



# NIAGARA COUNTY

## NY Rising Countywide Resiliency Plan

NY Rising Community Reconstruction Program

July 31, 2014



NY Rising Community Reconstruction Program

Niagara County NYRCR Planning Committee

Co-Chairs

Samuel M. Ferraro, Commissioner  
Niagara County Department of Economic Development

Dr. James Klyczek, President  
Niagara County Community College

Members

John Benoit, Chairman  
Niagara USA Chamber

Benjamin Bidell, AICP, Senior Planner  
Niagara County Department of Economic Development

Amy Fisk, AICP, Senior Planner  
Niagara County Department of Economic Development

Carol Houwaart-Diez, President  
United Way of Greater Niagara Development

Jonathan Schultz, Director  
Niagara County Emergency Services

Mark Seider, P.E., District Engineer  
Niagara County Soil and Water Conservation District

Kenneth Turner, Chief Operations Officer  
American Red Cross of Western NY

New York State Department of State  
Christopher Bauer, AICP  
Renee Parsons

This document was developed by the NYRCR Niagara County Planning Committee as part of the NY Rising Community Reconstruction (NYRCR) Program, and is supported by the NYS Department of State. The document was prepared by the following Consulting Team:





# Foreword

## Introduction

Flooding from severe summer storms in 2013 inflicted damages in five upstate counties, bringing home the reality that it no longer takes a hurricane or tropical storm for raging flood waters to wreak havoc in our communities. Those summer storms – as well as Superstorm Sandy, Hurricane Irene, and Tropical Storm Lee – signal 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 program. The NY Rising Community Reconstruction (NYRCR) Program provides the State's most impacted communities with the technical expertise needed to develop reconstruction strategies to build more resilient communities.

## Program Overview

The NYRCR Program is a planning and implementation process established to provide rebuilding and resiliency assistance to communities heavily damaged by Hurricane Irene, Tropical Storm Lee, Superstorm Sandy, and the severe summer storms of 2013. 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 that community members are best positioned to assess the needs and opportunities of the places where they live and work. Up to \$3 million was committed by the Governor for each of the five counties.

While part of the larger NYRCR effort involving over 100 communities in 20 other counties, the approach taken in the five upstate counties of Niagara, Madison, Herkimer, Oneida and Montgomery was tailored to meet their particular circumstances. In each, a countywide NYRCR Planning Committee was formed



Photo Credit: NYS Department of State

in consultation with local leaders that included members representing county planning, economic development, human service organizations, soil and water services, emergency services, highway services, local governments, educational institutions, business and other organizations.

The approach in these five counties was two-pronged, focusing first on identification of remaining recovery needs, and then on developing countywide long-term resiliency strategies and actions. Planning Committee meetings were held, during which Planning Committee members worked with the State's NYRCR Program team to identify storm damage, recognize recovery efforts in the immediate aftermath of the storms, and develop a list of projects still needed to recover from the storms. These reports, published in early April included descriptions of recovery projects and their estimated costs and project benefits.

The Planning Committees then looked more closely at where storm damages occurred; what assets are at risk; and how the risk to those assets can be reduced or eliminated. They describe in this plan the strategies they will use to avoid future damages a list of actions to implement those strategies.



All Planning Committee meetings were open to the public, and public engagement events attracted community members who provided feedback on proposals. Throughout the planning process, Planning Committees were supported by planners from New York State Department of State and consultants from planning firms that specialize in engineering, flood mitigation solutions, green infrastructure, and more.

To ensure tangible progress on the county's NYRCR Countywide Resiliency Plan, the plan includes an implementation schedule that identifies each strategy; actions to be taken to implement the strategy; potential funding sources; target dates; and responsible parties.

The program has leveraged the Regional Economic Development Council's State Agency Review Teams (SARTs), composed of representatives from 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.

## The NYRCR Countywide Resiliency Plan

Each NYRCR Planning Committee began the planning process by assessing storm damage and describing recovery needs. Next, the Planning Committee identified critical assets in the community and assessed the assets' exposure to risk. On the basis of this work, the Planning Committee described resiliency needs and opportunities. The Planning Committee then developed a series of reconstruction and resiliency strategies, and identified projects and implementation actions to help fulfill those strategies.

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, and potential funding sources. The list of projects presents a long-term approach to

becoming more resilient that reflects a need for some actions to be staged before others can be taken, and recognizes that the availability of funds for implementing projects will change over time. Inclusion of a project or action in this NYRCR Plan does not guarantee that a particular project or action will be eligible for funding or that it will be implemented. In addition, implementation of the projects and actions found in this NYRCR Plan are subject to applicable Federal, State, and local laws and regulations.

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 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. This NYRCR Countywide Resiliency Plan is an important step toward rebuilding a more resilient community.



Page Intentionally Left Blank



Niagara Falls (Photo Credit: Flickr/Bud)



# Table of Contents

Foreword .....	3
Executive Summary .....	11
<b>1 County Overview.....</b>	<b>15</b>
Niagara County Planning Area .....	15
Description of Summer 2013 Storm Damage .....	32
Critical Issues .....	34
Vision .....	36
Relationship to Regional Plans .....	36
<b>2 Assessment of Risk and Needs.....</b>	<b>41</b>
Assessment of Needs and Opportunities .....	41
Description of Community Assets .....	49
Assessment of Risks to Assets and Systems .....	63
<b>3 Reconstruction and Resiliency Strategies.....</b>	<b>71</b>
Community Planning and Capacity Building .....	72
Health and Social Services .....	74
Infrastructure .....	75
Natural and Cultural Resources .....	79
Housing .....	82
Economic Development .....	83
<b>4 Project Profiles .....</b>	<b>85</b>
<b>5 Schedule for Implementation .....</b>	<b>141</b>
<b>6 Additional Materials .....</b>	<b>153</b>
Public Engagement Process .....	151
Community Asset Inventory + Risk Assessment .....	155
End Notes .....	159



# Table of Contents, Continued

## List of Tables

Table 1 County Summary .....	31
Table 2 Residential Parcels in Floodplain .....	60
Table 3 Risk Assessment and Findings .....	67
Table 4 Community Planning and Capacity Building .....	74
Table 5 Health and Social Services.....	75
Table 6 Infrastructure.....	76-78
Table 7 Natural and Cultural Resources.....	81
Table 8 Economic Development.....	83
Table 9 Schedule for Implementation.....	142
Table 10 Project Phasing.....	150
Table 11 Asset Information.....	157

## List of Figures

Figure 1 Niagara County Map.....	19
Figure 2 Niagara County Typology Diagram.....	21
Figure 3 Niagara County Hydrology Map.....	23
Figure 4 Niagara County Hydric Soil Map.....	25
Figure 5 Niagara County Surficial Geography Map.....	27
Figure 6 Niagara County Topography Map.....	29
Figure 7 City of Niagara Falls “Heat Map” .....	43
Figure 8 Niagara County Flood Risk Areas.....	53
Figure 9 Niagara County Critical Assets and Risk Areas.....	55
Figure 10 Niagara County Critical Assets and Risk Areas (Niagara Falls and N. Tonawanda).....	57
Figure 11 Niagara County Critical Assets and Risk Areas (Lockport).....	59
Figure 12 Niagara County Residential Parcels in Floodplain.....	61
Figure 13 Niagara County Assets Color Code By Risk.....	65



Page Intentionally Left Blank



**Old Fort Niagara** (Photo Credit: Flickr/Artur Staszewski)



# Executive Summary

*The Niagara County NY Rising Countywide Resiliency Plan identifies future storm risks and presents strategies and projects to increase resiliency in future flood events. These projects may be eligible for State funding through the NY Rising program, or could be implemented through other Federal, State, local or non-profit funding sources or grants.*

## Overview

The NY Rising Community Reconstruction Program was established by Governor Cuomo to provide rebuilding and revitalization assistance to communities severely impacted by Superstorm Sandy, Hurricane Irene, Tropical Storm Lee and the severe summer storms of 2013. Through this program's Planning Committee the need for Countywide Resiliency Plans was established.

The NY Rising Countywide Resiliency (NYRCR) Plan for the Niagara Communities include the 20 municipalities located within Niagara County, including 3 cities, 12 towns, and 5 villages.

Several fast-moving, localized severe storm events dropped significant precipitation on communities within Niagara County in summer 2013. Hardest hit were the Cities of Niagara Falls, Lockport and North Tonawanda. Significant flooding, property damage, and power outages affected more than 17,000 residents region-wide.

In particular, severe water damage occurred to electric substations, water systems, wastewater treatment plants, businesses and homes. The storms' impacts were exacerbated by the intensity of the precipitation overwhelming the capacity of these cities' existing infrastructures and causing significant combined sewer and storm sewer backups at municipal treatment plants and discharges of raw and partially treated sewage into the Niagara River and Lake Ontario through their tributaries. Combined sewer overflow and stormwater system back-ups also contributed to at-grade and basement flooding of businesses and residences. Significant damage also occurred within the floodplain areas.

Several critical issues identified for future short-term recovery and long-term resiliency include:

- Climate change - reducing increased stormwater runoff volumes from more frequent and more intense storms due to climate change;
- Combined sewer systems - renovation and rehabilitation of municipal sewer systems with combined stormwater/sanitary sewer systems and the subsequent sewer overflows during storm events;
- Reliable Power - emergency power generators and dedicated emergency generators to keep collection systems, wastewater treatment facilities and systems operational during storm events.
- Improved Emergency Response Capacity - improvements to the existing emergency response capabilities for the individual municipalities and the County as a whole.
- Sharing of Resources - prioritizing and coordinating capital improvements and sharing of resources between communities.
- Green Infrastructure - using green infrastructure solutions to cost-effectively improve stormwater management.
- Data Collection - Countywide data collection from stormwater facilities to track and anticipate and plan for future needs.
- Integrated Flood Planning - Countywide stormwater management looking at both upstream and downstream impacts of flooding.
- Integrated Land Use Planning - planning strategies for responsible expansion of development into farmlands and increased urbanization.
- Education - sharing stormwater management and mitigation information with residents, businesses, service providers and government officials.

New York State has allocated up to \$3 million to support the implementation of these short-term recovery and long-term resiliency projects.

## Community-Driven Process

Development of the NYRCR Plan was implemented through a series of community and stakeholder meetings focused on the future resiliency of Niagara County.

The Niagara County NYRCR Planning Committee worked to develop a Vision Statement for the NYRCR Plan. The members of the NYRCR Committee, representing a diverse range of agencies and stakeholders within the county, came together during the planning process to develop a shared vision for the future. The following Vision Statement was developed by the NYRCR Committee after conducting public engagement events at which residents, municipal officials, and business owners participated:

“Niagara County is a place of diverse communities set amongst historically important natural and cultural resources. Through the NY Rising Community Reconstruction Program, the County will increase community resiliency related to future storm damage while addressing existing damage to its resources. The County and its communities will work together using a countywide coordinated approach to increasing resiliency; protecting municipal infrastructure, residents, their homes, and business and industry; increasing emergency response capacity; and enhancing natural systems. Niagara County will be prepared to respond to and quickly recover from future extreme weather emergency events as a result of this plan. Niagara County communities will work to increase community resiliency to future storm events and to protect key assets, enhancing residents’ quality of life and promoting economic opportunities.”

## Resilience Orientation

Recovery needs that were met following the summer 2013 storms included making repairs to the Niagara Falls Wastewater Treatment Plant to allow full treatment operations to resume, and repairing of sewer receivers, piping, and streets in the City of Lockport.

The strategies within the NYRCR plan and the projects that support the strategies are focused on creating long-term resiliency to future storms within Niagara County. Projects needed to increase resilience focus on stormwater management and the reduction of flooding that occurs as a result of aging infrastructure that is being burdened by more frequent and heavier runoff from storms. Projects needed to address these resiliency issues include: planning for and implementing green infrastructure initiatives; upgrading storm and sewer infrastructure; increasing emergency response capacities; and preserving natural and agricultural resources.



**View from a public informational meeting held in North Tonawanda**

*Photo Credit: AECOM/Staff Photographer (Non-Professional)*



### A Final Plan as a Blueprint for Implementation

The critical issues, needs, and risks identified within Niagara County informed the strategies and projects included in the NYRCR Plan. The resiliency strategies describe the NYRCR Committee's approach to meeting the needs identified within Niagara County, and the projects help to execute those strategies.

Each of the Niagara County NY Rising Countywide Resiliency Plan strategies are listed below.

**Strategy I.** Promote community acceptance of floodplain management principles and regulations.

**Strategy II.** Municipalities and watershed organizations should work with local and State agencies to provide periodic training sessions on flood-related issues and long-term mitigation or resiliency strategies.

**Strategy III.** Develop a countywide uniform Geographic Information Systems-based flood analysis mapping system.

**Strategy IV.** Analyze historical records of weather conditions and stream flow response to identify potential thresholds and trigger events that could lead to flooding.

**Strategy V.** Develop a Niagara County-specific Green Infrastructure Tool Kit for use by municipalities, developers and homeowners.

**Strategy VI.** Improve emergency response system and provide evacuation assistance to communities.

**Strategy VII.** Utilize Green Infrastructure to mitigate flooding.

**Strategy VIII.** Upgrade storm and sewage infrastructure to increase stormwater storage capacity during peak flow events and remove connections between storm and sewer systems.

**Strategy IX.** Protect utility infrastructure, especially power lines, routinely damaged as a result of wind, snow, and ice events, which can lead to sanitary lift station or sump pump failures and basement flooding.

**Strategy X.** Undertake detailed floodplain and watershed studies across the County.

**Strategy XI.** Maintain and enhance riparian buffers along waterways.

**Strategy XII.** Preserve and protect upland natural resources including forested areas and critical watershed wetlands.

**Strategy XIII.** Preserve, protect and enhance soil quality to reduce agricultural runoff.

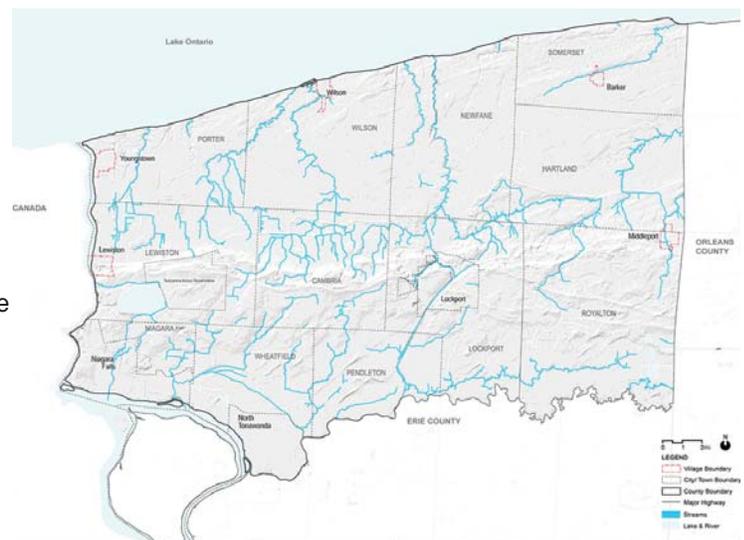
**Strategy XIV.** Conduct a countywide stream feature inventory.

**Strategy XV.** Educate property owners about combined sewer backflow risks and mitigation techniques.

**Strategy XVI.** Educate communities and property owners in floodplains about flood mitigation techniques.

**Strategy XVII.** Expand flood protection of underdeveloped parcels to spur economic growth.

**Strategy XVIII.** Identify underdeveloped parcels served by existing sewer and water infrastructure to target for future development as part of a comprehensive countywide development strategy.



Niagara County Overall Map

Diagram Credit: AECOM



Erie Canal (Photo Credit: Flickr/BobisTraveling)



## County Overview

*This section describes the County, including its landscape and geography. The section highlights the summer 2013 storm damage, areas of frequent flooding, and critical issues. The County Vision is presented, as well as relevant regional plans.*

### Niagara County Planning Area

Niagara County is located in the northwestern corner of New York State along the southern shore of Lake Ontario. Erie County and the Buffalo metropolitan areas border Niagara County to the south and southwest. Orleans County and Genesee County are located to the east and southeast, respectively. The Niagara River and the Province of Ontario Canada form the western border of Niagara County as well as the international border between the U. S. and Canada. Tonawanda Creek forms the southern boundary of the County with Erie County (see Figure 1). Niagara County encompasses a total land area of approximately 527 square miles.

The County includes 20 municipalities including the Cities of Niagara Falls, North Tonawanda, and Lockport, the towns of Cambria, Hartland, Lewiston, Lockport, Newfane, Niagara, Pendleton, Porter, Royalton, Somerset, Wheatfield, and Wilson; and the Villages of Barker, Lewiston, Middleport, Wilson, and Youngstown.

#### **Niagara County Land Use and Demographics**

The County is densely urbanized along its western edge with the Cities of Niagara Falls and North Tonawanda as well as suburbanized areas in the adjacent Towns of Niagara, Wheatfield and Lewiston. At the center of the County, the City of Lockport forms another urbanized area with suburbanized areas in the surrounding Town of Lockport. The remainder of the county outside of these urbanized areas and to the north and east is largely rural in character. The Towns of Cambria, Pendleton, Porter, Wilson, Royalton, Hartland, Newfane and Somerset are sparsely populated with a concentrated settlement in the Villages of Barker and Middleport on the eastern side of the County, Wilson on the north-central side of the County, and Youngstown on the northwest corner of the County.

According to the *2013 Niagara County Comprehensive Economic Development Strategy (CEDS)*, manufacturing, services, tourism, agriculture and public utilities all contribute to the Niagara County economy.<sup>1</sup> In 2010, the top four sectors for employment in Niagara County were Health Care & Social Assistance, Retail Trade, Accommodation and Food Service, and Manufacturing. However, the Manufacturing sector continued to provide the largest annual payroll, followed closely by the Health Care & Social Assistance sector. The County's urbanized and industrialized areas at its western edge along the Niagara River contribute to the importance and success of the industrial and manufacturing economy within the region. Availability of cheap energy from the Niagara Power Plant and easy access to the Great Lakes region via shipping, rail and highway have contributed to and supported dense settlement of the Cities of Niagara Falls and North Tonawanda.

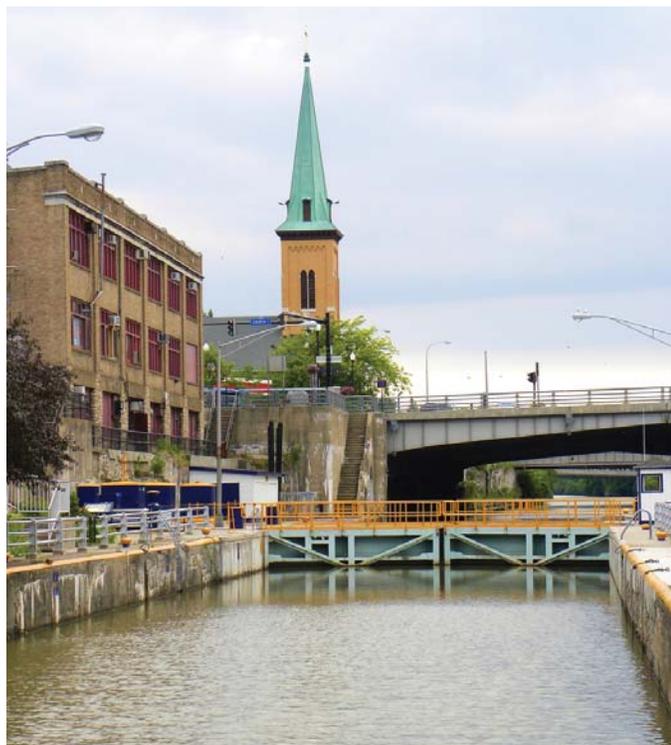
Farming remains an important sector of the economy in the County. The geographic setting of Niagara County significantly contributes to the importance and success of agriculture in the region. Areas of Niagara County continue to be very significant for fruit-growing within the State, largely due to the combined effects of productive soils for farming, relatively flat agricultural lands and a climate that is tempered and moderated by the presence of Lake Ontario and the Niagara Escarpment.

The proximity of the County to the natural features of the Niagara Falls and the Niagara Gorge to the north contributes to the success of tourism within the region. Tourism to Niagara Falls and other local attractions including the Seneca Niagara Casino & Hotel in downtown Niagara Falls also continues to contribute to the City's and County's economy. Areas from the Niagara Gorge to the west have further capitalized on the County's asset as a tourist



attraction and rich tradition of farming by promoting agritourism. The Niagara Wine Trail that crosses the County north to south as well as east to west is regarded as an up-and-coming attraction that can improve the County's economic outlook. The rich diversity of aquatic life in the Niagara River, Lake Ontario and many of the County's creeks makes the region a desirable destination for anglers from across the country, providing additional tourism and associated economic opportunities.

The Erie Canal is a historically important part of New York State as well as the County. It served as a major transportation corridor connecting the Great Lakes Region to the eastern seaboard. Stretching the length of the County from west to east, the Erie Canal gave rise to dense settlement at the City of Lockport. Use of the Canal has waned with the advent of trucking and the development of the national highway system, yet the Canal remains an important cultural feature that is now associated with increased regional tourism and recreational opportunities, including boating and fishing as well as parks, pedestrian and bike trails along its banks.



Erie Canal near St. Mary's Catholic Church

Photo Credit: Brilliant Images Photography

According to the American Community Survey (2008-2012), the County had a 2012 estimated population of 215,124.<sup>2</sup> Niagara County's population peaked in 1960 and has steadily declined over the past several decades. Historically, land use in the County has been rural and dominated by agriculture. Since 1960, however, household growth within rural areas outside of the County's three cities has increased over the last few decades. Between 1980 and 2000, the number of households in rural areas increased by 33.4 percent, while the number of households in developed areas grew by only 1 percent.<sup>3</sup> The population shifts within Niagara County indicate sprawling growth patterns over the last few decades, with nearly all household growth concentrated in rural areas outside of or on the fringes of its three cities.

This type of an expanding development pattern without actual growth in population often results in fragmented and "leapfrogged" land use patterns that consume valuable farmlands, jeopardizing open spaces and important natural resources such as wetlands, floodplains and woodlands. Concerns over undesirable development patterns like these that result from redistribution of population are being expressed throughout the County.<sup>4</sup>

If not managed correctly, subtle changes in land use over time can add cumulative pressures for converting agriculture and other rural uses to other uses that may place significant strain on local infrastructure and increased demand for public services. Increased demand in turn, puts added stress on the financial resources of the County and local governments which are expected to provide support infrastructure and services. The financing of new or expanded infrastructure generally comes from increased property and special district taxes. Stakeholders with varied interests and levels of expertise in wide-ranging topics expressed interest and concern over the effects of sprawl in Niagara County. The *Niagara Communities Comprehensive Plan 2030* (2009) indicated that stakeholders, regardless of their backgrounds and interests, were overwhelmingly concerned about the physical, environmental, social and fiscal implications of sprawl on the overall character and economic health of communities in Niagara County.<sup>5</sup>



**A classic view of the varying topography in Niagara County**  
*Photo Credit: Flickr/Luis Angel Camargo*

### Niagara County Natural Features

There are a number of natural features in the County that influence the consideration of stormwater management and resiliency planning, including topography, soil, and hydrology.

#### Topography

The primary natural features that make Niagara County geographically and geologically unique are the Niagara Escarpment, the Niagara Gorge and Niagara Falls. Niagara Falls and Gorge are located on the western edge of the County. The Niagara River flows north to the Niagara Gorge. Niagara Falls occurs as the Niagara River overtops the Niagara Escarpment into the Niagara gorge. At the Falls, the Upper Niagara River reach drops approximately 212 feet from its upper reach into the lower Niagara River reach. The Niagara River is the primary drainage passage for the four upper Great Lakes of the Midwestern part of the U.S., the largest supply of freshwater in the world. The Niagara Escarpment extends as an elevated ridge that stretches across the County in an east-west direction, dividing the County into two main watersheds. The dramatic drop-off of the escarpment to the north is what creates the Niagara Falls elevation change. The land to the north of the escarpment is part of the Ontario Plain which gently slopes northward to the shore of Lake Ontario. The land to the south of the Niagara Escarpment is part of the Huron Plain, which slopes in a gentle, southeastward direction towards the Tonawanda Creek and the Niagara River. The primary drainage way of this portion of the County to the Niagara River is Tonawanda Creek which flows more than 90 miles westward from its headwaters in Genesee County east of Niagara County. Both the

Ontario and Huron Plains are characterized by relatively flat, uniform topography occasionally interrupted by low ridges. (See Figure 6). The relatively flat slopes of both the north and south portions of the County and the relatively sparse settlement patterns require a strong dependence upon sanitary lift and pump stations to adequately move effluent towards treatment plants.

#### Soils

Some 33% of the soils across the middle of the County are classified as glacial till ranging from moderately well drained to very poorly drained. An additional 36% of the soils consist of glacial lake clays and silts, characterized as somewhat poorly drained to very poorly drained. Areas with these clays and silts are also characterized as having relatively high water tables. Much of the glacial lake clays and silts are concentrated in the southwesterly corner of the County in the areas of Wheatfield, North Tonawanda, and Pendleton, and the Town of Lockport. Some 14% of the County's soils are characterized as hydric soils. Hydric soils are generally poorly drained, and may be strong indicators of the presence of other important wetland characteristics including areas of important groundwater recharge (See Figures 3 and 4). The large percentage of poorly draining soils creates challenges for stormwater management with regard to high runoff rates and slow ground infiltration. The relatively high water table conditions can also contribute substantially to infiltration into existing piped systems and basements increasing stormwater flow and volume into municipal systems. Extensive wetland areas, however, can provide opportunities for stormwater attenuation, filtration and infiltration.



**A view of a functioning lock located in Lockport, NY**  
*Photo Credit: Flickr/Doug Kerr*



**A view of the Niagara River gorge and rapids**

*Photo Credit: Flickr/Diego Torres Silvestre*

### *Hydrology and Drainage*

As discussed above in the topography section, drainage in the County is essentially in two opposite directions away from the Niagara Escarpment (See Figure 5). On the north side of the escarpment there are several distinct south to north flowing creeks that deposit water into Lake Ontario. The major creeks include Four Mile, Six Mile, Twelve Mile, Eighteenmile, Keg, Fish Creek, Hopkins, Jeddo Creek, Johnson Creek and Golden Hill Creeks. Numerous floodplain areas and wetlands abut these creeks.

On the south side of the escarpment drainage flows along numerous tributary creeks, including: Bull, Mud, Bergholtz and Cayuga Creeks, directed southwesterly towards Tonawanda Creek or the Niagara River through North Tonawanda and Wheatfield. Numerous wetlands line the creek edges with hydric soils being more dominant and concentrated in the southern portion of the County. The numerous creeks, wetlands and southwesterly sloping topography of the southern portion of the County makes this area more prone to frequent flooding due to the concentration of flow volumes in a such a large, interconnected watershed.

Additionally, the southern portion of the County is underlain by the New York and New England Carbonate Rock Aquifer, coincident with known wetland areas and areas of hydric soils. The aquifer area yields small to moderate quantities of water and is not used as a significant public water source. Niagara County's public water supply is drawn from the East Branch of the Niagara River. Many of the communities in adjacent New York State counties to the east of Niagara and across the international border in Canada draw their public water supply from Lake Ontario. Because of the Niagara Escarpment, Niagara County stormwater runoff, sewer treatment plants and combined sewer outfalls disburse waters towards each of these two water bodies, making discharge water quality a crucial concern to the surrounding region.



FIGURE 1: NIAGARA COUNTY MAP



Data Sources:  
 Base Imagery: ESRI Online Server  
 Assets/Parcel Data: Niagara County  
 Dept. of Economic Development

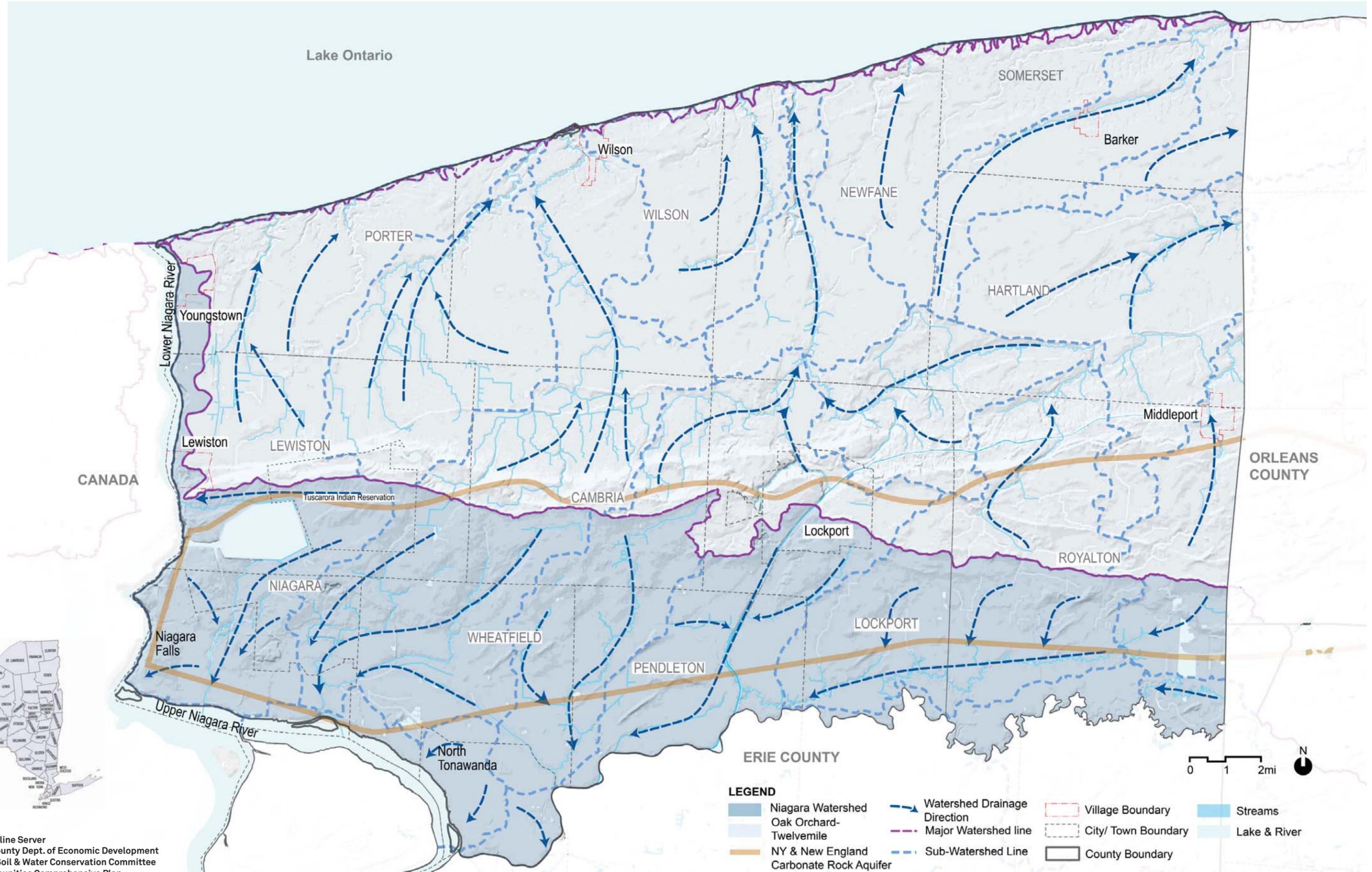
Page Intentionally Left Blank



Page Intentionally Left Blank



FIGURE 3: NIAGARA COUNTY HYDROLOGY MAP

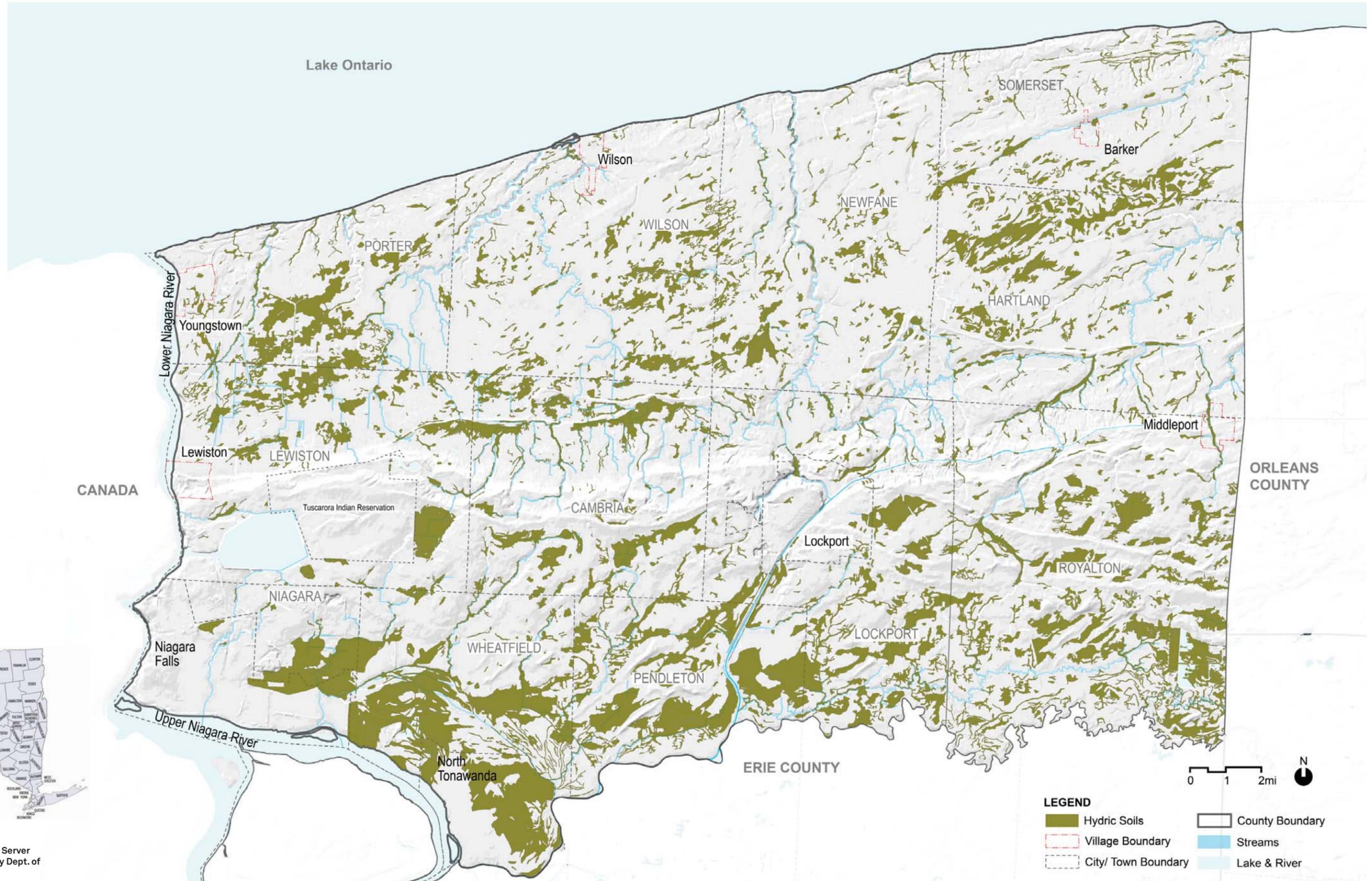


Data Sources:  
 Base Imagery: ESRI Online Server  
 Watershed: Niagara County Dept. of Economic Development  
 Sub-Watershed: NYS Soil & Water Conservation Committee  
 Aquifer: Niagara Communities Comprehensive Plan

Page Intentionally Left Blank



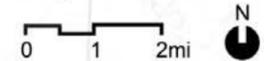
FIGURE 4: NIAGARA COUNTY HYDRIC SOIL MAP



Data Sources:  
 Base Imagery: ESRI Online Server  
 Hydric Soil: Niagara County Dept. of Economic Development

**LEGEND**

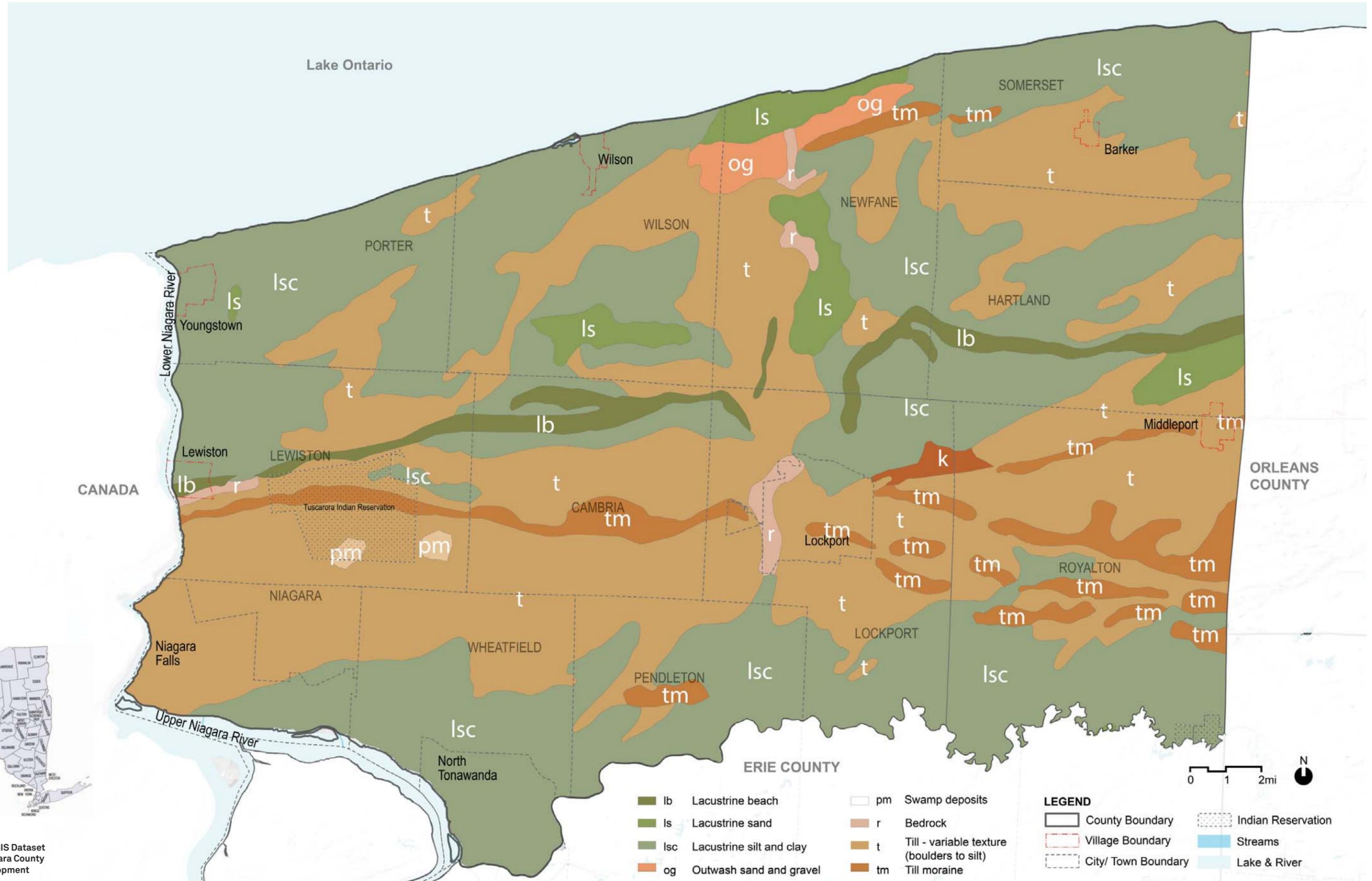
Hydric Soils	County Boundary
Village Boundary	Streams
City/ Town Boundary	Lake & River



Page Intentionally Left Blank



FIGURE 5: NIAGARA COUNTY SURFICIAL GEOGRAPHY MAP



Data Sources:  
 Soil Data: NYS Museum GIS Dataset  
 County Boundaries: Niagara County  
 Dept. of Economic Development

Page Intentionally Left Blank



FIGURE 6: NIAGARA COUNTY TOPOGRAPHY MAP



Data Sources:  
 Base Imagery: ESRI Online Server  
 Hydrology: Niagara County Dept. of Economic Development  
 Contour Lines: USGS

**LEGEND**

10' Contour	County Boundary
Village Boundary	Streams
City/ Town Boundary	Lake & River

Page Intentionally Left Blank



## Table 1: County Summary

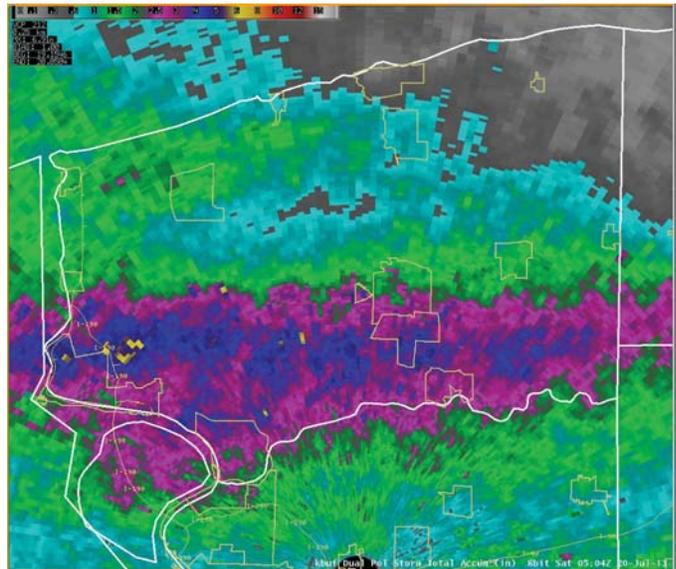
LOCATION	POPULATION (2008-2012 ACS)	HOUSING UNITS (2008-2012 ACS)	LAND AREA (SQUARE MILES)	DENSITY (POPULATION/SQUARE MILE)
Niagara County (total)	215,869	99,065	522.95	412.8
Village of Barker	685	236	0.42	1630.9
Town of Cambria	5,815	2,302	39.87	145.8
Town of Hartland	4,104	1,797	52.21	78.6
Town of Lewiston	16,239	6,592	36.20	448.6
Village of Lewiston	2,701	1,381	1.07	2524.3
City of Lockport	21,112	10,197	8.53	2475.0
Town of Lockport	20,399	8,727	44.63	457.1
Village of Middleport	1,704	798	0.88	1936.4
Town of Newfane	9,611	3,997	51.85	185.4
Town of Niagara	8,358	3,936	9.39	890.1
City of Niagara Falls	50,214	26,943	14.05	3573.9
City of North Tonawanda	31,498	14,586	10.10	3118.6
Town of Pendleton	6,401	2,337	27.18	235.5
Town of Porter	6,745	2,946	32.05	210.4
Town of Royalton	7,636	2,958	69.10	110.5
Town of Somerset	2,699	1,183	36.75	73.4
Town of Wheatfield	17,961	7,524	27.91	643.5
Town of Wilson	5,973	2,632	48.70	122.6
Village of Wilson	1,225	575	0.82	1493.9
Village of Youngstown	2,040	787	1.16	1758.6

Table 1 provides a summary of the most recently available demographic data by area. Specific information on the three cities located within the County, each of which experienced severe damage during the summer 2013 storms, is provided below.



## Description of Summer 2013 Storm Damage and Locations Prone to Flooding

Niagara County has historically been subject to both riverine and urban flooding. Riverine flooding occurs when river, stream or creek waters overtop their banks. Urban flooding, by contrast, is a specific phenomenon that occurs when there is lack of drainage in developed areas. Urban flooding is a type of flood characterized by a build-up of water over impervious surfaces outside of normal watercourses when precipitation exceeds the capacity of existing surface drainage systems. In developed areas where there are no open soil or vegetated areas that can be used for water storage or absorption, nearly all the precipitation needs to be transported to surface water or the stormwater drainage systems. High intensity precipitation can cause flooding in developed areas when in-ground storm drainage systems and surface channels do not have the necessary capacity to drain away the amounts of rain that is falling. With urban flooding, water may even enter in-ground storm drainage systems in one place only to overflow elsewhere back out of the drainage



Weather map showing intensity of rain storm on July 20, 2013, with greatest amount of rainfall occurring in a linear band through the center of the County (purple-magenta color on map).

Photo Credit: National Weather Service KBUF



Image of flooding at the Niagara Falls Wastewater Treatment Plant

Photo Credit: Niagara Falls Water Board

system due to overwhelming volumes. Urban flooding is unique in that it often occurs outside of FEMA mapped floodplain areas.

In the northern portion of the County, riverine flooding frequently occurs along the East and West Branches of Twelve Mile Creek in the Towns of Porter and Wilson, along stretches of Eighteenmile Creek in the Town of Newfane, and along Golden Hill Creek in the Town of Somerset near the Village of Barker. Limited flooding also occurs along the Lower Niagara River in Lewiston and Youngstown, where most of the infrastructure is above flood level. In the Southern portion of the County, riverine flooding occurs along multiple tributaries of Mud Creek in the Town of Lockport and Royalton, along Bull Creek in Pendleton and Cambria, along Bergholtz Creek in Wheatfield and the Town of Niagara, along the Cayuga Creek in the Town of Niagara and Cambria, as well as numerous locations along Tonawanda Creek in North Tonawanda, Pendleton, the Town of Lockport and Royalton. Urban flooding is largely concentrated in the Cities of Niagara, North Tonawanda, and Lockport where extensive paved areas, closely spaced buildings or buildings with large roof surface areas contribute to a high percentage of ground being covered by non-absorptive or impervious surfaces.



According to the National Oceanic and Atmospheric Administration's (NOAA's) National Climatic Data Center (NCDC), 23 flood events affecting Niagara County were recorded between January 1993 to July 2013.<sup>6</sup>

Prior to the storms of 2013, the most costly flooding event to affect Niagara County since 1993 occurred on September 9, 2004. The flooding affected counties throughout western and central New York State costing the entire area approximately \$3.7 million in property damage. This event was due to the torrential rains associated with the remnants of hurricane Francis, with rainfall of 3 to 5 inches occurring within a 6 to 9-hour period. The Tonawanda Creek crested 1.12 feet above flood stage the following day. This flooding event resulted in a Presidential Disaster Declaration for Niagara County and other affected counties. Four flooding events since 1985 have resulted in Presidential Disaster Declarations for Niagara County.<sup>7</sup> Most recently, severe rainstorms hit Niagara County on two separate dates during the summer of 2013.

The first event occurred on June 28 in the area of the City and Town of Lockport. During this storm five inches of rain fell over a period of two hours. This volume of precipitation is equivalent to over 15% of total rainfall that occurs on a yearly basis within the region. City of Lockport officials estimated that more than \$7 million in damage was done by the storm. About \$1.2 million of that was to municipal property. The rest was to homes and businesses. An estimated \$250,000 worth of damage was done at the wastewater treatment plant. The rainfall was so intense that it overwhelmed much of the City's combined stormwater and sanitary drainage system.

As a result nearly 600 homes experienced basement flooding of combined stormwater and sewage. Some 200 of these homes had flooding of the basement exceeded six feet in depth. The volume of stormwater flow is best captured by the reports of the combined stormwater and sanitary sewer flows that were encountered at the City's treatment plant. The plant normally treats 7 - 9 million gallons of water per day. It is designed to treat up to 22 million gallons a day. On June 28, volumes exceeded 93 million gallons. With the wastewater treatment plant well beyond capacity, the sewer lines backed up into city streets, yards and basements. The City responded with its Police, Fire, Parks, Engineering, and Utility departments to reroute traffic, pump out approximately 600 basements, unplug culverts and respond to emergency calls.



Image of flooded Lockport (City) Widewaters Marina Drive-In on June 28, 2013 Photo Credit: Heather Grimmer / Lockport Journal



Storm damage at the Niagara County Golf Course

Photo Credit: Niagara County



Storm damage in the City of Lockport showing sewer backflow

Photo Credit: Stephen M. Wallace / Lockport Journal



At the time of the flood, the City was in the process of replacing 1,000 feet of water line with new 8" pvc pipe to serve residents and a local elementary school. At the time, approximately 500' of pipe had been installed in an open trench. The flooding collapsed the trench, ruined the pipe installation and reduced the gravel base material to an unusable state. The City had to start the project over. Also in the City of Lockport, approximately 3,000 linear feet of Gooding Street experienced shoulder erosion damage and required repair. Willow Street experienced a sewer collapse, and multiple sewer receivers along Willow Street, High Street and other area streets were damaged.

The heavy rains also caused Eighteenmile Creek, a designated U.S. Environmental Protection Agency (EPA) Superfund site, to overflow its banks. A major contributor to the stream flow is the City of Lockport's wastewater treatment plant, which discharges directly into the Creek. The treatment plant sits at a low point in the City near where the Creek originates, and residential properties are nearby along Water Street. Flooding transported contaminated Creek silts to the Water Street properties. The Creek silts are primarily contaminated with polychlorinated biphenyls (PCBs) and other contaminants, including lead and chromium. Due to chronic flooding, in the late summer of 2013, the EPA proposed buying out and relocating five families, and demolishing their flood-prone homes due to the silt contamination deposited by the floodwaters.

The second summer storm occurred on July 19th and 20th in the vicinity of the Niagara River. The hardest hit communities in this area were the Cities of Niagara Falls and North Tonawanda and the Towns of Wheatfield, Niagara, and Lewiston. Rainfall of up to 4 inches was recorded in the City of North Tonawanda with wind gusts up to 60 miles per hour. In the City of Niagara Falls, rainfall of up to 3.4 inches was recorded. The storm was an extended series of intense thunderstorm cells that passed over a portion of the City in a sequential fashion with each cell dispensing more rain over areas that were becoming increasingly saturated. As the system became overloaded, low areas and areas where overflow relief was not available experienced the most significant flooding. In addition, the strong winds felled numerous trees knocking out power for more than 17,000 area residents. When power failed, numerous pump stations within the City's combined storm and sanitary system began to surcharge (backup), flooding

raw sewage onto streets and into the basements of nearby homes and businesses.

In Niagara Falls, the storms knocked out power to the wastewater treatment plant, causing significant damage to the plant, along with discharge of more than 100 million gallons of raw and partially treated wastewater into the Niagara River. The power failure also led to the backup of effluent and subsequent flooding of the interior of the Niagara Falls Water Board's wastewater treatment plant. The damage crippled the plant's ability to pump raw wastewater, feed treatment chemicals, remove solids from primary treatment, and process sludge. It took six days to mobilize, assemble, and activate a temporary raw wastewater pumping system to allow full treatment operations to resume and stop the overflow of wastewater to the Niagara River.

In the City of North Tonawanda, the Red Cross opened a shelter at the North Tonawanda High School for those left without power after the storm, staffed by volunteers, at the request of Niagara County Emergency Management officials. The Town of Niagara had its community center open on Saturday morning, July 20th, as an emergency shelter, and the Red Cross was on standby.

While there were reports of numerous streams flooding in Niagara Falls, North Tonawanda, Lewiston, Wheatfield, and Niagara, the extensive damage occurred outside of FEMA mapped areas due to the Combined Sewer and Sanitary systems, and extensive power failures that caused combined sanitary and stormwater lift stations to shut down. This pattern of flooding stands in contrast to the predominantly riverine flooding that occurred in other upstate counties in the storms of 2011 and 2013.

## Critical Issues

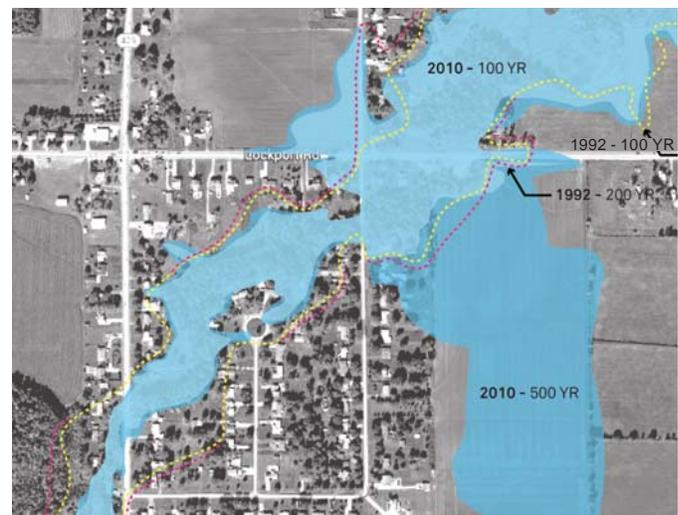
Several critical issues emerged in Niagara County because of the storms of summer 2013. While some of these issues are well known to residents and policy makers in the County, the storm events made them visible to a broader range of the public, and highlighted the gaps in the ability of the County to "bounce back" quickly from storm-related flooding. As part of the public outreach process, community residents, key stakeholders, and Planning Committee members were asked to identify the challenges their communities faced because of the summer 2013

storm damage. The following is a list of ten critical issues identified by the Niagara County community that the NYRCR Niagara County Plan should address to resolve flood-related issues:

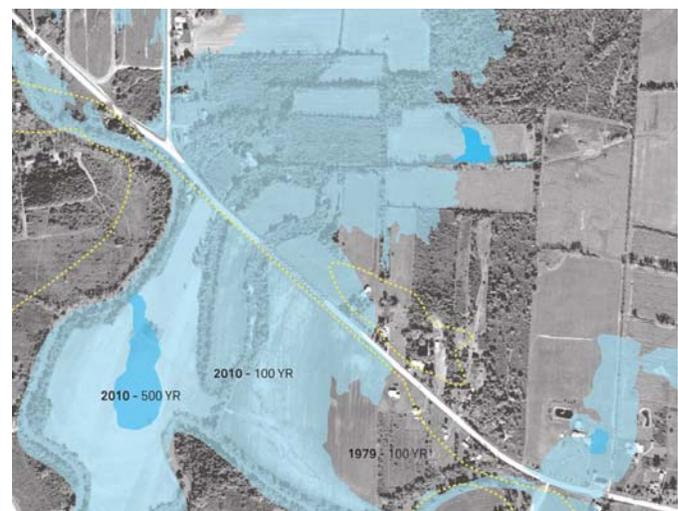
- Combined Sewer System:** The storms of 2013 and previous events have demonstrated that the County’s combined stormwater and sewer systems are particularly vulnerable to high intensity, high volume storm events. When these systems are overwhelmed, they cause significant and costly damage to both public and private property.
- Reliable Power:** The County’s flat terrain and widely dispersed population is reliant upon sanitary systems that require sanitary lift and pump stations. Lift and pump stations also require dependable power supplies with emergency back-up to allow for uninterrupted service during both wet and dry weather. Similarly, many homeowners have residences with basements in areas of high groundwater or are near flood zones. Owners are dependent upon reliable power to maintain sump pumps to keep basement areas habitable and dry. Flooding has occurred repeatedly due to power outages associated with both rain and snow storms.
- Improved Emergency Response Capacity:** Emergency response teams need improved equipment and communication resources to be able to rapidly respond to storm events and their aftermath across the County.
- Sharing of Resources:** Each municipality within the County has limited resources to handle the multitude of issues that recent flooding events and storm damage have exposed. Prioritizing and coordinating capital improvements and sharing or coordinating resources collaboratively is necessary to implement a comprehensive resiliency plan.
- Climate Change:** Climate change poses a number of distinct future risks including increased frequency of high intensity storms and temperature rise which may lead to an increase in freeze thaw flooding events during winter months. Much of the County’s infrastructure is limited in its capacity to handle both high intensity rain events and to support increased volume associated with new development. Mitigation of these risks may require both the increase of storm system capacities and the reduction of flows into systems that require mechanical treatment.



Town of Pendleton, NY FEMA floodplain changes between 1989 and 2010



Town of Wheatfield, NY FEMA floodplain changes between 1992 and 2010



Town of Royalton, NY FEMA floodplain changes between 1979 and 2010



- **Green Infrastructure:** The use of green infrastructure represents a significant opportunity for cost-effective stormwater system improvements with critical economic, environmental, social and public health co-benefits.
- **Data Collection:** There is a need for improved, countywide data on stormwater facilities and persistent flooding at specific locations to support a full understanding of the challenges and aid future planning efforts.
- **Integrated Flood Planning:** Because the County's watershed and creeks cover and cross multiple community boundaries, stormwater management needs to be regional in focus, taking into account both upstream and downstream impacts. The County's municipalities will need to coordinate efforts in order to maximize their impact.
- **Integrated Land Use Planning:** Recent Countywide development is expanding into rural areas with land use patterns that consume valuable farmlands, jeopardizing open spaces and natural resources such as wetlands, floodplains and woodlands which

provide critical flood management benefits. Communities will need to encourage desirable and appropriate growth and development so as to not exacerbate current flooding conditions or require costly infrastructural investments in the future.

- **Education:** The 2013 storm events raised County resident's awareness of their vulnerability to flooding and subsequent recovery needs. There is a need to share information among residents, businesses, government officials, and service providers within the County to speed recovery and plan future resiliency strategies.

## Vision

The Niagara County NYRCR Planning Committee worked to develop a Vision Statement for the Resiliency Plan. The Vision Statement was developed after the NYRCR Planning Committee conducted public engagement events at which residents, municipal officials, and business owners participated.

This Vision Statement sets the tone for the long-term strategies which are an outcome of the Niagara County NY Rising Countywide Resiliency Plan. The strategies, which follow in Section 3 of this document, address the needs and opportunities in the County and strengthen critical assets, with a range of projects tied to each of the strategies. Ultimately, each strategy and project should help achieve the vision set forth in the plan.

## County Vision Statement

*Niagara County is a place of diverse communities set amongst historically important natural and cultural resources. Through the NY Rising Community Reconstruction Program, the County will increase community resiliency related to future storm damage while addressing existing damage to its resources. The County and its communities will work together using a countywide coordinated approach to increasing resiliency; protecting municipal infrastructure, residents, their homes, and business and industry; increasing emergency response capacity; and enhancing natural systems. Niagara County will be prepared to respond to and quickly recover from future extreme weather emergency events as a result of this plan. Niagara County communities will work to increase community resiliency to future storm events and to protect key assets, enhancing residents' quality of life and promoting economic opportunities.*

## Relationship to Regional Plans

Damage from storms, such as the summer storms of 2013, and recovery and resiliency initiatives, along with risks presented by climate change and land use changes, are issues that cross jurisdictional boundaries and have regional implications. Niagara County is comprised of 20 municipalities, creating a need and an opportunity to coordinate projects that increase community resiliency on a countywide and regional level. Niagara County and its communities have participated in a number of countywide and regional planning initiatives, which this plan builds upon, as described below.

The *Niagara Communities Comprehensive Plan 2030* (2009) is a countywide document that emphasizes a multi-municipal approach to planning and decision-making.<sup>8</sup> The *Plan* identifies issues, opportunities, and



Niagara Communities Comprehensive Plan - 2030, referenced in this document

recommended actions related to land development patterns, natural resources protection, infrastructure and stormwater management needs, and maintenance/strategic upgrades of existing infrastructure.

The *Plan* also considers changing land uses such as an increase in residential land use without an increase in population. Development patterns like this often consume valuable farmland and threaten open spaces and natural resources like wetlands, floodplains, and woodlands. It also recognizes protection of the County's natural resources as a future economic development opportunity and calls out green infrastructure as a way to address some infrastructure needs and create stormwater management and ecological benefits. The *Plan* prioritizes maintenance, replacement programs, and strategic upgrades to infrastructure such as water, sewer, and drainage, rather than new infrastructure systems. It also recommends land use management policies to control development in floodplains.

Niagara County's annual reporting on economic development is included in the *Niagara County Comprehensive Economic Development Strategy (CEDS)* (2013).<sup>9</sup> The report provides an overview of the County's economy within the regional context. Economic development issues and projects are identified in the report. The goals identified for the County in the report include improving quality of life by implementing sustainable development practices such as compatible land uses, concentrated development patterns, and redevelopment of traditional population centers; and by protecting natural resources. Agricultural areas are identified as a key economic sector in the County, along with actions to support the sector.

*The Niagara County Comprehensive Emergency Management Plan* (2008) provides general all-hazards emergency management guidance to prevent, protect against, respond to, and recover from emergency events.<sup>10</sup> Actions to be taken by the County before, during, and after an emergency are outlined in the plan according to three components of emergency management: disaster prevention and mitigation, response, and recovery.

The *2008 Niagara County Multi-Jurisdiction Hazard Mitigation Plan* was prepared jointly by the Niagara County municipalities to address disaster and reduce their cost to property owners and local government, protect critical infrastructure, reduce exposure, and minimize community disruptions from disasters.<sup>11</sup> The 2008 plan is currently being updated to continue eligibility for FEMA's post-disaster Hazard Mitigation Grant Program Funds.

*The Cross Border Contingency Plan: Standard Operating Procedures for Peacetime Disasters* (2007) documents the partnership for cooperation on civil emergency planning between Erie County, Niagara County, New York State, and the Regional Municipality of Niagara, Province of Ontario.<sup>12</sup> Peacetime disasters are those that may be caused by natural forces or through the actions of humans, such as floods, fires, tornadoes, ice storms, rail crashes, or other incidents that endanger lives or loss of property within the region.

The document describes standard operating procedures for cooperation in an emergency and to provide mutual support to a municipality experiencing a disaster. The *Plan* was written to recognize the



advantages and necessities of mutual cooperation and aid in times of local disasters, including sharing resources and manpower. The *Plan* includes agency and government contacts to be used in an emergency situation, along with an outline of immediate actions to be taken.

*One Region Forward* is a collaborative effort led by a consortium of public and private sector organizations and supported by a grant from the U.S. Department of Housing and Urban Development to promote sustainability in the Buffalo Niagara region.<sup>13</sup> The research, public engagement, and planning process will result in the creation of a Regional Plan for Sustainable Development for the Buffalo Niagara region aimed at addressing economic, environmental, and social sustainability. The plan will center on five focus areas: Land Use and Development, Transportation and Mobility, Housing and Neighborhoods, Food Access and Justice, and Climate Change Action with established goals, performance metrics, and implementation strategies aimed at reaching those goals. *One Region Forward* is being coordinated with recent regional planning efforts.

The *Western New York Regional Economic Development Strategic Plan* (2011) was developed to ensure sustainable and long-term growth in jobs and income for the five-county region including Allegany, Cattaraugus, Chautauqua, Erie, and Niagara counties.<sup>14</sup> The strategy focuses on job readiness, smart growth, and entrepreneurship, along with target industry sectors including some related to the NYRCR Plan, agriculture and tourism. One of the criteria for projects in the strategy is adherence to smart growth principles to integrate economic development and job creation with community quality of life through preservation and enhancement of the built and natural environments (such as through infill development and the preservation of natural resources).

The *Plan* identifies strategies and projects/programs that are directly related to the NYRCR Plan. In the economic development strategy, the *Plan* recommends implementing smart growth by establishing the region as a center of green innovation

to create jobs and develop skill levels in sectors including green infrastructure through programs such as NYSERDA's Green Jobs/Green New York Program. In the Agricultural strategy, the *Plan* recommends the development and promotion of innovative farming practices.

The *Western New York Regional Sustainability Plan 2013* stems from a region-wide planning effort within the five-county region of Allegany, Cattaraugus, Chautauqua, Erie, and Niagara counties.<sup>15</sup> The *Plan* seeks to permit social and economic growth while preserving natural resources to create a sustainable regional economy. The *Plan* addresses climate adaptation across six focus areas: Energy, Land Use and Livable Communities, Transportation, Agriculture and Forestry, Water Resources, and Waste Management. Of particular relevance are the *Plan's* Land Use and Agricultural/Forestry goals that aim to preserve and protect these uses and the Water Resources goals to address regional water quantity concerns through a focus on flooding, stormwater runoff, infiltration, and regional water use. The *Plan* puts forward strategies that are directly related to the Niagara County NY Rising Countywide Resiliency Plan. In the Land Use and Agricultural/Forestry focus areas, these related strategies focus on establishing farmland and timberland protections and providing resources and training for sustainable agricultural production. In the Water Resources focus area, these related strategies focus on public education regarding watershed management, implementation of targeted sewer infrastructure improvements, removal of regulatory and administrative barriers to green infrastructure projects, implementation of green infrastructure practices to reduce stormwater flows and runoff, and promotion of land preservation and/or restoration to manage stormwater runoff. These goals and strategies and those of the NYRCR Plan are mutually supportive.

The *Erie Canal National Heritage Corridor 2011-2016 Strategic Plan* (2011) was developed by the Erie Canalway National Heritage Corridor Commission in partnership with the National Park Service to create a strategic plan for the Corridor.<sup>16</sup> The Strategic Plan is aimed at developing a work plan to preserve the Corridor's nationally significant resources, promote



tourism and recreation, inform the public and key audiences about the Corridor, and sustain financial resources for the Corridor. The *Plan* builds on the *Erie Canalway National Heritage Corridor Preservation and Management Plan (P&MP)* (2006), which offers a regional vision of the Corridor that incorporates preservation, conservation, recreation, story-telling, wayfinding, economic revitalization, and tourism development and marketing.

The *Sustainable Municipal Water Management: Measuring Progress and Reporting Publicly* (2012)<sup>17</sup> report was produced by The Great Lakes and St. Lawrence Cities Initiative to promote a comprehensive approach to protecting the shared water resources of the Great Lakes and St. Lawrence region. The report provides a framework for sustainable municipal water management. The framework recognizes an integrated approach to water management that takes into account the impacts of urbanization and climate change and broadens management actions beyond the scope of water service delivery and wastewater treatment. In particular, the report highlights a water management strategy that integrates infrastructure design and operations, land use planning and approvals, public education and participation, emergency planning and response, pollution prevention, and habitat and shoreline restoration. The report provides milestones and progress indicators, as well as best practices that have been implemented regionally.

Other plans consulted during the preparation of the NYRCR Plan include the *Erie-Niagara Framework for Regional Growth* (2006), the *Niagara River Greenway Plan* (2007), and the *Niagara County Agricultural Farmland Protection Plan* (1999). In addition, just prior to the development of this plan, the National Association of Development Organizations (NADO) Research Foundation hosted a training workshop in Niagara Falls in early 2014, which brought together city and county economic development directors, along with elected officials and other leaders from throughout the Buffalo Niagara region to discuss approaches to make the region, and its businesses more resilient to natural disasters. Materials from the workshop were consulted in the development of the NYRCR Plan.



South Grand Island Bridge, Niagara River (Photo Credit: Niagara County)



# 2

## Assessment of Risk and Needs

*The NYRCR Plan identified and assessed risk to high-value assets in Niagara County in order to understand which community assets were at risk, especially those whose loss or impairment would compromise critical facilities or essential community functions. Needs and opportunities in Niagara County were identified with public input to guide the planning process. The NYRCR Plan aims to ensure that community assets which were affected by the summer storms, or could be affected in the future, will be more resilient to future storms.*

### Assessment of Needs and Opportunities

The needs and opportunities for Niagara County have been identified through review of existing data sources and plans, discussions with public officials, field inspections, and input from the NYRCR Program Public Engagement process in Niagara County. These needs and opportunities are described in relation to the six Recovery Support Functions and asset categories through which critical assets in the County have been inventoried:

- **Community Planning and Capacity Building**, which addresses the community's ability to both implement storm recovery activities and to plan how to mitigate the effects of future storms. This might include education programs, special purpose plans or guidelines which might integrate socioeconomic, demographic risk assessment and consideration of vulnerable populations.
- **Economic Development**, which addresses returning economic and business activities including agriculture and tourism to a state of health and developing new economic opportunities that result in a sustainable and economically strong community. This category also addresses public or private investments that produce both economic growth and greater resilience.
- **Health and Social Services**, which considers the health and well-being of community members, the restoration and improvement of essential health and social services, such as health care facilities and community centers, especially those that serve the needs of vulnerable populations.
- **Housing**, which considers pre- and post-disaster housing issues, relating to single family, multi-family and particularly housing that serves vulnerable populations.

Recovery Support Functions make up the coordinating structure of the *National Disaster Recovery Framework* and are used at the Federal level to organize recovery activities and resources. These key functional areas of assistance are organized into six components:

- Community Planning and Capacity Building
- Economic Development
- Health and Social Services
- Housing
- Infrastructure
- Natural and Cultural Resources

• **Infrastructure**, which considers the protection, restoration, repair, and management of essential services provided by infrastructure – such as stormwater and sewer systems and power supply utilities – in the community.

• **Natural and Cultural Resources**, which considers the restoration and management of natural and cultural resources – such as creeks, wetlands, forested areas, floodplains, agricultural areas, parks and other open space areas and historical landmarks - from a risk reduction and economic development perspective. Another critical cultural resource includes the historic Erie Canal.

The needs and opportunities presented in this NYRCR Plan provide a basis for the strategies, projects, programs, policies, and actions that are proposed. These needs and opportunities emerged due to the damages caused by the 2013 summer storms, as well as ongoing risks faced by the County's assets. Such risks include lost economic opportunities attributed to damages or to energies and funds redirected toward recovery; rebuilding or expanding the local economy; making existing assets more resilient; and, needs which already existed when the storms hit.



## Community Planning and Capacity Building

The recent storm events reinforced community leaders' notions that there needs to be improved public education about flooding and stormwater management on many levels. There is an urgent need to assist the County and its communities with understanding the immediate risks and hazards of flooding and the need to understand the importance of stormwater management on a regional scale. In addition there is a need to educate public officials about the available resources for recovery so they can provide support and guidance in their local communities.

Much of the flood damage experience in the summer 2013 storms was the result of combined stormwater and sanitary systems within the County's urban areas. These events have happened repeatedly, yet there appears to be a poor understanding of the root causes of the problem on either a regional or local scale. A lack of public awareness about the challenges of these systems and ways to mitigate their impacts is hampering the County's ability to muster the "political will" to mandate changes. There are a number of mitigation strategies that could be advanced, including improved communication of the importance of building codes and compliance, renewed emphasis on building inspection, and other broad strategies to combat future combined sewer flooding and their associated costs and disruptions.

In addition, there is a clear need for improved data collection and mapping of flooding events to guide decision making about how to improve long-term resiliency. The County currently has a need for 10-year floodplain data that would allow more detailed planning of floodplains. There is also a need to clearly map existing combined sewer watersheds in conjunction with already mapped combined sewer outfalls (CSOs).

One example of the improved mapping is the City of Niagara Falls' Flood "Heat" map, an effective tool in the capture and communication of flood data to aid in future planning (Figure 7). In more rural areas where creeks and their tributaries play a crucial role in stormwater management, there are few locations where stream flows and water quality can be measured. There is no program to regularly inspect

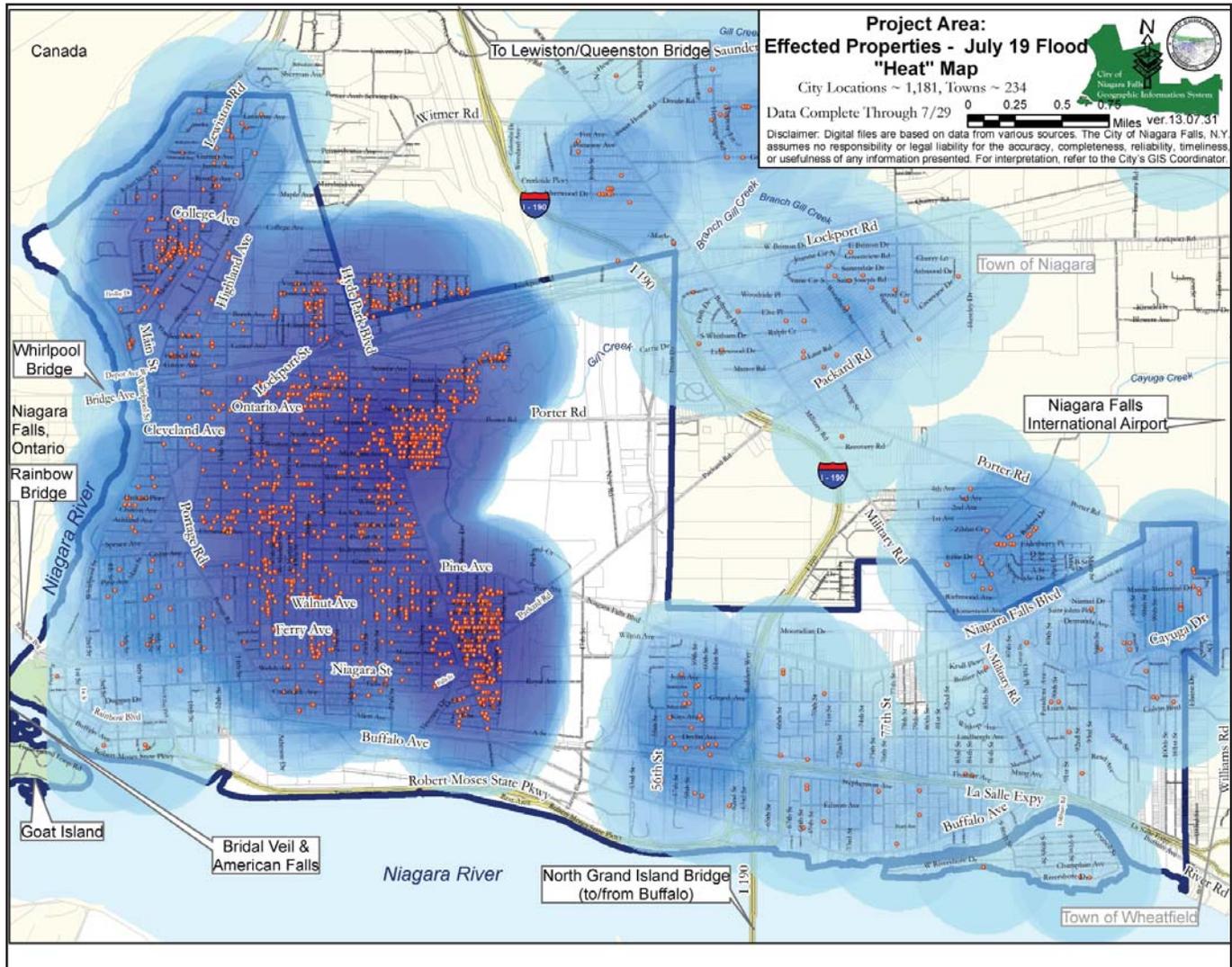
waterways to ensure that they are functioning, properly, are maintained and are not prone to localized flooding. Currently, there is no centralized County database or mapping effort dedicated to stormwater management that can be accessed and supplemented by local communities to record where persistent flooding occurs. Without this information it is difficult to address the inherent challenges of stormwater management in a landscape where watersheds, creeks and infrastructure systems cross municipal jurisdictions.

There is also a strong need for Niagara County-specific guidelines for the use and implementation of Green Infrastructure to promote low-cost stormwater management solutions as an alternative to expanding the capacity of existing traditional municipal stormwater systems. A green infrastructure tool kit that could be used and even incentivized by various municipalities, developers, businesses and residents to better manage stormwater could be an important way to improve public awareness of flood management, environmental restoration, and opportunities for reducing the costs associated with providing a robust stormwater infrastructure system, Countywide. In particular, there is the need for the development of green infrastructure guidelines and recommendations that are specific to the soils and vegetation of the County to ensure their successful implementation.



Image of green infrastructure existing in Niagara County, which could be used as a starting reference for Countywide ventures.  
Photo Credit: AECOM/Staff Photographer (Non-Professional)

Figure 7: City of Niagara Falls “Heat Map” indicating properties affected by the July 19, 2013 flood event. (Source: City of Niagara Falls)



An example resource is the Buffalo Niagara Rivekeeper’s *Green Infrastructure Solutions Plan*. This Plan informs residents about impacts of combined sewer overflows on the Niagara River watershed, Buffalo’s long-term control plan and regulatory environment, the effects of stormwater on the local wastewater treatment capacity, recommendations for green infrastructure program components, demonstration projects and additional long-term control recommendations. Educating the residents about green infrastructure solutions and the impacts of not having them in place helps them understand

how they are positively impacted.

The development of green infrastructure guidelines could also be tied to the development of green infrastructure material supply, construction and maintenance opportunities. A robust Countywide program emphasizing green infrastructure could be incorporated into school programs and provide important educational and job opportunities for disadvantaged populations. The promotion of green infrastructure systems has other co-benefits, outlined below.



**Economic Development**

There is an opportunity to ensure that future business and employment centers are located in areas of the County that are not in high or moderate risk areas, and are proximally located to infrastructural facilities that have the capacity to support continued operations and growth. These centers should be planned to incorporate best practices for managing stormwater to minimize the need for costly public investments in stormwater infrastructure to support these new growth centers.

The incorporation of green infrastructure into existing urban areas and business locations can serve as an important revitalization tool, improving the appearance and appeal of underutilized areas for redevelopment. Urban revitalization strategies centered around robust green infrastructure systems can help to reduce development pressures on infrastructure and can be an important way to preserve open space. Within Niagara County much of the scenic tourism, agritourism and recreational economies such as sport fishing, are closely tied to the preservation and enhancement of the natural landscape features that provide the economic draw to the region.

One of the key identified needs within the County was land conservation of both natural areas and farmlands. There appears to be consensus among County stakeholders about encouraging denser development clusters in rural areas to conserve open space and preserve the agriculture economy. Denser development with embedded green infrastructure



**Niagara County International Airport**  
 Photo Credit: Niagara County



**Robert Moses Niagara Power Plant**  
 Photo Credit: Niagara County

strategies is a strong way to minimize future downstream flooding, avoid costly expansion of stormwater and sanitary sewer collection systems, and conserve valuable open space. As a complement to this practice, strategies that target development to areas that are already served by sewer and water infrastructure could be used to encourage growth on underdeveloped parcels without continued consumption of rural land areas.

Existing roadways, utilities, and other infrastructure already in place within Niagara County’s population centers and “developed” areas can support increased growth without needing to consume undeveloped natural areas or farmland. A critical co-benefit to developing within existing population centers is increased job opportunities for disadvantaged populations that do not have the resources to travel to outlying suburban or rural areas on a daily basis. Flooding associated with the summer 2013 storms and other previous storms in Niagara County shows that areas with high population densities are at risk for continued flooding due to impervious surface conditions, combined stormwater and sewage systems, and generally undersized infrastructure.

There is an opportunity to combine economic development strategies with flood resiliency strategies in a way that promotes critical co-benefits and leads to new economic opportunities. For



**View of Lock along the Erie Canal**

*Photo Credit: Niagara County*

example, underdeveloped parcels in areas already served by sewer and water could be identified and targeted for future development that integrates infrastructure measures designed to promote greater flood resiliency, such as green infrastructure. In addition, brownfield areas should continue to be prioritized for environmental remediation as part of a countywide strategy to provide new development sites, while protecting surface and subsurface water quality. By prioritizing flood resiliency within economic development strategies, project opportunities with multiple linked benefits can be identified, encouraged, and incentivized, leveraging both public and private investment and providing new growth opportunities in the County.

### **Health and Social Services**

While many of the health and social services assets of the County were spared during the storm events of 2013, they remain critical assets for future events. In particular, there is a need to ensure continued emergency power to shelters and other critical public service locations in the event of future storms.

The summer storms also revealed challenges of the emergency response teams. There was a demonstrated need for improved communications during multiple flooding events spread over wide geographic areas. In addition, much of the response

to the flooding was by volunteer fire-fighting units, who lack proper equipment to respond to flooding events quickly. Emergency crews experienced a need for specialized rescue equipment such as emergency communications and technical rescue vehicles, generators and other more readily available equipment that would expedite response time.

### **Housing**

The vast majority of housing assets in the County are single-family residences. In certain communities - in particular the Cities of Lockport, North Tonawanda and Niagara Falls, as well as the Towns of Wheatfield and Lockport - residential neighborhoods suffered the bulk of the flooding. In the cities, this was a result of overwhelmed municipal infrastructure systems that were reliant on combined stormwater and sanitary sewer systems. As indicated in the Community Planning and Capacity Building sub-section, there is a need for improved education and understanding of how these storm systems put housing at risk. There is an opportunity to assist homeowners with ways to protect their homes from future backflow inundation. Across the country, there have been a number of successful educational and incentive programs aimed at promoting the installation of backflow devices to protect properties. In the City of Lansing, Michigan, for instance, Basement Backup Prevention Program (BZPZ) was created to allow residents to proactively address the issue of basement sewer back-ups and to offer assistance to protect residents from future backups (see [www.lansingmi.gov/basements](http://www.lansingmi.gov/basements)). This program educates its residents and also provides annual testing to ensure proper function of installed backflow prevention/cross-contamination assemblies. A similar program could be instituted within Niagara County to reduce future costs associated with repeated damage.

While much of the flooding from the summer 2013 storms was caused by CSO issues and flash flooding in areas of denser settlement, housing assets in floodplains were also damaged and are vulnerable to future storm events. Figure 12 shows the locations of residential parcels in the 100- and 500-year floodplains and Table 2 provides the number of residential parcels in the floodplain by location. Taken together, they provide an estimate of housing assets



in the floodplain; however, as they are based on parcel data, not all parcels include structures located within the floodplain. Overall, almost 10 percent of residential parcels in Niagara County are located within the 100-year floodplain and 8 percent are located within the 500-year floodplain. The majority of these parcels are single-family residential parcels. The largest concentration of parcels within the floodplain are found in the City of Niagara Falls, the Town of Wheatfield, the City and Town of Lockport, and the Town of Pendleton. As identified in the Community Planning and Capacity Building section above, there is an opportunity to develop more detailed mapping of flood events, base flood elevations, and 10-year floodplain locations in order to address future risk.

In areas where residential flooding occurred as a result of residences located within the 100-year and 500-year floodplains, there is an opportunity to develop guidance for strategies which address development within the floodplains. Residents reported that basement flooding in some areas was the result of groundwater infiltration that occurred when sump pumps did not operate due to power outages. This might be an opportunity to provide education about and incentivize the installation of sump systems with battery backup systems. There might be a related education program to check and replace batteries similar to the program to promote checking of smoke detectors. Opportunities to reduce residential flooding are critical to relieving the operational strain on emergency responders during and after flooding events. Reduction of basement flooding also reduces the costs associated with frequent disposal of damaged building materials that overwhelm municipal refuse collection.

### Infrastructure

The storms revealed a number of challenges with the County's infrastructure. The combined stormwater and sanitary systems in particular proved to be challenging during flood conditions. Overall, the sheer volume and intensity of the rain events overwhelmed the storm systems. The heavy volume damaged lift station and wastewater treatment equipment. There is an immediate need to repair or replace the damaged equipment. Many of the lift stations within the areas of heavy rainfall lost power due to falling trees or flooded electrical systems. Portable generators could not be installed in a timely manner to keep the systems operational. The need for reliable, permanently installed, and remotely activated backup-power is a critical need to keep systems in operation and to prevent future property and pump equipment damage.

One of the main challenges of the combined stormwater and sanitary systems is that high intensity rain events can overwhelm the capacity of the collector system and their dedicated wastewater treatment facilities. When storm flows exceed the capacity of the treatment plants, as occurred during the storm in Lockport, the combined stormwater is designed to by-pass the treatment plant and discharge untreated wastewater directly into the treatment plant's outlet at Eighteen Mile Creek. This discharge of untreated stormwater is called a combined sewer outfall (CSO) event. These discharges often violate Federal and State regulations, degrade downstream water quality and can pose a risk to human and other terrestrial and aquatic life.

One of the most obvious infrastructure needs relates to the sizing of the storm system equipment. Increased frequency of high intensity storm events may suggest the need to increase the design capacity of the stormwater management systems. This can be achieved in a number of ways. Simply increasing capacity is one way. Another way, which is encouraged by current Federal and State Clean Water Act regulations, is to separate sanitary and stormwater systems. Both of these options are very costly undertakings. The coincident incorporation of green infrastructure systems represents one opportunity to reduce the magnitude of volume



capacity increases within traditional in-ground pipe systems. Green infrastructure is typically intended to reduce the quantity impacts of low-volume storm events and improve water quality through filtration, typically the first inch to inch-and-a-half of rainfall. When used in conjunction with traditional stormwater systems, green infrastructure can be used to reduce and attenuate overall volumes of stormwater, effectively reducing the scale of system capacities. Simple strategies like porous pavements, rain gardens, rain barrels, infiltration tree pits and green roofs can reduce rainwater volumes that eventually make their way to wastewater treatment plants. Reduction of everyday, low volume flows conserves wastewater treatment plant energy use and reduces the wear and tear on equipment. Important co-benefits include reduced urban heat island, improved air quality, and improved neighborhood aesthetics, which are critical quality of life and public health improvements for urban residents and workers.

In urban and suburban park areas and more rural areas, ponds, streams, naturally occurring or constructed wetlands and bioswales can complement more urban green infrastructure strategies to provide larger stormwater volume management.

The summer storms of 2013 also revealed a need to repair or replace numerous culverts around the County. In many cases stream flows exceeded capacities of the culverts resulting in clogging by debris or backup of waters that led to localized flooding and erosion. Culvert replacement and repairs can be coordinated with stream restoration opportunities. Benefits of this include expanding head walls to allow for wetland opportunities and creating habitats and overflow areas to alleviate surges during peak precipitation events. The addition of wetlands can also improve water quality through the filtration process of the flora that inhabit wetland areas. Increased plant biomass provides erosion control adjacent to culverts and roads. In some cases damaged or undersized culverts can create fish barriers preventing movement of fish in the streams and creeks. By allowing the fish to migrate in these local waters it promotes interconnection to restore lost fish habitats.



View of North Tonawanda and a frozen canal  
*Photo Credit: Niagara County*

In some areas throughout the County, persistent flooding is due to the infiltration of groundwater into aging stormwater systems. In areas of high groundwater, stormwater systems are subject to persistent flows into the piped systems through cracks in pipes, catch basins and manholes. The presence of groundwater in the pipes effectively reduces the capacity of the systems during storm events. This results in localized flooding of roadways and surrounding areas. Excessive loading of the stormwater systems through infiltration can also overwhelm wastewater treatment plants that are connected to combined stormwater and sewer systems. Excessive flow exacerbated by groundwater infiltration overwhelms the treatment plant systems resulting in CSO discharges into the water bodies. In the Town of Porter, for example, even relatively low volume rain storms can trigger CSO events due to the presence of infiltrating groundwater.



## Natural and Cultural Resources

While the natural and cultural resources of Niagara County were not significantly damaged during the storms of the summer of 2013, they present an opportunity for implementing strategies to offset and prepare for future storm events.

The preservation, reconstruction, and enhancement of the County's natural resources are important needs in the development of storm recovery and resiliency strategies. Open space systems can be restored or enhanced to improve stormwater quantity management, reducing pressures to increase capacity or build new costly in-ground or "gray" infrastructure systems. Natural capacity can be improved through the clearing and restoration of streams as natural conduits for stormwater, the reconnection of streams to open floodplains and wetlands for attenuation, cleansing and infiltration, and forested areas for attenuation, infiltration and evapotranspiration.

The preservation, reconstruction, and enhancement of the County's natural areas are also critical to stormwater quality management. Water quality is critical to the long-term health of the natural environment and the County's human population. The reduction of run-off sedimentation from paved surfaces and open farmland is an important part of preserving the rich natural habitat of the County's streams and wetlands, which support world-class sport fishing habitat, for instance. Water quality in the County's creeks, the Niagara River, Lake Ontario and the Erie Canal is crucial to the viability of outdoor recreation including boating and enjoyment of pedestrian and bike trails.

Preservation of agricultural areas as part of a comprehensive open space plan is also an important need within the County. Current development of farmland in its sprawling pattern is contributing to increased fragmentation open space systems, reducing their effectiveness to provide meaningful stormwater management for the County as a whole. Increased development increases impervious surfaces that contribute to flooding. Poorly regulated and dispersed development across farmland requires the costly building and maintenance of public infrastructure to support the development. The

careful balance of concentrated and compact development and farmland preservation can be an effective way to ensure that there is sufficient absorptive capacity in the landscape, reducing the risks associated with future flooding.

The preservation of open space, natural features and farmland also has important co-benefits. Compact development strategies reduce infrastructure and building costs and they can contribute to the promotion of critical business opportunities related to agritourism and outdoor recreation. The rise in popularity of the Niagara Wine Trail and seasonal sportfishing are two examples of the business opportunities related to the use of open space as economic drivers. Lastly, the preservation of open space and natural features is crucial to the quality of life for the County's residents and visitors. Access to natural areas that promotes psychological well-being, opportunities for exercise, recreation and healthy socializing is crucial to maintaining a healthy population.



### Description of Community Assets

The NYRCR Plan aims to ensure that community assets that were affected by the 2013 summer storms, or could be affected in the future, will be more resilient to future storms. The Niagara County NYRCR Planning Committee identified community assets in order to evaluate risks to these assets and their community functions, and developed strategies and identified projects that will reduce risk and ensure long-term resilient growth.

Assets are community services and systems associated with facilities, infrastructure, places, and neighborhoods. There are a variety of assets in communities, such as schools, hospitals, fire stations, treatment plants, transportation, housing, commercial areas, parks, and natural areas. The Niagara County NYRCR Plan asset inventory includes a focus on assets whose loss or impairment would compromise critical facilities or essential community cultural, social, economic or environmental functions.

To identify community assets for the NYRCR Plan, digital datasets from County, State and Federal agencies were acquired and the County's parcels within or partially within the 100- and 500-year floodplains were mapped and identified as within one of two risk areas (Figure 8):

- High Risk Area: The boundary of the 100-year floodplain encompasses the High Risk Area.
- Moderate Risk Area: The area outside of the 100-year floodplain but within the boundary of the 500-year floodplain, encompasses the Moderate Risk Area.

Extreme Risk Areas are those defined as the boundary of the 10-year floodplain. This data was not available for Niagara County and therefore high and moderate risk areas were used to identify assets at risk.

The property classification information from the County's parcel data was used to identify types of assets in five asset classes:

- Economic
- Health and Social Services
- Housing
- Infrastructure Systems
- Natural and Cultural Resources

Additional information from aerial imagery and address data helped to locate the assets and provide information that was entered into the inventory for each asset, including: asset name, address, risk area, asset class, socially vulnerable populations, critical facility, and community value.

The Niagara County NYRCR Planning Committee and Consultant Team, with input from the public, identified 620 community assets as part of the inventory. Assets in the inventory that may be affected by flooding include large employers and concentrations of small businesses (such as downtown areas); residences with multiple dwellings and those that serve senior or other vulnerable populations; infrastructure systems; health and human service assets like the Niagara Falls Air Reserve and several schools and fire departments; and natural and cultural resource assets like the County Golf Course located in the City of Lockport.



**Example High Risk Asset: Elderwood Residences in Wheatfield**  
*Photo Credit AECOM/Staff Photographer (Non-Professional)*

## Description of Community Assets

The NYRCR Plan aims to ensure that community assets that were affected by the 2019 summer storms, or could be affected in the future, will be more resilient to future storms. The Niagara County NYRCR Planning Committee identified community assets in order to evaluate risks to these assets and their community functions; and to develop strategies and identify projects that will reduce risk and ensure long-term resilient growth.

Assets are community services and systems associated with facilities, infrastructure, places, and neighborhoods. There are a variety of assets in communities, such as schools, hospitals, fire stations, treatment plants, transportation, housing, commercial areas, parks, and natural areas. The Niagara County NYRCR Plan asset inventory includes a focus on assets whose loss or impairment would compromise critical facilities or essential community cultural, social, economic or environmental functions.

To identify community assets for the NYRCR Plan, digital datasets from County, State and Federal agencies were acquired and the County's parcels within or partially within the 100- and 500-year floodplains were mapped and identified as within one of two risk areas (Figure 8):

- High Risk Area: The boundary of the 100-year floodplain encompasses the High Risk Area.
- Moderate Risk Area: The area outside of the 100-year floodplain but within the boundary of the 500-year floodplain, encompasses the Moderate Risk Area.
- Extreme Risk Areas are those defined as the boundary of the 10-year floodplain. This data was not available for Niagara County and therefore high and moderate risk areas were used to identify assets at risk.



Example High Value Community Asset: Niagara Falls Fire Department  
Photo Credit: AECOM/Staff Photographer (Non-Professional)

The property classification information from the County's parcel data was used to identify types of assets in five asset classes:

- Economic
- Health and Social Services
- Housing
- Infrastructure Systems
- Natural and Cultural Resources

Additional information from aerial imagery and address data helped to locate the assets and provide information that was entered into the inventory for each asset, including: asset name, address, risk area, asset class, socially vulnerable populations, critical facility, and community value.

The Niagara County NYRCR Planning Committee and Consultant Team, with input from the public, identified 620 community assets as part of the inventory. Assets in the inventory that may be affected by flooding include large employers and concentrations of small businesses (such as



downtown areas); residences with multiple dwellings and those that serve senior or other vulnerable populations; infrastructure systems; health and human service assets like the Niagara Falls Air Reserve and several schools and fire departments; and natural and cultural resource assets like the County Golf Course located in the City of Lockport.

Assets that were affected by flooding during the summer 2013 storms include the Niagara Falls Wastewater Treatment Plant, the City of Lockport Wastewater Treatment Plant, the Niagara County Sewer District Water Pollution Control Center, and a number of homes and businesses.

Other assets impacted by flooding from the summer 2013 storms, but potentially outside of the 100- and 500-year floodplains, include those affected by sanitary sewer system back-ups, a result of combined sewer systems and power failures. These include electric substations, water systems, wastewater treatment plants, homes and businesses, streets, and sewer infrastructure within the Cities of Niagara Falls, North Tonawanda, and Lockport (including High Street), and the Towns of Lewiston, Wheatfield, and Niagara.

In evaluating the assets, the Consultant Team determined a community value for each asset (high, medium, and low), depending on the following criteria:

- **High community value:** Assets considered by the Federal Emergency Management Agency (FEMA) to be “critical” were ranked high community value. An asset that is considered critical by FEMA is one the community considers essential for the delivery of vital services and for the protection of the community. Assets were also considered locally significant if identified in the *2008 Niagara County Multi-Jurisdictional Hazard Mitigation Plan* critical infrastructure database or were deemed locally significant by the NYRCR Committee.
- **Medium community value:** Assets that have an effect on longer-term recovery or represent an important community interest reflecting a critical aspect of resiliency and quality of life in the community were ranked medium community value.

- **Low community value:** Assets that do not have a direct effect on relief or recovery, nor help to restore quality of life, were ranked low community value.

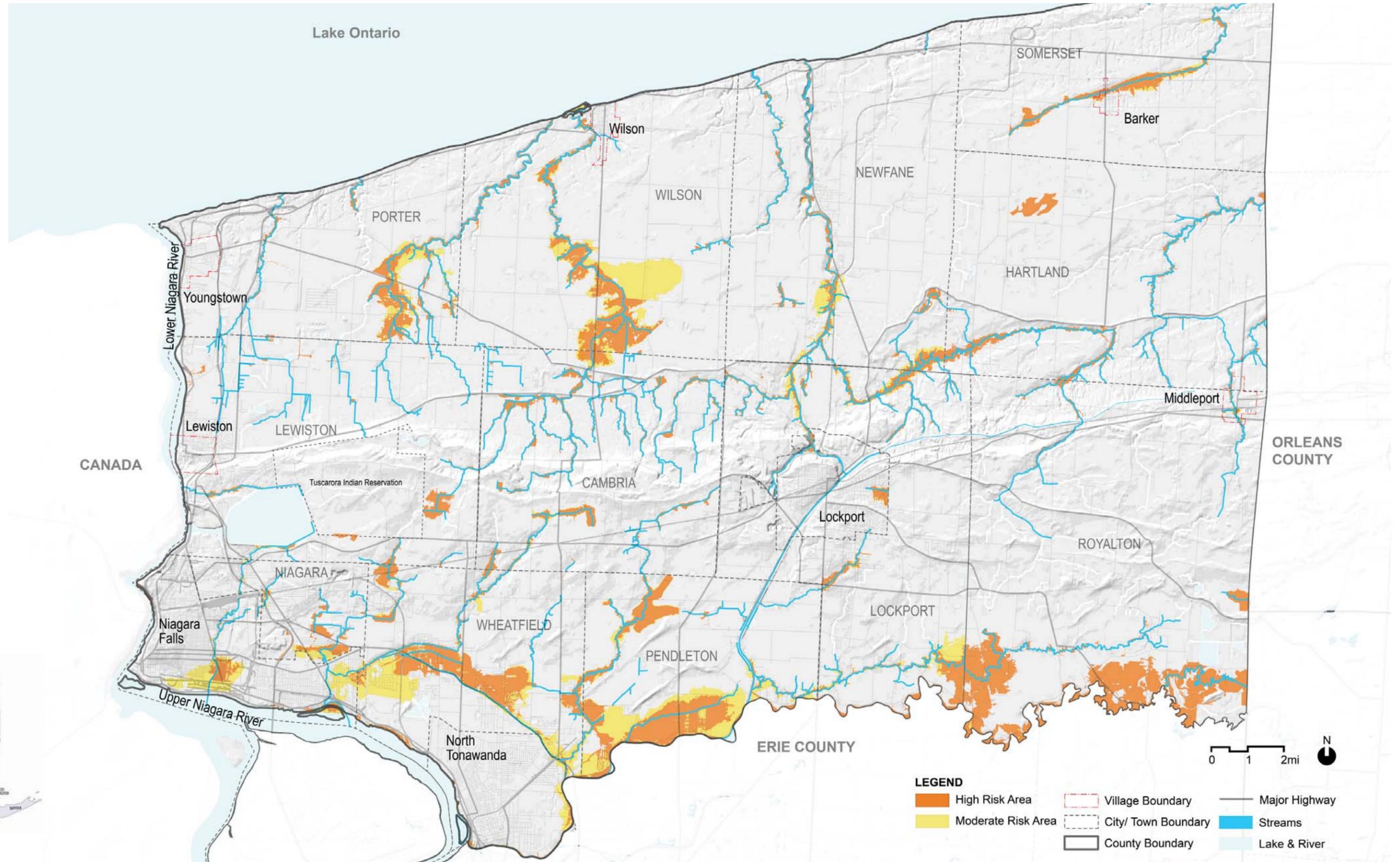
The 620 assets were entered into the Asset Inventory database. Approximately 412 assets were located in the 100-year floodplain, or high risk area, and approximately 209, were located within the 500-year floodplain, or moderate risk area. Of these, 66 critical assets were identified within the high and moderate risk areas and were therefore selected for evaluation using the risk assessment tool based on the assigned community value. These assets were either FEMA critical facilities, locally significant facilities in the 2008 Niagara County Multi- Jurisdictional Hazard Mitigation Plan, or locally significant assets identified by the NYRCR Committee. The high community value assets are shown in relation to the risk areas in Figures 9, 10, and 11.



Page Intentionally Left Blank



FIGURE 8: NIAGARA COUNTY FLOOD RISK AREAS

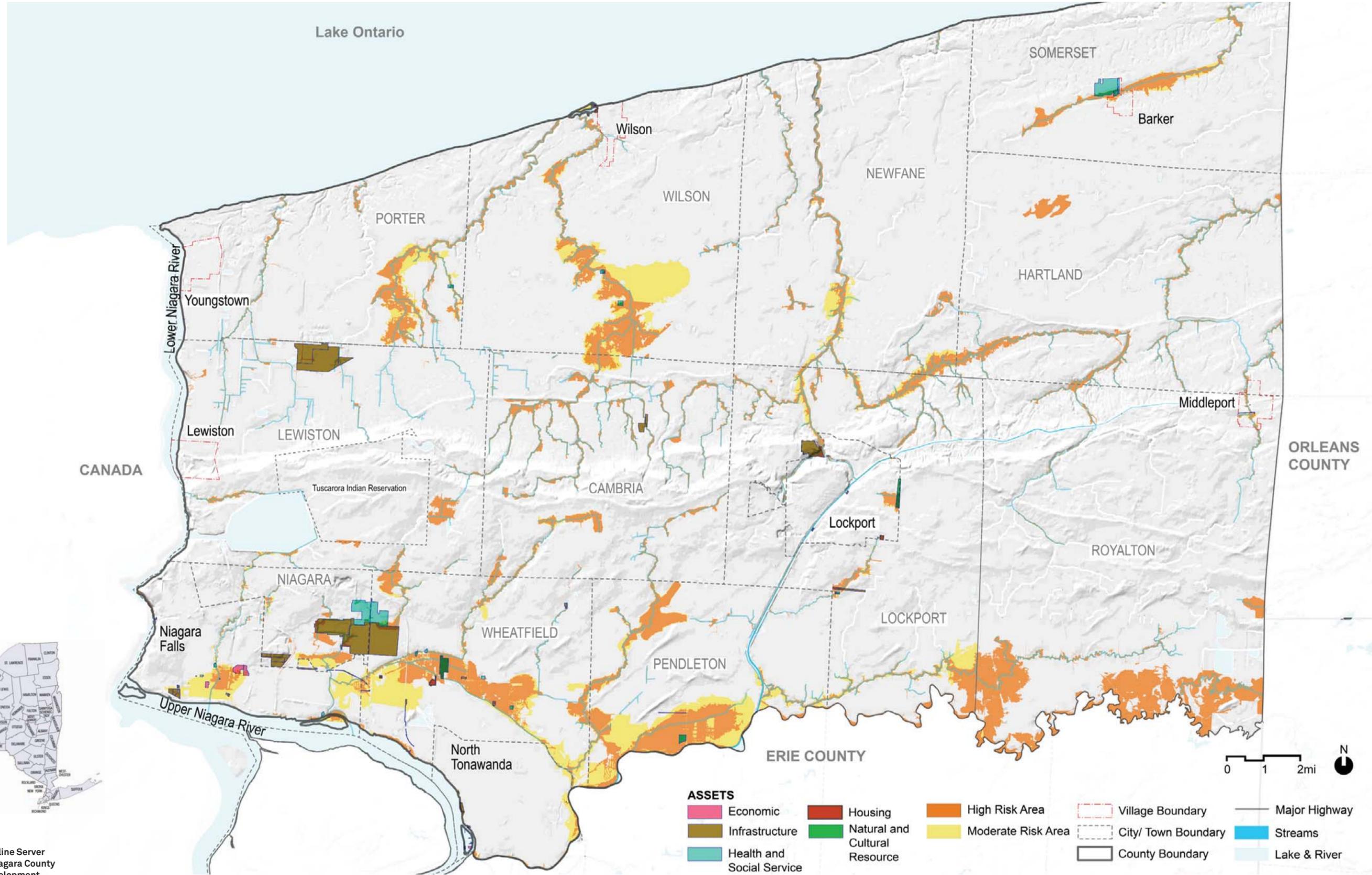


Data Sources:  
 Base Imagery: ESRI Online Server  
 Assets/Parcel Data: Niagara County  
 Dept. of Economic Development  
 Risk Area: FEMA 2010

Page Intentionally Left Blank



FIGURE 9: NIAGARA COUNTY CRITICAL ASSETS AND RISK AREAS

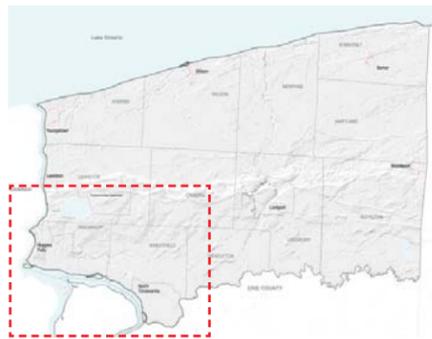
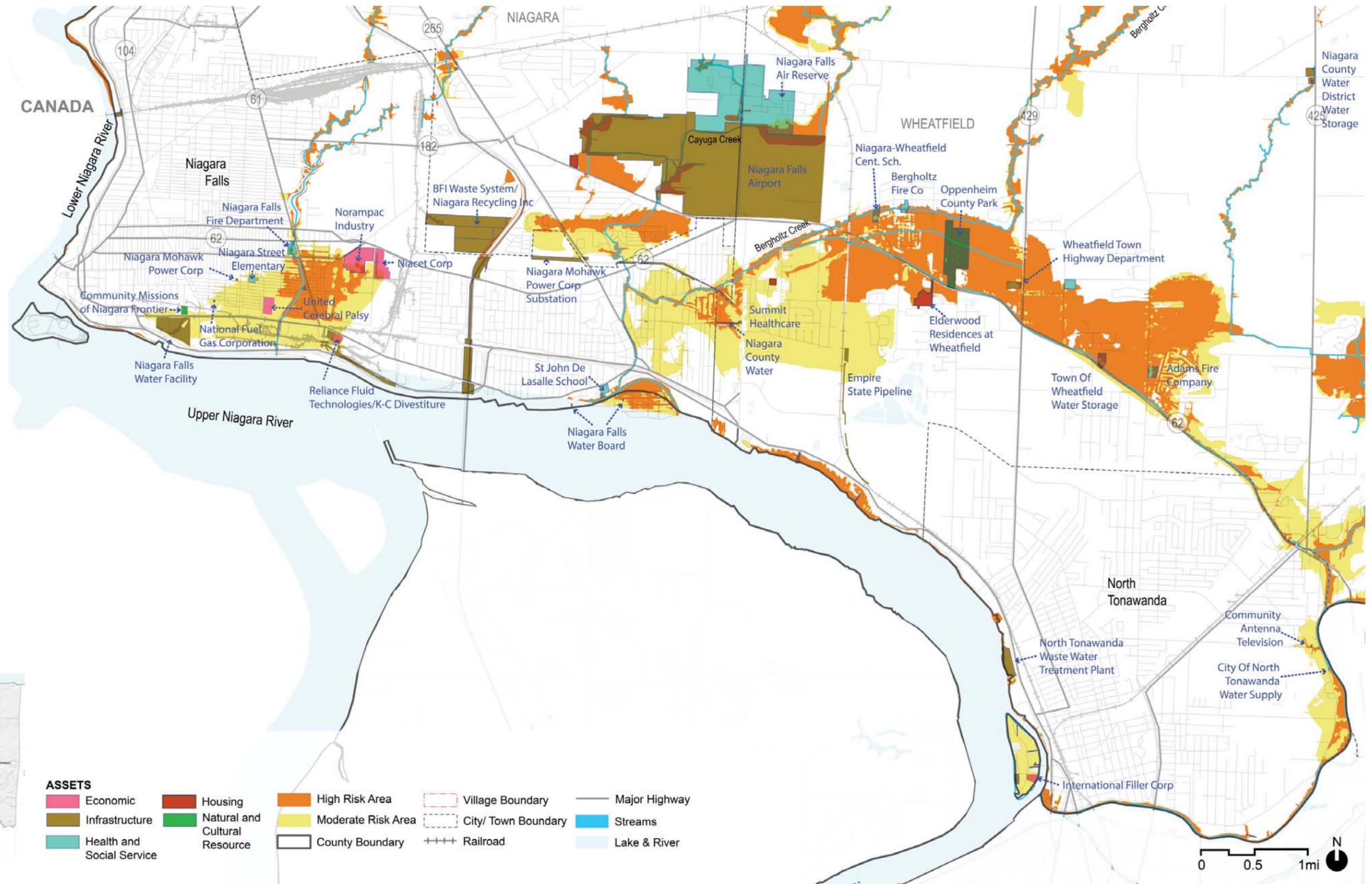


Data Sources:  
 Base Imagery: ESRI Online Server  
 Assets/Parcel Data: Niagara County  
 Dept. of Economic Development  
 Risk Area: FEMA 2010

Page Intentionally Left Blank



FIGURE 10: NIAGARA COUNTY CRITICAL ASSETS AND RISK AREAS [NIAGARA FALLS AND NORTH TONAWANDA]

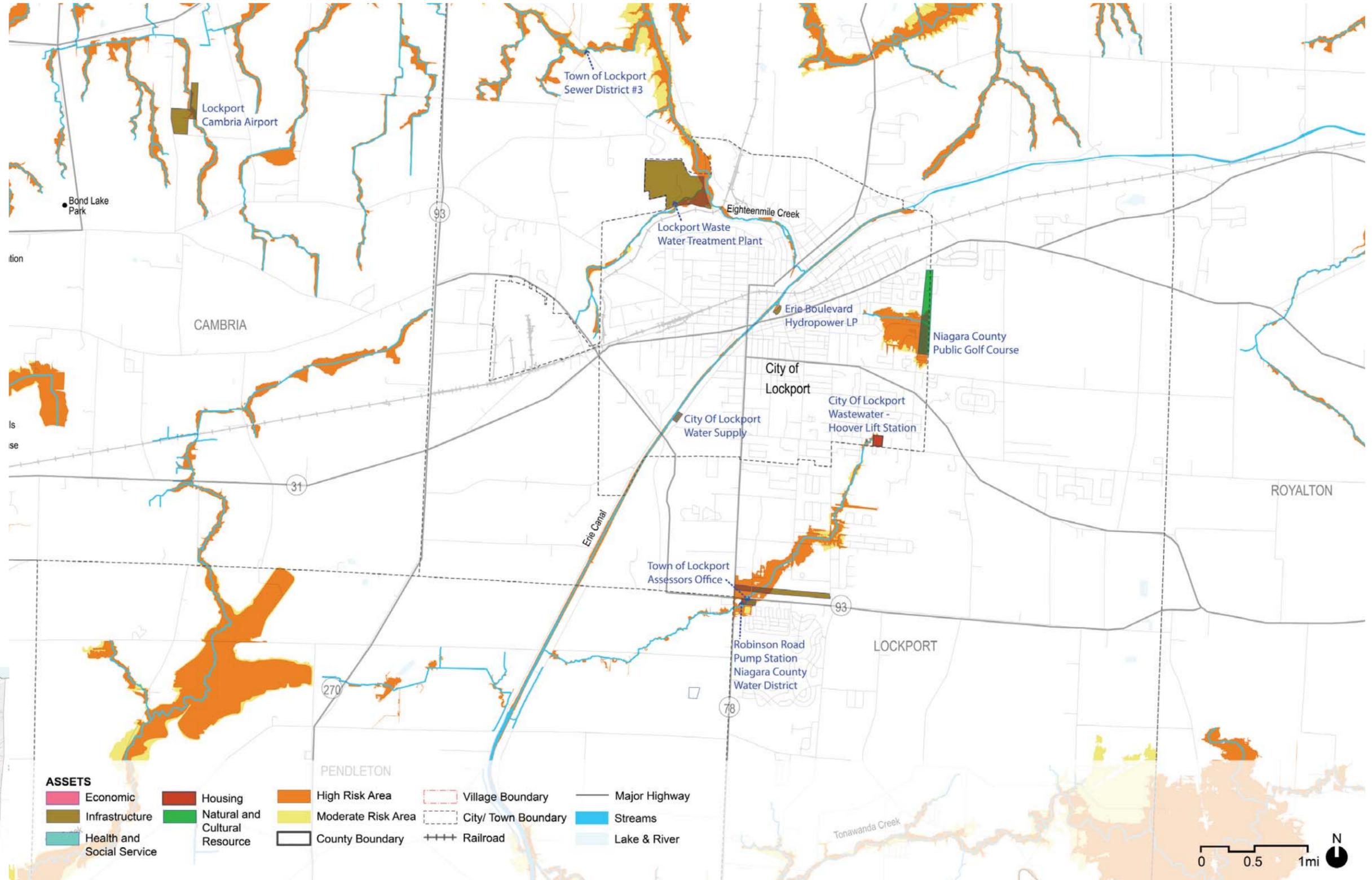


Data Sources:  
 Base Imagery: ESRI Online Server  
 Assets/Parcel Data: Niagara County  
 Dept. of Economic Development  
 Risk Area: FEMA 2010

Page Intentionally Left Blank



FIGURE 11: NIAGARA COUNTY CRITICAL ASSETS AND RISK AREAS - LOCKPORT



Data Sources:  
 Base Imagery: ESRI Online Server  
 Assets/Parcel Data: Niagara County  
 Dept. of Economic Development  
 Risk Area: FEMA 2010



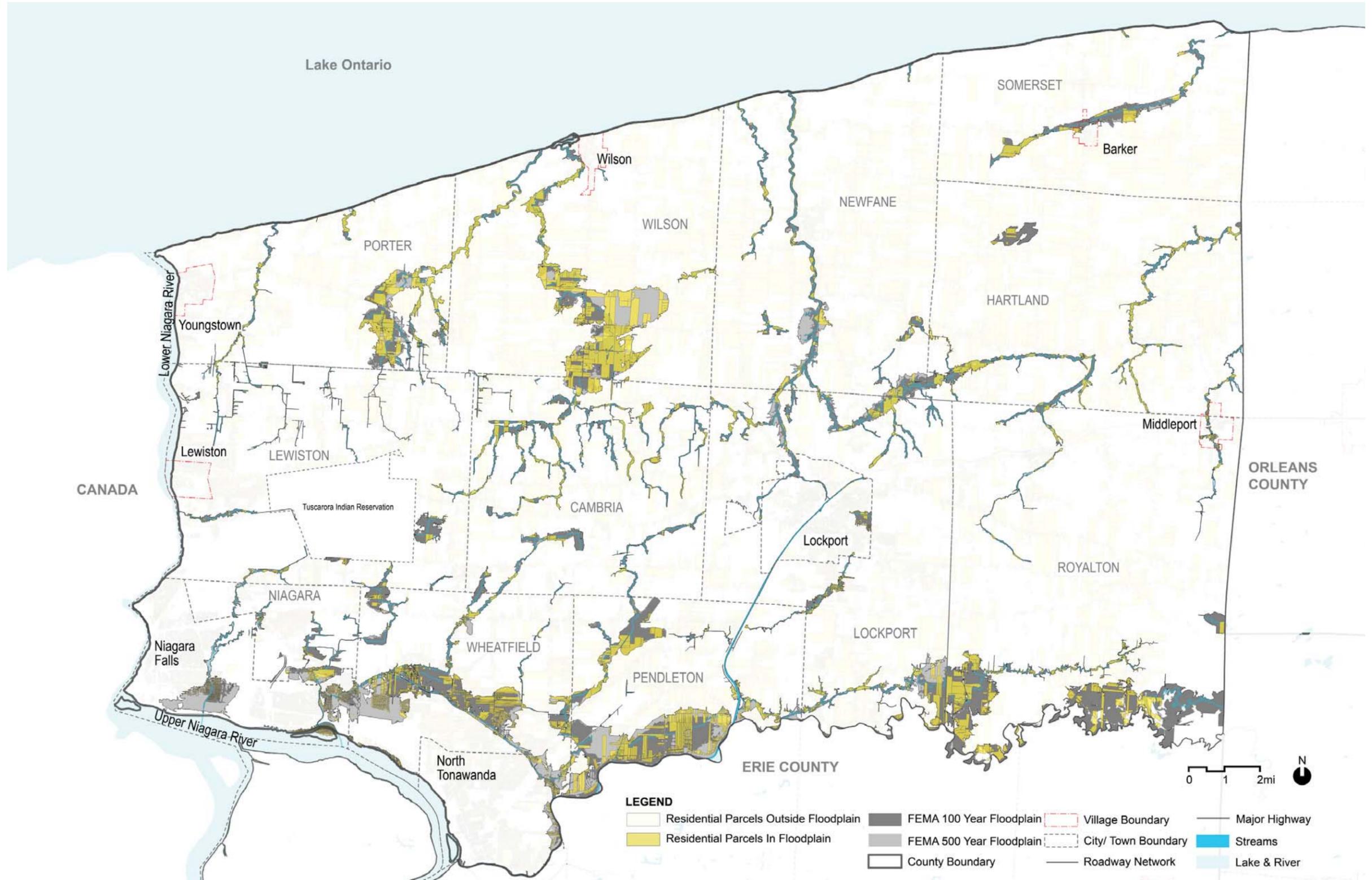
Table 2: Residential Parcels In Floodplain

LOCATION	RESIDENTIAL PARCELS IN 100 YEAR FLOODPLAIN	RESIDENTIAL PARCELS IN 500 YEAR FLOODPLAIN
Niagara County (total)	6,963	5,957
Village of Barker	15	8
Town of Cambria	337	21
Town of Hartland	155	0
Town and Village of Lewiston	342	67
City and Town of Lockport	751	357
Village of Middleport	138	76
Town of Newfane	362	48
Town of Niagara	166	194
City of Niagara Falls	1,466	2,102
City of North Tonawanda	88	234
Town of Pendleton	650	750
Town of Porter	303	120
Town of Royalton	152	0
Town of Somerset	117	34
Town of Wheatfield	1,247	1,716
Town and Village of Wilson	451	228

Table 2 provides an estimate of the residential parcels in floodplains by area. Not all parcels include structures inside the floodplain. Due to data aggregation, some municipalities are listed together.



FIGURE 12: RESIDENTIAL PARCELS IN FLOODPLAIN



Data Sources:  
 Base Imagery: ESRI Online Server  
 Assets/Parcel Data: Niagara County  
 Dept. of Economic Development  
 Risk Area: FEMA 2010

**LEGEND**

- Residential Parcels Outside Floodplain
- Residential Parcels In Floodplain
- FEMA 100 Year Floodplain
- FEMA 500 Year Floodplain
- Village Boundary
- City/ Town Boundary
- County Boundary
- Roadway Network
- Major Highway
- Streams
- Lake & River

Page Intentionally Left Blank



### Assessment of Risks to Assets and Systems

The risk assessment tool was developed by the New York State Department of State. The purpose of the risk assessment tool was to help evaluate the potential for floods to compromise community functions and to help communities assess and quantify the risk to their assets. These metrics assisted the NYRCR Committee in identifying and supporting projects that protect or reduce the risk to high-value community assets. Higher scores indicate a greater risk of damage during a storm event.

The formula-based spreadsheet incorporated information related to each asset to generate a risk score for each asset. Three factors associated with a storm event contribute to the overall risk for each asset: hazard, exposure, and vulnerability. Scoring information on these three factors and the total risk score is below:

**Hazard Score:** Measured based on the likelihood and magnitude of future storm events. A fixed score of 3 was assigned based on a 100-year flood event, which has a 1% annual chance of occurring.

**Exposure Score:** Measured by the moderating effect of topographic and shoreline features (landscape attributes). A score was calculated by point values assigned based on the risk area where each asset is located (Extreme, High, or Moderate) plus the condition of six landscape attributes. The possible exposure scores range from 0.5 to 5.

**Vulnerability Score:** Measured by ability of the asset to resist damage from a storm, or to recover quickly. A score calculated based on the impact on service or the function of the asset, including how long an asset is out of service or operating under a reduced capacity. The scores vary by asset type and range from 1 (short-term impacts) to 5 (long-term or indefinite impacts).

Using the risk assessment tool and past experience, the NYRCR Planning Committee estimated the potential consequences an asset faces from future storms.

### Risk Scores

The risk score is generated by multiplying the hazard, exposure, and vulnerability scores. Risk scores help identify assets with elevated potential for storm damage. The range of potential risk scores falls into four categories of risk score levels:

**Severe (Risk Score >53):** A Severe Risk score could represent that the asset is in a dangerous situation and relocation may be a priority option for the asset. No assets in Niagara County received a severe risk score.

**High (Risk Score of 24 to 53):** High Risk scores are indicative of conditions that could lead to significant negative outcomes from a storm, which may indicate the loss of service or function of an asset for an extended period of time. Ten assets in Niagara County received a high risk score, with scores ranging from 27 to 32.

**Moderate (Risk Score of 6 to 23):** Moderate Risk scores in this range pose moderate to serious consequences to an asset. Thirty-eight assets in Niagara County received a moderate risk score, with scores ranging from 9 to 23.

**Residual (Risk Score below 6):** A Residual Risk score suggests floods would pose minor or infrequent consequences to an asset. Two assets received a residual risk score, both with scores of five.

Risk areas and vulnerable assets are located throughout Niagara County, with the majority of assets concentrated within or adjacent to the County's three principal Cities of North Tonawanda, Lockport and Niagara Falls. These assets encompass all five types of critical assets: Economic, Health and Social Services, Housing, Infrastructure, and Natural and Cultural Resources. Sites that are considered Health and Social Services and Infrastructure comprise the majority of identified assets. Economic, Housing, and Natural Cultural Resources make up a significantly smaller portion of the vulnerable assets list.



A number of asset sites that are critical to a quick and successful recovery after flooding and storm events have been identified. Several municipal Emergency Services and Response offices, including fire and rescue stations and police offices, are some of the assets at highest risk. Wastewater treatment plants and critical infrastructure systems that have been historically vulnerable have also been identified as individual assets that are at high risk. If damaged during flooding from storm events, closure of the economic facilities for clean-up and repairs could cause disruptions in business activity and employment, depending on the severity of the flooding and damage. In addition, each of the facilities is classified as Industrial, Warehousing and Manufacturing. Operations related to chemical industry and hazardous materials could create additional clean-up issues from flood damage. Table 3 provides a summary of the risk assessment findings, providing the risk score level associated with each asset. Figure 13 maps these assets, color-coded by risk.

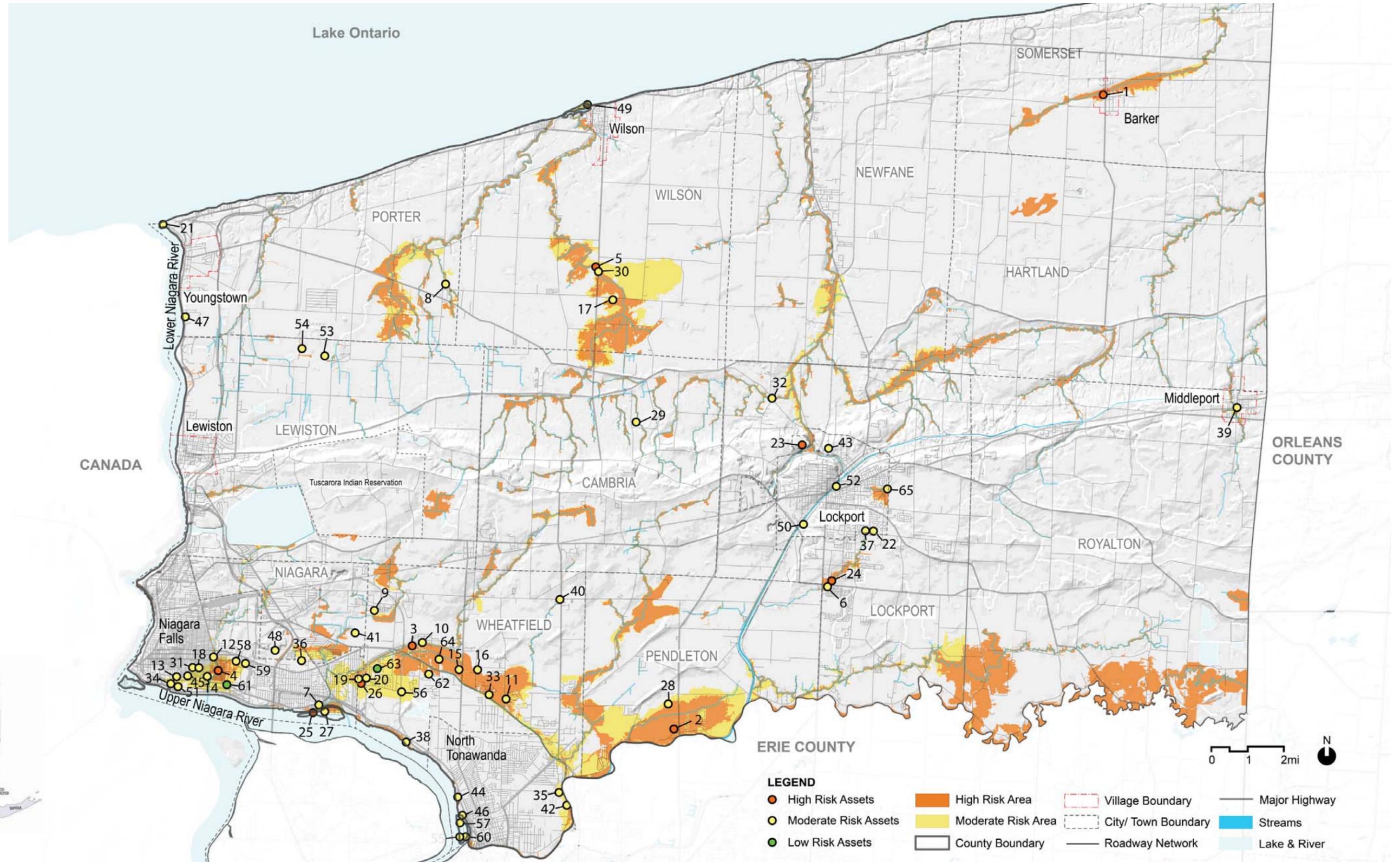
The risk areas identified by the asset inventory and risk assessment are located within the 100- and 500-year flood zones. However, Niagara County, as demonstrated by recent flooding events, also has sectors of severe flooding from over-capacity stormwater and combined sewer systems.

The numerous creeks, wetlands and southwesterly sloping topography of the southern portion of the County makes this area more prone to frequent flooding due to the concentration of flow volumes in a such a large, interconnected watershed.

The areas of flooding due to over capacity sewer systems are often highly localized, difficult to map, and may be outside FEMA flood zones. The Strategies section of this Plan discusses the need for identification and mapping of combined sewer outfalls and local knowledge of past flood events to further identify vulnerable assets within these critical areas.



FIGURE 13: NIAGARA COUNTY ASSETS COLOR CODED BY RISK



Data Sources:  
 Base Imagery: ESRI Online Server  
 Assets/Parcel Data: Niagara County  
 Dept. of Economic Development  
 Risk Area: FEMA 2010

Page Intentionally Left Blank



Table 3: Risk Assessment and Findings

ASSET ID	ASSET NAME	COMMUNITY VALUE	RISK SCORE LEVEL	RISK AREA
<b>HEALTH AND SOCIAL SERVICES ASSETS</b>				
1	Barker Fire Department	High	High	High
2	Wendleville Fire Company	High	High	High
3	Niagara-Wheatfield Central School District	High	High	High
4	Niagara Falls Fire Department - Royal Avenue Firehouse	High	High	High
5	Wilson Town Highway Department	High	High	High
6	Town of Lockport Assessors Office	High	Moderate	High
7	St. John De LaSalle School	High	Moderate	High
8	Heritage Nursing Home	High	Moderate	High
9	Niagara Falls Air Reserve	High	Moderate	High
10	Bergholtz Fire Company	High	Moderate	High
11	Adams Fire Company	High	Moderate	High
12	Niagara Falls Fire Department - Walnut Avenue	High	Moderate	High
13	Community Missions of Niagara Frontier	High	Moderate	Moderate
14	United Cerebral Palsy	High	Moderate	Moderate
15	Wheatfield Town Highway Department	High	Moderate	Moderate
16	Wheatfield School District #4 - Erick Road Elementary School	High	Moderate	High
17	South Wilson Volunteer Fire Company	High	Moderate	High
18	Niagara Street Elementary	High	Moderate	Moderate
19	Summit Healthcare	High	Moderate	Moderate
20	Niagara County Community College Summit Extension Center	High	Moderate	Moderate
21	US Coast Guard Station	High	Moderate	Moderate
22	Briody Health Care Facility	High	Moderate	High



Table 3: Risk Assessment and Findings, Continued

ASSET ID	ASSET NAME	COMMUNITY VALUE	RISK SCORE LEVEL	RISK AREA
<b>INFRASTRUCTURE SYSTEMS ASSETS</b>				
23	City of Lockport Wastewater Treatment Plant	High	High	High
24	Robinson Road Pump Station - Niagara County Water District	High	High	High
25	Niagara Falls Water Board (Rivershore Dr)	High	High	High
26	Niagara County Water Pump Station	High	High	High
27	Niagara Falls Water Board (Griffon Ave)	High	Moderate	High
28	Flying F Airport	Medium	Moderate	High
29	Lockport Cambria Airport	Medium	Moderate	High
30	Wilson Town Finished Water Storage	High	Moderate	High
31	Niagara Mohawk Power Corporation	High	Moderate	Moderate
32	Town of Lockport Sewer District #3	High	Moderate	High
33	Town of Wheatfield Water Storage	High	Moderate	High
34	Niagara Falls Wastewater Treatment Plant	High	Moderate	Moderate
35	Community Antenna Television	High	Moderate	High
36	Niagara Mohawk Power Corporation Substation	High	Moderate	High
37	City of Lockport Wastewater - Hoover Lift Station	High	Moderate	High
38	Empire State Pipeline	High	Moderate	High
39	National Grid Substation	High	Moderate	High
40	Niagara County Water District Water Storage	High	Moderate	High
41	Niagara Falls Airport	High	Moderate	High
42	City of North Tonawanda Water Supply (Old Falls Blvd)	High	Moderate	High
43	Town of Lockport Water Supply	High	Moderate	High
44	North Tonawanda Wastewater Treatment Plant	High	Moderate	High
45	National Fuel Gas Corporation	High	Moderate	Moderate
46	City of Lockport Raw Water Pump Station	High	Moderate	High



Table 3: Risk Assessment and Findings, Continued

ASSET ID	ASSET NAME	COMMUNITY VALUE	RISK SCORE LEVEL	RISK AREA
<b>INFRASTRUCTURE SYSTEMS ASSETS</b>				
47	Tennessee Gas Pipeline	High	Moderate	High
48	BFI Waste Systems / Niagara Recycling Inc	High	Moderate	High
49	Wilson Wastewater Treatment Plant	High	Moderate	High
50	City of Lockport Water Supply	High	Moderate	High
51	Niagara Mohawk Power Corporation (Buffalo Ave)	High	Moderate	Moderate
52	Erie Boulevard Hydropower LP	High	Moderate	High
53	Modern Landfill Inc	High	Moderate	High
54	Lake Ontario Ordnance Works	High	Moderate	High
55	City of North Tonawanda Water Supply (Archer St)	High	Moderate	High
56	Empire State Pipeline	High	Moderate	Moderate
57	City of North Tonawanda Water Supply (Michigan St)	High	Moderate	High
<b>ECONOMIC ASSETS</b>				
58	Norampac Industry	Medium	Moderate	High
59	Niacet Corp	Medium	Moderate	Moderate
60	International Filler Corp	Medium	Moderate	Moderate
61	Reliance Fluid Technologies/K-C Divestiture	Medium	Residual	Moderate
<b>HOUSING ASSETS</b>				
62	Elderwood Residences at Wheatfield	High	Moderate	High
63	Sawyer Gardens	High	Residual	Moderate
<b>NATURAL AND CULTURAL RESOURCE ASSETS</b>				
64	Oppenheim County Park	Medium	Moderate	High
65	Niagara County Public Golf Course	Medium	Moderate	High



Niagara Gorge (Photo Credit: Flickr/Diego Torres Silvestre)



# 3

## Reconstruction and Resiliency Strategies

*The strategies presented in the Niagara County NY Rising Countywide Resiliency Plan are statements of action that address how to best protect existing community assets, capitalize on opportunities, resolve critical issues identified during the planning process, and increase resiliency in future flood events.*

The Niagara County NYRCR Planning Committee and Consultant Team developed a set of preliminary reconstruction and resiliency strategies for the County. These strategies were determined based upon the inventory of community assets and known areas of vulnerability to flooding. The County's vision and its identified needs and opportunities shaped the selection of strategies. An initial list of several dozen strategies was assembled, culled from a variety of examples and other planning efforts which took into account similar needs and opportunities throughout Niagara County. Through an on-line survey, as well as on-going discussion at NYRCR Committee meetings and Public Engagement events, the initial list of strategies was narrowed down and consolidated into 14 strategies, which form the foundation for the Niagara County NY Rising Countywide Resiliency Plan.

The following strategies are presented by Recovery Support Function. Each of the six Recovery Support Functions (i.e., Community Planning and Capacity Building, Economic Development, Health and Social Services, Housing, Infrastructure, and Natural and Cultural Resources) includes one or more strategies which describe how to best protect and enhance the County's community assets, while seeking to capitalize on opportunities and resolve critical issues. Each of the 18 strategies will contribute to the County's vision for "building back better," and prepares the County for long-term resiliency.

The proposed strategies consider emergency disaster recovery, and long-term resiliency and economic development needs that are not met by existing planning and rebuilding initiatives. They are statements of action that address how to best protect existing community assets, capitalize on opportunities, resolve critical issues and meet short-, medium-, and long-term goals identified during the planning process.

Each of the strategies addresses issues relevant to Niagara County and the nature of the flooding which typically occurs. As identified in the County Overview, Section 1 of this document, Niagara County is relatively flat, with flooding occurring as a combined result of aging infrastructure, development in the floodplains, and a historic increase in developed land. The strategies suggest actions which may result in an increased awareness of best practices for future development and redevelopment within the County, for future resiliency.

In addition to the strategies, the NYRCR Committee and Consultant Team compiled a set of resiliency projects, which are listed in this section by relevant strategy. These projects are described in more detail in Section 4 - Project Profiles.

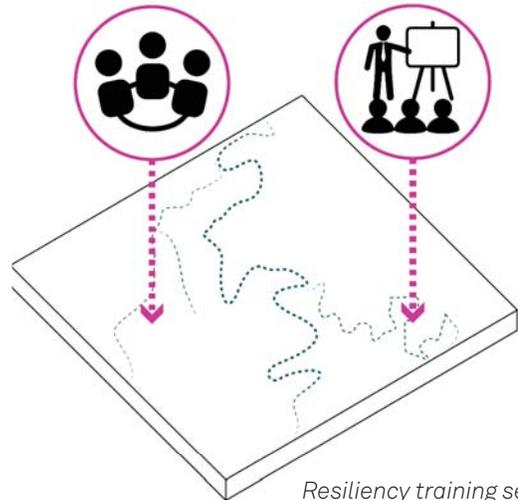


## Community Planning and Capacity Building

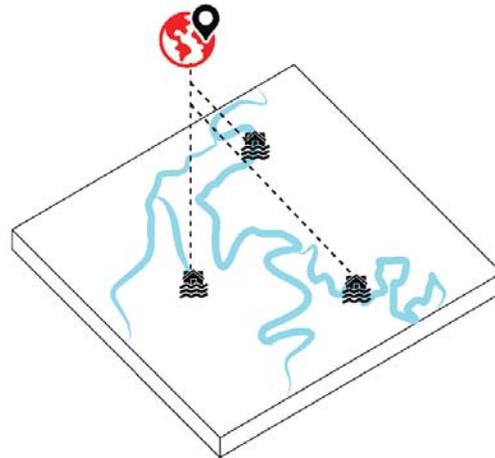
**Strategy I. Promote community acceptance of floodplain management principles and regulations.** Recent local legislation pertaining to regulations for and permitting of work within floodplain areas is a critical first step in the evolution of resilient and sustainable land use practices in floodplain areas. Understanding both the intent and the procedural requirements is important to promoting acceptance of this new way of thinking. The public, whether they are elected officials, design professionals, developers or residents needs to be engaged so that they see these regulations as serving their long-term interests.

- Develop a variety of presentations geared to specific interest groups including property owners, developers and design professionals.
- Develop a website or other mechanism for easy access to the regulations and requirements of each community.
- Cross link regulations and requirements to mapping resources so that properties can be located within defined floodplain areas.
- Develop a database of both local and national projects that meet the spirit of the regulations to spur interest in and demonstrate that the regulations can be of benefit to the larger Niagara County community.
- Develop a 10-year floodplain mapping data set for Niagara County to facilitate planning and decision-making about High Risk areas.
- Develop flood surge maps for each Niagara County community showing flood levels associated with specific storm events in both floodplain and combined sewershed areas. Categorize in relation to design 10-year, 50-year, 100-year, 200-year and 500-year storm events.
- Provide technical assistance to County communities about ways develop guidelines and ordinances related to stormwater system design, floodplain management and green infrastructure use that exceed current regulatory requirements to foster future resiliency and stormwater management capacity.

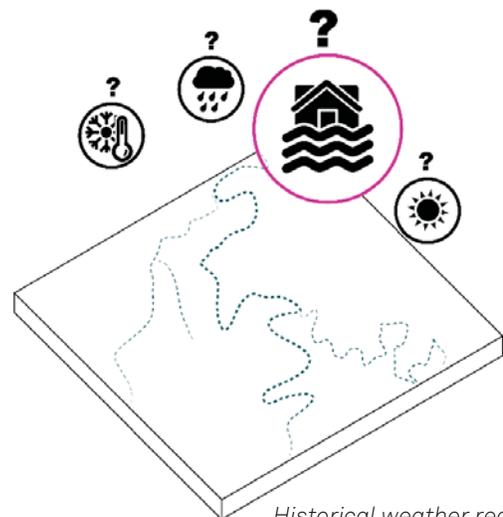
Potential partners for implementation include: Local AIA, ASLA, APA, and ASCE professional organizations; Niagara County Environmental Management Council; Niagara County Department of Economic Development; Western New York Stormwater Coalition; Buffalo Niagara RiverKeeper; and NYS Department of State.



*Resiliency training sessions*



*GIS flood analysis*



*Historical weather records*

**Strategy II. Municipalities and watershed organizations should work with local and State agencies to provide periodic training sessions on flood-related issues and long-term mitigation or resiliency strategies.**

The audience should include municipal leaders, code enforcement staff, planning boards, landowners, realtors, highway crews, lending institutions and others. Potential partners for implementation include: Niagara County Department of Economic Development; NYS Department of State; and NYS Department of Environmental Conservation.

**Strategy III. Develop a countywide, uniform GIS-based flood analysis mapping system.**

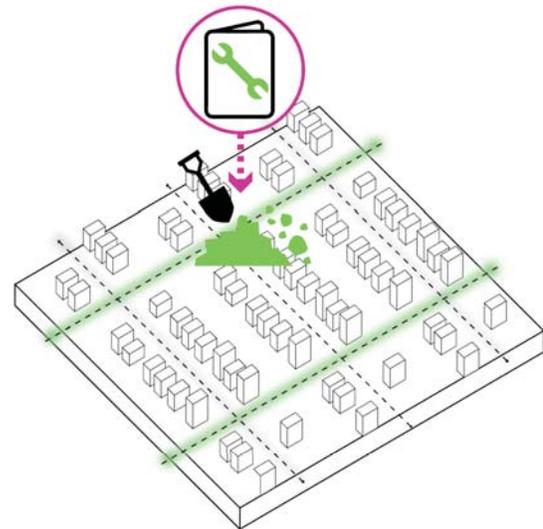
Such a comprehensive system would document historical flood damage and track future combined sewer overflow (CSO) backup, overflow and other flooding events; record types of flooding, frequency of events, their location, and the costs associated with flood damage. Work with local sewer districts to identify threshold precipitation and snow or ice melt conditions that can contribute to overwhelming CSOs. Vulnerable properties in frequently flooded areas may be targeted for outreach, education and enlistment in mitigation programs.

Potential partners for implementation include: Niagara County Emergency Services; Niagara County Soil and Water Conservation District; Niagara County Information Technology; Niagara County Water District; Niagara County Sewer District; and, Niagara County Department of Economic Development.

**Strategy IV. Analyze historical records of weather conditions and stream flow response to identify potential thresholds and trigger events that could lead to flooding.**

With climate change, there is a need to document current trends (if any) in precipitation amount, intensity, timing of snow melt and other forces potentially affecting flood frequency and magnitude. Identify conditions that could lead to ice-jam flooding and work with municipalities to identify the most vulnerable areas. Niagara County and the nearby Buffalo/Toronto Regions may have several long-term weather monitoring sites suitable for analysis.

Potential partners for implementation include: Buffalo Niagara Riverkeeper; Niagara County Soil and Water Conservation District; Cornell Extension Service of Niagara County; University of Buffalo; and Niagara University.



*Green infrastructure toolkit*

**Strategy V. Develop a Niagara County-specific Green Infrastructure Tool Kit for use by municipalities, developers and homeowners.**

Stormwater management tools such as rain gardens, bio-swales, tree trenches, stormwater planters, and pervious pavement and rain barrels capture and treat stormwater and allow it to infiltrate gradually into the ground. With more heavy-precipitation events and higher rainfall anticipated, it is critical to design green infrastructure projects with climate change projections in mind. Simple solutions such as increasing the depth of rain gardens can not only help treat localized flooding, but also increase a rain garden’s capacity for higher rainfall intensities in a changing climate. Include details, sizing requirements, treatment capacities, plant lists, soil testing requirements, etc.

Potential Partners include: Buffalo Niagara Riverkeeper; Niagara County Soil & Water Conservation District; and Cornell Cooperative Extension of Niagara County.



Table 4: Community Planning and Capacity Building

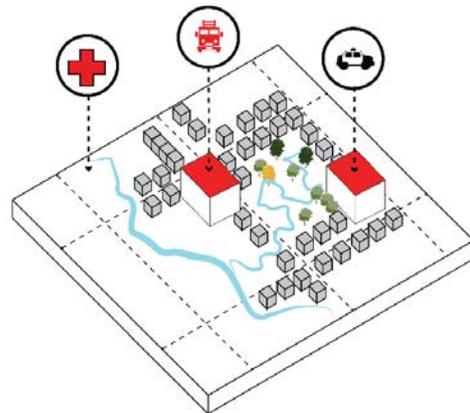
STRATEGY	PROJECTED/ACTION NAME	LOCATION	DESCRIPTION	ESTIMATED COST
V	City of Niagara Falls Green Infrastructure Solutions Planning	Niagara Falls	Develop a planning approach to implement green solutions that reduce impacts of flooding in the City.	\$225,000
V	Know Your Sewershed Programming	Niagara Falls	Work with property owners to educate residents about the effects of storm-water on flooding issues.	\$60,000

## Health and Social Services

### Strategy VI. Improve emergency response system and provide evacuation assistance to communities.

In the event of an emergency or other storm-related event, the capacity to reach immobile populations, or groups with limited means to evacuate, as well as emergency response capacity becomes essential. During and after the summer 2013 storms, emergency response personnel provided aid to municipalities and residents, including: response to multiple flood events at one time; deployment of rescue team members to respond to life-safety events; emergency pumping operations for individual neighborhoods and homes; and opened Red Cross emergency shelters in several locations. These response needs identified some gaps in response capacity, in particular the need for emergency generators to allow emergency responders to complete necessary tasks in areas without power.

Flooding in residential areas, like flooding that occurred during the summer 2013 storms, causes temporary housing needs as well as long-term recovery challenges. In the short-term, there is a large demand for information. Community members have questions related to non-life-threatening issues such as: who to call for pump outs, how to handle clean-up and disinfectant issues related to raw sewage flooding, where to dispose of damaged items that may not be picked up by local sanitation services, and other non-emergency issues. These requests for information can be routed through the existing 211 of Western New York call service system to reserve 911 call-handling capacity for emergency response situations and provide additional call volume capacity to serve local communities. The call service operates 24 hours a day, 7 days a week providing information and referrals related to health and human service issues.



Emergency response system

During Hurricane Irene and Tropical Storm Lee, the 211 system was used successfully to respond to flood-related calls in other upstate counties. In Niagara County, awareness of the system needs to be increased and promoted for use during storm events. The United Way, public officials and emergency response personnel should promote public awareness of the system and its uses in disaster and non-disaster situations. This would allow local elected officials to direct constituent questions to one resource to address the many types of issues that arise in the aftermath of flash flood storms for both renters and building owners.

Actions to improve the emergency response system will benefit all residents and business owners, but especially those most vulnerable due to socioeconomic conditions. Potential partners include: Niagara County Emergency Services, United Way of Greater Niagara, and American Red Cross.

Table 5: Health and Social Services

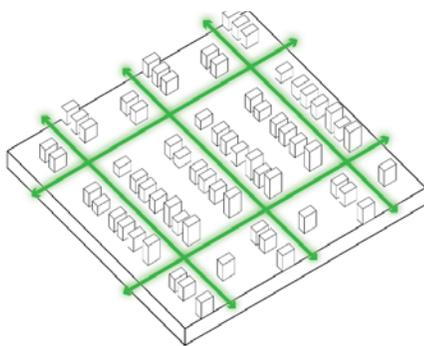
STRATEGY	PROJECTED/ACTION NAME	LOCATION	DESCRIPTION	ESTIMATED COST
VI	Portable Generators and Pumps	Wheatfield	Portable generators and pumps for emergency response	\$32,500
VI	Emergency Vehicle - Communication Truck	Countywide	Rapid Response Communication Vehicle	\$188,100
VI	Emergency Vehicle - Technical Rescue Truck	Countywide	Rapid Response Technical Rescue Equipment Vehicle	\$135,000
VI	Community Center (designated Red Cross Shelter) Standby Generator	Wheatfield	Install a standby generator at the Community Center (2790 Church Road)	\$95,000

## Infrastructure

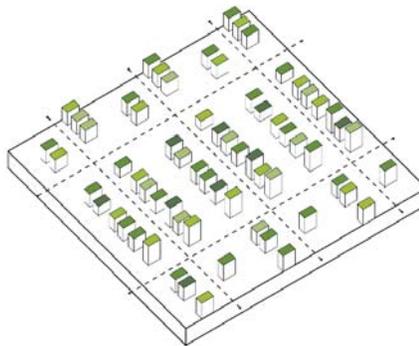
**Strategy VII. Utilize Green Infrastructure to mitigate flooding.** In areas with a high percentage of impervious land cover, such as urban areas, large volumes of surface runoff exacerbates flooding and negatively impacts water quality as the result of increased stormwater drainage to local waterways. Green infrastructure can be used to reduce and disconnect impervious surfaces and reduce stormwater flows. Daylighting streams previously buried in pipes or culverts and restoring channelized streams to their natural flow patterns allows streams to access their natural floodplains, improving

stormwater detention and reducing downstream flooding. Restoring streams to more natural profiles for both low water and high water flows can reduce runoff velocities, which in turn helps to reduce erosion.

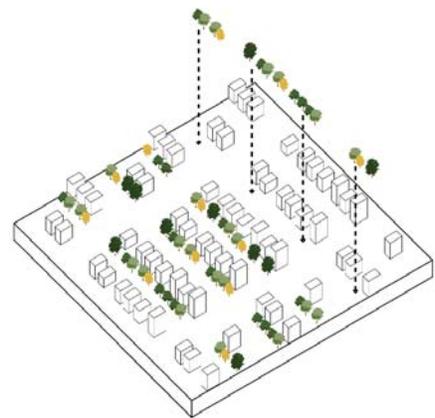
Potential partners include: Buffalo Niagara Riverkeeper; and Niagara County Soil & Water Conservation District.



Green streets



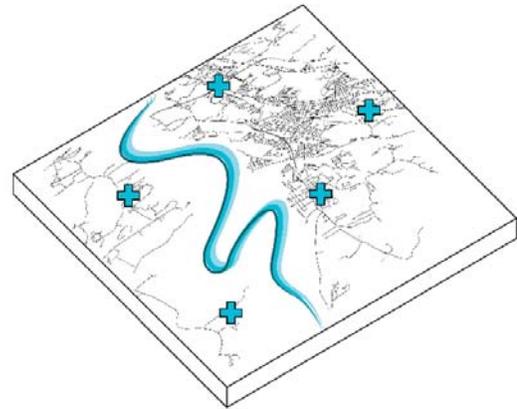
Green roofs



Tree planting



**Strategy VIII. Upgrade storm and sewage infrastructure to increase stormwater storage capacity during peak flow events and remove connections between storm and sewer systems.** Due to the age of the storm and sewer infrastructure in many of Niagara County’s communities, sanitary and stormwater flows combine during high water volume and overflow into local streams and rivers. Many of the local public works projects would address upgrades to the aging sewer infrastructure. These in-ground, piped or “gray” infrastructure projects represent one approach to handling future storm-related flooding events. In parallel with system capacity increases, “green” infrastructure projects can be used to reduce and attenuate overland flows into gray infrastructure, often at greatly reduced costs.

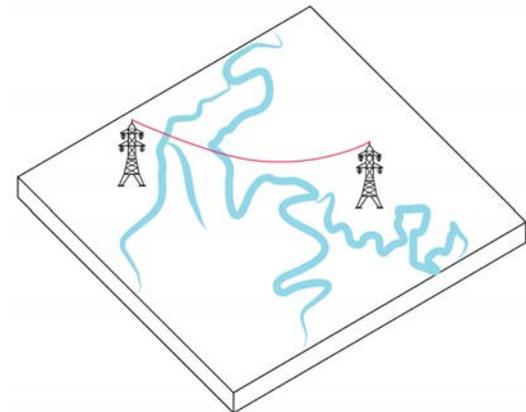


Storm + sewage infrastructure upgrades

Potential partners for implementation include:  
Niagara County Water District and Niagara County Sewer District.

**Strategy IX. Protect utility infrastructure - especially power lines - routinely damaged as a result of wind, snow, and ice events, which can lead to sanitary lift station or sump pump failures and basement flooding.**

The protection of utility infrastructure is critical to effectively managing the effects of storm-related events, particularly in Niagara County. Above-ground utilities, like power lines and lift stations, are exposed to weather-related elements which could lead to failure, due to the relatively flat geography of the County. There is a heavy reliance on sanitary lift stations in densely developed areas. Improved power reliance is an important component of the plan.



Utility protection

Potential partners include:  
National Grid; New York State Electric & Gas; Time Warner Cable; Verizon; and other utility providers.

Table 6: Infrastructure

STRATEGY	PROJECTED/ACTION NAME	LOCATION	DESCRIPTION	ESTIMATED COST
VII	Local green infrastructure solutions to manage stormwater runoff surrounding Gill Creek	Niagara Falls	Design and construct comprehensive green infrastructure demonstration project	\$1,500,000
VII	Niagara Falls Airport Green Infrastructure to capture stormwater run-off	Niagara Falls	Initial feasibility study for green infrastructure to increase stormwater and flooding issues	\$100,000+



## Niagara County NY Rising Countywide Resiliency Plan

Table 6: Infrastructure, Continued

STRATEGY	PROJECTED/ACTION NAME	LOCATION	DESCRIPTION	ESTIMATED COST
VII	County Golf Course Stream Corridor Restoration	Lockport (City)	Stream corridor restoration	TBD
VIII	Treatment Plant Modifications	Lockport (City)	Replace thickener tank	\$1,000,000
VIII	High Street Sewer Separation	Lockport (City)	Sewer separation	\$2,000,000
VIII	Northwest Storm Sewer Phase II	North Tonawanda	Drainage improvement study for sewer/ infrastructure upgrade	\$100,000
VIII	Water Pollution Control Center (WPCC) Secondary Clarifier Performance Improvements	Town of Niagara; Wheatfield	Installation of density current baffles	\$250,000
VIII	Sewer Collection System Emergency Power Facilities	Niagara Falls	Upgrade regulator controls and remote monitoring	\$829,000
VIII	Multiple Culverts	Cambria, Royalton, Wheatfield	Replace culverts with larger model	\$3,814,000
VIII	Collection system construction or renovation (multiple)	Cambria, Niagara (Town)	Construction/renovation of collection systems, correction of inflow and/or infiltration, interceptor sewer	\$2,625,000
VIII	Interceptor Sewer Manhole Rehabilitation	Niagara (Town)	Manhole rehabilitation to reduce inflow / infiltration	\$650,000
VIII	Correction of inflow and/or infiltration	Cambria	Repair/replacement in Fair Village to reduce inflow/infiltration	\$800,000
VIII	Correction of inflow and/or infiltration, sewage treatment plant rehabilitation	Wilson	Repair/replacement to reduce inflow/ infiltration	\$410,000
VIII	Correction of combined sewer overflow, collection sewer rehabilitation	Niagara Falls	Garfield Ave. outfall repairs and Chasm Ave outfall repairs	\$5,000,000 (collectively)
VIII	Correction of combined sewer overflow, sewer rehabilitation	Lockport (City)	Elimination of combined sewer overflows and sewer rehabilitation to improve water quality in Eighteen-mile Creek	\$4,400,000
VIII	2014 Storm Separation	North Tonawanda	Separate stormwater from sanitary sewers on 1st, 2nd and 3rd Avenues, and a portion of Ironton Street	\$300,000
VIII	Wastewater Treatment Plant Hardening and Protective Measures	Niagara Falls	Add ability to isolate and divert the plant sewer from the sewer collection system and construct a new wet weather relief structure	\$2,563,000



Table 6: Infrastructure, Continued

STRATEGY	PROJECTED/ACTION NAME	LOCATION	DESCRIPTION	ESTIMATED COST
VIII	Force main replacement	Niagara (Town)	Force main replacement, Sewer District 1, Tonawanda Creek	\$2,275,000
VIII	Sewer force main [stream bank slope stabilization]	Sewer District #1	Force main replacement	\$870,000
VIII	Sherwood Avenue Pump Station	North Tonawanda	Pump station rehabilitation	\$670,629
VIII	Pump station rehabilitation (multiple)	Pendleton, Lockport	Pump station rehabilitation	\$3,081,200 (collectively)
VIII	Sewage Treatment Plant Modifications	Lewiston, Royalton, Sewer District#1	Various (Grit system upgrade, water tank rehabilitation, plant modifications, sludge drying bed operations improvements)	\$20,030,000 (collectively)
VIII	Construction or renovation of force main, interceptor sewer, pump station	Cambria	Force main, interceptor sewer and pump station improvements	\$4,300,000
VIII	Construction or renovation of force main, interceptor sewer and pump stations	Pendleton	Force main, interceptor sewer and pump station improvements	\$1,810,000
VIII	Collection system construction or renovation, correction of inflow and/or infiltration, interceptor sewer	Lockport (Town)	Elimination of combined sewer overflows and sewer rehabilitation	\$2,799,000
VIII	Collection sewer rehabilitation, sewage treatment plant rehabilitation	Wilson	Sewage treatment plant and collection sewer improvements to improve water quality in Lake Ontario.	\$1,700,000
VIII	Construction of collection sewers, a pump station force main and sewage treatment plant	Porter	Installation of collector sewers, force main, pump station, and construction of a sewage treatment plant in the Ramsomville Sewer District.	\$8,081,000
IX	Sewer Collection System Emergency Power Facilities	Niagara Falls	Lift station emergency generators or hard wire back-up electrical service	\$356,000
IX	Pump Station Emergency Generators	Lockport (Town), North Tonawanda	Installation of emergency power generators at lift stations + portable generators	\$615,000
IX	Wastewater Treatment Plant Emergency Power System	Niagara Falls	Replace standby generator with modern, upsized equipment	\$349,000
IX	Sewer Lift Stations Standby Generators (4)	Wheatfield	Standby generators for 8 sewer lift stations in the Town of Wheatfield	\$184,000

## Natural and Cultural Resources

**Strategy X. Undertake detailed floodplain and watershed studies across the County.** In order to better coordinate cross-municipal watershed and floodplain management issues, and to maximize the use of natural areas to enhance future resiliency and flood risk reduction, planners need to have a detailed understanding of the landscape in which they are working. These detailed watershed studies can be used to aid decision-making about land acquisition, conservation, preservation, and restoration. Data from detailed studies can also assist local municipalities with planning of adjacent projects that could be linked to identified natural and cultural resources identified in the studies.

Studies should provide:

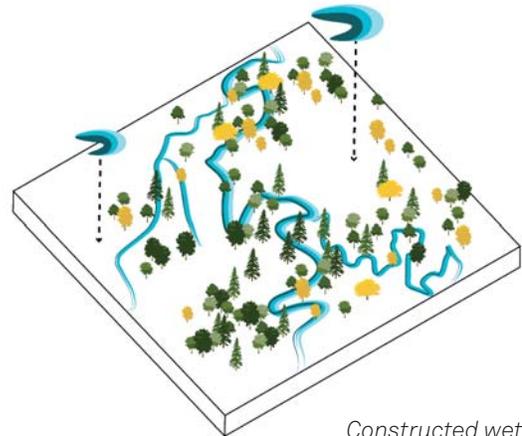
- Evaluation and updating of existing GIS data sets for mapped features.
- Detailed analysis of aerial photos for structural ground conditions like shoreline edges, buildings, roads and utilities.
- LIDAR (light detection and ranging) analysis of land cover.
- Mapping of critical ecological features including nearshore and Benthic Aquatic Habitat, Wetlands, Woodlands, Grass/Scrub, stream flows, and other features.

Potential partners include:

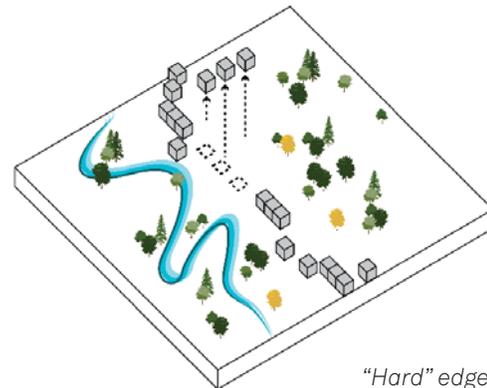
Western New York Land Conservancy and Buffalo Niagara Riverkeeper.

**Strategy XI. Maintain and enhance riparian buffers along waterways.** Vegetated buffer zones along waterways help protect waterways from the impact of adjacent land uses, reducing runoff water temperatures, siltation, and other pollutant intrusion. Landowners could be encouraged through multiple approaches to maintain a forested riparian stream buffer.

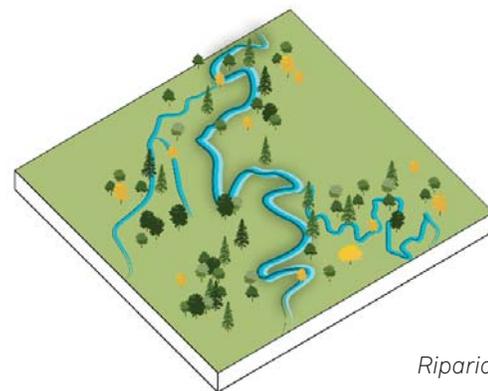
Potential partners for implementation include: Buffalo Niagara Riverkeeper and Niagara County Soil and Water Conservation District.



*Constructed wetlands*



*"Hard" edge removal*



*Riparian buffers*



**Strategy XII. Preserve and protect upland natural resources including forested areas and critical watershed wetlands.** Preserving watershed uplands will reduce stormwater runoff, improve water quality, enhance infiltration and promote uptake through evapotranspiration. Encourage municipalities in the County to enhance zoning bylaws to protect wetlands that may not be protected under State or federal law.

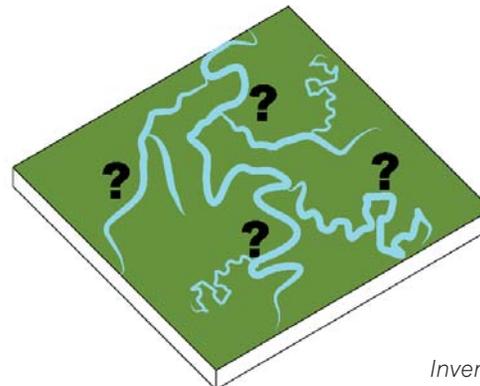
Potential partners for implementation include: Buffalo Niagara Riverkeeper.



*Preserve watershed uplands*

**Strategy XIII. Preserve, protect and enhance soil quality to reduce agricultural runoff.** Healthy soils hold more water for use by plants and the soil's water holding capacity reduces runoff that can cause flooding. Work with local agricultural communities to promote the improvement of soil health on agricultural lands using measures such as: reduced fertilizer and pesticide usage; no-till farming practices; increased use of cover crops; and vegetated buffer zones.

Potential partners for implementation include: Niagara County Soil and Water Conservation District.



*Inventory streams*

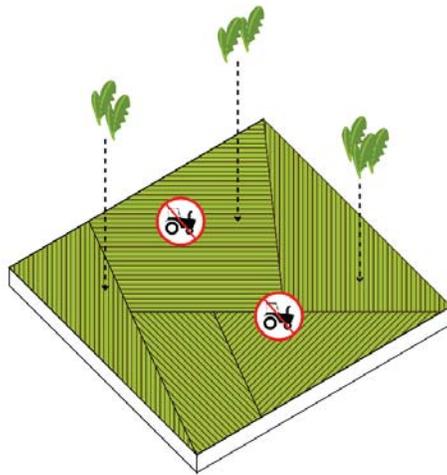
**Strategy XIV. Conduct a countywide stream feature inventory.** The inventory provides a basic familiarity with the stream corridor and surrounding watershed and can reveal trends important to understanding the stream system. The stream feature inventory should provide the following information:

- Conditions that affect hydraulic function, particularly sediment transport function such as bedrock sills and banks, cultural and natural grade controls, berms, and rip-rap or other revetment, and inadequate riparian vegetation.
- Potential sources of water quality impairment in the corridor, especially eroding banks, road runoff outfalls, brownfields, agricultural land in production, combined sewer outfalls, and exposed

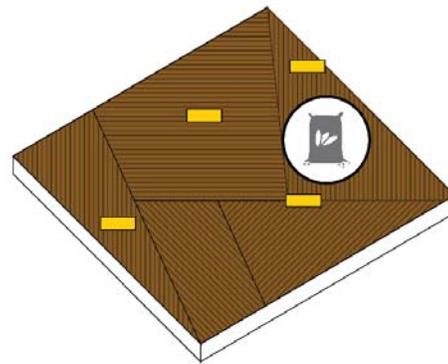
septic leach fields or other hazards.

- Locations of bank erosion sites that need to be documented and surveyed regularly for study of bank erosion rates.
- Infrastructure, including road crossings, bridge abutments, culverts and outfalls, and utility lines or poles.
- Other features such as tributary confluences, water intakes, springs, wells, diversions, and invasive species. This effort can be accomplished by trained staff utilizing a Global Positioning System (GPS) and a stream feature inventory data dictionary at a rate of approximately one mile/day.

Potential partners for implementation include: Buffalo Niagara Riverkeeper and Niagara County Soil & Water Conservation District.



No-till farming



Fertilizer management

Table 7: Natural and Cultural Resources

STRATEGY	PROJECTED/ACTION NAME	LOCATION	DESCRIPTION	ESTIMATED COST
X	Flood Study/Assessment of Cayuga, Bergholz and Sawyer Creeks	Niagara, Wheatfield	Flood study and/or geomorphic assessment to identify flooding causes and solutions	\$1,200,000
X, XI	Headwater Stream Protection: Bull Creek	Wheatfield, Pendleton	Feasibility Study to Improve Stream Corridor Wetlands + Adjacent Land	\$100,000
X, XI	Donner Creek Flood Study and Mitigation	North Tonawanda	Stream restoration study	\$60,000
XII	Property Acquisition/Creation of Wetlands and/or improved Floodplain Access and/or Floodplain Storage Capacity	Niagara (Town)	Construct wetlands and increase Floodplain storage capacity in lower level floods (Cayuga Village Neighborhood)	\$200,000 - \$600,000
XII	Property Acquisition/Creation of Wetlands and/or improved Floodplain Access and/or Floodplain Storage Capacity	Wheatfield	Construct wetlands and increase Floodplain storage capacity in lower level floods (Bergholtz and Sawyer Creeks)	\$200,000 - \$600,000
XII	Property Acquisition/Creation of Wetlands and/or improved Floodplain Access and/or Floodplain Storage Capacity	Niagara (Town)	Construct wetlands and increase Floodplain storage capacity in lower level floods (Tonawanda Creek Road; Tuscarora + Porter Roads)	\$200,000 - \$600,000
XIII	Cover Crop Plant/Liquid Fertilizer and Herbicide Applicator/No-Till Grain Drill	Countywide	Equipment purchase	\$40,000
XIII	Cover Crop Erosion Control	Countywide	Cover crop application	\$80/acre



## Housing

**Strategy XV. Educate property owners about combined sewer backflow risks and mitigation techniques.** Education on the risks flooding poses to residential property owners in Niagara County must be an ongoing effort. When several years pass without a CSO back-flow flood, it is human nature to become complacent and assume the risk may be less than it actually is. Public awareness of CSO flooding risks in basements with non-compliant drains, toilet and other similar features and their implications is an important aspect of building resiliency.

Educate property owners in areas of municipal combined sewer systems through outreach activities that:

- Promote understanding of where combined sanitary and stormwater systems are in their communities, how combined stormwater and sanitary systems work, and what causes them to back-up and overflow into basement areas.
- Provide information about how to sign-up for real-time warnings about imminent combined sewer backflow events.
- Disseminate technical information about the measures property owners can take to reduce their risk of costly backflow damage to their property with information about qualified contractors and equipment resources for repair and protection work.
- Encourage homeowners to remove non-permitted connections to sanitary systems like roof drainage downspouts or non-permitted building elements like floor drains, toilets or sinks through regular building inspections.
- Encourage homeowners to install back flow devices to prevent reverse-flow flood damages from combined municipal storm and sewer systems.
- Explain the risks and hazards of combined sewer effluent and proper measures for cleaning and disinfection of affected property.
- Provide information about how to inform municipal agencies during backflow events and how to file potential claims for damages.

This strategy promotes risk reduction by expanding education about causes of CSO backflows in residential properties. This strategy also promotes resiliency by encouraging building renovations that can prevent future basement backflow flooding.

Potential Project Partners include: United Way 211 Call Center; local building departments; and local sewer districts.

**Strategy XVI Educate communities and property owners in floodplains about flood mitigation techniques.** Educate property owners regarding options for mitigating their properties from flooding through outreach activities such as:

- Technical assistance programs that address measures that citizens can take to facilitate funding for mitigation measures.
- Encourage homeowners to install backflow devices to prevent reverse-flow flood damages from combined municipal storm and sewer systems.
- Educate the public about securing debris, propane tanks, yard items, or stored objects that may otherwise be damaged or swept downstream during flood events.
- Remind residents to help keep storm drains clear of debris during storms so that communities are not solely reliant on public works departments for maintenance activities.
- Encourage communities to consider enrolling in the National Flood Insurance Program's (NFIP) Community Rating System (CRS) to further strengthen and reinforce residential property owner education and outreach efforts.

Potential Partners include: FEMA; NYS Department of State; and Local Government Building Departments.



## Economic Development

**Strategy XVII. Expand flood protection of underdeveloped parcels to spur economic growth.**

This strategy enhances the economic development recovery support function by adopting flood protection measures to protect underdeveloped economic assets in the community and spur re-development. At-risk sites include properties along existing creeks or streams that might be subject to frequent erosion or abandoned industrial sites with buildings that could be retrofitted for new uses. Other sites might include brownfield areas that, if damaged could spread contaminated soils, increasing future remediation costs and posing a risk to public health.

Work further with the Niagara County Department of Economic Development to identify key properties in the County in risk areas to develop this recommendation further. A mapping exercise may need to occur first to identify parcels. There should be a focus on brownfield sites that might have redevelopment potential.

Tie this strategy to existing and future brownfield redevelopment opportunity areas (BOAs), such as the four currently designated BOAs in Niagara County, which include the Buffalo Avenue Industrial Corridor in Niagara Falls, the Highland Community in Niagara Falls, the Tourism Focus Area in Lockport, and Tonawanda Island in North Tonawanda.

This strategy enhances potential for future economic development by protecting properties from future storm damage.

Potential Partners include:  
Niagara County Department of Economic Development, NYS Department of Environmental Conservation, WNY Empire State Office; and NYS

Department of State.

**Strategy XVIII. Identify underdeveloped parcels served by existing sewer and water infrastructure to target for future development as part of a comprehensive countywide development strategy.**

Undertake a GIS analysis of underdeveloped parcels with sewer and water access to target for future growth and development. Integrate data (where available) on traditional 100-year and 500-year floodplains, historical flood levels, combined storm and sanitary sewer outfalls and sewersheds, impervious surfaces, and other data to identify underdeveloped parcels in sewer and water districts that have a higher risk for flooding. Identify infrastructure improvements including green infrastructure strategies that can be utilized to mitigate flood risk in areas with high development/ redevelopment potential.

Potential partners include: Niagara County Department of Economic Development; Niagara County Soil & Water Conservation District; Buffalo Niagara Riverkeeper; and NYS Department of State.

Table 8: Economic Development

STRATEGY	PROJECTED/ACTION NAME	LOCATION	DESCRIPTION	ESTIMATED COST
XVII	Install Collection System to Service Cambria Technology Park	Town of Cambria	Planning, design and construction of storm sewer collection system.	\$1,060,000



Lock 35 - Erie Canal (Photo Credit: Niagara County)



# 4

## Project Profiles

*The Recovery and Resiliency projects support the County's vision and strategies, address critical issues and needs, and mitigate risk to assets. The projects, in conjunction with the strategies, create a more resilient Niagara County.*

The following pages include detailed descriptions of the proposed projects identified by the NYRCR Planning Committee. The Niagara County NY Rising Countywide Resiliency Plan includes 58 proposed projects, identified as either Recovery or Resiliency projects in each Project Profile.

The projects represent short- and long-term actions that are linked to and help support the NYRCR Plan strategies, as detailed in Section 3: Reconstruction and Resiliency Strategies. They also address needs and opportunities identified by the NYRCR Committee, help to reduce risk to assets, and support the long-term resiliency of the County to future storms.

Projects identified as Recovery Projects were included in the March 31, 2014, submission to the State of New York for Recovery funds. The Recovery Projects respond to the storm events from the summer of 2013 by addressing needed repairs or gaps identified during the storm, or are executable on a shorter time frame. While categorized as Recovery Projects, the implementation of these projects will also reduce risk to assets and provide resiliency benefits.

The Resiliency Projects provide long-term resiliency benefits, such as reducing flooding risks. These projects are generally longer-range projects needed to ensure a more resilient and economically strong community.

All Project Profiles provide a detailed project description, a project location, a description of the project benefits, a discussion of potential funding sources and type of funding, and a list of the

strategies the project promotes. Where similar projects are described together in one Project Profile, all individual project names and their locations are listed in the Profile.

The Recovery Project Profiles also include a cost benefit analysis and a risk reduction analysis. The cost benefit analysis considers the anticipated cost of implementation, anticipated future costs if projects are not implemented as related to future storm damage, and a primarily qualitative evaluation of the benefits of the project. The risk reduction analysis considers the risk the project addresses and how it would be reduced.

## Lockport (City)

# 1 Treatment Plant Modifications

### RECOVERY PROJECT DESCRIPTION

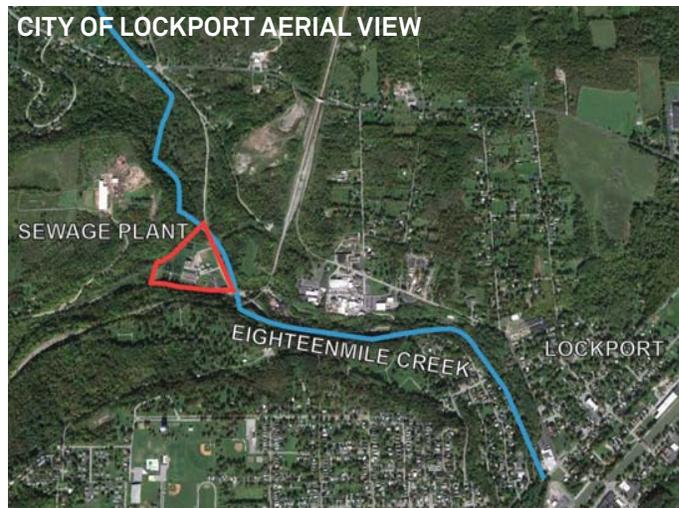
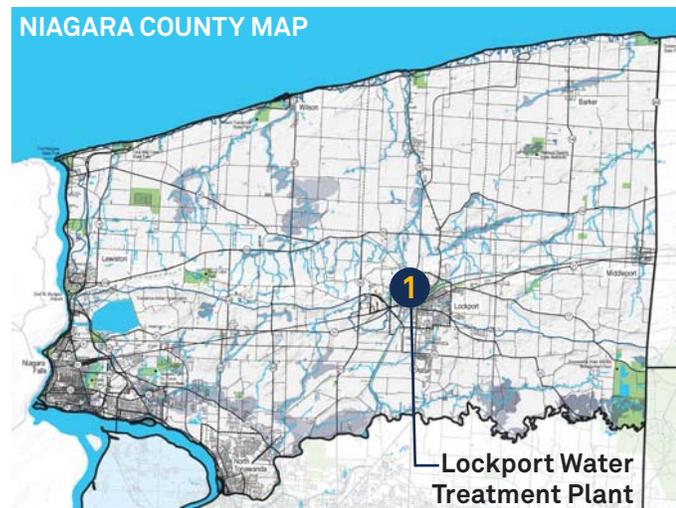
The Lockport wastewater treatment plant was badly damaged by the flooding that affected Lockport on June 28, 2013. The plant has two “grit chambers” which separate debris from the water before it moves on to get treated. One of these grit chambers broke in the storm and was later repaired. According to news media reports at the time, the Mayor declared a state of emergency as a precautionary measure, though there was not an immediate threat to public safety.

The June 2013 storm created flows into the wastewater treatment plant that it was unable to handle, resulting in sewer backups in residential dwellings and businesses.

This project is for a replacement thickener tank, which stores sludge. There are two current holding tanks, which are obsolete. The existing back-up thickener tank is from 1972. This project would replace the back-up thickener tank.

Modifications to the wastewater treatment plant will prevent overflows into Eighteenmile Creek, a designated EPA Superfund site. On March 13, 2012, the section of the Creek north of the Erie Canal in Lockport was added to the federal Superfund National Priorities List, making it a priority that contaminated solids be prevented from entering the Creek or watershed. Eighteenmile Creek has been designated as an Area of Concern (AOC) in accordance with the U.S.-Canada Great Lakes Water Quality Agreement, due to the identified contaminant potential in creek bottom sediment.

### PROJECT LOCATION



The wastewater treatment plant in the City of Lockport is located on Plank Road, along Eighteenmile Creek on the northwest side of the City.

### BENEFITS

**Economic Development** - Improved infrastructure will reduce the amount of effluent in Eighteenmile Creek and the streams within the watershed, improving water quality for riparian wildlife and bolstering the local fishing industry.

**Infrastructure** - The replacement thickener tank will increase the capacity of the wastewater treatment facility to handle storm surges and prevent overflows into Eighteenmile Creek. In addition, aging equipment at the wastewater facility will be updated creating greater resiliency in the system.

**Natural and Cultural Resources** - Additional capacity to the City’s wastewater treatment facility will indirectly improve water quality by reducing outflows from the system into Eighteenmile Creek.

**Housing** - Improved wastewater infrastructure will mitigate any future sewer discharge damage to residential dwellings and improve public health, safety and welfare.

# 1 Lockport (City) Treatment Plant Modifications

## COST BENEFIT ANALYSIS

The potential local and downstream water quality benefits and future repair and clean-up related costs savings of this project are considered to outweigh the estimated \$1,000,000 cost of the project for engineering design, labor, and equipment.



**Example of thickener tanks**  
Photo Credit: AECOM/Staff Photographer(Non-Professional)

## RISK REDUCTION ANALYSIS

The Lockport Wastewater Treatment Plant is a FEMA critical asset located in a high risk area that experienced damage during the flooding of the summer 2013 storms. The treatment plant modifications to replace the back-up thickener tank will reduce the future risk to this critical asset and to area water quality.

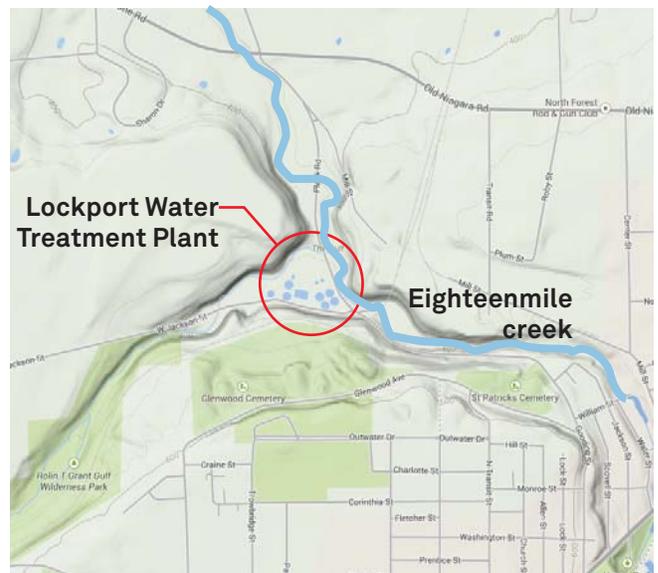
## PROJECT STATUS & POTENTIAL FUNDING SOURCES

The project is in conceptual/planning phase and would require engineering design and permit approvals. The Clean Water State Revolving Fund (CWSRF), jointly administered by the Environmental Conservation, provides financing to municipalities for construction of facilities that improve, maintain or protect water quality. This project appears on the 2014 Final CWSRF Intended Use Plan Multi-Year Project Priority List.

## STRATEGIES

The Strategies that these types of projects will help advance include:

**Strategy VIII:**  
Upgrade storm and sewage infrastructure.



The City of Lockport Wastewater Treatment Plant is located at a low point in the City, as indicated in the above topographic map.

## 2 Lockport (City) High Street Sewer Separation

### RECOVERY PROJECT DESCRIPTION

In one of the oldest areas in the City of Lockport, above the escarpment, a combined sewer was unable to handle the flow of storm and sanitary effluent during the June 2013 storm, causing sewer backups in residential dwellings and businesses. In total, Lockport sustained \$7.2 million damage from the summer storm. \$1.2 million damage to public infrastructure including pipes, manholes and wastewater treatment plant facilities and some \$6 million damage to private property. According to media reports, 600 residences flooded with combined sewer effluent, with at least 200 homes in the High Street area having least six feet of untreated sewage water flooding into their basements.

The High Street Sewer Separation project proposes the installation of a new stormwater main trunk line that can divert stormwater flows running through the existing, undersized combined sewer system that runs the length of High Street. Presently a separated stormwater system south of High Street discharges into the High Street combined sewer system, putting the combined system at risk for being overwhelmed during heavy weather events. The creation of a new separate stormwater trunk line will provide adequate pipe size for the contributing watershed to the south of High Street in addition to the existing stormwater inputs on High Street itself. The trunk line design calls for disposition of the stormwater flows into an existing outfall that drains into the Erie Canal, by passing the treatment plant and reducing loading on that system. End of pipe water quality treatment can be installed on the new line before it deposits into the canal. The proposed new storm sewer line will run from Maple Street to the Canal, a length of approximately 3,000 feet, utilizing an 18" pvc pipe. The depth of the pipe trench will be variable between 10' to 20'.

### PROJECT LOCATION



Location of High Street

### BENEFITS

**Community Planning and Capacity Building** - The proposed project provides critical benefits by diverting a significant volume of stormwater flow from the treatment plant which will reduce the City's overall volume of effluent that requires treatment improving its ability to handle heavy weather events.

**Economic Development** - By reducing the volume of stormwater received by the infrastructure this will lessen the wear on equipment prolonging its function. Additionally this will reduce energy and chemical treatment costs to the county, allowing it to use money previously spent on this infrastructure in other ways.

**Housing** - The proposed project has benefits to private housing by separating out the stormwater flows from the present combined sewer system and significantly reducing potential combined sewer basement back-up flooding in hundreds of homes during future peak flow wet weather events.

## 2 Lockport (City) High Street Sewer Separation

### BENEFITS, CONTINUED

**Natural and Cultural Resources** - The project has key co-benefits of environmental protection. This improvement will keep significant discharge volumes out of the Eighteenmile Creek outfall, a designated EPA Superfund site reducing disturbance of contaminated silts in the creek bed which can be transported further downstream, as far as Lake Ontario.

### COST BENEFIT ANALYSIS

The installation of a new stormwater main trunk line would address the undersized combined stormwater and sewer system that currently serves this portion of the City. During the 2013 summer storms, the system was overwhelmed and the City of Lockport sustained \$7.2 million in damage, including public infrastructures, homes and businesses from sewer backups. Creation of a new trunk line would provide adequate pipe size for the area the system serves, reducing sewer backup incidents and related cleanup costs and adding public health benefits due to a reduced risk of exposure to combined sewer overflow discharges. In addition, it would reduce the amount of stormwater directed to and treated at the City’s treatment plant. This can provide co-benefits by reducing operating costs related to conveyance and treatment. The potential benefits of this project and potential cost savings in future repairs are considered to outweigh the \$2,000,000 cost for engineering design and construction.

### RISK REDUCTION ANALYSIS

Implementation of the High Street Sewer Separation would help to prevent flooding and backups into basements like that which occurred during the summer storms of 2013 in the area, reducing risk to housing and economic assets. It would also reduce the risk of disturbing contaminated bottom sediment in Eighteenmile Creek by reducing flows to the Creek.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

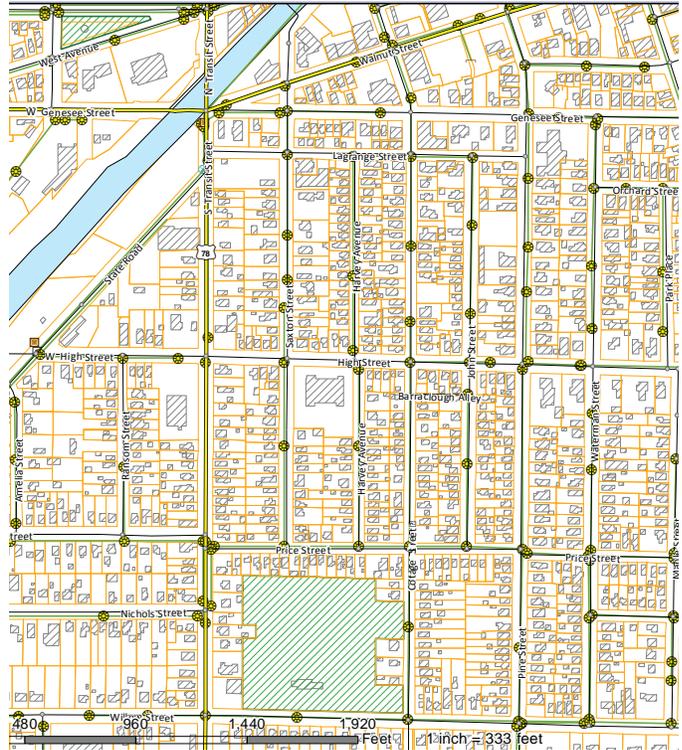
Preliminary design has not begun yet. The project is currently listed in the City’s capital budget for future infrastructure projects, but is unfunded.

### STRATEGIES

The Strategies that these types of projects will help advance include:

**Strategy VIII:**

Upgrade storm and sewage infrastructure.



Sewer map of High Street area in relationship to the Erie Canal.



Image of three vehicles partially submerged in the water along East High Street, as a result of the June 2013 storm. Photo Credit: Lockport Journal/Stephen M. Wallace

### 3 North Tonawanda Northwest Storm Sewer, Phase II (Witmer Road West)

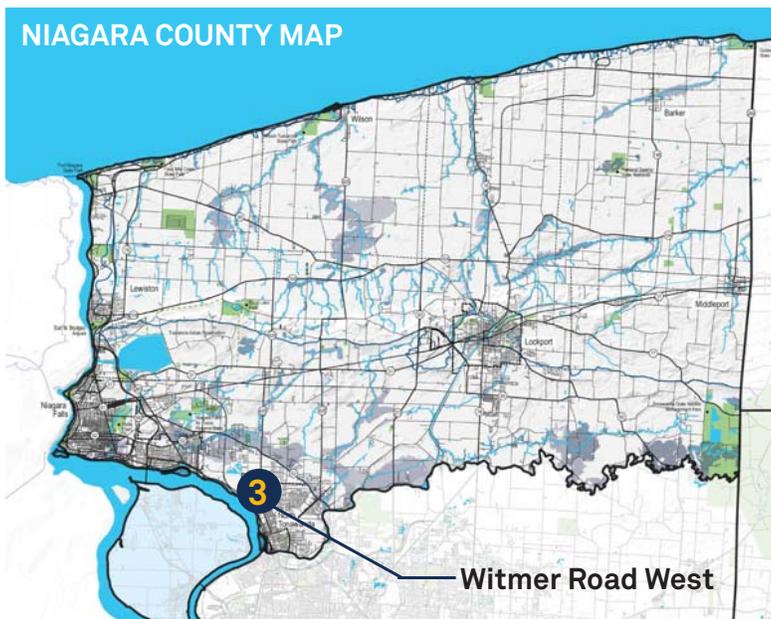
#### RECOVERY PROJECT DESCRIPTION

The City of North Tonawanda and the Town of Wheatfield have reduced flooding in the Witmer Road area by allowing the Town to tie their drainage system into the City's northwest storm sewer outfall to the Niagara River. The proposed project will address the needs of residents facing persistent flooding from Sawyer Creek.

The first phase of the project was initiated in 2012. The second phase of the project includes professional services associated with drainage improvements on the west side of Witmer Road. The project will consist of completing a topographic survey and a preliminary design to identify additional drainage improvements that can be made in the rear yards of homes on the west side of Witmer Road to drain more water toward the Phase 1 improvements which were completed in 2012. This project is a study and does not include detailed design. Detailed design and applications for regulatory approvals will be completed as a subsequent phase with a separate authorization.

Improvements to the drainage on the west side of Witmer Road will help prevent the flooding and basement sewage backups which occurred during the storms of 2013.

#### PROJECT LOCATION



*To the Left: The project is located along Witmer Road West, on the northwest side of the City of North Tonawanda. The project is adjacent to the Town of Wheatfield.*

#### BENEFITS

**Community Planning and Capacity Building** - The project seeks to implement planning strategies that follow floodplain boundaries and watersheds rather than municipal boundaries between the City of North Tonawanda and the Town of Wheatfield to improve the storm sewer outfall capacities for long buried tributaries of Sawyer Creek that drain to the Niagara River.

**Housing** - Improved storm sewer infrastructure will mitigate any future discharge flooding damage to residential dwellings and improve public health, safety and welfare.



### 3 North Tonawanda Northwest Storm Sewer, Phase II (Witmer Road West)

#### PROJECT STATUS & POTENTIAL FUNDING SOURCES

An RFP for design services was issued in February 2014. The project is currently funded through a municipal bond. The City of North Tonawanda is looking for reimbursement of the bond through the NY Rising Community Reconstruction Program.

#### COST BENEFIT ANALYSIS

This project retains the services of professional consultants (planners and engineers) to study the feasibility of combining the Town of Wheatfield Storm Sewer System to the City of North Tonawanda's Northwest Storm Sewer Outfall. The potential solutions generated from this study outweigh the estimated \$100,000 cost for topographic survey and preliminary engineering design.

#### RISK REDUCTION ANALYSIS

Implementation of drainage improvements would help to prevent flooding and backups into basements like that which occurred during the summer storms of 2013 in both the Town of Wheatfield and in the City of North Tonawanda, reducing risk to housing assets.

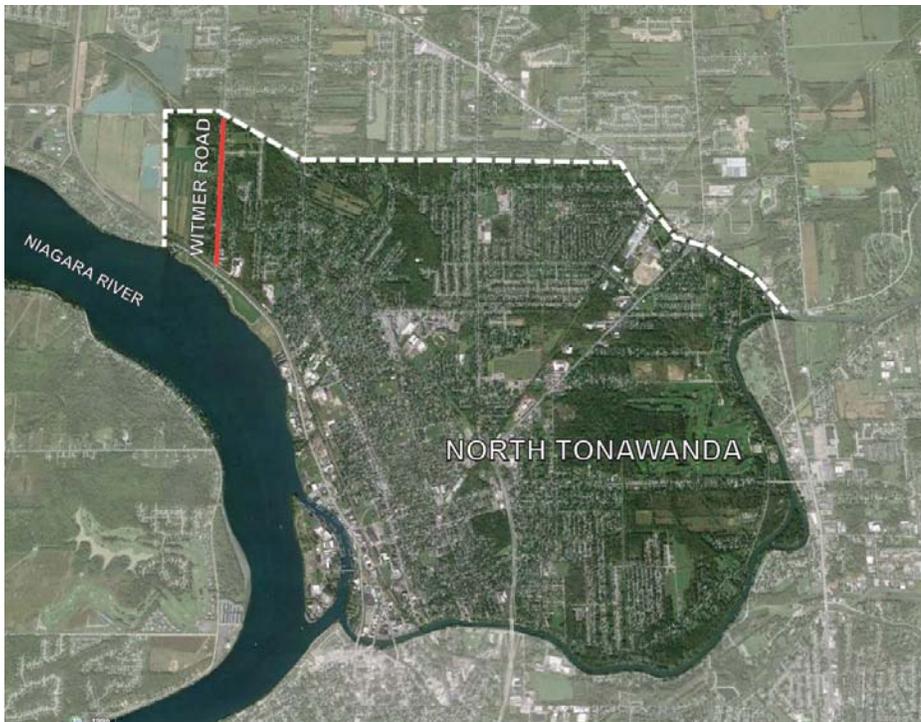
#### STRATEGIES

The Strategies that these types of projects will help advance include:

##### **Strategy VIII:**

Upgrade storm and sewage infrastructure.

#### AERIAL VIEW OF NORTH TONAWANDA + WHEATFIELD



Location of Witmer Road West

## 4 Niagara County Sewer District #1 Water Pollution Control Center Secondary Clarifier

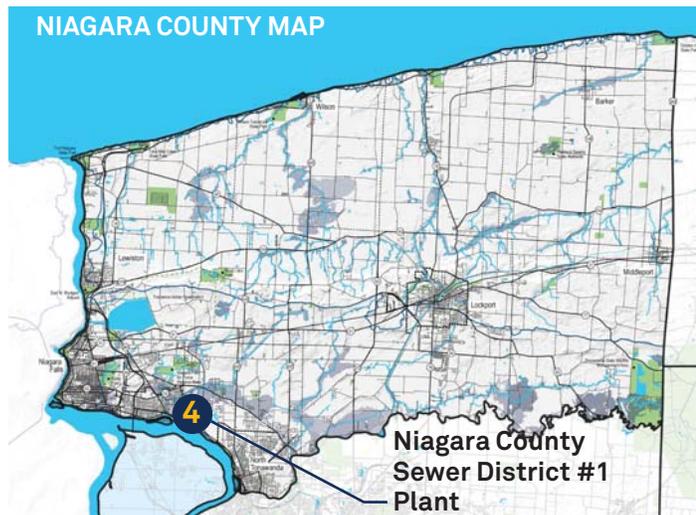
### RECOVERY PROJECT DESCRIPTION

The Niagara County Sewer District #1 serves six towns within Niagara County, including the Towns of Niagara and Wheatfield. The Niagara County Sewer District Water Pollution Control Center is located in the Town of Wheatfield, which it serves, as well as the Town of Niagara and four additional townships in the County.

During storm events in the summer of 2013, the Niagara County Sewage District Plant experienced excessive stormwater infiltration and inflow into the sanitary sewer system. The performance of the Water Pollution Control Center secondary clarifiers under high flow provides limited flexibility of operations due to solids washout and/or carryover during these periods.

A clarifier is a tank that removes solid particles and suspended solids from liquid which are usually deposited due to sedimentation in the stormwater. The process creates sludge, which is the discharge at the bottom of the tank resulting from the clarifying process. Solids carryover, due to short circulating and wet weather events, causing poor clarifier performance and limits the clarifier capacity. This forces plant operators to bypass secondary treatment processes earlier than desired, causing degradation of clarifier effluent quality. Effluent degradation has the potential to trigger State Pollution Discharge Elimination System (SPDES) permit violations.

### PROJECT LOCATION



The Niagara County Sewer District Water Pollution Control Center is located in the Town of Wheatfield, as shown above.

### BENEFITS

**Infrastructure** - This project will enhance the capacity of the clarifier allowing for the Water Pollution Control Center to treat more stormwater during future peak storm events. Benefits will accrue to all six townships served by the Sewer District #1.

**Natural and Cultural Resources** - The installation of current baffles as a component to the system will specifically ensure the State Pollution Discharge Elimination System (SPDES) permit is in compliance. By maintaining permitting with the SPDES, the County can be confident that they are safeguarding the groundwater and any surface water from storm-related solids washout or carryover. This will ultimately help the water quality in the Niagara River to maintain its habitats and support industries such as fishing and sport fishing. The Niagara County groundwater, which is close to the surface in this area, will be protected.



## 4 Niagara County Sewer District #1 Water Pollution Control Center Secondary Clarifier

### COST BENEFIT ANALYSIS

The installation of density current baffles, provides a component of a clarifier system that will offer a relatively low cost solution to the poor clarifier performance and capacity limits. The project will ensure compliance with the SPDES permit requirements as well as increase clarifier capacity. This will prevent any clean-up required to the groundwater or local streams and creeks as a result of carryover or solids washout during a storm event. These benefits outweigh the estimated \$250,000 cost for preliminary design and engineering. The project request is for full funding of the preliminary engineering and design of the secondary clarifier system.

### RISK REDUCTION ANALYSIS

The Niagara County Sewer District Water Pollution Center is a FEMA critical asset that experienced elevated wastewater flows during the summer 2013 storms. The upgrade of the secondary clarifier will reduce future risk to this critical asset by increasing operational flexibility during high flow periods and decreasing the risk of triggering SPDES permit violations.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

The construction bid for the clarifier baffle improvements was put out in June 2014 for a bid in mid-July 2014 with a 5% bid bond. The Niagara County Sewer District #1 is looking for reimbursement of the bond through the NY Rising Community Reconstruction Program.

### STRATEGIES

The Strategies that these types of projects will help advance include:

#### **Strategy VIII:**

Upgrade storm and sewage infrastructure.



**Example of secondary clarifier**

*Photo Credit: AECOM/Robb Williamson*

## Niagara Falls

# 5 Sewer Collection System Remote Monitoring and Regulator Control Upgrades

### RECOVERY PROJECT DESCRIPTION

The July 19, 2013 storm dropped more than 3 1/2 inches of rainfall on the Niagara Falls, N.Y. area in just a few hours, the equivalent of the average monthly rainfall for all of July. The resulting runoff to the combined sewer collection system caused a historic surcharge (sewage backup) in the sewers, creating basement flooding in over 1,100 homes in the City of Niagara Falls.

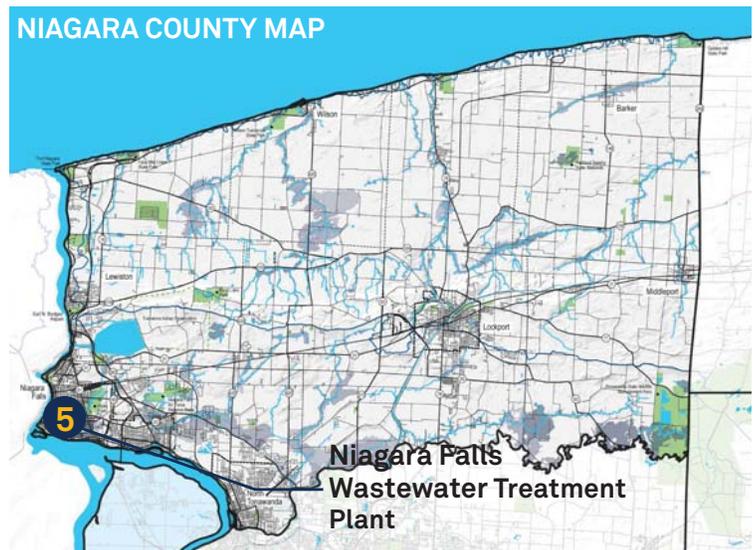
The surcharge also caused backup and flooding within the Niagara Falls Water Board's wastewater treatment plant, rendering it inoperable for nearly six days. During this time, more than 100 million gallons of raw sewage was delivered to the Niagara River. The damage crippled the plant's ability to pump raw wastewater, feed treatment chemicals, remove solids from primary treatment, and process sludge. A series of sewer regulators were incorporated into the combined sewer collection system in the 1930's, 1970's and 1980's. The intent of the regulator system was to provide the ability to divert excessive wet weather flow from the treatment plant to the utilities' permitted overflow outfalls. Over time, mechanical, electrical, and monitoring/communication systems degraded and have become more difficult to operate. Pneumatic lines have developed leakages, status indication devices no longer work due to corrosion, and the telemetry system linking the thirteen regulators is no longer reliable. All regulators remain functional, but require sewer crews to operate them manually at each individual location. While adequate for routine maintenance and less intense rainfall events, this prohibits effective use of the system during rapid onset heavy rainfall events. The inability of crews to respond quickly enough lead to widespread flooding of multiple floors of the treatment plant. This project would upgrade 12 of these structures.

Upgrades would allow structures to reject high flows automatically, or allow staff to selectively regulate flow by using operating devices at the structure or remotely from the wastewater treatment plant. The wastewater treatment plant serves the City's population of 49,722.

### BENEFITS

**Economic Development** - Upgrading the regulator controls and remote monitoring will reduce staff time and maintenance used to manually adjust the current regulators providing a cost savings to the City. This would improve staff response time during storm events to better protect critical and costly equipment. In addition, new equipment and current technologies provide a significant energy reduction to the electrical system currently regulating the system.

### PROJECT LOCATION



*The project is located along the Niagara River*



### Niagara Falls

## 5 Sewer Collection System Remote Monitoring and Regulator Control Upgrades

**Infrastructure** - Remote monitoring and regulator controls will increase the flexibility and efficiency of the wastewater treatment facility to handle storm surges and prevent overflows into residential dwellings and backups into the sewer system. Aging equipment at the wastewater facility will be updated, creating greater resiliency in the system.

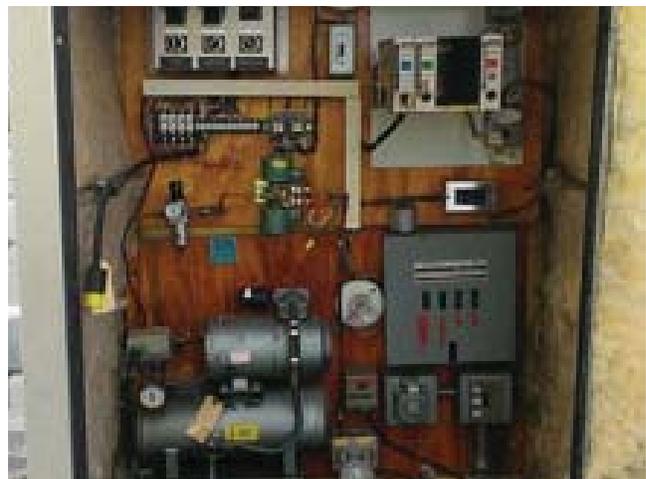
**Housing** - Improved storm sewer infrastructure will mitigate any future discharge flooding damage to residential dwellings and improve public health, safety and welfare.

### COST BENEFIT ANALYSIS

The expenditure to complete repairs would reduce the potential for flooding that could cause plant damage and take the wastewater treatment plant offline as happened during the summer 2013 storms, and therefore reduce future costs related to storm damage. The cost for repairs from the July 2013 flood event will exceed \$8.5M just to restore the facility capabilities, with no enhanced protective measures for future reoccurrences. The potential benefits and future cost savings of this project outweigh the estimated \$829,000 cost of the project for engineering design, project inspection, labor and equipment.



Temporary WWTP pumping system used post-2013 storm  
(above) Photo Credit: Niagara Falls Water Board



1970's era regulator control cabinet (above)  
Photo Credit: Niagara Falls Water Board

### RISK REDUCTION ANALYSIS

The Niagara Falls Wastewater Treatment Plant is a FEMA critical asset located in a moderate risk area that experienced backup and flooding during the summer 2013 storms. The upgrade of the collection system to remote monitor and regulator control will reduce future risk to this critical asset.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

The project is in the conceptual/planning phase and would require engineering design and permit approvals. The project is currently unfunded. It was submitted to the Federal Emergency Management Agency (FEMA) for a Hazard Mitigation Grant.

### STRATEGIES

The Strategies that these types of projects will help advance include:

#### Strategy VIII:

Upgrade storm and sewage infrastructure.



## 5 Niagara Falls Sewer Collection System Remote Monitoring and Regulator Control Upgrades

### ADDITIONAL COST DETAIL

NYRCR  
 NFWB Sewer Collection System Monitoring and Control  
 Cost Estimate

Item	Description	Dimension	Quantity	Cost Per Unit	Material Cost	Labor Cost	Total Cost
1	Mobilization and demobilization	EA	1	10000	-	-	\$10,000
2	Maintenance and protection of traffic	EA	2	5000	-	-	\$10,000
3	Install of 8" knife gate valve with pneumatic actuators	EA	2	\$3,125	\$6,250	\$6,250	\$15,000
4	Install of 10" knife gate valve with pneumatic actuators	EA	1	\$4,160	\$4,160	\$4,160	\$9,984
5	Install of 12" knife gate valve with pneumatic actuators	EA	5	\$4,168	\$20,840	\$20,840	\$50,016
6	Install of 14" knife gate valve with pneumatic actuators	EA	3	\$6,250	\$18,750	\$18,750	\$45,000
7	Install of 16" knife gate valve with pneumatic actuators	EA	1	\$7,080	\$7,080	\$7,080	\$16,992
8	Install of 18" knife gate valve with pneumatic actuators	EA	1	\$10,420	\$10,420	\$10,420	\$25,008
9	Install of 20" knife gate valve with pneumatic actuators	EA	1	\$12,500	\$12,500	\$12,500	\$30,000
10	Electrical wiring	EA	14	\$6,000	\$84,000	\$84,000	\$168,000
11	Level transmitters	EA	14	\$2,500	\$35,000	\$35,000	\$70,000
12	Telemetry and SCADA improvements	EA	14	\$10,000	\$140,000	\$140,000	\$280,000

Construction: \$730,000  
 Engineering: \$98,562  
**Project Total \$828,562**



Page Intentionally Left Blank

## Niagara Falls

# 6 Sewer Collection System Emergency Power Facilities

### RECOVERY PROJECT DESCRIPTION

On July 19th, 2013, a swift moving storm dropped over four inches of rainfall upon the Niagara Falls, N.Y. area in just a few hours, over an average month's worth of rainfall for this area. The resulting runoff to the combined sewer collection system caused a historic surcharge in the sewers, creating basement flooding in over 1,100 homes.

There are no permanently installed backup power sources for the sewer collection system's seven lift stations located within the City. The utility owns one portable generator for use during maintenance activities or isolated power outages, but a lack of permanent backup power sources makes the system susceptible to widespread outages, such as during the 2006 October "surprise" storm that crippled areas to the south and east. Widespread outages result in lift station damage and raw wastewater backing-up into homes and businesses.

The susceptibility to future power-related wastewater backups would be drastically reduced by this project which includes the provision of permanent emergency power sources for the two largest lift stations, the establishment of emergency electrical service to one additional lift station, and the acquisition of one portable generator to be used on an as-needed basis at one of the other five remaining lift stations. The portable generator can be used from the adjacent water treatment plant electrical system, which already has installed redundant emergency generators.

Improvements at the large lift stations would include installation of natural gas fired generators with wireless activation switches for control from the Wastewater Treatment Facility as well as associated electrical panel retrofits to accept generator power connections. The lift stations which would receive these improvements are located at: Frontier Avenue and 81st Street, Stepheson Avenue and 81st Street, and 56th Street and Buffalo Avenue.

### BENEFITS

**Health and Social Services** - Health risks associated with raw wastewater back-ups are exposure to a long list of pathogens causing disease or illness, including E. coli, Giardia lamblia and Hepatitis viruses, all at which in extreme cases can cause death or physical and mental defects. There is also the potential for toxic algal blooms which can cause people to be very ill or can be fatal.

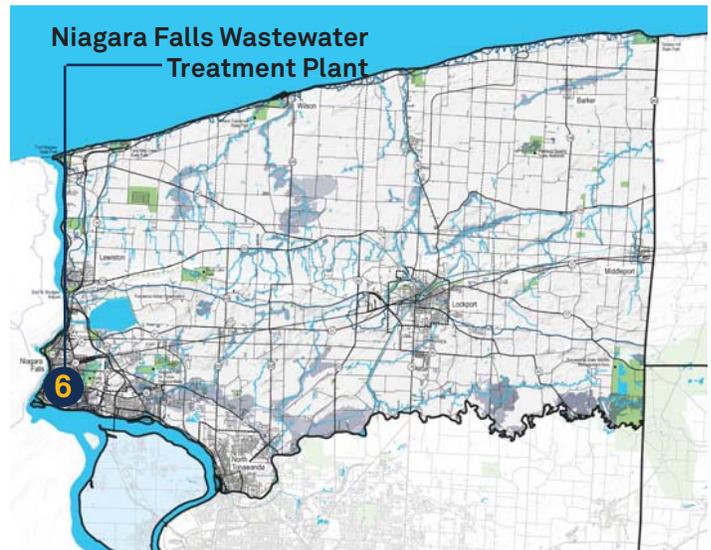
**Housing** - This project would provide consistent emergency power to critical utilities, preventing potential costly flood damage to homes and business due to power outages which stop crucial services to Niagara Falls and result in raw wastewater backups. These enhancements will benefit approximately 20,000 residents and businesses.

**Natural and Cultural Resources** - Emergency power will allow the treatment plants and lift stations to keep unwanted wastewater and contaminants from flowing into the creeks and streams or seeping into the groundwater, a benefit that will directly impact natural and cultural resources and protect habitats.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

The project is currently unfunded. It was submitted to the Federal Emergency Management Agency (FEMA) for a Hazard Mitigation Grant.

### PROJECT LOCATION



*The project is located along the Niagara River. The wastewater treatment plant serves the Community with 7 lift stations in the City.*



## Niagara Falls

# 6 Sewer Collection System Emergency Power Facilities

### COST BENEFIT ANALYSIS

The estimated preliminary cost for the sewer collection system emergency power facilities at two lift stations, a portable generator, and dedicated, hard wire back up electrical service to one additional lift station from the wastewater treatment plant is \$356,000. Project cost estimates were developed by CRA Infrastructure and Engineering, Inc, and reviewed by a third party engineer. Originally prepared for the FEMA grant application, these costs account for engineering design fees, project inspection fees, and labor and equipment for constructed improvements.



The lift stations receiving permanent emergency power sources are located at Frontier Ave/81st St, Stephenson/81st St. The lift station receiving emergency electrical service is at 56th St/Buffalo Ave.

### RISK REDUCTION ANALYSIS

The risk reduction, by providing permanent emergency power to the sewer collection system, immediately reduces risk of flooding and damages to the facilities due to loss of power. The long-term effects are prevention of serious widespread illness due to stoppage of services to homes and business causing raw wastewater backup. It also reduces risk of environmental impacts due to wastewater flooding.

### STRATEGIES

The Strategies that these types of projects will help advance include:

#### Strategy IX:

Protect utility infrastructure, especially power lines, routinely damaged as a result of wind, snow, and ice events, which can lead to sanitary lift station or sump pump failures and basement flooding.



Electrical Power systems damaged in flood (above)

Photo Credit: Niagara Falls Water Board



One of two large LaSalle lift stations presently without power

Photo Credit: Niagara Falls Water Board



## 6 Niagara Falls Sewer Collection System Emergency Power Facilities

### ADDITIONAL COST DETAIL

NYRCR

NFWB Sewer Collection System Emergency Power Facilities

Cost Estimate

Item	Description	Dimension	Quantity	Material Cost	Labor Cost	Total Cost
1	Mobilization and Demobilization	LS	1	-	-	\$5,000
2	Concrete Pad/Fnd'n Modifications	EA	3	\$8,400	\$9,000	\$17,400
3	80 kW Natural Gas Generator (Frontier)	EA	1	\$54,000	\$12,000	\$66,000
4	60 kW Natural Gas Generator (Stephenson)	EA	1	\$45,600	\$9,000	\$54,600
5	25 kW Diesel Generator (56th Street)	EA	1	\$36,000	\$7,200	\$43,200
6	Remote Radiator	EA	0	\$0	\$0	\$0
7	150kW Load Bank	EA	0	\$0	\$0	\$0
8	Rigging	EA	3	\$9,000	\$9,000	\$18,000
9	Automatic transfer switches-NEMA 1	EA	3	\$20,880	\$8,400	\$29,280
10	Sync Controls	EA	0	\$0	\$0	\$0
11	Fdr (2 350MCM/Ph)	LF	130	\$5,280	\$4,020	\$9,300
12	600 A HP-EM	EA	3	\$3,600	\$5,400	\$9,000
13	VFD per Motor	EA	0	\$0	\$0	\$0
14	Portable 80 kW tier-4 trailer mounted generator	EA	1	\$58,000	\$0	\$58,000

Construction:	\$309,780
Engineering:	\$46,467
<b>Project Total:</b>	<b>\$356,247</b>



Page Intentionally Left Blank

## 7 Lockport (Town) Pump Stations Emergency Power Generation (up to 7)

### RECOVERY PROJECT DESCRIPTION

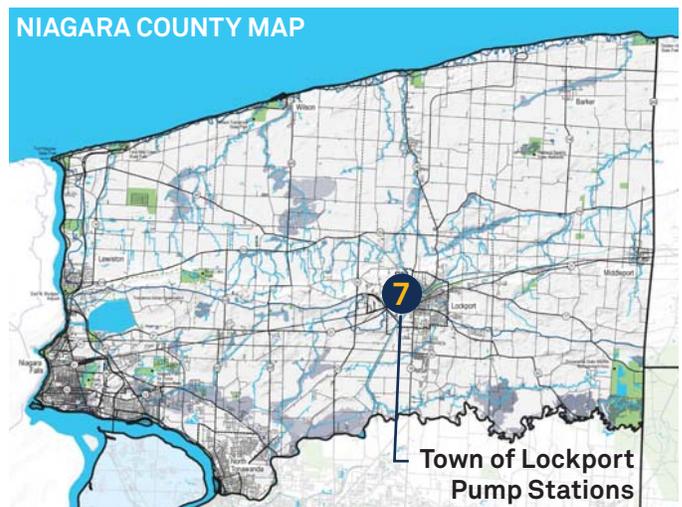
The Town of Lockport currently owns and operates 38 sanitary sewer lift stations throughout its collection system. When 5.4 inches of rain fell in the Town of Lockport on June 28, 2013, a number of these stations were affected. Power was lost to key pump stations that required the Town to perform emergency bypass of the pumps stations in order to protect private property. In other areas where power was lost, localized basement flooding occurred due to back-up of the combined stormwater/sanitary sewer system. Several entire subdivisions which were dependent on sewer lift station pumping suffered basement backup flooding.

Another emergency event occurred on December 22, 2013 due to an ice storm that quickly turned into warmer temperatures that resulted in flooding throughout the Town. Power was lost to multiple stations during this event due to fallen trees on power lines, causing lift stations to shut down.

The stations requiring emergency power generation to protect private property from flooding include:

1. Lincoln Gate Pump Station (Lincoln Avenue and Presidential Way) – Serves 25 single family homes
2. Lincoln Village Pump Station (Eastwood Drive near Lincoln Avenue) – Serves 40 single family homes
3. Sweetwood Drive Pump Station (Sweetwood at Strauss Road) – Serves multi-family homes
4. Village Mobile Home Park Pump Station – Serves largest mobile home park in Western New York
5. Niagara County Jail Pump Station (Old Niagara Road) - Serves single family homes and adjacent jail
6. Keck Road Pump Station (south of Lincoln Avenue) - Serves 40 single family homes
7. IDA Drive Pump Station (North of Enterprise Drive) - Serves the entire Town of Lockport Industrial Development Agency Park

### PROJECT LOCATION



*The seven lift stations are located throughout the Town of Lockport.*

### BENEFITS

**Infrastructure** - Natural gas-fired emergency electrical power generators and automatic transfer switches will increase the efficiency and reliability of pump stations and prevent backflows into several residential dwellings, industrial businesses and institutional dwellings.

**Economic Development** - Adding emergency safeguards to the pump stations will reduce staff time and maintenance used to clean up backflows in institutional dwellings, providing a cost savings to the City. In addition, it will prevent the loss of revenue to businesses and the City in affected industrial areas.

**Housing** - Improved storm sewer infrastructure will mitigate any future flooding damage to residential and institutional dwellings and improve public health, safety and welfare.

**Health and Social Services** - Emergency safeguards in the combined storm/sanitary sewer system will prevent discharges of untreated wastewater into dwellings and businesses, improving public safety and health.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

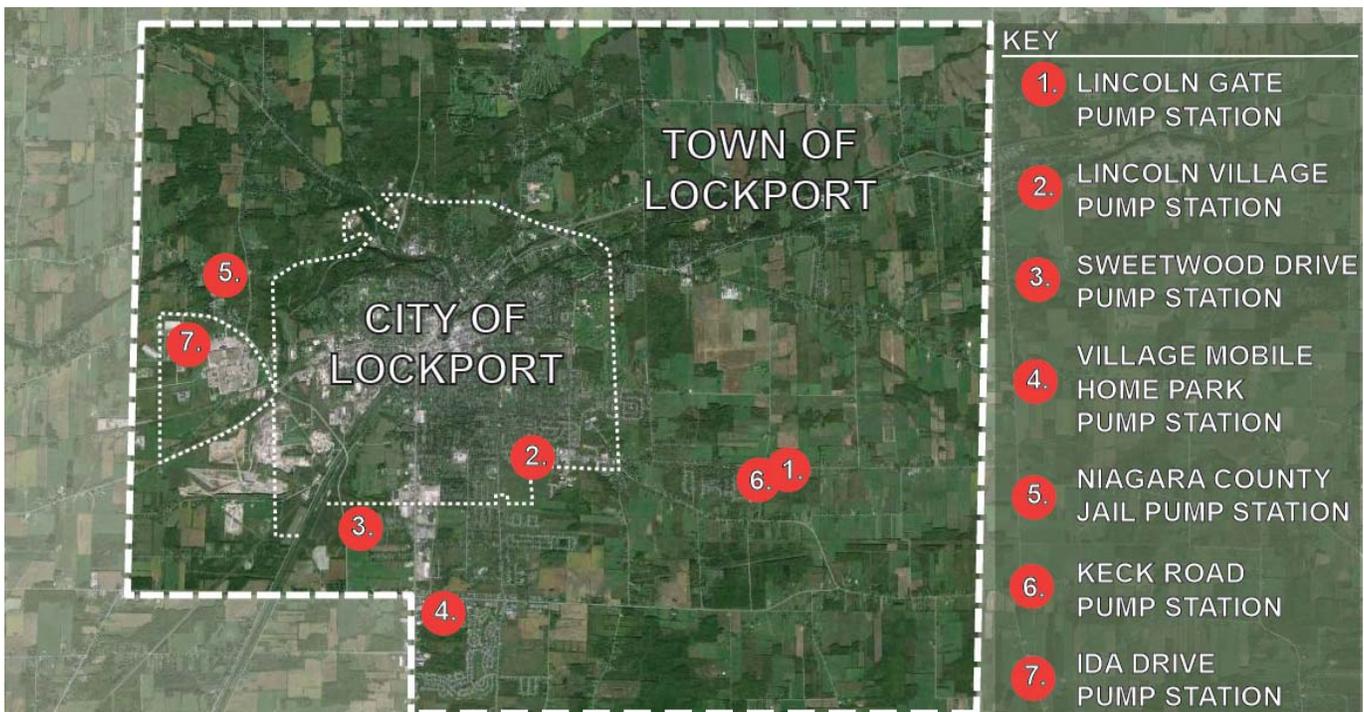
The project is currently unfunded. It does not currently appear on the Town's capital budget.

## 7 Lockport (Town) Pump Stations Emergency Power Generation (up to 7)

### COST BENEFIT ANALYSIS

The estimated preliminary cost for the pump station emergency power generators is \$315,000. Project cost estimates were provided by the Town of Lockport Consulting Engineer. This amount will fund up to seven emergency generators, at \$45,000 per unit. The estimated preliminary cost accounts for dedicated natural gas service electrical hookup and purchase of the generators and installation of generators on concrete utility pads. Costs are based upon two 5 horsepower generators at each station.

### LOCATION



The seven lift stations are located throughout the Town of Lockport.

### RISK REDUCTION ANALYSIS

The Town of Lockport sanitary sewer system is a FEMA critical asset that experienced loss of power to 7 of their 38 lift stations during 2013. The addition of automatic transfer switches to maintain power during storm events will reduce future risk to these essential pieces of equipment within this critical asset.

### STRATEGIES

The strategies that these types of projects will help advance include:

#### Strategy IX:

Protect utility infrastructure, especially power lines, routinely damaged as a result of wind, snow, and ice events, which can lead to sanitary lift station or sump pump failures and basement flooding.



Example of an emergency standby generator for a pump station

Photo Credit: AECOM/Mike Niedringhaus



## 8 Wheatfield Portable Generators and Pumps

### RECOVERY PROJECT DESCRIPTION

During the storms of summer 2013, all five of the Town of Wheatfield's fire companies were dispatched with fire trucks and pumps to assist with the clean out of resident's flooded basements. They responded to calls and went door-to-door offering assistance to residents without electrical power. This assistance took more than 24 hours to complete, requiring full engagement of the fire company personnel. In addition to summer storm events, winter storm events cause power outages due to ice and fallen trees. This causes problems for emergency personnel during the rough winter conditions.

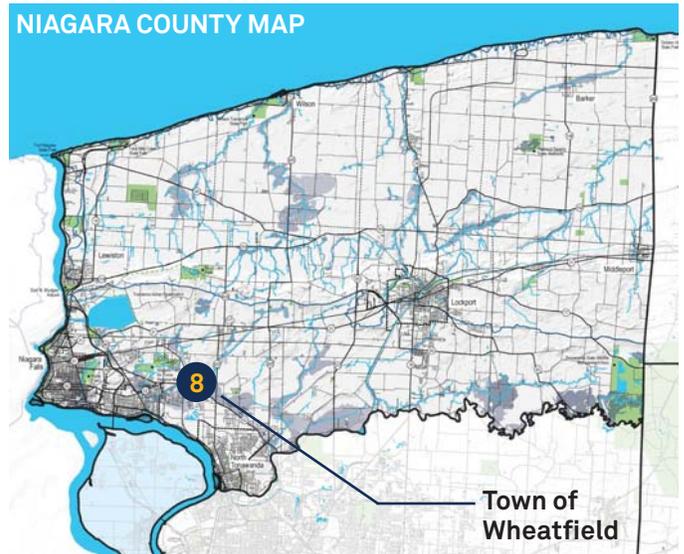
The Town of Wheatfield is asking for funding assistance to purchase three 2000 watt portable generators and three electric portable pumps for each of the five fire companies (15 total generators and 15 total pumps). The pumps would allow them to be able to work in wet environments, such as flooded property.

### BENEFITS

**Community Planning and Capacity Building** - The purchase of portable generators and pumps will increase capacity of the Town's emergency response vehicles and personnel from post-flooding clean-up activity through the use of portable equipment, which can be set up in locations without power. Increased capacity means the business and residence can more quickly return to normal during and after emergency events.

**Health and Social Services** - This will enable fire company vehicles and personnel to be available to a greater number of residents in the case of coincident or subsequent emergencies. An increased fleet of emergency response teams will thus lead to a quicker response time for residents in need providing health and social benefits to the Town of Wheatfield.

### PROJECT LOCATION



The Town of Wheatfield, located between the City of Niagara Falls and the City of North Tonawanda, is serviced by five fire companies.

### LOCATION OF PROJECTS



Fire Company locations in need of portable generators and pumps

## 8 Wheatfield Portable Generators and Pumps

### COST BENEFIT ANALYSIS

The estimated preliminary cost for the portable generators and pumps is \$32,500. Project cost estimates were provided by the Town of Wheatfield Supervisor. The cost breakdown is \$20,500 for fifteen 2,000 watt portable generators; and \$12,000 for fifteen 2-inch electric submersible pumps. Estimate does not include storage, maintenance and accessories. The cost benefits of this service out-weigh the initial costs because this would allow emergency personnel to reach a larger number of residences and businesses, thereby allowing a quicker return to normal conditions (and/or remain open) following storm events. This will also expand the reach of the Town allowing for development.



**Example of gasoline powered portable generator.**

*Photo Credit: Flickr/US SCPSC*



**Example of a submersible pump.**

*Photo Credit: Flickr/Chad Johnston*

### RISK REDUCTION ANALYSIS

Quicker and more consistent emergency response reduces the risk of major town emergencies due to summer and winter storm events. Reducing the Town's risk during flood events will impact the area long-term as Wheatfield grows. The health and social benefits of enhancing the Town's ability to prevent and better respond to future emergencies will allow residents to feel safer.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

The project is currently unfunded.

### STRATEGIES

The strategies that these types of projects will help advance include:

#### **Strategy VI:**

Improve emergency response system and provide evacuation assistance to communities.



## 9 North Tonawanda Pump Station Emergency Generator

### RECOVERY PROJECT DESCRIPTION

When 4.3 inches of rain fell on the City of North Tonawanda in a two-hour period on July 19, 2013, power was lost to some key pump stations, requiring the City to perform an emergency bypass of the pump stations in order to protect private property. Millions of gallons of sewage were discharged to the Niagara River via the storm sewer system as a result.

The existing wastewater treatment plant dates to 1930, with upgrades in 1979. The City is reliant on large diameter pipe storage capacity in-ground to detain stormwater during storm events. Lift stations throughout the system ensure that storm flows are maintained through the piping to the wastewater treatment plant. If a storm event exceeds the pipe capacity, stormwater backs up onto City streets which effectively provides storage until the system has sufficient time to drain.

During the July storm, “curb to curb” flooding occurred on City streets, overwhelming the combined storm/sanitary system. As a result of lost power at pump stations during the storm, water was unable to bypass the pumps that had lost power. The resulting back-up of combined sanitary and stormwater from the non-functioning pump stations resulted in back-up overflow into numerous residential basements throughout the City.

There are 26 pump/lift stations in the City. The City currently has back-up power to handle four or five of those pumps. This project will add back-up power to three additional stations.

### BENEFITS

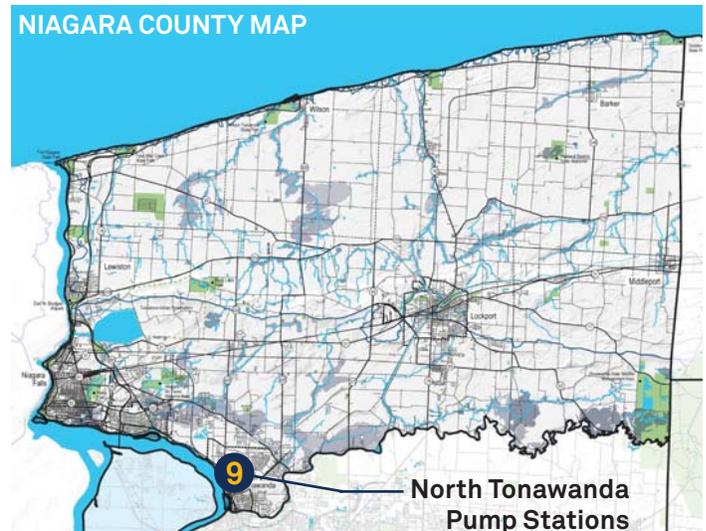
**Infrastructure** - Permanent dedicated natural gas-fired emergency electrical power generators will increase the efficiency and reliability of pump stations and prevent backflow onto City streets and into several residential dwellings.

**Economic Development** - Adding emergency safeguards to the pump stations will reduce City staff used to clean up backflows providing a cost savings to the City. In addition, it will prevent the loss of revenue to businesses and the City in affected areas.

**Housing** - Improved storm/sanitary sewer infrastructure will mitigate any future flooding damage to residential dwellings and improve public health, safety and welfare.

**Health and Social Services** - Emergency safeguards in the combined storm/sanitary sewer system will prevent discharges of untreated wastewater into dwellings and businesses improving public safety and health.

### PROJECT LOCATION



*The project covers locations at various pump stations in the City of North Tonawanda.*

## 9 North Tonawanda Pump Station Emergency Generator

### COST BENEFIT ANALYSIS

The estimated preliminary cost for the pump station emergency generator project is \$300,000. Project cost estimates were provided by the City Engineer. The estimated preliminary cost accounts for engineering design fees, electrical hookup, and labor and equipment for a prioritized list of pump station improvements. There are also certain fixed costs to design and construction of a fully integrated standby generator.

### RISK REDUCTION ANALYSIS

The City of North Tonawanda wastewater treatment facility is a FEMA critical asset that experienced loss of power to several of its pump/lift stations during the 2013 storm season. The addition of three emergency generators to maintain power during storm events will reduce future risk to these essential pieces of equipment within this critical asset.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

The City released an RFP in spring 2014 to design the electrical hookups. The project is currently funded through a municipal bond. The City is looking for reimbursement of the bond through the NY Rising Community Reconstruction Program.

### STRATEGIES

The strategies that these types of projects will help advance include:

#### Strategy IX:

Protect utility infrastructure, especially power lines, routinely damaged as a result of wind, snow, and ice events, which can lead to sanitary lift station or sump pump failures and basement flooding.



**Example of an emergency standby generator for a pump station**

*Photo Credit: AECOM/Mike Niedringhaus*



## Niagara County Emergency Services

# 10 Emergency Vehicle – Communications Truck

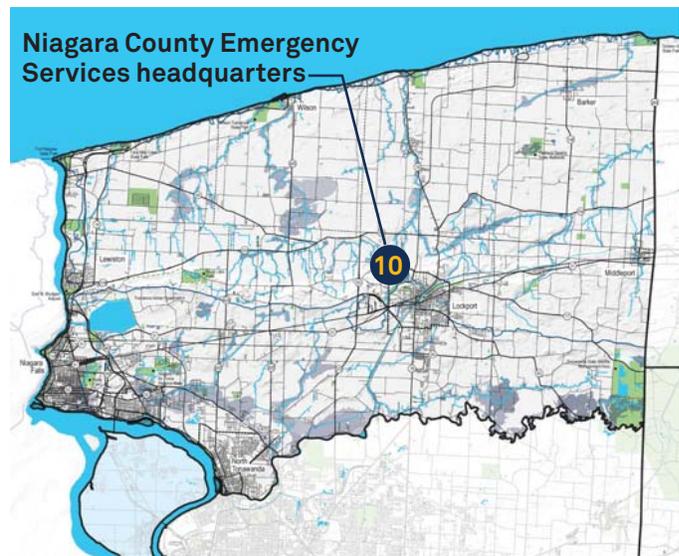
### RECOVERY PROJECT DESCRIPTION

The storm events of the summer 2013 proved to be challenging for the Niagara County Emergency Services. Two separate major rain events, one in June and one in July, put every Niagara County fire department into operation either within their local jurisdiction or providing mutual aid to a municipality affected by the storm. Though all life-safety events were handled and there was no loss of life or major injury in any municipality, the storms did show some gaps in response capability, Countywide. One major gap identified was the ability to respond to multiple flooding-type events simultaneously.

The County has a state-of-the-art stationary command post that was engaged and operating during both events, tracking activity and assisting with field communications. The vehicle being requested will be able to be onsite, to assist jurisdictions that have major operations taking place, filling communications gaps. During a major incident, this vehicle can establish initial communications. It will allow multiple agencies to operate on many frequencies on-scene prior to the stationary command post being activated.

The County is seeking to purchase a sport utility vehicle or suburban utility vehicle (SUV) and install a cache of radios and cross banding and repeater equipment that can be used in any jurisdiction in Niagara County, and surrounding communities. The Niagara County Emergency Service headquarters is centrally located within the County, at 5574 Niagara Street Extension, in Lockport. The truck would be housed at this location, and the service area would be Countywide.

### PROJECT LOCATION



*The Niagara County Emergency Service headquarters is centrally located within the county.*

### BENEFITS

**Economic Development** - A Countywide communications truck reduces costs to neighboring towns. Instead of purchasing individual trucks for each small town with limited emergency support services, it supplements a town's emergency services at a fraction of what it would cost to purchase, store and maintain the equipment.

**Health and Social Services** - Benefits from the project include improved on-scene first-responder communications prior to command post engagement, and rapid on-site communications management during multiple simultaneous events. Better communication during these events allots for more efficient and effective responses allowing citizens to feel safer providing social benefits to the area. The vehicle could also be utilized in neighboring counties/jurisdictions in an emergency event providing economic benefits that will impact the entire region. A vehicle of this type would benefit all emergency services and residents of Niagara County, improving preparedness and response coordination efforts between the volunteer responders.



## Niagara County Emergency Services

# 10 Emergency Vehicle – Communications Truck

### COST BENEFIT ANALYSIS

The estimated preliminary cost for the emergency communications truck is \$188,100. This would be a purchase order type of cost. Project cost estimate was provided by the Niagara County Department of Emergency Services, and is a request for full funding.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

The project is currently unfunded. It appears on the Niagara County Emergency Services capital project list.



**Example of emergency communications vehicle**

*Photo Credit: Niagara County Emergency Management*

### RISK REDUCTION ANALYSIS

This project will reduce the risks associated with poor emergency response time and poorly coordinated emergency services. These efforts will mean residents will be at less likely risk to injury or death during flood events. This will also aid in area where power outages prevent communications between emergency services and residents.

Having a Countywide communications vehicle keeps all the volunteers ready to respond to small isolated flood events to Countywide storm events. This flexibility and preparedness will allow residents and businesses to return to normal more quickly after flood events.

### STRATEGIES

The strategies that these types of projects will help advance include:

#### **Strategy VI:**

Improve Emergency Response system and provide evacuation assistance to communities.



## Niagara County Emergency Services

### 11 Emergency Vehicle – Tech Rescue Truck

#### RECOVERY PROJECT DESCRIPTION

Two separate, major rain events in the summer of 2013, one in June and one in July, put every Niagara County fire department into operation either within their local jurisdiction or providing mutual aid. The storms revealed some gaps in response capability Countywide, including the lack of a dedicated response truck for the Niagara County Technical Rescue Team. Presently, the rescue team members need to load rescue equipment into available vehicles when responding to events, delaying response time and creating the potential that not all of the necessary equipment will be available on-scene at time of arrival.

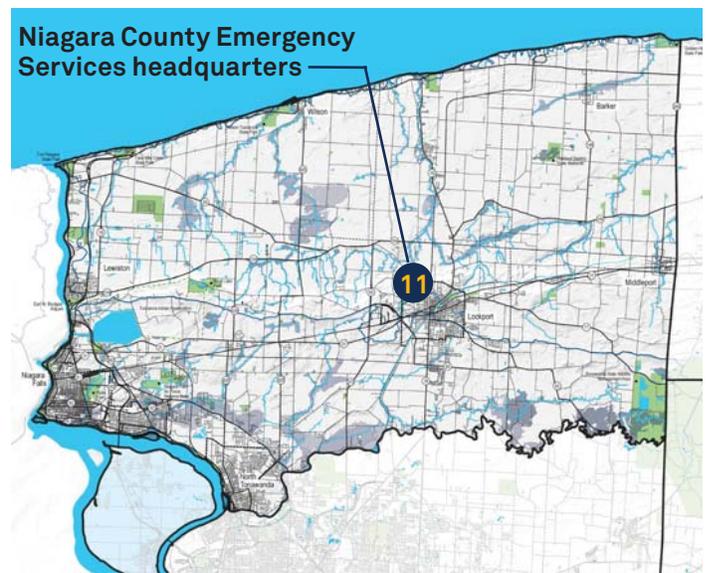
A dedicated, pre-staged tech rescue vehicle with a full complement of response equipment on-board could be more rapidly deployed and would insure needed equipment is transported. The County is seeking to purchase a Ford F-550 type pick-up truck with a rescue box on-board that would have compartments suited to the storage of rescue equipment. The Niagara County Emergency Service headquarters is centrally located within the County, at 5574 Niagara Street Extension, in Lockport. The truck would be housed at this location, and the service area would be Countywide. The vehicle would also have a hitch to allow the team to tow a technical rescue equipment team trailer carrying a cache of equipment for the specialized response that may be needed.

#### BENEFITS

**Economic Development** - Adding a pre-staged emergency rescue truck with on-board equipment to the County improves response time to emergencies, minimizing the loss of revenue to businesses and towns within affected areas. A Countywide rescue truck reduces costs to neighboring towns. Instead of purchasing individual trucks for each small town with limited emergency support services, it supplements a town's emergency services at a fraction of what it would cost to purchase, store and maintain the equipment.

**Health and Social Services** - As a mobile rescue unit, this emergency equipment would provide needed evacuation and rescue assistance to local communities within the County during emergencies. In addition, this mobile rescue unit could be utilized in neighboring counties and jurisdictions.

#### PROJECT LOCATION



*The Niagara County Emergency Service headquarters is centrally located within the county.*

## 11 Niagara County Emergency Services Emergency Vehicle – Tech Rescue Truck

### COST BENEFIT ANALYSIS

The estimated preliminary cost for the tech rescue truck is \$135,000. This would be a purchase order type of cost. Project cost estimate was provided by the Niagara County Department of Emergency Services, and is a request for full funding.



**Example of tech rescue vehicle**

*Photo Credit: Niagara County Emergency Management*

### RISK REDUCTION ANALYSIS

Addition of a rescue truck to the centrally located Countywide services would improve the response time of evacuation and rescue services during storm-related emergencies in local communities with limited emergency resources, greatly reducing the risk to public safety.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

The project is currently unfunded. It appears on the Niagara County Emergency Services capital project list.

### STRATEGIES

The strategies that these types of projects will help advance include:

**Strategy VI:**

Improve Emergency Response system and provide evacuation assistance to communities.

## 12 Stream Restoration

### RESILIENCY PROJECT DESCRIPTION

In high volume storm events, stormwater can overwhelm local collection systems leading to flooding. Stream Restoration projects will address localized flooding by restoring natural drainage patterns to streams and creeks which have been channelized, buried or otherwise impaired. This long-term sustainable strategy is more resilient than hard “gray” infrastructure solutions for capturing stormwater. Benefits include improved volume capacity, water quality, in-stream and riparian habitat, as well as improved downstream watershed water quality. Three projects proposed for stream restoration include:

- 1) Donner Creek is a tributary of the Niagara River that flows through the City of North Tonawanda. A preliminary project to perform survey, design, easement-mapping and permitting has been approved to restore Donner Creek to its near original state. The creek is currently overgrown, restricting flow and causing flooding.
- 2) The Niagara County Golf Course stream corridor experiences stormwater runoff during heavy precipitation events that run through residential back yards for which there are no easements. A NYS Department of Conservation permit is being sought to allow for clean-up, restoration and maintenance of this stream corridor.
- 3) Bull Creek, where it flows through the Towns of Pendleton and Wheatfield, was identified as a potential habitat conservation opportunity in the *Niagara Greenway Habitat Conservation Strategy* (2013). A feasibility study is proposed to evaluate solutions and develop a protection plan for the stream’s headwaters in order to increase stream and surrounding wetlands connectivity, and improve biodiversity through protecting and acquiring adjacent habitat.

### BENEFITS

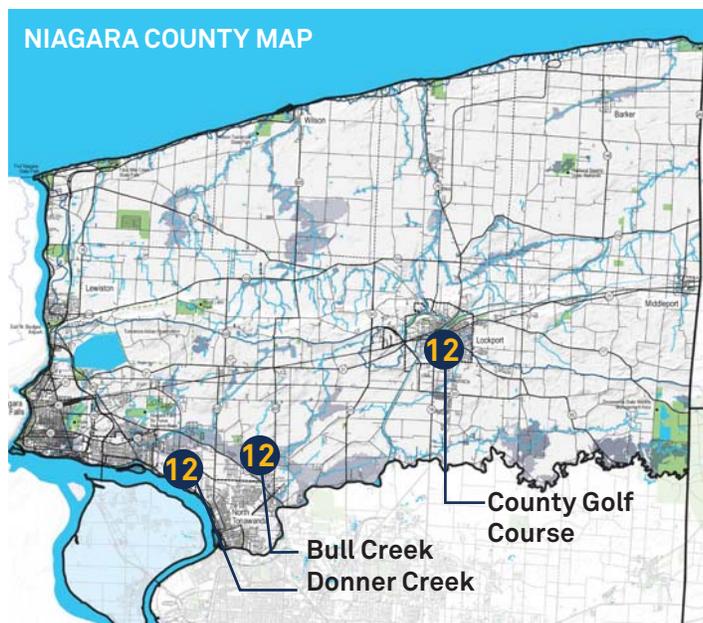
**Economic Development** - Stream restoration provides natural solutions to flooding which has a lower cost of construction than infrastructure.

**Housing** - These projects prevent repeated flood damage on public and private property by allowing the bodies of water to move peak storm flows more effectively.

**Infrastructure** - These projects will help to restore streams and creeks, which have been channelized, buried or otherwise impaired, to provide natural drainage systems for stormwater. This type of long-term, green infrastructure solution is more resilient than hard “grey” infrastructure solutions.

**Natural and Cultural Resources** - Benefits include improved water quality, in-stream habitat, and improved riparian habitat, while improving downstream watershed water quality. This allows for improved recreational activities as well such as fishing, hiking and hunting.

### PROJECT LOCATIONS



*Donner Creek, located in North Tonawanda; the Niagara County Golf Course Stream Corridor, located in Lockport (City); and Bull Creek, located in Wheatfield and Pendleton*

## 12 Stream Restoration

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

Initial funding in the amount of \$23,400 for the Donner Creek project has been authorized by the City for topographic survey, mapping, and design services. The type of funding request would be a cost share.

### STRATEGIES

The strategies that these types of projects will help advance include:

**Strategy VII:**

Utilize Green Infrastructure to mitigate flooding

**Strategy X:**

Undertake detailed floodplain and watershed studies across the County

**Strategy XI:**

Maintain and enhance riparian buffers along waterways



**Proposed Donner Creek Restoration Location** █

*Photo Credit: Google Images*



**Example of stream restoration techniques**

*Photo Credit: AECOM/David Lloyd*

### INDIVIDUAL PROJECTS

The table below displays the list of projects developed by the Community that are included in this grouping

PROJECT TITLE	PROJECT LOCATION
Donner Creek Flood Study and Mitigation	North Tonawanda
County Golf Course Stream Corridor Restoration	Lockport (City)
Headwater Stream Protection: Bull Creek	Wheatfield and Pendleton



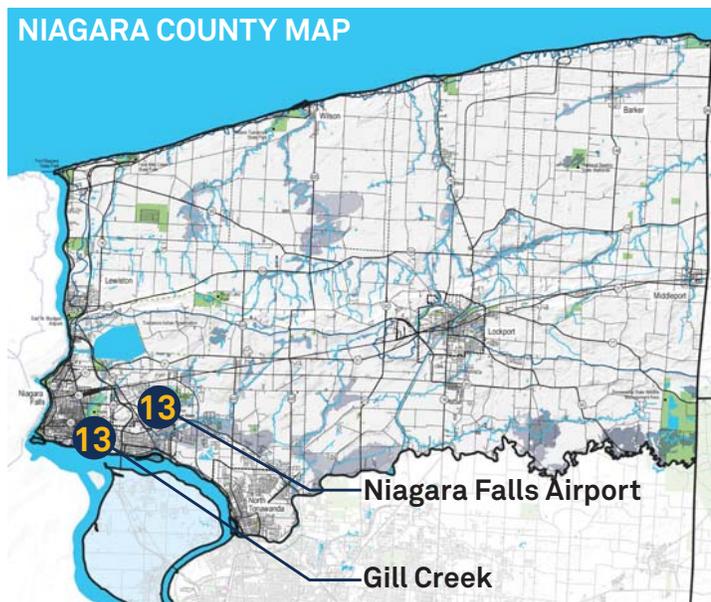
## 13 Green Infrastructure Installation

### RESILIENCY PROJECT DESCRIPTION

Green Infrastructure projects represent an alternative approach to stormwater management using natural systems to convey, store and infiltrate stormwater, reducing volume loads on existing piped drainage structures. These natural systems provide added benefit to communities improving property values, air and water quality, and reducing pollutants. Projects highlighted within Niagara County that are led or supported by the Buffalo Niagara Riverkeeper, a non-profit organization, include:

- 1) Niagara Falls Airport feasibility study for on-site green infrastructure solutions to increase capture of stormwater runoff discharging into Cayuga Creek.
- 2) Local/neighborhood level green infrastructure solutions to intercept, store and infiltrate stormwater runoff in the neighborhood adjacent to Gill Creek and Hyde Park Lake, in the City of Niagara Falls.
- 3) Green infrastructure solutions planning to develop a comprehensive and strategic planning approach to implement green infrastructure solutions that reduce or alleviate the impacts of flooding and Combined Sewer Overflows in the City of Niagara Falls.
- 4) Education and outreach through a series of workshops and handbooks to educate residents within strategic urban neighborhoods about the effects of stormwater on flooding issues in the City of Niagara Falls.

### PROJECT LOCATIONS



The Flood Study in Wheatfield and the Town of Niagara

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

The type of funding request would be straight funding.

Potential sources of funding for these projects include the Army Corps of Engineers, Great Lakes Program; the NYS Green Innovation Grant Program (GIGP); NYS Environmental Protection Fund; and Freshwater Future.

### STRATEGIES

The strategies that these types of projects will help advance include:

**Strategy VII:**  
Implement green infrastructure strategies.

**Strategy V:**  
Develop a Niagara County specific Green Infrastructure Tool Kit.

## 13 Green Infrastructure Installation

### BENEFITS

**Infrastructure** - Green infrastructure captures and manages stormwater before it runs off-site lowering the overall peak flows of water and increasing the capacity of the piped infrastructure system.

**Economic** - Green infrastructure is generally less expensive to maintain than piped infrastructure.

**Health and Social Services** - Green infrastructure removes pollutants from air and water through added plant biomass improving public health. Added plant biomass from green infrastructure also cools the air reducing urban heat island effect.

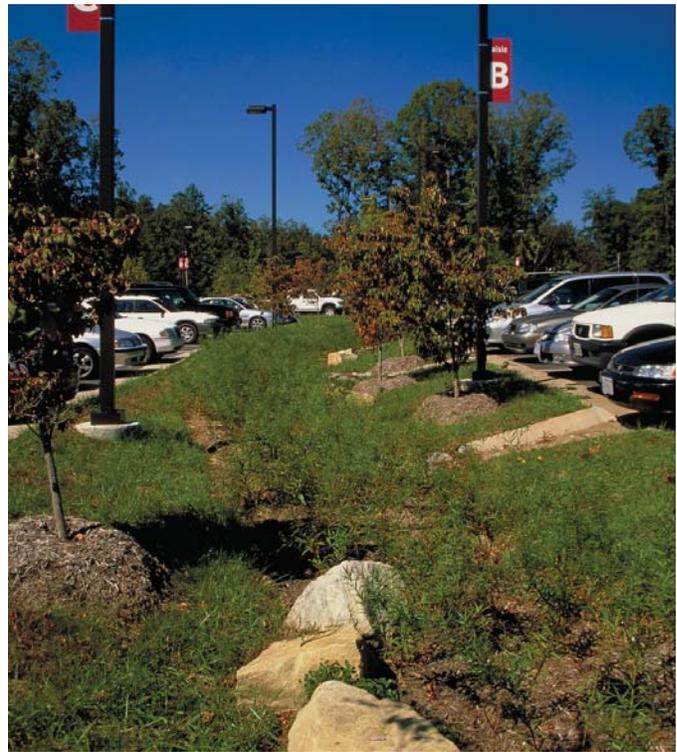
**Natural and Cultural Resources** - Infiltration of stormwater into the groundwater supply slows the flow of water into streams and rivers, reducing flooding during severe storm events. Infiltration of water removes pollutants and improves drinking water quality. Green infrastructure improves riparian habitat and habitat diversity for plants and wildlife and overall watershed quality.

**Housing** - Green infrastructure projects can improve the look of a neighborhood and increase residential property values through the addition of open green spaces, trees and plant biomass.



**Example of Green Infrastructure installation that captures stormwater runoff**

*Photo Credit: AECOM/Staff Photographer(Non-Professional)*



**Example of Bioswale Catchbasin in parking lot**

*Photo Credit: AECOM/David Lloyd*

### INDIVIDUAL PROJECTS

The table below displays the list of projects developed by the Community that are included in this grouping.

PROJECT TITLE	PROJECT LOCATION
Niagara Falls Airport Green Infrastructure to manage stormwater runoff	Niagara Falls
Local Green infrastructure solutions to manage stormwater runoff	Gill Creek/Niagara Falls
Strategic Planning to Reduce Flooding through Green Infrastructure	City of Niagara Falls
Know Your Sewershed Programming - Educational Workshops and Pamphlets	City of Niagara Falls



## 14 Created Wetlands and Floodplain Storage Capacity

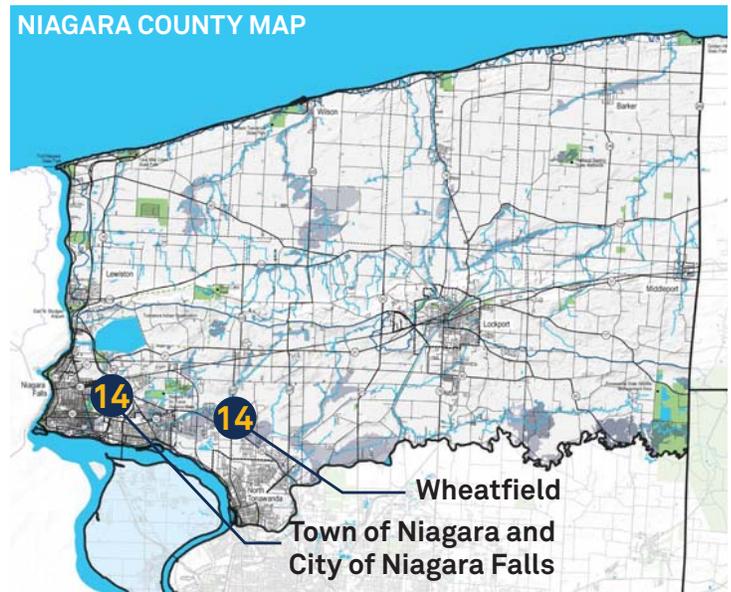
### RESILIENCY PROJECT DESCRIPTION

Created wetlands provide natural flood storage capacity. Targeted property acquisition at key locations allows for increased floodplain access, providing a network of overflow zones for creeks and streams during peak events and reducing risks to assets within surrounding and downstream floodplains. The result of increased storage capacity is attenuation of flows during peak precipitation events, capturing and slowing flows down. Increased water storage capacity in the floodplains will reduce risk of floods during lower level flood events.

These identified projects would be designed to alleviate 10-50 year flood events and reduce risks to critical assets. These projects would require a fully engineered flood study and/or geomorphic assessment to determine specific flood contributors, volumes, flows, and solutions.

- Properties at the end of Tuscarora Road where it meets Porter Road (just south of the Airport) to slow and store more flood waters prior to affecting downstream neighborhoods.
- Properties in the area surrounding the Cayuga Village Neighborhood to lessen flooding effects on the neighborhood (within the Porter Road, Military Road, and Niagara Falls Blvd Triangle). These properties would also protect riparian buffers, provide pollution abatement, and increase protected natural shoreline as identified in the *Niagara Greenway Habitat Conservation Strategy*.
- Properties between Bergholtz Creek and Sawyer Creek in the Town of Wheatfield to limit/slow the movement of flood waters downstream that further impact flooding/ bottlenecking at the Cayuga Creek – Bergholtz Creek confluence.

### PROJECT LOCATIONS



Property locations are in the Towns of Wheatfield and Niagara, and in the City of Niagara Falls.



Wetland Rehabilitation Services

Photo Credit: Buffalo Niagara Riverkeeper

## 14 Created Wetlands and Floodplain Storage Capacity

### BENEFITS

**Infrastructure** - Establishing a wetland and floodplain network provides benefits by increasing storage capacity for runoff during storm events, which reduces downstream stormwater flooding.

**Natural and Cultural Resources** - Wetlands also provide water quality treatment by capturing and filtering sediments and silts, while native wetland plant life filters out pollutants. This not only provides improved habitats which influence cultural resources and provided economic benefits such as fishing, hunting and hiking, but it also increases floodplain storage area groundwater recharge and supplemental water during droughts. This protects the streams and creeks from drying up and killing habitats and recreational industries.

**Health and Social Services** - This proposed project enhances neighborhood aesthetics. Improved community aesthetics contribute to the community with psychological benefits.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

Natural Resources Defense Council (NRDC) funds are available for habitat restoration of Cayuga Creek. The type of funding request would be straight funding.



**Example of created wetland installation**

*Photo Credit: Buffalo Niagara Riverkeeper*

### STRATEGIES

The strategies that these types of projects will help advance include:

**Strategy X:**

Undertake detailed floodplain and watershed studies across the County

### INDIVIDUAL PROJECTS

The table below displays the list of projects developed by the Community that are included in this grouping.

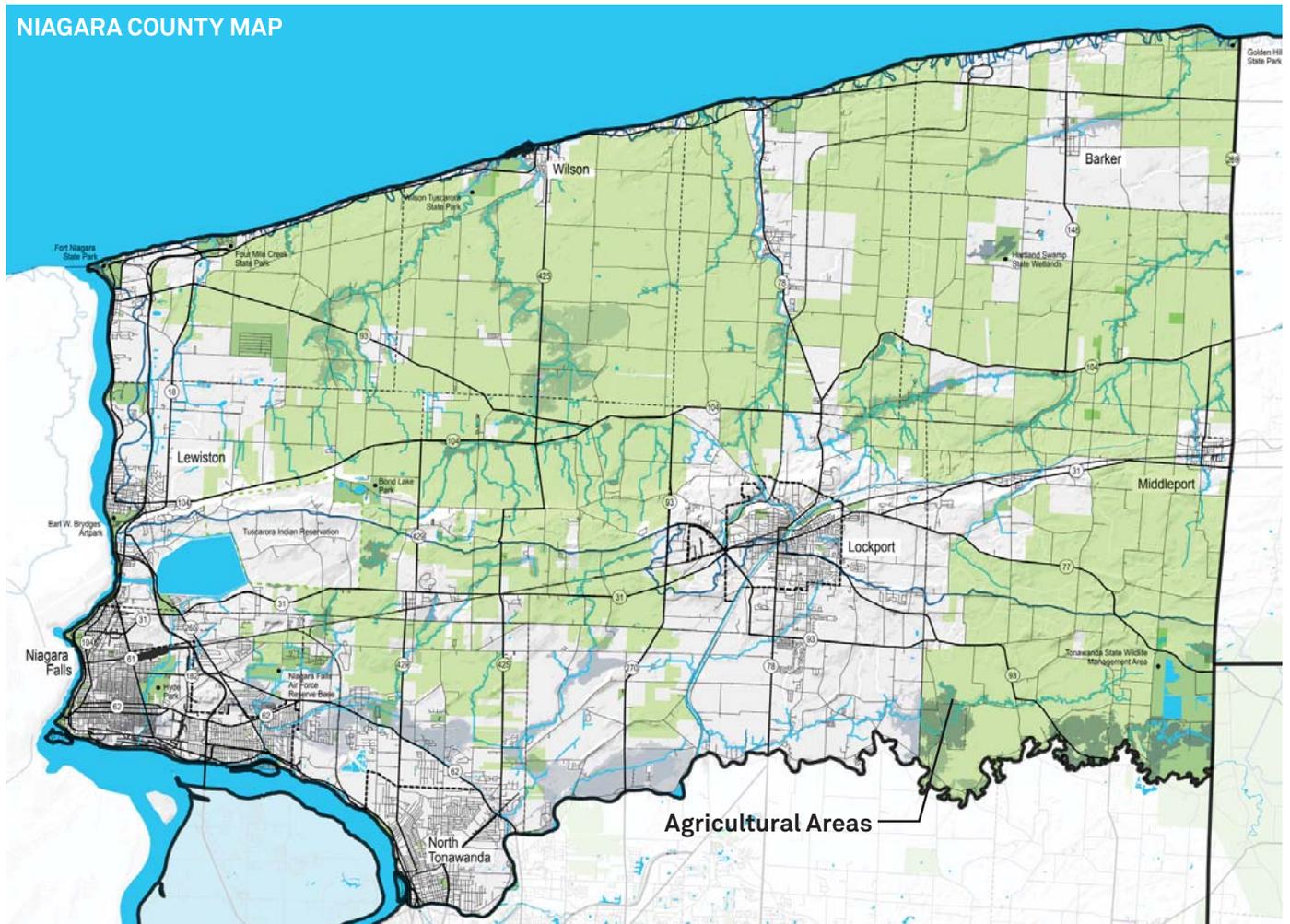
PROJECT TITLE	PROJECT LOCATION
Flood Study and Assessment of Cayuga, Bergholtz, and Sawyer Creeks	Wheatfield and Niagara
Property Acquisition/Creation of Wetlands and/or improved Floodplain Access and/or Floodplain Storage Capacity (Bergholtz and Sawyer Creeks)	Wheatfield
Property Acquisition/Creation of Wetlands and/or improved Floodplain Access and/or Floodplain Storage Capacity (Tuscarora + Porter Roads)	Niagara
Property Acquisition/Creation of Wetlands and/or improved Floodplain Access and/or Floodplain Storage Capacity (Cayuga Village Neighborhood)	Niagara

## 15 Cover Crop and No-Till Practices

### RESILIENCY PROJECT DESCRIPTION

Cover crops include grasses, legumes, and other herbaceous plants established for seasonal cover and conservation purposes to keep the soil planted year-round, building healthy soil through the continued presence of live roots. Cover crops provide a soil cover or barrier against soil erosion and help to keep the structure of soils intact. No-till or zone-till practices, utilized in conjunction with cover crops, promote healthy soils by avoiding or minimizing plowing which breaks down soil health by disrupting soil microbes, removing soil moisture, and exposing soils to erosion. No-till production involves not plowing or cultivating between crops in fields. Zone tillage reduces the limits of soil disturbance to the area of the planting row. No-till and zone-till practices aim to minimize soil disturbance and maintain crop residue on the soil surface by reducing the percentage of a crop row that is disturbed during planting.

### PROJECT LOCATIONS



These projects would promote the use of cover crops on agricultural land through the Niagara County Soil and Water Conservation District, and a cover crop grant program through the United States Department of Agriculture (USDA). The purchase of an interseeder by Niagara County Soil and Water Conservation District would make it available for use to sow cover crops in standing row crops while applying post emergent directed herbicides and fertilizer. The interseeder utilizes a No-Till Grain Drill designed to sow cover crops in standing row (existing) crops while applying post emergent directed herbicides and fertilizer.



## 15 Cover Crop and No-Till Practices

### BENEFITS

**Economic Development** - Relay cover crops increase the production of the primary crop due to better soil health and plant vigor. Relay planting reduces the costs for planting cover crops separately by as much as \$19/acre by reducing the number of trips to the field and reducing fertilizer input.

The rental of interseeder equipment by smaller farms reduces costs to farmers. Instead of purchasing a large piece of farm equipment, they can rent the equipment for a week at a fraction of what it would cost to purchase, store, and maintain the equipment.

Continuous soil cover reduces erosion and subsequent turbidity in streams, reducing the amount of effluent in the stream and improving water quality for riparian wildlife, and bolstering the local fishing industry.

**Natural and Cultural Resources** - Healthy soils have a higher capacity to hold water. Maintaining a continuous cover crop improves the soil quality and health, improves moisture infiltration, and reduces nutrient loss from soil erosion from stormwater runoff, and wind.

**Health and Social Services** - Reduced soil erosion lessens the amount of effluent in streams and improves drinking water quality.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

Funding sources for these projects could include the USDA Natural Resources Conservation Service (NCRS), which provides a 3-year cover crop grant program through USDA. It is now coordinating with farmers, providing a 75:25 cost share. Estimated cost for the program in Niagara County is \$80/acre. Cost for Interseeder is \$40K.

The type of funding request would be a cost share.

### STRATEGIES

The strategies that these types of projects will help advance include:

**Strategy XIII:**

Preserve, protect and enhance soil quality to reduce agricultural runoff.

### INDIVIDUAL PROJECTS

The table below displays the list of projects developed by the Community that are included in this grouping.

PROJECT TITLE	PROJECT LOCATION
Cover Crop Plant/Liquid Fertilizer and Herbicide Applicator/Interseeder	Countywide
Cover Crop Erosion Control	Countywide



Example of no-till farming technique

Photo Credit: Flickr/ <https://www.flickr.com/photos/cookingupastory/4014456475/>



## 16 Culvert Replacement

### RESILIENCY PROJECT DESCRIPTION

Culverts are used to convey water between areas, often where roadways cross streams. During storm events, undersized culverts can cause stormwater to back up behind culverts, overflowing into adjacent areas, causing erosion damage in creeks, and potentially damaging the roadway above the culvert. These seven projects would replace culverts located in Niagara County along State highways where the culverts have been identified as being deficient in size, with larger structures that would have the capacity to convey more stormwater. The existing culverts currently restrict flow at the design storm level. The culverts identified for replacement also have low condition ratings indicating that they are in disrepair and need of rehabilitation and expansion of head walls and raised elevations to prevent debris entrapment areas. Depending on the location, the replacement box culverts would be sized at between 20' by 5' and 5' by 2' allowing for wetland opportunities, improved water flow and uninterrupted road access during emergency events.

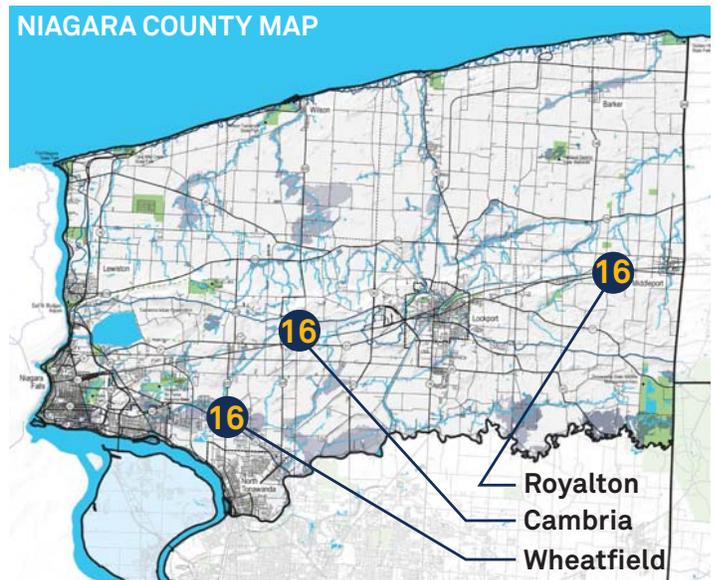
### BENEFITS

**Economic Development** - Using adequately sized culverts provides economic benefits by saving the County money on maintaining failing infrastructure or repeat road repairs due to malfunctioning culverts. This will allow the towns to use this money for other needed services.

**Health and Social Services** - Improvements to the culverts reduces flooding in the areas around the culverts by eliminating the constriction of water. This diminishes the potential for future flood damage to property and erosion damage to the road and nearby creeks or streams. This will keep roads open during future peak storm events for emergency evacuation.

**Infrastructure** - Using larger culverts that are adequately sized to carry water from major storms helps to protect infrastructure and facilities from damage, reduces need for maintenance, and prevents flooding.

### PROJECT LOCATIONS



Culverts will be replaced in several locations throughout Royalton, Cambria and Wheatfield.



Box Culvert Locations

## 16 Culvert Replacement

**Natural and Cultural Resources** - There are also natural, cultural and psychological benefits by allowing for potential wetland habitats adjacent to streams and creeks at expanded culverts. This provides aesthetic improvements as well as improves habitats for fishing, hunting and hiking.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

Funding sources for these projects could include Greater Buffalo-Niagara Regional Transportation Council programmed funds, via the Transportation Improvement Program (TIP) or Transportation Enhancement Program (TEP).

The type of funding request would be straight funding.



**Example of a culvert replacement project**

*Photo Credit: AECOM/David Lloyd*

### STRATEGIES

The Strategies that these types of projects will help advance include:

**Strategy VIII:**

Upgrade storm and sewage infrastructure to increase stormwater storage capacity during peak flow events, and remove connections between storm and sewer systems.

### INDIVIDUAL PROJECTS

The table below displays the list of projects developed by the Community that are included in this grouping.

PROJECT TITLE	PROJECT LOCATION
Rt. 425 at Loveland Rd. - Box Culvert 11'x4'	Wheatfield
Rt. 425 over unknown - Box Culvert 5'x2'	Wheatfield
Rt. 93 over unknown - Box Culvert 5'x6'	Royalton
Rt. 93 over unknown - Box Culvert 9'x5'	Royalton
Rt. 31 over Bergholtz Creek - Box Culvert 20'x5'	Cambria
Rt. 31 over Bull Creek - Box Culvert 20'x5'	Cambria
Rt. 31 over unnamed creek - Box Culvert 8'x5'	Cambria

## 17 Collection System Projects

### RESILIENCY PROJECT DESCRIPTION

During significant storm events, existing stormwater collection systems within the Town of Cambria experience reduced capacity at peak flow times due to inflow and infiltration, leading to flooding in several areas. New and improved stormwater collection systems would allow for better capture and removal of stormwater reducing or eliminating flooding during major storm events. Renovation of existing infrastructure and building new connections to the system will improve the system's overall capacity. The proposed construction projects include:

- 1) The renovation of existing and construction of new collection systems for Sewer #1 at Franklin Street and Townline Road;
- 2) A new collection sewer to service the Cambria Technology Park; and
- 3) The renovation of existing and construction of new stormwater collection systems at Witmer Road.

### BENEFITS

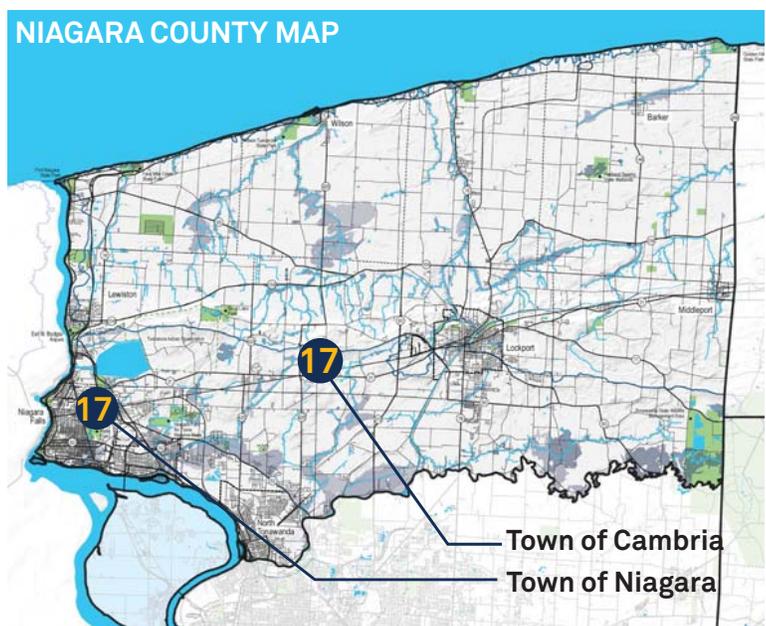
**Infrastructure** - The renovation of existing stormwater collection systems and the addition of new collection systems in under-served areas will increase the overall capacity of the system to handle storm surges creating greater resiliency in the system.

**Economic Development** - Improved infrastructure will alleviate flooding in targeted locations by capturing stormwater into a system for drainage, preventing a loss of revenue to businesses in these locations and minimizing Town staff time and resources for clean-up after flooding events. New collection systems will allow for additional development to Cambria Technology Park.

**Natural and Cultural Resources** - Additional capacity to the Town's stormwater collection system will indirectly improve water quality by reducing outflows from the system into the Niagara River, and inflows into the system from surrounding groundwater.

**Housing** - Improved wastewater infrastructure will alleviate any future flooding damage to residential dwellings and improve public health, safety and welfare.

### PROJECT LOCATIONS



*The collection system projects are located in the Town of Cambria and the Town of Niagara.*



## 17 Collection System Projects

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

Funding has been requested from the NYS Clean Water State Revolving Fund (CWSRF) 2014 Intended Use Plan (IUP). The costs for the rehabilitation and new construction of storm sewer infrastructure total to \$2.5 Million. The type of funding request would be straight funding.

### STRATEGIES

The Strategies that these types of projects will help advance include:

#### Strategy VIII:

Upgrade storm and sewage infrastructure to increase stormwater storage capacity during peak flow events and remove connections between storm and sewer systems.

#### Strategy XVIII:

Collection system upgrades to protect industrial park area that is an important economic development asset.

### INDIVIDUAL PROJECTS

The table below displays the list of projects developed by the Community that are included in this grouping.

PROJECT TITLE	PROJECT LOCATION
Collection System construction or renovation	Town of Niagara
Cambria Technology Park	Town of Cambria
Townline Road and Franklin Street	Town of Cambria



Example of sewer pipe construction

Photo Credit: Flickr/RussellStreet

## 18 Inflow/Infiltration Projects

### RESILIENCY PROJECT DESCRIPTION

Inflow and infiltration (I/I) occurs when excess water flows into existing sewer pipes from groundwater and stormwater. Existing groundwater seeps into pipes through holes, cracks, and weak joints (infiltration). In addition, stormwater enters the system through various drains as well as faulty manhole covers (inflow). Each of these I/I conditions adds to the flow the sewer system must handle and lessens available capacity for wastewater. I/I increases ongoing operational costs due to increased treatment volumes and treatment equipment wear and tear. I/I is most often associated with aging infrastructure that requires repair or replacement. Lack of repair to these pipes and manholes can create volumes of water that create combined sewer overflows (CSO) which commonly contribute a significant amount of pollutants to streams, rivers, creeks and lakes.

Projects to address inflow/infiltration include repair where feasible, or replacement of sewer lines in the Town of Cambria and the Village of Wilson, and interceptor manhole rehabilitation in the area served by the Niagara Falls Sewer District. Structures have been identified for repairs based on their condition, and contribution to system inflow/infiltration.

### BENEFITS

**Infrastructure** - These projects will reduce I/I entering the sewer system, which helps reduce strain on the sewer lines. Diminished peak flow can help to prevent localized backups of sewage into homes and businesses and reduce discharges into the region's waterways. Additionally, these type of projects would help to decrease long-term sewage treatment costs. This can provide co-benefits by reducing money spent on operating and maintaining conveyance and treatment equipment. Improvements and repairs to the system that reduce I/I would free up system capacity and increase long-term system resilience.

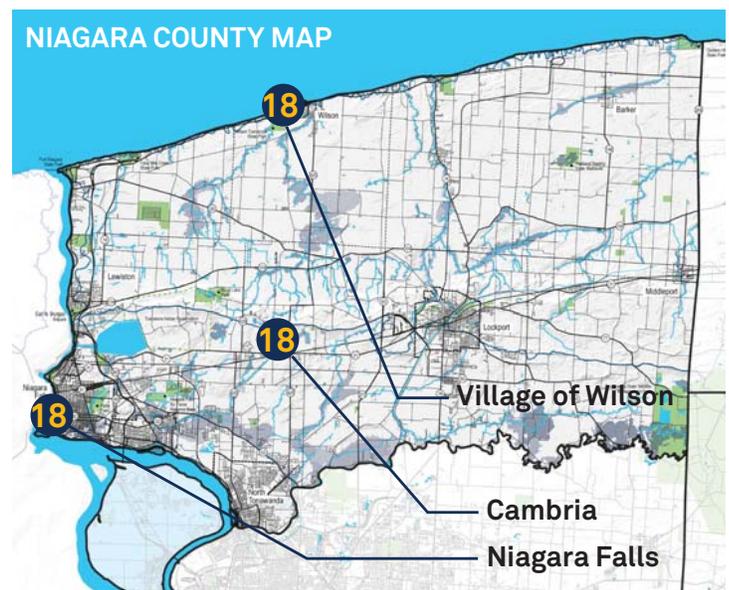
**Health and Social Services** - Reduction of backups into homes during extreme weather events will help to avoid cleanup costs for residents and provide public health benefits due to a minimized risk of exposure to combined sewer overflow discharges. Reduced incidents of sewer backups and wastewater system issues and associated damages would also decrease local government expenditures on clean-up and repair.

**Natural and cultural Resources** - I/I improvements will reduce CSOs to streams and creeks, which would protect habitats and allow for improved water quality of the streams and creeks.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

Funding sources for these projects could include the NYS Clean Water State Revolving Fund (CWSRF), which can be used to finance facilities that improve, maintain or protect water quality. The correction of inflow and/or infiltration projects in the Town of Cambria and Village of Wilson are listed on the 2014 Final CWSRF Intended Use Plan Multi-Year Project Priority List.

### PROJECT LOCATIONS



The Niagara County inflow/infiltration projects range from interceptor sewer manhole rehabilitation in Niagara Falls, to sewage treatment plant rehabilitation in the Village of Wilson.

## 18 Inflow/Infiltration Projects



**Example of a flooding due to I/I problems**

*Photo Credit: Town of Wilson*



**Example of a leaking manhole**

*Photo Credit: Village of Wilson*

### STRATEGIES

The Strategies that these types of projects will help advance include:

#### Strategy VIII:

Upgrade storm and sewage infrastructure to increase stormwater storage capacity during peak flow events, and remove connections between storm and sewer systems.

### INDIVIDUAL PROJECTS

The table below displays the list of projects developed by the Community that are included in this grouping.

PROJECT TITLE	PROJECT LOCATION
Interceptor Sewer Manhole Rehabilitation	Sewer District #1
Correction of inflow and/or infiltration in Fair Village	Cambria
Correction of inflow and/or infiltration, sewage treatment plant rehabilitation	Village of Wilson



**Example of a broken manhole**

*Photo Credit: Flickr/Brian Yap*



**Example of a cracked sewer pipe**

*Photo Credit: Flickr/Chrisdonia*

## 19 CSO Corrections

### RESILIENCY PROJECT DESCRIPTION

During periods of significant precipitation, combined sewer systems in Niagara County discharge untreated overflow into adjacent waterbodies, including the Niagara River and other waterbodies within Niagara County. Combined sewer systems collect stormwater runoff, sanitary sewage, and industrial wastewater in the same pipe to direct it to a wastewater treatment facility. During heavy rain events, the system's capacity can be exceeded and excess untreated or minimally treated water is discharged into adjacent waterbodies. The increase in combined volumes during heavy storm events that can overwhelm the system can also cause backup flooding into homes and businesses, such as during the summer 2013 storms.

Some of the County's combined sewer overflows have already been addressed through separation of the sanitary and storm systems with the installation of new sewer lines. There are still remaining combined sewer outfalls (CSO) with the potential to discharge into area waterbodies.

These CSO correction projects would separate the combined system into separate sanitary and storm sewer flow lines. The proposed construction projects included the elimination of the remaining combined sewer overflows and sewer rehabilitation to improve water quality in Eighteenmile Creek, two outfalls into the Niagara Gorge; and the alleviation of chronic flooding and sewage backups in basements in the first and second wards by separating existing combined sanitary sewers in North Tonawanda on 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> Avenues and a portion of Ironton Street.

### BENEFITS

**Infrastructure** - The separation of stormwater collection and sanitary sewer systems will increase the overall capacity of either system to handle additional volume creating greater resiliency in both systems.

**Economic** - Separation of the combined systems would allow for reduced sanitary sewer treatment and operating costs. Improved wastewater infrastructure will alleviate any future flooding damage to businesses preventing a loss of revenue. City staff time and maintenance costs for cleanup after flooding events would also be minimized.

**Natural and Cultural Resources** - Prevention of sanitary outflow discharge into the Niagara Gorge and Eighteenmile Creek will improve the stream quality, riparian habitat and overall watershed quality.

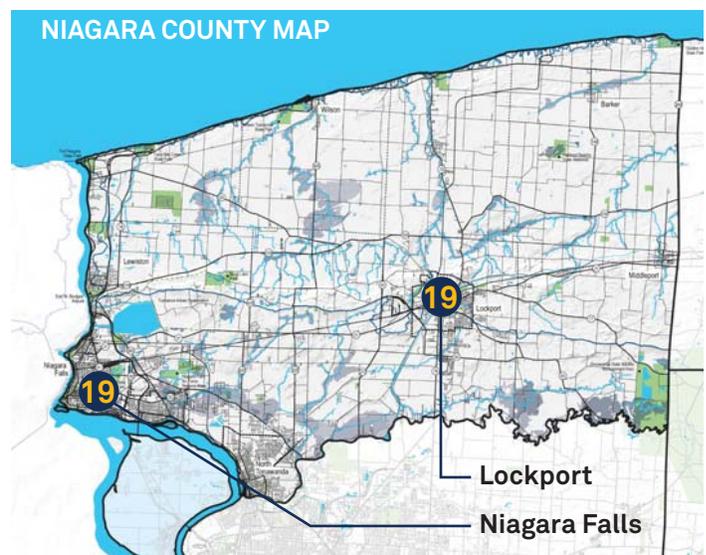
**Health and Social Services** - Separation of the combined storm/sanitary sewer system will prevent discharges of untreated wastewater into dwellings and businesses improving public safety and health.

**Housing** - Improved wastewater infrastructure will alleviate any future flooding damage to residential dwellings and businesses and improve public health, safety and welfare.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

The North Tonawanda 2014 Storm Sewer Separation has been approved for \$300,000 of serial bonds and would seek reimbursement for those bonds from the NY Rising Reconstruction Program.

### PROJECT LOCATIONS



*Correction of combined sewer overflow, and collection sewer rehabilitation projects in Niagara Falls and Lockport (City).*

## 19 CSO Corrections

### INDIVIDUAL PROJECTS

The table below displays the list of projects developed by the Community that are included in this grouping.

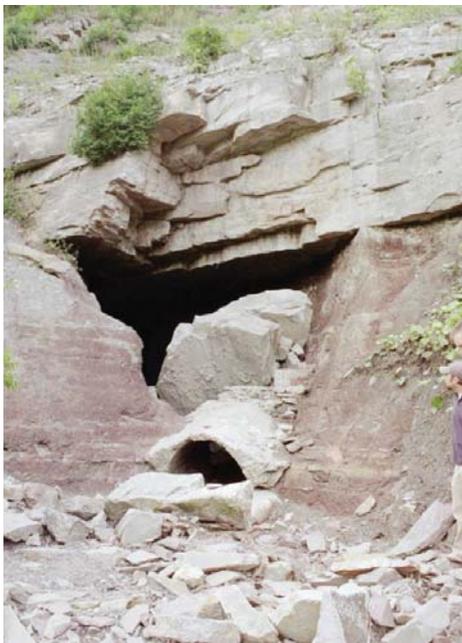
PROJECT TITLE	PROJECT LOCATION
Correction of combined sewer overflow Garfield Ave outfall, collection sewer rehabilitation	Niagara Falls
Correction of combined sewer overflow Chasm Ave outfall, collection sewer rehabilitation	Niagara Falls
Correction of combined sewer overflow, sewer rehabilitation	City of Lockport
North Tonawanda 2014 Storm Sewer Separation	North Tonawanda

### STRATEGIES

The Strategies that these types of projects will help advance include:

#### Strategy VIII:

Upgrade storm and sewage infrastructure.



**Deteriorating Garfield Avenue Outfall**

*Photo Credit: Niagara Falls Water Board*



**Example of a CSO outfall**

*Photo Credit: Flickr/Michael Pereckas*



## 20 Niagara Falls Wastewater Treatment Plant Hardening and Protective Measures

### RESILIENCY PROJECT DESCRIPTION

The inability to quickly isolate the Niagara Falls Wastewater Treatment Plant from storm-caused surcharging in the sewer collection system has resulted in significant damage to the facility and created system overflows of untreated wastewater. Mechanical and electrical devices that were submerged under raw wastewater must be removed for service, and repaired or replaced. The cost for repairs from the July 2013 flood event will exceed \$8.5M just to restore the facility capabilities, with no enhanced protective measures for future reoccurrences.

Consistent with several of the priority goals set forth in *New York's Great Lakes Basin Action Agenda* (Draft 2013), a variety of measures may be implemented to provide additional protection of the facility from excessive surcharging in the sewer collection system. Measures already in progress include repairs to the main sluice gates, repairs to the gate actuators, provisions for remote and computer control of the main gates, repairing plant sewer valves and actuators, and sealing wet well / dry well penetrations.

Under this project, an additional measure would be installed: the ability to isolate and divert the plant sewer from the sewer collection system, preventing future back-ups and flooding of the facility. A second additional measure would be the construction of a new wet weather relief structure at the Wastewater Treatment Plant, which would function much as the existing sewer regulators do; the intent of this structure would be to provide infrequent, high volume relief during extreme storm events to prevent flooding at the Plant and out in the collection system, further guarding against basement backups. The Wastewater Treatment Plant serves the City population of 49,722, and is located adjacent to the Robert Moses Parkway, along the Niagara River.

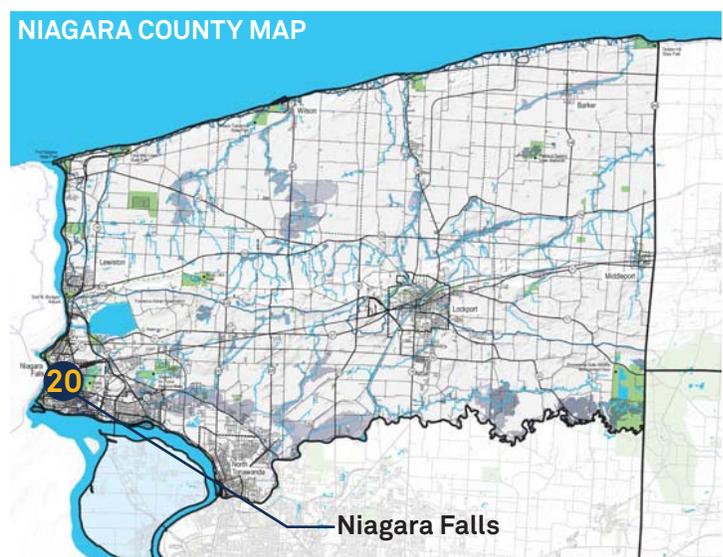
### BENEFITS

**Economic Development** - This proposed project will provide immediate cost benefits to the facility by repairing flood damaged equipment allowing for the plant to be fully operational and running efficiently. These repairs and modifications will also reduce energy costs with more efficient equipment.

**Housing** - These improvements would protect the Plant against future flood damage and help to guard against CSO backups into residential and commercial basements providing public health and social benefits. This would also decrease risk to local assets and reduce costs from repairs related to storm damage to the community. It also allows city-wide services to continue in high volume storms events, preventing streets and buildings from flooding.

**Infrastructure** - These improvements would help to prevent flooding at the Plant and in the collection system, contributing to the Plant's continued operation and reliability during heavy storm events.

### PROJECT LOCATION



*The project is located along the Niagara River*



Niagara Falls

## 20 Wastewater Treatment Plant Hardening and Protective Measures

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

The estimated project cost is \$2,563,000. A Hazard Mitigation Grant Program (HMGP) application has been submitted to FEMA and is under review.

### STRATEGIES

The Strategies that these types of projects will help advance include:

#### **Strategy VIII:**

Upgrade storm and sewage infrastructure.



One of Niagara Region's wastewater treatment plants

*Photo Credit: Niagara Falls Water Board*

## 21 Pump Station and Force Main Repairs and Replacements

### RESILIENCY PROJECT DESCRIPTION

Lift stations and pump stations are used to ensure that wastewater and storm flows are maintained through piping to wastewater treatment plants. If a storm event exceeds the pipe capacity or pump stations stop operating due to power outages, the combined storm/sanitary system backs up onto streets or into homes and businesses until the system has sufficient time to drain or until it overflows into local water bodies. These backups can discharge raw sewage into the environment.

Force mains are used to convey wastewater from a lower to a higher elevation under pressure where gravity is not sufficient to move flows. Force mains convey wastewater from the discharge side of a pump station to a discharge point. The Tonawanda Creek force main replacement would resize the existing force main and address stream bank slope stabilization along Tonawanda Creek.

Rehabilitation, replacement, and construction of pump stations and force mains would ensure these facilities are reliable and operable to help meet capacity and avoid back-up overflow. Rehabilitation of the Sherwood Avenue Pump Station would direct sewage flow away from an existing overtaxed sewershed, and flooded sewer system, and to the Meadow Drive 21-inch Interceptor in a different sewershed that has the excess capacity needed to handle the flow. In addition, the Sherwood area pump station would increase the existing pump capacity to allow for neighborhood development upstream of the new pump, and generate additional growth and tax base for the community. The improvements would be designed to eliminate the potential of pumping sewage to the Niagara River during extreme flooding events.

### BENEFITS

**Economic Development** - Improvements to system pump stations and force mains will help to ensure their operation and reliability during heavy storm events and expand the capacity of the stations. This will allow for increased development in areas already served by sewer and water infrastructure.

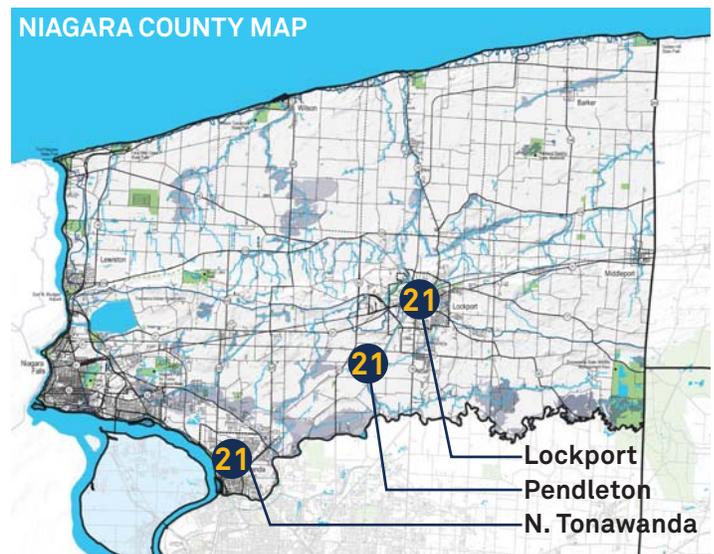
**Health and Social Services** - Efficiently operating pump stations will prevent CSO events and help to prevent residents from being exposed to raw sewage.

**Housing** - Preventing CSO events in homes, and businesses is an additional benefit to properly operating pump stations and force mains. This would also decrease risk to local assets and reduce costs from repairs related to storm damage.

**Infrastructure** - improved infrastructure creates better flows and expands capacity volumes, which will prepare the towns for future peak storm events. This will also reduce future costs as the equipment will not be overwhelmed.

**Natural and Cultural Resources** - Efficiently operating pump stations will prevent CSO events and help to protect local waterbodies from raw sewage backups and discharges into the environment. It would also improve public health and safety as well as local and regional water quality by helping to prevent raw sewage or minimally treated effluent discharges from entering into the environment.

### PROJECT LOCATIONS



*Pump Station repairs and replacements will occur in stations located in Lockport (Town), Pendleton, and North Tonawanda.*

## 21 Pump Station and Force Main Repairs and Replacements

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

Funding sources for the Sherwood Avenue Pump Station project could come from a special assessment district. Funding sources for these projects could include the NYS Clean Water State Revolving Fund (CWSRF) which can be used to finance facilities that improve, maintain or protect water quality. The pump station and force main rehabilitation/replacement projects are listed on the 2014 Final CWSRF Intended Use Plan Multi-Year Project Priority List.

### INDIVIDUAL PROJECTS

The table below displays the list of projects developed by the Community that are included in this grouping.

PROJECT TITLE	PROJECT LOCATION
Pump station replacement	Pendleton
Pump station rehabilitation	Town of Lockport
Sherwood Avenue Pump Station	North Tonawanda
Force Main replacement	Sewer District 1
Sewer Force Main [stream bank slope stabilization]	Sewer District 1

### STRATEGIES

The Strategies that these types of projects will help advance include:

**Strategy VIII:**

Upgrade storm and sewage infrastructure.

**Strategy XII:**

Maintain and enhance riparian buffers along waterways.

**Strategy XV:**

Educate property owners about combined sewer backflow risks and mitigation techniques.



**View of Water Tanks at Wastewater Treatment Plant**

*Photo Credit: AECOM/Staff Photographer (Non-Professional)*



## 22 Sewage Treatment Plant Modifications

### RESILIENCY PROJECT DESCRIPTION

Improvements to sewage treatment plants, such as installing protective measures and updating infrastructure, help to protect facilities from excessive surcharging in the sewer collection system, and increase the functionality of the facilities. Proposed improvements include a grit chamber system upgrade to improve water quality, improving sludge drying bed operations, and water tank rehabilitation. Both the City of Lockport and the City of Niagara Falls Wastewater Treatment Plants experienced grit chamber damage during the summer 2013 storms. This damage was caused by excessive flows, which stress and break the screens.

When wastewater treatment plants stop functioning, impacts occur at the plant as well as in other areas the plant serves. Loss of functionality at the wastewater treatment plant can cause raw sewage overflow in service areas, leading to loss of functionality and damage to homes and business.

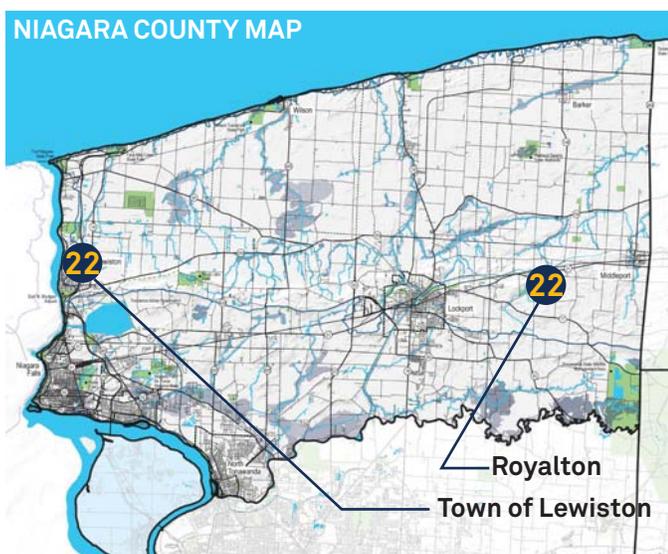
### BENEFITS

**Infrastructure** - Improvements that increase the functionality of wastewater treatment plants and their ability to handle high flows during storm events helps to allow continued operations and reliability during heavy storms. This would decrease risk to local assets and reduce costs from repairs related to storm damage.

**Housing** - This would protect the plant against future flood damage and help to guard against backups into residential and commercial basements. This provides economic and public health benefits to the communities and prevents potential costly damage from future storms.

**Natural and Cultural Resources** - The benefits from these type of improvements would be less opportunity for combined sewer overflows (CSO), which would protect the habitats in the rivers, creeks and streams in the area supporting local recreational fishing, hiking and hunting.

### PROJECT LOCATIONS



Sewage treatment plant modifications will occur Countywide, with specific rehabilitation efforts in Lewiston and Royalton.



View of sediment tanks at a WWTP

Photo Credit: AECOM/Staff Photographer(Non-Professional)

## 22 Sewage Treatment Plant Modifications

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

Funding sources for these projects could include the Clean Water State Revolving Fund (CWSRF) which can be used to finance facilities that improve, maintain or protect water quality. The pump station and force main rehabilitation and replacement projects are listed on the 2014 Final CWSRF Intended Use Plan Multi-Year Project Priority List. The Town of Lewiston has bonded \$3.5 million for sewage treatment plant rehabilitation projects; however, additional repairs are needed.

### INDIVIDUAL PROJECTS

The table below displays the list of projects developed by the Community that are included in this grouping.

PROJECT TITLE	PROJECT LOCATION
Sewage treatment plant rehabilitation	Town of Lewiston
Sewage treatment plant modification	Sewer District 1
Sewage treatment plant improvements	Sewer District 1
Sewage treatment plant modification [grit chamber system upgrade]	Sewer District 1
Sewage treatment plant modification [improvement of sludge drying bed operations]	Royalton

### STRATEGIES

The Strategies that these types of projects will help advance include:

#### Strategy VIII:

Upgrade storm and sewage infrastructure to increase stormwater storage capacity during peak flow events and remove connections between storm and sewer systems.



**Sewage Treatment Plant Location in Royalton** ●

Photo Credit: Google Images



**View of a WWTP Equipment Room**

Photo Credit: AECOM/Mike Niedringhaus



## 23 Sewage Treatment Plant and Sewer Infrastructure

### RESILIENCY PROJECT DESCRIPTION

Improvements to sewage treatment plants and collections systems such as rehabilitation, installing protective measures, and updating infrastructure, help to protect facilities from excessive surcharging in the sewer collection system and increase the functionality of the facilities. Proposed improvements to the collection systems include pump station and force main construction and implementation of strategies to reduce Inflow/Infiltration (I/I). In addition, sewage treatment plant modifications are proposed to improve water quality in Lake Ontario and adjacent waterbodies.

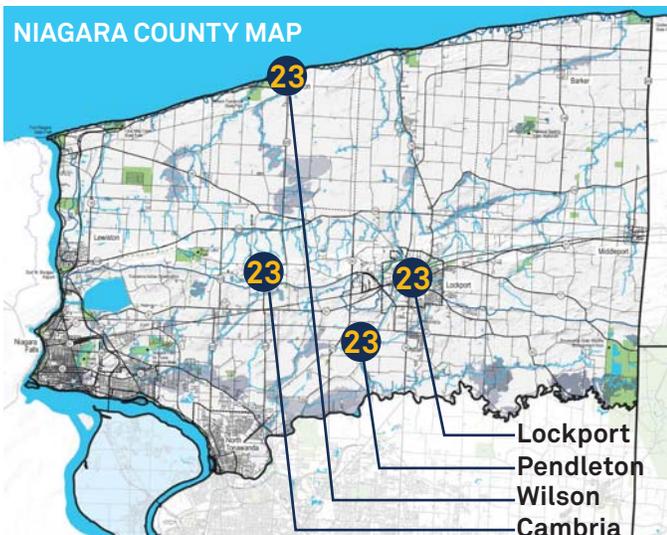


**View of a Sewage Treatment Plant Infrastructure**

*Photo Credit: AECOM/Robb Williamson*

When wastewater treatment plants, collection systems, and pump stations stop functioning, impacts occur at the plant as well as in other areas the plant serves. Loss of functionality at the wastewater treatment plant or in the collection systems can cause raw sewage overflow in service areas, leading to loss of functionality and damage to homes and business.

### PROJECT LOCATIONS



To the Left: The Niagara County Sewage Treatment Plant and Sewer infrastructure rehabilitation efforts will occur Countywide, with specific renovations in the Towns of Wilson, Lockport, Cambria, and Pendleton.



## 23 Sewage Treatment Plant and Sewer Infrastructure

### BENEFITS

**Infrastructure** - The renovation of existing stormwater collection systems and the addition of protective measures will prevent surcharges in the sewer collection systems for the municipalities and increase the overall capacity of these systems during major storm events.

**Economic Development** - Improved infrastructure will alleviate flooding in targeted locations by capturing stormwater, preventing a loss of revenue to businesses and minimizing City and Town staff time and resources for clean-up and maintenance after flooding events.

**Natural and Cultural Resources** - Renovation of the collection systems including adding increased capacity to the stormwater collection systems will indirectly improve water quality by reducing outflows from the system into Lake Ontario and other bodies of water and reducing inflows into the system from surrounding groundwater.

**Housing** - Improved wastewater infrastructure will alleviate any future flooding damage to residential dwellings throughout the County and improve public health, safety and welfare.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

Funding sources for these projects could include the Clean Water State Revolving Fund (CWSRF) which can be used to finance facilities that improve, maintain or protect water quality. The pump station and force main rehabilitation and replacement projects are listed on the 2014 Final CWSRF Intended Use Plan Multi-Year Project Priority List. The Village of Wilson collection sewer and sewage treatment plant rehabilitation project is locally funded and underway.

### INDIVIDUAL PROJECTS

The table below displays the list of projects developed by the Community that are included in this grouping.

PROJECT TITLE	PROJECT LOCATION
Collection sewer rehabilitation, sewage treatment plant rehabilitation	Village of Wilson
Collection system construction or renovation, correction of I/I, interceptor sewer	Town of Lockport
Construction or renovation of force main, interceptor sewer and pump station	Cambria
Construction or renovation of force main, interceptor sewer and pump station	Pendleton

### STRATEGIES

The Strategies that these types of projects will help advance include:

**Strategy VIII:**

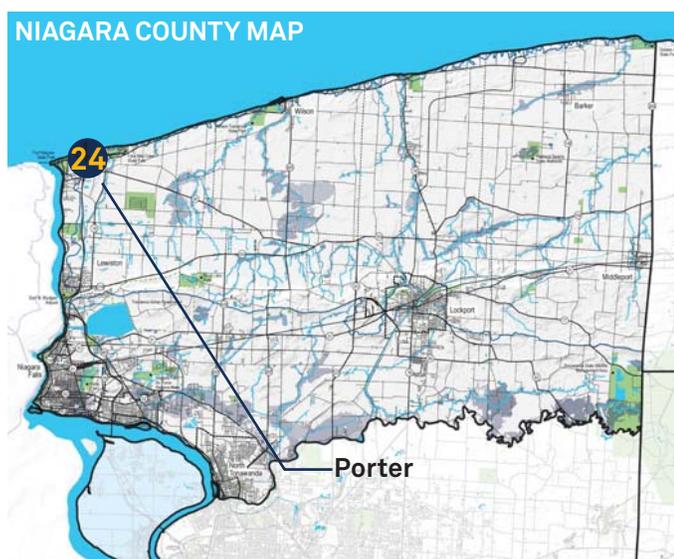
Upgrade storm and sewage infrastructure.

## 24 Porter (Town) Construction of sewage treatment plant & infrastructure

### RESILIENCY PROJECT DESCRIPTION

This project would involve the installation of a gravity sewer system and the construction of a wastewater treatment plant in the Ransomville Sewer District. Public sewer is not currently available in the hamlet of Ransomville and soil and groundwater conditions, along with small lots, can cause septic system failures. The *Town of Porter Comprehensive Plan (August 2004)* identifies a focus on more concentrated, dense development in and around the Village of Youngstown and the hamlet of Ransomville to accommodate population growth in the Town, while maintaining significant open space in the community. In order to accomplish this, the Comprehensive Plan recommends public sewer service be added in Ransomville. Sewer and water would be concentrated in the hamlet area and not extended from the Village to the hamlet, with the exception of service nodes, in order to limit sprawl and impacts on agricultural lands.

### PROJECT LOCATION



*This project involves the installation of a sewage treatment plant in the Ransomville Sewer District, within the Town of Porter.*

### BENEFITS

**Community Planning and Capacity Building** - The *Town of Porter Comprehensive Plan* notes that concentrating development on vacant lands surrounding the hamlet of Ransomville and the Village of Youngstown would help to minimize the need to expand costly services to all areas of the Town and allow for compact development to occur in the area providing growth opportunities.

**Economic Development** - This will also protect agricultural businesses by localizing construction for infrastructure and land needed for future expansion.

**Natural and Cultural Resources** - Protecting these areas results in natural and cultural benefits such as preserved habitats, opportunities for hiking, and recreational hunting. Additionally, the new infrastructure will help maintain water quality in the area as the town experiences economic expansion, as well as by reducing septic tank failures which would benefit local streams and creeks.

## 24 Porter (Town) Construction of sewage treatment plant & infrastructure

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

Funding sources for this project could include the NYS Clean Water State Revolving Fund (CWSRF) which can be used to finance facilities that improve, maintain or protect water quality. The project is listed on the 2014 Final CWSRF Intended Use Plan Multi-Year Project Priority List.

### STRATEGIES

The Strategies that these types of projects will help advance include:

#### **Strategy VIII:**

Upgrade storm and sewage infrastructure.



**View of a sewage treatment plant infrastructure**

*Photo Credit: AECOM/Robb Williamson*



## 25 Emergency Standby Generators

### RESILIENCY PROJECT DESCRIPTION

The Emergency Standby Generator project involves the purchase and fixed-installation of backup power generators to keep critical local government facilities operational during storms. In Niagara Falls, the wastewater treatment plant has a single 35 year-old diesel emergency generator sized to power communications, selected lighting, and a small number of valves and ventilating systems. Reliability of the equipment has been degrading over time and its capabilities are limited. Replacing the standby generator with modern, up-sized equipment will restore reliability under emergency conditions. Expansion of the emergency power distribution system will improve facility protection and survivability under circumstances of a total electrical outage. Staff health and safety will also be improved under these conditions.

Wheatfield residents would benefit from several standby generators: one for the Community Center located at 2790 Church Road, at the Town Hall campus, which doubled as a Red Cross Shelter in major storm events; and additional generators on sewer lift stations throughout the Town.

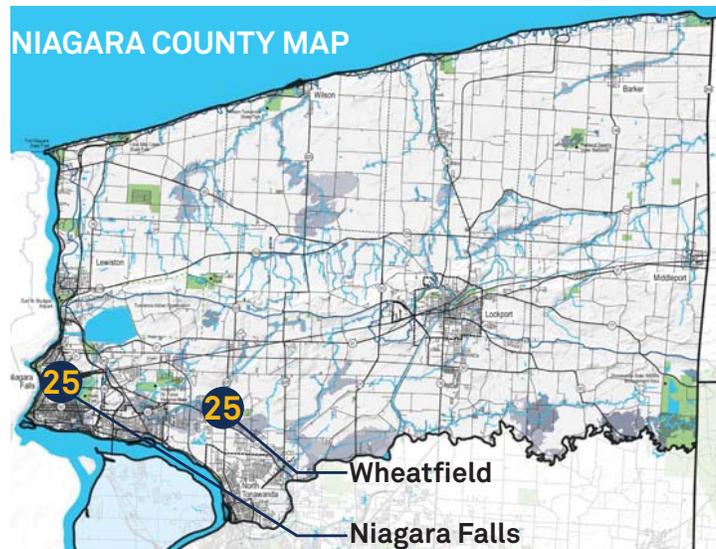
### BENEFITS

**Infrastructure** - Permanent dedicated emergency back-up power generator for the wastewater treatment facility and stand-by emergency generators for lift/pump stations and the Town Community Center will increase the efficiency and reliability of critical facilities during major storm events.

**Economic Benefit** - Adding emergency safeguards to the pump stations will reduce City staff and maintenance costs to clean up backflows. In addition, it will prevent the loss of revenue to businesses and the City in affected areas during flood events.

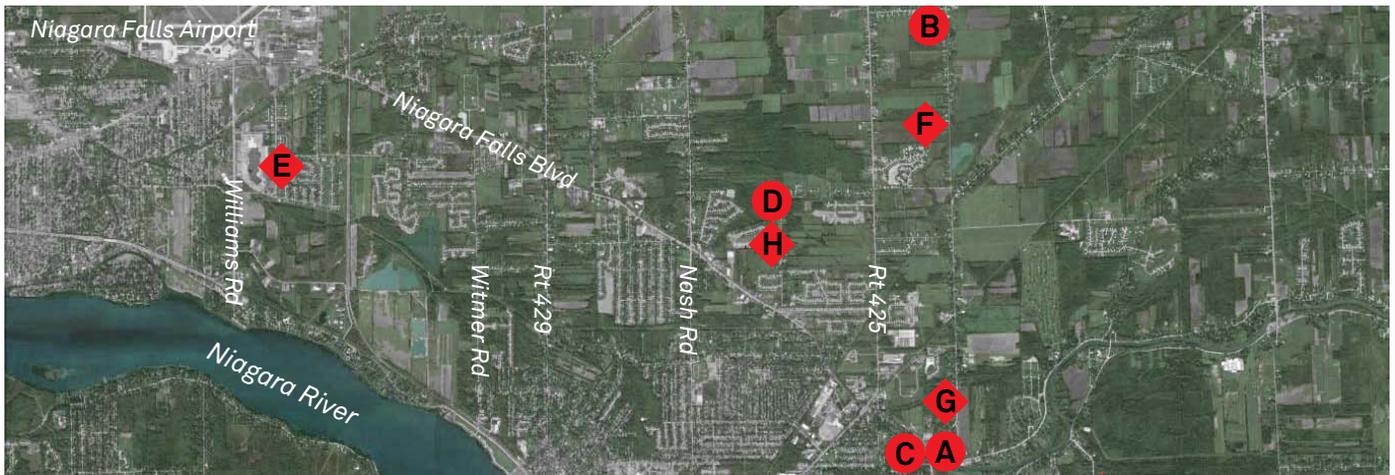
**Health and Social Services** - Improved storm/sanitary sewer infrastructure will mitigate any future flooding damage to residential dwellings and improve public health, safety and welfare. In addition, providing emergency power to the City Red Cross shelter will reduce the risks to public health and safety.

### PROJECT LOCATIONS



Emergency Standby Generators will be implemented in the Cities of Niagara Falls and Wheatfield.

### LOCATION OF PROJECTS



Priority Lift Station location in need of generator ● Lift Station location in need of generator ◆

## 25 Emergency Standby Generators

**Housing** - Improved emergency generators will prevent repeated flooding of residential properties and prevent raw sewage back-ups in homes and businesses.

### PROJECT STATUS & POTENTIAL FUNDING SOURCES

The anticipated cost to install a 100 amp generator for the Community Center in Wheatfield would be about \$95,000.00. The total estimated cost for four (4) standby generators for lift stations in Wheatfield is \$184,000.00. The estimated total project cost for the wastewater treatment plant emergency power system is \$349,000. A Hazard Mitigation Grant Program (HMGP) application for the wastewater treatment plant emergency power system project has been submitted and is under review.

The type of funding request would be straight funding.



**Example of emergency standby generator**

*Photo Credit: AECOM/Mike Niedringhaus*

### STRATEGIES

The Strategies that these types of projects will help advance include:

**Strategy VI:**

Improve emergency response system and provide evacuation assistance to communities.

**Strategy IX:**

Upgrade storm and sewage infrastructure.



**Example of Sewer Lift Station**

*Photo Credit: AECOM/Staff Photographer(Non-Professional)*

### INDIVIDUAL PROJECTS

The table below displays the list of projects developed by the Community that are included in this grouping.

PROJECT TITLE	PROJECT LOCATION
Sewer Lift Stations Standby Generators (4)	Wheatfield
Community Center (designated Red Cross Shelter) Standby Generator	Wheatfield
Wastewater Treatment Plant Emergency Power System	Niagara Falls



Railroad Tresslen Lockport (Photo Credit: Flickr/James G. Milles)



# 5

## Schedule for Implementation

*The Implementation Schedule lists all projects and their anticipated timeframes to present a schedule that will ensure tangible progress on the Niagara County NY Rising Countywide Resiliency Plan. The project timelines are an anticipated start date that would occur after funding is secured.*

The Niagara County NY Rising Countywide Resiliency Plan includes fifty-eight proposed projects that are linked to the Countywide resiliency strategies and the Federal Emergency Management Agency (FEMA) Recovery Support Functions. Projects represent short- and long-term actions to address emergency response, natural resources preservation, stormwater management, flooding occurring as a result of aging infrastructure, an increase in developed areas and impervious surfaces, and more frequent flash storms due to climate change.

Table 9, below, presents the implementation schedule to be followed to ensure progress on the NYRCR Plan. The implementation table lists the Recovery and Resiliency projects in the order they were presented in Section 4, Project Profiles. Projects grouped together in one profile in Section 4 are listed individually in the Implementation Table to document all project timeframes and show which projects are planned during a specific timeframe. The project timelines project an anticipated start date that would occur after funding is secured.

While timelines are estimated for all projects, some of these projects represent an identified need and a way to address the need rather than a fully developed project. Such projects will require design and engineering analysis to more specifically identify project actions and timeframes. Funding, regulatory reviews, detailed design processes, permitting, funding, and other pre-implementation actions will all help to determine the final implementation schedule.

Table 10 Project Phasing, groups the projects into short-, mid-, and long-term categories to provide a snapshot of anticipated implementation of the Plan. Short-term projects are those that would start 0-6 months after a funding award; mid-term projects would start 6-12 months after a funding award; long-term projects are those that would start 12+ months after a funding award.



# Table 9 - Schedule for Implementation

PROJECT NAME	DESCRIPTION	LOCATION	ESTIMATED COST	PROPOSED RESPONSIBLE PARTIES	ANTICIPATED START	ANTICIPATED COMPLETION
Project Profile 1: Treatment Plant Modifications	Replace thickener tank	City of Lockport	\$1,000,000	City of Lockport	12+ months	12-24 months
Project Profile 2: High Street Sewer Separation	Sewer Separation	City of Lockport	\$2,000,000	City of Lockport	12+ months	12-24 months
Project Profile 3: Northwest Storm Sewer, Phase II (Witmer Road West)	Drainage improvement study for sewer/ infrastructure upgrade	North Tonawanda	\$100,000	City of North Tonawanda	0-6 months	6-12 months
Project Profile 4: Water Pollution Control Center (WPCC) Secondary Clarifier Performance Improvements	Installation of density current baffles	Town of Niagara/ Wheatfield	\$250,000	Niagara County Sewer District #1	12+ months	12-24 months
Project Profile 5: Sewer Collection System Remote Monitoring and Regulator Control Upgrade	Upgrade regulator controls and remote monitoring	Niagara Falls	\$829,000	Niagara Falls Water Board	12+ months	12-24 months
Project Profile 6: Sewer Collection System Emergency Power Facilities	Lift station emergency generators or hard wire back-up electrical service	Niagara Falls	\$356,000	Niagara Falls Water Board	6-12 months	12-24 months
Project Profile 7: Pump Stations Emergency Power Generation (7 stations)	Installation of emergency power generation at lift stations	Town of Lockport	\$315,000	Town of Lockport	12+ months	12-24 months
Project Profile 8: Portable Generators and Pumps	Portable generators and pumps for emergency response	Wheatfield	\$32,500	Town of Wheatfield	0-6 months	0-6 months
Project Profile 9: Pump Station Emergency Generator	Installation of emergency power generation at pump stations	North Tonawanda	\$300,000	City of North Tonawanda	12+ months	12-24 months
Project Profile 10: Emergency Vehicle - Communications Truck	Rapid response communications vehicle	Countywide	\$188,100	Niagara County Emergency Services	0-6 months	0-6 months



Table 9, Continued

PROJECT NAME	DESCRIPTION	LOCATION	ESTIMATED COST	PROPOSED RESPONSIBLE PARTIES	ANTICIPATED START	ANTICIPATED COMPLETION
Project Profile 11: Emergency Vehicle - Tech Rescue Truck	Rapid response technical rescue equipment vehicle	Countywide	\$135,000	Niagara County Emergency Services	0-6 months	0-6 months
Project Profile 12: Donner Creek Flood Study and Mitigation	Stream Restoration	North Tonawanda	\$60,000	City of North Tonawanda	6-12 months	12-24 months
Project Profile 12: County Golf Course Stream Corridor Restoration	Stream Corridor Restoration	City of Lockport	TBD	Niagara County Dept. of Public Works	12+ months	12-24 months
Project Profile 12: Headwater Stream Protection: Bull Creek	Feasibility study to protect and improve stream corridor wetlands and adjacent land	Wheatfield and Pendleton	\$100,000	Buffalo Niagara Riverkeeper	12 + months	12-24 months
Project Profile 13: City of Niagara Falls Green Infrastructure Solutions Planning	On-site green infrastructure solutions to increase capture of stormwater runoff	Niagara Falls	\$225,000	Buffalo Niagara Riverkeeper	12+ months	12-24 months
Project Profile 13: Know Your Sewershed Programming	Educate residents about the effects of stormwater and flooding issues	Niagara Falls	\$60,000	Buffalo Niagara Riverkeeper	12+ months	12-24 months
Project Profile 13: Niagara Falls Airport Green Infrastructure to capture stormwater runoff	Initial feasibility study for green infrastructure solutions to increase stormwater runoff capture	Niagara Falls	\$100,000+	Buffalo Niagara Riverkeeper and other team members	12+ months	12-24 months
Project Profile 13: Local green infrastructure solutions to manage stormwater runoff surrounding Gill Creek	Design and construct comprehensive green infrastructure demonstration project	Niagara Falls	\$1.5 Million	Buffalo Niagara Riverkeeper	12+ months	12-24 months
Project Profile 14: Flood Study/Assessment of Cayuga, Bergholtz, and Sawyer Creeks	Flood study and/or geomorphic assessment to identify flooding causes and solutions	Niagara and Wheatfield	\$1.2 Million	Buffalo Niagara Riverkeeper	12+ months	12-24 months



Table 9, Continued

PROJECT NAME	DESCRIPTION	LOCATION	ESTIMATED COST	PROPOSED RESPONSIBLE PARTIES	ANTICIPATED START	ANTICIPATED COMPLETION
Project Profile 14: Property Acquisition/Creation of Wetlands and/or improved Floodplain Access and/or Floodplain Storage Capacity (Cayuga Village Neighborhood)	Construct wetlands and increase floodplain storage capacity in lower level floods	Niagara	\$200,000 - \$600,000	Buffalo Niagara Riverkeeper	12+ months	24 + months
Project Profile 14: Property Acquisition/Creation of Wetlands and/or improved Floodplain Access and/or Floodplain Storage Capacity (Tuscarora + Porter Roads)	Construct wetlands and increase floodplain storage capacity in lower level floods	Niagara	\$200,000 - \$600,000	Buffalo Niagara Riverkeeper	12+ months	24 + months
Project Profile 14: Property Acquisition/Creation of Wetlands and/or improved Floodplain Access and/or Floodplain Storage Capacity (Bergholtz and Sawyer Creek)	Construct wetlands and increase floodplain storage capacity in lower level floods	Wheatfield	\$200,000 - \$600,000	Buffalo Niagara Riverkeeper	12+ months	24 + months
Project Profile 15: Cover Crop Plant/Liquid Fertilizer and Herbicide Applicator/Interseeder	Equipment purchase	Countywide	\$40,000	Niagara County Soil and Water Conservation District	0-6 months	0-6 months
Project Profile 15: Cover Crop Erosion Control	Cover Crop Application	Countywide	\$80/acre	Niagara County Soil and Water Conservation District	0-6 months	6-12 months
Project Profile 16: Rt. 93 over unknown – Box culvert 5’x6’	Culvert Replacement	Royalton	\$500,000	NYS Department of Transportation	6-12 months	6-12 months
Project Profile 16: Rt. 93 over unknown – Box culvert 9’x5’	Culvert Replacement	Royalton	\$500,000	NYS Department of Transportation	6-12 months	6-12 months
Project Profile 16: Rt. 31 over Bergholtz Creek – Box culvert 20’x5’	Culvert Replacement	Cambria	\$650,000	NYS Department of Transportation	6-12 months	6-12 months



Table 9, Continued

PROJECT NAME	DESCRIPTION	LOCATION	ESTIMATED COST	PROPOSED RESPONSIBLE PARTIES	ANTICIPATED START	ANTICIPATED COMPLETION
Project Profile 16: Rt. 31 over Bull Creek – Box culvert 20’x5’	Culvert Replacement	Cambria	\$650,000	NYS Department of Transportation	6-12 months	6-12 months
Project Profile 16: Rt. 31 over unnamed creek – Box culvert 8’x5’	Culvert Replacement	Cambria	\$500,000	NYS Department of Transportation	6-12 months	6-12 months
Project Profile 16: Rt. 425 at Loveland Rd. - Box culvert 11’x4’	Culvert Replacement	Wheatfield	\$575,000	NYS Department of Transportation	6-12 months	6-12 months
Project Profile 16: Rt. 425 over unknown – Box culvert 5’x2’	Culvert Replacement	Wheatfield	\$439,000	NYS Department of Transportation	6-12 months	6-12 months
Project Profile 17: Collection system construction or renovation	Construction/renovation of collection system at Cambria Tech Park	Cambria	\$1,060,000	Town of Cambria	12+ months	12-24 months
Project Profile 17: Collection system construction or renovation	Construction/renovation of collection system in Sewer District #1 Franklin & Townline Road	Cambria	\$715,000	Town of Cambria	12+ months	12-24 months
Project Profile 17: Collection system construction or renovation	Construction/renovation of collection system at Witmer Road	Niagara	\$1,910,000	Town of Niagara	12+ months	12-24 months
Project Profile 18: Interceptor Sewer Manhole Rehabilitation	Manhole rehabilitation to reduce inflow/infiltration	Niagara	\$650,000	Niagara County Sewer District #1	12+ months	12-24 months



Table 9, Continued

PROJECT NAME	DESCRIPTION	LOCATION	ESTIMATED COST	PROPOSED RESPONSIBLE PARTIES	ANTICIPATED START	ANTICIPATED COMPLETION
Project Profile 18: Correction of inflow and/or infiltration	Repair/replacement in Fair Village to reduce inflow/infiltration	Cambria	\$800,000	Town of Cambria	12+ months	12-24 months
Project Profile 18: Correction of inflow and/or infiltration, sewage treatment plant rehabilitation	Repair/replacement to reduce inflow/infiltration	Wilson (Village)	\$410,000	Village of Wilson	12+ months	12-24 months
Project Profile 19: Correction of combined sewer overflow, collection sewer rehabilitation	Garfield Ave. outfall repairs	Niagara Falls	\$2,500,000	Niagara Falls Water Board	12+ months	12-24 months
Project Profile 19: Correction of combined sewer overflow, collection sewer rehabilitation	Elimination of combined sewer overflows and sewer rehabilitation to improve water quality in Eighteenmile Creek	City of Lockport	\$4,400,000	City of Lockport	12+ months	12-24 months
Project Profile 19: Correction of combined sewer overflow, collection sewer rehabilitation	Chasm Ave. outfall repairs	Niagara Falls	\$2,500,000	Niagara Falls Water Board	6-12 months	6-12 months
Project Profile 19: North Tonawanda 2014 Storm Separation	Separate stormwater from sanitary sewers on 1st, 2nd and 3rd Avenues, and a portion of Ironton Street	North Tonawanda	\$300,000	City of North Tonawanda	12+ months	12-24 months
Project Profile 20: Wastewater Treatment Plant Hardening and Protective Measures	Add ability to isolate and divert the plant sewer and construct a wet weather relief structure	Niagara Falls	\$2,563,000	Niagara Falls Water Board	12+ months	12-24 months
Project Profile 21: Force Main Replacement	Force main replacement, Tonawanda Creek	Sewer District 1	\$2,275,000	Niagara County Department of Public Works	12+ months	12-24 months
Project Profile 21: Sewer force main [stream bank slope stabilization]	Force Main Replacement	Sewer District #1	\$870,000	Niagara County Department of Public Works	12+ months	12-24 months



Table 9, Continued

PROJECT NAME	DESCRIPTION	LOCATION	ESTIMATED COST	PROPOSED RESPONSIBLE PARTIES	ANTICIPATED START	ANTICIPATED COMPLETION
Project Profile 21: Pump station replacement	Pump station replacement	Pendleton	\$1,025,200	Town of Pendleton	12+ months	12-24 months
Project Profile 21: Sherwood Avenue Pump Station	Pump station construction at Sherwood Avenue and Walck Road	North Tonawanda	\$670,629	City of North Tonawanda	12+ months	12-24 months
Project Profile 21: Pump station rehabilitation	Pump station rehabilitation	Town of Lockport	\$2,056,000	Town of Lockport	12+ months	12-24 months
Project Profile 22: Sewage treatment plant rehabilitation	Sewage treatment plant rehabilitation	Town of Lewiston	\$4,790,000	Town of Lewiston	12+ months	12-24 months
Project Profile 22: Sewage treatment plant modification [grit system upgrade]	Grit system upgrade at the Sewer District No. 1 sewage treatment plant	Sewer District #1	\$3,540,000	Niagara County Department of Public Works	12+ months	12-24 months
Project Profile 22: Sewage treatment plant improvements	Sewage treatment plant water tank rehabilitation	Sewer District #1	\$1,145,000	Niagara County Department of Public Works	12+ months	12-24 months
Project Profile 22: Sewage treatment plant modification	Plant modifications	Sewer District #1	\$10,325,000	Niagara County Department of Public Works	12+ months	24 + months
Project Profile 22: Sewage treatment plant modifications [improvement of sludge drying bed operation]	Modifications of the sewage treatment plant in the Hamlet of Gasport	Royalton	\$230,000	Town of Royalton	12+ months	12-24 months
Project Profile 23: Construction or renovation of force main, interceptor sewer and pump station	Force main, sewer and pump station improvements	Town of Cambria	\$4,300,000	Niagara County Department of Public Works	12+ months	24 + months



# Table 9, Continued

PROJECT NAME	DESCRIPTION	LOCATION	ESTIMATED COST	PROPOSED RESPONSIBLE PARTIES	ANTICIPATED START	ANTICIPATED COMPLETION
<b>Project Profile 23: Construction or renovation of force main, interceptor sewer and pump station</b>	<b>Force main, interceptor sewer and pump station improvements</b>	<b>Town of Pendleton</b>	<b>\$1,810,000</b>	<b>Niagara County Department of Public Works</b>	<b>12+ months</b>	<b>24 + months</b>
<b>Project Profile 23: Collection system construction or renovation, correction of inflow and/or infiltration, interceptor sewer</b>	<b>Collection system, inflow/infiltration, and interceptor sewer improvements</b>	<b>Town of Lockport</b>	<b>\$2,799,000</b>	<b>Town of Lockport</b>	<b>12+ months</b>	<b>24 + months</b>
<b>Project Profile 23: Collection sewer rehabilitation, sewage treatment plant rehabilitation</b>	<b>Sewage treatment plant and collection sewer improvements to improve water quality in Lake Ontario.</b>	<b>Village of Wilson</b>	<b>\$1,700,000</b>	<b>Village of Wilson</b>	<b>12+ months</b>	<b>24 + months</b>
<b>Project Profile 24: Construction of collection sewers, a pump station force main and sewage treatment plant</b>	<b>Construction of a sewage treatment plant, collector sewers and associate infrastructure in Ransomville</b>	<b>Porter</b>	<b>\$8,081,000</b>	<b>Town of Porter</b>	<b>12+ months</b>	<b>12-24 months</b>
<b>Project Profile 25: Community Center (designated Red Cross Shelter) Standby Generator</b>	<b>Install a standby generator at the Community center (2790 Church Road)</b>	<b>Wheatfield</b>	<b>\$95,000</b>	<b>Town of Wheatfield</b>	<b>0-6 months</b>	<b>0-6 months</b>
<b>Project Profile 25: WWTP Emergency Power System</b>	<b>Replace standby generator with modern, upsized equipment</b>	<b>Niagara Falls</b>	<b>\$349,000</b>	<b>Niagara Falls Water Board</b>	<b>6-12 months</b>	<b>6-12 months</b>
<b>Project Profile 25: Sewer Lift Stations Standby Generators (4)</b>	<b>Standby generators for 4 sewer lift stations in the Town of Wheatfield</b>	<b>Wheatfield</b>	<b>\$184,000</b>	<b>Town of Wheatfield</b>	<b>0-6 months</b>	<b>0-6 months</b>



Page Intentionally Left Blank



# Table 10 - Project Phasing

0-6 Months	Emergency Generators - Countywide
	Community Center (designated Red Cross Shelter) Standby Generator - Wheatfield
	Emergency Vehicle/Communications Truck - Countywide
	Emergency Vehicle/Tech Rescue Truck - Countywide
	Cover Crop Plant/Liquid Fertilizer and Herbicide Applicator/No-Till Grain Drill - Countywide
	Sewer Lift Stations Standby Generators (4) - Wheatfield
	Northwest Storm Sewer, Phase II (Witmer Road West) - North Tonawanda
6-12 Months	Portable Generators and Pumps - Town of Wheatfield
	Donner Creek Flood Study and Mitigation - North Tonawanda
	Correction of combined sewer overflow, collection sewer rehabilitation - Niagara Falls
	Rt. 425 at Loveland Rd. - box culvert 11'x4' - Wheatfield
	Rt. 425 over unknown - box culvert 5'x2' - Wheatfield
	Rt. 93 over unknown - box culvert 5'x6' - Royalton
	Rt. 93 over unknown - box culvert 9'x5' - Royalton
	Rt. 31 over Bergholtz Creek - box culvert 20'x5' - Cambria
	Rt. 31 over Bull Creek - box culvert 20'x5' - Cambria
	Rt. 31 over unnamed creek - box culvert 8'x5' - Cambria
	WWTP Emergency Power System - Niagara Falls
	Sewer Collection System Emergency Power Facilities - Niagara Falls
	12+ Months
Property Acquisition/Creation of Wetlands - Wheatfield	
Property Acquisition/Creation of Wetlands - Town of Niagara	
Property Acquisition/Creation of Wetlands - Town of Niagara	
County Golf Course Stream Corridor Restoration - City of Lockport	
Niagara Falls Airport Green Infrastructure - Niagara Falls	
Local Green Infrastructure Solutions - Niagara Falls	
Collection System Construction or Renovation - Cambria (Cambria Tech Park)	
Collection System Construction or Renovation - Cambria (Sewer District #1)	
Collection System Construction or Renovation - Town of Niagara	
Correction of CSO, Collection Sewer Rehabilitation - Niagara Falls (Garfield Ave.)	
Correction of CSO, Collection Sewer Rehabilitation - City of Lockport	
Force Main Replacement - Sewer District #1	



## Table 10, Continued

12+ Months

Interceptor Sewer Manhole Rehabilitation - Town of Niagara

Correction of Inflow and/or Infiltration - Cambria

Correction of Inflow and/or Infiltration, Sewage Treatment Plant Rehabilitation - Village of Wilson

WWTP Hardening and Protective Measures - Niagara Falls

Sewer Collection System Remote Monitoring and Regulator Control Upgrade - Niagara Falls

High Street Sewer Separation - City of Lockport

Treatment Plant Modifications - City of Lockport

North Tonawanda 2014 Storm Separation - North Tonawanda

Pump Stations Emergency Power Generation (7 Stations) - North Tonawanda

Pump Station Emergency Generator - North Tonawanda

Water Pollution Control Center Secondary Clarifier Improvements - Town of Niagara/Wheatfield

Construction of Collection Sewers, Force Main, and Sewage Treatment Plant - Town of Porter

Pump Station Rehabilitation - Town of Lockport

Pump Station Replacement - Pendleton

Sherwood Avenue Pump Station - North Tonawanda

Construction or Renovation of Force Main, Interceptor Sewer & Pump Station - Town of Cambria

Construction or Renovation of Force Main, Interceptor Sewer & Pump Station - Town of Pendleton

Collection System Construction/Renovation, Correction of I/I, Interceptor Sewer - Town of Lockport

Collection Sewer Rehabilitation, Sewage Treatment Plant Rehabilitation - Village of Wilson

Sewage Treatment Plant Modification - Sewer District #1

Sewage Treatment Plant Modification [grit chamber system update] - Sewer District #1

Sewage Treatment Plant Rehabilitation - Sewer District #1

Sewage Treatment Plant Modifications [improvement of sludge drying bed operation] - Royalton

Sewer Force Main [stream bank slope stabilization] - Sewer District #1

Headwater Stream Protection: Bull Creek - Niagara Falls

Cayuga Creek Riparian Habitat - Niagara Falls

City of Niagara Falls Green Infrastructure Solutions Planning - Niagara Falls

Know Your Sewershed Programming - Niagara Falls

Headwater Stream Protection: Bull Creek - Wheatfield and Pendleton



Old Fort Niagara (Photo Credit: Flickr/Goodsophism)



## Additional Materials

*This section is an appendix to the NYRCR Plan. It includes a description of the public engagement process, the community asset inventory and risk assessment information, and end notes with data sources and other information.*

### Public Engagement Process

Public outreach was an important component of the Niagara County NY Rising Countywide Resiliency Plan. Public involvement included Niagara County NYRCR Planning Committee meetings, stakeholder interviews, and public outreach events to engage a wide range of public perspectives at key milestones during the planning process.

#### Niagara County NYRCR Planning Committee

The NYRCR Planning Committee was established as the first step in the public outreach process. This Committee, comprised of volunteers, included a cross-section of representatives from different agencies, municipalities, and interested organizations throughout Niagara County.

The NYRCR Committee members were active partners in the development of the NYRCR Plan. They provided valuable input on local issues, needs and goals of the community, and assisted with each public engagement meeting. As community stakeholders, the NYRCR Committee assisted in drafting the NYRCR Plan's vision statement, developing reconstruction and resiliency strategies, and the identification and selection of projects. The NYRCR Committee was also instrumental in reviewing the initial findings, asset identification and analysis.

A total of seven NYRCR Committee meetings were held regularly and at critical milestones throughout the project.

### Stakeholder Interviews

With the goal of achieving a wide perspective on recovery/reconstruction needs and resiliency opportunities throughout the County, various stakeholders throughout the County were invited to take part in the planning process. The interest and support of the affected communities, in particular the Cities of Niagara Falls, North Tonawanda, and Lockport, were especially important in shaping the NYRCR Plan and ensuring its success.

A number of specific stakeholders and agencies were interviewed for their input. The Project Team participated in a site visit and met with members of the Niagara Water Board to learn the details of what occurred at the Niagara Falls Wastewater Treatment Facility during the summer 2013 storm event. The Project Team met with the City Engineer for the City of North Tonawanda, as well as with representatives with the City of Lockport, and toured the areas flooded in Lockport during the storm event. A meeting was held with the Mayor of the City of Niagara Falls to discuss storm damage and stormwater management issues. In addition, the Project Team met with Buffalo Niagara Riverkeeper, an environmental stewardship non-profit to discuss their projects and programs related to the Niagara River watershed.

## Public Engagement Events

Public outreach included three public meetings scheduled at specific milestones during the project. All three meetings were structured as open houses. The first two meetings were held at Niagara County Community College, Sanborn Theater. The third event was held in each of the three communities hardest hit during the 2013 summer storm event: City of Lockport, City of Niagara Falls, and City of North Tonawanda.

The first open house was held on March 19, 2014, and focused on informing the Community of the NY Rising Community Reconstruction Program and to solicit input on recovery projects initially identified as community priorities. The second open house was held on May 7, 2014, and focused on confirming the identification and location of local assets and constraints regarding riverine flooding issues and combined sewer overflow issues. The third set of open houses was held in June; one on June 10, 2014 in the City of Lockport, and two on June 11, 2014 in the Cities of Niagara Falls and North Tonawanda. The focus of these meetings was to share some of the strategies for improving the communities' resiliency to future storm events and receiving input on the strategies.

The series of open houses provided first-hand knowledge of the affected communities and enabled public input to be obtained that was used during the planning process and to draft the NYRCR Plan.



View from a public informational meeting held in North Tonawanda on June 11, 2014

Photo Credit: AECOM/Staff Photographer (Non-Professional)

## Public Outreach

Notice of each community meeting/open house was provided in advance by email and via the postal service to local media, and distributed to many municipalities, agencies, and organizations to post either on their websites or community events calendars. Local media coverage of the open houses provided additional information to a wide audience.

Social media was used to communicate NYRCR Plan information with critical updates of key project milestones and outreach events posted on NYRCR website at: [www.stormrecovery.ny.gov/nyrcr](http://www.stormrecovery.ny.gov/nyrcr). This strategy was ongoing throughout the project.

All public participation activities were designed and implemented to engage the members of the Community to the fullest extent possible under an aggressive project schedule. The most effective and informative form of connecting with critical stakeholders was through stakeholder meetings and interviews. The NYRCR Committee was regularly engaging the stakeholders and community at-large and, consequently, they received details regarding the specific storm events as well as specific recommendations regarding best practices for creating a more resilient community.



Tonawanda Newspaper from the summer of 2013 flooding brought to a public informational meeting

Photo Credit: AECOM/Staff Photographer (Non-Professional)



### Community Asset Inventory and Risk Assessment

Risk is the chance that something will be damaged or destroyed. The NYRCR Program works to reduce risk to community functions. Most community functions are associated with places, neighborhoods, facilities or infrastructure systems, referred to as assets. Assessing the risk to assets helped the NYRCR Committee understand and identify projects and measures to reduce risk and ensure appropriate long-term economic growth.

The purpose of the asset inventory and risk assessment is to help evaluate the potential for floods to compromise community functions and to help communities assess and quantify the risk to their assets. These metrics assisted the NYRCR Committee in identifying and supporting projects to protect or reduce the risk to high-value community assets.

#### Community Asset Inventory

An asset inventory was conducted to identify community assets within Niagara County in the 100- and 500-year floodplains. The identified assets were then classified by Recovery Support Function (Economic, Health and Social Services, Housing, Infrastructure Systems, and Natural and Cultural Resources). Further evaluation of the assets occurred to determine which facilities were considered FEMA critical assets or locally significant critical assets, as determined by the Niagara County Multi-Jurisdictional Hazard Mitigation Plan.

#### Risk Assessment

The assignment of risk to assets and systems was conducted using the formula-based spreadsheet risk assessment tool developed by the New York State Department of State. The risk assessment tool was used to analyze information and generate a risk score for each asset based on three factors that contribute to risk:

- **Hazard:** The likelihood and magnitude of anticipated hazard events.
- **Exposure:** Local landscape characteristics that tend to increase or decrease storm effects.
- **Vulnerability:** The capacity of an asset or system to return to service after a storm event.

Hazard, exposure, and vulnerability scores were assigned to each asset based on floodplain location, landscape attributes, and potential impact to service or function of the asset. The risk score for each critical asset was then generated by multiplying the hazard, exposure, and vulnerability scores.

The range of possible risk scores generated from these three factors are classified as severe, high, moderate, or residual risk. Severe risk scores are those over 53. A severe risk score could represent that the asset is in a dangerous situation and relocation may be a priority option for the asset. High risk scores range from 24 to 53 and are indicative of conditions that could lead to significant negative outcomes from a storm. Moderate risk scores range from 6 to 23 and are indicative of moderate to serious consequences in a storm. Residual risk scores are those lower than 6, which suggest floods would pose minor or infrequent consequences.

No assets in Niagara County received a severe risk score. Ten assets received a high risk score. Thirty-eight assets received a moderate risk score. Two assets received a residual risk score. The asset information and risk assessment scores that show the baseline condition of critical assets are included in Table 11.

Additional information on the asset inventory and risk assessment processes are described in Section 2 of this document, Assessment of Risks and Needs.



Page Intentionally Left Blank



# Table 11 - Community Asset Inventory and Risk Assessment

ASSET INFORMATION							LANDSCAPE ATTRIBUTES							RISK ASSESSMENT (100-year event)				
Asset Name	Risk Area	Asset Class	Asset Subcategory	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures Absent	Asset Site Below Base Flood Elevation	Freeboard Elevation Less than Two Feet Above BFE	Asset Near Point of Confluence	Asset Near Stormwater System Discharge	Vegetated Stream Bank Buffers Absent	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Risk Level
Norampac Industry	High	Economic	Industrial, Warehousing and Manufacturing	Yes	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2.50	3	23	Moderate
Niacet Corp	Moderate	Economic	Industrial, Warehousing and Manufacturing	Yes	No, Locally Significant	Medium	Yes	No	Yes	No	No	No	1	3	1.50	3	14	Moderate
International Filler Corp	Moderate	Economic	Industrial, Warehousing and Manufacturing	Yes	No, Locally Significant	Medium	Yes	No	No	No	No	No	0.5	3	1.00	3	9	Moderate
Reliance Fluid Technologies/K-C Divestiture	Moderate	Economic	Industrial, Warehousing and Manufacturing	Yes	No, Locally Significant	Medium	No	No	No	No	No	No	0	3	0.50	3	5	Residual
Barker Fire Department	High	Health and Social Services	Emergency Operations/Response	No	Yes, FEMA	High	Yes	Yes	Yes	No	Yes	Yes	2.5	3	3.50	3	32	High
Wendleville Fire Company	High	Health and Social Services	Emergency Operations/Response	No	Yes, FEMA	High	Yes	Yes	Yes	No	No	No	1.5	3	2.50	4	30	High
Niagara-Wheatfield Central School District	High	Health and Social Services	Schools	No	Yes, FEMA	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	High
Niagara Falls Fire Department - Royal Avenue Firehouse	High	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	Yes	Yes	No	Yes	No	2	3	3.00	3	27	High
Wilson Town Highway Department	High	Health and Social Services	Government and Administrative Services	No	No, Locally Significant	High	Yes	Yes	Yes	No	No	Yes	2	3	3.00	3	27	High
Town of Lockport Assessors Office	High	Health and Social Services	Government and Administrative Services	No	Yes, FEMA	High	Yes	Yes	Yes	No	No	No	1.5	3	2.50	3	23	Moderate
St. John De LaSalle School	High	Health and Social Services	Schools	No	Yes, FEMA	High	Yes	No	No	Yes	Yes	No	1.5	3	2.50	3	23	Moderate
Heritage Nursing Home	High	Health and Social Services	Daycare and Eldercare	No	Yes, FEMA	High	Yes	Yes	Yes	No	No	No	1.5	3	2.50	3	23	Moderate
Niagara Falls Air Reserve	High	Health and Social Services	Military Installations	No	Yes, FEMA	High	Yes	Yes	No	No	No	Yes	1.5	3	2.50	3	23	Moderate
Bergholtz Fire Company	High	Health and Social Services	Emergency Operations/Response	No	Yes, FEMA	High	Yes	No	No	No	No	Yes	1	3	2.00	3	18	Moderate
Adams Fire Company	High	Health and Social Services	Emergency Operations/Response	No	Yes, FEMA	High	Yes	Yes	No	No	No	No	1	3	2.00	3	18	Moderate
Niagara Falls Fire Department	High	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	No	No	No	Yes	No	1	3	2.00	3	18	Moderate
Community Missions of Niagara Frontier	Moderate	Health and Social Services	Community Centers	Yes	Yes, FEMA	High	Yes	No	Yes	No	Yes	No	1.5	3	2.00	3	18	Moderate
United Cerebral Palsy	Moderate	Health and Social Services	Schools	Yes	Yes, FEMA	High	No	No	Yes	No	Yes	No	1	3	1.50	3	14	Moderate
Wheatfield Town Highway Department	Moderate	Health and Social Services	Government and Administrative Services	No	No, Locally Significant	High	Yes	No	Yes	No	No	No	1	3	1.50	3	14	Moderate
Wheatfield School District #4 - Erick Road Elementary School	High	Health and Social Services	Schools	No	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	1.50	3	14	Moderate
South Wilson Volunteer Fire Department	High	Health and Social Services	Emergency Operations/Response	Yes	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	1.50	3	14	Moderate
Niagara Street Elementary	Moderate	Health and Social Services	Schools	Yes	Yes, FEMA	High	No	No	Yes	No	Yes	No	1	3	1.50	3	14	Moderate
Summit Healthcare	Moderate	Health and Social Services	Healthcare Facilities	Yes	No, Locally Significant	High	Yes	No	Yes	No	No	No	1	3	1.50	3	14	Moderate
Niagara County Community College Summit Extension Center	Moderate	Health and Social Services	Government and Administrative Services	Yes	No, Locally Significant	High	Yes	No	Yes	No	No	No	1	3	1.50	3	14	Moderate
US Coast Guard Station	Moderate	Health and Social Services	Military Installations	No	Yes, FEMA	High	No	Yes	Yes	No	No	No	1	3	1.50	3	14	Moderate
Briody Health Care Facility	High	Health and Social Services	Daycare and Eldercare	Yes	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	1.50	3	14	Moderate
Elderwood Residences at Wheatfield	High	Housing	Senior Housing	Yes	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	1.50	3	14	Moderate
Sawyer Gardens	Moderate	Housing	Senior Housing	No	Yes, FEMA	High	No	No	No	No	No	No	0	3	0.50	3	5	Residual
Lockport Wastewater Treatment Plant	High	Infrastructure	Wastewater	Yes	Yes, FEMA	High	Yes	Yes	Yes	Yes	No	Yes	2.5	3	3.50	3	32	High
Robinson Road Pump Station - Niagara County Water District	High	Infrastructure	Wastewater	No	Yes, FEMA	High	Yes	Yes	Yes	No	Yes	Yes	2.5	3	3.50	3	32	High
Niagara Falls Water Board	High	Infrastructure	Wastewater	No	Yes, FEMA	High	Yes	Yes	Yes	Yes	Yes	No	2.5	3	3.50	3	32	High
Niagara County Water Pump Station	High	Infrastructure	Water Supply	No	Yes, FEMA	High	Yes	Yes	Yes	No	Yes	No	2	3	3.00	3	27	High
Niagara Falls Water Board	High	Infrastructure	Wastewater	No	Yes, FEMA	High	Yes	No	Yes	No	Yes	No	1.5	3	2.50	3	23	Moderate
Flying F Airport	High	Infrastructure	Transportation	No	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2.50	3	23	Moderate



Table 11, Continued

ASSET INFORMATION							LANDSCAPE ATTRIBUTES							RISK ASSESSMENT (100-year event)				
Asset Name	Risk Area	Asset Class	Asset Subcategory	Socially Vulnerable Populations	Critical Facility	Community Value	Defensive Flood Protection Measures Absent	Asset Site Below Base Flood Elevation	Freeboard Elevation Less than Two Feet Above BFE	Asset Near Point of Confluence	Asset Near Stormwater System Discharge	Vegetated Stream Bank Buffers Absent	Landscape Attribute Score ("Yes" = +0.5)	Hazard Score	Exposure Score	Vulnerability Score	Risk Score	Risk Level
Lockport Cambria Airport	High	Infrastructure	Transportation	No	No, Locally Significant	Medium	Yes	Yes	No	No	No	Yes	1.5	3	2.50	3	23	Moderate
Wilson Town Finished Water Storage	High	Infrastructure	Water Supply	No	Yes, FEMA	High	No	Yes	Yes	No	No	Yes	1.5	3	2.50	3	23	Moderate
Niagara Mohawk Power Corporation	Moderate	Infrastructure	Power Supply	Yes	Yes, FEMA	High	Yes	Yes	Yes	No	Yes	No	2	3	2.50	3	23	Moderate
Town Of Lockport Sewer District #3	High	Infrastructure	Wastewater	No	Yes, FEMA	High	Yes	No	Yes	No	No	No	1	3	2.00	3	18	Moderate
Town Of Wheatfield Water Storage	High	Infrastructure	Water Supply	No	Yes, FEMA	High	Yes	Yes	No	No	No	No	1	3	2.00	3	18	Moderate
Niagara Falls Wastewater Treatment Plant	Moderate	Infrastructure	Wastewater	Yes	Yes, FEMA	High	Yes	No	Yes	No	Yes	No	1.5	3	2.00	3	18	Moderate
Community Antenna Television	High	Infrastructure	Telecommunications	No	Yes, FEMA	High	Yes	No	Yes	No	No	No	1	3	2.00	3	18	Moderate
Niagara Mohawk Power Corporation Substation	High	Infrastructure	Power Supply	No	Yes, FEMA	High	Yes	No	No	No	Yes	No	1	3	2.00	3	18	Moderate
City Of Lockport Wastewater - Hoover Lift Station	High	Infrastructure	Wastewater	No	Yes, FEMA	High	Yes	No	No	No	No	Yes	1	3	2.00	3	18	Moderate
Empire State Pipeline	High	Infrastructure	Liquid Fuels	No	Yes, FEMA	High	Yes	Yes	No	No	No	No	1	3	2.00	3	18	Moderate
National Grid Substation	High	Infrastructure	Power Supply	No	Yes, FEMA	High	Yes	No	Yes	No	No	No	1	3	2.00	3	18	Moderate
Niagara County Water District Water Storage	High	Infrastructure	Wastewater	No	Yes, FEMA	High	Yes	No	No	No	No	Yes	1	3	2.00	3	18	Moderate
Niagara Falls Airport	High	Infrastructure	Transportation	No	Yes, FEMA	High	No	Yes	No	No	No	Yes	1	3	2.00	3	18	Moderate
City Of North Tonawanda Water Supply	High	Infrastructure	Water Supply	Yes	Yes, FEMA	High	No	Yes	Yes	No	No	No	1	3	2.00	3	18	Moderate
Town Of Lockport Water Supply	High	Infrastructure	Water Supply	No	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	1.50	3	14	Moderate
North Tonawanda Wastewater Treatment Plant	High	Infrastructure	Wastewater	No	Yes, FEMA	High	No	No	No	No	Yes	No	0.5	3	1.50	3	14	Moderate
National Fuel Gas Company	Moderate	Infrastructure	Liquid Fuels	Yes	Yes, FEMA	High	No	No	Yes	No	Yes	No	1	3	1.50	3	14	Moderate
Lockport City Raw Water Pump Station	High	Infrastructure	Wastewater	No	No, Locally Significant	High	No	No	No	No	Yes	No	0.5	3	1.50	3	14	Moderate
Tennessee Gas Pipeline	High	Infrastructure	Liquid Fuels	No	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	1.50	3	14	Moderate
BFI Waste Systems / Niagara Recycling Inc	High	Infrastructure	Hazardous Materials, Solid Waste, and Recycling	No	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	1.50	3	14	Moderate
Wilson Wastewater Treatment Plant	High	Infrastructure	Wastewater	No	Yes, FEMA	High	No	No	No	No	No	Yes	0.5	3	1.50	3	14	Moderate
City Of Lockport Water Supply	High	Infrastructure	Water Supply	No	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	1.50	3	14	Moderate
Niagara Mohawk Power Corporation	Moderate	Infrastructure	Power Supply	Yes	Yes, FEMA	High	Yes	No	No	No	Yes	No	1	3	1.50	3	14	Moderate
Erie Boulevard Hydropower LP	High	Infrastructure	Power Supply	No	Yes, FEMA	High	No	No	No	No	Yes	No	0.5	3	1.50	3	14	Moderate
Modern Landfill Inc	High	Infrastructure	Hazardous Materials, Solid Waste, and Recycling	No	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	1.50	3	14	Moderate
Lake Ontario Ordnance Works	High	Infrastructure	Hazardous Materials, Solid Waste, and Recycling	No	No, Locally Significant	High	Yes	No	No	No	No	No	0.5	3	1.50	3	14	Moderate
City Of North Tonawanda Water Supply	High	Infrastructure	Water Supply	Yes	Yes, FEMA	High	No	No	No	No	No	No	0	3	1.00	3	9	Moderate
Empire State Pipeline	Moderate	Infrastructure	Liquid Fuels	No	Yes, FEMA	High	Yes	No	No	No	No	No	0.5	3	1.00	3	9	Moderate
City Of North Tonawanda Water Supply	High	Infrastructure	Water Supply	Yes	Yes, FEMA	High	No	No	No	No	No	No	0	3	1.00	3	9	Moderate
Oppenheim County Park	High	Natural and Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2.50	3	23	Moderate
Niagara County Public Golf Course	High	Natural and Cultural Resources	Parks and Recreation	No	No, Locally Significant	Medium	Yes	Yes	Yes	No	No	No	1.5	3	2.50	3	23	Moderate



## End Notes

### Section I: County Overview

1. Niagara County Department of Economic Development. *Niagara County Comprehensive Economic Development Strategy (CEDS)*. June 2013.
  2. U.S. Census Bureau. *2008-2012 American Community Survey*.
  3. *Niagara Communities Comprehensive Plan 2030: A Plan to Communicate, Collaborate and Connect*. July 2009: V-4.
  4. *Niagara Communities Comprehensive Plan 2030: A Plan to Communicate, Collaborate and Connect*. July 2009.
  5. *Niagara Communities Comprehensive Plan 2030: A Plan to Communicate, Collaborate and Connect*. July 2009.
  6. NOAA National Climatic Data Center. *Storm Events Database*. <http://www.ncdc.noaa.gov/stormevents>; and *Niagara County Multi-Jurisdiction Hazard Mitigation Plan*. Prepared for Niagara County Department of Emergency Services by Ecology and Environment, Inc. February 2008: 4.2.
  7. *Niagara County Multi-Jurisdiction Hazard Mitigation Plan*. Prepared for Niagara County Department of Emergency Services by Ecology and Environment, Inc. February 2008: 4.2.
  8. *Niagara Communities Comprehensive Plan 2030: A Plan to Communicate, Collaborate and Connect*. July 2009.
  9. Niagara County Department of Economic Development. *Niagara County Comprehensive Economic Development Strategy (CEDS)*. June 2013.
  10. *Niagara County Comprehensive Emergency Plan*. Prepared for County of Niagara by Ecology and Environment, Inc. Updated – June 2007.
  11. *Niagara County Multi-Jurisdiction Hazard Mitigation Plan*. Prepared for Niagara County Department of Emergency Services by Ecology and Environment, Inc. February 2008.
  12. *Cross Border Contingency Plan: Standard Operating Procedures for Peacetime Disaster*, July 2004.
  13. *One Region Forward*. <http://www.oneregionforward.org/>
  14. Western New York Regional Economic Development Council. *Western New York Regional Economic Development Strategic Plan: A Strategy for Prosperity in Western New York*. November 2011.
  15. NYSERDA *Cleaner Greener Communities*. Western New York Regional Sustainability Plan 2013.
  16. Erie Canalway National Heritage Corridor Commission and National Park Service. *Erie Canal National Heritage Corridor 2011-2016 Strategic Plan*. 2011
  17. *The Great Lakes and St. Lawrence Cities Initiative*. *Sustainable Municipal Water Management: Measuring Progress and Reporting Publicly*. July 2012.
  18. Buffalo Niagara Riverkeeper. *Buffalo Niagara Greenway Habitat Conservation Strategy Phase I*. January 2013. Prepared for the Greenway Ecological Standing Committee.
- Cover Images courtesy of Niagara Falls Water Board and Lockport Journal.

