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September 3, 1993

Mr. Brian Burke
White House Domestic Policy Council
Old Executive Office Building
Washington, D.C. 20503

Subject: Public Policy Issue Paper on Flood Insurance

Dear Mr. Burke:

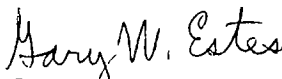
While talking with Dave Jansen regarding the issue raised in the enclosed policy paper, he suggested I send it to you.

The motivation for writing this paper came from my experience researching the various issues surrounding the proposed Auburn Dam last year. In July 1992, I represented a local environmental organization (Protect American River Canyons or PARC) during hearings held by Representative George Miller on Auburn Dam. PARC has no staff just concerned citizens volunteering their time. Neighbors donated money for expenses and I traveled to D.C. to be their voice.

When I learned that the National Flood Insurance Program is encouraging further urban development in floodplains, I was shocked and outraged as a citizen. I could not believe Federal programs would *increase* the risk to public health and safety by encouraging more people and property to reside in the deep Natomas Basin floodplain near Sacramento. The result is the enclosed paper.

I will be calling you to learn whether or not the paper raises in your mind significant enough concern to warrant action by the Clinton-Gore Administration

Sincerely,


Gary W. Estes

Enclosures: 2

PUBLIC POLICY ISSUE PAPER

for the

NATIONAL PERFORMANCE REVIEW

NEW DEVELOPMENT IN DEEP FLOODPLAINS IS BAD PUBLIC POLICY:

THE NATOMAS BASIN EXAMPLE

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August 16, 1993

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EXECUTIVE SUMMARY

At issue are Federal policies which **INCREASE** the risk to public health and safety from deep flooding. This increased risk is caused by encouraging more people to live and more buildings to be constructed in deep floodplains, such as Natomas Basin. This paper argues that to knowingly increase the risk to public health and safety is bad public policy.

The flood protection programs of the U.S. Army Corps of Engineers (Corps) and the National Flood Insurance Program administered by the Federal Emergency Management Agency (FEMA) work together to **increase** the number of people and buildings at risk of catastrophic flooding. This result is caused by the Corps building flood control structures, like levees and dams, creating a false sense of safety. Once a floodplain is protected from the 100-year flood by such structures, then urban development can proceed without any restrictions. FEMA compounds this false sense of safety by making flood insurance **available** to the people who move into the "protected" floodplain, but **not requiring** flood insurance. The Corps and FEMA are encouraging floodplain development by offering the Federal government's "seal of approval" that floodplains are safe for development.

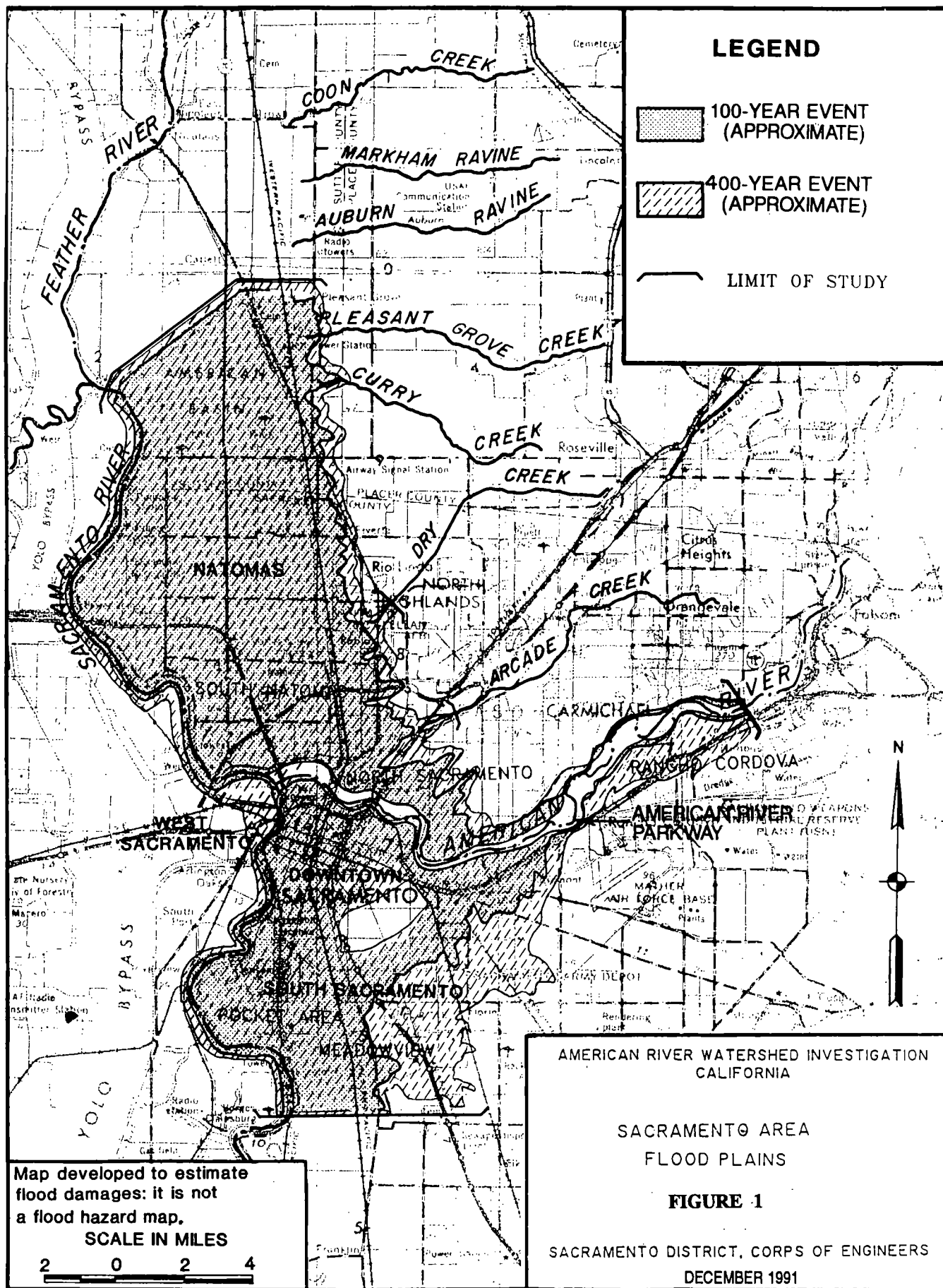
An example of this public policy gone wrong is the Natomas Basin located in the Sacramento (California) floodplain. The 55,000 acre Natomas Basin already has over 31,000 people and 13,730 structures located on 7,260 acres at risk of flooding to depths of 8 to 23 feet. The structures, plus the contents, are valued at \$2.351 billion with flood damage to them estimated at \$1.592 billion. By protecting these people and buildings, the remaining 47,622 acres of agricultural and vacant land are opened to development. This undeveloped land area totals 74 square miles which is **LARGER** than the District of Columbia (69 square miles).

Three local governments control land use decisions in Natomas Basin. Proposed urban development plans by these jurisdictions would allow over 170,000 more people and over 80,000 new homes to reside in Natomas Basin. The result would equal a city in excess of 200,000 people living in over 93,000 homes. The value of all structures and contents is estimated at over \$15 billion with potential flood damage estimated at \$8 to \$10 billion.

How much development has been encouraged in floodplains throughout the United States by existing public policy? How many times will this be repeated in the future across America? How many more disastrous floods must occur before we act? The Great Flood of 1993 shows the consequences of the current public policy. Now is the time to establish a decisive policy opposing Federal encouragement of urban development in deep floodplains.

This new policy can be implemented by enacting the same limitations on Federal actions which once encouraged development of coastal barrier areas. Enacted in 1982, the Coastal Barrier Resources Act (COBRA) prohibits Federal flood insurance for new development and restricts Federal financial assistance to designated coastal barrier areas. The same restrictions should apply to deep floodplains. Such restrictions applied to Natomas Basin will prevent:

- adding over 170,000 people living at risk of deep flooding,
- adding over \$13 billion of property at risk of destruction deep flooding,
- increasing the future cost of government to recover from a catastrophic flood disaster,
- shifting accountability for the consequences of local land use decisions to the Federal government, and
- taxpayers subsidizing profits estimated at \$5 to \$10 billion for land speculators and developers.



FOREWORD

On March 3, 1993, President Bill Clinton announced the National Performance Review to the nation. Vice President Al Gore will lead this effort to bring Total Quality Management (TQM) concepts to all parts of our Nation's government. The National Performance Review will focus six months of intense effort to evaluate the performance of government. Every aspect is open for evaluation. The President stated the Review will ". . . challenge the basic assumptions of every program asking: Does it work? Does it provide quality service? Does it encourage innovation?" He observed that many programs began for good reasons, but times have changed. He continued, "If there is something the Federal government should stop doing, we will try to make changes."

President Clinton and Vice President Gore asked citizens to communicate their suggestions for improving our Federal government. In response to their invitation, this issue paper is offered to focus attention and initiate dialogue regarding a flawed public policy. This paper identifies problems and offers possible solutions, though the problem definitions and solutions will likely change as the dialogue continues.

GEOGRAPHIC LOCATION¹

Our story begins in the floodplain of Sacramento, California. Formed by the confluence of the Sacramento River and American River, the Sacramento floodplain contains 116,000 acres (181 square miles). "To the conventional wisdom that one ought never to build on a floodplain, California has responded with its capital city."²

In the part of the Sacramento floodplain known as Natomas Basin, over 31,000 people have been allowed by Federal, California, and local governments to build their homes in a deep floodplain. Flood depths range from 8 to 23 feet in the existing developed areas. This 55,000-acre man-made basin was created in 1914 to "reclaim" wetlands and floodplain lands for agriculture.³ The entire Natomas Basin (86 square miles) covers an area *larger* than the District of Columbia (69 square miles). Approximately 13 percent (7,260 acres) of the land is in urban use and the remaining 87 percent (47,622 acres) consists of agricultural and vacant land available for development.

Figure 1 shows the Sacramento floodplain which could be flooded by a 100-year and 400-year flood event.⁴ The reader can see the rivers, creeks, and land areas comprising the 116,000 acre floodplain. The Sacramento River is the western boundary of the floodplain. Flowing north to south the Sacramento River passes Natomas, West Sacramento, Downtown Sacramento, and South Sacramento on its way to the Pacific Ocean through San Francisco Bay. The American River begins its journey in the Sierra Nevada Mountains flowing east to west joining the Sacramento River just south of Natomas Basin.

¹ Much of the information in this paper was obtained from the American River Watershed Investigation, California: Feasibility Report dated December 1991. The Report was prepared by the U.S Army Corps of Engineers, Sacramento District, and issued jointly with The Reclamation Board, State of California. It consists of Part I: Main Report and Part II: Environmental Impact Statement/Environmental Impact Report (EIS/EIR) with Appendixes A through T. This Report will be referenced as Corps Feasibility Report.

² John McPhee, Assembling California, Farrar, Straus and Giroux, (New York , 1993), p. 177.

³ Corps Feasibility Report, EIS/EIR, p. EIS 7-12.

⁴ The 100-year flood plain is approximately 110,000 acres and the 400-year flood plain is approximately 116,000 acres. Source: Corps Feasibility Report, Appendix C, p. C-14.

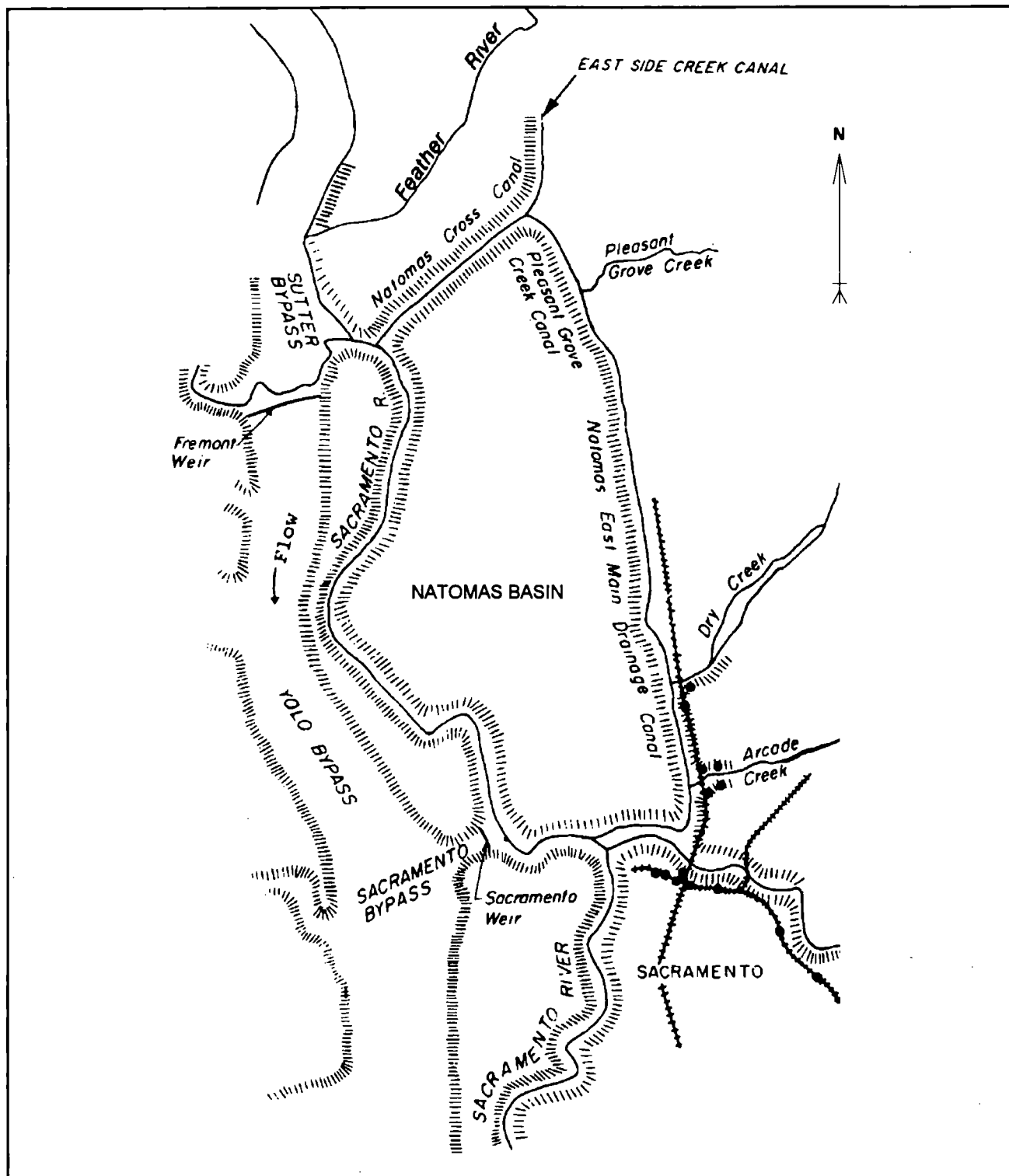


FIGURE 2
SACRAMENTO AREA

EXISTING FLOOD CONTROL STRUCTURES

LEGEND: ||||| Levees
• Floodgate
+++ Railroad

Adapted from: U.S. Army Corps of Engineers,
American River Watershed Investigation, California:
Feasibility Report, (Sacramento District, December
1991), Main Report, Plate 2



FIGURE 3
NATOMAS BASIN
AERIAL PHOTOGRAPH
SCALE: 1" = 3750 ft.
PHOTO DATE: 04-25-92

Figure 2 shows the man-made levees totaling over 41 miles creating Natomas Basin. Some 20.6 miles of canals plus another 20.6 miles of the Sacramento and American Rivers encircle the Basin. Water marks its boundaries. The north boundary is the Natomas Cross Canal. The east boundary is made of the Pleasant Grove Creek Canal and the Natomas East Main Drainage Canal. The south boundary is made of the Sacramento River and American River joining south of Natomas. The west boundary is the Sacramento River.

To give the reader an understanding of what Natomas Basin looks like, Figure 3 is an aerial photograph of the area. The expansive agricultural and vacant land in the large northern portion can be contrasted with small urbanized development in the southeastern corner between Interstate 80 and the American River.

DEVELOPMENT IN NATOMAS BASIN

Created by constructing drainage canals and 41 miles of encircling levees, Natomas Basin was considered "protected" from the 100-year flood. Like elsewhere in America, urban development was proposed to replace farming in Sacramento's floodplain. When officials of Sacramento City and Sacramento County decided to approve urban development, it made sense at the time as Natomas Basin is flat land and a 15 to 30 minute drive to downtown Sacramento. Since the level of flood protection met the minimum Federal standards set by the Federal Emergency Management Agency (FEMA) under the National Flood Insurance Program (NFIP), urban development proceeded. By 1990 over 31,000 people called this area home. Over 13,730 homes, businesses, industries, and public buildings were built over 7,260 acres in Natomas Basin. These buildings and their contents have an estimated value exceeding \$2.351 billion.⁵

In February 1986 a major Pacific Ocean storm brought record breaking rainfall to Northern California causing the Sacramento and American Rivers to reach new record high flows. The Natomas Basin levees held, but weaknesses were found. FEMA contracted with the Corps of Engineers to evaluate the Sacramento area flood control system. With new record river flows plus new FEMA safety standards for levees, Natomas Basin levees were downrated from 100-year flood protection to ranges of 40-year to 70-year protection.

Without going into the details, urban development stopped in Natomas Basin after the 1986 storm because the FEMA 100-year flood control standard was no longer met. Without 100-year flood control, FEMA would allow development to continue only if the first habitable floor is built one foot above the height of the 100-year flood elevation. Because of the potential high flood depths of 8 to 23 feet in Natomas Basin, it was impractical and uneconomical for residential buildings to meet the one foot standard. Residential development stopped.

Projects supported by the Federal, California, and local governments have worked to strengthen the Sacramento River levees. Projects to strengthen other levees around Natomas Basin are progressing. Once the minimum FEMA 100-year flood control standard is restored or exceeded, urban development can continue on the 47,622 acres (74 square miles) of vacant and agricultural land in Natomas Basin.

⁵ Corps Feasibility Report, Appendix C, Table III-3 on p. C-14, Table III-5 on p. C-18, Table III-6 on p. C-19, and p. C-29. Figures are existing conditions as defined on each table.

ACCOUNTABILITY FOR DEVELOPMENT CONSEQUENCES

Who will be held accountable for the consequences of further urban development in Natomas Basin? Who is responsible for promoting such urban development? Who is responsible for declaring Natomas Basin safe for development? In the minds of land speculators, developers, and the local government officials of Sacramento City, Sacramento County, and Sutter County, further urban development is the "Manifest Destiny" for Natomas Basin.

After 100-year flood protection is restored to Natomas Basin, FEMA will give its "seal of approval" and the requirement to build the first floor above the 100-year flood elevation will be removed. Development can continue. To local promoters and decision-makers, this means the flood risk has been determined by FEMA to be acceptable to the Federal government. FEMA's acceptance allows the flood risk caused by approving further development to be shifted from land speculators, developers, and local government taxpayers to Federal taxpayers. The land speculators and developers make their \$5 to \$10 billion of profits and leave the disaster cleanup bills for others to pay. This is wrong. The consequences of local land use decisions should stay with those promoting and making the decisions.

The accountability for land use decisions promoted by land speculators and developers and approved by local government officials is lost because the consequences are shifted to the Federal government. Accountability for decisions will only occur when institutions and individuals making decisions are held accountable for the resulting consequences. Without such ultimate accountability for their actions, land speculators and developers will pressure and encourage local government officials to allow further development in Natomas Basin. Continuing to shift the accountability for development consequences to the Federal government, and ultimately Federal taxpayers, is bad public policy.

How can the accountability for local land use decisions be left with the decision-makers? The answer is found in the Coastal Barrier Resources Act (COBRA) enacted in 1982. COBRA prohibits new development in designated coastal barrier areas from receiving flood insurance and other Federal financial assistance. By removing the Federal encouragement to development (i.e., flood insurance and other Federal financial assistance), land speculators, developers, and local government officials are held totally accountable for the consequences of their land use decisions. Development is still allowed in the floodplain, but the Federal government does not provide financial assistance nor does it provide flood insurance.⁶ All the risks and profits remain with those land speculators, developers, and local government officials who are willing to invest their money in floodplain development. The buck stops at the local level, where it belongs.

INCREASING THE RISK TO PUBLIC HEALTH AND SAFETY

Let's explore the possible consequences from further urban development in Natomas Basin. In the Corps of Engineers report on Sacramento flood hazards, the Corps identified THE flaw in all the flood control alternatives examined for protecting Sacramento: **All flood control alternatives increase the risk to public health and safety.** Why? Because the number of people and buildings exposed to flooding will increase due to urban development in floodplains. The Corps states:

⁶ Federal Emergency Management Agency, Mandatory Purchase of Flood Insurance Guidelines, FEMA 186, Effective on July 13, 1989, p. 24.

"Finally, under existing local and Federal flood plain management regulations, all of the alternatives carried forward in this report would provide a sufficient level of protection to permit development to proceed in Natomas and elsewhere in the flood plain. This development would significantly increase the number of people and the amount of property exposed to flooding and would increase the losses produced by an uncontrolled event."⁷

The most disturbing results from Natomas Basin flooding are the potential for significant loss of life, the massive disruption of peoples' lives, and the massive destruction of buildings and their contents. Over 31,000 people call this area home.

"Loss of life could be significant depending on the warning time given to residents to evacuate the basin. Advance warning would be essential because the breach would be proximately located to the urbanized portion of the basin. Floodwaters would thus reach vital transportation corridors relatively quickly, and eventually render the affected freeway and local roadway segments impassable."⁸

Proposed urban development plans by local governments would add over 170,000 people and over \$13 billion of new buildings and their contents in Natomas Basin. The total population would exceed 200,000 and property value exceed \$15 billion. Where do 200,000 people who lived in 93,000 homes find housing during and after the flood? What magnitude of human and economic disaster will befall the Sacramento area when a flood inundates a fully urbanized Natomas Basin? To answer this question let's compare the Great Flood of 1993 to a future flood in Natomas Basin with 200,000 people and over \$15 billion worth of structures and contents. Table A shows the comparison:

Table A

Comparison of Great Flood of 1993 to Future Flood of Urbanized Natomas Basin⁹

	Great Flood of 1993*	Future Flood Natomas Basin
Deaths	48	15
People Evacuated	100,000	200,000
Homes Damaged	45,000	93,000
Total Damages	\$12 to \$15 Billion	\$8 to \$10 Billion
Property Damage	\$6 to \$7 Billion	\$8 to \$10 Billion
Crop Damage	\$6 to \$8 Billion	0
Square Miles Flooded	31,250	86

* Actual and estimated as of Friday, August 6, 1993.

⁷ Corps Feasibility Report, EIS/EIR, p. EIS 1-8.

⁸ Sacramento Area Flood Control Agency, Revised Draft Environmental Impact Report for the Revised Natomas Area Flood Control Improvement Project, (Sacramento, March 1993), p. 5.3-1.

⁹ See Appendix B for sources.

The comparison is striking. In the Midwest the flood damage and destruction is spread over 31,250 square miles beside rivers stretching hundreds of miles. In Natomas Basin the destruction is concentrated in 86 square miles. It is ironic to compare the Midwest flood damage to that of a fully developed Natomas Basin. Crop damage is half of the Midwest damages because flooding occurred during the growing and planting season. Property damage is the entire source of damages in Natomas Basin.

The estimated property and crop damage, as of August 6, produced by the Great Flood is \$12 to \$15 billion spread over 31,250 square miles compared to an estimated \$8 to \$10 billion of property damage over just 86 square miles in Natomas Basin. Twice as many homes would be damaged in Natomas Basin (93,000) compared to the Midwest (45,000 as of August 6). Why would we knowingly create a potential catastrophe of this magnitude?

SEVERITY OF FLOOD DAMAGE

Why does flooding in Natomas Basin cause so much destruction? The answer is found in its physical features:

1. During flood events, river levels are higher than the ground level inside the Basin.
2. Rivers or canals surround the Basin on all sides.
3. Levees surround Natomas Basin on all sides.
4. Levees are 15 to 20 feet higher than the inside land area.
5. Natomas Basin has no drain.
6. Low lying lands inside the Basin are lower than surrounding land.
7. Flood waters fill the Basin whenever levees fail.

Together these physical features make Natomas Basin a disaster waiting to happen. Whenever a levee breaks, flood water could fill the Basin. Why? Natomas Basin is a 55,000-acre bathtub and swimming pool combined, but it has no drain! The 15 to 20 high levees form the "bathtub" walls. The land inside is the "bathtub" bottom, but the bottom is not flat. The bottom is like a swimming pool with the deep end located in the middle. From the deep center the pool gets shallower as one moves toward the levees.

On Figure 4 the land area shown as white (over 23 feet) is the lowest part of Natomas Basin. The next lowest land elevation is the land area marked 18 to 23 feet. Once flood waters get inside, it cannot get out until the river level goes down allowing some water to drain out the break in the levee. In these two low lying areas, water will remain until pumped out or it evaporates. These two areas are 5 to 10 feet *lower* than the land around them and would form a 17,700 acre (27.6 square mile) pond. It would cover 32 percent of the land area.

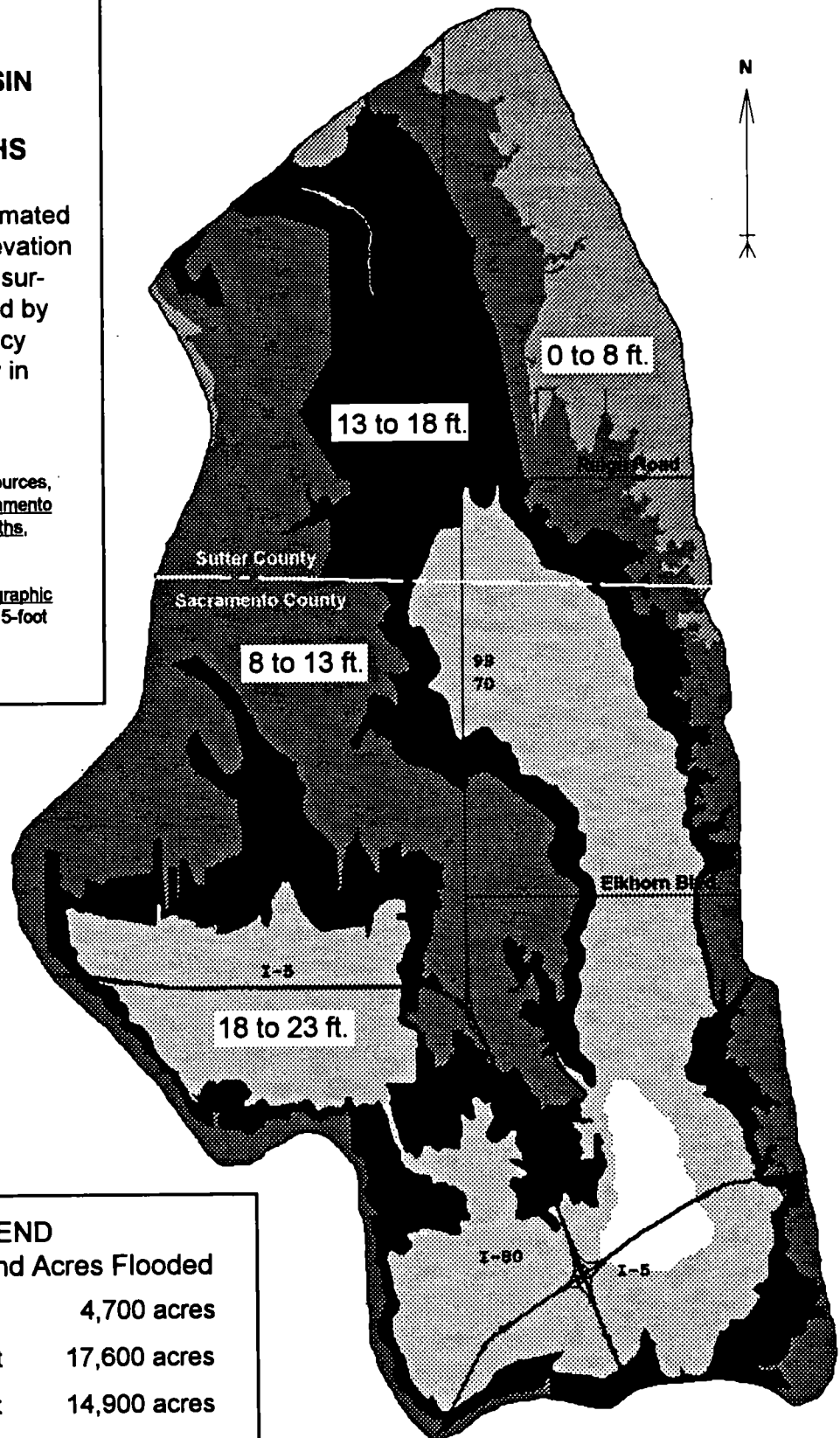
Figure 4 shows the land area covered by the estimated potential flood depths for Natomas Basin. The flood depths are based upon a flood elevation of 33 feet derived from the Flood Insurance Study and Flood Insurance Rate Map (FIRM) issued by the Federal Emergency Management Agency (FEMA) in March 1993. Figure 5 shows the estimated flood depths, the number of acres and square miles by flood depth, and the percentage of land area covered by flood depth.

FIGURE 4 **NATOMAS BASIN** **ESTIMATED** **FLOOD DEPTHS**

Flood depths are estimated from 33-foot flood elevation derived from Flood Insurance Rate Map issued by the Federal Emergency Management Agency in March 1993.

Map developed from:
 California Dept. of Water Resources,
Map of American River - Sacramento
Estimated Potential Flood Depths,
 June 1993.

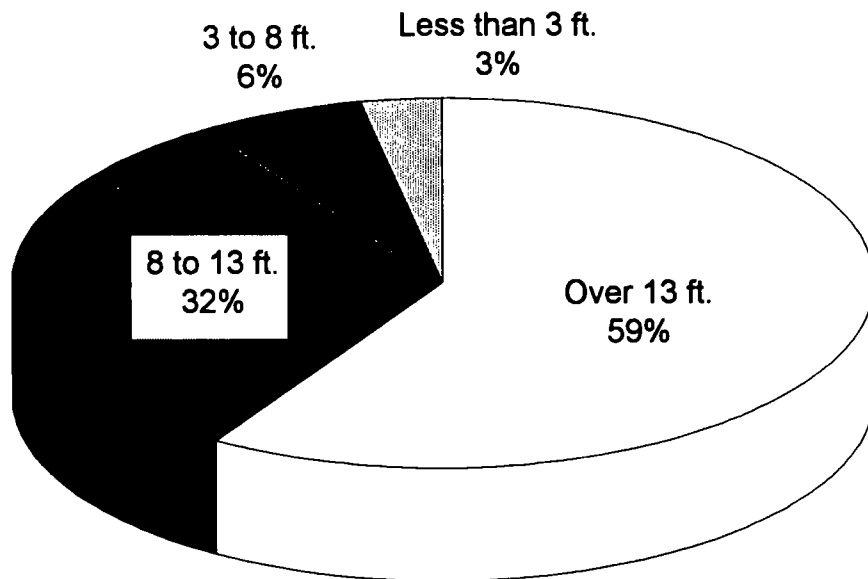
U.S. Geological Survey, Topographic
Maps (7.5 Minute Series) with 5-foot
 contour interval, various years.



LEGEND

Depth of Water and Acres Flooded

	0 to 8 feet	4,700 acres
	8 to 13 feet	17,600 acres
	13 to 18 feet	14,900 acres
	18 to 23 feet	16,600 acres
	over 23 feet	1,100 acres



Depth of Flood Water (feet)	Percent of Total Land	Land Area	
		(acres)	(sq. miles)
0 to 3	3.	1,400	2.
3 to 8	6.	3,300	5.
8 to 13	32.	17,600	28.
13 to 18	27.	14,900	23.
18 to 23	30.	16,600	26.
over 23	2.	1,100	2.
Totals	100.	54,900	86.

**FIGURE 5
NATOMAS BASIN
ESTIMATED FLOOD DEPTHS**

Percentage, acreage, and square mile
measurements of estimated flood depths

The depth of flood water and the duration of flooding have a significant impact upon property damage. Together flood depth and duration have a significant impact on property damage in Natomas Basin. The Corps of Engineers estimated flooding will last for 30 days. This is an extraordinary amount of time when compared to the flood duration of less than 5 days for other parts of the Sacramento floodplain. The Corps also estimated damages to buildings and contents would reach 100 percent where flood depths exceed 13 feet.¹⁰ Figure 5 shows that approximately 59 percent of Natomas Basin's land area could flood to depths exceeding 13 feet and 32 percent could flood to depths of 8 to 13 feet. A total of 91 percent of the land area could flood to depths exceeding 8 feet.

The Corps estimated 13,730 structures and the contents are valued at \$2.351 billion and would suffer flood damage estimated at \$1.592 billion, which is over 67 percent of the market value. "Natomas is the only reach (part the Sacramento floodplain) where flood damages would exceed 50 percent of the market value of the structure."¹¹

Even if a higher level of flood control is provided, the depth and duration of flooding in Natomas Basin is the same. Whenever the next larger flood breeches the levees, Natomas Basin fills with water. The Corps of Engineers observed:

"Flooding from levee failure would be similar in Natomas . . . **regardless of the frequency** of the flood event because (1) the ground elevation adjacent to the levees in these locations is lower than the water surface in the river, and (2) the volume of water in the American River . . . and Sacramento River in the case of Natomas . . . **would fill** the flood plains to similar depths."¹²

To illustrate the Corps point, Figure 6 is a Natomas Basin levee profile along the American River. It shows the highest river water level during the February 1986 storm was 13 feet above the ground level in Natomas Basin. If the levee had failed with the river at the highest level, Natomas Basin could have filled up. As shown on Figure 6, a single story house would have been completely covered by water.¹³

The Corps of Engineers concluded that the Natomas Basin will experience severe flooding whenever the flood control levees are breached. The only thing which changes is the probability, or frequency, of when flooding will occur. Severity of flooding in Natomas Basin is the same no matter the frequency of flood. In other words, severity of flooding in Natomas Basin is the same no matter the probability, or probable frequency, of flooding.

¹⁰ "For the Natomas reach, duration is 30 days, and the average velocity is less than 0.5 feet per second. **Duration has a significant effect on the flood damages for this area.** Damages to structure and content for each land use category [i.e., residential, commercial, industrial, public, and mobile home] were set at **100 percent** for depths greater than [sic] 13 feet. For the remaining reaches in the flood plain, duration is less than 5 days, and the average velocities range from 0.5 to 5 feet per second. Neither duration nor velocity had any significant effect on damages." Source: Corps Feasibility Report, Appendix C, p. C-22, (emphasis added)

¹¹ Ibid., p. C-25.

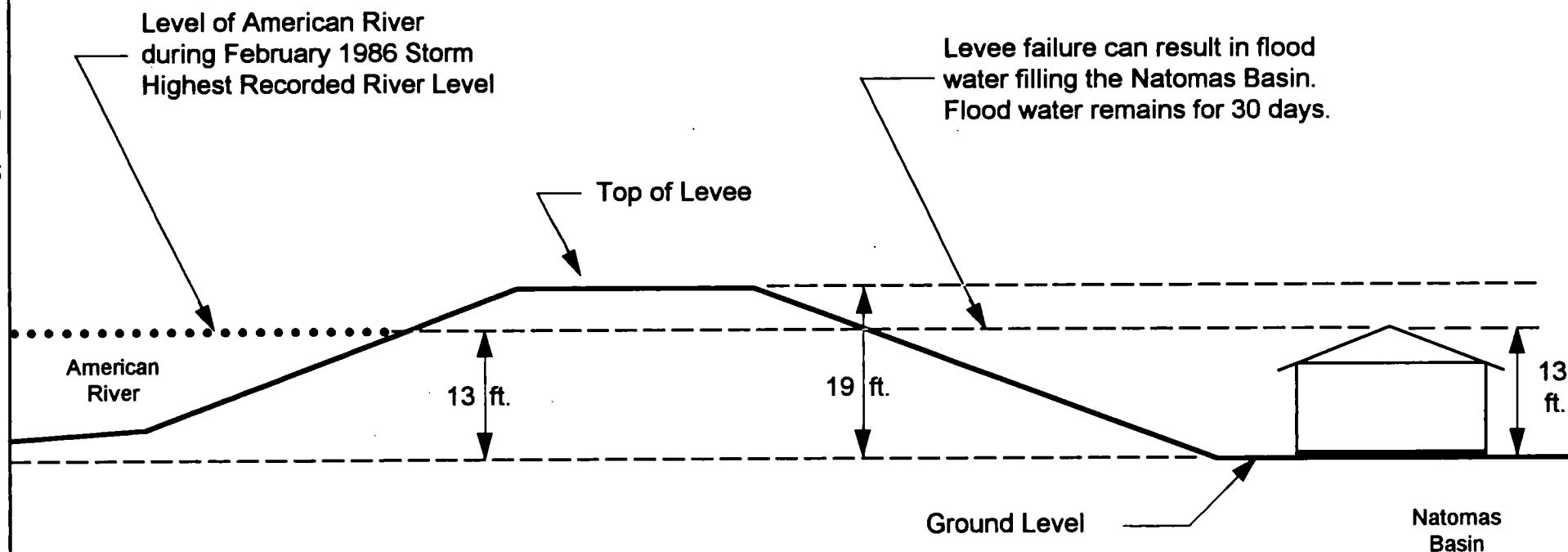
¹² Ibid., Main Report, p. III-18, (emphasis added).

¹³ Figure 6 is a graphic illustration of Natomas Basin flood depths and what this much water does to a single story house constructed on grade. Building on grade is the typical method used in much of California. The house is completely covered. Destruction is total for building and contents.

**FIGURE 6 LEVEE PROFILE
NATOMAS BASIN
AMERICAN RIVER
RIVER MILE 1.5
LOOKING DOWNSTREAM**

"Flooding from levee failure would be similar in Natomas . . . regardless of the frequency of the flood event because (1) the ground elevation adjacent to the levees in these locations is lower than the water surface in the river and (2) the volume of water in the American River . . . and Sacramento River . . . would fill the flood plains to similar depths."

SOURCE: U.S. Army Corps of Engineers, American River Watershed Investigation, California: Feasibility Report, (Sacramento District, December 1991), Main Report, p. III-18.



Drawn from U.S. Army Corps of Engineers, American River Watershed Investigation, California: Feasibility Report, (Sacramento District, December 1991), Appendix M, Chapter 2, Appendix M-2-A, Levee and Flood Profiles - Sections 5 through 9, Section 7.

PROBABILITY OF FLOODING

What is the probability of Natomas Basin flooding? To answer the question, consider an incident from the Great Flood of 1993:

"For various points along the Mississippi, the Army Corps of Engineers has calculated the probability of floods of varying heights. The smallest probability they bothered to calculate was a '500-year flood' - one so unlikely it can be expected to happen only once in five centuries. . . . [A]t Hannibal, Mo., a 500-year flood was determined to be 30 feet, so the city built its new levee a foot higher, at 31. It was finished in April after two years of work, and when the waters rose in early July residents heaped three feet more of sandbags atop it. When the crest reached Hannibal, the river was at 32 feet."¹⁴

This incident helps us to understand the uncertainty of predicting and controlling flood events. Also it shows the confusion caused by the terms used to describe flood events. The Corps of Engineers calculates the probability of floods of varying heights, or volumes. Each calculated flood event has an estimated water height which is caused by an estimated water volume. As can be expected, greater volume results in greater height. As the volume of water increases, the probability decreases because larger floods occur less often.

To name different flood events, engineers use a shorthand description based upon the probability of when each flood event will occur. Engineers take historical records of past floods and apply statistical calculations to predict the probability or chance of flooding. For example, the "500-year flood" is the calculated flood of a certain volume or height which has a 1 in 500 chance of occurring in any year. The 500-year flood has a one-fifth of one percent (0.20%) of occurring in any year. Over 30 years the 500-year flood has a 6 percent chance of occurring during the 30 years. The "500-year flood" DOES NOT mean this size of flood will only occur once in 500 years. As can be seen from Table B, over 100 years the 500-year flood has a 18 percent of occurring while the 100-year flood has a 63 percent chance of occurring during the same 100 years.

The terms 500-year flood and 100-year flood can be misleading. Such floods may be experienced in any year. Since the National Flood Insurance Program was established, there have been numerous instances where communities have experienced two, and even three, 100-year or greater floods within a span of several years. A notable example is Pennsylvania in the 1970's where within five years after Tropical Storm Agnes (1972) battered the state another 100-year flood occurred.¹⁵

Table B presents the percent chance or probability of different flood events happening in any year and over various numbers of years. The chance of the 1 in 100 flood, or the 100-year flood, occurring over the life of a 30-year mortgage is 26 percent, or about one in four. The question for the homeowner is whether or not to purchase flood insurance. By contrast, during the term of a 30-year mortgage, there is only a 1 percent chance of suffering a fire loss.¹⁶ What level of risk is acceptable? What level of risk is unacceptable?

¹⁴ Jerry Adler, "Troubled Waters," Newsweek, July 26, 1993, p.21.

¹⁵ Federal Emergency Management Agency, Mandatory Purchase of Flood Insurance Guidelines, FEMA 186, Effective on July 13, 1989, p. 7.

¹⁶ Ibid.

Table B

Percent Chance Of Floods Occurring Over The Years

Number Of Years	100-Year Flood (percent)	500-Year Flood (percent)
Any Year	1.0	0.20
30	26	6
50	39	10
75	53	14
100	63	18
200	87	33
400	98	55
500	99.34	63
1000	99.99	86
2000	99.99	98

CONGRESSIONAL RECOGNITION OF UNACCEPTABLE RISK

The unacceptable risk posed to public health and safety by further development in Natomas Basin was recognized in two Federal laws enacted in 1992. These two laws contained sections written to address Natomas Basin flooding issues. Each law and its legislative history talks specifically about Natomas Basin. Together these laws express the Congressional recognition of the unacceptable risk created by allowing further urban development of Natomas Basin

First, in the Department of Defense Appropriations Act of 1992, the Secretary of the Army was authorized to construct the Natomas Basin levee improvement features proposed by the Corps of Engineers. However, a limitation was placed upon these levee improvements:

"... provided that such construction does not encourage the development of deep floodplains."¹⁷

Second, in the Housing and Community Development Act of 1992 (H.R. 5334), changes were made to the National Flood Insurance Program (NFIP). A change was specifically designed to address Sacramento's flood insurance problems. Briefly, the legislation (a) created a new "flood restoration zone" for flood insurance rates, and (b) allowed the Federal Emergency Management Agency (FEMA) to establish floodplain management criteria for new construction in the flood restoration zone where flood depths exceed 5 feet. Speaking as the Chairman of the Senate Housing and Urban Affairs Subcommittee responsible for the legislation, former U.S. Senator Alan Cranston of California spoke on the floor of the Senate to clarify the intent behind the legislation:

"The flood restoration zone is not intended to allow the development of undeveloped areas including the Natomas basin area in Sacramento."¹⁸

¹⁷ Department of Defense Appropriations Act of 1992, Section 9159.

These two laws recognize the unacceptable risk caused by further urban development in Natomas Basin. Congress has established limits on further development. However, local government officials are working to get around the limitations contained in these two laws. Their efforts appear to be close to success and urban development will continue to fill Natomas Basin. Before this happens, the Clinton-Gore Administration and Congress should act to change Federal law by prohibiting flood insurance from being available to new development and by removing other Federal financial assistance.

Such action was taken by Congress in October 1982 with the passage of the Coastal Barrier Resources Act (COBRA).¹⁹ The law was enacted to restrict Federal government actions that were encouraging the development of certain coastal barrier areas. Among the restrictions in COBRA, no new flood insurance coverage was provided for any new construction in designated coastal barriers after October 1, 1983. While COBRA does not prevent private financing and development, it limits financial assistance by Federal agencies on undeveloped coastal barriers. Similar legislation should be enacted to remove Federal encouragement of further urban development in Natomas Basin. Further details for legislation to achieve this end is presented in Appendix A.

SUMMARY OF PUBLIC POLICY ISSUE

The basic public policy issue is whether or not the Federal government should encourage additional urban development in deep floodplains, such as Natomas Basin. The arguments against encouraging further development are based upon these beliefs and values:

- Government should reduce risk and protect the public health and safety, not increase such risks.
- Government should spent limited tax dollars protecting public health and safety, not wasted on projects increasing the risk to people and property.
- Predicting and controlling the forces of nature is subject to unacceptable error and mistake, not an activity government should depend upon for protecting public health and safety.
- The accountability for the consequences resulting from decisions should remain with the decision-makers responsible, not transferred to others.
- Each generation should think about the short and long term impacts of their actions, not leaving deficits and billion dollar blank checks to be paid for future flood disasters by future generations.
- Tax dollars should benefit the larger public good, not produce windfall profits for a few land speculators and developers.

The problems caused by allowing further urban development in Natomas Basin are:

1. The risk to human life and safety is increased by further urban development in Natomas Basin. Over 170,000 additional people could be added to the 31,000 already living there. What will be the level of human suffering when 200,000 people are flooded? Where does a city of over 200,000 people live when everything is under water for 30 days? How long will it take to rebuild? How many people will die?

¹⁸ Congressional Record - Senate, October 8, 1992, p. S17910.

¹⁹ 96 Stat. 1653, Public Law 97-348 (S. 1018), October 18, 1982.

2. The 55,000-acre Natomas Basin is a combined bathtub/swimming pool with no drain! Massive destruction of structures and the contents would result from flooding a fully urbanized Natomas Basin. Proposed urban development plans by local governments would increase the value of structures and contents to an estimated value of over \$15 billion. The potential property damage is estimated at \$8 to \$10 billion. This amount is similar to the destructive Great Flood of 1993 (as of August 6, 1993). How much will the local, California, and Federal governments pay for such a massive disaster relief effort? From where will the money come?

3. Flood depth, flood duration, and extent of destruction in Natomas Basin is the same no matter if the flood is a 100-year, 200-year, or 400-year event. Flood control structures create a false sense of security. Flood control structures for Natomas Basin only reduce the probability, or probable frequency, of flooding, not the severity of destruction. Instead of encouraging people to stay out of floodplains, government tries to predict and control the forces of nature. Why are we allowing more people and buildings to be placed in harms way when we know disaster will strike someday?

4. The accountability for flooding consequences caused by the decision to build in floodplains is transferred from local decision-makers to Federal taxpayers. How can local decision-makers be held accountable for their decisions when the resulting consequences are transferred to others?

5. By encouraging further development in Natomas Basin, Federal taxpayers are subsidizing profits for land speculators and developers who promote building in deep floodplains. Estimated profits are \$5 to \$10 billion. The land speculators and developers do not bear the cost of building flood control structures nor the cost of emergency disaster relief and recovery. Taxpayers are responsible for this financial burden. When will the costs be placed upon those responsible and not passed on to others?

CONCLUSION

The National Performance Review offers the opportunity to ask tough questions and to take corrective action. Federal public policy should not encourage increasing the number of people and buildings at risk of deep flooding. The Natomas Basin is a prime example of Federal policy gone wrong. Encouraging further urban development in deep floodplains is bad public policy. The Great Flood of 1993 shows the folly of continuing business as usual. Saying "it has always been done this way" is no excuse for continuing the practice. Now is the time to make fundamental changes.

APPENDIX A

PROPOSED LEGISLATIVE SOLUTION

Federal government actions are encouraging urban development in Natomas Basin. This is the same type of problem Congress faced when it enacted the Coastal Barrier Resources Act (COBRA). Adopted in October 1982, COBRA was enacted to restrict Federal government actions that were encouraging the development of certain coastal barrier areas.

The essential provisions of COBRA are:

1. Prohibits the National Flood Insurance Program from providing flood insurance protection for buildings built after October 1, 1983, in designated undeveloped coastal barriers.
2. Limits financial assistance by Federal agencies on undeveloped coastal barriers, except for enumerated situations such as emergency assistance actions essential to saving lives, protecting property, and protecting public health and safety. Such emergency assistance would not include disaster assistance and government loans.

While COBRA limits the availability of flood insurance and limits financial assistance by Federal agencies, it does not prevent private financing and development. The inability of the property owner to purchase flood insurance does not require a lender to refrain from making a conventional loan. The decision and risk remain with the property owner and the lender.¹

These same COBRA restrictions should be enacted by Congress for deep floodplains, like Natomas Basin. Doing so will greatly restrict new development and alter the type of development undertaken in the Natomas Basin. Existing buildings would be grandfathered and allowed to continue receiving flood insurance and Federal financial assistance.

Based upon the characteristics of Natomas Basin, five (5) criteria should be used to define deep floodplains subject to COBRA-type restrictions:

1. Damage from potential flood events will cause destruction of structures and contents to be 50 percent or greater of their value regardless of the flooding frequency or probability.
2. Depth of flooding is over five (5) feet for all potential flood events regardless of the frequency of flooding.
3. Duration of flooding is over five (5) days for all potential flood events regardless of the frequency of flooding.
4. Amount of undeveloped land in project area located in floodplain exceeds 5 percent of the project land area.
5. Potential risk to public health and safety is increased even after flood control measures are implemented.

¹ Federal Emergency Management Agency, Mandatory Purchase of Flood Insurance Guidelines, FEMA 186, Effective on July 13, 1989, p. 24

APPENDIX B

GREAT FLOOD OF 1993: The numbers are as of Friday, August 6, 1993. The information and numbers used are taken from The Sacramento Bee, August 8, 1993, p. A8, except where another source is noted.

A Newsweek, July 26, 1993, p. 22 .

As of August 6, 1993	Deaths (actual)	Homes Damaged (estimated)	Estimated Property Damage (billion)	Estimated Crop Damage (billion)	State Total Estimated Damages (billion)	Square Miles Flooded	Total Number States Flooded
Illinois	4		\$0.930	\$0.565	\$1.495		
Iowa	5		1.250	1.150	2.400		
Kansas	1		A 2.000	0.434	2.434		
Minnesota	4		0.018	0.990	1.008		
Missouri	25		1.700	1.100	2.800		
Nebraska	2		0.050	0.292	0.342		
N. Dakota	2		0.100	0.400	0.500		
S. Dakota	3		0.014	0.572	0.586		
Wisconsin	2		0.121	0.800	0.921		
TOTAL	48	44,984	\$6.183	\$6.303	\$12.486	31,250	9

Estimated damages range from \$12.486 billion to \$15 billion. Based upon totals for estimated crop and property damage from the table above, 50/50 split of damage costs to date. Applying 50/50 split to \$15 billion gives \$7.5 billion each.

"Homes Damaged" is based on 44,984 "Families affected" found in the article and rounded to 45,000.

"People Evacuated" is estimated by assuming 2.25 persons per home times 44,984 homes damaged yielding 101,214 people and rounded to 100,000.

"Square Miles Flooded" is calculated from estimated 20 million acres flooded divided by 640 acres/sq. mile equals 31,250 sq. miles.

FUTURE NATOMAS BASIN:

Deaths: Estimated deaths were derived from data in Corps Feasibility Report, Main Report, p. III-18 and Appendix C, Table III-3, p. 14. Estimated 25 fatalities in Sacramento's population of 366,500 produced a ratio of 1 death per 14,660 people. Applied to an estimated Natomas Basin population of 210,000 yields 15 deaths.

Homes Damaged (estimated): Based upon estimated housing units from:

City of Sacramento: South Natomas Community Plan:

Total Housing Units (buildout): 17,765

Total Population (buildout): 38,147

Source: Population and Housing Data by Community Plan Area, City of Sacramento, Planning and Development Department, March 1991, p. 6.

North Natomas Community Plan:

Total Housing Units (buildout): 33,527

Total Population (buildout): 66,910

Source: Draft Supplement to the 1986 North Natomas Community Plan EIR, City of Sacramento, Planning and Development Department, March 1993, p. 2.0-8.

Sutter County: Total Housing Units (buildout) 42,362
 Total Population (buildout): 105,056

Source: Technical Appendices to the South Sutter County General Plan Amendment and Draft Environmental Impact Report, Sutter County Planning Department, July 31, 1991, Appendix G "Land Use Calculations by Cells," Part 5.

Total Natomas Basin: Total Housing Units (buildout): 93,654
 Total Population (buildout): 210,113

Estimated Property Damage (billion): The estimated value of structures and contents is calculated by assuming the 200,000 people will have the same value of structures and contents as the current 31,000 people. So (200,000 divided by 31,000) times \$2.351 billion/per 31,000 people equals \$15.168 billion. Using the 67 percent flood damage figure for existing structures and contents yields (67% x \$15.168 billion = \$10.163 billion). Being more conservative using 50 percent damages on \$15.168 billion gives \$7.584 billion rounded to \$8 billion.

Estimated Crop Damage: "The economic evaluation for the Reconnaissance Report, American River Watershed Investigation, January 1988, indicated that the benefits attributable to agricultural crops were less than 1/2 half of 1 percent. As a result, flood damage reduction benefits were not estimated for agricultural crops." Source: Corps Feasibility Report, Appendix C, p. C-20.

PUBLIC POLICY ISSUE PAPER

for the

NATIONAL PERFORMANCE REVIEW

**NEW DEVELOPMENT IN DEEP FLOODPLAINS IS BAD PUBLIC POLICY:
THE NATOMAS BASIN EXAMPLE**

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EXECUTIVE SUMMARY

At issue are Federal policies which **INCREASE** the risk to public health and safety from deep flooding. This increased risk is caused by encouraging more people to live and more buildings to be constructed in deep floodplains, such as Natomas Basin. This paper argues that to knowingly increase the risk to public health and safety is bad public policy.

The flood protection programs of the U.S. Army Corps of Engineers (Corps) and the National Flood Insurance Program administered by the Federal Emergency Management Agency (FEMA) work together to **increase** the number of people and buildings at risk of catastrophic flooding. This result is caused by the Corps building flood control structures, like levees and dams, creating a false sense of safety. Once a floodplain is protected from the 100-year flood by such structures, then urban development can proceed without any restrictions. FEMA compounds this false sense of safety by making flood insurance **available** to the people who move into the "protected" floodplain, but **not requiring** flood insurance. The Corps and FEMA are encouraging floodplain development by offering the Federal government's "seal of approval" that floodplains are safe for development.

An example of this public policy gone wrong is the Natomas Basin located in the Sacramento (California) floodplain. The 55,000 acre Natomas Basin already has over 31,000 people and 13,730 structures located on 7,260 acres at risk of flooding to depths of 8 to 23 feet. The structures, plus the contents, are valued at \$2.351 billion with flood damage to them estimated at \$1.592 billion. By protecting these people and buildings, the remaining 47,622 acres of agricultural and vacant land are opened to development. This undeveloped land area totals 74 square miles which is **LARGER** than the District of Columbia (69 square miles).

Three local governments control land use decisions in Natomas Basin. Proposed urban development plans by these jurisdictions would allow over 170,000 more people and over 80,000 new homes to reside in Natomas Basin. The result would equal a city in excess of 200,000 people living in over 93,000 homes. The value of all structures and contents is estimated at over \$15 billion with potential flood damage estimated at \$8 to \$10 billion.

How much development has been encouraged in floodplains throughout the United States by existing public policy? How many times will this be repeated in the future across America? How many more disastrous floods must occur before we act? The Great Flood of 1993 shows the consequences of the current public policy. Now is the time to establish a decisive policy opposing Federal encouragement of urban development in deep floodplains.

This new policy can be implemented by enacting the same limitations on Federal actions which once encouraged development of coastal barrier areas. Enacted in 1982, the Coastal Barrier Resources Act (COBRA) prohibits Federal flood insurance for new development and restricts Federal financial assistance to designated coastal barrier areas. The same restrictions should apply to deep floodplains. Such restrictions applied to Natomas Basin will prevent:

- adding over 170,000 people living at risk of deep flooding,
- adding over \$13 billion of property at risk of destruction deep flooding,
- increasing the future cost of government to recover from a catastrophic flood disaster,
- shifting accountability for the consequences of local land use decisions to the Federal government, and
- taxpayers subsidizing profits estimated at \$5 to \$10 billion for land speculators and developers.

FOREWORD

On March 3, 1993, President Bill Clinton announced the National Performance Review to the nation. Vice President Al Gore will lead this effort to bring Total Quality Management (TQM) concepts to all parts of our Nation's government. The National Performance Review will focus six months of intense effort to evaluate the performance of government. Every aspect is open for evaluation. The President stated the Review will ". . . challenge the basic assumptions of every program asking: Does it work? Does it provide quality service? Does it encourage innovation?" He observed that many programs began for good reasons, but times have changed. He continued, "If there is something the Federal government should stop doing, we will try to make changes."

President Clinton and Vice President Gore asked citizens to communicate their suggestions for improving our Federal government. In response to their invitation, this issue paper is offered to focus attention and initiate dialogue regarding a flawed public policy. This paper identifies problems and offers possible solutions, though the problem definitions and solutions will likely change as the dialogue continues.

GEOGRAPHIC LOCATION¹

Our story begins in the floodplain of Sacramento, California. Formed by the confluence of the Sacramento River and American River, the Sacramento floodplain contains 116,000 acres (181 square miles). "To the conventional wisdom that one ought never to build on a floodplain, California has responded with its capital city."²

In the part of the Sacramento floodplain known as Natomas Basin, over 31,000 people have been allowed by Federal, California, and local governments to build their homes in a deep floodplain. Flood depths range from 8 to 23 feet in the existing developed areas. This 55,000-acre man-made basin was created in 1914 to "reclaim" wetlands and floodplain lands for agriculture.³ The entire Natomas Basin (86 square miles) covers an area **larger** than the District of Columbia (69 square miles). Approximately 13 percent (7,260 acres) of the land is in urban use and the remaining 87 percent (47,622 acres) consists of agricultural and vacant land available for development.

Figure 1 shows the Sacramento floodplain which could be flooded by a 100-year and 400-year flood event.⁴ The reader can see the rivers, creeks, and land areas comprising the 116,000 acre floodplain. The Sacramento River is the western boundary of the floodplain. Flowing north to south the Sacramento River passes Natomas, West Sacramento, Downtown Sacramento, and South Sacramento on its way to the Pacific Ocean through San Francisco Bay. The American River begins its journey in the Sierra Nevada Mountains flowing east to west joining the Sacramento River just south of Natomas Basin.

¹ Much of the information in this paper was obtained from the American River Watershed Investigation, California: Feasibility Report dated December 1991. The Report was prepared by the U.S Army Corps of Engineers, Sacramento District, and issued jointly with The Reclamation Board, State of California. It consists of Part I: Main Report and Part II: Environmental Impact Statement/Environmental Impact Report (EIS/EIR) with Appendixes A through T. This Report will be referenced as Corps Feasibility Report.

² John McPhee, Assembling California, Farrar, Straus and Giroux, (New York , 1993), p. 177.

³ Corps Feasibility Report, EIS/EIR, p. EIS 7-12.

⁴ The 100-year flood plain is approximately 110,000 acres and the 400-year flood plain is approximately 116,000 acres. Source: Corps Feasibility Report, Appendix C, p. C-14.

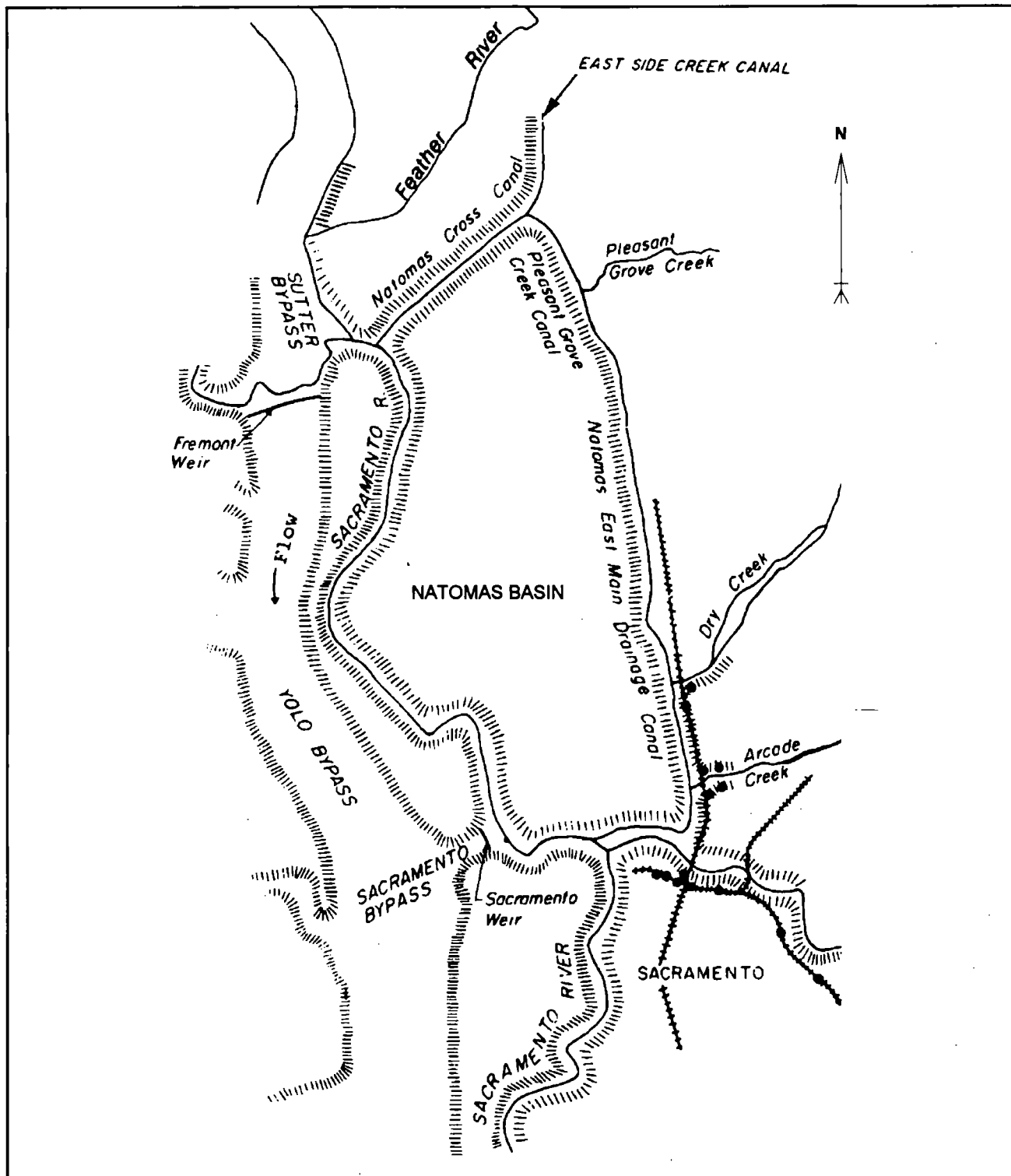


FIGURE 2
SACRAMENTO AREA

EXISTING FLOOD CONTROL STRUCTURES

LEGEND: ||||| Levees
• Floodgate
+++ Railroad

Adapted from: U.S. Army Corps of Engineers,
American River Watershed Investigation, California:
Feasibility Report, (Sacramento District, December
1991), Main Report, Plate 2

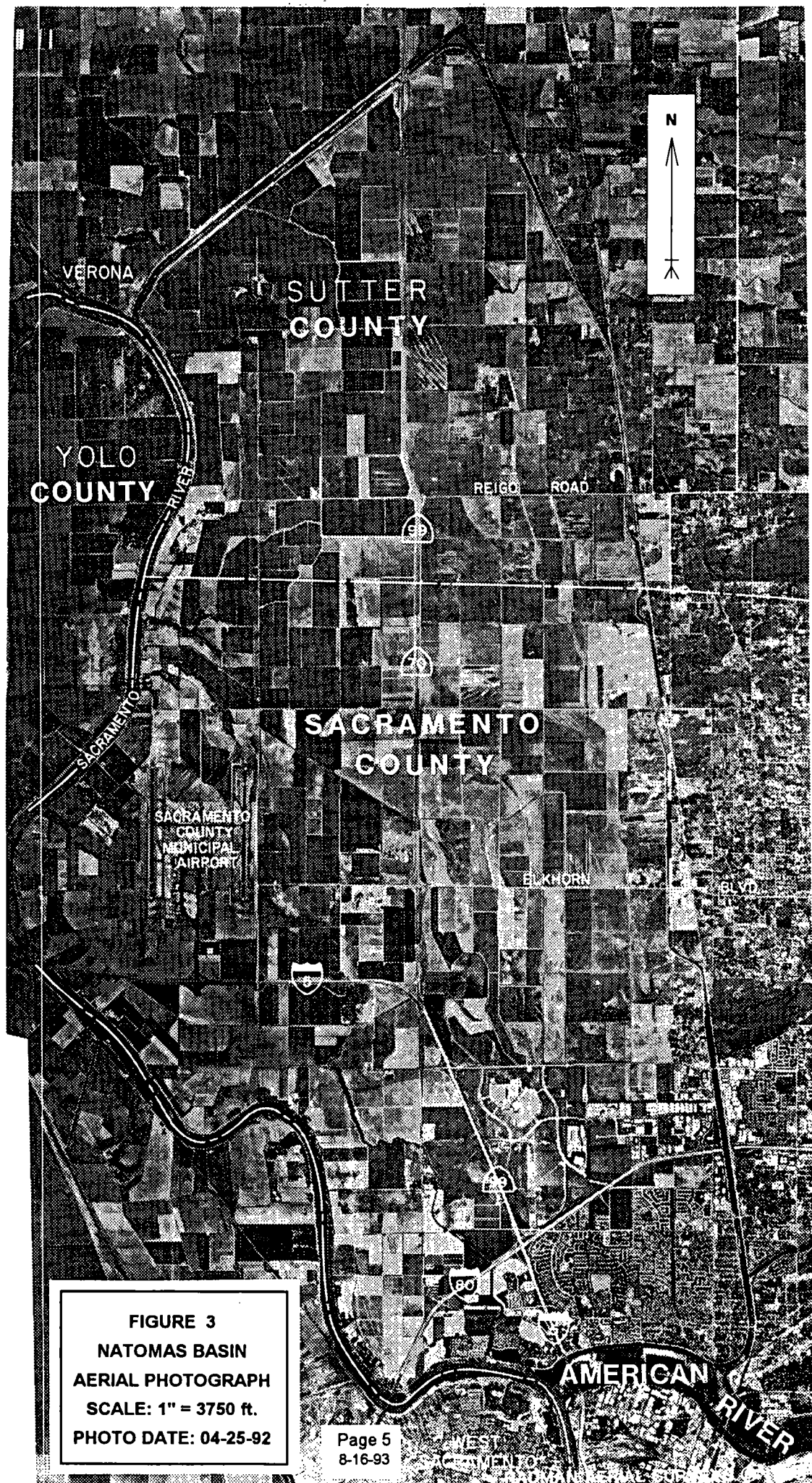


FIGURE 3
NATOMAS BASIN
AERIAL PHOTOGRAPH
SCALE: 1" = 3750 ft.
PHOTO DATE: 04-25-92

Figure 2 shows the man-made levees totaling over 41 miles creating Natomas Basin. Some 20.6 miles of canals plus another 20.6 miles of the Sacramento and American Rivers encircle the Basin. Water marks its boundaries. The north boundary is the Natomas Cross Canal. The east boundary is made of the Pleasant Grove Creek Canal and the Natomas East Main Drainage Canal. The south boundary is made of the Sacramento River and American River joining south of Natomas. The west boundary is the Sacramento River.

To give the reader an understanding of what Natomas Basin looks like, Figure 3 is an aerial photograph of the area. The expansive agricultural and vacant land in the large northern portion can be contrasted with small urbanized development in the southeastern corner between Interstate 80 and the American River.

DEVELOPMENT IN NATOMAS BASIN

Created by constructing drainage canals and 41 miles of encircling levees, Natomas Basin was considered "protected" from the 100-year flood. Like elsewhere in America, urban development was proposed to replace farming in Sacramento's floodplain. When officials of Sacramento City and Sacramento County decided to approve urban development, it made sense at the time as Natomas Basin is flat land and a 15 to 30 minute drive to downtown Sacramento. Since the level of flood protection met the minimum Federal standards set by the Federal Emergency Management Agency (FEMA) under the National Flood Insurance Program (NFIP), urban development proceeded. By 1990 over 31,000 people called this area home. Over 13,730 homes, businesses, industries, and public buildings were built over 7,260 acres in Natomas Basin. These buildings and their contents have an estimated value exceeding \$2.351 billion.⁵

In February 1986 a major Pacific Ocean storm brought record breaking rainfall to Northern California causing the Sacramento and American Rivers to reach new record high flows. The Natomas Basin levees held, but weaknesses were found. FEMA contracted with the Corps of Engineers to evaluate the Sacramento area flood control system. With new record river flows plus new FEMA safety standards for levees, Natomas Basin levees were downrated from 100-year flood protection to ranges of 40-year to 70-year protection.

Without going into the details, urban development stopped in Natomas Basin after the 1986 storm because the FEMA 100-year flood control standard was no longer met. Without 100-year flood control, FEMA would allow development to continue only if the first habitable floor is built one foot above the height of the 100-year flood elevation. Because of the potential high flood depths of 8 to 23 feet in Natomas Basin, it was impractical and uneconomical for residential buildings to meet the one foot standard. Residential development stopped.

Projects supported by the Federal, California, and local governments have worked to strengthen the Sacramento River levees. Projects to strengthen other levees around Natomas Basin are progressing. Once the minimum FEMA 100-year flood control standard is restored or exceeded, urban development can continue on the 47,622 acres (74 square miles) of vacant and agricultural land in Natomas Basin.

⁵ Corps Feasibility Report, Appendix C, Table III-3 on p. C-14, Table III-5 on p. C-18, Table III-6 on p. C-19, and p. C-29. Figures are existing conditions as defined on each table.

ACCOUNTABILITY FOR DEVELOPMENT CONSEQUENCES

Who will be held accountable for the consequences of further urban development in Natomas Basin? Who is responsible for promoting such urban development? Who is responsible for declaring Natomas Basin safe for development? In the minds of land speculators, developers, and the local government officials of Sacramento City, Sacramento County, and Sutter County, further urban development is the "Manifest Destiny" for Natomas Basin.

After 100-year flood protection is restored to Natomas Basin, FEMA will give its "seal of approval" and the requirement to build the first floor above the 100-year flood elevation will be removed. Development can continue. To local promoters and decision-makers, this means the flood risk has been determined by FEMA to be acceptable to the Federal government. FEMA's acceptance allows the flood risk caused by approving further development to be shifted from land speculators, developers, and local government taxpayers to Federal taxpayers. The land speculators and developers make their \$5 to \$10 billion of profits and leave the disaster cleanup bills for others to pay. This is wrong. The consequences of local land use decisions should stay with those promoting and making the decisions.

The accountability for land use decisions promoted by land speculators and developers and approved by local government officials is lost because the consequences are shifted to the Federal government. Accountability for decisions will only occur when institutions and individuals making decisions are held accountable for the resulting consequences. Without such ultimate accountability for their actions, land speculators and developers will pressure and encourage local government officials to allow further development in Natomas Basin. Continuing to shift the accountability for development consequences to the Federal government, and ultimately Federal taxpayers, is bad public policy.

How can the accountability for local land use decisions be left with the decision-makers? The answer is found in the Coastal Barrier Resources Act (COBRA) enacted in 1982. COBRA prohibits new development in designated coastal barrier areas from receiving flood insurance and other Federal financial assistance. By removing the Federal encouragement to development (i.e., flood insurance and other Federal financial assistance), land speculators, developers, and local government officials are held totally accountable for the consequences of their land use decisions. Development is still allowed in the floodplain, but the Federal government does not provide financial assistance nor does it provide flood insurance.⁶ All the risks and profits remain with those land speculators, developers, and local government officials who are willing to invest their money in floodplain development. The buck stops at the local level, where it belongs.

INCREASING THE RISK TO PUBLIC HEALTH AND SAFETY

Let's explore the possible consequences from further urban development in Natomas Basin. In the Corps of Engineers report on Sacramento flood hazards, the Corps identified THE flaw in all the flood control alternatives examined for protecting Sacramento: **All flood control alternatives increase the risk to public health and safety.** Why? Because the number of people and buildings exposed to flooding will increase due to urban development in floodplains. The Corps states:

⁶ Federal Emergency Management Agency, Mandatory Purchase of Flood Insurance Guidelines, FEMA 186, Effective on July 13, 1989, p. 24.

"Finally, under existing local and Federal flood plain management regulations, all of the alternatives carried forward in this report would provide a sufficient level of protection to permit development to proceed in Natomas and elsewhere in the flood plain. This development would significantly increase the number of people and the amount of property exposed to flooding and would increase the losses produced by an uncontrolled event."⁷

The most disturbing results from Natomas Basin flooding are the potential for significant loss of life, the massive disruption of peoples' lives, and the massive destruction of buildings and their contents. Over 31,000 people call this area home.

"Loss of life could be significant depending on the warning time given to residents to evacuate the basin. Advance warning would be essential because the breach would be proximately located to the urbanized portion of the basin. Floodwaters would thus reach vital transportation corridors relatively quickly, and eventually render the affected freeway and local roadway segments impassable."⁸

Proposed urban development plans by local governments would add over 170,000 people and over \$13 billion of new buildings and their contents in Natomas Basin. The total population would exceed 200,000 and property value exceed \$15 billion. Where do 200,000 people who lived in 93,000 homes find housing during and after the flood? What magnitude of human and economic disaster will befall the Sacramento area when a flood inundates a fully urbanized Natomas Basin? To answer this question let's compare the Great Flood of 1993 to a future flood in Natomas Basin with 200,000 people and over \$15 billion worth of structures and contents. Table A shows the comparison:

Table A

Comparison of Great Flood of 1993 to Future Flood of Urbanized Natomas Basin⁹

	Great Flood of 1993*	Future Flood Natomas Basin
Deaths	48	15
People Evacuated	100,000	200,000
Homes Damaged	45,000	93,000
Total Damages	\$12 to \$15 Billion	\$8 to \$10 Billion
Property Damage	\$6 to \$7 Billion	\$8 to \$10 Billion
Crop Damage	\$6 to \$8 Billion	0
Square Miles Flooded	31,250	86

* Actual and estimated as of Friday, August 6, 1993.

⁷ Corps Feasibility Report, EIS/EIR, p. EIS 1-8.

⁸ Sacramento Area Flood Control Agency, Revised Draft Environmental Impact Report for the Revised Natomas Area Flood Control Improvement Project, (Sacramento, March 1993), p. 5.3-1.

⁹ See Appendix B for sources.

The comparison is striking. In the Midwest the flood damage and destruction is spread over 31,250 square miles beside rivers stretching hundreds of miles. In Natomas Basin the destruction is concentrated in 86 square miles. It is ironic to compare the Midwest flood damage to that of a fully developed Natomas Basin. Crop damage is half of the Midwest damages because flooding occurred during the growing and planting season. Property damage is the entire source of damages in Natomas Basin.

The estimated property and crop damage, as of August 6, produced by the Great Flood is \$12 to \$15 billion spread over 31,250 square miles compared to an estimated \$8 to \$10 billion of property damage over just 86 square miles in Natomas Basin. Twice as many homes would be damaged in Natomas Basin (93,000) compared to the Midwest (45,000 as of August 6). Why would we knowingly create a potential catastrophe of this magnitude?

SEVERITY OF FLOOD DAMAGE

Why does flooding in Natomas Basin cause so much destruction? The answer is found in its physical features:

1. During flood events, river levels are higher than the ground level inside the Basin.
2. Rivers or canals surround the Basin on all sides.
3. Levees surround Natomas Basin on all sides.
4. Levees are 15 to 20 feet higher than the inside land area.
5. Natomas Basin has no drain.
6. Low lying lands inside the Basin are lower than surrounding land.
7. Flood waters fill the Basin whenever levees fail.

Together these physical features make Natomas Basin a disaster waiting to happen. Whenever a levee breaks, flood water could fill the Basin. Why? Natomas Basin is a 55,000-acre bathtub and swimming pool combined, but it has no drain! The 15 to 20 high levees form the "bathtub" walls. The land inside is the "bathtub" bottom, but the bottom is not flat. The bottom is like a swimming pool with the deep end located in the middle. From the deep center the pool gets shallower as one moves toward the levees.

On Figure 4 the land area shown as white (over 23 feet) is the lowest part of Natomas Basin. The next lowest land elevation is the land area marked 18 to 23 feet. Once flood waters get inside, it cannot get out until the river level goes down allowing some water to drain out the break in the levee. In these two low lying areas, water will remain until pumped out or it evaporates. These two areas are 5 to 10 feet *lower* than the land around them and would form a 17,700 acre (27.6 square mile) pond. It would cover 32 percent of the land area.

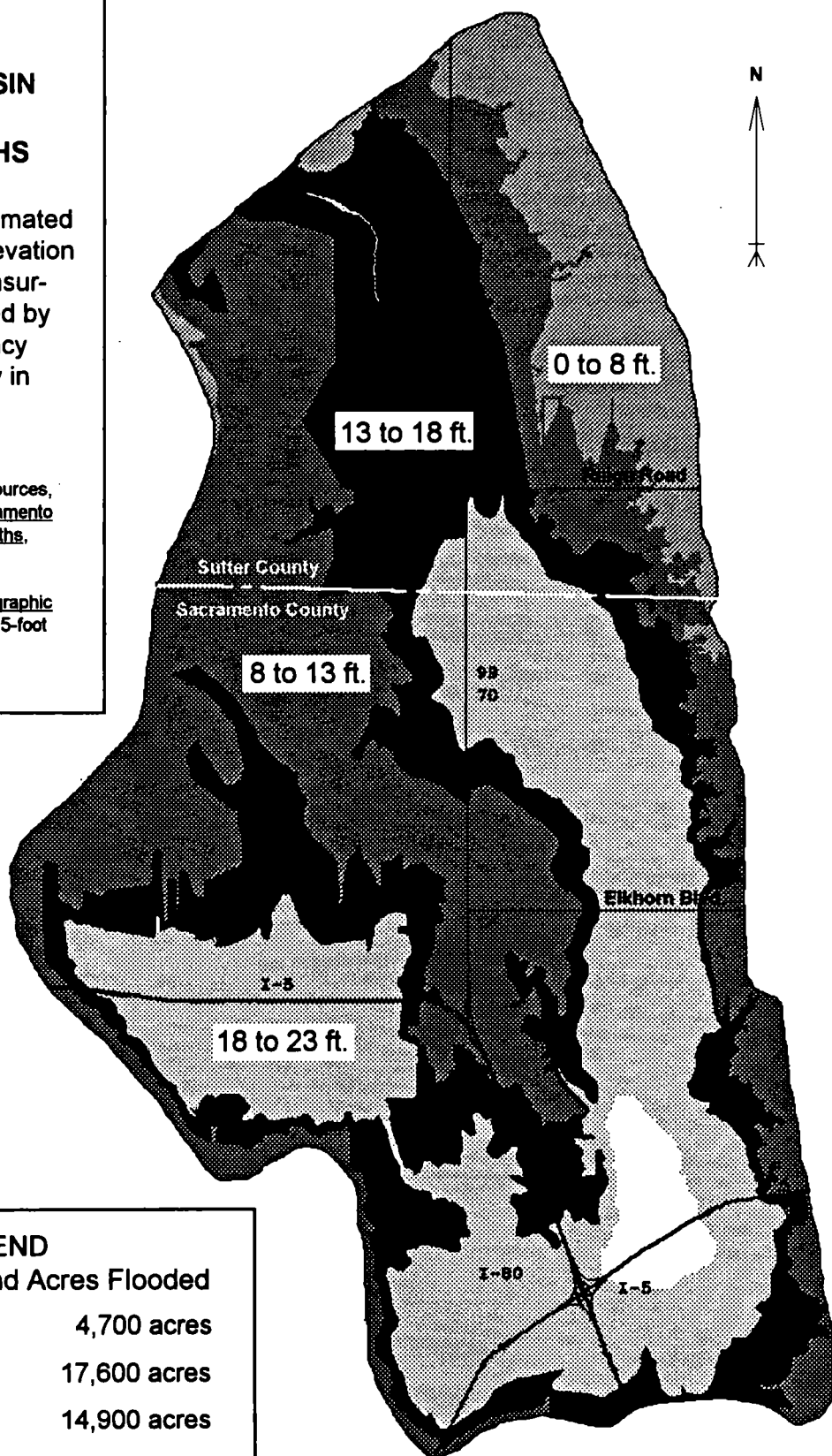
Figure 4 shows the land area covered by the estimated potential flood depths for Natomas Basin. The flood depths are based upon a flood elevation of 33 feet derived from the Flood Insurance Study and Flood Insurance Rate Map (FIRM) issued by the Federal Emergency Management Agency (FEMA) in March 1993. Figure 5 shows the estimated flood depths, the number of acres and square miles by flood depth, and the percentage of land area covered by flood depth.

FIGURE 4 **NATOMAS BASIN** **ESTIMATED** **FLOOD DEPTHS**

Flood depths are estimated from 33-foot flood elevation derived from Flood Insurance Rate Map issued by the Federal Emergency Management Agency in March 1993.

Map developed from:
 California Dept. of Water Resources,
Map of American River - Sacramento
Estimated Potential Flood Depths,
 June 1993.

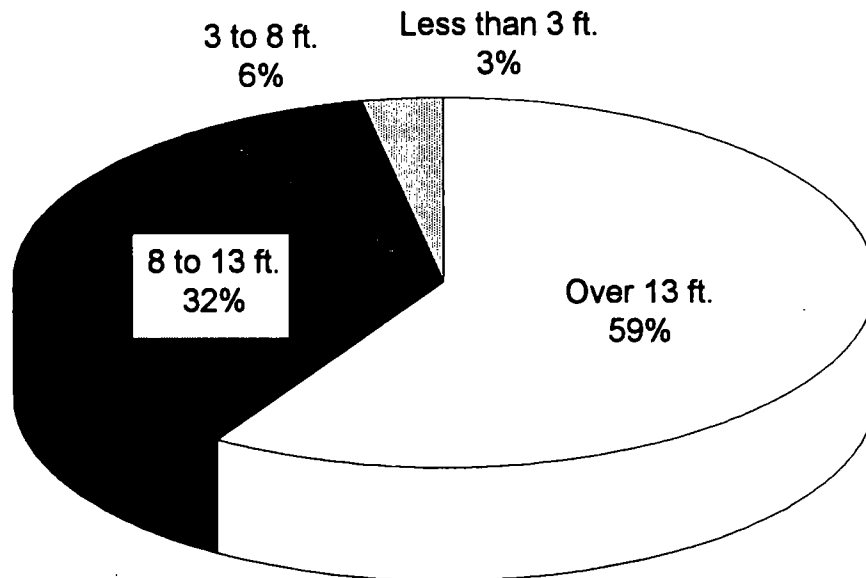
U.S. Geological Survey, Topographic
Maps (7.5 Minute Series) with 5-foot
 contour interval, various years.



LEGEND

Depth of Water and Acres Flooded

	0 to 8 feet	4,700 acres
	8 to 13 feet	17,600 acres
	13 to 18 feet	14,900 acres
	18 to 23 feet	16,600 acres
	over 23 feet	1,100 acres



Depth of Flood Water (feet)	Percent of Total Land	Land Area	
		(acres)	(sq. miles)
0 to 3	3.	1,400	2.
3 to 8	6.	3,300	5.
8 to 13	32.	17,600	28.
13 to 18	27.	14,900	23.
18 to 23	30.	16,600	26.
over 23	2.	1,100	2.
Totals	100.	54,900	86.

**FIGURE 5
NATOMAS BASIN
ESTIMATED FLOOD DEPTHS**

Percentage, acreage, and square mile
measurements of estimated flood depths

The depth of flood water and the duration of flooding have a significant impact upon property damage. Together flood depth and duration have a significant impact on property damage in Natomas Basin. The Corps of Engineers estimated flooding will last for 30 days. This is an extraordinary amount of time when compared to the flood duration of less than 5 days for other parts of the Sacramento floodplain. The Corps also estimated damages to buildings and contents would reach 100 percent where flood depths exceed 13 feet.¹⁰ Figure 5 shows that approximately 59 percent of Natomas Basin's land area could flood to depths exceeding 13 feet and 32 percent could flood to depths of 8 to 13 feet. A total of 91 percent of the land area could flood to depths exceeding 8 feet.

The Corps estimated 13,730 structures and the contents are valued at \$2.351 billion and would suffer flood damage estimated at \$1.592 billion, which is over 67 percent of the market value. "Natomas is the only reach (part the Sacramento floodplain) where flood damages would exceed 50 percent of the market value of the structure."¹¹

Even if a higher level of flood control is provided, the depth and duration of flooding in Natomas Basin is the same. Whenever the next larger flood breeches the levees, Natomas Basin fills with water. The Corps of Engineers observed:

"Flooding from levee failure would be similar in Natomas . . . **regardless of the frequency** of the flood event because (1) the ground elevation adjacent to the levees in these locations is lower than the water surface in the river, and (2) the volume of water in the American River . . . and Sacramento River in the case of Natomas . . . **would fill** the flood plains to similar depths."¹²

To illustrate the Corps point, Figure 6 is a Natomas Basin levee profile along the American River. It shows the highest river water level during the February 1986 storm was 13 feet above the ground level in Natomas Basin. If the levee had failed with the river at the highest level, Natomas Basin could have filled up. As shown on Figure 6, a single story house would have been completely covered by water.¹³

The Corps of Engineers concluded that the Natomas Basin will experience severe flooding whenever the flood control levees are breached. The only thing which changes is the probability, or frequency, of when flooding will occur. Severity of flooding in Natomas Basin is the same no matter the frequency of flood. In other words, severity of flooding in Natomas Basin is the same no matter the probability, or probable frequency, of flooding.

¹⁰ "For the Natomas reach, duration is 30 days, and the average velocity is less than 0.5 feet per second. **Duration has a significant effect on the flood damages for this area.** Damages to structure and content for each land use category [i.e., residential, commercial, industrial, public, and mobile home] were set at 100 percent for depths greater than [sic] 13 feet. For the remaining reaches in the flood plain, duration is less than 5 days, and the average velocities range from 0.5 to 5 feet per second. Neither duration nor velocity had any significant effect on damages." Source: Corps Feasibility Report, Appendix C, p. C-22, (emphasis added)

¹¹ Ibid., p. C-25.

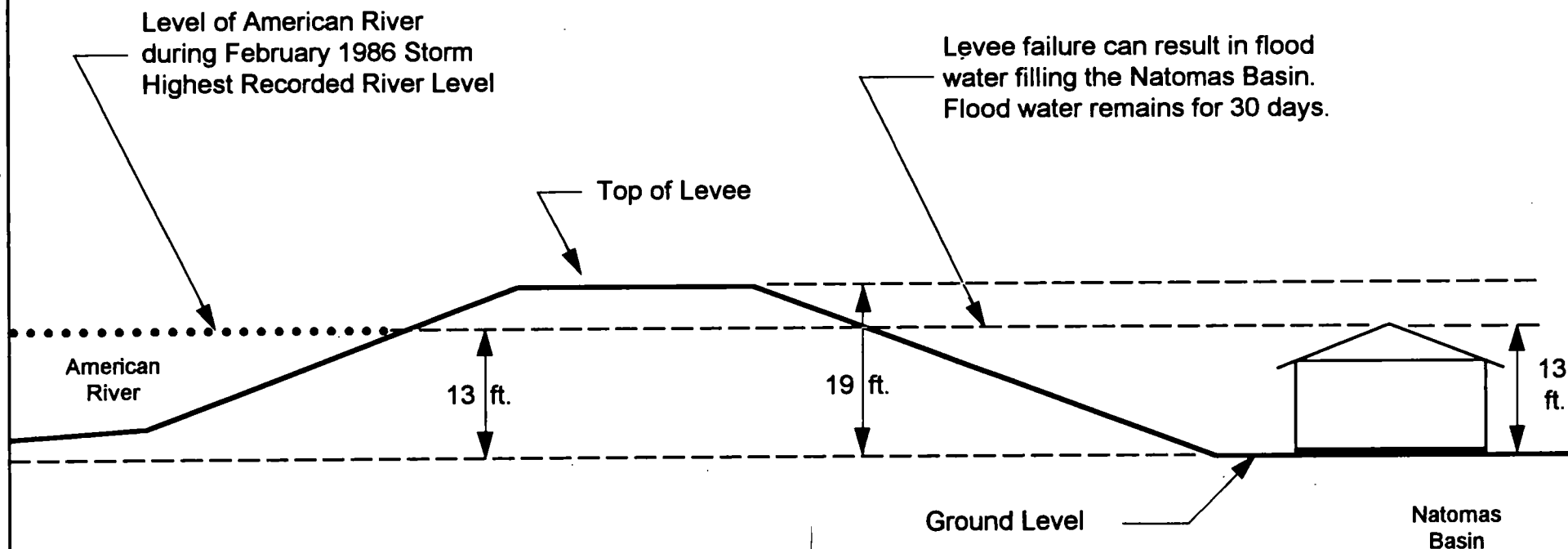
¹² Ibid., Main Report, p. III-18, (emphasis added).

¹³ Figure 6 is a graphic illustration of Natomas Basin flood depths and what this much water does to a single story house constructed on grade. Building on grade is the typical method used in much of California. The house is completely covered. Destruction is total for building and contents.

**FIGURE 6 LEVEE PROFILE
NATOMAS BASIN
AMERICAN RIVER
RIVER MILE 1.5
LOOKING DOWNSTREAM**

"Flooding from levee failure would be similar in Natomas . . . regardless of the frequency of the flood event because (1) the ground elevation adjacent to the levees in these locations is lower than the water surface in the river and (2) the volume of water in the American River . . . and Sacramento River . . . would fill the flood plains to similar depths."

SOURCE: U.S. Army Corps of Engineers, American River Watershed Investigation, California: Feasibility Report, (Sacramento District, December 1991), Main Report, p. III-18.



Drawn from U.S. Army Corps of Engineers, American River Watershed Investigation, California: Feasibility Report, (Sacramento District, December 1991), Appendix M, Chapter 2, Appendix M-2-A, Levee and Flood Profiles - Sections 5 through 9, Section 7.

PROBABILITY OF FLOODING

What is the probability of Natomas Basin flooding? To answer the question, consider an incident from the Great Flood of 1993:

"For various points along the Mississippi, the Army Corps of Engineers has calculated the probability of floods of varying heights. The smallest probability they bothered to calculate was a '500-year flood' - one so unlikely it can be expected to happen only once in five centuries. . . . [A]t Hannibal, Mo., a 500-year flood was determined to be 30 feet, so the city built its new levee a foot higher, at 31. It was finished in April after two years of work, and when the waters rose in early July residents heaped three feet more of sandbags atop it. When the crest reached Hannibal, the river was at 32 feet."¹⁴

This incident helps us to understand the uncertainty of predicting and controlling flood events. Also it shows the confusion caused by the terms used to describe flood events. The Corps of Engineers calculates the probability of floods of varying heights, or volumes. Each calculated flood event has an estimated water height which is caused by an estimated water volume. As can be expected, greater volume results in greater height. As the volume of water increases, the probability decreases because larger floods occur less often.

To name different flood events, engineers use a shorthand description based upon the probability of when each flood event will occur. Engineers take historical records of past floods and apply statistical calculations to predict the probability or chance of flooding. For example, the "500-year flood" is the calculated flood of a certain volume or height which has a 1 in 500 chance of occurring in any year. The 500-year flood has a one-fifth of one percent (0.20%) of occurring in any year. Over 30 years the 500-year flood has a 6 percent chance of occurring during the 30 years. The "500-year flood" DOES NOT mean this size of flood will only occur once in 500 years. As can be seen from Table B, over 100 years the 500-year flood has a 18 percent of occurring while the 100-year flood has a 63 percent chance of occurring during the same 100 years.

The terms 500-year flood and 100-year flood can be misleading. Such floods may be experienced in any year. Since the National Flood Insurance Program was established, there have been numerous instances where communities have experienced two, and even three, 100-year or greater floods within a span of several years. A notable example is Pennsylvania in the 1970's where within five years after Tropical Storm Agnes (1972) battered the state another 100-year flood occurred.¹⁵

Table B presents the percent chance or probability of different flood events happening in any year and over various numbers of years. The chance of the 1 in 100 flood, or the 100-year flood, occurring over the life of a 30-year mortgage is 26 percent, or about one in four. The question for the homeowner is whether or not to purchase flood insurance. By contrast, during the term of a 30-year mortgage, there is only a 1 percent chance of suffering a fire loss.¹⁶ What level of risk is acceptable? What level of risk is unacceptable?

¹⁴ Jerry Adler, "Troubled Waters," Newsweek, July 26, 1993, p.21.

¹⁵ Federal Emergency Management Agency, Mandatory Purchase of Flood Insurance Guidelines, FEMA 186, Effective on July 13, 1989, p. 7.

¹⁶ Ibid.

Table B

Percent Chance Of Floods Occurring Over The Years

Number Of Years	100-Year Flood (percent)	500-Year Flood (percent)
Any Year	1.0	0.20
30	26	6
50	39	10
75	53	14
100	63	18
200	87	33
400	98	55
500	99.34	63
1000	99.99	86
2000	99.99	98

CONGRESSIONAL RECOGNITION OF UNACCEPTABLE RISK

The unacceptable risk posed to public health and safety by further development in Natomas Basin was recognized in two Federal laws enacted in 1992. These two laws contained sections written to address Natomas Basin flooding issues. Each law and its legislative history talks specifically about Natomas Basin. Together these laws express the Congressional recognition of the unacceptable risk created by allowing further urban development of Natomas Basin

First, in the Department of Defense Appropriations Act of 1992, the Secretary of the Army was authorized to construct the Natomas Basin levee improvement features proposed by the Corps of Engineers. However, a limitation was placed upon these levee improvements:

" . . . provided that such construction does not encourage the development of deep floodplains."¹⁷

Second, in the Housing and Community Development Act of 1992 (H.R. 5334), changes were made to the National Flood Insurance Program (NFIP). A change was specifically designed to address Sacramento's flood insurance problems. Briefly, the legislation (a) created a new "flood restoration zone" for flood insurance rates, and (b) allowed the Federal Emergency Management Agency (FEMA) to establish floodplain management criteria for new construction in the flood restoration zone where flood depths exceed 5 feet. Speaking as the Chairman of the Senate Housing and Urban Affairs Subcommittee responsible for the legislation, former U.S. Senator Alan Cranston of California spoke on the floor of the Senate to clarify the intent behind the legislation:

"The flood restoration zone is not intended to allow the development of undeveloped areas including the Natomas basin area in Sacramento."¹⁸

¹⁷ Department of Defense Appropriations Act of 1992, Section 9159.

These two laws recognize the unacceptable risk caused by further urban development in Natomas Basin. Congress has established limits on further development. However, local government officials are working to get around the limitations contained in these two laws. Their efforts appear to be close to success and urban development will continue to fill Natomas Basin. Before this happens, the Clinton-Gore Administration and Congress should act to change Federal law by prohibiting flood insurance from being available to new development and by removing other Federal financial assistance.

Such action was taken by Congress in October 1982 with the passage of the Coastal Barrier Resources Act (COBRA).¹⁹ The law was enacted to restrict Federal government actions that were encouraging the development of certain coastal barrier areas. Among the restrictions in COBRA, no new flood insurance coverage was provided for any new construction in designated coastal barriers after October 1, 1983. While COBRA does not prevent private financing and development, it limits financial assistance by Federal agencies on undeveloped coastal barriers. Similar legislation should be enacted to remove Federal encouragement of further urban development in Natomas Basin. Further details for legislation to achieve this end is presented in Appendix A.

SUMMARY OF PUBLIC POLICY ISSUE

The basic public policy issue is whether or not the Federal government should encourage additional urban development in deep floodplains, such as Natomas Basin. The arguments against encouraging further development are based upon these beliefs and values:

- Government should reduce risk and protect the public health and safety, not increase such risks.
- Government should spend limited tax dollars protecting public health and safety, not wasted on projects increasing the risk to people and property.
- Predicting and controlling the forces of nature is subject to unacceptable error and mistake, not an activity government should depend upon for protecting public health and safety.
- The accountability for the consequences resulting from decisions should remain with the decision-makers responsible, not transferred to others.
- Each generation should think about the short and long term impacts of their actions, not leaving deficits and billion dollar blank checks to be paid for future flood disasters by future generations.
- Tax dollars should benefit the larger public good, not produce windfall profits for a few land speculators and developers.

The problems caused by allowing further urban development in Natomas Basin are:

1. The risk to human life and safety is increased by further urban development in Natomas Basin. Over 170,000 additional people could be added to the 31,000 already living there. What will be the level of human suffering when 200,000 people are flooded? Where does a city of over 200,000 people live when everything is under water for 30 days? How long will it take to rebuild? How many people will die?

¹⁸ Congressional Record - Senate, October 8, 1992, p. S17910.

¹⁹ 96 Stat. 1653, Public Law 97-348 (S. 1018), October 18, 1982.

2. The 55,000-acre Natomas Basin is a combined bathtub/swimming pool with no drain! Massive destruction of structures and the contents would result from flooding a fully urbanized Natomas Basin. Proposed urban development plans by local governments would increase the value of structures and contents to an estimated value of over \$15 billion. The potential property damage is estimated at \$8 to \$10 billion. This amount is similar to the destructive Great Flood of 1993 (as of August 6, 1993). How much will the local, California, and Federal governments pay for such a massive disaster relief effort? From where will the money come?

3. Flood depth, flood duration, and extent of destruction in Natomas Basin is the same no matter if the flood is a 100-year, 200-year, or 400-year event. Flood control structures create a false sense of security. Flood control structures for Natomas Basin only reduce the probability, or probable frequency, of flooding, not the severity of destruction. Instead of encouraging people to stay out of floodplains, government tries to predict and control the forces of nature. Why are we allowing more people and buildings to be placed in harms way when we know disaster will strike someday?

4. The accountability for flooding consequences caused by the decision to build in floodplains is transferred from local decision-makers to Federal taxpayers. How can local decision-makers be held accountable for their decisions when the resulting consequences are transferred to others?

5. By encouraging further development in Natomas Basin, Federal taxpayers are subsidizing profits for land speculators and developers who promote building in deep floodplains. Estimated profits are \$5 to \$10 billion. The land speculators and developers do not bear the cost of building flood control structures nor the cost of emergency disaster relief and recovery. Taxpayers are responsible for this financial burden. When will the costs be placed upon those responsible and not passed on to others?

CONCLUSION

The National Performance Review offers the opportunity to ask tough questions and to take corrective action. Federal public policy should not encourage increasing the number of people and buildings at risk of deep flooding. The Natomas Basin is a prime example of Federal policy gone wrong. Encouraging further urban development in deep floodplains is bad public policy. The Great Flood of 1993 shows the folly of continuing business as usual. Saying "it has always been done this way" is no excuse for continuing the practice. Now is the time to make fundamental changes.

APPENDIX A

PROPOSED LEGISLATIVE SOLUTION

Federal government actions are encouraging urban development in Natomas Basin. This is the same type of problem Congress faced when it enacted the Coastal Barrier Resources Act (COBRA). Adopted in October 1982, COBRA was enacted to restrict Federal government actions that were encouraging the development of certain coastal barrier areas.

The essential provisions of COBRA are:

1. Prohibits the National Flood Insurance Program from providing flood insurance protection for buildings built after October 1, 1983, in designated undeveloped coastal barriers.
2. Limits financial assistance by Federal agencies on undeveloped coastal barriers, except for enumerated situations such as emergency assistance actions essential to saving lives, protecting property, and protecting public health and safety. Such emergency assistance would not include disaster assistance and government loans.

While COBRA limits the availability of flood insurance and limits financial assistance by Federal agencies, it does not prevent private financing and development. The inability of the property owner to purchase flood insurance does not require a lender to refrain from making a conventional loan. The decision and risk remain with the property owner and the lender.¹

These same COBRA restrictions should be enacted by Congress for deep floodplains, like Natomas Basin. Doing so will greatly restrict new development and alter the type of development undertaken in the Natomas Basin. Existing buildings would be grandfathered and allowed to continue receiving flood insurance and Federal financial assistance.

Based upon the characteristics of Natomas Basin, five (5) criteria should be used to define deep floodplains subject to COBRA-type restrictions:

1. Damage from potential flood events will cause destruction of structures and contents to be 50 percent or greater of their value regardless of the flooding frequency or probability.
2. Depth of flooding is over five (5) feet for all potential flood events regardless of the frequency of flooding.
3. Duration of flooding is over five (5) days for all potential flood events regardless of the frequency of flooding.
4. Amount of undeveloped land in project area located in floodplain exceeds 5 percent of the project land area.
5. Potential risk to public health and safety is increased even after flood control measures are implemented.

¹ Federal Emergency Management Agency, Mandatory Purchase of Flood Insurance Guidelines, FEMA 186, Effective on July 13, 1989, p. 24

APPENDIX B

GREAT FLOOD OF 1993: The numbers are as of Friday, August 6, 1993. The information and numbers used are taken from The Sacramento Bee, August 8, 1993, p. A8, except where another source is noted.

A Newsweek, July 26, 1993, p. 22 .

As of August 6, 1993	Deaths (actual)	Homes Damaged (estimated)	Estimated Property Damage (billion)	Estimated Crop Damage (billion)	State Total Estimated Damages (billion)	Square Miles Flooded	Total Number States Flooded
Illinois	4		\$0.930	\$0.565	\$1.495		
Iowa	5		1.250	1.150	2.400		
Kansas	1		A 2.000	0.434	2.434		
Minnesota	4		0.018	0.990	1.008		
Missouri	25		1.700	1.100	2.800		
Nebraska	2		0.050	0.292	0.342		
N. Dakota	2		0.100	0.400	0.500		
S. Dakota	3		0.014	0.572	0.586		
Wisconsin	2		0.121	0.800	0.921		
TOTAL	48	44,984	\$6.183	\$6.303	\$12.486	31,250	9

Estimated damages range from \$12.486 billion to \$15 billion. Based upon totals for estimated crop and property damage from the table above, 50/50 split of damage costs to date. Applying 50/50 split to \$15 billion gives \$7.5 billion each.

"Homes Damaged" is based on 44,984 "Families affected" found in the article and rounded to 45,000.

"People Evacuated" is estimated by assuming 2.25 persons per home times 44,984 homes damaged yielding 101,214 people and rounded to 100,000.

"Square Miles Flooded" is calculated from estimated 20 million acres flooded divided by 640 acres/sq. mile equals 31,250 sq. miles.

FUTURE NATOMAS BASIN:

Deaths: Estimated deaths were derived from data in Corps Feasibility Report, Main Report, p. III-18 and Appendix C, Table III-3, p. 14. Estimated 25 fatalities in Sacramento's population of 366,500 produced a ratio of 1 death per 14,660 people. Applied to an estimated Natomas Basin population of 210,000 yields 15 deaths.

Homes Damaged (estimated): Based upon estimated housing units from:

City of Sacramento: South Natomas Community Plan:

Total Housing Units (buildout): 17,765

Total Population (buildout): 38,147

Source: Population and Housing Data by Community Plan Area, City of Sacramento, Planning and Development Department, March 1991, p. 6.

North Natomas Community Plan:

Total Housing Units (buildout): 33,527

Total Population (buildout): 66,910

Source: Draft Supplement to the 1986 North Natomas Community Plan EIR, City of Sacramento, Planning and Development Department, March 1993, p. 2.0-8.

Sutter County: Total Housing Units (buildout) 42,362
 Total Population (buildout): 105,056

Source: Technical Appendices to the South Sutter County General Plan Amendment and Draft Environmental Impact Report, Sutter County Planning Department, July 31, 1991, Appendix G "Land Use Calculations by Cells," Part 5.

Total Natomas Basin: Total Housing Units (buildout): 93,654
 Total Population (buildout): 210,113

Estimated Property Damage (billion): The estimated value of structures and contents is calculated by assuming the 200,000 people will have the same value of structures and contents as the current 31,000 people. So (200,000 divided by 31,000) times \$2.351 billion/per 31,000 people equals \$15.168 billion. Using the 67 percent flood damage figure for existing structures and contents yields (67% x \$15.168 billion = \$10.163 billion). Being more conservative using 50 percent damages on \$15.168 billion gives \$7.584 billion rounded to \$8 billion.

Estimated Crop Damage: "The economic evaluation for the Reconnaissance Report, American River Watershed Investigation, January 1988, indicated that the benefits attributable to agricultural crops were less than 1/2 half of 1 percent. As a result, flood damage reduction benefits were not estimated for agricultural crops." Source: Corps Feasibility Report, Appendix C, p. C-20.