removal and filtering of excess nutrients, pollutants and sediments
- Storage of floodwaters
- Absorption of flood energy and reduction in flood scour
- Water quality improvement
- Groundwater recharge

— Habitat for flora and fauna
— Recreational and aesthetic opportunities

As development occurs, many of the above benefits can be achieved through regulatory steps for protecting natural areas or natural functions. This section covers the resource protection programs and standards that can help mitigate the impact of natural hazards, while they improve the overall environment. Six areas were reviewed:

— Wetland protection
— Erosion and sedimentation control
— Stream/River restoration
— Best management practices
— Dumping regulations
— Farmland protection

WETLAND PROTECTION



Wetlands are often found in floodplains and topographically depressed areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flows. They also serve as a natural filter, which helps to improve water quality, and they provide habitat for many species of fish, wildlife and plants.

EROSION AND SEDIMENTATION CONTROL

Farmlands and construction sites typically contain large areas of bare exposed soil. Surface water runoff can erode soil from these sites, sending sediment into downstream waterways. Erosion also occurs along stream banks and shorelines as the volume and velocity of flow or wave action destabilize and wash away the soil. Sediment suspended in the water tends to settle out where flowing water slows down. This can clog storm drains, drain tiles, culverts and ditches and reduce the water transport and storage capacity of river and stream channels, lakes and wetlands.

There are two principal strategies to address these problems: minimize erosion and control sedimentation. Techniques to minimize erosion include phased construction, minimal land clearing, and stabilizing bare ground as soon as possible with vegetation and other soil stabilizing practices.

STREAM/RIVER RESTORATION

There is a growing movement that has several names, such as "stream conservation," "bioengineering," or "riparian corridor restoration." The objective of these approaches is to return streams, stream banks and adjacent land to a more natural condition, including the natural meanders. Another term is "ecological restoration," which restores native indigenous plants and animals to an area.

A key component of these efforts is to use appropriate native plantings along the banks that resist erosion. This may involve retrofitting the shoreline with willow cuttings, wetland plants, or rolls of landscape material covered with a natural fabric that decomposes after the banks are stabilized with plant roots.

In all, restoring the right vegetation to a stream has the following advantages:

— Reduces the amount of sediment and pollutants entering the water
— Enhances aquatic habitat by cooling water temperature
— Provides food and shelter for both aquatic and terrestrial wildlife
— Can reduce flood damage by slowing the velocity of water

- Increases the beauty of the land and its property value
- Prevents property loss due to erosion
- Provides recreational opportunities, such as hunting, fishing and bird watching
- Reduces long-term maintenance costs

Communities are required by state and federal regulations to monitor storm water drainage outfalls and control storm water runoff.

BEST MANAGEMENT PRACTICES

Point source pollutants come from pipes such as the outfall of a municipal wastewater treatment plant. They are regulated by the US EPA. Nonpoint source pollutants come from non-specific locations and harder to regulate. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, other chemicals, animal wastes, oils from street surfaces and industrial areas, and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams.

The term "best management practices" (BMPs) refers to design, construction and maintenance practices and criteria that minimize the impact of stormwater runoff rates and volumes, prevent erosion, protect natural resources and capture nonpoint source pollutants (including sediment). They can prevent increases in downstream flooding by attenuating runoff and enhancing infiltration of stormwater. They also minimize water quality degradation, preserve beneficial natural features onsite, maintain natural base flows, minimize habitat loss, and provide multiple usages of drainage and storage facilities.

DUMPING REGULATIONS

BMPs usually address pollutants that are liquids or are suspended in water that are washed into a lake or stream. Dumping regulations address solid matter, such as shopping carts, appliances and landscape waste that can be accidentally or intentionally thrown into channels or wetlands. Such materials may not pollute the water, but they can obstruct even low flows and reduce the channels' and wetlands' abilities to convey or clean stormwater.

Many cities have nuisance ordinances that prohibit dumping garbage or other "objectionable waste" on public or private property. Waterway dumping regulations need to also apply to "non-objectionable" materials, such as grass clippings or tree branches, which can kill ground cover or cause obstructions in channels. Regular inspections to catch violations should be scheduled.

Many people do not realize the consequences of their actions. They may, for example, fill in the ditch in their front yard without realizing that is needed to drain street runoff. They may not understand how re-grading their yard, filling a wetland, or discarding leaves or branches in a watercourse can cause a problem to themselves and others. Therefore, a dumping enforcement program should include public information materials that explain the reasons for the rules as well as the penalties.

FARMLAND PROTECTION

Farmland protection is an important piece of comprehensive planning and zoning throughout the United States. The purpose of farmland protection is to provide mechanisms for prime, unique, or important agricultural land to remain as such, and to be protected from conversion to nonagricultural uses.

Frequently, farm owners sell their land to residential or commercial developers and the property is converted to non-agricultural land uses. With development comes more buildings, roads and other infrastructure. Urban sprawl occurs, which can lead to additional stormwater runoff and emergency management difficulties.

Farms on the edge of cities are often appraised based on the price they could be sold for to urban developers. This may drive farmers to sell to developers because their marginal farm operations cannot afford to be taxed as urban land. The Farmland Protection Program in the United States Department of Agriculture's 2002 Farm Bill (Part 519) allows for funds to go to state, tribal, and local governments as well as nonprofit organizations to help purchase easements on agricultural land to protect against the development of the land.

LOCAL IMPLEMENTATION/CRS CREDIT

There is credit for preserving open space in its natural condition or restored to a state approximating its natural condition. The credit is based on the percentage of the floodplain that can be documented as wetlands protected from development by ownership or local regulations. Communities in Mecklenburg County could receive credit for Activity 420 – Open Space Preservation for preserving a portion of the SFHA as open space.

Additionally, credit is available for Activity 540 – Drainage System Maintenance. Having a portion of the drainage system inspected regularly throughout the year and maintenance performed as needed would earn a community credit. Communities could also get credit under this activity for providing a listing of problem sites that are inspected more frequently, and for implementing an ongoing Capital Improvements Program.

Table C.3 – Natural Resource Protection Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Natural Resource Protection Measures Considered by HMPC and Not Recommended			
-	Create GIS layer of all conservation easement areas to protect natural and restored buffers.	This action was completed by the City of Charlotte and does not currently need further action to maintain.	n/a
-	Identify open space for acquisition and permanent conservation	This is not a priority for the planning committee due to financial cost of land acquisition.	n/a
Natural Resource Protection Measures and Funding Recommended for Implementation			
Pineville-7	Continue to limit future development in identified flood hazard areas and prohibit new critical facilities from being located with the 500-year floodplain as required in the Town's flood damage prevention ordinance.	This action will result in preserved open space in flood-prone areas, protecting future development from risk. Town maintains Zoning and Subdivision Ordinances in partnership with Mecklenburg County to attain this goal.	Staff time and resources
Huntersville-2	Implement storm water mitigation projects, including the grading of ditches and replacing failing/potentially failing storm water structures	This action will help implement routine drainage system maintenance and result in protecting storm water structures from failing.	CMSWS funds, Grant funds

C.2.4 EMERGENCY SERVICES MEASURES

Emergency services measures protect people during and after a disaster. A good emergency management program addresses all hazards, and it involves all local government departments. This section reviews emergency services measures following a chronological order of responding to an emergency. It starts with identifying an impending problem (threat recognition) and continues through post-disaster activities.

THREAT RECOGNITION

The first step in responding to a flood is to know when weather conditions are such that an event could occur. With a proper and timely threat recognition system, adequate warnings can be disseminated.

The National Weather Service (NWS) is the prime agency for detecting meteorological threats. Severe weather warnings are transmitted through NOAA's Weather Radio System. Local emergency managers can then provide more site-specific and timely recognition after the Weather Service issues a watch or a warning. A flood threat recognition system predicts the time and height of a flood crest. This can be done by measuring rainfall, soil moisture, and stream flows upstream of the community and calculating the subsequent flood levels.

On smaller rivers and streams, locally established rainfall and river gauges are needed to establish a flood threat recognition system. The NWS may issue a "flash flood watch." This is issued to indicate current or developing hydrologic conditions that are favorable for flash flooding in and close to the watch area, but the occurrence is neither certain nor imminent. These events are so localized and so rapid that a "flash flood warning" may not be issued, especially if no remote threat recognition equipment is available. In the absence of a gauging system on small streams, the best threat recognition system is to have local personnel monitor rainfall and stream conditions. While specific flood crests and times will not be predicted, this approach will provide advance notice of potential local or flash flooding.

WARNING

The next step in emergency response following threat recognition is to notify the public and staff of other agencies and critical facilities. More people can implement protection measures if warnings are early and include specific detail.

The NWS issues notices to the public using two levels of notification:

- Watch: conditions are right for flooding, thunderstorms, tornadoes or winter storms.
- Warning: a flood, tornado, etc., has started or been observed.

A more specific warning may be disseminated by the community in a variety of ways. The following are the more common methods:

- CodeRED countywide mass telephone emergency communication system
- Commercial or public radio or TV stations
- The Weather Channel
- Cable TV emergency news inserts
- Telephone trees/mass telephone notification
- NOAA Weather Radio
- Tone activated receivers in key facilities
- Outdoor warning sirens
- Sirens on public safety vehicles
- Door-to-door contact

- Mobile public address systems
- Email notifications

Just as important as issuing a warning is telling people what to do in case of an emergency. A warning program should include a public information component.

STORMREADY

The National Weather Service (NWS) established the StormReady program to help local governments improve the timeliness and effectiveness of hazardous weather-related warnings for the public. To be officially StormReady, a community must:

- 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

Being designated a NWS StormReady community is a good measure of a community's emergency warning program for weather hazards.

RESPONSE

The protection of life and property is the most important task of emergency responders. Concurrent with threat recognition and issuing warnings, a community should respond with actions that can prevent or reduce damage and injuries. Typical actions and responding parties include the following:

- Activating the emergency operations center (emergency preparedness)
- Closing streets or bridges (police or public works)
- Shutting off power to threatened areas (utility company)
- Passing out sand and sandbags (public works)
- Holding children at school or releasing children from school (school superintendent)
- Opening evacuation shelters (the American Red Cross)
- Monitoring water levels (public works)
- Establishing security and other protection measures (police)

An emergency action plan ensures that all bases are covered and that the response activities are appropriate for the expected threat. These plans are developed in coordination with the agencies or offices that are given various responsibilities.

Emergency response plans should be updated annually to keep contact names and telephone numbers current and to ensure that supplies and equipment that will be needed are still available. They should be critiqued and revised after disasters and exercises to take advantage of the lessons learned and of changing conditions. The end result is a coordinated effort implemented by people who have experience working together so that available resources will be used in the most efficient manner possible.

EVACUATION AND SHELTER

There are six key components to a successful evacuation:

- Adequate warning

- Adequate routes
- Proper timing to ensure the routes are clear
- Traffic control
- Knowledgeable travelers
- Care for special populations (e.g., disabled persons, prisoners, hospital patients, schoolchildren)

Those who cannot get out of harm's way need shelter. Typically, the American Red Cross will staff a shelter and ensure that there is adequate food, bedding, and wash facilities. Shelter management is a specialized skill. Managers must deal with problems like scared children, families that want to bring in their pets, and the potential for an overcrowded facility.

LOCAL IMPLEMENTATION /CRS CREDIT

Flash flood warnings are issued by National Weather Service Offices, which have the local and county warning responsibility. Flood warnings are forecasts of coming floods, are distributed to the public by the NOAA Weather Radio, commercial radio and television, and through local emergency agencies. The warning message tells the expected degree of flooding, the affected river, when and where flooding will begin, and the expected maximum river level at specific forecast points during flood crest.

Communities in Mecklenburg County could receive credit for Activity 610 – Flood Warning Program for maintaining a program that provides timely identification of impending flood threats, disseminates warnings to appropriate floodplain residents, and coordinates flood response activities. Community Rating System credits are based on the number and types of warning media that can reach the community's flood prone population. Depending on the location, communities can receive credit for the telephone calling system and more credits for additional measures, like telephone trees. Being designated as a StormReady community also provides additional credits.

Table C.4 – Emergency Services Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Emergency Services Measures Considered by HMPC and Not Recommended			
-	Enhance use of Connect-CTY® to warn people of impending hazards, potential emergencies and disasters.	All Towns are now part of CharMeck alerts, which allows for better coordination on hazard warning and notification.	n/a
Emergency Services Measures and Funding Recommended for Implementation			
Charlotte-10	Equip emergency responders and managers for flood emergencies, including swift water rescue.	Training will support improved rescue and response capabilities	Hazard Mitigation Grant Program (7% set aside), Emergency Management Performance Grants (EMPG)
Charlotte-13	Develop evacuation routes that are not adversely affected by flooding.	This action will protect life safety by reducing the potential that individuals will drive through flooded streets.	Local staff time and resources

C.2.5 STRUCTURAL PROJECTS

Four general types of flood control projects are reviewed here: levees, reservoirs, diversions, and dredging. These projects have three advantages not provided by other mitigation measures:

- They can stop most flooding, protecting streets and landscaping in addition to buildings.
- Many projects can be built without disrupting citizens' homes and businesses.
- They are constructed and maintained by a government agency, a more dependable long-term management arrangement than depending on many individual private property owners.

However, as shown below, structural measures also have shortcomings. The appropriateness of using flood control depends on individual project area circumstances.

Advantages

- They may provide the greatest amount of protection for land area used
- Because of land limitations, they may be the only practical solution in some circumstances
- They can incorporate other benefits into structural project design, such as water supply and recreational uses
- Regional detention may be more cost-efficient and effective than requiring numerous small detention basins

Disadvantages

- They can disturb the land and disrupt the natural water flows, often destroying wildlife habitat
- They require regular maintenance
- They are built to a certain flood protection level that can be exceeded by larger floods
- They can create a false sense of security
- They promote more intensive land use and development in the floodplain

LEVEES AND FLOODWALLS

Probably the best-known flood control measure is a barrier of earth (levee) or concrete (floodwall) erected between the watercourse and the property to be protected. Levees and floodwalls confine water to the stream channel by raising its banks. They must be well designed to account for large floods, underground seepage, pumping of internal drainage, and erosion and scour.

RESERVOIRS AND DETENTION

Reservoirs reduce flooding by temporarily storing flood waters behind dams or in storage or detention basins. Reservoirs lower flood heights by holding back, or detaining, runoff before it can flow downstream. Flood waters are detained until the flood has subsided, and then the water in the reservoir or detention basin is released or pumped out slowly at a rate that the river can accommodate downstream.

Reservoirs can be dry and remain idle until a large rain event occurs. Or they may be designed so that a lake or pond is created. The lake may provide recreational benefits or water supply (which could also help mitigate a drought).



Retention pond

Flood control reservoirs are most commonly built for one of two purposes. Large reservoirs are constructed to protect property from existing flood problems. Smaller reservoirs, or detention basins, are built to protect property from the stormwater runoff impacts of new development.

DIVERSION

A diversion is a new channel that sends floodwaters to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During floods, the floodwaters spill over to the diversion channel or tunnel, which carries the excess water to a receiving lake or river.

LOCAL IMPLEMENTATION /CRS CREDIT

Structural flood control projects that provide at least 100-year flood protection and that result in revisions to the Flood Insurance Rate Map are not credited by the CRS so as not to duplicate the larger premium reduction provided by removing properties from the mapped floodplain. Other flood control projects can be accepted by offering a 25-year flood protection.

Table C.5 – Structural Projects Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Structural Project Measures Considered by HMPC and Not Recommended			
-	Consider channel diversion projects.	This strategy will not be cost effective in reducing risk in highly developed areas where mitigation is needed.	n/a
-	Continue to identify, rank and prioritize capital improvement projects, flood control (FC) projects and pond projects, using pre-established criteria for each.	This is an established practice of the City of Charlotte and does not require further resources through this plan to implement.	n/a
Structural Project Measures and Funding Recommended for Implementation			
Mecklenburg-5	Identify, fund, and implement eligible flood mitigation projects. FEMA-defined and locally verified “repetitive loss properties” to receive high priority.	Structural projects to mitigate repetitive loss properties will reduce potential property damage and may save lives.	FEMA Unified Hazard Mitigation Assistance / Storm Water Services capital fund

C.2.6 PUBLIC EDUCATION & AWARENESS

OUTREACH PROJECTS

Outreach projects are the first step in the process of orienting property owners to the hazards they face and to the concept of property protection. They are designed to encourage people to seek out more information in order to take steps to protect themselves and their properties.

Awareness of the hazard is not enough; people need to be told what they can do about the hazard. Thus, projects should include information on safety, health and property protection measures. Research has

shown that a properly run local information program is more effective than national advertising or publicity campaigns. Therefore, outreach projects should be locally designed and tailored to meet local conditions.

Community newsletters/direct mailings: The most effective types of outreach projects are mailed or distributed to everyone in the community. In the case of floods, they can be sent only to floodplain property owners.

News media: Local newspapers can be strong allies in efforts to inform the public. Local radio stations and cable TV channels can also help. These media offer interview formats and cable TV may be willing to broadcast videos on the hazards.

LIBRARIES AND WEBSITES

The two previous activities tell people that they are exposed to a hazard. The next step is to provide information to those who want to know more. The community library and local websites are obvious places for residents to seek information on hazards, hazard protection, and protecting natural resources.

Books and pamphlets on hazard mitigation can be given to libraries, and many of these can be obtained for free from state and federal agencies. Libraries also have their own public information campaigns with displays, lectures and other projects, which can augment the activities of the local government. Today, websites are commonly used as research tools. They provide fast access to a wealth of public and private sites for information. Through links to other websites, there is almost no limit to the amount of up to date information that can be accessed on the Internet.

In addition to online floodplain maps, websites can link to information for homeowners on how to retrofit for floods or a website about floods for children.

TECHNICAL ASSISTANCE

HAZARD INFORMATION

Residents and business owners that are aware of the potential hazards can take steps to avoid problems or reduce their exposure to flooding. Communities can easily provide map information from FEMA's FIRMs and Flood Insurance Studies. They may also assist residents in submitting requests for map amendments and revisions when they are needed to show that a building is located outside the mapped floodplain.

Some communities supplement what is shown on the FIRM with information on additional hazards, flooding outside mapped areas and zoning. When the map information is provided, community staff can explain insurance, property protection measures and mitigation options that are available to property owners. They should also remind inquirers that being outside the mapped floodplain is no guarantee that a property will never flood.

PROPERTY PROTECTION ASSISTANCE

While general information provided by outreach projects or the library is beneficial, most property owners do not feel ready to retrofit their buildings without more specific guidance. Local building department staffs are experts in construction. They can provide free advice, not necessarily to design a protection measure, but to steer the owner onto the right track. Building or public works department staffs can provide the following types of assistance:

- Visit properties and offer protection suggestions
- Recommend or identify qualified or licensed contractors

- Inspect homes for anchoring of roofing and the home to the foundation
- Explain when building permits are needed for home improvements.

PUBLIC INFORMATION PROGRAM

A Program for Public Information (PPI) is a document that receives CRS credit. It is a review of local conditions, local public information needs, and a recommended plan of activities. A PPI consists of the following parts, which are incorporated into this plan:

- The local flood hazard
- The property protection measures appropriate for the flood hazard
- Flood safety measures appropriate for the local situation
- The public information activities currently being implemented within the community, including those being carried out by non-government agencies
- Goals for the community's public information program
- The outreach projects that will be done each year to reach the goals
- The process that will be followed to monitor and evaluate the projects

LOCAL IMPLEMENTATION /CRS CREDIT

Communities in Mecklenburg County could receive credit under Activity 330 – Outreach Projects as well as Activity 350 – Flood Protection Information. Credit is available for targeted and general outreach projects. Credit is also provided for making publications relating to floodplain management available in the reference section of the local library.

Table C.6 – Public Education & Awareness Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Public Education & Awareness Measures Considered by HMPC and Not Recommended			
-	Build relationships and coordination with critical infrastructure partners, specifically power, utilities, and communications to build local resilience.	This action is addressed as needed during hazard events.	n/a
-	Inform public of flood risk by sending annual newsletter to owners and occupants of all buildings in floodplain.	Additional direct mailings are not cost effective. The planning committee is considering ways to improve online outreach.	n/a
Public Education & Awareness Measures and Funding Recommended for Implementation			
Mecklenburg-4	Update Flood Insurance Rate Maps to provide most accurate depiction of flood risk.	Enabling individuals to understand their flood risk will help them to take personal action to mitigate their risk.	Storm Water Services Capital Fund / CTP grant
Pineville-5	Advertise and promote the availability of flood insurance.	This is a low-cost action that will encourage property protection.	Local

APPENDIX D REFERENCES

- Carter, L., A. Terando, K. Dow, K. Hiers, K.E. Kunkel, A. Lascurain, D. Marcy, M. Osland, and P. Schramm, 2018: Southeast. In Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II [Reidmiller, D.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, pp. 743–808. doi: 10.7930/NCA4.2018.CH19.
- Chernet, Haregewoin Haile. 2013. The Impact of Climate Change on Dam Safety and Hydropower.
- Environmental Protection Agency. Toxic Release Inventory.
- FEMA Disaster Declarations Summary, Updated February 20, 2025.
- FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards. 2013.
- FEMA. Mecklenburg County and Incorporated Areas Flood Insurance Study. Revised November 16, 2018.
- FEMA. Community Information System, 2018.
- FEMA. OpenFEMA Dataset: NFIP Multiple Loss Properties. April 2024.
- Fluixá Sanmartín, J.; Altarejos García, L.; Morales Torres, A.; Escuder Bueno, I. (2018). Review article: Climate change impacts on dam safety. Natural Hazards and Earth System Sciences. 18(9):2471-2488. https://doi.org/10.5194/nhess-18-2471-2018
- James B. Elsner, Svetoslava C. Elsner, and Thomas H. Jagger. The increasing efficiency of tornadoes in the United States. Climate Dynamics/vol. 45 issue 3-4, pp 651-659.
- Marusak, Joe. Colonial Pipeline fuel spill near Charlotte was nearly twice as big as previously thought. The Charlotte Observer. July 22, 2022. https://www.charlotteobserver.com/news/local/article263684438.html
- Mecklenburg County Multi-Jurisdictional Hazard Mitigation Plan. 2020.
- National Drought Mitigation Center, Drought Impact Reporter.
- National Geophysical Data Center / World Data Service (NGDC/WDS): Significant Earthquake Database. National Geophysical Data Center, NOAA. doi:10.7289/V5TD9V7K
- National Integrated Drought Information System, U.S. Drought Portal.
- National Weather Service.
- NOAA, National Centers for Environmental Information, Storm Events Database.
- NOAA, National Hurricane Center.
- NOAA, Office of Coastal Management.
- North Carolina Department of Environmental Quality. Dam Inventory, November 2024.
- North Carolina Disease Event Tracking and Epidemiologic Collection Tool
- North Carolina Emergency Management. IRISK Database
- North Carolina Emergency Management. Risk Management Tool.
- North Carolina Forest Service. Annual Reports. 2009-2023.

- North Carolina Geological Survey. November 2024.
- North Carolina State Climate Office. Climate Tools.
- Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety.
- Skinner, Sarah and Fred Clasen-Kelly. Floods ravage dozens of homes in Mecklenburg, emergency declared in Caldwell, Catawba. The Charlotte Observer. June 10, 2019. https://www.charlotteobserver.com/news/local/article231378808.html
- Southern Wildfire Risk Assessment, 2024.
- State of North Carolina 2023 Hazard Mitigation Plan, December 2022.
- Thomae, Lucas. Liquid courage: Duke Energy not asking for forgiveness following flooding fiasco. Carolina Public Press. January 23, 2025. https://carolinapublicpress.org/68103/duke-energy-catawba-river-flooding/
- Tornado and Storm Research Organization (TORRO), Department of Geography, Oxford Brookes University.
- U.S. Army Corps of Engineers, National Inventory of Dams.
- U.S. Census Bureau. American Community Survey 2019-2023 5-Year Estimates.
- U.S. Census Bureau. 2010 Decennial Census.
- U.S. Census Bureau. 2020 Decennial Census.
- U.S. Department of Agriculture, Farm Service Agency, Disaster Designation Information, 2012-2023.
- U.S. Department of Agriculture, Risk Management Agency, Cause of Loss Historical Data Files, 2007-2021.
- U.S. Drought Monitor.
- U.S. Geological Survey Earthquake Hazards Program, Earthquake Catalog.
- U.S. Geological Survey Landslide Susceptibility and Incidence.
- USGCRP, 2023: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. https://doi.org/10.7930/NCA5.2023
- U.S. Global Change Research Program, 2016: The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. http://dx.doi.org/10.7930/J0R49NQX
- USGCRP, 2017: Climate Science Special Report: Fourth National Climate Assessment, Volume I [Wuebbles, D.J., D.W. Fahey, K.A. Hibbard, D.J. Dokken, B.C. Stewart, and T.K. Maycock (eds.)]. U.S. Global Change Research Program, Washington, DC, USA, 470 pp., doi: 10.7930/J0J964J6.
- VAISALA, National Lightning Detection Network.