

5.21 Navigation

5.21.1 Introduction

A change in the depth of navigation channels could affect the Tennessee River navigation system. Changes in the depth of navigation channels introduced by implementation of any of the policy alternatives may alter movements of bulk cargoes on the Tennessee River, affecting the cost to shippers. The following section analyzes potential changes in shippers costs as influenced by policy alternatives.

5.21.2 Impact Assessment Methods

To assess the impacts of the policy alternatives on navigation, the alternatives were grouped into three categories: (1) the alternative would not change navigation channel pool levels from the existing reservoir operations policy (same as the Base Case), (2) the alternative would increase navigation channel pool levels (a 2-foot increase, when possible, to a 13-foot navigation channel with a 2-foot overdraft protection is a common component of five of the policy alternatives), and (3) the alternative would decrease navigation channel pool levels.

To assess potential impacts on navigation, TVA developed and applied a methodology that used movement surveys of 2,270 origin-destination pairs. These pairs were based on the actual commodity movements of calendar year 2000.

Because of the flexibility created by surface transportation deregulation, it is sometimes difficult to determine the exact rate charged by a carrier on shipments moving under contract. Barge rates are a matter of negotiation between shipper and barge line operator, and these rates are not published in tariff form. Each carrier's rates are based on individual costs and specific market conditions; therefore, rates vary considerably among regions, across time, and from one barge line to another.

The rates for moving grains are a notable exception to negotiated contract rates for barge transport. Contract rates for the movement of grains appear to have peaked in 1986, when approximately 40 percent of all grain was shipped under contract. Since that time, a number of carriers have returned to the use of traditional tariffs as the basis for rate calculations.

Contract rates are also common in pipeline, rail, and motor carrier transportation; like barge rates, they may be maintained in complete confidentiality. In other cases (particularly for grain), tariff rates are still applied; nevertheless, there is seldom any dependable means for determining whether a contract rate or a tariff rate should be used to price a particular movement. A further complication is the use of rebates and allowances by carriers as an incentive to shippers in order to induce higher traffic volumes.

For this study, actual rates, as provided by shippers, receivers, or river port operators, were used whenever possible. All other rates were obtained from published sources or, when this was not possible, were estimated by TVA based on the mode of transportation, the tonnage,

5.21 Navigation

and other shipment characteristics. The methodologies used to estimate unobservable rates were developed through extensive contacts with shippers, railroads, motor carriers, and the barge industry. This information was often integrated with confidential federal data and the output of computerized simulation and costing models. The process was both guided and augmented by in-house TVA rating and costing expertise developed through decades of experience as a major shipper of coal and other bulk commodities, and through the implementation of navigation-based economic development programs throughout the Tennessee River basin. Except for grain and feed ingredients, unobservable barge rates were calculated through the application of a computerized barge-costing model developed by TVA.

Three points should be noted regarding the methodological standards applied in this study. First, the standards reflect essentially the same processes TVA has applied (or will apply) in developing transportation rates for other recent (or ongoing) USACE studies. Specifically, the outlined methodology was used in the Ohio River Mainstem Study (USACE 1999) and the Upper Mississippi Navigation Improvement Project Rate Study (USACE 1997), and is being applied in the Missouri River Master Water Control Manual Review and Update (USACE 2002) and the Bayou Sorrel Lock Improvement Plan (USACE 1998) assessment. This uniform approach has facilitated inter-project comparisons. Second, recent methodological improvements enable TVA to produce transportation rate/cost materials that are, simultaneously, more complete and more reliable than the transportation data TVA (or any other agency) has produced for similar studies in the past. Each rate study for each District of the USACE is integrated into a series of databases for quick accessibility and data manipulation. Third, the forecasted rates do not include the water-compelled rate effect. This effect infers that rail rates are lower when water transportation is available to the shipper due to competitive factors and the need of the railroads to maximize utility. The water-compelled rate effect is captured by the model used to estimate the total economic effects of the policy alternatives.

5.21.3 Base Case

Existing and future predicted commodity (2030) movements were compared, and the changes in shipper savings due to continued operation of the water control system under the existing reservoir operations policy were determined. These savings are listed in Table 5.21-01.

Under the Base Case, 2030 tonnage on the regional navigation system is estimated to increase from 38.3 million to 56.5 million tons. Total annual shipper savings is estimated to be \$597 million, with an average per-ton increase in shipper savings of \$0.45.

The impacts on a per-ton savings are shown in Table 5.21-01.

Table 5.21-01 Tennessee River Shipper Savings under the Base Case

Group	Commodities	Existing Average Per-Ton Savings	2030 Average Per-Ton Savings	Impact Average Per-Ton Savings
1	Coal and coke	\$ 8.07	\$ 8.03	\$ -0.04
2	Aggregates	\$10.30	\$10.05	\$ -0.25
3	All other	\$ 6.45	\$ 6.12	\$ -0.33
4	Iron and steel	\$ 8.19	\$ 8.18	\$ -0.01
5	Grains	\$ 8.59	\$ 8.29	\$ -0.30
6	Chemicals	\$19.59	\$19.84	\$ 0.25
7	Ores and minerals	\$10.67	\$ 8.95	\$ -1.72
8	Petroleum fuel	\$ 6.48	\$ 7.88	\$ 1.40
Average all commodities		\$ 9.24	\$ 9.69	\$ 0.45

5.21.4 Summer Hydropower Alternative

Under the Summer Hydropower Alternative, drawdown of mainstem reservoirs would begin on June 1 and reach normal winter pool levels by mid-September. The spring fill policy would not change. This would result in lower reservoir elevations during 5 months of the year, adversely affecting navigation. Losses in shipper savings would range from approximately \$11 million in 2004 to over \$17 million in 2030 compared to the Base Case.

5.21.5 Equalized Summer/Winter Flood Risk Alternative

Under the Equalized Summer/Winter Flood Risk Alternative, there is a potential for drawdown for each reservoir above River Mile 649 that would result in a 7-foot channel depth during some months. Two docks at Knoxville could be affected, with a resulting impact of approximately \$1.0 million in reduced annual shipper savings compared to the Base Case. Because this potential reduction represents less than 0.05 percent of the RED shipper savings on the river navigation system, the impact was considered insignificant.

5.21.6 Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Commercial Navigation Alternative, Tailwater Recreation Alternative, and Tailwater Habitat Alternative

Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Commercial Navigation Alternative, the Tailwater Recreation Alternative, and the Tailwater Habitat

5.21 Navigation

Alternative would result in increasing channel depth to 13 feet where possible. Compared to the Base Case, changes in shipper savings would occur only under the Commercial Navigation Alternative. Model results for shipper savings under these alternatives are listed in Table 5.21-02.

Table 5.21-02 Tennessee River Shipper Savings under the Commercial Navigation Alternative

Group	Commodities	Base Case 2030 Average Per-Ton Savings	Commercial Navigation Alternative 2030 Average Per-Ton	Impact Average Per-Ton Savings
1	Coal and coke	\$ 8.03	\$ 8.97	\$ 0.94
2	Aggregates	\$10.05	\$11.03	\$ 0.98
3	All other	\$ 6.12	\$ 6.67	\$ 0.55
4	Iron and steel	\$ 8.18	\$10.11	\$ 1.93
5	Grains	\$ 8.29	\$ 9.62	\$ 1.33
6	Chemicals	\$19.89	\$20.12	\$ 0.23
7	Ores and minerals	\$ 8.95	\$11.36	\$ 2.41
8	Petroleum fuel	\$ 7.88	\$ 7.88	0
Average all commodities		\$ 9.69	\$10.75	\$ 1.06

Table 5.21-02 shows the impacts on a per-ton savings. Shipper savings would increase under the Commercial Navigation Alternative. The increases would range between \$2.41 per ton for ores and minerals and \$0.23 per ton for chemicals. By 2030, the average per-ton shipper savings increase over the Base Case would be \$1.06 per ton. These savings would result in a total additional shipper benefit of \$37.7 million annually by 2030, an 8.2-percent increase, under the alternatives with a 13-foot channel depth. These savings also include a reduction of over \$10 million from potential 13-foot channel benefits that would accrue due to the constraints of the Chickamauga tailwater and Kentucky Reservoir. Without these constraints, total benefits by 2030 under alternatives with a 13-foot channel depth are estimated at \$507 million, an increase of 10.5 percent.

In accordance with RED evaluation policy, these savings are regional, including only shipments originating or destined for Tennessee River system facilities. They do not include additional shipper savings accruing to shippers or receivers outside the system, such as on the Ohio or Mississippi Rivers.

Modal diversion is the shifting of cargoes from barge to the rail or truck mode. Interest exists regarding impacts on modal diversion that would result under various alternatives. At issue is the behavior of shippers to change modes or increase barge shipments for an average gain of \$0.45 per ton. Elasticity of modal choice was explored in interviews with shippers. Operators

demonstrated highly inelastic modal selection, citing three primary reasons: (1) typically, capital investment to implement modal change is not recoverable; (2) many shippers are captive to the barge mode; and (3) shipment quantities are based on factors other than channel depth.

5.21.7 Preferred Alternative

Under the Preferred Alternative, Kentucky Lock and Dam tailwater would be maintained at an elevation of 301 feet by increasing releases from the Kentucky Reservoir as needed, and Pickwick Landing Lock and Dam tailwater would be adjusted by releases from Pickwick Reservoir when requested by towboat operators. The impact on navigation of this alternative is to allow for 10-foot draft barges on Kentucky, Pickwick, and Barkley Reservoirs during the traditional pool drawdown periods for those docks that can accommodate deeper draft equipment. As with the previous alternative analysis, the shipper saving benefit to non-utility industries in the region was estimated at \$0.3 million, and the shipper saving benefit to power plants in the region was estimated at \$2.1 million in the first year of implementation.

5.21.8 Summary of Impacts

Table 5.21-03 contains a summary of impacts on navigation by policy alternative. Under the Base Case, total shipper savings in 2030 is estimated at \$597 million, with an average per-ton increase in shipper savings of \$0.45. Future increased tonnage under the Base Case would result in more barge trips that in turn would result in more fuel consumption and greater air quality impacts.

Under the Summer Hydropower Alternative, drawdown of mainstem reservoirs would begin on June 1 and reach normal winter pool levels by mid-September. The spring fill policy would not change. This would result in lower reservoir elevations during 5 months of the year, adversely affecting navigation. Losses in shipper savings would range from approximately \$11 million in 2004 to over \$17 million in 2030 compared to the Base Case. Under the Equalized Summer/Winter Flood Risk Alternative, there is a potential drawdown for each reservoir above River Mile 649 that would result in a 7-foot channel depth during some months. Two docks at Knoxville could be affected, with a resulting regional economic impact of approximately \$1.0 million in reduced shipper savings compared to the Base Case. Because this potential reduction represents less than 0.05 percent of the RED shipper savings on the river navigation system, the impact was considered insignificant.

Under the Commercial Navigation Alternative, the average per-ton shipper savings increase over the Base Case would be \$1.06 per ton. These savings would result in a total additional shipper benefit of \$37.7 million annually by 2030, an 8.2-percent increase, under the alternatives with a 13-foot channel depth. These savings are regional, including only shipments originating or destined for Tennessee River system facilities. They do not include additional shipper savings accruing to shippers or receivers outside the system, such as on the Ohio or Mississippi Rivers.

5.21 Navigation

The increased tonnage per barge under the Commercial Navigation Alternative would result in fewer tows for the equivalent tonnage under the Base Case. This would result in smaller impacts on emission shifting and air quality.

Under the Preferred Alternative, Kentucky Lock and Dam tailwater would be maintained at an elevation of 301 feet by increasing releases from Kentucky Reservoir as needed, and Pickwick Landing Lock and Dam tailwater would be adjusted by releases from Pickwick Reservoir when requested by towboat operators. This would allow for 10-foot draft barges on Kentucky, Pickwick, and Barkley Reservoirs during the traditional pool drawdown periods for those docks that can accommodate deeper draft equipment. Shipper savings benefits during the first year of implementation for this alternative were estimated at \$0.3 million for non-utility industries in the region and \$2.1 million for power plants in the region.

Table 5.21-03 Summary of Impacts on Navigation by Policy Alternative

Alternative	Description of Impacts
Base Case	No change – Regional shipper savings of approximately \$378 million are expected to increase at an average annual rate of 1.5 to 2.0 percent, to \$597 million by 2030.
Reservoir Recreation A	No changes in shipper savings compared to the Base Case.
Reservoir Recreation B	No changes in shipper savings compared to the Base Case.
Summer Hydropower	Slightly adverse – Mainstem reservoir levels would be lower than under the Base Case during 5 months of the year. Losses in shipper savings would range from approximately \$11 million in 2004 to over \$17 million in 2030.
Equalized Summer/Winter Flood Risk	Slightly adverse – Potential for drawdown for each reservoir that would result in a 7-foot channel depth during some months. Losses in shipper savings are expected to range from \$1.2 million in 2004 to \$1.9 million in 2030.
Commercial Navigation	Slightly beneficial – Shipper savings would increase by \$17 million under the 13-foot channel option. Increased tonnage per barge would result in fewer impacts related to emission shifting and air quality.
Tailwater Recreation	No changes in shipper savings compared to the Base Case.
Tailwater Habitat	No changes in shipper savings compared to the Base Case.
Preferred	Slightly beneficial – Shipper savings would increase by approximately \$2.4 million in 2004 due to changes that would allow for 10-foot draft barges on Kentucky, Pickwick, and Barkley Reservoirs during the traditional pool drawdown periods for those docks that can accommodate deeper draft equipment.