

Tennessee-Tombigbee Waterway Project Design and Construction Activity

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In 1972 physical construction was initiated on the much discussed Tennessee-Tombigbee Waterway. The Waterway will connect the Tennessee River at Pickwick Lake with the Tombigbee River at Demopolis, Alabama, on the existing Black Warrior-Tombigbee Waterway, thereby providing shortened routes between shipping points of mid-America with the deep-water ports along the northern Gulf coast. Inland points and international ports will be provided with low cost water transportation.

The water level difference between the Demopolis and Pickwick pools is 341'. Each project element raises the Waterway an average of 28.5' except at Bay Springs where the lift will be 84'. All locks on the Waterway will have usable chamber dimensions of 110' x 600', permitting an eight barge tow to pass through at a single locking.

The Waterway will consist of three distinct sections: the River Section, the Canal Section, and the Divide Section. The River Section will be 148 miles along the Tombigbee River from the Demopolis pool to a location near Amory, Mississippi. This section will feature four locks and dams and a navigation channel with minimum channel dimensions of 9' deep x 300' wide. Total excavation for this section will be about 108,803,000 cubic yards and concrete for the structures will be about 949,500 cubic yards.

The Canal Section will be 44 miles long and will extend from near Amory, Mississippi to Bay Springs Lock and Dam. This section will be located in the flood plain to the east of the Tombigbee River and will contain five locks and a 12' deep by 300' wide navigation channel. Excavation will total about 48,997,000 cubic yards and concrete for the locks and associated spillways will be about 835,700 cubic yards.

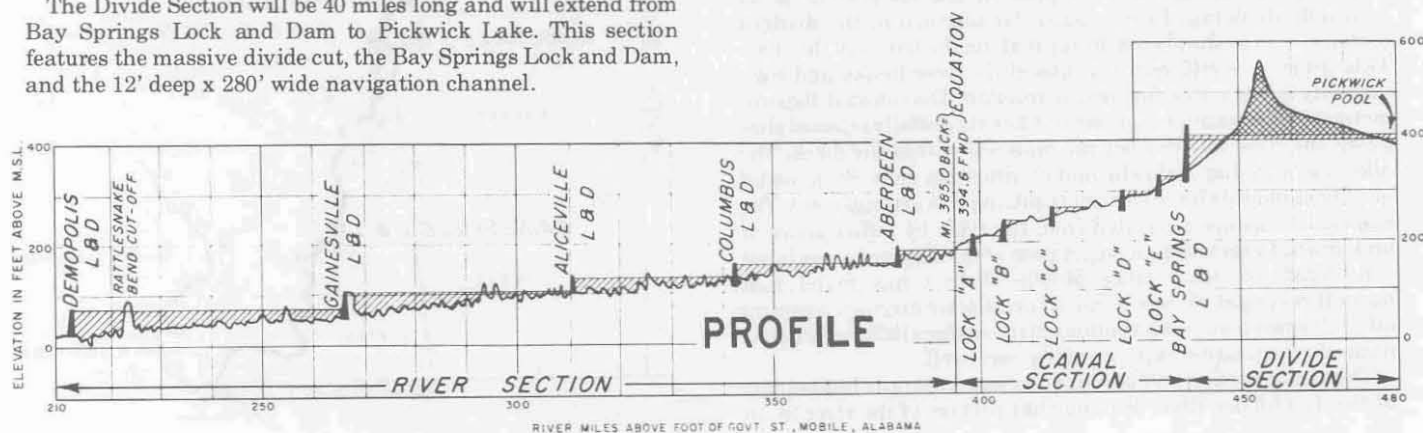
The Divide Section will be 40 miles long and will extend from Bay Springs Lock and Dam to Pickwick Lake. This section features the massive divide cut, the Bay Springs Lock and Dam, and the 12' deep x 280' wide navigation channel.

The Mobile District, Corps of Engineers, is responsible for design and construction of the River and Canal Sections and the Nashville District is responsible for the Divide Section. After completion, the Mobile District will operate and maintain the entire Waterway.

The portion of the River Section from the Demopolis Lock and Dam to the Gainesville Lock and Dam is essentially completed. One of the major features in the Demopolis Lake is the Rattlesnake Bend Cutoff. This cutoff required about 1,716,000 cubic yards of excavation but will shorten the navigation route by 8.7 miles.

The Gainesville Lock and Dam is the lower most structure on the Waterway and is located near Gainesville, Alabama. The lock is located in a channel across a natural bend in the river. The spillway is located in the natural river channel. This arrangement was the most economical one studied, and the fixed crest portion of the spillway provides a highly oxygenated minimum flow for maintenance of water quality in the cutoff natural channel. Construction of the lock and dam is now complete. The Gainesville navigation channel is about 40 miles long and features seven cutoffs, the largest of these being Big Creek Cutoff near the upstream end of the channel. Construction of the channel is about 55 percent complete. Raising of the Gainesville pool was completed in October 1978.

The Aliceville Lock and Dam is the next major structure on the Waterway and is nearing completion. Raising of the pool is scheduled for December of this year. The spillway for this project will feature both fixed crest and gated sections. The fixed crest portion was chosen both for economy and to maintain water quality downstream of the lock and dam. This structure is located in a relatively straight portion of the river, and the most



economical construction procedure was to construct the lock and dam in an earth cofferdike while diverting the river through an excavated diversion channel.

Aliceville was the first project where Mobile District made extensive use of bentonite-clay slurry trenches for control of groundwater movement. These slurry trenches were used beneath the construction cofferdike to aid in dewatering the construction area. The trenches extended down from the bottom of the impervious cofferdike to the top of the relatively impervious Eutaw Formation. An auxiliary system of well-points inside the cofferdike showed that the slurry trench was extremely effective. These trenches have also been installed beneath the earthen portion of the dam and are expected to be very effective in limiting underseepage through the overburden portion of the foundation. Slurry trenches are being used in a similar fashion for the remainder of the River Section projects and all of the Canal Section projects. Reservoir clearing for the Aliceville Lake is nearing completion and excavation for the navigation channel is about 21 percent complete.

Columbus Lock and Dam is located within a bend in the river about four miles northwest of Columbus, Mississippi. Principal project structures consist of the lock, a gated spillway, a minimum flow structure, and a system of overflow and nonoverflow dikes. These structures will be located upstream from Plymouth Bluff, an exposed shelf of the Eutaw Formation on the right bank of the Tombigbee River. This geologic feature, widely known for its paleontological value, was protected from permanent inundation by relocating the dam site and providing an assured minimum flow through the old river channel past the Bluff. Local citizens have indicated interest in reconstructing the old town of Plymouth which was once located on the Bluff. Construction of the lock and dam was begun in April 1975 and is about 87 percent complete.

Aberdeen Lock and Dam is the uppermost navigation structure on the River Section of the Waterway. Principal features for the project will consist of the lock located in a channel excavated in a bend in the river, a gated spillway adjacent to the lock, a minimum flow structure, and a system of overflow and nonoverflow dikes. The minimum flow structure will provide flows past the town of Aberdeen in the interest of preserving the integrity of the natural river channel. Due to the complex nature of U.S. Highway 45 and St. Louis-San Francisco Railroad relocations immediately downstream of the lock and dam, this project is being constructed in two phases. The first contract is for construction of the lock, spillway, and a portion of the adjoining channels. The second contract will be accomplished after relocations are well underway and will consist of the earthen portions of the dam, the minimum flow structure, and the remainder of the channels.

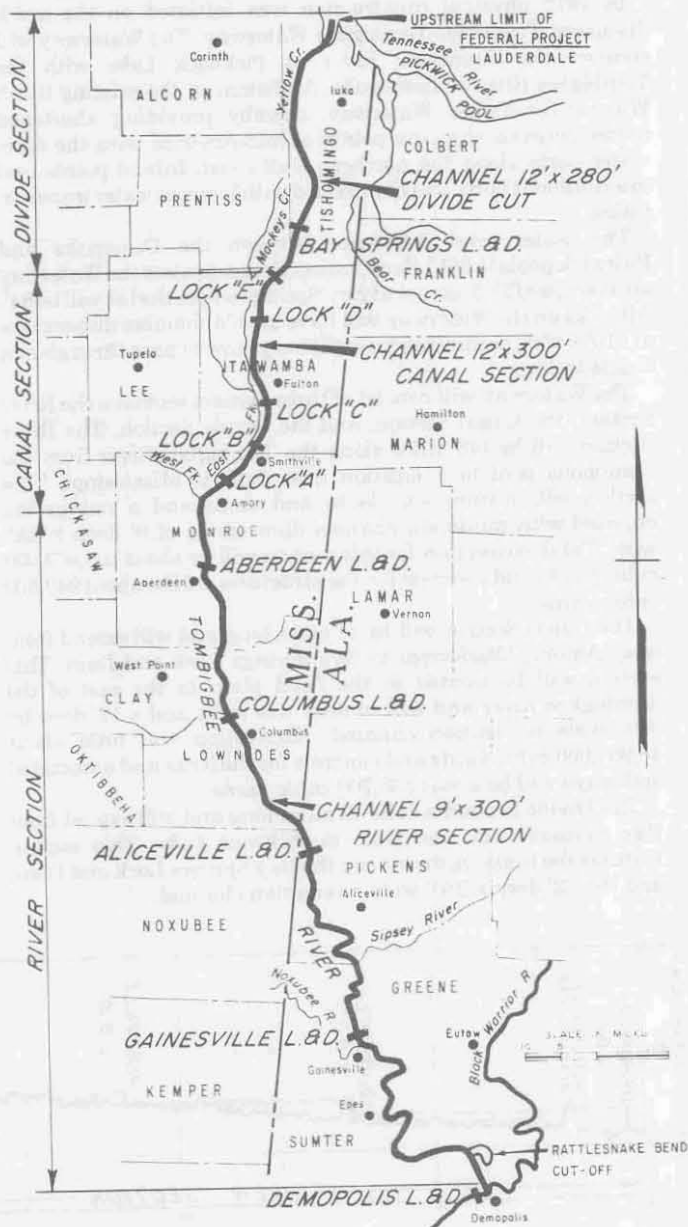
The large quantity of excavated material in the River Section was an item of serious concern in the design of the Waterway. The only economical way to perform the excavation is by hydraulic dredging. Past practice for disposal of the dredged material was to simply discharge it along the banks of the river. This practice would result in unsightly river banks and high turbidity in the water during construction. The selected disposal method is to construct containing dikes at carefully selected sites along the river and deposit the material within the dikes. The dikes contain disposal cells and clarification cells. State water quality standards have been met utilizing this arrangement. The disposal areas are separated from the river by buffer zones of undisturbed vegetation. Revegetation of the disposal areas is not considered necessary since Mobile District has found that natural revegetation has occurred on similar disposal areas on other river systems. Observations of the earlier sites confirm that natural revegetation is progressing very well.

The Canal Section will be formed by excavating a channel east of the Tombigbee River leaving that portion of the river in an

essentially natural state. A levee will extend along the west side of the canal between the river and the navigation channel. This levee will serve dual purposes. It will prevent floods on the river from entering the canal, and it will contain the navigation pool within the canal. Immediately upstream of each lock, a lake will be formed between the levee on the west and high ground to the east. This arrangement has been called the chain-of-lakes concept. This is a departure from the previous perched-canal concept whereby the canal would be constructed by excavating a portion of the canal depth and using the excavated material to construct two parallel levees that would form the channel.

The total lift of the five canal locks (designated as Locks A, B, C, D, and E) will be 140'. Locks A, D, and E will each have a 30' lift; whereas, the other two lifts will be 25'. Small, high level discharge structures with chute spillways will be located at Locks B and E to pass excess water resulting from lockages from the higher lift at Bay Springs Lock.

One of the basic concepts affecting the appearance of the Canal Section is the shaping of the levees between the locks. These levees will have varying top widths and flat sideslopes.



Excess excavated material will, to the greatest extent practical, be used in the levee. The flat sideslopes will permit revegetation of the levees with grass, shrubs, and even large trees where possible without compromising the safety of the levees. It is currently anticipated that this revegetation will occur naturally, and it is planned to do very little planting on the levees. A levee test section has been planted with various shrub, grass, and tree species, and this section will be compared with the prototype levees to ascertain that natural revegetation occurs at a sufficiently rapid rate.

The canal and levee will, in several locations, intercept tributaries of the river and thereby disturb natural flows to the river. It is planned to rectify this by constructing minimum flow structures at key points along the Canal Section. These structures will serve to preserve the integrity of the tributaries and during dry seasons should actually improve the quality of water in the river.

The Bay Springs Lock and Dam will be the lowermost project of the Divide Section and will be located on Mackey's Creek. It will have a normal lift of 84' which is the third highest east of the Mississippi River. The dam will be rockfill and will require about 203,000 cubic yards. The lock will involve about 475,500 cubic yards of concrete. A contract for construction of the lock and dam was awarded in April of this year and completion is scheduled for January 1983.

The divide cut will have a maximum depth below natural grade of about 175' and excavations will total about 149,700,000 cubic yards. The typical cross-section consists of sideslopes which vary from 1 vertical on 2 horizontal to 1 on 3 with berms located at strategic intervals above the channel bottom. Relief wells will be located along the lower berm. A contract for channel dredging in Yellow Creek was awarded in April 1974 and completed in June 1976. A critical construction contract for relocating the Illinois Central-Gulf Railroad and Yellow Creek Bridge was awarded in April 1976 and completed in July 1978. A contract for the most massive portion of the divide cut was awarded in March of this year for \$270,601,206 and is scheduled for completion in May 1984.

A critical feature of the Waterway is the relocation of highways, railroads, utilities, and cemeteries crossing the channels. Relocations of railroads, utilities, and cemeteries are handled between the Corps of Engineers and the affected parties, with the Federal Government assuming the costs for these relocations. There are eight railroad bridges with 39 miles of track affected. All costs for highway relocations, including design and construction, are borne by the States of Alabama and Mississippi. Bridges crossing the Waterway will have minimum vertical clearances of 52' above normal pool or 40' above that high water which is exceeded one percent of the time, whichever is greatest. Horizontal clearance will be 300'.

The Tennessee-Tombigbee Waterway is the first major waterway to be constructed under provisions of the National Environmental Policy Act of 1969. The environmental impact statement (EIS) was filed with the President's Council on Environmental Quality on April 20, 1971. Since the EIS was filed the Corps has continued to place greater emphasis on environmental considerations during design and construction of the Waterway. The Corps has established a Board of Environmental Consultants to specifically review environmental considerations. The board consists of three nationally known

professionals in the environmental field who meet regularly to review design and construction plans and actually inspect the construction at least once a year.

Environmental planning by the Corps and the guidance of the Board of Environmental Consultants have resulted in many environmental changes and refinements in the construction of the waterway. For example, Columbus Lock and Dam was moved one mile upstream to preserve the historic and geologic Plymouth Bluff; low flow structures were provided to enhance water quality and fisheries; special disposal methods were developed for the excavated materials; adoption of the chain-of-lakes concept in the Canal Section for aesthetic and environmental reasons; development of two environmental education and cultural centers along the Waterway; and archaeological and cultural resource studies and actions to preserve the significant sites or mitigate the losses. In the divide cut, excavated materials will be placed in about 50 areas along the channel. The material will be purposefully shaped and revegetated for aesthetics and to provide food and water for wildlife. The Corps contracted with Mississippi State University to study and aid in determining the best methods to use in the shaping and revegetating of the material.

The Tennessee-Tombigbee Waterway, which has been under consideration since the 1700's is now expected to be opened to navigation in mid-1984 depending on Congressional funding of the project. Actual construction of the Waterway is about 35 percent complete. Work completed and under contract now amounts to about 64 percent of the total construction cost of the Waterway, and it appears that after the long period of planning, design, and construction the Waterway will soon be a reality.

