FISCAL IMPACTS OF OCEAN CITY

BEACH EROSION CONTROL

NOV 1981

Maryland. Coastal Zone Management Program

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November 16, 1981

Mr. Terry Anthony
Coastal Resources Division
Tidewater Administration
Maryland Department of Natural Resources
Annapolis, Maryland 21401

Dear Mr. Anthony:

I am pleased to submit to you my final report, FISCAL IMPACTS OF
OCEAN CITY BEACH EROSION CONTROL. The report examines the fiscal impli-
cations for Ocean City, Maryland of participating in the funding of the
proposed erosion control projects.

Ocean City has had a budget surplus in eight of the previous ten
years, and was able to reduce its property tax rate from $1.60 to $1.33
per $100 of assessable basis in FY 1980. Based on past trends, my pro-
jections of the City's revenues and expenditures for the fiscal years
1983-1987 indicate that with the reduced tax, the City will continue
to generate a small budget surplus on balance over the period.

The study included a review of three alternative projects for beach
erosion control: the Short Groin Interim Project, Maryland's construc-
tion of the Corps of Engineers' Plan 2 without federal participation,
and the Beach Fill only Interim Project. For each alternative the annual
cost of debt service was calculated assuming that the project was financed
with 15 year State General Obligation Bonds.

The estimates of the impacts on the City were based on three assump-
tions about the share of the project cost that would be paid by Ocean
City: 100 per cent, 75 per cent, and 50 per cent.

We reviewed several potential sources of additional revenue that
could be used to finance the debt service. These sources were those
that were judged to be paid primarily by property owners and visitors
to Ocean City who also would be the immediate beneficiaries of the beach
restoration and erosion control. The revenue sources reviewed were a
restored property tax rate to $1.60, an increased room tax, a one per
cent sales tax add-on, an increase in the Admissions and Amusements Tax,
and establishing a fee for beach use.
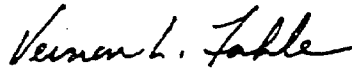
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Overall, with three alternative projects, three assumptions about interest rate, and three cost sharing options, there are 27 different scenarios about City revenue requirements discussed in the report.

The peak level of annual debt service costs for these alternatives range from a high of $5.5 million to a low of $1.1 million. The estimates of the additional receipts that would be produced by the revenue mechanisms in 1987 ranges from $1.0 to $2.0 million (both figures are expressed in 1982 dollars, based on an average 10 per cent rate of inflation in 1981 and 1982).

The analysis provides a wide range of project costs and revenue mechanisms for review while the choice of a specific program for implementation will depend on a variety of considerations, the findings of this study indicate that for Ocean City to participate in funding of any of the beach restoration alternatives will require that the City raise additional revenues.

I would like to thank the many people at the Department of Natural Resources and in Ocean City who helped to provide the information used in this report, and who have commented on the draft versions of the report.

Sincerely,

Vernon L. Fahle

FISCAL IMPACTS OF OCEAN CITY BEACH EROSION CONTROL

Prepared for

Coastal Resources Division
Tidewater Administration
Maryland Department of Natural Resources
Annapolis, Maryland

Contract No. C21-81-430

By

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I. INTRODUCTION AND SUMMARY

Ocean City, Maryland is Maryland's most popular resort area, attract-ing more than a quarter of a million visitors on peak summer weekends. The past decade has been a period of very rapid growth for Ocean City. During the decade the permanent resident population more than tripled, increasing to 4,946 from 1,493. During the same period, the number of housing units, most of which are owned by non-residents, also more than tripled, standing at 18,221 in 1980, up from 5,309 in 1970. This makes Ocean City the second largest city in Maryland in terms of the number of housing units.

Situated on a barrier island, the beaches at Ocean City are subject to continuous erosion and storm hazard. In recent years portions of the beach at Ocean City have almost disappeared, and it is clear that without intervention to maintain the beaches, their recreational value is severely threatened.

Presently, a U. S. Army Corps of Engineers' plan to restore this valuable recreational resource is before the U. S. Congress. However, construction on this project is not expected to begin until at least 1990. Because of this advanced start date, Maryland is considering an interim maintenance project that would stabilize the beach area. Also under discussion is whether the State should undertake the Corps resto-ration project on its own, rather than wait for the Army Corps of Engi-neers' to begin its work.

Purpose of Study

The present study examines the fiscal capability of Ocean City to participate in the funding of these proposed projects. Public taxation theory argues that when the beneficiary of a public expenditure can be identified, the preferred policy is to tax the beneficiary. Applying this principal to the beach maintenance program suggests that the property owners and visitors to Ocean City, who are the most immediate beneficiaries of the project, should participate in paying for the project. This, of course, implies that the City should finance at least some portion of the project if the benefit principal is to be applied in this case.

The purpose of this study is to review the fiscal impact of Ocean City's sharing the cost of the project. To accomplish this we reviewed historical data on Ocean City's expenditures and receipts for the most recent decade, and on the basis of the trends and relationships forecasted the levels of expenditures and receipts for the fiscal years 1983-1987.

Summary of Conclusions

Our projections indicate that Ocean City's revenues under it's present tax structure will be sufficient to meet necessary expenditures. Of course, revenues and expenditures in any single year are difficult to forecast accurately, but the trends suggest that over the period 1983-1987, Ocean City will probably generate a small budget surplus on balance.

The projections indicate that for Ocean City to participate in the financing of any of the non-federal beach erosion control projects, it will be necessary to raise additional revenues by increasing the present tax rates, or by adding a new revenue source. Applying the benefit principal described above, several taxing alternatives were evaluated to determine the amount of revenue that each can be expected to generate on an annual basis. Estimates of the revenues that each of these alternative revenue sources can be expected to provide are contained in Table I.A.

For comparative purposes Table I.A also contains a summary of the estimated annualized costs of three alternative maintenance projects. The first is the Short Groin Interim Project recommended by the Ocean, Bays, and Beaches Task Force of the Coastal Resources Advisory Committee and the Maryland Department of Natural Resources. The second is the cost of implementing the Army Corps of Engineers' Plan 2 without federal participation. The third alternative is the Beach Fill Interim Project which is similar to the beach restoration portion of the Corps of Engineers' Plan 2.

Table I.A contains estimates for only the peak costs of each alternative under the latest available interest rate (as of early September, 1981) for State General Obligation Bonds. These cost estimates are based on the project being financed for 15 years with the principal being repaid in equal annual installments. Three assumptions about the proportion of total project costs paid by Ocean City have been used. Detailed estimates and alternative assumptions about the interest rate are contained in the text and the appendix.

A summary of the fiscal impacts on the State, calculated on an annual, per capita basis, are contained in Table I.B. These estimates are for the capital and financing costs of the project alternatives only, and do not include any portion of the annual maintenance costs which might be assumed by the State. Estimates for additional years and alternative assumptions about interest costs can be found in Section V of the report.

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Table I.A
Summary of
Peak Year Annualized Costs of Projects
Assumed Interest Rate: .0919624

(1982 dollars)

Assumed Local Share	Short Groin Interim Project	Maryland Construction of Corps Plan 2	Beach Fill Only Interim Project
100%	2,560,000	5,136,000	2,326,000
75%	1,920,000	3,852,000	1,744,000
50%	1,280,000	2,568,000	1,163,000
Annual Maintenance	598,500	1,688,000	1,197,000

Estimates of Additional Revenues by Source, 1983-1987
(1,000's of 1982 dollars)

Fiscal Year	Projected Surplus	Restored Property Tax Rate	4% Room Tax	5% Room Tax	1% Sales Tax Add-on	Admissions and Amusement Tax	User Fees
1983	300	1,300	800	1,600	1,300	900	1,800
1984	200	1,400	900	1,700	1,300	900	1,800
1985	100	1,600	900	1,800	1,400	1,000	1,900
1986	400	1,700	1,000	1,900	1,400	1,000	2,000
1987	100	1,800	1,000	2,000	1,500	1,000	2,000

Note: For an explanation of how costs were converted to 1982 dollars, see the Technical Appendix.

Table I.B

Summary of

State Fiscal Impacts

Peak Year Costs in

Dollars Per Capita

Assumed Interest rate: .0919624

	State Share	
	25%	50%
Short Groin	.144	.289
Corps Plan 2	.298	.596
Beach Fill	.135	.270

II. FISCAL CAPACITY

Ocean City's revenues and expenditures are closely tied to the size of the visitor population. In Fiscal Year 1980 expenditures by Maryland's municipal areas and special taxing districts averaged $335.00 per capita. Applying this average to Ocean City's resident population yields an expected budget of $1,656,900, which is approximately 12 per cent of the amount actually expended.

Ocean City's sources of revenues are atypical as well. Forty-four per cent of its revenues in FY 1980 were from local property taxes, compared to an average of less than 25 per cent for all Maryland municipalities. Approximately 26 per cent of 1980 revenues were generated by two other local revenue sources, the room tax and charges for current services. Only relatively small portions of total revenue were from the local income tax and federal revenue sharing, owing to the small resident population in Ocean City.

The City's rapid economic growth during the 1970's has been characterized by a building and condominium boom which has both attracted a larger permanent population, and helped to convert Ocean City into a year-round resort community. As can be seen in Table II, while growth in the level of peak visitor population in August has slowed in recent years, the rate of increase in the visitors arriving during the non-summer months has continued at a much higher rate.

For the future, it appears that the rate of growth will decline in the next few years.* Most of the choice ocean front property has been developed, and only a limited amount of suitable undeveloped land is available on the back bay. Without annexation to provide additional waterfront property for development, future expansion will be limited to filling in between existing development and to replacing existing structures with larger, modern buildings.

Continued economic growth appears assured, however. In addition to the potential for redevelopment and higher densities in the older sections of town, the developing year-round character of the resort community provides a substantial potential for continued economic growth. Estimates of the average daily population and the resident population are contained in Table II. Of the three series which include visitor population (columns 2, 3 and 4), the most rapidly growing is the average annual daily population. As more people elect to visit Ocean City in the spring and fall seasons, the population series containing estimates for the months from September to May grow at a faster rate than that for the summer.

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* Ocean City currently continues to experience rapid growth, however. The City issued $7.5 million in building permits during August, 1981.

Table II

POPULATION ESTIMATES
1971-1980

	Permanent Residents	Average Annual [3]	Average Summer [3]	Peak August [3]
1971	1,493 [1]	31,100	65,500	101,500
1972		35,100	71,900	109,500
1973		39,800	79,400	110,200
1974		45,700	93,500	145,600
1975		52,400	105,100	164,100
1976		60,800	118,500	179,200
1977		56,800	103,500	149,800
1978	3,559 [4]	53,900	101,200	152,800
1979		63,200	122,600	173,700
1980	4,946 [2]	74,600	141,800	199,700

1) Source: <u>1970 Census of Population and Housing</u>

2) Source: <u>1980 Census of Population and Housing</u>

3) Source: Demoflush Estimates, Greater Ocean City Health Services Corporation

4) Source: Special census conducted by Ocean City

Revenue Projections

Although Ocean City experienced some fiscal difficulties during the sixties, revenues have exceeded expenditures in eight of the last ten years. The growth in revenues has been faster than expenditures and Ocean City lowered its property tax rate from $1.60 to $1.33 per $100 assessed value in FY 1980.

Several factors can be expected to affect the future levels of revenues. As the number of permanent residents in Ocean City increases, the amount of revenue received from income taxes, revenue sharing and as transfers and grants will increase. New additions to the property tax roles are expected to slow in the near future as the available buildable land becomes more scarce, however, the assessed value of property should continue to increase in real terms for two reasons. The restricted supply of desirable land will cause the value of existing property to rise faster than the general price level, and the tri-annual assessment procedure assures that the property values will be reviewed on a timely basis.

Our preliminary projections suggest that the revenues will continue to grow in real terms over the next several years, but that the rate of increase will slow somewhat. Separate projections were made for major revenue categories: 1) local property taxes, 2) room taxes, 3) charges for current services, and 4) other revenues. A summary of the projected revenues is contained in Table III. Detailed information on the procedures used can be found in the technical appendix.

The City's own forecasts of revenues and expenditures for FY 1981 and FY 1982 are below the trend line in those two years. For FY 1981 the revenues forecast by the City are slightly more than three per cent below the trend. For FY 1982 the City's forecasts are for revenues nearly four per cent less than the amount projected from the past trends.

During the period 1971-1979 Ocean City's revenues, after adjustment for inflation, grew at an average annual compound rate of 12.4 per cent a year. For the period covering Fiscal Years 1983-1987, we have projected revenues to grow at only 3.3 per cent a year. The expected decline in the rate of growth in revenues is primarily due to two influences: a slow down in the rate of economic expansion, and the reduced property tax rate.

The projected distribution of revenues by source are shown in Table IV. The relative importance of the property tax and charges for current services is not expected to change significantly. The proportion of total revenues obtained from the room tax is expected to increase, and the proportion of total revenues derived from other sources is projected to decline somewhat.

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Expenditure Projections

Historically the level of expenditures has been more volatile than has the level of revenues (see Figure 1). In each of the two years for which expenditures exceeded revenues, the rate of expenditures had risen sharply from the previous year, then fallen back the following year.* One factor that has contributed to this volatility has been the preference by Ocean City for financing capital improvements out of current revenues.

During the next few years governmental expenditures by Ocean City should grow more moderately. If the peak levels of visitor population continue to grow only slowly, while more visitors come during the non-summer months, Ocean City will be able to moderate the cost increases that would result from peak load problems. There also are indications that Ocean City is now willing to finance at least some capital improvement projects, thereby reducing the volatility of expenditure levels.

The projections of Ocean City's expenditure are contained in Table III. These projections are based on a two stage analysis. All expenditures directly tied to population levels were summed together for the first stage of the analysis. These expenditure categories were: 1) Public Safety, 2) Highways, 3) Sanitation and Waste Control, and 4) Recreation. In the first stage, least squares regression analysis was used to estimate the average annual population levels from Table III. This relationship was used to compute the expected levels of expenditures for the population induced spending for each year. This computed variable was then used as the independent variable for estimating the expected levels of "Other Government Expenditures", in much the same way that business overhead rates are computed.

Comparison of Revenues and Expenditures

Taken together, the revenues and expenditures are projected to increase at approximately the same rate, with a continued small budget surplus on balance. It should be noted that no allowance for inflation has been included in the projections** and that continued inflation would, of course, substantially affect the dollar amounts.***

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* Published data were not available for FY 1981, but the budgeted amount was less than 1980 expenditure levels.

** A ten per cent inflation was assumed to convert dollar amounts to 1982 dollars.

*** For example, an inflation rate of nine to ten per cent over the five year period would require an expenditure in 1987 of more than $26 million to maintain the same amount of purchasing power expressed in Table II.

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Table III

PRELIMINARY PROJECTIONS OF REVENUES AND EXPENDITURES

FOR OCEAN CITY 1983-1987

(1,000's of 1982 dollars)

Year	Revenues	Expenditures
1983	$15,200	$14,900
1984	15,700	15,500
1985	16,200	16,100
1986	16,900	16,500
1987	17,300	17,200

Table IV

DISTRIBUTION OF REVENUES BY SOURCE

1979 and PROJECTED 1987

	1979	1987
Property tax	52%	52%
Room tax	12%	17%
Charges for current services	14%	13%
Other revenues	22%	18%
Total	100%	100%

FIGURE 1

EXPENDITURES AND REVENUES FOR
FISCAL YEARS 1971-1980
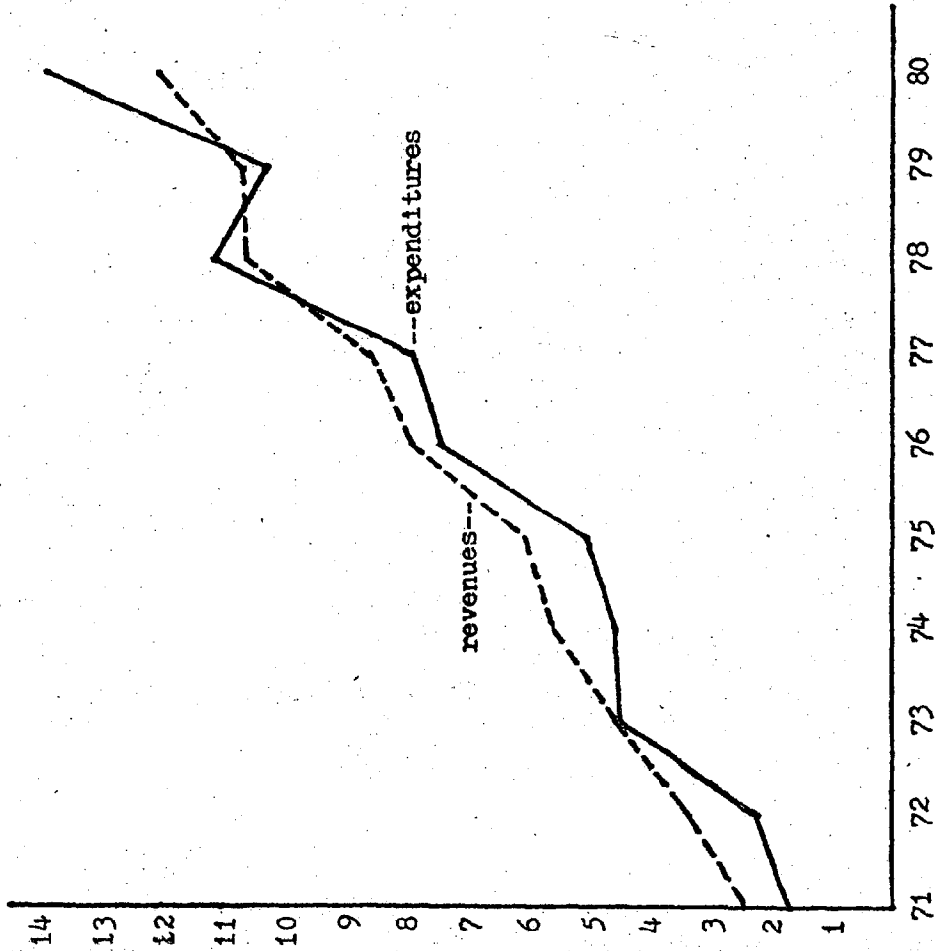
Source: Local Government Finances in Maryland, Department of Fiscal Services, 1971-1980.

Although the actual amount of surplus can be expected to vary from the trends from year to year, as has been the case historically, over the period the forecasts suggest that Ocean City can expect to generate a net surplus of approximately one million dollars (in constant 1982 dollars). This projected average yearly surplus of $200,000 is less than the average annual surplus ($600,000 in 1982 dollars) achieved by Ocean City during the period 1971-1980.

III. ADDITIONAL REVENUE SOURCES

The preceeding section indicated that Ocean City's revenues and expenditures can be expected to produce only a small surplus. This suggests, then, that for the City to be able to finance any new major capital project it will be necessary for the City to generate additional revenues.

For Ocean City to participate in the financing of any of the beach maintenance projects being considered, additional revenues would also be needed, of course. Accordingly, five alternative revenue sources are reviewed and estimates have been made of the amount of revenues each can be expected to provide. Each of the revenue alternatives was selected because the tax would be paid primarily by the beneficiaries of the project, in accordance with the public taxation principal discussed earlier.

Restored Property Tax

One source of potential additional revenues would be to restore the property tax in Ocean City to its previous level of $1.60 per $100 of assessable basis. This measure would increase the effective rate by approximately 20 per cent and raise an additional $1.3 million in 1983. The amount of increased tax receipts would rise to approximately $1.8 million in 1987.

Room Tax Add-on

This tax, paid directly by overnight visitors, is actually presented in two forms. The first assumes that the present tax rate of three per cent is increased by one percentage point, and the second assumes an increase in the rate to five per cent.

Under the first option the estimate of additional revenues in 1983 is $.8 million, rising to $1.0 million in 1987. The revenue estimates for the second option are twice that of the first, of course, $1.6 million and $2.0 million, respectively.

An increase in the current room tax rate would require authorization by the General Assembly. The current tax rate of three per cent of the value of the rental is the maximum authorized under current law.

Sales Tax Adjustment

The above revenue source alternatives would be paid only by the owners of property and/or overnight visitors staying in the City. Because many visitors either do not own property or do not take lodging in the City, other tax or revenue mechanisms designed to reach this group may be desirable.

One such mechanism would be a sales tax adjustment, the proceeds of which would be placed in a special trust fund established to finance the beach project. This could be applied either within Ocean City or to a special taxing district which include nearby areas patronized by visitors to Ocean City.

In FY 1980 sales tax revenues in Worcester County were $10,021,620, with approximately 50 per cent of this amount originating with sales in Ocean City. Assuming a three per cent growth in sales in real terms and a 10 per cent rate of inflation, the sales tax revenues from Ocean City will amount to approximately $6.6 million in 1983. A one per cent increase in the sales tax would generate $1.3 million in 1983 and about $1.5 million in 1987.

Admissions and Amusement Tax

A variant of the sales tax is the Admissions and Amusement Tax. The tax rate presently applied in Worcester County is two per cent, which generated revenues of $269,268 in FY 1980. Under existing legislation Ocean City could increase the tax rate to 10 per cent (five per cent on sales that are also subject to the State sales tax). Assuming that one-half of the sales currently subject to the Admissions and Amusement Tax are also subject to the Retail Sales Tax, increasing the tax to its maximum allowable rate would generate approximately $900,000 in 1983 and $1,000,000 in 1987, using the same assumptions about growth and inflation rates that were used to estimate increased revenues from the sales tax option above.

User Fees

A direct method of levying charges to generate additional revenues would be to establish a fee for people using the beach. The principal difficulties with the concept of a user fee are two: 1) it would be difficult to administer,* and 2) it would potentially generate a great deal of resistance as a nuisance, even though only relatively low fees would generate substantial revenues.

Only rough estimates of the amount of revenues that would be generated are possible. It is assumed that any user fee would be levied only on those actually using the beach. And beach use can vary considerably, depending on a wide range of factors including weather and general economic conditions.

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* One possible method might be to limit the number of access points to the beach and install coin operated turnstiles.

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The recreational benefit computations prepared by the Army Corps of Engineers' estimated the number of beach user-days at approximately 7,000,000 during the summer. However, if it assumed that on the average one-half of the population in Ocean City visits the beach on a given day, the number of user-days in 1980 would be closer to 10,000,000. Based on these figures even a modest user charge of 25 cents would generate between $1.75 and $2.5 million, based on 1980 visitor population. The lower estimates have been used in the tables in the next chapter.

IV. BEACH RESTORATION PROJECTS

Currently, two beach restoration projects are actively under consideration. The first is an interim maintenance project proposed by Maryland to stabilize the beaches until the Army Corps of Engineers' project is started in 1990. In addition to the detailed examination of the fiscal impacts of these two projects, the costs of a second interim maintenance project are examined because this alternative (sand fill only) appears to be most similar to the Plan 2 option now favored by the Army Corps of Engineers'.

The Short Groin Interim Beach Maintenance Project

The interim project recommended by the Ocean, Bays, and Beaches Task Force of the Coastal Resources Advisory Committee and the Maryland Department of Natural Resources is the "short groin" plan. The plan recommends that 47 groins be constructed along the approximately eight miles of ocean front extending from near 11th Street to the Maryland-Delaware line, with 925,520 cubic yards of sand fill to replenish the beach area. The project is proposed to be carried out over a five year period, incurring the following costs in each year:

Table V

Annual Construction Costs

Short Groin Project

(1982 dollars)

1982	$ 3,140,000
1983	3,425,000
1984	3,811,000
1985	4,097,000
1986	2,998,100
Total	$17,500,000

Note: Total has been rounded. See Appendix for an explanation of the cost estimates.

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Table VI

Interim Beach Maintenance Project
Annualized Costs and Additional Revenue Estimates
1983 - 1987

Assumed Interest Rate: .0919624

(1982 dollars)

Fiscal Year	Assumed Local Share		
	100%	75%	50%
1983	498,000	374,000	249,000
1984	1,022,000	767,000	511,000
1985	1,586,000	1,190,000	793,000
1986	2,173,000	1,630,000	1,086,000
1987	2,560,000	1,920,000	1,280,000

Estimates of Additional Revenues by Source, 1983-1987

(1,000's of 1982 dollars)

Fiscal Year	Projected Surplus	Restored Property Tax Rate	4% Room Tax	5% Room Tax	1% Sales Tax Add-on	Admissions and Amusement Tax	User Fees
1983	300	1,300	800	1,600	1,300	900	1,800
1984	200	1,400	900	1,700	1,300	900	1,800
1985	100	1,600	900	1,800	1,400	1,000	1,900
1986	400	1,700	1,000	1,900	1,400	1,000	2,000
1987	100	1,800	1,000	2,000	1,500	1,000	2,000

Note: Costs do not include estimated annual maintenance cost of $598,500 per year (1982 dollars). For comparison with Tables VII and IX, the peak level of annual costs would be $2,776,000 in 1983 if this interim project were financed with a single bond issue.

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The annualized costs of this interim project assume that State General Obligation Bonds are issued in the required amount each year. These costs were calculated for three assumed rates of interest. The most recent interest rate (as of early September, 1981) obtained by the State was .0919624. This rate was varied by ± 1.0 per cent to provide a range of annualized costs.

Three cost sharing options were considered. Option 1 assumes that the full annualized costs of the project are paid by the City. Options 2 and 3 assume that Ocean City pays 75 per cent and 50 per cent of the costs, respectively. In addition to the construction and interest costs contained in the table, approximately $598,500 in maintenance will be required for annual replenishment of the beaches.*

Table VI compares the first five years of annualized costs under the assumed interest rate of .0919624 with projected surplus revenues and the additional revenue sources described above. The annualized costs under the alternate assumptions about the interest rate vary from those in the table by plus or minus six per cent. Detailed estimates can be found in the Technical Appendix.

As can be seen from Table VI, if Ocean City were to pay 50 per cent of the project cost, any one of the revenue options will generate sufficient revenues to cover the costs. The four per cent room tax and the increased Admissions and Amusement Tax would produce a small short fall on current account in 1987, but this temporary shortage could be paid with earlier surpluses. Within one or two years, as debt service costs decline and revenues increase, the slight short fall would be eliminated.

With respect to the higher cost options, the only combination that would not provide sufficient revenue to fund them is the two options providing the smallest increase in revenues. It should be observed that these projections do not attempt to forecast inflation rates. Because inflation appears to be a long term condition, it is expected that the actual dollar values in these years will be higher than in Table VI.

Corps Plan No. 2

The beach maintenance and storm protection plan currently recommended by the U. S. Army Corps of Engineers' is its Plan 2. This plan calls for a 16.0 foot dune extending from the end of the boardwalk at 27th Street north to the Maryland-Delaware line where it would tie in with the existing Delaware dune line. From 27th Street south to North Division Street a 16.0 foot high steel sheet pile bulkhead would be constructed. "A minimum beach width of 165 feet is required to insure the integrity of the dune."**

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* See Appendix for discussion of cost estimates.

** Atlantic Coast of Maryland and Assateague Island, Virginia, Main Report and Environmental Impact Statement, U. S. Army Corps of Engineers', revised 23 February, 1981, p. 35.

Table VII

Maryland Construction of Corps Plan No. 2

With No Federal Involvement

Annualized Costs and Additional Revenue Estimates

1983 - 1987

Assumed Interest Rate: .0919624

(1982 dollars)

Fiscal Year	Assumed Local Share		
	100%	75%	50%
1983	5,136,000	3,852,000	2,568,000
1984	4,938,000	3,703,000	2,469,000
1985	4,739,000	3,555,000	2,370,000
1986	4,541,000	3,406,000	2,270,000
1987	4,342,000	3,257,000	2,171,000

Estimates of Additional Revenues by Source, 1983-1987

(1,000's of 1982 dollars)

Fiscal Year	Projected Surplus	Restored Property Tax Rate	4% Room Tax	5% Room Tax	1% Sales Tax Add-on	Admissions and Amusement Tax	User Fees
1983	300	1,300	800	1,600	1,300	900	1,800
1984	200	1,400	900	1,700	1,300	900	1,800
1985	100	1,600	900	1,800	1,400	1,000	1,900
1986	400	1,700	1,000	1,900	1,400	1,000	2,000
1987	100	1,800	1,000	2,000	1,500	1,000	2,000

Note: Costs do not include estimated annual maintenance cost of $1,688,000 a year (1982 dollars).

This project, although more expensive, provides a larger recreational beach area than do the interim projects, and protection against a 100 year storm. Because of the advanced start date for federal construction, and uncertainty about whether the federal government will even authorize the project, Maryland has under discussion the possibility of constructing the recommended plan without federal participation. The following discussion of the Corps Plan 2 examines the costs as if Maryland initiates the project in 1982.

The total cost of this project in 1982 is estimated to be $32,380,000. To estimate the annualized costs, it was assumed that all financing will be arranged in the first year, since a tentative construction schedule is not available. This assumption loaded the highest annual cost into the first year, rather than having it occur later, as with the Short Groin Interim Project. The changed assumption affects the level of peak costs as well. For comparative purposes, if the Short Groin Project were financed entirely in the first year, its peak cost would be $2,776,000, occuring in FY 1983.

Under these assumptions at least two additional revenue sources would be required for Ocean City to pay even the 50 per cent share of the project, and if the low revenue sources are used, a third revenue source would be required. Of course, cost sharing arrangements requiring the City to assume a larger share of the costs of this project would require additional revenue.

For the readers convenience, in Table VIII we have compared the differences in capital costs* to Maryland of constructing the Corps Plan 2 now and of initiating the Short Groin Project now and the local share of the Corps Plan 2 in 1990. The dollar cost estimates assume that inflation will continue at an average annual rate of 10 per cent per year over the period.

Beach Fill Interim Project

An alternative interim project included in the Trident report appears to be similar to the Corps Plan 2 recommendation in that it calls for beach fill with no construction of groins. It does not, however, include the construction of dunes or bulkheads, so it is relatively less expensive.

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* DNR has prepared a more complete estimate of the cost differences of these alternatives which includes annual maintenance costs as well. With maintenance costs included the cost difference for Maryland to construct the Corps Plan 2 with and without federal aid is about six per cent. Not included in this comparison is the cost of risk of damage from a major storm or the value of the increased recreational benefits that the alternatives would provide.

Table VIII

Comparison of Capital Costs Under Alternative

Funding Options

Project	City Assumed Share (1,000's of dollars)			Total Non-Federal Share of Capital Costs	Total Capital Cost of Project Alternatives
	100	75	50		
Short Groin Interim Project	17,500	13,125	8,750	17,500,000	17,500,000
Maryland Construction of Corps Plan 2	32,380	24,280	16,190	32,380,000	32,380,000
Corps Plan 2 with No Interim Measure	0	0	0	23,266,000	69,409,000
Short Groin Interim Project with Corps Plan 2	17,500	13,125	8,750	40,766,000	86,909,000

Note: The cost differences for Corps Plan 2 in 1982 and in 1990 are based on an assumed rate of inflation of 10 per cent per year over the period. For a detailed discussion of the cost estimates, see the Technical Appendix.

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This method uses sand of the proper grain size from an outside source that is pumped or hauled to the beach area. The possible sources are offshore deposits or the inlet and bays around Ocean City. The plan requires the movement of 2.6 million cubic yars of sand, with an annual replenishment estimated to be 150,000 cubic yards. The maintenance costs for this alternative are higher than for the other interim project because a larger volume of sand replenishment is required. Trident noted that the estimate of the yearly maintenance cost is uncertain because of difficulty in estimating the annual rate of erosion. The total capital cost of the interim project is estimated to be $14,700,000 (see the Technical Appendix for details).

The first principal advantage of the beach fill alternative is its lower initial cost. However, a comparison of Tables VI and IX shows that when the annual maintenance costs associated with each project alternative are included, the average annual costs of the beach fill alternative exceeds that of the Short Groin Project. In spite of this, the project may be preferred if it is seriously contemplated that the Corps Plan 2 project will be constructed either by Maryland or the federal government. Further discussion of this question can be found in the Appendix.

Table IX

Beach Fill Interim Project

Annualized Costs and Additional Revenue Estimates

1983 - 1987

Assumed Interest Rate: .0919624

(1982 dollars)

Fiscal Year	Assumed Local Share		
	100%	75%	50%
1983	2,326,000	1,744,000	1,163,000
1984	2,236,000	1,677,000	1,118,000
1985	2,146,000	1,610,000	1,073,000
1986	2,056,000	1,542,000	1,028,000
1987	1,966,000	1,475,000	983,000

Estimates of Additional Revenues by Source, 1983-1987

(1,000's of 1982 dollars)

Fiscal Year	Projected Surplus	Restored Property Tax Rate	4% Room Tax	5% Room Tax	1% Sales Tax Add-on	Admissions and Amusement Tax	User Fees
1983	300	1,300	800	1,600	1,300	900	1,800
1984	200	1,400	900	1,700	1,300	900	1,800
1985	100	1,600	900	1,800	1,400	1,000	1,900
1986	400	1,700	1,000	1,900	1,400	1,000	2,000
1987	100	1,800	1,000	2,000	1,500	1,000	2,000

Note: Costs do not include estimated annual maintenance cost of $1,197,000 a year (1982 dollars).

V. STATE FISCAL IMPACTS

The fiscal impacts of the two funding options requiring State participation have been assessed as an annual per capita cost for 1983 and 1987. These two years were selected because 1983 is the year of highest cost for Corps Plan 2, and 1987 is the year of maximum outlay for the Interim Project. These are summarized in Table X. The Maryland population is assumed to continue to grow at the same annual rate (0.7%) that it grew during the decade 1970-1980.

Table X

State Fiscal Impacts Per Capita
Dollars Per Capita

	State Share	
	25%	50%
Short Groin Interim Project		
Interest rate: .0819624		
1983	$.027	$.054
1987	.136	.272
Interest rate: .0919624		
1983	.029	.058
1987	.144	.289
Interest rate: .1019624		
1983	.031	.062
1987	.153	.306
Corps Plan No. 2		
Interest rate: .0819624		
1983	.279	.558
1987	.231	.463
Interest rate: .0919624		
1983	.298	.596
1987	.245	.500
Interest rate: .1019624		
1983	.317	.634
1987	.258	.516
Beach Fill Interim Project		
Interest rate: .0819624		
1983	.126	.253
1987	.105	.210
Interest rate: .0919624		
1983	.135	.270
1987	.111	.222
Interest rate: .1019624		
1983	.144	.288
1987	.117	.234

VI. IMPACT ON OCEAN CITY'S "BOND RATING"

It has been the assumption for the preceeding analysis, that the State would borrow the entire sum with General Obligation Bonds, and that the City would assume the responsibility for at least some portion of the indebtedness. The advantage to Ocean City of this arrangement is that it would obtain the lower interest rate available to the State. Without this State participation, the probable interest rate required to finance the project would be substantially higher. Business Week reported in its September 21, 1981 issue that tax free municipal bonds have surged to a record 12.97 per cent, and that some analysts expect the rate to go even higher. Because each percentage point of interest adds substantially to the annualized cost of the project, without State participation in the financing arrangements, the estimates of annualized costs used for this study would require substantial revision.

At the present time, Ocean City does not have a formal bond rating from either Moody's or Standard and Poor's. The City has been reluctant to finance capital projects during the past decade, and has incurred little in the way of indebtedness. However, as noted earlier, there now appears to be an increased willingness on the part of the government of Ocean City to incur debt for capital projects.

Under the assumption that State financing is used to fund the beach maintenance project, Ocean City's "bond rating" would have no effect on the cost of the project. The probable rating effect of this indebtedness is of interest, however, because of the probable impact on the costs to the City of financing other capital projects. While it is not possible to establish quantitatively how bond ratings are made, the process was outlined at a seminar in Florida in March of 1981.* Included in the discussion was a description of the factors considered in the rating process and a set of early warning guidelines used by Standard and Poor's to identify situations in which bond ratings may need to be revised.

The rating process reviews four broad areas: economic factors, debt factors, administrative factors, and fiscal factors.

Economic diversity in the municipality's tax base and in the growth of employment opportunities are important. These two elements are considered to be important because they determine the community's ability to repay. Applying this factor to Ocean City is difficult. While the City has a narrow economic base revolving around tourism, the property owners represent a diverse and relatively affluent segment of the population.

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* A copy of the paper presented at the seminar was provided by Mr. Hyman C. Grossman, Vice President-Municipal Ratings, Municipal Bond Department, Standard and Poor's Corporation, New York, New York, 1981.

The debt factors include type of security, debt burden, and debt history or trend. The concern here is with the community's ability to repay the debt, and the quality of planning for capital improvements. The debt burden must be measured against income and budget resources, as well as projected debt needs. In recent years Ocean City has been able to meet its financial obligations without difficulty. It also has recently reduced the property tax rate while its level of outstanding debt has been reduced from $2.6 million in FY 1975 to $1.8 million in 1980.

The administrative factors are concerned with whether the government is "geared up to the job" expected of it. The tax rate and levy limitations and debt limitations are considered important. In view of the recent reduction in the property tax rate and the absence of formal limitations, Ocean City should be strong in these areas. A second favorable aspect is the continued expansion in the tax base, although this can be expected to slow in the near future.

The final area is the current account analysis of fiscal factors. Although Ocean City incurred a substantial deficit in FY 1980, this should not affect its "rating" significantly. The concern is not great when the current account deficit is wiped out in the next year, as has been the case in recent years.

In general, the early warning guidelines include operating fund deficits, general fund deficits, and level of short term and overall deficit. These guidelines do include some quantitative dimensions, and some would be triggered by the proposed project. For example, the City's overall net debt ratio would be more than 50 per cent higher than four years previously. Under some of the high cost options described previously, another guideline would be triggered because short term interest and the current year debt service could exceed 20 per cent of total revenues. For most of the projected scenarios, the cost of financing the beach project alone would not cause this limit to be exceeded. This, however, does not consider that other debt may be inclurred by Ocean City between now and then and this guideline could be triggered by the combined indebtedness.

The remaining early warning guidelines provide trigger points that relate to short term trends in revenues and debt that cannot be anticipated this far in advance.

Although precise determination of the probable bond rating impact cannot be made without a complete audit of Ocean City's financial practices, based on the information available to this study, it appears that Ocean City could participate in partial financing of the project without an adverse rating impact. Ocean City has experienced vigorous growth during the past decade, and has maintained a budget surplus in most years. Its current level of debt is conservative, and the economic trends in the City indicate that continued expansion of the tax base will increase its ability to repay any future debt that may be incurred.

At this time, there is no reason to expect an adverse bond rating impact on Ocean City so long as the level of debt incurred is reasonable and a sound financial plan for generating necessary revenues is provided at the time the debt is incurred. Establishing what can be considered a "reasonable level of debt" is subject to interpretation, however. Based on Standard and Poor's early warning guidelines, debt service (plus short term interest) should not exceed 20 per cent of total revenues--about $2.5 million for Ocean City, currently. On the other hand, Maryland's cities, towns, villages, and special taxing districts have a more conservative ratio of 8.5 per cent during the period 1976-1980--about $1.1 million for Ocean City currently. Using these two points to establish a "range of reasonableness" suggest that debt service costs of between $1.3 and $3.0 million can be considered reasonable for Ocean City in 1983.*

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* One additional factor may affect Ocean City's "bond rating." Because of the storm hazard an additional element of risk is present that may discourage some investors. While this hazard would be a factor in any bond issue, the present willingness to invest there indicates that investors could be found. Additionally, since the completion of the project will reduce the risk of storm damage, the importance of this factor would be reduced by the investment being made.

VII.   CONCLUSIONS

Based on the trends in Ocean City's revenues and expenditures, over
the next several years Ocean City will continue to show a modest budget
surplus. While year to year deviations from the longer term trends in
revenues and expenditures can be expected to result in variations from
the projected balances in any given year, on average a slight surplus
is expected.

Since no significant budget surplus can be expected to occur, for
Ocean City to participate in the financing of any of the proposed beach
restoration projects, it will be necessary for the City to impose addi-
tional tax mechanisms to generate the necessary revenues. Several alter-
native taxes were reviewed, and all would be capable of generating sig-
nificant amounts of revenues--generally $1 million or more annually.

In accordance with the principal of taxation that whenever possible
the beneficiary of a public expenditure should be taxed, the revenue
alternatives reviewed were confined to those that would be paid princi-
pally by the property owners and visitors to Ocean City.

The range of alternatives among projects, interest rate costs, and
local share options provided nine alternative cost functions. Each was
converted to an annualized cost basis (excluding the cost of annual main-
tenance) for comparative purposes. Taken together there are a total of
27 alternative scenarios for the annualized capital costs of the alter-
natives.

The peak levels of annualized costs for each project range from a
low of $1,090,000 to a high of $5,460,000, depending on the cost of the
project, the assumed interest rate, and the assumed share paid by Ocean
City. Given this range of costs and the revenues that additional taxes
can be expected to generate, one additional revenue source can finance
most or all of the low cost scenario, two would be needed to finance the
intermediate range scenarios, and at least three would be required to
finance the higher cost scenarios.

TECHNICAL APPENDIX

This appendix contains technical details of the methods used to make the projections of revenues, expenditures, and annualized costs for the beach maintenance projects. While this appendix is intended to clearly explain how the projections and estimates were made, much of the detailed data used for this analysis is contained only on work sheets and computer tapes.

I. Fiscal Projections

In general, both the costs and the revenues of city government are related to the size of the city. As the population and economic base expands more services are required to be provided and additional capital investments must be made. Simultaneously, the increased wealth and income associated with the economic growth expands the tax base, providing additional revenues to pay the increased costs.

Most techniques used to make fiscal projections rely primarily on establishing a relationship between governmental costs and revenues and some measure of city size. The most popular techniques use the ratio method, usually based on population.

Ocean City, however, is not typical of cities in either Maryland or the United States. It is the second largest city in Maryland in terms of the number of housing units located there, but it has only a relatively small resident population. As a consequence, Ocean City receives a smaller than average proportion of its revenues as grants and revenue sharing, forcing it to rely more heavily on own source revenues.

A second way in which Ocean City differs substantially from a typical city is that it must be capable of delivering services to more than 250,000 people, even though the permanent population is less than 5,000. This causes a peak loading problem in which the capacity to provide essential services must exist even though it is not used for much of the year.

In preparing the projections of revenues and expenditures considerable effort was devoted to selecting the explanatory variables. It was necessary to determine whether the preferable explanatory variable was peak population, average annual, or average summer population, or whether a simple trend could account for the growth. Both linear and non-linear relationships were fitted. All expenditures and revenues were converted to constant dollars using the implicit deflator for GNP.

Expenditures Analysis

The method used here to estimate expenditures is a variant of the per capita multiplier method, widely used in situations where expenditures bear a close relationship to service demand. A major difficulty with the per capita multiplier method is that it assumes that the future relationship between expenditures and population will be similar to that existing in the study year. Therefore, service over- or under-utilization in a particular year may result in over or under estimates of the expected future levels of expenditures. Also, the ratio may be increasing or decreasing over time, and a single year's observation cannot account for this trend either.

The basic assumption underlying this approach is that, over the long run, the average operating cost per visitor is the best estimate of future operating costs occasioned by growth. The principle advantage of the regression method is the averaging of the relationship over several years. When the ratio method is applied to a single year's data, the level of expenditures in that year may reflect either excess capacity or service deficiancies occasioned by lack of adjustment to the current population/visitor levels.

Regression tests with the population variables established that the average annual population provides the "best" explanatory variable for the tourist related expenditures (T_e). Because of a severe autocorrelation problem, the correction method suggested by Durbin* was used to estimate the relationship. The equation obtained is $T_e = 103,997 + 51.882$ P with an R^2 of .43 (P = population).

The second stage of the estimating method consisted of computing the relationship between other expenditures and T_e. The assumption is that these expenditures are related to the T_e component in much the same way as overhead is related to direct costs. The two stage analysis uses the computed values of T_e as the independent, explanatory variable, thereby removing the random component. This regression yielded a ratio of .80 for other expenditures, with a small negative intercept which was ignored in subsequent calculations. The R^2 was .55.

Revenue Analysis

Revenues are divided into four categories according to the expected explanatory variables. The largest revenue source is property taxes, which are dependent on the growth in the assessable basis and indirectly on the growth in tourism. The second category is Charges for Current Services, expected to be dependent on growth in the average annual population. The third category is room tax receipts, also indirectly de-

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* For a discussion, see Econometric Methods, J. Johnston, McGraw-Hill Book Company, 1960.

pendent on the growth in tourism. The last category is other revenues which are obtained from miscellaneous sources. Each of these is discussed in turn.

Almost half of the revenues to Ocean City are obtained from property taxes. The property tax receipts, of course, depend upon the property values in Ocean City, and there are two bases for an increase in property values in real terms. The first is an increase in the value of property relative to other goods and services. This source of increase, because it is dependent on scarcity, is expected to be of greater importance in the future. The second source of increase is physical expansion, or construction. This source of growth is expected to be more important in the near term than in the future. Currently, Ocean City is experiencing a real estate boom, which is contrary to existing conditions in most of the rest of the country. However, the supply of buildable land is dwindling, and should be scarce within a few years.

The best regression fit relating growth in the assessable basis to increases in the average annual population was obtained with a non-linear equation. The equation explained 81 per cent of the historical growth in the assessable basis.

The regression relationship between Charges for Current Services and average annual population explained only about 50 per cent of the variation. In 1980 the average revenue per average annual population was $22.52. However, the additional revenue associated with an increase in the average annual population was much lower, amounting to slightly less than $7.00. This rather large difference between the average and marginal revenue is largely due to the peak load problem of Ocean City, due to the large seasonal variation in the number of people staying there.

An overriding characteristic of the revenues received for current services is that they were monotonically increasing for the entire decade. This suggested that either an anto-regressive equation or a trend would produce a better regression fit. The equation used for the projections is an auto-regressive relationship that produces an average growth rate of approximately one per cent per year. The equation explained 75 per cent of the historical growth of these revenues.

An increasingly important source of revenue to Ocean City is the room tax. This tax is, of course, also a function of the amount of tourism, but the best regression fit obtained was one which related the room tax receipts to tourism indirectly through increases in the assessable basis. This relationship explained 75 per cent of the variation in receipts, producing an average increase of $4.72 in receipts per year for each $1,000 increase in the value of the assessable base.

The final category of revenues is "other revenues", which includes a diverse variety of sources such as local income taxes, State grants

and transfers, federal revenue sharing, and miscellaneous receipts.
Individually each of these sources is quite small relative to total
receipts in Ocean City, and collectively these receipts amount to approx-
imately 20 per cent of total revenues. While some of these revenues are
related to tourism, most are not, and to a large extent the rate of growth
of these revenues is not dependent on the rate of growth of Ocean City.
Therefore, these revenues have been simply trended over the period. The
average yearly increase in these revenues has been approximately $184,000
per year, and the projections assume that this amount of annual increase
will continue over the next few years.

The most significant factor affecting growth in both revenues and
expenditures is the growth rate of average annual population in Ocean
City, defined as described in the main body of the text. The best fit
with historical data for average annual population was a non-linear re-
lationship in which the independent variable was the average annual pop-
ulation of the previous year.

This equation produced a slowly declining growth rate. The average
compound rate forecast for the entire projection period, 1982 through
1987, is 3.2 per cent. However, the expected yearly growth in average
population is expected to decline from slightly more than four per cent
for 1983 to approximately 2.4 per cent in 1987. The projected average
annual population for Ocean City for the period 1983-1987 are contained
in Table A.1.

The equations described earlier were applied to these projected levels
of annual average population, as appropriate, to obtain the projected
levels of expenditures and revenues in each of the forecast years. The

Table A.1

Average Annual Population

Projections for Ocean City, Maryland

1983-1987

Year	Population
1983	78,400
1984	81,100
1985	83,700
1986	85,900
1987	88,000

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first stage expenditures equation for tourist related revenues was applied directly to the population forecast, and then adjusted, using the second stage equation, to reflect the levels of other expenditures, producing the projections of total expenditures in a relatively straight forward manner.

The forecasts of revenues were somewhat more complex because of the indirect relationship between revenues and average annual population. Both the property tax revenues and the room tax revenues are related to average annual population indirectly via the projected levels of the assessable basis. As noted earlier, the assessable basis is a non-linear function of the average annual population. The procedure used was to estimate the assessable basis as a function of population, then adjust for inflation. In real terms, the projected growth of the assessable basis is expected to be 3.7 per cent in the 1982-83 period, gradually declining to approximately 2.1 per cent in the 1986-87 period. However, the forecast level of assessable basis for 1983 includes a substantial adjustment for inflation which accounts for most of the increase in assessable basis between FY 80 and FY 83.

The remaining projections for service related revenues and other revenues were simply extrapolations of the trends identified in the equations cited earlier. This also was a relatively straight forward application of the equations.

II. Estimates of Annualized Costs

To evaluate the fiscal impacts of Ocean City sharing in the costs of the beach maintenance projects it was necessary to estimate annualized costs of the alternative projects. All estimates of the annualized costs are based on two common assumptions. It is assumed that Maryland General Obligation Bonds are issued to finance the project, and that the bond issue is to be retired completely within 15 years, with equal portions being retired annually. Any significant deviation from these assumptions would, of course, substantially affect the annualized costs.

The annualized capital costs of all three projects are contained in Tables A.2 through A.10. The cost for each of the three project alternatives has been calculated for three assumptions about interest rates and three assumptions about the proportion of total costs paid by Ocean City.

In early September, 1981 the State of Maryland issue of General Revenue Bonds obtained an interest rate of .0919624. Given the present uncertainty of financial markets, this rate can only be viewed as an approximation of the actual interest costs, so this base rate was varied by ± one per cent to calculate a range of annualized project costs, to reflect this uncertainty.

Table A.2

Interim Beach Maintenance Project

Annualized Costs

Assumed Interest Rate .0819624

	Assumed Local Share		
Year	100%	75%	50%
1983	467,000	350,000	233,000
1984	959,000	719,000	479,000
1985	1,489,000	1,117 ,000	745,000
1986	2,041,000	1,531,000	1,021,000
1987	2,408,000	1,806,000	1,204,000
1988	2,312,000	1,734,000	1,156,000
1989	2,217,000	1,663,000	1,108,000
1990	2,122,000	1,591,000	1,061,000
1991	2,026,000	1,520,000	1,013,000
1992	1,931,000	1,448,000	965,000
1993	1,835,000	1,376,000	918,000
1994	1,740,000	1,305,000	870,000
1995	1,644,000	1,233,000	822,000
1996	1,549,000	1,162,000	774,000
1997	1,453,000	1,090,000	727,000
1998	1,148,000	861,000	574,000
1999	842,000	631,000	421,000
2000	528,000	396,000	264,000
2001	216,000	162,000	108,000

Note: Above costs do not include estimated annual maintenance
       costs of $598,500 per year (1982 dollars).

Table A.3

Interim Beach Maintenance Project

Annualized Costs

Assumed Interest Rate .0919624

	Assumed Local Share		
Year	100%	75%	50%
1983	498,000	374,000	249,000
1984	1,022,000	767,000	511,000
1985	1,586,000	1,190,000	793,000
1986	2,173,000	1,630,000	1,086,000
1987	2,560,000	1,920,000	1,280,000
1988	2,452,000	1,839,000	1,226,000
1989	2,345,000	1,759,000	1,173,000
1990	2,238,000	1,679,000	1,119,000
1991	2,131,000	1,598,000	1,066,000
1992	2,024,000	1,518,000	1,012,000
1993	1,917,000	1,438,000	958,000
1994	1,810,000	1,357,000	905,000
1995	1,703,000	1,277,000	851,000
1996	1,596,000	1,197,000	798,000
1997	1,488,000	1,116,000	744,000
1998	1,172,000	879,000	586,000
1999	856,000	642,000	428,000
2000	535,000	401,000	267,000
2001	218,000	164,000	109,000

Note: Above costs do not include estimated annual maintenance
costs of $598,500 per year (1982 dollars).

Table A.4

Interim Beach Maintenance Project

Annualized Costs

Assumed Interest Rate .1019624

	Assumed Local Share		
Year	100%	75%	50%
1983	529,000	397,000	265,000
1984	1,086,000	814,000	543,000
1985	1,684,000	1,263,000	842,000
1986	2,304,000	1,728,000	1,152,000
1987	2,711,000	2,033,000	1,356,000
1988	2,592,000	1,944,000	1,296,000
1989	2,474,000	1,855,000	1,237,000
1990	2,355,000	1,766,000	1,177,000
1991	2,236,000	1,677,000	1,118,000
1992	2,117,000	1,588,000	1,059,000
1993	1,999,000	1,499,000	999,000
1994	1,880,000	1,410,000	940,000
1995	1,761,000	1,321,000	881,000
1996	1,642,000	1,232,000	821,000
1997	1,524,000	1,143,000	762,000
1998	1,196,000	897,000	598,000
1999	870,000	652,000	435,000
2000	542,000	406,000	271,000
2001	220,000	165,000	110,000

Note: Above costs do not include estimated annual maintenance
costs of $598,500 per year (1982 dollars).

Table A.5

Maryland Construction of Corps Plan No. 2

with no Federal Involvement

Annualized Costs

Assumed Interest Rate .0819624

| Year | Assumed Local Share | | |
	100%	75%	50%
1983	4,813,000	3,609,000	2,406,000
1984	4,636,000	3,477,000	2,318,000
1985	4,459,000	3,344,000	2,229,000
1986	4,282,000	3,211,000	2,141,000
1987	4,105,000	3,079,000	2,052,000
1988	3,928,000	2,946,000	1,964,000
1989	3,751,000	2,813,000	1,876,000
1990	3,574,000	2,681,000	1,787,000
1991	3,397,000	2,548,000	1,699,000
1992	3,220,000	2,415,000	1,610,000
1993	3,043,000	2,282,000	1,522,000
1994	2,866,000	2,150,000	1,433,000
1995	2,689,000	2,017,000	1,345,000
1996	2,513,000	1,884,000	1,256,000
1997	2,336,000	1,752,000	1,168,000

Note: Above costs do not include estimated annual maintenance
costs of $1,688,000 per year (1982 dollars).

Table A.6

Maryland Construction of Corps Plan No. 2

with no Federal Involvement

Annualized Costs

Assumed Interest Rate .0919624

Year	Assumed Local Share		
	100%	75%	50%
1983	5,136,000	3,852,000	2,568,000
1984	4,938,000	3,703,000	2,469,000
1985	4,739,000	3,555,000	2,370,000
1986	4,541,000	3,406,000	2,270,000
1987	4,342,000	3,257,000	2,171,000
1988	4,144,000	3,108,000	2,072,000
1989	3,945,000	2,959,000	1,973,000
1990	3,747,000	2,810,000	1,873,000
1991	3,548,000	2,661,000	1,774,000
1992	3,350,000	2,512,000	1,675,000
1993	3,151,000	2,363,000	1,576,000
1994	2,953,000	2,215,000	1,476,000
1995	2,754,000	2,066,000	1,377,000
1996	2,556,000	1,917,000	1,278,000
1997	2,357,000	1,768,000	1,179,000

Note: Above costs do not include estimated annual maintenance costs of $1,688,000 per year (1982 dollars).

Table A.7

Maryland Construction of Corps Plan No. 2

with no Federal Involvement

Annualized Costs

Assumed Interest Rate .1019624

Year	Assumed Local Share		
	100%	75%	50%
1983	5,460,000	4,095,000	2,730,000
1984	5,240,000	3,930,000	2,620,000
1985	5,020,000	3,765,000	2,510,000
1986	4,800,000	3,600,000	2,400,000
1987	4,580,000	3,435,000	2,290,000
1988	4,360,000	3,270,000	2,180,000
1989	4,140,000	3,105,000	2,070,000
1990	3,919,000	2,940,000	1,960,000
1991	3,699,000	2,775,000	1,850,000
1992	3,479,000	2,609,000	1,740,000
1993	3,259,000	2,444,000	1,630,000
1994	3,039,000	2,279,000	1,520,000
1995	2,819,000	2,114,000	1,409,000
1996	2,599,000	1,949,000	1,299,000
1997	2,379,000	1,784,000	1,189,000

Note: Above costs do not include estimated annual maintenance
costs of $1,688,000 per year (1982 dollars).

Table A.8

Beach Fill Interim Project

Annualized Costs

Assumed Interest Rate: .0819624

	Assumed Local Share		
	100%	75%	50%
1983	2,179,000	1,635,000	1,090,000
1984	2,099,000	1,574,000	1,050,000
1985	2,019,000	1,514,000	1,010,000
1986	1,939,000	1,454,000	969,000
1987	1,859,000	1,394,000	929,000
1988	1,779,000	1,334,000	889,000
1989	1,699,000	1,274,000	849,000
1990	1,619,000	1,214,000	809,000
1991	1,538,000	1,154,000	769,000
1992	1,458,000	1,094,000	729,000
1993	1,378,000	1,034,000	689,000
1994	1,298,000	974,000	649,000
1995	1,218,000	913,000	609,000
1996	1,138,000	853,000	569,000
1997	1,058,000	793,000	529,000

Note: The above costs do not include estimated annual maintenance costs
of $1,197,000 (1982 dollars).

Table A.9

Beach Fill Interim Project

Annualized Costs

Assumed Interest Rate: .0919624

	Assumed Local Share		
	100%	75%	50%
1983	2,326,000	1,744,000	1,163,000
1984	2,236,000	1,677,000	1,118,000
1985	2,146,000	1,610,000	1,073,000
1986	2,056,000	1,542,000	1,028,000
1987	1,966,000	1,475,000	983,000
1988	1,876,000	1,407,000	938,000
1989	1,787,000	1,340,000	893,000
1990	1,697,000	1,273,000	848,000
1991	1,607,000	1,205,000	803,000
1992	1,517,000	1,138,000	758,000
1993	1,427,000	1,070,000	714,000
1994	1,337,000	1,003,000	669,000
1995	1,247,000	935,000	624,000
1996	1,157,000	868,000	579,000
1997	1,067,000	801,000	534,000

Note: The above costs do not include estimated annual maintenance costs of $1,197,000 (1982 dollars).

Table A.10

Beach Fill Interim Project

Annualized Costs

Assumed Interest Rate: .1019624

	Assumed Local Share		
	100%	75%	50%
1983	2,473,000	1,854,000	1,236,000
1984	2,373,000	1,780,000	1,186,000
1985	2,273,000	1,705,000	1,137,000
1986	2,174,000	1,630,000	1,087,000
1987	2,074,000	1,555,000	1,037,000
1988	1,974,000	1,481,000	987,000
1989	1,875,000	1,406,000	937,000
1990	1,775,000	1,331,000	887,000
1991	1,675,000	1,256,000	838,000
1992	1,576,000	1,182,000	788,000
1993	1,476,000	1,107,000	738,000
1994	1,376,000	1,032,000	688,000
1995	1,277,000	957,000	638,000
1996	1,177,000	883,000	588,000
1997	1,077,000	808,000	539,000

Note: The above costs do not include estimated annual maintenance costs of $1,197,000 (1982 dollars).

For each project and assumed interest rate, three assumptions about the share paid by Ocean City have been made. The first column contains the full annualized cost of each alternative, assuming that the City finances the entire project. Columns two and three assume that Ocean City finances 75 and 50 per cent of the costs, respectively.

The annualized costs for the Short Groin Interim Projects differ from those of the other two projects in one important aspect. Planning for this project has reached the stage where a preliminary construction time table has been prepared. Accordingly, the annualized costs of this project reflect that time table, and it has been assumed that financing of the project is conducted over a five year period.

For the remaining two project alternatives no such schedule is available, and for expository purposes it was assumed that all financing is arranged in the first year. This assumption slightly distorts the comparisons among the three alternatives in that, for the latter two projects, the highest annual costs occurs earlier and are slightly higher than would be the case if financing were phased with a construction time table. While these differences are relatively minor, the reader should be aware of them when making comparisons of the costs of the alternatives.

To aid the reader in making these comparisons, the peak cost of the Short Groin Interim Project was computed using the same assumptions as were used for the other two projects. At the .0919624 rate of interest the peak cost for the 100 per cent option is $2,776,000. Other options are affected proportionately. The effect of the phasing of financing over the five year construction period is to reduce the peak level of debt service costs by about eight per cent.

III. COMPARISON OF ADVANTAGES OF PROJECT ALTERNATIVES

As an additional aid to the reader, Table A.11 was prepared. The principal advantages of the four project alternatives have been briefly summarized. The major contrast evident in this table is between the two interim projects. If construction of the Corps Plan 2 is expected, whether by Maryland or with federal participation, the beach fill alternative would be the preferred choice. Although its annual cost including maintenance is slightly higher than the groin project, it would reduce Maryland's cost of constructing Corps Plan 2 by a minimum of 45 per cent, however it is financed.

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Table A.11

Comparison of Advantages of

Alternative Beach Maintenance Projects

Project	Reduce Long Shore Drift	Expected Level of Storm Protection	Increased Recreational Beach 3)	Maximum Amount to Count Towards Local Match	Expected Reduction in Cost of Corps Plan 2
Short Groin Interim Project	Yes	14 year storm in 1987 4)	Smallest increase	Sand fill portion only 1)	15% 2)
Corps Plan 2 without federal participation	No	100 year storm in 1984	Maximum increase	N/A	N/A
Beach Fill Only Interim Project	No	20 year storm in 1984 4)	Medium to maximum increase	All projects costs 1)	45% 2)
Corps Project Only in 1990	No	100 year storm in 1990	Maximum increase	N/A	N/A

1) This assumes that the Corps of Engineer's project is authorized by Congress prior to the start of construction.

2) This is the per cent of total construction costs derived by deducting the cost of beach fill provided by the Interim project from the total sand needs estimate for the Corps of Engineer's Plan 2.

3) The expected beach width upon completion of some projects was not specified. These judgements are based on the estimates of beach fill required by each project.

4) Source: Final Report Interim Beach Maintenance at Ocean City, Trident Engineering Associates, August 30, 1979. These estimates incorporate the 10 year storm protection provided by the existing beach.

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IV. DERIVATION OF PROJECT COST ESTIMATES

The cost estimates used in this report were made as consistent as possible to provide a common basis for comparison. Accordingly all of the estimates were adjusted to expected 1982 price levels to conform more closely to those prepared by the Shore Erosion Control Program, Capital Programs Administration, Department of Natural Resources. The estimates, provided by the Tidewater Administration are detailed in Table A.12. The estimates are based on the assumption of a 10 per cent rate of inflation and the following modifications to the Trident Study estimates:

1. Estimated engineering design costs have been included.

2. Estimates are for a total of 47 new stone groins, with beach fill. The Trident figures for these items have been adjusted to reflect current and estimated future dollar values.

3. Construction of groins by the Town of Ocean City in FY 79, FY 80 and proposed for FY 81 requires realignment of the groin field as originally proposed by the Trident Study in order to achieve optimum groin spacing.

4. Stone extensions to several existing timber groins, as originally proposed, is no longer feasible due to the realignment of the groin field and deterioration of a number of existing timber structures.

5. Potential cost savings derived by using existing stone groins as foundations for new, extended, groins is expected to be off-set by the cost of modifications to the basic structures to compensate for design differences.

The adjustment to the costs of the Corps Plan 2 project consisted of a simple expansion of the 1980 estimate to allow for two years of inflation at 10 per cent per year. The calculation was 26,760,000 x $(1.1)^2 = 32,380,000$ to obtain the estimated cost for 1982, and 26,760,000 x $(1.1)^{10} = 69,409,000$ to obtain the estimated cost for 1990.

The adjustment used to estimate the 1982 cost of the Beach Fill Interim Project was somewhat more involved since additional information was available. In its final report Trident Engineering based its project cost estimates on dredging cost data estimating the cost of sand fill at $2.85 and $4.00 per cubic yard for large and small quantities of sand, respectively. Subsequently, Trident revised its estimates of the cost of dredging small quantities of sand upward to $6.00 per cubic yard.*

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* Additional Data for Trident's Interim Beach Maintenance at Ocean City Report, Trident Engineering Associates, Inc., October, 1979, p. 7.

Table A.12

Estimates – Five Year Program
Short Groin Interim Project

First Year

Design 10 groins	@ $ 10,000 each	$ 100,000
Construct 10 groins	@ 171,900 each	1,719,000
Sand fill 10 groins	@ 132,100 each	1,321,000

$ 3,140,000

Second Year

Design 10 groins	@ $ 11,000 each	110,000
Construct 10 groins	@ 187,500 each	1,875,000
Sand fill 10 groins	@ 144,000 each	1,440,000

$ 3,425,000

Third Year

Design 10 groins	@ $ 12,000 each	120,000
Construct 10 groins	@ 203,100 each	2,031,000
Sand fill 10 groins	@ 166,000 each	1,660,000

$ 3,811,000

Fourth Year

Design 10 groins	@ $ 13,000 each	130,000
Construct 10 groins	@ 218,700 each	2,187,000
Sand fill 10 groins	@ 178,000 each	1,780,000

$ 4,097,000

Fifth Year

Design 7 groins	@ $ 14,000 each	98,000
Construct 7 groins	@ 234,300 each	1,640,100
Sand fill 7 groins	@ 180,000 each	1,260,000

$ 2,998,100

Grand Total $17,471,100
Say $17,500,000

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The estimates used for this study also inflated the 1979 cost of dredging large quantities of sand by 50 per cent, raising the cost to $4.28 per cubic yard. This estimate was then adjusted for three years of 10 per cent inflation to obtain $4.28 x $(1.1)^3$ = $5.70 as the estimated dredging cost per cubic yard in 1982. The total cost of the project was arrived at by multiplying the per unit figure by the estimated 2.6 million cubic yards of sand required by the project to obtain an estimated project cost of $14.7 million in 1982.

The revisions to the cost of beach maintenance after completion of the project were derived by applying the inflation factor to the appropriate estimate by Trident Engineering or the Army Corps of Engineers. The calculations for the beach fill were based on the Trident estimate of $6.00 per cubic yard for sand, adjusted for three years of inflation ($6.00 x $[1.1]^3$ = $7.86). The adusted estimate for the Corps Plan 2 was adjusted for two years of inflation ($1,395,000 x $[1.1]^2$ = $1,688,000).