



Table of Contents

Volume I

SECTION 1. INTRODUCTION1-1
2015 Plan Update Changes..... 1-1
1.1 BACKGROUND 1-1
1.1.1 DMA 2000 Origins -The Robert T. Stafford Disaster Relief and Emergency Assistance Act..... 1-1
1.1.2 Benefits of Mitigation Planning 1-2
1.1.3 Organizations Involved in the Mitigation Planning Effort..... 1-2
1.1.4 Implementation of the 2010 Hazard Mitigation Plan 1-6
1.1.5 Implementation of the Planning Process 1-6
1.1.6 Organization of This Mitigation Plan..... 1-7

SECTION 2. PLAN ADOPTION.....2-1
2015 Plan Update Changes..... 2-1
2.1 OVERVIEW 2-1
2.1.1 Plan Adoption by Local Governing Bodies 2-1

SECTION 3. PLANNING PROCESS3-1
2015 Plan Update Changes..... 3-1
3.1 Introduction 3-1
3.2 Planning Partnership - Organization and Activity 3-2
3.2.1 Organization of Planning Partnership 3-2
3.2.2 Planning Partnership Activities 3-7
3.3 Stakeholder Outreach and Involvement..... 3-9
3.4 Public Participation - Citizen Involvement..... 3-13
3.5 INCORPORATION OF EXISTING PLANS, STUDIES, REPORTS AND TECHNICAL INFORMATION 3-17
3.6 Integration with Existing Planning Mechanisms and Programs 3-21
3.7 Continued Public Involvement 3-21

SECTION 4 COUNTY PROFILE4-1
2015 Plan Update Changes..... 4-1
4.1 GENERAL INFORMATION..... 4-1
4.1.1 Physical Setting..... 4-1
4.2 POPULATION AND DEMOGRAPHICS 4-12
4.2.1 Population Characteristics..... 4-12
4.2.2 Vulnerable Populations 4-15
4.2.3 Population Trends 4-22
4.3 GENERAL BUILDING STOCK 4-26
4.4 Economy 4-33
4.5 Development Trends and New Development 4-34
4.6 CRITICAL FACILITIES..... 4-35
4.6.1 Essential Facilities..... 4-35
4.6.2 Transportation Systems..... 4-38
4.6.3 Lifeline Utility Systems 4-41
4.6.4 High-Potential Loss Facilities 4-45
4.6.5 Other Facilities..... 4-45



SECTION 5 RISK ASSESSMENT

5.1 METHODOLOGY AND TOOLS 5.1-1

 5.1.1 Methodology 5.1-1

 5.1.2 Tools..... 5.1-1

5.2 IDENTIFICATION OF HAZARDS OF CONCERN..... 5.2-1

5.3 HAZARD RANKING 5.3-1

 2015 Plan Update Changes 5.3-1

 5.3.1 Hazard Ranking Methodology 5.3-1

 5.3.2 Hazard Ranking Results 5.3-2

5.4 HAZARD PROFILES

 5.4.1 Dam Failure..... 5.4.1-1

 5.4.2 Drought 5.4.2-1

 5.4.3 Earthquake..... 5.4.3-1

 5.4.4 Extreme Temperature 5.4.4-1

 5.4.5 Flood 5.4.5-1

 5.4.6 Geological Hazards 5.4.6-1

 5.4.7 Severe Weather 5.4.7-1

 5.4.8 Severe Winter Weather 5.4.8-1

 5.4.9 Wildfire 5.4.9-1

 5.4.10 Disease Outbreak..... 5.4.10-1

 5.4.11 Hazardous Materials..... 5.4.11-1

 5.4.12 Infestation..... 5.4.12-1

SECTION 6 MITIGATION STRATEGY6-1

 2015 Plan Update Changes..... 6-1

 6.1 Background and Past Mitigation Accomplishments 6-1

 6.2 General Mitigation Planning Approach 6-2

 6.3 Review and Update of Mitigation Goals and Objectives..... 6-3

 6.3.1 Goals and Objectives 6-3

 6.4 Capability Assessment..... 6-7

 6.4.1 Planning and Regulatory Capability 6-7

 6.4.2 Administrative and Technical Capabilities 6-13

 6.4.3 Fiscal Capabilities 6-20

 6.5 Mitigation Strategy Development and Update 6-24

 6.5.1 Update of Municipal Mitigation Strategies 6-24

 6.5.2 Update of County Mitigation Strategies..... 6-29

 6.5.3 Mitigation Strategy Evaluation and Prioritization..... 6-29

 6.5.4 Benefit/Cost Review 6-30

SECTION 7. PLAN MAINTENANCE PROCEDURES7-1

 2015 Plan Update Changes..... 7-1

 7.1 Monitoring, Evaluating, and Updating the Plan 7-1

 7.1.1 Monitoring 7-4

 7.1.2 Evaluating 7-4

 7.1.3 Updating..... 7-6

 7.2 Implementation of Mitigation Plan Through Existing Programs..... 7-6

 7.3 Continued Public Involvement 7-7

Acronyms..... AC-1

References..... R-1



Appendices

- Appendix A – Sample Adoption Resolution
- Appendix B – Meeting Documentation
- Appendix C – Participation Matrix
- Appendix D – Public And Stakeholder Outreach Documentation
- Appendix E – Mitigation Action Worksheet Template and Instructions
- Appendix F – FEMA Guidance Worksheets
- Appendix G – Hazard Events and Losses
- Appendix H – Resolutions for Plan Adoption



Volume II

SECTION 8. PLANNING PARTNERSHIP 1

8.1 BACKGROUND 1

8.1.1 Initial Solicitation and Letters of Intent 1

8.1.2 Planning Partner Expectations 2

8.1.3 Jurisdiction Annex Templates 2

SECTION 9. ANNEXES

9.1 Morris County 9.1-1

9.2 Boonton, Town of 9.2-1

9.3 Boonton, Township of 9.3-1

9.4 Butler, Borough of 9.4-1

9.5 Chatham, Borough of 9.5-1

9.6 Chatham, Township of 9.6-1

9.7 Chester, Borough of 9.7-1

9.8 Chester, Township of 9.8-1

9.9 Denville, Township of 9.9-1

9.10 Dover, Town of 9.10-1

9.11 East Hanover, Township of 9.11-1

9.12 Florham Park, Borough of 9.12-1

9.13 Hanover, Township of 9.13-1

9.14 Harding, Township of 9.14-1

9.15 Jefferson, Township of 9.15-1

9.16 Kinnelon, Borough of 9.16-1

9.17 Lincoln Park, Borough of 9.17-1

9.18 Long Hill, Township of 9.18-1

9.19 Madison, Borough of 9.19-1

9.20 Mendham, Borough of 9.20-1

9.21 Mendham, Township of 9.21-1

9.22 Mine Hill, Township of 9.22-1

9.23 Montville, Township of 9.23-1

9.24 Morris Plains, Borough of 9.24-1

9.25 Morris, Township of 9.25-1

9.26 Morristown, Town of 9.26-1

9.27 Mount Arlington, Borough of 9.27-1

9.28 Mount Olive, Township of 9.28-1

9.29 Mountain Lakes, Borough of 9.29-1

9.30 Netcong, Borough of 9.30-1

9.31 Parsippany-Troy Hills, Township of 9.31-1

9.32 Pequannock, Township of 9.32-1

9.33 Randolph, Township of 9.33-1

9.34 Riverdale, Borough of 9.34-1

9.35 Rockaway, Borough of 9.35-1

9.36 Rockaway, Township of 9.36-1

9.37 Roxbury, Township of 9.37-1

9.38 Victory Gardens, Borough of 9.38-1

9.39 Washington, Township of 9.39-1

9.40 Wharton, Borough of 9.40-1



List of Tables

Table 1-1 Participating Jurisdictions in Morris County 1-2
Table 1-2 FEMA Local Mitigation Plan Review Crosswalk 1-4
Table 3-1 Participating Morris County Jurisdictions 3-2
Table 3-2 Morris County Hazard Mitigation Planning Partnership 3-5
Table 3-3 Summary of Mitigation Planning Activities / Efforts 3-8
Table 3-4 Record of the Review of Existing Programs, Policies, and Technical Documents for Participating Jurisdictions 3-19
Table 4-1 Land Use Summary for Morris County, 2002 & 2007 4-7
Table 4-2 County and State Parks in Morris County 4-9
Table 4-3 Urban Municipalities in Morris County 4-10
Table 4-4 Morris County Population Statistics 4-12
Table 4-5 Morris County Population Trends, 1790 to 2013 4-22
Table 4-6 Ten Largest Municipalities in Morris County 4-23
Table 4-7 Population Trends in Morris County by Municipality 4-24
Table 4-8 Number of Buildings and Improvement Value by Occupancy Class 4-27
Table 4-9 Water Suppliers in Morris County 4-41
Table 5.2-1 Identification of Natural Hazards of Concern for Morris County 5.2-2
Table 5.3-1 Probability of Occurrence Ranking Factors 5.3-1
Table 5.3-2 Numerical Values and Definitions for Impacts on Population, Property and Economy 5.3-2
Table 5.3-3 Probability of Occurrence Ranking for Hazards of Concern for Morris County 5.3-3
Table 5.3-4 Impact Ranking for Hazards of Concern for Morris County 5.3-4
Table 5.3-5 Total Risk Ranking Value for Hazards of Concern for Morris County 5.3-5
Table 5.4.1-1 Number of Dams by County in Morris County 5.4.1-3
Table 5.4.2-2 New Jersey Dam Inspection Requirements 5.4.1-4
Table 5.4.2-1 Drinking Water Suppliers in Morris County 5.4.2-9
Table 5.4.2-2 Economic, Environmental, and Social Impacts of Drought 5.4.2-12
Table 5.4.2-3 Agricultural Land in Morris County in 2012 5.4.2-13
Table 5.4.3-1 NEHRP Soil Classifications 5.4.3-2
Table 5.4.3-2 Richter Magnitude Scale 5.4.3-9
Table 5.4.3-3 Modified Mercalli Intensity Scale 5.4.3-9
Table 5.4.3-4 Modified Mercalli Intensity and PGA Equivalents 5.4.3-10
Table 5.4.3-5 Damage Levels Experienced in Earthquakes 5.4.3-10
Table 5.4.3-6 Approximate Population within NEHRP, Liquefaction and Landslide Susceptible Areas 5.4.3-20
Table 5.4.3-7 Estimated Displaced Households and Population Seeking Short-Term Shelter from 500- and 2,500-year MRP Events by Municipality 5.4.3-21
Table 5.4.3-8 Estimated Number of Injuries and Casualties from the 500-Year MRP Earthquake Event 5.4.3-23
Table 5.4.3-9 Estimated Number of Injuries and Casualties from the 2,500-Year MRP Earthquake Event 5.4.3-23
Table 5.4.3-10 Number of Buildings within NEHRP, Liquefaction and Landslide Susceptible Areas 5.4.3-24



Table 5.4.3-11 Replacement Value of Buildings within NEHRP, Liquefaction and Landslide Susceptible Areas..... 5.4.3-25

Table 5.4.3-12. Example of Structural Damage State Definitions for a Light Wood-Framed Building.. 5.4.3-27

Table 5.4.3-13 Estimated Buildings Damaged by General Occupancy for 100-year and 500-year MRP Earthquake Events 5.4.3-28

Table 5.4.3-14 Estimated Buildings Damaged by General Occupancy for 2, 500-year MRP Earthquake Events 5.4.3-28

Table 5.4.3-15 Estimated Value (Building and Contents) Damaged by the 500- and 2,500-Year MRP Earthquake Events 5.4.3-28

Table 5.4.3-16 Estimated Value (Building and Contents) Damaged by the 100-, 500- and 2,500-Year MRP Earthquake Events (Continued)..... 5.4.3-30

Table 5.4.3-17 Number of Critical Facilities Located in the NEHRP Soil Class D and E 5.4.3-32

Table 5.4.3-18 Number of Critical Facilities Located in the Liquefaction Susceptibility Class 4..... 5.4.3-33

Table 5.4.3-19 Estimated Damage and Loss of Functionality for Critical Facilities and Utilities in Morris County for the 500-Year MRP Earthquake Event..... 5.4.3-35

Table 5.4.3-20 Estimated Damage and Loss of Functionality for Critical Facilities and Utilities in Morris County for the 2,500-Year MRP Earthquake Event 5.4.3-35

Table 5.4.3-21 Estimated Debris Generated by the 500- and 2,500-year MRP Earthquake Events..... 5.4.3-37

Table 5.4.4-1 MRCC Temperature Extremes 5.4.4-5

Table 5.4.5-1 Total Land Area in the One-Percent and 0.2-Percent Annual Chance Flood Zones (Acres) 5.4.5-9

Table 5.4.5-2 Estimated Population Exposed to the Flood Hazard 5.4.5-11

Table 5.4.5-3 Estimated Population Displaced or Seeking Short-Term Shelter from the one-percent Annual Chance Flood Event..... 5.4.5-13

Table 5.4.5-4 Estimated General Building Stock Exposure to the One- Percent Annual Chance Flood Event – All Occupancies 5.4.5-15

Table 5.4.5-5 Estimated General Building Stock Exposure to the 0.2-Percent Annual Chance Flood Event – All Occupancies 5.4.5-16

Table 5.4.5-6 Estimated General Building Stock Potential Loss to the one-percent Annual Chance Flood Event..... 5.4.5-18

Table 5.4.5-7 Occupancy Class of Repetitive Loss Structures in Morris County..... 5.4.5-20

Table 5.4.5-8 Occupancy Class of Repetitive Loss Structures in Morris County, by Municipality 5.4.5-21

Table 5.4.5-9 NFIP Policies, Claims and Repetitive Loss Statistics..... 5.4.5-23

Table 5.4.5-10 Number of Critical Facilities Located in the One-Percent Annual Chance Flood Zone 5.4.5-27

Table 5.4.5-11 Number of Critical Facilities Located in the 0.2-Percent Annual Chance Flood Zone .. 5.4.5-29

Table 5.4.5-12. Estimated Debris Generated from the one-percent Flood Event 5.4.5-31

Table 5.4.7-1 NWS Wind Descriptions 5.4.7-5

Table 5.4.7-2 Fujita Damage Scale..... 5.4.7-6

Table 5.4.7-3 Enhanced Fujita Damage Scale 5.4.7-7

Table 5.4.7-4 The Saffir-Simpson Scale..... 5.4.7-8

Table 5.4.7-5 Hail Size 5.4.7-11

Table 5.4.7-6 Sheltering Needs for the 100- and 500-year MRP Hurricane Event 5.4.7-15

Table 5.4.7-7 Description of Damage Categories..... 5.4.7-16

Table 5.4.7-5 Estimated Building Value (Structure Only) Damaged by the 100-Year and 500-Year MRP Hurricane-Related Winds 5.4.7-17

Table 5.4.7-6 Estimated Impacts to Critical Facilities for the 100- Year Mean Return Period Hurricane-Related Winds 5.4.7-22

Table 5.4.7-7 Estimated Impacts to Critical Facilities for the 500-Year Mean Return Period Hurricane-Related Winds 5.4.7-22

Table 5.4.7-8 Debris Production for 100- and 500-Year Mean Return Period Hurricane-Related



Winds..... 5.4.7-23

Table 5.4.6-1 Total Land Area Located in the Landslide Susceptible Areas..... 5.4.6-7

Table 5.4.6-1 Estimated Population Located in the Landslide Hazard Areas..... 5.4.6-15

Table 5.4.6-1 Number of Buildings in the Landslide Hazard Area by Municipality..... 5.4.6-17

Table 5.4.6-1 Number of Buildings in the Subsidence and Sinkhole Hazard Area by Municipality..... 5.4.6-19

Table 5.4.6-1 Critical Facilities Exposed to the Landslide Hazard Areas (Classes A through B)..... 5.4.6-20

Table 5.4.6-1 Critical Facilities in the Subsidence and Sinkhole Hazard Area by Municipality..... 5.4.6-21

Table 5.4.8-1 RSI Ranking Categories 5.4.8-3

Table 5.4.8-2 General Building Stock Exposure and Estimated Losses from Severe Winter Storm Events 5.4.8-7

Table 5.4.9-1 Area in the Wildfire Fuel Hazard Ranking Zones in Morris County 5.4.9-3

Table 5.4.9-2 Approximate Area in Wildfire Fuel Hazard Ranking Zones in Morris County 5.4.9-4

Table 5.4.9-3 Fire Danger Rating and Color Code 5.4.9-7

Table 5.4.9-4 Estimated Vulnerable Population 5.4.9-11

Table 5.4.9-5 Building Stock Replacement Value Located in Wildfire Fuel Hazard Ranking Zones.. 5.4.9-12

Table 5.4.9-6 Facilities in Moderate and Low Wildfire Fuel Hazard Ranking Zones in Morris County 5.4.9-14

Table 5.4.9-7 Facilities in Extreme, Very High, or High Wildfire Fuel Hazard Ranking Zones in Morris County 5.4.9-15

Table 5.4.10-1 Federal and New Jersey Pandemic Phases and Situations..... 5.4.10-6

Table 5.4.11-1 Hazardous Waste Generated and Managed in Morris County, 2007 – 2011..... 5.4.11-4

Table 6-1 Morris County Hazard Mitigation Plan Goals and Objectives 6-3

Table 6-2 Morris County Hazard Mitigation Plan Objectives 6-5

Table 6-3 Comprehensive Range of Mitigation Actions 6-27

Table 6-4 Qualitative Cost and Benefit Ratings 6-31

Table 7-1 Morris County Hazard Mitigation Planning Partnership..... 7-1

Table 8-1 Participating Jurisdictions in Morris County..... 8-1

List of Figures

Figure 1-1 Morris County, New Jersey Mitigation Plan Area 1-3

Figure 1-2 Morris County Hazard Mitigation Planning Process..... 1-7

Figure 3-1 Screenshot of the Morris County 2015 Hazard Mitigation Website Home Page 3-15

Figure 3-2 Screenshot of the Morris County 2015 Hazard Mitigation Website Public Survey 3-16

Figure 3-3 Screenshot of the MCOEM Facebook Page announcing the planning project..... 3-17

Figure 4-1 Overview Map Morris County, New Jersey 4-2

Figure 4-2 2007 Land Use Land Cover for Morris County..... 4-8

Figure 4-3 Distribution of General Population for Morris County, New Jersey 4-14

Figure 4-4 Distribution of Persons over the Age of 65 in Morris County, New Jersey 4-17

Figure 4-5 Distribution of Low-Income Population in Morris County, New Jersey..... 4-18

Figure 4-6 New York Combined Statistical Area 4-21

Figure 4-7 Morris County Population Projections, 2010 to 2032 4-24

Figure 4-8 Distribution of Residential Building Stock and Value Density in Morris County 4-30



Figure 4-9 Distribution of Commercial Building Stock and Exposure Density in Morris County 4-31

Figure 4-10 Distribution of Industrial Building Stock and Value Density in Morris County 4-32

Figure 4-11 Potential New Development in Morris County 4-34

Figure 4-12 Essentials Facilities in Morris County 4-37

Figure 4-13 Transportation Facilities in Morris County 4-40

Figure 4-15 Utility Lifelines in Morris County 4-44

Figure 4-16 High-Potential Loss Facilities in Morris County 4-46

Figure 4-17 Other Facilities in Morris County 4-47

Figure 5.4.2-1 Drought Regions of New Jersey 5.4.2-4

Figure 5.4.3-1 Seismic (NEHRP) Soils in Morris County 5.4.3-3

Figure 5.4.3-2 Liquefaction Classes in Morris County 5.4.3-5

Figure 5.4.3-3 Susceptibility of Slopes to Landsliding During Earthquakes in Morris County 5.4.3-7

Figure 5.4.3-4 Faults in Northern New Jersey 5.4.3-8

Figure 5.4.3-5 Peak Ground Acceleration 100-Year Mean Return Period for Morris County 5.4.3-12

Figure 5.4.3-6 Peak Ground Acceleration 500-Year Mean Return Period for Morris County 5.4.3-13

Figure 5.4.3-7 Peak Ground Acceleration 2,500-Year Mean Return Period for Morris County 5.4.3-14

Figure 5.4.3-8 Earthquakes with Epicenters in Morris County, 1783 to 2014 5.4.3-16

Figure 5.4.3-9 Potential New Development in Morris County and NEHRP Soil Types 5.4.3-39

Figure 5.4.3-10 Potential New Development in Morris County, Liquefaction and Landslide Susceptible Areas 5.4.3-40

Figure 5.4.4-1 NWS Heat Index Chart 5.4.4-3

Figure 5.4.4-2 Adverse Effects of Prolonged Exposures to Heat on Individuals 5.4.4-3

Figure 5.4.4-3 NWS Wind Chill Index 5.4.4-4

Figure 5.4.4-4 Monthly Mean Temperatures in Northern New Jersey, 1895 to 2015 5.4.4-6

Figure 5.4.5-1 FEMA Flood Hazard Areas in Morris County 5.4.5-3

Figure 5.4.5-2 Frequency of Heavy Precipitation Events in the Northeastern United States, 1910 to 2010 5.4.5-7

Figure 5.4.5-3 NFIP Repetitive Loss Areas – Morris County 5.4.5-25

Figure 5.4.5-4 Potential New Development and Flood Boundaries 5.4.5-34

Figure 5.4.6-1 Historic Landslide Locations in Morris County, 1869 –2014 5.4.6-4

Figure 5.4.6-2 Landslide Susceptibility in Morris County 5.4.6-6

Figure 5.4.6-3 Carbonate Rock in the New Jersey Highlands 5.4.6-9

Figure 5.4.6-4 Abandoned Mines in Morris County 5.4.6-10

Figure 5.4.7-1 Historical Tropical Storm and Hurricane Tracks 2008 to 2012 5.4.7-5

Figure 5.4.7-2 Wind Speeds for the 100-Year Mean Return Period Event 5.4.7-9

Figure 5.4.7-3 Wind Speeds for the 500-Year Mean Return Period Event 5.4.7-10

Figure 5.4.7-4 Density of Losses for Structures (All Occupancies) for the County 100-Year MRP Hurricane (Wind-Only) Event 5.4.7-20

Figure 5.4.7-5 Density of Losses for Structures (All Occupancies) for the County 500-Year MRP Hurricane (Wind-Only) Event 5.4.7-21

Figure 5.4.9-1 Wildfire Fuel Hazard for Morris County 5.4.9-5

Figure 5.4.9-2 Wildfire Risk for Morris County 5.4.9-6

Figure 5.4.10-1 Pandemic Severity Index 5.4.10-6

Figure 5.4.11-1 Major Transportation in Morris County 5.4.11-6