Total time open in minutes is divided by sixty to express open time as a fraction of an hour.

Step 3: Calculate the hourly flow of each vehicle type for peak and off-peak periods. This is the same method as described for calculating navigation independent costs.

Step 4: Generate queues and average delay for peak and off-peak periods. Demand volume and bridge capacity are required to generate queues and average delay. Demand volume is the hourly flow of all vehicle types as calculated in step 3 above. Bridge capacity is equal to [one minus the percent of time the bridge is open during an hour] times demand volume. The arrival rate and average delay are calculated as described earlier in the queuing methodology portion of this section. Average delay in minutes is converted into average delay as a percent of an hour by dividing by sixty.

Step 5: Calculate navigation dependent costs on an hourly basis for each vehicle type for peak and off-peak periods. Navigation dependent costs consist of two parts: value of passenger time during delay and vehicle idling costs during delay. The value of passenger time is equal to the number of vehicles times the number of passengers per vehicle times the value of passenger time times the average delay as a percent of an hour. Idling costs are equal to a specified cost per vehicle hour times the number of vehicles times the average delay as a percent of an hour. The sum of these two hourly components are converted to an annual basis by multiplying by the annual number of period hours.

DIFFERENTIAL RUNNING SPEED APPROACH

As an alternative to the queuing method, a simpler technique is available with use of the differential running speed approach. The essence of this methodology requires the use of differential average running speeds that characterize the periods inclusive and exclusive of a bridge opening. The use of slower speeds to capture the effects of a bridge opening results in added user costs compared to the higher speed of a free-flow period.

Cost Calculation Procedure

The calculation procedure of the differential running speed approach strongly resembles the procedure used in calculation of navigation independent costs in the queuing method. The following steps are required.

Step 1: Calculate the hourly flow of each vehicle type for peak and off-peak periods in the same manner as described previously.

Step 2: Calculate the running cost per trip for each vehicle type using a weighted speed to reflect average bridge open time for peak and off-peak periods. Running cost per trip is calculated exactly as in the navigation independent costs portion of the queuing method with the exception of the selected speed. In this procedure the speed (transit with no bridge interruption) and the interrupted, or effective, speed assuming an average bridge open time are factored into the average running speeds. These with and without bridge opening speeds are weighted by the percent of an hour a bridge is open for a particular scenario. The bridge open percentage is calculated in exactly the same manner as previously described in the navigation dependent costs portion of the queuing method. Running cost per trip is then calculated using this weighted speed (see table 9-12).

Step 3: Calculate the value of time per vehicle crossing for each vehicle type for peak and off-peak periods. Using the weighted average speed, this step is the same as described earlier.

Step 4: Calculate total cost on an hourly and annual basis for each vehicle type for peak and off-peak periods, same as described earlier.

SELECTION OF METHODS

In order that the difference in peak and off-peak periods be best addressed, a combination of the two approaches has been selected to estimate vehicle costs. Queuing theory for peak-hour periods and average running speed, inclusive of bridge opening delays, for off-peak hours are most sensitive to the traffic conditions peculiar to the different service levels associated with peak and off-peak periods.

The results of test applications showed that for the peak-hour traffic delay estimate, the queuing-based methods yielded a more realistic value compared to the running-time approach. The effect of traffic interruptions from bridge openings during peak periods was not adequately captured by the differential running speed methods. Because of high roadway utilization during this period, interruptions produce a significant impact on delays and costs. The differential running speed method had the effect of averaging out the interrupted and free flow components to

Table 9-12

Off-Peak
Vehicle Speeds and Bridge Open Times

Condition	Bridge Open Time (in minutes)	Speed (in mph)
Existing		
St. Claude (low)		
free-flow	--	28.0
interrupted	7.4	8.0
weighted	--	26.0
Claiborne (mid)		
free-flow	--	26.0
interrupted	6.2	9.0
weighted	--	23.9
Florida (low)		
free-flow	--	24.0
interrupted	6.4	9.0
weighted	--	23.9
Without-Project		
St. Claude (low)		
free-flow	--	28.0
interrupted	7.4	8.0
weighted	--	26.0
Claiborne (mid)		
free-flow	--	26.0
interrupted	6.2	9.0
weighted	--	23.9
Florida (high)		
free-flow	--	55.0

Table 9-12 (continued)

Off-Peak
Vehicle Speeds and Bridge Open Times

Condition	Bridge Open Time (in minutes)	Speed (in mph)
With-Project		
St. Claude (low)		
free-flow	--	28.0
interrupted	7.4	8.0
weighted	--	19.7
Claiborne (mid)		
free-flow	--	26.0
interrupted	6.5	9.0
weighted	--	22.5
Florida (high)		
free-flow	--	55.0
With-Project		
St. Claude (mid)		
free-flow	--	28.0
interrupted	6.5	8.0
weighted	--	27.5
Claiborne (mid)		
free-flow	--	24.0
interrupted	6.5	9.0
weighted	--	23.6
Florida (high)		
free-flow	--	55.0

such a degree that the impact of the interrupted component was lost.

However, for off-peak analyses, the queuing approach did not appear to generate realistic results. This was primarily due to the low traffic volumes affected by the bridge openings. The queuing method is valid only under conditions where the traffic volume exceeds the practical capacity (inclusive of the bridge opening) of the analysis section. As a result, the queuing method grossly overstated the delay and cost estimates for the off-peak period. Therefore, use of the running-time approach utilizing properly weighted running speeds was selected as the preferred method for off-peak analyses.

MODEL RESULTS

WITHOUT-PROJECT CONDITIONS

The existing conditions for IHNC bridge crossings are described by a low-level bridge at St. Claude Avenue, a mid-level bridge at Claiborne Avenue, and a low-level bridge at Florida Avenue. Each bridge's relative share of 1990 total IHNC crossing traffic, as displayed earlier in table 9-1, shows 35, 51, and 14 percent for St. Claude, Claiborne, and Florida, respectively. The significant differences in relative shares are explained by several factors. As the only mid-level bridge in the three bridge system, Claiborne Avenue suffers fewer interruptions from shallow-draft traffic than does St. Claude Avenue. This fact alone explains the desirability of Claiborne over St. Claude. The extremely low share at Florida is the result of two conditions. The first is the fact that it is a low-level bridge, and therefore suffers significantly from navigation induced delays. The second, and more important consideration is the fact that access to the bridge is limited. Because there is no major traffic corridor associated with either side of the Florida crossing, through-traffic views the inconvenience of limited access as a significant limitation to Florida use. The combined effects of the low-level crossing and limited access make Florida much less desirable in the existing condition than the two alternative IHNC crossings.

The IHNC bridge crossings provide access between St. Bernard Parish and the portion of the City of New Orleans bounded by the Mississippi River, the IHNC, and the Mississippi River Gulf Outlet with the City of New Orleans upriver of the IHNC. The crossings over the IHNC do not provide exclusive access between the described areas. However, for most traffic, they represent the shortest route in terms of both time and distance and, therefore, represent the most efficient route. Alternative routes to the IHNC crossings typically add twenty or more miles one-way to a trip. As a result, most vehicles will incur considerable delay before diverting to alternate routes.

The future without-project condition has the same bridge configuration as described for the existing condition, with the exception of Florida Avenue. The State of Louisiana has authorized a new high-level span to be built at Florida Avenue. Estimates for the impact of this new crossing on relative shares and volumes of traffic captured by the different bridges were prepared by the Regional Planning Commission for Jefferson, Orleans, St. Bernard and St. Tammany Parishes (RPC). The RPC maintains a set of travel demand models for use in maintenance of the region's Long Range Transportation Plan. The travel demand models use socioeconomic information which suggests the number and nature of trips generated in the traffic corridor. They estimate that, as a result of changes in both these socioeconomic variables as well as the structural changes to the roadways, the relative shares of traffic carried by the bridges in the year 2000 would shift to 33, 45, and 22 percent on St. Claude, Claiborne, and Florida, respectively. The majority of the increased traffic on Florida appears to be due to trips formerly located on Claiborne Avenue (see table 9-1) which will now be assured of uninterrupted transit over the IHNC on the high-rise Florida Avenue Bridge. However, the existing constraints on Florida Avenue continue to be present in the without-project condition, namely, poor access, and single lane feeder streets. As a result, the full potential for capturing traffic share by the new high-level Florida Avenue Bridge is not realized.

Future without-project traffic volumes were also generated by the RPC. Limited growth of existing traffic volumes are forecast, based on modest population growth projections and small changes in related variables, such as employment.

Table 9-13 summarizes bridge user costs for the without-project condition. The distribution of costs for each bridge in table 9-13 is a reflection of bridge levels and traffic volume. Bridge specific peak-period navigation independent costs, which represent free-flow running costs, are approximately proportional to relative traffic shares.

This is not the case, however, with respect to peak period navigation dependent costs. St. Claude's share of navigation dependent costs is greatly in excess of its share of traffic volume. The reason for this is that St. Claude is a low-level crossing. While the peak-period bridge curfews prevent St. Claude from being raised as

Table 9-13
Vehicle Costs
Without-Project
(in 1992 $1,000)

	1990	2000	2010	2020	2030	2040	2060
PEAK NAVIGATION DEPENDENT COSTS							
St. Claude	4,929	5,465	6,344	6,444	6,444	6,444	6,444
Claiborne	1,364	1,259	764	783	783	783	783
Florida	1,507	0	0	0	0	0	0
TOTAL	7,800	6,724	7,107	7,227	7,227	7,227	7,227
PEAK NAVIGATION INDEPENDENT COSTS							
St. Claude	3,610	3,978	4,460	4,495	4,495	4,495	4,495
Claiborne	6,765	6,671	5,840	5,886	5,886	5,886	5,886
Florida	1,415	1,553	1,709	1,723	1,723	1,723	1,723
TOTAL	11,790	12,202	12,009	12,104	12,104	12,104	12,104
TOTAL PEAK COSTS	19,589	18,926	19,116	19,332	19,332	19,332	19,332
OFF-PEAK COSTS							
St. Claude	4,100	4,264	4,444	4,478	4,481	4,481	4,481
Claiborne	6,863	6,641	6,275	6,322	6,324	6,324	6,324
Florida	1,706	2,353	2,593	2,619	2,619	2,619	2,619
TOT OFF-PEAK COST	12,669	13,258	13,312	13,419	13,424	13,424	13,424
GRAND TOTAL COST	32,258	32,184	32,428	32,751	32,756	32,756	32,756

NOTE: Columns may not add due to rounding frequently as it would otherwise be raised in the absence of a curfew, it is still raised on average much more often than is the Claiborne Bridge. As a result, St. Claude has a disproportionately high share of navigation dependent costs and Claiborne has a disproportionately small share. The navigation dependent costs for Florida Avenue are similar to those for St. Claude in 1990 only. As of the year 2000, the high-level Florida Bridge will be in place and, therefore, there will no longer be navigation dependent costs for Florida trips.

The distribution of peak-period navigation dependent costs is significant since these costs represent the vast majority of navigation induced delays that could potentially be reduced in a with-project condition. Reductions in navigation dependent costs represent the bulk of vehicular benefits for the peak period.

Costs for the off-peak period are also displayed in table 9-13. As with peak-period navigation independent costs, off-peak costs are approximately proportional to relative traffic share. This is not surprising due to the similarity between the calculation procedure of the free-flow running costs and the differential running speeds method for the off-peak period. Unlike the queuing methodology of the peak period, the differential running speed approach of the off-peak period is unable to differentiate between navigation independent costs and navigation dependent costs.

Table 9-14 displays additional detail relative to vehicle delays. The percent of an hour each bridge is open during the peak period is equal to the maximum percentage implicit in the bridge curfews. The maximum percentage is always reached because the volume of navigation traffic is in excess of that required to reach the maximum allowed open time. Because the restrictive curfews limit the flow of navigation traffic during the peak period, the bridges must be open a greater portion of time in the off-peak period when no restriction exists. This fact is reflected in the percent open time of table 9-14. As discussed earlier, the fact that Claiborne is a mid-level crossing results in relatively low navigation dependent costs. This is reflected in the low open and delay times.

As can be seen in tables 9-13 and 9-14, construction of the high-rise Florida Bridge eliminates all peak navigation dependent costs for Florida Avenue traffic, causing total peak navigation costs to decline from 1990-2000. Increases in both navigation and vehicular traffic volumes are responsible for increases in future without-project costs over the time period. Decreased traffic volumes on

Table 9-14
Vehicle Delays
Without-Project
(in 1992 dollars)

	1990	2000	2010	2020	2030	2040	2060
ST. CLAUDE							
% HR OPEN PEAK	10.5	10.5	10.5	10.5	10.5	10.5	10.5
% HR OPEN OFF-PEAK	18.6	20.7	21.5	21.5	21.6	21.6	21.6
% HR DELAY PEAK	15.8	17.0	19.1	19.2	19.2	19.2	19.2
$ DELAY/VEHICLE/HOUR - PEAK							
AUTOS	0.935	1.007	1.130	1.140	1.140	1.140	1.140
SM TRUCKS	1.692	1.826	2.048	2.064	2.064	2.064	2.064
HVY TRUCKS	2.078	2.241	2.512	2.534	2.534	2.534	2.534
BUSSES	34.053	36.684	41.158	41.526	41.526	41.526	41.526
CLAIBORNE							
% HR OPEN PEAK	0.9	0.9	0.9	0.9	0.9	0.9	0.9
% HR OPEN OFF-PEAK	2.5	2.8	2.8	2.8	2.9	2.9	2.9
% HR DELAY PEAK	3.3	3.1	2.0	2.0	2.0	2.0	2.0
$ DELAY/VEHICLE/HOUR - PEAK							
AUTOS	0.194	0.185	0.119	0.121	0.121	0.121	0.121
SM TRUCKS	0.352	0.336	0.216	0.220	0.220	0.220	0.220
HVY TRUCKS	0.431	0.412	0.265	0.270	0.270	0.270	0.270
BUSSES	3.143	3.000	1.929	1.929	1.929	1.929	1.929
FLORIDA							
% HR OPEN PEAK	11.5	0.0	0.0	0.0	0.0	0.0	0.0
% HR OPEN OFF-PEAK	14.8	0.0	0.0	0.0	0.0	0.0	0.0
% HR DELAY PEAK	13.6	0.0	0.0	0.0	0.0	0.0	0.0
$ DELAY/VEHICLE/HOUR - PEAK							
AUTOS	0.808	0.000	0.000	0.000	0.000	0.000	0.000
SM TRUCKS	1.465	0.000	0.000	0.000	0.000	0.000	0.000
HVY TRUCKS	1.795	0.000	0.000	0.000	0.000	0.000	0.000

Claiborne from 1990 to 2000 are responsible for lower costs for Claiborne and for total costs. This is not the case from 2000 to 2010 when, despite a further decline in Claiborne volume, the increased efficiency of traffic relocated from Claiborne to Florida outweighs Claiborne's decreased traffic and delay costs. Thus, total costs increased from 2000 to 2010.

Costs for Diverted Traffic

Although the RPC's travel demand model accounts for vehicular traffic which crosses the IHNC bridges, it does not explicitly capture the trips that would use these routes if the congestion levels and delays were not present. With-project conditions induce the return of these trips back to the IHNC crossings. Since the cost of these 'diverted' trips was not included in the vehicle model's output of vehicle costs, an adjustment was in order to make without-project costs comparable to with-project costs. According to the RPC model results, in the year 2020 there will be 7,650 more trips which occur in the with-project scenario than will occur in the without-project scenario. This number is used to represent the number of diverted trips which were not originally captured.

The cost of making the diverted trip was estimated using costs derived from the vehicle model calculations. The diverted trip must cost less than the IHNC route in the without-project condition, or it will use one of the IHNC crossings. Similarly, the diverted trip must cost more than the with-project cost of an IHNC trip, or it will not shift to one of the IHNC routes once the with-project improvements are implemented. Since total and diverted traffic volumes for the IHNC crossings were estimated to be the same for all lock construction alternatives, the estimates from the lock scenario with the lowest per trip costs were used to represent minimum diversion costs. This average trip cost was then assigned to each of the 7,650 diverted vehicles and added to without-project costs beginning in the year 2000 in table 9-17 which summarizes with and without-project total vehicle costs.

WITH-PROJECT CONDITIONS

The with-project condition includes the replacement of the existing lock with a new lock located north of Claiborne Avenue. The St. Claude Bridge is replaced with an updated low-rise bridge and Claiborne remains as a mid-rise and is refitted with higher towers. As previously mentioned, the high-rise Florida Avenue Bridge will be built by the State in the without-project condition. An alternate with-

Table 9-15
Vehicle Costs
1200x110x36 Lock with curfew
(in 1992 $1,000)

	1990	2000	2010	2020	2030	2040	2060
PEAK NAVIGATION DEPENDENT COSTS							
St. Claude	2,818	3,236	3,760	4,284	4,752	4,752	4,752
Claiborne	421	425	430	435	435	435	435
Florida	0	0	0	0	0	0	0
TOTAL	3,239	3,661	4,189	4,719	5,187	5,187	5,187
PEAK NAVIGATION INDEPENDENT COSTS							
St. Claude	3,501	3,517	3,542	3,567	3,567	3,567	3,567
Claiborne	4,085	4,104	4,134	4,164	4,164	4,164	4,164
Florida	2,900	2,914	2,938	2,961	2,961	2,961	2,961
TOTAL	10,486	10,535	10,614	10,692	10,692	10,692	10,692
TOTAL PEAK COSTS	13,725	14,196	14,803	15,411	15,880	15,880	15,879
OFF-PEAK COSTS							
St. Claude	3,674	3,713	3,752	3,798	3,819	3,845	3,915
Claiborne	5,438	5,472	5,514	5,559	5,563	5,567	5,579
Florida	4,383	4,409	4,443	4,476	4,476	4,476	4,476
TOT OFF-PEAK COST	13,495	13,594	13,708	13,832	13,857	13,887	13,970
GRAND TOTAL COST	27,220	27,790	28,512	29,244	29,737	29,767	29,849

NOTE: Columns may not add due to rounding

Table 9-16
Vehicle Delays
1200x110x36 Lock with curfew
(in 1992 dollars)

	1990	2000	2010	2020	2030	2040	2060
ST. CLAUDE							
% HR OPEN PEAK	6.60	7.50	8.50	9.50	10.50	10.50	10.50
% HR OPEN OFF-PEAK	6.90	7.70	8.80	9.80	11.00	12.60	16.40
% HR DELAY PEAK	9.50	10.80	12.50	14.10	15.70	15.70	15.70
$ DELAY/VEHICLE - PEAK							
AUTOS	0.56	0.64	0.74	0.84	0.93	0.93	0.93
SM TRUCKS	1.02	0.86	1.34	1.52	1.69	1.69	1.69
HVY TRUCKS	1.25	1.43	1.64	1.87	2.07	2.07	2.07
BUSSES	20.47	23.42	27.00	30.58	33.89	33.89	33.89
CLAIBORNE							
% HR OPEN PEAK	0.90	0.90	0.90	0.90	0.90	0.90	0.90
% HR OPEN OFF-PEAK	1.30	1.50	1.60	1.80	2.00	2.20	2.80
% HR DELAY PEAK	1.30	1.30	1.30	1.30	1.30	1.30	1.30
$ DELAY/VEHICLE - PEAK							
AUTOS	0.08	0.08	0.08	0.08	0.08	0.08	0.08
SM TRUCKS	0.14	0.14	0.14	0.14	0.14	0.14	0.14
HVY TRUCKS	0.17	0.17	0.17	0.17	0.17	0.17	0.17
BUSSES	1.21	1.21	1.21	1.21	1.21	1.21	1.21
FLORIDA							
% HR OPEN PEAK	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% HR OPEN OFF-PEAK	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% HR DELAY PEAK	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$ DELAY/VEHICLE - PEAK							
AUTOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SM TRUCKS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HVY TRUCKS	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 9-17

Total Transportation Costs and Savings Summary
(in 1992 $1,000)

	1990	2000	2010	2020	2030	2040	2060	Average Annual
Without-Project								
w/curfew	32,258	32,184	32,428	32,751	32,756	32,756	32,756	
w/diversion adjustment		34,450	34,694	35,017	35,022	35,022	35,022	
w/o curfew	36,125	39,184	40,586	41,211	41,297	41,297	41,319	
w/diversion adjustment		41,450	42,852	43,477	43,563	43,563	43,585	
Savings		(7,000)	(8,158)	(8,460)	(8,541)	(8,541)	(8,563)	7,506 1/
Bridge Only w/o curfew	22,950	27,142	27,597	27,876	27,895	27,895	27,899	
w/diversion adjustment		29,408	29,863	30,142	30,161	30,161	30,165	
Savings		5,042	4,831	4,876	4,862	4,862	4,858	5,310 2/
900x90x22 w/curfew	29,166	29,370	29,642	29,926	29,978	30,039	30,062	
Savings		5,080	5,052	5,092	5,044	4,983	4,960	5,505 3/
900x110x22 w/curfew	29,340	29,310	29,571	29,842	29,881	29,929	30,043	
Savings		5,140	5,123	5,175	5,142	5,093	4,979	5,596 3/
900x110x36 w/curfew	29,124	29,316	29,579	29,850	29,891	29,939	30,054	
Savings		5,134	5,115	5,167	5,131	5,083	4,968	5,586 3/
1200x90x22 w/curfew	27,889	28,543	29,370	29,755	29,789	29,831	29,935	
Savings		5,907	5,324	5,262	5,233	5,191	5,087	5,722 4/
1200x110x22 w/curfew	27,207	27,777	28,495	29,225	29,733	29,767	29,845	
Savings		6,673	6,199	5,792	5,289	5,255	5,177	6,201 4/
1200x110x36 w/curfew	27,220	27,790	28,512	29,244	29,737	29,767	29,849	
Savings		6,660	6,182	5,774	5,285	5,255	5,173	6,188 4/
900x90x22 w/o curfew	31,155	32,150	33,409	34,685	35,893	37,367	38,405	
Savings		2,300	1,285	333	(871)	(2,345)	(3,383)	(55) 3/
900x110x22 w/o curfew	29,938	30,738	31,748	32,774	33,690	34,807	37,448	
Savings		3,712	2,945	2,244	1,332	215	(2,426)	2,052 3/
900x110x36 w/o curfew	30,051	30,859	31,886	32,924	33,853	34,989	37,675	
Savings		3,591	2,808	2,093	1,170	33	(2,653)	1,883 3/
1200x90x22 w/o curfew	28,084	28,820	29,747	30,685	31,515	32,528	34,923	
Savings		5,630	4,947	4,333	3,507	2,495	99	4,272 4/
1200 x110x22 w/o curfew	27,220	27,847	28,639	29,439	30,122	30,949	32,891	
Savings		6,603	6,054	5,579	4,901	4,073	2,131	5,703 4/
1200x110x36 w/o curfew	27,234	27,860	28,656	29,458	30,143	30,973	32,920	
Savings		6,590	6,037	5,560	4,880	4,049	2,102	5,593 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

project scenario known as "Bridge Only" calls for the existing lock to be rehabilitated, and to have a new mid-level St. Claude Bridge.

In addition to these improvements, the Project Mitigation Plan will provide a permanent access route which links St. Bernard Highway and West Judge Perez Drive, the two major traffic corridors in St. Bernard Parish, with Florida Avenue. This will address the Florida Avenue access problems and result in the increased utilization of the Florida Avenue crossing. The access route will be constructed in an undeveloped section of land in St. Bernard Parish, near the Orleans Parish line. The permanent access route improvements are not assumed to be part of the Bridge Only plan because they are not necessary for project mitigation and the mid-level St. Claude Bridge effectively addresses the traffic flow situation. However, without the permanent access route improvements, the Bridge Only plan does capture the 7,650 diverted vehicle trips and, therefore, requires the same adjustment to total vehicle costs as was required for the without-project condition. (This adjustment is also required for the Remove Bridge Curfews plan.) For purposes of displaying model results, all project improvements are assumed to be in place throughout the entire period of analysis, beginning with 1990.

Relocation of the lock to a new north-of-Claiborne site has implications for the number of bridge raisings and, therefore, on delays and effective speeds. The current lock is located on the riverside of the Claiborne Bridge which has, for all intents and purposes, a constant forty foot clearance. With the relocation of the new lock to the north of Claiborne Avenue, water levels under the new bridge will now be subject to Mississippi River stage fluctuations. In order to compensate for high river stages, the vertical lift towers for the Claiborne Bridge will be raised to provide the same degree of maximum vertical clearance that currently exists. Additionally, the number of barges needing the bridge to be raised will also increase.

Estimates of additional Claiborne Avenue Bridge raisings resulting from river stages are based on distributions of highest fixed points for towboats and tugboats, and river stage data. Comparisons of vessel height data with the stage data indicate an increase in the Claiborne Bridge openings from 14 percent of all traffic to 26 percent. This negative impact on landside traffic speeds and delays is factored into the with-project cost estimations. Another difference accounted for in the with-project landside cost measurement is the tows per lockage calculation for each lock size and its subsequent impact on the number of bridge openings.

Tables 9-15 and 9-16 illustrate details of the with-project costs and delays for a selected lock size--1200x110x36. Direct comparison to the without-project cost table is hampered by the lack of inclusion of the "diverted traffic" costs added to the without-project detailed costs (table 9-13). However, it can be seen that with-project peak navigation dependent costs are significantly reduced from those in the without-project condition. With-project delays in table 9-16 do not reach the maximum allowable openings for St. Claude until the year 2030, unlike in the without-project scenario. Despite higher navigation traffic volume in the with-project condition , maximum allowable openings are not reached until 2030 because the new lock can accommodate more tows per lockage. The length of time the bridges are open per lockage goes up, but the number of lockages goes down by a greater amount, thereby generating an efficiency for the larger locks with respect to bridge open time.

Table 9-17 displays total landside costs and savings for each with-project alternative, including conditions in which the bridge curfew is removed, both in the without-project condition, and for each with-project alternative. Without-project costs need to include the costs of the diverted traffic in order to make the appropriate comparison to the with-project costs. Savings in table 9-17 represent the difference between the complete without-project costs and the with-project costs for each alternative in both with curfew and without curfew scenarios.

With bridge curfews, there are modest differences in savings between alternatives. Interestingly, savings for the Bridge Only plan are actually lower than the north of Claiborne plans despite the fact that with the Bridge Only, virtually all navigation dependent costs are eliminated with the mid, mid, high configuration of St. Claude, Claiborne, and Florida Bridges. While eliminating navigation dependent costs, the Bridge Only plan does not capture the diverted trips that the north of Claiborne plans do because of the absence of permanent detour routes.

Without bridge curfews, savings for all alternatives are lower than under the with-curfew assumption. In fact, savings actually become negative in the later years for the smaller capacity lock alternatives. This occurs because the positive effect on total bridge open time that is produced by the larger tows-per-lockage number is eventually overcome by the negative effect of more with-project bridge openings. With curfews in place, peak period bridge openings are restricted. For the plan that involves only removing bridge curfews, transportation costs are significantly higher than those associated with the without-project condition. This outcome is expected given that the only impact to vehicular traffic generated by this plan is more bridge openings during the peak traffic periods.