

NY Rising Community Reconstruction Plan

NYRCR Towns of Shandaken and Hardenburgh

March 2014

NY Community Reconstruction Program



The NYRCR Shandaken and Hardenburgh
Planning Committee





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This document was developed by the Shandaken and Hardenburgh Committee as part of the New York Rising Community Reconstruction (NYRCR) Program within the Governor’s Office of Storm Recovery. The NYRCR Program is supported by New York Homes and Community Renewal, New York Department of State, and New York Department of Transportation.

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¹ * indicates co-chair; ** indicates Non-Voting



FOREWORD

INTRODUCTION

In the span of approximately one year, beginning in August 2011, the State of New York experienced three extreme weather events. Hurricane Irene, Tropical Storm Lee, and Superstorm Sandy wreaked havoc on the lives of New Yorkers and their communities. These tragic disasters signaled that New Yorkers are living in a new reality defined by rising sea levels and extreme weather events that will occur with increased frequency and power. They also signaled that we need to rebuild our communities in a way that will mitigate against future risks and build increased resilience.

To meet these pressing needs, Governor Andrew M. Cuomo led the charge to develop an innovative, community-driven planning program on a scale unprecedented and with resources unparalleled. The NY Rising Community Reconstruction (NYRCR) Program empowers the State's most impacted communities with the technical expertise needed to develop thorough and implementable reconstruction plans to build physically, socially, and economically resilient and sustainable communities.

PROGRAM OVERVIEW

The NYRCR Program, announced by Governor Cuomo in April of 2013, is a more than \$650 million planning and implementation process established to provide rebuilding and resiliency assistance to communities severely damaged by Hurricane Irene, Tropical Storm Lee, and Superstorm Sandy. Drawing on lessons learned from past recovery efforts; the NYRCR Program is a unique combination of bottom-up community participation and State-provided technical expertise. This powerful combination recognizes not only that community members are best positioned to assess the needs and opportunities of the places where they live and work, but also that decisions are best made when they are grounded in rigorous analysis and informed by the latest innovative solutions.

One hundred and two storm-affected localities across the State were originally designated to participate in the NYRCR Program. The State has allocated each locality between \$3 million and \$25 million to implement eligible projects identified in the NYRCR Plan. The funding for these projects is provided through the U.S. Department of Housing and Urban Development (HUD) Community

Development Block Grant – Disaster Recovery (CDBG-DR) program.²

Forty-five NYRCR Communities, each comprising one or more of the 102 localities, were created and led by a NYRCR Planning Committee composed of local residents, business owners, and civic leaders. Members of the Planning Committees were identified in consultation with established local leaders, community organizations, and in some cases municipalities. The NYRCR Program sets a new standard for community participation in recovery and resiliency planning, with community members leading the planning process. Across the State, more than 500 New Yorkers represent their communities by serving on Planning Committees. More than 400 Planning Committee Meetings have been held, during which Planning Committee members worked with the State's NYRCR Program team to develop community reconstruction plans

² Five of the 102 localities in the program—Niagara, Herkimer, Oneida, Madison, and Montgomery Counties—are not funded through the CDBG-DR program.



and identify opportunities to make their communities more resilient. All meetings were open to the public. An additional 125-plus Public Engagement Events attracted thousands of community members, who provided feedback on the NYRCR planning process and proposals. The NYRCR Program’s outreach has included communities that are traditionally underrepresented, such as immigrant populations and students. All planning materials are posted on the NYRCR Program’s website (www.stormrecovery.ny.gov/nyrcr), providing several ways for community members and the public to submit feedback on materials in progress.

Throughout the planning process, Planning Committees were supported by staff from the Governor’s Office of Storm Recovery (GOSR), planners from New York State (NYS) Department of State (DOS) and NYS Department of Transportation (DOT), and consultants from world-class planning firms that specialize in engineering, flood mitigation solutions, green infrastructure, and more.

With the January 2014 announcement of the NYRCR Program’s expansion to include 22 new localities, the program comprises over 2.7 million New Yorkers and covers nearly 6,500 square miles, which is equivalent to 14% of the overall State population and 12% of the State’s overall geography.

The NYRCR Program does not end with this NYRCR Plan. Governor Cuomo has allocated over \$650 million of funding to the program for implementing projects identified in the NYRCR Plans. NYRCR

THE NYRCR PLAN

This NYRCR Plan is an important step toward rebuilding a more resilient community. Each NYRCR Planning Committee began the planning process by defining the scope of its planning area, assessing storm damage, and identifying critical issues. Next, the Planning Committee inventoried critical assets

Communities are also eligible for additional funds through the program’s NY Rising to the Top Competition, which evaluates NYRCR Communities across eight categories, including best use of technology in the planning process, best approach to resilient economic growth, and best use of green infrastructure to bolster resilience. The winning NYRCR Community in each category will be allocated an additional \$3 million of implementation funding. The NYRCR Program is also working with both private and public institutions to identify existing funding sources and create new funding opportunities where none existed before.

The NYRCR Program has successfully coordinated with State and Federal agencies to help guide the development of feasible projects. The program has leveraged the Regional Economic Development Council’s State Agency Review Teams (SARTs), comprised of representatives from dozens of State agencies and authorities, for feedback on projects proposed by NYRCR Communities. The SARTs review projects with an eye toward regulatory and permitting needs, policy objectives, and preexisting agency funding sources. The NYRCR Program is continuing to work with the SARTs to streamline the permitting process and ensure shovels are in the ground as quickly as possible.

On the pages that follow, you will see the results of months of thoughtful, diligent work by NYRCR Planning Committees, passionately committed to realizing brighter, more resilient futures for their communities.

in the community and assessed the assets’ exposure to risk. On the basis of this work, the Planning Committee described recovery and resiliency needs and identified opportunities. The Planning Committee then developed a series of comprehensive reconstruction and resiliency



strategies, and identified projects and implementation actions to help fulfill those strategies.

The projects and actions set forth in this NYRCR Plan are divided into three categories. The order in which the projects and actions are listed in this NYRCR Plan does not necessarily indicate the NYRCR Community's prioritization of these projects and actions. **Proposed Projects** are projects proposed for funding through a NYRCR Community's allocation of CDBG-DR funding. **Featured Projects** are projects and actions that the Planning Committee has identified as important resiliency recommendations and has analyzed in depth, but has not proposed for funding through the NYRCR Program. **Additional Resiliency Recommendations** are projects and actions that the Planning Committee would like to highlight and that are not categorized as Proposed Projects or Featured Projects. The Proposed Projects and Featured Projects found in this NYRCR Plan were voted for inclusion by official voting members of the Planning Committee. Those voting members with conflicts of interest recused themselves from voting on any affected projects, as required by the NYRCR Ethics Handbook and Code of Conduct.

NYRCR Shandaken and Hardenburgh is eligible for up to \$6.0 million in CDBG-DR implementation funds.³

While developing projects for inclusion in this NYRCR Plan, Planning Committees took into account cost estimates, cost-benefit analyses, the effectiveness of each project in reducing risk to populations and critical assets, feasibility, and community support. Planning Committees also

considered the potential likelihood that a project or action would be eligible for CDBG-DR funding. Projects and actions implemented with this source of Federal funding must fall into a Federally-designated eligible activity category, fulfill a national objective (meeting an urgent need, removing slums and blight, or benefiting low to moderate income individuals), and have a tie to the natural disaster to which the funding is linked. These are among the factors that the Governor's Office of Storm Recovery will consider, in consultation with local municipalities and nonprofit organizations, when determining which projects and actions are best positioned for implementation.

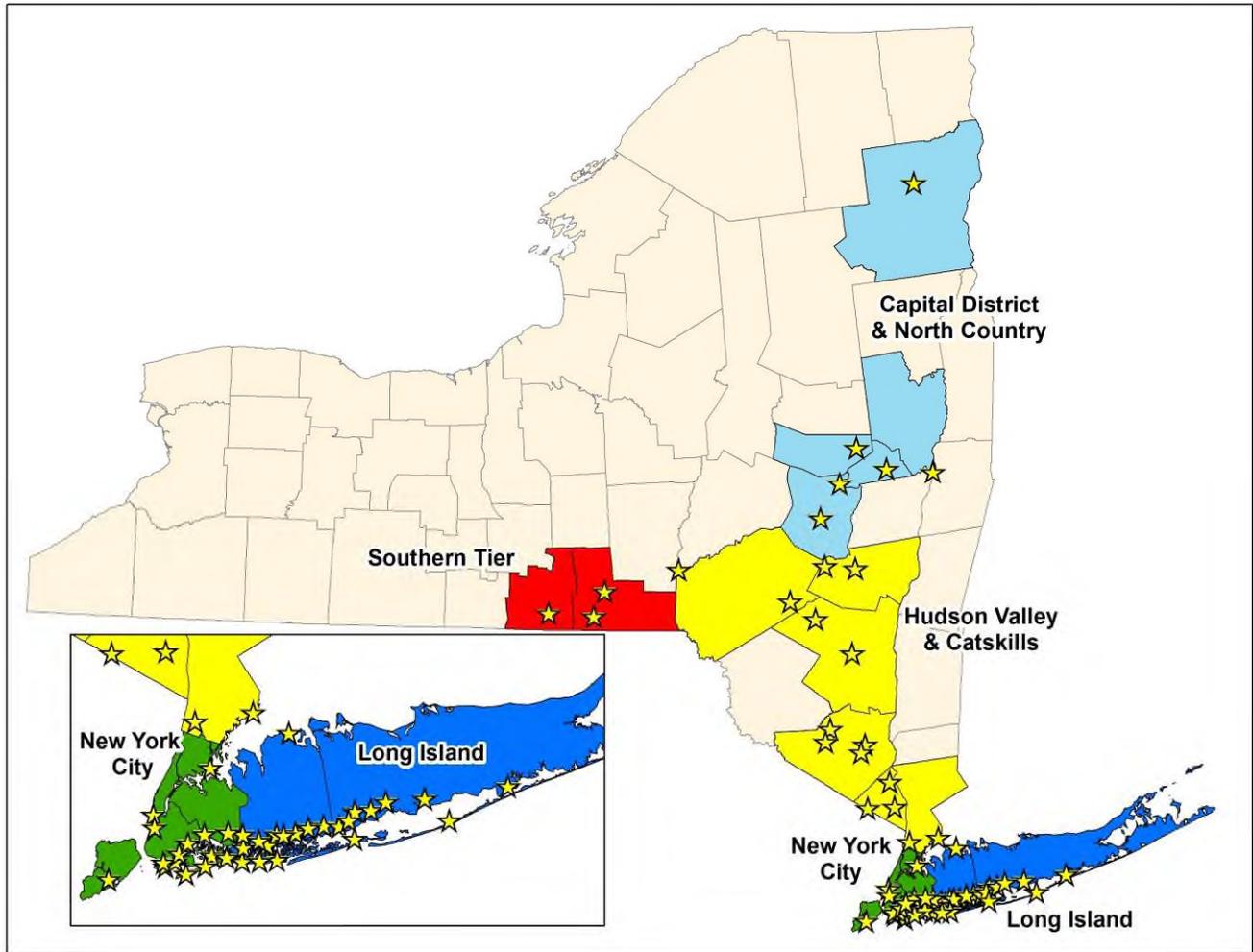
The total cost of Proposed Projects in this NYRCR Plan exceeds the NYRCR Community's CDBG-DR allocation to allow for flexibility if some Proposed Projects cannot be implemented due to environmental review, HUD eligibility, technical feasibility, or other factors. Implementation of the projects and actions found in this NYRCR Plan are subject to applicable Federal, State, and local laws and regulations, including the Americans with Disabilities Act (ADA). Inclusion of a project or action in this NYRCR Plan does not guarantee that a particular project or action will be eligible for CDBG-DR funding or that it will be implemented. The Governor's Office of Storm Recovery will actively seek to match projects with funding sources.

In the months and years to follow, many of the projects and actions outlined in this NYRCR Plan will become a reality helping New York not only to rebuild, but also to build back better.

³ The following localities' allocations comprise the NYRCR Community's total allocation: Town of Shandaken - \$3.0 million; Town of Hardenburgh - \$3.0 million



NYRCR COMMUNITIES⁴



Find out more at: StormRecovery.ny.gov/Community-Reconstruction-Program

⁴ Note: map includes those NYRCR Communities funded through the CDBG-DR program, including the NYRCR Communities announced in January 2014.



TABLE OF CONTENTS

FOREWORD i

NYRCR COMMUNITIESiv

EXECUTIVE SUMMARY xi

Section I. Community Overview 1

Planning process overview 3

Public engagement and outreach 4

Review of existing plans and studies..... 4

Inventory of critical community facilities 4

Risk assessment for critical assets 4

Development of community vision and goals..... 4

Identification of critical issues, needs, and opportunities..... 4

Identification of potential projects..... 5

Project analysis..... 5

Description of Storm Damage.....8

Repeat Flood Events and Damage – An Overview..... 8

In Conclusion..... 11

A profile of our towns 15

The link between land use and key issues..... 17

Housing..... 17

Infrastructure and Facilities..... 18

Economics..... 20

Critical Issues..... 21

Relationship of the Community Reconstruction Plan to Regional Plans 23

Review of Existing Plans and Studies..... 24

Section II. Assessment of Risk and Needs..... 31

Description of Community Assets and Assessment of Risk..... 31

Introduction and Overview 31

Inventory Process..... 31

Description of Community Assets..... 36

Assessment of Needs and Opportunities 60

Balancing Environmental Conservation with Community Protection 60

Community Planning and Capacity Building..... 61

Section III. Reconstruction and Resiliency Strategies 71

Section IV. Implementation – Project Profiles 91

Initial Project Identification 91

Preliminary Project Analysis..... 91

Detailed Analysis and Final Project Selection 91



Shandaken Proposed Projects 92

Backup Power Generator – Fixed Installation 92

Little Peck Hollow Road Bridge 95

Lower Birch Creek Road Bridge..... 98

Muller Road Bridge..... 101

Pantherkill Road Bridge..... 104

Peck Hollow Road Bridge..... 107

Improved Data Collection and Storage System to include Elevation Monuments..... 110

Town of Shandaken Municipal Complex..... 112

Fire District and Emergency Service Improvements..... 114

Phoenicia Stream Restoration and Recreation Trail – Phase 2: Realignment and Replacement of Bridge Street Bridge 116

Shandaken Featured Projects 118

Lower Muddy Brook Slope Repair..... 118

Pantherkill Road Slope Repair..... 121

Silver Hollow Slope Stabilization 123

Upper Muddy Brook Slope Repair..... 125

Phoenicia Water System Upgrade 127

Emergency Power Generator Hookup Improvements..... 128

Mt. Tremper Car Bridge – Phase 1..... 131

Mt. Tremper Car Bridge – Phase 2..... 134

Phoenicia Stream Restoration and Recreation Trail – Phase 1: Land Acquisition, Property Relocation, and Park Development..... 137

Phoenicia Stream Restoration and Recreation Trail – Phase 3: Streambank Restoration..... 139

Phoenicia Stream Restoration and Recreation Trail – Phase 4: Construction of Amphitheater and Trail Connection(s) 142

Home and Business Flood Mitigation Improvements 144

Building Department Digital Upgrades 147

Hardenburgh Proposed Projects 149

Ploutz Road and Millbrook Road Bridge Construction 149

Millbrook Road Bridge Replacement..... 151

Hinckley Bridge Replacement..... 153

Millbrook Road Bridge Abutment Stabilization..... 155

Rider Hollow Road at Todd Mountain Road Culvert Replacement..... 157

Grants Mill Covered Bridge Relocation (Millbrook Creek crossing) 160

Beaverkill Road Embankment Stabilization..... 163

Backup Power Generators – Fixed Installation 165

Old Baker Road and Rider Hollow Road (intersection) Culvert/Bridge Replacement 167

Broadband Service Extension 169

Hardenburgh Featured Projects 171

Upper Drybrook Road Bank Stabilization and Stream Bed Management..... 171



Section V. Additional Materials.....	175
Additional Resiliency Recommendations	175
Master Table of Projects	177
Public Engagement Process.....	187
<i>Communications Strategy: A Blueprint for Public Engagement</i>	<i>187</i>
<i>Information Gathering through Grassroots Input</i>	<i>187</i>
<i>Engagement Through Public Meetings</i>	<i>189</i>
<i>What We Heard, What We Learned.....</i>	<i>190</i>
<i>Getting the Word Out.....</i>	<i>193</i>
<i>Shandaken Community Asset Inventory</i>	<i>194</i>
<i>Hardenburgh Community Assets Inventory</i>	<i>214</i>
<i>Risk Assessment Data and Methodology.....</i>	<i>221</i>
Glossary.....	227
End Notes	229



LIST OF TABLES

Table 1. Review of Existing Plans and Studies.....	25
Table 2. Asset Categories.....	32
Table 3. Economic Assets	54
Table 4. Health and Social Service Assets.....	56
Table 5. Infrastructure Assets	57
Table 6. Natural and Cultural Resource Assets	58
Table 7. Strategy 1-Towns of Shandaken and Hardenburgh.....	74
Table 8. Strategy 2-Towns of Shandaken and Hardenburgh.....	78
Table 9. Strategy 3-Towns of Shandaken and Hardenburgh.....	81
Table 10. Strategy 4-Towns of Shandaken and Hardenburgh	84
Table 11. Strategy 5-Towns of Shandaken and Hardenburgh	87
Table 12. Additional Resiliency Recommendations	175
Table 13. Master Project Table - Shandaken.....	178
Table 14. Master Project Table - Hardenburgh.....	184
Table 15. Vulnerability Based on Impact on Service or Function of Community Assets	222
Table 16. Risk Score Ranges.....	225



LIST OF FIGURES

Figure 1. Shandaken Overview	6
Figure 2. Hardenburgh Overview	7
Figure 3. Shandaken Post-Irene Roadway Damage Points.....	12
Figure 4. Shandaken Post-Irene Roadway Closures.....	13
Figure 5. Hardenburgh Post-Irene Roadway Closures.....	14
Figure 6. Shandaken Population Distribution	16
Figure 7. Hardenburgh Employment.....	20
Figure 8. Shandaken Employment.....	21
Figure 9. GIS Web-mapping Portal (NYRCR Town of Shandaken).....	32
Figure 10. Shandaken Risk Areas.....	34
Figure 11. Hardenburgh Risk Areas.....	35
Figure 12. Shandaken Economic Assets	37
Figure 13. Shandaken Health and Social Services Assets.....	39
Figure 14. Hardenburgh Health and Social Services Assets.....	40
Figure 15. Shandaken Infrastructure Systems Assets.....	42
Figure 16. Hardenburgh Infrastructure Systems Assets.....	43
Figure 17. Shandaken Natural and Cultural Resource Assets.....	45
Figure 18. Hardenburgh Natural and Cultural Resource Assets.....	46
Figure 19. Shandaken Asset Risk Scores.....	52
Figure 20. Hardenburgh Asset Risk Scores.....	53
Figure 21. Location Map of Backup Generator	92
Figure 22. Location Map of Little Peck Hollow Road Bridge	95
Figure 23. Location Map of Lower Birch Creek Road Bridge	98
Figure 24. Location Map of Muller Road Bridge	102
Figure 25. Location Map of Pantherkill Road Bridge.....	104
Figure 26. Location Map of Peck Hollow Road Bridge	107
Figure 27. Location Map of Lower Muddy Brook Slope Repair.....	118
Figure 28. Location Map of Pantherkill Road Slope Repair	122
Figure 29. Location Map of Silver Hollow Slope Stabilization	123
Figure 30. Location Map of Upper Muddy Brook Slope Repair	125
Figure 31. Location Map of Phoenicia Water System	128
Figure 32. Location Map of Mt. Temper Car Bridge – Phase 1	131



Figure 33. Location Map of Mt. Temper Car Bridge – Phase 2	134
Figure 34. Location Map of Phoenicia Stream Restoration and Recreation Trail.....	139
Figure 35. Location Map of Millbrook Bridge	150
Figure 36. Location Map of Hinkley Road Bridge Replacement.....	154
Figure 37. Location Map of Rider Hollow Box Culvert.....	158
Figure 38. Location Map of Grants Mill Covered Bridge Relocation.....	160
Figure 39. Location Map of Upper Drybrook Road Streambank Mitigation	172
Figure 40. Shandaken Recovery Support Function Prioritization Public Meeting 1	190
Figure 41. Shandaken Recovery Support Function Prioritization Public Meeting 2	191
Figure 42. Shandaken Surveys Results (Electronic, Hard-Copy, Interviews).....	191
Figure 43. Hardenburgh Recovery Support Function Prioritization Public Meetings 1 (left) and 2 (right)	192
Figure 44. Hardenburgh Surveys Results (Electronic, Hard-Copy, Interviews).....	192



EXECUTIVE SUMMARY

OVERVIEW

The Towns of Shandaken and Hardenburgh are located in Ulster County, New York, in the Mid-Hudson Region. The combined area of the Towns of Shandaken and Hardenburgh comprise 201 square miles amid the Catskill Mountains, affording residents and visitors with plentiful opportunities for both active and passive recreation. The Town of Shandaken has 12 population centers (hamlets) with approximately 3,085 residents. It is the only Town wholly located within the Catskill State Park and the New York City (NYC) watershed. Public lands owned by both New York State (NYS) and NYC comprise nearly 80% of the Town. Meanwhile, Hardenburgh has a population of 238 people. Five of the Catskill peaks are within or border the Town of Hardenburgh, where 52% of the land is publically owned.

In August and September 2011 Hurricane Irene and Tropical Storm Lee pommelled the Towns of Shandaken and Hardenburgh. The impacts and challenges caused by these storms and resultant flooding were significant and affected the lives of all segments of the local community and the region at large; considerable recovery goals remain more than two years after the flooding. In both Towns, flooding wreaked havoc on roadways and transportation infrastructure. The devastating

effects of Irene forced the evacuation of over 200 people from the area, including residents of Shandaken and Hardenburgh. Displaced residents from the Towns were directed to an overnight shelter that had been set up at Belleayre Mountain, where beds, hot meals, and medical services were provided. In total, Ulster County experienced over \$10 M in damages; Shandaken marked Irene as the largest storm on record.

To address the significant lasting impacts of these devastating storms, and to establish long-term community viability and resiliency, Shandaken and Hardenburgh collaborated to develop a NY Rising Community Reconstruction (NYRCR) Plan. Beyond simply rebuilding, the NYRCR Shandaken/Hardenburgh Plan aims to build back better by increasing the Towns' resiliency against future flooding. Ultimately, saving lives; protecting properties; advancing economic development; and improving quality of local life, are envisioned outcomes. Through the NYRCR Program, each Town was allocated up to **\$3 million** to implement reconstruction and resiliency. These projects have been identified through a community-driven process and extensive analytical vetting that is detailed in the Plan.

CRITICAL ISSUES AND CHALLENGES

Critical issues that consistently arose in public meetings and through personal interviews and surveys in both Towns include the current inadequacy of infrastructure as well as communications reliability and economic viability. As the roadways and infrastructure are built adjacent to the streams and rivers, they are vulnerable to the frequent flood events that result

in damage and road closures. The result – after flood events, residents in these communities are often cut off from routes that ordinarily connect them to critical regional facilities and services. Moreover, during flood conditions, emergency response is severely hampered stranding vulnerable residents and business owners.

Other contributing factors to the severity of storm



impacts include aging, under-sized, and under-designed transportation and stormwater infrastructure is prevalent throughout both towns. These issues, combined with the location of critical asset and the mountainous terrain, limit the developable areas in the Towns and mitigation options.

Meanwhile, limited cell and Internet service contributes to physical and psychological isolation, which can be dangerous during emergencies and inadequate telecommunications also limits residents’ ability to access critical information about how to prepare for disasters, avoid danger, and seek assistance following disasters.

Relative to the need for expanded opportunities for economic development, there is great concern

about the limited land remaining for development for new residential or commercial uses. Additionally, there are restricted options for the relocation of assets currently in flood-prone areas. Collectively, these factors, coupled with an increasingly aging local population, deter economic growth and an adequate local workforce. Finally, the region’s popularity as a second home and vacation destination provides key patrons for local businesses, but also creates unpredictability and seasonal fluctuations in sales revenue and worker income. These issues have been considered in the development of the NYRCR Shandaken/Hardenburgh Plan.

COMMUNITY-DRIVEN PROCESS

The planning process was led by the NYRCR Shandaken/Hardenburgh Committee, comprised of local residents, business owners, and community leaders. The NYRCR Shandaken/Hardenburgh planning process was built on a community vision

statement that was created by the Committee with input from the public and local stakeholders. This vision provided the focus for identifying strategies and developing projects that would enable each Town to not only to survive, but to thrive.

Community Vision

Through collaborative discussions, stakeholder engagement, review of existing plans and studies, and a focused intention towards holistic community recovery, the Committee adopted the following vision to guide the recovery and resiliency efforts of the Towns of Shandaken and Hardenburgh: To rebuild stronger, safer, and more vibrant communities that will be more resilient in the face of future disasters by planning and developing actions to secure funding and other resources

The planning process included several crucial components, including ongoing public outreach, reviews of existing studies, a risk assessment of critical assets, identification of critical needs and opportunities, a cost-benefit analysis, and ultimately, identification of proposed projects and implementation strategies. The vision statement provided a guide for all aspects of the planning process.

Throughout the process, the public was informed

and encouraged to attend and participate in Committee meetings and public information events by targeted mailings, posters displayed at local businesses, social media via the Town website, Town cable TV, Facebook, email blasts, and local newspapers. Also, outreach was provided at two popular local festivals, the two-day Shandaken Fall Fest and the Cauliflower Festival at which NYRCR booths were provided to provide information about the program and three public meetings. The public meetings were aired on local the Town’s cable TV



station to ensure that the public had an opportunity

to be informed of the process.

FINAL PLAN AS A BLUEPRINT FOR IMPLEMENTATION

Based on the needs identified during the planning process, and an assessment of the vulnerability of critical assets in Shandaken and Hardenburgh, the Committee created a list of proposed and featured projects to increase resiliency against future disasters. These projects are listed below, but are not ranked in any priority order. Proposed Projects are projects proposed for funding through a NYRCR Community’s allocation of CDBG-DR funding. Featured Projects are projects and actions that the

Planning Committee has identified as important resiliency recommendations and has analyzed in depth, but has not proposed for funding through the NYRCR Program. Additional Resiliency Recommendations are projects and actions that the Planning Committee would like to highlight and that are not categorized as Proposed Projects or Featured Projects.

SHANDAKEN PROJECT LIST	
Project Name	Short Project Description
Shandaken Proposed Projects	
Backup Power Generator for Shandaken Town Hall	Fixed Installation of back-up propane generators for Shandaken town
Little Peck Hollow Rd Bridge	Rebuild and improve little peck hollow road bridge to improve flow capacity and convey flood waters.
Lower Birch Creek Rd Bridge	Realign the Lower Birch Creek Road and make necessary upgrades to the bridge structure in order to alleviate the existing roadway flooding condition.
Muller Rd Bridge	Rebuild and improve Muller Road Bridge and bridge abutment to improve flow capacity and convey flood waters.
Pantherkill Rd Bridge	Replace the existing Pantherkill Road bridge and bridge abutment over the Pantherkill stream to improve flow capacity and convey flood waters.
Peck Hollow Rd Bridge - Peck Hollow	Rebuild and improve Peck Hollow Road Bridge over Peck Hollow Creek. This project would replace the existing bridge and abutment to improve flow capacity and convey flood waters.
Improved Data Collection and Storage System to include Elevation Monuments	Install elevation monuments/markers in public locations in each hamlet to lower costs associated in elevation certificate data collection for flood prone structures
Municipal Complex	Construct a new town complex including relocating and co-locating Town Hall, highway department, emergency management services (EMS) and dog shelter out of the floodplain: the project removes these critical services from their currently damage-prone location in the flood plain to a new site on State Route 28.
Fire District and Emergency Service Improvements	Provide funding for up to three volunteer fire districts for unique upgrades and relocate the EMS ambulance garage out of the flood plain.
Phoenicia Stream Restoration and Recreation Trail - Phase 2: Realignment and Replacement of Bridge St. Bridge	Replace the existing Bridge Street Bridge with a longer and higher elevated structure that reduces the number of in-stream support structures, reduces debris and sediment buildup, lowers the flood plain above and below the bridge, and allows for more stream capacity during high water events.



SHANDAKEN PROJECT LIST	
Project Name	Short Project Description
Shandaken Featured Projects	
Lower Muddy Brook Slope Repair	This project will repair and stabilize Lower Muddy Brook slope and embankment near the intersection of Muddy Brook and Woodland Valley Roads.
Pantherkill Rd. Slope Repair	This project will repair and stabilize the Pantherkill road slope and embankment along the south side of Pantherkill road for a length of approximately 60 feet.
Silver Hollow Slope Stabilization	This project will repair and stabilize the Silver Hollow slope and embankment near 19 Silver Hollow Road in the hamlet of Chichester.
Upper Muddy Brook Slope Repair	This project will repair and stabilize the Upper Muddy Brook slope and embankment in the approximate location of 131 Muddy Brook Road.
Phoenicia Water System Upgrades	Upgrade the Phoenicia water system to increase capacity and make it more flood-proof and resilient during high water events.
Emergency Power Generation Hookup Improvements	Outfit lodging establishments, restaurants and gas stations (and perhaps other appropriate buildings) with quick connect capability to hook up generators after floods to ensure that each hamlet has locations with electricity for people to remain safe and access accommodations, showers, food and water.
Mt. Tremper Car Bridge - Phase 1	Remove and replace the Mt. Tremper car bridge with a pedestrian crossing. Phase 1: bridge removal
Mt. Tremper Car Bridge - Phase 2	Remove and replace the Mt. Tremper car bridge with a pedestrian crossing. Phase 2: pedestrian bridge design and replacement
Phoenicia Stream Restoration and Recreation Trail - Phase 1: Land Acquisition, Property Relocation; and Park Development	Acquire properties adjacent to the Bridge Street Bridge and create a park with associated amenities and flood protection measures. This phase 1 action is part of a greater stream restoration project that includes bridge replacement, a recreational trail, and streambank restoration.
Phoenicia Stream Restoration and Recreation Trail - Phase 3: Streambank Restoration	Stream restoration and gravel harvesting near the Bridge Street Bridge to remove impediments and debris accumulation, increase flood protection for neighboring properties, improve stream function and conveyance and increase safety for residents and visitors. This phase 3 action is part of a greater project that includes bridge replacement, a recreational trail, and reduction in flood elevation.
Phoenicia Stream Restoration and Recreation Trail - Phase 4: Construction Of Amphitheater and Trail Connection(s)	Construct an amphitheater, trail, and trail network connections near the Bridge Street Bridge. This phase 4 action is part of a greater stream restoration project that includes bridge replacement, creation of a public park, and streambank restoration.
Building Department Digital Upgrades	Plan and implement digital upgrade for the building department and provide GIS training for local officials to allow electronic post-storm building inspections and reports from the field and to increase the community CRS numbers.
Home and Business Flood Mitigation Improvements	Construct flood mitigation improvements for houses, businesses and assets located in hazard-prone areas to protect structures from future damage. Where appropriate, this may also include the acquisition and demolition of structures located in the hazard-prone areas to protect from future damage.



HARDENBURGH PROJECT LIST	
Project Name	Short Project Description
Hardenburgh Proposed Projects	
Ploutz Rd. and Millbrook Rd Bridge Construction	This project would construct an improved stream crossing structure that will replace two existing culverts with a 20' span bridge to cross an unnamed tributary of Millbrook Creek.
Millbrook Rd. Bridge Replacement	This project will replace the existing bridge with a 20' span bridge at the Millbrook Road Belleayre Stream crossing.
Hinckley Bridge	The project would replace the existing Hinckley Road Bridge at the Belleayre Stream crossing.
Millbrook Rd. Bridge Abutment Stabilization	The project would correct under-abutment scour on the west abutment of the Millbrook Rd. Bridge to stabilize the existing structure, thus ensuring safe mobility and access before, during and after a flood event.
Rider Hollow Rd/ Todd Mountain Rd. (intersection) Bridge replacement	Replace an antiquated bridge with a stream crossing structure capable of conveying larger flows.
Beaverkill Rd. Embankment Stabilization	The proposed road embankment stabilization project addresses erosion protection, stream restoration, and embankment repair, and would restore the stream to its pre-Irene channel conditions. Improvements would be made to the banks of Beaverkill Creek along Beaverkill Road, and would increase access, improve stream function, and increase safety for vehicular travel through the area.
Backup Power Generators - Fixed installation	Install back-up propane generators for key community facilities to ensure the provision of essential services during a disaster. Facilities slated for the improvements include the Town Hall and the two Highway Garages.
Grant's Mill/ Millbrook Covered Bridge Relocation	Relocation of the Millbrook Covered bridge from its present location to a "dry dock" location approximately 300 feet to the east and placing it on concrete abutments. - Its current abutments are in a seriously precipitous condition. The Covered Bridge is on the NYS and National Historical Site list and this project would protect the historic structure, mitigates water surface elevation issues in the vicinity, and reduces tailwater conditions on the Mill Brook Road Bridge.
Old Baker Road and Rider Hollow Road intersection Bridge Replacement	Replace the antiquated bridge on Rider Hollow Road with a new concrete slab bridge. This will alleviate the existing roadway flooding condition therefore have safety and mobility benefits. The new bridge will convey the 100-year design flow without roadway overtopping and will allow floating debris to pass through more easily.
Hardenburgh - Broadband Service Extension	Support Broadband service extension in the Beaverkill Valley, bringing broadband internet and improved communication services to the Beaverkill Valley on the south side of the mountain dividing the Town of Hardenburgh, currently an area unserved by broadband.
Hardenburgh Featured Projects	
Upper Drybrook Road Stream Bed Management	The stream has deposited a large gravel bar and threatens to encroach into the road cutting off ingress/egress by the residents upstream. This project will create increased access, improved stream function and increased safety for vehicular travel.
Beaverkill Road Stream and Stream Bank Restoration	Restore the Beaverkill Creek corridor and embankments back to its pre-Irene channel in the reach along Beaverkill Road,



HARDENBURGH PROJECT LIST

Project Name	Short Project Description
Upper Drybrook Road Bank Stabilization and Stream Bed Management	Improvements to address road embankment failure 400 feet up from the intersection of Drybrook Rd. and Erickson Rd. The project calls for earthen and heavy stacked rock embankment fortification and stream bed management.

Towns of Shandaken and Hardenburgh cover an immense geographic area. Projects identified in this Plan reflect the fiscal practicality of the residents who deal must with the basic issues of protecting the roads, infrastructure, and communications that provide lifelines to their respective communities. Community stewards bear the responsibility of balancing environmental protection with private land ownership and use. The residents of Shandaken and Hardenburgh are committed to improving their Towns by providing a first-line of defense against natural hazards to preserve a way of life for themselves and future generations with the support of the NYRCR plan which provides a blueprint for increased resiliency of their community.

SECTION I
Community
Overview





Courtesy of Tetra Tech



Section I. COMMUNITY OVERVIEW

From soothing respite...

On a normal day in the quaint towns of Shandaken and Hardenburgh, the streams provide a quiet respite from the daily routine for residents and visitors alike. The quiet breezes filtering through the trees enhance the sounds of the rambling creeks. The surrounding mountains offer spectacular views and majestic backdrops to rural living and vacationing. Both towns have a multitude of opportunities to enjoy the majestic beauty of nature. But occasionally nature brings its more extreme side to this otherwise tranquil region; sometimes in the form of snow and ice but in this case, in the form a massive hurricane.

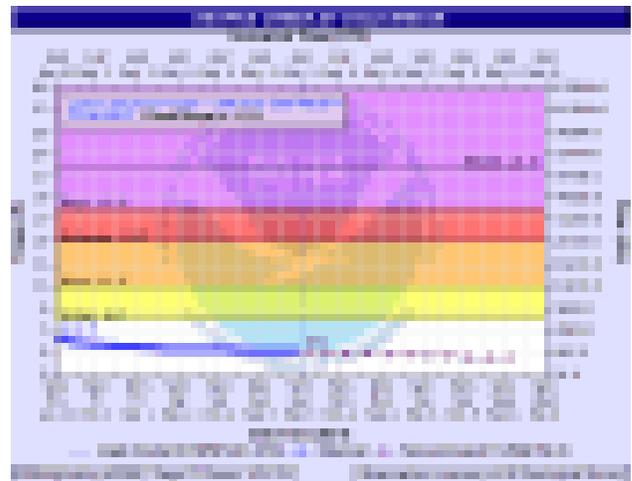
... to a raging current

In late August of 2011, state, county and local officials were watching in earnest as Hurricane Irene made her way north along the east coast of the United States. By August 24th, it had become apparent, with most forecast models predicting the storm’s impact to include much of New York, that preparations were appropriate. State and county warnings and information were distributed to local communities and regional news outlets were spending more time every day discussing the possible impacts of this monster storm. Citizens watched closely and made arrangements to move from areas prone to flooding. On August 27 warnings were received from Ulster County and the National Weather Service indicating the possibility of flooding that could impact the region. As residents slept, the storm arrived.

Having spared New York City and Long Island from the worst impacts, Hurricane Irene moved into the lower Hudson Valley. As she rose into the higher, cooler air of the upper atmosphere, pushed by the Catskill Mountains, her clouds cooled. Unable to hold the copious moisture contained in this massive

storm, torrential record-breaking rain began to fall. In Shandaken, by 5:50 am the level of the Esopus Creek at the Cold Brook stream gage was 9.73 feet. The gage is the direct indication of the amount of water to come. In this area, flash floods are too common an occurrence but on this day, no one could predict the havoc to ensue.

By 6:00 am, just 10 minutes from the first indication that a critical situation was upon the Town, the town officials declared a state of emergency. Within an hour the stream would rise almost a foot, and by midday it would have risen almost 13 feet. The creek became a raging current; water violently churning over streets, destroying culverts, and



Cold Brook Action Stages - Courtesy of NOAA

carrying away bridges, leaving gaping holes and deep gouges in the landscape. Residents were now completely cut off from civilization without telecommunication, or access to food, clean water, or medical services. During this time the Town of Hardenburgh, nestled deep within several valleys, its roads crisscrossing the forest, was transformed into a series of islands. Citizens could no longer reach the local hospital or supermarket in Margaretville. Around the entire region, roads and culverts were changed into water-logged gravel ditches while streams turned into roaring currents.



The high water lasted only just more than a day; however the damage that had been done would last for months and years.

...to building back better

In true testament to their resilience, the residents began the reconstruction of their communities in earnest; using all-terrain vehicles to check on neighbors, deliver supplies and medicine and reconnect their community. In the weeks that followed, state assistance arrived to augment local efforts to establish temporary bridges or rebuild bridges and roads. Volunteers by the hundreds assisted with food distribution and cleaning flooded homes. This was not the first time this community had faced a flooding disaster, and every resident knew it would not be the last. Showing the resolve and sense of community that makes their hometown one with heart and compassion, they began to consider how to rebuild stronger.

The Cold Brook Flood Gage is used as an indicator for Flood Action – a 9 foot reading with a forecast of rising water level triggers an Ulster County Flood Watch

Working with New York State leaders, with assistance from FEMA, the towns have begun to map out plans to improve their communities: making them stronger and more resilient. Their desire continues to be able to live amongst the beauty of nature. Their goal is be able to withstand the next time nature brings its extreme conditions to their doorsteps – safer, stronger and more resilient.



Town of Shandaken repairs a washout after Hurricane Irene and Tropical Storm Lee - Courtesy of Tetra Tech

THE DISASTERS

In the fall of 2011, back-to-back storms Hurricane Irene and Tropical Storm Lee became the most recent in a long history of flood events in the Towns of Shandaken and Hardenburgh, New York. The impacts and challenges caused by these storms and resultant flooding were significant and affected the lives of all segments of the local community and the region at large. Despite extensive collaboration between the community, the state, and agency partners to use available response and recovery resources, including inspired efforts by local volunteers, considerable recovery goals remain more than two years after the flood.

To address the significant lasting impacts and to establish long-term community viability and resiliency, the Towns of Shandaken and Hardenburgh have undertaken the important task of collaborating for the

development of a New York Rising Community Reconstruction (NYRCR) Plan. Under the guidance and funding of the NYRCR Program, the completed NYRCR Plan aims to address the most critical needs and impacts from Hurricane Irene and Tropical

Storm Lee while also identifying strategies and priorities for future resiliency, improved quality of life, community vibrancy, and economic growth.



Driven by stakeholder input, a local Planning Committee (Committee) has managed the planning process with support from the State of New York and an assigned Consultant Team. Over a period of nine months, the Committee has engaged and worked with all segments of the community to develop a comprehensive recovery and reconstruction strategy. This Plan represents the culmination of the NYRCR Shandaken/Hardenburgh Plan development process and presents the established community vision, goals, projects, initiatives, and implementation strategies to further recovery and achieve greater resiliency. In

addition, the following sections include the results of preliminary public outreach initiatives; community analysis; identification of issues, needs, and opportunities; and a review of the methodologies used in identifying and prioritizing strategies and projects for implementation.

Planning process overview

This focused planning process was guided by a steering Committee consisting of local residents, business owners, and community leaders. The Committee worked with an assigned team of consultants to collaboratively manage all components of the final NYRCR Shandaken/Hardenburgh Plan. Consultant partners provided technical expertise in all areas of planning, recovery, and development, and supported the Committee in developing materials, conducting public outreach, performing detailed analyses, and

RECOVERY SUPPORT FUNCTIONS

Community Planning and Capacity Building

Focuses on the community’s ability to implement storm recovery activities and to plan how to mitigate the effects of future storms.

Economic Development

Focuses on returning economic and business activities to healthy states following a disaster.

Health and Social Services

Focuses on identifying key needs that are critical to protecting the health and well-being of all residents from the effects of a post-disaster environment, particularly vulnerable populations.

Housing

Focuses on the provision of safe and adequate housing for current and future residents.

Infrastructure

Focuses on replacing or improving infrastructure to respond to disasters.

Natural and Cultural Resources

Focuses on leveraging these resources while protectina man-made assets.

identifying and prioritizing projects for implementation.

Throughout the entire process, the Committee has been supported by New York State Department of State (NYS DOS) planning staff and representatives from the NYRCR Program.

The NYRCR Program is an implementation focused planning process that uses and builds on existing plans and studies to leverage prior work that could be used in development of the recovery plan. An initial, thorough review of existing planning documents has been conducted to identify areas of completed planning

work as well as those areas that need additional analysis and effort. Plan components, supporting analysis, and subsequent recommendations focused on the six Recovery Support Functions as defined by the National Recovery Framework. The National Recovery Framework is a guide that enables effective recovery support to disaster-impacted States, Tribes, Territorial and local jurisdictions. It provides a flexible structure that enables disaster recovery managers to operate in a unified and collaborative manner. It also focuses on how best to restore, redevelop and revitalize the health, social, economic, natural and environmental fabric of the community and build a more resilient Nation. the National Disaster Recovery Framework defines core recovery principles, roles and responsibilities of recovery coordinators and other stakeholders, a coordinating structure that facilitates communication and collaboration among all



stakeholders, guidance for pre- and post-disaster recovery planning and; the overall process by which communities can capitalize on opportunities to rebuild stronger, smarter and safer.

Throughout the planning process, the Committee met regularly with the Consultant Team, NYS DOS planning staff, and the NYRCR Regional Lead. These meetings provided the venue for managing the overall process, assigning tasks, determining the direction of the plan, and ultimately selecting projects for prioritization. The NYRCR Planning Process included the following phases.

Public engagement and outreach

Public input was solicited and incorporated into the planning process through diverse and continuous methods to ensure maximum engagement.

Review of existing plans and studies

The planning process leveraged existing plans and studies to accelerate recovery, allow for informed decision-making, and place a greater focus on implementation.

Inventory of critical community facilities

All community facilities were identified and inventoried to ensure that essential community assets were incorporated into the Plan’s goals and direction.

Risk assessment for critical assets

Critical community assets were evaluated to determine the potential risk for damage or loss as a result of future disaster events.

Development of community vision and goals

The Towns of Shandaken and Hardenburgh

developed an overarching vision for their future as vibrant communities with increased resiliency to

flood events. The Committees generated a set of goals and ultimately strategies to guide the NYRCR Shandaken/Hardenburgh Plan’s development and support realization of the vision.

Identification of critical issues, needs, and opportunities

The NYRCR Shandaken/Hardenburgh Plan identifies the full range of issues,

needs, and project opportunities necessary to be addressed to achieve resiliency and community health and vibrancy. These factors include flood mitigation, damage and recovery needs, housing needs, economic development and business needs, and infrastructure needs among others. These needs, issues, and opportunities represent a combination of input from the Committee and public input garnered from a variety of public meetings and outreach.



Residents attend a NYRCR public meeting at Belleayre Ski Center - Courtesy of Tetra Tech



Relocation of the historic Grants Mill Bridge in Hardenburgh represents an opportunity to preserve the structure and reduce an obstruction at Millbrook Creek. Courtesy of Tetra Tech



Identification of potential projects

An initial list of potential projects was developed based on public input, community vision, key needs and opportunities, preliminary community analysis, and preliminary engineering analysis.

Project analysis

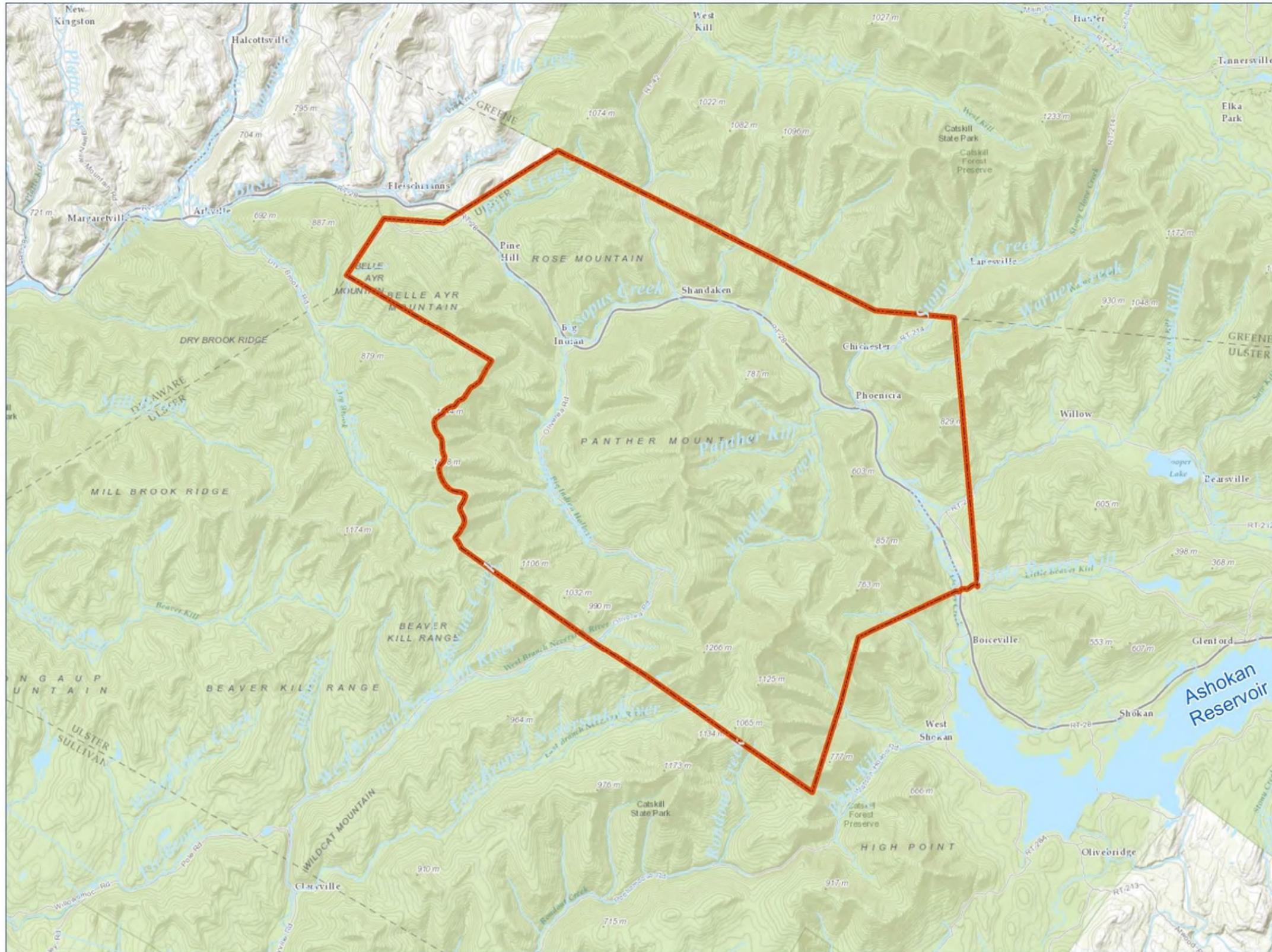
All projects identified were fully vetted through a series of detailed assessments including feasibility and cost-benefit analyses (among others) to verify the merit of each project and assist in prioritizing for implementation. Where feasible, projects were analyzed in a Hydrologic Engineering Centers River Analysis System (HEC-RAS) model to examine how they would affect overall Surface Water Elevation (SWE) and flooding in the community over time.

GEOGRAPHIC SCOPE OF THE PLAN

Based on a review of past events, the source of historical flooding, and the location of critical facilities impacted by flooding, the Committee agreed on a planning area bound by the municipalities of Shandaken and Hardenburgh to target the most flood prone areas of each community. Maps of the planning area are provided on the following pages.



NYRCR: TOWN OF SHANDAKEN, ULSTER COUNTY
Figure 1. Shandaken Overview



Legend

 Town of Shandaken/Planning Area

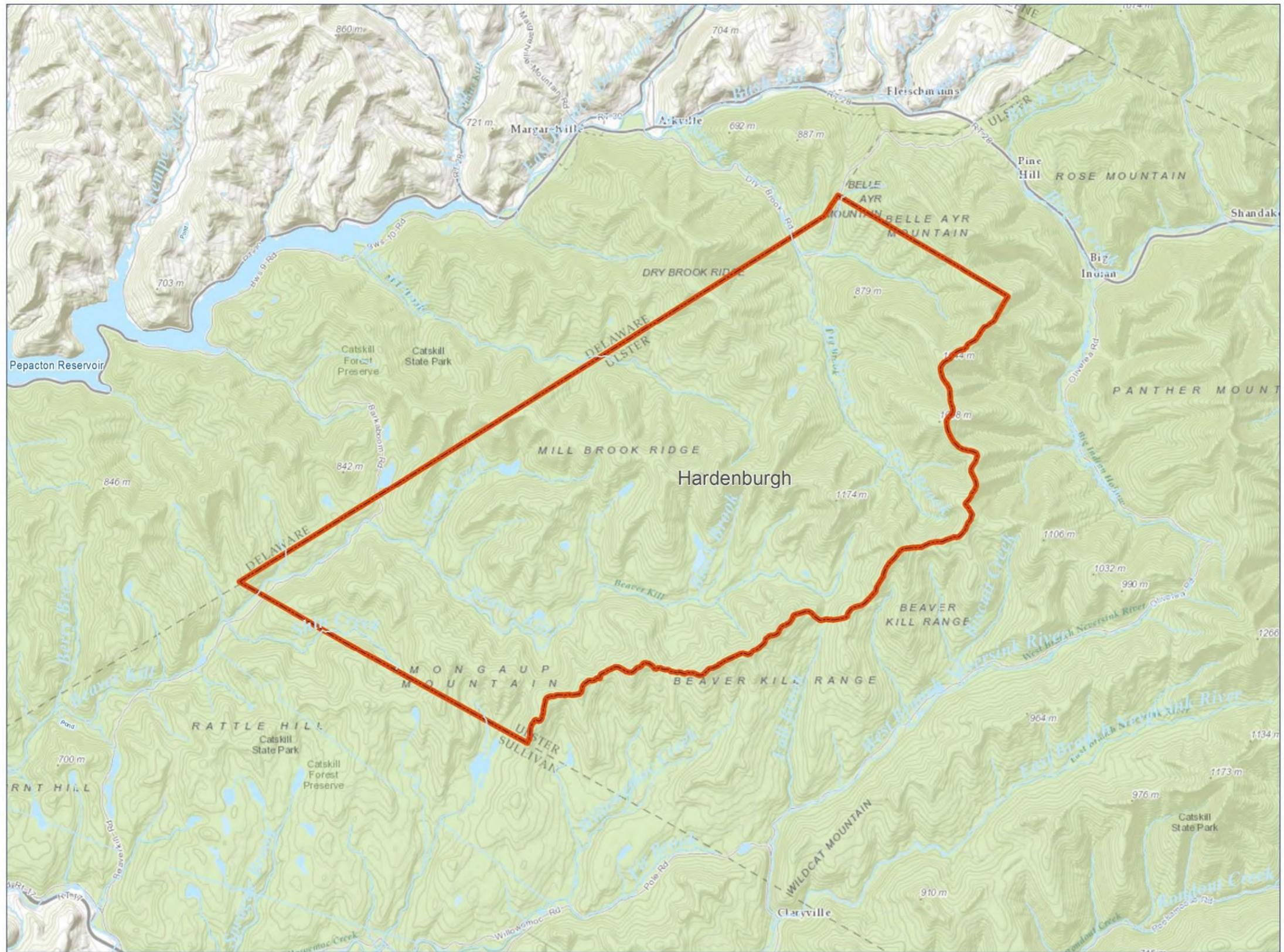
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Data Sources:
NYRCR
NYS DOS



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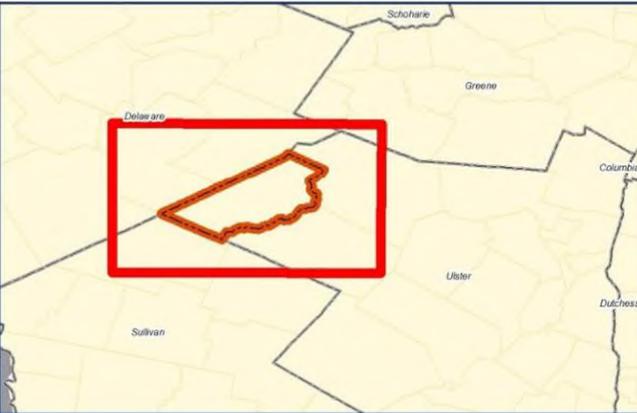


NYRCR: TOWN OF HARDENBURGH, ULSTER COUNTY
Figure 2. Hardenburgh Overview



Legend
 Town of Hardenburgh/Planning Area

This map is for reference only.
Data Sources:
NYRCR
NYS DOS



DESCRIPTION OF STORM DAMAGE

REPEAT FLOOD EVENTS AND DAMAGE – AN OVERVIEW

The Towns of Shandaken and Hardenburgh are vulnerable to flooding and have experienced devastating losses over the years. Between 1950 and 2012, Ulster County, where the towns are located, suffered 97 flood events for a total of \$12.3M in damage.

Recent history has shown that the Town of Shandaken can expect an average of seven episodes of major river flooding every 10 years. Since 1978, residents of Shandaken have submitted \$5,603,540.93 in flood insurance claims (Federal Emergency Management Agency [FEMA] National Flood Insurance Program [NFIP] Statistics, 2012). The majority of Shandaken’s development remains located in the valleys of Esopus Creek and its tributaries, which creates a high potential for significant future flood impacts.¹ The Town has indicated that the hamlets of Phoenicia, Mt. Pleasant, Allaben, Mt. Tremper, Oliveria, Shandaken, Chichester, and Woodland Valley have experienced extensive flooding resulting from riverine reaches in the Upper Esopus Watershed. Flood stages on the tributaries to Esopus Creek may be further elevated in the vicinity of the confluence with Esopus Creek. Flood stages may be particularly elevated in settings such as the hamlet of Phoenicia, where development occupies much of the available flood plain and the channel is confined. In Phoenicia, there are minimally elevated slopes along the Stony Clove Creek, which in times of elevated flood levels in the Esopus Creek, can lead to exacerbated flooding conditions. The consequence is locally enhanced inundation in the hamlet. Main Street, Bridge Street, High Street, Plank Road, and Station Road in the hamlet of Phoenicia are particularly acute hazard problem areas for flooding.

Highway infrastructure construction has also contributed to flood vulnerability. For example, the Esopus Creek flows along Route 28 below the hamlet of Big Indian and is locally altered by the road corridor, especially where the former meanders were cut off by installation of the roadway.

The 2012 Shandaken Flood Mitigation Plan, based on 2000 Census data, estimated the potential sheltering needs and the potential risk to the built environment as a result of the 1% and 0.2% flood events. For the 1% flood event, an estimated 902 people will be displaced and 461 people will seek short-term sheltering, representing 27.9% and 14.3% of the population. For the 0.2% flood event, an estimated 990 people will be displaced and 547 people will seek short-term sheltering, representing 30.6% and 16.9% of the population. Of the total built environment, approximately 1,216 parcels (34.3% *of total) and 320 buildings with an

Structures in Floodplain
Using the 2013 Preliminary Flood Hazard Area Mapping from FEMA, the Ulster County Department of Environment identified that there are approximately 336 residential structures located within the 1% annual floodplain and approximately 116 residential structures in the floodway. The same analysis was also completed for Hardenburgh, showing that a total of 12 residential structures were located in the 1% annual floodplain.

approximate replacement value of \$131,100,000 are in the 1% hazard area. Additionally, 1,382 parcels (39% of total) and 471 buildings with an approximate replacement value of \$176,300,000 are in the 2% hazard areas. Updated analysis based on the 2013 preliminary flood maps might indicate increased sheltering needs.

According to the Ulster County All-Hazard Mitigation Plan, the Town of Hardenburgh has 606 high flood risk acres with a value of \$18,811,933.



However, until recent mapping efforts began, the majority of the Town had never been mapped by FEMA – as of December 31, 2012, there are only nine NFIP polices in the entire town – which limits the data available for flood-prone and flood-damaged properties throughout the Town.

The floods after Hurricane Irene and Tropical Storm Lee had the greatest impact on Hardenburgh’s infrastructure, damaging or destroying numerous bridges and roads and creating significant access and mobility issues. With extremely limited transportation options, the loss of even one road during a flood can isolate and strand residents. Despite the use of available resources, critical infrastructure in Hardenburgh has sustained damage from previous storm events. Repair or replacement of roads, bridges, culverts, and other infrastructure must be addressed to create greater future resiliency. Without additional mitigation and flood protection projects, the Town stands to suffer similar damages during future events.

Given the history of floods that have struck the Towns of Shandaken and Hardenburgh, it is apparent that future flooding of varying degrees will occur. To ensure the long-term safety and health of both Towns, conditions of the natural and man-made environment that cause repetitive flooding and damage to homes, businesses, and critical assets must be addressed. An examination of each of the major storms that struck in the fall of 2011 provides a detailed understanding of the damage that occurred, the scope of the reconstruction needed and perhaps a view of what may occur again unless progressive action is taken.

Hurricane Irene

Hurricane Irene tracked up the East Coast of the United States August 21-27, 2011. Irene made its landfall in coastal New Jersey and then hit New York State on August 28; bringing heavy rains to the Catskill Mountains and throughout the Schoharie

Hurricane Irene
August 25 – September 5, 2011 - EM-3328 / DR-4020
Ulster County, New York, was designated eligible for Public Assistance and Individual Assistance to aid in recovery from the disaster

and Mohawk Valleys. On August 31, 2011, at Governor Cuomo’s request, President Obama issued a major disaster declaration (DR-4020) for New York State and the counties damaged by Hurricane Irene.²

In the weeks before Irene, soil moisture in areas from New Jersey to Vermont, including much of eastern New York State, was already extremely high. These saturated ground conditions left those areas less capable of absorbing the impending heavy rainfall, setting the stage for quick runoff and uprooted trees from the winds and rain to come.³

The heavy rains and strong winds associated with Hurricane Irene devastated parts of New York State beginning on the evening of August 28, knocking down numerous trees and power lines across Broome, Delaware, Sullivan, and Otsego Counties. Rainfall totals ranged between 8 and 12 inches, with higher amounts in the eastern Catskills and Schoharie Valley. Approximately 60,000 customers across Ulster County were affected by power outages in the wake of the storm, with some losing power for a week.

The Towns of Shandaken and Hardenburgh saw record flooding and infrastructure damage from the storm, most notably within the lower reaches of the Esopus Creek. Numerous accounts of flooding and flash flooding were reported in the Town of Shandaken on August 28, and waters remained at flood stage until shortly after midnight, August 29. The Mount Temper/Cold Brook river gage exceeded its 11-foot flood stage at 4:07 a.m. on August 28, its 15-foot moderate flood stage almost 3 hours later, its 18-foot major flood stage after another hour, and finally crested at a record 23.34 feet at noon on



August 29.

Critical assets in both communities were affected almost immediately — once the waters had hit a level of 18 feet, roads and bridges were flooded in the hamlet of Phoenicia; at 21 feet, water reached Route 28. On August 28, Route 28 was closed by flooding in Shandaken.⁴⁵

In the wake of Irene’s passing through Shandaken and Hardenburgh, the estimated peak discharge on Esopus Creek at Cold Brook was 75,800 cubic feet per second (cfs). This peak discharge is the highest on record, beating the previous highest of 65,300 cfs, which occurred in March 1980. The peak discharge records at several other gages in the basin were also broken. As a comparison, the discharge seen on the Esopus rivaled the annual average discharge of Niagara Falls (80,000 cfs).⁶

In response to the devastation, a state of emergency was issued by the Town of Hardenburgh on August 28. Flood waters washed out culverts along Haynes Hollow and Martin Road, causing major route closures and almost completely cutting off the town from essential emergency aid and responder access. Culverts and bridges on Millbrook, Rider Hollow, and Dry Brook Roads also sustained heavy damage, making vehicle access impossible for days, and reducing access to these areas to that of all-terrain vehicles only. The Barnhart Bridge, located at the intersection of Barnhart Road and Ulster County Route 102, was compromised, as was the bridge on Mill Brook Road. The Town Bridge for Barnhart Road at the intersection with Beaverkill Road was closed to vehicle traffic until remediation was completed on December 1, 2011. An Ulster County Bridge near the intersection of Drybrook Road and Graham Road was closed to vehicle traffic for approximately two weeks until a temporary bridge was installed to handle light vehicle traffic. Remediation work on the original bridge was completed on December 1

and the bridge was reopened to normal traffic. The town received emergency authorization to complete repair work at 10 locations along Rider Hollow Road and at nine locations along Haynes Hollow Road from the New York State Department of Environmental Conservation (NYS DEC).⁷⁸⁹

The Town of Shandaken issued a statement to the public on September 24 describing the storm’s destruction as a 16-mile swath from Olivearea through Mt. Tremper, with only one of the towns’ 12 hamlets left fairly unscathed. Several dikes in the town were breached, including on Route 42, at the Town Hall, Plank Road, and Route 212. The Winnisook Dam had erosion damage, and the lake’s water level was lowered as a precautionary measure to avoid a breach. Access was restricted on the Mt. Tremper Bridge (Route 28) until September 5 as a result of debris build-up and structural damage to the abutment.¹⁰

The devastating effects of Irene forced the evacuation of more than 200 people from the area, including residents from the Towns of Shandaken and Hardenburgh. Displaced residents from the Towns were sent to an overnight shelter that had been set up at Belleayre Mountain where beds, hot meals, and medical service was provided through September 9. Other shelters were set up at local fire houses. In total, Ulster County suffered more than \$10 M in damages, and the Town of Shandaken marked Irene as the largest storm on record.¹¹¹²

Tropical Storm Lee

On September 7, 2011, just after floodwaters from Hurricane Irene had receded, remnants of Tropical Storm Lee swept into the region, producing substantial rains and river flooding across parts of central New York State. Bands of heavy rain throughout the day on September 8 brought streams back to flood stage and threatened more flooding in areas of Shandaken and Hardenburgh



that were still trying to recover from the effects of Hurricane Irene. While the rains did cause minor flooding along the Esopus Creek, upstream of the Ashokan Reservoir, waters receded after cresting at 11.8 feet at the Cold Brook Gage.¹³¹⁴

Tropical Storm Lee
September 7 – 10, 2011 - EM-3341 / DR-4031
Ulster County, New York, was again designated eligible for Public Assistance and Individual Assistance for recovery efforts

The majority of impacts wrought by Tropical Storm Lee in Shandaken and Hardenburgh were primarily caused by the weakened state of critical infrastructure and on-going operations resulting from Hurricane Irene, which had ravaged the area only a week earlier. The Towns were still in states of emergency when the second round of heavy rain moved through the region. Rainfall runoff from the storm was not as severe as was experienced during Hurricane Irene, but was significant enough to break through some of the temporary stream channel and roadway repairs that had been completed in the aftermath of Hurricane Irene. Specifically, the Town of Shandaken lost temporary infrastructure on Oliverea Road, McKinley Hollow, and Little Peck Hollow, with additional damage to Burnham Hollow. Large amounts of debris from the storm had left Bridge Street Bridge once again impassable, as well as many of the sole-access roadways to Hardenburgh. Data gathered on post-Irene road closures in the Town of Shandaken is displayed in Figure 3. The figure shows that the greatest concentration of damage points occurred on State Route 214 in Chichester and Phoenicia, on Route 28 near Fox Hollow Road, and on State Route 42 in the Hamlet of Shandaken. Phone service was down for residents in the hamlets of Phoenicia and Mt. Tremper for several days.¹⁵¹⁶

Building inspections were completed in Shandaken to assess the damage from the storms, as shown in Figure 4. As the map shows, 19 of these properties

were reported as “unsafe” and another 35 were marked as “restricted” based on the extent of damages. The map demonstrates that homes that sustained the greatest degree of damage were in nine clusters generally located near the intersection of State Route 28 and State Route 214 in Phoenicia, the intersection of State Route 28 and State Route 212 in Mt. Tremper, State Route 214 at the eastern Town border, and on Oliverea Road near Burham Hollow.

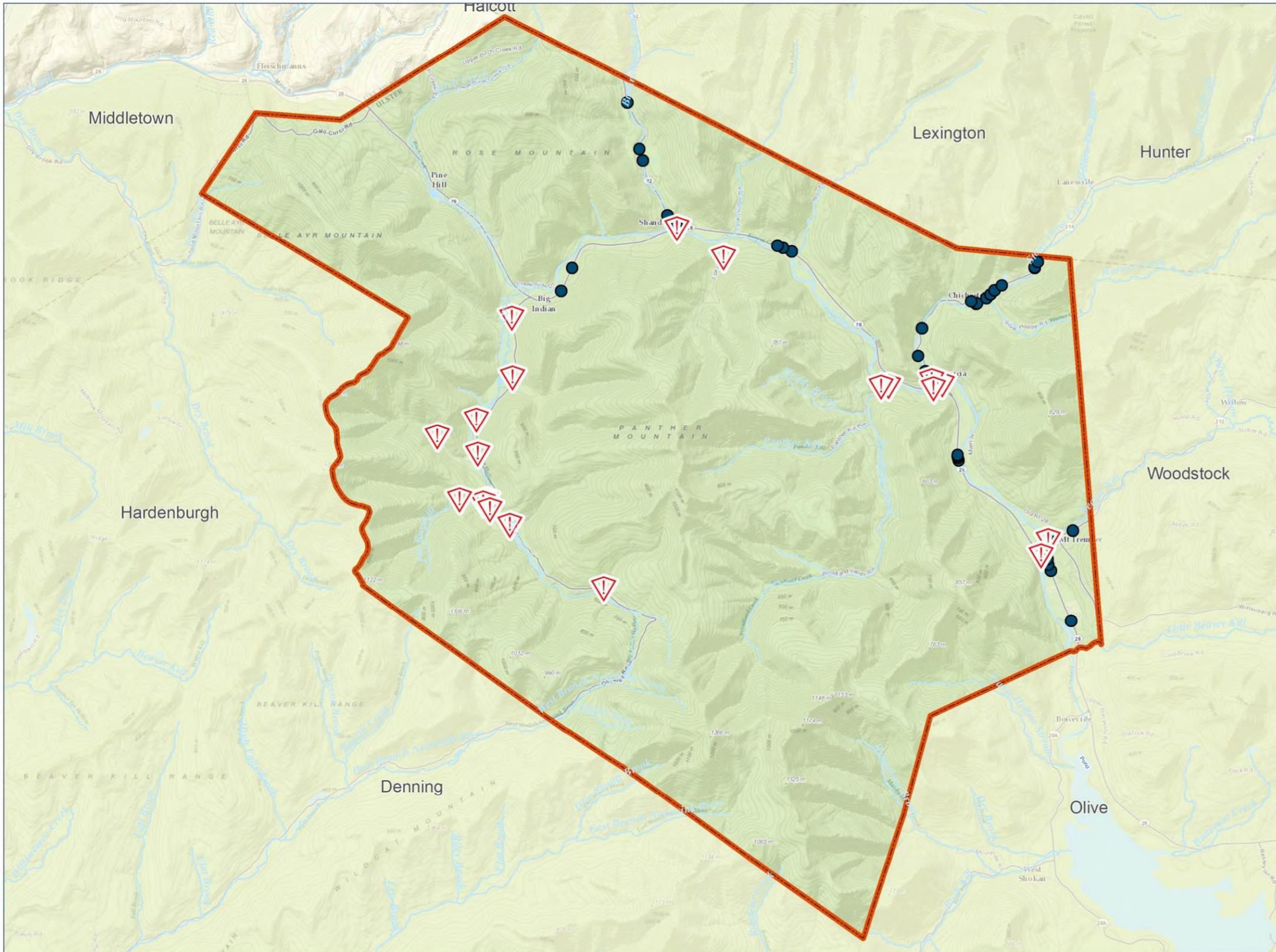
IN CONCLUSION...

These facts are important to capture and examine, as they present measurable impacts and allow for comparison to previous incidents. The damages identified, will serve as benchmarks that will help to guide future investment. Most importantly, however, and perhaps impossible to truly measure, is the impact on the citizens. While they have shown resolve and fortitude, each disaster is an exhausting episode; both physically and emotionally. Repetitive disasters over a lifetime wear deep at the fabric of communities, families and individuals. Achieving resilience in a community does not merely mean building its infrastructure strong enough to withstand a storm; it means helping the community to recover and face the future with hope so they too are stronger moving forward.



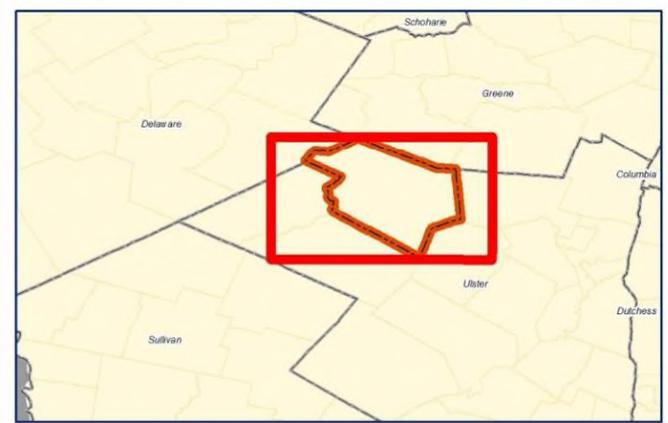
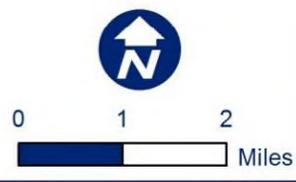
Post storm sedimentation-Shandaken, Courtesy of Tetra Tech

NYRCR: TOWN OF SHANDAKEN, ULSTER COUNTY
Figure 3. Shandaken Post-Irene Roadway Damage Points

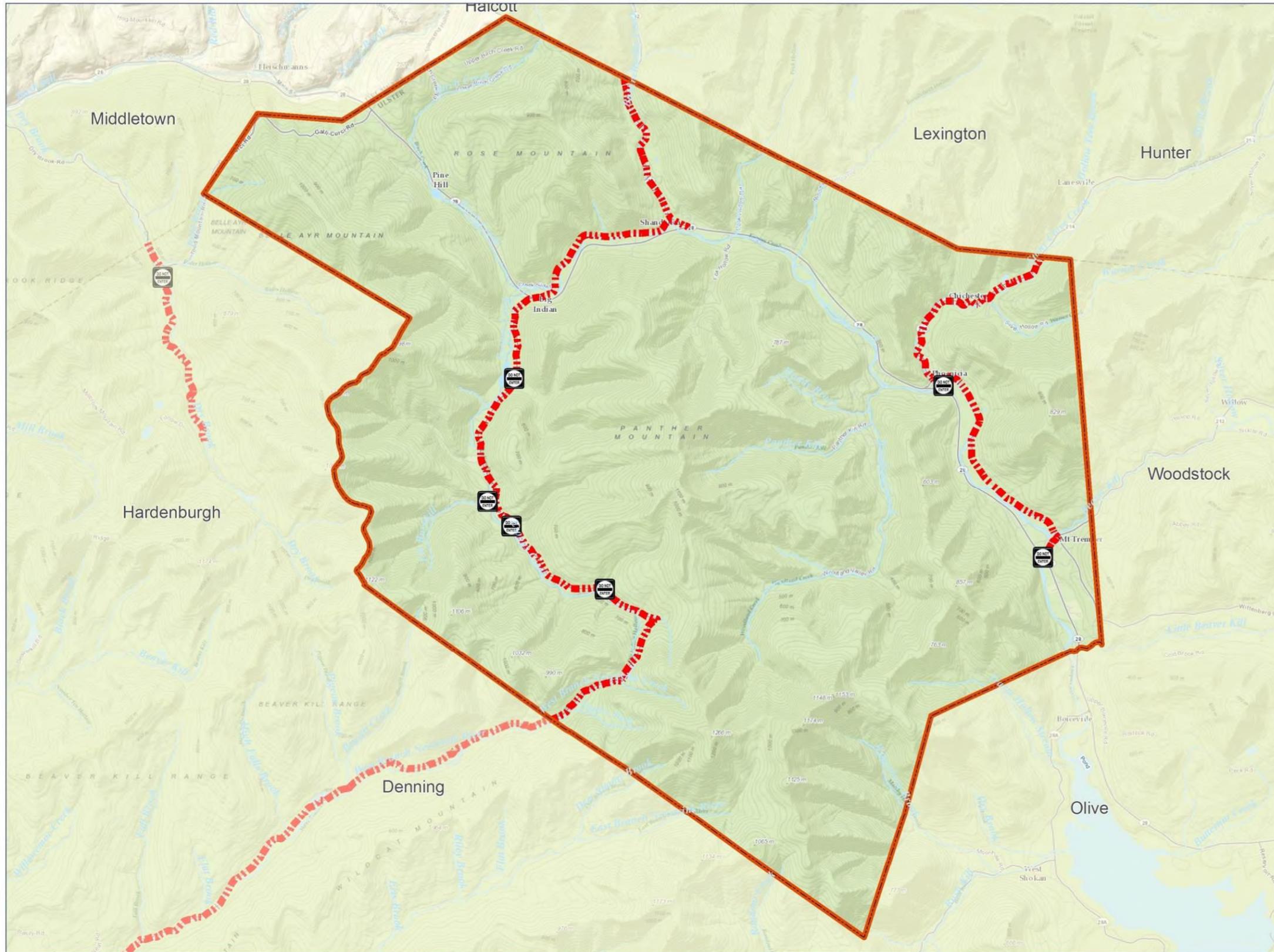


- Legend**
- Damaged Bridges
 - Post Irene Roadway Damage Points
 - Town of Shandaken/Planning Area

This map is for reference only.
 Data Sources:
 Shandaken: Bridge Damage
 NYDOT: Roadway Damage



NYRCR: TOWN OF SHANDAKEN, ULSTER COUNTY
Figure 4. Shandaken Post-Irene Roadway Closures

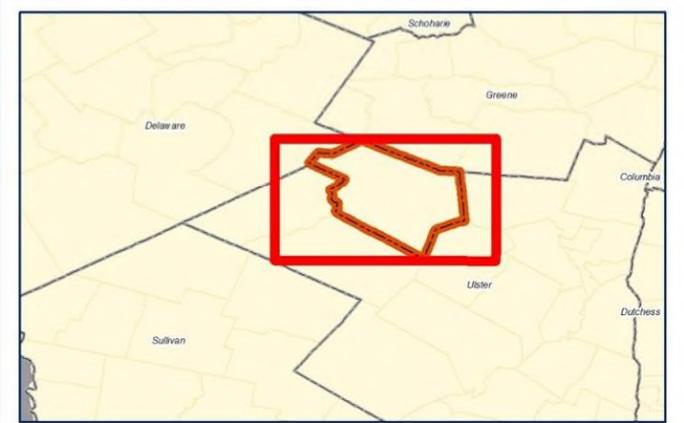


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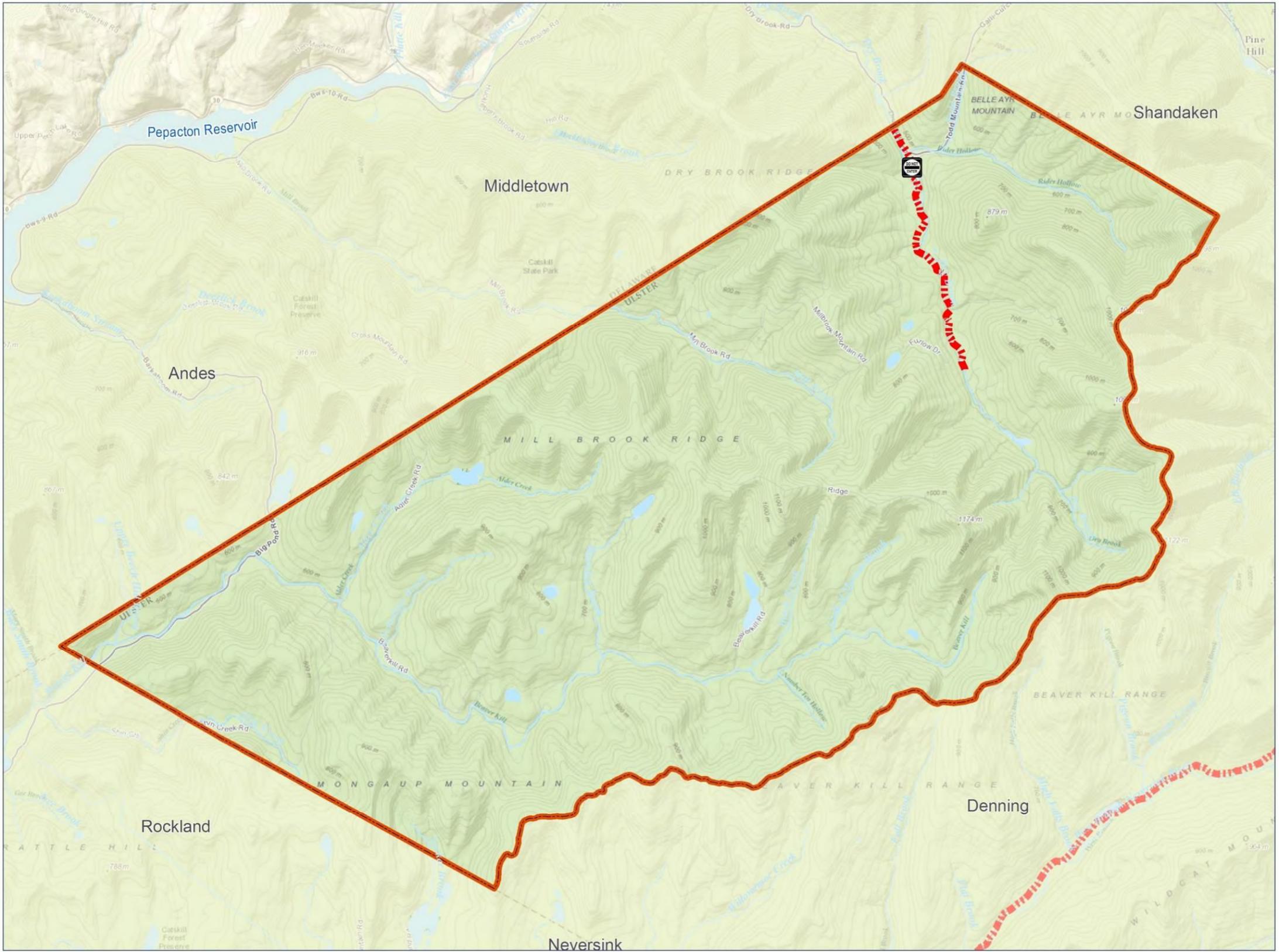
- Town of Shandaken/Planning Area
- Closed Bridges
- Closed Roadways

This map is for reference only.
Data Sources:
Ulster County: Closure Data

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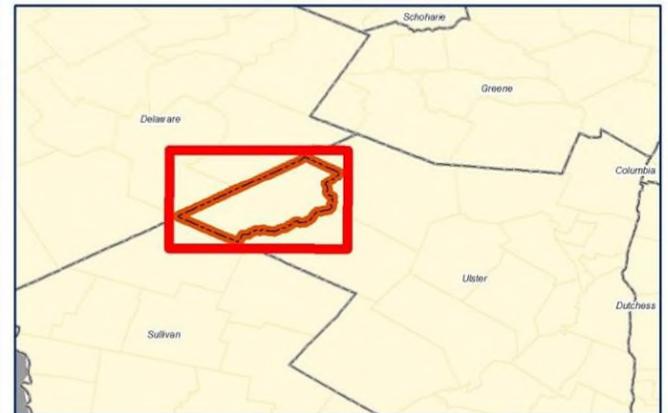
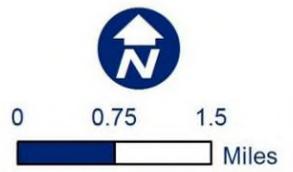
NYRCR: TOWN OF HARDENBURGH, ULSTER COUNTY
Figure 5. Hardenburgh Post-Irene Roadway Closures



Legend

- Town of Hardenburgh/ Planning Area
- Closed Bridges
- Closed Roadways

This map is for reference only.
Data Sources:
Ulster County: Closure Data





A PROFILE OF OUR TOWNS

Our Geography

Located amidst the central Catskill Mountains in the northwest corner of Ulster County, the Towns of Shandaken and Hardenburgh are surrounded by miles of beautiful forests, farmlands, and rich ecology. The quality of the surrounding natural environment creates striking landscapes, ample opportunities for recreation, and drives a healthy tourism industry. The Towns' hamlets and local roads grew around the natural terrain and features of the land without the aid of comprehensive plans or local ordinances. The resulting development pattern reflects a close relationship with the land and topography and creates a unique local character.



A statue of an eagle marks the Route 28 entrance to the hamlet of Phoenicia

Farming, tanneries, sawmills, and other agricultural pursuits were the basis of both Towns' early economies. Infrastructure improvements including improved roads and the addition of a railroad laid

the foundation for a blossoming tourism and resort industry in the region and provided a means to distribute local goods to distant markets.

However, the once thriving industries could not be sustained. Over the years, the area experienced a decline in the resort industry due to shifts in transportation and lifestyle. Even so, its scenic qualities and recreational opportunities of the natural environment have continued to play a driving role in the regional economy. The Belleayre Ski Center as well as numerous outdoor recreation activities –including biking and hiking trails, fishing, and tubing, among others – continues to encourage tourism and a second home market. Despite these attractions, the community struggles with challenges related to environmental protection and public- natural areas, including a lack of developable areas and the need to balance environmental conservation with flood protection for homes and businesses.

Today, Shandaken is comprised of twelve hamlets which are named places but do not have political identity. They are Woodland Valley, Oliverea, Chichester, Bushnellsville, Mt. Pleasant, Mt. Tremper, Phoenicia, Shandaken, Allaben, Big Indian, Pine Hill, and Highmount.

Hardenburgh's development and population is divided up amongst the three major river valleys traversing the town; the Dry Brook, the Millbrook, and the Beaver Kill. Although largely undeveloped, Hardenburgh does have some small farms and low-density residential development. Some of the farm types include Christmas tree farms and dairy farms.

The mountainous Towns are within the Catskills and are served by a network of largely secondary roads that are especially vulnerable to damage during floods. Although the highways have been improved in recent years, these improvements have sometimes meant that the roads now bypass the community centers, raising the challenges for



population and economic development. Still, these secondary thoroughfares are the lifeblood for transportation within the area, accenting the Committee’s eventual focus on infrastructure projects. In addition, the seasonal tourist train is not available at present to supplement the existing network of state routes and local roads, which increases the importance of maintaining safe and reliable roadway infrastructure.

Towns of Shandaken and Hardenburgh cover an immense geographic area. Residents are confronted with the basic issues of protecting the roads, infrastructure, and communications that provide lifelines to their respective communities and they bear the responsibility of balancing environmental protection with private land ownership and use, to protect the essence of what makes life in their rural towns specifically unique. The residents of Shandaken and Hardenburgh provide stewardship for the environment and provide a first- line of defense against encroachments to the environment to preserve a way of life not only for their own children but for future generations, as well.

A hamlet is an unincorporated community within a town. The hamlets within the Town of Shandaken each have developed an individual character but are governed under the municipal law of the Town.

concentration of residents is in the hamlet of Phoenicia which is one of the major flood prone areas of the Town.

Many of the residents are located throughout the river valleys that traverse both of these Towns. Many of these valleys are served by a single roadway that functions as the only way in our out.

This unique dynamic exacerbates the vulnerability of the population and heightens the importance of the transportation infrastructure in the Towns.

The populations of both Shandaken and Hardenburgh are increasingly aging with a median age of 50.2 and 50.3, respectively. In addition, 21.7% (Shandaken) and 18.9% (Hardenburgh) of the population are aged between 50 and 59, and 19.7% (Shandaken) and 21.8% (Hardenburgh) of the population are over the age of 65. These figures stand in considerable contrast to the State median age of 38. In just the past 10 years, the median age has increased from 45 (Shandaken) and 46.6 (Hardenburgh) in 2000. In addition, 20 to 40 year olds, who typically contribute significantly to local economies and workforces, account for only 17.6%

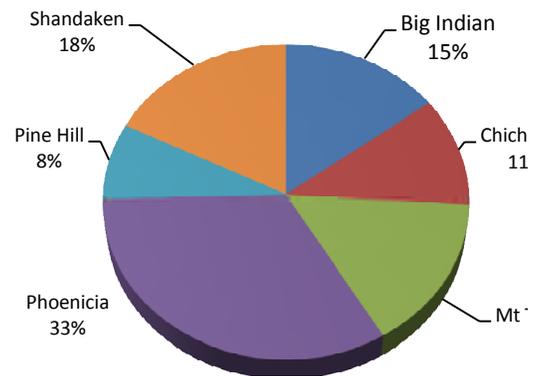
Our People

The population, income, land use, housing, and infrastructure of the Towns of Shandaken and Hardenburgh

According to the 2010 U.S. Census, the Town of Shandaken has a population of 3,085 people and the Town of Hardenburgh has a population of 238 people.

Figure 6 presents a summary of the 2010 U.S. Census general population statistics for the Town of Shandaken by Zip code in an attempt to show the approximate population distribution of the hamlets. The distribution indicates that the major

FIGURE 6. SHANDAKEN POPULATION DISTRIBUTION



Courtesy of Census 2010 (U.S. Census Bureau); HAZUS-MH 2.1



(Shandaken) and 17.2% (Hardenburgh) of the population. The existence of this aging population suggests that programs designed to provide support of the aging and vulnerable populations may be appropriate for the Towns.

Income

The median household income for Shandaken, according to the American Community Survey, is \$43,750, which is slightly higher than the County (\$43,554) and quite lower than the State (\$56,951). The median household income for Hardenburgh is \$36,731, which is considerably lower than both the County and State. Additionally, 13.4% of residents in Shandaken and 7.1% in Hardenburgh were considered below the poverty line compared with 12.1% of the County and 14.5% of the State. Wages are generally lower in the Towns than in larger urban and metropolitan areas, a fact that contributes to difficulties in affordable housing and attracting young families and an adequate workforce.

The link between land use and key issues

The Towns of Shandaken and Hardenburgh are located within the Catskill Park. Portions of the Town are in the Catskill Forest Preserve which is defined as the 287,500 acres of state land within the Catskill Park and is managed by the NYS DEC. The Catskill Park is a mountainous region of public and private lands in Southeastern New York's Ulster, Greene, Delaware and Sullivan Counties. The unique topography and terrain of Shandaken and Hardenburgh have lead way to the development of the river valleys where the land was less steep and easier to develop. Roadways were built alongside the creeks and streams within the floodplain to serve the homes and businesses. This pattern of development has intensified the effects of flooding disaster events.

The land uses in Shandaken includes older homes and tourist-oriented businesses along the roadways

in the valleys and within the Hamlets, There are also areas of resource-related industries, such as sawmills and bluestone. The dominant land use, consisting of 71% of the land area, is preserved forestland, owned by New York State (NYS) and New York City (NYC). Factors such as floodplains, regulatory environmental requirements, and the presence of the Catskill Park and land acquisitions by NYC for water quality protection, in addition, the scenic natural terrain has affected and limited land use and development. The town covers approximately 79,200 acres. 66% of the town is under public ownership and designated as public open space, 14% is residential, 9% is private open space, 7% is vacant land, and 4% is identified as "miscellaneous"¹⁷

Land use in the Town of Hardenburgh reflects its pastoral and agricultural past, with the majority of uses divided among residential, agricultural, and infrastructure. Similar to the Town of Shandaken, the majority of Hardenburgh's land area is public-owned and devoted to natural or conservation purposes. In total, approximately 54% of the Town's land area is owned by NYS or NYC and preserved in perpetuity.

The unique topography, steep slopes, environmentally sensitive lands, and abundance of preserved lands create a situation that limits the future growth and development of both Towns. However, it is these unique features and sense of place that draws visitors and serves as one of the major economic drives for the region.

Housing

Single-family, detached residential structures account for 82.5% of Shandaken's and 81.6% of Hardenburgh's housing units. The majority of are owner-occupied (72.0% Shandaken; 76.8% Hardenburgh) according to the 2010 Decennial Census. Median home values are \$215,200 for Shandaken and \$174,000 for Hardenburgh – both



less than the County (\$242,500) and State (\$301,000) median values.

Both Shandaken and Hardenburgh are home to numerous historic homes that contribute to local character and charm. Of the existing housing stock, 38.7% (Shandaken) and 28.3% (Hardenburgh) were built before 1939. Although homes in the Northeast in general tend to be older than for the nation as a whole, the median, or approximate middle year for construction is still 1958, much newer than the about a third of the homes in the study area that were built before 1939.¹⁸ The majority of houses in Hardenburgh (62.2%) were built between 1960 and 1999, with only 5.3% of the houses built since 2000. Shandaken has a fairly even distribution of age in the housing stock, with a notable 26% being built between 1970 and 1989 and only 6.5% after 1990. The ages of the homes are significant as the older housing stock may not comply with current floodplain regulations and construction standards — in other words, they may be more susceptible to flooding.

Statistically, both Towns appear to suffer from very high vacancy rates 45.8% (Shandaken) and 67.4% (Hardenburgh), compared with 9.7% for the State of New York. This relatively high figure, however, accounts for the region’s historic reputation and continued popularity as a vacation and second home-owner destination. As the Census does not consider second homes as “occupied,” these homes all appear as “vacant” at first glance. The Census, however, indicates that 980 of the 1,271 vacancies in Shandaken and 216 of the 232 vacancies in Hardenburgh are for seasonal or vacation use and are not actually vacant or abandoned. These figures help to illustrate the prevalence of second home and vacation properties and their importance to the local communities and economies.

Despite lower home values than the County and State, affordable housing has been identified as a

challenge by the community, especially for young families and the younger workforce. A number of home owners and renters are substantially burdened by housing costs in both Towns.

Infrastructure and Facilities

Because of the rural setting, critical infrastructure in the Towns of Shandaken and Hardenburgh consist of a series of local roads, bridges, and culverts, many of which have been damaged during past storms. The residents rely on the viability of these roads which provide a lifeline to facilities critical to their survival, health, and welfare. During severe storm events literally every major artery is compromised and prevents access to hospital, medical, fuel, and supermarket facilities. The protection and full function of this infrastructure in the Towns is essential to the safety of residents and their homes as well as to ensure that the public is not isolated during storms.

The primary thoroughfare through the Town of Shandaken is NYS Route 28, running east/west between Mt. Tremper and Highmount (and beyond into Delaware County). Additional primary roads include NYS Route 42, running north/south between Shandaken (hamlet) and the Town of Lexington (Greene County), and NYS Route 214, running north/south from Phoenicia (hamlet) and the Town of Hunter (Greene County). Another critical roadway is the portion of Ulster County Route 47 running north/south between the hamlets of Big Indian and over the mountain to Claryville (in Sullivan County). Similar to Hardenburgh the roads provide a critical connection to support services.

Until 1976, the Ulster and Delaware Railroad served the Town of Shandaken through the hamlets of Mt. Tremper, Phoenicia, Shandaken, Big Indian, Pine Hill, and Highmount. Although the railroad corridor still exists, it is currently inactive from Phoenicia west to Highmount at the Delaware County line. Between Phoenicia and east to Mt. Tremper, the



Catskill Mountain Railroad operates a seasonal tourist train.

The primary east/west roads through the Town of Hardenburgh are Ulster County Routes 54 / Beaverkill Valley Road connecting the Beaverkill area with the hamlet of Lewbeach (Sullivan County) and beyond. Dry Brook Road / County Route 49 run north/south and service the residents in the easternmost part of the town and provide access to the communities of Margaretville and Arkville in Delaware County. The town-maintained Mill Brook Road provides access to State Route 30/206 for the residents in the central portion of the town.

Additionally, Ulster County Route 49A connects the Town of Hardenburgh to the Town of Shandaken between the hamlets of Mapledale and Highmount. This road is the only one that provides access to Belleayre Mountain Ski Center, which is not only critical for the tourism and recreational value, but is also the designated emergency shelter for the entire central Catskill Mountain region.

Other Critical Infrastructure

In addition to roadway infrastructure the Town of Shandaken is host to a water district, two wastewater plants, and a community septic system. In addition there are five dams within the community.

The Phoenicia Water District supplies about 40,000 gallons of water per day (gpd) to residents and businesses in the hamlet of Phoenicia. The water system consists of three water sources, a filtration plant, a storage tank, and a water distribution system. Water from two surface water sources – an infiltration gallery and a spring supply – is treated at the water filtration plant. The third source (High Street Wells) consists of two drilled wells that convey water directly into the water distribution system. The Phoenicia treatment building has a back-up generator. The Pine Hill Water District supplies an average of about 15,000 gpd to its

largely residential users. The system includes the water supply, a storage reservoir, treatment building, and distribution system. The water supply consists of several springs and a back-up well. Municipal and public non-municipal wells and water towers are also present. In addition; a water tower and a pump house are located in the Town.

The New York City Department of Environmental Protection (NYC DEP) owns and operates two wastewater systems in Shandaken: a wastewater treatment facility on State Route 28 that serves the hamlet of Pine Hill and a community septic system in the hamlet of Chichester that treats about 13,000 gpd.

Five dams are located within the Town of Shandaken, one of which is classified as a high hazard dam (Pine Hill Lake Dam). In addition, the Town has identified locations of four levees along Esopus Creek: (1) on Route 212 in Mt. Tremper; (2) on Dike Road; (3) a former dike on Plank Road that was wiped out during Hurricane Irene; and (4) on Route 42 in Shandaken. Other small dams include a private barrier on Birch Creek and another at the end of Lower Birch Creek Road on New York State Land.

The Town of Hardenburgh has numerous bridges and road culverts contributing to the infrastructure of the community. As discussed above, the majority of the Town's development is located within the Dry Brook, Millbrook, and Beaver Kill river valleys. Accordingly, Drybrook Road, Millbrook Road and Beaver Kill Road are home to the majority of the Town's roadway infrastructure consisting of a multitude of bridges, culverts, and sections of roadways. Rider Hollow Road and Todd Mountain Road are two other important roadways that facilitate access to and from Route 28 and serve as the main points of access to the Hardenburgh Town Hall.



Economics

Education, healthcare, and social assistance play a key role in the economies of both Shandaken and Hardenburgh; however, the other key drivers for the two towns diverge. Shandaken’s economy is primarily based on tourism and related entertainment and accommodation services, while Hardenburgh retains more of its historic reliance on agroforestry, timber harvesting, or small niche-based agricultural industries on a small scale. Hardenburgh’s undeveloped forestland also provides opportunity for recreation such as hiking and camping. This feeds into the larger economic driver in the region, tourism. This difference is the result in part of the presence of several commercial hamlets in Shandaken compared with the more rural and less dense development pattern in Hardenburgh. Hardenburgh’s recreational value

adds to the regional economy and Shandaken provides access to restaurants, hotels, shopping, arts, and entertainment. Many of the businesses in the area support the Belleayre Ski Center. Belleayre is the major employer and the main economic driver in the area. Belleayre is in the process of developing an expansion that will add additional jobs and require additional business support.

According to the 2010 ZIP Code Business Pattern for the Town of Shandaken and several hamlets, the Town had a total of 109 business establishments; 28 were accommodation and food services.

Breakdowns of top employment sectors for both Towns are in Figures 7 and 8.

FIGURE 7. HARDENBURGH EMPLOYMENT

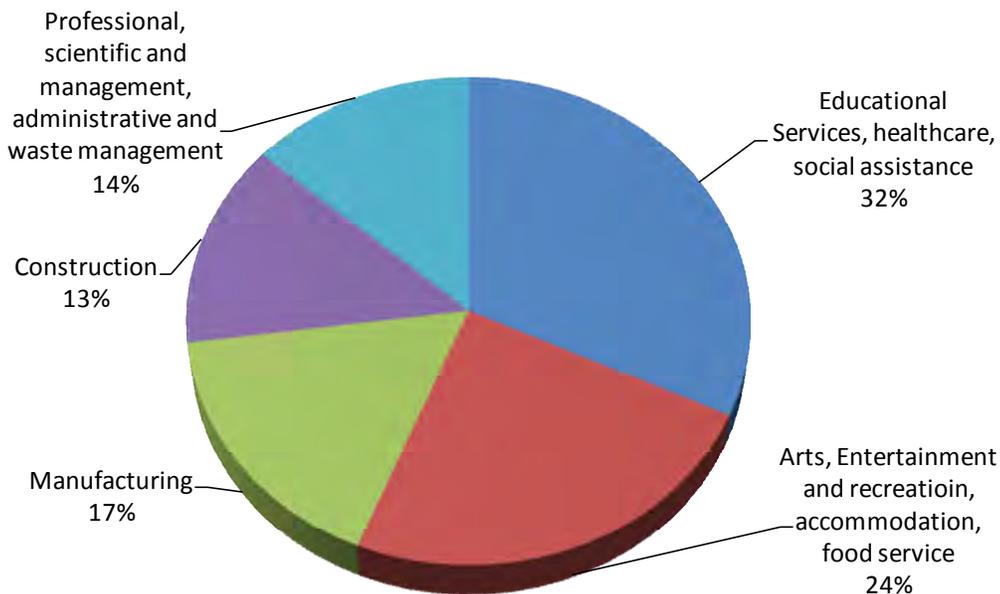
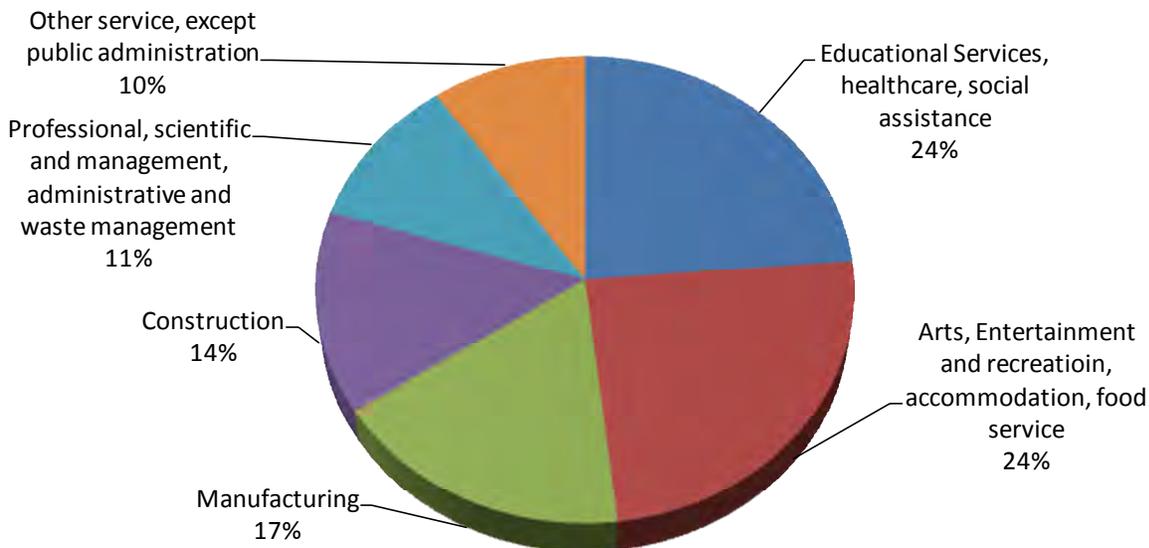




FIGURE 8. SHANDAKEN EMPLOYMENT



An additional key economic driver for the region relies on the surrounding natural beauty and recreation that drives a considerable market for second homes, tourism, and vacations. While this market provides stimulus to the local businesses, it also creates seasonal fluctuations in revenue that can be a challenge for local business owners to maintain operations year-round. The full potential of economic growth related to the natural resources and recreation opportunities has not been realized.

Other assets that support the local economy and can be leveraged for future growth include:

- Recreational opportunities: hiking/biking trails, Belleayre Ski Center and future resort, fishing, hunting, golf, kayaking, and tubing.
- Small-town character and charm: walkability, historic buildings, peaceful neighborhoods
- Strong community values
- Proximity and access to major markets
- Active community members and organizations
- Lack of significant competition in the region

CRITICAL ISSUES

Housing affordability

Affordable housing and a general lack of an adequate workforce housing have been identified as ongoing issues for the Town of Shandaken and Hardenburgh. While the median home value of \$215,200 in Shandaken and \$193,434 in Hardenburgh is less than both the County (\$242,500) and the State (\$301,000), it has become increasingly difficult for local wage earners to afford housing. Four key factors have combined to cause the majority of these issues:

- **Rising home prices outpacing income:** Between 2000 and 2011, home values in the Town of Shandaken increased 136% from \$91,200 to \$215,200 and increased 210% in Hardenburgh from \$91,700 to \$193,434.¹⁹ During this same time, median household income increased only 39% and remains the second lowest of all towns in Ulster County. The rapid rise in housing prices is the result



part of the second-home market driven by the area's scenic and recreational qualities.

- **Limited housing stock:** With few remaining development areas and a housing stock dominated by historic single-family homes with rising values, available housing is currently limited for young families and a young workforce.
- **Flood insurance rates:** Risk for continued flooding has driven insurance rates up and present additional financial burdens for homeowners.
- **Low wages:** Shandaken and Hardenburgh generally offer lower wages than more urban or developed areas. When combined with the above factors, these wages place an additional strain on housing affordability.

As a combined result of the above factors, 29.8% of home owners with a mortgage and a staggering 50.2% of renters are considered cost burdened and pay more than 35% of their household income on housing costs.

Economic Development Challenges

A number of factors currently deter the full economic potential of the two Towns and the region at large, including:

- **Limited land for development:** Few remaining parcels for the development of new residential and commercial uses or for the relocation of assets in flood-prone areas currently deter economic growth and an adequate workforce.
- **Realignment of Route 28:** Historically, the main artery for this region of the Catskills, Route 28, originally ran through almost all hamlets in Shandaken and encouraged commercial success and tourism. Realignment of Route 28 in the 1960s promoted increased travel speeds through the region but also caused the route to bypass many of the

hamlets. As a result, investment and development began to occur along the new Route 28 rather than in the traditional hamlet centers.

- **Aging population:** An increasingly aging population in both Shandaken and Hardenburgh limits the available workforce for local businesses.
- **Seasonal economy/workforce:** The region's popularity as a second home and vacation destination provides key patrons for local businesses but also creates unpredictability and seasonal fluctuations in revenue as well as seasonal workforce challenges.
- **Lack of incentives:** There is a currently a lack of incentives to attract and retain desirable businesses and development projects. Potential incentives could include tax abatements, fast-track permitting, fee waivers, and density bonuses among others.
- **Limited amenities, shops and services:** While commercial centers such as Phoenicia offer charming stores and restaurants, there remains an opportunity for additional shops, services, and amenities to increase tourism spending.

Limited Infrastructure and Services

Limited infrastructure systems in both Towns create ongoing safety and economic challenges. In particular, many homes currently have few access and exit routes (or only one) available, leading to the potential that residents will be stranded during flood events. Lingering damage to roads, culverts, bridges, and more sustain this risk for the current population of both Towns. There remains a key opportunity for additional flood-proof and mitigation enhancements to infrastructure recently repaired or replaced after Hurricane Irene and Tropical Storm Lee. Select improvements of core infrastructure would help strengthen resiliency against future storms and ensure the protection of



assets and safe mobility of residents.

The lack of a dedicated regional evacuation center of sufficient size for all residents places the community at further risk. Currently, the Belleayre Ski Center functions as an evacuation center; however, logistical and funding issues remain related to its use, operation, and provision of supplies.

The Towns also suffer from limited cell phone service, which reduces communication during emergencies and also deters economic growth. Of particular concern is the potential removal of existing land telephone lines in each hamlet that currently act as a means of emergency communication. Because of the lack of financial return, these lines have been slated for removal, which will create additional need for improved cell phone service.

Several utility issues are also present throughout the community. The majority of power lines currently remain above ground throughout Shandaken and Hardenburgh, which increases the risk for service outage during storms and also takes away from the aesthetic appeal of the hamlet centers. In addition, many areas throughout both

Untapped Tourism and Recreational Potential

While a large contributor to business in the Towns, the full potential of economic growth related to the natural resources and recreation opportunities has not been realized. A coordinated effort to fully capitalize on these assets could help to create a year-round economy and address the seasonal difficulties for business owners. Particular areas of concern include:

- Insufficient maps, signs, and wayfinding guides to direct visitors toward the full range of outdoor recreation opportunities

- Lack of coordinated marketing and branding initiatives, including a robust on-line presence, use of social media, marketing materials, and a coordinated regional tourism effort
- Limited access to waterways for recreation
- Limited connectivity or coordinated themes between hamlets
- Need for additional trails and connections
- Lack of full capitalization on the former rail line for recreation and tourism

Community Vision

Through collaborative discussions, stakeholder engagement, review of existing plans and studies, and a focused intention towards holistic community recovery, the Committee adopted the following vision to guide the recovery and resiliency efforts of the Towns of Shandaken and Hardenburgh: To rebuild stronger, safer, and more vibrant communities that will be more resilient in the face of future disasters by planning and developing actions to secure funding and other resources.

RELATIONSHIP OF THE COMMUNITY RECONSTRUCTION PLAN TO REGIONAL PLANS

The Committee recognizes the importance of identifying issues and challenges that transcend municipal boundaries and working collaboratively with neighboring communities to gain greater regional resiliency and prosperity. To this end, the Committee has taken advantage of opportunities for regional collaboration throughout this process by leveraging existing regional plans and studies, encouraging stakeholder input from neighboring communities, identifying projects with regional benefits, exploring opportunities to leverage multiple funding sources, protecting assets with regional significance, and fostering inter-agency cooperation to address any potential hurdles to implementation of projects.



Review of Existing Plans: The Towns of Shandaken and Hardenburgh have contributed to several regional studies and plans in recent years that aim to foster collaborative initiatives to enhance quality of life and all aspects of economic, community, and environmental health. A review of these and other regional planning efforts to identify common goals, emerging issues, and opportunities for collaboration was conducted.

Stakeholder Input: As public engagement continued throughout the planning process, the Committee sought to encourage input from neighboring communities as often as possible. Recognizing that the challenges of an individual community are rarely confined to its own boundaries, the Towns of Shandaken and Hardenburgh capitalized on numerous opportunities to discuss past experiences, current issues, and potential solutions with neighboring communities. Outreach proved to be a successful tool for gathering feedback and ideas from residents of other communities. The Committee's work included outreach during local Cauliflower Festival in Margaretville and the Fall Fest in Mt. Tremper, surveys of service providers, communication between other communities participating in the NYRCR Program, and other initiatives

The Committee's efforts also involved outreach to regional organizations such as the County planning office, watershed councils, and regional economic development agencies to discuss project ideas and opportunities for collaboration and to identify any required regulatory approval processes. Critically important to this process was the assessment of available resources that regional entities could provide to the Committee to aid in the planning process. This process was supported and furthered through coordination with the New York State Agency Review Team (SART), and helped to create a support network for the Committee.

Projects with Regional Significance: As part of the identification of their proposed initiatives and actions presented in this Plan, the Committee made a focused effort to advance projects that will also benefit neighboring municipalities. As the Committee identified and developed these projects, the Committee sought opportunities to effect change on a regional level while simultaneously benefitting from cost reductions available through collaboration. Infrastructure projects that would benefit both the Towns and the region were considered as well as emergency services, social services, waterway projects, and other ventures that naturally transcend municipal boundary lines. The Committee ensured that projects aimed at protecting regional assets were identified, highlighted, and considered for implementation.

REVIEW OF EXISTING PLANS AND STUDIES

During the process the Committee utilized existing plans and studies as a basis for decision making, to accelerate the planning process, to focus on needs not sufficiently addressed in existing documents, and to place greater focus on implementation.



TABLE 1. REVIEW OF EXISTING PLANS AND STUDIES

Resource	Relevance	Key Components for NYRCR Planning Process
Shandaken Comprehensive Plan	Establishes a vision for the long-term maintenance, growth, and development of the Town. Provides overarching goals and recommended implementation actions for all areas of the community including but not limited to infrastructure, community facilities, housing, economic development, and natural/cultural resources among others. The Plan is specifically centered on natural resource preservation and hamlet development strategies to create an economy based on environmentally sensitive development and tourism.	Community vision; detailed community/ demographic/ economic data; goals and recommendations for all areas of community and economic development. Offers specific economic development and hamlet development strategies focused on capturing tourism spending, local business development and promotion, and incentivizing desired development.
Revitalizing the Esopus/Delaware Region of the Central Catskills	Provides a regional collaborative economic revitalization plan for the Esopus and East Branch Delaware River region of the central Catskills. Outlines strategies for economic growth as well as Main Street and hamlet revitalization by capitalizing on the region’s assets including natural resource-based recreation opportunities and associated tourism potential.	Inventory of existing conditions, regional vision, identified goals, projects for economic development, and retail spending analysis.
Shandaken Flood Mitigation Plan and Ulster County Hazard Mitigation Plan	Provides County and local strategies for mitigating all potential hazards to the Town. Provides detailed information on past and current flood issues, existing flood initiatives, and recommendations for additional mitigation actions to address future disaster events.	Detailed past flood information, hazard vulnerabilities, assessed values and potential losses, past and ongoing mitigation projects, proposed mitigation initiatives
Mid-Hudson Region Economic Development Council Strategic Plan	A regional economic development strategy and vision for the Mid-Hudson region of New York. Illustrates the economic climate, trends in job creation and business growth for the region as well as strategies for leveraging assets, revitalizing traditional urban centers, and attracting desirable growth.	Key economic drivers, regional economic advantages and challenges, recommendations for economic development initiatives, regional projects
East Branch Delaware River Stream Corridor Management Plan	Provides local and regional guidance on watershed management to preserve and improve water quality, protect environmental resources and reduce community flood risk. Provides details on stream characteristics, conditions, processes, local issues and concerns related to stream management as well as recommendations for improvement.	Summaries of local issues and concerns collected through stakeholder outreach, existing/ongoing stream restoration projects, detailed stream management recommendations
Upper Esopus Creek Management Plan	Provides a thorough description of the Upper Esopus addressing issues of water quality and stream management. Provides a strategy for coordination of management activities among various stakeholders.	Summary of stream management in region and planning area, project recommendations, flood impacts and damage history
Catskill Mountains Scenic Byway Corridor Management Plan	Provides a strategy for protecting regional character and assets and capitalizing on scenic, natural and cultural resources to increase economic health and tourism. This plan also serves as a comprehensive nomination to designate sections of State Routes 28, 28A, 214, 42, 30, and local roads as a scenic byway.	Inventory of local resources, descriptions of key assets that define regional character, recommendations for tourism growth, increased recreational opportunities, transportation improvements, effective stewardship, marketing and branding, and implementation actions



TABLE 1. REVIEW OF EXISTING PLANS AND STUDIES

Resource	Relevance	Key Components for NYRCR Planning Process
A Three-County Regional Housing Assessment: Ulster, Orange, and Dutchess Counties from 2006-2020	Provides a comprehensive look at current housing trends and issues in the three-County plan area. Provides detailed information relating to affordability, economic climate, as well as existing and projected housing gaps at the local and regional level.	Housing gap analysis by income level, target affordable home values, and rents by local income, including projected future gaps and recommendations for providing adequate housing to accommodate future populations
Ulster County Main Streets Strategic Toolbox: A Report on the Hamlets of Phoenicia, Pine Hill & Shokan	The Report includes a strength, weaknesses, opportunities, and threats (SWOT) analysis summarizing each hamlet's strengths, weaknesses opportunities and threats, as well as regional and hamlet-specific economic and market analyses, including sales leakage estimates for major retail categories. A strategic action plan is also provided for each hamlet, along with branding concepts	Phoenicia and Pine Hill are located within Shandaken and are the primary designated commercial hamlet centers within the Town. Key economic revitalization strategies identified include the expansion of cultural/heritage tourism in general and better capitalizing on the presence of cultural heritage tourists and the arts in the region to support Main Street/hamlet revitalization.
Town of Shandaken Zoning Ordinance	Provides local land use regulations for allowable uses and development standards for 9 zoning districts, including a Floodway District and Flood-Fringe Overlay District. Hamlet centers fall within one of two zoning designations -- Hamlet Residential or Hamlet Commercial Districts.	Establishes the context for local development and revitalization opportunities, including allowable densities, heights, and permitted uses.
Town of Hardenburgh Zoning Ordinance	Provides local land use regulations for allowable uses and development standards without designating different zoning districts.	Establishes the context for local development, including allowable uses and basic development standards such as lot sizes and building height.

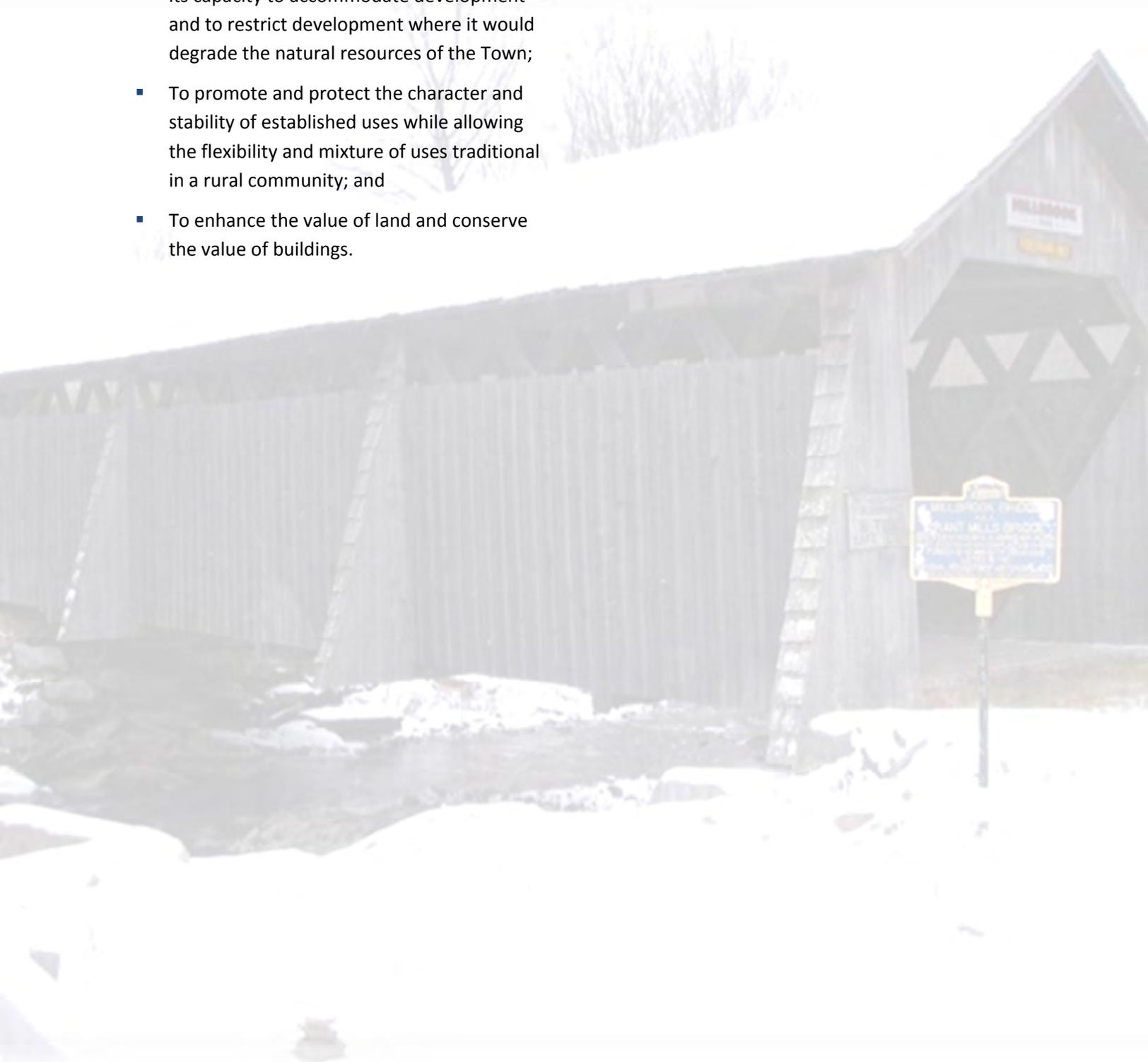
As noted above, in addition to local and regional plans, the Committee reviewed local zoning regulations governing development and revitalization within each of the Towns. Favorable aspects of Shandaken's zoning regulations include a hamlet-oriented development strategy that identifies both residential and commercial districts, as well as limited highway commercial development districts, primarily along Route 28. Standards for building and impervious coverage effectively address how much of a lot can be developed with buildings, pavements and other impermeable surfaces. Resorts and lodging are permitted in

several districts, as are restaurants and recreational uses – allowing local businesses to continue to attract local tourism spending and to capitalize on future tourism expansion. Floodway and Flood-Fringe Overlay Districts integrate flood damage prevention provisions with zoning.

The Town of Hardenburgh has what is described in the zoning code as a single residential zone; however it permits a variety of non-residential uses. The non-residential uses unrelated to agriculture are permitted with a special use permit. The goals of Hardenburgh’s zoning code include the following:



- To preserve the rural character of the Town and its sensitive natural environment;
- To promote the use of land in accord with its capacity to accommodate development and to restrict development where it would degrade the natural resources of the Town;
- To promote and protect the character and stability of established uses while allowing the flexibility and mixture of uses traditional in a rural community; and
- To enhance the value of land and conserve the value of buildings.





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SECTION II

Assessment of Risk and Need





Courtesy of Tetra Tech



Section II. ASSESSMENT OF RISK AND NEEDS

DESCRIPTION OF COMMUNITY ASSETS AND ASSESSMENT OF RISK

INTRODUCTION AND OVERVIEW

Successful disaster recovery focuses on projects and initiatives that aim to protect important assets and bolster a community’s resiliency against future storm events. One of the first tasks in the planning process was the need to clearly understand the type and location of critical assets and resources in Shandaken and Hardenburgh. These assets were listed in an inventory that includes resources, critical facilities, as well as social, economic, and environmental functions in the community that provide essential services or are of local significance.

This critical asset inventory identifies those functions and facilities the community relies on, such that the community would be at risk if they were destroyed or impaired because of weather events or flooding. By identifying and assessing the current and future risk to these assets, the community is able to proactively plan and implement measures to help ensure its protection during any future disasters.

INVENTORY PROCESS

Data Collection

To kick off this process, the Committee — with support from its consultants — prepared a preliminary inventory of assets through stakeholder outreach, Committee deliberations, and review of

datasets. The NYS DOS Risk Assessment Work Group facilitated development of a comprehensive list of datasets that were provided to the Shandaken and Hardenburgh NYRCR Committee. The NYS DOS provided databases that included datasets from numerous public and private sources.

In addition to the data provided by NYS DOS, the consultant team compiled local-level data from Ulster County using its Geographic Information System (GIS) database and the Shandaken Hazard Mitigation Plan.

A Collaborative Approach to Engaging the Public

While less GIS are available to the most rural areas of New York State than for their urban counterparts, rural residents have a wealth of local knowledge, which is simply not recorded in any discernable geographic format.

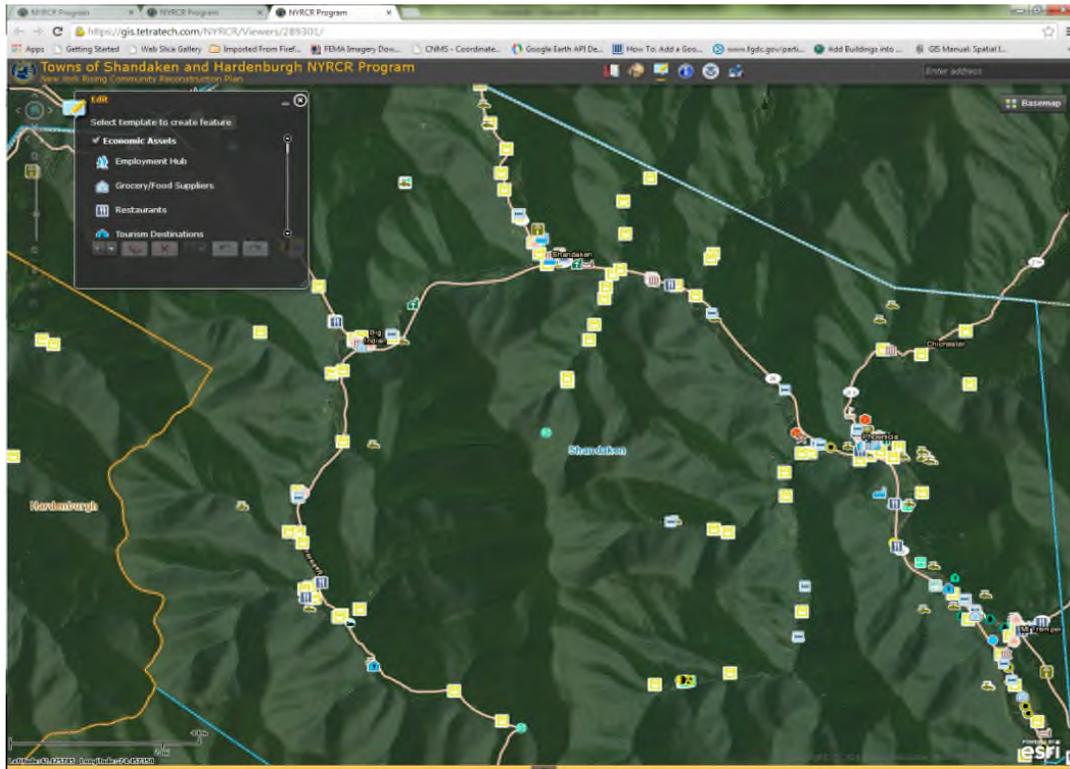
Community Map Portal
This unique on-line tool allows the committee to identify and detail community assets and critical facilities

To capitalize on this knowledge, two Committee meetings were held to engage the public in collaborative dialogue to identify and compile assets using an interactive GIS web-mapping portal.

This portal allowed Committee members to visualize, interact with, edit, and add assets and allowed for the capture and use of local knowledge to populate and refine the asset inventory information (Figure 9)



FIGURE 9. GIS WEB-MAPPING PORTAL (NYRCR TOWN OF SHANDAKEN)



Source: NYRCR Committee

Asset Classification

The assets identified were reviewed and classified into six categories, in accordance with the National Disaster Recovery Framework. These categories,

along with examples, are described in in Table 2 below.

TABLE 2. ASSET CATEGORIES	
Asset Class	Examples
Economic	Office buildings, business and industrial parks, manufacturing, warehouses, storage facilities, grocery, restaurants, banks, lodging, storefronts, downtown center, and seasonal/tourism destinations
Health and Social Services	Schools, health care, day care, elder care, emergency operations, government and administrative services, media and communications, police, fire, and rescue
Housing	Single-family and multi-family dwellings, supportive housing/group homes, senior housing, and affordable housing
Infrastructure Systems	Pedestrian, bicycle and vehicular ways, transit, bridges, airports, rail, ports, ferries, gas stations, water supply, stormwater, wastewater, solid waste, recycling, and power generation facilities
Natural and Cultural Resources	Natural habitats, wetlands and marshes, recreation facilities, parks, public access, open spaces, agricultural areas, religious establishments, libraries, museums, historic landmarks, and performing arts venues
Socially Vulnerable Populations	Assets predominantly providing services for people with disabilities, low- and very-low income populations, the elderly, young children, homeless, and people at risk of becoming homeless

Source: NYS DOS, 2013



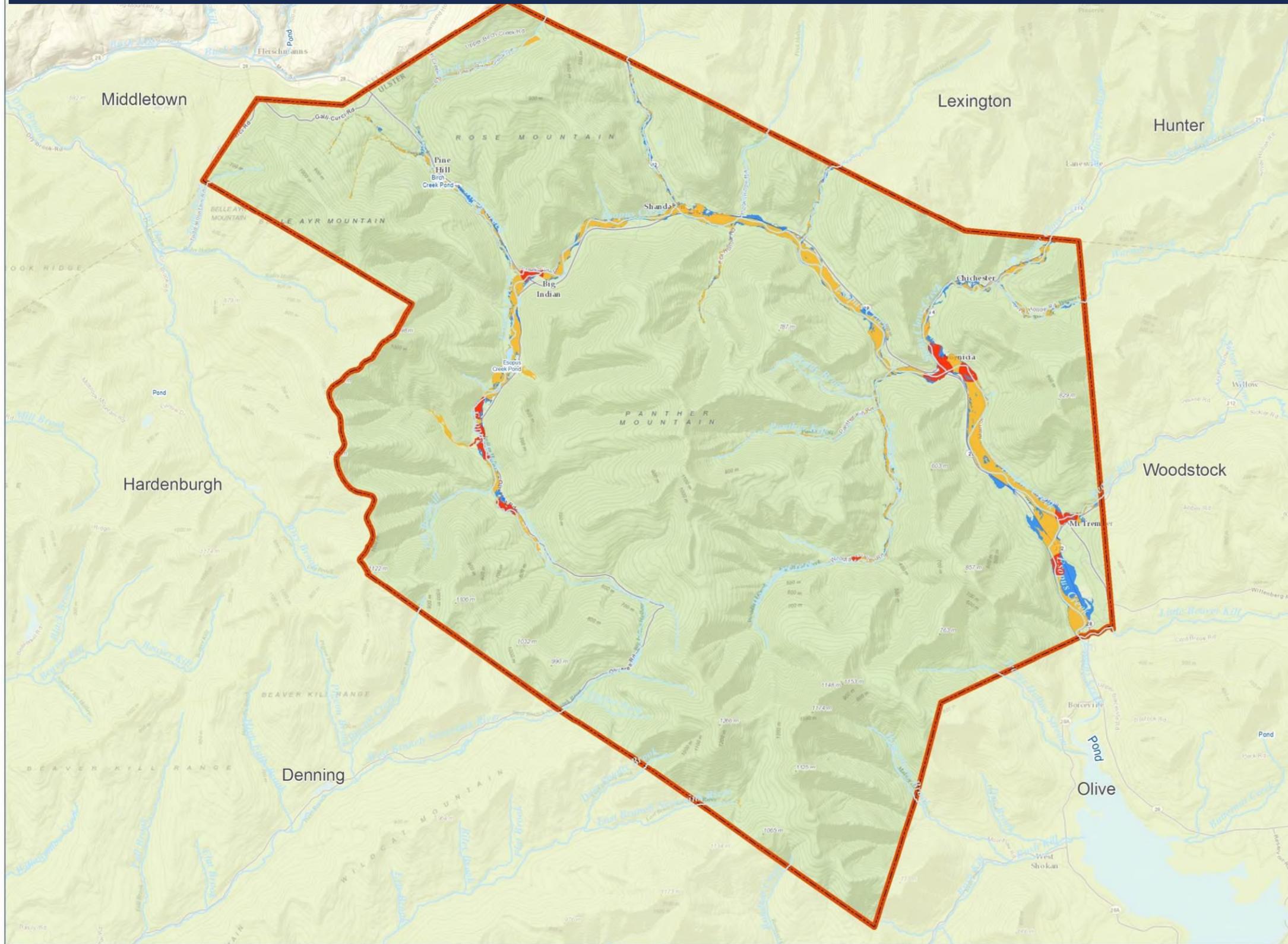
Assets were also classified as either “critical” or “non-critical” facilities. Critical assets, as defined by the FEMA, include, but are not limited to, features that create or extend the useful life of structures or facilities that provide important community services, such as healthcare facilities, emergency operation centers, and power generation facilities, among others.

Description of Risk Areas

Once assets were identified and classified, it was essential to understand which geographic areas

have been and will be affected by flooding to determine which assets are at risk and to what degree. The three risk areas for riverine communities are based on the current Flood Hazard Area (FHA) and the FEMA National Flood Insurance Policy severe repetitive loss data. These areas reflect the frequency and likelihood of flood inundation and are classified as either “extreme,” “high,” or “moderate” in descending order of risk magnitude. Figures 10 and 11 below show the risk areas in the planning areas of NYRCR Towns of Shandaken and Hardenburgh.

NYRCR: TOWN OF SHANDAKEN, ULSTER COUNTY
Figure 10. Shandaken Risk Areas

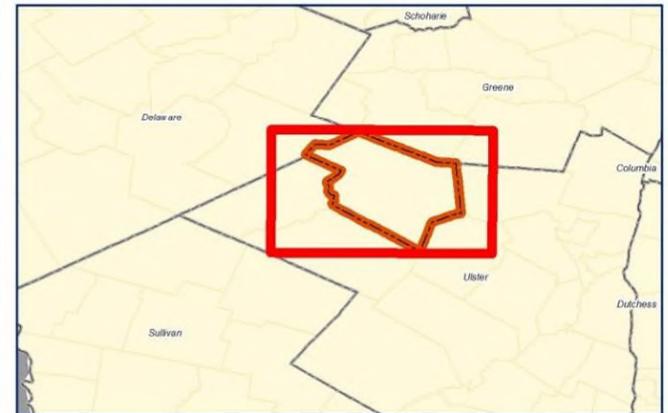


Legend

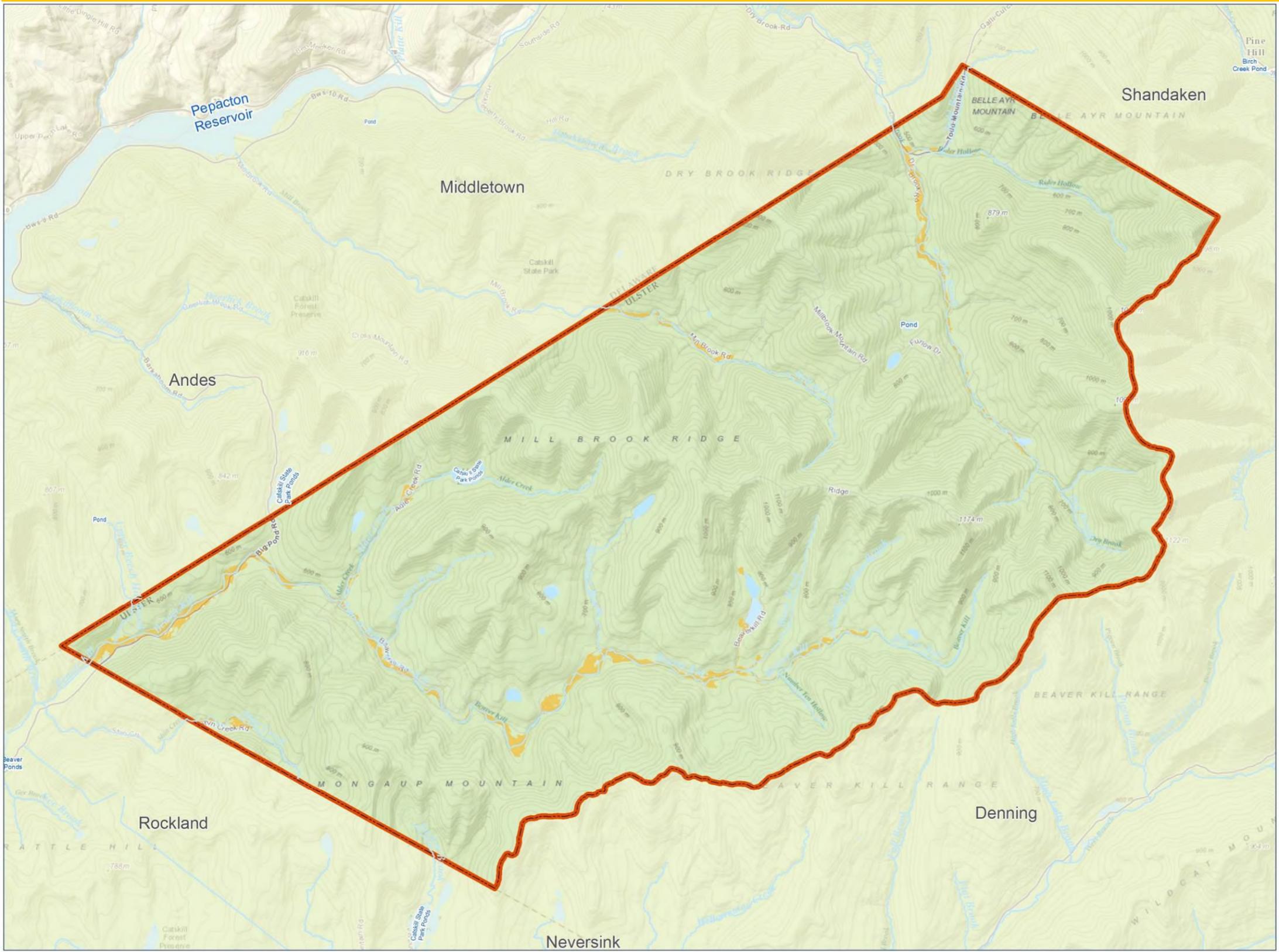
- Town of Shandaken/Planning Area
- Risk Area**
- Moderate Risk
- High Risk
- Extreme Risk

This map is for reference only.
Data Sources:
NYRCR- Asset Locations, Risk Areas,
Risk Scores

0 1 2 Miles



NYRCR: TOWN OF HARDENBURGH, ULSTER COUNTY
Figure 11. Hardenburgh Risk Areas

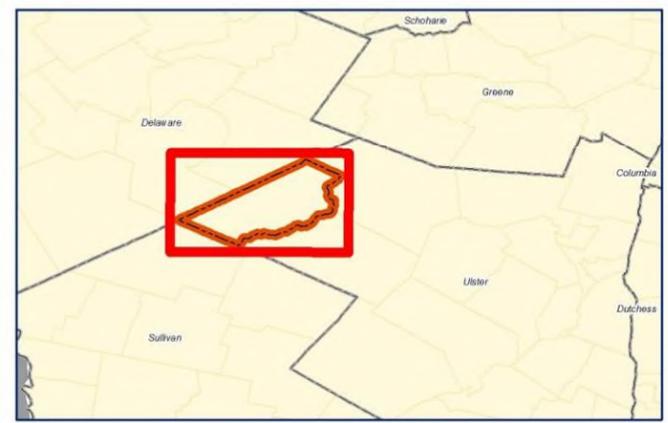


Legend

- Town of Hardenburgh/Planning Area
- Risk Area**
- Moderate Risk
- High Risk

This map is for reference only.
Data Sources: NYRCR- Asset Locations, Risk Areas, Risk Scores

0 0.75 1.5 Miles





DESCRIPTION OF COMMUNITY ASSETS

The following section describes NYRCR assets identified for Shandaken and Hardenburgh by recovery support function and provides additional information for each asset or group of assets. Figures 12 through 18 illustrate the assets’ locations by recovery support function within the NYRCR Planning Area and the extent of the defined risk area.

Shandaken Economic Assets

The Town of Shandaken has several hamlets that serve as economic centers of the western Catskills and support tourism generated by Belleayre Ski Center. The major hamlets include Phoenicia, Shandaken, Big Indian, Pine Hill, Mt. Tremper, and Chichester. The economic centers were hit hard by the storms and suffered severe damage as well as extended economic interruption as a result of the damage to local roads. The business center of Phoenicia was particularly hard hit, as the extended closure of the Bridge St. Bridge resulted in reduced revenue for the businesses. The Committee identified 80 economic assets within this category with 9 assets located in the Extreme Risk Area,



Courtesy of society6.com

including lodging and facilities that provide supplies, food, and services to residents during a potential disaster. The full inventory of assets appears in Section V.

Hardenburgh Economic Assets

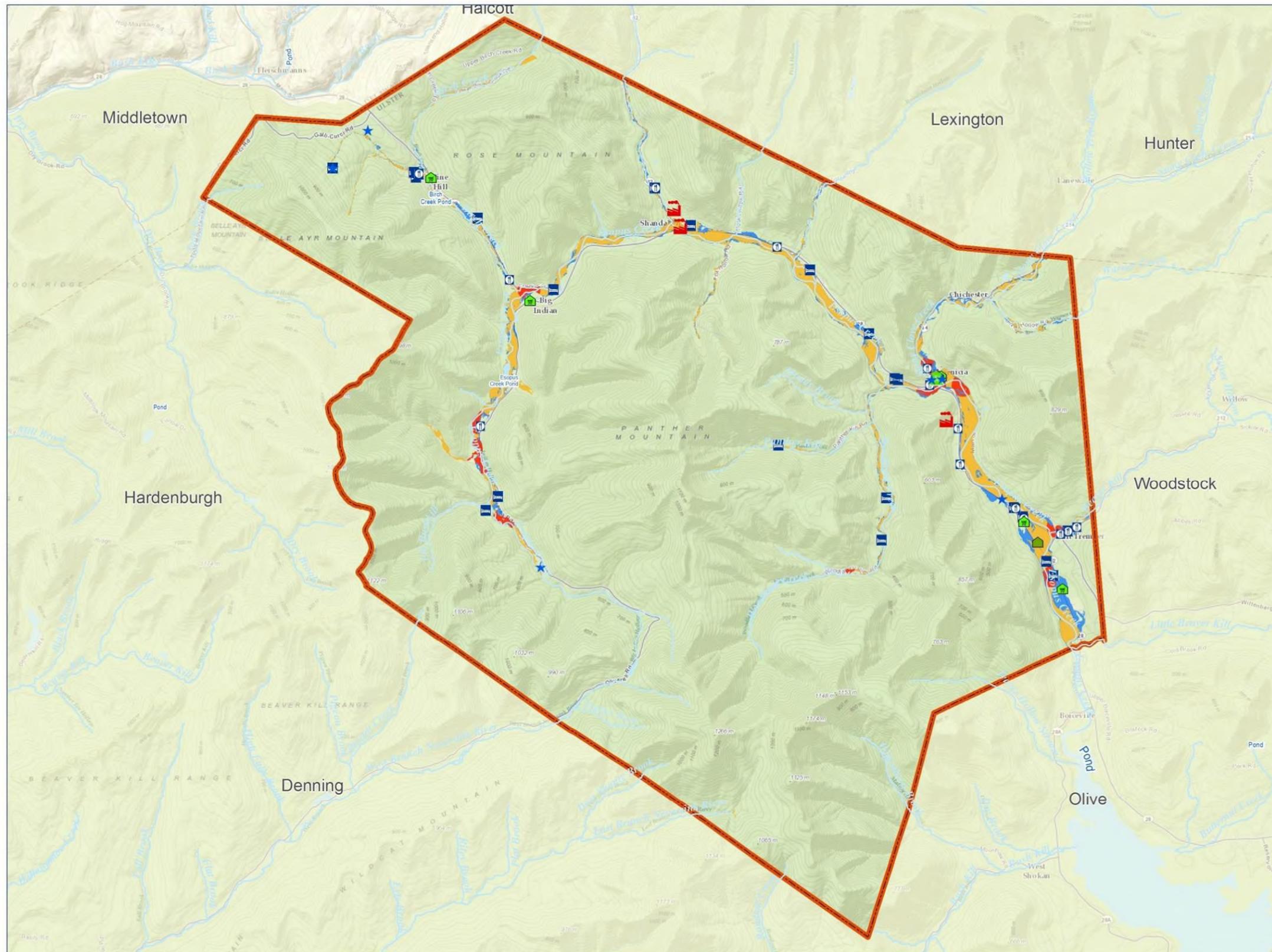
Understanding that Hardenburgh is a rural



Belleayre Ski Center: Courtesy of NYDEC

community, untouched by conventional commercial enterprises, the Committee did not identify any economic assets in Hardenburgh. The Town is home to various agricultural enterprises, and the Committee did categorize them as critical facilities. Hardenburgh is a small farming town, and non-farming residents are usually employed in nearby larger towns, although recreational opportunities add to its local economy. The full inventory of assets appears in Section V.

NYRCR: TOWN OF SHANDAKEN, ULSTER COUNTY
Figure 12. Shandaken Economic Assets



Legend

Town of Shandaken/Planning Area

Assets

- Banks and Financial Services
- Downtown Center
- Grocery/Food Suppliers
- Industrial and Manufacturing
- Large Business
- Lodging
- Restaurants
- Small Business
- Tourism Destinations

Risk Area

- Moderate Risk
- High Risk
- Extreme Risk

This map is for reference only.
 Data Sources: NYRCR- Asset Locations, Risk Areas, Risk Scores

0 1 2 Miles





Health and Social Service Assets



This asset category includes items that serve a variety of public functions, from health treatment facilities to

general-purpose shelters in public schools, from post offices to town halls. During a flood event, these facilities could serve as critical disaster response and recovery centers, and their identification is essential to future disaster management and preparedness. This category also includes many critical assets, including fire protection, police services, hospitals, and emergency operations facilities. Both Towns felt a severe impact from the storm damage that hindered their ability to access health and social services. In many cases, residents were cut off from all services by the road and bridge damage.

Shandaken Health and Social Service Assets

Forty-one facilities were identified in this asset category, including two assets in Phoenicia located



Margaretville Memorial Hospital Courtesy of <http://www.hahv.org/margaretvillehospital/about/>

in the Extreme risk area and noted as having a high community value. Some of the major facilities include the Phoenicia Firehouse, Shandaken Firehouse, Shandaken Emergency Operations Center (EOC), and the Shandaken Municipal Hall.

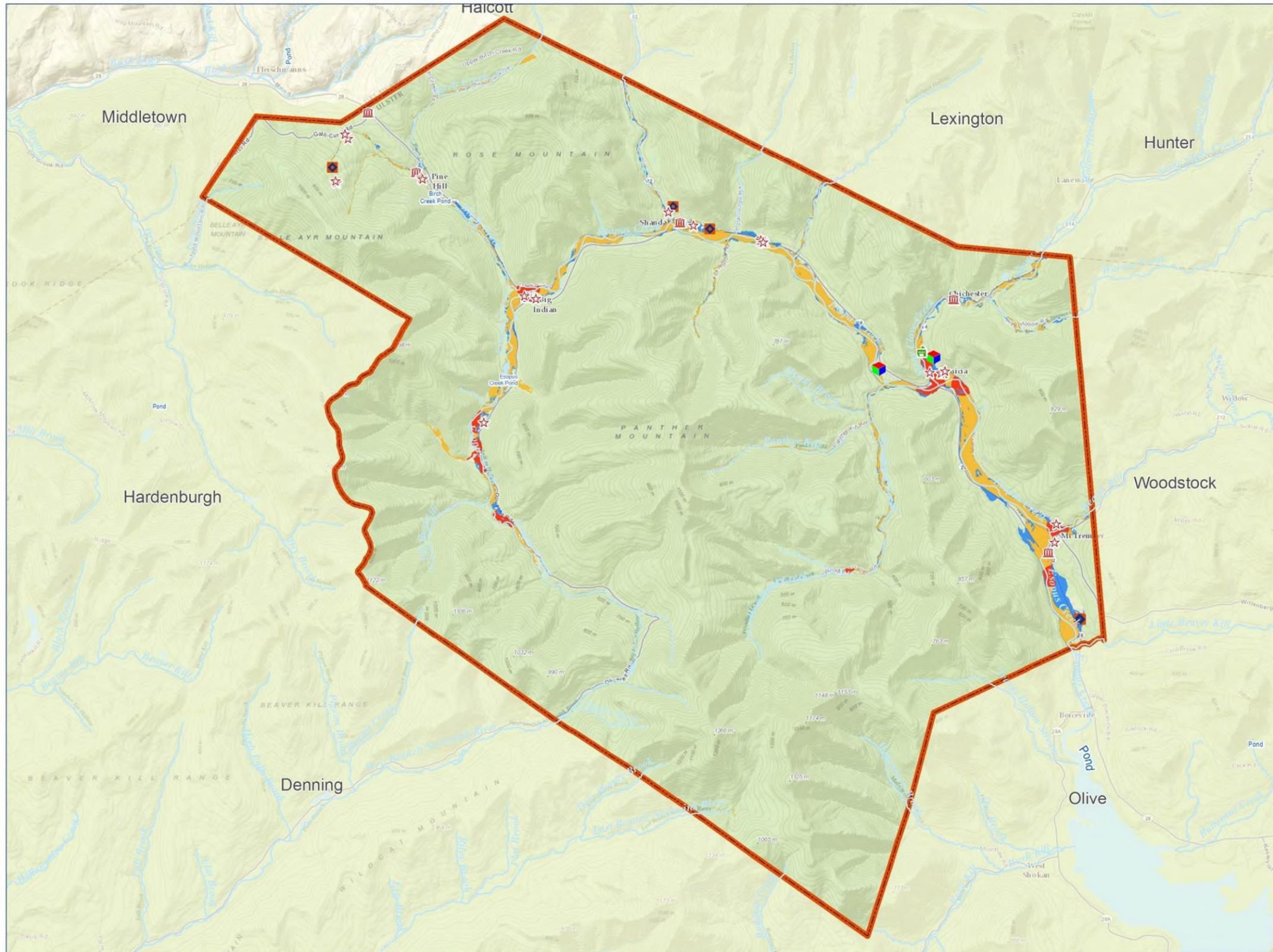
Hardenburgh Health and Social Service Assets

The residents of Hardenburgh rely on several facilities outside the Town’s municipal boundaries to provide essential services, including the Margaretville Memorial Hospital and Margaretville Central School. Some of the facilities within the Town include the Town of Hardenburgh Town Hall and the Town of Hardenburgh Highway Department. The full inventory of assets appears in Section V.

Critical Facilities

- Facilities that produce, use, or store highly volatile, flammable, explosive, toxic, or water-reactive materials;
- Hospitals and nursing homes, and housing for the elderly, which are likely to contain occupants who may not be mobile enough to avoid injury or escape death during a flood or a severe storm event;
- Emergency operation centers, or data storage centers that contain records or services that may become lost or inoperative during flood and storm events;
- Power-generating plants and other principal points of utility lines.

NYRCR: TOWN OF SHANDAKEN, ULSTER COUNTY
Figure 13. Shandaken Health and Social Services Assets



Legend

Town of Shandaken/Planning Area

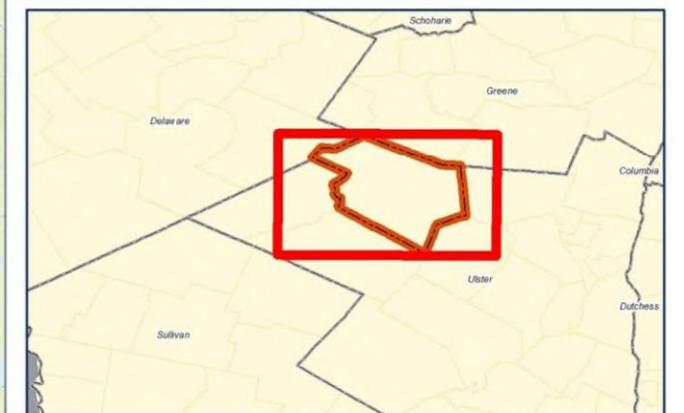
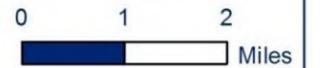
Assets

- Emergency Operations/Response
- Healthcare Facilities
- Schools
- Primary/Regional Hospitals
- Public Works Facilities
- Government and Administrative
- Daycare and Eldercare

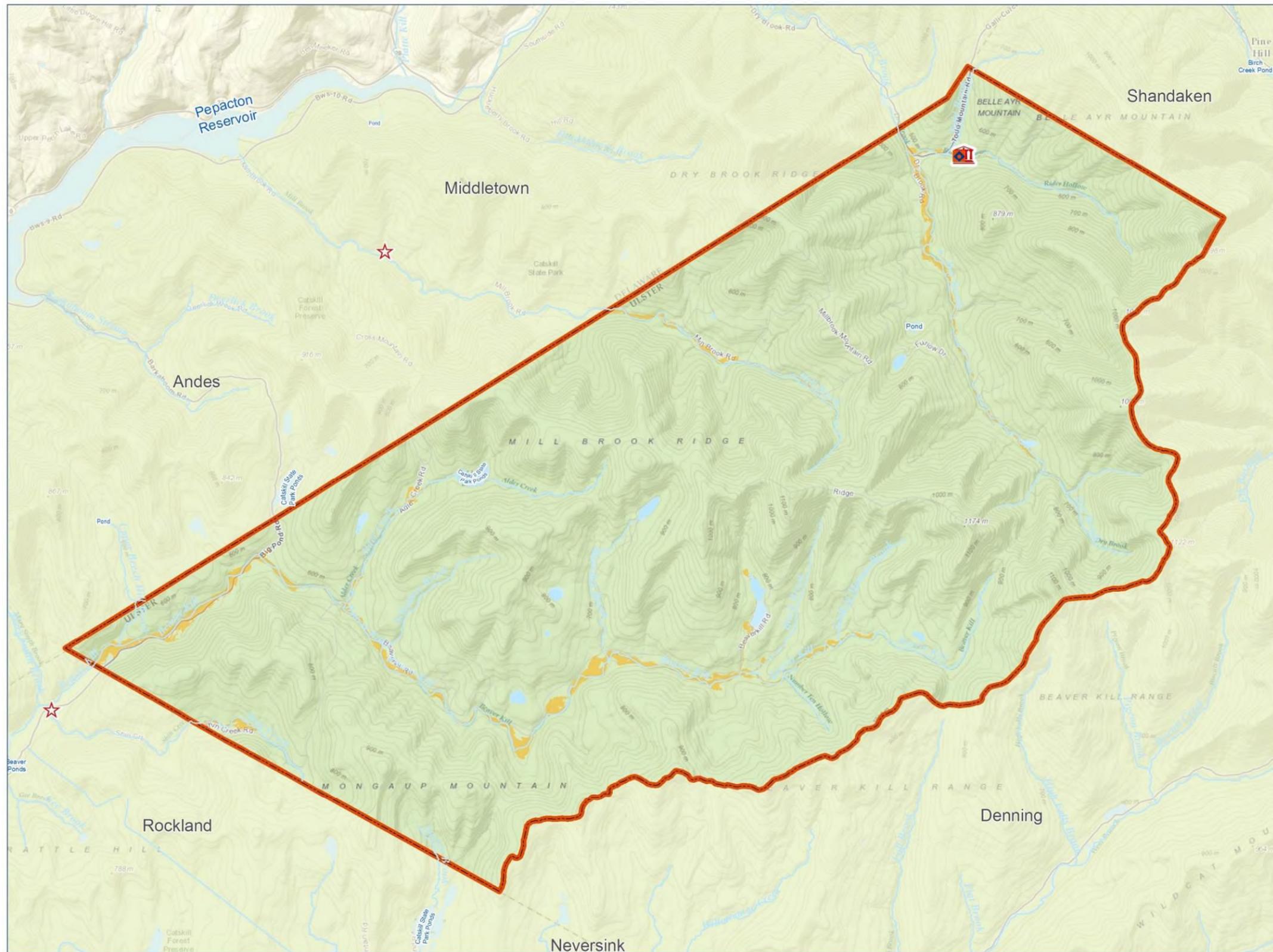
Risk Area

- Moderate Risk
- High Risk
- Extreme Risk

This map is for reference only.
 Data Sources:
 NYRCR- Asset Locations, Risk Areas,
 Risk Scores



NYRCR: TOWN OF HARDENBURGH, ULSTER COUNTY
Figure 14. Hardenburgh Health and Social Services Assets



Legend

Town of Hardenburgh/ Planning Area

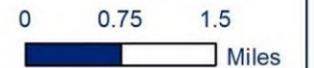
Subcategory

- Daycare and Eldercare
- Emergency Operations/Response
- Government and Administrative
- Healthcare Facilities
- Primary/Regional Hospitals
- Public Works Facilities
- Schools

Risk Area

- Moderate Risk
- High Risk

This map is for reference only.
 Data Sources:
 NYRCR- Asset Locations, Risk Areas,
 Risk Scores





Infrastructure Assets – The Way from Here to There



Courtesy of Phoeniciany.com

Infrastructure assets include resources such as pedestrian, bicycle, and vehicular ways; transit; bridges; airports; rail; ports; ferries; gas stations; water supply; stormwater, wastewater, and solid waste management; and recycling services.

Transportation assets including the system of roads and bridges are of critical importance to the residents of these rural towns. The sparsely populated area lends itself to isolation of residents caused by damage to the many roads and bridges in the communities. In many cases, residents were stranded for days after Hurricane Irene and Tropical Storm Lee as roads and bridges were literally washed away. Many assets within this category identified by the community and Committee were transportation- or stormwater-related facilities. Based on public comment and Committee feedback, safe access to these facilities during storm events

was clearly a priority. During a flood event, various facilities could provide access to critical disaster response and recovery personnel, and identification of these facilities is essential to future disaster management and preparedness. Some of these facilities may also be used to preserve sanitary conditions during a disaster.

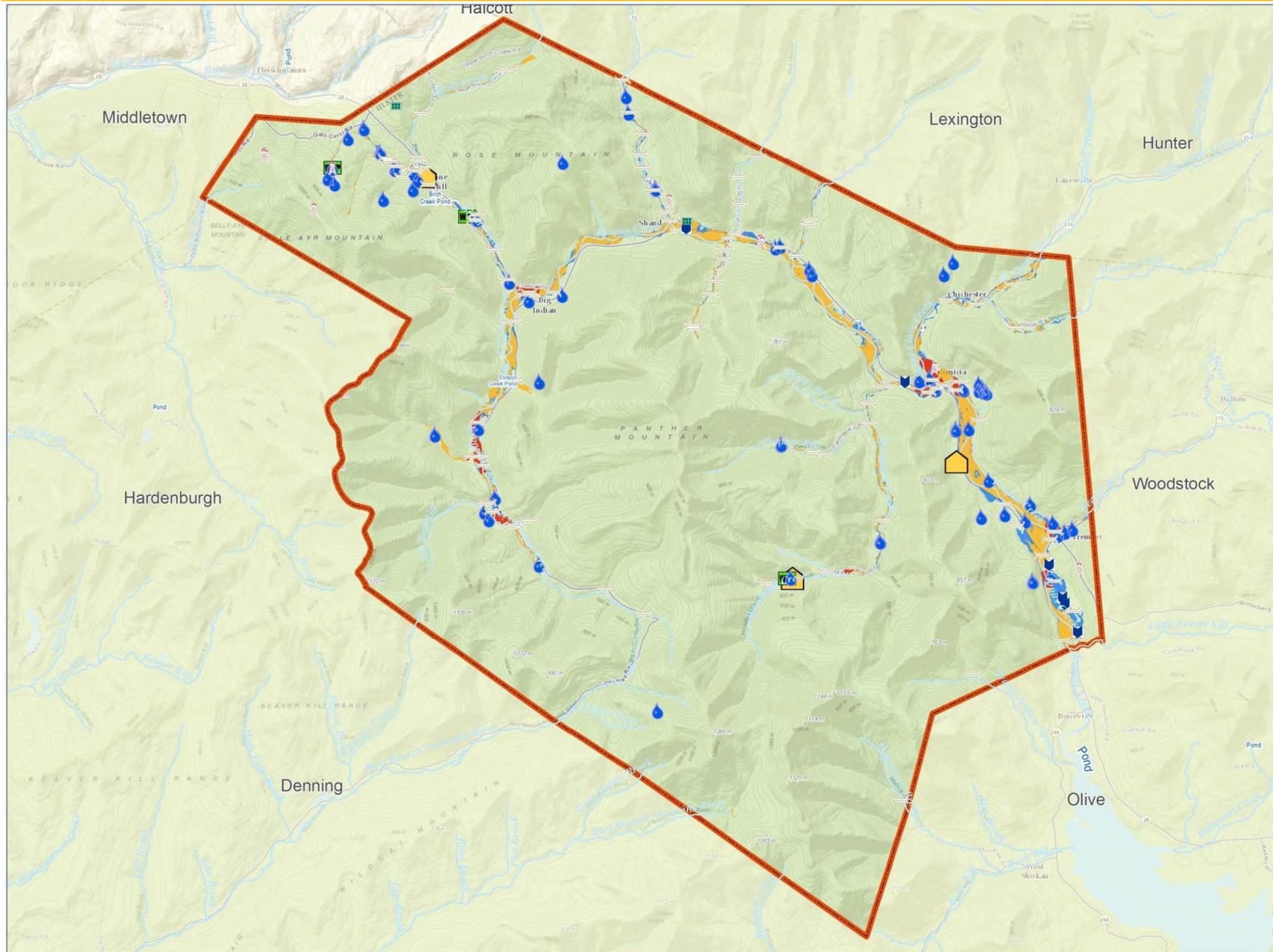
Shandaken Infrastructure Assets

A total of 220 facilities were identified within this category, including water storage facilities, bridges, and roadway segments. Facilities identified include the Bridge Street Bridge in Phoenicia and the Mt. Tremper Bridge in Mt. Tremper. The full inventory of assets appears in Section V.

Hardenburgh Infrastructure Assets

Similar to Shandaken, the Town of Hardenburgh was stricken by flood damage to roads, which affected the majority of its residents. Almost every road was impassible for a period during Hurricane Irene and Tropical Storm Lee. A total of 89 facilities were identified within this category, including Hinckley Road Bridge, the Old Baker Stream crossing structure, multiple points along Beaverkill Road, and the Dry Brook Road County concrete box culvert. The Committee also identified vulnerable roadway segments as assets. The full inventory of assets appears in Section V.

NYRCR: TOWN OF SHANDAKEN, ULSTER COUNTY
Figure 15. Shandaken Infrastructure Systems Assets



Legend

Town of Shandaken/Planning Area

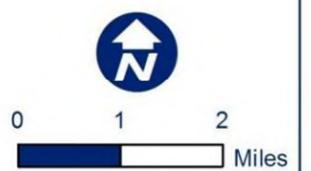
Assets

- Power Supply
- Stormwater
- Telecommunications
- Transportation
- Water Supply
- Wastewater
- Solid Waste and Recycling

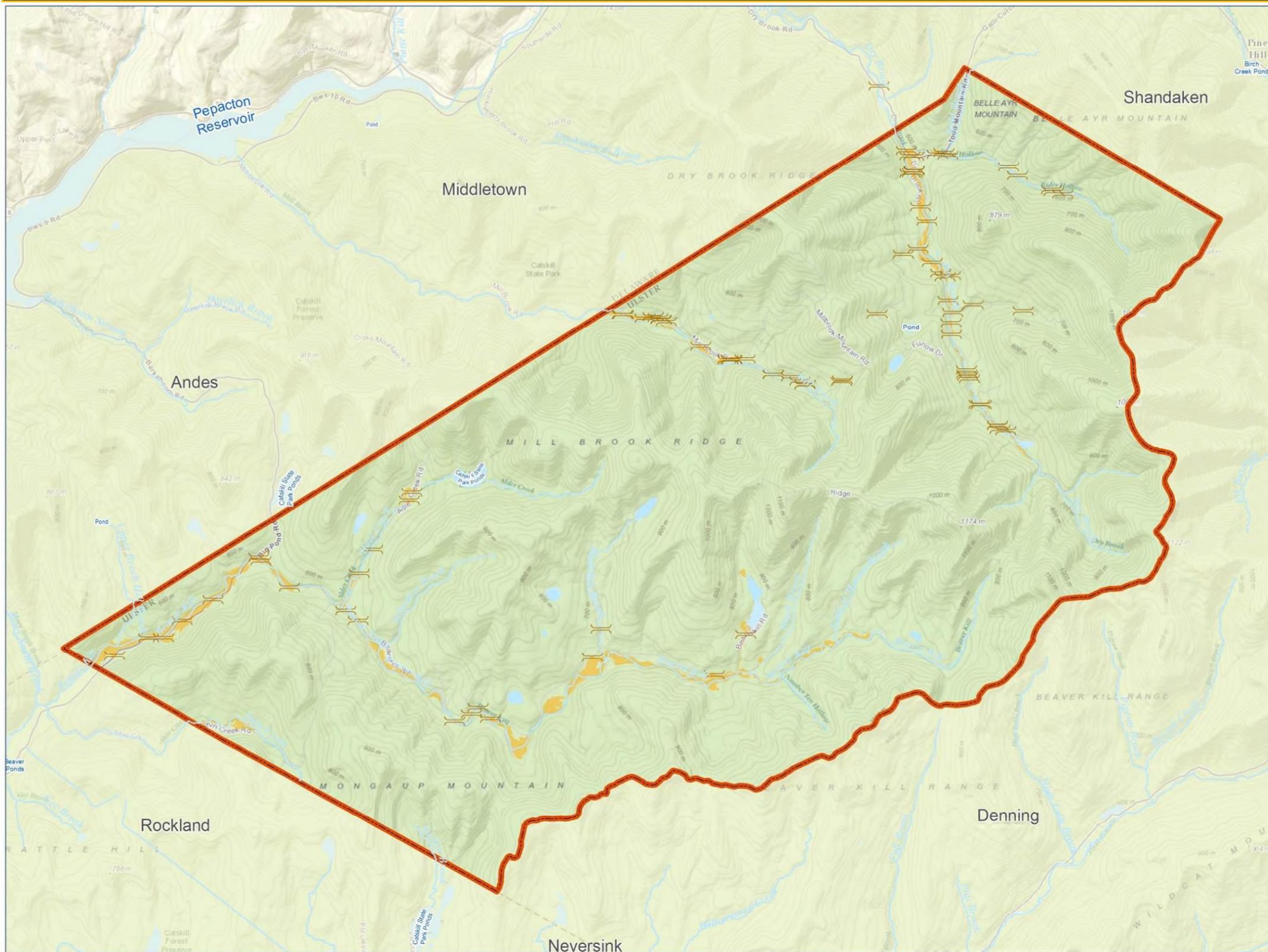
Risk Area

- Moderate Risk
- High Risk
- Extreme Risk

This map is for reference only.
 Data Sources:
 NYRCR- Asset Locations, Risk Areas,
 Risk Scores



NYRCR: TOWN OF HARDENBURGH, ULSTER COUNTY
Figure 16. Hardenburgh Infrastructure Systems Assets



Legend

Subcategory

Transportation

Town of Hardenburgh/Planning Area

Risk Area

Moderate Risk

High Risk



This map is for reference only.
 Data Sources:
 NYRCR- Asset Locations, Risk Areas,
 Risk Scores



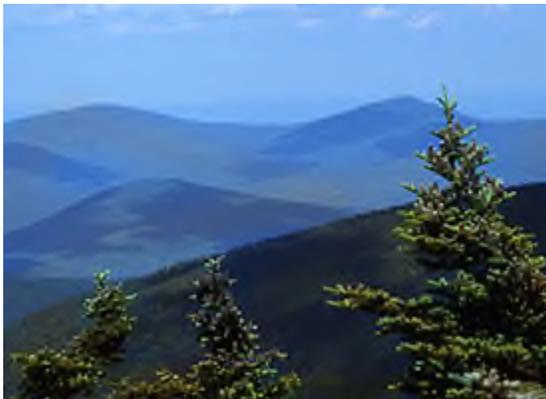


Natural and Cultural Resource Assets

Both Towns have a multitude of natural resource assets that define the character of the communities. This asset category includes natural and cultural resources such as natural habitats, wetlands and marshes, recreation facilities, parks, public access, open spaces, agricultural areas, religious establishments, libraries, museums, historic landmarks, and performing arts venues. Natural and cultural resources are important to the quality of life within the Towns, and some actually protect other assets within the community from potential impacts of flooding. The Towns Identified these assets recognizing the importance to (1) understand ways to protect historic and cultural resources, and (2) determine where natural resources such as wetlands or flood plains could be enhanced to help protect the Towns’ infrastructure and other assets during storm events.

Shandaken Natural and Cultural Resource Assets

A total of 44 facilities were identified within this



Courtesy of NYS DEC

category, including Belleayre Mountain Ski Center, Mt. Tremper Arts, and the Morton Memorial Library. The full inventory of assets appears in Section V.

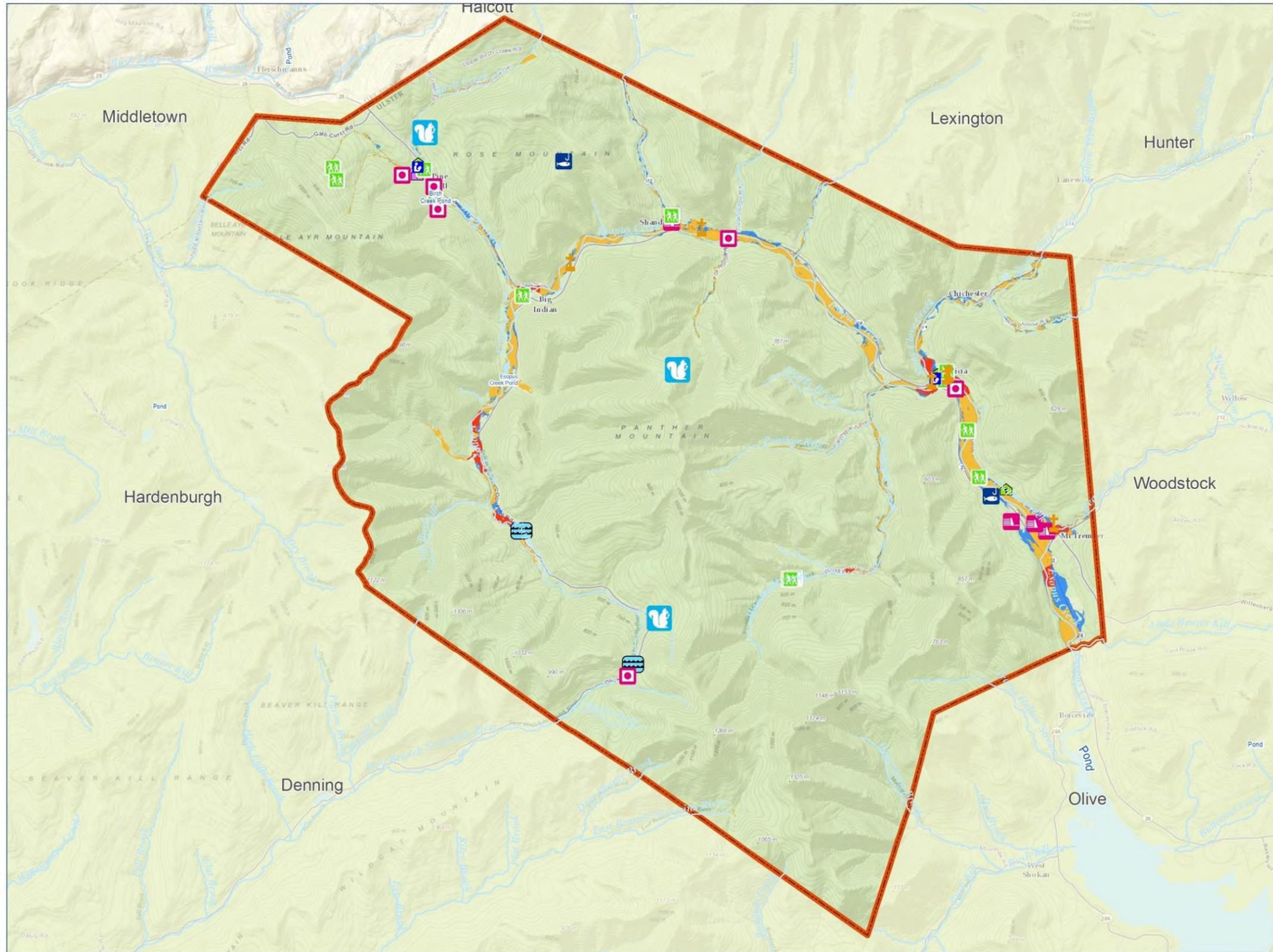
Hardenburgh Natural and Cultural Resource Assets

Hardenburgh’s community is defined by its unique natural resources, including miles of trails, acres of forests, and prime fishing areas. Twelve facilities were identified within this category, including Zimmerman Creek Fishing Access, Grants Mills/Millbrook Covered Bridge, and Dry Brook Community Hall and Church. The full inventory of assets appears in Section V.



Near Drybrook - Courtesy of dcnyhistory.org

NYRCR: TOWN OF SHANDAKEN, ULSTER COUNTY
Figure 17. Shandaken Natural and Cultural Resource Assets



Legend

Town of Shandaken/Planning Area

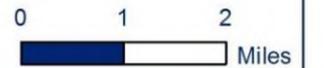
Assets

- Cultural or Religious
- Historic Landmarks and Facilities
- Libraries
- Hunting and Fishing Lands
- Parks and Recreation
- Community Centers
- Museums and Arts Centers
- Natural Habitats
- Natural Protective Features
- Water Bodies

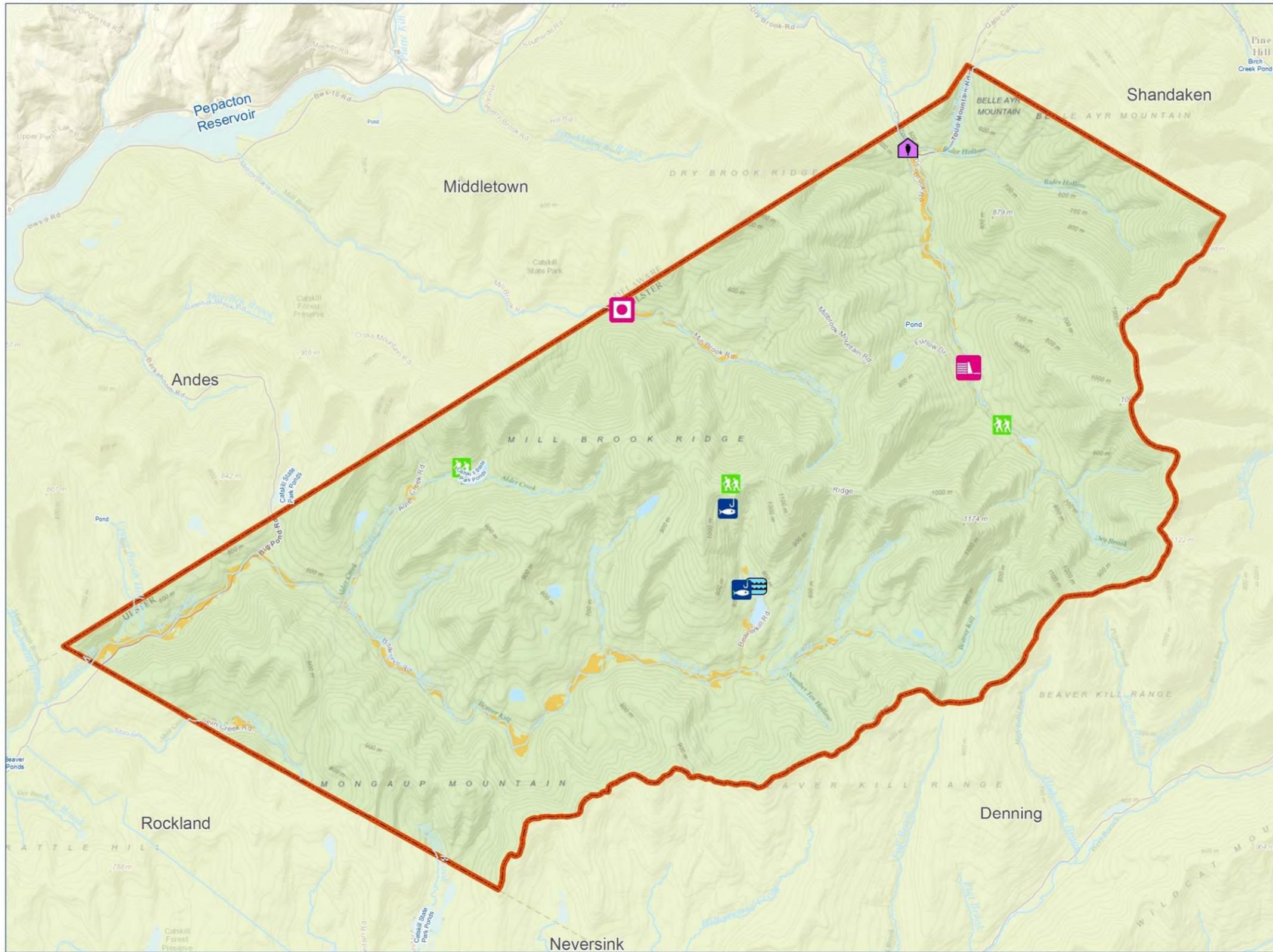
Risk Area

- Moderate Risk
- High Risk
- Extreme Risk

This map is for reference only.
 Data Sources:
 NYRCR- Asset Locations, Risk Areas,
 Risk Scores



NYRCR: TOWN OF HARDENBURGH, ULSTER COUNTY
Figure 18. Hardenburgh Natural and Cultural Resource Assets



Legend

Town of Hardenburgh/ Planning Area

Assets

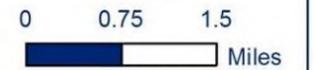
- Cultural or Religious
- Hunting and Fishing Lands
- Libraries
- Parks and Recreation
- Community Centers
- Museums and Arts Centers
- Historic Landmarks and Facilities
- Natural Habitats
- Natural Protective Features
- Water Bodies

Risk Area

- Moderate Risk
- High Risk



This map is for reference only.
 Data Sources:
 NYRCR- Asset Locations, Risk Areas,
 Risk Scores





Shandaken and Hardenburgh Housing

The Town's residents and the NYRCR Shandaken/Hardenburgh Planning Committee did not identify any housing assets.

Assessment of Risk to Assets and Systems

Shandaken Risk Overview

The NYRCR has provided the most recent FEMA models (Effective Models) to help assess the effectiveness of flood reduction actions proposed in the riverine areas of NYRCR communities. This report discusses the assessment process with emphasis on the baseline model and the evaluation of multiple scenarios representative of project priorities identified by the Committee and other stakeholders.

Major flooding occurs across Shandaken in the Esopus Creek valley and along many of its tributaries. The hamlets of Shandaken, Phoenicia, and Mt. Tremper are the population centers and all have experienced recent severe flooding. Olivera Road, Woodland Valley Road, Fox Hollow Road, and Routes 28, 40, 212, and 214 are other population corridors that suffer frequent flooding. Upland areas especially around the Belleayre Ski Center are



Gravel/cobble deposits, Shandaken, Courtesy of Tetra Tech

not prone to flooding, and some buildings have been used as emergency shelter during floods.

The Esopus Creek watershed is approximately 90 percent forest with little development pressure that would lead to increased impervious cover. However, there is clear evidence and historical reports of clear cut logging that caused widespread slope failure and increased sediment supply. Significant sediment transport occurs within the streams and large sediment fans along Esopus Creek. Sediment deposition occurs throughout the watersheds and, according to residents, is causing aggradation in confluences near Shandaken, Phoenicia, and upper Esopus Creek. Residents describe previous in-stream gravel harvesting practices that reduced flooding by increasing conveyance. Storing water would be extremely expensive since valley slopes in Shandaken typically range from 0.5 to 2%. Limited removal of gravel deposits in overbank areas can provide additional conveyance but will not create significant storage. Watershed management to increase water holding capacity in the forested areas is probably beneficial for residents.

Historical modification of streams occurred in Shandaken through in-stream gravel harvesting, agricultural practices, and road building. Many local roads and original state highways were built within



Bridge Street Bridge in Phoenicia is inundated by the rising flood waters of the Esopus during Hurricane Irene
Photo Courtesy of Ulster County Department of the Environment



the valleys of Esopus Creek and its tributaries, and low creek crossings were common. Debris and log jams; especially at road crossings, increase flooding during extreme events. Accordingly, many of the business in Shandaken are located in flood-prone areas along Esopus Creek. These businesses depend on their proximity to Esopus Creek and the existing road network. Ulster County, Shandaken and the NYC DEP all have programs to identify stream alterations that should improve water quality and reduce flooding. These projects may include roadway crossings, stream restoration, and embankment repair. A bridge removal project in Phoenicia may reduce flooding by reducing debris jams and removing abutments.

The Hamlet of Phoenicia is located at the mouth of Stony Clove Creek where it joins Esopus Creek. The town is built on the alluvial deposition of Stone Clove Creek, and the stream has been straightened and routed along the upgradient edge of the valley. Alluvial depositions are usually created as flowing water interacts with mountains or hills and deposits sediment or alluvium.

Floodway vs. Floodplain

A floodplain is defined as the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that becomes inundated with water during a flood. Most often floodplains are referred to as 100-year floodplains. A 100-year floodplain is not the flood that will occur once every 100 years, rather it is the flood that has a one-percent chance of being equaled or exceeded each year. Thus, the 100-year flood could occur more than once in a relatively short period of time. With this term being misleading, FEMA has properly defined it as the one-percent annual chance flood. This one percent annual chance flood is now the standard used by most Federal and State agencies and by the National Flood Insurance Program (NFIP) (FEMA, 2005).

A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations. – FEMA 2014

Gravel Management

When we talk about stream work, we make a distinction between "channel restoration" and "dredging."

Channel Restoration uses the appropriate, best available stream science and engineering to ensure an effective and sustainable project. Good engineering reduces the risk of unintended consequences.

Dredging is often used as a "quick fix" to a gravel problem, where the goal is to reduce the risk of a clear and imminent danger to public health and safety in the immediate post-flood response period.

Sometimes dredging is practiced with the expectation that even very large flows can be kept within the river banks. This misconception ignores the fact that the floodplain was created by centuries of repeated large flows, and will continue to be. During past large flows, the stream deposited cobble, gravel, sand and silt in the overbank areas and built the floodplain into what we see today.

Responsible land-use controls and flood proofing of structures are sustainable alternatives to dredging for mitigation of potential flood hazards in high-risk locations

Source: Ashoken Watershed Stream Management Program.

Phoenicia’s Main Street floods when water spills out of Stony Clove Creek and travels laterally through the hamlet. The sudden change in slope from the mountains into the Hamlet causes water velocities to slow and sediment aggradation to occur, creating a constant maintenance concern. The Bridge Street crossing of Esopus Creek also floods and prevents access to Main Street. This bridge was severely damaged during Hurricane Irene, which reduced business activity in Phoenicia. The bridge acts as an obstruction during high flow events and may be raised to reduce flooding.

Shandaken is located at the confluence of Bushnellsville and Esopus Creeks. Several homes and business in the area flooded during Hurricane Irene. A small levee along Bushnellsville Creek protects some properties up to an approximately 10-year flood event but may increase flooding downstream. Flooding in Shandaken is compounded by stream modifications, bridge crossings, and the location of buildings. The Route 28 Bridge crosses



Deposition

“the accumulation of natural materials by a gradual process”

Source: Encarta Dictionary

Management of sediment deposition in the waterways in is an ongoing challenge for the Towns as they struggle to find a solution for this issue.

Esopus Creek but is sloped such that the intersection of Route 42 and Route 28 floods at much lower flows than the bridge crossing. Residents report that sediment deposition has raised the channel bed up to 12 feet in the vicinity of the bridge. The HEC-RAS model analysis indicated that sediment removal upstream of and in the bridge opening may be the most effective short-term way to reduce flooding. However, frequent maintenance would likely be required to continue the benefit after each heavy rainfall.

Hardenburgh Risk Overview

The primary flooding problems occur in the Dry Brook, Rider Hollow, Mill Brook, and Beaverkill Creek valleys. The local roads were built parallel to the creeks, and undersized road culverts create overtopping and backwater conditions in all of these watersheds. Community leaders have not reported significant structure flooding during Hurricane Irene and other recent storms. Roadway flooding, which cuts off emergency access and washes out roads, is the greatest concern.

The watersheds are approximately 95% forest. However, there is clear evidence and historical reports of clear cut logging that caused widespread slope failure and increased the sediment supply. Site visits and discussions with community leaders and NYC DEP staff indicate significant sediment transport in the watersheds. Sediment deposition occurs throughout the stream network and may be causing aggradation in some areas. In addition,

debris and log jams, especially at road crossings, increase flooding. The valley slopes in Hardenburgh typically range from 1 to 4%, making storing water extremely expensive. Watershed management to increase water holding capacity in the forested areas is likely to produce more benefit.

In Hardenburgh, residents did not identify stream confluences as problem areas. Likewise, review of the FEMA HEC-RAS hydraulic models did not identify stream confluences that increase flooding, although several private residences are located at the mouth of streams where overbank flooding spills from a tributary into the mainstream. There is evidence of historical modification of streams through gravel harvesting, agricultural practices, and road building. These practices may create localized blockages, aggravate flooding, and increase deposition or scour.

Ulster County, Hardenburgh, and the NYC DEP all have established programs to identify stream alterations that both improve water quality and reduce flooding. These projects may include upgrading roadway crossings, stream restoration, and embankment repair. Projects that improve safety and increase mobility for emergency personnel to carry out evacuations are needed in the Dry Brook, Beaverkill, and Rider Hollow areas.

These flood-prone conditions in the both of the Towns form the basis for an understanding and assessment of risk to critical community assets.

Description of Methodology

Based on community and Committee feedback, in conjunction with information captured by the asset inventory, risks for Shandaken and Hardenburgh’s assets were assessed using the NYS DOS-provided Risk Assessment Tool. The Risk Assessment Tool is designed to assess and quantify the risk to individual community assets through built-in formulas that calculate an overall risk score category based on three factors: hazard, exposure,



and vulnerability. The tool calculates a score for each of these factors and combines them to represent the relative risk of each asset in the community to one another.

The Risk Assessment Tool calculation combines scores for the three factors using the formula Risk = Hazard x Exposure x Vulnerability.

Each factor in this equation is calculated automatically, based on appropriate inputs and are assigned as follows:

- **HAZARD SCORE:** assigned for each asset based on a 100-year storm event occurring within the next 100 years.
- **EXPOSUSURE SCORE:** determined by the risk area where the asset is located, and local landscape attributes that influence the potential for storm impacts. This score reflects how landscape features can moderate damage to individual assets.
- **VULNERABILITY SCORE:** reflects the level of impairment or consequences that assets may experience from a hazard event, and reflects the ability of the asset to resist damage from the hazard.

$$\begin{array}{c} \text{Hazard} \\ \times \text{Exposure} \\ \times \text{Vulnerability} \\ \hline = \text{Risk} \end{array}$$

Interpretation of Risk

Risk scores help to identify assets with an elevated potential for storm damage. Some factors that should be considered for each asset in developing a community risk management strategy include

- Contribution to life safety;
- Whether the asset is a critical facility;
- Value of asset to the community;

- Environmental services provided;
- Economic contribution of the asset; and
- Whether alternatives are available; and
- Capacity of the asset to adapt.

The Consultant Team evaluated risk for both a 100-year storm (1% annual chance) and a 500-year event (0.2% annual chance), which represent a higher-intensity storm event. Risks were calculated for each asset, resulting in categorization in one of several categories.

100-year Floodplain

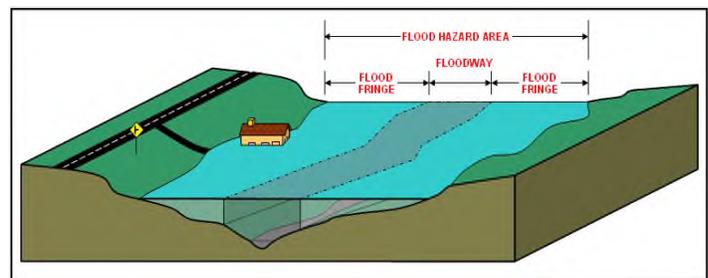
A one hundred-year floodplains (or 1% annual chance floodplain) can be described as a bag of 100 marbles, with 99 clear marbles and one black marble. Every time a marble is pulled out from the bag, and it is the black marble, it represents a 100-year flood event. The marble is then placed back into the bag and shaken up again before another marble is drawn. It is possible that the black marble can be picked one out of two or three times in a row, demonstrating that a 100-year flood event could occur several times in a row (Interagency Floodplain Management Review Committee, 1994).

Severe Category

Both exposure and vulnerability should be reduced for assets in this category, if possible. Relocation of these assets should be considered as a priority option.

High Category

Risk scores in the high category indicate conditions that could lead to significant negative outcomes from a storm.



Courtesy of NJDEP

Actions should be taken to reduce vulnerability,



such as elevating or flood-proofing the asset to help avoid a long-term loss of function.

Moderate Category

Risk scores in this category pose moderate-to-serious consequences, but adaptation may be a lower priority based on exposure, or because vulnerability remains relatively low. It is recommended that a combination of measures should be considered to reduce exposure or vulnerability.

Residual Category

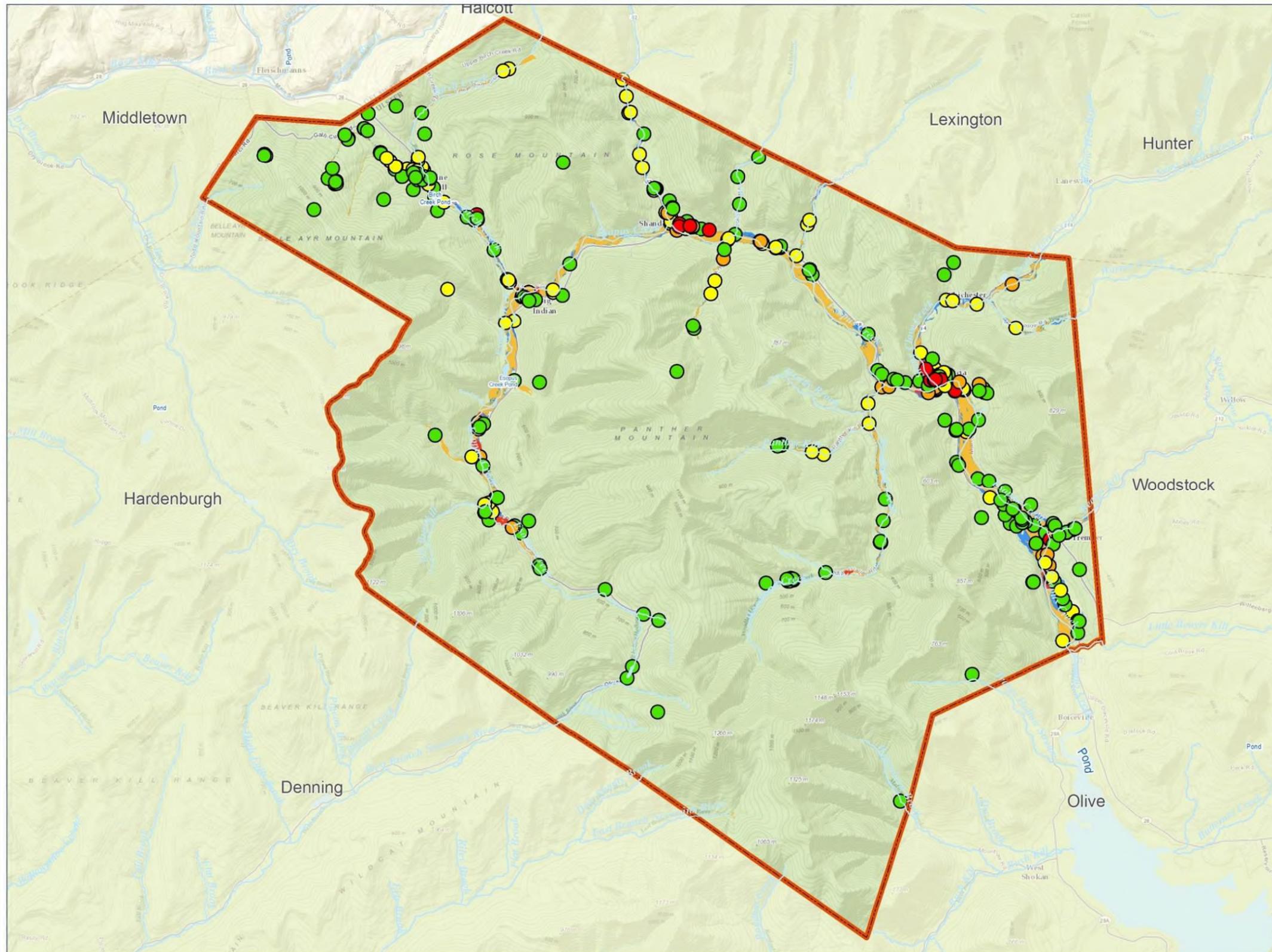
Risk scores in the residual category occur when both exposure and vulnerability are relatively low. This situation suggests floods would pose minor or infrequent consequences. Note that risk is never completely eliminated. Some residual risk still remains, even after management measures have been implemented. It is recommended to monitor conditions and adapt, as necessary.

The consultant team evaluated risk from both a 100-year storm (1% annual chance of occurrence) and the 500-year event (0.2% annual chance of occurrence), which represents a higher intensity storm event. For further information regarding risk scores, refer to Section V-Additional Materials.

Assessment Results

Many assets and infrastructure identified within the Towns are within or proximate to the floodplain or floodway. Clearly, many assets within Shandaken and Hardenburgh are exposed and extremely vulnerable to flood events, and the risk score results below indicate this vulnerability. As discussed in the methodology above, no risk scores were generated for all assets outside of an identified risk area, and these assets have been omitted from the following section. Figure 19 and Figure 20 show the geographic distribution of the risk scores for a 100-year storm event.

NYRCR: TOWN OF SHANDAKEN, ULSTER COUNTY
Figure 19. Shandaken Asset Risk Scores



Legend

Town of Shandaken/Planning Area

Risk Scores 100 Year Storm

- Severe
- High
- Moderate
- Residual

Risk Area

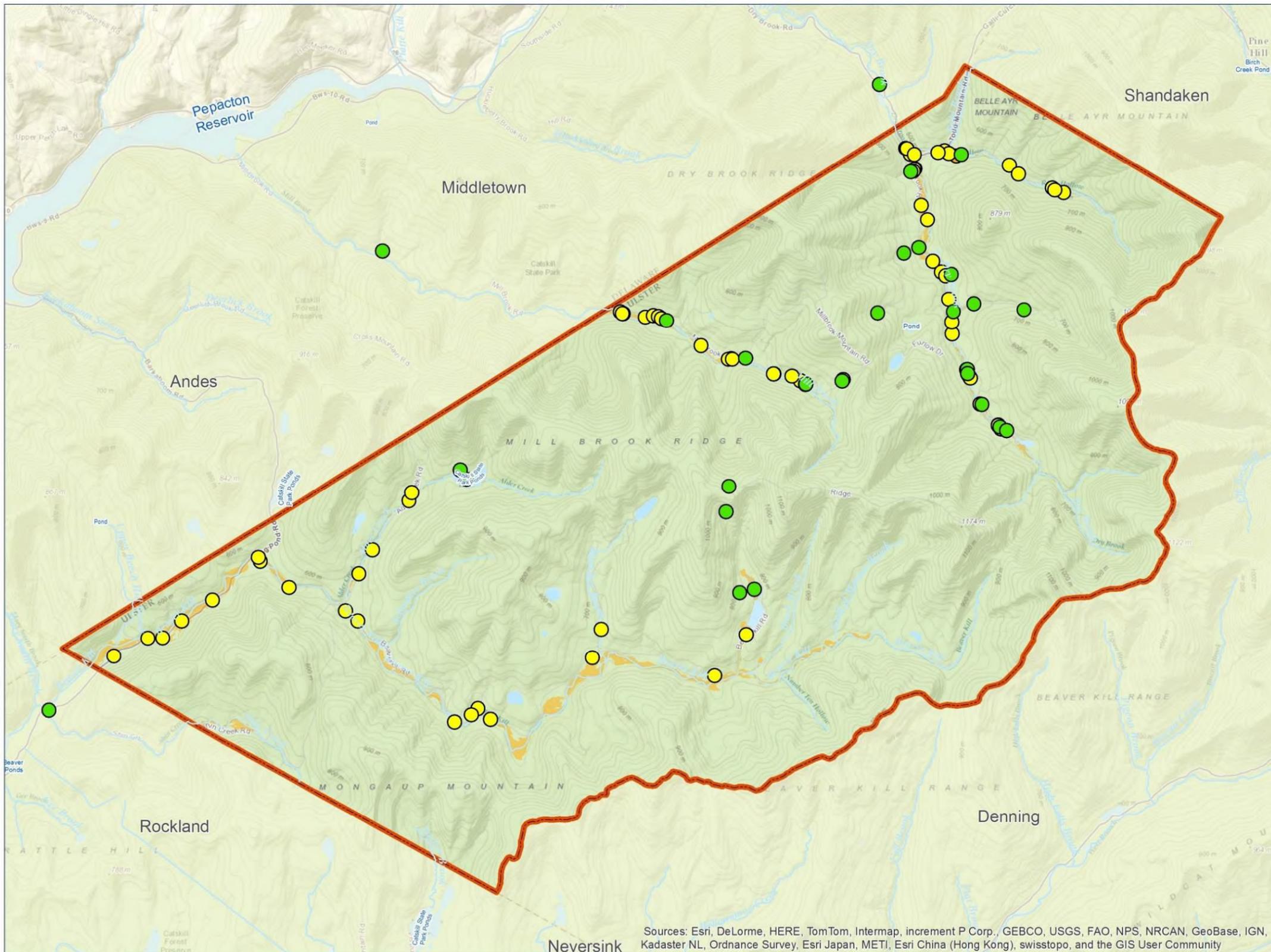
- Moderate Risk
- High Risk
- Extreme Risk

This map is for reference only.
 Data Sources:
 NYRCR- Asset Locations, Risk Areas,
 Risk Scores

0 1 2 Miles



NYRCR: TOWN OF HARDENBURG, ULSTER COUNTY
Figure 20. Hardenburgh Asset Risk Scores



Legend

Town of Hardenburgh/Planning Area

Risk Scores 100-year storm

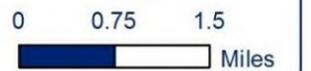
- Severe
- High
- Moderate
- Residual

Risk Area

- Moderate Risk
- High Risk



This map is for reference only.
 Data Sources:
 NYRCR- Asset Locations, Risk Areas,
 Risk Scores



Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community



As shown in Figures 19 and 20, a number of assets with severe and high risk scores during a 100-year event are within or near the Hamlets of Phoenicia, Shandaken, and Mt. Tremper. Assets with the highest risk scores include County Store (Severe), Town Tinker Tubes (Severe), Rock Cut Ledge Cottages (Severe), Mount Tremor Post Office (Severe), PARACO Gas-Phoenicia (Severe), Phoenicia Railroad (Severe), Phoenicia Junction Railroad (Severe), and Empire State Railway Museum (Severe).



Courtesy of the Town of Shandaken

Shandaken Economic Assets

Based on the risk scores, it is clear that economic assets are at severe or high risk from flooding. Three assets were identified at severe risk including the Rock Cut Ledge Cottages, while 19 assets, including the Phoenicia Deli, were identified at high risk from flooding during a 100-year event. This reflects the information provided by the community and the Committee. Table 3 lists the risk scores for economic assets in the Town of Shandaken.

Hardenburgh Economic Assets

The Town is home to various agricultural enterprises and the Committee did categorize them as critical facilities. Hardenburgh is a small farming town, and non-farming residents are usually employed in nearby larger towns, although recreational opportunities add to its local economy.

TABLE 3. ECONOMIC ASSETS

Asset/Asset Type	Asset Subcategory	100 Year Risk Score	500 Year Risk Score
NYRCR Town of Shandaken			
Key Bank	Banks and Financial Services	High	High
Ulster Savings Bank	Banks and Financial Services	High	High
Country Store	Grocery/Food Suppliers	Severe	Severe
Phoenicia Deli	Grocery/Food Suppliers	High	High
Catskill Rose	Lodging	High	High
Catskill Rose Restaurant	Restaurants	High	High
Tavern 214	Restaurants	High	High
FS Adventures	Tourism Destinations	High	High
Town Tinker Tubes	Tourism Destinations	Severe	Severe
Farmer Jones Baby Barns	Industrial, Warehousing and Manufacturing	High	High
Colonial Inn	Lodging	High	High
Weyside Cabins and Inn	Lodging	High	High
Apple Tree Inn	Lodging	High	High
Rock Cut Ledge Cottages	Lodging	Severe	Severe
Jeff Collins Stone Yard	Small Business	Moderate	High
Magliorelli Farm Stand	Grocery/Food Suppliers	High	High
Andersen's Cabins	Lodging	High	High



TABLE 3. ECONOMIC ASSETS

Asset/Asset Type	Asset Subcategory	100 Year Risk Score	500 Year Risk Score
Emerson Resort and Spa	Lodging	High	High
Kate's Lazy Meadow Cottages	Lodging	High	High
J Rocco's Steakhouse	Restaurants	High	High
Peekamoose Restaurant & Tap Room	Restaurants	High	High
Cold Spring Lodge	Restaurants	High	High
Catskill Mountain Tourist Train	Tourism Destinations	High	High
NYRCR Town of Hardenburgh			
None identified			

Source: NYRCR, NYS DOS

Based on the guidance and methodology described above, it is clear that substantial mitigation actions should be taken to reduce both vulnerability and exposure. Some buildings most vulnerable and exposed to flooding within the Hamlets should be considered for possible relocation. Other buildings should be prioritized for flood proofing or other mitigation measures. As described above, the Towns have a unique circumstance as most development is within the river valleys throughout the community, surrounded by mountains and steep slopes. Limited land is available for relocation because of the geographic features of the area; therefore, mitigation actions such as flood proofing should be explored.

Shandaken Health and Social Service Assets

The Mt. Tremper Post Office was identified at severe risk from flooding, while 14 assets including the Shandaken Town Hall were identified at high risk from flooding during a 100-year flooding event. Many of these facilities, including the Phoenicia

Firehouse, have been routinely affected by floods, especially by the flood events associated with Hurricane Irene and Tropical Storm Lee.

Hardenburgh Health and Social Service Assets

In Hardenburgh, the Town Highway Department was identified as having high risk to flooding. However, a number of facilities have been identified as having been affected by flooding events in the past and, as described above, an asset did not produce a risk score if it is located outside identified risk areas.

Table 4 lists the risk scores for health and social service assets in the Towns of Shandaken and Hardenburgh.



TABLE 4. HEALTH AND SOCIAL SERVICE ASSETS

Asset/Asset Type	Asset Subcategory	100 Year Risk Score	500 Year Risk Score
NYRCR Town of Shandaken			
Mt. Tremper PO	Government and Administrative Services	Severe	Severe
Phoenicia Firehouse/FC 1	Emergency Operations/Response	High	High
Phoenicia Pharmacy	Undefined	High	High
Shandaken Firehouse	Emergency Operations/Response	High	High
Ambulance and EMS	Emergency Operations/Response	High	High
Paramedic Housing	Emergency Operations/Response	High	High
Town Hall/TV	Emergency Operations/Response	High	High
Town Highway Garage/ Radio	Emergency Operations/Response	High	High
PHOENICIA FS 2	Emergency Operations/Response	High	High
Shandaken Town Hall	Government and Administrative Services	High	High
Town of Shandaken	Government and Administrative Services	High	High
Phoenicia PO	Government and Administrative Services	High	High
Shandaken PO	Government and Administrative Services	High	High
DMV	Government and Administrative Services	High	High
Emergency Heliport for Traumatic Incidents	Emergency Operations/Response	Moderate	Moderate
Ulster County DPW Sub Station	Public Works Facilities	Moderate	Moderate
Phoenicia Public School	Schools	High	High
Emergency Heliport - Landing Zone	Emergency Operations/Response	Moderate	Moderate
NYRCR Town of Hardenburgh			
Town of Hardenburgh Highway Department	Public Works Facilities	High	High

Source: NYS DOS, NYRCR

Based on the above guidance and methodology, it is clear that substantial mitigation actions should be taken to reduce both vulnerability and exposure. Some of the buildings and facilities that are most vulnerable and exposed to flooding within the Towns should be considered for possible relocation. Facilities in the Hamlets may be prioritized for flood proofing measures if relocation of these is not possible.

Shandaken Infrastructure Assets

Three assets, including the Energy Plan Facility, were identified at severe risk, and 66 assets, including the High Street Pump House, were identified at high risk from flooding during a 100-year flooding event. These results reflect information provided by the community and the Committee. Many infrastructure assets, including

the Bridge Street Bridge in Phoenicia, have been affected by floods, especially the flood events associated with Hurricane Irene and Tropical Storm Lee.

Hardenburgh Infrastructure Assets

Nine assets, including a bridge along Beaverkill Road, were identified at high risk, and 63 assets, including several bridges and culverts along Millbrook Road, were identified at moderate risk from flooding during a 100-year flooding event. This result reflects information provided by the community and the Committee. Many infrastructure assets, including several culverts and bridges along Rider Hollow Road, have been routinely affected by floods, especially the flood events associated with Hurricane Irene and Tropical Storm Lee.



Table 5 lists the risk scores for infrastructure assets in the Towns of Shandaken and Hardenburgh.

TABLE 5. INFRASTRUCTURE ASSETS			
Asset/ Asset Type	Asset Subcategory	100 Year Risk Score	500 Year Risk Score
NYRCR Town of Shandaken			
Energy Plant Facility	Liquid Fuels	Severe	Severe
2 Railroad Stations	Transportation	Severe	Severe
2 Creek Infrastructure	Water Supply	High	High
5 Roadways	Transportation	High	High
Secondary Well Source -Pine Hill Water	Water Supply	High	High
High Street Pump House	Water Supply	High	High
Bottini Fuel Storage facility	Hazardous Materials, Solid Waste, and Recycling	Moderate	Moderate
3 Communication Facilities	Telecommunications	Moderate/High	High
2 Potable Water	Water Supply	Moderate/High	Moderate
67 Bridges, Bridge Poor, Scour Critical Bridges	Transportation	Moderate/High	Moderate/High/Severe
4 Scour Critical Culvert	Stormwater	Moderate/High	Moderate/High
Electric Power Switching Facility	Power Supply	Moderate	Moderate
Tonche Bus Corp.	Transportation	Moderate	Moderate
Pine Hill Wastewater Treatment Plant	Wastewater	Moderate	Moderate
10 Culverts	Transportation	Moderate/High	Moderate/High
5 Drinking Water Treatment Plants	Water Supply	Moderate	Moderate
18 Drinking Water Wells	Water Supply	Residual/Moderate	Moderate/High
4 Drinking Water Springs	Water Supply	Moderate	Moderate
NYRCR Town of Hardenburgh			
2 Bridge Crossings (Rider Hollow Stream)	Transportation	High	High
7 Roadway Sections (Beaverkill Road, Dry Brook Road, Rider Hollow Road, Todd Mountain Road)	Transportation	High	High
43 Roadway Sections (Millbrook Road, Dry Brook Road, Rider Hollow Road, Alder Creek Road, Beaverkill Road, Vulnerable Roads)	Transportation	Moderate	Moderate
14 Bridges, Bridge Poor, Scour Bridges	Transportation	Moderate	Severe
6 Culverts	Transportation	Moderate	Moderate

Source: NYRCR, NYS DOS

Based on the guidance and methodology described above, it is clear that substantial mitigation actions should be taken to reduce both vulnerability and exposure. Some bridges and facilities that are most vulnerable and exposed to flooding within the Towns should be considered for possible relocation or substantial upgrades. Bridge Street Bridge in

Phoenicia should be examined for possible upgrades, as it serves as the main access way between the center of Phoenicia and Route 28. The Rider Hollow Culverts should be looked at for possible improvements as they facilitate access near many of Hardenburgh’s civic facilities.



Shandaken Natural and Cultural Resource Assets

The Empire State Railway Museum was identified at severe risk and six assets were identified at high risk from flooding during a 100-year flooding event. This result reflects information provided by the community and Committee. Many natural and cultural assets, including the Phoenicia Library, have been routinely affected by floods, especially the flood events associated with Hurricane Irene and Tropical Storm Lee.

Hardenburgh Natural and Cultural Resource Assets

The Dry Brook Community Hall and Church was identified at high risk and four assets were identified at moderate risk from flooding during a 100-year flooding event. This result reflects information provided by the community and the Committee. Many natural and cultural assets, including the Grants Mills/Millbrook Covered Bridge, have been routinely affected by floods,



Courtesy of Tetra Tech

especially the flood events associated with Hurricane Irene and Tropical Storm Lee.

Table 6 lists the risk scores for natural and cultural resource assets in the Towns of Shandaken and Hardenburgh.

TABLE 6. NATURAL AND CULTURAL RESOURCE ASSETS

Asset/Asset Type	o Asset Subcategory	100 Year Risk Score	500 Year Risk Score
NYRCR Town of Shandaken			
Phoenicia Wesleyan Church	Cultural or Religious Establishments	High	High
Empire State Railway Museum	Historic Landmarks and Facilities	Severe	Severe
Phoenicia Library	Libraries	High	High
Shandaken Theatrical Society Playhouse	Museums, Performing Arts Centers, and Stadiums	High	High
Big Indian Park	Parks and Recreation	Moderate	Moderate
Black Bear Campground	Parks and Recreation	Moderate	Moderate
St Francis DeSales Church Parish Hall	Cultural or Religious Establishments	High	High
Methodist Church	Cultural or Religious Establishments	High	High
Fox Hollow Railroad Bridge	Historic Landmarks and Facilities	Moderate	Moderate
DEC Flood Control Levee	Natural Protective Features	Moderate	Moderate
Dyke Rd DEC Flood Control Levee	Natural Protective Features	Moderate	Moderate
Dyke Rd DEC Flood Control Levee	Natural Protective Features	Moderate	Moderate
Smith Park	Parks and Recreation	Moderate	Moderate
Parish Field	Parks and Recreation	Moderate	Moderate
Sleepy Hollow Campground	Parks and Recreation	Moderate	Moderate
Uncle Pete's Campground	Parks and Recreation	Moderate	Moderate



TABLE 6. NATURAL AND CULTURAL RESOURCE ASSETS

Asset/Asset Type	o Asset Subcategory	100 Year Risk Score	500 Year Risk Score
Phoenicia Fish & Game Club	Hunting and Fishing Lands	High	High
NYRCR Town of Hardenburgh			
Dry Brook Community Hall and Church	Community Centers	High	High
Grants Mills/Millbrook Covered Bridge	Historic Landmarks and Facilities	Moderate	Moderate
Dry Brook	Natural Protective Features	Moderate	Moderate
NYS Dry Brook Road Trail Heads	Parks and Recreation	Moderate	Moderate
Balsam Lake (Privately Owned)	Water Bodies	Moderate	Moderate

Source: NYRCR, NYS DOS

The results of the analysis indicate that substantial mitigation actions should be taken to reduce both vulnerability and exposure. Some buildings and facilities, like the Phoenicia Library and the Dry Brook Community Hall and Church that are most vulnerable and exposed to flooding within the Towns should be considered for possible relocation or other mitigation measures. The enhancement of some of the existing natural assets like the Black Bear Campground with development of additional storage or stream bank mitigation could serve to protect facilities and critical infrastructure.



ASSESSMENT OF NEEDS AND OPPORTUNITIES

A combination of many factors contribute to the needs and opportunities identified by the Towns of Shandaken and Hardenburgh during the planning process. Damages caused by Hurricane Irene and Tropical Storm Lee, ongoing risk faced by assets, lost economic opportunities attributed to damages, insufficient local capital for rebuilding and economic expansion exacerbated existing issues in the communities. The needs and opportunities in this plan provide a basis for the strategies, projects, programs, policies, and actions to be proposed as a result of this community planning process. The existence of many catalyzing forces and factors, including some strategies and preliminary project ideas are identified during the needs and opportunities compilation.

The NYRCR Shandaken/Hardenburgh Planning Committee identified preliminary needs and opportunities for both towns categorized by each of the six Recovery Support Functions—Community Planning and Capacity Building, Economic Development, Health and Social Services, Housing, Infrastructure, and Natural and Cultural Resources—and that are the structural roadmap for this Plan. These support functions help provide a comprehensive basis for analysis and development of strategies to address the obstacles preventing increased resiliency. Both towns have similar needs, characteristic of rural Catskill Mountain communities. Where differences arise, they are pointed out under the discussion of specific opportunities and strategies. The identified needs and opportunities are presented below.

BALANCING ENVIRONMENTAL CONSERVATION WITH COMMUNITY PROTECTION

While mountainous terrain and beautiful streams help define the community’s character, provide the necessary setting to drive tourism, and protect critical drinking water supplies, they also place the



View of natural lands from Route 28 in Shandaken, Courtesy of Tetra Tech

community at risk for significant flood damage and cause certain economic and community development challenges. The additional impacts of agricultural and development, including timber removal, stream realignment, and increased impervious surfaces, have magnified this risk significantly causing more erosion and runoff. Any strategy leading to increased resiliency and health will need to strike a balance between environmental, ecological, and drinking water protection with the protection of community assets and the creation of opportunities for community development. The following difficulties in achieving this balance were identified by the Planning Committee.

Limited ability to address stream conditions increasing flood risk:

Over time, deposits of gravel and debris and streambank erosion have led to increased flood risk and damage to both Towns. The presence of the Catskill Park and land acquisitions by the City of NY for water quality protection require well-planned implementation strategies to ensure that stream-based flood mitigation projects such as bank restoration, gravel harvesting, or other measures to address repetitive flood damage projects and



provide necessary long-term benefits to the community.

Limited Development Sites

The presence of the Catskill Park and acquisition of large tracts of land by NYC for water quality protection, combined with flood prone property buyouts, means that there are limits to development in the communities. While the public lands are largely open for recreation leading to positive ecotourism, this unique circumstance can create development challenges for the communities by limiting the available development sites for residential and commercial growth. The unique topography, which includes a mix of extremely mountainous and steep terrain with narrow river valleys, leaves a limited area of developable land in these communities. According to the Shandaken Comprehensive Plan, 84% of the community is either developed or permanently preserved, and only approximately 4% (3,300 acres) is available vacant or private open space that could be developed after making adjustments for wetlands, water bodies, floodplains, and slopes greater than 20%. This lack of developable land makes it difficult to relocate homes, businesses, and critical assets out of flood-prone areas. This issue has become further exacerbated in Shandaken as flood events and subsequent buyout programs, which require properties to remain undeveloped in perpetuity and some of which have removed residential and commercial properties from the Town tax base.

Hardenburgh's zoning allows for only larger lot development acreage minimums, and areas above 2,500 feet in elevation along with areas with steep slopes require even larger lot minimums for development. This zoning inhibits the future development of the Town, and facilitates the preservation of the community's pastoral sense of place. While the majority of Hardenburgh is permanently preserved, many of the remaining

undeveloped properties are limited by steep slopes, flood hazard areas, wetlands, or other water features.

COMMUNITY PLANNING AND CAPACITY BUILDING

The Towns of Shandaken and Hardenburgh are vulnerable to flooding and have experienced devastating losses over the years that are described in more detail in Section I of this Plan. To ensure the long-term safety and health of both Towns, conditions of the natural and man-made environment that cause repetitive flooding and damage to homes, businesses, and critical assets must be addressed through short- and long-range planning and associated implementation plans, capital improvement plans, and disaster mitigation and recovery plans.

Both Towns have participated in planning studies in recent years. Shandaken's Comprehensive Plan establishes a vision for the long-term maintenance, growth, and development of the Town, and its Flood Mitigation Plan and Flood Warning and Response Plan recommends mitigation actions to minimizing loss of lives and property resulting from flood events. In a separate, but related initiative, the Town of Shandaken is pursuing participation in the Community Rating System (CRS) that provides incentives to improve floodplain management and associated codes and ordinances in addition to providing a reduction in NFIP flood insurance premiums for property owners in the town

The Ulster County Hazard Mitigation Plan offers County-wide and local strategies for mitigating potential hazards. Both towns have demonstrated a clear understanding of the importance of mitigation planning, and continue to pursue these efforts on a local and county scale. While the Town of Hardenburgh did not participate in the first Ulster County Hazard Mitigation Plan, the Town is participating in the 2014 Ulster County Hazard Mitigation Plan Update. The Town of Shandaken,



having prepared a single jurisdiction plan in 2013, may incorporate that into the County Plan Update.

These mitigation plans, and regional economic development plans geographically inclusive of both towns, are extremely valuable in their strategies for leveraging assets, revitalizing town centers, and attracting desirable growth. The obstacle for the towns now is focusing on specific resiliency actions and implementation.

Because both towns have been active in community planning in recent years the Committees identified very few needs and opportunities distinctly related to community planning and capacity building. Those that were identified are incorporated throughout the remaining five recovery support function sections.

Economic Development

The vast natural resources that help define the character of and provide the necessary setting to drive tourism in these two communities, also place them at risk for significant flood damage and cause certain economic and community development challenges. For example, the large tracts of land acquired over the years by the State of New York for the preservation of forestland and expansion of contiguous tracts of forestland and NYC to protect drinking water resources has limited the available development sites for residential and commercial growth. The removal of residential and commercial properties from the Town’s tax base and the relocation of assets out of flood-prone areas has become increasingly difficult due to the lack of developable parcels outside the risk area.

Additional zoning strategies to be explored by the Towns

- ❖ *Provide incentives, including density bonuses, could be offered for higher density housing for vulnerable populations in or proximate to hamlet centers to address limited opportunities for multi-family dwellings. Similar incentives could be incorporated into the Town's residential cluster provisions for future projects located outside of flood hazard areas. Mixed-use buildings could be allowed with appropriate development standards in the Hamlet zoning districts to better support pedestrian-friendly, compact Main-Street type revitalization opportunities.*
- ❖ *Offer incentives to encourage the use of low impact development techniques that enhance stormwater management on individual sites.*
- ❖ *Expand the range of arts-related commercial uses, including provisions for artist work-live spaces, to support cultural tourism and expansion of the arts as key hamlet revitalization strategies.*
- ❖ *Adopt higher regulatory standards in Flood Damage Prevention Ordinances and integrate into zoning provisions to enhance community resiliency.*
- ❖ *Include residential cluster provisions or other density bonuses to allow somewhat higher density housing and services for vulnerable populations outside of flood hazard areas, including some opportunities for senior housing and workforce housing.*
- ❖ *Incorporate standards to allow river-dependent recreational uses.*
- ❖ *Incorporate standards to regulate the allowable % of a lot covered by buildings and pavement.*
- ❖ *Develop standards and procedures to encourage the use of low impact development and sustainable design techniques that enhance stormwater management on individual sites.*



A number of other factors also deter the full economic potential of the two Towns and the region at large. The realignment of Route 28 in the 1960s began four decades of disinvestment in hamlet centers, since it provided increased travel speeds through the region and drew traffic and critical economic activity away from traditional hamlet centers. An increasingly aging working population limits the local workforce and the reliance on seasonal tourism dollars resulting in unpredictability and sometimes crippling revenue fluctuations. With the hope of addressing these issues while boosting the overall resiliency of the economy in the two Towns, the Committee listed the following needs and opportunities for further exploration

- **Need** to address the lack of broadband and cell service, and its impact on economic development and the diversification of the business base
- **Need** to increase tourism dollars spent in local businesses through diversification of commercial uses, increased marketing, and greater access to resources for business owners
- **Opportunity** to capitalize on recreation and tourism potential
- **Opportunity** to install additional wayfinding guides and signs to highlight available recreation opportunities
- **Need** to diversify the business sector beyond just lodging and tourism to stimulate economic growth, provide additional amenities, and establish a more vibrant tax base
- **Opportunity** to provide incentive programs to stimulate desirable business growth
- **Opportunity** to provide greater access to resources for local businesses

- **Need** to establish more resilient, vibrant, and protected hamlet centers to be commercial and social hubs
- **Opportunity** to invest in and strengthen hamlet centers
- **Need** to increase the community’s visibility through greater on-line and technology presence including websites, social media, and smart phone applications
- **Opportunity** to define and launch a coordinated branding and marketing strategy
- **Need** to increase visibility and use of local resources, services, and assets to promote business growth and tourism
- **Opportunity** to enhance visual character of the area (especially Route 28)
- **Opportunity** to enhance waterfront access
- **Need** to increase number of year-round visitors to the region

Health and Social Services

Recent history has shown that the Town of Shandaken can expect an average of 7 episodes of major river flooding every 10 years; Hardenburgh faces similar threats. Floods following Hurricane Irene and Tropical Storm Lee had devastating impacts on transportation infrastructure in both Towns, creating significant access and mobility issues. The loss of even one road in many areas of these towns can result in isolation and stranding of residents. The lack of a dedicated regional evacuation center of sufficient size for all residents places the community at further risk, and limited cell phone service throughout the region limits critical response capabilities during emergencies. The nearest comprehensive health care services are in the Village of Margaretville and the City of Kingston. The significant vulnerability posed by such critical deficiencies in emergency health care and interruptions to health and social services underlies a number of the needs and opportunities that the



Committee has identified.

- **Need** to attract education, health and service industries, and related facilities to the region
- **Opportunity** to attract more health services and facilities to meet the health and welfare needs of all members of the community and its visitors
- **Need** to improve the public schools (Onteora and Margaretville) as a pre-requisite to attracting more young professionals to the area
- **Need** to protect vulnerable populations and to ensure their ongoing protection during future disasters
- **Opportunity** to conduct targeted educational outreach to the most vulnerable populations, providing information on emergency resources and disaster preparedness tools
- **Need** to maintain access to health services before, during, and after disasters
- **Opportunity** to identify and operate helicopter landing zones outside of the floodplain
- **Need** to improve two existing emergency medical service (EMS) facilities
- **Need** to establish pet shelters to ensure that pet owners feel confident to evacuate knowing that their pets are secure

Housing

Housing affordability is an issue in many areas of the State, Housing affordability and a general lack of sufficient workforce housing have been identified as ongoing issues for the Town of Shandaken. Both Shandaken and Hardenburgh generally offer lower wages than more urban or developed areas, placing additional strain on housing affordability for local workers. The repetitive infrastructure damage from flooding and history of disinvestment in the hamlet centers make it difficult to attract young families

and a young workforce. Considering these factors, the Committee identified housing-related needs and opportunities to further evaluate in the NYRCR planning process:

- **Need** to identify homes that are physically and economically feasible for elevation or other mitigation enhancements
- **Opportunity** to secure and protect existing housing stock against future floods, and protect against the loss of residents and tax base
- **Opportunity** to create incentives to encourage rehabilitation of existing housing stock and development of housing for senior citizens
- **Need** to encourage additional workforce and affordable housing
- **Need** to develop diverse housing options in the community
- **Need** to identify available land suitable and feasible for future housing development
- **Need** to address concern with high taxes and costs of housing
- **Need** to address concern expressed that increased flood insurance rates will drive people away
- **Need** to present information on funding opportunities to assist home owners
- **Opportunity** to provide adequate housing that is affordable for each segment of the population through the use of innovative zoning and planning techniques and other incentives

Infrastructure

Limited infrastructure systems in both Towns create ongoing safety and economic challenges. In particular, many homes currently have few access and exit routes (or only one) available to them, leading to the potential for stranded residents during floods. The floods following Hurricane Irene and Tropical Storm Lee severely undermined



transportation systems in both towns, damaging or destroying numerous bridges and roads and resulting in isolation and stranding of numerous residents. The population of both towns remains at risk due to the lingering damage to roads, culverts, and bridges from previous flooding. The damaged and unmaintained infrastructure also reinforces a negative perception of area for potential investors. Both Towns suffer from limited cell phone service that impedes communication during emergencies and also deters economic growth. The Committee elaborated on these and other infrastructure-related needs:

- **Need** to complete select bridge repair or replacement
- **Need** to complete select culvert repair or replacement
- **Need** to complete select road repair or replacement
- **Need** to enhance telecommunications infrastructure (cell and Internet)
- **Opportunity** to stabilize and improve current infrastructure assets including roads, bridges, and communications to ensure mobility and safety in times of disasters
- **Need** to establish emergency communications infrastructure and systems
- **Opportunity** to create a communications infrastructure plan that provides for emergency communication, high-speed Internet, and cell service
- **Need** to establish a regional emergency and evacuation center
- **Opportunity** to improve data collection and storage to improve pre-disaster planning and post-disaster inspections and reporting
- **Need** to repair or construct underground utilities (electric, phone, and cable) in hamlet centers
- **Need** to identify areas for new or expanded sewage and wastewater treatment service areas, and storm water systems
- **Need** to address flood hazard mitigation by implementing evolving stream management plans and best management practices and to address stream conditions that cause repeat floods including gravel deposits, stream bank erosion, and remaining debris
- **Need** to balance environmental and drinking water protection with the need to protect homes, assets, and infrastructure from repetitive flooding
- **Opportunity** to identify areas for selective gravel harvest and stream restoration
- **Opportunity** to implement stream management plans
- **Opportunity** to consider climate change and future impacts in all initiatives
- **Need** to identify areas for channel restoration
- **Opportunity** to develop and implement stream management plans that balance environmental protection with the protection of community housing, infrastructure, and assets
- **Need** to effectively communication prior to, during, and after natural disasters
- **Need** to implement improved radio and universal cell service
- **Need** to an enhance flood prediction and notification system
- **Opportunity** to provide necessary communication infrastructure to ensure emergency communication capability and to provide services to attract/retain businesses
- **Need** to relocate critical facilities out of flood-prone areas
- **Need** to identify and pursue sewer expansions where appropriate or possible



- **Need** to bolster public facilities capabilities to be resource centers for disasters
- **Need** to install backup power generators for key community facilities
- **Need** to explore opportunities to flood-proof critical community facilities including municipal water systems in hamlet centers
- **Opportunity** to improve local emergency response facilities including fire districts, EMS, and police. Improvements should enhance first-responder capability and provide additional command center and sheltering capabilities

Natural and Cultural Resources

The substantial flood risk in Shandaken and Hardenburgh is primarily caused by the proximity of the Towns to Esopus Creek and the numerous brooks, streams, and other tributaries that drain the Esopus’ watershed. The proximity of the towns to these waterways, coupled with the number of human-made or influenced obstructions in the floodplain and their effect—reduced stream capacity in the area—that are the causes of substantial flood risk. The Towns’ natural resources are arguably their greatest assets, historically fueling the successful operation of farms, tanneries, sawmills, and other agricultural pursuits. Later these same resources offered the necessary framework for a booming mid-century tourism and resort industry, and in present times providing the necessary scenic beauty and recreational opportunities to fuel a new economic base founded in the emerging tourism and second-home market.

Despite these advantages, the communities struggle with challenges related to environmental protection and publicly-owned natural areas, including a lack of developable areas and the need to balance environmental conservation with flood protection for homes, businesses, and assets. A coordinated effort to fully capitalize on the abundant natural areas and recreational opportunities in the

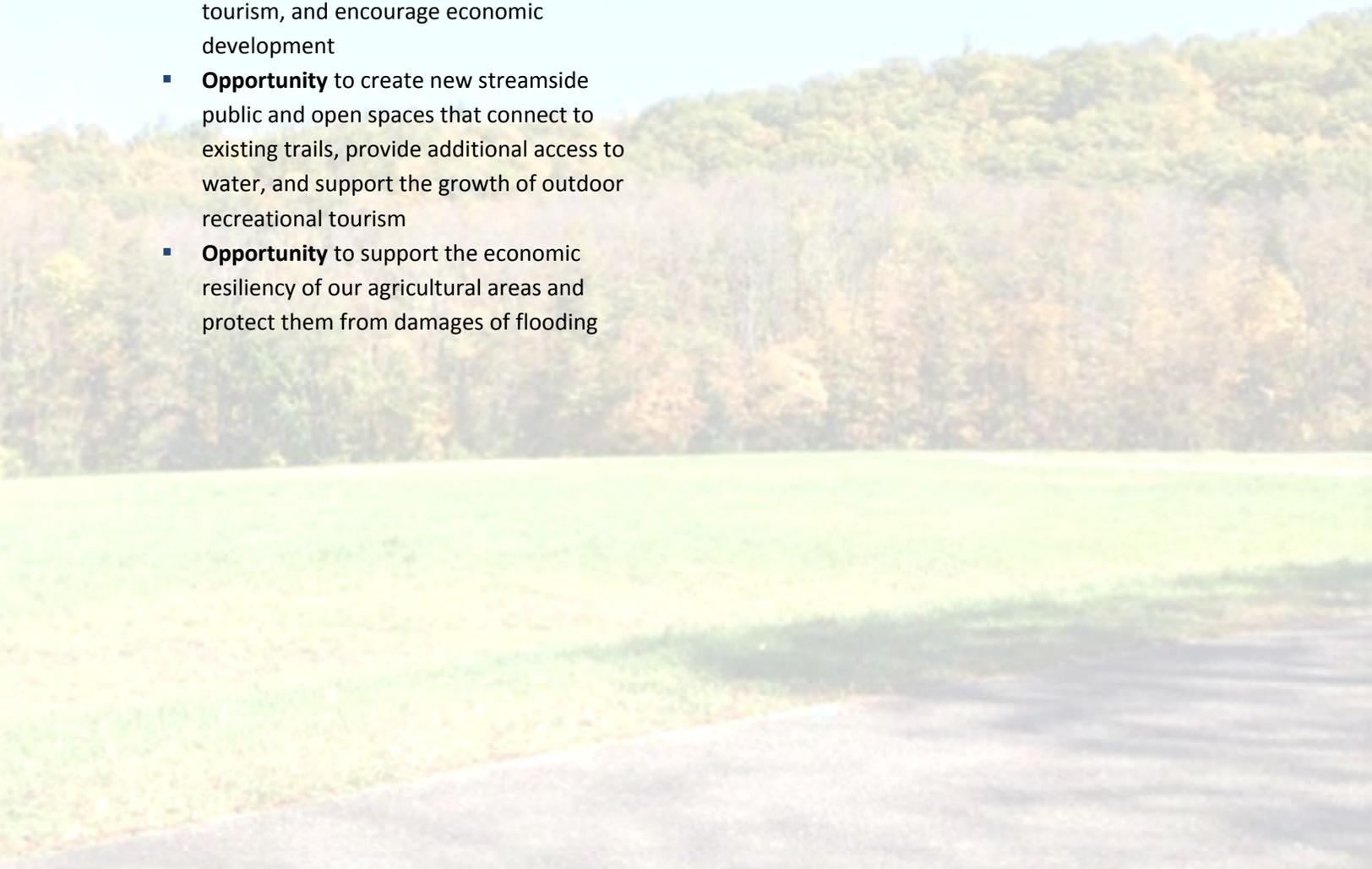
communities could help to create a year-round economy and address the seasonal difficulties for business owners. Two new projects may assist in the transition to a stronger, more reliable local economy -- the expansion of Belleayre Ski Center and the potential construction of the new Crossroads Ventures' Resort project, which will be adjacent to Belleayre. Together, these two projects are projected to add 540 full-time jobs and over 400 part-time or seasonal positions. Additionally, opportunities for increased tourism spending could boost local businesses, particularly given Crossroads Ventures' vision of creating a year-round resort experience.

The Committee identified a number of needs and opportunities relating to capitalizing on these opportunities, along with others to enhance the marketing of local historic resources and to make environmental and ecosystem protection improvements through flood reduction.

- **Need** to establish a community center to be a shelter, community gathering place, information center, and event venue
- **Need** to establish a central place to provide information due to lack of a local newspaper coverage
- **Opportunity** to provide improved or new facilities to allow for community gathering, special events, sheltering etc.
- **Need** to retain historic character and charm
- **Need** to protect identified historic and cultural assets from future flood damage
- **Need** to connect owners of historic assets with available resources and information
- **Opportunity** to create new streamside public and open spaces to be community gathering places, provide increased recreation opportunities, and connect to existing trail networks and provide passive flood control



- **Opportunity** to re-connect or re-establishing floodplains to provide passive flood control
- **Opportunity** to promote, protect, extend, and enhance existing natural, historic, and cultural assets
- **Need** to connect hamlets through additional trails and transportation options
- **Need** to protect historic resources and landmarks
- **Need** to create year-round tourism
- **Opportunity** to capitalize on the area's natural resources to connect hamlets, drive tourism, and encourage economic development
- **Opportunity** to create new streamside public and open spaces that connect to existing trails, provide additional access to water, and support the growth of outdoor recreational tourism
- **Opportunity** to support the economic resiliency of our agricultural areas and protect them from damages of flooding



View of natural lands from Route 28 in Shandaken, Source Tetra Tech, 2014



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SECTION III
Reconstruction
and Resiliency
Strategies





MILLBROOK
1902

PEDESTRIANS ONLY

TO MAINTAIN
WARNING
STONES
SAFE

MILLBROOK BRIDGE
A.K.A.
GRANT MILLS BRIDGE
CREATED IN 1902 BY E. A. MARKS & S. ALTON
LAST RESTORATION COMPLETED IN 1992
FUNDED BY COMMUNITY DONATIONS
LISTED IN THE
NATIONAL REGISTER OF HISTORICAL PLACES
AS PART OF THE GRANT MILLS BRIDGE



Section III. RECONSTRUCTION AND RESILIENCY STRATEGIES

The Shandaken and Hardenburgh NY Rising Committee developed a list of preliminary strategies to reflect community values, issues, needs, and opportunities or both towns. The strategies served as the foundation for identifying projects included in the NYRCR Shandaken/Hardenburgh Plan.

The preliminary strategies were developed collaboratively for both towns and drew from the inventory of community assets and known areas of vulnerability, flooding, and damage, and built on the Vision and Goals and the Needs and Opportunities identified and refined by the NYRCR Committee, presented in Sections I and II of this Plan. Many of the needs are included in the discussion to help draw the connection between those needs and the related strategies. Some of those needs and opportunities appear explicitly in one or more strategies, either by being referenced in a strategy title, or called out in the description of that strategy. Others are presented as actions in the associated tables beneath each strategy description. While most of the initially identified needs and opportunities are directly translated here into short or long-term strategies and actions, others are not. The Committee made decisions to promote the most immediate needs to serve the greatest community benefit. The Committee further refined the strategies through collaboration with the Consultant Team, NYS DOS, NYRCR Program Lead, and through public input.

Strategy 1: Reduce the impact of flooding on the built environment in the Towns, including critical facilities, transportation infrastructure, and communications systems

Hurricane Irene and Tropical Storm Lee, and prior storms, caused significant failures across transportation infrastructure systems including

Recovery Support Functions

Community Planning and Capacity Building

This addresses the community's ability to implement storm recovery activities and to plan how to mitigate the effects of future storms.

Infrastructure

Currently damaged, failing, or limited infrastructure systems were noted in Section I.C of this plan as the most prevalent and widespread issues identified by the Committee during this planning process

Economic Development

The primary economic concern after a disaster is returning economic and business activities to a state of health. Recovery periods present unique opportunities for developing new economic strengths resulting in a more sustainable and economically robust community.

Health and Social Services

After a disaster, one of the more immediate considerations is whether public health, health care facilities, and essential social service needs have been restored. Natural and Cultural Resources

Natural infrastructure has been increasingly recognized and promoted among hazard and climate planners and managers as low impact and sustainable means to mitigate losses from natural hazards.

Housing

The Towns of Shandaken and Hardenburgh suffer from several challenges hindering the provision of safe and adequate housing for current and future residents. Many of the inherent issues including housing affordability and limited development parcels were significantly exacerbated during past floods including those caused by Hurricane Irene and Tropical Storm Lee.

Natural and Cultural Resources

Natural infrastructure has been increasingly recognized and promoted among hazard and climate planners and managers as low impact and sustainable means to mitigate losses from natural hazards

roads, bridges, and culverts. These failures increase the risk for future flood damage, reduce stream function, and impede safe mobility. As both Towns are teeming with streams, creeks, and other tributaries to the larger Esopus and Delaware watersheds, investments in appropriate flood-resistant infrastructure systems are critical to



ensure resident safety, property protection, and mobility.

The strategy addresses a number of Committee-identified goals, including stabilize and improve current infrastructure assets; develop and implement stream management plans; improve communication infrastructure to ensure emergency communication capability and attract and retain businesses; and ensure all essential services including potable water, shelter, food, medicine, fuel, and travel corridors are functional at the time of disaster.

Needs addressed by this strategy may include transportation infrastructure upgrades, protection of assets incurring repetitive flood damage, and ensuring the continuity of critical government and emergency response capabilities. Proposed actions will address existing conditions contributing to repetitive flooding, including man-made obstructions in the floodway, natural sediment aggradation, and streambank failures.

This strategy directs efforts and investment toward fulfilling needs and taking specific actions:

- Stabilize, improve and protect current infrastructure assets including roads, bridges, and communications to ensure service, mobility and safety in times of disasters
 - Repair, replace and enhance bridges and culverts to address repetitive flooding and ensure mobility and access during a flood event
 - Stabilize failing road embankments to protect transportation infrastructure and increase vehicular safety
- Explore opportunities to improve or expand the facilities of essential service providers including fire companies, EMS, and first responders
 - Create enhanced communication infrastructure to ensure emergency communication capability
 - Enhance first-responder capability and provide additional command center and sheltering capabilities; improve the municipal communications network to provide emergency communications, cell and high-speed internet coverage; improved data collection, redundancy of Town communications capabilities and ensure dedicated phone lines for Town emergency management communications
 - Establish a municipal complex outside of the floodplain to house and improve emergency operations, evacuation and sheltering facilities, Highway Department Town administration, as well as providing a community gathering place and centralized source of information.
- Improve emergency notification and data collection capability to increase preparedness and ensure dissemination of critical information
 - Implement improved radio and universal cell service
 - Implement an enhanced flood prediction and notification system
- Ensure all essential services including but not limited to potable water, electric, shelter, food, medicine, fuel, and travel corridors are available and protected during the time of disaster
 - Provide backup power generation solutions to ensure provision of essential services during a disaster



- Explore the installation of underground utilities (electric, phone, and cable) in hamlet centers
- Relocate critical facilities out of flood-prone areas
- Bolster public facilities capabilities to be resource centers for future disasters
- Flood-proof critical community facilities including municipal water systems in hamlet centers
- Improve local emergency response facilities including fire districts, EMS, and police
- Identify areas for new or expanded sewage and wastewater treatment service areas, and storm water systems
- Balance environmental and drinking water protection with the need to protect homes, assets, and infrastructure from repetitive flooding
 - Identify areas for selective gravel harvest and stream restoration
 - Implement stream management plans
 - Using stream management analysis and techniques, address stream conditions that cause repeat floods including gravel deposits, stream bank erosion, and remaining debris

This strategy allows for investment in a range of resiliency projects to reduce the impacts. Flood impacts will be reduced by lowering the Towns' overall vulnerability to floods and targeted infrastructure investments will address current damage and deficiencies while building more resilient systems to increase flood protection for community assets, systems, homes, and businesses. Investment in communications infrastructure will benefit emergency response capabilities and bolster

desired economic growth in the communities. The Committee defined the actions and preliminary project ideas noted in Table 7 to support Strategy 1.



Post Irene road damage, Shandaken, Courtesy of Tetra Tech



TABLE 7. STRATEGY 1-TOWNS OF SHANDAKEN AND HARDENBURGH

Strategy 1: Reduce the impact of flooding on the built environment in the Towns, including critical facilities, transportation infrastructure, and communications systems					
Project Name	Short Project Description	Recovery Support Function	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
Bridge and culvert repair, upgrade, and replacement	7 projects in Shandaken and 66 in Hardenburgh to repair and replace various transportation infrastructure elements including damaged and undersized bridges and culverts. Projects reduce obstructions to flood waters, improve flow capacity, improve stream function, alleviate the existing roadway flooding conditions, and increase access and mobility.	Economic Development, Health and Social Services, Infrastructure, Natural and Cultural Resources	Shandaken Proposed: \$4,655,193 Shandaken Featured: \$750,000 Hardenburgh Proposed: \$110,000	Both	N
Slope Repair, Stream Restoration, and Bank Stabilization	5 projects in Shandaken and 44 projects in Hardenburgh to repair and stabilize various waterway slopes and embankments and restore stream channels to reduce bank failures and sloughing and protect adjacent roadways from future flooding and damage.	Economic Development, Health and Social Services, Infrastructure, Natural and Cultural Resources	Shandaken Featured: \$952,270 Hardenburgh Proposed: \$225,000 Hardenburgh Featured: \$325,000	Both	N
Shandaken - Fire District and Emergency Service Improvements	Provide funding for up to three volunteer fire districts for the unique upgrades they need to better serve as first responders and support command posts during and immediately after storms and other catastrophic events, and relocate the Emergency Medical Service (EMS) ambulance garage out of the flood plain.	Health and Social Services, Infrastructure	\$500,000	Proposed	
Shandaken - Phoenicia Water System Upgrades	This project would upgrade the Phoenicia Water System to increase capacity and make it more flood-proof and resilient during high water events.	Health and Social Services, Infrastructure	\$500,000	Featured	N
Shandaken - Phoenicia Stream Restoration and Recreation Trail - Phase 1: Land Acquisition, Property Relocation; and Park Development	This project would include the acquisition and removal of flood prone structures adjacent to the Bridge St. Bridge and creation of a park with associated amenities and flood protection measures. Provides streambank restoration, and flood mitigation, and reduction in flood elevation within the Hamlet.	Health and Social Services, Housing, Infrastructure, Natural and Cultural Resources	\$1,000,000	Featured	N



TABLE 7. STRATEGY 1-TOWNS OF SHANDAKEN AND HARDENBURGH

Strategy 1: Reduce the impact of flooding on the built environment in the Towns, including critical facilities, transportation infrastructure, and communications systems					
Project Name	Short Project Description	Recovery Support Function	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
Shandaken - Home and Business Flood Mitigation Improvements	Construct flood mitigation improvements for houses, businesses, and assets located in hazard-prone areas. Where appropriate, this may also include the acquisition and demolition of structures located in the hazard-prone areas to protect from future damage.	Economic Development, Health and Social Services, Housing	\$3,000,000 (assumes 30 buildings for an estimated \$30,000 per building)	Featured	N

Notes:
 Y/N Yes or no
 EMS Emergency medical services

A full description of Proposed Projects and Featured Projects is in Section IV: Implementation - Project Profiles.



Strategy 2: Enhance economic vitality through revitalizing hamlet centers, diversifying the business base, and promoting economic growth and tourism

The need for enhanced economic vitality is based on the Committee-established goals for the two Towns. The floods associated with Hurricane Irene and Tropical Storm Lee in 2011 crippled the Towns’ already fragile economy. Damages led to costly repairs for businesses and homeowners, and the losses incurred and the deficiencies in critical transportation networks function and emergency response capability painted a grim picture of the economic viability of the hamlet centers. This strategy proposes to direct ideas and resources toward reversing that negative perception, and to encourage existing land-owners to stay and to encourage new investment and growth in the Towns.

This strategy looks to leverage some of the two Towns’ greatest assets to promote new economic growth—traditional hamlet centers become the focus for flood protection and revitalization strategies, and existing local resources and businesses will be bolstered through increased visibility and marketing campaigns. The Committee looked to existing planning documents and local business leaders recommendations on diversifying the business base to provide additional amenities, increase the tax base, and enhance overall economic vitality.

Other assets that support the local economy and can be leveraged for future growth include:

- Recreational opportunities: hiking and biking trails, Belleayre Ski Center and future resort, fishing, hunting, golf, kayaking, tubing, etc.
- Small-town character and charm: walkability, historic buildings, peaceful neighborhoods
- Strong community values
- Proximity and access to major markets

- Active community members and organizations
- Lack of significant competition in the region

Revitalizing the economic base of the communities responds to a number of the key Issues identified in Section I of this plan, especially those related to a struggling economic environment. The lack of broadband and cell service, a local economy highly dependent on tourism and lodging, and the lack of prominent online and technological presence are economic inhibitors in both Towns, and lingering infrastructure damage from the 2011 floods reinforces the perception on an unstable business environment. This strategy directs efforts and investment toward fulfilling needs and taking advantage of noted opportunities.

- Address the lack of broadband and cell service, and its impact on economic development and the diversification of the business base
- Invest in and strengthen hamlet centers
 - Implement initiatives to encourage diversification of the business base beyond just lodging and tourism to establish a more vibrant tax base
 - Identify potential incentive programs to stimulate desirable business growth
 - Provide greater access to resources for existing and future local businesses
- Increase capitalization on recreation and tourism potential
 - Create additional wayfinding and signs to highlight available recreation opportunities
 - Increase the community’s visibility through greater online and technology presence including websites, social media, and smart phone applications



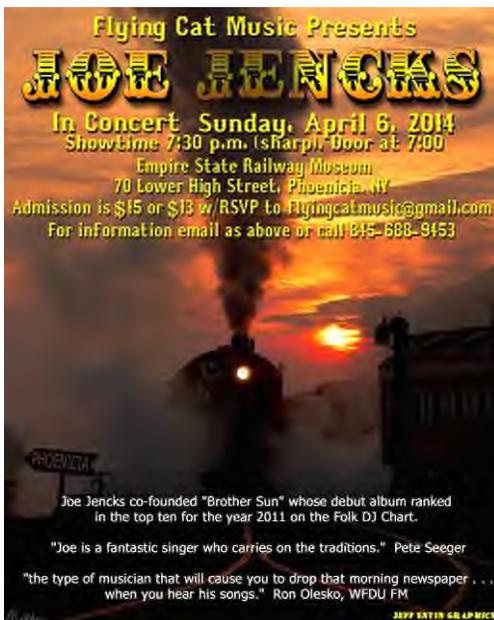
- Explore the creation of a coordinated branding and marketing strategy
- Create enhanced waterfront access
- Implement projects to enhance visual character of the area (especially Rt. 28)

Revitalization addressed the identified economic development and recovery challenges in the community. It requires a focus on needs and opportunities across other recovery support functions to be fully successful, including housing, community planning and capacity building, and infrastructure. For example, even a highly diversified businesses environment cannot thrive if the Towns’ commercial centers do not attract a broad local and tourist population. Similarly, improving and flood-proofing transportation infrastructure networks throughout both Towns will

be required to reverse the negative perception of the business climate, and to successfully attract new business investment.

Responding to the need for economic revitalization, resiliency and growth, this strategy capitalizes on the opportunity to increase tourism dollars spent in local businesses through increased marketing and online presence that could feature highlighted activities to attract visitors year-round. It suggests increasing access to resources (such as technical assistance and training), incentives (small business loans), and information on State and federal funding programs for local businesses.

The actions and preliminary project ideas in Table 8 were defined by the Committee in response to Strategy 2 and the identified issues, needs, and opportunities in Sections I and II of this Plan.



Courtesy of Town of Shandaken



View of Phoenicia, Courtesy of Tetra Tech



TABLE 8. STRATEGY 2-TOWNS OF SHANDAKEN AND HARDENBURGH

Strategy 2: Enhance economic vitality through revitalizing hamlet centers, diversifying the business base, and promoting economic growth and tourism					
Project Name	Short Project Description	Recovery Support Function	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
Bridge and culvert repair, upgrade, and replacement	7 projects in Shandaken and 66 in Hardenburgh to repair and replace various transportation infrastructure elements including damaged and undersized bridges and culverts. Projects will improve the transportation network and protect local assets from flood damage, incentivizing new commercial and residential growth in the area.	Economic Development, Health and Social Services, Infrastructure, Natural and Cultural Resources	Shandaken Proposed: \$4,655,193 Shandaken Featured: \$750,000 Hardenburgh Proposed: \$110,000	Both	N
Shandaken - Municipal Complex	This project includes the property acquisition for and construction of a Municipal Emergency Operations Center, Regional Evacuation site, and Community Health and human services Center, moving all of these functions out of their current highly vulnerable location in the floodplain. The building will perform as a community wellness and conferencing center during non-disaster response times and allow for 24/7 staffing for emergency services responders.	Economic Development, Health and Social Services,	\$3,000,000	Proposed	N
Shandaken - Phoenicia Water System Upgrades	This project would upgrade the Phoenicia Water System to increase capacity and make it more flood-proof and resilient during high water events.	Health and Social Services, Infrastructure, Economic Development	\$500,000	Featured	N
Shandaken - Emergency Power Generation Hookup Improvements	This project would outfit lodging establishments, restaurants, and gas stations with quick connect capability to hook up generators. Ensure that each hamlet has locations with electricity for people to remain safe and access accommodations, showers, food and water.	Health and Social Services, Infrastructure	\$50,000	Featured	N
Shandaken - Mt. Tremper Car Bridge - Phase 2	Replace the Mt. Tremper Bridge in the hamlet of Mt. Tremper with a pedestrian crossing. Existing bridge is severely deteriorated, currently closed to pedestrian and vehicle access, and increases local flood risks.	Infrastructure, Natural and Cultural Resources	\$2,500,000	Featured	N



TABLE 8. STRATEGY 2-TOWNS OF SHANDAKEN AND HARDENBURGH

Strategy 2: Enhance economic vitality through revitalizing hamlet centers, diversifying the business base, and promoting economic growth and tourism					
Project Name	Short Project Description	Recovery Support Function	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
Shandaken - Phoenicia Stream Restoration and Recreation Trail - Phases 1 - 4	A revitalization project in the hamlet of Phoenicia that provides an improved bridge, a trail network connecting local historic and cultural elements, replaces repetitive flood structures with a public park and an amphitheater, completes stream restoration, and improves local transportation access.	Health and Social Services, Housing, Infrastructure, Natural and Cultural Resources	Phase 1: \$1,000,000 Phase 2: \$2,800,000 Phase 3: \$200,000 Phase 4: \$1,500,000	Phase 2: Proposed; Others Featured	N
Shandaken - Home and Business Flood Mitigation Improvements	Construct flood mitigation improvements for houses, businesses, and assets located in hazard-prone areas including hamlet centers. Where appropriate, this may also include the acquisition and demolition of structures located in the hazard-prone areas to protect from future damage.	Economic Development, Health and Social Services, Housing	\$3,000,000 (assumes 30 buildings for an estimated \$30,000 per building)	Featured	N
Hardenburgh - Grants Mill Covered Bridge Relocation (Millbrook Creek crossing)	Relocate the historic Millbrook Creek Grants Mill Covered Bridge outside of the flood hazard area. The bridge is a listed historical structure on both the NY and National Registers of Historical Sites, and an important cultural and tourist asset in the Town of Hardenburgh.	Economic Development, Infrastructure	\$200,000	Proposed	N
Hardenburgh - Broadband Service Extension	Support Broadband service extension in the Beaverkill Valley, bringing broadband internet and improved communication services to the Beaverkill Valley on the south side of the mountain dividing the Town of Hardenburgh, currently an area unserved by broadband.	Economic Development, Health and Social Services, Housing	\$416,000	Featured	Y

Notes:
 Y/N Yes or no
 EMS Emergency medical services

A full description of Proposed Projects and Featured Projects is in Section IV: Implementation - Project Profiles.



Strategy 3: Ensure essential services are available for all before, during, and after a disaster

This strategy aims to meet the health and welfare needs of all members of the community and its visitors, and ensure ongoing protection of vulnerable populations during future disasters. Both Towns suffered significant health and social service challenges from historical repetitive flooding over the years. Limited transportation access routes and few healthcare, educational, and social services facilities near the hamlet centers, or even throughout the region, significantly increase health and safety risks during disasters. During Hurricane Irene and Tropical Storm Lee, as transportation routes became inundated, the lack of redundancy in access options created dangerous circumstances resulting in isolated individuals and difficulty accessing critical care and shelter facilities.

Ensuring sufficient health care access, mobility, sheltering capacity, and access to other essential goods and services is essential to the Towns’ future resiliency. Accomplishing this strategy will require providing new service options such as satellite health care centers, improving existing services such as the public schools, local EMS and Fire Department capabilities, and conducting widespread outreach to provide residents and business owners with the necessary information to adequately prepare for future disasters. The Committee identified needs, also in Section II of this Plan, which may be met under this strategy:

- Attract more health services and facilities to the Towns
 - Improve the public schools as a prerequisite to attracting more young professionals to the area
- Ensure ongoing protection of vulnerable populations during future disasters

- Identify issues and opportunities related to the protection of vulnerable populations
- Provide all residents, including vulnerable populations, with the necessary information to adequately prepare for future disasters
- Maintain access to health services before, during and after disaster events
 - Create improvements to existing EMS and Fire facilities

These needs and opportunities speak broadly to the overall goal of increasing access to services for residents of both Towns. Critical to that goal is ensuring that uninterrupted access to health care and emergency services is paramount in future resiliency planning. Accordingly, this strategy looks to fulfill actions under many recovery support functions, including health and social services, infrastructure, natural and cultural resources, and the opportunities presented under each in Section II of this plan. For example, ensuring access to regional health care resources will require investment in transportation infrastructure improvements and addressing stream conditions currently contributing to increased flood risk. Ensuring the provision of services during an event may require that some services be offered in the hamlet centers, which would reduce the threat of bridge closure and other access interruptions to regional transportation routes.

The actions and preliminary project ideas in Table 9 have been defined by the Committee to accomplish Strategy 3.



TABLE 9. STRATEGY 3-TOWNS OF SHADAKEN AND HARDENBURGH

Strategy 3: Ensure essential services are available for all before, during, and after a disaster					
Project Name	Short Project Description	Recovery Support Function	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
Shandaken - Backup Power Generator - Fixed installation	Install back-up propane generator to connect the resource to two town buildings: the Town Hall and the Town Highway Garage. Provides uninterrupted power to the Town’s Incident Command Center, other Town Hall functions, and the DPW garage during general power outages.	Health and Social Services, Infrastructure	\$50,000	Proposed	N
Bridge and culvert repair, upgrade, and replacement	7 projects in Shandaken and 66 in Hardenburgh to repair and replace numerous damaged and undersized bridges and culverts. Projects alleviate the existing roadway flooding conditions, and increase access and mobility for residents and emergency responders.	Economic Development, Health and Social Services, Infrastructure, Natural and Cultural Resources	Shandaken Proposed: \$4,655,193 Shandaken Featured: \$750,000 Hardenburgh Proposed: \$1,000,000	Both	N
Slope Repair, Stream Restoration, and Bank Stabilization	5 projects in Shandaken and 44 projects in Hardenburgh to repair and stabilize various waterway slopes and embankments and restore stream channels. Protects adjacent roadways from future flooding and damage, ensures access and mobility for residents and emergency responders.	Economic Development, Health and Social Services, Infrastructure, Natural and Cultural Resources	Shandaken Featured: \$952,270 Hardenburgh Proposed: \$225,000 Hardenburgh Featured: \$1,325,000	Both	N
Shandaken - Municipal Complex	This project includes the property acquisition for and construction of a new Town Complex to include a Municipal Emergency Operations Center, Regional Evacuation site, Highway Department, Town administration and Community Health and human services Center, moving all of these functions out of their current highly vulnerable location in the floodplain. The building will perform as a community wellness and conferencing center during non-disaster response times and allow for 24/7 staffing for emergency services responders	Economic Development, Health and Social Services,	\$3,000,000	Proposed	N



TABLE 9. STRATEGY 3-TOWNS OF SHANDAKEN AND HARDENBURGH

Strategy 3: Ensure essential services are available for all before, during, and after a disaster					
Project Name	Short Project Description	Recovery Support Function	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
Shandaken - Fire District and Emergency Service Improvements	Provide funding for up to three volunteer fire districts for the unique upgrades they need to better serve as first responders and support command posts during and immediately after storms and other catastrophic events, and relocate the EMS ambulance garage out of the flood plain.	Health and Social Services, Infrastructure	\$500,000	Proposed	
Shandaken - Phoenicia Water System Upgrades	This project would upgrade the Phoenicia Water System to increase capacity and make it more flood-proof and resilient during high water events.	Health and Social Services, Infrastructure	\$500,000	Featured	N
Shandaken - Emergency Power Generation Hookup Improvements	This project would outfit lodging establishments, restaurants, and gas stations with quick connect capability to hook up generators, and ensure that each hamlet has locations with electricity for people to remain safe and access accommodations, showers, food and water.	Health and Social Services, Infrastructure	\$50,000	Featured	N
Hardenburgh - Backup Power Generators	Purchase and install back-up propane generators for key community facilities including the Town Hall and the two Highway Garages	Health and Social Services, Infrastructure	\$180,000	Proposed	N
Hardenburgh - Broadband Service Extension	Support bringing broadband internet and improved communication services to the Beaverkill Valley and the Town of Hardenburgh.	Economic Development, Health and Social Services, Housing	\$416,000	Featured	Y

Notes:
 Y/N Yes or no
 EMS Emergency medical services

A full description of Proposed Projects and Featured Projects is in Section IV: Implementation - Project Profiles.



Strategy 4: Develop initiatives to address housing challenges related to flood risk, affordability, availability, and limited parcel availability

The floods associated with Hurricane Irene and Tropical Storm Lee in 2011 further impaired an already struggling housing stock. This strategy addresses the need to protect existing housing from repetitive flooding, diversify the availability of housing options, and to help homeowners in both Towns balance the costs of increasing flood insurance rates and expensive home flood-proofing measures. Strategic housing improvements to broaden the current housing stock in both Towns will also benefit economic development strategies, as they will protect against the loss of residents and increase the overall tax base, and will meet health and social services needs by providing affordable housing options to serve vulnerable populations. Preliminary actions and project ideas for this strategy will be based on the needs and opportunities identified during the planning process:

- Secure and protect existing housing stock against future floods
 - Identify and implement improvements for homes and businesses feasible for elevation, flood mitigation or buyout
 - Create incentives to encourage rehabilitation of existing housing stock and development of housing for senior citizens
 - Providing information on funding opportunities for home-owner assistance
- Provide adequate housing that is affordable for each segment of the population
- Encourage additional workforce and affordable housing and develop diverse housing options in the community

- Identify available land suitable and feasible for future housing development
- Pursue demolition of vacant or abandoned structures in town that are subject to environmental hazards such as mold.

This strategy directs the Committee to simultaneously address a growing concern with high taxes and costs of housing, including increasing flood insurance rates, with a significant lack of developable land and diversified housing options. This strategy encourages the Committee to capitalize on opportunities in the NYRCR planning process to identify non-Community Development Block Grant (CDBG) public and private housing programs available to address post-disaster housing supply, affordability, and accessibility needs. The Towns can use the NYRCR planning process as an opportunity to discuss participation in the NFIP CRS, which may be an effective method for reducing flood insurance costs for property owners. Preliminary project ideas proposed to fulfill this strategy to address housing challenges represent investment in a range of resiliency projects, and are described in Table 10.



Post Irene Damage, Shandaken, Courtesy of Tetra Tech



TABLE 10. STRATEGY 4-TOWNS OF SHANDAKEN AND HARDENBURGH

Strategy 4: Develop initiatives to address housing challenges related to flood risk, affordability, availability, and limited parcels					
Project Name	Short Project Description	Recovery Support Function	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
Shandaken - Improved Data Collection and Storage System to include Elevation Monuments	Install Elevation Monuments/Markers in public locations in each hamlet to lower costs associated in getting elevation certificates for structures and provide a more detailed elevation in relation to the Flood Elevations.	Housing, Infrastructure, Community Planning and Capacity Building	\$100,000	Proposed	N
Shandaken - Phoenicia Water System Upgrades	This project would upgrade the Phoenicia Water System to increase in the highly populated Hamlet of Phoenicia.	Health and Social Services, Infrastructure, Economic Development	\$500,000	Featured	N
Shandaken - Building Department Digital Upgrades	Improved Data Collection and Storage System to allow electronic post storm building inspections and reports from the field and to increase the community NYRCRS numbers.	Infrastructure, Community Planning and Capacity Building	\$30,000	Featured	N
Shandaken - Home and Business Flood Mitigation Improvements	Construct flood mitigation improvements for houses, businesses, and assets located in hazard-prone areas including hamlet centers. Increases safety for property owners and resiliency of building stock.	Economic Development, Health and Social Services, Housing	\$3,000,000 (assumes 30 buildings for an estimated \$30,000 per building)	Featured	N

Notes:

Y/N Yes or no

EMS Emergency medical services

A full description of Proposed Projects and Featured Projects is in Section IV: Implementation - Project Profiles.



Strategy 5: Protect, preserve, and enhance natural, cultural, and historic resources and assets

The sense of place and identity of most Towns in this region are defined by their natural, cultural, and historic resources. Along with the critical infrastructure and transportation assets that are often the focus of disaster mitigation or preparedness efforts, it is these elements of the community fabric that bind together all features of truly resilient communities, as they often represent the very reasons why residents choose to call these Towns home. Both Towns’ natural, cultural, and historic assets are critical components of their recovery and future economic development goals, so the protection and enhancement of those assets were important to the NYRCR planning effort.

This strategy addresses a range of needs and opportunities across multiple recovery support functions, pointing equally to actions that address needs in the Natural and Cultural Resources and the Economic Development categories, and fulfilling opportunities presented with respect to infrastructure improvements. Specifically, the community identified these needs in response to past floods and proposed actions to fuel future resiliency:

- Develop and implement stream management plans that balance environmental protection with the protection of community housing, infrastructure, and assets
 - Propose short-term projects to address the stream conditions currently contributing to increased flood risk and damage including gravel deposits, debris, stream bank erosion, and vegetation growth
 - Conduct meetings with appropriate agencies (NYCDEP, NYSDEC, County Soil and Water among others) to identify

potential regulatory and feasibility challenges and coordinate solutions

- Improve use of the area’s natural resources to connect hamlets, drive tourism, and encourage economic development
 - Create improved or new facilities to allow for community gathering, special events, and a central place for information
 - Promote, protect, extend, and enhance existing natural, historic, and cultural assets to increase quality of life and encourage year round economic vibrancy and tourism
- Ensure the retention of historic character and charm
 - Protect identified historic and cultural assets from future flood damage
 - Connect owners of historic assets with flood resiliency resources and information
 - Support the economic resiliency of agriforestry areas that support timber harvesting, silviculture, and niche-based practices and to protect them from future flood damage
- Connect hamlets through additional trails and transportation options

Addressing these needs would fulfill the Committee-identified goals of providing improved or new facilities for community gathering, special events, and sheltering; promote, protect, and enhance existing natural, historic, and cultural assets; increase use of the area’s natural resources to connect hamlets, drive tourism, and encourage economic development; and support the economic resiliency of our agricultural areas.



The preservation of natural, cultural, and historic resources relies on accurately identifying and highlighting existing resources and, through doing so, recognizing where these assets should be enhanced to provide the greatest community benefit. The network of creeks and streams is one of the most valuable environmental resources in the Towns. However, they are also the source of the hazard threat posed to many of the Towns'

cultural resources, including historic buildings and important community gathering spaces. Investments should be made in projects that respect a multitude of cultural and natural resources, and that are mindful not to enhance one at the expense of another. To accomplish these ends, the Committee proposed the actions and preliminary project ideas in Table 11, all of which work toward satisfying Strategy 5.



Courtesy of Town of Shandaken



TABLE 11. STRATEGY 5-TOWNS OF SHANDAKEN AND HARDENBURGH

Strategy 5: Protect, preserve, and enhance natural, cultural, and historic resources and assets					
Project Name	Short Project Description	Recovery Support Function	Estimated Cost	Proposed or Featured Project	Regional Project (Y/N)
Slope Repair, Stream Restoration, and Bank Stabilization	5 projects in Shandaken and 44 projects in Hardenburgh to repair and stabilize various waterway slopes and embankments and restore stream channels to reduce bank failures and sloughing and protect adjacent roadways from future flooding and damage.	Economic Development, Health and Social Services, Infrastructure, Natural and Cultural Resources	Shandaken Featured: \$952,270 Hardenburgh Proposed: \$225,000 Hardenburgh Featured: \$1,325,000	Both	N
Shandaken - Mt. Tremper Car Bridge - Phase 2	Replace the Mt. Tremper Bridge in the hamlet of Mt. Tremper with a pedestrian crossing. Existing bridge is severely deteriorated, currently closed to pedestrian and vehicle access, and increases local flood risks.	Infrastructure, Natural and Cultural Resources	\$2,500,000	Featured	N
Shandaken - Phoenicia Stream Restoration and Recreation Trail - Phases 1 - 4	A revitalization project in the hamlet of Phoenicia that provides a trail network connecting local historic and cultural elements, replaces repetitive flood structures with a public park and an amphitheater, completes stream restoration, and improves local transportation access.	Health and Social Services, Housing, Infrastructure, Natural and Cultural Resources	Phase 1: \$1,000,000 Phase 2: \$2,800,000 Phase 3: \$200,000 Phase 4: \$1,500,000	Phase 22: Proposed; Others Featured	N
Shandaken - Home and Business Flood Mitigation Improvements	Construct flood mitigation improvements for houses and businesses located in hazard-prone areas including hamlet centers. Where appropriate, this may also include improvements to historic buildings and cultural or community gathering centers.	Economic Development, Health and Social Services, Housing	\$3,000,000 (assumes 30 buildings for an estimated \$30,000 per building)	Featured	N
Hardenburgh - Grants Mill Covered Bridge Relocation (Millbrook Creek crossing)	Relocate the historic Millbrook Creek Grants Mill Covered Bridge outside of the flood hazard area. The bridge is a listed historical structure on both the NY and National Registers of Historical Sites, and an important cultural and tourist asset in the Town of Hardenburgh.	Economic Development, Infrastructure	\$200,000	Proposed	N

Notes:
 Y/N Yes or no
 EMS Emergency medical services

A full description of Proposed Projects and Featured Projects is in Section IV: Implementation - Project Profiles.



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SECTION IV

**Implementation
-Project Profiles**





Courtesy of Tetra Tech, 2014



Section IV. IMPLEMENTATION – PROJECT PROFILES

Following months of information gathering, data analysis, and scientific modeling, the NYRCR Committee identified projects to advance for prospective advancement under the NYRCR Program.

INITIAL PROJECT IDENTIFICATION

The project evaluation process was initiated through a combination of a review of existing plans, stakeholder surveys, and Committee discussions. The result was a collection of over 200 possible projects and initiatives that span a breadth of community needs and opportunities.

PRELIMINARY PROJECT ANALYSIS

Selecting proposed projects from a large group of worthy potential projects required a series of increasingly detailed qualitative and quantitative analyses. The full list of identified projects was initially evaluated and refined by four primary criteria to create a manageable universe of projects for further assessment. Project evaluation criteria included Categorization, Feasibility, Funding and Alignment with NYRCR Shandaken-Hardenburgh Plan goals.

DETAILED ANALYSIS AND FINAL PROJECT SELECTION

Final project selection and delineation into the three-tiered hierarchy of Proposed Projects, Featured Projects, and Additional Resiliency Recommendations was determined during the previous phase of assessment.

This process included detailed cost-benefit analysis, risk reduction analysis, and hydraulic modelling that was combined with ongoing public feedback and Committee discussions. The cost-benefit analysis included a full time equivalent (FTE) construction jobs were estimated based on a methodology

- ❖ *Proposed projects are proposed for funding through a community's allocation of CDBG-DR funding.*
- ❖ *Featured projects are innovative projects, where an initial study or discrete first phase of the project is proposed for Community Development Block Grant – Disaster Recovery (CDBG-DR) funding or other identified funding; and regulatory reforms and other programs that do not involve capital expenditures.*
- ❖ *Additional Resiliency Recommendations are resiliency projects and actions the Committee would like to highlight and are not categorized as Proposed or Featured Projects*

developed by the United States Department of Commerce Economics and Statistics Administration as presented in the September 2013 Economic Impact of Hurricane Sandy: Potential Economic Activity Lost and Gained in New Jersey and New York. This study estimated job creation from recovery spending on infrastructure projects in New York and reported 7.15 construction jobs and 8.4 total jobs per \$1,000,000 in construction spending.

As a result of the process described in this plan, the NYRCR Shandaken Hardenburgh Committee has selected proposed projects to address the needs of the community, and which are consistent with the strategies indicated in the NYRCR Shandaken Hardenburgh Plan. These projects are presented in two sections for each of the towns of Shandaken and Hardenburgh and are not presented in any priority order. The projects address the needs of the communities and are consistent with the strategies indicated in the plan. The projects range from roadway and stormwater infrastructure projects to the installation of fixed backup power generators.



SHANDAKEN PROPOSED PROJECTS

BACKUP POWER GENERATOR – FIXED INSTALLATION

Project Description

Background: Shandaken Town Hall, at 7209 Rt. 28, serves Shandaken residents by providing vital services during every day and emergency conditions and serves as the Town EOC. Currently, the town Hall does not have a fixed generator and is in the floodplain, making it susceptible to power outages and flooding. Ensuring the continuity of services provided by the Shandaken Town Hall is vital to the overall wellbeing of the Town of Shandaken during events like Irene.

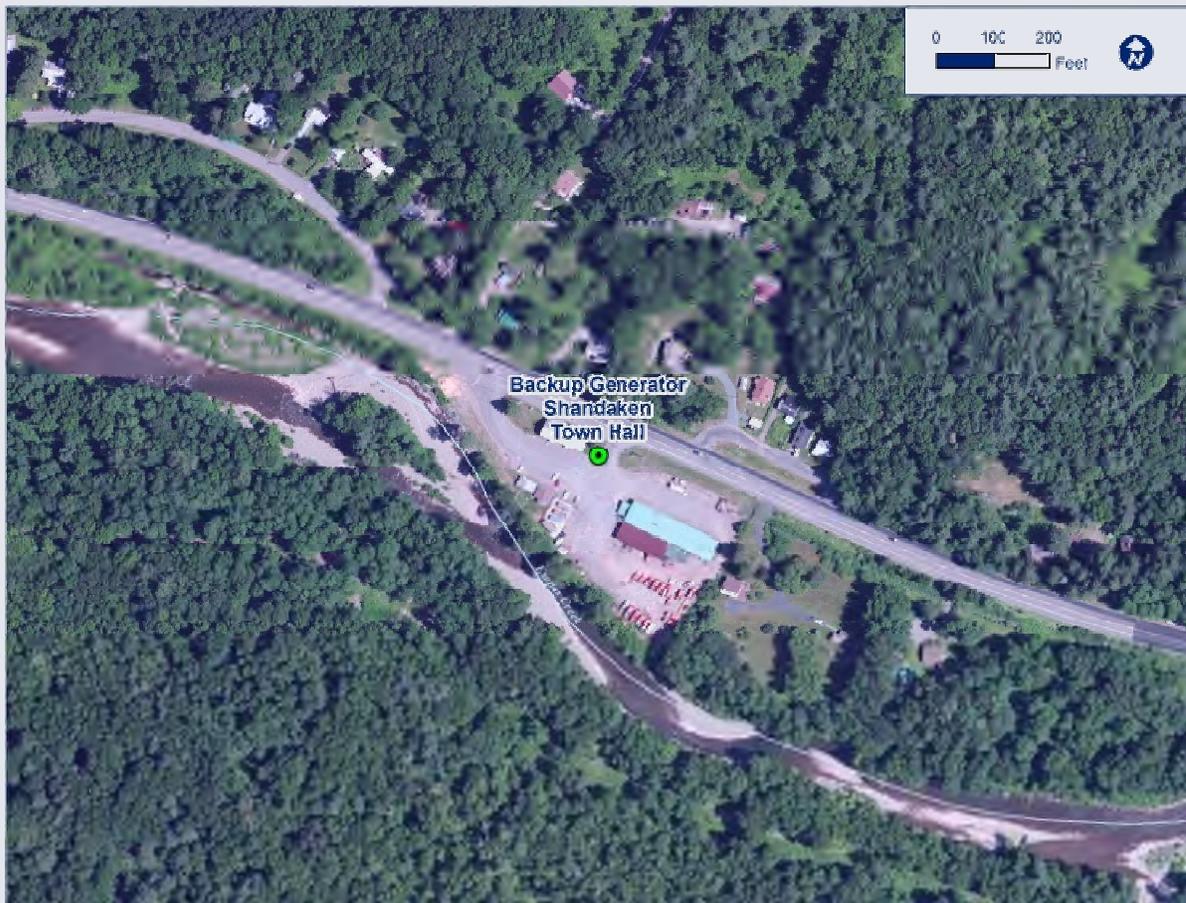
Connection to the Disaster: During the response to



Courtesy of the Town of Shandaken

Hurricane Irene, the Shandaken Town Hall was flooded and lost power. Town officials then moved Town Hall and EOC operations to the Shandaken-Allaben Hose Company’s station. When that facility was transformed into a staging area for other response assets, the EOC moved to the MF Whitney Hose Company’s station in Phoenicia. This facility is in the floodplain, and also experienced flooding during Hurricane Irene. Continuity of services were severely diminished due to the transition to

FIGURE 21. LOCATION MAP OF BACKUP GENERATOR





alternate locations.

Solution: The proposed project is to install back-up propane generators for Shandaken Town Hall. The generator, which is already in stock with the Town, will need associated electrical work to connect the resource to two town buildings: the Town Hall and the Town Highway Garage. The project would provide uninterrupted power to the Town’s EOC, other Town Hall functions, and the DPW garage during general power outages.

Project Cost Estimate

The estimated project cost is \$50,000.

Project Benefits or Co-Benefits

This fixed installation of backup power generators provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefits. This project is highly supported by Shandaken residents.

Continuity of Services: This project ensures that vital services provided by the Town Hall are not impacted by a power outage. Maintaining EOC operations during an emergency event is vital to coordinating resources and operations on a local and county level. By providing the Town Hall with a fixed back-up power generator, the speed and accessibility of the Town’s EOC and resources will not be affected by a power outage during a disaster.

Economic Benefits: This project is based on the effort to strengthen and prioritize local emergency response and recovery capabilities, and aimed at building a more resilient Town in the face of future disasters. This type of investment creates greater confidence for private investors, as it illustrates a commitment to the future of the Town’s residents, local work force, and health and social well-being.

Environmental Benefits: Although no environmental assets were identified as being completely secured, there are environmental benefits associated with this project. The project

will result in better environmental quality within the building due to health and safety improvements and any renovation associated with the project.

Social Benefits: Power outages can prevent the Town from operating normally. This makes Town officials and emergency personnel inaccessible to its



Generator - Courtesy of Generac

residents. The entire population of Shandaken, especially those in need of assistance from the Town, will benefit from the installation of a back-up power generator. It will combine the Town Hall and Highway Garage. Emergency and essential personnel, health care providers, and social services will also benefit.

Public Support: Public feedback gathered at community outreach events and public meetings showed a clear need for health and social services in the Town of Shandaken, including additional support for emergency responders and service providers. Specific public requests were made for projects to ensure fire houses and critical facilities have access to supplies and are supported by generators and to support fire houses as community centers by enhancing abilities. This project is a direct result of requests from public input.



Project Cost-Benefit Analysis

By ensuring the provision of essential services during a disaster, allowing for continued operation of critical facilities and communications during future disaster events, and supporting all other aspects of municipal functionality during a disaster, the project has a clear and significant benefit for all Town residents, officials, and visitors.

- Investment: **\$50,000**
- Jobs created: **0.4**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include assurance of a continuity of essential services during a disaster. This project reduces risk to resident and visitor safety by ensuring reliable power source to provide essential services, sheltering, and continued operation of critical facilities and communications during future disasters. This project provides support for all aspects of municipal functionality during a disaster

by reducing risk of additional damage or increased maintenance to municipal systems and facilities as a result of prolonged power outage.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing installation is expected to happen over the course of 1 month. .

Local, State and Federal Government Regulatory Requirements related to the project

- None

Jurisdiction

The Town of Shandaken.



LITTLE PECK HOLLOW ROAD BRIDGE

Project Description

Background: Little Peck Hollow Road is a secondary roadway off of Oliveria Road in the Hamlet of Oliveria which intersects Peck Hollow Creek, a tributary to Esopus Creek. The Little Peck Hollow Bridge is near 47 Little Peck Hollow Road.

Connection to the Disaster: Little Peck Hollow Road Bridge sustained heavy damage from severe flooding associated with Hurricane Irene and was temporarily closed to traffic, interrupting transportation access for all residents farther up Little Peck Hollow Road.

Solution: This project will rebuild and improve Little Peck Hollow Road Bridge to improve flow capacity, convey flood waters, and provide enhanced and

stable transportation infrastructure to the Town.

Project Cost Estimate

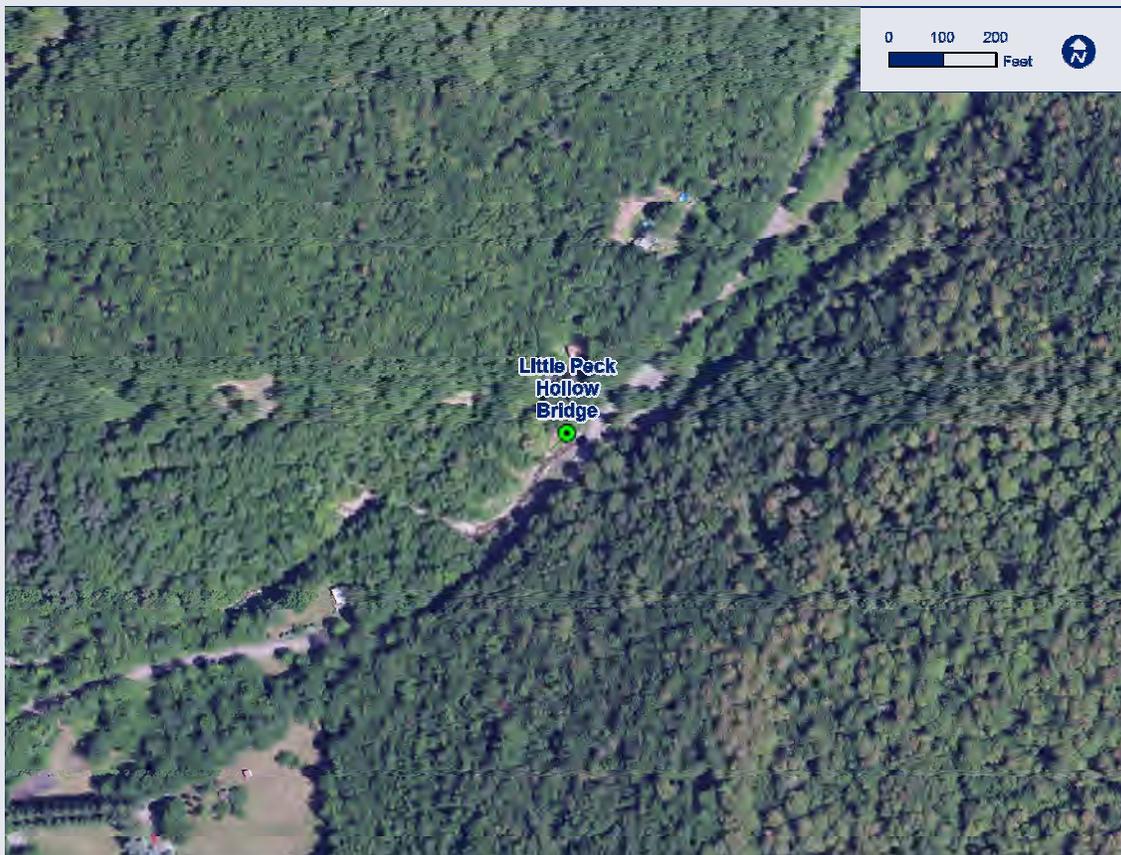
The estimated project cost is \$382,374.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental, and social benefits. This project is highly supported by Shandaken residents. The replacement of the bridge will benefit the entire population of Shandaken, especially those who live near the bridge and depend on it for access to their homes, businesses, and other essential facilities (hospitals, doctor offices, etc.).

Flood Protection and Safety: Replacement of the damaged bridge will provide inundation reduction

FIGURE 22. LOCATION MAP OF LITTLE PECK HOLLOW ROAD BRIDGE





for Little Peck Hollow Road which helps to provide reliable and much needed transportation access during storms. With limited existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes are safe for travel during storms. By providing increased travel safety for and access to the Little Peck Hollow Road, this project will help to provide necessary access to healthcare and critical facilities throughout the Town and region.

Economic Benefits: This project will encourage economic growth spurred by construction through the purchase and use of associated supplies and services. Rebuilding and improving Little Peck Hollow Road Bridge reduces local flood elevations and maintains a thoroughfare during higher water events, demonstrating the Town’s commitment to prioritizing and investing in infrastructure improvements in every hamlet, protecting residential access points as well as those transportation elements serving vibrant commercial hubs. This type of investment sets a strong foundation for additional growth and development in the area, illustrates a commitment to the future, and will encourage home owners and businesses to continue to invest in the area. Replacing the damaged bridge will have a positive economic effect on future recovery and repair spending and on the resiliency of the surrounding community.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity for Peck Hollow Creek to move potential flood waters and improvements to the bridge will help to improve water quality and maintain the natural characteristics in Little Peck Hollow Creek by minimizing the impact of transportation

infrastructure on the environment.

Public Support: The project makes an infrastructure investment to benefit the Town of Shandaken’s overall transportation network, while increasing public safety and emergency response capabilities. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects through the CR process.



Bridge replacement concept or rendering - Courtesy of CONTECH

Project Cost-Benefit Analysis

The reduction in flood water on a residential roadway, repair of damaged infrastructure, leveraging of additional funding, increased protection for adjacent properties, and protecting existing residential land uses will all contribute to the community benefits from this project.

- Investment: **\$382,374**
- Jobs created: **3.3**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storm events by providing reduced road inundation and reduced risk of stream bank failure during flood events. This project reduces the



risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storms.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 5 months.

Local, State and Federal Government Regulatory Requirements related to the project

- Article 15 Permit required
- Local Building Departments – Construction Permits

Jurisdiction

The Town of Shandaken.



LOWER BIRCH CREEK ROAD BRIDGE

Project Description

Background: The Lower Birch Creek Road is at approximately 8373 Route 28 in Shandaken, NY. This bridge is a vehicular bridge crossing Lower Birch Creek.

Connection to the disaster: As a result of Hurricane Irene and Tropical Storm Lee flooding in 2011, the Lower Birch Creek Bridge was damaged and in need of significant repair. The flooding caused substantial damage to the abutments.

Solution: The proposed project will realign the Lower Birch Creek Road and make necessary upgrades to the bridge structure to alleviate the existing roadway flooding situation.

Project Cost Estimate

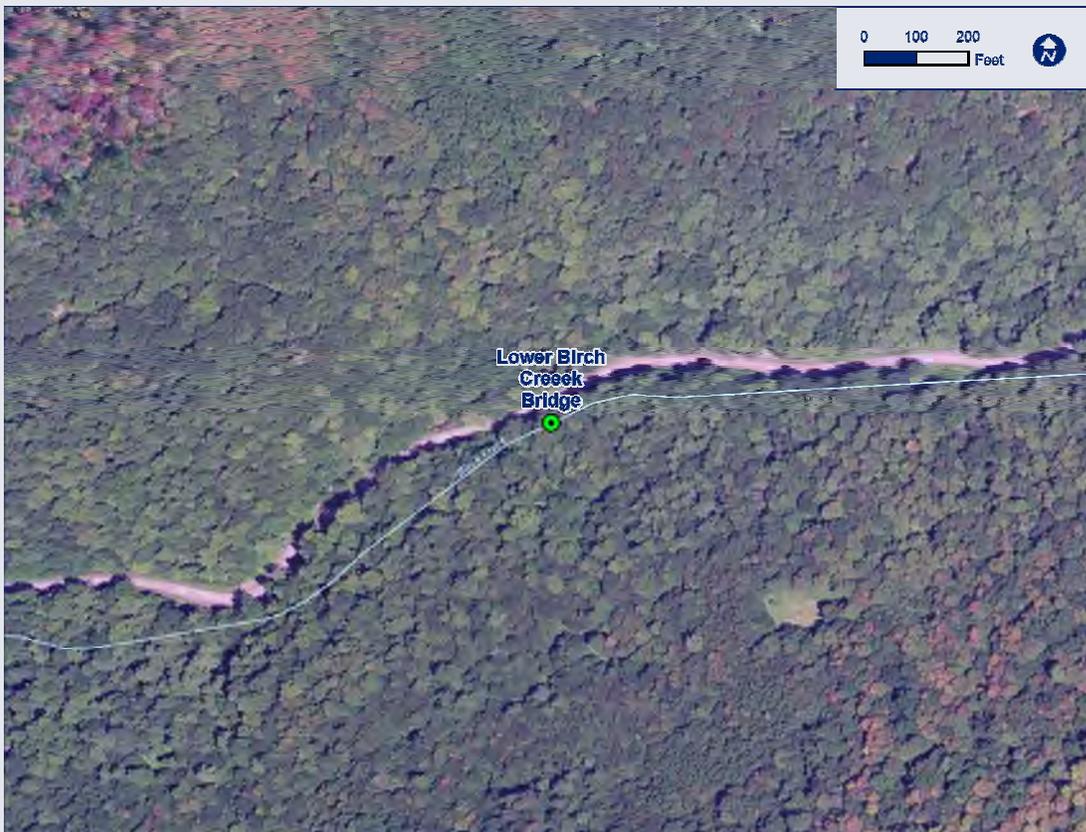
The estimated project cost is \$376,974.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental, and social benefits. This project is highly supported by Shandaken residents. The replacement of the bridge will benefit the entire population of Shandaken, especially those who live near the bridge and depend on it for access to their homes, businesses, and other essential facilities (hospitals, doctor offices, etc.).

Flood Protection and Safety: Replacement of the damaged bridge will provide inundation reduction for Lower Birch Creek Road which helps to provide reliable and much needed transportation access

FIGURE 23. LOCATION MAP OF LOWER BIRCH CREEK ROAD BRIDGE





during storms. With limited existing access points to main regional thoroughfares, it is critically



Bridge replacement concept or rendering - Courtesy of CONTECH

important to ensure secondary and local routes are safe for travel during storms. By providing increased travel safety for and access to the Lower Birch Creek Road, this project will help to provide necessary access to healthcare and critical facilities throughout the Town and region.

Economic Benefits: This project would create a number of construction jobs in the short term, potentially creating work for local and regional contractors in addition to sales for local and regional suppliers. In addition to economic growth spurred by construction, improvements that build a more resilient transportation network will also create greater confidence for private investors in Shandaken. As the Town continues to prioritize and implement projects that address flood safety and accessibility issues, individuals and private businesses will be more likely to invest in the Town, encouraged by the Town’s clearly demonstrated commitment to a strong future. Improvements to the bridge and realignment of the roadway will have a positive economic effect on future recovery and repair spending.

Environmental Benefits: There are several environmental benefits associated with this project.

This project will increase the capacity in which the Birch Creek can move potential flood waters. In addition, improvements to the bridge will help to improve water quality and maintain the natural characteristics in Birch Creek by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project makes an infrastructure investment to benefit the Town of Shandaken’s overall transportation network, while increasing public safety and emergency response capabilities. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most

important areas for focusing investment and resiliency projects through the NYRCR process.

Project Cost-Benefit Analysis

The reduction in flood water on a critical thoroughfare, repair of damaged infrastructure, leveraging of additional funding, increased protection for adjacent properties, and additional potential for economic growth collectively position the Town of Shandaken to benefit considerably from this project.

- Investment: **\$376,974**
- Flood level reduction: **Maximum 2.5’ decrease for the 10-yr flood event**
- Jobs created: **3.2**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storms by providing reduced road inundation and reduced risk of stream bank failure



during flood events. This project reduces the risk of stranding or isolating residents and visitors during storms by ensuring that vital transportation routes remain open to allow mobility and evacuation during storms. This project will result in a decrease in water surface elevation and affect the extent to which the area floods.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 5 months.

Local, State and Federal Government Regulatory Requirements related to the project

- DEC Article 15 Permit required



Lower Birch Creek Road Bridge – Courtesy of Tetra Tech

- NYS DOT – Highway Work Permit or Direct Involvement

Jurisdiction

The Town of Shandaken.



MULLER ROAD BRIDGE

Project Description

Background: The Muller Road Bridge is half a mile south of intersection of Fox Hollow Rd and NYS Route 28 in Shandaken, NY. This bridge is a vehicular bridge that crosses the Fox Hollow Creek.

Connection to the disaster: As a result of flooding from Hurricane Irene and Tropical Storm Lee in 2011, the Muller Road Bridge was damaged and left in need of significant repair. Furthermore, debris back-up and inhibited flood water flows at the bridge caused roadway flooding, cutting off access from all points further up Fox Hollow Road and prohibiting residents from exiting the area and emergency responders from providing critical aid into the area.

Solution: This project proposes to help alleviate the existing roadway flooding condition, by upgrading the existing structure. The proposed modifications include raising the bridge 2.5 feet and widening the distance between abutments by removing the old abutments.

Project Cost Estimate

The estimated project cost is \$350,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents.

Flood Protection and Safety: Rebuilding and upgrading the damaged bridge will provide inundation reduction for Muller Road which in turn helps to provide a reliable and much needed transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes are safe for travel during



Muller Road Bridge – Courtesy of Tetra Tech

storms. By providing increased travel safety for and access to the Muller Road, this project will help to provide necessary access to healthcare and critical facilities throughout the Town and region. This is important for emergency and essential personnel during events that result in evacuations, the need for distribution of supplies, and any other need for emergency assistance.

Economic Benefits: This project would create a number of construction jobs in the short term, potentially creating work for local and regional contractors in addition to materials and equipment sales for local and regional suppliers. In addition to economic growth spurred by construction, improvements aimed at building a more resilient transportation network will also create greater confidence for private investors in Shandaken. As the Town continues to prioritize and implement infrastructure projects that address lingering flood safety and accessibility issues, individuals and private businesses will more likely to invest in the Town, encouraged by the Town’s capital investments and clearly demonstrated commitment to a strong future. Finally, improvements to the bridge and realignment of the roadway will have a positive economic effect on future recovery and repair spending.



Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Fox Hollow Creek can move potential flood waters. In addition, improvements to the bridge will help to improve water quality and maintain the natural characteristics in Fox Hollow Creek by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project makes an infrastructure investment to benefit the Town of Shandaken’s overall transportation network, while increasing public safety and emergency response capabilities. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects through the CR process.

Project Cost-Benefit Analysis

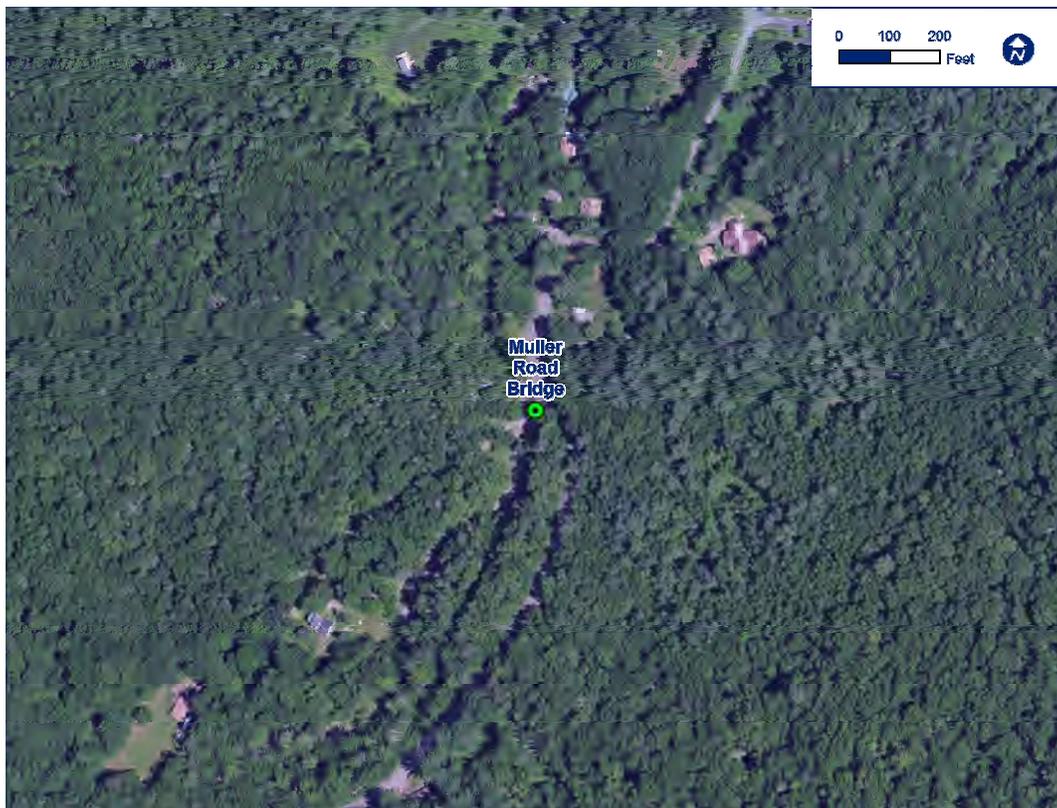
The reduction in flood water on a critical thorough fare, repair of damaged infrastructure, leveraging of additional funding, increased protection for adjacent properties, and additional potential for economic growth in the downtown collectively position the Town to benefit considerably from this project.

- Investment: **\$350,000**
- Flood level reduction: **Maximum 5.3’ decrease for the 25-yr flood event**
- Jobs created: **2.9**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storm events by providing reduced

FIGURE 24. LOCATION MAP OF MULLER ROAD BRIDGE





road inundation and reduced risk of stream bank failure during flood events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storm events. In addition, this project will result in a decrease in water surface elevation and therefore affect the extent to which the area floods.

Implementation Timeframe

General project implementation, including preparation of engineering design documents,

submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 5 months.

Local, State and Federal Government Regulatory Requirements related to the project

- DEC Article 15 Permit required
- NYS DOT – Highway Work Permit or Direct Involvement

Jurisdiction

The Town of Shandaken.



PANTHERKILL ROAD BRIDGE

Project Description

Background: The Pantherkill Road Bridge is located approximately 0.9 miles west of the intersection of Pantherkill Road and Woodland Valley Road in the Town of Shandaken.

Connection to the disaster: Hurricane Irene occurred on August 28, 2011, resulting in significant damage to the Pantherkill Road Bridge, including erosion of both bridge abutments.

Solution: This project would replace the existing bridge to improve flow capacity and convey flood waters. This new bridge will be able to withstand some of the most severe flooding events that may occur in the Town of Shandaken.

Project Cost Estimate

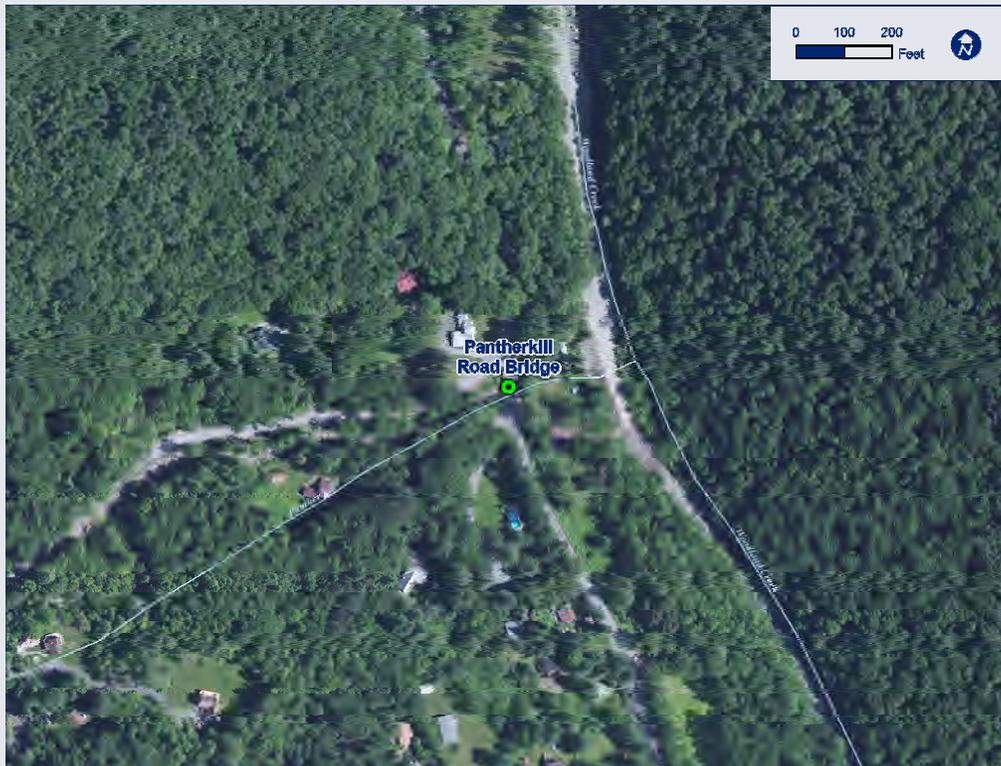
The estimated project cost is \$350,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. This project will benefit the entire population of Shandaken, especially those who live in the immediate area of the bridge and depend on it for access to their homes, businesses, and other essential facilities.

Flood Protection and Safety: Replacing the existing bridge will result in inundation reduction for Pantherkill Road which helps to provide a reliable and much needed transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes are safe for travel during storms. By providing increased

FIGURE 25. LOCATION MAP OF PANTHERKILL ROAD BRIDGE





travel safety for and access to the Pantherkill Road, this project will help to provide necessary access to healthcare and critical facilities throughout the Town and region. This is important for emergency and essential personnel during events that result in evacuations, the need for distribution of supplies, and any other need for emergency assistance.

Economic Benefits: Economically, improvements aimed at building a more resilient transportation network will create greater confidence for private investors in Shandaken. As the Town continues to prioritize and implement infrastructure projects that address lingering flood safety and accessibility issues, individuals and private businesses will more likely to invest in the Town, encouraged by the Town’s capital investments and clearly demonstrated commitment to a strong future. Finally, improvements to the bridge and realignment of the roadway will have a positive economic effect on future recovery and repair spending.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Pantherkill Creek can move potential flood waters. In addition, rebuilding the bridge will help to improve water quality and maintain the natural characteristics in Pantherkill Creek by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project makes an infrastructure investment to benefit the Town of Shandaken’s overall transportation network, while increasing public safety and emergency response capabilities. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most

important areas for focusing investment and resiliency projects through the CR process.



Bridge replacement concept or rendering - Courtesy of CONTECH

Project Cost-Benefit Analysis

The reduction in flood water on a residential roadway, repair of damaged infrastructure, leveraging of additional funding, increased protection for adjacent properties, and protecting existing residential land uses will all contribute to the community benefits from this project.

- Investment: **\$350,000**
- Jobs created: **2.9**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storm events by providing reduced road inundation and reduced risk of stream bank failure during flood events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during



storm events.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 5 months.

Local, State and Federal Government Regulatory Requirements related to the project

- Article 15 Permit required

Jurisdiction

The Town of Shandaken.



Pantherkill Road Bridge - Courtesy of Tetra Tech



PECK HOLLOW ROAD BRIDGE

Project Description

Background: Peck Hollow Road Bridge spans Peck Hollow Creek, located approximately 1 mile north of the intersection of Route 28 and Peck Hollow Road.

Connection to the disaster: Hurricane Irene occurred on August 28, 2011, resulting in damage to the Peck Hollow Road Bridge and ultimately its demolition. Hurricane Irene severely deteriorated the bridge, as flood waters damaged and displaced portions of the stone masonry abutments. As a result, the damaged bridge was dismantled and a temporary steel bridge was installed to maintain access to the northerly portion of Peck Hollow Road.

Solution: This project will rebuild and improve Peck

Hollow Road Bridge by replacing the existing bridge and abutment to improve flow capacity and convey flood waters.

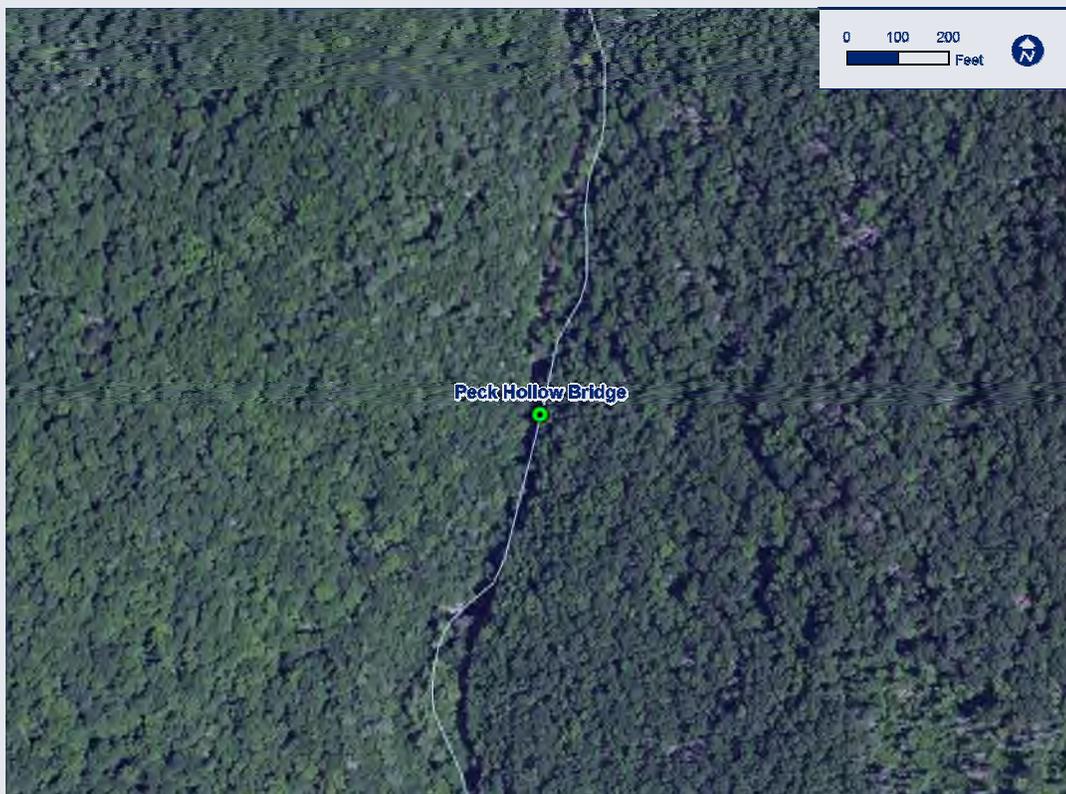
Project Cost Estimate

The estimated project cost is \$395,846.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those who live in the immediate area of bridge and those who depend on it for access to their homes, businesses, and other essential facilities (hospitals, doctor offices, etc.).

FIGURE 26. LOCATION MAP OF PECK HOLLOW ROAD BRIDGE





Flood Protection and Safety: This project will result in an inundation reduction for Peck Hollow Road which helps to provide reliable and much needed transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes are safe for travel during storms. By providing increased travel safety for and access to Peck Hollow Road, this project will help to provide necessary access to healthcare and critical facilities throughout the Town and region. This is important for emergency and essential personnel during events that result in evacuations, the need for distribution of supplies, and any other need for emergency assistance.

Economic Benefits: Improvements aimed at building a more resilient transportation network will create greater confidence for private investors in Shandaken. As the Town continues to prioritize and implement infrastructure projects that address lingering flood safety and accessibility issues, individuals and private businesses will more likely to invest in the Town, encouraged by the Town’s clearly demonstrated commitment to a strong future.



Bridge replacement concept or rendering - Courtesy of CONTECH



Peck Hollow Road Bridge - Courtesy of Tetra Tech

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Peck Hollow Creek can move potential flood waters. In addition, rebuilding the bridge will help to improve water quality and maintain the natural characteristics in Peck Hollow Creek by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project makes an infrastructure investment to benefit the Town of Shandaken’s overall transportation network, while increasing public safety and emergency response capabilities. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and economic development were the two most important areas for focusing investment and resiliency projects through the CR process.

Project Cost-Benefit Analysis

The reduction in flood water on a residential roadway, repair of damaged infrastructure, leveraging of additional funding, increased protection for adjacent properties, and protecting existing residential land uses will all contribute to the community benefits from this project.



- Investment: **\$395,846**
- Jobs created: **3.3**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storm events by providing reduced road inundation and reduced risk of stream bank failure during flood events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storm events.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 5 months.

Local, State and Federal Government Regulatory Requirements related to the project

- Article 15 Permit required

Jurisdiction

The Town of Shandaken.



IMPROVED DATA COLLECTION AND STORAGE SYSTEM TO INCLUDE ELEVATION MONUMENTS

Project Description

Background: Shandaken’s location along numerous rivers and tributaries means that a large number of homes and businesses are exposed to potential flooding events. Due to the volatile nature of flooding in this area, residents and officials must be equipped with the best sources of data possible.

Connection to the disaster: As a result of Hurricane Irene and Tropical Storm Lee in 2011, the Town of Shandaken Building Department experienced significant hardships in the facilitating homeowner’s efforts to recover and rebuild after incurring damages from the storms. At root of the problem was an insufficient amount and methodology for structural data gathering and storage, which burdened officials with bringing hard-copy survey and other information to specific properties in order to assess damage and issue permits. Exacerbating the issue was the lack of accurate elevation data throughout the Town, which prohibited code officials to determine whether a structure sits within a floodplain, especially at a time when FEMA maps had been redrawn and historical accounts of individual properties are no longer applicable.

Solution: This project proposes to install Elevation Monuments/Markers in public locations in each hamlet to lower costs associated in getting elevation certificates for structures and provide a more accurate elevation in relation to the Flood Elevations.

Project Cost Estimate

The estimated project cost is \$100,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In



Courtesy of Monroe County

addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those who live in the immediate area of waterways and areas of flooding.

Preparation and Safety: The project will result in extremely accurate elevation data that can be incorporated into a notification system for future flooding events. This will help to protect the Town’s residents and allow them time to evacuate their homes, if necessary. This increases the safety of residents, emergency responders, and essential personnel during flooding and other hazard events. This project will also assist in obtaining elevation certifications which highlight to individuals their ability to protect themselves and their homes from potential high water events.

Economic Benefits: Improvements aimed at strengthening and prioritizing residential resiliency and local emergency response and recovery capabilities creates greater confidence for private investors, as it illustrates a commitment to the future of the Town’s residents, local work force, and health and social well-being. In addition, by facilitating the accurate data collection of site and parcel elevation characteristics, the acquisition of flood elevation certificates for Shandaken homeowners, and the beginning of a larger data collection, storage, and management system for the



Town of Shandaken, this project ensures that the Town will be more resilient against future storms and may reduce flood insurance premiums for some, and future property losses for others.

Environmental Benefits: This project has the potential to enhance the quality of environmental data and facilitate environmental planning by providing detailed and current information regarding the Esopus Creek watershed.

Public Support: The project makes a data collection system investment to benefit the Town of Shandaken’s overall emergency information network, while increasing public safety and emergency response capabilities. Shandaken residents who participated in an NYRCR public meeting indicated that there is a critical need for better flood related data, emergency information and improved local and regional connectivity in order to support the publically selected two most important areas for focusing investment: Infrastructure and Economic Development.

Project Cost-Benefit Analysis

Based on available information and preliminary designs, the proposed project would have a net benefit on community economy, safety, and

resiliency.

- Investment: **\$100,000**
- Jobs created: **0.8**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project allows for immediate permit issuance, increases efficiency and safety during and after hazard events, reduces economic risk by potentially lowering flood insurance rates, and promotes acquiring elevation certificates.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 12 months.

Local, State and Federal Government Regulatory Requirements related to the project

- Potential Article 15 Permit required

Jurisdiction

The Town of Shandaken.



TOWN OF SHANDAKEN MUNICIPAL COMPLEX

Project Description

Background: Response coordination, law enforcement, firefighting, emergency medical services, and public works are critical functions to be performed every day to ensure the health and well-being of a community. During a disaster they become the most important service a government entity provides to its citizens. The Town must ensure that facilities dedicated to carrying out these functions are safe from the impacts of hazards.

Connection to the disaster: During the response to Irene, the Shandaken Town Hall was flooded and lost power. Town officials then moved to the Shandaken-Allaben Hose Company’s station to coordinate operations. When that facility was transformed into a staging area for other response assets, the EOC moved to the MF Whitney Hose Company’s station in Phoenicia. This facility is also in the floodplain, and had also experienced flooding during Hurricane Irene. The lack of a secure, flood-resistant, and continuous center of operations for the operations not only affected the fire department, but also the Shandaken Ambulance Service, which houses one of its advanced life support (ALS) ambulances at the fire station.

Solution: This project includes the construction of a new multi-use municipal facility on Route 28. This

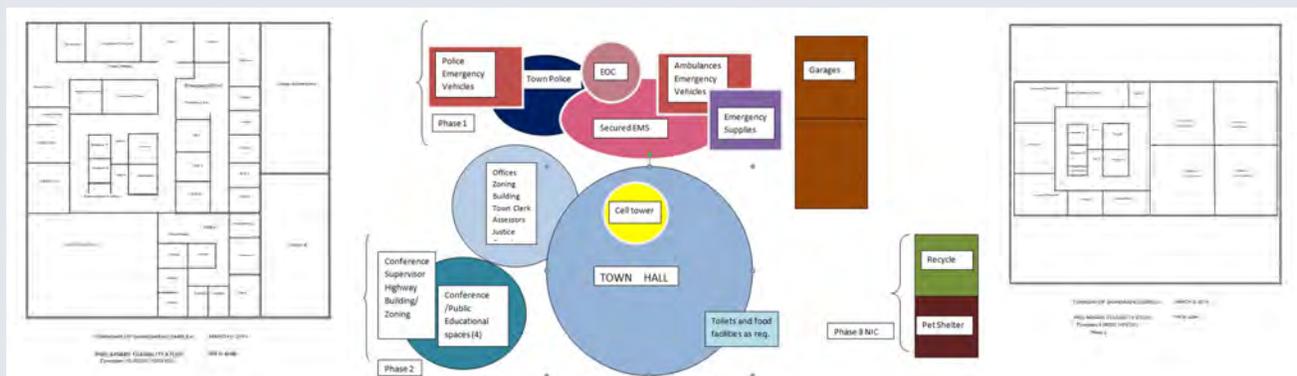
facility will include the Town’s administrative offices (such as the Supervisors and the Building Department/Zoning), the Police Department, the Town Emergency Operations Center, the Shandaken Ambulance Service, and garages for vehicles and large equipment. The facility could be used as a Regional Evacuation site, and as a Community Health and Human Services Center. The design of the new facility will include increased capacity for sheltering of vulnerable/ high risk populations and enhance command center and communications capability during a disaster. This project would include outfitting the facility with State-of-the-art Weather monitoring systems and improved communications networking. A solar energy component would be considered for uninterrupted power capability. The building will perform as a community wellness and conferencing center during non-disaster response times and allow for 24/7 staffing for emergency services responders.

Project Cost Estimate

The estimated project cost is \$3,000,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the



Conceptual Plans-Town of Shandaken Municipal Complex -Courtesy of the NYRCR Towns of Shandaken and Hardenburgh Committee



entire population of Shandaken, especially those considered socially vulnerable.

Continuity of Services: This new facility will provide a place for Town officials, police, fire, emergency management, public works, and other departments to assemble and coordinate during any type of emergency in Shandaken.

Protecting Vulnerable Populations: This new facility will increase the capacity of care for vulnerable and high risk populations by providing safe and accessible service during disaster. When the center is not operating under an emergency situation, it will serve as a community wellness and conferencing center.

Economic Driver: This project is based on the effort to strengthen and prioritize local emergency response and recovery capabilities, and aimed at building a more resilient Town in the face of future disasters. This type of investment creates greater confidence for private investors, as it illustrates a commitment to the future of the Town’s residents, local work force, and health and social well-being.

Environmental: Although no environmental assets were identified as being completely secured, there are environmental benefits associated with this project. The project will result in creation of a more secure community emergency operation facility. The resulting information network could lead to better response time to emergencies affecting environmental assets or infrastructure that may impact environmentally sensitive areas. In addition, the installation of solar arrays for power back up will reduce the need for other forms of back-up that are reliant on gasoline or fuels. This will help work towards a reduction of carbon emissions in the Town during power loss events by eliminating the reliance on carbon emitting back-up power sources.

Public Support: Public feedback gathered at NYRCR community outreach events and public meetings showed a clear need for health and social services

in the Town of Shandaken, including additional support for emergency responders and service providers. Specific public requests were made for projects to ensure fire houses and critical facilities have access to supplies and are supported by generators and to support fire houses as community centers by enhancing abilities.

Project Cost-Benefit Analysis

By ensuring the provision of essential services during a disaster, allowing for continued operation of critical facilities and communications during future disaster events, and supporting all other aspects of municipal functionality during a disaster, the project has a clear and significant benefit for all Town residents, officials, and visitors.

- Investment: **\$3,000,000**
- Jobs created: **10.1**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project allows for increased emergency service capability, reduces risk to resident safety by ensuring continuity of essential services during disasters, and reduces risk to residents and visitors by minimizing response times.

Implementation Timeframe

The multiple phases of this project, including design, permitting, contracting, and construction, are expected to take approximately 14 months.

Local, State and Federal Government Regulatory Requirements related to the project

- Potential Article 15 Permit required
- NYS DOT – Highway Work Permit

Jurisdiction

The Town of Shandaken.



FIRE DISTRICT AND EMERGENCY SERVICE IMPROVEMENTS

Project Description

Background: Volunteers serve as the backbone of Shandaken’s emergency response services. The men and women who serve in this capacity ensure the safety and well-being of all of Shandaken’s residents during everyday operations and emergency events. Funding to sustain these volunteer operations relies heavily on community support and donations.

Connection to the disaster: In response to Hurricane Irene and Tropical Storm Lee, the Big Indian-Oliverea Fire Company, an all-volunteer department, methodologically searched the district, checking each of 319 structures to account for residents, checking on medication needs, providing food, water, dry ice and fuel for generators. For eight of those days the community functioned without power, phone, or cell service. Dozens of stranded residents were brought out of mountainside homes, and 200 guests stranded in a valley hotel were moved to safety. For 15 days the Big Indian-Oliverea Fire Company fire house served as a shelter housing National Guard Troops and residents in need. It was also a collection point for donated supplies, and a source of respite. Throughout this period, volunteers prepared and served meals for those sheltered.

Recognizing the exhausted and inefficient state of the fire house kitchen, the Big Indian-Oliverea Fire Company Ladies Auxiliary completed a major renovation in the fall of 2013. New wiring, plumbing, and electrical upgrades were installed. Age old appliances were replaced with larger more efficient appliances including a larger refrigerator, a larger freezer, a new six-burner gas stove, a dishwasher, and a hot water heater. Other improvements were included; however, in order to fully “build back better,” additional projects need to be undertaken.

In addition, the MF Whitney Hose Company’s



Generator - Courtesy of Honeywell

station in Phoenicia, located in the floodplain, was flooded during Hurricane Irene. The lack of a secure, flood-resistant, and continuous center of operations for the operations not only affected the fire department, but also the Shandaken Ambulance Service, which houses one of its advanced life support (ALS) ambulances at the fire station.

Solution: This project will provide funding for up to three volunteer fire districts for the unique upgrades they need to better serve as first responders and support command posts during and immediately after storms and other catastrophic events, including three generators, and relocate the EMS ambulance garage out of the flood plain. Explore opportunities to improve or expand the facilities of essential service providers including fire companies, EMS, and first responders.

Project Cost Estimate

The estimated project cost is \$500,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those considered socially vulnerable.



Community Safety: The needed upgrades to volunteer fire districts in the Town is vital because it will allow the fire districts to better serve the community as first responders and support command posts during and immediately after storms and other events.

Economic Benefits: This project is based on the effort to strengthen and prioritize local emergency response and recovery capabilities, and aimed at building a more resilient Town in the face of future disasters. Among other improvements, this project will enable EMS and volunteer fire districts to better serve as first responders and support command posts during and immediately after storms and other catastrophic events. This type of investment creates greater confidence for private investors, as it illustrates a commitment to the future of the Town’s residents, local work force, and health and social well-being.

Environmental Benefits: Although no environmental assets were identified as being completely secured, there are environmental benefits associated with this project. The project will result better environmental quality within facilities due to health and safety improvements and better water quality due to upgraded septic.

Public Support: Public feedback gathered at community outreach events and public meetings showed a clear need for health and social services in the Town of Shandaken, including additional support for emergency responders and service providers. Specific public requests were made for projects to ensure fire houses and critical facilities have access to supplies and are supported by generators and to support fire houses as community centers by enhancing abilities.

Project Cost-Benefit Analysis

By increasing emergency sheltering capacity and communications amongst the Town’s most critical first responders, ensuring the provision of other essential services and allowing for continued operation of critical facilities in the event of future fire, natural disasters, and prolonged storm-related emergency events, the project has a clear and significant benefit for all Town residents, officials, and visitors.

- Investment: **\$500,000**
- Jobs created: **4.2**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project allows for increased emergency service capability, reduces risk to resident safety by ensuring continuity of essential services during disasters, and provides increased efficiency of the localized Fire and EMS presence.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 11 months.

Local, State and Federal Government Regulatory Requirements related to the project

- Local Building Department – Construction Permits

Jurisdiction

The Town of Shandaken.



PHOENICIA STREAM RESTORATION AND RECREATION TRAIL – PHASE 2: REALIGNMENT AND REPLACEMENT OF BRIDGE STREET BRIDGE

Project Description

Background: The Hamlet of Phoenicia is located at the confluence of Stony Clove Creek and Esopus Creek in a valley that is about ¼ mile wide. Most of the businesses are along Main Street/Route 214 which crosses Stony Clove Creek and runs parallel to Esopus Creek. The Bridge Street Bridge carries Bridge Street over the Esopus Creek, serving as one of two entrances into the Hamlet of Phoenicia, directly from NYS Route 28. The Bridge Street entrance provides access to the Phoenicia Business District from the east and quick access to Route 212 in the direction of Mt. Tremper and Woodstock.

Connection to the disaster: During Hurricane Irene and Tropical Storm Lee, town was impacted by the floodplain from both creeks with areas along Boardwalk, Bridge Street, Station Road and High Street flooded by the Esopus and areas along Main Street and State Route 214 flooded by Stony Clove Creek. The Bridge Street Bridge was overtopped and severely damaged as a result of the flooding.

Solution: This project would replace the existing Bridge Street Bridge with a longer and higher elevated structure that reduces the number of in-stream support structures reduces debris and sediment buildup, lowers the flood plain above and below the bridge, and allows for more stream capacity during high water events.

Project Cost Estimate

The estimated project cost is \$2,800,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the

entire population of Shandaken, especially those who live in the immediate area of bridge and depend on it for access to their homes, businesses, and other essential facilities (hospitals, doctor offices, etc.).

Flood Protection and Safety: Replacing the bridge helps to provide a reliable and much needed transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes are safe for travel during storms. This project will allow for improved access to portions of this area; thus, allowing improved access between Margaretville and Shandaken. A majority of health care and social services are located within these municipalities, including the Margaretville Hospital.

Economic Benefits: This major bridge replacement project would create a number of construction jobs, potentially creating work for local and regional contractors in addition to materials and equipment sales for local and regional suppliers. In addition to economic growth spurred by construction, improvements aimed at building a more resilient transportation network in Shandaken will also create greater confidence for private investors in



Bridge replacement concept or rendering - Courtesy of CONTECH



the Town. Replacement of the Bridge Street Bridge in Phoenicia shows the Town prioritizing and investing in infrastructure improvements to address lingering flood safety and accessibility issues, and setting the foundation for additional growth and development in the area. Finally, improvements to the bridge and surrounding environment will have a positive economic effect on future recovery and repair spending.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Esopus Creek can move potential flood waters. In addition, improvements to the bridge will help to improve water quality and maintain the natural characteristics around the Esopus Creek by minimizing the impact of transportation infrastructure on the environment and encouraging revegetation around the area.

Public Support: The project makes an infrastructure investment to benefit the Town of Shandaken’s overall transportation network, while increasing public safety and emergency response capabilities. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects thorough the CR process.

Project Cost-Benefit Analysis

The reduction in flood water on a critical thorough fare, repair of damaged infrastructure, leveraging of additional funding, increased protection for adjacent properties, and additional potential for

economic growth in the downtown collectively position the Town to benefit considerably from this project.

- Investment: **\$2,800,000**
- Jobs created: **23.5**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles by providing reliable access during storm events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storm events. In addition, this project has the potential to reduce property damage risk, and increase local economic growth.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 14 months.

Local, State and Federal Government Regulatory Requirements related to the project

- DEC Article 15 permit required
- NYS DOT – Highway Work Permit

Jurisdiction

The Town of Shandaken.



SHANDAKEN FEATURED PROJECTS

LOWER MUDDY BROOK SLOPE REPAIR

Project Description

Background: Numerous roads follow the winding creeks and tributaries around Shandaken. These roads have the potential to suffer from slope failure during storm events. The area of concern is located near 18 Muddy Brook Road adjacent to the intersection of Muddy Brook and Woodland Valley Roads.

Connection to the disaster: Heavy rains and flooding from Hurricane Irene and Tropical Storm Lee caused numerous instances of roadway embankment failure in this and other locations making travel hazardous.

Solution: This project will repair and stabilize the associated slope and embankment. Stabilization includes the installation of riprap, a 15” diameter drainage pipe, concrete anchor, new asphaltic paving, and the removal and replacement of the guardrail.

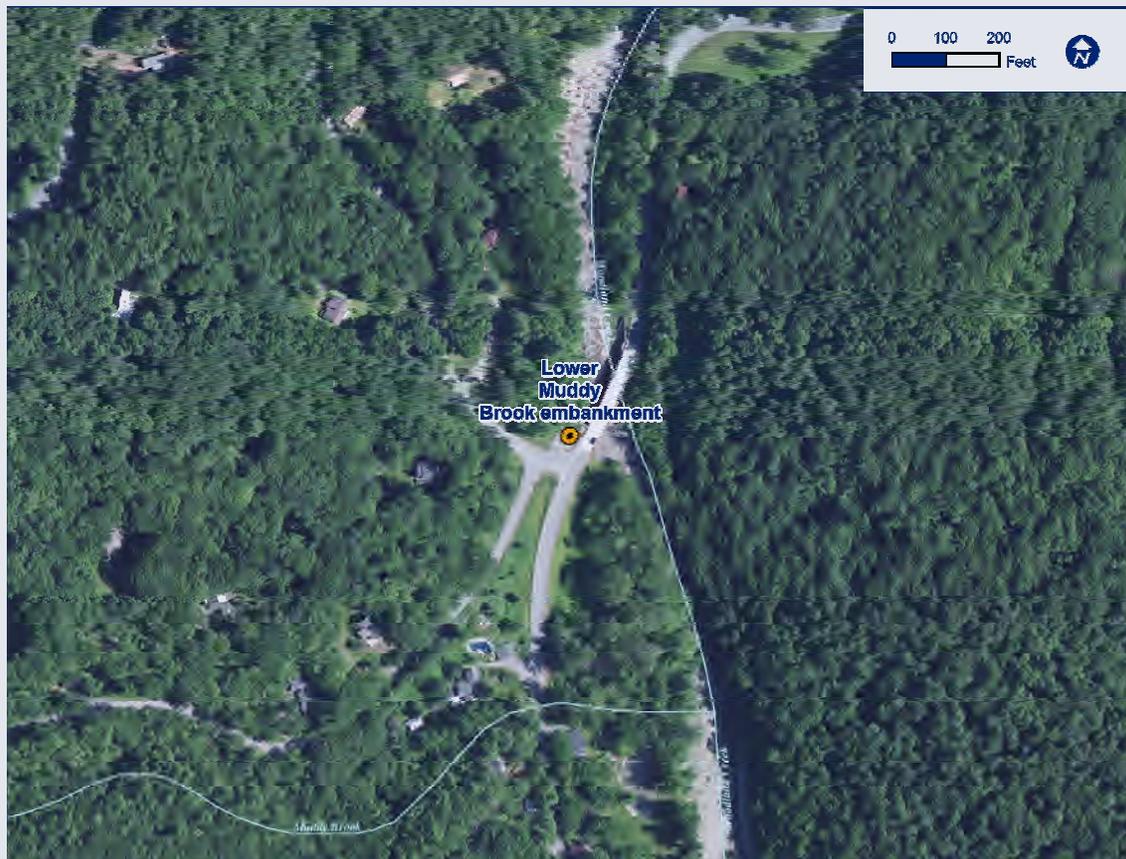
Project Cost Estimate

The estimated project cost is \$202,257.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those who live in the immediate area of Muddy Brook and

FIGURE 27. LOCATION MAP OF LOWER MUDDY BROOK SLOPE REPAIR





Lower Muddy Brook Roads.

Flood Protection and Safety:

This project will provide inundation reduction for Muddy Brook Road which helps to provide a reliable and much needed transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes

are safe for travel during storms. Repairing and stabilizing the Lower Muddy Brook slope and embankment will provide necessary improvements to address road embankment failure. Stabilization will improve safety for all users. By providing increased travel safety for and access to Muddy Brook Road, this project will help to provide necessary access to healthcare and critical facilities throughout the Town and region.

Improvements aimed at building a more resilient transportation network will create greater confidence for private investors in Shandaken. As the Town continues to prioritize and implement infrastructure projects that address lingering flood safety and accessibility issues, individuals and private businesses will more likely to invest in the Town, encouraged by the Town’s capital investments and clearly demonstrated commitment to a strong future. Finally, the slope repair project will have a positive economic effect on future recovery and repair spending for the Town of Shandaken.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Muddy Brook Creek can move potential flood



Slope repair product photo - Courtesy of Fairfax County

waters. In addition, improvements to the bridge will help to improve water quality and maintain the natural characteristics around the Muddy Brook Creek by minimizing the impact of transportation infrastructure on the environment.

Benefits: The project makes an infrastructure investment to benefit the

Town of Shandaken’s transportation network, improving environmental function and capabilities of a natural stream bed, while increasing public safety and emergency response capabilities. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects thorough the CR process.

Project Cost-Benefit Analysis

Based on available information and preliminary designs, the proposed project would have a net benefit on community safety, environment, and resiliency.

- Investment: **\$202,257**
- Jobs created: **1.7**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles by providing reliable access during storm events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and



evacuation, when necessary, during storm events.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is

expected to happen over the course of 14 months.

Local, State and Federal Government Regulatory Requirements related to the project

- DEC Article 15 permit required

Jurisdiction

The Town of Shandaken.



PANTHERKILL ROAD SLOPE REPAIR

Project Description

Background: Numerous roads follow the winding creeks and tributaries around Shandaken. These roads have the potential to suffer from slope failure during storm events. This area concerns Pantherkill Road.

Connection to the disaster: Heavy rains and flooding from Hurricane Irene and Tropical Storm Lee caused roadway embankment failure along the south side of Pantherkill Road. Specifically, the slope descending from the south side of Pantherkill road failed during the flooding from Tropical Storm Irene, and a portion of the eastbound lane of Pantherkill Road slipped downward toward Pantherkill Creek. Further toward the Creek, the failure area widens to about 100 feet along the Creek bank.

Solution: This project will repair and stabilize the Pantherkill Road slope and embankment for a length of approximately 60 feet. The site is a section of roadway approximately 0.9 miles south and west of Woodland Valley Road.

Project Cost Estimate

The estimated project cost is \$200,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those who live in the immediate area of Pantherkill Road.

Flood Protection and Safety: Inundation reduction for Pantherkill Road helps to provide a reliable and much needed transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is vital that



Pantherkill Road Slope Repair – Courtesy of Tetra Tech, 2014

secondary and local routes are safe for travel during storms. Repairing and stabilizing the Pantherkill Road slope and embankment will provide necessary improvements to address road embankment failure. Stabilization will improve safety for all users. By providing increased travel safety for and access to Pantherkill Road, this project will help to provide necessary access to healthcare and critical facilities throughout the Town and region.

Economic Benefits: Improvements aimed at building a more resilient transportation network will create greater confidence for private investors in Shandaken. As the Town continues to prioritize and implement infrastructure projects that address flood safety and accessibility issues, individuals and private businesses will more likely to invest in the Town, encouraged by the Town’s clearly demonstrated commitment to a strong future. Finally, the slope repair project will have a positive economic effect on future recovery and repair spending for the Town of Shandaken.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Pantherkill Creek can move potential flood waters. In addition, improvements to the bridge will help to improve water quality and maintain the natural



characteristics around the Pantherkill Creek by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project makes an infrastructure investment to benefit the Town of Shandaken’s transportation network, improving environmental function and capabilities of a natural stream bed, while increasing public safety and emergency response capabilities. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects through the CR process.

Project Cost-Benefit Analysis

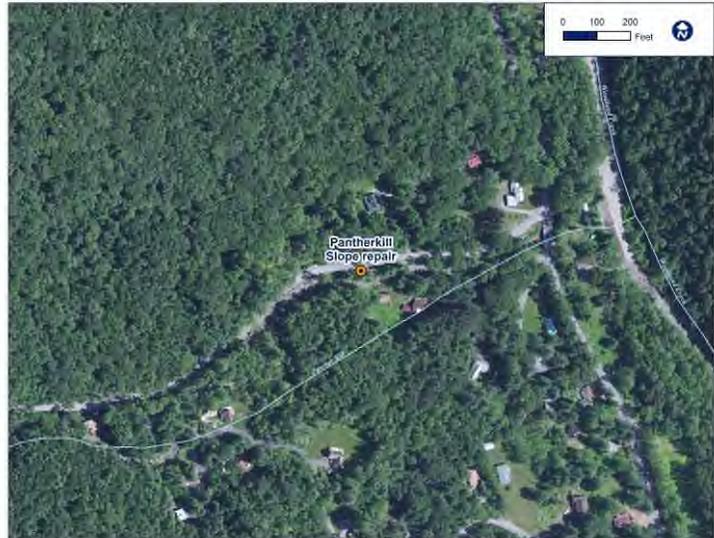
Based on available information and preliminary designs, the proposed project would have a net benefit on community safety, environment, and resiliency.

- Investment: **\$200,000**
- Jobs created: **1.7**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles by providing reliable access during storm events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storm events.

FIGURE 28. LOCATION MAP OF PANTHERKILL ROAD SLOPE REPAIR



Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 14 months.

Local, State and Federal Government Regulatory Requirements related to the project

- DEC Article 15 permit required

Jurisdiction

The Town of Shandaken.



SILVER HOLLOW SLOPE STABILIZATION

Project Description

Background: Silver Hollow Road in Chichester has a history of washout and closures due to flood conditions along the Stony Clove Creek.

Connection to the disaster: Heavy rains and flooding from Hurricane Irene and Tropical Storm Lee caused roadway embankment failure near 19 Silver Hollow Road. This project will repair and stabilize the Silver Hollow slope at this location.

Solution: The Silver Hollow Slope Stabilization project is proposed to reduce transportation impacts caused by embankment failure. Improvements will ensure access to a residential population in the Hamlet of Chichester – a population that has experienced frequent access

and service interruptions during past flood events when local flooding and roadway failure cut off their main point of ingress and egress

Project Cost Estimate

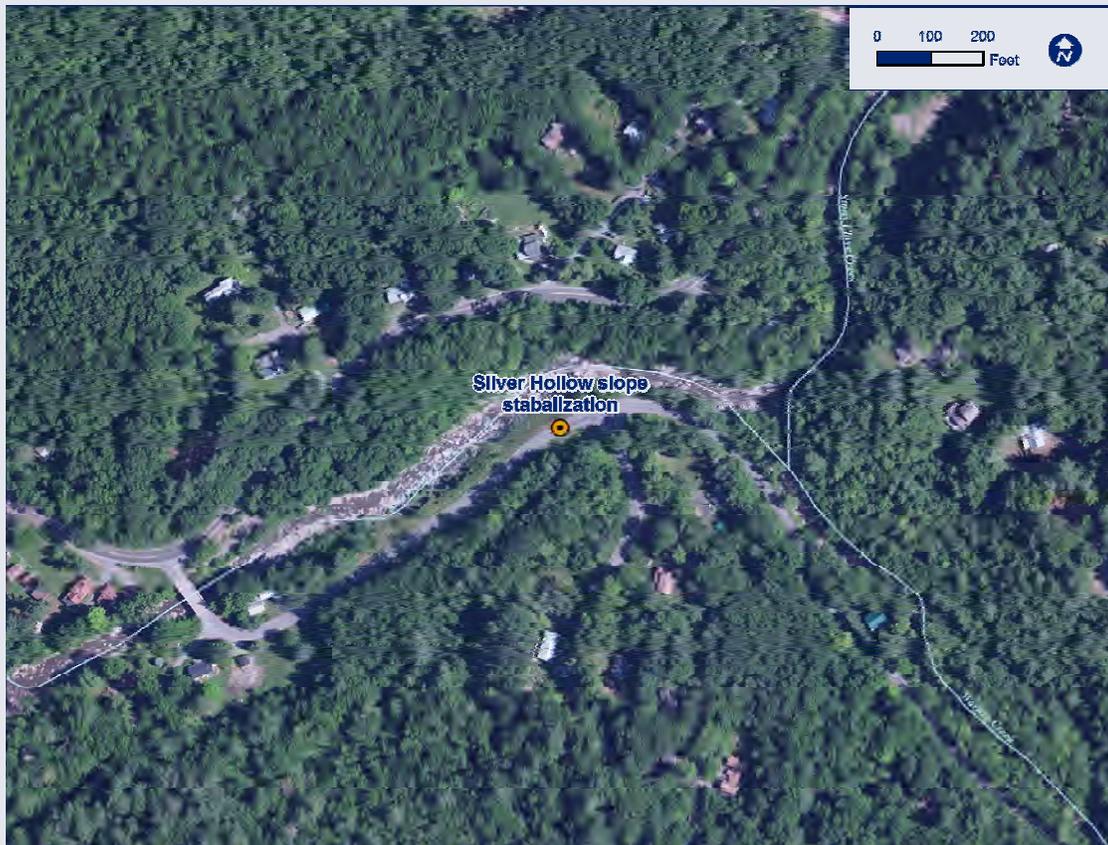
The estimated project cost is \$200,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those who live in the immediate area of Silver Hollow Road and Stony Clove Creek.

Flood Protection and Safety: Inundation reduction

FIGURE 29. LOCATION MAP OF SILVER HOLLOW SLOPE STABILIZATION





for Silver Hollow Road helps to provide a reliable and much needed transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes are safe for travel during storms. Repairing and stabilizing the Silver Hollow Road slope and embankment will provide necessary improvements to address road embankment failure. Stabilization will improve safety for all users. By providing increased travel safety for and access to Silver Hollow Road, this project will help to provide necessary access to healthcare and critical facilities throughout the Town and region.

Economic Benefits: Improvements aimed at building a more resilient transportation network will create greater confidence for private investors in Shandaken. As the Town continues to prioritize and implement infrastructure projects that address lingering flood safety and accessibility issues, individuals and private businesses will more likely to invest in the Town, encouraged by the Town’s capital investments and clearly demonstrated commitment to a strong future. Finally, the slope repair project will have a positive economic effect on future recovery and repair spending for the Town of Shandaken.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Stoney Clove Creek can move potential flood waters. In addition, improvements to the bridge will help to improve water quality and maintain the natural characteristics around the Stoney Clove Creek by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project makes an infrastructure investment to benefit the Town of Shandaken’s transportation network, improving environmental function and capabilities of a natural stream bed,

while increasing public safety and emergency response capabilities. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects through the CR process.

Project Cost-Benefit Analysis

Based on available information and preliminary designs, the proposed project would have a net benefit on community safety, environment, and resiliency.

- Investment: **\$200,000**
- Jobs created: **1.7**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles by providing reliable access during storm events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storm events.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 14 months.

Local, State and Federal Government Regulatory Requirements related to the project

- DEC Article 15 permit required

Jurisdiction

The Town of Shandaken.



UPPER MUDDY BROOK SLOPE REPAIR

Project Description

Background: Numerous roads follow the winding creeks and tributaries around Shandaken. These roads have the potential to suffer from slope failure during storm events. This area concerns the area around the area of 131 Muddy Brook Road.

Connection to the disaster: Heavy rains and flooding from Hurricane Irene and Tropical Storm Lee caused numerous instances of roadway embankment failure in this and other locations, making travel hazardous.

Solution: This project will repair and stabilize the associated slope and embankment. Stabilization will include excavation for and installation of steel sheet piling, installation of riprap, a concrete anchor, new asphaltic paving, and the removal and replacement

of the guardrail.

Project Cost Estimate

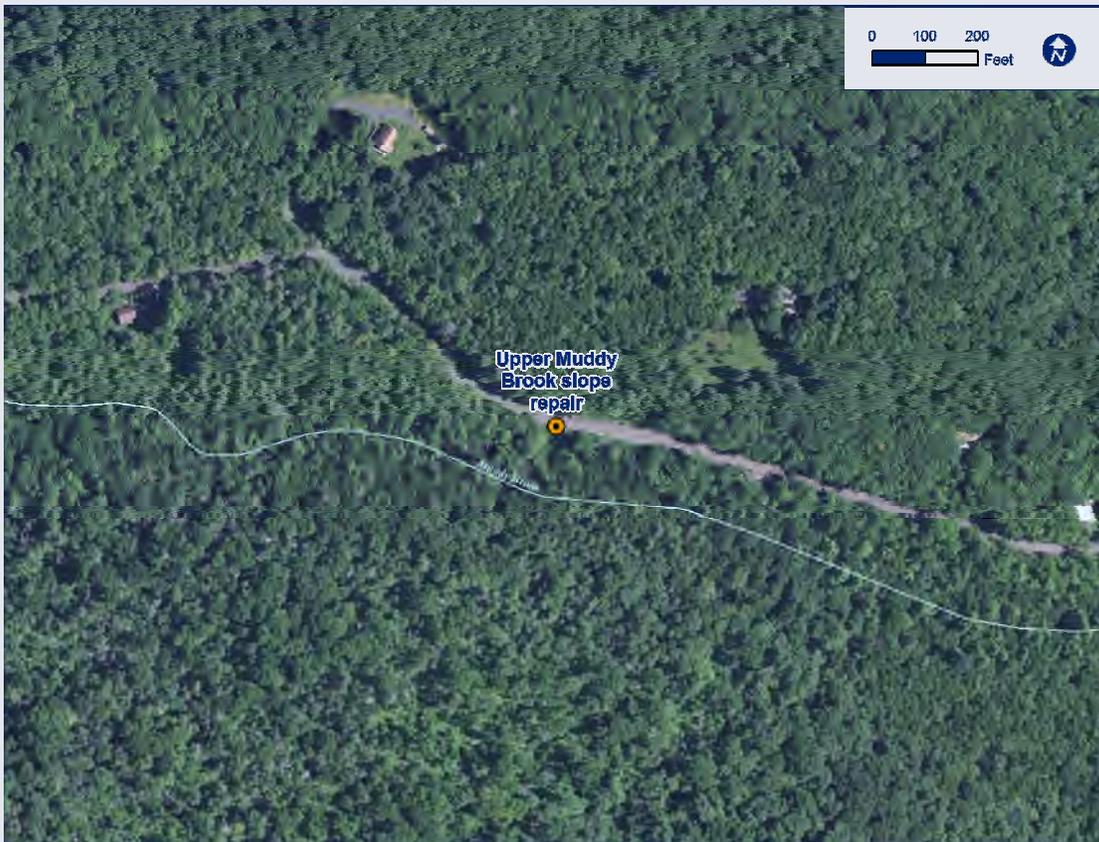
The estimated project cost is \$150,013.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those who live in the immediate area of Muddy Brook and Lower Muddy Brook Roads.

Flood Protection and Safety: Inundation reduction for Upper Muddy Brook Road helps to provide a reliable and much needed transportation redundancy during storm events. With limited

FIGURE 30. LOCATION MAP OF UPPER MUDDY BROOK SLOPE REPAIR





existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes are safe for travel during storms. Repairing and stabilizing the Upper Muddy Brook slope and embankment will provide necessary improvements to address road embankment failure. Stabilization will improve safety for all users. By providing increased travel safety for and access to Upper Muddy Brook Road, this project will help to provide necessary access to healthcare and critical facilities throughout the Town and region.

Improvements aimed at building a more resilient transportation network will create greater confidence for private investors in Shandaken. As the Town continues to prioritize and implement infrastructure projects that address lingering flood safety and accessibility issues, individuals and private businesses will more likely to invest in the Town, encouraged by the Town’s capital investments and clearly demonstrated commitment to a strong future. Finally, the slope repair project will have a positive economic effect on future recovery and repair spending for the Town of Shandaken.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Muddy Brook Creek can move potential flood waters. In addition, improvements to the bridge will help to improve water quality and maintain the natural characteristics around the Muddy Brook Creek by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project makes an infrastructure investment to benefit the Town of Shandaken’s transportation network, improving environmental function and capabilities of a natural stream bed, while increasing public safety and emergency response capabilities. Shandaken residents who

participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects through the CR process.

Project Cost-Benefit Analysis

Based on available information and preliminary designs, the proposed project would have a net benefit on community safety, environment, and resiliency.

- Investment: **\$150,013**
- Jobs created: **1.3**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles by providing reliable access during storm events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storm events.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 14 months.

Local, State and Federal Government Regulatory Requirements related to the project

- DEC Article 15 permit required

Jurisdiction

The Town of Shandaken.



PHOENICIA WATER SYSTEM UPGRADE

Project Description

Background: The Hamlet of Phoenicia serves as an economic hub for the Town of Shandaken. With its picturesque Catskills setting and strong community identity, Phoenicia serves both visitors and residents with recreational, business, and community services throughout the year.

Connection to the disaster: During the 2011 storms Hurricane Irene and Tropical Storm Lee, numerous residents in the Hamlet of Phoenicia went without water due to an insufficient capacity of the water system, especially during higher water events.

Solution: This project would upgrade the Phoenicia Water System to increase capacity and make it more flood-proof and resilient during high water events.

Project Cost Estimate

The estimated project cost is \$500,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those who are dependent on the water system.

Flood Protection Capability: Upgrading the Phoenicia water system will allow it to be more floodproof and resilient to storm events. The project will increase the system’s capacity, increase its resiliency to weather events, and reduce flood damage costs.

Continuity of Services: During flooding events, residents may be impacted by the loss of water service. For those residents who are considered socially vulnerable to such events, would be greatly impacted. The project will reduce the number of

residents impacted by loss of service.

Economic Benefits: This project is based on the effort to strengthen and prioritize local utilities, and is aimed at building a more resilient Town in the face of future disasters. By reducing the number of residences affected by loss of service, the project provides economic development benefit. This type of investment in critical public utilities creates greater confidence for private investors, as it illustrates a commitment to the future of the Town’s residents, local work force, and health and social well-being, and a reasonable anticipation of impending population growth and new development.

Environmental Benefits: This project has the potential to provide better environmental quality for Phoenicia’s buildings, facilities, and residences due to higher water quality.

Public Support: The project makes an important utility infrastructure investment to benefit the Town of Shandaken’s current resiliency to storms and future opportunities for growth in the population center of Phoenicia while increasing public safety. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects through the CR process.

Project Cost-Benefit Analysis

By increasing capacity of the Town’s water system and making the system more resistant to future storm damage, both the Hamlet and the Town will benefit considerably from this project.

- Investment: **\$500,000**
- Jobs created: **4.2**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a continuity of an essential service



during disasters and a reduction of risk of additional damage and future repair/maintenance to municipal systems and facilities.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and

review of responses and completing construction is expected to happen over the course of 13 months.

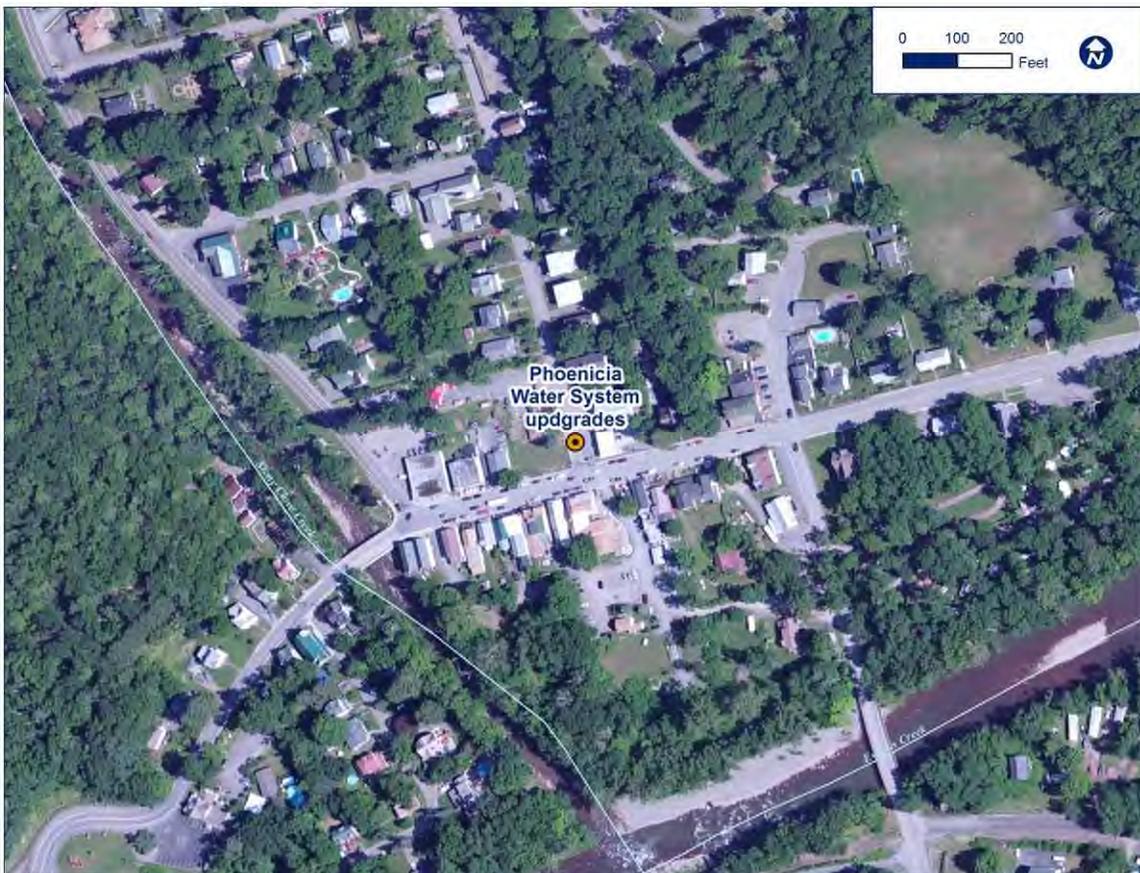
Local, State and Federal Government Regulatory Requirements related to the project

- DEC Article 15 permit required

Jurisdiction

The Town of Shandaken.

FIGURE 31. LOCATION MAP OF PHOENICIA WATER SYSTEM





EMERGENCY POWER GENERATOR HOOKUP IMPROVEMENTS

Project Description

Background: The ability for the community to immediately respond to and recover from emergencies and disasters will be greatly enhanced by minimizing disruption of access to fuel, communications, refrigeration, and other key elements of contemporary society that power outages deny citizens and responders during emergencies. This project will ensure that power is able to be efficiently restored as generators are brought to the community from external resources in the immediate aftermath of disasters.

Connection to the disaster: As a result of power outages during recovery and response efforts from Tropical Storms Irene and Lee in 2011, a lack of back-up power sources throughout the Town reduced the capacity of emergency responders to maintain continuous operations during and after the storm events.

Solution: This project would outfit lodging establishments, restaurants, and gas stations (and perhaps other appropriate buildings) with quick connect capability to hook up generators after floods to ensure that each hamlet has locations with electricity for people to remain safe and access accommodations, showers, food and water.

Project Cost Estimate

The estimated project cost is \$50,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the

entire population of Shandaken, especially those in need of food and shelter.

Continuity of Services: Installing a back-up power generator to key community facilities (lodging establishments and gas stations) ensures the provision of essential services to the community during a severe weather event or disaster. Power outages can prevent businesses from operating properly, making it difficult for town officials and residents to complete their day-to-day tasks. Being able to provide electricity for people to remain safe and access accommodations, showers, food, and water are all benefits from this project.

Economic Benefits: This project is based on the effort to strengthen and prioritize local utilities, and is aimed at building a more resilient Town in the face of future disasters. This type of investment creates greater confidence for private investors, as it illustrates a commitment to the future of the Town’s residents, local work force, and health and social well-being. By creating more reliable emergency power capabilities amongst

the Town’s businesses and other commercial establishments, this project ensures that the Town will become more resilient against future storms, and by investing in critical emergency operations and infrastructure, will reduce future losses to life and property.

Environmental Benefits: This project supports the creation of a more secure community power network which could lead to better response time to emergencies affecting environmental assets or infrastructure that may impact environmentally sensitive areas.

Public Support: Public feedback gathered at NYRCR community outreach events and public meetings showed a clear need for health and social services in the Town of Shandaken, including additional



Emergency Power Generator - Courtesy of Generac



support for emergency responders and service providers. Specific public requests were made for projects to ensure fire houses and critical facilities have access to supplies and are supported by generators and to support fire houses as community centers by enhancing abilities.

Project Cost-Benefit Analysis

The increased protection for Town residents and security for critical Town functions during future disaster events ensured by the installation of backup power generators would collectively position the Town to benefit considerably from this project.

- Investment: **\$50,000**
- Jobs created: **0.42**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this

project include a continuity of essential service for visitors and residents during disasters. This project also reduces the risk of additional damage or increased maintenance to local assets and businesses as a result of prolonged power outage.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 5 months.

Local, State and Federal Government Regulatory Requirements related to the project

- DEC Article 15 permit required

Jurisdiction

The Town of Shandaken.



MT. TREMPER CAR BRIDGE – PHASE 1

Project Description

Background: The Mt. Tremper Bridge (also known as the Mount Pleasant Bridge) is located in the Shandaken hamlet of Mt. Tremper, crossing over Esopus Creek.

Connection to the disaster: As a result of Hurricane Irene and Tropical Storm Lee in 2011, the Mt. Tremper Car Bridge experienced roadway flooding and significant structural damage. Debris build-up and structural damage to the bridge abutment forced authorities to restrict access to the bridge, and ultimately the bridge was closed down completely. As a result of the storm damage, the bridge has remained closed to vehicular and pedestrian traffic, and remains a danger to life and safety in the hamlet of Mt. Tremper. Perhaps most

importantly, the threat of the bridge washing out during future storm event, and its debris potentially being carried further downstream impacting critical Rt. 28 Bridge, is cause for immediate action on this project.

Solution: The proposed Phase 1 action is to replace the bridge with a pedestrian crossing given that the access by car is possible by State Route 28 Bridge. The proposed project is divided in two phases: 1) bridge removal and 2) redesign and construction of the pedestrian crossing. The bridge is currently closed to all forms of access due to instability.

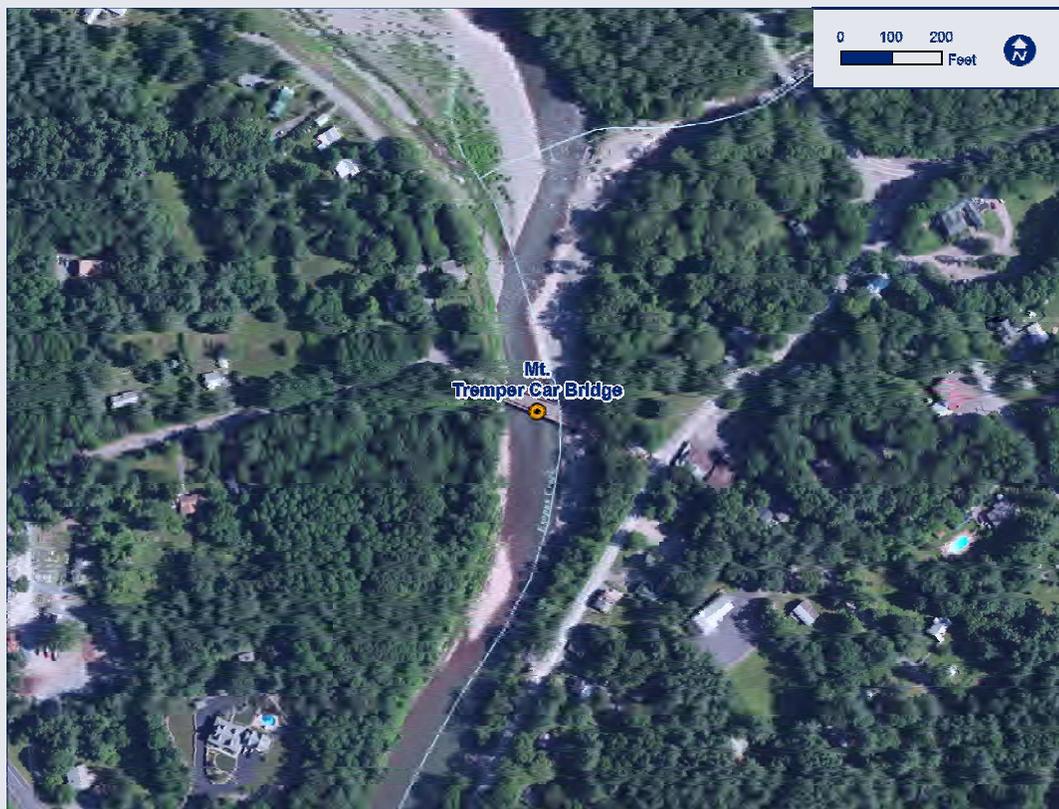
Project Cost Estimate

The estimated project cost is \$750,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the

FIGURE 32. LOCATION MAP OF MT. TEMPER CAR BRIDGE – PHASE 1





community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those who live in the immediate area of bridge.

Flood Protection and Safety: The replacement of a bridge with a pedestrian crossing will restore and enhance access to this area of Route 212. This project will meet an urgent need of the community and provide increased travel safety to this area. It will also help in providing stable and necessary access to healthcare and critical facilities throughout the Town and region.

This project would create a number of construction jobs potentially creating work for local and regional contractors in addition to materials and equipment sales for local and regional suppliers. In addition to economic growth spurred by construction, improvements aimed at removing and replacing damaged infrastructure in Shandaken will also create greater confidence for private investors in the Town.

Benefits: Replacement of the Mt. Tremper Bridge demonstrates the Town’s commitment to prioritizing and investing in infrastructure improvements, and setting the foundation for additional growth and development in the area. The proposed bridge design reduces local flood elevations and maintains a thoroughfare from the Hamlet during higher water events. These investments illustrate a commitment to the future, and will encourage individuals and businesses to continue to invest in the area.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Esopus Creek can move potential flood waters. In addition, improvements to the bridge will help to improve water quality, revegetate the surrounding

floodplain, and maintain the natural characteristics around the Esopus Creek by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project makes a significant investment to benefit the Town of Shandaken’s overall public space and pedestrian network, while increasing public safety and removing damaged infrastructure. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects through the CR process.



Rendering of Pedestrian Bridge - Courtesy of CONTECH

Project Cost-Benefit Analysis

The elimination of a major obstruction in the floodway, removal of damaged infrastructure, increased protection for adjacent properties, reuse of a damaged bridge as a pedestrian amenity, and additional potential for economic growth in Mt. Tremper collectively position the Town to benefit considerably from this project.

- Investment: **\$750,000**
- Flood level reduction: **Maximum 0.90’ reduction with 500-yr design flow.**
- Jobs created: **6.3**



Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include increased safety and reduced risk of residential injury through removal of an existing safety hazard as well as increased stream function and reduced flood elevation risk for properties.

Implementation Timeframe

General project implementation, including preparation of engineering design documents,

submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 26 months.

Local, State and Federal Government Regulatory Requirements related to the project

- DEC Article 15 permit required

Jurisdiction

The Town of Shandaken.



MT. TREMPER CAR BRIDGE – PHASE 2

Project Description

Background: The Mt. Tremper Bridge (also known as the Mount Pleasant Bridge) is located in the Shandaken hamlet of Mt. Tremper, crossing over Esopus Creek.

Connection to the disaster: As a result of Hurricane Irene and Tropical Storm Lee in 2011, the Mt. Tremper Car Bridge experienced roadway flooding and significant structural damage. Debris build-up and structural damage to the bridge abutment forced authorities to restrict access to the bridge, and ultimately the bridge was closed down completely. As a result of the storm damage, the bridge has remained closed to vehicular and pedestrian traffic, and remains a danger to life and

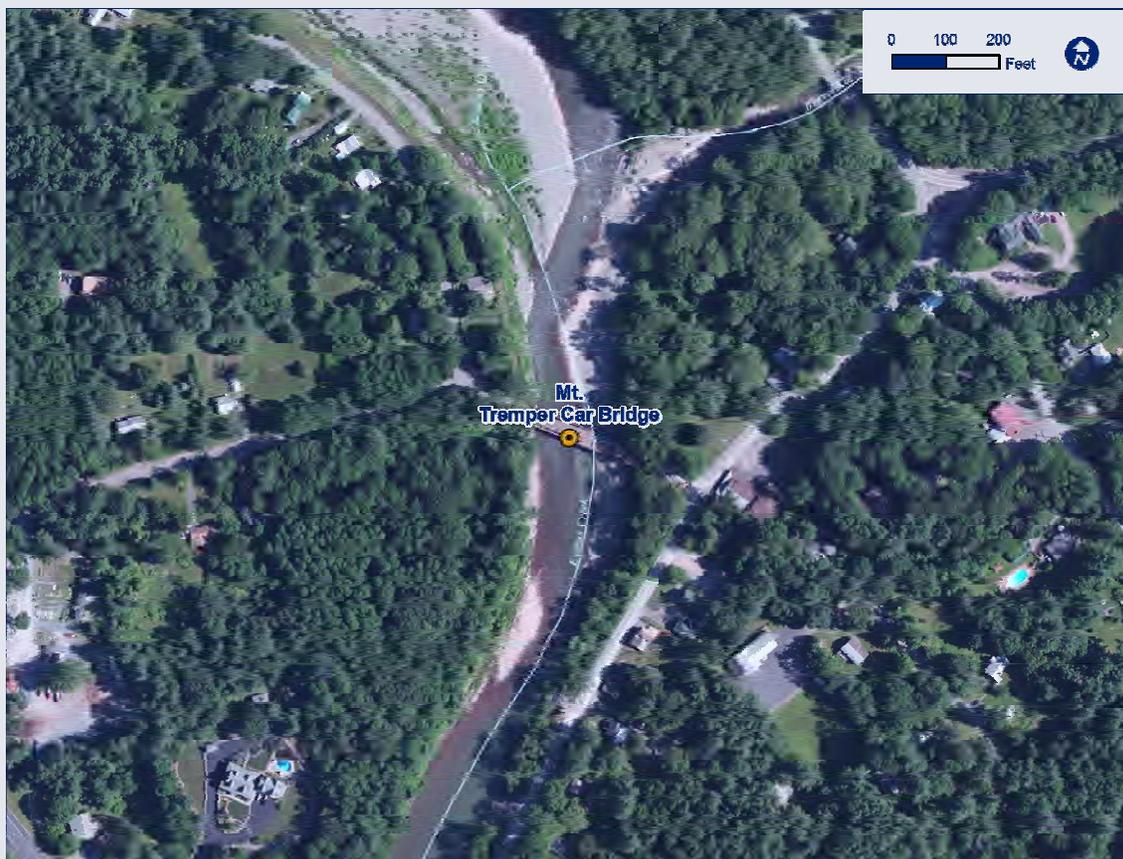
safety in the hamlet of Mt. Tremper. Perhaps most importantly, the threat of the bridge washing out during future storm event, and its debris potentially being carried further downstream impacting critical Rt. 28 Bridge, is cause for immediate action on this project.

Solution: The proposed Phase 2 action is to replace the bridge with a pedestrian crossing giving that the access by car is possible by State Route 28 Bridge. This is part of a larger project, Phase 1 of which will complete the demolition of the existing structure, which is severely damaged and closed to all traffic.

Project Cost Estimate

The estimated project cost is \$2,500,000.

FIGURE 33. LOCATION MAP OF MT. TEMPER CAR BRIDGE – PHASE 2





Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those who live in the immediate area of bridge.

Flood Protection and Safety: Inundation reduction for Route 212 in the area of the Mt. Tremper Bridge helps to provide a reliable and much needed transportation redundancy during storm events. Currently, the Mt. Tremper bridge is severely deteriorated and not in use. The bridge retains trees and other debris and may act as obstructions to high flows, causing flooding of the roadway. The replacement of a bridge with a pedestrian crossing will restore and enhance access to this area of Route 212. This project will meet an urgent need of the community and provide increased travel safety to this area. It will also help in providing necessary access to healthcare and critical facilities throughout the Town and region.

This project would create a number of construction jobs potentially creating work for local and regional contractors in addition to materials and equipment sales for local and regional suppliers. In addition to economic growth spurred by construction, improvements aimed at removing and replacing damaged infrastructure in Shandaken will also create greater confidence for private investors in the Town.

Benefits: Replacement of the Mt. Tremper Bridge demonstrates the Town’s commitment to prioritizing and investing in infrastructure improvements, and setting the foundation for additional growth and development in the area. The proposed bridge design reduces local flood elevations and maintains a thoroughfare from the Hamlet during higher water events. These

investments illustrate a commitment to the future, and will encourage individuals and businesses to continue to invest in the area.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Esopus Creek can move potential flood waters. In addition, improvements to the bridge will help to improve water quality, revegetate the surrounding floodplain, and maintain the natural characteristics around the Esopus Creek by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project makes an infrastructure investment to benefit the Town of Shandaken’s overall transportation network, while increasing public safety and removing repaired infrastructure. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects through the NYRCR process.

Project Cost-Benefit Analysis

The reduction in flood water on a critical thoroughfare, repair of damaged infrastructure, leveraging of additional funding, increased protection for adjacent properties, and additional potential for economic growth in the downtown collectively position the Town to benefit considerably from this project.

- Investment: **\$2,500,000**
- Flood level reduction: **Maximum 0.58’ reduction with 500-yr design flow.**
- Jobs created: **21**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include increased safety and reduced risk of residential injury through removal of an existing



safety hazard as well as increased stream function and reduced flood elevation risk for properties.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is

expected to happen over the course of 26 months.

Local, State and Federal Government Regulatory Requirements related to the project

- DEC Article 15 permit required

Jurisdiction

The Town of Shandaken.



PHOENICIA STREAM RESTORATION AND RECREATION TRAIL – PHASE 1: LAND ACQUISITION, PROPERTY RELOCATION, AND PARK DEVELOPMENT

Project Description

Background: The Hamlet of Phoenicia is located at the confluence of Stony Clove Creek and Esopus Creek in a valley that is about ¼ mile wide. Most of the businesses are along Main Street/Route 214 which crosses Stony Clove Creek and runs parallel to Esopus Creek.

Connection to the disaster: As a result of Hurricane Irene and Tropical Storm Lee in 2011, many town facilities and infrastructure incurred flooding damage which had major economic impact throughout the Town of Shandaken and the Hamlet of Phoenicia. This project would include the acquisition of properties adjacent to the Bridge St. Bridge and creation of a park with associated amenities and flood protection measures.

Solution: This project is part of a greater stream restoration project that includes bridge replacement, elements of a recreational trail network incorporating connectivity with Historic and cultural elements within the Hamlet as well as the acquisition and removal of flood prone structures, streambank restoration, and providing flood mitigation and reduction in flood elevation within the Hamlet.

Project Cost Estimate

The estimated project cost is \$1,000,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those who live in the immediate area of the project and



Courtesy of NYRCR Planning Committee

have been impacted by flooding and those that depend on this area for access to their homes, businesses, and other essential facilities (hospitals, doctor offices, etc.).

Flood Protection and Safety: Inundation reduction for Bridge Street and the area of the Phoenicia recreation trail will help provide a reliable and much needed transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes are safe for travel during storms. The stream restoration project will include a network of recreational trails connecting them with historic and cultural elements within the hamlet and provide flood mitigation and reduction in flood elevation within the hamlet.

Economic Benefits: Adaptive reuse of the acquired properties in the area of Bridge Street Bridge demonstrates the Town’s commitment to prioritizing and investing in public space and pedestrian improvements, improving blight conditions, and setting the foundation for additional growth and development in the area. The proposed bridge and park design reduces local flood elevations which will encourage individuals and businesses to continue to invest in the area. Additionally, improvements to the bridge and



surrounding environment will have a positive economic effect on future recovery and repair spending.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Esopus Creek can move potential flood waters. In addition, improvements to the bridge will help to improve water quality and maintain the natural characteristics around the Esopus Creek by minimizing the impact of transportation infrastructure on the environment and encouraging revegetation around the area.

Public Support: The project makes an infrastructure investment to benefit the Town of Shandaken’s overall transportation network, while increasing public safety and removing repaired infrastructure. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects thorough the CR process.

Project Cost-Benefit Analysis

The repair of damaged infrastructure and housing stock, increased protection for adjacent properties, and additional potential for economic growth in the downtown collectively position the Town to benefit considerably from this project.

- Investment: \$1,000,000
- Jobs created: 8.4

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for



Concept Plan - Courtesy of Tetra Tech

vehicles during storm events and a reduction of risks associated with stranding or isolating residents and visitors during storm events. In addition, this project will encourage economic growth by utilizing the area’s natural resources to attract visitors, thus supporting existing and new businesses.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 26 months.

Local, State and Federal Government Regulatory Requirements related to the project

- Local Building Department – Construction Permit

Jurisdiction

The Town of Shandaken.



PHOENICIA STREAM RESTORATION AND RECREATION TRAIL – PHASE 3: STREAMBANK RESTORATION

Project Description:

Background: The Hamlet of Phoenicia is located at the confluence of Stony Clove Creek and Esopus Creek in a valley that is about ¼ mile wide. Most of the businesses are along Main Street/Route 214 which crosses Stony Clove Creek and runs parallel to Esopus Creek.

Connection to the disaster: As a result of Hurricane Irene and Tropical Storm Lee in 2011, many town facilities and infrastructure incurred flooding damage which had major economic impact throughout the Town of Shandaken and the hamlet of Phoenicia. This project would include stream restoration and gravel harvesting near the Bridge St.

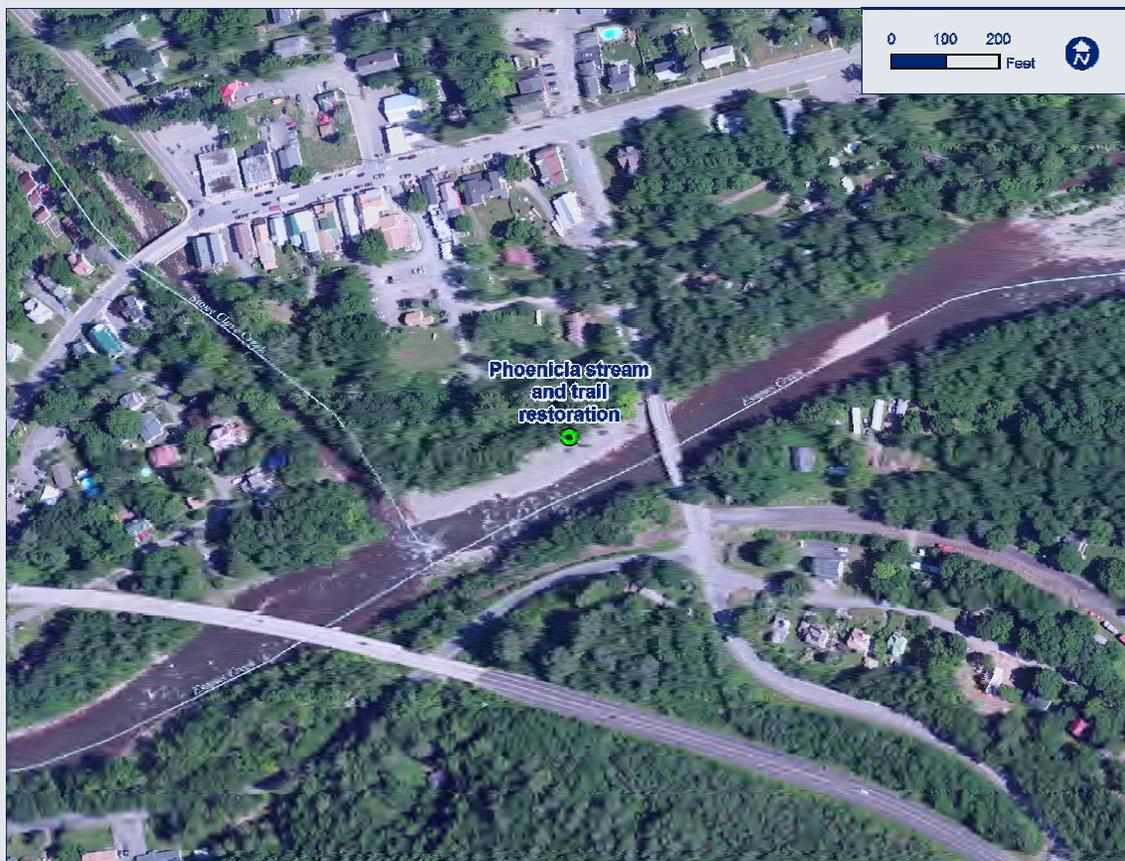
Bridge to remove impediments and debris accumulation, increase flood protection for neighboring properties, improve stream function and conveyance and increase safety for residents and visitors.

Solution: This project is part of a greater stream restoration project that includes bridge replacement, elements of a recreational trail network incorporating connectivity with Historic and cultural elements within the Hamlet as well as the acquisition and removal of flood prone structures, streambank restoration, and providing flood mitigation and reduction in flood elevation within the Hamlet.

Project Cost Estimate

The estimated project cost is \$200,000.

FIGURE 34. LOCATION MAP OF PHOENICIA STREAM RESTORATION AND RECREATION TRAIL





Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those who live in the immediate area of the Phoenicia Stream and have been impacted by flooding and those that depend on this area for access to their homes, businesses, and other essential facilities (hospitals, doctor offices, etc.).

Flood Protection and Safety: Inundation reduction for Bridge Street and the area of the Phoenicia recreation trail will help provide a reliable and much needed transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes are safe for travel during storms.

Economic Benefits: This injected funding into the regional construction supply line encourages

economic growth through additional induced spending, which occurs as employees and businesses participating in the construction work in turn spend money on other local goods and services. The potential induced benefit includes short term increase in value added tax revenues. Additionally, as a result of this project, this section of historically damaged streambank in downtown Phoenicia will become more resilient against future storms, which in turn will help to reduce any future maintenance or repair costs associated with infrastructure failure and transportation interruptions in this area.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Esopus Creek can move potential flood waters. In addition, improvements to the bridge will help to improve water quality and maintain the natural characteristics around the Esopus Creek by minimizing the impact of transportation infrastructure on the environment and restoring the natural flow of the creek.

Public Support: The project makes an infrastructure investment to benefit the Town of Shandaken’s overall transportation network, while increasing public safety and removing repaired infrastructure. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects through the CR process.



SAMPLE Rendering of Pedestrian Bridge - Courtesy of CONTECH



Project Cost-Benefit Analysis

Based on available information and preliminary designs, the proposed project would have a net benefit on community safety, environment, and economic development.

- Investment: **\$200,000**
- Jobs created: **1.7**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storm events and a reduction of risks associated with stranding or isolating residents and visitors during storm events. In addition, this project will encourage economic growth by utilizing the area's natural resources to attract visitors, thus supporting existing and new businesses.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 26 months.

Local, State and Federal Government Regulatory Requirements related to the project

- Local Building Department – Construction Permit

Jurisdiction

The Town of Shandaken.



PHOENICIA STREAM RESTORATION AND RECREATION TRAIL – PHASE 4: CONSTRUCTION OF AMPHITHEATER AND TRAIL CONNECTION(S)

Project Description:

Background: The Hamlet of Phoenicia is located at the confluence of Stony Clove Creek and Esopus Creek in a valley that is about ¼ mile wide. Most of the businesses are along Main Street/Route 214 which crosses Stony Clove Creek and runs parallel to Esopus Creek.

Connection to the disaster: As a result of Tropical Storms Irene and Lee in 2011, many town facilities and infrastructure incurred flooding damage which had major economic impact throughout the Town of Shandaken and the hamlet of Phoenicia.

Solution: This project would include the construction of an Amphitheater, Trail and Trail Network Connections near the Bridge St. Bridge. This project is part of a greater stream restoration project that includes bridge replacement, elements of a recreational trail network incorporating connectivity with Historic and cultural elements within the Hamlet as well as the acquisition and removal of flood prone structures, streambank restoration, and providing flood mitigation and reduction in flood elevation within the Hamlet.

Project Cost Estimate:

The estimated project cost is \$1,500,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Shandaken residents. The project will benefit the entire population of Shandaken, especially those who live in the immediate area of the Phoenicia Stream and have been impacted by flooding and those that depend on this area for access to their homes, businesses, and other essential facilities



Courtesy of Tetra Tech

(hospitals, doctor offices, etc.).

Flood Protection and Safety: Inundation reduction for Bridge Street and the area of the Phoenicia recreation trail will help provide a reliable and much needed transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes are safe for travel during storms. The stream restoration project will include a network of recreational trails connecting them with historic and cultural elements within the hamlet and provide flood mitigation and reduction in flood elevation within the hamlet.

Economic Benefits: Adaptive reuse of the acquired properties in the area of Bridge Street Bridge demonstrates the Town’s commitment to prioritizing and investing in public space and pedestrian improvements, improving blight conditions, and setting the foundation for additional growth and development in the area. The proposed park and amphitheater design reduces will bring more tourist dollars into the area, and encourage individuals and businesses to continue to invest in Phoenicia.

Environmental Benefits: This project has the potential to enhance existing open space and recreation by providing a venue in which visitors



and residents may enjoy the area during recreational activities. In addition, this project increases awareness and connectivity with the environmentally sensitive areas of Phoenicia. Finally, this project will help maintain the natural characteristics of Esopus Creek.

Public Support: The project makes an investment to benefit the Town of Shandaken’s overall economy, by creating an entertainment venue and trail network to draw visitors from around the region and beyond. Shandaken residents who participated in an NYRCR public meeting indicated that Infrastructure and Economic Development were the two most important areas for focusing investment and resiliency projects thorough the CR process.

Project Cost-Benefit Analysis

The project makes an investment to benefit the Town of Shandaken’s overall economy, by creating an entertainment venue and trail network to draw visitors from around the region and beyond. Based on available information and preliminary designs, the proposed project would have a net benefit on local economic recovery.

- Investment: **\$1,500,000**
- Jobs created: **12.6**

Anticipated Reduction of Risk associated with the Project

Overall, the project encourages local economic growth by reducing the risk of limited economic growth by providing an amenity that tie into the area’s natural surroundings, existing trail network and outdoor businesses. Additional amenities will help to attract visitors and support existing and new local businesses reducing the risk of economic decline.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 26 months.

Local, State and Federal Government Regulatory Requirements related to the project

- DEC Article 15 Permit

Jurisdiction

The Town of Shandaken.



HOME AND BUSINESS FLOOD MITIGATION IMPROVEMENTS

Project Description

Background: The majority of the built environment in the Town of Shandaken is located in the valleys of the Esopus Creek and its tributaries. This close proximity of homes and businesses to waterways has resulted in extensive past flooding and property damage in many of the Town’s hamlets with a high potential for significant future flood impacts. Improvements to flood prone homes and businesses may not address the extent of flooding in the Town but will however protect important assets, increase resident safety and improve individual properties’ ability to mitigate and withstand any future flooding.

Connection to the disaster: Historic Repetitive flooding and damage from past disasters including Hurricane Irene and Tropical Storm Lee , have caused substantial challenges for the Town including property damage, vacancy, increased flood insurance, loss of residents and customers and an increasing hesitancy for new investment.

Solution: This project would construct and/or install flood mitigation improvements for houses, businesses and assets located in hazard-prone areas to protect structures from future damage. Where appropriate this may also include the acquisition and demolition of structures located in the hazard-prone areas to protect from future damage.

Providing flood mitigation improvements for homes and businesses increases public safety and positions the Town for greater future community and economic resiliency.

Specific actions would focus on flood proofing and mitigation improvements for existing buildings in flood prone areas and will address individual lots or buildings on a site-specific basis. Project work would typically include either wet proof or dry-proofing crawlspaces or basements of existing

buildings, as well as consideration for minor architectural features at or above the finished floor, such as flood-resistant doors. Project work will also consider reinforcement of walls or changing finished floor materials and/or raising the finished floor of a building on an individual property basis. Flood proofing of new construction is not included in this project.

Project Cost Estimate

The total project cost is approximately **\$3,000,000**; however actual costs will be determined by the number and extent of improved properties.

Project Benefits or Co-Benefits

Protecting existing building stock from future flood damage provides multiple benefits to the community including risk and damage reduction and increased public safety as well as related economic, social and cultural benefits.

Economic Benefits: improvements aimed at creating safer residences and building a more resilient Town will also create greater confidence for private investors and home buyers.

By investing in flood mitigation improvements for housing stock and commercial properties, this project will retain and help attract residents and businesses which will ultimately benefit business growth and bolster local economies. Private homeowner and commercial renovation and incentives also directly contribute to increased property values, local business growth, and increased tax revenues. In addition, this project will have a financial benefit by increasing property resiliency thus reducing any future maintenance or repair costs associated with flood damage.

The construction phase of this project will create construction and support jobs from labor, materials, equipment and other sales for suppliers and support industries. As spending is injected into local and regional job and supply markets, an increase in



induced spending also occurs as employees and businesses benefitting from the construction work in turn spend money on other goods and services.

Limited Development Parcels: Due to a lack of available parcels for new development, The Town of Shandaken has a limited ability to create new housing or to replace housing removed during buyout programs. By helping to ensure the protection of existing housing stock, this project will aid in maintaining existing tax base and residents which are essential for a healthy community and economy.

Preservation of Local Character and Historic

Resources: For any older houses, this project will further the protection of existing historic character and cultural value. Protecting the unique character and charm of these historic homes ensures their benefit will be retained for future generations and may also increase local property values.

Creating and retaining sense of place: By investing in projects that will improve and protect existing building stock, the Town is protecting its unique character and sense of place.

Public Support: The project provides improvements to existing building stock to address repetitive flood conditions, which was one of the most highly publically supported resiliency project types among Shandaken public respondents who responded to surveys, interviews, and project type scoring during public meetings.

Project Cost-Benefit Analysis

Improvements to increase flood protection for existing homes and businesses benefit overall community resilience towards future storms by ensuring the protection of the Town’s assets and the safety of its residents.

Based on available information and preliminary designs, the proposed project would have a net benefit on community safety and health, as well as

economic growth, historic preservation and other community needs which collectively position the Town to benefit considerably from this project.

- Investment: **\$3,000,000**
- Jobs created: **25.2***

*** The construction jobs were estimated based on a methodology developed by the United States Department of Commerce Economics and Statistics Administration as presented in the September 2013 Economic Impact of Hurricane Sandy: Potential Economic Activity Lost and Gained in New Jersey and New York. This study estimated job creation from recovery spending on infrastructure projects in New York and reported 7.15 construction jobs and 8.4 total jobs per \$1,000,000 in construction spending.*

Anticipated Reduction of Risk associated with the Project

Identifying and implementing improvements to homes and businesses feasible for elevation, flood mitigation or buyout will provide greater resident safety and property protection during flood events. While this project will not reduce flood surface elevations for the Town, it will increase the resiliency of the building stock, without which continued flooding may result in loss of life, future structural damage, property loss, and potentially loss of residents and businesses.

These improvements may also create a reduced need for evacuations and/or assistance to homes in flooded areas; thus, protecting emergency response and essential personnel. If residents are not trapped in their homes due to flooding, in case of an emergency, they will have quicker access to hospitals and other health care providers

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and



permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 26 months.

Local, State and Federal Government Regulatory Requirements related to the project

Completion of the proposed project will require regulatory and permitting approvals from appropriate agencies. Required permits will be

dependent on individual site conditions and may include but not be limited to an Article 15 permit, NYS DOT Highway Work Permit and local construction and building permits.

Jurisdiction

The Town of Shandaken.



BUILDING DEPARTMENT DIGITAL UPGRADES

Project Description

Background: Shandaken’s location along numerous rivers and tributaries means that a large number of homes and businesses are exposed to potential flooding events. Due to the volatile nature of flooding in this area, residents and officials must be equipped with the best sources of data, means of preparedness and strategies for post disaster assessment.

Connection to the disaster: As a result of Hurricane Irene and Tropical Storm Lee in 2011, the Town of Shandaken Building Department experienced significant hardships when facilitating homeowner’s efforts to recover and rebuild after incurring damages from the storms. At the root of this problem is an insufficient amount and methodology for structural data gathering and storage, which delayed post disaster inspections which in turn caused delays in repairing and/or resuming occupancy of individual structures.

Solution: This project proposes to plan and implement a Digital Collection and Storage System for the existing Building Department and to provide training in GIS for local officials to allow electronic post storm building inspections and reports from the field. These improvements will allow The Town to expedite building inspections and to utilize GIS to store and assess data to create pre-disaster awareness of flood prone conditions at the parcel level. By having building inspections done more quickly, it will allow residents and business owners to know if their building is safe to occupy after a flooding event and will increase safety for both the town officials and residents. This project will also

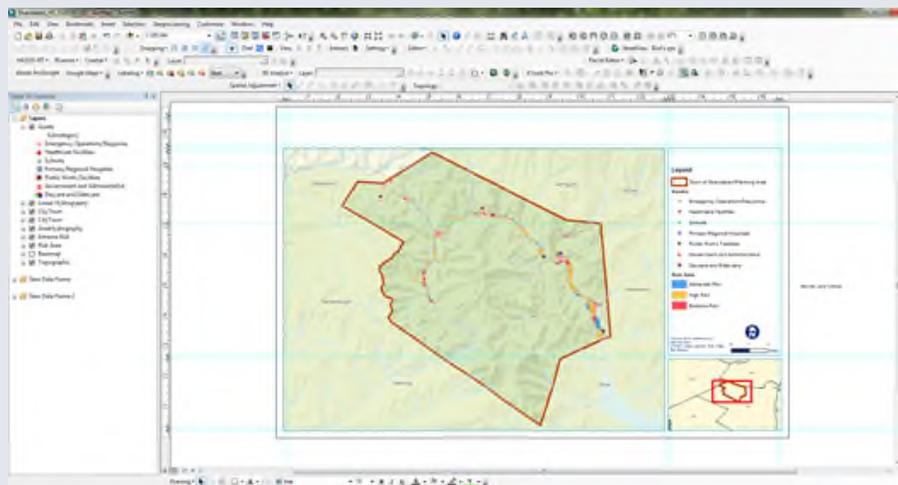
increase the community’s Community Rating System (CRS) score thus assisting in the reduction of local flood insurance rates.

Project Cost Estimate

\$30,000

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk reduction, emergency preparedness and expedited recovery as well as potential economic and social benefits. In addition, this project is highly supported by Shandaken



GIS - Courtesy of Tetra Tech

residents. The project will benefit the entire population of Shandaken, especially those who live in the immediate area of waterways and areas of flooding.

Safety and Recovery: This project will create reduced risks to health and safety of residents and buildings through additional training and capacity building for available technology resources. In particular this project will increase efficiency and functionality of post storm information gathering and data collection and to facilitate expedited inspections and ultimate recovery.

This project will provide GIS capability allowing the Town to utilize available data to identify and track flood prone areas and properties. Awareness of



these properties and assessment through GIS will provide the Town with the tools to better inform residents of their flood risk and to facilitate pre disaster planning to better protect residents from future flooding events and allow them time to evacuate their homes, if necessary. This increases the safety of residents, emergency responders, and essential personnel during flooding and other hazard events.

Economic Benefits: Improvements aimed at expediting post-storm recovery and improving local emergency preparedness creates greater confidence for private investors, as it illustrates a commitment to the future of the Town’s residents, local work force, and health and social well-being. In addition, by facilitating the accurate data collection and assessment of site and parcel elevation characteristics, this project ensures that the Town will be more resilient against future storms and may reduce flood insurance premiums for some.

Public Support: The project makes a data collection system investment to benefit the Town of Shandaken’s overall emergency information network, while increasing public safety and emergency response capabilities. Shandaken residents who participated in an NYRCR public meeting indicated that there is a critical need for better flood related data, emergency information and improved local and regional connectivity in order to support the publically selected two most important areas for focusing investment; Infrastructure and Economic Development.

Project Cost-Benefit Analysis

Based on available information and preliminary designs, the proposed project would have a net benefit on community economy, safety, and resiliency.

- Investment: **\$30,000**
- Jobs created: **0.3***

** The construction jobs were estimated based on a methodology developed by the United States Department of Commerce Economics and Statistics Administration as presented in the September 2013 Economic Impact of Hurricane Sandy: Potential Economic Activity Lost and Gained in New Jersey and New York. This study estimated job creation from recovery spending on infrastructure projects in New York and reported 7.15 construction jobs and 8.4 total jobs per \$1,000,000 in construction spending.*

Anticipated Reduction of Risk associated with the Project

Overall, this project reduces risks associated with a lack of data storage capability and training in GIS for local officials that make post storm building inspections and reporting difficult, and create a disconnect with the potential to use data collected for future mitigation initiatives. This project allows for expedited permit issuance, increases efficiency and safety during and after hazard events, and reduced economic risk by potentially lowering flood insurance rates.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 12 months.

Local, State and Federal Government Regulatory Requirements related to the project

- Potential Article 15 Permit required

Jurisdiction

The Town of Shandaken.



HARDENBURGH PROPOSED PROJECTS

PLOUTZ ROAD AND MILLBROOK ROAD BRIDGE CONSTRUCTION

Project Description

Background: The current Ploutz Road and Millbrook Road Bridge is located at an unnamed tributary of Millbrook Creek in Hardenburgh.

Connection to the disaster: As a result of Hurricane Irene and Tropical Storm Lee in 2011, the roadway at Ploutz Road and Millbrook Road washed out during storm-induced flooding, prohibiting access to upper Millbrook Road residents and all residents of Hardenburgh.

Solution: The Ploutz Road and Millbrook Road Bridge Construction Project would construct an improved stream crossing structure that will replace two existing culverts with a 20' span bridge to cross an unnamed tributary of Millbrook Creek.

Project Cost Estimate

The estimated project cost, which includes demolition and removal of the existing culvert and construction of an improved stream crossing structure, is \$250,000.

Project Benefits or Co-Benefits

This bridge demolition and construction project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Hardenburgh residents. The project will benefit all residents of Hardenburgh, especially those who live or in the immediate area of the project.

Flood Protection and Safety: By removing these culverts and constructing the 20' bridge, this project reduces safety risk for vehicular traffic by reducing the incidence of road inundation and reducing the risk of stream bank failure during storm events. In addition, this project reduces the risk of stranding

or isolating residents located above the project area and providing passage for residents, emergency response staff, and other essential personnel during storm events and other emergencies. The results of this project will also serve socially vulnerable populations including individuals with disabilities and elderly persons who may rely on access to healthcare facilities for vital medical services located within Shandaken and Margaretville, including the Margaretville Hospital.

Economic Benefits: This project will encourage economic growth spurred by construction through the purchase and use of associated supplies and services. In addition to the direct economic increase associated with this project, potential economic benefits include additional permanent jobs, increased taxes, and increased expendable income that may be spent on local goods and services.

Environmental Benefits: the project will result in an increase in conveyance capacity and reduction of upstream water surface elevations, lower water flows in Millbrook Stream to maintain natural characteristics by decreasing the risk of flooding, and improved water quality.

Public Support: The project provides improved stream function and flood-resistant infrastructure improvements, which were the two most highly publically supported resiliency project types among Hardenburgh public respondents who responded to surveys, interviews, and project type scoring during public meetings.

Project Cost-Benefit Analysis

Based on available information and preliminary designs, the proposed project would have a net benefit on community safety and health, as well as mobility, safety and other community needs. The reduction in flood water on a critical thoroughfare and replacement of old infrastructure positions the



Town to benefit considerably from this project.

- Investment: **\$250,000**
- Addresses damage to critical infrastructure from federal disaster No. 4020: **Yes**
- Jobs created: **2.1**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storm events by providing reduced road inundation and reduced risk of stream bank failure during flood events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during

storms.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 1 month.

Local, State and Federal Government Regulatory Requirements related to the project

- Article 15 permit required

Jurisdiction

The Town of Hardenburgh.

FIGURE 35. LOCATION MAP OF MILLBROOK BRIDGE





MILLBROOK ROAD BRIDGE REPLACEMENT

Project Description

Background: The existing Millbrook Road Bridge is located near the intersection of Millbrook and Hinckley Roads in the northwestern area of Hardenburgh near the Delaware County line.

Connection to the disaster: As a result Hurricane Irene and Tropical Storm Lee in 2011, flooding overtopped the roadway and undermined the bridge, due to scour. All residents were without access to the bridge and its connecting thoroughfares.

Solution: This project will replace the existing bridge with an upgraded bridge at the Millbrook Road/Belleayre Stream crossing near the intersection of Millbrook and Hinckley Roads. The project will increase access and mobility for Hardenburgh residents and visitors, and improve stream function.

Project Cost Estimate

The estimated project cost, which includes construction of an improved stream crossing structure, is \$350,000.

Project Benefits or Co-Benefits

This bridge demolition and construction project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefits. In addition, this project is highly supported by Hardenburgh residents. The project will benefit the entire population of Hardenburgh, especially those who live or in the immediate area of the project.

Flood Protection and Safety

Inundation reduction for Millbrook and Hinckley Roads helps to provide a reliable and much-needed

transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is critically important to ensure that secondary and local routes are safe for travel during storms. Replacing the Millbrook Road Bridge across Belleayre Stream Bridge will meet an urgent community need within the Town. Replacement will improve safety for all users. By providing increased travel safety for Millbrook and Hinckley Roads, this project will help to provide necessary access to healthcare and critical facilities throughout the Town and region.



Rendering of new bridge - Courtesy of LHV Precast

Economic Benefits: This project will encourage economic growth spurred by construction through the purchase and use of associated supplies and services. Additional economic benefits include associated permanent jobs and increased expendable income that may be spent on local goods and services. Finally, by providing safer, more reliable transportation and accessibility, individual property values are likely to grow over the long term.

Environmental Benefits: There are several environmental benefits associated with this project.



This project will increase the capacity in which the Belleayre Stream can move potential flood waters. In addition, improvements to the bridge will help to improve water quality and maintain the natural characteristics in the Belleayre Stream by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project provides improved stream function and flood-resistant infrastructure improvements, which were the two most highly publically supported resiliency project types among Shandaken and Hardenburgh public respondents. This information was gathered through online and hard-copy surveys, interviews, and project type scoring at public meetings.

Project Cost-Benefit Analysis

The reduction in flood water on a critical thoroughfare, repair of damaged infrastructure, and increased protection for adjacent properties collectively position the Town to benefit considerably from this project.

- Investment: **\$350,000**
- Addresses damage to critical infrastructure from federal disaster No. 4020: **Yes**
- Jobs created: **2.9**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this

project include a reduction in safety risks for vehicles during storm events by providing reduced road inundation and reduced risk of stream bank failure during flood events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storms.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 1 month.

Local, State and Federal Government Regulatory Requirements related to the project

- Article 15 permit required

Jurisdiction

The Town of Hardenburgh.



HINCKLEY BRIDGE REPLACEMENT

Project Description

Background: The current Hinckley Road Bridge is at the Belleayre Stream crossing near intersection of Hinckley Road and Millbrook Road in the northwestern area of Hardenburgh.

Connection to the disaster: As a result of Hurricane Irene and Tropical Storm Lee in 2011, flooding at the Hinckley Road Bridge caused abutment failure, cutting off access to two residences from the approach road.

Solution: The project would replace the existing Hinckley Road Bridge. The existing narrow, one-lane structure appears to serve two private residences. The roadway could likely be made passable by raising the road or replacing the structure

Project Cost Estimate

The estimated project cost, which includes construction of an improved stream crossing structure, is \$325,000.

Project Benefits or Co-Benefits

This bridge demolition and construction project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Hardenburgh residents.

Flood Protection and Safety: By replacing the current bridge, this project reduces safety risk for vehicular traffic by reducing the incidence of road inundation and reducing the risk of stream bank failure during storm events. In addition, this project reduces the risk of stranding or isolating residents connected by the Hinckley Bridge and providing access to and from the affected dwellings for emergency services and construction vehicles during emergency and non-emergency events. The

results will also include safer access to homes, businesses, and other essential facilities, but will also serve socially vulnerable populations including individuals with disabilities and elderly persons who may rely on access to healthcare facilities for vital medical services located within Shandaken and Margaretville, including the Margaretville Hospital.

Economic Benefits: This project will encourage economic growth spurred by construction through the purchase and use of associated supplies and services. In addition, by creating safer more reliable transportation and accessibility, individual property



Rendering of new bridge - Courtesy of Iowa State University

values are also likely to grow over the long term. Finally, as a result of this project, the improved structure will increase resiliency by reducing road inundation and risk of stream bank failure which in turn will help to reduce any future maintenance or repair costs associated with flood damage.

Environmental Benefits: Although no areas of wetlands were identified within the project impact area, the reduction in water surface elevation during smaller interval storm events could lead to the revitalization of wetland areas that may exist in the affected area. It is anticipated that the post



construction condition will help facilitate the movement of trout to any spawning sites within the stream.

Public Support: The project provides improved stream function and flood-resistant infrastructure improvements, which were the two most highly publically supported resiliency project types among Shandaken and Hardenburgh public respondents. This information was gathered through online and hard-copy surveys, interviews, and project type scoring during public meetings.

Project Cost-Benefit Analysis

Based on available information and preliminary designs, the proposed project would have a net benefit on community safety and health, as well as mobility, safety and other community needs. The reduction in flood water on a critical thoroughfare, repair of damaged infrastructure, and increased protection for adjacent properties collectively position the Town to benefit considerably from this project.

- Investment: **\$325,000**
- Addresses damage to critical infrastructure from federal disaster No. 4020: **Yes**
- Flood level reduction: **1.1'**
- Jobs created: **2.7**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storm events by providing reduced road inundation and reduced risk of stream bank failure during flood events. In

addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storm events. Finally, this project will result in a decrease in water surface elevation and therefore affect the extent to which the area floods.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 2 months.

Local, State and Federal Government Regulatory Requirements related to the project

- Article 15 permit required

Jurisdiction

The Town of Hardenburgh.

FIGURE 36. LOCATION MAP OF HINKLEY ROAD BRIDGE REPLACEMENT





MILLBROOK ROAD BRIDGE ABUTMENT STABILIZATION

Project Description

Background: The existing Millbrook Road Bridge is located near the intersection of Millbrook and Hinckley Roads in the northwestern area of Hardenburgh near the Delaware County line.

Connection to the disasters: Flooding from Hurricane Irene and Tropical Storm Lee in 2011 severely damaged the west abutment of the Millbrook Road Bridge. During these events, the bridge was not closed, though residents were warned of the precarious condition of the bridge and told to cross at their own risk. Conditions have grown increasingly more dangerous since those storm events.

Solution: The project would correct under-abutment damage on the west abutment of the Millbrook Rd. Bridge to stabilize the existing structure, thus ensuring safe mobility and access before, during and after a flood.

Project Cost Estimate:

The estimated project cost, which includes repair of one abutment to the Millbrook Road Bridge, is \$35,000.

Project Benefits or Co-Benefits:

This abutment repair project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefits. In addition, this project is highly supported by Hardenburgh residents. The project will benefit all residents of Hardenburgh, especially those who live or in the immediate area of the project.

Flood Protection and Safety: Inundation reduction for Millbrook Road helps to provide a reliable and much-needed transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is critically

important to ensure secondary and local routes are safe for travel during storms. Stabilizing the Millbrook Road Bridge will protect the structure from future flooding events, maintain safety for emergency vehicles and personnel during storm events, and ensure safe mobility and access before, during and after flooding events. This project will benefit residents, visitors, and vehicles within the area. Stabilization will improve safety for all users. By providing increased travel safety for and access to Millbrook Road, this project will help to provide necessary access to healthcare and critical facilities throughout the Town and region.



Product photo of abutment - Courtesy of New York State Department of Transportation

Economic Benefits: This project will encourage economic growth spurred by construction through the purchase and use of associated supplies and services. Also, by creating safer more reliable transportation and accessibility, individual property values are also likely to grow over the long term. Finally, as a result of this project, the improved structure will increase resiliency by reducing road inundation and risk of stream bank failure which in turn will help to reduce any future maintenance or



repair costs associated with flood damage.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Millbrook Stream can move potential flood waters. In addition, improvements to the bridge will help to improve water quality and maintain the natural characteristics in the Millbrook Stream by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project provides improved stream function and flood-resistant infrastructure improvements, which were the two most highly publically supported resiliency project types among Shandaken and Hardenburgh public respondents. This information was gathered as a result of online and hard-copy surveys, interviews, and project type scoring during public events.

Project Cost-Benefit Analysis

Based on available information and preliminary designs, the proposed project would have a net benefit on community safety and health, as well as mobility, and other community needs. The reduction in flood water on a critical thorough fare, repair of damaged infrastructure, and increased protection for adjacent properties collectively position the Town to benefit considerably from this project.

- Investment: **\$35,000**

- Addresses damage to critical infrastructure from federal disaster No. 4020: **Yes**
- Assets protected:
- Jobs created: **.2**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storm events by providing reduced road inundation and reduced risk of stream bank failure during flood events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storms.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 1 month.

Local, State and Federal Government Regulatory Requirements related to the project

- Article 15 permit required

Jurisdiction

The Town of Hardenburgh.



RIDER HOLLOW ROAD AT TODD MOUNTAIN ROAD CULVERT REPLACEMENT

Project Description

Background: The current Rider Hollow Road at Todd Mountain Road Culvert is located in Hardenburgh.

Connection to the disasters: Flooding from Hurricane Irene and Tropical Storm Lee in 2011 overtopped the roadway, caused embankment failure, and damaged the adjacent guardrail and roadway. All residents were prohibited from traveling around the area for two days – cutting off access to and from the Highway Department and Town Hall. For weeks afterwards, the area was dangerous for travel and residents were warned to travel at their own risk.

Solution: The proposed project would replace an antiquated bridge, which is a concrete deck structure with heavy rock abutments, with a stream crossing structure capable of conveying larger flows to help alleviate the existing roadway flooding condition.

Demolition and construction work includes: demolition and removal of existing culvert and construction of improved stream crossing structure

Project Cost Estimate

The estimated project cost, which includes demolition and removal of the existing bridge and construction of a LHV precast concrete deck bridge with precast abutments, including sheet piling, is \$75,000.

Project Benefits or Co-Benefits

This bridge demolition and construction project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Hardenburgh residents. The project will benefit all residents of Hardenburgh, especially those who live or in the immediate area of the project.



Product photo of upgraded abutment - Courtesy of New York State Department of Transportation

Flood Protection and Safety: Inundation reduction for the area of Rider Hollow Road and Todd Mountain Road helps to provide a reliable and much needed transportation redundancy during storm events. Replacing the existing culvert structures with a bridge will alleviate existing roadway flooding. This will protect the area of from future flooding events, maintain safety for emergency vehicles and personnel during storm events, and ensure safe mobility and access before, during and after flooding events. This project will benefit residents and emergency response or other essential personnel needing access during storm events. By providing increased travel safety for and access to Rider Hollow and Todd Mountain Roads, this project will help to provide necessary access to healthcare and critical facilities throughout the region, including the Margaretville Hospital.

Economic Benefits: This project will encourage economic growth spurred by construction through the purchase and use of associated supplies and services. Also, by creating safer more reliable transportation and accessibility, individual property values are also likely to grow over the long term. Finally, as a result of this project, the improved structure will increase resiliency by reducing road inundation and risk of stream bank failure which in



FIGURE 37. LOCATION MAP OF RIDER HOLLOW BOX CULVERT



turn will help to reduce any future maintenance or repair costs associated with flood damage.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Todd Brook can move potential flood waters. In addition, improvements to the bridge will help to improve water quality and maintain the natural characteristics in the Todd Brook by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project provides improved stream function and flood-resistant infrastructure improvements, which were the two most highly publically supported resiliency project types among

Shandaken and Hardenburgh public respondents. This information was gathered through online and hard-copy surveys, interviews, and project type scoring at public meetings.

Project Cost-Benefit Analysis

The reduction in flood water on a critical thoroughfare, repair of damaged infrastructure, and increased protection for adjacent properties collectively position the Town to benefit considerably from this project.

- Investment: **\$75,000**
- Addresses damage to critical infrastructure from federal disaster No. 4020: **Yes**
- Flood level reduction: **4.12 ft.**
- Assets protected:



- Jobs created: **7.6**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storm events by providing reduced road inundation and reduced risk of stream bank failure during flood events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storm events. Finally, this project will result in a decrease in water surface elevation and therefore affect the extent to which the area floods.

Implementation Timeframe

General project implementation, including preparation of engineering design documents,

submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 12 months. General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 1 month. This timeline includes the demolition of existing structures and construction of the new bridge.

Local, State and Federal Government Regulatory Requirements related to the project

- Article 15 permit required

Jurisdiction

The Town of Hardenburgh.



GRANTS MILL COVERED BRIDGE RELOCATION (MILLBROOK CREEK CROSSING)

Project Description

Background: The Grants Mill Covered Bridge is a listed historical structure on both the New York State and National Registers of Historical Sites, and an important cultural asset in the Town of Hardenburgh.

Connection to the disasters: During Hurricane Irene and Tropical Storm Lee in 2011, large amounts of debris gathered around the upstream side of the Grants Mill historic covered bridge, creating significant reduction in flow and increasing the flooded area of the adjacent roadway. As a result, flood waters caused additional scour damage to nearby roadway and bank slopes, while overtopping the bridge deck and scouring the bridge abutments.

This historical, Non-use Bridge was a contributing factor to a road closure for five days to all residents located above the bridge area.

Solution: The proposed project would relocate the Millbrook Creek Grants Mill Covered Bridge to a location outside of the flood hazard area. The Town of Hardenburgh has proposed moving the bridge from its present location to a "dry dock" location approximately 300 feet to the east, and placing it on concrete abutments. This project will preserve and protect the bridge which is a valuable cultural and historic asset

Project Cost Estimate

The estimated project cost, which includes the removal and relocation of the covered bridge from its present location to a "dry dock" location

FIGURE 38. LOCATION MAP OF GRANTS MILL COVERED BRIDGE RELOCATION





approximately 300 feet to the east, is \$200,000.

Project Benefits or Co-Benefits

This bridge relocation project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Hardenburgh residents. This project will benefit the entire population of Hardenburgh, especially those who live in the immediate area of the bridge.

Flood Protection and Safety: By reducing water inundation, this project will protect nearby properties and will prevent debris and flow issues creating additional flood risk. Because this project will mitigate water surface elevations and reduce bridge tail water conditions, it will increase local residents’ access to the majority of health care and social services, which are located within the neighboring municipalities of Margaretville and Phoenicia. It will provide critical access to the Margaretville Hospital. The project allows for residents and emergency services to easily access these facilities from day-to-day and during storms.

Economic Benefits: This project will encourage economic growth spurred by construction through the purchase and use of associated supplies and services. Also, by creating safer more reliable transportation and accessibility, individual property values are also likely to grow over the long term. Finally, as a result of this project, the improved structure will increase resiliency by reducing road inundation and risk of stream bank failure which in turn will help to reduce any future maintenance or repair costs associated with flood damage. In addition, this project protects and important local and historic asset by moving it to a safe location. Preserving this historic bridge ensures residents and visitors, including vulnerable populations, will be able to enjoy its historic value for years to come and will assist in generating tourism and related

economic growth.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Millbrook Stream can move potential flood waters. In addition, improvements to the bridge will help to improve water quality, revegetate the floodplain, and maintain the natural characteristics in the Millbrook Stream by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project provides improved stream function and flood-resistant infrastructure improvements, which were the two most highly publically supported resiliency project types among Shandaken and Hardenburgh public respondents. This information was gathered through online and hard-copy surveys, interviews, and project type scoring at public meetings.

Project Cost-Benefit Analysis

The reduction in flood water on a critical thorough fare, repair of damaged infrastructure, and increased protection for adjacent properties collectively position the Town to benefit considerably from this project.

- Investment: **\$200,000**
- Addresses damage to critical infrastructure from federal disaster No. 4020: **Yes**
- Flood level reduction: **2.24 ft.**
- Assets protected:
- Jobs created: **1.7**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storms by providing reduced road inundation and reduced risk of stream bank failure during flood events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital



transportation routes remain open to allow mobility and evacuation, when necessary, during storm events. Finally, this project will result in a decrease in water surface elevation and therefore affect the extent to which the area floods.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and

review of responses and completing construction is expected to happen over the course of 2 months. This timeline includes the construction of the concrete abutments and relocation of the bridge.

Local, State and Federal Government Regulatory Requirements related to the project

- Article 15 permit required

Jurisdiction

The Town of Hardenburgh.



BEAVERKILL ROAD EMBANKMENT STABILIZATION

Project Description

Background: The Beaverkill Creek is a major tributary of the East Branch of Delaware River. Beaverkill Road generally parallels the creek and is within the floodplain in many areas, although there are few crossing of the main creek.

Connection to the disaster: As a result of Hurricane Irene and Tropical Storm Lee in 2011, flooding along Beaverkill Creek caused roadway embankment failure in this project location and other areas along Beaverkill Road. Currently, Beaverkill Road remains one-lane in width. Residents are cautioned to travel along this road at their own risk.

Solution: The proposed road embankment stabilization project addresses erosion protection, stream restoration, and embankment repair, and would restore the stream to its pre-Irene channel conditions. Improvements would be made to the banks of Beaverkill Creek along Beaverkill Road, roughly 2000 feet before Monk's Compound.

Project Cost Estimate

The estimated project cost is \$225,000.

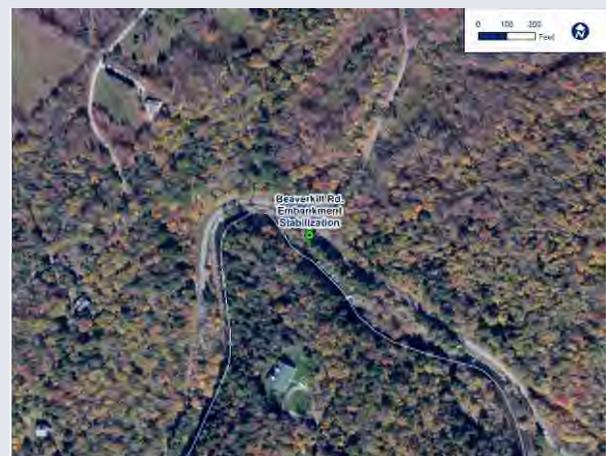
Project Benefits or Co-Benefits

This road embankment project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Hardenburgh residents. The stabilization of the embankment will benefit the entire population of Hardenburgh, especially those who live in the immediate area of the Beaverkill Creek and Beaverkill Road and depend on it for access to their homes, businesses, and other essential facilities (hospitals, doctors' offices, etc.).

Flood Protection and Safety: Inundation reduction for Beaverkill Road helps to provide a reliable and much needed transportation redundancy during

storm events. With limited existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes are safe for travel during storms. Stabilizing the banks of Beaverkill Creek along Beaverkill Road will protect the structure from erosion, restore the stream, and repair the embankment. Stabilization will create increased access, improve stream function, and increase and maintain safety for vehicular travel through the area and for emergency vehicles and personnel during storm events. Stabilization will also improve safety for all users. By providing increased travel safety for and access to Beaverkill Road, this project will help to provide necessary access to health care and critical facilities throughout the Town and region.

Economic Benefits: This project will encourage economic growth spurred by construction through the purchase and use of associated supplies and services. Also, by creating safer more reliable transportation and accessibility, individual property values are also likely to grow over the long term. Finally, as a result of this project, the improved structure will increase resiliency by reducing road inundation and risk of stream bank failure which in turn will help to reduce any future maintenance or repair costs associated with flood damage. Finally,



Embankment stabilization location - Courtesy of Tetra Tech



this project would provide augmented access to Turnwood General Store, which provides food and other supplies to local residents.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the Beaverkill Stream can move potential flood waters. In addition, improvements to the bridge will help to improve water quality, reduce sedimentation, and maintain the natural characteristics in the Millbrook Stream by minimizing the impact of transportation infrastructure on the environment.

Public Support: The project provides improved stream function and flood-resistant infrastructure improvements, which were the two most highly publically supported resiliency project types among Shandaken and Hardenburgh public respondents. This information was gathered through online and hard-copy surveys, interviews, and project type scoring at public meetings.

Project Cost-Benefit Analysis

The reduction in flood water on a critical thorough fare, repair of damaged infrastructure, and increased protection for adjacent properties collectively position the Town to benefit considerably from this project.

- Investment: **\$225,000**
- Addresses damage to critical infrastructure from federal disaster No. 4020: **Yes**
- Jobs created: **1.9**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storms by providing reduced road inundation and reduced risk of stream bank failure during floods. In addition, this project reduces the risk of stranding or isolating residents and visitors

during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storms.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 1 month.

Local, State and Federal Government Regulatory Requirements related to the project

- Article 15 permit required

Jurisdiction

The Town of Hardenburgh.



Embankment stabilization product photo - Courtesy of Montgomery County Department of Environmental Protection



BACKUP POWER GENERATORS – FIXED INSTALLATION

Project Description

Background: The Hardenburgh Town Hall serves as the community focal point for town services.

Connection to the disaster: During Hurricane Irene and Tropical Storm Lee, the Hardenburgh Town Hall experienced a power outage due to a lack of a back-up power generator. Due to this outage, communications and emergency services were impacted, resulting in delayed response and resource delivery.

Solution: This project would purchase and install back-up propane generators for key community facilities in the Town of Hardenburgh. Facilities slated for the improvements include the Town Hall located at 51 Rider Hollow Road, and the two Highway Garages, located at 49 Rider Hollow Road and 192 Alder Creek Rd.

When installed, the back-up generators will ensure the provision of essential services and will provide support for all aspects of municipal functionality during a disaster.

Project Cost Estimate

The estimated cost, which includes installation of a permanent backup generator and the electrical work needed to connect the generator to three Town buildings, is \$180,000.

Project Benefits or Co-Benefits

This fixed installation of backup power generators provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Hardenburgh

residents. The entire population of Hardenburgh, especially those in need of assistance from the Town, will benefit from the installation of generators at the town hall and highway garage.

Continuity of Services: This project ensures that vital services provided by the Town Hall and Highway Garages are not impacted by a power outage. Maintaining community operations during an emergency event is vital to coordinating resources. By providing the Town Hall with a fixed back-up power generator, the speed and accessibility of the Town’s resources will not be affected by a power outage during disaster.

Economic Benefits: This project is based on the effort to strengthen and prioritize local emergency response and recovery capabilities, and aimed at building a more resilient Town in the face of future disasters. This type of investment creates greater confidence for private investors, as it illustrates a commitment to the future of the Town’s residents, local work force, and health

and social well-being. In addition this project will create a future economic benefit by reducing potential damage to critical facilities as a result of prolonged power outage.

Continuity of Services: Installing back-up generators to key community facilities ensures the provision of essential services during a severe weather event or disaster. During a power outage, the Town of Hardenburgh may have no phone service or computer access, making Town officials and emergency personnel inaccessible to its residents. With a backup generator, these officials and personnel will be available to residents if an



Propane Generator - Courtesy of Honeywell



emergency should occur.

Environmental: Although no environmental assets were identified as being completely secured, there are environmental benefits associated with this project. The project will result in better environmental quality within the building due to health and safety improvements and any renovation associated with the project.

Public Support: The project increased public safety, and increased emergency response capabilities, which were both among the realm of publically supported resiliency project types among Shandaken and Hardenburgh public respondents. This information was gathered through online and hard-copy surveys, interviews, and project type scoring at public meetings.

Project Cost-Benefit Analysis

The increased protection for Town residents and security for critical Town functions during future disaster events ensured by the installation of backup power generators would collectively position the Town to benefit considerably from this project.

- Investment: **\$180,000**
- Addresses damage to critical infrastructure from federal disaster No. 4020: **No**
- Jobs created: **1.5**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this

project include assurance of a continuity of essential services during disaster. Essentially, this project reduces risk to resident and visitor safety by ensuring reliable power source to provide essential services, sheltering and to continue the operation of critical facilities and communications during future disaster events. In addition, this project provides support for all aspects of municipal functionality during a disaster by reducing risk of additional damage or increased maintenance to municipal systems and facilities as a result of prolonged power outage.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses and completing construction is expected to happen over the course of 1 month.

Local, State and Federal Government Regulatory Requirements related to the project

- None

Jurisdiction

The Town of Hardenburgh.



OLD BAKER ROAD AND RIDER HOLLOW ROAD (INTERSECTION) CULVERT / BRIDGE REPLACEMENT

Project Description

Background: Rider Hollow Road serves as an important thoroughfare in Hardenburgh. It is the road that allows for access to the Hardenburgh Town Hall. The resiliency of this roadway is important to the Town’s everyday functions.

Connection to the disaster: As a result of Hurricane Irene and Tropical Storm Lee in 2011, flooding overtopped the roadway and damaged the culvert. Travel was prohibited for all residents for three days. For weeks after the events, residents were cautioned to travel along this road at their own risk.

Solution: This project would replace the antiquated bridge on Rider Hollow Road with a new concrete slab bridge. This will alleviate the existing roadway flooding condition therefor have safety and mobility benefits. The proposed replacement is a new LHV precast concrete deck structure with precast abutments including sheet piling which is in compliance with engineered sizing and NYS DEC approval.

Project Cost Estimate

The estimated project costs are \$75,000 provided by the Town Supervisor.

Project Benefits or Co-Benefits

This bridge demolition and construction project provides multiple benefits to the community including risk and damage reduction, economic, environmental and social benefit. In addition, this project is highly supported by Hardenburgh residents. The project will benefit all residents of Hardenburgh, especially those who live or in the immediate area of the project.

Flood Protection and Safety: By removing this culvert and constructing the 40’ bridge, this project reduces safety risk for vehicular traffic by reducing the incidence of road inundation and reducing the

risk of stream bank failure during storm events. In addition, this project reduces the risk of stranding or isolating residents located above the project area and providing passage for residents, emergency response staff, and other essential personnel during storm events and other emergencies.

Economic Benefits: This project will encourage economic growth spurred by construction through the purchase and use of associated supplies and services. Also, by creating safer more reliable transportation and accessibility, individual property values are also likely to grow over the long term. Finally, as a result of this project, the improved structure will increase resiliency by reducing road inundation and risk of stream bank failure which in turn will help to reduce any future maintenance or repair costs associated with flood damage.



Photo of new LHV precast concrete deck structure with precast abutments - Courtesy of LHV Precast Inc.

Environmental Benefits: There are several environmental benefits associated with this project. This project will increase the capacity in which the unnamed tributary can move potential flood waters. In addition, improvements to the bridge will help to improve water quality, reduce sedimentation, and maintain the natural characteristics in the unnamed tributary by minimizing the impact of transportation infrastructure on the environment.



Public Support: The project provides improved stream function and flood-resistant infrastructure improvements, which were the two most highly publically supported resiliency project types among Shandaken and Hardenburgh public respondents. This information was gathered through online and hard-copy surveys, interviews, and project type scoring at public meetings.

Project Cost-Benefit Analysis

Based on available information and preliminary designs, the proposed project would have a net benefit on community safety and health, as well as mobility, safety and other community needs. The reduction in flood water on a critical thorough fare, repair of damaged infrastructure, and increased protection for adjacent properties collectively position the Town to benefit considerably from this project.

- Investment: **\$75,000**
- Addresses damage to critical infrastructure from federal disaster No. 4020: **Yes**
- Jobs created: **6**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storm events by providing reduced

road inundation and reduced risk of stream bank failure during flood events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow mobility and evacuation, when necessary, during storms.

Implementation Timeframe

General project implementation, including preparation of engineering design documents, submittal to regulatory agencies for review and permit approval, preparation of bid documents and review of responses, and completing construction is expected to happen over the course of 1 months.

Local, State and Federal Government Regulatory Requirements related to the project

- None

Jurisdiction

The Town of Shandaken.



BROADBAND SERVICE EXTENSION

Project Description

Background: The Beaverkill Valley is a community steeped in history and culture. A significant part of the economic opportunities for existing businesses and small business startups is based on eco-tourism as the Valley hosts an abundance of natural resources perfect for hiking, fishing, kayaking, birding, and related outdoor activities. With the growing rise in the tourism industry, the Valley is uniquely positioned to capitalize on these opportunities, yet in the absence of much needed telecommunication infrastructure the Beaverkill Valley is left at a great disadvantage compared to other tourism based communities.

Connection to the disasters: The geographic location of the Beaverkill Valley is both a blessing and a misfortune, as its extremely remote location presents a tremendous challenge in developing effective telecommunications infrastructure necessary to modern day economic development and quality of life for its residents. Perhaps most importantly, the lack of infrastructure nearly cripples emergency response during threatening weather related events, which were chronicled during the recent catastrophic effects of Hurricane Irene and Tropical Storm Lee.

Solution: This project would support the "end of the line" Broadband service extension in the Beaverkill Valley, bringing much needed broadband internet and improved communication services to the Beaverkill Valley on the south side of the mountain dividing the Town of Hardenburgh, currently an area unserved by broadband. The extension is being proposed jointly by the Town of Hardenburgh and the Margaretville Telephone Company Inc. (MTC), located in the Village of Margaretville.

Project Cost Estimate

The estimated project cost, which includes pre-construction engineering and design, and two



Courtesy of Microsoft

phases of fiber optic cable installation, is \$416,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, and social benefit. The entire population of Hardenburgh, especially those in the Beaverkill Valley section, will benefit from the expansion of broadband internet service.

Information Sharing: Expanding broadband internet service to the Beaverkill Valley section of the Town of Hardenburgh will benefit both health care and social services. Expanding internet service will assist with access and quality of health care in the Town and surrounding communities. Physicians may interface with subject matter experts across the country in emergency situations and remote monitoring may minimize the need for patient transfers.

Continuity of Emergency Services: Emergency services rely heavily on communications in order to ensure that essential resources are distributed and received to those most in need. During emergency situations, this need for reliable communications increases. This project will contribute to the overall communication structure for emergency responders in the Beaverkill Valley, thus ensuring that vital



emergency services and critical asset network capabilities are not disrupted during disaster.

Economic Benefits

The provision of Broadband will help promote business and increase both the economic vitality and quality of life in this small rural Catskill Mountain community. In order to attract investors and promote the development of new or relocation of existing business to this area, potential investors need to be assured that communications outside of the community are strong and secure.

Environmental Benefits: This project has the potential to create a more secure and reliable information network for the Town. This will improve the response time to emergencies affecting environmental assets or infrastructure that may impact environmentally sensitive areas.

Public Support: The project has the potential for increased public safety, and increased emergency response capabilities, which were both among the realm of publically supported resiliency project types Hardenburgh public respondents. This information was gathered through online and hard-copy surveys, interviews, and project type scoring at public meetings.

Project Cost-Benefit Analysis

The improvements to telecommunication infrastructure and the regional approach to this project which aims at leveraging resources amongst neighboring communities collectively position the Town to benefit considerably from this project.

- Investment: **\$240,000**
- Addresses damage to critical infrastructure from federal disaster No. 4020: **Yes**
- Flood level reduction: **N/A**
- Jobs created: **2**

Anticipated Reduction of Risk associated with the Project

Because there is no cell service in the Valley and the existing copper phone lines are showing their age and suffering from decades of neglect, emergency responders are often left at a huge disadvantage when trying to communicate with each other and outside assistance providers. In fact there have been times when the Valley (Firehouse included) have been without any phone service making any emergency communication nearly impossible. The firehouse is also the relief aid point in the Valley during floods and other weather related events. In addition, this all-volunteer fire department is still required to take necessary training as an essential element of their protocol. Broadband connectivity would enable these first responders to utilize available web based training as an alternative to otherwise time consuming travel and expense.

Implementation Timeframe

- 2 years

Local, State and Federal Government Regulatory Requirements related to the project

- None

Jurisdiction

The Town of Hardenburgh.



HARDENBURGH FEATURED PROJECTS

UPPER DRYBROOK ROAD BANK STABILIZATION AND STREAM BED MANAGEMENT

Project Description

Background: Drybrook provides access for number residents, and serves as one of the main roadways in Hardenburgh. The resiliency of this roadway is important to the everyday life of the residents in the Town.

Connection to the disaster: As a result Hurricane Irene and Tropical Storm Lee in 2011, flooding overtopped Upper Drybrook Road, causing slope failure and transportation interruptions. When the floods receded, the stream had deposited a large gravel bar which threatens to encroach into the road cutting off access to the residents upstream.

Solution: This project would provide necessary improvements to address road embankment failure including embankment fortification and stream bed management. When complete this will create increased access, improved stream function and increased safety for residents and visitors during travel.

Project Cost Estimate

The estimated project cost, which includes improvements to address road embankment failure and stream bed work, is \$1,000,000.

Project Benefits or Co-Benefits

This project provides multiple benefits to the community including risk and damage reduction, economic, and social benefit.

Flood Protection and Safety: Inundation reduction for Upper Drybrook Road helps to provide a reliable and much needed transportation redundancy during storm events. With limited existing access points to main regional thoroughfares, it is critically important to ensure secondary and local routes are safe for travel during storms. Stabilizing the banks

and managing the stream bed along Upper Drybrook Road will improve safety for all users. By providing increased travel safety for and access to Upper Drybrook Road, this project will help to provide necessary access to healthcare and critical facilities throughout the Town and region, including access to Margaretville Hospital.

Economic Benefits: This project will encourage economic growth spurred by construction through the purchase and use of associated supplies and services. Also, by creating safer more reliable transportation and accessibility, individual property values are also likely to grow over the long term. Finally, as a result of this project, the improved structure will increase resiliency by reducing road inundation and risk of stream bank failure which in turn will help to reduce any future maintenance or repair costs associated with flood damage. Environmentally, this project has the potential to reduce sedimentation and convey flood waters, maintain the natural characteristics of Drybrook Creek, improve water quality, and restore the natural flow of the creek.

Public Support: The project provides improved stream function and flood-resistant infrastructure improvements, which were the two most highly publically supported resiliency project types among Shandaken and Hardenburgh public respondents. This information was gathered through online and hard-copy surveys, interviews, and project type scoring at public meetings.

Project Cost-Benefit Analysis

The reduction in flood water on a critical thorough fare, repair of damaged infrastructure, and increased protection for adjacent properties collectively position the Town to benefit considerably from this project.

- Investment: **\$1,000,000**
- Addresses damage to critical infrastructure from federal disaster No. 4020: **Yes**



- Assets protected:
- Jobs created: **8.4**

Anticipated Reduction of Risk associated with the Project

The risk reduction benefits associated with this project include a reduction in safety risks for vehicles during storm events by providing reduced road inundation and reduced risk of stream bank failure during flood events. In addition, this project reduces the risk of stranding or isolating residents and visitors during storm events by ensuring that vital transportation routes remain open to allow

mobility and evacuation, when necessary, during storms.

Implementation Timeframe

- 2 years

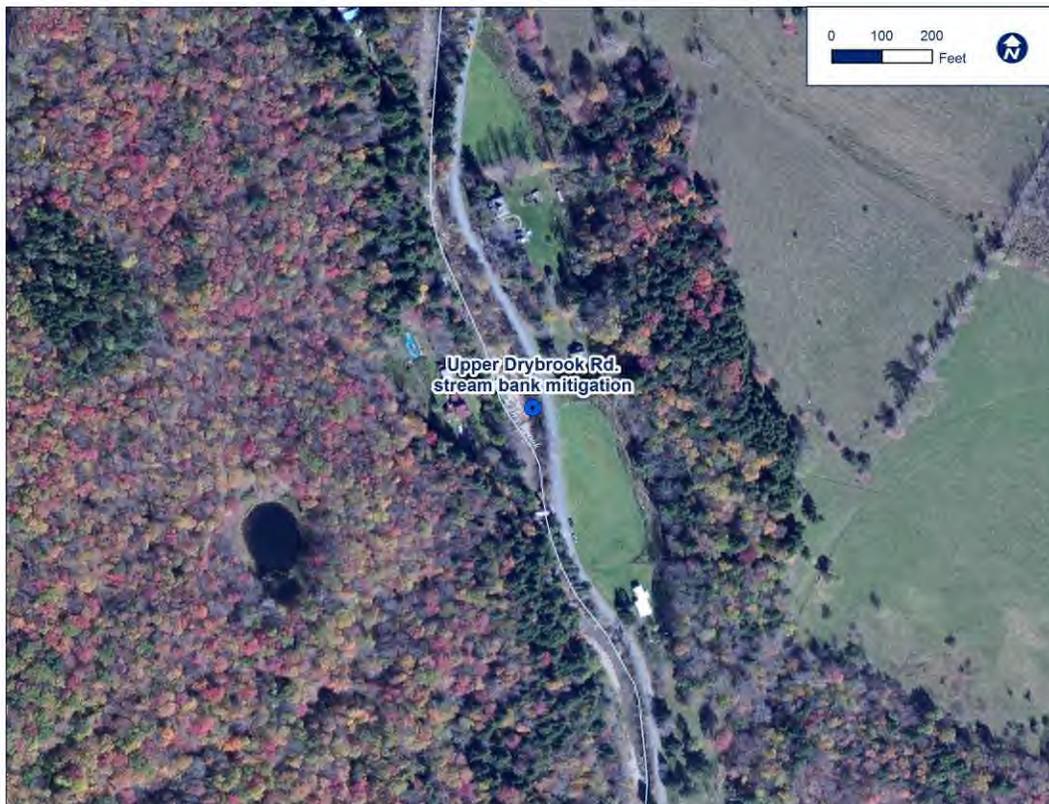
Local, State and Federal Government Regulatory Requirements related to the project

- Article 15 Permit required
- NYS DOT – Highway Work Permit

Jurisdiction

The Town of Hardenburgh.

FIGURE 39. LOCATION MAP OF UPPER DRYBROOK ROAD STREAMBANK MITIGATION



SECTION V

**Additional
Materials**





Courtesy of Tetra Tech



Section V. ADDITIONAL MATERIALS

ADDITIONAL RESILIENCY RECOMMENDATIONS

TABLE 12. ADDITIONAL RESILIENCY RECOMMENDATIONS				
Project Name	Short Project Description	Responsible Party	Regional Project (Y/N)	Strategy
Hardenburgh Landing Zones	Identify helicopter landing zones outside of delineated floodplains	Town of Hardenburgh	Y	3
Communication Network Improvements	Improve the municipal communications network to provide emergency communications, cell and high-speed internet coverage, ensure redundancy of Town communications capabilities and ensure dedicated phone line for town emergency management communications.	Town of Shandaken	N	2,3
Enhanced flood prediction and notification system	Create an enhanced flood prediction and notification system that has real-time flood threat recognition capability and utilizes the best available data, science and technology. Create additional stream gage locations and support of gage automation at specific sites, installation of precipitation monitoring stations, new town-wide weather data collection stations, and create command center call-in capability to Birch Creek, Stony Clove, Woodland Valley, Allaben, and any newly established USGS gages.	Town of Shandaken	Y	1
Margaretville Hospital Helipad	Install a helipad at Margaretville Hospital		Y	3
Route 42/Route 28 Area Hydraulic Study and Levee Review	Build on the base analysis from the CR Planning Process to provide additional information and recommendations to be used as a resource in the planning and development of further actions to reduce flood impacts. Pursue a comprehensive hydraulic analysis of the Route 42/Route 28 area including an analysis of the levee that represents present and potential constrictions.	Town of Shandaken	Y	1,3
McKinley Hollow Bridge Area Mitigation Measures	Work on stream, roads and other flood mitigation measures on the Esopus above and below the McKinley Hollow Bridge in the Hamlet of Oliverea. Remove gravel from approximately 300ft. downstream of McKinley Hollow to 200ft. upstream, including under the bridge.	Town of Shandaken	N	1,3



TABLE 12. ADDITIONAL RESILIENCY RECOMMENDATIONS

Project Name	Short Project Description	Responsible Party	Regional Project (Y/N)	Strategy
Stream Corridor Management Initiative	Implement stream corridor management actions to address conditions causing repetitive flooding. Potential actions include selective gravel harvesting and development of gravel deposit areas, debris/impediment removal, stream bank restoration and stabilization, invasive species control among others.	Town of Shandaken	N	1,5
Demolition of Vacant/Abandoned Structures	Pursue demolition of vacant/ abandoned structures in town that are subject to environmental hazards such as mold.	Town of Shandaken	N	2,5



MASTER TABLE OF PROJECTS

The Towns of Shandaken and Hardenburgh NYRCR Committee has undertaken an iterative and methodical process to arrive at the Proposed Projects, Featured Projects, and Additional Resiliency Recommendations presented in this plan. The three-part methodology presented below was designed to identify and consider the full range of potential actions and outcomes through a variety of analytical and quantitative assessment combined with stakeholder outreach, public engagement, and Committee discussions.

- 1. Initial project Identification:** The project evaluation process was initiated through a combination of existing plan review, preliminary stakeholder surveys, and Committee discussions, which collectively returned more than 50 possible projects and initiatives spanning the full breadth of community needs and opportunities.
- 2. Preliminary Project Analysis:** Selecting top proposed projects from a large group of worthy potential projects required a series of increasingly detailed qualitative and quantitative analyses. The full list of identified projects was initially evaluated and refined by four primary criteria to create a manageable universe of projects for further assessment. Project evaluation criteria included Categorization, Feasibility, Funding, and Alignment with NYRCR Plan Goals.
- 3. Detailed Analysis and Final Project Selection:** Final project selection and delineation into the three-tiered hierarchy of Proposed Projects, Featured Projects, and Additional Resiliency Recommendations were identified through a series of in-depth analyses applied to those projects identified during the previous phase of assessment. This process included detailed Cost Benefit Analysis, Risk Reduction Analysis, and Hydraulic Modeling combined with ongoing

public feedback and Committee discussions. Projects of great community benefit that were infeasible for cost, timing, or other considerations have been included as Featured Projects or Additional Resiliency Recommendations in this plan for future implementation through alternative means.

Table 13 reflects all projects developed by the Community – Proposed Projects, Featured Projects, and Additional Resiliency Recommendations. Projects in this table are not ranked or prioritized.



TABLE 13. MASTER PROJECT TABLE - SHANDAKEN

Project Name	Short Project Description	Project Category	Estimated Cost	Regional Project (Y/N)	Strategy
Backup Power Generator - Fixed Installation For Shandaken Town Hall	Install back-up propane generators for Shandaken Town Hall (or at new municipal complex if funded through NYRCR). The generator, which is already in stock with the town, will need associated electrical work in order to connect the resource to two town buildings: the Town Hall and the Town Highway Garage.	Proposed Project	\$50,000	N	2,3
Little Peck Hollow Rd Bridge	Rebuild and improve Little Peck Hollow Road Bridge near 47 Little Peck Hollow Road to improve flow capacity and convey flood waters.	Proposed Project	\$382,374	N	1,2,3
Lower Birch Creek Rd Bridge	Realign the Lower Birch Creek Road and make necessary upgrades to the bridge structure in order to alleviate the existing roadway flooding condition. The proposed modifications include widening the distance between abutments and raising the deck of the bridge to improve flow capacity and convey flood waters.	Proposed Project	\$376,974	N	1, 2,3
Muller Rd Bridge	Rebuild and improve Muller Rd Bridge and bridge abutment. To improve flow capacity and convey flood waters. The proposed modifications include widening the distance between abutments by removing the old abutments and raising the deck elevation.	Proposed Project	\$350,000	N	1,2,3
Pantherkill Rd Bridge	Replace the existing Pantherkill Road Bridge and bridge abutment over the Panther Kill Stream to improve flow capacity and convey flood waters. The improved replacement bridge is designed to prevent the structure from causing significant restrictions in the stream width and to create a structure that is able to safely pass a 100-yr storm event.	Proposed Project	\$350,000	N	1,2,3



TABLE 13. MASTER PROJECT TABLE - SHANDAKEN

Project Name	Short Project Description	Project Category	Estimated Cost	Regional Project (Y/N)	Strategy
Peck Hollow Rd Bridge - Peck Hollow	Rebuild and improve Peck Hollow Road Bridge over Peck Hollow Creek. This project would replace the existing bridge and abutment to improve flow capacity and convey flood waters. The proposed replacement will safely accommodate stormwater flows generated by a 100-yr storm event and eliminate any potential for future damage caused by severe storms.	Proposed Project	\$395,846	N	1,2,3
Improved Data Collection And Storage System To Include Elevation Monuments	Install elevation monuments/markers in public locations in each hamlet to lower costs associated in getting elevation certificates for structures and provide a more detailed elevation in relation to the flood elevations.	Proposed Project	\$100,000	N	4
Municipal Complex	Construct a new town complex including relocating and co-locating Town Hall, Highway Department, ems and dig shelter out of the floodplain: this replaces the municipal emergency operations, evacuation and health center: construct a new municipal emergency operations center, regional evacuation site, and community health and human services center. The project removes these critical services from their currently damage-prone location in the flood plain to a new site on state route 28.	Proposed Project	\$3,000,000	N	2,3
Fire District And Emergency Service Improvements	Provide funding for up to three volunteer fire districts for the unique upgrades they need to better serve as first responders and support command posts during and immediately after storms and other catastrophic events, and relocate the EMS ambulance garage out of the flood plain.	Proposed Project	\$500,000	N	1,3



TABLE 13. MASTER PROJECT TABLE - SHANDAKEN

Project Name	Short Project Description	Project Category	Estimated Cost	Regional Project (Y/N)	Strategy
Phoenicia Stream Restoration And Recreation Trail - Phase 2: Realignment And Replacement Of Bridge St. Bridge	Replace the existing Bridge Street Bridge with a longer and higher elevated structure that reduces the number of in-stream support structures, reduces debris and sediment buildup, lowers the flood plain above and below the bridge, and allows for more stream capacity during high waters. This project would increase conveyance capacity and improve stream function for most flow conditions. At the same time, it would increase the access during floods and increase safety for the local community.	Proposed Project	\$2,800,000	N	1,2,3,5
Lower Muddy Brook Slope Repair	This project will repair and stabilize Lower Muddy Brook Slope and embankment near the intersection of Muddy Brook and Woodland Valley Roads.	Featured Project	\$202,257	N	1,2,3,5
Pantherkill Rd Slope Repair	This project will repair and stabilize the Pantherkill Road Slope and embankment along the south side of Pantherkill Road for a length of approximately 60 feet.	Featured Project	\$200,000	N	1,2,3,5
Silver Hollow Slope Stabilization	This project will repair and stabilize the Silver Hollow Slope and embankment near 19 Silver Hollow Road in the hamlet of Chichester.	Featured Project	\$200,000	N	1,2,3,5
Upper Muddy Brook Slope Repair	This project will repair and stabilize the Upper Muddy Brook Slope and embankment in the approximate location of 131 Muddy Brook Road.	Featured Project	\$150,013	N	1,2,3,5
Phoenicia Water System Upgrades	Upgrade the Phoenicia Water System to increase capacity and make it more flood-proof and resilient during high waters.	Featured Project	\$500,000	N	1, 4
Emergency Power Generation Hookup Improvements	Outfit lodging establishments, restaurants and gas stations (and perhaps other appropriate buildings) with quick connect capability to hook up generators after floods to ensure that each hamlet has locations with electricity for people to remain safe and access accommodations, showers, food and water.	Featured Project	\$50,000	N	3



TABLE 13. MASTER PROJECT TABLE - SHANDAKEN

Project Name	Short Project Description	Project Category	Estimated Cost	Regional Project (Y/N)	Strategy
Mt. Tremper Car Bridge - Phase 1	Remove and replace the Mt. Tremper Car Bridge with a pedestrian crossing. Phase 1: bridge removal	Featured Project	\$750,000	N	1,2,3
Mt. Tremper Car Bridge - Phase 2	Remove and replace the Mt. Tremper Car Bridge with a pedestrian crossing. Phase 2: pedestrian bridge design and replacement	Featured Project	\$2,500,000	N	2,5
Phoenicia Stream Restoration And Recreation Trail - Phase 1: Land Acquisition, Property Relocation; And Park Development	Acquire properties adjacent to the Bridge St. Bridge and create a park with associated amenities and flood protection measures. This phase 1 action is part of a greater stream restoration project that includes bridge replacement, elements of a recreational trail network connecting historic and cultural elements within the hamlet, as well as the acquisition and removal of flood prone structures, streambank restoration, and providing flood mitigation and reduction in flood elevation within the hamlet.	Featured Project	\$1,000,000	N	1,2,5
Phoenicia Stream Restoration And Recreation Trail - Phase 3: Streambank Restoration	Stream restoration and gravel harvesting near the Bridge St. Bridge to remove impediments and debris accumulation, increase flood protection for neighboring properties, improve stream function and conveyance and increase safety for residents and visitors. This phase 3 action is part of a greater stream restoration project that includes bridge replacement, elements of a recreational trail network connecting historic and cultural elements within the hamlet, as well as the acquisition and removal of flood prone structures, streambank restoration, and providing flood mitigation and reduction in flood elevation within the hamlet.	Featured Project	\$200,000	N	1,2,5



TABLE 13. MASTER PROJECT TABLE - SHANDAKEN

Project Name	Short Project Description	Project Category	Estimated Cost	Regional Project (Y/N)	Strategy
Phoenicia Stream Restoration and Recreation Trail - Phase 4: Construction of Amphitheater and Trail Connection(S)	Construct an amphitheater, trail, and trail network connections near the Bridge St. Bridge. This phase 4 action is part of a greater stream restoration project that includes bridge replacement, elements of a recreational trail network connecting historic and cultural elements within the hamlet, as well as the acquisition and removal of flood prone structures, streambank restoration, and providing flood mitigation and reduction in flood elevation within the hamlet.	Featured Project	\$1,500,000	N	1,2,5
Building Department Digital Upgrades	Plan and implement digital upgrade for the building department and provide GIS training for local officials to allow electronic post-storm building inspections and reports from the field and to increase the community CRS numbers.	Featured Project	\$30,000	N	4
Home And Business Flood Mitigation Improvements	Construct flood mitigation improvements for houses, businesses and assets located in hazard-prone areas to protect structures from future damage. Where appropriate, this may also include the acquisition and demolition of structures located in the hazard-prone areas to protect from future damage. Assuming 30 structures.	Featured Project	\$3,000,000	N	1,2,4,5
Communication Network Improvements	Improve the municipal communications network to provide emergency communications, cell and high-speed internet coverage, ensure redundancy of town communications capabilities and ensure dedicated phone line for town emergency management communications.	Additional Resiliency Recommendation	\$200,000	N	2,3



TABLE 13. MASTER PROJECT TABLE - SHANDAKEN

Project Name	Short Project Description	Project Category	Estimated Cost	Regional Project (Y/N)	Strategy
Enhanced Flood Prediction And Notification System	Create an enhanced flood prediction and notification system that has real-time flood threat recognition capability and utilizes the best available data, science and technology. Create additional stream gauge locations and support of gauge automation at specific sites, installation of precipitation monitoring stations, new town-wide weather data collection stations, and create command center call-in capability to Birch Creek, Stony Clove, Woodland Valley, Allaben, and any newly established USGS gauges.	Additional Resiliency Recommendation	\$200,000	Y	1
McKinley Hollow Bridge Area Mitigation Measures	Work on stream, roads and other flood mitigation measures on the Esopus above and below The McKinley Hollow Bridge in the hamlet of Oliveria. Remove gravel from approximately 300ft. downstream of McKinley Hollow to 200ft. upstream, including under the bridge.	Additional Resiliency Recommendation	\$250,000	N	1,3
Stream Corridor Management Initiative	Implement stream corridor management actions to address conditions causing repetitive flooding. Potential actions include selective gravel harvesting and development of gravel deposit areas, debris/impediment removal, stream bank restoration and stabilization, invasive species control among others.	Additional Resiliency Recommendation	\$200,000	N	1,5
Demolition Of Vacant/Abandoned Structures	Pursue demolition of vacant/ abandoned structures in town that are subject to environmental hazards such as mold.	Additional Resiliency Recommendation	Depends On # Of Properties	N	2,5



TABLE 14. MASTER PROJECT TABLE - HARDENBURGH

Project Name	Short Project Description	Project Category	Estimated Cost	Regional Project (Y/N)	Strategy
Ploutz Rd. and Millbrook Rd Bridge Construction	This project would construct an improved stream crossing structure that will replace two existing culverts with a 20' span bridge to cross an unnamed tributary of Millbrook Creek. The project will increase access and mobility, and improve stream function.	Proposed Project	\$250,000	N	1,2,3
Millbrook Rd. Bridge Replacement	This project will replace the existing bridge with a 20' span bridge at the Millbrook Road Belleayre Stream crossing 100 feet west of the intersection of Millbrook and Hinckley Roads. The project will increase access and mobility, and improve stream function.	Proposed Project	\$350,000	N	1,2,3
Hinckley Bridge	The project would replace the existing Hinckley Road Bridge at the Belleayre Stream crossing near the intersection of Hinckley Rd. and Millbrook Rd. The current configuration is an obstruction to the 100-year flood, disrupting flow and prohibiting ingress and egress from approaching roadways on either side. This project would make the roadway made passable by raising the road and replacing the structure.	Proposed Project	\$325,000	N	1,2,3
Millbrook Rd. Bridge Abutment Stabilization	The project would correct under-abutment scour on the west abutment of the Millbrook Rd. Bridge to stabilize the existing structure, thus ensuring safe mobility and access before, during and after a flood.	Proposed Project	\$35,000	N	1,2,3
Rider Hollow Rd/ Todd Mountain Rd. (intersection) Bridge replacement	Replace an antiquated bridge with a stream crossing structure capable of conveying larger flows. To help alleviate the existing roadway flooding condition, a replacement structure has been proposed that conveys the 100-year design flow without roadway overtopping and allows floating debris to pass through more easily	Proposed Project	\$75,000	N	1,2,3



TABLE 14. MASTER PROJECT TABLE - HARDENBURGH

Project Name	Short Project Description	Project Category	Estimated Cost	Regional Project (Y/N)	Strategy
Beaverkill Rd. Embankment Stabilization	The proposed road embankment stabilization project addresses erosion protection, stream restoration, and embankment repair, and would restore the stream to its pre-Irene channel conditions. Improvements would be made to the banks of Beaverkill Creek along Beaverkill Road, roughly 2000 feet before Monk's Compound, and would increase access, improve stream function, and increase safety for vehicular travel through the area.	Proposed Project	\$225,000	N	1,2,3,5
Backup Power Generators - Fixed installation	Install back-up propane generators for key community facilities to ensure the provision of essential services during a disaster. Facilities slated for the improvements include the Town Hall located at 51 Rider Hollow Road, and the two Highway Garages, located at 49 Rider Hollow Road and 192 Alder Creek Rd.	Proposed Project	\$180,000	N	3
Grant's Mill/ Millbrook Covered Bridge Relocation	Relocation of the Millbrook Covered bridge from its present location to a "dry dock" location approximately 300 feet to the east and placing it on concrete abutments. - Its current abutments are in a seriously precipitous condition. The Covered Bridge is on the NYS and National Historical Site list and this project would protect the historic structure, mitigates water surface elevation issues in the vicinity, and reduces tailwater conditions on the Mill Brook Road Bridge.	Proposed Project	\$200,000	N	1,2,3,5
Old Baker Road and Rider Hollow Road intersection Bridge Replacement	Replace the antiquated bridge on Rider Hollow Road with a new concrete slab bridge. This will alleviate the existing roadway flooding condition therefor have safety and mobility benefits. The new bridge will convey the 100-year design flow without roadway overtopping will allow floating debris to pass through more easily.	Proposed Project	\$75,000	N	1,2,3



TABLE 14. MASTER PROJECT TABLE - HARDENBURGH

Project Name	Short Project Description	Project Category	Estimated Cost	Regional Project (Y/N)	Strategy
Hardenburgh - Broadband Service Extension	Support Broadband service extension in the Beaverkill Valley, bringing broadband internet and improved communication services to the Beaverkill Valley on the south side of the mountain dividing the Town of Hardenburgh, currently an area unserved by broadband.	Proposed	\$416,000	Y	2,3
Upper Drybrook Road Stream Bed Management	The stream has deposited a large gravel bar and threatens to encroach into the road cutting off ingress egress by the residents upstream. This project will create increased access, improved stream function and increased safety for vehicular travel.	Featured Project	\$200,000	N	1,2,3
Beaverkill Road Stream and Stream Bank Restoration	Restore the Beaverkill Creek corridor and embankments back to its pre-Irene channel in the reach along Beaverkill Road, approximately 1000 ft. before Scudder Brook Bridge near Adler Creek Road.	Featured Project	\$125,000	N	1,2,3
Upper Drybrook Road Bank Stabilization and Stream Bed Management	Improvements to address road embankment failure 400 feet up from the intersection of Drybrook Rd. and Erickson Rd. The project calls for earthen and heavy stacked rock embankment fortification and stream bed management.	Featured Project	\$1,000,000	N	1,2,3,5
Hardenburgh Landing Zones	Identify helicopter landing zones outside of delineated floodplains	Additional Resiliency Recommendation	\$275,000	Y	3
Margaretville Hospital Helipad	Install a helipad at Margaretville Hospital	Additional Resiliency Recommendation		Y	1



PUBLIC ENGAGEMENT PROCESS

COMMUNICATIONS STRATEGY: A BLUEPRINT FOR PUBLIC ENGAGEMENT

Community collaboration and engagement are integral to recovery and resiliency efforts, from immediate post-disaster activities to identifying and implementing projects that guard against future devastation from storms. The public engagement process for Shandaken and Hardenburgh NYRCR advanced the NYRCR Program framework for community-driven resiliency initiatives that began with a communications strategy. This strategy was deliberately targeted to reach residents, homeowners, non-resident property owners, business owners, and community and social service organizations across both the public and private sectors.

A multi-faceted outreach campaign in Shandaken/Hardenburgh was launched and based on a communications strategy that considered



Courtesy of Tetra Tech

community demographics (age, education, socio-economic factors, etc.), the availability (or lack of availability) of Internet connectivity, as well as the visibility of venues that attract regular foot traffic (web-based and brick-and-mortar facilities such as storefronts, places of worship, health care outlets, etc.).

INFORMATION GATHERING THROUGH GRASSROOTS INPUT

The Planning Committee, working with the consultant solicited information and public opinions about community needs and opportunities relative to storm recovery and building resiliency. Public input about these needs and opportunities, in light of existing/non-existing community resources, critical assets, and essential redundancies, was instrumental to the development of proposed and featured project identification and plan

implementation.

Regular Planning Committee Meetings

Since the inception of the NYRCR Program in August 2013, the NYRCR Planning Committee, comprised of local residents, businesspeople, and community organizational stakeholders, met virtually weekly to discuss issues, prospective projects, and to advance the vetting and outreach processes. Guided by formal meeting agendas and Roberts Rules of Order, each meeting included time for public comment in an open, inviting environment and where meeting notes and summaries were recorded, reviewed, and then accepted at the subsequent meeting. Meetings were typically held at the Shandaken Town Hall, located at 7209 State Route 28, Shandaken.

All planning meetings were advertised on the NYRCR Program website, as well as on the Towns’ websites and Shandaken’s Face Book page and public access channel scroller. Shandaken also used Twitter to distribute information about meeting dates.

Cauliflower Festival – Education Booth, Survey

The 10th Annual Cauliflower Festival, held at the Margaretville Pavilion off Bridge Street, provided an early-stage opportunity for public education and information gathering about the NYRCR Program and the local project planning initiative. Attended by residents, second-property owners, and others throughout the region, the festival provided an ideal opportunity to educate the public about the reconstruction/resiliency program focus and to gather public input. An article describing the planning process and promoting the NYRCR outreach booth at the festival was advertised in the



Courtesy of Tetra Tech



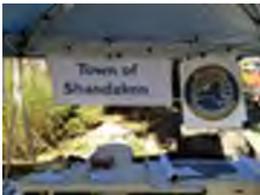
local newspaper.

A community survey was also distributed at the Cauliflower Festival to introduce the NYRCR Program to the public and to gauge storm damage and areas of among property owners. The booth was shared by the Margaretville NYRCR Committee with the NYRCR Shandaken/Hardenburgh Planning Committee (Committee), as the latter communities depend on Margaretville as a commercial hub. The information booth was an ideal opportunity to introduce the NYRCR Program to the public, and to engage them in discussions that led to valuable information gathering and exchanges.

Shandaken Fall Festival

The NYRCR Shandaken/Hardenburgh Planning Committee staffed a booth at the Fall Festival to (1) obtain public input regarding the public’s needs and concerns resulting from recent flooding events, and (2) solicit feedback from the public regarding their vision for the future of the Towns. Maps of the

communities were available for the public to review and mark up to indicate vulnerable areas and critical assets. The public was encouraged to fill out surveys to document their input.



Courtesy of Tetra Tech

Online, Hard-Copy Surveys

Surveys prepared for the general public and for community stakeholder organizations were developed, distributed, and publicized by the Committee via email, and were distributed in hard-copy form around the Towns in high-visibility, heavily-trafficked locations. The purpose of the surveys was to gather input regarding the impacts of storm events, and where community needs and opportunities exist to close the gap vis-à-vis potential projects for funding through the NYRCR Program and other funding channels.

While electronic surveys were tabulated using the online survey tool Survey Monkey®, hard-copy submissions were manually entered by the Consultant Team. The surveys documented both quantitative and qualitative information, and enabled participants to rank the importance of the six recovery support functions defined by the NYRCR Program.

Telephone Interviews

The Consultant Team also conducted telephone interviews with key community stakeholders representing organizations that included health care, business, social service,



Courtesy of Tetra Tech

education, non-profits, and first responders. While this largely qualitative information was also manually recorded in Survey Monkey®, results were consistent with other data collected, indicating infrastructure as the primary focus area for NYRCR Program funding.

Interactive Exercises

Attendees at the first public meeting (described below) indicated their prioritization of the recovery support functions through a mock spending exercise. Given “play” money, each community member in attendance indicated how they would spend NYRCR Program funding by placing their “dollars” in ballot boxes labeled by support function. Results from this exercise are indicated in the graph below and are largely consistent with all other forms of opinion gathering, suggesting that infrastructure and economic development were the top two areas on which the public felt the Committee should focus. Ultimately, the Committee used the results of this exercise as a basis for project identification.



ENGAGEMENT THROUGH PUBLIC MEETINGS

Three community-wide Public Engagement meetings were conducted to: educate the public about the NYRCR Program; obtain input from the Towns’ residents, property owners, and business owners; review the draft Conceptual Plan; review prospective proposed projects, featured projects and additional resiliency recommendations; based on public input, intelligence gathering, and scientific analysis.

Meeting dates and locations included:

Public Engagement Meeting #1: October 19, 2013, 1:00 – 4:00 p.m., Belleayre Ski Center

The purpose of the meeting was to inform the public of the NYRCR planning process and obtain input on the visioning and goals of the plan, in addition to eliciting input on the public’s perception of the needs and opportunities facing the Towns of



Courtesy of Tetra Tech

Shandaken and Hardenburgh. This meeting provided a platform for attendees to share ideas on ways to spend financial resources on projects that focus on the recovery, build

resiliency in the community, and meet one of the six recovery functions of the plan. To gauge the public’s level of concern regarding each of these categories, the attendees were asked to participate in an interactive exercise investing Shandaken and Hardenburgh “money” in the six needs areas. The Committee used the results of this exercise to provide a basis for future prioritization of needs in the NYRCR Shandaken/Hardenburgh Plan.

Public Engagement Meeting #2: November 9, 2013, 1:00 – 4:00 p.m., Belleayre Ski Center

The purpose of this meeting was to solicit comments on the draft NYRCR Conceptual Plan and

to gather input on strategies and implementation projects aimed to increase the resiliency of the Towns.

This Saturday event was well-attended by about 85 people who engaged in dialogue and spent considerable time pouring over the many area maps posted around the room. This enabled them to see where their properties are located relative to waterways and topography.

Public Engagement Meeting #3: February 18, 2014, 7:00 – 9:00 p.m., Shandaken Town

Despite an ominous early day of snow, skies largely cleared for the evening meeting at Shandaken



Courtesy of Tetra Tech, 2014

Town Hall, which was attended by about 45 members of the public. The

audience listened intently to a presentation that showcased the NYRCR Shandaken/Hardenburgh Plan process and how proposed and featured projects came to be prospectively identified. Public response, by way of verbal and written comments, provided valuable feedback that helped fine-tune and shape the proposed and featured projects for the ultimate NYRCR Shandaken/Hardenburgh Plan.

Meeting Hand-Outs, Visuals

- Agendas
- Frequently Asked Questions about the NYRCR Program
- Vision and Goals
- Conceptual Plan
- Maps and HEC-RAS Modeling

A fourth and final public meeting will be held to unveil Shandaken and Hardenburgh’s NYRCR Plan.

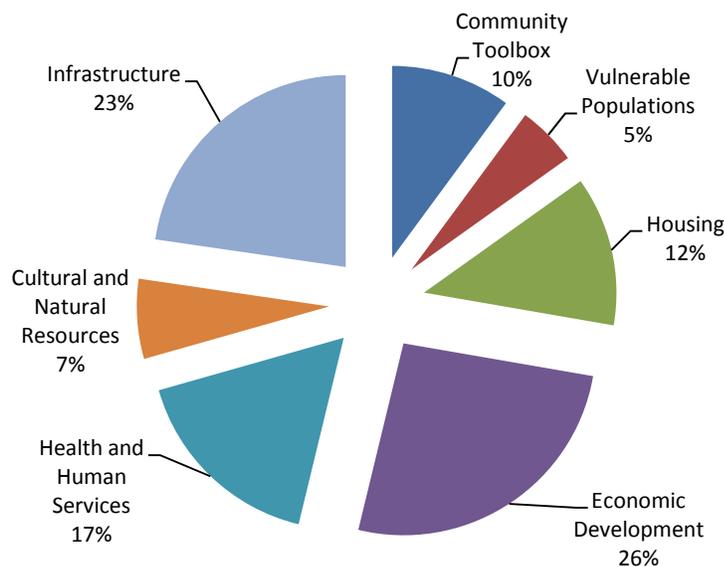


The three Public meetings were all videotaped and viewable on Shandaken’s public access channel. This proved to be a most valuable outreach service for those who could not attend meetings.

WHAT WE HEARD, WHAT WE LEARNED

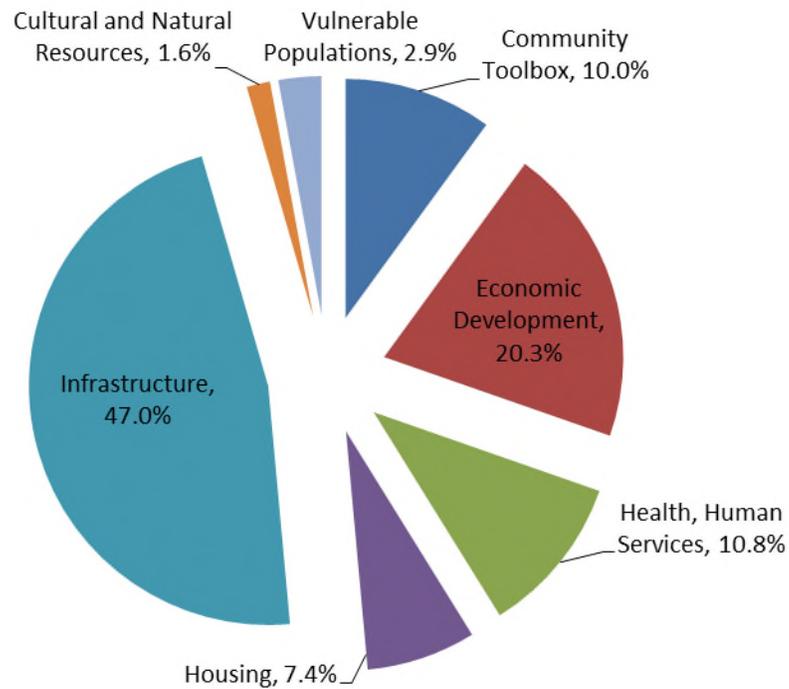
The place where public opinion and scientific observation and analysis met ultimately formed the basis for proposed projects, featured projects, and additional resiliency recommendations. The graphs below indicate results of electronic and hard-copy surveys, public opinion gathered through the interactive exercises at the public meetings, and verbal input collected at all meetings. The pie charts here are indicative of the public’s ranking of the six recovery support functions. Overall, public opinion prioritized the need to focus resiliency efforts on infrastructure improvements in both communities.

FIGURE 40. SHANDAKEN RECOVERY SUPPORT FUNCTION PRIORITIZATION PUBLIC MEETING 1

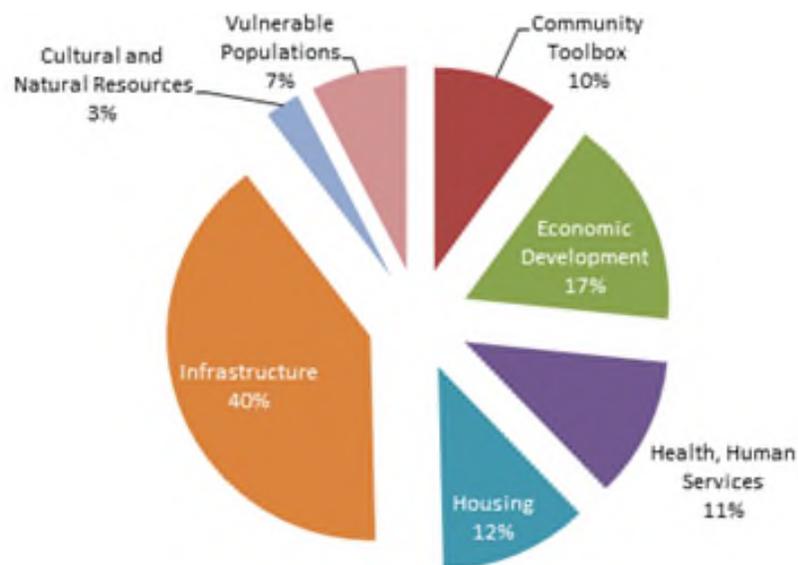




**FIGURE 41. SHANDAKEN RECOVERY SUPPORT FUNCTION PRIORITIZATION
PUBLIC MEETING 2**



**FIGURE 42. SHANDAKEN SURVEYS RESULTS (ELECTRONIC, HARD-COPY,
INTERVIEWS)**





**FIGURE 43. HARDENBURGH RECOVERY SUPPORT FUNCTION PRIORITIZATION
 PUBLIC MEETINGS 1 (LEFT) AND 2 (RIGHT)**

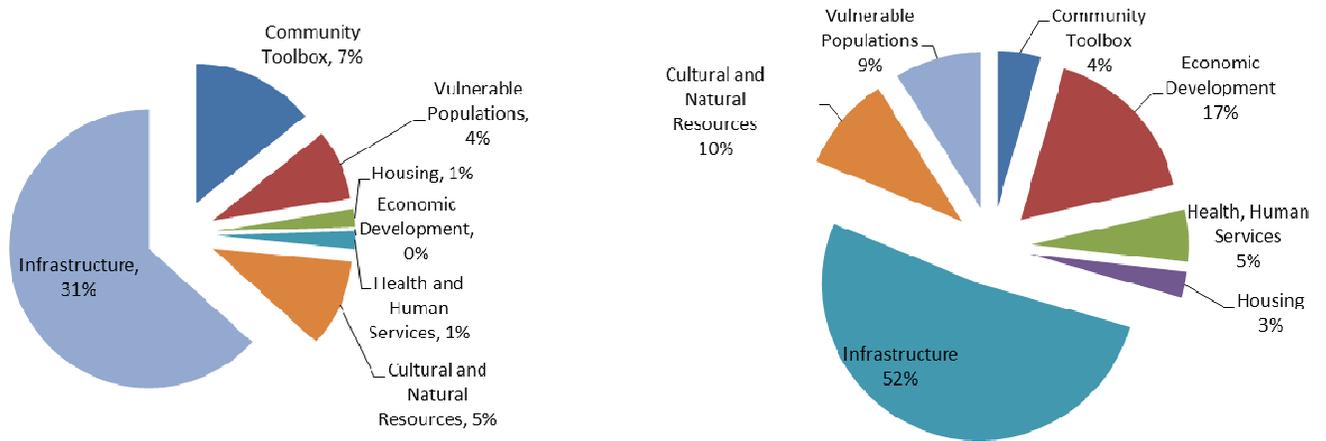
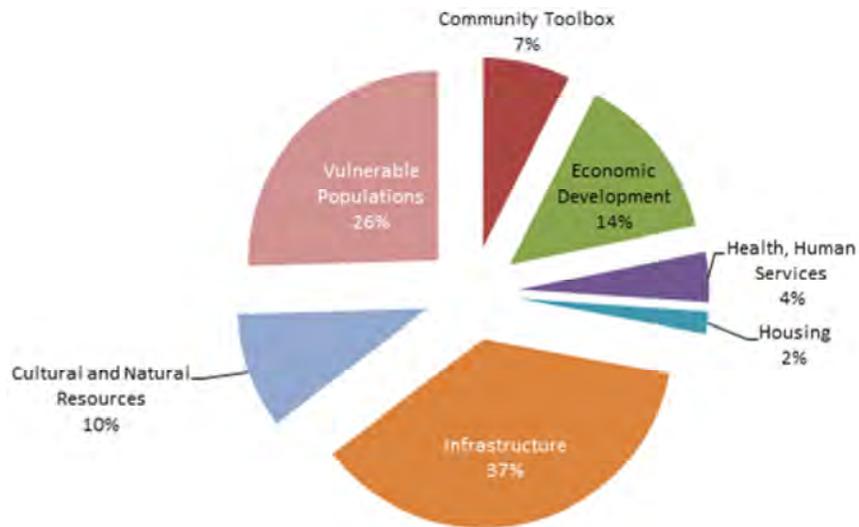


FIGURE 44. HARDENBURGH SURVEYS RESULTS (ELECTRONIC, HARD-COPY, INTERVIEWS)





GETTING THE WORD OUT

The demographic profile of Shandaken and Hardenburgh showed that residential target audiences for messaging include sizeable aging and low-income populations that either do not have access to the Internet, or choose not to use it. Public outreach efforts incorporated a wide variety of multi-media messages to educate readers/viewers about the NYRCR Program and localized meetings and opportunities for public input, including:

- media alerts
- newspaper advertisements (print and online)
- informational flyers and posters
- web site notifications (including NYRCR Program, Towns)
- community/school web sites
- social media (YouTube, FaceBook, Twitter, Constant Contact)
- public access channel scrollers
- public access channel meeting recordings
- in-mailbox postcards and letters



Above: This newspaper advertisement was also a poster for distribution around the Towns in locations with high visibility.

Below: A postcard was sent to every property owner in Shandaken and Hardenburgh, each individually tailored to the respective Town.

Courtesy of Tetra Tech





SHANDAKEN COMMUNITY ASSET INVENTORY

Risk Assessment Tool

Asset Information							Landscape Attributes							Risk Assessment				Optional: Risk Assessment (500-year event)			
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Key Bank	Extreme	Economic	Banks and Financial Services	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	3.50	5	53	4	3.50	5	70
Ulster Savings Bank	Extreme	Economic	Banks and Financial Services	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	3.50	5	53	4	3.50	5	70
Country Store	Extreme	Economic	Grocery/Food Suppliers	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	No	No	2	3	4.00	5	60	4	4.00	5	80
Phoenicia Deli	Extreme	Economic	Grocery/Food Suppliers	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	3.50	5	53	4	3.50	5	70
Catskill Rose	Extreme	Economic	Lodging	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	3.50	5	53	4	3.50	5	70
Catskill Rose Restaurant	Extreme	Economic	Restaurants	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	3.50	5	53	4	3.50	5	70
Tavern 214	Extreme	Economic	Restaurants	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	3.50	5	53	4	3.50	5	70
FS Adventures	Extreme	Economic	Tourism Destinations	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	3.50	5	53	4	3.50	5	70
Town Tinker Tubes	Extreme	Economic	Tourism Destinations	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	No	No	2	3	4.00	5	60	4	4.00	5	80
Phoenicia Firehouse/FC 1	Extreme	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	Yes	Yes	No	No	No	1.5	3	3.50	5	53	4	3.50	5	70
Phoenicia Pharmacy	Extreme	Health_and_Social_Services	Undefined	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	3.50	5	53	4	3.50	5	70
PARACO GAS-Phoenicia	Extreme	Infrastructure Systems	Liquid Fuels	Yes	Yes, FEMA	High	Yes	Yes	Yes	Yes	No	No	2	3	4.00	5	60	4	4.00	5	80
STONY CLOVE CREEK	Extreme	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	No	No	Yes	2	3	4.00	3	36	4	4.00	3	48
ESOPUS CREEK	Extreme	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	Yes	Yes	No	Yes	2.5	3	4.50	3	41	4	4.50	3	54
TRIB ESOPUS CREEK	Extreme	Infrastructure Systems	Transportation	Yes	No	Medium	Yes	Yes	Yes	Yes	No	Yes	2.5	3	4.50	3	41	4	4.50	3	54
COUNTY ROAD 121	Extreme	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	Yes	No	No	Yes	2	3	4.00	3	36	4	4.00	3	48
BEAVER KILL	Extreme	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	4.00	3	36	4	4.00	3	48
ESOPUS CREEK OVFL	Extreme	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	No	No	Yes	2	3	4.00	3	36	4	4.00	3	48
ESOPUS CREEK	Extreme	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	4.00	3	36	4	4.00	3	48
ESOPUS CREEK	Extreme	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	Yes	2	3	4.00	3	36	4	4.00	3	48
ESOPUS CREEK	Extreme	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	Yes	No	Yes	2.5	3	4.50	3	41	4	4.50	3	54
ESOPUS CREEK poor	Extreme	Infrastructure Systems	Transportation	No	No	Low	Yes	Yes	Yes	No	No	Yes	2	3	4.00	3	36	4	4.00	3	48
Phoenicia	Extreme	Infrastructure Systems	Transportation	Yes	No	Medium	Yes	Yes	Yes	Yes	No	No	2	3	4.00	5	60	4	4.00	5	80



Risk Assessment Tool																					
Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Phoenicia Junction	Extreme	Infrastructure Systems	Transportation	Yes	No	Low	Yes	Yes	Yes	Yes	No	No	2	3	4.00	5	60	4	4.00	5	80
BEAVER KILL	Extreme	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	4.00	3	36	4	4.00	3	48
High Street Pump House	Extreme	Infrastructure Systems	Water Supply	No	Yes, FEMA	High	Yes	Yes	Yes	No	No	Yes	2	3	4.00	2	24	4	4.00	2	32
Phoenicia Water District Storage	Extreme	Infrastructure Systems	Water Supply	No	Yes, FEMA	High	Yes	Yes	Yes	Yes	No	No	2	3	4.00	2	24	4	4.00	2	32
LAZY MEADOW	Extreme	Infrastructure Systems	Water Supply	No	No	Low	Yes	Yes	No	No	No	No	1	3	3.00	2	18	4	3.00	2	24
CATSKILL ROSE	Extreme	Infrastructure Systems	Water Supply	Yes	No	Low	Yes	Yes	No	No	No	No	1	3	3.00	2	18	4	3.00	2	24
PHOENICIA WATER DISTRICT	Extreme	Infrastructure Systems	Water Supply	No	No, Locally Significant	High	Yes	Yes	No	No	No	Yes	1.5	3	3.50	2	21	4	3.50	2	28
PHOENICIA WATER DISTRICT	Extreme	Infrastructure Systems	Water Supply	No	No, Locally Significant	High	Yes	Yes	No	No	No	Yes	1.5	3	3.50	2	21	4	3.50	2	28
Culvert	Extreme	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	No	No	No	No	1	3	3.00	3	27	4	3.00	3	36
Main St/ Plank Rd	Extreme	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	Yes	No	No	2	3	4.00	3	36	4	4.00	3	48
High St.	Extreme	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	3.50	3	32	4	3.50	3	42
Stony Clove Creek	Extreme	Infrastructure Systems	Water Supply	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	Yes	2	3	4.00	3	36	4	4.00	3	48
Esopus Creek	Extreme	Infrastructure Systems	Water Supply	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	Yes	2	3	4.00	3	36	4	4.00	3	48
Phoenicia Wesleyan Church	Extreme	Natural and Cultural Resources	Cultural or Religious Establishments	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	3.50	5	53	4	3.50	5	70
Empire State Railway Museum	Extreme	Natural and Cultural Resources	Historic Landmarks and Facilities	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	No	No	2	3	4.00	5	60	4	4.00	5	80
Phoenicia Library	Extreme	Natural and Cultural Resources	Libraries	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	3.50	5	53	4	3.50	5	70
Shandaken Theatrical Society Playhouse	Extreme	Natural and Cultural Resources	Museums, Performing Arts Centers, and Stadiums	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	3.50	5	53	4	3.50	5	70
Big Indian Park	Extreme	Natural and Cultural Resources	Parks and Recreation	No	0	Medium	Yes	Yes	No	No	No	Yes	1.5	3	3.50	1	11	4	3.50	1	14
Black Bear Campground	Extreme	Natural and Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	No	Yes	2.5	3	4.50	1	14	4	4.50	1	18
Phoenicia Supermarket	High	Economic	Grocery/Food Suppliers	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	No	No	2	3	3.00	5	45	4	3.00	5	60



Risk Assessment Tool																					
Asset Information							Landscape Attributes							Risk Assessment				Optional: Risk Assessment (500-year event)			
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Farmer Jones Baby Barns	High	Economic	Industrial, Warehousing and Manufacturing	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	Yes	No	2.5	3	3.50	5	53	4	3.50	5	70
Colonial Inn	High	Economic	Lodging	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2.50	5	38	4	2.50	5	50
Weyside Cabins and Inn	High	Economic	Lodging	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2.50	5	38	4	2.50	5	50
Apple Tree Inn	High	Economic	Lodging	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	Yes	No	2.5	3	3.50	5	53	4	3.50	5	70
Rock Cut Ledge Cottages	High	Economic	Lodging	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	Yes	Yes	3	3	4.00	5	60	4	4.00	5	80
Jeff Collins Stone Yard	High	Economic	Small Business	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	No	No	2	3	3.00	2	18	4	3.00	2	24
Shandaken Firehouse	High	Health and Social Services	Emergency Operations/Response	No	Yes, FEMA	High	Yes	Yes	Yes	Yes	Yes	No	2.5	3	3.50	5	53	4	3.50	5	70
Ambulance and EMS	High	Health and Social Services	Emergency Operations/Response	No	Yes, FEMA	High	Yes	Yes	Yes	No	No	No	1.5	3	2.50	5	38	4	2.50	5	50
Paramedic Housing	High	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	Yes	Yes	Yes	No	No	2	3	3.00	5	45	4	3.00	5	60
Town Hall/TV	High	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	Yes	Yes	No	Yes	No	2	3	3.00	5	45	4	3.00	5	60
Town Highway Garage/ Radio	High	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	Yes	Yes	No	Yes	Yes	2.5	3	3.50	5	53	4	3.50	5	70
PHOENICIA FS 2	High	Health and Social Services	Emergency Operations/Response	No	Yes, FEMA	High	Yes	Yes	Yes	Yes	Yes	No	2.5	3	3.50	5	53	4	3.50	5	70
Shandaken Town Hall	High	Health and Social Services	Government and Administrative Services	Yes	Yes, FEMA	High	Yes	Yes	Yes	No	Yes	No	2	3	3.00	5	45	4	3.00	5	60
Town of Shandaken	High	Health and Social Services	Government and Administrative Services	Yes	Yes, FEMA	High	Yes	Yes	Yes	No	Yes	Yes	2.5	3	3.50	5	53	4	3.50	5	70
Mount Tremper PO	High	Health and Social Services	Government and Administrative Services	Yes	No	Low	Yes	Yes	Yes	Yes	Yes	Yes	3	3	4.00	5	60	4	4.00	5	80
Phoenicia PO	High	Health and Social Services	Government and Administrative Services	Yes	No	Low	Yes	Yes	Yes	Yes	No	No	2	3	3.00	5	45	4	3.00	5	60
Shandaken PO	High	Health and Social Services	Government and Administrative Services	Yes	No, Locally Significant	Low	Yes	Yes	Yes	Yes	Yes	No	2.5	3	3.50	5	53	4	3.50	5	70
DMV	High	Health and Social Services	Government and Administrative Services	Yes	No	Low	Yes	Yes	Yes	No	Yes	No	2	3	3.00	5	45	4	3.00	5	60



Risk Assessment Tool																					
Asset Information							Landscape Attributes							Risk Assessment				Optional: Risk Assessment (500-year event)			
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Emergency Heliport for Traumatic Incidents	High	Health_and_Social_Services	Emergency Operations/Response	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2.50	3	23	4	2.50	3	30
Ulster County DPW Sub Station	High	Health_and_Social_Services	Public Works Facilities	No	No, Locally Significant	High	Yes	Yes	No	No	No	No	1	3	2.00	2	12	4	2.00	2	16
C87001A	High	Infrastructure Systems	Stormwater	No	No	High	Yes	Yes	No	Yes	Yes	No	2	3	3.00	3	27	4	3.00	3	36
C870151	High	Infrastructure Systems	Stormwater	Yes	No, Locally Significant	High	Yes	Yes	No	Yes	Yes	Yes	2.5	3	3.50	3	32	4	3.50	3	42
Town Highway Garage/ Radio	High	Infrastructure Systems	Telecommunications	Yes	Yes, FEMA	High	Yes	Yes	Yes	No	Yes	Yes	2.5	3	3.50	2	21	4	3.50	2	28
BROAD ST HOLLOW	High	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
BUSHNELLSVILLE CK	High	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
BIRCH CREEK	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
BUSHNELLSVILLE CK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
BUSHNELLSVILLE CK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
BUSHNELLSVILLE CRK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
BUSHNELLSVILLE CRK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
SHANDAKEN TUN OLT	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	No	1.5	3	2.50	3	23	4	2.50	3	30
PECK HOLLOW STRM	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	No	1.5	3	2.50	3	23	4	2.50	3	30
ESOPUS CREEK	High	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	Yes	Yes	Yes	3	3	4.00	3	36	4	4.00	3	48
ESOPUS CREEK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
WOODLAND CREEK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
BUSHNELLSVILLE CK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
WARNER CREEK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
ESPOUS CREEK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	Yes	No	Yes	2.5	3	3.50	3	32	4	3.50	3	42
PANTHER KILL	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	No	1.5	3	2.50	3	23	4	2.50	3	30
PANTHER KILL	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	No	1.5	3	2.50	3	23	4	2.50	3	30
ESOPUS CREEK	High	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
ESOPUS CREEK	High	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	Yes	No	Yes	2.5	3	3.50	3	32	4	3.50	3	42



Risk Assessment Tool																					
Asset Information							Landscape Attributes							Risk Assessment				Optional: Risk Assessment (500-year event)			
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
		Systems																			
WOODLAND CREEK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
FOX HOLLOW CREEK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
BROAD ST HOLLOW	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	5	3.00	3	45
CATHEDRAL GLEN	High	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	5	3.00	3	45
BIRCH CREEK	High	Infrastructure Systems	Transportation	No	No	Low	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
STONY CLOVE CREEK	High	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
ROSE MOUNTAIN ST	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2.50	3	23	4	2.50	3	30
FOX HOLLOW BROOK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
CATHEDRAL GLEN/ Historic Stone Arch Bridge	High	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
BUSHNELLSVILLE CK	High	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	4	3.00	3	36
BIRCH CREEK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
BIRCH CREEK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	5	3	3	45
STONY CLOVE CREEK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	5	3	3	45
BROAD ST HOLLW BK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	5	3	3	45
STONY CLOVE CREEK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
ESOPUS CREEK	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	Yes	No	Yes	2.5	3	3.5	3	31.5	4	3.5	3	42
BIRCH CREEK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
ESOPUS CREEK	High	Infrastructure Systems	Transportation	No	No	Medium	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
ESOPUS CREEK	High	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
ESOPUS CREEK	High	Infrastructure Systems	Transportation	No	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
ESOPUS CREEK poor Mt. Pleasant/Tremper Bridge	High	Infrastructure Systems	Transportation	No	No	Low	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
	High	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	Yes	Yes	No	Yes	2.5	3	3.5	3	31.5	4	3.5	3	42



Risk Assessment Tool																					
Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
BIRCH CREEK	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
CATHEDRAL GLEN	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
WARNER CREEK	High	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
PANTHER KILL	High	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
Phoenicia Water District Main Filtration Plant	High	Infrastructure Systems	Water Supply	No	0	High	Yes	Yes	Yes	Yes	No	No	2	3	3	2	18	4	3	2	24
AYURMEDIX USA	High	Infrastructure Systems	Water Supply	No	No	Low	Yes	Yes	No	No	No	No	1	3	2	2	12	4	2	2	16
PHOENICIA WATER DISTRICT	High	Infrastructure Systems	Water Supply	No	No	High	Yes	Yes	No	No	No	No	1	3	2	2	12	4	2	2	16
PINE HILL WATER COMPANY	High	Infrastructure Systems	Water Supply	Yes	No, Locally Significant	High	Yes	Yes	No	No	No	No	1	3	2	2	12	4	2	2	16
WOODLAND VALLEY CAMPGROUND	High	Infrastructure Systems	Water Supply	No	No	Low	Yes	Yes	Yes	No	No	No	1.5	3	2.5	2	15	4	2.5	2	20
STARLITE MOTEL (SHAND)	High	Infrastructure Systems	Water Supply	No	No	Low	Yes	Yes	Yes	No	No	No	1.5	3	2.5	2	15	4	2.5	2	20
CATSKILL SEASONS INN	High	Infrastructure Systems	Water Supply	Yes	No	Low	Yes	Yes	Yes	No	No	No	1.5	3	2.5	2	15	4	2.5	2	20
COLONIAL INN	High	Infrastructure Systems	Water Supply	Yes	No	Low	Yes	Yes	Yes	No	No	No	1.5	3	2.5	2	15	4	2.5	2	20
WOODLAND VALLEY CAMPGROUND	High	Infrastructure Systems	Water Supply	No	No	Low	Yes	Yes	No	No	No	No	1	3	2	2	12	4	2	2	16
EMERSON INN & SPA	High	Infrastructure Systems	Water Supply	No	No	Low	Yes	Yes	No	No	No	No	1	3	2	2	12	4	2	2	16
SLIDE MOUNTAIN FOREST HOUSE	High	Infrastructure Systems	Water Supply	No	No	Medium	Yes	Yes	No	No	No	No	1	3	2	2	12	4	2	2	16
AYURMEDIX USA	High	Infrastructure Systems	Water Supply	No	No	Low	Yes	Yes	No	No	No	No	1	3	2	2	12	4	2	2	16
SLEEPY HOLLOW CAMPSITE	High	Infrastructure Systems	Water Supply	Yes	No	Low	Yes	Yes	No	No	No	Yes	1.5	3	2.5	2	15	4	2.5	2	20
PEEKAMOOS RESTAURANT & TAP ROOM	High	Infrastructure Systems	Water Supply	No	No	Low	Yes	Yes	No	No	No	No	1	3	2	2	12	4	2	2	16
COPPER HOOD INN	High	Infrastructure Systems	Water Supply	Yes	No	Low	Yes	Yes	No	Yes	No	No	1.5	3	2.5	2	15	4	2.5	2	20
CATSKILL SEASONS INN	High	Infrastructure Systems	Water Supply	No	No	Low	Yes	Yes	No	No	No	No	1	3	2	2	12	4	2	2	16
COLONIAL INN	High	Infrastructure Systems	Water Supply	Yes	No	Low	Yes	Yes	No	No	No	No	1	3	2	2	12	4	2	2	16



Risk Assessment Tool																					
Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
MARKS MOUNTAIN BROOK INN, INC	High	Infrastructure Systems	Water Supply	Yes	No	Low	Yes	Yes	No	No	No	No	1	3	2	2	12	4	2	2	16
Bottini Fuel Storage facility	High	Infrastructure Systems	Hazardous Materials, Solid Waste, and Recycling	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
Panther Kill Road Bridge	High	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
Muller Road Bridge	High	Infrastructure Systems	Transportation	No	0	High	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
Lost Clove Road Culvert	High	Infrastructure Systems	Transportation	No	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
Little Peck Hollow Culvert	High	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
Main Street Bridge	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
Cruckshank Road Culvert	High	Infrastructure Systems	Transportation	No	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
Alpine Road Culvert	High	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
Elm Street Culvert/ HISTORIC Stone Arch Bridge	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
Station & Bonnieview twin bridges	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
Lower Birch Creek Culvert	High	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
Academy Street Culvert/ Historic Stone Arch Bridge	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
Cold Brook Road Culvert	High	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
Cathedral Glen Bridge	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2.5	3	22.5	4	2.5	3	30
State Route 42	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36



Risk Assessment Tool																					
Asset Information							Landscape Attributes							Risk Assessment				Optional: Risk Assessment (500-year event)			
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Plank Rd., Phoenicia	High	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
Station Rd.	High	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	No	Yes	2.5	3	3.5	3	31.5	4	3.5	3	42
Secondary Well Source -Pine Hill Water	High	Infrastructure_Systems	Water Supply	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	Yes	2	3	3	3	27	4	3	3	36
St Francis DeSales Church Parish Hall	High	Natural_and_Cultural_Resources	Cultural or Religious Establishments	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	No	No	2	3	3	5	45	4	3	5	60
Methodist Church	High	Natural_and_Cultural_Resources	Cultural or Religious Establishments	No	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	No	No	2	3	3	5	45	4	3	5	60
Fox Hollow Railroad Bridge	High	Natural_and_Cultural_Resources	Historic Landmarks and Facilities	No	0	Medium	Yes	Yes	Yes	No	No	Yes	2	3	3	1	9	4	3	1	12
DEC Flood Control Levee	High	Natural_and_Cultural_Resources	Natural Protective Features	Yes	No, Locally Significant	High	Yes	Yes	No	No	No	No	1	3	2	1	6	4	2	1	8
Dyke Rd DEC Flood Control Levee	High	Natural_and_Cultural_Resources	Natural Protective Features	Yes	No, Locally Significant	High	Yes	Yes	No	No	No	Yes	1.5	3	2.5	1	7.5	4	2.5	1	10
Dyke Rd DEC Flood Control Levee	High	Natural_and_Cultural_Resources	Natural Protective Features	Yes	No, Locally Significant	High	Yes	Yes	No	No	No	Yes	1.5	3	2.5	1	7.5	4	2.5	1	10
Smith Park	High	Natural_and_Cultural_Resources	Parks and Recreation	Yes	No, Locally Significant	Medium	Yes	Yes	No	No	No	No	1	3	2	1	6	4	2	1	8
Parish Field	High	Natural_and_Cultural_Resources	Parks and Recreation	Yes	No, Locally Significant	Medium	Yes	Yes	No	Yes	No	No	1.5	3	2.5	1	7.5	4	2.5	1	10
Sleepy Hollow Campground	High	Natural_and_Cultural_Resources	Parks and Recreation	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	Yes	2	3	3	1	9	4	3	1	12
Uncle Pete's Campground	High	Natural_and_Cultural_Resources	Parks and Recreation	No	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	Yes	2	3	3	1	9	4	3	1	12
Magliorelli Farm Stand	Moderate	Economic	Grocery/Food Suppliers	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	Yes	No	2	3	2.5	4	30	4	2.5	4	40
Andersen's Cabins	Moderate	Economic	Lodging	No	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2	4	24	4	2	4	32
Emerson Resort and Spa	Moderate	Economic	Lodging	No	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2	4	24	4	2	4	32
Kate's Lazy Meadow Cottages	Moderate	Economic	Lodging	No	No, Locally Significant	Medium	Yes	Yes	Yes	No	Yes	No	2	3	2.5	4	30	4	2.5	4	40
J Rocco's Steakhouse	Moderate	Economic	Restaurants	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2	4	24	4	2	4	32



Risk Assessment Tool																					
Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Peekamoose Restaurant & Tap Room	Moderate	Economic	Restaurants	No	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2	4	24	4	2	4	32
Cold Spring Lodge	Moderate	Economic	Restaurants	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2	4	24	4	2	4	32
Catskill Mountain Tourist Train	Moderate	Economic	Tourism Destinations	No	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2	4	24	4	2	4	32
Chichester PO	Moderate	Health and Social Services	Government and Administrative Services	Yes	No	Low	Yes	Yes	Yes	No	No	No	1.5	3	2	4	24	4	2	4	32
Phoenicia Public School	Moderate	Health and Social Services	Schools	No	Yes, FEMA	High	Yes	Yes	Yes	No	No	No	1.5	3	2	4	24	4	2	4	32
Emergency Heliport -Landing Zone	Moderate	Health_and_Social_Services	Emergency Operations/Response	Yes	No, Locally Significant	High	Yes	Yes	No	No	No	No	1	3	1.5	2	9	4	1.5	2	12
C870150	Moderate	Infrastructure Systems	Stormwater	No	No	High	Yes	Yes	No	No	Yes	No	1.5	3	2	2	12	4	2	2	16
C870109	Moderate	Infrastructure Systems	Stormwater	Yes	No	Medium	Yes	Yes	No	No	Yes	No	1.5	3	2	2	12	4	2	2	16
Town Hall/TV	Moderate	Infrastructure Systems	Telecommunications	Yes	Yes, FEMA	High	Yes	Yes	Yes	No	Yes	No	2	3	2.5	4	30	4	2.5	4	40
Verizon Station	Moderate	Infrastructure Systems	Telecommunications	Yes	Yes, FEMA	High	Yes	Yes	Yes	No	No	No	1.5	3	2	4	24	4	2	4	32
ROCHESTER HOLLOW	Moderate	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	No	No	No	1.5	3	2	2	12	4	2	2	16
ROMER MTN KILL	Moderate	Infrastructure Systems	Transportation	No	No	High	Yes	Yes	Yes	No	No	No	1.5	3	2	2	12	4	2	2	16
BURNS BROOK	Moderate	Infrastructure Systems	Transportation	Yes	No	High	Yes	Yes	Yes	No	Yes	No	2	3	2.5	2	15	4	2.5	2	20
PINE HILL WWTP	Moderate	Infrastructure Systems	Wastewater	Yes	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2	2	12	4	2	2	16
PINE HILL WATER COMPANY	Moderate	Infrastructure Systems	Water Supply	Yes	No, Locally Significant	High	Yes	Yes	No	No	No	No	1	3	1.5	1	4.5	4	1.5	1	6
EMERSON INN & SPA	Moderate	Infrastructure Systems	Water Supply	No	No	Low	Yes	Yes	Yes	No	No	No	1.5	3	2	1	6	4	2	1	8
UNCLE PETES CAMPGROUND	Moderate	Infrastructure Systems	Water Supply	No	No	Low	Yes	Yes	No	No	No	No	1	3	1.5	1	4.5	4	1.5	1	6
COLD SPRING LODGE	Moderate	Infrastructure Systems	Water Supply	Yes	No	Medium	Yes	Yes	No	No	No	No	1	3	1.5	1	4.5	4	1.5	1	6
COLD SPRING LODGE	Moderate	Infrastructure Systems	Water Supply	Yes	No	Low	Yes	Yes	No	No	No	No	1	3	1.5	1	4.5	4	1.5	1	6
J ROCCOS STEAKHOUSE	Moderate	Infrastructure Systems	Water Supply	Yes	No	Low	Yes	Yes	No	No	No	No	1	3	1.5	1	4.5	4	1.5	1	6
Electric Power Switching Facility	Moderate	Infrastructure_Systems	Power Supply	No	Yes, FEMA	High	Yes	Yes	Yes	No	No	No	1.5	3	2	2	12	4	2	2	16
Tonche Bus Corp.	Moderate	Infrastructure_Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	Yes	No	No	No	1.5	3	2	2	12	4	2	2	16
Fox Hollow Culvert	Moderate	Infrastructure_Systems	Transportation	No	0	High	Yes	Yes	Yes	No	No	No	1.5	3	2	2	12	4	2	2	16



Risk Assessment Tool																					
Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
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Dutcher Bridge	Moderate	Infrastructure_Systems	Transportation	No	0	High	Yes	Yes	Yes	No	No	No	1.5	3	2	2	12	4	2	2	16
Culvert	Moderate	Infrastructure_Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	No	No	No	No	1	3	1.5	2	9	4	1.5	2	12
culvert	Moderate	Infrastructure_Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	No	No	No	No	1	3	1.5	2	9	4	1.5	2	12
Phoenicia Fish & Game Club	Moderate	Natural_and_Cultural_Resources	Hunting and Fishing Lands	No	No, Locally Significant	Low	Yes	Yes	Yes	No	No	No	1.5	3	2	4	24	4	2	4	32
Empire State Railway Museum	Moderate	Natural_and_Cultural_Resources	Museums, Performing Arts Centers, and Stadiums	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	Yes	No	No	2	3	2.5	4	30	4	2.5	4	40
Emerson Coffee Shoppe	N/A	Economic	Grocery/Food Suppliers	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Belleayre Plaza	N/A	Economic	Grocery/Food Suppliers	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Big Indian Market & Deli	N/A	Economic	Grocery/Food Suppliers	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Shandaken, Town of Mine	N/A	Economic	Industrial, Warehousing and Manufacturing	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Umhay, Arthur Mine	N/A	Economic	Industrial, Warehousing and Manufacturing	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
LONGHOUSE LODGE - NP	N/A	Economic	Lodging	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
SUNSET LODGE- NP	N/A	Economic	Lodging	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Pine Hill Arms	N/A	Economic	Lodging	Yes	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Copperhood Inn and Spa	N/A	Economic	Lodging	Yes	No, Locally Significant	Medium	Yes	No	No	Yes	No	No	1	3	FALSE	3	0	4	FALSE	3	0
Belleayre Lodge and Cabins	N/A	Economic	Lodging	Yes	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Starlite Motel	N/A	Economic	Lodging	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Slide Mtn Forst House	N/A	Economic	Lodging	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Alpine Inn	N/A	Economic	Lodging	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Catskill Seasons Inn	N/A	Economic	Lodging	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Phoenicia Lodge and Cabins	N/A	Economic	Lodging	Yes	No, Locally Significant	Medium	Yes	No	No	Yes	No	No	1	3	FALSE	3	0	4	FALSE	3	0
Simpler Times Cabin	N/A	Economic	Lodging	Yes	No, Locally Significant	Medium	Yes	No	No	Yes	No	No	1	3	FALSE	3	0	4	FALSE	3	0
Menla Mountain Retreat	N/A	Economic	Lodging	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0



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Roxmoor Colony	N/A	Economic	Lodging	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Hide-a-way Camp sites	N/A	Economic	Lodging	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Catamount Lodge	N/A	Economic	Lodging	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Catskill Seasons Inn	N/A	Economic	Restaurants	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Phoenicia Plaza	N/A	Economic	Restaurants	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Tiso's Restaurant	N/A	Economic	Restaurants	Yes	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Pine Hill Arms	N/A	Economic	Restaurants	Yes	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
The Phoenician	N/A	Economic	Restaurants	Yes	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Phoenicia Diner	N/A	Economic	Restaurants	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Catamount Restaurant	N/A	Economic	Restaurants	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Phoenix Restaurant	N/A	Economic	Restaurants	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Four Corners, LTD.	N/A	Economic	Restaurants	Yes	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
SNOWMAKING COMPRESSOR BLD	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
BELLEAYRE MAINT GARAGE	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
CHLORINE BLDG-LOWER AREA	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
CHLORINE BLDG-UPPER AREA	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
CHLORINE BLDG-CROSS COUNT	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
BELLEAYRE ADAPTIVE CENTER	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
RESIDENCE/NURSERY-NP	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
GARAGE-STORAGE AREA-NP	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
SALT SHED-UPPER AREA-NP	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
BUTLER BUILDING-NP	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
STORAGE BARN (MAINT BLDG)	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0



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LIFT 6 ELEC. VAULT SHELTE	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
KOHLER BLDG. (SUMMIT)	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
SKI SCHOOL BLDG. (UP. ARE	N/A	Economic	Tourism Destinations	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
TRAIL 18 ELEC. BLDG.-NP	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
STORAGE (GARAGE AREA)- NP	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
GLEN PUMP HOUSE (NOVICE)-	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
STORAGE SHED (FRICK AREA)	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
COUNTERWEIGH T	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
CHLOR. SHED - NOVICE AREA	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
CHLORINATION SHED-UPPER-N	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
STORAGE SHED (PUMPHOUSE)-	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
AIR COMPRESSOR BLDG. #1-N	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
GARAGE (UPPER AREA)	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
WOODSHED	N/A	Economic	Tourism Destinations	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
BELLEAYRE MT SKI CENTER	N/A	Economic	Tourism Destinations	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Full Moon Resort	N/A	Economic	Tourism Destinations	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Senior Center	N/A	Health and Social Services	Daycare and Eldercare	Yes	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Mount Tremper Firehouse	N/A	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	No	No	Yes	No	No	1	3	FALSE	3	0	4	FALSE	3	0
Pine Hill Firehouse/FC 1	N/A	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Big Indian Firehouse	N/A	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0



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Belleayre Mt Ski Center, Overlook Lodge	N/A	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
Belleayre Mountain Longhouse Lodge	N/A	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
PHOENICIA FS 3	N/A	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	No	No	Yes	No	No	1	3	FALSE	3	0	4	FALSE	3	0	
Pine Hill Fire Company	N/A	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
Belleayre Ski Lodge	N/A	Health and Social Services	Emergency Operations/Response	No	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
Zen Mountain Monastery	N/A	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
Pine Hill PO	N/A	Health and Social Services	Government and Administrative Services	Yes	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
SALT STORAGE STRUCTURE	N/A	Health and Social Services	Public Works Facilities	Yes	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
RECYCLE BLDG. (UPPER AREA)	N/A	Health and Social Services	Public Works Facilities	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
HWY MAINT MT TREMPER	N/A	Health and Social Services	Public Works Facilities	Yes	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
Windy Ridge Playschool	N/A	Health_and_Social_Services	Daycare and Eldercare	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
Belleayre Mountain Helicopter Landing Zone	N/A	Health_and_Social_Services	Emergency Operations/Response	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
Pine Hill Air Emergency Transport Landing Zone	N/A	Health_and_Social_Services	Emergency Operations/Response	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
Emergency Heliport for Traumatic Incidents	N/A	Health_and_Social_Services	Emergency Operations/Response	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
Highmount PO	N/A	Health_and_Social_Services	Government and Administrative Services	Yes	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
Big Indian Post Office	N/A	Health_and_Social_Services	Government and Administrative Services	No	No, Locally Significant	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	
American Legion Post 950	N/A	Health_and_Social_Services	Military Installations	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0	



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Town of Shandaken Gravel Bank	N/A	Health_and_Social_Services	Public Works Facilities	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
REFUSE RECYCLING CENTER-0	N/A	Infrastructure Systems	Hazardous Materials, Solid Waste, and Recycling	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
FUEL ISLAND SHED-NP	N/A	Infrastructure Systems	Liquid Fuels	No	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Electric Substation - Shandaken	N/A	Infrastructure Systems	Power Supply	Yes	Yes, FEMA	High	Yes	No	No	Yes	No	No	1	3	FALSE	3	0	4	FALSE	3	0
C870004	N/A	Infrastructure Systems	Stormwater	No	No	High	Yes	No	No	Yes	No	No	1	3	FALSE	2	0	4	FALSE	2	0
C870007	N/A	Infrastructure Systems	Stormwater	Yes	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
Verizon Station	N/A	Infrastructure Systems	Telecommunications	Yes	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
State Comm Tower	N/A	Infrastructure Systems	Telecommunications	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Glenbrook Cell Tower	N/A	Infrastructure Systems	Telecommunications	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
New Cingular Wireless PCS, LLC	N/A	Infrastructure Systems	Telecommunications	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
CELLCO PARTNERSHIP	N/A	Infrastructure Systems	Telecommunications	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Cell TOWER	N/A	Infrastructure Systems	Telecommunications	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
TELEPHONE CONNECTIONS BLD	N/A	Infrastructure Systems	Telecommunications	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
FOX HOLLOW CREEK	N/A	Infrastructure Systems	Transportation	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
PECK HOLLOW STRM	N/A	Infrastructure Systems	Transportation	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
WITTENBERG BROOK	N/A	Infrastructure Systems	Transportation	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
TRIB BIRCH CREEK	N/A	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
MILL STREET	N/A	Infrastructure Systems	Transportation	Yes	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
DOUGHERTY BROOK	N/A	Infrastructure Systems	Transportation	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
LTL MABEN HOLLOW	N/A	Infrastructure Systems	Transportation	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
WOODLAND CREEK	N/A	Infrastructure Systems	Transportation	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
Rte. 28 Bridge	N/A	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0



Risk Assessment Tool																					
Asset Information							Landscape Attributes							Risk Assessment				Optional: Risk Assessment (500-year event)			
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
HATCHERY HOLLOW	N/A	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
PECK HOLLOW STRM	N/A	Infrastructure Systems	Transportation	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
PECK HOLLOW STRM	N/A	Infrastructure Systems	Transportation	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
BIRCH CREEK	N/A	Infrastructure Systems	Transportation	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
Giant Ledge Strea	N/A	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
Woodchuck Hollow RR Trestle	N/A	Infrastructure Systems	Transportation	Yes	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
Mount Pleasant	N/A	Infrastructure Systems	Transportation	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Fox Hollow Creek	N/A	Infrastructure Systems	Transportation	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
SEWAGE MONITOR BLDG.(BONN	N/A	Infrastructure Systems	Wastewater	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
PUMP HOUSE-009	N/A	Infrastructure Systems	Wastewater	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
PUMP HOUSE (UPPER AREA)-N	N/A	Infrastructure Systems	Wastewater	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
SC PINE HILL VALVE PIT-NP	N/A	Infrastructure Systems	Wastewater	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
SC PINE HILL PUMPHOUSE-NP	N/A	Infrastructure Systems	Wastewater	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Water Tower	N/A	Infrastructure Systems	Water Supply	No	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
Pine Hill Water Supply	N/A	Infrastructure Systems	Water Supply	No	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
TISKILWA WATER ASSOCIATION	N/A	Infrastructure Systems	Water Supply	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
ZEN MOUNTAIN MONASTERY	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
PHOENICIA WATER DISTRICT	N/A	Infrastructure Systems	Water Supply	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
PHOENICIA WATER DISTRICT	N/A	Infrastructure Systems	Water Supply	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
PHOENICIA WATER DISTRICT	N/A	Infrastructure Systems	Water Supply	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
PINE HILL WATER COMPANY	N/A	Infrastructure Systems	Water Supply	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
ELLIOTT MOBILE HOME PARK	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
EMERSON INN & SPA	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
EMERSON INN & SPA	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0



Risk Assessment Tool																					
Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
EMERSON INN & SPA	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
EMERSON INN & SPA	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
HIDE AWAY CAMPSITES	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
ALPINE INN	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
MENLA MOUNTAIN RETREAT	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
PHOENICIA DINER	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
COLD SPRING LODGE	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
TISKILWA WATER ASSOCIATION	N/A	Infrastructure Systems	Water Supply	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
COPPER HOOD INN	N/A	Infrastructure Systems	Water Supply	Yes	No	Low	Yes	No	No	Yes	No	No	1	3	FALSE	2	0	4	FALSE	2	0
BELLEAYRE SKI CENTER	N/A	Infrastructure Systems	Water Supply	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
BELLEAYRE SKI CENTER	N/A	Infrastructure Systems	Water Supply	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
BELLEAYRE SKI CENTER	N/A	Infrastructure Systems	Water Supply	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
PINE HILL WATER COMPANY	N/A	Infrastructure Systems	Water Supply	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
PINE HILL WATER COMPANY	N/A	Infrastructure Systems	Water Supply	Yes	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
BELLEAYRE SKI CENTER	N/A	Infrastructure Systems	Water Supply	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
BELLEAYRE SKI CENTER	N/A	Infrastructure Systems	Water Supply	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
MARKS MOUNTAIN BROOK INN, INC	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
EMERSON INN & SPA	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
EMERSON INN & SPA	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
EMERSON INN & SPA	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
FULL MOON	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
HIDE AWAY CAMPSITES	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
FOUR CORNERS COUNTRY INN	N/A	Infrastructure Systems	Water Supply	Yes	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
TISOS	N/A	Infrastructure	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0



Risk Assessment Tool																					
Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
RESTAURANT		Systems																			
ZEN MOUNTAIN MONASTERY	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
PHOENICIA PLAZA	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
ALPINE INN	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
HASBROUCKS PLEASANT ACRES	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
MENLA MOUNTAIN RETREAT	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
PHOENICIA WATER DISTRICT	N/A	Infrastructure Systems	Water Supply	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
BIG INDIAN MARKET AND DELI	N/A	Infrastructure Systems	Water Supply	Yes	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
CATSKILL SEASONS INN	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
STARLITE MOTEL (SHAND)	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
BELLEAYRE LODGE AND CABINS	N/A	Infrastructure Systems	Water Supply	Yes	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
BELLEAYRE SKI CENTER	N/A	Infrastructure Systems	Water Supply	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
BELLEAYRE SKI CENTER	N/A	Infrastructure Systems	Water Supply	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
PHOENICIA DINER	N/A	Infrastructure Systems	Water Supply	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
CHLORINATION BLDG (MAIN L	N/A	Infrastructure Systems	Water Supply	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
WATER SPRING HOUSE- NP???????	N/A	Infrastructure Systems	Water Supply	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
SHANDAKEN TUNNEL OUTLET	N/A	Infrastructure Systems	Water Supply	Yes	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
AIR QUALITY MONITORING	N/A	Infrastructure Systems	0	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Paraco Fuel Storage	N/A	Infrastructure_S ystems	Hazardous Materials, Solid Waste, and Recycling	No	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
Belleayre Plaza	N/A	Infrastructure_S ystems	Liquid Fuels	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
Stephen Fischer "Crazy Nell" Bridge	N/A	Infrastructure_S ystems	Transportation	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0



Risk Assessment Tool																					
Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
CR 47	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
Former Big Indian Spring Water tanker filling station	N/A	Infrastructure_Systems	Water Supply	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	2	0	4	FALSE	2	0
SHANDAKEN WILD FOREST	N/A	Natural and Cultural Resources	Hunting and Fishing Lands	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
ULSTER CO./SHANDAKEN	N/A	Natural and Cultural Resources	Natural Habitats	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
NYC Watershed CE - Shandaken	N/A	Natural and Cultural Resources	Natural Habitats	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
MOUNT PLEASANT FLOOD PROTECTION PROJ.	N/A	Natural and Cultural Resources	Natural Protective Features	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
PARK RANGER CABIN	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
BATH HOUSE (DUA)-NP	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
REISER ESTATE SAPHOUSE	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
REISER ESTATE WORKSHOP	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
REISER ESTATE BARN	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
HIKER'S BATHROOM	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
SHOWER BUILDING-013	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
DISCOVERY LODGE (NOVICE	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
REISER ESTATE GUESTHOUSE-	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
REISER ESTATE HOUSE	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0



Risk Assessment Tool																					
Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
CARETAKER'S CABIN-001	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
WOOD SHED	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
OVERLOOK LODGE (UPPER ARE	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
SUMMIT 6-STORAGE BLDG	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Low	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
WOODLAND VALLEY CAMPGROUND	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
Pine Hill Community Center	N/A	Natural_and_Cultural_Resources	Community Centers	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Baptist Camp	N/A	Natural_and_Cultural_Resources	Cultural or Religious Establishments	Yes	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Shandaken Methodist Church	N/A	Natural_and_Cultural_Resources	Cultural or Religious Establishments	Yes	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Zen Monastery	N/A	Natural_and_Cultural_Resources	Cultural or Religious Establishments	Yes	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Camp Winnisook	N/A	Natural_and_Cultural_Resources	Historic Landmarks and Facilities	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
National Historic Community/ Entire Hamlet	N/A	Natural_and_Cultural_Resources	Historic Landmarks and Facilities	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Giggle Hollow Railroad Trestle	N/A	Natural_and_Cultural_Resources	Historic Landmarks and Facilities	Yes	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
Woodchuck Hollow Railroad Trestle	N/A	Natural_and_Cultural_Resources	Historic Landmarks and Facilities	Yes	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
Morton Memorial Library/ Historic Structure	N/A	Natural_and_Cultural_Resources	Libraries	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Town of Shandaken Museum/ Historic School House	N/A	Natural_and_Cultural_Resources	Museums, Performing Arts Centers, and Stadiums	Yes	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0



Risk Assessment Tool																					
Asset Information							Landscape Attributes							Risk Assessment				Optional: Risk Assessment (500-year event)			
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Mount Tremper Arts	N/A	Natural_and_Cultural_Resources	Museums, Performing Arts Centers, and Stadiums	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Giant Ledge/ Panther Mtn Trail head	N/A	Natural_and_Cultural_Resources	Natural Habitats	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
Belleayre Mountain Ski Center	N/A	Natural_and_Cultural_Resources	Parks and Recreation	No	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Belleayre Beach	N/A	Natural_and_Cultural_Resources	Parks and Recreation	No	No	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	3	0	4	FALSE	3	0
Glenbrook Park	N/A	Natural_and_Cultural_Resources	Parks and Recreation	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
Winnisook Lake - Headwaters for Esopus and Neversink Creeks.	N/A	Natural_and_Cultural_Resources	Water Bodies	Yes	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0
Little Peck Hollow Pond	N/A	Natural_and_Cultural_Resources	Water Bodies	No	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	FALSE	1	0	4	FALSE	1	0



HARDENBURGH COMMUNITY ASSETS INVENTORY

Risk Assessment Tool

Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence : Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge : Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
TOWN OF HARDENBURGH HIGHWAY DEPT	High	Health_and_Social_Services	Public Works Facilities	No	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	5	38	4	2.50	5	50
MILL BROOK BELLE AYR BROOK	High	Infrastructure Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
MILL BROOK	High	Infrastructure Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
EAGLE ROAD BRIDGE (COUNTY COVERED BRIDGE)	High	Infrastructure Systems	Transportation	no	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
RIDER HOLLOW STRM	High	Infrastructure Systems	Transportation	No	No	Low	Yes	Yes	No	Yes	Yes	No	2	3	3.00	3	27	4	3.00	3	36
RIDER HOLLOW STRM	High	Infrastructure Systems	Transportation	No	No	Low	Yes	Yes	No	Yes	Yes	No	2	3	3.00	3	27	4	3.00	3	36
GRAHM ROAD COUNTY BRIDGE	High	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
KELLY FLAT COUNTY BRIDGE	High	Infrastructure Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
COUNTY BRIDGE AT MACFARLAND ROAD	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
BEUTH ROAD FIVE FOOT STEEL CULVERT	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	Medium	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
BELLEAYRE BROOK BRIDGE	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
HINKLEY ROAD BRIDGE	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
ULSTER COUNTY CONCRETE ABUTTMENT BRIDGE WITH CONCRETE WING WALLS	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
COUNTY BRIDGE CONCRETE WING WALLS	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
COUNTY BRIDGE CONCRETE ABUTMENTS CONCRETE WING WALLS	High	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30



Risk Assessment Tool

Asset Information							Landscape Attributes							Risk Assessment				Optional: Risk Assessment (500-year event)			
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence : Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge : Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
Old baker stream crossing structure	High	Infrastructure_Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
warren Todd box culvert	High	Infrastructure_Systems	Transportation	No	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
Todd brook box culvert	High	Infrastructure_Systems	Transportation	No	No, Locally Significant	Medium	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
FLOOD DAMAGE VULNERABLE MULTI LANE TOWN ROAD	High	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
SIX FOOT BOILER CULVERT -STATE LAND 2	High	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
8 FOOT WIDE BY 6 FOOT HIGH SECTIONAL CONCRETE BOX CULVERT WITH HEAVY RIP RAP WING WALLS	High	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
12 FOOT WIDE, 6 FOOT HIGH CONCRETE BOX CULVERT WITH 4 CONCRETE WING WALLS	High	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
8 FOOT WIDE BY 6 FOOT HIGH SECTIONAL CONCRETE BOX CULVERT WITH HEAVY RIP RAP WING WALLS	High	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
BEAVERKILL ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	Yes	Yes	No	2	3	3.00	3	27	4	3.00	3	36
BEAVERKILL ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	Yes	Yes	No	2	3	3.00	3	27	4	3.00	3	36
0	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
0	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
BEAVERKILL ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
BEAVERKILL ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
BEAVERKILL ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30



Risk Assessment Tool

Asset Information							Landscape Attributes							Risk Assessment				Optional: Risk Assessment (500-year event)			
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence : Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge : Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
BEAVERKILL ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5		2.50	3	23	4	2.50	3	30
0	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
ALDER CREEK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
0	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
BEAVERKILL ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
BEAVERKILL ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	Yes	Yes	No	2	3	3.00	3	27	4	3.00	3	36
BEAVERKILL ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
ALDER CREEK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
BEAVERKILL ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
0	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
0	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
BEAVERKILL ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
BEAVERKILL ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
0	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
DRY BROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
DRY BROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
0	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
MILLBROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
MILLBROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
ALDER CREEK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
DRY BROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
DRY BROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
DRY BROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
DRY BROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
DRY BROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30



Risk Assessment Tool

Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence : Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge : Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
DRY BROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
0	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
MILLBROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
MILLBROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
MILLBROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
RIDER HOLLOW ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
RIDER HOLLOW ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
DRY BROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
DRY BROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
DRY BROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	Yes	Yes	No	2	3	3.00	3	27	4	3.00	3	36
0	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
RIDER HOLLOW ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	Yes	Yes	No	2	3	3.00	3	27	4	3.00	3	36
TODD MOUNTAIN ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	Yes	Yes	No	2	3	3.00	3	27	4	3.00	3	36
TODD MOUNTAIN ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	Yes	Yes	No	2	3	3.00	3	27	4	3.00	3	36
MILLBROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
MILLBROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
MILLBROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30



Risk Assessment Tool

Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence: Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge: Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
MILLBROOK ROAD	High	Infrastructure_Systems	Transportation	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
DRY BROOK COMMUNITY HALL AND CHURCH	High	Natural_and_Cultural_Resources	Community Centers	No	No, Locally Significant	Medium	Yes	Yes	No	Yes	Yes	No	2	3	3.00	5	45	4	3.00	5	60
GRANTS MILLS/MILLBROOK COVERED BRIDGE	High	Natural_and_Cultural_Resources	Historic Landmarks and Facilities	No	No, Locally Significant	High	Yes	Yes	No	No	Yes	No	1.5	3	2.50	3	23	4	2.50	3	30
Dry Brook	High	Natural_and_Cultural_Resources	Natural Protective Features	No	No	Medium	Yes	Yes	No	No	Yes	No	1.5	3	2.50	1	8	4	2.50	1	10
NYS DRY BROOK ROAD TRAIL HEAD	High	Natural_and_Cultural_Resources	Parks and Recreation	Yes	No, Locally Significant	Medium	Yes	Yes	No	No	Yes	No	1.5	3	2.50	1	8	4	2.50	1	10
BALSAM LAKE (PRIVATELY OWNED)	High	Natural_and_Cultural_Resources	Water Bodies	No	No	Low	Yes	Yes	No	No	Yes	No	1.5	3	2.50	1	8	4	2.50	1	10
Middletown/Hardenburgh Fire Hall	N/A	Health and Social Services	Emergency Operations/Response	No	Yes, FEMA	High	No	No	No	No	No	No	0	3	FALSE	4	0	4	FALSE	4	0
Lew Beach Fire Department	N/A	Health and Social Services	Emergency Operations/Response	No	Yes, FEMA	High	No	No	No	No	No	No	0	3	FALSE	4	0	4	FALSE	4	0
Arena Fire Dept.	N/A	Health and Social Services	Emergency Operations/Response	No	Yes, FEMA	High	No	No	No	No	No	No	0	3	FALSE	4	0	4	FALSE	4	0
Town of Hardenburgh Town Hall	N/A	Health and Social Services	Government and Administrative Services	No	Yes, FEMA	High	No	No	No	No	No	No	0	3	FALSE	4	0	4	FALSE	4	0
MARGARETVILLE MEMORIAL Hospital	N/A	Health and Social Services	Primary/Regional Hospitals	Yes	Yes, FEMA	High	No	No	No	No	No	No	0	3	FALSE	4	0	4	FALSE	4	0
Margaretville Central School	N/A	Health and Social Services	Schools	Yes	Yes, FEMA	High	No	No	No	No	No	No	0	3	FALSE	4	0	4	FALSE	4	0
HAYNES HOLLOW STM	N/A	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
TAPPAN BRIDGE (ERICKSON ROAD BRIDGE) [WOODEN COVERED BRIDGE]	N/A	Infrastructure Systems	Transportation	Yes	No, Locally Significant	High	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0



Risk Assessment Tool																					
Asset Information							Landscape Attributes						Risk Assessment				Optional: Risk Assessment (500-year event)				
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence : Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge : Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
HAYNES HOLLOW CONCRETE SECTIONAL BOX CULVERT	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
HAYNES HOLLOW CONCRETE SECTIONAL BOX CULVERT 2	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
STEEL FOUR FOOT CULVERT	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
GRAHM ROAD 6 FT CULVERT	N/A	Infrastructure_Systems	Transportation	No	No, Locally Significant	Low	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
DRY BROOK ROAD COUNTY CONCRETE BOX CULVERT (SITE NECESSARY CONSTRUCTION BY COUNTY BRIDGE)	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	Low	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
3 FOOT COUNTY CULVERT	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
MARTIN ROAD ELLIPTICAL CULVERT	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
SCALZA FOUR FOOT ELLIPTICAL STEEL CULVERT	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
FOUR FOOT STEEL CULVERT WITH ANCILLIARY 2 FOOT HEAVY WALL PVC CULVERT	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
5 FOOT STEEL CULVERT WITH HEAVY ROCK WING WALLS	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	Medium	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
MC FARLAND ROAD EMBANKMENT FAILURE (FEMA 4020)	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	Medium	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0



Risk Assessment Tool																					
Asset Information							Landscape Attributes							Risk Assessment				Optional: Risk Assessment (500-year event)			
Asset	Risk Area	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures: Absent, below BFE, poor condition, lack maintenance commitment	Elevation: Elevation of the asset site is below BFE.	Freeboard: Elevation of the habitable or occupied portion of the asset is < 2 ft. above BFE.	Point of Confluence : Asset subject to increased flooding to confluence of merging streams.	Storm Water Discharge : Asset subject to increased flood risk due to storm water system discharge.	Vegetated Stream Bank Buffers: Asset within Floodway Fringe, and without adequate vegetated buffers	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Hazard Score	Exposure Score	Vulnerability Score	Risk Score
EAGLE LODGE ROAD EMBANKMENT FAILURE (400 LINEAL FEET)	N/A	Infrastructure_Systems	Transportation	No	No, Locally Significant	Medium	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
ARTHUR WHITE BRIDGE	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
THREE FOOT STEEL CULVERT	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
SIX FOOT STEEL CULVERT-STATE LAND 1	N/A	Infrastructure_Systems	Transportation	Yes	No, Locally Significant	High	No	No	No	No	No	No	0	3	FALSE	2	0	4	FALSE	2	0
FISH HATCHERY	N/A	Natural and Cultural Resources	Hunting and Fishing Lands	No	No	Low	No	No	No	No	No	No	0	3	FALSE	4	0	4	FALSE	4	0
Zimmerman Creek Fishing Access	N/A	Natural and Cultural Resources	Hunting and Fishing Lands	No	No	Low	No	No	No	No	No	No	0	3	FALSE	1	0	4	FALSE	1	0
BALSAM LAKE MOUNTAIN WILD FOREST	N/A	Natural and Cultural Resources	Hunting and Fishing Lands	No	No	Low	No	No	No	No	No	No	0	3	FALSE	1	0	4	FALSE	1	0
OBSERVER CABIN	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Low	No	No	No	No	No	No	0	3	FALSE	4	0	4	FALSE	4	0
ULSTER CO./HARDENBURGH	N/A	Natural and Cultural Resources	Parks and Recreation	No	No	Low	No	No	No	No	No	No	0	3	FALSE	4	0	4	FALSE	4	0
ALDER LAKE WITH CONCRETE DAM	N/A	Natural_and_Cultural_Resources	Parks and Recreation	No	No, Locally Significant	Medium	No	No	No	No	No	No	0	3	FALSE	1	0	4	FALSE	1	0
COYKENDALL HOUSE	N/A	Natural_and_Cultural_Resources	Cultural or Religious Establishments	No	No	Low	No	No	No	No	No	No	0	3	FALSE	4	0	4	FALSE	4	0



RISK ASSESSMENT DATA AND METHODOLOGY

Data Sources Used

NYS DOS Provided Data:

- Federal Communications Commission
- Insurance Services Office, Inc.
- National Oceanic and Atmospheric Administration (NOAA)
- Federal Communications Commission (2012)
- National Park Service (2011)
- National Pipeline Mapping System (2003)
- NYS Department of Health, NYS Department of Transportation
- NYS Division of Homeland Security and Emergency Services
- NYS Office for People With Developmental Disabilities
- NYS Office of General Services
- NYS Office of Mental Health
- NYS Department of Environmental Conservation (2009)
- NYS Education Department (2000)
- Environmental Systems Research Institute (ESRI) (2010).

LOCAL DATA, ULSTER COUNTY:

- Parcels
- Tax Data
- Critical facilities
- Natural Resources
- Infrastructure
- Soils
- Depth Grids
- Flood Hazard Areas (FHA)
- Buyout Properties
- Damaged Roadways
- Building Data
- Land Use
- Zoning

Description of Methodology

The risk assessment for assets within the Towns incorporated NYRCR baseline methodology, enhanced by specific assumptions at the request of the committee. The baseline methodology included four major components of the analysis: the Risk Area, Hazard Factor, Exposure Score, and Vulnerability Score.

Risk area classifications (extreme, high, or moderate) are determined by the asset's location relative to mapped coastal risk zones.

The hazard score of 3 was assigned for the hazard factor in the tool (100-year flood water level occurring within a 100-year planning time frame).

The exposure score is determined by the sum of a base score (derived from the risk area in which the asset is located) plus 0.5 point for each of the six landscape feature conditions below, if present. A base score was assigned for Exposure to each asset depending on highest-class risk area (Extreme = 2, High = 1, and Moderate = 0.5) in which a significant portion of the asset is located. The total exposure score was calculated for each asset by adding 0.5 point to the base score for each of the following conditions:

- Defensive flood protection measures – are absent, below base flood elevation (BFE), in poor condition, or lack maintenance commitment;
- Elevation – the asset site is below BFE;
- Freeboard – elevation of the habitable or occupied portion of the asset is less than 2 feet above BFE;
- Point of Confluence – asset is within an area subject to increased flood risk (based on consultant's judgment or NYRCR Planning Committee guidance) due to confluence of merging streams;
- Storm Water Discharge – asset is within an area subject to increased flood risk (based



on consultant judgment or planning team guidance) due to storm water system discharge; and

- Vegetated Stream Bank Buffers – asset is within Floodway Fringe (based on FEMA definition).

Vulnerability score:

Table 15 outlines the methodology, which accounts for an asset with a known length of time of service disruption or complete loss of service.

TABLE 15. VULNERABILITY BASED ON IMPACT ON SERVICE OR FUNCTION OF COMMUNITY ASSETS

Impact	Insignificant 1	Minor 2	Moderate 3	Significant 4	Major 5
A. Economic Assets	Limited interruption in service or short-term reduced service	Service loss for up to 1 week or longer-term reduced services	Service loss for more than 1 week up to 1 month or longer-term reduced service	Service loss for more than 1 month or permanent reduced capacity	Permanent loss of service of the economic asset
B. Health and Social Services Assets	Limited interruption in service or short-term reduced services; Services under more than usual stress but manageable	Service loss of up to 1 week or longer-term reduced services; Services under more than usual stress on several fronts	Service loss for more than 1 week up to 1 month or longer-term reduced service; Services under severe pressure	Service loss for more than 1 month or permanent reduced capacity	Permanent loss of service of any one of the essential services listed
C. Housing Assets	Limited inconvenience	Out of use for up to 1 week	Out of use for more than 1 week up to 1 month	Out of use for up to 6 months (OR) permanent loss of 15% or less of housing in a group asset	Out of use for more 6 months (OR) permanent loss of more than 15% of the housing in a group asset
D. Infrastructure System Assets	Limited interruption in service or short-term reduced service	Service loss for up to 1 week or longer-term reduced services	Out of use for more than 1 week up to 1 month or longer-term reduced service	Service loss for more than 1 month or permanent reduced capacity	Permanent loss of service of any one of the facilities listed



TABLE 15. VULNERABILITY BASED ON IMPACT ON SERVICE OR FUNCTION OF COMMUNITY ASSETS

Impact	Insignificant 1	Minor 2	Moderate 3	Significant 4	Major 5
E. Natural and Cultural Resources Assets	Limited interruption in service or short-term reduced service (OR) Limited loss of access, habitat, or use	Service loss for up to 1 week or longer term reduced services; Minimal natural habitat impacts, temporary loss of public access, temporary loss of open space/tourism assets	Out of use for more than 1 week up to 1 month (OR) Moderate impacts on natural habitats, sustained loss of public access, long-term loss of private open space	Service loss greater than 1 month (OR) Permanently diminished capacity of natural resources; substantial damages of important natural habitat.	Permanent loss of service of the cultural asset (OR) Complete loss of important natural habitats
F. Assets Providing Services for Socially Vulnerable Populations	Limited service interruption	Service loss for up to 1 week	Out of use for more than 1 week up to 1 month	Permanent service interruption of more than 1 and less than 6 months	Service interruption of 6 or more months

Each community worked toward developing a methodology for assessing risk, which also considered the unique situation and individual dynamics of areas at risk within that community. To assess true vulnerability, the planning committee determined which asset locations required consideration and concluded that because asset-specific information on facility recovery times (after impact by a flooding event) was not available, standard assumptions based on similar facilities should be used. The committee worked together to develop a tiered-factor approach to assess risk, generating risk scores that accurately reflected vulnerabilities and overall risk within the community. The factor is adjusted based on similar facility types in a descending 5 point scale that is reduced by one point determined by its risk area location. For example, as noted in the vulnerability section below, all buildings were assumed to be 5 and all garages and storage buildings were assumed to be 4. Assumptions were reviewed and approved by the committee. When specific vulnerability

information was available, the standard methodology was applied; however, if information was not available, the following assumptions were applied:

Risk Area Assumptions

1. Risk Areas:
 - a. Extreme risk areas: areas within the 100-year FHA that are within 1,000 feet of a Repetitive Loss Property.
 - b. High risk areas: areas within the 100-year FHA
 - c. Moderate risk areas: areas within the 500-year FHA
 - d. “N/A” risk areas: areas outside of an identified FHA (all assets not located in an Extreme, High or Moderate Risk Area were identified as N/A, and do not produce a risk score. Assets in this category are given a



risk score of “False” in the risk assessment tool)

2. Socially Vulnerable Populations:
 - a. Areas with a maximum 25 people/sq. mile density of population earning less than \$20,000.00 per year
 - b. Areas with a maximum 25 people/sq. mile density of population over the age of 65.

Assumptions for the Landscape Attributes and Vulnerability

Landscape attributes:

1. Defensive Flood Protection Measures: all assets were assumed “Yes” if absent, below BFE, in poor condition, or lacking maintenance commitment.
2. Elevation: all assets outside the extreme, high, or moderate risk area were assumed “No,” and all assets in the High and Moderate Hazard Zone were assumed “Yes” if the asset site is below BFE.
3. Freeboard: all assets outside the extreme, high, or moderate risk area were assumed “No,” and all building, structure, and bridge assets in the extreme, high, and moderate risk areas were assumed “Yes” if elevation of the habitable or occupied portion of the asset is less than 2 feet above BFE.
4. Point of Confluence (POC): all assets within 1,500 feet downstream of major POC (this is a Hazard Mitigation Plan (HMP) dataset with all streams with 4,300 cubic feet per second [CFS] or more during a 100-year storm event) and within the extreme, high, or moderate risk areas are “Yes”; all others are “No.”
5. Storm Water Discharge: all assets within 1,000 feet of a major culvert (HMP dataset) and within the extreme, high, or moderate risk areas are “Yes.”

6. Vegetated Stream Buffers: all assets within the floodway are assumed “Yes”; all others “No.”

Assets in “Extreme” and “High” Risk Areas

Vulnerability:

1. All buildings were assumed to be 5.
2. All garages storage buildings were assumed to be 4.
3. All transportation infrastructure and water treatment facilities were assumed to be 3.
4. All wells and springs were assumed to be 2.
5. All natural and cultural resources other than buildings were assumed to be 2.
6. All natural resources were assumed to be 1.

Assets in the “Moderate” Risk Area

Vulnerability:

1. All buildings were assumed to be 4.
2. All garages storage buildings were assumed to be 3.
3. All transportation infrastructure and water treatment facilities were assumed to be 2.
4. All wells and springs were assumed to be 1.
5. All natural and cultural resources other than buildings were assumed to be 2.
6. All natural resources were assumed to be 1.

Landscape Attributes:

1. Point of Confluence: “Yes” if the asset is subject to increased flooding due to an upstream point of confluence, and “No” if the asset is not affected. Comments justifying impact were provided where available.
2. Stormwater Discharge: “Yes” if the asset is affected by stormwater discharge and “No” if the asset is not affected. Comments justifying impact were provided where available.



TABLE 16. RISK SCORE RANGES

100 YEAR EVENT	500 YEAR EVENT
Severe (Risk Score >53)	Severe (Risk Score >70)
Risk scores in the “Severe” category occur only if one of the two factors, exposure or vulnerability, is rated 5, and the other is 4 or higher, which could indicate that the asset is in a dangerous situation. Both exposure and vulnerability should be reduced, if possible. Consider relocation a priority option for these assets.	
High (Risk Score 24 - 53)	High (Risk Score 32 - 70)
Risk scores in the “High” category are indicative of conditions that could lead to significant negative outcomes from a storm. Using the risk scoring system, a total of 24 (or 32 for the 500-year event) can be achieved only if the vulnerability is 4 and exposure is 2, or vice versa. A vulnerability of 4 indicates likely loss of service of an asset for an extended period of time. For many assets, this loss may be unacceptable. Actions should be taken to reduce vulnerability, such as elevating or floodproofing the asset to help avoid a long-term loss of function. A score of 4 for exposure indicates most of the local landscape attributes that help reduce storm damages are absent. Actions to restore landscape attributes may be appropriate. All other risk scores higher than 24 (or 32 for the 500-year event) indicate either the exposure or the vulnerability (or both) are higher than the conditions discussed above, lending more weight to need to take actions that reduce risk. Relocation may be necessary in the future if other means of adaptation or management actions are not effective.	
Moderate (Risk Score 6 - 23)	Moderate (Risk Score 8 - 31)
Risk scores in the “Moderate” category pose moderate to serious consequences, but adaptation may be of lower priority based on one factor, exposure, or because vulnerability remains relatively low. Use a combination of measures to reduce exposure and vulnerability.	
Residual (Risk Score <6)	Residual (Risk Score <8)
Risk scores in the “Residual” category occur when both exposure and vulnerability are relatively low. This situation suggests floods would pose minor or infrequent consequences. However, a vulnerability score of 3 may not be acceptable for critical facilities or assets of high community value, because the community cannot afford to be without these services, even infrequently. Note that risk is never completely eliminated. Some residual risk still remains even after management measures have been implemented. It is recommended that the community monitors conditions and adapts as necessary.	

Source: NYS DOS, 2013

While the risk scores differ between the two events as a result of using different hazard scores, the basis for how assets are categorized into the severe, high, moderate, or residual risk levels is the same for the two events, as shown by the similarly colored regions in Figure 20. For example, a risk score of 60 in the 100-year event evaluation is shown as 80 in the 500-year event evaluation; however, both scores are classified as severe risk.

Interpretation of Risk

Risk scores in this category occur only if one of the two factors, exposure or vulnerability, is rated 5, and the other is 4 or higher; this could indicate that the asset is in a dangerous situation. Both exposure and vulnerability should be reduced, if possible. Consider relocation a priority option for these

assets.

Risk scores in this category are indicative of conditions that could lead to significant negative outcomes from a storm. Using the risk scoring system, a total of 24 (or 32 for the 500-year event) can be achieved only if the vulnerability is 4 and exposure is 2, or vice versa. A vulnerability of 4 indicates likely loss of service of an asset for an extended period of time. For many assets, this may be unacceptable. Actions should be taken to reduce vulnerability, such as elevating or flood-proofing the asset, to help avoid a long-term loss of function. A score of 4 for exposure indicates most of the local landscape attributes that help reduce storm damages are absent. Actions to restore landscape attributes may be appropriate. All other risk scores



higher than 24 (or 32 for the 500-year event) indicate either the exposure or the vulnerability (or both) are higher than the conditions discussed above, lending more weight to need to take actions that reduce risk. Relocation may be necessary in the future if other means of adaptation or management actions are not effective.

Risk scores in this category pose moderate to serious consequences, but adaptation may be of lower priority due to one factor, exposure, or vulnerability remaining relatively low. A combination of measures would likely reduce exposure and/or vulnerability.

Risk scores in this category occur when both exposure and vulnerability are relatively low. This suggests that floods would pose minor or infrequent consequences. However, a vulnerability score of 3 may not be acceptable for critical facilities or assets of high community value, because the community cannot afford to be without these services, even infrequently. Note that risk is never completely eliminated. Some residual risk still remains after management measures have been implemented, and it is recommended that the community monitors conditions and adapts as necessary.



GLOSSARY

ALS	Advanced life support
BFE	Base Flood Elevation
CDBG	Community Development Block Grant
CDBG-DR	Community Development Block Grant Disaster Recovery
cfs	Cubic feet per second
CRS	Community Ratings System
DPW	Department of Public Works
EMS	Emergency Medical Service
EOC	Emergency Operations Center
ESRI	Environmental Systems Research Institute
FEMA	Federal Emergency Management Agency
FHA	Flood Hazard Area
FTE	Full time equivalent
GIS	Geographic Information Systems
gpd	Gallons of water per day
HAZUS-MH	Hazards US-Multi-Hazard risk assessment model
HEC-RAS	Hydrologic Engineering Center - River Analysis System
IA	Individual Assistance
MTC	Margaretville Telephone Company
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NYC DEP	New York State Department of Environmental Protection
NYRCR	New York Rising Community Reconstruction
NYS DEC	New York State Department of Environmental Conservation
NYS DOS	New York Department of State
PA	Public Assistance
POC	Point of Confluence



RL	Repetitive Loss
SART	State Agency Review Team
SRL	Severe Repetitive Loss
SWOT	Strength, weaknesses, opportunities and threats



END NOTES

¹ Town of Shandaken Comprehensive Plan, 2005

² FEMA, 2013

³ The U.S. Department of Housing and Urban Development considers families that pay more than 30% of their income for housing as cost burdened.

⁴ NYS, 2012

⁵ NCDC, 2013

⁶ "Niagara Falls - World Waterfall Database". Retrieved 2013-11-15.

⁷ Town of Hardenburgh, 2014

⁸ Town of Shandaken, 2011

⁹ NCDC, 2013

¹⁰ Town of Shandaken, 2011

¹¹ FEMA, 2013

¹² NCDC, 2013

¹³ FEMA, 2013

¹⁴ NCDC, 2013

¹⁵ Town of Shandaken, 2011

¹⁶ NCDC, 2013

¹⁷ Shandaken Comprehensive Plan, 2005

¹⁸ <https://www.census.gov/compendia/statab/2012/tables/12s0988.pdf>

¹⁹ 2010 Census and 2011 American Community Survey