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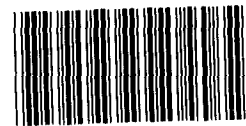
**Report To The Director  
Federal Emergency Management Agency**

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**The Federal Emergency Management  
Agency Can Reduce Mapping Cost**

The Federal Emergency Management Agency (FEMA) has not systematically assessed flood-prone communities to determine what type of mapping they require for entering the National Flood Insurance Program. As a result, FEMA has used time-consuming and expensive detailed mapping in communities with low developmental potential, where less detailed mapping was appropriate.

GAO believes that developmental potential is the key factor for determining which mapping alternative should be used. GAO recommends that FEMA develop a systematic approach to determine which type of mapping should be undertaken in the remaining communities.



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RESOURCES, COMMUNITY,  
AND ECONOMIC DEVELOPMENT  
DIVISION

B-207018

The Honorable Louis O. Giuffrida  
Director, Federal Emergency  
Management Agency

Dear Mr. Giuffrida:

This report discusses how the Federal Emergency Management Agency selected the method used to map communities for entry into the regular phase of the National Flood Insurance Program and whether it is possible to expedite the conversion of the remaining 7,300 communities without the costly and time-consuming detailed mapping. GAO performed this review because the deadline established by the Congress of August 1, 1983, for completing mapping was fast approaching with a significant number of communities still to be mapped. The report makes recommendations to you on page 18.

As you know, 31 U.S.C. §720 requires the head of a Federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations not later than 60 days after receipt of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after receipt of the report.

We are sending copies of this report to the Director, Office of Management and Budget; interested congressional committees, subcommittees, and individual Members of Congress; and officials of the selected States and communities discussed in this report. Copies are also being furnished to your Office of Inspector General for distribution within the agency.

Sincerely yours,

A large, stylized handwritten signature in black ink, appearing to read "J. Dexter Peach".

J. Dexter Peach  
Director



D I G E S T

Before the National Flood Insurance Program was established, flood victims turned to Federal and State governments for their relief and rehabilitation needs. To stem the growing demand for Federal disaster assistance, the Congress passed the National Flood Insurance Act of 1968. The act allowed property owners in flood-prone areas to purchase Federal flood insurance if their community joined the program and adopted and enforced adequate flood plain management regulations designed to protect lives and property from future floods. To join the program, a community needs a map which shows the potential areas of flooding. The map, called a flood insurance rate map, has two purposes: (1) it identifies the areas where flood plain management regulations must be enforced and (2) it helps determine what rates policyholders will pay for flood insurance.

Because detailed mapping turned out to be a time-consuming process, the Congress, in 1969, created an "emergency" phase of the flood insurance program, permitting communities to join on an interim basis, without a detailed flood insurance rate map. When a community first joins the program, it is placed in the emergency phase and is given a map which broadly delineates the area of flood hazard. The community then adopts a set of minimal flood plain management regulations and each policyholder receives a limited amount of insurance coverage at a fixed price.

Subsequently, the more detailed flood insurance rate map, which allows the community to enter the "regular" phase, is completed. The community is then legally required to adopt more specific and stringent flood plain management regulations to enter the program's regular phase. In the regular phase, policyholders can buy more insurance coverage than

under the program's emergency phase. However, the rates policyholders pay are no longer at a fixed price. The rates will vary to reflect the flooding risk policyholders face as identified on the flood insurance rate map.

The act gave the Federal Emergency Management Agency (FEMA), which administers the program, until August 1, 1983, to produce flood insurance rate maps for the Nation's 17,400 flood-prone communities. To date, FEMA has completed rate maps for about 9,000 communities and has another 1,100 communities under study. This has left 7,300 communities without rate maps. GAO performed this review to determine what options existed to transfer communities from the program's emergency to regular phase because the mapping deadline was approaching. On April 8, 1983, GAO testified on options the Congress could consider in connection with the emergency phase. (See pp. 1 to 4.)

#### RATE MAPS CAN BE PRODUCED IN VARIOUS WAYS

To produce rate maps, FEMA uses three techniques that vary in how long they take and how much they cost. Each technique is appropriate, depending on the circumstances. Where a community has a large flood-prone area and has a potential for development (building in flood-prone areas is a common practice), the appropriate method is to produce a rate map by doing a detailed study.

This approach--which takes about 4 years and is estimated to cost about \$50,000 per community--produces a detailed rate map which shows the various areas of flood risk and the expected height of flood waters during a 100-year flood (refers to the elevation that flood waters have a 1-percent chance of reaching or exceeding in any given year). This detailed information is important to adopting and enforcing adequate flood plain management regulations which apply to new construction and substantial reconstruction, but is useless to a community that is entirely built up or which for other reasons--such as a flood-prone area which is park land--has no developmental potential.

Occasionally, detailed data that may have been produced by the community or another Federal or State agency already exists on a community's flooding areas. In such instances, FEMA will take the existing data and produce a rate map similar to the one generated under the detailed study approach. Existing data study rate maps, however, cost considerably less--about \$8,000--and usually take about 2 years to complete.

Where no development has taken place in a community, stringent flood plain management regulations are less critical. In these instances, FEMA can avoid detailed mapping. Instead, FEMA can use a special conversion process to convert by changing the less detailed hazard map that the community received to enter the emergency phase into a rate map. This approach costs about \$1,000 and takes about 1 year. (See pp. 6 to 8.)

FEMA HAS PRIMARILY  
PRODUCED DETAILED RATE  
MAPS

FEMA has relied heavily on the detailed study approach to produce rate maps. GAO found that this approach resulted from a decision to focus on the detailed study process. GAO also found that the other mapping techniques, in particular the special conversion process, were implemented on an ad hoc basis and were not part of FEMA's annual decisionmaking concerning which communities need rate maps. (See pp. 9 to 11.)

As part of its review, GAO visited 36 communities in FEMA's Philadelphia, Chicago, and Dallas regions. Half of these communities already had a rate map and had been transferred to the program's regular phase. Among these communities GAO found that, on the basis of their lack of developmental potential, 11 communities could have received a rate map using the special conversion process. (See pp. 11 to 13.) Similarly, among the 18 emergency-phase communities still needing rate maps, GAO found ample opportunities to produce rate maps using both the existing data study and special conversion approaches. (See pp. 13 to 15.)

## RECOMMENDATION

Since rate maps are needed for 7,300 communities, GAO believes that FEMA needs to take a closer look at how it makes future mapping decisions. FEMA has recognized the need to revise its approach and has taken what GAO believes is the first step by proposing to rank the remaining 7,300 communities on the basis of criteria which measure their developmental potential. GAO recommends that the Director, FEMA, develop a systematic approach to determine which type of mapping should be undertaken in the remaining communities. This approach would include (1) ranking communities on the basis of their developmental potential, (2) incorporating the other mapping approaches into the decisionmaking process, (3) weighing the added flood plain management data provided by a detailed map against the map's cost and the developmental potential of the community in question, and (4) making appropriate mapping decisions based upon this information. (See p. 18.)

## AGENCY COMMENTS

FEMA agreed with GAO's recommendation and is taking action in response to it.



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ABBREVIATIONS

FEMA	Federal Emergency Management Agency
GAO	General Accounting Office



## CHAPTER 1

### INTRODUCTION

To enter the "regular" phase of the National Flood Insurance Program a community needs a flood insurance rate map. This rate map shows areas of relative flood risk and helps determine the rate a policyholder pays for flood insurance. The National Flood Insurance Act of 1968 (Public Law 90-448) gave the Federal Emergency Management Agency (FEMA)<sup>1</sup> 15 years to produce rate maps for the over 17,400 flood-prone communities in the Nation. FEMA has produced rate maps for about 9,000 regular-phase communities. FEMA has another 8,400 communities in the "emergency" phase of the program, where only limited amounts of flood insurance are available. Of these emergency-phase communities, FEMA has about 1,100 communities under study to obtain rate maps.

Since the emergency phase was set to expire in May 1983 and since the mapping deadline of August 1, 1983, was approaching, we made this review to determine what options existed for expediting the transference of communities from the program's emergency phase to the program's regular phase. On April 8, 1983, we testified before the Subcommittee on Insurance, Senate Committee on Banking, Housing, and Urban Affairs, on options the Congress could consider in connection with the expiration of the emergency phase. We are now reporting on how FEMA can improve its decisionmaking to obtain flood insurance rate maps for the remaining 7,300 communities in the emergency phase not yet under study, if the emergency phase of the program is extended. The Congress extended the flood insurance program until September 30, 1983, by Public Law 98-35.

### RATE MAPS AND THE FLOOD INSURANCE PROGRAM

The National Flood Insurance Program was established so that flood victims would not have to turn to Federal and State governments for disaster assistance. Under the provisions of the 1968 act, as amended, property owners in flood-prone areas are eligible to purchase Federal flood insurance if their community--normally a city or county--joins the program and adopts and enforces adequate flood plain management regulations, i.e., building placement, elevation, and construction standards designed to protect lives and property from future floods.

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<sup>1</sup>From 1968 to 1979, the National Flood Insurance Program was administered by the Department of Housing and Urban Development. All duties and functions of the Secretary of Housing and Urban Development were transferred to the Director, Federal Emergency Management Agency, under section 202 of Reorganization Plan No. 3 of 1978.

Under the act's original provisions, a flood insurance rate map has to be prepared in order for a community to join the program. The rate map has two important purposes. First, it determines the rate a policyholder pays for flood insurance by identifying in which risk zone the property is located. Policyholders in zones which border a river or coastline generally face a greater risk. Second, the rate map shows the elevation that flood waters have a 1-percent chance of reaching or exceeding in any given year--commonly referred to as "the 100-year flood." This elevation information is important in establishing and enforcing adequate flood plain management regulations.

Because of the need to collect detailed engineering data in each community, preparing these rate maps proved to be time-consuming and inhibited communities from joining the program. In the program's first year of operation, only four communities joined, and only a handful of insurance policies were sold.

To allow easier entry into the program, the Congress, in December 1969, amended the 1968 act to create an "emergency" phase. The emergency phase was established as a temporary aspect of the program, which was periodically reauthorized and set to expire on May 20, 1983.

This phase permitted a community to be admitted to the program without a flood insurance rate map. Instead, a flood hazard boundary map--a less detailed map which broadly identified a community's flood-prone areas--was used to admit a community into the emergency phase. As with the regular phase of the program, FEMA requires a community in the emergency phase to adopt flood plain management regulations to guide new construction in flood-prone areas. However, these regulations are less stringent in the emergency phase than those in the program's regular phase, thus reflecting the reduced level of detail in the flood hazard boundary map. In addition, because the flood hazard boundary maps identify only broad areas of risk, a flat insurance rate is charged to all policyholders in the emergency phase, regardless of how close they are to the source of flooding. Furthermore, in the emergency phase insurance coverage is limited to \$35,000 for a single-family building while in the program's regular phase coverage for a single-family building can be as high as \$185,000.

The 1968 act established two key goals for the program's mapping activities. First, by August 1973, FEMA was to identify all communities having flood hazard areas. Over 20,000 communities having such areas were identified. Second, and more importantly, FEMA was required to establish flood risk zones in

the identified flood hazard areas by August 1, 1983. The method used to meet this second requirement and admit communities to the program's regular phase is through the development of flood insurance rate maps.

#### HOW THE PROGRAM IS MANAGED

The National Flood Insurance Program is administered by FEMA. The program's insurance aspects are managed by FEMA's Federal Insurance Administration. In discharging its responsibilities, the Federal Insurance Administration sets insurance rates; develops an insurance manual for agents' use; underwrites policies; and maintains liaison with the insurance industry, trade associations, and mortgage lenders. A private contractor performs the program's day-to-day insurance operations, which are monitored by Federal Insurance Administration staff. The private contractor is responsible for recordkeeping on policyholders, accepting premiums, settling claims, and providing the Federal Insurance Administration with statistical and financial data on the insurance operations.

With regard to the program's noninsurance aspects, FEMA's State and Local Programs and Support Directorate (1) identifies flood-prone areas; (2) provides communities with flood hazard boundary maps and flood insurance rate maps so that they can enter the program's emergency and regular phases, respectively; (3) establishes flood plain management criteria; (4) oversees participating communities' adoption of necessary ordinances and enforcement of required flood plain management regulations; and (5) oversees continued community eligibility for flood insurance, resulting from the communities' compliance with FEMA's criteria.

#### PROGRAM STATISTICS

As of April 15, 1983, over 17,400 communities were participating in the program. Of these communities, over 8,400 were in the program's emergency phase and approximately 9,000 were in the regular phase. An additional 2,800 communities have had flood hazard areas identified but have decided not to participate in the program.

According to unaudited FEMA data, as of April 3, 1983, the program had almost 1.86 million policyholders with a Federal liability, as measured by insurance in force, of over \$106.2 billion. Of this total, about 276,600 policies with insurance coverage of approximately \$8.6 billion were in the program's emergency phase, while over 1.58 million policies with insurance coverage of about \$97.6 billion were in the program's regular phase.

Since the program's inception in 1968, the Congress has appropriated about \$606 million for the total mapping effort. Of this total, nearly \$54 million has been used for flood hazard boundary maps; \$481 million has been used for flood insurance rate maps; and about \$71 million has been used for special studies to improve FEMA's mapping techniques and for map printing, storage, and distribution.

#### OBJECTIVES, SCOPE, AND METHODOLOGY

Our primary objective was to identify ways communities could be quickly and inexpensively converted from the emergency phase to the regular phase of the National Flood Insurance Program. Because the emergency phase was set to expire in May 1983, we wanted to be able to present the Congress with options to consider in making decisions on the emergency phase. We presented options in testimony before the Subcommittee on Insurance, Senate Committee on Banking, Housing, and Urban Affairs on April 8, 1983.

To accomplish our primary objective, we reviewed how FEMA decides which communities need a rate map and how FEMA decides what type of mapping process is appropriate for the selected community. Hence, another objective of this review was to identify how FEMA can improve its decisionmaking for producing rate maps.

Our review was performed in accordance with generally accepted government audit standards. Work was conducted from October 1982 through April 1983 at FEMA Headquarters in Washington, D.C., and at FEMA's Philadelphia, Chicago, and Dallas regional offices.

To determine how FEMA decides which communities need a rate map, we first reviewed FEMA's rules and regulations, policies and procedures, and applicable records. We subsequently met with FEMA headquarters and regional officials to discuss how they select communities for mapping. We also met with State flood plain management officials and other individuals knowledgeable about mapping to obtain their views on how FEMA selects communities. Appendix I provides a list of the organizations we contacted or visited.

To better understand FEMA's criteria for transferring communities from the emergency to the regular phase, we made a nonscientific selection of 18 regular phase communities--6 in each of three regions we visited--which had been transferred in 1980. We visited each community, interviewed local officials, and collected data on the development of the community and its flood-prone area.

To determine how FEMA decides what type of rate map is appropriate for a selected community, we reviewed FEMA documents and interviewed FEMA officials. We wanted to identify (1) what methods are used to produce a rate map, (2) the appropriate circumstances for selecting each method, (3) which methods FEMA has used in the past, and (4) what methods FEMA is proposing to use to convert the remaining 7,300 communities in the emergency phase to the program's regular phase. Since FEMA was proposing to convert about 2,800 communities using the most time-consuming and expensive mapping method, we made a nonscientific selection of 18 emergency phase communities--6 in each of the three regions we visited--which, on the basis of available data, appeared to warrant the most elaborate mapping approach. We visited each community, interviewed local officials, and collected data on the development of the community and its flood-prone area. We also reviewed available studies evaluating FEMA's mapping effort.

## CHAPTER 2

### FEMA CAN IMPROVE ITS PROCESS FOR

#### DECIDING HOW TO MAP COMMUNITIES

FEMA's process for making decisions about when and how a community should receive a rate map, so that the community can be converted from the emergency to the regular phase of the program, does not fully consider less expensive and less time-consuming alternatives. On the basis of our limited tests, we found that FEMA has tended to develop rate maps that provide more detailed and costly information about a community's flood-prone area than appears to be necessary, in light of the limited growth potential in some of these communities. Faced with the need to make mapping decisions on about 7,300 communities in the emergency phase, FEMA has taken the first steps to improve its decisionmaking process. FEMA needs to develop a comprehensive approach which evaluates the mapping alternatives in a systematic fashion and selects the mapping alternative best suited to a community's developmental potential.

#### MAPPING TECHNIQUES USED TO PRODUCE FLOOD INSURANCE RATE MAPS

FEMA has used three techniques to produce flood insurance rate maps--detailed studies, existing data studies, and special conversions. FEMA has generally obtained flood insurance rate maps through detailed studies. These studies take about 4 years to complete and will cost, on the average, about \$50,000. The alternative mapping techniques--existing data studies and special conversions--can be used to produce flood insurance rate maps in less time and at less cost. FEMA, however, has chosen to rely on the detailed study technique to develop flood insurance rate maps to enforce the more stringent flood plain management regulations. FEMA estimates that 73 percent of the communities in the regular phase of the flood insurance program will have detailed studies by the end of fiscal year 1983.

#### Detailed flood insurance rate maps

The most commonly used approach for converting communities from the emergency phase to the regular phase is the detailed flood insurance rate map. This rate map shows the various flood risk zones within the community and provides data on the expected height of flood waters during a 100-year flood. The community then uses the data from the rate map to adopt flood plain management regulations, which will require new construction or substantial reconstruction to be built in ways which will minimize future flood losses.



To prepare a detailed flood insurance rate map, FEMA first contracts with another Federal agency, such as the U.S. Army Corp of Engineers or a private engineering firm, to study the flood hazard area of a community. The study contractor collects data on the community's past flooding history as well as any other flood studies which have been performed in the area by other entities, such as a State highway department. The study contractor subsequently performs land and aerial surveys, develops hydrologic and hydraulic analyses, and prepares a draft map and a narrative report. The study contractor's narrative report includes information on the community's characteristics, such as its population, and also includes the data the contractor used to make the analysis. According to FEMA records, this part of the detailed study process usually takes about 20 months.

The draft map and narrative report are subsequently turned over to one of FEMA's technical evaluation contractors for review. The technical evaluation contractor translates the draft map into FEMA's standard format, checks the flood data and matches it to surrounding communities' maps, and transmits the preliminary flood insurance rate map to the appropriate FEMA regional office. This part of the detailed study process usually takes about 8 months.

The regional office then sets up a meeting with the community to explain the preliminary flood insurance rate map and to resolve any questions community officials have concerning the preliminary rate map. After this informal meeting, a legally mandated appeals process begins. During the 90-day appeals period, the community or any individual in the community can present data concerning the accuracy of the preliminary rate map. From the time the preliminary rate map is sent to the FEMA regional office by the technical evaluation contractor until all appeals have been resolved, about 11 months have expired. After the preliminary flood insurance rate map is approved, local officials have 6 months to enact the community's flood plain management regulations. According to FEMA records, the entire detailed study process takes about 45 months, and FEMA estimates the studies will cost, on average, about \$50,000.

#### Alternative mapping techniques are available

FEMA has used two other mapping techniques to develop flood insurance rate maps. These techniques have produced rate maps at less cost and with less time involved. The first alternative technique is to produce a rate map using available existing data. If a community has had flood studies performed either on its own or by another Federal or State government agency, then the existing data study approach can be used. The existing data study technique differs from the detailed study technique

primarily because FEMA does not hire a study contractor to collect the original data. Rather, the existing data are provided directly to FEMA's technical evaluation contractor, who prepares a preliminary flood insurance rate map. After the preliminary flood insurance rate map is prepared, the process to obtain the final flood insurance rate map is the same as for the detailed study.

The rate map produced by the existing data study technique is similar to the rate map generated by the detailed study process since the former includes both detailed risk zones and data on the potential elevation of flood waters during a 100-year flood. For this reason, FEMA considers this approach analogous to the detailed study technique. However, FEMA has estimated that using the existing data study technique can cost considerably less--about \$8,000--and usually takes about 2 years.

The second alternative technique FEMA uses is to simply convert the existing flood hazard boundary map, without doing any detailed field work, into a flood insurance rate map. FEMA has made these "special conversions" for selected communities where little or no additional development is expected. This process produces a flood insurance rate map which does not have data on the probable height of flood waters and shows only broad categories of risk. However, because little development and, therefore, no new construction is expected, the need for detailed flood plain management regulations is reduced. FEMA has stated that producing a flood insurance rate map in this manner can cost as little as \$1,000 and can be accomplished in about 1 year.

FEMA has relied primarily  
on the detailed study approach

As stated earlier, FEMA has relied primarily on the detailed study technique to produce rate maps. Between 1968 and 1972, FEMA refined this technique. FEMA converted mostly large and developing communities to the regular phase, primarily using this process for the next 5 years, to enforce the more stringent flood plain management regulations. Beginning in 1977, FEMA began to explore using less costly alternative mapping techniques. In the three FEMA regions we visited, we found that about 82 percent of the communities in the regular phase were converted through the detailed study technique.

According to the Chief of the Engineering Branch, Office of Natural and Technological Hazards in FEMA's State and Local Programs and Support Directorate, by the end of fiscal year 1983,

FEMA will have prepared 10,300 flood insurance rate maps.<sup>1</sup> The distribution of these rate maps under the three techniques will be as follows:

- 7,500 communities will be converted through the detailed study approach.
- 300 communities will be converted through the existing data study approach.
- 2,500 communities will be converted through the special conversion approach.

Included in the 2,500 special conversions are about 600 communities that asked to join the program but for which FEMA determined the flood risk was so minimal that no rate map was required.

FEMA'S REGIONS USE DIFFERENT  
APPROACHES IN SELECTING COMMUNITIES  
FOR DETAILED MAPPING

FEMA's headquarters has not established standardized criteria for FEMA's regional offices to use in deciding which communities should be mapped in a particular year. As a result, in the three regions we visited, we found that FEMA regional officials had developed their own widely different criteria for selecting communities to map. For example, officials in the Philadelphia regional office told us that they base decisions on a subjective evaluation of four factors, placing particular emphasis on a community's development potential and how much of the community might be flooded. In contrast, in FEMA's Dallas regional office, FEMA officials told us that they use a relatively elaborate system which assigns a numerical value to 11 factors and ranks the communities on the basis of the total score. The factors include measures of the community's population, population growth, insurance policies and claims, and recent flooding history.

While the Philadelphia and Dallas regional offices make mapping decisions internally, we found that FEMA's Chicago regional office tended to rely on State flood plain management

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<sup>1</sup>Currently, FEMA has converted about 9,000 communities and has about 1,100 communities under study. The 10,300 figure is an estimate of converted communities plus communities under study at the end of fiscal year 1983.

officials<sup>2</sup> to decide which communities need to be mapped next. We found that the State officials tended to select larger communities--those located in urban, developing areas with a history of flooding problems. However, according to FEMA officials, if a large community was selected to be mapped, smaller communities which were located within the same watershed (i.e., along the same river or stream) or in the same county were often mapped at the same time. Officials at FEMA and the States in this region believed that this was a cost-effective process because it can minimize travel and other study costs.

The selection criteria used by the three regions were developed to decide which communities needed to be mapped through the detailed study technique. The selections were made annually by the regions in response to a call from FEMA's Office of State and Local Programs and Support for a list of communities which need to be mapped in detail. Then, FEMA's headquarters combined the lists of all of FEMA's regions. This combined list assumed that all communities needed to be mapped using the detailed study technique. Consequently, FEMA headquarters focused its attention on whether adequate funds were available to perform detailed studies in all communities the regions had suggested and, if funds were not adequate, which communities should be mapped.

During the actual detailed study process, we did find that an opportunity exists to alter the approach either by scaling back the detailed study effort or by using the less costly existing data studies approach. When FEMA, the study contractor, and the community meet to negotiate the time and cost of the study contractor's effort, they can agree to either scale back the amount of detailed data to be collected or decide to use existing data if they are sufficient. Our discussions with regional officials, however, indicated that this has not been done on a regular basis.

The other alternative technique--special conversions--is not considered as part of the annual decisionmaking process. Although FEMA has guidance for regional staff to perform special conversions, the guidance is not a mandatory part of the annual selections. Specifically, if regional staff, while

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<sup>2</sup>Each State has a flood plain coordinator who is funded in part by FEMA. The coordinator assists communities participating in the program by, for example, helping them define and adopt the the program's required flood plain management regulations.

carrying out their regular duties, encounter a community that does not appear to be developing and meets the criteria regarding the amount of flood insurance coverage in the community, they can submit the information necessary to process the flood hazard boundary map into a flood insurance rate map.

REGULAR PHASE COMMUNITIES--  
NOT ALL NEEDED THE DETAILED  
STUDY APPROACH

To determine what impact FEMA's process for selecting communities had on how communities were mapped and to determine if alternative conversion approaches could have been used, we visited a nonscientific selection of 18 communities in the regular phase. The 18 communities were located in FEMA's Philadelphia, Chicago, and Dallas regions; all communities had been converted to the regular phase of the program in 1980. We selected 1980 so that the community officials would be familiar with the operation of the regular phase of the program. We used the following criteria to select three communities in each of six States: one community was to have a large number of insurance policies; one community with less than 10 insurance policies was to have a high flood hazard area population as compared to total population; and one community was to be statistically between the other two in insurance policies and population. Of the 18 communities selected, 17 were converted through a detailed map. Data on the communities in the regular phase that we visited are in appendix II.

On the basis of our analysis, only 6 of the 18 communities appeared to warrant mapping using the detailed study approach. This technique is warranted when a community has the potential for flooding and is rapidly developing. We defined "developing" to mean the growth of or addition of new industry which would promote building and an increasing population in the flood plain. In our review, we found that only 6 of 18 communities met this criteria. A typical community meeting this criteria was Slidell, Louisiana. This community has a total population of 26,718, with 20,000 people living in the flood plain. It is growing because of its close proximity to New Orleans. The city's population increased 66 percent from 1970 to 1980 as measured by the census, making it one of the fastest growing cities in Louisiana.

The special conversion process can be used when a community does not possess developmental potential as evidenced by a small growth in population, a small or nondeveloping flood plain area when compared with the total community area, and a slowly growing local economy. On the basis of our review, it appears that 12 of the 18 communities in the program's regular phase

could have been converted through the special conversion process. Indicative of the type of community in this category is Shepherdstown, West Virginia. This community, located in the northeastern panhandle of the State, is not developing. Shepherdstown had a total population of 1,791 in 1980, had only three insurance policies, and had no flood insurance claims experience. Its population increased 6 percent from 1970 to 1980 as measured by the census. The land area of 0.3 square miles was totally developed.

FEMA officials could not  
always explain why communities  
were mapped in detail

After we visited the communities, assessed their developmental potential, and compared it to the mapping approach FEMA had used, we went back to the FEMA regional officials responsible for community mapping selection to discuss the results of our limited test. In the Philadelphia regional office, both the Chief of the Natural Hazards Branch and the Chief of the Natural and Technological Hazards Division could not explain why the six communities in the regular phase were mapped in detail or how the community's characteristics met the region's criteria for mapping selection. The mapping costs for the six communities in the Philadelphia region were \$420,000.

The Acting Chief for the Natural Hazards Branch in the Chicago region explained that the communities that were mapped in detail in the 1977-78 time frame and converted in 1980 were selected on the basis of their location in a watershed. Thus, small adjacent communities with no developmental potential, similar to communities we selected, were mapped as part of a larger package of communities in the same watershed. The mapping costs for the five communities mapped in detail in the Chicago region were \$417,000.

A Civil Engineer in the Natural and Technological Hazards Division in the Dallas region could not comment on why the six communities in the regular phase were selected because he was not involved with the previous years' selection. However, he stated that if these six communities in the regular phase we selected were evaluated on the basis of region's current criteria, only two out of the six would be chosen for detailed mapping. The mapping costs for the six communities in the Dallas region were \$217,000.

Our opinions on which communities should have been mapped in detail are listed in appendix II.

FEMA's FISCAL YEAR 1984 BUDGET  
PROPOSED TO DO FEWER DETAILED STUDIES

Faced with 7,300 communities in the program's emergency phase still needing rate maps in order to be admitted to the program's regular phase, FEMA developed a plan as part of its fiscal year 1984 budget. The plan identified the extent to which the three mapping techniques would be used to convert the remaining communities, at an estimated cost of \$153 million. This plan divided the 7,300 communities as follows:

- 2,800 communities would be converted through the detailed study approach.
- 1,300 communities would be converted through the existing data study approach.
- 3,200 communities would be converted through the special conversion approach.

Because this plan envisioned a significant increase in the number of communities converted through the alternative techniques, we asked FEMA officials how they arrived at the distribution of communities to be converted under the three approaches. The Chief of the Engineering Branch, Office of Natural and Technological Hazards, told us that FEMA developed the distribution by first determining how many communities could be converted using the special conversion approach. FEMA made this determination by establishing certain criteria. In particular, if a community had fewer than 10 flood insurance policies and had one or no insurance claims filed, it was deemed to be a candidate for special conversion. A comparison of this criteria with available data produced a list of about 3,200 communities which could be converted using the special conversion process.

With regard to the remaining 4,100 communities, the Chief, Engineering Branch, told us that, on the basis of a survey of State flood plain coordinators, FEMA estimated that 1,300 communities could be converted through existing data studies. However, in response to our questions, this official acknowledged that the 1,300-community estimate was only an educated guess. FEMA assumed that the remaining 2,800 communities would all need to be mapped by the detailed study approach.

EMERGENCY PHASE COMMUNITIES--  
NOT AS MANY DETAILED STUDIES  
MAY BE NEEDED

To perform a limited test of whether the amount of detailed mapping FEMA was proposing in its plan appeared to be appropriate, we made a nonscientific selection of 18 communities in the emergency phase in FEMA's Philadelphia, Chicago, and Dallas regions. We selected these communities by expanding FEMA's criteria for special conversions so that we would be selecting communities which would appear to be most in need of conversion through the detailed study approach. In particular, we developed a list of communities in the emergency phase which had more than 100 flood insurance policies, more than 25 flood insurance claims, and \$1 million or more in flood insurance coverage. We then selected three communities in each of six States covered by the three FEMA regions. Data on the communities in the emergency phase that we visited are shown in appendix III.

The most important factor for determining the level of mapping is the developmental potential of the community. Developmental potential is important because without development, the information provided by a detailed study is of limited use to a community. A detailed study provides better flood plain delineations and elevations so that a community can better regulate development of its flood plain and, thereby, mitigate future flood losses. On the basis of our review, we found that 4 of the 18 communities in the emergency phase had developmental potential which warranted a detailed study. Sulphur, Louisiana, provides a representative example of one of these communities. Located in southwestern Louisiana, it is the third fastest growing community in the State mainly because of its proximity to the oil and gas industry. Its population increased from 15,000 in 1970 to 19,700 in 1980. About 2,500 people live in the flood plain according to a local official. The community had 385 policies in force, and the average home value was about \$50,000.

Relying on existing data studies is another method that FEMA can use to convert communities to the program's regular phase. An existing data study uses available information to produce a flood insurance rate map. In our review of 18 communities, we found 2 communities that could use existing information to produce a flood insurance rate map. Raleigh County, West Virginia, is one such community. This community is a large unincorporated county covering 600 square miles in the southeastern part of the State. Its population of 46,000



increased 44 percent from 1970 to 1980. According to a local official, about 21,500 people live in the county's flood plain, which covers 22 square miles. The county has several growth industries, including medical and retail sales, and has recently received Federal funds to complete infrastructures, such as sewers and roads. Currently, the county is having the Soil Conservation Service prepare a flood study for future planning and development.

Converting communities in the emergency phase with the flood hazard boundary map is the final alternative method that FEMA uses. The flood hazard boundary map can make an acceptable flood insurance rate map when a community lacks developmental potential, population in the flood plain, or industry to support growth. Given the lack of these factors, we found that the flood hazard boundary map would be an acceptable flood insurance rate map for 12 out of the 18 communities in the emergency phase. Typical of these communities is Windber, Pennsylvania, located southeast of Johnstown, Pennsylvania. Windber is a small community in which about 200 of its 5,600 residents live in the flood plain. On the basis of the 1980 census, Windber's population has declined 12 percent since 1970. The community does not have any developable land. Furthermore, no industry presently supports growth because the two major industries--coal and steel--are on the decline. However, in September 1982, FEMA hired a study contractor to perform a detailed study of Windber.

FEMA's regions had different views on our limited test

After we visited the emergency-phase communities and assessed their developmental potential, we went back to FEMA's regional officials to discuss the results of our limited test. In the Philadelphia region, the Chief, Natural Hazards Branch, and the Chief, Natural and Technological Hazards Division, would not comment on the appropriate mapping approach for the six communities in the emergency phase nor could they comment on the developmental potential for these communities.

In the Chicago region, the Acting Chief, Natural Hazards Branch, stated that many of the region's communities in the emergency phase could be converted to the program's regular phase without a detailed study. The region had estimated that about 1,200 of the 1,600 remaining communities in the emergency phase could be converted through the special conversion approach. The Acting Chief believed, however, that a field visit to each community should be made to determine whether a flood plain and any growth potential exist.

A Civil Engineer in the Natural and Technological Hazards Division in the Dallas region was very receptive to the results of our assessment of the six communities in the emergency phase. Three of the communities--Livingston Parish, Louisiana; Liberty, Texas; and Odessa, Texas--were on the region's tentatively approved mapping projects for fiscal year 1983. Regional officials stated that preaward visits to communities may lead to the elimination of detailed studies for these three communities.

Our opinions on which mapping technique should be used to produce rate maps for these communities in the emergency phase are listed in appendix III.

FEMA IS PROPOSING TO REVIEW  
HOW MANY DETAILED STUDIES ARE  
NEEDED

On the basis of our efforts, FEMA has recently taken the first steps to determine, in a more systematic fashion, how the 7,300 communities still needing rate maps will be converted to the regular phase of the program. In April 1983, FEMA issued a request for proposals from private contractors to develop a system for assessing the developmental potential of flood-prone communities. Using the system developed, the contractor will rank all of the 7,300 communities on the basis of likely future flood plain development.

The Chief of the Natural Hazards Policy Staff told us that FEMA would use the ranking to decide which communities need to be mapped in detail and which can be converted through the existing flood hazard boundary map. The Chief, however, was not able to identify exactly what criteria FEMA would use to classify the ranked communities. He stated that such an identification would not be made until the proposed study was completed--in about 9 months. It was his view that the ranking would probably result in a group, which, given its developmental potential, obviously needs detailed studies and a group, which, on the basis of its lack of developmental potential, could be converted without detailed study. For communities which did not fall into either category, he believed FEMA would have to proceed on an ad hoc basis, relying on FEMA's regional staff to visit the communities and make a judgment about the appropriate mapping approach.

Potential savings in greater use  
of alternative conversion techniques

FEMA can reduce the cost and time required to convert a community from the emergency phase to the regular phase of the

program by making greater use of the two alternative techniques. The following table shows the cost and time for each of the three conversion techniques and the dollar savings by using the alternative techniques rather than the detailed study.

<u>Techniques</u>	<u>Average cost</u>	<u>Years to complete</u>	<u>Dollar savings if alternative is used</u>
Detailed study	\$50,000	4	-
Existing data study	8,000	2	\$42,000
Special conversion	1,000	1	49,000

Considering that about 7,300 communities still need to be converted to the program's regular phase, FEMA can produce substantial dollar and time savings by making even greater use of the two alternative conversion techniques than suggested by FEMA's plan as submitted with the fiscal year 1984 budget.

#### CONCLUSIONS

FEMA's process for making mapping decisions can be improved. The process, as it has been implemented, has generally focused on whether or not to map a community in detail. To date, it has not included a systematic analysis of other available, less costly alternatives for converting communities to the program's regular phase. In addition, because each region makes mapping decisions differently, the process has placed varying emphasis on a community's future developmental potential as a factor affecting the decision on how to map.

We believe that developmental potential is the key factor in making decisions on how to produce a rate map for a particular community. If a community is growing, it will need the detailed risk zone and flood water height information that a detailed study provides in order to develop adequate flood plain management regulations that apply to new construction. If a community has no potential for development, the extra information which a detailed map provides over a flood hazard boundary map may not, in our view, warrant the added cost.

Because FEMA's approach to date has focused on detailed mapping and has placed varying amounts of emphasis on analyzing a community's growth potential, we believe opportunities to convert communities to the program's regular phase without detailed mapping may have been missed. Of the 18 communities in

the regular phase we visited, we believe that 12 could have been converted through the less costly special conversion approach; only 1 was.

As recently as January 1983, FEMA proposed a long-range plan which would provide for a significant number of special conversions among the 7,300 communities still needing rate maps; however, FEMA was still proposing to map about 2,800 communities in detail. A limited test we conducted of 18 emergency-phase communities, that we expected would need detailed mapping, indicated that, even among this group, opportunities existed to convert communities to the program's regular phase through the special conversion and existing data study approach.

We believe that FEMA needs to take a closer look at how it will make future mapping decisions. FEMA has recognized the need to revise its approach and has taken what we believe is the first step by proposing to rank the remaining 7,300 communities on the basis of criteria which measure their developmental potential. We believe that (1) FEMA needs to develop a systematic approach which ranks the remaining communities on the basis of their developmental potential, (2) incorporates other mapping approaches into the decisionmaking process, and (3) weighs the added flood plain management data provided by a detailed map against the map's cost and the developmental potential of the community in question.

RECOMMENDATION TO THE DIRECTOR,  
FEDERAL EMERGENCY MANAGEMENT AGENCY

To improve FEMA's process for making decisions about mapping communities in the emergency phase, we recommend that the Director, Federal Emergency Management Agency, develop a systematic approach which

- emphasizes developmental potential in determining which mapping approach to use,
- incorporates other mapping approaches into the decisionmaking process,
- weighs the added flood plain management data in a detailed map against the map's cost and the community's developmental potential, and
- makes appropriate mapping decision on the basis of this information.

AGENCY COMMENTS

In providing oral comments on this report, the Acting Associate Director, Office of State and Local Programs and Support, FEMA, stated that FEMA agreed with the recommendation and is taking action in response to it. He stated that FEMA was in the process of contracting for a study to rank communities needing rate maps on the basis of developmental potential.

ORGANIZATIONS AND OFFICIALS INTERVIEWED

We obtained information from the following organizations and officials:

STATE FLOOD PLAIN MANAGERS

Florida  
 Georgia  
 Illinois  
 Indiana  
 Louisiana  
 Pennsylvania  
 Texas  
 West Virginia

COMMUNITIESOFFICIALIllinois

Alsip  
 Harwood Heights  
 Peoria  
 Adams County  
 Calhoun County  
 Jersey County

Building Commissioner  
 Deputy Clerk  
 Permit Engineer  
 County Clerk  
 County Building Inspector  
 Count

Indiana

Chesterfield  
 Clark County  
 Schneider  
 English  
 Fulton County  
 Koscuisko County

Clerk/Treasurer  
 Planning Commissioner  
 Clerk/Treasurer  
 Town Clerk  
 County Attorney  
 Ordinance Administrator

Louisiana

Donaldsonville  
 Kentwood  
 Slidell  
 Lasalle Parish  
 Livingston Parish  
 Sulphur

City Manager  
 Mayor  
 Mayor  
 President  
 President  
 Mayor

Pennsylvania

Lykens  
 Ridgeway  
 Springdale  
 Conemaugh  
 Hartley  
 Windber

Borough Secretary  
 Borough Manager  
 Borough Secretary  
 Township Supervisor  
 Township Secretary  
 Borough Manager

Texas

Irving  
 Rockwall  
 Tyler  
 Liberty  
 Odessa  
 Round Rock

Engineering Administrator  
 Director of Community  
 Service  
 Assistant City Engineer  
 Administrative Assistant  
 to the City Manager  
 Director of Public Works  
 Director of Planning and  
 Community Development

West Virginia

Mingo County  
 New Cumberland  
 Shepherdstown  
 Greenbrier County  
 Raleigh County  
 Wayne County

Building Permit Officer  
 City Clerk  
 Mayor  
 Assistant Director of  
 Planning Commission  
 County Planner  
 Administrative Assistant  
 to County Commission

OTHER FEDERAL AGENCIESLOCATIONCorps of Engineers

North Central Division  
 Louisville District  
 Rock Island District  
 Lower Mississippi Valley  
 Division  
 Vicksburg District  
 New Orleans District  
 Southwestern Division  
 Fort Worth District  
 Galveston District  
 Philadelphia District

Chicago, Ill.  
 Louisville, Ky.  
 Rock Island, Ill.  
 Vicksburg, Miss.  
 Vicksburg, Miss.  
 New Orleans, La.  
 Dallas, Tex.  
 Fort Worth, Tex.  
 Galveston, Tex.  
 Philadelphia, Pa.

Soil Conservation Service

Northeast National  
 Technical Center  
 Texas State Office

Broomall, Pa.  
 Temple, Tex.

U.S. Geological Survey

Louisiana State District  
 Office

Baton Rouge, La.

ENGINEERING FIRMS

Harza Engineering  
 Greenhorne and O'Mara, Inc.  
 Gannett, Fleming, Corddry  
 and Carpenter, Inc.  
 Freese and Nichols, Inc.  
 Turner, Collie and Brandon  
 Inc.  
 Carl C. Crane, Inc.

Chicago, Ill.  
 Riverdale, Md.  
 Camp Hill, Pa.  
 Fort Worth, Tex.  
 Houston, Tex.  
 Madison, Wis.

OTHERS

Executive Director, Association of State Floodplain Managers,  
 Inc.

Chairman, Association of State Floodplain Managers, Inc.

Electronic Data Systems Federal Corporation, Chicago, Dallas,  
 and Philadelphia



COMMUNITIES GAO VISITED IN THE PROGRAM'S REGULAR

Region	<u>Number of policies</u>	<u>Value of coverage</u>	<u>Number of claims</u>	<u>Value of claims</u>	<u>Population</u>		<u>Map cost</u>	<u>Gr Si COI</u>
					<u>Entire area</u>	<u>Flood area</u>		
Virginia	97	\$ 3,852,200	1	\$ 0	2,181	1,626	\$ 16,800	
York, Pa.	140	3,949,100	26	48,306	5,604	556	18,575	
York, Pa.	8	195,700	3	4,765	4,418	8	12,100	
County, W.Va.	861	33,403,100	151	358,672	27,469	19,668	348,800	
Marland, W.Va.	86	2,614,700	13	10,969	1,752	900	14,500	
Marstown, W.Va.	3	128,800	0	0	1,791	775	9,200	
Indiana								
Wald, Ind.	1	35,000	0	0	2,701	535	22,958	
County, Ind.	188	6,138,400	0	0	37,300	3,125	238,559	
County, Ind.	27	810,300	2	7,658	364	364	16,984	
County, Ill.	75	2,453,400	0	0	17,134	0	18,694	
Heights, Ill.	1	200,000	0	0	8,228	300	0	
County, Ill.	129	7,676,100	44	218,402	124,160	84	120,071	
Louisiana								
County, Tex.	335	12,116,800	19	2,771	109,943	24,972	81,900	
County, Tex.	5	479,600	0	0	5,939	3	17,248	
County, Tex.	77	3,961,600	11	18,734	70,508	100	56,000	
County, La.	100	3,022,800	2	0	7,901	800	23,000	
County, La.	2	44,500	0	0	2,667	14	19,900	
County, La.	2,640	101,856,500	132	12,280	26,718	20,000	19,000	

Community was appropriately converted by FEMA using the special conversion process.

25682

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COMMUNITIES GAO VISITED IN THE PROGRAM'S EMERGENCY PHASE

	Number of <u>policies</u>	Value of <u>coverage</u>	Number of <u>claims</u>	Value of <u>claims</u>	Population		GAO's Selection of Study Methods		
					<u>Entire area</u>	<u>Flood area</u>	<u>Special conversion</u>	<u>Existing data study</u>	<u>Detailed study</u>
<b>Ohio Region</b>									
Dauphin, Pa.	168	\$ 4,223,900	38	\$ 139,103	8,581	651	X	-	-
Lebanon, Pa.	102	2,135,800	38	94,244	1,779	82	X	-	-
York, Pa.	222	4,709,300	2	4,534	5,585	200	X	-	-
Franklin County, W.Va.	150	3,298,700	27	41,963	21,952	2,500	-	-	X
Highland County, W.Va.	227	4,857,100	61	162,803	45,631	21,500	-	X	-
Lincoln County, W.Va.	277	7,128,200	90	398,294	31,932	2,600	X	-	-
<b>Illinois Region</b>									
Adair County, Ill.	283	5,672,100	3	12,796	22,000	2,000	X	-	-
Clinton County, Ill.	340	4,775,400	17	32,782	5,867	1,300	X	-	-
DeWitt County, Ill.	338	5,277,500	50	72,424	10,116	300	X	-	-
Elkhart, Ind.	75	1,993,700	0	0	633	300	X	-	-
Madison County, Ind.	37	1,027,000	31	231,310	19,300	1,500	X	-	-
Warrick County, Ind.	268	8,083,000	33	239,352	59,555	300	-	-	X
<b>Texas Region</b>									
Comal County, Tex.	157	5,821,700	51	21,724	7,945	586	X	-	-
El Paso, Tex.	79	2,439,400	0	0	90,027	8,500	-	X	-
Frederick Rock, Tex.	104	5,018,700	18	0	13,000	500	-	-	X
Calderon Parish, La.	171	3,363,900	117	60,342	17,000	900	X	-	-
Madison Parish, La.	926	26,901,300	334	174,186	58,806	9,116	X	-	-
St. Landry, La.	385	13,245,500	49	6,400	19,709	773	-	-	X
							<u>12</u>	<u>2</u>	<u>4</u>