

CECW-CP

30 November 2004

MEMORANDUM FOR PLANNING COMMUNITY OF PRACTICE

SUBJECT: Economic Guidance Memorandum, 05-06, Shallow Draft Vessels Operating Costs,  
Fiscal Year 2004

The enclosed information is provided for immediate use. Questions related to this memorandum should be addressed to Lillian Almodovar, CECW-CP at 202/761-5875.



Harry E. Kitch, P.E.  
Deputy, Planning Community of Practice  
Directorate of Civil Works

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**Economic Guidance Memorandum 05-06  
FY 2004 Shallow Draft Vessel Operating Costs**

**I – Introduction**

The towboat and barge costs on the accompanying spreadsheets are provided for use by Corps of Engineers planners in studies to estimate the potential benefits of improvements to the Mississippi river and associated inland and intracoastal waterways of the United States. The costs were gathered and aggregated using a survey instrument approved by OMB and interviews were conducted on site, by phone and by mail with vessel owners and operators from 2003-2004 and reflect 2003 cost levels. This cost information, has been updated to reflect FY 2004 price levels and interest rates. Spreadsheet formats from previous Planning Guidance were used for consistency. Daily costs are based on the Corps current FY 2004 Water Resources interest rate of 5.625 percent.

To facilitate the interpolation for vessel sizes not shown, and to provide consistency, formulae based on cost data and regression analyses were utilized to derive many of the line item costs. The specific results of these formulae are displayed to the nearest cent, but should not be taken as an indication of high precision. The following sections present the methodology applied and results presented in the current Planning Guidance spreadsheets.

**II - Estimated Towboat Costs**

The towboat spreadsheets displayed on pages that follow present total daily costs. Total daily operating costs are the sum of replacement and operating costs including crew-related and boat-related costs, as well as administration costs, and fuel costs. The combined influence of percent changes in towboat replacement costs and operating costs resulted in overall increases in total daily costs as compared to FY 2000 estimates. With the exception of the 400-600 horsepower category, percent changes increased gradually with horsepower, ranging from approximately 1 percent in the lower horsepower categories to 25 percent in higher horsepower categories.

**Replacement Cost**

Many firms noted a rule-of-thumb of \$1,000 per horsepower for replacement cost. Both shipyards and towboat owner/operators provided replacement cost data. Replacement costs provided by owner/operators represented both custom built and standard yard designs. Shipyard quotes were slightly higher than those reported by owner/operators. Prices quoted by

owner/operators are more closely aligned with the price paid rather than the price quoted by the shipyards. The linear model derived to represent replacement cost is as follows:

$$\text{Replacement Cost} = 135,479.69349 + 1,178.48392 * \text{Horsepower}$$

The Standard Error of the Estimate is 495,812, Standard Error of the Coefficient is 21.54463, and  $R^2$  is 0.98. Variation in horsepower therefore accounts for 98 percent of the variance in replacement cost. Estimated towboat replacement costs calculated from the model ranged from \$907.52 per horsepower for 500 horsepower towboats to \$1,164.94 for the larger 10,000 horsepower towboat. Replacement costs were converted to a daily cost using an amortization formula over a 25 year horizon at the current Corps project discount rate of 5.625 percent, divided by an estimated 340 operating days per year.

### **Operating Cost**

The operating cost captures crew-related costs and boat-related costs. The differences in operating cost were explained using the variable of horsepower. The model for estimating operating cost is as follows:

$$\text{Operating Cost} = 1257.42032 + 0.43503 * \text{Horsepower}$$

The Standard Error of the Estimate is 442.12537, Standard Error of the Coefficient is 0.03120, and  $R^2$  is 0.83. In general terms, this implies that horsepower as a single independent variable accounts for approximately 83 percent of the variance in total operating cost. Compared to FY 2000 estimates, operating cost estimates in the current update were higher for towboats with horsepower equal or greater than 5000. Operating costs increased by 2 percent in the 5000-6000 horsepower class, by 6 percent in the 6100-7000 horsepower class, while the 7100-8000, 8100-9000, and 10000 horsepower classes showed a steady increase of 11, 15 and 21 percent respectively. With the exception of the 400-600 horsepower class, which showed a 1 percent increase from the previous update, towboats with horsepower lower than 5000 had operating cost estimates that were 3 to 8 percent lower than FY 2000 Economic Guidance Memorandum (EGM) estimates.

### **Crew-Related Cost**

Crew-related costs were estimated using a model developed from reported owner/operator data. The model for crew-related cost is as follows:

$$\text{Crew Cost} = 736.32955 + 0.32874 * \text{Horsepower}$$

The Standard Error of the Estimate is 379.27699, Standard Error of the Coefficient is 0.02373, and  $R^2$  is 0.80. Thus, the independent variable of horsepower accounts for 80 percent of the variance of crew-related costs. Compared to FY 2000 EGM estimates, crew-related costs increased by 2 to 25 percent for the horsepower ranges of 5000-6000 to 10,000 horsepower, respectively. Lower operating costs than FY 2000 EGM estimates were observed for towboats with horsepower lower than 5000. Percent reduction in these lower horsepower

vessels ranged from 2 to 13 percent. The only exception was observed in the 400-600 horsepower class, which showed a 2 percent increase from the previous update.

### **Towboat-Related Costs**

Development of a model was attempted for boat-related costs. The independent variable, horsepower, only explained approximately 50 percent of the variance in boat-related costs. Given, that boat-related and crew-related costs comprise total operating costs and that the total operating cost model accounted for much of the variance, total boat-related costs were derived by taking the difference between estimated total operating costs and estimated crew-related costs.

Line item costs associated with crew-related cost are crew wages, fringe benefits, food and subsistence, and crew transportation. Line item costs associated with boat-related costs are maintenance and repair, supplies, insurance, and other (e.g., taxes). Individual costs comprising the two major categories were arrived at by applying the percentage distribution derived from the reported cost data. The percentages based on the latest data are similar to those presented in the FY 2000 EGM.

Crew wages and fringe benefits (including training) are the major components of crew-related costs and on average account for 76 and 18 percent respectively. Food and subsistence on average account for 4 percent, while the cost of transporting crew account for 2 percent. The FY2000 EGM reported the following distributions: crew wages 71 percent; fringe benefits (including training) 22 percent; food and subsistence 4 percent; and crew transportation 3 percent. As for boat-related costs, maintenance and repair on average represent 53 percent of all boat-related costs while, insurance on average accounts for 20 percent. Supplies and other boat costs on average represent 17 and 10 percent of towboat-related costs respectively. In the FY2000 EGM estimated maintenance and repair costs were 53 percent, supplies were 20 percent, insurance was 19 percent and other was 8 percent.

Note: For spreadsheet purposes, four cost categories represent crew and boat-related costs. The titles of most categories identify the costs included in the category. However, there are exceptions including "Insurance", which includes uninsured or self-insured property damage claims, and "Wages", which includes mandated payroll taxes. "Fringe benefits" and "Other" have been used to include a variety of miscellaneous crew and boat-related expenses. "Fringe benefits", in addition to the usual employer options such as health and life insurance as well as vacation and retirement benefits, includes training (because it is mostly paid time for participation), pre-employment and periodic medical exams and tests, personal injury claims and settlements, and safety awards and other bonuses. "Other" includes property taxes, which are usually minimal, but does not include fuel taxes (which are treated as part of fuel cost on the spreadsheet) or income taxes. The biggest "Other" expense is usually communications services, followed by waste disposal, safety and insurance inspections, and port charges and towboat assistance if applicable.

### **Administrative Costs**

There is no uniformity in how overhead costs are reported by towboat owner/operators. Some firms charge the overhead to the towboat, others charge all overhead to the barge. As a result, no model to estimate administrative costs was developed. Overhead costs were calculated as a percentage of operating costs. The percent of administrative cost was derived from costs reported by owner/operators. On average, administrative costs are an additional 12 percent above the total operating cost.

### **Fuel Consumption**

Reported fuel consumption by owners/operators represents average actual power fuel consumption per day. Actual power fuel consumption is what firms actually experienced during the year. The model relating fuel consumption to horsepower is as follows:

$$FuelConsumption = 0.07743 * Horsepower^{(1.24127)}$$

The Standard Error of the Estimate is 0.36396, Standard Error of the Coefficient is 0.07336, and  $R^2$  is 0.87. Thus, the dependent variable horsepower accounted for 87 percent of the variance in fuel consumption. The model estimates that a one percent increase in horsepower would result in approximately a 1.24 percent increase fuel consumption. An analysis performed during the FY2000 update suggested that towboats were better grouped into two categories in relation to horsepower and fuel consumption. Towboats with horsepower sizes greater than 6,000 and those with 6,000 or less horsepower were found to represent two distinct transportation situations and suggested the use of two different models to represent the fuel consumption of the two populations. Based on the current survey sample, there does not seem to be strong evidence of the need to use two models to estimate fuel consumption.

### **Fuel Costs**

Fuel consumption related costs were calculated by multiplying the total number of gallons consumed by towboats by the average price of fuel per gallon. The typical type of fuel used in towboats is the high-sulfur No. 2 diesel fuel. Due to the wide variation in the price paid for a gallon of fuel and considering the monthly and annual fuel price fluctuations, price data from a secondary source was reviewed. Price data were obtained from the United States Department of Energy (USDOE); Energy Information Administration publication titled Petroleum Marketing Monthly, December 2003. Prices for high-sulfur diesel fuel were obtained from Table 17. U.S. No. 2 Diesel Fuel Price by Sulfur content and sales type.

The average price of high-sulfur diesel fuel for the years 2000, 2001, 2002 and the first nine months of 2003 were \$0.981, \$0.892, \$0.822 and \$0.995 respectively. The overall average for three years and 9 months of 2003 was \$0.923. Based on this overall average, the current study adopted an average fuel price of \$1.166 (\$0.923 avg. price + \$0.20 Waterways tax + \$0.043 Deficit Reduction tax) to calculate costs. The total price per gallon used in this analysis is approximately 50 percent higher than what was used in the FY 2000 EGM (\$0.788 including

taxes), a clear indication that fuel prices paid by towboat operators have increased significantly since the last update.

### **III - Estimated Barge Costs**

The barge spreadsheets displayed on pages that follow present total daily costs for different types (e.g., open hopper, covered hopper, deck and tank barges) and dimensions of barges as well as port costs. Total daily costs are comprised of daily replacement cost, operating cost and administrative cost. Daily operating costs of open hopper barges declined by 2.78 to 7.40 percent from FY 2000 estimates. Daily operating costs for covered hopper increased by 0.65 percent while, deck and self-unloading barges experienced increases that were between 1.75 to 6 percent. Many of the tank barges experienced slight decreases of less than 3 percent though some chemical tank barges experienced an increase of approximately 2 percent. Total daily costs are a function of reduced daily replacement costs and generally greater operating costs.

#### **Replacement Cost**

Replacement costs for the various types and dimensions of barges shown (deck barges, all hopper barges, and most tank barges) on the spreadsheets were calculated based on formulas that apply labor and steel costs. Labor costs for a particular barge type and dimension are a function of estimated worker hours and Department of Labor average earnings for boatyard workers. Steel costs for a particular barge type and dimension are a function of the estimated barge steel weights and published steel prices. These formulas were first used in the FY 97 EGM. For the FY 2004 EGM, 2003 boatyard worker earnings and steel prices were utilized to estimate barge replacement costs. Also, the additional costs for such items as kevels, chocks, manholes, hatches, pumps, piping, etc. were handled as a percentage or specific increase to hull steel cost. As in previous EGMs, estimated costs include an overhead of 15% on materials, 100% on labor, and a 10% builder's margin.

Steel prices per ton were less in 2003 whereas labor rates were greater. The combination of these factors resulted in barge replacement costs that were 2% to 9% less than reported in the FY 2000 EGM.

Formulae were applied in the FY 2004 EGM given 2003 labor rates and steel prices to estimate barge replacement costs. Generally, the formulae utilized performed well in comparison to reported replacement costs. One exception was the self-unloading cement barge for which price quotes were utilized in the FY 2004 Guidance to represent the replacement cost of self-unloading cement barge.

#### **Operating Costs**

Barge operating costs are comprised of the four cost items: maintenance and repair, supplies, insurance, and other. Averages of the operating cost items were utilized in updating the barge spreadsheets. Firms provided estimates for a variety of barge dimensions however, the survey did not produce sufficient observations to permit the calculation of dimension-specific cost averages for each of the many barge dimensions encountered during the survey. Therefore

following the approach used in the previous EGM, the barge operating cost data analysis focused on the more common barge sizes and interpolates findings to generate estimates for the lesser common barges. It is assumed that the lesser common barge sizes portray similar trends to those reflected in the more common barge types and sizes.

Note: The "Other" cost category has been used for taxes and miscellaneous barge operating costs. In addition, this cost includes inspections and condition surveys. The shore side services such as tankermen, the cost of pumpmen, firemen and other barge equipment operators carried as part of the towboats crew are not included in the "Other" cost. Also, port costs comprised of shifting, fleeting, and cleaning are not included but are addressed in a later section of the EGM.

### ***Open Hopper Barges***

Average reported operating costs of the 195x35x12 open hopper barge were used to update operating costs of the open hopper barge in the FY 2000 EGM. Operating costs were approximately 10 percent lower for the 195x35x12 open hopper when compared to the FY 2000 estimates. The percent change in current estimates of operating costs of the 195x35x12 open hopper compared to those from FY 2000 were used to update all other open hopper dimensions listed in the EGM. Operating costs of the other open hopper barges listed in the FY 2000 EGM were adjusted to reflect the same percent change as that observed in the 195x35x12 open hopper barge. The distribution of maintenance and repair, supply, insurance and other costs were assumed to be in the same proportions as those in the 195x35x12 open hopper barge.

### ***Covered Hopper, Deck and Self-Unloading Barges***

All firms that reported data regarding covered hopper barges represented the Jumbo barge variety. Fittingly, only the Jumbo covered hopper barge (dimensions 195x35x12) is listed in the EGM. Operating costs for the covered barge were updated using survey averages for the same barge. Covered hopper operating costs are approximately 24 percent higher compared to the FY 2000 EGM.

Firms that reported data regarding deck barges provided data for a variety of deck barge dimensions. No one dimension appeared to be more common and as a result the calculation of averages was not suitable. Overall operating costs for the 195x35x12 and the 130x35x10 deck barges listed in the EGM were updated by adjusting FY 2000 overall operating costs to reflect proportional percent changes as those observed by the 195x35x12 covered hopper barge. The distribution of costs within each cost category was assumed to have remained the same as was in the FY 2000 EGM.

One firm operating self-unloading barges participated in the survey and provided only vessel replacement cost information. To update costs for self-unloading barges, overall operating costs were adjusted to reflect cost relationships from the FY 2000 EGM between self-unloading barges and the jumbo covered hopper barge. Updated costs of deck barges and self-unloading barges were compared to reported actual data for validation.

### ***Tank Barges***

Operating cost estimates for the Jumbo oil tank barge in the EGM were updated using average cost estimates from the survey. Operating costs are approximately 20 percent greater for the 195x35x12 tank barge as compared to FY 2000 EGM estimates. Limited data was available for the remaining tank barge types and dimensions including the pressurized and asphalt tank barges. Operating costs for these remaining dimensions were estimated by extrapolating costs from the Jumbo oil tank barge based on cost relationships in the FY 2000 EGM. Operating costs were verified against reported data where possible and were found to be reasonable estimates.

### **Administrative Costs**

Reported administrative operating costs of the 195x35x12 open hopper and covered hopper barge respectively updated administrative costs of the 195x35x12 open hopper barge in the EGM. On average, administrative costs for the 195x35x12 open hopper and covered hopper barges were respectively 25 and 32 percent higher than comparable estimates from FY 2000 EGM. The percent change in current estimates of administrative costs of the 195x35x12 open hopper compared to those from the FY2000 EGM was used to update all other open hopper dimensions listed in the EGM.

For the same reasons as those explained earlier for operating costs, administrative costs for the 195x35x12, the 130x35x10 deck barges, and the two self-unloading barges listed in the EGM were updated by adjusting FY 2000 overall operating costs to reflect the same percent change as that observed in the 195x35x12 covered hopper barge.

Similar to the overhead costs reported for towboats, tank barge overhead costs were inconsistent by type and dimension. As a result, administrative costs for all tank barges were estimated by applying FY 2000 proportions of administrative costs to operating costs of each tank barge type. Following the methodology described, overall administrative costs were up for all tank barges. Percent increases ranged from roughly 12 percent to approximately 20 percent.

### **Port Costs**

Average daily port costs are shown on the barge spreadsheets as additional information for the planner. Reported port costs increased for all barges types. Port costs were 14 percent greater for the 195x35x12 open hopper barge as compared to the FY 2000 EGM. Port costs for the remaining open hopper barge dimensions were calculated based on a comparison of their capacity to the 195x35x12. The premise is that port costs are a function of barge capacity.

Port costs for the 195x35x12 open hopper barge increased by approximately 46 percent. Operators of covered hopper barges indicated significant increases in port service charges in most locations on the inland waterway system. Port costs for the 195x35x12 tank barge increased by approximately 23 percent. Port costs for the remaining tank barge dimensions were calculated by comparing the FY 2000 EGM port costs of all tank barges to the 195x35x12 oil tank barge costs and applying these relationships to FY2004 port cost

estimates for the 195x35x12 oil tank barge. Port costs were verified using actual data where available. Note that "NA" in the spreadsheets indicates "not applicable" and "- -" indicates "not available". "NA" is utilized for hopper barges because typically the customer pays the cost of loading and unloading. Whereas "- -" is utilized for tank barge loading and unloading because the question posed to survey participants was regarding self-unloading and loading costs.

FY 2004 Estimated Daily Operating Costs for Mississippi River System Towboats

TABLE -1													
FY 2004 ESTIMATED DAILY OPERATING COSTS FOR MISSISSIPPI RIVER SYSTEM TOWBOATS													
Horsepower	400-600	800-1000	1200	1400-1600	1800-2000	2200-2400	2800-3400	4000-4400	5000-6000	6100-7000	7100-8000	8100-9000	10000
Type	Harbor or Linehaul	Linehaul	Linehaul	Linehaul	Linehaul	Linehaul	Linehaul	Linehaul	Linehaul	Linehaul	Linehaul	Linehaul	Linehaul
Replacement Cost	453,762	925,156	1,278,701	1,632,246	2,103,640	2,575,033	3,517,820	4,814,153	6,346,182	7,583,590	8,762,074	9,940,558	11,649,360
Cost Recovery Basis:													
25 years @ 5.625%	100.71	205.33	283.80	362.27	466.89	571.52	780.76	1,068.48	1,408.5004	1,683.14	1,944.70	2,206.26	2,583.52
Operating Days per year	340	340	340	340	340	340	340	340	340	340	340	340	340
Average Operating Costs													
Crew Wages	684.53	784.47	859.42	934.37	1,034.31	1,134.25	1,334.12	1,608.95	1,933.74	2,196.08	2,445.92	2,695.76	3,058.03
Fringe Benefits	162.13	185.80	203.55	221.30	244.97	268.64	315.98	381.07	457.99	520.12	579.30	638.47	724.27
Food & Subsistence	36.03	41.29	45.23	49.18	54.44	59.70	70.22	84.68	101.78	115.58	128.73	141.88	160.95
Crew Transportation	18.01	20.64	22.62	24.59	27.22	29.85	35.11	42.34	50.89	57.79	64.37	70.94	80.47
Total Crew Costs	900.70	1,032.20	1,130.82	1,229.44	1,360.94	1,492.43	1,755.42	2,117.04	2,544.40	2,889.58	3,218.32	3,547.06	4,023.73
Maintenance & Repair	304.34	326.88	343.78	360.68	383.21	405.75	450.81	512.78	586.01	645.16	701.50	757.83	839.52
Supplies	97.62	104.85	110.27	115.69	122.92	130.14	144.60	164.48	187.97	206.94	225.01	243.08	269.28
Insurance	114.85	123.35	129.73	136.11	144.61	153.11	170.12	193.50	221.14	243.46	264.72	285.97	316.80
Taxes & Other	57.42	61.68	64.86	68.05	72.30	76.56	85.06	96.75	110.57	121.73	132.36	142.99	158.40
Total Boat Costs	574.24	616.75	648.64	680.53	723.04	765.56	850.59	967.51	1,105.69	1,217.29	1,323.58	1,429.87	1,583.99
Total Operating Costs	1,474.94	1,648.95	1,779.46	1,909.97	2,083.98	2,257.99	2,606.01	3,084.55	3,650.09	4,106.87	4,541.90	4,976.93	5,607.72
Administration	176.99	197.87	213.53	229.20	250.08	270.96	312.72	370.15	438.01	492.82	545.03	597.23	672.93
Average Fuel Use (GPD) (Note 1)													
GPD HiPower Use	500.00	900.00	1,200.00	1,500.00	1,900.00	2,300.00	3,100.00	4,200.00	5,500.00	6,550.00	7,550.00	8,550.00	10,000.00
GPD Actual Use	173.41	359.70	514.07	678.13	909.38	1,152.76	1,669.74	2,434.21	3,401.95	4,225.85	5,040.89	5,882.47	7,145.11
Average Fuel Cost (Note 2)													
With HiPower Use	583.00	1,049.40	1,399.20	1,749.00	2,215.40	2,681.80	3,614.60	4,897.20	6,413.00	7,637.30	8,803.30	9,969.30	11,660.00
With Actual Power Use	202.20	419.41	599.40	790.70	1,060.34	1,344.12	1,946.92	2,838.29	3,966.67	4,972.34	5,877.68	6,858.96	8,331.19
Total Daily Costs													
HiPower Use	2,344.54	3,119.71	3,701.09	4,282.46	5,057.63	5,832.80	7,383.13	9,514.84	12,034.14	14,068.95	16,006.87	17,944.79	20,754.78
Actual Power Use	1,959.66	2,485.39	2,898.02	3,322.85	3,905.09	4,502.71	5,736.45	7,501.44	9,670.00	11,367.36	13,150.18	14,975.67	17,691.39
Average Crew Size	3.20	3.30	5.00	5.00	5.61	6.33	7.08	7.76	8.77	9.00	9.50	10.00	10.00

Note 1 Actual daily fuel use is based on survey data and reflects variation in power use over the trip cycle for the type of towing performed by the towboat sizes shown.

HiPower daily fuel use is based on the continuous use of about 80% of full rated towboat horsepower.

Note 2 Fuel cost @ \$1.166 per gallon (\$0.923 + \$0.20 Waterway Tax + \$0.043 Deficit Reduction Tax)

**FY 2004 Estimated Daily Operating Costs for Mississippi River System Barges**

<b>TABLE 2</b>										
<b>FY 2004 ESTIMATED DAILY OPERATING COSTS FOR MISSISSIPPI RIVER SYSTEM BARGES</b>										
Barge Type	Open Hopper	Open Hopper	Open Hopper	Open Hopper	Open Hopper	Covered Hopper	Deck	Deck	Self Unloader	Self Unloader
Length,Width,Hull Depth	175'x26'x12'	195'x26'x12'	195'x35'x12' (Note 1)	245'x35'x12'	260'x52.5'x12'	195'x35'x12' (Note 1)	130'x35'x10'	195'x35'x12'	195'x35'x13'	290'x50'x13'
Nominal Capacity (tons)	925	1100	1500	1900	3100	1500	750	1500	1300	3000
Barge Service	Coal & Other	Coal & Other	Coal & Other	Coal & Other	Coal & Other	Grain & Other	Sand/Gravel	Stone (Note 2)	Cement	Cement
Replacement Cost	\$171,801	\$191,435	\$280,110	\$351,933	\$560,219	\$322,110	\$190,270	\$338,794	\$1,412,069	\$3,000,000
Cost Recovery Basis:										
25 Years @ 5.625%	\$37.04	\$41.27	\$60.39	\$75.88	\$120.79	\$69.45	\$41.02	\$73.05	\$434.92	\$924.02
Operating Days per Year	350	350	350	350	350	350	350	350	245	245
Average Operating Costs										
Maintain & Repair	\$5.93	\$7.12	\$9.58	\$12.04	\$19.16	\$10.25	\$4.95	\$6.19	\$146.06	\$157.89
Supplies	\$0.63	\$0.75	\$1.01	\$1.27	\$2.02	\$2.83	\$0.00	\$0.00	\$2.06	\$2.23
Insurance	\$2.59	\$3.11	\$4.18	\$5.25	\$8.36	\$3.45	\$1.86	\$1.24	\$23.94	\$25.88
Other	\$0.66	\$0.79	\$1.07	\$1.34	\$2.14	\$3.58	\$2.48	\$3.71	\$27.03	\$29.21
Total Operating Costs	\$9.81	\$11.77	\$15.84	\$19.90	\$31.68	\$20.11	\$9.28	\$11.14	\$199.08	\$215.20
Administration	\$7.23	\$8.67	\$11.68	\$11.68	\$11.68	\$12.22	\$1.32	\$1.32	\$46.19	\$46.19
Total Daily Costs	\$57.38	\$65.40	\$93.30	\$114.23	\$174.93	\$107.98	\$55.29	\$92.03	\$732.57	\$1,296.68
Average Port Costs										
Shifting	\$12.32	\$14.78	\$19.90	\$25.00	\$39.79	\$34.41	NA	NA	\$29.68	\$32.09
Fleeting	\$8.15	\$9.78	\$13.16	\$16.53	\$26.32	\$20.52	NA	NA	\$6.07	\$6.56
Cleaning	\$3.20	\$3.84	\$5.17	\$6.50	\$10.35	\$11.13	NA	NA	\$0.00	\$0.00
Load/Unload	NA	NA	NA	NA	NA	NA	NA	NA	\$171.63	\$364.63
Average Daily Port Cost	\$23.67	\$28.40	\$38.23	\$48.03	\$76.46	\$66.06	NA	NA	\$207.38	\$403.28

Note 1 200'x35' box barge costs about 2.5% more, has a nominal capacity of 1600 tons

Note 2 For deck barge with coamings, add \$20,000

**TABLE 3  
FY 2004 ESTIMATED DAILY OPERATING COSTS FOR MISSISSIPPI RIVER SYSTEM BARGES**

Barge Type	Tank	Tank	Tank	Tank	Tank	Tank	Tank	Pressure Tank	Pressure Tank	Pressure Tank
Length,Width,Hull Depth	195'x35'x12'	147'x52'x12'	175'x54'x12'	240'x50'x12'	290'x50'x12'	297.5'x54'x12'	297.5'x54'x12'	278'x50'x12'	210'x44'x12'	195'x35'x12'
	Double Hull	Double Hull	Type II	Type II	Type I					
Nominal Capacity (tons)	1425	1600	1975	2500	3000	3325	3300	2500	1500	1000
Barge Service	Oil Trades	Asphalt	Ammonia	LPG	Chlorine					
Replacement Cost (Note 1)										
Without Coils	\$742,747	\$816,891	\$976,111	\$1,192,905	\$1,398,326	\$1,523,985	NA	\$4,750,000	\$3,459,310	\$2,162,069
With Coils	\$787,792	\$867,341	\$1,038,481	\$1,272,105	\$1,494,026	\$1,630,014	\$1,948,101	NA	NA	NA
Cost Recovery Basis: 20 years @ 5.625%										
Without Coils	\$164.85	\$181.30	\$216.64	\$264.76	\$310.35	\$338.24	NA	\$1,054.24	\$767.78	\$479.86
With Coils	\$174.85	\$192.50	\$230.49	\$282.34	\$331.59	\$361.77	\$432.37	NA	NA	NA
Operating Days per Year	340	340	340	340	340	340	340	340	340	340
Average Operating Costs										
Maintain & Repair	\$43.79	\$48.16	\$57.55	\$70.33	\$82.44	\$89.78	\$95.27	\$217.31	\$108.14	\$72.09
Supplies	\$1.55	\$1.63	\$1.80	\$2.04	\$2.24	\$2.38	\$135.49	\$121.40	\$2.35	\$1.57
Insurance	\$20.03	\$23.62	\$31.62	\$43.04	\$54.33	\$61.46	\$37.56	\$74.68	\$113.92	\$75.95
Other	\$18.97	\$19.57	\$20.84	\$22.57	\$24.21	\$25.22	\$55.01	\$163.55	\$66.91	\$44.60
Total Operating Costs	\$84.34	\$92.97	\$111.82	\$137.98	\$163.22	\$178.83	\$323.33	\$576.94	\$291.32	\$194.21
Administration	\$25.67	\$28.00	\$33.01	\$39.86	\$46.36	\$50.37	\$28.47	\$71.67	\$66.51	\$66.51
Total Daily Costs										
Without Coils	\$289.44	\$318.31	\$380.63	\$466.01	\$547.38	\$597.34	NA	\$1,796.06	\$1,193.50	\$783.02
With Coils	\$300.32	\$330.50	\$395.69	\$485.14	\$570.50	\$622.96	\$822.40	NA	NA	NA
Average Port Costs										
Shifting	\$66.63	\$66.37	\$65.77	\$64.93	\$64.09	\$63.49	NA	NA	NA	NA
Fleeting	\$20.22	\$20.15	\$19.97	\$19.71	\$19.46	\$19.28	NA	NA	NA	NA
Cleaning	\$16.18	\$16.12	\$15.96	\$15.76	\$15.55	\$15.39	NA	NA	NA	NA
Load/Unload	--	--	--	--	--	--	NA	NA	NA	NA
Average Daily Port Cost	\$103.03	\$102.63	\$101.70	\$100.40	\$99.10	\$98.17	NA	NA	NA	NA

Note 1 Tank barge replacement costs include vapor recovery system. For multi-product piping, pumps, and fittings, add 15%.

**TABLE 4  
FY 2004 ESTIMATED DAILY OPERATING COSTS FOR MISSISSIPPI RIVER SYSTEM BARGES**

Barge Type (1)	Steel Tank	Chemical Tank	Chemical Tank	Chemical Tank	Chemical Tank	Chemical Tank	Chemical Tank
Length,Width,Hull Depth	195'x35'x13'	195'x35'x12'	195'x35'x12'	195'x35'x12'	195'x35'x12'	195'x35'x12'	195'x35'x12'
	Single Skin	Type III Steel	Type II Zinc Coated	Type III Lined	III Coils & Lined	II Aluminum	II Stainless
Nominal Capacity (tons)	1500	1425	1425	1425	1425	1425	1425
Barge Service	Molasses, Urea Solutions, Clay Slurry	Benzene, Toluene, Xylene, Aqua Ammonia	Alcohols, etc except Acids, Coatings for Cargo Purity (2)	Hydrochloric, Sulphuric (3) and Phosphoric (4) Acids	Caustic Soda	Acetic Acid, Acrylonitrile, Nitric Acid	Phosphoric Acid, Maximum Cargo Purity
Replacement Cost	\$708,528	\$742,747	\$787,747	\$832,747	\$877,747	\$1,280,664	\$1,814,274
Cost Recovery Basis:							
25 Years, 5.625%	\$157.25	\$164.85	\$174.84	\$184.82	\$194.81	\$284.24	\$402.67
Operating Days per Year	340	340	340	340	340	340	340
Average Operating Costs							
Maintain & Repair	\$27.01	\$64.83	\$62.80	\$70.90	\$74.28	\$60.78	\$60.78
Supplies	\$1.35	\$2.70	\$4.05	\$4.05	\$4.05	\$4.05	\$4.05
Insurance	\$16.21	\$28.36	\$37.82	\$33.76	\$36.47	\$40.52	\$101.29
Other	\$2.70	\$9.45	\$10.80	\$12.16	\$13.51	\$13.51	\$33.76
Total Operating Costs	\$47.27	\$105.34	\$115.47	\$120.88	\$128.30	\$118.85	\$199.88
Administration	\$16.88	\$48.62	\$48.62	\$48.62	\$48.62	\$48.62	\$48.62
Total Daily Costs	\$237.79	\$333.39	\$354.39	\$370.66	\$388.96	\$476.84	\$686.78
Average Port Costs							
Shifting	\$21.09	\$47.03	\$47.03	\$47.03	\$47.03	\$47.03	\$47.03
Fleeting	\$4.98	\$14.65	\$14.65	\$14.65	\$14.65	\$14.65	\$14.65
Cleaning	\$20.88	\$36.81	\$36.81	\$36.81	\$36.81	\$36.81	\$36.81
Load/Unload	--	--	--	--	--	--	--
Average Daily Port Cost	\$46.95	\$98.50	\$98.50	\$98.50	\$98.50	\$98.50	\$98.50

Note 1 46 CFR 153 regulations specify type construction and tank materials for hazardous cargoes. Types I, II, and III barges are all double skin. Type I construction has maximum ability to resist penetration due to collision or grounding. Table 1 in 46 CFR 153 lists tank barge cargoes and shows type barge required, and required or prohibited tank materials.

Note 2 Tank coatings are not specified in 46 CFR 153 regulations. Zinc, copper, and certain other materials are prohibited for certain cargoes.

Add \$40,000 for epoxy in lieu of zinc tank coating. Multi-product barges cost about 15% more to build, 100% more to operate.

Note 3 Sulphuric acid may be carried in unlined, lead-lined, or rubber-lined steel tanks, depending on concentration. (Usually unlined)

Note 4 Phosphoric acid may be carried in rubber-lined or stainless steel tanks. (usually stainless) Other acids shown have no options.

**UPDATING SHALLOW DRAFT VESSEL OPERATING AND  
REPLACEMENT COSTS QUESTIONNAIRE  
2003**

LOCATION: \_\_\_\_\_

DATE: \_\_\_\_\_

1. Name of your business \_\_\_\_\_

2. What year was your business established at this location? \_\_\_\_\_

3. Briefly describe the major purpose of this business? \_\_\_\_\_

\_\_\_\_\_

4. What waterways do you generally operate on? \_\_\_\_\_

\_\_\_\_\_

5. Please indicate the number of Towboats in your fleet. \_\_\_\_\_

6. Please indicate the overall number of Barges in your fleet.

\_\_\_\_\_

Deck	Open Hopper	Covered Hopper	Tank	Total Barges
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7. What are the main commodities transported?

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

## Towboat Operating Costs Checklist

Please provide costs for each type of towboat you operate and for different horsepower sizes if relevant.

<b>Cost Item</b>	
<b>Towboat Category</b>	
1. Type of Service (i.e., shifting, fleeting, linehaul)?	
2. Towboat Horsepower?	
3. Number of boats of this size?	
<b>Towboat Investment Cost</b>	
4. Towboat replacement/construction cost?	
5. Custom or yard design?	
6. Navigation and communication equipment costs?	
<b>Towboat Operating Costs</b>	
<b>Crew related costs</b>	
7. Crew size (normal manning level)?	
8. Crew wages?	
9. Total crew fringe benefits?	
a. Social Security	
b. Workmen's compensation	
c. Health insurance	
d. Retirement contribution	
e. Training	
f. Other	
10. Crew food and subsistence?	
11. Crew transportation costs?	
<b>Boat related costs</b>	
12. Total maintenance costs?	
a. Major costs (annual average costs of repairs such as overhauls and restorations to hull, deck, and engine)	
b. Routine costs (maintenance costs as a result of normal use)	
13. Total supply costs? (i.e., deck, galley, engine supplies such as lube oil etc.)	
14. Insurance?	
a. Boat	
b. Property and indemnity (P&I)	
c. Spill liability	
15. Other (i.e., taxes, equipment and communications etc)?	
<b>Fuel Costs</b>	
16. Fuel consumption (per day)? a) Actual use b) Hi Power use	
17. Fuel costs (per gallon w/tax)?	
<b>Operation Information</b>	
18. Days operable per year?	
19. Days working (revenue service)?	
<b>Administrative Costs</b>	
20. Overhead costs?	

### Barge Operating Costs Checklist

Please provide costs for each type of barge you operate (deck, hopper, tank, other) and for different sizes if relevant.

<b>Cost Item</b>	
<b>Barge Category</b>	
1. Barge Type (deck, open hopper, tank etc.)?	
a. If a tank, is it single, double, type I, II, or III?	
2. Barge Dimensions (LxWxD)?	
3. Number of Barges of this size?	
4. Barge Capacity (tons)?	
5. Type of service (grain, coal, oil etc)?	
<b>Barge Investment Cost</b>	
6. Replacement/Construction Cost?	
<b>Barge Operating Costs</b>	
7. Maintenance and Repairs?	
8. Supplies?	
9. Insurance?	
10. Other costs?	
<b>Annual Utilization</b>	
11. Days operable per year?	
12. Days working (revenue service)?	
<b>Port costs</b>	
13. Shifting?	
14. Fleeting?	
15. Cleaning?	
16.* Self-unload cost (operator, fuel, other)?	
17.* Self-unload rate (tons or barrels)?	
<b>Administrative Costs</b>	
18. Overhead costs?	

\* Hourly cost or rate