



Report to the Ranking Member,  
Committee on Financial Services,  
House of Representatives

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March 2016

# NATIONAL FLOOD INSURANCE PROGRAM

## Continued Progress Needed to Fully Address Prior GAO Recommendations on Rate-Setting Methods

Accessible Version

# GAO Highlights

Highlights of [GAO-16-59](#), a report to the Ranking Member, Committee on Financial Services, House of Representatives

## Why GAO Did This Study

NFIP, which is administered by FEMA, provided insurance to help protect over 5.1 million policyholders against flood losses in 2015. The program has struggled financially in its attempts to keep rates affordable and pay for losses from catastrophic flooding. GAO has previously identified a number of challenges to FEMA's rate-setting process, including the lack of updated information in the model and the impact of charging rates that do not fully reflect flood risk. GAO was asked to review FEMA's current rate-setting methods.

This report (1) examines FEMA's current methods for setting rates and compares them with practices used by private insurers and (2) identifies steps FEMA has taken to address recommendations from GAO's October 2008 and July 2013 reports. GAO reviewed documentation on the methods FEMA uses to set NFIP rates, and interviewed FEMA officials, risk modeling experts, and insurance industry officials who were selected on the basis of their experience.

## What GAO Recommends

GAO makes no new recommendations but maintains that those from its 2008 and 2013 reports still have merit and should be fully addressed. These recommendations included ensuring that FEMA's rate-setting methods accurately reflect flood risks, collecting data to analyze the impact of grandfathered properties, and obtaining the flood risk data needed to determine full-risk rates for subsidized properties. FEMA concurred with our past recommendations and described plans to implement them.

View [GAO-16-59](#). For more information, contact Alicia Puente Cackley at (202) 512-8678 or [cackleya@gao.gov](mailto:cackleya@gao.gov).

March 2016

## NATIONAL FLOOD INSURANCE PROGRAM

### Continued Progress Needed to Fully Address Prior GAO Recommendations on Rate-Setting Methods

## What GAO Found

The Federal Emergency Management Agency (FEMA) sets National Flood Insurance Program (NFIP) full-risk rates using a model that includes some characteristics of catastrophe models used by private insurers. In particular, both models assess flood probability and damage to estimate potential flood losses. Like private insurers, NFIP also uses variables specific to each structure in estimating the degree of damage from an event in calculating insurance rates. However, key differences exist between the practices of FEMA and private insurers. For example, FEMA offers subsidized rates to some policyholders that are intended to promote affordability and that do not reflect the full risk of flooding. Private insurers offer discounted rates, but the discounts are based on policyholders' risk reduction practices.

FEMA staff identified a number of actions the agency has taken or has underway to improve its NFIP rate-setting methods and address recommendations from GAO's October 2008 and July 2013 reports. However, FEMA needs to make more progress before these recommendations can be considered fully addressed. For example:

**Ensuring rate-setting methods accurately reflect flood risk.** FEMA staff said that the agency had begun collecting information to verify flood probability curves and damage estimates used in its rate-setting model. FEMA staff noted that some of these efforts would continue over the next 5 to 10 years. FEMA staff also stated that the agency had established the Technical Mapping Advisory Council (TMAC), as required by the Biggert-Waters Flood Insurance Reform Act of 2012, to review the agency's flood mapping activities and provide recommendations. TMAC's October 2015 interim annual report identified a number of recommendations, including that FEMA develop well-defined and easily quantifiable performance metrics on flood hazards. To fully address our recommendation, FEMA must finish collecting flood probability and damage estimate data and update the rate-setting model as appropriate.

**Analyzing the impact of grandfathered properties.** FEMA staff said that in 2010 the agency had begun tracking new policies—including property location and losses—with grandfathered rates. These policies allow owners of properties that are remapped into riskier flood zones to keep their previous lower rates. But FEMA staff noted that the agency was unable to collect data on such policies from before 2010 because FEMA did not track when these policies were first grandfathered. To fully address our recommendation, FEMA must collect information on all grandfathered policies and determine the financial impact of these policies on NFIP.

**Determining full-risk rates for subsidized properties.** FEMA staff said that the agency was currently evaluating approaches, including the use of new technologies, to collect elevation information for these properties without financially burdening policyholders. To fully address our recommendation, FEMA must collect the information needed to determine full-risk rates for subsidized properties.

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## Abbreviations

ASB	Actuarial Standards Board
BFE	base flood elevation
Biggert-Waters Act	Biggert-Waters Flood Insurance Reform Act of 2012
DHS	Department of Homeland Security
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
HFIAA	Homeowner Flood Insurance Affordability Act of 2014
NAS	National Academy of Sciences
NFIP	National Flood Insurance Program
NRC	National Research Council
SFHA	Special Flood Hazard Area
TMAC	Technical Mapping Advisory Council
Treasury	Department of the Treasury

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March 17, 2016

The Honorable Maxine Waters  
Ranking Member  
Committee on Financial Services  
House of Representatives

Dear Ms. Waters:

The National Flood Insurance Program (NFIP), which is administered by the Federal Emergency Management Agency (FEMA), provided flood insurance coverage that is generally unavailable in the private market to over 5.1 million policyholders in 2015 and is a key component of the federal government's efforts to limit the damage and financial impact of floods. Floods are the most common and destructive natural disaster in the United States, and they can result in billions of dollars in losses each year.

For many years, NFIP did not need to borrow funds from U.S. Department of the Treasury (Treasury), as policy premiums and fees covered expenses and claim payments.<sup>1</sup> Since the extraordinary losses associated with Hurricanes Katrina, Wilma, and Rita in 2005 and Hurricane Sandy in 2012, however, NFIP has accumulated significant debt. Further, it faces a number of challenges related to its rate-setting process, which our prior body of work identified. In October 2008 and July 2013 reports, we made a number of recommendations related to NFIP's rate-setting process to help ensure that rates accurately reflect flood risks.<sup>2</sup>

In our February 2015 report on high-risk areas in the federal government, we noted that NFIP likely would not generate sufficient premium revenue to repay the billions of dollars borrowed from Treasury for claims from the 2005 and 2012 hurricanes or potential claims related to future catastrophic losses.<sup>3</sup> As of November 2015, FEMA owed Treasury \$23 billion, up from \$20 billion as of November 2012. FEMA made a \$1 billion

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<sup>1</sup>According to FEMA staff, NFIP premiums during these years included subsidies that contributed to the program's current debt position.

<sup>2</sup>GAO, *Flood Insurance: FEMA's Rate-setting Process Warrants Attention*, [GAO-09-12](#) (Washington, D.C.: Oct. 31, 2008) and *Flood Insurance: More Information Needed on Subsidized Properties*, [GAO-13-607](#) (Washington, D.C.: July 3, 2013).

<sup>3</sup>GAO, *High Risk Series: An Update*, [GAO-15-290](#) (Washington, D.C.: Feb. 11, 2015).

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principal repayment at the end of December 2014—it's first such payment since 2010. FEMA's inability to generate sufficient revenue to cover its losses highlights structural weaknesses in the way NFIP is funded.

In light of FEMA's ongoing challenges, you asked us to examine FEMA's current methods for setting NFIP rates. This report (1) examines FEMA's current methods for setting rates and compares them to methods generally used by private property-casualty insurers and (2) provides information on the steps FEMA has taken to address recommendations from our October 2008 and July 2013 reports.

To address these objectives, we obtained and reviewed documentation describing FEMA's flood risk model and the methods FEMA used to set full-risk and subsidized rates for policyholders, and we met with FEMA staff to discuss their current methods for setting rates. We also discussed the changes they had made to their rate-setting methods in light of the Biggert-Waters Flood Insurance Reform Act of 2012 (Biggert-Waters Act) and the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA).<sup>4</sup> We reviewed our prior reports and other studies and analyzed relevant laws and regulations. Further, we discussed with FEMA staff actions they have taken to address recommendations from our October 2008 and July 2013 reports. We were not able to verify all of the actions we discussed with FEMA staff because in many cases the actions are ongoing.

We also interviewed industry stakeholders from 13 organizations with flood insurance expertise—including academics, risk professionals, and insurance industry organization officials—to determine how FEMA's rate-setting methods are set and how they compare to those used by private sector property-casualty insurers. We judgmentally selected these organizations based on criteria such as the breadth of their experience and the type of organization in order to obtain a broad range of views. In addition, we reviewed relevant studies on flood risk and flood insurance, including those from the American Academy of Actuaries, Congressional Budget Office, and the National Research Council. We interviewed various insurance industry stakeholders noted above to gather information about NFIP and methods private insurers use to set insurance rates. Finally, we identified and met with officials from private insurance companies, including one that offered flood insurance policies through

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<sup>4</sup>Pub. L. No. 112-141, 126 Stat. 405, 916 (2012); Pub. L. No. 113-89, 128 Stat. 1020 (2014).

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NFIP, and a reinsurance broker. Appendix I contains additional information about our scope and methodology.

We conducted this performance audit from April 2014 to March 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

Floods can do extraordinary damage to both homes and possessions and often result in large financial losses for homeowners. But standard homeowners insurance policies do not include flood coverage, because private insurers have historically found it unprofitable to insure infrequent, severe disasters that are difficult to forecast and can produce catastrophic losses that can threaten company solvency. In 1968, Congress created NFIP to reduce property losses from floods and public spending to compensate disaster victims and provide insurance that was not widely available in the private market.<sup>5</sup>

NFIP was designed to address a number of policy objectives. According to FEMA, these include identifying flood risk, offering affordable insurance premiums to encourage program participation and community-based floodplain management, and reducing the reliance on federal disaster assistance. Through NFIP, FEMA maps floodplain boundaries and requires participating communities to adopt and enforce floodplain management regulations that mitigate the effects of flooding. NFIP makes federally backed flood insurance available to residents in participating communities. Residents in high-risk areas of participating communities, known as Special Flood Hazard Areas (SFHA), may be required to maintain flood insurance.<sup>6</sup>

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<sup>5</sup>Pub.L. No. 90-448, Tit. XIII, § 1301, et seq. 82 Stat. 476, 572 (1968).

<sup>6</sup>SFHAs, which are depicted on NFIP maps, represent the land area that would be submerged by the floodwaters of the “base flood,” or a flood that has a 1 percent chance of being equaled or exceeded in any given year. NFIP’s floodplain management regulations must be enforced in SFHAs, and the mandatory purchase of flood insurance applies to properties in SFHAs that are secured by federally backed mortgages or mortgages obtained from federally regulated institutions.

NFIP offers two kinds of flood insurance premiums: full-risk and subsidized. FEMA defines full-risk rates as those charged to a group of policies that generate premiums sufficient to pay the group’s anticipated losses and expenses. According to FEMA, these rates are based on the probability of a range of possible floods, damage estimates based on that level of flooding, and accepted actuarial principles. FEMA staff noted that approximately 80 percent of FEMA’s policyholders pay full-risk rates. To set these rates, FEMA generally considers a property’s risk of flooding and several other factors. Specifically, FEMA uses property characteristics, location in flood zones (table 1) which are depicted on Flood Insurance Rate Maps (FIRM), elevation of the property relative to the community’s base flood elevation (BFE), and structural characteristics such as building type, number of floors, presence of a basement, and the year a structure was built relative to the year of a community’s original flood map.<sup>7</sup> Additionally, FEMA uses data on prior claims, coverage amounts, and policy deductible amounts. The prices policyholders pay for flood insurance vary by zone and by the structural characteristics of the insured buildings.

**Table 1: National Flood Insurance Program Flood Zone Designations**

Flood zone designation	Risk level
A, AE <sup>a</sup>	High-risk
V, VE <sup>a</sup>	High-risk coastal
B, C, X	Moderate- to low-risk
D	Undetermined risk

Source: Federal Emergency Management Agency. | GAO-16-59

<sup>a</sup>Zones A, AE, V, and VE are Special Flood Hazard Areas (SFHA). According to FEMA staff, zones A and AE include coastal and noncoastal hazards.

FEMA also offers subsidized rates that do not fully reflect the risk of flooding but are intended to provide policyholders with more affordable premiums while encouraging floodplain management and the widespread

<sup>7</sup>The BFE indicates the estimated height of floodwaters that have a 1 percent chance of being equaled or exceeded in any given year.



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purchase of flood insurance.<sup>8</sup> Prior to Biggert-Waters Act and HFIAA requirements, FEMA determined subsidized rates by estimating the total dollar amount that it expected to collect from full-risk premiums and subtracting that total from the dollar value of losses produced by the program's historical average loss year.<sup>9</sup> The difference between these two sums became a minimum aggregate target amount to collect in premiums from subsidized policyholders. When setting subsidized rates for individual properties, FEMA staff said they also consider flood risk, previous rate increases, and statutory limits on rate increases.

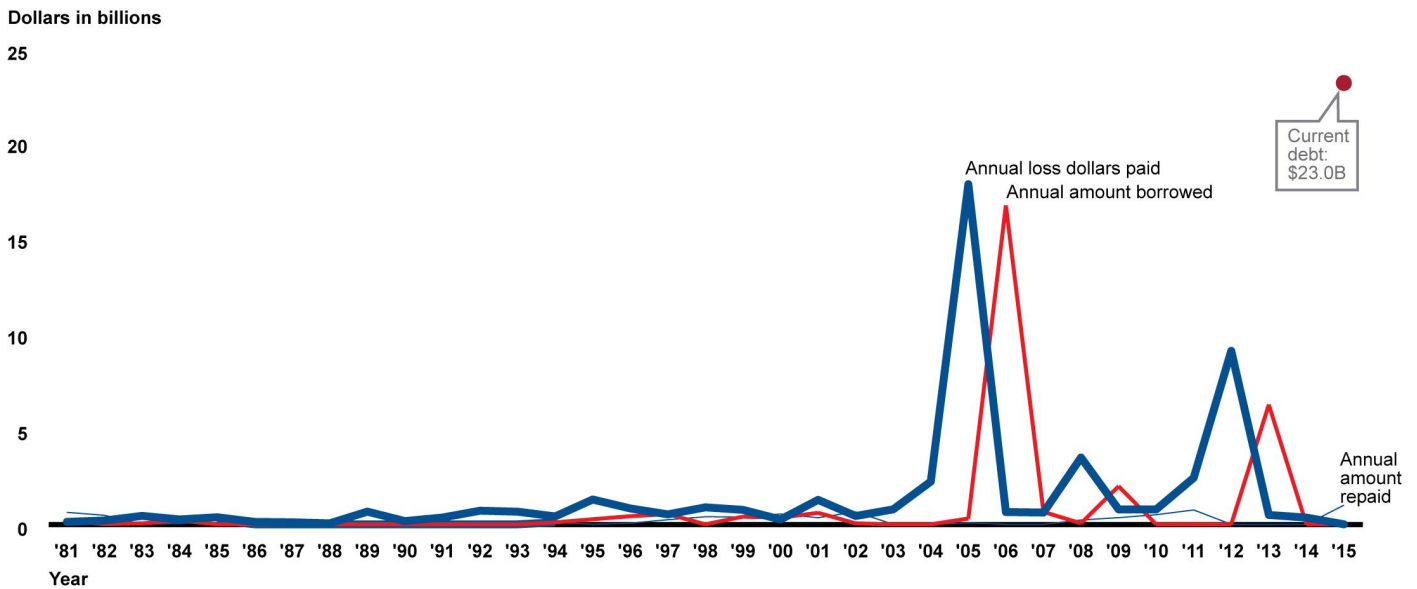
Since the program offers rates that do not fully reflect the risk of flooding, NFIP's overall rate-setting structure was not designed to be actuarially sound in the aggregate, nor was it intended to generate sufficient funds to fully cover all losses. Instead, Congress authorized FEMA to borrow from Treasury when needed. Until the 2005 hurricanes, FEMA had used its authority to borrow intermittently and was able to repay the loans. Since 2005, however, FEMA has used its authority to borrow from Treasury to pay losses that exceeded premium revenue and any accumulated surplus—particularly after Hurricanes Katrina, Wilma, and Rita in 2005 and Hurricane Sandy in 2012—and has not been able to fully repay the debt (see fig. 1).

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<sup>8</sup>FEMA defines subsidized rates as those charged to a group of policies that results in aggregate premiums insufficient to pay for anticipated losses and expenses. NFIP also offers grandfathered policies that allow policyholders to continue paying their previously lower rate when they are mapped into a higher-risk zone. FEMA does not consider these policies subsidized because they are within a class of policies that are not subsidized for the class as a whole. FEMA staff said that property owners who receive grandfathered policies are cross-subsidized by other policyholders in the same class.

<sup>9</sup>The historical average loss year is the minimum target amount that the program needs to collect from all premiums to cover at least average annual losses, as determined by historical data. According to FEMA, the historical average loss year does not fully account for catastrophic losses.

**Figure 1: National Flood Insurance Program Annual Losses Paid and Amounts Borrowed and Repaid, 1981-2015**



Source: GAO analysis of Federal Emergency Management Agency data. | GAO-16-59

In July 2012, the President signed into law the Biggert-Waters Act, which affected many aspects of NFIP. For example, the Biggert-Waters Act included requirements that FEMA

- increase rates at 25 percent per year until full-risk rates were reached for certain subsidized properties, including secondary residences, businesses, and severe repetitive loss properties;
- increase rates at 20 percent per year over a 5-year period to phase out grandfathered policy rates;
- prohibit subsidized rates for properties purchased after, or not insured, as of July 6, 2012;
- establish a reserve fund;
- improve flood risk mapping; and
- develop new methods related to compensation for companies that sell, write, and service flood insurance policies (Write Your Own insurers).

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In March 2014, however, Congress passed and the President signed into law HFIAA, which repealed or altered portions of the Biggert-Waters Act. HFIAA reinstated certain rate subsidies removed by the Biggert-Waters Act, including those for properties purchased after, or not insured, as of July 6, 2012. For these properties, and certain others, rates would rise by at least 5 percent per year. HFIAA also restored grandfathered policy rates (except for certain properties that were newly mapped into higher-risk zones) and generally limited yearly increases in property-specific rates to 18 percent. In addition, HFIAA added an annual surcharge of \$25 to all NFIP policies covering primary residences (owner-occupied, single-family detached buildings and individual condominium units) and a \$250 surcharge to policies for all other buildings. As of November 2015, FEMA estimated that it had met the requirements for almost two-thirds of the Biggert-Waters Act provisions and about half of the HFIAA provisions and was taking actions on others.

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## FEMA's Rate-Setting Process and How It Compares to Private Sector Rate Setting

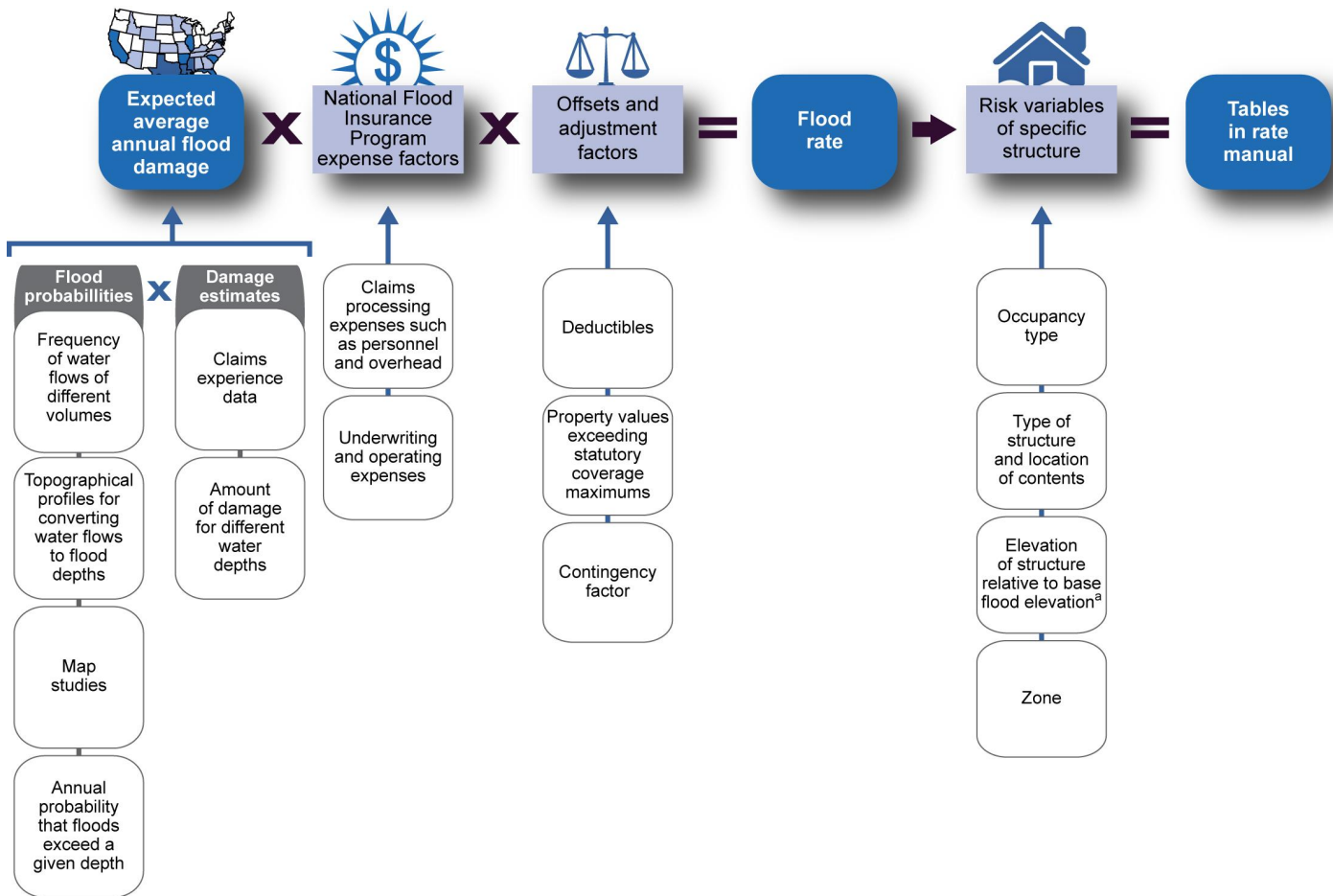
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### Methods FEMA Uses to Set NFIP Rates

FEMA determines full-risk rates by estimating the probability of floodwaters reaching various levels in a structure relative to the BFE and using prior NFIP claims experience and other factors to estimate the percentage of the value of a structure that is expected, on average, to be damaged when different flood levels occur. FEMA sets rates for structures in flood zones that account for a range of topographies including broad, shallow floodplains and steep, narrow valleys. In addition, FEMA accounts for a number of expenses and factors, including NFIP operating expenses such as NFIP staff salaries, underwriting expenses, and claims processing activities. FEMA staff also includes a contingency factor of 10 percent for A zones and 20 percent for V zones to account for, among other things, the likelihood that large events can occur before sufficient surplus is accumulated and the uncertainty of modeling assumptions in high-risk flood zones. FEMA also uses data on policy deductibles to estimate the percentage of flood damage that insurance will not cover and that policyholders must pay. Similarly, FEMA makes an adjustment to remove flood damage that exceeds NFIP

coverage limits, because such damage is also the policyholder's responsibility. The deductibles and coverage limits are prescribed by statutory provisions. Figure 2 provides an overview of the method FEMA uses to set full-risk rates.

**Figure 2: Overview of FEMA's Method for Setting Full-Risk Rates, as of November 2015**



Source: GAO analysis of Federal Emergency Management Agency information. | GAO-16-59

<sup>a</sup>Federal Emergency Management Agency staff noted that map studies information is also used in this step of rate setting.

The Biggert-Waters Act and HFIAA generally focused on subsidized and grandfathered rates, although full-risk policies are subject to the annual limits on premium increases outlined in HFIAA. Full-risk rates continue to apply to certain properties located in zones A, AE, V, and VE. Also, certain primary residences with policies that lapsed as of July 6, 2012,

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may pay full-risk rates.<sup>10</sup> According to FEMA, the agency changed rates for certain properties that received subsidized rates to comply with Biggert-Waters Act and HFIAA requirements, and staff said that these new rates went into effect April 1, 2015.<sup>11</sup> As noted earlier, prior to Biggert-Waters Act and HFIAA requirements, the agency determined subsidized rates by estimating the total dollar amount that FEMA expected to collect from full-risk premiums and subtracting that total from the dollar value of losses produced by the program's historical average loss year. The difference between these two sums became a minimum aggregate target amount to collect in premiums from subsidized policyholders. FEMA staff said they had already begun increasing rates prescribed by legislation for certain subsidized properties and no longer use the subsidized rate-setting method they had previously used. This included increased rates for subsidized policies covering nonprimary residences, severe repetitive loss properties, and substantially damaged/substantially improved properties as required by the Biggert-Waters Act. In addition, it included increased rates for subsidized policies covering primary residences as required by HFIAA.

The Biggert-Waters Act also required FEMA to phase out premium discounts for grandfathered properties. However, HFIAA subsequently restored these grandfathered rates retroactively to July 6, 2012, the enactment date of the Biggert-Waters Act. HFIAA also provided a lower "preferred-risk premium" rate for 1 year. After a year, the rate will increase annually until the policy reaches its full-risk, grandfathered, or subsidized rate, depending on the property's eligibility. According to FEMA staff, the preferred-risk premium rate is implemented as a new subsidy to NFIP

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<sup>10</sup>Under the Biggert-Waters Act, full-risk rates were required for policies that lapsed in coverage as a result of the deliberate choice of the policyholder. But HFIAA subsidies are eliminated for NFIP policies that lapsed in coverage unless the decision of the policyholder to permit a lapse in coverage was a result of the property covered by the policy no longer being required to retain such coverage. For any policy that lapses but is not automatically charged full-risk rates, rate increases of 25 percent or 5 percent to 15 percent may apply if the policy falls within a category subject to a rate increase. FEMA has stated that policies for certain buildings in high-risk areas that lapsed due to a late renewal payment (received after the 30-day grace period but less than 90 days after expiration) can be re-issued and renewed at subsidized rates. But as HFIAA states, buildings with lapsed policies are not eligible for a subsidy unless the lapse was the result of the policy no longer being required to retain flood insurance coverage.

<sup>11</sup>HFIAA's rate caps limited average increases for a risk class to 15 percent and each individual's total premium increase to 18 percent, including the reserve fund assessment but not the federal policy fee and HFIAA-mandated surcharge.

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policyholders. The discount between the gradually increasing rate (starting at the preferred-risk premium rate) and the rate that would be otherwise charged is not offset by any source.

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### NFIP Shares Some Similarities with Private Sector Rate Setting, but Other Attributes Differ

FEMA's model for setting NFIP's full-risk rates incorporates data on flood risks that generally applies the same principles as catastrophe models used by private insurers. More specifically, private insurers and NFIP use models to generate, among other things, two key estimates—frequency of flood occurrence and severity of flood damage—that help them estimate their potential losses. As explained earlier, the NFIP rate-setting model generates rates for flood insurance, in part by estimating the probabilities of various levels of floodwaters and expected flood damage. Similar to the NFIP model, private insurers use catastrophe models to estimate the frequency of various flood events and the severity or amount of losses the flood events could produce. In addition, private insurers involved in flood modeling also rely on flood maps and data on the likelihood of flooding and damage, similar to the data used by NFIP. Like private insurers, NFIP also uses variables specific to each structure in estimating the degree of damage from an event in calculating insurance rates. Figure 3 provides an excerpt of NFIP's full-risk rate table for one of NFIP's high-risk zones. The figure illustrates how NFIP rates can vary according to occupancy of the structure (e.g., single family home, two to four family home, mobile home), type of home and location of contents (e.g., one-floor home with basement), elevation of the home relative to the area's BFE, and specific flood zone. Further, both NFIP and private insurers' models typically incorporate information about each structure's insurance coverage, such as deductibles and maximum coverage limits.

**Figure 3: Excerpt from National Flood Insurance Program Flood Insurance Manual, Full-Risk Rate Table for AE Zone (Building Coverage)**

AE zone represents structures in a high risk area in which mapping has identified that the area would be submerged from a flood with a 1 percent annual chance of flooding.

The AE-Zone contains 30 zones, A01 through A30, which represent a continuum of topographies. On one end is zone A01, a very broad and shallow floodplain; on the other is zone A30, a steep and narrow mountainous valley. FEMA averages the risks from zones A01 through A30 to arrive at one rate for Zone AE. This rate is the basis upon which a few other factors are applied to develop rate tables like this one.

Classifies the type of structure and associated building characteristics such as the number of floors, whether the structure has a basement, and whether it is a manufactured home.

Classifies the occupancy type such as single and 1-4 family homes or other residential or non-residential structures.

Depicts the number of feet a structure's lowest floor is located relative to the base flood elevation. The lower the structure, the higher the risk of flooding.

FIRM ZONES AE, A1-A30 — BUILDING RATES <sup>b</sup>								
ELEVATION OF LOWEST FLOOR ABOVE OR BELOW THE BFE	1 FLOOR No Basement/Enclosure/ Crawlspace		MORE THAN 1 FLOOR No Basement/Enclosure/ Crawlspace		MORE THAN 1 FLOOR With Basement/Enclosure/ Crawlspace		MANUFACTURED (MOBILE) HOME	
	1-4 Family	Other Residential & Non-Residential	1-4 Family	Other Residential & Non-Residential	1-4 Family	Other Residential & Non-Residential	Single Family	Non-Residential
+4	.25 / .08	.20 / .09	.24 / .08	.20 / .08	.24 / .08	.20 / .08	.29 / .14	.29 / .14
+3	.30 / .08	.28 / .11	.25 / .08	.22 / .08	.27 / .08	.23 / .09	.35 / .15	.33 / .15
+2	.43 / .08	.38 / .12	.35 / .08	.29 / .08	.32 / .08	.28 / .10	.50 / .16	.47 / .19
+1	.76 / .10	.66 / .17	.61 / .09	.47 / .10	.46 / .09	.36 / .12	.89 / .23	.88 / .28

In each cell with two numbers, the number to the left signifies the rate per \$100 for the first \$60,000 of insurance purchased, while the number to the right signifies the rate per \$100 for any additional coverage, up to \$250,000 total.<sup>a</sup>

Source: GAO annotation of Federal Emergency Management Agency table. | GAO-16-59

<sup>a</sup>Different coverage limits apply to "Other Residential and Non-Residential."

<sup>b</sup>These rates are effective for new or renewed policies after April 1, 2015.

However, some general differences between private insurance and NFIP exist (table 2). NFIP has a number of policy objectives. Among others, these include offering affordable insurance premiums that do not reflect the full risk of flooding to encourage program participation and community-based floodplain management, and reducing the reliance on federal disaster assistance. Conversely, private insurers focus on different objectives, which include ensuring rate and capital adequacy, maintaining solvency, and producing a return on investment. The differences between NFIP and private insurers apply to rate setting as well. For example, NFIP generally accepts all applicants regardless of an individual's property risk and sets rates across a smaller number of broad rate classes. Private insurers generally insure applicants based on

individual property risks and a larger number of more specific rate classes.

**Table 2: General Differences between National Flood Insurance Program and Private Property-Casualty Insurers**

<b>Characteristic</b>	<b>National Flood Insurance Program</b>	<b>Private property-casualty insurer</b>
Policy objectives	Encourage participation through affordable insurance premiums. Promote community flood hazard mitigation practices and floodplain management. Reduce reliance on federal disaster assistance.	Maintain solvency, rate and capital adequacy, and return on investment.
Underwriting	Applicants almost always accepted regardless of individual's risk. <sup>a</sup> Accepting all applicants increases the risk of adverse selection and NFIP's exposure to flood losses. <sup>b</sup>	Accepts applicants to insure based on individual risks and aggregate risks in company's portfolio. This practice reduces the risk of adverse selection and helps maintain company solvency.
Pricing policies	Offers risk-based and discounted (subsidized and grandfathered) rates that are intended to encourage NFIP participation and achieve affordability policy objectives.	Offers risk-based rates that reflect the risks insured. Discounts offered are generally based on policyholders' risk reducing-practices.
Rate classes	Uses a smaller number of broader rate classes, or flood zones, by averaging the different risks of a wide range of topographies.	Measures risk as precisely as feasible, including the use of many risk characteristics within the ratemaking process, and a larger number of rate classes.
Large and catastrophic risk management	Borrowing from Treasury negates the need to hold substantial capital or purchase reinsurance. Therefore, these expenses are not reflected in NFIP rates and policyholders do not bear the cost of capital they would require.	Use of capital and reinsurance, among other instruments (e.g., catastrophe bonds). Associated expenses are included in the rates and help maintain solvency.

Source: GAO and Federal Emergency Management Agency. | GAO-16-59

<sup>a</sup>Provided that the subject property is located in a community that participates in NFIP by adopting and enforcing building standards and floodplain management strategies for its flood-prone areas.

<sup>b</sup>Adverse selection is the social phenomenon whereby persons with a higher than average probability of loss seek greater insurance coverage than those with less risk.



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## Continued Progress Needed to Fully Address Prior GAO Recommendations on NFIP Rate-Setting Methods

FEMA staff identified a number of actions, which follow below, that the agency has taken or has under way to address the recommendations that we made in our October 2008 and July 2013 reports related to NFIP rate-setting methods.<sup>12</sup> FEMA, however, has yet to fully address the recommendations from these past reports. In our October 2008 report, we recommended that FEMA take steps to ensure that rate-setting methods and the data used to set rates result in full-risk premiums that accurately reflect the risk of flooding. We also recommended that FEMA collect information on the number, location, and losses associated with grandfathered properties and analyze the financial impact of these properties on NFIP. In our 2013 report, we recommended that FEMA develop and implement a plan to obtain elevation information on subsidized policies to establish full-risk rates for properties with subsidized rates. The following describes actions FEMA staff identified that the agency has taken or has under way to address our recommendations.

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## Ensuring Rate-Setting Methods Accurately Reflect Flood Risk

According to FEMA staff, the agency has taken or has actions under way in the following areas that are intended to ensure its rate-setting methods and the data it uses to set rates result in full-risk premiums rates that accurately reflect the risk of losses from flooding.

## Verifying Accuracy of Flood Probabilities

In our October 2008 report, we found that FEMA's estimates of probabilities that floods of different severities could occur in a given year had not been updated since the 1970s and 1980s. FEMA stated that our finding was unfounded and said that flood probabilities were expressed relative to BFEs, which are revised as flood maps are updated. But as we also reported in 2008, flood risk experts have said that flood probabilities are likely to change as land use, infrastructure, and weather patterns change. We further concluded that even if the probability curves are adjusted to reflect new BFEs, other changes since the 1980s could result in the probability curves themselves no longer being accurate.<sup>13</sup> As a

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<sup>12</sup>[GAO-09-12](#) and [GAO-13-607](#).

<sup>13</sup>FEMA's flood probability curves refer to the annual probability that flood waters will reach or exceed a given depth relative to the BFE. For each flood zone, curves reflect various flood probabilities. We use the term "accurate" in our current report to refer to whether flood probability or damage estimates are based on up-to-date and appropriate data, methods, and science. We acknowledge that flood probabilities are only estimates.

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result, we recommended that FEMA verify the accuracy of flood probabilities. FEMA agreed with the need to verify the accuracy of flood probabilities and described steps the agency has taken to address this area of our recommendation, but has not yet fully addressed it.

During our current review, FEMA staff told us that the agency initiated work in 2010 to gather information from flood insurance studies on water depths that would help the agency assess the accuracy of its flood probability curves.<sup>14</sup> However, FEMA staff said that as of November 2015 they had not finished collecting this information and did not have enough to conduct a statistically valid assessment of the flood probability curves. FEMA staff noted they plan to continue to gather information on water depths as flood insurance studies are updated over the next 5 to 10 years, and the staff believes this information would allow for a statistically valid assessment of the flood probability curves.

FEMA staff noted that the agency initiated work in 2012 to validate its existing flood probability curves and determine the effect of recent factors, such as climate change and land use and development on the curves as part of a broader effort to assess the risk exposure of NFIP policies in coastal and riverine areas nationwide. FEMA staff said that this work would help FEMA better understand the variation of flood probability curves along individual streams and across geographic areas and assist FEMA in selecting standardized curves to use in the program. FEMA staff said the agency determined that its current flood probability curves approximated average policyholder risk based on its initial qualitative analysis of the data collected, but the staff noted that this determination was based on a limited amount of data. FEMA staff added that the agency would be able to conduct additional analyses as flood insurance studies are completed in the future; however, the staff noted that it may be several years before enough studies are complete to provide a statistically meaningful body of data. To fully address this area of our recommendation, FEMA must collect the data needed to verify the accuracy of the flood probability estimates the agency uses in its rate-setting model, and update probability estimates used in the model as appropriate.

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<sup>14</sup>A flood insurance study is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community. When a flood study is completed for the NFIP, the information and maps are assembled into a flood insurance study. The flood insurance study report contains detailed flood elevation data in flood profiles and data tables.

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## Verifying the Accuracy of Damage Estimates

In our October 2008 report, we found that potentially outdated and inaccurate claims data could affect damage estimates and, in turn, the rates generated by the NFIP rate-setting model. We recommended that FEMA take steps to verify the accuracy of damage estimates. FEMA agreed with the need to verify the accuracy of damage estimates and described steps the agency has taken to address this area of our recommendation, but has not fully addressed it. During our current review, FEMA staff told us that the agency had updated its rate-setting model with flood damage data from a 2006 U.S. Army Corps of Engineers (Corps) study, replacing Corps data from the 1970s. In addition, FEMA staff noted that the agency had updated damage estimates for the high-risk coastal (VE) zone based on NFIP work completed in January 2011. Further, FEMA staff said that the agency changed its analysis of water depth data after identifying inconsistencies in the reporting of this information during the rate-setting process used to determine rates effective April 1, 2015. FEMA staff said that they planned to begin collection of revised depth damage data and some structural data by April 1, 2016. However, due to the significant number of changes being implemented, the revised reporting requirements have been delayed until October 1, 2016. FEMA staff also noted that the agency had started to collect more robust information on the interior and exterior depths of flooding for homes or structures, value of structures, duration of flooding, and building characteristics such as foundation type and exterior wall type.

In August 2015, the National Research Council (NRC) issued its final report on rate setting for NFIP properties with negatively elevated structures (those with the lowest floor elevation below the BFE), including how NFIP uses damage information to set rates.<sup>15</sup> The NRC report concluded, among other things, that NFIP claims data for a given depth of flooding were highly variable, suggesting that flood depth was not the only driver of damage to structures or that the quality of the damage and flood depth reports that support the insurance claims was poor. The NRC report noted that research would be required to determine the most important drivers of flood damage and develop an appropriate damage prediction function for use in the rate calculation. FEMA staff agreed with the NRC report's finding that flood damage to negatively elevated structures could be highly variable, and that additional work would be

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<sup>15</sup>National Research Council, *Tying Flood Insurance to Flood Risk for Low-Lying Structures in the Floodplain* (Washington, D.C.: The National Academies Press, 2015).

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needed to determine how to more accurately and specifically assess flood risk for these structures. FEMA staff added that the agency expects to identify additional negatively elevated structures as policyholders with previously subsidized rates obtain property elevation information. FEMA staff said that the agency will use the NRC report to determine whether to make potential NFIP changes, but the staff did not provide a time frame for when potential changes may be made. To fully address this area of our recommendation, FEMA must complete its collection of data on flood damage and update damage estimates used in its rate-setting model as appropriate. To that end, conducting research recommended in the NRC report to determine the most important drivers of flood damage and develop an appropriate damage prediction function could help FEMA ensure that damage estimates are as accurate as possible and NFIP rates reflect the risk of flooding.

## Verifying Accuracy of Flood Maps

In our October 2008 report, we found that although FEMA had been working to update FIRMs and improve their quality, some maps remained out of date despite modernization efforts and may or may not have accurately reflected the actual risk of flooding. As a result, we recommended that FEMA take steps to verify the accuracy of NFIP flood maps. FEMA staff disagreed with our assessment of their map modernization efforts and its effect on rate adequacy. FEMA stated that older maps are not always outdated and that in many areas the flood hazard has not changed or is possibly decreasing. We noted, however, that while it was possible some maps might not have changed, FEMA did not provide analysis to support its contention.<sup>16</sup> FEMA described steps the agency has taken to verify the accuracy of flood maps and modernize its mapping program, but it has not yet fully addressed our recommendation.

During our current review, FEMA staff said that they are continually updating maps by assessing them every 5 years to determine if flood hazards depicted on them are still accurate. Their review of the program's flood map inventory is based on physical, climate, and engineering factors to evaluate the depiction of flood risk presented on the maps. In addition, FEMA staff said they ensure maps are updated more frequently than every 5 years to reflect changing conditions by working with communities whose flood risk changes. Local communities are required to communicate with FEMA when flood risk changes in between the 5 year cycle. Further, FEMA staff said that as of November 2015, 94

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<sup>16</sup>[GAO-09-12](#).

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percent of the U.S. population lived in areas with updated flood maps, up from the 68 percent with updated maps as of March 2008. According to an NRC study on NFIP, flood studies and updating maps can be expensive, so the NFIP strategy is to carry out the updates in densely populated areas.<sup>17</sup>

In addition, to better identify risks by working with communities, FEMA initiated the Risk Mapping, Assessment, and Planning (Risk MAP) program. FEMA staff noted that Risk MAP, which started in 2009, is intended to create a national, comprehensive approach for managing FEMA's mapping program, using the best available technology. The program's mission is to deliver quality data that increases public awareness of flood risks and reduces risk to life and property through the collaborative efforts of states, localities, and tribal entities.<sup>18</sup> Through more precise flood mapping products, risk assessment tools, and planning and outreach support, Risk MAP intends to strengthen the ability to make informed decisions about reducing risk. Risk MAP also focuses on products and services beyond the traditional flood maps and works with local officials to help put flood risk data and assessment tools to use, effectively communicating risk to citizens and enabling communities to enhance their mitigation plans and actions. These products address project prioritization, elevation data acquisition, a watershed study approach, engineering and mapping, risk assessment, mitigation planning support, and risk communications. Further, FEMA staff said that they measure data quality and ensure flood hazard data are tracked according to whether engineering data are new, updated, or still valid through a continuous review and update process. FEMA staff said, for example, that they evaluate changes in topography, hydrology, and land development as part of this validation process. In addition, FEMA has defined four key areas to track Risk MAP performance. These areas include addressing gaps in flood hazard data, deploying Risk MAP for an increasing amount of the U.S. population, increasing the risk awareness of public officials, and increasing community risk reducing measures.

FEMA staff also noted that the agency, as of November 2015, had begun addressing a number of issues raised in a 2009 NRC study that

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<sup>17</sup>National Research Council, *Tying Flood Insurance to Flood Risk for Low-Lying Structures in the Floodplain*.

<sup>18</sup>*Congressional Budget Justification, Fiscal Year 2016*, Department of Homeland Security.

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examined, among other things, FEMA's current methods of constructing flood maps, including the relationships among the methods used to conduct a flood map study, the accuracy of the predicted flood elevations, and the accuracy of predicted flood inundation boundaries.<sup>19</sup> NRC made a number of recommendations in its 2009 study on how to improve specific aspects of FEMA's flood data, models, and mapping. For example, the study recommended that FEMA increase collaboration with federal, state, and local government agencies to acquire high-resolution, high-accuracy topographic and other data throughout the nation.<sup>20</sup> According to FEMA staff, over the last 2 years multiple federal agencies have begun collaborative efforts to collect these data, but the extent of these efforts depends on available resources and the degree of actual collaboration. In addition, they said that based on the amount of data collected to date, it may take longer than FEMA's expected time frame of 8 years to complete.

Finally, FEMA established the Technical Mapping Advisory Council (TMAC) as required by the Biggert-Waters Act to review and make recommendations to FEMA on matters related to NFIP. TMAC's October 2015 interim annual report identified a number of recommendations to improve the effectiveness of NFIP flood mapping processes and products.<sup>21</sup> For example, the report recommends that FEMA develop well-defined and easily quantifiable performance metrics on flood hazards, including metrics on the inventory of valid (verified), expiring, unverified, and unknown flood hazard miles. It also recommended that FEMA address unstudied flood hazard miles. FEMA staff said that they are continually assessing the validity of the map inventory and are coordinating with TMAC to improve how the agency assesses flood hazards. TMAC made recommendations to FEMA regarding these improvements in December 2015. FEMA staff said they plan to issue a formal response to the 2015 TMAC recommendations by the end of December 2016 and intend to include in that response an implementation approach. In addition, FEMA staff said that they plan to make a concerted effort to expand the assessment process for geographies with moderate

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<sup>19</sup>National Research Council. *Mapping the Zone: Improving Flood Map Accuracy* (Washington, D.C.: The National Academies Press, 2009).

<sup>20</sup>The report identified the U.S. Geological Survey, National Oceanic and Atmospheric Administration, and U.S. Army Corps of Engineers as federal agencies that could collaborate to acquire these data.

<sup>21</sup>Technical Mapping Advisory Council, *2015 Annual Report, Interim* (Washington D.C.: Oct. 30, 2015).

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to low flood risk as well as areas that are still mapped in paper format. Staff noted that they had begun to develop an assessment process to evaluate the coastal flood map inventory. This expansion of the assessment process coincides with recommendations FEMA has received from TMAC. FEMA staff said they plan to explore other opportunities to improve the assessment process in conjunction with TMAC.

FEMA described a number of actions that the agency has taken since our 2008 report that are intended to improve and update NFIP maps, including the development of its Risk MAP program. To fully address this area of our recommendation, FEMA must continue its efforts to reassess flood risk and update maps, including working closely with communities to reflect changing flood conditions on maps. To this end, FEMA's work to address NRC's 2009 recommendations and those made by TMAC will be important for ensuring the accuracy of flood maps.

Ensuring That Flood Probabilities Reflect the Effect of Long-Term Planned and Ongoing Development, Erosion Trends, and Climate Change

In our October 2008 report, we found that some experts suggested that incorporating ongoing and planned development, erosion trends, and climate change into flood risk modeling would more fully capture longer-term flood risk exposure but FEMA did not take these variables into account. We recommended that FEMA ensure that the effects of long-term planned and ongoing development and climate change are reflected in the flood probabilities used to set rates. FEMA described steps to address this area of our recommendation, but has not yet fully implemented it. In response to our report, FEMA did not comment on the issue of long-term planned and ongoing development but said that it had conducted one study focusing on one aspect of climate change—sea level rise—and initiated another study on the effect of climate change on NFIP, including the effect of sea level rise, changes in hurricane frequency and intensity, and changes in precipitation patterns. FEMA also commented that the agency would carefully evaluate the studies' findings to determine how to best account for climate change in setting flood insurance rates. With respect to the effects of erosion, FEMA commented that the agency did not have authority to establish erosion zones for NFIP. However, FEMA increased rates for all V zone (coastal high risk) properties, consistent with recommendations made by the Heinz Center in a study conducted for FEMA in April 2000.<sup>22</sup>

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<sup>22</sup>Heinz Center, *Evaluation of Erosion Hazards* (Washington D.C.: April, 2000).

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During our current review, FEMA staff noted that the agency set NFIP rates annually for 1 year policies; therefore, NFIP rates only reflect the effects of long-term development, erosion, and climate change for the one year being priced. FEMA staff said that adequately pricing flood risk requires updated maps, including any changes in flood risk due to climate change. In addition, staff said that they need to be able to evaluate the risk of its actuarially priced policies based on updated maps and charge a price reflecting that risk. Further, FEMA staff noted that the Biggert-Waters Act required TMAC to develop recommendations for incorporating the best available climate science in flood insurance studies and maps and using the best available methodology when considering the effects of sea level rise and future development on flood risk. TMAC's October 2015 interim future conditions report recommended that FEMA provide flood hazard information for coastal and Great Lakes areas that includes the future effects of long-term erosion and sea/lake level rise and consider the range of potential future natural and manmade coastal changes, such as inundation and coastal erosion.<sup>23</sup> FEMA described steps it has taken to address development, erosion, and climate change. To fully address this area of our recommendation, FEMA must evaluate findings from its study on climate change and determine how to best account for climate change in setting flood insurance rates. To that end, assessing TMAC's future conditions report once it is finalized and addressing any recommendations it may contain will help FEMA ensure that it accounts for the best available information on climate change and that rates fully reflect the risk of flooding.

#### Reevaluating the Practice of Classifying Risk by Flood Zone

In our October 2008 report, we found that FEMA classifies properties according to flood risk using a single, nationwide class rating system rather than an individual property or community-by-community rating system. We recommended that FEMA reevaluate the practice of aggregating risks across zones to determine whether the current risk groups were still relevant in light of NFIP's growth in the number of policyholders insured. FEMA did not agree with this area of our recommendation and challenged our discussion about the number of risk

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<sup>23</sup>Technical Mapping Advisory Council. *2015 Future Conditions Report, Interim*.



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groups used for rate setting.<sup>24</sup> FEMA described steps the agency has taken to address this area of our recommendation, but has not fully addressed it.

As part of our current review, FEMA staff stated that they reevaluated the use of zones to classify risk and set rates for NFIP by reviewing actuarial guidance on risk classification used in the insurance industry and reviewing NFIP's founding legislation and the program's policy objectives. FEMA staff determined that their risk classification system and use of zones were consistent with actuarial guidance on risk classification and sufficient for low-risk structures that were at or above BFE. FEMA staff added that the agency did not anticipate classifying risk at the individual structure level for NFIP properties due to the cost and complexity involved. In addition to reassessing the overall use of zones, FEMA staff said that the agency had assessed the demographics of NFIP policyholders in the high-risk (AE) zone and the potential need to subdivide that zone into smaller zones that could better reflect both post-storm observations and evidence of wave hazards in certain areas of coastal VE zones. To acknowledge that some inland areas that share a boundary with coastal VE zones could experience flooding as a result of wave action, FEMA developed a methodology to delineate the coastal AE zone by the Limit of Moderate Wave Action, which is an area that could experience waves reaching 1.5 feet or greater during a flood. In December 2008, FEMA required all new detailed coastal studies starting in fiscal year 2009 to delineate the Limit of Moderate Wave Action on flood maps for informational purposes.<sup>25</sup>

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<sup>24</sup>In response to our recommendation on zones, FEMA said that our concerns about the program's risk classification and use of zones was misplaced, and we did not recognize two important points. FEMA said that private sector risk classification involves grouping various risks and that we did not consider the amount of complexity that more highly refined risk groups would create. However, we noted that we did recognize and consider the challenges associated with using more refined risk groups and therefore did not specifically recommend that FEMA change its risk rating system.

<sup>25</sup>Communities that adopt Zone VE standards in the Coastal A Zone and reference the Limit of Moderate Wave Action area receive Community Rating System credits, which could lower flood insurance premiums for residents and business owners. The Community Rating System is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from community actions that meet the three goals of reducing flood damage to insurable property, strengthening and supporting the insurance aspects of NFIP, and encouraging a comprehensive approach to floodplain management.

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Further, FEMA noted that NRC's final report on negatively elevated structures addressed the practice of classifying risk and setting rates by zone for high-risk, high-premium structures.<sup>26</sup> The NRC report concluded that averaging the annual loss over a large set of flood probability curves led to rate classes that encompassed high variability in flood hazards for negatively elevated structures. As a result, the premiums charged were too high for some policyholders and too low for others. FEMA staff agreed with the need to better understand the variable nature of flood risk for negatively elevated structures and said that cost-benefit analysis would determine how accurately and specifically flood risk could be assessed for these structures. FEMA staff noted that improvements to risk assessment for these structures are under way to modernize how flood risk is determined and used to set rates. To fully address this area of our recommendation, FEMA must continue its efforts to better understand the nature of flood risk for negatively elevated structures and to set rates that fully reflect their risk.

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## Analyzing the Impact of Grandfathered Properties

In our October 2008 report, we found that FEMA did not track the number of grandfathered properties or calculate how much lower grandfathered premiums were than rates that fully reflect risk. As a result, FEMA did not know the effect of grandfathered properties on the program's total premium collection. We recommended that FEMA collect information on the location, number, and losses associated with grandfathered policies and analyze the financial impact these properties had on NFIP. FEMA concurred with this area of our recommendation and described steps the agency has taken to address it, but has not yet fully done so.

During our current review, FEMA staff said that the agency began tracking policies that were grandfathered after 2010 and collecting related information on their number, location, and flood losses. However, FEMA staff noted that the agency is unable to collect data on policies with grandfathered rates prior to 2010 because it did not track when these policies first had grandfathered rates. FEMA staff also said that the agency has begun to comply with HFIAA Section 28, which requires

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<sup>26</sup>FEMA staff noted that approximately 5 percent of NFIP's approximately 5.1 million policies are for negatively elevated structures, and staff expect to identify additional negatively elevated structures as subsidized policy rates are phased out and their elevation becomes known. Many but not all of these subsidized structures are expected to be negatively elevated, and are not currently rated based on their negative elevation. National Research Council, *Tying Flood Insurance to Flood Risk for Low-Lying Structures in the Floodplain*.

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FEMA to clearly communicate full flood risk determinations to individual property owners regardless of whether their premiums are based on full actuarial rates. As part of this process, FEMA staff added that the agency as of November 2015 is evaluating the best way to collect the data while balancing cost and accuracy. To fully address this area of our recommendation, FEMA must collect information on all grandfathered policies and determine their financial impact on NFIP.

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## Determining Full-Risk Rates for Subsidized Properties

In our July 2013 report, we found that data constraints limited FEMA's ability to establish rates that reflected actual flood risk for subsidized policies and estimate their aggregate cost to the program.<sup>27</sup> We recommended that FEMA develop and implement a plan, including a timeline, to obtain needed elevation information as soon as practicable in order to determine full-risk rates for properties with previously subsidized rates. FEMA agreed with this area of our recommendation and said that the agency would evaluate the appropriate approach for obtaining or requiring the submission of this information. Further, FEMA said that it would explore technological advancements and engage with industry stakeholders to determine the availability of technology, building information data, readily available elevation data, and current flood hazard data that could be used to implement the recommendation.

During our current review, FEMA staff said that the agency faced a cost challenge with respect to elevation certificates, which are needed to determine full-risk rates for subsidized properties. They said that obtaining these certificates for at least 1 million policies could take considerable time and cost several hundred million dollars.<sup>28</sup> While policyholders paying full-risk rates pay for their elevation certificates, FEMA staff said that the agency was reluctant to require policyholders paying subsidized rates to incur the additional cost of obtaining elevation certificates because of the financial burden it could cause. FEMA staff said that the agency encouraged policyholders that seek to ensure the appropriateness of their NFIP rates to voluntarily submit elevation documentation. In addition, they noted that the agency was exploring

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<sup>27</sup>[GAO-13-607](#).

<sup>28</sup>According to FEMA, the cost of elevation certificates can vary greatly. With over a million subsidized policies, assuming a cost of \$300 to \$500 per elevation certificate, the cost for obtaining elevation certificates could total several hundred million dollars. It is unclear what effect increased demand for elevation certificates could have on the price.

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alternative methods of obtaining elevation information for these properties, including light detection and ranging and geographic information system technology.<sup>29</sup> To fully address this area of our recommendation, FEMA must collect information needed to determine full-risk rates for subsidized properties.

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## Agency Comments

We provided a draft of this report to FEMA within DHS for its review and comment. DHS provided technical comments, which we incorporated as appropriate. In addition, in its written response, reproduced in appendix II, DHS agreed with our past recommendations. The written response noted that in light of these recommendations and those of others, FEMA is prioritizing the development of a modernized approach to flood rating and underwriting. The written response also included information on the steps that FEMA and DHS plan to take to address each of these recommendations and, for most actions, provided an estimated completion date.

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As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to the appropriate congressional committees, the Secretary of the Department of Homeland Security, and other interested parties. In addition, the report is available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact Alicia Puente Cackley at (202) 512-8678 or [cackleya@gao.gov](mailto:cackleya@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix III.

Sincerely yours,

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<sup>29</sup>Light detection and ranging is a remote sensing method that uses light in the form of a pulsed laser to measure ranges or variable distances to earth. These light pulses—combined with other data—generate precise, three-dimensional information about the shape of the earth and its surface characteristics. Geospatial information systems are computer systems used to capture, store, check, and display information related to positions on the earth's surface. These systems can be used to study climate change, land use planning, business, and national defense.

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*Alicia Puente Cackley*

Alicia Puente Cackley  
Director, Financial Markets and Community Investment

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# Appendix I: Objectives, Scope, and Methodology

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This report examines the Federal Emergency Management Agency's (FEMA) current methods for setting National Flood Insurance Program (NFIP) rates. It describes (1) FEMA's current methods for setting rates and compares them with the methods used by private insurers and (2) steps FEMA has taken to address recommendations from our October 2008 and July 2013 reports.

To address our first objective, we reviewed FEMA rate-setting documentation, including FEMA's Actuarial Rate Review, Rate Manual, Specific Rating Guidelines, and Technical Documentation that describe FEMA's flood risk model and the methods FEMA currently uses to set full-risk and subsidized rates for policyholders. In addition, we reviewed NFIP revised rate tables (for policies written or renewed on or after April 1, 2015) included in FEMA's Flood Insurance Manual (revised February 2015). We also reviewed GAO reports and NFIP studies, including reviews by the American Academy of Actuaries, Congressional Budget Office, Resources for the Future, and the National Research Council, among others, that we identified in a literature review or in interviews. Finally, we reviewed FEMA materials on the Biggert-Waters Flood Insurance Reform Act of 2012 (Biggert-Waters Act) and Homeowner Flood Insurance Affordability Act of 2014 (HFIAA) to determine changes to NFIP rate setting. To address our first objective, we also interviewed FEMA staff and representatives from 13 organizations with flood insurance expertise—including property-casualty insurers, a reinsurance broker, actuaries, risk professionals, and an industry organization that represents property-casualty insurers. We judgmentally selected these organizations based on criteria such as the breadth of their experience and the type of organization in order to obtain a broad range of views.

To address our second objective, we reviewed our October 2008 and July 2013 reports on NFIP, including report findings and recommendations. In addition, we reviewed a document FEMA staff used to track progress on our recommendations and that outlined steps FEMA had taken to address them. We also conducted multiple interviews with FEMA actuaries and other program staff to determine the status of efforts to address past recommendations. For the purposes of this report, we discussed the actions FEMA has taken in response to our past reports but have not verified the results of these efforts because FEMA has considerable ongoing work to address our recommendations.

We conducted this performance audit from April 2014 to March 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our

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findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

# Appendix II: Comments from the Department of Homeland Security

U.S. Department of Homeland Security  
Washington, DC 20528



**Homeland  
Security**

March 7, 2016

Alicia Puente Cackley  
Director, Financial Markets and Community Investment  
U.S. Government Accountability Office  
441 G Street, NW  
Washington, DC 20548

Re: Draft Report GAO-16-59 "NATIONAL FLOOD INSURANCE PROGRAM:  
Continued Progress Needed to Fully Address Prior GAO Recommendations on  
Rate-Setting"

Dear Ms. Puente Cackley:

Thank you for the opportunity to review and comment on this draft report. The U.S. Department of Homeland Security (DHS) appreciates the U.S. Government Accountability Office's (GAO) work in planning and conducting its review and issuing this report.

The draft report considers provisions in both the Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12) and the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA) that affect many aspects of the National Flood Insurance Program (NFIP), including its finances, rate setting, and participation.

In light of GAO recommendations and the recommendations from other sources, such as the National Academy of Sciences and the Technical Mapping Advisory Committee (TMAC), FEMA is prioritizing the development of a modernized approach to flood rating and underwriting. This priority is reflected in the performance plans of FEMA's senior leaders. FEMA believes the development of a new approach to rating will help to address most of GAO's recommendations.

The draft report made no new recommendations, but referenced three recommendations from two prior reports (GAO-09-12 and GAO-13-607). The Department previously concurred with the two recommendations in GAO-09-12 and one recommendation in GAO-13-607. This new report acknowledges rate setting within the larger context of both FEMA's statutory authority to carry out the NFIP and the uncertainty of the rate setting process. FEMA has taken a number of steps to address the issues and implement the recommendations identified in GAO's prior reports.



**GAO-09-12, “FLOOD INSURANCE: FEMA’S Rate-Setting Process Warrants  
Attention”**

In short, GAO recommended that the Secretary of Homeland Security direct FEMA to ensure rate setting methods accurately reflect flood risk and to analyze the impact of grandfathered properties. In addressing the first recommendation, FEMA must:

- Verify the accuracy of flood probability estimates. To do this, FEMA will continue to collect and analyze multi-return period data for NFIP policyholders. The data to support this recommendation will be available as new flood insurance studies are completed. FEMA will continue to monitor the completion of these studies to assess when a statistically valid amount of data is available, which may take several years. FEMA’s efforts to address this recommendation in the past have been carried out through a series of discrete studies to gather and assess the data available. FEMA is developing a plan to create and maintain an infrastructure that would allow FEMA to continuously collect and analyze multi-frequency data for individual structures. When that plan is completed, FEMA will share it with GAO. Estimated Completion Date (ECD): September 30, 2017.
- Verify the accuracy of damage estimates. To do this, FEMA will collect the data required to revise its damage estimates and then undertake studies to determine the key drivers of flood damage in addition to depth. On April 1, 2016, FEMA plans to release guidance to NFIP providers on collecting improved depth-damage data beginning October 1, 2016. As data becomes available, FEMA will then incorporate the improved data in its rate-setting methodology. The data will become available as significant flood events occur. This data will also be used for analysis of the significant drivers of flood damage recommended by the National Academy of Sciences in its report “Tying Flood Insurance to Flood Risk for Low-Lying Structures in the Floodplain.” ECD: October 31, 2017.
- Verify the accuracy of flood maps. To do this, FEMA will continue reassessing flood risk and updating flood maps. By law, FEMA is required to assess the need to revise and update all flood maps once every five years, or more often as FEMA determines. To this end, FEMA leverages the Coordinated Needs Management Strategy (CNMS) as a mechanism to assess the validity of the map inventory. An assessment process to evaluate coastal flood map inventory is under development. FEMA will make a concerted effort to expand the assessment process for geographic areas with moderate to low flood risk as well as areas that are still mapped in paper format. Many coastal flood studies developed in the late stages of Map Modernization or early years of Risk MAP also require an evaluation. In addition, FEMA, as

directed by BW-12 and HFIAA, is working in coordination with TMAC to address improvements to the Agency's assessment of flood hazard. The TMAC made recommendations to FEMA regarding improvements to the flood hazard assessment process in December 2015. FEMA will issue a formal response to the 2015 TMAC recommendations by December 2016, which will address an implementation approach. ECD: December 31, 2016.

- Ensure that flood probabilities reflect the long term planned and ongoing development, erosion trends, and climate change, and improve its assessment of flood hazards. To do this, assessing TMAC's future conditions report and recommendations will help FEMA ensure it accounts for the best information on climate change. In conjunction with its response to TMAC's 2015 annual report, FEMA will issue a formal response to the 2015 TMAC future conditions recommendations by the end of the calendar year which will address an implementation approach. ECD: December 31, 2016.
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In addressing the second recommendation, FEMA must collect information on grandfathered policyholders and assess their financial impact on the NFIP. Historically, FEMA has not required Write Your Own (WYO) companies to report grandfathered information for all policyholders. Starting in 2010, FEMA required documentation of limited grandfathered information for new businesses, but the data is often not correctly reported or is inconsistent with how the policy is underwritten. Consequently, to identify the grandfathered status of structures, starting April 1, 2016, and during the next two years, FEMA will require current zone determinations for all policyholders. The two year process consists of three phases:

- Phase one begins April 1, 2016, and will apply to new NFIP business. Phase one builds on previous efforts to gather grandfathering information for new business by requiring current zone determinations to be reported consistently for all new policyholders. Phase two will begin on October 1, 2016, and will apply to the renewal of both pre-Flood Insurance Rate Map (FIRM) subsidized policies and policies on structures that have been mapped into the Special Flood Hazard Area (SFHA).

- Under Phase two, FEMA will require current zone determinations for all policyholders that are renewing with a rated zone of B, C, or X (verifying Preferred Risk Policy (PRP) policyholders and policyholders rated under the newly mapped provision of HFIAA, and distinguishing standard X zone policyholders between those that are grandfathered and those that are truly outside the SFHA) and all pre-FIRM subsidized policyholders. Phase two will be complete for all applicable policies renewing through September 30, 2017. Additional time will be needed to gather and analyze the data. Phase three will begin October 1, 2017, and will apply to the renewal of all structures with rated zones in the SFHA, other than pre-FIRM subsidized structures which were addressed in Phase two. FEMA will require zone determinations for all A and V zone renewals, and elevation determinations for all policies that are elevation rated.
- Phase three will be completed for all applicable policyholders renewing through September 30, 2018. Additional time will be needed to gather and analyze data for this phase as well. After these three phases are complete FEMA will require zone determination data to be updated as maps continue to change.

This process will enable FEMA to determine which policyholders are grandfathered, but FEMA will not be able to determine the property specific full risk rate in all circumstances. The property specific full risk rate requires an elevation certificate (EC), but FEMA does not require all policyholders with grandfathered properties to submit an EC. Collecting and analyzing data on grandfathered structures that were mapped into the SFHA will likely take until March 1, 2018.

**GAO-13-607, “FLOOD INSURANCE: More Information Needed on Subsidized Properties”**

In short, GAO recommended that the Secretary of the Department of Homeland Security direct the FEMA Administrator to determine full risk rates for subsidized properties. To do this, FEMA must collect information needed to determine full-risk rates for subsidized policyholders.

Due to the high cost of a traditional EC, FEMA policy does not required subsidized policyholders to obtain an EC. As FEMA continues to implement rate increases for subsidized policyholders required by BW-12 and HFIAA, subsidized premiums will increase to levels that could meet or exceed the structure’s full-risk rate. But an EC is required to determine the full risk rate for most zones in the SFHA. An EC provides structure specific elevation information, which is necessary to determine the full-risk rate. Without an EC, subsidized policyholders will not know when they have reached their

full-risk. FEMA strongly encouraged policyholders to purchase ECs to be able to transition to a full-risk rate when eligible. As rates increase, FEMA expects more policyholders will purchase ECs and qualify for full-risk rates. This process may take many years.

To find a faster and more cost effective solution, FEMA is investigating technologies that could replace a traditional EC. FEMA has done a preliminary assessment using Geospatial Analysis, Light Detection and Ranging (LiDAR), a remote sensing method using light in the form of a pulsed laser to measure ranges (variable distances) to the Earth, elevation data sets, and other data to determine approximate first floor elevations of policyholder structures (referred to as remote sensing). Based on this assessment, FEMA determined, though these tools may be adequate to understand the aggregate programmatic impact of subsidies (and grandfathering where ECs are missing), the technologies are not adequate for two reasons. To date, precise data generated by remote sensing is not available nationwide and this data produces results that differ from a traditional EC. Consequently, a premium based on remote sensing data may be significantly higher or lower than a premium based on a traditional EC, which is currently required for rating most non-grandfathered policies located within an area of special flood hazard. The tools-based estimate may mislead the policyholder about their potential premiums.

Although an estimate using currently available technologies would not yet help the policyholder understand their full risk rate, technological capabilities in this area continue to develop rapidly. FEMA plans to undertake an annual assessment of technological advancements to assess the coverage and accuracy of technological alternatives to traditional ECs. Based on these assessments FEMA will evaluate opportunities to satisfy the recommendation. ECD: December 31, 2016.

Again, thank you for the opportunity to review and comment on this draft report. Technical comments were previously provided under separate cover. Please feel free to contact me if you have any questions. We look forward to working with you in the future.

Sincerely,



Jim H. Crumpacker, CIA, CFE  
Director  
Departmental GAO-OIG Liaison Office

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# Appendix III: GAO Contact and Staff Acknowledgments

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## GAO Contact

Alicia Puente Cackley, (202) 512-8678 or [cackleya@gao.gov](mailto:cackleya@gao.gov)

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## Staff Acknowledgments

In addition to the contact named above, Marshall Hamlett (Assistant Director); Steve Ruszczyk (Analyst-in-Charge); Emily Chalmers; Pamela Davidson; Rachel DeMarcus; Ross Gauthier; Angela Pun; Marc Molino; Jessica Sandler; Joseph Silvestri; and Frank Todisco made key contributions to this report.

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# Appendix IV: Accessible Data

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## Agency Comment Letter

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Text of Appendix II:  
Comments from the  
Department of Homeland  
Security

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Page 1

U.S. Department of Homeland Security

Washington, DC 20528

March 7, 2016

Alicia Puente Cackley

Director, Financial Markets and Community Investment

U.S. Government Accountability Office

441 G Street, NW

Washington, DC 20548

Re: Draft Report GAO-16-59 "NATIONAL FLOOD INSURANCE PROGRAM: Continued Progress Needed to Fully Address Prior GAO Recommendations on Rate-Setting"

Dear Ms. Puente Cackley:

Thank you for the opportunity to review and comment on this draft report. The U.S. Department of Homeland Security (DHS) appreciates the U.S. Government Accountability Office's (GAO) work in planning and conducting its review and issuing this report.

The draft report considers provisions in both the Biggert-Waters Flood Insurance Reform Act of 2012 (BW-12) and the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA) that affect many aspects of

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the National Flood Insurance Program (NFIP), including its finances, rate setting, and participation.

In light of GAO recommendations and the recommendations from other sources, such as the National Academy of Sciences and the Technical Mapping Advisory Committee (TMAC), FEMA is prioritizing the development of a modernized approach to flood rating and underwriting. This priority is reflected in the performance plans of FEMA's senior leaders. FEMA believes the development of a new approach to rating will help to address most of GAO's recommendations.

The draft report made no new recommendations, but referenced three recommendations from two prior reports (GAO-09-12 and GAO-13-607). The Department previously concurred with the two recommendations in GAO-09-12 and one recommendation in GAO-13-607. This new report acknowledges rate setting within the larger context of both FEMA's statutory authority to carry out the NFIP and the uncertainty of the rate setting process. FEMA has taken a number of steps to address the issues and implement the recommendations identified in GAO's prior reports.

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GAO-09-12, "FLOOD INSURANCE: FEMA'S Rate-Setting Process Warrants Attention"

In short, GAO recommended that the Secretary of Homeland Security direct FEMA to ensure rate setting methods accurately reflect flood risk and to analyze the impact of grandfathered properties. In addressing the first recommendation, FEMA must:

- Verify the accuracy of flood probability estimates. To do this, FEMA will continue to collect and analyze multi-return period data for NFIP policyholders. The data to support this recommendation will be available as new flood insurance studies are completed. FEMA will continue to monitor the completion of these studies to assess when a statistically valid amount of data is available, which may take several years. FEMA's efforts to address this recommendation in the past have been carried out through a series of discrete studies to gather and assess the data available. FEMA is developing a plan to create and maintain an infrastructure that would allow FEMA to continuously collect and analyze multi-frequency data for individual structures. When that plan is completed, FEMA will share it with GAO. Estimated Completion Date (ECD): September 30, 2017.
- Verify the accuracy of damage estimates. To do this, FEMA will collect the data required to revise its damage estimates and then



undertake studies to determine the key drivers of flood damage in addition to depth. On April 1, 2016, FEMA plans to release guidance to NFIP providers on collecting improved depth-damage data beginning October 1, 2016. As data becomes available, FEMA will then incorporate the improved data in its rate-setting methodology. The data will become available as significant flood events occur. This data will also be used for analysis of the significant drivers of flood damage recommended by the National Academy of Sciences in its report "Tying Flood Insurance to Flood Risk for Low-Lying Structures in the Floodplain." ECD: October 31, 2017.

- Verify the accuracy of flood maps. To do this, FEMA will continue reassessing flood risk and updating flood maps. By law, FEMA is required to assess the need to revise and update all flood maps once every five years, or more often as FEMA determines. To this end, FEMA leverages the Coordinated Needs Management Strategy (CNMS) as a mechanism to assess the validity of the map inventory. An assessment process to evaluate coastal flood map inventory is under development. FEMA will make a concerted effort to expand the assessment process for geographic areas with moderate to low flood risk as well as areas that are still mapped in paper format. Many coastal flood studies developed in the late stages of Map Modernization or early years of Risk MAP also require an evaluation. In addition, FEMA, as

Page 3

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Sincerely,

Jim H. Crumpacker, CIA, CFE

Director

Departmental GAO-OIG Liaison Office

## Data Tables

**Data Table for Figure 1: National Flood Insurance Program Annual Losses Paid and Amounts Borrowed and Repaid, 1981-2015**

Year	Losses (\$ in billions)	Amount Borrowed (\$ in billions)	Amount Repaid (\$ in billions)
1981	0.127118	0.164615	0.624970
1982	0.198296	0.013915	0.470965
1983	0.439455	0.05	0.000000
1984	0.254643	0.2	0.036879
1985	0.368239	0	0.213121
1986	0.126385	0	0

Appendix IV: Accessible Data

Year	Losses (\$ in billions)	Amount Borrowed (\$ in billions)	Amount Repaid (\$ in billions)
1987	0.105432	0	0
1988	0.051023	0	0
1989	0.661658	0	0
1990	0.167897	0	0
1991	0.353682	0	0
1992	0.710225	0	0
1993	0.659059	0	0
1994	0.411075	0.1	0.100000
1995	1.295578	0.265	0.000000
1996	0.828039	0.4236	0.062000
1997	0.519537	0.53	0.239600
1998	0.886357	0	0.395000
1999	0.754971	0.4	0.381000
2000	0.251721	0.345	0.541000
2001	1.277002	0.6	0.345000
2002	0.433647	0.05	0.650000
2003	0.780805	0	0.000000
2004	2.232335	0	0.000000
2005	17.768904	0.3	0.075000
2006	0.641193	16.66	0.000000
2007	0.614007	0.65	0.000000
2008	3.487554	0.05	0.225000
2009	0.780115	1.987988	0.347988
2010	0.774689	0	0.500000
2011	2.427308	0	0.750000
2012	9.06158	0	0.000000
2013	0.488815	6.25	0.000000
2014	0.351446	0	0.000000
2015	0	0	1.000000

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