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High and Dry on the Waterfront

By James C. Schwab, AICP

Just north of New York City, in Rockland County, New York, on the western side of the Hudson River, sits the village of Piermont on a little more than one square mile of land, with about 2,500 people. Within that village lives Klaus Jacob, a seismologist at Columbia University's Lamont-Doherty Earth Observatory, who helped generate remarkably accurate estimates of the likely loss from an event like Hurricane Sandy.

What is equally remarkable is what happened to his home in Piermont. Taking a hint from Hurricane Irene in 2011, Jacob, who had already raised his house in 2003, wanted to avert damage by raising it higher above the base flood elevation established by the Federal Emergency Management Agency (FEMA) before Sandy hit. He soon learned that the town had a 22-foot height limit in its zoning regulations. His eight-foot-high top floor would exceed that limit if he elevated the house, and he chose not to give up the attic. Instead, he and his wife did what they could to elevate their kitchen appliances, including the stove, within the existing structure. That saved some of their property from the flooding from Sandy, but the existing zoning kept them from saving more. For a scientist who had worked with New York planners to estimate correctly the impact of Sandy, this outcome was, to say the least, a bit ironic.

In a YouTube video produced after the storm by the university's Earth Institute, Jacob notes that Sandy produced flooding one to two feet above the 100-year floodplain, "affecting a lot more people than those that normally get flood insurance, including myself." The result in Piermont, he says, was a "microcosm of what happened in New York City."

WHERE TO DRAW THE LINE

Questions such as those that faced Jacob become more likely after almost every natural disaster that involves flooding, whether from hurricane storm surges or from torrential downpours overloading rivers and streams. Those

events trigger a process within FEMA's National Flood Insurance Program (NFIP) to reassess existing flood maps based on new flood data, resulting in Advisory Base Flood Elevations (ABFEs) that establish new benchmarks for how high the 100-year flood will rise in specific locations. That base flood elevation is actually the level at which there is deemed a one percent annual chance of a flood occurring. It is a product of engineering calculations taking into account the historic experience with flooding in a community at the time the map is produced. The problem is that such maps are not static. They are influenced over time by the amount of development and impervious surface allowed into the floodplain and even the overall watershed. In the case of New York City, the maps that existed prior to Sandy dated from 1983. The city was well aware that they were outdated and was concerned about their accuracy before the storm.

FEMA released the new ABFEs for New York and New Jersey in February 2013. There are two primary consequences of these maps. The first is a change in flood insurance rates for properties previously located beyond the base flood elevation that now find themselves within the 100-year floodplain. In some cases, that may trigger requirements for flood insurance that did not previously apply to those properties; in others, it may simply mean that flood insurance becomes more expensive. The second consequence is that NFIP regulations require some form of mitigation for properties in the floodplain that are substantially dam-

aged; that is, those that have suffered damage exceeding 50 percent of market value. Mitigation can take a number of forms: wet or dry floodproofing, elevation, and buyouts are the most common. As a result of ABFEs including additional properties within the newly mapped floodplain, the owners are unable to rebuild without taking some appropriate action to reduce risk.

The scope of damage from Sandy gives some indication of the size of the rebuilding challenges that face these communities. According to the National Hurricane Center, Sandy damaged or destroyed nearly 650,000 homes in an arc ranging from Rhode Island to Maryland. It also killed 147 people in New York, New Jersey, and Connecticut.

In New York City, 218,000 residents live within currently mapped floodplains. The city has 520 miles of waterfront, much of it devoted to industrial and commercial uses; it is by far the largest shoreline of any city in the U.S. Approximately 90,000 buildings in New York City were in areas flooded by Hurricane Sandy, and 84 percent of those were built before FEMA produced its first flood insurance rate maps (FIRMs) for the city in 1983. New York thus has a great deal of property that is not compliant with current standards, much of which faces significant costs to upgrade to current codes. Moreover, in an urban area as dense as New York, relocating structures is often simply not an option. Other strategies are needed. The city's study of its urban design options, *Designing for Flood Risk*, notes that 98 percent

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About the Author

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of the buildings destroyed by Sandy, and 94 percent of those severely structurally damaged, were built before 1983.

Thus, the new ABFEs were no small deal for New York. They are laden with physical and economic implications for both property owners and the city itself. The city planning department notes that typical FEMA requirements are based on assumptions that apply to less dense communities with a wider range of options for reorienting land use. As a result, city officials decided even before Sandy that they needed to develop options that would be more applicable to denser urban areas. The city's search for such options also led to another study, funded by HUD and released in June 2013, *Urban Waterfront Adaptive Strategies*. One hope behind these efforts is that they will prove useful not only to New York itself, but to numerous other similarly dense cities across the country.

ADD A DOSE OF REFORM

Communities affected by Sandy face not only the immediate consequences of remapping, but the initial impact of the Flood Insurance Reform Act of 2012, also known as Biggert-Waters, after its two prime sponsors in the U.S. House of Representatives.

Passed a few months before Sandy, Biggert-Waters sought to remedy the long-term insolvency of the NFIP by amending its rate formulas as well as some of its regulations. Historically, the NFIP has offered subsidized, or non-actuarial, rates for flood insurance on properties built before FIRMs were established in any given area. The earliest maps were issued in 1974. Hurricane Katrina left the NFIP laden with nearly \$18 billion in debt. By 2012,

Congress had decided that reforming the rate structure was the most viable path to solvency for the program. Moreover, critics had argued for years that subsidized rates disguised the actual level of risk associated with many properties, effectively sending ratepayers the wrong signals, according to Samantha A. Medlock, policy counsel for the Association of State Floodplain Managers.

In New York State, just over 75 percent of the 176,000 policies in force are pre-FIRM, with 65 percent paying subsidized rates. As a result of the new law, property owners will see increases of 25 percent yearly until their policies catch up with actuarially established rates, which can be as high as \$1,410 yearly for homes at base flood elevation (BFE), and \$9,500 for those four feet below BFE, depending on the value of the home. Combine the impact of the new ABFEs

with that of Biggert-Waters, and the stage is set for property owners experiencing increases of hundreds of dollars annually in insurance premiums. For instance, according to Medlock, owners of pre-FIRM homes in A zones (see box) could now pay between \$1,050 and \$2,750, compared to \$230 to \$540 for homes built at least two feet above BFE, an elevation difference known as freeboard. Freeboard is defined as some safety factor, usually expressed in feet, that is required by state or local government above the BFE defined by FEMA. In other words, local zoning or building regulations might require that a building's ground floor be at least one or two feet above BFE. At the same time, some remedies, such as elevation, that would lower premiums, may become far more economically advantageous in the face of such cost increases. The annualized difference, spread over a number

FEMA FLOOD ZONE DEFINITIONS

The FEMA Map Service Center offers the following definitions on the FEMA website for A, V, and X zones:

A Zone: Areas with a one percent annual chance of flooding and a 26 percent chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown within these zones.

V Zone: Coastal areas with a one percent or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26 percent chance of flooding over the life of a 30-year mortgage. No base flood elevations are shown within these zones.

X Zone (if shaded on map): Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. Are also used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than one square mile.

Unshaded X Zones extend beyond the 500-year floodplain, but may still be capable of flooding in extreme events.

of years, could in many cases support the cost of elevating the home to achieve the premium reduction.

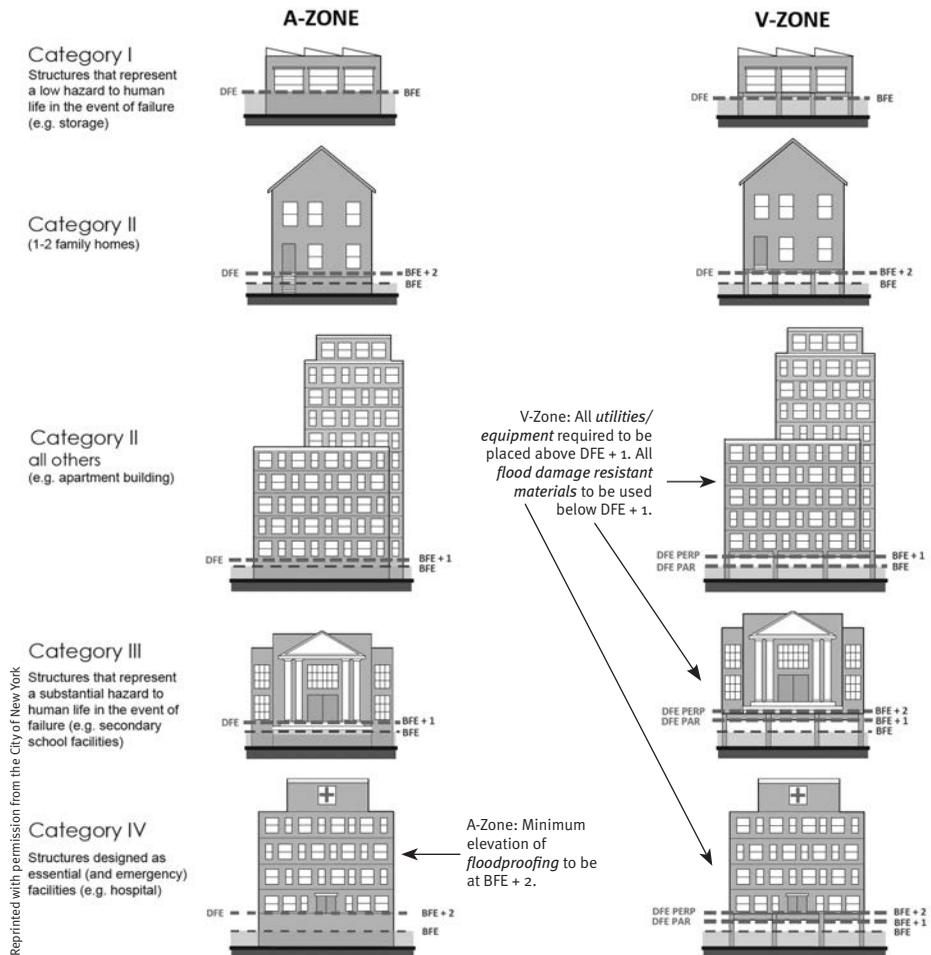
Another provision of Biggert-Waters could also have profound impacts on some urban neighborhoods in flood-prone areas. Once a pre-FIRM property is sold, or its flood insurance has lapsed, the subsidized rates disappear and actuarial rates apply with no transition period. This could well increase the difficulty of selling such properties by making them less attractive.

While the Northeast is the first region to feel the full impact of the Biggert-Waters reforms, it will not be the last. The changes will take effect nationwide, and with each major flood disaster, new ABFEs will compound that impact. What happens now in New York and New Jersey is merely a harbinger of changes to come elsewhere.

RESPONDING TO THE CHALLENGE

New York City officials have unquestionably responded with the most aggressive search for solutions. This effort is driven in large part by the challenge posed by dense urban development and the need to maintain the vibrancy of waterfront neighborhoods in the face of the changes that will inevitably be generated by both the remapping and flood insurance reform. Unlike some coastal communities, New York cannot simply elevate or relocate all its waterfront properties to escape the implications of these changes. In many cases, the neighborhoods would become physically unattractive and economically nonviable as a result. For high rises and many other multistory buildings, elevation is not a viable option; wet or dry floodproofing is more likely (see box).

The first problem facing many home owners in New York City under the new flood maps was the same one facing Klaus Jacob in his modest home in Piermont—the inability under existing zoning to elevate their homes because of height restrictions. Confronted with new flood insurance rates and unable to make adjustments that would reverse those increases, such property owners are caught between a federal rock and a locally regulated hard place. In a city known for high rises, however, planners wasted little time in confronting this dilemma. By January 31, 2013, Mayor Michael Bloomberg signed Executive Order No. 230, suspending the height limits for home owners seeking to comply with NFIP rules. Since then, the planning department has developed a text amendment for the city council to codify the needed changes, while also



From *Designing for Flood Risk*, this diagram illustrates how New York has differentiated required freeboard (in feet) for various building categories in both A and V flood zones.

addressing other issues such as low-grade parking and streetscape mitigations, and took these out for public review at 41 community boards in areas affected by flooding, emphasizing in part

how these changes would help residents lower their flood insurance premiums. The community boards offered nearly unanimous approval. The city planning commission approved the changes

TYPES OF FLOODPROOFING

There are basically two kinds of floodproofing: wet and dry. Both are workable options for protecting buildings and contents from flooding, but by design they have very different implications for building use:

Wet floodproofing allows water to enter and leave a structure without the use of mechanical equipment. This cannot work with basements because water would accumulate below the base flood elevation without a means of release. The idea is to equalize water pressure inside and outside through openings in the walls. This effectively renders lower levels unusable for most purposes, as living

and working space needs to be above the area where wet floodproofing is used.

Dry floodproofing uses water barriers such as sealant, aquarium glass, or other flood shields to protect a lower level from infiltration by water during a flood. In some cases, this may include the use of removable panels on windows that can be put in place during a flood emergency but otherwise kept in storage. This thus allows the use of floodproofed basements and other below-grade structures and retains building access at street grade, though such access can pose problems during a flood and thus is not allowed in entirely residential buildings.

in September, and city council approval was expected by the end of October (as this issue was going to press).

The diagram on page 4 helps to illustrate how New York has chosen to regulate buildings according to both building type and the flood zone in which they are located with respect to its “design flood elevation,” defined as the base flood elevation (BFE) plus the required freeboard. Adding one or two feet is a common approach, but New York, with a more complicated development environment, breaks out freeboard requirements by building category.

The issue in New York, however, is more than simply changing the text in the zoning

alternatives that could succeed in a dense urban environment, and to explore those options, it had already launched before Hurricane Sandy the studies that produced *Designing for Flood Risk* and *Urban Waterfront Adaptive Strategies*.

“Because of the coastal flood risks New York City faces and changes to the National Flood Insurance Program,” City Planning Commissioner Amanda M. Burden, FAICP, explains, “our communities are faced with the need to rebuild and retrofit buildings to withstand the next severe storm. Before Hurricane Sandy, we began our *Designing for Flood Risk* study to articulate principles for resilient buildings and neighborhoods that not only can withstand

the living space in single-family homes. Shrubbery, for instance, can soften the otherwise harsh blankness of the empty space beneath elevated ground floors. In new buildings, setbacks from the streetscape, not normally encouraged in a dense urban environment, may provide the needed space to accommodate various access features including ramps and steps while protecting living or working space from flooding. In retail or office locations where only modest elevation is needed, however, the design flood elevation may keep window space at eye level while allowing access through a short series of indoor steps, with a short, solid wall at street level.



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➡ Architectural elements can be used to mitigate the visual effects of elevated first floors on the streetscape. (From *Designing for Flood Risk*.)

code. The larger issue is that of preserving the quality of the urban fabric by encouraging the kinds of creative design changes in buildings and streetscapes that could maintain the character of waterfront urban neighborhoods. For flood protection, it may be important to elevate living or working space to design flood elevations. New buildings can do this by using street-level space for parking or building lobbies, or by building atop a berm that lifts the building’s base above flood level. For instance, some buildings in Baltimore’s Inner Harbor use the ground level for an open lobby while placing retail space on the second floor.

Building elevations that simply create blank walls at street level, however, create serious problems for the atmosphere of such a neighborhood or commercial district. New York City needed to make clear that there were better

flooding, but also support lively and pedestrian-friendly streets. This study was crucial to our ability to quickly craft thoughtful zoning changes following the storm to promote flood-resistant construction along with vibrant streetscapes and walkable neighborhoods. We believe these lessons can be applied more broadly to the region and to other coastal communities seeking to foster livable, walkable neighborhoods.”

One issue, complicated somewhat by compliance with the Americans with Disabilities Act (ADA), is that of stairways. Ramps are viable in larger buildings but can be problematic for closely built multistory housing, at the same time that elevators at floodable levels are equally problematic. Yet stairways and other design elements can be used, as the diagram above illustrates, to mitigate at least some of the more troubling visual impacts of elevating

SMALL BUT DENSE

One common reaction outside New York to almost any land-use regulations in New York is that the city is unique and that little that it does applies elsewhere. While that may often be the case in certain respects, what New York is doing with regard to flood risk may actually prove to be of considerable value for many other smaller cities facing similar design challenges. Density is not unique to New York, nor is the question of maintaining a walkable, visually attractive urban environment in flood-prone areas near waterfronts, whether they are harbors, inlets, rivers, or lakes. New Jersey, for instance, is full of smaller municipalities with comparable densities. What New York is trying to accomplish in response to Sandy may prove useful.

Hoboken, for example, is a city of about 50,000 people living in little more than one and



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➡ Elevated retail use in Soho, New York City (from *Designing for Flood Risk*).

The new changes included a reduction in required lot size for variances from a half-acre to 10,000 square feet, better reflecting typical infill lot sizes in the city’s dense environment. The ordinance also empowers the newly designated floodplain administrator (formerly “construction official”) to “review all development permits in the coastal high hazard area of the area of special flood hazard to determine if the proposed development alters the natural coastline so as to increase potential flood damage,” as well as to review plans for walls enclosing space below the base flood level. Another new section details freeboard requirements in special flood hazard areas, ranging from one foot for residential structures (except those in V zones, requiring two feet), up to three feet in V zones for buildings handling, storing, using, or disposing of hazardous materials. The ordinance also requires “attendant utilities and sanitary facilities” in new residential construction to be located above the BFE plus the required freeboard.

Looking forward, however, the city has additional issues to consider. The urban design retrofit considerations that have consumed a good deal of planning attention in New York are likely to get serious consideration over the coming year, according to Marks. The city’s Department of Administration, using a \$200,000 grant from the New Jersey Department of Com-

a quarter square miles. Numerous smaller villages along the New Jersey Shore, including most of those on the barrier islands, have little or no land outside the coastal floodplain. There is not much room to move, so it becomes important to use the available land wisely. The volume of damage from Sandy in many of these communities suggests that has not always happened.

Hoboken, however, is anxious to fix those problems. With 521 acres, or nearly 64 percent, of its upland space in the A zone, and 60.5 acres in the V zone, Hoboken faces serious constraints in trying to develop on high ground. The V zone is the area not only affected by coastal wave action in addition to still-water flooding. Another 62.5 acres lie in the X zone, defined as the area between the 100-year and 500-year floodplain boundaries.

In September, the city council undertook consideration of proposed amendments to the city’s flood damage protection ordinance. A cover letter from community development director Brandy Forbes, AICP, indicated the city is pursuing qualifications in the NFIP’s Community Rating System, which allows communities to accumulate points for activities beyond basic NFIP requirements as a means of lowering flood insurance premiums. Each of nine steps

in the program can lower rates by five percent. The new ordinance included adoption of the most recent FIRMS for Hoboken, replacing earlier maps from 2006, themselves much more recent than those in New York. According to Stephen Marks, AICP, the city’s assistant business administrator, the city’s goal was to act on the ordinance before the first anniversary of Hurricane Sandy, October 29.

- ➡ FEMA’s preliminary floodmap for Hoboken, issued in June 2013, shows V zones in the dark shaded areas and A zones in the light shaded area, along with the locations of critical community facilities.



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FREEBOARD REQUIREMENTS FOR AREAS OF SPECIAL FLOOD HAZARD

Building Type	Zones			
	X	A	Coastal A	V
Residential structures	+1'	+1'	+1'	+2'
Building and other structures with school or day care facilities, and other nonresidential structures not itemized below	+1'	+1'	+2'	+2'
Essential facilities including, but not limited to: fire, rescue, ambulance, and police stations and emergency vehicle garages; buildings designated as emergency shelters; other facilities required for emergency response; hospitals and other health care facilities having surgery or emergency treatment facilities; power generating stations and other public utility facilities	+1'	+2'	+2'	+3'
Buildings and other facilities that manufacture, process, handle, store, use, or dispose of hazardous materials	+1'	+2'	+2'	+3'
Temporary structures	n/a	+1'	+2'	n/a

- ➔ Hoboken's proposed Flood Damage Prevention Ordinance amendments include this new table detailing freeboard requirements based on flood zone and structure type.

community Affairs, released a request for proposals in October, seeking multidisciplinary consultant teams to develop a series of plans. The package includes development of new community design standards, a hazard mitigation plan, an open space, recreation, and historic preservation plan, and new codes, ordinances, and standards, with an eye toward the sorts of design guidelines that would help Hoboken address those questions.

FACING THE FUTURE

Sandy was not an anomaly, any more than Ike or Katrina or countless other storms and floods have been anomalies. It was a signal that planners need to anticipate such challenges as their communities continue to reinvent themselves in the quest for economic resilience and an urban quality of life. Combining flood protection with an attractive urban environ-

FURTHER READING ON SANDY AND FLOOD RISK DESIGN

- Hurricane Sandy Rebuilding Task Force. 2013. *Hurricane Sandy Rebuilding Strategy*. Available at http://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2013/HUDNo.13-125.
- New York Department of City Planning, City of. 2013. *Designing for Flood Risk*. New York: NYC Planning. Available at www.nyc.gov/designingforfloodrisk.
- New York Department of City Planning, City of. 2013. *Urban Waterfront Adaptive Strategies*. New York: NYC Planning. Available at www.nyc.gov/uwas.

ment will require creative design solutions, particularly in an era when climate change may raise the stakes for waterfront neighborhoods and commercial districts. Finding the kinds of adaptive solutions that New York is trying to define in the wake of Sandy is a matter not only of survival, but of restoring value to the urban core.

That said, other cities may well have to undertake exercises similar to that in New York, yet unique to their own history and circumstances. With growing numbers of Americans moving to coastal areas, those cities will need to determine how best to maintain the attractions of the urban shoreline while adequately protecting those areas from coastal storms and flooding. This is no small issue for the future of American urban planning. With hundreds of billions of dollars of urban real estate at stake, it may well become one of the most important.

Landscaping can help mitigate the visual effects of a home that has elevated its first floor as a flood protection measure. Cover image reprinted with permission from the City of New York; design concept by Lisa Barton.

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