A DISASTER THAT DOESN'T HAVE TO HAPPEN: THE EAST BATON ROUGE PARISH FLOOD OF 2001

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In 1983, the Amite River Basin and East Baton Rouge Parish (County) suffered a record flood that caused damages of $171.7 million in the Basin, including $65.3 million in the Parish (USACE 1984). This was only the most recent event for the watershed which has experienced four major floods from 1972-1983. Floods are certainly not a new occurrence to the region, but the events are becoming more costly and as a result are causing a greater public cry for government action to reduce the problem. The personal hardships and monetary losses could have been avoided to a significant degree had state and local governments initiated and implemented a rationale flood damage reduction program during the past 20 years. Instead inaction and myoptic planning for single purpose projects resulted in the present hazardous situation. It is the purpose of this paper to describe the problem and suggest a long-term solution that has been ignored by decision-makers.

Along with other sunbelt states, Louisiana grew rapidly during the sixties and seventies; this growth was particularly evident in East Baton Rouge Parish, the site of the state capital, the location of two major universities, and a center of petrochemical industries within the Mississippi River industrial corridor. In 1980, the population was 366,200, a 63% increase from 1960. Population projections (Maruggi and Fletes 1983) show that the Parish could grow to 551,100 by the year 2000, an increase of 66% over 1980. The earliest flood worthy of note was in 1907 when the population of the parish was approximately 33,000.

East Baton Rouge Parish is approximately 293,500 acres, 113,000 acres of which are within the 100-year flood zone (Federal Emergency Management Agency). The urban or built-up area grew from 24,500 acres in 1956 (Singleton 1972) to 81,400 acres in 1979 (USGS 1979). With pressures to convert more lands from agricultural uses, forests and open space, development extended more and more into floodprone areas, while at the same time compounding the problem by increasing runoff as a result of impervious surfaces, such as roads, roofs, and parking lots. The topography contributes to the problems through the low elevation and overall low relief of the Pleistocene terrace and Mississippi River valley. Streams are contained within well defined

channels most of the year but during flood the waters spread across valley floors. Most damage results when winter or spring fronts linger in the area and cause headwater flooding, i.e., high stages due to runoff from excessive precipitation over the drainage basin. To complicate matters, backwater flooding occurs along the lower reaches of tributaries when high water on the Amite River impedes runoff from secondary streams and causes impounded water to overflow onto adjacent areas. In 1983, the most devastating flood inundated 55,000 acres in the parish and damaged 1578 homes and 37 businesses (USACE 1984).

Flood damages are not attributable to a lack of planning. Beginning in 1946, land use plans were prepared for the parish. The first was by Harland, Bartholomew and Associates (1946) that described the city as complicating the natural flooding of the metropolitan area by providing inadequate facilities. The Bartholomew plan (1946) recognized that "the drainage problem is not a problem only of the Baton Rouge metropolitan area, it has certain regional aspects that must be given consideration before the problem can be solved." A more recent independent plan (Singleton 1972) suggested setting aside the floodplains for open space use and flood conveyance. In 1983, the East Baton Rouge Plannng Commission Staff (1983) made a strong recommendation aimed directly at reducing future flood losses by stating: "Prevention of the development of residential subdivisions or multi-family residential complexes in areas subject to inundation should be a primary consideration in determining which vacant land should be earmarked for future residential use." However, elected and appointed decision-makers do not implement these recommendations and voters defeat tax proposals that would pay for drainage costs (Morning Advocate 1984a).

Greater damage is attributable to obstructions to flow, increased runoff from development, and encroachment into the more hazardous areas. Subdivision filings, elevations, and higher percentages of subdivisions in floodprone areas show the attraction to the more hazardous locations (Dudash 1984, East Baton Rouge Planning Commission Staff 1983). In addition, subdivisions originally built above flood levels now are victims because of upstream development that pours more water through them faster than existing drainage channels can handle.

Government suggests structural public works projects as the best alternative for reducing flood damages. Channelization of watercourses partially resulting from recommendations in the

Bartholomew plan, was intitiated in 1957 by the state and parish (USACE 1974) and shifted the problem to the then less densely populated areas along the Amite River. In 1965, additional drainage and flood control projects were implemented. The U.S. Army Corps of Engineers (1979) studied a flood control plan for the Amite River Basin, but the benefit to cost ratio did not exceed one. Several dams, channelization, and diversion projects were studied by the State Department of Public Works but were not implemented because of opposition or the defeat of financing proposals.

In 1983 the Office of Public Works, Louisiana Department of Transportation and Development, undertook still another study and prepared a Preliminary Engineering Report on a Comite River Diversion Channel and an Engineering and Economic Feasibility Report for a dam and reservoir on the Amite River (Office of Public Works 1984a & 1984b). The Comite Channel diverts a portion of the Comite flood waters into the Mississippi River through a corridor north of the more densely populated floodplains of the City of Baton Rouge. The Office of Public Works estimates the cost to be between $62 million and $104 million, depending on capacity, location, and nature of channel, i.e., earthen or paved. The multi-purpose Amite River project, located north of East Baton Rouge Parish, is an earthen dam, 19,950 feet long and 80 feet high, creating a 15,000 acre permanent reservoir providing "flood control, recreation, a large supply of potable (drinking) water and hydroelectric power" (Office of Public Works 1984). Storage of floodwaters requires an additional 4000 acres. The $130 million project reduces water levels from an event similar to the 1983 flood by as much as 6.6 feet in some parts of East Baton Rouge Parish and may have reduced damages from $171 million to $35 million in the basin. For the first time benefit to cost ratio is above unity (USACE 1984).

These structural plans are proceeding with little or no study or evaluation of the primary and secondary beneficial and adverse impacts of the actions on the physical, biological, and cultural setting of the basin. Rather than early integration of these concerns into the planning process (National Environmental Policy Act of 1969, as amended), the environmental issues apparently are being included as an afterthought to satisfy Federal permitting requirements. Analysis of all issues and realistic alternatives in a full disclosure document may result in identification of better solutions for flood damage reduction that must either be integrated with the projects, result in modification of the proposed projects, or cause abandonment of it.

The plans and benefits attributed to the projects envisioned by engineers sound ominous because they very closely parallel the project and proclamations of safety and savings described by Platt (1982) for Jackson, Mississippi. Both study areas have similar flood characteristics; the floodplains are multi-jurisdictional with special flood districts; studies were conducted by U.S. Army Corps of Engineers; and both basins selected structural techniques for the solution to the flood problem. The 1973 USACE report "did not call into question Jackson's planning and zoning policies which allowed further encroachment upon floodplains" (Platt 1982). The Office of Public Works' Reports do not mention regulation or zoning of floodprone lands within the Amite River Basin and in particular in East Baton Rouge Parish where most of the existing and potential damage occurs. Short-sighted planning is unfortunate because the flood victims will pay for the agency's inadequate flood damage reduction planning as well as having to pay for the project.

A long-term solution to flooding in East Baton Rouge Parish and the Amite Basin is a comprehensive flood damage reduction plan for the Basin. Where feasible, structural techniques protect existing development; when necessary the government purchases property and relocates people; and throughout, zoning and regulation prevent the rampant filing of subdivisions and building of homes in the highest risk area. These issues and the mix of components in the basin need to be systematically evaluated and can be efficiently completed by modelling land use changes and benefits as well as costs. The first step is to delineate the floodway, which, in the case of this basin, includes the backwater areas. Simultaneously, zoning laws can be formulated for adoption and financing methods can be proposed and evaluated. The vehicle for this type of planning exists.

The Amite Basin Drainage and Water and Conservation District was formed in 1981 to propose long-term solutions for flood damage reduction. The Board, appointed by the governor, included at one time or another mayors, councilmen, police jurors, and other community leaders representing the six parishes in the Amite River Basin. Instead of having an active, innovative program which includes subcommittees to evaluate alternatives, investigation of approaches for generating revenue to implement a plan, and which involves more of the general public, the board has waited for directions from the state. One past Board President said he was disappointed that the state didn't come forward with funds and stronger directives for the Board (Morning Advocate 1982). The Board relies on the Office of Public Works and its single-minded

approach to flood damage reduction for solutions. Only one or two on the Board has ever spoken of reducing damages; most only desire lowering water levels; but this does not automatically result in less damage in the long term. The Board needs to be revised if it is to take a lead in reducing flood damages.

However, changing leadership is only the first step. Implementation of a comprehensive approach will take education of the general public. Public and private attitude at this time may not allow for a comprehensive plan. An ordinance proposed in 1981 (Morning Advocate 1981) to severely limit construction in East Baton Rouge Parish floodplains was not implemented. One councilman is on record as stating the key to keeping development going in the fastest growing areas of the parish is cleaning drainage canals to make the floodplain smaller (Morning Advocate 1981). Other elected officials feel that the state or local goverments cannot prevent people from building in floodplains (State Times 1983). Flood victims have strongly expressed a desire for the dam and diversion at public meetings and meetings sponsored by special interest groups such as Friends United for Darlington (FUND), a coalition of flood victims living in the lower end of the basin. Controversy has lead to the expected upstream-downstream conflict between those who demand protection and those whose lands are being taken (Morning Advocate 1984, State Times 1984). Opposed to the dam are landowners from the parishes of East Feliciana and St. Helena whose properties will be seized for the project. The Amite River Conservation League is an action oriented group of upstream residents who believe the burden of flood damage reduction should be shared with downstream flood plain occupants by including zoning for open space use of floodplains, floodproofing, and use of small structures strategically distributed throughout the watershed.

All of the factors are rapidly coming together in East Baton Rouge Parish for a devastating flood of unequalled dimensions. Populations pressures cause homes to be built in high risk areas; a structural plan, as proposed, provides the false sense of security necessary to encourage additional accelerated growth; heavy frontal precipitation occurs every three to four years; the government and the private sector systematically ignore floodplain management; and finally no comprehensive plans are being considered. Once all the pieces come into place, at about the same time the dam and diversion are completed in 1997, a flood of record will inundate East Baton Rouge Parish by the year 2001. Population projections forecast more than prosperity, they foretell of devastation for those many who buy and build in the floodplain,

thinking the dam and diversion have solved the spring problems. It is a disaster that can be prevented if parish decision-makers implement some of the recommendations of their professional staff and work with others in the Basin to prepare and implement a comprehensive flood damage reduction program that will reduce the long-term impacts and the short-term problems.

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RELOCATION: A FLOODPLAIN MANAGEMENT ALTERNATIVE

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Introduction

As a floodplain management alternative, relocation provides unique opportunities to maximize local, regional, and national benefits from flood control projects. This paper illustrates how these benefits can be realized through cooperative master planning efforts. Relocation is consistent with federal policy and can satisfy the federal objective to lessen flood losses. It also provides nonfederal interests unique opportunities to get more for their dollar. In light of proposed cost-sharing reforms and recent policies, this should be even more desirable. A brief review of a completed relocation project and a description of an ongoing relocation study illustrate how cooperative master planning can lead toward more efficient use of resources and maximization of local, regional, and national benefits.

Economic and Policy Framework

In the Flood Control Act of 1938, Congress authorized the Corps of Engineers to consider relocation as an alternative to structural measures. But since 1974, Public Law 93-251 requires federal planners to consider relocation or other nonstructural alternatives in the survey, planning, or design of any federal flood protection project.

For evaluation of flood protection alternatives, economic efficiency has remained the primary federal objective, although secondary objectives such as environmental quality, regional economic development, and social welfare have also been included. Currently, there is only one federal objective for water and related land resources planning--"to contribute to national economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements." Contributions to national economic development (NED benefits) are defined as "increases in the net value of the national output of goods and services" (P&G 2.0.0, 1983).

The other criteria--environmental quality, social welfare, and other social effects--may still be included, but are not required. Although RED is no longer a federal objective, it cannot be completely separated from the NED objective. RED benefits include NED benefits realized at the regional scale, income transfers, and employment benefits (P&G. 1.7.1, 1983). Thus, RED should be seriously considered at the federal scale and should be the primary nonfederal objective.

External Benefits and the Nonfederal Share

Nonfederal interests already share in the costs of flood control projects, but in efforts to improve efficiency and equity, cost-sharing reforms are being proposed. These are reflected in the Reagan administration's water project financing and cost-sharing policy which states in part that, "project beneficiaries, not necessarily governmental entities, should ultimately bear a substantial part of the cost of all project development" (Reagan, 1984).

According to proponents of this policy, cost-sharing "would 1) reduce the bias toward projects which are larger than is optimally efficient, or not efficient at all, 2) reduce the bias toward nonreimbursable purposes, and 3) reduce the proportion of the project cost paid by the general taxpayer" (Waelti, 1985). More importantly, however, such policies should provide additional incentive for nonfederal interests to get more from their investments. This means maximization of RED as well as NED benefits; and one source of RED benefits is from external project benefits.

In addition to flood control, projects have other impacts. In some projects, such external effects will be negligible, but in others they can be substantial. If these external effects are beneficial, they can significantly increase the total benefits of a project. Thus, maximization of a project's external benefits, in addition to its direct benefits, will provide the optimal return on both the federal and nonfederal investment. This can be achieved through cooperative master planning at the federal and nonfederal levels.

Relocation

Relocation provides unique opportunities to maximize the return from both the federal and nonfederal investment. Not only is it possible to eliminate completely future flood-related costs, but opportunities also exist to 1) replace declining flood-prone neighborhoods with improved flood-free neighborhoods, and 2) to conduct the relocation process in the broader context of community and regional economic development.

Relocation is not always the best alternative. However, if a community has a severe flood problem, if the depth of inundation makes floodproofing impractical, if structural measures are expensive, and if the community can benefit from economic development or redevelopment, then relocation may be the best alternative.

Soldiers Grove, Wisconsin--A Completed Relocation Project

Soldiers Grove is currently receiving attention as America's only solar village, yet only a few years ago it was merely another village in the floodplain. Situated along the banks of the Kickapoo River, Soldiers Grove was flooded in 1907, 1912, 1917, 1935, and 1951. A levee was proposed, but the cost of maintenance would have been prohibitive and would have done little to solve the other problems--"the outmigration of young people to urban areas, the severe blight in the downtown, the feeling that Soldiers Grove was slowly dying" (Becker, 1980). In 1978 another flood hit, but by that time the community was convinced that relocation was the answer, and a concerted effort began. Four years later, in 1983, the work was nearly done.

"[T]he village gained enterprises it didn't have before. They include a dental clinic, restaurant, nursing home and pharmacy." Total employment increased from 95 to 155. In 1980, "Soldiers Grove's population was up for the first time in years, from 514 in 1970 to 622 in 1980". "Its tax base grew by nearly 2 million dollars" (U.S. News & World Report, 1985). In short, relocation of Soldiers Grove did more than eliminate the costs of floodplain occupancy. A new comprehensive community plan which integrates relocation, energy efficiency, and city ordinances provides the community with a more stable economic future, and thus benefits the regional and national economies.

Clifton, Arizona--Flood Control and Redevelopment

The Los Angeles District Corps of Engineers is currently conducting a study of flood control measures for the town of Clifton, Arizona. A major feature of the plan under consideration is relocation of over 100 families and businesses to a flood-free site. Historically, Clifton has been dependent on the copper industry. Because of a downswing in the copper market, a recent strike and a severe flood, it is necessary to integrate the flood control plan into Clifton's plans for redevelopment.

Clifton was founded in 1873 in a deep narrow canyon on the banks of the San Francisco River, after copper was discovered nearby. Lands outside of the floodplain were either public or in the ownership of the mines. Due to the

lack of land for development, economic growth and diversification were limited and the community remained dependent on the mines. Frequent floods posed a continual threat to the community. Velocities were high and depths great. Floodwalls provided limited protection and a flood warning system was installed for safety. Other solutions such as dams, levees, and channels were considered by the Corps of Engineers and others, but because of excessive costs or impracticability, nothing was constructed.

In April of 1982 the mine was shut down and did not open again until October, with a reduced workforce. In July of 1983, the union struck rather than accepting further concessions (The Register, 1983). Three months later on October 1, 1983, the flood-of-record hit, inundating over 300 homes and businesses. Now, a year and a half after the flood, the Town of Clifton is still trying to pull itself together from the flood, the strike, and years of dependence on "the company."

Planning efforts immediately following the flood concentrated on flood recovery and permanent solutions to the flood problem. Because of the numerous federal, state, and local agencies involved in these efforts, the need for cooperative planning was apparent. To coordinate these activities, the Governor of Arizona formed a special task force to provide a forum for agencies who could assist in flood recovery. Another group, the Clifton Flood Recovery Working Group, was formed to work with the Corps study team. The Corps study proceeded from reconnaissance to the feasibility phase, largely as a result of the efforts of this nine-agency working group.

Even before others got involved, the Town of Clifton saw a need to plan for redevelopment of their community towards a future free of flooding and independent of the mine. Since these two goals are so interrelated, master planning became the focus of the cooperative planning efforts. Two committees were formed by town council resolution. The Technical Advisory Committee, which includes representatives of federal, state, and local agencies and the Chamber of Commerce, was formed to develop a comprehensive plan for the community. The Citizen's Relocation Committee was formed to provide an interface between the community residents, the Technical Advisory Committee, and the Planning and Zoning Board. The Citizen's Committee is also working to gain Congressional support for the flood control project. The ultimate goals of the committees are 1) business retention, 2) economic growth and diversification, and 3) implementation of the structural/nonstructural flood control plan.

Because of the downswing in the copper market, the strike, and the flood, the survival of Clifton is dependent on economic redevelopment. Redevelopment is a process, and relocation could impinge on that process. Yet, without flood control, redevelopment would not be possible. This potential for problems simply provided the opportunity to rally additional expertise to aid in master planning the community. If redevelopment is successful, it will be the result of cooperative master planning.

If the future Clifton is a flood-free community that is in harmony with the environment and meets the social needs of its people, if it is a community with economic diversity that contributes to the growth of the region, the state, and the nation, then the federal and nonfederal objectives will be met and the project will provide the maximum return for the investment.

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RELOCATION OF A LARGE, SLAB ON-GRADE HOUSE FROM A FLOODPLAIN

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Introduction

Haikey Creek is one of several creeks that flow outward from the city of Tulsa, Oklahoma, toward the Arkansas River. The 37-square-mile Haikey Creek watershed is funnel shaped. It lies entirely within southern Tulsa County and the rapidly developing southeast quadrant of the Tulsa metropolitan area.

The area receives an average of 37 inches of rain a year and is prone to violent thunderstorms that often cause serious flooding problems along creeks and rivers. Before the 1960's, the Haikey Creek basin was largely devoted to agricultural uses, and frequent floods curtailed truck farming on the rich bottom lands. The Soil Conservation Service recorded 35 major floods and 80 minor ones along Haikey Creek between 1940 and 1960, with damages almost exclusively confined to agricultural activities.

Today, the watershed is about 25% developed with mixed residential and commercial. Development occurs mostly throughout the nothern part of the watershed that encompasses the city limits of Tulsa and its suburb, Broken Arrow. Rapidly spreading urbanization is spilling over these uplands, but much of the watershed remains unincorporated and undeveloped, dotted with farm dwellings and scattered developments. A burgeoning suburb, Bixby, extends into the southwestern portion of the watershed.

In the lower two miles of the watershed, the creek skirts about 50 floodprone structures, mostly built during the 1970's and priced to attract upper-middle-income families. The rural isolation, tall trees, and lush vegetation attracted development in the years before flood plain management was extended to this and other unincorporated areas of Tulsa County. After serious flooding in 1974 and 1976, officials of Tulsa County requested that the US Army Corps of Engineers investigate the possibility of a local flood protection project on the lower reach of the creek. Subsequently, the lower area became the site for the US Army Corps of Engineers flood control project described in this report. Some of the owners of the homes in this

area have received flood insurance payments that exceed the homes' values.

Work began in 1982 on the Corps project, which includes construction of a levee around a subdivision and acquisition/clearance of some scattered upstream structures. One of the homes acquired was a large two-story house that the homeowner elected to move to a new floodfree site.

Although moving structures is fairly common in the Tulsa area, few large, two-story houses built on a concrete slab had been relocated. The owner agreed to allow the Tulsa District Corps of Engineers to document the process in this report, in the hope that it might help others considering such a move.

Flooding Problem

In early 1972, Ms. Nancy Kincaid built what she calls her "dream house" in rural Tulsa County. The two-story house contained 3,200 square feet with a rock and frame exterior, two large porches, and a native rock fireplace. It was built on 13 wooded and grassland acres, providing pastureland for the horses and sloping gently down toward a wooded creek about 600 feet behind the house.

The Kincaid house was built on an old, normally dry oxbow of Haikey Creek, near the bottom of the funnel-shaped watershed now being rapidly covered by suburban sprawl. Based on a September 1979 flood insurance study performed for the Tulsa County area, an estimated 2 feet of water, flowing as fast as 4 feet per second, could enter the house in a 100-year flood; flooding in the yard would be about 3.7 feet deep. The 100-year flood is a magnitude of flood flow that has a 1% chance of occurring in any given year. With future upstream development, the threat of flooding would increase.

June 1974 Flood

On the night of June 8, 1974, a trio of tornadoes and violent thunderstorms hit the Tulsa area, inflicting widespread damage that totaled nearly $50 million.

It was far into the night before the flood waters made their way down the meandering Haikey Creek to the bottom lands, where the water washed away an upstream levee and routed neighbors from their homes. "A family that lived near me escaped by walking out with three children on their shoulders

through waist-deep-water and they discovered later they had just missed some downed power lines," Ms. Kincaid remembers.

Downstream in the Hickory Hills subdivision, about 40 homes were flooded, including one where a family of 10 cut a hole through the roof to escape water that rose as high as 6 feet in their house. In all, the flood caused about $1 million in damages in the Haikey Creek project area. The return frequency for the June flood was estimated as that of a 10 to 15 year storm.

For Ms. Kincaid, the flood provided tangible proof of the flood predictions, but the interior of her home received no damage. "The water came within 2 inches of coming in the door, but none got inside the house," she says.

In the ensuing years, Tulsa County and the cities of Tulsa, Broken Arrow, and Bixby -- which all share jurisdiction within the watershed -- adopted regulations on flood plain development to comply with the Federal flood insurance program. In the mid 1970's, the Corps began planning a local flood protection project under the authority of Section 205 of the Flood Control Act of 1948, as amended.

May 1976 Flood

The second major flood hit on May 30, 1976. Again, the storm inflicted widespread damage throughout the metropolitan area. Total damages were estimated at more than $34 million, of which about $650,000 was in the Haikey project area. Flood stages in the Hickory Hills area were 1-1/2 to 2 feet lower than the 1974 flood. Three persons drowned in the 1976 flood within the city of Tulsa.

Once again on Haikey Creek the water moved more slowly down the largely unmodified channel, so that the peak occurred in the early morning darkness.

"After it became clear that we were probably in for another flood, I made what emergency preparations I could and waited -- for a long time," Ms. Kincaid remembers.

"The water rose very slowly until it surrounded the house. It rose into the garage, which is lower than the rest of the house."

At about 3 a.m., water was 3 inches from her doorway. The level hovered there for several hours, then almost imperceptively began to recede. Once again, no water had entered; the house was safe.

Corps Project

In April 1975, the Tulsa County Commission requested that the Corps investigate the flood problem along Haikey Creek under the authority of Section 205 of the 1948 Flood Control Act, as amended. The Corps received authorization to begin detailed studies in September 1975.

The 1976 flood sparked renewed interest in the Corps' Haikey Creek project, and planning meetings were well attended in the late 1970's when alternative flood control methods were debated. Some local officials and citizens wanted to channelize the creek to the Arkansas River; others favored a levee or upstream reservoirs; and still others wanted to move as many structures as possible out of the flood plain.

Forty-seven residences, three mobile homes, and three greenhouse complexes had been built within the standard project flood plain in the project area. The standard project flood results from the most severe storm expected in the watershed. Most of the houses lie within the Hickory Hills subdivision, about one-half mile upstream from Haikey Creek's confluence with the Arkansas River. Most of the other structures are scattered upstream of the subdivision.

The recommended plan is a combination plan combining a traditional structural solution with a nonstructural plan. The plan required construction of a levee and the removal or elevation of some flood plain structures. Benefits from the plan would exceed the costs by 2.5 to 1.

The structural part of the plan calls for a 5,700-foot levee to be built around the relatively dense development in Hickory Hills, tying into a hill that rises west of the subdivision.

In the upstream project area, which included the Kincaid house, development was more scattered, and other solutions were required. The Corps estimated that the levee, which would restrict flows downstream, could raise the level of a 100-year flood by as much as 0.5 foot in the upstream area for about one-half mile. Clearly, the government would have to take some action to offset that induced flooding in the upstream area. But levee or channel works were not economically justified in the upstream area.

Among options posed to upstream owners were floodproofing or building ring levees around their structures. As the Corps plan was being finalized, most of the inhabitants of the upstream area said they favored evacuation --

that is, total removal of their homes -- over floodproofing. They rejected floodproofing plans that they said could make their homes isolated "islands" during major floods. The Corps determined that the depths and velocities of water made floodproofing a questionable option for most upstream residents. For these reasons, the approved plan for the upstream area includes acquiring and removing most structures. Owners of one mobile home and one farmhouse preferred floodproofing, and the approved plan gave them the option to raise their structures in place.

In the plan implementation, Tulsa County was to be responsible for acquiring the lands, easements, and rights-of-way. The county was also to pay 20% of the cost of the nonstructural portion of the project -- the acquisition/clearance of upstream structures. The county portion was approximately $820,000 of the total $3.3 million project.

The Corps' Haikey Creek Local Flood Protection Project was approved in October 1981.

Moving The House

Acquisition

One of the homes to be acquired as a part of the Haikey Creek Local Flood Protection Project was the large two-story house owned by Ms. Kincaid. She decided to relocate the house, if it was feasible, rather than allowing it to be demolished on the site.

Properties needed for the Corps project were acquired by the local sponsor, the Tulsa County Board of Commissioners, with Corps approval. The county in turn contracted with a local agency with long experience in property acquisition, the Tulsa Urban Renewal Authority, to conduct the actual acquisitions. This arrangement resulted in extensive negotiations for Ms. Kincaid, because she and the staffs of three agencies had to reach consensus. Negotiations lasted several weeks, but agreement ultimately was reached in mid-October 1982. The price was based on fair market value, as determined by appraisers.

From the sale proceeds, Ms. Kincaid purchased back the structure for its estimated salvage value. The salvage value is the amount the government estimates as the value of the improvement for off-site removal.

Determining Feasibility

Before many firm decisions could be made, Ms. Kincaid had to determine the technical, economic, and legal feasibility of moving the structure. This step involved making a number of decisions, at least tentatively, including selecting a new site and a house mover.

A new site had been purchased before the decision was made to move the existing house. The purchase included 10 acres on a hill about 15 miles west and north of the Haikey Creek site. The new site is within the city of Tulsa but in a suburban fringe area that is still largely rural.

To select a mover, she queried government officials for the names of persons who had moved structures successfully within the Tulsa area. She interviewed those individuals and their movers. Many of the movers declined to bid because of the size of the house and its slab construction.

She selected a Tulsa-area mover, Mr. Charlie Frunk, after inspecting previous structures he had moved, obtaining his bid, and receiving his assurances that her home could be moved successfully.

"You learn a lot in this interviewing process about moving houses," Ms. Kincaid says, "because you really have to investigate each step of the process to evaluate the movers and their bids." She also obtained bids from contractors for plumbing and electrical work. For some people, this step might be simplified by obtaining a general contractor; Ms. Kincaid served as her own general contractor. Again, obtaining these bids involved a learning process about the steps involved in the move.

"The contractors' bids are really only estimates, because the scope of their work may change after the move, in ways you can't predict," Ms. Kincaid says. "For example, we lost some heating ductwork during the move that we hadn't counted on; the contractors' advance bids couldn't have taken that into account."

The next step was to assemble all the bids and estimate the price of the move. Ms. Kincaid checked with builders and government officials to estimate what she would have to pay for a comparable new house. She compared the costs of new construction, estimated at $40-$50 a square foot, against the estimated moving costs and determined that moving her structure was economically feasible.

Conclusion

Furnishings were moved back into the house, and Ms. Kincaid resumed occupancy in April of 1983. In all, the move and renovation work took about 6 months.

The tables below summarize total costs to the Government in conjunction with the Haikey Creek project and the costs incurred by the homeowner during the move.

GOVERNMENT COST
ACQUIRING AND RELOCATING HOUSE

Item	Cost
Market Value of House	$100,000
Salvage Value	-5,000
Net Payment for House	$ 95,000
Relocation assistance and interest differential	15,000
TOTAL PAYMENT TO OWNER	$110,000

COST OF MOVING AND REBUILDING HOME

Item	Cost
House mover	$15,000
Carpentry and materials	22,000
Air conditioning and heating	6,100
Foundation and clab	5,000
Masonry	4,900
Plumbing	3,700
Floor coverings	3,300
Electrical Work	1,600
Septic System	1,600
Painting	1,300
Sheetrocking	1,100
Insulation	1,100
Driveway (gravel) and Sidewalk (concrete)	500
Miscellaneous	900
TOTAL COST	$68,100

NOTE: Data does not include costs for land, moving and storing furniture, or general contracting and other work that the owner performed herself.