

Hazard Profile – Severe Winter Storm

Winter storms have been characterized by the Town / Village of Harrison Mitigation Planning Committee as the 3rd most severe hazard event to which the study area is susceptible. Because storm intensity and duration can vary extremely from year to year, The Town / Village must always be prepared for a worst case scenario event. Winter storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize a region, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. The cost of snow removal, damage repair, and business losses can have a tremendous impact on the study area. Communications and power can be disrupted for days until damage can be repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents can result with injuries and deaths. Information for this hazard was taken from the below listed as well as other sources:

- *Northeast Regional Climate Center (NRCC) based at Cornell University.* A review of the climatic conditions of New York State, and their effects upon persons, property, and economics. This document was obtained from the following Cornell University web site http://nysc.eas.cornell.edu/climate_of_ny.html. The center is a partner of the National Climatic Data Center. The NRCC contact person is Keith Eggleston.
- *NOAA Satellite and Information Services and National Climate Data Center.* <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms> . This web-based database maintains the records for many types of disasters dating back to 1950, and allows users to make queries by state, disaster type, and time period, etc.
- *Town of Harrison Department of Public Works files*

The following chart provides the definition of a winter storm:

Table 5-43 Severe Winter Storm Definition

Term	Definition
Winter Storm	Includes ice storms, blizzards, and can be accompanied by extreme cold. The National Weather Service characterizes blizzards as being combinations of winds in excess of 35 miles per hour with considerable falling or blowing snow, which frequently reduces visibility.

Source: NYSEMO 2008 Hazard Mitigation Plan

Winter storms are a common seasonal occurrence in the Town / Village of Harrison although individual storm intensity and duration can vary widely. The most damaging and costly winter season in recent memory is 1996 and in particular the months of January, February and March. Municipal public works officials can testify to the feeling that “it felt like it snowed every 48 hours from January through early March”. Road deicing materials (salt) were in short supply at one point and deliveries became sporadic and less than what was ordered due to transportation problems associated with distribution points. The estimated 18 to 24 inches of snow that fell during the January 1996 Blizzard required a request for assistance to the New York National Guard. Military personnel and equipment assisted the overburdened municipal work force with snow removal following the actual storm event.

Geographic Location and Extent

The entire Town / Village of Harrison is susceptible to winter storms. The Northeast Regional Climate Center (NRCC) based at Cornell University in Ithaca, New York states that the mean snowfall for the study area is 40 to 50 inches annually. A typical snow event can range from a dusting to more than 12 inches. Several factors will determine the severity of a severe winter storm including temperature, wind speed, type of precipitation, day or nighttime event as well as when in the winter season the storm occurs. Typical categories of severe winter storms include heavy snow, blizzard, sleet or freezing rain and ice storms.

The Northeast Snowfall Impact Scale (NESIS) developed by Paul Kocin of The Weather Channel and Louis Uccellini of the National Weather Service ([Kocin and Uccellini, 2004](#)) characterizes and ranks high-impact Northeast snowstorms. These storms have large areas of 10 inch snowfall accumulations and greater. NESIS has five categories: Extreme, Crippling, Major, Significant, and Notable. The index differs from other meteorological indices in that it uses population information in addition to meteorological measurements. Thus NESIS gives an indication of a storm's societal impacts. This scale was developed because of the impact Northeast snowstorms can have on the rest of the country in terms of transportation and economic impact. (<http://www.ncdc.noaa.gov/oa/climate/research/snow-nesis/>)

Table 5-44 Northeast Snowfall Impact Scale

NESIS Snowstorm CategoriesCategory	NESIS Value (Snowfall in Inches)	Description
1	1-2.499	Notable
2	2.5-3.99	Significant
3	4-5.99	Major
4	6-9.99	Crippling
5	10+	Extreme

Source: <http://www.ncdc.noaa.gov/oa/climate/research/snow-nesis/#rankings>

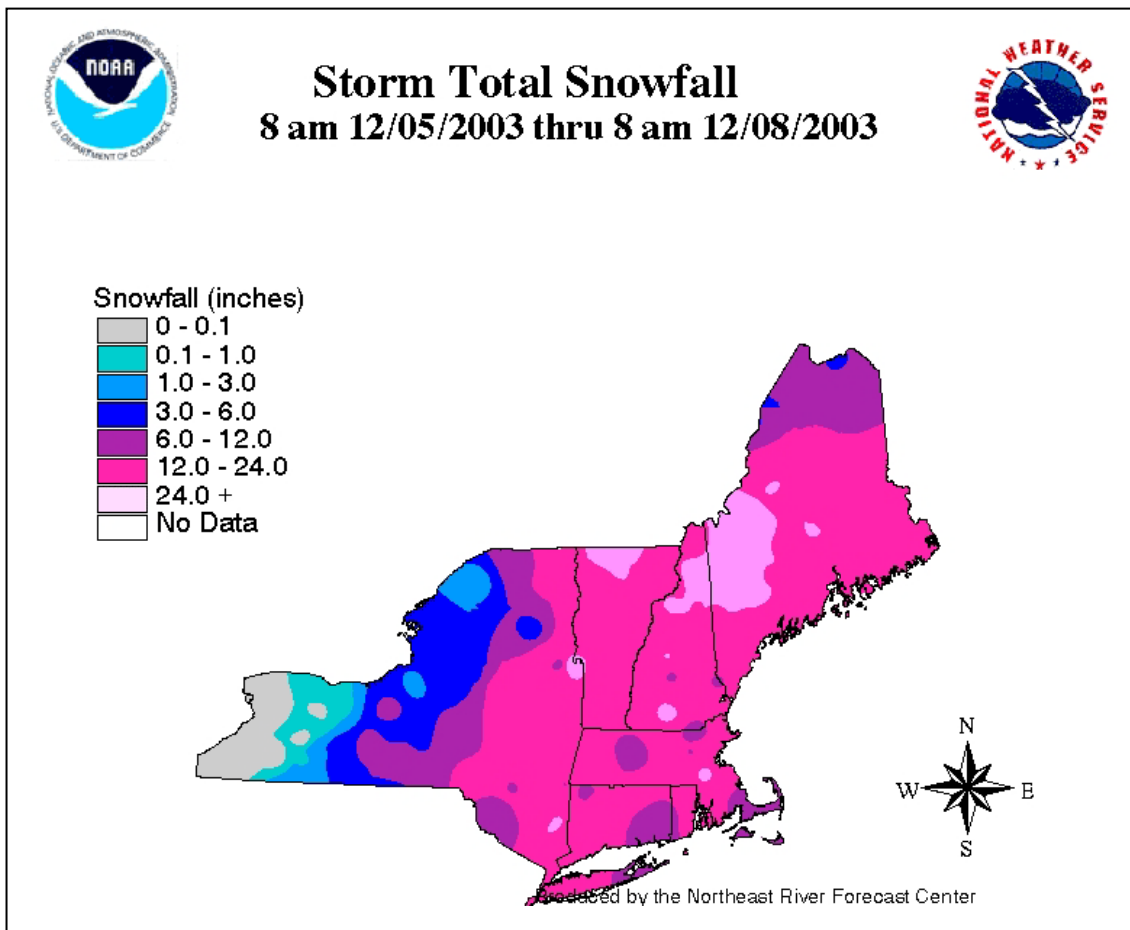
Severe winter storms have the ability to disrupt municipal operations and the every day lives of people over periods of one to several days. Schools and businesses may be closed, municipal workers may be forced to defer routine services in order to clear roads of snow. Snow and ice have the ability to down trees and power lines which can cause homes and businesses to be without the ability to provide heat. Municipal snow and ice control equipment vehicles may cause damage to roads and bridges as a result of several freeze and thaw cycles as well as cumulative damage from road salt and other chlorides.

Previous Occurrences and Losses

Westchester County and the Town / Village of Harrison have experienced some 57 snow / ice storms of varying intensities between January 1950 and May 2008 according to the NOAA National Climatic Data Center. Presidential Disaster Declarations for Severe Winter Storm Events are listed in Table 5-71. The **NEWS FROM THE NORTHEAST REGIONAL CLIMATE CENTER** reported the following on the January 1996 “Blizzard of 96”:

ITHACA, N.Y. -- While much of the eastern United States digs out from the Blizzard of `96, the snow has stopped falling but snowfall records continue to fall and storm-related anecdotes pile up, according to climatologists from the Northeast Regional Climate Center at Cornell University. Philadelphia and parts of New Jersey were hammered by the greatest one-storm, snowfall totals ever. In Philadelphia, the storm left 30.7 inches of snow, breaking the old one-storm snowfall total by 9.4 inches - the previous record was the Feb. 11-12, 1983, storm that blanketed the City of Brotherly Love with 21.3 inches of snow. This week's blizzard exceeded the 12 inches of snow left during 1993's so-called "Storm of the Century." The all-time record snowfall for New Jersey - 34 inches in coastal Cape May, in February 1899 - was beaten by 1 inch at Whitehouse Station in northeastern Hunterdon County, N.J., which received 35 inches of snow through Jan. 9. The snowfall record in Newark, N.J. - 22.6 inches set on Feb. 3-4, 1961 - did not measure up to the 1996 blizzard's 27.8 inches. The 1993 "Storm of Century" left but 12.7 inches in Newark, a faint match for this week's onslaught. Central Park in New York City recorded 20.2 inches of snow in this storm, making it the third highest snowfall ever there. On parts of nearby Staten Island, N.Y., more than 27 inches of snow fell. LaGuardia International Airport, N.Y., recorded 24 inches of snow, which exceeds the normal for the entire season of 22.6 inches. Most of upstate New York saw little or no snow. The snow line was very pronounced: In Columbia County, N.Y., between Albany and New York City, weather stations such as Ancram, N.Y., recorded 23 inches of snow, while nearby Valatie, N.Y., saw but 2 inches. Scranton, Pa., recorded 21 inches of snow, while Binghamton, N.Y., just to the north on Interstate 81, recorded only a trace of snowfall from this storm. Through the middle Atlantic corridor, the Blizzard of `96 spared few places. Dulles International Airport, in the Virginia suburbs of Washington, D.C., had a storm total of 24.6 inches of snow, but set a new 24-hour period record of 19.8 inches. Pocahontas County, W.Va., was pounded with between 40 and 48 inches of snow. Webster County, W.Va., recorded between 24 and 46 inches of the white stuff, and Randolph County, W.Va., experienced between 20 and 40 inches of snow. Petersburg and Brandywine, W.Va., both received 30 inches of snow. Shenandoah, Va., caught 37 inches of snow from the blizzard and Sperryville, Va., had 31 inches.

Figure 5-26 Snowfall for study area December 5, 2003 storm event



Source: NOAA

On February 12, 2006, the New York Times reported 16-24 inches of snow had fallen in the New York Metropolitan Area. The snow was accompanied by wind gusts of up to 50 miles per hour. Consolidated Edison Company of New York, which provides electric service to the area reported 250 crews had been mobilized for response coverage in Westchester County.

Table: 5-45 Presidential Disaster Declarations for Severe Winter Storm Events

Type of Event	Date	Declaration Number	Municipal Assistance in Dollars
Nor'easter (winter storm)	December 1992	0974-DR-NY	
Blizzard	March 1993	3107-EM-NY	
Blizzard	January 1996	1083-DR-NY	
Snowstorm	February 2003	3184-EM-NY	

Source: FEMA Presidential Declarations

Probability of Future Events

The Town / Village of Harrison lies within high latitudes thus making the study area prone to winter storm events. The study area over time can meet the mean average snowfall of 40 to 50 inches. Based on historical records, input from the HMPC and the institutional memory of municipal officials, the probability of occurrence for a severe winter storm in the Town/Village is considered frequent (likely to occur more than once every 5 years)

Vulnerability Assessment

A vulnerability assessment is defined as assessing the vulnerability of people and the built environment to a given level of hazard. After identifying types of risk, a vulnerability analysis can help to determine the weak points in the community. This assessment examines the vulnerability of the existing and future built environment, such as structures, utilities, roads and bridges, as well as environmental vulnerability, such as open space that can suffer from erosion. Once the geographic areas of risk are identified in the Town / Village, vulnerability can be assessed for the population, property and resources at risk in those areas. Vulnerability indicates what is likely to be damaged by the identified hazards and how severe the damage may be. For example, if an area is determined to be at risk of flooding, vulnerability estimates for that area could include residential property losses, impacts to the tax base and damages to public infrastructure. Severe winter storm events can impact the entire Town/Village of Harrison. All assets including population, structures, critical facilities and utilities are vulnerable. The following sections evaluate and estimate the potential impact of severe storms:

- Overview of vulnerability
- Data and methodology used in the evaluation
- Impact on life, safety and health
- Identifying structures including general building stock, critical facilities and critical infrastructure
- Economic impact
- Addressing Repetitive Loss Properties (NFIP data for floods, other hazards as available)
- Estimating Potential Losses
- Analyzing Development Trends (new buildings, critical facilities and Infrastructure)
- Additional Data and Next Steps
- Overall vulnerability conclusion
- Multi-jurisdictional Risk Assessment

Overview of Vulnerability

Severe winter storms are a major concern to the Town / Village of Harrison. As with any weather related event, technology allows for advance warnings as to the intensity and severity of such events. Severe winter storms can include heavy snow, ice, and blizzard conditions. Heavy snow can immobilize the study area, stranding commuters, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can collapse roofs and knock down trees and power lines. The cost of snow removal, damage repair, and business losses can have a tremendous impact on the study area government. Heavy accumulations of ice can

bring down trees, electrical wires and utility poles. Communications and power may be disrupted for days until damage can be repaired. Even small accumulations of ice may cause extreme hazards to motorists and pedestrians. Some winter storms are accompanied by strong winds, creating blizzard conditions with blinding wind-driven snow, severe drifting, and dangerous wind chills. Strong winds with these intense storms and cold fronts can knock down trees, utility poles, and power lines. Blowing snow can reduce visibilities to only a few feet in areas where there are no trees or buildings. Serious vehicle accidents can result with injuries and deaths.

Data and Methodology

Information for this hazard was provided by National, Institutional and Local databases as well as HAZUS-MH which provided population and general building stock information. The Town /Village of Harrison provided information with respect to municipal losses and costs associated with cleanups for Presidential Declarations.

Impact on Life, Safety and Health

The disruption of services during a severe winter storm and the ability to move about freely can impact the entire study area's population with particular emphasis on elderly, low and fixed income populations. The elderly are at risk from falls on icy surfaces. Public service transportation may be temporarily disrupted leaving populations with no means of food shopping, attending scheduled appointments and completing everyday activities. Table 5-72 below listed the population most susceptible problems associated with Severe Winter Storms.

Table: 5-46 Population Susceptible to Severe Winter Storms

Population Category	Number of Persons Susceptible
Elderly (Over 65 years of age)	3,537
Low Income (Persons living in households with annual incomes less than \$25,000 per year)	828

Source: Westchester County Department of Planning/2000 US Census

Impact on General Building Stock, Critical Facilities and Infrastructure

All General Building Stock, Critical Facilities and Infrastructure in the study area is susceptible to Severe Winter Storms. Locally available historical data on the impacts of this type event is limited. Discussions with municipal officials with respect to critical facilities impact identified leaking roofs as a common occurrence from ice buildup and damage to snow and ice control equipment.

Utilizing HAZUS – MH, possible severe storm damage scenarios were developed for events which could result in damage to the general building stock of .5%, 1%, 2% and 5%. These damage estimates are for information only in order to identify the potential for losses from such a winter storm event. Actual storm related damage data is not available.

Table: 5-47 General Building Stock Exposure with Percentage Damage Loss Estimates (\$1,000)

Building Occupancy Class	Number of Buildings	Total Value	.5% Damage Loss Estimate	1% Damage Loss Estimate	2% Damage Loss Estimate	5% Damage Loss Estimate
Agriculture	57	9,704	48.52	94.04	188.08	485.2
Commercial	673	669,177	3345.885	6691.77	13,383.54	33,458.85
Education	27	52,876	264.38	528.76	1,057.5	2,643.8
Government	16	18,789	93.945	187.89	375.78	939.45
Industrial	190	180,212	901.06	1802.12	3,604.24	9,010.6
Residential	6,618	1,865,990	9329.95	18659.90	37,379.8	93,399.5
Religion	43	41,243	206.215	412.43	824.86	2,062.15
Total	7,624	2,837,991	14,189.995	28,379.91	56,759.82	141,899.55

Damage to roadways as a result of winter storms is a common occurrence and requires maintenance and repair work once the winter season ends. Freezing and thawing cycles, the application of salt and chloride solutions to roadways creates pavement cracking, potholes and may include loss of overlayed wearing surfaces. Funds to perform this type work are typically incorporated in the Department of Public Works annual operating budget. Other areas where there is a potential for damage from a severe winter storm is the 100 and 500 year floodplain areas. Freezing and thawing cycles, damage to trees and associated debris from ice and heavy snow as well as blocked stormwater conveyance systems has the potential to cause flooding events under the right set of circumstances.

Economic Impact

The fact that severe winter weather is a common occurrence in the study area means that many residents, businesses and visitors are prepared to function to a certain extent under such conditions. Because technology can provide advance warnings for such events, residents will typically stock up on needed food items before such an event while shopping for other goods and services can be put off and appointments rescheduled. There are no data sources available to determine what impact a severe winter storm has on the economy. For the study area, any impact would be short term, typically a day or two based on past events. The most significant economic impact would be to the financial resources of the Town/Village of Harrison local government. Costs to maintain a passable highway network as well as the removal of snow from roadways and sidewalks, especially in the downtown business areas, can quickly escalate to the ten's of thousands or hundred's of thousands of dollars. During the winter storm of January 6-8, 1996, the Town / Village requested reimbursement under Presidential Declaration DR-1083 amounting to \$XXXXXXXXXXXX. Additionally the New York National Guard spent several days in the study area and surrounding communities assisting with snow removal.

Addressing Repetitive Loss Properties (NFIP data for floods, other hazards as available)

The National Flood Insurance Program provides information on payments to homeowners resulting from losses due to flooding where a separate insurance policy for such events has been purchased. Under the severe winter storm category, flooding may be a secondary or resulting event brought about by a combination of heavy snows, quickly warming temperatures and rain events before the ground has had time to thaw. Flooding events, repetitive loss properties and the associated analysis are discussed elsewhere in this report.

Estimating Potential Losses

See Table 5-73 above.

Analyzing Development Trends (new buildings, critical facilities and Infrastructure)

Section 4 of this plan Municipal Profile – Future Development identifies several areas in the Town / Village of Harrison where the potential for development or redevelopment exists. As of January 1, 2009, construction underway is limited due to the economic turndown. The New York State Building Code has specific requirements for snow loads on a structure both uniform and concentrated. Severe winter storms have the potential for causing secondary impacts to any development including travel restrictions during such events, power outages, damage from windblown and falling debris. At the design stage of any such development, these factors should be given consideration particularly in the case of critical facilities and infrastructure.

Additional Data and Next Steps

Data available concerning severe winter storms is limited to municipal services related costs where a Presidential Declaration has been issued as a result of an event. There have been 4 such declarations since 1992 for the study area. FEMA HAZUS-MH does not provide modeling for Severe Winter Storm events. Some basic loss information was prepared for evaluating a severe winter storms impact utilizing occupancy class, building values and a percentage of loss. Having the ability to monitor and record individual losses associated with individual properties has the potential to lead to the development of models for evaluating severe winter storm related losses.

Overall vulnerability conclusion

The severe winter storm hazard has been determined to be a significant event and has been ranked as a high risk for the Town /Village of Harrison.