GULF STATES UTILITIES COMPANY
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March 19, 1984
RBG-17,340
File No. G9.5, G10.2.2

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commisson
Washington, D. C. 20555

Dear Mr. Denton:

River Bend Station-Units 1 & 2
Docket Nos. 50-458/50-459

In response to a request by your Staff, please find attached a copy of a U. S. Army Corps of Engineers letter dated November 27, 1983. The informational brochures referred to in the letter were provided to the Licensing Project Manager.

Sincerely,

William J. Lee Jr

for J. E. Booker
Manager-Engineering
Nuclear Fuels & Licensing
River Bend Nuclear Group

JEB/WJR/JWC/kt

Attachment

Cool Brochures
To: Reg File
Re: PM

COPIES TO: Booker
Cook
Wetterhahn

ORIGINAL TO: Reed

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160

REPLY TO
ATTENTION OF:

November 22, 1983

Engineering Division
MR&T Main Stem Section

Mr. J. E. Booker
Manager - Engineering
Nuclear Fuels & Licensing
River Bend Nuclear Group
Gulf South Utilities Company
Post Office Box 2951
Beaumont, Texas 77704

Dear Mr. Booker:

This is in reply to your letter of November 7, 1983, requesting information about the Old River Control project.

The Old River Control project, located on the west bank of the Mississippi River about 50 miles northwest of Baton Rouge, Louisiana, is a vital part of the Mississippi River and Tributaries flood control plan. The essential purpose of the Old River project is to control and regulate the diversion of flows from the Mississippi River into the Atchafalaya River to assure stability in these two river systems. Without the project, the Mississippi River would change its course to that of the Atchafalaya River and enormous social, economic, and environmental damages would follow. Informational brochures are enclosed which describe the Mississippi River and Tributaries Project and the Old River project and which also deal with the historical relationship of the Mississippi and Atchafalaya Rivers.

The Old River project was authorized by the Flood Control Act of 1954 (PL 780, 83d Congress). The principal existing features are: two mechanically operated gated control structures, designated the low sill structure and the overbank structure; an inflow channel from the Mississippi River to the low sill control structure; an outflow channel connecting the

low sill control structure with Red River; a lock for navigation connecting the Mississippi and Old Rivers; forebay and tailbay channels for the lock; an earthen dam closing Old River; enlargement and extension of main line Mississippi River levees; and bank stabilization as required in the Red and Atchafalaya Rivers between the outflow channel and the vicinity of Simmesport. Construction was begun in 1955 and the project was officially placed in operation in 1963. The project is operated in accordance with the requirements of the authorizing legislation, so that 30 percent of the total latitude flow is passed down the Atchafalaya River and 70 percent is passed down the lower Mississippi. This flow distribution has proven to be effective in maintaining stability in both the Mississippi and Atchafalaya River systems. In response to requests from both agricultural and wildlife interests, the operation of the Old River project was reviewed during the preparation of the Environmental Impact Statement for the Atchafalaya Basin Floodway (Atchafalaya Basin Water and Land Resources Study). That review concluded that no changes in operation should be made. The low sill structure operates at all stages, whereas the overbank structure operates (together with the low sill) only at flood stages. These two structures duplicate, as nearly as possible, the flow conditions which existed between the Mississippi and Atchafalaya Rivers prior to the construction of the project.

The low sill structure was very seriously damaged during the flood of 1973 when a large scour hole formed just in front of the structure, undermined the southern inflow training wall, and created a void of some 750,000 cubic feet beneath the entire south half of the main structure. At that time the continued effectiveness of the low sill structure was truly in doubt. Emergency measures to deal with the damage were immediately undertaken to fill the scour hole in front of the structure with stone riprap and build a riprap dike to replace the training wall that had been

destroyed. Later, when the existence and size of the void underneath the structure had been determined, that void was filled with special cement grout mixtures. A drawing is enclosed showing the damage and emergency repairs.

Following the emergency repairs, an extended program of major rehabilitation was carried out, to further repair the low sill structure, to improve flow conditions through both structures, and to enhance the scour resistance of the channels near the low sill structure. A listing of work accomplished is enclosed. Because of these actions, we have reestablished our ability to control flows and the project is now more than equal to its authorized task for all normal operating conditions, including the design flood. With one important exception, the project is now more dependable and damage resistant than when it was first constructed. That exception is the ability of the low sill structure to cope with potential emergency situations. Because of the damage to the foundation of the low sill structure, the safe maximum differential head that can be placed on the structure has been reduced from 37 feet to 22 feet. The 22 foot limit could be exceeded in, for example, a marine accident in which barges are drawn into the structure and act to block its clear opening. Repair of the damaged foundation is not practicable, but it is possible to deal with the problem indirectly by constructing an auxiliary control structure to insure that the differential head at the project does not exceed the safe limit for the low sill structure, even in emergency situations. The auxiliary structure, now under construction, is scheduled for completion in late 1985. When the auxiliary structure is completed and is operating together with the existing control structures, we will have a high degree of confidence that the project will operate successfully for all conditions for many, many years to come. In the interim, we maintain a 24 hour surveillance of the river, and have on station a picket boat to deal with such accidents.

In summary, we believe that the damage sustained by the low sill structure in 1973 has been effectively dealt with, and that with completion of the auxiliary structure, the Old River Control project will continue to operate effectively for the foreseeable future.

If I can be of further assistance, please let me know.

Sincerely,

Frederic M. Chatry
Chief, Engineering Division

Enclosure

REHABILITATION MEASURES

ITEM	DATE COMPLETED
Cleaning and testing of drainage system	Nov 75
Install additional piezometers	Sep 76
Modification of gates for orifice flow	Jul 77
Scour repairs	Jul 77
Stilling basin repair	Dec 76
Outflow channel scour protection	Sep 77
Inflow channel scour protection	Aug 80
Overbank structure modifications	Dec 81
Construction of spare gate leaves	Aug 82

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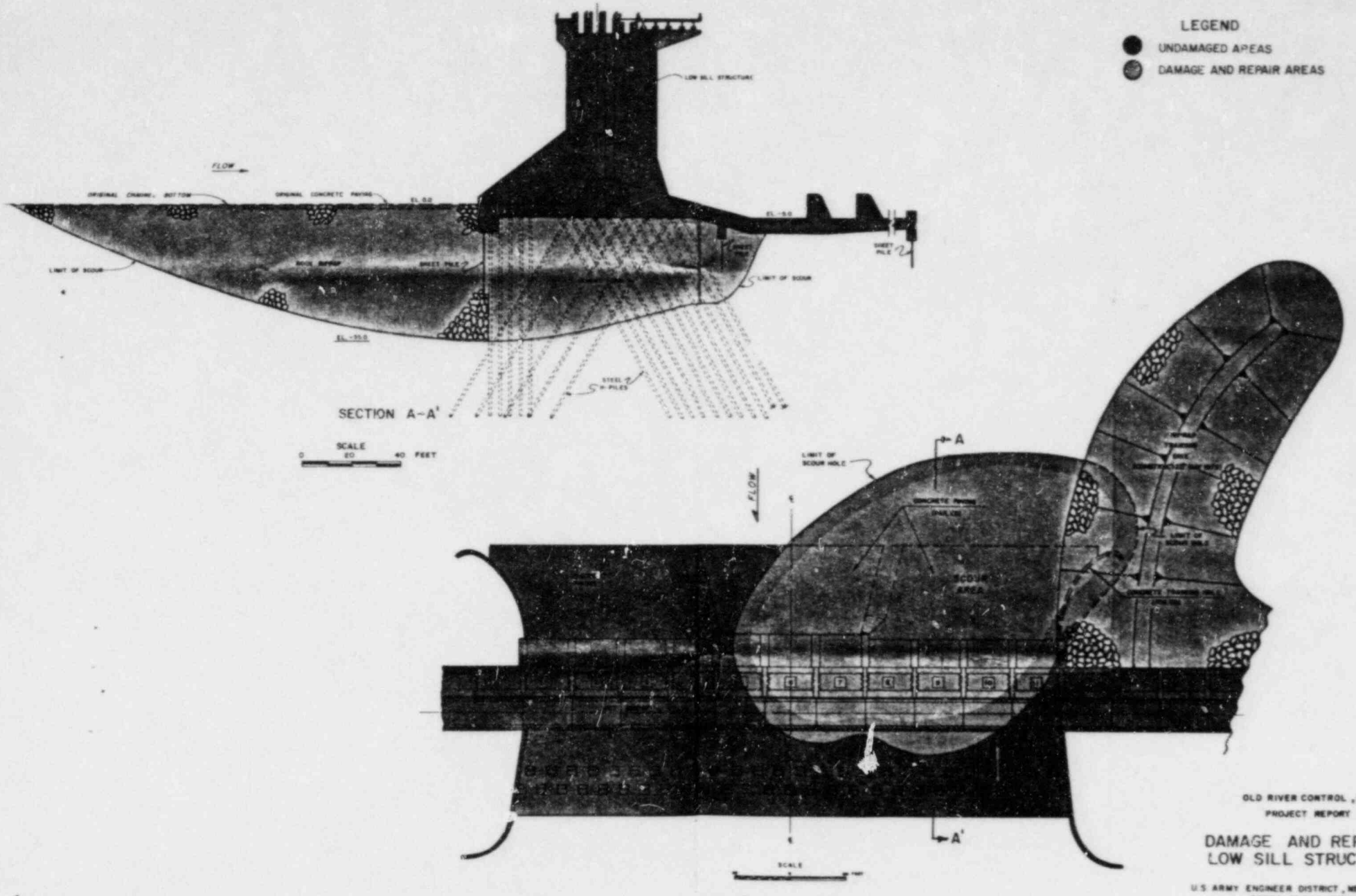


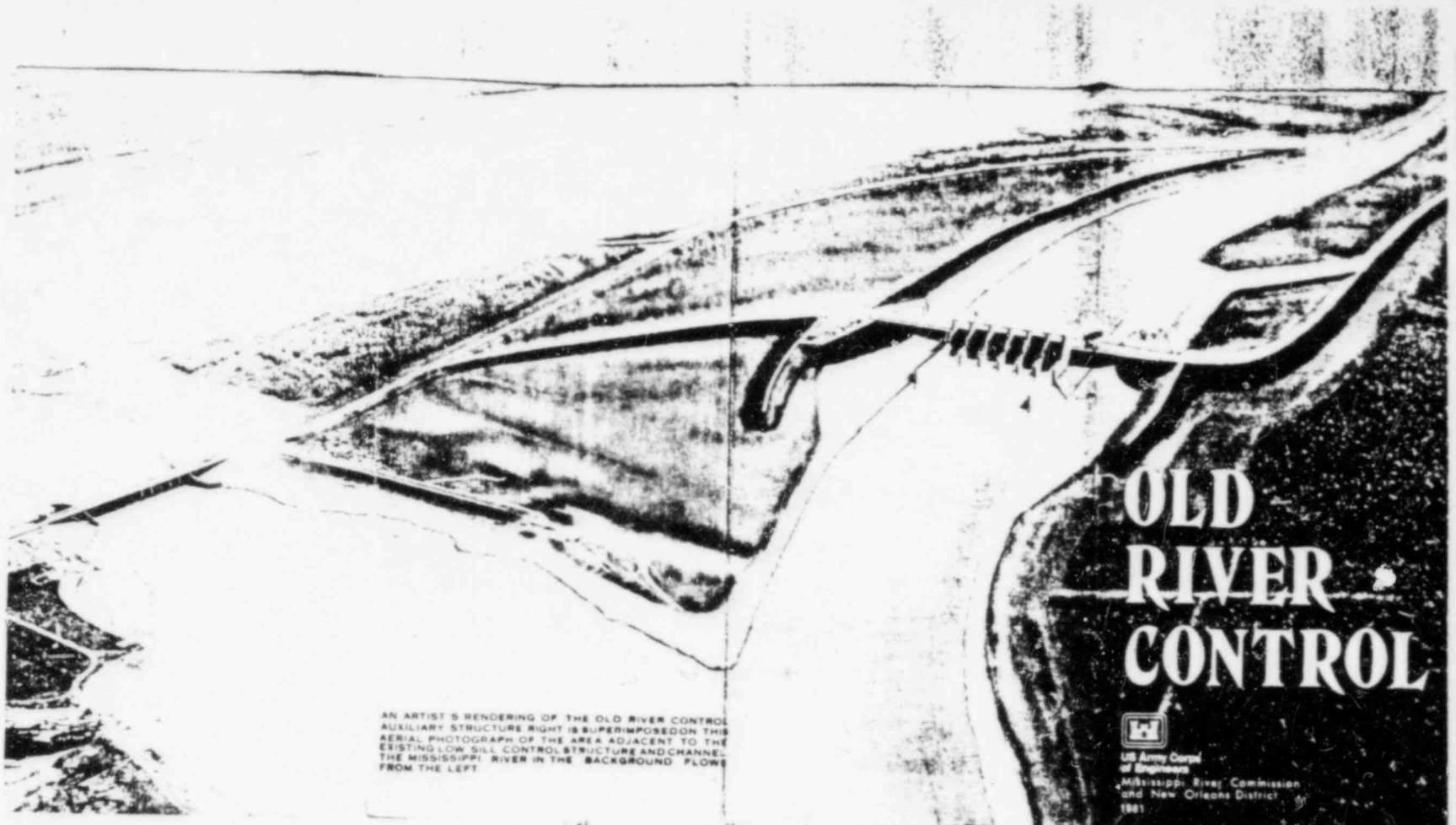
OLD RIVER CONTROL, LA
PROJECT REPORT

DAMAGE AND REPAIRS LOW SILL STRUCTURE

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

MARCH 1979 FILE NO. N-2-2870

PLATE



OLD RIVER CONTROL

US Army Corps of Engineers
Mississippi River Commission
and New Orleans District
1981

AN ARTIST S RENDERING OF THE OLD RIVER CONTROL AUXILIARY STRUCTURE RIGHT IS SUPERIMPOSEDON THIS AERIAL PHOTOGRAPH OF THE AREA ADJACENT TO THE EXISTING LOW SILL CONTROL STRUCTURE AND CHANNEL THE MISSISSIPPI RIVER IN THE BACKGROUND FLOWS FROM THE LEFT

INTRODUCTION

By a number of standards, Old River is remarkable—not in size, however, for it is neither long nor unusually wide. Rather, its peculiarity arises from other causes. Created by the Mississippi River, of which it was once a part, it would have long ceased to exist if it had not been for man. Having flowed in both directions in the past, today it doesn't flow at all. Left behind when the Mississippi changed its course 150 years ago, it almost captured its sire. A river of paradoxes, indeed, is Old River.

THE SOURCE: THE MISSISSIPPI

Old River, some 50 miles northwest of Baton Rouge, is one of several pieces which, fitted together, form a dynamic, complex river system involving the Mississippi, Atchafalaya, and Red Rivers. In its original state, Old River was a section of an abandoned loop of the mighty Mississippi. There are many such abandoned loops along the Mississippi, of course. But what made Old River distinctive was that it connected the Red, Atchafalaya, and Mississippi Rivers. What made it important was that the Mississippi was attempting to divert most of its flow through Old River and down the Atchafalaya, away from its present channel past Baton Rouge and New Orleans to the Gulf. And therein, as Shakespeare wrote, lies the tale.

According to scientists, the Mississippi River south of Baton Rouge began to develop about 5-6,000 years ago as sea level approached its present height. Since that time, the Mississippi has migrated back and forth across south-central and southeastern Louisiana at least seven times, each time developing a delta by deposition of tremendous quantities of sands, silts, and clays. In this manner the present day

THE EXISTING OLD RIVER SYSTEM. THE MISSISSIPPI RIVER, FOREGROUND, FLOWS FROM THE RIGHT. THE LOW SILL CONTROL STRUCTURE, CENTER (WITH OVERBANK STRUCTURE TO THE RIGHT), STRADDLES A MAN-MADE CHANNEL CONNECTING RED RIVER (UPPER RIGHT) WITH OLD RIVER (UPPER LEFT) AND THE ATCHAFALAYA RIVER IN THE DISTANCE. THE LOCK AND DAM ARE NOT VISIBLE, BUT ARE LOCATED IN THE LIGHT CROSS-LIKE AREA ON THE UPPER LEFT.

(3)

landforms of south-central and southeastern Louisiana were developed.

The Mississippi, like all sediment-bearing rivers—"alluvial" rivers—has the habit of winding through its valleys, twisting, caving banks and topping them in floodtimes. Occasionally it bypasses a sharp loop by cutting across its neck. Thus, its length at or near the cutoff is shortened, its speed of flow increases, and it begins attacking another bank, gradually forming a new loop, repeating the cycle.

About the fifteenth century A.D., a westwardly meandering loop of the Mississippi River, later called Turnbull's Bend, broke into the basin of the Red River and captured that stream. The Mississippi also intersected a small distributary of the Red River which flowed south and later became known as the Atchafalaya.

When the first European settlers arrived, they found the Red River emptying into the Mississippi at Turnbull's Bend, and the Atchafalaya River to be a well-defined distributary flowing out of Turnbull's Bend a few miles to the south. The colonists constructed levees to hold back the spring floods, with some success; to promote navigation they cut across some additional loops on the rivers.

THE BEGINNING OF THE PROBLEM

In 1831 Captain Henry M. Shreve, the distinguished steamboatman and founder of Shreveport, dug such a cut across the narrow neck of Turnbull's Bend. The river accepted the shortcut and abandoned its old channel, the upper part of which eventually silted up, leaving the lower part, which came to be called "Old River," open.

The Red no longer flowed into the Mississippi, but into the Atchafalaya. Old River connected them to the Mississippi. The current usually flowed west from the Mississippi through Old River into the Atchafalaya; however, during high water on the Red the flow sometimes reversed. Thus, Old River linked the two river systems.

But man's actions were again to be felt. For years the head of the Atchafalaya River had been blocked by a massive "raft"—a 30-mile-long log jam—that had defied efforts of settlers to remove it. In 1839 the State of Louisiana began to remove the raft and to open up the river as a free-flowing stream.

THE PROBLEM GROWS

As a result, the Atchafalaya began enlarging, becoming deeper and wider, and carrying more and more of the Mississippi's flow.

The Atchafalaya's appetite for the Mississippi water came as no surprise to the experts; as early as 1804 an army officer reported that the river, left to its own devices, would become the new Mississippi channel. The U. S. Army Corps of Engineers, given the job of improving Mississippi navigation by Congress in 1879 with the foundation of the Mississippi River Commission, watched the situation carefully through the years.

The Atchafalaya offered the Mississippi a shorter outlet to the Gulf of Mexico—142 miles compared to 315—and by 1951 it was apparent that, unless something were done soon, the Mississippi would change course by capturing the Atchafalaya. The danger was imminent; by 1975 the change could be an accomplished fact.

THE EFFECTS OF A CHANGE OF COURSE...

If the Mississippi were to change course, the effects on southern Louisiana would be catastrophic. For one thing, Louisiana, along with the rest of the South, has been emerging from its rural, agrarian past into the industrial age. Corporations have constructed billions of dollars worth of plants, most of which depend upon fresh water in one way or another for the manufacturing process, along both banks of the Mississippi River. Loss of the Mississippi would turn the present river channel into a saltwater estuary, and cities below Baton Rouge, including New Orleans, would be hard-pressed to find usable drinking water.

would be controlled by a complex to be built at Old River.

The report established three principles: (1) provision should be made for flood flows without endangering downstream flood control works, (2) the distribution of flow and sediment between the Mississippi and the Atchafalaya was then favorable to continued stability, and should be maintained, and (3) the control structure should not worsen Red River backwater stages.

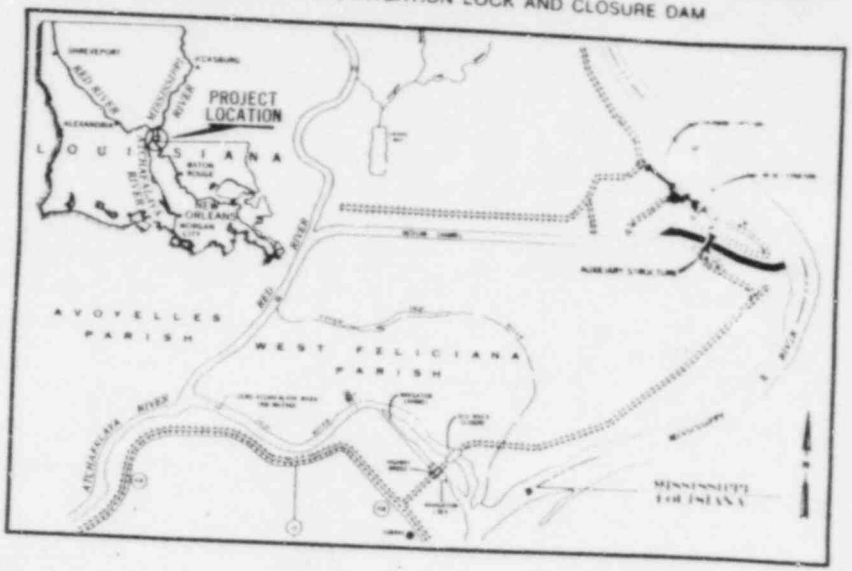
To remedy the problem, the plan proposed to dam Old River and build two control structures, one to operate at all times and stages, and the other to operate only during floods. A lock to preserve navigation between the Mississippi River and the Atchafalaya-Red River system was also included.

Under the plan, diversion of flow when the Mississippi was not in flood would be controlled by the "low sill structure," a reinforced concrete structure 566 feet wide with 11 gates to be constructed on dry land about 11 miles upstream from Old River. New channels would be constructed connecting it with the Mississippi and the Red-Atchafalaya system.

During major floods, some of the overbank flows would be passed into the Atchafalaya through an overbank structure to be built just upstream from the low sill structure to augment the low sill structure's flow. It would be 3,356 feet long and have 73 gates with a weir crest at 52 feet above sea level. When the Mississippi reached that stage, it would be above the bank in front of the structure, and water would pass through the opened gates.

The Old River control structures were to be operated so as to maintain the distribution of flow and sediments between the lower Missis-

THE OLD RIVER NAVIGATION LOCK AND CLOSURE DAM



...ON THE ATCHAFALAYA BASIN

Nor would the Atchafalaya Basin be able to accept the Mississippi flow without massive flooding and the upheaval of the existing social and economic patterns of that area. In all likelihood, if the entire Mississippi were to move down the Atchafalaya, the small towns along its banks, including Morgan City and Berwick, would be seriously threatened.

...ON FLOOD CONTROL

A third effect would be the rendering useless of hundreds of millions of dollars worth of flood control projects which the Mississippi River Commission and the Corps of Engineers have built in southern Louisiana in connection with existing developments along the rivers. The Corps would have to develop new and very expensive flood control projects in the Mississippi delta.

...ON THE NAVIGATION SYSTEM

Lastly, the tremendous volume of shallow draft navigation between the nation's heartland—the upper Mississippi—and the ports of Baton Rouge and New Orleans would be severely disrupted. Additionally, a change in the river's course would also require modifications to locks and channels for the Gulf Intracoastal Waterway and other major navigation routes in southern Louisiana.

THE CORPS DEVELOPS A SOLUTION

Something had to be done. In 1953 a report by the Mississippi River Commission recommended that the Mississippi River and Tributaries Project be modified so that the diversion of flow from the Mississippi into the Atchafalaya River and the Atchafalaya River in approximately the same proportions as occurred naturally in 1950. That distribution was determined to be approximately 30 percent of the total latitude flow (combined flow in the Red River and in the Mississippi above the control structures) passing down the Atchafalaya River on an annual basis.

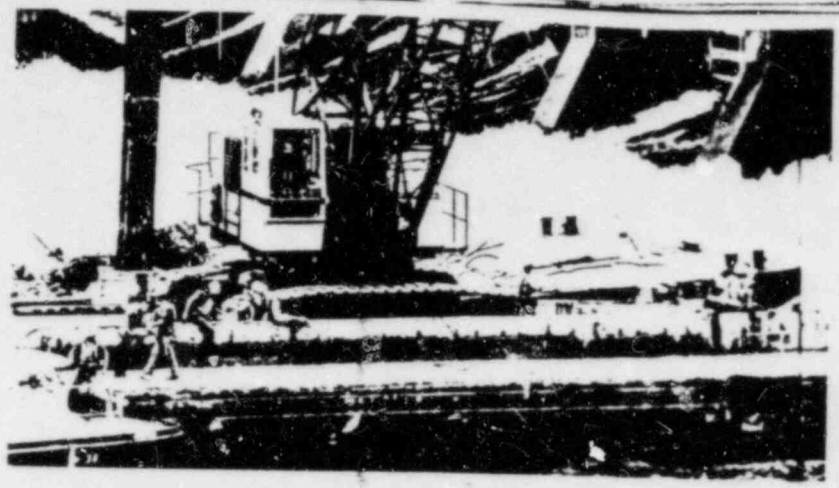
CONGRESS ACTS—CORPS RESPONDS

The Office of the Chief of Engineers in Washington received the report and passed it along with recommendations to the Secretary of the Army, who referred the matter to Congress. On September 3, 1954, Congress authorized the Old River Control Project.

Construction began on the low sill and the overbank structures in 1955 and was completed 4 years later at a cost of $15,000,000. Inflow and outflow channels were constructed to connect the low sill structure to the Mississippi and Red Rivers.

The lock was constructed just to the south of the Old River channel, complete with forebay and tailbay channels. Finished in 1963, it is 75 feet wide, 1,185 feet long, has a floor 11 feet below sea level, and is one of the most modern locks in the nation. The cost was also $15,000,000, not including the highway bridge crossing it.

Once these structures were operating, Old River was closed by an earthen dam 1,500 feet wide and 60 feet high. Finally, the Mississippi levees between Shaw and Torras were strengthened, and the banks were reinforced and stabilized along the Atchafalaya and Red Rivers from the outflow channel to Simmesport. The total cost of this massive effort to keep the Mississippi in place was $67,000,000.



WORKMEN MAKE REPAIRS IN THE TURBULENT TAILBAY AREA OF THE OLD RIVER CONTROL STRUCTURE

THE GREAT FLOOD OF 1973 TAKES ITS TOLL

For the next 10 years the Mississippi rolled quietly on to the Gulf, presenting none of the typical spring floods that mark its long history. While there had not been a major flood since 1950, the situation would change dramatically in 1973.

Persistent, extremely heavy rainfalls during the fall of 1972 and the winter and spring of 1973 in the central plains and the Mississippi and Ohio valleys caused many of the tributaries of the Mississippi to exceed flood stage. The Mississippi crested several times that spring, and a prolonged flood fight ensued up and down

end that guided the flow into the structure washed away; the wall was undermined and it collapsed. A large scour hole developed in front of and beneath the structure and partially eroded the foundations under it, exposing up to 50 feet of the 90-foot-long pilings supporting part of it. Though seriously impaired, the structure did not collapse.

REPAIRS AND MODIFICATIONS

Repair work started immediately. The fallen wall in front of the structure was replaced by a rock dike, large stones were placed in the scour hole, and specially developed cement grout was pumped through the [illegible]

conditions, providing additional channel scour protection for the inflow and outflow channels, replacement of damaged piezometers (which measure uplift pressures) under the low sill structure and stilling basin, cleaning of drainage systems under the low sill structure, repairing of severely eroded areas in the stilling basin of the low sill structure, and modifications to the tailbay of the overbank structure.

OLD RIVER CONTROL TODAY

The entire system is continuously monitored to detect any changes in inflow and outflow channel cross section, uplift pressure, vibration, and structural alinements and settlement, so that corrective action, if needed, can be taken promptly. Furthermore, marine traffic in the vicinity is kept under observation at all times.

Repair and rehabilitation have restored the capability of the low sill structure to perform well on a day-to-day basis. The damage it sustained in 1973, however, permanently impaired its foundation so that the safe differential in water surfaces across the structure is now 22 feet instead of the 37 feet originally designed. This does not hinder normal operations, including major floods, but it does significantly reduce the ability of the structure to deal with emergency situations.

The floods of 1974, 1975, and 1979 continued the relentless attack of a frustrated river on its man-made yoke, and pointed out several remaining areas of concern.

One concern is the danger presented by loose barges. So strong is the current through the structure that any unpowered or disabled vessel nearing the inflow channel is likely to be drawn into it.

PHYSICAL DATA

LOW-SILL STRUCTURE:

Reinforced concrete, with steel gates. Eleven gate bays each with 44-foot clear width between piers. Weir crest elevation is 10.0 feet above m.s.l. except for 3 center bays which have crest elevation of 5.0 feet below m.s.l. for passing low flows. Total length, 566 feet between abutments. Maximum water surface elevation 69.8 feet m.s.l. in forebay.

OVERBANK STRUCTURE:

Reinforced concrete, with gate panels. Seventy-three gate bays, each with 44-foot clear width between piers. Weir crest elevation is 52.0 feet above m.s.l. Total length, 3,356 feet between abutments.

MAXIMUM DISCHARGE CAPACITY:

Approximately 700,000 c.f.s. for both structures.

NAVIGATION LOCK:

"U"-frame, reinforced concrete with steel miter gates, usable length 1,180 feet, width 75 feet. Sill elevation -11 feet m.s.l.

HIGHWAY BRIDGE OVER LOCK:

Steel vertical lift. Elevation low member, lift span down, 74 feet m.s.l.—lift span up, 116 feet m.s.l. Navigation opening, 75 foot width.

AUXILIARY STRUCTURE (UNDER CONSTRUCTION):

Reinforced concrete with steel tainter gates. Six gate bays each with 82-foot clear width between piers. Weir crest elevation is 5.0 feet below m.s.l. Total length, 442 feet between abutments.

$290,500,000, including allowances for inflation.

When completed, the auxiliary structure will be operated together with the low sill structure. With both structures operating, the amount of water through the low sill will be reduced significantly, thereby reducing water pressure and current and, in turn, destructive turbulence. The auxiliary structure will provide protection during emergencies; in case of accident either at or the low sill structure can be

(6)

the big river, its tributaries, and its distributaries.

The sheer volume of water passing through both Old River structures was awesome, but it was the low sill structure that bore the brunt. For one thing, the Mississippi could not handle as much water as it had in 1950 because of changed conditions. The Atchafalaya, on the other hand, had been deepening and flowing faster, thus demanding even more water that would, in turn command an even greater flow.

The low sill structure had been designed to curb that flow, and it did so. Unfortunately, the turbulence of the water during the massive 1973 flood battered it unmercifully. Stone placed to protect a 67-foot-high curving wall on the south

As the emergency repair work was progressing, engineering studies were made to determine, as nearly as possible, the safe limits to which the low sill structure could be operated and the long-range impacts of the damages. The studies concluded that although the structure had been seriously and permanently damaged, its residual capability was substantial and could be improved by various rehabilitation measures.

As a result, a comprehensive program of major rehabilitation was approved for the low sill and the overbank structures. The rehabilitation program included modifying the gates of the low sill structure to improve hydraulic flow

Still another problem is the great difference in water levels ("head") between the higher Mississippi and the lower Atchafalaya. At present, to retain a 70-30% division of flow, the head ranges from 9 to 16 feet, depending upon the stages of the three rivers. The greater the head, the greater the stress on the structure.

THE AUXILIARY STRUCTURE

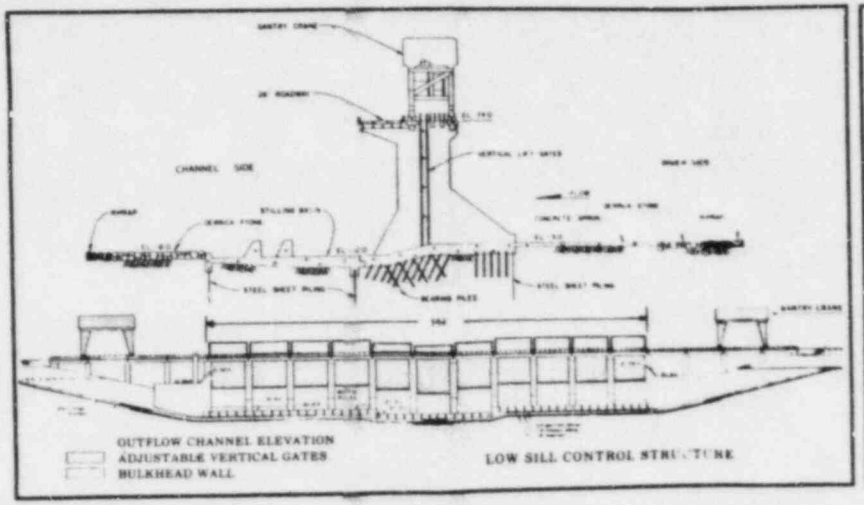
The Corps New Orleans District, realizing that repairs and modifications to the two structures were not enough, recommended that an auxiliary structure with a new inflow channel be built near the present ones. The Chief of Engineers approved, and physical construction, which started in July 1981, is targeted for completion in 1985 at an estimated cost of

closed safely.

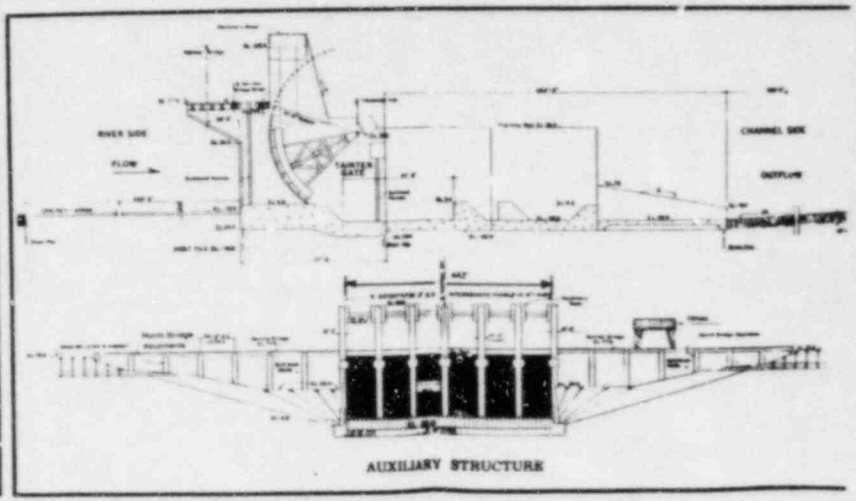
In addition to flood control, the Old River structures provide fresh water to the Atchafalaya Basin, one of the last great primitive areas in the nation not part of the national refuge or park systems. This fresh water is needed by the extensive plant and animal life in the basin swamps.

HYDROELECTRIC POWER

The feasibility of hydroelectric power generation at the Old River site is being investigated by the town of Vidalia, Louisiana. If economically feasible, and if licensed by the Federal Energy Regulatory Commission, the town plans to construct and operate a hydroelectric plant.



LOW SILL CONTROL STRUCTURE



AUXILIARY STRUCTURE

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