Section 2. Problem Identification

This section presents information on existing and projected future conditions pertinent to the development of problems and needs related to flood control and navigation at Bayou Sorrel Lock.

1. Existing Conditions

Bayou Sorrel Lock is a feature of the Atchafalaya Basin, Louisiana project, which is a feature of the Flood Control, Mississippi River and Tributaries project. The lock passes inland barge tows moving on the Morgan City-to-Port Allen Alternate Route of the Gulf Intracoastal Waterway project though the East Atchafalaya Basin Protection Levee. The Gulf Intracoastal Waterway project and other navigation channels, including those on the Mississippi River and the Atchafalaya River, comprise an inland navigation system that annually moves millions of tons of waterborne cargo. Existing conditions pertinent to the Bayou Sorrel Lock and its flood control and navigation functions are presented in this section.

a. **Flood Control, Mississippi River and Tributaries Project.** The Flood Control, Mississippi River and Tributaries (MR&T) Project is a comprehensive project for the control of floods in the alluvial valley of the Mississippi River between Cape Girardeau, Missouri and Head of Passes, Louisiana. The MR&T project includes a combination of features such as: levees along the main stem of the Mississippi River and its tributaries in the alluvial plain to confine floodflows; reservoirs on the tributaries to store excess floodflows; floodways; and improvements to increase channel capacity, such as revetting, diking, and dredging. Other features include, without limitation, control structures, cutoffs, pumping plants, locks, floodwalls, and floodgates. The project is designed to convey a project flood safely to the Gulf of Mexico.

Approximately one-half of the 3,000,000 cubic feet per second project flood flow would remain in the Mississippi River, and the other 1,5000,000 cubic feet per second of flow would be accommodated by the Atchafalaya Basin, Louisiana project. The Atchafalaya Basin, Louisiana project is a complex flow conduit with confining levees, one natural and two artificial intakes, a natural and an artificial outlet, and appurtenant drainage and navigation structures. Descriptions of the various features of the Flood Control, Mississippi River and Tributaries project pertinent to this study are presented below and are shown in Figure 1.

(1) The East Atchafalaya Basin Protection Levee (EABPL) extends from its junction with the Mississippi River levee near Morganza, Louisiana, generally southward approximately 107 miles to Bayou Chene on the east bank of the Lower Atchafalaya River, about 10 miles south of Morgan City, Louisiana. This levee and levee/floodwall system forms the eastern boundary of the Morganza and Atchafalaya Basin Floodways. Bayou Sorrel Lock and Bayou Boeuf Lock, which provide for navigation through the EABPL, are located in this levee.

(2) The West Atchafalaya Basin Protection Levee (WABPL) extends from the Mansura Hills to Hamburg Levee near Hamburg, Louisiana, south and southeastward approximately 150 miles to the junction of the Lower Atchafalaya River and the Gulf Intracoastal Waterway, near Atchafalaya Bay. The levee forms the western boundary of the West Atchafalaya and Atchafalaya Basin Floodways, which are described below. Two drainage structures, the Wax Lake Outlet, and Berwick Lock, are located in this levee.

(3) Atchafalaya River. The Atchafalaya River is the largest distributary of the Mississippi River and is the single natural intake of the Atchafalaya Basin Floodway. It extends under various names from its source at a junction with Old River to Atchafalaya Bay and is generally centrally located within the floodway. It is divided into three segments: an upper leveed segment, 50 miles in length, of reasonably direct alignment; a middle unleveed segment, covering a distance of about 50 miles ending at Morgan City, comprising a system of multiple natural and artificial channels and lakes with poorly defined alignment; and a lower outlet section from Morgan City to the gulf. In the upper segment, it has been necessary to augment the natural capacity of the river by dredging. In the middle segment, development of a centrally located main channel of substantial capacity is necessary to avoid excessive levee grades. The intake capacity of the Atchafalaya River exceeds 700,000 cubic feet per second, and its outlet capacity is about 1,200,000 cubic feet per second. The river is presently of adequate size to convey its proper portion of the design flow in the upper and lower segments but is deficient in the middle segment.

(4) Atchafalaya River levees. Through roughly the upper half of its length, the Atchafalaya River is confined between levees on its east and west banks. These levees serve to protect the lands of the Morganza and West Atchafalaya Floodways when the use of these floodways is not required. Accordingly, their grades are not set to confine maximum Atchafalaya River flows without operation of the respective floodways. On the west bank, opposite the important towns of Simmesport, Melville, and Krotz Springs, the grade is set to provide protection for maximum flows with all floodways operating, and the three towns mentioned are protected on the floodwayside by full grade levees which tie to the river levee.

(5) Morganza Floodway. The Morganza Floodway is the east side artificial intake for the Atachafalaya Basin Floodway comprising an area of 68,000 acres. It is bounded on the east by the Morganza Floodway lower guide levee which extends southwesterly from the west bank Mississippi River levee near Morganza to a junction with the east Atchafalaya Basin protection levee at the latitude of Ktotz Springs. On the north and west, it is bounded by the Morganza Floodway upper guide levee, which extends southwesterly from the west bank Mississippi River levee to a junction with the east bank Atchafalaya River levee near Red Cross. Inflows into Morganza Floodway are controlled by the Morganza Control Structure. The design discharge capacity of the floodway is 600,000 cubic feet

per second. The floodway is crossed by the Texas and Pacific Railway and the Louisiana Highway 1 high level crossing over the Morganza Control Structure, the Texas and Pacific Railway high level crossing at Melville, and by the New Orleans, Texas, and Mexico Railway (Missouri Pacific Railroad) and U. S. Highway 190 high level crossings at Krotz Springs, all of which were constructed as part of the project. Comprehensive type flowage easements have been obtained on all the lands in the floodway, and over 12,800 acres in the upper Pointe Coupee protected area above the Morganza upper guide levee.

(6) West Atchafalaya Floodway. The West Atchafalaya Floodway, the west side artificial intake for the Atchafalaya basin Floodway, compromises an area of about 170,000 acres. This intake is bounded on the north by the Bayou des Glaises levee, on the west by the previously described west Atchafalaya Basin protection levee, and on the east by the west bank Atchafalaya River levee. The lower limit of the west Atchafalaya Floodway is at the approximate latitude of the Krotz Springs. Inflows to the West Atchafalaya Floodway will be uncontrolled over the Bayou des Glaises levee and the west bank Atchafalaya River levee. The design capacity of the west Atchafalaya Floodway is 250,000 cubic feet per second. The floodway is crossed by the New Orleans, Texas, and Mexico Railway (Missouri Pacific Railroad), and the U. S. Highway 190 high level crossing at Krotz Springs. Simple flowage easements have been acquired over all lands in this floodway.

(7) Lower Atchafalaya Basin. The natural and artificial intakes of the Atchafalaya Basin Floodway deliver their flows to the Lower Atchafalaya basin, that portion of the floodway extending from the approximate latitude of Krotz Springs to the approximate latitude of Morgan City. It is bounded on the east by the East Atchafalaya Basin Protection Levee and on the west by the West Atchafalaya Basin Protection Levee; an area averaging 14 miles in width by 65 miles in length. The design capacity of the lower Atchafalaya Basin is 1,500,000 cubic feet per second. Through this portion of the floodway the Atchafalaya River loses its identity and is replaced by a network of natural streams and artificial channels. The central portion of the Lower Atchafalaya Basin is now dominated by the Atchafalaya Basin Main Channel, which has been developed by dredging and selective stream closures. At the lower end of the Lower Atchafalaya basin are two bodies of open water, Grand Lake and Six Mile Lake. The history of the Lower Atchafalaya Basin since the inception of the project has been characterized by repeated overbank overflow with attendant extensive sedimentation forming alluvial levees adjacent to many channels. The sedimentation was particularly extensive in the two lakes. No railroads or highways cross this portion of the floodway. The Chief of Engineers is authorized to acquire simple flowage easements over approximately 70,000 acres of land not subject to frequent overflow below the latitude of Krotz Springs.

(8) Atchafalaya Basin Floodway Outlets. The Atchafalaya Basin Floodway has two outlets, one natural and one artificial, as described below.

a) *Lower Atchafalaya River*. The lower Atchafalaya River is connected to the Six Mile Lake through Stouts Pass and Berwick Bay, and extends from Morgan City to Atchafalaya Bay. It is 18.3 miles in length and has a design capacity of 1,200,000 cubic feet per second. Bayou Shaffer, which shares a common junction with Berwick Bay and the Lower Atchafalaya River, and rejoins the Lower Atchafalaya River 9.7 miles below, is an integral part of the Lower Atchafalaya River outlet. The terminal portion of the east Atchafalaya basin protection levee follows the left descending banks of bayou Shaffer and the Lower Atchafalaya River for a distance of 16 miles, and limits the backwater overflow to the east.

b) *Wax Lake Outlet*. The Wax Lake Outlet was constructed to augment the natural outlet capacity of the Lower Atchafalaya River, and consists of a dredged channel, through the Teche Ridge, connecting Six Mile Lake with Atchafalaya Bay. The design discharge capacity is 270,000 cubic feet per second. The Southern Pacific Railroad and U. S. Highway 90 bridges built as a part of the project cross the outlet. Also included are the east and west Calumet Floodgates.

(9) Appurtenant drainage. Drainage intercepted by the floodway levee is rectified by a drainage channel landward of each levee line, which utilizes artificial and natural channels, with necessary control structures, extending from the head of the basin levee systems to tidewater levels near the gulf. Structures on the west side include the Bayou Darbonne Structure, the Bayou Courtableau Weirs, and the Bayou Courtableau Drainage Structure, all in the vicinity of Courtableau, and the Charenton Floodgate near Charenton. The Bayou des Glaises Diversion Channel and the Bayou Cocodrie and Tributaries features are important tributaries in the west side. The outlet to the gulf on the west side is through the Charenton Drainage Canal. On the east side, the Pointe Coupee Drainage Structure, in the Morganza Upper guide levee, provides a gravity outlet for the protected areas in the upper Pointe Coupee Parish. The outlet to the east side is via Bayou Boeuf, Bayou Chene, and the improved landside borrow pit from Bayou Chene to the Lower Atchafalaya River at mile 129. Landside borrow pit canals, gravity structures, and pumping plants complete the intercepted drainage facilities at and below Morgan City and west of Berwick. Pumping stations include Ellerslie, Gordy, North Bend, Maryland, Centerville, Franklin, Bayou Yokely, Wax Lake East and West, Morgan City, and Tiger Island.

(10) Navigation Structures. Navigation works associated with the floodway levees include Bayou Sorrel Lock on the 12-by 125-foot Gulf Intracoastal Waterway, Morgan City- Port Allen Alternate Route, Bayou Boeuf Lock located on the Main Channel of the Gulf Intracoastal Waterway, and the Berwick Lock in the levees on the west side. These structures are utilized as necessary and feasible for diversion of flood and drainage flows and for the diversion of fresh water

flows to the landslide during low water seasons when navigation requirements permit.

(11) Atchafalaya River Navigation. A 12-by 125-foot navigation channel is maintained from the Gulf Intracoastal Waterway at Morgan City to the Mississippi River via the Atchafalaya and Old Rivers.

(12) Old River, Louisiana, Project. This project was authorized by Public Law 780, 83rd Congress, to prevent the Mississippi River from adopting the course of the Atchafalaya River. It provides for the construction of a low sill control structure and channel and an overbank control structure between the Mississippi River and the head of the Atchafalaya River near Simmesport, Louisiana; for the construction of a navigation lock in Old River, which connected the Mississippi River and the Atchafalaya River; and for the closure of Old River. Following damage to the low sill control structure during the 1973 Mississippi River and tributaries flood, an auxiliary control structure was built to supplement the low sill structure. The features included in the initial authorization were completed in 1962, and the auxiliary structure was completed in 1986. The Old River project is operated to maintain a 70-30 percentage distribution of the combined flows of the Red and Mississippi Rivers, at the latitude of Old River, between the Mississippi River and the Atchafalaya River. The Old River Lock has chamber dimensions 74 by 1,200 by 11 feet. This lock provides a connection between the Mississippi River at Mile 304 Above Head of Passes and the Atchafalaya River navigation channel.

b. Atchafalaya Basin, Louisiana Project Flood Flowline. A feasibility study of the Atchafalaya Basin, Louisiana, flood control project was performed in the late 1970's; the results of which were presented in the report, Atchafalaya Basin Floodway System, Louisiana, dated January 1982. The study included the development of a plan to safely pass the project flood, based on projected conditions. The report confirmed that modifications to Bayou Sorrel Lock and other existing features of the Atchafalaya Basin, Louisiana project had been authorized and approved and that the implementation of such would continue. In February 1983 the Chief of Engineers approved the measures to pass the project flood under his discretionary authority (See Exhibit 1). In 1986, Congress passed Section 601 of the Water Resources Development Act, Public Law 99-662, which further confirmed the authorization of the measures to safely pass the project flood in the Atchafalaya Basin.

A reanalysis of the then-authorized project flood flow line, based on projections of channel development and sedimentation in the Atchafalaya Basin Floodway and Atchafalaya Bay, was presented in the design memorandum, MR&T Atchafalaya Basin, Louisiana Project Flood Flow Line Design Memorandum No. 1, Hydraulic Design, dated January 1987. The Lower Mississippi Valley Division Engineer of the U.S. Army Corps of Engineers approved the design memorandum, which recommended revisions to the project flood flowline, in June 1987. Bayou Sorrel Lock was constructed to a top-of-wall

elevation of 24 feet, based on the then-approved project flood flowline. The elevation at Bayou Sorrel Lock, for the flowline approved in June 1987, is 28.7 NGVD. The development of a plan to pass the project flood at Bayou Sorrel Lock to accommodate the flowline approved in June 1987 is being addressed in this feasibility study.

c. **Navigation System.** Bayou Sorrel Lock is a feature of the Atchafalaya Basin, Louisiana project; however, it also serves navigation moving over the Gulf Intracoastal Waterway (GIWW) system (see figure 2). The Mississippi River, the GIWW inland navigation system, and navigation features included in the Flood Control, Mississippi River and Tributaries project, comprise the inland navigation system pertinent to this study.

Features of the GIWW pertinent to the study are generally those located in the state of Louisiana west of the Mississippi River. These features include.

(1) an inland channel, the mainstem of the GIWW, 12 feet deep and 125 feet wide, between the Mississippi River at Harvey, Louisiana, and the Sabine River near Orange, Texas;

(2) Harvey Lock, connecting the inland channel and the Mississippi River at Harvey, Louisiana;

(3) an alternate inland navigation route, the Algiers Canal alternate route, approximately 9 miles long, 12 feet deep, and 125 feet wide between the mainstem of the GIWW and the Mississippi River near Algiers on the west bank of the Mississippi River in New Orleans, Louisiana;

(4) Algiers Lock, connecting the Algiers Canal alternate route and the Mississippi River;

(5) an alternate inland navigation route, the Morgan City to Port Allen alternate route, between the mainstem of the GIWW at Morgan City, Louisiana, and the Mississippi River at Port Allen, Louisiana;

(6) Port Allen Lock, connecting the Morgan City-to-Port Allen alternate route and the Mississippi River at Port Allen, Louisiana;

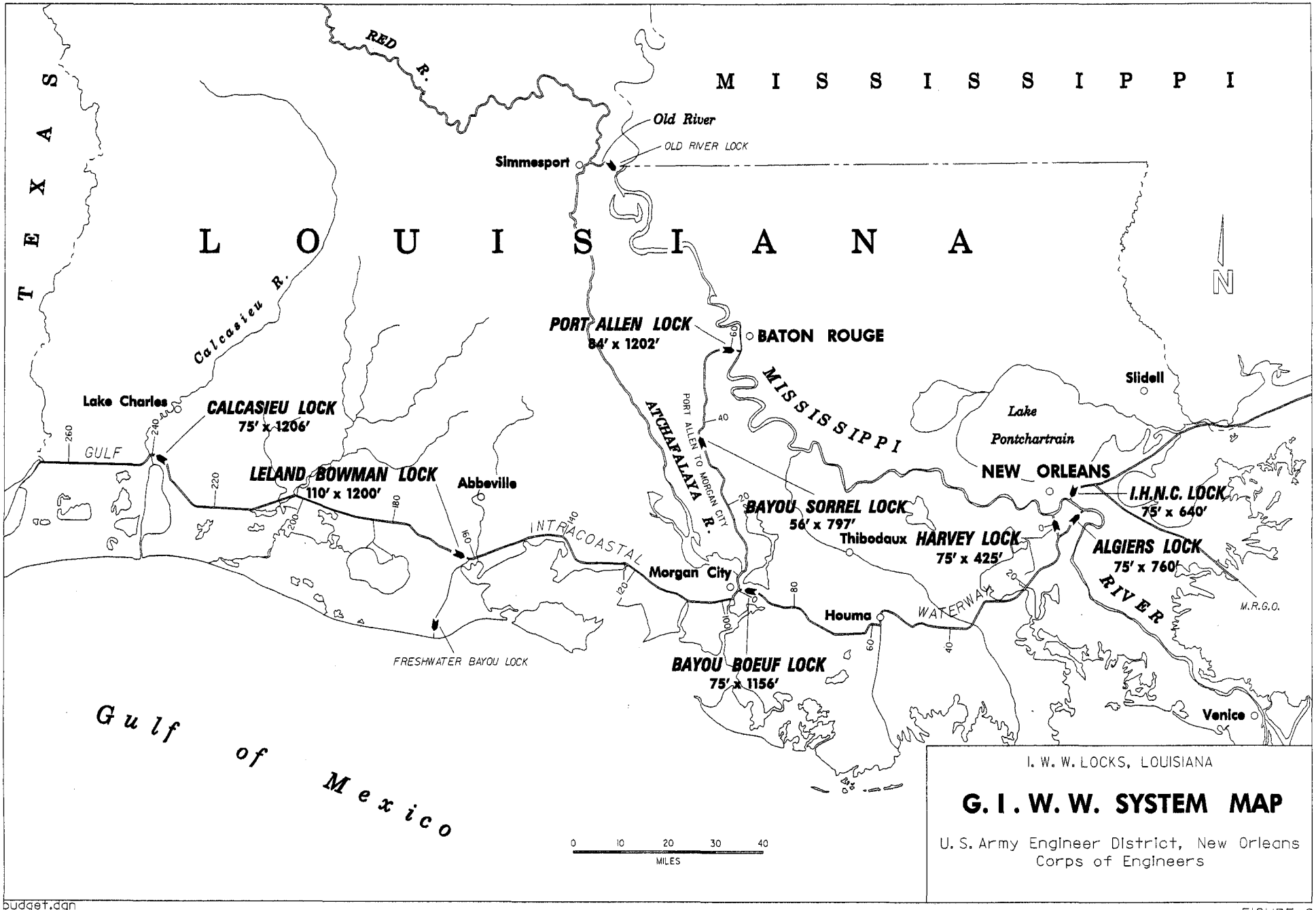
(7) Calcasieu Lock and Leland Bowman Lock, located on the mainstem of the GIWW east of the Calcasieu River, to prevent saltwater intrusion into the Grand and White Lakes system, and

(8) the Inner Harbor Navigation Canal Lock, connecting the Mississippi River and the GIWW mainstem east of the Mississippi River in New Orleans, Louisiana.

In addition to the above, there are additional navigation features pertinent to the GIWW inland navigation system, which were constructed under the authority of the Flood Control, Mississippi River and Tributaries project. One of these is Bayou Sorrel Lock, which passes inland navigation traffic moving over the GIWW, Morgan City to Port Allen Alternate, through the EABPL. Another is Bayou Boeuf Lock, which passes inland navigation traffic moving over the main route of the GIWW through the EABPL in Morgan City, Louisiana. Old River

Lock, located north of the Atchafalaya Basin, Louisiana project, passes inland navigation moving between the Red and Atchafalaya Rivers and the Mississippi River. The locations, chamber dimensions, and construction dates of the locks in the study area are presented in Table 2-1.

The Gulf Intracoastal Waterway is a middle-aged system compared to other inland waterway segments within the United States. As Table 2-1 shows, with the exception of Old River and Leland Bowman, the locks are over 40 years old. However, the GIWW continues to be a critical part of our nation's infrastructure and confers wide-ranging benefits on national and state economies. The GIWW intersects all deep-draft ship channels along the gulf coast and connects with many navigable waterways to shallow-draft ports in Texas, Louisiana, Mississippi, Alabama, Georgia, and Florida. The waterway is not only important to American commerce, it supports a variety of other public purposes, including flood control, waterside commercial development, and water-based recreational activities.



I. W. W. LOCKS, LOUISIANA

G. I. W. W. SYSTEM MAP

U. S. Army Engineer District, New Orleans
Corps of Engineers

budget.dgn

FIGURE 2

Table 2-1

Location, Chamber Dimensions, and Construction Dates of Study Area Locks

	GIWW Mile[1]	Miss. River Mile[2]	Length (Feet)	Width (Feet)	Sill Depth (Feet)	Max Lift (Feet)	Year Opened
GIWW Mainstem, East of Mississippi River							
Inner Harbor Navigation Canal Lock	0	92.6	640	75	31.5	17	1923
GIWW Mainstem, West of Mississippi River							
Harvey Lock	0	98.2	425	75	12	20	1935
Bayou Boeuf Lock	93.3	n.a.	1156	75	13	11	1954
Leland Bowman Lock	162.7	n.a.	1200	110	15	5	1985
Calcasieu Lock	238.9	n.a.	1206	75	13	4	1950
GIWW, Algiers Canal Alternate Route							
Algiers Lock	0	88.0	760	75	13	18	1956
GIWW, Morgan City to Port Allen Alternate Route							
Port Allen Lock	64.1	227.6	1202	84	14	45	1961
Bayou Sorrel Lock	36.7	n.a.	797	56	14	21	1952
Atchafalaya River and Red River to Mississippi River Link							
Old River Lock	n.a.	304	1200	75	11	35	1963

[1]Miles west of Harvey Lock in New Orleans, Louisiana.
[2]Miles above the Head of Passes of the Mississippi River.

d. **Bayou Sorrel Lock**. Bayou Sorrel Lock was completed in 1951. The existing structure consists of two, U-frame, reinforced concrete gate structures. Each gate structure has a clear width of 56 feet and consists of an 80–foot approach section, a 68–foot gate bay section, and an 83.5–foot chamber section connected by 600–feet of earth chamber. The lock chamber has a useable length of 790–feet with a bottom width of 56 feet and 1 on 2.5 side slopes protected with riprap and articulated concrete mattresses. The sill of the lock is at elevation -14.8 NGVD, and the top of the concrete walls and gates is at elevation +24.0 NGVD. The lock is stable for its original design loading conditions and is in good operating condition; however, the elevation of the gate bays are now 5 feet below the project flood flow line and 8 feet below the project flood design grade. The East Atchafalaya Basin Protection Levee (EABPL) in the vicinity of Bayou Sorrel Lock has been upgraded to the current flood design grade of 30.3.

New operating machinery along with approach guidewalls has been recently installed. The operation and maintenance costs at Bayou Sorrel have increased steadily because of age, but overall the lock is in reasonably good condition.

Streamlined reliability analyses have been performed on the other locks in the GIWW system, the capacities of which may affect the conclusions relative to Bayou Sorrel Lock. These analyses are included in the Engineering Appendix. Generally, the locks in the study area are structurally sound and their electrical and mechanical systems are reliable. There should be no significant changes in the capacities of the other locks over the planning horizon. However, it should be noted that most of the locks have reached or are approaching their 50-year project life, as is Bayou Sorrel Lock.

e. **Restrictions to Navigation.** The Morgan City-to-Port Allen Alternate Route of the GIWW provides a 64-mile route for tows moving between the Mississippi River north of Baton Rouge and the GIWW west of Morgan City. The Mississippi River and the main stem of the GIWW provides an alternate route that is 224 miles long, adds 32 hours of travel time, and tows must go through either the Harvey Lock or the Algiers Lock in the New Orleans area and Bayou Boeuf Lock immediately east of Morgan City. There is a third alternate route, between the Mississippi River at Old River Lock and the mainstem of the GIWW at Morgan City via the Atchafalaya River. This route is not heavily used due to the combination of strong river currents and poorly aligned openings in several sets of adjacent bridges crossing the Atchafalaya River. Restrictions to navigation pertinent to this study are presented below.

(1) Morgan City-to-Port Allen Alternate Route. Project dimensions for the main stem channel and the alternate route are 12 feet deep and 125 feet wide. Port Allen and Bayou Sorrel Locks restrict navigation on the Morgan City-to-Port Allen Alternate Route, by the channel dimensions and alignment of the navigation channel, by major flood discharges in the Atchafalaya Basin Floodway, and by flood stages in Grand River caused by local rainfall events.

Tow configurations on the Morgan City-to-Port Allen alternate route are assembled in various combinations. Typical barge sizes are:

35 ft x 195 ft
52 ft x 195 ft
54 ft x 260 ft
55 ft x 300 ft

Tugs range from 54 ft -to- 80 ft in length.

Barge tows moving on the Morgan City-to-Port Allen Alternate Route must transit both Port Allen Lock and Bayou Sorrel Lock. There are significant delays at these locks due to the high volume of traffic. These delays are discussed in the section below, Waterborne Commerce and Vessel Traffic. Lockage times at Port Allen Lock and Bayou Sorrel Lock are affected by the high water on the Mississippi River system. Emptying and filling times at Port Allen Lock and Bayou Sorrel Lock are longer when stages in the Mississippi River and Atchafalaya Basin Floodway, respectively, are high during the spring flood season on the Mississippi River.

The U.S. Army Corps of Engineers, New Orleans District, has entered into a Memorandum of Agreement (MOA) with the Captain of the Port New Orleans (Coast Guard), Louisiana, the Louisiana Office of Emergency Preparedness, and the Iberville Parish Office of Emergency Preparedness concerning the Bayou Sorrel and Bayou Pigeon Waterway (i.e. the Morgan City-to-Port Allen Alternate Route). The entire MOA is attached as Exhibit 2 following the Main Report. The Corps responsibility under this MOA are (1) Maintain mooring facilities in the vicinity of the Bayou Sorrel Lock, (2) Effect closure of the Bayou Sorrel Lock when the gauge reads 7.3 feet, (3) Effect reopening of the Bayou Sorrel Lock when the gauge reads 6.9 feet, on the predicted continuous fall, and (4) Coordinate priority exceptions with the U.S. Coast Guard and Louisiana Wildlife & Fisheries.

The U.S. Coast Guard's responsibilities under the MOA are to establish no wake zones upon the landside gage at Bayou Sorrel Lock reading 6.0 ft NGVD and rising. If conditions persist, they issue a marine Information Broadcast advising traffic will be limited to one way only at Bayou Sorrel when the gauge reads 6.5 ft NGVD, on the rise. At this stage barge traffic becomes a hazard to houses and businesses located along Grand Bayou in the Bayou Sorrel community. In addition 33 CFR Part 162, Chapter 75 mandates the U.S. Coast Guard to restrict tows using the Morgan City-to-Port Allen Alternate Route to be no larger than 55 feet wide by 750 feet long due to bend way constrictions in the channel. Larger tow configurations, not to exceed 80 feet wide by 1,180 feet long, are allowed with a special permit.

This MOA was entered into for the purpose of forming an agreed basis for action to minimize the effects on residences of marine transportation activities during flooding of the waterway. Erosion has and will continue to be a concern of the local residences. The area affected by the MOA is roughly 1 and ½ miles to the north and

south of Bayou Sorrel Lock. When it becomes necessary to operate the lock and waterway with respect to the MOA, barge traffic is forced to use staging areas within the mile and a half distance of the lock.

(2) Mississippi River and GIWW Mainstem via New Orleans. Navigation on the Mississippi River and GIWW Mainstem Route is restricted by Harvey, Algiers, and Bayou Boeuf Locks and by major flood discharges in the Mississippi River.

Barge tows moving on the Mississippi River and GIWW Mainstem Route must transit either Harvey or Algiers Locks in New Orleans and then Bayou Boeuf Lock in Morgan City to reach the GIWW Mainstem Route west of Morgan City. Delays at these locks due to the high volume of traffic are discussed in the section below, Waterborne Commerce and Vessel Traffic. Lockage times at these locks are affected by the high water on the Mississippi River system. Emptying and filling times at these locks are longer when stages in the Mississippi River and Atchafalaya Basin Floodway are high during the spring flood season on the Mississippi River.

(3) Atchafalaya River via Old River Lock. Navigation on the Atchafalaya River is restricted by Old River Lock and by restrictions caused by a combination of high current and poor bridge alignments at groups of bridges located at Simmesport, Krotz Springs, and Morgan City, Louisiana.

Barge tows moving on the Atchafalaya River Route must transit Old River Lock north of Simmesport, Louisiana, to reach the GIWW Mainstem Route west of Morgan City. Delays at Old River Lock due to the high volume of traffic are discussed in the section below, Waterborne Commerce and Vessel Traffic.

Barge tows moving over the Atchafalaya River are restricted on an annual basis by groups of bridges at Simmesport and Krotz Springs, Louisiana, and less frequently by the bridges at Morgan City, Louisiana, as discussed in the section above, Morgan City-to-Port Allen Alternate Route.

f. Waterborne Commerce and Vessel Traffic. Waterborne commerce and vessel traffic at Bayou Sorrel Lock and on the inland navigation system was collected and analyzed as a basis for projections of future conditions. The basis for the development of this data was 1992, which was the most recent data available when the analysis was initiated. It should be noted that at the time this analysis was conducted, the most recent database available by WCSC was 1993. However, in 1993 the Mississippi River basin was experiencing severe floods that affected navigation over several months. Because of this, it was decided to use the 1992 WCSC database since this represented a more typical year of commerce on the inland waterway system.

The distribution of 1992 Bayou Sorrel Lock traffic by ten major commodity groups is presented in Table 2-2. Approximately 90 percent of the total traffic that moved through the Bayou Sorrel lock in 1992 consisted of petroleum products, industrial chemicals, non-metallic minerals, and metallic ores with petroleum products comprising almost a third of

the total volume of Bayou Sorrel lock traffic. The 1992 data was compared with subsequent data and determined to be representative of the period 1992 through 1999.

The total volume of waterborne commerce (tonnage) moving through Bayou Sorrel Lock and the average delays to barge tows at the lock for the period, 1991 through 1999 are presented in Table 2-3.

Table 2-4 displays the distribution of commodity types for each of the primary locks within the study area by way of commodity group percentages for the year 1992. Commodity group percentages for individual locks generally reflect the percentages of their respective segments. For example, the locks located on the mainstem of the GIWW west of the Mississippi River; Algiers, Harvey, Bayou Boeuf, Calcasieu, and Leland Bowman Locks; reveal the high percentage of refined petroleum products traversing this waterway segment, which comprise nearly 50 percent of the total traffic. On the Morgan City to Port Allen Route, the commodity group percentages at Port Allen and Bayou Sorrel Locks show not only the importance of petroleum products but also the significant percentage of industrial chemicals, non-metallic minerals, and metallic ores. The commodity group percentages at Old River Lock reveal the type of traffic that travels on the Atchafalaya River. As Table 2–4 shows, petroleum products and non-metallic minerals comprise the bulk of traffic on this waterway segment.

In order to illustrate traffic flow patterns between the primary system locks, Table 2-5 displays a matrix of traffic flows between locks expressed as a percent of each lock's total traffic volume.

Historical traffic on the three GIWW segments is displayed in Table 2-6. Traffic volume on these segments has fluctuated significantly over the last 20 years. Traffic for the system, which fell to a 20-year low in 1982, rebounded to a new record high level in 1988. Historical average lock delays for the period, 1989 to 1999, for the three GIWW segments are presented in Table 2-7.

Table 2–2

Commodity Distribution for Tonnage Through Bayou Sorrel Locks in 1992

Commodity Group	Total Bayou Sorrel Traffic (Tons)	% Of Total Traffic
Farm Products	508,452	2.3
Metallic Ores	2,265,514	10.3
Coal	14,219	0.1
Crude Petroleum	1,125,637	5.1
Non-Metallic Minerals	4,607,857	21.0
Forest Products	86,102	0.4
Industrial Chemicals	6,047,484	27.5
Agricultural Chemicals	490,081	2.2
Petroleum Products	6,740,743	30.7
All Other	97,760	0.4
Total	21,983,849	100.0

Source: Waterborne Commerce of the United States

Table 2–3

Lock Utilization Summary-Bayou Sorrel Lock
(1991–1999)

Year	Number of Tows	Tonnage (1,000's)	Avg Delay Per Tow (Hrs)
1991	6,593	25,825	4.9
1992	6,120	21,140	2.1
1993	7,365	25,985	3.8
1994	6,693	24,283	2.2
1995	6,626	24,001	2.4
1996	6,218	23,397	4.9
1997	6,515	25,080	3.1
1998	5,874	22,644	11.1
1999	6,189	23,158	4.7

Source: Lock Performance Monitoring System. (LPMS)

Table 2-4
Commodity Group Percentages by Lock - 1992

Group	Old River	Port Allen	Bayou Sorrel	IHNC	Algiers	Harvey	Bayou Boeuf	Calcasieu	Leland Bowman
Farm Prod	6	2	2	2	2	7	3	2	2
Metallic Ores	1	10	10	5	3	6	3	7	7
Coal	0	0	0	37	0	0	0	0	0
Crude Petroleum	3	5	5	7	27	12	24	15	13
Non-metallic Minerals	49	23	21	8	7	18	9	3	4
Forest Products	1	1	1	1	0	0	0	1	1
Industrial Chemicals	6	27	28	9	14	15	14	24	25
Agricultural Chemicals	1	2	2	3	1	1	1	2	2
Petroleum Products	33	29	30	27	45	40	45	45	45
All Other	0	1	1	1	1	1	1	1	1
Total	100	100	100	100	100	100	100	100	100

Source: Waterborne Commerce Of The United States

Table 2–5

Common Traffic Flows Between Locks - 1992

	Percent of Traffic that Uses:								
Lock (traffic from)	Old River	Port Allen	Bayou Sorrel	IHNC	Algiers	Harvey	Bayou Boeuf	Calcasieu	Leland Bowman
Old River	100.0	0.0	0.0	0.0	1.0	0.5	2.0	21.0	24.0
Port Allen	0.0	100.0	97.1	0.3	0.0	0.0	1.5	78.1	78.6
Bayou Sorrel	0.0	99.2	100.0	0.4	0.2	0.1	1.8	80.1	80.6
IHNC	0.0	0.4	0.4	100.0	24.3	8.1	27.1	23.3	24.6
Algiers	0.3	0.0	0.2	28.5	100.0	0.0	74.2	58.8	63.5
Harvey	1.0	0.0	0.3	31.4	0.0	100.0	90.7	74.3	79.3
Bayou Boeuf	1.0	1.5	1.7	26.0	60.1	22.3	100.0	69.3	74.5
Calcasieu	4.0	46.9	47.0	13.6	29.1	11.2	42.4	100.0	100.0
Leland Bowman	5.1	44.8	45.0	13.6	29.9	11.3	43.3	96.7	100.0
Total System	9.9	27.8	27.0	26.4	27.0	4.9	31.6	49.9	50.0

Table 2–6

GIWW Tonnage for
Selected Years and Selected Segments[1]

Year	Mississppi River to Sabine[2]	Morgan City - Port Allen Alternate Route[3]	Mobile Bay - New Orleans[4]
1998	61,366,000	24,008,000	23,306,000
1997	66,973,000	26,437,000	24,786,000
1996	68,714,000	25,064,000	24,633,000
1995	68,322,000	25,463,000	23,319,000
1994	67,915,000	24,588,000	24,082,000
1993	65,340,000	27,097,000	25,756,000
1992	66,460,000	23,727,000	23,742,000
1991	65,328,000	24,342,000	23,449,000
1990	67,679,000	29,632,000	25,782,000
1989	66,415,798	27,264,185	25,972,550
1988	69,292,154	27,072,639	27,267,590
1987	63,967,724	19,682,861	24,069,572
1986	64,471,662	25,180,797	23,589,414
1985	63,092,992	23,150,132	21,577,873
1984	55,840,086	21,324,578	20,413,239
1983	51,545,852	19,253,008	16,524,665
1982	50,372,504	17,833,864	15,184,211
1981	52,591,854	18,083,914	17,342,703
1980	54,916,394	19,066,976	19,124,329
1979	55,947,248	20,254,735	21,238,833
1978	61,753,493	18,066,503	22,610,406
1977	63,277,175	18,456,491	24,795,828
1976	59,108,942	18,961,414	23,201,285
1975	56,750,361	17,083,459	21,726,203
1974	60,839,703	15,895,856	21,307,231
1973	62,265,498	14,269,832	19,323,261
1972	68,904,972	19,173,890	21,613,217
1971	70,563,298	14,368,939	18,660,228
1970	65,129,464	16,637,934	16,075,626
1960	36,263,828	2,773,826[5]	7,606,145
1950	21,707,241	1,818,760[5]	4,065,913

[1]Source: Waterborne Commerce of the United States
[2]Mississippi river to GIWW west mile 266.
[3]Not included in Mississippi River to Sabine traffic.
[4]Via Plaquemine Lock, Bayou Plaquemine, Bayou Sorrel Lock, and the borrow pit of East Atchafalaya Protection Levee.
[5]Inner Harbor Navigation Canal to GIWW East, mile 134.

Table 2–7

Average Delays by Lock[1]
1989 – 1999
(Hours)

Lock	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989
Old River	0.2	0.2	0.3	0.2	0.2	0.5	0.2	0.3	0.3	0.3	0.3
Port Allen	2.7	2.2	4.5	3.4	2.1	2.7	2.0	1.5	2.1	2.2	1.2
Bayou Sorrel	4.7	11.1	3.1	4.9	2.4	2.2	3.8	2.1	4.9	3.9	3.2
IHNC	6.4	12.5	22.3	11.0	7.6	9.2	14.6	6.3	12.3	16.2	11.6
Algiers	4.3	4.5	4.9	4.4	3.3	4.1	8.8	4.4	4.9	4.6	4.6
Harvey	1.2	1.7	2.3	1.2	0.7	1.5	9.0	2.3	3.2	4.2	2.4
Bayou Boeuf	0.4	0.4	0.6	0.7	0.9	0.7	1.6	0.5	0.7	0.4	0.7
Calcasieu	0.9	0.7	1.0	2.2	2.5	1.1	1.6	0.8	0.8	1.2	2.7
Leland Bowman	1.6	0.6	0.6	1.0	0.6	0.5	1.1	0.5	0.4	1.0	0.8

[1]Source: Lock Performance Monitoring System (LPMS). Delay time is the time for a barge to completely lock through the structure.

g. **Natural Resources.** The discussion of the natural resources is generally limited to the Bayou Sorrel Lock and the areas immediately surrounding the lock, which could potentially be impacted by plans considered in this feasibility study.

(1). Environmental Setting. The Bayou Sorrel vicinity is mostly rural and undeveloped. One of the main geographical features of the area is the East Atchafalaya Basin Protection Levee, which generally runs north-south, and separates the Atchafalaya Basin Floodway from the protected land to the east. Undeveloped land, both inside and outside of the Atchafalaya Basin Floodway, is almost entirely cypress swamp and bottomland hardwood forest. The community of Bayou Sorrel lies mainly along the high bank of Lower Grand River, just outside of the Atchafalaya Basin Floodway. Development in the area is severely limited by the lack of land with sufficient elevation to avoid flooding. Many of the residents of Bayou Sorrel work in the oil refineries and chemical plants located along the Mississippi River, and many also commercially fish for crawfish, an important fishery of the Atchafalaya Basin Floodway. Although the community of Bayou Sorrel is protected from the floodwaters of the Atchafalaya Basin Floodway, the community occasionally sustains minor damages from high water levels of Lower Grand River caused by regional rainfall and poor drainage.

(2). Vegetation. The Bayou Sorrel area is surrounded by extensive bottomland forests and cypress swamps. These forests and swamps occur both within and outside of the Atchafalaya Basin Floodway. The Atchafalaya Basin Floodway is the largest river swamp in North America and contains some of the largest remaining tracts of bottomland hardwood forests and cypress/tupelo swamps in the Lower Mississippi River Valley. The elevation of the land and its susceptibility to flooding greatly influences the plant species composition of the forests and swamps. Barely perceivable elevation changes of one to two feet can make the difference between a cypress/tupelo-dominated swamp and a bottomland hardwood forest. Bottomland hardwood tree species dominating the area include sugarberry (locally called hackberry), Drummond red maple, black willow, sycamore, live oak, water oak, Nuttall oak, overcup oak, green ash, water hickory (bitter pecan), common persimmon, sweetgum, and honey locust. Various vines, shrubs, and herbaceous vegetation occur in the understory. Cypress swamps support bald cypress, water tupelo, red maple, and black willow. Within the Atchafalaya Basin Floodway, the USACE has developed a series of confined dredged material disposal areas encompassing about 375 acres. All of these disposal areas were constructed in areas of bottomland hardwood forest and cypress swamp. These disposal areas are vegetated mainly by light-seeded species such as black willow, sycamore, and cottonwood.

(3). Wildlife. Bottomland hardwood forests, swamps, and the margins of permanent water bodies provide outstanding wildlife habitat in the project area. The wildlife resources of the floodway have historically been recognized for their diversity and abundance due to the variety and magnitude of available habitats. Wildlife species include game animals, fur animals, migratory birds, endangered

species, and numerous other non-game species. Forested wetlands in the study area provide prime habitats for a variety of wading birds including green-backed heron, little blue heron, snowy egret, yellow-crowned night heron, and white ibis. An active wading bird nesting colony is located about two miles south-southeast of the Bayou Sorrel Lock. More than 170 bird species, or about 40 percent of the birds listed by the Louisiana Ornithological Society as occurring in Louisiana, have been observed in and immediately adjacent to the floodway. The floodway is an important wintering area for waterfowl in the Mississippi Flyway. The principal big game animal in the floodway and adjacent lands is the white-tailed deer. Important small game mammals include fox squirrel, gray squirrel, swamp rabbit, eastern cottontail, and raccoon.

(4). Aquatic Resources. Aquatic habitats in the study area include riverine habitats, lacustrine (lake) habitats, and seasonally flooded woodlands. Riverine habitats include the GIWW, Lower Grand River, and the East Access Channel. Those water bodies are characterized by the presence of flowing water throughout most or all of the year, high turbidity, good water quality, high dissolved oxygen levels, steep banks, and a substrate composed of sand or hard clay. Lacustrine habitat in the study area is provided by borrow pits along Lower Grand River and various lakes, bayous, and sparsely vegetated cypress tupelo swamps that remain flooded during low river stages. Backwater lakes are influenced primarily by backwater flooding (waters raised indirectly by the Atchafalaya River). During low river stages, backwater lakes in the floodway may become completely dry, depending on rainfall. In backwater lakes, the water quality is generally good throughout fall, winter, and early spring, but low oxygen levels are experienced during the late spring and early summer, during high and falling river stages. Low oxygen levels in the lacustrine habitats reduce the production of many commercially and recreationally important fishery species. More than 100 species of finfish and commercially-important shellfish have been collected from the diverse habitats in the floodway. The high production is due, in large part, to the seasonal flooding of forested wetlands. Standing crop values and species diversity are among the highest found in the southeastern United States. More than 1,000 pounds of finfish per acre have been documented in water bodies just south of the study area. Recreationally-harvested finfish in the project area include largemouth bass (the most popular), white crappie, black crappie, yellow bass, warmouth, bluegill, redear sunfish, and blue catfish, channel catfish, and several other species of catfish. The commercial fishery for finfish in the floodway is of significant economic importance to the local communities, with catfish, buffalo fish, and freshwater drum comprising most of the commercial landings. Crawfish are, by far, the most important commercially harvested species in the floodway. The greatest threats to fishery resources production in the floodway are excessive sedimentation and poor water quality. Sedimentation has substantially reduced the acreage of open water habitat and cypress/tupelo swamps in the floodway. Poor water quality in the floodway is a direct result of isolation from, or limited introduction of, headwater flows (riverine input) and/or insufficient primary production. Construction of spoil banks, shoaling, natural

levee deposition, and construction of disposal areas in the vicinity of the Bayou Sorrel Lock have isolated some floodplain forests from headwater flows.

(5). Federal Endangered or Threatened Species. Bald eagles occasionally forage near the Bayou Sorrel Lock but no nesting occurs in the vicinity. The closest nest is about 1.8 miles to the southwest of the Bayou Sorrel Lock. Bottomland hardwood forests within the Atchafalaya Basin Floodway provide habitat suitable for the threatened Louisiana black bear, which occupies the northern and southern portions of the basin. The project area is not considered to be occupied habitat of the Louisiana black bear since the only bears found in the area are roaming males. The pallid sturgeon is an endangered fish found in the Missouri, Mississippi, and Atchafalaya Rivers. The species adapted to large, free-flowing, and turbid rivers. Based on available evidence, there is a possibility that pallid sturgeon may occur in the East Access Channel near Bayou Sorrel.

(6). Cultural Resources. A cultural resources survey of the area around Bayou Sorrel Lock was completed. No significant archeological sites were located. A standing structure survey did not identify any properties eligible for the National Register of Historic Places (NRHP). Bayou Sorrel Lock was studied to determine if it is eligible for the NRHP. Although Bayou Sorrel Lock underwent a number of changes over the years, the original design remains intact. New Orleans District has recommended the Lock for eligibility to the NRHP and the State Historic Preservation Officer agreed with our recommendation. Letters are attached at the end of the report as Exhibit 3. EM 1110-2-1205 allows for mitigation of adverse impacts. The adverse impacts to the Lock will be mitigated by recordation to the standards of the Historic American Engineering Record.

2. Most Probable Future Conditions

Most probable future conditions are the projected conditions, in the absence of the navigation improvement plan or any change in law or public policy. The without-project condition is used to quantify and describe water-resource problems and needs and also serves as the baseline against which alternative improvement plans are evaluated. The benefits, costs, and effects attributed to each alternative plan of improvement represents the increment of change between the with-and without-project conditions.

a. **Flood Control, Mississippi River and Tributaries Project**. The most probable future conditions relative to the Flood Control, Mississippi River and Tributaries Project is that the currently-approved Atchafalaya Basin project flood flow line will not change over the 50-year planning horizon, and that the construction of measures to safely pass the Atchafalaya Basin project flood will continue. Among the measures that would be constructed would be the modification of Bayou Sorrel Lock. The plan to pass the project flood at Bayou Sorrel Lock has not been developed.

b. **Navigation System**. Projections of future traffic demands and transportation costs is one of the most pertinent for this study. Information on projections of future traffic demands and transportation costs and on the assumptions developed relative to the development of navigation plans is presented below. The most probable future (without-project) conditions relative to the inland navigation system developed for the this study are as follow:

- The operation and maintenance of all system locks will be continued through the period of economic analysis to ensure continued navigability.
- All existing waterway projects or those under construction are to be considered in place and will be operated and maintained through the period of analysis.
- All system locks are using the most efficient locking policies and procedures.
- Alternative non-system transportation means (rail and non-system water) are assumed to have sufficient capacity to move diverted system traffic at current costs over the period of analysis.
- Waterway user taxes will continue in the form of the towboat fuel tax prescribed by the Water Resources Development Act of 1986, Public Law 99-662.
- The capacities of system locks, including Bayou Sorrel Lock will remain unchanged.
- Traffic demands on the system will grow at the mid-growth rates developed for this study.

A review of the 1992 commodity distribution for the entire waterway system of traffic, displayed in Table 2 - 7, shows that nearly 88 percent of the total tonnage was associated with coal, crude petroleum, non-metallic minerals, petroleum products and industrial chemicals. Because of their importance to the total system of traffic, as well as for Bayou Sorrel lock traffic, traffic projections for these groups must be regionally focused and specific to existing origin-destination patterns in order to be meaningful.

The WEFA Group under contract with the New Orleans District conducted traffic projections for these commodity groups. In order to determine which regions for WEFA to focus their analysis on, a review of 1992 Waterborne Commerce detail records, provided by the Waterborne Commerce Statistics Center (WCSC), was conducted. The records in the WCSC database represented individual barge-level movements that traveled any portion of the GIWW - Mississippi River to Sabine, GIWW - Morgan City to Port Allen Alternative Route, Atchafalya River or the Inner Harbor Navigation Canal waterways. Within this database, origin/destination information was used to determine the most common origin regions and destination regions for each of the above mentioned commodity groups.

As a result of this effort, WEFA was asked to provide long-term (25 year) consumption projections of coal by Electric Utility companies in the South Atlantic region (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina and Tennessee); Crude Petroleum production projections for the region of the Gulf of Mexico (Onshore); Non-Metallic Minerals production projections for the Southwest region (Arkansas, Louisiana,

New Mexico, Oklahoma and Texas) and Industrial Chemicals production projections also for the Southwest region.

For Petroleum Products, WEFA was asked to provide consumption projections for the whole group itself and for the major subgroups of Gasoline, Jet fuel, Distillate fuel oil, Residual fuel oil, Liquefied Petroleum Gas and Other Petroleum products expressed in BTU's for the South Atlantic region, the Southwest region and the Midwest region (Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin).

The remaining 12 percent of total system traffic in 1992 consisted of the five remaining commodity groups: Grain, Metallic Ores, Forest Products, Agricultural Chemicals and Miscellaneous. Since the level of traffic among these remaining commodities were minor compared to the groups previously considered, projected traffic for these commodities were derived through the use of national-level projections.

For the commodity groups of Metallic Ores, Forest Products, Agricultural Chemicals and Miscellaneous, long term traffic projections were taken from "U.S. Long-Term Economic Outlook, Volume 1 – Trend/Moderate Growth Scenario, Third Quarter 1997" published by the WEFA Group. In these publications, long-term Industrial Production Indexes for various industry groupings are provided. For grain, long-term traffic projections were adapted from work previously developed in October 1996 by Jack Faucett Associates (JFA) for the Upper Mississippi River and Illinois Waterway Navigation Study.

Table 2 – 8 shows the growth factors corresponding to each of the ten commodity groups discussed above. For grain, coal, crude petroleum, non-metallic minerals, industrial chemicals, and petroleum products, growth factors were developed for the periods 1992 – 2000, 2000 – 2010 and 2010 – 2020. For the remaining commodities, growth factors were developed for the periods 1992 – 2000 and 2000 – 2010. The growth factors were applied to the 1992 base tonnage to yield future system tonnage for these same periods. For succeeding periods the growth factor associated with the last developed forecasted period was carried forward.

Projected tonnages for the total waterway system and for Bayou Sorrel lock are presented in Tables 2 – 9 and 2 – 10. These represent the mid growth or most likely traffic growth scenario. Low growth and High growth traffic projections will be discussed and presented in section 3 of this report and section 9 of the Economics Appendix under Sensitivity Analysis.

Table 2 – 7

Commodity Distribution for 1992 Total System Traffic

Commodity Group	Total System Traffic (Tons)	% Of Total Traffic
Farm Products	2,242,409	2.8
Metallic Ores	4,369,926	5.4
Coal	7,909,035	9.8
Crude Petroleum	13,783,793	17.0
Non-Metallic Minerals	12,568,341	15.5
Forest Products	345,238	0.4
Industrial Chemicals	12,033,383	14.8
Agricultural Chemicals	1,511,647	1.9
Petroleum Products	25,697,391	31.7
All Other	643,689	0.8
Total	81,104,852	100

Source: Waterborne Commerce of the United States

Table 2 – 8

Traffic Growth Factors by Commodity Group

Commodity Group	Time Period					
	1992 - 2000	2000 – 2010	2010 - 2020	2020 – 2030	2030 - 2040	2040 - 2060
Farm Products	1.22	1.19	1.13	1.13	1.13	1.28
Metallic Ores	1.12	1.23	1.23	1.23	1.23	1.51
Coal	1.42	1.00	1.11	1.11	1.11	1.23
Crude Petroleum	0.73	0.83	1.02	1.02	1.02	1.04
Non-metallic Minerals	1.22	1.17	1.13	1.13	1.13	1.28
Forest Products	1.24	1.28	1.28	1.28	1.28	1.64
Industrial Chemicals	1.26	1.31	1.24	1.24	1.24	1.54
Agricultural Chemicals	1.13	1.08	1.08	1.08	1.08	1.17
Petroleum Products	1.09	1.09	1.09	1.10	1.10	1.21
Miscellaneous	0.99	1.27	1.27	1.27	1.27	1.61

Table 2 – 9

Projected System Traffic Growth
(In Thousands of Short Tons)

Mid Growth Scenario

Commodity Group	1992	2000	2010	2020	2030	2040	2060
Farm Products	2,242.41	2,735.74	3,255.52	3,678.73	4,156.96	4,697.38	6,012.64
Metallic Ores & Mins	4,369.93	4,894.32	6,020.02	7,404.64	9,107.72	11,202.49	16,915.76
Coal	7,909.04	11,205.09	11,205.09	12,437.65	13,805.79	15,324.43	18,849.05
Crude Oil	13,783.79	10,062.17	8,351.60	8,518.63	8,689.00	8,862.79	9,217.31
Non-Metallic Mins	12,568.34	15,333.38	17,940.07	20,272.28	22,907.68	25,885.68	33,133.67
Forest Products	345.24	428.10	547.97	701.40	897.79	1,149.17	1,884.64
Industrial Chemicals	12,033.38	15,162.07	19,862.34	24,629.34	30,540.39	37,870.06	58,319.91
Agricultural Chemicals	1,511.65	1,708.16	1,844.82	1,992.40	2,151.80	2,323.95	2,719.01
Petroleum Products	25,697.39	28,054.38	30,616.70	33,471.06	36,652.15	40,209.80	48,713.57
Miscellaneous	643.69	634.64	806.00	1,023.60	1,299.97	1,650.96	2,658.02
Total	81,104.85	90,218.04	100,450.11	114,129.73	130,209.27	149,176.70	198,423.58

Table 2 – 10

Projected Bayou Sorrel Lock Traffic Growth
(In Thousands of Short Tons)

Mid Growth

Commodity Group	1992	2000	2010	2020	2030	2040	2060
Farm Products	508.45	620.31	738.17	834.13	942.56	1,065.10	1,363.33
Metallic Ores & Minerals	2,265.51	2,537.38	3,120.98	3,838.81	4,721.74	5,807.73	8,769.67
Coal	14.22	21.76	21.76	24.15	26.80	29.75	36.60
Crude Oil	1,125.64	821.72	682.03	695.67	709.58	723.77	752.72
Non-Metallic Mins	4,607.86	5,621.59	6,577.26	7,432.30	8,398.50	9,490.31	12,147.59
Forest Products	86.10	106.77	136.66	174.93	223.91	286.60	470.03
Industrial Chemicals	6,047.48	7,619.83	9,982.00	12,377.69	15,348.34	19,031.93	29,309.17
Agricultural Chemicals	490.08	553.79	598.10	645.94	697.62	753.43	881.51
Petroleum Products	6,740.74	7,196.54	7,838.63	8,565.31	9,382.41	10,305.76	12,551.31
Miscellaneous	97.76	126.11	160.16	203.41	258.32	328.07	528.19
Total	21,983.85	25,225.79	29,855.73	34,792.32	40,709.79	47,822.46	66,810.12

Table 2-11

Projected Tonnages and Delays by Lock
Most Probable Future Conditions

	1992		2000		2010		2020	
Lock	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)
Old River	7,822	0.15	9,168	0.18	11,178	0.23	17,587	0.45
Port Allen	23,244	1.20	26,650	1.82	30,152	3.08	30,395	3.22
Bayou Sorrel[1]	22,554	2.32	25,817	4.25	29,170	12.74	29,287	15.03
IHNC[2]	20,830	6.31	25,071	20.33	25,976	32.79	26,158	37.20
Algiers	21,837	2.37	22,262	2.64	23,767	4.17	25,028	7.35
Harvey	3,797	0.62	4,317	0.75	6,204	1.46	8,473	3.44
Bayou Boeuf	25,915	1.24	26,967	1.42	29,780	2.09	33,238	3.95
Leland Bowman	40,533	0.32	44,348	0.36	50,964	0.44	58,725	0.55
Calcasieu	40,359	1.53	43,853	1.75	50,258	2.21	57,890	2.90
Total Tons (Ktons)	80,301		88,683		97,598		107,602	
Total Net Benefits (millions $)	824.2		862.1		929.2		1,036.5	
Savings per Ton (Kton)	10.26		9.72		9.52		9.63	

[1]Projections based on the existing 56- by 797-foot chamber at Bayou Sorrel Lock

[2] It should be noted that recent declines in coal traffic moving through the IHNC Lock has caused average delays per tow to be not as severe as was projected. An investigation is currently underway to determine the long-term or short-term nature of the decline. In either case, this will have no impact on the outcome of this analysis since there is essentially no common traffic between the Bayou Sorrel Lock and the IHNC Lock

Table 2-11
(Continued)

Lock	1992		2000		2010		2020	
	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)
Old River	7,822	0.15	9,168	0.18	11,178	0.23	17,587	0.45
Port Allen	23,244	1.20	26,650	1.82	30,152	3.08	30,395	3.22
Bayou Sorrel	22,554	2.32	25,817	4.25	29,170	12.74	29,287	15.03
IHNC	20,830	6.31	25,071	20.33	25,976	32.79	26,158	37.20
Algiers	21,837	2.37	22,262	2.64	23,767	4.17	25,028	7.35
Harvey	3,797	0.62	4,317	0.75	6,204	1.46	8,473	3.44
Bayou Boeuf	25,915	1.24	26,967	1.42	29,780	2.09	33,238	3.95
Leland Bowman	40,533	0.32	44,348	0.36	50,964	0.44	58,725	0.55
Calcasieu	40,359	1.53	43,853	1.75	50,258	2.21	57,890	2.90
Total Net Benefits (millions $)	80,301		88,683		97,598		107,602	
Savings per Ton	824.2		862.1		929.2		1,036.5	

[1]Projections based on the existing 56- by 797-foot chamber at Bayou Sorrel Lock

c. **Natural Resources**. In the absence of a new lock, the existing lock and waterway would continue operating. Annual maintenance dredging would occur just south of the lock at the intersection of the East Access Channel and the GIWW. The dredged material would be placed along the west bank of the East Access Channel in confined disposal areas. New disposal areas would have to be developed over time as existing disposal areas reach their capacity. Aquatic habitats within the Atchafalaya Basin Floodway are expected to continue a gradual conversion to vegetated land due to the natural deposition of silt, sand, and clay that occurs during high river stages. Outside of the floodway, no significant changes in aquatic habitats are expected.

3. Problems, Needs, and Opportunities

a. **Flood Control.** Bayou Sorrel Lock is an integral feature of the Atchafalaya Basin, Louisiana Project feature of the Mississippi River and Tributaries project. The project flood flow line was revised because of changes and projected changes in the Atchafalaya Basin and Atchafalaya Bay. The top of wall of Bayou Sorrel Lock is 5 feet lower than the current approved project flood flow line and 8 feet below the project flood design grade. The lock is stable for its original design loading conditions and is in good operating condition; however, the structure cannot be raised to accommodate the higher flow line. The lock must be replaced or other structural measures must be implemented to pass the project flood. These measures have been authorized for construction under the authority of the Flood Control, Mississippi River and Tributaries project. There is a need to develop and implement a plan to safely pass the project flood at Bayou Sorrel Lock.

b. **Navigation.** There is a need to increase the capacity of Bayou Sorrel Lock to reduce the cost to navigation caused by delays at the lock, which averaged 4.7 hours per tow in 1999 and are projected to climb to12.7 hours by the year 2010. Although delays cannot be eliminated, they can be significantly reduced with a larger chamber.

Of the total tonnage on the GIWW west of the Mississippi River, approximately seven percent (4.2 million tons) was comprised of movements having an origin or destination above the first structure encountered on the Mississippi River (at the approximate latitude of St. Louis), nine percent (5.7 million tons) had an origin or destination along the Ohio River, and less than one percent (492,000 tons) had an origin or destination west of the first structure encountered on the GIWW in Texas.

Lockage congestion at Bayou Sorrel results from both the growth in traffic volumes and the increase in the size and configuration of the tows. The traffic congestion in Bayou Sorrel causes excessive delays and has increased lock transit time to a point where it is the highest west of the Mississippi River. Lockage delays represent a significant economic loss to the shipping industry and, ultimately, to the consumer.

Tonnages through Bayou Sorrel lock were 24,000 in 1995; 23,400 in 1996 and 25,000 in 1997. Average delays were 2.4 hours in 1995, 4.9 hours in 1996, and 3.1 hours in 1997 per vessel. The cost to the towing industry of these delays was roughly $5.8 million in 1995, $11.5 million in 1996, and $7.8 million in 1997. Tonnages are projected to

increase over the 50-year planning horizon affecting an increase in delays and costs to navigation, particularly, with larger locks located at both Port Allen Lock and Leland Bowman Lock. Port Allen Lock which is the next lock on Morgan City-to-Port Allen Alternate Route north of Bayou Sorrel Lock has dimensions of 84–feet by 1200–feet and Leland Bowman Lock the next lock in the system to the south of Bayou Sorrel has dimensions of 110–feet by 1,200–feet.

The need to develop and implement a plan to safely pass the project flood at Bayou Sorrel Lock provides an opportunity to address current and projected delays to barge tows at the lock. The portion of the cost of the construction of a new navigation lock at Bayou Sorrel that would be allocated to navigation could be decreased if the new lock also provided for the flood control objective.

c. **Lockage Problems.** Bayou Sorrel Lock is one of the smallest locks in the GIWW system west of the Mississippi River. The lock was constructed and designed to handle the standard size barge at the time of 175 –feet by 26 –feet. In recent years the towing industry has greatly increased its use of larger barges, such as, the "jumbo barge", 195 – feet by 35 –feet, and integrated "super jumbo" barges, 300 –feet by 55 –feet. The "jumbo barge" has been primarily used on the Mississippi River.

d. **Erosion.** What has also become a growing a problem associated with the wider tows is erosion along the waterway. While this is a problem along the entire GIWW, it has become a greater nuisance in the more populated areas around the lock structure itself. Wider tows, longer delays, and more conditions resulting from higher water elevations have made it necessary for the Corps to operate the lock in accordance with the MOA (Exhibit 2) signed October 2001 by the Captain of the Port New Orleans Louisiana, Iberville Parish Office of Emergency Preparedness and the Louisiana Office of Emergency Preparedness to minimize the effects on residences of marine transportation activity. Any new plan that addresses Navigation problems will include measures to minimize erosion associated with Lock operations.

4. Study Objectives

ER 1105-2-100 stipulates that "The Federal objective of water and related land resources planning is to contribute to national economic development (NED) consistent with protecting the Nation's environment..." Contributions to NED are the direct net benefits that accrue in the study area and the rest of the nation. Water and related land resources project plans shall be formulated to alleviate problems and take advantage of opportunities in ways that contribute to this objective. The following specific planning objectives were developed for the Bayou Sorrel Lock, Louisiana feasibility study:

a. Develop the most effective plan for passing the Atchafalaya Basin Floodway project flood at Bayou Sorrel Lock.

b. Reduce navigation delays associated with the lock, to the maximum extent practicable while minimizing the impacts to the surrounding area.