

APPENDIX O
INHC Lock Replacement Study, 2008 Updated Economic Analysis

Inner Harbor Navigation Canal (IHNC) Lock, Investigative Study

General

The IHNC Lock, opened in 1923, is located on the Inner Harbor Navigation Canal, which intersects the Mississippi River at mile 93 above Head of Passes and connects the eastern and western sections of the Gulf Intracoastal Waterway (GIWW). The lock is 75 feet wide and 640 feet long and has a depth over the sill of 31.5 feet. A Feasibility Study, completed in 1997, determined that a larger replacement lock was economically justified and pre-construction activities have begun on the authorized plan, which includes a 1200 ft x 110 ft x 36 ft lock. However, recent investigations of shallow-draft traffic moving through the existing IHNC Lock have revealed a steady decline over the past several years raising concerns about overall project justification.

As a result, an Investigative Study was initiated to determine the causes and nature of the decline in IHNC Lock traffic and also to revise the long-term GIWW shallow-draft traffic forecasts used in the 1997 Feasibility Study. These revised forecasts were then used to update the shallow-draft benefits associated with the authorized plan. Because shallow-draft benefits comprised about 80 percent of the total project benefits in the 1997 Feasibility Study, it is believed that overall project justification could be determined by focusing on this benefit category.

Traffic Analysis

This analysis examined the reasons for the recent decline in IHNC Lock traffic and evaluated whether the decline is either short term or long-term in nature. In addition, long-term (50-year) shallow-draft traffic projections were developed by commodity group for the entire waterway system being studied, which included the GIWW (Louisiana Portion); the GIWW (Morgan City Port Allen Route); the Inner Harbor Navigation Canal, La; and the Atchafalaya River, La. The National Ports and Waterways Institute (NPWI) from the University of New Orleans under contract from the New Orleans district performed this effort. A brief summary of their findings is provided below.

Recent History:

Table 1 shows historical IHNC Lock traffic levels from 1990 – 2002 by major commodity group. As can be observed total IHNC Lock traffic declined essentially in a uniform manner from 23.1 million tons in 1990 to 17.3 million tons in 2002, equivalent to a decline of 25 percent for the period. At the time of this analysis, 2002 represented the latest information from the Waterborne Commerce Statistics Center (WCSC).

Coal traffic, responsible for 35 percent of the lock traffic in 1990, declined from 8.0 million tons to 2.1 million tons in 2002, a decline of 5.9 million tons. The steep decline in coal traffic is largely responsible for the overall decline in total lock traffic.

Table 1

IHNC Lock Traffic 1990 – 2002
(In Thousands of Short Tons)

Commodity Group	1990	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Farm Products	558	640	820	623	367	292	208	232	214	165	246	268
Metallic Ores	1,385	581	650	1,458	1,161	1,404	1,391	1,233	1,064	1,334	1,052	1,454
Coal	7,982	7,908	6,838	5,911	5,902	5,239	4,398	5,112	3,276	3,178	2,333	2,050
Crude Petroleum	2,275	1,828	2,044	1,800	1,454	1,752	1,824	1,594	1,645	1,548	1,265	1,621
Non-Metallic Minerals	1,930	1,321	1,878	2,805	2,233	2,970	2,770	2,871	3,036	3,134	3,136	3,066
Forest Products	130	152	167	250	187	231	378	339	231	277	135	145
Chemicals (Ind. & Ag)	2,399	2,244	2,162	2,741	2,837	2,960	3,813	2,998	3,602	4,074	3,800	4,145
Petroleum Products	5,929	5,799	6,549	5,722	4,804	5,527	5,144	4,530	4,362	4,287	4,162	4,504
All Others	467	377	413	323	1,806	1,530	1,117	934	612	753	467	2
Total	23,055	20,850	21,521	21,633	20,751	21,905	21,043	19,843	18,042	18,750	16,596	17,253

Source: Waterborne Commerce Statistics Center (WCSC)
Note: 1991 traffic was unavailable at the time of this report.

Petroleum products, which generated 26 percent of the lock traffic in 1990, declined from 5.9 million tons to 4.5 million tons in 2002, a decline of 1.4 million tons.

Methodology:

Because coal and petroleum products represented over 60 percent of IHNC Lock traffic in the 1997 Feasibility Study, and because these two commodity groups are responsible for the majority of the overall decline since the 1997 analysis, the emphasis on the traffic analysis was directed to these two groups. The basic approach that the NPWI used for these two groups was to develop a detailed market analyses for each commodity group using secondary data from published sources supplemented with primary data from interviews with industry operators and managers. The other commodity groups were addressed by using secondary data from published sources. A complete description of the methodology and sources used can be found in the reports prepared by the NPWI. These are Inner Harbor Navigation Canal (IHNC) Lock Investigative Study and Traffic Projections on Shallow-Draft Inland Waterway System in Louisiana.

Major Reasons for Decline and Future Outlook:

Commodity flow data indicate long term decreasing traffic trends for both coal and petroleum products. Long-term and consistently declining markets are normally associated more with structural changes in market conditions compared to short-term price-quantity variations. Since long-term structural changes in the industry lead to downsizing and rationalization of resources (e.g., selling assets, moving to another area, etc.) a recovery is much more difficult than price-induced short-term changes.

Coal

The regional market for coal traffic is based on the supply needs of 12 power plants located in the Gulf Coast region east of the IHNC lock.

During the last decade environmental regulations have lowered the demand for Illinois Basin high-sulfur coal, representing more than 90 percent of the IHNC Lock coal traffic, and increased the demand for imported South American coal. The main advantage of imported coal is its high BTU and low sulfur content.

Imported South American coal is shipped mainly through the Port of Mobile thereby avoiding the IHNC Lock. The use of imported coal by Gulf Coast plants has been steadily growing, from 4.5% in 1999 to 28.8% in 2003. However, the most likely future is that there will be no further substitution of Illinois Basin coal with imported coal. The discussions with power plant operators and Energy Information Administration (EIA) subject area specialists indicated that the market penetration of imported coal has reached a plateau, especially following the recent rise in the cost of international shipping and the growing demand for South American coal in Europe. Consequently, no change in the existing sourcing and routing patterns are expected and, therefore, trends in lock traffic

will develop in parallel to the regional demand for coal. Accordingly, some growth in IHNC Lock traffic is anticipated. However, unless clean coal burning technologies make a dramatic research break-through to satisfy environmental considerations, a return to early 1990 traffic levels is unlikely.

Petroleum Products

The Gulf Coast has the largest concentration of refineries in the nation, with most of them situated at waterfront locations along the lower Mississippi, the GIWW, and other waterway extensions. Discussions with the industry confirmed that the main traffic is between refineries in the Lower Mississippi and Houston area and their affiliates along the eastern portion of the GIWW in Alabama and Mississippi.

Transportation fuel movements through the lock usually take place when a refinery on one side of the lock has to serve a customer on the other side of the lock. For example, fuel supplies from the refineries in the Lower Mississippi area often move transportation fuels to its Alabama and Florida terminals via barges. Presently, there is no east-west pipeline for products. Another typical case of lock traffic is between refineries, when these refineries have complementary capabilities. That is, some refineries may lack some of the downstream units, especially for production of specialty fuels. A related inter-refinery movement of products through the lock is simply in cases of shortages or excesses in a specific distillate.

Discussions with the refinery and barging industries indicated that the reduction in product traffic between 1990 and 2002 could be attributed to: (a) industry consolidation and (b) expansion of downstream capabilities. The consolidation refers to the merger and acquisition activities among oil companies, such as that between Exxon and Mobil and Chevron and Texaco. The effect of this consolidation is to make each region essentially self-contained, making movements less necessary. The availability of refineries on both sides of the IHNC Lock eliminates the need to transfer products between refineries and distribution terminals that involve crossing the lock, as described above.

Expansion of downstream capabilities of existing refineries also eliminates some of the need to transfer products between refineries, since each may have a wider range of capabilities. As both trends are expected to continue, the declining trend in lock traffic of these commodities is likely to continue. In addition, no change in the present transportation pattern, such as shift to pipelines, is expected.

Discussions with the industry indicated that existing trends are likely to continue in the near future, but no observations were made with regards to the longer term. As adequate information is not available for a long-term forecast, it is more appropriate to use the forecast values through 2010 and assume no change of conditions beyond 2010.

IHNC Lock Traffic – Conclusions

The patterns of IHNC Lock traffic for the period 1990-2002 were examined in detail and the underlying market dynamics responsible for these changes were analyzed. Traffic declines in coal and petroleum products were responsible for about 90 percent of the downturn during the period. Structural changes in the market, such as constraints imposed by environmental regulations restricting the use of high-sulfur coal, and consolidation of refinery activities by major oil are the main underlying reasons. The market adjustments brought about by structural changes are generally long-term, associated with rationalization of industry resource use (e.g., down-sizing, selling assets, conversion to other uses, etc.) and consequently impose rigidities to recovery.

Forecasted Traffic Levels

Using the mid growth rates developed by the NPWI, table 2 displays the updated traffic forecasts by year and commodity group for the IHNC Lock, assuming no lock constraints i.e. increases in traffic and the associated increases in delays and transportation costs will not constrain waterway traffic growth. Table 3 displays the corresponding growth rates by time period.

For comparison purposes, table 4 displays the IHNC Lock mid-growth unconstrained traffic projections used in the 1997 Feasibility Report. Table 5 displays the corresponding growth rates by time period.

By far the greatest difference between the 1997 traffic forecast and the revised traffic forecast for the IHNC lock is in coal. In the 1997 Feasibility Study, for the base year of 1990, 8.0 million tons of coal traversed the IHNC Lock and was forecasted to grow to 26.3 million tons by 2060. In the 2005 revised forecast, for the base year of 2002, 2.1 million tons traversed the IHNC Lock and is forecasted to grow to 3.8 million tons by the year 2055.

Figure 1 graphically shows the magnitude of the difference in IHNC Lock traffic projections between the 1997 Feasibility report and the 2005-updated forecast.

Transportation Costs

Transportation costs to the shipper by the various modes of transportation (typically water and rail) from the 1997 analysis were updated to reflect 2001 prices. This is an essential input to the economic analysis since the benefits of waterway transportation are computed as the difference between the two modes.

In the 1997 analysis, the Tennessee Valley Authority (TVA), under contract with the New Orleans District, developed transportation costs by the various modes for movements that traveled any portion of the waterways within the study area. The costs represented 1992 price levels. Subsequently, TVA has developed similar costs for

Table 2
2005 Update Unconstrained Traffic Projections
IHNC Lock Traffic
Mid Growth
(In Thousands of Short Tons)

Commodity Group	2002	2005	2015	2025	2035	2045	2055-65
Farm Products	268	268	401	401	468	535	669
Metallic Ores	1,454	1,565	1,901	2,180	2,572	3,075	3,578
Coal	2,050	2,214	2,541	2,951	3,238	3,484	3,771
Crude Petroleum	1,621	1,520	1,216	963	1,115	1,064	1,013
Non-Metallic Minerals	3,066	3,372	5,007	6,795	7,817	8,634	9,503
Forest Products	145	145	217	217	217	254	290
Industrial Chemicals	3,087	3,720	6,727	8,151	9,141	10,565	12,266
Agricultural Chemicals	1,058	1,275	2,306	2,794	3,134	3,622	4,205
Petroleum Products	4,504	3,845	2,307	2,033	1,868	1,648	1,428
All Others	2	2	2	2	2	2	2
Total	17,253	17,925	22,625	26,488	29,571	32,883	36,726

Table 3

**2005 Update Percent Growth
IHNC Lock Traffic
Mid Growth
(In Thousands of Short Tons)**

<u>Commodity Group</u>	<u>Yr 02 - 05</u>	<u>Yr 05 - 15</u>	<u>Yr 15 - 25</u>	<u>Yr 25 - 35</u>	<u>Yr 35 - 45</u>	<u>Yr 45 - 55</u>	<u>Yr 55 - 65</u>
Farm Products	0%	50%	0%	17%	14%	25%	0%
Metallic Ores	8%	21%	15%	18%	20%	16%	0%
Coal	8%	15%	16%	10%	8%	8%	0%
Crude Petroleum	-6%	-20%	-21%	16%	-5%	-5%	0%
Non-Metallic Minerals	10%	48%	36%	15%	10%	10%	0%
Forest Products	0%	50%	0%	0%	17%	14%	0%
Industrial Chemicals	21%	81%	21%	12%	16%	16%	0%
Agricultural Chemicals	21%	81%	21%	12%	16%	16%	0%
Petroleum Products	-15%	-40%	-12%	-8%	-12%	-13%	0%
All Others	0%	0%	0%	0%	0%	0%	0%
Total	4%	26%	17%	12%	11%	12%	0%

Table 4
1997 Feasibility Unconstrained Traffic Projections
IHNC Lock Traffic
Mid Growth
(In Thousands of Short Tons)

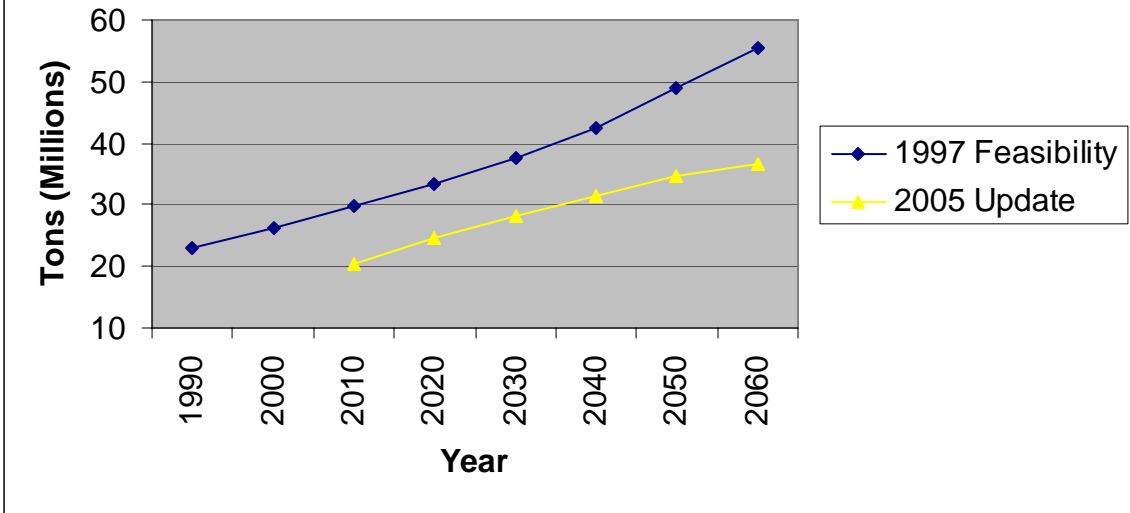
Commodity Group	1990	2000	2010	2020	2030	2040	2050	2060
Farm Products	558	686	830	1,004	1,215	1,470	1,808	2,146
Metallic Ores	1,385	1,260	1,223	1,186	1,150	1,116	1,083	1,049
Coal	7,982	10,243	11,985	14,022	16,406	19,195	22,746	26,297
Crude Petroleum	2,275	1,570	2,009	1,768	1,556	1,369	1,212	1,054
Non-Metallic Minerals	1,930	2,027	2,128	2,235	2,346	2,464	2,587	2,710
Forest Products	130	153	165	178	192	208	226	243
Industrial Chemicals	1,908	2,518	2,971	3,506	4,137	4,882	5,834	6,786
Agricultural Chemicals	491	663	769	893	1,035	1,201	1,411	1,621
Petroleum Products	5,929	6,894	7,601	8,424	9,385	10,512	11,957	13,401
All Others	467	122	130	139	149	159	171	182
Total	23,055	26,136	29,811	33,355	37,571	42,576	49,033	55,489

Table 5

**1997 Feasibility Percent Growth
IHNC Lock Traffic
Mid Growth
(In Thousands of Short Tons)**

<u>Commodity Group</u>	<u>Yr 90 - 00</u>	<u>Yr 00 - 10</u>	<u>Yr 10 - 20</u>	<u>Yr 20 - 30</u>	<u>Yr 30 - 40</u>	<u>Yr 40 - 50</u>	<u>Yr 50 - 60</u>
Farm Products	23%	21%	21%	21%	21%	23%	19%
Metallic Ores	-9%	-3%	-3%	-3%	-3%	-3%	-3%
Coal	28%	17%	17%	17%	17%	18%	16%
Crude Petroleum	-31%	28%	-12%	-12%	-12%	-12%	-13%
Non-Metallic Minerals	5%	5%	5%	5%	5%	5%	5%
Forest Products	18%	8%	8%	8%	8%	8%	8%
Industrial Chemicals	32%	18%	18%	18%	18%	20%	16%
Agricultural Chemicals	35%	16%	16%	16%	16%	17%	15%
Petroleum Products	16%	10%	11%	11%	12%	14%	12%
All Others	-74%	7%	7%	7%	7%	7%	7%
Total	13%	14%	12%	13%	13%	15%	13%

Figure 1
IHNC Lock Unconstrained Traffic
Mid Forecast



another ongoing lock replacement study within the New Orleans District, representing 2001 price levels. These updated transportation rates were used in this analysis.

For comparison purposes, the distribution of gross cost savings per ton (the difference between an IHNC water route and the next least costly non-IHNC water route or mode) for the IHNC Lock traffic is displayed in table 6 for the 1997 Feasibility Study and the 2005 updated analysis.

In addition, a weighted (by tons) gross cost savings by commodity group is also displayed in table 7 showing 1992 and 2001 savings for the total system. As is shown, gross cost savings by ton, for the most part, have declined over the period of 1992, when the original TVA analysis was completed, to 2001, when TVA completed the updated analysis.

System Analysis

As in the 1997 study, a system approach is required to evaluate the National Economic Development (NED) benefits of potential navigation improvements to the Gulf Intracoastal Waterway System. This analytical approach explicitly recognizes that individual locks are only components in a complete navigation system, and that alterations of the traffic processing characteristics of specific components will have impacts throughout the navigation system. The General Equilibrium Model described below is used to perform this system analysis.

General Equilibrium Model

The General Equilibrium Model (GEM) used in the 1997 analysis was also used in this updated analysis to evaluate the existing conditions, the future without-project conditions, and the future conditions with the improved IHNC Lock in place. As was discussed in the 1997 Feasibility Report, GEM is a tool used for the economic evaluation of potential changes to various components of a navigation system. The model estimates the total transportation costs, including congestion costs, incurred by individual movements desirous of using all or portions of a navigation system. System transport costs for these individual movements are then compared to the total transport costs of that movement via the least-cost alternative mode or alternative non-system water route. If the alternative means of transport has lower costs than water system transport for a given movement, then that movement is presumed to be diverted from the navigation system to the alternative mode/non-system water route. Conversely, movements enjoying less costly transportation on the navigation system are presumed to use the navigation system, realizing net savings of the difference between the cost of system transport and the next least costly alternative means of movement. The sum of all these transportation costs savings represents the total resource savings to the nation attributable to the navigation system.

Table 6
IHNC Lock Traffic
Gross Cost Savings Distribution

Gross Cost Savings (\$)	2005 Update (2001 Prices)		1997 Feasibility (1992 Prices)	
	Tons	% of Total Tons	Tons	% of Total Tons
<0	306,645	2%	410,052	2%
>=0 <1.50	166,956	1%	2,216,696	10%
>=1.50 <4.00	1,796,785	10%	6,849,096	30%
>=4.00 <7.00	3,336,291	19%	2,025,369	9%
>=7.00 <11.00	5,914,666	34%	1,748,160	8%
>=11.00 <16.00	2,789,022	16%	3,687,050	16%
>=16.00 <24.00	1,719,164	10%	4,208,653	18%
>=24.00 <31.00	731,262	4%	1,194,425	5%
>=31.00 <36.00	245,431	1%	214,612	1%
>=36.00 <42.00	130,354	1%	344,205	1%
>=42.00 <50.00	109,489	1%	42,962	0.2%
>=50.00	6,935	0.04%	113,721	0.5%
Total	17,253,000	100%	23,055,000	100%

Table 7

**Gross Cost Savings
By Commodity Group
Total System - 1997 Feasibility vs 2005 Update**

<u>Commodity Group</u>	<u>1997 Feasibility Weighted Gross Cost Savings (\$) (1992 Prices)</u>	<u>2005 Update Weighted Gross Cost Savings (\$) (2001 Prices)</u>
Farm Products	9.22	15.18
Metallic Ores	25.40	17.27
Coal	2.44	2.46
Crude Petroleum	15.98	14.21
Non-Metallic Minerals	21.26	13.39
Forest Products	7.52	7.23
Industrial Chemicals	18.83	16.22
Agricultural Chemicals	20.86	14.56
Petroleum Products	15.44	9.74
All Others	12.23	15.61

As was done in the 1997 analysis, GEM was run in this analysis for various future years to determine the system wide transportation savings for the future without-project condition and for the future with-project condition. The difference in the system benefits between these two conditions represents the NED savings attributable to the improved IHNC lock in place.

Shallow-Draft System Analysis - Results

Incorporating the updated inputs (traffic forecasts and transportation rates) described above, GEM was run to estimate the total transportation cost savings (NED benefits) attributable to the with-project and without-project conditions. The model was used to estimate the benefits to the existing and improved systems for the calendar years 2015, 2025, 2035, 2045, 2055, and 2065. For intermediate years, the system transportation benefits are estimated by assuming a constant change in benefits between the years explicitly modeled. The new IHNC lock is scheduled to be operational in the year 2019.

Table 8 displays the total system transportation savings by year for the without-project condition and the total system and incremental transportation savings by year for the with-project condition. System transportation cost savings represents the total transportation cost savings attributable to the entire modeled system of waterways (existing system elements and any improvements in place). Incremental transportation cost savings represents the portion of total system transportation cost savings attributable to the potential improvement under consideration (measured as the difference between with-project and without-project total transportation cost savings).

Table 9 displays the average annual incremental transportation savings associated with the authorized plan. Presented in the first section of the table is the estimate developed in the 1997 Feasibility Report by price level, interest rate and base year (the first year of project operation) used in the 1997 analysis. The second section of the table compares the 2005-updated estimate with the 1997 estimate after adjusting the 1997 estimate to reflect the same price level, interest rate and base year used in the updated analysis.

As is shown, when the 2005-updated average annual incremental savings estimate is compared to the estimate used in the 1997 report, after being adjusted to the same price level, interest rate and base year, a significant decrease is apparent. The 2005-updated estimate is approximately 28 percent lower than the 1997 estimate would be if the same project interest rate, price level and base year were used. This reduction is primarily due to the reduction in traffic forecasts.

Other Benefit Categories

Deep-Draft Navigation Benefits

As described in the 1997 Feasibility Study, benefits to deep-draft navigation arise from two categories of deep-draft vessel activity. The major activity category, in terms of both

Table 8

**Shallow-Draft
Total & Incremental Transportation Savings
(2001 Price Level, \$1,000)**

Condition	2015	2025	2035	2045	2055	2065
Without-Project (Total)	1,113,454	1,220,001	1,277,356	1,313,353	1,325,272	1,325,272
1200 x 110 x 36 ft Lock (Total)	1,126,793	1,266,552	1,372,333	1,469,453	1,500,559	1,500,559
(Incremental)	13,339	46,551	94,976	156,100	175,287	175,287

Table 9

Average Annual Incremental Transportation Savings
(\$1,000)

	<u>1997 Feasibility</u>	<u>2005 Update</u>	<u>1997 Feasibility</u>
Price Level	1996	2001	2001
Interest Rate	7.375	7.125	7.125
Base Year	2012	2019	2019
Avg Annual	87,448	78,086	108,014

number and magnitude of savings, is generated by lockages which may be called “intra-harbor” lockages. These lockages result from a vessel’s desire to use deep-draft loading and unloading facilities in the two distinct sections that make up the complex of the Lower Mississippi River deep-draft facilities, the riverfront and the tidewater portion of the Port of New Orleans (the IHNC and the MR-GO). The second activity category arises from lockages for vessels departing from the tidewater section of the Port of New Orleans via the passes of the Mississippi River. These “thru” lockages are motivated by potential savings in vessel sailing time.

For this reanalysis, due to the relatively small amount of savings, compared to the shallow-draft benefits, it was decided to use the deep-draft benefits calculated in the 1997 Feasibility Study. In the 1997 Feasibility Study, the deep-draft average annual benefit estimate in 1993 prices was \$991,000 using an interest rate of 7.375 percent and a 2012 base year. After price level adjusting these benefits to 2001 prices, using the Institute of Water Resources (IWR) Deep-Draft Vessel Operating Costs for the years 1993 and 2001 (a 10 percent decrease), the average annual deep-draft benefits associated with the authorized plan was estimated to be \$1.0 million using the project interest rate of 7.125 percent and a base year of 2019.

Vehicular Benefits

Vehicular traffic benefits, described in the 1997 Feasibility Study, arose mainly from the fact that vehicles needed to cross the Inner Harbor Navigation Canal will have fewer bridge opening delays in the with-project condition. This occurs because the new larger lock can accommodate more tows per lockage thereby requiring fewer bridge openings to process the traffic. The length of time the bridges are open goes up, but the number of lockages goes down by a greater amount, thereby generating an efficiency for the larger lock with respect to bridge open time.

The vehicular traffic benefits calculated in the 1997 Feasibility Study were used in this reanalysis. In the 1997 Feasibility Study, the vehicular average annual benefit estimate in 1992 prices was \$5.9 million using an interest rate of 7.375 percent and a 2012 base year. After price level adjusting these benefits to 2001 prices, using the Consumer Price Index Transportation (a 16 percent increase), the average annual vehicular benefits associated with the authorized plan were estimated to be \$6.3 million using the project interest rate of 7.125 percent and a base year of 2019.

Savings to Federal Projects

Savings to Federal Projects refers to cost that would be avoided with project implementation. For the authorized plan, the avoided costs would include the operations, maintenance, and replacement (OM&R) costs on the existing lock. OM&R costs, developed for the 1997 Feasibility Study were used for this analysis. In the 1997 Feasibility Study, the Savings to Federal Projects average annual benefit estimate in 1996 prices was \$1.6 million using an interest rate of 7.375 percent and a 2012 base year.

After these costs, were adjusted to 2001 prices using the Engineering and Design-Civil Works Construction Cost Index System (CWCCIS)(a 9 percent increase), the average annual Savings to Federal Projects were estimated to be \$1.7 million using the project interest rate of 7.125 percent and a base year of 2019.

Project Costs

First Costs

Remaining project expenditures by year in 2005 dollars, including mitigation costs, are displayed in table 10 for the authorized plan. As is shown, the total remaining project cost is estimated to be \$585.7 million. Using the project interest rate of 7.125 percent the interest during construction is estimated to be \$373.6 million. These costs, when annualized, were adjusted to 2001 prices using CWCCIS. The average annual estimate was computed to be \$58.4 million.

Operations Maintenance & Replacement Costs

OM&R costs developed in the 1997 Feasibility Study for the authorized plan was used for this analysis. In the 1997 Feasibility Study, the OM&R average annual cost estimate in 1996 prices was \$1.4 million using an interest rate of 7.375 percent and a 2012 base year. After these costs, in 1996 price levels, were adjusted to 2001 prices using the (CWCCIS) (a 9 percent increase), the average annual OM&R cost for the authorized plan was estimated to be \$1.5 million using the project interest rate of 7.125 and a base year of 2019.

Economic Justification

Table 11 displays the composition of total average annual benefits and costs (2001 price levels) as well as the corresponding annual net benefits (average annual benefits minus average annual costs) and benefit-to-cost ratio (BCR) for the authorized plan using the project interest rate of 7.125 percent, a 7.0 percent interest rate and the FY06 interest rate of 5.125 percent. As is shown annual net benefits are estimated to be \$27.2 million using the project interest rate of 7.125 percent producing a BCR of 1.5. Using a 7.0 percent interest rate, annual net benefits are estimated to be \$29.2 million producing a BCR of 1.5. Using the FY06 interest rate of 5.125 percent, annual net benefits are estimated to be \$57.9 million producing a BCR of 2.4.

Table 10

Remaining Construction Expenditures
By Year Including Mitigation Cost
(2005 Prices; \$1,000's)

<u>Year</u>	<u>Authorized Plan</u>
2006	20,000
2007	45,000
2008	50,000
2009	55,000
2010	70,000
2011	90,000
2012	80,000
2013	70,000
2014	45,000
2015	24,000
2016	19,000
2017	12,681
2018	5,000
Total	585,681

Table 11
Summary Of Benefits and Costs
Authorized Plan
(2001, \$1,000)

	<u>7.125 Percent</u>	<u>7.0 Percent</u>	<u>5.125 Percent</u>
<u>Benefits</u>			
Shallow Draft	78,086	78,702	88,960
Deep Draft	998	1,001	1,050
Vehicular	6,319	6,316	6,273
Savings to Fed. Project	1,703	1,703	1,708
Total Average Annual Benefits	87,106	87,722	97,991
<u>Costs</u>			
Remaining Construction	58,394	56,989	38,569
O&M	1,509	1,510	1,523
Total Average Annual Costs	59,903	58,499	40,092
Average Annual Net Benefits	27,203	29,223	57,899
BCR	1.45	1.50	2.44