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HARBOR PROGRAM METHODOLOGY

Exemplary Harbor Assistance
Evaluation for 1983

TC224.W6H37 1982

for:

Wisconsin Department of Transportation

by:

Louis Berger & Associates, Inc.

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TABLE OF CONTENTS

		Page
I.	INTRODUCTION	I- 1
II.	ANALYSIS OF HARBOR ASSISTANCE PROJECTS	
	1. Milwaukee	II- 1
	2. Manitowoc Harbor	II- 6
	3. Marinette	II-11
	4. Sheboygan	II-15
	5. La Pointe, Wisconsin	II-19
	6. Prairie Du Chien	II-25
	7. Sturgeon Bay, Wisconsin	II-29
	8. La Crosse	II-36
	9. Milwaukee, Grain Elevator Marine Leg	II-41
III.	ANALYSIS OF PREVIOUS YEAR HARBOR ASSISTANCE PROJECTS	
	10. Superior	III- 1
	11. Kenosha	III- 7
	12. Milwaukee Dredging	III-12
IV.	GENERAL SUMMARY OF PARAMETERS USED IN BENEFIT ESTIMATES	IV- 1

I. INTRODUCTION

I. INTRODUCTION

The purpose of this report is to set forth the costs, benefits and impacts associated with projects that applied for state assistance for 1983 harbor developments. A total of nine projects are included in the evaluations for 1983 assistance, seven on the Great Lakes and two on the inland waterways. Also, several projects from the past years are included in the evaluation process, to assist in the presentation of a more well-rounded selection of project and benefit types.

The evaluation of each project is based on the methodology outlined in the Main Report, and consists primarily of five general steps. The first step is the development of project life, costs and associated operations and maintenance costs. The second step is the development of traffic projections that will utilize the project when it begins operations. Included in this step is a check on the project/port capacity to insure that all projected traffic can indeed benefit from the project. The third step is the determination of the per unit benefit associated with project throughput. In the terminology of the Main Report, this is the determination of benefits based on with and without project prices. In a few instances, these two steps are combined for pragmatic reasons, although in general the two steps must be accomplished individually.

The fourth step is to combine the cost, traffic and unit savings information developed in the earlier steps. The result is the computation of the various present value components of the project, annualized benefits of the project and the Benefit/cost Ratio (BCR) of the project. The BCR and the annualized net present value of the project summarize the economic efficiencies inherent in the project. The last step is the estimation of the economic impacts arising from the project. These impacts include the change in income, sales, taxes and employment expected as a result of the project. For comparison, similar impacts arising from a marginal state investment, i.e., one with a BCR of 1.0, are also computed and used to estimate the net impacts of the project.

The next two sections of the report contain the summaries for each of the projects evaluated. Each summary includes a narrative, appropriate tables on estimated future project traffic and benefits, a summary table of the economic effects of the project by region and a table listing the parameters used for the estimation of the economic impacts. The summaries are intentionally brief to assist in comparisons between the various projects. However, each includes the relevant project costs, benefits and economic impacts.

The last section of this report contains an overview of the manner in which many of the benefit estimates were accomplished. Due to the similarity of many projects, it was deemed unnecessary to explicitly set forth the manner of benefit estimation for each project summary. This section does so, to assist in the understanding of exactly how the benefits of particular projects arise and how they are quantified in relation to each project.

II. ANALYSIS OF HARBOR ASSISTANCE PROJECTS

II.1 EXEMPLARY HARBOR ASSISTANCE EVALUATION: MILWAUKEE (GREENFIELD AVENUE)

The project calls for improvements of a 13.8 acre tract along the Kinnikinic River. Currently dredged to a 21 foot draft, this project will provide a 27 foot depth connecting to the federally maintained channel that currently has a depth of 27 feet. In addition, a dock wall of 826 feet will be constructed, along with a concrete ship apron of 33,040 square feet. The City has requested $2,527,400 which represents 80 percent of the total project cost of $3,159,250.

Step 1 - Project Life and Project Cost

The basic construction cost of the project is $3,017,311. Contract preparation and supervision will add an additional $141,939, bringing the total to $3,159,250. Of this cost, 41 percent is attributable to the dock wall, 14 percent is for dredging and 45 percent is for the ship apron. Proper determination of maintenance costs depends upon each of the structures involved and the rate of siltation of the area dredged. Assuming that a 5 percent level of maintenance is sufficient, the project should have a useful life of 50 years. The required level of maintenance calls for an approximate expenditure of $151,000 per year. The present value of the annual maintenance costs is $1,942,815, and the total present value of the project cost is $5,102,065.

Steps 2, 3, and 4 - Projected Tonnage

As the facility will be new, there is no current tonnage throughput and base tonnage is zero. The benefit evaluation of the facility, based on the project application, considers the implementation of a iron ore pellet plant which would use the dock to load pellets for shipment to Chicago. The facility will load 500,000 tons in its first year of operation, which is the third year of the project in question, and increases by 9 percent annually thereafter. Projected tonnages are shown in Table 1.

TABLE 1.1

PROJECTED PROJECT TONNAGE - SELECTED YEARS

Year	Tonnage
3	500,000
5	509,040
10	530,255
15	549,076
20	568,564
25	588,744
30	609,641
40	653,686
50	700,912

Steps 5, 6, 7, 8, and 9 - Projected Benefits

The tonnage listed in Table 1.1, in being shipped to Chicago, can, by use of the 27 foot channel, be loaded in vessels which can more efficiently utilize the 27 foot depth. Using the equation given on Page 60 of this report, the increased depth provides cheaper transport capability at a rate of $.00475 per ton-mile. Given the water distance of 74 miles from Milwaukee, this leads to a benefit of slightly greater than $.35 per ton.

In addition, by providing a depth of 27 feet, the value of the land owned by the City of Milwaukee and hence the rent received, increases by $15,000 and 13 percent per acre, respectively. The rent for the 13 acres will thus be increased by 13 acres x $15,000 x .13 = $25,350 per year, using the City's formula for their valuation of land and differential rent of 13 percent between riverside and lakeside access. This yields a discounted value of $349,850. The total present value of benefits is $2,671,658. The annual net benefit stream for selected years is shown in Table 1.2. This value is the sum of per ton benefits for the iron ore throughput and rent differentials per year, less annual maintenance costs of $150,866. The benefit of the project is shown to be -$2,569,650 with a benefit-cost ratio of .5097 and an internal rate of return of .5929.

TABLE 1.2

Benefits Net of O&M for Selected Project Years

Year	Net Benefits
1	-125,516
5	53,301
10	60,753
15	67,364
20	74,210
25	75,608
30	88,640
40	104,157
50	118,967

Steps 10 and 11 - Project Evaluation

Project impacts are summarized in Table 1.3, based on the parameters shown in Table 1.4. As expected, the project has positive income, sales, employment and tax impacts. However, due to the negative net benefits of the entire project the net impact of this project will be less than a typical state investment resulting in negative net impacts from the project.

Table 1.3

WISCONSIN HARBOR ASSISTANCE PROGRAM
ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

Project Site	Milwaukee	Local Area Benefit Proportion	1.00
Project Type	Dockwall/Dredging	Non-Local/State Benefit Proportion	.00
		Non-State Benefit Proportion	.00
Application Number	83001		
Alternative Number	1	Local Share Of Initial Costs	.20
Version Number	1	Non-Local/State Share Of Initial Costs	.80
		Non-State Share of Initial Costs	.00
Project Life (Years)	50		
Discount Rate (Percent)	7		

	Local Area	Non-Local State	State	Out Of State	Total	State Expected Change	State Net Impact	Project Expected Change	Project Net Impact
Discounted Benefits	$ 2,672	0	2,672	0	2,672				
Discounted Benefits	2,575	2,527	5,102	0	5,102				
Net Present Value	96.6	2,527	-2430	0	-2430				
Benefit-Cost Ratio	1.03	.00	52	.00	.52				
Annualized Net Present Value	7.0	-183.1	-176.1	0.0	-176.1				
Annualized									
Personal Income	442.5	0.0	442.5	0.0	442.5	820.7	-378.2	820.7	-378.2
Sales	2406.1	0.0	2406.1	0.0	2406.1	5353.4	-2947.3	5353.4	-2947.3
Federal Personal Income Taxes	83.8	0.0	83.8	0.0	83.8	153.2	-69.4	153.2	-69.4
State Personal Income Taxes	21.0	0.0	21.0	0.0	21.0	38.8	-17.8	38.8	-17.8
State Excise Taxes	6.7	0.0	6.7			17.8	-11.1		
Employment (Number of Jobs)	27.6	0.0	27.6	0.0	27.6	55.9	-28.3	55.9	-28.3

Table 1.4

Impact Variables

PROJECT SITE	MILWAUKEE
PROJECT TYPE	DOCKWALL/DREDGING
APPLICATON NUMBER	83001
ALTERNATIVE NUMBER	1
VERSION NUMBER	1

	LOCAL	NON-LOCAL STATE	NON-STATE
BENEFIT-INCOME MULTIPLIER	2.28	2.22	2.22
SALES-INCOME MULTIPLIER	5.438	6.523	6.523
ANNUAL WAGES PER WORKER	$ 16,006	$ 14,677	$ 14,677
FEDERAL PERSONAL INCOME TAX RATE	.1355	.1355	.1355
FEDERAL SOCIAL INSURANCE TAX RATE	.0539	.0512	.0512
STATE PERSONAL INCOME TAX RATE	.0475	.0473	.0473
STATE EXCISE TAX	.0217	.0217	-----

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II.2. EXEMPLARY HARBOR ASSISTANCE EVALUATION, 1983: MANITOWOC HARBOR

The assistance application of the Port of Manitowoc is for the dredging of the Manitowoc River approximately 720 feet beyond the current federal dredging limits. This project would deepen the river to 12 feet, at a total first cost of $275,400. Of this sum, $142,000 is to be provided by the Corps of Engineers, while the rest is to be paid by local interests. Under the terms of this application, the annual local costs, would be borne by the City of Manitowoc, with the intention of applying annually for harbor assistance from the State of Wisconsin, until such time as a second user is located on this section of the river.

Step 1 - Project Life and Project Cost

Due to the federal involvement in this project and the necessity of continuing annual payments throughout the project life, the project life and maintenance costs for the project have been computed somewhat differently than for the other applications for assistance. Based on information contained in the Corps of Engineers' documents authorizing this project, the cost allocation used for this project corresponds to an approximate 20 year project life with no maintenance costs. Therefore, the project was designated as having a 20 year life, at which time it would be re-constructed, yielding a total evaluation period of 40 years. The discounted cost of replacing the project in 20 years is $71,169, yielding a total present value of project costs of $346,569. This yields an annualized cost of $25,996 for the 40 year evaluation period.

Steps 2 - 9 - Project Benefits

Benefits resulting from this project arise primarily from the ability to maintain and expand the ship building industry within the port. The existing user of this section of the port currently has bids on several projects ranging between $2 million and $9 million, several of which are contingent on sufficient channel depth to allow for the construction and launching of the vessels. Benefits for this project are based on the additional value that the project will create over and above the payment of productive factors necessary for vessel construction, i.e., the value added during production that is not

accounted for by materials, labor and capital costs. Recent statistics on vessel construction are not available for the State of Wisconsin or any of its counties, necessitating the use of nation figures. Due to the competitive nature of the ship building industry, this should not be viewed as a serious data problem. The necessary information was taken from the 1977 Survey of Manufacturers Industry Series, Table 5a for the ship and boat building and repairing industry (SIC's 3731 & 3732). For this industrial sector, 78.5 cents of each dollar of sales is used for the purchase of materials and labor. The remaining 21.5 cents represents the implicit rental value and return to capital used in the production process. The implicit rental value of capital was estimated at 94 percent of the 21.5 cents, leaving 6 percent as the after tax rate-of-return to capital, or 1.29 cents per dollar of sales as the benefit of the project.

Benefits for this project have been computed on the basis that the project would allow for construction of one additional vessel per year at a value of $3,250,000. This figure is based on one of the smaller vessels cited in the application and is assumed as a representative vessel for each year of the project life. Based on the benefit per dollar of sales, yearly benefits would be $41,925, yielding a present value of benefits of $558,936 and a benefit-cost ratio of 1.61. It should be noted that the application cites the possibility of closing or re-locating the facility due to lack of sufficient draft at the project site. In such an event, the benefits would increase significantly as shown in Table 2.2. Also, no benefits have been computed for a possible second user, since no firms have made any type of commitment to the project area. A summary of economic impacts is contained in the following table.

Steps 10 and 11 - Project Evaluation

The proposed project exhibits fairly strong gross and net economic impacts. On both levels all impacts are significantly positive for each case evaluated. The primary cause of the strong positive impact is the inflow of the 50% federal cost share, which amplifies project impacts relative to a state only investment.

Table 2.1

WISCONSIN HARBOR ASSISTANCE PROGRAM
ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

Project Site	Manitowoc	Local Area Benefit Proportion	1.00
Project Type	Dockwall/Dredging	Non-Local/State Benefit Proportion	.00
		Non-State Benefit Proportion	.00
Application Number	83002		
Alternative Number	1	Local Share Of Initial Costs	.25
Version Number	1	Non-Local/State Share Of Initial Costs	.25
		Non-State Share of Initial Costs	.50
Project Life (Years)	40		
Discount Rate (Percent)	7		

	Local Area	Non-Local State	State	Out Of State	Total	State: Expected Change	State: Net Impact	Project: Expected Change	Project: Net Impact
Discounted Benefits	$ 559	0	559	0	559				
Discounted Costs	87	87	173	173	347				
Net Present Value	472	-87	386	-173	212				
Benefit-Cost Ratio	6.43	.00	13.73	.00	1.61				
Annualized Net Present Value	34.5	-6.5	28.0	-12.5	15.5				
Annualized									
Personal Income	80.6	0.0	80.6	0.0	80.6	29.0	51.6	58.0	22.6
Sales	498.1	0.0	498.1	0.0	498.1	189.2	308.9	378.4	119.7
Federal Personal Income Taxes	15.0	0.0	15.0	0.0	15.0	5.4	9.6	16.8	4.2
State Personal Income Taxes	4.1	0.0	4.1	0.0	4.1	1.4	2.7	2.8	1.3
State Excise Taxes	1.7	0.0	5.9			0.4	1.3		
Employment (Number of Jobs)	6.1	0.0	6.1	6.1	6.1	2.0	4.1	4.0	2.1

Table 2.2

WISCONSIN HARBOR ASSISTANCE PROGRAM

ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

PROJECT SITE	MANITOWOC	LOCAL AREA BENEFIT PROPORTION	1.00
PROJECT TYPE	DREDGING 40	NON-LOCAL/STATE BENEFIT PROPORTION	.00
		NON-STATE BENEFIT PROPORTION	.00
APPLICATON NUMBER	83002		
ALTERNATIVE NUMBER	1	LOCAL SHARE OF INITIAL COSTS	.25
VERSION NUMBER	2	NON-LOCAL/STATE SHARE OF INITIAL COSTS	.25
		NON-STATE SHARE OF INITIAL COSTS	.50
PROJECT LIFE (YEARS)	40		
DISCOUNT RATE (PERCENT)	7		

	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	STATE EXPECTED CHANGE	STATE NET IMPACT	PROJECT EXPECTED CHANGE	PROJECT NET IMPACT
DISCOUNTED BENEFITS	$ 2,600	$ 0	$ 2,600	$ 0	$ 2,600				
DISCOUNTED COSTS	$ 87	$ 87	$ 173	$ 173	$ 347				
NET PRESENT VALUE	$ 2,513	$ -87	$ 2,426	$ -173	$ 2,253				
BENEFIT-COST RATIO	30.01	.00	15.00	.00	7.50				
ANNUALIZED NET PRESENT VALUE	$ 176.4	$ -6.5	$ 182.9	$ -13.1	$ 169.9				
ANNUALIZED									
PERSONAL INCOME	$ 390.0	$ 0.0	$ 390.0	$ 0.0	$ 390.0	$ 29.0	$ 361.0	$ 58.0	$ 332.0
SALES	$ 2410.2	$ 0.0	$ 2410.2	$ 0.0	$ 2410.2	$ 189.2	$ 2221.1	$ 378.3	$ 2031.9
FEDERAL PERSONAL INCOME TAXES	$ 72.7	$ 0.0	$ 72.7	$ 0.0	$ 72.7	$ 5.4	$ 85.6	$ 10.8	$ 61.9
STATE PERSONAL INCOME TAXES	$ 17.6	$ 0.0	$ 17.6	$ 0.0	$ 17.6	$ 1.4	$ 16.2	$ 2.7	$ 14.8
STATE EXCISE TAXES	$ 5.9	$ 0.0	$ 5.9			$ 0.4	$ 5.5		
EMPLOYMENT (NUMBER OF JOBS)	29.7	0.0	29.7	0.0	29.7	2.0	27.7	4.0	25.8

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Table 2.3

ADDITIONAL

IMPACT VARIABLES

PROJECT SITE	MANITOWOC
PROJECT TYPE	DREDGING 50
APPLICATON NUMBER	83002
ALTERNATIVE NUMBER	1
VERSION NUMBER	1

	LOCAL	NON-LOCAL STATE	NON-STATE
BENEFIT-INCOME MULTIPLIER	1.99	2.22	2.22
SALES-INCOME MULTIPLIER	6.180	6.523	6.523
ANNUAL WAGES PER WORKER	$ 13,127	$ 14,677	$ 14,677
FEDERAL PERSONAL INCOME TAX RATE	.1355	.1355	.1355
FEDERAL SOCIAL INSURANCE TAX RATE	.0509	.0512	.0512
STATE PERSONAL INCOME TAX RATE	.0451	.0473	.0473
STATE EXCISE TAX	.0217	.0217	-----

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II.3. EXEMPLARY HARBOR ASSISTANCE EVALUATION, 1983 MARINETTE

The City of Marinette has requested a total of $2,320,000 as the State share of the $2,900,000 Menominee River Bulkhead Project. This application contains two related, interdependent projects. The first is construction of approximately 1485 feet of new bulkhead, with some spot dredging to connect the newly created dock space with the existing Corps of Engineers' river channel. Estimated cost of this phase of the application is $1,400,000. The second aspect of the application is a $1,300,000 dredging project that would increase the project depth of the western most portion of the defined Corps of Engineers' river channel from 12 feet to a new project depth of 19 feet. An additional $200,000 is included in the project cost to account for bid preparation and supervision of contractors.

Step 1 - Project Life and Project Costs

The life of this project, with associated maintenance costs is estimated to be 40 years. On an annualized basis, project first costs of $2,900,000 are $217,525. For a project of this type, operations' costs will generally be internalized in the production process. Maintenance costs are estimated as 2.5 percent annually of initial construction costs, or $67,500 annually. (This roughly corresponds to re-constructing the project every 20 years.) Total annualized costs for the project are the sum of the two, yielding annual costs of $285,025, with total present value of costs of $3,796,000.

Steps 2 - 9 - Projected Benefits

Benefits associated with this project result primarily from the ability to expand the ship building industry within the port of Marinette. The industry currently has sales in the port of approximately $40 million annually, with an average expenditure of about $4.2 million per vessel. In the ship building industry, 78.5 cents of each dollar of sales is spent on materials and labor, with the remaining 21.5 cents representing the use of and return to capital used by the industry. Using an after-tax rate-of-return of 6 percent, 1.29 cents of each dollar of sales will represent a benefit to the project, i.e., the additional value created by the project after all productive factors have been paid.

While the proposed project will approximately double the size of the dock area at the project site, it is not reasonable to assume that output will also immediately double. Primarily this is a result of some additional capabilities planned for the project area and the different types of vessels that will be constructed in the area. Also, facilities are normally constructed to allow for future expansion, and not to immediately attain capacity. To account for this phenomena, a three-stage phasing has been used in computing benefits. During the first 10 years of project life, an approximate 30 percent increase in sales results from implementation of the project, or about three vessels per year with an average value of $4.2 million each. During the next ten years of project life an additional increase of 30 percent of sales is evidenced. During the last 30 years of the project life, sales have doubled from their current levels, resulting in increased sales of $40 million.

Steps 10 and 11 - Project Evaluation

Based on the benefits per dollar of sales cited above, yearly benefits for the first 10 years of the project are $162,540, for the second 10 years $325,080 and for the remaining 20 years of the project $516,000. The discounted value of these benefits over the project life are $3,857,046, resulting in annualized benefits of $289,308. This yields a benefit-cost ratio of 1.02 and net annual benefits of $4,283.

Gross economic impacts from the project are quite significant. However, all net impacts are negative and fairly significant. This is a result of the low BCR and the generally higher multipliers exhibited by the state relative to Marinette County.

Table 3.1

FORM HAR0:

WISCONSIN HARBOR ASSISTANCE PROGRAM

ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

PROJECT SITE	MARINETTE	LOCAL AREA BENEFIT PROPORTION	1.00
PROJECT TYPE	DOCKWALL/DREDGING	NON-LOCAL/STATE BENEFIT PROPORTION	.00
		NON-STATE BENEFIT PROPORTION	.00
APPLICATON NUMBER	83003		
ALTERNATIVE NUMBER	1	LOCAL SHARE OF INITIAL COSTS	.20
VERSION NUMBER	1	NON-LOCAL/STATE SHARE OF INITIAL COSTS	.80
		NON-STATE SHARE OF INITIAL COSTS	.00
PROJECT LIFE (YEARS)	40		
DISCOUNT RATE (PERCENT)	7		

	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	STATE EXPECTED CHANGE	STATE NET IMPACT	PROJECT EXPECTED CHANGE	PROJECT NET IMPACT
DISCOUNTED BENEFITS	$ 3,857	$ 0	$ 3,857	$ 0	$ 3,857				
DISCOUNTED COSTS	$ 1,475	$ 2,320	$ 3,795	$ 0	$ 3,795				
NET PRESENT VALUE	$ 2,381	$ -2,320	$ 61	$ 0	$ 61				
BENEFIT-COST RATIO	2.61	.00	1.02	.00	1.02				
ANNUALIZED NET PRESENT VALUE	$ 4.6	$ -174.9	$ 4.6	$ 0.0	$ 4.6				
ANNUALIZED									
PERSONAL INCOME	$ 462.3	$ 0.0	$ 462.3	$ 0.0	$ 462.3	$ 635.2	$ -172.9	$ 635.2	$ -172.9
SALES	$ 3283.2	$ 0.0	$ 3283.2	$ 0.0	$ 3283.2	$ 4143.4	$ -860.2	$ 4143.4	$ -860.2
FEDERAL PERSONAL INCOME TAXES	$ 86.6	$ 0.0	$ 86.6	$ 0.0	$ 86.6	$ 118.6	$ -40.6	$ 118.6	$ -32.0
STATE PERSONAL INCOME TAXES	$ 19.5	$ 0.0	$ 19.5	$ 0.0	$ 19.5	$ 30.0	$ -10.5	$ 30.0	$ -10.5
STATE EXCISE TAXES	$ 7.0	$ 0.0	$ 7.0			$ 9.6	$ -2.6		
EMPLOYMENT (NUMBER OF JOBS)	32.9	0.0	32.9	0.0	32.9	43.3	-10.3	43.3	-10.3

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Table 3.2

FORM HARVAR:

ADDITIONAL

IMPACT VARIABLES

PROJECT SITE	MARINETTE
PROJECT TYPE	DOCKWALL/DREDGING
APPLICATON NUMBER	83003
ALTERNATIVE NUMBER	1
VERSION NUMBER	1

	LOCAL	NON-LOCAL STATE	NON-STATE
BENEFIT-INCOME MULTIPLIER	1.69	2.22	2.22
SALES-INCOME MULTIPLIER	7.102	6.523	6.523
ANNUAL WAGES PER WORKER	$ 14,037	$ 14,677	$ 14,677
FEDERAL PERSONAL INCOME TAX RATE	.1355	.1355	.1355
FEDERAL SOCIAL INSURANCE TAX RATE	.0518	.0512	.0512
STATE PERSONAL INCOME TAX RATE	.0422	.0473	.0473
STATE EXCISE TAX	.0217	.0217	-----

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II.4 EXEMPLARY HARBOR ASSISTANCE EVALUATION: SHEBOYGAN

This project involves construction of 728 feet of sheet piling with a walkway and loading surface. The walkway and loading surface will replace an extant facility which is eroding into the river. The area is adjacent to several shanties and is used for the unloading of fish.

Step 1 - Project Life and Project Cost

The project has a construction cost of $1,778,111 and along with contract preparations and supervision costs of $10,000, will have a total cost of $1,788,111, of which 80 percent, or $1,430,489 is being requested from the State. Properly maintained, the project should have a life of 50 years. With maintenance costs, the present value of costs for the entire project $2,268,000.

Steps 2, 3, and 4 - Projected Tonnage

In 1982, tonnage through the shanty area is estimated to be 3125 tons. Of this, 3000 tons is brought in by one firm for animal consumption, while the other 125 tons is brought in by seven different commercial fisherman for human consumption. It is expected that the fish for animal consumption will remain steady at 3000 tons per year while the fish for human consumption should grow at a rate of approximately 2.5 percent per year. Therefore, projected tonnage is as follows:

Year	Tonnage
5	3141
10	3160
15	3181
20	3205
25	3262
30	3336
40	3430
50	3550

Steps 5 - 11 - Projected Benefits

Without the project, it is expected that each load of fish would need to travel one-half hour further. The fish for animal consumption is assumed to be carried in larger vessels of 20 to 30 ton capacities, while the fish for human consumption is considered to be carried in vessels of five to ten ton capacities. Average load for the former is assumed to be 15 tons and one ton for the latter.

The estimated cost per half-hour of the larger vessel is $34.68 and thus the per ton benefit is $2.31 for these 3000 tons in every year of operation. The estimated cost per half-hour of the other vessels, and thus the benefit per ton, is $24.81. Cost estimates are based on contractor's reports for optimization of Lake Erie Harbor approach channels.

As such, the net benefit level of the project is $158,036. The project's benefits accrue entirely to the port area. The benefit/cost ratio of this project is .07, the net present value is -2,110,000. As all inputs are negative, the internal rate of return is not valuable information. Impacts are detailed in the following pages.

Year	Tonnage in Type A Vessel	X$24.81	Tonnage in Type B Vessels	X$2.31	Total Benefit
0	125	3,101.25	3000	6930	10,031.25
5	141	3,498.21	3000	6930	10,428.21
10	160	3,969.60	3000	6930	10,899.60
15	181	4,490.61	3000	6930	11,420.61
20	205	5,086.05	3000	6930	12,016.05
25	262	6,500.22	3000	6930	13,430.22
30	336	8,336.16	3000	6930	15,266.16
40	430	10,668.30	3000	6930	17,598.30
50	550	13,645.00	3000	6930	20,575.50

Table 4.1

WISCONSIN HARBOR ASSISTANCE PROGRAM

ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

PROJECT SITE	SHEBOYGAN	LOCAL AREA BENEFIT PROPORTION	1.00
PROJECT TYPE	DOCKWALL/DREDGING	NON-LOCAL/STATE BENEFIT PROPORTION	.00
		NON-STATE BENEFIT PROPORTION	.00
APPLICATON NUMBER	83004		
ALTERNATIVE NUMBER	2	LOCAL SHARE OF INITIAL COSTS	.20
VERSION NUMBER	1	NON-LOCAL/STATE SHARE OF INITIAL COSTS	.80
		NON-STATE SHARE OF INITIAL COSTS	.00
PROJECT LIFE (YEARS)	50		
DISCOUNT RATE (PERCENT)	7		

	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	STATE EXPECTED CHANGE	STATE NET IMPACT	PROJECT EXPECTED CHANGE	PROJECT NET IMPACT
DISCOUNTED BENEFITS	$ 158	$ 0	$ 158	$ 0	$ 158				
DISCOUNTED COSTS	$ 845	$ 1,422	$ 2,268	$ 0	$ 2,268				
NET PRESENT VALUE	$ -687	$ -1,422	$ -2,110	$ 0	$ -2,110				
BENEFIT-COST RATIO	.19	.00	.07	.00	.07				
ANNUALIZED NET PRESENT VALUE	$ -49.9	$ -103.3	$ -153.2	$ 0.0	$ -153.2				
ANNUALIZED									
PERSONAL INCOME	$ 21.5	$ 0.0	$ 21.5	$ 0.0	$ 21.5	$ 365.7	$ -344.2	$ 365.7	$ -344.2
SALES	$ 132.7	$ 0.0	$ 132.7	$ 0.0	$ 132.7	$ 2385.3	$-2252.6	$ 2385.3	$-2252.6
FEDERAL PERSONAL INCOME TAXES	$ 4.0	$ 0.0	$ 4.0	$ 0.0	$ 4.0	$ 68.3	$ -81.9	$ 68.3	$ -64.3
STATE PERSONAL INCOME TAXES	$ 1.0	$ 0.0	$ 1.0	$ 0.0	$ 1.0	$ 17.3	$ -16.3	$ 17.3	$ -16.3
STATE EXCISE TAXES	$ 0.3	$ 0.0	$ 0.3			$ 5.5	$ -5.2		
EMPLOYMENT (NUMBER OF JOBS)	1.6	0.0	1.6	0.0	1.6	24.9	-23.3	24.9	-23.3

Table 4.2

FORM HARVAR:

ADDITIONAL

IMPACT VARIABLES

08/31/82

ANALYSIS BY MRK/PRB

PROJECT SITE	SHEBOYGAN
PROJECT TYPE	DOCKWALL/DREDGING
APPLICATON NUMBER	83004
ALTERNATIVE NUMBER	1
VERSION NUMBER	1

	LOCAL	NON-LOCAL STATE	NON-STATE
BENEFIT-INCOME MULTIPLIER	1.87	2.22	2.22
SALES-INCOME MULTIPLIER	6.183	6.523	6.523
ANNUAL WAGES PER WORKER	$ 13,248	$ 14,677	$ 14,677
FEDERAL PERSONAL INCOME TAX RATE	.1355	.1355	.1355
FEDERAL SOCIAL INSURANCE TAX RATE	.0515	.0512	.0512
STATE PERSONAL INCOME TAX RATE	.0459	.0473	.0473
STATE EXCISE TAX	.0217	.0217	-----

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II.5. EXEMPLARY HARBOR ASSISTANCE EVALUATION, 1983 LA POINTE, WISCONSIN

The town of La Pointe, Wisconsin has requested a total of $540,928 as the state share of a proposed $676,160 dredging and new pier/dockwall project. The application contains two related, but independent projects. The dredging portion of the proposal represents maintenance dredging at three sites in the harbor that will allow continued operations of the ferry to the island. The second portion of the proposal is construction of a new pier/dockwall that would shield the harbor allowing for continuous operations throughout the operating season.

Step 1 - Project Costs and Life

The estimated life of this project is 50 years with associated operations and maintenance costs of 5% annually. The first cost of the entire application is $676,160, with $55,160 scheduled for the dredging portion of the application, $621,000 scheduled for the pier/dockwall construction. Included in these amounts are $32,000 for bid preparation and contract supervision. The annual maintenance costs are $2,758 for the dredging portion of the application and $31,050 for the pier/dockwall portion of the application. Based on the fifty (50) year project life, annualized construction costs are $3,997 and $44,997 for the dredging and dockwall respectively. Including O&M the annualized costs for each are $6,755 for dredging and $76,047 for the dockwall.

Steps 2, 3 and 4 - Projected Traffic

The projected "traffic" for these two projects consists of autos and passengers that currently use the ferry as transportation to and from the islands. In 1981 there were 175,000 passengers and 52,000 autos transported by the ferries, with an annual growth of about 4% over the past decade. This rate of growth continued through 1990 and then decreased to 2.4% annually over the next 23 years of the project life, at which time it was held constant for the remainder of the project life. The 2.4% annual increase after 1990 is the approximate rate of growth in income for the non-SMSA portion of the BEA Region within which La Pointe is located. It was held constant after the 30th year of the project life to reflect increasing congestion on the island.

Steps 5 - 11 - Project Benefits

The project benefits consist of the value lost if due to lack of sufficient water depth the ferry operations were forced to close. Current published fares on the ferry are $3.75 for autos and $1.50 for passengers. Based on costs for tug boats (see Appendix C of Main Report), approximately 90% of revenue is accounted for by payments to factors, so that the lost value of ceasing operations is 10% of revenue. Thus in each year the value per auto is 3.75 cents and per passenger 15 cents. Assuming the application is correct and that without the project ferry operations would cease within 18 months, the present value of the benefits are $1,040,096 for the dredging portion of the application, or $75,364 on an annualized basis.

Benefits for the pier/dockwall construction accrue to the project due to the ability to continue operations during certain types of storms in the area. Assuming that storms are sufficiently severe to shut-down operations one day per month, the present value revenue loss associated with this closure is $346,699. Unlike the benefits of permanent closure, there are a significant number of costs that cannot be avoided in temporary shut-downs. Basically, fuel costs of 30% of costs are the only significant avoidable costs. Thus of the revenue lost, 70% represents a genuine loss to society, resulting in present value of benefits for continuous operations of $242,689. Estimates of the additional vessel storage benefits for the pier/dockwall project are based on two of the 5 vessels having to be stored at Bayfield, necessitating an additional round-trip per day at a cost of $19 per vessel. Using a 270 day working year, the present value of avoiding these extra trips is $14,597, resulting in total benefits for the pier/dockwall project of $384,286.

Based on a fifty (50) year project life, the dredging portion of this application has annualized costs of $6,755 and annualized benefits of $75,364 if the existing condition sufficiently deteriorates over the next eighteen (18) months to force closure of the ferry operations. This yields a Benefit-Cost Ratio of 11.2 and net present value of benefits of $68,609. It has not been possible to make an independent assessment of when depths within the harbor will occur that will force closure. However, if closure did not occur until the fifth year of project life, i.e. no benefits for the first five years, project benefits would be $59,989 on an annualized basis. Similarly, if no benefits for the dredging portion of the project were to accrue for the first ten years fo the project, annualized benefits would be $46,886, yielding a BCR of 6.9. Thus, the critical issue in relation to the dredging portion of this application would appear to be the timing of the project. Based on incidents described in the

application, it would appear that depth problems already exist, so that benefits to the project should begin to accrue upon its completion.

For the pier/dockwall portion of the application, annualized costs are $76,047 with annualized benefits of $242,689 resulting from the ability for continuous operations and $141,597 resulting from added safety and berthing capability at the harbor. On an annualized basis, benefits are $27,845, yielding a BCR of .37 and negative net present value of benefits. Economic efficiencies and impacts are summarized in Tables 5.1 to 5.3. For the dredging portion of this application, net imports are significant and positive. However, for the pier portion of the application, net imports are all negative due to the low benefit-cost ratio.

Table 5.2

WISCONSIN HARBOR ASSISTANCE PROGRAM

ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

PROJECT SITE	LAPOINTE	LOCAL AREA BENEFIT PROPORTION	1.00
PROJECT TYPE	PIER	NON-LOCAL/STATE BENEFIT PROPORTION	.00
		NON-STATE BENEFIT PROPORTION	.00
APPLICATON NUMBER	83005		
ALTERNATIVE NUMBER	2	LOCAL SHARE OF INITIAL COSTS	.20
VERSION NUMBER	1	NON-LOCAL/STATE SHARE OF INITIAL COSTS	.80
		NON-STATE SHARE OF INITIAL COSTS	.00
PROJECT LIFE (YEARS)	50		
DISCOUNT RATE (PERCENT)	7		

	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	STATE EXPECTED CHANGE	STATE NET IMPACT	PROJECT EXPECTED CHANGE	PROJECT NET IMPACT
DISCOUNTED BENEFITS	$ 384	$ 0	$ 384	$ 0	$ 384				
DISCOUNTED COSTS	$ 552	$ 497	$ 1,049	$ 0	$ 1,049				
NET PRESENT VALUE	$ -168	$ -497	$ -665	$ 0	$ -665				
BENEFIT-COST RATIO	.70	.00	.37	.00	.37				
ANNUALIZED NET PRESENT VALUE	$ -12.2	$ -36.1	$ -48.3	$ 0.0	$ -48.3				
ANNUALIZED									
PERSONAL INCOME	$ 47.2	$ 0.0	$ 47.2	$ 0.0	$ 47.2	$ 169.2	$ -122.0	$ 169.2	$ -122.0
SALES	$ 260.4	$ 0.0	$ 260.4	$ 0.0	$ 260.4	$ 1103.4	$ -843.0	$ 1103.4	$ -843.0
FEDERAL PERSONAL INCOME TAXES	$ 9.1	$ 0.0	$ 9.1	$ 0.0	$ 9.1	$ 31.6	$ -28.5	$ 31.6	$ -28.5
STATE PERSONAL INCOME TAXES	$ 1.9	$ 0.0	$ 1.9	$ 0.0	$ 1.9	$ 8.0	$ -6.1	$ 8.0	$ -6.1
STATE EXCISE TAXES	$ 0.7	$ 0.0	$ 0.7			$ 2.6	$ -1.8		
EMPLOYMENT (NUMBER OF JOBS)	4.0	0.0	4.0	0.0	4.0	11.5	-7.5	11.5	-7.5

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Table 5.3

WISCONSIN HARBOR ASSISTANCE PROGRAM

ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

PROJECT SITE	LAPOINTE
PROJECT TYPE	DREDGING/PIER
APPLICATON NUMBER	83005
ALTERNATIVE NUMBER	3
VERSION NUMBER	1
PROJECT LIFE (YEARS)	50
DISCOUNT RATE (PERCENT)	7

LOCAL AREA BENEFIT PROPORTION	1.00
NON-LOCAL/STATE BENEFIT PROPORTION	.00
NON-STATE BENEFIT PROPORTION	.00
LOCAL SHARE OF INITIAL COSTS	.20
NON-LOCAL/STATE SHARE OF INITIAL COSTS	.80
NON-STATE SHARE OF INITIAL COSTS	.00

	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	STATE EXPECTED CHANGE	STATE NET IMPACT	PROJECT EXPECTED CHANGE	PROJECT NET IMPACT
DISCOUNTED BENEFITS	$ 1,424	$ 0	$ 1,424	$ 0	$ 1,424				
DISCOUNTED COSTS	$ 601	$ 541	$ 1,142	$ 0	$ 1,142				
NET PRESENT VALUE	$ 823	$ -541	$ 282	$ 0	$ 282				
BENEFIT-COST RATIO	2.37	.00	1.25	.00	1.25				
ANNUALIZED NET PRESENT VALUE	$ 59.8	$ -39.3	$ 20.5	$ 0.0	$ 20.5				
ANNUALIZED									
PERSONAL INCOME	$ 174.9	$ 0.0	$ 174.9	$ 0.0	$ 174.9	$ 184.2	$ -9.3	$ 184.2	$ -9.3
SALES	$ 965.2	$ 0.0	$ 965.2	$ 0.0	$ 965.2	$ 1201.3	$ -236.1	$ 1201.3	$ -236.1
FEDERAL PERSONAL INCOME TAXES	$ 33.6	$ 0.0	$ 33.6	$ 0.0	$ 33.6	$ 34.4	$ -0.4	$ 34.4	$ -0.8
STATE PERSONAL INCOME TAXES	$ 6.9	$ 0.0	$ 6.9	$ 0.0	$ 6.9	$ 8.7	$ -1.8	$ 8.7	$ -1.8
STATE EXCISE TAXES	$ 2.7	$ 0.0	$ 2.7			$ 2.8	$ -0.1		
EMPLOYMENT (NUMBER OF JOBS)	14.7	0.0	14.7	0.0	14.7	12.5	2.2	12.5	2.2

Table 5.4

ADDITIONAL

IMPACT VARIABLES

PROJECT SITE	LAPOINTE
PROJECT TYPE	DREDGING
APPLICATON NUMBER	83005
ALTERNATIVE NUMBER	1
VERSION NUMBER	1

	LOCAL	NON-LOCAL STATE	NON-STATE
BENEFIT-INCOME MULTIPLIER	1.69	2.22	2.22
SALES-INCOME MULTIPLIER	5.520	6.523	6.523
ANNUAL WAGES PER WORKER	$ 11,863	$ 14,677	$ 14,677
FEDERAL PERSONAL INCOME TAX RATE	.1355	.1355	.1355
FEDERAL SOCIAL INSURANCE TAX RATE	.0565	.0512	.0512
STATE PERSONAL INCOME TAX RATE	.0398	.0473	.0473
STATE EXCISE TAX	.0217	.0217	-----

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II.6 EXEMPLARY HARBOR ASSISTANCE EVALUATION: PRAIRIE DU CHIEN

This project entails the building of a new dock wall of 1600 feet, and 400,000 cubic yards of dredging. The purpose of this project is to provide a stable facility for cargo handling. The facilities currently in use are subject to frequent flooding and a stable and useable facility is necessary. The City has requested $1,150,000 of the $1,495,000 needed for the project.

Step 1 - Project Life and Project Costs

The request for assistance considers the life of the project to be 25 years long. The initial cost of the project is $1,410,000, including $750,000 for dredging, and $660,000 for the dock wall. Contract preparation and supervision will add $85,000. Maintenance costs are approximately $70,500 per year, and this has a present value of $745,385. However, this project will need significant site development to accommodate traffic. Based on generic terminal development costs from the Mid-America Port Study these are about $2.6 million. This yields a total present value of costs of about $7,229,000.

Steps 2, 3, and 4 - Projected Tonnage

Current tonnage through the Port of Prairie du Chien consists of 420,000 tons of grain, 100,000 tons of coal and 27,000 tons of salt. It is considered that coal will not be moved over this dock and therefore coal traffic will not be predicted here. All other municipal facilities will move operations to this facility. Projected tonnages for salt and grain are given in Table 6.1, based on annual growth rates for SIC's 01 and 14 for traffic on the Upper Mississippi River shown in Exhibit 2.3 of the Main Report. The cargoes will move over other docks until September 1984, the target opening date of this facility.

TABLE 6.1

Projected Tonnage for Selected Years

Year	Grain	Annual Growth %	Salt	Annual Growth %	Total
5	518,407	4.3	23,981	-2.4	542,388
7	563,949	3.1	22,870	-1.1	586,819
10	610,928	3.1	22,416	-1.1	633,344
15	711,677	3.1	21,223	-1.1	732,900
20	829,042	3.1	20,093	-1.1	849,135
25	965,761	3.1	19,024	-1.1	984,785

Steps 5 - 9 - Projected Benefits

The benefit for grain is the saved truck cost of seven miles times six cents per mile or 42 cents per ton, less the additional river transport cost of two and one-half miles times 0.3 cents per mile or 0.75 cents per ton. The savings for salt is the saving of truck transport cost of 1.2 miles times six cents per mile or 7.2 cents less one-half mile times 0.3 cents per mile or 0.15 cents per ton. The level of benefits for selected years is shown in Table 6.2.

Steps 10 and 11 - Project Evaluation

The present discounted value of the benefit stream is $2,928,570. The benefit to cost ratio is 0.41.

TABLE 6.2

Benefits for Selected Years

Year	Benefits
5	$215,385
10	253,586
15	295,063
20	343,397
25	399,718

Project impacts are summarized in Table 6.3. Due to the BCR below 1, gross impacts are generally low and net impacts are significantly negative.

Table 6.3

WISCONSIN HARBOR ASSISTANCE PROGRAM

ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

PROJECT SITE	PRAIRIE DU CHIEN	LOCAL AREA BENEFIT PROPORTION	.46
PROJECT TYPE	DREDGING/DOCKWALL	NON-LOCAL/STATE BENEFIT PROPORTION	.21
		NON-STATE BENEFIT PROPORTION	.33
APPLICATON NUMBER	83006		
ALTERNATIVE NUMBER	1	LOCAL SHARE OF INITIAL COSTS	.78
VERSION NUMBER	1	NON-LOCAL/STATE SHARE OF INITIAL COSTS	.22
		NON-STATE SHARE OF INITIAL COSTS	.00
PROJECT LIFE (YEARS)	25		
DISCOUNT RATE (PERCENT)	7		

	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	STATE EXPECTED CHANGE	STATE NET IMPACT	PROJECT EXPECTED CHANGE	PROJECT NET IMPACT
DISCOUNTED BENEFITS	$ 1,347	$ 615	$ 1,962	$ 968	$ 2,929				
DISCOUNTED COSTS	$ 6,088	$ 1,141	$ 7,229	$ 0	$ 7,229				
NET PRESENT VALUE	$ -4,741	$ -526	$ -5,266	$ 966	$ -4,300				
BENEFIT-COST RATIO	.22	.54	.27	.00	.41				
ANNUALIZED NET PRESENT VALUE	$-413.4	$ -45.8	$ -459.2	$ 84.3	$ -374.9				
ANNUALIZED									
PERSONAL INCOME	$ 172.7	$ 119.0	$ 291.7	$ 187.1	$ 478.8	$ 1399.2	$-1107.5	$ 1399.2	$ -920.4
SALES	$ 1728.2	$ 776.5	$ 2504.7	$ 1220.2	$ 3724.9	$ 9126.8	$-6622.1	$ 9126.8	$-5401.9
FEDERAL PERSONAL INCOME TAXES	$ 31.2	$ 22.2	$ 53.5	$ 34.9	$ 88.4	$ 261.2	$ -265.5	$ 261.2	$ -172.8
STATE PERSONAL INCOME TAXES	$ 7.0	$ 5.6	$ 12.7	$ 8.8	$ 12.7	$ 66.2	$ -53.5	$ 66.2	$ -53.5
STATE EXCISE TAXES	$ 2.7	$ 1.8	$ 4.5			$ 21.2	$ -16.7		
EMPLOYMENT (NUMBER OF JOBS)	13.1	8.1	21.2	12.7	34.0	95.3	-74.1	95.3	-61.4

Table 6.4

ADDITIONAL

IMPACT VARIABLES

PROJECT SITE	PRAIRIE DU CHIEN
PROJECT TYPE	DREDGING/DOCKWALL
APPLICATON NUMBER	83006
ALTERNATIVE NUMBER	1
VERSION NUMBER	1

	LOCAL	NON-LOCAL STATE	NON-STATE
BENEFIT-INCOME MULTIPLIER	1.47	2.22	2.22
SALES-INCOME MULTIPLIER	10.009	6.523	6.523
ANNUAL WAGES PER WORKER	$ 13,158	$ 14,677	$ 14,677
FEDERAL PERSONAL INCOME TAX RATE	.1355	.1355	.1355
FEDERAL SOCIAL INSURANCE TAX RATE	.0454	.0512	.0512
STATE PERSONAL INCOME TAX RATE	.0408	.0473	.0473
STATE EXCISE TAX	.0217	.0217	-----

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II.7 EXEMPLARY HARBOR ASSISTANCE EVALUATION, 1983 STURGEON BAY, WISCONSIN

The city of Sturgeon Bay, WI has requested a total of $1,222,548 as the state share of a proposed $1,528,185 dredging and dockwall project that would improve existing facilities in the harbor. The dredging portion of the application would increase the depth of the area around the dock to a uniform 19 feet. The dockwall and associated services portion of the application would re-construct approximately 915 feet of pile bulkhead, provide sanitary sewer line and hookup facilities and provide necessary hard work area for the dock facility.

Step 1 - Project Costs and Life

The estimated life of the project is fifty (50) years, with associated operations and maintenance costs of 2.5% annually. Total cost of the project is $1,528,185 plus O&M, with $1,510,685 representing project construction costs. Based on the budget breakdown contained in the application, the dredging portion of the application has a first cost of $264,000, resulting in annualized costs of $19,129 plus $6,600 O&M costs annually for total annualized costs of $25,729. For the land portion of the application total costs are $1,246,685 plus O&M, yielding annualized costs of $90,334 for construction,$31,167 for O&M, and total annualized costs of $121,501.

Steps 2, 3, and 4 - Projected Traffic

As with the other applications concerned with the provision of space for expansion of the ship building/repair industry, the primary commodity that would utilize this project is the vessel itself. The rationale behind re-construction of the dockwall is that it is currently used for the mooring of vessels for repair, three per year, which is not projected to increase over the life of the project, i.e. no additional berthing space is to be provided by the project. The rationale behind the dredging portion is that the depth around the dock area is rather spotty and not uniformly 19 feet, is some cases as shallow as 7 feet according to the application. Increasing the depth to a uniform 19 feet will allow loaded vessels to utilize these repair facilities for emergency repairs. Projected vessels that might need the increased depth for emergency repairs are one vessel per year, i.e. one vessel that will need the increased depth to use the facility. Thus, for the dockwall portion of the project, projected "traffic" is three vessels per year and for the dredging portion of the project, one vessel per year.

Steps 5 - 9 - Project Benefits

For the dredging portion of the project, the benefits that would accrue by allowing loading vessels to utilize the facilities are based on the costs of vessel operations and the formula for computing dredging benefits contained in the Main Report. Since it is expected that emergency repairs would be affected on vessels which are already "near" the facilities, the portion of the vessels that would need to utilize the Soo Locks in relation to this project is zero. Thus, the formula reduces to 5 parameters, ton-miles, speed, vessel costs, project depth with and without the project. Vessel speed of 14mph is assumed for these vessels as shown in the Main Report. Since the vessels are always loaded we need not concern ourselves with vessel speed in ballast. Ton-miles are estimated in two steps. Estimates of the tons per vessel is based on increasing the effective channel depth from 12' to 19'. The estimated miles for the emergency trip into the facility is 200, implying that only vessels quite nearby will stop for emergency repairs at this facility. Thus the ton-miles per vessel are 957,600. The integral ($e^{-.145\,c}$, c=channel depth) from 12' to 19' yields a value of $.112 per ton. Thus annual savings are 957,600 times (2*speed) times $.112 = $15,322. (Note: The speed is multiplied by two, so as to account for going into the harbor and out of the harbor loaded, rather than loaded and in ballast.) Benefits for the dockwall construction, and associated services, are computed on the same basis as other projects related to ship building. Based on the three vessels moored at the existing facility, with average yearly expenditures of $85,000 each, annual benefits are $3,290 (3 times $85,000 times .215 times .06.) This represents the value lost that is not accounted for by payments to input factors used in vessel repair.

Over a fifty (50) year project life, with $2.5 annual O&M costs the annualized costs of the entire application is $148,498, which includes $1,268 annualized costs for bid preparation and contract supervision not included in the cost estimates for the two portions of the application considered separately. The use of a 2.5 percent rate for annual O&M costs is based on the operating costs being internalized in the production process, with the 2.5 percent representing maintenance costs. Total present value of benefits for the application are $256,862, with an annualized value of $18,612, resulting in a BCR of .13 for the entire application.

For the dredging portion of the application, annualized costs are $25,729 compared with annualized benefits of $15,322 yielding a BCR of .6. For the dockwall portion of the application, annualized benefits and costs are $3,290 and $121,501 yielding a BCR of .03. Tables 7.1 and 7.2 summarize project efficiencies

for the dredging and dockwall portions of this project considered seperately. Table 7.3 summarizes the project efficiencies of the entire application.

Steps 10 and 11 - Project Evaluation

Due to the low benefit-cost ratios all net economic impacts are significantly negative, for all three evaluations undertaken. In general, even the gross impacts are rather low for a project of this size. Economic impacts are summarized in Tables 7.1 to 7.3.

Table 7.1

WISCONSIN HARBOR ASSISTANCE PROGRAM

ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

PROJECT SITE	STURGEON BAY	LOCAL AREA BENEFIT PROPORTION	1.00
PROJECT TYPE	DREDGING	NON-LOCAL/STATE BENEFIT PROPORTION	.00
		NON-STATE BENEFIT PROPORTION	.00
APPLICATON NUMBER	83007		
ALTERNATIVE NUMBER	1	LOCAL SHARE OF INITIAL COSTS	.20
VERSION NUMBER	1	NON-LOCAL/STATE SHARE OF INITIAL COSTS	.80
		NON-STATE SHARE OF INITIAL COSTS	.00
PROJECT LIFE (YEARS)	50		
DISCOUNT RATE (PERCENT)	7		

	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	STATE EXPECTED CHANGE	STATE NET IMPACT	PROJECT EXPECTED CHANGE	PROJECT NET IMPACT
DISCOUNTED BENEFITS	$ 211	$ 0	$ 211	$ 0	$ 211				
DISCOUNTED COSTS	$ 136	$ 214	$ 350	$ 0	$ 350				
NET PRESENT VALUE	$ 75	$ -214	$ -138	$ 0	$ -138				
BENEFIT-COST RATIO	1.55	.00	.60	.00	.60				
ANNUALIZED NET PRESENT VALUE	$ -10.0	$ -15.5	$ -10.0	$ 0.0	$ -10.0				
ANNUALIZED									
PERSONAL INCOME	$ 24.9	$ 0.0	$ 24.9	$ 0.0	$ 24.9	$ 56.4	$ -31.5	$ 56.4	$ -31.5
SALES	$ 157.5	$ 0.0	$ 157.5	$ 0.0	$ 157.5	$ 367.8	$ -210.3	$ 367.8	$ -210.3
FEDERAL PERSONAL INCOME TAXES	$ 4.6	$ 0.0	$ 4.6	$ 0.0	$ 4.6	$ 10.5	$ -7.6	$ 10.5	$ -5.9
STATE PERSONAL INCOME TAXES	$ 1.1	$ 0.0	$ 1.1	$ 0.0	$ 1.1	$ 2.7	$ -1.6	$ 2.7	$ -1.6
STATE EXCISE TAXES	$ 0.4	$ 0.0	$ 0.4			$ 0.9	$ -0.5		
EMPLOYMENT (NUMBER OF JOBS)	1.8	0.0	1.8	0.0	1.8	3.8	-2.0	3.8	-2.0

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Table 7.2

WISCONSIN HARBOR ASSISTANCE PROGRAM 08/31/82

ANALYSIS RESULTS SUMMARY ANALYSIS BY MMK/PRB

(RESULTS IN $000)

PROJECT SITE	STURGEON BAY	LOCAL AREA BENEFIT PROPORTION	1.00
PROJECT TYPE	DOCKWALL	NON-LOCAL/STATE BENEFIT PROPORTION	.00
		NON-STATE BENEFIT PROPORTION	.00
APPLICATON NUMBER	83007		
ALTERNATIVE NUMBER	2	LOCAL SHARE OF INITIAL COSTS	.20
VERSION NUMBER	1	NON-LOCAL/STATE SHARE OF INITIAL COSTS	.80
		NON-STATE SHARE OF INITIAL COSTS	.00
PROJECT LIFE (YEARS)	50		
DISCOUNT RATE (PERCENT)	7		

	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	STATE EXPECTED CHANGE	STATE NET IMPACT	PROJECT EXPECTED CHANGE	PROJECT NET IMPACT
DISCOUNTED BENEFITS	$ 45	$ 0	$ 45	$ 0	$ 45				
DISCOUNTED COSTS	$ 642	$ 1,009	$ 1,651	$ 0	$ 1,651				
NET PRESENT VALUE	$ -597	$ -1,009	$ -1,606	$ 0	$ -1,606				
BENEFIT-COST RATIO	.07	.00	.03	.00	.03				
ANNUALIZED NET PRESENT VALUE	$ -116.6	$ -73.3	$ -116.6	$ 0.0	$ -116.6				
ANNUALIZED									
PERSONAL INCOME	$ 5.3	$ 0.0	$ 5.3	$ 0.0	$ 5.3	$ 266.3	$ -260.9	$ 266.3	$ -260.9
SALES	$ 33.8	$ 0.0	$ 33.8	$ 0.0	$ 33.8	$ 1736.9	$-1703.0	$ 1736.9	$-1703.0
FEDERAL PERSONAL INCOME TAXES	$ 1.0	$ 0.0	$ 1.0	$ 0.0	$ 1.0	$ 49.7	$ -62.1	$ 49.7	$ -48.7
STATE PERSONAL INCOME TAXES	$ 0.2	$ 0.0	$ 0.2	$ 0.0	$ 0.2	$ 12.6	$ -12.4	$ 12.6	$ -12.4
STATE EXCISE TAXES	$ 0.1	$ 0.0	$ 0.1			$ 4.0	$ -3.9		
EMPLOYMENT (NUMBER OF JOBS)	0.4	0.0	0.4	0.0	0.4	18.1	-17.8	18.1	-17.8

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Table 7.3

WISCONSIN HARBOR ASSISTANCE PROGRAM 08/31/82

ANALYSIS RESULTS SUMMARY ANALYSIS BY MRK/PRB

(RESULTS IN $000)

PROJECT SITE	STURGEON BAY
PROJECT TYPE	DOCKWALL & DREDGING
APPLICATON NUMBER	83007
ALTERNATIVE NUMBER	3
VERSION NUMBER	1
PROJECT LIFE (YEARS)	50
DISCOUNT RATE (PERCENT)	7

LOCAL AREA BENEFIT PROPORTION	1.00
NON-LOCAL/STATE BENEFIT PROPORTION	.00
NON-STATE BENEFIT PROPORTION	.00
LOCAL SHARE OF INITIAL COSTS	.20
NON-LOCAL/STATE SHARE OF INITIAL COSTS	.80
NON-STATE SHARE OF INITIAL COSTS	.00

						STATE		PROJECT	
	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	EXPECTED CHANGE	NET IMPACT	EXPECTED CHANGE	NET IMPACT
DISCOUNTED BENEFITS	$ 257	$ 0	$ 257	$ 0	$ 257				
DISCOUNTED COSTS	$ 778	$ 1,223	$ 2,001	$ 0	$ 2,001				
NET PRESENT VALUE	$ -521	$ -1,223	$ -1,744	$ 0	$ -1,744				
BENEFIT-COST RATIO	.33	.00	.13	.00	.13				
ANNUALIZED NET PRESENT VALUE	$ -126.7	$ -88.8	$ -126.7	$ 0.0	$ -126.7				
ANNUALIZED									
PERSONAL INCOME	$ 30.2	$ 0.0	$ 30.2	$ 0.0	$ 30.2	$ 322.7	$ -292.4	$ 322.7	$ -292.4
SALES	$ 191.3	$ 0.0	$ 191.3	$ 0.0	$ 191.3	$ 2104.7	$-1913.3	$ 2104.7	$-1913.3
FEDERAL PERSONAL INCOME TAXES	$ 5.6	$ 0.0	$ 5.6	$ 0.0	$ 5.6	$ 60.2	$ -69.7	$ 60.2	$ -54.7
STATE PERSONAL INCOME TAXES	$ 1.3	$ 0.0	$ 1.3	$ 0.0	$ 1.3	$ 15.3	$ -13.9	$ 15.3	$ -13.9
STATE EXCISE TAXES	$ 0.5	$ 0.0	$ 0.5			$ 4.9	$ -4.4		
EMPLOYMENT (NUMBER OF JOBS)	2.2	0.0	2.2	0.0	2.2	22.0	-19.8	22.0	-19.8

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Table 7.4

ADDITIONAL

IMPACT VARIABLES

08/31/82

ANALYSIS BY MMK/PRB

PROJECT SITE	STURGEON BAY
PROJECT TYPE	DREDGING
APPLICATON NUMBER	83007
ALTERNATIVE NUMBER	1
VERSION NUMBER	1

	LOCAL	NON-LOCAL STATE	NON-STATE
BENEFIT-INCOME MULTIPLIER	1.62	2.22	2.22
SALES-INCOME MULTIPLIER	6.330	6.523	6.523
ANNUAL WAGES PER WORKER	$ 13,866	$ 14,677	$ 14,677
FEDERAL PERSONAL INCOME TAX RATE	.1355	.1355	.1355
FEDERAL SOCIAL INSURANCE TAX RATE	.0489	.0512	.0512
STATE PERSONAL INCOME TAX RATE	.0434	.0473	.0473
STATE EXCISE TAX	.0217	.0217	-----

II.8. EXEMPLARY HARBOR ASSISTANCE EVALUATION - LA CROSSE

The City of La Crosse has requested $232,000 to develop a $290,000 dock facility near mile 696.5 on the Upper Mississippi River. The dock is a new facility, being planned to handle increased commerce through the area, and to handle tonnage which will be redirected from other facilities that will be unable to accommodate their present traffic levels in a few years.

Step 1 - Determination of Project Cost and Project Life

The cost of construction of the facility is $230,000. As the construction will be performed by a private contractor, the contract amount is $270,000, with insurances, contingencies and other fees. Contract preparation and supervision will bring the total cost of this project to $290,000. However, site development costs will add approximately $2.2 million to total project costs.

Properly maintained, the dock should have a useful life of 25 years. Proper maintenance will require an annual expenditure of 5 percent of construction costs. Total discounted costs of the project are $3,761,000, consisting of $2.49 million in initial costs, and the remainder representing the present value of annual O&M expenditures of $121,500.

Steps 2, 3 and 4 - Project Throughput

The assistance request made by the City of La Crosse estimates cargo throughput in the first year to be 60,000 tons of salt and 60,000 tons of coal. Additionally, five tons of manufactured goods will be using this facility in the first year of its operation. This will grow to 10 tons by year five. An additional 50,000 tons of bulk commodities will be rerouted from another city dock which will lose its lease in the second year of operation.

To these base tonnages, the appropriate growth rates from Table 7.1 of Main Report have been applied for various commodities moving on the Mississippi River, through the State of Wisconsin. Project cargo flow is shown in Table 8.1.

TABLE 8.1

La Crosse Dock Projected Cargo Flow

Year	Coal	Salt	Manufactured Goods	Other Bulk	Total
1	50,000	60,000	5	-	110,005
2	50,867	58,560	6	50,000	159,433
3	51,816	57,155	8	50,750	159,729
4	52,749	55,783	9	51,511	160,052
5	53,698	54,444	10	52,284	160,436
10	58,708	47,590	10	56,324	162,632
15	65,137	44,914	10	58,034	168,095
20	72,270	42,389	10	59,796	174,465
25	80,183	40,006	11	61,612	181,812
30	88,964	37,756	11	63,482	190,213
40	109,514	33,623	11	67,396	210,544
50	134,812	29,954	11	71,551	236,328

Steps 5 - 9 - Project Benefits - Transportation Cost Differentials

The project benefit in this case is the difference in total transportation cost for each cargo as compared to the most likely project alternative. Coal handling at this facility is eight cents per ton cheaper than the closest facility to which the coal would go. This represents savings by elimination of rail transport. Other bulk commodities show a per ton savings of $1.87 per ton. Manufactured goods result in a savings of truck transportation of four miles in distance, or 24 cents per ton. Salt, on the other hand, would normally be shipped via Winona, Minnesota.

Winona to La Crosse provides a savings, by truck, of 29 miles, but La Crosse is 22 highway miles further from the final destination. As a result, the net cost of trans-loading salt over this facility is -$1.23 per ton. Table 8.2 shows the benefits for each year displayed in Table 8.1.

TABLE 8.2

Benefits in $

Year	Coal	Salt	Manufactured Goods	Other Bulk	TOTAL
1	4,000	-73,800	1	-	-17,801
2	4,069	-72,029	1	93,500	25,541
3	4,145	-70,301	2	94,902	28,748
4	4,220	-68,613	2	96,326	31,935
5	4,296	-66,966	2	97,771	35,103
10	4,697	-58,536	2	165,326	51,489
15	5,211	-55,244	2	108,524	58,493
20	5,782	-52,138	2	111,819	65,465
25	6,415	-49,207	3	115,214	72,425
30	7,117	-46,440	3	118,711	79,391
40	8,761	-41,356	3	126,031	93,439
50	10,785	-36,843	3	133,800	107,745

Steps 10 and 11 - Project Evaluation

The present discounted value of the benefit stream is then $778,000. The benefit cost ratio is therefore .21. Net present value and the internal rate of return are negative. The various impacts are detailed on the following pages, assuming that the impacts are distributed in accordance with the origins and destinations of tonnage over the dock. As expected due to the low BCR, all net impacts are significantly negative.

Table 8.3

WISCONSIN HARBOR ASSISTANCE PROGRAM 08/31/82

ANALYSIS RESULTS SUMMARY ANALYSIS BY MMK/PRB

(RESULTS IN $000)

PROJECT SITE	LA CROSSE	LOCAL AREA BENEFIT PROPORTION	.87
PROJECT TYPE	DOCK	NON-LOCAL/STATE BENEFIT PROPORTION	.08
		NON-STATE BENEFIT PROPORTION	.05
APPLICATON NUMBER	83008		
ALTERNATIVE NUMBER	1	LOCAL SHARE OF INITIAL COSTS	.91
VERSION NUMBER	1	NON-LOCAL/STATE SHARE OF INITIAL COSTS	.09
		NON-STATE SHARE OF INITIAL COSTS	.00
PROJECT LIFE (YEARS)	25		
DISCOUNT RATE (PERCENT)	7		

	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	STATE EXPECTED CHANGE	STATE NET IMPACT	PROJECT EXPECTED CHANGE	PROJECT NET IMPACT
DISCOUNTED BENEFITS	$ 677	$ 62	$ 739	$ 39	$ 778				
DISCOUNTED COSTS	$ 3,637	$ 224	$ 3,761	$ 0	$ 3,761				
NET PRESENT VALUE	$ -2,261	$ -161	$ -3,022	$ 39	$ -2,983				
BENEFIT-COST RATIO	.19	.28	.20	.00	.21				
ANNUALIZED NET PRESENT VALUE	$ -260.1	$ -14.1	$ -263.5	$ 3.4	$ -260.1				
ANNUALIZED									
PERSONAL INCOME	$ 126.8	$ 12.0	$ 138.9	$ 7.5	$ 146.4	$ 728.0	$ -589.1	$ 728.0	$ -581.6
SALES	$ 702.1	$ 78.5	$ 780.7	$ 49.1	$ 829.8	$ 4748.5	$-3967.8	$ 4748.5	$-3918.7
FEDERAL PERSONAL INCOME TAXES	$ 23.9	$ 2.2	$ 26.2	$ 1.4	$ 27.6	$ 135.9	$ -139.6	$ 135.9	$ -108.3
STATE PERSONAL INCOME TAXES	$ 5.7	$ 0.6	$ 6.3	$ 0.4	$ 6.3	$ 34.4	$ -28.1	$ 34.4	$ -28.1
STATE EXCISE TAXES	$ 1.9	$ 0.2	$ 2.1			$ 11.0	$ -8.9		
EMPLOYMENT (NUMBER OF JOBS)	9.7	0.8	10.5	0.5	11.0	49.6	-39.1	49.8	-38.6

Table 8.4

ADDITIONAL

IMPACT VARIABLES

08/31/88

ANALYSIS BY MWC/PRS

PROJECT SITE LA CROSSE
PROJECT TYPE DOCK

APPLICATON NUMBER 83008
ALTERNATIVE NUMBER 1
VERSION NUMBER 1

	LOCAL	NON-LOCAL STATE	NON-STATE
BENEFIT-INCOME MULTIPLIER	2.15	2.22	2.22
SALES-INCOME MULTIPLIER	5.536	6.583	6.583
ANNUAL WAGES PER WORKER	$ 13,066	$ 14,677	$ 14,677
FEDERAL PERSONAL INCOME TAX RATE	.1355	.1355	.1355
FEDERAL SOCIAL INSURANCE TAX RATE	.0533	.0512	.0512
STATE PERSONAL INCOME TAX RATE	.0451	.0473	.0473
STATE EXCISE TAX	.0217	.0217	-----

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II.9 EXEMPLARY HARBOR ASSISTANCE EVALUATION MILWAUKEE, GRAIN ELEVATOR MARINE LEG

The city of Milwaukee has requested $4,004,000 as the state share for the construction of the marine leg portion for a grain terminal and elevator. Currently, there is inadequate capacity to handle grain through the Port of Milwaukee. With the addition of this facility, it is expected that the Port of Milwaukee will be able to better compete with the Port of Chicago and the Illinois River markets for the area's grain. This will result in a higher price to the farmer in Milwaukee, at a lower transportation cost than that of shipment to either Chicago or to the Illinois Waterway.

Step 1 - Project Life and Project Cost

The facility has an estimated project life of 50 years with a maintenance cost of 7.5 percent per year. The impact of this project is generally out of the area, half to the State and the remaining part out-of-state. In addition to the site development costs, the elevator will cost $131,779,360 to build. The maintenance cost of this facility will be 7.5 percent of construction costs, or $2,383,000 per year, yielding a total present value of costs for the project of $64,562,000.

Steps 2, 3, and 4 - Projected Tonnage

In 1979, the Port of Milwaukee shipped 1,576,268 tons of grain to Canada and overseas. With a normal growth rate and considering that by 1984, the facility's projected first full year of operation, the grain elevator should handle one fourth of all tonnage through the port, the first year tonnage is expected to be 466,345 tons at the grain facility. In that the effect of the facility is to increase capacity at the Port of Milwaukee and to raise the price paid for all grain through the port, all tonnage through the port is affected.

Steps 5 - 9 - Projected Benefits

Due to the rather extensive study of this project, per unit benefits have been computed directly. It is expected that grain through this facility will generally originate in western Wisconsin and northern Illinois, so that river ports on the

Illinois Waterway represent the alternative. As cited in the application, bid differentials between these two areas are about $.10 per bushel. Due to competition at the margin, only 1/2 of this differential is used as the per unit benefit resulting in a savings of $1.75 per ton for all grain through the port. Table 9.1 shows tonnage and benefits for selected project years.

TABLE 9.1

Tonnages and Benefits for Selected Years

Project Year	Tons	x	Benefits per Ton	=	Benefits
1	1,865,740		$ 1.75		3,265,045
5	2,207,520		$ 1.75		3,863,160
10	2,581,372		$ 1.75		4,517,401
15	2,978,016		$ 1.75		5,211,528
20	3,435,612		$ 1.75		6,012,321
25	3,963,519		$ 1.75		6,936,158
30	4,572,544		$ 1.75		8,001,952
40	6,085,720		$ 1.75		10,650,011
50	8,099,647		$ 1.75		14,174,382

The present discounted value of the benefit stream is $72,566,000. The net present value is therefore $8,004,0000 yielding a BCR of 1.12 for the entire project.

Steps 10 - 11 - Project Evaluation

Project impacts are summarized in Table 9.2. For the entire project both gross and net impacts are generally positive. However, since a substantial portion of the benefits (27%) flow out-of-state, net state impacts and net project state tax revenues are negative. Parameters used in the estimation of impacts are shown in Table 1.4 of this section.

Table 9.2

WISCONSIN HARBOR ASSISTANCE PROGRAM

ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

PROJECT SITE	MILWAUKEE	LOCAL AREA BENEFIT PROPORTION	.10
PROJECT TYPE	MARINE LEG	NON-LOCAL/STATE BENEFIT PROPORTION	.63
		NON-STATE BENEFIT PROPORTION	.27
APPLICATON NUMBER	83009		
ALTERNATIVE NUMBER	1	LOCAL SHARE OF INITIAL COSTS	.87
VERSION NUMBER	1	NON-LOCAL/STATE SHARE OF INITIAL COSTS	.13
		NON-STATE SHARE OF INITIAL COSTS	.00
PROJECT LIFE (YEARS)	50		
DISCOUNT RATE (PERCENT)	7		

	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	STATE EXPECTED CHANGE	STATE NET IMPACT	PROJECT EXPECTED CHANGE	PROJECT NET IMPACT
DISCOUNTED BENEFITS	$ 7,257	$ 45,716	$ 52,973	$ 19,593	$ 72,566				
DISCOUNTED COSTS	$ 60,557	$ 4,004	$ 64,562	$ 0	$ 64,562				
NET PRESENT VALUE	$-53,301	$ 41,712	$-11,588	$ 19,593	$ 8,004				
BENEFIT-COST RATIO	.12	11.42	.82	.00	1.12				
ANNUALIZED NET PRESENT VALUE	$-3,871.7	$ 3029.9	$ -841.8	$ 1423.2	$ 581.4				
ANNUALIZED									
PERSONAL INCOME	$ 1201.8	$ 7372.1	$ 8573.9	$ 3159.5	$11733.4	$10411.0	$-1837.1	$10411.0	$ 1322.4
SALES	$ 6535.4	$48088.4	$54623.8	$20609.3	$75233.1	$67911.2	-13287.4	$67911.2	$ 7321.9
FEDERAL PERSONAL INCOME TAXES	$ 227.6	$ 1376.4	$ 1604.0	$ 589.9	$ 2193.9	$ 1943.7	$ -430.6	$ 1943.7	$ 250.1
STATE PERSONAL INCOME TAXES	$ 57.1	$ 348.7	$ 405.8	$ 149.4	$ 405.8	$ 492.4	$ -86.7	$ 492.4	$ -86.7
STATE EXCISE TAXES	$ 18.1	$ 111.4	$ 129.5			$ 157.4	$ -27.8		
EMPLOYMENT (NUMBER OF JOBS)	75.1	502.3	577.4	215.3	792.6	709.3	-132.0	709.3	83.3

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III. ANALYSIS OF PREVIOUS YEAR HARBOR ASSISTANCE PROJECTS

III.10. EXEMPLARY HARBOR ASSISTANCE EVALUATION: SUPERIOR

The City of Superior, Wisconsin, requested $1,120,000 towards a $27,478,000 grain elevator. The grain elevator will be funded in the following manner: In addition to the Harbor Assistance funds, (1) $280,000 will come from local sources; (2) a city tax rider from parking fees, etc., will earmark $1,970,000 towards the project; (3) a revenue bond of $18,000,000 will be put towards the elevator; (4) the Federal Department of Housing and Urban Development has offered a grant of $5,858,000; and, funds for relocation of homes at the Connors Point area, the location of the proposed facility, will add $250,000.The Connors Point Facility has a designed throughput capacity of $2,800,000 tons per year.

Step 1 - Project Life and Project Cost

As has been the assumption for most structural projects, with proper maintenance, this project should have a life of 50 years. The cost, as mentioned above, is $27,478,000. Maintenance costs for an elevator are slightly higher than for docks and wharves, and are estimated to be 7.5 percent of construction costs, or $2,032,000 per year. At a discount rate of 7 percent, this yields total costs for the project of $55,599,000, in present discounted value.

Steps 2, 3, and 4 - Projected Tonnage

It is anticipated that the facility will begin operation in 1984, and have a first year tonnage of 1,336,311. This is the differential expected between 1980 tonnage through the Port of Duluth-Superior, and the projected 1984 tonnage. Tonnage will grow at a rate equivalent to that of all Great Lakes' grain traffic, until in the 24th year of the elevator's operation (2008), when the capacity of 2,800,000 tons is reached. Tonnage through the facility for selected years is shown in Table 10.1

An alternate scenario, developed for expositional purposes only, is that the new facility is able to better compete with the older facilities immediately. As such, the elevator operates at capacity (2,800,000 tons) for all years.

TABLE 10.1

Tonnage for Selected Years

Year	Tonnage
1	1,336,311
5	1,581,411
10	1,899,890
15	2.191.823
20	2,528,612
24 through 50	2,800,000

Steps 5 - 9 - Projected Benefits

The benefit of the grain elevator is the ability of shippers closer to Duluth-Superior than to Milwaukee or Chicago to save rail charges of transport further. The rail differential from Duluth-Superior to either Chicago or Milwaukee is $1.40 a ton. Price differentials, service differentials and the competitive nature of the grain market in general will make the benefit per ton approximately $.70. Therefore the benefits for selected years are:

TABLE 10.2

Benefits for Selected Years

Year	Benefit
1	935,418
5	1,106,987
10	1,329,923
15	1,534,276
20	1,770,028
24 through 50	1,960,000

The present discounted value of this benefit stream is $19,564,846. The net present value is therefore negative with a benefit-cost ratio of .35. The internal rate of return on this project is well below zero.

In the alternative scenario where capacity is reached in year 1, the benefit level for each year is $1,960,000 and the present value of the benefit stream is $27,049.463. This yields a negative net present value and a benefit cost ratio of .49.

Steps 10 and 11 - Project Evaluation

Due to the low BCR, all net impacts are negative and quite large. In general this net loss is almost as large as the gross impacts, indicating significantly negative impacts. Tables 10.3 and 10.4 summarize the project impacts for the two scenarios considered.

Table 10.3

WISCONSIN HARBOR ASSISTANCE PROGRAM

ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

PROJECT SITE	SUPERIOR
PROJECT TYPE	DREDGING/GRAIN
APPLICATON NUMBER	81002
ALTERNATIVE NUMBER	1
VERSION NUMBER	1
PROJECT LIFE (YEARS)	50
DISCOUNT RATE (PERCENT)	7

LOCAL AREA BENEFIT PROPORTION	.51
NON-LOCAL/STATE BENEFIT PROPORTION	.03
NON-STATE BENEFIT PROPORTION	.46
LOCAL SHARE OF INITIAL COSTS	.75
NON-LOCAL/STATE SHARE OF INITIAL COSTS	.04
NON-STATE SHARE OF INITIAL COSTS	.21

						STATE		PROJECT	
	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	EXPECTED CHANGE	NET IMPACT	EXPECTED CHANGE	NET IMPACT
DISCOUNTED BENEFITS	$ 9,978	$ 587	$ 10,565	$ 9,000	$ 19,565				
DISCOUNTED COSTS	$ 48,722	$ 1,099	$ 49,821	$ 5,770	$ 55,591				
NET PRESENT VALUE	$-38,744	$ -512	$-39,256	$ 3,229	$-36,026				
BENEFIT-COST RATIO	.20	.53	.21	1.56	.35				
ANNUALIZED NET PRESENT VALUE	$-2,814.3	$ -37.2	$-2851.5	$ 234.6	$-2616.9				
ANNUALIZED									
PERSONAL INCOME	$ 1304.6	$ 94.6	$ 1399.3	$ 1451.3	$ 2850.6	$ 8034.0	$-6634.7	$ 8964.5	$-6113.9
SALES	$11078.9	$ 617.4	$11696.3	$ 9466.8	$21163.0	$52405.6	-40709.4	$58475.4	-37312.4
FEDERAL PERSONAL INCOME TAXES	$ 251.1	$ 17.7	$ 268.8	$ 271.0	$ 539.8	$ 1499.9	$-1563.3	$ 1673.7	$-1133.9
STATE PERSONAL INCOME TAXES	$ 58.1	$ 4.5	$ 62.5	$ 68.6	$ 62.5	$ 380.0	$ -317.5	$ 424.0	$ -361.5
STATE EXCISE TAXES	$ 19.6	$ 1.4	$ 21.1			$ 121.5	$ -100.4		
EMPLOYMENT (NUMBER OF JOBS)	98.0	6.4	104.5	98.9	203.4	547.4	-442.9	610.8	-407.4

Table 10.4

WISCONSIN HARBOR ASSISTANCE PROGRAM

ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

PROJECT SITE	SUPERIOR	LOCAL AREA BENEFIT PROPORTION	.39
PROJECT TYPE	DREDGING/GRAIN	NON-LOCAL/STATE BENEFIT PROPORTION	.03
		NON-STATE BENEFIT PROPORTION	.58
APPLICATON NUMBER	81002		
ALTERNATIVE NUMBER	2	LOCAL SHARE OF INITIAL COSTS	.75
VERSION NUMBER	1	NON-LOCAL/STATE SHARE OF INITIAL COSTS	.04
		NON-STATE SHARE OF INITIAL COSTS	.21
PROJECT LIFE (YEARS)	50		
DISCOUNT RATE (PERCENT)	7		

	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	STATE EXPECTED CHANGE	STATE NET IMPACT	PROJECT EXPECTED CHANGE	PROJECT NET IMPACT
DISCOUNTED BENEFITS	$ 10,549	$ 811	$ 11,361	$ 15,689	$ 27,049				
DISCOUNTED COSTS	$ 48,722	$ 1,099	$ 49,821	$ 5,770	$ 55,591				
NET PRESENT VALUE	$-38,172	$ -288	$-38,460	$ 9,918	$-28,542				
BENEFIT-COST RATIO	.22	.74	.23	2.72	.49				
ANNUALIZED NET PRESENT VALUE	$-2,772.8	$ -20.9	$-2793.7	$ 720.5	$-2073.2				
ANNUALIZED									
PERSONAL INCOME	$ 1379.3	$ 130.9	$ 1510.2	$ 2529.9	$ 4040.1	$ 8034.0	$-6523.8	$ 8964.5	$-4924.4
SALES	$11713.1	$ 853.6	$12566.7	$16502.7	$29069.4	$52405.6	-39838.9	$58475.4	-29406.0
FEDERAL PERSONAL INCOME TAXES	$ 265.5	$ 24.4	$ 289.9	$ 472.3	$ 762.3	$ 1499.9	$-1536.0	$ 1673.7	$ -911.4
STATE PERSONAL INCOME TAXES	$ 61.4	$ 6.2	$ 67.6	$ 119.7	$ 67.6	$ 380.0	$ -312.4	$ 424.0	$ -356.5
STATE EXCISE TAXES	$ 20.8	$ 2.0	$ 22.7			$ 121.5	$ -98.7		
EMPLOYMENT (NUMBER OF JOBS)	103.6	8.9	112.6	172.4	284.9	547.4	-434.8	610.8	-325.9

Table 10.5

ADDITIONAL

IMPACT VARIABLES

PROJECT SITE	SUPERIOR
PROJECT TYPE	DREDGING/GRAIN
APPLICATON NUMBER	81002
ALTERNATIVE NUMBER	1
VERSION NUMBER	1

	LOCAL	NON-LOCAL STATE	NON-STATE
BENEFIT-INCOME MULTIPLIER	1.80	2.22	2.22
SALES-INCOME MULTIPLIER	8.492	6.523	6.523
ANNUAL WAGES PER WORKER	$ 13,309	$ 14,677	$ 14,677
FEDERAL PERSONAL INCOME TAX RATE	.1355	.1355	.1355
FEDERAL SOCIAL INSURANCE TAX RATE	.0570	.0512	.0512
STATE PERSONAL INCOME TAX RATE	.0445	.0473	.0473
STATE EXCISE TAX	.0217	.0217	-----

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III.11. EXEMPLARY HARBOR ASSISTANCE EVALUATION: KENOSHA

The City of Kenosha requested $38,400 as the state share of an estimated $48,000 project to repair the north dock in the city. Remaining cost will be provided by the city of Kenosha. This is one of two docks in the city. The dock wall is in an advanced state of deterioration and without repair will be unusable in the near future.

Step 1 - Project Life and Cost

Estimated project life with associated operations and maintenance costs of 5% yearly is 50 years. O&M costs will be incurred by local interests. The present value of this cost stream is approximately $71,000.

Steps 2, 3, and 4 - Projected Tonnage

The project in question, as it concerns the repair of the north dock wall, is clearly a dock specific project. The port, in total handles an average of slightly over 82,000 tons a year. Most of this is shipment of frozen food products. There is no detail available to discern the share of tonnage crossing the dock in question. However, as all tonnage through the Port of Kenosha crosses either the north or south dock at the mouth of Pike Creek, and as these docks are basically similar, it is reasonable to assume that one-half of the port's tonnage, or 41,000 tons, crosses the north dock (the dock needing repairs). This figure is be used as the base tonnage for the dock in question. Based on annual growth rates for food and kindred products from Table 7.1 of the Main Report, annual growth of this tonnage will be 2.9% until 1990 and 1.6% thereafter. Projected tonnage for selected years is shown in Table 11.1

TABLE 11.1

Projected Tonnage - Selected Years

Year	Tonnage
1981	42,189
1985	47,300
1990	54,568
1995	59,075
2000	63,955
2010	74,957
2020	87,851
2030	102,964

Steps 5 - 9 - Project Benefits

The only cost affected by this project in a significant manner results from the need to transport cargoes to the alternative dock from the storage site. This would be done by truck, using standard 20 ton vehicles. Current tonnage levels are such that the dock operators, Morelli Overseas Export Service, Inc., could operate one truck full-time. As determined in the "Inner Harbor Navigation Canal Lock Replacement Study" (1978, U.S. Army Corps of Engineers), the unit cost for such an operation is slightly more than $.50 per ton, for an owner operated vehicle. Hiring of outside trucking firms or the use of rented equipment leads to a cost of approximately $1.25 per ton. A reasonable estimate for the cost of the within port movement in question is therefore $.65 per ton, which would correspond to a truck haul of about 10 miles. Annual benefits for selected years are shown in Table 11.2 below.

TABLE 11.2

Project Benefits - Selected Years

Year	Benefit (1981 $)
1981	27,422.85
1985	30,745.00
1990	35,469.00
2000	41,570.75
2020	57,103.15
2030	66,926.60

The present value of the discounted benefits is $513,538. Using the procedure cited in the Main Report, the discounting of benefits is shown in Table 11.3. Based on the project costs cited earlier, the benefit-cost ratio of this project is 7.19, with net annual benefits of $32,100. The economic efficiencies of this project are summarized in Table 11.4.

Steps 10 and 11 - Project Evaluation

Project impacts are estimated to be significantly positive. Due to the high benefit-cost ratio, net impacts are also significantly positive. Generally, net impacts are about 80% of the gross impacts, indicating rather large impacts stemming from the project. Project impacts are summarized in Table 11.4 and the parameters used for these estimates are shown in Table 11.5.

TABLE 11.3

DISCOUNTED BENEFITS

Year	Discount[1] Factor	x	Benefits	=	Present Value
1	.9345794		27,422.85		25,628.83
2	.8734386		28,253.39		24,677.61
3	.8162978		29,083.93		23,741.15
4	.7628952		29,914.46		22,821.60
5	.7129861		30,745.00		21,920.76
6	.6663422		31,689.84		21,116.28
7	.6227497		32,634.68		20,323.24
8	.5820091		33,579.52		19,543.59
9	.5439337		34,524.36		18,778.96
10	.5083491		35,469.20		17,573.23
11	.4750928		36,055.11		17,129.52
12	.4440119		36,641.02		16,269.05
13	.4149644		37,226.93		15,447.85
14	.3878171		37,812.84		14,664.47
15	.3624460		38,398.75		13,917.47
16	.3387345		39,033.15		13,221.88
17	.3165744		39,667.55		12,557.73
18	.2958638		40,301.95		11,923.89
19	.2765083		40,936.35		11,319.24
20	.258419		41,570.75		10,742.67
21	.2416131		42,285.88		10,212.59
22	.2257131		43,001.01		9,705.89
23	.2109469		43,716.14		9,221.78
24	.1971465		44,431.27		8,759.47
25	.1842492		45,146.40		8,318.19
26	.1721954		45,861.53		7,897.15
27	.1608383		46,576.66		7,495.60
28	.1504822		47,291.79		7,112.79
29	.1405828		48,006.92		6,747.99
30	.1313671		48,722.05		6,400.48
31-35	.538631		51,450.92		27,713.06
36-40	.3840362		55,999.03		21,505.65
41-45	.2738689		60,060.19		16,445.88
46-50	.1952244		64,961.92		12,682.15
Sum of discounted benefits					513.537.71

1) value equals $\left(\frac{1}{1.07}\right)^n$, where n = project year

TABLE 11.4

WISCONSIN HARBOR ASSISTANCE PROGRAM - ANALYSIS RESULTS SUMMARY
(Results in $000)

Project Site:	Kenosha	Local Area Benefit Proportion :	.95
Project Type:	Dockwall Repair	Non-Local/State Benefit Proportion :	.05
Application Number:	81003	Local Share of Initial Costs :	.20
Alternative Number:	1	Non-Local/State Share of Initial Costs:	.80
Version Number:	1	Non-State Share of Initial Costs :	.00
Project Life (years) :	50		
Discount Rate (percent):	7		

	Local Area	Non-Local State	State	Out of State	Total	Expected Change	Net Impact	Expected Change	Net Impact
Discounted Benefits	$488	26	514	0	514				
Discounted Costs	$ 41	31	71	0	71				
Net Present Value	$447	-5	442	0	442				
Benefit-Cost-Ratio	11.99	.84	7.19	0	7.19				
Annualized Net Present Value	$ 32.50	-0.4	32.10	0	32.10				
Annualized									
Personal Income	63.1	4.1	67.2	0	67.2	11.5	55.7	11.5	55.7
Sales	363.9	27.0	390.9	0	390.9	75.1	315.8	75.1	315.8
Federal Personal Income Taxes	11.8	0.8	12.6	0	12.6	22	10.4	22	10.4
State Personal Income Taxes	3.0	0.2	3.2	0	3.2	.6	2.7	.6	2.7
State Excise Taxes	1.0	0.1	1.0			.2	.3		
Employment (# of jobs)	4.0	0.3	4.3	0	4.3	.8	3.5	.8	3.5

Table 11.5

ADDITIONAL

IMPACT VARIABLES

PROJECT SITE	KENOSHA
PROJECT TYPE	DOCKWALL REPAIR
APPLICATON NUMBER	81003
ALTERNATIVE NUMBER	1
VERSION NUMBER	1

	LOCAL	NON-LOCAL STATE	NON-STATE
BENEFIT-INCOME MULTIPLIER	1.78	2.22	2.22
SALES-INCOME MULTIPLIER	5.767	6.523	6.523
ANNUAL WAGES PER WORKER	$ 15,794	$ 14,677	$ 14,677
FEDERAL PERSONAL INCOME TAX RATE	.1355	.1355	.1355
FEDERAL SOCIAL INSURANCE TAX RATE	.0516	.0512	.0512
STATE PERSONAL INCOME TAX RATE	.0478	.0473	.0473
STATE EXCISE TAX	.0217	.0217	-----

III.12 EXEMPLARY HARBOR ASSISTANCE EVALUATION, 1982 MILWAUKEE DREDGING

The city of Milwaukee has requested a total of $1,588,000 as the state share of a proposed $1,985,000 dredging project which would cover a substantial portion of the port area. The dredging work will be performed in waters outside of the Federal dredging project limits. These areas include three Municipal Mooring Basins, South Slips No. 1, 2, 3 and 4 and along the easterly ends of South Piers No. 1 and 2. Included in this project would be new dredging in South Slip No. 5. In all cases, dredging would be performed to a depth of 27 feet below the reference datum.

Step 1 - Project Costs and Life

The life of this project with associated maintenance costs is estimated at fifty years. On an annualized basis, project first costs are $143,831. Annual maintenance costs are estimated as 5% of the construction cost of the project ($1,973,500), yielding annual maintenance costs of $98,675. Total annual project costs are then $242,506.

Steps 2, 3, and 4 - Projected Traffic

Existing traffic through these facilities that would benefit from the increased channel depth is the general cargo through the port of Milwaukee and the liquid bulk commodities using South Slip No. 5. This slip has been maintained at a 21' depth, which is sufficient for the type of liquid carrying vessels that would utilize the facility. Therefore, projected liquid bulk traffic that might benefit from the project is zero. Projected general cargo that would benefit from the project was based on a 1979 traffic level of 383,202 tons shipped through the port that was destined or originated at foreign ports. Based on the growth rates for all commodities received from foreign ports, growth in tonnage was 1.6% annually through 1990, and 2% annually thereafter.

Steps 5 - 9 - Projected Benefits

Unit benefits were based on the formula for computing dredging benefits contained in the Main Report. Annual tonnage was based on the traffic projections cited above. Due to draft limitations on the great Lakes, the length of haul was determined to be the distance from Milwaukee to Montreal, where re-loading would occur to take advantage of greater channel depth. Combining these two figures yielded total ton-miles per year. Vessel costs and speeds were taken from Step 8 of the Main Report, as was savings in vessl costs (the exponential term in the formula). The savings per ton computed as $4.95 (implied by the formula), with

the present value of benefits being $35,484,159, based on increasing the project depth from 22' to 27'. The 22' figure represents the average depth of the three mooring basins to be dredged in relation to reference datum for channel depth.

Steps 10 and 11 - Project Evaluation

Based on a fifty (50) year project cost and 5% annual O&M, annualized cost of this project are $242,506. The present value of benefits is $35,484,159, which is $2,571,147 on an annualized basis. This yields a BCR of 10.6 and net present value of benefits of $32.1 million. All impacts from the project are estimated to be significantly positive, mainly as a result of the large benefit-cost ratio. In general, the net impacts are about 90% of gross impacts, indicating a rather robust project in terms of impacts. The economic efficiencies and impacts of this project are shown in Table 12.1.

Table 12.1

WISCONSIN HARBOR ASSISTANCE PROGRAM

ANALYSIS RESULTS SUMMARY

(RESULTS IN $000)

PROJECT SITE	MILWAUKEE	LOCAL AREA BENEFIT PROPORTION	.78
PROJECT TYPE	DREDGING	NON-LOCAL/STATE BENEFIT PROPORTION	.11
		NON-STATE BENEFIT PROPORTION	.11
APPLICATON NUMBER	81001		
ALTERNATIVE NUMBER	1	LOCAL SHARE OF INITIAL COSTS	.20
VERSION NUMBER	1	NON-LOCAL/STATE SHARE OF INITIAL COSTS	.80
		NON-STATE SHARE OF INITIAL COSTS	.00
PROJECT LIFE (YEARS)	50		
DISCOUNT RATE (PERCENT)	7		

	LOCAL AREA	NON-LOCAL STATE	STATE	OUT OF STATE	TOTAL	STATE EXPECTED CHANGE	STATE NET IMPACT	PROJECT EXPECTED CHANGE	PROJECT NET IMPACT
DISCOUNTED BENEFITS	$ 27,678	$ 3,903	$ 31,581	$ 3,903	$ 35,484				
DISCOUNTED COSTS	$ 1,755	$ 1,588	$ 3,343	$ 0	$ 3,343				
NET PRESENT VALUE	$ 25,922	$ 2,315	$ 28,237	$ 3,903	$ 32,141				
BENEFIT-COST RATIO	15.77	2.46	9.45	.00	10.61				
ANNUALIZED NET PRESENT VALUE	$ 2334.7	$ 168.2	$ 2051.1	$ 283.5	$ 2334.7				
ANNUALIZED									
PERSONAL INCOME	$ 4583.9	$ 629.4	$ 5213.3	$ 629.4	$ 5842.7	$ 539.2	$ 4674.1	$ 539.2	$ 5303.6
SALES	$24927.0	$ 4105.8	$29032.8	$ 4105.8	$33138.5	$ 3516.9	$25515.9	$ 3516.9	$29621.6
FEDERAL PERSONAL INCOME TAXES	$ 868.2	$ 117.5	$ 985.7	$ 117.5	$ 1103.2	$ 100.7	$ 1136.7	$ 100.7	$ 1002.6
STATE PERSONAL INCOME TAXES	$ 217.7	$ 29.8	$ 247.5	$ 29.8	$ 247.5	$ 25.5	$ 222.0	$ 25.5	$ 222.0
STATE EXCISE TAXES	$ 69.0	$ 9.5	$ 78.5			$ 8.2	$ 70.4		
EMPLOYMENT (NUMBER OF JOBS)	286.4	42.9	329.3	42.9	372.2	36.7	292.5	36.7	335.4

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IV. GENERAL SUMMARY OF PARAMETERS USED IN BENEFIT ESTIMATES

IV. GENERAL SUMMARY OF PARAMETERS USED IN BENEFIT ESTIMATES

The purpose of this attachment is to provide somewhat greater detail about the estimation of the basic parameters used in the estimation of benefits. While each of the evaluations contains general information on the computation of these parameters, it was not deemed necessary to explicitly provide details in each project summary. This attachment sets forth the sources and methods used to obtain parameter estimates that are used for the evaluation of more than one project. Four specific types of benefits are detailed in this attachment.

Two of the applications are for assistance in the construction of grain facilities and associated waterways, Superior and Milwaukee, Wisconsin. Due to the differences in information related to each project, as well as differences in the market area of each project, different methods were used to estimate the per unit benefit accruing to each project. The Port of Milwaukee Elevator has been the subject of several detailed studies and these were used as a basis for the estimation of benefits. According to a Battelle Columbus Laboratories study entitled "The Economic and Financial Feasibility of Constructing and Operating a Grain Export Elevator at the Port of Milwaukee," July, 1981, the differential bid price between Chicago and Milwaukee elevators was $.24 per bushel and $.10 per bushel between Illinois River Terminals and Milwaukee. It was deemed unlikely that Milwaukee could directly compete with Chicago, due to Chicago's locational advantage for Illinois and Indiana grain. However, it is virtually certain that they could effectively compete for a substantial portion of tonnage presently being shipped via the Illinois Waterway that originates north of the Illinois Waterway. The benefit per bushel was computed as one-half the bid price differential, or $.5 per bushel, due to the fact that the Milwaukee elevator will compete at the margin with Illinois Waterway Terminals. That is, some of the grain that would switch to the Milwaukee elevator could save $.10 per bushel, while the last grain that would be attracted to the Milwaukee Elevator would have almost no savings by using the new elevator. Assuming uniform grain production patterns and that grain will flow to the elevator offering the profit maximizing bid price given the production area of the grain, the average savings for each unit attracted to the new elevator will be one-half the average bid price differential. In this case it is not necessary to compute the with and without project prices and then the differential, because the price differential is already known. Commodity projections are based on growth rates for farm products exported shown in Exhibit 7.1 (page 21) of the Main Report.

As with the Milwaukee Elevator, the development of a grain elevator at Superior, Wisconsin is directly tied to dredging that would provide sufficient channel depth to be competitive with other Great Lakes Elevators. Thus the savings per unit resulting from the dredging must be computed as the differential between the Superior Elevator and some likely alternative port or shipment mode. In this area of the country three alternatives to Superior are available, other Great Lakes ports, inland waterways terminals with shipment via the Gulf ports, or rail to the West Coast terminals. While all three are used, the most likely alternative was deemed to be via other Great Lakes ports, specifically Milwaukee or Chicago. The grain that could potentially be attracted to this facility would come from areas west of the Mississippi River in the Northern Tier States and would generally be railed to the port from inland elevators. Representative rail rates to Superior, Milwaukee and Chicago were obtained from points around Brewster, MN for 80-car unit train movements of grain, in consecutive movements and subject to minimum tonnage requirements. The rate per ton is $11.00 to Superior and $12.40 per ton to either Milwaukee or Chicago, resulting in a savings of $1.40 per ton to use the Superior elevator. However, as with the Milwaukee elevator this was cut in half to $.70 due to the attraction of grain that currently moves at the margin. Two important aspects of this unit savings should be noted.

First, the $.70 per ton saving translates into about a $.02 per bushel savings, which is considerably lower than that computed for Milwaukee and is certainly within the differential bid prices between ports and modes. Second, while Milwaukee is treated as an alternative to Superior, the grain on which benefits are taken for each project is different and comes from different production areas. Thus, there is no double-counting (or transferring) of benefits between the two proposed projects. Projected grain tonnage through Superior was based on the growth rates for grain exports shown in Exhibit 7.1 of the Main Report. The existing (1979) grain tonnage of 7.3 million through Superior is assumed to continue to use existing elevators in the port and that benefits will only accrue to any growth in traffic during the project life, subject to capacity constraints at this elevator 2.8 million tons annually.

The second type of benefit that appears at several proposed projects results from dredging or dockwall construction to provide areas of expansion for the ship building industry. In these cases the commodity "shipped" is the vessel itself, so that some type of standard commodity type of benefit will not apply. Therefore, a slightly broader measure of benefits was used for

these projects, namely the profitability of these operations or the excess of sales over payments to factors used in the production of vessels.

Information on the ship building industry is not available at the county or state level due to disclosure reasons. However, the competitive nature of the industry suggests that national level data should be a good approximation of the industry within the state. Date on the industry was obtained from the 1977 Survey of Manufacturers - Industry Series, Table 5a, the most current data available. For SIC 3731 (Ship Building and Repairing) and SIC 3732 (Boat Building and Repairing) the information taken from the Survey of Manufactures is presented below.

SIC	Value of Shipments[1]	Payroll[1]	Cost of Materials[1]
3731	6,495.1	2,494.0	2,670.1
3732	1,822.6	445.8	984.7

1 Millions of dollars.

After netting out labor and materials costs, approximately 21.5% of the value of shipments is still unaccounted for. This represents the implicit rental of and return to capital goods used in the production of vessels. Of this remainder, 94% was ascribed to the rental price of capital goods, with 6% of the remaining value attributed as benefits to the project. This figure (6%) was based on two related, but independent studies. The first was a study by the Contractor showing an approximate 6% return to capital in the business sector of the U.S. economy. The second is a study by B.M. Fraumeni and D.W. Jorgenson entitled "The Role of Capital in U.S. Economic Growth, 1948-1976," contained in Capital, Efficiency and Growth,,edited by G.M. von Furstenberg (Ballinger Publishing, 1980.) For SIC 37 (Transportation Equipment & Ordinance, except motor vehicles) they show an average return of 5.35% over the period 1948-1976. Although this figure is lower than the 6% used, over the 1953-76 period the corresponding rate implied in the study is 5.95%. Overall, the 6% figure seemed a fairly reasonable approximation to the rate-of-return.

Based on these data, the per unit benefit can be computed as follows: For every dollar of sales by the ship building industry, $.785 will be spent on materials and labor. Of the remaining $.215, 94% represents the implicit rental price of capital goods, with the remaining 6% representing the additional value created by each dollar of sales that is not accounted for

as payments to factor inputs (labor, capital and materials.) Thus $.129 (.06 times $.215) of each dollar of sales represents the benefit (value) that can be attributed to projects whose main purpose is the provision of additional dock space or associated services for the ship building industry. For example, if a particular project were to increase the production capability such that an additional $1,000,000 of vessels could be constructed annually, $987,100 of the increased sales would represent factor payments, while $12,900 (.06 times .215 times $1,000,000) would represent the benefit to the project.

Included in the applications are two projects on the inland waterways. The primary benefits associated with these two projects (in essence projects to expand existing port facilities) result from savings in transportation costs that accrue by not having to use a more expensive alternative mode or port. Due to the well-developed nature of the waterway, and the rather intense competition between the waterways and railroads for bulk commodities, generally rail was considered the alternative to port expansion and waterway shipment at Prairie cu Chien and Lacrosse. The necesary information to compute savings was taken from the recently completed Upper Mississippi River Master Plan, (UMR Study),and a recent study on barge rates completed by the Institute for Water Resources. Two specific commodities and a general commodity group were included in the rate analysis.

The first commodity considered was coal. Computation of the rail rate was based on the U.S. Department of Transportation Rail Rate Study completed as a part of the UMR Study. Since no specific origins for the coal are known, the average rail haul shown for this study was used as the distance of the movement. Based on this 510.8 mile haul, and the statistical analysis contained in the report, the average rail rate is $8.44. The best available estimate of costs is the 80%-20% split developed by the ICC for variable and fixed costs respectively. Thus the costs associated with this movement are $6.79 per ton. Estimates of the barge rate are based on the IWR study, using a length of haul that is 1.3 times the rail length of haul, i.e. barge is approximately 30% more circuitous than a similar type of rail movement. This yields a barge movement of 665 miles with a 1979 rate of $3.18. This was increased by 8% per year to obtain comparability with the rail rate. An additional $3.00 was added to barge transportation to account for truck or rail shipment from the mine to the waterway and the associated trans-loading of the coal into barges. The UMR Study shows this difference to be $2.26, which is generally based on movements to the Peabody Coal Dock in East St. Louis from mines in southern Illinois. The use of other docks will generally be more expensive, particularly if the coal is trucked from the mine to the dock. A judgement was made that the $3.00 addition to the waterway was representive of

coal movements in general, representing a net savings on the waterway of $.08 per ton. This figure is quite consistent with other studies which show that while water transport of coal is generally cheaper than rail, they are extremely competitive.

For general movements of grain a similar approach was used. Based on the U.S. DOT study for UMR, the average haul of 628 miles yields a rail rate of $12.77, or a variable cost of $10.22 per ton. Based on the IWR Study and barge circuity, the corresponding barge movement is 816 miles at a rate of $4.38 per ton. Associated charges for rail are $1.84 and $2.40 for loading and unloading. By barge the same two charges are $1.95 and $1.66, respectively, plus an additional $2.73 for the longer truck to river elevators. This resulted in a savings per ton of $3.74, which was divided by two to represent the competition at the margin between rail and water. Where other grain facilities are located nearby, the alternative is not rail, but to utilize the nearby facilities. Since grain is generally trucked to river terminals, the savings per ton was based on trucking costs of $.06 per ton-mile and $.03 per ton-mile on the water. The truck cost figure is taken from a monthly report published by the U.S. Department of Agriculture for February, 1982. This figure is also consistent with the U.S. DOT study on inland waterways user charges which shows average trucking costs for grain in the neighborhood of $.055 to $.065 per ton-mile. The figure for the waterways was taken from the IWR barge rate study. In this instance, savings could be computed as follows: Suppose that the grain can be trucked to a nearby elevator at an additional truck haul of 10 miles, resulting in an increased truck cost of $.60 per ton. If the elevator was to the south, there would also be a slightly shorter waterway, with a savings of $.03 per ton-mile. If this distance were say also 10 miles shorter, then the waterway leg of the trip would be $.03 cheaper. Overall, the additional costs would be $.57 per ton (10 miles times $.06 minus 10 miles times $.003).

For other commodities, the only direct comparison available is from the UMR Study, Transportation Appendix, Table 3.16. Based on the 80% variable cost rule for rail this table yields a differential of $3.94 per ton, assuming no additional shipment away from the river. Where another port is a possible alternative, water rates are adjusted as noted above for grain. Unless the origin or destination is at riverside, another port is a good alternative. However, for commodities with origins or destinations at riverside, additional trucking costs, loading and unloading costs will generally limit the use of some other port to about a 50 mile radius. For example, a commodity shipped from Madison could select several possible inland ports, with the cost differential between each reflecting small differences in the length of haul to each port. However, for an industry located on

the waterway, use of an alternative port would require additional loading, trans-shipment and unloading of the commodity. This can substantially limit the potential for use of a nearby port.

The fourth type of benefit considered in this attachment is the increased cost efficiencies at a port resulting from increased channel depth and the ability to use larger vessels in shipping cargo. As was noted earlier, there are some cases where increased channel depth is so closely tied to a specific facility that benefits must be computed for the entire facility as one single project. For example, the Milwaukee Elevator is simply not a viable project without a 27-foot channel depth. Thus to avoid possible double-counting of benefits, the entire facility and not simply dredging is considered as the relevant project costs to be compared to the computed benefits. In economic jargon the dredging is referred to as a limitational input, because no matter how much of other inputs are used, i.e., a larger elevator, output cannot be increased without an increase in the limitational input, i.e., increased channel depth.

The above caveat applies mainly to new types of projects. For existing facilities, cargo is being moved but cost efficiencies can be realized with an increase in channel depth. The method used to compute the cost efficiencies resulting from increased channel depth is set forth in Step 8 of the Main Report. This discussion is meant to clarify the rationale behind this method. A very detailed analysis of the efficiencies of increased channel depth would proceed as follows: A statistical analysis of actual draft versus maximum draft for vessels utilizing a port or harbor would be undertaken and then compared with the distribution of the Great Lakes fleet of vessels. If the channel depth at a port or harbor were say 21-feet, then the probability of a vessel using the port having a maximum possible draft of over 21-feet is determined by the distribution of vessel size for the fleet. For example, a fleet of two vessels having maximum drafts of 15' and 27' would yield a probability of 50% that a vessel using the port could load to a depth greater than 21' if additional depth were provided, although no vessel could actually have a draft greater than 21'. If the channel depth were increased to 27' then both vessels could potentially load to their maximum depth. Thus the probability that a vessel utilizing the port cannot load to its maximum depth decreases from 50% to zero. The cost efficiencies could then be computed as the savings of loading the larger vessel to its maximum draft rather than 21' times the "adjusted" probability that cargo will be shipped on the larger vessel. (The "adjusted" probability is to account for that fact that larger vessels carry more cargo. In the above example, if the two vessels were transporting cargo along the same routes, each

vessel would not carry 50% of the cargo. The correct distribution would be the weighted average of each vessel's capacity.)

In this simple example, direct computation of the cost efficiencies would present no problems. However, real world examples would involve hundreds of vessels with different routes and destinations. Direct computation of efficiencies in this case is difficult and very time-consuming. To simplify this task, the method developed for the estimation of efficiencies incorporates the above considerations into a formuls shown on page 26 of the Main Report. The basic formula is rather simple, however accounting for delays and reduced speeds at the Soo Locks and Welland Channel complicates the formula somewhat. If we ignore the effects of the Soo Locks the formula can be stated as follows:

Savings per year = (Ton-Miles times savings per ton-mile per hour) times hours. Using the notation of Appendix C, this formula is:

$$S = TM * (e^{-.145 * C_{w/o}} - e^{-.145 * C_w}) * (\frac{1}{V_b} + \frac{1}{V_1})$$

where

C = channel depth with (C_w) and without ($C_{w/o}$) the project.

Ignoring the exponential term for the moment, the first and last term of this equation could be combined and with a little arrangement would yield tons times hours for the entire vessel, i.e., miles/speed per hours = trip time. When multiplied by the exponential term the hours and tons will offset each other yielding a dollar figure.

In terms of the simple example cited above, the exponential term represents the integral of $e^{-.145c}$ from the existing channel depth ($C_{w/o}$) to the new channel depth (C_w), measured in dollars per ton. The exponential function itself is an estimate of the change in transport costs due to the use of vessels loaded to greater depths, where vessel depths are infinitely variable. Thus, the efficiencies of increasing channel depth from 21' to 27' can be simply computed using this formula rather than computing the savings individually for vessels having maximum drafts of 22', 23' and so on up to 27', and then adding them up to obtain total efficiencies. The exponential function

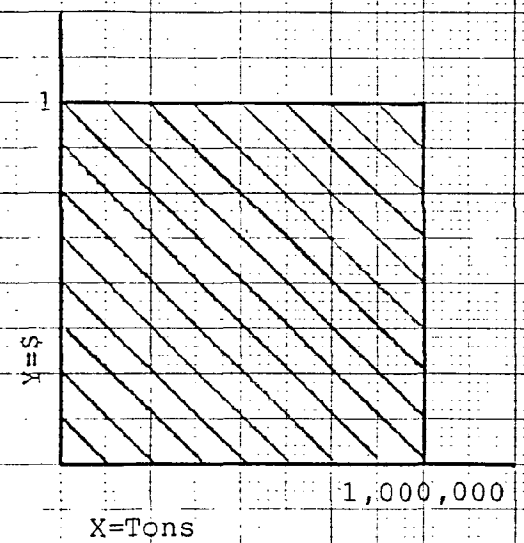
represents an estimate of the unit savings resulting from summing small changes of increased depth, rather than looking at 1 foot changes in depth and then summing.

The rationale behind the formula can be illustrated with a simple example. Suppose that channel depth is increased from 21' to 27' and that the difference in vessel cost per unit of time were $1.00 between 21' and 27' vessels. Using $1.00 as a measure of savings might be a good first approximation, but this $1.00 would not reflect the savings of 24' vessels that could now use the port. If one disaggregates the process to compute savings for 24' and 27' vessels, then the question is immediately raised of looking at 22', 23', 25' and 26' vessels. If one disaggregates further, then why not undertake the analysis in terms of half feet or inches and get very detailed in the analysis. Rather obviously, no matter how small the change is that is examined, there is always a smaller change that could be substituted. The exponential function represents an analysis where infinitesimal changes in vessel size are examined and then summed to obtain cost efficiencies. The idea is shown in Graphs 1a, 1b and 1c. In Graph 1a, our estimated savings are the $1.00 per ton for an hypothesized 1,000,000 tons of cargo. In Graph 1b, our estimated savings (shaded area) are based on a disaggregation of vessel size, whwere 24' vessels would save $.50 and 27' vessels would save $1.00.

The difference between the two graphs and the estimated savings results from the fact that not all vessels will realized the $1.00 savings. In this example, half would save $1.00 and the other half $.50 per ton. Thus the estimated savings drop from $1,000,000 to $750,000 (500,000 tons times $1 plus 500,000 times $.50.) In Graph 1c, the analysis is undertaken in 1' increments, with savings of $.16 2/3 per foot and each vessel type carrying 1/6th of the tonnage. In this case savings would be estimated at $583,333. As the analysis is disaggregated more the computed savings will continue to drop towards $500,000 (as this example is set up.) The exponential function used in the estimate of savings resulting from increased channel depth is an estimate of what Graph 1c would look like if vessel depth could be continuously changed (based on actual vessel costs.) That is, it would represent the integral of a regression equation of the points in Graph 1c.

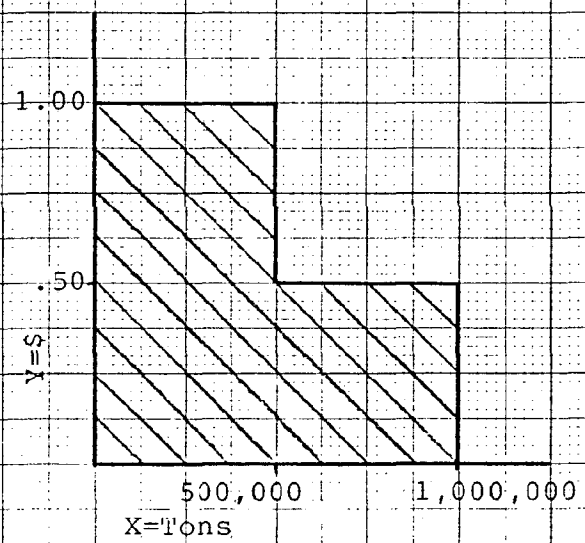
GRAPH 1A

All 27' vessels



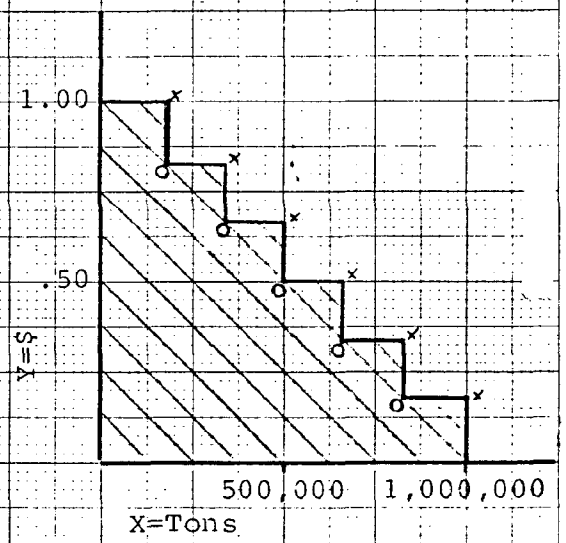
GRAPH 1B

50% 27', 50% 24' Vessels



GRAPH 1C

22'-27' Vessels,
16 2/3% each



46 1320
K+E 10 X 10 TO ½ INCH 7 X 10 INCHES
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Wisconsin Coastal Management Program

Progress Report

For WCMP Staff Use	
WCMP Project Number:	827.1
Date Received:	10/4

AD-CM 4(5/80)

Submit this Progress Report to: Wisconsin Dept. of Administration
Office of Coastal Management
101 S. Webster Street, 7th Floor
Madison, WI 53702

Project Title: Economic Analysis of Commercial Harbors Maintenance and Development Needs Study	Purchase Order Number: 731
Project Duration in MONTHS:	Report Period From: June 1, 1982 To: August 31, 1982
Project Type (Check one or more):	CMP funds spent to date: 22,450.00 — % of budgeted funds: 70%
☐ Improve SCA Management SCA Number _____	Match spent to date: 10,019.43 — % of budgeted funds 125%
☒ Implement State Law	Signature of project manager: Michael M. Kennedy
☐ CEIP (Coastal Energy Impact Project)	
☐ Demonstration	

1. Objectives of Project (as contracted):

The following are the objectives of this project where a methodology for evaluating the benefits and costs of harbor projects will be developed and applied:

A. Update and complete:
   1. U.S. Maritime Administration's Port Facility Inventory
   2. 1980 WisDOT harbor needs inventory

B. Develop a process that identifies the benefits and costs of proposed commercial harbor development projects by:
   1. Following a step-by-step process set forth in a manual format.
   2. Determining the net present value of projects.
   3. Defining project benefits as net savings in transportation costs with instate and outstate benefit proportions identified.
   4. Identifying the geographic distribution of the socio-economic impact of harbor improvement projects.
   5. Providing realistic and rational, non-quantifiable criteria to supplement the project ranking process.

C. Apply the developed methodology to Harbor Assistance Program project candidates.

2. Thoroughly discuss progress made toward accomplishing objectives during this reporting period:

1. "Rrocedures for Evaluation of the Harbor Assistance Program of the Wisconsin Department of Transportation" was published in draft form in July 1982.by Louis Berger & Associates.

2. "Harbor Program Methodology Exemplary Harbor Assistance Evaluation for 1983 Projects" was published in August 1982.by Louis Berger and Associates.

3. The Wisconsin Department of Transportation's 1982 Harbor Terminal Facility and Needs Survey has been completed with a statewide response rate of 83%.

3. Problems/Concerns (issues, project, or administrative concerns):

The final report for Objectives B and C is due September 30, 1982. Revision of the U.s. Maritime Administrations Port Facility Inventories is currently under way based on the results of the survey. A tabulation of harbor needs will be made. A contract extension has been obtained to complete these tasks.

4. Impact thus far, if any, of the project on the shoreline, coastal resources, or coastal residents:

The Harbor Assistance Program Advisory Council at its meeting on September 14, 1982, used the results, to date, of the project during their discussions resulting in a recommendation to the WisDOT's Secretary that six projects receive state grants.

Signature of person authorized to receive funds:

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