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*Submitted electronically via joseph.ruggeri@dep.state.nj.us*

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**Re: Federal Emergency Management Agency (FEMA) Preliminary Flood Insurance Rate Maps (FIRMs) and Preliminary Flood Insurance Studies (FISs) for Hudson, Monmouth, and Middlesex Counties of New Jersey**

Dear Mr. Schaefer:

Thank you for the opportunity to comment on the Federal Emergency Management Agency (FEMA) Preliminary Flood Insurance Rate Maps (FIRMs) and Preliminary Flood Insurance Study (FIS) for Hudson, Monmouth, and Middlesex Counties of New Jersey that were released in December 2013. These comments are submitted by the Natural Resources Defense Council (NRDC), which works on behalf of our more than 1.4 million members and online activists to ensure a safe and healthy environment for all living things. With offices in New York, Washington, D.C., San Francisco, Los Angeles, Chicago, Montana, and Beijing, our staff of more than 400 lawyers, scientists, policy analysts and others, works to protect the environment and public health through advocacy and education.

NRDC is supportive of FEMA's efforts to update its FIRMs for the three counties of New Jersey. Up-to-date maps are essential for informing the public and local officials about the risks of flooding. More importantly, having a complete and accurate understanding of the counties' current *and* future flood risks is necessary to ensure that the work to rebuild New Jersey in the wake of Hurricane Sandy will actually enhance communities' resilience to future flooding rather than continuously put lives and properties in harm's way.

However, New Jersey's coastal communities face increasing flood risks due to climate change and the Preliminary FIRMs and FISs fail to take into account climate change impacts,

such as anticipated sea level rise and associated intensification of storm surge, as well as increasing storm frequencies. Moreover, in 2012, Congress required FEMA to consider climate change impacts when updating FIRMs. FEMA itself has already recognized the importance of integrating climate change adaptation into its programs and policies and is doing so in other areas of disaster preparedness. In addition, sea level rise data and other relevant local scientific information are readily available. Similarly, information from recent storms like Hurricane Sandy was not included in the FISs. As the most recent large event, the impacts of Hurricane Sandy can provide valuable data for model calibration. For these reasons, and because failure to factor climate change-related risks into FIRMs will have significant impacts, we encourage FEMA to revise the counties' flood maps to include climate change impacts, as well as information from Sandy, before finalizing them.

Thank you for considering our recommendations. Our detailed comments follow below.

#### **I. New Jersey's Coastal Communities Face Increasing Flood Risks Due to Effects of Climate Change**

As the climate warms, the nation's flood risks will increase. According to a 2013 FEMA report that analyzed the effects of climate change on the National Flood Insurance Program (NFIP), rising sea level, coupled with stronger and more frequent storms, will put coastal communities, on average, at a 55% greater risk of flooding by 2100.<sup>1</sup> As such, New Jersey's coastal counties are especially vulnerable to the impacts of climate change given its extensive low-lying areas and tidally influenced rivers.

The Rutgers Climate Institute released a report in 2013 stating that since 1915, sea level has risen at a rate of more than 1.5 inches per year along the New Jersey coast – a pace greater than the rate of global sea level rise due to the fact that the New Jersey shore is subsiding at the same time that sea levels are rising.<sup>2</sup> Sea levels in the Northeast from Cape Hatteras, NC to the Long Island, NY area are rising faster than average, according to two recent studies that suggest New Jersey is in this “hot spot” of relatively rapid sea level rise.<sup>3</sup> Because of largely anthropogenically-driven sea level rise, Hurricane Sandy flooded an area roughly 27 square miles greater than it

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<sup>1</sup> Federal Emergency Management Agency, *The Impact of Climate Change and Population Growth on the National Flood Insurance Program through 2100*, June 2013, 6-1, available at [http://www.aecom.com/deployedfiles/Internet/News/Sustainability/FEMA%20Climate%20Change%20Report/Climate\\_Change\\_Report\\_AECOM\\_2013-06-11.pdf](http://www.aecom.com/deployedfiles/Internet/News/Sustainability/FEMA%20Climate%20Change%20Report/Climate_Change_Report_AECOM_2013-06-11.pdf).

<sup>2</sup> Rutgers Climate Institute, *State of the Climate: New Jersey*, 2013, 6, available at <http://climatechange.rutgers.edu/custom/climatereport-final-2013/> (“Rutgers Climate Institute Report”).

<sup>3</sup> John D. Boon, *Evidence of Sea Level Acceleration at U.S. and Canadian Tide Stations, Atlantic Coast, North America*, *Journal of Coastal Research* (2012), 1437 – 1445, available at <http://www.jcronline.org/doi/pdf/10.2112/JCOASTRES-D-12-00102.1>; Asbury H. Sallenger Jr. et. al., *Hotspot of accelerated sea-level rise on the Atlantic coast of North America*, *Nature Climate Change* (2012), 884-888.

would have in 1880, placing an additional 38,000 New Jersey residents at risk from flooding.<sup>4</sup> The Rutgers Climate Institute Report also projected that sea level along the New Jersey coast will rise 7 to 16 inches by 2030, 13 to 28 inches by mid-century, and 30 to 71 inches by 2100.<sup>5</sup> Furthermore, there is high confidence that the impacts of future storms are likely to be more severe due to rising sea levels. Rising sea levels will raise the baseline for flood events, and when coupled with projected increases in storm intensity<sup>6</sup>, will lead to increased incidences of coastal flooding and erosion for New Jersey.<sup>7</sup> Flooding similar to that seen during Hurricane Sandy, even from storms of far weaker intensity and size, could occur every other year by 2100 because of increasing storm surges as a result of rising seas.<sup>8</sup>

## **II. The Accuracy of the FISs is Undermined by Not Using the Most Relevant Historical Data**

### **a. The FISs Failed to Incorporate Data from Hurricane Sandy**

While the FISs incorporated updated topographic data and new coastal analyses, the benefit of the updated FIRMs is undermined by the fact that they are based on historical data that does not include recent information from Hurricane Sandy. As explained in more detail below, historical data related to flood and storm events can no longer be relied upon as the *sole* predictors of future risks. That being said, the historical data that is used must, at a minimum, include the most recent, relevant information. The three FISs were underway when Hurricane Sandy hit in October 2012 and it was decided that data from the event would not be included in the study.<sup>9,10,11</sup> This is a major flaw in the FISs. Data from recent events like Hurricane Sandy should not only be considered, but should be prioritized as it may capture some of the effects of climate change that have already occurred or are likely to in the near future. While the FISs envision that maps and flood elevations will be amended periodically to

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<sup>4</sup> Kenneth G. Miller et.al., *A geological perspective on sea-level rise and its impacts along the U.S. mid-Atlantic coast*, Earth's Future (2013), available at <http://onlinelibrary.wiley.com/doi/10.1002/2013EF000135/pdf>.

<sup>5</sup> Rutgers Climate Institute Report at 6.

<sup>6</sup> *Id.*

<sup>7</sup> Ben Strauss et. al., *New Jersey and the Surging Sea: A Vulnerability Assessment with Projections for Sea Level Rise and Coastal Flood Risk*, Climate Central (2013), 17, available at <http://sealevel.climatecentral.org/uploads/ssrf/NJ-Report.pdf>.

<sup>8</sup> William Sweet et. al., *Hurricane Sandy Inundation Probabilities Today and Tomorrow*, American Meteorological Society (September 2013), available at <http://www1.ncdc.noaa.gov/pub/data/cmb/bams-sotc/extreme-events/2012/BAMS-Extremes-of-2012-Section-06.pdf>.

<sup>9</sup> Federal Emergency Management Agency, *Flood Insurance Study, Hudson County, New Jersey*, December 20, 2013, 11 ("Hudson FIS").

<sup>10</sup> Federal Emergency Management Agency, *Flood Insurance Study, Monmouth County, New Jersey*, January 31, 2014, 46 ("Monmouth FIS").

<sup>11</sup> Federal Emergency Management Agency, *Flood Insurance Study, Middlesex County, New Jersey*, January 31, 2014, 61 ("Middlesex FIS").

reflect future changes<sup>12</sup>, the longer FEMA waits to update information, the longer people are at risk and the more infrastructure will be constructed that will provide insufficient levels of protection.

### **b. The FISs Failed to Incorporate Recent Sea Level Rise for New Jersey**

The coastal analyses in the FISs appear to be based on information contained in FEMA's 2011 Model Validation for FEMA Region II Storm Surge Study (2011 Storm Surge Study).<sup>13</sup> For calibration and reporting purposes, the 2011 Storm Surge Study compared high water mark (HWM) data for historic storm events with the most current National Tidal Datum Epoch (NTDE) that is based on the 19-year period of 1983-2001.<sup>14</sup> Therefore, the analyses and results for the 2011 Storm Surge Study, and thereby the FISs, are tied to sea level elevations that are no longer correct because they do not incorporate the most recent data on sea level rise. As discussed above, the 2013 Rutgers Climate Institute Report found that the observed sea level rise along the New Jersey shore (Atlantic City) has averaged 1.5 inches per decade since 1912.<sup>15</sup> As such, sea levels may have increased by as much as a quarter foot relative to the current NTDE.

## **III. Climate Change Impacts Should Be Incorporated Before Finalizing New Jersey Counties' FIRMs**

### **a. Pursuant to the Biggert-Waters Flood Insurance Reform Act of 2012 ("Biggert-Waters"), FEMA is Now Required to Consider Climate Change Impacts When Updating FIRMs**

Traditionally, FEMA has used only historical storm information to determine where flood zones should be mapped. This mapping practice was changed after the passage of the Biggert-Waters Flood Insurance Reform Act<sup>16</sup> ("Biggert-Waters") in 2012, which directs FEMA to use "any relevant information... relating to the best available science regarding future changes in sea levels, precipitation, and intensity of hurricanes" when updating flood maps. While the process of updating flood maps for Hudson, Monmouth, and Middlesex Counties began in

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<sup>12</sup> *Hudson FIS* at 9; *Monmouth FIS* at 19; *Middlesex FIS* at 25.

<sup>13</sup> Federal Emergency Management Agency, *Draft Report, Redefinition of the Coastal Flood Hazard Zones in FEMA Region II: Analysis of the Coastal Storm Surge Flood Frequencies, Summary and Background of Restudy*, August 2011, 6-1, available at [https://www.rampp-team.com/documents/region2/storm\\_surge/Supporting%20Documents%202011\\_11\\_10.pdf](https://www.rampp-team.com/documents/region2/storm_surge/Supporting%20Documents%202011_11_10.pdf) ("FEMA Region II Coastal Flood Study").

<sup>14</sup> FEMA Region II Coastal Flood Study at 6-6.

<sup>15</sup> Rutgers Climate Institute Report at 6.

<sup>16</sup> The Biggert-Waters Flood Insurance Reform Act of 2012, Pub. L. No: 112-141., § 100216(b) (H.R. 4348, 112th Cong., 2012), available at <http://www.gpo.gov/fdsys/pkg/PLAW-112publ141/pdf/PLAW-112publ141.pdf>.

2008, and thus before the passage of Biggert-Waters, FEMA should nevertheless comply with the mapping mandate of Biggert-Waters. Accounting for the future effects of climate change when updating and revising FIRMs is the only way to ensure that maps reflect the true extent of a community's flood risk. To do anything less would result in putting billions of dollars and millions of lives at stake.

**b. The FISs Failed to Consider the Effects of Climate Change on New Jersey's Coastal Flood Risks**

The purpose of a FIS is to revise and update previous FIRMs based on new information and thereby enable local and regional planners to further promote sound land use and floodplain development. However, the accuracy and long-term benefit of the FISs for Hudson, Monmouth, and Middlesex Counties are undermined by the fact that the supporting analyses did not take into account anticipated sea level rise or projected increases in the frequency and severity of future storms and precipitation events. For example, in the Hudson County FIS, the modeling system that was used to perform coastal storm surge analyses was validated by using reconstructed wind and pressure fields from five major flood events for the Region II domain: the 1938 hurricane, Hurricane Ethel of 1960, Hurricane Gloria of 1985, and two extra-tropical storms, from 1991 and 1992.<sup>17</sup> The FISs for Monmouth and Middlesex Counties used the same five major flood events for modeling calibration plus an additional sixth event, the Great Atlantic Hurricane of 1944.<sup>18</sup> In all three County FISs, the storm surge model was then used to simulate 30 *historical* extra-tropical storms and 157 synthetic hurricanes to create a synthetic water elevation record from which the 10-, 2-, 1-, and 0.2- percent annual chance of exceedence elevations were determined.<sup>19</sup> This means that flood zones were updated and plotted on maps using solely historical data and without any forward-looking analysis.

Past flood records are no longer reliable predictors of future risks as our rapidly warming climate is quickly changing the probabilities of rare and unusual natural disasters. Use of historical data must be coupled with credible projections of future conditions. FEMA's reliance on historical data, therefore, would likely lead to an underestimation of New Jersey's coastal flood risks, even if using the latest and most advanced hydrologic and hydraulic modeling technologies.

As discussed above, New Jersey's coastal communities will experience more and higher flood events as a result of climate change. In order for FEMA to develop maps that capture New

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<sup>17</sup> *Hudson County FIS* at 11.

<sup>18</sup> *Monmouth County FIS* at 46; *Middlesex County FIS* at 61.

<sup>19</sup> *Id.*; *Hudson County FIS* at 11.

Jersey's growing vulnerability to coastal flooding – and thereby reflect the state's true extent of future flooding – the agency must factor in the effects of climate change, including anticipated sea level rise and more frequent and intensified storms.

**c. FEMA has Already Recognized the Importance of Integrating Climate Change Adaptations into the Agency's Programs, Policies, and Operations; Sea Level Rise Data for the New Jersey Coast is Readily Available**

On December 23, 2013, FEMA issued guidance through its Regional offices to state, local, tribal, and territorial partners on the ability to incorporate sea level rise estimates in Hazard Mitigation Assistance (HMA) project grant applications<sup>20</sup>. Pursuant to the instructions outlined in the President's Executive Order – Preparing the United States for the Impacts of Climate Change<sup>21</sup>, this initiative shows FEMA's commitment to incorporate climate change adaptations into its programs, policies, and operations. This commitment, however, should not be limited to FEMA's HMA grant programs; instead, the agency needs to recognize the importance of integrating climate change considerations into *all* aspects of its agency planning, including its Flood Hazard Mapping Program. Given our nation's increasing flood risks due to projected sea level rise and increases in storm intensity and frequency, FEMA must take into account such anticipated effects in its flood maps in order to effectively prepare the nation for the impacts of climate change.

Moreover, FEMA's decision to allow HMA grants to include consideration of future sea level rise represents a new and important opportunity for communities to receive funding to prepare for climate change. Previously, if an HMA applicant wanted to make repairs or improvements that took into account sea level rise, any additional costs could not be factored into FEMA's benefit-cost analysis and therefore may not be covered. Now, such improvements can receive funding and help communities become more resilient to the impacts of sea level rise and climate change.

To help state and local jurisdictions include sea level rise data into their HMA applications, FEMA recommends the following federal government sources for relative sea level rise data along coastal areas:

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<sup>20</sup> FEMA Hazard Mitigation and Sea Level Rise, available at <http://www.fema.gov/media-library/assets/documents/89659>.

<sup>21</sup> The White House, Office of the Press Secretary, *Executive Order – Preparing the United States for the Impacts of Climate Change*, November 1, 2013.

- The National Oceanic and Atmospheric Administration (NOAA) Center for Operational Oceanographic Products and Service' Mean Annual SLR Trend Data;
- The U.S. Geological Survey's (USGS) new tool to see future temperature and precipitation projections at the county level, available at: [http://www.usgs.gov/newsroom/article.asp?ID=3745&from=rss\\_home](http://www.usgs.gov/newsroom/article.asp?ID=3745&from=rss_home);
- NOAA's climate.gov website, which includes decision support information;
- The U.S. Army Corps of Engineers Climate Adaptation Sea Level Change Curves; and
- Globalchange.gov, which provides more information specific to New Jersey and New York.<sup>22</sup>

As listed above, ample data on anticipated sea level rise for the New Jersey coast already exists. Thus, FEMA has no excuse but to use this readily available information in order to consider the effects of rising sea levels on the state's coastal flood risks, and update FIRMs accordingly.

**d. Failure to Factor Climate Change-Related Risks Into FIRMs Will Have Significant Impacts**

The updated maps are intended to help New Jersey officials determine the best policies for rebuilding in the wake of Hurricane Sandy. However, if the maps do not account for projected impacts of climate change, they may be underestimating the flood risks facing New Jersey's coastal communities. As a result, property owners may be wasting money and putting their lives and properties at risk by either rebuilding in equally or more vulnerable areas as before or by accommodating structures to meet building codes that may be outdated in a few years. Furthermore, failure to consider how future conditions will increase the risk of flooding may lead to construction of flood protection and resiliency projects that are inadequate to protect people and properties both now and into the future. In either scenario, it means that communities will continue to live in harm's way and face repetitive flooding all because of inadequate information that fails to capture the true risks of flooding.

Given that the National Flood Insurance Program is approximately \$24 billion in debt<sup>23</sup>, FEMA cannot afford to keep ignoring the climate change impacts on the nation's flood risks. Instead, FEMA must develop flood maps that accurately reflect the true extent of New Jersey's coastal flood risks. To do so, FEMA must factor in the effects of climate change, including future

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<sup>22</sup> United States Government Accountability Office, *National Flood Insurance Program: Continued Attention Needed to Address Challenges*, Sept. 18, 2013, 4, available at <http://www.gao.gov/assets/660/657939.pdf>.

<sup>23</sup> Shiva Polefka, *Moving Out of Harm's Way*, Center for American Progress (December 12, 2013), 4.

sea level rise and more changes in storm frequency and intensity, and assess how these impacts may affect the type and spatial extent of the state's current flood zones.

The growing vulnerability to flooding that New Jersey's coastal counties faces is just one example of how climate change is affecting communities across the country. FEMA must integrate climate change preparedness planning into its overall flood risk management strategy to prevent avoidable future flood damages and potential loss of life. As a first step, FEMA should revise New Jersey's Preliminary FIRMs for Hudson, Monmouth, and Middlesex Counties to reflect the increasing flood risks that these communities face as a result of rising seas and climate change.

Thank you for the opportunity to comment on FEMA Preliminary FIRMs and Preliminary FIS for Hudson, Monmouth, and Middlesex Counties of New Jersey. We strongly urge FEMA to adopt our recommendations set forth above to ensure that the state's coastal residents can be best protected from future flood hazards and damages. If you should have any questions, please do not hesitate to contact us.

Sincerely,



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