

SECTION 7 - SHALLOW-DRAFT SYSTEM ANALYSIS

OVERVIEW

GEM was run to estimate the total transportation cost savings (NED benefits) attributable to the with and without-project conditions. The model was used to estimate the benefits to the existing and improved systems for calendar years 1990, 2000, 2010, 2020, 2030, 2040, and 2060. For intermediate years, the system transportation benefits are estimated by assuming a constant change in benefits between the years explicitly modeled.

WITHOUT-PROJECT CONDITIONS

Table 7 - 1 summarizes the results of the without-project GEM runs. Displayed are the annual tonnages and expected levels of delay for modeled system locks. Annual tonnage moved on the entire system as well as the annual net transportation cost savings of the system. (Note that system tonnage does not include tonnage that does not transit at least one of the modeled GIWW locks.) The following paragraphs are observations regarding the model results for the without-project condition.

The GEM estimates of system and lock traffic for the existing 1990 conditions agreed with observed data. GEM showed 82.8 million tons of total traffic in the modeled system compared with the WCSC plus constructed movement tonnage estimate of 82.8 million tons (adjusted for the deletion of "small" and negative gross cost savings movements). The results at individual locks were also quite reasonable. However, because of the nature of the reconciliation process that jointly reconciled Port Allen, Algiers and Harvey locks, comparison of "actual" 1990 tonnages and GEM results required some additional treatment.

Table 7 - 2 provides the basis for comparing "actual" 1990 traffic with the model results, by lock. The first column of tonnages shows adjusted WCSC tonnage, i.e., original WCSC tonnage plus constructed movements. The second column of tonnages represents an estimate of adjusted WCSC corrected for alt code misassignment. This adjustment applied to Port Allen, Algiers and Harvey directly, and to Bayou Sorrel and Bayou Boeuf by routing implication. The basis for the estimate of the corrected routings for Port Allen, Algiers and Harvey was the LPMS tonnage for each lock multiplied by the sum of adjusted WCSC for the three locks, divided by the sum of LPMS for the three locks. The third and fourth column of tonnages represent the number of movements deleted from the movement file that had negative

Table 7 - 1

Without-Project Conditions
Tonnage and Delay by Lock

Lock	1990		2000		2010		2020	
	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)
Port Allen	27.8	1.7	30.8	2.5	31.2	2.6	31.5	2.8
Bayou Sorrel	27.1	5.5	29.6	15.9	30.1	19.6	30.3	22.9
IHNC	23.1	10.4	25.5	25.3	26.3	40.7	26.6	52.5
Algiers	24.5	3.3	24.5	3.3	26.4	5.3	27.0	6.4
Harvey	3.8	0.3	4.3	0.3	6.9	0.8	8.6	1.3
Bayou Boeuf	28.0	0.9	28.6	0.9	32.3	1.8	34.7	3.4
Calcasieu	46.3	1.3	50.2	1.8	56.9	4.0	62.3	18.0
Total Tons	82.8		87.4		96.1		100.8	
Total Net Savings	1,251.5		1,274.9		1,385.0		1,407.0	
Savings per Ton	15.12		14.60		14.42		13.96	

Lock	2030		2040		2060	
	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)	Tons (Millions)	Delay (Hrs)
Port Allen	31.7	2.9	31.9	2.9	32.5	3.2
Bayou Sorrel	30.3	22.8	30.3	22.1	30.3	22.6
IHNC	26.6	54.5	26.7	60.2	26.7	60.2
Algiers	27.4	7.3	27.7	8.4	27.7	8.1
Harvey	9.9	1.9	10.2	2.1	9.8	1.8
Bayou Boeuf	36.3	7.9	37.0	16.3	36.6	10.2
Calcasieu	63.4	88.3	63.7	101.3	63.8	182.7
Total Tons	102.3		103.4		104.9	
Total Net Savings	1,225.6		1,250.3		1,153.8	
Savings per Ton	11.98		12.09		11.00	

Table 7 - 2

Comparison of Reported 1990 Traffic and GEM Results
(1,000 Tons)

Lock	Adjusted WCSC	Adjusted WCSC Corrected for Foutings	Deleted Negative Movements	Deleted "Small" Movements	Comparison "Actual" 1990	GEM Results	GEM Differences
Port Allen	28,210	27,800	161	13	27,626	27,811	185
Bayou Sorrel	27,781	26,401	225	14	26,162	27,095	933
IHNC	23,493	23,493	405	32	23,056	23,056	0
Algiers	24,628	25,000	71	17	24,912	24,501	(411)
Harvey	3,338	3,600	57	15	3,528	3,780	252
Bayou Boeuf	27,345	27,628	112	33	27,483	27,967	484
Calcasieu	46,501	46,501	152	28	46,321	46,321	0

gross cost savings and those that were relatively "small". The last two columns show the individual lock tonnages from GEM and the difference between GEM and "actual" 1990.

The GEM results are quite reasonable estimates of recorded results for 1990. Given "non-optimal" actual behavior, the fact that "actual" 1990 tonnages are themselves only estimates for certain routes, the assignment of transportation costs to the population of movements from the actually costed movements in the sample, the approximation in delay function estimation in part due to the use of an average head condition, and the loss of some detail in the aggregation of the movement file, the results generated by GEM represent a high degree of calibration of the model for this study where emphasis is on the IHNC Lock.

The without-project condition results displayed in table 7 - 1 assume that all structures continue to provide service at historical levels. The results do not account for the services outages at IHNC Lock that would result from the rehabilitation work described in Section 6. The navigation impacts resulting from these outages are however, quite substantial, and must be taken into account.

To quantify the navigation impacts of these outages, the GEM was run with a modified navigation network specified. The specific modification was to express IHNC Lock capacity as zero. This created a situation that effectively represented lock closure. With IHNC Lock closed within the model logic, traffic with an IHNC routing was forced to seek a non-system alternative (Ten-Tom, rail, or truck) since there are no alternative system routings that involve IHNC Lock specified for any movement.

Several considerations lend support to this formulation of impact measurement. First, the duration of the closures is fairly significant, 30 days per closure. Given durations of this length, users would be motivated to make adjustments to current practices. Second, closures would be announced well in advance of implementation. This would permit users to carefully plan and schedule their actions. Third, the distribution of the gross cost savings for IHNC Lock traffic in the relevant time period is heavily weighted to the lower end of the savings scale relative to the savings that are equivalent to the length of the closures. Approximately 40 percent of tonnage has a gross rate savings equivalent to a wait of up to only three days, 85 percent of tonnage up to 15 days, and 95 percent of tonnage up to only 19 days. Consequently, the likelihood of diversions is great.

The closure scenario was run for the year 2000, the mid-point of the 5-year period during which the rehabilitation work is scheduled. The system transportation savings associated with this condition were subtracted from the without-project system transportation savings in order to measure the impact of closure. Given the non-seasonal nature of tonnage on this system, this annual value was divided by twelve to represent a monthly value.

The navigation system impacts of IHNC Lock closure are summarized in table 7 - 3. This table displays the change in the without-project and lock closure conditions for tonnages and average delays at each system lock. As a result of lock closure, total system tonnage is reduced by an amount equal to the without-project condition IHNC Lock tonnage. Because of the multiple lock use associated with the diverted tonnage, the volume at the other system locks declined as well. The tonnage decline at these other locks produces the beneficial effect of lowering their respective average delays. The traffic that continues to be served by these locks enjoys the advantage of the lower delay. The impact of these lower delays is captured in the system savings for the closure condition and mitigates, to some extent, the negative effect on system savings that results from the diverted traffic. In total, system savings would fall by \$242.9 million for a twelve month period (\$20.2 million per month), the equivalent of \$9.51 per diverted ton.

As described earlier in Section 6, the navigation losses that will result from IHNC Lock closure are part of the without-project condition. However, these losses are not reflected in the without-project condition displayed in table 7 - 1. As such, the system cost savings for the without-project condition are overstated. Therefore, when cost savings for improved conditions that eliminate the need for rehabilitation are subsequently measured, the savings for that improved condition will be understated. To correctly reflect the level of with-project savings and also to help isolate the impacts of lock closure, navigation losses associated with rehabilitation work have been reflected, not as part of the without-project condition, but as a separate impact that can be claimed, as appropriate, as a project savings.

WITH-PROJECT CONDITIONS

The with-project scenarios consist of six larger IHNC Lock sizes built north of the Claiborne Avenue Bridge. For each of these, two separate benefit calculations were done. One assuming that the existing bridge curfews on the Claiborne

Table 7 - 3

IHNC Lock Closure Impacts

Lock	W/O Project (Yr 2000)		IHNC Closure Change In:	
	Tons (1,000)	Delay (Hrs)	Tons (1,000)	Delay (Hrs)
Port Allen	30,817	2.5	20	0
Bayou Sorrel	29,808	15.9	9	-0.1
IHNC	25,531	25.3	(25,531)	-25.3
Algiers	24,513	3.3	(3,776)	-1.6
Harvey	4,343	0.3	(2,901)	-0.2
Bayou Boeuf	28,616	0.9	(6,078)	-0.5
Calcasieu	50,164	1.8	(5,451)	-0.6
Total System	87,350		(25,531)	
System Savings (\$1,000)	1,274,892		1,032,039	

Avenue Bridge will continue, the other assuming that the curfews would be removed. In addition to the alternatives just mentioned, two other with project scenarios were studied. The first analyzed the results of replacing the existing low level St. Claude Avenue Bridge with a mid-level bridge, while still using a "rehabilitated" existing lock. The second studied the effects of removing bridge curfews at the existing St. Claude and Claiborne Avenue Bridge, while retaining the existing "rehabilitated" lock and bridge structures. Focusing on the IHNC Lock, tables 7 - 4 through 7 - 10 display the average delay, traffic processed, and transportation cost savings results of the GEM runs for each scenario, including the without-project condition, by the future years specified above. The following paragraphs are observations regarding the model results.

Table 7 - 4 shows the GEM estimates of average delay per tow for the without-project and various with-project conditions. Table 7 - 4 shows that in the with-project scenarios of replacing the existing St. Claude Avenue Bridge with a mid-level bridge or removing bridge curfews, a significant reduction in IHNC Lock average delay results. However the magnitude of the reduction diminishes over time and finally reaches the point where the delay would return to the level of the without-project condition.

This behavior occurs because as these alternatives are implemented there would be a modest outward shift in the delay function (see figure 5 - 1) reflecting a higher capacity. While modest, the immediate effect of this shift on average delay would be significant because of the general functional form of the relationship. There would be movement from a point representing a high level of utilization on a relatively steep portion of the original function to a point representing a level of utilization on a much flatter portion of the new function. However, because the outward shift in capacity is modest, traffic need only increase modestly before the more steep portion of the new function is encountered where delay is sensitive to a change in traffic volume. Additional traffic is serviced but the system eventually equilibrates at a delay level equal to that of the without-project condition.

For the new lock construction alternatives, the outward shift in the delay function is sufficiently large relative to the traffic demand that delay remains low until the later years of the period of analysis. The same process described above for the "bridge only" alternatives still applies in principle however. As such, the new lock alternative that produces the smallest increase in capacity

Table 7 - 4
IHNC Lock Average Delays
By Alternative and Year
(Hours)

Condition	1990	2000	2010	2020	2030	2040	2060
Without Project	10.4	25.3	40.7	52.5	54.5	60.2	60.2
Removal of Bridge Curfews	6.3	15.3	38.2	40.7	54.5	54.5	60.2
Replace St. Claude Bridge	3.7	7.9	27.5	40.7	54.5	54.5	60.2
900 x 90 x 22 ft. (With bridge curfews)	0.6	0.8	1.2	1.7	3.1	10.8	40.7
900 x 90 x 22 ft. (Without bridge curfews)	0.4	0.5	0.7	0.9	1.5	4.0	40.7
900 x 110 x 22 ft. (With bridge curfews)	0.3	0.4	0.6	0.7	1.0	1.5	8.5
900 x 110 x 22 ft. (Without bridge curfews)	0.3	0.4	0.5	0.6	0.9	1.3	4.8
900 x 110 x 36 ft. (With bridge curfews)	0.5	0.6	0.7	0.9	1.3	2.0	11.1
900 x 110 x 36 ft. (Without bridge curfews)	0.3	0.4	0.5	0.6	0.8	1.2	4.7
1200 x 90 x 22 ft. (With bridge curfews)	0.3	0.3	0.4	0.5	0.7	0.9	3.1
1200 x 90 x 22 ft. (Without bridge curfews)	0.2	0.3	0.4	0.5	0.6	0.9	2.4
1200 x 110 x 22 ft. (With bridge curfews)	0.2	0.2	0.3	0.4	0.5	0.6	1.2
1200 x 110 x 22 ft. (Without bridge curfews)	0.2	0.2	0.3	0.3	0.4	0.5	1.0
1200 x 110 x 36 ft. (With bridge curfews)	0.2	0.2	0.3	0.3	0.4	0.6	1.2
1200 x 110 x 36 ft. (Without bridge curfews)	0.2	0.2	0.3	0.3	0.4	0.6	1.1

(900 x 90 x 22) is the first to experience significant increases in average delay.

Table 7 - 5 shows the traffic accommodated, or processed, at the IHNC Lock. Table 7 - 6 expresses these same traffic volumes as a percent of total unconstrained demand. Table 7 - 7 displays similar information, but in the form of unaccommodated traffic levels. These three tables demonstrate that all of the new lock construction alternatives accommodated essentially 100 percent of the IHNC Lock traffic demand through the year 2040. Not until 2060 are there any substantial diversions. However, in the without project and rehabilitated existing lock scenarios, significant traffic is diverted as early as 2010.

Tables 7 - 8 and 7 - 9 compare the system tonnage processed in the with and without project conditions. Table 7 - 8 displays the "bridge only" improvement alternatives and the lock improvement with bridge curfews alternatives. Table 7 - 9 displays the lock improvement without bridge curfews alternatives. Presented are the without-project tonnages at each system lock and project-induced changes in traffic, by lock, by year, for the various improved conditions. These improved future conditions begin to show changes in IHNC Lock traffic in the year 2000. These tonnage volumes for IHNC Lock can also be identified by referring back to the with and without-project tonnages in table 7 - 5.

At the other system locks, with-project traffic impacts are non-existent through 2020 for all alternatives. After 2020, induced traffic impacts appear but are minimal. The largest changes occur in 2060 at Harvey and Bayou Boeuf Locks where increases of less than 300,000 tons are indicated. Differences in induced/traffic between lock improvement alternatives are also minimal. No differences are indicated until 2060 and then only between the smallest capacity alternative (900 x 90 x 22) and all other lock improvement alternatives. As a consequence of the virtually identical with and without-project traffic at the other system locks, the with and without-project average delay differences would also be minimal.

Table 7 - 10 displays the total system transportation savings by year for the without-project condition and the total system and incremental transportation savings by year for each with-project alternative. System transportation cost savings represent the total transportation cost savings attributable to the entire modelled system network (existing system elements and all system additions assumed in place). Incremental transportation cost savings represent the portion of total system transportation cost savings attributable to the potential improvement under

Table 7 - 5

IHNC Lock Traffic Accomodated
By Alternative and Year
(1,000 Tons)

Condition	1990	2000	2010	2020	2030	2040	2060
Without Project	23,056	25,531	26,277	26,564	26,600	26,691	26,691
Removal of Bridge Curfews	23,056	26,130	27,670	27,738	27,999	27,999	28,072
Replace St. Claude Bridge	23,056	26,135	28,510	28,856	29,041	29,041	29,092
900 x 90 x 22 ft. (With bridge curfews)	23,056	26,135	29,811	33,355	37,533	42,436	44,150
900 x 90 x 22 ft. (Without bridge curfews)	23,056	26,135	29,811	33,355	37,533	42,503	45,894
900 x 110 x 22 ft. (With bridge curfews)	23,056	26,135	29,811	33,355	37,533	42,503	53,766
900 x 110 x 22 ft. (Without bridge curfews)	23,056	26,135	29,811	33,355	37,533	42,503	53,766
900 x 110 x 36 ft. (With bridge curfews)	23,056	26,135	29,811	33,355	37,533	42,503	53,766
900 x 110 x 36 ft. (Without bridge curfews)	23,056	26,135	29,811	33,355	37,533	42,503	53,766
1200 x 90 x 22 ft. (With bridge curfews)	23,056	26,135	29,811	33,355	37,533	42,503	53,766
1200 x 90 x 22 ft. (Without bridge curfews)	23,056	26,135	29,811	33,355	37,533	42,503	53,766
1200 x 110 x 22 ft. (With bridge curfews)	23,056	26,135	29,811	33,355	37,533	42,503	53,804
1200 x 110 x 22 ft. (Without bridge curfews)	23,056	26,135	29,811	33,355	37,533	42,503	53,804
1200 x 110 x 36 ft. (With bridge curfews)	23,056	26,135	29,811	33,355	37,533	42,503	53,804
1200 x 110 x 36 ft. (Without bridge curfews)	23,056	26,135	29,811	33,355	37,533	42,503	53,804

Table 7 - 6

IHNC Lock Percent of Total Demand Accomodated
By Alternative and Year

Condition	1990	2000	2010	2020	2030	2040	2060
Without Project	100%	98%	88%	80%	71%	63%	48%
Removal of Bridge Curfews	100%	100%	93%	83%	75%	66%	51%
Replace St. Claude Bridge	100%	100%	96%	87%	77%	68%	52%
900 x 90 x 22 ft. (With bridge curfews)	100%	100%	100%	100%	99.9%	99.7%	80%
900 x 90 x 22 ft. (Without bridge curfews)	100%	100%	100%	100%	99.9%	99.8%	83%
900 x 110 x 22 ft. (With bridge curfews)	100%	100%	100%	100%	99.9%	99.8%	97%
900 x 110 x 22 ft. (Without bridge curfews)	100%	100%	100%	100%	99.9%	99.8%	97%
900 x 110 x 36 ft. (With bridge curfews)	100%	100%	100%	100%	99.9%	99.8%	97%
900 x 110 x 36 ft. (Without bridge curfews)	100%	100%	100%	100%	99.9%	99.8%	97%
1200 x 90 x 22 ft. (With bridge curfews)	100%	100%	100%	100%	99.9%	99.8%	97%
1200 x 90 x 22 ft. (Without bridge curfews)	100%	100%	100%	100%	99.9%	99.8%	97%
1200 x 110 x 22 ft. (With bridge curfews)	100%	100%	100%	100%	99.9%	99.8%	97%
1200 x 110 x 22 ft. (Without bridge curfews)	100%	100%	100%	100%	99.9%	99.8%	97%
1200 x 110 x 36 ft. (With bridge curfews)	100%	100%	100%	100%	99.9%	99.8%	97%
1200 x 110 x 36 ft. (Without bridge curfews)	100%	100%	100%	100%	99.9%	99.8%	97%

Table 7 - 7

IHNC Lock Traffic Unaccommodated
By Alternative and Year
(1,000 Tons)

Condition	1990	2000	2010	2020	2030	2040	2060
Without Project	0	604	3,534	6,791	10,973	15,885	28,799
Removal of Bridge Curfews	0	5	2,141	5,617	9,574	14,577	27,418
Replace St. Claude Bridge	0	0	1,301	4,499	8,532	13,535	26,398
900 x 90 x 22 ft. (With bridge curfews)	0	0	0	0	40	140	11,340
900 x 90 x 22 ft. (Without bridge curfews)	0	0	0	0	40	73	9,596
900 x 110 x 22 ft. (With bridge curfews)	0	0	0	0	40	73	1,724
900 x 110 x 22 ft. (Without bridge curfews)	0	0	0	0	40	73	1,724
900 x 110 x 36 ft. (With bridge curfews)	0	0	0	0	40	73	1,724
900 x 110 x 36 ft. (Without bridge curfews)	0	0	0	0	40	73	1,724
1200 x 90 x 22 ft. (With bridge curfews)	0	0	0	0	40	73	1,724
1200 x 90 x 22 ft. (Without bridge curfews)	0	0	0	0	40	73	1,724
1200 x 110 x 22 ft. (With bridge curfews)	0	0	0	0	40	73	1,686
1200 x 110 x 22 ft. (Without bridge curfews)	0	0	0	0	40	73	1,686
1200 x 110 x 36 ft. (With bridge curfews)	0	0	0	0	40	73	1,686
1200 x 110 x 36 ft. (Without bridge curfews)	0	0	0	0	40	73	1,686

Table 7 - 8

Changes In System Traffic
By Alternative and Year
(1,000 Tons)

Lock	W/O Project Traffic	Remove Bridge Curfews	Replace St. Claude Bridge	900 x 90 x 22 ft. (With Curfews)	900 x 110 x 22 ft. (With Curfews)
<u>1990</u>					
Port Allen	27,811	0	0	0	0
Bayou Sorrel	27,095	0	0	0	0
IHNC	23,056	0	0	0	0
Algiers	24,501	0	0	0	0
Harvey	3,780	0	0	0	0
Bayou Bouef	27,967	0	0	0	0
Calcasieu	46,321	0	0	0	0
Total System	82,788	0	0	0	0
<u>2000</u>					
Port Allen	30,817	0	0	0	0
Bayou Sorrel	29,808	0	0	0	0
IHNC	25,531	599	604	604	604
Algiers	24,513	0	0	0	0
Harvey	4,343	0	0	0	0
Bayou Bouef	28,616	0	0	0	0
Calcasieu	50,164	0	0	0	0
Total System	87,350	599	604	604	604
<u>2010</u>					
Port Allen	31,174	0	0	0	0
Bayou Sorrel	30,115	0	0	0	0
IHNC	26,277	1,393	2,233	3,534	3,534
Algiers	26,417	0	0	0	0
Harvey	6,920	0	0	0	0
Bayou Bouef	32,318	0	0	0	0
Calcasieu	56,908	0	0	0	0
Total System	96,067	1,392	2,232	3,534	3,534
<u>2020</u>					
Port Allen	31,546	0	0	0	0
Bayou Sorrel	30,308	0	0	0	0
IHNC	26,564	1,174	2,292	6,791	6,791
Algiers	27,029	0	0	0	0
Harvey	8,609	0	0	0	0
Bayou Bouef	34,652	0	0	0	0
Calcasieu	62,271	0	0	0	0
Total System	100,778	1,174	2,293	6,791	6,791

Table 7 - 8

Changes In System Traffic
By Alternative and Year
(1,000 Tons)

Lock	W/O Project Traffic	Remove Bridge Curfews	Replace St. Claude Bridge	900 x 90 x 22 ft. (With Curfews)	900 x 110 x 22 ft. (With Curfews)
<u>2030</u>					
Port Allen	31,737	0	0	(13)	(13)
Bayou Sorrel	30,303	0	0	(12)	(12)
IHNC	26,600	1,399	2,441	10,933	10,933
Algiers	27,399	0	0	32	32
Harvey	9,850	0	0	151	151
Bayou Bouef	36,313	0	0	182	182
Calcasieu	63,640	0	0	1	1
Total System	102,276	2,441	1,399	10,734	10,734
<u>2040</u>					
Port Allen	31,914	0	0	12	12
Bayou Sorrel	30,267	0	0	12	12
IHNC	26,691	1,308	2,350	15,745	15,812
Algiers	27,745	1	1	(64)	(64)
Harvey	10,236	4	4	87	87
Bayou Bouef	37,018	0	0	19	19
Calcasieu	63,686	11	11	51	52
Total System	103,416	2,165	1,123	14,612	14,613
<u>2060</u>					
Port Allen	32,465	0	0	0	0
Bayou Sorrel	30,304	0	0	0	0
IHNC	26,691	1,381	2,401	17,459	27,075
Algiers	27,664	0	0	8	47
Harvey	9,782	0	0	48	271
Bayou Bouef	36,625	0	0	50	265
Calcasieu	63,825	0	0	0	0
Total System	104,876	2,402	1,382	17,318	26,112

NOTE: Lock totals may not add to system totals due to common traffic between locks.

Table 7 - 8

Changes in System Traffic
By Alternative and Year
(1,000 Tons)

Lock	W/O Project Traffic	900 x 110 x 36 ft. (With Curfews)	1200 x 90 x 22 ft. (With Curfews)	1200 x 110 x 22 ft. (With Curfews)	1200 x 110 x 36 ft. (With Curfews)
<u>1990</u>					
Port Allen	27,811	0	0	0	0
Bayou Sorrel	27,095	0	0	0	0
IHNC	23,056	0	0	0	0
Algiers	24,501	0	0	0	0
Harvey	3,780	0	0	0	0
Bayou Bouef	27,967	0	0	0	0
Calcasieu	46,321	0	0	0	0
Total System	82,788	0	0	0	0
<u>2000</u>					
Port Allen	30,817	0	0	0	0
Bayou Sorrel	29,808	0	0	0	0
IHNC	26,133	604	604	604	604
Algiers	24,513	0	0	0	0
Harvey	4,343	0	0	0	0
Bayou Bouef	28,616	0	0	0	0
Calcasieu	50,164	0	0	0	0
Total System	87,952	604	604	604	604
<u>2010</u>					
Port Allen	31,174	0	0	0	0
Bayou Sorrel	30,115	0	0	0	0
IHNC	27,296	3,534	3,534	3,534	3,534
Algiers	26,417	0	0	0	0
Harvey	6,920	0	0	0	0
Bayou Bouef	32,318	0	0	0	0
Calcasieu	56,908	0	0	0	0
Total System	97,086	3,534	3,534	3,534	3,534
<u>2020</u>					
Port Allen	31,546	0	0	0	0
Bayou Sorrel	30,308	0	0	0	0
IHNC	27,296	6,791	6,791	6,791	6,791
Algiers	27,029	0	0	0	0
Harvey	8,609	0	0	0	0
Bayou Bouef	34,652	0	0	0	0
Calcasieu	62,271	0	0	0	0
Total System	101,511	6,791	6,791	6,791	6,791

Table 7 - 8

Changes In System Traffic
By Alternative and Year
(1,000 Tons)

Lock	W/O Project Traffic	900 x 110 x 36 ft. (With Curfews)	1200 x 90 x 22 ft. (With Curfews)	1200 x 110 x 22 ft. (With Curfews)	1200 x 110 x 36 ft. (With Curfews)
<u>2030</u>					
Port Allen	31,737	(13)	(13)	(13)	(13)
Bayou Sorrel	30,303	(12)	(12)	(12)	(12)
IHNC	27,471	10,933	10,933	10,933	10,933
Algiers	27,399	32	32	32	32
Harvey	9,850	151	151	151	151
Bayou Bouef	36,313	182	182	182	182
Calcasieu	63,640	1	1	1	1
Total System	103,147	10,734	10,734	10,734	10,734
<u>2040</u>					
Port Allen	31,914	12	12	12	12
Bayou Sorrel	30,267	12	12	12	12
IHNC	27,471	15,812	15,812	15,812	15,812
Algiers	27,746	(64)	(64)	(64)	(64)
Harvey	10,240	87	87	87	87
Bayou Bouef	37,018	19	19	19	19
Calcasieu	63,697	52	52	52	52
Total System	104,011	14,613	14,613	14,613	14,613
<u>2060</u>					
Port Allen	32,465	0	0	0	0
Bayou Sorrel	30,304	0	0	0	0
IHNC	27,520	27,075	27,075	27,113	27,113
Algiers	27,664	45	47	54	54
Harvey	9,792	262	271	309	309
Bayou Bouef	36,625	265	265	287	287
Calcasieu	63,825	0	0	0	0
Total System	105,705	26,112	26,112	26,112	26,112

NOTE: Lock totals may not add to system totals due to common traffic between locks.

Table 7 - 9

Changes in System Traffic
By Alternative and Year
(1,000 Tons)

Lock	W/O Project Traffic	900 x 90 x 22 ft. (Without Curfews)	900 x 110 x 22 ft. (Without Curfews)	900 x 110 x 36 ft. (Without Curfews)
<u>1990</u>				
Port Allen	27,811	0	0	0
Bayou Sorrel	27,095	0	0	0
IHNC	23,056	0	0	0
Algiers	24,501	0	0	0
Harvey	3,780	0	0	0
Bayou Bouef	27,967	0	0	0
Calcasieu	46,321	0	0	0
Total System	82,788	0	0	0
<u>2000</u>				
Port Allen	30,817	0	0	0
Bayou Sorrel	29,808	0	0	0
IHNC	25,531	604	604	604
Algiers	24,513	0	0	0
Harvey	4,343	0	0	0
Bayou Bouef	28,616	0	0	0
Calcasieu	50,164	0	0	0
Total System	87,350	604	604	604
<u>2010</u>				
Port Allen	31,174	0	0	0
Bayou Sorrel	30,115	0	0	0
IHNC	26,277	3,534	3,534	3,534
Algiers	26,417	0	0	0
Harvey	6,920	0	0	0
Bayou Bouef	32,318	0	0	0
Calcasieu	56,908	0	0	0
Total System	96,067	3,534	3,534	3,534
<u>2020</u>				
Port Allen	31,546	0	0	0
Bayou Sorrel	30,308	0	0	0
IHNC	26,564	6,791	6,791	6,791
Algiers	27,029	0	0	0
Harvey	8,609	0	0	0
Bayou Bouef	34,652	0	0	0
Calcasieu	62,271	0	0	0
Total System	100,778	6,791	6,791	6,791

Table 7 - 9

Changes In System Traffic
By Alternative and Year
(1,000 Tons)

Lock	W/O Project Traffic	900 x 90 x 22 ft. (Without Curfews)	900 x 110 x 22 ft. (Without Curfews)	900 x 110 x 36 ft. (Without Curfews)
<u>2030</u>				
Port Allen	31,737	(13)	(13)	(13)
Bayou Sorrel	30,303	(12)	(12)	(12)
IHNC	26,600	10,933	10,933	10,933
Algiers	27,399	32	32	32
Harvey	9,850	151	151	151
Bayou Bouef	36,313	182	182	182
Calcasieu	63,640	1	1	1
Total System	102,276	10,734	10,734	10,734
<u>2040</u>				
Port Allen	31,914	12	12	12
Bayou Sorrel	30,267	12	12	12
IHNC	26,691	15,812	15,812	15,812
Algiers	27,745	(64)	(64)	(64)
Harvey	10,236	87	87	87
Bayou Bouef	37,018	19	19	19
Calcasieu	63,686	52	52	52
Total System	103,416	14,613	14,613	14,613
<u>2060</u>				
Port Allen	32,465	0	0	0
Bayou Sorrel	30,304	0	0	0
IHNC	26,691	19,203	27,075	27,075
Algiers	27,664	8	47	47
Harvey	9,782	48	271	271
Bayou Bouef	36,625	50	265	265
Calcasieu	63,825	0	0	0
Total System	104,876	19,063	26,112	26,112

NOTE: Lock totals may not add to system totals due to common traffic between locks.

Table 7 - 9

Changes In System Traffic
By Alternative and Year
(1,000 Tons)

Lock	W/O Project Traffic	1200 x 90 x 22 ft. (Without Curfews)	1200 x 110 x 22 ft. (Without Curfews)	1200 x 110 x 36 ft. (Without Curfews)
<u>1990</u>				
Port Allen	27,811	0	0	0
Bayou Sorrel	27,095	0	0	0
IHNC	23,056	0	0	0
Algiers	24,501	0	0	0
Harvey	3,780	0	0	0
Bayou Bouef	27,967	0	0	0
Calcasieu	46,321	0	0	0
Total System	82,788	0	0	0
<u>2000</u>				
Port Allen	30,817	0	0	0
Bayou Sorrel	29,808	0	0	0
IHNC	25,531	604	604	604
Algiers	24,513	0	0	0
Harvey	4,343	0	0	0
Bayou Bouef	28,616	0	0	0
Calcasieu	50,164	0	0	0
Total System	87,350	604	604	604
<u>2010</u>				
Port Allen	31,174	0	0	0
Bayou Sorrel	30,115	0	0	0
IHNC	26,277	3,534	3,534	3,534
Algiers	26,417	0	0	0
Harvey	6,920	0	0	0
Bayou Bouef	32,318	0	0	0
Calcasieu	56,908	0	0	0
Total System	96,067	3,534	3,534	3,534
<u>2020</u>				
Port Allen	31,546	0	0	0
Bayou Sorrel	30,308	0	0	0
IHNC	26,564	6,791	6,791	6,791
Algiers	27,029	0	0	0
Harvey	8,609	0	0	0
Bayou Bouef	34,652	0	0	0
Calcasieu	62,271	0	0	0
Total System	100,778	6,791	6,791	6,791

Table 7 - 9
 Changes In System Traffic
 By Alternative and Year
 (1,000 Tons)

Lock	W/O Project Traffic	1200 x 90 x 22 ft. (Without Curfews)	1200 x 110 x 22 ft. (Without Curfews)	1200 x 110 x 36 ft. (Without Curfews)
<u>2030</u>				
Port Allen	31,737	(13)	(13)	(13)
Bayou Sorrel	30,303	(12)	(12)	(12)
IHNC	26,600	10,933	10,933	10,933
Algiers	27,399	32	32	32
Harvey	9,850	151	151	151
Bayou Bouef	36,313	182	182	182
<u>Calcasieu</u>	<u>63,640</u>	<u>1</u>	<u>1</u>	<u>1</u>
Total System	102,276	10,734	10,734	10,734
<u>2040</u>				
Port Allen	31,914	12	12	12
Bayou Sorrel	30,267	12	12	12
IHNC	26,691	15,812	15,812	15,812
Algiers	27,745	(64)	(64)	(64)
Harvey	10,236	87	87	87
Bayou Bouef	37,018	19	19	19
<u>Calcasieu</u>	<u>63,686</u>	<u>52</u>	<u>52</u>	<u>52</u>
Total System	103,416	14,613	14,613	14,613
<u>2060</u>				
Port Allen	32,465	0	0	0
Bayou Sorrel	30,304	0	0	0
IHNC	26,691	27,075	27,113	27,113
Algiers	27,664	47	54	54
Harvey	9,782	271	309	309
Bayou Bouef	36,625	265	287	287
<u>Calcasieu</u>	<u>63,825</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total System	104,876	26,112	26,112	26,112

NOTE: Lock totals may not add to system totals due to common traffic between locks.

Table 7-10

Shallow-Draft
Total & Incremental Transportation Savings
(1992, \$1,000 7.75%)

Condition	1990	2000	2010	2020	2030	2040	2060	Average Annual
Without-Project	1,251,510	1,274,892	1,385,961	1,407,014	1,225,598	1,250,316	1,153,804	
Existing Lock	1,256,850	1,289,462	1,389,911	1,425,148	1,225,598	1,243,889	1,153,804	9,997 1/
Existing Bridge w/o curfews at St. Claude Bridge	5,339	14,570	3,950	18,134	0	(6,427)	0	
Existing Lock Replace St. Claude Bridge w/o curfews	1,260,154 8,644	1,300,297 25,404	1,406,748 20,787	1,425,148 18,134	1,225,598 0	1,243,889 (6,427)	1,153,804 0	13,013 2/
900 x 90 x 22 w/curfew	1,264,184 12,674	1,310,828 35,934	1,459,779 64,818	1,498,897 89,883	1,324,087 98,489	1,276,927 26,611	1,195,725 41,920	82,849 3/
900 x 90 x 22 w/o curfew	1,264,544 13,034	1,311,377 36,485	1,451,694 65,733	1,498,453 91,439	1,327,423 101,825	1,291,192 40,876	1,195,725 41,920	86,174 3/
900 x 110 x 22 w/curfew	1,264,558 13,048	1,311,429 36,536	1,451,848 65,887	1,498,847 91,834	1,328,617 103,020	1,297,359 47,043	1,283,490 129,685	90,650 3/
900 x 110 x 22 w/o curfew	1,264,596 13,085	1,311,486 36,594	1,451,942 65,981	1,498,997 91,984	1,328,885 103,287	1,297,937 47,621	1,284,826 141,022	91,290 3/
900 x 110 x 36 w/curfew	1,264,418 12,908	1,311,229 36,337	1,451,552 65,591	1,498,420 91,406	1,327,957 102,359	1,296,218 45,902	1,275,440 121,635	89,806 3/
900 x 110 x 36 w/o curfew	1,264,610 13,100	1,311,506 36,614	1,451,970 65,009	1,499,037 92,023	1,328,942 103,345	1,296,025 47,709	1,294,894 141,090	91,340 3/
1200 x 90 x 22 w/curfew	1,264,909 13,399	1,311,866 36,974	1,452,419 65,458	1,499,594 92,581	1,329,678 104,080	1,299,112 48,796	1,300,789 146,985	93,688 4/
1200 x 90 x 22 w/o curfew	1,264,920 13,410	1,311,884 36,992	1,452,449 65,488	1,499,646 92,632	1,329,773 104,175	1,299,315 48,999	1,302,766 148,961	93,849 4/

Table 7 - 10

Shallow-Draft
Total Incremental Transportation Savings
(1992, \$1,000, 7.75%)

Condition	1990	2000	2010	2020	2030	2040	2060	Average Annual
1200 x 110 x 22 w/curfew	1,264,976 13,466	1,311,969 37,076	1,452,583 66,622	1,499,852 92,838	1,330,115 104,517	1,299,955 49,639	1,305,464 151,679	94,248 4/
1200 x 110 x 22 w/o curfew	1,264,998 13,488	1,312,000 37,108	1,452,629 66,668	1,499,917 92,904	1,330,214 104,616	1,340,115 49,798	1,306,004 152,199	94,353 4/
1200 x 110 x 36 w/curfew	1,264,994 13,484	1,311,993 37,100	1,452,616 66,655	1,499,895 92,882	1,330,174 104,576	1,340,035 49,719	1,305,601 151,797	94,304 4/
1200 x 110 x 36 w/o curfew	1,264,995 13,484	1,311,995 37,102	1,452,621 66,660	1,499,905 92,892	1,330,195 104,597	1,340,082 49,766	1,305,891 152,079	94,322 4/

- 1/ Over the period 1996 - 2045
- 2/ Over the period 2004 - 2053
- 3/ Over the period 2011 - 2060
- 4/ Over the period 2012 - 2061

consideration (measured as the difference between with and without-project total transportation cost savings).

Until alternatives show significant differences in IHNC Lock average delay and traffic diversions, transportation savings are similar. The incremental savings indicate that these are only short to intermediate term savings generated by the "bridge only" improvement alternatives. The incremental transportation savings also indicate that savings for the lock construction plans are similar in magnitude until the later years. This result follows from the fact IHNC Lock traffic diversions are similar, system traffic impacts are similar, and differences in IHNC Lock delays are similar until the later project years.

Also presented in table 7 - 10 is the average annual incremental transportation savings for each alternative. The average annual value is expressed as of the base year for each alternative (discussion of alternative plan base years is provided in Section 10).

Several observations regarding these average annual values are noteworthy. First, the "bridge only" alternatives generate savings that are only about 19 to 22 percent (unadjusted for base year differences) of the lock construction alternatives. Second, the lock construction alternative with the highest savings (1200 x 110 x 22 without bridge curfews) is only about 14 percent greater (unadjusted for base year differences) than the alternative with the lowest level of savings (900 x 90 x 22 with bridge curfews). Third, as the lock capacity of a new lock alternative increases, the differences between with and without bridge curfews decreases. However, even for the lowest capacity alternative, the difference in average annual transportation savings is only about 4.0 percent. The lower the traffic processed relative to lock capacity, the smaller will be the effect of disruptions to navigation as from bridge curfews.