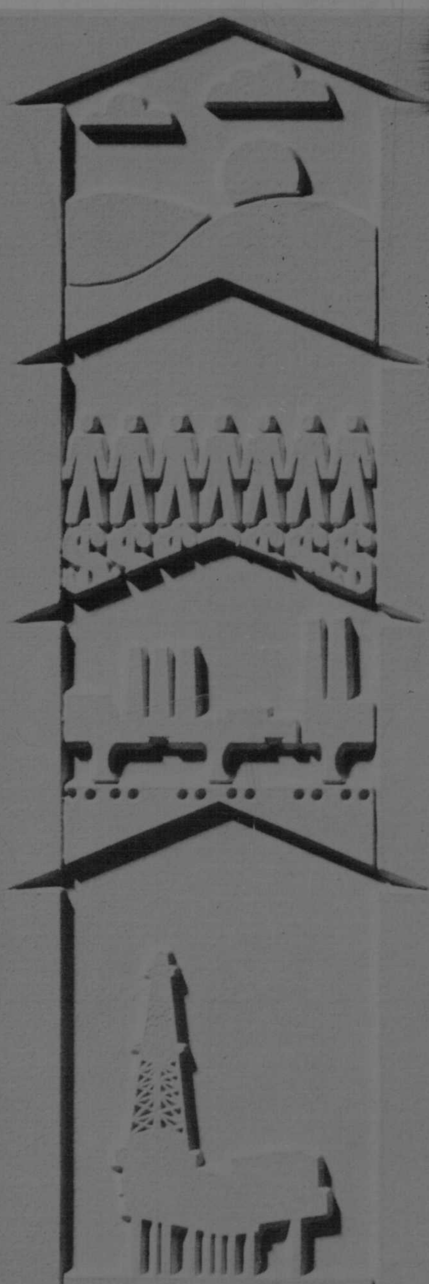
METHODOLOGY FOR ASSESSING ONSHORE IMPACTS FOR OUTER CONTINENTAL SHELF OIL AND GAS DEVELOPMENT

VOLUME III
BALTIMORE CANYON TEST CASE

JULY 1978



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WESTON
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THE NATIONAL SCIENCE FOUNDATION
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Roy F. Weston, Inc. in association with:
Frederic R. Harris, Inc. for Industry Requirements
University of Delaware (Center for Policy Studies)
for Economic/Fiscal Impacts

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TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

WESTON

DESIGNERS CONSULTANTS

TABLE OF CONTENTS
(continued)

WESTON

TABLE OF CONTENTS
(continued)

WESTON

TABLE OF CONTENTS
(continued)

WESTON

TABLE OF CONTENTS
(continued)

CHAPTER 5 - ENVIRONMENTAL IMPACT

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

WESTON
DESIGNERS CONSULTANTS

LIST OF TABLES

WESTON

LIST OF TABLES
(continued)

LIST OF TABLES
(continued)

WESTON

LIST OF TABLES
(continued)

LIST OF TABLES
(continued)

WESTON

LIST OF GRAPHS

Graph No. Page

CHAPTER 1 - INDUSTRY REQUIREMENTS

Section 1 - Base Information

Production Employment Curve

Figure No.

LIST OF FIGURES

CHAPTER 2 - LOCATION ANALYSIS

CHAPTER 3 - ECONOMIC IMPACT

CHAPTER 4 - DEMOGRAPHIC IMPACT

CHAPTER 5 - ENVIRONMENTAL IMPACT

WESTON

LIST OF FIGURES
(continued)

SUMMARY

This volume contains a "test case" of the set of methodologies (contained in Volume II), capable of assessing the onshore implications of Outer Continental Shelf (OCS) oil and gas exploration, development/production, and well workovers.

The test case is structured around a possible Baltimore Canyon resource discovery and recovery scenario. The United States Geological Survey (USGS) probabilistic forecast of recoverable resources for the Baltimore Canyon area is one of the primary inputs. Impacts are related to the geographical area (and its associated qualitative and quantitative descriptors) in proximity to the selected drilling areas.

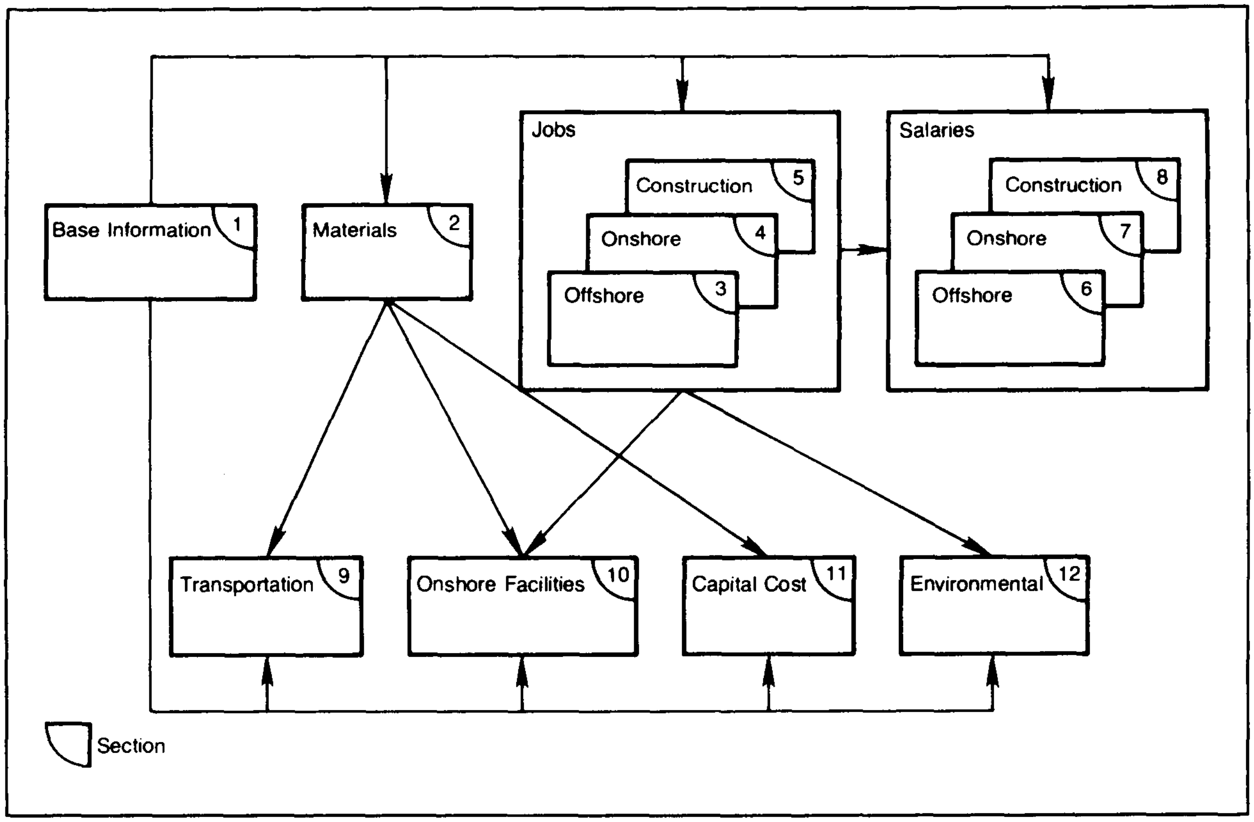
The test case in Volume III is not intended to be a stand-alone exercise. The reader must be thoroughly familiar with the Volume II methodologies. Many insights and labor-saving exercises are generated during the test case development, and are contained in the appropriate sections of Volume III. It is strongly recommended, therefore, that anyone wishing to apply the methodologies be familiar with both volumes.

The results contained in Volume III have been structured primarily to validate the methodology of Volume II, and the reader is cautioned not to assume that they represent "real life" results. The data can be extremely valuable, however, in the sense of understanding relative time/impact considerations.

INDUSTRY REQUIREMENTS

Chapter 1, Industry Requirements, generates an estimate of onshore impacts associated with the offshore development scenario. The physical scenario of offshore activity is generated in Section 1, and all data are summarized on the Base Information Summary Sheet (BISS). The BISS then, is a time-phased description of the offshore activity, ranging from the track leases and associated mobile drilling activity, recoverable resources profiles, development/production scenarios, platform/well workover schedules, to selection of transportation schemes.

In applying the methodology of Volume II to generating the BISS, it was found convenient to establish a number of intermediate steps. Therefore, the BISS is supported by six worksheets. Each worksheet supports specific line items of the summary BISS, which is used as the primary input to Sections 2 through 12, the impact assessment sections. The relationship of the BISS to the impact assessment sections and their own interrelationships, is shown in the Industry Requirements Information Flow Diagram which follows.



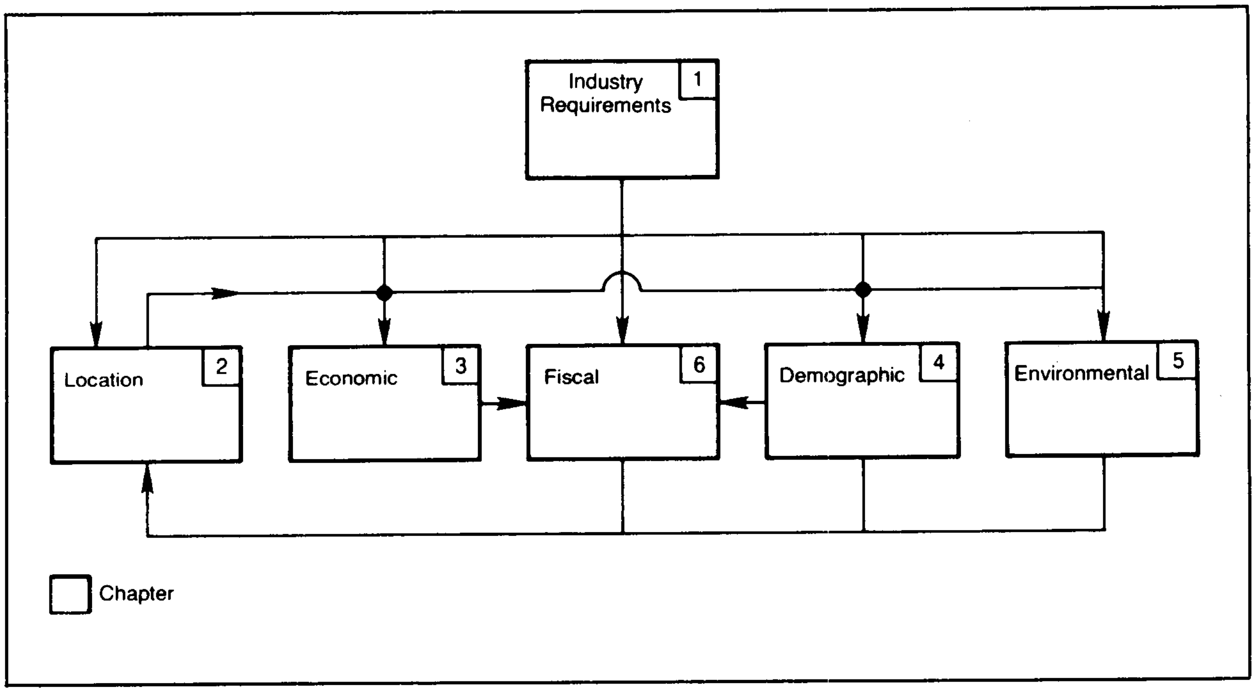
INDUSTRY REQUIREMENTS INFORMATION FLOW

Instructions for completing the Impact Assessment Summary Sheets (IASS) are contained in Volume II, Chapter 1. It is obvious that a large volume of simple calculations are required. In order to significantly reduce the data generation effort required, techniques using a Hewlett Packard (HP-67) hand-held programmable calculator will be described. The generalized programs are included in the text, as well as the formats for data entry. The first example is contained in Section 2 (page 2-2), and relates to the exploratory drilling array. This program is revised and augmented in Section 3, and used to generate operating offshore and transportation jobs. Two types of programs are used: one utilizes variable data (inserted and stored in locations for recall); the second employs variable data which are internally generated.

The conventional data generation approach of Volume II is fully described and can be implemented. As the reader progresses through Section 1, however, it will become increasingly obvious that the small investment in time and money necessary to employ the HP-67 (or equivalent) is extremely cost-effective.

IMPACT ASSESSMENTS

Chapters 2 through 6 use the industry requirements of Chapter 1, and assess their location, economic, fiscal, demographic, and environmental effects. The flow of analysis is described in the Methodology Information Flow Diagram shown below.



METHODOLOGY INFORMATION FLOW

LOCATION ANALYSIS

The location analysis test case is necessarily limited and abbreviated. It is difficult to structure a test case that would be short of a full logic enumeration of all relevant economic, physical, social, and political factors. That level of effort, and the purpose of the test case, make a full enumeration beyond the scope of this study. The logic is sufficiently demonstrated to yield a high degree of assurance that the full enumeration will provide reasonable results.

ECONOMIC IMPACT

Two sets of economic impact analyses are developed in this chapter. In the first set, it is assumed that all primary onshore activities specified by the industry requirements analysis will be located in a single county. These results can be viewed as an outside, or boundary, condition. In the second set, the locations projected for OCS onshore facilities (as identified in the location analysis) are used. These results can be viewed as an initial "most likely" condition.

DEMOGRAPHIC IMPACT

This chapter concentrates on population, growth rate, projected population, and projected impacts on population. Details are shown for Atlantic County (New Jersey), Sussex County (Delaware), and Somerset County (Maryland). These are the three counties covered in the Set 1 Economic Analysis.

For a complete examination of the region of interest, the demographic impact data should be reviewed with other elements of the study (e.g., income distribution, employment categories, etc.), as shown in Chapter 3, Economic Impact.

ENVIRONMENT IMPACT

In addition to exercising the Volume II methodologies, this chapter identifies the portions of the methodologies that appear to be effective, which areas are too cumbersome, and the recommendations that can be made for the future to produce an efficient, workable impact assessment methodology.

The analysis is constrained by the lack of site-specific data needed for a detailed determination of impacts. Like the location analysis, that level of effort, and the purpose for the test case, makes a full enumeration beyond the scope of this study. In any event, it is felt that no impact assessment methodology is capable of dealing accurately with long-term, low-rate impacts, such as the inexorable continued loss of wetlands; i.e., each parcel being relatively insignificant, but the total having a substantial impact.

FISCAL IMPACT

The majority of the inputs to the fiscal analysis are derived from the economic analysis chapter, to such an extent that the fiscal analysis should be assumed an extension of that discussion. Several alternative methods are examined. It is clear that the analysis will require not only informed local judgement, but also experience in state and local fiscal analysis.

The data contained in this volume were prepared by Roy F. Weston, Inc. with the assistance of:

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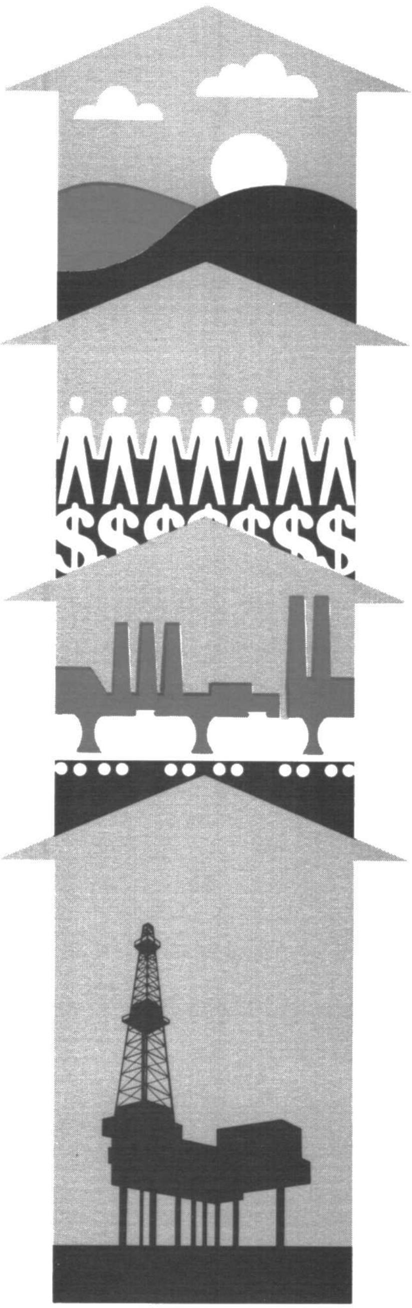


CHAPTER 1

INDUSTRY REQUIREMENTS

SECTION 1

BASE INFORMATION

1.1 INTRODUCTION

The industry requirements methodology generates jobs, salaries, materials, land requirements, facilities, capital investments and environmental factors resulting from offshore exploration and development. The data generated become the major input to the location analysis of Chapter 2, and the various impact analyses discussed in Chapters 3 through 6.

Offshore resource data are developed in Section 1 of this chapter, and are displayed on the Base Information Summary Sheet (BISS). The BISS is then the major source of input data to Sections 2 through 12, each of which results in an Impact Assessment Summary Sheet (IASS).

This industry requirements test case will utilize the detailed methodology of Volume II, Chapter 1, and a set of input data representative of the Baltimore Canyon region, and then, step by step, will develop the full set of data outputs. It must be recognized that it is not possible to incorporate every element of the analysis in a nonquantitative detailed methodology as described in Volume II. Some elements of the approach, which could be referred to as computational "tricks," only appear in this quantitative chapter. The user is therefore cautioned not to attempt to develop his own industry requirements data solely from a reading of Volume II. No doubt a user with sufficient initiative and time could accomplish an exercise solely from Volume II; however, a significant reduction in effort will occur following a detailed review of the Volume III exercises.

The Baltimore Canyon test case starts with acceptance of the United States Geological Survey's (USGS) estimates of resources in the area, including a subarea prediction for the first lease sale, no. 40. The USGS estimates are stated in terms of minimum and maximum quantities of recoverable oil and gas. It is important to understand that these are only estimates; they are subject to change once exploratory drilling starts and reserves become better delineated by actual drilling and potential discovery. As new resource estimates are obtained, the data in the chapter should be updated. The exercise here assumes that it is accomplished at a point in time (prior to exploratory drilling) when little, if any, recoverable resources information outside of the USGS estimates are available.

The USGS estimates for the Baltimore Canyon (high--5 percent probable, and low--95 percent probable) are entered in the box on the BISS. The USGS estimates for lease sale no. 40, which are also available, are entered on the BISS. These initial estimates are shown in Volume II, Chapter 1, Table 1-6, including the number of tracts offered and leased. Other basic input data (available only as averages at this point in time), such as, water depth, distance offshore, well depth, etc. are entered on the BISS.

1.2 GENERATING THE BISS

Based on the USGS data, an assumed midpoint for recoverable resources is calculated by simple averaging, and application of a 20 percent reduction associated with environmental or other prohibitions to drilling that may exist in the area. The timing and size of future tracts offered and leased for the Baltimore Canyon region are then estimated and entered on the BISS. The recoverable resources profiles for the remaining leases are developed using the declining balance technique (described on the reference sheet, Volume II, Chapter 1, page 1-38). This technique is based on the assumption that:

- Oil companies will lease the potentially most productive areas first.

- The potentially most productive areas will be larger fields.

(Note that it is assumed that the discovery of recoverable resources occurs three years after the lease sale is consummated.) In Scenario A, the entire amount is discovered at one point in time, whereas in Scenario B, the amount is distributed over several years. (See Volume II, Chapter 1, page 1-6, procedure f.) A separate BISS worksheet is available for entering the Uniform Distribution Scenario B. Note that the total recoverable resources (entered in the left-hand column) is the same as Scenario A.

The first page of the BISS will be complete after calculation of the exploratory phase rig and drilling activity. This is based on the lease schedule and the tables of Volume II, Chapter 1, Section 1.

The second page of the BISS starts with calculation of the platform installation schedules. This is one of several schedules, and is the arithmetic average of the two scenarios. When an arithmetic average is involved (in later years when more concrete data become available averaging may not be necessary), the calculations are best performed on a worksheet. The platform installation schedule is developed on Worksheet No. 2. The resource availability schedule forms the input for the platform installation data of Tables 1-8 to 1-11 (Volume II, Chapter 1). In the absence of concrete data, the low efficient flow rate tables should be used. Enter the table data on the worksheet for each element of the recoverable resources schedule. (Note that platform installation starts three years after discovery of the recoverable resources.) For Scenario B, use the size of find and schedule from the Uniform Distribution Scenario B Worksheet and perform the same operation as described for Scenario A. (See Worksheet No. 4 for layout.) The average values for the platforms installed are then transferred to the BISS.

The wells drilled are calculated on Worksheet No. 3 and transferred to the BISS. Start with the recoverable resources schedules as input, and use Tables 1-8 to 1-11 (Volume II, Chapter I) to determine wells drilled. (Note that well drilling starts in the year following platform installation.)

Platforms in operation and flow rates follow the pattern of the previous analyses. Establish a calculation worksheet for both scenarios, and then using the recoverable resources schedules and Tables 1-12 to 1-15, as appropriate, sum the variables and obtain the average of the two scenarios, and enter the results on the BISS. Worksheet No. 5 shows the summary results of the detailed activity to obtain platforms in operation and production rates for the two scenarios and the resultant average. The averages are entered on the BISS.

Well workovers are calculated using Tables 1-16 to 1-19 as appropriate; the discovery date and recoverable resources are inputs. The Scenario A calculations are shown on BISS Worksheet No. 6. The average for Scenarios A and B is entered on the BISS. This entry completes the BISS calculations.

The production employment curves (Graphs 1-1 to 1-3, Volume II, Chapter 1) are created from the BISS production data.

Base Information Summary Sheet

1-5/6

Base Information Summary Sheet

1-7/8

Base Information Summary Sheet

1-9/10

Base Information Summary Sheet

1-11/12

B155 Worksheet No. 2

1- 13/14

BISS Worksheet No. 3

1-15/16

BISS Worksheet No. 3

1 - 17/8

Wells Drilled Scenario B
(Example)

1. From BISS Worksheet - Uniform Distribution Scenario B

	1977	1980	1981	1982	1983
Oil	0.9	0.2	0.2	0.2	0.3

2. From Table 1-8 (Volume II, Chapter 1) and input from 1. above.

Wells Drilled

1980	1984	1985	1986	1987	1988	1989	1990	1991	1992
0.2	8	16	16	14	6				
1981									
0.2		8	16	16	14	6			
1982									
0.2			8	16	16	14	6		
1983									
0.3				8	16	16	14	8	5
Total[1]	8	24	40	54	52	36	20	8	5

[1] Transfer to BISS Worksheet No. 3.

Summary Data

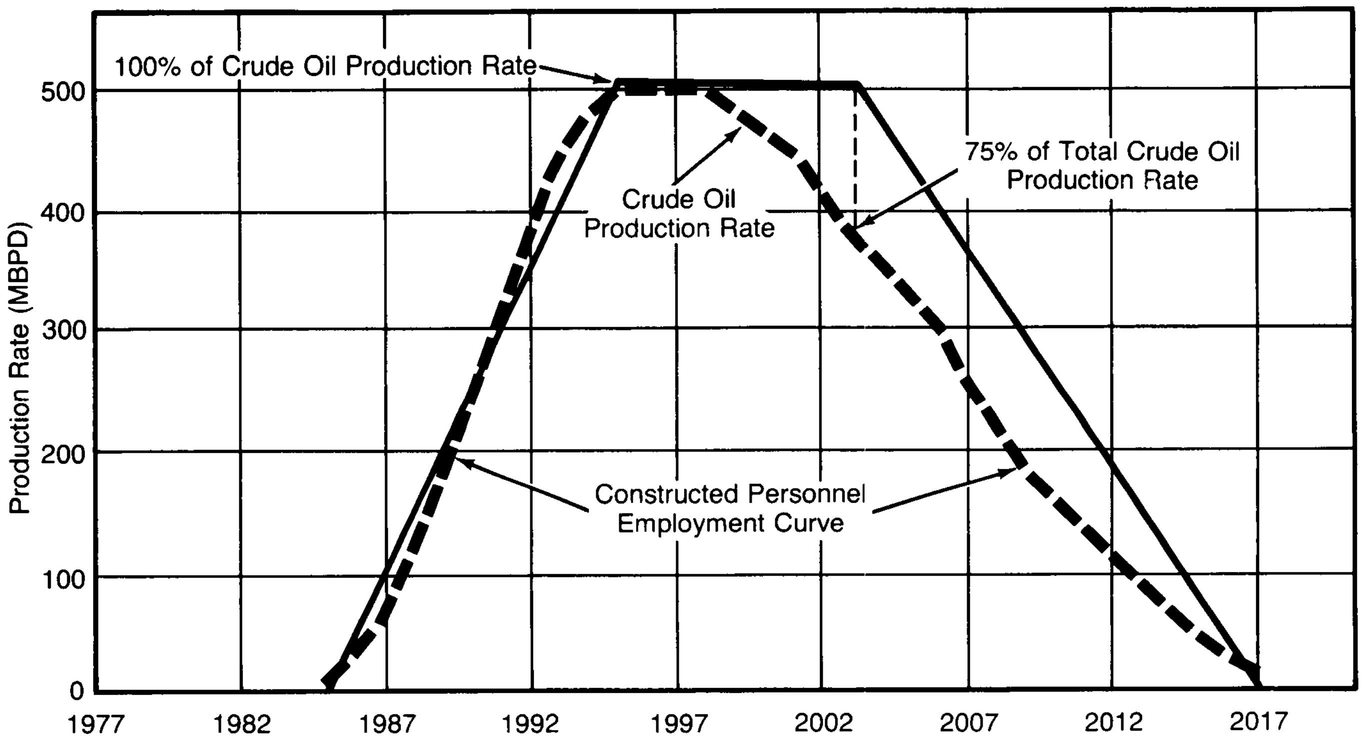
Year	Platforms in Operation: Oil Scenario A	Oil Scenario B	Oil Average	Gas Scenario A	Gas Scenario B	Gas Average	Production Rate: Oil (MBPD) Scenario A	Oil Scenario B	Oil Average	Gas (MMCFD) Scenario A	Gas Scenario B	Gas Average
1984	1	1	1	1	1	1	0	0	0	0	0	0
1985	3	4	4	3	4	4	13	8	11	75	35	55
1986	5	8	7	5	8	7	40	32	36	215	145	180
1987	8	13	11	3	13	11	67	72	70	355	330	343
1988	11	18	15	11	18	15	104	135	120	545	630	588
1989	14	23	19	15	23	19	143	214	179	735	1,050	893
1990	16	26	22	16	27	22	188	306	247	960	1,600	1,280
1991	17	30	24	17	28	23	233	395	314	1,185	1,860	1,523
1992	17	30	24	17	30	24	283	478	381	1,435	2,250	1,843
1993	17	30	24	17	30	24	331	548	440	1,685	2,540	2,113
1994	18	31	25	18	31	25	365	587	476	1,950	2,700	2,335
1995				18	31	25	385	610	498	2,050	2,800	2,425
1996				18	31	25	390	607	499	2,075	2,800	2,438
1997				19	32	26	395	600	498	2,100	2,800	2,450
1998							400	595	493	2,150	2,800	2,475
1999								557	479	2,175	2,780	2,478
2000								521	461	2,200	2,780	2,490
2001								477	439	2,225	2,680	2,453
2002	↓	↓	↓		↓	↓	↓	427	414	2,225	2,430	2,328
2003	18	31	25	↓	32	26	400	374	387	2,225	2,220	2,223
2004	17	29	23	19	31	25	398	316	357	2,213	1,970	2,092
2005	16	26	21	18	29	24	390	259	325	2,150	1,690	1,920
2006		22	19	13	26	22	378	199	289	2,063	1,350	1,707
2007	↓	16	16	17	21	19	363	145	254	1,975	1,020	1,498
2008	16	13	15	17	18	18	339	98	219	1,815	750	1,283
2009	15	10	13	16	12	14	315	60	188	1,590	450	1,020
2010	15	7	11	16	8	12	285	32	159	1,368	250	809
2011	13	4	9	15	5	10	255	14	135	1,145	143	644
2012	12	2	7	13	2	3	228	5	117	935	88	612
2013	11	1	6	13	2	8	179	3	91	725	63	394
2014	7	0	4	9	2	6	133	0	67	515	38	277
2015	5	0	3	7	1	4	93	0	47	347	25	186
2016	2	0	1	3	1	2	53	0	27	180	13	97
2017	0	0	0	0	0	0	23	0	12	0	0	0

BISS Worksheet No. 6

1-21/22

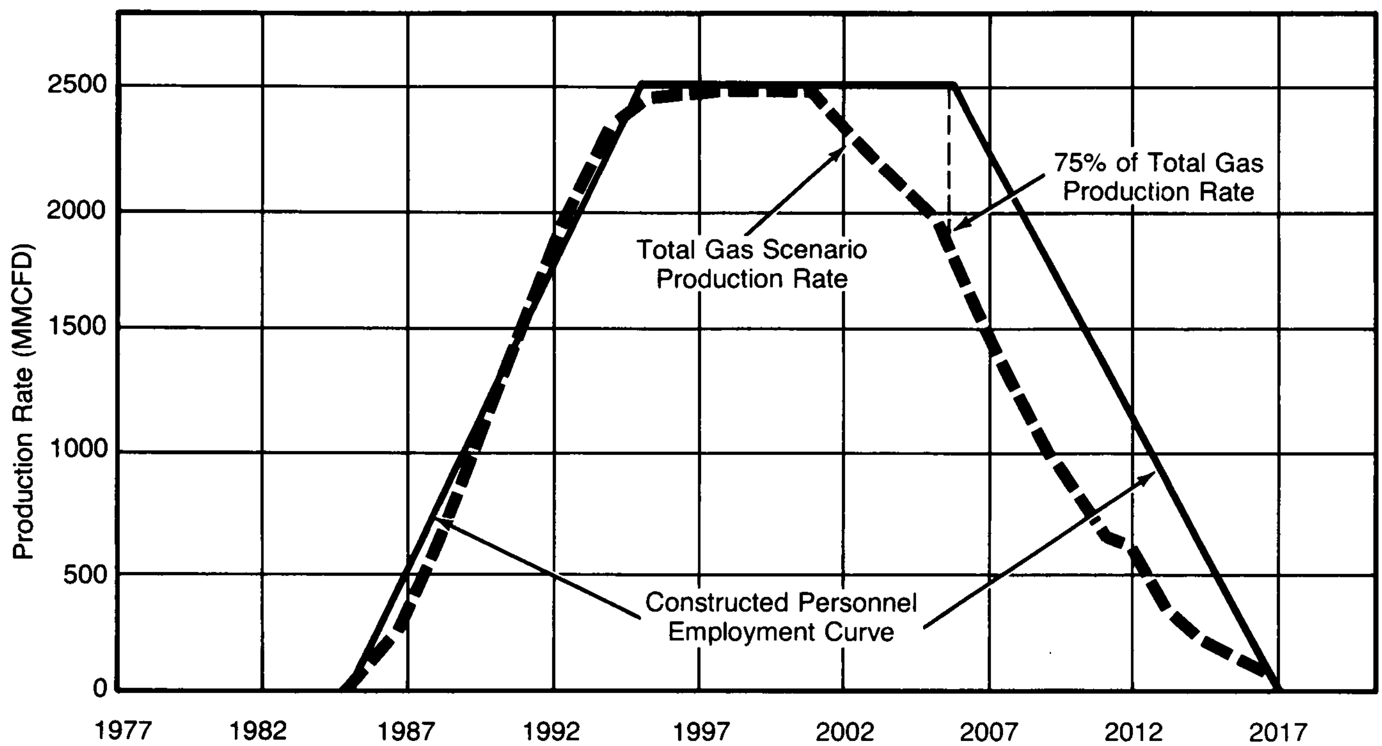
GRAPH 1-1
PRODUCTION EMPLOYMENT CURVE

• CRUDE OIL



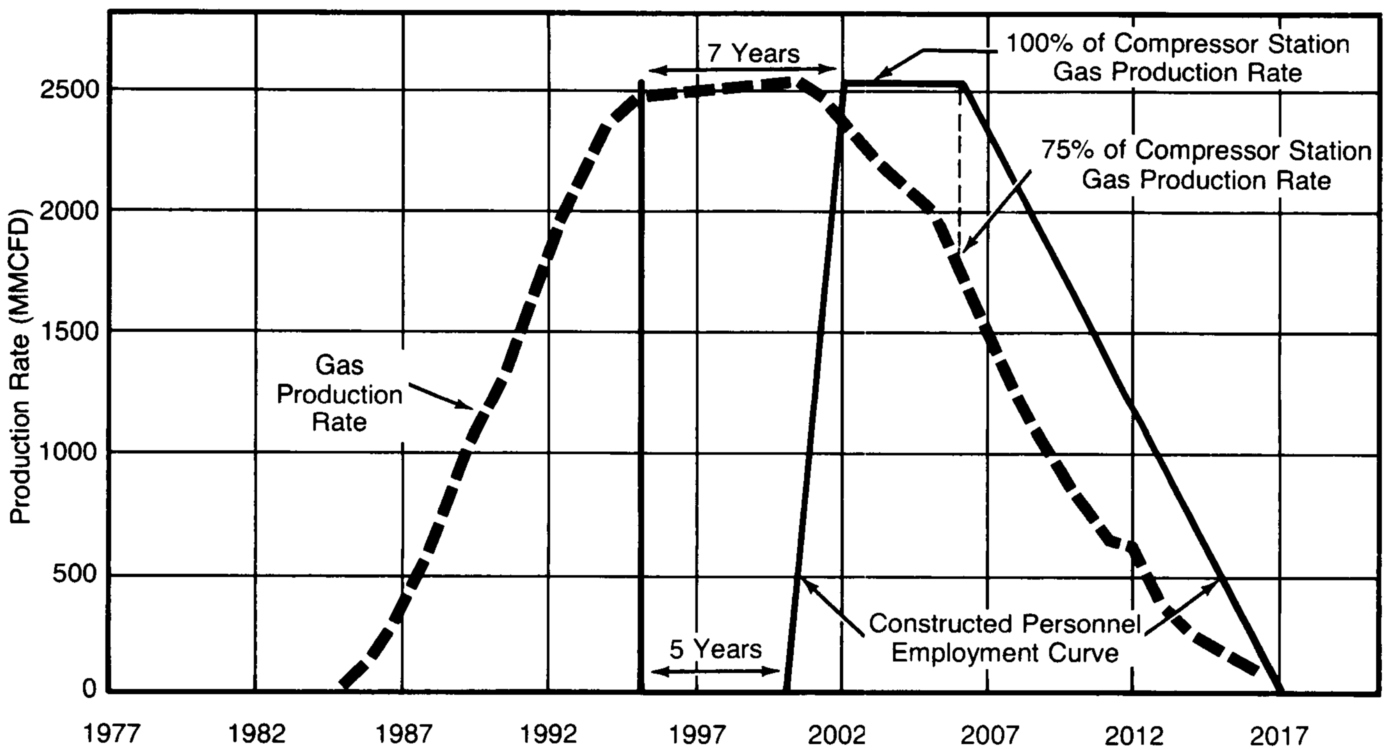
GRAPH 1-2
PRODUCTION EMPLOYMENT CURVE

• GAS



GRAPH 1-3
PRODUCTION EMPLOYMENT CURVE

- **GAS (COMPRESSOR STATION ONLY)**



SECTION 2

MATERIAL CONSUMPTION

Instructions for completion of IASS No. 2 are contained in Volume II, Chapter 1, Section 2. Techniques will be described in this section which will significantly reduce the data generation effort required.

EXPLORATORY DRILLING

From the graphs in Volume II, Chapter 1 obtain the necessary factors for exploratory drilling.

Activity	From Graph 2-1[1,2]
Exploratory Drilling	
Alloy steel	167.00 tons/well
Carbon steel	134.00 tons/well
Drilling mud	750.00 tons/well
Cement	242.00 tons/well
Fuel	580.00 tons/well
Fresh water	4,625.00 tons/well
Food	17.12 tons/well[3]
Total	6,515.12 tons/well

Once the factors have been derived, the necessary data for entry on IASS No. 2 are obtained by multiplying each factor by the number of wells drilled (as obtained from the BISS).

Since well drilling occurs over a 20-year period, and eight entries (including total) per year are required, there are 160 separate entries for a full array. In some analyses, only two totals may be necessary; therefore, given the factor total just determined, only 20 separate entries would be required.

---

[1] At the assumed well depth of 16,000 feet.

[2] Graphs referenced in this section are found in Volume II, Chapter 1.

[3] Food consumption is based on number of employees, calculated on Graph 3-1 in Section 3. From that graph it can be derived that, in total, there are 91.3 employees/rig (year). From Graph 2-1 (Food) it can be determined that there are 0.75 tons/employee of food. Therefore, food in exploratory development can be put on the same basis as the other activities by the following relationship:

$$91.3 \frac{\text{employees}}{\text{rig (yr)}} \times \frac{\text{rig (yr)}}{4 \text{ wells}} \times \frac{0.75 \text{ tons}}{\text{employee}} = 17.12 \text{ tons/well}$$

In any event, the total number of calculations on all the IASS's represents a significant manual effort. The use of a programmable calculator, similar to the Hewlett-Packard HP-67, will dramatically reduce the effort involved. For example, the exploratory drilling array could be programmed as follows:

No.	Instruction	Location	Data Input
001	fLBLA	0	No. of years (20)
002	RCL0	1	12.78
003	hSTI	2	28.79
004	fLBLB	3	36.80
005	RCL(i)	4	54.81
006	fINT	5	62.82
007	RCLE	6	72.83
008	X	7	72.84
009	I	8	64.85
010	0	9	56.86
011	0	fP≶S	
012		0	46.87
013	DSP0	1	40.88
014	fRND	2	34.89
015	DSP2	3	22.90
016	RCL(i)	4	28.91
017	gFRAC	5	28.92
018	+	6	20.93
019	hPAUSE	7	20.94
020	fDSZ	8	16.95
021	GTOB	9	8.96
022	hRTN	A	4.97
		E	THE FACTOR
		fP≶S	

The program takes 5 minutes to construct, and can be entered along with the data input in several minutes. The tabular results then become available at several second intervals. The data result is the positive number (to the left of the decimal, in hundreds of tons), and the decimal display shows the year for entry on the IASS.

DEVELOPMENTAL DRILLING

From the graphs in Volume II, Chapter 1, obtain the necessary factors for developmental drilling.

Activity	From Graph 2-2[1]
Developmental Drilling	
Alloy steel	433.00 tons/well
Carbon steel	125.00 tons/well
Drilling mud	625.00 tons/well
Cement	217.00 tons/well
Fuel	975.00 tons/well
Fresh water	4,000.00 tons/well
Subtotal	6,375.00 tons/well
Food	54.90 tons/platform[2]

Using the same HP-67 program, and adjusting data inputs accordingly, the IASS entries can be rapidly produced. (The data changes for the program would be 18 ST00 and 16.84, 56.85,. . .in locations 1 and on.)

PRODUCTION

The structural weight for platforms is obtained from Graph 2-3 in Section 2 at an assumed water depth of 220 feet (3,640 tons/platform for moderate sea states). Assume that construction occurs over a 3-year period with one third of the activity in each year.

The food calculation is similar to the examples given previously. Multiply the derived factor by the platforms in operation as obtained from the BISS.

WELL WORKOVERS

From the graphs in Volume II, Chapter 1 obtain the necessary factors for well workovers.

Activity	Graph 2-4[1]
Tubular steel	50.00 tons/platform
Drilling mud	1,250.00 tons/platform
Cement	417.00 tons/platform
Fuel	6,200.00 tons/platform
Fresh water	40,000.00 tons/platform
Total	47,917.00 tons/platform

Multiply the derived factors by the Well Workover Phase (Platforms) from the BISS, and enter the results on IASS No. 3.

[1] At the assumed well depth of 16,000 feet.

[2] Food consumption is based on number of employees, calculated on Graph 3-2 in Section 3. In total there are 73.2 employees/developmental platform. Again, from Graph 2-1 (Food), there are 0.75 tons/employee. Therefore:

$$73.2 \frac{\text{employees}}{\text{platform}} \times 0.75 \frac{\text{tons}}{\text{employee}} = 54.9 \frac{\text{tons}}{\text{platform}}$$

PIPELINE CONSTRUCTION

There are a number of alternative ways to approach the problem of pipeline quantity. The user will make estimates incorporating platform layout, platform spacing, sizing strategy, etc. The user cannot expect to optimize material quantities. Instead, he should plan on conveying the resources to shore recognizing certain factors; for example, the largest single pipeline for carrying a volume of material is the cheapest pipeline alternative, up to the maximum standard size. Also, small pipes should be manifolded into larger pipes rather than make long parallel runs of the smaller size.

Oil

Assume that one main line is used to bring the oil ashore. The maximum production flow rate on the BISS is ~ 500 MBPD. The distance to shore is shown on the BISS as 75 miles. Using Table 2-1 (Volume II, Chapter 1), a 30-inch pipeline would be needed.

Referring to Graph 2-5, the material weights in tons per mile are: steel 370, concrete 910. For a 75-mile run, the total requirement would be:

$$75 \text{ miles} \times 370 \frac{\text{tons}}{\text{mile}} = 27{,}750 \text{ tons-steel}$$

$$75 \text{ miles} \times 910 \frac{\text{tons}}{\text{mile}} = 68{,}250 \text{ tons-concrete}$$

This represents the main line to shore. As additional platforms are installed, assume that they will be 2 miles apart, and each platform will be equipped with a 12-inch gathering pipeline. From Graph 2-5, it is determined that material weights would be approximately 75 tons/mile for both concrete and steel.

The following table can then be constructed:

Oil

Year	Platforms Installed[1]	Pipeline Information Size (inches)	Pipeline Information Distance (miles)	Material Concrete (tons)	Material Steel (tons)
1983	1	30	75	68,250	27,750
1984	3	12	3 x 4 = 12	900	900
1985	3	12	3 x 6 = 18	1,350	1,350
1986	4	12	4 x 8 = 32	2,400	2,400
1987	4	12	4 x 10 = 40	3,000	3,000
1988	4	12	4 x 12 = 48	3,600	3,600
1989	3	12	3 x 14 = 42	3,150	3,150
1990	2	12	2 x 16 = 32	2,400	2,400
1993	1	12	1 x 18 = 18	1,350	1,350

Gas

A similar methodology is used to determine gas pipeline quantity. The maximum gas flow from the BISS is approximately 2,500 MMCFD. In the case of gas, it should be assumed that size will be limited by flow capacity, and that two main lines to shore will be used. Each pipeline (at 1,250 MMCFD) would be approximately 40 inches in diameter. The following table can be constructed:

Gas

Year	Platforms Installed[1]	Pipeline Information Size (inches)	Pipeline Information Distance (miles)	Material Concrete (tons)	Material Steel (tons)
1983	1	40 x 2	75	255,000	99,000
1984	2	12	2 x 4 = 8	600	600
1985	3	12	3 x 6 = 18	1,350	1,350
1986	4	12	4 x 8 = 32	2,400	2,400
1987	4	12	4 x 10 = 40	3,000	3,000
1988	5	12	5 x 12 = 60	4,500	4,500
1989	3	12	3 x 14 = 42	3,150	3,150
1990	2	12	2 x 16 = 32	2,400	2,400
1993	1	12	1 x 18 = 18	1,350	1,350
1996	1	12	2 x 20 = 40	3,000	3,000

[1] From BISS.

Assume that pipe-coating yard activity will begin in 1979 for the initial 1983 requirement, and distribute the total of 255,000 + 68,250 = 323,250 tons of concrete over the 5-year period. For follow-on platforms, assume activity is in the year the platform is to be installed. Enter the summary results on IASS No. 2.

Impact Assessment Summary
Sheet No. 2

SECTION 3

OPERATING OFFSHORE AND TRANSPORTATION JOBS

From the graphs in Volume II, Chapter 1 obtain the necessary factors for each of the activities to be accomplished in this section and the key variable. Reference data which will be helpful in performing these calculations are located at the end of the section.

Activity	From Graph 3-1
Mobile Drilling	91.3 employees
Professional	14.0 employees
Administrative	6.3 employees
Skilled	30.0 employees
Unskilled	41.0 employees
Variable - Rig years	

Given these factors and the key variable, the necessary data for entry on IASS No. 3 are obtained by multiplying each factor by the number of rig years (as obtained from the BISS). If a programmable calculator similar to the Hewlett-Packard HP-67 is used, follow the procedures outlined in the following paragraphs.

Take the program as described in Section 2, page 2-2, and:

1. Remove steps 9 to 12 (which simply illustrate a scaling factor).
2. Revise the data input to correspond to the rig year schedule from the BISS (20, 3.78, 7.79, 9.80...).
3. Proceed with each of the remaining activities in a similar fashion.

Activity	From Graphs 3-
Developmental Drilling	80.65
Professional	5.75
Administrative	7.40
Skilled	37.50
Unskilled	30.00
Variable - Platforms installed (developmental/ production phase)	
Production Platforms	16.20
Administrative	1.20
Skilled	10.00
Unskilled	5.00
Variable - Production platforms	

Activity	From Graphs 3-
Well Workovers	30.00
Administrative	3.00
Skilled	15.00
Unskilled	12.00
Variable - Well workovers	

The Reference Data section shows a new HP-67 program for use when the production rate is a variable, and where intercepts other than zero exist. This type of program will be of significant use in later sections. The necessary input for this activity is shown as an example.

	Intercept	Slope
Tanker Mooring	7	0.0333
Professional	1	0.0050
Administrative	1	0.0025
Skilled	2	0.0083
Unskilled	3	0.0175
Variable - Production rate (MBPD)		

	Intercept	Slope
Pump Station	4	0.006
Administrative	1	0
Skilled	2	0.004
Unskilled	1	0.002
Variable - Production rate (MBPD)		

	Intercept	Slope	Break Point
Compressor Station	8	0.025	1000
Professional	4	0.012	1000
Administrative	1	0.002	1000
Skilled	1	0.005	1000
Unskilled	2	0.006	1000
Variable - Production rate (MMCFD)			

Service boat information is best taken from Graph 3-8 (Volume II, Chapter 1), multiplied by the platform installations, and recorded on IASS No. 3.

REFERENCE DATA

In Graphs 1-1 and 1-2 (Volume III, Chapter 1) the employment smoothing function (referred to as the constructed Personnel Employment Curve) is derived from the detailed production data of the BISS.

The program described below will internally generate the curves from a set of inputs, which for this test case are:

Location	Element	Data[1] Oil	Data[1] Gas
1	First year of activity	1985	1985
2	Last year of activity	2017	2017
3	First year of level off	1995	1995
4	Last year of level off	2003	2006
5	Level off output	500	2500

The result then, is a machine-available approximation of the variable of interest--production rates.

The factors are then inputed. For the tanker mooring data, it is apparent that more than just the slope input is necessary, since the y axis intercept is not zero. In many cases in later sections, the factor is a two-segment curve (the line breaks at some point and takes on a different slope). The program is therefore written to accept two sets of values and the point at which the break occurs. Since this is not the case in the tanker mooring data, zeros are inserted in the appropriate locations.

Location	Element	Data[2]
6	Slope - first leg	0.0175
7	Intercept - first leg	3
8	Slope - second leg	0
9	Intercept - second leg	0
0	Break point	0

[1] See Graphs 1-1 and 1-2 from which these data are taken.

[2] For unskilled manpower.

The instructional program of 108 steps is as follows:

No.	Instruction
001	fLBLA
002	RCL2
003	RCL1
004	-
005	1
006	+
007	STOA
008	RCL3
009	RCL1
010	-
011	1
012	+
013	STOB
014	RCL4
015	RCL1
016	-
017	1
018	+
019	STOC
020	RCL5
021	RCLB
022	÷
023	STOD
024	RCL5
025	RCLA
026	RCLC
027	-
028	1
029	+
030	÷
031	CHS
032	STOE
033	1
034	hSTI
035	fLBLB
036	RCLB
037	hRCI
038	gx >y
039	GTO1
040	RCLD
041	X
042	GTO3
043	fLBL1
044	hRCI
045	RCLC
046	gx ≤y
047	GTO2
048	hSTI
049	RCL5
050	GTO3
051	fLBL2
052	RCLA
053	hRCI
054	gx >y
055	GTO4
056	hRCI
057	RCLC
058	-
059	RCLE
060	X
061	RCL5
062	+
063	fLBL3
064	RCLO
065	fx=0
066	GTO4
067	gx >y
068	GTO4
069	GTO5
070	FLBL4
071	fx ≷y
072	RCL6
073	X
074	RCL7
075	+
076	GTO6
077	fLBL5
078	hx ≷y
079	RCL8
080	X
081	RCL9
082	+
083	fLBL6
084	DSP0
085	fRND
086	DSP2
087	RCLI
088	hRCI
089	+
090	1
091	-
092	1
093	0
094	0
095	÷
096	gFRAC
097	+
098	R/S

No.	Instruction	No.	Instruction
099	fISZ	104	GTOB
100	RCLA	105	fLBL7
101	hRCI	106	0
102	gx>y	107	0
103	GT07	108	hRTN

Impact Assessment Summary
Sheet No. 3

Impact Assessment Summary
Sheet No. 3

SECTION 4

OPERATING ONSHORE JOBS

The activities and factors shown in Table 4-1 are obtained from the graphs in Volume II, Section 4.[1] The nonmachine approach uses the graph relationships, and introduces the key variable values. The results are then recorded on IASS No. 4.

The machine solution requires an adaptation of several of the programs previously developed. Up to this point, two types of programs have been developed. One utilizes variable data stored in locations for recall (see Section 2, page 2-2); the second employs variable data which are internally generated (see Section 3, page 3-3).

For service and helicopter base calculations, a combination of the two previous programs is required:

No.	Instruction
001 - 006	From Section 2, page 2-2 (001-006)
007	Insert RCLA
008 - 029	From Section 3, page 3-4 (065-086)[2]
030 - 046	From Section 2, page 2-2 (016-032)

The input data for the activities in this section are displayed in Table 4-1.

For all key variables associated with production rates, use the program described in the reference data portion of Section 3. Follow that input format, and distinguish between oil (MBPD) and gas (MMCFD) as appropriate. Record the results on IASS No. 4

[1] In the case of curvilinear forms, kinked linear approximations were used for ease of calculation. Accuracy was not reduced significantly.
[2] Change RCL statements 0 to A, 6 to B, 7 to C, 8 to D, 9 to E.

WESTON DESIGNERS CONSULTANTS

Table 4-1

Input Data -- Operating Onshore Jobs*

Activity	Break Point	Operating Personnel First Leg Intercept	Operating Personnel First Leg Slope	Operating Personnel Second Leg Intercept	Operating Personnel Second Leg Slope
Service Base[1]	4	0	94.5	235	36.0
Exploration[2]	4	0	30.0	65	14.0
Development[3]	4	0	42.0	120	12.0
Production[4]	4	0	22.5	50	10.0
Helicopter Base[5,6]	0	0	5.0	0	0
Onshore Pump Station[7]	1,000	4	0.006	10	0
Administrative	0	1	0	0	0
Skilled	1,000	2	0.004	6	0
Unskilled	1,000	1	0.002	3	0
Onshore Compressor Station[7]	2,000	4	0.006	16	0
Administrative	2,000	1	0.0005	2	0
Skilled	2,000	2	0.0030	8	0
Unskilled	2,000	1	0.0025	6	0
Tank Farm[7]	0	14	0.020		
Administrative	0	2	0.001		
Skilled	0	3	0.008		
Unskilled	0	9	0.011		
Onshore Tanker Terminal[7]	0	30	0.048		
Professional	0	4	0.012		
Administrative	0	2	0.008		
Skilled	0	6	0.010		
Unskilled	0	18	0.018		
Onshore Gas Processing Plant[7]	0	9	0.046		
Administrative	0	2	0		
Skilled	0	5	0.023		
Unskilled	0	2	0.023		
Crude Oil Stabilization Plant[7]	0	8	0.080		
Administrative	0	2	0.002		
Skilled	0	3	0.036		
Unskilled	0	3	0.044		

*See footnotes on following page.

WESTON DESIGNERS CONSULTANTS

Table 4-1
(continued)

Activity	Break Point	Operating Personnel First Leg Intercept	First Leg Slope	Second Leg Intercept	Second Leg Slope
Fixed Platform Fabrication Yard[8,9]	10,000	0	0.06	350	0.025
Pipe-Coating Yard[10,11]	10	0	6	25	3.5

[1]Breakout of personnel (per Graph 4-1):

Professional	2%
Administrative	5%
Skilled	30%
Unskilled	63%
Total	100%

[2]Rig-years from the BISS.
[3]Platform installation from the BISS.
[4]Platforms in operation from the BISS.
[5]Breakout of personnel (per Volume II, Chapter 1, Graph 4-1):

Professional	20%
Administrative	5%
Skilled	60%
Unskilled	15%
Total	100%

[6]Volume II, Chapter 1, page 9-2.
[7]Smoothed labor/production rate.
[8]Tons/year from IASS No. 2.
[9]Distribution:

Professional	10%
Administrative	7%
Skilled	78%
Unskilled	5%
Total	100%

[10]Pipe/month (miles).
[11]Distribution:

Professional	3%
Administrative	7%
Skilled	40%
Unskilled	50%
Total	100%

Impact Assessment Summary
Sheet No. 4

Impact Assessment Summary
Sheet No. 4

4/7-8

SECTION 5

CONSTRUCTION JOBS (ONSHORE AND OFFSHORE)

The information concerning onshore and offshore construction jobs given in this section was provided by Frederic R. Harris, Inc., from an interpolation of graph data.

Impact Assessment Summary
Sheet No. 5

Impact Assessment Summary

Sheet No. 5

5 - 5/6

Impact Assessment Summary

Sheet No. 5

5/7-8

SECTION 6

OPERATING OFFSHORE AND TRANSPORTATION SALARIES

The activities and factors shown in Table 6-1 are obtained from the graphs in Volume II, Section 6. Use the appropriate models generated in previous sections.

Table 6-1

Input Data -- Operating Offshore and Transportation Salaries

Activity	Total Salaries ($ million/year)
Mobile Drilling Rigs	
Professional	0.195 x Rig years[1]
Skilled	0.240 x Rig years
Unskilled	0.215 x Rig years
Developmental Drilling	
Professional	0.080 x Platform installations[1]
Skilled	0.303 x Platform installations
Unskilled	0.159 x Platform installations
Production Platforms	
Administrative	0.014 x Platform installations (cumulative)[1]
Skilled	0.074 x Platform installations (cumulative)
Unskilled	0.032 x Platform installations (cumulative)
Well Workovers	
Administrative	0.038 Well workovers[1]
Skilled	0.120 Well workovers
Unskilled	0.065 Well workovers

[1] Obtain variable data from the BISS.

Table 6-1
(continued)

Activity	Total Salaries ($ million/year)
Tanker Mooring, Pump Station, Compressor Station	
Professional	0.029 x Employees[1]
Administrative	0.023 x Employees
Skilled	0.023 x Employees
Unskilled	0.016 x Employees
Service Boats	
Professional	0.035 x Employees
Skilled	0.017 x Employees
Unskilled	0.013 x Employees
Supply Boats	Per Volume II, Chapter 1, Graph 6-7.

Record the results on IASS No. 6.

[1]Obtain employment data from IASS No. 3.

Impact Assessment Summary

Sheet No. 6

6 - 3/4

Impact Assessment Summary

Sheet No. 6

SECTION 7

OPERATING ONSHORE SALARIES

Operating onshore jobs for each of the related OCS activities are shown in Section 4. The annual salaries for each of the activities are presented in Volume II, Section 7, and summarized here in Table 7-1. Enter the product of employees and salaries on IASS No. 7.

Table 7-1

Input Data -- Operating Onshore Salaries

Activity	Total Salaries ($ million/year)
Service Base	
Professional	0.028 x Employees
Administrative	0.024 x Employees
Skilled	0.016 x Employees
Unskilled	0.012 x Employees
Helicopter Base	
Professional	0.030 x Employees
Administrative	0.025 x Employees
Skilled	0.018 x Employees
Unskilled	0.013 x Employees
Pump Station, Compressor Station, Tank Farm	
Professional	0.021 x Employees
Administrative	0.020 x Employees
Skilled	0.017 x Employees
Unskilled	0.012 x Employees
Tanker Terminal	
Professional	0.023 x Employees
Administrative	0.021 x Employees
Skilled	0.017 x Employees
Unskilled	0.012 x Employees

Table 7-1
(continued)

Activity	Total Salaries ($ million/year)
Gas Processing Plant, Crude Oil Stabilization Plant	
Professional	0.025 x Employees
Administrative	0.022 x Employees
Skilled	0.019 x Employees
Unskilled	0.012 x Employees
Fabrication Yard	
Professional	0.025 x Employees
Administrative	0.021 x Employees
Skilled	0.019 x Employees
Unskilled	0.013 x Employees

1 ASS No. 7

7 | 3-4

IASS No. 7

7/5-6

WESTON

SECTION 8

CONSTRUCTION SALARIES (ONSHORE AND OFFSHORE)

Construction jobs for each of the related OCS activities are shown in Section 5. The annual salaries for each of the activities are presented in Volume II, Section 8, and summarized here in Table 8-1. Enter the product of employees and salaries on IASS No. 8.

Table 8-1

Input Data -- Construction Salaries (Onshore and Offshore)

Activity	Total Salaries ($ million/year)
Onshore Pump and Compressor Stations, Tank Farms, Service Bases	
Professional	0.0260 x Employees[1]
Administrative	0.0220 x Employees
Skilled	0.0180 x Employees
Unskilled	0.0120 x Employees
Offshore Pipeline Laying, Offshore Pump and Compressor Stations, Tanker Mooring, Tanker Terminal	
Professional	0.0285 x Employees[1]
Administrative	0.0220 x Employees
Skilled	0.0220 x Employees
Unskilled	0.0170 x Employees
Crude Oil Stabilization and Gas Processing Plants, LNG Plant (Omit)	
Professional	0.0303 x Employees[1]
Administrative	0.0230 x Employees
Skilled	0.0190 x Employees
Unskilled	0.0140 x Employees

[1] From IASS No. 5.

Table 8-1
(continued)

Activity	Total Salaries ($ million/year)
Fabrication and Pipe-Coating Yards	
Professional	0.0313 X Employees[1]
Administrative	0.0263 x Employees
Skilled	0.0213 x Employees
Unskilled	0.0163 x Employees
Platform Construction	
Professional	0.18 million x Platform installation[1]
Administrative	0.18 million x Platform installation
Skilled	0.50 million x Platform installation
Unskilled	0.24 million x Platform installation

Enter results on IASS No. 8.

[1] From IASS No. 5.

I ASS No. 8

8-3/4

1 ASS No. 8

8/5-6

IASS No.8

8-7/8

SECTION 9

TRANSPORTATION REQUIREMENTS

The instructions for determining transportation requirements are contained in Volume II, Chapter 1, Section 9. Enter the results on IASS No. 9.

IASS No.9

9-3/4

SECTION 10

ONSHORE FACILITIES REQUIREMENTS

The instructions for determining the onshore facilities requirements are contained in Volume II, Chapter 1, Section 10. Use of the HP-67 programs described in Chapters 2 and 3 of this volume will greatly simplify the effort required. Enter the results on IASS No. 10.

IASS No 10

10-3/4

1 ASS No 10

10/5-6

SECTION 11

CAPITAL COSTS

Capital costs can be determined by applying the graphs contained in Volume II, Chapter 1, Section II, and the timing information available in Section 10 (Onshore Facilities Requirements). Where activities occur over time, use incremental additions after the first year. Enter the results obtained on IASS No. 11.

IASS No. 11

11 | 3-4

SECTION 12

ENVIRONMENTAL FACTORS

The environmental relationships and factors are shown in Table 12-1, and are derived from the graphs in Volume II, Section 12. Enter the results on IASS No. 12.

Table 12-1

Input Data -- Environmental Factors

Activity	MGAL/Year
Liquid Wastes	
Gas Processing Plant	0.009 x MMCFD
Crude Oil Stabilization Plant	0.045 x MBPD
Pump Station	0.002 x MBPD
Compressor Station	0.002 x MMCFD
Tank Farm	0.009 x MBPD
Tanker Terminal	0.068 x MBPD
LNG Plant (Omit)	
	Tons/Year
Solid Wastes	
Service Base	210 x Employees[1]
Fabrication Yard	210 x Employees
Pipe-Coating Yard	210 x Employees
Helicopter Base	210 x Employees
Exploratory Drilling	700 x Wells drilled[2]
Developmental Drilling	350 x Wells drilled[3]
Gas Processing Plant	0.175 x Employees[1]
Crude Oil Stabilization Plant	0.175 x Employees
Pump Station	0.175 x Employees
Compressor Station	0.175 x Employees

[1] From IASS No. 4.
[2] From the BISS -- exploratory wells.
[3] From the BISS -- developmental/production wells.

Table 12-1
(continued)

Activity	Tons/Year
Solid Wastes (continued)	
Tank Farm	0.175 x Employees
Tanker Terminal	0.175 x Employees
Well Workovers	11,000 x Well workovers[3]
	MGAL/Year
Sanitary Wastes	
Service Base	3.3 x Employees[1]
Fabrication Yard	3.3 x Employees
Pipe-Coating Yard	3.3 x Employees
Helicopter Base	3.3 x Employees
Exploratory Drilling	155 x Wells drilled[2]
Developmental Drilling	69 x Wells drilled[3]
Gas Processing Plant	10.8 x Employees[1]
Crude Oil Stabilization Plant	10.8 x Employees
Pump Station	10.8 x Employees
Compressor Station	10.8 x Employees
Tank Farm	10.8 x Employees
Tanker Terminal	10.8 x Employees
Well Workovers	160 x Well workovers[3]
Production Platforms	0.179 x Platforms in operation[3]

Enter the results on IASS No. 12.

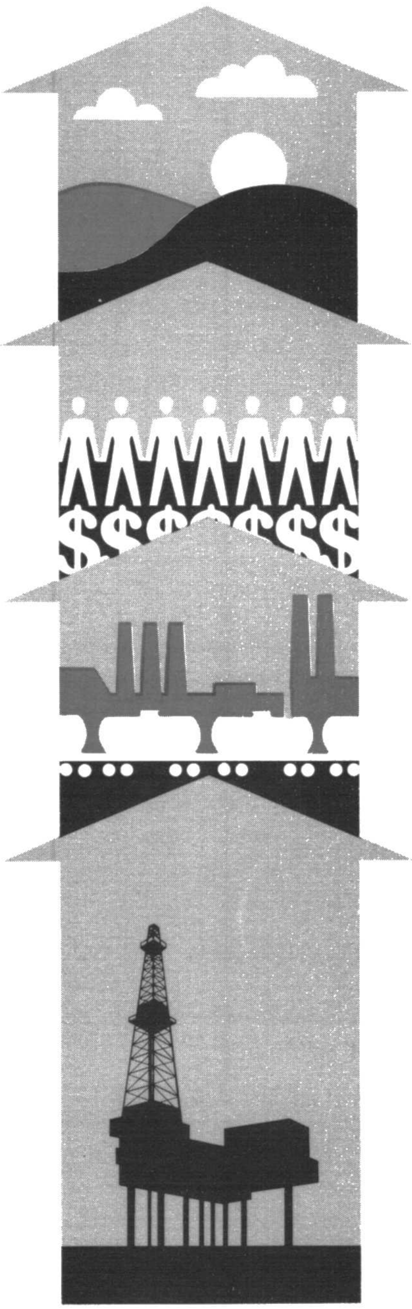
[1] From IASS No. 4.
[2] From the BISS -- exploratory wells.
[3] From the BISS -- developmental/production wells.

IASS No. 12

12 | 3-4

IASS No. 12

12-5/6



CHAPTER 2

LOCATION ANALYSIS

INTRODUCTION

The location analysis methodology provides a framework for identifying the probable spatial distribution of onshore support activities. It guides the user in selecting the level of detail and sophistication of the analytical techniques. The user also determines the number of alternatives to be considered in the location analysis. If the user's perspective is a single county, then only those alternatives within the county need to be considered in detail. If it is determined that a facility will locate outside the geographical area of interest, that facility is dropped from further consideration. For users with larger spheres of interest, the same procedure applies.

The methodology is divided into discrete units. Two of the units involve locating a group of support facilities since, in each case, their location is inextricably interrelated. Where a hierarchy of location factors exist for an onshore support facility, the methodology utilizes decision points and checkpoints as aids in applying the correct weight to each factor.

Factors such as incentives/disincentives, and environmental constraints are incorporated into the methodology by guiding the user in applying user-determined weightings to previously obtained rankings. The user, as the best informed source of their importance, controls the final selection of the most probable location of the onshore support facility.

At the beginning of each unit or group of units, where necessary, a flow diagram is presented which shows the process that will be followed while proceeding through the unit. From the onset, it will be apparent that tasks completed in the industry requirements section provide the basis for the location analysis. Also, feedback from the demographic and environmental sections is essential. The points at which demographic and environmental inputs are required are indicated.

In working through the following sections, summary data for this test case have been entered on the Location Analysis Results Form which is included.

This location analysis test case is necessarily limited and abbreviated. It is difficult to structure a test case that would be short of a full logic enumeration of all relevant economic, physical, social and political factors. That level of effort, and the purpose for the test case, made a full enumeration beyond the scope of this study. However, the logic is sufficiently demonstrated to yield a high degree of assurance that the full enumeration will yield reasonable results.

WESTON ENVIRONMENTAL CONSULTANTS-DESIGNERS

LOCATION ANALYSIS RESULTS FORM

Location of Facilities

SERVICE BASES

Temporary

Newport, Rhode Island

Permanent

Newport, Rhode Island (Multiple)

Lewes, Delaware

Raritan Bay, New Jersey (Multiple)

Cape May, New Jersey

HELIPORTS

ANCILLARY SERVICES

Newport, Rhode Island

Lewes, Delaware

Raritan Bay, New Jersey

Cape May, New Jersey

MARINE REPAIR AND MAINTENANCE

Newport, Rhode Island

Lewes, Delaware

Raritan Bay, New Jersey

Cape May, New Jersey

PLATFORM CONSTRUCTION YARDS

None

PLATFORM FABRICATION YARDS

None

PIPE-COATING YARDS

Rhode Island

PIPELINE LANDFALL

Ocean County

TANK FARM

New York Harbor

GAS PROCESSING PLANT

Ocean County

CRUDE OIL PROCESSING PLANT

Ocean County

MARINE TERMINAL

New York Harbor

SECTION 1

SERVICE BASES, HELIPORTS, AND ANCILLARY SERVICES

1.1 SERVICE BASES

The temporary and permanent service bases for the Baltimore Canyon test case are located using the location analysis methodology discussed in Volume II, Chapter 2. Key inputs, initially, are questions which relate to whether or not new service bases are likely to be developed and the number of bases required. During the initial stages of exploration, oil companies will use existing port facilities as a temporary base if facilities are available, and if they can be assured of good service. Flow diagrams for temporary and permanent service bases are shown in Figures 1-1 and 1-2, respectively.

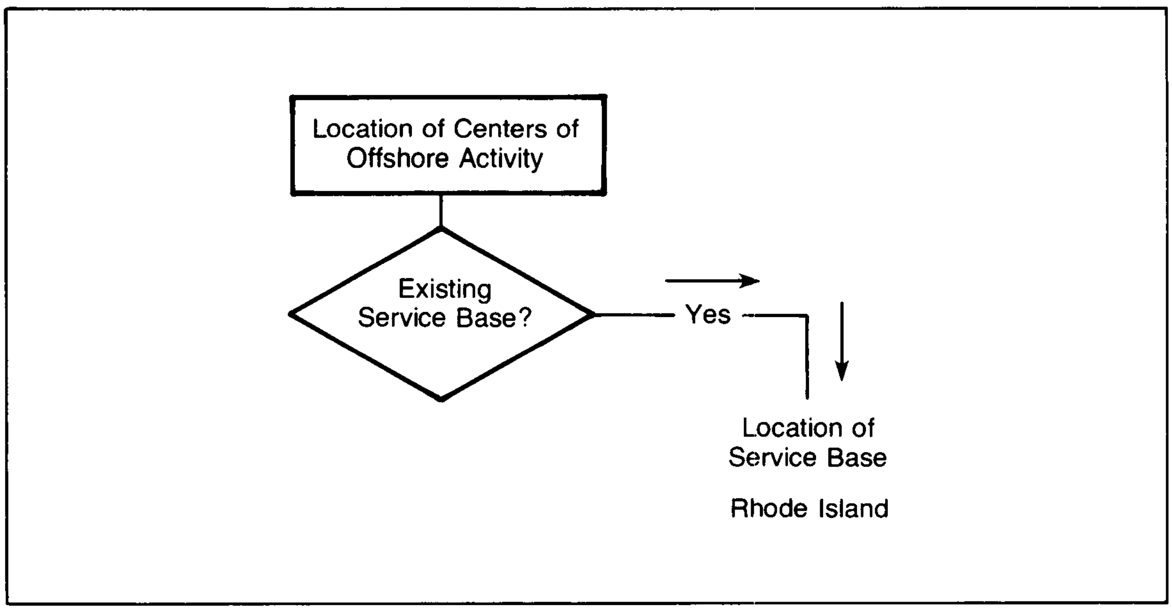


FIGURE 1-1 TEMPORARY SERVICE BASE FLOW DIAGRAM

1.1.1 Decision Point No. 1 -- Existing Service Base?

Following the methodology in Volume II, Chapter 2, it is determined that in the Baltimore Canyon Trough Region, there are no existing service bases supporting the offshore activity.

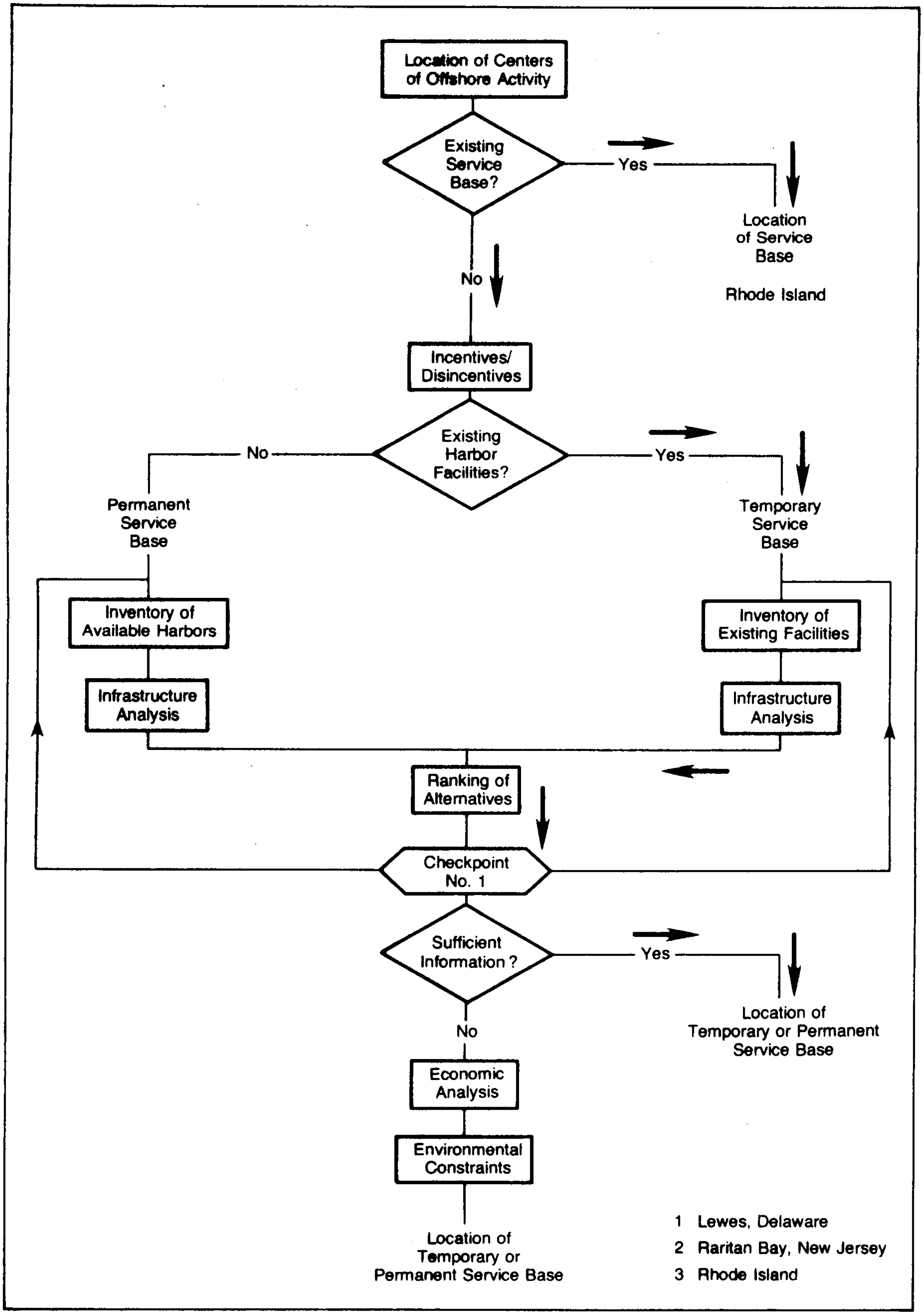


FIGURE 1-2 PERMANENT SERVICE BASE FLOW DIAGRAM

1.1.1.1 Location of Centers of Offshore Activity. The distance offshore to the tracts leased, and maps of coastline and offshore areas provide the input for this procedure.

Using the distances derived on the Base Information Summary Sheet (Chapter 1, Section 1), probable centers of exploration are located on the coastline and offshore areas map of the region, subject to the rules specified in Volume II.

1.1.1.2 Incentives/Disincentives. Oil companies, if at all possible, will locate onshore facilities where the local response is positive, and will avoid areas where there is organized local opposition. The incentives/disincentives of probable centers are shown as follows:

- Incentives -- Lewes, Delaware -- Very low land cost on long-term lease (actual figures not available).

- Disincentives -- Atlantic City, New Jersey -- High land cost (actual figures not available; unstable market caused by gambling development interests).

  Raritan Bay -- Strong labor union activity.

1.1.2 Decision Point No. 2

There are existing developed ports located within 100-150 miles of the OCS activity; this leads to the conclusion that temporary service bases are likely to be developed.

1.1.2.1 Temporary Service Base -- Location Factors. The location of a temporary service base is evaluated for the necessary physical characteristics and facilities outlined in Volume II, Chapter 2.

An inventory of existing harbor facilities is shown in the following table.

Location	Distance to Offshore Activity	Minimum Channel Depth	Available		Slope*		Wharf Footage	Availability			
								Fresh Water		S.W. Dis.	
			Acreage	Warehouse	< 2%	> 2%		Yes	No	Yes	No
Atlantic City	75	15	None	None			None	X		X	
Raritan Bay	110	20+	75+	Ample			600+	X		X	
Lewes, Delaware	95	12	20+	-			200+	X		X	
Cape May	85	15	None	None			None	X		X	

*Not verified.
Reserved for later use.

Working through the procedure for evaluating infrastructure conditions gives the results shown in the table below.

Location	Housing		Health Care		Education		Recreation/ Entertainment	
	Adequate*	Deficient	Adequate	Deficient	Adequate	Deficient	Adequate	Deficient
Atlantic City	X		X		X		X	
Raritan Bay	X		X		X		X	
Lewes, Delaware	X		X		X		X	
Cape May	X		X		X		X	

*Adequacy represents availability within reasonable commuting distance.

1.1.2.2 Permanent Service Base -- Location Factors. Permanent service bases are established when the oil companies have identified commercial quantities of oil or gas. The location of these permanent service bases depends on satisfying the physical characteristics outlined in Volume II, Chapter 2.

Permanent Service Base -- Inventory of Existing Harbor Facilities

Based on the criteria established in Volume II, Chapter 2 and data on local port facilities, an inventory of existing harbor facilities is determined.

Location	Distance to Offshore Activity	Minimum Channel Depth	Available		Slope		Wharf Footage	Availability			
								Fresh Water		S.W. Dis.	
			Acreage	Warehouse	<2%	>2%		Yes	No	Yes	No
Atlantic City	75	15	None	None	-	-	-	X		X	
Cape May	85	15	None	None	-	-	-	X		X	
Lewes, Delaware	95	12	35+		20+		200+	X		X	
Raritan Bay	110	20+	35+				600+	X		X	

Reserved for later use.

Permanent Service Base -- Infrastructure

Using the instructions given, the adequacy or deficiency of infrastructure elements in the general location area (within reasonable commuting distance) is developed.

Location	Housing		Health Care		Education		Recreation/ Entertainment	
	Adequate	Deficient	Adequate	Deficient	Adequate	Deficient	Adequate	Deficient
Atlantic City	X		X		X		X	
Cape May	X		X		X		X	
Lewes, Delaware	X		X		X		X	
Raritan Bay	X		X		X		X	

1.1.2.3 Service Base Alternatives. To determine if all feasible alternatives have been selected, answer the following questions:

- Have all ports in the region presently used for support of oil activity been included?
- Have all ports within an equal distance of the most distant alternative been included?

If the answer to either of these is "no", then those additional locations must be included in the analysis. Furthermore, it should be determined if states or counties with port facilities near the most distant alternatives have been actively encouraging location in their jurisdictions. This alternative has been included in the analysis, which is summarized in the following discussion.

Ranking of Alternatives -- 1 (Within 100 Miles)

This discussion covers those areas within 100 miles of the centers of offshore activity that have adequate sites.

Location	Distance to Offshore Activity	Infrastructure Adequate	Infrastructure Deficient (specify)	Rank Nearest Adequate Site	Incentive Yes	Incentive No	Disincentive Yes	Disincentive No	Final Rank
Atlantic City	75	Yes		1		X	X		3
Cape May	85	Yes		2		X		X	2
Lewes, Delaware	95	Yes		3	X			X	1

Checkpoint No. 1

Sufficient alternative sites for locating temporary/permanent service bases have not been selected. Hence, proceed to Ranking of Alternatives -- 2.

Ranking of Alternatives -- 2 (Within 100-150 Miles)

This discussion covers those areas within 100-150 miles of the centers of offshore activity that have adequate sites.

Location	Distance to Offshore Activity	Infrastructure Adequate	Infrastructure Deficient (specify)	Rank Nearest Adequate Site	Incentive Yes	Incentive No	Disincentive Yes	Disincentive No	Final Rank
Raritan Bay	110	X		1		X	X		1

Checkpoint No. 2

Sufficient alternative sites for locating temporary/permanent service bases have not been selected. Hence, proceed to the next level of Ranking of Alternatives.

Ranking of Alternatives -- 3 (Within 150-200 Miles)

This discussion covers those areas within 150-200 miles of the centers of offshore activity that have adequate sites.

Location	Distance to Offshore Activity	Infrastructure Adequate	Infrastructure Deficient (specify)	Rank Nearest Adequate Site	Incentive Yes	Incentive No	Disincentive Yes	Disincentive No	Final Rank
Rhode Island	165	X		1	X			X	1

1.1.3 Decision Point No. 3

At this point, there is sufficient information to select the sites of some or all of the service bases, within an environmental constraints evaluation.

An environmental analysis is performed using the instructions given in Volume II, Chapter 2, and the locations ranked according to the results.

Location	Location Factors Ranking	Environmental Ranking*	Final Ranking
Rhode Island	1	1	1
Raritan Bay	1	1	1
Atlantic City	3	2	3
Cape May	2	3	2
Lewes, Delaware	1	2	2

*Ranking is based on the general area environmental setting. All environmental issues can be overcome by proper site layout and management practices within each harbor considered in this analysis.

1.1.4 Location Analysis Summary Sheet No. 1 -- Service Bases

It has been determined that the number of bases needed is 4-8, based upon the decision point steps involved in the service base location analysis. The following is the ranking of sites:

1. Rhode Island (multiple)
2. Lewes, Delaware (1)
3. Raritan Bay, New Jersey (multiple)
4. Cape May (1)
5. Atlantic City

The possible number of service bases is given in parentheses. Enter final locations on the Location Analysis Results Form shown in the Introduction to this chapter.

1.2 HELICOPTER FACILITIES

Helicopters will operate from pads constructed at the service base, and thus, there is no need for new helicopter facilities.

1.3 ANCILLARY SERVICES

Associated with each service base is a series of small, highly specialized support services. Included are:

- Wellhead equipment company.
- Cement supplier.
- Food caterer.
- Diving company.
- Logging and perforating company.
- Hundreds of other specialized companies.

These services are distributed among the ports where the service bases are recommended. Enter location of the ancillary services (same as the service bases) on Location Analysis Results Form shown in the Introduction to this chapter.

SECTION 2

MARINE REPAIR AND MAINTENANCE FACILITIES

2.1 DESCRIPTION

The location analysis described in Volume II, Chapter 2, provides the conditions and factors for locating marine repair and maintenance facilities. For this test case, use the flow diagram in Figure 2-1 below, and investigate the possibility of using the existing marine repair facility for each of the services required under this category.

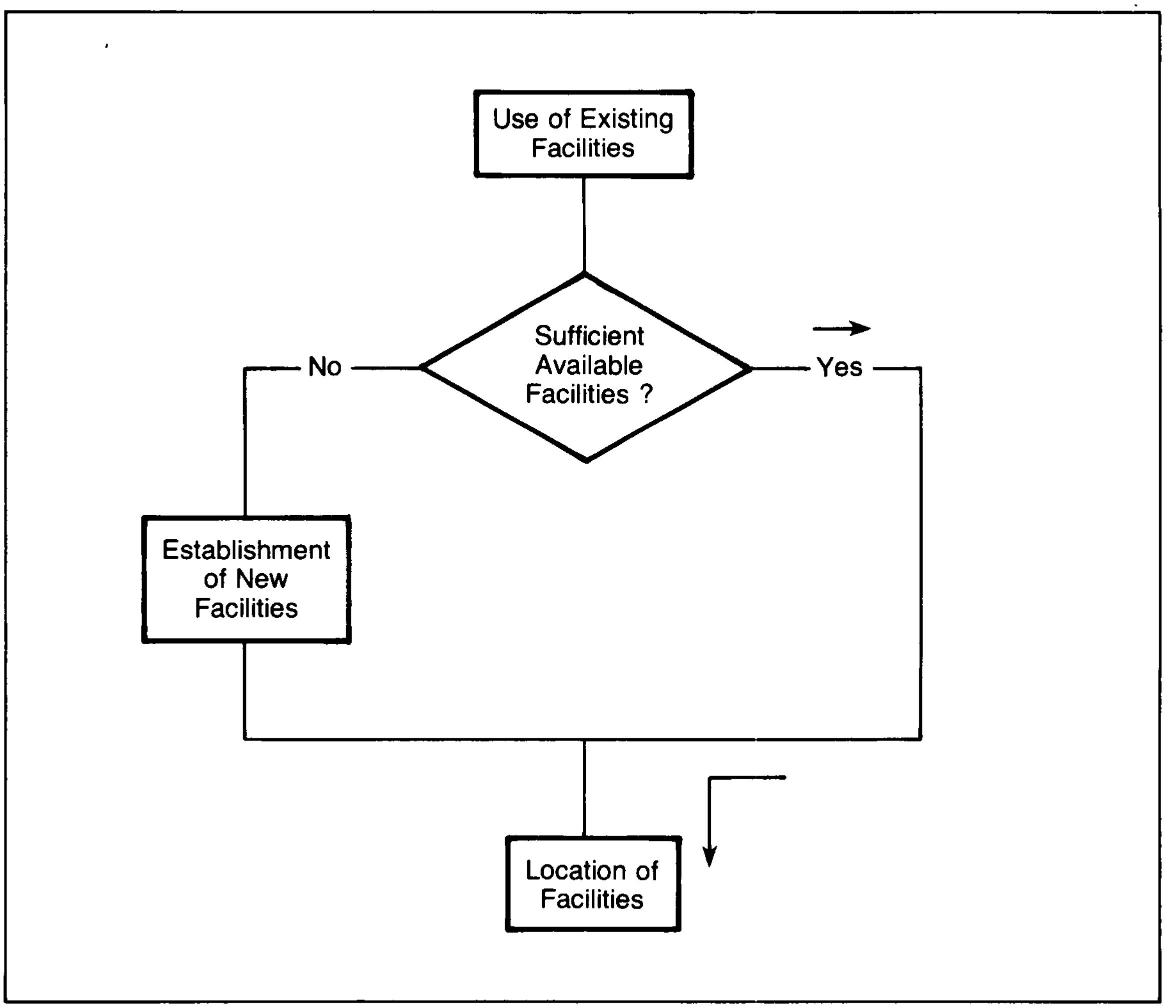


FIGURE 2-1 MARINE REPAIR AND MAINTENANCE FACILITY FLOW DIAGRAM

2.2 USE OF EXISTING MARINE REPAIR AND MAINTENANCE FACILITIES

At present, marinas at Cape May and Lewes, Delaware have maintenance and repair capabilities limited to pleasure craft and fishing vessels less than 100 feet. With certain improvements and expansion, the facilities at these two locations will be able to handle maintenance and repair needs associated with OCS development.

Location	Distance to Service Base	Hull	Mechanical Repair	Electrical Repair	Inspections	Haul Out	
						Cable	Dry Dock, etc.
Rhode Island	-	X	X	X	X		X
Lewes, Delaware	-	X	X	X	X	X	
Raritan Bay	-	X	X	X	X		X
Cape May	-	X	X	X	X	X	

2.3 DECISION POINT NO. 1

From the preceding analysis, it is concluded that the existing facilities will be sufficient to meet the projected demand. Enter final locations on Location Analysis Results Form.

SECTION 3

PLATFORM CONSTRUCTION/FABRICATION YARDS

A platform construction/fabrication yard is likely to be built along the Atlantic coast, but location in the Baltimore Canyon impact area is unlikely. High labor and land costs act as strong disincentives to "push" the location to the southern Atlantic Coast.

SECTION 4

PIPE-COATING YARDS

Background information on requirements for pipe-coating yards is found in Volume II, Chapter 2. Figure 5-2 of that chapter provides threshold values indicating the point at which pipe-coating yards will be developed. The following flow diagram (Figure 4-1) shows the procedure for determining the need for a pipe-coating yard. Primary indicators of the level of demand, as shown in the flow diagram, generated the following output for the Baltimore Canyon Test Case:

- Is there assurance of $3-5 million in business? Yes
- Has a long-term production/delivery contract been signed? No
- Have permits to lay a pipeline been applied for? No

If the answer to any of these questions is "yes", proceed to the next step in the flow diagram.

4.1 DEMAND FOR PIPE-COATING FACILITIES

Following the instructions given in Volume II, Chapter 2, it has been determined that one temporary pipe-coating yard is required in the impacted region.

The demand for coated pipe <u>is sufficient</u> to require the construction of a portable pipe-coating yard; however, the demand for coated pipe is <u>not sufficient</u> to require establishment of a permanent pipe-coating yard. Hence, evaluate potential sites by the location factors checklist for portable pipe-coating facilities, incentives/disincentives and land costs, then continue by ranking of alternatives.

4.2 LOCATION FACTORS

Pipe-Coating Yards (Portable Facility) - Location Factors

1. 30 acres flat (<3 percent slope) land (well drained).
2. 750-feet marginal wharf.
3. Channel depth - 10 feet minimum; 20-30 feet preferable.
4. Available energy and water supply.
5. Highway access.
6. Proximity to other onshore support facilities.
7. Weather.

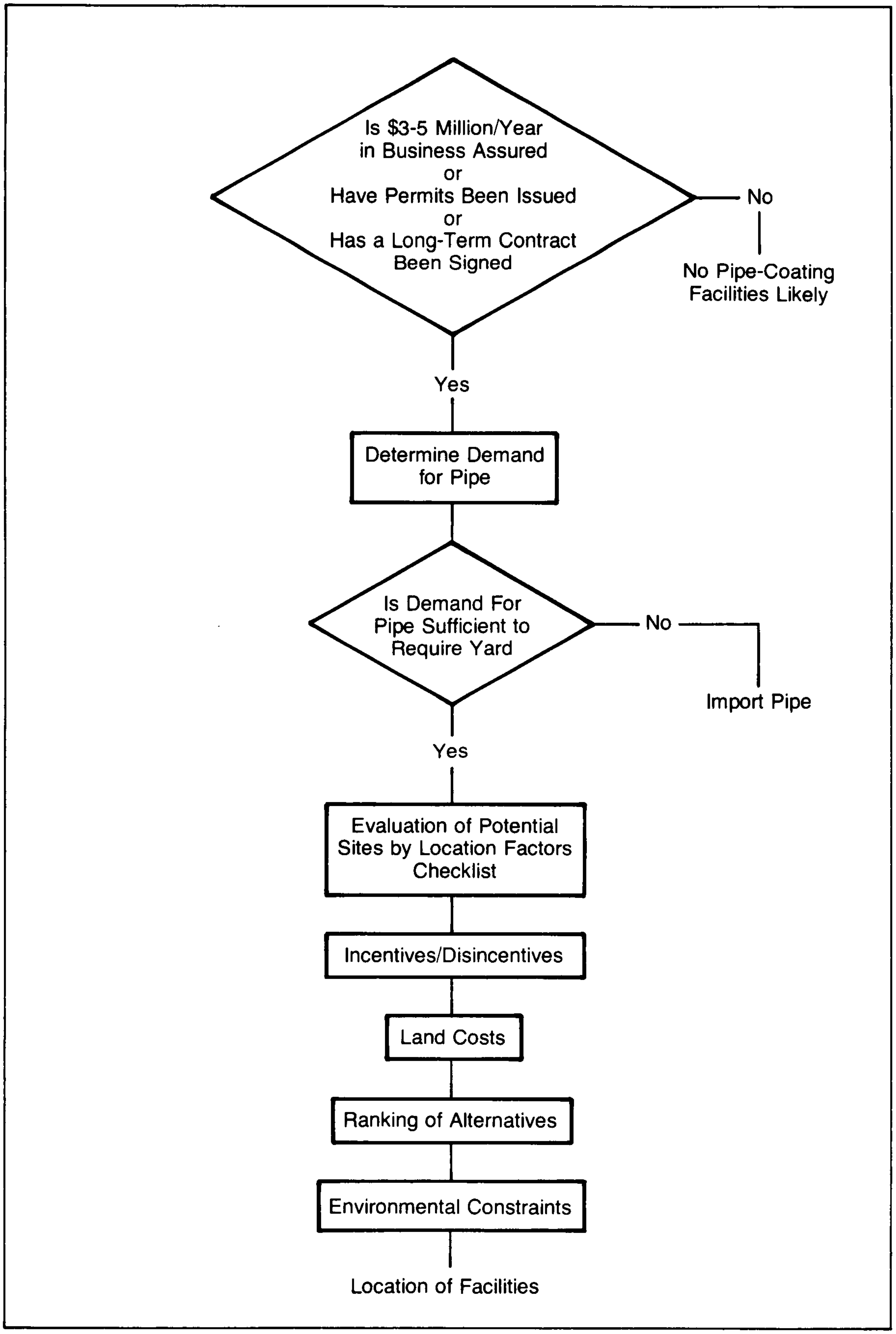


FIGURE 4-1 PIPE-COATING YARD FLOW DIAGRAM

Pipe-Coating Yards - Alternative Locations

Using the input listed in Section 4 of Chapter 2, Volume II, sites are identified with the following characteristics:

1. 30-75 acres well-drained land with < 3 percent slope (portable facility).

2. 750 feet of marginal wharf.

3. 10-30 feet water depth.

4. Highway access.

5. Available water and energy supply.

From the analysis, Rhode Island and Raritan Bay have been identified as alternative locations.

4.3 INCENTIVES/DISINCENTIVES

Using the information in Volume II, Chapter 2, incentives and disincentives of the alternative locations are identified and the locations ranked as follows:

Rank (Location)	Description
Incentives:	
1. Rhode Island	Existing operation. Identical location of more than one service base with ancillary services. Local preferential treatment given oil companies in the past.
2. Raritan Bay	No incentives identified; no existing operations; no history of, or indication of preferential treatment.
Disincentives:	
1. Raritan Bay	New York/New Jersey labor unions.
2. Rhode Island	No disincentives identified.

4.4 LAND COSTS

The discussion of land costs as a major factor in determining the siting of a pipe-coating yard is given in Volume II, Chapter 2. For this test case, it was determined that there was no differential in land costs.

4.5 RANKING OF ALTERNATIVES

After working through the procedures, the pipe-coating yard locations are ranked as shown in the table.

Location	Cost	Incentives/ Disincentives	Rank
Rhode Island	-	+	1
Raritan Bay	-	-	2

4.6 ENVIRONMENTAL CONSTRAINTS

The alternative locations are evaluated and ranked based on the environmental constraints given in Volume II, Chapter 2.

Location	Location Factors Ranking	Environmental Ranking	Final Ranking
Rhode Island	1	1	1
Raritan Bay	2	2	2

The results indicate that the temporary pipe-coating yard will be located in Rhode Island. Enter the result on the Location Analysis Results Form.

SECTION 5

MARINE TERMINAL, PIPELINE LANDFALL, TANK FARM, PROCESSING PLANTS

Location of the marine terminal, pipeline landfall, tank farm, and gas/oil processing plants are closely interrelated. Requirements for these facilities are discussed in detail in Volume II, Chapter 2.

5.1 MARINE TERMINAL

5.1.1 Location Factors

Location factors for determining the site for a marine terminal are outlined in Volume II, Chapter 2. Procedures are also presented for identifying alternative sites for the marine terminal. Results for the Baltimore Canyon test case are shown in the following table.

Cost of developing a new marine terminal cannot be justified along the Delaware, New Jersey, New York, and Rhode Island coasts since adequate facilities are already in existence. At the same time, the locational relationship between the marine terminal and pipeline landfall is obviated.

Location	Channel		Available Berthing	Free of Traffic Congestion?		Distance to Pipeline Landfall	Clastic Bottom		Maximum Bottom Current (knots)
	Width	Depth		Yes	No		Yes	No	
Rhode Island	Adequate		Yes	X		N/A			
New York	Adequate		Yes		X	N/A	Data not available		
Wilmington	Adequate		Yes	X		N/A			
Philadelphia Camden	Adequate		Yes	X		N/A			

5.1.2 Land Requirements and Costs

The procedure for estimating land requirements and costs have been followed, and no land cost differential was identified for this test case. Land required for tank farms, gas processing plants and crude oil stabilization facilities are obtained from Chapter 1, Industry Requirements.

5.1.3 Incentives/Disincentives

In evaluating the incentives/disincentives for a marine terminal, the Rhode Island site was determined unsuitable because tank farm facilities do not currently exist.

5.1.4 Ranking of Alternatives

Adequate alternative harbors (those meeting the criteria established in the Alternative Harbors discussion in Volume II, Chapter 2) are entered in the table below.

Location	Available Acres		Cost	Incentives/ Disincentives	Rank
	Adjacent	Not Adjacent			
Rhode Island	Adequate		No Differential	Disincentive	4
New York Harbor	Adequate		"		1
Wilmington	Adequate		"		2
Philadelphia/ Camden	Adequate		"		3

5.1.5 Environmental Constraints

Using the instructions for determining the environmental constraints, final ranking of the alternative locations is presented in this table.

Location	Location Factors Ranking	Environmental Ranking	Final Ranking
Rhode Island	4	3	4
New York Harbor	1	2	1
Wilmington	2	2	2
Philadelphia/Camden	3	2	3

5.2 PIPELINE LANDFALL

Background information and criteria for determining the pipeline route and landfall are detailed in Volume II, Chapter 2. Using those considerations, potential locations have been developed in this section for the Baltimore Canyon test case.

No significant offshore constraints have been noted that would preclude landfall in either Atlantic or Ocean County, New Jersey.

The long straight beaches of the New Jersey coast, backed by the gently sloping Coastal Plain do not offer insurmountable constraints to pipeline landfall location. Both Atlantic and Ocean Counties are acceptable; however, analysis of offshore characteristics, nearshore bathymetry and the existence of two deep inlets for work boat movement indicate a preference for Ocean County.

Analysis of the onshore criteria favors landfall in Ocean County. The adjacent lands are not as heavily developed, nor are land costs as high as other sites.

Based on analysis of location factors, alternative locations are ranked as follows:

Location	Rank
Ocean City	1
Atlantic County	2

Using the instructions for evaluating environmental constraints, the alternative locations are ranked as follows:

Location	Location Factors Ranking	Environmental Ranking	Final[1] Ranking
Ocean County	1	2	1
Atlantic County	2	1	2

5.3 TANK FARM

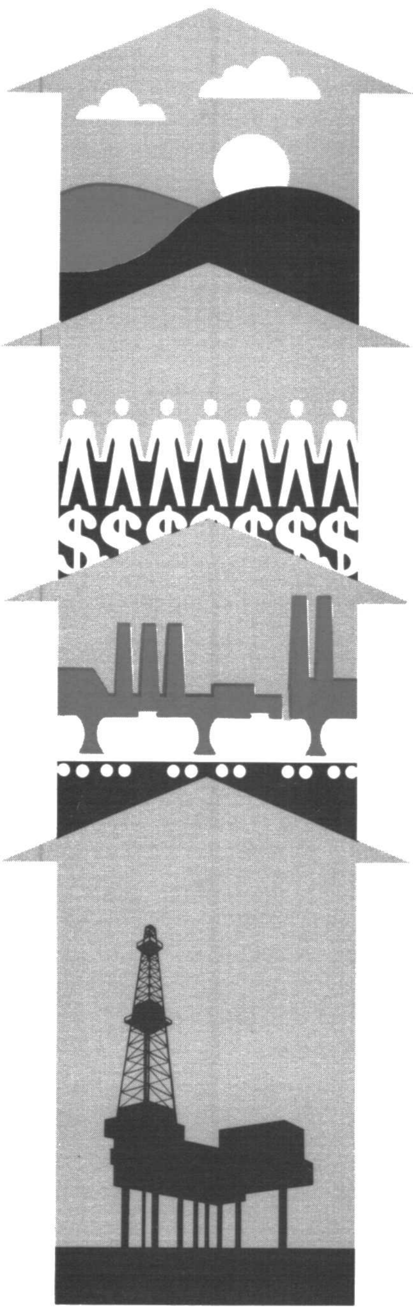
Tank farms are included within marine terminal facilities. Sufficient capacity is available at existing ports or facilities which obviates the location of a new tank farm. Hence, there is no further analysis of tank farm location.

In developing this test case, the New York Harbor area was selected as the tank farm location. This result is entered on the Location Analysis Results Form.

5.4 GAS PROCESSING PLANT/CRUDE OIL PARTIAL PROCESSING PLANT, COMPRESSOR STATION/OIL BOOSTER PUMP STATION

Sites for these facilities are determined using information from the pipeline landfall location analysis, land requirements from the industry requirements analysis, and applicable local zoning and land use regulations. Since Ocean County was the only site satisfying the location criteria for this test case, no alternative site evaluation was carried out. The result is entered on the Location Analysis Results Form.

[1]Final ranking is also based on the locational decision for the gas processing plant. Since Ocean County ranks first through this analysis process, it is suggested that the landfall site should not disrupt the barrier beach. Enter the result on the Location Analysis Results Form.



CHAPTER 3

ECONOMIC IMPACT

INTRODUCTION

This chapter contains illustrative examples of how portions of the Volume II, Chapter 3, Economic Impact, can be employed to obtain estimates of the effects of OCS oil and gas development in the Baltimore Canyon. The sensitivity of effects to alternative discoveries and locations for primary onshore facilities is developed.

Each section of this chapter presents a set of results based on application of the associated Volume II methodology. The cross references between the methodology and results are:

Volume III		See Volume II
Section 1	- Time Period	Section 1
Section 2	- Region of Impact	Section 2
Section 3	- Updated OBERS Baseline	Subsection 3.2
Section 4	- Employment by Industry Baseline	Subsection 3.3
Section 5	- Industry Output Multipliers	Subsection 4.2
Section 6	- Converting Industry Requirements to Economic Terms	Section 4
Section 7	- Impact Output by Industry	- -
Section 8	- Converting Output to Employment	Subsection 4.3
Section 9	- Converting Employment to Occupation	Subsection 4.4.1
Section 10	- Converting Occupation to Family	Subsection 4.4.2
Section 11	- Development of Impact Data	- -
Section 12	- Spatial Allocation	Section 5

Figure 3-i illustrates the process of tracing out the development showing source of data and procedures used.

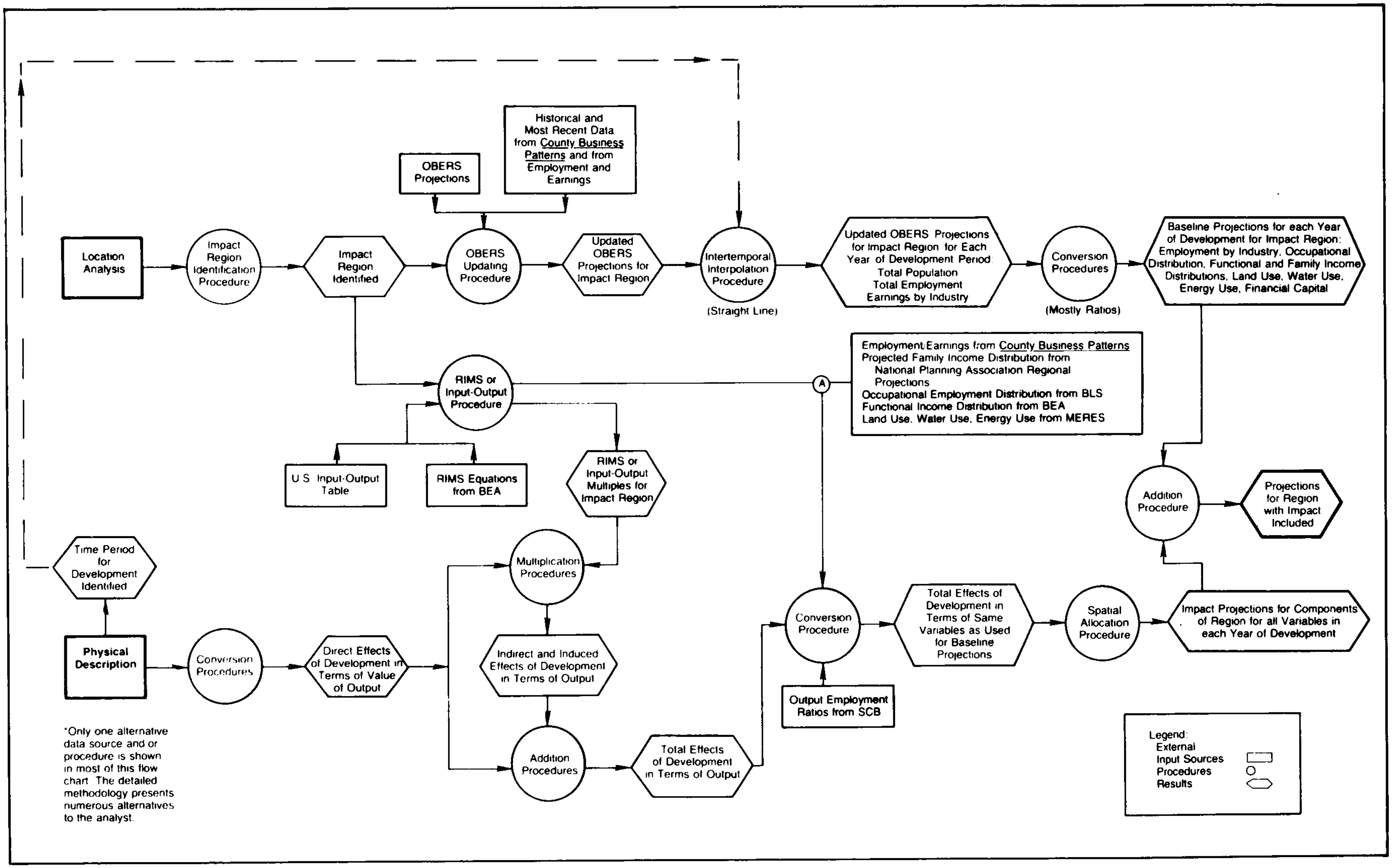


FIGURE 3-i FLOW CHART OF PRIMARY COMPONENTS OF ECONOMIC ANALYSIS

SECTION 1

RESULT 1
TIME PERIOD FOR DEVELOPMENT

1.1 DATA INPUTS

The physical industry requirements description of development specifies that development will occur over the 42-year time span from 1977 through 2018.

1.2 PROCEDURE

No procedure is required to determine the time period for development. The years 1977 and 2018 will be included to show the level of activity before and after the development period.

1.3 RESULTS

Economic activity will be traced from 1977 through 2018.

SECTION 2

RESULT 2
REGION OF IMPACT

2.1 DATA INPUTS

Two sets of economic analyses will be developed. In the first set, it is assumed that all primary onshore activity specified by the industry requirements will be located in a single county. The results can be viewed as an outside or boundary condition.

In the second set, the locations projected for OCS development facilities, as identified in the location analysis, are examined. These results can be viewed as an initial "most likely" condition.

2.2 PROCEDURE

The methodology prescribes that the region of impact should contain all of the SMSA or non-SMSA portions of the BEA region in which the primary activity is located, plus contiguous and nearby areas likely to receive major effects. As in all aspects of the methodology, reason and judgement must be permitted to alter the mechanical application of procedures. The two sets of regions defined for the location of primary activity are described in the following subsection. Policy makers interested only in part of the regions outlined or in larger areas would define them differently. The objective here has been to include those areas which can reasonably be expected to receive significant impacts while also selecting building block areas for which data are available such as counties, BEA regions and SMSA's. The major consistent modification to the previously described methodology is to exclude from the region of impact distant counties in non-SMSA portions of BEA areas, especially when major SMSA's lie between the primary location and the distant counties.

2.3 RESULTS

2.3.1 Set 1

Region I encompasses primary activity located in Atlantic County, New Jersey. Atlantic County is in the non-SMSA portion of BEA 15. Thus, the non-SMSA portion of BEA 15 will be included except for Schuylkill, Carbon and Monroe Counties, Pennsylvania, which are a considerable distance from Atlantic County and are on the opposite side of the Philadelphia, Reading and Allentown-Bethlehem-Easton SMSA's. Also included will be the SMSA's contiguous to Atlantic County, Philadelphia and Vineland-Millville-Bridgeton and the nearly contiguous SMSA of Wilmington. (See Figure 2-1.)

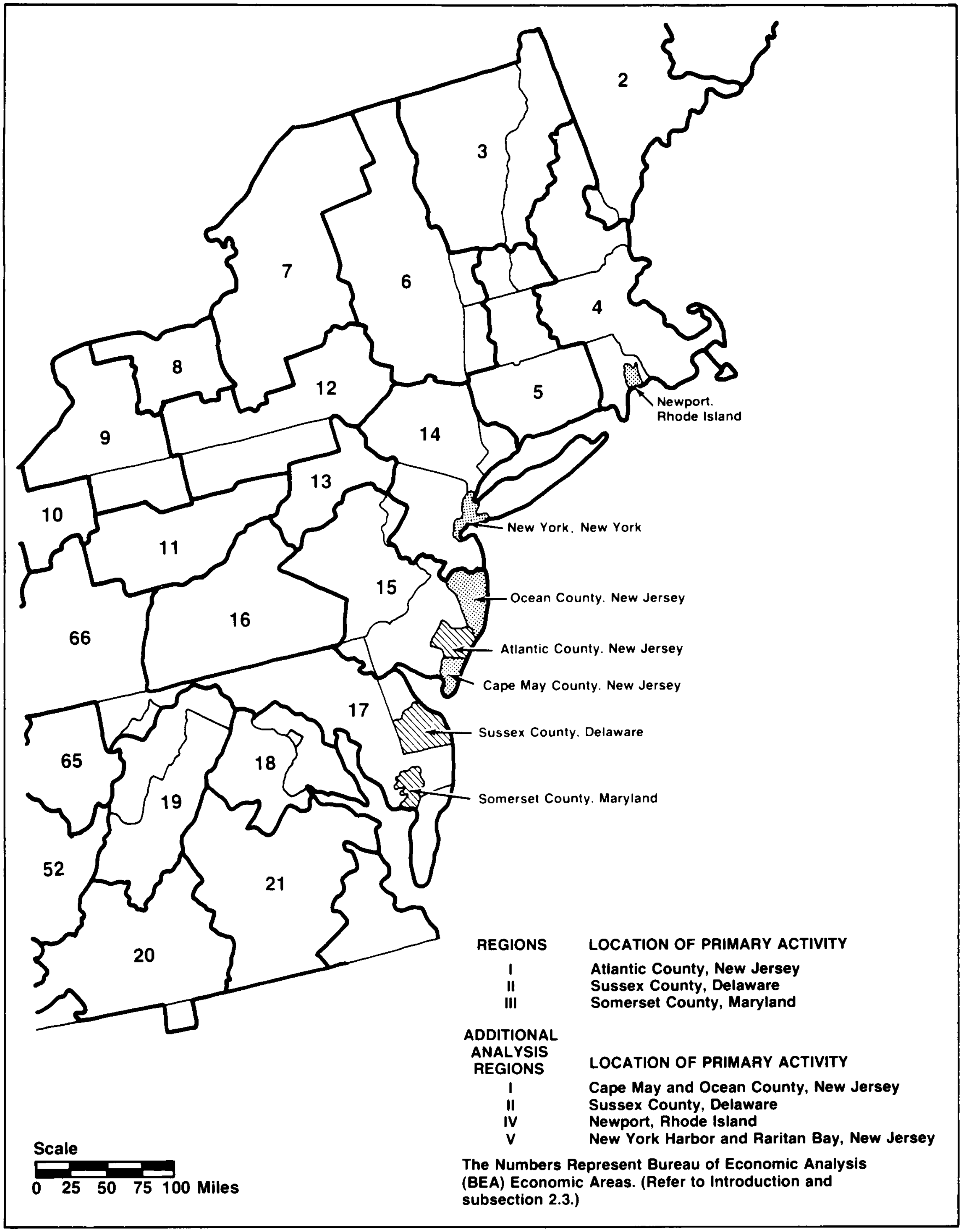


FIGURE 2-1 ECONOMIC IMPACT REGIONS

Region II encompasses primary activity located in Sussex County, Delaware. Sussex County is in the non-SMSA portion of BEA 17. Thus, the non-SMSA portion of BEA 17 will be included except for Frederick and Washington Counties, Maryland, which are a considerable distance from Sussex County and are on the opposite side of the Baltimore SMSA. Also included will be the nearby SMSA's of Baltimore, Wilmington and Washington, D.C. While Washington is closer to Sussex County, Baltimore is included because its industrial structure makes it a more likely source of support for OCS activities. (Refer to Figure 2-1.)

Region III centers on primary activity located in Somerset County, Maryland. Somerset County is also in the non-SMSA portion of BEA 17 so this area, excepting Frederick and Washington Counties, is included again; the Baltimore and Washington, D.C. SMSA's are also included. In this case, however, the slightly more southern location of Somerset than Sussex and its location in Maryland rather than Delaware dictate that is will not have as much an effect on the Wilmington SMSA which has been omitted. The nearby Newport News-Hampton, and Norfolk-Portsmouth, Virginia SMSA's across the Chesapeake Bay Bridge-Tunnel make them necessary for inclusion in the region. Note that their inclusion and the exclusion of Wilmington is somewhat arbitrary and is done so as to produce different regions.

2.3.2 Set 2

Region I contains Cape May and Ocean counties in New Jersey which are the center of activity containing a permanent service base site, a maintenance and repair facility, ancillary services, the pipeline landfall, the gas processing plant, and the crude oil processing plant.

Region II contains Sussex County, Delaware, with the center of activity at Lewes which contains a permanent service base site, a maintenance and repair facility, and ancillary services.

Region IV is Newport, Rhode Island and is the center of activity, corresponding to BEA Economic Area Number 4 (Boston, Massachusetts). This location contains a temporary service base site which is required to support all of the abort case activity. This area will also be the site of a permanent service base, a maintenance and repair facility, a heliport, ancillary services and the pipe-coating yard for the full development case.

Region V is New York Harbor and Raritan Bay which correspond to BEA Economic Area Number 14 (New York, New York). This site will contain a permanent service base, a maintenance and repair facility, a heliport, ancillary services, a marine terminal, and a tank farm for the full development case.

Region III, Somerset County, Maryland (contained in Set 1), is not included since the location analysis projects no primary activity for this area.

SECTION 3

RESULT 3
ESTABLISHING UPDATED OBERS BASELINE VALUES

3.1 DATA INPUTS

The OBERS, 1972, Series E Projections were used to help establish updated baseline values. Personal income estimates were obtained from Survey of Current Business for 1962, 1969, 1970, 1971, and 1975. These values differed slightly from the OBERS values, but were close enough to judge the extent by which the OBERS forecast was off track by 1975.

Population estimates for the same years are from Current Population Reports, Series P-25. This series is also the series used by OBERS and provides consistent estimates. Employment estimates for the same years are from Earnings and Employment by States and Areas. While these estimates are useful for this purpose, they are not consistent with OBERS. The difference between Earnings and Employment estimates and OBERS estimates is basically due to the treatment of agricultural employment and is relatively constant over time. Because of this it was possible to use the data source, plus the constant difference to produce the estimates for comparison with OBERS.

Earnings estimates for the same years are also available through Employment and Earnings. The data available are given in weekly earnings per worker. Because the employment estimates are not the same as OBERS, the earnings estimates are also different and are tied to the employment estimates. The employment estimates were taken from County Business Patterns.

3.2 PROCEDURE

None of the three regions used corresponds precisely to any combination of OBERS regions. However, each one is very close (except for a few counties) to being the norm of several SMSA's and a non-SMSA portion of a BEA region. Thus, the procedure followed is to evaluate the OBERS projections for the areas which most nearly correspond to each of the three regions used here, and then to modify the projections to account for the minor differences between the actual regions and the OBERS area using County Business Patterns data. For example, the only difference between Region I and a sum of OBERS regions is the exclusion of three Pennsylvania counties. County Business Patterns data for these three counties were used to establish a ratio of their employment to the total regional employment, and this same ratio was used to adjust all of the OBERS projections.

The first step in evaluating the OBERS projections is to use a series of naive forecasting models to project each variable and compare these forecasts with OBERS projections. In this case none of the naive models were adequate for any of the variables. Because of this, an alternative model based on geometric increases at geometrically decreasing rates was applied to all OBERS projections to extrapolate a year-by-year baseline projection. For example, in personal income:

OBERS 1971 estimate = 15,051 million
OBERS 1980 projection = 22,494 million
OBERS 2020 projection = 101,151 million
1971-1980 growth rate = $(22{,}494/15{,}051)^{1/9}$
1971-2020 growth rate = $(101{,}151/15{,}051)^{1/49}$
1971-2020 rate of change in growth rate = $(\text{1971-2020 growth rate}/\text{1971-1980 growth rate})^{1/49}$
Year 1 = 1971
Year 49 = 2020
Projection model = $\text{1971 estimate} * (\text{1971-80 growth rate} * (\text{rate of change 1971-2020})^{\text{year}})^{\text{year}}$

This model's projections must necessarily exactly hit the first (1971) and last (2020) values. The model then gives values for every year in between. There is a tendency to slightly underestimate the intermediate values, but these underestimates never exceeded 2 percent. Based on these extrapolated projections the most recent data (for 1975) are then compared to the model estimate based on the OBERS values. The criteria for determining a structural change was a 5 percent difference between projection and estimate.

Population and total employment procedures are identical to the personal income procedure and the same criteria for acceptance is used. For this procedure the interpolation model for total earnings by industry was identical, but because consistent earnings data were unavailable, the criterion for acceptance was changed. The new criterion stated that if personal income, population and employment were all within 5 percent, then it would be assumed that earnings would also remain within 5 percent, and the OBERS baseline could be used unchanged. Earnings figures are converted to employment by industry using the most recent year's employment/earnings ratio from the Survey of Current Business.

3.3 RESULTS

The results established that the personal income estimate meets the criterion for accepting the OBERS baseline values for personal income, and population estimate verifies the OBERS baseline values for population. The employment estimate verifies the OBERS baseline values for total employment.

The criterion for accepting earnings estimates stated that if the other three hold so do the earnings. This is the case here.

Results for population, employment, personal income and earnings by region are displayed for:

- Set 1 regions - Tables 4-1(1) to 4-3(1).
- Set 2 regions - Tables 4-4(1) to 4-6(1).

(Note that Set 2 data are two new regions, IV and V and Regions I and II from Set 1. The regional totals for Set 2 - the total Baltimore Canyon Trough economic impact region - are shown in Table 4-6(1). No totals are shown for Set 1 since it is assumed that all primary activity occurs, in turn, in each of the regions.)

SECTION 4

RESULT 4
• CONVERTING UPDATED OBERS EARNINGS BY INDUSTRY BASELINE VALUES TO EMPLOYMENT BY INDUSTRY BASELINE VALUES

• BASELINE USE OF RESOURCES

4.1 DATA INPUTS

Regional earnings by industry baseline values from Result 3 were used, along with the national earnings per employee by industry from the Survey of Current Business for the OBERS industries (except for the government sector which is found as a residual).

4.2 PROCEDURE

Earnings are multiplied by the inverse of earnings per employee to obtain employment estimates.

4.3 RESULTS

Baseline employment in each of the nine OBERS industries is shown as follows:

- Set 1 regions - Tables 4-1(2 and 3) to 4-3(2 and 3).
- Set 2 regions - Tables 4-4(2 and 3) to 4-6(2 and 3) (see additional explanation for Set 2 regions in subsection 3.3 of this chapter.)

Baseline use of resources (land, gas, water, etc.) based on use ratios from MERES (see Volume II, Chapter 3, subsection 3.3.4 and summarized in Table 11-1) is shown as follows:

- Set 1 regions - Tables 4-1(4) to 4-3(4).
- Set 2 regions - Tables 4-4(4) to 4-6(4) (see additional explanation for Set 2 regions in subsection 3.3.)

BASELINE SUMMARY TABLES[1]
REGIONS I, II, III

Table 4-1 (1) Table 4-2 (1) Table 4-3 (1)	Baseline population (POPULA); employment (EMPLOY); personal income (PERINC); and earnings (EARN) in thousands of jobs and millions of dollars.
Table 4-1 (2) Table 4-2 (2) Table 4-3 (2)	Baseline employment in agriculture (AGR); mining (MNG); construction (CONSTR); manufacturing (MFG); and transportation, communications and public utilities (TRANS) in thousands of jobs.
Table 4-1 (3) Table 4-2 (3) Table 4-3 (3)	Baseline employment in wholesale and retail trade (WHORET); finance, insurance and real estate (FIRE); services (SERVIC); and government (GOVT) in thousands of jobs.
Table 4-1 (4) Table 4-2 (4) Table 4-3 (4)	Baseline use of acres of land (LND); thousands of cubic feet of natural gas (GAS); thousands of barrels of oil (OIL); thousands of gallons of water (WATER); thousands of kilowatt-hours of electricity (ELEC): thousands of gallons of water purchased from utilities (INT); and thousands of gallons of discharge into sewers (DIS).

[1] Annual results are shown for Region I. For Regions II and III, five-year intervals are displayed.

Table 4-1 (1)

Baseline Summary Tables
Region I

YEAR	POPULA	EMPLOY	PERINC	EARN
1977.00	6141.62	2610.57	28686.5	22042.1
1978.00	6194.46	2656.39	29875.4	22897.4
1979.00	6247.10	2701.73	31100.5	23778.4
1980.00	6297.51	2746.56	32362.2	24685.6
1981.00	6351.59	2790.81	33660.9	25619.3
1982.00	6403.63	2834.44	34997.0	26580.1
1983.00	6455.31	2877.39	36370.7	27568.3
1984.00	6506.73	2919.62	37782.4	28584.2
1985.00	6557.36	2961.07	39232.3	29628.3
1986.00	6608.69	3001.69	40720.7	30701.0
1987.00	6659.21	3041.43	42247.7	31302.5
1988.00	6709.41	3080.25	43813.5	32933.3
1989.00	6759.28	3118.09	45418.2	34093.6
1990.00	6803.79	3154.90	47061.8	35283.7
1991.00	6857.95	3190.65	48744.3	36503.9
1992.00	6906.73	3225.28	50465.7	37754.5
1993.00	6955.12	3258.75	52225.8	39035.8
1994.00	7003.11	3291.01	54024.5	40347.9
1995.00	7050.69	3322.03	55861.6	41691.0
1996.00	7097.94	3351.75	57736.8	43065.4
1997.00	7144.55	3380.15	59649.8	44471.2
1998.00	7190.31	3407.18	61600.2	45908.5
1999.00	7236.61	3432.81	63587.5	47377.5
2000.00	7281.23	3457.00	65611.2	48878.1
2001.00	7326.75	3479.72	67670.8	50410.5
2002.00	7371.08	3500.93	69765.6	51974.6
2003.00	7414.89	3520.62	71895.0	53570.5
2004.00	7459.17	3538.74	74058.1	55198.2
2005.00	7500.91	3555.29	76254.0	56857.5
2006.00	7543.11	3570.22	78492.0	58548.4
2007.00	7584.73	3583.53	80741.0	60270.7
2008.00	7625.79	3595.19	83030.0	62024.2
2009.00	7666.25	3605.19	85347.9	63808.8
2010.00	7706.11	3613.51	87693.5	65624.2
2011.00	7745.37	3620.14	90065.5	67470.1
2012.00	7784.00	3625.07	92462.7	69346.3
2013.00	7822.00	3628.30	94883.7	71252.3
2014.00	7859.35	3629.82	97327.0	73187.8
2015.00	7896.05	3629.63	99791.1	75152.3
2016.00	7932.08	3627.72	102274.	77145.5
2017.00	7967.43	3624.11	104775.	79166.7
2018.00	8002.10	3618.79	107292.	81215.5
2019.00	8036.07	3611.78	109823.	83291.2

Table 4-1 (2)

Region I

YEAR	AGR	MNG	CONSTR	MFG	TRANS
1977.00	25.3177	2.95793	94.6669	667.751	111.405
1978.00	26.3001	3.07275	98.3401	693.660	115.727
1979.00	27.3120	3.19098	102.124	720.349	120.180
1980.00	28.3540	3.31272	106.020	747.832	124.765
1981.00	29.4265	3.43802	110.030	776.119	129.484
1982.00	30.5301	3.56696	114.157	805.225	134.340
1983.00	31.6651	3.69956	118.401	835.161	139.335
1984.00	32.8320	3.83590	122.764	865.938	144.470
1985.00	34.0313	3.97602	127.248	897.569	149.747
1986.00	35.2633	4.11997	131.855	930.064	155.168
1987.00	36.5236	4.26779	136.586	963.435	160.735
1988.00	37.8274	4.41953	141.442	997.690	166.450
1989.00	39.1601	4.57524	146.426	1032.84	172.315
1990.00	40.5270	4.73495	151.537	1068.89	178.330
1991.00	41.9286	4.89870	156.778	1105.86	184.497
1992.00	43.3651	5.06653	162.149	1143.75	190.818
1993.00	44.8357	5.23846	167.651	1182.56	197.294
1994.00	46.3438	5.41454	173.287	1222.31	203.925
1995.00	47.8806	5.59479	179.055	1263.00	210.714
1996.00	49.4652	5.77923	184.958	1304.64	217.660
1997.00	51.0799	5.96788	190.996	1347.22	224.765
1998.00	52.7308	6.16076	197.169	1390.77	232.029
1999.00	54.4130	6.35769	203.477	1435.27	239.454
2000.00	56.1416	6.55927	209.922	1480.73	247.038
2001.00	57.9017	6.76491	216.504	1527.15	254.783
2002.00	59.6983	6.97481	223.221	1574.53	262.689
2003.00	61.5314	7.18893	230.076	1622.83	270.755
2004.00	63.4010	7.40740	237.066	1672.19	278.981
2005.00	65.3069	7.63009	244.192	1722.46	287.368
2006.00	67.2490	7.85699	251.454	1773.68	295.913
2007.00	69.2272	8.08811	258.851	1825.86	304.618
2008.00	71.2414	8.32343	266.382	1878.98	313.481
2009.00	73.2912	8.56292	274.047	1933.04	322.501
2010.00	75.3763	8.80654	281.844	1988.04	331.676
2011.00	77.4966	9.05425	289.772	2043.96	341.005
2012.00	79.6515	9.30602	297.829	2100.80	350.488
2013.00	81.8409	9.56181	306.015	2158.54	360.121
2014.00	84.0639	9.82154	314.328	2217.17	369.904
2015.00	86.3204	10.0852	322.765	2276.69	379.833
2016.00	88.6097	10.3527	331.326	2337.07	389.906
2017.00	90.9313	10.6239	340.006	2398.30	400.122
2018.00	93.2846	10.8993	348.805	2460.36	410.477
2019.00	95.6637	11.1774	357.720	2523.25	420.968

Table 4-1 (3)

Region I

YEAR	WHORET	FIRE	SERVIC	GOVT
1977.00	461.330	146.031	412.413	304.699
1978.00	479.282	151.698	428.416	316.522
1979.00	497.723	157.534	444.899	328.700
1980.00	516.711	163.544	461.873	341.240
1981.00	536.256	169.731	479.343	354.143
1982.00	556.367	176.096	497.320	367.429
1983.00	577.051	182.642	515.808	381.089
1984.00	598.316	189.373	534.817	395.133
1985.00	620.172	196.291	554.353	409.567
1986.00	642.624	203.397	574.422	424.394
1987.00	665.681	210.695	595.032	439.621
1988.00	689.350	218.186	616.189	455.252
1989.00	713.636	225.873	637.898	471.291
1990.00	738.549	233.758	660.166	487.743
1991.00	764.039	241.842	682.996	504.611
1992.00	790.267	250.128	706.396	521.899
1993.00	817.036	258.616	730.368	539.610
1994.00	844.550	267.309	754.918	557.749
1995.00	872.665	276.207	780.049	576.315
1996.00	901.433	285.313	805.764	595.314
1997.00	930.859	294.626	832.066	614.747
1998.00	950.944	304.149	858.959	634.615
1999.00	991.691	313.880	886.443	654.921
2000.00	1023.10	323.822	914.520	675.665
2001.00	1055.14	333.974	943.191	696.848
2002.00	1087.92	344.337	972.457	718.470
2003.00	1121.32	354.910	1002.32	740.531
2004.00	1155.39	365.694	1032.77	763.031
2005.00	1190.12	376.687	1063.82	785.968
2006.00	1225.52	387.889	1095.45	809.342
2007.00	1261.57	399.299	1127.68	833.150
2008.00	1298.27	410.917	1160.49	857.390
2009.00	1335.63	422.740	1193.38	882.059
2010.00	1373.53	434.767	1227.84	907.154
2011.00	1412.26	446.996	1262.38	932.672
2012.00	1451.54	459.426	1297.48	958.606
2013.00	1491.43	472.054	1333.15	984.954
2014.00	1531.95	484.876	1369.36	1011.71
2015.00	1573.07	497.892	1406.12	1038.87
2016.00	1614.79	511.097	1443.41	1066.42
2017.00	1657.09	524.487	1481.23	1094.36
2018.00	1699.98	538.061	1519.56	1122.63
2019.00	1743.43	551.812	1558.40	1151.37

Table 4-1 (4)

Region I

YEAR	LND	GAS	OIL	WATER	ELEC	INT	DIS
1977.00	.227120E+08	.180443E+10	.556052E+08	.523370E+11	.128962E+09	.151413E+08	.545348E+10
1978.00	.237206E+08	.188456E+10	.580745E+08	.546612E+11	.134689E+09	.158137E+08	.569567E+10
1979.00	.336162E+08	.267070E+10	.823016E+08	.774644E+11	.190878E+09	.224108E+08	.807174E+10
1980.00	.338711E+08	.269100E+10	.829258E+08	.780519E+11	.192326E+09	.225807E+08	.813296E+10
1981.00	.246434E+08	.195787E+10	.603337E+08	.567877E+11	.139929E+09	.164289E+08	.591724E+10
1982.00	.261184E+08	.207506E+10	.639451E+08	.601868E+11	.148305E+09	.174123E+08	.627142E+10
1983.00	.355260E+08	[illegible]	.869774E+08	.818053E+11	.201722E+09	.236640E+08	.853032E+10
1984.00	.254007E+08	.201804E+10	.621878E+08	.585328E+11	.144229E+09	.169338E+08	.609908E+10
1985.00	.257613E+08	.204669E+10	.630707E+08	.593637E+11	.146277E+09	.171742E+08	.618567E+10
1986.00	.261147E+08	.207477E+10	.639359E+08	.601781E+11	.148283E+09	.174098E+08	.627052E+10
1987.00	.264604E+08	.210224E+10	.647824E+08	.609749E+11	.150247E+09	.176403E+08	.635355E+10
1988.00	.267981E+08	.212907E+10	.656092E+08	.617531E+11	.152164E+09	.178654E+08	.643463E+10
1989.00	.271273E+08	.215522E+10	.664152E+08	.625117E+11	.154033E+09	.180849E+08	.651368E+10
1990.00	.274477E+08	.218067E+10	.671994E+08	.632498E+11	.155852E+09	.182984E+08	.659059E+10
1991.00	.277587E+08	[illegible]	.679606E+08	[illegible]	.157618E+09	.185058E+08	.666527E+10
1992.00	.280599E+08	.222931E+10	.686965E+08	.646607E+11	.159329E+09	.187066E+08	.673761E+10
1993.00	.283511E+08	.225245E+10	.694113E+08	.653317E+11	.160982E+09	.189007E+08	.680753E+10
1994.00	.286318E+08	.227475E+10	.700986E+08	.659785E+11	.162576E+09	.190879E+08	.687492E+10
1995.00	[illegible]	.229619E+10	.707592E+08	.666003E+11	.164108E+09	.192678E+08	.693971E+10
1996.00	.291603E+08	.231673E+10	.713924E+08	.671963E+11	.165577E+09	.194402E+08	.700181E+10
1997.00	.294073E+08	.233636E+10	.719972E+08	.677656E+11	.166979E+09	.196049E+08	.706114E+10
1998.00	[illegible]	.235504E+10	.725730E+08	.683075E+11	.168315E+09	.197617E+08	.711760E+10
1999.00	[illegible]	.237276E+10	.731109E+08	.688213E+11	.169601E+09	.199103E+08	.717114E+10
2000.00	.300759E+08	.238948E+10	.736341E+08	.693063E+11	.170776E+09	.200506E+08	.722167E+10
2001.00	.302735E+08	.240518E+10	.741180E+08	.697617E+11	.171898E+09	.201824E+08	.726913E+10
2002.00	.304581E+08	.241985E+10	.745699E+08	.701871E+11	.172946E+09	.203054E+08	.731345E+10
2003.00	[illegible]	[illegible]	.749892E+08	.705817E+11	.173919E+09	.204196E+08	.735457E+10
2004.00	.307871E+08	.244598E+10	.753753E+08	.709451E+11	.174814E+09	.205247E+08	.739244E+10
2005.00	.309310E+08	.245741E+10	.757276E+08	.712767E+11	.175631E+09	.206207E+08	.742699E+10
2006.00	.310609E+08	.246774E+10	.760457E+08	.715761E+11	.176369E+09	.207073E+08	.745810E+10
2007.00	[illegible]	.247693E+10	.763291E+08	.718429E+11	.177026E+09	.207845E+08	.748599E+10
2008.00	.312781E+08	.248499E+10	.765775E+08	.720767E+11	.177602E+09	.208521E+08	.751035E+10
2009.00	.313651E+08	.249190E+10	.767905E+08	.722771E+11	.178096E+09	.209101E+08	.753123E+10
2010.00	.314375E+08	.249766E+10	.769677E+08	.724439E+11	.178507E+09	.209583E+08	.754861E+10
2011.00	[illegible]	.250224E+10	.771089E+08	.725769E+11	.178835E+09	.209968E+08	.756247E+10
2012.00	.315381E+08	.250565E+10	.772140E+08	.726758E+11	.179079E+09	.210254E+08	.757277E+10
2013.00	.315662E+08	.250788E+10	.772828E+08	.727405E+11	.179238E+09	.210441E+08	.757952E+10
2014.00	.315794E+08	.250893E+10	.773152E+08	.727710E+11	.179313E+09	.210530E+08	.758269E+10
2015.00	.315776E+08	[illegible]	.773111E+08	.727671E+11	.179304E+09	[illegible]	.758229E+10
2016.00	.315612E+08	.250748E+10	.772705E+08	.727290E+11	.179210E+09	.210408E+08	.757832E+10
2017.00	.315298E+08	.250499E+10	.771936E+08	.726565E+11	.179031E+09	.210198E+08	.757077E+10
2018.00	.314835E+08	.250131E+10	.770803E+08	.725500E+11	.178768E+09	.209890E+08	.755966E+10
2019.00	.314225E+08	.249646E+10	.769310E+08	.724094E+11	.178422E+09	.209483E+08	.754501E+10

Table 4-2 (1)

Baseline Summary Tables
Region II

YEAR	POPULA	EMPLOY	PERINC	EARN
1977	6422.	2903.	31903.	26508.
1980	6662.	3090.	36260.	30084.
1985	7085.	3403.	44656.	36939.
1990	7538.	3715.	54644.	45040.
1995	8024.	4020.	66438.	54531.
2000	8545.	4312.	80264.	65560.
2005	9104.	4584.	96346.	78267.
2010	9704.	4830.	114913.	92782.
2015	10349.	5045.	136184.	109218.

Table 4-2 (2)

Region II

YEAR	AGR	MNG	CONSTR	MFG	TRANS
1977	49.05	1.57	111.51	373.50	128.83
1980	55.67	1.78	126.55	423.89	146.21
1985	68.36	2.19	155.39	520.48	179.54
1990	83.35	2.67	189.47	634.62	218.90
1995	100.91	3.23	229.40	768.35	265.03
2000	121.32	3.89	275.79	923.75	318.64
2005	144.84	4.64	329.25	1102.80	380.40
2010	171.70	5.50	390.31	1307.32	450.94
2015	202.11	6.48	459.45	1538.90	530.83

Table 4-2 (3)

Region II

YEAR	WHORET	FIRE	SERVIC	GOVT
1977	482.91	143.12	518.15	806.45
1980	548.06	162.43	588.05	915.25
1985	672.96	199.45	722.06	1123.83
1990	820.53	243.18	880.40	1370.26
1995	993.44	294.43	1065.93	1659.03
2000	1194.37	353.98	1281.52	1994.57
2005	1425.86	422.59	1529.90	2381.16
2010	1690.30	500.96	1813.63	2822.76
2015	1989.73	589.70	2134.91	3322.80

Table 4-2 (4)

Region II

YEAR	LND	GAS	OIL	WATER	ELEC	INT	DIS
1977	.438481E+08	.348366E+10	.107352E+09	.101043E+12	.248977E+09	.292321E+08	.105286E+11
1980	.562862E+08	.447184E+10	.137804E+09	.129705E+12	.319602E+09	.375242E+08	.135152E+11
1985	.108885E+09	.865072E+10	.266580E+09	.250912E+12	.618266E+09	.725899E+08	.261449E+11
1990	.250664E+09	.199149E+11	.613696E+09	.577626E+12	.142331E+10	.167110E+09	.601883E+11
1995	.300005E+09	.238349E+11	.734494E+09	.691325E+12	.170348E+10	.200003E+09	.720356E+11
2000	.252603E+09	.200689E+11	.618443E+09	.582094E+12	.143432E+10	.168402E+09	.606538E+11
2005	.141599E+09	.112498E+11	.346673E+09	.326298E+12	.804021E+09	.943993E+08	.340000E+11
2010	.650698E+08	.516968E+10	.159309E+09	.149946E+12	.369477E+09	.433799E+08	.156242E+11
2015	.473471E+08	.376164E+10	.115919E+09	.109106E+12	.268844E+09	.315647E+08	.113687E+11

Table 4-3 (1)

Baseline Summary Tables
Region III

YEAR	POPULA	EMPLOY	PERINC	EARN
1977	6849.	3106.	32828.	27441.
1980	7068.	3236.	37139.	30993.
1985	7460.	3588.	45446.	37800.
1990	7888.	3886.	55347.	45854.
1995	8357.	4177.	67084.	55325.
2000	8871.	4455.	80925.	66393.
2005	9434.	4715.	97157.	79247.
2010	10052.	4950.	116091.	94080.
2015	10731.	5157.	138057.	111089.

Table 4-3 (2)

Region III

YEAR	AGR	MNG	CONSTR	MFG	TRANS
1977	44.87	1.45	111.02	318.19	132.96
1980	50.68	1.64	125.39	359.38	150.17
1985	61.81	2.00	152.94	438.31	183.15
1990	74.98	2.42	185.52	531.71	222.17
1995	90.46	2.92	223.84	641.53	268.06
2000	108.56	3.51	268.62	769.87	321.69
2005.	129.58	4.19	320.63	918.92	383.97
2010	153.83	4.97	380.64	1090.92	455.84
2015	181.65	5.87	449.46	1288.15	530.25

Table 4-3 (3)

Region III

YEAR	WHORET	FIRE	SERVIC	GOVT
1977	499.94	143.62	526.54	915.59
1980	564.65	162.22	594.70	1034.11
1985	688.67	197.84	725.32	1261.24
1990	835.41	240.00	879.86	1529.97
1995	1007.96	289.57	1061.60	1845.99
2000	1209.61	347.50	1273.98	2215.29
2005	1443.79	414.78	1520.62	2644.17
2010	1714.04	492.42	1805.25	3139.11
2015	2023.92	581.44	2131.62	3706.63

Table 4-3 (4)

Baseline Summary Tables
Region III

YEAR	LND	GAS	OIL	WATER	ELEC	INT	DIS
1977	.451975E+03	.359086E+10	.110656E+09	.104152E+12	.256639E+09	.301317E+08	.108526E+11
1980	.573654E+08	.455758E+10	.140446E+09	.132192E+12	.325730E+09	.382436E+08	.137743E+11
1985	.108736E+09	.863892E+10	.266217E+09	.250570E+12	.617423E+09	.724909E+08	.261092E+11
1990	.248374E+09	.197329E+11	.608089E+09	.572349E+12	.141031E+10	.165583E+09	.596384E+11
1995	.296540E+08	.235596E+11	.726012E+09	.683341E+12	.168380E+10	.197693E+09	.712037E+11
2000	.249962E+09	.198591E+11	.611976E+09	.576007E+12	.141932E+10	.166641E+09	.600196E+11
2005	.140897E+09	.111941E+11	.344956E+09	.324681E+12	.800038E+09	.939316E+08	.338316E+11
2010	.656994E+08	.521971E+10	.160850E+09	.151396E+12	.373052E+09	.437996E+08	.157754E+11
2015	.432642E+08	.383451E+10	.118164E+09	.111219E+12	.274052E+09	.321761E+08	.115890E+11

ADDITIONAL ANALYSES
BASELINE SUMMARY TABLES[1]
REGIONS IV, V AND RT

Table 4-4 (1) Table 4-5 (1) Table 4-6 (1)	Baseline population (POPULA); employment (EMPLOY); personal income (PERINC); and earnings (EARN) in thousands of jobs and millions of dollars.
Table 4-4 (2) Table 4-5 (2) Table 4-6 (2)	Baseline employment in agriculture (AGR); mining (MNG); construction (CONSTR); manufacturing (MFG); and transportation, communications and public utilities (TRANS) in thousands of jobs.
Table 4-4 (3) Table 4-5 (3) Table 4-6 (3)	Baseline employment in wholesale and retail trade (WHORET); finance, insurance and real estate (FIRE); services (SERVIC); and government (GOVT) in thousands of jobs.
Table 4-4 (4) Table 4-5 (4) Table 4-6 (4)	Baseline use of acres of land (LND)(millions); thousands of cubic feet of natural gas (GAS); thousands of barrels of oil (OIL); thousands of gallons of water (WATER); thousands of kilowatt-hours of electricity (ELEC); thousands of gallons of water purchased from utilities (INT); and thousands of gallons of discharge into sewers (DIS).

[1] The regional total (RT) tables are the sum of the additional analyses Regions IV and V, and Regions I and II from the previous set. This is the total Baltimore Canyon Trough economic impact region as defined in Chapter 2, Location Analysis.

Table 4-4 (1)

Baseline Summary Tables
Region IV

YEAR	POPULA	EMPLOY	PERINC	EARN
1977	6883.	3051.	33200.	25330.
1980	7079.	3224.	37545.	28596.
1985	7410.	3499.	45730.	34735.
1990	7744.	3752.	55164.	41795.
1995	8081.	3976.	65903.	49817.
2000	8420.	4164.	77977.	58820.
2005	8760.	4308.	91377.	68796.
2010	9100.	4404.	106051.	79708.
2015	9438.	4449.	121897.	91479.

Table 4-4 (2)

Region IV

YEAR	AGR	MNG	CONSTR	MFG	TRANS
1977	29.09	3.40	108.79	767.37	128.03
1980	32.84	3.84	122.81	866.28	144.53
1985	39.90	4.66	149.18	1052.26	175.56
1990	48.01	5.61	179.50	1266.15	211.24
1995	57.22	6.69	213.95	1509.17	251.78
2000	67.56	7.89	252.62	1781.93	297.29
2005	79.02	9.23	295.46	2084.12	347.71
2010	91.55	10.70	342.33	2414.70	402.86
2015	105.07	12.28	392.88	2771.29	462.35

Table 4-4 (3)

Region IV

YEAR	WHORET	FIRE	SERVIC	GOVT
1977	530.21	167.82	473.90	350.20
1980	598.55	189.45	535.00	395.30
1985	727.06	230.12	649.90	480.20
1990	874.85	276.90	782.00	577.80
1995	1042.75	330.04	932.10	688.60
2000	1231.21	389.69	1100.50	813.10
2005	1440.00	455.78	1287.20	951.00
2010	1668.43	528.07	1491.30	1101.80
2015	1914.81	606.06	1711.60	1264.60

Table 4-4 (4)

Region IV

YEAR	LND	GAS	OIL	WATER	ELEC	INT	DIS
1977	.265462E+08	.210905E+10	.649924E+08	.611725E+11	.150733E+09	.176974E+08	.637413E+10
1980	.397532E+08	.315832E+10	.973268E+08	.916064E+11	.225726E+09	.265021E+08	.954534E+10
1985	.304398E+08	.241839E+10	.745248E+08	.701446E+11	.172842E+09	.202932E+08	.730904E+10
1990	.326459E+08	.259366E+10	.799260E+08	.752284E+11	.185368E+09	.217639E+08	.783875E+10
1995	.345952E+08	.274854E+10	.846987E+08	.797204E+11	.196437E+09	.230635E+08	.830682E+10
2000	.362252E+08	.287803E+10	.886893E+08	.834767E+11	.205693E+09	.241502E+08	.869822E+10
2005	.374801E+08	.297772E+10	.917615E+08	.863682E+11	.212818E+09	.249868E+08	.899952E+10
2010	.383175E+08	.304426E+10	.938118E+08	.882980E+11	.217573E+09	.255450E+08	.920059E+10
2015	.387068E+08	.307518E+10	.947648E+08	.891950E+11	.219783E+09	.258044E+08	.929406E+10

Table 4-5 (1)

Region V

YEAR	POPULA	EMPLOY	PERINC	EARN
1977	19464.	8497.	109849.	84909.
1980	19932.	8954.	122718.	95165.
1985	20732.	9690.	146713.	114360.
1990	21558.	10377.	174077.	136342.
1995	22413.	10997.	204989.	161269.
2000	23295.	11532.	239569.	189247.
2005	24205.	11967.	277875.	220336.
2010	25146.	12290.	319870.	254506.
2015	26116.	12490.	365441.	291651.

Table 4-5 (2)

Region V

YEAR	AGR	MNG	CONSTR	MFG	TRANS
1977	97.53	11.39	364.67	2572.26	429.15
1980	109.31	12.77	408.72	2882.96	480.98
1985	131.35	15.35	491.15	3464.46	578.00
1990	156.60	18.30	585.56	4130.36	689.10
1995	185.23	21.64	692.62	4885.54	815.08
2000	217.37	25.40	812.78	5733.11	956.49
2005	253.08	29.57	946.30	6674.93	1113.62
2010	292.33	34.15	1093.06	7710.09	1286.32
2015	334.99	39.14	1252.58	8835.36	1474.05

Table 4-5 (3)

Region V

YEAR	WHORET	FIRE	SERVIC	GOVT
1977	1777.29	562.53	1588.70	1173.70
1980	1991.97	630.48	1780.60	1315.50
1985	2393.75	757.65	2139.70	1580.90
1990	2853.87	903.28	2551.00	1884.70
1995	3375.64	1068.42	3017.40	2229.30
2000	3961.25	1253.78	3540.80	2616.00
2005	4611.99	1459.75	4122.60	3045.80
2010	5327.26	1686.13	4761.90	3518.20
2015	6104.76	1932.21	5456.90	4031.60

Table 4-5 (4)

Region V

YEAR	LND	GAS	OIL	WATER	ELEC	INT	DIS
1977	.739247E+08	.587320E+10	.130988E+09	.170351E+12	.419756E+09	.492831E+08	.177504E+11
1980	.110426E+09	.877314E+10	.270353E+09	.254463E+12	.627017E+09	.736171E+08	.265149E+11
1985	.843023E+08	.669767E+10	.206395E+09	.194264E+12	.478683E+09	.562016E+08	.202422E+11
1990	.902790E+08	.717251E+10	.221028E+09	.208037E+12	.512618E+09	.601859E+08	.216773E+11
1995	.956694E+08	.760079E+10	.234225E+09	.220459E+12	.543226E+09	.637798E+08	.229716E+11
2000	.100328E+09	.797086E+10	.245630E+09	.231193E+12	.569677E+09	.668851E+08	.240901E+11
2005	.104116E+09	.827179E+10	.254904E+09	.239922E+12	.591185E+09	.694105E+08	.249997E+11
2010	.106920E+09	.849465E+10	.261771E+09	.246385E+12	.607110E+09	.712801E+08	.256731E+11
2015	.108661E+09	.863289E+10	.266031E+09	.250395E+12	.616993E+09	.724401E+08	.260910E+11

Table 4-6 (1)

Regional Total (RT)

YEAR	POPULA	EMPLOY	PERINC	EARN
1977	38911.	17062.	203639.	158789.
1980	39993.	18014.	228885.	178530.
1985	41784.	19553.	276330.	215662.
1990	43650.	20999.	330945.	258461.
1995	45568.	22315.	393192.	307308.
2000	47542.	23464.	463421.	362505.
2005	49570.	24414.	541853.	424256.
2010	51656.	25138.	628528.	492620.
2015	53800.	25613.	723314.	567500.

Table 4-6 (2)

Regional Total (RT)

YEAR	AGR	MNG	CONSTR	MFG	TRANS
1977	200.99	19.32	679.63	4380.88	797.41
1980	226.18	21.71	764.10	4920.95	896.49
1985	273.64	26.17	922.97	5934.77	1082.83
1990	328.48	31.31	1106.07	7100.02	1297.57
1995	391.25	37.16	1315.02	8426.05	1542.62
2000	462.39	43.74	1551.11	9919.52	1819.45
2005	542.24	51.07	1815.20	11584.31	2129.09
2010	630.95	59.16	2107.54	13420.15	2471.80
2015	728.50	67.98	2427.68	15422.23	2847.06

Table 4-6 (3)

Regional Total (RT)

YEAR	WHORET	FIRE	SERVIC	GOVT
1977	3251.80	1019.50	2993.20	2635.00
1980	3655.29	1145.90	3365.50	2967.30
1985	4413.94	1383.51	4066.00	3594.40
1990	5287.79	1657.12	4873.60	4320.50
1995	6284.50	1969.10	5795.40	5153.30
2000	7409.93	2321.27	6837.40	6099.40
2005	8667.98	2714.80	8003.50	7163.90
2010	10059.62	3149.93	9294.70	8349.90
2015	11582.36	3625.86	10709.50	9657.90

Table 4-6 (4)

Regional Total (RT)

YEAR	LND	GAS	OIL	WATER	ELEC	INT	DIS
1977	.167031E+09	.132703E+11	.408938E+09	.384903E+12	.948428E+09	.111354E+09	.401066E+11
1980	.746912E+09	.190943E+11	.588409E+09	.553826E+12	.136467E+10	.160224E+09	.577084E+11
1985	.249388E+09	.198135E+11	.610570E+09	.574684E+12	.141607E+10	.166259E+09	.598818E+11
1990	.401036E+09	.318617E+11	.981849E+09	.924141E+12	.227715E+10	.267358E+09	.962949E+11
1995	.459171E+09	.364804E+11	.112418E+10	.105810E+13	.260725E+10	.306114E+09	.110254E+12
2000	.419231E+09	.333073E+11	.102640E+10	.966070E+12	.238047E+10	.279488E+09	.100664E+12
2005	.314126E+09	.249567E+11	.769065E+09	.723865E+12	.178365E+10	.209417E+09	.754262E+11
2010	.241745E+09	.192063E+11	.591859E+09	.557073E+12	.137267E+10	.161163E+09	.580466E+11
2015	.226292E+09	.179785E+11	.554025E+09	.521463E+12	.128492E+10	.150861E+09	.543360E+11

SECTION 5

RESULT 5
ESTIMATED INDUSTRY OUTPUT MULTIPLIERS FOR THE REGION OF IMPACT

The relationship between the total indirect and induced activities stimulated by OCS activity, and the OCS direct or primary activity is expressed as a set of multipliers. In this application only simulated input-output multipliers are used. For a variety of reasons discussed in Appendices A and B of Volume II, Chapter 3, these multipliers are probably slight overstatements of what can actually be expected. However, the overall multiplier impacts produced are quite similar in magnitude to those obtained from Curtis Harris' methodology (after adjusting for a number of differences). In this application the multipliers were held constant over the whole period of development.

5.1 DATA INPUTS

Information was derived from the 1972 U.S. input-output tables, the Department of Commerce, and the regions of impact established in Result 2. Employment estimates for the regions and for the U.S. were obtained from the OBERS projections and *County Business Patterns*.

5.2 PROCEDURE

The detailed procedure for obtaining regional industrial output multipliers is described in Volume II, Chapter 3.

5.3 RESULTS

From this procedure a 25 x 25 matrix of multipliers for each region of impact is developed. These are then used to multiply the primary requirements of Result 6.

SECTION 6

RESULT 6
CONVERTING INDUSTRY REQUIREMENTS TO ECONOMIC TERMS

The industry requirements specify the amounts of men, materials and transportation services that will be required for each OCS-related activity. These are all measured in terms of physical quantities, such as number of men and tons of steel. This part of the methodology converts these physical quantities into economic terms, and assigns each of the activities to one of the industrial sectors used in the study. It is also used to sort the activities into those which generate a demand for inputs and those which are themselves inputs to the first kind of activity. (Industrial sectors are shown in Table 6-1.)

6.1 DATA INPUTS

Information used in this procedure was established in the industry requirements which include the temporal pattern of development.

Prices were derived for a number of the physical inputs including: steel (tubular carbon, tubular alloy, and pipe), drilling mud, cement, concrete, diesel fuel, food, water and electricity. Because prices vary so frequently, they should be obtained for each application. (The set used in this test case is shown in Table 6-2.) Possible sources are listed below:

- Steel, drilling mud, cement - American Petroleum Institute (API); or the off-shore division of a major oil company.
- Diesel fuel and concrete - Local firms supplying these products in bulk.
- Water and electricity - Local utilities can supply schedules for these.
- Food - The cost of a ton of food can be estimated by an oil company.

Other services need to be priced as well and these are best obtained from the API or an oil company. Included are helicopter and boat trips to the off-shore area.

Prices for oil and gas produced are also used in this procedure. These should be based on latest Federal government forecasts or API estimates.

Table 6-1

Industrial Sectors

1. Agriculture
2. Metal Mining
3. Nonmetallic Mining
4. Petroleum and Natural Gas
5. Construction
6. Food and Kindred Products
7. Textiles
8. Paper and Allied Products
9. Printing and Publishing
10. Chemicals and Allied Products
11. Petroleum and Related Products
12. Primary Metals
13. Fabricated Metals
14. Nonelectrical Machinery
15. Electrical Machinery
16. Motor Vehicles and Parts
17. Other Transportation Equipment
18. Other Manufacturing
19. Transportation and Warehousing
20. Communications
21. Utilities
22. Wholesale and Retail Trade
23. Finance, Insurance, Real Estate
24. Services
25. Households

Table 6-2

Prices Assumed For Baltimore Canyon Development

Item	Price
Crude Petroleum	$11/barrel
Natural Gas	$1/1000 cubic feet
Helicopter Trips	$400/each
Supply and Crew Boat Use	$80,000/year each
Food	$1,500/ton
Steel (all kinds)	$700/ton
Concrete	$70/ton
Drilling Mud (net)	$100/ton
Diesel Fuel	$31.50/barrel
Electric Power	$.05/kilowatt-hour
Water	$9,169 for first 3.1 million gallons

6.2 PROCEDURE

The way in which the industry requirements are converted to a matrix of primary effects for each industry in each year is described in the following paragraphs by indicating the appropriate treatment of each of the Impact Assessment Summary Sheets from the industry requirements chapter.

6.2.1 Converting Base Information Summary Sheet - Oil and Gas Production

Full Development Case

The Base Information Summary Sheet (Chapter 1), gives oil and gas production rates for the duration of OCS activity. The entire production in each year is treated as an increase in final demand for Sector 4, Petroleum and Natural Gas Mining. The value of the increased final demand is calculated as the product of the quantity of oil times the assumed price of oil, plus the quantity of gas times the price of gas.

Even though the industry requirements treat separately many of the activities undertaken to produce the oil and gas each year (such as offshore oil and gas production jobs), these separate activities cannot be counted in addition to the value of the oil and gas produced. This would result in double counting because the input-output relationships used to determine the indirect and induced effects of OCS activity assume that oil and gas output will require certain amounts of production activity. A possible alternative approach would be to account for oil and gas production entirely in terms of its inputs, rather than in terms of its output.

However, the industry requirements do not list all requirements for production in each year, and the use of the inputs provided would omit some of the production requirements. The approach taken here is to account for oil and gas production in terms of the value of output and then to make several modifications.

One modification is to add the extensive use of water and air transportation in offshore activities as a direct stimulus to final demand. The U.S. input-output relationships are based primarily upon onshore production and do not adequately account for this special characteristic of offshore production. Similarly, the offshore production process requires that food be applied to the offshore workers, while onshore workers satisfy their own food requirements with their incomes. Thus, there is a direct final demand stimulus to account for supplying food to offshore workers. For several other areas, the amount of activities normally required per dollar of output in the U.S. input-output relationships were checked against their levels in the offshore case to determine whether or not the offshore requirements differed from those normally encountered onshore. The results, in general, indicated that offshore

...y did not require excessive amounts of these activities. For example, the products implied by service bases for offshore production did not differ substantially from the products required for onshore production, and thus, no special treatment of service bases was necessary (except for the transportation aspect noted previously).

The most significant area in which the value of output stimulus fails to account for the full range of OCS-related activity is in the capital investments required for offshore production. The construction of platforms, pipelines, gas processing plants, etc. are not subsumed under oil and gas production as normal inputs and are accounted for separately (discussed in the following paragraphs). Figure 6-1 illustrates the idealized process.

Aborted-Development Case

In the case where oil and gas production does not begin because of no significant finds, the input approach to accounting for all activity must be followed even though it is recognized that some activities will not be included.

6.2.2 Converting Impact Assessment Summary Sheets Nos. 3, 4 and 5 - Offshore, Onshore and Construction Jobs

Since these summary sheets deal in jobs and the required inputs to the economic analysis are values which are provided in Impact Assessment Summary Sheets Nos. 6, 7 and 8, no information is required.

6.2.3 Converting Impact Assessment Summary Sheets Nos. 6, 7 and 8 - Offshore, Onshore and Construction Salaries

Most of the salaries obtained from these summary sheets are included as part of the value of final output of other industries. The exceptions are drilling-type activities, including exploratory or mobile drilling, development drilling and well-workover activity. These activities are not part of the value of normal oil and gas production activity, nor are they included in the value of capital facilities such as platforms and pipelines. They are essentially investment-type activities and the value of the salaries and materials used should be added as direct stimuli to final demand. The salaries paid are thus added to final demand for Sector 25, Households.

6.2.4 Converting Impact Assessment Summary Sheet No. 2 - Materials

The materials used in excess of those normally expected as part of oil and gas production or construction of capital facilities must be accounted for separately. Thus, the physical quantities of each kind of material are multiplied by their prices and the resulting values are reduced by any normally expected amounts before being added to the final demands for the appropriate sectors. Excess value of steel is

1. Normal inputs from all industries for production of amount F of oil and gas (from U.S. Input-Output Tables): N = [1 | 2 | ... | n]

2. Actual inputs from some industries for production of amount F of oil and gas (from industry requirements): A = [1 | 2 | ... | m]

3. Negative differences = excess requirements for offshore oil and gas production from some industries: E = [1 | 2 | ... | m]

4. Investment requirements for some industries for developing OCS oil and gas (from industry requirements): I = [1 | 2 | ... | k]

5. Final demand stimulus for this year: F + E + I

FIGURE 6-1 IDEALIZED PROCESS FOR ACCOUNTING FOR PRIMARY OCS ACTIVITY

added to Sector 12, Primary Metals; food is added to Sector 6, Food and Kindred Products; mud is added to Sector 10, Chemicals and Allied Products; cement is added to Sector 18, Other Manufacturing; and fuel is added to Sector 11, Petroleum and Related Products. The values of the materials used in exploratory or mobile drilling, development drilling and well-workover activities are included in the materials not elsewhere included.

6.2.5 Converting Impact Assessment Summary Sheet No. 9 - Transportation

Transportation by tugs, supply boats, crew boats and helicopters could require capital expenditures if new vehicles are required. In many cases, the number of vehicles required will be small enough so that existing fleets will be adequate to supply the OCS needs from excess capacity. If new vehicles are required then Sector 17, Other Transportation Equipment, will be stimulated by their values which should be obtained from the API. The stimulation of Sector 4, Crude Oil and Natural Gas Mining, by the value of output of these quantities each year automatically (through the input-output relationships) accounts for most inputs, including some transportation inputs. However, OCS development requires the use of far more air and water transportation than the industry requirements for the economy as a whole would predict. The transportation and warehousing industry (Sector 19) is stimulated separately by the value of the trips made, and prices per trip made by each vehicle are required. Note that the values of the commodities transported are accounted for elsewhere.

Derrick barges are used in platform installation activity and their value is included in the cost of platforms as part of Sector 17, Other Transportation Equipment.

6.2.6 Converting Impact Assessment Summary Sheet No. 10 - Onshore Facilities Requirements

The land, power and water used by various facilities are part of the inputs to other activities. These commodities are used in gas processing plants, crude oil stabilization, pump stations, compressor stations, tank farms and tank terminals as inputs to the petroleum and natural gas mining industry (Sector 4) and do not need to be accounted for separately. However, when these inputs are used in pipe-coating yards, they are part of an investment process and are accounted for as inputs to Sector 5, Construction.

In service bases these inputs are part of the costs used in calculating value added and are included as part of wholesale and retail trade which service base activities most closely resemble. Fabrication yard activity provides inputs to platform construction. Helicopter base activities are included as part of Sector 19, Transportation and Warehousing activity. In the abort development case, the value of power and water used are considered as final demand additions to Sector 21, Utilities.

6.2.7 Converting Impact Assessment Summary Sheet No. 11 - Capital Costs

The capital costs are assumed to be the total dollar value of a physical installation or facility when completed. The dollars are used to acquire land, construct facilities, and install capital equipment. Some OCS support activities require construction that is indistinguishable in terms of input requirements for many other types of industrial construction. Examples are service bases and helicopter bases. For these, the entire capital cost can be allocated as an increase in final demand for Sector 5, Construction. Other OCS-related activities require facilities whose construction is completely different from normal construction. An example is platform fabrication, which resembles shipbuilding more than construction, and is thus included as a final demand stimulus for Sector 17, Other Transportation Equipment, which includes shipbuilding. Still other facilities, such as compressor stations, require a combination of normal industrial construction and large quantities of special inputs such as fabricated metals (Sector 13) for tanks and nonelectrical machinery (Sector 14) for pumps and compressors. Table 6-3 indicates the percentage of each capital facility's cost which is treated as a final demand for each impact sector.

Table 6-3

Capital Facility Cost Distribution

Facility	Sector (percent)
Service Base	5 (100%)
Fabrication Yard	5 (100%)
Pipe-Coating Yard	5 (100%)
Helicopter Base	5 (100%)
Platform	17 (100%)
Compressor Station	5 (60%), 13 (20%), 14 (20%)
Pump Station	5 (60%), 13 (20%), 14 (20%)
Tanker Mooring	5 (80%), 13 (10%), 14 (10%)
Tanker Terminal	5 (60%), 13 (20%), 14 (20%)
Gas Processing Plant	5 (70%), 13 (20%), 14 (10%)
Tank Farms	5 (60%), 13 (30%), 14 (10%)
Pipeline	5 (20%), 13 (20%) (The remaining 60% occurs as part of pipe-coating activity.)

The dollar values to be allocated are obtained from Impact Assessment Summary Sheet No. 11.

6.2.8 Converting Impact Assessment Summary Sheet No. 12 - Environmental Factors

The economic impact assessment methodology does not consider the economic impacts of environmental residuals. These factors have an influence on the economic impacts by possibly causing a change in location, or higher costs to reduce environmental damage.

6.3 RESULTS

The results of applying the procedures discussed in the previous paragraphs to the Baltimore Canyon full development and limited (no show or abort) development cases appear as entries in Tables 6-4 and 6-5. Each table lists the value of output generated by the primary activity for each industrial sector in each year of projected development.

For the Set 1 regions, the entire set of primary requirements affects each region in turn.

For the Set 2 regions, the primary requirements are allocated to Regions I, II, IV, V on the basis of the conclusions of the location analysis (Chapter 2).

Table 6-4

Full Development Case
Primary Requirements in Terms of Final Demand for Output
by Industry in Thousands of Dollars

Industry Sector	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1938	1989	1990
1														
2														
3														
4								77,745	206,590	404,420	683,755	1,034,045	1,442,845	1,918,075
5	33,048	26,158	26,158	42,658	26,158	214,418	188,260							
6	308	405	855	1,005	1,440	1,650	1,935	2,265	2,820	3,375	3,585	3,885	4,095	3,728
7														
8														
9														
10	900	1,200	2,400	3,000	4,050	4,650	5,760	6,560	7,841	8,675	7,868	6,350	3,530	
11	6,426	8,199	16,400	21,053	27,808	38,609	45,767	59,337	54,564	69,527	45,501	66,870	56,424	40,925
12	15,775	16,587	19,875	21,459	23,601	25,925	19,152	28,203	44,017	60,435	73,457	81,088	85,785	77,869
13						87,850	87,850							
14						49,330	49,330							
15														
16														
17				13,670	35,670	76,670	105,000	134,330	134,330	141,670	126,000	113,300	63,000	29,330
18	2,489	2,559	2,839	2,979	3,224	3,364	1,355	1,703	2,272	2,867	3,236	3,539	3,654	3,218
19	1,700	1,960	3,120	3,720	4,760	6,020	6,560	7,360	8,040	8,620	7,660	8,300	7,472	5,800
20														
21														
22														
23														
24														
25	2,232	2,976	5,952	7,440	10,416	13,214	13,878	15,852	15,108	15,022	12,132	12,790	9,986	6,577

Table 6-4
(continued)

Industry Sector	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
1														
2														
3														
4	2,281,980	2,660,850	2,879,850	3,055,050	3,024,025	3,038,990	3,020,375	3,021,470	2,999,570	2,890,435	2,707,205	2,475,430	2,187,810	1,888,145
5														
6	3,773	3,248	2,535	2,340	1,965	1,650	1,755	1,575	1,410	1,283	1,088	1,095	1,055	848
7														
8														
9														
10														
11	27,064	18,498	12,879											
12	72,764	52,593	30,977	16,551	10,285	5,999	9,222	6,027	2,371					
13														
14														
15														
16														
17	13,670	13,670	13,670	13,670	13,670	13,670								
18	3,129	2,370	1,479	929	659	417	526	338	195	59				
19	5,120	4,680	4,380	3,320	2,900	3,080	1,400	940	860	860	640	640	640	500
20														
21														
22														
23														
24														
25	5,658	5,658	6,161	5,295	5,001	4,604	2,319	1,575	1,125	450	675	1,125	900	450

Table 6-4
(continued)

Industry Sector	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1															
2															
3															
4	1,576,070	1,283,340	1,036,965	797,890	574,145	412,815	291,270	207,685	144,175	102,200	71,175	40,150	20,075		
5															
6	803	23													
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19	500	400	230	280	280	140	140	140	140	140	140	140	140	140	140
20															
21															
22															
23															
24															
25	675	225													

Table 6-5

Aborted Development Case
Primary Requirements in Terms of Final Demand for Output
by Industry in Thousands of Dollars

Industry Sector	1977	1978	1979	1980	1981	1982	1983
1							
2							
3							
4							
5	760						
6	305	214	399	214	309	161	66
7							
8							
9							
10	204	136	272	136	238	102	34
11	6,426	4,651	8,199	4,651	6,760	4,314	1,439
12	2,436	1,624	3,248	1,624	2,842	1,218	406
13							
14							
15							
16							
17							
18	210	140	280	140	245	105	35
19	900	640	1,160	640	1,040	600	300
20							
21	18	18	18	18	18	18	18
22							
23							
24							
25	6,271	4,510	8,032	4,510	7,526	4,376	2,219

SECTION 7

RESULT 7
TOTAL IMPACT OF DEVELOPMENT IN TERMS OF OUTPUT BY INDUSTRY

7.1 DATA INPUTS

The data for this procedure are taken from the industry requirements in terms of output from Result 6, and the industry output multiplier from Result 5.

7.2 PROCEDURE

Multiply the industry requirements for each of the 25 impact industries in each of the 42 years, times the 625 industry multipliers for each region.

For Regions IV and V of Set 2, the regional industry multipliers were taken from Guideline 5, Regional Multipliers, Industry-Specific Gross Output Multipliers For BEA Economic Areas, by the Regional Economic Analysis Division, BEA, U.S. Department of Commerce (January 1977).

The 56 WRC (Water Resource Council) Sectors were grouped under the first 24 of the 25 industries in the analysis of OCS activity; for industry 25 (Households), the value from Region I was used for both Regions IV and V of Set 2.

7.3 RESULTS

The results include direct (primary), indirect and induced impacts by each of the 25 industries for each of the 42 years. The 25 industries are aggregated to conform with the nine baseline industries for comparison, and for further processing these values are not reproduced in this report.

SECTION 8

RESULT 8
CONVERTING OUTPUT IMPACTS BY INDUSTRY TO EMPLOYMENT IMPACTS BY INDUSTRY

8.1 DATA INPUTS

The output by industry estimates are derived from the national input-output tables. Regional employment by industry is taken from County Business Patterns or Employment and Earnings, and price indexes for adjusting output estimates are from the Survey of Current Business. The productivity indexes by industry are from 1985: Interindustry Forecast of the American Economy. Impact output by industry was developed in Result 7.

8.2 PROCEDURE

The 1967 output is estimated as a ratio of regional employment to national employment times national output. This gives a crude approximation of regional output, assuming constant average output/employee throughout the whole nation. This regional output is then divided by employment numbers from Employment and Earnings to given regional output per regional employee. This number is then multiplied by the productivity index (1967 base) and the price index (1967 base) to give output/employee in 1975 dollars for the region. In this application the same ratios are used for all three regions because they are very similar and overlap geographically to such an extent that separate estimates are not worthwhile. Table 8-1 lists the 1975 output/employee for each of the 25 industries. The output/employee numbers by industry are multiplied by the impact output by industry estimates to get preliminary estimated employment by industry. These figures are reduced for future years to allow for productivity growth at an average rate of 2.9 percent per year by dividing the preliminary figures by (1.029)t where t is the number of years from the present.

8.3 RESULTS

The results are impact employment estimates for the nine OBERS industries (aggregated for the 25 industries data) for:

- Set 1 Regions -- Tables 11-2 (2 and 3) to 11-4 (2 and 3).
- Set 2 Regions -- Tables 11-8 (2 and 3) to 11-11 (2 and 3).

The impact employment estimates relate to the base case employment estimates referred to in Section 4.

Table 8-1

Producing Output per Employee Estimates

Sector	I-O Sectors	I-O Output Final Demand (millions of $)	Regional/National Employment
1	1-4	63,793	3,323/173,935
2	---	---	---
3	7, 9, 10	6,545	1,902/108,500
4	8	15,031	52/223,988
5	11, 12	103,280	67,697/2,962,733
6	14, 15	97,391	31,956/1,586,152
7	16-19	47,481	28,101/2,316,005
8	24, 25	22,764	10,409/641,409
9	26	22,118	17,563/1,029,091
10	27	23,182	16,421/876,201
11	28-32	56,704	10,411/645,123
12	37, 38	52,593	36,826/1,303,067
13	39-43	41,502	14,146/1,271,085
14	44-50	39,435	16,138/1,943,130
15	51-58	60,046	33,805/1,905,171
16	59-60	65,733	31,529/1,953,384
17	61	7,811	31,529/1,953,384
18	13, 20-23, 33-36, 62-64	72,610	14,486/1,286,674
19	65	52,823	18,009/986,901
20	66, 67	22,511	18,814/964,155
21	68	37,321	11,090/611,232
22	69	163,365	260,784/14,535,368
23	70, 71	160,964	59,354/3,201,271
24	72-77, 81-83	165,960	174,227/8,938,459
25	86	4,701	927,323/52,706,934

1975 Price Index	1967-1975 Productivity Rate: Rate	1967-1975 Productivity Rate: Clopper Almon #	1975 Regional Output/Employee
1.861	1.0206	[10]	8,424
---	---	---	---
1.969	1.0552	[15]	192,904
1.969	1.0396	[16]	137,510
1.984	1.0276	[18]	69,726
1.826	1.0142	[33]	106,894
1.379	1.0426	[37]	41,082
1.704	1.0553	[49]	96,827
1.704	1.0502	[58]	52,876
1.813	1.0402	[61]	64,979
2.515	1.0471	[69]	233,967
1.856	1.0347	[88]	87,119
1.856	1.0791	[101]	117,621
1.614	1.1036	[116]	73,151
1.407	1.0506	[130]	107,924
1.446	1.0505	[133]	54,576
1.446	1.1025	[139]	80,328
1.749	1.0622	[150]	72,129
1.678	1.0455	[151]	58,667
1.749	1.0696	[158]	120,321
1.678	1.0336	[161]	87,779
1.636	1.0447	[164]	25,886
1.85	1.053	[168]	139,556
1.666	1.0387	[170]	36,492
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SECTION 9

RESULT 9
CONVERTING EMPLOYMENT IMPACTS BY INDUSTRY TO OCCUPATIONAL IMPACTS

9.1 DATA INPUTS

Data inputs include employment impacts by industry from Result 8, and an industry-occupation matrix from the Bureau of Labor Statistics (shows occupational distribution for each industry; available for states and in the form of projections to 1985). This matrix is shown in Table 9-1.

9.2 PROCEDURE

Multiply the impact employment in each industry in each year by the percent distribution of employment by occupation for the industry. The occupational distribution used here has eight occupations and does not change from year to year.

9.3 RESULTS

The result, for each of the 42 years of development, is an 8 x 8 matrix of occupational impacts by industry. This is aggregated to the impact on each of the eight occupations in each year. The results are shown as follows:

- Set 1 Regions -- Tables 11-2 (5 and 6) to 11-4 (5 and 6).
- Set 2 Regions -- Tables 11-8 (5 and 6) to 11-11 (5 and 6).

Table 9-1

Industry-Occupation Percentage Matrix

	Professional	Managerial	Clerical	Sales	Craftsmen	Operations	Service	Laborers
Mining	8.84	10.57	11.08	.50	27.33	40.50	1.18	0.00
Construction	5.85	10.37	5.00	.31	51.29	8.94	.41	17.85
Manufacturing	11.30	5.64	12.55	1.74	22.07	39.83	1.36	5.52
Public Utilities	6.29	6.57	13.27	3.80	14.60	49.67	1.55	4.24
Trade	6.86	8.01	25.39	.98	21.34	25.10	2.93	9.39
Finance, Insurance, Real Estate	2.13	21.95	16.74	21.48	7.47	12.64	13.37	4.21
Services	3.00	21.70	48.31	17.86	1.73	.44	5.57	1.39
Government	35.80	6.49	15.33	.61	5.55	4.86	29.44	1.92

SECTION 10

RESULT 10
CONVERTING OCCUPATIONAL IMPACTS BY
INDUSTRY TO FAMILY INCOME DISTRIBUTION IMPACTS

10.1 DATA INPUTS

The occupational impacts by industry used are obtained from Result 9. An earnings by occupation by industry matrix from the Bureau of Labor Statistics gives the earnings, present or projected, of workers in various occupations by industry. Information conserning earners per family by income class is taken from the 1970 Census. (Table 10-1).

10.2 PROCEDURE

Occupational impacts are sorted into earnings classes using the industry-occupation-earnings matrix. Each earner is assumed to belong to a family whose income from all sources places it in the income class next above the earnings class. The number of earners in each income class is reduced to the number of families by dividing by the earners per family figure for each income class.

10.3 RESULTS

The results are the impacts on the number of families in each income class for each year of development. The results are shown as follows:

- Set 1 Regions -- Tables 11-2(7) to 11-4(7).
- Set 2 Regions -- Tables 11-8(7) to 11-11(7).

Table 10-1

Earners Per Family By Income Class

Income Class	Number of Earners
$ 4,000 - $ 8,000	1.47
8,000 - 10,000	1.73
10,000 - 15,000	2.15
15,000 - 25,000	2.07

SECTION 11

RESULT 11
IMPACT USE OF RESOURCES

11.1 DATA INPUTS

Data inputs are obtained from the Result 4 baseline values and employment impacts from Result 8. Resource use ratios from MERES appear in Table 11-1.

11.2 PROCEDURE

Multiply the yearly employment projections by the respective resource use ratios. This procedure will yield the resource use for each resource category per year.

This procedure assumes that productivity increases through time and that, consequently, increases in resource demand will be offset by a reduction in resource use through increased technological change.

11.3 RESULTS

The results appear as follows:

- Set 1 regions -- Tables 11-2(4) to 11-4(4).
- Set 2 regions -- Tables 11-8(4) to 11-11(4).

Table 11-1

Resource Use Ratios

Resource	Use per Employer
Land	8.7 acres
Gas	691.2 thousand cubic ft/year
Oil	21.3 thousand barrels/year
Water Use	20048.1 gallons/year
Electricity	49.4 thousand kilowatt hours/year
Intake of Water	5800.0 gallons/year
Discharge of Wastewater	2089.0 gallons/year

SUMMARY TABLES[1]

FULL DEVELOPMENT IMPACT
REGIONS I, II, III

Table 11-2 (1) Table 11-3 (1) Table 11-4 (1)	Population (POPIMP); employment (FMPIMP); personal income (INCIMP); and earnings (ERNIMP) in number of jobs and thousands of dollars.
Table 11-2 (2) Table 11-3 (2) Table 11-4 (2)	Employment in agriculture (AGRIMP); mining (MNGIMP); construction (CSTIMP); manufacturing (MFGIMP); and transportation, communication and public utilities (TRNIMP) in number of jobs.
Table 11-2 (3) Table 11-3 (3) Table 11-4 (3)	Employment in wholesale and retail trade (WRSIMP); finance, insurance and real estate (FIRIMP); services (SERIMP); and government (GVTIMP) in number of jobs.
Table 11-2 (4) Table 11-3 (4) Table 11-4 (4)	Use of acres of land (LNDI); thousands of cubic feet of natural gas (GASI); thousands of barrels of oil (OILI); thousands of gallons of water (WATERI); thousands of kilowatt-hours of electricity (ELECI); thousands of gallons of water purchased from utilities (INTI); and thousands of gallons of discharge into sewers (DISI).
Table 11-2 (5) Table 11-3 (5) Table 11-4 (5)	Number of jobs in professional (PROFES); managerial (MANAGE); clerical (CLERIC); sales (SALES); and craftsmen (CRAFTS) occupations.
Table 11-2 (6) Table 11-3 (6) Table 11-4 (6)	Number of jobs in operative (OPERAT); service (SERVIC); and laborer (LABOR) occupations.
Table 11-2 (7) Table 11-3 (7) Table 11-4 (7)	Number of families in income classes $4-8,000 (CLASSA); $8-10,000 (CLASSB); $10-15,000 (CLASSC); and $15-25,000 (CLASSD).

SUMMARY TABLES

ABORTED DEVELOPMENT IMPACT
REGIONS, I, II, III

Summary Tables 11-5, 11-6 and 11-7 show the aborted development impact for Regions I, II and III. These tables are categorized the same as those outlined above.

[1] Annual results are shown for Region I. For Regions II and III, five-year intervals are displayed.

Table 11-2 (1)

Summary Tables
Full Development Impact
Region I

YEAR	POPIMP	EMPIMP	INCIMP	ERNIMP
1977.00	5850.55	2436.85	27326.9	20997.5
1978.00	5115.79	2193.82	24673.1	18910.2
1979.00	5932.01	2565.47	29531.9	22579.1
1980.00	9012.04	3929.21	46297.2	35315.0
1981.00	9766.31	4291.13	51756.8	39392.1
1982.00	41032.4	18162.2	224249.	170317.
1983.00	38739.0	17287.3	218546.	165654.
1984.00	18677.6	9350.76	108454.	82051.0
1985.00	23334.0	10536.0	139595.	105423.
1986.00	30945.5	14055.5	190677.	143759.
1987.00	37491.9	17123.5	237853.	179051.
1988.00	46651.7	21417.5	304643.	228991.
1989.00	53252.4	24565.6	357823.	263603.
1990.00	61369.2	28435.4	424172.	313014.
1991.00	67399.2	31357.4	479054.	358757.
1992.00	74044.2	34576.9	541022.	404751.
1993.00	75006.1	35611.9	570723.	426586.
1994.00	76867.7	36122.9	592985.	442867.
1995.00	73423.2	34594.3	581722.	434155.
1996.00	71318.6	33678.2	580135.	432718.
1997.00	68071.7	32205.3	568330.	423712.
1998.00	65883.9	31217.4	564395.	420625.
1999.00	63316.1	30035.1	556353.	414525.
2000.00	59131.8	28072.0	532786.	396907.
2001.00	53789.4	25546.4	496805.	370088.
2002.00	47519.5	22712.1	452601.	337183.
2003.00	41039.4	19509.4	398404.	296860.
2004.00	34472.5	16356.5	342305.	255133.
2005.00	28007.7	13275.1	284726.	212301.
2006.00	22155.8	10491.3	230624.	172048.
2007.00	17427.3	8233.79	185517.	138483.
2008.00	13061.7	6157.97	142217.	106237.
2009.00	9159.71	4307.51	101975.	76239.4
2010.00	6416.75	3004.91	73020.9	54644.2
2011.00	4415.50	2063.73	51344.6	36463.6
2012.00	3072.00	1430.65	36490.9	27367.9
2013.00	2082.05	965.777	25256.0	18965.9
2014.00	1441.75	665.868	17854.0	13425.8
2015.00	931.621	451.228	12405.8	9342.79
2016.00	542.601	243.158	6996.17	5277.21
2017.00	267.035	121.465	3511.63	2653.34
2018.00	3.79608	1.71670	50.8978	38.5274
2019.00	0.	0.	0.	0.

Table 11-2 (2)

Region I

YEAR	AGRIMP	MNGIMP	CSTIMP	MFGIMP	TRNIMP
1977.00	0.	3.93550	481.160	877.257	145.058
1978.00	0.	3.67379	373.511	811.051	139.262
1979.00	0.	4.65753	368.841	980.323	182.328
1980.00	0.	5.31430	530.938	1530.04	248.940
1981.00	0.	6.71277	365.701	1942.85	285.869
1982.00	0.	21.7981	2733.31	7433.17	874.860
1983.00	0.	20.3919	2343.35	7335.07	844.872
1984.00	0.	340.885	112.552	4134.38	514.496
1985.00	0.	864.787	132.149	4660.81	622.054
1986.00	0.	1637.56	290.878	5603.54	802.419
1987.00	0.	2700.51	418.633	5959.71	919.824
1988.00	0.	3936.15	581.111	6682.43	1141.40
1989.00	0.	5331.18	745.521	6593.93	1277.49
1990.00	0.	6881.89	929.831	6711.61	1428.19
1991.00	0.	7934.00	1058.61	6965.10	1545.57
1992.00	0.	9010.81	1188.85	7344.29	1677.57
1993.00	0.	9475.83	1242.36	7305.71	1711.56
1994.00	0.	9767.52	1273.35	7226.50	1711.75
1995.00	0.	9395.55	1223.39	6663.99	1633.93
1996.00	0.	9175.74	1193.82	6647.79	1591.43
1997.00	0.	8662.40	1150.40	6256.94	1508.33
1998.00	0.	8615.61	1117.46	6038.29	1456.93
1999.00	0.	8311.95	1077.30	5780.95	1400.28
2000.00	0.	7783.70	1003.33	5384.81	1308.53
2001.00	0.	7034.35	917.691	4899.70	1189.39
2002.00	0.	6295.69	815.626	4356.90	1057.91
2003.00	0.	5407.33	700.562	3742.74	909.328
2004.00	0.	4535.20	547.503	3137.42	761.940
2005.00	0.	3678.93	476.650	2546.89	619.049
2006.00	0.	2911.20	377.099	2010.05	490.041
2007.00	0.	2236.01	296.061	1577.44	383.608
2008.00	0.	1709.39	221.399	1179.70	287.407
2009.00	0.	1195.33	154.844	825.138	201.592
2010.00	0.	835.264	108.182	575.427	140.399
2011.00	0.	572.729	74.1831	395.335	96.5715
2012.00	0.	396.465	51.4167	274.025	67.2037
2013.00	0.	267.740	34.6970	184.952	45.6339
2014.00	0.	184.442	23.9108	127.489	31.7101
2015.00	0.	124.331	16.1917	86.3649	21.7389
2016.00	0.	68.4331	8.83462	47.4572	12.3044
2017.00	0.	33.2526	4.33274	23.1842	6.41029
2018.00	0.	.730315E-03	.265877E-01	0.241694	0.838632
2019.00	0.	0.	0.	0.	0.

Table 11-2 (3)
Region I

YEAR	WRSIMP	FIRIMP	SERIMP	GVTIMP
1977.00	438.046	81.8695	332.414	290.258
1978.00	427.907	73.5679	294.845	261.404
1979.00	499.668	89.6322	352.180	312.122
1980.00	767.826	135.304	530.157	488.176
1981.00	823.512	150.922	569.967	544.535
1982.00	3545.60	609.963	2389.69	2354.37
1983.00	3359.59	584.432	2266.59	2299.91
1984.00	1544.62	372.946	1085.96	1134.23
1985.00	1910.77	565.848	1383.60	1457.31
1986.00	2517.50	866.924	1876.87	1987.25
1987.00	3032.64	1215.33	2316.98	2475.10
1988.00	3770.26	1655.74	2948.99	3165.45
1989.00	4289.09	2090.43	3438.48	3713.03
1990.00	4939.05	2585.88	4022.95	4396.06
1991.00	5421.32	2933.60	4449.25	4959.26
1992.00	5990.95	3295.88	4931.82	5595.06
1993.00	6170.36	3442.43	5094.92	5896.90
1994.00	6256.00	3527.77	5174.50	6121.97
1995.00	5990.37	3386.73	4959.04	6001.53
1996.00	5831.29	3306.09	4829.84	5981.67
1997.00	5567.51	3131.29	4623.85	5857.17
1998.00	5395.11	3089.54	4483.20	5814.49
1999.00	5189.30	2977.99	4314.88	5730.18
2000.00	4849.20	2746.81	4033.36	5486.63
2001.00	4413.55	2536.43	3670.93	5115.91
2002.00	3924.35	2254.59	3264.07	4661.04
2003.00	3371.13	1936.48	2803.60	4103.63
2004.00	2825.75	1623.81	2350.27	3526.82
2005.00	2293.89	1317.56	1907.68	2934.74
2006.00	1812.67	1042.15	1507.77	2378.29
2007.00	1422.33	818.127	1183.23	1914.31
2008.00	1063.74	611.803	884.905	1468.57
2009.00	744.030	427.879	618.966	1053.89
2010.00	519.764	298.943	432.383	755.372
2011.00	356.478	205.004	296.555	531.700
2012.00	247.128	142.076	205.565	378.319
2013.00	166.822	95.8717	138.756	262.174
2014.00	115.014	66.0649	95.6554	165.592
2015.00	77.2363	44.7335	64.3093	122.150
2016.00	42.8569	24.5520	35.6259	72.9493
2017.00	20.9716	11.9623	17.4192	36.6784
2018.00	0.285746	.626623E-01	0.210386	0.532583
2019.00	0.	0.	0.	0.

Table 11-2 (4)

Region I

LNDI	GASI	OILI	WATERI	ELECI	INTI	DISI
21635.6	.171891E+07	52969.8	.498565E+08	122850.	14423.7	.519502E+07
19086.2	.151637E+07	46728.3	.439819E+08	108375.	12724.1	.458289E+07
22319.6	.177325E+07	54644.5	.514328E+08	126734.	14879.7	.535926E+07
34164.1	.271587E+07	83692.1	.787732E+08	194103.	22789.4	.820812E+07
37332.8	.296603E+07	91401.0	.860290E+08	211982.	24888.5	.896417E+07
158011.	.125537E+08	386854.	.364117E+09	897211.	105341.	.379408E+09
150421.	.119507E+08	368273.	.346628E+09	854117.	100281.	.361184E+09
72912.6	.579278E+07	178510.	.168018E+09	414010.	48608.4	.175074E+09
91663.1	.728248E+07	224417.	.211227E+09	520478.	61108.7	.220097E+09
122263.	.971519E+07	299383.	.281787E+09	694343.	81522.1	.293620E+09
148974.	.118358E+08	364730.	.343293E+09	845900.	99316.2	.357710E+09
186332.	.148038E+08	456193.	.429380E+09	.105802E+07	124222.	.447412E+09
213720.	.169797E+08	523247.	.492493E+09	.121354E+07	142480.	.513175E+09
247393.	.196545E+08	605674.	.570075E+09	.140471E+07	164925.	.594015E+09
273604.	.217373E+08	669857.	.630486E+09	.155357E+07	182402.	.656963E+09
300819.	.238996E+08	736488.	.693201E+09	.170810E+07	200546.	.722312E+09
309823.	.246149E+08	758533.	.713950E+09	.175923E+07	206549.	.743932E+09
314269.	.249681E+08	769417.	.724195E+09	.178447E+07	209513.	.754607E+09
300971.	.239116E+08	736860.	.693551E+09	.170896E+07	200647.	.722676E+09
293000.	.232783E+08	717345.	.675183E+09	.166370E+07	195333.	.703537E+09
280186.	.222603E+08	685974.	.645656E+09	.159094E+07	186791.	.672769E+09
271591.	.215775E+08	664931.	.625849E+09	.154214E+07	181061.	.652131E+09
261305.	.207603E+08	639747.	.602146E+09	.148373E+07	174204.	.627433E+09
244227.	.194034E+08	597935.	.562791E+09	.138676E+07	162818.	.586425E+09
222253.	.176576E+08	544137.	.512156E+09	.126199E+07	148169.	.533663E+09
197596.	.156986E+08	483768.	.455335E+09	.112198E+07	131730.	.474457E+09
169732.	.134849E+08	415550.	.391127E+09	963765.	113155.	.407552E+09
142301.	.113056E+08	348393.	.327917E+09	808011.	94867.7	.341687E+09
115494.	.917576E+07	282760.	.266141E+09	655791.	76995.7	.277317E+09
91274.2	.725157E+07	223464.	.210330E+09	518269.	60849.4	.219163E+09
71634.0	.569120E+07	175380.	.165072E+09	406749.	47756.0	.172004E+09
53574.3	.425639E+07	131165.	.123456E+09	304204.	35716.2	.128640E+09
37475.3	.297735E+07	91750.0	.863574E+08	212791.	24983.6	.899839E+07
26177.5	.207976E+07	64089.7	.603228E+08	148640.	17451.7	.628560E+07
17954.9	.142645E+07	43958.5	.413749E+08	101951.	11969.9	.431124E+07
12446.7	988867.	30473.0	.286819E+08	70674.4	8297.80	.298864E+07
8402.26	667545.	20571.0	.193620E+08	47709.4	5601.51	.201751E+07
5793.05	460243.	14183.0	.133494E+08	32893.9	3862.03	.139100E+07
3925.68	311889.	9611.16	.904626E+07	22290.7	2617.12	942615.
2158.97	171527.	5285.76	.497509E+07	12259.0	1439.31	518401.
1056.75	83956.7	2587.21	.243515E+07	6000.39	704.498	253741.
14.9353	1186.59	36.5658	34416.6	84.8051	9.95688	3546.19

Table 11-2 (5)

Region I

YEAR	PROFES	MANAGE	CLERIC	SALES	CRAFTS
1977.00	245.909	262.241	347.010	149.351	493.676
1978.00	218.948	229.000	311.662	132.266	419.130
1979.00	257.609	265.646	373.108	156.630	463.768
1980.00	395.732	406.589	565.748	239.256	721.474
1981.00	443.946	479.649	639.806	262.905	710.378
1982.00	1862.54	1868.35	2569.97	1092.70	3421.57
1983.00	1784.23	1764.82	2467.40	1041.65	3183.87
1984.00	895.317	826.791	1309.14	515.606	1240.82
1985.00	1119.61	1071.67	1666.04	649.957	1586.51
1986.00	1486.40	1457.47	2247.48	863.850	2140.18
1987.00	1802.30	1842.13	2770.01	1062.75	2649.67
1988.00	2244.20	2352.01	3499.28	1337.00	3332.23
1989.00	2560.90	2764.39	4058.13	1541.84	3858.02
1990.00	2954.09	3258.03	4733.71	1792.68	4500.33
1991.00	3251.40	3620.17	5236.78	1978.47	4983.70
1992.00	3561.33	4015.79	5783.53	2189.77	5498.80
1993.00	3684.98	4153.78	5973.11	2259.76	5669.36
1994.00	3735.49	4226.03	6064.99	2294.48	5758.28
1995.00	3576.79	4050.97	5810.66	2198.36	5515.91
1996.00	3481.53	3946.34	5658.98	2140.62	5371.15
1997.00	3327.96	3779.88	5414.53	2047.14	5140.32
1998.00	3225.54	3665.87	5249.39	1934.61	4983.93
1999.00	3102.92	3528.96	5051.91	1909.80	4796.05
2000.00	2899.77	3299.46	4722.60	1785.02	4483.44
2001.00	2539.02	3002.80	4297.72	1624.59	4080.06
2002.00	2346.21	2669.58	3820.84	1444.50	3626.82
2003.00	2015.28	2293.03	3282.01	1240.73	3115.34
2004.00	1689.61	1922.50	2751.64	1040.13	2612.22
2005.00	1371.26	1560.24	2233.27	844.245	2119.74
2006.00	1084.04	1233.53	1765.60	667.238	1676.27
2007.00	850.792	963.140	1385.62	523.630	1315.74
2008.00	636.239	724.046	1036.33	391.606	984.025
2009.00	445.073	506.452	724.964	273.915	688.322
2010.00	310.904	353.784	506.369	191.347	480.814
2011.00	213.240	242.648	347.338	131.237	329.783
2012.00	147.817	168.199	240.805	90.9694	228.610
2013.00	99.7792	113.535	162.581	61.4030	154.323
2014.00	68.7836	78.2698	112.116	42.3289	106.397
2015.00	46.6094	53.0311	75.9980	28.6781	72.0980
2016.00	25.6256	29.1528	41.8269	15.7630	39.6476
2017.00	12.5344	14.2558	20.5074	7.70575	19.4023
2018.00	0.160657	0.175303	0.356338	.901013E-01	0.266699
2019.00	0.	0.	0.	0.	0.

Table 11-2 (6)

Region I

YEAR	OPERAT	SERVIC	LABOR
1977.00	554.837	185.767	169.990
1978.00	503.462	165.605	143.774
1979.00	604.937	196.749	159.199
1980.00	926.390	298.310	245.954
1981.00	1098.53	324.328	236.012
1982.00	4292.21	1355.37	1146.03
1983.00	4168.71	1288.79	1060.13
1984.00	2324.37	625.692	368.076
1985.00	2865.77	790.290	440.121
1986.00	3761.95	1062.03	561.233
1987.00	4483.44	1301.72	646.424
1988.00	5529.48	1643.59	778.058
1989.00	6222.44	1901.59	848.510
1990.00	7102.53	2214.01	943.637
1991.00	7791.37	2444.00	1021.12
1992.00	8549.09	2705.15	1111.19
1993.00	8776.83	2791.69	1133.20
1994.00	8883.28	2833.86	1140.43
1995.00	8502.42	2715.13	1089.74
1996.00	8273.46	2643.96	1059.44
1997.00	7903.32	2529.10	1007.98
1998.00	7658.94	2451.77	975.537
1999.00	7366.28	2359.36	937.386
2000.00	6383.39	2205.23	875.364
2001.00	6263.91	2007.02	796.505
2002.00	5568.52	1764.57	708.210
2003.00	4785.29	1532.84	608.381
2004.00	4010.54	1284.98	510.006
2005.00	3254.73	1043.01	413.995
2006.00	2572.54	824.378	327.224
2007.00	2019.16	646.919	256.730
2008.00	1510.08	483.823	192.042
2009.00	1056.27	338.433	134.375
2010.00	737.859	236.405	93.0328
2011.00	506.074	162.147	64.3798
2012.00	350.805	112.403	44.6492
2013.00	236.797	75.8775	30.1613
2014.00	163.248	52.3139	20.8140
2015.00	110.610	35.4497	14.1238
2016.00	60.3025	19.4946	7.79416
2017.00	29.7402	9.54043	3.84459
2018.00	0.373918	0.131954	0.111453
2019.00	0.	0.	0.

Table 11-2 (7)

Region I

YEAR	CLASSA	CLASSB	CLASSC	CLASSD
1977.00	194.836	412.345	231.507	440.712
1978.00	172.153	367.276	194.712	394.572
1979.00	203.508	436.926	214.049	464.927
1980.00	310.044	667.380	328.923	715.960
1981.00	335.971	744.345	305.792	824.490
1982.00	1419.19	3073.12	1513.42	3358.54
1983.00	1349.34	2940.32	1390.03	3237.79
1984.00	643.002	1437.83	501.937	1694.40
1985.00	805.953	1871.17	675.561	2094.86
1986.00	1075.85	2503.23	948.911	2726.21
1987.00	1310.32	3057.44	1224.45	3244.15
1988.00	1645.96	3841.20	1586.33	3980.88
1989.00	1893.26	4422.59	1999.67	4462.57
1990.00	2195.97	5135.32	2266.20	5079.47
1991.00	2419.35	5664.88	2534.75	5565.51
1992.00	2676.50	6264.10	2812.65	6097.15
1993.00	2760.29	6450.70	2913.59	6253.07
1994.00	2800.84	6557.83	2968.06	6325.23
1995.00	2683.10	6282.52	2845.79	6052.46
1996.00	2612.35	6117.05	2773.57	5888.72
1997.00	2497.59	5850.34	2659.94	5622.72
1998.00	2420.96	5671.57	2580.22	5448.08
1999.00	2329.43	5457.45	2484.63	5239.17
2000.00	2177.00	5100.74	2323.97	4895.41
2001.00	1981.39	4642.32	2114.64	4454.73
2002.00	1761.85	4127.61	1879.63	3960.09
2003.00	1513.30	3545.33	1614.61	3401.71
2004.00	1268.56	2972.19	1353.90	2852.20
2005.00	1029.71	2412.37	1098.62	2314.65
2006.00	813.789	1906.67	869.046	1829.74
2007.00	638.603	1496.36	682.093	1436.13
2008.00	477.594	1119.07	510.170	1074.07
2009.00	334.066	782.732	356.911	751.327
2010.00	233.363	546.801	249.276	524.813
2011.00	160.055	375.018	170.999	359.969
2012.00	110.948	259.944	118.562	249.543
2013.00	74.9903	175.450	80.0585	169.461
2014.00	51.6285	120.941	55.2181	116.152
2015.00	34.9806	81.9305	37.4397	78.7156
2016.00	19.2301	45.0228	20.6196	43.2968
2017.00	9.40375	21.9975	10.1251	21.1994
2018.00	0.116019	0.234310	0.205694	0.313177
2019.00			0.	0.

Table 11-3 (1)

Summary Tables
Full Development Impact
Region II

YEAR	POPIMP	EMPIMP	INCIMP	ERNIMP
1977	4726.	2137.	23476.	19506.
1980	7288.	3380.	39666.	32909.
1985	18972.	9112.	119577.	98915.
1990	50924.	25097.	369144.	304265.
1995	60805.	30463.	503472.	413238.
2000	48998.	24723.	460241.	375929.
2005	23223.	11692.	245760.	199643.
2010	5323.	2649.	63030.	50891.
2015	815.	397.	10727.	8603.

Table 11-3 (2)

Region II

YEAR	WRSIMP	FIRIMP	SERIMP	GVTIMP
1977	440.05	69.41	286.24	593.44
1980	691.60	115.34	456.92	1001.20
1985	1706.91	513.60	1193.76	3009.35
1990	4462.26	2461.42	3566.79	9256.82
1995	5395.04	3235.36	4395.03	12572.20
2000	4365.67	2662.41	3575.91	11437.10
2005	2065.30	1258.74	1691.38	6073.85
2010	467.90	285.60	383.33	1548.27
2015	70.17	42.74	57.46	216.74

Table 11-3 (3)

Region II

YEAR	AGRIMP	MNGIMP	CSTIMP	MFGIMP	TRNIMP
1977	0.	2.68	478.15	614.42	140.02
1980	0.	3.81	576.07	1114.66	241.51
1985	0.	858.71	169.90	3581.44	604.65
1990	0.	6868.87	900.79	4105.53	1388.06
1995	0.	9381.48	1187.65	3671.16	1574.33
2000	0.	7772.20	979.30	2794.98	1259.63
2005	0.	3673.49	462.93	1322.13	595.94
2010	0.	834.03	105.07	298.80	135.15
2015	0.	124.65	15.73	44.77	20.96

Table 11-3 (4)

Region II

YEAR	LNDI	GASI	OILI	WATERI	ELECI	INTI	DISI
1977	18587.9	.147678E+07	45508.4	.428336E+08	105545.	12392.0	.446324E+07
1980	29405.3	.233620E+07	71992.3	.677610E+08	166968.	19603.5	.706065E+07
1985	79278.6	.629855E+07	194096.	.182688E+09	450157.	52852.4	.190360E+08
1990	218344.	.173470E+08	534565.	.503146E+09	.123979E+07	145562.	.524275E+08
1995	265031.	.210563E+08	648869.	.610732E+09	.150489E+07	176687.	.636379E+08
2000	215092.	.170887E+08	526605.	.495654E+09	.122133E+07	143395.	.516469E+08
2005	101721.	.808155E+07	249041.	.234403E+09	577587.	67813.9	.244247E+08
2010	23048.5	.183116E+07	56429.1	.531125E+08	130873.	15365.7	.553429E+07
2015	3457.18	274667.	8464.14	.796666E+07	19630.4	2304.79	830121.

Table 11-3 (5)

Region II

YEAR	PROFES	MANAGE	CLERIC	SALES	CRAFTS
1977	207.85	228.44	289.86	127.70	441.55
1980	335.25	353.13	475.29	205.00	638.65
1985	959.49	931.99	1430.92	559.96	1366.89
1990	2567.23	2925.39	4170.69	1582.18	3969.89
1995	3098.24	3639.66	5114.83	1938.13	4859.98
2000	2511.73	2966.01	4158.55	1574.08	3951.66
2005	1187.78	1402.57	1966.50	744.50	1868.28
2010	269.30	318.03	445.89	168.73	423.80
2015	40.38	47.68	66.94	25.29	63.56

Table 11-3 (6)

Region II

YEAR	OPERAT	SERVIC	LABOR
1977	419.71	161.93	154.00
1980	713.09	258.93	220.63
1985	2318.73	687.48	373.52
1990	5786.00	1968.72	783.37
1995	6886.50	2411.17	891.16
2000	5574.65	1958.71	714.37
2005	2635.81	926.45	337.87
2010	597.56	209.97	76.57
2015	89.59	31.49	11.54

Table 11-3 (7)

Region II

YEAR	CLASSA	CLASSB	CLASSC	CLASSD
1977	170.40	347.95	212.47	348.74
1980	271.13	565.32	298.75	570.57
1985	703.82	1604.88	596.55	1707.89
1990	1953.22	4500.12	2075.67	4171.17
1995	2381.97	5497.86	2609.49	4935.49
2000	1932.75	4464.63	2132.26	3990.56
2005	914.23	2111.58	1008.01	1886.75
2010	207.17	478.59	228.73	427.81
2015	31.06	71.72	34.36	64.19

Table 11-4 (1)

Summary Tables
Full Development Impact
Region III

YEAR	POPIMP	EMPIMP	INCIMP	ERNIMP
1977	4608.	2089.	22086.	18462.
1980	7115.	3308.	37385.	31198.
1985	18529.	8911.	112882.	93889.
1990	50059.	24663.	351229.	290988.
1995	59834.	29908.	480299.	396107.
2000	48337.	24276.	440962.	361779.
2005	22973.	11481.	236592.	192978.
2010	5282.	2601.	61006.	49439.
2015	812.	390.	10445.	8405.

Table 11-4 (2)

Region III

YEAR	AGRIMP	MNGIMP	CSTIMP	MFGIMP	TRNIMP
1977	0.	6.19	478.12	581.43	139.42
1980	0.	14.07	576.52	1055.99	240.97
1985	0.	886.93	171.27	3413.90	603.21
1990	0.	6926.26	903.33	3756.75	1385.77
1995	0.	9439.73	1189.46	3244.97	1569.22
2000	0.	7820.40	980.89	2449.88	1255.56
2005	0.	3696.28	463.67	1158.95	594.01
2010	0.	839.20	105.24	261.80	134.72
2015	0.	125.42	15.75	39.23	20.90

Table 11-4 (3)

Region III

YEAR	WRSIMP	FIRIMP	SERIMP	GVTIMP
1977	433.75	69.10	280.17	615.99
1980	682.84	116.17	448.10	1040.97
1985	1683.90	516.12	1170.63	3132.74
1990	4414.86	2466.72	3515.78	9709.17
1995	5334.18	3238.52	4330.41	13216.6
2000	4317.03	2665.32	3523.97	12071.2
2005	2042.30	1260.12	1666.81	6438.94
2010	462.68	285.92	377.76	1649.61
2015	69.39	42.78	56.63	280.44

Table 11-4 (4)

Region III

YEAR	LNDI	GASI	OILI	WATERI	ELECI	INTI	DISI
1977	18178.1	.144422E+07	44505.0	.418892E+08	103218.	12118.7	.436483E+07
1980	28777.5	.228633E+07	70455.3	.663144E+08	163403.	19185.0	.690992E+07
1985	77524.9	.615922E+07	189802.	.178647E+09	440199.	51683.3	.186149E+08
1990	214563.	.170467E+08	525310.	.494435E+09	.121833E+07	143042.	.515199E+08
1995	260198.	.206723E+08	637036.	.599594E+09	.147744E+07	173465.	.624773E+08
2000	211202.	.167797E+08	517082.	.486690E+09	.119924E+07	140802.	.507129E+08
2005	99880.9	.793536E+07	244536.	.230163E+09	567140.	66587.3	.239829E+08
2010	22632.0	.179807E+07	55409.4	.521527E+08	128508.	15088.0	.543428E+07
2015	3394.76	269708.	8311.31	.782282E+07	19276.0	2263.17	815133.

Table 11-4 (5)

Region III

YEAR	PROFES	MANAGE	CLERIC	SALES	CRAFTS
1977	202.78	224.92	283.72	125.40	435.34
1980	327.47	348.35	466.35	201.71	629.40
1985	937.54	918.96	1406.08	551.23	1339.83
1990	2521.14	2897.93	4118.58	1563.80	3914.13
1995	3039.67	3603.01	5046.72	1914.35	4787.04
2000	2464.66	2936.69	4103.87	1555.00	3893.17
2005	1165.51	1388.70	1940.64	735.48	1840.62
2010	264.25	314.89	440.03	166.68	417.53
2015	39.62	47.21	66.06	24.98	62.62

Table 11-4 (6)

Region III

YEAR	OPERAT	SERVIC	LABOR
1977	405.35	158.83	151.91
1980	689.75	254.46	217.22
1985	2252.89	675.63	363.82
1990	5647.04	1943.26	763.34
1995	6710.69	2378.60	866.03
2000	5432.67	1932.56	694.10
2005	2568.67	914.08	328.28
2010	582.34	207.17	74.40
2015	87.31	31.07	11.21

Table 11-4 (7)

Region III

YEAR	CLASSA	CLASSB	CLASSC	CLASSD
1977	167.18	340.53	210.63	338.41
1980	266.62	554.40	296.46	553.76
1985	691.88	1575.35	589.68	1659.78
1990	1927.75	4437.65	2061.48	4070.59
1995	2349.51	5417.90	2589.15	4808.07
2000	1906.71	4400.41	2116.05	3887.76
2005	901.91	2081.21	1000.35	1838.13
2010	204.38	471.71	227.00	416.79
2015	30.64	70.68	34.10	62.53

Table 11-5 (1)

Summary Tables
Aborted Development Impact
Region I

YEAR	POPIMP	EMPIMP	INCIMP	ERNIMP
1978.00	183.504	70.1160	788.570	604.383
1979.00	2687.28	1162.19	13378.4	10228.6
1980.00	2830.00	1146.67	13511.0	10306.1
1981.00	95.0412	41.7592	503.673	383.345
1982.00	378.828	157.080	2070.35	1572.42
1983.00	2705.74	1206.06	15244.7	11555.2

Table 11-5 (2)

Region I

YEAR	WRSIMP	FIRIMP	SERIMP	GVTIMP
1978.00	12.4258	3.32156	9.25573	8.35467
1979.00	376.564	105.655	287.127	141.395
1980.00	116.117	24.6185	84.5726	142.466
1981.00	15.6900	2.44055	11.4813	5.29916
1982.00	25.2416	6.09568	20.0618	21.7364
1983.00	[illegible]	[illegible]	[illegible]	[illegible]

Table 11-5 (3)

Region I

YEAR	AGRIMP	MNGIMP	CSTIMP	MFGIMP	TRNIMP
1978.00	0.	3.91156	1.01762	34.8204	3.31561
1979.00	0.	1.12140	16.9574	202.718	126.617
1980.00	0.	9.00665	50.8483	282.843	38.3186
1981.00	0.	.277594E-01	0.498311	5.78175	4.55685
1982.00	0.	5.54095	10.3186	67.3706	13.9066
1983.00	0.	1.16357	19.3358	177.220	259.791

Table 11-5 (4)

Region I

[illegible]	GASI	OILI	WATERI	ELECI	INTI	DISI
510.510	48154.2	1493.47	.140569E+07	3463.73	406.673	146472.
10111.1	803308.	24754.7	.232998E+08	57412.3	6740.72	.212782E+07
9976.03	792579.	24424.1	.229886E+08	56645.5	6650.69	.239539E+07
363.305	28864.0	889.472	837193.	2062.91	242.204	57235.1
1157.81	115900.	3571.57	.336166E+07	8283.37	972.541	350282.
13492.7	833626.	25689.0	.241791E+08	59579.2	6995.12	.251915E+07

Table 11-5 (5)

Region I

YEAR	PROFES	MANAGE	CLERIC	SALES	CRAFTS
1978.00	7.72538	6.89390	10.8744	4.19364	10.7075
1979.00	139.115	149.115	217.839	109.477	115.392
1980.00	59.2711	63.9067	94.8769	40.5278	94.1897
1981.00	5.28542	5.50706	7.50924	4.11758	4.02039
1982.00	14.6329	15.2790	23.7833	9.20643	23.3774
1983.00	138.349	147.674	234.522	100.996	136.680

Table 11-5 (6)

Region I

YEAR	OPERAT	SERVIC	GABOR
1978.00	19.4327	5.21199	3.02923
1979.00	191.354	147.609	47.0130
1980.00	174.104	47.5558	31.9267
1981.00	6.50583	5.83703	1.69218
1982.00	43.4404	11.1640	7.65035
1983.00	208.679	140.685	56.8170

Table 11-5 (7)

Region I

YEAR	CLASSA	CLASSB	CLASSC	CLASSD
1978.00	5.32787	12.4097	4.26011	19.3037
1979.00	155.242	307.771	45.7313	124.610
1980.00	45.6154	110.945	42.1639	121.745
1981.00	6.22943	11.3747	1.50789	4.05663
1982.00	11.1205	25.6636	11.1926	30.7845
1983.00	133.226	282.158	73.5932	146.551

Table 11-6 (1)

Summary Tables
Aborted Development Impact
Region II

YEAR	POPIMP	EMPIMP	INCIMP	ERNIMP
1978.00	131.347	60.1367	675.392	560.909
1979.00	2307.92	1061.69	12137.9	10117.0
1980.00	2289.51	1051.81	12461.0	10338.4
1981.00	82.3245	38.4769	451.651	382.813
1982.00	305.339	143.767	1763.77	1461.70
1983.00	2345.12	1112.43	13955.8	11553.9

Table 11-6 (2)

Region II

YEAR	HRSIMP	FIRIMP	SERIMP	GVTIMP
1978.00	10.9256	2.94308	7.99951	17.0643
1979.00	364.233	102.045	273.035	307.795
1980.00	104.615	21.9455	70.7295	314.530
1981.00	15.2819	2.31834	11.0332	11.6465
1982.00	23.1744	5.30125	16.7850	44.4702
1983.00	333.341	90.4054	255.208	391.662

Table 11-6 (3)

Region II

YEAR	AGRIMP	MNGIMP	CSTIMP	MFGIMP	TRNIMP
1978.00	0.	3.37283	0.932145	27.6376	3.17218
1979.00	0.	0.734262	15.0597	112.726	125.389
1980.00	0.	19.6756	47.2860	173.019	25.3861
1981.00	0.	.135987E-01	0.469824	2.95340	4.51705
1982.00	0.	3.22325	9.44505	43.7045	7.28401
1983.00	0.	0.827407	13.4909	92.2946	259.997

Table 11-6 (4)

Region II

LNDI	GASI	OILI	WATERI	ELECI	INTI	DISI
523.206	41567.8	1210.95	.120567E+07	2970.45	348.804	125630.
9236.64	733335.	22013.9	.212847E+08	52447.1	6157.76	.221735E+07
9237.74	733423.	22015.5	.212873E+08	52453.4	6158.50	.221412E+07
334.749	26575.2	817.553	771389.	1900.76	223.166	[illegible]
1250.77	99371.4	3062.24	.283226E+07	7192.09	833.849	300329.
9676.13	768011.	23694.7	.223021E+08	54954.0	6452.08	.232336E+07

Table 11-6 (5)

Region II

YEAR	PROFES	MANAG	CLERIC	SALES	CRAFTS
1978.00	6.61151	5.92057	9.25336	3.56901	9.20801
1979.00	127.279	134.645	139.533	102.871	93.3008
1980.00	46.6311	52.8704	73.4543	33.6865	74.6461
1981.00	4.71076	5.17244	6.92804	3.90508	3.49641
1982.00	11.5506	12.5623	13.3814	7.07509	13.2657
1983.00	127.340	137.990	217.680	94.6593	121.335

Table 11-6 (6)

Region II

YEAR	OPERAT	SERVIC	LABOR
1978.00	15.7769	4.47935	2.57210
1979.00	145.024	140.201	41.9313
1980.00	171.940	39.9273	24.6852
1981.00	5.04763	5.59921	1.53116
1982.00	31.9351	9.48604	5.70646
1983.00	165.341	135.819	52.1672

Table 11-6 (7)

Region II

YEAR	CLASSA	CLASSB	CLASSC	CLASSD
1978.00	4.59434	10.5439	3.72403	11.7309
1979.00	148.137	267.902	39.5400	93.4535
1980.00	41.8253	90.5504	33.7472	85.5796
1981.00	5.90979	10.7394	1.31309	3.07656
1982.00	9.73256	21.6352	8.50137	21.7925
1983.00	136.628	263.605	63.0405	119.500

Table 11-7 (1)

Summary Tables
Aborted Development Impact
Region III

YEAR	POPIMP	EMPIMP	INCIMP	ERNIMP
1978.00	127.173	59.1676	628.656	525.224
1979.00	2281.10	1052.11	11627.3	9708.70
1980.00	2234.37	1039.00	11743.1	9709.64
1981.00	81.9303	38.3782	443.063	370.013
1982.00	295.336	139.337	1647.74	1373.33
1983.00	2525.64	1105.15	13370.6	11136.5

Table 11-7 (2)

Region III

YEAR	WRSIMP	FIRIMP	SERIMP	GVTIMP
1978.00	10.6352	2.94361	7.68833	17.5247
1979.00	363.543	102.202	272.301	323.943
1980.00	102.152	21.5045	63.7348	326.977
1981.00	15.2876	2.32404	11.0310	12.3459
1982.00	23.4712	5.71795	16.5039	45.8229
1983.00	332.921	90.6261	294.646	371.584

Table 11-7 (3)
Region III

YEAR	AGRIMP	MNGIMP	CSTIMP	MFGIMP	TRNIMP
1978.00	0.	4.05324	0.937373	26.0907	3.13992
1979.00	0.	1.31483	16.0734	105.577	125.404
1980.00	0.	19.9572	47.1499	107.605	24.9017
1981.00	0.	.354549E-01	0.470930	2.86162	4.52276
1982.00	0.	3.26405	9.42022	41.4187	7.20820
1983.00	0.	1.54436	18.5268	56.2473	260.304

Table 11-7 (4)
Region III

LNDI	GASI	OILI	WATERI	ELECI	INTI	FISI
365.075	40296.8	1239.01	.116619E+07	2873.58	337.383	121516.
7133.34	727217.	22403.9	.210928E+08	51974.1	6102.22	.219765E+07
9034.23	714146.	22139.7	.208299E+08	51326.5	6026.19	.217047E+07
353.391	26527.0	317.456	769411.	1295.88	222.594	30172.1
1212.23	96309.7	2657.45	.277344E+07	6833.24	808.154	281975.
7614.70	753879.	23337.7	.221561E+08	54594.3	6409.86	.230865E+07

Table 11-7 (5)
Region III

YEAR	PROFES	MANAGE	CLERIC	SALES	CRAFTS
1978.00	6.38739	5.78077	6.99647	3.48267	8.90821
1979.00	126.051	133.189	196.589	102.709	97.0183
1980.00	44.9294	51.4197	71.0539	32.7617	72.3252
1981.00	4.83099	5.17487	6.92675	3.91108	3.46667
1982.00	11.1830	12.5716	17.9027	7.78740	17.7744
1983.00	126.345	137.721	217.071	94.7907	119.946

Table 11-7 (6)

Region III

YEAR	OPERAT	SERVIC	LABOR
1978.00	15.1431	4.36459	2.47493
1979.00	142.774	137.304	41.4429
1980.00	116.714	38.8197	23.9662
1981.00	5.04158	5.59240	1.52436
1982.00	22.9295	9.29525	5.55566
1983.00	163.663	133.354	51.7914

Table 11-7 (7)

Region III

YEAR	CLASSA	CLASSB	CLASSC	CLASSD
1978.00	4.47866	10.2536	3.63552	11.3070
1979.00	147.745	286.353	39.0331	91.3249
1980.00	40.7027	87.8046	32.9061	31.8874
1981.00	6.00052	10.7413	1.30628	3.05470
1982.00	9.59337	21.1081	6.32715	21.0039
1983.00	136.363	262.350	67.7102	117.349

IMPACT SUMMARY TABLES
ADDITIONAL ANALYSIS REGIONS

Results 8 through 11 for the additional analysis regions (where the primary impact is assumed to be distributed among Regions I, II, IV and V, as described in the Introduction) for the abort case and full-development case are given in the following summary tables.

The abort case is applicable to Region IV only, which determines the go/no-go decision for full-development in all four regions, including Region IV. The summary table series for the regions in the additional analysis regions differ from those for Regions I, II and III (see Tables 11-8 (7), Region I; 11-9 (7); Region II; and 11-10 (7), Region III) by estimating the number of employees in the five income categories instead of the number of families in only four income categories. The fifth category is: Employees in Income Class E (income above $25,000).

SUMMARY TABLES[1]

FULL DEVELOPMENT IMPACT
REGIONS I, II, IV, V

Table 11-8 (1) Table 11-9 (1) Table 11-10 (1) Table 11-11 (1)	Population (POPIMP); employment (FMPIMP); personal income (INCIMP); and earnings (ERNIMP) in number of jobs and thousands of dollars.
Table 11-8 (2) Table 11-9 (2) Table 11-10 (2) Table 11-11 (2)	Employment in agriculture (AGRIMP); mining (MNGIMP); construction (CSTIMP); manufacturing (MFGIMP); and transportation, communication and public utilities (TRNIMP) in number of jobs.
Table 11-8 (3) Table 11-9 (3) Table 11-10 (3) Table 11-11 (3)	Employment in wholesale and retail trade (WRSIMP); finance, insurance and real estate (FIRIMP); services (SERIMP); and government (GVTIMP) in number of jobs.
Table 11-8 (4) Table 11-9 (4) Table 11-10 (4) Table 11-11 (4)	Use of acres of land (LNDI); thousands of cubic feet of natural gas (GASI); thousands of barrels of oil (OILI); thousands of gallons of water (WATERI); thousands of kilowatt-hours of electricity (ELECI); thousands of gallons of water purchased from utilities (INTI); and thousands of gallons of discharge into sewers (DISI).
Table 11-8 (5) Table 11-9 (5) Table 11-10 (5) Table 11-11 (5)	Number of jobs in professional (PROFES); managerial (MANAGE); clerical (CLERIC); sales (SALES); and craftsmen (CRAFTS) occupations.
Table 11-8 (6) Table 11-9 (6) Table 11-10 (6) Table 11-11 (6)	Number of jobs in operative (OPERAT); service (SERVIC); and laborer (LABOR) occupations.
Table 11-8 (7) Table 11-9 (7) Table 11-10 (7) Table 11-11 (7)	Number of employees in income classes \$4-8,000 (CLASSA); \$8-10,000 (CLASSB); \$10-15,000 (CLASSC); \$15-25,000 (CLASSD); and (CLASSE) above \$25,000.

[1] Annual results are shown for Region I. For Regions II, III, IV, V, five-year intervals are displayed. A final set of tables (Table 11-12) gives the regional summary across all regions of interest (Regions I + II + IV + V).

Table 11-8 (1)

Summary Tables

Full Development Impact - Additional Analysis Regions
Region I

YEAR	POPIMP	EMPIMP	INCIMP	FRNIMP
1977.00	0.0	0.0	0.0	0.0
1978.00	0.0	0.0	0.0	0.0
1979.00	962.10	416.09	5457.5	4172.6
1980.00	1152.99	502.70	6806.8	5192.1
1981.00	1468.02	645.02	9012.2	6859.2
1982.00	34016.61	15056.79	223061.3	169414.3
1983.00	33712.27	15026.91	229597.2	174030.3
1984.00	3447.93	1547.11	23860.7	18051.8
1985.00	5230.48	2361.72	37665.8	28445.3
1986.00	8049.38	3656.06	60239.6	45417.1
1987.00	10922.16	4988.43	84879.2	63894.0
1988.00	15038.08	6903.89	121215.6	91114.2
1989.00	19058.93	8791.98	159267.6	119555.9
1990.00	23319.80	10805.39	201910.6	151378.8
1991.00	26540.77	12348.05	237920.7	178175.3
1992.00	29648.07	13844.95	275027.7	205754.5
1993.00	31083.79	14563.99	298221.6	222903.8
1994.00	32107.23	15088.34	318435.8	237822.3
1995.00	31415.89	14802.03	321916.6	240255.1
1996.00	31280.79	14771.46	331005.4	246894.3
1997.00	30928.89	14632.73	337823.2	251869.2
1998.00	30710.95	14551.60	346077.9	257920.1
1999.00	30294.14	14370.55	352034.0	262292.3
2000.00	29054.54	13793.26	348000.3	259248.6
2001.00	29675.16	14093.74	366171.9	272775.1
2002.00	24843.26	11799.43	315656.4	235160.7
2003.00	21962.12	10427.71	287208.4	214005.4
2004.00	15956.13	7570.84	214665.0	159998.1
2005.00	15869.45	7521.82	219537.2	163691.3
2006.00	12939.94	6124.59	183982.2	137252.6
2007.00	10487.05	4954.78	153178.1	114342.3
2008.00	8107.88	3822.48	121601.8	90837.7
2009.00	5968.39	2759.72	90330.6	67534.2
2010.00	4245.55	1990.80	67039.7	50168.2
2011.00	3018.91	1411.02	49879.8	36616.3
2012.00	2171.81	1011.43	36038.0	27028.3
2013.00	1523.02	706.46	25689.5	19440.8
2014.00	1091.98	504.33	19075.2	14291.5
2015.00	770.35	354.11	13721.4	10333.6
2016.00	441.55	201.94	8045.0	6068.4
2017.00	225.51	102.56	4200.9	3174.1
2018.00	3.36	1.52	67.6	48.1
2019.00	3.42	1.54	66.0	50.1

WESTON
ENVIRONMENTAL CONSULTANTS-DESIGNERS

Table 11-8 (2)

Region I

YEAR	AGRIMP	MNGIMP	CSTIMP	MFGIMP	TRNIMP
1977.00	0.0	0.0	0.0	0.0	0.0
1978.00	0.0	0.0	0.0	0.0	0.0
1979.00	0.0	0.11188	9.7680	128.891	17.064
1980.00	0.0	0.13550	11.8298	155.183	20.245
1981.00	0.0	0.17394	15.1854	195.810	25.613
1982.00	0.0	4.60545	2148.0588	3299.110	385.277
1983.00	0.0	4.61553	2099.7322	3295.179	386.932
1984.00	0.0	65.47963	38.7593	421.514	52.228
1985.00	0.0	168.65634	61.8999	568.293	74.595
1986.00	0.0	320.62939	97.9469	824.337	108.591
1987.00	0.0	530.37720	137.0569	1003.344	142.196
1988.00	0.0	773.72583	191.1198	1341.249	192.917
1989.00	0.0	1049.03687	246.2842	1613.047	241.749
1990.00	0.0	1355.11279	305.7412	1873.673	296.823
1991.00	0.0	1566.75513	351.8201	2081.041	334.021
1992.00	0.0	1775.36963	396.7576	2265.338	374.441
1993.00	0.0	1867.36182	419.4063	2334.876	394.590
1994.00	0.0	1925.18604	436.8062	2380.313	408.648
1995.00	0.0	1852.05640	430.2095	2332.980	401.720
1996.00	0.0	1808.87793	430.9893	2329.132	402.590
1997.00	0.0	1747.27344	426.6809	2321.512	397.730
1998.00	0.0	1698.77417	427.9309	2311.815	396.287
1999.00	0.0	1639.06177	424.1702	2285.671	392.663
2000.00	0.0	1535.04443	408.6216	2198.304	378.279
2001.00	0.0	1526.38721	418.9539	2253.439	387.475
2002.00	0.0	1241.83252	351.9031	1892.994	325.580
2003.00	0.0	1066.72363	312.0427	1678.675	288.773
2004.00	0.0	752.60083	227.3139	1222.912	210.388
2005.00	0.0	725.91309	226.5620	1218.792	209.678
2006.00	0.0	574.49438	185.0939	994.957	171.394
2007.00	0.0	451.17603	150.2246	807.499	138.946
2008.00	0.0	337.41772	116.2529	624.891	107.590
2009.00	0.0	235.98909	84.1866	452.524	77.991
2010.00	0.0	164.91997	60.9131	327.424	56.357
2011.00	0.0	113.10069	43.3005	232.751	40.101
2012.00	0.0	78.38457	31.1277	167.320	28.864
2013.00	0.0	52.89024	21.8038	117.202	20.257
2014.00	0.0	36.44193	15.6085	83.900	14.536
2015.00	0.0	24.66881	10.9894	59.071	10.270
2016.00	0.0	13.52652	6.2836	33.776	5.924
2017.00	0.0	6.57433	3.1996	17.200	3.075
2018.00	0.0	0.00054	0.0466	0.251	0.162
2019.00	0.0	0.00054	0.0474	0.255	0.159

WESTON
ENVIRONMENTAL CONSULTANTS DESIGNERS

Table 11-8 (3)

Region I

YEAR	WPSIMP	FIRIMP	SERIMP	GVTIMP
1977.00	0.0	0.0	0.0	0.0
1978.00	0.0	0.0	0.0	0.0
1979.00	128.2320	7.5263	118.7335	5.7584
1980.00	155.2989	9.1174	143.9340	6.9570
1981.00	199.3502	11.7037	188.2569	8.9267
1982.00	5278.3398	309.8857	3423.1433	208.3762
1983.00	5289.8945	310.5630	3432.0391	207.9627
1984.00	508.8215	29.8724	409.0295	21.4111
1985.00	812.6079	47.7074	595.2776	32.6848
1986.00	1285.8228	75.4892	892.6445	50.5975
1987.00	1799.2449	105.6318	1201.5466	69.0367
1988.00	2509.9768	147.2991	1653.0684	95.5454
1989.00	3233.1409	189.8143	2097.2461	121.6753
1990.00	4013.6909	235.6396	2575.1799	149.5397
1991.00	4618.5659	271.1523	2953.7925	170.6894
1992.00	5208.5195	305.7871	3327.1436	191.6056
1993.00	5505.8711	323.2437	3517.1001	201.5564
1994.00	5734.2695	336.6531	3657.6528	208.8130
1995.00	5647.6914	331.5693	3600.9683	204.8510
1996.00	5657.9180	332.1704	3605.3608	204.4279
1997.00	5627.6016	330.3901	3577.0481	202.5080
1998.00	5617.7578	329.8127	3567.8442	201.3850
1999.00	5568.4063	326.9148	3534.7891	198.8791
2000.00	5364.2734	314.9312	3402.9263	190.8900
2001.00	5499.9219	322.8936	3489.6296	195.0484
2002.00	4619.7109	271.2175	2932.9080	163.2969
2003.00	4096.3984	240.4957	2600.2939	144.3130
2004.00	2984.1106	175.1947	1893.5488	104.7756
2005.00	2974.2412	174.6154	1887.9307	104.0973
2006.00	2429.8733	142.6551	1541.3684	84.7605
2007.00	1972.1145	115.7805	1250.4719	68.5710
2008.00	1526.1362	89.5961	967.6919	52.9007
2009.00	1105.1807	64.8839	700.7695	38.1927
2010.00	799.6523	46.9467	507.0383	27.5514
2011.00	568.4348	33.3723	360.4321	19.5276
2012.00	408.6382	23.9907	259.1064	13.9975
2013.00	286.2351	16.8046	181.4958	9.7770
2014.00	204.9056	12.0297	129.9254	6.9796
2015.00	144.2665	8.4697	91.4760	4.9007
2016.00	82.4889	4.8428	52.3042	2.7947
2017.00	42.0065	2.4662	26.6355	1.4196
2018.00	0.6141	0.0361	0.3894	0.0211
2019.00	0.6219	0.0365	0.3944	0.0213

Table 11-8 (4)

Region I

YEAR	LNDI	GASI	OILI	WATERI	ELECI	INTI	DISI
1977.00	.0	.0	.0	.0	.0	.0	.0
1978.00	.0	.0	.0	.0	.0	.0	.0
1979.00	.361996E 04	.287600E 06	.886266E 04	.834176E 07	.205547E 05	.241331E 07	.869207E 06
1980.00	.437348E 04	.347466E 06	.107075E 05	.100782E 08	.248333E 05	.291566E 07	.105014E 07
1981.00	.561166E 04	.445837E 06	.137389E 05	.129314E 08	.318639E 05	.374111E 07	.134744E 07
1982.00	.130994E 06	.104072E 08	.320710E 06	.301860E 09	.743805E 06	.873293E 08	.314536E 08
1983.00	.130734E 06	.103866E 08	.320073E 06	.301261E 09	.742329E 06	.871561E 08	.313912E 08
1984.00	.134599E 05	.106937E 07	.329535E 05	.310167E 08	.764274E 05	.897327E 07	.323192E 07
1985.00	.205470E 05	.163242E 07	.503047E 05	.473480E 08	.116669E 06	.136980E 08	.493364E 07
1986.00	.318077E 05	.252707E 07	.778740E 05	.732970E 08	.180609E 06	.212051E 08	.763751E 07
1987.00	.433993E 05	.344800E 07	.106254E 06	.100009E 09	.246428E 06	.289329E 08	.104208E 08
1988.00	.600639E 05	.477197E 07	.147053E 06	.138410E 09	.341052E 06	.400426E 08	.144222E 08
1989.00	.764903E 05	.607702E 07	.187269E 06	.176263E 09	.434324E 06	.509935E 08	.183664E 08
1990.00	.940069E 05	.746869E 07	.230155E 06	.216628E 09	.533786E 06	.626713E 08	.225725E 08
1991.00	.107428E 06	.853497E 07	.263014E 06	.247555E 09	.609994E 06	.716187E 08	.257951E 08
1992.00	.120451E 06	.956963E 07	.294898E 06	.277565E 09	.683941E 06	.803007E 08	.289221E 08
1993.00	.126707E 06	.100666E 08	.310213E 06	.291980E 09	.719461E 06	.844712E 08	.304242E 08
1994.00	.131269E 06	.104291E 08	.321382E 06	.302492E 09	.745364E 06	.875123E 08	.315195E 08
1995.00	.128778E 06	.102312E 08	.315283E 06	.296752E 09	.731220E 06	.858518E 08	.309214E 08
1996.00	.128512E 06	.102100E 08	.314632E 06	.296140E 09	.729710E 06	.856744E 08	.308576E 08
1997.00	.127305E 06	.101141E 08	.311677E 06	.293358E 09	.722857E 06	.848699E 08	.305678E 08
1998.00	.126599E 06	.100581E 08	.309949E 06	.291732E 09	.718849E 06	.843993E 08	.303983E 08
1999.00	.125024E 06	.993292E 07	.306093E 06	.288102E 09	.709905E 06	.833492E 08	.300201E 08
2000.00	.120001E 06	.953390E 07	.293797E 06	.276529E 09	.681387E 06	.800009E 08	.288141E 08
2001.00	.122616E 06	.974159E 07	.300197E 06	.282553E 09	.696231E 06	.817437E 08	.294418E 08
2002.00	.102655E 06	.815577E 07	.251328E 06	.236556E 09	.582892E 06	.684367E 08	.246490E 08
2003.00	.907210E 05	.720763E 07	.222110E 06	.209056E 09	.515129E 06	.604807E 08	.217835E 08
2004.00	.658663E 05	.523296E 07	.161259E 06	.151781E 09	.373999E 06	.439108E 08	.158155E 08
2005.00	.654398E 05	.519908E 07	.160215E 06	.150798E 09	.371578E 06	.436265E 08	.157131E 08
2006.00	.532839E 05	.423332E 07	.130454E 06	.122786E 09	.302555E 06	.355226E 08	.127943E 08
2007.00	.431066E 05	.342474E 07	.105537E 06	.993340E 08	.244766E 06	.287377E 08	.103505E 08
2008.00	.332555E 05	.264210E 07	.814188E 05	.766334E 08	.188830E 06	.221704E 08	.798515E 07
2009.00	.240095E 05	.190752E 07	.587820E 05	.553271E 08	.136330E 06	.160064E 08	.576505E 07
2010.00	.173200E 05	.137604E 07	.424041E 05	.399118E 08	.983456E 05	.115467E 08	.415879E 07
2011.00	.122759E 05	.975297E 06	.300547E 05	.282883E 08	.697043E 05	.818391E 07	.294762E 07
2012.00	.879943E 04	.699099E 06	.215434E 05	.202772E 08	.499646E 05	.586629E 07	.211287E 07
2013.00	.614623E 04	.488308E 06	.150477E 05	.141633E 08	.348993E 05	.409749E 07	.147580E 07
2014.00	.438763E 04	.348590E 06	.107421E 05	.101108E 08	.249137E 05	.292509E 07	.105354E 07
2015.00	.308077E 04	.244762E 06	.754257E 04	.709926E 07	.174931E 05	.205385E 07	.739739E 06
2016.00	.175688E 04	.139581E 06	.430132E 04	.404851E 07	.997584E 04	.117125E 07	.421853E 06
2017.00	.892415E 03	.709008E 05	.218488E 04	.205646E 07	.506727E 04	.594943E 06	.214282E 06
2018.00	.132334E 02	.105137E 04	.323991E 02	.304949E 05	.751416E 02	.882230E 04	.317755E 04
2019.00	.133589E 02	.106134E 04	.327062E 02	.307839E 05	.758538E 02	.890591E 04	.320766E 04

Table 11-8 (5)

Region I

YEAR	PROFES	MANAGF	CLERIC	SALES	CRAFTS
1977.00	0.0	0.0	0.0	0.0	0.0
1978.00	0.0	0.0	0.0	0.0	0.0
1979.00	30.800	47.478	111.002	27.037	66.279
1980.00	37.169	57.449	134.326	32.736	80.007
1981.00	47.409	74.287	173.641	42.573	101.959
1982.00	1069.069	1681.782	3650.786	809.662	3107.692
1983.00	1066.848	1679.637	3655.373	811.352	3084.929
1984.00	114.449	175.608	404.098	94.353	257.507
1985.00	173.760	268.056	609.898	138.485	403.242
1986.00	263.762	414.226	936.367	208.928	633.934
1987.00	363.664	568.726	1275.969	281.278	373.914
1988.00	502.323	788.140	1764.142	387.178	1213.983
1989.00	636.935	1006.919	2247.565	491.029	1551.481
1990.00	779.222	1241.855	2765.482	602.393	1910.996
1991.00	887.652	1422.935	3167.906	689.922	2183.140
1992.00	991.915	1599.913	3560.883	775.375	2445.867
1993.00	1040.528	1686.747	3755.323	819.032	2569.511
1994.00	1075.444	1750.358	3899.416	850.965	2658.895
1995.00	1053.643	1713.212	3833.300	837.404	2604.011
1996.00	1050.186	1715.446	3832.940	835.167	2594.168
1997.00	1039.764	1693.858	3802.430	831.787	2566.557
1998.00	1032.900	1690.026	3768.396	829.448	2548.202
1999.00	1018.884	1669.688	3748.462	821.520	2512.196
2000.00	976.927	1603.094	3604.523	790.711	2407.229
2001.00	997.140	1638.662	3690.519	810.559	2454.947
2002.00	833.887	1372.519	3096.232	680.954	2051.109
2003.00	736.214	1213.300	2741.447	603.579	1809.356
2004.00	534.007	881.099	1993.976	439.444	1311.357
2005.00	529.993	875.740	1964.943	437.980	1300.381
2006.00	431.137	713.217	1618.973	357.531	1057.115
2007.00	349.474	577.122	1311.996	290.001	853.794
2008.00	269.579	445.365	1013.985	224.363	657.510
2009.00	193.721	321.633	733.361	162.437	473.869
2010.00	139.617	232.090	529.953	117.498	341.259
2011.00	99.864	164.545	376.258	83.505	241.453
2012.00	70.801	117.979	270.159	60.016	172.784
2013.00	49.408	82.428	169.015	42.031	120.482
2014.00	35.239	58.853	135.153	30.092	85.865
2015.00	24.720	41.337	95.049	21.176	60.169
2016.00	14.084	23.577	54.289	12.107	34.264
2017.00	7.147	11.977	27.619	6.166	17.371
2018.00	0.103	0.173	0.409	0.094	0.245
2019.00	0.104	0.175	0.413	0.095	0.247

Table 11-8 (6)

Region I

YEAR	OPERAT	SERVIC	LABOR
1977.00	0.0	0.0	0.0
1978.00	0.0	0.0	0.0
1979.00	94.672	15.131	23.701
1980.00	114.081	18.309	28.637
1981.00	144.919	23.644	36.605
1982.00	3088.525	507.803	1142.139
1983.00	3086.470	508.380	1134.595
1984.00	358.145	55.462	87.533
1985.00	551.444	84.096	132.796
1986.00	859.552	129.463	204.887
1987.00	1170.920	176.761	277.301
1988.00	1620.774	244.556	362.937
1989.00	2060.062	311.820	486.322
1990.00	2525.668	383.895	596.059
1991.00	2875.615	439.823	681.275
1992.00	3212.703	494.412	763.623
1993.00	3367.851	521.405	803.847
1994.00	3477.900	541.444	834.161
1995.00	3402.583	532.263	820.869
1996.00	3386.707	532.218	821.871
1997.00	3348.050	528.034	817.460
1998.00	3321.122	526.096	815.652
1999.00	3271.368	520.552	808.120
2000.00	3132.188	500.569	778.253
2001.00	3191.772	512.495	797.889
2002.00	2664.767	429.944	670.224
2003.00	2349.018	380.673	594.297
2004.00	1701.290	276.880	432.916
2005.00	1685.812	275.615	431.462
2006.00	1369.471	224.802	352.451
2007.00	1105.267	182.177	286.034
2008.00	850.594	140.794	221.350
2009.00	612.621	101.627	160.295
2010.00	440.860	73.582	115.977
2011.00	311.729	52.241	82.443
2012.00	222.930	37.509	59.268
2013.00	155.355	26.243	41.516
2014.00	110.654	18.764	29.721
2015.00	77.524	13.196	20.927
2016.00	44.118	7.537	11.967
2017.00	22.368	3.834	6.097
2018.00	0.346	0.057	0.094
2019.00	0.348	0.057	0.095

Table 11-8 (7)

Region I

YEAR	CLASSA	CLASSB	CLASSC	CLASSD	CLASSE
1977.00	0.0	0.0	0.0	0.0	0.0
1978.00	0.0	0.0	0.0	0.0	0.0
1979.00	111.002	133.504	124.116	47.478	0.0
1980.00	134.326	161.027	149.913	57.449	0.0
1981.00	173.641	205.168	191.941	74.287	0.0
1982.00	3650.786	3088.525	6636.379	1681.782	0.0
1983.00	3655.378	3086.470	2454.327	5831.410	0.0
1984.00	404.098	358.145	237.348	547.564	0.0
1985.00	609.898	551.444	355.377	845.058	0.0
1986.00	936.387	0.0	1402.829	1316.923	0.0
1987.00	1275.969	0.0	1906.260	1806.304	0.0
1988.00	1764.142	0.0	2635.446	2504.447	0.0
1989.00	2247.565	0.0	3349.253	3195.335	0.0
1990.00	2765.482	0.0	3565.642	4534.465	0.0
1991.00	0.0	3167.906	3996.713	5183.648	0.0
1992.00	0.0	3560.883	4470.738	5813.566	0.0
1993.00	0.0	3755.323	4693.102	6115.816	0.0
1994.00	0.0	3899.416	4853.504	4585.301	1750.358
1995.00	0.0	3833.300	4755.715	4495.055	1718.212
1996.00	0.0	3832.940	3386.707	5836.602	1715.446
1997.00	0.0	3802.430	3348.059	5783.637	1693.858
1998.00	0.0	3788.396	3321.122	5752.289	1690.026
1999.00	0.0	0.0	3748.462	8952.633	1669.688
2000.00	0.0	0.0	3604.523	5201.715	4987.250
2001.00	0.0	0.0	3690.518	5312.711	5090.746
2002.00	0.0	0.0	3096.232	4445.887	4257.516
2003.00	0.0	0.0	2741.447	3927.567	3758.871
2004.00	0.0	0.0	1993.976	2850.529	2726.463
2005.00	0.0	0.0	1964.943	2830.890	2706.114
2006.00	0.0	0.0	1619.973	2304.255	2201.469
2007.00	0.0	0.0	1311.996	1573.477	2069.391
2008.00	0.0	0.0	1013.965	1712.738	1595.818
2009.00	0.0	0.0	733.361	874.743	1151.659
2010.00	0.0	0.0	529.953	630.419	930.463
2011.00	0.0	0.0	376.258	446.413	583.371
2012.00	0.0	0.0	270.159	319.707	421.580
2013.00	0.0	0.0	0.0	344.370	362.136
2014.00	0.0	0.0	0.0	245.807	253.528
2015.00	0.0	0.0	0.0	172.574	181.544
2016.00	0.0	0.0	0.0	98.407	103.537
2017.00	0.0	0.0	0.0	27.619	74.969
2018.00	0.0	0.0	0.0	0.409	1.112
2019.00	0.0	0.0	0.0	0.413	1.122

Table 11-9 (1)

Summary Tables

Full Development Impact - Additional Analysis Regions
Region II

YEAR	POPIMP	EMPIMP	INCIMP	ERNIMP
1977	0.	0.	0.	0.
1980	1068.	494.	6137.	5092.
1985	6451.	3098.	45069.	37281.
1990	36194.	17838.	302416.	249265.
1995	53380.	26743.	527099.	432631.
2000	52658.	26570.	609036.	497465.
2005	31118.	15667.	417909.	339489.
2010	9301.	4629.	143807.	116112.
2015	1986.	968.	35047.	28107.

Table 11-9 (2)

Region II

YEAR	AGRIMP	MNGIMP	CSTIMP	MFGIMP	TRNIMP
1977	0.	0.	0.	0.	0.
1980	0.	0.07	12.96	124.67	21.07
1985	0.	277.60	93.33	473.77	102.02
1990	0.	2233.14	576.75	1702.37	533.43
1995	0.	3052.36	890.31	2292.99	811.31
2000	0.	2529.78	905.72	2313.66	821.75
2005	0.	1196.29	545.54	1393.45	494.85
2010	0.	271.82	164.42	419.68	149.11
2015	0.	40.68	35.01	89.36	31.85

Table 11-9 (3)

Region II

YEAR	WRSIMP	FIRIMP	SERIMP	GVTIMP
1977	0.	0.	0.	0.
1980	151.14	8.31	160.50	15.05
1985	1088.65	59.85	908.61	94.44
1990	6727.82	369.85	5150.88	543.70
1995	10385.62	570.93	7924.60	815.13
2000	10565.32	580.81	8043.05	809.85
2005	6363.82	349.84	4845.65	477.53
2010	1917.98	105.44	1459.81	141.10
2015	408.39	22.45	310.84	29.51

Table 11-9 (4)

Region II

YEAR	LNDI	GASI	OILI	WATERI	ELECI	INTI	DISI
1977	.0	.0	.0	.0	.0	.0	.0
1980	.429566E+4	.341283E+6	.105170E+5	.989882E+7	.243914E+5	.286377E+7	.103145E+7
1985	.269549E+5	.214152E+7	.659929E+5	.621142E+8	.153054E+6	.179699E+8	.647227E+7
1990	.155190E+6	.123296E+8	.379948E+6	.357616E+9	.881193E+6	.103460E+9	.372634E+8
1995	.232666E+6	.184849E+8	.569631E+6	.536151E+9	.132112E+7	.155111E+9	.558667E+8
2000	.231158E+6	.183651E+8	.565940E+6	.532677E+9	.131255E+7	.154106E+9	.555046E+8
2005	.136303E+6	.108290E+8	.333706E+6	.314093E+9	.773948E+6	.908684E+8	.327283E+8
2010	.402753E+5	.319980E+7	.986050E+5	.928096E+8	.228690E+6	.268502E+8	.967070E+7
2015	.842229E+4	.669136E+6	.206201E+5	.194081E+5	.478231E+5	.561486E+7	.202232E+7

Table 11-9 (5)

Region II

YEAR	PROFES	MANAGE	CLERIC	SALES	CRAFTS
1977	0.0	0.0	0.0	0.0	0.0
1980	36.92	59.50	138.71	35.03	73.74
1985	226.98	376.08	848.27	200.18	500.94
1990	1275.65	2200.02	4902.54	1131.48	2942.35
1995	1886.22	3327.33	7463.96	1733.47	4356.63
2000	1858.12	3317.47	7514.51	1756.67	4268.65
2005	1086.59	1963.15	4488.84	1056.58	2481.04
2010	318.58	581.96	1342.28	317.86	723.27
2015	66.13	122.07	283.84	67.60	149.29

Table 11-9 (6)

Region II

YEAR	OPERAT	SERVIC	LABOR
1977	0.0	0.0	0.0
1980	101.73	20.99	27.15
1985	649.55	129.99	166.32
1990	3683.51	753.68	948.89
1995	5385.51	1145.44	1444.94
2000	5235.28	1151.40	1468.11
2005	3020.14	686.69	884.09
2010	874.02	205.05	266.38
2015	179.16	43.30	56.71

Table 11-9 (7)

Region II

YEAR	CLASSA	CLASSB	CLASSC	CLASSD	CLASSE
1977	0.0	0.0	0.0	0.0	0.0
1980	138.71	149.86	145.70	59.50	0.0
1985	848.27	649.55	496.49	1103.99	0.0
1990	4902.54	0.0	5386.07	7549.50	0.0
1995	0.0	7463.96	7975.88	7976.32	3327.33
2000	0.0	0.0	7514.50	9611.45	9444.23
2005	0.0	0.0	4488.84	5647.50	5530.78
2010	0.0	0.0	1342.28	1345.44	1941.67
2015	0.0	0.0	0.0	463.00	505.09

Table 11-10 (1)

Summary Tables

Full Development Impact-Additional Analysis Regions
Region IV

YEAR	POPIMP	EMPIMP	INCIMP	ERNIMP
1977	7258.	3218.	41000.	31281.
1980	6585.	2998.	41881.	31899.
1985	5819.	2748.	43546.	33076.
1990	27186.	13172.	243299.	184338.
1995	37570.	18487.	396471.	299698.
2000	35085.	17350.	431803.	325720.
2005	19264.	9473.	273559.	205955.
2010	5179.	2507.	83970.	63112.
2015	942.	444.	17251.	12946.

Table 11-10 (2)

Region IV

YEAR	AGRIMP	MNGIMP	CSTIMP	MFGIMP	TRNIMP
1977	0.0	0.91	467.82	792.51	91.70
1980	0.0	0.86	462.35	696.38	78.80
1985	0.0	185.59	74.22	634.52	85.96
1990	0.0	1491.13	380.34	2274.63	361.89
1995	0.0	2038.11	547.00	2960.77	509.49
2000	0.0	1689.38	522.20	2808.83	483.09
2005	0.0	799.01	289.28	1555.92	267.55
2010	0.0	181.53	77.58	417.02	71.74
2015	0.0	27.16	13.91	74.75	12.96

Table 11-10 (3)

Region IV

YEAR	WRSIMP	FIRIMP	SERIMP	GVTIMP
1977	1040.20	61.07	719.01	44.53
1980	988.29	58.02	672.12	41.49
1985	974.35	57.20	697.83	38.03
1990	4992.94	293.13	3196.10	182.30
1995	7180.92	421.58	4573.15	255.85
2000	6855.33	402.47	4348.38	240.11
2005	3797.59	222.95	2410.	131.11
2010	1018.47	59.79	645.79	34.69
2015	182.56	10.72	115.75	6.14

Table 11-10 (4)

Region IV

YEAR	LNDI	GASI	OILI	WATERI	ELECI	INTI	DISI
1977	.279944E+5	.222410E+7	.685379E+5	.645096E+8	.158957E+6	.186629E+8	.672187E+7
1980	.260853E+5	.207243E+7	.638641E+5	.601105E+8	.148117E+6	.173902E+8	.626348E+7
1985	.239051E+5	.189922E+7	.585262E+5	.550863E+8	.135737E+6	.159367E+8	.573996E+7
1990	.114600E+6	.910480E+7	.280573E+6	.264083E+9	.650719E+6	.764002E+8	.275172E+8
1995	.160836E+6	.127781E+8	.393770E+6	.370626E+9	.913251E+6	.107224E+9	.386191E+8
2000	.150943E+6	.119922E+8	.369551E+6	.347830E+9	.857079E+6	.100629E+9	.362437E+8
2005	.824186E+5	.654801E+7	.201783E+6	.189924E+9	.467986E+6	.549457E+8	.197899E+8
2010	.218075E+5	.173257E+7	.533909E+5	.502528E+8	.123827E+6	.145384E+8	.523631E+7
2015	.386233E+4	.306855E+6	.945604E+4	.890027E+7	.219309E+5	.257488E+7	.927402E+6

Table 11-10 (5)

Region IV

YEAR	PROFES	MANAGE	CLERIC	SALES	CRAFTS
1977	232.94	354.97	763.63	170.73	669.94
1980	214.82	332.93	712.77	158.99	631.74
1985	200.46	313.25	715.23	162.17	467.76
1990	943.77	1518.78	3406.48	745.80	2310.25
1995	1309.16	2149.32	4834.67	1062.02	3222.61
2000	1222.93	2019.51	4575.36	1009.01	3001.53
2005	664.70	1104.39	2519.66	558.46	1625.22
2010	175.16	292.56	671.74	149.50	426.82
2015	30.90	51.87	119.81	26.77	75.05

Table 11-10 (6)

Region IV

YEAR	OPERAT	SERVIC	LABOR
1977	677.53	105.93	242.24
1980	618.56	98.97	229.69
1985	633.94	98.72	156.25
1990	3036.85	472.88	737.90
1995	4194.92	671.27	1043.19
2000	3891.95	635.33	994.46
2005	2100.43	349.83	550.86
2010	549.91	93.26	147.70
2015	96.44	16.63	26.48

Table 11-10 (7)

Region IV

YEAR	CLASSA	CLASSB	CLASSC	CLASSD	CLASSE
1977	1441.16	348.17	1073.60	354.97	0.0
1980	712.77	947.22	1005.55	332.93	0.0
1985	715.23	633.94	417.13	981.47	0.0
1990	3406.48	0.0	4247.62	5518.59	0.0
1995	0.0	4834.67	5909.38	5593.79	2149.32
2000	0.0	0.0	4575.36	6530.74	6243.97
2005	0.0	0.0	2519.66	3559.59	3394.31
2010	0.0	0.0	671.74	790.88	1044.04
2015	0.0	0.0	0.0	216.25	227.70

Table 11-11 (1)

Summary Tables
Full Development Impact - Additional Analysis Regions
Region V

YEAR	POPIMP	EMPIMP	INCIMP	ERNIMP
1977	272.	119.	1520.	1175.
1980	1371.	616.	8203.	6362.
1985	7672.	3586.	55318.	43119.
1990	40550.	19518.	347933.	272512.
1995	57232.	28081.	577318.	454188.
2000.	53361.	26416.	626516.	494915.
2005	29500.	14585.	399181.	316524.
2010	7834.	3829.	120972.	96252.
2015	1421.	680.	24808.	19798.

Table 11-11 (2)

Region V

YEAR	AGRIMP	MNGIMP	CSTIMP	MFGIMP	TRNIMP
1977	0	0.04	27.18	17.00	2.92
1980	0	0.18	15.62	175.54	23.74
1985	0	211.10	101.35	780.37	111.00
1990	0	1696.22	585.38	3376.81	551.10
1995	0	2318.74	857.98	4632.36	796.45
2000	0	1922.32	817.17	4394.35	755.27
2005	0	918.55	455.99	2452.02	421.38
2010	0	206.66	120.89	649.84	111.71
2015	0	30.93	21.66	116.42	20.11

Table 11-11 (3)

Region V

YEAR	WRSIMP	FIRIMP	SERIMP	GVTIMP
1977	41.51	2.44	26.32	1.65
1980	205.01	12.04	175.46	8.53
1985	1330.55	78.12	923.69	49.63
1990	7684.75	451.16	4902.91	270.12
1995	11263.37	661.26	7161.74	388.62
2000	10727.56	629.80	6803.66	365.58
2005	5986.07	351.44	3797.68	201.85
2010	1587.07	93.18	1006.32	52.99
2015	284.32	16.69	180.28	9.41

Table 11-11 (4)

Region V

YEAR	LNDI	GASI	OILI	WATERI	ELECI	INIT	DISI
1977	.103566E+4	.822816E+5	.253559E+4	.238656E+7	.588066E+4	.690442E+6	.248678E+6
1980	.536008E+4	.425850E+6	.131230E+5	.123517E+8	.304354E+5	.357339E+7	.128704E+7
1985	.311964E+5	.247850E+7	.763774E+5	.718884E+8	.177138E+6	.207976E+8	.749073E+7
1990	.169811E+6	.134912E+8	.415743E+6	.391308E+9	.964211E+6	.113207E+9	.407740E+8
1995	.244300E+6	.194092E+8	.598115E+6	.562961E+9	.138718E+7	.162867E+9	.586602E+8
2000	.229817E+6	.182585E+8	.562654E+6	.529584E+9	.130494E+7	.153211E+9	.551824E+8
2005	.126889E+6	.100811E+8	.310660E+6	.292401E+9	.720497E+6	.845928E+8	.304680E+8
2010	.333093E+5	.264636E+7	.815503E+5	.767572E+8	.189135E+6	.222062E+8	.799806E+7
2015	.591432E+4	.469883E+6	.144799E+5	.136288E+8	.335825E+5	.394288E+7	.142012E+7

Table 11-11 (5)

Region V

YEAR	PROFES	MANAGE	CLERIC	SALES	CRAFTS
1977	7.98	13.65	27.80	6.13	27.71
1980	44.90	70.79	166.12	39.99	98.42
1985	258.17	411.51	945.87	214.26	606.62
1990	1381.00	2262.69	5150.81	1139.52	3362.98
1995	1969.45	3274.32	7476.73	1659.00	4810.87
2000	1846.12	3083.03	7077.61	1575.08	4498.89
2005	1015.78	1704.18	3932.52	878.33	2468.18
2010	265.82	447.76	1038.15	232.58	644.21
2015	47.06	79.57	185.31	41.64	113.75

Table 11-11 (6)

Region V

YEAR	OPERAT	SERVIC	LABOR
1977	21.59	3.88	10.31
1980	137.34	22.72	35.84
1985	810.83	130.73	207.89
1990	4378.61	714.98	1128.19
1995	6217.54	1037.97	1635.10
2000	5796.93	982.62	1555.88
2005	3172.16	545.92	868.16
2010	825.96	144.11	230.14
2015	145.54	25.72	41.23

Table 11-11 (7)

Region V

YEAR	CLASSA	CLASSB	CLASSC	CLASSD	CLASSE
1977	49.38	14.19	41.82	13.65	0.0
1980	166.12	195.91	183.31	70.79	0.0
1985	945.87	810.83	552.88	1276.30	0.0
1990	5150.81	0.0	6221.77	8146.20	0.0
1995	0.0	7476.73	8890.61	8439.31	3274.32
2000	0.0	0.0	7077.61	9910.50	9428.04
2005	0.0	0.0	3932.52	5464.57	5188.13
2010	0.0	0.0	1038.15	1200.21	1590.36
2015	0.0	0.0	0.0	330.85	348.97

Table 11-12 (1)

Summary Tables
Full Development Impact - Additional Analysis Regions
Regional Total

YEAR	POPIMP	EMPIMP	INCIMP	ERNIMP
1977	7531.	3337.	42520.	32456.
1980	10177.	4611.	63028.	48544.
1985	25172.	11793.	181598.	141921.
1990	127250.	61334.	1095558.	857493.
1995	179598.	88113.	1822804.	1426771.
2000	170158.	84129.	2015354.	1577348.
2005	95750.	47247.	1310181.	1025659.
2010	26559.	12955.	415789.	325644.
2015	5120.	2446.	90826.	71185.

Table 11-12 (2)

Regional Total

YEAR	AGRIMP	MNGIMP	CSTIMP	MFGIMP	TRNIMP
1977	0.0	0.94	495.00	809.51	94.61
1980	0.0	1.24	502.75	1151.77	143.85
1985	0.0	842.94	330.80	2456.95	373.59
1990	0.0	6775.60	1848.21	9227.48	1743.24
1995	0.0	9261.26	2725.51	12219.10	2518.98
2000	0.0	7676.52	2653.71	11715.15	2438.39
2005	0.0	3639.77	1517.37	6620.17	1393.46
2010	0.0	824.93	423.81	1813.96	388.91
2015	0.0	123.43	81.56	339.60	75.19

Table 11-12 (3)

Regional Total

YEAR	WRSIMP	FIRIMP	SERIMP	GVTIMP
1977	1081.71	63.51	745.33	46.18
1980	1499.74	87.48	1152.01	72.03
1985	4206.15	242.87	3125.41	214.77
1990	23419.20	1349.79	15825.06	1145.66
1995	34477.59	1985.35	23260.45	1664.45
2000	33512.48	1928.02	22598.01	1606.43
2005	19121.71	1098.85	12941.25	914.58
2010	5323.17	305.35	3618.95	256.33
2015	1019.53	58.33	698.34	49.96

Table 11-12 (4)

Regional Total

YEAR	LNDI	GASI	OILI	WATERI	ELECI	INTI	DISI
1977	.290300E+5	.230639E+7	.710735E+5	.668962E+8	.164837E+6	.193533E+8	.697054E+7
1980	.401146E+5	.318703E+7	.982114E+5	.924392E+8	.227777E+6	.267430E+8	.963210E+7
1985	.102603E+6	.815166E+7	.251201E+6	.236437E+9	.582598E+6	.684022E+8	.246366E+8
1990	.533608E+6	.423942E+8	.130642E+7	.122963E+10	.302991E+7	.355738E+9	.128127E+9
1995	.766580E+6	.609034E+8	.187680E+7	.176649E+10	.435276E+7	.511053E+9	.184067E+9
2000	.731919E+6	.581497E+8	.179194E+7	.168662E+10	.415596E+7	.487946E+9	.175745E+9
2005	.411050E+6	.326572E+8	.100636E+7	.947215E+9	.233401E+7	.274033E+9	.986993E+8
2010	.112712E+6	.895478E+7	.275950E+6	.259731E+9	.639997E+6	.751414E+8	.270638E+8
2015	.212797E+5	.169064E+7	.520986E+5	.490365E+8	.120830E+6	.141865E+8	.510958E+7

Table 11-12 (5)

Regional Total

YEAR	PROFES	MANAGE	CLERIC	SALES	CRAFTS
1977	240.92	368.62	791.43	176.86	697.65
1980	333.81	520.67	1151.92	266.75	883.90
1985	859.37	1368.90	3119.27	715.09	1978.56
1990	4379.64	7223.34	16225.32	3619.19	10526.57
1995	6218.47	10469.17	23608.66	5291.89	14994.12
2000	5904.09	10023.10	22771.98	5131.47	14176.29
2005	3297.06	5647.45	12925.96	2931.36	7874.82
2010	899.16	1554.36	3582.13	817.44	2135.55
2015	168.81	294.85	684.00	157.19	398.27

Table 11-12 (6)

Regional Total

YEAR	OPERAT	SERVIC	LABOR
1977	699.12	109.81	252.55
1980	971.71	160.98	321.32
1985	2645.76	443.53	663.26
1990	13624.65	2325.43	3411.03
1995	19200.55	3386.93	4944.11
2000	18056.34	3269.92	4796.70
2005	9978.53	1858.06	2734.60
2010	2690.75	516.00	760.20
2015	498.67	98.85	145.35

Table 11-12 (7)

Regional Total

YEAR	CLASSA	CLASSB	CLASSC	CLASSD	CLASSE
1977	1490.54	362.36	1115.43	368.62	0.0
1980	1151.92	1454.01	1484.46	520.67	0.0
1985	3119.27	2645.76	1821.88	4206.82	0.0
1990	16225.32	0.0	19361.10	25748.75	0.0
1995	0.0	23608.66	27531.58	26504.48	10469.17
2000	0.0	0.0	22771.98	31254.41	30103.49
2005	0.0	0.0	12925.96	17502.54	16819.33
2010	0.0	0.0	3582.13	3966.95	5406.52
2015	0.0	0.0	0.0	1182.67	1263.31

SUMMARY TABLES

ABORTED DEVELOPMENT IMPACT
REGION IV - NEWPORT, RHODE ISLAND

Table 11-13 (1)	Population (POPIMP); employment (FMPIMP); personal income (INCIMP); and earnings (ERNIMP) in number of jobs and thousands of dollars.
Table 11-13 (2)	Employment in agriculture (AGRIMP); mining (MNGIMP); construction (CSTIMP); manufacturing (MFGIMP); and transportation, communication and public utilities (TRNIMP) in number of jobs.
Table 11-13 (3)	Employment in wholesale and retail trade (WRSIMP); finance, insurance and real estate (FIRIMP); services (SERIMP); and government (GVTIMP) in number of jobs.
Table 11-13 (4)	Use of acres of land (LNDI); thousands of cubic feet of natural gas (GASI); thousands of barrels of oil (OILI); thousands of gallons of water (WATERI); thousands of kilowatt-hours of electricity (ELECI); thousands of gallons of water purchased from utilities (INTI); and thousands of gallons of discharge into sewers (DISI).
Table 11-13 (5)	Number of jobs in professional (PROFES); managerial (MANAGE); clerical (CLERIC); sales (SALES); and craftsmen (CRAFTS) occupations.
Table 11-13 (6)	Number of jobs in operative (OPERAT); service (SERVIC); and laborer (LABOR) occupations.
Table 11-13 (7)	Number of families in income classes \$4-8,000 (CLASSA); \$8-10,000 (CLASSB); \$10-15,000 (CLASSC); and \$15-25,000 (CLASSD).

Table 11-13 (1)

Summary Tables
Aborted Development Impact
Region IV

YEAR	POPIMP	EMPIMP	INCIMP	ERNIMP
1977	2015	893	11025	8411
1978	1343	601	7621	5811
1979	2373	1072	14011	10678
1980	1290	587	7914	6028
1981	2015	925	12838	9773
1982	1145	529	7573	5761
1983	474	221	3247	2469

Table 11-13 (2)

Region IV

YEAR	AGRIMP	MNGIMP	CSTIMP	MFGIMP	TRNIMP
1977	0.0	0.23	30.62	209.41	28.51
1978	0.0	0.15	13.51	142.45	19.46
1979	0.0	0.28	24.32	255.10	34.60
1980	0.0	0.15	13.43	138.12	18.99
1981	0.0	0.24	21.15	212.16	29.83
1982	0.0	0.14	12.22	120.01	17.13
1983	0.0	0.06	4.99	44.53	7.53

Table 11-13 (3)

Regional Total

YEAR	WRSIMP	FIRIMP	SERIMP	GVTIMP
1977	262.91	15.43	333.71	12.36
1978	177.36	10.41	229.18	8.32
1979	319.29	18.75	404.47	14.83
1980	176.26	10.35	221.99	8.13
1981	277.67	16.30	354.83	12.80
1982	160.44	9.42	202.75	7.33
1983	65.50	3.85	91.31	3.06

Table 11-13 (4)

Regional Total

YEAR	LNDI	GASI	OILI	WATERI	ELECI	INTI	DISI
1977	.777066E+4	.617365E+6	.190247E+5	.179065E+8	.441230E+5	.518044E+7	.186585E+7
1978	.522726E+4	.415297E+6	.127978E+5	.120456E+8	.296812E+5	.348484E+7	.125514E+7
1979	.932320E+4	.740712E+6	.228258E+5	.214842E+8	.529386E+5	.621547E+7	.223864E+7
1980	.511047E+4	.406018E+6	.125118E+5	.117765E+8	.290181E+5	.340698E+7	.122710E+7
1981	.804748E+4	.639358E+6	.197024E+5	.185444E+8	.456949E+5	.536499E+7	.193232E+7
1982	.460620E+4	.365955E+6	.112772E+5	.106144E+8	.261547E+5	.307080E+7	.110602E+7
1983	.192116E+4	.152633E+6	.470352E+4	.442708E+7	.109086E+5	.128077E+7	.461299E+6

Table 11-13 (5)

Regional Total

YEAR	PROFES	MANAGE	CLERIC	SALES	CRAFTS
1977	60.07	114.55	264.06	70.39	129.86
1978	40.37	77.49	179.92	48.22	84.30
1979	72.20	137.63	319.73	85.31	151.26
1980	39.48	75.54	175.52	46.82	82.86
1981	61.73	119.79	278.28	74.57	129.42
1982	35.28	68.57	159.35	42.63	74.15
1983	14.21	29.63	68.70	18.87	29.52

Table 11-13 (6)

Regional Total

YEAR	OPERAT	SERVIC	LABOR
1977	170.41	35.41	48.45
1978	114.92	24.10	31.54
1979	206.09	42.87	56.57
1980	112.63	23.54	31.05
1981	175.25	37.29	48.69
1982	100.17	21.36	27.95
1983	39.43	9.16	11.31

Table 11-13 (7)

Regional Total

YEAR	CLASSA	CLASSB	CLASSC	CLASSD	CLASSE
1977	434.47	83.86	260.32	114.55	0.0
1978	179.92	170.55	172.89	77.49	0.0
1979	319.73	305.52	308.77	137.63	0.0
1980	175.52	167.22	169.16	75.54	0.0
1981	278.28	261.23	265.72	119.79	0.0
1982	159.35	100.17	201.37	68.57	0.0
1983	68.70	39.43	39.34	73.36	0.0

SECTION 12

RESULT 12
SPATIAL ALLOCATION OF IMPACTS

12.1 DATA INPUTS

The data inputs for this procedure include the population of each county in the impact regions, and the distance of each county from the primary sites.

12.2 PROCEDURE

The allocation of indirect and induced impacts of OCS activity to specific places within the general region of impact is accomplished by using a modified gravity model. Each place receives indirect and induced impacts in proportion to its share of the sum of the gravity ratios calculated for all places within the region of impact. The ratio for each place is calculated as the population of the place divided by the square of its distance from the site of primary activity. In this application, the share of indirect and induced activity in the primary impact county (Atlantic County, New Jersey; Somerset County, Maryland; or Sussex County, Delaware -- also Ocean County, New Jersey; Newport, Rhode Island or New York, New York) is to be calculated. Thus, for this application it is sufficient to treat whole counties as places and to use their approximate centers as the points to which distances are calculated. An exception is for the primary impact counties for which the distance in the divisor of the gravity ratios will be considered to be 10, reflecting the economic advantage of locating service-type support activities as close as possible to the primary activities.

Table 12-1 indicates the steps used in calculating the proportion of induced and indirect activity allocated to each of the primary impact counties. Note that 1970 population figures are used for allocations in all years in this case. While it would be somewhat more accurate to use forecasted and estimated population figures for each year, the trends in population growth in all areas for this example are such as to minimize the effect of using projected figures. This would not be the case in frontier OCS development regions, however. In such regions the growth in population in the primary activity areas as development occurs should be permitted to increase the allocation of indirect and induced effects to these primary activity areas.

In cases where allocations to specific cities in large regions with many small cities is desired, a means of limiting the number of such cities included is necessary. Experience has indicated that a reasonable criterion that can be employed in such cases is that the ratio of population to distance squared must be greater than 2 for allocating any indirect and induced effect to a city. In frontier areas with few cities, such a criterion is not necessary because all places will receive some effects.

The allocation of indirect and induced activities to each county must be done with some care. If the indirect and induced activities include heavy manufacturing activities and a given county has no initial activity in these sectors, then the realistic likelihood that such facilities could be constructed to provide the required output must be considered. If it seems unlikely that such facilities would be constructed, then the proportion of these activities that would have been allocated to the counties without facilities should be added to the proportions in counties with such facilities, or the additional requirements may be assumed to be met from imports.

12.3 RESULTS

The results of the allocation procedure appear in the right-hand column of Table 12-1 as proportions of indirect and induced activity to be allocated to each county in each region. The procedure produces results in agreement with *a priori* expectations in general terms:

1. When the county which is the primary site is relatively large (as in the case of Atlantic County, New Jersey), it will also be the location of most of the indirect and induced activity.

2. When there is a very large population concentration not far away (as in the case of Philadelphia relative to Atlantic County), it will receive a large proportion of the indirect and induced activity.

3. When a large population concentration is somewhat farther away, however (as in the case of Baltimore relative to Somerset County), it will receive a proportion of the indirect and induced activity not much larger than nearby smaller counties.

4. When an intermediate-sized place is the site of primary activity and is far from large places, most of the indirect and induced activity will occur near the primary activity (note that Sussex County, Delaware receives a larger proportion of the indirect and induced activity of Region II than Atlantic County does in Region I, even though Atlantic County is more than twice as large as Sussex County).

Table 12-1

Spatial Allocation of Indirect and Induced Activity Among Counties of the Region

Region I	Population (1)	Distance (2)	Ratio (3)= $(1)/(2)^2$	Proportion (4) = $(3)/\Sigma(3)$
Atlantic County, NJ	175,043	10	1750.43	.5287
Ocean, NJ	208,470	43	112.74	.0341
Cape May, NJ	59,554	31	61.96	.0187
Cumberland, NJ	121,374	39	79.79	.0241
Burlington, NJ	323,132	46	152.68	.0461
Camden, NJ	456,291	47	206.52	.0624
Gloucester, NJ	172,681	52	63.86	.0193
Philadelphia, PA	1,948,609	63	490.85	.1483
Chester, PA	278,311	83	40.38	.0122
Bucks, PA	415,056	95	45.99	.0139
Delaware, PA	600,035	73	112.57	.0340
Montgomery, PA	623,799	81	95.07	.0287
Salem, NJ	60,346	52	22.32	.0067
Cecil, MD	53,291	88	6.88	.0021
New Castle, DE	385,856	75	68.57	.0207
Total	5,881,848	869	3310.61	1.0000

Table 12-1
(Continued)

Region II	Population (1)	Distance (2)	Ratio (3)= $(1)/(2)^2$	Proportion (4) = $(3)/\Sigma(3)$
Sussex, DE	80,356	10	803.56	.5712
Kent, DE	81,892	37	59.81	.0425
Queen Annes, MD	18,422	50	7.37	.0052
Caroline, MD	19,781	38	13.70	.0097
Talbot, MD	23,682	56	7.55	.0054
Dorchester, MD	29,405	53	10.47	.0074
Wicomico, MD	54,236	40	33.90	.0241
Somerset, MD	18,924	53	6.74	.0048
Worcester, MD	24,442	40	15.28	.0109
Accomack, VA	29,004	99	2.96	.0004
Northampton, VA	14,442	119	1.02	.0007
Baltimore City, MD	905,759	107	79.07	.0562
Baltimore, MD	621,077	121	42.42	.0302
Carroll, MD	69,006	130	4.08	.0029
Harford, MD	115,378	108	9.89	.0070
Howard, MD	61,911	112	4.93	.0035
Anne Arundel, MD	297,539	90	36.72	.0261
Cecil, MD	53,291	76	9.22	.0066
Salem, NJ	60,346	92	7.13	.0051
New Castle, DE	385,856	81	58.80	.0418
District of Columbia	756,510	121	51.67	.0367
Montgomery, MD	522,809	130	30.90	.0220
Prince Georges, MD	660,567	110	54.56	.0388
Prince William, VA	111,102	131	6.47	.0046
Loudoun, VA	37,150	144	1.79	.0013
Arlington, VA	174,284	126	10.96	.0078
Fairfax, VA	455,021	130	26.89	.0191
Fairfax City, VA	21,970	129	1.32	.0009
Alexandria City, VA	110,938	126	6.98	.0050
Falls Church City, VA	10,772	125	0.69	.0005
Total	5,825,872	2775	1406,85	1.0000

Table 12-1
(Continued)

Region III	Population (1)	Distance (2)	Ratio (3)= $(1)/(2)^2$	Proportion (4) = $(3)/\Sigma(3)$
Somerset, MD	18,924	10	189.24	.2848
Sussex, DE	80,356	53	28.60	.0430
Trent, DE	81,892	89	10.33	.0155
Queen Annes, MD	18,422	82	2.74	.0041
Caroline, MD	19,781	74	3.61	.0054
Talbot, MD	23,682	72	4.57	.0069
Dorchester, MD	29,405	51	11.30	.0170
Wicomico, MD	54,236	33	49.80	.0750
Worcester, MD	24,442	28	36.28	.0546
Accomack, VA	29,004	45	14.32	.0216
Northampton, VA	14,442	58	4.29	.0065
Baltimore City, MD	905,759	126	56.97	.0857
Baltimore, MD	621,077	142	30.74	.0463
Carroll, MD	69,006	150	3.06	.0046
Harford, MD	115,378	153	4.93	.0074
Howard, MD	61,911	140	3.16	.0048
Anne Arundel, MD	16,146	111	1.31	.0019
Montgomery, MD	522,809	133	29.54	.0445
Prince Georges, MD	660,567	126	41.55	.0625
District of Columbia, VA	756,510	141	37.98	.0572
Loudoun, VA	37,150	164	1.38	.0021
Arlington, VA	174,284	149	7.84	.0118
Fairfax, VA	455,021	158	18.20	.0274
Fairfax City, VA	21,970	157	0.89	.0013
Alexandria City, VA	110,938	150	4.93	.0074
Falls Church City, VA	10,772	149	0.48	.0007
Hampton City, VA	120,779	127	7.49	.0113
Newport News City, VA	138,177	133	7.81	.0118
York, VA	33,203	144	1.60	.0024
Chesapeake City, VA	89,580	133	5.06	.0076
Norfolk City, VA	307,951	116	22.88	.0344
Portsmouth City, VA	110,963	119	7.83	.0118
Virginia Beach City, VA	172,106	112	13.72	.0206
Total	5,907,003	3619	664.43	1.0000

Table 12-1
(Continued)

Region I*[1]	Population (1)	Distance (2)	Ratio $= \frac{(1)}{(2)^2}$	Porportion $(4)=\frac{(3)}{\Sigma(3)}$
Ocean County, NJ	208,470	10	2084.70	.5295
Burlington, NJ	323,132	29	384.22	.0976
Atlantic, NJ	175,043	40	109.40	.0278
Camden, NJ	456,291	45	225.33	.0572
Gloucester, NJ	172,681	54	59.22	.0150
Cumberland, NJ	121,374	58	36.08	.0092
Cape May, NJ	59,554	60	16.54	.0042
Philadelphia, PA	1,948,609	60	541.28	.1375
Bucks, PA	415,056	64	101.33	.0257
Salem, NJ	60,346	66	13.85	.0035
Delaware, PA	600,035	68	129.76	.0330
Montgomery, PA	623,799	70	127.31	.0323
New Castle, DE	385,856	80	60.29	.0153
Chester, PA	278,311	86	37.63	.0096
Cecil, MD	53,291	93	6.16	.0016
Total	5,881,848	883	3933.10	1.0000

[1]Region I* is the same as Region I. However, here the primary activity is projected to be in Ocean County instead of Atlantic County. This results in different distances and proportions from those obtained in the Region I case.

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Table 12-1
(Continued)

Region IV	Population (1)	Distance (2)	Ratio(3) $= \frac{(1)}{(2)^2}$	Proportion(4) $= \frac{(3)}{\Sigma(3)}$
Newport, RI	94,559	10	945.59	.1106
Washington, RI	85,706	15	380.92	.0445
Bristol, MA	444,301	16	1735.55	.2028
Bristol, RI	45,937	18	141.78	.0166
Kent, RI	142,382	20	355.96	.0416
Providence, RI	580,261	28	3153.59	.3688
Dukes, MA	6,117	34	5.29	.0006
Plymouth, MA	333,314	36	257.19	.0301
Worcester, MA	637,969	38	441.81	.0516
Barnstable, MA	96,656	42	54.79	.0064
Norfolk, MA	605,051	45	298.79	.0349
Suffolk, MA	735,190	54	252.12	.0296
Middlesex, MA	1,397,268	60	388.13	.0454
Nantucket, MA	3,774	62	0.98	.0001
Essex, MA	637,887	80	99.67	.0116
Hillsborough, NH	223,941	100	22.39	.0026
Rockingham, NH	138,951	110	11.48	.0013
Merrimack, NH	80,925	125	5.18	.0006
Belknap, NH	32,367	140	1.65	.0002
Carroll, NH	18,548	155	0.77	.0001
Total	6,341,102	1188	8,553.63	1.0000

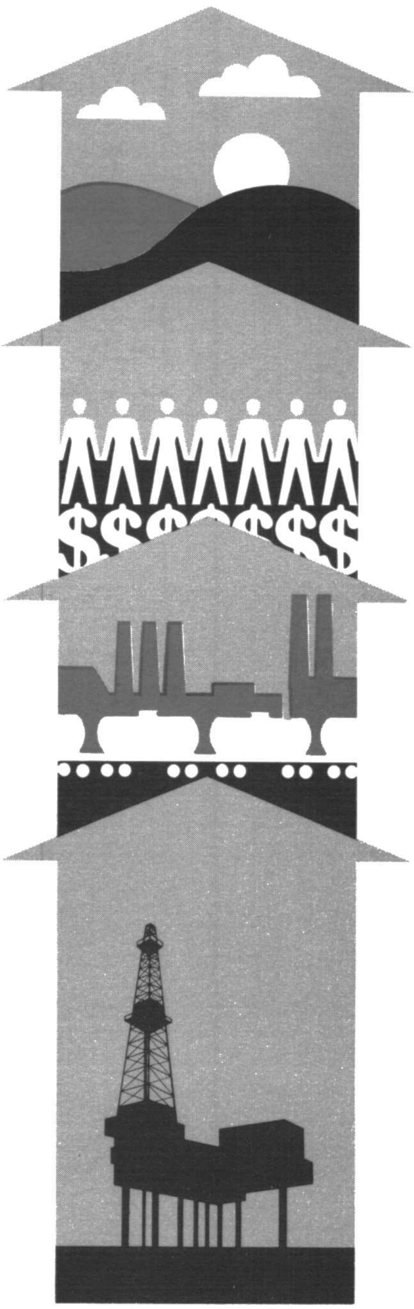
Table 12-1
(Continued)

Region V	Population (1)	Distance (2)	Ratio(3) $= \frac{(1)}{(2)^2}$	Proportion(4) $= \frac{(3)}{\Sigma(3)}$
New York, NY	1,539.233	10	15,392.33	.3171
Hudson, NJ	609.266	10	6092.66	.1255
Union, NJ	543,166	10	5431.16	.1119
Nassau, NY	1,428,075	12	9917.19	.2043
Essex, NJ	929,986	14	4744.83	.0977
Bergen, NJ	898,012	18	2771.64	.0571
Monmouth, NJ	459,379	20	1148.45	.0236
Passaic, NJ	460,782	20	1151.96	.0237
Middlesex, NJ	583,813	22	1206.23	.0248
Morris, NJ	383,454	25	613.53	.0126
Somerset, NJ	198,372	25	317.40	.0065
Westchester, NY	894,104	34	773.45	.0159
Fairfield, CT	792,814	35	647.20	.0133
Rockland, NY	229,903	35	187.68	.0039
Suffolk, NY	1,124,950	36	868.02	.0179
Sussex, NJ	77,528	46	36.64	.0007
Hunterdon, NJ	69,718	48	30.26	.0006
Putnam, NY	56,696	50	22.68	.0005
Orange, NY	221,657	60	61.57	.0013
Sullivan, NY	52,580	72	10.14	.0002
Dutchess, NY	222,295	75	39.52	.0008
Ulster, NY	141,241	75	25.11	.0005
Total	11,916,974	752	48,489.65	1.0000

12.4 CONCLUSIONS

This chapter has generated detailed base case data by region and impact data by region, based on alternative OCS activities. Although Figure 3-i of the Introduction shows the final result as the addition of the base case and the impact, this is too simplistic. In reality, the base plus impact will depend on regional parameters such as the level of unemployment and underutilized assets from schools through industrial facilities of all kinds. In some cases, most of the impact could be part of the baseline.

In consideration of this problem, the sum of the base case and the OCS impact will not be displayed.



CHAPTER 4

DEMOGRAPHIC IMPACT

SECTION 1

INTRODUCTION

Assessment of the impact on demographic characteristics of the Baltimore Canyon Trough Region from OCS development is carried out applying the procedural steps outlined in the demographic analysis matrix, Table 5-1 in Volume II, Chapter 4.

For a complete examination of the region of interest, the data in this chapter should be reviewed in conjunction with other elements of the study. For example, for income distribution employment categories, etc., see the economic analysis in Chapter 3. The location analysis in Chapter 2 examines housing situations, recreation, infrastructure, etc.

The demographic analysis section of this study will concentrate on population, growth rate, projected population, and projected impact on population, including details on population and related characteristics for Atlantic, Sussex, and Somerset counties.

SECTION 2

ANALYSIS REGION

A major input to this analysis section has been the location analysis discussion that determined areas of possible OCS development-related activities within the bounds of the Baltimore Canyon Trough region. Based on this information, and applying the procedure recommended in the demographic analysis section in Volume II, the Baltimore Canyon Trough-based analysis area components were determined. This area extends from Long Island, New York, to the Accomack-Northampton region in Virginia. Counties that are included are as follows:

State	County
New York	Nassau, Suffolk
New Jersey	Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Middlesex, Monmouth, Ocean, Salem
Delaware	Kent, New Castle, Sussex
Maryland	Caroline, Dorcester, Kent, Queen Annes, Somerset, Talbot, Wicomico, Worcester
Virginia	Accomack, Northampton

Although the Baltimore Canyon Trough region does not extend beyond Long Island physically, it is understood that the economic climate of Rhode Island is more appropriate to attract OCS development-related activities than even New Jersey where environmental constraints may play a major role in location decision. Hence, for data compilation, Rhode Island is also included in this analysis (refer to Chapter 2, Location Analysis).

In the Set 1 regions of the economic analysis, all of the direct industries are concentrated in turn in each of the three highlighted regions: Somerset County, Maryland; Sussex County, Delaware; and Atlantic County, New Jersey. These regions encompass a number of SMSA's and parts of non-SMSA's in the region covering portions of New Jersey, Delaware, Maryland, Virginia, Pennsylvania, and Washington, D.C. For understanding the relative population characteristics of these states, the demographic analysis tables include the state figures for New York, New Jersey, Delaware, Maryland, Pennsylvania, Virginia, Rhode Island, and Washington, D.C. In addition, the analysis includes specific demographic information on: Atlantic County and City; Sussex County and Lewes; and Somerset County and Crisfield. These counties are separately identified for their distinct characteristics, namely:

County	Characteristic	Concerned Urban Center
Atlantic, New Jersey	Urbanized recreation	Atlantic City
Sussex, Delaware	Agri-marine recreation	Lewes
Somerset, Maryland	Agri-marine rural	Crisfield

SECTION 3

GENERAL SETTING

The analysis region is shown in Figure 3-1 and consists of parts of the northeast and south census regions.

States	Geographic Division	Census Region
New York, New Jersey	Middle Atlantic	Northeast
Delaware, Maryland, Virginia	South Atlantic	South

The region contains full or parts of a number of SMSA's; the counties involved are given below:

SMSA	County
Wilmington	New Castle, Delaware; Cecil, Maryland; Salem, New Jersey
Vineland-Millville-Bridgeton	Cumberland, New Jersey
Atlantic City	Atlantic, New Jersey
Philadelphia	Burlington, Camden, Gloucester, New Jersey
New York	Nassau, Suffolk, New York

3.1 COMMUNITY CHARACTER

The Baltimore Canyon demographic region is a heavily populated urban belt spreading from New York to Virginia. The region exhibits characteristics of a farming community (Maryland), bedroom community (New Jersey), and recreational community (New Jersey, Delaware) in addition to the transportation corridors provided by the region for the north-south flow along the eastern seaboard, and the industrial support of economic development of the region.

Major population centers in the region are Long Island and Wilmington. There are a number of major urban centers adjacent or close to the Baltimore Canyon region, which may have an impact from the OCS development-associated activities in the region. They include: New York City,

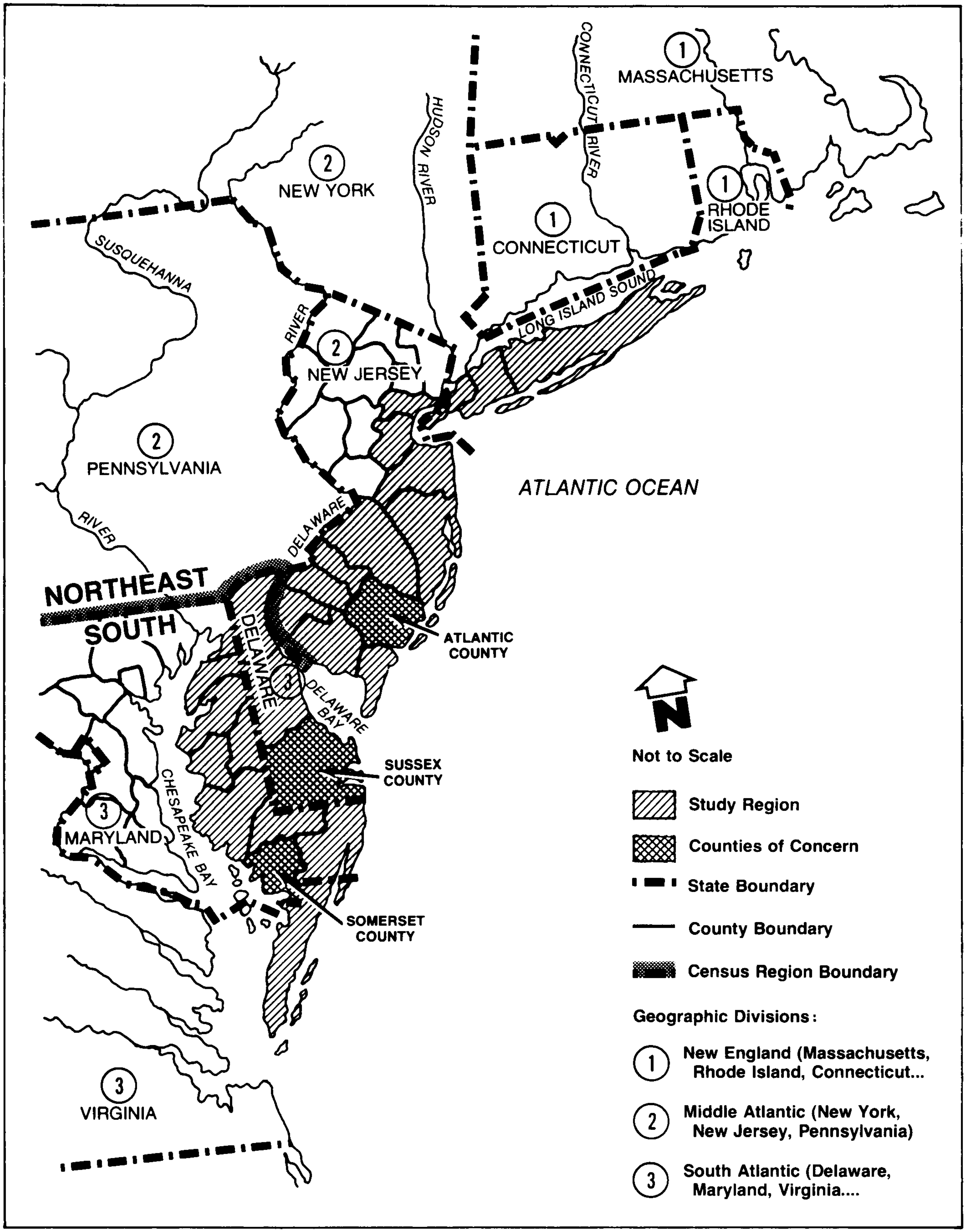


FIGURE 3-1 LOCATION OF BALTIMORE CANYON DEMOGRAPHIC REGION

Newark, Trenton, Philadelphia, Baltimore, Washington, D.C., Richmond, and Norfolk. These urban areas are shown in Figure 3-2.

The impact of OCS development-related activities in the region on these urban centers can be judged partially from their proximity to the potential areas of site location, but mainly through the network of highways that brings the region close to these urban centers.

3.2 POPULATION CHARACTERISTICS

Table 3-1 lists the major population characteristics of the 25 counties in the region, as well as the associated states. (As mentioned earlier, since this analysis does not refer to any specific site, the information provided in the table concerns general characteristics. For detailed characteristics refer to the General Social and Economic Characteristics PC(1)-C series for the state, by Bureau of the Census, 1970, the latest available data.) Population characteristics for Atlantic City are available mostly at the same level of detail as for counties. However, for Lewes in Sussex County, and Crisfield in Somerset County, the information is limited unless local planning offices and agencies are contacted for detailed information on population characteristics.

3.2.1 Population and Growth Rate

The Baltimore Canyon demographic region contained a total population of 6,356,200 persons in 1975. Heavy population concentrations were in Nassau-Suffolk counties of New York, representing 43 percent of the total population of the region. The eight counties in Maryland and the two in Virginia represented only four percent of the region's total population.

Historic population figures for the counties of concern and the cities within, are given in Table 3-2. It shows that Atlantic City was decreasing its population as well as its share in the county's total population since 1960, while the county experienced a moderate increase in population during this period.

Historically, the Baltimore Canyon demographic region had increased its population at a higher rate than the nation. The region represented 3.0 percent of the nation's total population in 1975; the region's share in 1960 was only 2.6 percent. The growth rates of the region and the United States are given below:

	Growth Rate (Percent)	
	1960-1970	1970-1975
United States	13.4	4.2
Baltimore Canyon Demographic Region	28.2	6.4

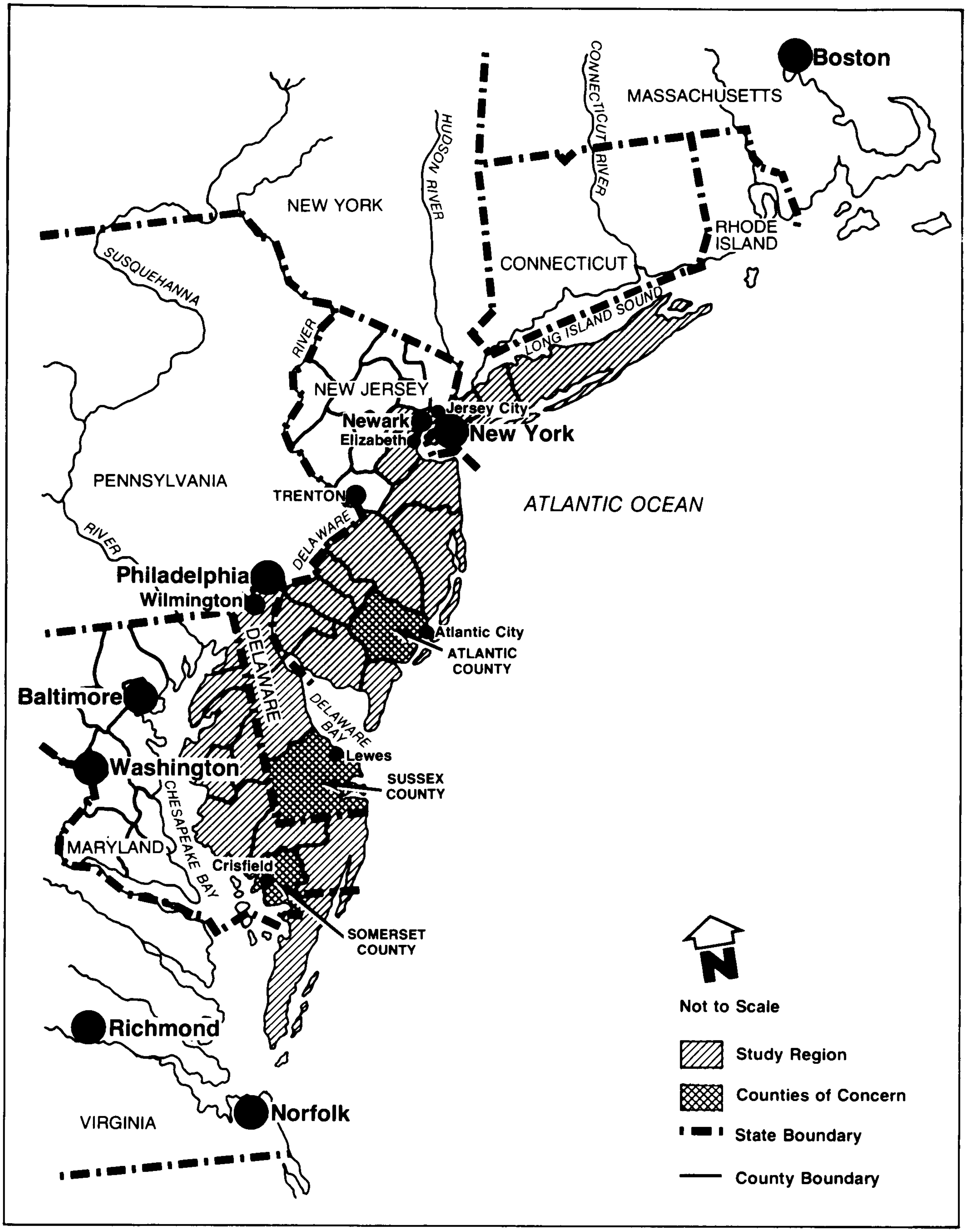


FIGURE 3-2 MAJOR URBAN CENTERS IN THE BALTIMORE CANYON DEMOGRAPHIC REGION

Table 3-1

Base Conditions

		New York		New Jersey								
		Nassau	Suffolk	Atlantic	Burlington	Camden	Cape May	Cumberland	Gloucester	Middlesex	Monmouth	Ocean
Population Characteristics												
Total Population	1960	1,300,171	666,784	160,880	224,499	392,035	48,555	106,850	134,840	433,856	334,401	108,241
	1970	1,428,838	1,127,030	175,043	323,132	456,291	59,554	121,374	172,681	583,813	459,379	208,470
	175	1,455,947	1,279,690	179,725	326,470	483,080	63,625	129,085	183,810	609,715	480,270	258,940
Population Density (Persons/Square Mile)	1975	5,038	1,377	316	399	2,186	238	258	559	1,954	1,009	403
Rate of Growth of Population (Percent)	'60-'70	9.9	69.0	8.8	43.9	16.4	22.7	13.6	28.1	34.6	38.1	92.6
	'70-'75	1.9	13.5	2.7	1.0	5.9	6.8	6.4	6.4	4.4	4.5	24.2
Urban Population (Percent of Total Population)	1970	99.7	89.8	81.1	80.5	95.9	61.8	73.5	70.8	95.4	81.8	44.3
Net Migration (Percent of 1960 Population)	'60-'70	1.1	49.3	4.8	27.3	4.7	21.9	2.1	15.2	19.9	25.8	79.5
Non-White Population (Percent of Total Population)	1970	5.0	5.2	17.8	9.4	11.8	8.4	14.8	8.6	4.8	8.8	3.3
Percent Growth in Non-White Population	'60-'70	66.9	64.4	7.5	97.3	46.7	20.5	27.1	17.5	56.2	23.8	88.7
Age - Sex Composition:	1970											
Female Population (Percent of Total Population)		51.7	50.9	53.4	47.1	52.0	51.3	52.5	51.2	50.5	51.2	51.6
Percent Age Distribution:	1970											
Below 5 Years		6.9	10.0	7.5	8.8	8.7	6.6	9.1	9.2	8.9	8.7	8.5
5 to 17 Years		28.0	29.7	23.9	27.4	26.5	21.7	26.0	28.1	26.9	27.4	24.4
18 to 64 Years		57.2	52.7	52.3	57.8	55.8	51.7	54.9	55.0	57.8	54.0	51.3
65 and Over		7.9	7.6	16.3	6.0	9.0	20.0	10.0	7.7	6.4	9.9	15.8
Median Age	1970	30.9	26.4	35.5	24.2	29.4	38.9	29.3	27.2	27.5	28.4	32.7
Education:	1970											
Median School Years Completed		12.4	12.2	11.2	12.3	11.9	11.3	10.7	11.8	12.1	12.3	11.9
High School Graduates (Percent)*		65.8	59.0	44.4	59.6	49.1	45.2	40.0	48.7	55.0	60.1	49.2
College Graduates (Percent)*		17.0	12.0	6.2	12.6	9.8	7.3	5.7	8.0	11.2	4.3	7.3

(*Percent of Population 25 Years and Over)

Table 3-1
(continued)

		New York		New Jersey								
		Nassau	Suffolk	Atlantic	Burlington	Camden	Cape May	Cumberland	Gloucester	Middlesex	Monmouth	Ocean
Household Characteristics:	1970											
Number of Households		407,416	313,489	67,755	87,758	143,150	28,335	38,932	51,075	151,599	142,927	80,460
Percent Population in Group Quarters		1.1	3.6	1.4	8.6	1.2	4.0	3.0	1.6	2.2	2.8	1.1
Persons Per Household		3.5	3.8	2.8	3.8	3.2	2.8	3.2	3.4	3.4	3.3	3.0
Labor Force Characteristics												
Total Labor Force	1970	587,880	404,201	69,855	141,614	184,674	21,430	49,845	67,279	247,852	179,406	71,176
Labor Force Participation Rate (Percent of Total Population)		41.1	35.9	39.9	43.8	40.5	36.0	41.1	39.0	42.5	39.0	34.1
Civilian Labor Force		585,516	403,170	69,440	111,180	183,289	19,955	49,773	66,695	247,422	169,624	69,114
Female Labor Force (Percent of Civilian L.F.)		35.6	33.6	41.1	36.6	36.6	37.7	40.6	34.4	36.3	35.8	34.2
Military Employment (Percent of Total Labor Force)		0.4	0.2	0.6	21.5	0.7	6.9	0.1	0.9	0.2	5.4	2.9
Employment:	1970											
Total Civilian Employment		569,199	388,978	65,462	106,838	175,971	18,667	46,942	64,034	239,940	162,759	65,841
Employment/Population Ratio (Percent)		39.8	34.5	37.4	33.1	38.6	31.3	38.7	37.1	41.1	35.4	31.6
Unemployment Rate (Percent of Civilian L.F.)		2.8	3.5	5.7	3.9	4.0	6.5	5.7	4.0	3.0	4.0	4.7
Employment by Major Groups: (Percent of Total Employed)	1970											
Manufacturing		20.1	21.8	16.5	29.9	30.2	11.4	41.5	33.6	38.9	22.9	18.6
Wholesale & Retail Trade		22.7	20.5	24.9	20.4	21.7	23.3	16.1	18.9	18.2	20.4	24.3
Services		16.9	16.1	17.0	13.9	13.1	15.1	11.4	13.7	13.2	14.9	14.4
Construction		5.3	7.4	8.2	5.9	6.4	12.0	5.3	7.2	5.0	6.5	10.3
Government		16.6	21.0	17.0	18.4	13.9	22.6	13.0	14.7	13.1	17.5	17.8

Table 3-1
(continued)

		New Jersey	Delaware			Maryland						
		Salem	Kent	New Castle	Sussex	Caroline	Dorchester	Kent	Queen Anne's	Somerset	Talbot	Wicomico
Population Characteristics												
Total Population	1960	58,711	65,651	307,446	73,195	19,462	29,666	15,481	16,569	19,623	21,578	49,050
	1970	60,346	81,892	385,856	80,353	19,781	29,405	16,146	18,422	18,924	23,682	54,236
	1975	63,515	91,600	399,000	88,600	20,620	29,640	16,780	19,650	19,090	25,860	57,850
Population Density (Persons/Square Mile)	1975	174	154	911	93	64	50	60	52	56	99	152
Rate of Growth of Population (Percent)	'60-'70	2.8	24.7	25.5	9.8	1.6	-0.9	4.3	11.2	-3.6	9.8	10.6
	'70-'75	5.3	11.9	3.4	10.3	4.2	0.8	3.9	6.7	0.9	9.2	6.7
Urban Population (Percent of Total Population)	1970	54.0	38.6	91.2	14.2	---	39.4	21.5	---	16.2	28.8	28.1
Net Migration (Percent of 1960 Population)	'60-'70	-7.5	4.9	11.7	-1.4	-4.0	-4.7	-2.4	4.2	-6.0	4.8	2.6
Non-White Population (Percent of Total Population)	1970	15.5	17.1	13.1	21.1	20.2	30.9	24.7	24.5	37.5	24.3	21.2
Percent Growth in Non-White Population	'60-'70	4.8	35.9	35.7	8.8	1.1	0.6	2.2	0.6	-2.9	-2.0	4.1
Age - Sex Composition:												
Female Population (Percent of Total Population)	1970	50.8	49.5	51.5	51.7	51.2	51.8	51.2	50.0	51.8	52.2	52.4
Percent Age Distribution:	1970											
Below 5 Years		8.2	9.4	8.8	8.5	7.5	7.6	7.1	7.4	7.0	6.9	7.4
5 to 17 Years		27.0	27.8	27.2	26.2	27.0	23.8	25.2	26.3	26.8	24.2	26.2
18 to 64 Years		55.6	55.6	56.5	54.2	52.6	55.1	54.6	54.0	52.1	54.4	55.8
65 and Over		9.2	7.2	7.5	11.1	12.9	13.5	13.1	12.3	14.1	14.5	10.6
Median Age	1970	29.5	24.2	27.0	29.8	31.7	33.7	30.2	32.4	32.6	35.2	30.4
Education:	1970											
Median School Years Completed		11.3	12.1	12.2	11.1	10.2	9.7	10.6	10.1	9.3	10.9	11.0
High School Graduates (Percent)*		44.8	52.3	57.6	43.0	31.2	28.5	37.2	33.3	21.5	39.2	40.9
College Graduates (Percent)*		5.7	9.6	15.1	6.8	5.5	4.8	8.8	6.1	3.5	10.3	8.7
(*Percent of Population 25 Years and Over)												

Table 3-1
(continued)

		New Jersey	Delaware			Maryland						
		Salem	Kent	New Castle	Sussex	Caroline	Dorchester	Kent	Queen Anne's	Somerset	Talbot	Wicomico
Household Characteristics:	1970											
Number of Households		19,408	25,037	120,646	29,307	7,004	10,841	6,049	6,549	6,897	8,907	18,375
Percent Population in Group Quarters		1.0	6.1	2.6	1.8	1.6	2.3	4.4	1.6	2.6	1.8	2.6
Persons per Household		3.2	3.5	3.3	3.1	3.0	3.0	3.1	3.1	3.1	2.9	3.1
Labor Force Characteristics												
Total Labor Force	1970	24,303	34,298	157,637	33,709	7,732	12,959	6,794	7,772	7,306	10,216	23,462
Labor Force Participation Rate (Percent of Total Population)	1970	40.3	41.9	40.8	42.0	39.1	44.1	42.1	42.2	38.6	43.1	43.2
Civilian Labor Force	1970	24,104	28,433	157,222	33,500	7,714	12,959	6,765	7,715	7,282	10,197	23,420
Female Labor Force (Percent of Civilian L.F.)	1970	34.9	42.1	37.1	39.6	36.7	43.7	38.2	36.8	40.0	41.6	41.6
Military Employment (Percent of Total L.F.)	1970	0.8	17.1	0.3	0.6	0.2	---	0.4	0.7	0.3	0.2	0.2
Employment:												
Total Civilian Employment	1970	23,203	27,233	151,125	32,569	7,524	12,160	6,368	7,378	6,356	9,940	22,647
Employment/Population Ratio (Percent)	1970	38.4	33.2	39.2	40.5	38.0	41.4	39.4	40.0	33.6	42.0	41.8
Unemployment Rate (Percent of Civilian L.F.)	1970	3.7	4.2	3.9	2.8	2.5	6.2	5.9	4.4	12.7	2.5	3.3
Employment by Major Groups (Percent of Total Employed)	1970											
Manufacturing		44.8	24.6	30.5	30.2	29.4	38.8	20.1	19.9	26.9	16.7	24.4
Wholesale & Retail Trade		15.3	19.3	19.4	18.3	18.7	16.2	18.4	19.5	21.1	21.6	24.4
Services		11.2	14.7	17.2	13.1	12.7	10.7	17.7	16.9	14.6	17.6	14.3
Construction		5.9	8.9	7.1	9.0	8.3	6.7	9.3	11.1	7.3	10.0	7.2
Government		11.4	24.3	13.7	15.3	13.8	14.5	11.7	18.3	17.4	11.0	14.5

Table 3-1
(continued)

		Maryland	Virginia		Baltimore Canyon Region	Rhode Island	New Jersey	Delaware	Maryland	Washington D.C.	Virginia	Pennsylvania
		Worcester	Accomack	Northampton								
Population Characteristics												
Total Population	1960	23,733	30,635	16,966	4,658,878	859,488	6,066,782	446,292	3,100,689	763,956	3,954,429	11,319,366
	1970	24,442	29,004	14,442	5,972,536	948,845	7,168,164	548,101	3,922,399	756,510	4,648,494	11,793,907
	1975	27,830	30,000	15,800	6,356,192	952,200	7,414,700	579,000	4,188,630	712,000	4,980,570	12,001,090
Population Density (Persons/Square Mile)	1975	58	63	72	556	908	986	292	423	11,672	125	267
Rate of Growth of Population	'60-'70	3.0	-5.3	-14.9	28.2	10.5	18.2	22.8	26.5	-1.0	17.3	4.2
	'70-'75	13.9	3.4	9.4	6.4						7.1	1.8
Urban Population (Percent of Total Population)	1970	14.6	---	---	84.1	87.0	88.9	72.1	76.6	100.0	63.1	71.5
Net Migration (Percent of 1960 Population)	'60-'70	-5.5	-9.4	-21.5	---	1.1	8.0	8.5	12.4	-13.1	3.6	-3.3
Non-White Population (Percent of Total Population)	1970	32.8	37.6	52.5	8.7	3.3	11.2	14.8	18.4	72.1	19.0	8.9
Percent Growth In Non-White Population	'60-'70	-0.9	-8.3	-17.6	---	37.6	49.4	29.0	34.7	30.6	5.4	19.2
Age - Sex Composition:												
Female Population (Percent of Total Population)	1970	52.0	52.2	52.7	51.3	51.0	51.6	51.2	51.1	53.5	50.6	52.0
Percent Age Distribution	1970											
Below 5 Years		8.1	7.2	7.3	8.2	8.0	8.2	8.9	8.8	7.9	8.4	7.9
5 to 17 Years		26.7	25.0	27.6	27.8	23.8	25.2	27.1	26.5	21.9	25.9	24.8
18 to 64 Years		52.3	52.3	50.8	55.4	57.2	56.8	56.0	57.0	60.8	57.8	56.5
65 and Over		12.9	15.5	14.3	8.6	11.0	9.8	8.0	7.7	9.4	7.9	10.8
Median Age	1970	31.9	35.0	33.7	---	29.6	30.5	26.9	27.3	29.0	27.0	31.0
Education:	1970											
Median School Years Completed		10.2	9.5	9.2	---	11.5	12.1	12.1	12.1	12.2	11.7	12.0
High School Graduates (Percent)*		32.3	30.7	31.9	---	46.4	52.5	54.6	52.3	55.2	47.8	50.2
College Graduates (Percent)*		5.6	4.6	5.4	---	9.4	11.8	13.1	13.9	17.8	12.3	8.7

(*Percent of Population 25 Years and Over)

Table 3-1
(continued)

	Maryland	Virginia		Baltimore Canyon Region	Rhode Island	New Jersey	Delaware	Maryland	Washington D.C.	Virginia	Pennsylvania
	Worcester	Accomack	Northampton								
Household Characteristics: 1970											
Number of Households	8,962	11,409	5,468	1,797,755	307,309	2,305,293	174,990	1,234,680	278,390	1,484,952	3,880,102
Percent Population in Group Quarters	0.5	1.0	0.5	2.5	5.4	2.0	3.0	2.7	5.2	4.2	2.5
Persons per Household	3.1	2.9	3.0	3.3	3.2	3.2	3.3	3.3	2.9	3.3	3.1
Labor Force Characteristics											
Total Labor Force 1970	9,924	11,313	6,041	2,378,678	418,586	3,023,010	225,644	1,655,695	356,409	1,942,369	4,729,886
Labor Force Participation Rate 1970 (Percent of Total Population)	40.6	39.0	41.8	39.8	44.1	42.2	41.2	42.2	47.1	41.8	40.1
Civilian Labor Force 1970	9,916	11,220	5,924	2,321,549	388,002	2,972,561	219,155	1,590,094	348,113	1,766,740	4,712,303
Female Labor Force 1970 (Percent of Civilian L.F.)	38.6	40.1	44.1	36.3	41.0	38.0	38.1	38.8	48.8	39.5	37.2
Military Employment 1970 (Percent of Total L.F.)	0.1	0.8	1.9	2.4	7.3	1.7	2.9	4.0	2.3	9.0	0.4
Employment: 1970											
Total Civilian Employment	9,597	10,513	5,191	2,236,435	372,304	2,858,967	210,927	1,538,766	334,967	1,714,250	4,536,903
Employment/Population Ratio (Percent)	39.3	36.2	35.9	37.4	39.2	39.9	38.5	39.2	44.3	36.9	38.5
Unemployment Rate (Percent of Civilian L.F.)	3.2	6.3	12.4	3.7	4.0	3.8	3.8	3.2	3.8	3.0	3.7
Employment by Major Groups (Percent of Total Employed)											
Manufacturing	22.3	23.7	14.9	21.6	35.1	32.0	29.7	19.5	4.9	22.4	34.1
Wholesale & Retail Trade	18.1	21.2	18.2	21.5	19.0	19.2	19.2	19.2	14.4	18.0	18.8
Services	16.9	12.0	16.8	16.3	13.6	14.1	16.4	15.4	20.5	15.7	13.5
Construction	9.9	8.3	4.9	6.5	5.4	5.4	7.6	6.6	4.8	7.4	5.4
Government	12.6	14.8	10.8	18.0	15.6	13.8	15.3	25.7	42.1	23.5	13.2

Table 3-2

Population Characteristics

Atlantic, Sussex, Somerset Counties
and Atlantic City, Lewes, Crisfield
(1960-1975)

	Population			Percent Share of County Population			Percent Growth Rate		Population Density (Persons/sq. mi.)
	1960	1970	1975	1960	1970	1975	1960-70	1970-75	1975
Atlantic County	160,880	175,043	179,725				8.8	2.7	316
Atlantic City	59,544	47,859	43,969	37.0	27.3	24.5	-19.6	- 8.1	3,546
Sussex County	73,195	80,353	88,600				9.8	10.3	93
Lewes	3,025	2,563	2,657	4.1	3.2	3.0	-15.3	3.7	836
Somerset County	19,623	18,924	19,090				- 3.6	0.9	56
Crisfield	3,540	3,078	3,146	18.0	16.3	16.5	-15.1	2.2	1,966

Although the region's share was higher in 1975, its growth rate was declining from an average annual growth rate of 2.8 percent in the 1960's to 1.2 percent in the first half of this decade. One of the fastest growing counties of the region, Ocean County in New Jersey, increased its population by 140 percent during the 1960-1975 period, representing an average annual increase of 9.3 percent.

Somerset County (Maryland) as well as Crisfield had declining population growth during the 1960-1970 decade; however, in the 1970's the town as well as the county has been growing in population, though at a very slow rate.

3.2.2 Population Density

The overall population density of the region in 1975 was 556 persons per square mile. This high density (as compared to the nation's 60 persons per square mile in 1975) is attributed to the heavy population concentration in Nassau-Suffolk counties, and Camden, Middlesex, and Monmouth counties. Most of the coastal counties of Maryland have densities as low as 50 persons per square mile (Dorcester County).

Atlantic City has a density of population of 3,546 persons per square mile compared to the County's overall density of only 316 persons per square mile. Similarly, Crisfield's density in 1975 was 1,966 persons per square mile while that of Somerset County was only 56 (Table 3-2).

3.2.3 Urban Population

In 1970, more than 84 percent of the region's population lived in "urban places" (U.S. Bureau of the Census definition) as compared to the 73.5 percent nationwide. Four counties in the region had no "urban" population, while in Nassau County it represented 99.7 percent of the county population.

Urban population in Atlantic County was 81.1 percent of its total population. Sussex and Somerset Counties are mostly rural; only 14.2 and 16.2 percent, respectively, of these counties lived in "urban" places.

3.2.4 Migration

During the 1960-1970 period, less than one-half the population increases in New Jersey, Delaware, and Maryland were due to net migration into these states. Suffolk (New York), and Ocean (New Jersey) Counties experienced a high increase in total population during 1960-1970, with most of the increase being attributed to net migration. Almost the entire increase in population in Cape May County was from net migration. Other counties which experienced a high net migration effect were Burlington, Gloucester, Middlesex, and Monmouth Counties in New Jersey. Counties which were declining in population due to out-migration were

Accomack and Northampton Counties (Virginia), and Dorcester and Somerset Counties (Maryland).

The migration effect on Atlantic County was not significant; total increase in population during the 1960-1970 period was only 8.8 percent, of which 4.8 percent was associated with net in-migration. While Sussex County has grown by 9.8 percent, only 1.4 percent of this represents net in-migration. In Somerset County there was a population decrease of 3.6 percent in 1960-1970, caused mainly by a 6.0 percent net out-migration from the county.

3.2.5 Racial Composition

The nonwhite population in the region represented 8.7 percent of the 1970 population. This ratio was 12.5 percent for the nation. All of the Maryland counties in the region had higher shares of nonwhite population, while in most of the New Jersey counties this representation was close to the national average.

During 1960-1970, the nonwhite population increased at a higher rate than the total population in most counties in the region, except those in Virginia and a few in Maryland.

Atlantic, Sussex, and Somerset Counties had larger shares of nonwhite population in 1970. In Somerset County 37.5 percent of the total population was nonwhite. Nonwhite population in Atlantic City represented 56.1 percent of its total population.

3.2.6 Age/Sex Composition

Female population in the region represented 51.3 percent of the total population in 1970. All counties in the region had higher proportions of females in the total population, except Burlington (New Jersey) and Kent (Delaware) Counties.

Atlantic County had the highest female share (53.4 percent) among all counties in the region. Significantly, the ratio was as high as 56.2 percent in Atlantic City. Sussex and Somerset Counties had a slightly higher female population than the national average of 51.3 percent (Table 3-3).

Table 3-3

Age/Sex Composition, 1970,
Atlantic, Sussex, Somerset Counties
and Atlantic City

	Atlantic County	Atlantic City	Sussex County	Somerset County
Female population (% of 1970 total population)	53.4	56.2	51.7	51.8
Age distribution, 1970 (percent)				
Below 5 years	7.5	6.3	8.5	7.0
5 to 17 years	23.9	20.1	26.2	26.8
18 to 64 years	52.3	48.7	54.2	52.1
65 and over	16.3	24.9	11.1	14.1
Median age	35.5	44.1	19.8	32.6

The median population age of the counties ranged from 24.2 years in Burlington (New Jersey) and Kent (Delaware) to 38.9 years in Cape May (New Jersey). In counties where the median age was higher, the old age population (aged 65 and over) represented comparatively higher proportions of total population; for example, in Cape May, the elderly population's share was 20.0 percent while only 6.0 percent of the total population in Burlington County belonged to this age group. The overall working age group of the region represented 55.4 percent of total population (Table 3-1).

The median age of the Atlantic County population in 1970 was 35.5 years while it was 44.1 percent in Atlantic City where 24.9 percent of the total population belonged to the "65 years and over" age group. Only 6.3 percent was below 5 years of age. In Sussex County the median age was 29.8 percent, and its working age group represented 54.2 percent of total population (Table 3-3).

3.2.7 Education

In 1970, median school years completed in the region varied from 9.2 in Northampton (Virginia) to 12.2 years in Nassau (New York). Among persons 25 years old and over, more than 50 percent had four or more years of high school education and 14 percent completed four or more years of college. The literacy rate is high in Nassau County where 65.8 percent of persons 25 years and over were high school graduates. In Somerset County this ratio was the lowest (21.5 percent) among the counties in the region.

3.2.8 Household Characteristics

Total number of households in the region in 1970 was 1,797,800 with an average density of 3.3 persons per household. About 2.5 percent of the total population lived in group quarters; this ratio was 8.6 percent in Burlington (New Jersey) and 0.5 percent in Worcester (Maryland) and Northampton (Virginia) Counties, representing the two extremes in representation of population in group quarters.

In Atlantic City household density was 2.4 persons per unit, while for the county it was 2.8 persons per unit. About 2.7 percent of the city's total population in 1970 resided in group quarters.

3.3 LABOR FORCE AND EMPLOYMENT

Background information on the region's labor force and employment characteristics can be used in projecting the employment situation in the analysis years using the employment/population relationship. The 1970 data on employment for the constituent counties in the region, as well as the states (involved in the economic analysis) are included in Table 3-1.

3.3.1 Labor Force

Total labor force of the region in 1970 was 2,378,700, 2.4 percent of which represented military employment. The overall labor force participation rate (labor force as percent to total population) was 39.8 percent, close to the national average of 40.4 percent. Among the counties in the region, Ocean County (New Jersey) had the lowest labor force participation rate (34.2 percent). This rate was the highest (44.1 percent) for Dorcester County (Maryland).

Military employment in the total labor force was 21.5 percent in Burlington County (New Jersey) and 17.1 percent in Kent County (Delaware); other major military employment figures include 6.9 percent in Cape May (New Jersey), and 5.4 percent in Monmouth (New Jersey). Most of the remaining counties had insignificant proportions of military employment.

The labor force participation rate in Atlantic City was 39.1 percent, of which only 0.3 percent constituted military employment. The female force in the city represented 46.8 percent of the civilian labor force; this corresponds to the higher share of female population in the city.

The share of female labor force in the region was 36.3 percent of the total civilian labor force; this ratio for counties with higher shares of population, such as Nassau and Suffolk Counties, was lower than the regional figure (Table 3-1).

3.3.2 Employment

Total civilian employment in the region was 2,236,400 persons. This accounted for an employment/population ratio of 37.4 percent. (In 1970 the equivalent ratio for the nation was 37.7 percent.)

The regional unemployment rate was 3.7 percent while the national unemployment rate was 4.4 percent in 1970. Most of the highly populated counties in the region had unemployment rates of 4 percent or less.

The unemployment rate was highest (12.7 percent) in Somerset County (Maryland), while Atlantic City had an unemployment rate of 8.9 percent of its civilian labor force.

Manufacturing employment in the region represented 21.6 percent of total employment, and was very closely followed by wholesale and retail trade (21.5 percent). Higher proportions of manufacturing employment were in Cumberland, Gloucester, Middlesex, and Salem Counties in New Jersey and Dorcester County (Maryland). Services employment constituted 16.3 percent of the region's total employment.

Manufacturing employment in Atlantic City was only 10.1 percent of the city's total employment in 1970. Trade and services categories represented one-half of all employment in the city.

3.4 ADDITIONAL DATA ON ATLANTIC, SUSSEX, AND SOMERSET COUNTIES

Due to their special conditions, the counties of Atlantic, Sussex, and Somerset are analyzed for more demographic parameters in order to assess the relative importance of these counties.

3.4.1 Commuting Pattern

The use of public transportation to work, and the share of workers commuting to outside the jurisdiction of the three counties and Atlantic City in 1970 are given below:

	Atlantic County	Atlantic City	Sussex County	Somerset County
Percent of workers commuting to outside the county/city	14.6	5.2	13.2	23.7
Use of public transportation (percent of all workers)	10.0	25.2	1.0	1.9

3.4.2 Income Distribution

The 1970 family income levels in the three counties and Atlantic City are given in Table 3-4. While Maryland had only 7.7 percent of its families below the low income level in 1970, the corresponding ratio for Somerset County was as high as 24.6 percent. Also, the median family income in Somerset County was only 53 percent of that for the state.

The median family income among white families in these three counties was about 50 percent higher than that for Negro families. In Atlantic City, however, incomes of white and Negro families were much closer, mainly because of a very high proportion of nonwhite population (56.1 percent) in this city. Per capita incomes in these three counties and Atlantic City were lower than their respective state average.

3.4.3 Farm Population

Since Sussex and Somerset Counties have a major share of their land in farms, and since agricultural activities constitute an important factor in these counties, it is beneficial to review the farming population and its characteristics as part of the baseline analysis of these counties. Table 3-5 gives these and associated factors for the counties of Atlantic, Sussex, and Somerset. During the 1960-1970 decade, farm population declined in all three counties. Similarly total farm acreage also decreased in these counties during the 1964-1969 period.

The median family income of farm families was close to that for the entire county population. In Somerset County this median family income among farm population was higher than that for the total population.

3.4.4 Housing

Data on housing units in the three counties and Atlantic City are given below:

	Atlantic		Sussex	Somerset
	County	City	County	County
Year-round units, 1970	67,755	22,870	29,307	6,897
Percent change (1960-1970)	19.4	1.6	22.0	5.9
Vacancy rate, 1970 (percent of total number of units)	10.4	14.5	12.4	13.5
Average persons per unit	2.8	2.4	3.1	3.1

The importance of recreation in these counties has resulted in the high vacancy rates in these counties.

Table 3-4

Family Income, 1969

Atlantic, Sussex, and Somerset Counties

	Atlantic County	Atlantic City	Sussex County	Somerset County
Percent Number of Families with Income:				
Less than $ 5,000	23.2	37.7	24.7	42.0
$ 5,000 to $ 9,999	35.4	37.3	38.4	35.0
$10,000 to $14,999	24.0	16.3	24.7	17.0
$15,000 to $24,999	13.1	7.2	10.0	5.2
$25,000 and Over	4.3	1.5	2.2	0.8
Median Family Income ($)				
All Families	8,767	6,392	8,257	5,878
White families	9,283	6,784	8,775	6,416
Negro families	6,185	5,914	5,731	4,903
Per Capita Income (4)	3,064	2,554	2,649	1,935
Families Below Low Income Level (Percent of Total Families)	9.9	16.9	12.6	24.6

Table 3-5

Farm Population

Atlantic, Sussex, and Somerset Counties

	Atlantic	Sussex	Somerset
Total Farm Population, 1970 Percent of Total Population	1,404 0.8	5,568 6.9	1,508 8.0
Change in Farm Population (Percent Change, 1960-1970)	-41.4	-52.8	-42.6
Median Family Income ($)	7,452	7,806	8,316
Persons Below Low Income Level in 1969 (Percent of Farm Population)	6.0	11.4	12.9
Total Farm Average, 1969 Percent of Total Land	31,000 8.5	341,000 56.1	70,000 32.3
Change in Farm Acreage, 1964-1969 (Percent)	-19.4	-6.3	-11.3
Value of Farm Land Per Acre ($), 1969	756	380	437

SECTION 4

BASELINE PROJECTIONS

Major sources of population projections for the states in the Baltimore Canyon demographic region are:

- OBERS -- Series E projections.
- State projections.

OBERS-E projections for the concerned states do not disaggregate to the state's political subdivisions. These projections are for the state, its SMSA's and non-SMSA's, both of which may include more than one county or parts of different counties.

State projections refer to those developed by state agencies or the ones accepted by the state as the official projections. Table 4-1 lists the state agencies involved, projection methodology, period, etc., as referred to the concerned counties of the region. Since OBERS-E projections are not available at the county level, the respective state projections are used for the baseline projections. Most of the states' projections are through the cohort survival and/or trend extrapolation method.

The projections for New York counties (Nassau, Suffolk) were obtained from the state Economic Development Board for years to 2005. Through trend extrapolation, projections to year 2020 were obtained. The Series II population projections developed by the New Jersey Department of Labor and Industry reflect a continuation of the current trend of population growth (there are four series of projections based on different assumptions) in the various counties of New Jersey. The state projections are comparatively lower than the OBERS-E projections for New Jersey. The two projection series are given in the following tables:

Table 4-1

Population Projection Sources of Concerned States

Baltimore Canyon Demographic Region

State	Agencies Involved	Projection Approach	Projected to (Year)	Direction of Projection	Projected Parameters
New York	Economic Development Board	Cohort Survival	2000	County to State	Total Population, Age-Sex Distribution, Households
New Jersey	Department of Labor and Industry	Cohort Survival and Trend Extrapolation	2020	County to State	Total Population
Delaware	State Planning Office and University of Delaware, Department of Urban Affairs	Cohort Survival and Trend Extrapolation	1995	County to State	Total Population, Age-Sex Distribution
Maryland	Department of State Planning	Cohort Survival and Trend Extrapolation	1990	County to State	Total Population, Age-Sex Distribution, Race
Virginia	Division of State Planning and Community Affairs	Linked Employment - Population	2000	County to State	Total Population
Pennsylvania	Office of State Planning and Development	Cohort Survival, Trend Extrapolation, Linked Employment - Population	1990	County to State	Total Population, Age-Sex Composition, Labor Force, Employment for Labor Market Area
Rhode Island	Department of Statewide Planning	Cohort Survival	2040	State to Municipality	Total Population, Age Distributions for State

Population Projections For New Jersey						
1975 to 2020						
	1975 Estimate	1980 Estimate	1985 Estimate (In Thousands)	1990 Estimate	2000 Estimate	2020 Estimate
OBERS Projections	7,333[1]	8,080.3	8,491.4	8,923.3	9,693.9	11,152.3
State Projections	7,414.7	7,780.3	8,032.1	8,283.9	8,787.5	9,794.8

Since state projections are the official ones for New Jersey (source: New Jersey Department of Labor and Industry: New Jersey Population Projections, 1980-2020, 1975), the projections at county level as developed by the state are accepted for the baseline projection analysis.

In Delaware, the OBERS-E projections are used as the official population figures for the state. The University of Delaware College of Urban Affairs and Public Policy has developed population projections for Sussex County, one of the three counties of concern, to year 1995. Extrapolating the trend in share of the state's total, population projections for Sussex County, to the year 2020 are determined.

Population projections for Maryland developed by the Maryland Department of State Planning and the OBERS projections are given here for comparison.

Population Projections For Maryland				
1980 to 2000				
	1980 Estimate	1985 Estimate	1990 Estimate	2000 Estimate
State Projections	4,507,560	4,879,790	5,302,300	6,227,090
OBERS Projections	4,473,400	4,857,400	5,274,500	5,947,400

These state planning projections are only slightly higher than OBERS projections for all the projection years, except the year 2000. Since the OBERS projections do not disaggregate to counties, it is difficult to use these projections for the number of counties in the region. The state projections include projections for the 23 counties and the City

[1] Current Population Reports, U.S. Department of Commerce, Bureau of the Census, Series P-25, No. 678, May 1977.

of Baltimore for years to 2000; furthermore, the state projections are the government policy goals, and are accepted as the official projection series for state governmental allocation decisions.

Hence, the Maryland Department of State Planning projections are used in the baseline projections. Since these projections are only to year 2000, they are extrapolated to year 2020 using the projected growth trend for the state and the group of counties within the Baltimore Canyon demographic region.

The Division of State Planning and Community Affairs of Virginia has developed population projections for the state and the counties to year 2000. Projections to year 2020 for the two counties in Virginia within the Baltimore Canyon region are developed through extrapolation of the projections for the Accomack-Northampton Planning District, and disaggregating to the two counties of Accomack and Northampton.

Population projections for the counties in the Baltimore Canyon demographic region and the states associated with the region are given in Table 4-2. These projections are for years 1980, 1985, 1990, 1995, 2000, 2010, and 2020. Projected populations for the Baltimore Canyon demographic region for the intermediate years to year 2018, derived through graphical interpolation, are given in Table 4-3.

The region is projected to grow at an average annual rate of one percent until year 2000, and by 0.65 percent to year 2020. The projected overall growth of population between 1975 and 2020 is 41.1 percent.

Projected population figures for Atlantic, Somerset, and Sussex Counties are included in the regional populations shown in Table 4-2. Somerset County, Maryland, is projected to retain its rural character with much less than the regional average rate of growth. Sussex County, Delaware, is projected to increase its population by 44.5 percent during the 1975-2020 period. During the same period, Atlantic County, New Jersey, is projected to increase its population only by 31.7 percent.

Table 4-2

Baseline Population Projections: 1975 to 2020

Counties and States of Baltimore Canyon Demographic Region

STATE/COUNTY		1975	1980	1985	1990	1995	2000	2010	2020
New York:	Nassau	1,404,909	1,394,772	1,393,241	1,391,070	1,376,935	1,349,932	1,301,100	1,275,200
	Suffolk	1,245,024	1,371,471	1,509,691	1,653,378	1,776,594	1,866,118	2,021,300	2,186,30C
New Jersey:	Atlantic	179,725	187,860	193,960	200,060	206,160	210,260	224,460	236,660
	Burlington	326,470	355,180	382,360	409,540	436,720	463,900	518,260	572,620
	Camden	483,080	515,315	544,075	572,835	601,595	630,355	687,875	745,395
	Cape May	63,625	69,105	73,860	78,615	83,370	88,125	97,635	107,145
	Cumberland	129,085	138,360	146,655	154,950	163,245	171,540	188,130	204,720
	Gloucester	183,810	196,070	207,435	218,800	230,165	241,530	264,260	286,990
	Middlesex	609,715	639,970	667,125	694,280	721,435	748,590	802,900	857,210
	Monmouth	480,270	503,345	522,880	542,415	561,950	581,485	620,555	659,625
	Ocean	258,940	333,840	347,220	360,600	373,980	387,360	414,120	440,880
	Salem	63,515	68,280	72,200	76,120	80,040	83,960	90,800	99,640
Delaware:	(Sussex)	(88,600	91,800	95,800	100,100	104,700	108,300	117,500	128,000)
	State	579,000	626,500	665,700	707,400	742,300	779,100	851,500	927,200
Maryland:	Caroline	20,620	21,180	21,860	22,770	22,800	22,850	21,130	23,440
	Dorcester	29,640	30,500	31,810	33,230	34,730	36,310	39,660	42,360
	Kent	16,780	16,640	16,710	17,060	17,520	18,080	18,680	19,300
	Queen Annes	19,650	19,620	19,940	20,600	21,400	22,090	22,840	23,800
	Somerset	19,090	19,600	20,130	20,600	21,310	22,030	22,800	23,900
	Talbot	25,860	26,270	27,630	29,740	31,580	33,340	35,860	39,080
	Wicomico	57,850	60,490	66,730	72,200	77,620	83,240	90,700	96,820
	Worcester	27,830	30,430	33,100	36,190	39,840	43,870	49,710	53,070
Virginia:	Accomack	30,760	30,800	30,800	31,500	32,200	32,800	34,800	36,600
	Northampton	15,122	15,800	16,400	17,100	17,800	18,700	20,500	22,700
	Baltimore Canyon Region	6,356,192	6,671,400	7,011,500	7,361,100	7,671,300	7,935,400	8,439,500	8,968,100
	Rhode Island	952,200	1,000,400	1,050,100	1,095,400	1,135,300	1,173,600	1,253,600	1,324,700
	New Jersey	7,414,700	7,780,250	8,032,070	8,283,890	8,535,710	8,787,530	9,291,170	9,794,810
	Delaware	579,000	626,500	665,700	707,400	742,300	779,100	851,500	927,200
	Maryland	4,188,630	4,507,560	4,879,790	5,302,300	5, ,550	6,227,090	6,975,000	7,695,000
	Washington D.C.	712,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000

Table 4-3

Population Projections

Baltimore Canyon Demographic Region

1977 to 2018[1]

(Population in Thousands)

Year	Population	Year	Population	Year	Population
1977	6,460	1991	7,420	2005	8,180
1978	6,530	1992	7,480	2006	8,230
1979	6,610	1993	7,548	2007	8,280
1980[2]	6,671	1994	7,610	2008	8,335
1981	6,735	1995[2]	7,671	2009	8,385
1982	6,812	1996	7,720	2010[2]	8,440
1983	6,865	1997	7,770	2011	8,490
1984	6,945	1998	7,825	2012	8,540
1985[2]	7,012	1999	7,875	2013	8,595
1986	7,075	2000[2]	7,935	2014	8,645
1987	7,145	2001	7,972	2015	8,700
1988	7,215	2002	8,025	2016	8,745
1989	7,280	2003	8,080	2017	8,805
1990	7,361	2004	8,130	2018	8,845

[1]OCS activity period.
[2]Table 4-2 projection figures rounded to nearest thousand.

SECTION 5

IMPACT ANALYSIS

The major input for this section comes from Volume III, Chapter 3, Economic Impact. Most of the employment-related data are available in the economic impact chapter; however, since the economic impact region is different from the Baltimore Canyon Demographic region, these data were adjusted to fit in with the demographic impact baseline information.

5.1 ABORTED DEVELOPMENT CASE

In Set 2, the economic impact analysis addressed Region IV with the center of activity at Newport, Rhode Island, as the possible region for the aborted-development case. This area will be the site of the temporary service base which is required for all of the abort case activity, even though this region is physically outside the Baltimore Canyon demographic region. However, part of the OCS development-related onshore activities and facilities could be located in this region in both abort and full-development cases. Baseline and impact employment for Region IV are given in Chapter 3, Tables 4-4(1) and 11-13(1), respectively. Detailed demographic or associated impact from the aborted-development case is omitted in this section because Region IV is not identified as part of the Baltimore Canyon region in the demographic impact analysis, and the employment and population-related impact is only minimal. Also, it is only a short-term impact (to year 1983).

5.2 FULL DEVELOPMENT CASE

5.2.1 Employment Impact

Table 5-1 provides the baseline and impact employment in the region associated with the full-development case. The impact employment (total of direct, indirect, and induced employment) estimate is tied to the baseline employment. In the process of converting the direct impact to indirect and induced employment, the region of influence of the impact employment extends beyond the physical boundaries of the demographic region. However, no attempt was made to separate the demographic region from the economic region with regard to the impact employment.

5.2.2 Employment-Associated Population Increase

Since the impact region is much larger than a community or a county, it is difficult to estimate accurately the migratory population generated by the new employees associated with the OCS development. If it were a

Table 5-1

Employment Impact and Associated Population Increase
Baltimore Canyon Demographic Region: 1977-2018

Year	Employment[1]	Impact Employment[2]		Population[3]	Impact Population[4]	
		Number	Percent of Baseline Employment		Number	Percent of Baseline Population
1977	2,832,710	3,340	0.12	6,460,000	7,530	0.12
1980	3,004,820	4,610	0.15	6,671,400	10,180	0.15
1985	3,281,270	11,790	0.36	7,011,500	25,170	0.36
1990	3,541,380	61,330	1.73	7,361,100	127,250	1.73
1995	3,756,490	88,110	2.35	7,671,300	179,600	2.34
2000	3,915,920	84,130	2.15	7,935,400	170,160	2.14
2005	4,028,650	47,250	1.17	8,180,000	95,750	1.17
2010	4,106,900	12,950	0.32	8,439,500	26,560	0.31
2015	4,142,070	2,450	0.06	8,700,000	5,120	0.06
2018	4,157,150	10	0.00	8,845,000	20	0.00

[1] Using the employment/population ratio derived from Chapter 3, Tables 4-1, 4-2 and 4-3 multiplied by the projected baseline population from Table 4-3.

[2] Projected impact employment for the region from Table 11-12, Chapter 3.

[3] Baseline population of the region as given in Table 4-3.

[4] Impact population for the region from Table 11-12, Chapter 3.

single county or a community for which the impact is assessed, it is possible to estimate the number of employees moving into the area based upon the type of activities involved and the characteristics of the local labor force, including the unemployment situation.

For the demographic region case study, only the general population impact is estimated, i.e., the population associated with the projected impact employment rather than the migratory population. The projected impact population and its share in the total baseline populations of the region are shown in Table 5-1. It is assumed that most of the impact employment and, therefore, the impact population are included within the baseline projections for the region. (The percentage of the initial work force which will be transferred from similar facilities outside the region is assumed to be a minimum.)

5.2.3 Population Density

The baseline density of the region will change from 565.3 persons per square mile in 1977 to 69.4 persons per square mile in 2000, and 774.0 persons per square mile in the year 2018. The region, as one unit, will not show any measurable increase in its baseline population density based upon the assumption that any population migration into the region will be negligible. However, for specific areas like Sussex County, Delaware, or Atlantic County, New Jersey, the population influx from neighboring counties could be substantial, and would result in a higher density due to the OCS development-related activities in the area.

5.2.4 Requirement of Housing and Educational Facilities

Household characteristics and housing requirements associated with the impact population are given in Table 5-2. The estimate of the number and types of housing units as shown in this table does not mean that these units are additional requirements over the baseline population needs due to the OCS development. The purpose of this table is only to illustrate the procedure to estimate housing needs when part of the impact employment is migratory in nature.

The number of children depends on the type of housing units and age distribution of the migrant population. A ratio of 0.75 school child to one new resident worker is used here to estimate the number of school children associated with the impact population (refer to subsection 4.5.2 of Chapter 4, Volume II). Similarly, using the ratio of 23 pupils per classroom, and 1,000 students per school, the number of classrooms and schools required for accommodating the projected school-age population was estimated. These estimates are given in Table 5-2. This analysis can be more sophisticated and area-specific if age structure, family composition, and information on the local school system is available.

Table 5-2

Housing and Educational Facilities Requirements
Baltimore Canyon Demographic Region: 1977-2018

Year	Impact Population In[1]		Number of Housing Units[2]			Number of School Children[3]	Number of Classrooms	Number of Schools
	Group Quarters	Housing Units	Single Family	Multi-Family	Total			
1977	190	7,340	1,440	780	2,220	2,510	110	3
1980	250	9,930	1,960	1,050	3,010	3,460	150	3
1985	630	24,540	4,840	2,600	7,440	8,840	380	9
1990	3,180	124,070	24,430	13,160	37,590	46,000	2,000	46
1995	4,490	175,110	34,490	18,570	53,060	66,080	2,870	66
2000	4,250	165,910	32,680	17,590	50,270	63,100	2,740	63
2005	2,390	93,360	18,390	9,900	28,290	35,440	1,540	35
2010	660	25,900	5,100	2,750	7,850	9,710	420	10
2015	130	4,990	980	530	1,510	1,840	80	2
2018	-	20	4	2	6	5	-	-

[1] Based on existing situation with regard to population living in group quarters (see Table 3-1).

[2] Average number of persons per household in the region distributed between single family and multi-family units at the ratio of 65 to 35.

[3] Number of school children estimated at the rate of 0.75 per new resident worker, 28 pupils per classroom and 1,000 students per school (see Volume II, Chapter 4, subsection 4.5.2).

5.2.5 Infrastructure and Community Facilities

The movement of workers and their families, and the movement of heavy equipment and construction materials associated with OCS development will impact the existing transportation system of the area. Since the overall impact assessment is not site-specific, no attempt has been made to assess the transportation-related impact for the region.

The type, size, capacity, and number of recreational facilities required for the impact population are given in Table 5-3. This table also includes an estimate of other community facilities and infrastructure requirements based on the assumptions presented in subsection 4.6.2, Chapter 4, Volume II.

5.3 IMPACT FOR ATLANTIC, SOMERSET, AND SUSSEX COUNTIES

Using the spatial allocation of impacts table (Volume III, Chapter 3, Table 12-1), employment impact in the three counties can be estimated as a proportionate share of the total impact. Since Atlantic and Somerset counties are not projected to have any primary activity related to OCS development (see Chapter 2, Location Analysis), their shares in total impact will be generated from the proportions obtained from Region I with Ocean County, and Region II with Sussex County, respectively, as the centers of primary impact.

5.3.1 Impact Employment

Employment is the guiding factor in determining the impact on demographic and associated characteristics of the area; the shares of impact employment for the three counties of concern are given in Table 5-4. This shows that the only county with major employment impact will be Sussex, Delaware, where 57 percent of the total impact of Region II (with primary activities, i.e., permanent service base, a maintenance and repair facility, and ancillary services in full-development case located in Lewes, Sussex County) will be concentrated based on location analysis distribution of primary activities related to OCS development.

In Somerset County, Maryland, there can be only a minimum impact with respect to the overall impact of Region II. However, since the population of the county is also a minimum compared to the urban counties of the region, the relative impact on the county cannot be discounted. Although, in the location analysis, Atlantic County is not projected to have any primary activity, its relative importance with respect to Ocean County should determine the actual impact in this county, beyond the percentage share of 2.78 of Region I[1] impact.

[1] Note that exploratory rigs off Atlantic County were put into operation by Exxon Oil Company in late March of 1978, emphasizing the importance of the county as a possible location for primary activity once the exploratory operations prove the abundance of onland natural gas in the Baltimore Canyon Trough.

Table 5-3

Infrastructure and Community Facilities Requirements
Baltimore Canyon Demographic Region: 1977-2018

Year	Recreational Facilities[1]				Water Supply[2] (mgd)	Municipal Sewage Collection[3] (mgd)	Solid Waste Generation[3] (tons/day)	Law Enforcement (No. of Police Officers[3])	Health Care[3]	
	Play lot Small Parks	Neighborhood Parks	District Parks	Large Urban Parks					No. of Beds	No. of Physicians
1977	4	1	-	-	1.16	0.75	22.6	8	23	4
1980	5	2	-	-	1.57	1.02	30.5	10	31	5
1985	13	4	1	-	3.88	2.52	75.5	25	76	12
1990	64	21	4	2	19.60	12.73	381.8	127	382	59
1995	90	30	6	3	27.66	17.96	538.8	180	539	83
2000	85	28	6	3	26.20	17.02	510.5	170	510	78
2005	48	16	3	1	14.75	9.58	287.3	96	287	44
2010	13	4	1	-	4.09	2.66	79.7	27	80	12
2015	3	1	-	-	0.79	0.51	15.4	5	15	2
2018	-	-	-	-	0.00	0.00	0.0	-	-	-

[1] National Recreation Criteria for Outdoor Recreation Facilities

Average Size	2,500 sq. ft to 1.0 acre	5 to 20 acres	20 to 100 acres	100+ acres
Population Served per Unit	500 to 2,500	2,000 to 10,000	10,000 to 50,000	50,000 min.

[2] Current consumption rate of 154 gallons per day for the Middle Atlantic Water Resources Council Region. The rate includes domestic, industrial commercial and other uses per capita.

[3] Assumed standards as given in subsection 4.6.2 of Chapter 4, Volume II.

Table 5-4

Impact Employment in Atlantic, Somerset, and Sussex Counties
1977-2018

Year	Atlantic County, NJ			Somerset County, MD			Sussex County, DE		
	Baseline Employment	Impact Employment		Baseline Employment	Impact Employment		Baseline Employment	Impact Employment	
		Number	% of Baseline		Number	% of Baseline		Number	% of Baseline
1977	68,400	-	-	7,810	-	-	30,180	-	-
1980	70,260	14	0.0	7,940	2	0.0	30,840	280	0.9
1985	72,540	66	0.1	8,150	15	0.2	32,190	1,770	5.5
1990	74,820	300	0.4	8,340	86	1.0	33,630	10,190	30.3
1995	77,100	410	0.5	8,630	130	1.5	35,180	15,280	43.4
2000	78,640	380	0.5	8,920	130	1.4	36,390	15,180	41.7
2005	81,100	210	0.3	9,060	75	0.8	37,800	8,950	23.7
2010	83,950	55	0.1	9,230	22	0.2	39,480	2,640	6.7
2015	86,000	10	0.0	9,440	5	0.1	41,150	550	1.3
2018	87,400	-	-	9,570	-	-	41,700	2	0.0
Impact Employment As Percent Share of Region	2.78 % of Region I			0.48 % of Region II			57.12 % of Region II		

5.3.2 Impact Population

In Sussex County, where the impact is substantial in terms of employment generated by the OCS development-related primary and secondary activities, it is assumed that 25 percent of the primary jobs will be filled by imported workers. This is with the assumption that the baseline civilian labor force of the county will absorb the remaining 75 percent of the total impact employment. Using a procedure similar to that applied for the entire region, the impact population, additional housing needs and school children, etc., are calculated and presented in Table 5-5.

In Somerset County where the unemployment rate is high (12.7 percent in 1970), the projected impact employment is minimal. It is concluded that there is no influx of employment-associated population to this county. Atlantic County has a sizeable labor force which can absorb the 2.78 percent impact employment of Region I. Hence, it is assumed that no influx of population to the county will occur due to the OCS development activities.

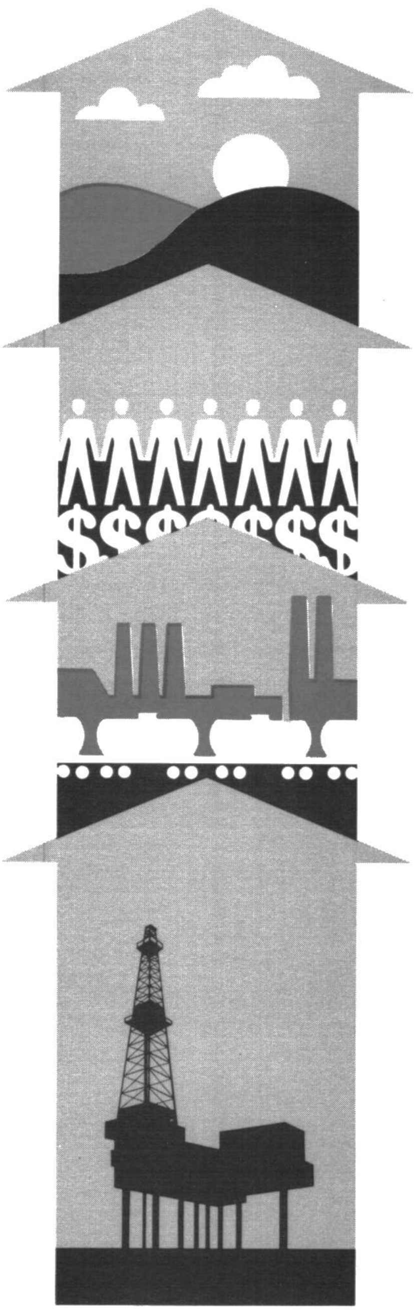
Table 5-5

Impact Population in Atlantic, Somerset, and Sussex Counties: 1977-2018

	Impact Population[1]						Additional Housing and School Requirements Due to Migrant Population in Sussex County			
	Atlantic County		Somerset County		Sussex County					
Year	Number	Percent of Baseline	Number	Percent of Baseline	Number	Percent of Baseline	Migrant Population[2]	Housing Units	School Children	Number of Classrooms
1977	-	-	-	-	-	-	-	-	-	-
1980	32	0.0	4	0.0	610	0.7	150	48	53	2
1985	150	0.1	31	0.2	3,690	3.9	920	290	330	14
1990	650	0.3	170	0.8	20,670	20.6	5,170	1,640	1,910	83
1995	870	0.4	260	1.2	30,490	29.1	7,620	2,410	2,870	125
2000	810	0.4	250	1.1	30,080	27.8	7,520	2,380	2,850	124
2005	440	0.2	150	0.7	17,790	15.8	4,480	1,420	1,680	73
2010	120	0.1	44	0.2	5,310	4.5	1,330	420	500	22
2015	22	0.0	10	0.0	1,140	0.9	290	92	100	4
2018	-	-	-	-	4	0.0	1	-	-	-

[1] Based on Table 5-4 and the impact employment/population ratios applicable to Region I (for Atlantic) and Region II (for Somerset and Sussex).

[2] Assuming 25 percent of the employment is from outside the county, convert this to population using impact employment/population ratio.



CHAPTER 5

ENVIRONMENTAL IMPACT

INTRODUCTION

This chapter will present a scenario of the Baltimore Canyon Region onshore area as a test case of the environmental impact assessment methodology. Given the expected OCS oil and gas activity presented in Chapter 1, Industry Requirements, and by using the environmental methodology (Volume II, Chapter 5), the most likely onshore impacts which will occur due to OCS-related onshore facilities, will be reviewed.

A further objective of this exercise is to reveal which portions of the environmental assessment methodology are effective, which areas are too cumbersome, and what recommendations can be made for the future to produce an efficient, workable impact assessment methodology.

The analysis is constrained by the lack of site-specific data which would allow for a detailed determination of impacts. Until specific onshore locations are determined for facilities such as pipelines, oil storage tanks, processing plants, and service bases, only general information can be provided for impact assessment.

In applying the environmental assessment methodology, the first step is to develop an environmental information baseline. For this test case, such an inventory has been prepared only for three specific counties which will serve as examples of diverse coastal areas where OCS-related activities could take place. A regional baseline of environmental information is included because several documents exist covering that topic in detail.[1] For instance:

a. U.S. Department of the Interior, Bureau of Land Management, <u>Final Environmental Statement</u> -- 1976 Outer Continental Shelf, <u>Oil</u> and Gas Lease Sale, Offshore the Mid-Atlantic States, OCS Sale No. 40, 1976.

b. Arthur D. Little, Inc., <u>Potential Onshore Effects of Deepwater Oil, Terminal-Related Industrial Development -- Part 2 -- Mid-Atlantic Region</u>, prepared for the Council on Environmental Quality, 1974.

c. Woodward-Clyde Consultants, <u>Mid-Atlantic Regional Study -- An Assessment of the Onshore Effects of Offshore Oil and Gas Development</u>, prepared for the American Petroleum Institute, 1975.

d. Resource Planning Associates, Inc., <u>Identification and Analysis of Mid-Atlantic Onshore OCS Impacts</u>, 1975.

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[1] Information on each of these reports and numerous others may be obtained from the Coastal Zone Information Center, 3300 Whitehaven Street, N.W., Washington, D.C. 20235 (phone: 202-634-4255) or the OCS Referral Center, Room 4126, U.S. Department of the Interior, Washington, D.C. 20240 (phone: 202-343-9314).

Presentation of all known environmental information for the region from Cape Hatteras to the eastern point of Long Island would be a repetitious effort. One of the major findings of the EIA methodology developed in Volume II was the need for site specificity before environmental impacts can be developed. There is little value, for instance, in trying to estimate the effect of losing 7,000 acres spread out in numerous parcels between Long Island and North Carolina. The level of impact might range from negligible to severe if the acreage were selected only within existing industrial parks or only within salt marshes. Impacts would also depend on the state of prior industrialization; locating oil and gas facilities in the New York harbor area has fewer and less unique impacts than the same activity in the Alaska panhandle.

SECTION 1

METHODOLOGY SEQUENCE

1.1 STUDY AREA SELECTION

Counties or cities within the mid-Atlantic region selected for this test case which may be the recipients of onshore OCS-related activity are detailed in the location analysis. On the basis of that analysis, Middlesex County, New Jersey and Sussex County, Delaware, were chosen for their expected OCS facilities. In addition, Northampton County, Virginia, was selected on the basis of its known involvement in the OCS development.

The three selections represent different environmental and social settings. In this way, they are very useful examples to illustrate use of the environmental impact assessment (EIA) methodology.

The study sites are shown in Figure 1-1 and their characteristics are as follows:

1. Raritan Bay, Middlesex County, New Jersey	Urban; highly industrialized; existing oil and gas facilities; vacant industrial land; increasing unemployment; recreation areas nearby; few natural areas.
2. Lewes, Sussex County, Delaware	Semi-rural; recreation; sport and commercial fishing; marine research; parks; vacant industrial waterfront site; available labor.
3. Northampton County, Virginia	Rural; farming; commercial fishing; sensitive estuarine/ocean peninsula; high unemployment; little industry.

1.2 ENVIRONMENTAL BASELINE

An environmental baseline must be established for each area prior to analysis of impacts. Region-wide documents may be used for this as long as such information is integrated with locally-relevant material. The depth and specificity of baseline data used is a function of the types of industrial activity expected. For the three test sites, these are:

- Raritan Bay
  - Permanent service base.
  - Ancillary services.
  - Marine repair and maintenance.
  - Tank farm.
  - Marine terminal.

Figure 1-1

Mid-Atlantic Coastal Zone

- Lewes.
  - Permanent service base.
  - Ancillary services.
  - Marine repair and maintenance.

- Northampton County.
  - Platform fabrication yard.[1]

1.3 FUTURE CONDITIONS

After the environmental baseline is completed, future conditions in the study area without OCS-related activity will be developed. This step is summarized briefly for this test case situation.

1.4 DETERMINATION OF IMPACTS

The major technical manipulation of the Baltimore Canyon test case involves a determination of impacts, that is, those environmental effects which are severe enough to limit use of the environment in some way. Such limitations could be either biological (e.g., increased turbidity resulting in decreased biological productivity) or social (e.g., loss of recreational opportunities).

Impact assessment for this test case is as complete as possible. Since site specific information is not available (except for the platform fabrication yard in Northampton County), this step will involve a descriptive matrix of the types of potential sites in each county and impacts if one or all were selected. It thus becomes a "what if" situation based on set assumptions which are also spelled out.

1.5 CONCLUSIONS AND RECOMMENDATIONS

As the final step, conclusions and recommendations will be established which detail the advantages, shortcomings, and future needs of the EIA methodology and its use.

The case study is somewhat limited in detail since its purpose is simply to illustrate how the methodology works. This example is not intended to be as complete as an actual impact assessment might be for one of the specified counties. Additional baseline data would be needed and a thorough search of the available environmental literature undertaken to accomplish a viable assessment.

[1] Not selected in the location analysis, but development is already underway.

SECTION 2

METHODOLOGY IMPLEMENTATION FOR THE BALTIMORE CANYON TEST CASE

The assessment methodology is described in Volume II, Chapter 5 of this study. In conducting the Baltimore Canyon Test Case, Step 1 is initiated and the methodology worked in sequence until the impact and ameliorative actions sections have been completed.

2.1 STEP 1: ESTABLISHMENT OF THE ENVIRONMENTAL BASELINE CONDITIONS

The environmental baseline is established for each of the three counties. Documents which were secured and utilized for this step are given in footnotes within each section. This baseline covers such fundamental information as:

- General location.
- Climate and topography.
- Water resources.
- Air and water quality.
- Land use and recreation.
- Aesthetics.
- General ecology.

Topics not covered in this environmental setting are economics, demographics, and fiscal analyses. Within this baseline, an environmental information matrix is completed for each of the three counties.

2.1.1 Environmental Baseline for Middlesex County, New Jersey

If oil and gas are found in OCS Lease Sale No. 40, the Baltimore Canyon Trough off New Jersey, it is possible that significant OCS development or activity may occur in the Raritan Bay area. Although the distance is greater to the Raritan Bay from the leased tracts than to Atlantic City, Cape May, or even Lewes, Delaware, there are distinct advantages to locating there:

a. The area is highly developed and has all the necessary infrastructure. Oil and gas facilities already exist and could be used as is or after some expansion.

b. The labor climate is favorable, with an increasing rate of unemployment. A large, trained labor pool is available.

c. Due to the developed nature of the area, less environmental impact might be expected although air quality would be a major concern.

d. The Raritan Bay (and New York Harbor) area could service some of the Grand Banks OCS activity if needed, although nearer ports exist.

The environmental baseline begins by describing the physical setting of the Raritan Bay area. An understanding of these characteristics is important in ascertaining impacts on the region. Some of the characteristics (e.g., land, soils, meteorology, water resources) ultimately act as limits on development; these characteristics may be substantially changed by OCS-induced development.

Raritan Bay is located south of Staten Island and lies wholly on the Coastal Plain (see Figure 1-1).

The Coastal Plain is part of the emerging Atlantic Plain, which, together with the continental shelf off the East Coast, is a deposition area for land-based sediments derived from the East Coast of North America. The outer half of the plain lies at an elevation of less than 100 feet. With few exceptions, the sediments of this region are not consolidated, but consist mainly of interbedded loose sands, soft clay and marl, sloping almost imperceptibly to the southeast and the sea. These sediments have a vast water storage capacity, and in combination with the state's abundant precipitation, constitute a long-term water resource of enormous value. It is on the Coastal Plain that the majority of New Jersey's prime agricultural land is located.

The Raritan River is the major watercourse, and drains primarily the Piedmont region. Numerous short streams are tributaries to the Raritan along the northwestern border of the Coastal Plain. Eastward, the slope of the Plain drains directly into the Atlantic Ocean, except for tributaries of the Raritan in the north. These Coastal Plain streams flow sluggishly in shallow, relatively broad valleys. Their lower reaches are drowned due to the most recent post-glacial rise in sea level, thus forming large bays, estuaries and marshes along the coast.

Located across Raritan Bay from Staten Island and the New York City metropolis, Middlesex County is at once a blend of intensive industrial and commerical development, residential "bedroom" communities, older established communities, and, in the south, agricultural and open space (see Figure 2-1).

Maximum relief of the area is about 100 feet. Physiographically, the county covers two distinct provinces. In the western portion lies the Piedmont Plain, consisting of low-lying hills and wide valleys sloping toward Raritan Bay, and underlain by consolidated sandstones and shales of Triassic age. The larger, eastern portion is included in the Coastal Plain, underlain by unconsolidated Cretaceous and recent sediments, many of which produce groundwater.

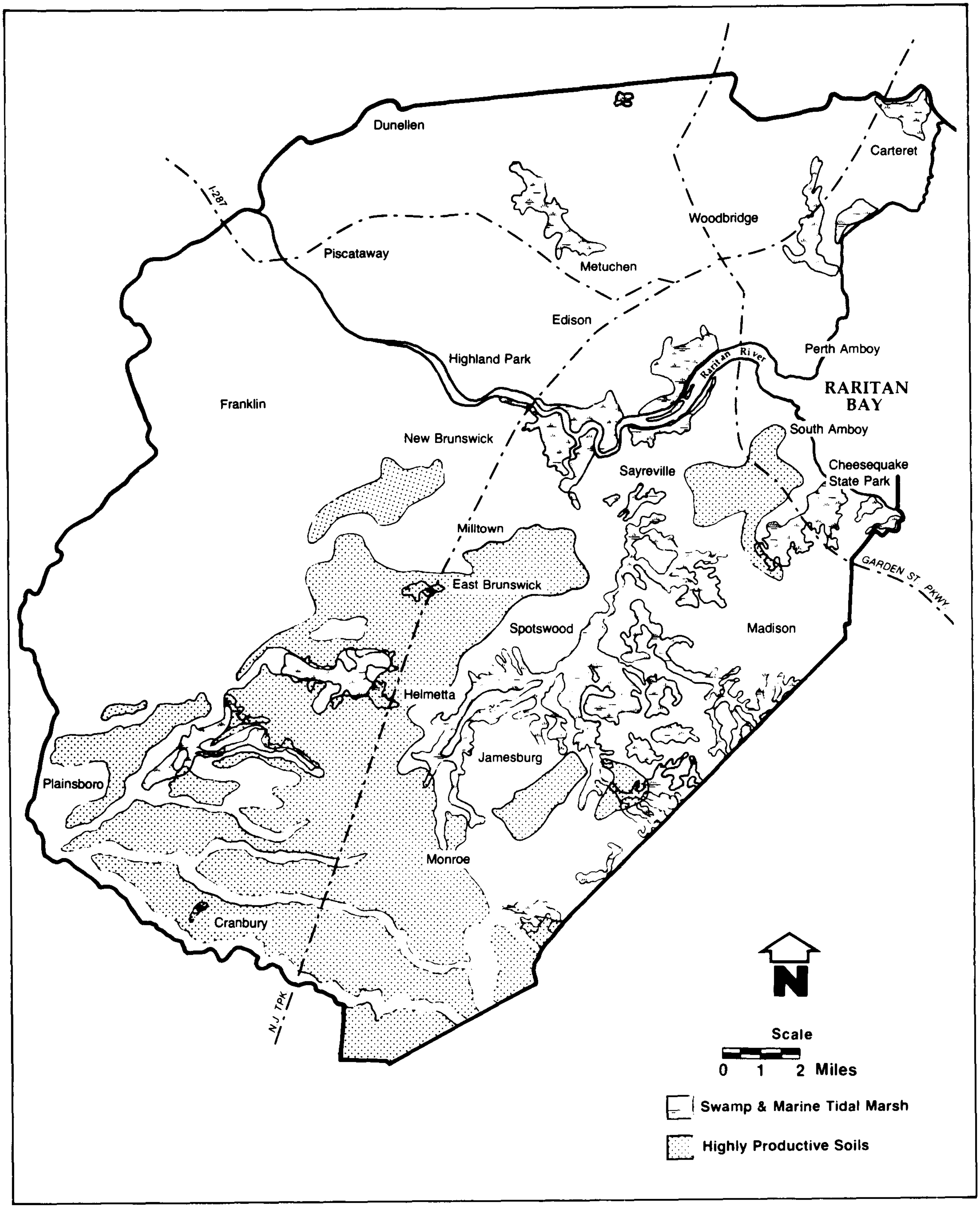

FIGURE 2-1 MIDDLESEX COUNTY, NEW JERSEY

Like the rest of the mid-Atlantic region, Middlesex County's climate is relatively mild, with annual precipitation averaging about 43 inches. Prevailing winds are usually out of the northwestern quadrant.

Because of the already developed nature of Middlesex County, particularly the northern portion, many oil and gas facilities already exist there.

2.1.1.1 Present Land Use. As shown in Table 2-1, approximately 45 percent of Middlesex County's 204,000 acres has been developed. Of the remaining acreage, agriculture accounts for approximately 12 percent, and undeveloped land, including wetlands, woodlands, and miscellaneous property, approximately 42 percent.

In regard to land use, the majority of development has taken place in the northern portion of the county, while most of the undeveloped farmland and woodlands, much of which is considered open for development, is located in the south. This pattern of development is in obvious response to the continuing expansion of industry, commercial operations, and residential development southward from the more heavily settled and industrialized New Jersey counties to the north and New York. Because of this continuing pressure, the Planning Board expects that under normal development, nearly 85 percent of the land in Middlesex County will be fully developed by 2000.[1]

2.1.1.2 Water Resources. The most important groundwater resources are the Raritan and Magothy formation aquifers. A study of the county's water supply situation conducted for the Middlesex County Planning Board in 1971, resulted in the following information:

- Current fresh water use by both public and private sectors (but municipally supplied) amounted to about 100 mgd in 1966, with developed supplies approximating 115 mgd, 65 percent of which came from groundwater.

- Total fresh water needs were expected to grow to 230 mgd by 1985 and 330 mgd by 2000. Of potentially-available additional water reserves, some 355 mgd of surfacewater was identified and 40-55 mgd of groundwater.

[1] "Comprehensive Water Plan, Phases Two and Three," Middlesex County Planning Board, October 1970.

Table 2-1

Middlesex County, New Jersey
Approximate Land Use

	1970	
	Acreage	Total Land (%)
Residential	39,883	19.52
Nonresidential	53,126	26.00
Industry	6,377	3.12
Roads and streets	14,623	7.15
Public open space	8,026	3.93
Other nonresidential	24,100	11.79
Total developed	93,009	45.52
Agriculture	25,000	12.23
Undeveloped	86,304	42.24
Water and swamp	15,545	7.60
Other vacant	70,759	34.64
Total land	204,313	100.00

Source: Middlesex County Planning Board, Middlesex County Interim Master Plan, (Number 20), 1970 (Appendix C).

Assuming that all these reserves could be developed without objections being raised from localities outside Middlesex County (particularly with respect to surfacewater), a comfortable safety margin would exist. However, there appears to be some doubt that such reserves would actually be available only for Middlesex County.

2.1.1.3 Current Water Quality. Raritan Bay is a seriously polluted estuary surrounded by an intensely developed area. Very low levels of dissolved oxygen (1.8 mg/l) have been reported at the mouth of the bay and values of up to 100 times greater for nitrate and five times greater for phosphate than in the continental shelf waters have been found there. Most of this load is due to discharge of municipal and industrial effluents and produces eutrophic conditions in the summer. Coliform bacteria counts are high and have forced the closing of some public beaches.

A detailed survey of the extent of water pollution in the Middlesex area was not available. However, it is well known that the Raritan River throughout much of its length in the county is heavily polluted, although efforts are being made to redress the situation. Similarly, many of the tributaries to the Raritan are polluted, not only from industrial sources but from inadequately treated municipal sewage. Wastes from industrial complexes in Arthur Kill and along the Raritan River, along with millions of tons of raw and semi-treated sewage, have found their way into Raritan Bay. This pollution has had a severe impact on the bay itself and has adversely affected recreational and fishing activities. No clamming areas are open to the public in the entire region due to fecal bacterial contamination.

Saltwater intrusion, due to overproduction of groundwater, has advanced to a serious stage in the Farrington sand member of the Raritan formation. This has adversely affected the quality of water obtained from the Farrington in the area around Perth Amboy. The problem of saltwater intrusion was recognized in the early 1940's, but in the interim, little has been done to correct the situation; in fact, water withdrawals have increased. Several schemes have been suggested to control further encroachment, but as yet, none has been implemented.

2.1.1.4 Current Air Quality. No detailed survey of the extent of air pollution in Middlesex County was available. It is known that air pollution is of considerable concern in the Perth Amboy and New Brunswick areas. Principal sources are the industrial complexes in these areas, as well as heavy vehicular traffic along Routes 1, 18, and 130, and the New Jersey Turnpike. Air pollution problems are of less concern in the southern portion of the county because of its essentially rural character. The New York Harbor region experiences severe air quality problems, especially during the summer months.

2.1.1.5 Existing Ecology. Due to the heavy industrial uses of Raritan River water and the bay, the study area supports minimal biologically-oriented recreation (such as sport fishing) or commercial fishing.

During winter, the bay and associated marshes serve as wintering grounds for numerous waterfowl. Cheesequake State Park provides both biological and recreational diversity to an area which supports about 1900 people per square mile. Other greenbelts exist along the Raritan River and small tributaries which lie within the flood plain.[1] Most areas with relatively undisturbed vegetation fall into the category of coastal plain pine-oak forests.[2]

Few of the original salt marshes in the county remain in an undisturbed state suitable for fishery and wildlife propagation and support. The marshes of Cheesequake State Park support a mixture of Spartina and Phragmites vegetation on low-lying and drier areas, respectively.[3] This marsh, and most others are impacted by land fills, housing development, urban runoff, and dredging of boat channels. Although much of the Raritan Bay and River waterfront is occupied by urban centers (Perth Amboy, Morgan, South Amboy, Laurence Harbor, Sayreville, and South River) and industrial sites, some marshland continues to thrive along the tidal portions of the Raritan River. Wildlife in the county consists primarily of those species which can coexist with human activities, i.e., muskrat, raccoon, rabbit, ducks, geese, songbirds, etc. Little hunting or fishing activity takes place in the immediate bay vicinity due to pollution, a dense population base, and significant industrial activity.

2.1.1.6 Matrix Evaluation -- Middlesex County, New Jersey. This step of the baseline data compilation is designed to provide an easily understood visual array of the most notable environmentally-sensitive characteristics of the specific study region. Its purpose is to provide a quick visual assessment of the important environmental features. Environmental characteristics are noted under certain boundary conditions. The larger the boundary condition (i.e., state rather than township), the more widespread the value of that characteristic. A completed environmental information matrix for Middlesex County is shown in Figure 2-2.

2.1.1.7 Red Flag Components. These factors are indicated in the last column of the environmental information matrix. Red flag components comprise the most valuable and sensitive environmental characteristics of a study area and may preclude any OCS-related activities which could significantly damage the component.

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[1]Middlesex County Planning Board, Long Range Comprehensive Plan, New Brunswick, New Jersey, 1974.

[2]Robichaud, B. and Buell, M.F., Vegetation of New Jersey, Rutgers University Press, 1973.

[3]Collier, C., "A Study of Land Use Effects on a Coastal Wetland-Cheesequake Creek Marsh, New Jersey," M.S. Thesis, University of Pennsylvania, Philadelphia, Pennsylvania, 1977.

WESTON

ENVIRONMENTAL CONSULTANTS-DESIGNERS

	ENVIRONMENTAL CHARACTERISTICS	OF IMPORTANCE TO: TOWNSHIP	COUNTY	STATE	RED FLAG COMPONENT
		Boundary Conditions			
ECOLOGY	Waterfowl Migration Route				
	Marine Mammals or Turtles				
	Nurseries/Breeding Areas				
	Rare and Endangered Species				
	Primary Productivity				
	Salt Marshes	●			
	Freshwater Wetlands				
	Sea Bird or Seal Rookeries				
	Estuarine Habitats	●			
	Fish Species (economic)				
	Shellfish/Crabs				
	Native Fauna				
	Native Flora				
	Terrestrial Habitats				
	Water Quality				●
LAND USE					
	Recreational Beaches	●			
	Boating	●			
	Wildlife Refuge or Preserve				
	Farming				
	Open Space	●			
	Aesthetics				
	Other:Air Quality				●
SOCIO-ECONOMIC	Commercial Finfishing				
	Commercial Shellfishing				
	Sports Fishing	●			
	Historic Area				
	Scientific Research Area				
	Archaeological Sites				
	Ocean Dump Sites	●			
	Small Boat Traffic		●		
	Unique Environmental Area				
GEOMORPHOLOGY					
	Unstable Sediments and Beaches				
	Tidal Flats	●			
	Barrier Beaches				
	Hydrological Conditions	●			
	Rocky Shores				
	Estuaries, Bays				
	Geomorphological Features				
	Weather Conditions				
OTHER	Public Attitudes Toward Development				
	Government Incentives/Disincentives				

FIGURE 2-2 ENVIRONMENTAL INFORMATION MATRIX — MIDDLESEX COUNTY, NEW JERSEY

The purpose of including red flag components is to allow the user to focus in on those topics of analysis which appear to be of major concern to those likely to be affected by OCS development.

2.1.2 Environmental Baseline for Sussex County, Delaware

Sussex County, with particular emphasis on Lewes, was selected as the possible location of several OCS-related facilities. Lewes is located off a sheltered backwater just inshore of the Atlantic Ocean and Delaware Bay juncture. The offshore lease areas are almost due east to slightly northeast of this location, thus making proximity to the drilling sites a major consideration.

Delaware's coastal zone is regulated by the Coastal Zone Act of 1971, a result of fears of likely petroleum refinery expansion and a possible deepwater terminal. This act specifies that no additional heavy industry be allowed to locate in the coastal zone, such activity being regulated by the State Coastal Zone Industrial Control Board. Due to this legislation, region-wide impacts on Delaware's coastal zone are minimized. OCS-related facilities may locate in existing industrial zones or on appropriate land already owned by industry.[1]

2.1.2.1 Present Land Use. Lewes does have some industrially-zoned land which is ideally located on Delaware Bay to provide offshore support services. This area is locally known as the "fish factory" and was a large menhaden processing center in the late 1950's. Most other lands in the coastal zone of Sussex County are public beaches, state parks, recreational homesites, or protected marshlands. Land uses are shown in Figure 2-3.

The predominant use of land in Lewes is for residential purposes, occupying approximately 82 percent of the urbanized area. Since the area is predominately resort and seasonal in character, other urban uses, i.e., commerce, transportation and industry are generally limited, encompassing approximately 18 percent of the urbanized area. The industrial areas which remain and which could be used for OCS support facilities include the 87-acre former Fish Products property, now Star Enterprises, and smaller industrial sites in the City of Lewes and along the Lewes-Rehoboth Canal. The urban uses in total occupy only slightly more than 10 percent of the total land area of the CCD (County Census Division), which includes the eastern half of Sussex County.

The majority of the lands in the study area are in an open use category, i.e., agriculture, woodland, recreation, beaches, and wetlands. Almost 90 percent of the total study area falls into this class, which encompasses some 41,500 acres. Within the open use class, agricultural uses occupy almost 16,000 acres or 38 percent of the total and 34 percent of the total lands in the CCD. These uses constitute the single

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[1]Coastal Zone Act Administration, Delaware State Planning Office, Dover, Delaware, 1974.

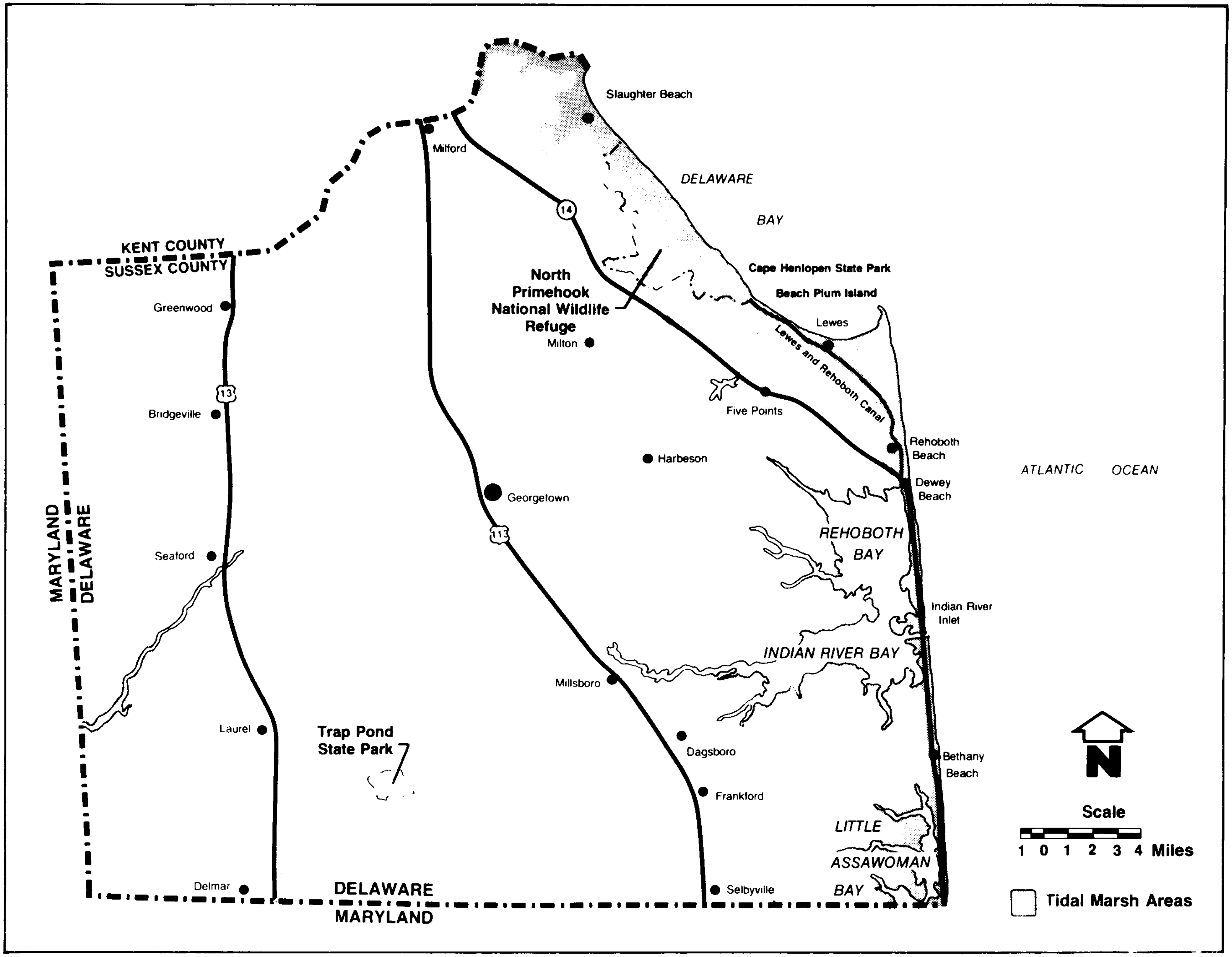

FIGURE 2-3 SUSSEX COUNTY, DELAWARE

largest category of use. Wetlands occupy some 9,000 acres, comprising almost 22 percent of the open uses category and 20 percent of the total uses/classes of land in the CCD. The remaining area is made up of woodlands, coastal beach areas, and open recreational uses such as golf courses.[1]

The topography of the area is relatively flat with elevations ranging from sea level to about 50 feet above sea level. It is mostly mainland, but sandy barrier beaches and dunes occupy the Atlantic coast and marshlands are found along the Delaware Bay. There are few rivers and streams draining the area, reflecting the flat topography. For the most part the area consists of permeable sands which allow relatively little runoff.

2.1.2.2 Water Resources. Sussex County has six general drainage basins. These are: Cedar Creek, Broadkill River, Nanticoke River, Indian River Bay, Little Assawoman Bay, and Bunting and Cypress Branches.

The major groundwater source is Pleistocene sands, which extend to an approximate depth of 120 feet. This is significant because groundwater is the major source of potable water in the county. The Pleistocene, Manokin, and Pocomoke sediments form a groundwater source with quality ranging from good to excellent. The Pleistocene aquifer is quite large, containing about 10 cubic miles of saturated sands. The water quality is poor, however, in the upper Pleistocene with low pH and high iron content. Some of the surfacewaters have "problem areas" and caution areas related to pollution from point and/or nonpoint sources.[2]

The coastal Sussex area comprises the eastern half of Sussex County and includes the drainage basins of the Broadkill River, Indian River Bay, and Little Assawoman Bay. All of these waterways exhibit characteristics typical of coastal situations in that they contain saline, brackish, and fresh water environments as well as complex, tidal hydrodynamic circulation patterns.

The temperate climate of Sussex County is largely influenced by the Atlantic Ocean and Delaware Bay, as well as the Chesapeake Bay. The temperatures average from 54°F to 56°F with the warmer temperatures occurring in the southern portions. Average annual precipitation, based on monthly precipitation reports for 1971 and the average of data from 1931 through 1960, is between 44 and 47 inches, with the higher average in the southern portion. The average snowfall ranges from 10-15 inches in the south, and up to 20 inches in the north.

2.1.2.3 Current Water Quality. The seasonal tourism and recreation, agriculture, and rural character of the area have had an impact on water

[1] Lewes CCD Pilot Study--Existing Land Use, Delaware State Planning Office, Dover, Delaware, 1975.

[2] Natural Environmental Baseline Inventory--Critical Natural Areas, Sussex County, Georgetown, Delaware, 1977.

quality. Through an extensive sampling program, the CSWQP (Coastal Sussex Water Quality Program) has shown that overall water quality in the area is good, but that several significant problems prevail. These include:

- Saltwater intrusion into groundwater supplies (particularly at Indian River Inlet, Bethany Beach, Dewey Beach, Fenwick Island, Oak Orchard, and Long Neck).
- Contamination of groundwater (particularly by nitrates) by animal waste leachate, agricultural fertilizer application, and septic tank effluent near Millsboro, Clarksville, Cedar Neck, Fairmount, and Grave Hill.
- Violation of dissolved oxygen standards in Upper Broadkill, Lower Broadkill, Upper Indian River, Lower Indian River Bay, North Rehoboth Bay, and Assawoman Bay.
- Violation of bacteriological standards in Upper Rehoboth Bay, the Lewes-Rehoboth Canal, portions of White Creek, and the Assawoman Canal.
- Potential eutrophic conditions in the Upper Indian River, Broadkill River below Milton, and in various finger canals in shoreline communities.

2.1.2.4 Current Air Quality. No major reports of ambient air quality in the coastal Sussex area were available. Indications are, however, that air quality is generally regarded as "good" due to the lack of industry in the area and distance from other industrial sites. It is possible that minor air quality degradation could occur immediately next to major travel routes (e.g., Route 14) during peak summer recreational travel or from the Delaware Power and Light Co. power plant on Indian River Bay.

Again, no documentation exists to verify or deny this. Otherwise, the influence of salt spray may be felt, but this should not constitute adverse air quality under the usual definition of the word.

2.1.2.5 Existing Ecology. Sussex County has abundant and varied wildlife resources valuable to the economy. There are good populations of deer, quail, rabbits, and waterfowl that are heavily hunted during open season and, along with other wildlife, are enjoyed by both visitors and local residents throughout the year. Some birds are also important in helping control insect pests, and others consume large quantities of weed seeds. Such predators as skunks, foxes, hawks, and owls help keep small rodents in check.

The landscape is one of generally level relief, complex soil and drainage patterns, and fields interspersed with wooded areas and shrubby growth along ditches. This extensive edge habitat is valuable to upland wildlife. Throughout the county, open ditch rights-of-way through poorly drained woods provide quality habitat for deer, quail, rabbits, and other upland wildlife. The grassy bottoms of shallow ditches are heavily used by wetland wildlife throughout the year.[1]

2.1.2.6 Aquatic Resources. Data on the types of aquatic species in Delaware Bay, their primary activity, and the frequency of occurrence of food sources for important fish are discussed by Maurer.[2] Both commerical fish (silver perch, spot, black drum, summer flounder, weakfish) and ecologically conspicuous fish (rays and skates) actively spawn and feed in the bay. In the most recent comprehensive survey of finfish in the lower bay, the Big Stone Beach site and Old Bare Shoal area contained the greatest number of species and individuals. Weakfish, hogchokers, and scup generally comprised 50 to 75 percent of the catch.

Sea trout and bluefish occur along the shore, depending on the season. Sea trout are more common in the spring and early summer, and the bluefish are more common from midsummer to early fall.

Beaches which line Delaware Bay and the estuaries of Delaware may be considered protected beaches. Depending on tidal exposure and substratum, these beaches may contain abundant, diverse fauna. Examples of protected beaches are the Cape Henlopen flat, Broadkill, Slaughter and Big Stone beaches.

The sport fisheries are a major recreational industry of the area. Major sport fishes include striped bass, bluefish, weakfish, summer flounder (fluke), scup (porgy), and winter flounder. The areas off Delaware Bay are important fishing grounds for numerous species during various seasons of the year. This is particularly true of striped bass during their spring and late fall migrations.

The decline of the menhaden fishery was responsible for the general decline in total commercial catch. The food fishery, primarily the outer trawl fishery, has remained fairly constant over the past 15 years, although the species composition of the catch has changed. Over the past five years, scup, summer flounder, and silver hake have been the three most important food fishes, both by poundage and number.

Over the past 15 years, silver hake, summer flounder, scup, butterfish and black sea bass catches have declined. The silver hake, an onshore-offshore migrant (OFM), is caught from the fall through spring.

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[1] Soil Survey of Sussex County, Delaware, U.S. Department of Agriculture, 1974.

[2] Maurer, D., The Delaware Estuary System, Environmental Impact and Socio-economic Effects - Volume 1 - Environmental Problems Associated with a Deepwater Port in the Delaware Bay Area, University of Delaware, Newark, Delaware, 1974.

Summer flounder and scup (OFM) are caught onshore during the summer and offshore during fall and winter. The butterfish (OFM) is caught onshore during spring and fall. The black sea bass (OFM) is taken onshore in pots during the summer and early fall.

Bluefish, Atlantic mackerel, striped bass and red hake catches have remained relatively stable over the past 15 years. Bluefish are caught in summer and early fall. The striped bass, a coastal migrant (CM), is caught primarily during the spring and fall migrations.

In recent years, catches of weakfish, yellowtail flounder, and bluefin tuna have become increasingly important.

2.1.2.7 Marsh. There are three types of coastal marsh regions in the area:

- Freshwater.
- Transition marsh.
- Coastal saline type, primarily cordgrass (*Spartina*).

In terms of wildlife, both muskrats and waterfowl are responsive to the degree of salinity of the coastal marshes; the heavier populations are associated with the freshwater areas. However, where purely saline marshes have not been altered by ditching and contain a good percentage of open water, such areas rank as high as similar areas of fresh marsh for waterfowl, particularly for the black duck and several species of diving ducks. These wetlands serve as buffers against flood damage, produce basic nutrients for primary producers, and form important nursery and rearing grounds for finfish and shellfish.

2.1.2.8 Beaches and Dunes. Some of Delaware's coastal beaches are bordered by various stages of dune development which harbor natural and man-made aviaries. This is best seen in the Cape Henlopen Park area near Lewes, the northernmost part of Delaware's Atlantic coastline.

Vegetation increases in density and length from the crest of the primary dune on the ocean side of Cape Henlopen toward the back slope of the secondary dune. The most common dune-stabilizing vegetation consists of marram grass (*Ammophila breviligulata*) and sea rocket (*Cakile edentula*).

Within the dune area, particularly between frontal and secondary systems, nesting sites of various species of birds occur. Representatives of terns and sandpipers are particularly well developed here. Several bird sanctuaries have been established in the park, again near the tip of Cape Henlopen. The dune grasses serve to initiate dune formation and stabilize dune migration. With increased seral development of vegetation, increased coverage ensues, followed in turn by colonization of many coastal birds seeking nesting sites. However, the initial stabilization of the dunes is dependent on marram grass, which is in large part influenced by its resistance to the demands of salt spray. Serious disruption of the marram grass could increase dune migration and produce subsequent changes to nesting sites.

Several prime environmental and historic/archaeological sites are located near Lewes in Sussex County.[1] An additional reference of value is: An Atlas of Delaware's Wetlands and Estuarine Resources, Delaware Coastal Management Program, State Planning Office, Dover, Delaware, 1976.

Specific natural areas are:

a. Beach Plum Island.

This is a transgressive barrier beach which is moving by washover and beach face truncation, inland and across the marshes of Canary Creek and Old Mill Creek (Red Mill Creek). The barrier apparently will maintain itself by a winnowing process as long as a source of sand and gravel exists. The wreck of a coal barge, positioned nearly perpendicular to the beach face, functions as a groin.

Of great visual beauty and ecological diversity, this narrow, thin washover barrier represents the only relatively unaltered expanse of beach on lower Delaware Bay. Air quality is excellent, and water quality appears high in the adjacent bay. Although Delaware Bay water quality is very good at this level, Broadkill River water has serious problems. The upstream discharges of one municipal sewage treatment plant and several industries are responsible for a low dissolved oxygen level and high fecal coliform count.

Dune vegetation is of excellent quality, as is that of the unaltered cordgrass marsh adjacent to the Broadkill River.

b. Canary Creek and Old Mill Creek Marshes.

Adjacent to the University of Delaware, Lewes, Marine Studies Complex, this area has achieved scientific reknown in the annals of coastal marsh ecology because of extensive research over a nearly 25-year period by staff and students. Educational uses are commensurately high.

Vegetation in the marshes of Canary Creek and Old Mill Creek (also known as Red Mill Creek) is principally saltmarsh cordgrass (*Spartina alterniflora*)--short form, and to a lesser extent tall form. Salt hay (*Spartina patens* and *Distichlis spicata*), big cordgrass (*Spartina cynosuroides*), and rushes

[1] Critical Natural Areas--Kent and Sussex Counties, Delaware Nature Education Society for the State Planning Office, Dover, Delaware, 1976.

(*Juncus* spp.) are also common in some sections. There is a heavy concentration of Phragmites (*Phragmites communis*) along the dirt road near the easterly boundary of the natural area.

A few scattered hummocks contain upland vegetation, including loblolly, pitch, and Virginia scrub pines, red cedar, and such deciduous species as sassafras, red maple, wild black cherry, and black gum. Bayberry is common in the shrub layer. These hummocks are frequently surrounded by substantial areas of salt hay and are havens for deer. Shell mounds are located on many of these hummocks as evidence of prehistoric occupation.

c. Cape Henlopen.

Cape Henlopen is a natural area of great diversity. A rapidly accreting spit, a large migrating sand dune, and an eroding shoreline combine to create a land form of national interest geologically. Within the boundaries of the defined natural area are several shell middens of archaeological significance and Gordons Pond, location of an early saltworks.

The littoral transport system, which moves material in a northwesterly direction is another factor determining Cape physiography. Sand and gravel eroded from the coast are deposited at the tip of the Cape. In the past, this process reshaped Cape Henlopen from the recurved spit system, which existed from 2,000 to 500 B.C., to the broadly rounded cuspate-type spit described during the seventeenth to nineteenth centuries. Subsequent construction of the inner breakwater in 1829 and the outer breakwater in 1890 contributed substantially to the formation of the simple spit which is the Cape. These breakwaters are also responsible for the silting of Lewes Harbor, or Breakwater Harbor. The spit is rapidly moving toward the inner breakwater and is expected to join with it, perhaps within a few years, if dredging is not employed. The present rapid erosion of the beach, approximately 10 feet per year, coupled with the resulting spit accretion, produces the changing form of the Cape.

The Great Dune, once 90 feet in height, lies perpendicular to the Atlantic coast. The cutting of a forest in the back barrier area early in the nineteenth century aided dune development. Sands from the beaches of Lewes Harbor were blown landward, forming the Great Dune, which has moved one-quarter mile south in the past 130 years and is still migrating.

Cape Henlopen is notably attractive to birdlife. The seabird nesting colony is inhabited by least and common terns, black skimmers, and piping plover. Surveys conducted by the Delaware

Ornithological Society indicate that the number of common tern and black skimmer nests has been decreasing in recent years, likely due to predation by foxes. The least tern population is apparently stable, and the piping plover is thriving.

Water quality in the adjacent bay and ocean is generally excellent. Inadequately treated sewage from the Lewes and Rehoboth Sewage Treatment Plants is discharged to the Lewes-Rehoboth Canal, causing a water quality rating of fair to poor. In the near future, sewage will be treated in a regional system, at which time water quality is expected to improve. Air quality is excellent throughout the natural area. The noise level is raised seasonally by heavy automobile and pleasure boat traffic.

2.1.2.9 Matrix Evaluation--Sussex County, Delaware. This step of the baseline data compilation is designed to provide an easily understood visual array of the most notable environmentally-sensitive characteristics of the specific study region. Its purpose is to provide a quick visual assessment of the important environmental features. Environmental characteristics are rated under certain boundary conditions. The larger the boundary condition (i.e., state rather than township), the more widespread the value of that characteristic. A completed environmental information matrix for Sussex County is shown in Figure 2-4.

2.1.2.10 Red Flag Components. These factors are indicated in the last column of the environmental information matrix. Red flag components comprise the most valuable and sensitive environmental characteristics of a study area and may preclude any OCS-related activities which could significantly damage the component.

The purpose of including red flag components is to allow the user to focus in on those topics of analysis which appear to be of major concern to those likely to be affected by OCS development.

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Boundary Conditions

	ENVIRONMENTAL CHARACTERISTICS	OF IMPORTANCE TO: TOWNSHIP	COUNTY	STATE	RED FLAG COMPONENT
ECOLOGY	Waterfowl Migration Route			●	
	Marine Mammals or Turtles				
	Nurseries/Breeding Areas			●	
	Rare and Endangered Species				
	Primary Productivity			●	
	Salt Marshes				●
	Freshwater Wetlands	●			
	Sea Bird or Seal Rookeries		●		
	Estuarine Habitats			●	
	Fish Species (economic)		●		
	Shellfish/Crabs		●		
	Native Fauna		●		
	Native Flora		●		
	Terrestrial Habitats			●	
	Water Quality			●	
LAND USE					
	Recreational Beaches				●
	Boating		●		
	Wildlife Refuge or Preserve			●	
	Farming			●	
	Open Space		●		
	Aesthetics			●	
	Other:Air Quality		●		
SOCIO-ECONOMIC	Commercial Finfishing		●		
	Commercial Shellfishing			●	
	Sports Fishing		●		
	Historic Area			●	
	Scientific Research Area	●			
	Archaeological Sites			●	
	Ocean Dump Sites		●		
	Small Boat Traffic				●
	Unique Environmental Area				
GEOMORPHOLOGY					
	Unstable Sediments and Beaches			●	
	Tidal Flats	●			
	Barrier Beaches		●		
	Hydrological Conditions	●			
	Rocky Shores				
	Estuaries, Bays			●	
	Geomorphological Features		●		
	Weather Conditions				
OTHER	Public Attitudes Toward Development				
	Government Incentives/Disincentives				●

FIGURE 2-4 ENVIRONMENTAL INFORMATION MATRIX — SUSSEX COUNTY, DELAWARE

2.1.3 Environmental Baseline for Northampton County, Virginia

Northampton County is located at the extreme southern point of the Delmarva Peninsula, and represents a rural county whose present commercial/industrial activities consist of farming, food processing, and commercial fishing. The county is about 33 miles long and averages 14 miles wide (see Figure 2-5). Its only land-based border is that with Accomack County to the north. It is bisected by U.S. Route 13 which runs northward up the peninsula through Maryland and Delaware and southward through the Chesapeake Bay Bridge-Tunnel to the Virginia mainland. The major towns in the county, with significant population figures, are:

- Eastville (203).
- Cape Charles (1689).
- Exmore (1421).

The Northampton County population was 14,442 in 1970.

Northampton County is fortunate to have the natural advantages of fertile soil, mild climate, clean waters, and protected harbors. An extremely attractive area, with white sandy beaches and picturesque harbors, it seems to have changed little since it was first settled. Perhaps because of its isolation, it is the most rural of the Delmarva counties. It is within this community that Brown and Root, of Houston, Texas plans to construct a platform fabrication facility to serve the expected offshore oil industry along the Atlantic coast.

2.1.3.1 Present Land Use. The county's primary land use is agriculture. Of the 140,800 acres of land area (220 sq mi), 51,000 were in agricultural use in 1970. This number had decreased by 20 percent since 1964, and the number of farms dropped to 241, a decrease of 23.5 percent from 1964. Thus, about 35 percent of the county's land is presently in agriculture, a figure which is deceptively low since much of the land area, especially along the Atlantic coast, consists of marshes and low-lying areas not suitable for farming.

Due to the rural nature of the county, less than 2 percent of the land is in industrial use and about 4 percent is designated as urban/residential/commercial. The county is connected to the Virginia mainland by the Chesapeake Bay Bridge-Tunnel which was completed in 1964[1] and was considered a potential stimulus for commerce and small business. Although construction of the Bridge-Tunnel did bring a temporary economic boom to the area, it was short-lived. Most of the workers stayed in rooming houses, and the expected tourism and housing development did

[1] County and City Data Book, U.S. Department of Commerce, Washington, D.C., 1972.

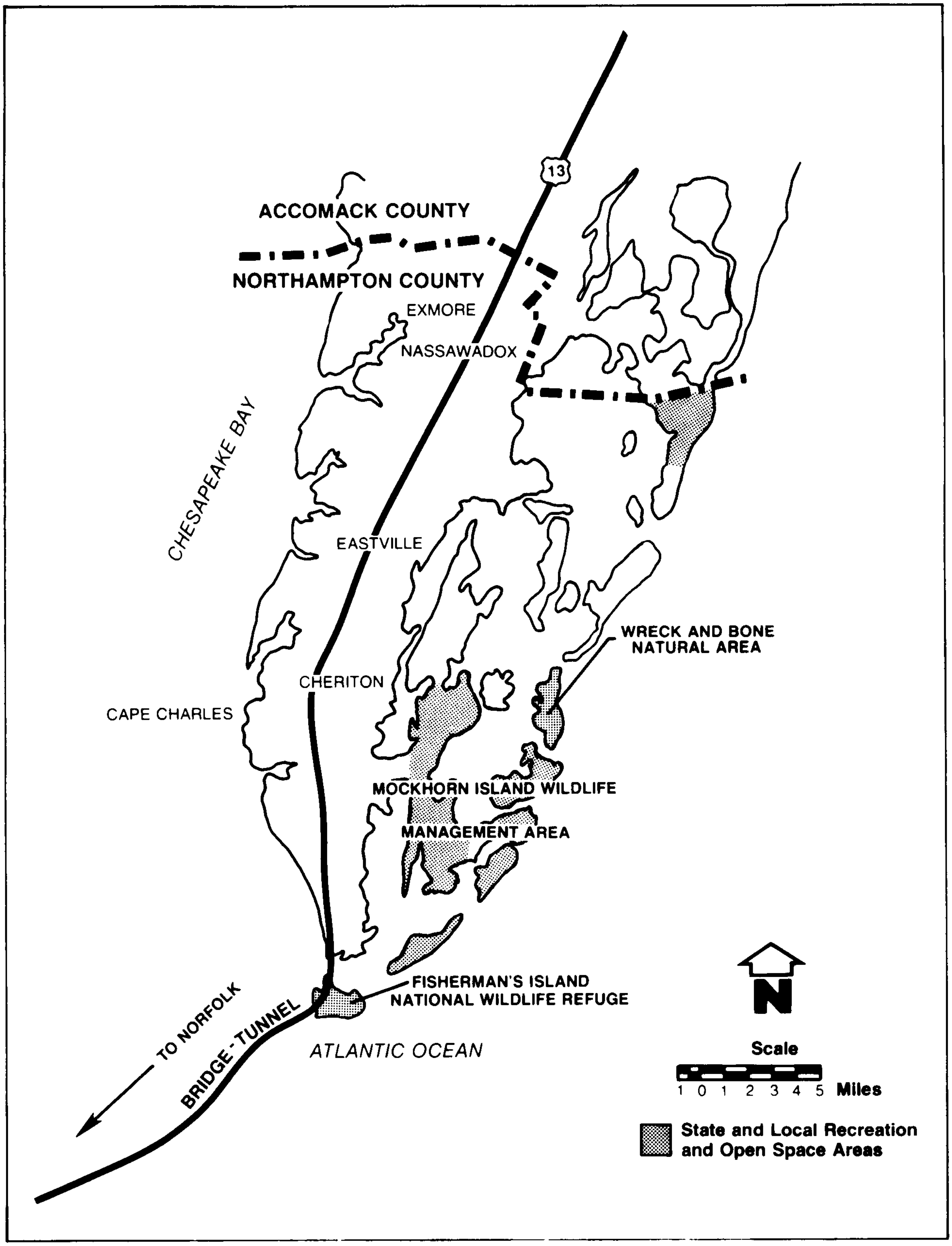

FIGURE 2-5 NORTHAMPTON COUNTY, VIRGINIA

not occur. With a one-way toll of $6.00, the Bridge-Tunnel discouraged Northampton residents from commuting to the Norfolk area for jobs. The most noticeable effects of the Bridge-Tunnel are two new motels and the closing of the car ferry.

Today, most of the available employment is seasonal. Four of the five businesses that employ more than 20 people year-round are food processing firms. The largest employs about 150 people in the winter and about 300 in the summer.

2.1.3.2 Water Resources. The towns of Exmore, Eastville, and Cape Charles operate central water supply facilities, but the majority of the county's residents rely on on-site wells. For this reason, quality and supply is a major environmental concern in the county. Agriculture uses large amounts of water for irrigation of crops and for food processing. Certain areas in the county are having groundwater problems, and many families have switched from shallow to deep wells. Major concerns are saltwater intrusion, groundwater pollution, and lowering of the aquifer because of over-pumping.[1]

Because of the fragile ecology of the peninsula, the Board of Supervisors urged the state to test the water supply and quality in 1975. On the basis of the study, the state declared the county (as well as Accomack County) a "critical groundwater area." This means that additional environmental precautions must be taken before new development occurs. Specifically, the State Water Control Board must issue a special permit for a new development which draws more than 50,000 gallons per day.

2.1.3.3 Current Water Quality. Cape Charles has a sewage collection system but no treatment plant, and currently discharges untreated wastewater directly into the Chesapeake Bay. The town has applied for funding to construct a treatment plant which may be operational sometime in mid-1978. There is some question whether the Cape Charles facility will be adequate to process industrial wastes, and the treatment plant may need to be expanded. However, the unit should service a large number of residential homes and is designed to accommodate the nearby town of Cheriton at a later date. County leaders are currently working to get priority for federal funding for the Cheriton collection system, but collection lines in Cape Charles will need to be built before the unit is fully operational.

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[1] NACo--Case Studies on Energy Impacts, Serving the Offshore Oil Industry: Planning for Onshore Growth--Northampton County, Virginia, National Association of Counties, 1735 New York Ave., Washington, D.C., 20006, 1976.

The county has also begun plans for a sewage treatment and collection service in Exmore, at the northern end of the county. This would provide service to nearby villages, and as a separate step, could be greatly expanded with collection service to the town of Nassawadox. The Exmore project is in the first phase, the feasibility study, so it will probably be at least four years before such a unit is operational. Except for Cape Charles, and until new facilities are built, all homes in the county must continue to rely on septic tanks.[1]

Problem areas with regard to water quality include saltwater intrusion, nearshore pollution from sewage outfalls, and localized pollution of surfacewater from various residential and commercial effluents.

The county operates a 75-acre solid-waste landfill. As yet, no reports of groundwater or surfacewater pollution from landfill leachate have been recorded. Overall, water quality will improve as the sewage treatment systems are made operational.

2.1.3.4 Current Air Quality. No reports of current air quality in Northampton County were available, but a general lack of industrial activity in the area indicates a lack of air quality problems.

2.1.3.5 Existing Ecology. Northampton County has many natural recreational resources which support camping, hiking, and water sports. There is a public beach, several boat ramps, and sports facilities in the public schools. County leaders have cooperated in a public recreational program which includes using school facilities after hours and abandoned school buildings for community centers.

The Planning Commission, as part of its deliberations on the county's master plan, is promoting additional public facilities, such as hiking and bike trails. Recreational uses of the county's beaches, wetlands, marshes, and natural areas is increasing steadily.

The study area is located on the Atlantic Coastal Plain which dips gradually eastward from the Piedmont Plateau out to the continental shelf. This area was originally vegetated by pine-hardwood forests bordering extensive marshes along the Atlantic Coast and Chesapeake Bay.

The county encompasses the lowermost portion of the Chesapeake Bay Eastern Shore, including its outlet to the Atlantic Ocean. One of the most productive estuaries in the world, the bay supports a multi-million

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[1] Northampton: Background Study, Urban Pathfinders, Inc., Baltimore, Maryland, 1975.

dollar fishing industry, and provides wintering habitat for thousands of migratory waterfowl. Because this area is vital to the maintenance of waterfowl populations of the Atlantic Flyway, 15 national wildlife refuges have been established on the bay and its tributaries, or on the nearby Atlantic Coast.

2.1.3.6 Marshes. Marshes of the Atlantic Coast and Chesapeake Bay within the study area are primarily brackish or salt estuarine bay marshes. In the salt marshes, the dominant vegetation is cordgrass (Spartina alterniflora) in areas inundated daily and salt meadow hay (Spartina patens) in areas inundated at least once monthly. In the brackish marshes, the dominant vegetation is typically big cordgrass (Spartina cynosuroides), olney three-square (Scirpus olneyi), saltmarsh cordgrass, and salt meadow cordgrass.[1]

The marshlands are vital to the maintenance of numerous fish and wildlife species of Chesapeake Bay. Mudflats adjacent to these marshes support clams and oysters; waterfowl numbering several hundred thousand winter on Chesapeake Bay, and numerous species of fish depend on the marshes to provide spawning or nursery areas.

Northampton County has extensive marshes on the seaward shoreline, protected by barrier beaches. These marshes (and nearshore areas) specifically support large populations of soft clams, menhaden, blue crabs, black sea bass, sea scallops, southern quahog, striped bass, sea trout, porgy and numerous other sport and commercial species.[2] The Chesapeake Bay shoreline is equally important as an ecologically-productive area even though the extent of marshes in this area is less.

2.1.3.7 Pine-Hardwood Forests. Forests throughout the area have been diminished considerably and greatly altered since settlement in the 1600's. Practically all of the better-drained soils have been cleared for agriculture, and species composition of woodlands in the low-lying wetter areas has been altered by repeated timbering. Pine, principally loblolly (Pinus taeda), mixed with red maple (Acer rubrum), hickory (Carya sp.), sweet gum (Liquidambar styraciflua), and several species of oak (Quercus sp.) grow on the better-drained soils. Swamps and low-lying areas typically support red maple, tupelo-gum (Nyssa aquatica), bald cypress (Taxodium distichum), water oak (Quercus nigra), willow oak (Quercus phellos), and black gum. Historically, Atlantic white

[1] Mid-Atlantic Regional Study: An Assessment of the Onshore Effects of Offshore Oil and Gas Development, Woodward-Clyde Consultants, Edison, New Jersey, 1975.

[2] Final EIS-OCS Lease Sale No. 40, U.S. Department of the Interior, Bureau of Land Management, 1975.

cedar (Chamaecyparis thyoides) was abundant in many of the swamp areas; however, most of the cedar stands have been eliminated as the result of extensive logging.[1]

2.1.3.8 Critical Natural Areas. Existing in Northampton County are a number of critical natural areas. These are:

a. Fisherman's Island National Wildlife Refuge.

This refuge consists of 13,000 acres of salt marsh surrounding sand dunes, maritime shrub forest and freshwater marshes. The area provides nesting habitat for herons, egrets, shorebirds, terns and osprey, and is used extensively by peregrine falcons during migration. The island is the southernmost tip of the Delmarva Peninsula.

b. Mockhorn Island Wildlife Refuge.[2]

This large wetland and natural area lies between the barrier islands of the county and the mainland, to which it is connected by a land bridge. Most of the refuge is owned by the Nature Conservancy, with some sections having been turned over to the Department of the Interior for preservation.

c. Wreck Island Natural Area.[2]

This barrier island on the Atlantic shore of Northampton County covers some 30,000 acres of marsh, wetlands, and dunes and is administered by the State of Virginia as a natural area and a wildlife management area.

2.1.3.9 Wildlife. Seaward the broad-barrier sand beaches provide ideal habitat for various shore and marine birds that migrate through in vast numbers. The saltwater bays, estuaries, and marshes provide habitat for many kinds of waterfowl, marine life, various marsh mammals, plus the usual assortment of other birds and mammals.[3] Among the waterfowl, various species of sea ducks and divers are particularly numerous during the winter, including three scoters, goldeneye, bufflehead, old-squaw, and the red-breasted merganser. The predominant

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[1] Lippson, A.J. (Ed.), The Chesapeake Bay in Maryland: An Atlas of Natural Resources, The Johns Hopkins University Press, Baltimore, Maryland, 55 pp, 1973.

[2] Coastal Wetlands of Virginia, Virginia Institute of Marine Science, Gloucester Point, Virginia, 154 pp, 1969.

[3] Coastal Wetlands of Virginia, Interim Report - Guidelines for Activities Affecting Virginia Wetlands, Virginia Institute of Marine Science, Gloucester Point, Virginia, 52 pp, 1974.

species of the estuaries include the Canada goose, black duck, canvasback and the two scaups. This coastal zone is one of the foremost wintering areas of the American brant. The snow goose migrates through seasonally in large numbers, and a few thousand spend the winter. This coastal region is particularly noted for the vast numbers of bird migrants, not only waterfowl and shorebirds, but many other bird groups as well.

A few species of waterfowl nest in the area, including the mallard, black duck, gadwall, blue-winged teal, and wood duck. Birds that are important nesters in this area include three species of egrets, four herons, four rails, 14 shorebirds (including two gulls and five terns), and a host of the common terrestrial species. The osprey nests throughout this coastal segment, and is commonly seen in some sectors.

Many species of the original mammalian fauna are no longer present. Of those that remain, many are not particularly abundant, except for certain rodents and a few of the larger mammals. The white-tail deer, for example, thrives in the pine-oak woodlands and farming communities of the Delmarva Peninsula. That species and the ever-common cottontail rabbit are important game animals to hunters of the region. Associated with the estuarine marsh system are a number of furbearers that contribute to the economy of the state. These include the muskrat, mink, long-tail weasel, land otter, skunk, raccoon, opossum, red fox, and grey fox.

This region contains two wildlife species that are classed as endangered: the southern bald eagle and the American peregrine falcon. Both of these birds are migratory. The peregrine falcon migrates through in very small numbers, and the bald eagle is an uncommon transient. Both may be found along the estuaries and beaches, where their food is obtained. The falcon preys mostly on aquatic birds, while the eagle's food consists mostly of fish. Another species, not yet on the endangered list, but considered as "rare", is the Ipswich sparrow. This bird winters on the sandy beaches along the Atlantic coast.

2.1.3.10 Matrix Evaluation--Northampton County, Virginia. This step of the baseline data compilation is designed to provide an easily-understood visual array of the most notable environmentally-sensitive characteristics of the specific study region. Its purpose is to provide a quick visual assessment of the important environmental features. Environmental characteristics are rated under certain boundary conditions. The larger the boundary condition (i.e., state rather than township), the more widespread the value of that characteristic. A completed environmental information matrix for Northampton County is shown in Figure 2-6.

Boundary Conditions

ENVIRONMENTAL CHARACTERISTICS		OF IMPORTANCE TO: TOWNSHIP	COUNTY	STATE	RED FLAG COMPONENT
ECOLOGY	Waterfowl Migration Route				●
	Marine Mammals or Turtles		●		
	Nurseries Breeding Areas		●		
	Rare and Endangered Species				
	Primary Productivity		●		
	Salt Marshes		●		
	Freshwater Wetlands				
	Sea Bird or Seal Rookeries		●		
	Estuarine Habitats		●		
	Fish Species (economic)			●	
	Shellfish Crabs			●	
	Native Fauna				
	Native Flora				
	Terrestrial Habitats				
	Water Quality			●	
LAND USE	Recreational Beaches		●		
	Boating		●		
	Wildlife Refuge or Preserve				●
	Farming			●	
	Open Space	●			
	Aesthetics		●		
	Other:Air Quality				
SOCIO-ECONOMIC	Commercial Finfishing				●
	Commercial Shellfishing				●
	Sports Fishing			●	
	Historic Area	●			
	Scientific Research Area				
	Archaeological Sites				
	Ocean Dump Sites				
	Small Boat Traffic	●			
	Unique Environmental Area				●
GEOMORPHOLOGY	Unstable Sediments and Beaches			●	
	Tidal Flats		●		
	Barrier Beaches			●	
	Hydrological Conditions	●			
	Rocky Shores				
	Estuaries, Bays		●		
	Geomorphological Features				
	Weather Conditions				
OTHER	Public Attitudes Toward Development				
	Government Incentives/Disincentives				

FIGURE 2-6 ENVIRONMENTAL INFORMATION MATRIX — NORTHAMPTON COUNTY, VIRGINIA

2.1.3.11 Red Flag Components. These factors are indicated in the last column of the environmental information matrix. Red flag components comprise the most valuable and sensitive environmental characteristics of a study area and may preclude any OCS-related activities which could significantly damage that component.

The purpose of including red flag components is to allow the user to focus in on those topics of analysis which appear to be of major concern to those likely to be affected by OCS development.

2.2 STEP 2: DEVELOPMENT OF FUTURE ENVIRONMENTAL CONDITIONS WITHOUT OCS-RELATED ACTIVITIES

As indicated in the methodology (Volume II, Chapter 5), this step may be completed either by producing a series of map overlays or by convening a panel of experts knowledgeable in the study area's composition and direction. For the Baltimore Canyon Test Case, this step consists of only a short narrative about each county, developed by communications with the indicated agencies and research facilities, and published references.

2.2.1 Middlesex County, New Jersey

The natural environment of Middlesex County's coastal area has been severely affected in the past. Water quality in the Raritan River and Bay has been very poor, with major problems being high concentrations of oxygen-demanding substances, oil pollution, siltation, industrial wastes, and excessive shoreline development. Air quality has been adversely affected by numerous chemical, oil refining, shipping and transportation, facilities, and urban housing developments.

The ecology of the coastal area has suffered greatly, but a noticeable recovery over the last four years has been recorded. Some common benthic and fish species have returned to the Raritan River, for instance.[1]

Although rapid land development is taking place in the central and southern parts of the county, the shoreline area is not being further developed to any great extent. Both private and governmental groups recognize the value of the coastal zone and together are producing regulations (and voter referendums) which may even create marshland, parks, and open space in areas previously used for commercial/industrial purposes.[2] Farmland will continue to be lost to residential and commercial interests.

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[1] Dr. T. Tuffey, Personal communication, Water Resources Research Institute, Rutgers University, New Brunswick, New Jersey, 1978.

[2] Dr. D.L. Morell, Personal communication, Center for Environmental Studies, Princeton University, Princeton, New Jersey, 1978.

Water quality along the shore areas is improving slightly, but at a slow rate. Increased pollution control and treatment of sewage should continue the trend toward a cleaner waterfront.[1]

The trend for an improvement in air quality, especially in the summer, cannot be predicted yet. It is hoped, however, as more industries comply with EPA effluent standards that air quality will improve. Also, improved emission control equipment and technical changes in response to higher energy costs may influence an improvement in regional air quality.

From an ecological viewpoint, it is unlikely that either aquatic or terrestrial habitats will improve in quality over the next 10 years. Water pollution in the intensely-developed New York City metropolitan area will not be appreciably improved during this time. In addition, continued conversion of open space in the county to residential/commercial/industrial uses will adversely impact surfacewater as well as terrestrial habitats. Few sizeable marshes remain which could be acquired for wildlife refuges to counteract this trend in the study area.

Overall, Middlesex County, without the influence of OCS-related activities will show gradual improvements in air quality, a continued loss of open space to residential/commercial uses, and possible increases in natural areas along the existing shoreline. Water quality may improve slightly due to effluent controls, but surfacewater runoff from the increasingly urbanized area may negate this effect.

2.2.2 Sussex County, Delaware

Projections for future water quality conditions call for general improvements of localized polluted conditions. Several areas are closed to shellfishing and crabbing due to high coliform counts, including: the Lewes-Rehoboth Canal, the Lewes Refuge Harbor in Delaware Bay, and many areas along the shores of Rehoboth Bay and Indian River Bay. At present, clearance has been given by the state and the Environmental Protection Agency for a subregional sewage treatment plant which would serve Lewes and Rehoboth Beach. Effluent from this system will be returned to the groundwater via a large spray irrigation field near Millsboro. This action, along with the recommendation that small plants or lagoons be utilized to serve many of the shoreline residential clusters, should greatly improve water quality.[2]

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[1] Middlesex County Comprehensive Master Plan, Middlesex County Planning Board, New Brunswick, New Jersey, 1974.

[2] Coastal Sussex Water Quality Program, Prepared by Roy F. Weston, Inc., for Sussex County, Delaware, 1977.

Groundwater problems should improve slightly over the next 10 years. Much of the contamination, although almost always localized, stems from farming operations. These sources are not projected to decrease significantly. However, sources of pollution from septic tanks in medium concentration housing areas will be reduced as sewage treatment plans are implemented.

Saltwater intrusion problems occur along the Atlantic shoreline and some sections of the Rehoboth Bay shore area. Use of groundwater for domestic purposes is slated to increase and higher salinity of some water supplies is expected.

Air quality problems at present are minor and occur only during the height of the tourist season. High volumes of traffic on Rehoboth Beach's main streets produce temporary, localized adverse air quality effects, as well as an increase in noise. Future conditions would not improve since population and recreational user-days are both projected to increase year-by-year.

Land use trends, as projected by the University of Delaware, predict increases in residential and commercial categories at the expense of open space and forests. Farmland, however, is also expected to increase as more land is cleared for such use. The trend toward second homes along the Atlantic shore and Delaware Bay is expected to continue. Low-density residential housing is predicted to increase 26 percent from 1975 to 2000.[1] The number of acres of wetlands, brushland, and beaches is slated to remain constant for the study area through 2000. No known acquisition of wetlands or open space by the state, county, or such groups as the Nature Conservancy is known.

Ecological conditions of the Sussex County coastal zone over the next 10 years will not change significantly. Although sewage treatment of the major residential areas will relieve some of the stress on local aquatic species, continued residential development, land conversion, erosion, and nonpoint source pollution will serve to place additional pressures on the terrestrial and aquatic ecosystems. However, recreational users of the area will benefit by the opening of contaminated shellfishing areas.[2]

In conclusion, Sussex County will have to deal with an increasing population, with especially heavy usage during the summer recreational season. Open space will be lost to residential developments and flora and fauna will be subjected to increased stress from a large population and less diversified available habitats.

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[1]North Coastal Land Use Plan, Delaware Planning and Zoning Commission, Dover, Delaware, 1977.

[2]Dr. Don Maurer, Personal communication, University of Delaware Marine Laboratory, Lewes, Delaware, 1977.

2.2.3 Northampton County, Virginia

Future environmental conditions in Northampton County would be about the same as at present. Being the most rural of the three counties studied, and depending heavily on farming, fishing, and food processing for its economic health, the county does not expect any significant change in the industrial climate. Also, no rapid increase in recreational use of the area is expected for two reasons; first, the region is far removed from major urban centers (except Norfolk, which has Virginia Beach as its recreation area); second, most of the barrier islands are state or federally-owned and managed as natural areas or wildlife refuges.[1]

Surface and nearshore water quality are expected to improve as the Cape Charles sewage treatment plant becomes operational. This action will likely have a moderate positive effect on local ecological communities.

Air quality has historically been good and is not expected to be degraded by any known developments. Groundwater supplies have been adequate for the population size and, except for minor local saltwater problems, no changes in this situation would be expected.[2]

The biological productivity of the county would likely increase over the next 10-year period if present (non-OCS) trends prevailed. Nearshore marshlands are increasingly being placed under protective covenants, such as wildlife refuges, and much farmland is being left fallow as smaller farms are abandoned or sold to larger holdings. Due to these factors, both wildlife (deer, rabbits, raccoons, muskrats, etc.) and waterfowl would have more habitat available for feeding and nesting. Lack of land development indicates low erosion levels, other than that caused by farming, benefiting crabs, shellfish, and finfish using nearshore aquatic habitats.[3]

In conclusion, future conditions in Northampton County without OCS-related activity, would be very similar to present circumstances. The county would still enjoy a very rural setting. Primary economic driving forces would still be farming, fishing, and food processing. Recreational uses of the area would continue to increase at the present low rate, with primary emphasis on hunting (especially waterfowl), fishing, use of beaches, camping, and development of some summer homes. Water quality would improve somewhat as treatment plants are finished and air quality would remain excellent. No major commercial/industrial developments, other than OCS support, are anticipated.

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[1] Shoreline Situation Report, Northampton County, Virginia, Virginia Institute of Marine Science, Gloucester Point, Virginia, 1975.

[2] Brown and Root Impact Study, Urban Pathfinders, Inc., Baltimore, Maryland, 1975.

[3] Local Management of Wetlands--Environmental Considerations, Virginia Institute of Marine Science, SRAMSOE No. 35, Gloucester Point, Virginia, 1973.

2.3 STEP 3: DEVELOPMENT OF ENVIRONMENTAL IMPACTS

2.3.1 Middlesex County, New Jersey

The impact assessment sequence is begun by analyzing the decision diagram to determine which of the three impact analysis techniques to employ. This process is shown for Middlesex County by the categories and values which are circled in Figure 2-7.

Since most of the categories circled are in the "1" value category, the first of the impact assessment techniques, question analysis, will be used to estimate environmental impacts. Reasoning behind selection of each of the value categories is as follows:

a. Condition of offshore activity - "exploration".

b. Size of onshore facilities - "large" - due to findings of the location analysis that many facilities would be needed in the area, including: permanent service base, ancillary services, marine repair and maintenance, marine terminal, and a tank farm; the latter two facilities fall into the "large" category described in the methodology.

c. Availability of existing facilities - "yes" - numerous oil refineries exist in the Raritan Bay area. The conclusions of OCS Oil and Gas - An Environmental Assessment, 1974, by CEQ were that oil would displace imported crude and that few new petroleum refinery or storage facilities would be required in the heavily developed mid-Atlantic region. Existing facilities are most likely sufficient to handle an "average" yield of OCS oil and gas in the study area.

d. Anticipated impacts - "minor" - due to the presence of existing oil and gas facilities and the necessary infrastructure needed to support it. Also, the ecological sensitivity of the area is not great due to few remaining natural areas of significant size.

e. Presence of red flags - "few" - but only in the areas of air and water quality.

f. Disincentives - "few" - local organizations, especially in northern Middlesex County do not favor expansion of the petroleum industry in the area.

g. Incentives - "minor" - the stated policy of the Port of New York, New Jersey is to seek OCS-related activity but only insofar as it does not aggravate existing air and water quality problems. Unemployment in the region has been increasing and additional industrial activity is actively sought.

Decision Category	Value Category 1	2	3
a. Condition of Offshore Activity	Exploration	Development	Production
b. Size of Onshore Facilities	Small	Medium	Large
c. Availability of Existing Facilities	Yes	Possibly	No
d. Anticipated Impacts	Minor	Moderate	Major
e. Presence of Red Flag Impacts	Few (1-2)	Several (3-4)	Many (5 +)
f. Disincentives, Public or Private	Few or none	Minor	Major
g. Incentives, Public or Private	Major	Minor	None
h. Availability of Baseline Data	Adequate	Marginal	None
i. Other			
Result: Impact Analysis Technique	Question Analysis	Matrix Analysis	Optimum Pathway Matrix

Directions: For each of the decision categories above, circle that value category which best describes the situation for the study area. The value categories (1 through 3) correspond to impact analysis techniques nos. 1 through 3. Thus, circling most of the categories in column 1 indicates that analysis technique no. 1 would be most applicable for the expected project. The techniques increase in complexity, cost, quantification, and comprehensiveness as one moves from no. 1 to no. 3.

FIGURE 2-7 DECISION DIAGRAM FOR CHOOSING AN IMPACT ANALYSIS TECHNIQUE, MIDDLESEX, NEW JERSEY

h. Availability of baseline data - "adequate" - the various regional OCS baseline and impact studies, technical studies from Rutgers University, EPA, National Marine Fisheries Service at Sandy Hook, and Middlesex County Planning Board suffice to provide a background description of the area.

From the list of onshore facilities which may be required in the Raritan Bay area, the following will be absorbed by existing facilities:

- Tank farm.
- Marine terminal.
- Marine repair and maintenance.

The following facilities will most likely be developed anew or expanded from smaller existing facilities:

- Ancillary services.
- Permanent service base.

Activities which will likely be required if the support services (mainly supply) and the permanent service base are constructed include:

- Excavating.
- Fill depositing.
- Grading.
- Pile driving.
- General construction.
- Dredging.
- Land surface clearing.
- Paving.
- Spoil depositing.

Disturbances which may occur from those activities are listed below. However, this list is based on the presumption that the sites used will be existing industrial land not adjacent to marshes or natural areas, and that "virgin" land will not be developed. Likely disturbances include:

- Loss of estuarine habitat.
- Erosion and siltation.
- Onshore construction effects.
- Disruption of dredged areas.

The number of acres needed for the service base and support facilities (ancillary services), as developed in the industry requirements, is about 250. This size land area is obtainable along the developed waterfront of the Raritan Bay/River.

The question analysis is based on the QRD system (question-rule-data). To properly follow this analytical technique, rules are established which set forth assumptions or information which, when quantified with the necessary data, produce an answer or result to the original question. This system basically fragments the usual question-answer process by which decisions are made into smaller subunits which can be handled more clearly by a user. For this analysis, the rule and data steps will be combined into a single descriptive format, primarily due to the preliminary stage of expected OCS-onshore activity. Such "lumping" is necessary since details needed to quantify impacts will not be available until a site is chosen and specifics are determined, such as:

- Number of acres of land utilized.
- Cubic yards of sediments dredged.
- Number of ships to be berthed.
- Types and volumes of supplies to be stored.
- Types and volumes of effluents to be discharged.
- Additional developments necessary to support the facilities.

A reasonable estimate of environmental impacts can best be attempted by simply asking the correct questions and developing data to answer those questions. For Middlesex County, the important questions are:

1. Where are the facilities likely to be placed?

2. Are existing sites and facilities available?

3. How much developed/undeveloped land will be required and what characteristics must it have?

4. Will the facilities produce air pollution?

5. Will likely secondary developments increase the likelihood of air pollution?

6. How do expected pollution levels compare with state and federal standards?

7. Will water pollution levels increase?

8. What types of effluents and runoffs may be expected from the facilities?

9. Will groundwater quality or quantity be affected?

10. How do expected water quality changes relate to state and federal standards?

11. Will changes in land use, water, or air quality affect nearby recreation or natural areas?

12. What effect will the facilities have on the amount and type of solid waste produced in the community?

13. Is induced growth (i.e., secondary development) expected to any great degree?

14. What effect will induced growth have on air quality, water quality, solid waste, or land use?

15. Will other effects, such as excessive noise or dust be created?

16. Is the proposed site suitable, or are there other more appropriate locations for the project?

17. Does the choice of the site conflict with the community's land use plans, or with the desires of groups in the community?

18. Will the proposed project be accompanied by drainage or erosion problems?

19. What effect will the project have on existing wetlands, agricultural land, forestry lands, or other important areas?

20. What will be the aesthetic impacts of the project, particularly visual; for example, will it eliminate or provide new scenic views and vistas?

21. Will the proposed action increase or decrease the number of boating, swimming, or other recreational facilities in the community or region?

22. Will it have any effect on hunting and fishing opportunities in the region?

23. Will the project have any effect on valuable or rare or endangered plants or animals?

24. To what degree will the proposed action alter present wildlife habitats in the community?

25. Will the project affect fish or shellfish in the waters in or near the community?

26. Will important habitats, food chains, or plant and animal populations themselves be affected by any induced growth from the project?

27. What are the kinds and amounts of minerals and other natural resources likely to be used for the construction and operation of the project?

28. Will the project affect any historical or archaeological sites?

29. Will the project have any effect on cultural facilities or opportunities?

Results of the question analysis provide at least reasonably well-defined boundary conditions within which possible environmental impacts may be estimated. The development of data (and subsequent answers) to the questions is done by a short, topic-specific discussion:

a. Facility Requirements.

Analysis of preliminary OCS-related studies by the Middlesex County Planning Board[1] indicates that the 250 acres of land required are available in previously industrial use areas in Perth Amboy, near the Outerbridge Crossing. In addition, the City of Perth Amboy, with support from the New Jersey Department of Energy, is actively promoting and seeking OCS support facilities. Eight marine terminals presently serve the Perth Amboy/Arthur Kill area, most handling petroleum products. One major refinery in the area is Chevron, at Perth Amboy, which refines about 120,000 bbl/day. This facility could be expanded if necessary. A second refinery, Hess, was in operation at Sewaren but closed in 1974 after that firm's St. Croix, U.S. Virgin Islands refinery came on stream. The Hess facility at present serves as a marine terminal and fuel desulfurization plant.

b. Land Use.

Existing use of the acreage desired for OCS facilities consists of an old primary metal plant, vacant land, and some secondary shrub and woodland growth. The parcels are not part of a wetland or natural area, and are not presently hunted or used for other recreational pursuits. The area is primarily industrial and urban. Development to the south and east of Perth Amboy (other than in South Amboy) is not feasible due to a lack of facilities, open land, deepwater channels, and major zoning restrictions which favor residential/recreational uses.

c. Air and Water Pollution.

Development of a major service base is not expected to cause a noticeable local or regional impact on air or water pollution. Some minor evaporative loss of hydrocarbons from gasoline and fuel oils could occur at the marine terminal/ship-loading area

[1] Mr. James Fong, personal communication, March 1978.

the service base, but transfer and storage of such materials is at present closely regulated by EPA and the New Jersey Department of Environmental Protection. In addition, spill prevention and control countermeasure (SPCC) plans to prevent the spillage and containment of any stored oil are required for all facilities which store more than 5,000 gallons of petroleum products.

Air pollution in the region could increase if the volume of offshore oil reaching local refineries is not offset by a decrease in imported crude. Analysis of such air pollution effects is best accomplished by detailed air quality modeling, perhaps by the state or an engineering consultant.

Water quality impacts are judged to be minimal. The service base site proposed for development requires little land clearing. Bulkheads are present but will probably have to be altered and strengthened and docks will require pile driving. Sanitary wastes will be treated by the Perth Amboy treatment plant and few other waste streams are anticipated. Runoff must be controlled, however, and state requirements for setbacks, vegetation buffer zones, and sedimentation basins must be enforced to minimize nonpoint source pollution of adjacent waters. Some dredging may be required along the docks, but deep ship channels already exist in Arthur Kill and the Raritan River/Bay.

d. Induced Growth.

Few adverse impacts from secondary developments are expected due to the highly developed nature of the study region. An excellent transportation system exists to bring supplies to the service base; most suppliers of food, construction equipment, medical aid, etc. are located in the region. Communications systems, housing, entertainment, recreation, police protection, water systems, and waste treatment are all available locally. Also, a large, trained labor pool numbering in the hundreds of thousands is available within a 10-mile radius. Induced growth effects would, therefore, be negligible.

It is important to note that both the State of New Jersey and Perth Amboy are actively seeking OCS-related industries to locate in Perth Amboy. Preliminary analysis by the state has shown that such a development is in keeping with goals and needs of that area. The availability of sites, existing facilities, and infrastructure, and the low level of expected impacts bodes well for the successful location of several facilities in this portion of Middlesex County.

2.3.2 Lewes, Delaware

Completion of the decision diagram in Figure 2-8 indicates that either a question analysis or matrix analysis technique would be suitable. The matrix technique, however, is more suitable to larger projects, and especially those which are expected to release effluents (residuals) to the environment. Since the Lewes area is expected to host only a service base, marine repair yard, and auxiliary facilities, the matrix analysis is less applicable than the question analysis technique. The following value categories were chosen, based on a first-hand knowledge of the area and consultation with the Delaware State Planning Office and the University of Delaware Marine Lab at Lewes. Specific reasons for the choice were:

a. Condition of offshore activity - exploration.

b. Size of onshore facilities - "small" - service base, marine repair, and auxiliary services are proposed for Lewes as indicated by the location analysis.

c. Availability of existing facilities - "yes" - some piers, warehouses, and one large industrial site are available.

d. Anticipated impacts - "moderate" - due to the small-town nature of Lewes, intense local recreation use, sensitivity of the estuarine ecosystem, major sport-fishing activities, and some commercial shellfishing operations in the nearby bay/ocean areas.

e. Presence of red flags - "several" (3-4)-

   1. Salt marshes are present in the immediate area although the available industrial site lies adjacent to mixed commercial/industrial/recreational land uses; biological productivity of local marshes is high.

   2. Recreational beaches - Cape Henlopen State Park and the Lewes beaches are near the industrial area.

   3. Unique environmental area - Cape Henlopen dunes, Beach Plum Island, extensive marshes, Primehook National Wildlife Refuge, large concentrations of over-wintering waterfowl.

   4. Government disincentives - possible OCS activity is limited to Lewes itself due to Delaware's Coastal Zone Act which limits industrial expansion of large facilities within the coastal zone.

Decision Category	Value Category 1	Value Category 2	Value Category 3
a. Condition of Offshore Activity	Exploration	Development	Production
b. Size of Onshore Facilities	Small	Medium	Large
c. Availability of Existing Facilities	Yes	Possibly	No
d. Anticipated Impacts	Minor	Moderate	Major
e. Presence of Red Flag Impacts	Few(1-2)	Several (3-4)	Many (5+)
f. Disincentives, Public or Private	Few or none	Minor	Major
g. Incentives, Public or Private	Major	Minor	None
h. Availability of Baseline Data	Adequate	Marginal	None
i. Other			
Result: Impact Analysis Technique	Question Analysis	Matrix Analysis	Optimum Pathway Matrix

Directions: For each of the decision categories above, circle that value category which best describes the situation for the study area. The value categories (1 through 3) correspond to impact analysis techniques nos. 1 through 3. Thus, circling most of the categories in column 1 indicates that analysis technique no. 1 would be most applicable for the expected project. The techniques increase in complexity, cost, quantification, and comprehensiveness as one moves from no. 1 to no. 3.

FIGURE 2-8 DECISION DIAGRAM FOR CHOOSING AN IMPACT ANALYSIS TECHNIQUE, LEWES, DELAWARE

f. Disincentives - "minor" - see item 4; also, a minor preservationist faction exists in Lewes which is opposed to large-scale activity in the area.

g. Incentives - "minor" - the town of Lewes and the owners of the available 87-acre Star Enterprises property are pushing for OCS activity to locate there, as is the state. However, no unified effort has been mounted by all parties concerned.

h. Availability of baseline data - "adequate" - numerous studies have been conducted in the Delaware Bay area, primarily by the University of Delaware Marine Lab at Lewes. Thus, characterization of the natural environment is available. In addition, the Delaware State Planning Office has conducted several studies in the Lewes area on infrastructure, water resources, and water quality.

Of the three types of OCS-related facilities proposed for Lewes, none can be totally located within existing facilities. Although numerous docks and marinas exist both in Lewes Harbor and in the Lewes-Rehoboth Canal, none are sufficiently large or in good repair to accept the proposed service base, marine repair yard, or auxiliary services. These facilities will likely be developed within the Star Enterprises property or on other waterfront properties along the canal or harbor.

Activities which will likely be required include:

- Dredging.
- Paving.
- Pile driving.
- General construction.

Disturbances which may occur from the above activities are based on the assumption that the Star Enterprises property will be the major area utilized and will include:

- Disruption of dredged areas.
- Turbidity and siltation.
- Loss of estuarine habitat.
- Increased road traffic.
- Onshore construction effects.

The land area available at Star Enterprises is 87 acres but could be expanded to 150 by bulkheads placed into the shallow bay waters next to the property[1]. This is sufficient to provide for the service base and

[1] Philadelphia Inquirer Newspaper, p. 10-B, 19 February 1978.

perhaps the marine repair facilities. However, a large-scale marine repair yard could not be located in Lewes or nearby areas unless the 150-acre available site provided enough land area for both facilities. Vessels as large as 60-to 100-foot crew/supply boats cannot at present be serviced in Lewes.

As in the Middlesex County example, specific analysis steps in the QRD technique will be "lumped".

Questions to which data and answers must be supplied before specific impacts can be estimated are also listed in the Middlesex example.

Results of the QRD technique are presented as follows:

a. Facility Requirements.

A maximum of 150 acres (in one plot) could be made available for a service base and a marine repair facility. Smaller parcels of land in Lewes and in Sussex County away from the immediate coastal zone edge are available where auxiliary facilities such as construction materials, pipe, cement, drilling mud, fuels, food and other suppliers could locate. Such support functions need not locate adjacent to the service base.

b. Land Use.

Fairly strict zoning laws in Sussex County and the presence of the Delaware Coastal Zone Act severely limit the amount of waterfront land available for industrial use. However, the land proposed for development is at present zoned industrial and has buildings in various states of repair extant on the property. Adjacent uses consist of the Lewes-Cape May ferry terminal and smaller commercial properties. Recreational beaches are located about one-half mile to the west (Lewes Beach) and 1 mile to the east (Cape Henlopen). Nearshore areas are influenced by numerous piers and rotten pilings remaining from the days of the large menhaden fishing operation at the site. One pier is presently in use.

c. Air and Water Pollution.

Air pollution is not a problem in the study area and should not increase with the addition of the proposed facilities. Ship smoke emissions may be visible at times, but such activity would be localized and intermittent. Minor evaporative loss of fuels at the site could occur but should be negligible due to the general high air quality, whereas in a "problem" air shed such emissions might be scrutinized more closely for their contribution to the regional problem.

Water quality, primarily sewage treatment plant effluent, is an existing problem in the canal and harbor areas. This should improve by the early 1980's when a regional treatment plant is expected to be on line. The expected OCS-related facilities will generate some minor local water quality degradation, primarily from surface runoff and periodic dredging. The extent of such pollution will depend on housekeeping practices and the scrutiny of state regulatory agencies. Generally, service bases and supply facilities are listed as "clean" operations having few effluents. Spill prevention and control countermeasures (SPCC) will be in effect to minimize possible adverse impacts of spilled stored fuels and oils.

Dredging activity will disturb nearshore water quality when deeper ship channels are developed. Turbidity and siltation may adversely affect local marine biota at such times. This same impact may develop if many ship movements cause resuspension of bottom muds.

d. Induced Growth.

The study region infrastructure is developed enough that few impacts will occur. Transportation, housing, labor, water, general supplies, and recreation are all available locally. It is most likely that much of the needed labor can be obtained locally to staff the various supply jobs. Additional personnel will, however, probably be transferred to Lewes from the service base's home port area. In general, the size of the industrial zone available for development precludes OCS-related activities which are too large for the socioeconomic system of Sussex County to absorb without excessive impacts. This factor may be accurately reflected in the state's desire and the town of Lewes' push to have an OCS-related facility locate in the industrial zone. Such action may appreciably aid present high unemployment levels.

An increase of 100 families, for instance, into the coastal portion of Sussex County might place a slight strain on available housing, but such development will be slow enough (as offshore oil reserves are better defined) to not upset present uses (farming, recreation, biological productivity) in the region.

2.3.3 Northampton County, Virginia

Although this OCS-facilities site was not located via the location analysis, development of a platform construction yard by Brown and Root of Houston, Texas, has been in the works for four years. The original site purchased was a 200-acre farm, one-half mile south of the town of Cape Charles. Located on the Chesapeake Bay side of the Delmarva Peninsula, this site abuts the waterfront and provides access to the deepwater channel in the bay. It is anticipated that this fabrication yard will supply most of the needed production platforms along the Atlantic seaboard.

Platform fabrication, the construction of drilling and production rigs, is an integral part of the offshore oil industry. Each offshore rig is built to the specifications of the oil company to meet the demands of the ocean floor, the winds and tides, and the oil and/or gas fields. Therefore, the timing of platform construction is closely tied to that of oil extraction. Most offshore oil platforms currently in use along the American coast are constructed in a few facilities located in the Gulf Coast and then towed on ocean-going barges to the oil field. A plant in Oakland, California supplies much of the Pacific Coast. Since only one or two fabrication sites are needed for an entire coastline, and because the trip by barge is expensive and potentially dangerous, platform companies prefer to build new facilities as near as possible to the oil fields.[1]

Analysis of the decision diagram (Figure 2-9) shows that the Brown and Root project is of major proportions and requires a detailed impact assessment technique. Although the optimum pathway matrix is indicated by the decision diagram as the technique of choice, this method is most effective when applied to a comparison of two or more competing sites. Inasmuch as the site for the fabrication yard has already been selected, an optimum choice cannot be determined, rendering this technique less useful than desired for this project.

As described in the methodology (Volume II, Chapter 5), such a situation is best addressed by a complete environmental impact statement (EIS). This is, in fact, exactly what was done. A small-scale EIS was completed by the firm of Urban Pathfinders, Inc., centering mostly on socioeconomic impacts. During 1977, a more detailed analysis of all possible impact areas is being addressed by the firm of Hayes, Seay, Mattern and Mattern in a year-long study. This EIA includes a detailed study of the biological systems, archaeology/history, socioeconomics, infrastructure, air and water quality, fiscal considerations, and geology.

[1] NACo--Case Studies on Energy Impacts, Serving the Offshore Oil Industry: Planning for Onshore Growth--Northampton County, Virginia, National Association of Counties, Washington, D.C., 1976.

Decision Category	Value Category 1	Value Category 2	Value Category 3
a. Condition of Offshore Activity	Exploration	Development	Production
b. Size of Onshore Facilities	Small	Medium	Large
c. Availability of Existing Facilities	Yes	Possibly	No
d. Anticipated Impacts	Minor	Moderate	Major
e. Presence of Red Flag Impacts	Few (1-2)	Several (3-4)	Many (5+)
f. Disincentives, Public or Private	Few or none	Minor	Major
g. Incentives, Public or Private	Major	Minor	None
h. Availability of Baseline Data	Adequate	Marginal	None
i. Other			
Result: Impact Analysis Technique	Question Analysis	Matrix Analysis	Optimum Pathway Matrix

Directions: For each of the decision categories above, circle that value category which best describes the situation for the study area. The value categories (1 through 3) correspond to impact analysis techniques nos. 1 through 3. Thus, circling most of the categories in column 1 indicates that analysis technique no. 1 would be most applicable for the expected project. The techniques increase in complexity, cost, quantification, and comprehensiveness as one moves from no. 1 to no. 3.

FIGURE 2-9 DECISION DIAGRAM FOR CHOOSING AN IMPACT ANALYSIS TECHNIQUE, NORTHAMPTON COUNTY, VIRGINIA

The impact analysis technique most commonly used for large EIS's are generically related to a basic question analysis technique. That is, problems and concerns are identified by public review meetings, consultation with local, state, or federal offices, and analysis of the area by a baseline study. Such problems are then answered by procurement of the data needed to supply the necessary information. For instance, if loss of marshland is of concern, the best way to respond is to determine the exact site location and map out marshland which will be involved directly or indirectly by the project. As a result, for instance, the answer may be that the site will obliterate about 60 acres of marsh, and that the township possesses a total of 16,200 acres of marsh. Scientific review and public meetings may then reveal that most persons connected with the township and project do not consider this a significant impact.

The actual type of impact assessment technique used by a contractor (or the state) is, of course, not known at this time for the Brown and Root project.

The social and environmental impacts that result from platform fabrication are potentially greater than those caused by other offshore oil operations because fabrication requires permanent onshore facilities, and employees normally work five-day shifts. These workers and their families will probably want to move to the new community in the very early stages of OCS development. Increased employment by the fabrication company will begin as soon as the oil companies place the contracts, i.e., when marketable quantities of oil or gas are found. Thus, the communities where platform fabrication facilities are sited will probably be the first to show the social and economic effects of the offshore oil industry. However, fabrication facilities are adaptable for non-OCS development, and the major platform fabrication companies are involved in other kinds of large construction. This means that the few communities having fabrication sites will not be tied exclusively to OCS development for new growth. For example, shutdown of an oil field will not adversely affect a nearby platform construction facility as it would an oil-related company.

In the specific case of Northampton County, however, impacts have been minimized by several stipulations demanded of the developer by the County Planning Commission. Such stipulations came as a result of the four-year planning process during which the pros and cons of the project have been aired by each of the respective sides. During this time, the total land area involved was reduced to 1700 acres and the request for industrial zoning involved only 980 acres. Also, realignment of site plans produced a facility design which did not require the use of any marshland. The remaining 720 acres will serve as buffer strips and wildlife habitat. Land to be used for the actual facility is primarily farmland. The amended zoning ordinance requires a ceiling on the number of employees, which legally holds Brown and Root to a fixed timetable for hiring. By this technique, the county has some ability to plan for the secondary impacts which arise from a rapid population increase. The applicant also agreed to establish programs to train local residents for the necessary jobs. It will also provide land for temporary mobile home housing during early stages of construction, and is being encouraged to provide bus service to Norfolk for employees, thus decreasing the expected housing and infrastructure impacts. Possible ameliorative actions which may be required to offset ecological impacts will be delineated by the EIS presently underway.

SECTION 3

CONCLUSIONS AND RECOMMENDATIONS

The purpose in working through this Baltimore Canyon Test Case is to illustrate both the advantages and shortcomings of the environmental impact assessment methodology as presently organized.

Conclusions of this aspect of the study are:

a. Environmental impact assessment of the natural environment cannot be approached with a great degree of accuracy until specific sites are identified.

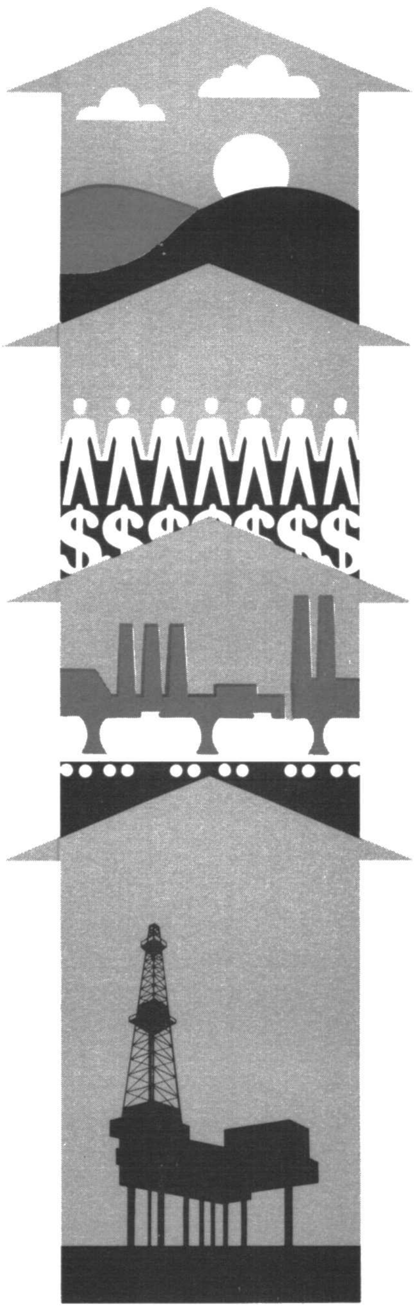
b. Impact assessment cannot deal accurately with long-term, low-rate impacts, such as the inexorable but continued loss of wetlands, of which each parcel is not a measurable loss, but the total lost is significant.

c. The most flexible and useful impact analysis technique is a basic question and answer technique, similar to the QRD technique described earlier. This method of analysis allows for increased complexity and sophistication of study as the expected impacts become more complex; it is the common "technique" employed in making most types of decisions, and is widely practiced in the preparation of environmental impact statements.

d. A matrix analysis technique is useful when it is unclear what questions should be asked. This technique can provide specific guidance, especially if prepared for a generic series of projects, such as for marine terminals. Matrix techniques become excessively burdensome if they are constructed with too large an analytical field in mind.

e. The optimum pathway matrix technique, developed by the Institute of Ecology, University of Georgia, is a very useful, semi-quantitative technique best applied to a comparison of the environmental suitability of two or more sites. Thus, this technique is well suited to fulfill the legislative need to compare alternative sites during the EIS process.

f. In general, there are no assessment techniques available which can quantitatively relate physical habitat alterations, such as dredging of an estuarine pipeline channel, to future biological impacts, such as the percent reduction in blue crab populations.



CHAPTER 6
FISCAL IMPACT

INTRODUCTION

This chapter contains illustrative examples of how portions of the Volume II, Chapter 6 fiscal methodology, can be employed to obtain estimates of the effects of OCS oil and gas development in the Baltimore Canyon region. The sensitivity of effects to alternative discoveries and locations for primary onshore facilities is developed.

The majority of inputs to the fiscal analysis are derived from the economic analysis. Only Set 1 regions (see Chapter 3, subsection 2.1) will be examined here (those regions where it is assumed that all primary onshore activity specified by the industry requirements will be located in the single county). For each region, both the find and no-find case will be examined.

Three alternative fiscal impact methodologies were discussed in Volume II, Chapter 6. This illustrative application uses only the programmed methodology (option 1) approach.

The fiscal methodology is used to produce state baseline and impact projections for each state which is wholly or partially encompassed by the three listed regions. Thus, for a state like Delaware which is wholly or partially within all three regions of impact, there are three impact projections for each of the two overall exploration and development scenarios. County fiscal impact projections are made for each of the three counties when each is the focal point of primary onshore facilities.

Unlike the economic, demographic and environmental projections, the fiscal impact projections are not aggregated over the entire region of impact. From the standpoint of fiscal impact assessment, such aggregation would be meaningless because fiscal impacts are borne by individual governmental units. Thus, for a given region of impact, projections are made of the fiscal impacts on the relevant state and county units within the region.

At the state level revenue sources are broken down into 24 categories, and expenditures into five categories. County revenue sources are broken down into four categories and expenditures into three categories. Each category is projected separately. The estimate of the direction and magnitude of the net fiscal pressure created by any given exploration and development scenario is based on a comparison of aggregated revenue minus expenditure forecasts for the baseline case and the impact scenario. Projections do not provide accurate estimates of the future level of actual state or county spending and receipts because the projection methodology does not incorporate an endogenous response mechanism capable of forecasting discretionary fiscal responses to changing fiscal conditions.

SECTION 1

IMPLICATIONS OF THE APPLICATION RESULTS

One of the principal advantages given for employing the programmed methodology is that the state or local user can understand how the various projections are generated and can therefore subject them to informed local judgement. As a result of performing the Baltimore Canyon study, it is clear that even before the user attempts precise application of the methodology, numerous adjustments are likely to be necessary for any given governmental unit. Although the programmed methodology provides the necessary basic structure for the projection process, some restructuring will still be necessary in most cases. Moreover, it is not possible to specify any general rules for how these adjustments should be made. Thus, it is clear that the implementation process requires not only informed local judgement, but also experience in state and local fiscal analysis. This experience is necessary both for designing the appropriate adjustments and for detecting implementation problems.

The results of the application also indicate that the methodology does work. When the methodology is appropriately tailored to fit specific governmental units, reasonable projections can be produced. Even though the extent of the tailoring required is more than anticipated, the original objective of the programmed methodology, providing a methodology which state and local governments could use to develop their own projections, is still fulfilled.

SECTION 2

FISCAL IMPACT PROJECTIONS

2.1 GENERAL COMMENTS

In addition to the demonstrated importance of tailoring and fine tuning the fiscal methodology for each governmental unit, the Baltimore Canyon application also illustates that adjustments may be required for the economic and demographic projections. When specific fiscal impact simulations appear to be unreasonable, it is not always clear that the problem can be corrected by altering some element in the fiscal impact methodology. The problem may involve the demographic or economic impact projections. Moreover, the examination of individual input projections may not reveal the problem if there is a synergistic effect produced by combining various input projections with the fiscal impact projection procedures. In order to solve these kinds of methodological problems, each of the components of the total impact methodology would have to be adjusted as a part of the whole. This total adjustment process might require several iterations before satisfactory projection procedures are achieved for all parts. Under these circumstances, the tailoring of the fiscal impact methodology was carried to the point where it was clear what kind of effort would be required in order to achieve reasonable results.

2.2 PROCEDURES USED TO ADAPT ECONOMIC AND DEMOGRAPHIC PROJECTIONS TO THE FISCAL IMPACT INPUT REQUIREMENTS

2.2.1 Baseline Inputs

Total state and county (Atlantic, Sussex, and Somerset) population projections were taken directly from the demographic output. For projections of total state income, OBERS projections were used. When only part of a state was included in the region of impact, the 1970 ratio of the population of the included part to the whole state was applied to the whole state population projection to obtain a projection for the included part of the state. The same kind of population ratio was used to allocate the total state income to the included part of the state. At the county level, the ratio of 1972 county income to state income was applied to total state income to produce the county income projection.

2.2.2 Impact Inputs

Both population and income projections for states, parts of states, and counties are based on the impact ratios generated by the gravity model described in the economic impact assessment (see Chapter 3, Table 12-1). These ratios were used to allocate the total regional impact population and income to the relevant governmental units.

2.3 EXOGENOUS FORECASTS

Exogenous forecasts of inflation rates and increased rates in the cost and quality of education are necessary to generate fiscal impact projections. The specific forecasts which are used are given in Tables 2-1 and 2-2.

2.4 RESULTS

The following tables display some representative results of the illustrative application. The specific measure of fiscal impact referred to in Tables 2-3 through 2-7 is the difference between impact revenue minus impact expenditure, and baseline revenue minus baseline expenditure.

Table 2-3 displays a state impact projection which shows a negative fiscal impact in early years but a positive impact in later years. When only exploration takes place, Table 2-4 shows that the impact is positive and concentrated in early years. At the county level, the fiscal impacts are positive in both the exploration and development case, Table 2-5, and the exploration only case, Table 2-6. In Table 2-7 the effect of changing the location of the primary onshore facilities can be seen. If the onshore location is in Delaware (Region II) instead of New Jersey (Region I), the magnitude of the Delaware impact is significantly increased. The remaining tables present disaggregated projections for Maryland and Somerset Counties.

Table 2-1

Price Inflation Projection
(Consumer Price Index)

Year	Average Annual Rate %
1976	5.8
1977	6.0
1978	6.0
1979	5.0
1980	4.0
1981	3.5
1982	3.5
.	.
.	.
.	.
2005	3.5

Table 2-2

Expenditure Per Student Projection,
Higher and Other Education, Maryland

Year	Change in Expenditure per Student Due to: Cost Increase (1)	Change in Expenditure per Student Due to: Improved Quality (2)	Total Change (3)	Expenditure per Student (4)
1975	7.8%	3.0%	10.8%	$ 3,272
1976	8.0	3.0	11.0	3,625
1977	7.0	.	11.0	4,024
1978	6.0	.	10.0	4,467
1979	5.5	.	9.0	4,914
1980	.	.	8.5	5,356
1981	.	.	.	5,811
1982	.	.	.	6,305
1983	.	.	.	6,841
1984	.	.	.	7,422
1985	.	.	.	8,053
1986	.	.	.	8,738
1987	.	.	.	9,480
1988	.	.	.	10,286
1989	.	.	.	11,161
1990	.	.	.	12,109
1991	.	.	.	13,138
1992	.	.	.	14,255
1993	.	.	.	15,467
1994	.	.	.	16,782
1995	.	.	.	18,208
1996	.	.	.	19,756
1997	.	.	.	21,435
1998	.	.	.	23,257
1999	.	.	.	25,234
2000	.	.	.	27,379
2001	.	.	.	29,706
2002	.	.	.	32,231
2003	.	.	.	34,970
2004	.	.	.	37,943
2005	5.5	3.0	8.5	41,168

WESTON
ENVIRONMENTAL CONSULTANTS-DESIGNERS

Table 2-3

Full Development Impact, Region III, Maryland
($000)

Year	Fiscal Impact
1977	-819
1978	-1,114
1979	-1,107
1980	-4,171
1981	-3,617
1982	-1,484
1983	-1,527
1984	-1,512
1985	-1,103
1986	-344
1987	956
1988	2,866
1989	5,384
1990	8,513
1991	11,801
1992	15,406
1993	18,405
1994	21,873
1995	25,159
1996	28,925
1997	32,675
1998	35,567
1999	37,437
2000	38,301
2001	37,686
2002	36,037
2003	33,243
2004	29,597
2005	26,307
2006	22,145
2007	17,519
2008	13,770
2009	10,615
2010	8,039
2011	6,153
2012	4,798
2013	3,442
2014	2,278
2015	1,235
2016	533

Table 2-4

Aborted Development Impact, Region III, Maryland
($000)

Year	Fiscal Impact
1977	-392
1978	-350
1979	-12
1980	-39
1981	-273

WESTON

Table 2-5

Full Development Impact, Region III, Somerset County, Maryland

($000)

Year	Fiscal Impact
1977	14
1978	25
1979	32
1980	158
1981	184
1982	110
1983	169
1984	273
1985	401
1986	600
1987	822
1988	1,129
1989	1,476
1990	1,910
1991	2,311
1992	2,751
1993	3,088
1994	3,519
1995	3,939
1996	4,460
1997	5,008
1998	5,457
1999	5,786
2000	5,991
2001	5,991
2002	5,843
2003	5,513
2004	5,042
2005	4,604
2006	3,993
2007	3,254
2008	2,641
2009	2,105
2010	1,660
2011	1,313
2012	1,060
2013	798
2014	541
2015	305
2016	115

Table 2-6

Aborted Development Impact, Region III, Somerset County, Maryland

($000)

Year	Fiscal Impact
1977	7
1978	8
1979	0
1980	1
1981	14

Table 2-7

Full Development Impact, Region II, Delaware

($000)

Year	Fiscal Impact[1] Region I	Region II
1977	54	1,162
1978	96	2,102
1979	118	2,629
1980	627	12,288
1981	594	13,321
1982	323	7,481
1983	457	10,709
1984	682	16,222
1985	930	17,363
1986	1,299	31,611
1987	1,660	40,803
1988	2,140	52,955
1989	2,635	65,605
1990	3,217	80,344
1991	3,679	92,350
1992	4,141	104,186
1993	4,397	110,993
1994	4,744	120,189
1995	5,024	127,787
1996	5,392	137,580
1997	2,450	146,913
1998	5,937	152,313
1999	5,975	153,720
2000	5,876	151,537
2001	5,579	144,237
2002	5,169	134,018
2003	4,638	120,500
2004	4,049	105,544
2005	3,511	91,561
2006	2,901	76,062
2007	2,243	58,742
2008	1,725	45,405
2009	1,313	35,093
2010	984	26,936
2011	747	19,968
2012	569	15,728
2013	426	10,464
2014	260	6,830
2015	161	3,683

[1]Fiscal impact on Region II, assuming the alternative of primary activity occurring in Region I or Region II.

Table 2-8

State School Enrollment, Maryland

(000)

Year	Elementary Baseline	Elementary Impact (including baseline)	Secondary Baseline	Secondary Impact (including baseline)
1977	324	324	341	341
1980	354	358	346	347
1985	411	416	356	357
1990	477	485	367	369
1995	547	555	380	381
2000	620	625	392	393
2005	676	678	402	402
2010	736	736	412	412
2015	790	790	422	422

Table 2-9

County Secondary Enrollment, Somerset County, Maryland

Year	Baseline	Impact (including baseline)
1977	3,678	3,940
1980	3,684	5,432
1985	3,891	5,552
1990	3,982	7,306
1995	4,119	7,178
2000	4,258	6,413
2005	4,332	5,120
2010	4,407	4,546
2015	4,512	4,524

WESTON ENVIRONMENTAL CONSULTANTS-DESIGNERS

Definitions of Revenue and Expenditure Categories
(For use with Tables 2-10 through 2-17)

County Area	
Category	Definition
Revenue	
CR1	Property tax
	Intergovernmental revenue
CR2	Education
CR3	Public welfare
CR4	Other (other taxes, other intergovernmental revenues, charges, and miscellaneous revenue)
Expenditure	
CE1	Education
CE2	Public welfare
CE3	Other

State	
Revenue	
	Intergovernmental revenue
SR1	Public welfare
SR2	Education
SR3	Other
	Taxes
SR4	General sales and gross receipts
	Selective sales
SR5	Motor fuel
SR6	Alcoholic beverages
SR7	Tobacco
SR8	Insurance
SR9	Public utilities
SR10	Parimutuals
SR11	Amusements
SR12	Other
	Licenses
SR13	Motor vehicles

WESTON

Definitions of Revenue and Expenditure Categories
(For use with Tables 2-10 through 2-17)

Revenue (continued)	
	<u>Licenses</u>
SR14	Other
SR15	Individual income
SR16	Corporate net income
SR17	Death and gift
SR18	Property (state)
SR19	Severance
SR20	Document and stock transfer
SR21	Other
	<u>Current charges</u>
SR22	State institutions of higher education
SR23	Other
SR24	Miscellaneous general revenue
Expenditures	
	<u>Education</u>
SE1	Local schools
SE2	Higher education and other education
	<u>Public welfare</u>
SE3	Intergovernmental
SE4	Direct
SE5	Other

Table 2-10

Baseline County Revenue, Somerset County, Maryland

($000)

Year	CR1	CR2	CR3	CR4
1977	2,241	2,549	8,405	3,735
1980	2,277	2,550	8,400	5,342
1985	2,977	2,561	12,308	11,979
1990	3,886	2,575	17,994	26,860
1995	4,230	2,595	27,015	53,902
2000	5,278	2,620	41,022	108,171
2005	6,149	2,654	61,823	217,077
2010	7,162	2,698	93,642	435,629
2015	10,667	2,758	143,215	1,116,449

Table 2-11

Baseline County Expenditure, Somerset County, Maryland

($000)

Year	CE1	CE2	CE3
1977	4,235	7,309	3,957
1980	4,238	7,303	4,271
1985	4,267	11,597	5,885
1990	4,302	17,846	8,107
1995	4,350	27,759	9,997
2000	4,416	43,150	12,326
2005	4,499	66,007	15,198
2010	4,609	100,971	18,740
2015	4,760	155,445	29,509

Table 2-12

Baseline State Expenditure, Maryland

($000)

Year	SE1	SE2	SE3	SE4	SE5
1977	658,831	375,302	237,006	191,855	1,364,301
1980	729,302	380,774	250,131	199,942	1,558,458
1985	1,024,888	391,790	452,707	216,453	1,994,600
1990	1,469,739	404,293	785,628	235,194	2,532,628
1995	2,123,900	417,736	1,328,393	255,343	2,828,360
2000	3,068,151	431,661	2,206,164	276,215	3,154,879
2005	4,305,408	442,414	3,553,775	292,332	3,515,392
2010	6,054,585	453,794	5,698,358	309,390	3,913,436
2015	8,432,957	464,186	9,041,775	324,967	5,644,375

Table 2-13

Baseline State Revenue, Maryland

($000)

Year	SR1	SR2	SR3	SR4	SR5	SR6
1977	191,181	122,102	210,491	421,416	175,498	27,093
1980	199,240	135,163	240,446	532,109	198,670	31,133
1985	215,693	189,944	370,736	841,809	262,737	42,199
1990	234,369	272,389	390,745	1,331,750	347,461	57,196
1995	254,447	393,626	436,372	1,885,592	411,251	69,382
2000	275,245	568,626	486,749	2,669,762	486,753	84,164
2005	291,306	797,928	542,371	3,780,049	576,115	102,096
2010	308,304	1,122,107	603,783	5,352,076	681,884	123,849
2015	323,826	1,562,894	870,840	9,677,553	1,030,695	191,864

Year	SR7	SR8	SR9	SR10	SR11	SR12
1977	38,716	36,526	36,080	17,821	520	78,337
1980	47,067	43,884	46,755	20,235	720	102,368
1985	69,968	63,990	77,190	26,892	1,323	171,338
1990	104,012	93,306	127,434	35,740	2,431	286,772
1995	138,382	121,765	188,290	42,510	3,999	429,572
2000	184,110	158,905	278,206	50,564	6,578	643,481
2005	244,949	207,372	411,062	60,142	10,821	963,907
2010	325,892	270,623	607,363	71,535	17,800	1,443,891
2015	553,720	451,021	1,146,060	108,663	37,393	2,762,180

Table 2-13
(continued)

Year	SR13	SR14	SR15	SR16	SR17	SR18
1977	74,847	18,771	94,717	98,819	15,098	54,180
1980	85,496	21,442	128,474	126,593	18,247	65,373
1985	114,749	28,778	228,601	205,084	26,866	95,980
1990	154,010	38,624	406,756	332,235	39,554	140,933
1995	184,998	46,396	647,749	481,700	52,120	185,194
2000	222,220	55,730	1,031,525	698,405	68,677	246,361
2005	266,931	66,944	1,642,678	1,012,601	90,494	319,799
2010	320,637	80,413	2,615,923	1,468,146	119,243	420,234
2015	491,868	123,356	5,320,054	2,718,433	200,660	705,240

Year	SR19	SR20	SR21	SR22	SR23	SR24
1977	0	10,681	2,342	69,592	190,004	118,607
1980	0	9,237	2,500	70,237	249,780	169,685
1985	0	8,203	3,003	71,535	422,187	329,545
1990	0	7,285	3,607	73,008	713,590	640,001
1995	0	5,790	3,877	74,592	1,079,464	1,112,404
2000	0	4,602	4,168	76,232	1,632,929	1,933,502
2005	0	3,657	4,480	77,499	2,470,169	3,360,675
2010	0	2,907	4,816	78,840	3,736,681	5,841,285
2015	0	2,950	6,611	80,064	7,218,779	12,966,078

WESTON

Table 2-14

Baseline Plus Impact County Revenue, Somerset County, Maryland

($000)

Year	CR1	CR2	CR3	CR4
1977	2,260	2,551	8,406	3,766
1980	2,400	2,564	8,400	5,623
1985	3,119	2,579	12,308	12,540
1990	4,230	2,621	17,994	29,202
1995	4,910	2,650	27,015	58,373
2000	5,598	2,672	41,022	114,658
2005	6,287	2,678	61,823	221,918
2010	7,190	2,704	93,642	437,343
2015	10,670	2,759	143,215	1,116,761

Table 2-15

Baseline Plus Impact Expenditure, Somerset County, Maryland

($000)

Year	CE1	CE2	CE3
1977	4,240	7,309	3,989
1980	4,274	7,303	4,496
1985	4,311	11,597	6,160
1990	4,417	17,846	8,814
1995	4,489	27,759	10,826
2000	4,543	43,150	13,065
2005	4,560	66,007	15,537
2010	4,624	100,971	18,813
2015	4,762	155,445	29,517

Table 2-16

Baseline Plus Impact State Expenditure, Region III, Maryland

($000)

Year	SE1	SE2	SE3	SE4	SE5
1977	659,829	375,426	237,006	191,855	1,366,114
1980	736,261	381,602	250,131	199,942	1,571,404
1985	1,033,527	392,576	452,707	216,453	2,008,826
1990	1,492,337	405,867	785,628	235,194	2,565,317
1995	2,151,082	419,184	1,328,393	255,343	2,862,693
2000	3,093,174	432,681	2,206,164	276,215	3,182,286
2005	4,317,366	442,787	3,553,775	292,332	3,526,643
2010	6,057,352	453,860	5,698,358	309,390	3,915,628
2015	8,433,273	464,192	9,041,775	324,967	5,644,594

Table 2-17

Baseline Plus Impact State Revenue, Region III, Maryland

($000)

Year	SR1	SR2	SR3	SR4	SR5	SR6
1977	191,181	122,287	210,770	421,873	175,688	27,122
1980	199,240	136,452	242,443	535,800	200,048	31,349
1985	215,693	191,545	309,931	847,010	264,360	42,459
1990	234,369	276,577	395,789	1,347,076	351,460	57,854
1995	254,447	398,664	441,669	1,906,233	415,753	70,141
2000	275,245	573,263	490,978	2,690,891	490,605	84,831
2005	291,306	800,145	544,107	3,791,173	577,811	102,397
2010	308,304	1,122,619	604,121	5,354,855	682,238	123,913
2015	323,826	1,562,953	870,874	9,677,909	1,030,732	191,871

Year	SR7	SR8	SR9	SR10	SR11	SR12
1977	38,758	36,565	36,119	17,840	521	78,422
1980	47,393	44,189	47,080	20,375	725	103,079
1985	70,400	64,385	77,667	27,058	1,331	172,397
1990	105,208	94,380	128,901	36,151	2,459	290,072
1995	139,897	123,098	190,351	42,976	4,043	434,275
2000	185,567	160,162	280,408	50,964	6,630	648,574
2005	245,670	207,982	412,272	60,319	10,853	966,743
2010	326,061	270,763	607,679	71,572	17,809	1,444,640
2015	553,740	451,038	1,146,102	108,667	37,395	2,762,282

Table 2-17
(continued)

Year	SR13	SR14	SR15	SR16	SR17	SR18
1977	74,928	18,791	94,820	98,927	15,115	54,238
1980	86,089	21,590	129,366	127,472	18,374	65,824
1985	115,458	28,956	230,013	206,351	27,032	96,576
1990	155,783	39,069	411,437	336,059	40,009	142,551
1995	187,023	46,903	654,840	486,973	52,690	187,221
2000	223,978	56,172	1,039,689	703,933	69,221	248,286
2005	267,716	67,141	1,647,512	1,015,581	90,761	320,737
2010	320,804	80,454	2,617,281	1,468,908	119,305	420,457
2015	491,886	123,360	5,320,249	2,718,533	200,667	705,267

Year	SR19	SR20	SR21	SR22	SR23	SR24
1977	0	10,693	2,345	69,607	190,210	118,735
1980	0	9,301	2,518	70,335	251,512	170,862
1985	0	8,254	3,022	71,627	424,796	331,581
1990	0	7,368	3,649	73,193	721,802	647,366
1995	0	5,853	3,920	74,762	1,091,280	1,124,582
2000	0	4,638	4,201	76,352	1,645,853	1,948,804
2005	0	3,668	4,493	77,543	2,477,439	3,370,565
2010	0	2,908	4,819	78,847	3,738,621	5,844,318
2015	0	2,950	6,612	80,064	7,219,045	12,966,556