OFFSHORE OIL:

ITS IMPACT ON TEXAS COMMUNITIES

Volume II
Local Impact Scenarios

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ITS IMPACT ON TEXAS COMMUNITIES

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VOLUME II
LOCAL IMPACT SCENARIOS

Texas Coastal Management Program
General Land Office of Texas
Bob Armstrong, Commissioner

U.S. DEPARTMENT OF COMMERCE NOAA
COASTAL SERVICES CENTER
2234 SOUTH HOBSON AVENUE
CHARLESTON, SC 29405-2413

prepared by

Research and Planning Consultants, Inc.
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CONTENTS

VOLUME II: LOCAL IMPACT SCENARIOS

		Page
Part A	Scenario Descriptions	
	Introduction	2
	Scenario I	5
	Scenario II	5
	Scenario III	6
Part B	Analysis of Scenarios	
	1. Introduction	13
	2. Methodologies B, C, and D: Exploration, Development, and Production	15
	Primary Requirements	15
	Exploration Phase	16
	Development Phase	20
	Production Phase	23
	Total Primary Requirements	24
	Primary Requirements Over Time	25
	Distribution of Requirements to Study Sites	26
	Indirect Land Requirements	29
	Primary Water Requirements	33
	Primary Tax Revenues	34
	Expenditures for Primary Activities	34
	Primary and Indirect Land Requirements	35
	Preparation of Input to Input/Output Model	35
	Indirect Water Requirements	35
	Indirect Tax Revenues to State and Local Governments	36
	Personal Income	36
	Indirect Employment	36

3. Methodology E: Net Onshore Effects 37

Aggregation of State Tax Revenues For All Phases in Each Affected Study Site 37

Aggregation of Primary and Indirect Employment For All Phases in Each Affected Study Site 37
Total Employment 38
Origin-of-Employment 38
New Population 41
Housing Units 42
New Students 43

Aggregation of Primary and Indirect Water Requirements For All Phases 44

Aggregation of Study Site Tax Revenues For All Phases in Each Affected Study Site . . . 44

Identification of Significant Infrastructural Issues 45
Domestic and Municipal Water Requirements 45
Residential Land 45
Significant Infrastructural Issues 46

State and Local Economic Analysis 49
Infrastructural Impacts Associated With Significant Infrastructural Issues . . . 49
Infrastructural Costs 50
Fiscal Impact 51
Local Fiscal Impact Assessment 52

4. Methodology F: Environmental Impact Assessment . . . 58

Introduction 58
Previous Studies 58
Relationship of Environmental Impact Assessment Elements 59
Environmental Impact Matrix Development . . . 60

General Environmental Impact Evaluation 67
Land 67
Water 68
Waste Residuals 70

Special Environmental Issue Analysis 72

Preparation of Environmental Assessment 76

5. Methodology G: Social Impact Assessment 77

Introduction 77

Social Impact Matrix Development 78
Demographic Factors 82
Services to People 82
Land Use and Environmental Factors 83
Housing Factors 83
Employment Factors 83
Traditional Moral Values 84

Special Social Issue Analysis 84

Preparation of Social Assessment 84

6. Summary 85

Part C Scenario I

1. Introduction and Summary 87

2. Primary Requirements 91

Exploration Phase 91
Primary Activity Requirements 91
Primary Facilities Requirements 93
Primary Services Requirements 93
Primary Supplies Requirements 94

Development Phase 94
Primary Activity Requirements 94
Primary Facilities Requirements 96
Primary Services Requirements 97
Primary Supplies Requirements 98
Pipeline Laying Requirements 98

Production Phase 99
Primary Activity Requirements 99
Primary Facilities, Services, and
Supplies Requirements 99

Total Primary Requirements 101

3. Primary Requirements Over Time 103

4. Distribution of Requirements to Study Sites 106

Exploration Phase 106

Development Phase 110

Production Phase 110

Total Allocated Primary Requirements 111

Total Allocated Primary Requirements Over Time 111

5. Land Requirements 119

Indirect Land Requirements 119

Total Land Requirements 123

6. Water Requirements 126

Primary Water Requirements 126

Indirect Water Requirements 129

Primary and Indirect Water Requirements 130

7. Employment 132

Indirect Employment 132

Total Employment 133

Origin-of-Employment 135

New Population 138

New Housing Units 139

New Students 139

8. Primary Expenditures 142

9. Primary and Indirect Personal Income 147

10. State Tax Revenue 150

Primary State Tax Revenue 150

Indirect State Tax Revenue 150

Total State Tax Revenue 150

11. Local Tax Revenue 156

Primary Local Tax Revenue 156

Indirect Local Tax Revenue 156

Total Local Tax Revenue 156

12. Domestic and Municipal Water Requirements 162

13. Residential Land Requirements 164

14. Economic Impact Analysis 167

Introduction 167

Infrastructural Costs 167

Fiscal Impact 167

Summary 178

15. Environmental Impact Analysis 182

General Environmental Impact Evaluation 182

Special Environmental Issue Analysis 218

Environmental Impact Assessment Summary 223

16. Social Impact Analysis 225

General Impact Evaluation 225
Region I: Orange and Jefferson Counties 225
Region II: Harris, Galveston, and Chambers Counties 229
Region III: Brazoria County 233

Special Social Issue Analysis 236

Social Impact Assessment Summary 237

17. Impact on Region I: Orange and Jefferson Counties 238

Summary of Requirements 238

Significant Infrastructural Issues 238

Infrastructural Impacts Associated With Significant Infrastructural Issues 241

Summary of Fiscal, Environmental, and Social Impacts 242
Fiscal 242
Environmental 242
Social 242

18. Impact on Region II: Harris, Galveston and Chambers Counties 243

Summary of Requirements 243

Significant Infrastructural Issues 243

Infrastructural Impacts Associated With Significant Infrastructural Issues 245

Summary of Fiscal, Environmental, and Social Impacts 246
Fiscal 246
Environmental 246
Social 247

19. Impact on Region III: Brazoria County 248

Summary of Requirements 248

Significant Infrastructural Issues 248

Summary of Fiscal, Environmental, and Social Impacts 250
Fiscal 250
Environmental 250
Social 250

Part D Scenario II

1. Introduction and Summary 252

2. Primary Requirements 255

Exploration Phase 255
Primary Activity Requirements 255
Primary Facilities Requirements 257
Primary Services Requirements 257
Primary Supplies Requirements 258

Development Phase 258
Primary Activity Requirements 258
Primary Facilities Requirements 260
Primary Services Requirements 260
Primary Supplies Requirements 261
Pipeline Laying Requirements 261

Production Phase 262
Primary Activity Requirements 262
Primary Facilities, Services, and Supplies Requirements 262

Total Primary Requirements 264

3. Primary Requirements Over Time 266

4. Distribution of Requirements to Study Sites 269

Exploration Phase 269

Development Phase 273

Production Phase 273

Total Allocated Primary Requirements 274

Total Allocated Primary Requirements Over Time 274

5. Land Requirements 281

Indirect Land Requirements 281

Total Land Requirements 285

6. Water Requirements 288

Primary Water Requirements 288

Indirect Water Requirements 291

Primary and Indirect Water Requirements 292

7. Employment 294

Indirect Employment 294

Total Employment 295

Origin-of-Employment 297

New Population 300

New Housing Units 301

New Students 302

8. Primary Expenditures 304

9. Primary and Indirect Personal Income 309

10. State Tax Revenue 311

Primary State Tax Revenue 311

Indirect State Tax Revenue 312

Total State Tax Revenue 314

11. Local Tax Revenue 316

Primary Local Tax Revenue 316

Indirect Local Tax Revenue 317

Total Local Tax Revenue 318

12. Domestic and Municipal Water Requirements 321

13. Residential Land Requirements 322

14. Economic Impact Analysis 324

Introduction 324

Infrastructural Costs 324

Fiscal Impact 324

Summary 335

15. Environmental Impact Analysis 336

General Environmental Impact Evaluation 336

Special Environmental Issue Analysis 370

Environmental Impact Assessment Summary 378

16. Social Impact Analysis 380

General Social Impact Evaluation 380

Region VI: San Patricio and Nueces Counties 380

Region VII: Cameron, Hidalgo, and Willacy Counties 384

Special Social Issue Analysis 389

Social Impact Assessment Summary 390

17. Impact on Region VI: San Patricio and Nueces Counties 392

Summary of Requirements 392

Significant Infrastructural Issues 392

Infrastructural Impacts Associated With Significant Infrastructural Issues 395

Summary of Fiscal, Environmental, and Social Impacts 396
Fiscal 396
Environmental 396
Social 397

18. Impact on Region VII: Cameron, Hidalgo, and Willacy Counties 398

Summary of Requirements 398

Significant Infrastructural Issues 398

Infrastructural Impacts Associated With Significant Infrastructural Issues 400

Summary of Fiscal, Environmental, and Social Impacts 401
Fiscal 401
Environmental 401
Social 402

Part E Scenario III

1. Introduction and Summary 404

2. Primary Requirements 408

Exploration Phase 408
Primary Activity Requirements 408
Primary Facilities Requirements 410
Primary Services Requirements 410
Primary Supplies Requirements 411

Development Phase 411
Primary Activity Requirements 411
Primary Facilities Requirements 413

Primary Services Requirements 413
Primary Supplies Requirements 414
Pipeline Laying Requirements 414

Production Phase 415
Primary Activity Requirements 415
Primary Facilities, Services, and Supplies Requirements 415

Total Primary Requirements 415

3. Primary Requirements Over Time 419

4. Distribution of Requirements to Study Sites 422

Exploration Phase 422

Development Phase 423

Production Phase 423

Total Allocated Primary Requirements 427

Total Allocated Primary Requirements Over Time 431

5. Land Requirements 435

Indirect Land Requirements 435

Total Land Requirements 439

6. Water Requirements 442

Primary Water Requirements 442

Indirect Water Requirements 442

Primary and Indirect Water Requirements 446

7. Employment 449

Indirect Employment 449

Total Employment 451

Origin-of-Employment 451

New Population 453

New Housing Units 453

New Students 453

8. Primary Expenditures 459

9. Primary and Indirect Personal Income 465

10. State Tax Revenue 465

Primary State Tax Revenue 467

Indirect State Tax Revenue 467

Total State Tax Revenue 469

11. Local Tax Revenue 472

Primary Local Tax Revenue 472

Indirect Local Tax Revenue 472

Total Local Tax Revenue 474

12. Domestic and Municipal Water Requirements 477

13. Residential Land Requirements 479

14. Economic Impact Analysis 482

Introduction 482

Infrastructural Costs 482

Fiscal Impact 482

Summary 495

15. Environmental Impact Analysis 496

General Environmental Impact Evaluation 496

Special Environmental Issue Analysis 529

Environmental Impact Assessment Summary 537

16. Social Impact Analysis 539

General Social Impact Evaluation 539

Region IV: Matagorda, Jackson, Calhoun and Victoria Counties 539

Region V: Aransas and Refugio Counties . . . 544
Region VI: San Patricio and Nueces Counties 548

Special Social Issue Analysis 552

Social Impact Assessment Summary 553

17. Impact on Region IV: Matagorda, Jackson, Calhoun and Victoria Counties 555

Summary of Requirements 555

Significant Infrastrucutral Issues 555

Infrastructural Impacts Associated With Significant Infrastructural Issues 564

Summary of Fiscal, Environmental, and Social Impacts 565
Fiscal 565
Environmental 565
Social 566

18. Impact on Region V: Aransas and Refugio Counties . . 567

Summary of Requirements 567

Significant Infrastructural Issues 567

Infrastructural Impacts Associated With Significant Infrastructural Issues 570

Summary of Fiscal, Environmental, and Social Impacts 570
Fiscal 570
Environmental 571
Social 571

19. Impact on Region VI: San Patricio and Nueces Counties 572

Summary of Requirements 572

Significant Infrastructural Issues 572

Infrastructural Impacts Associated With Significant Infrastructural Issues 572

Summary of Fiscal, Environmental, and Social Impacts 576

Fiscal 576
Environmental 576
Social 576

Part F OCS Development: A Sociocultural Portrait of a Small Community 577

Introduction 578
Methodology 579
Description of Port O'Connor 580
Possible Future Growth and Its Impacts 593
Conclusions 598

ACCOMPANYING VOLUMES

VOLUME I Executive Summary

Chapter 1	Introduction
Chapter 2	Study Approach
Chapter 3	Organization of the Study
Chapter 4	Findings
Chapter 5	Status of Relevant Legislation
Chapter 6	Common Methodological Errors
Chapter 7	Major Policy Variables
Chapter 8	Conclusions and Recommendations

Volume III Aggregate State Impacts

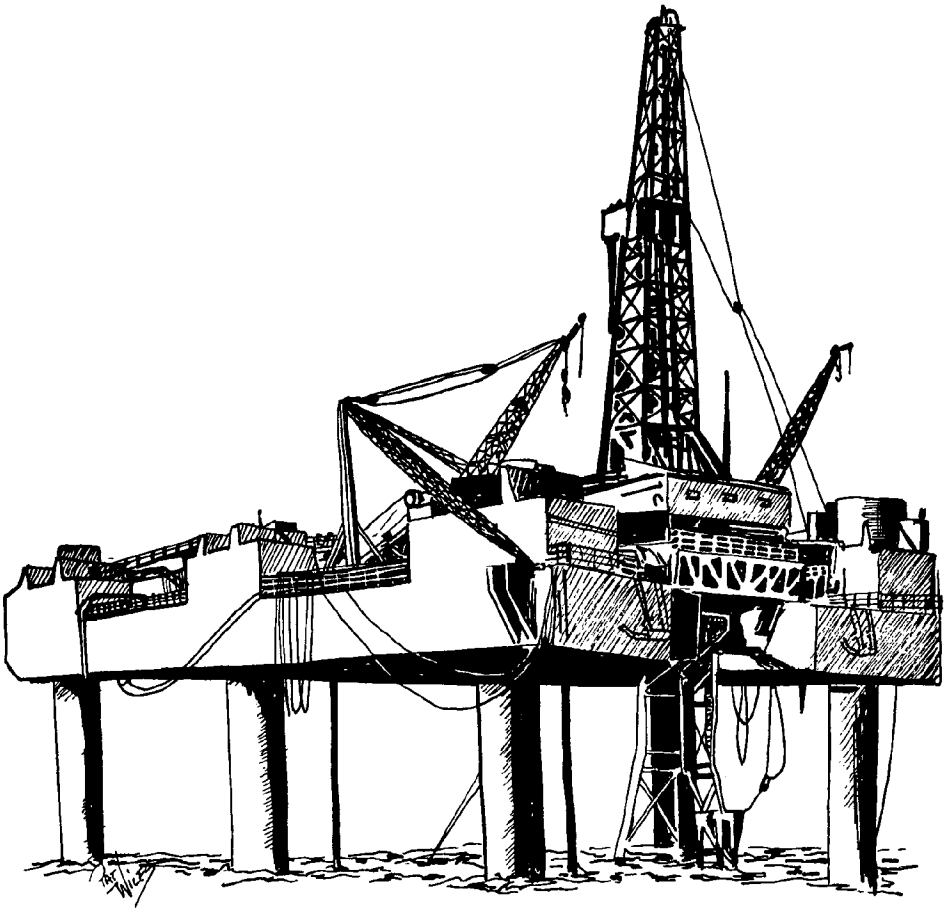
Chapter 1	Introduction and Summary
Chapter 2	Refining
Chapter 3	Gas Processing
Chapter 4	Drilling Rig Construction
Chapter 5	Platform Construction
Chapter 6	Petrochemical Plants
Chapter 7	Storage Facilities

VOLUME IV Appendices

Appendix A	Study Methodology
Appendix B	Reasonable Ranges for Location and Extent of OCS Oil and Gas Development in the Texas Gulf of Mexico
Appendix C	Descriptions of Strikes
Appendix D	Industry Practices
Appendix E	The OCSOG Model
Appendix F	Estimating Fiscal Costs
Appendix H	Inventory of Existing Facilities
Appendix I	Anthropological Methods and Perspectives for Developing Community Profiles
Appendix J	Bibliography

PART A

SCENARIO DESCRIPTIONS



SCENARIO DESCRIPTIONS

Introduction

The Study Methodology (Appendix A) is designed to calculate the impacts of a given Outer Continental Shelf (OCS) development scenario. A scenario, in turn, can best be seen as a postulated OCS development sequence including pre-lease sale exploration, the lease sale, exploratory drilling, development, production, and amount of oil and/or gas produced. Each scenario is specific in terms of location, timing of events, type and amount of equipment required, and amounts of production.

Three scenarios have been developed (see Figures 1, 2, 3, and Map 1). The three scenarios and the strike areas which comprise them were selected such that all three taken together would present a range in the postulated location; type and amount of equipment required for exploration, development, and production; time periods of development; and amount and type of production.

For each scenario, the following data were postulated for current leases (tracts which were leased as of July 1, 1976), for Sale #44 leases, for Sale #47 leases, and for all current and postulated future activity combined (the row labeled "composite" in Figures 1 through 3):

I. Pre-Lease Sale Exploration
   A. Dates - dates were postulated according to standard industry practices (see Appendix D). It was assumed that pre-lease sale exploration would continue up to the time of the sale. This data is not applicable to current leases, of course, since the lease sale for such tracts has already taken place.

   B. Amount of equipment - amount of equipment was postulated, again, according to industry practices (Appendix D). Here again, this data does not pertain to current leases.

II. Tracts Offered (Future)
   A. Date - the dates for tracts offered are the dates of Sale #44 or Sale #47, as the case may be. Here again, this data is not provided for current leases.

   B. Number - the number of tracts to be offered in Sale #44 is a known quantity. The Department of Interior re-

leased that information on February 12, 1976. The number of tracts to be offered in Sale #47 was postulated based on past events (see Appendices B and C). Again, the number of tracts offered is not pertinent for current leases.

III. Tracts Leased

A. Date - thirty days was assumed to elapse between the lease sale and the effective date of the lease. Thus, for Sale #44, held in October, 1976, the lease date is November, 1976. Likewise, the postulated lease date for Sale #47 is May, 1977. Lease date is not provided for current leases.

B. Number of leased tracts - number of currently leased tracts is known. Number of tracts to be leased in Sales #44 and #47 was postulated based on past events (Appendices B and C).

IV. Exploratory Drilling

A. Number of tracts to be explored - for currently leased tracts, this number does not include those tracts which have already been explored or are currently being explored; it refers to postulated future exploration only and was based on past events (Appendices B and C).

B. Beginning Date, Number and Type of Rigs, and Ending Date - this data was postulated based on industry practices (Appendix D).

V. Developed Tracts

A. Number of tracts - again, this number refers to postulated future development and was based on past events (Appendices B and C).

B. Number of Platforms, Date of Platform Installation, Number of Wells, and Date Development Drilling Completed - all were postulated based on industry practices (Appendix D).

VI. Tracts Put Into Production

A. Number of Producing Tracts - refers to postulated future producing tracts and was based on past events (Appendices B and C).

B. Number of Producing Platforms, Date of First Production, Number of Production Platforms, Date Equipped With Production Equipment, and Number of Underwater Completions - all were postulated based on industry practices (Appendix D).

VII. Gas Production

A. Annual Amount By Platform - the postulated amount per tract derived from Appendix C was roughly prorated for each platform based on the number of platform wells.

B. Inclusive Dates - the beginning date is the same as the date of platform installation and the date of first production, and the ending date is an unknown time in the future, N.

VIII. Oil Production - Annual Amount By Platform and Inclusive Dates were derived in the same way that data for the same categories under "Gas Production" (above) were derived.

It is essential to point out that the scenarios are not predictions; they are postulations to be used only for the purpose of determining the impacts of the postulated activities if they were to actually occur. For example, if a scenario postulates that exploratory activity will begin in Area X in November, 1976, and that does not actually occur, the study of the impacts brought about by such a scenario is not, therefore, invalidated. The date of November, 1976, was used only as a convenient starting point for ensuing activities. If, in fact, activities do not actually begin until much later, it is only the starting date which is changed; the study of ensuing events and their impacts is still valid. All starting dates provided in a scenario are highly arbitrary, but, as the succeeding sections note, are based to some extent on past events.

Moreover, current leases, Lease Sale #44, and Lease Sale #47 are used as bases for postulated activity simply because they are known to exist (in the case of current leases) or are known to be in the future (in the cases of Lease Sales #44 and #47). The total number of tracts leased through May, 1977, can be seen as the postulated number of tracts to be leased in the foreseeable future, if not in Sale #44 or Sale #47, then sometime later in time. Thus, here again, if a scenario postulates that X number of tracts will be leased in Sale #47, and that doesn't occur, the study is not invalidated. That is, X number of tracts are postulated to be leased in the foreseeable future; Sales #44 and #47 were used as convenient, but not binding or delimiting starting points.

In sum, while scenarios were developed with the aid of analyses of past events and standard industry practices, they must not be seen as predictions upon which the success of the study rests. They must, instead be seen as postulated activities which provide a base from which the study can proceed.

Scenario I

Scenario I is composed of three of the strike areas described in Appendix C. Two of those strike areas are in the High Island East Addition South Extension Area and are made up of 11 and 8 tracts, respectively. The other area is in the north extreme of the Garden Banks Area and includes 20 tracts (see Map 1). These areas are referred to as Strike Areas 4, 5 and 21 in Appendix C.

Figure 1 reveals that four ships are postulated to participate in pre-lease sale exploration, that 16 tracts are postulated to be offered in Sale #47, and that by May, 1977, a total of 21 tracts are postulated to be leased. Further, according to Scenario I, 12 tracts will undergo exploratory drilling. The "Composite" row under the "Exploratory Drilling" heading indicates that between 10/76 and 1/77, one semi-submersible will be in use; between 1/77 and 4/77, two semi-submersibles will be in use; and so on. Seven tracts will be developed; eleven platforms will be installed. The "Composite" row under the heading, "Number of Wells," indicates that between 4/80 and 10/83, a total of 119 wells will be drilled from the eleven platforms in the seven developed tracts.

The same seven tracts will be put into production and the same eleven platforms will be producing platforms; three of them will be equipped with production equipment. The "Gas Production" column indicates that by 5/83, this scenario area will be producing 297 million MCF of gas annually. No oil production, other than condensate, is expected in Scenario I.

The producing trend in all three areas is Pleistocene, the water depth ranges from 80 to 300 meters, and the drilling depth range is from 5,000 to 11,500 feet.

It is anticipated that by 6/81 three gathering lines (one for each of the strike areas) will be connected to a large trunk line now being constructed to serve the region. Each line will be approximately 20" in diameter and will be from four to sixteen miles in length.

Scenario II

Scenario II comprises two of the strike areas described in Appendix C. One, made up of 16 tracts, is in the South Padre Island Area; the other is in the South Padre Island East Addition Area and also includes 16 tracts (See Map 1). These areas are referred to as Strike Areas 18 and 19 in Appendix C.

It can be seen from Figure 2 that one ship is expected to participate in pre-lease sale exploration, that nine tracts are expected to be offered in Sale #47, and that by May, 1977, a total of 11 of the areas' tracts are postulated to be leased. Moreover, according to Scenario II, nine tracts will undergo exploratory drilling. The "Composite" row under the "Exploratory Drilling" heading indicates that between 7/77 and 10/77, one jack-up will be in use; between 10/77 and 1/78, two jack-ups will be in use; and so on. Five tracts will be developed; seven platforms will be installed. The "Composite" row under the heading, "Number of Wells," indicates that between 1/81 and 7/84, a total of 59 wells will be drilled from the seven platforms in the five developed tracts.

The same five tracts will be put into production and the same seven platforms will be producing platforms; two of them will be equipped with production equipment. By 11/83, gas production will amount to 72 million MCF annually, and oil production will be 640,000 BBLs annually.

The producing trend for Strike Area 18 is Plio-Pleistocene; for Strike Area 19 it is Mio-Pliocene. Water depth ranges from 30 to 80 meters in the two areas, and the drilling depth range is 2,000 to 12,000 feet.

It is expected that by 8/82 two pipelines (one for oil production and one for gas production) from Strike Area 18, through Strike Area 19, to Cameron County will be required. Each line will be in the 12 - 15" diameter range and should each be 60 to 70 miles in length.

Scenario III

Scenario III comprises two of the strike areas described in Appendix C. One, encompassing 16 tracts, is in the Brazos South Addition Area; the other, located in the Mustang Island East Addition Area, also comprises 16 tracts (see Map 1). These areas are referred to as Strike Areas 14 and 16 in Appendix C.

Figure 3 illustrates that two ships will be involved in pre-lease sale exploration, that one tract is to be offered in Sale #44, that eight tracts are expected to be offered in Sale #47, and that by May, 1977, a total of 17 of the areas' tracts are expected to be leased. Further, according to Scenario III, 12 tracts will undergo exploratory drilling. The "Composite" row at the "Exploratory Drilling" column reveals that between 6/76 and 9/76, one semi-submersible will be in use; between 8/77 and 12/77, three semi-submersibles and one jack-up will be in use; and so on. Six tracts will be developed; nine platforms will be installed. The "Composite" row under the heading, "Number of Wells," indicates that between 12/79 and 12/82, a total of 84 wells will be drilled from the nine platforms on the six developed tracts.

FIGURE 1

Scenario 1 Strike Area(s) 4, 5 and 21 (From Appendix C)

LEASES	ACTIVITIES: PRE-LEASE SALE EXPLORATION DATES	PRE-LEASE SALE EXPLORATION AMOUNT	TRACTS OFFERED (FUTURE) DATE	TRACTS OFFERED (FUTURE) NO.	TRACTS LEASED DATE	TRACTS LEASED NO.	EXPLORATORY DRILLING (Two Exploratory Wells Per Explored Tract) (J = Jack-up; S = Semi-Submersible): NUMBER OF TRACTS	BEGINNING DATE	NUMBER AND TYPE OF RIGS	ENDING DATE	DEVELOPED TRACTS: NUMBER OF TRACTS	NUMBER OF PLATFORMS	DATE OF PLATFORM INSTALLATION	NUMBER OF WELLS	DEVELOPMENT DRILLING COMPLETED	TRACTS PUT INTO PRODUCTION: NUMBER OF PRODUCING TRACTS	NUMBER OF PRODUCING PLATFORMS	DATE OF FIRST PRODUCTION	NUMBER OF PRODUCTION PLATFORMS	DATE EQUIPPED WITH PRODUCTION EQUIPMENT	NUMBER OF UNDERWATER COMPLETIONS	GAS PRODUCTION (In Millions of MCF): ANNUAL AMOUNT BY PLATFORM	INCLUSIVE DATES	OIL PRODUCTION (In 1000's of BBLS): ANNUAL AMOUNT BY PLATFORM	INCLUSIVE DATES
CURRENT	-	-	-	-	-	10	1 1 1 1	10/76 1/77 4/77 7/77	Total of 35	7/77 10/77 1/78 4/78	1 1 1	1 1 1	4/80 9/81 10/80 6/81	15 7 11 11	5/81 2/82 6/81 2/82	1 1 1	1 1 1	4/80 9/81 10/80 6/81	1	8/81	0	19 10 29 29	4/80 to N 7/81 to N 10/80 to N 6/81 to N		
SALE #44	-	-	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	-	0	0	-	0	
SALE #47	Present Until 4/77	3 Ships	4/77	16	5/77	11	1 1 1 1 1 1 1 1 1 1 1	8/77 11/77 2/78 5/78 8/78 11/78 2/79 5/79	Total of 35	5/78 8/78 11/78 2/79 5/79 8/79 11/79 2/80	1 1 1 1 1 1 1	1 1 1 1 1 1 1	2/81 11/82 8/81 2/83 2/82 5/83 8/82	15 11 13 7 13 7 11	3/82 7/83 6/82 7/83 10/82 10/83 4/83	1 1 1 1 1 1	1 1 1 1 1 1	2/81 11/82 8/81 2/83 2/82 5/83 8/82	1 1	6/82 6/83	1	20 15 18 17 20 15 15	2/81 to N 11/82 to N 8/81 to N 2/83 to N 2/82 to N 5/83 to N 8/82 to N		
COMPOSITE	Present Until 4/77	4 Ships	10/76 and 4/77	16	Present Until 5/77	21	12	10/76 to 1/77, 1S; 1/77 to 4/77, 2S; 4/77 to 8/77, 3S; 8/77 to 10/77, 4S; 10/77 to 11/77, 3S; 11/77 to 1/78, 4S; 1/78 to 2/78, 3S; 2/78 to 4/78, 4S; 4/78 to 8/79, 3S; 8/79 to 11/79, 2S; 11/79 to 2/80, 1S.			7	11	4/80 10/80 2/81 6/81 8/81 9/81 2/82 8/82 11/82 2/83 5/83		Total of 119 wells drilled between 4/80 and 10/83		7	11	4/80 10/81 2/81 6/81 8/81 9/81 2/82 8/82 11/82 2/83 5/83	3	8/81 6/82 6/83	1	19 48 68 97 115 125 145 160 175 192 297*	4/80 to 10/80 10/80 to 2/81 2/81 to 6/81 6/81 to 8/81 8/81 to 9/81 9/81 to 2/82 2/82 to 8/82 8/82 to 11/82 11/82 to 2/83 2/83 to 5/83 5/83 to N	0	-

* Includes production from approximately five tracts which have shut-in gas, have been explored, or are currently being explored as of 1 July, 1976.
Note: It is reasonable to assume an annual production of 70 to 75,000 BBLs of condensate per 20 million MCF of gas.

FIGURE 2

Scenario II Strike Area(s) 18 & 19 (From Appendix C)

LEASES	ACTIVITIES: PRE-LEASE SALE EXPLORATION DATES	PRE-LEASE SALE EXPLORATION AMOUNT	TRACTS OFFERED (FUTURE) DATE	TRACTS OFFERED (FUTURE) NO.	TRACTS LEASED DATE	TRACTS LEASED NO.	EXPLORATORY DRILLING (Two Exploratory Wells Per Explored Tract) (J = Jack-up; S = Semi-Submersible): NUMBER OF TRACTS	BEGINNING DATE	NUMBER AND TYPE OF RIGS	ENDING DATE	DEVELOPED TRACTS: NUMBER OF TRACTS	NUMBER OF PLATFORMS	DATE OF PLATFORM INSTALLATION	NUMBER OF WELLS	DEVELOPMENT DRILLING COMPLETED	TRACTS PUT INTO PRODUCTION: NUMBER OF PRODUCING TRACTS	NUMBER OF PRODUCING PLATFORMS	DATE OF FIRST PRODUCTION	NUMBER OF PRODUCTION PLATFORMS	DATE EQUIPPED WITH PRODUCTION EQUIPMENT	NUMBER OF UNDERWATER COMPLETIONS	GAS PRODUCTION (In Millions of MCF): ANNUAL AMOUNT BY PLATFORM	INCLUSIVE DATES	OIL PRODUCTION (In 1000's of BBLS): ANNUAL AMOUNT BY PLATFORM	INCLUSIVE DATES
CURRENT	--	--	--	--	--	7	1 1 1 1 1 1 1	7/77 10/77 1/78 4/78 7/78 10/78	TOTAL OF 33	4/78 7/78 10/78 1/79 4/79 7/79	1 1 1	1 1 1	1/81 6/82 7/81 3/82	10 8 23 5	11/81 2/83 8/82 8/82	1 1 1	1 1 1	1/81 6/82 7/81 3/82	1	5/82	0	13 9 14 0	1/81 until N 6/82 until N 7/81 until N --	70 55 95 200	1/81 until N 6/82 until N 7/81 until N 3/82 until N
SALE #44	--	--	--	0	--	0	0	--	0	--	0	0	--	0	--	0	0	--	0	--	0	0	-	0	--
SALE #47	Present to 4/77	1 Ship	4/77	9	5/77	4	1 1 1	8/79 11/79 2/80	TOTAL OF 33	5/80 8/80 11/80	1 1 1	1 1 1	2/83 11/83 8/83	10 8 5	12/83 7/84 1/84	1 1 1	1 1 1	2/83 11/83 8/83	1	6/84	0	13 9 14	2/83 until N 11/83 until N 8/83 until N	70 55 95	2/83 until N 11/83 until N 8/83 until N
COMPOSITE	Present to 4/77	1 Ship	4/77	9	Present to 5/77	11	9	7/77 to 10/77, 1J; 10/77 to 1/78, 2J; 1/78 to 1/79, 3J; 1/79 to 4/79, 2J; 4/79 to 7/79, 1J; 8/79 to 11/79, 1J; 11/79 to 2/80, 2J; 2/80 to 5/80, 3J; 5/80 to 8/80, 2J; 8/80 to 11/80, 1J.			5	7	1/81 7/81 3/82 6/82 2/83 8/83 11/83		Total of 59 wells drilled between 1/81 and 7/84		6	7	1/81 7/81 3/82 6/82 2/83 8/83 11/83	2	5/82 6/84	0	13 27 36 49 63 72	1/81 to 7/81 7/81 to 6/82 6/82 to 2/83 2/83 to 8/83 8/83 to 11/83 11/83 to N	Oil / Gas 70 / 13 165 / 27 365 / 27 420 / 36 490 / 49 585 / 63 640 / 72	1/81 until 7/81 7/81 until 3/82 3/82 until 6/82 6/82 until 2/83 2/83 until 8/83 8/83 until 11/83 11/83 until N

FIGURE 3

Scenario III Strike Area(s) 16 & 14 (From Appendix C)

LEASES	ACTIVITIES: PRE-LEASE SALE EXPLORATION DATES	PRE-LEASE SALE EXPLORATION AMOUNT	TRACTS OFFERED (FUTURE) DATE	TRACTS OFFERED (FUTURE) NO.	TRACTS LEASED DATE	TRACTS LEASED NO.	EXPLORATORY DRILLING (Two Exploratory Wells Per Explored Tract) (J = Jack-up; S = Semi-Submersible): NUMBER OF TRACTS	BEGINNING DATE	NUMBER AND TYPE OF RIGS	ENDING DATE	DEVELOPED TRACTS: NUMBER OF TRACTS	NUMBER OF PLATFORMS	DATE OF PLATFORM INSTALLATION	NUMBER OF WELLS	DEVELOPMENT DRILLING COMPLETED	TRACTS PUT INTO PRODUCTION: NUMBER OF PRODUCING TRACTS	NUMBER OF PRODUCING PLATFORMS	DATE OF FIRST PRODUCTION	NUMBER OF PRODUCTION PLATFORMS	DATE EQUIPPED WITH PRODUCTION EQUIPMENT	NUMBER OF UNDERWATER COMPLETIONS	GAS PRODUCTION (In Millions of MCF): ANNUAL AMOUNT BY PLATFORM	INCLUSIVE DATES	OIL PRODUCTION (In 1000's of BBLS): ANNUAL AMOUNT BY PLATFORM	INCLUSIVE DATES
CURRENT	--	--	--	--	--	12	1 1 1 1 1 1	6/76 9/76 12/76 3/77 6/77 9/77	TOTAL OF 3 SEMI-SUBMERSIBLES	3/77 6/77 9/77 12/77 3/78 6/78	1 1 1	1 1 1	12/79 5/81 6/80 2/81	14 9 9 9	1/81 1/82 2/81 10/81	1 1 1	1 1 1	12/79 5/81 6/80 2/81	1	4/81	0	17 12 19 22	12/79 to N 5/81 to N 6/80 to N 2/81 to N	0 0 0 0	-- -- -- --
SALE #44	Present until 10/76	1 ship	10/76	1	11/76	1	1	8/77	1 Jack-Up	5/78	1	1 1	2/81 7/82	14 6	3/82 12/82	1	1 1	2/81 7/82	0	--	0	13 9	2/81 to N 7/82 to N	0 0	-- --
SALE #47	Present until 4/77	2 ship	4/77	8	5/77	4	1 1 1 1	2/78 5/78 8/78 11/78	TOTAL OF 3 JACK-UPS AND 1 SEMI-SUBMERSIBLE	11/78 2/79 5/79 8/79	1 1 1	1 1 1	8/81 1/82 5/82	11 6 6	6/82 6/82 10/82	1 1 1	1 1 1	8/81 1/82 5/82	1	12/82	0	12 10 22	8/81 to N 1/82 to N 5/82 to N	0 0 0	-- -- --
COMPOSITE	Present until 4/77	2 ships	10/76 and 4/77	9	Present until 5/77	17	12	6/76 to 9/76, 1S ; 9/76 to 12/76, 2S; 12/76 to 8/77, 3S; 8/77 to 12/77, 3S and 1J; 12/77 to 2/78, 2S and 1J; 2/78 to 3/78, 2S and 2J; 3/78 to 6/78, 1S and 2J; 6/78 to 8/78, 2J; 8/78 to 11/78, 3J; 11/78 to 2/79, 1S and 2J; 2/79 to 5/79, 1S and 1J; 5/79 to 8/79, 1S.			6	9	12/79 6/80 2/81 2/81 5/81 8/81 7/82 5/82 7/82		Total of 84 wells drilled between 12/79 and 12/82		6	9	12/79 6/80 2/81 2/81 5/81 8/81 1/82 5/82 7/82	2	4/81 12/82	0	21.5 30.5 57.5 92.5 104.5 116.5 126.5 140.5 205.5**	Present to 12/79 12/79 to 6/80 6/80 to 2/81 2/81 to 5/81 5/81 to 8/81 8/81 to 1/82 1/82 to 5/82 5/82 to 7/82 7/82 to N	0	--

Note: It is reasonable to assume an annual production of 70 to 75,000 BBLS of condensate per 20 million MCF of gas.

* Current annual production from strike areas 14 and 16.

** Includes production from one tract which is currently shut in and potential production from one tract which is currently being explored.

The same six tracts will be put into production; the same nine platforms will be producing platforms; two will be equipped with production equipment. By 7/82, gas production will amount to 205.5 million MCF annually. No oil production, other than gas well condensate, is expected.

The producing trend in both areas is Upper Miocene. Water depth ranges from 45 to 100 meters; the drilling depth range is 6,000 to 13,000 feet. It is anticipated that by 6/80, two pipelines associated with Scenario III will be built. One, a 20" gas line of approximately 10 miles, will serve all of Strike Area 14 and will be connected to a gathering line already extending to Strike Area 14. The other will extend from Strike Area 16 to Nueces County. It will be a gas line of approximately 20" in diameter and 60-70 miles in length.

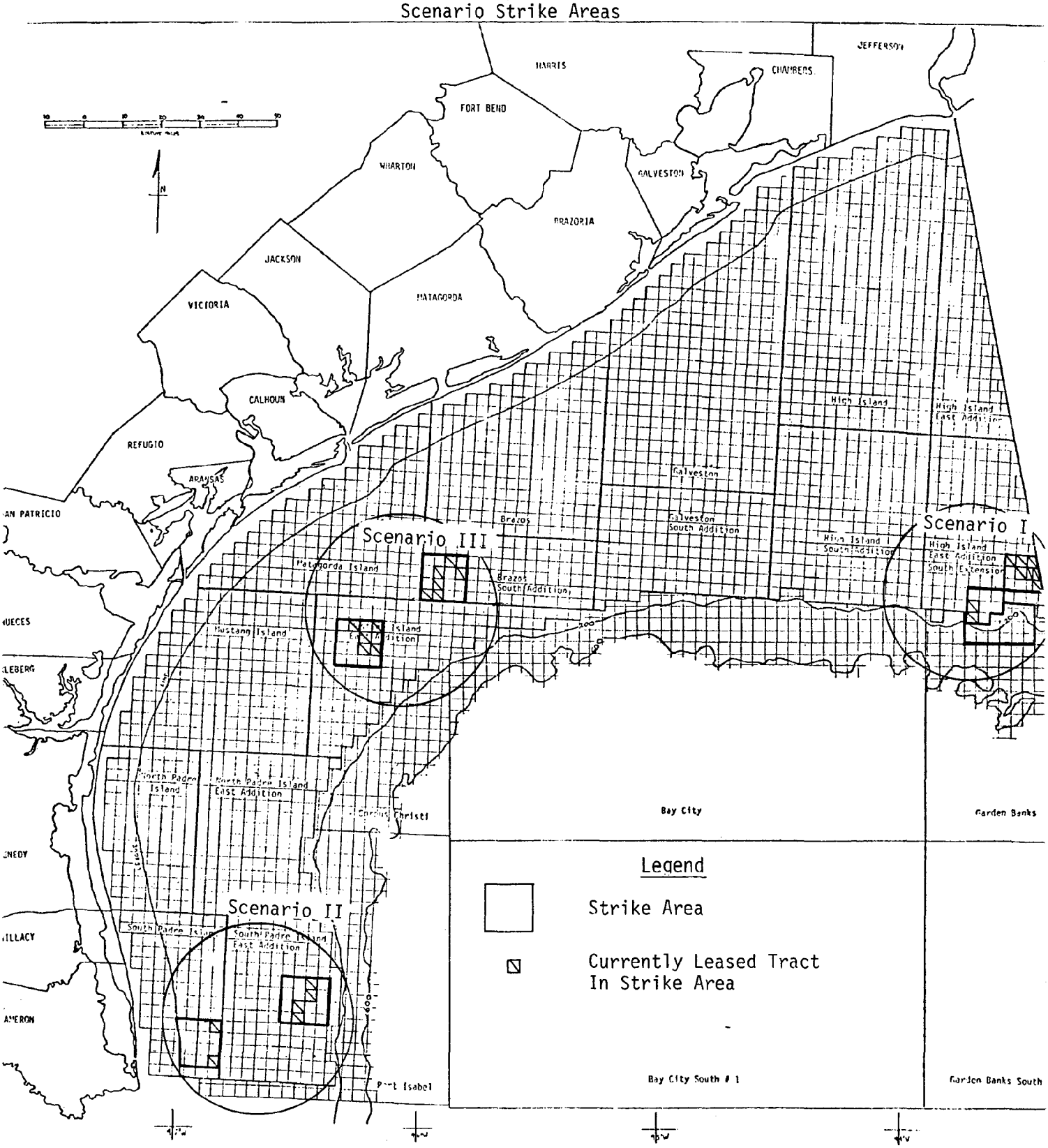
None of the foregoing scenarios include projections for new or expanded oil refineries, gas plants, or rig construction. (Volume III, however, does contain projections for these and other activities.) Projections concerning these OCS-related developments have intentionally been omitted from the scenarios for several reasons.

First, while studies of the impact of OCS development on the Mid-Atlantic region and the New England region have, of necessity, included an analysis of the impact of new refineries, gas plants, or storage facilities, this was done primarily because there is in those regions no extensive network of such facilities already existing. Such is not the case along the Texas Gulf Coast. Here, there is already a large refining capacity, numerous gas plants, and great storage capacity. Thus, the need to project future construction of such facilities is less urgent.

Secondly, it is reasonable to assume that any Texas federal OCS production would replace - not augment - the current input of foreign crude to Texas refineries. Thus, while the origin of the crude oil is likely to change, the demand for refining capacity or gas plant facilities or storage capacity is likely to remain sufficiently constant that the analysis of such change takes on a relatively low priority in this study.

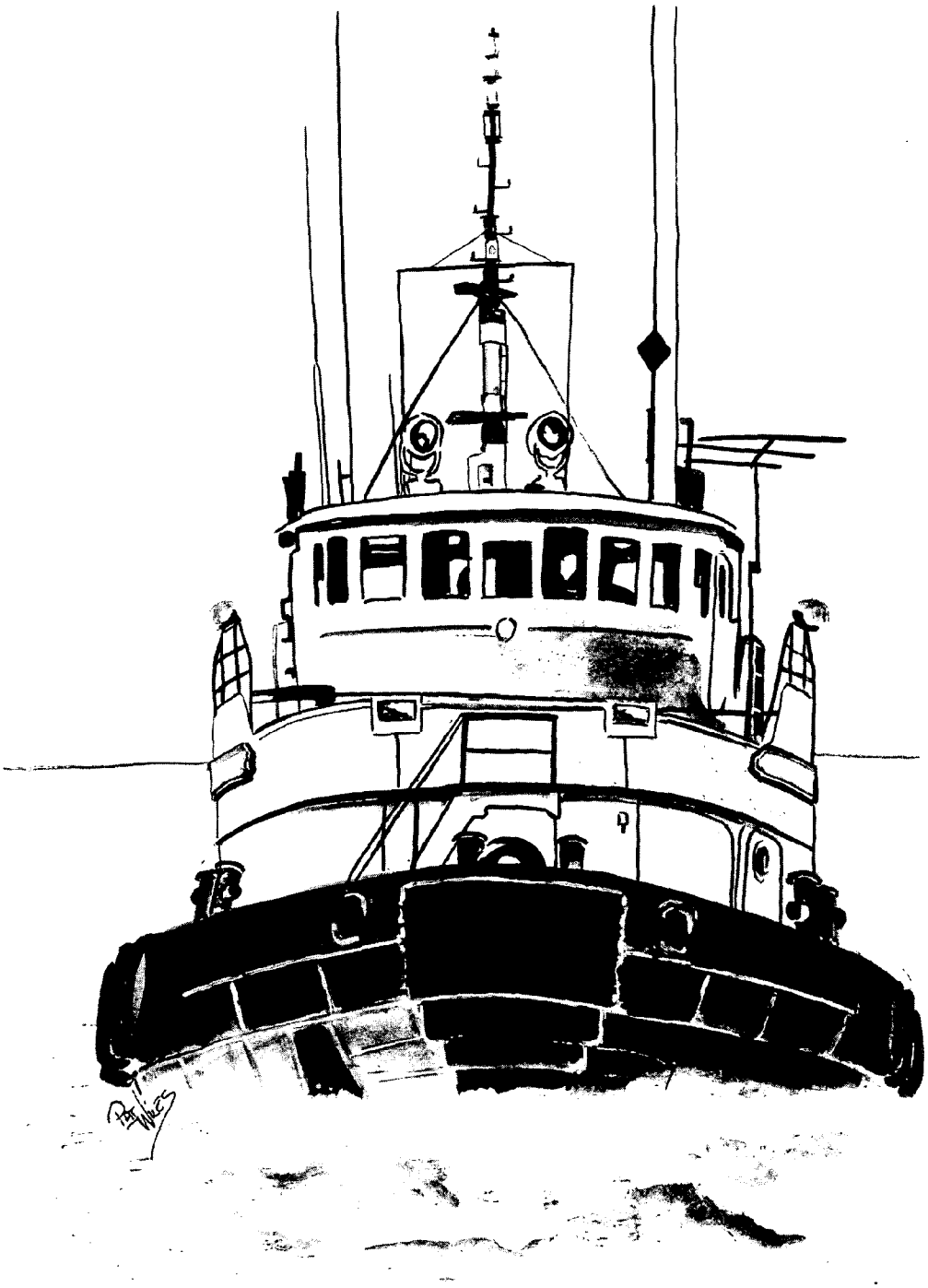
Finally, refinery and gas plant contruction or expansion has historically been a function of market demand not product supply. Thus, even if OCS development were to dramatically increase the supply of oil and gas, refinery and gas plant construction would not necessarily be undertaken unless the demand for finished petroleum products rose accordingly.

Map 1
Scenario Strike Areas



PART B

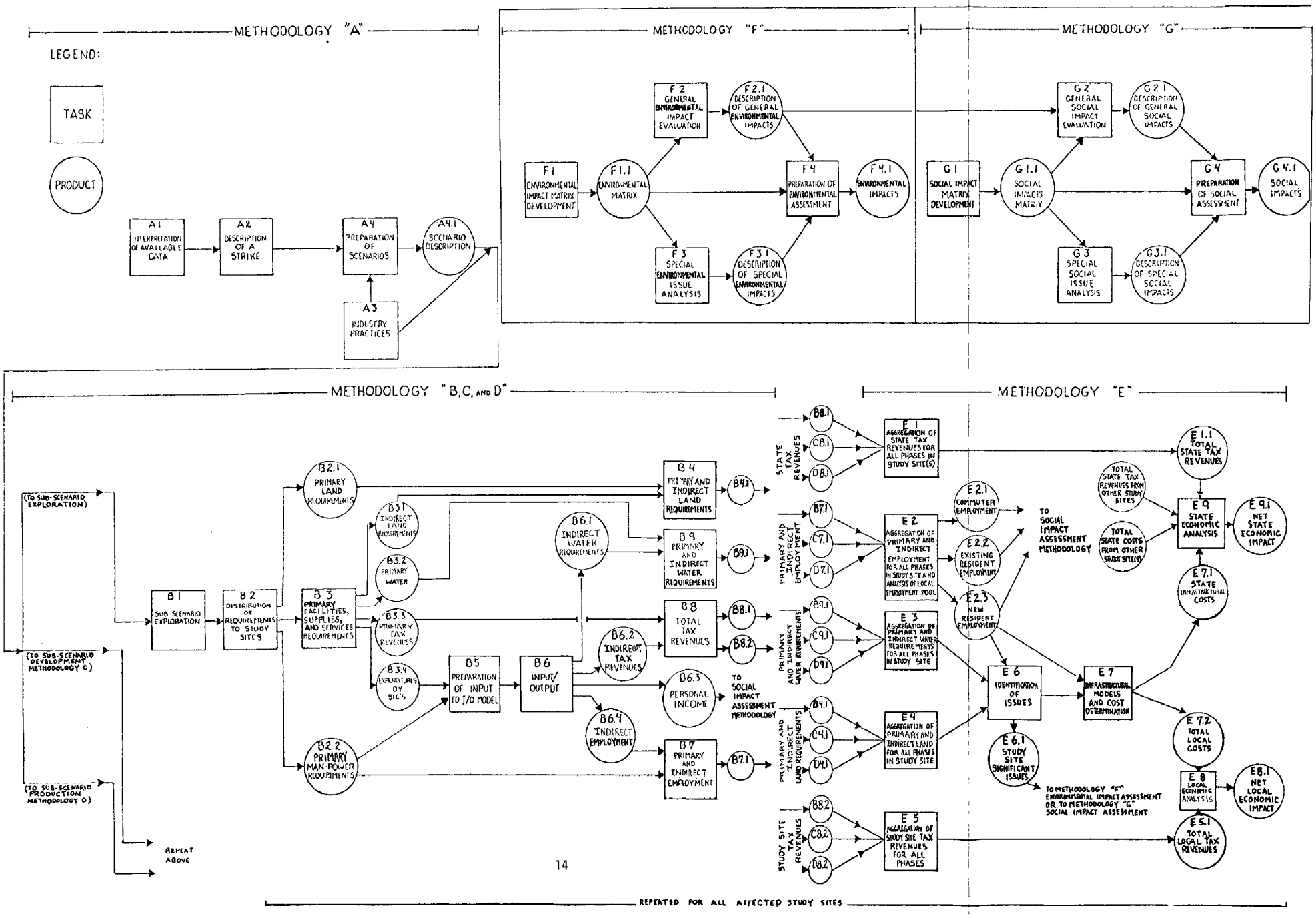
ANALYSIS OF SCENARIOS



1. INTRODUCTION

The three scenarios described in Part A, "Scenario Descriptions," are input, one at a time, to Methodologies B,C,D,E,F, and G. The following is a description of the manner in which each task of Methodologies B through G (see Appendix A) was completed for each of the scenarios. The tasks are described in the order in which they appear in the methodologies. (See accompanying Methodology Flowchart.)

Figure A1. ONSHORE IMPACTS OF OCS DEVELOPMENT STUDY METHODOLOGY



2. METHODOLOGIES B,C, and D:

EXPLORATION, DEVELOPMENT, AND PRODUCTION

After the scenarios have been described, the Study Methodology (Appendix A) specifies that the three phases of OCS oil and gas activity - exploration, development, and production - shall each be analyzed. Such analyses, called sub-scenarios, include determination of primary and indirect onshore requirements and distribution of those requirements to onshore study sites. While each of the three phases, however, are convenient components through which to analyze OCS activities, they are not in actual practice completely separate activities. On the contrary, they overlap in time. More importantly, some of the requirements of one phase duplicate those of another thus presenting the possibility of double-counting requirements if those phases were to be analyzed singly. For these reasons, the three phases are analyzed as separate activities, but not as independent activities. That is, the analysis of the requirements of one phase takes into account the requirements of the others.

Primary Requirements

Since the activities of each scenario are merely postulated, the amount of land, the number of personnel, the facilities, the services, and the supplies required to carry out such activities are also, of necessity, postulations. Many studies have attempted to determine the extent to which such resources are required for Outer Continental Shelf oil and gas development. They include the following:

1. Draft Environmental Statement for Proposed Outer Continental Shelf Mid-Atlantic Oil and Gas Lease Sale (No. 40), Bureau of Land Management, 1975 (BLM 40)

2. Draft Environmental Statement for Proposed Outer Continental Shelf Oil and Gas General Lease Sale Gulf of Mexico (No. 41), Bureau of Land Management, 1975 (BLM 41)

3. Effects of Offshore Oil and Natural Gas Development on the Coastal Zone, Congressional Research Service, 1976 (CRS)

4. Mid-Atlantic Regional Study: An Assessment of the Onshore Effects of Offshore Oil and Gas Development, Woodward-Clyde Consultants, 1975 (WC)

5. Florida Coastal Policy Study: Impact of Offshore Oil Development, Florida State University and University of South Florida, 1975 (FSU)

6. A Methodology for the Siting of Onshore Facilities Associated with OCS Development, New England River Basins Commission, 1976 (NE)

7. OCS Oil and Gas: An Environmental Assessment, CEQ, 1974 (CEQ)

8. A Study of the New Use Demands on the Coastal Zone and Offshore Areas of New Jersey and Delaware, Braddock, Dunn, and McDonald, 1976 (BDM)

These sources have been studied and the relevant information has been extracted from each. Based on those figures, reasonable postulations of requirements for the exploration, development, and production phases of each scenario have been made.

Below are estimates extracted from these sources as they relate to the exploratory, development, and production phases. The source of the estimate is enclosed in parenthesis and the figure which will be used in this study is underscored.

(Pre-lease sale exploration - seismic exploration, for example - has not been included in the determination of onshore requirements related to OCS oil and gas development since it is widely agreed that such activities create only insignificant demands for onshore facilities).

I. Exploration Phase

A. Primary Activity Requirements

1. Personnel required to operate an exploratory rig.

a. 60; 30 per cycle, 2 seven-day cycles (FSU)
b. 72 (BLM40)
c. 60

2. Land required for an exploratory rig. Since the rigs are located offshore, they require no land.

3. Personnel required to operate a dockside unit.

a. 34 (FSU)
b. 42-44 (NE)
c. 35

4. Land required for a dockside unit.

   a. 1.5 acres (NE)
   b. 1.5 acres

5. Helicopters per exploratory rig.

   a. 1 (NE)
   b. 1

6. Personnel required per helicopter.

   a. 4 (BLM40)
   b. 4 (FSU)
   c. 3 (NE)
   d. 4

7. Land required for helicopters. It is normal procedure during the exploration phase for helicopter companies to use space at existing air terminals, since exploration is an activity of uncertain duration with no guarantee that development drilling, and thus long-term activity, will ensue. Therefore, no land requirement is estimated for helicopters in the exploratory phase.

8. Marine vessels required per exploratory rig.

   a. 3 (NE)
   b. 3

9. Personnel required per marine vessel.

   a. 16 (BLM40)
   b. 16 (FSU)
   c. 6-12 (NE)
   d. 16

10. Dock space required for each marine vessel.

    a. 200 ft. (NE)
    b. 200 ft.

11. Total personnel required to operate one offshore exploratory rig, to provide dockside support, and to provide air and marine transportation.

    a. 140 (CRS)
    b. 113 (BLM40)
    c. 113 (WC)
    d. 126 (FSU)
    e. 155 (CEQ)
    f. 217 (OTA)
    g. 147

12. Total land required for dockside support and for transportation to and from rigs.

    a. 3-5 acres (NE)
    b. 2.6 acres (WC)
    c. 5 acres (OTA)
    d. 1.5 acres and 600 ft. of docking space

B. Primary Facilities Requirements

The primary onshore facilities associated with the exploratory phase are docks, storage space, and office space. It is estimated that no dock personnel, in addition to those enumerated in item 7 above, will be required during the exploratory phase to service the boats which service the rigs. That is, to the extent that any dockside servicing of these vessels is required, the necessary personnel for such servicing are included in item 7, the estimation of the number of workers required for marine transportation. Storage facilities necessary for the exploration phase include open storage and warehousing. To the extent that personnel or land are required for such facilities, they are included in the estimates of workers and land required for dockside support of exploratory rigs, discussed above. Further, office space during the exploration phase involves only the personnel and land requirements postulated to be necessary for dockside support of exploratory rigs, discussed above.

C. Primary Services Requirements

The primary services associated with offshore exploratory rigs are helicopter services, boat services, well logging, and diving services.

1. Helicopter and boat services postulated as being necessary to service exploration rigs (described above) are virtually all such services required in the exploration phase as a whole. Thus, no additional helicopter or boat services are postulated.

2. Personnel required to operate a well logging company. (Well logging is the recording of information about subsurface geology. It can include mud or core analysis or other means to determine the presence of oil or gas.)

    a. 10 (BLM40)
    b. 10 (FSU)
    c. 10

3. Land required for a well logging company.

   a. 4 acres (BLM40)
   b. 4 acres

4. Personnel required to operate a diving company.

   a. 11 (BLM40)
   b. 11 (FSU)
   c. 11

5. Land required for a diving company.

   a. .5 acre (BLM40)
   b. .5 acre

D. Primary Supplies Requirements

The primary supplies associated with the exploration phase of OCS oil and gas development are cement, drilling mud, and oil field supply, including wellhead equipment and downhole equipment.

1. Personnel required to operate a cement company. (Cement is used to provide a protective coating around the well casing and to prevent the influx of undesirable fluids).

   a. 12 (BLM40)
   b. 12 (FSU)
   c. 12

2. Land required for a cement company.

   a. 5 acres (BLM40)
   b. 5 acres

3. Personnel required to operate a drilling mud company. (Drilling mud or drilling fluid is a fluid which is circulated through the wellbore during rotary drilling in order to counteract downhole pressure and to remove cuttings.)

   a. 23 (BLM40)
   b. 13 (FSU)
   c. 13 (The BLM40 study was concerned with the Mid-Atlantic Region, a frontier area in terms of OCS oil and gas development. The FSU study, on the other hand, was done for a Gulf Coast region; therefore, its estimate (13) is probably the most realistic for purposes of this study.)

4. Land required for a drilling mud company.

   a. 4 (BLM40)
   b. 4

5. Personnel required to operate an oil field equipment supply company. (Oil field supplies, downhole equipment, and well-head equipment include such items as casing head, tubing head, christmas trees, blowout preventers, and others.)

   a. 32 (BLM40)
   b. 32 (FSU)
   c. 32

6. Land required for an oil field equipment supply company.

   a. 5.5 acres (BLM40)
   b. 5.5 acres

II. Development Phase

A. Primary Activity Requirements

1. Personnel required to operate a development platform.

   a. 52 (BLM40)
   b. 56 (FSU)
   c. 56

2. Land required for a development platform. Since the platforms are located offshore, they require no land.

3. Personnel required to operate an onshore support unit for a development platform.

   a. 13 (BLM40)
   b. 20 (FSU)
   c. 15

4. Land required for an onshore support unit for a development platform.

   a. 2.6 acres per platform (WC)
   b. 2.2 acres per platform (OTA)
   c. 2.5 acres

5. Total personnel required to operate one development platform and to provide onshore support.

   a, 65 (BLM40)
   b. 76 (FSU)
   c. 65(WC)
   d. 71

B. Primary Facilities Requirements

The primary onshore facilities associated with the development phase are docks, storage space, an operations base, and an administrative office. (The operations base and administrative office listed here must not be confused with onshore support for the development platforms described above; the facilities listed in this section are those necessary for all development phase activities, not simply for direct support of development platforms.)

1. Personnel required for docks. It is estimated that no additional dock personnel will be required to service the boats which service the development platforms. To the extent that such personnel shall be required, they are included in the estimation of manpower required for marine transportation, to be discussed later.

2. Land required for docks.

   a. 100-200 ft. of loading space per platform (NE)
   b. 200 ft. of loading space per platform

3. Personnel and land required for storage facilities. As in the exploration phase, storage facilities necessary for the development phase include open storage and warehousing. To the extent that land or personnel are required for such facilities, they are included in the estimates of requirements for onshore support of development platforms discussed above.

4. Personnel required to operate an operations base.

   a. 33 (BLM40)
   b. 55 (FSU)
   c. 40

5. Land required for an operations base. (See item 7 below.)

6. Personnel required to operate an administrative base.

   a. 42 (BLM40)
   b. 50 (NE)
   c. 45

7. Land required for an operations base and an administrative base combined.

   a. 50 acres (BLM40)
   b. 50 acres (FSU)
   c. 55.5 acres (BLM41)
   d. 30-50 acres (NE)
   e. 50 acres

C. Primary Services Requirements

The primary services associated with the development phase of OCS oil and gas extraction are helicopter services, boat services, well logging and diving.

1. Helicopters per development platform.

   a. 3-4 (NE)
   b. 3

2. Personnel required for helicopter. (Same as exploration phase.)

3. Land required per helicopter. (Unlike the exploration phase, the development phase entails the leasing of land for helicopters rather than the use of space at existing air terminals.)

   a. 1 acre (NE)
   b. 1 acre

4. Marine vessels per platform. (Same as exploration phase)

5. Personnel required per marine vessel. (Same as exploration phase.)

6. Land required for each marine vessel. (Same as exploration phase.)

7. Personnel required to operate a well logging company. (Same as exploration phase.)

8. Land required for a well logging company. (Same as exploration phase.)

9. Personnel required to operate a diving company. (Same as exploration phase.)

10. Land required for a diving company. (Same as exploration phase.)

Platform construction and installation are not included in the computation of personnel and land requirements because conversations with officials from Brown & Root, Inc., which owns platform construction yards in Houston and Corpus Christi, Texas, indicate the number of platforms required in Scenario I could easily be supplied by Gulf Coast platform producers using current manpower and land. (See, however, Volume III.)

D. Primary Supplies Requirements

The primary supplies associated with the development phase, as with the exploration phase, are cement, drilling mud, and oil field supplies including wellhead and downhole equipment. In each case, the employment and land requirement multipliers remain identical to those of the exploration phase.

E. Pipeline Laying Requirements

These requirements will vary with each scenario and can be found in the Chapters dealing with each specific scenario.

III. Production Phase

A. Primary Activity Requirements

1. Personnel required to operate a producing platform.

   a. 16 (CRS)
   b. 16 (BLM40)
   c. 16 (WC)
   d. 10 (WC)
   e. 12 (OTA)
   f. 16

2. Land required for a producing platform. Since the platforms are located offshore, they require no land.

3. Personnel required to operate an onshore support unit for a producing platform.

   a. 16 (BLM40)
   b. 20 (FSU)
   c. 18

4. Land required for an onshore support unit for a producing platform.

   a. 1-2 acres (NE)
   b. .5 acres (OTA)
   c. 1 acre

5. Total personnel required to operate a producing platform and to provide onshore support.

   a. 32 (BLM40)
   b. 30 (FSU)
   c. 34

B. Primary Facilities Requirements

At least four sources (NE, BLM 40, WC and FSU) indicate that the facilities and the number ofpersonnel and amount of land required to operate them during the production phase are identical to the facilities, personnel, and land required in the development phase. Such is the postulation in this study, also.

C. Primary Services Requirements

As in the case of facilities, previous research indicates that the services and the number of personnel and amount of land required to provide them are identical in the development phase and the production phase. (The one exception of course, is that platform construction and installation and well logging are virtually never required during production.) Again, such is postulated in this study.

D. Primary Supplies Requirements

Here again, the supplies and the manpower and amount of land required to supply them in the producing phase are postulated to be identical as those of the development phase.

IV. Total Primary Requirements

The computation of primary personnel and land requirements for all phases - exploration, development, and production - of a scenario is not simply a matter of totaling those requirements for each of the three phases. To proceed in such a manner would result in dramatic overestimations of the total requirements. For example, if two oil field supply companies (or branches) with a combined personnel requirement of 64 and land requirement of eleven acres are postulated to be necessary for the exploration phase, and if five such companies (or branches) with a combined personnel requirement of 160 and land requirement of 27.5 acres are postulated to be necessary in each of the subsequent phases (development and production) one cannot conclude that a total of twelve oil field supplies companies (or branches) with a combined personnel requirement of 384 and land requirement of 66 acres are necessary for all the phases of that scenario. Instead, it should be assumed that the maximum requirements for any phase are sufficient to provide oil field supplies in all phases. Thus, the grand total would be 5 companies or branches, 160 workers, and 27.5 acres of land.

Platform construction and installation, as we have seen, are not included in the determinations of personnel and land requirements of scenarios. In addition, the construction of the necessary exploratory rigs, ships, boats, and barges has been excluded. In general, activities which are not primary facilities, services, or supplies are not dealt with here. For example: the servicing of rigs by boats is included, but the training of divers at diver's schools is not. These particular activities have been excluded for one or more of the following reasons:

1. They are products or services which will continue to be produced even in the absence of increased OCS oil and gas development offshore Texas; that is, they are "produce and store" items, not "built only on order" items. For example, oil field equipment is manufactured and kept in stock regardless of OCS activity. The supplying of that equipment to offshore rigs, however, is an activity which is dependent on OCS oil and gas development.

2. The postulated activities of the scenarios will very likely not necessitate the acquisition of additional land or manpower for the production of those items; such is the case of platform construction and installation. (See, However, Volume III.)

3. The activities which lead up to primary facilities, services, and supplies - for example, the mining of ore which goes into the steel which is fabricated into platforms - are accounted for in the input/output model into which the primary activities are fed.

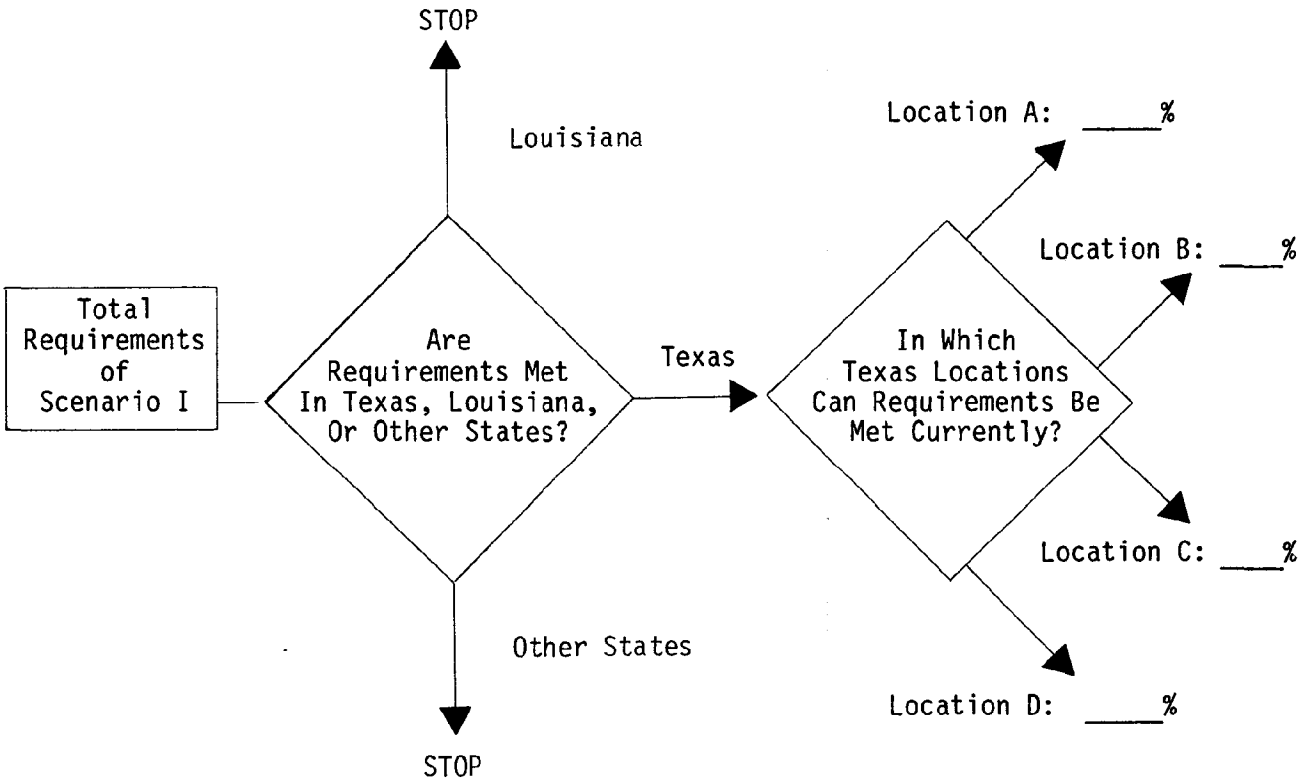
While these activities are excluded from the detailed analysis of required land and manpower, they are dealt with in this study in a special way. Thus, while those activities may not justifiably be considered primary, they may still generate impacts and are thus considered in a separate yet comprehensive manner in Volume III.

Primary Requirements Over Time

The calculation of total requirements of all phases of a scenario is a necessary but not sufficient output of Methodology Tasks B1, C1, and D1 (See Appendix A). The primary requirements must also be distributed over time since not all of them will be simultaneously required, nor will they all be required for the same length of time. The dates on which the activities of a scenario begin and end are postulated in each scenario description. (See Figures 1,2, and 3.) When those dates are put together with the total requirements of the corresponding scenario, a picture of the distribution of requirements over time emerges. The time at which the requirements must be met come either from the Scenario Descriptions or are RPC estimates. Some of the requirements represent activities which, when completed, are never required again; thus, the manpower and land are not required again. In these cases, the personnel undoubtedly move on to other areas and the land is given over to other uses. Exploratory rigs represent activities, the demand for which will rise and then decline but will rise again. Helicopters service is one such example. In these cases, it is assumed that in the slow period following the first burst of activity, the manpower and land requirements will remain constant in expectation of the second burst of activity.

Distribution of Requirements to Study Sites

In order to allocate the requirements for primary personnel and land in the exploration, development, and production phases of a scenario, it is necessary to know (a) which of these requirements will be met by companies or company branches located in Texas, (b) where within the State those Texas companies or branches are located, and (c) what percentage of each of the primary requirements isolated in (a) will be allocated to each of the location isolated in (b). This process can be graphically illustrated as follows:



The answer to question (a) - which of the primary requirements of a scenario will be met by companies or company branches in Texas - can be approached in two different ways. First, for the purposes of this study it can be assumed that all such requirements will be met by Texas-based companies or branches. Secondly, it is possible to conduct interviews with officials from each type of company (mud suppliers, diving services, for example) to obtain their estimates of the distribution of primary requirements to Texas-based companies or branches and to such entities in other states.

The first approach - "the 100% Texas-supplied" approach - appears to be the most reliable of the two, except for certain capital-intensive sectors which, it will be seen, will be treated separately. (See Volume III.) Thus, the assumption that all requirements for each scenario will be met from Texas-based entities has been adopted because:

1. While not all of the primary requirements of each scenario may, in fact, be met by Texas-based entities, increased OCS oil and gas developments in other areas - particularly offshore Louisiana - will undoubtedly draw upon the resources of Texas-based firms, thus creating somewhat of a tradeoff, even though it may not be a one-to-one exchange.

2. The resources to meet the primary requirements of each scenario do exist in Texas. The "100% assumption," therefore, is plausible and certainly to some degree probable.

3. The 100% assumption presents the "greatest impact" case and thus demonstrates what could conceivably happen and what the most severe strain on areas affected by each scenario would be.

4. The second approach - the interview method - would require company officials to provide estimates which, at best, would be approximations of the amount of facilities, services, and supplies of Texas-based entities now or in the past and in areas other than the areas affected by each scenario.

5. The interviews could only be conducted with a representative sample of companies; to survey them all would require an inordinate amount of time and resources. Further more, such a representative sample could very possibly overlook several companies which would drastically alter the net approximations from the sample of companies. What is in question is not empirical evidence or easily quantifiable data, but rather estimates of some future activity.

6. Such approximations would, of necessity, overlook the possibility of future change in the current allocation of requirements to Texas brought about by an increasing number of Texas-based firms, by an increasing demand on Louisiana-based firms, by an increasing demand on Louisiana-based entities which thus place greater demands on Texas, or by any of a myriad other possibilities.

There are, of course, some industrial sectors for which it is virtually impossible to anticipate future activity in Texas in comparison to other states and for which the "100% Texas-supplied" approach is unrealistic. These sectors are capital-intensive sectors which are already well developed in Louisiana and, to a lesser degree, in other states including Texas. Platform construction, marine vessel construction, and mobile exploratory rig construction are prime examples. In order to calculate the potential impact of increased investment in these sectors in Texas, they have been treated in this study in a special way. (See Volume III.)

The remaining primary activities - those for which the "100% Texas-supplied" assumption has been adopted - include the following:

1. Drilling contractors, either doing exploratory drilling from mobile rigs, development drilling from platforms, or operating producing platforms;

2. Dockside support for exploratory rigs;

3. Onshore support for development/production platforms;

4. Onshore operations bases for the development/production phase;

5. Onshore administrative bases for the development/production phase;

6. Dock facilities;

7. Helicopter services;

8. Boat services;

9. Well logging services;

10. Diving services;

11. Cement services;

12. Mud services;

13. Oil field equipment; and

14. Pipeline laying services.

Having made an allocation of the primary requirements to the State of Texas, it is necessary to answer the second question referred to in the "Introduction:" Where within the State of Texas are the required primary facilities, services, and supplies located?

An answer is provided by a survey of the following documents:

1. County Business Patterns, United States Department of Commerce;

2. Petroleum Industry Yellow Pages: Gulf Coast Region 1976, The Whico Atlas Company;

3. Texas Employment Commission, unpublished data on a computer tape;

4. Report Generator, Dunn and Bradstreet computer tape;

5. Telephone book Yellow Pages for every significant urban and industrial center along the Texas Gulf Coast; and

6. Interviews with oil company representatives.

A survey of these documents facilitated the determination of the availability of those primary facilities, services, and supplies in the seven Coastal Study Sites identified in Phase I of this study. (See Natural Resource, Socioeconomic, and Demographic Inventory of the Texas Coastal Area, RPC, Inc., 1976.) The percentage of all facilities, services, and supplies in the Texas Coastal Area (a 19-county area) was computed for each study site (see Figure 4 and Map 2).

Having determined the Texas-other states allocation and having determined the location of primary facilities, services, and supplies in the State of Texas, it now remains to determine from which of the seven coastal study sites the postulated primary requirements of each scenario will be met. This must be done for each of the three phases - exploration, development, and production. Such determination has been made for each scenario (see specific scenarios).

The final step in distributing requirements to study sites is to make sub-allocations within each affected study site when alternative locations for development exist within those study sites. This has been done for each scenario, but the reader is cautioned that these sub-allocations, like the scenarios themselves, are not predictions. Rather, they are postulated to be the specific areas, within the study sites, which are most likely to meet the personnel and land requirements of the scenario in question.

Indirect Land Requirements

The land necessary for the conduct of primary activities and for the provision of primary facilities, services, and supplies (primary sectors) is certainly not all the land that a scenario will require. In addition to that land, which in this study has been termed primary land requirements, land for such indirect activities as schools, commercial establishments, water treatment facilities and many more will be required. It is virtually impossible to predict with precision the amount of indirect land requirements the activities of a scenario will generate. Few previous studies of OCS oil and gas development impacts have addressed the question of indirect land requirements. There is, however, one exception: OCS Oil and Gas - An Environmental Assessment published in 1974 by the Council on Environmental Quality. The CEQ attempted to predict the indirect land requirements of OCS oil and gas development roughly by following these steps:

Figure 4

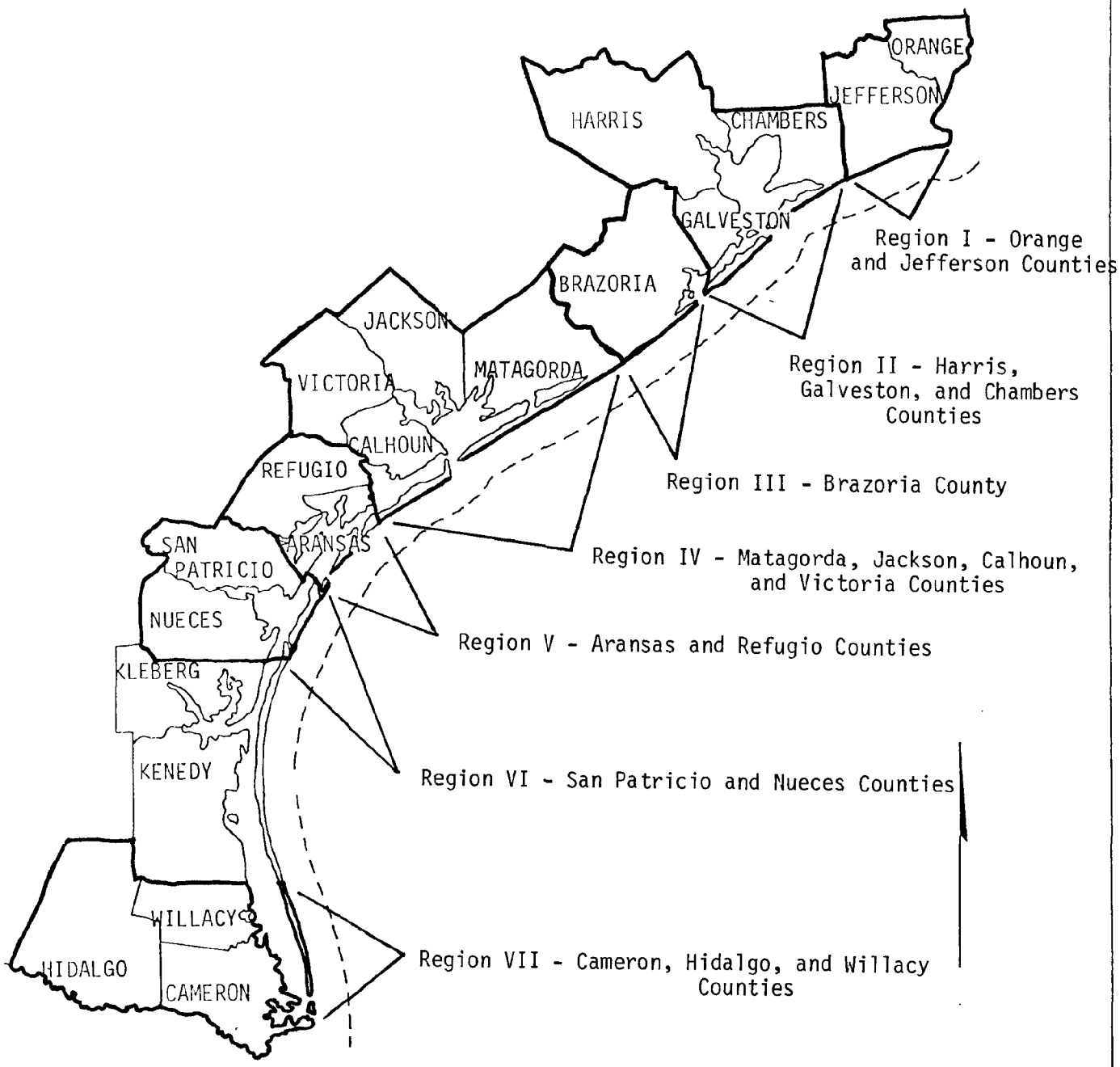
Availability of Primary Facilities, Services, and Supplies in the Texas Coastal Area

Requirements (Facilities, Services, and Supplies)	Regions						
	I	II	III	IV	V	VI	VII
Drilling Contractors	1%	91%	0%	2%	0%	6%	0%
Dockside Support for Exploratory Rigs	1%	91%	0%	2%	0%	6%	0%
Onshore Support for Development/Production Platforms	1%	91%	0%	2%	0%	6%	0%
Onshore Operations Bases for Development/ Production	1%	91%	0%	2%	0%	6%	0%
Onshore Administrative Bases for Development Production	1%	91%	0%	2%	0%	6%	0%
Docks	27%	44%	5%	4%	0%	15%	4%
Helicopters	4%	81%	6%	2%	0%	7%	0%
Boats	0%	80%	10%	0%	0%	10%	0%
Well Logging Services	10%	65%	5%	5%	0%	15%	0%
Diving Services	6%	85%	5%	0%	0%	4%	0%
Cement	10%	65%	5%	5%	0%	15%	0%
Mud	10%	65%	4%	5%	1%	15%	0%
Oilfield Equipment	10%	65%	5%	5%	0%	15%	0%
Lay Barges and Other Vessels Required for Pipeline Laying	0%	89%	0%	3%	0%	11%	0%

Region I: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/Hidalgo/Willacy Counties.

Map 2

TEXAS COASTAL AREA



1. A function Y of commercial and industrial acreage per employee was developed for each region;

2. It was assumed that current total commercial and industrial land would be the lower boundary of future acreage requirements for such activities;

3. Using function Y, employment projections were translated into future requirements for other (that is, indirect) land.

Employment projections rather than population or household projections were used because they are considered better indicators of industrial or commercial activity and land use than are population or number of households projections.

This study employs a similar approach. Indirect land requirements for each affected study site have been calculated by following these steps:

1. UA/LF = X; where UA = current urban acreage, LF = current total labor force, and X = urban acre per person in the labor force.

2. X x PPE = PUA; where PPE = projected employment in primary sectors, and PUA = projected urban acreage.

3. PUA - PPSA = IA; where PPSA = projected primary sector acreage, and IA = indirect acreage.

Urban acreage was calculated by totaling acreage for the following uses:

1. Residential-urban, commercial, and residential development including streets, roads, and educational sites in such areas;

2. Industrial areas, railyards, and docks including streets, roads, and educational sites in such areas;

3. Undeveloped tracts, greenbelts, cemeteries, and undifferentiated urban land including streets and roads in such areas;

4. Parks and recreational facilities;

5. Sewage disposal sites;

6. Solid-waste disposal sites, sanitary sites, and open sites;

7. Airfields; and

8. Artificial reservoirs.

Several explanatory notes concerning this method of estimating indirect land requirements must be made:

1. The indirect land requirements totals include land for residences of employees of primary sectors, recreation areas, educational institutions, indirect commercial and industrial establishments, and more. In short, all significant indirect land requirements are assumed to be included.

2. Indirect land requirements ultimately generated by indirect employment are not included.

3. Virtually all indirect land uses analyzed here are examined further in Methodology E, Net Onshore Impacts.

4. The process by which indirect land requirements were calculated is not meant to imply any cause-effect relationships. For example, one cannot correctly assume that each additional employee in Region I causes 1.215 acres to be urbanized. That figure - 1.215 - is only an indicator of the current relationship between urban acreage and total employment as they now stand.

5. It is assumed that when X amount of increased employment leads to Y amount of indirect land requirements, Y will not decrease if X decreases, but that Y will increase if X increases. Thus, there are no declines in the amount of indirect land required even though primary sector employment may fluctuate.

Primary Water Requirements

The primary water requirements in each scenario are virtually all associated with offshore drilling. The water requirements of, for example, an oilfield equipment supply company or a well logging company are relatively insignificant in comparison with those of offshore drilling contractors. While drilling mud and cement do require water, the vast majority of such water is included in the water requirements of drilling contractors, who actually use the drilling mud and cement. In contrast, the onshore water requirements of helicopter and boat services, well logging services, drilling mud suppliers, cementing services, diving services, and oil field equipment suppliers are relatively minor; the same can be said of the onshore water requirements of such activities in aggregation. Thus, only the water requirements of offshore drilling contractors (which, again, include many of the significant water requirements of other primary facilities, services, and supplies) are analyzed here.

Conversations with Gulf Coast drilling contractors (particularly the Field Drilling Company of Houston, Texas) indicate that offshore drilling contractors use approximately 7,500 gallons of water per rig drilling day. Thus, in each scenario, primary water requirements were calculated by multiplying that figure (7,500 gallons) by the number of rig drilling days involved in that scenario.

(It is interesting to compare the primary water requirements of this study with those of similar studies. The most complete previous effort to calculate primary water requirements was undertaken by the New England River Basins Commission in a document titled A Methodology For Siting of Onshore Facilities Associated with OCS Development, 1976. That study estimated that 170,000 gallons of water are required for each exploratory well, and 140,000 gallons are required for each development well. When those estimates are used, the primary water requirements for Scenario I, for example, total 20,740,000 gallons, a figure reasonably close to the 29,850,000 gallons derived by using 7,500 gallons per day/per rig. The 7,500-gallon per day/per rig multiplier was used in this study, however, because it was supplied by a Gulf Coast, as opposed to a New England, source.)

Finally, it is assumed that the water utilized by offshore drilling contractors will undoubtedly be furnished in those study sites in which onshore support units for such contractors are located.

Primary Tax Revenues

The direct tax revenues derived in each of the affected study sites of each scenario from the primary exploration, development, and production activities were calculated by using the tax payment coefficients of the OCSOG Model (See Appendix E). The results are direct tax payments to federal, state, and local governments; tax payments to state and local governments are broken out in Methodology Tasks B8, C8, and D8 (See Appendix A). It must be noted that the tax payments for any given time period in any scenario represent only the amount of tax dollars accruing to the affected unit or units of government during that time period. They do not indicate that the affected unit or units of government actually collect that amount of tax revenues during that particular time period. Indeed, in many cases there may be a significant time lag between the time that taxes accrue to a unit of government and the time at which that unit of government actually collects those taxes. The actual time and amount of tax payments will be further analyzed in Methodology E. (See Appendix A.)

Expenditures for Primary Activities

Like direct tax payments, the expenditures made in each affected study site of each scenario for primary exploration, development, and production activities were calculated by using expenditure coefficients of the OCSOG Model (See Appendix E).

Primary and Indirect Land Requirements

Primary and indirect land requirements were derived simply by totaling direct land requirements and indirect land requirements.

Preparation of Input to Input/Output Model

In accordance with the study methodology (Appendix A), data decks for input to regional modifications of the Texas Input/Output Model were prepared. (A description of the Texas I/O Model and the modifications of it (the OCSOG Model) used in this study are contained in Appendix E.) Primary manpower requirements, expenditures by relevant SIC's, and primary water requirements for any given scenario comprised the input to the I/O Model.

In its essence, an input/output model is an accounting system which traces the flow of goods and services throughout a regional economy. An input/output model is especially suited for the calculation of indirect effects of any change in the level of sales, purchases, production, or employment in any one of a region's economic sectors. In very basic terms, if sector A reduces or increases expenditures, for example, those changes can be termed primary effects. The changes in sectors B through Z, which are brought by the primary effects, can be called indirect effects.

A Texas Input/Output Model was developed in 1973 and served as the basis for the Outer Continental Shelf Oil and Gas (OCSOG) Model constructed for this study. In brief, the OCSOG Model entailed two kinds of modifications of the State Input/Output Model:

1. It was modified geographically; that is, seven separate regional modifications were constructed (one for each of the seven coastal study sites displayed on Map 2); and

2. It was modified sectorally; that is, those industrial sectors which are specifically related to OCS oil and gas development (offshore drilling, for example) were disaggregated from those sectors which had originally subsumed them (drilling contracting, for example).

(Again, the reader is urged to refer to Appendix E for a detailed description of the OCSOG Model.)

Indirect Water Requirements

Indirect water requirements generated by the exploration, development, and production phases of any scenario are calculated by using the indirect water requirement coefficients of the OCSOG Model (See Appendix

E). The term "indirect" here refers to the requirements which, in Input/Output terminology, are referred to as "indirect and induced." The one word,"indirect", is used here and throughout the study (unless otherwise noted) for convenience. The indirect water requirement coefficients of the OCSOG Model vary from one affected study site to another and are, therefore, dealt with in more detail in each specific scenario.

Indirect Tax Revenues to State and Local Governments

Indirect tax payments to state and local governments generated by the exploration, development, and production phases of any scenario are calculated by using the indirect tax payment coefficients of the OCSOG Model (See Appendix E). Those coefficients vary from one study site to another and are analyzed separately in each scenario.

It must be noted that the tax payments for any given time period in any scenario represent only the amount of tax dollars accruing to the affected unit or units of government during that time period. They do not indicate that the affected unit or units of government actually collect that amount of tax revenue during that particular time period. Indeed, in many cases there may be a significant time lag between the time that taxes accrue to a unit of government and the time at which that unit of government actually collects those taxes. The actual time and amount of tax payments are further analyzed in Methodology E.

Personal Income

Personal income, both primary and indirect, generated by the three phases of any scenario are, once again, calculated by using personal income coefficients of the OCSOG Model (See Appendix E). Those coefficients vary from one affected study site to another and are displayed in each scenario for each affected study site.

Indirect Employment

Indirect employment generated by the exploration, development, and production phases of any scenario are calculated by using the indirect employment coefficients of the OCSOG Model (See Appendix E). Again, these coefficients are not constant from one study site to another and are, therefore, analyzed further in each separate scenario.

3. METHODOLOGY E: NET ONSHORE EFFECTS

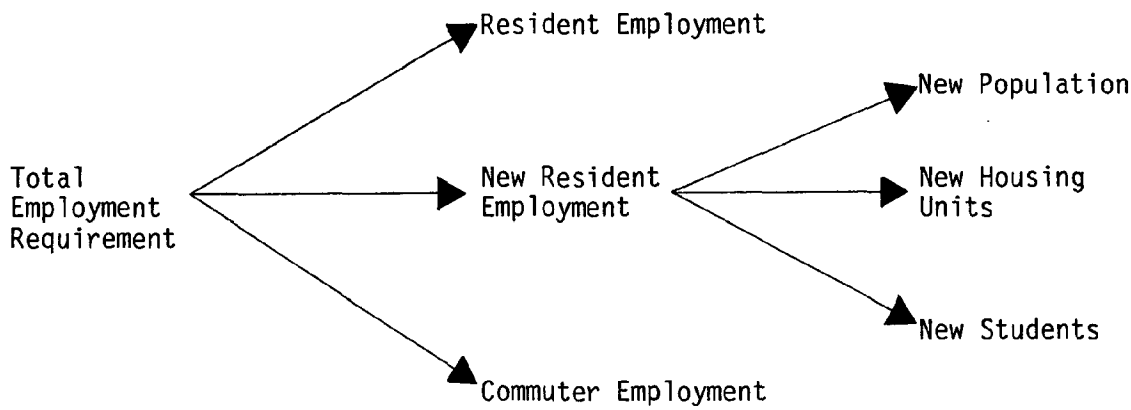
Aggregation of State Tax Revenues For All Phases in Each Affected Study Site

Total state tax revenues generated in each affected study site by the exploration, development, and production phases are determined by totaling primary tax payments to the state government and indirect tax payments to that unit of government.

Primary tax payments to all levels of government (federal, state, and local) in each affected study site from the exploration, development, and production phases of any scenario were calculated earlier. Those revenues were calculated by using the tax payment coefficients of the OCS Model (See Appendix E). At this point, the primary tax payments to the State government only are extracted from those total tax payments. Again, this is done by using state tax payment coefficients of the OCSOG Model. Using those coefficients, primary state tax payments are derived for each affected study site over time. They are added to indirect state tax revenue to derive total state tax revenue over time in each affected study site.

Aggregation of Primary and Indirect Employment For All Phases in Each Affected Study Site

The new population associated with OCS oil and gas development in any affected site is primarily a function of the new employment; the same can be said of the number of new housing units and of the number of new students. The first step in calculating new population, housing units, and students, then, is to calculate new employment, and the first step in that process is the determination of total manpower requirements over time in each affected study site of any scenario. Thus, the process can be seen graphically as follows:



I. Total Employment

Total employment requirements are calculated simply by totaling the primary employment requirements over time in each affected study and indirect employment requirements over time in each affected study site. This is done in each scenario.

II. Origin-of-Employment

Having calculated total employment requirements, it remains to determine what percentage of those requirements will be resident employment, what percentage new resident, and what percentage commuter employment. By "resident employment" is meant employees who currently reside in the affected study site in question; by "new resident employment" is meant employees who do not currently reside in the affected study site in question but who move there to work and establish residences there; and by "commuter employment" is meant employees who do not currently reside in the affected study site in question and who commute there to work but do not establish residences there.

At least two previous studies have addressed this question of the origin-of-employment: Mid-Atlantic Regional Study - An Assessment of the Onshore Effects of Offshore Oil and Gas Development by Woodward-Clyde Consultants, 1975; and the Draft Environmental Statement for Proposed Outer Continental Shelf Mid-Atlantic Oil and Gas Lease Sale (No.40), Bureau of Land Management, 1975. The origin-of-employment assumptions, drawn from Offshore Operators Committee data, used in those studies is displayed in Figure 5.

Figure 5

Origin-of-Employment Assumptions Used in Selected Previous Studies

	Resident		New Resident		Commuter	
	WC	BLM	WC	BLM	WC	BLM
Exploration Rigs	37%	37%	40%	40%	23%	23%
Development Platforms	37%	43%	40%	57%	23%	0
Operations Bases	82%	82%	18%	18%	0	0
Rig/Platform Support	62%	62%	38%	38%	0	0

(Note: WC = Mid-Atlantic Regional Study; BLM = Environmental Impact Statement for Proposed OCS Mid-Atlantic Sale #40.)

From the data presented in Figure 5 and from logical conclusions concerning employment patterns generally, it can be assumed that the origin-of-employment related to OCS oil and gas development is controlled primarily by three variables:

1. The particular OCS development activity in question. That is, origin-of-employment for activities such as exploration which are normally performed by a high percentage of temporary personnel operating out of a headquarters elsewhere would be significantly different than origin-of-employment for OCS activities such as operations base activities which are normally performed by a high percentage of permanent resident personnel.

2. Area of onshore support. That is, origin-of-employment is greatly affected by the extent to which the onshore support area has had previous experience with offshore energy development or industrial activity in general and thus experienced a demand for the kinds of personnel required by the OCS development in question. Thus, it is assumed that origin-of-employment in Texas, which has had significant previous OCS oil and gas development, would differ from origin-of-employment in frontier areas. (Recall that both studies referred to earlier concerned the Mid-Atlantic region, a frontier area.)

3. Historic employment/unemployment trends in the onshore support area. It is assumed, for example, that a support area with low unemployment would result in different origin-of-employment percentages than an area with a traditionally high rate of experienced unemployed.

Thus, the origin-of-employment percentages presented in each scenario are based on the particular OCS activity in question; the fact that Texas in general and some sites in particular (Houston and Galveston, for example) have had extensive previous experience with OCS oil and gas development; and on historic employment/unemployment trends in the affected study site in question. Further, they are based on discussions with private sector officials.

In some cases, the percentage of "new resident" employees may seem too high. For example, it might be assumed that Region II (the Houston, Galveston, Chambers Counties area) currently has in its labor force more than enough personnel to fulfill all the employment requirements placed upon it by Scenario I. Nevertheless, it is still expected that new residents will move into the area in anticipation of securing OCS-related or OCS-generated (indirect) employment. Further, by assuming a high "new resident" percentage, a relatively high degree of impact can be analyzed; extent of impact can be scaled down if, indeed, "new resident" employment is lower than assumed. Thus, the origin-of-employment estimates displayed in each scenario are RPC study assumptions (not predictions) employed for the purpose of furtherance of the study.

When the origin-of-employment percentages of each scenario are applied to the employment requirements for each activity in each affected region and in each relevant time period of that Scenario, the numbers of resident, new resident, and commuter employment is the result.

It will be noted that total employment in any affected region in any given scenario fluctuates from one time period to another. It will also be seen that that fluctuation occurs in resident and commuter employment and not in new resident employment. This constancy in the number of new resident employees is based on several assumptions:

1. Commuter employment,in activities such as exploratory drilling and others will, by its very nature, show a great deal of fluctuation;

2. New resident employees are not likely to relocate to the affected study site in question unless they are relatively certain of long-term employment; and

3. A great deal of fluctuation will take place in the number of resident employees who will, to a great extent, be drawn from a pool of employed and/or unemployed persons as the OCS activities dictate.

The number of new resident employees in each affected study site in each scenario, as stated earlier, provides the key with which new population, new housing units, and new schools can be calculated. (Resident employment and commuter employment are important in their own right and are further analyzed in Methodology G, Social Impact Analysis.)

III. New Population

Many previous studies have utilized new resident employment projections to calculate projected population totals; the methods have been essentially the same in each. Figure 6 arrays the studies which have been analyzed and the methods used in those studies to calculate projected population.

Figure 6

Methods of Population Projections Used in Previous Studies

	Study	Method
1.	An Economic Impact Analysis of Proposed 1974 Outer Continental Shelf Oil and Gas General Lease Sale, Offshore Texas, by Herbert W. Grubb, Office of the Governor of Texas, 1974.	Employment X 2.58 = Population
2.	Offshore Revenue Sharing, Gulf South Research Institute, 1975.	Employment X 3.14 = Population
3.	Decisions for Delaware: Sea Grant Looks at OCS Development by Joel Goodman, University of Delaware, 1975.	Employment X 4 = Population
4.	Mid-Atlantic Regional Study, Woodward-Clyde Consultants, 1975.	Employment X 3 = Population
5.	OCS Oil and Gas: An Environmental Assessment, CEQ, 1974.	Employment X 2.07 =
6.	Florida Coastal Policy Study: Impact of Offshore Oil Development, Florida State University, 1976.	Employment X 2.45 = Population

It is readily apparent, then, that every study surveyed in Figure 6 used a multiplier to derive population. It is appropriate that the most recent multiplier for the State of Texas be used in this study. U.S. Census data reveals that in 1970 there were 4,141,529 employed persons in the State, and the total population was 11,195,431. Thus, there were 2.7 persons in the total population for every employed person. That multiplier is not at all inconsistent with those used in previous works and shall be adapted for use in this study. Based on the new resident employment totals in each scenario and the multiplier described above, the new population totals for each affected study site over time in each scenario were derived.

IV. Housing Units

Similarly, several studies have attempted to project the number of housing units generated by OCS-related activities. Figure 7 displays those studies and the methods used within them.

Figure 7

Survey of Methods of Projecting Number of Housing Units

	Study	Method
1.	Mid Atlantic Regional Study, Woodward-Clyde Consultants, 1975.	Employment X 1 = No. of Housing Units
2.	OCS Oil and Gas: An Environmental Assessment, CEQ, 1974.	$\frac{\text{Population}}{3.1}$ = No. of Housing Units
3.	Florida Coastal Policy Study: Impact of Offshore Oil Development, Florida State University, 1976.	Employment X .69 = No. of Housing Units
4.	A Study of the New Use Demands on the Coastal Zone and Offshore Areas of New Jersey and Delaware, Braddock, Dunn, and McDonald, 1976.	Population X .325 to .363 = No. of Housing Units

While there appears to be a great variance in the methods outlined in Figure 7, in practice they yield similar results. Once again, the basic approach has been to utilize a multiplier, and this study does the same: it employs a multiplier based on Texas data. Thus, when the 1970 Texas population (11,195,431) is divided by the number of housing units in Texas in 1970 (3,809,086) the multiplier - .34 - is derived. That is, the number of housing units generated by the OCS activities of an scenario is equal to new population X .34. (This is the same as population divided by 2.94; it can be seen that this method is very similar to those described in Figure 7.)

Based on the population totals in each scenario and the multiplier described above, the total number of housing units needed in each affected study site over time in that scenario was derived.

V. Students

The number of new elementary and high school students brought into an area by OCS-related activities has also been projected by various studies. Figure 8 arrays those studies and the methods utilized by them. Again, while there is some variance in the methods used, similar results are achieved with each. Here, as in the approach to population and number of new housing units, a multiplier has been used. This study uses a multiplier based on Texas student/population characteristics. Again, 1970 census data has been used to derive the multiplier. In that year, Texas population was 11,195,431, and the total number of elementary and high school students in the State was 2,820,611. Thus, Population x .252 is equal to the number of students. It can be seen that this multiplier is very close to those described in Figure 8.

Figure 8

Survey of Methods of Projecting Number of New Students

	Study	Method
1.	Mid-Atlantic-Regional-Study, Woodward-Clyde Consultants, 1975.	Employment X .75 = No. of Students
2.	OCS Oil and Gas: An Environmental Assessment, CEQ, 1974.	Population X .25 = No. of Students

Figure 8 cont.

Study	Method
3. State of Virginia (as described in Effects of Offshore Oil and Natural Gas Development on the Coastal Zone, U.S. of Representatives, Ad Hoc Select Commitee on Outer Continental Shelf, 1976.	Population X .2625 = No. of Students

Based on population totals and the multiplier described above, the total number of new elementary and high school students in each affected study site over time in that scenario was calculated.

Aggregation of Primary and Indirect Water Requirements For All Phases

Primary and indirect water requirements of all phases of any scenario for all affected study sites and over time are aggregated by totaling primary water requirements and indirect water requirements.

Aggregation of Study Site Tax Revenues For All Phases in Each Affected Study Site

Total study site tax revenues generated in each affected study site by the exploration, development, and production phases are determined by totaling primary tax payments to local governments and indirect tax payments to those units of government.

Primary tax payments to all levels of government (federal, state, and local) in each affected study site from the exploration, development, and production phases of any scenario were calculated earlier. Those revenues were calculated by using the tax payment coefficients of the OCS Model (see

Appendix E). At this point, the primary tax payments to local governments only are extracted from those total tax payments. Again, this is done by using local tax payment coefficients of the OCSOG Model. Using those coefficients, primary local tax payments are derived for each affected study site over time. They are added to indirect local tax payments to derive total local tax revenue over time in each affected study site.

Identification of Significant Infrastructural Issues

The study methodology (Appendix A) specifies that for each affected study site of each scenario domestic and municipal water requirements and residential land be calculated, and that the significant infrastuctural impacts be identified.

I. Domestic and Municipal Water Requirements

The computation of domestic and municipal water requirements over time in each scenario is based on the postulated amount of new population in each affected study site and an average per capita water demand coefficient. That coefficient was multiplied by the new population to derive total new domestic and municipal water requirements.

II. Residential Land

The approach used to calculate the amount of land required for the new housing units involved two steps. First, new residence occupancy trends were compiled for each affected study site based upon interviews with appropriate city planners and chambers of commerce in each region. The new occupancy trends were expressed for each region as the percent of new occupants residing in apartment units, single family units, and mobile home units. Those figures reflect the influence of migration within the region and new immigration, housing availability, and type of housing preference.

Secondly, the land requirement per housing unit was estimated for each affected study site based upon city zoning requirements and interviews with the Texas Apartment Association and the Texas Real Estate Research Center. These acreage requirements per unit of housing of each type subsume the proportion of parking space, open space, and onsite access roads as well as the land of the housing unit itself.

Finally, new residential land requirements for new housing units were derived by multiplying the number of projected new housing units by the percentage of new occupants which reside in apartments, by the percentage which reside in single-family dwellings, and by the percentage which reside in mobile home parks. The results are a number of new apartment units, single-family dwellings, and mobile homes. Each one of those was multiplied by the appropriate acreage requirement.

For example, assume that in study site X:

1. New occupancy trends are such that 55% of new residents reside in apartment units, 25% in single-family dwellings, and 20% in mobile homes; and

2. The acreage requirements for apartment units is .05, for single-family dwellings is .20, and for mobile homes is .10; and

3. The number of projected new housing units is 80. The acreage required for new apartment units, then, would equal 80 x.55x.05, or 2.2 acres. The acreage required for single family dwellings would equal 80 x.25x.2, or 4 acres; for mobile homes, 80 x.2x.1 or 1.6 acres. Total residential acreage requirement, then, would equal 2.2 + 4 + 1.6, or 7.8 acres.

III. Significant Infrastructural Issues

The study methodology (Appendix A) specifies that when the requirements for land, water, and personnel and the number of new residents, new housing units, and new students generated by an OCS scenario are calculated for each affected study site over time, the significant infrastructural issues facing each affected study site are to be isolated. A significant infrastructural issue was identified when the OCS-generated demand on an infrastructural service (water, sewage, police protection, etc.) could potentially supercede a unit of government's capacity to provide that service. For example, if every city in any affected study site is currently experiencing maximum or near-maximum demand on sewage treatment facilities, any increase in population brought about by an OCS scenario will make sewage treatment a significant issue.

Any list of services provided by a unit of government would, of course, be lengthy. To survey each and every one to determine if it could be a significant ssue would have been an undertaking of immense proportions. Thus, only the major infrastructural issues were surveyed here. They are:

1. Administrative/Financial Capabilities;
2. Housing;
3. Water Demand;
4. Sewage Collection and Treatment;
5. Solid Waste Collection and Disposal;
6. Crime Prevention;
7. Fire Protection;
8. Recreational Facilities;
9. Health Facilities; and
10. Educational Services.

It can be seen that the list was kept relatively short; to include any of the lesser issues would have entailed an ever-increasing investment of resources for an ever-diminishing return in terms of insight into a unit of government's capacity to absorb impact. While the list is brief, however, it includes virtually every major issue faced on an ongoing basis by the governments of affected study sites.

The list of issues (above) is a list of "candidate" issues only. That is, not every one of them was considered significant in each affected study site. To determine which of those candidate issues were to be called significant issues in any given study site, a technique for determining the study site's capacity to handle each of those issues was devised.

First, for each candidate issue, one or more indicators of a government's ability to handle that issue were established. For example, the indicators used for the assessment of a study site's capacity to provide health services to any increase in population generated by OCS activities were the number of hospital beds and the number of physicians. Each candidate issue and the indicators for each issue are listed in Figure 9.

After candidate issues and the indicator or indicators for each were established, standard measures for the indicators were used as a basis of comparison with a government's current or future capacity to deal with that issue. For example, the standard measure for the number of police officers (the indicator for the candidate issue, Crime Prevention) is one officer for every 800 residents. That standard measure was obtained from the Texas Commission on Law Enforcement Officers Standards and Education. Figure 9 reveals, where applicable, the standard measure used for each indicator and the source of that indicator.

After candidate issues, indicators, and standard measures were established, the units of government within an affected study site were analyzed in terms of their current capacity to meet those standard measures for each indicator for the purpose of identifying significant issues. For example, if a unit of government currently has one police officer for every 700 residents, crime prevention was not identified as a significant issue since the standard measure used was 1/800. If, on the other hand, a government's current ratio is lower than 1/800, crime prevention was identified as a significant issue.

Figure 9

Infrastructural Issues, Indicators, and Standard Measures

Issue	Indicator	Standard Measure	Source of Standard Measure
1. Administrative/Financial Capabilities	a. Assessed Valuation/ General Obligation Bonds	a. 10/1 Ratio	a. State Law or City Charter
	b. Ratio of Assessment	b. Maximum of 100%	b. State Law
	c. Tax Rate	c. Cities With Less Than 5,000 Population: $1.50 Cities With More Than 5,000 Population: $2.50	c. State Law
2. Housing	a. Vacancy Rate in County for Rental Units/ Homes	a. NA*	a. NA*
	b. Construction Rate	b. NA*	b. NA*
3. Water Supply	a. Maximum Daily System Capacity/Maximum Daily Use	a. NA*	a. NA*
	b. Storage Capacity	b. 100 Gallons Per Person	b. TWQB*
4. Sewage Collection	a. Maximum Daily Capacity/Maximum Daily Use	a. NA*	a. NA*
5. Solid Waste Collection and Disposal	a. Existing Solid Waste Disposal Site Acreage	a. One Acre Per 3,900 Residents	a. TWQB*
6. Crime Prevention	a. Number of Police Officers	a. One Per 800 Residents	a. TCLEOSE*
7. Fire Protection	a. Number of Firefighters	a. One Per 1.800 Residents	a. TML*
	b. State Insurance Board Fire Rate	b. $.40 Per $100 Valuation	b. State Board of Insurance
8. Recreational Facilities	a. Number of Parks in Immediate Vicinity	a. Metropolitan Areas: .267 parks per 1000population. Cities: .465 parks per 1000 population. Towns: .511 parks per 1000 population	a. State Averages
	b. Acreage of Parks	b. Metropolitan Acres: 6.9 acres per 1000 population. Cities: 9.8 acres per 1000 population. Towns: 7.4 acres per 1000 population.	b. State Averages
9. Health Facilities	a. Number of Hospital Beds	a. One Per 225 Residents	a. TDHR*
	b. Number of Physicians	b. One Per 1,500 Residents	b. TDHR*
10. Educational Services	a. Student/Teacher Ratio	a. 16.35/1	a. State Average

* NA = Not Applicable
TWQB = Texas Water Quality Board
TCLEOSE = Texas Commission on Law Enforcement Officer Standards and Education
TML = Texas Municipal League
TDHR = Texas Department of Health Resources

While the indicators used in this study are necessary in the identification of infrastructural issues, they may not in all cases be sufficient to define the acuteness of the problem at issue. Therefore, the identified issues, as described above, were discussed with appropriate administrators, planners, and managers in the affected local government, for the purpose of verification and qualification as well as to recognize issues of concern which would not be diagnosed with the indicators used.

State and Local Economic Analysis

State and local governments will feel the impact of OCS development primarily through rising tax revenues and infrastructural costs, the former due to increased employment and income, and the latter as a result of expanded demand for public services. Consequently, the economic analysis focused on these fiscal effects. Specifically, the analysis explored the infrastructural impacts, in addition to costs, of the special infrastructural issues identified for each affected study site; evaluated the infrastructural costs to state and local governments; and compared these costs with the expected tax revenues to determine anticipated budgetary surpluses or deficits over time and to identify the net fiscal impact of each activity on each region.

1. Infrastructural Impacts Associated With Significant Infrastructural Issues

The Study Methodology Task, "Identification of Significant Issues," isolated those infrastructural elements in each affected study site of each scenario which could be significantly affected by the scenario's activities. Unlike the analysis of impacts on operating costs, which involve the addition of new residents to current infrastructural systems which have the capacity to absorb more demands, the analysis of significant infrastructural issues raises the possibility that large-scale, capital expenditures may be required to provide the additional needed services.

It is not clear, however, that because a study site reveals, for example, a need for expanded health services when the infrastructural capacity indicators of this study are applied, that the affected study site will undertake the construction of a new hospital or the expansion of an existing one or any other large-scale capital investment. Between that kind of large capital investment (which would significantly affect the fiscal analysis contained in the following pages) and a decision to "make do" with existing facilities, there exists an infinite number of short-term, non-capital-intensive solutions. A discussion of some of those solutions is contained in the Executive Summary Volume.

II. Infrastructural Costs

A key to understanding infrastructural costs to units of government affected by OCS oil and gas development is contained in the per capita service costs to those units of government as they are now constituted. That per capita cost can be multiplied by the number of anticipated new residents to obtain a figure which represents an increase in costs of providing services to those new residents. For example, if City A's expenditures are $14,500,000 annually and its population is 57,000, City A's per capita annual expenditure is $254. If the population of City A were to increase by 550 persons, one could reasonably expect that, all other things being equal, City A's annual expenditures would increase by $139,700 (550 x $254). Such a procedure, of course, assumes that an increase in population is the primary factor which leads to increased expenditures. It is likely that other variables also influence the level of expenditures - geographical size of the governmental unit, government regulations, and employment statistics are just three examples. But when those intervening variables are held constant, as this procedure assumes, increase in population becomes the dominant variable.

This procedure incorporates these additional assumptions:

1. The cost of providing services to the existing population and the cost of providing services to an increase in population (marginal cost) are comparable. While there is some evidence to indicate that service costs at the margin are greater than ongoing costs, this procedure assumes that a unit of goverment's annual expenditures for physical plant and operating costs can absorb an increase in population at the same per capita rate.

2. All expenditures of a unit of government can be expressed meaningfully in, and are therefore included in, the cost per capita figure. (For a complete discussion of infrastructural cost models, see Appendix F.)

In order to derive governmental costs per capita in any affected study site, the following data (sources are in parentheses) were collected.

1. The study site's 1972 population estimate (U.S. Department of Commerce, Bureau of the Census; Series P-25, No 535; November, 1974).

2. Total expenditures of local governments within the study site for Fiscal Year 1972 (U.S. Department of Commerce, Bureau of the Census; 1972 Census of Governments, Volume 4, Numbers 3,4, and 5; October, 1974). Expenditures, both capital outlay and operating expenses, for the following categories were included in the total: (Intergovernmental revenues were subtracted from direct general expenditures.)

a. Education;
b. Highways;
c. Public Welfare;
d. Hospitals;
e. Health;
f. Police Protection;
g. Sewerage;
h. Sanitation other than sewerage;
i. Parks and Recreation;
j. Natural Resources;
k. Housing and Urban Renewal;
l. Corrections
m. Libraries;
n. Financial Administration;
o. General Control;
p. General Public Buildings;
q. Interest on General Debt; and
r. Other and Unallocable

3. Total expenditures of the state government within study site for Fiscal Year 1973 (State of Texas, Legislative Budget Board; State Agency Expenditures By County Fiscal Year 1973; April, 1974). Only State dollars, not Federal dollars funneled through state agencies, were included.

When the per capita annual expenditure data was applied to the projected increases in population over time in each affected study site of each scenario, costs to local, county, and State governments were calculated. These cost estimates were derived by multiplying the projected population figures by the appropriate per capita annual service cost. The cost to local governments were calculated inclusive of county government expenditures.

III. Fiscal Impact

The cost data present an incomplete picture of the two-sided fiscal impact; they must be subtracted from the corresponding tax revenues to show the net gains or losses to government treasuries from OCS development. This was also done to calculate the resulting tax revenue surplus or deficit for both local and State governments. (The process by which the fiscal impact is determined is distilled to a form readily usable by local officials in "Local Fiscal Impact Assessment", below.)

Because the revenues flow over a time span of the scenario, the surpluses or deficits were discounted to present value and presented for the local governments and for the State government.

The discounting process is based on the fact that the farther in the future a given dollar receipt or outlay is, the less it is worth today because of the positive market rate of interest. For example, at 6% interest one could set aside $1 today, and it will grow to $1.06 within the year. Hence, the present value of $1.06 payable a year from now is $1. To paraphrase a trite expression, the present value of two birds in the bush is one in the hand.

Of course, the key to determining present value is in the choice of the interest rate, a problem which can be considered from two perspectives:

1. The rate currently received on investments maturing at the end of the time period could be used as an approximation of the value presently placed by the market on receipts received at that future time.

2. The rate paid on bonds issued by government units maturing at the end of the scenario period could also be used. This would be especially appropriate if a flow of funds out of rather than into the treasury were anticipated.

This study weighed bond rates more heavily in choosing an interest rate of 6% for these reasons: first, government units tend to have limited investment funds which are usually channelled into short-term investments; second, the expected fiscal impact, especially on the local level, is one of persistent and increasing deficits, to be most probably financed through higher taxes or additional borrowing.

IV. Local Fiscal Impact Assessment

The impact of OCS development on community coffers is of paramount concern to local government officials. Specifically, they are concerned with this question: by how much will the additional tax revenues due to increased employment and incomes be offset by the increased demand for public services and facilities by new resident employees and their families? Or, in economic terms, does the difference between marginal revenue and marginal cost represent a surplus or deficit to the local government?

An approach whereby a government official can estimate this fiscal impact during any one time period is derived and outlined below. It is a simplification of the process used in this study rather than a step-by-step duplication. While the final totals may insignificantly vary, the expected differences between the two approaches should not change conclusions drawn as a result of either analysis. Use of this method for successive time

spans should provide the manager with an indication of the probable fiscal impact and hopefully facilitate the amelioration of any deleterious effects.

The process utilizes these data:

1. New employment, E, associated with various exploration, development and production activities. Each direct activity is indicated by subscript i, where i = 1...n. In addition to these direct activities, all indirect activities are grouped as one further category, indicated by i = n+1. Thus, E_{n+1} is new indirect employment.

2. Direct (M_D) and indirect (M_I) tax multipliers for each direct activity, estimating tax revenue per employee per year. These are obtained from the individual scenario analyses.

3. Percentage of employed who are new residents of the area (N) by activity or as a percentage of total new employment.

4. New population as a multiple of new resident employment. This study assumes that each new resident will increase population by 2.7.

5. Per capita local government cost (C_p) .

In addition, let I = fiscal impact
R = tax revenue due to OCS development
C = local government cost

Then, $I = R - C$. (1)

A positive value indicates a surplus; a negative value shows a deficit.

For activity i, the new tax revenue is the product of new employment and the annual tax payment per employee. That is, on an annual basis:

$$R_i = E_i M_{Di} + E_i M_{Ii}$$

$$= E_i (M_{Di} + M_{Ii}) \quad .$$

Let $M_i = M_{Di} + M_{Ii}$.

Thus, $R_i = E_i M_i$.

For n activities, annual $R = \sum_{i=1}^{n} E_i M_i$.

Since the tax payments due to indirect employment are taken into account by the indirect multiplier, to include E_{n+1} would result in doublecounting. Thus, payments are summed only for the direct activities.

To determine tax payments for time spans other than one year, let T = time in months.

$$R_T = T/12 \sum_{i=1}^{n} E_i M_i \quad . \qquad (2)$$

The increased cost for activity i is the product of the expected population growth due to activity i and per capita government cost.

$$C_i = \text{new population} \times C_p \quad .$$

New population is number of new residents ($E_i N_i$) times the projected population increase per new resident employee (2.7).

Thus, $C_i = 2.7 E_i N_i C_p$.

Let $A = 2.7 C_p$ (a constant) ,

Therefore, $C_i = E_i N_i A$.

For n direct activities, annual $C = \sum_{i=1}^{n} E_i N_i A$.

Unlike tax payments, the cost to the local government due to increased resident indirect employment is not taken into account through a multiplier and thus must be explicitly included.

Thus, total annual $C = \sum_{i=1}^{n+1} E_i N_i A$.

For T months, $C_T = T/12 \sum_{i=1}^{n+1} E_i N_i A$. (3)

Substituting (2) and (3) into (1):

$$I_T = T/12 \sum_{i=1}^{n} E_i M_i - T/12 \sum_{i=1}^{n+1} E_i N_i A$$

$$= T/12 \left(\sum_{i=1}^{n} E_i M_i - \left(\sum_{i=1}^{n} E_i N_i A + E_{n+1} N_{n+1} A \right) \right)$$

$$= T/12 \left(\sum_{i=1}^{n} E_i (M_i - N_i A) - E_{n+1} N_{n+1} A \right) \quad . \qquad (4)$$

Because the percentage of the employed who will be new residents varies among activities, this method assumes that N can be determined for each activity and for the indirect employment. If this is not the case, an estimate of total employment will suffice. In equation (4), N would then be a constant.

An Example

The process might best be understood through an example. For illustrative purposes, 9 direct activities are assumed; that is, n = 9. The n+1 activity is an estimate of indirect employment. Values for E, M_D, M_I, and N are shown in columns 2,3,4, and 6 respectively of Figure 10. In addition, let C_p = $402, population per resident employee = 2.7, and T = 3 months.

The following steps may be easily followed to determine the fiscal impact:

1. Add M_D (column 3) to M_I (column 4) for each of the n activities to get the total tax multiplier M (column 5). This shows the total tax revenue per new employee per year for each direct activity.

2. Multiply N (column 6) by A, where A = $2.7C_p$. In this example, A = $1085.4 = 2.7 X $402. The results show local government cost per new employee per year (column 7).

3. Subtract cost per new employee per year (column 7) from tax revenues per new employee per year (column 5) to determine the net fiscal effect per employee per year of each activity (column 8).

4. Multiply column 8 by the number of employees (column 2) to derive the net fiscal impact per activity. In our example, only helicopter service provided the local treasury with a surplus. That is, it was the only activity which more than covered the additional costs incurred by the city in servicing the new population.

5. Sum column 9 to show the annual fiscal impact of the direct activities. This result is the term

$$\sum_{i=1}^{n} E_i(M_i - N_iA).$$

6. To show total fiscal impact for 3 months, use the results of step 5 and equation (4).

Figure 10

ILLUSTRATIVE USE OF LOCAL FISCAL IMPACT APPROACH

1	2	3	4	5	6	7	8	9
n ACTIVITY	EMPLOYMENT E	DIRECT TAX MULTIPLIER M_D	INDIRECT TAX MULTIPLIER M_I	TOTAL TAX MULTIPLIER $M=M_D+M_I$	NEW RESIDENTS AS PERCENTAGE OF EMPLOYED N	LOCAL GOVERNMENT COST PER EMPLOYEE PER YEAR* NxA	NET FISCAL EFFECT PER EMPLOYEE PER YEAR M-NxA	ANNUAL FISCAL IMPACT E(M-NxA)
1. Drilling Contractor	95	37	216.93	253.93	45%	488.43	- 234.50	-22,277.50
2. Helicopter Service	4	2,465	175.77	2,640.77	60%	651.24	+1,989.53	+ 7,958.12
3. Boat Service	48	210	83.65	293.65	60%	651.24	- 357.69	-17,164.32
4. Well Logging	10	194	144.17	338.17	60%	651.24	- 313.03	- 3,130.30
5. Diving	11	108	144.37	252.37	60%	651.24	- 398.87	- 4,387.57
6. Cement	12	180	173.43	353.43	40%	434.16	- 80.73	- 968.76
7. Mud	13	203	193.62	396.62	40%	434.16	- 37.54	- 488.02
8. Oil Field Supply	32	258	166.62	424.62	40%	434.16	- 9.54	- 305.28
9. Pipeline	0	1,000	573.12	1,573.12	45%	488.43	+1,084.69	0.00
Indirect	47	-	-	-	50%	542.70	-	-
TOTAL								-$40,263.63

* In this example, A = addition to population per resident employee multiplied by per capita government cost.
= 2.7 ($402)
= $1,085.40

$$I_T = T/12 \left(\sum_{i=1}^{n} E_i(M_i - N_iA) - E_{n+1}N_{n+1}A \right) \qquad (4)$$

$$= 1/4 \left(-\$40,263.63 - (47)(.5)(\$1,085.4) \right)$$

$$= -\ \$16,442.63 \quad .$$

Besides showing the total impact, this approach is useful in that it identifies the fiscal impact of each activity.

The formula described above is readily adaptable to a sensitivity analysis of results simply by varying any of its terms. Five terms are used in the analysis: number of new employees, new resident employees as a percentage of total new employees, new population per new resident employee, tax multipliers, and per capita government cost. Any or all can be varied to determine the effect that a higher or lower value may have on the expected impact. For instance, per capita cost was estimated at $402 in the above example. City officials could readily assess the fiscal impact of OCS activities when per capita government cost is, for example, $500, by merely working through the process using $500 as the value of Cp. Similarly, if fewer resident employees as a percentage of new employees (N) but more people per new resident employee (3.5, for example, instead of 2.7) were expected, the impact could be estimated simply by substituting the new values.

Although the process may be computerized, the approach is straightforward enough to require only a pocket calculator. An inherent advantage of the computer, of course, is that once the program is written, new impact estimates may be derived by merely changing input data. This may save a considerable amount of time if many impact assessments under differing conditions are desired.

4. METHODOLOGY F: ENVIRONMENTAL IMPACT ASSESSMENT

Introduction

The objective of the environmental impact analysis, as stated in the study methodology (Appendix A) is to describe the environmental effects likely to result from OCS activities as specified and implied in each development scenario. Two background considerations concerning the development of this impact evaluation are important. First, three previous comparable studies were reviewed to illustrate which topics are usually included and which analytic approaches are typically used in such impact evaluations. Given this review of those studies which are exemplary of the state-of-the-art, the procedure to be used and the topics to be included in this analysis were described, and the scope of this analysis was defined.

I. Previous Studies

Identification and Analysis of Mid-Atlantic Onshore OCS Impacts, prepared for the Middle Atlantic Governor's Coastal Resources Council by Research Planning Associates, presents a comprehensive critique of the scope and methodologies applied in studies which are germane to this effort. In particular, two documents are especially of note: Mid-Atlantic Regional Study (Woodward-Clyde Consultants, 1975) and OCS Oil and Gas: An Environmental Assessment (Council on Environmental Quality, 1972). Petroleum Development in New England (prepared by Arthur D. Little, Inc. for the New England Regional Commission, 1975) presents alternative study procedures at a more general regional scale then the two previous citations.

In summary, land use impacts and impacts on air and water quality are the most extensively described environmental aspects of OCS development. The most widely used procedure for estimating land use impacts is to compare specified land requirements against an inventory of available and suitable land. The air and water quality impact assessment procedure is commonly represented as adding emissions and water loadings onto base levels, to detect possible violation of standards. Other aspects such as impacts on fragile ecosystems were treated qualitatively, as a perspective on the actualization of onshore OCS development. These are, in general, the topics and approaches which were used in this study; they are described in greater detail below.

II. Relationship of Environmental Impact Assessment Elements

As seen in the study methodology, Tasks F2, F3, and F4 (General Environmental Impact Evaluation, Special Environmental Issue Analysis, and Environmental Impact Assessment, respectively) describe and summarize the environmental effects of each described OCS scenario. Task F1, Environmental Impact Matrix Development, completed only once, is an input into Tasks F2 and F3. It serves as a reference checklist of the range of actions and impacts which may be considered in an impact assessment.

The General Environmental Impact Evaluation, Task F2, analyzes and describes the impacts of the direct and indirect OCS generated activities, as described in the exploration, development, and production phases of each scenario description. The analysis was made in terms of direction, magnitude, and importance of principal types of environmental change.

There are, however, other important aspects of environmental impact to consider in addition to those of activities directly described in other parts of this report. These were separately analyzed in Task F3, Special Environmental Issue Analysis. This separate consideration is more loosely tied into scenario evaluation, and is an effective means to describe secondary environmental effects, OCS effects on features already recognized as problems in a study area, and impacts on sensitive environmental items of significant resource value to the State of Texas and the nation.

The preparation of an environmental assessment, Task F4, provided a context for coordination and synthesis of the analysis of impacts described in Tasks F2 and F3. It summarizes the principal categories of environmental impact.

Environmental Impact Matrix Development

The Environmental Impact Matrix developed in this study is a categorical listing of possible environmental impacts of OCS-related actions. The matrix serves as a checklist or reminder of the full range of actions and impacts to be considered in the preparation of the General Environmental Impact Evaluation, the Special Environmental Issue Analysis, and the assessment of offshore environmental impacts.

In this context, the Environmental Impact Matrix does not include a numerical assessment of either the magnitude or importance of any impact. Such assessment was made for each scenario in the general impact evaluation and the special issue analysis. The impact matrix does not take into account any mitigational measure which may reduce or remove adverse impact, or enhance beneficial impact. Although the inclusion of an impact in the matrix assumes an action's compliance with environmental standards regulations, it is not assumed that such compliance precludes environmental impact.

The characteristics and conditions of the environment may effect the location, magnitude, and timing of OCS actions offshore and onshore. This inverse relationship was not considered in the development of the environmental impact matrix. This relationship involves the process of mitigating adverse impact and, hence, was beyond the scope of this section.

The format used in developing the OCS Environmental Impact Matrix was based upon A Procedure for Evaluating Environmental Impact, a two-dimensional matrix model prepared by L. Leopold of the U.S. Geological Survey. The activities axis was refined with special reference to types of activities relevant to OCS related development. The environmental effects axis was refined with special reference to types of effects relevant to critical environmental issues. Information contained in Appendix D and in Final Environmental Statements for OCS lease sales provided a basis for refining the proposed activity axis. Growth impact issues identified in case studies conducted by RPC, Inc. (see Figure 11), areas of particular concern nominated by Texas Parks and Wildlife Department (see Figure 12), and environmental problems related to OCS development identified in a natural resource inventory of the Texas coastal area (see Figure 13) were used in refining the environmental effects axis of the U.S.G.S. matrix.

The OCS activities and environmental impact matrix is shown in Figure 14. Axis I, environmental characteristics, includes physical and chemical characteristics, biological conditions, and cultural factors. The physical and chemical characteristics group itemizes water quality by source (I.A.1), air quality (I.A.2), and physical processes (I.A.3). Biological conditions are grouped in two categories, habitat (I.B.1) and unique or sensitive features (I.B.2). While impact on habitat indicates impact on

Figure 11

Growth Impact Issues Related to Natural Resources
(developed in case studies by RPC, Inc.)

1. Scattered housing developments
2. Increased mobile home parks on septic tank systems
3. Incompatible and competing land uses due to lack of suitable land and unrestricted development
4. Urban sprawl
5. Traffic congestion requiring improvement of transportation network
6. Septic tank filter field problems due to inadequate installation
7. Exceeding capacity of water treatment plants results in water quality problems
8. Drainage of surface water lakes to meet water needs
9. Excessive solid waste generation
10. Overuse of sanitary landfill sites
11. Traffic noise pollution
12. Increased dredging and waterway maintenance costs
13. Wildlife habitat damage
14. Excessive usage of outdoor recreational parks and facilities
15. Groundwater pollution from raw sewerage dumps and toxic material runoff from open dumps
16. Rat and insect infestation of open dumps
17. Marshland, reservoir, and channel siltation
18. Upland sheet erosion
19. Reduction of wildlife habitat and fisheries breeding grounds
20. Fish and wildlife mass kill
21. Noise pollution and industrial blight
22. Congestive and incompatible housing development
23. Navigational conflicts
24. Fresh water intrusion into saline areas
25. Saline intrusion into fresh water areas
26. Increase in underwater obstructions
27. Competition for available space
28. Incompatible development on flood prone and hurricane zone space
29. Increase in oil spills and slicks

Figure 12

Justification of Areas of Particular Concern
in the Texas Coastal Zone

(as nominated by Texas Parks and Wildlife Department,
Resources of the Texas Coastal Zone, Coastal Management Program, 1976)

1. Areas of unique, scarce, fragile, or vulnerable natural habitat, physical feature, historic significance, cultural value, or scenic importance
2. Areas of high natural productivity or essential habitat for living resources
3. Area of substantive recreational value or opportunity
4. Areas especially suited to intensive use or development and where developments and facilities are dependent upon the use or access of coastal waters
5. Areas of unique geologic or topographic significance
6. Areas of significant hazard if developed, due to storms, slides, floods, erosion, subsidence
7. Areas needed to protect, maintain, or replentish coastal land or resources
8. Shrimp nursery
9. Finfish nursery
10. Blue crab nursery
11. Oyster Reef
12. Grassflats
13. Marshes
14. Spawning grounds
15. Water exchange passes
16. Freshwater inflow
17. Waterfowl areas
18. Endangered species
19. Fish-eating bird rookeries
20. Muscrat, otter, and nutria habitat
21. Non-game bird watching areas
22. State parks, recreation areas, historic parks, structures, fishing piers, and management areas
23. Urban natural areas
24. Rural natural areas
25. Trails
26. National parks, reserves, refuges

Figure 13

Texas Coastal Area Natural Resource Problems

(Identified by RPC, Inc. as related to OCS development)

1. Urbanization involves competition for land and usual loss of land for agricultural and wildlife habitat uses.
2. Residential subdivisions favoring wooded areas directly impacts wildlife habitat and surface runoff.
3. Increased population growth results in excessive load on recreational facilities, especially those areas with limited access to recreational areas.
4. Municipal growth results in increase in solid and liquid waste generation and overuse of sanitary landfill sites.
5. Air pollution
6. Bay and estuarine pollution results from increased solid waste generation, poor upland waste disposal, increased upland water runoff carrying silts, and indiscriminant use of biocides.
7. Bay water quality is affected by decreasing fresh water supply, poor Gulf water interchange, impairment of circulation by dikes and spoil banks.
8. Endangered species are not sufficiently protected by wildlife sanctuaries.
9. Groundwater developments to satisfy freshwater needs results in loss of groundwater quality, water level decline, subsidence, surface faulting, and increased potential of flooding.
10. Increased OCS activities increased the likelihood of oil spills, the effect of which is dependent upon the geographic location of the spill.
11. Geothermal resource development in the coastal area may have a range of impacts.
12. Excessive and unmanaged recreation on the barrier islands may damage stabilizing vegetation which is difficult to re-establish due to climatic conditions.
13. Several natural coastal hazards may restrict constructive activities in several vulnerable coastal zone locations.

Figure 14

ENVIRONMENTAL IMPACT MATRIX

AXIS I: CHARACTERISTICS AND CONDITIONS OF THE ENVIRONMENT				AXIS II. OCS-RELATED ACTIONS WHICH MAY CAUSE ENVIRONMENTAL IMPACT																												
				A. STAGING AREA		B. OFFSHORE OPERATIONS				C. TRANSPORT							D. PROCESSING & STORAGE							E. INDUCED ACTIVITIES					F. OTHER OR COMMON				
				a. Industrial Sites & Buildings, Yards	b. Piers, Seawalls, Bulkheads, & Marinas	a. Platform Siting	b. Subsea Completions	c. Formation Water Discharge	d. Drill Cutting Disposal	a. Pipeline Installation	b. Channel & Harbor Dredging	c. Spoil Emplacement	d. Trucking	e. Shipping	f. Aircraft	g. River & Canal Traffic	a. Petrochemical Industry	b. Oil Refining	c. Petroleum and Product Storage	d. Energy Generation	e. Stabilization & Oxidation Ponds	f. Stack Exhaust Emissions	g. Industrial Water Discharge	a. Urbanization	b. Auto Traffic	c. Solid Waste Disposal	d. Residential-Municipal Wastewater Treatment	e. Subdivision Development	a. Oil Spills	b. Surface Water Diversion	c. Ground Water Withdrawal	d. Surface Paving	e. Highways & Bridges
A. PHYSICAL & CHEMICAL CHARACTERISTICS	1. Water Quality	a. Surface									/	/				/				/			/				/		/				
		b. Ground																			/					/	/				/		
		c. Ocean or Bay			/			/	/	/	/			/		/							/				/		/			/	
	2. Air	a. Air Quality											/		/		/	/		/		/			/	/			/				
	3. Processes	a. Flooding			/						/	/												/				/				/	/
		b. Erosion, Deposition			/						/	/																/				/	/
		c. Subsidence																													/		
		d. Surface Faulting																													/		
		e. Freshwater Inflows to Bays									/												/							/			
		f. Bay - Gulf Water exchange & Circulation			/					/	/	/																					
B. BIOLOGICAL CONDITIONS	1. Habitat	a. Woodlands																		/								/					/
		b. Savannah-Prairie	/												/									/				/				/	/
		c. Grassflats	/	/						/		/				/			/					/					/			/	/
		d. Marsh	/	/						/		/				/			/					/						/			/
		e. Benthic (Ocean, Bay) Substrate				/		/		/	/	/																	/				
	2. Unique or Sensitive	a. Marine Food Web			/		/	/		/	/	/																	/				
		b. Fishing Bank			/	/	/	/		/	/																		/				
		c. Coral Bank			/	/	/	/		/																			/				
		d. Oyster Reef								/	/	/															/		/				
		e. Spawning and Nursery Grounds		/						/	/	/											/				/		/				
		f. Bird Rookeries		/						/		/				/								/	/			/	/			/	/
		g. Waterfowl Areas		/						/		/												/					/			/	
		h. Endangered Species								/		/	/		/							/	/	/					/				/
		i. Barrier Islands								/		/													/	/	/					/	/
C. CULTURAL FACTORS	1. Human Utilization	a. Industrial	/																					/									/
		b. Residential	/																					/	/	/	/	/				/	/
		c. Cropland	/														/	/	/	/	/			/		/	/	/				/	/
		d. Rangeland-Pasture	/														/	/	/	/	/			/		/	/	/				/	/
		e. Wilderness or Open Area	/	/																				/				/	/				/
		f. Soil Quality Contamination										/									/		/				/	/	/				
		g. Commercial Fishing		/	/	/				/				/															/				
	2. Human Interest	a. Game Areas											/		/									/	/				/				/
		b. Sport Fishing		/	/	/			/	/		/		/									/				/		/				
		c. Gulf Beaches		/						/															/				/				
		d. Formal Parks	/																			/		/	/								/
		e. Urban or Rural Natural Areas	/	/																				/	/	/	/	/				/	/
		f. Wildlife Refuge								/		/		/	/							/		/	/				/				
		g. Historical and Archeological	/	/	/	/		/				/												/								/	/

the general environmental quality for the biota occupying each habitat, environmental features of special importance may be separately considered. Cultural factors include land or water use (I.C.1) and recreational and human interest features (I.C.2).

Axis II, OCS-related actions, is divided into direct causes of impact and induced activities which may cause impact. In addition to OCS actions in staging operations (II.A), offshore operations (II.B), transport operations (II.C), and storage and processing operations (II.D), induced actions (II.E) resulting from local population and municipal growth may have environmental effects. Some of the effects of population growth might occur without OCS development, but as they will be associated with increased OCS activity, these subsidiary activities must be included herein.

The number of actions listed horizontally on Axis II is 30 and the vertical list of environmental characteristics contains 38, which give a total of 1140 possible interactions. Within such a matrix only a few of the interactions would be likely to involve impacts of such magnitude and importance that they deserve comprehensive evaluation. The most efficient way to use the matrix is to check each aspect of OCS-related development and to read down the list of environmental characteristics which have previously been found to be possibly effected. By considering the effects of each of the six action categories in turn, the general environmental assessment and special environmental issue analysis will cover the full range of OCS developmental impacts by sector of operation.

The OCS-related actions have been specified to indicate first-order causes of environmental effects. For example, channel dredging (II.C.b) and spoil emplacement (II.C.d) refer separately to the physical disruption of the channel bottom and resulting turbidity and to the disruption of adjacent areas caused by associated spoil emplacement, although both channel dredging and spoil emplacement might be grouped under channel maintenance.

The impacts of possible actions as indicated by a slash in the respective boxes are not always comparable. Impacts may be registered with different expected magnitude and importance. Various impacts also may vary in that some may be seasonal, short-term, or long-term impacts. Again, this matrix only serves as a checklist for evaluating the extent and duration of environmental impact.

Any of the identified actions which cause impact can be expanded to produce secondary matrices which may cover greater detail for the purpose of evaluation of impact. For example, Figure 15 is an expanded impact matrix showing subactions included in pipeline installation in the coastal wetlands, and ecological descriptions within just two effected environmental characteristics from Figure 14.

FIGURE 15

Expanded Impact Matrix of Pipeline Installation

		Pipeline Installation			
		ditching	filling & berming	station sites	access roads
Bay Water Quality	turbidity				
	pH				
	trace metals				
Marsh Habitat	direct loss of space				
	nesting sites				
	migration corridors				

Finally, it is necessary to clarify similarities between the classified environmental conditions on the impact matrix. Land as a habitat condition (I.B.1) is different from land use as a cultural factor (I.C.1). The change in land use from cropland to residential subdivision affects the biological use of cropland as a habitat, and affects the economic, physical, and social aspects of this land use: crop production, soil stability, and social ties to the land. Another example is that of barrier islands as a habitat for stabilizing vegetation (I.B.2.i), as a land with restricted suitability for development (I.C.1.e), as an area of recreation and human interest (I.C.2.b.,c.,d.,f), as an area with limited groundwater resources (I.A.1.b.), and as an area prone to natural hazards (I.A.3.a.,b).

General Environmental Impact Evaluation

Four categories of first order effect can be abstracted from the Environmental Impact Matrix: impacts of water use and of land use, and impacts on air and water quality. Activities in the matrix under staging area, transport, storage and processing, and induced activities each have land and water requirements, and some have potential air and water quality impacts. The analytic approach was simplified from that of the "shopping list" of the matrix by using these four generally inclusive categories. The matrix is still useful as a checklist. The four categories are also those commonly used in other studies.

The procedures which were used in assessing impacts within the context of the four categories have been previously reviewed. Modifications of these procedures, as required by available data bases and the defined scope of this study, are presented below.

I. Land

The direct and indirect land requirements are expressed as a percent of the available and suitable land within the study region. Although this procedure does not express relative future competition for such land, it does provide a quantitative perspective which may be part of an accumulated impact on Texas. Current land use is cross-referenced by substrate suitability groups identified by the Bureau of Economic Geology in Environmental Geologic Atlas of the Texas Coastal Zone. The inventory was developed based on point-count density patterns of the land use and physical properties maps. The area included in the inventory comprises the cities in each region, identified in the sub-allocation of OCS requirements

to onshore sites, and the area included in an arbitrary one mile extra-territorial jurisdiction extension of the city line.

Direct OCS industries requiring onshore land development include onshore support units for rigs and platforms (1.5 and 2.5 acres); operations and administrative bases (50 acreas together); helicopter (1 acre), well logging (4 acres), and diving (.5 acres per unit) services; cement (5 acres), mud (4 acres), and oil field equipment (5.5 acres per unit) suppliers. Additionally, docking space is required for exploratory vessels, service boats, and pipeline lay barges and their supply and crew boats. The characteristics of these onshore support units' requirements are similar, consisting of land for office space, warehousing, and service and storage yards. These companies preferably, although perhaps not necessarily, locate near waterway access canals. Construction characteristics would be categorized as "light foundations" requiring substrates of low shrink-swell potential and medium to high loadbearing strength. Obviously, docking space must be sited adjacent to ship channels, in harbors or marinas.

Indirect land requirement values are a total composite of eight use categories: residential and commercial, industrial including railroads and docks, recreation parks, sewage treatment plants, solid waste disposal sites, airfields, water impoundments, and greenbelts and cemeteries. The physical requirements of these eight categories of land use vary (Figure 16) and therefore indirect land cannot be simply treated as one "use" unit as is direct land. The procedure used here to assess the ability of a region to meet indirect land requirements was therefore to qualitatively compare the array of indirect land's physical requirements to substrate-suitability groups in the region. Additionally, the identification of significant infrastructural issues was used to determine if public service-related land requirements may pose a strain on land availability.

II. Water

In the Texas coastal area, water supplies ultimately derive from either surface impoundments or groundwater sources; the proportionate use depends on the climatic and historical development characteristics of particular regions of the coast. The water required under each scenario was assumed to be drawn in the established regional proportion of distribution to surface and ground water sources. The assessment of impacts on ground water supplies was based upon comparative current rates of recharge and withdrawal, and where possible, the estimated volume of fresh ground water available. The impacts on surface supplies were assessed with consideration given to current water use, available supplies, and, where appropriate, to proposed reservoir construction.

Figure 16

Indirect Land Requirements' Characteristics

Indirect Land Uses		Suitable Substrate Groups
1. Residential-commercial	Low shrink-swell, good drainage.	II, III, I
2. Industrial-railyards	High load-bearing strength, low shrink-swell potential, good drainage	II, III
3. Greenbelts & cemeteries	Low slope, moderate shear strength, above high water table level.	NA.*
4. Parks & recreation	Varies with activity, most units satisfactory at some time of year.	I, II, III, IV, V, VI, VII
5. Sewage treatment	Low to moderate permeability depending on disposal practices; foundations as in (2) above.	I, III
6. Solid waste disposal	Low permeability, good surface drainage, above water table.	I
7. Airfields	As in (2) above.	II, III
8. Artificial reservoirs	Low permeability (if supplied by groundwater-high perm.); moderate shear strength; moderate compressibility.	I, III

*Not Applicable

Substrate Group Properties

I. Dominantly clay and mud,low permeability,high water-holding capacity,poor drainage, low shear strength,high corrosivity.
II. Dominantly sand, high to very high permeability, low water-holding capacity, low compressibility,high shear strength,low plasticity.
III. Dominantly clayey sand and silt, moderate permebility,drainage, andwater-holding capacity,low to moderate compressibility.
IV. Coastal marsh, very low permeability, very poor drainage,high plasticity, low shear strength,subject to salt water flooding.
V. Inland swamp and marsh, permenantly high water table, very poor load bearing strength, subject to frequent flooding,high acidity.
VI. Salt marsh,very high corrosivity, subject to frequent tidal inundations, like (V) above.
VII. Made land and spoil, properties variable, mixed mud, silt, and sand.

III. Waste Residuals

Environmental degradation is generally associated with urban centers, industrial activity, or intensive agricultural development. Generated wastes have been described as "resources out of place" (Waste Management in the Texas Coastal Zone (prepared for the ICNRE by Texas A&M University Environmental Engineering Division).

As mentioned before, the assessment of impacts of OCS onshore development on air and water quality is based upon the incremental addition of OCS related waste residuals generation to current levels of pollution. The main focus of this methodological section is on the preparation of waste generation coefficients. These coefficients were multiplied by the postulated levels of employment and/or population to derive the level of waste generation in each scenario over time.

(1) Wastewater return flows - By wastewater return flow is meant that amount of water which has been diverted from either ground or surface water sources, and which, having been used is returned to the natural fluvial system. Reinjection of water into subsurface wells, an increasing practice to abate dehydration of subsurface clays, was not considered. There was no direct industrial water return flow calculated, as the majority of this water is assumed to be disposed of at the OCS platforms. The indirect industrial water return flow coefficient is less than domestic or municipal water return flow. The industrial return flow percentage depends on the use of the water (e.g., cooling vs. process/packing water). The statewide wastewater reuse ratio is 0.69 (Texas Water Development Board, 1968 Texas Water Plan); the ratio tends to be higher in the arid regions and in industries using water mainly for cooling. The industrial return flow coefficient used in this assessment is 0.31, i.e., for every unit of water diverted for indirect OCS requirements, 0.31 units are returned.

A municipal and domestic water return percentage estimate is 58 percent of diverted water, the return flow proportion used by Waste Management in the Texas Coastal Zone, and accepted for use here. These two return flow coefficients were multiplied by indirect industrial and domestic/municipal water requirements over time to produce scenario waste water return flows.

(2) Wastewater effluents, solid waste, and air emissions - The coefficients describing these waste residuals generation were developed on the basis of each scenario's regional waste generation and industrial characteristics. The primary data source used was again, Waste Management in the Texas Coastal Zone. A systematic description of waste generation in direct OCS industries, companies, or activities was not applied here, as their waste characteristics are to an extent specialized and data about these characteristics is unavailable. This waste source is therefore

treated descriptively in the text for each scenario where appropriate.

The following technique was used to develop indirect OCS industrial waste coefficients. The above citation provided waste levels for a hypothetical composite community of 100,000 people which was a representative cross-section of the Texas Coastal Zone. The employment levels of the ten major industrial waste producers in that community (with a total labor force of 6,329), which were also included in this study's OCSOG input/output model, were compared to employment levels of each respective sector reported for each regional Council of Government involved in the scenarios. From this comparison, weighted coefficients of waste generation (units of pounds per employee per month) were derived; they are region-specific. The industries included are listed below.

- Food & Kindred Products
- Lumber and Wood Products
- Paper Products
- Printing and Publishing
- Chemicals and Allied Products
- Petroleum Products
- Primary Metal Products
- Fabricated Metal Products
- Machinery
- Electrical Equipment
- Transportation Equipment

The indirect industrial waste coefficients are presented in Figure 17.

Figure 17

Waste Generation Coefficients

	Indirect Industrial pounds/employee/day			Municipal pounds/capital/day
Applicable Area*	A	B	C	All Regions
Water				
B.O.D.	7.8	10.8	8.1	0.17
T.S.S.	3.8	8.3	10.3	0.2
Solid Waste	53.8	41.7	24.7	8.0
Air	45.6	57.1	10.4	5.87
Particulates	1.6	1.5	0.4	0.4
Gaseous	44.0	55.6	10.0	5.83
SO_x	11.0	13.9	2.5	0.02
NO_x	11.0	13.9	2.5	0.44
CO_x	11.0	13.9	2.5	4.53
H.C.	11.0	13.9	2.5	0.84

* Area A = Regions I, II, III
Area B = Regions IV, V, VI
Area C = Region VII

The municipal/domestic waste generation coefficients for wastewater effluents and solid waste are as reported in Waste Management (p. VI-16). An estimate there of 6 lbs./capita/day as an air emissions coefficient was subdivided in this study into point and non-point sources as shown in Figure 18. Mobile source emissions were based on emissions per vehicle mile reported in Waste Management, a coastal zone average of .65 autos per person from county population and vehicle registration, and an annual mileage per auto within a region of 7,200 miles. It is assumed that an average auto is driven 12,000 miles per year, and that 60% of this travel is within the region in which it is registered. The municipal/domestic waste coefficients as used in this study for all regions are presented in Figure 17.

Figure 18

Subdivision of Municipal Air Emissions Coefficients
(pounds/capita/day)

	Stationary (point)	Mobile (non-point)	Total
Particulates	0.019	0.016	0.04
Gaseous	0.0856	5.737	5.83
SO_x	0.0016	0.015	0.02
NO_x	0.005	0.433	0.44
CO_x	0.055	4.47	4.53
H.C.	0.024	0.819	0.84

Special Environmental Issue Analysis

The study methodology (Appendix A) specifies that secondary environmental effects of OCS-related activity are to be identified. For example, OCS water requirements may have an immediate impact on water supplies, yet if such requirements are met by ground water sources, land surface subsidence may be a possible secondary impact. As previously mentioned, the

Environmental Impact Matrix, Figure 14, only indicates first order causes of environmental effects. These secondary effects are not included in the matrix.

The study of possible environmental effects of various activities may be better compared to a house of cards than to a row of dominoes. Natural interactions produce ramifications in several dimensions rather than in progressive straight-line series. Yet it is clear that some secondary environmental effects are more important than others, either in their own magnitude or in the number of 'environmental cards' dependent upon them. In the "Special Issue Analysis", these obvious and basic secondary effects were identified where appropriate, and their magnitude under the OCS development scenario was assessed.

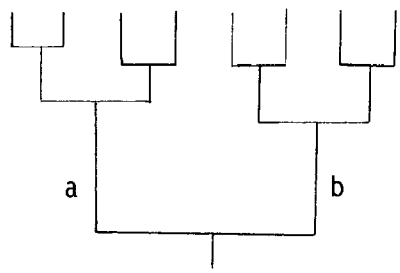
The second required activity in the "Special Environmental Issue Analysis" is to evaluate areas of particular concern. This analytic activity includes further analysis of possible important impacts identified in the "General Environmental Impact Evaluation".

Finally, an evaluation of unique or sensitive environmental features may represent a basically different analytic approach than what was previously used. The "General Environmental Impact Evaluation" and the preceding activities of the "Special Environmental Issue Analysis" were conducted by scanning OCS-related activities to identify possible environmental effects. In this final activity, various areas of environmental significance were scanned to identify what sorts of activities may affect them.

Ninety-one natural areas in the Texas coastal area have been nominated as areas of particular concern by Texas Parks and Wildlife Department (Resources of the Texas Coastal Zone, 1976). The approach in this study to assess possible affects on these natural areas is based upon the grouping, or 'clustering', of these natural areas by their common bases of concern, rather than by geographical location in a study region. This 'similarity clustering' allows the study of each natural group as a unit sharing common characteristics and sensitivities, as well as providing for the study of each different group, or class, of natural areas. Since affects of OCS Scenarios activities cannot be reasonably predicted at, for example, a specific oyster reef, this clustering approach was taken as it is reasonable to describe the types of affects which could affect any oyster reef in a group typified by such natural areas.

Each natural areas grouping is united by common bases of concern, and is distinguished from other groups by a different set of these common concerns. These bases of concern are alsocomparable to the biological conditions elements presented in the "Environmental Impact Matrix". These bases of concern for each natural area group were compared with the possible OCS-related activities which may affect the condition of the natural area, as outlined in Figure 14.

The calculation of similarity groups treats the justifications of particular concern as equally weighted, "presence-absence" data. Each natural area's basis for concern are compared to the basis for concern of every other natural area in each scenario's study regions. If any pair of natural areas both score the "presence" of a particular basis of concern, a positive match is noted; mismatches are noted if one of the pair scores "presence" and the other scores "absence" of that particular concern. Similarity equals the number of positive matches divided by the sum of the number of positive and mis-matches (Jaccard's Similarity Coefficient; see Numerical Taxonomy, Sneath and Sokal, 1973). A similarity matching of 1.0 indicates complete similarity; 0.0 indicates complete distinctiveness. Most similar pairs of natural areas are grouped, then most similar groups are clustered together. Meaningful clusters of natural areas may be recognized by "closest branching" patterns based on the relative length of a "stem" to a "branching point" in the similarity dendrogram.



As seen above, the relative length increases at 'a' and 'b' define the groups. The reliability of this group division may be checked by comparing the similarity and exclusiveness of each group's bases for concern.

For example, Figure 19 presents three critical habitat areas, 10 justifications of concern for all or some of the areas, and a "dendrogram" which relates the similarity of the three habitat areas in terms of their respective reasons for concern. The marshes near the Anahuac National Wildife Refuge and the Robinson's Lake habitat are related at 0.89 similarity units. That group of two habitats is related to the Elmgrove Point habitat at 0.74 similarity units. The sample shows the first pair to be similar on the basis of the 1st, 2nd, and 4th to 9th reasons for concern. The first group is different from the third habitat in the 1st and 3rd reasons for concern.

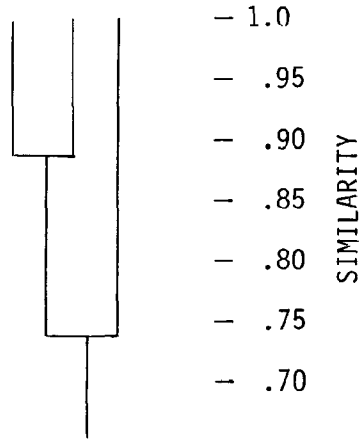
Figure 19

Sample Similarity Analysis

	Marshes near Anahuac National Wildlife Refuge	Robinson's Lake	Elmgrove Pt., East Bay
Areas of vulnerable natural habitat	X	X	
Areas of high natural productivity	X	X	X
Areas needed to maintain coastal resources			X
Shrimp nursery	X	X	X
Finfish nursery	X	X	X
Blue crab nursery	X	X	X
Marshes	X	X	X
Waterfowl areas	X	X	X
Muscrat, otter, and nutria habitat	X	X	X
Non-game bird watching areas	X		

CRITICAL HABITATS

JUSTIFICATION AS AREA OF CONCERN



Preparation of Environmental Assessment

In the previous two sections of the Environmental Impact Analysis, three approaches to evaluating impact were presented. In "General Environmental Impact Evaluation", proportionate increases over current levels were identified for land development, solid waste generation and disposal, water resource commitments, return flow and wastewater loadings, and for air emmissions. In "Special Environmental Issue Analysis", the possible array of secondary effects of land development and water resource development was presented. Finally, possible sources of impact upon natural areas groupings (identified through similarity analysis of clusters) were described.

Where possible, the increase in activities representing or resulting in environmental effects was quantified to express magnitude of impact. Where quantification was not feasible, it was not possible to explicitly describe the magnitude of impact. In all cases an attempt was made to describe the importance of possible effects under scenario development. Importance was recognized with consideration of current regional characteristics and of common sensical expectations of preferable environmental quality. In all areas described in the reports, inclusion in the analysis was an implicit indication that community planners or investigators might further analyze those arrays of environmental effect should scenario activities come to fruition.

The environmental assessment at this point synthesizes the regional environmental impacts seen to be of importance. The overall environmental effects were summarized in terms of principal categories of change, either positive or negative The summarized impacts were indicated for each scenario on the Environmental Impact Matrix for easy comparison of the important categories of effect in the different scenarios.

5. METHODOLOGY G: SOCIAL IMPACT ASSESSMENT

Introduction

The word "social" when used in the term "social impact" has often been used interchangeably with the terms, "socioeconomic", "sociodemographic", "socio-infrastructural", or "socio-environmental". This is, in one sense, appropriate because social impacts are certainly inseparably tied to the economic, demographic, infrastructural, and environmental systems. In another sense, however, this confusion of terms has been unfortunate because it has meant that social impacts, as a set of impacts distinct from all others, have seldom been analyzed separately. Instead, they have usually been assessed only to the extent that impacts on other systems have been assessed.

In this study, "social impacts" are defined as impacts on individual affected persons or groups. By their very nature, then, social impacts grow out of impacts on other systems economic, demographic, infrastructural, or environmental. That is, the social impact assessment of this study attempts to answer the question," given the impacts on systems, what can be said of the impacts on people?"

It is clear from the statement of that purpose, that a social impact assessment of that type would be largely qualitative and would attempt to nominate issues of potential concern. A comprehensive exposition of each social impact and all manifold ramifications or a precise quantification of social effects is not possible. Much more important than an inclusive listing of all potential social impacts and an exact calculation of the nature and magnitude of such impacts, is a general description of who experiences such impacts. In this regard, special emphasis was given to the existing residents of the affected study sites. That is, it was assumed that new residents and commuters will come to a study site because they have anticipated an improvement in the quality of their lives. Existing residents, on the other hand, have not made a conscious decision to reside in an OCS-impacted area; rather, they reside in a study site for reasons of their own, and OCS development has come to them.

It was further assumed that populous, highly developed, and diverse urban centers will absorb social impacts in such a way that impacts on any one individual would be less than is the case in smaller, less diverse cities and towns. Special emphasis, then, has been given to the existing residents of less populous affected study sites.

Social Impact Matrix Development

The Social Impact Assessment Methodology requires an identification of the social effects likely to result from OCS development activity. The social impact matrix developed in accordance with the study methodology (Appendix A) consists of a categorical listing of possible social impacts resulting from OCS-related actions. These social impacts are subdivided into six major "Quality of Life" categories which provide a base for further assessment of the type and magnitude of social impact. The interactions between the Quality of Life Categories and the OCS-related actions are representative of the range of possible actions or impacts to be considered in the preparation of the general social impact evaluation and of the special social issue analysis.

As with the environmental impact matrix, the social impact matrix does not include a numerical assessment of the magnitude, importance, or positive or negative effect of any specific impact. These determinations are made for each scenario in the general impact evaluation and the special issue analysis. Additionally, the social impact matrix does not consider any mitigating measures which may be necessary to reduce or eliminate adverse impact, or enhance beneficial impact.

The format used in developing the OCS impact matrix is based on A Procedure for Evaluating Environmental Impact, a two-dimensional matrix model prepared for the U.S. Geological Survey by L.B. Leopold; and on information contained in this report's description of the "Environmental Impact Matrix Development." Two major factors were considered in the development of this social matrix. The six, major OCS-related activity categories and the twenty-five activity functions were identified through an analysis and consolidation of information contained in Appendix D, in this report's "Environmental Impact Matrix Development", and in a Bureau of Land Management working paper entitled "The Outer Continental Shelf-Oil and Gas Development Process". The six "Quality of Life" categories and the thirty-six social impact factors were derived through an analysis of the growth impact issues identified in case studies conducted by R.P.C., Inc.; rapid growth impact issues identified by the Department of Housing and Urban Development publication entitled Rapid Growth From Energy Projects-Ideas For State and Local Actions, as well as pertinent information from many other relevant social impact reports and studies.

The social impact matrix is shown in Figure 20. Axis I, Quality of Life categories and characteristics, includes demographic, public service, land use, housing, employment, and traditional value and amenity relationships. Two of these major categories are further subdivided into descriptive social elements. Demographic Factors (IA) are grouped into two subcategories-Population Characteristics (IA1) and group cohesion (IA2). Services to People (IB) are divided into four group elements - general

Figure 20

SOCIAL IMPACT MATRIX

QUALITY OF LIFE ACTIVITY CATEGORIES AND CHARACTERISTICS			II. OCS-RELATED ACTIONS WHICH MAY EFFECT SOCIAL IMPACT																										
			A. STAGING AREA		B. OFFSHORE OPERATIONS		C. TRANSPORT ACTIVITIES			D. STORAGE AND PROCESSING ACTIVITIES			E. INDUCED ACTIVITIES							F. COMMON							
			a. Onshore Facility	b. Nearshore Facility (Piers, Seawalls, etc.)	a. Public Hearings on Lease Area	b. Drilling Operations	a. Offshore/Onshore Pipeline Installation	b. Transport Systems (Channel, Harbor)	c. Trucking, Shipping, Aircraft Activities	a. Petroleum and Product Storage Facility Operation	b. Petroleum Refining and Petrochemical Industry	c. Energy Generation	a. Support Industry	b. Subsidiary Enterprises	c. Urbanization	d. Subdivision Development	e. Vehicular Traffic	f. Solid Waste Generation	g. Sewerage Generation	a. Population Increase	b. Industrial Personnel Relocation	c. Local Employment of Industrial Workers	d. Land Area Conversion	e. Preparatory Industrial Activities	f. Offshore/Onshore Permitting Activities	g. Environmental Degradation	h. Construction Activities
A. DEMOGRAPHIC FACTORS	1. POPULATION CHARACTERISTICS	a. Size				/							/	/	/	/				/	/							/
		b. Density												/	/	/				/	/							
		c. Composition													/	/				/	/			/			
		d. Living Conditions of Fixed Income Elderly												/	/	/				/	/		/				/
	2. GROUP COHESION	a. Family Groups													/	/				/	/		/				
		b. Church Groups													/	/				/	/						
		c. Public School Groups													/	/											
		d. Ethnic Groups																		/	/	/					
		e. Formal Associations											/	/	/	/				/	/	/		/			
B. SERVICES TO PEOPLE	1. GENERAL SERVICES	a. Transportation Efficiency & Quality	/	/				/	/	/	/		/	/	/	/	/			/			/			/	/
		b. Water and Sewerage Treatment	/	/						/	/	/	/	/	/	/		/	/	/			/			/	
		c. Recreational Diversity and Quality		/		/									/	/				/						/	
		d. Government Administration Capabilities							/			/			/	/	/	/	/	/				/	/		
		e. Cultural Facilities												/	/	/				/						/	
	2. EDUCATION	a. Availability of Educational Facilities													/	/				/							
		b. Availability of Vocational Programs									/		/		/	/				/							
		c. Quality of Education													/	/				/	/	/					
	3. PUBLIC HEALTH	a. Availability of Health Care													/					/							
		b. Resident Anxiety - Mental Health			/										/	/				/				/			
	4. PUBLIC SAFETY	a. Police Protection	/	/									/	/	/	/	/			/	/	/					/
		b. Crime Rates												/	/	/	/			/	/	/					/
		c. Fire Protection	/	/				/		/	/		/	/	/	/				/							
C. LAND USE FACTORS		a. Development Potential/Land Availability	/	/			/	/	/	/	/	/	/	/	/	/	/			/			/	/	/	/	
		b. Land Development Patterns	/	/			/	/		/	/	/	/	/	/	/				/	/		/		/	/	
		c. Environmental Quality (Reception of)	/	/	/	/	/	/	/	/	/	/	/	/	/	/		/	/				/			/	
D. HOUSING FACTORS		a. Competition for and Quality of Housing Vacancy Rate							/	/	/	/		/	/	/				/	/	/	/				/
		b. Number and Quality of Mobile Home Parks														/				/	/				/		
		c. Density and Clustering of Living Conditions												/	/	/			/	/			/			/	
		d. Availability of Low Income Housing													/	/			/	/					/		
E. EMPLOYMENT FACTORS		a. Opportunities for Women and Minorities						/	/	/	/	/	/	/						/		/					/
		b. Opportunities for Unemployed	/	/		/	/	/	/	/	/	/	/	/						/		/					/
		c. Income Levels	/	/			/	/	/	/	/	/	/	/								/					/
		d. Employment Distribution among Job Categories	/	/		/	/	/	/	/	/	/	/	/	/					/	/	/					
F. TRADITIONAL VALUES		a. Sense of Privacy													/	/	/			/							
		b. Image of Community			/			/	/	/	/	/	/	/	/	/				/	/	/	/	/	/	/	
		c. Predominant Moral Values												/	/	/	/			/	/	/	/				

service (IB1), education (IB2), public health (IB3), and public safety (IB4). The social characteristics identified are those which will generally describe the quality of life of the public health within the sphere of influence of OCS development in the area. The list is not all-inclusive, nor are the factors arranged in order of importance, significance, or magnitude. They represent only the major areas of social concern which may be considered in assessing the impact of OCS activities upon an area or local government.

Axis II, OCS-related actions, is divided into direct causes of impact and induced activities which may result in social impact. In addition to OCS activities in staging operations (IIA), offshore operations (IIB), transport activities (IIC) and storage and processing activities (IID); induced activities (IIE) resulting from local population and municipal growth may have significant social effects upon the OCS-development-impacted area. Many of the effects of population growth would occur without OCS development, but as OCS activity is a component of such growth, these subsidiary activities are included in the social impact matrix. Additionally, continued operation of OCS development activities may constitute an entirely new status quo and way of life.

The number of actions listed horizontally on Axis II is 25 and the vertical list of Quality of Life Characteristics is 36, with a total of 900 possible interactions. However, only a few of the interactions would be expected to involve impacts of such magnitude and importance that they would require a more in-depth comprehensive evaluation. The social impacts will differ in magnitude, importance, and significance among coastal areas, counties and even communities. The characteristic of the impact experienced by each entity or community will depend upon the existing social, economic, and cultural condition of that particular community; upon the people of the community; and upon the timing, magnitude, and overlapping activity from OCS development.

The use of the matrix involves checking across each aspect of OCS-related development and reading down the list of social impact or quality of life characteristics to determine which interaction would effect social change, positively or negatively. Through a consideration of the effects in each of the six activity categories in turn, a full range of OCS development impacts by sector of operation can be determined in the general social assessment and special social issue analysis. The OCS-related activities and the quality of life categories have been specified to indicate first-order causes and effect of social change only. Any of the identified actions which cause impact can be expanded to produce secondary matrices which may cover greater detail for the purpose of finer impact evaluation. For example, Figure 21 is an expanded impact matrix showing sub-activities of subsidiary activities (IIEb) and community image (IFb), as originally presented in Figure 20.

Figure 21

SAMPLE EXPANDED IMPACT MATRIX

Land Development Patterns	downtown deterioration			
	traffic flow congestion			
	non-aesthetic roadside advertisment			
Image of Community	neighborhood relations			
	sense of pace of life			
		shopping mall at city edge	concentrated and fragmented developments along major thoroughfares	construction of commercial establishments
		Subsidiary Enterprises		

The impacts of possible actions are indicated by a slash in the respective boxes at the intersection of Axis I factors and Axis II actions. However, as earlier stated, these impacts may be registered with different expected magnitude and importance and may not always be comparable on a lateral basis. Various impacts also may vary in that some may be short-term or long-term depending upon the OCS development phase activity. As in the Environmental Impact Matrix, this matrix only serves as a checklist for evaluating the extent and duration of social impacts.

General Social Impact Evaluation

A general social impact evaluation was completed for each affected study site of each scenario. Each such evaluation includes a short summary of the existing social characteristics of the affected study site but has as its primary element a description of the nature of the relationsips between the expected OCS-related activities and the associated social effects. The analysis of these relationships was based on the Social Impact Matrix. Each of the six "Quality of Life Categories" on that matrix (Demographic Factors, Services to People, Land Use Factors, Housing Factors, Employment Factors, and Traditional Values) were examined for each affected study site in terms of the changes in those categories likely to be brought about by OCS-related activities. In general, that analysis was largely qualitative and varied in scope and method from one study site to another. Certain elements of the analysis, however, were common to all affected study sites and all scenarios; they are described below.

I. Demographic Factors

Changes in population size and density can easily be expressed as percentage changes. The projected new population associated with each affected study site of each scenario was compared with 1973 Bureau of Census population estimates for the study sites. Population size and density were then expressed as percentages by which those characteristics would change due to OCS-related activities.

II. Services to People

In the methodology task, "Identification of Significant Issues" (see Appendix A), the potentially significant infrastructural (government service) issues were isolated for each affected study site of each scenario.

Using those isolated issues as a basis, the social impacts (as distinct from the administrative, fiscal, or other impacts) of shortages in those government services were assessed. In addition, the social impacts of tax revenue surpluses or deficits associated with any scenario were examined.

III. Land Use and Environmental Factors

Using the environmental impact assessment as a starting point, the social impacts of any significant environmental issue associated with but not limited to land use factors were assessed.

IV. Housing Factors

As in the case of "Services to People" (No.II, above), if housing availability, density, or quality were isolated as significant issues in the methodology task entitled "Identification of Significant Issues," the associated social impacts were assessed. The effect, if any, of OCS development on land and existing housing prices were also described.

V. Employment Factors

Each scenario includes a projection of the number of local residents to be employed in OCS-related activities. It was assumed that all such "resident" employees will be drawn from a pool of currently unemployed persons, and the total number of projected "resident" employees was expressed as a percentage of total number of currently unemployed persons in the affected study site. In addition, the personal income projected to be generated in each affected study of each scenario was compared to the current annual, total personal income within the study sites to determine the percentage by which personal income would change through the addition of the scenario's activities. In a similar manner, OCS-related expenditures were compared to the current level of industrial expenditures in each affected study site.

Finally, it was possible to determine if the activities of any scenario would result in the introduction of new job categories in each affected study site. That is, for each study site of each Scenario, a determination was made as to whether the OCS-related requirements placed on

a study site represented industrial sectors or job categories which had not previously existed in the study site or had existed on a relatively small scale.

VI. Traditional Values

The analysis of impacts on tradional values was largely a consideration of any significant social impacts isolated in the first five "Quality of Life" categories and the extent to which such significant impacts, if any, could be expected to impact such traditional values as image of community, predominant moral values, and sense of privacy.

All of the analyses described above had as their ultimate purpose the identification of any significant social impacts to be analyzed further.

Special Social Issue Analysis

For each of the significant social impacts isolated in the "General Social Impact Evaluation", the magnitude of the impact; the manner in which such impact, if negative, could be ameliorated; and the possible induced social impacts were described. The process by which such an analysis was completed varied from one scenario to another.

Preparation of Social Assessment

Based on the General Social Impact Evaluation and the Special Social Issue Analysis, a composite description of the social impacts of each scenario was developed. That description includes the overall social impacts on each affected study site of a scenario and a summary of the principal categories of social impacts for the total affected area.

6. SUMMARY

The foregoing description is a necessary link between the Study Methodology (Appendix A) and the Scenarios themselves (Parts C,D, and E). While the methodology provides the fundamental framework for the study, it does not describe the actual techniques which were used to complete each methodology task. The preceding analysis does, however, include such descriptions.

In short, the Study Methodology and the processes which were employed to operationalize the methodology are both intended to provide a methodological approach to the assessment of the primary and indirect economic, fiscal, infrastructural, environmental, and social impacts of OCS oil and gas development.

PART C

SCENARIO I

1. INTRODUCTION AND SUMMARY

Scenario I, as described in Part A (see particularly Figure 1), postulates OCS development in a 39-tract area located in the southernmost portion of the High Island East Addition South Extension Area and the northernmost portion of the Garden Banks Area. (see Map 3). The Scenario postulates that:

1. Between the present time and May 1977, a total of 21 tracts will be leased;

2. Twelve of the 21 tracts will undergo exploratory drilling;

3. A maximum of four drilling rigs will be in use at any one time;

4. Seven tracts will undergo development drilling;

5. Eleven platforms will be installed on those seven tracts;

6. A total of 119 development wells will be drilled from those eleven platforms;

7. All seven of the developed tracts will be put into production, and the eleven development platforms will be producing platforms;

8. Three of the eleven platforms will be outfitted with production equipment;

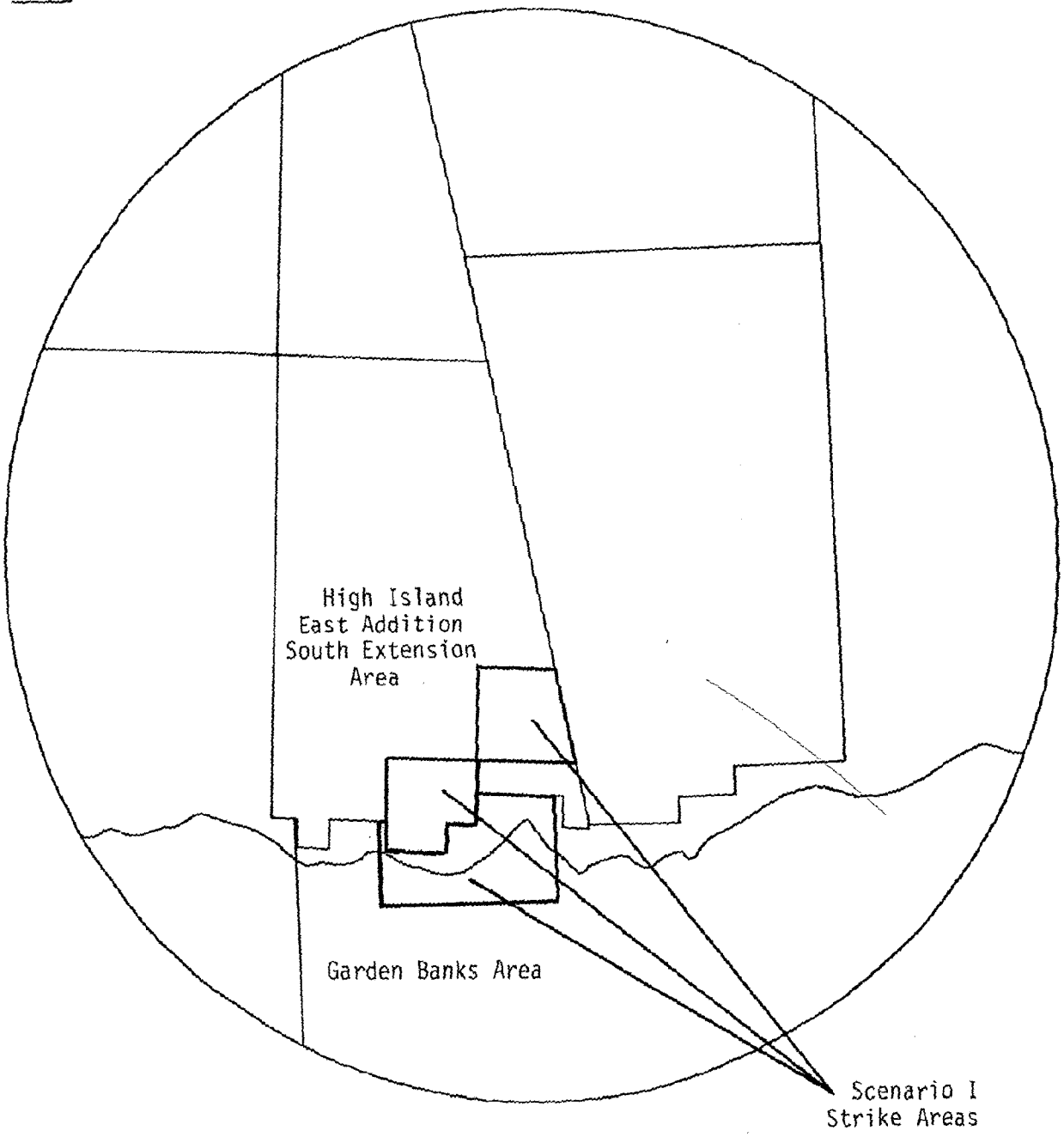
9. There will be one undersea completion; and

10. Peak production will be 297 million MCF of gas annually.

The scenario analysis results in estimated requirements of 2579 direct employees, 388 acres of land, and 9200 feet of docking space (see Chapter 2). The peak demand period is estimated to be the sixth year after exploratory drilling commences (Chapter 3).

The requirements for Scenario I activities are expected to be met in Region I (Orange and Jefferson Counties), Region II (Harris, Galveston, and Chambers Counties), and Region III (Brazoria County). In the peak demand period, 303 direct employees, 87 acres of land, and 600 feet of docking space will be required in the Orange/Jefferson area. In the Harris/Galveston/Chambers area, 1638 direct employees, 287 acres of land, and 7000 feet of docking space will be required. The figures for Brazoria

Map 3 Scenario I



County are 122 direct employees, 8 acres, and 1600 feet of docking space (Chapter 4).

The Orange/Jefferson area requirements are likely to be met in Beaumont, Port Arthur, and Sabine Pass; the Harris/Galveston/Chambers requirements in Houston and Galveston; and the Brazoria County requirements in Freeport (Chapter 4).

When all projected primary and indirect requirements are included, the requirements on the Orange/Jefferson area are estimated to be 224 acres of land; 217.8 acre feet of water; 149 resident employees, 181 new resident employees, and 15 commuters, for a total of 345; 489 new residents, 166 new housing units; and 123 new students.

In the Harris/Galveston/Chambers area the requirements are projected to be 858 acres of land; 1,656.1 acre feet of water; 1023 resident employees, 1132 new resident employees, and 33 commuters, for a total of 2188; 3050 new residents; 1039 new housing units; and 770 new students.

For Brazoria County, the figures are 92 acres of land; 84.65 acre feet of water; 32 resident employees and 98 new residents for a total of 130; 265 new residents; 90 new housing units; and 67 new students. (See Chapters 5 and 13 for land requirements; Chapters 6 and 12 for water requirements; Chapter 7 for employment, population, housing unit, and new student information; and Chapters 17, 18, and 19 for total requirements.)

Business expenditures are expected to total over $20 million in Region I, nearly $164 million in Region II, and $12.5 million in Region III (see Chapter 8). Personal income should total nearly $7 million in the Orange/Jefferson area, almost $90 in the Harris/ Galveston/Chambers area, and $2.4 million in Brazoria County (see Chapter 9).

Fiscal deficits are expected to occur in the local governmental entities of all three regions. (See Chapters 11 and 14.) The State government, on the other hand, is expected to realize a net revenue/cost surplus (Chapters 10 and 14).

No significant environmental effects are expected in Region I (see Chapters 15 and 17) or in Region III (see Chapter 15 and 19). In Region II (Harris/Galveston/Chambers), however, wastewater loadings and air quality are potentially significant environmental concerns (see Chapters 15 and 18).

In Region I, Beaumont may experience a shortage of recreational facilities; and in Port Arthur, sewage collection is a potentially significant infrastructural issue (see Chapter 17).

In Houston, recreational facilities and educational services are seen as potentially significant areas; in Galveston, sewage collection is so categorized (see Chapter 18). No potentially significant issues were isolated in Freeport (see Chapter 19).

In short, fiscal impacts are expected to be the most noticeable impacts of Scenario I in each of the three affected regions.

2. PRIMARY REQUIREMENTS

Based on the postulations made in the Scenario I Description and the methods utilized to calculate estimates of the requirements of primary exploration, development, and production activities (see Part B), the following estimations of requirements for primary Scenario I activities, facilities, services, and supplies were made.

Exploration Phase

I. Primary Activity Requirements

Scenario I postulates, as we have seen, that a maximum of four exploratory rigs will be in use at any given time. Thus, it is reasonable to assume that Scenario I will require 240 persons (4X60) for the on-rig operation of exploratory rigs (see Figure 22). The rigs themselves, since they are offshore, require no land.

The dockside support associated with exploratory rigs includes support units (repair facilities, etc.) and administrative units. It is assumed that the four exploratory rigs in use in Scenario I will be owned by four separate companies, each with its own dockside facilities. Thus it is postulated that four dockside units are required for the exploratory phase. It is reasonable to assume, therefore, that a total of 135 persons (4X35) and 6 acres of land (4X1.5) will be required for dockside support of exploratory rigs in Scenario I (see Figure 22).

Since there are four exploratory rigs involved in Scenario I, 4 helicopters are required during the exploration phase; a total of 16 workers (4X4) are required, then, for air transportation during the exploration phase of Scenario I (see Figure 22).

Similarly, since there are four exploratory rigs postulated, 12 boats (4X3), 192 workers (12X16) in marine transportation, and 2400 feet of dockage (12X200) is estimated to be required (see Figure 22).

A total of 147 workers per rig - 588 for the four rigs - are estimated to be required to operate offshore rigs, to provide dockside support, and to provide transportation to and from the exploratory rigs of Scenario I. In addition, 1.5 acres plus 600 ft. of docking space is estimated to be required for each exploratory rig; a total of 6 acres and 2400 feet of dockage for all four rigs (see Figure 22).

Figure 22

Requirements for the Exploration Phase of Scenario I

	Unit Required	Personnel Required	Land (Acres) Required
1. Exploratory Rigs	4*	240 (4X60)	0
2. Dockside Support for Exploratory Rigs	4 (4x1)	140 (4x35)	6 (4x1.5)
3. Transportation to and from Exploratory Rigs			
a. Air (Helicopter)	4** (4x1)	16** (4x4)	Existing Air Terminal Space
b. Marine (Boats)	12** (4x3)	192** (12x16)	2400 ft. of dock Space (12x200)**
4. Total: Items 1, 2, and 3	-	588** (4x147)	6** (4x1.5)
5. Facilities			
a. Docks	4 loading berths and 4 other docks (4x1)(4x1)**	Existing dock personnel	(See Item 3b)
b. Storage	-	(See Item 2)	(See Item 2)
c. Office Space		(See Item 2)	(See Item 2)
6. Services			
a. Helicopters	(See Item 3a)	(See Item 3a)	(See Item 3a)
b. Boats	(See Item 3b)	(See Item 3b)	(See Item 3b)
c. Well Logging	2**	20** (2x10)	8** (2x4)
d. Diving	2**	22** (2x11)	1** (2x0.5)
7. Supplies			
a. Cement	2**	24** (2x12)	10** (2x5)
b. Mud	2**	26** (2x13)	8** (2x4)
c. Oil Field Equipment	2**	64** (2x32)	11** (2x5.5)
8. Total		744	44

* From Scenario I Description
** Not Included in Grand Total to Avoid Double Counting

II. Primary Facilities Requirements

The primary onshore facilities associated with the exploratory phase are docks, storage space, and office space. We have already seen that a total of 2400 ft. of docking space is postulated to be required to service the exploration rigs required in the Scenario. Included in that figure is one loading berth and one other dock per rig. Thus, a total of four loading berths and four other docks are required for Scenario I (see Figure 22). It is estimated that no additional dock personnel will be required to service the boats which service the exploration rigs. To the extent that any dockside servicing of these vessels is required, the necessary personnel for such servicing are included in the estimation of manpower required for marine transportation, discussed above.

Storage facilities necessary for the exploration phase include open storage and warehousing. To the extent that personnel or land are required for such facilities, they are included in the estimates of workers and land required for dockside support of exploratory rigs, discussed above. Further, office space during the exploration phase involves only the personnel and land requirements postulated to be necessary for dockside support of exploratory rigs, discussed above.

III. Primary Services Requirements

The primary services associated with offshore exploratory rigs are helicopter services, boat services, well logging, and diving services.

Helicopter and boat services postulated as being necessary to service exploration rigs (described earlier) are virtually all such services required in the exploration phase as a whole. Thus no additional helicopter or boat services are postulated (see Figure 22).

It is estimated that during the exploration phase of Scenario I, the services of a maximum of two well logging companies or company branches will be required to service the four exploratory rigs. Thus, a total of 20 workers (2X10) and 8 acres of land (2X4) will be required for well logging services during the exploration phase of Scenario I (see Figure 22).

Moreover, it is estimated that during the exploration phase of Scenario I the services of a maximum of two diving companies or branches will be required. Therefore, a total of 22 workers (2X11) and 1 acre (2x.5) will be required (see Figure 22).

IV. Primary Supplies Requirements

The primary supplies associated with the exploration phase of OCS oil and gas development are cement, drilling mud, and oil field supply, including wellhead equipment and downhole equipment.

It is estimated that during the exploration phase of Scenario I, cement will be supplied by a maximum of two companies or branches. Accordingly, 24 employees (2X12) and 10 acres of land (2X5) will be required for this activity (see Figure 22).

Similarly, it is estimated that two mud companies or branches will be required - a total of 26 workers (2X13) and 8 acres (2X4) - and two oil field equipment supply companies - 64 employees (2X32) and eleven acres (2X5.5) - will be required during the exploration phase of Scenario I (see Figure 22).

In sum, the total number of workers postulated to be required during the exploration phase (using only the facilities, services, and supplies described above as being "primary") is 744; total land required is 44 acres and 2400 feet of dock space.

Development Phase

I. Primary Activity Requirements

Scenario I postulates that eleven development platforms will be installed within the geographical boundaries of the scenario location (see Figure 1). It is also assumed that five drilling crews will be required for those eleven platforms. Thus, Scenario I will require 280 workers (5X56) for the on-platform operation of development platforms (see Figure 23). The platforms themselves, since they are located offshore, require no land.

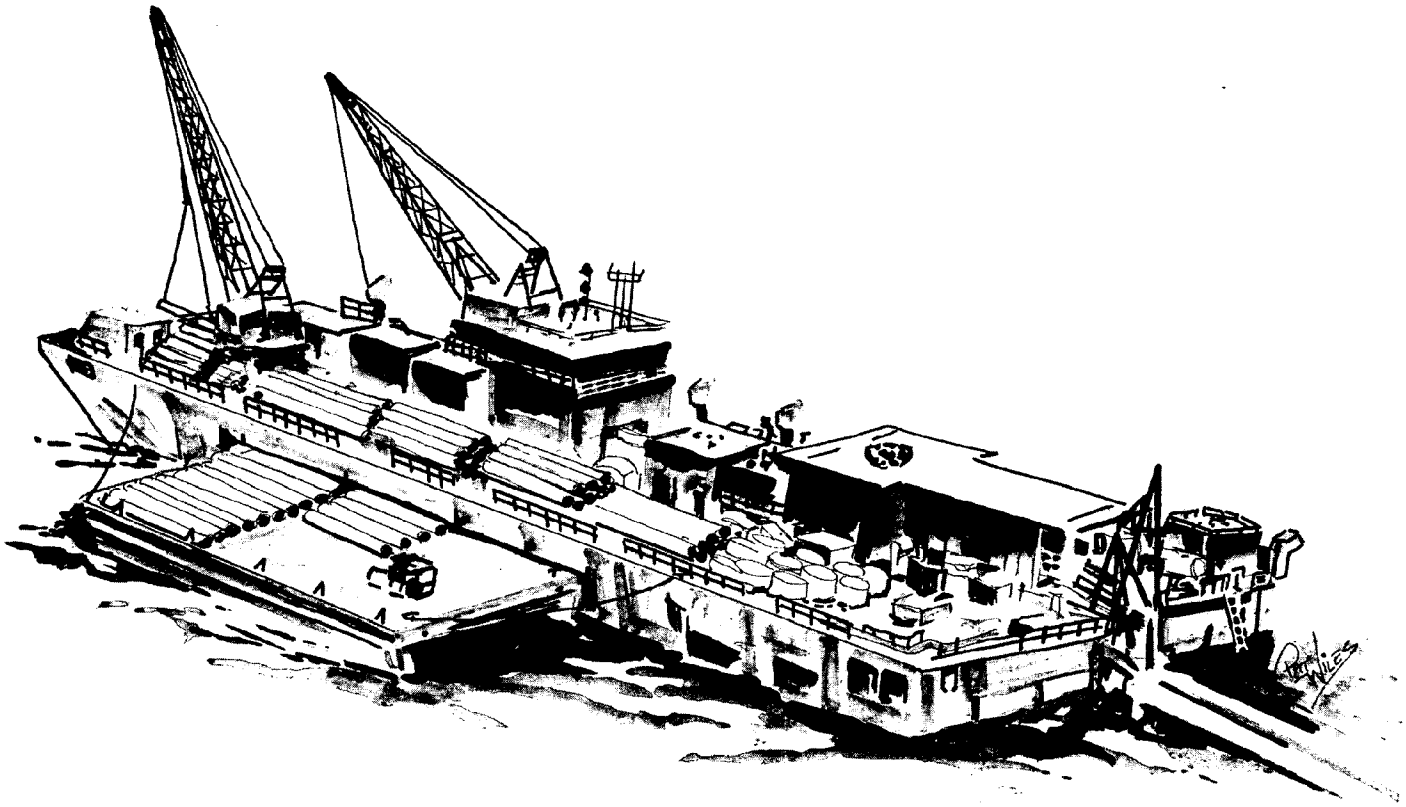
It is postulated that the eleven platforms will be owned by a maximum of five oil companies. It is further postulated, then, that there will be a maximum of five onshore support units to serve the eleven platforms. Accordingly, 165 workers (11X15) and 27.5 acres of land (11X2.5) will be required for onshore support of development platforms in Scenario I. In sum, a total of 71 workers and 2.5 acres of land are required to operate one platform and to provide onshore support for that platform during the development phase of Scenario I (see Figure 23).

Figure 23

Requirements for the Development Phase of Scenario I

	Units Required	Personnel Required	Land (Acres) Required
1. Platforms	11* **	280 (5 crews X 56)	0
2. Onshore Support for Development Platforms	5**	165** (11x15)	27.5 (11x2.5)
3. Total: Items 1 and 2	-	71 per platform** (56 + 15)	27.5** (11x2.5)
4. Facilities			
a. Docks	11 loading berths (11x1)**	Existing Dock Personnel (See Item 2)	2200 ft. of dock space (11x200)** (See Item 2)
b. Storage	-		
c. Operations base	5**	200** (5x40)	250** (5x50)
d. Administrative Base	5**	225** (5x45)	
5. Services			
a. Helicopter	33** (11x3)	132** (33x4)	33** (33x1)
b. Boat	33** (11x3)	528** (33x16)	6600 ft. of loading space(33x200)**
c. Well Logging	3	30 (3x10)	12 (3x4)
d. Diving	2**	22** (2x11)	1** (2x0.5)
6. Supplies			
a. Cement	3**	36** (3x12)	15** (3x5)
b. Mud	4**	52** (4x13)	16** (4x4)
c. Oil Field Equipment	5**	160** (5x32)	27.5** (5x5.5)
7. Pipeline			
a. Lay Barge	2	160	400 ft. of docking space
b. Other Vessels	4		
8. Total		1990	382

* From Scenario I Description
** Not Included in Grand Total to Avoid Double-Counting



II. Primary Facilities Requirements

The primary onshore facilities associated with the development phase are docks, storage space, an operations base, and an administrative office. (The operations base and administrative office listed here must not be confused with onshore support for the development platforms described above; the facilities listed in this section are those necessary for all development phase activities, not simply for direct support of development platforms.)

Since eleven platforms are postulated in Scenario I, eleven loading berths and a maximum of 2200 feet of loading space (11X200) will be required for the development phase of Scenario I (see Figure 23). It is estimated that no additional dock personnel will be required to service the boats which service the development platforms. To the extent that such personnel shall be required, they are included in the estimation of manpower required for marine transportation, to be discussed later.

As in the exploration phase, storage facilities necessary for the development phase include open storage and warehousing. To the extent that land or personnel are required for such facilities, they are included in the estimates of requirements for onshore support of development platforms discussed above.

Since it is postulated that the eleven development platforms will be owned by a total of five oil companies, it is assumed that five operations bases and five administrative offices shall also be required. Thus, 200 employees (5X40) are estimated to be required to operate operations bases, 225 workers (5X45) are estimated to be needed for administrative bases, and 250 acres of land (5X50) are estimated to be required for both operations bases and administrative bases during the development phase of Scenario I (see Figure 23).

III. Primary Services Requirements

The primary services associated with the development phase of OCS oil and gas extraction are helicopter services, boat services, well logging, and diving. Since Scenario I postulates eleven development platforms, a total of 33 helicopters (11X3), 132 workers (33X4), and 33 acres of land (33X1) are required for air transportation during the development phase of Scenario I (See Figure 23).

Requirements for boat services are calculated in a similar manner: 33 boats (11X3), 528 employees (33X16), and 6600 feet of loading space (33X200). (See Figure 23). It is also esimated that a maximum of three well logging companies or branches will be required to service the eleven platforms. Accordingly, 30 employees (3X10) and 12 acres of land (3X4) will be required. Finally, it is assumed that the requirements for diving services in the development phase will be identical to those of the exploration phase: 22 employees (2X11) and one acre (2X.5). (see Figure 23).

IV. Primary Supplies Requirements

The primary supplies associated with the development phase, as with the exploration phase, are cement, drilling mud, and oil field supplies including wellhead and downhole equipment. Where the exploration phase required two companies or company branches to supply each of these items, it is postulated that the development phase will require 3 cement companies or branches, 4 mud companies or branches, and five oil field supply companies or branches. In each case, however, the employment and land requirement multipliers remain the same; that is, 12 employees and 5 acres for each cement company or branch, 13 employees and 4 acres for each mud company or branch, and 32 employees and 5.5 acres for each oil field supply company or branch. Thus, the total requirements for cement supply are 36 employees (3X12) and 15 acres (3X5); for mud supply, 52 employees (4X13) and 16 acres (4X4); for oil field supply, 160 employees (5X32) and 27.5 acres of land (5X5.5)(see Figure 23).

V. Pipeline Laying Requirements

Scenario I postulates that three main gathering pipelines will be constructed to transport production from the eleven producing platforms. The three lines, it is further postulated, will be connected to a large trunk line now being constructed to serve the entire region in which Scenario I is situated. Thus, no new additional pipeline rights-of-way, terminal, or storage facilities are postulated. The three lines will comprise a total of 25 miles of 20" pipeline.

It is assumed that two lay barges, each with two accompanying vessels, will be required. The New England River Basins Commission study estimated that two lay barges laying 24" diameter pipe simultaneously, each followed by one other vessel, would require a total of 47 workers, 3 docks, and 300 feet of docking space. Those figures, however include only the supply

boats and crew boats, not the lay barges themselves. Thus, a total of 160 workers, 4 docks, and 400 feet of docking space are more realistic figures and are postulated in Scenario I.

In sum, the total number of workers postulated to be required during the development phase (using the facilities, services, and supplies described above) is 1,990; total land requirement is 382 acres and 9,200 feet of docking space.

Production Phase

I. Primary Activity Requirements

Scenario I postulates that all eleven development platforms will ultimately be producing platforms. Thus, 176 workers (11X16) will be required for the on-platform operation of producing platforms (see Figure 24). The platforms themselves, since they are located offshore, require no land.

It has been postulated that the eleven platforms will be owned by a maximum of five oil companies and that, therefore, there will be a maximum of five onshore support units to serve the eleven platforms. Accordingly, 198 workers (11X18) and 11 acres of land (11X1) will be required for onshore support of producing platforms in Scenario I (see Figure 24). This study, then, postulates that a total of 34 workers per platform are required for the actual operation of a producing platform and for onshore support; a total of 374 workers for the eleven platforms (see Figure 24).

II. Primary Facilities, Services, and Supplies Requirements

As Part B noted, the manpower and land requirements of primary facilities, services, and supplies during the production phase are estimated to be identical to such requirements during the development phase (see Figure 24).

Thus, the total number of workers postulated to be required during the production phase (using the facilities, services, and supplies described above) is 1,729; total land requirement is 353.5 acres and 8,800 feet of docking space.

Figure 24

Requirements for the Production Phase of Scenario I

	Units Required	Personnel Required	Land (Acres) Required
1. Platforms	11*	176 (11x16)	0
2. Onshore Support for Production Platforms	5	198 (11x18)	11** (11x1)
3. Total: Items 1 and 2	-	374** (11x34)	11** (11x1)
4. Facilities			
a. Docks	11 loading berths (11x1)	Existing Dock Personnel (See Item 2)	2200 ft. of dock space (11x20) (See Item 2)
b. Storage	-		
c. Operations Base	5	200 (5x40)	250 (5x50)
d. Administrative Base	5	225 (5x45)	
5. Services			
a. Helicopter	33 (11x3)	132 (33x4)	33 (33x1)
b. Boat	33 (11x3)	528 (33x16)	6600 ft. of loading space (33x200)
c. Diving	2	22 (2x11)	1 (2x0.5)
6. Supplies			
a. Cement	3	36 (3x12)	15 (3x5)
b. Mud	4	52 (4x13)	16 (4x4)
c. Oil Field Equipment	5	160 (5x32)	27.5 (5x5.5)
7. Total		1729	353.5

* From Scenario I Description
** Not Included in Grand Total to Avoid Double-Counting

Total Primary Requirements

Part B pointed out that the computation of primary personnel and land requirements for all phases - exploration, development, and production - of Scenario I is not simply a matter of totaling those requirements for each of the three phases. Such a procedure would result in double-counting and thus over-estimations of the total requirements (see Part B).

Such double-counting is possible throughout. In Figures 22, 23, and 24, those items which have not been included in the grand totals (in an attempt to avoid double-counting) are clearly marked. The grand totals of requirements for all phases of Scenario I are then displayed in Figure 25.

Figure 25

Total Requirements for All Phases of Scenario I

	Units Required	Personnel Required	Land (Acres) Required
1. Exploratory Rigs	4	240	0
2. Dockside Support for Exploratory Rigs	4	140	6
3. Platforms	11	456	0
4. Onshore Support for Development/Production Platforms	5	198	27.5
5. Facilities			
a. Docks	11	0	2200 feet
b. Operations Base	5	200	} 250
c. Administrative Base	5	225	
6. Services			
a. Helicopters	33	132	33
b. Boats	33	528	6600 feet
c. Well Logging	3	30	12
d. Diving	2	22	1
7. Supplies			
a. Cement	3	36	15
b. Mud	4	52	16
c. Oil Field Equipment	5	160	27.5
8. Pipeline			
a. Lay Barge	2	} 160	} 400 feet
b. Other Vessels	4		
9. GRAND TOTAL		2579	388 acres and 9200 feet of docking space

3. PRIMARY REQUIREMENTS OVER TIME

The calculation of total requirement of all phases of Scenario I is a necessary but not sufficient output of Methodology Tasks B1, C1, and D1. The primary requirements must also be distributed over time since not all of them will be simultaneously required, nor will they all be required for the same length of time. The dates on which the activities of Scenario I begin and end are postulated in the Scenario I description (see Figure 1). When those dates are put together with the total requirements of Scenario I (see Figure 25), a picture of the distribution of requirements over time emerges (see Figure 26). The time at which the requirements must be met come either from the Scenario I Description or are RPC estimates. Some of the columns in Figure 26 represent activities which, when completed, are never required again; thus, the manpower and land are not required again. In these cases, the personnel undoubtedly move on to other areas and the land is given over to other uses. Exploratory rigs are examples of such cases. On the other hand, some columns in Figure 26 represent activities, the demand for which will rise and then decline but will rise again. Helicopters service is one such example. In these cases, it is assumed that in the slow period following the first burst of activity, the manpower and land requirements will remain constant in expectation of the second burst of activity.

Finally, it must be noted that Figure 26 displays requirements over time only until 10/83, or seven years after exploratory drilling in Scenario I is begun. The last time period on Figure 26 (5/83 to 10/83) represents peak demand on personnel and land. After 10/83 (or seven years after exploratory drilling commences), demand for personnel and land will gradually decline until it reaches a level necessary for continuous operation of the eleven producing platforms. The analysis of that decline, the speed at which it takes place, and its impacts would constitute a study of proportions similar to the study of the build-up. Without presenting a sophisticated analysis of the slowdown, however, the following general assumptions, based on Scenario I postulations, can be set forth:

1. Beginning in late 1983 (seven years after exploratory drilling begins) personnel required for operation of the eleven platforms will fall from a high of 360 (in the 5/83 to 10/83 period) to 176 (16 workers per platform) by early 1989 or approximately 12½ years after exploratory drilling begins.

2. Also by early 1989, the number of required well logging companies will fall from three to one, the number of required diving companies will fall from two to one, cement companies from three to one, and oil field supply companies from five to one; required manpower and land

will fall accordingly. (It can be assumed, however, that the companies or branches which are no longer required by Scenario I activities will stay in place and serve other developments either in the OCS or onshore.)

3. Pipeline laying services will not be required after 5/83 (approximately 6½ years after exploratory drilling begins).

This list is not meant to be inclusive, but rather to merely present a representative sample of declining activities.

Figure 26 Total Requirements of Scenario I Over Time

REQUIREMENTS

Time Period	Exploratory Rigs *	Dockside Support For Exploratory Rigs**	Platforms*	Development Drilling (Crews)	Production Drilling (Crews)	Onshore Support For Platforms**	Docks**	Operations Bases**	Administrative Bases	Helicopters**	Boats**	Well Logging (Companies or Branches)**	Diving (Companies** or Branches)	Cement (Companies** or Branches)	Mud Companies** or Branches)	Oil Field Equipment(Companies or Branches)**	Lay Barges & Other Vessels Needed in Pipeline Laying**	Total Employment**	Total Land (Acres)**	Docking Space**	Time Period
10/76-1/77	1	1	0	0	0	0	2	0	0	1	3	1	1	1	1	1	0	225	20.5	600	10/76-1/77
1/77-4/77	2	2	0	0	0	0	4	0	0	2	6	1	1	1	1	1	0	372	27	1200	1/77-4/77
4/77-8/77	3	3	0	0	0	0	6	0	0	3	9	2	2	2	2	2	0	597	42.5	1800	4/77-8/77
8/77-10/77	4	4	0	0	0	0	8	0	0	4	12	2	2	2	2	2	0	744	44	2400	8/77-10/77
10/77-11/77	3	3	0	0	0	0	6	0	0	3	9	2	2	2	2	2	0	744	44	2400	10/77-11/77
11/77-1/78	4	4	0	0	0	0	8	0	0	4	12	2	2	2	2	2	0	744	44	2400	11/77-1/78
1/78-2/78	3	3	0	0	0	0	6	0	0	3	9	2	2	2	2	2	0	744	44	2400	1/78-2/78
2/78-4/78	4	4	0	0	0	0	8	0	0	4	12	2	2	2	2	2	0	744	44	2400	2/78-4/78
4/78-8/79	3	3	0	0	0	0	6	0	0	3	9	2	2	2	2	2	0	649	42.5	1800	4/78-8/79
8/79-11/79	2	2	0	0	0	0	4	0	0	2	6	1	1	1	1	1	0	554	41	1200	8/79-11/79
11/79-2/80	1	1	0	0	0	0	2	0	0	1	3	1	1	1	1	1	0	459	39.5	600	11/79-2/80
2/80-4/80	0	0	0	0	0	0	-	0	0	-	-	-	-	-	-	-	0	364	38	0	2/80-4/80
4/80-10/80	0	0	1	1	0	1	1	1	1	3	3	1	1	1	1	1	3	603	96.5	1000	4/80-10/80
10/80-2/81	0	0	2	2	0	1	2	1	1	5	6	1	1	1	1	1	3	685	99.5	1800	10/80-2/81
2/81-6/81	0	0	3	3	0	2	3	2	2	9	9	1	1	1	1	2	0	856	158	2600	2/81-6/81
6/81-8/81	0	0	4	4	0	3	4	3	3	12	12	1	1	1	2	2	0	1027	216.5	3400	6/81-8/81
8/81-9/81	0	0	5	5	0	3	5	3	3	15	15	2	1	2	2	3	3	1193	225	4200	8/81-9/81
9/81-2/82	0	0	6	5	1	3	6	3	3	18	18	2	2	2	2	3	3	1287	228	5000	9/81-2/82
2/82-8/82	0	0	7	5	2	4	7	4	4	21	21	2	2	2	3	4	0	1511	296	5800	2/82-8/82
8/82-11/82	0	0	8	5	3	4	8	4	4	24	24	2	2	2	3	4	0	1605	299	6600	8/82-11/82
11/82-2/83	0	0	9	5	4	5	9	5	5	27	27	3	2	3	3	5	6	1918	322	7600	11/82-2/83
2/83-5/83	0	0	10	5	5	5	10	5	5	30	30	3	2	3	4	5	6	2025	379	8400	2/83-5/83
5/83-10/83	0	0	11	4	6	5	11	5	5	33	33	3	2	3	4	5	0	2063	382	9200	5/83-10/83
				3	7																
				2	8																
				1	9																
				0	10																
				0	11																

* From Scenario I Description

** RPC Estimate

4. DISTRIBUTION OF REQUIREMENTS TO STUDY SITES

As Part B noted, it is necessary to determine which of the seven Coastal Study Sites will fill each of the primary requirements of the exploration, development, and production phases of Scenario I. The following analysis makes such a determination.

Exploration Phase

Figure 27 displays the primary requirements of the exploration phase as postulated in Scenario I.

Figure 27

Primary Requirements of Exploration Phase of Scenario I

Requirements	Personnel Required	Personnel Per Unit	Total Personnel Required	Land(Acres) Per Unit	Total Land Required
1. Exploratory Rigs	4	60	240	0	0
2. Dockside Support for Exploratory Rigs	4	35	140	1.5	6
3. Docks	8	-	-	-	-
4. Helicopters	4	4	16	-	-
5. Boats	12	16	192	200ft./dock	2400ft./dock
6. Well Logging Companies	2	10	20	4	8
7. Diving Services	2	11	22	.5	1
8. Cement Companies	2	12	24	5	10
9. Mud Companies	2	13	26	4	8
10. Oil Field Equipment Companies	2	32	64	5.5	11
TOTAL			744		44 acres & 2400 ft. of docking space

Given those requirements; given the distribution of facilities, services, and supplies among the study sites (see Figure 4); and given the geographic location of Scenario I, the following allocation (Figure 28) is made.

Figure 28

Allocation of Exploration Phase Requirements

Requirements (Facilities, Services, and Supplies)	Regions						
	I	II	III	IV	V	VI	VII
Drilling Contractors (Exploratory Rigs)	0	4	0	0	0	0	0
Dockside Support for Exploratory Rigs	0	4	0	0	0	0	0
Onshore Support for Development/Production Platforms	NA	NA	NA	NA	NA	NA	NA
Onshore Operations Bases for Development/ Production	NA	NA	NA	NA	NA	NA	NA
Onshore Administrative Bases for Development/ Production	NA	NA	NA	NA	NA	NA	NA
Docks	2	5	1	0	0	0	0
Helicopters	0	4	0	0	0	0	0
Boats	0	10	2	0	0	0	0
Well Logging Services	0	1	1	0	0	0	0
Diving Services	0	2	0	0	0	0	0
Cement	1	1	0	0	0	0	0
Mud	1	1	0	0	0	0	0
Oil Field Equipment	1	1	0	0	0	0	0
Lay Barges and Other Vessels Required for Pipeline Laying	NA	NA	NA	NA	NA	NA	NA

RegionI: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/Hidalgo/Willacy Counties.

NA = Not Applicable

Figure 29

Primary Requirements of Development Phase of Scenario I

Requirements	Units Required	Personnel Per Unit	Total Personnel Required	Land(Acres) Per Unit	Total Land Required
1. Platforms	11 5 Drilling Crews	56	280	0	0
2. Onshore Support for Development/ Production Platforms	5	15	165	5.5	27.5
3. Onshore Operations Bases for Development/Production	5	40	200	50	250
4. Onshore Administrative Bases for Development/ Production	5	45	225		
5. Helicopters	29	4	116	1	33*
6. Boats	21	16	336	200ft./dock	4200ft./dock
7. Docks	3	-	-	200ft./dock	2200ft./dock**
8. Well Logging Companies	1	10	10	4	4
9. Diving Services	-	-	-	-	-
10. Cement Companies	1	12	12	5	5
11. Mud Companies	2	13	26	4	8
12. Oil Field Equipment Companies	3	32	96	5.5	16.5
13. Lay Barges and Other Vessels Required for Pipeline Laying	6 (2 lay barges & 4 auxiliary vessels)	50/lay barge & 15/auxiliary vessel	160	66.67 ft. of dock space	400 ft. of dock space

* Includes land required for four helicopters utilized during the exploration phase, but which required only existing air terminal space in the exploration phase.

** Includes docking space for eight vessels utilized during the exploration phase, but which utilized existing dock space in the exploration phase.

Figure 30

Allocation of Development Phase Requirements

Requirements (Facilities, Services and Supplies)	Regions I	II	III	IV	V	VI	VII
Drilling Contractors (For Development Drilling)	1	4	0	0	0	0	0
Dockside Support for Exploratory Rigs	NA	NA	NA	NA	NA	NA	NA
Onshore Support for Development/Production Platforms	1	4	0	0	0	0	0
Onshore Operations Bases for Development/ Production	1	4	0	0	0	0	0
Onshore Administrative Bases for Development/ Production	1	4	0	0	0	0	0
Docks	1	1	1	0	0	0	0
Helicopters	2	23	4	0	0	0	0
Boats	0	17	4	0	0	0	0
Well Logging Services	0	1	0	0	0	0	0
Diving Services	- - - - - No Addition To That Of Exploratory Phase - - -						
Cement	0	1	0	0	0	0	0
Mud	1	1	0	0	0	0	0
Oil Field Equipment	1	2	0	0	0	0	0
Lay Barges and Other Vessels Required for Pipeline Laying	0	6	0	0	0	0	0

Region I: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/Hidalgo/Willacy Counties.

NA = Not Applicable

The allocations made in Figure 28 (and ultimately in Figures 30,32, and 33) must be seen as RPC estimates, made on the basis of the current distribution in Texas of primary facilities, services, and supplies required for Scenario I; on the basis of the geographical location of Scenario I; and on the basis of current and projected industrial growth patterns along the Texas Gulf Coast.

Development Phase

Figure 29 displays the primary requirements of the development phase as postulated in Scenario I, over and above those postulated in the exploration phase. That is, the requirements detailed in Figure 29 should be seen as additions to those in Figure 27.

Given those requirements; give the distribution of primary facilities, services, and supplies among the study sites (Figure 4); and given the geographical location of Scenario I, the allocation made in Figure 30 was the result.

Production Phase

Figure 31 presents the primary requirements of the production phase as postulated in Scenario I,over and above those postulated for the exploration and development phases. That is, the requirements detailed in Figure 31 should be seen as additions to those in Figures 27 and 29.

Figure 31

Primary Requirements of Production Phase of Scenario I

Requirements	Units Required	Personnel Per Unit	Total Personnel Required	Land(Acres) Per Unit	Total Land Required
1. Platforms	11 Operations Crews	16	176	0	0
2. Onshore Support for Development/ Production Platforms	5*	3 Per Platform	33	(Does not exceed requirements of development phase.)	

* Same units as those used in the development phase, with slightly increased staffing.

The allocation of these requirements to study sites is shown in Figure 32. Since the same onshore support units (Item 2 in Figure 31) are used in the production phase as were used in the development phase - with slightly increased staffing in the production phase - they are not shown on Figure 32.

Total Allocated Primary Requirements

When the primary requirements allocated in Figures 28, 30, and 32 are brought together, the result is a display of the primary requirements of all phases of Scenario I distributed to study sites (see Figure 33). Items in Figure 33 can be seen as the addition of corresponding items in Figures 28, 30, and 32. It can be seen from Figure 33 that there are three affected Coastal Study Sites in Scenario I. They are:

Region I - Orange and Jefferson Counties;
Region II - Harris, Galveston, and Chambers Counties; and
Region III - Brazoria County.
(See Map 4)

Total Allocated Primary Requirements Over Time

When Figure 33 is juxtaposed with Figure 26, a picture of allocated primary requirements over time emerges. Figure 34 presents that picture. In each column in Figure 34, the first number applies to Region I, the second to Region II, and the third to Region III.

In accordance with the methodology, (see Appendix A), the allocated primary requirements over time were found to be both available and accessible in the study sites to which they were allocated. For example, the 287 acres of land required in the Harris/Galveston/Chambers Counties area is both available and accessible for the uses to which it will be put.

The allocated primary requirements detailed in Figure 34 must be seen as increases in the respective industrial sectors in the study site to which they have been allocated. For example, in the 10/76 -1/77 time period, as Figure 34 reveals, one well logging company or branch will be required in Region II - the Harris/Galveston/Chambers Counties area. That must be seen as an increase in the well logging industry in that area equivalent to the establishment of one additional, new well logging company. That increase could come in the form of the expansion of one or more existing well logging companies or, indeed, in the establishment of a

Figure 32

Allocation of Production Phase Requirements

Requirements (Facilities, Services, and Supplies)	Regions I	II	III	IV	V	VI	VII
Drilling Contractors (For Production Platform Operation)	1	10	0	0	0	0	0
Dockside Support for Exploratory Rigs	NA	NA	NA	NA	NA	NA	NA
Onshore Support for Development/Production Platforms	- - - No Addition To That Of Development Phase (Figure 30)						
Onshore Operations Bases for Development/ Production	- - - No Addition To That Of Development Phase (Figure 30)						
Onshore Administrative Bases For Development/ Production	- - - No Addition To That Of Development Phase (Figure 30)						
Docks	- - - No Addition To That Of Development Phase (Figure 30)						
Helicopters	- - - No Addition To That Of Development Phase (Figure 30)						
Boats	- - - No Addition To That Of Development Phase (Figure 30)						
Well Logging Services	- - - No Addition To That Of Development Phase (Figure 30)						
Diving Services	- - - No Addition To That Of Development Phase (Figure 30)						
Cement	- - - No Addition To That Of Development Phase (Figure 30)						
Mud	- - - No Addition To That Of Development Phase (Figure 30)						
Oil Field Equipment	- - - No Addition To That Of Development Phase (Figure 30)						
Lay Barges and Other Vessels Required for Pipeline Laying	- - - No Addition To That Of Development Phase (Figure 30)						

Region I: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/Hidalgo/Willacy Counties.

NA = Not Applicable

Figure 33

Primary Requirements of All Phases of Scenario I

Requirements (Facilities, Services, and Supplies)	Regions I	II	III	IV	V	VI	VII
Drilling Contractors (Exploration, Development and/or Production	1 Dev. 1 Prod.	4 Exp. 4 Dev. 10 Prod.	0	0	0	0	0
Dockside Support for Exploratory Rigs	0	4	0	0	0	0	0
Onshore Support for Development/Production Platforms	1	4	0	0	0	0	0
Onshore Operations Bases for Development/Production	1	4	0	0	0	0	0
Onshore Administrative Bases for Development/Production	1	4	0	0	0	0	0
Docks	3	6	2	0	0	0	0
Helicopters	2	27	4	0	0	0	0
Boats	0	27	6	0	0	0	0
Well Logging Services	0	2	1	0	0	0	0
Diving Services	0	2	0	0	0	0	0
Cement	1	2	0	0	0	0	0
Mud	2	2	0	0	0	0	0
Oil Field Equipment	2	3	0	0	0	0	0
Lay Barges and Other Vessels Required for Pipeline Laying	0	6	0	0	0	0	0

Region I: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/Hidalgo/Willacy Counties.

Map 4

Affected Study Sites of Scenario I

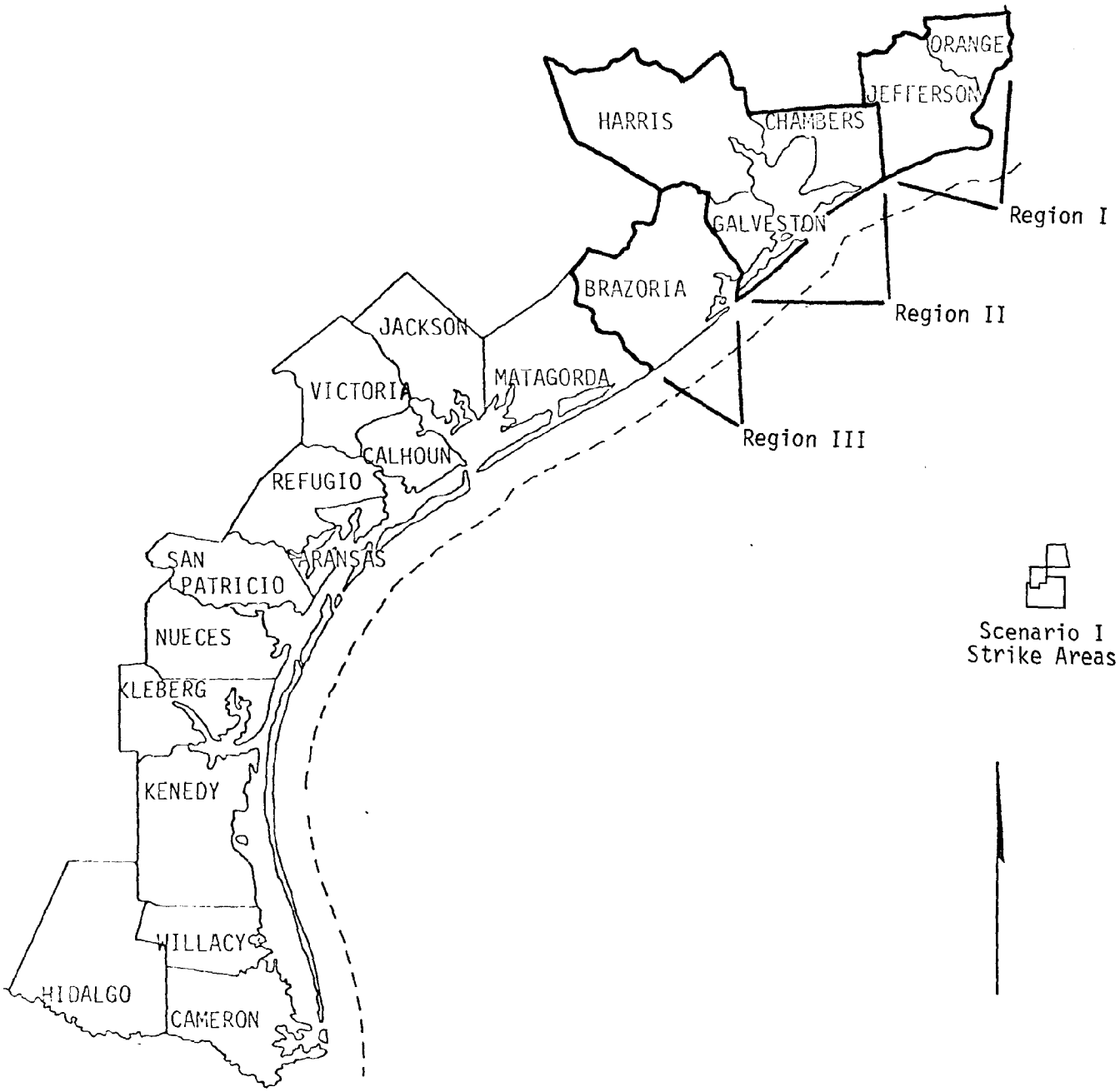


Figure 34 Allocation of All Requirements of Scenario I

Time Period	Exploratory Rigs			Dockside Support For Exploratory Rigs			Development Drilling Contractors			Production Operation Contractors			Onshore Support For Platforms			Docks			Operations Bases			Administrative Bases			Helicopters			Boats			Well Logging (Companies or Branches)			Diving (Companies or Branches)			Cement (Companies or Branches)			Mud (Companies or Branches)			Oil Field Equipment (Companies or Branches)			Lay Barges & Other Vessels Needed In Pipeline Laying			Total Employment			Total Land (Acres)			Docking Space			Time Period
10/76-1/77	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	3	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	225	0	0	20.5	0	300	300	0	10/76-1/77
1/77-4/77	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	2	0	0	5	1	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	356	16	0	22	0	300	600	300	1/77-4/77
4/77-8/77	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	2	3	1	0	0	0	0	0	0	0	3	0	0	8	1	0	2	0	0	2	0	0	2	0	1	1	0	1	1	0	0	0	0	45	536	16	9.5	33	0	600	900	300	4/77-8/77
8/77-10/77	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	2	4	2	0	0	0	0	0	0	0	3	1	0	10	2	0	2	0	0	2	0	0	2	0	1	1	0	1	1	0	0	0	0	45	663	36	9.5	34.5	0	600	1200	600	8/77-10/77
10/77-11/77	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	2	3	1	0	0	0	0	0	0	0	3	0	0	8	1	0	2	0	0	2	0	0	2	0	1	1	0	1	1	0	0	0	0	45	663	36	9.5	34.5	0	600	1200	600	10/77-11/77
11/77-1/78	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	2	4	2	0	0	0	0	0	0	0	3	1	0	10	2	0	2	0	0	2	0	0	2	0	1	1	0	1	1	0	0	0	0	45	663	36	9.5	34.5	0	600	1200	600	11/77-1/78
1/78-2/78	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	2	3	1	0	0	0	0	0	0	0	3	0	0	8	1	0	2	0	0	2	0	0	2	0	1	1	0	1	1	0	0	0	0	45	663	36	9.5	34.5	0	600	1200	600	1/78-2/78
2/78-4/78	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	2	4	2	0	0	0	0	0	0	0	3	1	0	10	2	0	2	0	0	2	0	0	2	0	1	1	0	1	1	0	0	0	0	45	663	36	9.5	34.5	0	600	1200	600	2/78-4/78
4/78-8/79	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	2	3	1	0	0	0	0	0	0	0	3	0	0	8	1	0	2	0	0	2	0	0	2	0	1	1	0	1	1	0	0	0	0	45	568	36	9.5	33	0	600	900	300	4/78-8/79
8/79-11/79	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	1	2	1	0	0	0	0	0	0	0	2	0	0	5	1	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	45	473	36	9.5	31.5	0	300	600	300	8/79-11/79
11/79-2/80	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	3	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	45	376	36	9.5	30	0	300	300	0	11/79-2/80
2/80-4/80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	263	36	9.5	28.5	0	0	0	0	2/80-4/80
4/80-10/80	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	3	0	0	2	1	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	3	0	45	522	36	9.5	87	0	0	800	200	4/80-10/80
10/80-2/81	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	2	0	0	1	0	0	1	0	0	5	1	0	5	1	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	3	0	45	604	36	9.5	89	1	0	1600	200	10/80-2/81
2/81-6/81	0	0	0	0	0	0	1	2	0	0	0	0	0	2	0	0	3	0	0	2	0	0	2	0	0	8	1	0	8	1	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	1	1	0	101	719	36	9.5	1475	1	0	2400	200	2/81-6/81
6/81-8/81	0	0	0	0	0	0	1	3	0	0	0	0	1	2	0	1	3	0	1	2	0	1	2	0	1	10	1	0	10	2	0	1	0	0	1	0	0	1	0	1	1	0	1	1	0	0	0	0	208	783	36	66	149.5	1	200	2800	400	6/81-8/81
8/81-9/81	0	0	0	0	0	0	1	4	0	0	0	0	1	2	0	1	4	0	1	2	0	1	2	0	1	13	1	0	13	2	0	1	1	0	1	0	1	1	0	1	1	0	1	2	0	0	3	0	220	927	46	71	149	5	200	3600	400	8/81-9/81
9/81-2/82	0	0	0	0	0	0	1	4	0	0	1	0	1	2	0	1	4	1	1	2	0	1	2	0	2	15	2	0	15	3	0	1	1	0	2	0	1	1	0	1	1	0	1	2	0	0	3	0	220	1001	66	71	151	6	200	4000	800	9/81-2/82
2/82-8/82	0	0	0	0	0	0	1	4	0	0	2	0	1	3	0	2	4	1	1	3	0	1	3	0	2	17	2	0	18	3	0	1	1	0	2	0	1	1	0	1	2	0	2	2	0	0	0	0	274	1171	66	83	207	6	400	4600	800	2/82-8/82
8/82-11/82	0	0	0	0	0	0	1	4	0	0	3	0	1	3	0	2	5	1	1	3	0	1	3	0	2	19	3	0	20	4	0	1	1	0	2	0	1	1	0	1	2	0	2	2	0	0	0	0	274	1245	86	83	209	7	400	5100	1000	8/82-11/82
11/82-2/83	0	0	0	0	0	0	1	4	0	0	4	0	1	4	0	2	5	2	1	4	0	1	4	0	2	22	3	0	23	4	0	2	1	0	2	0	1	2	0	1	2	0	2	3	0	0	6	0	274	1558	86	83	282	7	400	6000	1200	11/82-2/83
2/83-5/83	0	0	0	0	0	0	1	4	0	0	5	0	1	4	0	3	5	2	1	4	0	1	4	0	2	24	4	0	25	5	0	2	1	0	2	0	1	2	0	2	2	0	2	3	0	0	6	0	287	1632	106	87	284	8	600	6400	1400	2/83-5/83
5/83-10/83	0	0	0	0	0	0	1	3	0	1	5	0	1	4	0	3	6	2	1	4	0	1	4	0	2	27	4	0	27	6	0	2	1	0	2	0	1	2	0	2	2	0	2	3	0	0	0	0	303	1638	122	87	287	8	600	7000	1600	5/83-10/83

(Note: The first figure in each column refers to Region I, the second to Region II, and the Third to Region III.)

totally new company. No attempt has been made to describe the form in which that increase will come. What has been described is the size of that increase; that is, the land and manpower equivalents of one new well logging company or branch (10 employees and 4 acres). The primary requirements are seen as increases to their respective sectors because:

1. A determination as to whether Scenario I requirements will in fact cause increases in some industrial sectors (as opposed to such increases being absorbed by existing companies) is dependent on an analysis of current and projected business activity in each sector in each study site. Such an analysis, however, is beyond the scope of this study.

2. One of the underlying assumptions in this study is that current activity will continue at its present rate of growth - that is, "business as usual." Thus, the activities in Scenario I can reasonably be assumed to cause increases in the affected industrial sectors in the affected study sites.

There are, of course, alternative locations for development within each affected study site. Thus, it becomes necessary to further allocate a study site's primary requirements within that affected study site. Figure 35 makes such an allocation. It must be noted again, as Part B noted, that the sub-allocations must not be seen as predictions, but rather as postulations.

Figure 35
Sub-Allocation of Study Site Requirements

Study Site	Region I		Region II		Region III	
Requirement	Number Required	Probable Location	Number Required	Probable Location	Number Required	Probable Location
1. Exploratory Rigs	0	-	4	Galveston Wharves	0	-
2. Dockside Support for Exploratory Rigs	0	-	4	Houston	0	-
3. Development Drilling Contractors	1	Beaumont	4	Houston	0	-
4. Production Operations Contractors	1	Beaumont	10	Houston	0	-
5. Onshore Support for Development/ Production Platforms	1	Beaumont	4	Houston	0	-
6. Docks	3	2-Sabine Pass; 1-Pt. Arthur	6	2-Galveston; 2-Texas City; 2-Houston	2	Freeport
7. Operations Bases	1	Beaumont	4	Houston	0	-
8. Administrative Bases	1	Beaumont	4	Houston	0	-
9. Helicopters	2	Sabine Pass	27	20-Houston; 7-Galveston	4	Freeport
10. Boats	0	-	27	7-Galveston 20-Houston	6	Freeport
11. Well Logging Companies	0	-	2	1-Houston 1-Galveston	1	Freeport

Figure 35
Sub-Allocation of Study Site Requirements
(Continued)

Study Site Requirement	Region I		Region II		Region III	
	Number Required	Probable Location	Number Required	Probable Location	Number Required	Probable Location
12. Diving Companies	0	-	2	Houston	0	-
13. Cement Companies	1	Beaumont	2	1-Houston 1-Galveston	0	-
14. Mud Companies	2	1-Sabine Pass 1-Beaumont	2	1-Houston 1-Galveston	0	-
15. Oil Field Equipment Supply Companies	2	Beaumont	3	Houston	0	-
16. Lay Barges and Other Vessels Needed in Pipeline Laying	0	-	6	5-Houston 1-Galveston	0	-

5. LAND REQUIREMENTS

Indirect Land Requirements

Part B contains an extensive discussion of the process by which indirect land requirements in each affected study site of each scenario were derived. It will be recalled from Part B that the following procedures were used:

1. UA/LF = X; where UA = current urban acreage, LF = current total labor force, and X = urban acres per person in the labor force.

2. X x PPE = PUA; where PPE = projected employment in primary sectors and PUA = projected urban acreage.

3. PUA - PPSA = IA; where PPSA = projected primary sector acreage and IA = indirect acreage.

It will also be recalled that urban acreage in each affected study site was calculated by totaling acreage for the following uses:

1. Residential-urban, commercial, and residential development including streets, roads, and educational sites in such areas;

2. Industrial areas, railyards, and docks including streets, roads and educational sites in such area;

3. Undeveloped tracts, greenbelts, cemeteries, and undifferentiated urban land including streets and roads in such areas;

4. Parks and recreational facilities;

5. Sewage disposal sites;

6. Solid-waste disposal sites, sanitary sites, and open sites;

7. Airfields; and

8. Artificial reservoirs.

The affected study sites of Scenario I, as we have seen, are Region I (Orange and Jefferson Counties), Region II (Harris, Galveston, and Chambers Counties), and Region III (Brazoria County).

Current acreage for items 1,2,3,4, and 8 (except for Harris County) was extracted from the Environmental Geologic Atlas of the Texas Coastal Zone, published by the Bureau of Economic Geology (BEG) at the University of Texas in 1973. The Beaumont-Port Arthur Area edition, the Galveston-Houston Area edition, and the Bay City-Freeport edition were used. Since only a portion of Harris County is included in the BEG Atlas, its current acreage for items 1,2,3,4, and 8 was calculated through an analysis of the NASA land use map of Harris County.

Current acreage for item 5 was derived by multiplying the average amount of land used for each sewage treatment site by the number of such sites in each county. The Texas Department of Health Resources (TDHR) has estimated that acreage for sewage disposal sites averages 15; there are 229 sewage disposal sites in Region I, 677 in Region II, and 80 in Region III.

Current acreage for item 6 was derived by totaling the acreage for each solid waste disposal site in each of three regions. The TDHR records reveal seven such sites in Region I, 67 in Region II, and 13 in Region III. Where the exact acreage for any given solid waste site was unavailable, the average size of such facilities in the Texas Coastal Region (40.39 acres) was used.

Airfield acreage in each county was obtained from the Texas Transportation Institute (TTI). Since airfield acreage was in some cases estimated by the TTI, total acreage is, accordingly, also estimated.

Current acreage for each of the eight categories in each of the three affected study sites of Scenario I is displayed in Figure 36.

Figure 36

Current Land Use (Acres) in Scenario I Affected Study Sites

	Use	Region I	Region II	Region III
1.	Residential-Urban, Commercial, Residential Development	66,560	355,744	18,560
2.	Industrial, Railyards, Docks	7,040	71,373	4,992
3.	Undeveloped, Greebelts, Cemeteries, Undifferen-iated Land	2,880	12,800	192

4.	Parks and Recreation	704	18,048	320
5.	Sewage Disposal	3,435	10,155	1,200
6.	Solid Waste	529	2,908	474
7.	Airfields	2,225	14,626	900
8.	Artificial Reservoirs	13,760	28,800	11,392
	TOTAL	97,133	514,454	38,039

Figure 37 reveals total land use for the eight categories and total labor force in each of the three regions. Total labor force figures were derived from 1974 Texas Employment Commission Statistics.

Figure 37

	Region I	Region II	Region III
Urban Acreage	97,133	514,454	38,039
Labor Force	131,200	981,450	50,650

Both projected employment in primary sectors by time/by study site and projected primary study site acreage by time/by study site can be found in Figure 34. When these figures are employed in the formula described above, indirect acreage by study site/by time results.

Examples: 8/81 to 9/81 in Region II

(1) $\frac{514,454}{981,450} = .524$ (2) $.524 \times 927 = 485.75$ (3) $485.75 - 149 = 336.75$

Indirect acreage = 337 acres

2/83 to 5/83 in Region III

(1) $\frac{38,039}{50,650} = .751$ (2) $.751 \times 106 = 79.61$ (3) $79.61 - 8 = 71.61$

Indirect acreage = 72 acres

2/81 to 6/81 in Region I

(1) $\frac{97,133}{131,200} = .74$ (2) $.74 \times 101 = 74.74$ (3) $74.74 - 9.5 = 65.24$

Indirect acreage = 65 acres

Figure 38 illustrates the indirect land requirements in each of the three affected study sites by time, based on the time periods, primary sectors' employment projections, and projected primary sector acreage requirements contained in Figure 34.

Figure 38

Indirect Land Requirements

Time Period	Region I	Region II	Region III
10/76- 1/77	0	97	0
1/77- 4/77	0	165	12
4/77- 8/77	24	248	12
8/77-10/77	24	313	27
10/77-11/77	24	313	27
11/77- 1/78	24	313	27
1/78- 2/78	24	313	27
2/78- 4/78	24	313	27
4/78- 8/79	24	313	27
8/79-11/79	24	313	27
11/79- 2/80	24	313	27
2/80- 4/80	24	313	27
4/80-10/80	24	313	27
10/80- 2/81	24	313	27
2/81- 6/81	65	313	27
6/81- 8/81	88	313	27
8/81- 9/81	92	337	30
9/81- 2/82	92	374	44
2/82- 8/82	120	407	44
8/82-11/82	120	443	58
11/82- 2/83	120	534	58
2/83- 5/83	125	571	72
5/83-10/83	137	571	84

The reader is encouraged to read the explanatory notes concerning this process of calculating indirect land requirements in Part B.

Finally, it is safe to assume that the indirect land required in Region I will be in or near Beaumont, Port Arthur, or Sabine Pass; in Region II will be in or near Houston or Galveston; and in Region III will be in or near Freeport.

Primary and Indirect Land Requirements

As Part B explained, total primary and indirect land requirements were calculated simply by summing the two individual quantities. Figure 39 below displays primary land requirements (extracted from Figure 34).

Figure 39

Primary Land Requirements (Acres)

Time Period	Primary Land Requirements (Acres) Region I	Region II	Region III
10/76- 1/77	0	20.5	0
1/77- 4/77	0	22	0
4/77- 8/77	9.5	33	0
8/77-10/77	9.5	34.5	0
10/77-11/77	9.5	34.5	0
11/77- 1/78	9.5	34.5	0
1/78- 2/78	9.5	34.5	0
2/78- 4/78	9.5	34.5	0
4/78- 8/79	9.5	33	0
8/79-11/79	9.5	31.5	0
11/79- 2/80	9.5	30	0
2/80- 4/80	9 5	28.5	0
4/80-10/80	9.5	87	0
10/80- 2/81	9.5	89	1
2/81- 6/81	9.5	147.5	1
6/81- 8/81	66	149.5	1
8/81- 9/81	71	149	5
9/81- 2/82	71	151	6
2/82- 8/82	83	207	6
8/82-11/82	83	209	7
11/82- 2/83	83	282	7
2/83- 5/83	87	284	8
5/83-10/83	87	287	8

Indirect land requirements were displayed in Figure 38. When the numbers in Figure 38 are added to the corresponding numbers of Figure 39, Primary and Indirect Land Requirements (Figure 40) is the result.

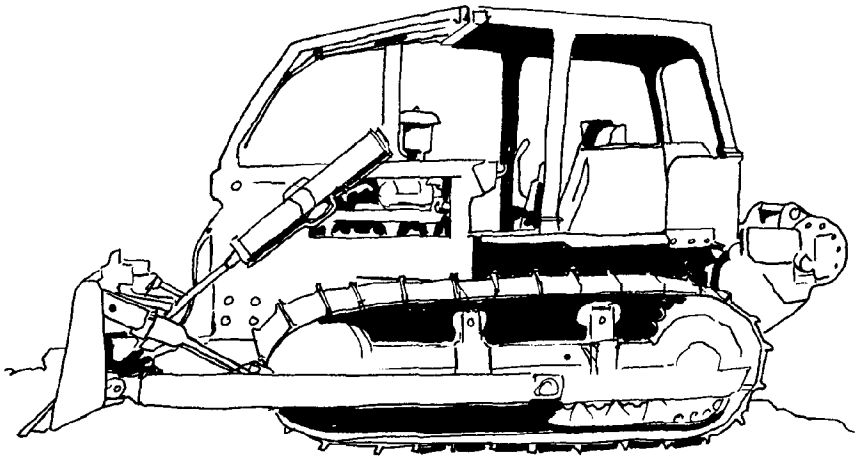
Figure 40

Primary and Indirect Land Requirements (Acres)

Time Period	Primary and Indirect Land Requirements Region I	Region II	Region III
10/76- 1/77	0	117.5	0
1/77- 4/77	0	187	12
4/77- 8/77	33.5	281	12
8/77-10/77	33.5	347.5	27
10/77-11/77	33.5	347.5	27
11/77- 1/78	33.5	347.5	27
1/78- 2/78	33.5	347.5	27
2/78- 4/78	33.5	347.5	27
4/78- 8/79	33.5	346	27
8/79-11/79	33.5	344.5	27
11/79- 2/80	33.5	343	27
2/80- 4/80	33.5	341.5	27
4/80-10/80	33.5	400	27
10/80- 2/81	33.5	402	28
2/81- 6/81	74.5	460.5	28
6.81- 8/81	154	462.5	28
8/82- 9/81	163	486	35
9/81- 2/82	163	525	50
2/82- 8/82	203	614	50
8/82-11/82	203	652	65
11/82- 2/83	203	816	65
2/83- 5/83	212	855	80
5/83-10/83	224	858	92

The uses to which the primary land requirements will be put in each affected study site and in each time period is indicated in Figure 34. The uses to which indirect land requirements will be put include, as was explained above, land for residences of employees of primary sectors, recreation areas, educational institutions, indirect commercial and industrial establishments; in short, all significant indirect land requirements are assumed to be included.

The primary land requirements within each affected study site were suballocated in Figure 35. Similarly, the indirect land requirements within each affected study site were sub-allocated. Therefore, it is reasonable to assume, as the suballocations of both primary and indirect land requirements assumed, that the Region I land requirements will be met in or near Beaumont, Sabine Pass, and Port Arthur; that the Region II land requirements will be largely met in or near Houston and Galveston; and that the Region III land requirements will be met in or near Freeport.



6. WATER REQUIREMENTS

Primary Water Requirements

Primary water requirements were calculated following the procedure outlined in Part B. For Scenario I, primary water requirements are revealed below, in Figure 41.

Figure 41

Primary Water Requirements for Scenario I

Time Period	Days (assuming 20 drilling days per mo.)	Rig(either mobile exploratory or development platforms, 1 rig per platform in operation at any time)	Gallons of Water
10/76- 1/77	60	1	450,000
1/77- 7/77	60	2	900,000
4/77- 8/77	80	3	1,800,000
8/77-10/77	40	4	1,200,000
10/77-11/77	20	3	450,000
11/77- 1/78	40	4	1,200,000
1/78- 2/78	20	3	450,000
2/78- 4/78	40	4	1,200,000
4/78- 8/79	320	3	7,200,000
8/79-11/79	60	2	900,000
11/79- 2/80	60	1	450,000
2/80- 4/80	-	-	-
4/80-10/80	120	1	900,000
10/80- 2/81	80	2	1,200,000
2/81- 6/81	80	3	1,500,000
6/81- 8/81	40	2	600,000
8/81- 9/81	20	3	450,000
9/81- 2/82	100	4	3,000,000
2/82- 8/82	120	2	1,800,000
8/82-11/82	60	1	450,000
11/82- 2/83	60	2	900,000
2/83- 5/83	60	3	1,350,000
5/83-10/83	100	2	1,500,000
TOTAL			29,850,000

Thus, a total of 29,850,000 gallons of water will be required between the commencement of exploratory drilling and the completion of development drilling.

The water utilized by offshore drilling contractors will undoubtedly be furnished in those study sites in which onshore support units for such contractors are located. The "Distribution of Requirements to Study Sites" (Figure 34) reveals the following distribution of onshore support units for the four exploratory drilling contractors and the five development drilling contractors postulated to be required in Scenario I:

Figure 42

Onshore Support Units for Scenario I

	Dockside Support for Exploratory Rigs			Development Drilling Contractors		
	Region I	Region II	Region III	Region I	Region II	Region III
10/76- 1/77	0	1	0	0	0	0
1/77- 4/77	0	2	0	0	0	0
4/77- 8/77	0	3	0	0	0	0
8/77-10/77	0	4	0	0	0	0
10/77-11/77	0	3	0	0	0	0
11/77- 1/78	0	4	0	0	0	0
1/78- 2/78	0	3	0	0	0	0
2/78- 4/78	0	4	0	0	0	0
4/78- 8/79	0	3	0	0	0	0
8/79-11/79	0	2	0	0	0	0
11/79- 2/80	0	1	0	0	0	0
2/80- 4/80	0	0	0	0	0	0
4/80-10/80	0	0	0	0	0	0
10/80- 2/81	0	0	0	0	2	0
2/81- 6/81	0	0	0	1	2	0
6/81- 8/81	0	0	0	1	3	0
8/81- 9/81	0	0	0	1	4	0
9/81- 2/82	0	0	0	1	4	0
2/82- 8/82	0	0	0	1	4	0
8/82-11/82	0	0	0	1	4	0
11/82- 2/83	0	0	0	1	4	0
2/83- 5/83	0	0	0	1	4	0
5/83-10/83	0	0	0	1	3	0

Figure 43, based on the distribution of Figure 42, displays total number of offshore rigs - either exploratory or development - utilizing onshore support from each of the three affected study sites. Figure 43 also distributes the primary water requirements by time (Figure 41) to each of the three affected study sites based on the total number of offshore rigs utilizing onshore support from each study site.

Figure 43

Distribution of Primary Water Requirements

Time Period	Total Offshore Rigs			Primary Water Requirements in 1000's of Gallons (Acre Feet)		
	Region I	Region II	Region III	Region I	Region II	Region III
10/76- 1/77	0	1	0	0	450(1.38)	0
1/77- 4/77	0	2	0	0	900(2.76)	0
4/77- 8/77	0	3	0	0	1,800(5.52)	0
8/77-10/77	0	4	0	0	1,200(3.68)	0
10/77-11/77	0	3	0	0	450(1.38)	0
11/77- 1/78	0	4	0	0	1,200(3.68)	0
1/78- 2/78	0	3	0	0	450(1.38)	0
2/78- 4/78	0	4	0	0	1,200(3.68)	0
4/78- 8/79	0	3	0	0	7,200(22.10)	0
8/79-11/79	0	2	0	0	900(2.76)	0
11/79- 2/80	0	1	0	0	450(1.38)	0
2/80- 4/80	0	0	0	0	0	0
4/80-10/80	0	1	0	0	900(2.76)	0
10/80- 2/81	0	2	0	0	1,200(3.68)	0
2/81- 6/81	1	2	0	500(1.53)	1,000(3.07)	0
6/81- 8/81	1	1	0	300(.92)	300(.92)	0
8/81- 9/81	1	2	0	150(.46)	300(.92)	0
9/81- 2/82	1	3	0	750(2.3)	2,250(6.9)	0
2/82- 8/82	1	1	0	900(2.76)	900(2.76)	0
8/82-11/82	0	1	0	0	450(1.38)	0
11/82- 2/83	1	1	0	450(1.38)	450(1.38)	0
2/83- 5/83	1	2	0	750(2.3)	900(2.76)	0
5/83-10/83	1	1	0	750(2.3)	750(2.3)	0
TOTAL				4,250 (13.04)	25,600 (78.56)	0
GRAND TOTAL				29,850 (91.61)		

A comparison of Figure 42 with Figure 43 will reveal that the total number of offshore rigs fluctuates while the number of development drilling contractors remains fairly constant through time. This is so because it was assumed that the drilling contracting business engendered in Scenario I would stay in place even if the activity which originally engendered their development was to temporarily decline. Thus, while it is assumed that an increase in the offshore drilling sector, once established, will remain in place through time, it is also assumed that the amount of drilling each contractor will do (and thus the water each will require) will fluctuate.

Indirect Water Requirements

Indirect water requirements generated by the exploration, development, and production phases of Scenario I were calculated by using the indirect water requirement coefficients of the OCSOG Model (see Appendix E). The term "indirect" here refers to the requirements which, in Input/Output terminology, are referred to as "indirect and induced." The one word, "indirect," is used here and throughout the study (unless otherwise noted) for convenience. The indirect water requirement coefficients of the OCSOG Model are displayed in Figure 44.

Figure 44

Indirect Water Requirement Coefficients of the OCSOG Model

	Coefficients (Acre Feet/Per Employee/Per Year)		
Primary Activity	Region I	Region II	Region III
Drilling Contractors	.15577	.202	NA

(Note: NA = not applicable in Scenario I. The only primary activity considered here is "Drilling Contractors" for the same reason that it was the only primary activity considered in the calculation of primary water requirements (see Part B).)

The coefficients in Figure 44 were used to calculate the indirect water requirements for each affected study site and for each significant Scenario I time period (see Figure 45).

Primary and Indirect Water Requirements

The aggregation of primary and indirect water requirements of Scenario I are obtained by adding the numbers in Figure 43 to the corresponding numbers in Figure 45. The result is Figure 46, Aggregation of Primary and Indirect Water Requirements/Scenario I.

Figure 45

Indirect Water Requirements/Scenario I

Time Period	Indirect Water Requirements in 1000's of Gallons (Acre Fee) Region I	Region II	Region III
10/76- 1/77	0	987.3 (3.03)	0
1/77- 4/77	0	1,974.7 (6.06)	0
4/77- 8/77	0	3,949.3 (12.12)	0
8/77-10/77	0	2,632.9 (8.08)	0
10/77-11/77	0	1,316.4 (4.04)	0
11/77- 1/78	0	2,632.9 (8.08)	0
1/78- 2/78	0	1,316.4 (4.04)	0
2/78- 4/78	0	2,632.9 (8.08)	0
4/78- 8/79	0	15,797.2 (48.48)	0
8/79-11/79	0	1,974.7 (6.06)	0
11/79- 2/80	0	987.3 (3.03)	0
2/80- 4/80	0	0 0	0
4/80-10/80	0	1,844.3 (5.66)	0
10/80- 2/81	0	2,456.9 (7.54)	0
2/81- 6/81	948.2 (2.91)	2,456.9 (7.54)	0
6/81- 8/81	472.5 (1.45)	1,844.3 (5.66)	0
8/81- 9/81	237.9 (.73)	1,228.5 (3.77)	0
9/81- 2/82	1,182.9 (3.63)	6,582.2 (20.20)	0
2/82- 8/82	1,420.7 (4.36)	8,426.5 (25.86)	0
8/82-11/82	710.4 (2.18)	4,477.2 (13.74)	0
11/82- 2/83	710.4 (2.18)	4,737.9 (14.54)	0
2/83- 5/83	710.4 (2.18)	5,001.8 (15.35)	0
5/83-10/83	1,521.7 (4.67)	6,800.5 (20.87)	0
TOTAL	7,915.1 (24.29)	82,059.1 (251.83)	0
GRAND TOTAL		89,974.2 (276.12)	

Figure 46

Aggregation of Primary and Indirect Water Requirements/Scenario I

Primary and Indirect Water Requirements in 1000's of Gallons (Acre Feet)

Time Period	Region I	Region II	Region III
10/76- 1/77	0	1,437.3 (4.41)	0
1/77- 4/77	0	2,874.7 (8.82)	0
4/77- 8/77	0	5,749.3 (17.67)	0
8/77-10/77	0	3,832.9 (11.76)	0
10/77-11/77	0	1,766.4 (5.42)	0
11/77- 1/78	0	3,832.9 (11.76)	0
1/78- 2/78	0	1,766.4 (5.42)	0
2/78- 4/78	0	3,832.9 (11.76)	0
4/78- 8/79	0	22,997.2 (70.58)	0
8/79-11/79	0	2,874.7 (8.82)	0
11/79- 2/80	0	1,437.3 (4.41)	0
2/80- 4/80	0	0 0	0
4/80-10/80	0	2,744.3 (8.42)	0
10/80- 2/81	0	3,656.9 (11.22)	0
2/81- 6/81	1,448.2 (4.44)	3,456.9 (10.61)	0
6/81- 8/81	772.5 (2.07)	2,144.3 (6.58)	0
8/81- 9/81	387.9 (1.19)	1,528.5 (4.69)	0
9/81- 2/82	1,932.9 (5.93)	8,832.2 (27.10)	0
2/82- 8/82	2,320.7 (7.12)	9,326.5 (28.62)	0
8/82-11/82	710.4 (2.18)	4,927.2 (15.12)	0
11/82- 2/83	1,160.4 (3.56)	5,187.9 (15.92)	0
2/83-10/83	1,160.4 (3.56)	5,901.8 (18.11)	0
5/83-10/83	2,271.7 (6.97)	7,550.5 (23.17)	0
TOTAL	12,165.1 (37.33)	107,659.1 (330.4)	0
GRAND TOTAL			119,824.2 (367.8)

7. EMPLOYMENT

Indirect Employment

Indirect employment generated by the exploration, development, and production phases of Scenario I were calculated by using the indirect employment coefficients of the OCSOG Model (see Appendix E). Those coefficients are shown in Figure 47.

Figure 47

Indirect Employment Coefficients of OCSOG Model

	Coefficients (Indirect Employees/Per Primary Employee/Per Year)		
Primary Activity	Region I	Region II	Region III
Drilling Contractors	.49479	1.2615	NA
Helicopter Service	.69333	.92867	.1188
Boat Service	NA	.4752	.12046
Well Logging	NA	1.05431	.3446
Diving	NA	1.02312	NA
Cement	.4326	1.07422	NA
Mud	.55936	1.31344	NA
Oilfield Equipment Supply	.36011	.97015	NA
Pipeline Laying	NA	3.15141	NA

(Note: NA = Not applicable in Scenario I.)

The indirect employment coefficients displayed in Figure 47 were used to calculate indirect employment over time in each affected study site of Scenario I (see Figure 48). There is no "Total" row in Figure 48 because; unlike tax payments, water requirements, and personal income; indirect employment can not be cumulated from one time period to the next. For example, the 457 indirect employees shown to be required in Region II during the 2/82 - 8/82 time period must not be seen as additions to the 353 required in the previous time period. Instead, 457 must be seen as representing the total indirect employment requirement in that time period in that region.

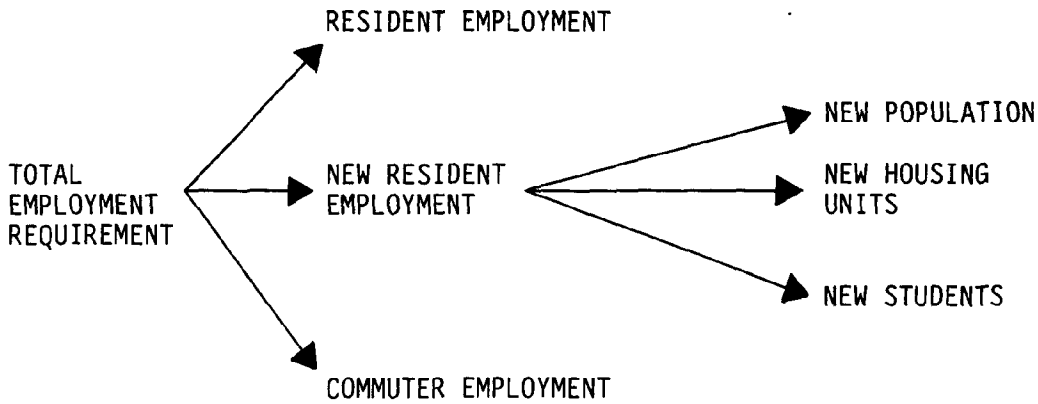
Figure 48

Indirect Employment/Scenario I

Time Period	Region I	Region II	Region III	TOTAL
10/76- 1/77	0	47	0	47
1/77- 4/77	0	71	0	71
4/77- 8/77	6	140	1	147
8/77-10/77	3	85	1	89
10/77-11/77	2	42	0	44
11/77- 1/78	3	85	1	89
1/78- 2/78	2	42	0	44
2/78- 4/78	3	85	1	89
4/78- 8/79	24	580	4	608
8/79-11/79	5	89	2	96
11/79- 2/80	5	70	1	76
2/80- 4/80	3	35	1	39
4/80-10/80	10	265	2	277
10/80- 2/81	6	202	1	209
2/81- 6/81	15	206	1	222
6/81- 8/81	8	116	1	125
8/81- 9/81	4	67	2	73
9/81- 2/82	24	353	3	380
2/82- 8/82	44	457	6	507
8/82-11/82	22	242	3	267
11/82- 2/83	22	330	4	356
2/83- 5/83	24	341	3	368
5/83-10/83	42	550	8	600

Total Employment

The new population associated with OCS oil and gas development in any affected site is primarily a function of the new employment; the same can be said of the number of new housing units and of the number of new students. The first step in calculating new population, housing units, and students, then, is to calculate new employment, and the first step in that process is the determination of total manpower requirements over time in each affected study site of Scenario I; thus, the process can be seen graphically as follows:



Total employment requirements are calculated simply by totaling the primary employment requirements over time in each affected study site (Figure 34) and indirect employment requirements over time in each affected study site (Figure 48).

The result is Figure 49, Aggregation of Primary and Indirect Employment. There is no "Total" row in Figure 49 because the employment figures cannot be cumulated from one time period to the next. The employment figure for any time period in any region must not be seen as an addition to the previous, corresponding figure. Rather, it should be seen as the total employment requirement in that time period in that region.

Figure 49

Aggregation of Primary and Indirect Employment/Scenario I

Time Period	Region I	Region II	Region III	Total
10/76- 1/77	0	272	0	272
1/77- 4/77	0	427	16	443
4/77- 8/77	51	676	17	744
8/77-10/77	48	748	37	833
10/77-11/77	47	705	36	788
11/77- 1/78	48	748	37	833
1/78- 2/78	47	705	36	788
2/78- 4/78	48	748	37	833
4/78- 8/79	69	1148	40	1257
8/79-11/79	50	562	38	650

Figure 49 cont.

11/79- 2/80	50	448	37	535
2/80- 4/80	48	318	37	403
4/80-10/80	55	787	38	880
10/80- 2/81	51	806	37	894
2/81- 6/81	116	925	37	1078
6/81- 8/81	216	899	37	1152
8/81- 9/81	224	994	48	1266
9/81- 2/82	244	1354	69	1667
2/82- 8/82	318	1628	72	2018
8/82-11/82	296	1487	89	1872
11/82- 2/83	296	1888	90	2274
2/83- 5/83	311	1973	109	2393
5/83-10/83	345	2188	130	2663

Origin-of-Employment

Having calculated total employment requirements, it remains to determine what percentage of those requirements will be resident employment, what percentage new resident, and what percentage commuter employment. By "resident employment" is meant employees who currently reside in the affected study site in question; by "new resident employment" is meant employees who do not currently reside in the affected study site in question but who move there to work and establish residences there; and by "commuter employment" is meant employees who do not currently reside in the affected site in question and who commute there to work but do not establish residences there.

Part B contains an extensive discussion concerning the derivation of the origin-of-employment percentages displayed in Figure 50. In short, it can be stated that the percentages are based on the particular OCS activity in question; the fact that Texas in general and some sites in particular (Houston and Galveston, for example) have had extensive previous experience with OCS oil and gas development; and on historic employment/unemployment trends in the affected study site in question. Further, they are based on discussions with private sector officials.

In some cases, the percentage of "new resident" employees may seem too high. For example, it might be assumed that Region II (the Houston, Galveston, Chambers Counties area) currently has in its labor force more than enough personnel to fill all the employment requirements placed upon it by Scenario I. Nevertheless, it is still expected that new residents

Figure 50

Origin-of-Employment Percentages

	Region I			Region II			Region III		
	Resi-dent	New Resident	Com-muter	Resi-dent	New Resident	Com-muter	Resi-dent	New Resident	Com-muter
Exploratory Rigs	NA	NA	NA	40%	45%	15%	NA	NA	NA
Dockside Support for Exploratory Rigs	NA	NA	NA	40%	45%	15%	NA	NA	NA
Development Drilling	40%	40%	20%	45%	40%	15%	NA	NA	NA
Production Operation	50%	50%	0	60%	40%	0	NA	NA	NA
Onshore Support for Platforms	30%	60%	10%	35%	60%	5%	NA	NA	NA
Operations Bases	50%	50%	0	60%	40%	0	NA	NA	NA
Administrative Bases	35%	65%	0	40%	60%	0	NA	NA	NA
Helicopters	30%	70%	0	40%	60%	0	25%	75%	0
Boats	NA	NA	NA	40%	60%	0	25%	75%	0
Well Logging	NA	NA	NA	40%	60%	0	25%	75%	0
Diving	NA	NA	NA	40%	60%	0	NA	NA	NA
Cement	50%	50%	0	60%	40%	0	NA	NA	NA
Mud	50%	50%	0	60%	40%	0	NA	NA	NA
Oilfield Equip. Supply	50%	50%	0	60%	40%	0	NA	NA	NA
Pipeline Laying	NA	NA	NA	40%	45%	15%	NA	NA	NA
Indirect Employment	45%	55%	NA	50%	50%	NA	25%	75%	NA

(Note: NA = Not applicable in Scenario I.)

Figure 51

Resident, New Resident, and Commuter
Employment Scenario I

Time Period	Region I			Region II			Region III		
	Resi-dent	New Resi-dent	Com-muter	Resi-dent	New Resi-dent	Com-muter	Resi-dent	New Resi-dent	Com-muter
10/76- 1/77	0	0	0	124	134	14	0	0	0
1/77- 4/77	0	0	0	187	211	29	4	12	0
4/77- 8/77	26	25	0	298	335	43	4	13	0
8/77-10/77	23	25	0	321	370	57	9	28	0
10/77-11/77	22	25	0	278	370	57	8	28	0
11/77- 1/78	23	25	0	321	370	57	9	28	0
1/78- 2/78	22	25	0	278	370	57	8	28	0
2/78- 4/78	23	25	0	321	370	57	9	28	0
4/78- 8/79	35	34	0	705	400	43	12	28	0
8/79-11/79	16	34	0	133	400	29	10	28	0
11/79- 2/80	16	34	0	34	400	14	9	28	0
2/80- 4/80	14	34	0	0	400*	0	9	28	0
4/80-10/80	21	34	0	377	401	9	10	28	0
10/80- 2/81	17	34	0	379	408	19	9	28	0
2/81- 6/81	61	53	2	435	470	20	9	28	0
6/81- 8/81	91	112	13	401	470	28	9	28	0
8/81- 9/81	95	116	13	456	500	38	13	35	0
9/81- 2/82	104	127	13	629	686	39	18	51	0
2/82- 8/82	135	168	15	761	828	39	19	53	0
8/82-11/82	113	168	15	620	828	39	22	67	0
11/82- 2/83	113	168	15	882	966	40	22	68	0
2/83- 5/83	128	168	15	918	1014	41	27	82	0
5/83-10/83	149	181	15	1023	1132	33	32	98	0

*While this number is larger than the total number of employees required in Region II in this time period (See Figure 49), it is assumed that the new residents will not move away.

will move into the area in anticipation of securing OCS-related or OCS-generated (indirect) employment. Further, by assuming a high "new resident" percentage, a relatively high degree of impact can be analyzed; extent of impact can be scaled down if, indeed, "new resident" employment is lower than assumed. Thus, the origin-of-employment estimates displayed in Figure 50 are RPC study assumptions (not predictions) employed for purposes of furtherance of the study.

When the origin-of-employment percentages of Figure 50 are applied to the employment requirements for each activity in each affected region and in each relevant Scenario I time period the numbers of resident, new resident, and commuter employment (Figure 51) is the result.

New Population

As Part B indicated, the number of new resident employees in each affected study site (Figure 51) provides the key with which new population can be calculated. (The reader is urged to review this section of Part B.) In short, the new population for each affected study site of Scenario I were calculated by multiplying new resident employment by 2.7 persons.

Based on the new resident employment totals in Figure 51 and the 2.7 multiplier, the new population totals for each affected study site over time (Figure 52) were derived.

Figure 52

New Population/Scenario I

Time Period	Region I	Region II	Region III
10/76- 1/77	0	362	0
1/77- 4/77	0	570	32
4/77- 8/77	68	905	35
8/77-10/77	68	999	76
10/77-11/77	68	999	76
11/77- 1/78	68	999	76
1/78- 2/78	68	999	76
2/78- 4/78	68	999	76
4/78- 8/79	92	1080	76
8/79-11/79	92	1080	76
11/79- 2/80	92	1080	76

2/80- 4/80	92	1080	76
4/80-10/80	92	1083	76
10/80- 2/81	92	1102	76
2/81- 6/81	143	1269	76
6/81- 8/81	302	1269	76
8/81- 9/81	313	1350	95
9/81- 2/82	343	1852	138
2/82- 8/82	454	2236	143
8/82-11/82	454	2236	181
11/82- 2/83	454	2608	184
2/83- 5/83	454	2738	221
5/83-10/83	489	3056	265

New Housing Units

The approach to calculation of the number of new housing units associated with Scenario I activities in each affected study site was, once again, the utilization of a multiplier. That is, the number of new housing units generated by the OCS activities of Scenario I is equal to new population x .34 (see Part B for a detailed discussion of the use of this multiplier.)

Based on the population totals displayed in Figure 52 and the multiplier discribed above, the total number of new housing units in each affected study site over time (Figure 53) was derived.

New Students

Like new population and new housing units, the number of new students associated with Scenario I activities was calculated through use of a multiplier: new population x .252. (Again, Part B contains an extensive discussion of the derivation of this multiplier.)

Based on population totals in Figure 52 and the multiplier described above, the total number of new elementary and high school students in each affected study site over time was calculated (Figure 54).

Figure 53

New Housing Units/Scenario I

Time Period	Region I	Region II	Region III
10/76- 1/77	0	123	0
1/77- 4/77	0	194	11
4/77- 8/77	23	308	12
8/77-10/77	23	340	26
10/77-11/77	23	340	26
11/77- 1/78	23	340	26
1/78- 2/78	23	340	26
2/78- 4/78	23	340	26
4/78- 8/79	31	367	26
8/79-11/79	31	367	26
11/79- 2/80	31	367	26
2/80- 4/80	31	367	26
4/80-10/80	31	368	26
10/80- 2/81	31	375	26
2/81- 6/81	49	431	26
6/81- 8/81	103	431	26
8/81- 9/81	106	459	32
9/81- 2/82	117	630	47
2/82- 8/82	154	760	49
8/82-11/82	154	760	62
11/82- 2/83	154	887	63
2/83- 5/83	154	931	75
5/83-10/83	166	1039	90

Figure 54

New Students/Scenario I

Time Period	Region I	Region II	Region III
10/76- 1/77	0	91	0
1/77- 4/77	0	114	8
4/77- 8/77	17	228	9
8/77-10/77	17	252	19
10/77-11/77	17	252	19
11/77- 1/78	17	252	19
1/78- 2/78	17	252	19
2/78- 4/78	17	252	19
4/78- 8/79	23	272	19
8/79-11/79	23	272	19
11/79- 2/80	23	272	19
2/80- 4/80	23	272	19
4/80-10/80	23	273	19
10/80- 2/81	23	278	19
2/81- 6/81	36	320	19
6/81- 8/81	76	320	19
8/81- 9/81	79	340	24
9/81- 2/82	86	467	35
2/82- 8/82	114	563	36
8/82-11/82	114	563	45
11/82- 2/83	114	657	46
2/83- 5/83	114	690	56
5/83-10/83	123	770	67

8. PRIMARY EXPENDITURES

Like tax payments, the expenditures made in each of the three affected study sites for primary exploration, development, and production activities are calculated by using expenditure coefficients of the OCSOG Model (see Appendix E). Those coefficients are arrayed in Figure 55. When the coefficients in Figure 55 are used, expenditures are derived.

Figure 56 displays the expenditures in primary exploration, development, and production activities in Region I (Orange and Jefferson Counties) based on Scenario I employment in those activities. Expenditures are broken down by relevant activity - that is, those Scenario I activities postulated to take place in Region I - and are presented by the significant Scenario I time periods (see Figure 1).

Figure 57 provides the same kind of expenditure information for Region II (Harris, Galveston, and Chambers Counties); Figure 58 for Region III (Brazoria County).

The total expenditures over time during Scenario I can be analyzed in several ways. Figure 59 contains totals by study site, by time period, and by activity.

Thus, it can be seen that expenditures in Region I will total $20,385,000; $163,878,000 in Region II; and $12,483,000 in Region III, for a total of $196,746,000.

Figure 55

Expenditure Coefficients of OCSOG Model

	Expenditure Coefficient ($ Million Annually Per Employee)		
Primary Activity	Region I	Region II	Region III
Drilling Contractors	.0386	.0386	NA
Helicopter Service	.0417	.0411	.0437
Boat Service	NA	.021057	.0334
Well Logging	NA	.032	.0334
Diving	NA	.0383	NA
Cement	.0357	.0358	NA
Mud	.0403	.04	NA
Oil Field Equipment Supply	.0345	.0345	NA
Pipeline Laying	NA		

(Note: NA = Not applicable in Scenario I)

Figure 56. Expenditures/Scenario I in Region I

Time Period	Drilling Contractors		Helicopter Services		Cement		Mud		Oil Field Equipment Supply		Total
	Emp.	Expenditures*	Emp.	Expenditures*	Emp.	Expenditures*	Emp.	Expenditures*	Emp.	Expenditures*	
10/76-1/77	0	0	0	0	0	0	0	0	0	0	0
1/77-4/77	0	0	0	0	0	0	0	0	0	0	0
4/77-8/77	0	0	0	0	0	0	13	.175	32	.368	.543
8/77-10/77	0	0	0	0	0	0	13	.087	32	.184	.271
10/77-11/77	0	0	0	0	0	0	13	.044	32	.092	.136
11/77-1/78	0	0	0	0	0	0	13	.087	32	.184	.271
1/78-2/78	0	0	0	0	0	0	13	.044	32	.092	.136
2/78-4/78	0	0	0	0	0	0	13	.087	32	.184	.271
4/78-8/79	0	0	0	0	0	0	13	.7	32	1.472	2.172
8/79-11/79	0	0	0	0	0	0	13	.131	32	.276	.407
11/79-2/80	0	0	0	0	0	0	13	.131	32	.276	.407
2/80-4/80	0	0	0	0	0	0	13	.087	32	.184	.271
4/80-10/80	0	0	0	0	0	0	13	.262	32	.552	.814
10/80-2/81	0	0	0	0	0	0	13	.175	32	.368	.543
2/81-6/81	56	.72	0	0	0	0	13	.175	32	.368	1.263
6/81-8/81	56	.36	4	.028	0	0	13	.087	32	.184	.659
8/81-9/81	56	.18	4	.014	12	.036	13	.044	32	.092	.366
9/81-2/82	56	.9	4	.069	12	.178	13	.218	32	.46	1.825
2/82-8/82	56	1.081	8	.167	12	.214	13	.262	64	1.104	2.828
8/82-11/82	56	.54	8	.083	12	.107	13	.131	64	.552	1.413
11/82-2/83	56	.54	8	.083	12	.107	13	.131	64	.552	1.413
2/83-5/83	56	.54	8	.083	12	.107	26	.262	64	.552	1.544
5/83-10/83	72	1.158	8	.139	12	.178	26	.437	64	.92	2.832
TOTAL		6.019		.666		.927		3.757		9.016	20.385

*Expenditures are given in millions of dollars.

Figure 57 Expenditures/Scenario I in Region II

Time Period	Drilling Contractors		Helicopter Services		Boat Services		Well Logging		Diving Services		Cement		Mud		Oil Field Equipment Supply		Pipeline Laying		Total
	Emp.	Expenditures*	Emp.	Expenditures*	Emp.	Expenditures*	Emp.	Expenditures*	Emp.	Expenditures*	Emp.	Expenditures*	Emp.	Expenditures*	Emp.	Expenditures*	Emp.	Expenditures*	
0/76-1/77	60	.579	4	.041	48	.253	10	.08	11	.105	12	.107	13	.13	32	.276	0	0	1.571
1/77-4/77	120	1.158	8	.082	80	.421	10	.08	11	.105	12	.107	13	.13	32	.276	0	0	2.359
4/77-8/77	180	2.316	12	.164	128	.898	20	.213	22	.281	24	.286	13	.173	32	.368	0	0	4.699
8/77-10/77	240	1.544	12	.082	160	.562	20	.107	22	.14	24	.143	13	.087	32	.184	0	0	2.849
0/77-11/77	240	.772	12	.041	160	.281	20	.053	22	.07	24	.072	13	.043	32	.092	0	0	1.424
1/77-1/78	240	1.544	12	.082	160	.562	20	.107	22	.14	24	.143	13	.087	32	.184	0	0	2.849
1/78-2/78	240	.772	12	.041	160	.281	20	.053	22	.07	24	.072	13	.043	32	.092	0	0	1.424
2/78-4/78	240	1.544	12	.082	160	.562	20	.107	22	.14	24	.143	13	.087	32	.184	0	0	2.849
4/78-8/79	180	9.264	12	6.56	160	4.492	20	.852	22	1.124	24	1.144	13	.692	32	1.472	0	0	19.696
8/79-11/79	120	1.158	12	.123	160	.842	20	.16	22	.211	24	.215	13	.13	32	.276	0	0	3.115
1/79-2/80	60	.579	12	.123	160	.842	20	.16	22	.211	24	.215	13	.13	32	.276	0	0	2.536
2/80-4/80	-	-	12	.082	160	.562	20	.107	22	.14	24	.143	13	.087	32	.184	0	0	1.305
4/80-10/80	56	1.081	12	.247	160	1.685	20	.32	22	.421	24	.43	13	.26	32	.552	80	5.128	10.124
0/80-2/81	112	1.441	20	.274	160	1.123	20	.213	22	.281	24	.286	13	.173	32	.368	80	3.418	7.577
2/81-6/81	112	1.441	32	.438	160	1.123	20	.213	22	.281	24	.286	13	.173	32	.368	80	3.418	7.741
6/81-8/81	168	1.081	40	.274	160	.562	20	.107	22	.14	24	.143	13	.087	32	.184	80	1.710	4.288
8/81-9/81	224	.721	52	.178	208	.365	10	.027	22	.07	12	.036	13	.043	64	.184	80	.855	2.479
9/81-2/82	240	3.86	60	1.027	240	2.106	10	.133	22	.351	12	.179	13	.217	64	.92	80	4.204	12.997
2/82-8/82	256	4.941	68	1.397	288	3.032	10	.16	22	.421	12	.215	26	.52	64	1.104	80	5.128	16.918
8/82-11/82	272	2.625	76	.781	320	1.685	10	.08	22	.211	12	.107	26	.26	64	.552	80	2.564	8.865
1/82-2/83	288	2.779	88	.904	368	1.937	20	.16	22	.211	24	.215	26	.26	96	.828	160	5.128	12.422
2/83-5/83	304	2.934	96	.986	400	2.106	20	.16	22	.211	24	.215	26	.26	96	.828	160	5.128	12.828
5/83-10/83	248	3.989	108	1.849	432	3.79	20	.267	22	.351	24	.358	26	.433	96	1.38	160	8.546	20.963
TOTAL		48.123		9.954		30.072		3.919		5.686		5.26		4.505		11.132		45.227	163.876

*Expenditures are given in millions of dollars.

Figure 58

Expenditures/Scenario I in Region III

Time Period	Helicopter Services		Boat Services		Well Logging		Total
	Emp.	Expenditure*	Emp.	Expenditure*	Emp.	Expenditure*	
10/76-1/77	0	0	0	0	0	0	0
1/77-4/77	0	0	16	.145	0	0	.145
4/77-8/77	0	0	16	.193	0	0	.193
8/77-10/77	4	.029	32	.193	0	0	.222
10/77-11/77	4	.015	32	.097	0	0	.112
11/77-1/78	4	.029	32	.193	0	0	.222
1/78-2/78	4	.015	32	.097	0	0	.112
2/78-4/78	4	.029	32	.193	0	0	.222
4/78-8/79	4	.232	32	1.544	0	0	1.776
8/79-11/79	4	.044	32	.29	0	0	.334
11/79-2/80	4	.044	32	.29	0	0	.334
2/80-4/80	4	.029	32	.193	0	0	.222
4/80-10/80	4	.087	32	.58	0	0	.667
10/80-2/81	4	.058	32	.386	0	0	.444
2/81-6/81	4	.058	32	.386	0	0	.444
6/81-8/81	4	.029	32	.193	0	0	.222
8/81-9/81	4	.015	32	.097	10	.028	.14
9/81-2/82	8	.146	48	.724	10	.139	1.009
2/82-8/82	8	.175	48	.869	10	.167	1.211
8/82-11/82	12	.131	64	.58	10	.084	.795
11/82-2/83	12	.131	64	.58	10	.084	.795
2/83-5/83	16	.175	80	.724	10	.084	.983
5/83-10/83	16	.291	96	1.449	10	.139	1.879
TOTAL		1.762		9.996		.725	12.483

* Expenditures are given in millions of dollars

Figure 59

Total Expenditures/Scenario I

Time Period	ACTIVITY																											Sub-Total
	Drilling Contractors Region			Helicopters Services Region			Boat Services Region			Well Logging Region			Diving Services Region			Cement Region			Mud Region			Oil Field Equipment Supply Region			Pipeline Laying Region			
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	
10-76- 1/77	0	.579	0	0	.041	0	0	.253	0	0	.08	0	0	.105	0	0	.107	0	0	.13	0	0	.276	0	0	0	0	1.571
1/77- 4/77	0	1.158	0	0	.082	0	0	.421	.145	0	.08	0	0	.105	0	0	.107	0	0	.13	0	0	.276	0	0	0	0	2.504
4/77- 8/77	0	2.316	0	0	.164	0	0	898	.193	0	.213	0	0	.281	0	0	.286	0	.175	.173	0	.368	.368	0	0	0	0	5.435
8/77-10/77	0	1.544	0	0	.082	.029	0	.562	.193	0	.107	0	0	.14	0	0	.143	0	.087	.087	0	.184	.184	0	0	0	0	3.342
10/77-11/77	0	.772	0	0	.041	.015	0	.281	.097	0	.053	0	0	.07	0	0	.072	0	.044	.043	0	.092	.092	0	0	0	0	1.672
11/77- 1/78	0	1.544	0	0	.082	.029	0	.562	.193	0	.107	0	0	.14	0	0	.143	0	.087	.087	0	.184	.184	0	0	0	0	3.342
1/78- 2/78	0	.772	0	0	.041	.015	0	.281	.096	0	.053	0	0	.07	0	0	.072	0	.044	.043	0	.092	.092	0	0	0	0	1.672
2/78- 4/78	0	1.544	0	0	.082	.029	0	.562	.193	0	.107	0	0	.14	0	0	.143	0	.087	.087	0	.184	.184	0	0	0	0	3.342
4/78- 8/79	0	9.264	0	0	.656	.232	0	2.492	1.544	0	.852	0	0	1.124	0	0	1.144	0	.7	.692	0	1.472	1.472	0	0	0	0	23.644
8/79-11/79	0	1.158	0	0	.123	.044	0	.842	.29	0	.16	0	0	.211	0	0	.214	0	.131	.13	0	.276	.276	0	0	0	0	3.856
11/79- 2/80	0	.579	0	0	.123	.044	0	.842	.29	0	.16	0	0	.211	0	0	.215	0	.131	.13	0	.276	.276	0	0	0	0	3.277
2/80- 4/80	0	0	0	0	.082	.029	0	.562	.193	0	.107	0	0	.14	0	0	.143	0	.087	.087	0	.184	.184	0	0	0	0	1.798
4/80-10/80	0	1.081	0	0	.247	.087	0	1.685	.58	0	.32	0	0	.421	0	0	.43	0	.262	.26	0	.552	.552	0	0	5.128	0	11.605
10/80- 2/81	0	1.441	0	0	.274	.058	0	1.123	.386	0	.213	0	0	.281	0	0	.286	0	.175	.173	0	.368	.368	0	0	3.418	0	8.564
2/81- 6/81	.72	1.441	0	0	.438	.058	0	1.123	.386	0	.213	0	0	.281	0	0	.286	0	.175	.173	0	.368	.368	0	0	3.418	0	9.448
6/81- 8/81	.36	1.081	0	.028	.274	.029	0	.562	.193	0	.107	0	0	.14	0	0	.143	0	.087	.087	0	.184	.184	0	0	1.71	0	5.169
8/81- 9/81	.18	.721	0	.014	.178	.015	0	.365	.097	0	.027	.028	0	.07	0	.036	.036	0	.044	.043	0	.092	.184	0	0	.855	0	2.985
9/81- 2/82	.9	3.86	0	.069	1.027	.146	0	2.106	.724	0	.133	.139	0	.351	0	.178	.179	0	.218	.217	0	.46	.92	0	0	4.204	0	15.831
2/82- 8/82	1.081	4.941	0	.167	1.397	.175	0	3.032	.869	0	.16	.167	0	.421	0	.214	.215	0	.262	.52	0	1.104	1.104	0	0	5.128	0	20.956
8/82-11/82	.54	2.625	0	.083	.781	.131	0	1.685	.58	0	.08	.084	0	.211	0	.107	.107	0	.131	.26	0	.552	.552	0	0	2.564	0	11.073
11/82- 2/83	.54	2.779	0	.083	.904	.131	0	1.937	.58	0	.16	.084	0	.211	0	.107	.215	0	.131	.26	0	.552	.828	0	0	5.128	0	14.63
2/83- 5/83	.54	2.934	0	.083	.986	.175	0	2.106	.724	0	.16	.084	0	.211	0	.107	.215	0	.262	.26	0	.552	.828	0	0	5.128	0	15.355
5/83-10/83	1.158	3.989	0	.139	1.849	.291	0	3.79	1.449	0	.267	.139	0	.351	0	.178	.358	0	.437	.433	0	.92	1.38	0	0	8.546	0	25.674
SUB-TOTAL	6.019	48.123	0	.666	9.954	1.762	0	30.072	9.996	0	3.919	.725	0	5.686	0	.927	5.26	0	3.757	4.505	0	9.016	11.133	0	0	45.227	0	
TOTAL		54.142			12.382			40.068			4.644			5.686			6.187			8.262			20.149			45.227		
GRAND TOTAL																												196.746

NOTE: Expenditures are given in millions of dollars.

9. PRIMARY AND INDIRECT PERSONAL INCOME

Person income, both primary and indirect, generated by the three phases of Scenario I were, once again, calculated by using personal income coefficients of the OCSOG Model (see Appendix E). Those are revealed in Figure 60.

The personal income coefficients displayed in Figure 60 were used to calculate the personal incomes shown in Figure 61.

Figure 60

Personal Income Coefficients of the OCS Model

Primary Activity	Coefficients (Dollars/Per Employee/Per Year) Region I	Region II	Region III
Drilling Contractors	11,520.60	22,500.00	NA
Helicopter Service	14,250.33	23,192.00	8,908.71
Boat Service	NA	11,386.00	1,037.22
Well Logging	NA	15,967.00	5,296.14
Diving	NA	25,202.00	NA
Cement	14,124.11	25,613.00	NA
Mud	15,839.91	30,872.00	NA
Oil Field Equipment Supply	11,918.64	23,342.00	NA
Pipeline Laying	NA	56,816.00	NA

(Note: NA = Not applicable in Scenario I.)

Figure 61

Personal Income/Scenario I

Personal Income

Time Period	Region I	Region II	Region III	Total
10/76- 1/77	0	$ 970,457	0	$ 970,457
1/77- 4/77	0	1,422,237	$ 28,148	1,450,385
4/77- 8/77	$ 195,771	2,807,496	37,531	3,040,798
8/77-10/77	97,885	1,689,473	43,470	1,830,828
10/77-11/77	48,942	844,737	21,734	915,413
11/77- 1/78	97,885	1,689,473	42,470	1,830,828
1/78- 2/78	48,942	844,737	21,734	915,413
2/78- 4/78	97,885	1,689,473	43,470	1,830,828
4/78- 8/79	783,084	11,395,788	347,764	12,526,636
8/79-11/79	146,828	1,859,210	65,205	2,071,243
11/79- 2/80	146,828	1,521,710	65,205	1,733,743
2/80- 4/80	97,885	789,473	43,470	930,828
4/80-10/80	293,657	5,271,060	130,412	5,695,129
10/80- 2/81	195,771	3,915,885	86,941	4,198,597
2/81- 6/81	410,822	4,008,653	86,941	4,506,416
6/81- 8/81	214,910	2,285,249	43,470	2,543,629
8/81- 9/81	121,578	1,339,688	26,147	1,487,413
9/81- 2/82	607,897	7,077,494	192,506	7,877,897
2/82- 8/82	948,676	9,239,767	231,007	10,419,450
8/82-11/82	482,337	4,847,356	152,561	5,482,254
11/82- 2/83	438,337	6,583,376	152,561	7,218,274
2/83- 5/83	525,817	6,810,848	189,618	7,526,283
5/83-10/83	953,167	11,094,186	362,946	12,410,299
TOTAL	$6,998,904	$89,997,826	$2,416,311	$99,413,041
GRAND TOTAL		$99,413,041		

10. STATE TAX REVENUE

Primary State Tax Revenue

The direct tax payments to the State government in each affected study site from the exploration, development, and production phases of Scenario I are calculated by using the direct state tax payment coefficients of the OCSOG Model (see Appendix E). Figure 62 displays those coefficients. Using those coefficients, primary state tax payments were derived for each affected study site over time; they are displayed in Figure 63.

Indirect State Tax Revenue

Indirect tax payments generated by the exploration, development, and production phases of Scenario I were, like direct tax payments, calculated by using the indirect tax payment coefficients of the OCSOG Model (see Appendix E). Indirect state tax coefficients are shown in Figure 64.

The indirect state tax coefficients in Figure 64 were used to calculate the indirect state tax payments shown in Figure 65.

Total State Tax Revenue

Aggregated primary and indirect tax payments to the state government can calculated by adding the payments displayed in Figure 63 to the corresponding payments in Figure 65. The result is presented in Figure 66, Aggregated State Payments/Scenario I.

It must be noted that the tax payments for any given time period in Figure 66 represent only the amount of tax dollars accruing to the affected unit or units of government during that time period. They do not indicate that the affected unit or units of government actually collect that amount of tax revenue during that particular time period. Indeed, in many cases there may be a significant time lag between the time that taxes accrue to a unit of government and the time at which that unit of government actually collects those taxes. Thus, we see only tax accruals in Figure 66; the actual time and amount of tax payments will be further analyzed in succeeding chapters.

Figure 62

State Tax Payment Coefficients of OCSOG Model

Primary Activity	State Tax Payment Coefficient ($ Million Annually Per Employee) Region I	Region II	Region III
Drilling Contractors	0	.000037	NA
Helicopter Service	.000333	.000313	.000286
Boat Service	NA	.000210	.000360
Well Logging	NA	.000324	.000286
Diving	NA	.000140	NA
Cement	.000333	.000360	NA
Mud	.000400	.000401	NA
Oil Field Equipment Supply	.000344	.000345	NA
Pipeline Laying	NA	.003522	NA

(Note: NA = Not applicable in Scenario I)

Figure 63

Primary State Tax Payments/Scenario I

Direct State Tax Payments

Time Period	Region I	Region II	Region III	Total
10/76- 1/77	0	$ 9,726	0	$ 9,726
1/77- 4/77	0	12,274	$ 1,440	13,714
4/77- 8/77	$ 5,403	23,917	1,920	31,240
8/77-10/77	2,702	13,448	2,111	18,261
10/77-11/77	1,350	6,724	1,055	9,129
11/77- 1/78	2,702	13,448	2,111	18,261
1/78- 2/78	1,350	6,724	1,055	9,129
2/78- 4/78	2,702	13,448	2,111	18,261
4/78- 8/79	21,612	104,628	16,884	143,124
8/79-11/79	4,052	19,062	3,166	26,280
11/79- 2/80	4,052	18,507	3,166	25,725
2/80- 4/80	2,702	11,968	2,111	16,781
4/80-10/80	8,304	177,821	6,332	192,457
10/80- 2/81	5,403	120,073	4,221	129,697
2/81- 6/81	5,403	121,325	4,221	130,949
6/81- 8/81	2,924	61,425	2,111	66,460
8/81- 9/81	1,794	32,328	1,293	35,415
9/81- 2/82	8,974	165,730	9,345	184,049
2/82- 8/82	17,138	208,071	11,214	236,423
8/82-11/82	8,469	106,490	7,333	122,292
11/82- 2/83	8,469	185,187	7,333	200,989
2/83- 5/83	9,769	187,641	9,059	206,469
5/83-10/83	16,281	316,235	17,499	350,015
TOTAL	$141,555	$1,936,200	$117,091	
GRAND TOTAL		$2,194,846		

Figure 64

Indirect State Tax Coefficients of OCSOG Model

Primary Activity	Coefficients (Dollars/Per Employee/Per Year Region I	Region II	Region III
Drilling Contractors	128.80	252.87	NA
Helicopter Service	80.00	234.70	99.57
Boat Service	NA	101.43	43.12
Well Logging	NA	213.01	118.57
Diving	NA	204.77	NA
Cement	113.00	245.08	NA
Mud	169.91	302.74	NA
Oil Field Equipment Supply	75.02	254.50	NA
Pipeline Laying	NA	1,035.95	NA

(Note: NA = Not applicable in Scenario I.)

Figure 65

Indirect Tax Payments to State Government/Scenario I

Time Period	Region I	Region II	Region III	Total
10/76- 1/77	0	$ 10,095.71	0	$ 10,095.71
1/77- 4/77	0	14,934.90	$ 172.48	15,107.38
4/77- 8/77	$ 1,536.49	29,347.58	229.97	31,114.04
8/77-10/77	768.25	17,743.44	296.35	18,808.04
10/77-11/77	384.12	8,871.73	148.18	9,404.03
11/77- 1/78	768.25	17,743.44	296.35	18,808.04
1/78- 2/78	384.12	8,871.73	148.18	9,404.03
2/78- 4/78	768.25	17,743.44	296.35	18,808.04
4/78- 8/79	6,145.96	121,718.00	2,370.84	130,234.80
8/79-11/79	1,152.37	19,029.08	444.53	20,625.98
11/79- 2/80	1,152.37	15,236.03	444.53	16,832.93
2/80- 4/80	768.25	7,628.64	296.35	8,693.24
4/80-10/80	2,304.74	71,404.30	889.06	74,598.10
10/80- 2/81	1,536.49	52,948.98	592.71	55,078.18
2/81- 6/81	3,938.49	53,887.78	592.71	58,418.98
6/81- 8/81	2,023.58	29,616.94	296.35	31,936.87
8/81- 9/81	1,124.79	16,885.02	246.99	18,256.80
9/81- 2/82	5,623.95	88,245.68	1,688.34	95,557.97
2/82- 8/82	8,109.06	113,258.70	2,026.01	123,393.97
8/82-11/82	4,054.53	58,921.68	1,285.06	64,261.27
11/82- 2/83	4,054.53	85,877.18	1,285.06	91,216.77
2/83- 5/83	4,606.74	88,169 50	1,557.11	94,333.35
5/83-10/83	8,536.89	143,574.75	2,882.64	154,994.28
TOTAL	$59,742.22	$1,091.754.20	$18,486.15	
GRAND TOTAL		$1,169,982.60		

Figure 66

Aggregated State Tax Payments/Scenario I

Direct and Indirect State Tax Payments

Time Period	Region I	Region II	Region III	Total
10/76- 1/77	0	$ 19,822	0	$ 19,822
1/77- 4/77	0	27,209	$ 1,612	28,821
4/77- 8/77	$ 6,939	53,265	2,150	62,354
8/77-10/77	3,470	31,191	2,407	37,068
10/77-11/77	1,734	15,596	1,203	18,533
11/77- 1/78	3,470	31,191	2,407	37,068
1/78- 2/78	1,734	15,596	1,203	18,533
2/78- 4/78	3,470	31,191	2,407	37,068
4/78- 8/79	27,756	226,346	19,256	273,360
8/79-11/79	5,204	38,091	3,611	46,906
11/79- 2/80	5,204	33,743	3,611	42,558
2/80- 4/80	3,470	19,597	2,407	25,474
4/80-10/80	10,609	249,225	7,221	267,055
10/80- 2/81	6,939	173,222	4,814	184,975
2/81- 6/81	9,341	175,213	4,814	189,368
6/81- 8/81	4,948	91,042	2,407	98,397
8/81- 9/81	2,919	49,213	1,540	53,672
9/81- 2/82	14,598	253,976	11,033	279,607
2/82- 8/82	25,247	321,330	13,240	359,817
8/82-11/82	12,524	165,412	8,618	186,554
11/82- 2/83	12,524	271,064	8,618	292,206
2/83- 5/83	14,376	275,811	10,616	300,803
5/83-10/83	24,818	459,810	20,382	505,010
TOTAL	$201,294	$3,028,158	$135,577	
GRAND TOTAL		$3,365,029		

11. LOCAL TAX REVENUE

Primary Local Tax Revenue

The direct tax payments to local governments in each affected study site from the exploration, development, and production activities of Scenario I are calculated by using the direct local tax payment coefficients of the OCSOG Model (Appendix E). Figure 67 displays those coefficients. Using those coefficients, primary local tax payments were derived for each affected study site over time; they are displayed in Figure 68.

Indirect Local Tax Revenue

Indirect tax payments generated by the exploration, development, and production phases of Scenario I were, like direct tax payments, calculated by using the indirect tax payment coefficients of the OCSOG Model (Appendix E). Indirect local tax payment coefficients are shown in Figure 69.

The indirect local tax coefficients shown in Figure 69 were used to calculate the indirect local tax payments shown in Figure 70.

Total Local Tax Revenue

Aggregated primary and indirect tax payments to the local governments can be calculated by adding the payments displayed in Figure 68 to the corresponding payments in Figure 70. The result is presented in Figure 71, Aggregated Local Tax Payments/Scenario I.

It must be noted that the tax payments for any given time period in Figure 71, represent only the amount of tax dollars accruing to the affected unit or units of government during that time period. They do not indicate that the affected unit or units of government actually collect that amount of tax revenue during that particular time period. Indeed, in many cases there may be a significant time lag between the time that taxes accrue to a unit of government and the time at which that unit of government actually collects those taxes. Thus, we see only tax accruals in Figure 71; the actual time and amount of tax payments will be further analyzed in succeeding chapters.

Figure 67

Local Tax Payment Coefficients of
OCSOG Model

Primary Activity	Local Tax Payment Coefficients ($Million Annually Per Employee) Region I	Region II	Region III
Drilling Contractors	0	.000037	NA
Helicopter Service	.002333	.002465	.002571
Boat Service	NA	.000210	.000360
Well Logging	NA	.000194	.000143
Diving	NA	.000108	NA
Cement	.000167	.000180	NA
Mud	.000200	.000203	NA
Oil Field Equipment Supply	.000260	.000258	NA
Pipeline Laying	NA	.001000	NA

(Note: NA = Not applicable in Scenario I)

Figure 68

Primary Local Tax Payments/Scenario I

Direct Local Tax Payments

Time Period	Region I	Region II	Region III	Total
10/76- 1/77	0	$ 9,586	0	$ 9,586
1/77- 4/77	0	14,286	$ 1,440	15,726
4/77- 8/77	$ 3,640	28,204	1,920	33,764
8/77-10/77	1,820	15,589	3,634	21,043
10/77-11/77	910	7,794	1,817	10,521
11/77- 1/78	1,820	15,589	3,634	21,043
1/78- 2/78	910	7,794	1,817	10,521
2/78- 4/78	1,820	15,589	3,634	21,043
4/78- 8/79	14,560	121,776	29,072	165,408
8/79-11/79	2,730	22,273	5,451	30,454
11/79- 2/80	2,730	21,718	5,451	29,899
2/80- 4/80	1,820	14,109	3,634	19,563
4/80-10/80	5,460	83,362	10,902	99,724
10/80- 2/81	3,640	63,178	7,268	74,086
2/81- 6/81	3,640	73,088	7,268	83,946
6/81- 8/81	3,375	39,648	3,634	46,657
8/81- 9/81	1,855	23,849	1,936	27,640
9/81- 2/82	9,273	130,303	16,366	155,942
2/82- 8/82	19,954	172,919	19,639	212,512
8/82-11/82	9,977	75,218	13,831	99,026
11/82- 2/83	9,977	126,460	13,831	150,268
2/83- 5/83	10,627	133,128	17,842	161,596
5/83-10/83	17,712	236,475	32,136	286,323
TOTAL	$128,250	$1,451,885	$206,157	
GRAND TOTAL		$1,786,292		

Figure 69

Indirect Local Tax Coefficients of OCSOG Model

Primary Activity	Coefficients (Dollars/Per Employee/Per Year) Region I	Region II	Region III
Drilling Contractors	153.40	216.93	NA
Helicopter Service	581.33	175.77	101.29
Boat Service	NA	83.65	42.36
Well Logging	NA	144.17	110.14
Diving	NA	144.37	NA
Cement	74.44	173.43	NA
Mud	72.17	193.62	NA
Oil Field Equipment Supply	47.83	166.62	NA
Pipeline Laying	NA	573.12	NA

(Note: NA = Not applicable in Scenario I.)

Figure 70

Indirect Tax Payments to Local Governments/Scenario I

Time Period	Region I	Region II	Region III	Total
10/76- 1/77	0	$ 7,673.49	0	$ 7,673.49
1/77- 4/77	0	11,772.41	$ 169.44	11,941.85
4/77- 8/77	$ 822.93	23,311.53	225.92	24,360.38
8/77-10/77	411,46	14,271.21	299.45	14,982.12
10/77-11/77	205.73	7,135.60	149.72	7,941.05
11/77- 1/78	411.46	14,271.21	299.45	14,982.12
1/78- 2/78	205.73	7,135.60	149.72	2,491.12
2/78- 4/78	411.46	14,271.21	299.45	14,982.12
4/78- 8/79	3,291.72	96,815.16	2,395.56	102,502.44
8/79-11/79	617.19	14,898.91	449.17	15,965.27
11/79- 2/80	617.19	11,644.96	449.17	12,711.32
2/80- 4/80	411.46	5,594.01	299.45	6,304.92
4/80-10/80	1,234.39	45,780.84	898.34	47,913.57
10/80- 2/81	822.93	35,038.63	598.89	36,460.45
2/81- 6/81	3,686.40	35,741.71	598.89	40,027.00
6/81- 8/81	2,230.72	20,129.95	299.45	22,660.12
8/81- 9/81	1,189.82	11,738.41	241.50	13,169.73
9/81- 2/82	5,949.06	61,839.47	1,673.75	69,462.28
2/82- 8/82	9,066.83	79,913.02	2,008.50	90,987.35
8/82-11/82	4,533.41	41,844.48	1,283.98	47,661.87
11/82- 2/83	4,533.41	57,244.38	1,283.98	63,061.77
2/83- 5/83	4,767.97	59,807.84	1,563.71	66,139.52
5/83-10/83	8,969.28	96,612.21	2,888.59	108,470.08
TOTAL	$51,921.76	$774,485.24	$18,526.08	
GRAND TOTAL		$847,401.87		

Figure 71

Aggregated Local Tax Payments/Scenario I

Direct and Indirect Local Tax Payments

Time Period	Region I	Region II	Region III	Total
10/76- 1/77	0	$ 17,259	0	$ 17,259
1/77- 4/77	0	26,058	$ 1,609	27,667
4/77- 8/77	$ 4,463	51,516	2,146	58,125
8/77-10/77	2,231	29,860	3,933	36,024
10/77-11/77	1,116	14,930	1,967	18,013
11/77- 1/78	2,231	29,860	3,933	36,024
1/78- 2/78	1,116	14,930	1,967	18,013
2/78- 4/78	2,231	29,860	3,933	36,024
4/78- 8/79	17,852	218,592	31,468	267,912
8/79-11/79	3,347	37,172	5,901	46,420
11/79- 2/80	3,347	33,363	5,901	42,611
2/80- 4/80	2,231	19,703	3,933	25,867
4/80-10/80	6,694	129,143	11,800	147,637
10/80- 2/81	4,463	98,217	7,867	110,547
2/81- 6/81	7,326	108,780	7,867	123,973
6/81- 8/81	5,606	59,778	3,933	69,317
8/81- 9/81	3,045	35,587	2,178	40,810
9/81- 2/82	15,222	192,142	18,040	225,404
2/82- 8/82	29,021	252,831	21,648	303,500
8/82-11/82	14,510	117,062	15,115	146,687
11/82- 2/83	14,510	183,704	15,115	213,329
2/83- 5/83	15,395	192,936	19,406	227,737
5/83-10/83	26,681	333,087	35,025	394,793
TOTAL	$182,638	$2,226,370	$224,685	
GRAND TOTAL		$2,633,693		

12. DOMESTIC AND MUNICIPAL WATER REQUIREMENTS

The computation of domestic and municipal water requirements over time in Scenario I was based upon the postulated amount of new population in each region and an average per capita water demand coefficient. In this Scenario, 120 gallons per capita per day was used as a coefficient of residential and municipal water demand (households, beautification, street cleaning, etc.). This coefficient is used in Waste Management in the Texas Coastal Zone and was used here in lieu of county specific water demand coefficients.

Figure 72 presents total new domestic and municipal water requirements in Scenario I over time for each affected region, derived by multiplying the per capita water demand coefficient times regional new population times the length of the appropriate time periods.

Figure 72

Total New Domestic and Municipal Water Requirements
(Acre-feet)

Time Period	Region I	Region II	Region III
10/76- 1/77	0	12.0	0
1/77- 4/77	0	18.89	1.06
4/77- 8/77	3.01	30.0	1.16
8/77-10/77	1.5	22.07	1.68
10/77-11/77	0.75	11.04	0.84
11/77- 1/78	1.5	22.07	1.68
1/78- 2/78	0.75	11.04	0.84
2/78- 4/78	1.5	22.07	1.68
4/78- 8/79	16.26	190.9	3.36
8/79-11/79	3.05	35.8	2.52
11/79- 2/80	3.05	35.8	2.52
2/80- 4/80	2.03	23.9	1.68
4/80-10/80	6.1	71.79	5.04
10/80- 2/81	4.07	48.7	3.36
2/81- 6/81	6.32	56.08	3.36
6/81- 8/81	6.67	28.04	1.68
8/81- 9/81	3.46	14.91	1.05
9/81- 2/82	18.94	102.3	7.62
2/82- 8/82	30.09	148.22	9.48
8/82-11/82	15.05	74.11	6.0
11/82- 2/83	15.05	86.44	6.1
2/83- 5/83	15.05	90.75	7.32
5/83-10/83	27.01	168.81	14.64

13. RESIDENTIAL LAND REQUIREMENTS

The number of new housing units over time was derived (see Figure 53) from the calculated new population generated by OCS activities multiplied by a Texas-general housing unit per population coefficient. The approach used here to derive residential land requirements involved two steps. First, new residence occupancy trends were compiled for each study site based upon interviews with appropriate city planners and chambers of commerce in each region. The new occupancy trends are expressed in Figure 73 for each region as the percent of new occupants residing in apartment units, single family units, and mobile home units. The pattern which is demonstrated includes the influence of migration within the region and new immigration, housing availability, and type of housing preference.

Figure 73

Current Location Trends in New Occupancy

	Apartment Units	Single Family Units	Mobile Home Units
Region I	58%	22%	20%
Region II	50%	50%	0
Region III	45%	43%	12%

Secondly, the land requirement per housing unit was estimated for each region based upon city zoning requirements and interviews with the Texas Apartment Association and the Texas Real Estate Research Center. These acreage requirements per unit housing type are presented in Figure 74. The coefficients subsume the proportion of parking space, open space, and onsite access roads as well as the land of the housing unit itself.

Figure 74

Acreage Requirements For Housing Unit Types

	Apartments	Single Family Dwellings	Mobile Home Parks
Acreage per unit	.05	.20	.12

New residential land requirements for new housing units were derived by multiplying the number of new housing units by appropriate values of Figure 73, and then by multiplying the resulting number of apartment, single family, and mobile home units by the appropriate values of Figure 74. The calculated new residential land requirements are presented in Figure 75 over time for each region.

The residential land requirements shown in Figure 75 are not additions to the total land requirements shown in Figure 40. Rather, the amounts shown in Figure 75 represent only the residential land portion of the amounts shown in Figure 40.

Figure 75

Residential Land Requirements

Time Period	Region I	Region II	Region III
10/76- 1/77	0	15.4	0
1/77- 4/77	0	24.3	1.4
4/77- 8/77	2.2	38.5	1.5
8/77-10/77	2.2	42.5	3.2
10/77-11/77	2.2	42.5	3.2
11/77- 1/78	2.2	42.5	3.2
1/78- 2/78	2.2	42.5	3.2
2/78- 4/78	2.2	42.5	3.2
4/78- 8/79	3	45.8	3.2
8/79-11/79	3	45.8	3.2
11/79- 2/80	3	45.8	3.2
2/80- 4/80	3	45.8	3.2
4/80-10/80	3	46.0	3.2
10/80- 2/81	3	46.9	3.2
2/81- 6/81	4.8	53.9	3.2
6/81- 8/81	10.0	53.9	3.2
8/81- 9/81	10.2	57.4	3.9
9/81- 2/82	11.4	78.8	5.8
2/82- 8/82	14.9	95.0	6.0
8/82-11/82	14.9	95.0	7.6
11/82- 2/83	14.9	110.9	7.7
2/83- 5/83	14.9	116.4	9.9
5/83-10/83	16.1	129.9	11.1

14. ECONOMIC IMPACT ANALYSIS

Introduction

Part B contains an extensive discussion of the process by which economic/fiscal impact was analyzed. The analysis in this chapter was performed in accordance with that process. In short, infrastructural costs, tax revenues, and net fiscal impact are analyzed below.

Infrastructural Costs

As Part B explained, the key to understanding infrastructural costs to units of government affected by Scenario I activities is contained in the per capita service costs of those units of government as they are currently constituted. Using the procedure outlined in Part B, the information contained in Figure 76 was derived.

When that data is applied to the projected increases in population over time associated with Scenario I, Figures 77 (for Region I), 78 (for Region II), and 79 (for Region III) result. Each figure shows the costs to local, county, and state governments in columns C, D, and H, respectively. These cost estimates were derived by multiplying the population figure in column B by the appropriate per capita annual service cost in Figure 76, adjusted to correspond with the length of the time period in Column A. The cost to local governments is calculated inclusive of county government expenditures.

Fiscal Impact

Cost data alone present an incomplete picture of the two-sided fiscal impact; they must be subtracted from the corresponding tax revenues to show the net gains or losses to government treasuries from OCS development. This was also done in Figures 77, 78, and 79; columns F and J reveal the resulting tax revenue surplus or deficit for local and state governments, respectively. Minus (-) signs indicate deficits; plus (+) signs indicate surpluses. (The process by which the fiscal impact is determined is distilled to a form readily usable by local officials in Part B.)

Because the revenues flow over a time span of 7 years, the surpluses or deficits are discounted (in accordance with the process outlined in Part

Figure 76

Government Expenditures/Scenario I

STUDY SITE

	Region I (Orange and Jefferson Counties)	Region II (Harris, Galveston, and Chambers Counties)	Region III (Brazoria County)
1. Population (1972 Est.)	318,400	2,002,700	113,000
2. Local Gov't. Expenditures	$81,590,000	$609,312,000	$40,367,000
3. Local Gov't. Per Capita Expenditures	$256	$304	$357
4. County Expenditures (included in Item #2)	$10,203,000	$73,780,000	$6,152,000
5. County Gov't. Per Capita Expenditures (included in Item #3)	$32	$37	$54
6. State Gov't. Expenditures	$56,553,000	$375,819,000	$21,855,000
7. State Gov't. Per Capita Expenditures	$178	$188	$193

Figure 77

Fiscal Impact/Region I/Scenario I

A [1]	B [2]	C	D [3]	E [4]	F	G [5]	H	I [6]	J	K [5]
Time Period	Population	Cost to Local Governments (Pop.x$256 Annually)	Cost to County Governments (Pop. x $32 Annually)	Local Tax Revenue	Local Tax Revenue Surplus or Deficit	Present Value of Local Tax Revenue Surplus or Deficit	Cost to State Government (Pop.x$178 Annually	State Tax Revenue	State Tax Revenue Surplus or Deficit	Present Value of State Tax Revenue Surplus or Deficit
10/76-1/77	0	0	0	0	--	--	0	0	--	--
1/77-4/77	0	0	0	0	--	--	0	0	--	--
4/77-8/77	68	5,802	725	4,463	- 1,339	- 1,276	4,035	6,939	+ 2,904	+ 2,766
8/77-10/77	68	2,901	363	2,231	- 1,063	- 1,003	2,017	3,470	+ 1,453	+ 1,371
10/77-11/77	68	1,450	181	1,116	- 334	- 314	1,009	1,734	+ 725	+ 681
11/77-1/78	68	2,901	363	2,231	- 1,063	- 988	2,017	3,470	+ 1,453	+ 1,351
1/78-2/78	68	1,450	181	1,116	- 334	- 309	1,009	1,734	+ 725	+ 671
2/78-4/78	68	2,901	363	2,231	- 1,063	- 974	2,017	3,470	+ 1,453	+ 1,331
4/78-8/79	92	31,398	3,925	17,852	- 13,546	- 12,174	21,835	27,756	+ 5,921	+ 5,020
8/79-11/79	92	5,887	736	3,347	- 2,540	- 2,122	4,094	5,204	+ 1,110	+ 927
11/79-2/80	92	5,887	736	3,347	- 2,540	- 2,092	4,094	5,204	+ 1,110	+ 914
2/80-4/80	92	3,925	491	2,231	- 1,694	- 1,381	2,729	3,470	+ 741	+ 604
4/80-10/80	92	11,774	1,472	6,694	- 1,954	- 1,548	8,188	10,609	+ 2,421	+ 1,918
10/80-2/81	92	7,849	981	4,463	- 3,386	- 2,630	5,469	6,939	+ 1,480	+ 1,150
2/81-6/81	143	12,201	1,525	7,326	- 2,415	- 1,840	8,485	9,341	+ 856	+ 652
6/81-8/81	302	12,883	1,611	5,606	- 7,277	- 5,491	8,959	4,948	- 4,011	- 3,027
8/81-9/81	313	6,677	835	3,045	- 3,632	- 2,727	4,643	2,919	- 1,724	- 1,295
9/81-2/82	343	36,582	4,573	15,222	- 21,360	- 15,654	25,439	14,598	- 10,841	- 7,945
2/82-8/82	454	58,104	7,264	29,021	- 29,083	- 20,702	40,406	25,247	- 15,159	- 10,791
8/82-11/81	454	29,053	3,632	14,510	- 14,543	- 10,203	20,203	12,524	- 7,679	- 5,387
11/82-2/83	454	29,053	3,632	14,510	- 14,543	- 10,055	20,203	12,524	- 7,679	- 5,309
2/83-5/83	454	29,053	3,632	15,395	- 13,658	- 9,307	20,203	14,376	- 5,827	- 3,971
5/83-10/83	489	52,153	6,520	26,681	- 25,472	- 16,940	36,267	24,818	- 11,449	- 7,614
TOTAL*		$349,885	$43,743	$182,638	-$167,247	-$119,790	$243,311	$201,294	-$42,017	-$25,375

1. Taken from Figure 1.
2. Taken from Figure 52.
3. The figures in Column D are included in the corresponding figures of Column C.
4. Taken from Figure 71.
5. Assumes an interest rate of 6 percent.
6. Taken from Figure 66.

*Entries may not add to totals due to rounding.

Figure 78

Fiscal Impact/Region II/Scenario I

A [1] Time Period	B [2] Population	C Cost to Local Governments (Pop.x$304 Annually)	D [3] Cost to County Governments (Pop. x $37 Annually)	E [4] Local Tax Revenue	F Local Tax Revenue Surplus or Deficit	G [5] Present Value of Local Tax Revenue Surplus or Deficit	H Cost to State Government (Pop.x Annually	I [6] State Tax Revenue	J State Tax Revenue Surplus or Deficit	K [5] Present Value of State Tax Revenue Surplus or Deficit
10/76-1/77	362	27,511	3,349	17,259	- 10,252	- 10,104	17,014	19,822	+ 2,808	+ 2,767
1/77-4/77	570	43,319	5,273	26,058	- 17,261	- 16,765	26,790	27,209	+ 419	+ 407
4/77-8/77	905	91,704	11,161	51,516	- 40,188	- 38,283	56,713	53,265	- 3,448	- 3,285
8/77-10/77	999	50,630	6,161	29,660	- 20,770	- 19,594	31,802	31,191	- 111	- 105
10/77-11/77	999	25,308	3,080	14,930	- 10,378	- 9,743	15,651	15,596	- 55	- 52
11/77-1/78	999	50,630	6,161	29,860	- 20,770	- 19,311	31,302	31,191	- 111	- 103
1/78-2/78	999	25,308	3,080	14,930	- 10,378	- 9,602	15,651	15,596	- 55	- 51
2/78-4/78	999	50,630	6,161	29,860	- 20,770	- 19,032	31,302	31,191	- 111	- 102
4/78-8/79	1080	437,749	53,279	218,592	- 219,157	- 185,804	270,720	226,346	- 44,374	- 37,621
8/79-11/79	1080	82,078	9,990	37,172	- 44,096	- 36,845	50,760	38,091	- 12,669	- 10,586
11/79-2/80	1080	82,078	9,990	33,363	- 48,715	- 40,115	50,760	33,743	- 17,017	- 14,013
2/80-4/80	1080	54,719	6,660	19,703	- 35,016	- 28,556	33,840	19,597	- 14,243	- 11,615
4/80-10/80	1083	164,612	20,036	129,143	- 35,469	- 28,095	101,802	249,225	+ 147,423	+ 116,773
10/80-2/81	1102	111,667	13,591	98,217	- 13,450	- 10,449	69,059	173,222	+ 104,163	+ 80,920
2/81-6/81	1269	128,589	15,651	108,780	- 19,809	- 15,093	79,524	175,213	+ 95,689	+ 72,907
6/81-8/81	1269	64,294	7,826	59,778	- 4,516	- 3,408	39,762	91,042	+ 51,280	+ 38,693
8/81-9/81	1350	34,199	4,163	35,587	+ 1,388	+ 1,042	21,150	49,213	+ 28,063	+ 21,072
9/81-2/82	1852	234,581	28,836	192,142	- 42,439	- 31,103	145,073	253,976	+ 108,903	+ 79,813
2/82-8/82	2236	339,864	41,365	252,831	- 87,033	- 61,954	210,184	321,330	+ 111,146	+ 79,118
8/82-11/82	2236	169,932	20,683	117,062	- 52,870	- 37,091	105,092	165,412	+ 60,320	+ 42,317
11/82-2/83	2608	198,203	24,124	183,704	- 14,499	- 10,025	122,576	271,064	+ 148,488	+ 102,664
2/83-5/83	2738	208,083	25,326	192,936	- 15,147	- 10,321	128,686	275,811	+ 147,125	+ 100,251
5/83-10/83	3056	387,084	47,112	333,087	- 53,997	- 35,911	239,389	459,810	+ 220,421	+ 146,593
TOTAL*		$3,062,724	$373,057	$2,226,370	-$836,354	-$676,162	$1,894,102	$3,028,156	+$1,134,054	+$806,762

1. Taken from Figure 1.
2. Taken from Figure 52.
3. The figures in Column D are included in the corresponding figures of Column C.
4. Taken from Figure 71.
5. Assumes an interest rate of 6 percent.
6. Taken from Figure 66.

*Entries may not add to totals due to rounding.

Figure 79

Fiscal Impact/Region III/Scenario I

A [1]	B [2]	C	D [3]	E [4]	F	G [5]	H	I [6]	J	K [5]
Time Period	Population	Cost to Local Governments (Pop.x $357 Annually)	Cost to County Governments (Pop. x $54 Annually)	Local Tax Revenue	Local Tax Revenue Surplus or Deficit	Present Value of Local Tax Revenue Surplus or Deficit	Cost to State Government (Pop.x$193 Annually	State Tax Revenue	State Tax Revenue Surplus or Deficit	Present Value of State Tax Revenue Surplus or Deficit
10/76- 1/77	0	0	0	0	--	--	0	0	--	--
1/77-4/77	32	2,856	432	1,069	- 1,787	- 1,736	1,544	1,612	+ 68	+ 66
4/77-8/77	35	4,165	630	2,146	- 2,019	- 1,923	2,252	2,150	- 102	- 97
8/77-10/77	76	4,522	684	3,933	- 589	- 556	2,445	2,407	- 38	- 36
10/77-11/77	76	2,261	342	1,967	- 294	- 276	1,222	1,203	- 19	- 18
11/77-1/78	76	4,522	684	3,933	- 589	- 548	2,445	2,407	- 38	- 35
1/78-2/78	76	2,261	342	1,967	- 294	- 272	1,222	1,203	- 19	- 18
2/78-4/78	76	4,522	684	3,933	- 589	- 540	2,445	2,407	- 38	- 35
4/78-8/79	76	36,176	5,472	31,468	- 4,708	- 3,992	19,557	19,256	- 301	- 255
8/79-11/79	76	6,783	1,026	5,901	- 882	- 737	3,667	3,611	- 56	- 47
11/79-2/80	76	6,783	1,026	5,901	- 882	- 726	3,667	3,611	- 56	- 46
2/80-4/80	76	4,522	684	3,933	- 589	- 480	2,445	2,407	- 38	- 31
4/80-10/80	76	13,566	2,052	11,800	- 1,766	- 1,399	7,334	7,221	- 113	- 90
10/80-2/81	76	9,044	1,368	7,867	- 1,177	- 914	4,889	4,814	- 75	- 58
2/81-6/81	76	9,044	1,368	7,867	- 1,177	- 897	4,889	4,814	- 75	- 57
6/81-8-81	76	4,522	684	3,933	- 589	- 444	2,445	2,407	- 38	- 29
8/81-9/81	95	2,827	427	2,178	- 649	- 487	1,528	1,540	+ 12	+ 9
9/81-2/82	138	20,528	3,104	18,040	- 2,488	- 1,823	11,097	11,033	- 64	- 47
2/82-8/82	143	25,526	3,861	21,648	- 3,878	- 2,761	13,800	13,240	- 560	- 399
8/82-11/82	181	16,155	2,444	15,115	- 1,040	- 730	8,733	8,618	- 115	- 81
11/82-2/83	184	16,422	2,484	15,115	- 1,307	- 904	8,878	8,618	- 260	- 180
2/83-5/83	221	19,725	2,984	19,406	- 319	- 217	10,663	10,616	- 47	- 32
5/83-10/83	265	39,420	5,962	35,025	- 4,395	- 2,923	21,310	20,382	- 928	- 617
TOTAL*		$256,153	$38,745	$224,685	-$31,468	-$25,285	$138,477	$135,577	-$2,900	-$2,133

1. Taken from Figure 1.
2. Taken from Figure 52.
3. The figures in Column D are included in the corresponding figures of Column C.
4. Taken from Figure 71.
5. Assumes an interest rate of 6 percent.
6. Taken from Figure 66.

*Entries may not add to totals due to rounding.

B) to present value and presented in Column G for the local governments, and column K for the state government.

The existence and size of the expected deficits on the local level is the most salient feature of Figures 77, 78, and 79. The fiscal impact is a direct function of population; it is least (present value of -$25,285) in Region III where the increase in population is expected to be least, and greatest (present value of -$676,162) in Region II where the increase in population is expected to be greatest.

Even the State is not immune from deficits in Region I and III. Activity in Region II, however, is sufficient to provide the State with a total surplus in excess of $1 million. The present value of this surplus, of course, is less (over $778 thousand) because most of the revenues are received in the later years of the scenario. The aggregated State revenues are presented in Figure 80.

Figures 77 through 80 are helpful in that they describe the dollar amounts of surpluses or deficits experienced by local or state governments in each affected study site of Scenario I, based on the postulated activities of Scenario I. Nevertheless, understanding of the data might be enhanced by a presentation of the percentage of projected costs which are covered by projected revenues over time in each affected study site. Figures 81, 82, 83 (for Regions I, II, and III, respectively), and 84 (combined State revenues) show such information.

A review of these figures immediately confirms that 1) there are great variations from one affected study site to another; 2) within any one study site, there can be great differences between the State's revenue/cost ratio and the local governments' revenue/cost ratio; and 3) for any one revenue/cost ratio curve (either State or local governments) within any one affected study site, there may or may not be significant variations over time. Those variations are due primarily to the following reasons:

1. Each affected study site has a different set of postulated OCS-related activities, time periods during which those activities take place, and number of workers involved in those activities over time.

2. Each activity has its own tax multipliers for tax payments (direct and indirect) to local governments and for tax payments (direct and indirect) to State government.

3. Each affected study site has a different per capita cost for local government services and for State government services.

For those reasons, the net fiscal impact of each activity in terms of tax revenue surplus or deficit per employee per year, presented in Figure 85 for the local governments and in Figure 86 for the State government,

Figure 80

Total State Tax Revenue
(Scenario I)

Time Period[1]	Combined State Revenues[2]	Combined State Costs[3]	Combined Tax Revenue Surplus or Deficit[4]	Present Value of Combined Tax Revenue Surplus or Deficit[5]
10-76-1/77	$ $19,822	$ 17,014	+$ 2,808	+$ 2,767
1/77-4/77	28,821	28,334	+ 487	+ 473
4/77-8/77	62,354	63,000	- 646	- 616
8/77-10/77	37,068	35,764	+ 1,304	+ 1,230
10/77-11/77	18,533	17,882	+ 651	+ 611
11/77-1/78	37,068	35,764	+ 1,304	+ 1,213
1/78-2/78	18,533	17,882	+ 651	+ 602
2/78-4/78	37,068	35,764	+ 1,304	+ 1,194
4/78-8/79	273,358	312,112	- 38,754	- 32,856
8/79-11/79	46,906	58,521	- 11,615	- 9,706
11/79-2/80	42,558	58,521	- 15,963	- 13,145
2/80-4/80	25,474	39,014	- 13,540	- 11,042
4/80-10/80	267,055	117,324	+ 149,731	+ 118,601
10/80-2/81	184,975	79,407	+ 105,568	+ 82,012
2/81-6/81	189,368	92,898	+ 96,470	+ 73,502
6/81-8/81	98,397	51,166	+ 47,231	+ 35,637
8/81-9/81	53,672	27,321	+ 26,351	+ 19,786
9/81-2/82	279,607	181,609	+ 97,998	+ 71,821
2/82-8/82	359,817	264,390	+ 95,427	+ 67,928
8/82-11/82	186,554	134,028	+ 52,526	+ 36,849
11/82-2/83	292,206	151,657	+ 140,549	+ 97,175
2/83-5/83	300,803	159,552	+ 141,251	+ 96,248
5/83-10/83	505,010	296,966	+ 208,044	+ 138,362
TOTAL*	$3,365,027	$2,275,890	+$1,089,137	+$778,646

1. Taken from Figure 1.
2. Addition of Columns I from Figures 2, 3, and 4 for each time period.
3. Addition of Columns H from Figures 2, 3, and 4 for each time period.
4. Addition of Columns J from Figures 2, 3, and 4 fro each time period.
5. Addition of Columns K from Figures 2, 3, and 4 for each time period.

* Entries may not add to totals due to rounding

Figure 81

REVENUES AS PERCENTAGE OF COSTS

STATE & LOCAL GOVERNMENTS

REGION I/SCENARIO I

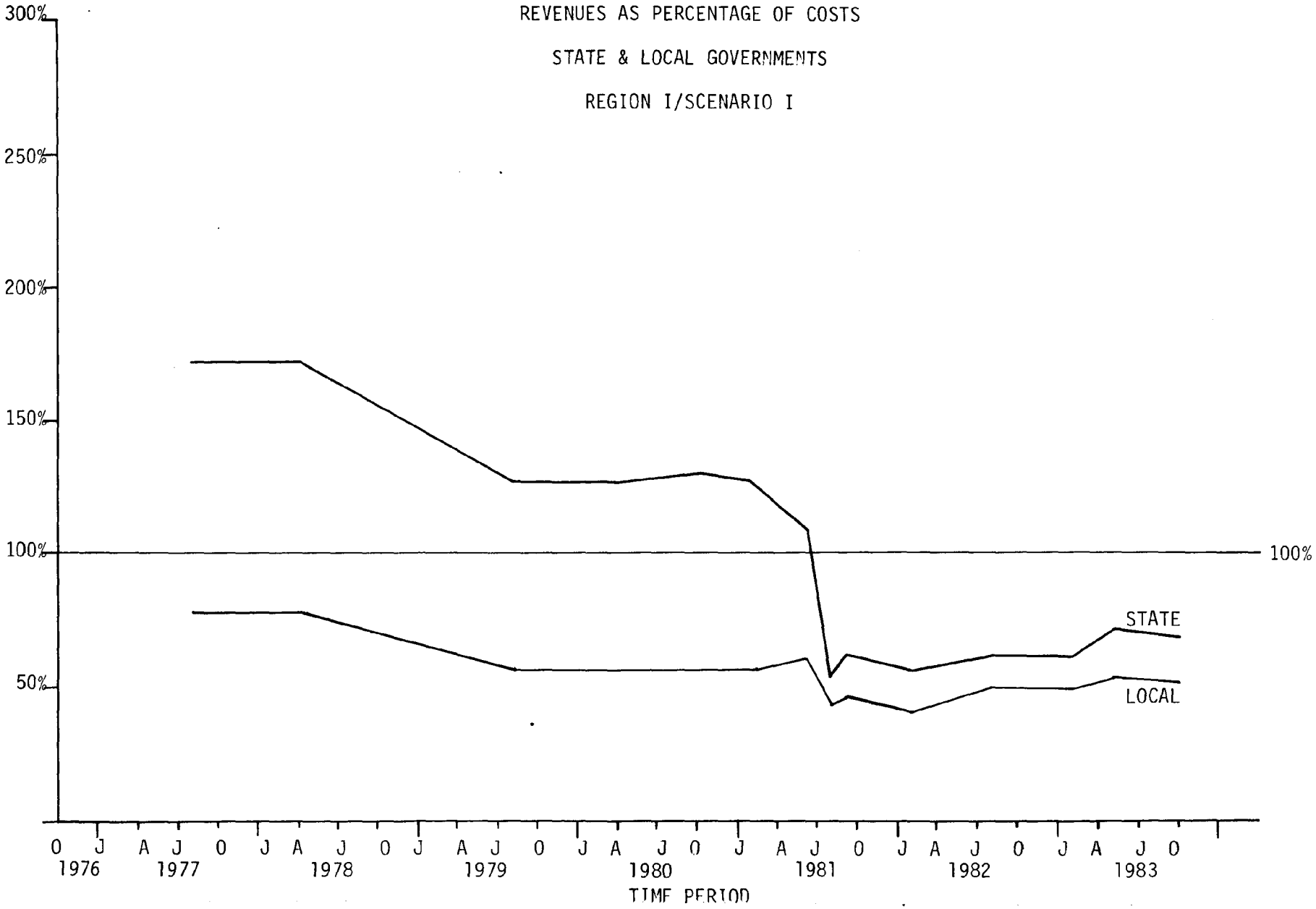


Figure 82

REVENUES AS A PERCENTAGE OF COSTS

STATE & LOCAL GOVERNMENTS

REGION II/SCENARIO I

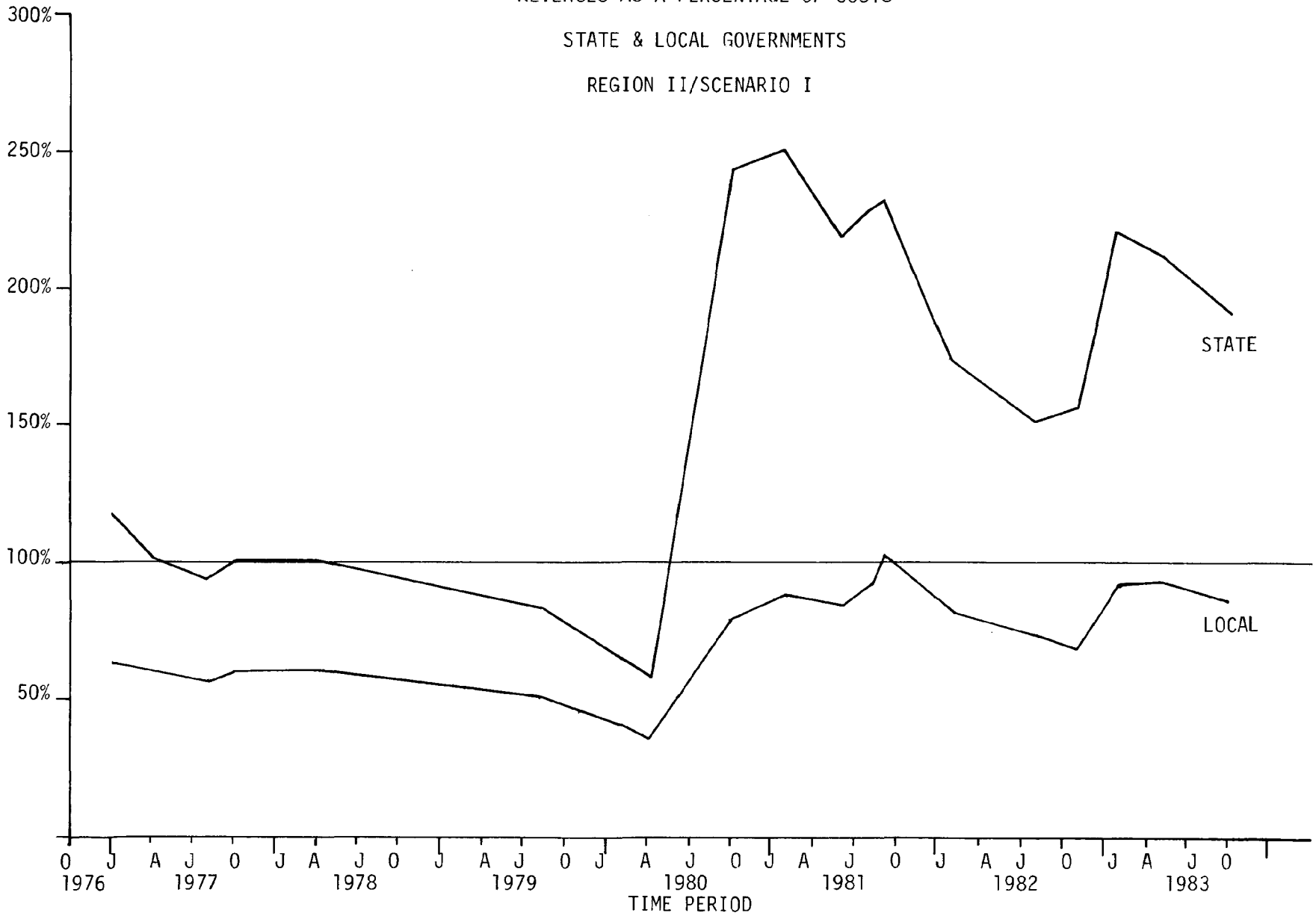


Figure 83

REVENUES AS A PERCENTAGE OF COSTS

STATE & LOCAL GOVERNMENTS

REGION III/SCENARIO I

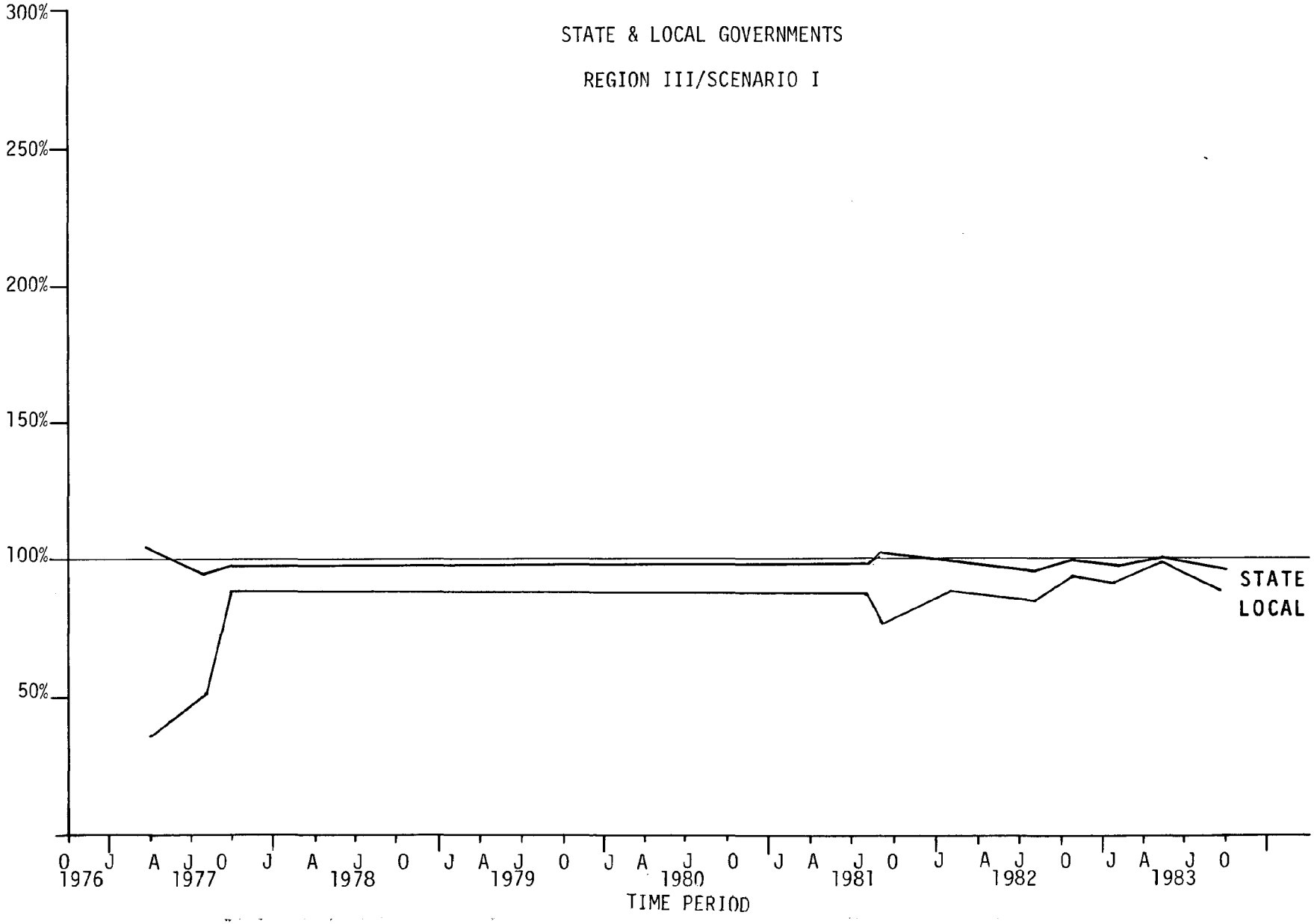
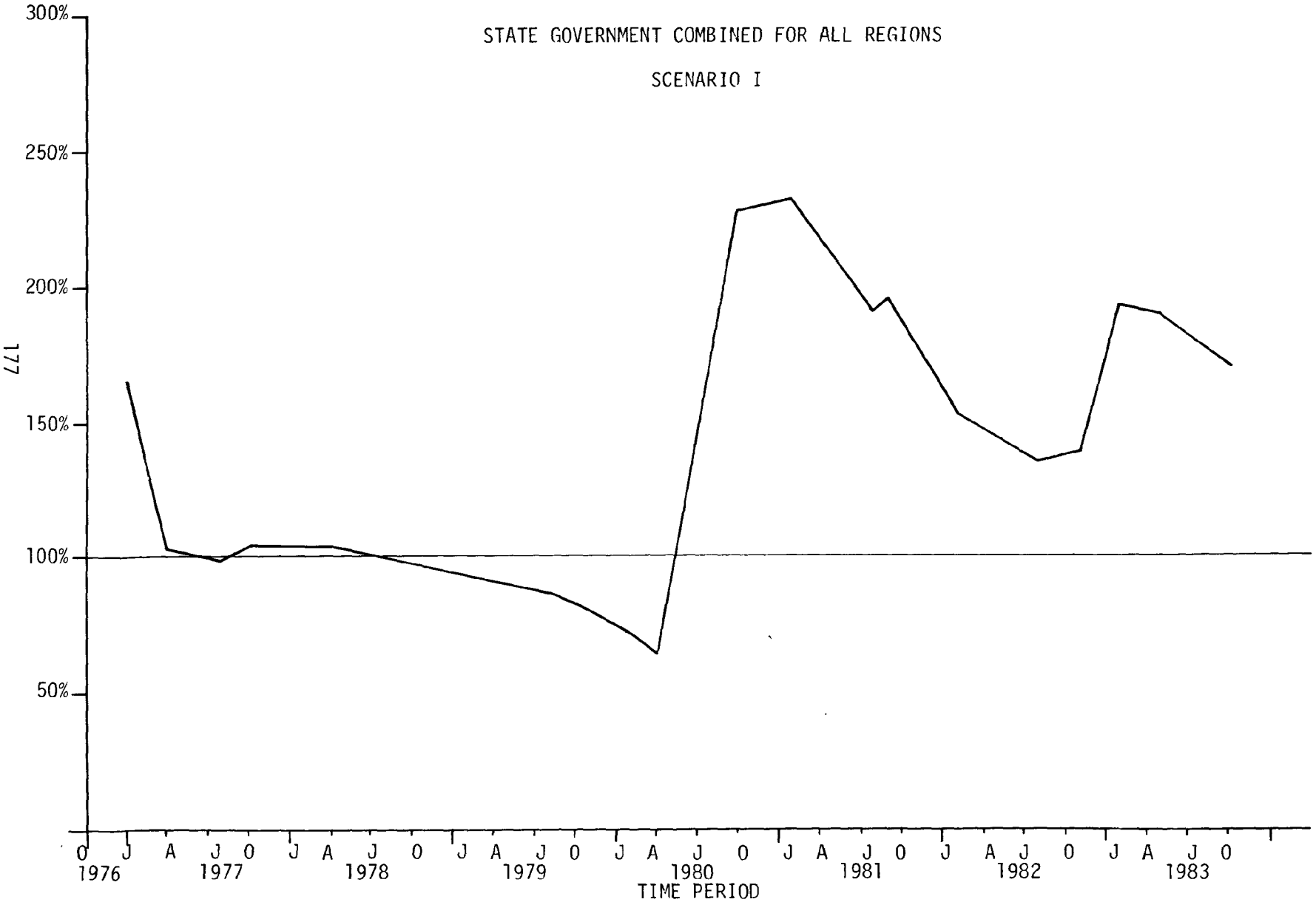


Figure 84

REVENUES AS A PERCENTAGE OF COSTS

STATE GOVERNMENT COMBINED FOR ALL REGIONS

SCENARIO I



varies for each region and unit of government. It is readily calculated for each activity by subtracting the additional government cost per new employee per year (columns C) from the additional tax revenue per new employee per year (columns B). The first value is the product of the new resident employees as a percentage of new employees, the increase in population per resident employee, and the per capita government cost. The second term is the sum of the direct and indirect tax multipliers. The theoretical derivation of the factors is treated in Appendix E.

Only two activities, helicopter services and pipeline laying, are identified in Figure 85 as providing for each employee sufficient tax revenues to more than cover the added costs incurred by the local governments. The employment resulting from each is small, and only the former is postulated to occur in all three regions. Consequently, their positive effect on local treasuries is more than offset by the negative impact of the remaining activities, and continuous deficits occur.

The fiscal effects of the activities are more favorable to the State government, as Figure 86 shows. When the impact of each activity is aggregated for all regions, only 4 activities (production operation, onshore support, operation bases, and administrative bases) provide the State with a tax revenue deficit. Some activities channel sizeable surpluses into the treasury. Pipeline laying, for example results in net tax revenues of $4,300 per year for each added pipeline employee.

The fiscal impact is not uniform across regions, however. Production operation and operation bases, for example, are deficit activities in Region I and surplus activities in Region II. These differences help to explain the previously noted variations in Figures 81, 82, and 83. For instance, from Figure 82 it can be seen that early in the Scenario I time period the State government's revenues exceed government costs by 72%. This is because the Region I activities which have deficit impact (those associated with drilling contractors) are not postulated to begin until late in the period. Further, the large jump in the State revenue/cost ratios in Region II (Figure 82) during the 1980-1981 period is due to the commencement at that time in that region of such activities as development drilling, helicopter services, and pipeline laying. Finally, the relative flatness of both curves on Figure 83 is due to the fact that in Region III there are relatively few kinds of activities, and relatively stable levels of those activities are postulated.

Summary

Analysis of available data enable these conclusions to be drawn concerning the fiscal impact of OCS development upon State and local governments:

Figure 85

Fiscal Impact of Exploration, Development and Production Activities
Local Governments/Scenario I

Dollars Per Employee Per Year

A	B Total Tax Multipliers [1]			C Government Cost [2]			D Tax Revenue Surplus or Deficit [3]		
Activity	Region I	Region II	Region III	Region I	Region II	Region III	Region I	Region II	Region III
Exploratory Rigs	NA [4]	254	NA	NA	369	NA	NA	- 115	NA
Dockside Support	NA	254	NA	NA	369	NA	NA	- 115	NA
Development Drilling	153	254	NA	276	328	NA	- 123	- 74	NA
Production Operation	153	254	NA	346	328	NA	- 193	- 74	NA
Onshore Support	153	254	NA	415	492	NA	- 262	- 238	NA
Operations Bases	153	254	NA	346	328	NA	- 193	- 74	NA
Administrative Bases	153	254	NA	449	492	NA	- 296	- 238	NA
Helicopters	2,914	2,641	2,672	484	492	723	+2,430	+2,149	+1,949
Boats	NA	294	402	NA	492	723	NA	- 198	- 321
Well Logging	NA	338	253	NA	492	723	NA	- 154	- 470
Diving	NA	252	NA	NA	492	NA	NA	- 240	NA
Cement	214	353	NA	346	328	NA	- 132	+ 25	NA
Mud	272	397	NA	346	328	NA	- 74	+ 69	NA
Oilfield Equipment	308	425	NA	346	325	NA	- 38	+ 100	NA
Pipeline Laying	NA	1,573	NA	NA	369	NA	NA	+1,204	NA

1. Derived by adding the indirect tax multipliers in Figure 69 and the direct tax multipliers in Figure 67.

2. Calculated by multiplying the new resident employees as a percentage of employed (taken from Figure 50) by the increase in population per resident employee (assumed to be 2.7) by per capita government cost (found in Figure 76).

3. The net fiscal effect per employee per year is determined by subtracting Columns C from Columns B.

4. NA = not applicable in Scenario I.

Figure 86

Fiscal Impact of Exploration, Development and Production Activities
State Government/Scenario I

Dollars Per Employee Per Year

A	B[1]			C[2]			D[3]			
Activity	Total Tax Multipliers Region I	Region II	Region III	Government Cost Region I	Region II	Region III	Tax Revenue Surplus or Deficit Region I	Region II	Region III	Combined[4]
Exploratory Rigs	NA[5]	290	NA	NA	228	NA	NA	+ 62	NA	+ 62
Dockside Support	NA	290	NA	NA	228	NA	NA	+ 62	NA	+ 62
Development Drilling	129	290	NA	192	203	NA	- 63	+ 87	NA	+ 24
Production Operation	129	290	NA	240	203	NA	-111	+ 87	NA	- 24
Onshore Support	129	290	NA	288	305	NA	-159	- 15	NA	- 174
Operations Bases	129	290	NA	240	203	NA	-111	+ 87	NA	- 24
Administrative Bases	129	290	NA	312	305	NA	-183	- 15	NA	- 198
Helicopters	413	548	386	336	305	391	+ 77	+ 243	- 5	+ 315
Boats	NA	311	403	NA	305	391	NA	+ 6	+12	+ 18
Well Logging	NA	537	405	NA	305	391	NA	+ 232	+14	+ 246
Diving	NA	345	NA	NA	305	NA	NA	+ 40	NA	+ 40
Cement	446	605	NA	240	203	NA	+206	+ 402	NA	+ 608
Mud	570	704	NA	240	203	NA	+330	+ 501	NA	+ 831
Oilfield Equipment	419	600	NA	240	203	NA	+179	+ 397	NA	+ 576
Pipeline Laying	NA	4,558	NA	NA	228	NA	NA	+4,330	NA	+4,330

1. Derived by adding the indirect tax multipliers in Figure 64 and the direct tax multipliers in Figure 62.

2. Calculated by multiplying the new resident employees as a percentage of employed (taken from Figure 50) by the increase in population per resident employee (assumed to be 2.7) by per capita government cost (found in Figure 76).

3. The net fiscal effect per employee per year is determined by subtracting Columns C from Columns B.

4. The total equals the addition of impacts from Regions I, II, and III.

5. NA = not applicable in Scenario I.

1. Each affected region in Scenario I has different postulated OCS-related activities, time periods during which they take place, and number of involved workers over time. These factors, when combined with varying tax multipliers and per capita service costs for each government unit, imply that no two governmental units will experience exactly the same fiscal effects.

2. The OCS-related activities were analyzed to determine their fiscal impact in terms of tax revenue surplus or deficit per employee per year. Primarily because local government costs per capita are much higher than State costs per capita, there are more deficit activities on the local level than on the State level.

3. OCS development does not help local governments in the three study sites financially. Rather, it results in a widening dollar gap between added costs and revenues which will have to be met by expanded borrowing in the short-term, decreased services, or increased taxes.

4. Even the State will experience OCS-related deficits in Regions I and III. Nevertheless, sufficient surplus-generating activities like pipeline laying and mud supply occur in Region II on a scale large enough to provide the state with projected surpluses (especially in 1980 and after) totalling over $1 million, with a present value of approximately $778,000.

15. ENVIRONMENTAL IMPACT ANALYSIS

General Environmental Impact Evaluation

This evaluation, in accordance with the study methodology (Appendix A), describes the environmental effects likely to result from OCS activities. The categories of study included here are land, solid waste generation, water use and water quality, and air quality, which are procedurally described in the section "Environmental Impact Assessment" in Part B.

I. General Environmental Description

A. Climate

The climate of the Scenario I coastal counties is humid and moderate with characteristics of both tropical and subtropical zones. Figure 87 presents three general climatic parameters: normal annual precipitation, normal mean annual temperature (1941-1970 averages), and a typical wind current frequency rose for a 1° quadrant offshore area. Further to the south on the Texas coast the observed trends continue with increasing temperature and decreasing annual precipitation.

In the area shown in Figure 87, there is a uniform yearly rainfall distribution. Heavy rainfalls are infrequent but are most likely to occur between June and August. Over part of Brazoria and Harris Counties and also over the northern part of Jefferson County there are zones of air convergence, bringing unstable moist air and thunderstorms.

The inverse trends of precipitation and temperature along the Texas Coast result in a gradation from net excess to net deficit of rainfall after evapotranspiration. The northern portion of the coastal zone, shown in Figure 87, is fortunate in having a net excess of rainfall gradually increasing from four inches per year in western Brazoria County to more than 12 inches per year in Orange County. Over a ten-year period, this area may expect three years of drought and seven years of surplus rainfall.

Two principal wind patterns dominate the Texas coast: persistent gentle southeasterlies from March to November, and strong, short-lived, northerlies from December to February. Wind speed seldom exceeds 45 miles per hour.

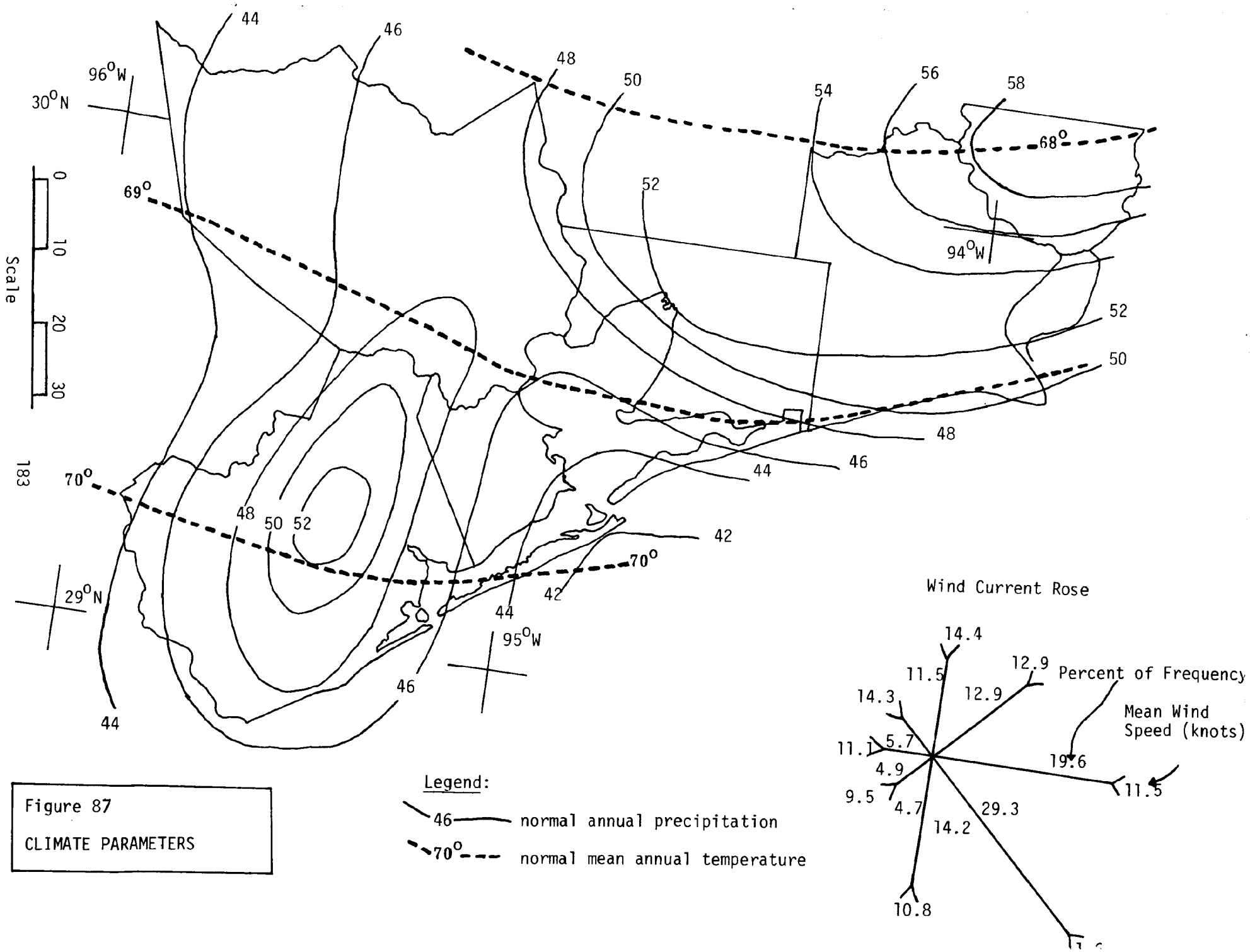


Figure 87

CLIMATE PARAMETERS

There is a relatively high probability of tropical storms landing on this part of the Texas Coast. Between 1901 and 1973 there were 12 tropical cyclones of which 5 may be designated as being of hurricane strength. Two of these were severe hurricanes (wind speeds greater than 100 m.p.h. and core pressures below 28 inches of mercury). There is, then, in any given year, a 16 percent chance that a tropical cyclone will cross this area, 7% chance of a hurricane, and a 3% probability that the storm will be a severe hurricane. The probable hurricane months are August and September. Of course, depending on its strength and on its proximity to the region of its landfall, a hurricane may cause extensive property damage and loss of life through high winds, surge tide flooding, and secondary flooding from extensive post-storm rainfall runoff.

B. Water

The five major rivers and their many tributories constitute the fluvial systems of this area. The five rivers - Sabine, Neches, Trinity, San Jacinto, and Brazos (from east to west) - and their mean monthly flow rates are shown in Figure 88. These five river basins have a combined total surface drainage area of more than 86,000 square miles, with most of the rivers extending far inland. Each river basin's drainage area is also shown in Figure 88. The magnitude of these rivers' flows makes them a valuable source of fresh water and a convenient disposal basin for industrial and municipal return flows.

Several of the segments of the rivers and their tributaries in this area exceed water quality standards and have been designated as "water quality segments" by the Texas Water Quality Board. Such segments are located in Figure 89. Although poor water quality in these segments may be caused by pollution upstream, restrictions are imposed on potential discharges to these segments in this area.

Figure 88 also shows volume of groundwater withdrawal within the area in 1974 and its designated use. In Brazoria County, groundwater supplies about 5 percent of total industrial water demand. There are two distinctive end-members in withdrawal rates. Jefferson and Chambers Counties groundwater wells produce only a small amount (2.5 and 4.8 thousand acrefeet in 1974, respectively). At the other extreme, Harris County groundwater production in 1974 totaled more than 490 thousand acre-feet in a ratio of 3:2:1 for municipal:industrial:irrigation uses. Figure 90 shows the association between geologic and hydrologic (aquifers) units and their various classification in the Scenario I study area. The designation of hydrologic units in Orange County is similar to that of Chambers and Jefferson Counties.

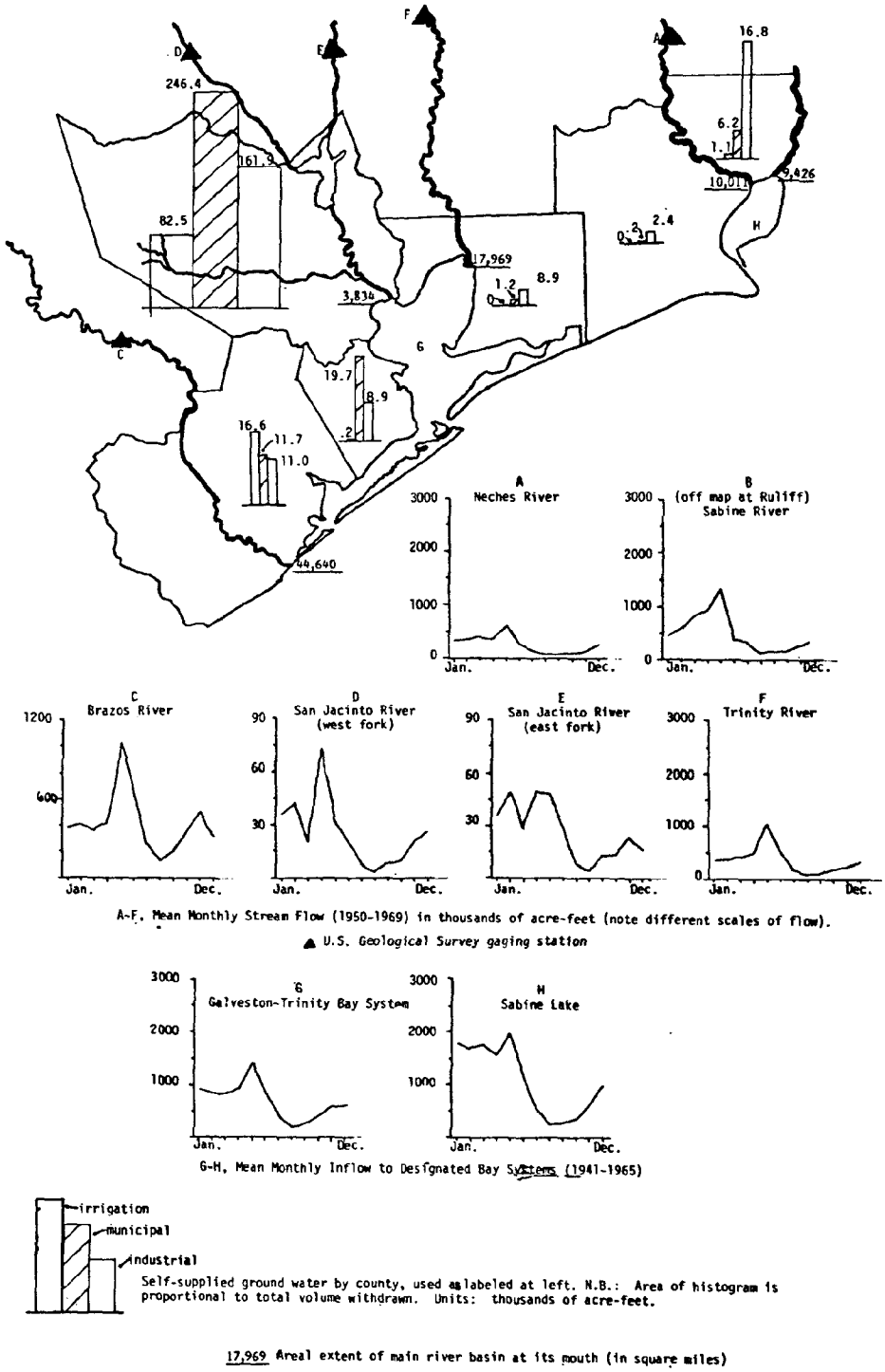


Figure 88. Water Resources

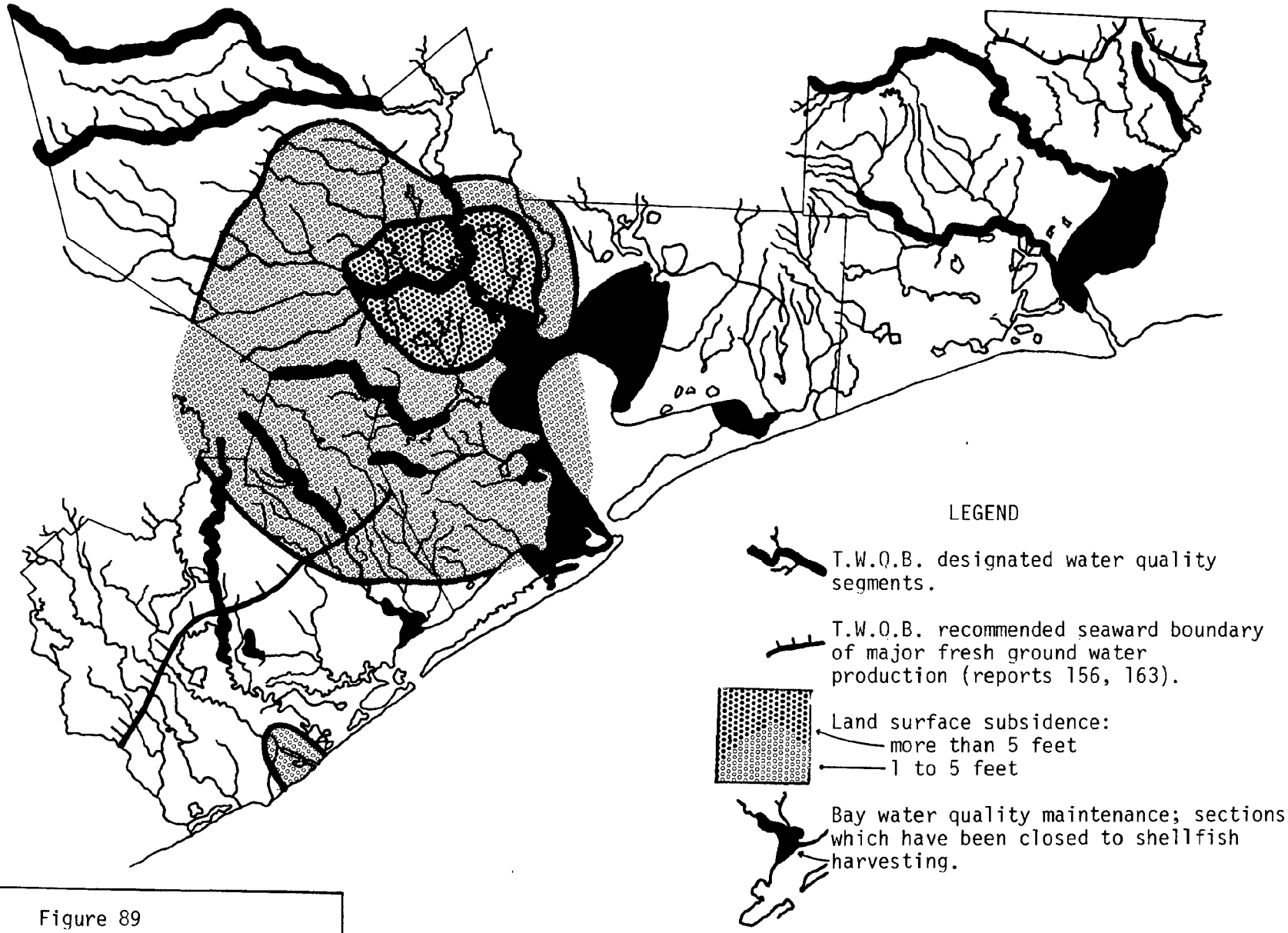


Figure 89

Problems Related to Water Development

Figure 90

Correlation Chart of Recent Aquifers in the Scenario I Area

This report				Wood and Gabrysch (1965)	Sandeen and Wesselman (1969)	Lang, Winslow, and White (1950)	Pettit and Winslow (1957)	Wesselman (1971)
System	Series	Stratigraphic unit	Aquifer	Houston district	Brazoria County	Houston district	Galveston County	Chambers and Jefferson Counties
Quaternary	Holocene	Quaternary alluvium	Chicot aquifer: Upper unit	Confining layer and Alta Loma Sand of Rose (1943)	Chicot aquifer: Upper unit	Alluvial deposits	Beach and dune sand	Chicot aquifer: Upper unit
	Pleistocene	Beaumont Clay				Beaumont Clay	Beaumont Clay	
		Montgomery Formation	Chicot aquifer: Lower unit		Chicot aquifer: Lower unit	"Alta Loma Sand"	"Alta Loma Sand"	Chicot aquifer: Lower unit
		Bentley Formation						
		Willis Sand				Zone 7	Lissie Formation	
						Zone 6		
Tertiary	Pliocene	Goliad Sand	Evangeline aquifer	Heavily pumped layer	Evangeline aquifer	Zone 5		Evangeline aquifer
	Miocene	Fleming Formation	Burkeville confining layer	Zone 2				Burkeville aquiclude
			Jasper aquifer: Upper unit			Zone 4		Jasper aquifer
						Zone 3		
			Jasper aquifer: Lower unit			Zone 2		
						Zone 1		

(after: T.W.D.B. report 190 Analog-Model Studies of Groundwater Hydrology in the Houston District, Texas p.9, 1975).

There are three inter-related areas of concern which involve natural responses to extensive groundwater withdrawals. Water level declines in the Houston area represent diminishing artesian pressure. Most of the water in Chicot and Evangeline Aquifers is under artesian conditions. Even with outcrop saturation and rejection of potential recharge, the water levels are not stable as the aquifers' transmissivity is not sufficient at existing gradients to resupply the water field in the area about a well. Thus, although there is no water shortage, water levels in large capacity wells in the Houston area have declined about 90 to 370 feet in the last 34 years, at an average rate of eight feet per year. This in itself does not represent significant problems, and only requires larger and more costly pumping mechanisms.

With decreasing artesian pressure and drawdown of water levels, the barrier between fresh and saline groundwater migrates updip in the geologic units containing the aquifers. A downdrawn reservoir may fill again by natural processes if pumping is reduced, but dissolved salts may be difficult to remove once they contaminate the aquifer. Natural dilution is a slow process and the effects of salination may be long-lasting once recovery actually begins.

The production of groundwater from aquifers under Chambers and Jefferson Counties is largely limited by the salinity of much of the basin's resources. Only a small portion of groundwater in this area is fresh or slightly saline (less than 1,000 to 3,000 mg/L respectively). The salinity is due to 1) salts naturally occuring in the subsurface deposits and 2) encroachment updip in the geologic units of sea-water. To avoid salination of groundwater resources, the Texas Water Development Board has recommended that future well pumping be restricted seaward of the line shown in Figure 89.

The third area of concern related to extensive groundwater withdrawals is land surface subsidence. Decreasing artesian pressure creates stresses across the aquifer which cause water to slowly move out of water-saturated clays and into adjacent sands. The highly compressible clays become compacted in the subsurface, which translates vertically to land surface subsidence. The effect is pronounced in areas of concentrated and extensive withdrawal. Figure 89 shows the approximate extent of subsidence to date in the study area. Most subsidence has occured around the Houston-Pasadena-Bayport area, in the Beaumont-Port Arthur-Orange area, about Freeport, and in rural areas of Brazoria County from large withdrawals for rice irrigation. The costs of the effects are significant, extending from the mundane damage to buildings and pipeline systems to increased vulnerability of hurricane flooding.

Finally, it should be noted that extensive withdrawal-related problems affect more than the immediate area. The extent of water

level decline in the Houston area represents a cone of groundwater level depression extending into Chambers and Brazoria Counties in this area, as well as towards the north.

The shape of the major bays along the Texas Coast (including Sabine Lake) represents the various results of the processes of sedimentation, subsidence, longshore sediment transport, and sea level rise in filling the now drowned Pleistocene river valleys. Sabine Lake has been almost closed off from the Gulf of Mexico by extensive deposition of silt and clay supplied by the Mississippi River when its mouth was to the west of the birdsfoot delta. The sediment supplied to the coastal area by the Brazos River was so extensive that its estuary has been completely filled.

The present Galveston Bay System and Sabine Lake are shallow water bodies, not exceeding 2 fathoms (Figure 91) except in dredged ship channels (Figure 93) and in the Gulf passes (San Luis Pass, Bolivar Roads, and Sabine Pass). Circulation and tidal exchange in the bays are mainly affected by sources of water inflow, basin geometry, dominant wind directions, and artificial obstructions (Texas City Dike, Morgan Point dredge disposal mound).

Bay system salinity gradients vary with seasonal changes in runoff and river inflow (compare graphs of Figure 88, maximum water input in Figure 91, and isohaline contours of Figure 82). The salinity gradient which exists across the Galveston Bay System is believed to be essential to the use of the bay and adjacent marshes as a spawning and nursery ground for fish and shrimp (Figure 93).

C. Land

The topography of the Scenario I study area is characteristically a flat coastal plain with a Gulfward slope of 2 to 5 feet per mile. This coastal plain is variously dissected by river valleys with meandering channels and slowly headward eroding streams. Positive topographic features other than this low-lying valley and plain morphology may be of two kinds: saltdomes which have raised the ground surface, in a conical shape, 10 to 40 feet above the local trend; and Pleistocene distributary and barrier island sands which form sinuous low lying ridges unnoticeable when profiled at 5 foot topographic contours.

The geologic history affecting this area's present substrate characteristics, as well as those for the Texas coastal zone as far south as Nueces County, was dominated by river deltaic deposition. What are now seen as the five major rivers in the study area also had

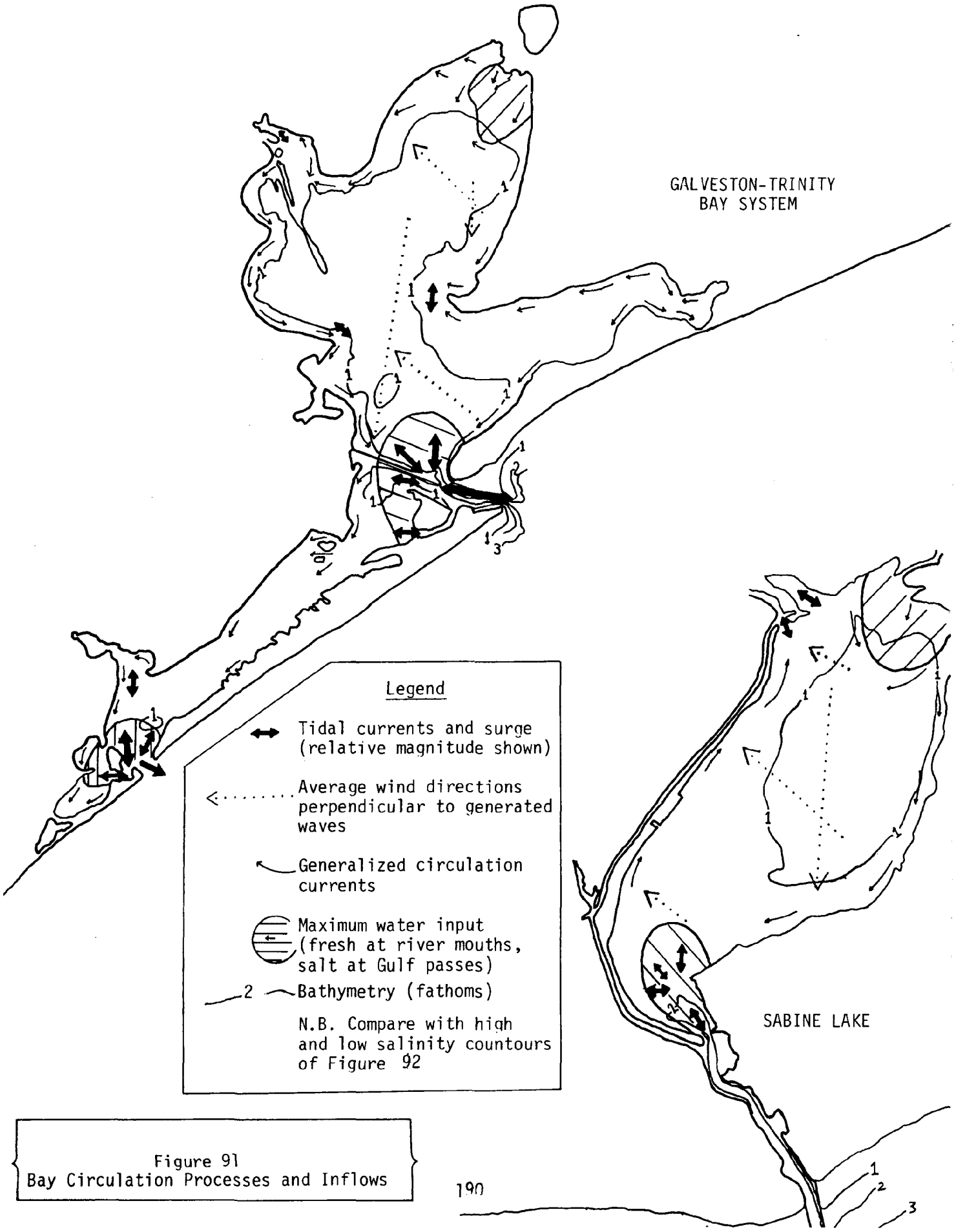


Figure 91
Bay Circulation Processes and Inflows

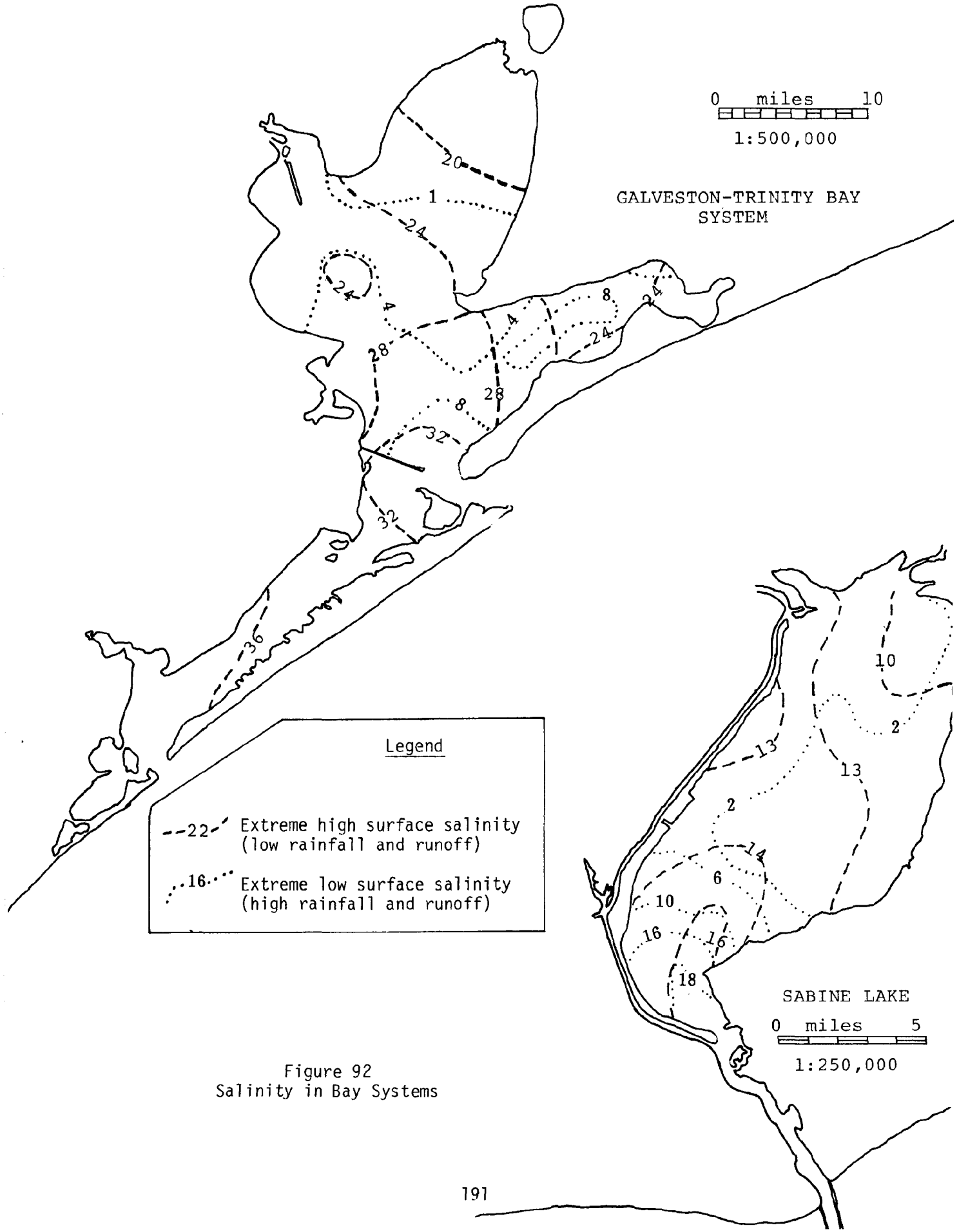


Figure 92
Salinity in Bay Systems

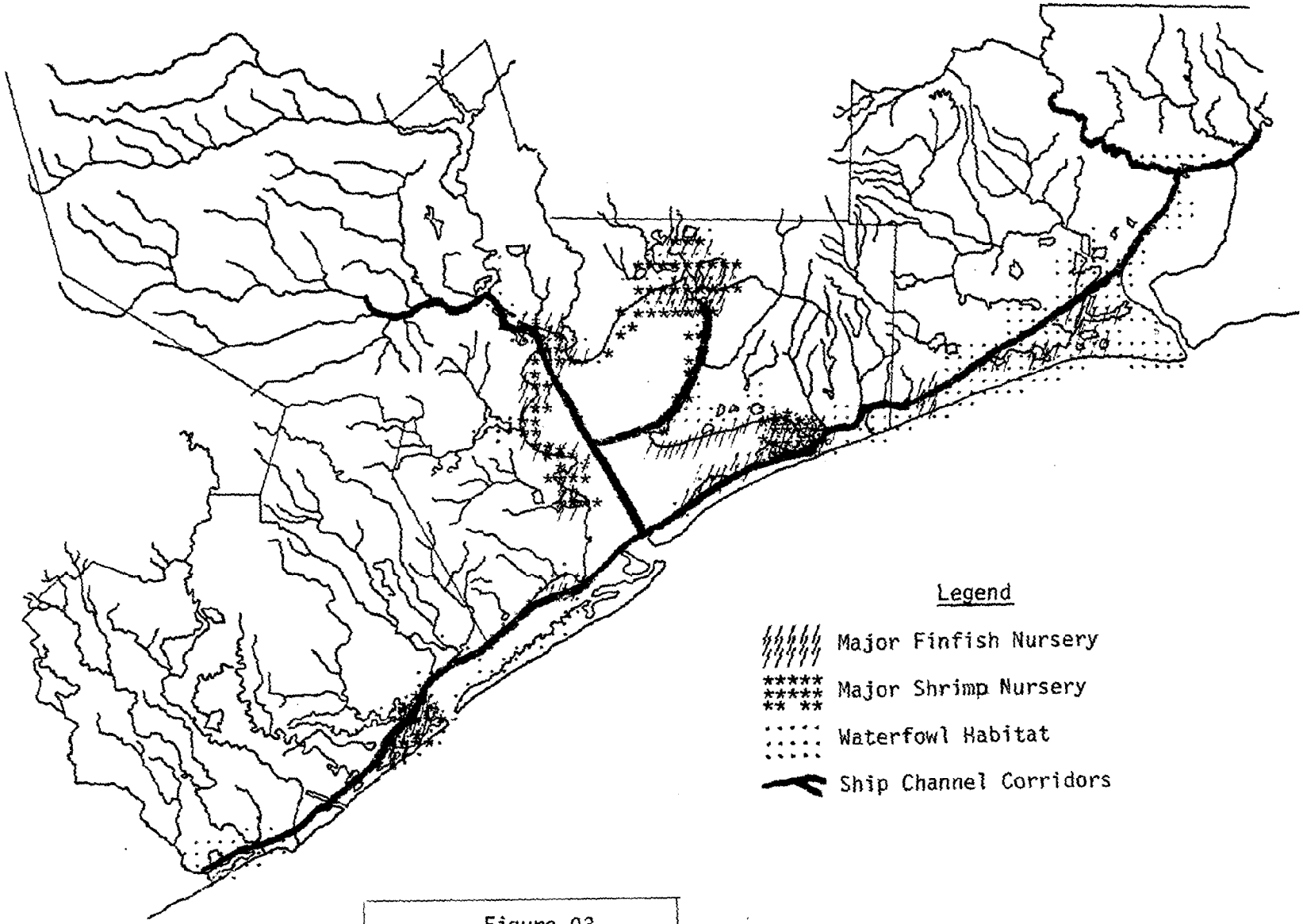


Figure 93

Wetlands Habitat and Ship Channel Corridors

major ancient counterparts, coursing across and through the Pleistocene coastal plain. Therefore, the substrate units in the area largely represent different deltaic environment deposits. Figure 94 lists these substrate units defined by the Bureau of Economic Geology, their physical properties, and their suitability for alternate human uses.

The locations of urban industrial and residential centers are affected by more factors than substrate capability. However, within a metropolitan and municipal area, it is possible to design alternative construction to minimize foundation-substrate unsuitability. The distribution over a large area of rangeland and cropland is, however, more correlated with substrate capability. Cropland, often with the higher return value of land development, tends to be developed on the group I substrates of the coastal plain. Rangeland tends to develop on group III substrates of the coastal plain, as well as on fluvial woodlands and upper marsh environments.

Figure 95 presents current acreage estimates of ten categories of land use in the three Scenario I regions. Figure 96 presents a land development inventory of selected portions of the three regions of Scenario I, as described in the section "Environmental Impact Assessment Procedure." The total 'other' land in Figure 96 is allocated into agriculture, range-pasture, woodland-timber, recreation and marsh land patterns. It should be noted that the extent of land prone to hurricane surge flooding in Region I, primarily in Port Arthur, has been reduced since the publication of the maps by the construction of the Port Arthur Storm Protection System.

Keeping in mind that substrate limitations may often be effectively overcome by investment in appropriate engineering designs, it may be seen by comparison of Figures 94 and 96 that a considerable amount of land in all three regions is unsuitably developed.

Shoreline development across the three regions varies from very lowlying salt marsh to highly developed made-land to naturally occuring mainland shoreline. Much of the western shoreline of Sabine Lake is made-land, heavily urbanized and developed. Along the Neches-Sabine Ship Channel is port development, including more than 50 docks and 14,000 feet of docking space. Most of Trinity Bay's shoreline is undeveloped. The western shore of Galveston Bay is almost continuously industrialized or urbanized from Texas City to Baytown. Included in Region II are more than 285 docks with more than 99,000 feet of docking space. The Gulf shoreline of Region I and II are made of narrow sandy beaches backed by 10-14 foot high dunes. Much of the shoreline across Brazoria County is restricted for development by extensive saline and brackish water marshes and numerous coastal lakes. In some areas recreation is limited by a scarcity of access

Figure 94

Evaluation of the natural suitability of physical properties groups for various coastal activities and land uses, Bay City-Freeport map area, Texas.*

Suitability is evaluated on the basis of natural properties and may be improved by special engineering and construction methods. Significant properties considered as positive criteria for evaluating land use suitability (+ = satisfactory; – = unsatisfactory; 0 = possible problems).

(1) Road construction: Earthen structures and fill material–low shrink-swell potential, low compressibility, and low plasticity.
(2) Road construction: Base material–low compressibility, low shrink-swell potential, and high shear strength.
(3) Road construction: Grade material–low compressibility, low shrink-swell potential, and high shear strength.
(4) Fill material: Topsoil–loam or sandy/silty clay composition.
(5) Fill material: General, below topsoil–silty/sandy clay composition with low to moderate shrink-swell potential.
(6) Foundation: Heavy–high load-bearing strength, low shrink-swell potential, and good drainage.
(7) Foundation: Light–low shrink-swell potential.
(8) Underground installations: Low shrink-swell potential, high load-bearing strength, and good drainage.
(9) Buried cables and pipes: Low shrink-swell potential and low corrosivity.
(10) Excavatability: Ease of digging with conventional machinery.
(11) Waste disposal: Septic systems–moderate permeability, low to moderate shrink-swell potential, and good subsurface drainage.
(12) Waste disposal: Solid waste–low permeability and good surface drainage.
(13) Waste disposal: Unlined liquid-waste retention ponds–low permeability.
(14) Water storage: Earthen dams and dikes–low permeability, moderate shear strength, and moderate compressibility.
(15) Water storage: Unlined reservoirs or ponds above ground-water level–low permeability.
(16) Water storage: Reservoirs or ponds supplied by ground water–high permeability.

GENERAL PHYSICAL PROPERTIES	PRINCIPAL ENVIRONMENTAL GEOLOGIC MAP UNIT	Coastal Activities and Land Uses															
		Road Construction			Fill Material		Foundation					Waste Disposal			Water Storage		
		(1) Earthen structures and fill material	(2) Base material	(3) Grade material	(4) Topsoil	(5) General, below topsoil	(6) Heavy	(7) Light	(8) Underground installations	(9) Buried cables and pipes	(10) Excavatability	(11) Septic systems	(12) Solid waste	(13) Unlined liquid-waste retention ponds	(14) Earthen dams and dikes	(15) Unlined reservoirs or ponds above ground-water level	(16) Reservoirs or ponds supplied by ground water
Group I Dominantly clay and mud, low permeability, high water-holding capacity, high compressibility, high to very high shrink-swell potential, poor drainage, level to depressed relief, low shear strength, high plasticity, high to very high acidity, high corrosivity	Interdistributary muds, abandoned channel-fill muds, overbank fluvial muds, mud-filled coastal lakes and tidal creeks, mud veneer over reworked delta facies	–	–	–	0	–	–	0	–	–	+	–	+	+	0	+	–
Group II Dominantly sand, high to very high permeability, low water-holding capacity, low compressibility, low shrink-swell potential, good drainage, low ridge and depressed relief, high shear strength, low plasticity	Beach, beach ridges, low fore-island dunes, vegetated shell ramp and barrier flat, wash-over fan, point bars, and wind-tidal flats	+	+	+	0	+	+	+	+	+	+	0	–	–	–	–	+
Group III Dominantly clayey sand and silt, moderate permeability, drainage, and water-holding capacity, low to moderate compressibility and shrink-swell potential, level relief with local mounds and ridges, high shear strength	Meanderbelt sands, levee, crevasse splay, and distributary sands, and Pleistocene fluvial, distributary, and delta-front sands	+	+	+	+	+	0	+	0	+	+	+	0	0	+	0	0
Group IV Coastal marsh, fresh to brackish, very low permeability, high water-holding capacity, very poor drainage, depressed relief, low shear strength, high plasticity, high organic content, subject to salt-water flooding, high to very high corrosivity	Fresh to brackish marsh, marsh-filled abandoned coastal lakes and tidal creeks	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Group V Inland swamp and marsh, permanently high water table, very low permeability, high water-holding capacity, very poor drainage, very poor load-bearing strength, high organic content, subject to frequent flooding, very high acidity	Swamp, inland marsh, and marsh-filled channels	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Group VI Salt marsh, permanently high water table, very low permeability, high water-holding capacity, very poor drainage, very poor load-bearing strength, very high corrosivity, subject to frequent tidal inundations	Salt marsh	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Group VII Made land and spoil, properties highly variable, mixed mud, silt, and sand, reworked spoil commonly sandy and moderately sorted with properties similar to those of Group III	Subaerial spoil heaps or mounds, subaerial reworked spoil, subaqueous spoil, made land	HIGHLY VARIABLE: USE WITH CAUTION															

(from: Environmental Geologic Atlas, Texas Coastal Zone, University of Texas Bureau of Economic Geology)

Figure 95

Current Land Use (Acres) in Scenario I Affected Study Sites

	Use	Region I	Region II	Region III
1.	Residential-Urban, Commercial, Residential Development	66,560	355,744	18,560
2.	Industrial, Railyards, Docks	7,040	71,373	4,992
3.	Undeveloped, Greenbelts, Cemeteries, Undifferentiated Land	2,880	12,800	192
4.	Parks and Recreation	704	18,048	320
5.	Sewage Disposal	3,435	10,155	1,200
6.	Solid Waste	529	2,908	474
7.	Airfields	2,225	14,626	900
8.	Artificial Reservoirs	13,760	28,800	11,392
9.	Agriculture, Cultivated land and Orchards	267,328	814,189	346.880
10.	Range-pasture, Uncultivated	172,800	153,856	200,000
TOTAL		537,261	1,482,499	584,919

Figure 96

Regional Land Development Inventory (acres)

REGION I TOTALS (Beaumont, Port Arthur, and Sabine Pass Areas)

	Group III	Group II	Group I	Made Land	Unsuitable	Total
industrial	1,953	209	1,674	1,744	419	5,999
residential-commercial	13,352	797	21,920	0	1,494	37,563
other land	24,552	1,485	18,354	2,740	15,922	63,053
total	39,857	2,491	41,948	4,484	17,637	106,615

agriculture	range-pasture	woodland-timber	recreation	marsh	other
21,423 (35%)	6,477 (11%)	7,274 (12%)	4,085 (7%)	11,657 (19%)	9,765 (16%)

Prone to hurricane surge-tide flooding 21,822 (20%)

REGION II TOTALS (Houston, Texas City, and Galveston Areas)

	Group III	Group II	Group I	Made Land	Unsuitable	Total
industrial	6,178	399	30,988	2,093	299	39,957
residential-commercial	35,572	797	94,558	3,188	0	134,115
other land	73,339	4,284	93,562	4,783	11,558	176,462
total	114,090	5,480	219,108	10,064	1,793	350,534

agriculture	range-pasture	woodland-timber	recreation	marsh	other
25,209 (14%)	51,115 (30%)	19,828 (11%)	8,570 (5%)	4,981 (3%)	66,759 (37%

prone to hurricane surge-tide flooding 19,032 (5%)

REGION III TOTALS (Freeport Area)

	Group III	Group II	Group I	Made Land	Unsuitable	Total
industrial	0	0	1,495	787	0	2,292
residential-commercial	1,993	0	0	100	100	2,193
other land	1,993	0	5,381	996	3,188	11,558
total	3,986	0	6,876	1,793	3,288	15,943

agricultural	range-pasture	woodland-timber	recreation	marsh	other
0	6,377 (55%)	399 (3%)	199 (2%)	2,092 (18%)	2,491 (22%)

prone to hurricane surge-tide flooding 12,654 (79%)

roads. The area between the Brazos River mouth and the city of Surfside is heavily industrialized and includes the city of Freeport and the Brazosport megocommunity. There is nearly 1,500 feet of port docking space here. Throughout the regions, plans are being implemented and developed for increasing harbor facilities as well as superports.

The three study regions in Scenario I have constituted the main share of industrialization in the Texas Coastal Zone. Yet there remain several unique and important natural features in the area, affected to various extents by this historical urban-industrial development. The coastal wetlands in the Scenario I area, as a result of geologic history and climatic characteristics, account for a large percentage of the highly productive wetlands of the Texas coastal area. These wetlands - marsh, estuary, and tidal flat - support waterfowl, shrimp and finfish nursery grounds, and the food web dependent upon them including numerous species of small herbivore and carnivores. There are several endangered species in the area's habitats. Several national, private, and state wildlife reserves provide protected natural areas. Yet the main role of protecting and maintaining those natural resources falls to individual landowners.

This area also contains most of the woodland development in the Texas coastal area. Major wooded areas include river bottoms, upland sandy soils in Harris and Chambers Counties, Lawhorn Woods in Jefferson County, and northern Orange County.

D. Waste Residuals

1. Solid Wastes

Figure 97 presents estimated solid waste generation by county in municipal, agricultural, and industrial activities. Municipal wastes are presented on a wet basis; on a dry basis they are assumed to be 75% combustible and 25% inert. Residential wastes include household garbage, lawn clippings, and miscellaneous furniture, appliances, etc. Commercial wastes include refuse from stores, markets, offices, schools, airports, etc. Also included in the municipal waste total are demolition and construction wastes and other wastes (street cleaning, treatment plant residues, dead animals, etc.). Agricultural wastes are presented on a dry weight basis and include estimates of livestock manure and field and crop waste. Industrial wastes are assumed to be 62% combustible and 38% inert and include heavy and light manufacturing wastes, food processing wastes, chemical and petroleum industry wastes, and other smaller categories where appropriate.

Figure 97

Estimates of Solid Waste Generation
(Million pounds per year)

Wastes	Orange	Jefferson	Chambers	Galveston	Harris	Brazoria
1. Residential	64.9	223.0	11.1	155.0	1,580.0	98.3
2. Commercial	91.1	313.0	7.53	216.0	2,230.0	139.0
3. Total Municipal	214.25	737.8	22.95	511.5	5,244.0	326.2
4. Total Agricultural	13.82	212.0	167.42	26.62	215.1	333.1
5. Manufacturing	132.6	804.3	0	313.7	2,141.0	206.18
6. Total Industrial	219.6	837.0	21.3	313.7	2,252.0	206.18
GRAND TOTAL (3+4+6)	447.67	1,786.8	211.67	851.82	7,711.1	865.48

The values of Figure 97 represent different patterns of population size, industrial activity and type, and agricultural base. There are three general waste generation distribution patterns. Galveston and Harris Counties in Region II and Orange and Jefferson Counties in Region I are both characterized by more municipal and industrial wastes than agricultural wastes. This pattern is reversed in Chambers County. In Brazoria County, municipal and agricultural waste levels are comparable as a percent of total, and together account for three times the industrial waste generation. It is of interest to note that in both Galveston and Harris Counties, municipal and agricultural waste levels are comparable as a percent of total, and together account for three times the industrial waste. The ratio of municipal to industrial to agricultural solid waste totals is 8:4:1. Reflecting this dominance of population size and industrial activity, Harris, Jefferson, and Brazoria Counties are the top three solid waste producers, closely followed by Galveston County.

Most municipal solid wastes are collected for external treatment and disposal. Depending on local situations, as little as 50% of produced solid waste is collected, the remainder being disposed of on-site or directly salvaged. Most agricultural wastes are disposed or salvaged (reused) on site. A weighted average of industrial waste salvage operations indicates that 7 to 16 percent of industrial solid waste is directly salvaged. This percent varies with the industry. As much as 70% of fabricated metal industry wastes may be salvaged on-site. There may be next to no salvage in primary metal fabrication and in petroleum processing sectors.

The optimum conditions for sanitary landfill solid waste disposal in the Texas coastal area requires the dominantly mud and clay substrates of group I (Figure 94) with low permeability, high water holding capacity, poor drainage, low to depressed topographic relief, and away from active fluvial processes (Evaluation of Sanitary Landfill Sites, B.E.G., 1972). In the Scenario I study area, 25 to 67 percent of operating landfill sites meet the criteria. Landfill operations under other conditions require more engineering maintanence and monitoring to minimize contamination of the locale's hydraulogic system. It will be seen elsewhere (Identification of Significant Infrastructural Issues) that there is sufficient disposal acreage currently available to suitably meet the waste volume demands of the Scenario I Area.

2. Water Effluents

The total amount of wastewater discharged by county gives an idea of the pollution potential for the drainage basins. Figure 98 gives this information. Three measures are used to estimate pollution potential: biological oxygen demanding materials (B.O.D.), total

Figure 98

Wastewater Effluent

	Domestic Waste			Industrial Waste			Number of Dischargers
	B.O.D.	T.S.S.	Flow	B.O.D.	T.S.S.	Flow	
Orange	529	665	4.3	7,438	25,883	838.0	24
Jefferson	3,982	4,781	20.8	112,463	252,777	460.0	50
Chambers	31	90	0.31	14	741	1.4	5
Galveston	3,913	6,529	16.0	79,370	46,997	1,144.0	41
Harris	58,128	91,765	163.0	79,723	178,518	1,317.4	301
Brazoria	2,118	NA	11.6	28,291.8	NA	645.9	68

B.O.D. - pounds/day
T.S.S. - pounds/day
Flow - cubic feet per second
N.A. - not available

suspended solids (T.S.S.), and return flow as that amount of diverted ground and surface water being returned to the natural system. It is again seen that the values are directly related to population size and industrial activity.

Stream flow volume and rate, and number and density of dischargers are factors which greatly determine the extent of streamwater quality degredation. Due to variations in these factors throughout the area, only certain of the stream segments actually exceed water quality standards (Figure 89).

3. Air Emissions

The comprehensiveness of atmospheric emissions data is basically poor. The emissions date in Figure 99 is self-reported by industry. Non-point source (or mobile) automobile emissions are not included.

Figure 100 presents an estimated combined emissions source inventory for the entire Texas Coastal Zone. Gaseous emissions (NOx, SOx, HC, CO) account for 98 percent by weight of total emissions. Carbon monoxide is the highest single air pollutant, followed by hydrocarbons. Over 70% of CO emissions and roughly 50% of hydrocarbon emissions are due to automobiles. Industrial chemicals and petroleum refining account for over 84 percent of industrial processing emissions. Municipal incineration accounts for about 60 percent of the particulate and SOx emissions in the solid waste disposal category. Aircraft emissions account for about 66% of particulate emissions in the Transportation category.

The distribution of air quality monitoring stations is insufficient to provide a comprehensive picture of ambient air quality. Also, emissions listed in Figures 99 and 100 are not the only air pollutants of concern. The moisture in the humid air of Scenario I regions may react with some of the gaseous emissions to form such products as sulfuric and nitric acid mists which eventually settle to the ground, affecting vegetation and public health. Photochemical oxidants result from chemical reactions in the air and effect ozone levels. Problems known to exist are shown in Figure 101. Isopleth maps of SO_2 resulting from estimated low-level non-point sources (e.g., automobiles) are present in Figure 102. Note that these forecast estimates only result from about 4 percent of the total SO_x emissions. The patterns exhibited in Figure 102 are the result of transportation density and dominant wind dispersion potential.

Figure 99

Industrial Air Emissions Inventory
(thousand tons/year)

County	NO_x	SO_x	HC	CO	Particulutes
Harris	100.00	125.0	325.0	450.0	60.0
Jefferson	60.0	90.0	250.0	350.0	15.0
Brazoria	60.0	9.0	150.0	180.0	6.0
Galveston	60.0	40.0	110.0	110.0	9.0
Orange	20.0	4.6	30.0	80.0	8.0
Chambers	16.0	30.0	4.0	3.25	2.5

(from: Rice Center for Community Research, Gulf Research Report 1976, p. 104.)

Figure 100

Combined Emission Source Inventory

Emissions due to:	NO_x	SO_x	HC	CO	Particulates
Fuel Combustion	38%	0.1%	10.1%	-	11.2%
Industrial Processing	23%	95%	36.8%	28%	27.1%
Solid Waste Disposal	.6%	.7%	1.7%	1%	40.5%
Transportation	38%	4.2%	15.3%	71.2%	18.4%

(From: Waste Management in the Texas Coastal Zone p. IV - 24)

Figure 101

Aspects of Violated Air Quality Standards

Area	Photochemical Oxidents	SO_x	HC	Particulates
Clute/Freeport	XX			X
Greater Houston	XX	X	X	XX
Beaumont/Port Arthur	XX	XX	X	X
Standard	160 $\mu g/m^3$ for one hour	560-800 $\mu g/m^3$ averaged over 30 minutes	160 $\mu g/m^3$	100 $\mu g/m^3$ mean over 5 hour period

X = probable or frequent violations
XX - certain or problematic violations

(From: Gulf Research Report, p. 104)

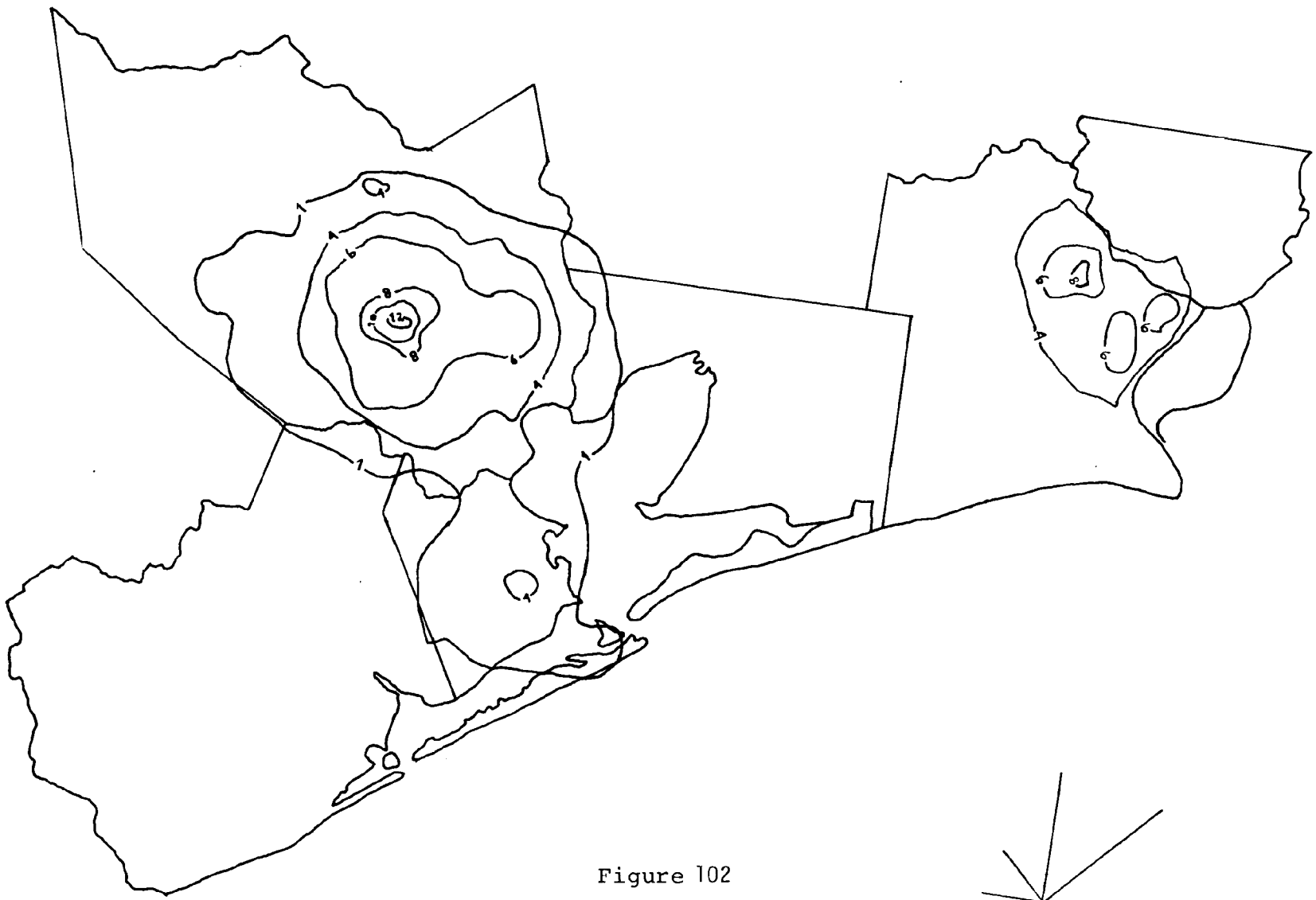


Figure 102

Contours of SO_2 Concentration $\mu g/m^3$

(1972 average)

II. Impact Evaluation

A. Land

Land requirements over time in the Scenario I study regions are presented in Figure 103. In Regions I, II, and III, the initial rate of total land demand is 3, 29, and 3 acres per month, respectively. After the first year of the Scenario time span, the rate of increase of land requirements decreases to near zero for the following three years, after which it again increases. There are two patterns which may be seen here, although the absolute rates differ among the three regions. In Regions II and III, the rate of demand continually increases throughout this final period except for the last eight months in Region II. In Region I, however, after a short-lived rapid increase at 18.5 acres per month, the rate of demand falls markedly to a gradual increase at 2.5 acres per month.

The type of land required and its rate of increase also affects the facility with which the requirements can be met. Again, although the absolute amounts of land required vary, there are different patterns in the proportions of direct, indirect, and residential land. In Region I, the amount and rate of increase of direct land required closely follows indirect land requirements over time. In Region III, direct land requirements follow the pattern of residential land requirements, although direct land demand does not begin until halfway through the time span.

1. Direct Land Requirements

As described in the section "Environmental Impact Assessment" in Part B, the substrate group most suitable for direct OCS land uses is Group III (see Figure 94) or reclaimed land made suitable. Although Group II may present even fewer construction problems, its distribution throughout the regions is sparse, except of course about Galveston. There are three conditions under which all or part of the direct land requirements may be met: (1) there may be open, undeveloped tracts zoned for industrial use; (2) there may be vacant albeit developed facilities available for lease or sale; or (3) existing companies may have 'buffer land' about current plant sites into which they may expand.

If all direct land requirements can be met within currently designated industrial areas, assuming development on suitability group III or on made land, then in Region I the direct land requirement is 2.4% of current use, at the final, maximum demand time span (see Figure 96). In Region III, there is no industrial development

Figure 103

Scenario I Land Requirements

Time Period	LAND (acres) Primary Region I	Primary Region II	Primary Region III	*Indirect Region I	*Indirect Region II	*Indirect Region III	Residential Region I	Residential Region II	Residential Region III	Total (1st three columns) Region I	Total Region II	Total Region III	DOCKING SPACE (feet) Region I	Region II	Region III
10/76-1/77	0	20.5	0	0	81.6	0	0	15.4	0	0	117.5	0	300	300	0
1/77-4/77	0	22	0	0	143.7	10.6	0	24.3	1.4	0	187	12	300	600	300
4/77-8/77	9.5	33	0	21.8	209.5	10.5	2.2	38.5	1.5	33.5	281	12	600	900	300
8/77-10/77	9.5	34.5	0	21.8	270.5	23.8	2.2	42.5	3.2	33.5	347.5	27	600	1,200	600
10/77-11/77	9.5	34.5	0	21.8	270.5	23.8	2.2	42.5	3.2	33.5	347.5	27	600	1,200	600
11/77-1/78	9.5	34.5	0	21.8	270.5	23.8	2.2	42.5	3.2	33.5	347.5	27	600	1,200	600
1/78-2/78	9.5	34.5	0	21.8	270.5	23.8	2.2	42.5	3.2	33.5	347.5	27	600	1,200	600
2/78-4/78	9.5	34.5	0	21.8	270.5	23.8	2.2	42.5	3.2	33.5	347.5	27	600	1,200	600
4/78-8/79	9.5	33	0	21.8	270.5	23.8	2.2	42.5	3.2	33.5	346	27	600	900	300
8/79-11/79	9.5	31.5	0	21.8	270.5	23.8	2.2	42.5	3.2	33.5	344.5	27	300	600	300
11/79-2/80	9.5	30	0	21.8	270.5	23.8	2.2	42.5	3.2	33.5	343	27	300	300	0
2/80-4/80	9.5	28.5	0	21.8	270.5	23.8	2.2	42.5	3.2	33.5	341.5	27	0	0	0
4/80-10/80	9.5	87	0	21.8	267.0	23.8	2.5	46.0	3.2	33.5	400	27	0	800	200
10/80-2/81	9.5	89	1	21.8	266.1	23.8	2.5	46.9	3.2	33.5	402	28	0	1,600	200
2/81-6/81	9.5	147.5	1	60.2	259.1	23.8	4.8	53.9	3.2	74.5	460.5	28	0	2,400	200
6/81-8/81	66	149.5	1	78.0	259.1	23.8	10.0	53.9	3.2	154	462.5	28	200	2,800	400
8/81-9/81	71	149	5	81.8	279.6	26.1	10.2	57.4	3.9	163	486	35	200	2,600	400
9/81-2/82	71	151	6	80.6	295.2	38.2	11.4	78.8	5.8	163	525	50	200	4,000	800
2/82-8/82	83	207	6	105.1	312.0	38.0	14.9	95.0	6.0	203	614	50	400	4,600	800
8/82-11/82	83	209	7	105.1	348.0	50.4	14.9	95.0	7.6	203	652	65	400	5,100	1,000
11/82-2/83	83	282	7	105.1	423.1	50.3	14.9	110.9	7.7	203	816	65	400	6,000	1,200
2/83-5/83	87	284	8	110.1	454.6	61.8	14.9	116.4	9.2	212	855	80	600	6,400	1,400
5/83-10/83	87	287	8	120.9	441.1	72.9	16.1	129.9	11.1	224	858	92	600	7,000	1,600

*Total indirect land requirements minus residential land.

inventoried on Group III substrates. The final, maximum direct land requirement (8 acres) is 0.4 percent of the area's inventoried made land industrial use category. However, when it is recalled that land requirements gradually increase to these maximum levels at rates less than 30 acres per month over any twelve month period, and typically at rates between 5 to 15 acres per month over several years, then the net percent impact at any time is seen to be less than that specified above. What the above percentage values indicate is an approximate net intensification of activity after seven years, within an area already designated for industrial use.

If, at the other extreme, none of the direct OCS land requirements can be met in currently designated industrial areas, then the requirements must be expressed against the appropriate suitability class use groups as presented in Figure 96. In Regions I, II, and III, the direct land requirements are 0.3, 0.4, and 0.3 percent, respectively, of suitable 'other' land. Most of the competing uses for such land is agricultural (cultivated fields, largely rice and sorghum production) and range-pasture.

The maximum required docking space in direct OCS activities is 600 and 7,000 feet in Regions I and II, respectively. There requirements are 4.3 and 7.1 percent of currently inventoried docking space available in Regions I and II. However, several harbor authorities are presently implementing plans to increase port facilities. In Region III, however, the maximum requirement of 1,600 feet by the last Scenario time period is greater than currently available docking space in the Brazos Navigation Harbor (1,500 feet). Another 5,500 feet is owned by the navigation district and may be developed in the future. To the extent that major expansion of this port may be directly stimulated by such a Scenario's requirements, environmental impacts would be responses to river bank bulkheading and construction of dockside access, storage, and operations facilities. As much of the surrounding area is reclaimed land and intensively industrially developed, impact of such dockside development on terrestrial biologic communities would be slight, if any, considering the magnitude of such development. The affects of further channel bulkheading so close to the Brazos River mouth would probably also be slight.

2. Residential Land Requirements

It is assumed that all residential land requirements will be met within the municipalities inventoried in Figure 96, as described in the section "Environmental Impact Assessment" in Part B. The substrate requirements for suitable residential development, i.e., development with minimal foundation problems, are less restricted than for industrial development as there is generally less loading force superimposed on building foundations. The residential land

development demand is less than half of one percent of currently designated residential land in any of the three regions at the final time period representing maximum net development. It will also be seen in the section "Identification of Significant Issues", that housing availability is not of significant concern in any of the study sites.

3. Indirect Land Requirements

The indirect land requirement is the largest category of land demand in Figure 103. The amount of indirect land required does not increase proportionately with direct land requirements, as the former is calibrated to direct OCS employment, in which land use per unit activity is not proportionately related to employment levels.

As described in Part B "Indirect Land Requirements", an unspecified fraction of the indirect land required comprises indirect industrial growth. If all such indirect land were industrially defined, it would account for an added increment of 3.2 percent of current industrial land in Regions I and III, and an increment of 5.3 percent in Region II, beyond that proportioned increment of direct OCS land requirements, at the final maximum level of development. The total percentage of current industrial land would be 5.6, 8.8, and 3.6 percent in Regions I, II, and III respectively. While the use of the 'all industrial indirect land' assumption provides a reference point for the impact assessment of intensive industrial development, the assumption is clearly untenable.

Parks and recreation, sewage treatment, solid waste disposal, and airfields, which are other components of indirect land, are tied with demand on governmental services and infrastructural planning goals. As will be seen in Chapters 17 and 18, formally defined recreation area is below per capita standards in Beaumont and Houston. Sewage treatment in Galveston, as a significant issue, is currently requiring added plant sites (see Chapter 18).

Treated as a unit, the various indirect land uses have different substrate requirements, as described in Figure 16, yet mostly require properties of Groups I and III. A visual comparison of final indirect land demand (Figure 103) with the amount of 'other' land in each region characterized by those two suitability classes (Figure 96), indicates that within the composite inventory of each region there is ample land available, entailing the possibility of only slight to moderate land use conversions. The direction of net change is assumed to be towards continuing urbanization, but certainly not above current regional urbanization rates.

In summary, the OCS Scenario I land requirements may represent a net intensification of current industrial land development of no more than 5.6, 8.6, and 3.6 percent in Regions I, II, and III, respectively. More probable is a net intensification on the order of 3 to 5 percent maximum. This level was derived by assuming development on most suitable and available land, and most indirect land as industrial land.

Region I has been recently urbanizing at a rate of 1,720 acres per year, well above levels postulated in Scenario I. In Region III, one official with the Brazosport Chamber of Commerce expects current area growth to be better than 3 percent a year, and the OCS land requirement adds less than 3.6 percent over seven years. In light of current development, the OCS land requirements, although perhaps of moderate magnitude, do not seem to be a very important issue.

B. Solid Waste Generation

Direct OCS related industries in Scenario I may be grouped into four categories on the basis of similarity of waste production: offshore rig and platform activities; dockside support for rigs and platforms; operations and administrative bases, well-logging and diving services, and oil field equipment suppliers; and cement and mud companies.

Waste material produced by offshore activities, including galley, paper, glass, metal, and other wastes, amount to about 4.5 pounds per worker per day (BLM OCS lease sale 40, p. 310, 1976.) In the last year of the Scenario I time span, the unit of maximum activity, this activity would produce 262.8 thousand pounds of waste materials. By OCS Order #7, such solid waste materials must be transported to shore for disposal, and it is assumed here that such onshore removal will occur in the regional proportion of onshore support for platforms. Therefore, in the year of maximum activity, Region I will receive 52.6 thousand pounds and Region II will receive 210.2 thousand pounds of solid waste produced offshore. As will be seen subsequently, this waste level will add another 2.5% (in Region I) and 1.25 percent (in Region II) to the OCS waste levels due to indirect industrial and municipal activities.

Waste production by the other three direct OCS activities listed above is not quantified, but is treated here to give a perspective of the type of waste which each may produce. It is expected that the amount of waste those three categories produce will not be significant.

Operations and administrative bases, well logging and diving services, and oil field suppliers may be expected to mainly generate

waste comparable to commercial activities - paper, packaging, and miscellaneous. Dockside support activity wastes would include the solid wastes brought ashore from rigs and platforms, discarded equipment, and barreled spent lubricants. Cement and mud companies, besides having paper wastes, would also have drilling mud and lime wastes. Most of such waste would probably be treated on-site.

Figure 104 presents solid waste generation over time in Scenario I by indirect industrial and domestic, municipal, and commercial sources. The values were derived as described in the section 'Environmental Impact Assessment' in Part B. These wastes production levels are compared with current regional solid waste production characteristics in the three Scenario I regions (see Figure 97). In the final year of maximum waste production, indirect industrial and domestic waste production represents a 0.1, 0.2, and 0.14 percent increase over current levels in Regions I, II, and III, respectively. In Regions I and III, the ratio of domestic to industrial waste production in that final Scenario year is 2.3 and 4, respectively. In Region II, however, indirect industrial waste production is 2.6 times that of domestic production in that final year. The characteristics of these wastes materials is as described for solid waste in the general environmental description.

The significant issue of solid waste production is that of disposal. Open dumps and sanitary landfills are the most common forms of solid waste disposal. When current regional solid waste disposal site acreage (Figure 95) is compared with current regional solid waste generation (Figure 97), it may be seen that the land required for OCS solid waste disposal is 0.525, 6.15, and 0.7 acres in Regions I, II, and III, respectively. These acreage values include direct as well as indirect OCS wastes. This is only a fraction of current regional disposal site acreage. It should, however, be noted that the inventory of current site acreage does not reveal how much of such facility has already been used, and how much is yet available. It should also be noted that the amount of disposal site acreage does not continually grow, but increases as a stepwise function. The impact of OCS waste on disposal facilites would depend upon the timing of peak OCS waste production relative to the last incremental increase of available disposal facilities. At any event, it will be seen in Chapers 17, 18, and 19 that solid waste disposal site acreage in the three Scenario I regions are above standard, and was not recognized as a potential problem for OCS development as postulated in this Scenario. In all three regions there is an ample amount of substrate group I which is the best suitability group for solid waste disposal. Therefore, assuming good operations practices - (see Evaluation of Sanitary Landfill Sites Bureau of Economic Geology, 1972) to minimize health hazards from rodents and insects and to minimize groundwater pollution from open dump rain water runoff or groundwater percolations - impacts of solid waste may be considered to be of small magnitude and negligible importance.

Figure 104

Solid Waste Generation in Scenario I

Time Period	Region I			Region II			Region III		
	IND.	DOM.	TOTAL	IND.	DOM.	TOTAL	IND.	DOM.	TOTAL
10/76-1/77	0	0	0	227.6	260.6	488.2	0	0	0
1/77-4/77	0	0	0	343.8	410.0	753.8	0	23.0	23.0
4/77-8/77	29.1	49.0	78.1	677.9	651.5	1,329.4	4.8	25.2	30.0
8/77-10/77	9.7	32.6	42.3	274.4	479.5	753.9	3.2	36.5	39.7
10/77-11/77	3.2	16.3	19.5	76.8	239.8	307.6	0	18.2	18.2
11/77-1/78	9.7	32.6	42.3	274.4	479.5	753.9	3.2	36.5	39.7
1/78-2/78	3.2	16.3	19.5	67.8	239.8	307.6	0	18.2	18.2
2/78-4/78	9.7	32.6	42.3	274.4	479.5	753.9	3.2	36.5	39.7
4/78-8/79	154.8	261.2	416.0	3,744.4	3,836.0	7,580.4	26.0	292.0	318.0
8/79-11/79	24.2	49.0	73.2	430.9	719.3	5,020.2	9.7	54.7	64.4
11/79-2/80	24.2	49.0	73.2	338.9	719.3	1,058.2	4.8	54.7	59.5
2/80-4/80	9.7	32.6	42.3	113.0	479.5	592.5	3.2	36.5	39.7
4/80-10/80	96.8	109.4	206.2	2,566.3	1,559.5	4,125.8	19.4	109.4	128.8
10/80-2/81	38.7	73.0	111.7	1,304.1	1,057.9	2,362.0	6.5	73.0	79.5
2/81-6/81	96.8	137.3	234.1	1,329.9	1,218.2	2,548.1	6.5	73.0	79.5
6/81-8/81	25.8	145.0	170.8	374.4	609.1	983.5	3.2	36.5	39.7
8/81-9/81	6.5	75.1	81.6	108.1	324.0	432.1	3.2	22.8	26.0
9/81-2/82	193.7	411.6	605.3	2,848.7	2,222.4	5,071.1	29.1	165.6	194.7
2/82-8/82	426.1	653.8	1,079.9	4,425.6	3,219.8	7,645.4	58.1	205.9	264.0
8/82-11/82	106.5	326.9	433.4	1,171.8	1,609.9	2,781.7	14.5	130.3	144.8
11/82-2/83	106.5	326.9	433.4	1,597.9	1,877.8	3,475.9	19.4	132.5	151.9
2/83-5/83	116.2	326.9	443.1	1,651.1	1,971.4	3,622.5	14.5	159.1	173.6
5/83-10/83	338.9	586.8	925.7	4,438.5	3,667.2	8,105.7	64.6	318.0	382.6

IND. - Indirect Industrial
DOM. - Domestic and Municipal Commercial
Units - thousands of pounds

C. Water

Total water requirements over time in each region in Scenario I are presented in Figure 105. Over the 7-year Scenario I time period, these water requirements average 31.1 acre-feet annually in Region I, 236.6 in Region II, and 12.1 acre-feet annually in Region III.

The last year period (10/82 to 10/83) water requirements, representing peak demand, are 76.9, 432.9, and 30.1 acre-feet for Regions I, II, and III, respectively. The mean and maximum monthly water requirements are for Regions I, II, and III, 2.6 and 6.7 acre-feet, 19.7 and 38.4 acre-feet, and 1.0 and 2.9 acre-feet, respectively.

These water requirements may be met in various ways by ground or surface water sources, either self-suppied (within regions) or imported from outside the region. In Region II, communities are being urged to increasingly draw from surface water sources in the greater Houston area. The Region I municipalities rely mostly on surface water sources.

The OCS Scenario I water requirements represent a small, almost negligible increase over current development levels. If all water requirements were exclusively met with groundwater, the maximum annual water demand in 1983 would be only .3, .1, and .13 percent of 1974 production in Regions I, II, and III (see Figure 88). The incremental increase would be much less if all requirements were met by water diverted from surface sources, either within the region impoundments or from the major river impoundments currently serving the regions.

Figure 106 presents the volume of return wastewater flows over time for each Scenario I region. These return flow rates were based on coefficients discussed in the chapter "Environmental Impact Assessment Procedure." The maximum average return flow, in cubic feet per second, is 0.06, 0.35, and 0.03 over all of Regions I, II, and III, respectively. In comparison to current regional return flow levels (see Figure 98), this postulated level of Scenario I wastewater return flow is a negligible incremental increase of less than .01 of one percent. These return flow levels are less than .1 of one percent of the return flow rates in most of the three regions' water quality segments (see Figure 89). As these return flows will not all be disposed of in one channel, but will be dispersed throughout each region, the proportionate impact must be considered as being even less.

Associated with the return flows are wastewater effluents. Wastewater effluents' coefficients for B.O.D. and T.S.S. are described in Part B. Figure 107 presents the total levels of waste water

Figure 105

Scenario I Water Requirements (Acre Feet)

Time Period	Region I	Region II	Region III
10/76-1/77	0	16.41	0
1/77-4/77	0	27.71	1.06
4/77-8/77	2.25	47.64	1.16
8/77-10/77	1.5	33.83	1.68
10/77-11/77	0.75	16.46	0.84
11/77-1/78	1.5	33.83	1.68
1/78-2/78	0.75	16.46	0.84
2/78-4/78	1.5	33.83	1.68
4/78-8/79	16.26	261.48	3.36
8/79-11/79	3.05	44.53	2.52
11/79-2/80	3.05	40.21	2.52
2/80-4/80	2.03	23.9	1.68
4/80-10/80	6.1	80.21	5.04
10/80-2/81	4.07	59.92	3.36
2/81-6/81	10.76	66.69	3.36
6/81-8/81	9.04	34.62	1.68
8/11-9/81	4.65	19.6	1.05
9/81-2/82	24.87	129.4	7.62
2/28-8/82	37.2	176.84	9.48
8/82-11/82	17.23	89.23	6.0
11/82-2/83	18.61	102.36	6.1
2/83-5/83	18.61	108.86	7.32
5/83-10/83	33.98	191.98	14.64
TOTAL	217.8	1,656.1	84.65

Figure 106

Total Wastewater Return Flow (includes indirect industrial and municipal)
(Acre-feet)

Time Period	Region I	Region II	Region III
10/76-1/77	0	7.9	0
1/77-4/77	0	12.8	0.6
4/77-8/77	1.3	21.2	0.7
8/77-10/77	0.9	15.3	1.0
10/77-11/77	0.4	7.7	0.5
11/77-1/78	0.9	15.3	1.0
1/78-2/78	0.4	7.7	0.5
2/78-4/78	0.9	15.3	1.0
4/78-8-79	7.0	117.5	7.8
8/79-11/79	1.3	21.1	1.5
11/79-2/80	1.3	20.1	1.5
2/80-4/80	0.9	12.8	1.0
4/80-10/80	2.9	43.4	2.9
10/80-2/81	1.9	30.6	2.0
2/81-6/81	4.6	34.9	2.0
6/81-8/81	4.3	18.0	1.0
8/81-9/81	2.2	9.8	0.6
9/81-2/82	12.1	65.6	4.4
2/82-8/82	18.8	94.0	5.5
8/82-11/82	9.5	47.2	3.5
11/82-2/83	9.5	54.7	3.5
2/83-5/83	9.5	54.4	4.3
5/83-10/83	17.1	104.4	8.5

Figure 107

Wastewater Effluent Loadings
(1000's of pounds)

Time Period	Region I B.O.D.	Region I T.S.S.	Region II B.O.D.	Region II T.S.S.	Region III B.O.D.	Region III T.S.S.
10/76-1/77	0	0	38.4	22.6	0	0
1/77-4/77	0	0	58.3	34.6	0.5	0.6
4/77-8/77	5.2	3.3	111.7	64.2	1.2	0.9
8/77-10/77	2.1	1.5	49.8	31.3	1.3	1.1
10/77-11/77	0.8	0.6	17.4	10.7	0.4	0.5
11/77-1/78	2.1	1.5	49.8	31.3	1.3	1.1
1/78-2/78	0.8	0.6	17.4	10.7	0.4	0.5
2/78-4/78	2.1	1.5	49.8	31.3	1.3	1.1
4/78-8/79	28.0	17.2	622.0	360.4	10.0	9.2
8/79-11/79	4.5	2.9	77.5	48.4	2.6	2.1
11/79-2/80	4.5	2.9	64.2	41.9	1.9	1.7
2/80-4/80	2.1	1.5	26.5	19.9	1.3	1.1
4/80-10/80	16.3	9.5	403.6	220.3	5.2	4.1
10/80-2/81	7.2	4.5	210.8	118.5	2.5	2.3
2/81-6/81	16.9	10.2	217.9	124.4	2.5	2.3
6/81-8/81	6.8	5.4	67.0	41.6	1.3	1.1
8/81-9/81	2.8	2.4	22.5	15.7	1.0	0.8
9/81-2/82	36.7	24.0	458.4	256.8	7.0	5.8
2/82-8/82	75.4	46.4	707.3	393.1	12.8	9.2
8/82-11/82	22.3	15.7	203.4	123.0	4.9	4.3
11/82-2/83	22.3	15.7	270.6	159.8	5.6	4.7
2/83-5/83	23.7	19.8	330.3	165.9	5.5	5.0
5/83-10/83	61.4	38.6	718.7	405.2	16.1	12.6

loadings over time as postulated in Scenario I. Only point source effluents are considered, as these are what may be ascribed to direct or indirect OCS activities.

The presence of oxygen demanding wastes in stream and bay waters results in a decrease of available dissolved oxygen for fish and aquatic invertebrates and plants. The effect of suspended solids (sediments) is to decrease biotic filter feeding efficiency and to decrease the amount of sunlight available to aquatic plants, decreasing plant respiration and oxygen production.

The maximum average daily production of B.O.D. effluent is 409, 4,791, and 107 pounds in Regions I, II, and III, respectively. The maximum average daily production of T.S.S. is 257, 2,701, and 84 pounds in Region I, II, and III. Fifty to eighty percent of effluent production is in the indirect industrial sector, as opposed to the municipal sector.

In Region I, the maximum B.O.D. production in the Scenario is .33 of one percent of current B.O.D. waste loadings, and T.S.S. is .09 of one percent of current T.S.S. waste loadings. In Region III, maximum B.O.D. loadings in Scenario I are .35 of one percent. In Region II, however, the proportionate increment of Scenario I waste loadings is larger: the maximum B.O.D. loading is 2.1 percent of current effluent loadings; the maximum T.S.S. loading is eight-tenths of one percent of current T.S.S. effluent levels.

While the magnitude of these increased effluents' loadings is small in some sections of Region II, the added B.O.D. increment may be of importance. It is not expected that this small increase in wastewater effluent loading will be passed on to Galveston Bay, as dilution of the OCS generated wastes will naturally occur by the large water inflow to the Galveston Bay System.

D. Air Quality

Air emissions over time in Scenario I as a result of indirect industrial, municipal-residential, and transportation activity are presented in Figure 108. Direct OCS-related air emissions are not included in Figure 109, but would include dockside support power equipment exhaust, helicopter and boat exhaust where these vehicles cross over the regions to offshore rigs and platforms, and minor emissions from the heating of operations and administrative bases and from other service and supply company offices.

In the last year of the Scenario I time span, the interval of maximum activity, in Regions I and III total particulate and gaseous emissions are seen to be each less than 0.08 of one percent of current

Figure 108

OCS Air Emissions/Scenario I
(indirect industrial, residential municipal, and transportation)
All values in thousands of pounds

Time Period	Particulates I	Particulates II	Particulates III	Gaseous I	Gaseous II	Gaseous III	NO_x I	NO_x II	NO_x III	SO_x I	SO_x II	SO_x III	H.C. I	H.C. II	H.C. III	CO I	CO II	CO III
10/76-1/77	0	8.1	0	0	376.2	0	0	60.8	0	0	47.1	0	0	73.9	0	0	194.2	0
1/77-4/77	0	12.3	0.1	0	580.4	16.8	0	92.9	1.3	0	71.3	0.1	0	113.4	2.4	0	202.9	13.1
4/77-8/77	1.1	23.5	0.2	59.5	1,029.5	23.6	8.3	174.5	2.7	6.0	140.2	1.4	11.0	207.0	3.9	33.6	507.8	15.6
8/77-10/77	0.5	10.6	0.3	31.7	574.1	29.2	3.8	82.5	2.7	2.1	56.1	0.8	5.4	106.5	4.5	20.5	327.8	21.4
10/77-11/77	0.2	3.2	0.1	14.5	230.2	13.3	1.6	27.0	1.0	0.7	14.4	0	2.4	39.0	1.9	9.9	149.6	10.3
11/77-1/78	0.5	10.6	0.3	31.7	574.1	29.2	3.8	82.5	2.7	2.1	57.3	0.8	5.4	106.5	4.5	20.5	327.8	21.4
1/78-2/78	0.2	3.2	0.1	14.5	230.2	13.3	1.6	27.0	1.0	0.7	14.4	0	2.4	39.0	1.9	9.9	149.6	10.3
2/78-4/78	0.5	10.6	0.3	31.7	574.1	29.2	3.8	82.5	2.7	2.1	57.3	0.8	5.4	106.5	4.5	20.5	327.8	21.4
4/78-8/79	1.5	32.6	0.6	79.3	1,464.9	58.5	46.1	244.2	5.3	31.9	193.8	1.5	61.1	292.1	9.0	68.7	734.8	42.6
8/79-11/79	0.9	16.4	0.6	55.5	876.9	47.8	7.7	127.7	5.0	5.1	89.9	2.1	10.1	163.6	7.7	32.7	495.6	33.0
11/79-2/80	0.9	13.7	0.5	55.5	801.7	43.9	7.7	108.9	4.0	5.1	72.3	1.1	10.1	144.8	6.7	32.7	476.8	32.0
2/80-4/80	0.5	5.8	0.3	31.7	442.1	29.2	3.8	49.5	2.7	2.1	24.3	0.8	5.4	73.5	4.5	20.5	294.8	21.4
4/80-10/80	3.4	84.1	1.1	159.0	3,236.0	95.6	25.8	610.5	10.0	20.1	528.6	4.3	31.3	688.5	15.5	81.8	1,408.3	66.0
10/80-2/81	1.6	44.1	0.6	84.9	1,838.0	58.5	12.0	324.9	5.3	8.2	269.3	1.5	15.7	377.8	9.0	49.3	866.1	42.6
2/81-6/81	3.6	45.7	0.6	179.2	1,976.0	58.5	27.4	338.9	5.3	20.2	274.9	1.5	34.2	399.8	9.0	97.5	962.1	42.6
6/81-8/81	1.5	14.1	0.3	123.7	750.4	29.2	13.3	110.1	2.7	5.7	78.1	0.8	20.5	140.6	4.5	87.4	421.7	21.4
8/81-9/81	0.6	4.8	0.2	60.0	324.7	19.2	5.4	39.9	2.0	1.5	22.9	0.8	9.2	56.1	2.6	43.8	205.7	13.6
9/81-2/82	7.9	95.8	1.5	458.3	3.950.3	140.6	62.2	704.8	14.1	40.6	588.1	5.4	82.8	815.9	22.4	272.6	1,841.6	98.9
2/82-8/82	16.0	147.7	1.7	824.9	5,967.2	197.7	123.1	1,082.1	23.2	88.7	912.9	12.4	155.7	1,243.0	33.5	457.3	2,729.1	128.6
8/82-11/82	4.8	42.8	1.1	325.3	2,132.2	106.9	39.8	328.2	10.2	22.6	243.6	3.3	56.1	408.6	16.7	206.9	1,151.7	76.8
11/82-2/83	4.8	56.9	1.3	325.3	2,676.0	102.4	39.8	430.0	11.3	22.6	331.4	4.3	56.1	5,239.9	17.9	206.9	1,390.6	79.1
2/83-5/83	5.1	59.0	1.2	333.2	2,787.9	127.9	39.8	446.1	11.8	24.6	342.5	3.4	58.1	544.6	19.7	298.9	1,454.6	93.1
5/83-10/83	13.0	150.3	3.5	704.8	6,304.0	284.7	102.0	1,109.3	30.7	70.8	916.7	14.0	130.9	1,292.6	46.6	401.5	2.985.2	193.2

emissions loadings to the atmosphere (see Figure 99). Carbon monoxide is the single largest source of air pollution attributable to Scenario I activity, with a 0.1 percent increase over current emissions levels in Regions I and III. Most of this CO is produced from low-level mobile sources (autos) and may not be a major addition to the chemical production of photochemical oxidants.

In Region II during this time period, gaseous emissions represent 0.45 percent increase over current levels (compare Figures 108 and 99). This includes a 0.6% NO_x increase, 0.6% CO increase, and a 0.4 percent SO_x increase. Most of the NO_x and SO_x emissions are from indirect industry sources. Most of the carbon monoxide emissions are from mobile sources. There is a 0.2 percent increase of particulates emissions postulated in Scenario I, with the major source being indirect industrial activity.

Although all of the proportionate increases in air emissions are small (less than one percent), they represent a further incremental deterioration of air quality in all three regions, and especially in Region II (see Figure 101). Therefore, air quality impacts are designated as important issues to be further discussed.

Special Environmental Issue Analysis

Secondary environmental effects may occur depending upon the manner and extent that the OCS land requirements are met. As described in the "General Environmental Impact Evaluation," OCS land requirements may be met either entirely within already developed areas by intensification of activity, or in part by land use conversion and original development. The former option may be assumed to involve far fewer secondary effects than would the latter. The two categories of OCS-related land requirements which might involve major development are residential uses and direct and indirect industrial uses. These groups have similar development features which may possibly produce secondary impact. These features are alteration of ground cover, excavation, surface paving, and landscaping. These construction processes may result in altered drainage patterns and flooding, depending upon the physical characteristics of the development sites, the magnitude and distribution of development, and upon the physical design of the new construction.

There are four principal physiographic areas which are suitable for such developments in the affected study sites of Scenario I: river and stream valley slopes, low-lying coastal land, upland coastal plain, and wooded upland areas. In Region II, streams notoriously flood at peak discharge in the spring and early summer, which is a continual hazard for

development. All three regions are subject to extensive surface flooding following hurricane surge-tides and post-storm rainfall. Residential or industrial construction along stream banks could increase local erosion. Efforts at erosion control could result in additional peak discharge and greater flooding. The effect of surface paving in low-lying areas may result in sheet water flooding of wide areal extent, as the stream gradients in the lower coastal area are insufficient to handle storm rainwater runoff if much of the water cannot percolate into the ground. Much of the upland coastal plain is underlain by impermeable mud and silt. During land development, rainwater runoff would easily erode large volumes of unstabilized or unprotected soil. Substrates in wooded areas are fragile products of long-term vegetative accumulation. Constructive development in wooded areas could result in major erosive gullies, extensive ground slumping on moderate slopes, and may add a significant landing of toxic metals derived from vegetative decay into the fluvial system.

It is not possible to quantify the magnitude of such secondary effects without assuming an arbitrary distribution of the OCS land requirements to the different physiographic areas. It may be sufficient to point out these possible problems for further study should such construction permits be sought by developers. Finally, it may be recalled that total land development as a result of Scenario I requirements is probably less than a 4 percent increase in development over the seven years of the scenario time span, which is well within current rates of land development. It should also be noted that, typically, once such development occurs, the affected area seldom is returned to its original, undeveloped condition. Fixation of development may limit the direction of future development planning.

Secondary environmental effects resulting from OCS water requirements depend upon the source of water used to meet the demands. Immediate impacts on water supply and water quality have already been described. The use of surface water may result in a decrease in freshwater inflows to the bay-estuarine systems. However, this proportionate decrease related to OCS requirements must be considered as negligible. Possible effects of reduced freshwater inflows are mentioned later in this section. Secondary effects related to the use of ground water to satisfy Scenario I requirements might be an incremental increase of land surface subsidence, saltwater intrusion, and surface faulting. However again, the OCS water requirement is so small, relative to current withdrawal rates (0.3, 01., and 0.13 percent in Regions I, II, and III, respectively) that no such secondary impacts may reasonably be attributed to the scenario's activities.

The major areas of environmental concern in the affected Scenario I study regions are air and water quality, land surface subsidence, and the preservation of unique or vulnerable biologic habitats and the biota dependent upon those habitats. Land surface subsidence has already been discussed. Possible impacts on the biologic system will be considered

later in this section.

Wastewater loadings of biological oxygen demanding wastes in Region II was described in the "General Environmental Impact Evaluation" as a potentially significant impact (a two percent increase over current loadings). There are more than seven major stream segments in Region II which have been designated as "water quality segments" because of current pollution levels. The violation of standards results from direct domestic and industrial treatment plant wastewater discharge into streams characterized by sluggish and seasonally low flow rates. All of the water quality segments (W.Q.S.) in Region II have violated dissolved oxygen standards, in most of the W.Q.S.'s fecal coliform count standards are exceeded, and in some of the W.Q.S.'s the levels of chloride, sulfate, and dissolved solids are excessively high while pH is too low. Five of the W.Q.S.'s are among the top 25 polluted streams in Texas.

It will be seen in Chapter 18 that sewage treatment is not a significant issue in Region II, as plant capacity is not exceeded by plant operation levels. However, the problem of pollution in this region is related to the extent of treatment or to success in discharge, and the density of dischargers along this region's stream segments. Restrictions in discharge rate and increased standards of effluent quality are and may be further imposed on the industries and municipalities in the region. Therefore, although the B.O.D. loadings increase attributable to OCS is small, it is identified as an important impact should the activities postulated in Scenario I come to fruition.

The designation of importance to possible air quality impacts in Region II, given Scenario I activities, may be tenuous. The magnitude of the increase of air emissions in Region II is small (0.2 to 0.6 percent increase), yet is an order of magnitude greater than the level of emissions increases in either Region I or Region III. However, this 0.2 to 0.6 percent increment represents a maximum increase of 280,000 to more than 12 million pounds of air emissions per year. That this absolute amount of air emissions is a small proportion of current levels indicates the magnitude of the current air quality problems which exists in Region II.

The abatement of an air quality impact is itself a difficult problem involving costly equipment, technical conversions and changes in way of life. A significant portion of air emissions in both the Scenario I postulation and in the current environment is from non-point source auto and truck transportation. An effective decrease in air pollution requires added anti-pollution devices in vehicles, acceptance of mass transit alternatives to reduce the number of vehicle miles driven, and more refined fuels. Also required are efficient and implementable transportation plans to reduce traffic conjestion in thoroughfares and around large parking lots' exits, as more carbon monoxide per gallon of fuel is emitted at low idle speeds endemic to stalled traffic flow.

Both the Houston and Galveston S.M.S.A.'s have been designated as Air Quality Maintenance Areas (A.Q.M.A.) signifying a high priority requirement in these areas for the reduction of photochemical oxidants and particulate matter to meet ambient air quality standards. Ultimately, the stringent regulations of air emissions within these A.Q.M.A.'s will have a direct effect on the rate and form of urban and industrial growth (Texas Gulf Coast Program Research Report 1, Rice Center, 1976.).

Figure 109 presents a grouping of the natural areas occurring in the three regions effected in Scenario I and the bases for concern about them, as described in Part B. Three groups of natural areas may be distinguished: (1) coastal marshes and estuaries, (2) river bottom hardwood assemblages, and (3) major areas used for sport fishing and oystering. The first group is important because of its nursery grounds for fish, shrimp, and blue crab; for the waterfowl and pelt-animals it supports; and as a habitat of endangered species, principally the alligator and Red Wolf.

The "Environmental Impact Matrix" (Figure 14) shows an array of possible sources of impact upon these natural areas. The activities related to OCS development which may influence the environmental quality of marshes and estuaries are shore area residential development; pier, dock, or bulkheading activity; general increased exposure to human usage by hunting, trapping, ranching, and nature observation; and alteration of chemical conditions. The productivity of the marsh-estuarine system is dependent upon a sensitive salinity balance regulated by fresh water inflow and Gulf saltwater exchange. Pollution of bay and estuarine waters decreases productivity, quality of harvest, and quality of human usage.

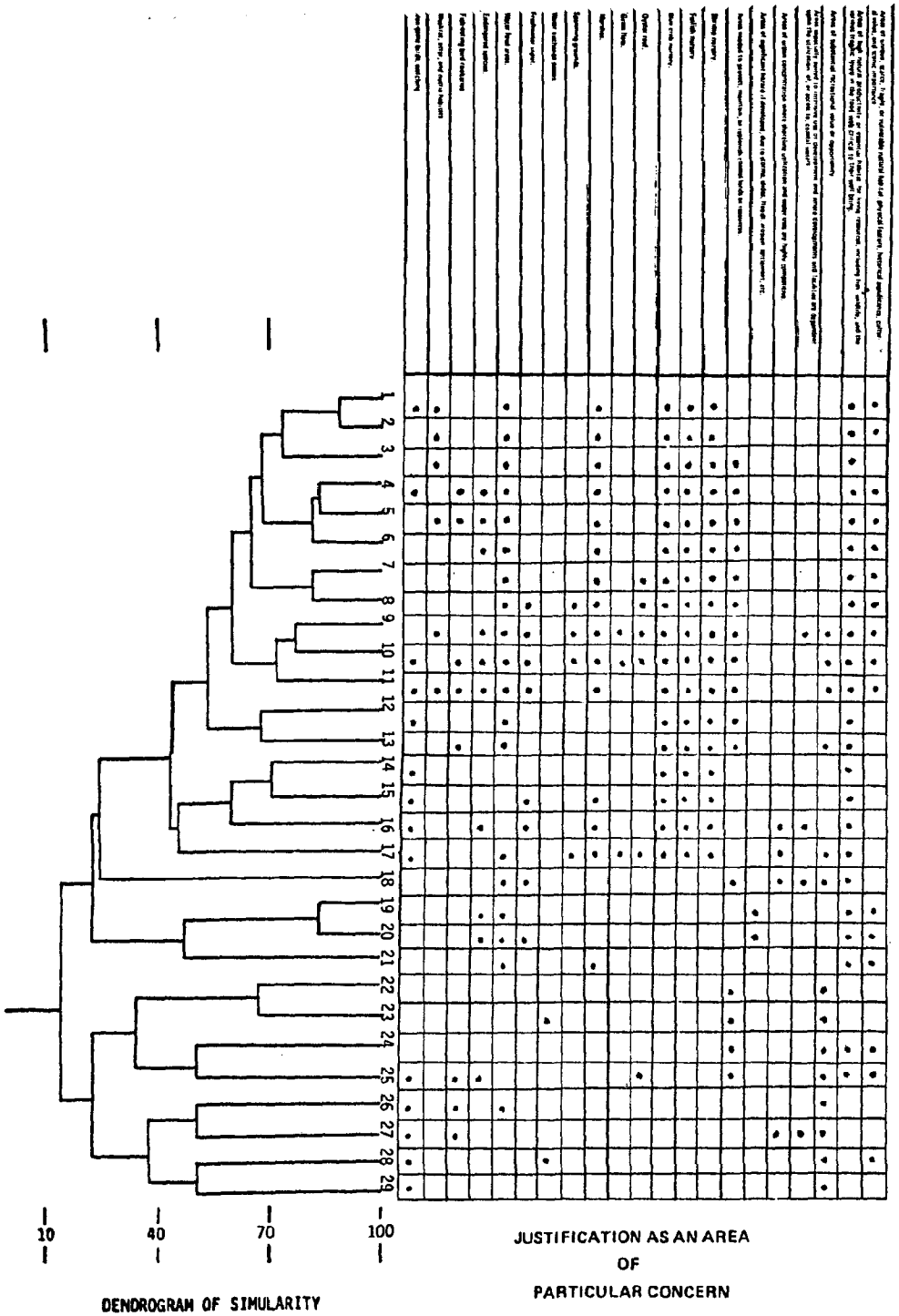
Effects on river bottom wooded areas have been previously described as possible due to the development of residential subdivisions. Such areas are attractive for home buyers because of their scenic or aesthetic appeal. Yet there are natural hazards, such as flooding and the instability of slopes, which affect the long-term desirability of such development. These streambottom woodlands are important habitats for deer, quail, alligator, and waterfowl. Eagles may also find suitable nesting sites in older trees in such areas, but no such occurences have been reported in recent years.

The last group includes major bay-Gulf interchange passes, oyster reefs in Galveston Bay, and jetties, dikes, and subaqueous flats attractive to sport fishing. The areas included in this group can be affected by water pollution and by increased waterway transport which may decrease the ability of people to utilize the open water areas. Fishing, hunting, and trapping are favored recreational practices in all three regions, offsetting impacts of a deficit in formal park areas. An incremental increase in recreational use of all areas described here by persons associated with Scenario I activities could involve competition for use of the resources.

Figure 109

ANALYSIS OF CRITICAL HABITATS

(nominated by Texas Parks and Wildlife Department)



Environmental Impact Assessment Summary

In the final analysis, the principal categories of environmental effect for the total affected area in Scenario I include:

- the intensification of land development within current development rates,
- further degradation of environmental quality with increasing discharge of air and water pollutants, and
- the likely increase of recreation usage of coastal wetlands.

Figure 110 presents the OCS Environmental Impact Matrix with environmental effects indicated as were found to be important in Scenario I. That other "effect boxes" in the matrix are not checked does not mean that there is no impact, but rather that the effects of the postulated levels of activity in Scenario I cannot be reasonably considered to be of such magnitude as to be important at this level and orientation of analysis.

Figure 110

ENVIRONMENTAL IMPACT

SCENARIO I

AXIS I: CHARACTERISTICS AND CONDITIONS OF THE ENVIRONMENT			AXIS II. OCS-RELATED ACTIONS WHICH MAY CAUSE ENVIRONMENTAL IMPACT																												
			A. STAGING AREA		B. OFFSHORE OPERATIONS				C. TRANSPORT							D. PROCESSING & STORAGE							E. INDUCED ACTIVITIES					F. OTHER OR COMMON				
			a. Industrial Sites & Buildings, Yards	b. Piers, Seawalls, Bulkheads, & Marinas	a. Platform Siting	b. Subsea Completions	c. Formation Water Discharge	d. Drill Cutting Disposal	a. Pipeline Installation	b. Channel & Harbor Dredging	c. Spoil Emplacement	d. Trucking	e. Shipping	f. Aircraft	g. River & Canal Traffic	a. Petrochemical Industry	b. Oil Refining	c. Petroleum and Product Storage	d. Energy Generation	e. Stabilization & Oxidation Ponds	f. Stack Exhaust Emissions	g. Industrial Water Discharge	a. Urbanization	b. Auto Traffic	c. Solid Waste Disposal	d. Residential-Municipal Wastewater Treatment	e. Subdivision Development	a. Oil Spills	b. Surface Water Diversion	c. Ground Water Withdrawal	d. Surface Paving	e. Highways & Bridges
A. PHYSICAL & CHEMICAL CHARACTERISTICS	1. Water Quality	a. Surface								/	/				/				/			■				■		/				
		b. Ground																		/					/	/				/		
		c. Ocean or Bay		/			/	/	/	/			/		/							/				/		/			/	
	2. Air	a. Air Quality										/		/		/	/		/		■			■	/			/				
	3. Processes	a. Flooding		/						/	/												/				/				/	/
		b. Erosion, Deposition		/						/	/																/				/	/
		c. Subsidence																												/		
		d. Surface Faulting																												/		
		e. Freshwater Inflows to Bays								/												/							/			
		f. Bay - Gulf Water exchange & Circulation		/					/	/	/																					
B. BIOLOGICAL CONDITIONS	1. Habitat	a. Woodlands																	/								/					/
		b. Savannah-Prairie	/											/									/				/				/	/
		c. Grassflats	/	/					/		/				/			/					/					/			/	/
		d. Marsh	/	/					/		/				/			/					/						/			/
		e. Benthic (Ocean, Bay) Substrate				/		/	/	/	/																	/				
	2. Unique or Sensitive	a. Marine Food Web			/		/	/	/	/	/																	/				
		b. Fishing Bank			/	/	/	/	/	/																		/				
		c. Coral Bank			/	/	/	/	/																			/				
		d. Oyster Reef							/	/	/															/		/				
		e. Spawning and Nursery Grounds		/					/	/	/											/				/		/				
		f. Bird Rookeries		/					/		/				/								/	/			/	/			/	/
		g. Waterfowl Areas		/					/		/												/					/			/	
		h. Endangered Species							/		/	/		/							/	/	/					/				/
		i. Barrier Islands							/		/													/	/	/					/	/
C. CULTURAL FACTORS	1. Human Utilization	a. Industrial	/																				/									/
		b. Residential	/																				/	/	/	/	/				/	/
		c. Cropland	/													/	/	/	/	/			/		/	/	/				/	/
		d. Rangeland-Pasture	/													/	/	/	/	/			/		/	/	/				/	/
		e. Wilderness or Open Area	/	/																			/				/	/				/
		f. Soil Quality Contamination									/									/		/				/	/	/				
		g. Commercial Fishing		/	/	/			/				/															/				
	2. Human Interest	a. Game Areas										/		/									/	/				/				/
		b. Sport Fishing		●	/	/		/	/		/		/									■				■		/				
		c. Gulf Beaches		/					/															/				/				
		d. Formal Parks	/																		/		/	/								/
		e. Urban or Rural Natural Areas	/	/																			/	/	/	/	/				/	/
		f. Wildlife Refuge							/		/		/	/							/		/	/				/				
		g. Historical and Archeological	/	/	/	/		/			/												/								/	/

■ Identified Negative Impact

● Identified Positive Impact

16. SOCIAL IMPACT ANALYSIS

General Social Impact Evaluation

The Study Methodology (Appendix A) requires an analysis of the general social effects likely to result from OCS activities in each affected study site of each scenario. Accordingly, such an analysis was completed for Regions I, II, and III, the affected study sites of Scenario I. Those analyses have been done in the manner outlined in Part B in the chapter entitled "Methodology G: Social Impact Assessment." (The reader is encouraged to review that chapter before reading further.)

Three general social impact assessments follow: one each for Regions I, II, and III.

I. Region I: Orange and Jefferson Counties

A. Existing Social Characteristics

Region I, composed of Orange and Jefferson Counties, is primarily an urban, industrial, manufacturing center. Its population increased by 29% between 1950 and 1960 but by only 3.2% between 1960 and 1970. The percentage of Black residents (21.4%) is the largest of all Scenario I regions. Net migration between 1960 and 1970 was-9.9%.

Over 43% of this region's wage earners earn between $3,000 and $10,000 annually, while 11.6% earn below the poverty level. Further, over 28% of persons 25 years of age or older have no more than 9 years of education. The median number of school years completed in Jefferson County is 11.6; in Orange County it is 11.3. The rate of unemployment as of July, 1975, was 9.3% in Jefferson County and 10.3% in Orange County.

Thirty percent of Region I's labor force is employed in manufacturing, from which production value exceeds the region's retail sales, fishing production, agricultural production, and mineral production combined. Oil refining capacity in this region comprises 8.6% of the nation's total capacity; 32.6% of the state's. While, in general, Region I is not noted as a significant agricultural area, 13.6% of the State's total rice acreage is found here.

B. Impact on Demographic Factors

This region's projected 1980 population will be increased by only .13% as a result of new population associated with Scenario I, and population density by .15% (see Figure 111).

The impacts of Scenario I activities on the composition of Region I's population, as well as impacts on such groups as families, church groups, school groups, ethnic groups, and formal associations, is virtually impossible to predict with precision for several reasons. First, the state-of-the-art of social impact assessment is nearly devoid of highly developed and verified approaches to assessment of impacts on groups. Secondly, to the extent which such approaches do exist, their attempts to quantify such qualitative effects make them suspect. Finally, if an approach did exist and was verified, the relatively insignificant increases in Region I's population and population density due to Scenario I activities (see Figure 111) would undoubtedly yield indefensible results.

C. Impact on Services to People

Recreational facilities in Beaumont and sewage collection in Port Arthur could become significant infrastructural issues as a result of the increased population associated with Scenario I (see Chapter 17).

The severity of the social impacts of potential shortages of such government services depends, to a great extent, on the degree to which crowding of such facilities as recreation sites and the overflowing of sewage facilities becomes noticeable. When shortages of services result in noticeable effects, the impact is a change in the residents' perception of quality of life in their community and the predictable response of residents is to demand an expansion of services.

More importantly, this study's analysis of tax revenues and local government expenditures associated with Scenario I in Region I reveals that significant differences between government cost and tax revenues could result. To the extent that local financial deficits brought about by Scenario I result in higher ratios of assessment or tax rates, the impact, again, can be a dissatisfaction on the part of existing residents of Region I with the OCS development.

The amount of activity associated with Scenario I will be slight as compared to existing activities in Region I. Therefore, any resultant social impacts will undoubtedly be so minor that they probably will not cause significant adverse effects on an individual

Figure 111

Selected Impact Statistics/Region I/Scenario I

Population/1980 Projection	353,174
Maximum OCS-Related Population	489
% Change; OCS-Related	.13%
Total Population: 1980 Projection + Maximum OCS-Related Population	353,663
Density of Population: 1980, Projected	269.6
Density of Population: 1980, Projected + OCS-Related	270.0
% Increase: OCS-Related	.15%
Maximum OCS-Related Resident Employment	149
Current Unemployment (Sept. 75)	12,384
% of Currently Unemployed to be Hired	1.2%
Total, Projected, OCS-Related Personal Income	$ 6,998,904
Current, Total, Annual Personal Income (1973) x 7 years (Life of Scenario I)	$10,290,000,000
% Increase: OCS-Related	.07%
Total, Projected, OCS-Related Expenditures	$ 20,385,000
Current, Total, Annual Expenditures (1973) x 7 years (Life of Scenario I)	$41,786,437,000
% Increase: OCS-Related	.05%

level.

D. Impact of Land Use and Environmental Factors

This study's "Environmental Impact Assessment" contains a thorough analysis of land use associated with Scenario I. According to this analysis, Region I has the required acreage for Scenario I activities, and no further environmental degradation will likely result. Thus, no significant social impacts are expected in this regard.

E. Impact of Housing Factors

The availability of housing units in sufficient number to accommodate the projected new population associated with Scenario I in Region I was not isolated in this study as a potentially significant infrastructural issue (see Chapter 17). It was not regarded, therefore, as a source of social impact in Region I. Further, it is assumed that the demand for land and housing units generated by Scenario I in Region I, in comparison with such current demand, is not great enough to significantly affect land or housing prices. Thus, no significant social impact is expected. Finally, no significant impacts in regards to the number or quality of mobile home sites or the density of housing units in general is anticipated.

F. Impact of Employment Factors

Maximum resident employment - that is, the maximum number of existing residents who will be employed - in Region I as a result of Scenario I activities is projected to be 149 (see Figure 111). If it is assumed that all of those resident employees will be drawn from the existing unemployment pool and that none will be currently employed persons who change jobs, the percentage of currently unemployed to be hired during Scenario I in Region I is still only 1.2% (see Figure 111), a relatively minor decline in unemployed residents.

The calculation of social effects of personal income generated by Scenario I in Region I presents a similar picture. Total personal income in Region I over the seven years of Scenario I activities is projected to be $6,998,904 (see Figure 111). The total personal income in Region I over the seven year life of Scenario I, based on

II. Region II: Harris, Galveston, and Chambers Counties

A. Existing Social Characteristics

Region II, the Harris/Galveston/Chambers Counties area, is largely a heavily populated, highly urban, industrialized area. Its population increased by 50.3% between 1950 and 1960, and by 38% between 1960 and 1970; a 53% increase is expected between 1970 and 1990. Its population is 94.4% urban and made up of a relatively high percentage (21%) of Black residents. Net migration between 1960 and 1970 was 20.1%.

It can properly be seen as a relatively affluent area, with 42.1% of wage earners earning over $10,000 annually and only 9.5% of the families below the poverty level. Similarly, educational levels are comparatively high. Only 12.7% of persons 25 years of age or older have less than nine years of education. Median school years completed is 12.1, 11.5, and 10.5 in Harris, Galveston, and Chambers Counties, respectively. Unemployment has consistently been relatively low: in the 3.7% to 5.6% range as recently as July, 1975.

Manufacturing, in which 17% of the region's total labor force was employed in 1970, accounts for an annual production value which is more than 8 times the value of the region's fishing, agriculture, and mineral production combined. The area is a leader in refining. The nine refineries located in Region II comprise 38.5% of the State's refining capacity and 10.2% of the nation's.

While the fishing industry is dwarfed by manufacturing, it nonetheless accounts for approximately 34% of the State's catch, excluding catches brought in from the Gulf of Mexico.

B. Impact on Demographic Factors

The region's population trends are such that the additional residents associated with Scenario I will have negligible demographic impact. Figure 112 reveals that the OCS-related population of Scenario I will increase the region's projected 1980 population by a maximum of .12% and the region's projected 1980 population density by a maximum of .11%.

As seen in the Social Impact Assessment of Region I, the impacts of Scenario I activities on the composition of the region's population, as well as impacts on families, church groups, ethnic groups and

Figure 112

Selected Impact Statistics/Region II/Scenario I

Population/1980 Projection	2,450,479
Maximum OCS-Related Population	3,056
% Change; OCS-Related	.12%
Total Population: 1980 Projection + Maximum OCS-Related Population	2,453,535
Density of Population: 1980, Projected	894.98 (895)
Density of Population: 1980, Projected + OCS-Related	896.
% Increase: OCS-Related	.11%
Maximum OCS-Related Resident Employment	1,023
Current Unemployment (Sept. 75)	54,677
% of Currently Unemployed to be Hired	1.9%
Total, Projected, OCS-Related Personal Income	89,997,826
Current, Total, Annual Personal Income (1973) x 7 years (Life of Scenario I)	75,936,000,000
% Increase: OCS-Related	.12%
Total, Projected, OCS-Related Expenditures	163,878,000
Current, Total, Annual Expenditures (1973) x 7 years (Life of Scenario I)	176,243,424,000
% Increase: OCS-Related	.09%

formal associations are virtually impossible to predict. And if they were predictable, the increase in OCS-related population projected in this region would not be substantial enough to produce social impacts.

C. Impact on Services to People

In the City of Houston, recreational facilities and educational services have been isolated as potentially significant infrastructural issues, given the new population associated with Scenario I (see Chapter 18). In Galveston, sewage collection was isolated as such an issue. As we have seen in the social impact assessment of Region I, however, the social impact of shortfalls in government services are largely dependent on the degree to which the overuse of these facilities becomes noticeable.

It is reasonable to assume, however, that because the population centers of Region II (Houston and its suburbs, Galveston, Texas City, and others) are so populous, any social effects engendered by Scenario I activities on "Services to People" will be spread over such a large population that individual effects will be practically negligible and, thus, social impacts slight.

D. Impact of Land Use and Environmental Factors

The Environmental Impact Assessment of this study concludes that in Region II, air and water quality could potentially worsen to significant levels as a result of Scenario I activities. The social impacts of such environmental issues, however, is much less obvious and more difficult to assess. In fact, it can reasonably be concluded that the residents of Region II have, for an extended period of time, lived in an areas in which air and water quality is from time to time in some specific sites below the standards of relevant state and federal agencies. It can also be concluded, therefore, that the social impacts of environmental degradation directly attributable to Scenario I activities will not be significant.

E. Impact of Housing Factors

Since the availability of housing units in Region II was not considered a potentially significant infrastructural issue as a result of Scenario I activities (see Chapter 18), it is reasonable to assume that there will be no related social impacts. Much like Region

I, no significant social impacts are anticipated in terms of land prices, the number and quality of mobile homes, and the density of housing units.

F. Impact of Employment Factors

Scenario I activities in Region II are projected to employ a maximum of 1,023 existing residents: only 1.9% of those currently unemployed (see Figure 112). This small percentage will probably have almost no effect on the current unemployment level. When this region's total personal income over the seven-year period of Scenario I activities ($89,997,826) is compared to its total personal income over the seven-year life of Scenario I, based on the 1973 total personal income ($75,936,000,000), only a .12% increase is seen as a result of Scenario I activities (see Figure 112).

Total projected expenditures of OCS related businesses in Region II over the seven-year period are $163,878,000, while the seven-year total expenditures, based on the 1973 level, are $76,243,424,000. This represents only .09% increase. In reality, these percentages will likely be even less, because the annual regional totals will probably be higher than the 1973 level.

Since Region II has been involved in the oil industry for a long period of time, there will be no new industrial sectors or job categories instituted as a result of Scenario I. In addition, since the unemployment level will probably not be greatly affected by Scenario I activities, there will probably be no significant impacts, directly attributable to Scenario I, on women and minority employment.

G. Impact on Traditional Values

The individuals' perception of quality of life, of the community, and of traditional values will probably not be significantly impacted by Scenario I in Region II. The impacts in this region on income, employment levels, expenditures, and other factors have been seen to be so slight and dispersed over such a large population, that any prediction of significant social impacts would be highly questionable. A similar conclusion, it will be recalled, was reached in the social impact assessment of Region I.

III. Region III: Brazoria County

A. Existing Characteristics

Region III, which is comprised of Brazoria County, is unique in that it has employment patterns, income levels, education levels, and commercial characteristics similar to those in the Region II area and at the same time a rural/urban mix and agricultural production similar to a typical, rural, agricultural-based county. Brazoria County's population increased by 42.1% between 1960 and 1970 and is expected to increase by 56.8% between 1970 and 1990; 38.7% of the county's population is rural. Net migration between 1960 and 1970 was 25.1%. Nearly 48% of its wage earners earned over $10,000 annually, making this region a relatively affluent area. Only 8.4% of the county's families are below poverty level.

Almost one-fourth of the population over 25 years of age have less than nine years of education, while the median number of school years completed is 12.1. The unemployment rate was 4.4% as of July, 1975.

Production from manufacturing, which employs 20.8% of this region's labor force, is valued at more than the value of agriculture production and mineral production combined. Gas and oil production account for 3.3% of the State's total. Brazoria County's 6 gas plants combined comprise 8.3% of the State's total gas plant capacity, a relatively significant one-county total.

B. Impact on Demographic Factors

The projected population growth related to Scenario I activities are minimal in comparison to this region's normal growth patterns. Scenario I activities are projected to increase Region III's 1980 projected population by only .18%, and population density by .40%. Since much of this county is rural and the existing population is much less than that of Regions I or II, any increase in population will create slightly greater effects than in the other two regions. Although the percentage increases in population and population density due to Scenario I activities are greater in Region III than in Regions I and II, they are nonetheless not great enough to create significant social impacts. As with the other regions in Scenario I, it is practically impossible to predict social impacts on groups, such as family, church groups, school groups, ethnic groups and formal associations.

C. Impacts on Services to People

No public services have been flagged as potentially significant issues in the city of Freeport as a result of Scenario I activities (see Chapter 19). Thus, it is reasonable to conclude, that significant, long-term social impacts due to public service shortages in Region III are unlikely.

D. Impact of Land Use and Environment Factors

This study's "Environmental Impact Assessment" concludes that the land use associated with Scenario I activities in Region III is not likely to be a cause of social impact. Moreover, significant social impacts as a result of environmental degradation due to Scenario I are not foreseen.

E. Impact of Housing Factors

The availability of housing units is not expected to be a source of social impact in Region III since there appears to be a sufficient number to accommodate existing needs plus the projected new population due to Scenario I activities (see Chapter 29). Because of this availability, neither land nor housing prices are expected to rise significantly as a direct result of Scenario I activities. Finally, the number and quality of mobile homes are not anticipated to engender significant social impacts.

F. Impact of Employment Factors

The maximum resident employment in Region III associated with Scenario I activities is projected to 32 employees. If it is assumed that all of these employees will be drawn from a pool of currently unemployed, the current unemployment level will be reduced by only 1.3% (see Figure 113). In addition, Scenario I activities over the seven-year period are projected to generate a total personal income of $2,415,000 in Region III. That figure represents only a .07% increase in total personal income in Region III over the seven-year life of Scenario I, based on the 1973 personal income level (see Figure 113). Likewise, the total projected OCS-related expenditures of Scenario I in Region III are $12,483,000. Total expenditures in Region III over the seven years, based on the 1973 level, will be $13,742,659,000.

Figure 113

Selected Impact Statistics/Region III/Scenario I

Population/1980 Projection	140,403
Maximum OCS-Related Population	265
% Change; OCS-Related	.18%
Total Population: 1980 Projection + Maximum OCS-Related Population	140,668
Density of Population: 1980, Projected	98.6
Density of Population: 1980, Projected + OCS-Related	99
% Increase: OCS-Related	40%
Maximum OCS-Related Resident Employment	32
Current Unemployment (Sept. 75)	2,350
% of Currently Unemployed to be Hired	1.36%
Total, Projected, OCS-Related Personal Income	2,416,311
Current, Total, Annual Personal Income (1973) x 7 years (Life of Scenario I)	3,633,000,000
% Increase: OCS-Related	.07%
Total, Projected, OCS-Related Expenditures	12,483,000
Current, Total, Annual Expenditures (1973) x 7 years (Life of Scenario I)	13,742,659,000
% Increase: OCS-Related	.09%

Thus, Scenario I activities can be expected to increase expenditures by a maximum of .09% (see Figure 113). Since increases in both personal income and expenditures are based on the 1973 levels, it is expected that, in reality, they will be even less than described above.

Although Region III has not historically been a center of oil and gas activities, as Region I and Region II have been, no new industrial sectors or job categories will be introduced as a result of Scenario I; thus, no resultant social impact is expected.

Finally, given that relatively few people are expected to be employed in Scenario I activities in Region III, it is not anticipated that there will be a related impact on women and minority employment.

G. Impact on Traditional Values

It has just been shown that in Region III income, employment levels, expenditures and other elements have engendered such minimal impact that the individuals' perception of quality of life, of the community, and of traditional values also will probably not be significantly impacted.

Special Social Issue Analysis

The Study Methodology (Appendix A) requires a description of special social impacts related to OCS activities for each affected study site. These impacts, according to the methodology, are to be isolated in the "General Social Impact Evaluation." The reader is urged to review in the "Analysis of Scenarios," the chapter entitled "Methodology G: Social Impact Assessment" in order to become familiar with the procedure in which these analyses were done.

In accordance with the methodology, then, the General Social Impact Evaluation was completed for each region of Scenario I. That analysis isolated no potentially significant social issues arising from Scenario I activities. It was seen in the analysis of each of these regions, that due to their substantial population and extensive previous experience with OCS-related activities, any social effects engendered by Scenario I activities would be spread over such a large population and diverse industrial milieu that individual effects would be practically negligible; thus, social impacts slight.

Social Impact Assessment Summary

As we have seen, the "General Social Impact Evaluation" analyzed the general social effects likely to result from OCS activities in each affected study site in Scenario I. These isolated potential social effects were analyzed further in the "Special Social Issue Analysis," as was the magnitude of these potential impacts and the possible induced social impacts.

In sum, the "General Social Impact Evaluation" and the "Special Social Issue Analysis" indicated that not one of the three affected study sites of Scenario I were likely to experience any potentially significant social impacts as a result of Scenario I activities. That is not meant to imply, however, that absolutely no social impacts are likely to occur due to Scenario I activities. It simply means that based on the postulations of Scenario I, there is no compelling reason to expect significant social impacts directly attributable to the Scenario's activities. A possible result of ruling out the possibility of any social effects is that policy makers may tend to conclude that social impacts are not a major concern, when in fact, social impacts could be exacerabeted by OCS development activities not specifically postulated in Scenario I. Thus, social impacts could occur and should gain the attention of policy makers.

Each region in Scenario I not only has a population sufficiently large to absorb with relative ease any possible social effects due to Scenario I activities, but each region also has had experience with oil related industrial sectors for many years. But this does not mean that any one of the affected study sites could never experience a much greater population growth than has been postulated for Scenario I activities and thus experience social impacts. Freeport, for example, is a mid-sized city situated in a county which, to a large extent, is more rural than the other regions of Scenario I. It is expected that Freeport will be able to absorb the population growth postulated for Scenario I activities, but if urban growth were to proceed at a considerably faster rate than expected, such social impacts as crowding, inadequate housing, and dissatisfaction on the part of existing residents, would likely occur. There is also the possibility of further degradation of the environment in the greater Houston area. This could result in dissatisfaction with development on the part of existing residents and a perception on the part of prospective new residents that may discourage their relocation to Houston.

In sum, although the Social Impact Evaluation of the affected study sites in Scenario I has concluded that there are no projected significant social impacts in any of the regions as a result of Scenario I activities, it does not intend to imply that none could ever occur.

17. IMPACT ON REGION I: ORANGE AND JEFFERSON COUNTIES

Summary of Requirements

A summary of the impacts of Scenario I activities on any of the three affected study sites is most easily undertaken by reviewing the requirements placed on that site by such activities. Figure 114 provides such a review for Region I, the Orange and Jefferson Counties area. In Figure 114, all requirements are given over time; that is, in each relevant Scenario I time period. Land requirements are categorized primary, indirect, residential, and total; water requirements are given for primary and indirect activities, domestic and municipal use, and total water requirements. Employment requirements are broken down in two ways: direct and indirect; and resident, new resident and commuter. Thus, the figures in the total employment column are equal to the sum of the corresponding figures in the direct and indirect columns, or to the sum of corresponding figures in the resident, new resident, and commuter columns. New population, new housing units, and new students data is also provided. Column totals are provided only for water requirements data. These are the only figures which can be cumulated. In the cases of land, employment, population, housing units and students, each column entry is the total requirement of that time period (shown in the first and last columns) and is not an addition to the requirement of the previous time period; thus, no column total is provided.

Significant Infrastructural Issues

Part B includes a detailed discussion of the manner in which the significant infrastructural issues raised by Scenario I activities were identified in each affected study site of Scenario I. (The reader is urged to review that section of Part B.) In short, a significant infrastructural issue was identified when the OCS-generated demand on an infrastructural service (water, sewage, police protection, etc.) could potentially supercede a unit of government's capacity to provide that service. For example, if every city in any affected study site is currently experiencing maximum or near-maximum demand on sewage treatment facilities, any increase in population brought about by an OCS scenario will make sewage treatment a significant issue.

Any list of services provided by a unit of government would, of course, be lengthy. To survey each and every one to determine if it could be a significant issue would have been an undertaking of immense proportion. Thus, only the major infrastructural issues were surveyed here. They are:

Figure 114. Summary of Requirements/Scenario I/Region I

Time Period	LAND REQUIREMENTS (Acres)					WATER (Acre Feet)				EMPLOYMENT									
	Primary	*Indirect	Residential	Total	Docking Space (Feet)	Primary	Indirect	Domestic+ Municipal	Total	Direct	Indirect	Total	Resi-dent	New Resi-dent	Com-muter	New Population	New Housing Units	New Students	Time Period
10/76-1/77	0	0	0	0	300	0	0	0	0	0	0	0	0	0	0	0	0	0	10/76-1/77
1/77-4/77	0	0	0	0	300	0	0	0	0	0	0	0	0	0	0	0	0	0	1/77-4/77
4/77-8/77	9.5	21.8	2.2	33.5	600	0	0	2.25	2.25	45	6	51	26	25	0	68	23	17	4/77-8/77
8/77-10/77	9.5	21.8	2.2	33.5	600	0	0	1.5	1.5	45	3	48	23	25	0	68	23	17	8/77-10/77
10/77-11/77	9.5	21.8	2.2	33.5	600	0	0	0.75	0.75	45	2	47	22	25	0	68	23	17	10/77-11/77
11/77-1/78	9.5	21.8	2.2	33.5	600	0	0	1.5	1.5	45	3	48	23	25	0	68	23	17	11/77-1/78
1/78-2/78	9.5	21.8	2.2	33.5	600	0	0	0.75	0.75	45	2	47	22	25	0	68	23	17	1/78-2/78
2/78-4/78	9.5	21.8	2.2	33.5	600	0	0	1.5	1.5	45	3	48	23	25	0	68	23	17	2/78-4/78
4/78-8/79	9.5	21.8	2.2	33.5	600	0	0	16.26	16.26	45	24	69	35	34	0	92	31	23	4/78-8/79
8/79-11/79	9.5	21.8	2.2	33.5	300	0	0	3.05	3.05	45	5	50	16	34	0	92	31	23	8/79-11/79
11/79-2/80	9.5	21.8	2.2	33.5	300	0	0	3.05	3.05	45	5	50	16	34	0	92	31	23	11/79-2/80
2/80-4/80	9.5	21.8	2.2	33.5	0	0	0	2.03	2.03	45	3	48	14	34	0	92	31	23	2/80-4/80
4/80-10/80	9.5	21.8	2.5	33.5	0	0	0	6.1	6.1	45	10	55	21	34	0	92	31	23	4/80-10/80
10/80-2/81	9.5	21.8	2.5	33.5	0	0	0	4.07	4.07	45	6	51	17	34	0	92	31	23	10/80-2/81
2/81-6/81	9.5	60.2	4.8	74.5	0	1.53	2.91	6.32	10.76	101	15	116	61	53	2	143	49	36	2/81-6/81
6/81-8/81	66	78.0	10.0	154	200	0.92	1.45	6.67	9.04	208	8	216	91	112	13	302	103	76	6/81-8/81
8/81-9/81	71	81.8	10.2	163	200	0.46	0.73	3.46	4.65	220	4	224	95	116	13	313	106	79	8/81-9/81
9/81-2/82	71	80.6	11.4	163	200	2.30	3.63	18.94	24.87	220	24	244	104	127	13	343	117	86	9/81-2/82
2/82-8/82	83	105.1	14.9	203	400	2.76	4.36	30.09	37.2	274	44	318	135	168	15	454	154	114	2/82-8/82
8/82-11/82	83	105.1	14.9	203	400	0	2.18	15.05	17.23	274	22	296	113	168	15	454	154	114	8/82-11/82
11/82-2/83	83	105.1	14.9	203	400	1.38	2.18	15.05	18.61	274	22	296	113	168	15	454	154	114	11/82-2/83
2/83-5/83	87	110.1	14.9	212	600	1.38	2.18	15.05	18.61	287	24	311	128	168	15	454	154	114	2/83-5/83
5/83-10/83	87	120.9	16.1	224	600	2.30	4.67	27.01	33.98	303	42	345	149	181	15	489	166	123	5/83-10/83
						13.04	24.29	180.45	217.8										

* Total indirect land minus residential land

1. Administrative/Financial Capabilities;
2. Housing;
3. Water Demand;
4. Sewage Collection and Treatment;
5. Solid Waste Collection and Disposal;
6. Crime Prevention;
7. Fire Protection;
8. Recreational Facilities;
9. Health Facilities; and
10. Educational Services.

For each of those ten candidate issues, one or more indicators of a government's ability to handle that issue were established. Next, standard measures for the indicators were used as a basis of comparison with a government's current or future capacity to deal with that issue. Finally, the units of government within an affected study site were analyzed in terms of their current capacity to meet the standard measures for each indicator for the purpose of identifying significant infrastructural issues.

The local governments of Region I which were analyzed in the manner described in the preceding paragraphs are the City of Beaumont and the City of Port Arthur. (It will be recalled that it was postulated that these two cities would fulfill the bulk of Scenario I requirements of Region I.)

Neither of the Region I cities are currently experiencing any administrative/financial shortcomings. The City of Beaumont currently has a relatively high assessed valuation/general obligation bond ratio, but has a ratio of assessment of only 60% and a tax rate which allows for graduation upward. Similarly, the city seems well-equipped to handle an increase in housing demand and water demand and increased sewage treatment and solid waste loads. Additionally, the number of police officers and fire fighters in Beaumont meets the standard measures employed in this study. Health facilities, in terms of both the number of hospital beds and the number of physicians, are sufficient. Likewise, educational services are not seen as a significant issue.

Beaumont is, however, below the standard for number of parks and acreage of parks. Therefore, availability of recreational facilities has been flagged as a significant issue in Beaumont, even though water based recreation, not included in the indicator, does supplant part of the local demand for recreation.

The City of Port Arthur, like Beaumont, appears well-suited(in terms of the standard measures employed in this study) in such areas as administrative/financial capabilities, water supply and solid waste treatment, housing, crime prevention, and fire protection. In addition, Port

Arthur's recreational facilities, health facilities and educational services appear to be more than adequate. Sewage collection mains in Port Arthur were recognized as deteriorating resulting in local filterfield infiltration problems. Therefore, sewage collection is also flagged as a significant issue, although the indicator shows sewage treatment capacity to be more than adequate.

Thus, the significant infrastructural issues in Beaumont and Port Arthur are expected to be those shown in Figure 115.

Figure 115

Significant Issues/Scenario I/Region I Cities

1.	Beaumont	Recreational Facilities
2.	Port Arthur	Sewage Collection

Infrastructural Impacts Associated With Significant Infrastructural Issues

Unlike the analysis of impacts on operating costs, which involve the addition of new residents to current infrastructural systems which have the capacity to absorb more demands, the analysis of significant infrastructural issues raises the possibility that large-scale, capital expenditures may be required to provide the additional needed services. (Operating costs were analyzed in Chapter 14 and are summarized below.)

It is not clear, however, that because a study site reveals, for example, a need for expanded health services when the infrastructural capacity indicators of this study are applied, that the affected study site will undertake the construction of a new hospital or the expansion of an existing one or any other large-scale capital investment. Between that kind of large capital investment (which would significantly affect the fiscal analysis contained in Chapter 14 and in the Summary below) and a decision to "make do" with existing facilities, there exists an infinite number of short-term, non-capital-intensive solutions. A discussion of some of these solutions is contained in the Executive Summary.

The environmental and social impacts of these significant infrastructural issues were analyzed in Chapters 15 and 16, respectively, and are also summarized below.

Summary of Fiscal, Environmental, and Social Impacts

I. Fiscal

The analysis of fiscal impacts (see Chapter 14) revealed that over the seven-year life of Scenario I, local governments in Region I will incur a total cost of $349,885 due to Scenario I activities; during the same period they will accrue $182,638 in tax revenues from Scenario I-related activities. The total deficit over the seven-year period, then, will be $167,247. Chapter 14 also noted that at no time during the life of Scenario I will local tax revenues associated with Scenario I cover more than 77% of incurred costs associated with Scenario I in Region I. At times, that percentage drops as low as 42%.

This fiscal impact will be, according to the analysis of the preceding chapters, the most significant and pronounced in Region I due to Scenario I activities.

II. Environmental

Chapter 15, Environmental Impact Analysis, concluded that it is reasonable to expect no significant environmental impacts, over and above current environment conditions, in Region I as a direct result of Scenario I activities.

III. Social

Like environmental impact, no social impacts as a direct result of Scenario I activities are expected in Region I.

18. IMPACT ON REGION II: HARRIS, GALVESTON, AND CHAMBERS COUNTIES

Summary of Requirements

As in Chapter 17 (for Region I), the assessment of impacts of Scenario I begins with a summarization of all requirements placed on the affected region. Figure 116 provides such a review for Region II. In Figure 116, all requirements are given over time; that is, in each relevant Scenario I time period. Land requirements are categorized primary, indirect, residential, and total; water requirements are given by primary and indirect activities, domestic and municipal use, and total water requirements. Employment requirements are broken down in two ways: direct and indirect; and resident, new resident and commuter. Thus, the figures in the total employment column are equal to the sum of the corresponding figures in the direct and indirect columns, or to the sum of corresponding figures in the resident, new resident, and commuter columns. New population, new housing units, and new students data is also provided. Column totals are provided only for water requirements data. These are the only figures which can be cumulated. In the cases of land, employment, population, housing units and students, each column entry is the total requirement of that time period (shown in the first and last columns) and is not an addition to the requirement of the previous time period; thus, no column total is provided.

Significant Infrastructural Issues

Part B includes a detailed discussion of the manner in which the significant infrastructural issues raised by Scenario I activities were identified in each affected study site of Scenario I; Chapter 17 includes a shorter description of that process. (The reader is encouraged to review that process.)

The local governments of Region II which were analyzed in accordance with that procedure are the City of Houston and the City of Galveston. (It will be recalled that it was postulated that these two cities would fulfill the bulk of Scenario I requirements of Region II.)

Houston appears well-suited to handle increased demands in nearly every area. Water storage capacity, while somewhat lower than the standard measure employed in this study, still tops the 100 million-gallon mark and is not, therefore, singled out as a significant issue. Recreational

Figure 116. Summary of Requirements/Scenario I/Region II

	LAND (Acres)					WATER (Acre-Feet)				EMPLOYMENT									
Time Period	Primary	*Indirect	Residential	Total	Docking Space (feet)	Primary	Indirect	Domestic+ Municipal	Total	Direct	Indirect	Total	Resi-dent	New Resi-dent	Com-muter	New Population	New Housing Units	New Students	Time Period
10/76-1/77	20.5	81.6	15.4	117.5	300	1.38	3.03	12.0	16.41	225	47	272	124	134	14	362	123	91	10/76-1/77
1/77-4/77	22	143.7	24.3	187	600	2.76	6.06	18.89	27.71	356	71	427	187	211	29	570	194	144	1/77-4/77
4/77-8/77	33	209.5	38.5	281	900	5.52	12.12	30.0	47.64	536	140	676	298	335	43	905	308	228	4/77-8/77
8/77-10/77	34.5	270.5	42.5	347.5	1200	3.68	8.08	22.07	33.83	663	85	748	321	370	57	999	340	252	8/77-10/77
10/77-11/77	34.5	270.5	42.5	347.5	1200	1.38	4.04	11.04	16.46	663	42	705	278	370	57	999	340	252	10/77-11/77
11/77-1/78	34.5	270.5	42.5	347.5	1200	3.68	8.08	22.07	33.83	663	85	748	321	370	57	999	340	252	11/77-1/78
1/78-2/78	34.5	270.5	42.5	347.5	1200	1.38	4.04	11.04	16.46	663	42	705	278	370	57	999	340	252	1/78-2/78
2/78-4/78	34.5	270.5	42.5	347.5	1200	3.68	8.08	22.07	33.83	663	85	748	321	370	57	999	340	252	2/78-4/78
4/78-8/79	33	270.5	42.5	346	900	22.1	48.48	190.9	261.48	568	580	1148	705	400	43	1080	367	272	4/78-8/79
8/79-11/79	31.5	270.5	42.5	344.5	600	2.67	6.06	35.8	44.53	473	89	562	133	400	29	1080	367	272	8/79-11/79
11/79-2/80	30	270.5	42.5	343	300	1.38	3.03	35.8	40.21	378	70	448	34	400	14	1080	367	272	11/79-2/80
2/80-4/80	28.5	270.5	42.5	341.5	0	0	0	23.9	23.9	283	35	318	0	400	0	1080	367	272	2/80-4/80
4/80-10/80	87	267.0	46.0	400	800	2.76	5.66	71.79	80.21	522	265	787	377	401	9	1083	368	273	4/80-10/80
10/80-2/81	89	266.1	46.9	402	1600	3.68	7.54	48.7	59.92	604	202	806	379	408	19	1102	375	278	10/80-2/81
2/81-6/81	147.5	259.1	53.9	460.5	2400	3.07	7.54	56.08	66.69	719	206	925	435	470	20	1269	431	320	2/81-6/81
6/81-8/81	149.5	259.1	53.9	462.5	2000	0.92	5.66	28.04	34.62	783	116	899	401	470	28	1269	431	320	6/81-8/81
8/81-9/81	149	279.6	57.4	486	3600	0.92	3.77	14.91	19.6	927	67	994	456	500	38	1350	459	340	8/81-9/81
9/81-2/82	151	295.2	78.8	525	4000	6.90	20.20	102.3	129.4	1001	353	1354	629	686	39	1852	630	467	9/81-2/82
2/82-8/82	207	312.0	95.0	614	4600	2.76	25.86	148.22	176.84	1171	457	1628	761	828	39	2236	760	563	2/82-8/82
8/82-11/82	209	348.0	95.0	652	5100	1.38	13.74	74.11	89.23	1245	242	1487	620	828	39	2236	760	563	8/82-11/82
11/82-2/83	282	423.1	110.9	816	6000	1.38	14.54	86.44	102.36	1558	330	1888	882	988	40	2608	887	657	11/82-2/83
2/83-5/83	284	454.6	116.4	855	6400	2.76	15.35	90.75	108.86	1632	341	1973	918	1014	41	2738	931	690	2/83-5/83
5/83-10/83	287	441.1	129.9	858	7000	2.30	20.87	168.81	191.98	1638	550	2188	1023	1132	33	3056	1039	770	5/83-10/83
						78.56	251.83	1325.73	1656.1										

* (Total indirect land minus residential land)

facilities, however, are a significant issue. Houston falls below the State average for number of parks and park acreage. Likewise, educational services are a significant issue; Houston's student/teacher ratio (19.3) is considerably higher than the State average (16.3).

The City of Galveston currently has a ratio of assessment of 80% (the highest of the five cities analyzed in Scenario I) but a relatively low tax rate and, in sum, seems to have no administrative/financial problems. Similarly, housing, water supply, solid waste disposal, crime prevention, and fire protection do not appear to be significant issues. Galveston has more parks than the State average and, while total acreage of parks is less than the State average, recreational facilities are not considered a significant issue. Educational services appear to be adequate. The indicator for sewage collection shows that this system is operating at capacity. Current planning is considering adding additional major and minor treatment plants. Sewage collection is therefore a significant issue in Galveston.

Thus, the significant infrastructural issues in Houston and Galveston are expected to be those shown in Figure 117.

Figure 117

Significant Issues/Scenario I/Region II Cities

1.	Houston	Recreational Facilities Educational Services
2.	Galveston	Sewage Collection

Infrastructural Impacts Associated With Significant Infrastructural Issues

Unlike the analysis of impacts on operating costs, which involve the addition of new residents to current infrastructural systems which have the capacity to absorb more demands, the analysis of significant infrastructural issues raises the possibility that large-scale, capital expenditures may be required to provide the additional needed services. (Operating costs were analyzed in Chapter 14 and are summarized below.)

It is not clear, however, that because a study site reveals, for example, a need for expanded health services when the infrastructural capacity indicators of this study are applied, that the affected study site will undertake the construction of a new hospital or the expansion of an existing one or any other large-scale capital investment. Between that kind of large capital investment (which would insignificantly affect the fiscal analysis contained in Chapter 14 and in the summary below) and a decision to "make do" with existing facilities, there exists an infinite number of short-term, non-capital-intensive solutions. A discussion of some of those solutions is contained in the Executive Summary.

The environmental and social impacts of these significant infrastructural issues were analyzed in Chapters 15 and 16, respectively, and are also summarized below.

Summary of Fiscal, Environmental, and Social Impacts

I. Fiscal

The analysis of fiscal impacts (see Chapter 14) revealed that over the seven-year life of Scenario I, local governments in Region II will incur a total cost of $3,062,724 due to Scenario I activities; during the same period they will accrue $2,226,370 in tax revenues from Scenario I-related activities. The total deficit over the seven-year period, then, will be $ 836,354.. Chapter 14 also noted that very seldom during the life of Scenario I will local tax revenues associated with Scenario I cover more than total incurred costs associated with Scenario I in Region II. At times, that percentage drops as low as 41%.

As was the case in Region I, this fiscal impact will be, according to the analysis of the preceding chapters, the most significant and pronounced in Region II due to Scenario I activities.

II. Environmental

Chapter 15, Environmental Impact Analysis, isolated the following potentially significant environmental issues in Region II due to Scenario I activities:

A. Wastewater Loadings of Biological Oxygen Demanding (BOD) Wastes

At least seven major stream segments in Region I are already designated as "water quality segments" due to current pollution levels. While the increase in BOD loadings directly attributable to Scenario I activities is relatively small, it could become a significant environmental issue.

B. Air Quality

Both the Houston and Galveston Standard Metropolitan Statistical Areas have been designated as Air Quality Maintenance Areas due to current environmental conditions. Again, although the air emissions directly attributable to Scenario I activities in Region II are relatively minor, air quality is a potentially significant environmental issue.

III. Social

As was the case in Region I (see Chapter 17), no social impacts as a direct result of Scenario I activities are expected in Region II.

19. IMPACT ON REGION III: BRAZORIA COUNTY

Summary of Requirements

As in Chapters 17 and 18 (for Regions I and II, respectively), the assessment of impacts of Scenario I begins with a summarization of all requirements placed on the affected region. Figure 118 provides such a review for Region III. In Figure 118, all requirements are given over time; that is, in each relevant Scenario I time period. Land requirements are categorized primary, indirect, residential and total; water requirements are given for primary and indirect activities, domestic and municipal use, and total water requirements. Employment requirements are broken down in two ways: direct and indirect; and resident, new resident and commuter. Thus, the figures in the total employment column are equal to the sum of the corresponding figures in the direct and indirect columns, or to the sum of corresponding figures in the resident, new resident, and commuter columns. New population, new housing units, and new students data is also provided. Column totals are provided only for water requirements data. These are the only figures which can be cumulated. In the cases of land, employment, population, housing units and students, each column entry is the total requirements of that time period (shown in the first and last columns) and is not an addition to the requirement of the previous time period; thus, no column total is provided.

Significant Infrastructural Issues

Part B includes a detailed discussion of the manner in which the significant infrastructural issues raised by Scenario I activities were identified in each affected study site of Scenario I; Chapter 17 includes a shorter description of that process. (The reader is encouraged to review that process.)

The only local government of Region III which was analyzed in accordance with that procedure is the city of Freeport. (It will be recalled that it was postulated that Freeport would fulfill the bulk of Scenario I requirements of Region III. Freeport meets the standard measures of this study in every area. Thus, no issues have been identified as significant in Freeport. (see Figure 119.)

Figure 118

Summary of Requirements/Scenario I

Region III

	LAND REQUIREMENTS (Acres)					WATER (Acre Feet)				EMPLOYMENT									
ime Period	Primary	*Indirect	Residential	Total	Docking Space (Feet)	Primary	Indirect	Domestic+ Municipal	Total	Direct	Indirect	Total	Resi-dent	New Resi-dent	Com-muter	New Population	New Housing Units	New Students	Time Period
0/76-1/77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10/76-1/77
1/77-4/77	0	10.6	1.4	12	300	0	0	1.06	1.06	16	0	16	4	12	0	32	11	8	1/77-4/77
4/77-8/77	0	10.5	1.5	12	300	0	0	1.16	1.16	16	1	17	4	13	0	35	12	9	4/77-8/77
8/77-10/77	0	23.8	3.2	27	600	0	0	1.68	1.68	36	1	37	9	28	0	76	26	19	8/77-10/77
0/77-11/77	0	23.8	3.2	27	600	0	0	0.84	0.84	36	0	36	8	28	0	76	26	19	10/77-11/77
1/77-1/78	0	23.8	3.2	27	600	0	0	1.68	1.68	36	1	37	9	28	0	76	26	19	11/77-1/78
1/78-2/78	0	23.8	3.2	27	600	0	0	0.84	0.84	36	0	36	8	28	0	76	26	19	1/78-2/78
2/78-4/78	0	23.8	3.2	27	600	0	0	1.68	1.68	36	4	40	12	28	0	76	26	19	2/78-4/78
4/78-8/79	0	23.8	3.2	27	300	0	0	3.36	3.36	36	1	37	9	28	0	76	26	19	4/78-8/79
8/79-11/79	0	23.8	3.2	27	300	0	0	2.52	2.52	36	2	38	10	28	0	76	26	19	8/79-11/79
11/79-2/80	0	23.8	3.2	27	0	0	0	2.52	2.52	36	1	37	9	28	0	76	26	19	11/79-2/80
2/80-4/80	0	23.8	3.2	27	0	0	0	1.68	1.68	36	1	37	9	28	0	76	26	19	2/80-4/80
4/80-10/80	0	23.8	3.2	27	300	0	0	5.04	5.04	36	2	38	10	28	0	76	26	19	4/80-10/80
10/80-2/81	1	23.8	3.2	28	200	0	0	3.36	3.36	36	1	37	9	28	0	76	26	19	10/80-2/81
2/81-6/81	1	23.8	3.2	28	200	0	0	3.36	3.36	36	1	37	9	28	0	76	26	19	2/81-6/81
6/81-8/81	1	23.8	3.2	28	400	0	0	1.68	1.68	36	1	37	9	28	0	76	26	19	6/81-8/81
8/81-9/81	5	26.1	3.9	35	400	0	0	1.05	1.05	46	2	48	13	35	0	95	32	24	8/81-9/81
9/81-2/82	6	38.2	5.8	50	800	0	0	7.62	7.62	66	3	69	18	51	0	138	47	35	9/81-2/82
2/82-8/82	6	38.0	6.0	50	800	0	0	9.48	9.48	66	6	72	19	53	0	143	49	36	2/82-8/82
8/82-11/82	7	50.4	7.6	65	1000	0	0	6.0	6.0	86	3	89	22	67	0	181	62	45	8/82-11/82
11/82-2/83	7	50.3	7.7	65	1200	0	0	6.1	6.1	86	4	90	22	68	0	184	63	46	11/82-2/83
2/83-5/83	8	61.8	9.2	80	1400	0	0	7.32	7.32	106	3	109	27	82	0	221	75	56	2/83-5/83
5/83-10/83	8	72.9	11.1	92	1600	0	0	14.64	14.64	122	8	130	32	98	0	265	90	67	5/83-10/83
						0	0	84.65	84.65										

* Total indirect land minus residential land

Figure 119

Significant Issues/Scenario I/Region III

1. Freeport None

Summary of Fiscal, Environmental, and Social Impacts

I. Fiscal

The analysis of fiscal impacts (see Chapter 14) revealed that over the seven-year life of Scenario I, local governments in Region III will incur a total cost of $256,153 due to Scenario I activities; during the same period they will accrue $224,685 in tax revenues from Scenario I-related activities. The total deficit over the seven-year period, then, will be $ 31,468. Chapter 14 also noted that at no time during the life of Scenario I will local tax revenues associated with Scenario I cover more than 98% of incurred costs associated with Scenario I in Region III. At times, that percentage drops as low as 37%.

As was the case in Regions I and II, this fiscal impact will be, according to the analysis of the preceding chapters, the most significant and pronounced in Region III due to Scenario I activities.

II. Environmental

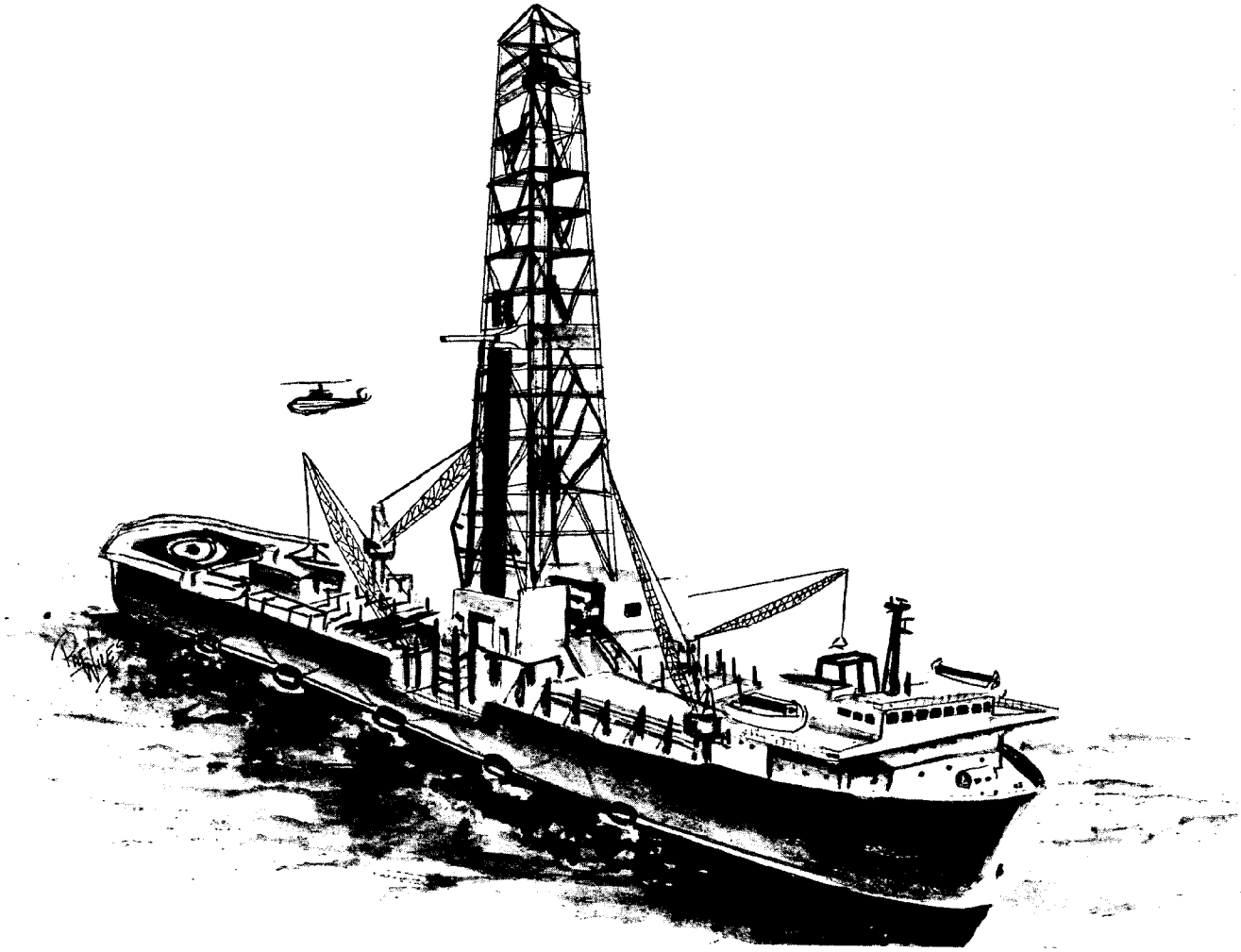
As was true of Region I, Chapter 15, Environmental Impact Analysis, concluded that it is reasonable to expect no significant environmental impacts, over and above current environment conditions, in Region III as a direct result of Scenario I activities.

III. Social

Like Regions I and II, no social impacts as a direct result of Scenario I activities are expected in Region III.

PART D

SCENARIO II



1. INTRODUCTION AND SUMMARY

Scenario II, as described in Part A (see particularly Figure 2), postulates OCS development in a 32-tract area located in the southernmost portion of the South Padre Island Area and the easternmost portion of the South Padre Island East Addition Area. (see Map 5.) The Scenario postulates that:

1. Between the present time and May, 1977, a total of 11 tracts will be leased;

2. Nine of the 11 tracts will undergo exploratory drilling;

3. A maximum of three drilling rigs will be in use at any one time;

4. Five tracts will undergo development drilling;

5. Seven platforms will be installed on those five tracts;

6. A total of 59 development wells will be drilled from those seven platforms;

7. All five of the developed tracts will be put into production, and seven development platforms will be producing platforms;

8. Two of the seven platforms will be outfitted with production equipment;

9. There will be no undersea completions; and

10. Peak production will be 640,000 BBLs of oil per year and 72 million MCF of gas annually.

The Scenario analysis resulted in projected requirements of 1,727 direct employees, 240.5 acres of land, and 6,000 feet of docking space (see Chapter 2). The peak demand period is projected to be the seventh year after exploratory drilling begins (Chapter 3).

The requirements for Scenario II activities are expected to be met in Region VI (San Patricio and Nueces Counties) and Region VII (Cameron, Hidalgo, and Willacy Counties). In the peak demand period, 315 direct employees, 67 acres of land, and 1,000 feet of docking space will be required in the San Patricio/Nueces area. In the Cameron/Hidalgo/Willacy area, 951 direct employees, 168 acres of land, and 4,600 feet of docking space will be required.

The San Patricio/Nueces area requirements are likely to be met in or near Ingleside, Corpus Christi, and/or Harbor Island; the Camer-

on/Hidalgo/Willacy area requirements in or near Brownsville and/or Pt. Isabel (Chapter 4).

When all projected primary and indirect requirements are included, the requirements on the San Patricio/Nueces area are projected to be 167 acres of land; 70.25 acre feet of water; 191 resident employees, 237 new resident employees, and 29 commuters, for a total of 457; 640 new residents; 218 new housing units; and 161 new students.

In the Cameron/Hidalgo/Willacy area the requirements are projected to be 400 acres of land; 209.53 acre feet of water; 427 resident employees, 786 new resident employees; and 33 commuters for a total of 1,246; 2,122 new residents; 721 new housing units; and 535 new students. (see Chapters 5 and 13 for land requirements; Chapters 6 and 12 for water requirements; Chapter 7 for employment, population, housing unit, and student information; and Chapters 17 and 18 for total requirements.)

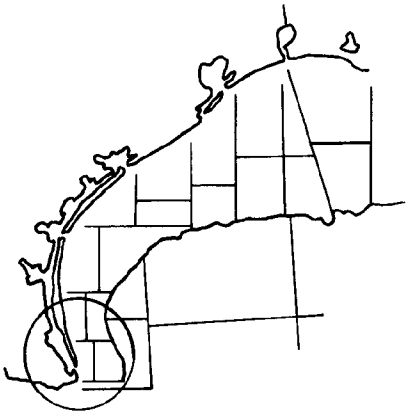
Business expenditures are expected to total over $48 million in Region VI and over $102 million in Region VII (see Chapter 8). Personal income is projected to approach $26 million in Region VI and to exceed $54 million in Region VII (see Chapter 9).

Fiscal deficits are projected to occur in the local governmental entities of both regions (see Chapters 11 and 14). However, Scenario II activities are expected to result in a net benefit for the State government (Chapters 10 and 14).

In Region VI, wastewater effluent loadings and air quality were isolated as potentially significant environmental issues (see Chapters 15 and 17). In Region VII, demand for industrial, commercial, and residential land; wastewater effluents; and air quality were isolated (see Chapters 15 and 18).

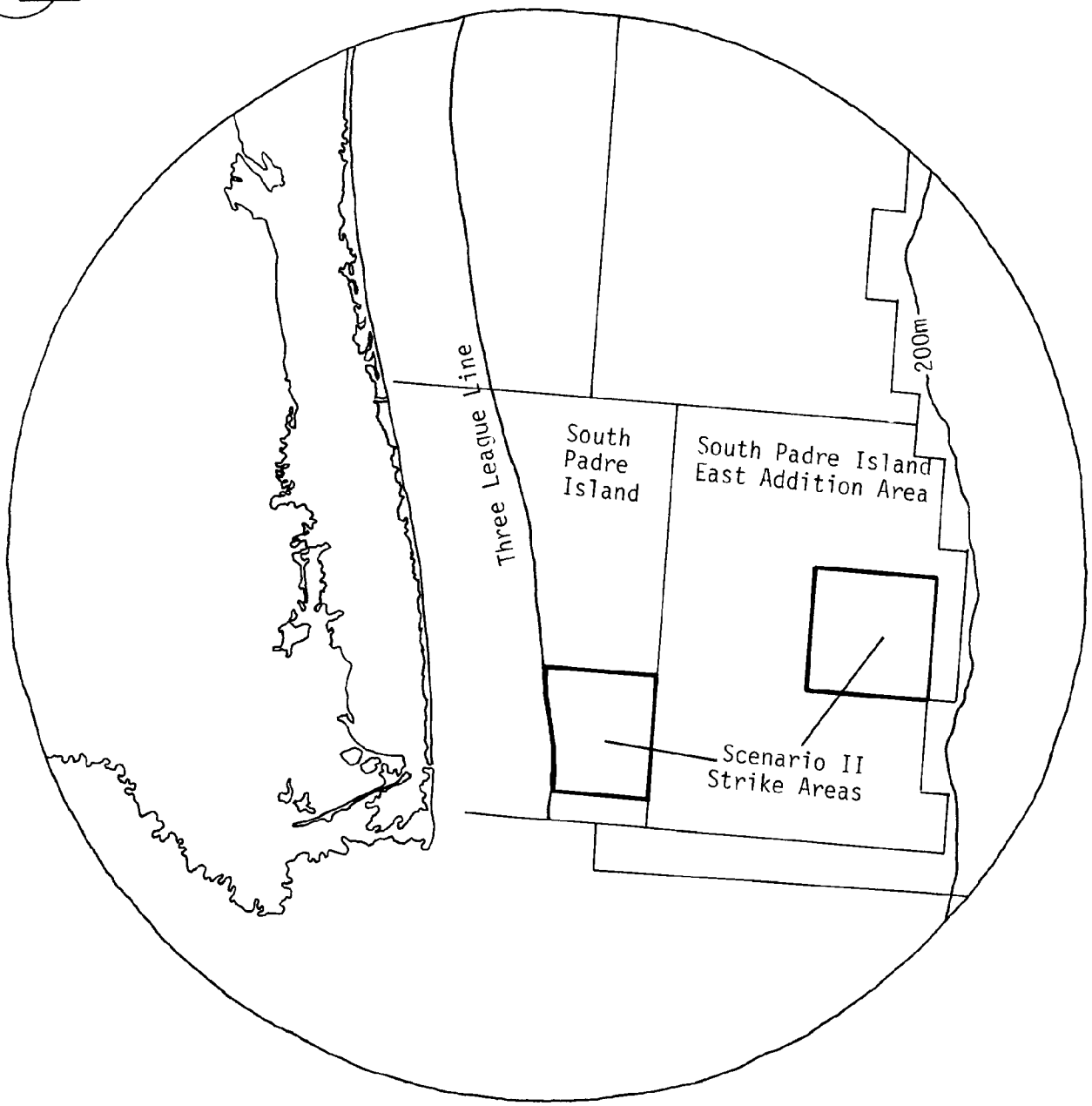
No significant social impacts are projected for Region VI (see Chapters 16 and 17), but Region VII could experience social impacts due to shortages in public services, increased competition for land, and maldistribution of economic benefits (see Chapters 16 and 18).

In Region VI, Corpus Christi could experience a shortage in educational facilities (see Chapter 17). In Region VII, Brownsville may experience shortages of housing and educational services; Pt. Isabel may have a shortage of housing, recreational and health facilities (see Chapter 18).



Map 5

Scenario II



2. PRIMARY REQUIREMENTS

Based on the postulations made in the Scenario II description and the methods utilized to calculate estimates of the requirements of primary exploration, development, and production activities (see Part B), the following estimations of requirements for primary Scenario II activities, facilities, services, and supplies were made.

Exploration Phase

I. Primary Activity Requirements

Scenario II postulates, as we have seen, that a maximum of three exploratory rigs will be in use at any given time. Thus, it is reasonable to assume that Scenario II will require 180 persons (3X60) for the on-rig operation of exploratory rigs (see Figure 120). The rigs themselves, since they are offshore, require no land.

The dockside support associated with exploratory rigs includes support units (repair facilities, etc.) and administrative units. It is assumed that the three exploratory rigs in use in Scenario II will be owned by three separate companies, each with its own dockside facilities. Thus it is postulated that three dockside units are required for the exploratory phase. It is reasonable to assume, therefore, that a total of 105 persons (3X35) and 4.5 acres of land (3X1.5) will be required for dockside support of exploratory rigs in Scenario II. (See Figure 120).

Since there are three exploratory rigs involved in Scenario II, 3 helicopters are required during the exploration phase; a total of 12 workers (3X4) are required, then, for air transportation during the exploration phase of Scenario II (see Figure 120).

Similarly, since there are three exploratory rigs postulated, 9 boats (3X3), 144 workers (9X16) in marine transportation, and 1800 feet of dockage (9X20) are estimated to be required (see Figure 120).

A total of 147 workers per rig - 441 for the three rigs - are estimated to be required to operate offshore rigs, to provide dockside support, and to provide transportation to and from the exploratory rigs of Scenario II. In addition, 1.5 acres plus 600 ft. of docking space are estimated to be required for each exploratory rig; a total of 4.5 acres and 1800 feet of dockage for all three rigs (see Figure 120).

Figure 120

Requirements for the Exploration Phase of Scenario II

	Required	Required	Land (Acres) Required
1. Exploratory Rigs	3*	180 (3X60)	0
2. Dockside Support for Exploratory Rigs	3 (3X1)	105 (3X35)	4.5 (3X1.5)
3. Transportation to and from Exploratory Rigs			
a. Air (Helicopter)	3** (3X1)	12** (3X4)	Existing Air Terminal Space
b. Marine (Boats)	9** (3X3)	144** (9X16)	1800 ft. of dock Space (9X200)
4. Total: Items 1, 2, and 3	-	441** (3X147)	4.5** (3X1.5)
5. Facilities			
a. Docks	3 loading berths and 3 other docks (3X1) (3X1) **	Existing dock personnel	(See Item 3b)
b. Storage	-	(See Item 2)	(See Item 2)
c. Office Space	-	(See Item 2)	(See Item 2)
6. Services			
a. Helicopters	(See Item 3a)	(See Item 3a)	(See Item 3a)
b. Boats	(See Item 3b)	(See Item 3b)	(See Item 3b)
c. Well Logging	2**	20** (2X10)	8** (2X4)
d. Diving	2**	22** (2X11)	1** (2X0.5)
7. Supplies			
a. Cement	2**	24** (2X12)	10** (2X5)
b. Mud	2**	26** (2X13)	8** (2X4)
c. Oil Field Equipment	2**	64** (2X32)	11** (2X5.5)
8. Total	-	597	42.5

* From Scenario II Description
** Not Included in Grand Total to Avoid Double-Counting

II. Primary Facilities Requirements

The primary onshore facilities associated with the exploratory phase are docks, storage space, and office space. We have already seen that a total of 1800 ft. of docking space is postulated to be required to service the exploration rigs required in the Scenario. Included in that figure is one loading berth and one other dock per rig. Thus, a total of three loading berths and three other docks are required for Scenario II (see Figure 120). It is estimated that no additional dock personnel will be required to service the boats which service the exploration rigs. To the extent that any dockside servicing of these vessels is required, the necessary personnel for such servicing are included in the estimation of manpower required for marine transportation, discussed above.

Storage facilities necessary for the exploration phase include open storage and warehousing. To the extent the personnel or land are required for such facilities, they are included in the estimates of workers and land required for dockside support of exploratory rigs, discussed above. Further, office space during the exploration phase involves only the personnel and land requirements postulated to be necessary for dockside support of exploratory rigs, discussed above.

III. Primary Services Requirements

The primary services associated with offshore exploratory rigs are helicopter services, boat services, well logging, and diving services.

Helicopter and boat services postulated as being necessary to service exploration rigs (described earlier) are virtually all such services required in the exploration phase as a whole. Thus no additional helicopter or boat services are postulated (see Figure 120).

It is estimated that during the exploration phase of Scenario II, the services of a maximum of two well logging companies or company branches will be required to service the three exploratory rigs. Thus, a total of 20 workers (2x10) and 8 acres of land (2x4) will be required for well logging services during the exploration phase of Scenario II (see Figure 120).

Further, it is estimated that during the exploration phase of Scenario II the services of a maximum of two diving companies or branches will be required. Therefore, a total of 22 workers (2x11) and 1 acre (2x.5) will be required (see Figure 120).

IV. Primary Supplies Requirements

The primary supplies associated with the exploration phase of OCS oil and gas development are cement, drilling mud, and oil field supply, including wellhead equipment and downhole equipment.

It is estimated that during the exploration phase of Scenario II, cement will be supplied by a maximum of two companies or branches. Accordingly, 24 employees (2x12) and 10 acres of land (2x5) will be required for this activity (see Figure 120).

Similarly, it is estimated that two mud companies or branches will be required - a total of 26 workers (2x13) and 8 acres (2x4) - and two oilfield equipment supply companies - 64 employees (2x32) and eleven acres (2x5.5) - will be required during the exploration phase of Scenario II (see Figure 120).

In sum, the total number of workers postulated to be required during the exploration phase (using only the facilities, services, and supplies described above as being "primary") is 597; total land required is 42.5 acres and 1800 feet of dock space.

Development Phase

I. Primary Activity Requirements

Scenario II postulates that seven development platforms will be installed within the geographical boundaries of the scenario location (see Figure 2). It is also assumed that three drilling crews will be required for those seven platforms. Thus, Scenario II will require 168 workers (3x56) for the on-platform operation of development platforms (see Figure 121). The platforms themselves, since they are located offshore, require no land.

It is postulated that the seven platforms will be owned by a maximum of three oil companies. It is further postulated, then, that there will be a maximum of three onshore support units to serve the seven platforms. Accordingly, 105 workers (7x15) and 17.5 acres of land (7x2.5) will be required for onshore support of development platforms in Scenario II. In sum, a total of 71 workers and 2.5 acres of land are required to operate one platform and to provide onshore support for that platform during the development phase of Scenario II (see Figure 121).

Figure 121

Requirements for the Development Phase of Scenario II

	Units Required	Personnel Required	Land (Acres) Required
1. Platforms	7* **	168 (3 crews X 56)	0
2. Onshore Support for Development Platforms	3**	105** (7X15)	17.5 (7X2.5)
3. Total: Items 1 and 2	-	71 per platform** (56 + 15)	17.5 (7X2.5)
4. Facilities			
a. Docks	7 loading berths (7X1)**	Existing Dock Personnel (See Item 2)	1400 ft. of dock space (7X200)** (See Item 2)
b. Storage	-		
c. Operations base	3**	120** (3X40)	150** (3X50)
d. Administrative Base	3**	135** (3X45)	
5. Services			
a. Helicopter	21** (7X3)	84** (21X4)	21** (21X1)
b. Boat	21** (7X3)	336** (21X16)	4200 ft. of loading space (21X200)**
c. Well Logging	2	20 (2X10)	8 (2X4)
d. Diving	2**	22** (2X11)	1** (2X0.5)
6. Supplies			
a. Cement	2**	24** (2X12)	10** (2X5)
b. Mud	3**	39** (3X13)	12** (3X4)
c. Oil Field Equipment	3**	96** (3X32)	16.5** (3 X5.5)
7. Pipeline			
a. Lay Barge	2	160	400 ft. of docking space
b. Other Vessels	4		
8. Total		1309	236

* From Scenario II Description

** Not included in Grand Total to avoid Double-Counting

II. Primary Facilities Requirements

The primary onshore facilities associated with the development phase are docks, storage space, an operations base, and an administrative office. (The operations base and administrative office listed here must not be confused with onshore support for the development platforms described above; the facilities listed in this section are those necessary for all development phase activities, not simply for direct support of development platforms.)

Since seven platforms are postulated in Scenario II, seven loading berths and a maximum of 1400 feet of loading space (7x200) will be required for the development phase of Scenario II (see Figure 121). It is estimated that no additional dock personnel will be required to service the boats which service the development platforms. To the extent that such personnel shall be required, they are included in the estimation of manpower required for marine transportation, to be discussed later.

As in the exploration phase, storage facilities necessary for the development phase include open storage and warehousing. To the extent that land or personnel are required for such facilities, they are included in the estimates of requirements for onshore support of development platforms discussed above.

Since it is postulated that the seven development platforms will be owned by a total of three oil companies, it is assumed that three operations bases and three administrative offices shall also be required. Thus, 120 employees (3x40) are estimated to be required to operate operations bases, 135 workers (3x45) are estimated to be needed for administrative bases, and 150 acres of land (3x50) are estimated to be required for both operations bases and administrative bases during the development phase of Scenario II (see Figure 121).

III. Primary Services Requirements

The primary services associated with the development phase of OCS oil and gas extraction are helicopter services, boat services, well logging and diving.

Since Scenario II postulated seven development platforms, a total of 21 helicopters (7x13), 84 workers (21x4), and 21 acres of land (21x1) are required for air transportation during the development phase of Scenario II (see Figure 121).

Requirements for boat services are calculated in a similar manner: 21 boats (7x3), 336 employees (21x16), and 4200 feet of loading space (21x200). (See Figure 121.)

It is also estimated that maximum of two well logging companies or branches will be required to service the seven platforms. Accordingly, 20 employees (2x10) and 8 acres of land (2x4) will be required. Finally, it is assumed that the requirements for diving services in the development phase will be identical to those of the exploration phase: 22 employees (2x11) and one acre (2x.5). (See Figure 121.)

IV. Primary Supplies Requirements

The primary supplies associated with the development phase, as with the exploration phase, are cement, drilling mud, and oil field supplies including wellhead and downhole equipment. Where the exploration phase required two companies or company branches to supply each of these items, it is postulated that the development phase will require 2 cement companies or branches, 3 mud companies or branches, and 3 oil field supply company or branches. In each case, however, the employment and land requirement multipliers remain the same; that is, 12 employees and 5 acres for each cement company or branch, 13 employees and 4 acres for each mud company or branch, and 32 employees and 5.5 acres for each oil field supply company or branch. Thus, the total requirements for cement supply are 24 employees (2x12) and 10 acres (2x5); for mud supply, 39 employees (3x13) and 12 acres (3x4); for oil field supply, 96 employees (3x32) and 16.5 acres of land (3x5.5). (See Figure 121.)

V. Pipeline Laying Requirements

Scenario II postulated that two main gathering pipelines, one for gas and one for oil, will be constructed to transport production from the seven producing platforms. Those pipelines, it is further postulated, will extend from Strike Area 18, through Strike Area 19, to Cameron County (see Map 1, Part A). The lines will be in the 12-16" diameter range and will be 60 to 70 miles in length.

It is assumed that two lay barges, each with two accompanying vessels will be required. The NE study estimated that two lay barges laying 24" diameter pipe simultaneously, each followed by one other vessel, would require a total of 47 workers, 3 docks, and 300 feet of docking space. Those figures, however, include only the supply boats and crew boats, not the lay barges themselves. Thus, a total of 160 workers, 4 docks, and 400 feet of docking space are more realistic figures and are postulated in Scenario II.

In sum, the total number of workers postulated to be required during the development phase (using the facilities, services, and supplies described above) is 1,309, total land requirement is 236 acres and 6,000 feet of docking space.

Production Phase

I. Primary Activity Requirements

Scenario II postulates that all seven development platforms will ultimately be producing platforms. Thus, 112 workers (7x16) will be required for the on-platform operation of producing platforms (see Figure 122). The platforms themselves, since they are located offshore, require no land.

It has been postulated that the seven platforms will be owned by a maximum of three oil companies and that, therefore, there will be a maximum of three onshore support units to serve the seven platforms. Accordingly, 126 workers (7x18) and 7 acres of land (7x1) will be required for onshore support of producing platforms in Scenario II (see Figure 122). This study, then, postulates that a total of 34 workers per platform are required for the actual operation of a producing platform and for onshore support; a total of 238 workers for the seven platforms (see Figure 122).

II. Primary Facilities, Services, and Supplies Requirements

As Part B noted, the manpower and land requirements of primary facilities, services, and supplies during the production phase are estimated to be identical to such requirements during the development phase (see Figure 122).

Thus, the total number of workers postulated to be required during the production phase (using the facilities, services, and supplies described above) is 1,094; total land requirement is 217.5 acres and 5,600 feet of docking space.

Figure 122

Requirements for the Production Phase of Scenario II

	Units Required	Personnel Required	Land (Acres) Required
1. Platforms	7*	112 (7X16)	0
2. Onshore Support for Production Platforms	3	126 (7X18)	7** (7X1)
3. Total: Items 1 and 2	-	238** (7X34)	7** (7X1)
4. Facilities			
a. Docks	7 loading berths (7X1)	Existing Dock Personnel	1400 ft. of dock space (7X200)
b. Storage	-	(See Item 2)	(See Item 2)
c. Operations Base	3	120 (3X40)	150 (3X50)
d. Administrative Base	3	135 (3X45)	
5. Services			
a. Helicopter	21 (7X3)	84 (21X4)	21 (21X1)
b. Boat	21 (7X3)	336 (21X16)	4200 ft. of loading space (21X200)
c. Diving	2	22 (2X11)	1 (2X0.5)
6. Supplies			
a. Cement	2	24 (2X12)	10 (2X5)
b. Mud	3	39 (3X13)	12 (3X4)
c. Oil Field Equipment	3	96 (3X32)	16.5 (3X5.5)
7. Total		1094	217.5

* From Scenario II Description
** Not Included in Grand Total to Avoid Double-Counting

Total Primary Requirements

Part B pointed out that the computation of primary personnel and land requirements for all phases - exploration, development, and production — of Scenario II is not simply a matter of totaling those requirements for each of the three phases. Such a procedure would result in double-counting and thus over-estimations of the total requirements (see Part B). Such double-counting is possible throughout. In Figures 120, 121, and 122, those items which have not been included in the grand totals (in an attempt to avoid double-counting) are clearly marked. The grand totals of requirements for all phases of Scenario I are then displayed in Figure 123.

Figure 123

Total Requirements for All Phases of Scenario II

	Units Required	Personnel Required	Land (Acres) Required
1. Exploratory Rigs	3	180	0
2. Dockside Support for Exploratory Rigs	3	105	4.5
3. Platforms	7	280	0
4. Onshore Support for Development/Production Platforms	3	126	17.5
5. Facilities			
a. Docks	7	0	1400 feet
b. Operations Base	3	120	150
c. Administrative Base	3	135	
6. Services			
a. Helicopters	21	84	21
b. Boats	21	336	4200 feet
c. Well Logging	2	20	8
d. Diving	2	22	1
7. Supplies			
a. Cement	2	24	10
b. Mud	3	39	12
c. Oil Field Equipment	3	96	16.5
8. Pipeline			
a. Lay Barge	2	160	400 feet
b. Other Vessels	4		
9. GRAND TOTAL		1727	240.5 acres and 6000 feet of docking space

3. PRIMARY REQUIREMENTS OVER TIME

The calculation of total requirements of all phases of Scenario II is a necessary but not sufficient output of Methodology Tasks B1, C1, and D1. The primary requirements must also be distributed over time since not all of them will be simultaneously required, nor will they all be required for the same length of time. The dates on which the activities of Scenario II begin and end are postulated in the Scenario II description (see Figure 2). When those dates are put together with the total requirements of Scenario II (see Figure 123), a picture of the distribution of requirements over time emerges (see Figure 124). The time at which the requirements must be met come either from the Scenario II Description or are RPC estimates. Some of the columns in Figure 124 represent activities which, when completed, are never required again; thus, the manpower and land are not required again. In these cases, the personnel undoubtedly move on to other areas and the land is given over to other uses. Exploratory rigs are examples of such cases. On the other hand, some columns in Figure 124 represent activities, the demand for which will rise and then decline but will rise again. Helicopters service is one such example. In these cases, it is assumed that in the slow period following the first burst of activity, the manpower and land requirements will remain constant in expectation of the second burst of activity.

Finally, it must be noted that Figure 124 displays requirements over time only until 7/84, or seven years after exploratory drilling in Scenario II is begun. The last time period on Figure 124 (1/84 to 7/84) represents peak demand on personnel and land. After 7/84 (or seven years after exploratory drilling commences), demand for personnel and land will gradually decline until it reaches a level necessary for continuous operation of the seven producing platforms. The analysis of that decline, the speed at which it takes place, and its impacts would constitute a study of proportions similar to the study of the build-up. Without presenting a sophisticated analysis of the slowdown, however, the following general assumptions, based on Scenario II postulations, can be set forth:

1. Beginning in mid-1984 (seven years after exploratory drilling begins) personnel required for operation of the seven platforms will eventually fall from a high of 264 (in the 1/84 to 7/84 period) to 112 (16 workers per platform).

2. During the same time, the number of required well logging companies will fall from two to one, the number of required diving companies will fall from two to one, cement companies, from two to one, and oil field supply companies, from three to one; required manpower and land will fall accordingly. (It can be assumed, however, that the companies or branches which are no longer required by Scenario II activities will stay in place and serve other developments either in the OCS or onshore.)

Time Period	Exploratory Rigs *	Dockside Support For Exploratory Rigs**	Platforms*	Development Drilling (Crews)	Production Drilling (Crews)	Onshore Support For Platforms**	Docks**	Operations Bases**	Administrative Bases	Helicopters**	Boats**	Well Logging (Companies or Branches)**	Diving (Companies Branches)
7/77-10/77	1	1	0	0	0	0	2	0	0	1	3	1	1
10/77-1/78	2	2	0	0	0	0	4	0	0	2	6	1	1
1/78-4/78	3	3	0	0	0	0	6	0	0	3	9	2	2
4/78-7/78	3	3	0	0	0	0	6	0	0	3	9	2	2
7/78-10/78	3	3	0	0	0	0	6	0	0	3	9	2	2
10/78-1/79	3	3	0	0	0	0	6	0	0	3	9	2	2
1/79-4/79	2	2	0	0	0	0	4	0	0	2	6	1	1
4/79-7/79	1	1	0	0	0	0	2	0	0	1	3	1	1
7/79-8/79	0	0	0	0	0	0	0	0	0	0	0	0	0
8/79-11/79	1	1	0	0	0	0	2	0	0	1	3	1	1
11/79-2/80	2	2	0	0	0	0	4	0	0	2	6	1	1
2/80-5/80	3	3	0	0	0	0	6	0	0	3	9	2	2
5/80-8/80	2	2	0	0	0	0	4	0	0	2	6	1	1
8/80-11/80	1	1	0	0	0	0	2	0	0	1	3	1	1
11/80-1/81	0	0	0	0	0	0	0	0	0	0	0	0	0
1/81-7/81	0	0	1	1	0	1	1	1	1	3	3	1	1
7/81-11/81	0	0	2	2	0	2	2	2	2	6	6	1	1
11/81-3/82	0	0	2	2	1	2	2	2	2	6	6	1	1
3/82-6/82	0	0	3	2	1	2	3	2	2	9	9	1	1
6/82-8/82	0	0	4	3	1	3	4	3	3	12	12	2	2
8/82-2/83	0	0	4	3	3	3	4	3	3	12	12	2	2
2/83-8/83	0	0	5	3	4	3	5	3	3	15	15	2	2
8/83-11/83	0	0	6	3	4	3	6	3	3	18	18	2	2
11/03 12/83	0	0	7	3	4	3	7	3	3	21	21	2	2
12/83-1/84	0	0	7	3	5	3	7	3	3	21	21	2	2
1/84-7/84	0	0	7	3	6	3	7	3	3	21	21	2	2

* From Scenario II Description
** RPC Estimate

Cement (Companies** or Branches)	Mud (Companies** or Branches)	Oil Field Equipment (Companies or Branches)**	Lay Barges & Other Vessels Needed in Pipeline Laying**	Total Employment**	Total Land (Acres)**	Docking Space**	Time Period
1	1	1	0	225	20.5	600	7/77-10/77
1	1	1	0	372	22	1200	10/77-1/78
2	2	2	0	597	42.5	1800	1/78-4/78
2	2	2	0	597	42.5	1800	4/78-7/78
2	2	2	0	597	42.5	1800	7/78-10/78
2	2	2	0	597	42.5	1800	10/78-1/79
1	1	1	0	597	42.5	1800	1/79-4/79
1	1	1	0	597	42.5	1800	4/79-7/79
0	0	0	0	597	42.5	1800	7/79-8/79
1	1	1	0	597	42.5	1800	8/79-11/79
1	1	1	0	597	42.5	1800	11/79-2/80
2	2	2	0	597	42.5	1800	2/80-5/80
1	1	1	0	502	41	1200	5/80-8/80
1	1	1	0	407	39.5	600	8/80-11/80
0	0	0	6	472	38	400	11/80-1/01
1	1	1	6	631	96.5	1200	1/81-7/81
1	1	1	6	802	155	2000	7/81-11/81
1	1	1	6	818	155	2000	11/81-3/82
1	2	2	6	848	158	2800	3/82-6/82
2	2	2	6	1067	216.5	3600	6/82-8/82
2	2	2	0	939	216.5	3200	8/82-2/83
2	2	2	0	1033	219.5	4000	2/83-8/83
2	3	3	0	1156	232	4600	8/83-11/83
2	3	3	0	1234	235	5600	11/83-12/83
2	3	3	0	1250	235	5600	12/83-1/84
2	3	3	0	1266	235	5600	1/84-7/84

Figure 124

Total Requirements of Scenario II over time

3. Pipeline laying services will not be required after 3/82 (approximately 4½ years after exploratory drilling begins).

This list is not meant to be inclusive, but rather to merely present a representative sample of declining activities.

4. DISTRIBUTION OF REQUIREMENTS TO STUDY SITES

As Part B noted, it is necessary to determine which of the seven Coastal Study Sites will fill each of the primary requirements of the exploration, development and production phases of Scenario II. The following analysis makes such a determination.

Exploration Phase

Figure 125 displays the primary requirements of the exploration phase as postulated in Scenario II.

Figure 125

Primary Requirements of Exploration Phase of Scenario II

Requirements	Units Required	Personnel Per Unit	Total Personnel Required	Land (Acres) Per Unit	Total Land Required
1. Exploratory Rigs	3	60	180	0	0
2. Dockside Support for Exploratory Rigs	3	35	105	1.5	4.5
3. Docks	6	-	-	-	-
4. Helicopters	3	4	12	-	-
5. Boats	9	16	144	200ft./dock	1800ft./dock
6. Well Logging	2	10	20	4.0	8.0
7. Diving Services	2	11	22	.5	1.0
8. Cement Companies	2	12	24	5.0	10.0
9. Mud Companies	2	13	26	4.0	8.0
10. Oil Field Equipment Companies	2	32	64	5.5	11.0
			597		42.5 acres & 1800 ft. of docking space

Figure 126

Allocation of Exploration Phase Requirements

Requirements (Facilities, Services, and Supplies)	Regions						
	I	II	III	IV	V	VI	VII
Dirlling Contractors (Exploratory Rigs)	0	0	0	0	0	1	2
Dockside Support for Exploratory Rigs	0	0	0	0	0	1	2
Onshore Support for Development/Production Platforms	NA	NA	NA	NA	NA	NA	NA
Onshore Operations Bases for Development/ Production	NA	NA	NA	NA	NA	NA	NA
Onshore Administrative Bases for Development/ Production	NA	NA	NA	NA	NA	NA	NA
Docks	0	0	0	0	0	2	4
Helicopters	0	0	0	0	0	0	3
Boats	0	0	0	0	0	0	9
Well Logging Services	0	0	0	0	0	0	2
Diving Services	0	0	0	0	0	0	2
Cement	0	0	0	0	0	0	2
Mud	0	0	0	0	0	0	2
Oil Field Equipment	0	0	0	0	0	0	2
Lay Barges and Other Vessels Required for Pipeline Laying	NA	NA	NA	NA	NA	NA	NA

Region I: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/ Hidalgo/Willacy Counties.

NA = Not Applicable

Figure 127

Primary Requirements of Development Phase of Scenario II

Requirements	Units Required	Personnel Per Unit	Total Personnel Required	Land(Acres) Per Unit	Total Land Required
1. Platforms	7 3 Drilling Crews	56	168	0	0
2. Onshore Support for Development/ Production Platforms	3	15 per Platform	105	2.5 per Platform	7.5
3. Onshore Operations Bases for Development/Production	3	40	120	50	150
4. Onshore Administrative Bases for Development/ Production	3	45	135		
5. Helicopters	18	4	72	1	21*
6. Boats	12	16	192	200ft./dock	2400ft./dock
7. Docks	1	-	-	200ft./dock	1400ft./dock**
8. Mud Companies	1	13	13	4	4
9. Oil Field Equipment Companies	1	32	32	5.5	5.5
10. Lay Barges and Other Vessels Required for Pipeline Laying	6 (2 lay barges & 4 auxiliary vessels)	50/lay barge & 15/auxiliary vessels	160	66.67 ft. of dock space	400 ft. of dock space

* Includes land required for three helicopters utilized during the exploration phase, but which required only existing air terminal space in the exploration phase.

** Includes docking space for six vessels utilized during the exploration phase, but which utilized existing dock space in the exploration phase.

Figure 128

Allocation of Development Phase Requirements

Requirements (Facilities, Services and Supplies)	Regions						
	I	II	III	IV	V	VI	VII
Drilling Contractors (For Development Drilling)	0	0	0	0	0	1	2
Dockside Support for Exploratory Rigs	NA	NA	NA	NA	NA	NA	NA
Onshore Support for Development/Production Platforms	0	0	0	0	0	1	2
Onshore Operations Bases for Development/ Production	0	0	0	0	0	1	2
Onshore Administrative Bases for Development/ Production	0	0	0	0	0	1	2
Docks	0	0	0	0	0	0	1
Helicopters	0	0	4	0	0	6	12
Boats	0	0	4	0	0	3	9
Well Logging Services	---No Addition To That of Exploratory Phase---						
Diving Services	---No Addition To That of Exploratory Phase---						
Cement	---No Addition To That of Exploratory Phase---						
Mud	0	0	0	0	0	0	1
Oil Field Equipment	0	0	0	0	0	1	0
Lay Barges and Other Vessels Required for Pipeline Laying	0	0	0	0	0	3	3

Region I: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/Hidalgo/Willacy Counties.

NA = Not Applicable

Given those requirements; given the distribution of facilities, services, and supplies among the study sites (see Figure 4); and given the geographic location of Scenario II, the following allocation (Figure 126) is made.

The allocations made in Figure 126 (and ultimately in Figures 128,130, and 131) must be seen as RPC estimates, made on the basis of the current distribution in Texas of primary facilities, services, and supplies required for Scenario II; on the basis of the geographical location of Scenario II; and on the basis of current and projected industrial growth patterns along the Texas Gulf Coast.

Development Phase

Figure 127 displays the primary requirements of the development phase as postulated in Scenario II, over and above those postulated in the exploration phase. That is, the requirements detailed in Figure 127 should be seen as additions to those in Figure 125.

The allocation of those requirements to study sites is shown in Figure 128.

Production Phase

Figure 129 presents the primary requirements of the production phase as postulated in Scenario II, over and above those postulated for the exploration and development phases. That is, the requirements detailed in Figure 129 should be seen as additions to those in Figures 125 and 127.

Figure 129

Primary Requirements of Production Phase of Scenario II

Requirements	Units Required	Personnel Per Unit	Total Personnel Required	Land (Acres) Per Unit	Total Land Required
1. Platforms	7 Operations Crews	16	112	0	0

2. Onshore Support for Development/ Production Platforms	3*	3 Per Platform	21	(Does not exceed requirements of development phase.)

* Same units as those used in the development phase, with slightly increased staffing.

The allocation of these requirements to study sites is shown in Figure 130. Since the same onshore support units (Item 2 in Figure 129) are used in the production phase as were used in the development phase - with slightly increased staffing in the production phase - they are not shown on Figure 130.

Total Allocated Primary Requirements

When the primary requirements allocated in Figures 126, 128, and 130 are brought together, the result is a display of the primary requirements of all phases of Scenario II distributed to study sites (see Figure 131). Items in Figure 131 can be seen as the addition of corresponding items in Figures 126, 128, and 130. It can be seen from Figure 131 that there are two affected Coastal Study Sites in Scenario II. They are:

Region VI - San Patricio and Nueces Counties; and
Region VII - Cameron, Hidalgo and Willacy Counties

(See Map 6)

Total Allocated Primary Requirements Over Time

When Figure 131 is juxtaposed with Figure 124, a picture of allocated primary requirements over time emerges. Figure 132 presents that picture. In each column in Figure 132, the first number applies to Region VI, and the second to Region VII.

In accordance with the methodology (see Appendix A), the allocated primary requirements over time were found to be both available and accessible in the study sites to which they were allocated.

Figure 130

Allocation of Production Phase Requirements

Requirements (Facilities, Services, and Supplies)	Regions						
	I	II	III	IV	V	VI	VII
Drilling Contractors (For Production Platform Operation)	0	0	0	0	0	2	5
Dockside Support for Exploratory Rigs	NA	NA	NA	NA	NA	NA	NA
Onshore Support for Development/Production Platforms	--No Addition To That Of Development Phase (Fig. 128)						
Onshore Operations Bases for Development/ Production	--No Addition To That Of Development Phase (Fig. 128)						
Onshore Administrative Bases For Development/ Production	--No Addition To That Of Development Phase (Fig. 128)						
Docks	--No Addition To That Of Development Phase (Fig. 128)						
Helicopters	--No Addition To That Of Development Phase (Fig. 128)						
Boats	--No Addition To That Of Development Phase (Fig. 128)						
Well Logging Services	--No Addition To That Of Development Phase (Fig. 128)						
Diving Services	--No Addition To That Of Development Phase (Fig. 128)						
Cement	--No Addition To That Of Development Phase (Fig. 128)						
Mud	--No Addition To That Of Development Phase (Fig. 128)						
Oil Field Equipment	--No Addition To That Of Development Phase (Fig. 128)						
Lay Barges and Other Vessels Required for Pipeline Laying	--No Addition To That Of Development Phase (Fig. 128)						

Region I: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/ Hidalgo/Willacy Counties.

NA = Not Applicable

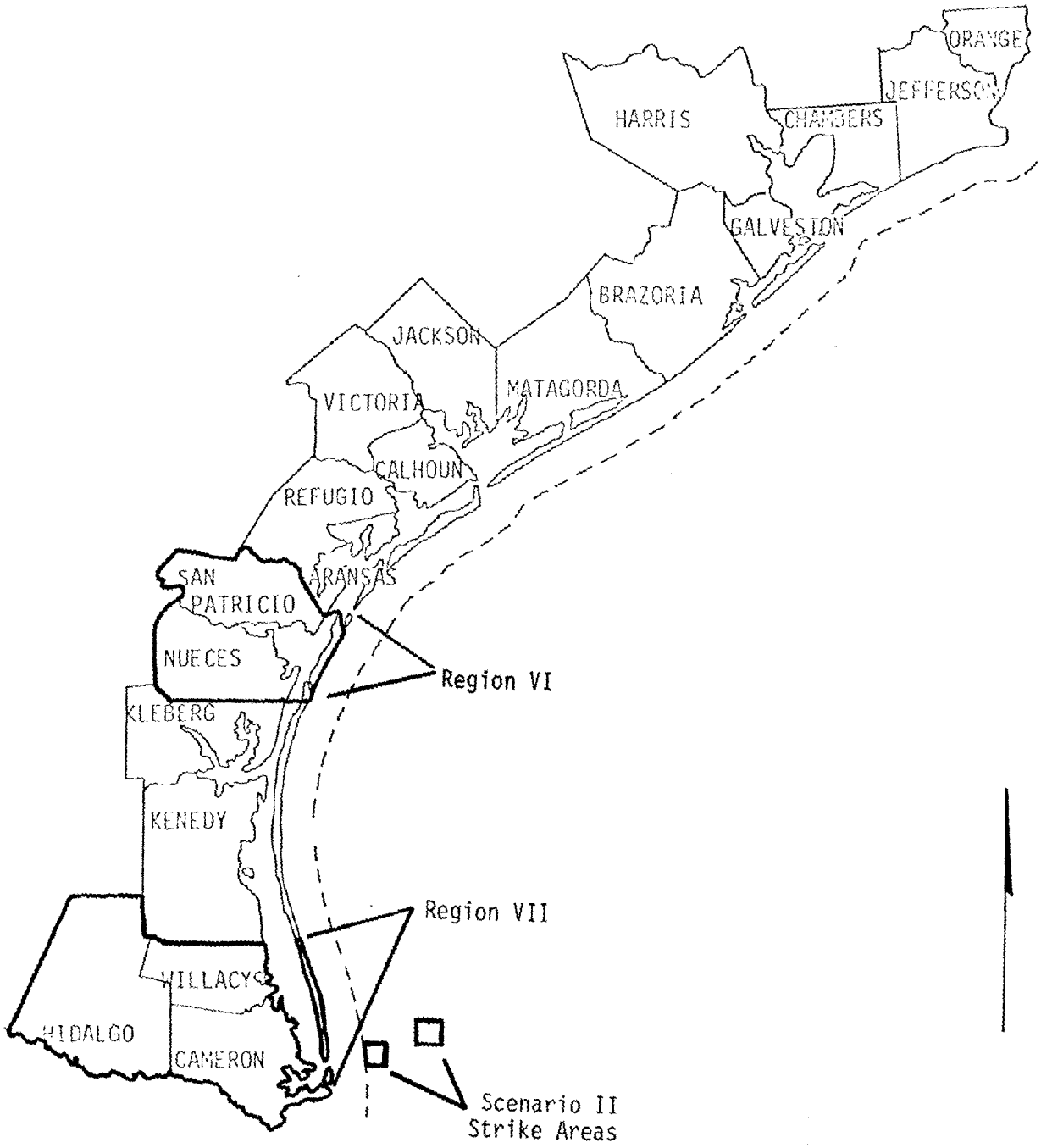
Figure 131

Primary Requirements of All Phases of Scenario II

Requirements (Facilities, Services, and Supplies)	Regions						
	I	II	III	IV	V	VI	VII
Drilling Contractors (Exploration, Development and/or Production	0	0	0	0	0	2 Exp. 1 Dev. 2 Prod.	2 Exp. 2 Dev. 5 Prod.
Dockside Support for Exploratory Rigs	0	0	0	0	0	1	2
Onshore Support for Development/Production Platforms	0	0	0	0	0	1	2
Onshore Operations Bases for Development/Production	0	0	0	0	0	1	2
Onshore Administrative Bases for Development/Production	0	0	0	0	0	1	2
Docks	0	0	0	0	0	2	5
Helicopters	0	0	0	0	0	6	15
Boats	0	0	0	0	0	3	18
Well Logging Services	0	0	0	0	0	0	2
Diving Services	0	0	0	0	0	0	2
Cement	0	0	0	0	0	0	2
Mud	0	0	0	0	0	0	3
Oil Field Equipment	0	0	0	0	0	1	2
Lay Barges and Other Vessels Required for Pipeline Laying	0	0	0	0	0	3	3

Region I: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/Hidalgo/Wallacy Counties.

Map 6
Affected Study Sites of Scenario II



Time Period	Exploratory Rigs		Dockside Support For Exploratory Rigs		Development Drilling Contractors		Production Operation Contractors		Onshore Support For Platforms		Docks		Operations Bases		Administrative Bases		Helicopters		Boats		Well Logging (Companies or Branches)		Diving (Companies or Branches)	
7/77-10/77	0	1	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	3	0	1	0	1
10/77-1/78	0	2	0	2	0	0	0	0	0	0	0	4	0	0	0	0	0	2	0	6	0	1	0	1
1/78-4/78	1	2	1	2	0	0	0	0	0	0	2	4	0	0	0	0	1	2	3	6	0	2	0	2
4/78-7/78	1	2	1	2	0	0	0	0	0	0	2	4	0	0	0	0	1	2	3	6	0	2	0	2
7/78-10/78	1	2	1	2	0	0	0	0	0	0	2	4	0	0	0	0	1	2	3	6	0	2	0	2
10/78-1/79	1	2	1	2	0	0	0	0	0	0	2	4	0	0	0	0	1	2	3	6	0	2	0	2
1/79-4/79	0	2	0	2	0	0	0	0	0	0	0	4	0	0	0	0	0	2	0	6	0	1	0	1
4/79-7/79	0	1	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	3	0	1	0	1
7/79-8/79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8/79-11/79	0	1	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	3	0	1	0	1
11/79-2/80	0	2	0	2	0	0	0	0	0	0	0	4	0	0	0	0	0	2	0	6	0	1	0	1
2/80-5/80	1	2	1	2	0	0	0	0	0	0	2	4	0	0	0	0	1	2	3	6	0	2	0	2
5/80-8/80	1	1	1	1	0	0	0	0	0	0	2	2	0	0	0	0	1	1	3	3	0	1	0	1
8/80-11/80	0	1	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	3	0	1	0	1
11/80-1/81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/81-7/81	0	0	0	0	0	1	0	0	0	1	0	1	0	1	0	1	0	3	0	3	0	1	0	1
7/81-11/81	0	0	0	0	1	1	0	0	1	1	1	1	1	1	1	1	3	3	3	3	0	1	0	1
11/81-3/82	0	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	3	3	3	3	0	1	0	1
3/82-6/82	0	0	0	0	1	1	0	1	1	1	1	2	1	1	1	1	3	6	3	6	0	1	0	1
6/82-8/82	0	0	0	0	1	2	0	1	1	2	2	2	1	2	1	2	6	6	3	9	0	2	0	2
8/82-2/83	0	0	0	0	1	2	0	3	1	2	2	2	1	2	1	2	6	6	3	9	0	2	0	2
2/83-8/83	0	0	0	0	1	2	1	3	1	2	2	3	1	2	1	2	6	9	3	12	0	2	0	2
8/83-11/83	0	0	0	0	1	2	1	3	1	2	2	4	1	2	1	2	6	12	3	15	0	2	0	2
11/83-12/83	0	0	0	0	1	2	1	3	1	2	2	5	1	2	1	2	6	15	3	18	0	2	0	2
12/83-1/84	0	0	0	0	1	1	1	4	1	2	2	5	1	2	1	2	6	15	3	18	0	2	0	2
1/84-7/84	0	0	0	0	0	1	1	5	1	2	2	5	1	2	1	2	6	15	3	18	0	2	0	2

(Note: The first figure in each column refers to Region VI; the second figure refers to Region VII.)

Cement (Companies or Branches)		Mud (Companies or Branches)		Oil Field Equipment (Companies or Branches		Lay Barges & Other Vessels Needed In Pipeline Laying		Total Employment		Land (Acres)		Docking Space		Time Period
0	1	0	1	0	1	0	0	0	225	0	20.5	0	600	7/77-10/77
0	1	0	1	0	1	0	0	0	372	0	22	0	1200	10/77-1/78
0	2	0	2	1	1	0	0	179	418	7	35.5	600	1200	1/78-4/78
0	2	0	2	1	1	0	0	179	418	7	35.5	600	1200	4/78-7/78
0	2	0	2	1	1	0	0	179	418	7	35.5	600	1200	7/78-10/78
0	2	0	2	1	1	0	0	179	418	7	35.5	600	1200	10/78-1/79
0	1	0	1	0	1	0	0	179	418	7	35.5	600	1200	1/79-4/79
0	1	0	1	0	1	0	0	179	418	7	35.5	600	1200	4/79-7/79
0	0	0	0	0	0	0	0	179	418	7	35.5	600	1200	7/79-8/79
0	1	0	1	0	1	0	0	179	418	7	35.5	600	1200	8/79-11/79
0	1	0	1	0	1	0	0	179	418	7	35.5	600	1200	11/79-2/80
0	2	0	2	1	1	0	0	179	418	7	35.5	600	1200	2/80-5/80
0	1	0	1	0	1	0	0	179	323	7	34	600	600	5/80-8/80
0	1	0	1	0	1	0	0	84	323	5.5	34	0	600	8/80-11/80
0	0	0	0	0	0	3	3	164	308	5.5	32.5	200	200	11/80-1/81
0	1	0	1	0	1	3	3	160	471	5.5	91	200	1000	1/81-7/81
0	1	0	1	0	1	3	3	331	471	64	91	1000	1000	7/81-11/81
0	1	0	1	0	1	3	3	331	487	64	91	1000	1000	11/81-3/82
0	1	0	2	1	1	3	3	331	517	64	94	1000	1600	3/82-6/82
0	2	0	2	1	1	3	3	361	706	67	149.5	1200	2400	6/82-8/82
0	2	0	2	1	1	0	0	281	658	67	149.5	1000	2200	8/82-2/83
0	2	0	2	1	1	0	0	297	736	67	152.5	1000	3000	2/83-8/83
0	2	0	3	1	2	0	0	297	859	67	165	1000	3800	8/83-11/83
0	2	0	3	1	2	0	0	315	919	67	168	1000	4600	11/83-12/83
0	2	0	3	1	2	0	0	315	935	67	168	1000	4600	12/83-1/84
0	2	0	3	1	2	0	0	315	951	67	168	1000	4600	1/84-7/84

Figure 132

Allocation of All Requirements of Scenario II

The allocated primary requirements detailed in Figure 132 must be seen as increases in the respective industrial sectors in the study site to which they have been allocated. For example, in the 8/83 - 11/83 time period, as Figure 132 reveals, two well logging companies or branches will be required in Region VII - the Cameron/Hidalgo/Willacy Counties area. That must be seen as an increase in the well logging industry in that area equivalent to the establishment of two additional, new well logging companies. That increase could come in the form of the expansion of one or more existing well logging companies or, indeed, in the establishment of totally new companies. No attempt has been made to describe the form in which that increase will come. What has been described is the size of that increase; that is, the land and manpower equivalents of two new well logging companies or branches (20 employees and 8 acres). The primary requirements are seen as increases to their respective sectors because:

1. A determination as to whether Scenario II requirements will in fact cause increases in some industrial sectors (as opposed to such increases being absorbed by existing companies) is dependent on an analysis of current and projected business activity in each sector in each study site. Such an analysis, however, is beyond the scope of this study.

2. One of the underlying assumptions in this study is that current activity will continue at its present rate of growth - that is, "business as usual." Thus, the activities in Scenario II can reasonably be assumed to cause increases in the affected industrial sectors in the affected study sites.

There are, of course, alternative locations for development within each affected study site. Thus, it becomes necessary to further allocate a study site's primary requirements within that affected study site. Figure 133 makes such an allocation. It must be noted that the sub-allocations must not be seen as predictions, but rather as postulations.

Figure 133

Sub-Allocation of Study Site Requirements

Study Site	Region VI		Region VII	
Requirement	Number Required	Probable Location	Number Required	Probable Location
1. Exploratory Rigs	1	Ingleside	2	Brownsville
2. Dockside Support for Exploratory Rigs	1	Ingleside	2	Brownsville
3. Development Drilling Contractors	1	Corpus Christi	2	Brownsville
4. Production Operations Dontractors	2	Corpus Christi	5	Brownsville
5. Onshore Support for Development/ Production Platforms	1	Corpus Christi	2	Brownsville
6. Docks	1	Harbor Island	2	1-Port Isabel 1-Brownsville
7. Operations Bases	1	Corpus Christi	2	Brownsville
8. Administrative Bases	1	Corpus Christi	2	Brownsville
9. Helicopters	6	Corpus Christi	15	Brownsville
10. Boats	3	2-Harbor Island; 1-Ingleside	18	15-Brownsville 3-Port Isabel
11. Well Logging Companies	0	-	2	Brownsville
12. Diving Companies	0	-	2	Brownsville
13. Cement Companies	0	-	2	Brownsville
14. Mud Companies	0	-	3	Brownsville
15. Oil Field Equipment Supply Companies	1	Corpus Christi	2	Brownsville
16. Lay Barges and Other Vessels Needed in Pipeline Laying	3	Corpus Christi	3	Brownsville

5. LAND REQUIREMENTS

Indirect Land Requirements

Part B contains an extensive discussion of the process by which indirect land requirements in each affected study site of each scenario were derived. It will be recalled from Part B that the following procedures were used:

1. $\frac{UA}{LF} = X$; where UA = current urban acreage, LF = current total labor force, and X = urban acres per person in the labor force.

2. X x PPE = PUA; where PPE = projected employment in primary sectors, and PUA = projected urban acreage.

3. PUA - PPSA = IA; where PPSA = projected primary sector acreage, and IA = indirect acreage.

It will also be recalled that urban acreage in each affected study site was calculated by totaling acreage for the following uses:

1. Residential-urban, commercial, and residential development including streets, roads, and educational sites in such areas;

2. Industrial areas, railyards, and docks including streets, roads, and educational sites in such areas;

3. Undeveloped tracts, greenbelts, cemeteries, and undifferentiated urban land including streets and roads in such areas;

4. Parks and recreational facilities;

5. Sewage disposal sites;

6. Solid-waste disposal sites, sanitary sites, and open sites;

7. Airfields; and

8. Artificial reservoirs.

The affected study sites of Scenario II, as we have seen, are Region VI (San Patricio and Nueces Counties) and Region VII (Cameron, Hidalgo, and Willacy Counties).

For Region VI, current acreage for items 1, 2, 3, and 4 was extracted from the Environmental Geological Atlas of the Texas Coastal Zone, published by the Bureau of Economic Geology (BEG) at the University of Texas in 1973.

For Region VII, current acreage for items 1, 2, 3, and 4 was extracted from the Land Use Plan for the Lower Rio Grande Valley, published by the Lower Rio Grande Valley Development Council in 1973.

Current acreage for item 5 was derived by multiplying the average amount of land use for each sewage treatment site by the number of such sites in each county. The Texas Department of Health Resources (TDHR) has estimated that acreage for sewage disposal sites averages 15; there are 84 sewage disposal sites in Region VI, and 116 in Region VII.

Current acreage for item 6 was derived by totaling the acreage for each solid waste disposal site in each of the two regions. The TDHR records reveal 14 such sites in Region VI and 34 in Region VII. Where the exact acreage for any given solid waste site was unavailable, the average size of such facilities in the Texas Coastal Region (40.39 acres) was used.

Airfield acreage in each county was obtained from the Texas Transportation Institute (TTI). Since airfield acreage was in some cases estimated by the TTI, total acreage is, accordingly, also estimated.

For Region VI, current acreage for item 8 was extracted from the BEG Geologic Atlas; for Region VII it was taken from the Comprehensive Study and Plan of Development for the Lower Rio Grande Basin, published by the United States Department of Agriculture in 1969.

Current acreage for each of the eight categories in each of the two affected study sites of Scenario II is displayed in Figure 134.

Figure 134

Current Land Use (Acres) in Scenario II Affected Study Sites

Use	Region VI	Region VII
1. Residential-Urban, Commercial, Residential Development	27,264	30,836
2. Industrial, Railyards, Docks	6,080	2,120
3. Undeveloped, Greenbelts, Cemeteries, Undifferentiated Land	2,816	4,576

4. Parks and Recreation	7,232	2,074
5. Sewage Disposal	1,260	1,740
6. Solid Waste	547	1,468
7. Airfields	2,758	5,524
8. Artificial Reservoirs	4,544	8,586
TOTAL	52,501	56,924

Figure 135 reveals total land use for the eight categories and total labor force in each region. Total labor force figures were derived from 1974 Texas Employment Commission statistics.

Figure 135

	Region VI	Region VII
Urban Acreage	52,501	56,924
Labor Force	113,310	135,160

Both projected employment in primary sectors by time/by study site and projected primary study site acreage by time/by study site can be found in Figure 132. When these figures are employed in the formula described above, indirect acreage by study site/by time results.

Examples: 7/81 to 11/81 in Region VI

(1) $\frac{52,501}{113,310} = .463$ (2) $.463 \times 331 = 153.25$ (3) $153.25 - 64 = 89.25$

Indirect acreage = 89 acres

11/83 to 12/83 in Region VII

(1) $\frac{56,924}{135,160} = .421$ (2) $.421 \times 919 = 386.9$ (3) $386.9 - 168 = 218.9$

Indirect Acreage = 219 acres

Figure 136 illustrates the indirect land requirements in each of the affected study sites by time, based on the time periods, primary sectors' employment projections, and projected primary sector acreage requirements contained in Figure 132.

The reader is encouraged to read the explanatory notes concerning this process of calculating indirect land requirements in Part B.

Finally, it is safe to assume that the indirect land required in Region VI will be in or near Ingleside, Harbor Island, or Corpus Christi; in Region VII in or near Brownsville and Port Isabel.

Figure 136

Indirect Land Requirements

Time Period	Region VI	Region VII
7/77-10/77	0	74
10/77- 1/78	0	135
1/78- 4/78	76	140
4/78- 7/78	76	140
7/78-10/78	76	140
10/78- 1/79	76	140
1/79- 4/79	76	140
4/79- 7/79	76	140
7/79- 8/79	76	140
8/79-11/79	76	140
11/79- 2/80	76	140
2/80- 5/80	76	140
5/80- 8/80	76	140
8/80-11/80	76	140
11/80- 1/81	76	140
1/81- 7/81	76	140
7/81-11/81	89	140
11/81- 3/82	89	140
3/82- 6/82	89	140
6/82- 8/82	100	148
8/82- 2/83	100	148
2/83- 8/83	100	157
8/83-11/83	100	197
11/83-12/83	100	219
12/83- 1/84	100	226
1/84- 7/84	100	232

Primary and Indirect Land Requirements

As Part B explained, total primary and indirect land requirements were calculated simply by summing those two individual quantities. Figure 137 below displays primary land requirements (extracted from Figure 132).

Figure 137

Primary Land Requirements/Scenario II

Time Period	Primary Land Requirements (Acres) Region VI	Region VII
7/77-10/77	0	20.5
10/77- 1/78	0	22
1/78- 4/78	7	35.5
4/78- 7/78	7	35.5
7/78-10/78	7	35.5
10/78- 1/79	7	35.5
1/79- 4/79	7	35.5
4/79- 7/79	7	35.5
7/79- 8/79	7	35.5
8/79-11/79	7	35.5
11/79- 2/80	7	35.5
2/80- 5/80	7	35.5
5/80- 8/80	7	34
8/80-11/80	5.5	34
11/80- 1/81	5.5	32.5
1/81- 7/81	5.5	91
7/81-11/81	64	91
11/81- 3/82	64	91
3/82- 6/82	64	94
6/82- 8/82	67	149.5
8/82- 2/83	67	149.5
2/83- 8/83	67	152.5
8/83-11/83	67	165
11/83-12/83	67	168
12/83- 1/84	67	168
1/84- 7/84	67	168

Indirect land requirements were displayed in Figure 136. When the numbers in Figure 136 are added to the corresponding numbers of Figure 137, Primary and Indirect Land Requirements (Figure 138) is the result.

The uses to which the primary land requirements will be put in each affected study site and in each time period is indicated in Figure 132. The uses to which indirect land requirements will be put include, as was explained above, land for residences of employees of primary sectors, recreation areas, educational institutions, indirect commercial and industrial establishments; in short, all significant indirect land requirements are assumed to be included.

Figure 138

Primary and Indirect Land Requirements (Acres)/Scenario II

	Primary and Indirect Land Requirements	
Time Period	Region VI	Region VII
7/77-10/77	0	94.5
10/77- 1/78	0	157
1/78- 4/78	83	175.5
4/78- 7/78	83	175.5
7/78-10/78	83	175.5
10/78- 1/79	83	175.5
1/79- 4/79	83	175.5
4/79- 7/79	83	175.5
7/79- 8/79	83	175.5
8/79-11/79	83	175.5
11/79- 2/80	83	175.5
2/80- 5/80	83	175.5
5/80- 8/80	83	174
8/80-11/80	81.5	174
11/80- 1/81	81.5	172.5
1/81- 7/81	81.5	231
7/81-11/81	153	231
11/81- 3/82	153	231
3/82- 6/82	153	234
6/82- 8/82	167	297.5
8/82- 2/83	167	297.5
2/83- 8/83	167	309.5
8/83-11/83	167	362
11/83-12/83	167	387
12/83- 1/84	167	394
1/84- 7/84	167	400

The primary land requirements within each affected study site were sub-allocated in Figure 133. Similarly, the indirect land requirements within each affected study site were sub-allocated. Therefore, it is reasonable to assume, as the sub-allocations of both primary and indirect land requirements assumed, that the Region VI land requirements will be met in or near Ingleside, Harbor Island, and Corpus Christi; and that the Region VII land requirements will be met in or near Brownsville and Port Isabel.

6. WATER REQUIREMENTS

Primary Water Requirements

Primary water requirements were calculated following the procedure outlined in Part B. For Scenario II, primary water requirements are revealed below in Figure 139.

Figure 139

Primary Water Requirements for Scenario II

Time Period	Days (assuming 20 drilling days per mo.)	Rig (either mobile exploratory or development platforms, 1 rig per platform in operation at any time	Gallons of Water
7/77-10/77	60	1	450,000
10/77- 1/78	60	2	900,000
1/78- 4/78	60	3	1,350,000
4/78- 7/78	60	3	1,350,000
7/78-10/78	60	3	1,350,000
10/78- 1/79	60	3	1,350,000
1/79- 4/79	60	2	900,000
4/79- 7/79	60	1	450,000
7/79- 8/79	20	0	-
8/79-11/79	60	1	450,000
11/79- 2/80	60	2	900,000
2/80- 5/80	60	3	1,350,000
5/80- 8/80	60	2	900,000
8/80-11/80	60	1	450,000
11/80- 1/81	40	0	-
1/81- 7/81	120	1	900,000
7/81-11/81	80	2	1,200,000
11/81- 3/82	80	1	600,000
3/82- 6/82	60	2	900,000
6/82- 8/82	40	3	900,000
8/82- 2/83	120	1	900,000
2/83- 8/83	120	1	900,000
8/83-11/83	60	2	900,000
11/83-12/83	20	3	450,000
12/83- 1/84	20	2	300,000
1/84- 7/84	120	1	900,000
TOTAL			21,000,000

Thus, a total of 21,000,000 gallons of water will be required between the commencement of exploratory drilling and the completion of development drilling.

The water utilized by offshore drilling contractors will undoubtedly be furnished in those study sites in which onshore support units for such contractors are located. The "Distribution of Requirements to Study Sites" (Figure 132) reveals the following distribution of onshore support units for the three exploratory drilling contractors and the three development drilling contractors postulated to be required in Scenario II:

Figure 140

Onshore Support Units for Scenario II

Time Period	Dockside Support for Exploratory Rigs		Development Drilling Contractors	
	Region VI	Region VII	Region VI	Region VII
7/77-10/77	0	1	0	0
10/77- 1/78	0	2	0	0
1/78- 4/78	1	2	0	0
4/78- 7/78	1	2	0	0
7/78-10/78	1	2	0	0
10/78- 1/79	1	2	0	0
1/79- 4/79	0	2	0	0
4/79- 7/79	0	1	0	0
7/79- 8/79	0	0	0	0
8/79-11/79	0	1	0	0
11/79- 2/80	0	2	0	0
2/80- 5/80	1	2	0	0
5/80- 8/80	1	1	0	0
8/80-11/80	0	1	0	0
11/80- 1/81	0	0	0	0
1/81- 7/81	0	0	0	1
7/81-11/81	0	0	1	1
11/81- 3/82	0	0	1	1
3/82- 6/82	0	0	1	1
6/82- 8/82	0	0	1	2
8/82- 2/83	0	0	1	2
2/83- 8/83	0	0	1	2
8/83-11/83	0	0	1	2
11/83-12/83	0	0	1	2
12/83- 1/84	0	0	1	1
1/84- 7/84	0	0	0	1

Figure 141, based on the distribution of Figure 140, displays total number of offshore rigs - either exploratory or development - utilizing onshore support from each of the affected study sites. Figure 141 also distributes the primary water requirements by time (Figure 139) to each of the affected study sites based on the total number of offshore rigs utilizing onshore support from each study site.

Figure 141

Distribution of Primary Water Requirements

Time Period	Total Offshore Rigs Region VI	Total Offshore Rigs Region VII	Primary Water Requirements in 1000's of Gallons (Acre Feet) Region VI	Primary Water Requirements in 1000's of Gallons (Acre Feet) Region VII
7/77-10/77	0	1	0	450(1.38)
10/77- 1/78	0	2	0	900(2.76)
1/78- 4/78	1	2	450(1.38)	900(2.76)
4/78- 7/78	1	2	450(1.38)	900(2.76)
7/78-10/78	1	2	450(1.38)	900(2.76)
10/78- 1/79	1	2	450(1.38)	900(2.76)
1/79- 4/79	0	2	0	900(2.76)
4/79- 7/79	0	1	0	450(1.38)
7/79- 8/79	0	0	0	0
8/79-11/79	0	1	0	450(1.38)
11/79- 2/80	0	2	0	900(2.76)
2/80- 5/80	1	2	450(1.38)	900(2.76)
5/80- 8/80	1	1	450(1.38)	450(1.38)
8/80-11/80	0	1	0	450(1.38)
11/80- 1/81	0	0	0	0
1/81- 7/81	0	1	0	900(2.76)
7/81-11/81	1	1	600(1.84)	600(1.84)
11/81- 3/82	0	1	0	600(1.84)
3/82- 6/82	1	1	450(1.38)	450(1.38)
6/82- 8/82	1	2	300(.92)	600(1.84)
8/82- 2/83	0	1	0	900(2.76)
2/83- 8/83	0	1	0	900(2.76)
8/83-11/83	1	1	450(1.38)	450(1.38)
11/83-12/83	1	2	150(.46)	300(.92)
12/83- 1/84	1	1	150(.46)	150(.46)
1/84- 7/84	0	1	0	900(2.76)
TOTAL			4,800(14.7)	16,200(49.7)

A comparison of Figure 140 with Figure 141 will reveal that the total number of offshore rigs fluctuates while the number of development drilling contractors remains fairly constant through time. This is so because, it may be recalled, it was assumed that the drilling contracting business engendered in Scenario II would stay in place even if the activity which originally engendered their development was to temporarily decline. Thus, while it is assumed that an increase in the offshore drilling sector, once established, will remain in place through time, it is also assumed that the amount of drilling each contractor will do (and thus the water each will require) will fluctuate.

Indirect Water Requirements

Indirect water requirements generated by the exploration, development, and production phases of Scenario II were calculated by using the indirect water requirement coefficients of the OCSOG Model (see Appendix E). The term "indirect" here refers to the requirements which, in Input/Output terminology, are referred to as "indirect and induced." The one word, "indirect," is used here and throughout the study (unless otherwise noted) for convenience. The indirect water requirement coefficients of the OCSOG Model are displayed in Figure 142. Because Region VII has had such little experience with OCS-related activities, coefficients are not established for that region. Therefore, coefficients established in other areas of the Texas Coast are used for Region VII in this and in succeeding calculations of indirect requirements.

Figure 142

Indirect Water Requirement Coefficients of the OCSOG Model

Primary Activity	Coefficients (Acre Feet/Per Employee/Per Year) Region VI	Region VII
Drilling Contractors	.121	.16

(Note: The only primary activity considered here is "Drilling Contractors" for the same reason that it was the only primary activity considered in the calculation of primary water requirements - see Part B.)

The coefficients in Figure 142 were used to calculate the indirect water requirements for each affected study site and for each significant Scenario II time period (see Figure 143).

Figure 143

Indirect Water Requirements/Scenario II

Time Period	Indirect Water Requirements in 1000's of Gallons (Acre Feet) Region VI		Region VII	
7/77-10/77	0	0	782.04	(2.40)
10/77- 1/78	0	0	1,564.08	(4.80)
1/78- 4/78	593.05	(1.82)	1,564.08	(4.80)
4/78- 7/78	593.05	(1.82)	1,564.08	(4.80)
7/78-10/78	593.04	(1.82)	1,564.08	(4.80)
10/78- 1/79	593.05	(1.82)	1,564.08	(4.80)
1/79- 4/79	593.05	(1.82)	1,564.08	(4.80)
4/79- 7/79	593.05	(1.82)	1,564.08	(4.80)
7/79- 8/79	198.77	(.61)	521.36	(1.60)
8/79-11/79	593.05	(1.82)	1,564.08	(4.80)
11/79- 2/80	593.05	(1.82)	1,564.08	(4.80)
2/80- 5/80	593.05	(1.82)	1,564.08	(4.80)
5/80- 8/80	593.05	(1.82)	782.04	(2.40)
8/80-11/80	0	0	782.04	(2.40)
11/80- 1/81	0	0	0	0
1/81- 7/81	0	0	1,459.81	(4.48)
7/81-11/81	736.42	(2.26)	974.29	(2.99)
11/81- 3/82	736.42	(2.26)	1,251.27	(3.84)
3/82- 6/82	553.95	(1.70)	938.45	(2.88)
6/82- 8/82	368.21	(1.13)	1,111.15	(3.41)
8/82- 2/83	1,104.63	(3.39)	4,170.89	(12.80)
2/83- 8/83	1,420.71	(4.36)	4,170.89	(12.80)
8/83-11/83	710.36	(2.18)	2,085.45	(6.40)
11/83-12/83	237.87	(.73)	694.06	(2.13)
12/83- 1/84	237.87	(.73)	765.75	(2.35)
1/84- 7/84	1,420.71	(4.36)	5,005.07	(15.36)
TOTAL	13,656.4	(41.91)	41,135.4	(126.24)
GRAND TOTAL	54,791.8	(168.15)		

Primary and Indirect Water Requirements

The aggregation of primary and indirect water requirements of Scenario II is obtained by adding the numbers in Figure 141 to the corresponding numbers in Figure 143. The result is Figure 144, Aggregation of Primary and Indirect Water Requirements/Scenario II.

Figure 144

Aggregation of Primary and Indirect Water Requirements/Scenario II

Time Period	Primary and Indirect Water Requirements in 1000's of Gallons (Acre Feet)			
	Region VI		Region VII	
7/77-10/77	0	0	1,232.04	(3.78)
10/77- 1/78	0	0	2,464.08	(7.56)
1/78- 4/78	1,043.05	(3.2)	2,464.08	(7.56)
4/78- 7/78	1,043.05	(3.2)	2,464.08	(7.56)
7/78-10/78	1,043.05	(3.2)	2,464.08	(7.56)
10/78- 1/79	1,043.05	(3.2)	2,464.08	(7.56)
1/79- 4/79	593.05	(1.82)	2,464.08	(7.56)
4/79- 7/79	593.05	(1.82)	2,014.08	(6.18)
7/79- 8/79	198.77	(.61)	521.36	(1.6)
8/79-11/79	593.05	(1.82)	2,014.08	(6.18)
11/79- 2/80	593.05	(1.82)	2,464.08	(7.56)
2/80- 5/80	1,043.05	(3.2)	2,464.08	(7.56)
5/80- 8/80	1,043.05	(3.2)	1,232.04	(3.78)
8/80-11/80	0	0	1,232.04	(3.78)
11/80- 1/81	0	0	0	0
1/81- 7/81	0	0	2,359.81	(7.24)
7/81-11/81	1,336.42	(4.1)	1,574.29	(4.83)
11/81- 3/82	736.42	(2.26)	1,851.27	(5.68)
3/82- 6/82	1,003.95	(3.08)	1,388.45	(4.26)
6/82- 8/82	668.21	(2.05)	1,711.15	(5.25)
8/82- 2/83	1,104.63	(3.39)	5,070.89	(15.56)
2/83- 8/83	1,420.71	(4.36)	5,070.89	(15.56)
8/83-11/83	1,160.36	(3.56)	2,535.45	(7.78)
11/83-12/83	387.87	(1.19)	994.06	(3.05)
12/83- 1/84	387.87	(1.19)	915.75	(2.81)
1/84- 7/84	1,420.71	(4.36)	5,905.07	(18.12)
TOTAL	18,456.4	(56.6)	57,335.4	(175.9)
GRAND TOTAL	75,791.8 (232.6)			

7. EMPLOYMENT

Indirect Employment

Indirect employment generated by the exploration, development, and production phases of Scenario II were calculated by using the indirect employment coefficients of the OCSOG Model (see Appendix E). Those coefficients are shown in Figure 145.

Figure 145

Indirect Employment Coefficients of OCSOG Model

Primary Activity	Coefficients (Indirect Employees/Per Primary Employee/Per Year) Region VI	Region VII
Drilling Contractors	1.196	1.215
Helicopter Service	.949	.981
Boat Service	.422	.508
Well Logging	NA	.426
Diving	NA	.938
Cement	NA	1.05
Mud	NA	.985
Oilfield Equipment Supply	.884	.933
Pipeline Laying	3.15	3.15

(Note: NA = Not applicable in Scenario II.)

The indirect employment coefficients displayed in Figure 145 were used to calculate indirect employment over time in each affected study site of Scenario II (see Figure 146). There is no "Total" row in Figure 146 because; unlike tax payments, water requirements, and personal income; indirect employment cannot be cumulated from one time period to the next. For example, the 201 indirect employees shown to be required in Region II during the 8/82-2/83 time period must not be seen as additions to the 101 required in the previous time period. Instead, 201 must be seen as representing the total indirect employment requirement in that time period in that region.

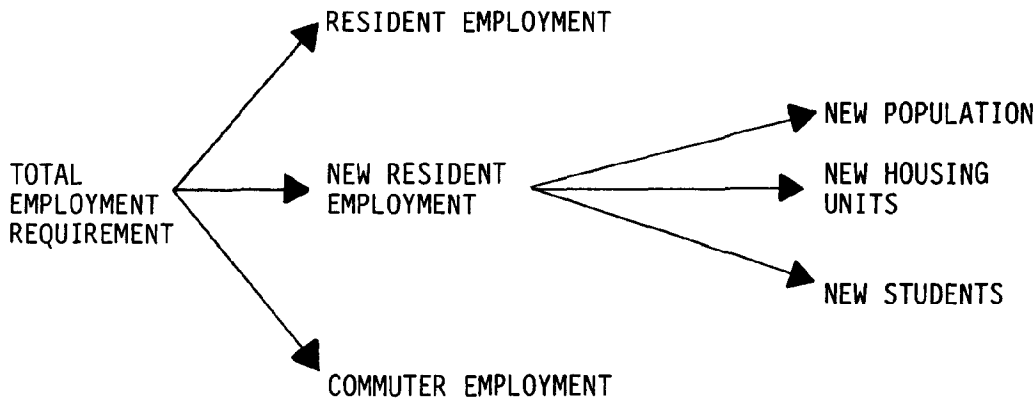
Figure 146

Indirect Employment/Scenario II

Time Period	Region VI	Region VII	Total
7/77-10/77	0	42	42
10/77- 1/78	0	67	67
1/78- 4/78	31	76	107
4/78- 7/78	31	76	107
7/78-10/78	31	76	107
10/78- 1/79	31	76	107
1/79- 4/79	31	76	107
4/79- 7/79	31	76	107
7/79- 8/79	10	25	35
8/79-11/79	31	76	107
11/79- 2/80	31	76	107
2/80- 5/80	31	76	107
5/80- 8/80	31	58	89
8/80-11/80	13	58	71
11/80- 1/81	51	68	119
1/81- 7/81	150	245	395
7/81-11/81	126	163	289
11/81- 3/82	126	169	295
3/82- 6/82	95	129	224
6/82- 8/82	66	101	167
8/82- 2/83	68	201	269
2/83- 8/83	78	219	296
8/83-11/83	40	129	169
11/83-12/83	13	46	59
12/83- 1/84	13	48	61
1/84- 7/84	78	295	373

Total Employment

The new population associated with OCS oil and gas development in any affected site is primarily a function of the new employment; the same can be said of the number of new housing units and of the number of new students. The first step in calculating new population, housing units, and students, then, is to calculate new employment, and the first step in that process is the determination of total manpower requirements over time in each affected study site of Scenario II; thus, the process can be seen graphically as follows:



Total employment requirements are calculated simply by totaling the primary employment requirements over time in each affected study site (see Figure 132) and indirect employment requirements over time in each affected study site (Figure 146).

The result is Figure 147, Aggregation of Primary and Indirect Employment. There is no "Total" row in Figure 147 because the employment figures cannot be cumulated from one time period to the next. The employment figure for any time period in any region must not be seen as an addition to the previous, corresponding figure. Rather, it should be seen as the total employment requirement in that time period in that region.

Figure 147

Aggregation of Primary and Indirect Employment/Scenario II

Time Period	Region VI	Region VII	Total
7/77-10/77	0	267	267
10/77-1/78	0	439	439
1/78-4/78	210	494	704
4/78-7/78	210	494	704
7/78-10/78	210	494	704
10/78-1/79	210	494	704
1/79-4/79	210	494	704
4/79-7/79	210	494	704
7/79-8/79	189	443	632
8/79-11/79	210	494	704
11/79-2/80	210	494	704
2/80-5/80	210	494	704

5/80-8/80	210	381	591
8/80-11/80	97	381	478
11/80-1/81	215	376	591
1/81-7/81	310	716	1,026
7/81-11/81	457	634	1,091
11/81-3/82	457	656	1,113
3/82-6/82	426	646	1,072
6/82-8/82	427	807	1,234
8/82-2/83	349	859	1,208
2/83-8/83	375	955	1,330
8/83-11/83	337	988	1,325
11/83-12/83	328	965	1,293
12/83-1/84	328	983	1,311
1/84-7/84	393	1,246	1,639

Origin-of-Employment

Having calculated total employment requirements, it remains to determine what percentage of those requirements will be resident employment, what percentage new resident, and what percentage commuter employment. By "resident employment" is meant employees who currently reside in the affected study site in question; by "new resident employment" is meant employees who do not currently reside in the affected study site in question but who move there to work and establish residences there; and by "commuter employment" is meant employees who do not currently reside in the affected study site in question and who commute there to work but do not establish residences there.

Part B contains an extensive discussion concerning the derivation of the origin-of-employment percentages displayed in Figure 148. In short, it can be stated that the percentages are based on the particular OCS activity in question; the fact that Texas in general and some sites in particular (Houston and Galveston, for example) have had extensive previous experience with OCS oil and gas development; and on historic employment/unemployment trends in the affected study site in question. Further, they are based on discussions with private sector officials.

In some cases, the percentage of "new resident" employees may seem too high. For example, it might be assumed that Region VI (the San Patricio and Nueces Counties area) currently has in its labor force more than enough personnel to fill all the employment requirements placed upon it by Scenario II. Nevertheless, it is still expected that new residents will move into the area in anticipation of securing OCS-related or OCS-generated (indirect) employment. Further, by assuming a high "new resident" percentage, a relatively high degree of impact can be analyzed; extent of impact can be scaled down if, indeed, "new resident" employment is lower than assumed. Thus, the origin-of-employment estimates displayed in Figure 148 are RPC study assumptions (not predictions) employed for purposes of furtherance of the study.

Figure 148

Origin-of-Employment Percentages/Scenario II

	Region VI			Region VII		
	Resi-dent	New Resi-dent	Com-muter	Resi-dent	New Resi-dent	Com-muter
Exploratory Rigs	30%	50%	20%	10%	40%	50%
Dockside Support for Exploratory Rigs	30%	50%	20%	10%	40%	50%
Development Drilling	40%	40%	20%	25%	55%	20%
Production Operation	50%	50%	0	30%	70%	0
Onshore Support for Platforms	40%	50%	10%	25%	60%	15%
Operations Bases	50%	50%	0	30%	70%	0
Administrative Bases	45%	55%	0	35%	65%	0
Helicopters	30%	70%	0	20%	80%	0
Boats	30%	70%	0	30%	70%	0
Well Logging	NA	NA	NA	30%	70%	0
Diving	NA	NA	NA	20%	80%	0
Cement	NA	NA	NA	30%	70%	0
Mud	NA	NA	NA	30%	70%	0
Oilfield Equip. Supply	50%	50%	0	40%	60%	0
Pipeline Laying	30%	50%	20%	10%	40%	50%
Indirect Employment	50%	50%	0	50%	50%	0

(Note: NA = Not applicable in Scenario II.)

Figure 149

Resident, New Resident, and Commuter
Employment Scenario II

Time Period	Region VI			Region VII		
	Resi-dent	New Resi-dent	Com-muter	Resi-dent	New Resi-dent	Com-muter
7/77-10/77	0	0	0	71	148	48
10/77-1/78	0	0	0	110	234	95
1/78-4/78	75	116	19	126	273	95
4/78-7/78	75	116	19	126	273	95
7/78-10/78	75	116	19	126	273	95
10/78-1/79	75	116	19	126	273	95
1/79-4/79	75	116	19	126	273	95
4/79-7/79	75	116	19	126	273	95
7/79-8/79	54	116	19	75	273	95
8/79-11/79	75	116	19	126	273	95
11/79-2/80	75	116	19	126	273	95
2/80-5/80	75	116	19	126	273	95
5/80-8/80	75	116	19	60	273	48
8/80-11/80	0	116*	0	60	273	48
11/80-1/81	81	118	16	63	273	40
1/81-7/81	129	165	16	248	415	53
7/81-11/81	191	237	29	166	415	53
11/81-3/82	191	237	29	188	415	53
3/82-6/82	160	237	29	174	415	57
6/82-8/82	159	237	31	243	496	68
8/82-2/83	97	237	15	293	538	28
2/83-8/83	123	237	15	325	600	30
8/83-11/83	85	237	15	317	638	33
11/83-12/83	75	237	16	292	640	33
12/83-1/84	75	237	16	298	652	33
1/84-7/84	140	237	16	427	786	33

*While this number is larger than the total number of employees required in Region VI in this time period (see Figure 147), it is assumed that the new residents will not move away.

When the origin-of-employment percentages of Figure 148 are applied to the employment requirements for each activity in each affected region and in each relevant Scenario II time period the number of resident, new resident, and commuter employees (Figure 149) is the result.

New Population

As Part B indicated, the number of new resident employees in each affected study site (Figure 149) provides the key with which new population can be calculated. (The reader is urged to review this section of Part B.) In short, the new population for each affected study site of Scenario II was calculated by multiplying new resident employment by 2.7 persons.

Based on the new resident employment totals in Figure 149, and the 2.7 multiplier, the new population totals for each affected study site over time (Figure 150) were derived.

Figure 150

New Population/Scenario II

Time Period	Region VI	Region VII
7/77-10/77	0	400
10/77- 1/78	0	632
1/78- 4/78	313	737
4/78- 7/78	313	737
7/78-10/78	313	737
10/78- 1/79	313	737
1/79- 4/79	313	737
4/79- 7/79	313	737
7/79- 8/79	313	737
8/79-11/79	313	737
11/79- 2/80	313	737
2/80- 5/80	313	737
5/80- 8/80	313	737
8/80-11/80	313	737
11/80- 1/81	319	737
1/81- 7/81	446	1,121
7/81-11/83	640	1,121
11/81- 3/82	640	1,121

3/82- 6/82	640	1,121
6/82- 8/82	640	1,339
8/82- 2/83	640	1,453
2/83- 8/83	640	1,620
8/83-11/83	640	1,723
11/83-12/83	640	1,728
12/83- 1/84	640	1,760
1/84- 7/84	640	2,122

New Housing Units

The approach to calculation of the number of new housing units associated with Scenario II activities in each affected study site was, once again, the utilization of a multiplier. That is, the number of new housing units generated by the OCS activities of Scenario II is equal to new population x .34 (See Part B for a detailed discussion of the use of this multiplier.)

Based on the population totals displayed in Figure 150 and the multiplier described above, the total number of new housing units in each affected study site over time (Figure 151) was derived.

Figure 151

New Housing Units/Scenario II

Time Period	Region VI	Region VII
7/77-10/77	0	136
10/77- 1/78	0	215
1/78- 4/78	106	251
4/78- 7/78	106	251
7/78-10/78	106	251
10/78- 1/79	106	251
1/79- 4/79	106	251
4/79- 7/79	106	251
7/79- 8/79	106	251
8/79-11/79	106	251
11/79- 2/80	106	251
2/80- 5/80	106	251
5/80- 8/80	106	251
8/80-11/80	106	251
11/80- 1/81	108	251

1/81 -7/81	152	381
7/81-11/78	218	381
11/81- 3/82	218	381
3/82- 6/82	218	381
6/82- 8/82	218	455
8/82- 2/83	218	494
2/83- 8/83	218	551
8/83-11/83	218	586
11/83-12/83	218	588
12/83- 1/84	218	598
1/84- 7/84	218	721

New Students

Like new population and new housing units, the number of new students associated with Scenario II activities was calculated through use of a multiplier: new population x .252. (Again, Part B contains an extensive discussion of the derivation of this multiplier.)

Based on population totals in Figure 150 and the multiplier described above, the total number of new elementary and high school students in each affected study site over time was calculated (Figure 152).

Figure 152

New Students/Scenario II

Time Period	Region VI	Region VII
7/77-10/77	0	101
10/77- 1/78	0	159
1/78- 4/78	79	186
4/78- 7/78	79	186
7/78-10/78	79	186
10/78- 1/79	79	186
1/79- 4/79	79	186
4/79- 7/79	79	186
7/79- 8/79	79	186
8/79-11/79	79	186
11/79- 2/80	79	186
2/80- 5/80	79	186
5/80- 8/80	79	186

8/80-11/80	79	186
11/80-1/81	80	186
1/81-7/81	112	282
7/81-11/81	161	282
11/81-3/82	161	282
3/82-6/82	161	282
6/82-8/82	161	337
8/82-2/83	161	366
2/83-8/83	161	408
8/83-11/83	161	434
11/83-12/83	161	435
12/83-1/84	161	443
1/84-7/84	161	535

8. PRIMARY EXPENDITURES

Like tax payments, the expenditures made in each of the affected study sites for primary exploration, development, and production activities are calculated by using expenditure coefficients of the OCSOG Model (see Appendix E). Those coefficients are arrayed in Figure 153. Once again, coefficients established in other Texas coastal areas were used for Region VII.

Figure 153

Expenditure Coefficients of OCSOG Model

Primary Activity	Expenditure Coefficient ($ Million Annually Per Employee) Region VI	Region VII
Drilling Contractors	.0386	.0386
Helicopter Service	.0417	.0413
Boat Service	.0211	.0211
Well Logging	NA	.0144
Diving	NA	.0373
Cement	NA	.0357
Mud	NA	.04
Oil Field Equipment Supply	.0345	.0345
Pipeline Laying	.128	.128

(Note: NA = Not Applicable in Scenario II)

When the coefficients in Figure 153 are used, expenditures are derived.

Figure 154 displays the expenditures in primary exploration, development, and production activities in Region VI (San Patricio and Nueces Counties) based on Scenario II employment in those activities. Expenditures are broken down by relevant activity - that is, those Scenario II activities postulated to take place in Region VI - and are presented by the significant Scenario II time periods.

Figure 155 provides the same kind of expenditure information for Region VII (Cameron, Hidalgo, and Willacy Counties).

The total expenditures over time during Scenario II can be analyzed in several ways. Figure 156 contains totals by study site, by time period, and by activity.

Figure 154

Expenditures/Scenario II in Region VI

Time Period	Drilling Contractors		Helicopter Services		Boat Services		Pipeline Laying		Oil Field Equipment Supply		Total*
	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	
7/77-10/77	0	0	0	0	0	0	0	0	0	0	0
10/77-1/78	0	0	0	0	0	0	0	0	0	0	0
1/78-4/78	60	.579	4	.042	48	.253	0	0	32	.276	1.150
4/78-7/78	60	.579	4	.042	48	.253	0	0	32	.276	1.150
7/78-10/78	60	.579	4	.042	48	.253	0	0	32	.276	1.150
10/78-1/79	60	.579	4	.042	48	.253	0	0	32	.276	1.150
1/79-4/79	60	.579	4	.042	48	.253	0	0	32	.276	1.150
4/79-7/79	60	.579	4	.042	48	.253	0	0	32	.276	1.150
7/79-8/79	60	.193	4	.014	48	.084	0	0	32	.092	.383
8/79-11/79	60	.579	4	.042	48	.253	0	0	32	.276	1.150
11/79-2/80	60	.579	4	.042	48	.253	0	0	32	.276	1.150
2/80-5/80	60	.579	4	.042	48	.253	0	0	32	.276	1.150
5/80-8/80	60	.579	4	.042	48	.253	0	0	32	.276	1.150
8/80-11/80	0	0	4	.042	48	.253	0	0	32	.276	.571
11/80-1/81	0	0	4	.028	48	.169	80	1.71	32	.184	2.091
1/81-7/81	0	0	0	0	48	.506	80	5.12	32	.552	6.178
7/81-11/81	56	.721	12	.167	48	.338	80	3.41	32	.368	5.004
11/81-3/82	56	.721	12	.167	48	.338	80	3.41	32	.368	5.004
3/82-6/82	56	.540	12	.125	48	.253	80	2.56	32	.276	3.754
6/82-8/82	56	.360	24	.167	48	.169	80	1.71	32	.184	2.590
8/82-2/83	56	1.081	24	.500	48	.506	0	0	32	.552	2.639
2/83-8/83	72	1.390	24	.500	48	.506	0	0	32	.552	2.948
8/83-11/83	72	.695	24	.250	48	.253	0	0	32	.276	1.474
11/83-12/83	72	.232	24	.083	48	.084	0	0	32	.092	.491
12/83-1/84	72	.232	24	.083	48	.084	0	0	32	.092	.491
1/84-7/84	72	1.390	24	.500	48	.506	0	0	32	.552	2.948
TOTAL		13.345		3.046		6.579		17.92		7.176	48.066

*Expenditures are given in millions of dollars.

Figure 155. Expenditures/Scenario II in Region VII

Time Period	Drilling Contractors		Helicopter Services		Boat Services		Well Logging		Diving Services		Cement		Mud		Oil Field Equipment Supply		Pipeline Laying		Total*
	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	
7/77-10/77	60	.579	4	.041	48	.253	10	.036	11	.103	12	.107	13	.130	32	.276	0	0	1.525
10/77-1/78	120	1.158	8	.083	96	.507	10	.036	11	.103	12	.107	13	.130	32	.276	0	0	2.400
1/78-4/78	120	1.158	8	.083	96	.507	20	.072	22	.205	24	.214	26	.260	32	.276	0	0	2.775
4/78-7/78	120	1.158	8	.083	96	.507	20	.072	22	.205	24	.214	26	.260	32	.276	0	0	2.775
7/78-10/78	120	1.158	8	.083	96	.507	20	.072	22	.205	24	.214	26	.260	32	.276	0	0	2.775
10/78-1/79	120	1.158	8	.083	96	.507	20	.072	22	.205	24	.214	26	.260	32	.276	0	0	2.775
1/79-4/79	120	1.158	8	.083	96	.507	20	.072	22	.205	24	.214	26	.260	32	.276	0	0	2.775
4/79-7/79	120	1.158	8	.083	96	.507	20	.072	22	.205	24	.214	26	.260	32	.276	0	0	2.775
7/79-8/79	120	.386	8	.028	96	.169	20	.024	22	.068	24	.071	26	.087	32	.092	0	0	.925
8/79-11/79	120	1.158	8	.083	96	.507	20	.072	22	.205	24	.214	26	.260	32	.276	0	0	2.775
11/79-2/80	120	1.185	8	.083	96	.507	20	.072	22	.205	24	.214	26	.260	32	.276	0	0	2.775
2/80-5/80	120	1.185	8	.083	96	.507	20	.072	22	.205	24	.214	26	.260	32	.276	0	0	2.775
5/80-8/80	60	.579	8	.083	96	.507	20	.072	22	.205	24	.214	26	.260	32	.276	0	0	2.196
8/80-11/80	60	.579	8	.083	96	.507	20	.072	22	.205	24	.214	26	.260	32	.276	0	0	2.195
11/80-1/81	0	0	8	.055	96	.338	20	.048	22	.137	24	.143	26	.173	32	.184	80	1.71	2.788
1/81-7/81	56	1.081	12	.248	96	1.013	20	.114	22	.411	24	.429	26	.520	32	.552	80	5.12	9.518
7/81-11/81	56	.721	12	.165	96	.675	20	.096	22	.274	24	.286	26	.347	32	.368	80	3.41	6.342
11/81-3/82	72	.926	12	.165	96	.675	20	.096	22	.274	24	.286	26	.347	32	.368	80	3.41	6.547
3/82-6/82	72	.695	24	.248	96	.507	20	.072	22	.205	24	.214	26	.260	32	.276	80	2.56	5.037
6/82-8/82	128	.824	24	.165	144	.506	20	.048	22	.137	24	.143	26	.173	32	.184	80	1.71	3.890
8/82-2/83	160	3.088	24	.496	144	1.519	20	.144	22	.411	24	.429	26	.520	32	.552	0	0	7.159
2/83-8/83	160	3.088	36	.744	192	2.026	20	.144	22	.411	24	.429	26	.520	32	.552	0	0	7.914
8/83-11/83	160	1.544	48	.496	240	1.266	20	.072	22	.205	24	.214	39	.390	64	.552	0	0	4.739
11/83-12/83	160	.515	60	.207	288	.506	20	.024	22	.068	24	.071	39	.130	64	.184	0	0	1.705
12/83-1/84	176	.566	60	.207	288	.506	20	.024	22	.068	24	.071	39	.130	64	.184	0	0	1.756
1/84-7/84	192	3.706	60	1.239	288	3.039	20	.144	22	.411	24	.429	39	.780	64	1.104	0	0	10.852
TOTAL		30.457		5.500		19.082		1.944		5.541		5.783		7.497		8.740		17.92	102.464

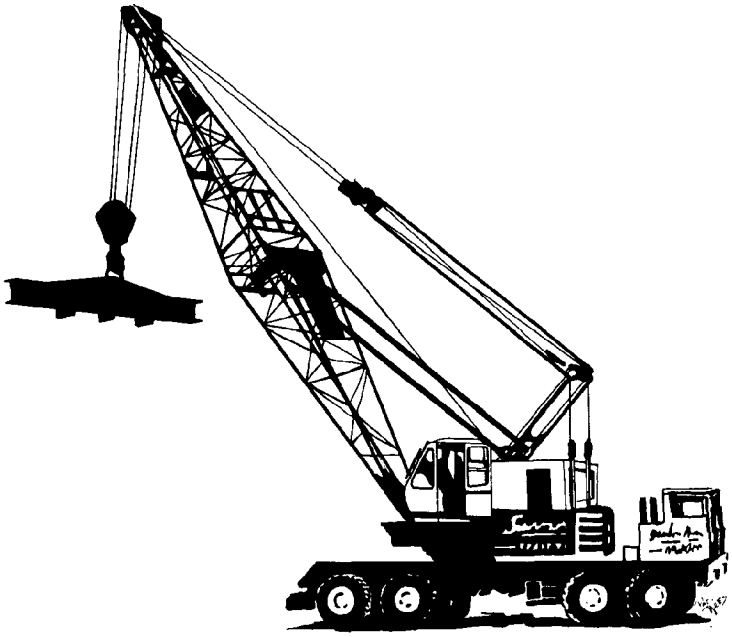
*Expenditures are given in millions of dollars.

Figure 156. Total Expenditures/Scenario II

Time Period	ACTIVITY																						
	Drilling Contractors		Helicopter Services		Boat Services		Well Logging		Diving Services		Cement		Mud		Oil Field Equipment Supply		Pipeline Laying		
	Region VI	Region VII	Region VI	Region VII	Region VI	Region VII	Region VI	Region VII	Region VI	Region VII	Region VI	Region VII	Region VI	Region VII	Region VI	Region VII	Region VI	Region VII	
7/77-10/77	0	.579	0	.041	0	.253	0	.036	0	.103	0	.107	0	.130	0	.276	0	0	1.525
10/77-1/78	0	1.158	0	.083	0	.507	0	.036	0	.003	0	.107	0	.130	0	.276	0	0	2.400
1/78-4/78	.579	1.158	.042	.083	.253	.507	0	.072	0	.205	0	.214	0	.260	.276	.276	0	0	3.925
4/78-7/78	.579	1.158	.042	.083	.253	.507	0	.072	0	.205	0	.214	0	.260	.276	.276	0	0	3.925
7/78-10/78	.579	1.158	.042	.083	.253	.507	0	.072	0	.205	0	.214	0	.260	.276	.276	0	0	3.925
10/78-1/79	.579	1.158	.042	.083	.253	.507	0	.072	0	.205	0	.214	0	.260	.276	.276	0	0	3.925
1/79-4/79	.579	1.158	.042	.083	.253	.507	0	.072	0	.205	0	.214	0	.260	.276	.276	0	0	3.925
4/79-7/79	.579	1.158	.042	.083	.253	.507	0	.072	0	.205	0	.214	0	.260	.276	.276	0	0	3.925
7/79-8/79	.193	.386	.014	.028	.084	.169	0	.024	0	.068	0	.071	0	.087	.092	.092	0	0	1.308
8/79-11/79	.579	1.158	.042	.083	.253	.507	0	.072	0	.205	0	.214	0	.260	.276	.276	0	0	3.925
11/79-2/80	.579	1.158	.042	.083	.253	.507	0	.072	0	.205	0	.214	0	.260	.276	.276	0	0	3.925
2/80-5/80	.579	1.158	.042	.083	.253	.507	0	.072	0	.205	0	.214	0	.260	.276	.276	0	0	3.925
5/80-8/80	.579	.579	.042	.083	.253	.507	0	.072	0	.205	0	.214	0	.260	.276	.276	0	0	3.346
8/80-11/80	0	.579	.042	.083	.253	.507	0	.072	0	.205	0	.214	0	.260	.276	.276	0	0	2.767
11/80-1/81	0	0	.028	.055	.169	.338	0	.048	0	.137	0	.143	0	.173	.184	.184	1.71	1.71	4.879
1/81-7/81	0	1.081	0	.248	.506	1.013	0	.114	0	.411	0	.429	0	.520	.552	.552	5.12	5.12	15.696
7/81-11/81	.721	.721	.167	.165	.338	.675	0	.096	0	.274	0	.286	0	.347	.368	.368	3.41	3.41	11.346
11/81-3/82	.721	.926	.167	.165	.338	.675	0	.096	0	.274	0	.286	0	.347	.368	.368	3.41	3.41	11.551
3/82-6/82	.540	.695	.125	.248	.253	.507	0	.072	0	.205	0	.214	0	.260	.276	.276	2.56	2.56	8.791
6/82-8/82	.360	.824	.167	.165	.169	.506	0	.048	0	.137	0	.143	0	.173	.184	.184	1.71	1.71	6.48
8/82-2/83	1.081	3.088	.500	.496	.506	1.519	0	.144	0	.411	0	.429	0	.520	.552	.552	0	0	9.798
2/83-8/83	1.390	3.088	.500	.744	.506	2.026	0	.144	0	.411	0	.429	0	.520	.552	.552	0	0	10.862
8/83-11/83	.695	1.544	.250	.496	.253	1.266	0	.072	0	.205	0	.214	0	.390	.276	.552	0	0	6.213
11/83-12/83	.232	.515	.083	.207	.084	.506	0	.024	0	.068	0	.071	0	.180	.092	.184	0	0	2.196
12/83-1/84	.232	.565	.083	.207	.084	.506	0	.024	0	.068	0	.071	0	.180	.092	.184	0	0	2.247
1/84-7/84	1.390	3.706	.500	1.239	.506	3.039	0	.144	0	.411	0	.429	0	.780	.552	1.104	0	0	13.800
SUB-TOTAL	13.345	30.457	3.046	5.500	6.579	19.082	0	1.944	0	5.541	0	5.783	0	7.497	7.176	8.740	17.92	17.92	
TOTAL	43.802		8.546		25.661		1.944		5.541		5.783		7.497		15.916		35.84		150.530
GRAND TOTAL									116.090										

NOTE: Expenditures are given in millions of dollars

Thus, it can be seen that expenditures will total $48,060,000 in Region VI and $102,464,000 in Region VII for a total of $150,530,000.



9. PRIMARY AND INDIRECT PERSONAL INCOME

Personal income, both primary and indirect, generated by the three phases of Scenario II were, once again, calculated by using personal income coefficients of the OCSOG Model (see Appendix E). Those are revealed in Figure 157.

Figure 157

Personal Income Coefficients of the OCS Model

Primary Activity	Coefficients (Dollars/Per Employee/Per Year) Region VI	Region VII
Drilling Contractors	22,461	21,316
Helicopter Service	24,880	22,801
Boat Service	11,474	11,138
Well Logging	NA	7,209
Diving	NA	22,905
Cement	NA	24,186
Mud	NA	15,890
Oil Field Equipment Supply	23,125	21,752
Pipeline Laying	56,816	56,816

(Note: NA = Not applicable in Scenario II.)

The personal income coefficients displayed in Figure 157 were used to calculated the personal incomes shown in Figure 158.

Figure 158

Personal Income/Scenario II

Time Period	Region VI	Region VII	Total
7/77-10/77	0	$ 855,426	$ 855,426
10/77- 1/78	0	1,331,623	1,331,623
1/78- 4/78	$ 684,483	1,536,834	2,221,317
4/78- 7/78	684,483	1,536,834	2,221,317

7/78-10/78	684,483	1,536,834	2,221,317
10/78-1/79	684,483	1,536,834	2,221,317
1/79-4/79	684,483	1,536,834	2,221,317
4/79-7/79	684,483	1,536,834	2,221,317
7/79-8/79	228,161	512,278	740,439
8/79-11/79	684,483	1,536,834	2,221,317
11/79-2/80	684,483	1,536,834	2,221,317
2/80-5/80	684,483	1,536,834	2,221,317
5/80-8/80	684,483	1,217,094	1,901,577
8/80-11/80	347,568	1,217,094	1,564,662
11/80-1/81	989,259	1,355,783	2,345,042
1/81-7/81	2,918,016	4,709,797	7,627,813
7/81-11/81	2,464,136	3,139,863	5,603,999
11/81-3/82	2,464,136	3,253,549	5,717,685
3/82-6/82	1,848,102	2,508,566	4,356,668
6/82-8/82	1,281,828	1,960,431	3,242,259
8/82-2/83	1,572,844	3,949,707	5,522,551
2/83-8/83	1,752,532	4,353,825	6,106,357
8/83-11/83	876,266	2,604,631	3,480,897
11/83-12/83	292,089	935,564	1,227,653
12/83-1/84	292,089	963,985	1,256,074
1/84-7/84	1,752,532	5,954,434	7,706,966
TOTAL	$25,924,388	$54,655,156	$80,579,544

10. STATE TAX REVENUE

Primary State Tax Revenue

The direct tax payments to the State government in each affected study site from the exploration, development, and production phases of Scenario II are calculated by using the direct state tax payment coefficients of the OCSOG Model (see Appendix E). Figure 159 displays those coefficients.

Figure 159

Tax Payment Coefficients of OCSOG Model

Primary Activity	Tax Payment Coefficient ($Million Annually Per Employee) Region VI	Region VII
Drilling Contractors	.0059	.0026
Helicopter Service	.0056	.0055
Boat Service	.0012	.0012
Well Logging	NA	.0018
Diving	NA	.0019
Cement	NA	.0021
Mud	NA	.0018
Oil Field Equipment Supply	.0022	.0022
Pipeline Laying	.0022	.0022

(Note: NA = Not Applicable in Scenario II)

Using those coefficients, primary state tax payments were derived for each affected study site over time; they are displayed in Figure 160.

Figure 160

Primary State Tax Payments/Scenario II

Time Period	Region VI	Region VII	Total
7/77-10/77	0	$ 9,252	$ 9,252
10/77- 1/78	0	12,656	12,656

1/78- 4/78	$ 6,044	15,753	21,797
4/78- 7/78	6,044	15,753	21,797
7/78-10/78	6,044	15,753	21,797
10/78- 1/79	6,044	15,753	21,797
1/79- 4/79	6,044	15,753	21,797
4/79- 7/79	6,044	15,753	21,797
7/79- 8/79	2,015	5,251	7,266
8/79-11/79	6,044	15,753	21,797
11/79- 2/80	6,044	15,753	21,797
2/80- 5/80	6,044	15,753	21,797
5/80- 8/80	6,044	15,183	21,227
8/80-11/80	5,549	15,183	20,732
11/80- 1/81	50,659	56,702	107,361
1/81- 7/81	151,312	171,797	323,109
7/81-11/81	102,823	114,531	217,354
11/81- 3/82	102,823	114,734	217,557
3/82- 6/82	77,117	86,993	164,110
6/82- 8/82	52,077	60,030	112,107
8/82- 2/83	15,352	39,817	55,169
2/83- 8/83	15,616	46,741	62,357
8/83-11/83	7,808	30,885	38,693
11/83-12/83	2,603	11,450	14,053
12/83- 1/84	2,603	11,500	14,103
1/84- 7/84	15,616	69,301	84,917
TOTAL	$664,413	$1,013,783	
GRAND TOTAL		$1,678,196	

Indirect State Tax Revenue

Indirect tax payments generated by the exploration, development, and production phases of Scenario II were, like direct tax payments, calculated by using the indirect tax payment coefficients of the OCSOG Model (see Appendix E). Indirect state tax coefficients are shown in Figure 161.

Figure 161

Indirect State Tax Coefficients of OCSOG Model

Primary Activity	Coefficients (Dollars/Per Employee/Per Year) Region VI	Region VII
Drilling Contractors	180	250
Helicopter Service	185	240
Boat Service	87	72
Well Logging	NA	102
Diving	NA	195
Cement	NA	249
Mud	NA	43
Oil Field Equipment Supply	198	248
Pipeline Laying	1036	1036

(Note: NA = Not applicable in Scenario II.)

The indirect state tax coefficients in Figure 161 were used to calculate the indirect state tax payments shown in Figure 162.

Figure 162

Indirect State Tax Payments/Scenario II

Time Period	Region VI	Region VII	Total
7/77-10/77	0	$ 8,516	$ 8,516
10/77- 1/78	0	13,370	13,370
1/78- 4/78	$ 5,513	15,049	20,562
4/78- 7/78	5,513	15,049	20,562
7/78-10/78	5,513	15,049	20,562
10/78- 1/79	5,513	15,049	20,562
1/79- 4/79	5,513	15,049	20,562
4/79- 7/79	5,513	15,049	20,562
7/79- 8/79	1,838	5,016	6,854
8/79-11/79	5,513	15,049	20,562
11/79- 2/80	5,513	15,049	20,562
2/80- 5/80	5,513	15,049	20,562
5/80- 8/80	5,513	11,299	16,812

8/80-11/80	2,813	11,299	14,112
11/80- 1/81	15,688	18,845	34,533
1/81- 7/81	46,696	64,016	110,712
7/81-11/81	35,231	42,678	77,909
11/81- 3/82	35,231	44,011	79,242
3/82- 6/82	26,423	33,729	60,152
6/82- 8/82	17,985	25,394	43,379
8/82- 2/83	12,516	38,744	51,260
2/83- 8/83	13,956	41,912	55,868
8/83-11/83	6,978	24,664	13,642
11/83-12/83	2,326	8,750	11,076
12/83- 1/84	2,326	9,084	11,410
1/84- 7/84	13,956	56,496	70,452
TOTAL	$289,093	$593,264	
GRAND TOTAL		$882,357	

Aggregated primary and indirect tax payments to the State government can be calculated by adding the payments displayed in Figure 160 to the indirect tax payments of the same time periods. The result is presented in Figure 163, Aggregated State Tax Payments/Scenario II.

Figure 163

Aggregated State Tax Payments/Scenario II

Time Period	Region VI	Region VII	Total
7/77-10/77	0	$ 17,768	$ 17,768
10/77- 1/78	0	26,026	26,026
1/78- 4/78	$ 11,557	30,802	42,359
4/78- 7/78	11,557	30,802	42,359
7/78-10/78	11,557	30,802	42,359
10/78- 1/79	11,557	30,802	42,359
1/79- 4/79	11,557	30,802	42,359
4/79- 7/79	11,557	30,802	42,359
7/79- 8/89	3,853	10,267	14,120
8/79-11/79	11,557	30,802	42,359
11/79- 2/80	11,557	30,802	42,359
2/80- 5/80	11,557	30,802	42,359

5/80- 8/80	11,557	26,482	38,039
8/80-11/80	8,362	26,482	34,844
11/80- 1/81	66,347	75,547	141,894
1/81- 7/81	198,008	235,813	433,821
7/81-11/81	138,054	157,209	295,263
11/81- 3/82	138,054	158,745	296,799
3/82- 6/82	103,540	120,722	224,262
6/82- 8/82	70,062	85,424	155,486
8/82- 2/83	27,868	78,561	106,429
2/83- 8/83	29,572	88,563	118,225
8/83-11/83	14,786	55,549	70,335
11/83-12/83	4,929	20,200	25,129
12/83- 1/84	4,929	20,584	25,513
1/84- 7/84	29,572	125,797	155,369
TOTAL	$953,506	$1,607,047	
GRAND TOTAL		$2,560,553	

It must be noted that the tax payments for any given time period in Figure 163 represent only the amount of tax dollars accruing to the affected unit or units of government during that time period. They do not indicate that the affected unit or units of government actually collect that amount of tax revenue during that particular time period. Indeed, in many cases there may be a significant time lag between the time that taxes accrue to a unit of government and the time at which that unit of government actually collects those taxes. Thus, we see only tax accruals in Figure 163; the actual time and amount of tax payments will be further analyzed in succeeding chapters.

11. LOCAL TAX REVENUE

Primary Local Tax Revenue

The direct tax payments to local governments in each affected study site from the exploration, development and production activities of Scenario II are calculated by using the direct local tax payment coefficients of the OCSOG Model (Appendix E). Figure 164 displays those coefficients.

Figure 164

Tax Payment Coefficients of OCSOG Model

Primary Activity	Tax Payment Coefficient ($ Million Annually Per Employee). Region VI	Region VII
Drilling Contractors	.0059	.0026
Helicopter Service	.0056	.0055
Boat Service	.0012	.0012
Well Logging	NA	.0018
Diving	NA	.0019
Cement	NA	.0021
Mud	NA	.0018
Oil Field Equipment Supply	.0022	.0022
Pipeline Laying	.0022	.0022

(Note: NA = Not Applicable in Scenario II)

Using those coefficients, primary local tax payments were derived for each affected study site over time; they are displayed in Figure 165.

Figure 165

Primary Local Tax Payments/Scenario II

Time Period	Region VI	Region VII	Total
7/77-10/77	0	$ 9,307	$ 9,307
10/77- 1/78	0	14,876	14,876
1/78- 4/78	$ 7,459	16,550	24,009
4/78- 7/78	7,459	16,550	24,009
7/78-10/78	7,459	16,550	24,009
10/78- 1/79	7,459	16,550	24,009
1/79- 4/79	7,459	16,550	24,009
4/79- 7/79	7,459	16,550	24,009
7/79- 8/79	2,487	5,516	8,003
8/79-11/79	7,459	16,550	24,009
11/79- 2/80	7,459	16,550	24,009
2/80- 5/80	7,459	16,550	24,009
5/80- 8/80	7,459	15,980	23,439
8/80-11/80	6,964	15,980	22,944
11/80- 1/81	17,975	23,606	41,581
1/81- 7/81	49,040	76,841	125,881
7/81-11/81	43,086	51,227	94,313
11/81- 3/82	43,086	51,430	94,516
3/82- 6/82	32,314	46,010	78,324
6/82- 8/82	26,430	32,708	59,138
8/82- 2/83	39,292	58,731	98,023
2/83- 8/83	39,556	78,645	118,201
8/83-11/83	19,778	51,994	71,772
11/83-12/83	6,593	20,650	27,243
12/83- 1/84	6,593	20,700	27,293
1/84- 7/84	39,556	124,509	164,065
TOTAL	$447,340	$847,660	
GRAND TOTAL		$1,295,000	

Indirect Local Tax Revenue

Indirect tax payments generated by the exploration, development, and production phases of Scenario II were, like direct tax payments, calculated by using the indirect tax payment coefficients of the OCSOG Model (Appendix E). Indirect local tax payment coefficients are shown in Figure 166.

Figure 166

Indirect Local Tax Coefficients of OCSOG Model

Primary Activity	Coefficients (Dollars/Per Employee/Per Year) Region VI	Region VII
Drilling Contractors	180	217
Helicopter Service	207	185
Boat Service	71	88
Well Logging	NA	71
Diving	NA	142
Cement	NA	177
Mud	NA	44
Oil Field Equipment Supply	127	163
Pipeline Laying	573	573

(Note: NA = Not applicable in Scenario II.)

The indirect local tax coefficients shown in Figure 166 were used to calculate the indirect local tax payments shown in Figure 167.

Total Local Tax Revenue

Aggregated primary and indirect tax payments to the local governments can be calculated by adding the payments displayed in Figure 165 to the indirect tax payments of the same time periods. The result is presented in Figure 168, Aggregated Local Tax Payments/Scenario II.

It must be noted that the tax payments for any given time period in Figure 168 represent only the amount of tax dollars accruing to the affected unit or units of government during that time period. They do not indicate that the affected unit or units of government actually collect that amount of tax revenue during that particular time period. Indeed, in many cases there may be a significant time lag between the time that taxes accrue to a unit government and the time at which that unit of government actually collects those taxes. Thus, we see only tax accruals in Figure 168; the actual time and amount of tax payments will be further analyzed in succeeding chapters.

Figure 167

Indirect Tax Payments to Local Governments/Scenario II

Time Period	Region VI	Region VII	Total
7/77-10/77	$ 0	$ 7,043	$ 7,043
10/77- 1/78	0	11,539	11,539
1/78- 4/78	4,775	12,780	17,555
4/78- 7/78	4,775	12,780	17,555
7/78-10/78	4,775	12,780	17,555
10/78- 1/78	4,775	12,780	17,555
1/79- 4/79	4,775	12,780	17,555
4/79- 7/79	4,775	12,780	17,555
7/79- 8/79	1,592	4,249	5,851
8/79-11/79	4,775	12,780	17,555
11/79- 2/80	4,775	12,780	17,555
2/80- 5/80	4,775	12,780	17,555
5/80- 8/80	4,775	9,525	14,300
8/80-11/80	2,075	9,525	11,600
11/80- 1/81	9,023	11,821	20,844
1/81- 7/81	26,656	41,906	68,562
7/81-11/81	21,959	27,937	49,896
11/81- 3/82	21,959	29,094	51,053
3/82- 6/82	16,469	22,376	38,845
6/82- 8/82	11,393	17,647	29,040
8/82- 2/83	11,260	33,492	44,752
2/83- 8/83	12,700	36,714	49,414
8/83-11/83	6,350	21,415	27,765
11/83-12/83	2,117	7,674	9,791
12/83- 1/84	2,117	7,674	10,081
1/84- 7/84	12,700	49,524	62,224
TOTAL	$206,120	$464,475	
GRAND TOTAL	$670,595		

Figure 168

Aggregated Local Tax Payments/Scenario II

Time Period	Region VI	Region VII	Total
7/77-10/77	0	$ 16,350	$ 16,350
10/77- 1/78	0	26,415	26,415
1/78- 4/78	$ 12,234	29,330	41,564
4/78- 4/78	12,234	29,330	41,564
7/78-10/78	12,234	29,330	41,564
10/78- 1/79	12,234	29,330	41,564
1/79- 4/79	12,234	29,330	41,564
4/79- 7/79	12,234	29,330	41,564
7/79- 8/79	4,079	9,775	13,854
8/79-11/79	12,234	29,330	41,564
11/79- 2/80	12,234	29,330	41,564
2/80- 5/80	12,234	29,330	41,564
5/80- 8/80	12,234	25,505	37,739
8/80-11/80	9,039	25,505	34,544
11/80- 1/81	26,998	35,427	62,425
1/81- 7/81	75,696	118,747	194,443
7/81-11/81	65,045	79,164	144,209
11/81- 3/82	65,045	80,524	145,569
3/82- 6/82	48,783	68,386	117,169
6/82- 8/82	37,823	50,355	88,178
8/82- 2/83	50,552	92,223	142,775
2/83- 8/83	52,256	115,359	167,615
8/83-11/83	26,128	73,409	99,537
11/83-12/83	8,710	28,324	37,034
12/83- 1/84	8,710	28,664	37,374
1/83- 7/84	52,256	174,033	226,289
TOTAL	$653,460	$1,312,135	
GRAND TOTAL	$1,965,595		

12. DOMESTIC AND MUNICIPAL WATER REQUIREMENTS

The computation of domestic and municipal water requirements over time in Scenario II follows the approach established for Scenario I. The coefficient of residential and municipal water demand used is 120 gallons per person per day and subsumes water use in households, beautification, street cleaning and so forth.

Figure 169 presents total new domestic and municipal water requirements in Scenario II for each affected region.

Figure 169

Total New Domestic and Municipal Water Requirements

(acre-feet)

Time Period	Region VI	Region VII
7/77-10/77	0	13.2
10/77- 1/78	0	20.7
1/78- 4/78	10.5	24.3
4/78- 7/78	10.5	24.3
7/78-10/78	10.5	24.3
10/78- 1/79	10.5	24.3
1/79- 4/79	10.5	24.3
4/79- 7/79	10.5	24.3
7/79- 7/79	3/6	8.1
8/79-11/79	10.5	24.3
11/79- 2/80	10.5	24.3
2/80- 5/80	10.5	24.3
5/80- 8/80	10.5	24.3
8/80-11/80	10.5	24.3
11/80- 1/81	6.9	16.2
1/81- 7/81	29.7	74.4
7/81-11/81	28.2	49.5
11/81- 3/82	28.2	49.5
3/82- 6/82	21.0	37.2
6/82- 8/82	14.1	29.4
8/82- 2/82	35.4	80.4
2/83- 8/83	49.5	125.4
8/83-11/83	21.0	57.0
11/83- 1/84	6.9	19.2
12/83- 1/84	6.9	19.5
1/84- 7/84	42.3	140.7
TOTAL	409.2	1,007.7

13. RESIDENTIAL LAND REQUIREMENTS

New residential land requirements in Scenario II were derived as described in the "Analysis of Scenarios", Part B. Figure 170 presents new occupancy trends in Regions VI and VII expressed as the percent of new occupants residing in apartment (more than 4 families) units, single family units, and mobile home units.

Figure 170

Current Locational Trends in New Occupancy

	Apartment Units	Single Family Units	Mobile Home Units
Region VI	36%	49%	15%
Region VII	35%	45%	20%

Figure 171 presents acreage requirements per unit housing type. These coefficients were derived as described in the "Analysis of Scenarios" and subsume the proportion of parking space, open space, and on-site access roads as well as the footage of the housing unit itself.

Figure 171

Acreage Requirements for Housing Unit Types

	Apartment Units	Single Family Units	Mobile Home Units
Acreage per unit	.05	.20	.12

New residential land requirements for new housing units are derived by multiplying the number of new housing units by appropriate percentage values of Figure 170 and then by multiplying the resulting number of multifamily, single family, and mobile home units by the appropriate values of Figure 171. Figure 172 presents the calculated new residential land requirements in Scenario II.

Figure 172

Residential Land Requirements

Time Period	Region VI	Region VII
7/77-10/77	0	17.9
10/77- 1/78	0	28.4
1/78- 4/78	14.2	33.0
4/78- 7/78	14.2	33.0
7/78-10/78	14.2	33.0
10/78- 1/79	14.2	33.0
1/79- 4/79	14.2	33.0
4/79- 7/79	14.2	33.0
7/79- 8/79	14.2	33.0
8/79-11/79	14.2	33.0
11/79- 2/80	14.2	33.0
2/80- 5/80	14.2	33.0
5/80- 8/80	14.2	33.0
8/80-11/80	14.2	33.0
11/80- 1/81	14.2	33.0
1/81- 7/81	20.3	50.1
7/81-11/81	29.2	50.1
11/81- 3/82	29.2	50.1
3/82- 6/82	29.2	50.1
6/82- 8/82	29.2	50.9
8/82- 2/83	29.2	65.0
2/83- 8/83	29.2	72.4
8/83-11/83	29.2	77.0
11/83-12/83	29.2	77.3
12/83- 1/84	29.2	78.7
1/84- 7/84	29.2	94.8

The residential land requirements shown in Figure 172 are not additions to the total land requirements shown in Figure 138. Rather, the amounts shown in Figure 172 represent only the residential land portion of the amounts shown in Figure 138.

14. ECONOMIC IMPACT ANALYSIS

Introduction

Part B contains an extensive discussion of the process by which economic/fiscal impact was analyzed. The analysis in this chapter was performed in accordance with that process. In short, infrastructural costs, tax revenues, and net fiscal impact are analyzed below.

Infrastructural Costs

As Part B explained, the key to understanding infrastructural costs to units of government affected by Scenario II activities is contained in the per capita service costs of those units of government as they are currently constituted. Using the procedure outlined in Part B, the information contained in Figure 173 was derived.

When that data is applied to the projected increases in population over time associated with Scenario II, Figures 174 (for Region VI), and 175 (for Region VII) result. Each figure shows the costs to local, county, and State governments in columns C, D, and H, respectively. These cost estimates were derived by multiplying the population figure in column B by the appropriate per capita annual service cost in Figure 173, adjusted to correspond with the length of the time period in Column A. The cost to local governments is calculated inclusive of county government expenditures.

Fiscal Impact

Cost data alone present an incomplete picture of the two-sided fiscal impact; they must be subtracted from the corresponding tax revenues to show the net gains or losses to government treasuries from OCS development. This was also done in Figures 174 and 175; columns F and J reveal the resulting tax revenue surplus or deficit for local and State governments, respectively. The parentheses indicate deficits. The process by which the fiscal impact is determined is distilled to a form readily usable by local officials in Part B.

Figure 173

Government Expenditures/Scenario II

	Region VI (San Patricio and Nueces Counties	Region VII (Cameron, Hidalgo, and Willacy Counties)
1. Population (1972 Est.)	297,900	365,500
2. Local Gov't. Expenditures	$98,239,000	$72,471,000
3. Local Gov't. Per Capita Expenditures	$ 330	$ 198
4. County Expenditures (included in Item #2)	$ 8,553,000	$ 9,069,000
5. County Gov't. Per Capita Expenditures (included in Item #3)	$ 29	$ 25
6. State Gov't. Expenditures	$ 60,356,000	$ 80,640,000
7. State Gov't. Per Capita Expenditures	$ 203	$ 221

Figure 174. Fiscal Impact/Region VI/Scenario II

A[1]	B[2]	C	D[3]	E[4]	F	G[5]	H	I[6]	J	K[5]
Time Period	Population	Cost to Local Governments (Pop.x$198 Annually)	Cost to County Governments (Pop.x $25 Annually)	Local Tax Revenue	Local Tax Revenue Surplus or Deficit	Present Value of Local Tax Revenue Surplus or Deficit	Cost to State Government (Pop.x$203 Annually	State Tax Revenue	State Tax Revenue Surplus or Deficit	Present Value of State Tax Revenue Surplus or Deficit
7/77-10/77	0	0	0	0	0	0	0	0	0	0
10/77-1/78	0	0	0	0	0	0	0	0	0	0
1/78-4/78	313	25,823	2,296	12,234	($13,589)	(13,008)	15,885	11,557	(4,328)	(4,143)
4/78-7/78	313	25,823	2,296	12,234	(13,589)	(12,820)	15,885	11,557	(4,328)	(4,083)
7/78-10/78	313	25,823	2,296	12,234	(13,589)	(12,634)	15,885	11,557	(4,328)	(4,024)
10/78-1/79	313	25,823	2,296	12,234	(13,589)	(12,452)	15,885	11,557	(4,328)	(3,966)
1/79-4/79	313	25,823	2,296	12,234	(13,589)	(12,272)	15,885	11,557	(4,328)	(3,908)
4/79-7/79	313	25,823	2,296	12,234	(13,589)	(12,094)	15,885	11,557	(4,328)	(3,852)
7/79-8/79	313	8,608	756	4,079	(4,529)	(4,011)	5,295	3,853	(1,442)	(1,277)
8/79-11/79	313	25,823	2,296	12,234	(13,589)	(11,862)	15,885	11,557	(4,328)	(3,778)
11/79-2/80	313	25,823	2,296	12,234	(13,589)	(11,690)	15,885	11,557	(4,328)	(3,723)
2/80-5/80	313	25,823	2,296	12,234	(13,589)	(11,521)	15,885	11,557	(4,328)	(3,669)
5/80-8/80	313	25,823	2,296	12,234	(13,589)	(11,354)	15,885	11,557	(4,328)	(3,616)
8/80-11/80	313	25,823	2,296	9,039	(16,784)	(13,821)	15,885	8,362	(7,523)	(6,195)
11/80-1/81	319	17,545	1,542	26,998	9,453	7,709	10,793	66,347	55,554	45,305
1/81-7/81	446	73,590	6,467	75,696	2,106	1,668	45,269	198,008	152,739	120,984
7/81-11/81	640	70,400	6,187	65,045	(5,355)	(4,160)	43,307	138,054	94,747	73,605
11/81-3/82	640	70,400	6,187	65,045	(5,355)	(4,080)	43,307	138,054	94,747	72,189
3/82-6/82	640	52,800	4,640	48,783	(4,017)	(3,016)	32,480	103,540	71,060	53,359
6/82-8/82	640	35,200	3,093	37,823	2,623	1,951	21,653	70,062	48,409	35,999
8/82-2/83	640	105,600	9,280	50,552	(55,048)	(39,760)	64,960	27,868	(37,092)	(26,791)
2/83-8/83	640	105,600	9,280	52,256	(53,344)	(37,423)	64,960	29,572	(35,388)	(24,826)
8/83-11/83	640	52,800	4,640	26,128	(26,672)	(18,441)	32,480	14,786	(17,694)	(12,234)
11/83-12/83	640	17,600	1,547	8,710	(8,890)	(6,117)	10,827	4,929	(5,898)	(4,058)
12/83-1/84	640	17,600	1,547	8,710	(8,890)	(6,087)	10,827	4,929	(5,898)	(4,058)
1/84-7/84	640	105,600	9,280	52,256	(53,344)	(35,477)	64,960	29,572	(35,388)	(23,535)
TOTAL*		$1,017,396	$89,702	$653,460	($363,936)	($282,772)	$625,853	$953,506	$327,653	$259,725

1. Taken from Figure 124.
2. Taken from Figure 150.
3. The figures in Column D are included in the corresponding figures of Column C.
4. Taken from Figure 168.
5. Assumes an interest rate of 6 percent.
6. Taken from Figure 163.

*Entries may not add to totals due to rounding.

Figure 175. Fiscal Impact/Region VII/Scenario II

A[1]	B[2]	C	D[3]	E[4]	F	G[5]	H	I[6]	J	K[5]
Time Period	Population	Cost to Local Governments (Pop.x$ 198 Annually)	Cost to County Governments (Pop.x $25 Annually)	Local Tax Revenue	Local Tax Revenue Surplus or Deficit	Present Value of Local Tax Revenue Surplus or Deficit	Cost to State Government (Pop.x$221 Annually	State Tax Revenue	State Tax Revenue Surplus or Deficit	Present Value of State Tax Revenue Surplus or Deficit
7/77-10/77	400	$ 19,800	$ 2,500	$ 16,350	($ 3,450)	($ 3,400)	$ 22,100	$ 17,768	($ 4,332)	($ 4,269)
10/77-1/78	630	31,185	3,938	26,415	(4,770)	(4,633)	34,918	26,026	(8,892)	(8,637)
1/78-4/78	737	36,482	4,606	29,330	(7,152)	(6,846)	40,719	30,802	(9,917)	(9,493)
4/78-7/78	737	36,482	4,606	29,330	(7,152)	(6,747)	40,719	30,802	(9,917)	(9,356)
7/78-10/78	737	36,482	4,606	29,330	(7,152)	(6,650)	40,719	30,802	(9,917)	(9,220)
10/78-1/79	737	36,482	4,606	29,330	(7,152)	(6,553)	40,719	30,802	(9,917)	(9,087)
1/79-4/79	737	36,482	4,606	29,330	(7,152)	(6,459)	40,719	30,802	(9,917)	(8,956)
4/79-7/79	737	36,482	4,606	29,330	(7,152)	(6,365)	40,719	30,802	(9,917)	(8,826)
7/79-8/79	737	12,161	1,535	9,775	(2,386)	(2,245)	13,573	10,267	(3,306)	(3,111)
8/79-11/79	737	36,482	4,606	29,330	(7,152)	(6,243)	40,719	30,802	(9,917)	(8,656)
11/79-2/80	737	36,482	4,606	29,330	(7,152)	(6,153)	40,719	30,802	(9,917)	(8,531)
2/80-5/80	737	36,482	4,606	29,330	(7,152)	(6,064)	40,719	30,802	(9,917)	(8,408)
5/80-8/80	737	36,482	4,606	25,505	(10,977)	(9,172)	40,719	26,482	(14,237)	(11,896)
8/80-11/80	737	36,482	4,606	25,505	(10,977)	(9,039)	40,719	26,482	(14,237)	(11,724)
11/80-1/81	737	24,321	3,071	35,427	11,106	9,057	27,146	75,547	48,401	39,472
1/81-7/81	1,121	110,979	14,013	118,747	7,768	6,153	123,870	235,813	111,943	88,669
7/81-11/81	1,121	73,986	9,342	79,164	5,178	4,023	82,580	157,209	74,629	57,976
11/81-3/82	1,121	73,986	9,342	80,524	6,538	4,981	82,580	158,745	76,165	58,031
3/82-6/82	1,121	55,490	7,006	68,386	12,896	9,684	61,935	120,722	58,787	44,143
6/82-8/82	1,339	44,187	5,579	50,355	6,168	4,587	49,320	85,424	36,104	26,848
8/82-2/83	1,453	143,957	18,163	92,223	(51,734)	(37,367)	160,557	78,561	(81,996)	(59,225)
2/83-8/83	1,620	160,380	20,250	115,359	(45,021)	(31,584)	179,010	88,653	(90,357)	(63,390)
8/83-11/83	1,723	85,289	10,769	73,409	(11,880)	(8,214)	95,196	55,549	(39,647)	(27,412)
11/83-12/83	1,728	28,512	3,600	28,324	(188)	(129)	31,824	20,200	(11,624)	(7,998)
12/83-1/84	1,760	29,040	3,667	28,664	(376)	(257)	32,413	20,584	(11,829)	(8,100)
1/84-7/84	2,122	210,078	26,525	174,033	(36,045)	(23,972)	234,481	125,797	(108,684)	(72,281)
TOTAL*		$1,504,653	$189,966	$1,312,135	($192,518)	($149,607)	$1,679,412	$1,607,047	($72,365)	($43,437)

1. Taken from Figure 124.
2. Taken from Figure 150.
3. The figures in Column D are included in the corresponding figures of Column C.
4. Taken from Figure 168.
5. Assumes an interest rate of 6 percent.
6. Taken from Figure 163.

*Entries may not add to totals due to rounding.

Because the revenues flow over a time span of 7 years, the surpluses or deficits are discounted to present value and presented in Column G for the local governments, and column K for the State government. An interest rate of six percent was used; its choice is explained in Part B.

The existence and size of the expected deficits on both the local and State levels is the most salient feature of Figures 174 and 175. Fiscal impact is nota direct function of population; it is more in Region VI where the increase in population is expected to be less, and smaller in Region VII where the increase in population is expected to be greater.

Even the State incurs deficits in Region VII due to fairly high per capita expenditure levels. The aggregated State revenues are presented in Figure 176.

Figures 174 through 176 are helpful in that they describe the dollar amounts of surpluses or deficits experienced by local or State governments in each affected study site of Scenario II, based on the postulated activities of Scenario II. Nevertheless, understanding of the data might be enhanced by a presentation of the percentage of projected costs which are covered by projected revenues over time in each affected study site. Figures 177 and 178 (for Regions VI and VII, respectively) and 179 (combined State revenues) show such information.

A review of these figures reveals similar revenue/cost ratio curves between regions, even though actual dollar deficits differ between study sites and between the State and local governments within any one study site. These dollar differences are due primarily to the following reasons:

1. Each affected study site has a different set of postulated OCS-related activities, time periods during which those activities take place, and number of workers involved in those activities over time.

2. Each activity has its own tax multipliers for tax payments (direct and indirect to local governments and for tax payments (direct and indirect) to State government.

3. Each affected study site has a different per capita cost for local government services and for State government services.

As a result, the net fiscal impact of each activity in terms of tax revenue surplus or deficit per employee per year, presented in Figure 180 for the local governments and in Figure 181 for the State government, varies for each region and unit of government. Its derivation is discussed in Part B.

Only two activities, helicopter services and pipeline laying, are identified in Figure 180 as providing for each employee sufficient tax

Figure 176

Total State Tax Revenue
(Scenario II)

Time Period[1]	Combined[2] State Revenues	Combined[3] State Costs	Combined Tax[4] Revenue Surplus or Deficit	Present Value of Combined Tax[5] Revenue Surplus or Deficit
7/77-10/77	$ 17,768	$ 22,100	($ 4,332)	($ 4,269)
10/77-1/78	26,026	34,918	(8,892)	(8,637)
1/78-4/78	42,359	56,604	(14,245)	(13,636)
4/78-7/78	42,359	56,604	(14,245)	(13,439)
7/78-10/78	42,359	56,604	(14,245)	(13,244)
10/78-1/79	42,359	56,604	(14,245)	(13,053)
1/79-4/79	42,359	56,604	(14,245)	(12,864)
4/79-7/79	42,359	56,604	(14,245)	(12,678)
7/79-8/79	14,120	18,868	(4,748)	(4,205)
8/79-11/79	42,359	56,604	(14,245)	(12,434)
11/79-2/80	42,359	56,604	(14,245)	(12,254)
2/80-5/80	42,359	56,604	(14,245)	(12,077)
5/80-8/80	38,039	56,604	(18,565)	(15,512)
8/80-11/80	34,844	56,604	(21,760)	(17,919)
11/80-1/81	141,894	37,939	103,955	84,776
1/81-7/81	433,821	169,139	264,682	209,653
7/81-11/81	295,263	125,887	169,376	131,581
11/81-3/82	296,799	125,887	170,912	130,220
3/82-6/82	224,262	94,415	129,847	97,502
6/82-8/82	155,486	70,973	84,513	62,847
8/82-2/83	106,429	225,517	(119,088)	(86,016)
2/83-8/83	118,225	243,970	(125,745)	(88,216)
8/83-11/83	70,335	127,676	(57,341)	(39,646)
11/83-12/83	25,129	42,651	(17,552)	(12,077)
12/83-1/84	25,513	43,240	(17,727)	(12,138)
1/84-7/84	155,369	299,441	(144,072)	(95,816)
TOTAL*	$2,560,553	$2,305,265	$ 255,288	$ 216,449

1. Taken from Figure 124.
2. Addition of Columns I from Figures 174 and 175 for each time period
3. Addition of Columns H from Figures 174 and 175 for each time period
4. Addition of Columns J from Figures 174 and 175 for each time period
5. Addition of Columns K from Figures 174 and 175 for each time period

*** Entries may not add to totals due to rounding**

Figure 177

Revenues As Percentage Of Costs
State And Local Governments
Region VI/Scenario II

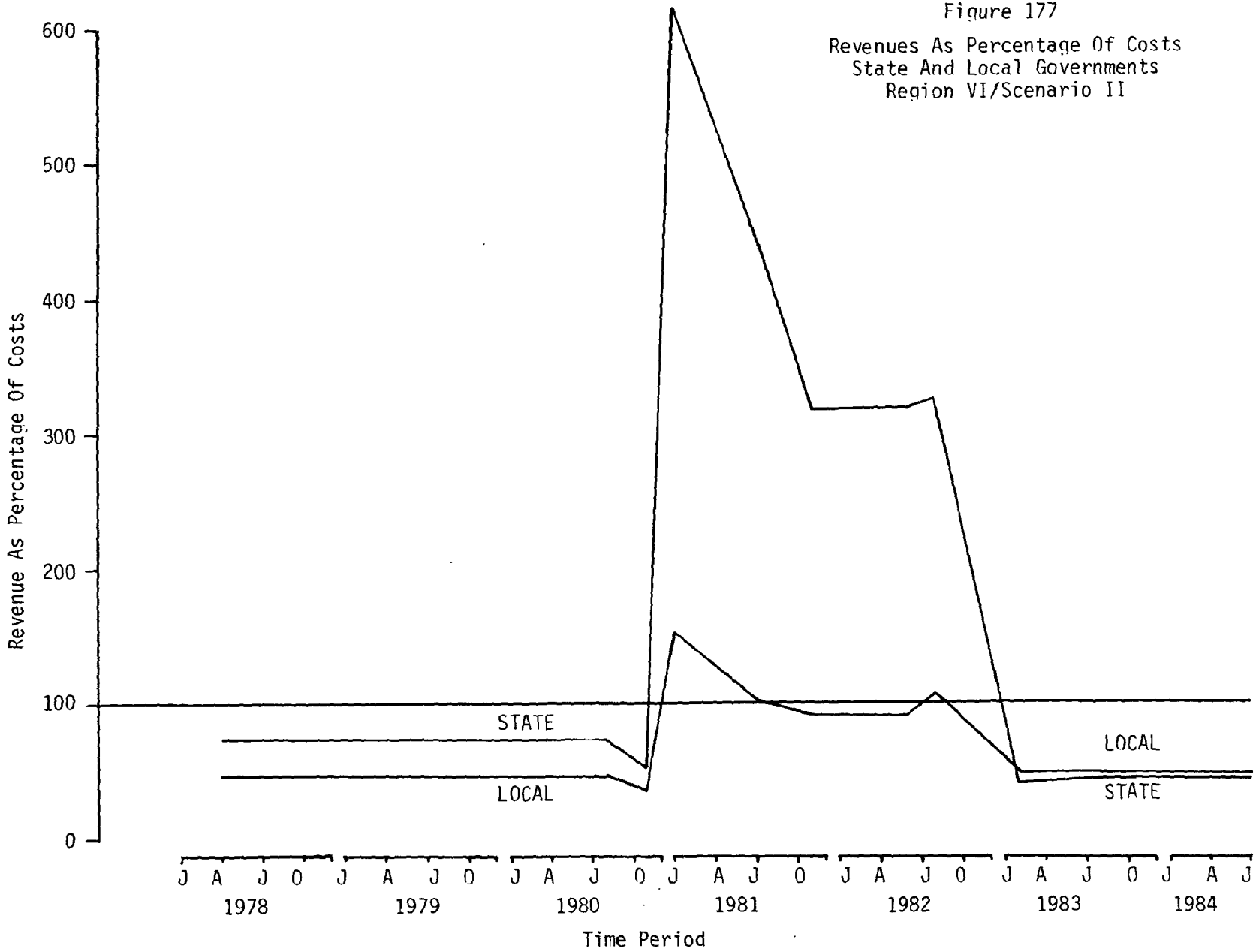


Figure 178

Revenues As Percentage Of Costs
State And Local Governments
Region VII/Scenario II

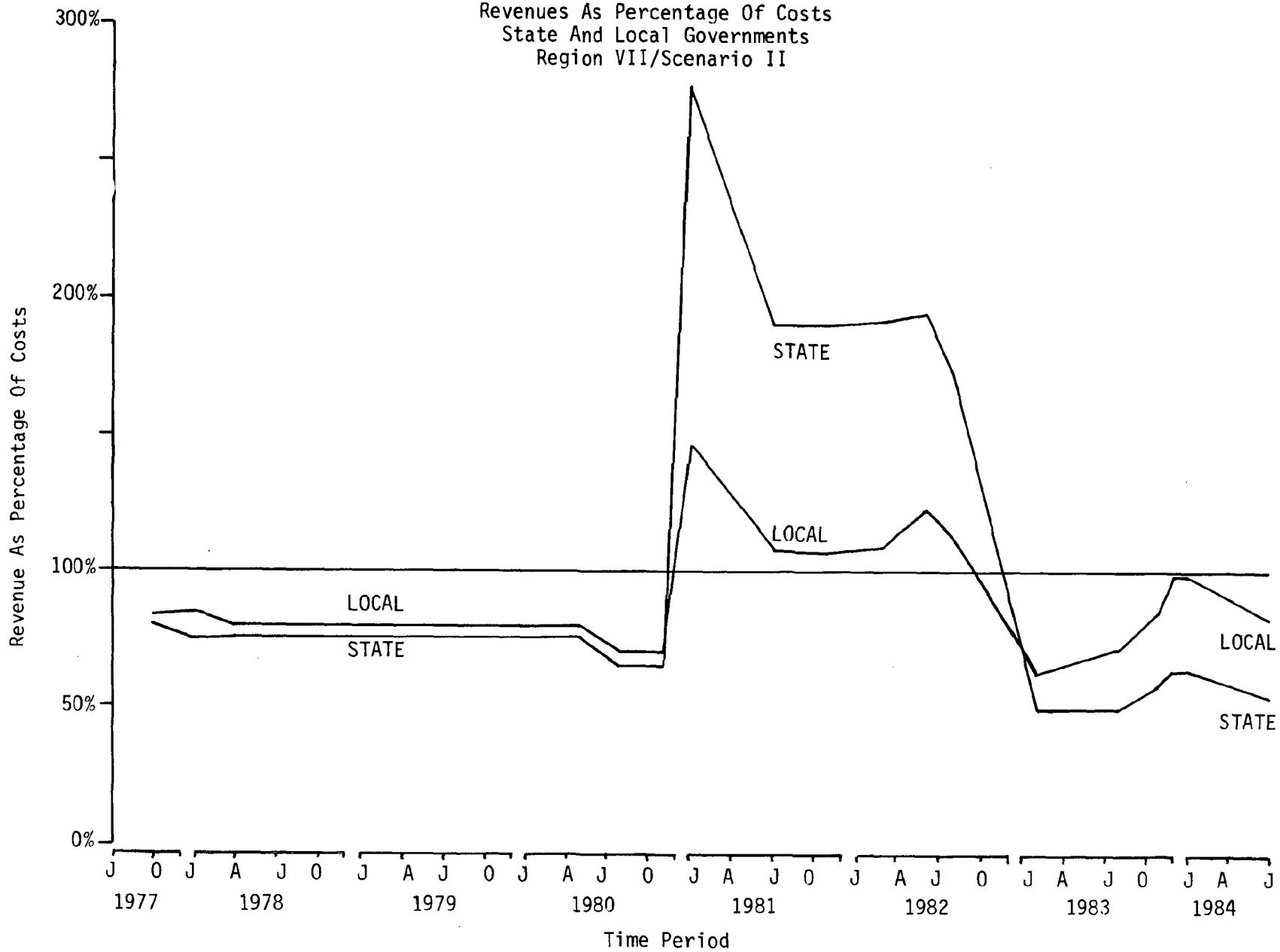


Figure 179

Revenues As Percentage Of Costs
State Governments Combined For Both Regions
Scenario II

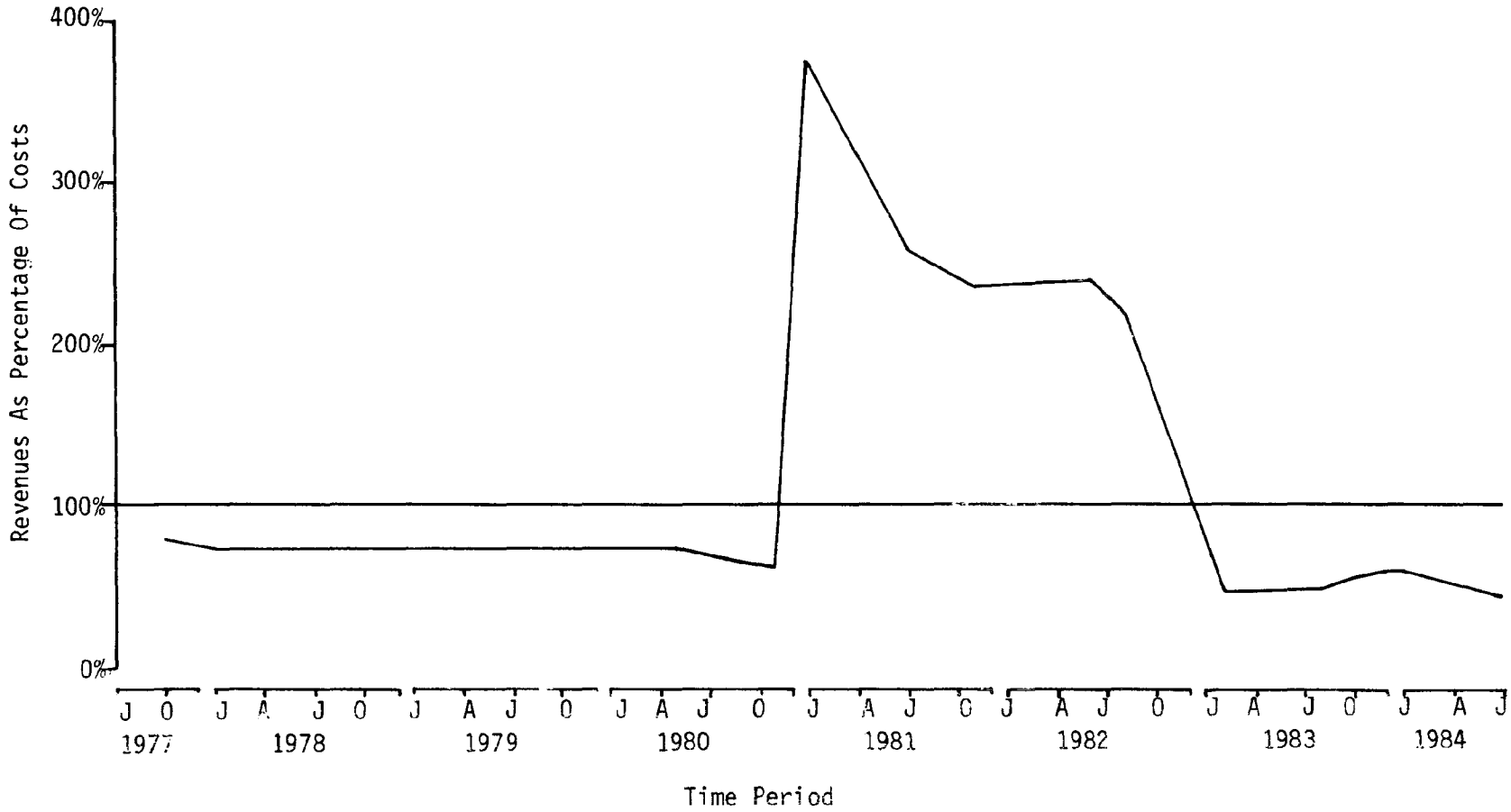


Figure 180

Fiscal Impact of Exploration, Development and Production Activities
Local Governments/Scenario II

Dollars Per Employee Per Year

A Activity	B Total Tax Multipliers [1] Region VI	 Region VII	C Government Cost [2] Region VI	 Region VII	D Tax Revenue Surplus or Deficit [3] Region VI	 Region VII
Exploratory Rigs	213	255	446	214	(233)	41
Dockside Support	213	255	446	214	(233)	41
Development Drilling	213	255	356	294	(143)	(39)
Production Operation	213	255	446	374	(233)	(119)
Onshore Support	213	255	446	321	(233)	(66)
Operations Bases	213	255	446	374	(233)	(119)
Administrative Bases	213	255	490	347	(277)	(92)
Helicopters	2,651	2,664	624	428	2,027	2,236
Boats	275	298	624	374	(349)	(76)
Well Logging	NA [4]	157	NA	374	NA	(217)
Diving	NA	243	NA	428	NA	(185)
Cement	NA	354	NA	374	NA	(20)
Mud	NA	244	NA	374	NA	(130)
Oilfield Equipment	386	421	446	321	(60)	100
Pipeline Laying	1,573	1,573	446	214	1,127	1,359

1. Derived by adding the indirect tax multipliers in Figure 166 and the direct tax multipliers in Figure 164.

2. Calculated by multiplying the new resident employees as a percentage of employed (taken from Figure 148) by the increase in population per resident employee (assumed to be 2.7) by per capita government cost (found in Figure 173).

3. The net fiscal effect per employee per year is determined by subtracting Columns C from Columns B.

4. NA = not applicable in Scenario II.

Figure 181

Fiscal Impact of Exploration, Development and Production Activities
State Government/Scenario II

Dollars Per Employee Per Year

A	B		C		D		
	Total Tax Multipliers [1]		Government Cost [2]		Tax Revenue Surplus or Deficit [3]		
Activity	Region VI	Region VII	Region VI	Region VII	Region VI	Region VII	Combined [4]
Exploratory Rigs	213	288	274	239	(61)	49	(12)
Dockside Support	213	288	274	239	(61)	49	(12)
Development Drilling	213	288	219	328	(6)	(40)	(46)
Production Operation	213	288	274	418	(61)	(130)	(191)
Onshore Support	213	288	274	358	(61)	(70)	(131)
Operations Bases	213	288	274	418	(61)	(130)	(191)
Administrative Bases	213	288	301	388	(88)	(100)	(188)
Helicopters	518	554	384	477	134	77	211
Boats	291	282	384	418	(93)	(136)	(229)
Well Logging	NA [5]	246	NA	418	NA	(172)	(172)
Diving	NA	330	NA	477	NA	(147)	(147)
Cement	NA	604	NA	418	NA	39	39
Mud	NA	443	NA	418	NA	25	25
Oilfield Equipment	544	592	274	358	270	234	504
Pipeline Laying	4,558	4,558	274	239	4,284	4,319	8,603

1. Derived by adding the indirect tax multipliers in Figure 161 and the direct tax multipliers in Figure 159.

2. Calculated by multiplying the new resident employees as a percentage of employed (taken from Figure 148) and by the increase in population per resident employee (assumed to be 2.7) by per capita government cost (found in Figure 173).

3. The net fiscal effect per employee per year is determined by subtracting Columns C from Columns B.

4. The total equals the addition of impacts from Regions VI and VII.

5. NA = not applicable in Scenario II.

revenues to more than cover the added costs incurred by the local governments. The employment resulting from each is small. Consequently, their positive effect on local treasuries is more than offset by the negative impact of the remaining activities, and continuous deficits occur.

The fiscal effects of the activities are somewhat more favorable to the State government, as Figure 181 shows. When the impacts of each activity is aggregated for all regions, only five provide the State with a revenue surplus.

Revenues increase dramatically for both regions in the 1981-1982 period due to pipeline laying. This activity channels sizeable surpluses into the State treasury especially. The revenues are sufficient to provide the State with a surplus in Region VI and a much smaller deficit in Region VII. During the remaining time periods, however, the revenues are not projected to cover government costs.

Summary

Analysis of available data enable these conclusions to be drawn concerning the fiscal impact of OCS development upon State and local governments:

1. Each affected region in Scenario II has different postulated OCS-related activities, time periods during which they take place, and number of involved workers over time. These factors, when combined with varying tax multipliers and per capita service costs for each government unit, imply that no two governmental units will experience exactly the same fiscal effects. The dollar amounts consequently differ, although the revenue/cost ratio curves are similarly shaped.

2. The OCS-related activities were analyzed to determine their fiscal impact in terms of tax revenue surplus or deficit per employee per year. Primarily because local government costs per capita are at leastin one case more than State costs per capita, there are more deficit activities on the local level than on the State level.

3. OCS development does not help local governments in the two study sites financially. Rather, it results in a widening dollar gap between added costs and revenues which will have to be met by decreased services, increased taxes, or federal impact aid, if the deficit were to cause the total budget to have a deficit.

15. ENVIRONMENTAL IMPACT ANALYSIS

General Environmental Impact Evaluation

This Chapter, in accordance with the Study Methodology (Appendix A), describes the environmental effects likely to result from OCS activities in Scenario II. The categories of study included here are land, solid waste generation, water use and water quality, and air quality, which are procedurally described in the section "Environmental Impact Assessment" (Part B).

I. General Environmental Description

A. Climate

The climate of the Scenario II coastal counties represents the hot and arid Southern member of the climatic continuum along the Texas coast. Figure 182 presents three general climatic parameters: normal annual precipitation, normal mean annual temperature (1941-1970 averages), and a typical wind current frequency diagram for an offshore 1° square quadrant. Two weather patterns influence the distribution of rainfall shown in Figure 182. A tropical continental air mass moving east brings dry air in the summer months with temperatures going over 105° F, especially in the Valley. A tropical maritime air mass entering South Texas from the south and southeast dominates the region from May to September bringing warm and moist air. The zone of convergence of these climatic regimes may result in thunderstorms in spring and fall.

The general inverse trend of precipitation and temperature across the regions results in a gradation of net deficit rainfall following runoff and evapotranspiration. From the Rio Grande to north of Corpus Christi Bay there is an average net precipitation deficit of 32 inches to 17 inches annually. In Region VI, the Corpus Christi Bay area, there is an average long-term expectancy of two years of excess rainfall and eight years of drought conditions. Further south in Region VII, the long term net deficit is more severe with only a 10 percent expectency of excess rainfall and a 90 percent expectency of drought conditions. While the consistent warm air is favorable for the area's high agricultural production, there is also a need for extensive irrigation.

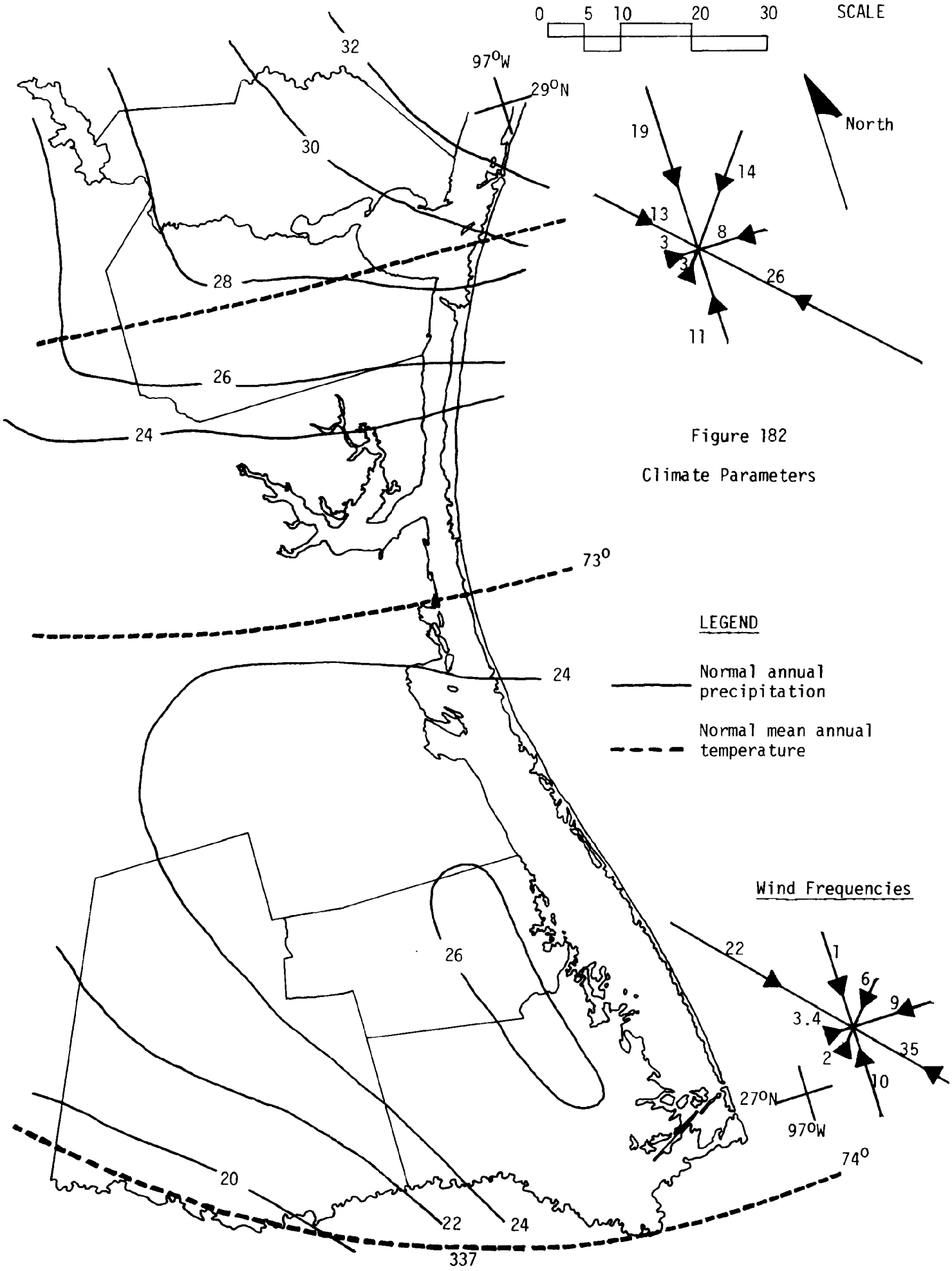
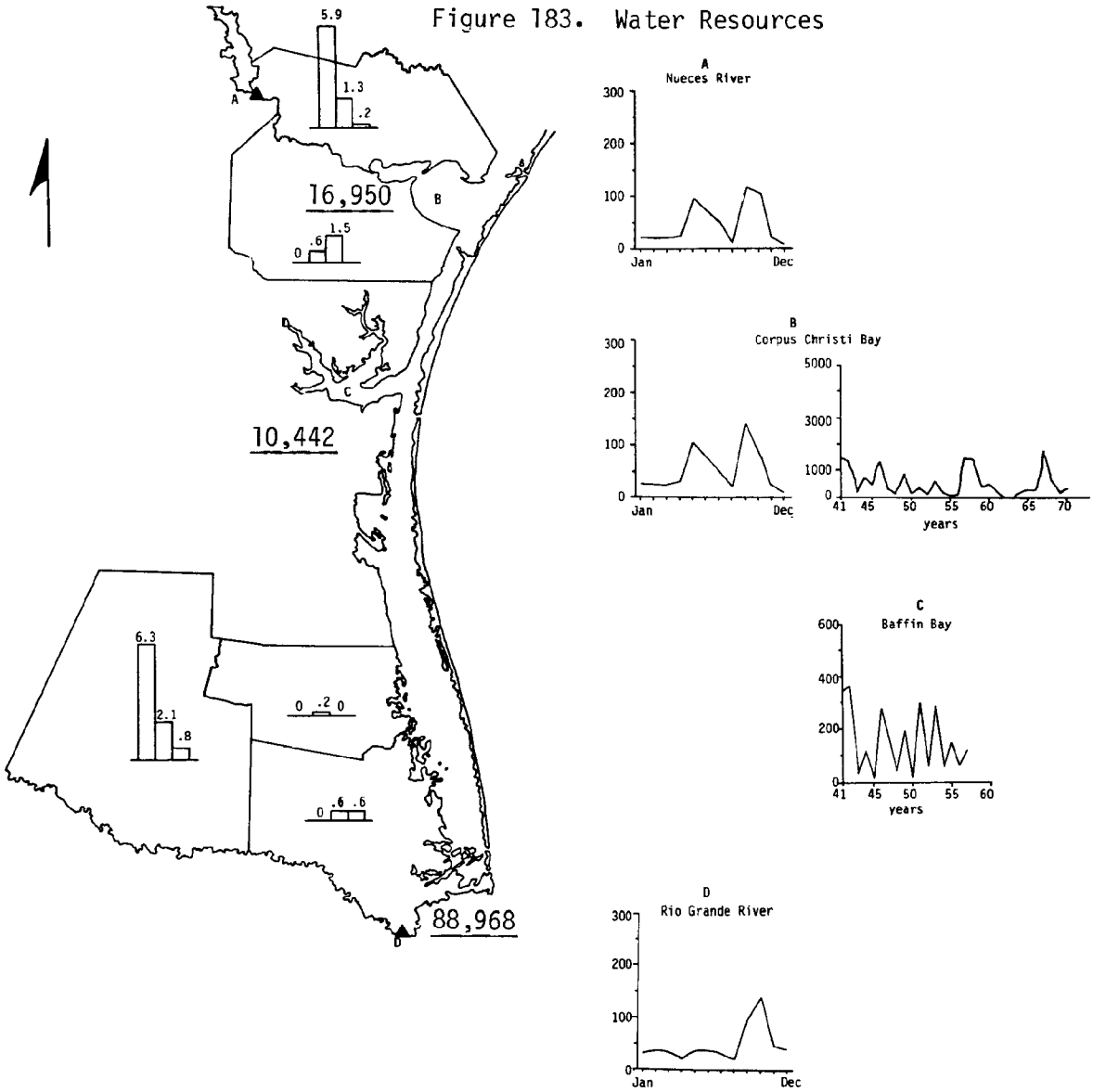


Figure 182

Climate Parameters

Figure 183. Water Resources



LEGEND

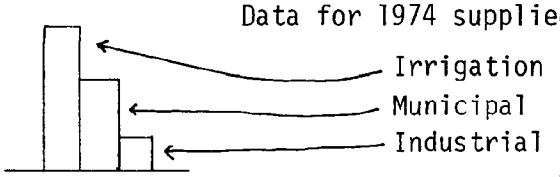
U.S. Geological Survey gaging station

Graphs

A,D - Mean monthly stream flow (1950-1969) in thousands acre-feet.
B - (at left) Mean monthly inflow (1950-1969) in thousands of acre-feet.
(at right) Long-term inflow in thousands of acre-feet.
C - Long-term in thousands of acre-feet,
(no data available on mean monthly inflow).

16,950 - Areal extent of main river basins at mouths (square miles)

- Self-supplied groundwater by county, used as labeled below.
N.B.: Area of histogram is proportional to total volume withdrawn.
All units: thousands of Acre-feet.
Data for 1974 supplied by Texas Water Development Board.



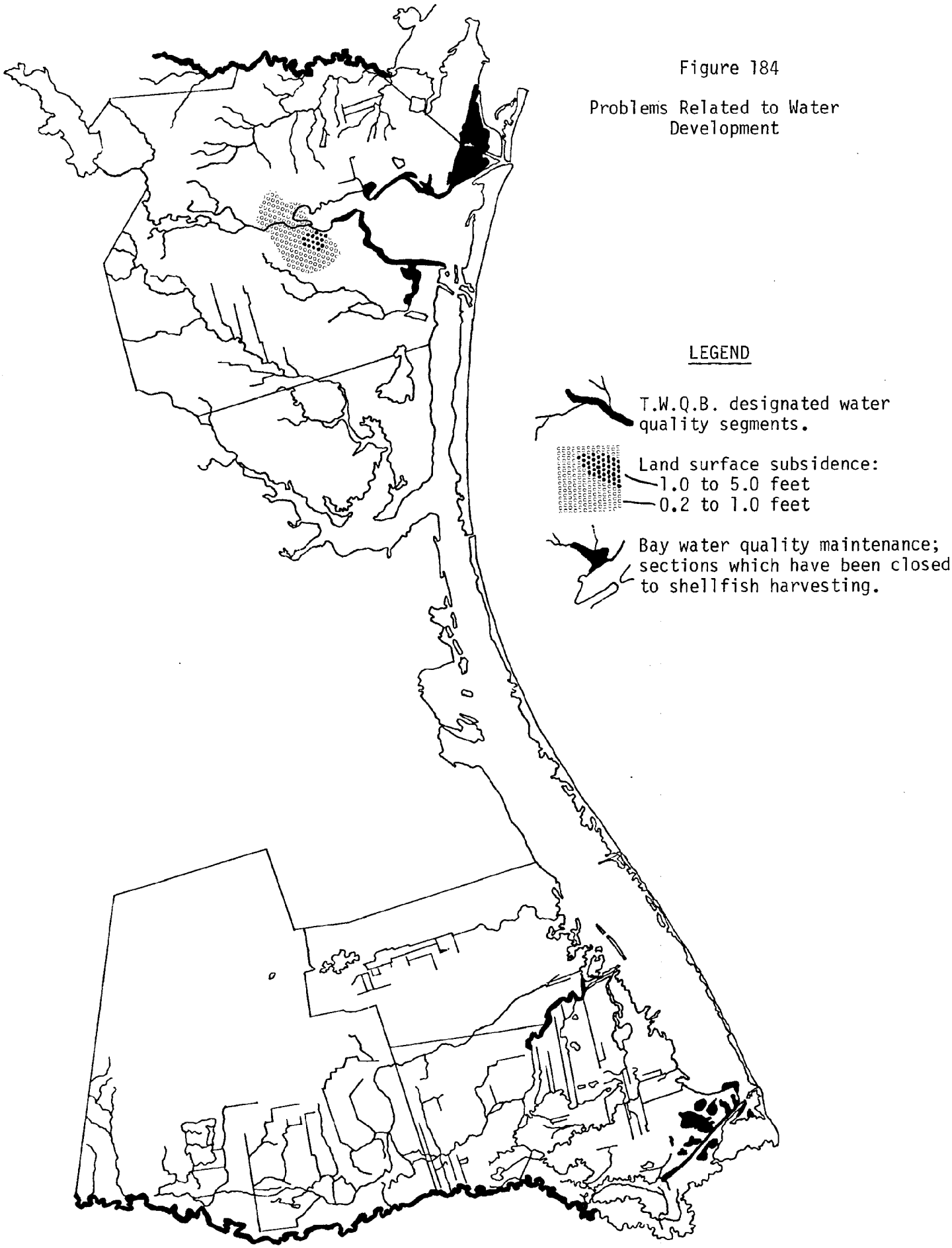


Figure 184

Problems Related to Water Development

While there is a high probability of tropical storms landing on this part of the Texas coast, the probability appears somewhat less than in the regions described in Scenario I. Between 1901 and 1973 in the Corpus Christi Bay area there were 9 tropical cyclones of which 5 may be designated as being of hurricane strength. Three of these were severe hurricanes with wind speeds exceeding 100 m.p.h. and core pressures below 28 inches of mercury. In the Valley (Region VII), of the nine tropical cyclones only three were of hurricane strength and only one severe hurricane landed on the coast. There is, then, a 12 percent chance that a tropical cyclone will cross the Scenario II regions in any given year. In Region VI there are 7 and 4 percent probabilities of hurricane and severe hurricane landings, and in Region VII there are 4 and 1 percent probabilities, respectively. The main hurricane months are August and September.

B. Water

There are only two main rivers in the Scenario II study regions, the Nueces and Rio Grande. The Nueces-Rio Grande river basin lies between these two and consists of Petronila, San Fernando, Santa Gertrudis, and Los Olmos Creeks which flow into Baffin Bay, and Arroyo Colorado in the Valley. The size of the three river basins are shown in Figure 183. The Rio Grande basin has a total drainage of 182,215 square miles, 88,968 square miles of which are in the United States and 48,259 square miles of which are in Texas. The Nueces River, impounded at Corpus Christi Lake, and the Rio Grande, impounded at Falcon Reservoir, provide the major surface fresh water supplies for Regions VI and VII, respectively.

The Aransas River, forming the northern boundary of San Patricio County; the Corpus Christi inner harbor; Arroyo Colorado tidal; and part of the Rio Grande are shown as "water quality segments" in Figure 184, as designated by the Texas Water Quality Board. The Aransas River has excessively high pH, high dissolved solids levels, and low levels of dissolved oxygen. Its water quality problems are mainly due to municipal wastewater discharges and to runoff from agricultural fields. The Corpus Christi Inner Harbor has violated pH levels (too high), primarily resulting from industrial cooling water discharge (TWQB, Water Quality Management Plan for the Nueces River Basin, 1975).

In Region VII, the Arroyo Colorado has high dissolved solids levels, high fecal coliform bacteria counts, and high pH resulting from inadequate domestic wastewater treatment facilities. The Rio Grande has a high pH level on occasion, which is thought to be a natural tendency. (TWQB, Water Quality Management Plan for the Rio

Grande Basin, 1975). In addition to the specified "water quality segments," there are other water quality problems in this region, especially in the North and South Floodways used to relieve excess floodwater after heavy rains. These water courses are the central links of an extensive irrigation canal network and are of poor quality in biological and chemical parameters, resulting from agricultural runoff and direct disposal of human sewage in rural communities, termed "colonias."

Figure 183 also shows histograms of groundwater production by county. Use of groundwater by municipalities is restricted by the water's generally poor quality and high salinity. The major groundwater producing unit in Hidalgo County is the Goliad Sand of Pliocene age. The main aquifers being tapped in San Patricio County are the Goliad, Willis (Lizzie), and Beaumont components of the Gulf Coast Aquifer. (The array of aquifer nomenclature used in the Texas coastal area may be found in Figure 90, Part C.)

There has been negligible land level subsidence in either of the Scenario II regions, in part related to the minor rate of groundwater withdrawal. The potential for subsidence problems as seen in the Houston region does exist, however, as withdrawal exceeds recharge by an estimated 15 million gallons per day (M.G.D.) in San Patricio County and by one M.G.D. in Nueces County (Land Resources of the Coastal Bend Region, 1974, p. 140) An area to the west of Corpus Christi has had more subsidence, which is thought to be a result of extensive local petroleum extraction (see Figure 184).

The present shape of Corpus Christi Bay and the coastal lagoons represents the various results of the processes of sedimentation, longshore transport, subsidence, and sea level rise over the past 30,000 years. Corpus Christi Bay is one of the deepest bays on the Texas coast with depths exceeding 15 feet. The Laguna Madre averages 2 to 3 feet in depth with 8 to 9 foot maxima except in the Gulf Intracoastal Waterway (G.I.W.W.) (see Figure 185). Circulation and tidal exchange is mainly dependent upon artificially maintained Gulf passes and upon dominant wind directions.

Figure 186 illustrates the variability of salinity in the coastal estuary-lagoon system of this area. Nueces River inflow and runoff from coastal lowlands of Willacy and Cameron Counties are the sole major sources of fresh water to the estuary-lagoon system. During periods of low runoff, Gulf water is responsible for keeping salinities down in Laguna Madre. It has been established that the G.I.W.W. has helped to regulate salinities through the reaches of Laguna Madre. Part of the purpose of the Corpus Christi Lake impoundment is to regulate freshwater inflow to Nueces and Corpus Christi Bays and to provide fresh water during drought conditions. Yet with river inflow reduced approximately one-third, Nueces Bay salinity often reaches 55 ppt.

Figure 185. Bay Circulation Processes and Inflows

LEGEND

Generalized circulation currents

Tidal currents and surge (relative magnitude shown)

Maximum water input (fresh at river mouths, salt at Gulf passes)

Areas of salt-water flooding by wind-tidal processes

Bathymetry (fathoms)

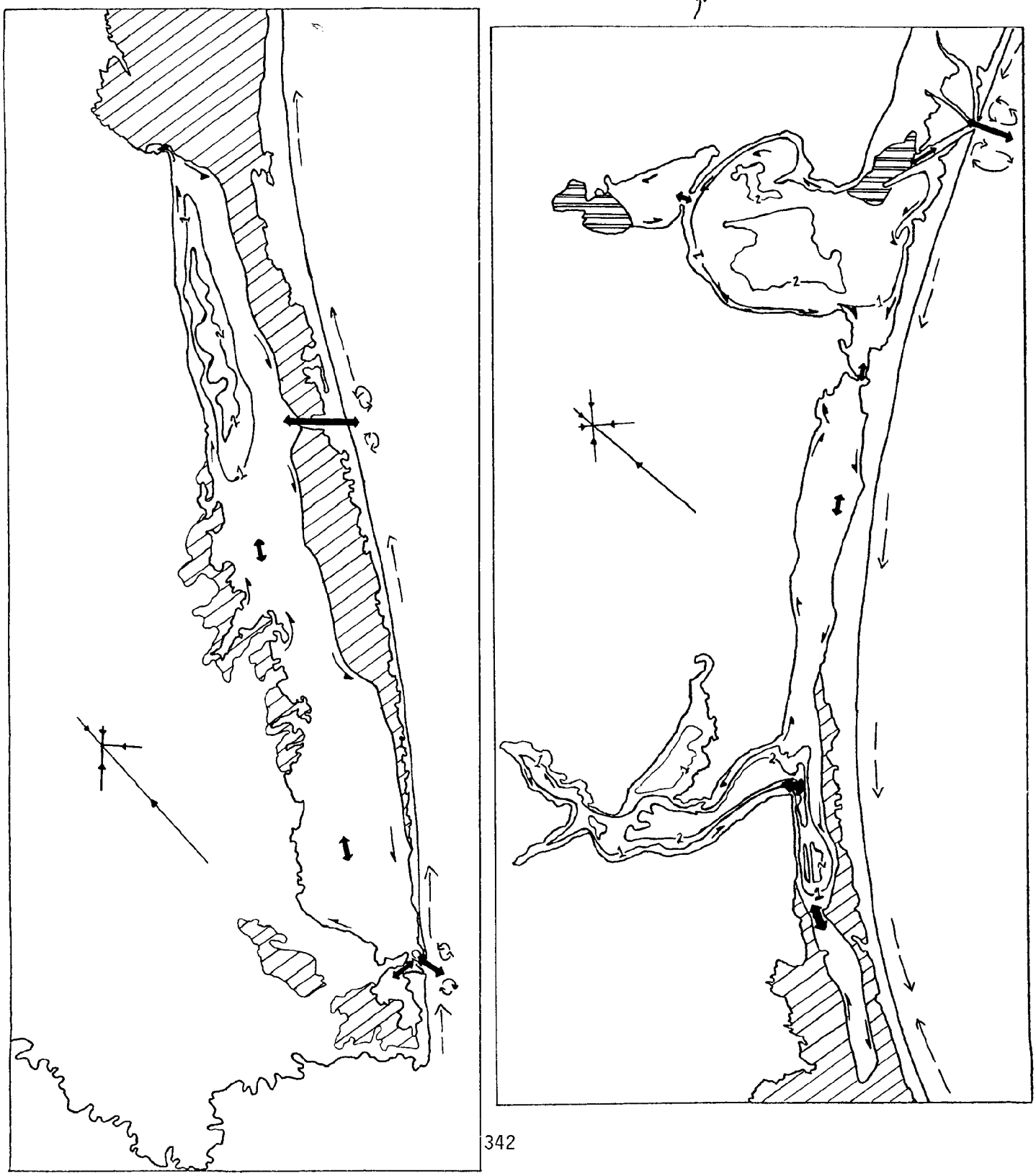
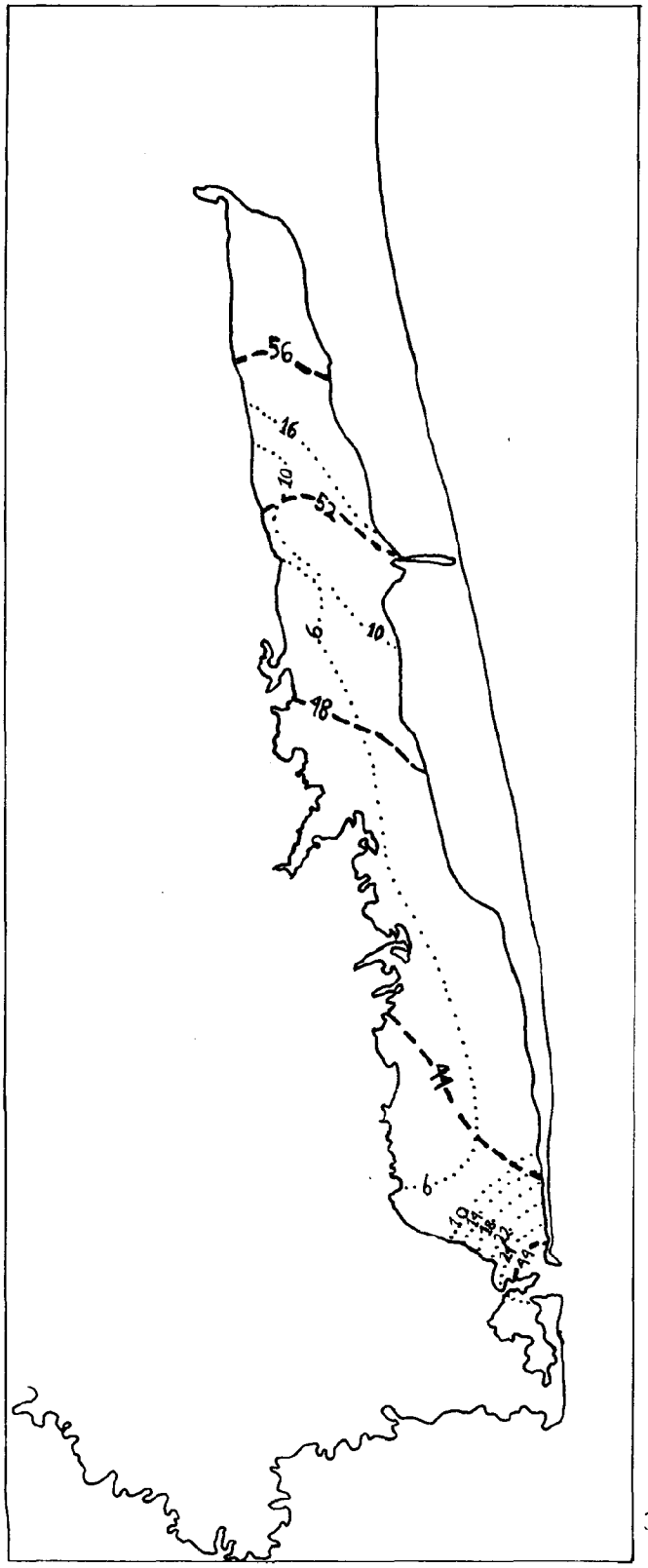


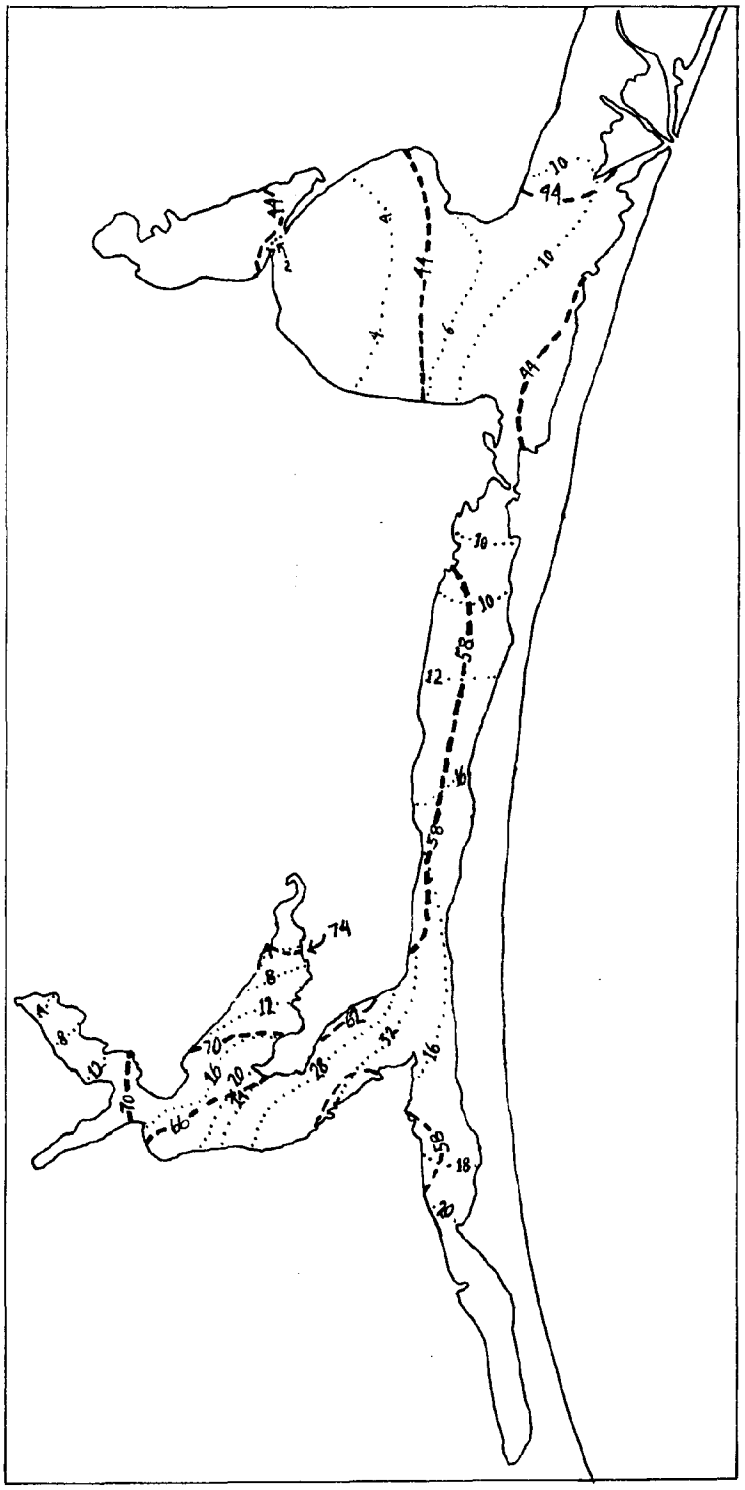
Figure 186. Salinity of Bay Systems

LEGEND

22 Extreme high surface salinity (low rainfall and runoff)

16 Extreme low surface salinity (high rainfall and runoff)





The variability in salinity markedly affects fish and spawning grounds resources of this area. Corpus Christi Bay has poor standing crops of plants and animals compared to other Texas bays. Fish kills in Laguna Madre often occur due to extreme hypersalinity. Again, since the dredging of the G.I.W.W. in 1948, fish kills have been less frequent. The most favorable areas for finfish and shrimp are shown in Figure 187.

C. Land

The topography of the Region VI counties is characteristically a flat or gently rolling plain with a southeast slope of 2½ to 5 feet per mile. The maximum elevation is about 200 feet in northwestern San Patricio County. At some places stream erosion has produced a hilly terrain. The Nueces River valley may be as wide as three miles and cut below the general plain by roughly 80 feet. Sand dunes occur at the coastal boundary of the mainland.

Three main topographic subdivisions may be recognized in Region VII. Hebbronville Plain in central Hidalgo County is bounded to the south and east by Mission Ridge. The Sand Belt in northern Hidalgo and Willacy Counties is characterized by stabilized and active dunes, potholes, and blowouts. The Rio Grande Delta Plain along southern Hidalgo, Cameron, and Willacy Counties includes upland terraces and coastal lowland swamps and marshes. It is characterized by water filled meander cutoffs called resacas (ox-bow lakes).

Three main geologic processes have dominated in these two regions to affect topographic and substrate characteristics. River deltaic deposition has affected most of Cameron and Willacy Counties and the upland areas of San Patricio and Nueces Counties. Aeolian transport has affected much of northern Hidalgo County and Kenedy County between Regions VI and VII. Shoreline processes left relict coastal barrier island sands now incorporated at the edge of the mainland between Baffin Bay and Aransas Bay north of San Patricio County. To the extent that these different geological environments have resulted in different sediments, the physical properties of the deposits may vary. Figure 188 lists these substrate units found in Regions VI and VII, their physical properties, and their suitability to alternate human uses, as defined by the Texas Bureau of Economic Geology.

Figure 189 lists current acreage estimates of ten categories of land use in the two Scenario II regions. Figure 190 presents a land development inventory of selected portions of the two Scenario II regions, as described in the section "Environmental Impact Assessment," Part B. The total "other" land in Figure 190 is allocated into agricultural, range-pasture, woodland-timber, recreation, and marsh land usage.

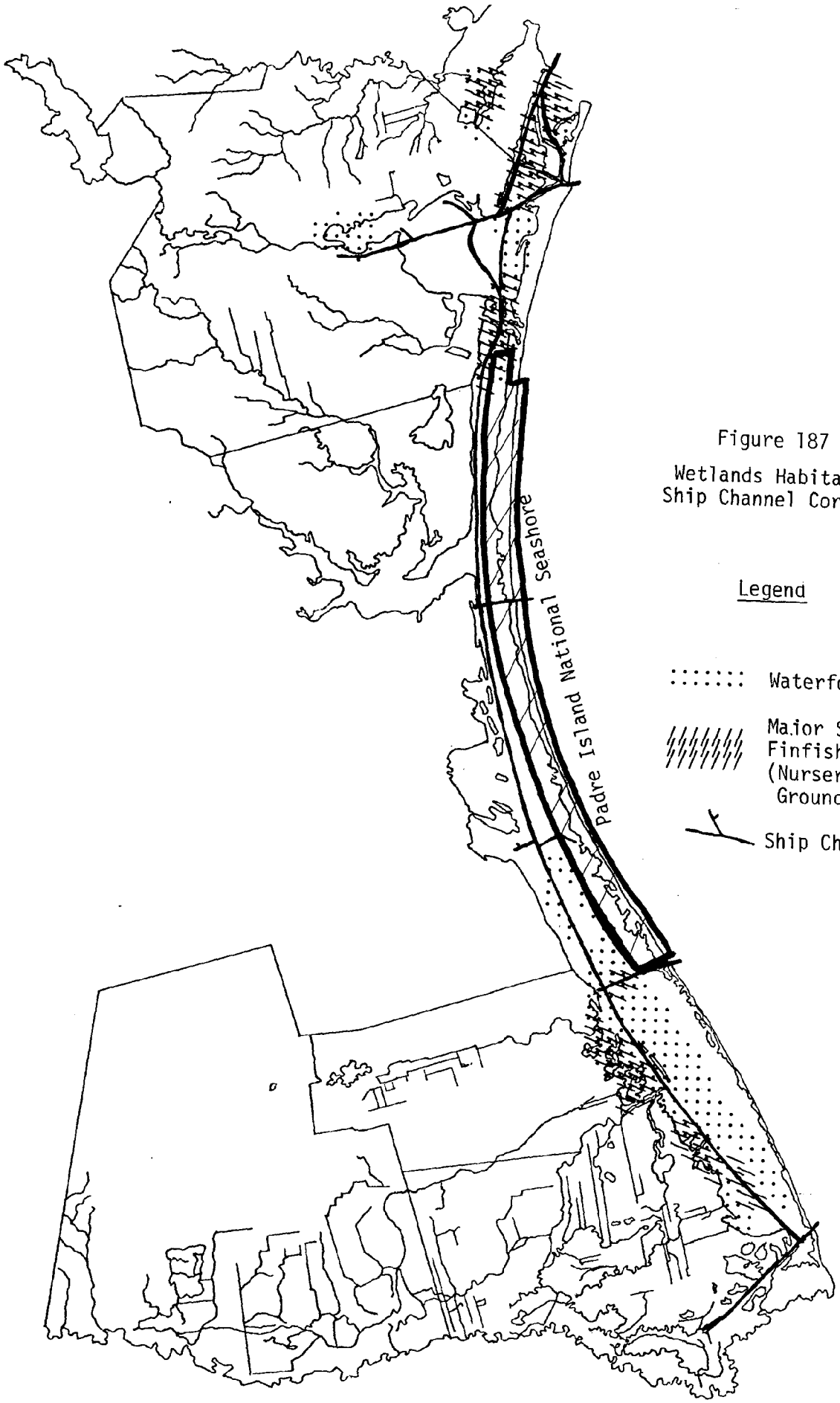


Figure 187

Wetlands Habitat and
Ship Channel Corridors

Legend

Waterfowl Habitat

Major Shrimp or
Finfish Habitat
(Nursery and Spawning
Grounds)

Ship Channel Corridors

Figure 188

Evaluation of natural suitability of physical properties groups for various coastal activities and land uses.(From:BEG Environmental Geologic Atlas,Texas Coastal Zone)

Suitability is evaluated on the basis of natural properties and may be improved by special engineering and construction methods. Significant properties considered as positive criteria for evaluating land use suitability (+ = satisfactory; – = unsatisfactory; 0 = possible problems).

(1) Road construction: Earthen structures and fill material–low shrink-swell potential, low compressibility, and low plasticity.
(2) Road construction: Base material–low compressibility, low shrink swell potential, and high shear strength
(3) Road construction: Grade material–low compressibility, low shrink-swell potential, and high shear strength.
(4) Fill material: Topsoil–loam or sandy/silty clay composition.
(5) Fill material: General, below topsoil–silty/sandy clay composition with low to moderate shrink-swell potential.
(6) Foundation: Heavy–high load bearing strength, low shrink-swell potential, and good drainage.
(7) Foundation: Light–low shrink-swell potential.
(8) Underground installations: Low shrink-swell potential, high load bearing strength, and good drainage.
(9) Buried cables and pipes: Low shrink-swell potential and low corrosivity.
(10) Excavatability: Ease of digging with conventional machinery.
(11) Waste disposal: Septic systems–moderate permeability, low to moderate shrink-swell potential, and good subsurface drainage.
(12) Waste disposal: Solid waste–low permeability and good surface drainage.
(13) Waste disposal: Unlined liquid-waste retention ponds–low permeability.
(14) Water storage: Earthen dams and dikes–low permeability, moderate shear strength, and moderate compressibility.
(15) Water storage: Unlined reservoirs or ponds above ground-water level–low permeability.
(16) Water storage: Reservoirs or ponds supplied by ground water–high permeability.

PHYSICAL PROPERTIES GROUPS	Coastal Activities and Land Uses															
	Road Construction			Fill Material		Foundation					Waste Disposal			Water Storage		
	(1) Earthen structures and fill material	(2) Base material	(3) Grade material	(4) Topsoil	(5) General, below topsoil	(6) Heavy	(7) Light	(8) Underground installations	(9) Buried cables and pipes	(10) Excavatability	(11) Septic systems	(12) Solid waste	(13) Unlined liquid-waste retention ponds	(14) Earthen dams and dikes	(15) Unlined reservoirs or ponds above ground-water level	(16) Reservoirs or ponds supplied by ground water
I Dominantly clay and mud, low permeability, high water-holding capacity, high compressibility, high to very high shrink-swell potential, poor drainage, level to depressed relief, low shear strength, high plasticity. Geologic units include interdistributary muds, abandoned channel-fill muds, overbank fluvial mude, mud-filled coastal lakes	–	–	–	0	–	–	0	–	–	+	–	+	+	0	+	–
II Dominantly sand, high to very high permeability, low water-holding capacity, low compressibility, low shrink-swell potential, good drainage, low ridge and depressed relief, high shear strength, low plasticity. Geologic units include Modern barrier island sands (beach, foredunes, vegetated barrier flats, wind-deflation troughs and storm runnels, washover sands), and subaerial bay-margin sand	+	+	+	0	+	+	+	+	+	+	0	–	–	–	–	+
III Dominantly clayey sand and silt, moderate permeability and drainage, moderate water-holding capacity, low to moderate compressibility, and shrink-swell potential, level relief with local mounds and ridges, high shear strength. Geologic units include meanderbelt sands, alluvium, levee, crevasse splay, distributary sands, Pleistocene fluvial, distributary, marine deltaic sands and reworked deltaic and fluvial facies, deltaic sands and reworked facies may be covered by loess or mud veneer	+	+	+	+	+	0	+	0	+	+	+	0	0	+	0	0
IV Coastal marsh, fresh to brackish, very low permeability, high water-holding capacity, very poor drainage, depressed relief, low shear strength, high plasticity, high organic content, subject to salt-water flooding. Geologic units, fresh to brackish marsh in abandoned channels	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
V Inland marsh, fresh-water, alternately wet and dry, variable substrate, commonly mud, low to moderate permeability, moderate water-holding capacity, poor drainage, poor to moderate load-bearing strength, moderately high organic content, subject to flooding, locally thin mud may veneer sand substrate. Geologic units include fresh-water marsh and local ephemeral fresh-water marsh in eolian blowout areas and wind-deflation troughs not mapped	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
VI Wind-tidal flat and salt marsh, sand with minor amounts of mud and algal mat laminations, alternately submergent (0-6 feet) and emergent, unvegetated, subject to intense eolian transport of sand, local depressed areas with soft substrate, properties similar to Group II. Geologic units include several wind-tidal flat facies, salt marsh, and washover distal fan facies.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
VII Made land and spoil, properties highly variable, mixed mud, silt, and sand, reworked spoil commonly sandy and moderately sorted with properties similar to Group III. Geologic units include subaerial spoil heaps or mounds, subaerial reworked spoil, subaqueous spoil, made land	HIGHLY VARIABLE: USE WITH CAUTION															
VIII Transitional wind-tidal flat and eolian sand sheet, brief periods of tidal inundation alternating with longer sustained periods of wind deflation and clay-dune accretion, numerous clay dunes with properties similar to Group I, wind-tidal flat properties similar to Group VI, essentially an area of wind destruction of eolian sand sheet	–	–	–	–	–	–	–	–	–	+	–	–	–	–	–	–
IX Clay-sand dunes and dune complexes, active and inactive, sparsely and heavily vegetated respectively, see Geologic map to differentiate dunes, mixed sand, silt, and clay with variable properties similar to Group III, older vegetated dune complexes have higher sand and caliche content, currently active dunes high in clay content. Geologic units include inactive, brush-covered clay-sand dune complex, and active, grass-covered clay-sand dunes (gravlens)	+	+	+	+	+	0	0	0	+	0	+	0	0	+	0	0
X Eolian sand sheet, poorly to well stabilized with grass, brush, and live oaks, see Geologic map to differentiate vegetation cover, moderate to very high permeability, low to moderate water-holding capacity, low compressibility, low shrink-swell potential, good to fair drainage, high shear strength, low plasticity, shallow water table, flat to hummocky or ridge-like topography. Geologic units include active dune blowout area, sand sheet with strong relict grain, sand sheet with no relict grain, sand sheet deflation area, moderately stabilized dune and sand sheet, and well-stabilized dune and sand sheet	+	+	+	–	0	+	+	+	+	+	0	–	–	–	–	+
XI Active dune complex, sand, friable, very high permeability, low water-holding capacity, low compressibility, low shrink-swell potential, good drainage, high shear strength, low plasticity, unstable due to migration, local relief up to 30 feet. Geologic units include active dune complex in sand sheet area, back island dune field, fore-island blowout dune, and coppice dune and sand flats	+	+	+	–	–	–	–	0	0	+	–	–	–	–	–	0
XII Loess sheet, silt and fine sand, thin and locally discontinuous, overlying calichified fluvial sands and local conglomerates, loess variable thickness, properties similar to Group X, underlying bedrock compound of massively bedded sands and some sandy clays with extensive caliche cement, engineering plans should involve consideration of depth of loess and specific properties of the subjacent Pleistocene sediment. Geologic units include loess sheet overlying caliche-capped fluvial sand facies	THIN VENEER OVER VARIABLE SUBSTRATE: USE WITH CAUTION															

Figure 189

Current Land Use (Acres) in Scenario II Affected Study Sites

	Use	Region VI	Region VII
1.	Residential-Urban, Commercial, Residential Development	27,264	30,836
2.	Industrial, Railyards, Docks	6,080	2,120
3.	Undeveloped, Greenbelts, Cemeteries, Undifferentiated Land	2,816	4,576
4.	Parks and Recreation	7,232	2,074
5.	Sewage Disposal	1,260	1,740
6.	Solid Waste	547	1,468
7.	Airfields	2,758	5,524
8.	Artificial Reservoirs	4,544	8,586
9.	Agriculture, Cultivated Land and Orchards	520,320	1,034,202
10.	Range-pasture, Uncultivated	161,280	684,176
TOTAL		734,101	1,775,302

Figure 190

Regional Land Development Inventory

REGION VI TOTALS (Corpus Christi, Ingleside, Harbor Island)

	Group III	Group II	Group I	Made Land	Unsuitable	Total
industrial	1,419	224	1,419	2,083	552	5,697
residential-commercial	8,469	3,189	9,964	-	0	21,622
other land	18,732	12,056	30,889	896	1,993	64,566
total	29,094	15,544	42,746	6,077	3,089	91,885

agriculture	range-pasture	woodland-timber	recreation	marsh	other
33,678 (52%)	15,543 (24%)	3,587 (6%)	3,388 (5%)	1,993 (3%)	6,377 (10%)

prone to hurricane surge-tide flooding 11,956 (12%)

REGION VII TOTALS (Brownsville, Port Isabel)

	Group III	Group II	Group I	Made Land	Unsuitable	Total
industrial	399	-	-	-	-	399
residential-commercial	4,285	-	698	-	-	4,983
other land	5,181	-	1,196	399	498	7,274
total	9,865	-	1,894	399	498	12,656

agricultural	range-pasture	woodland-timber	recreation	marsh	other
5,182 (71%)	996 (14%)	-	199 (3%)	598 (8%)	299 (4%)

prone to hurricane surge-tide flooding 5,897 (47%)

Mainland shoreline development across both regions varies from lowlying salt marsh to stabilized, high relief dune fields. Most of the mainland shoreline is undeveloped except for scattered recreational buildings and docks. Corpus Christi is the only major urban-industrial center at the coastline. The Laguna Atascosa National Wildlife Refuge borders 20 miles of southern Laguna Madre. The Padre Island National Seashore, shown in Figure 187, extends between Region VI and VII.

Major deep draft port facilities exist at Corpus Christ, Harbor Island, and at Brownsville. In Region VI, there are 72 piers, wharves, and docks at the Port of Corpus Christi, 57 percent of which are privately owned. The public facilities are located in the main harbor at Corpus Christi. Ports at Ingleside, Harbor Island, and La Quinta are operated by private industries. There is more than 7,000 feet of docking space. In Region VII, there are eight deep draft berths and 8 shallow draft berths at the Port of Brownsville Ship Channel. Port Isabel's main harbor has three docks for cargo, oil, and general purpose comprising more than 1,500 feet of docking space. In addition to these docking facilities, there are other ports and docks serving an extensive shrimping industry.

D. Waste Residuals

1. Solid Wastes

Figure 191 presents estimated solid waste generation by county in municipal, agricultural, and industrial activities. Municipal wastes are presented on a wet basis; on a dry basis they are assumed to be 75% combustible and 25% inert. Residential wastes include household garbage, lawn clippings, and miscellaneous furniture appliances, etc. Commercial wastes include refuse from stores, markets, offices, schools, airports, etc. Also included in the municipal waste total are demolition and construction wastes and other wastes (street cleaning, treatment plant residues, dead animals, etc.). Agricultural wastes are presented on a dry weight basis and include estimates of livestock manure and field and crop waste. Industrial wastes are assumed to be 62% combustible and 38% inert and include heavy and light manufacturing wastes, food processing wastes, chemical and petroleum industry wastes, and other smaller categories where appropriate.

Figure 191

Estimates of Solid Waste Generation
(million pounds per year)

		San Patricio	Nueces	Cameron	Willacy	Hidalgo
1.	Residential	43.0	217.0	127.0	14.2	166.0
2.	Commercial	60.5	303.0	179.0	10.3	231.0
3.	Total/Municipal	142.35	715.7	420.8	30.39	546.3
4.	Total/Agricultural	979.6	1,224.82	916.6	649.46	1,222.5
5.	Manufacturing	19.0	173.4	54.31	0.54	39.2
6.	Total/Industrial	19.0	173.4	54.31	0.54	39.2
GRAND TOTAL (3+4+6)		1,140.95	2,113.92	1,391.71	680.39	1,808.0

The values of Figure 191 present one basic pattern of population size, industrial activity and type, and agricultural base. It may be recalled that the regions affected in Scenario I were more heterogeneous, expressing three patterns of waste generation. In both Scenario II regions, agricultural solid waste generation exceeds municipal solid waste generation, which exceeds industrial solid wastes. In Region VI this ratio is 14:5:1 (A:M:I), and in Region VII this ratio is 38:10:1. Nueces County is the top solid waste producer; Willacy County produces the smallest amount of solid wastes. Region VII has the higher proportion of agricultural waste production, which reflects the greater emphasis on agricultural development in the Valley.

The optimum conditions for sanitary landfill solid waste disposal in the Texas coastal area require the dominantly mud and clay substrates of group I (Figure 188) with low permeability, high water holding capacity, poor drainage, low to depressed topographic relief, and away from active fluvial processes (Evaluation of Sanitary Landfill Sites, B.E.G., 1972). In both Scenario II regions, an estimated 40 percent of the operating solid waste disposal sites meet this criterion. Landfill operations under other conditions require more engineering maintenance and monitoring to minimize contamination of the locale's hydraulogic system. It will be seen elsewhere

(Identification of Significant Issues) that there is sufficient disposal acreage currently available to suitably meet the waste volume demands of the Scenario II area.

2. Water Effluents

The total amount of wastewater discharged by each county gives an idea of the pollution potential for the drainage basins. Figure 192 presents this information for domestic and industrial wastewater discharge. Not included in the tabulation are non-point source discharges and notably agricultural runoff. Surface water runoff from croplands in Region VII contain high concentrations of pesticides and mineral fertilizers. Such runoff pollutes drainage canal water and the natural drainage system of the area. Also not included in the summary are estimates of domestic waste discharge in rural areas without regional wastewater treatment facilities, which add a significant loading of biological oxygen demanding wastes and suspended solids.

Figure 192

Wastewater Effluent

	Domestic Waste			Industrial Waste			Number of Discharges
	B.O.D.	T.S.S.	Flow	B.O.D.	T.S.S.	Flow	
San Patricio	466	1,344	2.3	26	8	0.2	7
Nueces	2,185	6,537	23.6	8,260	17,571	250.1	28
Cameron	1,606	1,569	10.8	8,363	247	196.0	9
Willacy	73	87	0.9	-	-	-	1
Hidalgo	1,135	2,561	8.0	-	34	0.4	10

B.O.D. - pounds/day
T.S.S. - pounds/day
Flow - cubic feet per second

Low levels of freshwater inflow to the estuary-lagoonal system and poor bay-lagoon circulation results in a greater likelihood that wastes entering the coastal water system will not be diluted and dispersed, thus lowering the capacity of the coastal water masses to assimilate such water pollution. The reader is again referred to Figure 184 and its accompanying text for an identification of polluted areas.

3. Air Emissions

The comprehensiveness of atmospheric emissions data is basically poor. The emissions data presented in Figure 193 is self-reported by industry. Non-Point source (or mobile) automobile emissions are not included. In Region VII there are negligable levels of emissions for certain parameters.

Figure 193

Industrial Air Emissions Inventory
(thousand tons/year)

County	NOx	SOx	HC	CO	Particulates
San Patricio	84.3	0.8	2.6	0.8	2.9
Nueces	30.0	7.0	36.9	210.9	9.6
Cameron	0.5	-	10.1	5.8	0.8
Willacy	-	-	-	-	0.2
Hidalgo	0.6	-	0.5	-	0.9

Figure 194 presents an estimated combined emissions source inventory for the entire Texas Coastal Zone. Gaseous emissions (NOx, SOx, HC, CO) account for 98 percent by weight of total emissions. Carbon monoxide is the highest single air pollutant, followed by hydrocarbons. Over 70% of CO emissions and roughly 50% of hydrocarbon emissions are due to automobiles. Industrial chemicals and petroleum refining account for over 84 percent of industrial processing emissions. Municipal incineration accounts for about 60 percent of the particulate and SOx emissions in the solid waste disposal category.

Aircraft emissions account for about 66% of particulate emissions in the Transportation category.

Figure 194

Combined Emission Source Inventory

Emissions due to:	NOx	SOx	HC	CO	Particulates
Fuel Combustion	38%	0.1%	10.1%	-	11.2%
Industrial Processing	23%	95%	36.8%	28%	27.1%
Solid Waste Disposal	.6%	.7%	1.7%	1%	40.5%
Transportation	38%	4.2%	15.3%	71.2%	18.4%

(From: Waste Management in the Texas Coastal Zone p. IV - 24)

The distribution of air quality monitoring stations across the Scenario II regions is insufficient to comprehensively describe ambient air quality. Only the Corpus Christi area seems to have serious air quality problems and frequent violations of standards. Studies have shown that the ozone levels related to photochemical atmospheric reactions have exceeded national standards in the Corpus Christi area including Nueces County. Also, particulate concentration and hydrocarbon emissions show probable or frequent violations of standards. Figure 195 presents an isopleth map of SO_2 concentration in the Corpus Christi area resulting from estimated low-level non-point sources. The pattern represents transportation and industrial density and dominent wind dispersion potential. It may be expected that other pollutant concentrations may follow a similar pattern.

II. Impact Evaluation

A. Land

Land requirements over time in the Scenario II study regions are presented in Figure 196. In Regions VI and VII, the initial rate of total land demand is 28 and 20 acres per month, respectively. In the second, third, and fourth years of the Scenario II time span, the rate

Contours of SO_2 Concentration of $\mu g/m^3$
(1972 average)

Figure 195

Figure 196

Scenario II Land Requirements

Time Period	LAND (acres) Primary Region VI	Primary Region VII	*Indirect Region VI	*Indirect Region VII	Residential Region VI	Residential Region VII	Total Land Region VI	Total Land Region VII	DOCKING SPACE (feet) Region VI	Region VII
7/77-10/77	0	20.5	0	56.1	0	17.9	0	94.5	0	600
1-/77- 1/78	0	22	0	106.6	0	28.4	0	157	0	1200
1/78- 4/78	7	35.5	61.8	107	14.2	33	83	175.5	600	1200
4/78- 7/78	7	35.5	61.8	107	14.2	33	83	175.5	600	1200
7/78-10/78	7	35.5	61.8	107	14.2	33	83	175.5	600	1200
10/78- 1/79	7	35.5	61.8	107	14.2	33	83	175.5	600	1200
1/79- 4/79	7	35.5	61.8	107	14.2	33	83	175.5	600	1200
4/79- 7/79	7	35.5	61.8	107	14.2	33	83	175.5	600	1200
7/79- 8/79	7	35.5	61.8	107	14.2	33	83	175.5	600	1200
8/79-11/79	7	35.5	61.8	107	14.2	33	83	175.5	600	1200
11/79- 2/80	7	35.5	61.8	107	14.2	33	83	175.5	600	1200
2/80- 5/80	7	35.5	61.8	107	14.2	33	83	175.5	600	1200
5/80- 8/80	7	34	61.8	107	14.2	33	83	174	600	600
8/80-11/80	5.5	34	61.8	107	14.2	33	81.5	174	0	600
11/80- 1/81	5.5	32.5	61.6	107	14.4	33	81.5	173.5	200	200
1/81- 7/81	5.5	91	55.7	89.9	20.3	50.1	81.5	231	200	1000
7/81-11/81	64	91	59.8	89.9	29.2	50.1	153	231	1000	1000
11/81- 3/82	64	91	59.8	89.9	29.2	50.1	153	231	1000	1000
3/82- 6/82	64	94	59.8	89.9	29.2	50.1	153	234	1000	1800
6/82- 8/82	67	149.5	70.8	88.1	29.2	59.9	167	297.5	1200	2400
8/82- 2/83	67	149.5	70.8	83	29.2	65	167	297.5	1000	2200
2/83- 8/83	67	152.5	70.8	84.6	29.2	72.4	167	309.5	1000	3000
8/83-11/83	67	165	70.8	120	29.2	77	167	362	1000	3800
11/83-12/83	67	168	70.8	141.7	29.2	77.3	167	387	1000	4600
12/83- 1/84	67	168	70.8	147.3	29.2	78.7	167	394	1000	4600
1/84- 7/84	67	168	70.8	137.2	29.2	99.8	167	400	1000	4600

*Total indirect land minus residential land

of increase of land requirements drops to near zero, after which it again increases. The pattern of direct and indirect OCS land use increases in a step-wise manner through these final years of the Scenario postulation. In Region VI, two increases spaced apart by 7 months describe growth steps at 18 and 7 acres per month. In Region VII, three step-wise increases have rates of 10, 32, and 17 acres per month, in order of occurance. In both regions, the lengths of time of land demand increases are relatively short (2 to 6 months intervals) in comparison to no-new-demand periods which lie between the increases (12 to 42 month intervals).

The type of land which is required and its rate of increase also affects the facility with which the requirements can be met. In addition to variance in the absolute amount of land requirements, the proportion of direct, indirect, and residential land requirements exhibit different patterns. (It may be recalled that residential land has been subtracted out of total indirect land.)

In Region VI, the amount of primary land closely tracks the amount of residential land required during the first half of the Scenario time span (ratio of Indirect to Residential to Primary is I:R:P::8.8:2:1). During the latter half of the Scenario time span, primary land more closely follows indirect land (I:P:R::2.4:2.3:1). This change in pattern is due to the increase of activity in Region VI during the development and production phases. During the exploration phase, Region VI only supports a minor role in the Scenario postulation.

In Region VII, during the first half of the Scenario a similar pattern is present (I:P:R::3.2:1:1). Following the mid-range of the Scenario the amount of primary land does track indirect land for a brief period, but then establishes a more complex pattern with residential and primary land gradually increasing and indirect land (total minus residential) fluctuating. During the exploratory phase, Region VII supports the major share of offshore activities. The first increase of primary land half-way through the Scenario represents the increased requirements of the development, as opposed to exploration, phase. In addition, land requirements for onshore bases of pipelaying barges, etc. add to the total primary land requirement.

The following three sections evaluate the region's ability to satisfy the direct, residential, and indirect land requirements as postulated in Scenario II.

1. Direct Land Requirements

As described in the section, "Environmental Impact Assessment" (Part B of this report), the substrate group most suitable for most direct OCS land uses is group III (see Figure 188) or reclaimed land made suitable. Although Group II substrates may present even fewer foundation problems, due to its geographic distribution in Region VI, most historical development on this substrate has favored recreational and residential uses. In Region VI, Group II substrates do not occur in significant amounts around developed areas.

There are three conditions under which all or part of the direct land requirements may be met on suitable substrates: (1) there may be open, undeveloped tracts zoned for industrial use; (2) there may be vacant albeit developed facilities available for lease or sale; or (3) existing companies may have "buffer land" about current plant sites and into which they may expand. Figure 190 presents a baseline regional land development inventory by substrate group for the communities to which a sub-allocation of requirements was previously made.

If all direct land requirements can be met within currently designated industrial areas in Region VI in a manner as described above, then it is seen that the final and maximum direct land requirement in Region VI (67 acres) is but 1.8% of currently inventoried suitable land. This maximum requirement is reached in three pulses of 2.3, 14.6, and 1.5 acres per month and represents an approximate net intensification of industrial activity after seven years, within an area already designated for industrial use. If, on the other extreme, none of the direct OCS land requirements can be met in this manner, then the requirements must be expressed against the appropriate suitability class use groups as presented in Figure 190. In Region VII the direct land requirements are two-tenths of one percent of 'other' suitable land. Most of the competing uses for such land are agriculture and range-pasture. These net requirements are certainly within regional growth rates and represent an impact of neither serious magnitude nor of much importance.

In Region VII, direct requirements have been sub-allocated to Brownsville and Port Isabel. It is seen that the direct land requirements for Scenario II would be a very large proportion of these communities' industrial lands (42%) and also a relatively large proportion of suitable "other" land within these two cities' jurisdictions (3%). Therefore, the previous sub-allocation must be seen as not completely suitable. If direct OCS land needs were also met in other areas of Cameron County, for example in or around Harlingen, the percent net industrialization would still be a 15% growth. This figure is irrespective of substrate suitability. In the tri-county

region at large, Scenario II direct land needs are 8 percent of all inventoried industrial land (see Figure 189). It is evident, therefore, that direct land requirements in Region VII as a result of Scenario II postulations are of large magnitude and importance, and will therefore be further analyzed in the "Special Environmental Issue Analysis."

The maximum required docking space for direct OCS activities is 1000 feet to be met in and around the Corpus Christi area of Region VI; and 4600 feet in and around port facilities of Region VII including Port Isabel, the Brownsville Ship Cannel, Port Mansfield, and the channel to Harlingen. The proportionate impact of these docking requirements upon current facilities depends upon the length of time that OCS-involved vessels are in port, the intensity of current use of available port facilities, and the available water frontage which is already owned and developable by harbor authorities in each region. Both regions have historically depended upon their port activities for a significant share of their regional income, and it may be assumed that OCS docking needs will not pose any immediate environmental impacts.

2. Residential Land Requirements

It is assumed that all residential land requirements will be met within the municipalities inventoried in Figure 190. The substrate needs for suitable residential development, i.e., development with minimal foundation problems, are less restricted than for industrial development as there is generally less loading force superimposed on building foundations.

The residential land development demand resulting from Scenario II postulations in Region VI is less than a fifth of one percent of currently designated residential land in this region. However, in Region VII, the residential land requirement is two percent of current residential acreage inventoried in Figure 190. In addition, it is seen in the section "Infrastructural Issues in Region VII/Scenario II," that there is currently a housing shortage in both Brownsville and Port Isabel. To the extent that employees in Scenario II attempt to locate in these areas as postulated, this residential land demand thereby represents an important impact.

3. Indirect Land Requirements

The maximum indirect land requirement in Region VI and in Region VII is 70.8 and 147.2 acres, respectively. The amount of indirect

land does not increase proportionately with direct land needs, as the former is calibrated to net direct OCS employment and not to direct OCS land needs. Direct activities do not proportionately relate land use and employment.

The indirect land requirement expressed in Figure 196 includes unspecified amounts of land for industrial and commercial uses, vacant or undeveloped land, parks and recreation areas, sewage treatment and solid waste disposal sites, airfields, and artificial reservoirs. Treated as a unit, these various indirect land uses have different substrate requirements, as described in Figure 16 of Part B, yet most require or prefer properties of Groups I and III (see, also, Figure 188). A visual comparison of the maximum indirect land demand (Figure 196) with the amount of "other" land in each region characterized by these two suitability classes (Figure 190), indicates in Region VI that there is ample land to meet these requirements with minimal environmental impact. In Region VII, indirect land requires 2.2% of the inventoried suitable "other" land, which may exacerbate the impacts already desribed for direct and residential land needs.

To the extent that a major portion of indirect land in Region VII is industrially comprised, the previously described impacts would be certainly increased.

Parks and recreational facilities in Port Isabel are noted to be below standards used to identify significant issues in the section "Infrastructural Impacts," referred to above; a portion of indirect land in Region VII may be assumed to be given to making up this deficit.

It will be seen subsequently that solid waste disposal acreage required for direct and indirect OCS-related solid waste generation is, in Region VI, 2.5% of the net indirect land, and is, in Region VII, 8 percent of net indirect land requirements. It will be seen, however, that these disposal acreage requirements need not be assumed to involve important impacts on currently available disposal facilities.

B. Solid Waste Generation

Direct OCS-related industries may be grouped into four categories on the basis of similarity of solid waste production: (1) offshore rig and platform activities; (2) dockside support for rigs and platforms; (3) operations and administrative bases, well-logging and diving services, and oil field equipment suppliers; and (4) cement and mud supply companies.

Waste materials produced by offshore activities, including galley, paper, glass, metal, and other wastes, have been approximated at 4.5 pounds per worker per day (BLM OCS lease sale #40). In the last years of the Scenario II postulation, the year of maximum offshore employment, this activity would produce 229.95 thousand pounds of waste materials. By OCS Order #7, such solid waste materials must be transported to shore for disposal, and it is here assumed that such onshore removal will occur in the regional proportion of onshore support for platforms, as postulated for Scenario II. Therefore, in the year of maximum activity, Region VI will receive 76.6 thousand pounds and Region VII will receive 153.3 thousand pounds of solid waste produced offshore. As will be seen subsequently, the waste level will add another 2.9% (in Region VI) and 2.1% (in Region VII) to the waste levels due to onshore indirect industrial and municipal activities.

Waste production by the other three direct OCS activities listed above is not quantified, but is treated here to give a perspective of the type of waste which each may produce. It is expected that the amount of waste those three categories produce will not be significant.

Operations and administrative bases, well logging and diving services, and oil field suppliers may be expected to mainly generate waste comparable to commercial activities - paper, packaging, and miscellaneous. Dockside support activity wastes would include the solid wastes brought ashore from rigs and platforms, discarded equipment, and barreled spent lubricants. Cement and mud companies, besides having paper wastes, would also have drilling mud and lime wastes. Most of such waste would probably be treated on-site.

Figure 197 presents solid waste generation over time in Scenario II by indirect industrial and domestic, municipal and commercial sources. The values were derived as described in the section 'Environmental Impact Assessment,' in Part B of this report. The maximum annual waste production thus postulated is 2650.5 thousand pounds in Region VI and 7352.6 thousand pounds in Region VII. Together with offshore wastes brought ashore, these solid waste levels represent an estimated increase of 0.3% and 0.7% over current levels in Regions VI and VII, respectively (see Figure 191). In Region VI during this peak production year, the ratio of industrial to domestic solid waste levels is 2.3. In Region VII the ratio of domestic to industrial solid waste levels is 3.0. It may be recalled from Figure 191 that the domestic/industrial solid waste generation ratio is 4.9 and 10.6 in Regions VI and VII, respectively. Therefore, it is seen that the proportions of solid waste production sources are reversed over current patterns in Region VI. However, as the magnitude of increase of solid waste production is small in both sectors combined, it is expected that this issue will not be seen as important.

Figure 197

Solid Waste Generation in Scenario II

Time Period	Region VI Ind.	Region VI Dom.	Region VI Total	Region VII Ind.	Region VII Dom.	Region VII Total
7/77-10/77	0	0	0	93.4	288.0	381.4
10/77- 1/78	0	0	0	148.9	455.0	603.9
1/78- 4/78	116.3	83.5	199.8	168.9	530.6	699.5
4/78- 7/78	116.3	83.5	199.8	168.9	530.6	699.5
7/78-10/78	116.3	83.5	199.8	168.9	530.6	699.5
10/78- 1/79	116.3	83.5	199.8	168.9	530.6	699.5
1/79- 4/79	116.3	83.5	199.8	168.9	530.6	699.5
4/79- 7/79	116.3	83.5	199.8	168.9	530.6	699.5
7/79- 8/79	12.5	27.8	40.3	18.5	176.9	195.4
8/79-11/79	116.3	83.5	199.8	168.9	530.6	699.5
11/79- 2/80	116.3	83.5	199.8	168.9	530.6	699.5
2/80- 5/80	116.3	83.5	199.8	168.9	530.6	699.5
5/80- 8/80	116.3	83.5	199.8	128.9	530.6	659.5
8/80-11/80	48.9	83.5	132.4	128.9	530.6	659.5
11/80- 1/81	127.6	56.6	184.2	100.8	353.8	454.6
1/81- 7/81	1125.9	237.6	1363.5	1089.3	1614.2	2703.5
7/81-11/81	630.5	227.5	858.0	483.1	1076.2	1559.3
11/81- 3/82	630.5	227.5	858.0	500.9	1076.2	1577.1
3/82- 6/82	356.5	170.6	527.1	286.8	807.1	1093.9
6/82- 8/82	165.1	113.8	278.9	149.7	642.7	792.4
8/82- 2/83	510.4	341.3	851.7	893.6	2092.3	2985.9
2/83- 8-83	585.5	341.3	926.8	973.7	2332.8	3306.5
8/83-11/83	150.1	170.6	320.7	286.8	1240.6	1527.4
11/83-12/83	16.3	56.9	73.2	34.1	414.7	448.8
12/83- 1/84	16.3	56.9	73.2	35.6	422.4	458.0
1/84- 7/84	585.5	341.3	926.8	1311.6	3055.7	4367.3

Ind - Indirect Industrial
Dom. - Domestic and Municipal, Commercial
Units - Thousands of pounds

The significant issue of solid waste generation is that of disposal. Open dumps and sanitary landfills are the most common forms of solid waste disposal. When current regional solid waste disposal site acreage (Figure 189) is compared with current regional solid waste generation (Figure 191), it may be seen that the land required for OCS solid waste disposal is 1.7 acres and 11.0 acres in Regions VI and VII, respectively. These values are 2.5% and 8% of the net indirect land requirements in each respective region.

These acreage estimates include direct as well as indirect solid waste disposal requirements. The land required represents 0.3% and 0.8% of current respective regional solid waste disposal site acreage. It should, however, be noted that the inventory does not reveal how much of the current facilities have been already used or consumed, and how much is yet available. It may also be recalled that each region has only an estimated 40 percent of their disposal sites on suitable substrates, as defined by the Bureau of Economic Geology. Furthermore, the amount of solid waste disposal site acreage does not increase continually, but as a step-wise function. The impact of OCS solid waste would depend upon the timing of peak waste production relative to the last incremental increase of available disposal facilities. In any event, it is seen in 'Identification of Significant Issues' that solid waste disposal site acreage is not a significant infrastructural problem in either Region VI or VII. Therefore assuming good operations practices to minimize health hazards and groundwater pollution, impacts of Scenario II solid waste generation may be considered to be of small magnitude and negligible importance.

C. Water

Total water requirements over time in each region of Scenario II are presented in Figure 198. Over the 7-year Scenario II time period, these water requirements average 66.56 acre-feet annually in Region VI and 169.09 acre-feet annually in Region VII. The maximum annual water requirements are 95.09 and 288.3 acre-feet in Regions VI and VII, respectively. The maximum monthly water requirement is 7.78 and 26.47 acre-feet in each respective region.

In Region VI, these water requirements may be met by proportions of ground and surface water, either self-supplied (within region source) or imported from outside the region. In Region VII, it is expected that these requirements would draw upon surface water sources only.

Figure 198

Scenario II Water Requirements
(acre-feet)

Time Period	Region IV	Region VII
7/77-10/77	0	16.98
10/77- 1/78	0	28.26
1/78- 4/78	13.7	31.86
4/78- 7/78	13.7	31.86
7/78-10/78	13.7	31.86
10/78- 1/79	13.7	31.86
1/79- 4/79	12.32	31.86
4/79- 7/79	12.32	30.48
7/79- 8/79	4.21	9.7
8/79-11/79	12.32	30.48
11/79- 2/80	12.32	31.86
2/80- 5/80	13.7	31.86
5/80- 8/80	13.7	28.08
8/80-11/80	10.5	28.08
11/80- 1/81	6.9	16.2
1/81- 7/81	29.7	81.64
7/81-11/81	32.3	54.33
11/81- 3/82	30.46	55.18
3/82- 6/82	24.08	41.46
6/82- 8/82	16.15	34.65
8/82- 2/83	38.79	95.96
2/83- 8/83	53.86	140.96
8/83-11/83	24.56	64.78
11/83-12/83	8.09	22.25
12/83- 1/84	8.09	22.31
1/84- 7/84	46.66	158.82
	465.81	1,183.64

The OCS Scenario II water requirements represent a small, almost negligible increase over current demand levels in Region VI. In Region VII, water rights allocations are virtually all tied up. However, it is expected that the small amounts of water for direct and indirect industrial demands, as postulated in Scenario II, may be purchased with few problems from those entities already possessing the water rights, particularly municipalities. It is also expected that the water needed to serve new population demands, as postulated in Scenario II, may also be met with no difficulty. Therefore, Sceanrio II water committment is not considered to be an important environmental problem.

Figure 199 presents the volume of return wastewater flows over time for each Scenario II region. These return flows were based on coefficients discussed in 'Environmental Impact Assessment,' Part B of this report. The maximum average return flow, in cubic feet per second, is 0.072 and 0.218 over all of Regions VI and VII, respectively. In comparison to current regional return flow levels (see Figure 192), this postulated level of Scenario II wastewater return flow is a negligible incremental increase of less than 0.1%. In Region VI the Scenario return flows are only 0.15% of average discharge rates to water quality segments. In Region VII the Scenario return flows are only 2.3% of average discharge rates to water quality segments in that region. As the Scenario II return flows would actually be distributed across the region and not into one channel, the proportionate impact must be considered as being even less.

Associated with return flows are wastewater effluent loadings. The derivation of wastewater effluent coefficients used in this study is presented in Part B of this report. Figure 200 presents the total levels of wastewater loadings over time as postulated for Scenario II. It is assumed that the values in Figure 200 are those concentrations (when compared with return flow volume - Figure 199) entering coastal waters, rather than the concentrations entering wastewater treatment plants. Only point source effluents are considered, as these are what may be ascribed to direct or indirect Scenario II activities.

The presence of oxygen demanding wastes in stream and bay waters results in a decrease of available dissolved oxygen for fish and aquatic invertebrates and plants. The effect of suspended solids (sediments) is to decrease biotic filter feeding efficiency and to decrease the amount of sunlight available to aquatic plants, decreasing plant respiration and oxygen production.

The maximum average daily production of B.O.D. effluents is 1695 pounds and 2750 pounds in Region VI and VII. The maximum average daily production of T.S.S. is 1334 pounds and 3463 pounds in Regions

Figure 199

Total Wastewater Return Flow
(includes indirect industrial and
municipal - units in acre-feet)

Time Period	Region VI	Region VII
7/77-10/77	0	8.54
10/77- 1/78	0	13.59
1/78- 4/78	6.56	15.69
4/78- 7/78	6.56	15.69
7/78-10/78	6.56	15.69
10/78- 1/79	6.56	15.69
1/79- 4/79	6.56	15.69
4/79- 7/79	6.56	15.69
7/79- 8/79	2.29	5.29
8/79-11/79	6.56	15.69
11/79- 2/80	6.56	15.69
2/80- 5/80	6.56	15.69
5/80- 8/80	6.56	14.84
8/80-11/80	6.0	14.84
11/80- 1/81	3.9	9.3
1/81- 7/81	17.1	44.59
7/81-11/81	16.9	29.73
11/81- 3/82	16.9	29.99
3/82- 6/82	12.83	22.49
6/82- 8/82	8.45	18.16
8/82- 2/83	21.45	50.47
2/83- 8/83	30.15	76.57
8/83-11/83	12.98	34.98
11/83-12/83	4.13	11.77
12/83- 1/84	4.13	12.13
1/84- 7/84	25.95	86.36

Figure 200

Wastewater Effluent Loadings
(1000's of pounds)

Time Period	Region VI B.O.D.	Region VI T.S.S.	Region VII B.O.D.	Region VII T.S.S.
7/77-10/77	0	0	36.7	46.1
10/77- 1/78	0	0	58.5	73.5
1/78- 4/78	34.9	28.8	66.7	83.8
4/78- 7/78	34.9	28.8	66.7	83.8
6/78-10/78	34.9	28.8	66.7	83.8
10/78- 1/79	34.9	28.8	66.7	83.8
1/79- 4/79	34.9	28.8	66.7	83.8
4/79- 7/79	34.9	28.8	66.7	83.8
7/79- 8/79	4.8	4.4	9.9	12.1
8/79-11/79	34.9	28.8	66.7	83.8
11/79- 2/80	34.9	28.8	66.7	83.8
2/80- 5/80	34.9	28.8	66.7	83.8
5/80- 8/80	34.9	28.8	53.6	67.1
8/80-11/80	17.4	15.3	53.6	67.1
11/80- 1/81	36.3	29.2	40.5	50.8
1/81- 7/81	305.2	240.2	391.5	494.6
7/81-11/81	176.4	140.9	181.2	228.4
11/81- 3/82	176.4	140.9	187.1	235.8
3/82- 6/82	102.1	82.5	111.2	139.8
6/82- 8/82	49.3	40.8	62.8	78.5
8/82- 2/83	151.8	124.6	337.6	425.0
2/83- 8/83	171.2	139.5	368.9	464.3
8/83-11/83	48.7	41.4	120.4	150.6
11/83-12/83	7.5	7.0	20.0	24.6
12/83- 1/84	7.5	7.0	20.7	25.4
1/84- 7/84	171.2	139.5	495.0	623.3

VI and VII, respectively. Indirect industrial activity accounts for 10 to 21 times the effluent loadings which domestic wastewater contains.

In Region VI, the maximum B.O.D. production in Scenario II is 15% of current B.O.D. waste loadings, and T.S.S. is 5.2% of current T.S.S waste loadings. However the Scenario B.O.D. and T.S.S. levels are 2.15% and 1.56%, respectively, of permitted discharge rates.

In Region VII, the maximum B.O.D. production in Scenario II is 25% of current B.O.D. waste loadings, and T.S.S. is 77% of current T.S.S. loadings. However the Scenario B.O.D. and T.S.S. levels are 24% and 12%, respectively, of permitted discharge rates.

It is seen, therefore, that wastewater effluent loadings may be of such magnitude as to cause important deterioration in the water quality of each regions' streams. This issue will be further analyzed in 'Special Environmental Issue Analysis/Scenario II.'

D. Air Quality

Air emissions over time in Scenario II as a result of indirect industrial, municipal-residential, and transportation activity are presented in Figure 201. Direct OCS-related air emissions are not included in Figure 201, but would include dockside support power equipment exhaust, helicopter and boat exhaust where these vehicles cross over the regions to offshore rigs and platforms, and minor emissions from the heating of operations and administrative bases and from other service and supply company offices.

In the year of maximum production of air emissions, in Region VI total particulate and gaseous emissions amount to 152.7 thousand pounds and 3901.8 thousand pounds, respectively. When compared to an inventory of self-reporting industrial air emissions (Figure 193), it is seen that Scenario II emissions represent about five to six-tenths of one percent of current Region VI emissions. Carbon monoxide is the single largest gaseous component of Scenario II emissions (1576 thousand pounds). Hydrocarbon emissions (854, 750 th. lb.) and sulfur dioxide emissions (694,450 th. lb.) account for the largest proportionate increases over their respective base-level loadings, 1.08% and 4.45%. Most of the CO emissions are from postulated automobile sources; most of the other gaseous components are from indirect industrial sources and may to an extent follow a density distribution comparable to that shown in Figure 195.

Figure 201

OCS Air Emissions/Scenario II
(indirect industrial, residential municipal, and transportation)

All values in thousands of pounds

Time Period	Particulates VI	Particulates VII	Gaseous VI	Gaseous VII	NO_x VI	NO_x VII	SO_x VI	SO_x VII	HC VI	HC VII	CO VI	CO VII
7/77-10/77	0	15.9	0	247.7	0	25.3	0	10.2	0	39.7	0	172.6
10/77- 1/78	0	25.2	0	391.9	0	40.1	0	16.2	0	62.9	0	272.8
1/78- 4/78	15.5	29.2	319.3	455.1	51.2	46.3	39.4	18.4	62.4	72.8	166.4	317.6
4/78- 7/78	15.5	29.2	319.3	455.1	51.2	46.3	39.4	18.4	62.4	72.8	166.4	317.6
7/78-10/78	15.5	29.2	319.3	455.1	51.2	46.3	39.4	18.4	62.4	72.8	166.4	317.6
10/78- 1/79	15.5	29.2	319.3	455.1	51.2	46.3	39.4	18.4	62.4	72.8	166.4	317.6
1/79- 4/79	15.5	29.2	319.3	455.1	51.2	46.3	39.4	18.4	62.4	72.8	166.4	317.6
4/79- 7/79	15.5	29.2	319.3	455.1	51.2	46.3	39.4	18.4	62.4	72.8	166.4	317.6
7/79- 8/79	4.3	9.1	71.4	136.4	8.3	11.6	4.4	2.3	12.1	20.5	46.7	102.1
8/79-11/79	15.5	29.2	319.3	455.1	51.2	46.3	39.4	18.4	62.4	72.8	166.4	317.6
11/79- 2/80	15.5	29.2	319.3	455.1	51.2	46.3	39.4	18.4	62.4	72.8	166.4	317.6
2/80- 5/80	15.5	29.2	319.3	455.1	51.2	46.3	39.4	18.4	62.4	72.8	166.4	317.6
5/80- 8/80	15.5	29.2	319.3	438.9	51.2	42.3	39.4	14.4	62.4	68.8	166.4	313.6
8/80-11/80	13.1	29.2	229.3	438.9	28.7	42.3	16.9	14.4	56.2	68.8	166.4	313.6
11/80- 1/81	12.3	19.3	281.7	298.6	50.9	29.7	42.9	11.1	58.6	47.3	129.2	210.5
1/81- 7/81	72.6	98.3	1969.2	1617.4	410.6	199.1	376.9	114.3	442.7	279.7	738.9	1024.4
7/81-11/81	53.4	61.6	1288.4	979.9	244.0	108.1	211.7	51.6	274.7	161.8	558.1	658.3
11/81- 3/82	53.4	61.6	1288.4	987.1	244.0	79.9	211.7	53.4	274.7	163.6	558.1	660.1
3/82- 6/82	35.8	45.0	811.2	704.3	144.1	73.4	120.0	31.0	167.2	113.7	379.7	486.0
6/82- 8/82	21.3	34.5	444.1	529.0	71.9	50.6	55.8	16.8	87.2	82.6	229.0	379.1
8/82- 2/83	64.5	119.1	1352.1	1886.6	220.8	205.6	172.4	95.7	266.8	310.1	691.9	1275.3
2/83- 8/83	67.2	132.4	1452.2	2094.2	245.9	226.9	197.5	104.4	291.9	343.4	717.0	1419.5
8/83-11/83	28.4	66.6	536.0	1020.2	75.3	97.2	51.2	32.1	98.4	159.2	310.9	731.5
11/83-12/83	8.3	21.3	133.6	316.0	13.8	26.3	5.8	4.5	21.5	47.0	92.4	238.3
12/83- 1/84	8.3	21.7	133.6	322.2	13.8	26.8	5.8	4.7	21.5	47.9	92.4	242.8
1/84- 7/84	67.2	159.9	1452.2	2757.8	245.9	300.9	197.5	140.4	291.9	453.5	717.0	1863.0

In Region VII during the year of maximum Scenario II air emissions, total particulate and gaseous emissions amount to 291.6 and 4710.2 thousand pounds, respectively. When compared to the inventory of self-reporting industrial emissions (Figure 193), it is seen that Scenario II emissions represent a 7.7% and 13.5 percent increase over current atmospheric loadings in Region VII. Carbon monoxide is again the single largest gaseous emission (3312.2 thousand pounds), and represents an estimated 28.5% increase over current emissions levels. Whereas SOx emissions are currently small, Scenario II activities are postulated to result in an added 199,100 pounds during this year of maximum activity. In contrast to the postulated activities in Region VI, most gaseous emissions in the Valley are postulated to result from municipal or domestic/transportation sources.

It is important to note that these stated proportionate increases compare indirect industrial and residential-transportation emissions in Scenario II to self-reported industrial emissions. An estimate of automobile emissions for Corpus Christi's downtown and industrial zone areas includes, in thousands of pounds per year, 177.3 - particulates, 1,679 - NOx, 42.9 - SOx, 1,185 - HC, and 11,850 - CO (Water Needs and Residuals Management). In the 18-county Corpus Christi Air Quality Maintenance Area, an estimated 74.97 million pounds of hydrocarbon emissions per year results from automobiles, compared to 4.8 times that amount for industries located in the same area (Texas Gulf Coast Program Research Report #1). Automobiles play a small but statistically significant role in atmospheric emissions, particularly of hydrocarbons and carbon monoxide. The proportionate Scenario II emissions increases given above are therefore overestimates of what probable impacts may occur should Scenario postulations come to fruition.

Nonetheless, the level of Scenario emissions is of such magnitude to suggest that air quality impacts may be important. It has already been seen that ozone levels, hydrocarbons concentration, as well as particulate concentrations have presented air quality problems in the Corpus Christi area. No major air quality problems have yet developed in Region VII. So it may be reasonable to assume that air quality may be an important environmental impact, either by exacerbating current problems in Region VI, or by engendering new problems in Region VII.

Special Environmental Issue Analysis

In the 'General Environmental Impact Evaluation' it was seen that the main onshore effects of the postulated Scenario II activities may be increased demand for industrial and residential land in Region VII, air quality deterioration in both regions, and water pollution in both regions. In this section these potentially significant impacts will be further analyzed. Also, secondary effects of immediate environmental impacts will be discussed. Finally, a discussion of the possible affects of Scenario II activities on the biological conditions of Regions VI and VII will be presented.

It will be recalled that the Scenario II direct and residential land requirements in Region VII represent a total of 5 percent of such land uses currently developed in Brownsville and Port Isabel, the areas to which facilities and service needs have been sub-allocated. The direct OCS land requirement was seen to be 42 percent of such currently developed or designated land use in these two areas. Therefore, it was suggested that industrial and residential land requirements would be met throughout Region VII, especially in Cameron County, rather than in just the cities of Brownsville and Port Isabel. The direct OCS land requirement was seen to be 15% of industrial land in Cameron County.

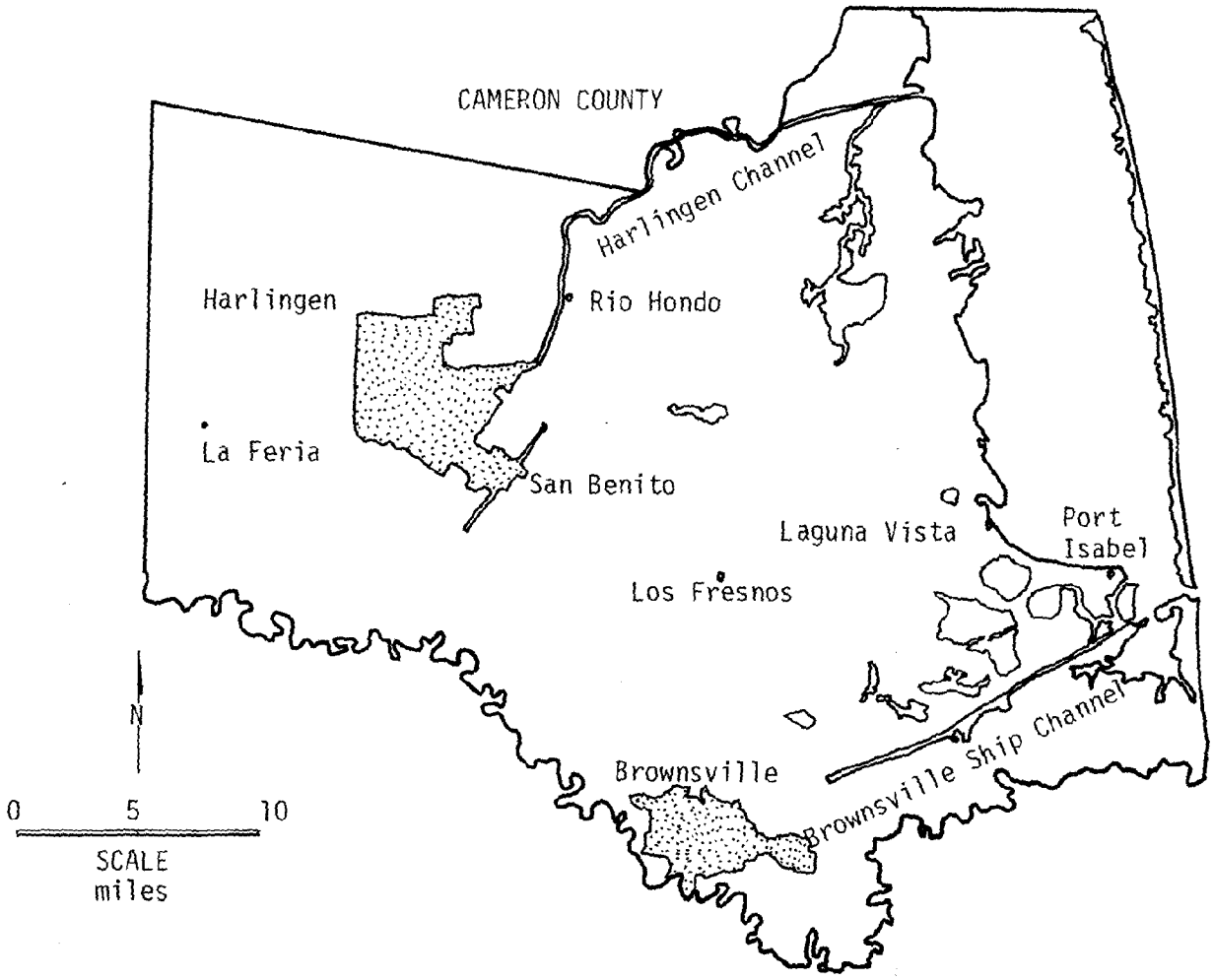
Figure 202 presents a map and tabulated inventory of alternative industrial and residential locations in Cameron County to which companies and individuals involved in the Scenario II postulation might locate. The municipalities are all within accessible range of ports and waterways. Additionally, Port Mansfield to the north in Willacy County may also be an alternate location of development.

Two studies have projected land use development in Region VII - Brownsville Urban Transportation Study, 1970; and Comprehensive Study and Plan of Development-Lower Rio Grande Basin, 1969. Based on these reports' projections, it is reasonable to expect a 45 to 60 percent increase in urban-industrial development in Region VII over the next 20 to 30 years. The Brownsville study projects a 49% increase in industrial land use between 1970 and 1990. Concommittant with this increase of land development, a decrease of 6.4% in agricultural land is expected. The type of agriculture to be mainly affected is irrigated cropland. This loss may be offset with increased irrigation acreage elsewhere, and by increased efficiency of crop production.

It may be assumed that these projections do not include the land requirements specified and implied in the OCS Scenario. Therefore, the OCS requirements may be seen as additions to these projections.

In summary, this 'Special Issue Analysis' has shown that the impact of

Figure 202



CURRENT LAND USE IN SELECTED CITIES
(acres)

	Industrial	Residential	Commercial
Brownsville	295	3,024	496
Harlingen	635	1,760	253
San Benito	108	717	107
Port Isabel	21	139	25
Rio Hondo	17	101	11
Laguna Vista	-	55	0.6
Los Fresnos	9	99	6
La Feria	3	191	13
TOTAL	1,088	6,137	953.6

land use conversion in Region VII, given Scenario II postulations, may not be as great as was previously suggested. However, it is nonetheless reasonable to expect that the land-use conversions may be important. Future studies may be desired to investigate the impacts on current tax roles, and also of post-Scenario operations levels and phase-out impacts. Finally, it may be assumed that existing land-use plans and those being prepared may serve to guide physical plant location to maximize coherency of community design.

Secondary effects of land development in Region VII may be expected to mainly involve alterations of groundcover and surface drainage patterns. "Storm rainwater tends to accumulate rather than effectively runoff because of the flat topography, lack of natural channels, and inadequate drainage systems. Man-made obstruction to surface flow such as canals, railroads, and roads block natural flow and may cause inundation of large areas. In some cases, these restrictions cause water to stand for long periods of time in highly developed urban areas" (Study and Plan of Development, LRGV). To the extent that surface paving will cover more area as a result of Scenario II land development, and to the extent that such activities decrease any percolation of floodwater in the region's dominantly clay soils, such secondary effects may be important.

Current water quality problems in Regions VI and VII were described in 'General Environmental Description/Scenario II.' Included are five water quality segments (W.Q.S.) designated by the Texas Water Quality Board. These segments have State Abatement Priority Rankings of 19, 54, 63, 117, and 164 among the 288 segments in Texas. These segments are all restricted to contact recreation, yet are suitable for propogation of fish. It is recognized that water quality and hence ecological conditions in fish and shrimp habitats in Region VII's floodways, Arroyo Colorado, and Laguna Madre have been deteriorating (Study and Plan of Development, LRGV.).

These current problems result variously from excessive concentrations of pollutants discharged from municipal wastewater treatment plants, industrial cooling and processing water discharge, agricultural runoff, and direct disposal of poorly treated wastes. Attempts to meet effluent discharge standards are often complicated by overloading of facilities during flood conditions and limited capacity to retain treated wastes during low-flow conditions. The Corpus Christi, Brownsville, and Ingleside sewage treatment plants are, overall, operating at 67 to 72 percent of capacity.

It is, therefore, reasonable to assume that wastewater effluent loadings on the scale postulated in Scenario II for Regions VI and VII would represent an important impact upon regional water quality. Such impacts could be felt at the same time that efforts, under State and federal measures, are being made to improve water quality. However, it is not expected that water quality will limit or restrict location of OCS-related companies or personnel.

Air quality impact is the third area which may be considered as an important environmental change given Scenario II activities. The abatement of air quality impact is a difficult problem involving costly equipment, technical conversions and changes in way of life. A significant portion of air emissions both in Scenario II postulations and in the present case is from non-point source auto or truck transportation. An effective decrease in air pollution requires added anti-pollution devices in vehicles, acceptance of mass transit alternatives to reduce the number of vehicle miles driven, and more refined fuels. Also required are efficient and implementable transportation plans to reduce traffic conjestion in thoroughfares and around large parking lots' exits, as more carbon monoxide per gallon of fuel is emitted at low speeds endemic to stalled traffic flow.

The Corpus Christi S.M.S.A. has been designated as an air quality maintenance area by the E.P.A. Thus, there is a high priority requirement in this area for the reduction of photochemical oxidants and particulate matter to meet ambient air quality standards. Ultimately, stringent regulations may have a direct affect on the rate and form of urban and industrial growth in this region.

Of present concern in Region VII is air quality degredation from field burning of sugar cane crop residue. Also an increasing concern is international air pollution by regional air currents bringing industrial pollutants from Matamoros, Mexico with less stringent emissions regulations, into the south Texas region. The success of this region's important tourist and winter resident business, of course, depends upon maintaining "clean" air.

In order to better understand the impacts of current and projected development in the southern Texas coastal area, a more extensive air quality monitoring network will have to be implemented.

Figures 203 and 204 present groupings of natural areas occurring in the coastal reaches of Regions VI and VII, respectively, and the bases of concern about the natural areas. Figure 204 also describes natural areas between Regions VI and VII. A background description of these presentations may be found in Part B of this report, 'Environmental Impact Assessment.' Three general groups may be distinguished in Figure 203: (1) areas of high natural productivity including marshes and grassflats suitable to shrimp, finfish, and blue crab nursery grounds and to waterfowl dependent upon this salt marsh-estuary ecological system; (2) areas of recreational interest including sport fishing along water-exchange passes; and (3) special unique and vulnerable areas due to the occurance of endangered species (principally the Brown Pelican) and diminishing oyster reefs.

Given the similarity of bases of concern in Figure 204, no distinct group is apparent. In general, these natural areas are identified as

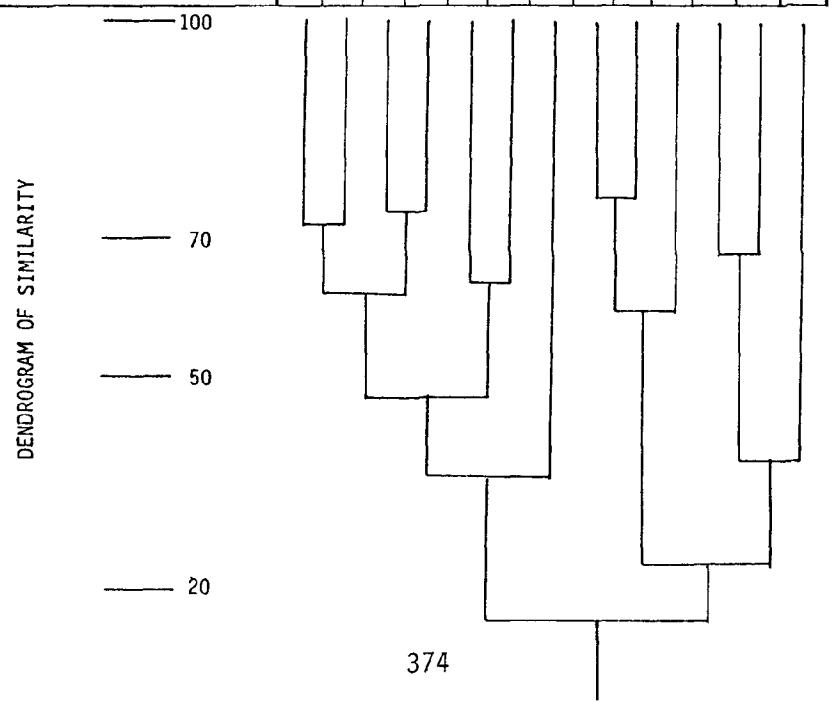
Figure 203

ANALYSIS OF CRITICAL HABITATS

(nominated by Texas Parks and Wildlife Department)

JUSTIFICATION AS AN AREA OF PARTICULAR CONCERN	Redfish Bay, Harbor Is., and mangroves	Mustang Island bayside grassflats & marshes	Nueces River & Upper Nueces Bay marshes	Oso Bay	Nueces Bay	North shore of Nueces Bay	Ingleside Cove	Aransas Pass	Fish Pass on Mustang Island	Water exchange area through Kennedy Causeway	Pelican Island	Northeast corner of Nueces Bay, reef areas	Oyster reefs in Corpus Christi Bay
Areas of unique, scarce, fragile, or vulnerable natural habitat, physical feature, historical significance, cultural value, and scenic importance.	•										•	•	•
Areas of high natural productivity or essential habitat for living resources, including fish, wildlife, and the various trophic levels in the food web critical to their well being.	•	•	•	•	•	•	•						
Areas of substantial recreational value or opportunity.	•	•						•	•				•
Areas especially suited to intensive use or development and where developments and facilities are dependent upon the utilization of, or access to, coastal waters.				•			•						
Areas of unique geologic or topographic significance to industrial or commercial development.							•						
Areas of significant hazard if developed, due to storms, slides, floods, erosion, settlement, etc.													
Areas needed to protect, maintain, or replenish coastal lands or resources.	•	•	•	•	•	•	•	•	•	•	•	•	•
Shrimp nursery.	•	•	•	•	•	•							
Finfish nursery.	•	•	•	•	•	•	•						
Blue crab nursery.	•	•	•	•	•	•							
Oyster reef.					•							•	•
Grass flats.	•	•				•	•						
Marshes.	•	•	•	•									
Spawning grounds.	•				•								
Water exchange passes.								•	•	•			
Freshwater input.			•										
Water fowl areas.	•	•	•	•							•	•	
Endangered species.	•												
Fish-eating bird rookeries.	•		•								•	•	
Muskrat, otter, and matrix habitats.													
Non-game birds, watching	•	•	•	•				•				•	

CRITICAL HABITATS



DENDROGRAM OF SIMILARITY

Figure 204

ANALYSIS OF CRITICAL HABITATS

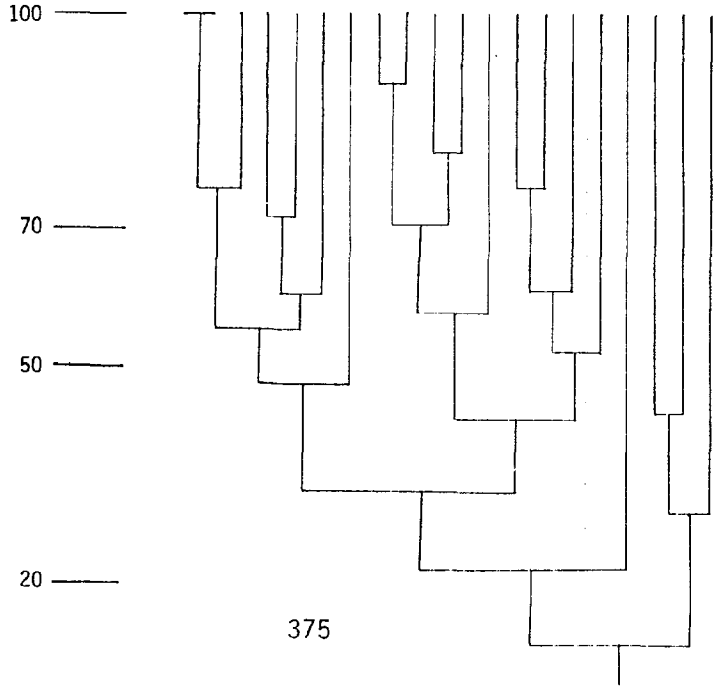
(nominated by Texas Parks and Wildlife Department)

	Creek west of Four Mile Slough	Natural drainage area from Arroyo Colorado	Mud Hole	Arroyo Colorado to Port Harlingen	Brownsville Ship Channel	Rio Grande to Brownsville	Baffin Bay, Laguna Madre - deeper areas	Upper Laguna Madre (B)	Middle Laguna Madre, Baffin Bay margin (B)	Four Mile Slough to Arroyo Colorado (B)	Gabrielson Is. to Cabello Is. (B)	Bay side of southern tip of Padre Island (B)	Cayo Atascosa (C)	Mexiquita Flats (C)	South Bay (C)	Laguna Vista Cove (C)	Lee side of S. Padre Island	Brazos Santiago Pass	Dunes of Mustand, Padre, St. Joseph's Is.	Nine mile Hole
Areas of unique, scarce, fragile, or vulnerable natural habitat, physical feature, historical significance, cultural value, and scenic importance.												•	•	•	•			•	•	
Areas of high natural productivity or essential habitat for living resources, including fish, wildlife, and the various trophic levels in the food web critical to their well-being.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•			
Areas of substantial recreational value or opportunity.				•	•	•	•	•	•	•	•	•						•	•	•
Areas especially suited to intensive use or development and where developments and facilities are dependent upon the utilization of, or access to, coastal waters.												•								
Areas of unique geologic or topographic significance to industrial or commercial development.																			•	
Areas of significant hazard if developed, due to storms, slides, floods, erosion, settlement, etc.																			•	
Areas needed to protect, maintain, or replenish coastal lands or resources.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•		
Shrimp nursery.	•	•	•	•	•	•		•	•	•	•		•	•	•					
Finfish nursery				•	•			•	•	•	•	•	•	•	•	•				
Blue crab nursery.				•						•	•	•	•	•	•	•				
Oyster reef.															•					
Grass flats.								•	•	•	•	•	•				•			
Marshes.								•												
Spawning grounds.								•	•	•		•								
Water exchange passes.																		•		•
Freshwater input.	•	•		•		•														
Water fowl areas.						•		•	•	•	•	•	•				•			
Endangered species.																				
Fish-eating bird rookeries.								•	•						•					
Muskrat, otter, and nutria habitats.																				
Non-game birds, watching								•	•		•				•			•		

CRITICAL HABITATS

JUSTIFICATION AS AN AREA OF PARTICULAR CONCERN

DENDROGRAM OF SIMILARITY



DENDROGRAM OF SIMILARITY

important due to naturally productive bay-lagoon margin marshes, wind-tidal flats, and grassflats. Whereas these areas may tend to be more saline than similar natural areas in Region VI, less varying salinity conditions allow more productive output. (Further Studies on Recreation and Metabolism of Texas Bays, 1958-1960, 1962). The areas marked as Group B in Figure 204 may be of special note as spawning grounds; the areas of Group C are of note as areas of unique or vulnerable biological resources, including the endangered species of Laguna Atascosa National Wildlife Refuge, and oyster reefs in South Bay.

The 'Environmental Impact Matrix' shows an array of possible sources of impact upon these natural areas. The remainder of this section will be given to describing those Scenario activities which may generally be expected to affect the natural areas members of each group recognized above, using the 'Impact Matrix' as a reference guide as described in Part B of this report, 'Environmental Impact Assessment.' It would be tenuous to make any statement about the extent that Scenario events may further extend current problems. Therefore, it will be sufficient to describe the complexities of possible impact of such Scenario developments irrespective of current conditions or present activities.

The OCS-related activities of Scenario II which may influence the environmental quality of the natural group including marshes and grass-flats of high natural productivity include shoreline development by or for piers, marinas, etc. and residential subdivisions; pollution by wastewater effluents and surface water runoff; and pipeline installation and associated dredging or spoil emplacement. Such activities take place in the present day without the activities designated under Scenario II.

The construction activities of shoreline development often entail filling and dredging different areas of shallow water or low relief grassflats and marshes in order to increase developable area, to increase access to the development, and even to reduce local health problems related to insect infestation. This reduction of net acreage has a direct impact upon the net productivity of the ecological system. However, it is very difficult to assess how much acreage is needed as a composite to maintain high productivity, and which parts of the physical habitat are most productive or most necessary to the whole system.

The productivity of the marsh-estuarine system is dependent upon a sensitive salinity balance regulated by freshwater inflow and Gulf water exchange. Pollution of bay waters may decrease the quality of habitat for fish, shrimp, and blue crabs which spawn and nurse their young in these coastal grassflats and marshes. The possibility that discharged effluents, generated by direct and indirect OCS-related activities, may add to deterioration of these systems has already been discussed. Although impounding the waters of the Nueces River has decreased freshwater inflow to the Corpus Christi Bay system by an estimated 30%, the amounts of water

required in Scenario II cannot reasonably be expected to add a significant further direct reduction of freshwater inflow.

Figure 15 in Part B of this report presents an expanded impact matrix of pipeline installation. The installation of pipelines in shallow water often involves jet-sled dredging which may suspend toxic metals and generally increase turbidity. The activities may to an unknown extent disturb the project areas' faunal inhabitants, primarily waterfowl and small mammals, but this effect is probably short-term. Finally, the return of the project area to its original condition may often be complicated by aspects of vegetative succession and by the tendency for opportunistic species to colonize the area more efficiently than native flora. A Study of Selected Coastal Zone Ecosystems in Relation to Gas Pipelining Activities presents a documented analysis of such problems. Choosing right-of-ways for pipelines involve similar problems as selecting alternate marsh locations for shoreline development. The Bureau of Economic Geology is currently conducting a baseline inventory of biologic, geologic, and hydrologic characteristics of coastal submerged lands in Texas for the General Land Office. Such information will be of use in future planning efforts.

Other natural areas groups shown in Figures 203 and 204 present special unique or vulnerable characteristics above and beyond the general sensitivity of the previously described marsh-grassflat ecosystems. Included in these different groups are important oyster reefs, vulnerable and diminishing under stress from bay dredging turbidity and from the dredging of oyster reefs for shell lime; unique areas habitated by endangered species, including the Brown Pelican, the Wood Ibis, the White Faced Ibis, Audubon's Carcara, Northern Aplomado Falcon, Ferrunginous Hawk, American Osprey, Prairie Falcon, Western Snowy Plover, Ocelot, and Jaguarundi. There are a number of national, state, and private wildlife refuges, reserves, and sanctuaries in Regions VI and VII. Any proposed coastal development may need to specially consider possible effects on these species' habitats.

Finally, St. Joseph's, Mustang, and Padre Islands form an important and sensitive natural coastal barrier to Gulf storms. They act to take the brunt of wind and wave energy associated with the landing of tropical cyclones and hurricanes. The barrier islands are more likely to be affected by indirect activities associated with OCS development than by direct onshore activities. Impacts may be due to the crossing of pipelines coming ashore, excessive negative disruption by recreational vehicles and large numbers of vacationers, and by subdivision development. Any development on the barrier islands may expect the possibility of destruction during hurricanes, either by wind, flooding, or by erosion of the unstable sandy foundation substrate near washover channels. The removal of vegetation destabilizing the active/stabilized dune equilibria increases the likelihood of the formation of such washover channels.

Environmental Impact Assessment Summary

In the final analysis, the principal categories of environmental effect for the total affected area in Scenario II include:

- an important intensification of land development and land use conversions, especially for direct OCS-related onshore industrial activities, but also for residential land,

- further or engendered environmental quality degredation with increasing discharge of air and water pollutants, and

- a possible important conversion and disruption of coastal wetland habitats depending on the geographic scale of activities' influences.

Figure 205 presents the OCS Environmental Impact Matrix with environmental effects indicated as were found to be important in Scenario II. That other "effect boxes" in the matrix are not checked does not mean that there would be no impact, but rather that the effects of the postulated levels of activity in Scenario II cannot be reasonably considered to be of such magnitude as to be important at this level and orientation of analysis.

Figure 205

ENVIRONMENTAL IMPACT SCENARIO II

AXIS I: CHARACTERISTICS AND CONDITIONS OF THE ENVIRONMENT				AXIS II. OCS-RELATED ACTIONS WHICH MAY CAUSE ENVIRONMENTAL IMPACT																											
				A. STAGING AREA		B. OFFSHORE OPERATIONS				C. TRANSPORT							D. PROCESSING & STORAGE							E. INDUCED ACTIVITIES				F. OTHER OR COMMON				
				a. Industrial Sites & Buildings, Yards	b. Piers, Seawalls, Bulkheads, & Marinas	a. Platform Siting	b. Subsea Completions	c. Formation Water Discharge	d. Drill Cutting Disposal	a. Pipeline Installation	b. Channel & Harbor Dredging	c. Spoil Emplacement	d. Trucking	e. Shipping	f. Aircraft	g. River & Canal Traffic	a. Petrochemical Industry	b. Oil Refining	c. Petroleum and Product Storage	d. Energy Generation	e. Stabilization & Oxidation Ponds	f. Stack Exhaust Emissions	g. Industrial Water Discharge	a. Urbanization	b. Auto Traffic	c. Solid Waste Disposal	d. Residential-Municipal Wastewater Treatment	e. Subdivision Development	a. Oil Spills	b. Surface Water Diversion	c. Ground Water Withdrawal	d. Surface Paving	e. Highways & Bridges
A. PHYSICAL & CHEMICAL CHARACTERISTICS	1. Water Quality	a. Surface									/	/				/				/									/				
		b. Ground																			/					/	/				/		
		c. Ocean or Bay			/			/	/	/	/			/		/							/				/		/			/	
	2. Air	a. Air Quality											/		/		/	/		/					/	/			/				
	3. Processes	a. Flooding			/						/	/												/				/				/	/
		b. Erosion, Deposition			/						/	/																/				/	/
		c. Subsidence																													/		
		d. Surface Faulting																													/		
		e. Freshwater Inflows to Bays									/												/							/			
		f. Bay - Gulf Water exchange & Circulation			/					/	/	/																					
B. BIOLOGICAL CONDITIONS	1. Habitat	a. Woodlands																		/								/					/
		b. Savannah-Prairie													/													/				/	/
		c. Grassflats		/	/							/				/			/					/					/			/	/
		d. Marsh		/	/							/				/			/					/						/			/
		e. Benthic (Ocean, Bay) Substrate					/		/	/	/	/																	/				
	2. Unique or Sensitive	a. Marine Food Web				/		/	/	/	/	/																	/				
		b. Fishing Bank				/	/	/	/	/	/																		/				
		c. Coral Bank				/	/	/	/	/																			/				
		d. Oyster Reef								/	/	/															/		/				
		e. Spawning and Nursery Grounds			/					/	/	/											/				/		/				
		f. Bird Rookeries			/					/		/				/								/	/			/	/			/	/
		g. Waterfowl Areas			/					/		/												/					/			/	
		h. Endangered Species								/		/	/		/							/	/	/					/				/
		i. Barrier Islands								/		/													/	/	/					/	/
C. CULTURAL FACTORS	1. Human Utilization	a. Industrial		/																				/									/
		b. Residential		/																				/	/	/	/	/				/	/
		c. Cropland															/	/	/	/	/					/	/	/				/	/
		d. Rangeland-Pasture		/													/	/	/	/	/			/		/	/	/				/	/
		e. Wilderness or Open Area		/	/																			/				/	/				/
		f. Soil Quality Contamination										/									/		/				/	/	/				
		g. Commercial Fishing			/	/	/			/				/															/				
	2. Human Interest	a. Game Areas											/		/									/	/				/				/
		b. Sport Fishing			●	/	/		/	/		/		/									■				■		/				
		c. Gulf Beaches			/					/															/				/				
		d. Formal Parks		/																		/		/	/								/
		e. Urban or Rural Natural Areas		/	/																			/	/	/	/	/				/	/
		f. Wildlife Refuge								/		/		/	/							/		/	/				/				
		g. Historical and Archeological		/	/	/	/		/			/												/								/	/

● Identified Positive Impact

■ Identified Negative Impact

16. SOCIAL IMPACT ANALYSIS

General Social Impact Evaluation

The general social impact assessments were completed in the manner described fully in Part B; the reader is encouraged to refer to that Part for procedural information.

Two general social impact evaluations follow: one each for Regions VI and VII, the regions affected by Scenario II activities.

I. Region VI: San Patricio and Nueces Counties

A. Existing Social Characteristics

San Patricio and Nueces Counties, comprising Region VI, are economically and socially diverse. Not only is this a populous, industrialized area, with an active port system; it is a significant agricultural, fishing, and mineral producing area as well. Its population increased by 32.4% between 1950 and 1960 but by only 6.8% between 1960 and 1970. The region is predominantly urban with 46.8% of the population being of Spanish heritage. Net migration between 1960 and 1970 was -13.1%.

Over 43% of this region's employed persons earn between $3,000 and $10,000 annually, while 18.4% earn below the poverty level. Nearly 35% of the area's over-25 population has less than nine years of education. The median number of school years completed in San Patricio County is 10.0; in Nueces County is 11.8. The rate of unemployment as of July 1975 was 8.6% in San Patricio County and 8.1% in Nueces County.

Although only 10% of this area's labor force is employed in manufacturing, annual manufacturing value is more than the value of agricultural and mineral production combined. Region VI produced 3.7% of the State's total gas well gas and 6.1% of its condensate. Additionally, the combined maximum daily capacity of the six refineries in the Corpus Christi area is 12.2% of the State's total; 3.2% of the nation's. Further, this area has 18 gas plants with the combined maximum daily capacity being 5.6% of the State's total.

B. Impact on Demographic Factors

Scenario II activities are projected to increase this region's population by .19%, and population density by .09% (see Figure 206). This increase is so slight that no population related impacts are expected.

As the Social Impact Assessments of the Scenario I regions noted, it is virtually impossible to predict impacts on families, church groups, ethnic groups, school groups, and formal associations. Yet, if they were predictable, population growth associated with Scenario II activities in Region VI would probably not be substantial enough to generate social impacts.

C. Impact on Services to People

A potentially significant infrastructural issue as a result of population growth associated with Scenario II activities in the City of Corpus Christi is educational services.

As the Social Impact Assessments of Scenario I pointed out, the severity of social impacts of potential shortages of such government services as educational services depends largely upon the degree to which crowding of this facility becomes noticeable. When this deficiency results in observable effects, the impact is a change in the residents' perception of quality of life in their community; the predictable response of residents is to demand an extension of services. It is reasonable to assume that since the number of new students associated with Scenario II activities in the City of Corpus Christi is relatively small, any significant social impacts due to the shortages of educational facilities are unlikely.

D. Impact of Land Use and Environmental Factors

This study's Environmental Impact Assessment (Chapter 15) concludes that Region VI could experience further air quality deterioration and water pollution as a result of Scenario II activities. The social impacts of such environmental issues, however, is much less obvious and more difficult to assess. It is reasonable to assume that the residents of this region have, for a period of time, lived in an area where air and water quality, from time to time, in certain sites do not meet State and federal standards. It can thus be concluded that the social impacts of environmental degradation directly attributable to Scenario II activities will most likely not be significant.

Figure 206

Selected Impact Statistics/Region VI/ Scenario II

Population/1980 Projection	330,805
Maximum OCS-Related Population	640
% Change; OCS-Related	.19%
Total Population: 1980 Projection + Maximum OCS-Related Population	331,445
Density of Population: 1980, Projected	212
Density of Population: 1980, Projected + OCS-Related	212.2
% Increase: OCS-Related	.09%
Maximum OCS-Related Resident Employment	191
Current Unemployment (Sept. 75)	8,996
% of Currently Unemployed to be Hired	2.1%
Total, Projected, OCS-Related Personal Income	$25,924,388
Current, Total, Annual Personal Income (1973) x 7 years (Life of Scenario I)	$8,043,000,000
% Increase: OCS-Related	.32%
Total, Projected, OCS-Related Expenditures	$48,066,000
Current, Total, Annual Expenditures (1973) x 7 years (Life of Scenario I)	$19,934,677,000
% Increase: OCS-Related	.24%

E. Impact of Housing Factors

Region VI appears to have a sufficient number of available housing units to accommodate the projected new population associated with Scenario II activities. It was, therefore, not regarded as a source of social impact. It can be assumed that because of this availability, neither land nor housing prices will create any significant social impacts. Finally, no significant impacts in regard to the number or quality of mobile home sites or the density of housing units in general are foreseen.

F. Impact of Employment Factors

In Region VI, the maximum number of existing residents who will be employed as a result of Scenario II activities is 640. Assuming that those resident employees will be chosen from the existing unemployment pool and that none will be currently employed persons who change jobs, the percentage of currently unemployed to be hired during Scenario II activities in Region VI is 2.1% (see Figure 206), a relatively minor decline in unemployed residents.

Similarly, total projected OCS-related personal income in this region over the seven years of Scenario II activities is $25,924,388, only .32% of the total personal income over that seven-year period, based on the 1973 personal income figure of $1,149,000,000 (see Figure 206). Furthermore, the total projected OCS-related business expenditures of Scenario II in Region VI over the seven years is $48,066,000. This figure represents a .24% increase over the seven-year total expenditure in Region VI based on the 1973 level (see Figure 206). In reality, these personal income and expenditure percentages will presumably be less since the annual region totals will most likely be higher than the 1973 level. In comparison to the three regions of Scenario I, it would seem that the OCS-related increases in personal income and expenditures in Region VI are relatively high, but these increases are still less than 1%. Thus no significant social impacts are expected to arise in these areas.

The Corpus Christi area in Region VI has been involved in the oil industry for a reasonable length of time; therefore, no new job categories or industrial sectors will be established as a result of Scenario II activities. Finally, since the effect on the unemployment level is expected to be relatively small, it is safe to assume that Scenario II activities will have no substantial impacts on the employment of women or minorities over and above the current trends of such employment in Region VI.

G. Impact on Traditional Values

The preceding analysis has shown that in Region VI, income, employment, expenditures, housing, and others have engendered such minimal impacts and will be dispersed over such a sizeable population base that there is no reason to suspect that the individual's perception of quality of life in the community, or of other traditional amenities will be significantly altered by Scenario II activities.

Region VII - Cameron, Hidalgo and Willacy Counties

A. Existing Social Characteristics

Region VII, the Cameron/Hidalgo/Willacy area, is a relatively slowly growing, poor, poorly educated, agricultural region. Population increased by 14.9% between 1950 and 1960; between 1960 and 1970, it declined -4.2%. Over 77% of the region's population is Spanish; only .88% is black. Net migration between 1960 and 1970 was -29.3%.

Approximately 36% of this region's wage earners have incomes of less than $3,000 annually, and 40.7% of the area's families are below the poverty level. Similarly, educational levels are comparatively low. Almost 57% of this area's population over 25 years of age has less than nine years of education. Median school years completed in Cameron, Hidalgo and Willacy Counties is 8.4, 7.4, and 7.4, respectively. As of July, 1975, the unemployment rate in Cameron County was 11.2%; in Hidalgo County, 12.0%; and in Willacy County, 8.9%. Manufacturing employs about 11% of the area's total labor force. It accounts for an annual production value which is half of the agricultural value. The value of this area's mineral production, although low, increased by over 19% in 1972; indicating that the area could be growing rapidly in this field. The leading minerals in Region VII are oil and natural gas.

Agriculture in this Region is known throughout the nation and the world for the more than 40 crops produced and marketed commercially. Not only is agriculture this areas's largest income producer, its production accounts for 5.7% of the State's total value of crops and livestock. Tourism ranks second only to agriculture as the greatest contributor to the economy of this region.

B. Impact of Demographic Factors

Although population declined 4.2% in Region VII between 1960 and 1970, it is estimated to increase by 33.5% by 1990. Scenario II activities are projected to increase Region VII's population by .56% and population density by .57% (see Figure 207). Although these percentage increases in population and population density due to Scenario II activities are much greater in Region VII than Region VI, they are, nonetheless, probably not substantial enough to engender significant social impacts. As with Region VI, it is virtually impossible to predict social impacts on such groups as family, church groups, school groups, ethnic groups, and formal associations. It should be pointed out, though, that since over 77% of the region's population is of Spanish heritage, that group is more than likely to have majority participation in these associations. If the 2,000 new residents coming into the area as a result of Scenario II activities are of a different social milieu, they may bring with them new ideas which may cause social impacts. But as mentioned above, population increase as a result of Scenario II activities is under 1% and social impacts, if any, would be slight.

C. Impact on Services to People

The analysis of infrastructural issues isolated educational services as a potentially significant infrastructural issue associated with Scenario II activities in Brownsville. In Port Isabel, recreational facilities and health facilities have been isolated as such issues. As we have seen in Region VI's social impact assessment, the social impacts of shortages of these public services are, to a large extent, subject to the degree to which strains on these services become noticeable. Although administrative/financial characteristics were not identified as a special issue, Region VII has a considerable number of families near or below the poverty level; that fact makes it difficult for the cities to raise their tax rates. Consequently, some of the public services may already be substandard, and because of this paucity of funds, the cities may be financially unable to improve these public services to meet the needs of the residents.

Population increases in Region VII associated with Scenario II activities, although less than 1%, may create impacts on these public services for the following reason. This study's analysis of tax revenues and local government expenditures shows that significant differences between government cost and tax revenues could occur as a result of Scenario II activities. (see Chapter 14). The fact that the public services could be put under considerable strain due to these activities may make it imperative for the cities to raise their ratios of assessment or tax rates - thus creating dissatisfaction with OCS

Figure 207

Selected Impact Statistics/Region VII/Scenario II

Population/1980 Projection	380,516
Maximum OCS-Related Population	2,112
% Change; OCS-Related	.56%
Total Population: 1980 Projection + Maximum OCS-Related Population	382,638
Density of Population: 1980, Projected	125.6
Density of Population: 1980, Projected + OCS-Related	126.3
% Increase: OCS-Related	.57%
Maximum OCS-Related Resident Employment	427
Current Unemployment (Sept. 75)	16,670
% of Currently Unemployed to be Hired	2.6%
Total, Projected, OCS-Related Personal Income	54,655,156
Current, Total, Annual Personal Income (1973) x 7 years (Life of Scenario I)	7,392,000,000
% Increase: OCS-Related	.74%
Total, Projected, OCS-Related Expenditures	102,464,000
Current, Total, Annual Expenditures (1973) x 7 years (Life of Scenario I)	15,977,612,000
% Increase: OCS-Related	.64%

development among the existing residents. The problem could be compounded if the impoverished residents are unable to pay these tax increases. The amount of activity associated with Scenario II will probably be considerable as compared to existing activities in Region VII. There is, therefore, a distinct possibility of social impacts on an individual level.

D. Impact of Land Use and Environmental Factors

According to this study's Environmental Impact Assessment, air and water quality in Region VII could potentially deteriorate as a result of Scenario II activities. This study also concluded that land use conversion may be impacted due to Scenario II activities. Because urban industrial land development in Region VII has been projected to increase at a considerable rate without Scenario II activities, the projected increase of land conversion associated with Scenario II activities may not be substantial enough to engender social impacts over and above what will be experienced with the other projected growth.

Air and water quality are important to the well-being of Region VII. The success of its tourist industry, which is important to its economy, is greatly reliant upon the quality of this region's environment. If positive measures are not taken to prevent deterioration of the air and the situation worsens with Scenario II activities, not only could Region VII's economy be affected, but also resentment among the residents could follow.

E. Impact of Housing Factors

As will be seen in Chapter 18, the lack of available housing units in Region VII is considered a potentially significant infrastructural issue. Thus, it is regarded as a possible source of social impact in this region. When the number of available housing units is less than the number of people requiring the units, competition for the available units and available land usually follows; thus increasing current prices of the housing units and the land. As would seem to follow, the demand for mobile home sites would also become greater. The existing residents have already turned to using mobile homes because of the lack of available housing. The population increase in Region VII associated with Scenario II activities could create unrest among the existing residents if the new population moved into the available housing units at the expense of the local residents or contributed to an increase in land and housing prices due to increased demand. In all probability, the quality of mobile home sites and the density of housing will be impacted as a result of the lack of available housing units.

F. Impact of Employment Factors

Scenario II activities are projected to employ a maximum of 427 residents in Region VII (see Figure 207). Assuming that all of these employees will be drawn from the current unemployment pool, the current unemployment level will be lowered by 2.6%.

Region VII has had such limited OCS-related activities in the past that new industrial sectors as well as new job categories will be introduced to accommodate Scenario II activities. Since this area has had little experience with offshore energy development and industrial activity in general, it has not experienced an extensive demand for the kinds of personnel required by OCS development. This mismatch between the Scenario II requirements and the characteristics of the local job seekers could result in the in-migration of more experienced workers from other areas.

The percentages of new resident employment and of commuter employment from Scenario II activities are much greater than in most other coastal areas projected to be impacted by OCS Scenarios. Although Scenario II activities are projected to employ 427 existing residents in Region VII, there is a good possibility that those employed will be chosen from the skilled unemployed workers in the area and from those who have jobs in other parts of the region. It is therefore reasonable to assume that, in reality, the existing unemployment pool in Region VII may not be greatly affected by Scenario II activities.

Scenario II activities over the seven-year period are projected to produce a total income of $54,655,156 in Region VII. Based on the 1973 total personal income level, this represents a .74% increase in Region VII's total personal income over the seven-year life of Scenario II activities (see Figure 207). Although employment and personal income in Region VII will likely be affected by new industry due to Scenario II; the new residents, rather than the existing residents, will probably reap the greatest benefits from these activities.

Similarly, the total projected OCS expenditures of Scenario II in this region are $102,464,000; total expenditures over the seven years, based on the 1973 level would be $15,977,612,000 (see Figure 207). Thus, Scenario II activities can be expected to increase expenditures by .64% (see Figure 207). Since these increases in personal income and expenditures are based on the 1973 levels, it is expected that, in reality, the percentages will be even less than described above.

Given the relatively high number of companies that will be needed

in Region VII due to the introduction of new industrial sectors associated with Scenario II, it is reasonable to assume that there will be social impacts involved. The institution of new job categories may also be a source of social impact in this region. The unskilled workers of the region may not be able to profit from these new jobs unless they are able to train for these positions. Even then, they would be in competition with the skilled workers of the area and those workers coming in from other parts of the region.

It is also reasonable to assume that ethnic minorities will be impacted by employment patterns since they represent the majority of the population in this region, and more than likely compose the greater percentage of the unemployment pool. There is no reason to believe, however, that employment trends for women will be significantly impacted due to Scenario II activities over and above the current trends of such employment in Region VII.

G. Impact on Traditional Values

The foregoing analyses of social impacts in Region VII indicate that individuals' perception of quality of life in the community or of other traditional amenities could possibly be affected by Scenario II activities. As a result of Scenario II activities, Region VII may not continue growing in the same pattern as it has in the past. This potential change in the economic mix of the community may bring different reactions among the affected citizens, both positive and negative. The individual's perception of the community could conceivable change due to an influx of new residents, new industry, more jobs, increased business activities, increased incomes and other factors as a result of Scenario II.

SPECIAL SOCIAL ISSUE ANALYSIS

In Region VI, no potentially significant social issues arising from Scenario II activities were isolated. But if any social effects were engendered from these activities, they would be spread over such a large population and sizable industrial sector that individual effects would be slight, thus social impacts small.

The General Social Impact Evaluation of Region VII isolated several potentially significant social impacts associated with Scenario II activities. The population growth associated with Scenario II may put a noticeable strain on the already strained public services. Deterioration of air and water quality due to Scenario II activities may be a source of social impact if preventative measures are not taken

The critical shortages of available housing in Region VII will likely continue with the arrival of the new residents associated with Scenario II. One possible affect of the influx of new resident employees could be an increased demand for housing with a resultant rise in housing and land prices. This situation could be a source of bitterness among the local residents who are currently in substandard housing. The increased use of agricultural lands for mobile home parks due to this population growth and lack of available housing could also be a cause of individual discord with Scenario II activities.

The introduction of new industrial sectors and job categories due to Scenario II activities may also be a source of impact in Region VII. The new jobs created may greatly benefit the disadvantaged, unemployed residents in the area. Although personal income increases are not extremely large, any increases in an economically distressed area may have socially significant effects. It has been seen that with new industry comes new residents and more strain on the public services and the chance of the unemployment level remaining almost the same.

The individual's perception of the quality of the community and of traditional values will most likely be impacted due to Scenario II activities. The number of new residents in the area may have a direct effect on altering the character of the community. Industrial growth in Region VII associated with Scenario II activities will generate more job opportunities; help raise the income level, create better housing and civic improvements; and, in general, produce more economic activity and diversification. This growth may also generate social costs, such as jammed highways, smog, urban sprawl, noise and congestion which could create dissatisfaction on the part of the existing residents.

Social Impact Assessment Summary

The 'General Social Impact Evaluation' discussed the general social effects likely to result from OCS activities in each affected study site in Scenario II. These isolated social effects, their magnitude, and possible induced social impacts were analyzed further in the 'Special Social Issue Analysis.' These analyses indicated that Region VI was not likely to experience any significant social impacts as a result of Scenario II activities. While it was seen in the analyses of the affected regions of Scenario I that there is no reason to completely rule out the possibility of social impacts occurring in any region, no significant social impacts directly attributable to Scenario II activities are expected in Region VI. Policymakers should, however, be attentive to the possibility that social impacts could be aggravated by OCS development activities not specifically postulated in Scenario II. For example, Ingleside could experience urban

growth at a much faster rate than expected; such that not only would its public services be strained but there would also be crowding and a general dissatisfaction on the part of the existing residents.

In sum, although no significant social impacts are projected for Region VI, there is no reason to conclude that none could ever occur.

The Social Impact Evaluation of Region VII, on the other hand, found potentially significant impacts as a result of Scenario II activities. Therefore, policymakers should be attuned not only to already identifiable social impacts but also to any other impacts that may arise from these projected impacts. The positive impacts of Scenario II activities may generate unforeseen negative impacts that may not only create discontent on the part of the existing residents but also could cause new residents to seek another area in which to settle.

There is also the possibility that the potentially significant social impacts which have been identified may or may not become critical. In short, such potentially positive impacts as increased employment and income could effectively counterbalance any or all potentially negative impacts. It is impossible to predict if the net social impacts will be positive or negative. It is not impossible, however, to be aware of potential impacts and to provide for amelioration if they were to ultimately occur.

17. IMPACT ON REGION VI: SAN PATRICIO AND NUECES COUNTIES

A summary of the impacts of Scenario II activities on either of the two affected study sites is best understood by reviewing the requirements placed on that site by such activities. Figure 208 provides such a review for Region VI, the San Patricio and Nueces Counties area. In Figure 208, all requirements are given over time; that is, in each relevant Scenario II time period. Land requirements are categorized primary, indirect, residential, and total; water requirements are given for primary and indirect activities, domestic and municipal use, and as total water requirements. Employment requirements are broken down in two ways: direct and indirect; and resident, new resident and commuter. Thus, the figures in the total employment column are equal to the sum of the corresponding figures in the direct and indirect columns, or to the sum of corresponding figures in the resident, new resident, and commuter columns. New population, new housing units, and new students data is also provided. Column totals are provided only for water requirements data. These are the only figures which can be cumulated. In the cases of land, employment, population, housing units and students, each column entry is the total requirement of that time period (in the first and last columns) and is not an addition to the requirement of the previous time period; thus, no column total is provided.

Significant Infrastructural Issues

Part B includes a detailed discussion of the manner in which the significant infrastructural issues (raised by Scenario activities) were identified in each affected study site of Scenario II. (The reader is urged to review that section of Part B) In short, a significant infrastructural issue was identified when the OCS-generated demand on an infrastructural service (water, sewage, police protection, etc) could potentially supercede a unit of government's capacity to provide that service. For example, if every city in any affected study site is currently experiencing maximum or near-maximum demand on sewage treatment facilities, any increase in population brought about by an OCS Scenario will make sewage treatment a significant issue.

As the analysis of Scenario I indicated, any list of services provided by a unit of government would, of course, be lengthy. To survey each and every one to determine if it could be a significant issue would have been an undertaking of immense proportions. Thus, only the major infrastructural issues were surveyed here. They are:

Time Period	LAND REQUIREMENTS (Acres)					WATER (Acre Feet)				EMPLOYMENT					
	Primary	*Indirect	Residential	Total	Docking Space (Feet)	Primary	Indirect	Domestic + Municipal	Total	Primary	Indirect	Total	Resi-dent	New Resi-dent	Com-muter
7/77-10/77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/77-1/78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/78-4/78	7	61.8	14.2	83	600	1.38	1.82	10.5	13.7	179	31	210	75	116	19
4/78-7/78	7	61.8	14.2	83	600	1.38	1.82	10.5	13.7	179	31	210	75	116	19
7/78-10/78	7	61.8	14.2	83	600	1.38	1.82	10.5	13.7	179	31	210	75	116	19
10/78-1/79	7	61.8	14.2	83	600	1.38	1.82	10.5	13.7	179	31	210	75	116	19
1/79-4/79	7	61.8	14.2	83	600	0	1.82	10.5	12.32	179	31	210	75	116	19
4/79-7/79	7	61.8	14.2	83	600	0	1.82	10.5	12.32	179	31	210	75	116	19
7/79-8/79	7	61.8	14.2	83	600	0	.61	3.6	4.21	179	10	189	54	116	19
8/79-11/79	7	61.8	14.2	83	600	0	1.82	10.5	12.32	179	31	210	75	116	19
11/79-2/80	7	61.8	14.2	83	600	0	1.82	10.5	12.32	179	31	210	75	116	19
2/80 -5/80	7	61.8	14.2	83	600	1.38	1.82	10.5	13.7	179	31	210	75	116	19
5/80-8/80	7	61.8	14.2	83	600	1.38	1.82	10.5	13.7	179	31	210	75	116	19
8/80-11/80	5.5	61.8	14.2	81.5	0	0	0	10.5	10.5	84	13	97	0	116	0
11/80-1/81	5.5	61.6	14.4	81.5	200	0	0	6.9	6.9	164	51	215	81	118	16
1/81 -7/81	5.5	55.7	20.3	81.5	200	0	0	29.7	29.7	160	150	310	129	165	16
7/81-11/81	64	59.8	29.2	153	1000	1.84	2.26	28.2	32.3	331	126	457	191	237	29
11/81-3/82	64	59.8	29.2	153	1000	0	2.26	28.2	30.46	331	126	457	191	237	29
3/82-6/82	64	59.8	29.2	153	1000	1.38	1.70	21.0	24.08	331	95	426	160	237	29
6/82-8/82	67	70.8	29.2	167	1200	.92	1.13	14.1	16.15	361	66	427	159	237	31
8/82-2/83	67	70.8	29.2	167	1000	0	3.39	35.4	38.79	281	68	349	97	237	15
2/83-8/83	67	70.8	29.2	167	1000	0	4.36	49.5	53.86	297	78	375	123	237	15
8/83-11/83	67	70.8	29.2	167	1000	1.38	2.18	21.0	24.56	297	40	337	85	237	15
11/83-12/83	67	70.8	29.2	167	1000	.46	.73	6.9	8.09	315	13	328	75	237	16
12/83-1/84	67	70.8	29.2	167	1000	.46	.73	6.9	8.09	315	13	328	75	237	16
1/84-7/84	67	70.8	29.2	167	1000	0	4.36	42.3	46.66	315	78	393	140	237	16
						14.7	41.91	409.2	465.81						

* Total indirect land minus residential land

New Population	New Housing Units	New Students	Time Period
0	0	0	7/77-10/77
0	0	0	10/77-1/78
313	106	79	1/78- 4/78
313	106	79	4/78-7/78
313	106	79	7/78-10/78
313	106	79	10/78-1/79
313	106	79	1/79-4/79
313	106	79	4/79-7/79
313	106	79	7/79-8/79
313	106	79	8/79-11/79
313	106	79	11/79-2/80
313	106	79	2/80-5/80
313	106	79	5/80-8/80
313	106	79	8/80-11/80
319	108	80	11/80-1/81
446	152	112	1/81-7/81
640	218	161	7/81-11/81
640	218	161	11/81-3/82
640	218	161	3/82-6/82
640	218	161	6/82-8/82
640	218	161	8/82-2/83
640	218	161	2/83-8/83
640	218	161	8/83-11/83
640	218	161	11/83-12/83
640	218	161	12/83-1/84
640	218	161	1/84-7/84

Figure 208

Summary of Requirements/Scenario II

Region VI

1. Administrative/Financial Capabilities;
2. Housing;
3. Water Demand;
4. Sewage Collection and Treatment;
5. Solid Waste Collection and Disposal;
6. Crime Prevention;
7. Fire Protection;
8. Recreational Facilities;
9. Health Facilities; and
10. Educational Services.

For each of those ten candidate issues, one or more indicators of a government's ability to handle that issue were established. Next, standard measures for the indicators were used as a basis of comparison with a government's current or future capacity to deal with that issue. Finally, the units of government within an affected study site were analyzed in terms of their current capacity to meet the standard measures for each indicator for the purpose of identifying significant infrastructural issues.

The local governments of Region VI which were so analyzed are Corpus Christi and Ingleside. (it will be recalled that these two cities were postulated to fulfill most of the Scenario II requirements in Region VI.)

Neither of the Region VI cities are currently experiencing any administrative/financial shortcomings with general obligatory bonds less than 6 percent of assessed valuation, a ratio of assessment of 60 percent and a moderate tax rate ($1.35 and $1.54 in Ingleside and Corpus Christi, respectively) which would allow for graduation upward. The City of Corpus Christi also appears well equipped to provide adequate housing, water supplies, sewage collection and treatment, solid waste collection and disposal, crime prevention, fire protection, and health facilities. While the number of formal municipal parks is more than the standard, their total acreage is below the standard employed in this study. Recreational facilities are not flagged as a significant issue, however, as alternate recreation is available on Mustang and North Padre Islands, as well as other water-based recreation sites.

Corpus Christi exceeds the standard in educational services, as indicated by a student/teacher ratio of 16.6/1. The group of Corpus Christi independent school districts (I.S.D) is also below the state average for I.S.D. per pupil expenditures. Therefore, educational services has been flagged as a significant issue.

Like Corpus Christi, the City of Ingleside appears well equipped in terms of the indicator standards for housing, water supply, sewage and solid waste collection, treatment and disposal, fire protection, crime

prevention, and recreational facilities. Health facilities are available in terms of hospitals and practitioners in nearby Aransas Pass, Taft, and Corpus Christi. Ingleside itself supports one physician and a clinic, visited 3 days a week by a county health doctor. Therefore, it is reported that health facilities are adequate and not a significant issue in this community. Likewise, educational services are not seen as a special issue.

Thus the significant infrastructural issues in Corpus Christi and Ingleside are expected to be those shown in Fgure 209.

Figure 209

Significant Issues/Scenario/Region VI Cities

1.	Corpus Christi	Educational Services
2.	Ingleside	None

Infrastructural Impacts Associated With Significant Infrastructural Issues

Unlike the analysis of impacts on operating costs, which involve the addition of new residents to current infrastructural systems which have the capacity to absorb more demands, the analysis of significant infrastructural issues raises the possibility that large-scale, capital expenditures may be required to provide the additional needed services. (Operating costs were analyzed in Chapter 14 and are summarized below.)

It is not clear, however, that because a study site reveals, for example, a need for expanded health services when the infrastructural capacity indicators of this study are applied, that the affected study site will undertake the construction of a new hospital or the expansion of an existing one or any other large-scale capital investment. Between that kind of large capital investment (which would significantly affect the fiscal analysis contained in Chapter 14 and in the summary below) and a decision to "make do" with existing facilities, there exists an infinite number of short-term, non-capital-intensive solutions. A discussion of some of those solutions is contained in the Executive Summary.

The environmental and social impacts of these significant infrastructural issues were analyzed in Chapters 15 and 16, respectively, and are also summarized below.

Summary of Fiscal, Environmental, and Social Impacts

I. Fiscal

The analysis of fiscal impacts on local governments in Region VI (see Chapter 14) revealed that over the seven-year life of Scenario II, local governments of Region VI will face a total deficit of $363,936. Local tax revenue during that time are expected to total $653,460; local government costs will total $1,017,396. Chapter 14 also indicated that at some times during the life of Sceanrio II, local governments in Region VI will accure tax revenues sufficient to cover less than 35% of the local governments costs associated with Scenario II.

The fiscal impact described above will be, according to the preceding chapters, the most pronounced impact on Region VI due to Scenario II activities.

II. Environmental

The Environmental Impact Analysis (Chapter 15) noted that the following environmental issues would be potentially significant in Region VI due to Scenario II activities:

A. Wastewater Effluent Loadings

Although the increase of wastewater effluents directly attributable to Sceanrio II activities is relatively minor, an important impact on regional water quality could result. (See Chapter 15.)

B. Air Quality

Given the fact that the Corpus Christi SMSA has been designated as an Air Quality Maintenance Area by the U.S. Environmental Protection Agency, even the air emissions directly attributable to Scenario II activities could make air quality a significant environmental issue.

III. Social

The Social Impact Assessment indicated that no significant social impacts as a direct result of Scenario II activities are expected in Region VI. (See Chapter 16.)

18. IMPACT ON REGION VII: CAMERON, HIDALGO, AND WILLACY COUNTIES

Summary of Requirements

As in Chapter 17 (for Region VI) the assessment of impacts of Scenario II begins with a summary of all requirements placed on the affected region. Figure 210 provides such a review for Region VII. In Figure 210, all requirements are given over time; that is, in each relevant Scenario II time period. Land requirements are categorized primary, indirect, residential, and total; water requirements are given for primary and indirect; activities, domestic and municipal use, and total water requirements. Employment requirements are broken down in two ways: direct and indirect and resident, new resident and commuter. Thus, the figures in the total employment column are equal to the sum of the corresponding figures in the direct and indirect columns, or to the sum of corresponding figures in the resident, new resident, and commuter columns. New population, new housing units, and new students data are also provided. Column totals are provided only for water requirements data. These are the only figures which can be cumulated. In the cases of land, employment, population, housing units and students, each column entry is the total requirement of that time period (in the first and last columns) and is not an addition to the requirement of the previous time period; thus, no column total is provided.

Significant Infrastructural Issues

Part B includes a detailed discussion of the manner in which the significant infrastructural issues (raised by Scenario II activities) were identified in each affected study site of Scenario II; Chapter 17 includes a brief description of that process.

The units of local government of Region VII which were analyzed in accordance with that process are Brownsville and Pt. Isabel.

The City of Brownsville has a low ratio of assessed valuation/obligatory bonds at 12.8 (minimum by state law is 10) but also has a low ratio of assessment (50 percent) and tax rate. Therefore administrative/financial factors are not considered a significant issue. Brownsville also appears to be adequate in water supplies, sewage and solid waste collection and treatment, crime prevention, fire protection, recreational facilities, and health services. Middle income housing availability was reported to be in deficit and housing has been flagged as a significant issue. Educational services exceed the standard employed in this study and are therefore flagged as a significant issue. (See Figure 211.)

Time Period	LAND REQUIREMENTS (Acres)					WATER (Acre-feet)				EMPLOYMENT					
	Primary	*Indirect	Residential	Total	Docking Space (feet)	Primary	Indirect	Domestic + Municipal	Total	Primary	Indirect	Total	Resi-dent	New Resi-dent	Com-muter
7/77-10/77	20.5	56.1	17.9	94.5	600	1.38	2.40	13.2	16.98	225	42	267	71	148	48
10/77-1/78	22	106.6	28.4	157	1200	2.76	4.80	20.7	28.26	372	67	439	110	234	95
1/78-4/78	35.5	107	33	175.5	1200	2.76	4.80	24.3	31.86	418	76	494	126	273	95
4/78-7/78	35.5	107	33	175.5	1200	2.76	4.80	24.3	31.86	418	76	494	126	273	95
7/78-10/78	35.5	107	33	175.5	1200	2.76	4.80	24.3	31.86	418	76	494	126	273	95
10/78-1/79	35.5	107	33	175.5	1200	2.76	4.80	24.3	31.86	418	76	494	126	273	95
1/79-4/79	35.5	107	33	175.5	1200	2.76	4.80	24.3	31.86	418	76	494	126	273	95
4/79-7/79	35.5	107	33	175.5	1200	1.38	4.80	24.3	30.48	418	76	494	126	273	95
7/79-8/79	35.5	107	33	175.5	1200	0	1.60	8.1	9.7	418	25	443	75	273	95
8/79-11/79	35.5	107	33	175.5	1200	1.38	4.80	24.3	30.48	418	76	494	126	273	95
11/79-2/80	35.5	107	33	175.5	1200	2.76	4.80	24.3	31.86	418	76	494	126	273	95
2/80-5/80	35.5	107	33	175.5	1200	2.76	4.80	24.3	31.86	418	76	494	126	273	95
5/80-8/80	34	107	33	174	600	1.38	2.40	24.3	28.08	323	58	381	60	273	48
8/80-11/80	34	107	33	174	600	1.38	2.40	24.3	28.08	323	58	381	60	273	48
11/80-1/81	32.5	107	33	173.5	200	0	0	16.2	16.2	208	68	376	63	273	40
1/81-7/81	91	89.9	50.1	231	1000	2.76	4.48	74.4	81.64	471	245	716	248	415	53
7/81-11/81	91	89.9	50.1	231	1000	1.84	2.99	49.5	54.33	471	163	634	166	415	53
11/81-3/82	91	89.9	50.1	231	1000	1.84	3.84	49.5	55.18	487	169	656	188	415	53
3/82-6/82	94	89.9	50.1	234	1800	1.38	2.88	37.2	41.46	517	129	646	174	415	57
6/82-8/82	149.5	88.1	59.9	297.5	2400	1.84	3.41	29.4	34.65	706	101	807	243	496	68
8/82-2/83	149.5	83	65	297.5	2200	2.76	12.80	80.4	95.96	658	201	859	293	538	28
2/83-8/83	152.5	84.6	72.4	309.5	3000	2.76	12.80	125.4	140.96	736	219	955	325	600	30
8/83-11/83	165	120	77	362	3800	1.38	6.40	57.0	64.78	859	129	988	317	638	33
11/83-12/83	168	141.7	77.3	387	4600	.92	2.13	19.2	22.25	919	46	965	292	640	33
12/83-1/84	168	147.3	78.7	394	4600	.46	2.35	19.5	22.31	935	48	983	298	652	33
1/84-7/84	168	137.2	99.8	400	4600	2.76	15.36	140.7	158.82	951	295	1,246	427	786	33
						49.7	126.24	1,007.7	1,183.64						

*Total indirect land minus residential land

New Population	New Housing Units	New Students	Time Period
400	136	101	7/77-10/77
632	215	159	10/77-1/78
737	251	186	1/78-4/78
737	251	186	4/78-7/78
737	251	186	7/78-10/78
737	251	186	10/78-1/79
737	251	186	1/79-4/79
737	251	186	4/79-7/79
737	251	186	7/79-8/79
737	251	186	8/79-11/79
737	251	186	11/79-2/80
737	251	186	2/80-5/80
737	251	186	5/80-8/80
737	251	186	8/80-11/80
737	251	186	11/80-1/81
1,121	381	282	1/81-7/81
1,121	381	282	7/81-11/81
1,121	381	282	11/81-3/82
1,121	381	282	3/82-6/82
1,339	455	337	6/82-8/82
1,453	494	366	8/82-2/83
1,620	551	408	2/83-8/83
1,723	586	434	8/83-11/83
1,728	588	435	11/83-12/83
1,760	598	443	12/83-1/84
2,122	721	535	1/84-7/84

Figure 210

Summary of Requirements/Scenario II

Region VII

In Port Isabel, although the ratio of assessment is high (80%), general obligation bonds are only 4 percent of assessed valuation and the tax rate is relatively low ($1.25). Therefore, administrative/financial capabilities are not considered as critical infrastructural factors in this study. Of the other issues and indicators, recreational facilities total park acreage, and health facilities are below the standards used in this study. These three issues have been flagged as significant. Also, housing availability, as in Brownsville, was identified and flagged as an issue from conversations with Port Isabel city officials. (See Figure 211.)

Figure 211

Significant Issues/Scenario II/Region VII Cities

1.	Brownsville	Housing Educational Services
2.	Port Isabel	Housing Recreational Facilities Health Facilities

Infrastructural Impacts Associated With Significant Infrastructural Issues

Unlike the analysis of impacts on operating costs, which involve the addition of new residents to current infrastructural systems which have the capacity to absorb more demands, the analysis of significant infrastructural issues raises the possibility that large-scale capital expenditures may be required to provide the additional needed services. (Operating costs were analyzed in Chapter 14 and are summarized below.)

It is not clear, however, that because a study site reveals, for example, a need for expanded health services when the infrastructural capacity indicators of this study are applied, that the affected study site will undertake the construction of a new hospital or the expansion of an existing one or any other large-scale capital investment. Between that kind of large capital investment (which would significantly affect the fiscal analysis contained in Chapter 14, and in the summary below) and a decision to "make do" with existing facilities, there exists an infinite number of short-term, non-capital-intensive solutions. A discussion of some of those solutions is contained in the Executive Summary.

The environmental and social impacts of these significant infrastructural issues were analyzed in Chapters 15 and 16, respectively, and are also summarized below.

Summary of Fiscal, Environmental, and Social Impacts

I. Fiscal

Chapter 14 (Economic Impact Analysis) revealed that over the seven-year life of Scenario II, local governments in Region VII will incur a total cost of $1,504,653 due to Scenario II activities. During the same time period, those same units of government will accure $1,312,135 in tax revenues from Scenario II-related activities. The total deficit over the life of Scenario II is thus projected to be $192,518. The Economic Impact Analysis also revealed that occasionally during the seven-year Scenario II period will local tax revenues associated with Scenario II cover more than 100% of incurred costs associated with Scenario II activities in Region VII. At times, that percentage drops to less than 65%.

II. Environmental

The Environmental Impact Analysis (Chapter 15) isolated the following potentially significant environmental issues in Region VII due to Scenario II activities:

A. Demand for industrial, commercial, and residential land.

Chapter 15 noted that the excessive demand for land in Brownsville and Pt. Isabel may result in Scenario II land requirements being met in other parts of Region VII (notably, Harlingen and Port Mansfield) rather than in just Brownsville and Pt. Isabel. It is also reasonable to expect that land use conversions will be significant (see Chapter 15).

B. Wastewater

As was the case in Region VI, Scenario II activities could result in significant water quality impacts even though the increase of wastewater effluents directly attributable to Scenario II activities is relatively minor.

C. Air Quality

Air quality degradation also could be of potential concern in Region VII, given the existing emission level, control complexities of international scope, and Scenario II postulated loadings. (See Chapter 15.)

III. Social

The Social Impact Assessment (Chapter 16) isolated several potentially significant social impacts in Region VII as a result of Scenario II activities.

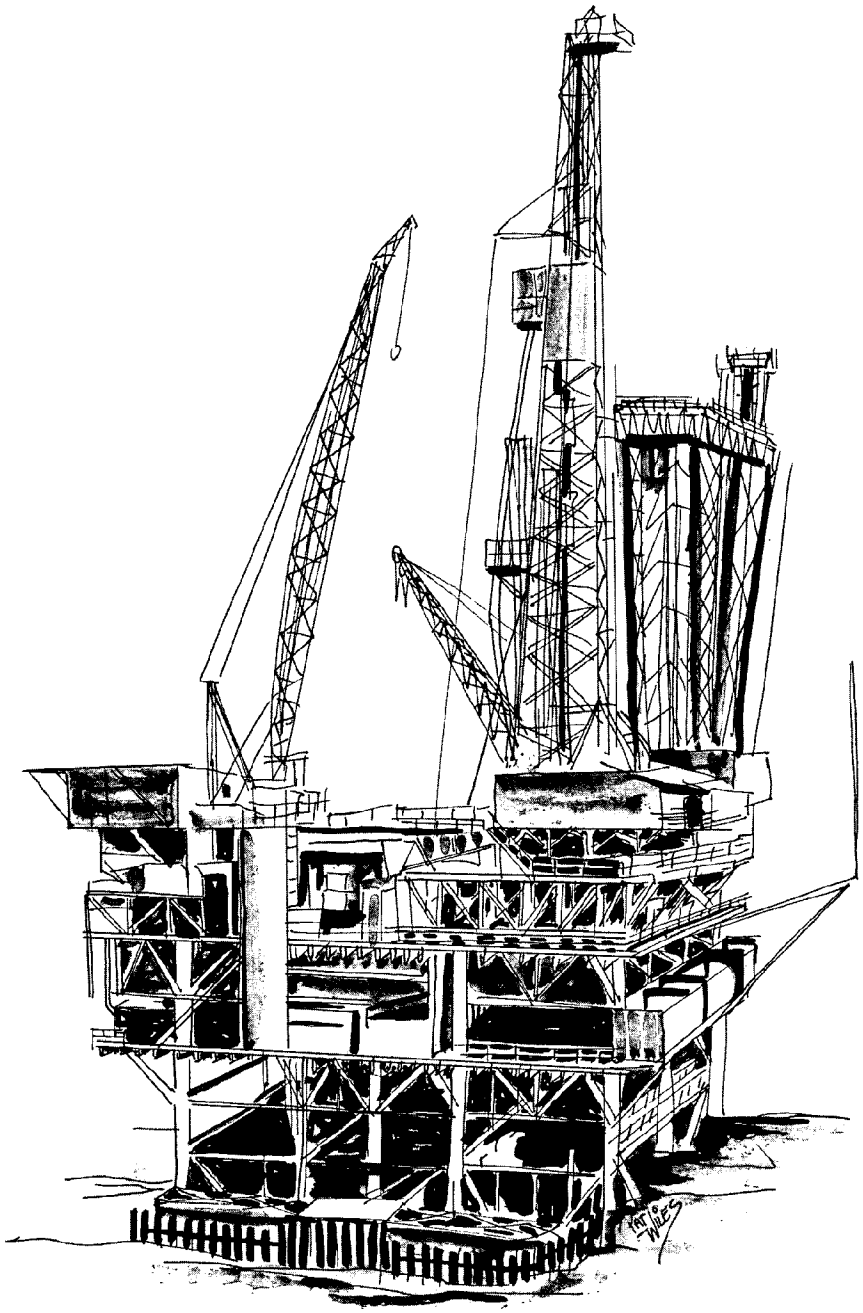
A. If infrastructural services are impacted to the extent that noticeable shortages in public facilities and services result, social impacts - in the form of dissatisfaction with congestion, a lowered perception of quality of life, and discontent with any accompanying rise in taxes - could ensue.

B. Increased competition for land and housing and accelerated degradation of the natural environment could also result in the kinds of social impacts mentioned in 'A' above and described more fully in Chapter 16.

C. To the extent that the benefits of increased employment levels, personal income, and business expenditures accrue to newcomers rather than to the existing unemployed pool, dissatisfaction on the part of existing residents is a distinct possibility.

PART E

SCENARIO III



1. INTRODUCTION AND SUMMARY

Scenario III, as described in Part A (see especially Figure 3), postulates OCS development in a 32-tract area located partially in the Brazos South Addition Area and partially in the Mustang Island East Addition Area (see Map 7). The Scenario postulates that:

1. Between the present time and May, 1977, a total of 17 tracts will be leased;

2. Twelve of the 17 tracts will undergo exploratory drilling;

3. A maximum of four drilling rigs will be in use at any one time;

4. Six tracts will undergo development drilling;

5. Nine platforms will be installed on those six tracts;

6. A total of 84 developments wells will be drilled from those nine platforms;

7. All six of the developed tracts will be put into production, and nine development platforms will be producing platforms;

8. Two of the nine platforms will be outfitted with production equipment;

9. There will be no undersea completions; and

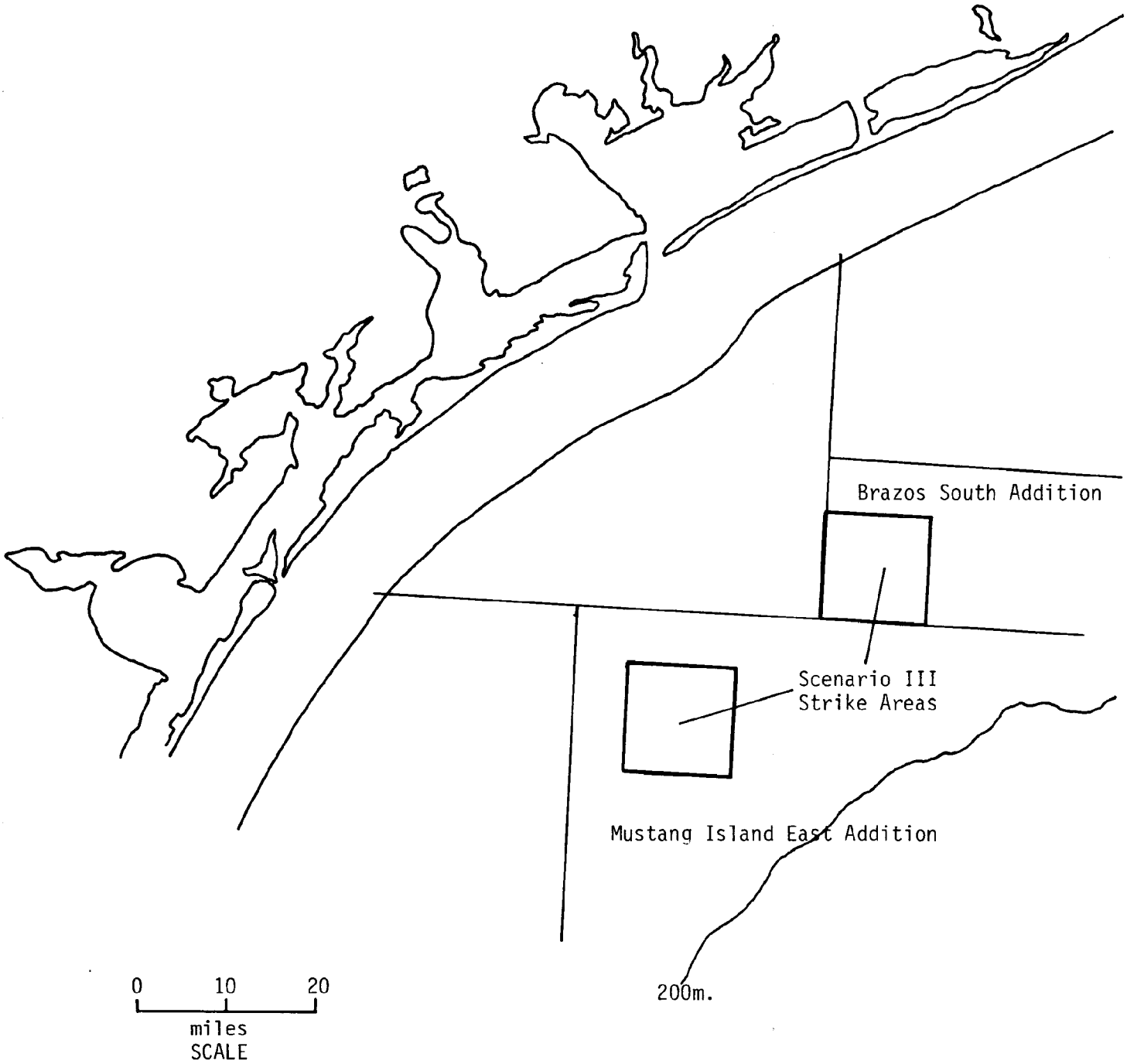
10. Peak production will be 205.5 million MCF of gas annually.

The Scenario analysis results in estimated requirements of 2296 direct employees, 321.5 acres of land, and 7400 feet of docking space (see Chapter 2). The peak demand period is estimated to be the sixth year after exploratory drilling commences (Chapter 3).

The requirements for Scenario III activities are expected to be met in Region IV (Matagorda, Jackson, Calhoun, and Victoria Counties), Region V (Aransas and Refugio Counties), and Region VI (San Patricio and Nueces Counties). In the peak demand period, 565 direct employees, 141.5 acres of land, and 1000 feet of docking space will be required in the Matagorda/Jackson/Calhoun/Victoria area. In the Aransas/Refugio area, 205 direct employees, 9.5 acres of land, and 2600 feet of docking space will be required. The figures for the San Patricio/Nueces area are 892 direct employees, 164 acres, and 3600 feet of docking space (Chapter 4).

Map 7

Scenario III Strike Areas



The Matagorda/Jackson/Calhoun/Victoria area requirements are likely to be met in Port O'Connor, Port Lavaca, Bay City, and Victoria; the Aransas/Refugio area requirements in Rockport; and the San Patricio/Nueces area requirements in Ingleside, Corpus Christi, and Aransas Pass (Chapter 4).

When all projected primary and indirect requirements are included, the requirements on the Matagorda/Jackson/Calhoun/Victoria area are estimated to be 414.5 acres of land; 378.05 acre-feet of water; 204 resident employees, 344 new resident employees, and 48 commuters, for a total of 596; 929 new residents; 316 new housing units; and 234 new students.

In the Aransas/Refugio area the requirements are projected to be 266.5 acres of land; 347.93 acre-feet of water; 84 resident employees, 155 new resident employees, and 33 commuters, for a total of 272; 419 new residents; 142 new housing units; and 106 new students.

For the San Patricio/Nueces area, the figures are 413 acres of land; 941.79 acre-feet of water; 424 resident employees, 566 new resident employees, and 51 commuters, for a total of 1,041; 1,528 new residents; 520 new housing units; and 385 new students. (see Chapters 5 and 13 for land requirements; Chapters 6 and 12 for water requirements; Chapter 7 for employment, population, housing unit, and new student information; and Chapters 17,18, and 19 for total requirements.)

Business expenditures are expected to total over $27 million in Region IV, over $27 million in Region V, and more than $145 million in Region VI. (see Chapter 8). Personal income should total over $10 million in the Matagorda/Jackson/Calhoun/Victoria area, nearly $15 million in the Aransas/Refugio area, and over $51 million in San Patricio/Nueces area (Chapter 9).

Fiscal deficits are expected to occur in the local governmental entities of all three regions. (see Chapters 11 and 14.) The State government is also expected to incur net deficits. (Chapters 10 and 14).

Increased demand for land, land use conversions, possible secondary effects of residential land development, solid waste disposal in Calhoun County, and air emissions are potentially significant environmental issues facing Region IV (see Chapters 15 and 17). In Region V, land use conversions, possible secondary effects of residential development, increased return flow wastewater volume and effluent loadings, and atmospheric emissions are potentially significant environmental issues (see Chapters 15 and 18). For Region VI, air and water quality are such issues (see Chapters 15 and 19, and Chapters 15 and 17 of Part D in this volume).

Rapid population growth, competition for housing and land, potential shortages of public services, and a changing economic base are sources of

social impacts in both Region IV and Region V. No serious social impacts are expected in Region VI.

In Bay City, housing and recreational facilities have been isolated as potentially significant infrastructural issues; in Victoria, recreation and educational facilities were so flagged; in Port Lavaca, recreational facilities; and in Port O'Connor, incorporation as a city, sewage collection and treatment, housing, solid waste disposal, and traffic patterns are such issues (see Chapter 17). (Port O'Connor is somewhat unique, and impacts on it-particularly social impacts-are dealt with separately in Part F of this volume.)

In Rockport, only educational services was isolated as a potentially significant infrastructural issue (see Chapter 18). In Corpus Christi, educational services were so identified; and in Aransas Pass, housing, sewage treatment, recreation, and education merit special attention (see Chapter 19 and Chapter 17 of Part D in this volume).

2. PRIMARY REQUIREMENTS

Based on the postulations made in the Scenario III description and the methods utilized to calculate estimates of the requirements of primary exploration, development and production activities (see Part B), the following estimations of requirements for primary Scenario III activities, facilities, services, and supplies were made.

Exploration Phase

I. Primary Activity Requirements

Scenario III postulates, as we have seen, that a maximum of four exploratory rigs will be in use at any given time. Thus, it is reasonable to assume that Scenario III will require 240 persons (4X60) for the on-rig operation of exploratory rigs (see Figure 212). The rigs themselves, since they are offshore, require no land.

The dockside support associated with exploratory rigs includes support units (repair facilities, etc.) and administrative units. It is assumed that the four exploratory rigs in use in Scenario III will be owned by four separate companies, each with its own dockside facilities. Thus it is postulated that four dockside units are required for the exploratory phase. It is reasonable to assume, therefore, that a total of 135 persons (4X35) and 6 acres of land (4X1.5) will be required for dockside support of exploratory rigs in Scenario III (see Figure 212).

Since there are four exploratory rigs involved in Scenario III, 4 helicopters are required during the exploration phase; a total of 16 workers (4X4) are required, then, for air transportation during the exploration phase of Scenario III (see Figure 212).

Similarly, since there are four exploratory rigs postulated, 12 boats (4X3), 192 workers (12X16) in marine transportation, and 2,400 feet of dockage (12X200) are estimated to be required (see Figure 212).

A total of 147 workers per rig - 588 for the four rigs - are estimated to be required to operate offshore rigs, to provide dockside support, and to provide transportation to and from the exploratory rigs of Scenario III. In addition, 1.5 acres plus 600 ft of docking space are estimated to be required for each exploratory rig; a total of 6 acres and 2,400 feet of dockage for all four rigs (see Figure 212).

Figure 212

Requirements for the Exploration Phase of Scenario III

	Unit Required	Personnel Required	Land (Acres) Required
1. Exploratory Rigs	4*	240 (4X60)	0
2. Dockside Support for Exploratory Rigs	4 (4x1)	140 (4x35)	6 (4x1.5)
3. Transportation to and from Exploratory Rigs			
a. Air (Helicopter)	4** (4x1)	16** (4x4)	Existing Air Terminal Space
b. Marine (Boats)	12** (4x3)	192** (12x16)	2400 ft. of dock Space (12x200)**
4. Total: Items 1, 2, and 3	-	588** (4x147)	6** (4x1.5)
5. Facilities			
a. Docks	4 loading berths and 4 other docks (4x1)(4x1)**	Existing dock personnel	(See Item 3b)
b. Storage	-	(See Item 2)	(See Item 2)
c. Office Space		(See Item 2)	(See Item 2)
6. Services			
a. Helicopters	(See Item 3a)	(See Item 3a)	(See Item 3a)
b. Boats	(See Item 3b)	(See Item 3b)	(See Item 3b)
c. Well Logging	2**	20** (2x10)	8** (2x4)
d. Diving	2**	22** (2x11)	1** (2x0.5)
7. Supplies			
a. Cement	2**	24** (2x12)	10** (2x5)
b. Mud	2**	26** (2x13)	8** (2x4)
c. Oil Field Equipment	2**	64** (2x32)	11** (2x5.5)
8. Total		744	44

* From Scenario III Description
** Not Included in Grand Total to Avoid Double Counting

II. Primary Facilities Requirements

The primary onshore facilities associated with the exploratory phase are docks, storage space, and office space. We have already seen that a total of 2,400 ft. of docking space is postulated to be required to service the exploration rigs required in the Scenario. Included in that figure is one loading berth and one other dock per rig. Thus, a total of four loading berths and four other docks are required for Scenario III (see Figure 212).

It is estimated that no additional dock personnel will be required to service the boats which service the exploration rigs. To the extent that any dockside servicing of these vessels is required, the necessary personnel for such servicing are included in the estimation of manpower required for marine transportation, discussed above.

Storage facilities necessary for the exploration phase include open storage and warehousing. To the extent the personnel or land are required for such facilities, they are included in the estimates of workers and land required for dockside support of exploratory rigs, discussed above. Further, office space during the exploration phase involves only the personnel and land requirements postulated to be necessary for dockside support of exploratory rigs, discussed above.

III. Primary Services Requirements

The primary services associated with offshore exploratory rigs are helicopter services, boat services, well logging, and diving services.

Helicopter and boat services postulated as being necessary to service exploration rigs (described earlier) are virtually all such services required in the exploration phase as a whole. Thus no additional helicopter or boat services are postulated (see Figure 212).

It is estimated that during the exploration phase of Scenario III, the services of a maximum of two well logging companies or company branches will be required to service the four exploratory rigs. Thus, a total of 20 workers (2X10) and 8 acres of land (2X4) will be required for well logging services during the exploration phase of Scenario III (see Figure 212).

Moreover, it is estimated that during the exploration phase of Scenario III the services of a maximum of two diving companies or branches will be required. Therefore, a total of 22 workers (2X11) and 1 acre (2X.5) will be required (see Figure 212).

IV. Primary Supplies Requirements

The primary supplies associated with the exploration phase of OCS oil and gas development are cement, drilling mud, and oil field supply, including wellhead equipment and downhole equipment.

It is estimated that during the exploration phase of Scenario III, cement will be supplied by a maximum of two companies or branches. Accordingly, 24 employees (2X12) and 10 acres of land (2X5) will be required for this activity (see Figure 212).

Similarly, it is estimated that two mud companies or branches will be required - a total of 26 workers (2X13) and 8 acres (2X4), - and two oil field equipment supply companies - 64 employees (2X32) and eleven acres (2X5.5) - will be required during the exploration phase of Scenario III (see Figure 212).

In sum, the total number of workers postulated to be required during the exploration phase (using only the facilities, services, and supplies described above as being 'primary') is 744; total land required is 44 acres and 2,400 feet of dock space.

Development Phase

I. Primary Activity Requirements

Scenario III postulates that nine development platforms will be installed within the geographical boundaries of the Scenario location. It is also assumed that four drilling crews will be required for those nine platforms. Thus, Scenario III will require 224 workers (4X56) for the on-platform operation of development platforms (see Figure 213). The platforms themselves, since they are located offshore, require no land.

It is postulated that the nine platforms will be owned by a maximum of four oil companies. It is further postulated, then, that there will be a maximum of four onshore support units to serve the nine platforms. Accordingly, 135 workers (9X15) and 22.5 acres of land (9X2.5) will be required for onshore support of development platforms in Scenario III. In sum, a total of 71 workers and 2.5 acres of land are required to operate one platform and to provide onshore support for that platform during the development phase of Scenario III (see Figure 213).

Figure 213

Requirements for the Development Phase of Scenario III

	Units Required	Personnel Required	Land (Acres) Required
1. Platforms	9 ** *	224 (4 crews X 56)	0
2. Onshore Support for Development Platforms	4 **	135 (9 X 15)	22.5 (9x2.5)
3. Total: Items 1 and 2	-	71 per platform** (56 + 15)	22.5 ** (9x2.5)
4. Facilities			
a. Docks	9 loading berths (9x1) **	Existing Dock Personnel	1800 ft. of dock space (9x200)**
b. Storage	-	(See Item 2)	(See Item 2)
c. Operations base	4 **	160 ** (4x40)	200 ** (4x50)
d. Administrative Base	4 **	180** (4x45)	
5. Services			
a. Helicopter	27 ** (9x3)	108 ** (27x4)	27 ** (27x1)
b. Boat	27 ** (9x3)	432 ** (27x16)	5400 ft. of loading space(27x200)**
c. Well Logging	3	30 (3x10)	12 (3x4)
d. Diving	2 **	22 ** (2x11)	1 ** (2x0.5)
6. Supplies			
a. Cement	3 **	36** (3x12)	15 ** (3x5)
b. Mud	4 **	52 ** (4x13)	16 ** (4x4)
c. Oil Field Equipment	4 **	128 ** (4x32)	22 ** (4x5.5)
7. Pipeline			
a. Lay Barge	2	160	400 ft. of docking space
b. Other vessels	4		
8. Total		1667	315.5

* From Scenario III Description
** Not Included in Grand Total to Avoid Double-Counting

II. Primary Facilities Requirements

The primary onshore facilities associated with the development phase are docks, storage space, an operations base, and an administrative office. (The operations base and administrative office listed here must not be confused with onshore support for the development platforms described above; the facilities listed in this section are those necessary for all development phase activities, not simply for direct support of development platforms.)

Since nine platforms are postulated in Scenario III, nine loading berths and a maximum of 1,800 feet of loading space (9X200) will be required for the development phase of Scenario III (see Figure 213). It is estimated that no additional dock personnel will be required to service the boats which service the development platforms. To the extent that such personnel shall be required, they are included in the estimation of manpower required for marine transportation, to be discussed later.

As in the exploration phase, storage facilities necessary for the development phase include open storage and warehousing. To the extent that land or personnel are required for such facilities, they are included in the estimates of requirements for onshore support of development platforms discussed above.

Since it is postulated that the nine development platforms will be owned by a total of four oil companies, it is assumed that four operations bases and four administrative offices shall also be required. Thus, 160 employees (4X40) are estimated to be required to operate operations bases, 180 workers (4X45) are estimated to be needed for administrative bases, and 200 acres of land (4X50) are estimated to be required for both operations bases and administrative bases during the development phase of Scenario III (see Figure 213).

III. Primary Services Requirements

The primary services associated with the development phase of OCS oil and gas extraction are helicopter services, boat services, well logging, and diving. Since Scenario III postulates nine development platforms, a total of 27 helicopters (9X3), 108 workers (27X4), and 27 acres of land (27X1) are required for air transportation during the development phase of Scenario III (see Figure 213).

Requirements for boat services are calculated in a similar manner: 27 boats (9X3), 432 employees (27X16), and 5,400 feet of loading space (27X200). (see Figure 213).

It is also estimated that a maximum of three well logging companies or branches will be required to service the nine platforms. Accordingly, 30 employees (3X10) and 12 acres of land (3X4) will be required. Finally, it is assumed that the requirements for diving services in the development phase will be identical to those of the exploration phase: 22 employees (2X11) and one acre (2X5). (see Figure 213).

IV. Primary Supplies Requirements

The primary supplies associated with the development phase, as with the exploration phase, are cement, drilling mud, and oil field supplies including wellhead and downhole equipment. Where the exploration phase required two companies or company branches to supply each of these items, it is postulated that the development phase will require 3 cement companies or branches, 4 mud companies or branches, and four oil field supply companies or branches. In each case, however, the employment and land requirement multipliers remain the same; that is 12 employees and 5 acres for each cement company or branch, 13 employees and 4 acres for each mud company or branch, and 32 employees and 5.5 acres for each oil field supply company or branch. Thus, the total requirements for cement supply are 36 employees (3X12) and 15 acres (3X5); for mud supply, 52 employees (4X13) and 16 acres (4X4); for oil field supply, 128 employees (4X32) and 22 acres of land (4X5.5). (see Figure 213).

V. Pipeline Laying Requirements

Scenario III postulates that two main gathering pipelines will be constructed to transport production from the nine producing platforms. One of these lines, it is further postulated, will be approximately 10 miles in length and will be connected to a gathering line currently serving the Brazos South Addition Area. The other line will extend from the Mustang Island East Addition Area to shore in Nueces County; it will be 60 to 70 miles in length. It is assumed that two lay barges, each with two accompanying vessels will be required. The NE study estimated that two lay barges laying 24" diameter pipe simultaneously, each followed by one other vessel, would require a total of 47 workers, 3 docks, and 300 feet of docking space. These figures, however, include only the supply boats and crew boats, not the lay barges themselves. Thus, for two lay barges and 4 other vessels, a total of 160 workers, 4 docks, and 400 feet of docking space are more realistic figures and are postulated in Scenario III.

In sum, the total number of workers postulated to be required during the development phase (using the facilities, services and supplies described above) is 1,667. Total land requirement is 315.5 acres and 7,600 feet of docking space.

Production Phase

I. Primary Activity Requirements

Scenario III postulates that all nine development platforms will ultimately be producing platforms. Thus, 144 workers (9X16) will be required for the on-platform operation of producing platforms (see Figure 214). The platforms themselves, since they are located offshore, require no land.

It has been postulated that the nine platforms will be owned by a maximum of four oil companies and that, therefore, there will be a maximum of four onshore support units to serve the nine platforms. Accordingly, 162 workers (9X18) and 9 acres of land (9X1) will be required for onshore support of producing platforms in Scenario III (see Figure 214). This study, then, postulates that a total of 34 workers per platform are required for the actual operation of a producing platform and for onshore support; a total of 306 workers for the nine platforms (see Figure 214).

II. Primary Facilities, Services and Supplies Requirements

As Part B noted, the manpower and land requirements of primary facilities, services and supplies during the production phase are estimated to be identical to such requirements during the development phase (see Figure 214).

Thus, the total number of workers postulated to be required during the production phase (using the facilities, services, and supplies described above) is 1,424; total land requirement is 290 acres and 7,200 feet of docking space.

Total Primary Requirements

Part B pointed out that the computation of primary personnel and land requirements for all phases - exploration, development and production - of a Scenario is not simply a matter of totaling those requirements for each of the three phases. Such a procedure would result in double-counting and thus over-estimations of the total requirements.

Figure 214

Requirements for the Production Phase of Scenario III

	Units Required	Personnel Required	Land (Acres) Required
1. Platforms	9 *	144 (9x16)	0
2. Onshore Support for Production Platforms	4	162 (9x18)	9 ** (9x1)
3. Total: Items 1 and 2	-	306 ** (9x34)	9 ** (9x1)
4. Facilities			
a. Docks	9 loading berths (9x1)	Existing Dock Personnel (See Item 2)	1800 ft. of dock space (9x20) (See Item 2)
b. Storage	-		
c. Operations Base	4	160 (4x40)	200 (4x50)
d. Administrative Base	4	180 (4x45)	
5. Services			
a. Helicopter	27 (9x3)	108 (27x4)	27 (27x1)
b. Boat	27 (9x3)	432 (27x16)	5400 ft. of loading space (27x200)
c. Diving	2	22 (2x11)	1 (2x0.5)
6. Supplies			
a. Cement	3	36 (3x12)	15 (3x5)
b. Mud	4	52 (4x13)	16 (4x4)
c. Oil Field Equipment	4	128 (4x32)	22 (4x5.5)
7. Total		1424	290

* From Scenario III Description
** Not Included in Grand Total to Avoid Double-Counting

Such double-counting is possible throughout. In Figures 212, 213, and 214, those items which have not been included in the grand totals (in an attempt to avoid double-counting) are clearly marked. The grand totals of requirements for all phases of Scenario III are then displayed in Figure 215.

Figure 215

Total Requirements for all Phases of Scenario III

	Units Required	Personnel Required	Land (Acres) Required
1. Exploratory Rigs	4	240	0
2. Dockside Support for Exploratory Rigs	4	140	6
3. Platforms	9	368	0
4. Onshore Support for Development/Production Platforms	4	168	22.5
5. Facilities			
a. Docks	9	0	1800 feet
b. Operations Base	4	160	200
c. Administrative Base	4	180	
6. Services			
a. Helicopters	27	180	27
b. Boats	27	432	5400 feet
c, Well Logging	3	30	12
d. Diving	2	22	1
7. Supplies			
a. Cement	3	36	15
b. Mud	4	52	16
c. Oil Field Equipment	4	128	22
8. Pipeline			
a. Lay Barge	2	160	400 feet
b. Other Vessels	4		
9. GRAND TOTAL		2296	321.5 acres and 7400 ft of docking space

3. PRIMARY REQUIREMENTS OVER TIME

The calculation of total requirements of all phases of Scenario III is a necessary but not sufficient output of Methodology Tasks B1, C1, and D1. The primary requirements must also be distributed over time since not all of them will be simultaneously required, nor will they all be required for the same length of time. The dates on which the activities of Scenario III begin and end are postulated in the Scenario III description (see Figure 3). When those dates are put together with the total requirements of Scenario III (see Figure 215), a picture of the distribution of requirements over time emerges (see Figure 216). The time at which the requirements must be met come either from the Scenario III description or are RPC estimates. Some of the columns in Figure 216 represent activities which, when completed, are never required again; thus, the manpower and land are not required again. In these cases, the personnel undoubtedly move on to other areas and the land is given over to other uses. Exploratory rigs are examples of such cases. On the other hand, some columns in Figure 216 represent activities, the demand for which will rise and then decline but will rise again. Helicopters service is one such example. In these cases, it is assumed that in the slow period following the first burst of activity, the manpower and land requirements will remain constant in expectation of the second burst of activity.

Finally, it must be noted that Figure 216 displays requirements over time only until 12/82 or 6.5 years after exploratory drilling in Scenario III is begun. The last time period on Figure 216 (10/82 to 12/82) represents peak demand on personnel and land. After 12/82 (or 6.5 years after exploratory drilling commences), demand for personnel and land will gradually decline until it reaches a level necessary for continuous operation of the nine producing platforms. The analysis of that decline, the speed at which it takes place, and its impacts would constitute a study of proportions similar to the study of the build-up. Without presenting a sophisticated analysis of the slowdown, however, the following general assumptions, based on Scenario III postulations, can be set forth:

1. Beginning in late 1982 (6.5 years after exploratory drilling begins) personnel required for operation of the nine platforms will eventually fall from a high of 352 (in the 10/82 to 12/82 period) to 144 (16 workers per platform).

2. During the same time, the number of required well logging companies will fall from three to one, the number of required diving companies will fall from two to one, cement companies from three to one, and oil field supply companies from four to one; required manpower and land will fall accordingly. (It can be assumed, however, that the companies or branches which are no longer required by Scenario III activities will stay in place and serve other developments either in the OCS or onshore.)

Time Period	Exploratory Rigs *	Dockside Support for Exploratory Rigs**	Platforms*	Development Drilling (Crews)	Production Drilling (Crews)	Onshore Support For Platforms**	Docks**	Operations Bases**	Administrative Bases	Helicopters**	Boats**	Well Logging (Companies or Branches) **	Diving (Companies or Branches) **	Cement (Companies or Branches) **
6/76- 9/76	1	1	0	0	0	0	2	0	0	1	3	1	1	1
9/76-12/76	2	2	0	0	0	0	4	0	0	2	6	1	1	1
12/76- 3/77	3	3	0	0	0	0	6	0	0	3	9	2	2	2
3/77- 6/77	3	3	0	0	0	0	6	0	0	3	9	2	2	2
6/77- 8/77	3	3	0	0	0	0	6	0	0	3	9	2	2	2
8/77- 9/77	4	4	0	0	0	0	8	0	0	4	12	2	2	2
9/77-12/77	4	4	0	0	0	0	8	0	0	4	12	2	2	2
12/77- 2/78	3	3	0	0	0	0	6	0	0	3	9	2	2	2
2/78- 3/78	4	4	0	0	0	0	8	0	0	4	12	2	2	2
3/78- 5/78	3	3	0	0	0	0	6	0	0	3	9	2	2	2
5/78- 6/78	3	3	0	0	0	0	6	0	0	3	9	2	2	2
6/78- 8/78	2	2	0	0	0	0	4	0	0	2	6	1	1	1
8/78-11/78	3	3	0	0	0	0	6	0	0	3	9	2	2	2
1/78- 2/79	3	3	0	0	0	0	6	0	0	3	9	2	2	2
2/79- 5/79	2	2	0	0	0	0	4	0	0	2	6	1	1	1
5/79- 8/79	1	1	0	0	0	0	2	0	0	1	3	1	1	1
8/79-12/79	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/79- 6/80	0	0	1	1	0	1	1	1	1	3	3	1	1	1
6/80- 1/81	0	0	2	2	0	2	2	2	2	6	6	1	1	1
1/81- 2/81	0	0	2	1	1	2	2	2	2	6	6	1	1	1
2/81- 5/81	0	0	4	2	2	2	4	2	2	12	12	2	1	2
5/81- 8/81	0	0	5	3	2	3	5	3	3	15	15	2	2	2
8/81-10/81	0	0	6	4	2	4	6	4	4	18	18	2	2	2
10/81- 1/82	0	0	6	3	3	4	6	4	4	18	18	2	2	2
1/82- 3/82	0	0	7	4	4	4	7	4	4	21	21	3	2	3
3/82- 5/82	0	0	7	3	5	4	7	4	4	21	21	3	2	3
5/82- 6/82	0	0	8	4	5	4	8	4	4	24	24	3	2	3
6/82- 7/82	0	0	8	2	7	4	8	4	4	24	24	3	2	3
7/82-10/82	0	0	9	3	7	4	9	4	4	27	27	3	2	3
10/82-12/82	0	0	9	2	8	4	9	4	4	27	27	3	2	3

* From Scenario III Description
** RPC Estimate

Mud (Companies or Branches) **	Oil Field Equipment (Companies or Branches) **	Lay Barges & Other Vessels Needed in Pipeline Laying **	Total Employment**	Total Land (Acres)**	Docking Space**	Time Period
1	1	0	225	20.5	600	6/76- 9/76
1	1	0	372	22	1200	9/76-12/76
2	2	0	597	42.5	1800	12/76- 3/77
2	2	0	597	42.5	1800	3/77- 6/77
2	2	0	597	42.5	1800	6/77- 8/77
2	2	0	744	44	2400	8/77- 9/77
2	2	0	744	44	2400	9/77-12/77
2	2	0	744	44	2400	12/77- 2/78
2	2	0	744	44	2400	2/78- 3/78
2	2	0	649	42.5	1800	3/78- 5/78
2	2	0	649	42.5	1800	5/78- 6/78
1	1	0	649	42.5	1800	6/78- 8/78
2	2	0	649	42.5	1800	8/78-11/78
2	2	0	649	42.5	1800	11/78- 2/79
1	1	6	634	41	1400	2/79- 5/79
1	1	6	619	39.5	1000	5/79- 8/79
0	0	6	524	38	400	8/79-12/79
1	1	6	683	96.5	1200	12/79- 6/80
1	1	0	690	155	1600	6/80- 1/81
1	1	0	706	155	1600	1/81- 2/81
2	2	0	782	161	3200	2/81- 5/81
3	3	0	1046	229	4000	5/81- 8/81
3	3	0	1265	287.5	4800	8/81-10/81
3	3	0	1281	287.5	4800	10/81- 1/82
3	3	0	1397	299.5	5600	1/82- 3/82
3	3	0	1413	299.5	5600	3/82- 5/82
4	4	0	1536	312	6400	5/82- 6/82
4	4	0	1568	312	6400	6/82- 7/82
4	4	0	1646	315	7200	7/82-10/82
4	4	0	1662	315	7200	10/82-12/82

Figure 216

Total Requirements of Scenario III over time

3. Pipeline laying services will not be required after 6/80 (approximately 4 years after exploratory drilling begins).

This list is not meant to be inclusive, but rather to merely present a representative sample of declining activities.

4. DISTRIBUTION OF REQUIREMENTS TO STUDY SITES

As Part B noted, it is necessary to determine which of the seven Coastal Study Sites will fill each of the primary requirements of the exploration, development and production phases of Scenario III. The following analysis makes such a determination.

Exploration Phase

Figure 217 displays the primary requirements of the exploration phase as postulated in Scenario III.

Figure 217

Primary Requirements of Exploration Phase of Scenario III

	Requirements	Units Required	Personnel Per Unit	Total Personnel Required	Land(Acres) Per Unit	Total Land Required
1.	Exploratory Rigs	4	60	240	0	0
2.	Dockside Support for Exploratory Rigs	4	35	140	1.5	6
3.	Docks	8	-	-	-	-
4.	Helicopters	4	4	16	-	-
5.	Boats	12	16	192	200ft./dock	2400ft./dock
6.	Well Logging Companies	2	10	20	4	8
7.	Diving Services	2	11	22	.5	1
8.	Cement Companies	2	12	24	5	10
9.	Mud Companies	2	13	26	4	8
10.	Oil Field Equipment Companies	2	32	64	5.5	11
TOTAL				744		44 acres & 2400 ft. of docking space

Given those requirements; given the distribution of facilities, services, and supplies among the study sites (see Figure 4); and given the geographic location of Scenario III, the following allocation (Figure 218) is made.

The allocations made in Figure 218 (and ultimately in Figures 220, 222, and 223) must be seen as RPC estimates, made on the basis of the current distribution in Texas of primary facilities, services, and supplies required for Scenario III; on the basis of the geographical location of Scenario III; and on the basis of current and projected industrial growth patterns along the Texas Gulf Coast.

Development Phase

Figure 219 displays the primary requirements of the development phase as postulated in Scenario III, over and above those postulated in the exploration phase. That is, the requirements detailed in Figure 219 should be seen as additions to those in Figure 217.

Given those requirements; given the distribution of primary facilities, services, and supplies among the study sites (see Figure 4); and given the geographical location of Scenario III, the allocation made in Figure 220 was the result.

Production Phase

Figure 221 presents the primary requirements of the production phase as postulated in Scenario III, over and above those postulated for the exploration and development phases. That is, the requirements detailed in Figure 221 should be seen as additions to those in Figures 217 and 219.

Figure 218

Allocation of Exploration Phase Requirements

Requirements (Facilities, Services and Supplies)	Regions						
	I	II	III	IV	V	VI	VII
Drilling Contractors (Exploratory Rigs)	0	0	0	1	1	2	0
Dockside Support for Exploratory Rigs	0	0	0	1	1	2	0
Onshore Support for Development/Production Platforms	NA	NA	NA	NA	NA	NA	NA
Onshore Operations Bases for Development/ Production	NA	NA	NA	NA	NA	NA	NA
Onshore Administrative Bases for Development/ Production	NA	NA	NA	NA	NA	NA	NA
Docks	0	0	0	2	2	4	0
Helicopters	0	0	0	2	0	2	0
Boats	0	0	0	0	6	6	0
Well Logging Services	0	0	0	1	0	1	0
Diving Services	0	0	0	0	0	2	0
Cement	0	0	0	1	0	1	0
Mud	0	0	0	0	1	1	0
Oil Field Equipment	0	0	0	1	0	1	0
Lay Barges and Other Vessels Required for Pipeline Laying	NA	NA	NA	NA	NA	NA	NA

Region I: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/ Hidalgo/Willacy Counties.

NA = Not Applicable

Figure 219

Primary Requirements of Development Phase of Scenario III

Requirements	Units Required	Personnel Per Unit	Total Personnel Required	Land(Acres) Per Unit	Total Land Required
1. Platforms	9 4 Drilling Crews	56	224	0	0
2. Onshore Support for Development/ Production Platforms	4	15 per platform	135	2.5 per platform	2.5
3. Onshore Operations Bases for Development/Production	4	40	160		
4. Onshore Administrative Bases for Development/ Production	4	45	180	50	200
5. Helicopters	23	4	92	1	27*
6. Boats	15	16	240	200ft./dock	3000ft./dock
7. Docks	1	-	-	200ft./dock	1800ft./dock**
8. Well Logging Companies	1	10	10	4	4
9. Cement Companies	1	12	12	5	5
10. Mud Companies	2	13	26	4	8
11. Oil Field Equipment Companies	2	32	64	5.5	11
12. Lay Barges and Other Vessels Required for Pipeline Laying	6 (2 lay barges & 4 auxiliary vessels)	50/lay barge & 15/auxiliary vessel	160	66.67 ft. of dock space	400ft. of dock space

* Includes land required for four helicopters utilized during the exploration phase, but which required only existing air terminal space in the exploration phase.

**Includes docking space for eight vessels utilized during the exploration phase, but which utilized existing dock space in the exploration phase.

Figure 220

Allocation of Development Phase Requirements

Requirements (Facilities, Services and Supplies)	Regions						
	I	II	III	IV	V	VI	VII
Drilling Contractors (For Development Drilling)	0	0	0	2	0	2	0
Dockside Support for Exploratory Rigs	NA	NA	NA	NA	NA	NA	NA
Onshore Support for Development/Production Platforms	0	0	0	2	0	2	0
Onshore Operations Bases for Development/Production	0	0	0	2	0	2	0
Onshore Administrative Bases for Development/Production	0	0	0	2	0	2	0
Docks	0	0	0	0	1	0	0
Helicopters	0	0	0	10	0	13	0
Boats	0	0	0	3	4	8	0
Well Logging Services	0	0	0	0	0	1	0
Diving Services	- - No Addition To That of Exploratory Phase - -						
Cement	0	0	0	0	0	1	0
Mud	0	0	0	1	0	1	0
Oil Field Equipment	0	0	0	0	1	1	0
Lay Barges and Other Vessels Required for Pipeline Laying	0	0	0	0	0	6	0

Region I: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/Hidalgo/Willacy Counties.

NA = Not Applicable

Figure 221

Primary Requirements of Production Phase of Scenario III

	Requirements	Units Required	Personnel Per Unit	Total Personnel Required	Land(Acres) Per Unit	Total Land Required
1.	Platforms	9 Operations Crews	16	144	0	0
2.	Onshore Support for Development/ Production Platforms	4*	3 Per Platform	27	(Does not exceed requirements of development phase.)	

* Same units as those used in the development phase, with slightly increased staffing.

The allocation of these requirements to study site is shown in Figure 222.

Since the same onshore support units (Item 2 in Figure 219) are used in the production phase as were used in the development phase -with slightly increased staffing in the production phase - they are not shown on Figure 222.

Total Allocated Primary Requirements

When the primary requirements allocated in Figures 218, 220, and 222 are brought together, the result is a display of the primary requirements of all phases of Scenario III distributed to study sites (see Figure 223). Items in Figure 223 can be seen as the addition of corresponding items in Figures 218, 220, and 222. It can be seen from Figure 223 that there are three affected Coastal Study Sites in Scenario III. They are:

Region IV - Matagorda, Jackson, Calhoun, and Victoria Counties;
Region V - Aransas and Refugio Counties; and
Region VI - San Patricio and Nueces Counties.

(See Map 8)

Figure 222

Allocation of Production Phase Requirements

Requirements (Facilities, Services, and Supplies)	Regions						
	I	II	III	IV	V	VI	VII
Drilling Contractors (For Production Platform Operation	0	0	0	3	0	6	0
Dockside Support for Exploratory Rigs	NA	NA	NA	NA	NA	NA	NA
Onshore Support for Development/Production Platforms	-No Addition To That Of Development Phase (Figure 220)-						
Onshore Operations Bases for Development/ Production	-No Addition To That Of Development Phase (Figure 220)-						
Onshore Administrative Bases for Development/ Production	-No Addition To That Of Development Phase (Figure 220)-						
Docks	-No Addition To That Of Development Phase (Figure 220)-						
Helicopters	-No Addition To That Of Development Phase (Figure 220)-						
Boats	-No Addition To That Of Development Phase (Figure 220)-						
Well Logging Services	-No Addition To That Of Development Phase (Figure 220)-						
Diving Services	-No Addition To That Of Development Phase (Figure 220)-						
Cement	-No Addition To That Of Development Phase (Figure 220)-						
Mud	-No Addition To That Of Development Phase (Figure 220)-						
Oil Field Equipment	-No Addition To That Of Development Phase (Figure 220)-						
Lay Barges and Other Vessels Required for Pipeline Laying	-No Addition To That Of Development Phase (Figure 220)-						

Region I: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/Hidalgo/Willacy Counties.

NA = Not Applicable

Figure 223

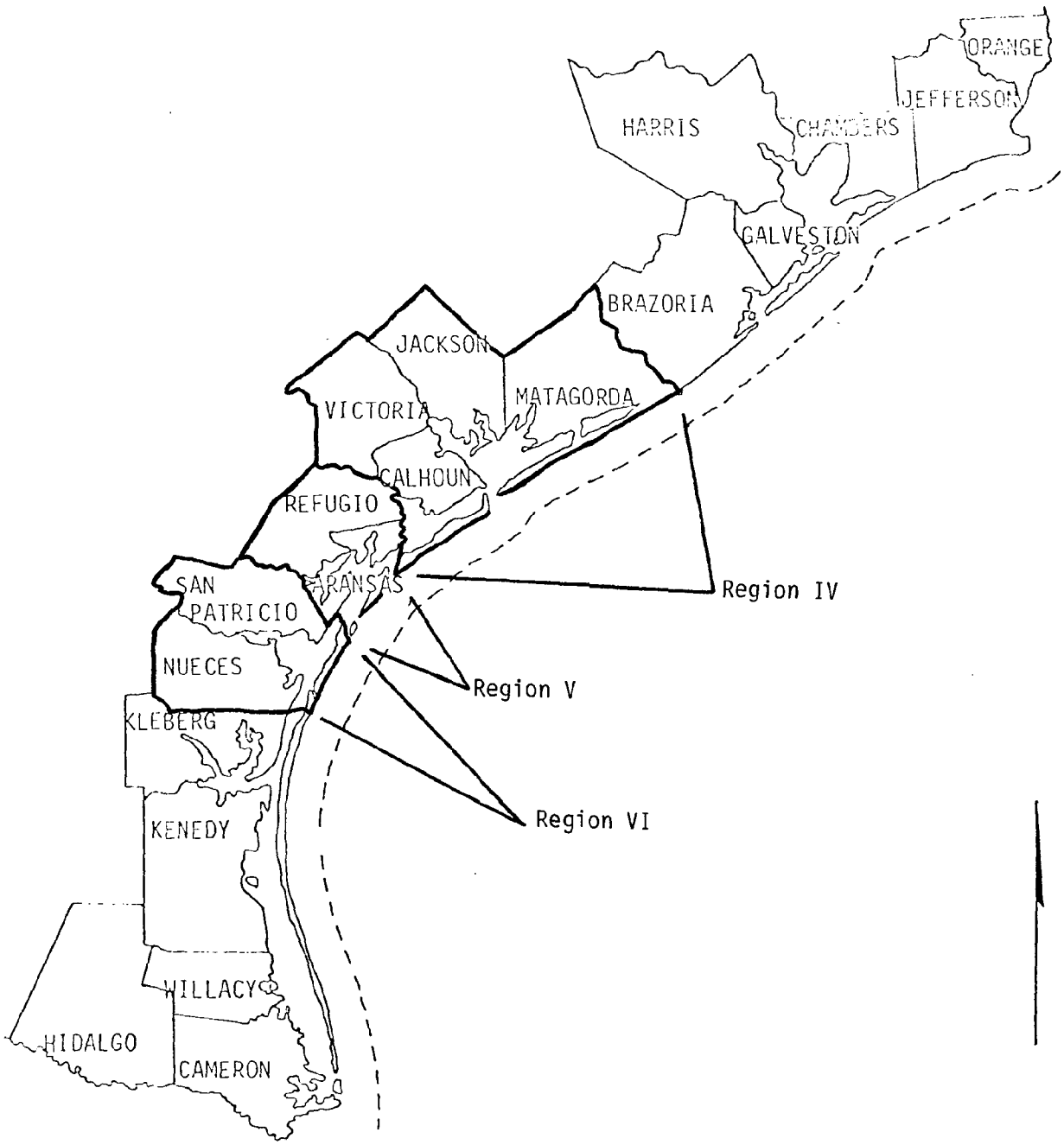
Primary Requirements of All Phases of Scenario III

	I	II	III	IV	V	VI	VII
Drilling Contractors (Exploration, Development and/or Production	0	0	0	1 Exp. 2 Dev. 3 Prod.	1 Exp.	2 Exp. 2 Dev. 6 Prod.	0
Dockside Support for Exploratory Rigs	0	0	0	1	1	2	0
Onshore Support for Development/Production Platforms	0	0	0	2	0	2	0
Onshore Operations Bases for Development/ Production	0	0	0	2	0	2	0
Onshore Administrative Bases for Development/ Production	0	0	0	2	0	2	0
Docks	0	0	0	2	3	4	0
Helicopters	0	0	0	12	0	15	0
Boats	0	0	0	3	10	14	0
Well Logging Services	0	0	0	1	0	2	0
Diving Services	0	0	0	0	0	2	0
Cement	0	0	0	1	0	2	0
Mud	0	0	0	1	1	2	0
Oil Field Equipment	0	0	0	1	1	2	0
Lay Barges and Other Vessels Required for Pipeline Laying	0	0	0	0	0	6	0

Region I: Orange/Jefferson Counties; II: Harris/Galveston/Chambers Counties; III: Brazoria County; IV: Matagorda/Jackson/Victoria/Calhoun Counties; V: Aransas/ Refugio Counties; VI: San Patricio/Nueces Counties; VII: Cameron/ Hidalgo/Willacy Counties.

Map 8

Affected Study Sites of Scenario III



Total Allocated Primary Requirements Over Time

When Figure 223 is juxtaposed with Figure 216, a picture of allocated primary requirements over time emerges. Figure 224 presents that picture. In each column in Figure 224, the first number applies to Region IV, the second to Region V, and the third to Region VI.

In accordance with the methodology (see Appendix A), the allocated primary requirements over time were found to be both available and accessible in the study sites to which they were allocated.

The allocated primary requirements detailed in Figure 224 must be seen as increases in the respective industrial sectors in the study site to which they have been allocated. For example, in the 12/79-6/80 time period, as Figure 224 reveals, one well logging company or branch will be required in Region VI - the San Patricio/Nueces Counties area. That must be seen as an increase in the well logging industry in that area equivalent to the establishment of one additional, new well logging company. That increase could come in the form of the expansion of one or more existing well logging companies or, indeed, in the establishment of a totally new company. No attempt has been made to describe the form in which that increase will come. What has been described is the size of that increase; that is, the land and manpower equivalents of one new well logging company or branch (10 employees and 4 acres). The primary requirements are seen as increases to their respective sectors because:

1. A determination as to whether Scenario III requirements will in fact cause increases in some industrial sectors (as opposed to such increases being absorbed by existing companies) is dependent on an analysis of current and projected business activity in each sector in each study site. Such an analysis, however, is beyond the scope of this study.

2. One of the underlying assumptions in this study is that current activity will continue at its present rate of growth - that is, "business as usual." Thus, the activities in Scenario III can reasonably be assumed to cause increases in the affected industrial sectors in the affected study sites.

There are, of course, alternative locations for development within each affected study site. Thus, it becomes necessary to further allocate a study site's primary requirements within that affected study site. Figure 225 makes such an allocation. It must be noted that the sub-allocations must not be seen as predictions, but as postulations.

Time Period	Exploratory Rigs	Dockside Support For Exploratory Rigs	Development Drilling Contractors	Production Operation Contractors	Onshore Support For Platforms	Docks	Operations Bases	Administrative Bases	Helicopters	Boats	Well Logging (Companies or Branches)	Diving (Companies or Branches)	Cement (Companies or Branches)
6/76-9/76	0 0 1	0 0 1	0 0 0	0 0 0	0 0 0	0 1 1	0 0 0	0 0 0	0 0 1	0 1 2	0 0 1	0 0 1	0 0 1
9/76-12/76	0 1 1	0 1 1	0 0 0	0 0 0	0 0 0	1 1 2	0 0 0	0 0 0	1 0 1	0 2 4	0 0 1	0 0 1	0 0 1
12/76-3/77	1 1 1	1 1 1	0 0 0	0 0 0	0 0 0	1 2 3	0 0 0	0 0 0	1 0 2	0 3 6	1 0 1	0 0 2	1 0 1
3/77-6/77	1 1 1	1 1 1	0 0 0	0 0 0	0 0 0	1 2 3	0 0 0	0 0 0	1 0 2	0 3 6	1 0 1	0 0 2	1 0 1
6/77-8/77	1 1 1	1 1 1	0 0 0	0 0 0	0 0 0	1 2 3	0 0 0	0 0 0	1 0 2	0 3 6	1 0 1	0 0 2	1 0 1
8/77-9/77	1 1 2	1 1 2	0 0 0	0 0 0	0 0 0	2 2 4	0 0 0	0 0 0	2 0 2	0 5 7	1 0 1	0 0 2	1 0 1
9/77-12/77	1 1 2	1 1 2	0 0 0	0 0 0	0 0 0	2 2 4	0 0 0	0 0 0	2 0 2	0 5 7	1 0 1	0 0 2	1 0 1
12/77-2/78	1 1 1	1 1 1	0 0 0	0 0 0	0 0 0	1 2 3	0 0 0	0 0 0	1 0 2	0 3 6	1 0 1	0 0 2	1 0 1
2/78-3/78	1 1 2	1 1 2	0 0 0	0 0 0	0 0 0	2 2 4	0 0 0	0 0 0	2 0 2	0 5 7	1 0 1	0 0 2	1 0 1
3/78-5/78	1 1 1	1 1 1	0 0 0	0 0 0	0 0 0	1 2 3	0 0 0	0 0 0	1 0 2	0 3 6	1 0 1	0 0 2	1 0 1
5/78-6/78	1 1 1	1 1 1	0 0 0	0 0 0	0 0 0	1 2 3	0 0 0	0 0 0	1 0 2	0 3 6	1 0 1	0 0 2	1 0 1
6/78-8/78	0 1 1	0 1 1	0 0 0	0 0 0	0 0 0	1 1 2	0 0 0	0 0 0	1 0 1	0 2 4	0 0 1	0 0 1	0 0 1
8/78-11/78	1 1 1	1 1 1	0 0 0	0 0 0	0 0 0	1 2 3	0 0 0	0 0 0	1 0 2	0 3 6	1 0 1	0 0 2	1 0 1
11/78-2/79	1 1 1	1 1 1	0 0 0	0 0 0	0 0 0	1 2 3	0 0 0	0 0 0	1 0 2	0 3 6	1 0 1	0 0 2	1 0 1
2/79-5/79	0 1 1	0 1 1	0 0 0	0 0 0	0 0 0	1 1 2	0 0 0	0 0 0	1 0 1	0 2 4	0 0 1	0 0 1	0 0 1
5/79-8/79	0 0 1	0 0 1	0 0 0	0 0 0	0 0 0	0 1 1	0 0 0	0 0 0	0 0 1	0 1 2	0 0 1	0 0 1	0 0 1
8/79-12/79	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
12/79-6/80	0 0 0	0 0 0	0 0 1	0 0 0	0 0 1	0 0 1	0 0 1	0 0 1	1 0 2	0 1 2	0 0 1	0 0 1	0 0 1
6/80-1/81	0 0 0	0 0 0	1 0 1	0 0 0	1 0 1	0 1 1	1 0 1	1 0 1	3 0 3	0 2 4	0 0 1	0 0 1	0 0 1
1/81-2/81	0 0 0	0 0 0	0 0 1	0 0 1	1 0 1	0 1 1	1 0 1	1 0 1	3 0 3	0 2 4	0 0 1	0 0 1	0 0 1
2/81-5/81	0 0 0	0 0 0	1 0 1	1 0 1	1 0 1	1 1 2	1 0 1	1 0 1	5 0 7	0 5 7	1 0 1	0 0 2	1 0 1
5/81-8/81	0 0 0	0 0 0	1 0 2	1 0 1	1 0 2	1 1 3	1 0 2	1 0 2	6 0 9	0 6 9	1 0 1	0 0 2	1 0 1
8/81-10/81	0 0 0	0 0 0	2 0 2	1 0 1	2 0 2	1 2 3	2 0 2	2 0 2	8 0 10	2 6 10	1 0 1	0 0 2	1 0 1
10/81-1/82	0 0 0	0 0 0	1 0 2	1 0 2	2 0 2	1 2 3	2 0 2	2 0 2	8 0 10	2 6 10	1 0 1	0 0 2	1 0 1
1/82-3/82	0 0 0	0 0 0	2 0 2	1 0 3	2 0 2	1 2 4	2 0 2	2 0 2	9 0 12	3 7 11	1 0 2	0 0 2	1 0 2
3/82-5/82	0 0 0	0 0 0	1 0 2	2 0 3	2 0 2	1 2 4	2 0 2	2 0 2	9 0 12	3 7 11	1 0 2	0 0 2	1 0 2
5/82-6/82	0 0 0	0 0 0	2 0 2	2 0 3	2 0 2	2 2 4	2 0 2	2 0 2	10 0 14	3 8 13	1 0 2	0 0 2	1 0 2
6/82-7/82	0 0 0	0 0 0	1 0 1	2 0 5	2 0 2	2 2 4	2 0 2	2 0 2	10 0 14	3 8 13	1 0 2	0 0 2	1 0 2
7/82-10/82	0 0 0	0 0 0	1 0 2	2 0 5	2 0 2	2 3 4	2 0 2	2 0 2	12 0 15	3 10 14	1 0 2	0 0 2	1 0 2
10/82-12/82	0 0 0	0 0 0	1 0 1	3 0 5	2 0 2	2 3 4	2 0 2	2 0 2	12 0 15	3 10 14	1 0 2	0 0 2	1 0 2

(Note: The first figure in each column refers to Region IV, the second to Region V, and the third to Region VI.)

Mud (Companies or Branches)	Oil Field Equipment (Companies or Branches)	Lay Barges & Other Vessels Needed In Pipeline Laying	Total Employment	Total Land (Acres)	Docking Space	Time Period
0 0 1	0 0 1	0 0 0	0 16 209	0 0 20.5	0 300 300	6/76-9/76
0 0 1	0 0 1	0 0 0	4 127 241	0 1.5 20.5	300 300 600	9/76-12/76
0 1 1	0 1 1	0 0 0	121 188 288	10.5 11 21	300 600 900	12/76-3/77
0 1 1	0 1 1	0 0 0	121 188 288	10.5 11 21	300 600 900	3/77-6/77
0 1 1	0 1 1	0 0 0	121 188 288	10.5 11 21	300 600 900	6/77-8/77
0 1 1	0 1 1	0 0 0	125 220 399	10.5 11 22.5	600 600 1200	8/77-9/77
0 1 1	0 1 1	0 0 0	125 220 399	10.5 11 22.5	600 600 1200	9/77-12/77
0 1 1	0 1 1	0 0 0	125 220 399	10.5 11 22.5	600 600 1200	12/77-2/78
0 1 1	0 1 1	0 0 0	125 220 399	10.5 11 22.5	600 600 1200	2/78-3/78
0 1 1	0 1 1	0 0 0	125 220 304	10.5 11 21	300 600 900	3/78-5/78
0 1 1	0 1 1	0 0 0	125 220 304	10.5 11 21	300 600 900	5/78-6/78
0 0 1	0 0 1	0 0 0	125 220 304	10.5 11 21	300 600 900	6/78-8/78
0 1 1	0 1 1	0 0 0	125 220 304	10.5 11 21	300 600 900	8/78-11/78
0 1 1	0 1 1	0 0 0	125 220 304	10.5 11 21	300 600 900	11/78-2/79
0 0 1	0 0 1	0 0 6	30 220 464	9 11 21	300 300 800	2/79-5/79
0 0 1	0 0 1	0 0 6	30 125 464	9 9.5 21	0 300 700	5/79-8/79
0 0 0	0 0 0	0 0 6	30 125 369	9 9.5 19.5	0 0 400	8/79-12/79
0 0 1	0 0 1	0 0 6	30 125 528	10 9.5 77	0 200 1000	12/79-6/80
0 0 1	0 0 1	0 0 0	193 125 372	67.5 9.5 78	0 600 1000	6/80-1/81
0 0 1	0 0 1	0 0 0	193 125 380	67.5 9.5 78	0 600 1000	1/81-2/81
0 1 1	0 1 1	0 0 0	235 125 422	69.5 9.5 82	200 1200 1800	2/81-5/81
1 1 1	1 1 1	0 0 0	284 141 621	80 9.5 139.5	200 1400 2400	5/81-8/81
1 1 1	1 1 1	0 0 0	483 141 641	137.5 9.5 140.5	600 1600 2600	8/81-10/81
1 1 1	1 1 1	0 0 0	483 141 657	137.5 9.5 140.5	600 1600 2600	10/81-1/82
1 1 1	1 1 1	0 0 0	503 157 737	138.5 9.5 151.5	800 1800 3000	1/82-3/82
1 1 1	1 1 1	0 0 0	519 157 737	138.5 9.5 151.5	800 1800 3000	3/82-5/82
1 1 2	1 1 2	0 0 0	541 173 822	139.5 9.5 163	1000 2000 3400	5/82-6/82
1 1 2	1 1 2	0 0 0	541 173 854	139.5 9.5 163	1000 2000 3400	6/82-7/82
1 1 2	1 1 2	0 0 0	549 205 892	141.5 9.5 164	1000 2600 3600	7/82-10/82
1 1 2	1 1 2	0 0 0	565 205 892	141.5 9.5 164	1000 2600 3600	10/82-12/82

Figure 224

Allocation of All Requirements of Scenario III

Figure 225

Sub-Allocation of Study Site Requirements

Study Site Requirement	Region IV		Region V		Region VI	
	Number Required	Probable Location	Number Required	Probable Location	Number Required	Probable Location
1. Exploratory Rigs	1	Port O'Connor	1	Rockport	2	Ingleside
2. Dockside Support for Exploratory Rigs	1	Port O'Connor	1	Rockport	2	Ingleside
3. Development Drilling Co Contractors	2	Port O'Connor	0	-	2	Corpus Christi
4. Production Operations Contractors	3	Port O'Connor	0	-	6	Corpus Christi
5. Onshore Support for Development/ Production Platforms	2	Port O'Connor	0	-	2	Corpus Christi
6. Docks	2	1-Port O'Connor 1-Port Lavaca	3	Rockport	4	1-Ingleside 2-Aransas Pass 1-Corpus Christi
7. Operations Bases	2	1-Bay City 1-Victoria	0	-	2	Corpus Christi
8. Administrative Bases	2	1-Bay City 1-Victoria	0	-	2	Corpus Christi
9. Helicopters	12	9-Port O'Connor 3-Port Lavaca	0	-	15	Corpus Christi
10. Boats	3	2-Port O'Connor 1-Port Lavaca	10	Rockport	14	7-Aransas Pass 4-Corpus Christi 3-Ingleside

Figure 225

Sub-Allocation of Study Site Requirements
(Continued)

Study Site Requirement	Region IV		Region V		Region VI	
	Number Required	Probable Location	Number Required	Probable Location	Number Required	Probable Location
11. Well Logging Companies	1	Port Lavaca	0	-	2	Corpus Christi
12. Diving Companies	0	-	0	-	2	Corpus Christi
13. Cement Companies	1	Port O'Conner	0	-	2	Corpus Christi
14. Mud Companies	1	Port Lavaca	1	Rockport	2	1-Corpus Christi 1-Ingleside
15. Oil Field Equipment Supply Companies	1	Port O'Connor	1	Rockport	2	1-Corpus Christi 1-Ingleside
16. Lay Barges and Other Vessels Needed in Pipeline Laying	0	-	0	-	6	4-Corpus Christi 2-Ingleside

5. LAND REQUIREMENTS

Indirect Land Requirements

Part B contains an extensive discussion of the process by which indirect land requirements in each affected study site of each Scenario were derived. It will be recalled from Part B that the following procedures were used:

1. $\frac{UA}{LF} = X$; where UA = current urban acreage, LF = current total labor force, and X = urban acres per person in the labor force.

2. $X \times PPE = PUA$; where PPE = projected employment in primary sectors, and PUA = projected urban acreage.

3. $PUA - PPSA = IA$; where PPSA = projected primary sector acreage, and IA = indirect acreage.

It will also be recalled that urban acreage in each affected study site was calculated by totaling acreage for the following uses:

1. Residential-urban, commercial, and residential development including streets, roads, and educational sites in such areas;

2. Industrial areas, railyards, and docks including streets, roads, and educational sites in such areas;

3. Undeveloped tracts, greenbelts, cemeteries, and undifferentiated urban land including streets and roads in such areas;

4. Parks and recreational facilities;

5. Sewage disposal sites;

6. Solid-waste disposal sites, sanitary sites, and open sites;

7. Airfields; and

8. Artificial reservoirs.

The affected study sites of Scenario III, as we have seen, are Region IV (Matagorda, Jackson, Victoria, and Calhoun Counties), Region V (Aransas and Refugio Counties), and Region VI (San Patricio and Nueces Counties).

For each region, current acreage for items 1,2,3,4, and 8 was extracted from the Environmental Geologic Atlas of the Texas Coastal Zone, published by the Bureau of Economic Geology (BEG) at the University of Texas in 1973.

Current acreage for item 5 was derived by multiplying the average amount of land use for each sewage treatment site by the number of such sites in each county. The Texas Department of Health Resources (TDHR) has estimated that acreage for sewage disposal sites averages 15; there are 68 sewage disposal sites in Region IV, 11 in Region V, and 84 in Region VI.

Current acreage for item 6 was derived by totaling the acreage for each solid waste disposal site in each of the three regions. The TDHR records reveal 15 such sites in Region IV, 12 in Region V, and 14 in Region VI. Where the exact acreage for any given solid waste site was unavailable, the average size of such facilities in the Texas Coastal Region (40.39 acres) was used.

Airfield acreage in each county was obtained from the Texas Transportation Institute (TTI). Since airfield acreage was in some cases estimated by the TTI, total acreage is, accordingly, also estimated.

Current acreage for each of the eight categories in each of the three affected study sites of Scenario III is displayed in Figure 226.

Figure 226

Current Land Use (Acres) in Scenario III Affected Study Sites

	Use	Region IV	Region VI	Region VII
1.	Residential-Urban, Commercial, Residential Development	14,342	8,640	27,264
2.	Industrial, Railyards, Docks	2,304	640	6,080
3.	Undeveloped, Greenbelts, Cemeteries, Undifferentiated Land	3,072	64	2,816
4.	Parks and Recreation	960	640	7,232
5.	Sewage Disposal	1,020	165	1,260
6.	Solid Waste	410	207	547
7.	Airfields	4,343	662	2,758
8.	Artificial Reservoirs	8,864	0	4,544
TOTAL		35,315	11,018	52,501

Figure 227 reveals total land use for the eight categories and total labor force in each region. Total labor force figures were derived from 1974 Texas Employment Commission statistics.

Figure 227

	Region IV	Region V	Region VI
Urban Acreage	35,315	17,290	52,501
Labor Force	48,155	8,460	113,310

Both projected employment in primary sectors by time/by study site and projected primary study site acreage by time/by study site can be found in Figure 224. When these figures are employed in the formula described above, indirect acreage by study site/by time results.

Examples:

6/78 to 8/78 in Region IV

(1) $\frac{35,315}{48,155} = .733$ (2) $.733 \times 125 = 91.63$ (3) $91.63 - 10.5 = 81.13$

Indirect Acreage = 81 acres

8/79 to 12/79 in Region V

(1) $\frac{11,018}{8,460} = 1.3$ (2) $1.3 \times 125 = 162.5$ (3) $162.5 - 9.5 = 153$

Indirect Acreage = 153 acres

3/82 to 5/82 in Region VI

(1) $\frac{52,501}{113,310} = .463$ (2) $.463 \times 737 = 341.23$ (3) $341.23 - 151.5 = 189.73$

Indirect Acreage = 190 acres

Figure 228 illustrates the indirect land requirements in each of the affected study sites by time, based on the time periods, primary sectors' employment projections, and projected primary sector acreage requirements contained in Figure 224.

The reader is encouraged to read the explanatory notes concerning this process of calculating indirect land requirements in Part B.

Figure 228

Indirect Land Requirements

Time Period	Region IV	Region V	Region VI
6/76-9/76	0	21	76
9/76-12/76	3	164	91
12/76-3/77	78	233	112
3/77-6/77	78	233	112
6/77-8/77	78	233	112
8/77-9/77	81	275	162
9/77-12/77	81	275	162
12/77-2/78	81	275	162
2/78-3/78	81	275	162
3/78-5/78	81	275	120
5/78-6/78	81	275	120
6/78-8/78	81	275	120
8/78-11/78	81	275	120
11/78-2/79	81	275	120
2/79-5/79	13	275	157
5/79-8/79	13	153	194
8/79-12/79	13	153	151
12/79-6/80	12	153	167
6/80-1/81	74	153	94
1/81-2/81	74	153	102
2/81-5/81	103	153	113
5/81-8/81	128	174	148
8/81-10/81	217	174	156
10/81-1/82	217	174	164
1/82-3/82	230	195	190
3/82-5/82	242	195	190
5/82-6/82	257	215	218
6/82-7/82	257	215	232
7/82-10/82	261	257	249
10/82-12/82	273	257	249

Finally, it is safe to assume that the indirect land required in Region IV will be in or near Port O'Connor, Port Lavaca, Bay City, or Victoria; in Region V, in or near Rockport; and in Region VI, in or near Corpus Christi, Aransas Pass, or Ingleside.

Primary and Indirect Land Requirements

As Part B noted, total primary and indirect land requirements were computed by summing those two quantities. Figure 229 displays primary land requirements (extracted from Figure 224).

Indirect land requirements were displayed in Figure 228. When the numbers in Figure 228 are added to the corresponding numbers of Figure 229, Primary and Indirect Land Requirements (Figure 230) is the result.

The uses to which the primary land requirements will be put in each affected study site and in each time period is indicated in Figure 224. The uses to which indirect land requirements will be put include, as was explained above, land for residences of employees of primary sectors, recreation areas, educational institutions, indirect commercial and industrial establishments; in short, all significant indirect land requirements are assumed to be included.

The primary land requirements within each affected study site were sub-allocated in Figure 225. Similarly, the indirect land requirements within each affected study site were sub-allocated. Therefore, it is reasonable to assume, as the sub-allocations of both primary and indirect land requirements assumed, that the Region IV land requirements will be met in or near Port O'Connor, Port Lavaca, Bay City or Victoria; that the Region V land requirements will be met in or near Rockport; and that the Region VI land requirements will be met in or near Corpus Christi, Aransas Pass or Ingleside.

Figure 229

Primary Land Requirements/Scenario III

Time Period	Primary Land Requirements (Acres) Region IV	Region V	Region VI
6/76- 9/76	0	0	20.5
9/76-12/76	0	1.5	20.5
12/76- 3/77	10.5	11	21
3/77- 6/77	10.5	11	21
6/77- 8/77	10.5	11	21
8/77- 9/77	10.5	11	22.5
9/77-12/77	10.5	11	22.5
12/77- 2/78	10.5	11	22.5
2/78- 3/78	10.5	11	22.5
3/78- 5/78	10.5	11	21
5/78- 6/78	10.5	11	21
6/78- 8/78	10.5	11	21
8/78-11/78	10.5	11	21
11/78- 2/79	10.5	11	21
2/79- 5/79	9	11	21
5/79- 8/79	9	9.5	21
8/79-12/79	9	9.5	19.5
12/79- 6/80	10	9.5	77
6/80- 1/81	67.5	9.5	78
1-81- 2/81	67.5	9.5	78
2/81- 5/81	69.5	9.5	82
5/81- 8/81	80	9.5	139.5
8/81-10/81	137.5	9.5	140.5
10/81- 1/82	137.5	9.5	140.5
1/82- 3/82	138.5	9.5	151.5
3/82- 5/82	138.5	9.5	151.5
5/82- 6/82	139.5	9.5	163
6/82- 7/82	139.5	9.5	163
7/82-10/82	141.5	9.5	164
10/82-12/82	141.5	9.5	164

Figure 230

Primary and Indirect Land Requirements (Acres) Scenario III

Time Period	Primary and Indirect Land Requirements		
	Region IV	Region V	Region VI
6/76- 9/76	0	21	96.5
9/76-12/76	3	165.5	111.5
12/76- 3/77	88.5	244	133
3/77- 6/77	88.5	244	133
6/77- 8/77	88.5	244	133
8/77- 9/77	91.5	286	184.5
9/77-12/77	91.5	286	184.5
12/77- 2/78	91.5	286	184.5
2/78- 3/78	91.5	286	184.5
3/78- 5/78	91.5	286	141
5/78- 6/78	91.5	286	141
6/78- 8/78	91.5	286	141
8/78-11/78	91.5	286	141
11/78- 2/79	91.5	286	141
2/79- 5/79	22	286	178
5/79- 8/79	22	162.5	215
8/79-12/79	22	162.5	170.5
12/79- 6/80	22	162.5	244
6/80- 1/81	141.5	162.5	172
1/81- 2/81	141.5	162.5	180
2/81- 5/81	172.5	162.5	195
5/81- 8/81	208	183.5	287.5
8/81-10/81	354.5	183.5	296.5
10/81- 1/82	354.5	183.5	304.5
1/82- 3/82	368.5	204.5	341.5
3/82- 5/82	380.5	204.5	341.5
5/82- 6/82	396.5	224.5	381
6/82- 7/82	396.5	224.5	395
7/82-10/82	402.5	266.5	413
10/82-12/82	414.5	266.5	413

6. WATER REQUIREMENTS

Primary Water Requirements

Primary water requirements were calculated following the procedure outlined in Part B. For Scenario III, primary water requirements are revealed below, in Figure 231.

Thus a total of 26,100,000 gallons of water will be required between the commencement of exploratory drilling and the completion of development drilling.

The water utilized by offshore drilling contractors will undoubtedly be furnished in those study sites in which onshore support units for such contractors are located. The "Distribution of Requirements to Study Sites" (Figure 224) reveals the following distribution of onshore support units for the exploratory drilling contractors and the four development drilling contractors postulated to be required in Scenario III:

Figure 233, based on the distribution of Figure 232, displays total number of offshore rigs - either exploratory or development - utilizing onshore support from each of the affected study sites. Figure 233 also distributes the primary water requirements by time (Figure 231) to each of the affected study sites based on the total number of offshore rigs utilizing onshore support from each study site.

A comparison of Figure 232 with Figure 233 will reveal that the total number of offshore rigs fluctuates while the number of development drilling contractors remains fairly contant through time. This is so because, it may be recalled, it was assumed that the drilling contracting business engendered in Scenario III would stay in place even if the activity which originally engendered their development was to temporarily decline. Thus, while it is assumed that an increase in the offshore drilling sector, once established, will remain in place through time, it is also assumed that the amount of drilling each contractor will do (and thus the water each will require) will fluctuate.

Indirect Water Requirements

Indirect water requirements generated by the exploration, development, and production phases of Scenario III were calculated by using the indirect water requirement coefficients of the OCSOG Model (see Appendix E). The term "indirect" here refers to the requirements which, in

Figure 231

Primary Water Requirements for Scenario III

Time Period	Days (assuming 20 drilling days per mo.)	Rig (either mobile exploratory or development platforms, 1 rig per platform in operation at any time)	Gallons of Water
6/76-9/76	60	1	450,000
9/76-12/76	60	2	900,000
12/76-3/77	60	3	1,350,000
3/77-6/77	60	3	1,350,000
6/77-8/77	40	3	900,000
8/77-9/77	20	4	600,000
9/77-12/77	60	4	1,800,000
12/77-2/78	40	3	900,000
2/78-3/78	20	4	600,000
3/78-5/78	40	3	900,000
5/78-6/78	20	3	450,000
6/78-8/78	40	2	600,000
8/78-11/78	60	3	1,350,000
11/78-2/79	60	3	1,350,000
2/79-5/79	60	2	900,000
5/79-8/79	60	1	450,000
8/79-12/79	80	0	0
12/79-6/80	120	1	900,000
6/80-1/81	140	2	2,100,000
1/81-2/81	20	1	150,000
2/81-5/81	60	2	900,000
5/81-8/81	60	3	1,350,000
8/81-10/81	40	4	1,200,000
10/81-1/82	60	3	1,350,000
1/82-3/82	40	3	900,000
3/82-5/82	40	2	600,000
5/82-6/82	20	3	450,000
6/82-7/82	20	1	150,000
7/82-10/82	60	2	900,000
10/82-12/82	40	1	300,000
TOTAL			26,100,000

Figure 232

Onshore Support Units for Scenario III

Time Period	Dockside Support for Exploratory Rigs			Development Drilling Contractors		
	Region IV	Region V	Region VI	Region IV	Region V	Region VI
6/76-9/76	0	0	1	0	0	0
9/76-12/76	0	1	1	0	0	0
12/76-3/77	1	1	1	0	0	0
3/77-6/77	1	1	1	0	0	0
6/77-8/77	1	1	1	0	0	0
8/77-9/77	1	1	2	0	0	0
19/77-12/77	1	1	2	0	0	0
12/77-2/78	1	1	1	0	0	0
2/78-3/78	1	1	2	0	0	0
3/78-5/78	1	1	1	0	0	0
5/78-6/78	1	1	1	0	0	0
6/78-8/78	0	1	1	0	0	0
8/78-11/78	1	1	1	0	0	0
11/78-2/79	1	1	1	0	0	0
2/79-5/79	0	1	1	0	0	0
5/79-8/79	0	0	1	0	0	0
8/79-12/79	0	0	0	0	0	0
12/79-6/80	0	0	0	0	0	1
6/80-1/81	0	0	0	1	0	1
1/81-2/81	0	0	0	0	0	1
2/81-5/81	0	0	0	1	0	1
5/81-8/81	0	0	0	1	0	2
8/81-10/81	0	0	0	2	0	2
10/81-1/82	0	0	0	1	0	2
1/82-3/82	0	0	0	2	0	2
3/82-5/82	0	0	0	1	0	2
5/82-6/82	0	0	0	2	0	2
6/82-7/82	0	0	0	1	0	1
7/82-10/82	0	0	0	1	0	2
10/82-12/82	0	0	0	1	0	1

Figure 233

Distribution of Primary Water Requirements

Time Period	Total Offshore Rigs Region IV	Region V	Region VI	Primary Water Requirements in 1000's of Gallons (Acre Feet) Region IV	Region V	Region VI
6/76-9/76	0	0	1	0	0	450(1.38)
9/76-12/76	0	1	1	0	450(1.38)	450(1.38)
12/76-3/77	1	1	1	450(1.38)	450(1.38)	450(1.38)
3/77-6/77	1	1	1	450(1.38)	450(1.38)	450(1.38)
6/77-8/77	1	1	1	300(.92)	300(.92)	300(.92)
8/77-9/77	1	1	2	150(.46)	150(.46)	300(.92)
9/77-12/77	1	1	2	450(1.38)	450(1.38)	900(2.76)
12/77-2/78	1	1	1	300(.92)	300(.92)	300(.92)
2/78-3/78	1	1	2	150(.46)	150(.46)	300(.92)
3/78-5/78	1	1	1	300(.92)	300(.92)	300(.92)
5/78-6/78	1	1	1	150(.46)	150(.46)	150(.46)
6/78-8/78	0	1	1	0	300(.92)	300(.92)
8/78-11/78	1	1	1	450(1.38)	450(1.38)	450(1.38)
11/78-2/79	1	1	1	450(1.38)	450(1.38)	450(1.38)
2/79-5/79	0	1	1	0	450(1.38)	450(1.38)
5/79-8/79	0	0	1	0	0	450(1.38)
8/79-12/79	0	0	0	0	0	0
12/79-6/80	0	0	1	0	0	900(2.76)
6/80-1/81	1	0	1	1,050(3.22)	0	1,050(3.22)
1/81-2/81	0	0	1	0	0	150(.46)
2/81-5/81	1	0	1	450(1.38)	0	450(1.38)
5/81-8/81	1	0	2	450(1.38)	0	900(2.76)
8/81-10/81	2	0	2	600(1.84)	0	600(1.84)
10/81-1/82	1	0	2	450(1.38)	0	900(2.76)
1/82-3/82	1	0	2	300(.92)	0	600(1.84)
3/82-5/82	1	0	1	300(.92)	0	300(.92)
5/82-6/82	1	0	2	150(.46)	0	300(.92)
6/82-7/82	0	0	1	0	0	150(.46)
7/82-10/82	1	0	1	450(1.38)	0	450(1.38)
10/82-12/82	0	0	1	0	0	300(.92)
TOTAL				7,800(23.9)	4,800(14.7)	13,500(41.4)

Input/Output terminology, are referred to as "indirect and induced." The one word, "indirect", is used here and throughout the study (unless otherwise noted) for convenience. The indirect water requirement coefficients of the OCSOG Model are displayed in Figure 234. Because Region V has had such little experience with OCS-related activities, coefficients are not established for that region. Therefore, coefficients established in other areas of the Texas Coast are used for Region V in this and in succeeding calculations of indirect requirements.

Figure 234

Indirect Water Requirement Coefficients of the OCSOG Model

Primary Activity	Coefficients (Acre Feet/Per Employee/Per Year) Region IV	Region V	Region VI
Drilling Contractors	.16	.16	.121

(Note: The only primary activity considered here is "Drilling Contractors" for the same reason that it was the only primary activity considered in the calculation of primary water requirements (see Part B).

The coefficients in Figure 234 are used to calculate the indirect water requirements for each affected study site and for each significant Scenario III time period (see Figure 235).

Primary and Indirect Water Requirements

The aggregation of Primary and Indirect Water Requirements of Scenario III were obtained by adding the numbers in Figure 233 to the corresponding numbers in Figure 235. The result in Figure 236, Aggregation of Primary and Indirect Water Requirements/Scenario III.

Figure 235

Indirect Water Requirements/Scenario III

Indirect Water Requirements in 1000's of Gallons (Acre Feet)

Time Period	Region IV		Region V		Region VI	
6/76-9/76	0		0		593.05	(1.82)
9/76-12/76	0		782.04	(2.40)	593.05	(1.82)
12/76-3/77	782.04	(2.40)	782.04	(2.40)	593.05	(1.82)
3/77-6/77	782.04	(2.40)	782.04	(2.40)	593.05	(1.82)
6/77-8/77	521.36	(1.60)	521.36	(1.60)	394.28	(1.21)
8/77-9/77	260.68	(.80)	260.68	(.80)	394.28	(1.21)
9/77-1277	782.04	(2.40)	782.04	(2.40)	1,182.84	(3.63)
12/77-2/78	521.36	(1.60)	521.36	(1.60)	788.56	(2.42)
2/78-3/78	260.68	(.80)	260.68	(.80)	394.28	(1.21)
3/78-5/78	521.36	(1.60)	521.36	(1.60)	394.28	(1.21)
5/78-6/78	260.68	(.80)	260.68	(.80)	198.77	(.61)
6/78-8/78	521.36	(1.60)	521.36	(1.60)	394.28	(1.21)
8/78-11/78	782.04	(2.40)	782.04	(2.40)	593.05	(1.82)
11/78-2/79	782.04	(2.40)	782.04	(2.40)	593.05	(1.82)
2/79-5/79	0		782.04	(2.40)	593.05	(1.82)
5/79-8/79	0		0		593.05	(1.82)
8/79-12/79	0		0		0	0
12/79-6/80	0		0		1,104.63	(3.39)
6/80-1/81	1,704.20	(5.23)	0		1,287.11	(3.95)
1/81-2/81	244.39	(.75)	0		237.87	(.73)
2/81-5/81	938.45	(2.88)	0		710.36	(2.18)
5/81-8/81	938.45	(2.88)	0		1,261.04	(3.87)
8/81-10/81	1,111.15	(3.41)	0		840.70	(2.58)
10/81-1/82	1,668.36	(5.12)	0		1,420.71	(4.36)
1/82-3/82	1,111.15	(3.41)	0		1,052.50	(3.23)
3/82-5/82	1,251.27	(3.84)	0		1,052.50	(3.23)
5/82-6/82	625.63	(1.92)	0		524.62	(1.61)
6/82-7/82	625.63	(1.92)	0		632.15	(1.94)
7/82-10/82	1,876.90	(5.76)	0		1,893.19	(5.81)
10/82-12/82	1,391.38	(4.27)	0		1,261.04	(3.87)
Total	20,264.64	(62.19)	8,341.76	(25.60)	22,164.39	(68.02)
Grand Total			50,770.79	(155.81)		

Figure 236

Aggregation of Primary and Indirect Water Requirements/Scenario III

Timer Period	Primary and Indirect Water Requirements in 1000's of Gallons (Acre Feet) Region IV	Region V	Region VI
6/76-9/76	0	0	1,043.05(3.20)
9/76-12/76	0	1,232.04(3.78)	1,043.05(3.20)
12/76-3/77	1,232.04(3.78)	1,232.04(3.78)	1,043.05(3.20)
3/77-6/77	1,232.04(3.78)	1,232.04(3.78)	1,043.05(3.20)
6/77-8/77	821.36(2.52)	821.36(2.52)	694.28(2.13)
8/77-9/77	410.68(1.26)	410.68(1.26)	694.28(2.13)
9/77-12/77	1,232.04(3.78)	1,232.04(3.78)	2,082.84(6.39)
12/77-2/78	821.36(2.52)	821.36(2.52)	1,088.56(3.34)
2/78-3/78	410.68(1.26)	410.68(1.26)	694.28(2.13)
3/78-5/78	821.36(2.52)	821.36(2.52)	694.28(2.13)
5/78-6/78	410.68(1.26)	410.68(1.26)	348.77(1.07)
6/78-8/78	521.36 1.60)	821.36(2.52)	694.28(2.13)
8/78-11/78	1,232.04(3.78)	1,232.04(3.78)	1,043.05(3.20)
11/78-2/79	1,232.04(3.78)	1,232.04(3.78)	1,043.05(3.20)
2/79-5/79	0	1,232.04(3.78)	1,043.05(3.20)
5/79-8/79	0	0	1,043.05(3.20)
8/79-12/79	0	0	0
12/79-6/80	0	0	2,004.63(6.15)
6/80-1/81	2,754.20(8.45)	0	2,337.11(7.17)
1/81-2/81	244.39(.75)	0	387.87(1.19)
2/81-5/81	1,388.45(4.26)	0	1,160.36(3.56)
5/81-8/81	1,388.45(4.26)	0	2,161.04(6.63)
8/81-10/81	1,711.15)5.25)	0	1,440.70(4.42)
10/81-1/82	2,118.36(6.50)	0	2,320.71(7.12)
1/82-3/82	1,411.15(4.33)	0	1,652.50(5.04)
3/82-5/82	1,551.27(4.76)	0	1,352.50(4.15)
5/82-6/82	775.63(2.38)	0	824.62(2.53)
6/82-7/82	625.63(1.92)	0	782.15(2.40)
7/82-10/82	2,326.90(7.14)	0	2,343.19(7.19)
10/82-12/82	1,391.38(4.27)	0	1,561.04(4.79)
TOTAL	28,064.64(86.1)	13,141.76(40.3)	35,664.39(109.4)
GRAND TOTAL		76,870.79(235.9)	

7. EMPLOYMENT

Indirect Employment

Indirect employment generated by the exploration, development, and production phases of Scenario III were calculated by using the indirect employment coefficients of the OCSOG Model (see Appendix E). Those coefficients are shown in Figure 237.

Figure 237

Indirect Employment Coefficients of OCSOG Model

	Coefficients (Indirect Employees/Primary Employee/Year)		
Primary Activity	Region IV	Region V	Region VI
Drilling Contractors	.679	1.215	1.196
Helicopter Service	.570	NA	.949
Boat Service	.131	.508	.422
Well Logging	.587	NA	.426
Diving	NA	NA	.881
Cement	.553	NA	1.06
Mud	.701	.985	1.322
Oil Field Equipment Supply	.445	.933	.884
Pipeline Laying	NA	NA	3.15

(Note: NA = Note Applicable in Scenario III.)

The indirect employment coefficients displayed in Figure 237 were used to calculate indirect employment over time in each affected study site of Scenario III (see Figure 238). There is no "Total" row in Figure 238 because; unlike tax payments, water requirements, and personal income; indirect employment can not be cumulated from one time period to the next. For example, the 213 indirect employees shown to be required in Region VI during the 8/79-12/79 time period, must not be seen as additions to the 179 required in the previous time period. Instead, 213 must be seen as representing the total indirect employment requirement in that time period in that region.

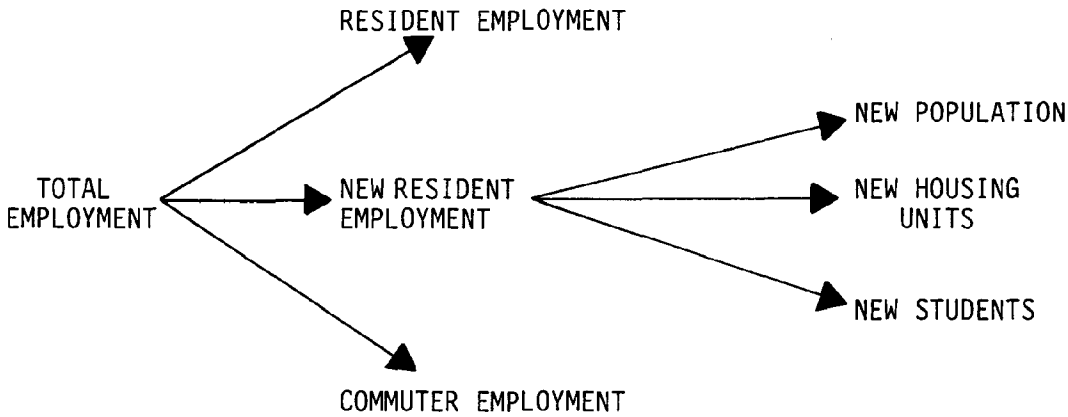
Figure 238

Indirect Employment/Scenario III

Time Period	Region IV	Region V	Region VI	Total
6/76-9/76	0	2	39	41
9/76-12/76	1	22	44	67
12/76-3/77	12	34	51	97
3/77-6/77	15	35	50	100
6/77-8/77	9	23	34	66
8/77-9/77	3	12	22	37
9/77-12/77	13	38	70	121
12/77-2/78	10	26	47	83
2/78-3/78	6	14	24	44
3/78-5/78	10	26	34	70
5/78-6/78	3	12	16	31
6/78-8/78	10	26	36	72
8/78-11/78	15	39	53	107
11/78-2/79	13	38	52	103
2/79-5/79	5	39	178	222
5/79-8/79	3.	20	179	202
8/79-12/79	5	28	213	246
12/79-6/80	8	41	354	403
6/80-1/81	33	49	121	203
1/81-2/81	6	8	20	34
2/81-5/81	19	21	61	101
5/81-8/81	22	22	82	126
8/81-10/81	23	15	57	95
10/81-1/82	38	23	90	151
1/82-3/82	25	16	68	109
3/82-5/82	26	17	70	113
5/82-6/82	11	8	39	58
6/82-7/82	15	10	44	69
7/82-10/82	40	30	131	201
10/82-12/82	31	21	88	150

Total Employment

The new population associated with OCS oil and gas development in any affected site is primarily a function of the new employment; the same can be said of the number of new housing units and of the number of new students. The first step in calculating new population, housing units, and students, then is to calculate new employment, and the first step in that process is the determination of total manpower requirements over time in each affected study site of Scenario III; thus, the process can be seen graphically as follows:



Total employment requirements are calculated simply by totaling the primary employment requirements over time in each affected study site (Figure 224) and indirect employment requirements over time in each affected study site (Figure 238).

The result is Figure 239, Aggregation of Primary and Indirect Employment. There is no "Total" row in Figure 239 because the employment figures cannot be cumulated from one time period to the next. The employment figure for any time period in any region must not be seen as an addition to the previous, corresponding figure. Rather, it should be seen as the total employment requirement in that time period in that region.

Origin-of-Employment

Having calculated total employment requirements, it remains to determine what percentage of those requirements will be resident employment, what percentage new resident, and what percentage commuter employment.

Figure 239

Aggregation of Primary and Indirect Employment/Scenario III

Time Period	Region IV	Region V	Region VII	Total
6/76-9/76	0	18	248	266
9/76-12/76	5	149	285	439
12/76-3/77	133	222	339	694
3/77-6/77	136	223	338	697
6/77-8/77	130	211	322	663
8/77-9/77	128	232	421	781
9/77-12/77	138	258	469	865
12/77-2/78	135	246	446	827
2/78-3/78	131	234	423	788
3/78-5/78	135	246	338	718
5/78-6/78	128	232	320	680
6/78-8/78	135	246	340	721
8/78-11/78	140	259	357	756
11/78-2/79	138	258	356	752
2/79-5/79	35	259	642	936
5/79-8/79	33	145	643	821
8/79-12/79	35	153	582	770
12/79-6/80	38	166	882	1,086
6/80-1/81	226	174	493	893
1/81-2/81	199	133	408	740
2/81-5/81	254	146	483	883
5/81-8/81	306	163	703	1,172
8/81-10/81	506	156	698	1,360
10/81-1/82	521	164	747	1,432
1/82-3/82	528	173	805	1,506
3/82-5/82	545	174	807	1,526
5/82-6/82	552	181	861	1,594
6/82-7/82	556	183	898	1,637
7/82-10/82	589	235	1,023	1,847
10/82-12/82	596	226	980	1,802

Part B contains a detailed description of what is meant by "resident employment," by "new resident employment," and by "commuter employment." That Part also explains how origin-of-employment percentages are derived. The reader is encouraged to review Part B before proceeding.

The origin-of-employment percentages relevant to Scenario III are found in Figure 240.

When the origin-of-employment percentages of Figure 240 are applied to the employment requirements for each activity in each affected region and in each relevant Scenario III time period, the number of resident, new resident, and commuter employees (Figure 241) is the result.

New Population

From new resident employment projections, new population was derived using the method described in Part B. New population associated with the activities of Scenario III are displayed in Figure 242 (New Resident population x 2.7).

New Housing Units

The number of new housing units was derived from the new population using the method described in Part B. New housing units associated with the activities of Scenario III are displayed in Figure 243 (New population x .34).

New Students

Like housing units, the number of new students was derived from the new population using the method described in Part B. New students associated with the activities of Scenario III are shown in Figure 244. (New population x .252).

Figure 240

Origin-of-Employment Percentages/Scenario III

	Region IV			Region V			Region VI		
	Resi-dent	New Resi-dent	Com-muter	Resi-dent	New Resi-dent	Com-muter	Resi-dent	New Resi-dent	Com-muter
Exploratory Rigs	20%	40%	40%	25%	40%	35%	30%	50%	20%
Dockside Support for Exploratory Rigs	20%	40%	40%	25%	40%	35%	30%	50%	20%
Development Drilling	30%	40%	30%	NA	NA	NA	40%	40%	20%
Production Operation	35%	65%	0	NA	NA	NA	50%	50%	0
Onshore Support for Platforms	30%	50%	20%	NA	NA	NA	40%	50%	10%
Operations Bases	35%	65%	0	NA	NA	NA	50%	50%	0
Administrative Bases	35%	65%	0	NA	NA	NA	45%	55%	0
Helicopters	25%	75%	0	NA	NA	NA	30%	70%	0
Boats	30%	70%	0	30%	70%	0	30%	70%	0
Well Logging	40%	60%	0	NA	NA	NA	50%	50%	0
Diving	NA	NA	NA	NA	NA	NA	40%	60%	0
Cement	30%	70%	0	NA	NA	NA	40%	60%	0
Mud	50%	50%	0	30%	70%	0	50%	50%	0
Oilfield Equip-ment Supply	50%	50%	0	40%	60%	0	50%	50%	0
Pipeline Laying	NA	NA	NA	NA	NA	NA	30%	50%	20%
Indirect Employment	50%	50%	0	50%	50%	0	50%	50%	0

(Note: NA = Not applicable in Scenario III)

Figure 241

Resident, New Resident, and Commuter Employment Scenario III

Time Period	Region IV			Region V			Region VI		
	Resi-dent	New Resi-dent	Com-muter	Resi-dent	New Resi-dent	Com-muter	Resi-dent	New Resi-dent	Com-muter
6/76-9/76	0	0	0	6	12	0	95	134	19
9/76-12/76	1	4	0	45	71	33	108	158	19
12/76-3/77	34	61	38	72	117	33	126	194	19
3/77-7/77	35	63	38	72	118	33	125	194	19
7/77-8/77	29	63	38	60	118	33	109	194	19
8/77-9/77	27	63	38	71	128	33	145	238	38
9/77-12/77	35	65	38	84	141	33	169	262	38
12/77-2/78	32	65	38	72	141	33	146	262	38
2/78-3/78	28	65	38	60	141	33	123	262	38
3/78-5/78	32	65	38	72	141	33	57	262	19
5/78-6/78	30	65	33	58	141	33	39	262	19
6/78-8/78	32	65	38	72	141	33	59	262	19
8/78-11/78	36	66	38	84	142	33	76	262	19
11/78-2/79	34	66	38	83	142	33	75	262	19
2/79-5/79	0	66*	0	84	142	33	243	348	51
5/79-8/79	0	66*	0	3	142	0	243	349	51
8/79-12/79	0	66*	0	11	142	0	201	349	32
12/79-6/80	0	66*	0	24	142	0	371	465	46
6/80-1/81	79	126	21	32	142	0	14	465	14
1/81-2/81	52	126	21	0	142*	0	0	465*	0
2/81-5/81	86	144	24	4	142	0	2	465	16
5/81-8/81	111	171	24	21	142	0	209	465	29
8/81-10/81	175	286	45	14	142	0	204	465	29
10/81-1/82	183	293	45	22	142	0	253	465	29
1/82-3/82	181	302	45	31	142	0	309	465	31
3/82-5/82	187	313	45	32	142	0	311	465	31
5/82-6/82	186	318	48	39	142	0	349	481	31
6/82-7/82	188	320	48	41	142	0	368	499	31
7/82-10/82	203	338	48	80	155	0	424	566	33
10/82-12/82	204	344	48	71	155	0	381	566	33

*While this number is larger than the total number of employees required in this region, in this time period (see Figure 1); it is assumed that the new residents will not move away.

Figure 242

New Population/Scenario III

Time Period	Region IV	Region V	Region VI
6/76-9/76	0	32	362
9/76-12/76	11	192	427
12/76-3/77	165	316	524
3/77-6/77	170	319	524
6/77-8/77	170	319	524
8/77-9/77	170	346	643
9/77-12/77	176	381	707
12/77-2/78	176	381	707
2/78-3/78	176	381	707
3/78-5/78	176	381	707
5/78-6/78	176	381	707
6/78-8/78	176	381	707
8/78-11/78	178	383	707
11/78-2/79	178	383	707
2/79-5/79	178	383	940
5/79-8/79	178	383	942
8/79-12/79	178	383	942
12/79-6/80	178	383	1,256
6/80-1/81	340	383	1,256
1/81-2/81	340	383	1,256
2/81-5/81	389	383	1,256
5/81-8/81	462	383	1,256
8/81-10/81	772	383	1,256
10/81-1/82	791	383	1,256
1/82-3/82	815	383	1,256
3/82-5/82	845	383	1,256
5/82-6/82	859	383	1,299
6/82-7/82	864	383	1,347
7/82-10/82	913	419	1,528
10/82-12/82	929	419	1,528

Figure 243

New Housing Units/Scenario III

Time Period	Region IV	Region V	Region VI
6/76- 9/76	0	11	123
9/76-12/76	4	65	145
12/76- 3/77	56	107	178
3/77- 6/77	59	108	178
6/77- 8/77	59	108	178
8/77- 9/77	59	118	219
9/77-12/77	60	130	240
12/77- 2/78	60	130	240
2/78- 3/78	60	130	240
3/78- 5/78	60	130	240
5/78- 6/78	60	130	240
6/78- 8/78	60	130	240
8/78-11/78	61	130	240
11/78- 2/79	61	130	240
2/79- 5/79	61	130	320
5/79- 8/79	61	130	320
8/79-12/79	61	130	320
12/79- 6/80	61	130	427
6/80- 1/81	116	130	427
1/81- 2/81	116	130	427
2/81- 5/81	132	130	427
5/81- 8/81	157	130	427
8/81-10/81	262	130	427
10/81- 1/82	269	130	427
1/82- 3/82	277	130	427
3/82- 5/82	287	130	427
5/82- 6/82	292	130	442
6/82- 7/82	294	130	458
7/82-10/82	310	142	520
10/82-12/82	316	142	520

Figure 244

New Students/Scenario III

Time Period	Region IV	Region V	Region VI
6/76- 9/76	0	8	91
9/76-12/76	3	48	108
12/76- 3/77	42	80	132
3/77- 6/77	43	80	132
6/77- 8/77	43	80	132
8/77- 9/77	43	87	162
9/77-12/77	44	96	178
12/77- 2/78	44	96	178
2/78- 3/78	44	96	178
3/78- 5/78	44	96	178
5/78- 6/78	44	96	178
6/78- 8/78	44	96	178
8/78-11/78	45	97	178
11/78- 2/79	45	97	178
2/79- 5/79	45	97	237
5/79- 8/79	45	97	237
8/79-12/79	45	97	237
12/79- 6/80	45	97	317
6/80- 1/81	86	97	317
1/81- 2/81	86	97	317
2/81- 5/81	98	97	317
5/81- 8/81	116	97	317
8/81-10/81	195	97	317
10/81- 1/82	199	97	317
1/82- 3/82	205	97	317
3/82- 5/82	213	97	317
5/82- 6/82	216	97	327
6/82- 7/82	218	97	339
7/82-10/82	230	106	385
10/82-12/82	234	106	385

8. PRIMARY EXPENDITURES

Like tax payments, the expenditures made in each of the affected study sites for primary exploration, development, and production activities are calculated by using expenditure coefficients of the OCSOG Model (see Appendix E). Those coefficients are arrayed in Figure 245. Once again, coefficients established in other Texas coastal areas were used for Region V.

Figure 245

Expenditure Coefficients of OCSOG Model

Primary Activity	Region IV	Region V	Region VI
Drilling Contractors	.0386	.0386	.0386
Helicopter Service	.0417	NA	.0417
Boat Service	.0211	.0211	.0211
Well Logging	.0328	NA	.0144
Diving	NA	NA	.0352
Cement	.0357	NA	.0320
Mud	.0403	.0400	.0403
Oil Field Equipment Supply	.0345	.0345	.0345
Pipeline Laying	NA	NA	.128

(Note: NA = Not Applicable in Scenario III)

When the coefficients in Figure 245 are used, expenditures are derived.

Figure 246 displays the expenditures in primary exploration, development, and production activities in Region IV (Matagorda, Jackson, Victoria, and Calhoun Counties) based on Scenario III employment in those activities. Expenditures are broken down by relevant activity - that is, those Scenario III activities postulated to take place in Region IV - and are presented by the significant Scenario III time periods.

Figure 247 provides the same kind of expenditure information for Region V (Aransas and Refugio Counties), and Figure 248 for Region VI (San Patricio and Nueces Counties).

Figure 246. Expenditures/ Scenario III in Region IV

Time Period	Drilling Contractors		Helicopters		Boats		Well Logging		Cement		Mud		Oil Field Equipment Supply		Total
	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	
6/76-9/76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/76-12/76	0	0	4	.042	0	0	0	0	0	0	0	0	0	0	.042
12/76-3/77	60	.579	4	.042	0	0	10	.082	12	.107	0	0	0	0	.810
3/77-6/77	60	.579	4	.042	0	0	10	.082	12	.107	0	0	0	0	.810
6/77-8/77	60	.386	4	.028	0	0	10	.055	12	.071	0	0	0	0	.540
8/77-9/77	60	.193	8	.028	0	0	10	.027	12	.036	0	0	0	0	.284
9/77-12/77	60	.579	8	.084	0	0	10	.082	12	.107	0	0	0	0	.852
12/77-2/78	60	.386	8	.056	0	0	10	.055	12	.071	0	0	0	0	.568
2/78-3/78	60	.193	8	.028	0	0	10	.027	12	.036	0	0	0	0	.284
3/78-5/78	60	.386	8	.056	0	0	10	.055	12	.071	0	0	0	0	.568
5/78-6/78	60	.193	8	.028	0	0	10	.027	12	.036	0	0	0	0	.284
6/78-8/78	60	.386	8	.056	0	0	10	.055	12	.071	0	0	0	0	.568
8/78-11/78	60	.579	8	.084	0	0	10	.082	12	.107	0	0	0	0	.852
11/78-2/79	60	.579	8	.084	0	0	10	.082	12	.107	0	0	0	0	.852
2/79-5/79	0	0	8	.084	0	0	10	.082	12	.107	0	0	0	0	.273
5/79-8/79	0	0	8	.084	0	0	10	.082	12	.107	0	0	0	0	.273
8/79-12/79	0	0	8	.111	0	0	10	.109	12	.143	0	0	0	0	.363
12/79-6/80	0	0	8	.167	0	0	10	.164	12	.214	0	0	0	0	.545
6/80-1/81	56	1.261	12	.292	0	0	10	.191	12	.250	0	0	0	0	1.994
1/81-2/81	56	.180	12	.042	0	0	10	.027	12	.036	0	0	0	0	.285
2/81-5/81	72	.695	20	.209	0	0	10	.082	12	.107	0	0	0	0	1.093
5/81-8/81	72	.695	24	.250	0	0	10	.082	12	.107	13	.131	32	.276	1.541
8/81-10/81	128	.824	32	.222	32	.113	10	.055	12	.071	13	.087	32	.184	1.556
10/81-1/82	128	1.235	32	.334	32	.169	10	.082	12	.107	13	.131	32	.276	2.334
1/82-3/82	128	.824	36	.250	48	.169	10	.055	12	.071	13	.087	32	.184	1.640
3/82-5/82	144	.926	36	.250	48	.169	10	.055	12	.071	13	.087	32	.184	1.742
5/82-6/82	144	.463	40	.139	48	.084	10	.027	12	.036	13	.044	32	.092	.885
6/82-7/82	144	.463	40	.139	48	.084	10	.027	12	.036	13	.044	32	.092	.885
7/82-10/82	144	1.390	48	.501	48	.253	10	.082	12	.107	13	.131	32	.276	2.740
10/82-12/82	160	1.029	48	.334	48	.169	10	.055	12	.071	13	.087	32	.184	1.929
TOTAL		15.003		4.066		1.210		1.968		2.568		.829		1.748	27.392

*Expenditures are given in millions of dollars.

Figure 247

Expenditures/Scenario III in Region V

Time Period	Drilling Contractors		Boats		Mud		Oil Field Equipment Supply		Total*
	Emp.	Direct Tax Payments*	Emp.	Direct Tax Payments*	Emp.	Direct Tax Payments*	Emp.	Direct Tax Payments*	
6/76-9/76	0	0	16	.085	0	0	0	0	.085
9/76-12/76	60	.579	32	.169	0	0	0	0	.748
12/76-3/77	60	.579	48	.253	13	.130	32	.276	1.238
3/77-6/77	60	.579	48	.253	13	.130	32	.276	1.238
6/77-8/77	60	.386	48	.169	13	.087	32	.184	.826
8/77-9/77	60	.193	80	.141	13	.043	32	.092	.469
9/77-12/77	60	.579	80	.422	13	.130	32	.276	1.407
12/77-2/78	60	.386	80	.281	13	.087	32	.184	.938
2/78-3/78	60	.193	80	.141	13	.043	32	.092	.469
3/78-5/78	60	.386	80	.281	13	.087	32	.184	.938
5/78-6/78	60	.193	80	.141	13	.043	32	.092	.469
6/78-8/78	60	.386	80	.281	13	.087	32	.184	.938
8/78-11/78	60	.579	80	.422	13	.130	32	.276	1.407
11/78-2/79	60	.579	80	.422	13	.130	32	.276	1.407
2/79-5/79	60	.579	80	.422	13	.130	32	.276	1.407
5/79-8/79	0	0	80	.422	13	.130	32	.276	.828
8/79-12/79	0	0	80	.563	13	.173	32	.368	1.104
12/79-6/80	0	0	80	.844	13	.260	32	.552	1.656
6/80-1/81	0	0	80	.985	13	.303	32	.644	1.932
1/81-2/81	0	0	80	.141	13	.043	32	.092	.276
2/81-5/81	0	0	80	.422	13	.130	32	.276	.828
5/81-8/81	0	0	96	.507	13	.130	32	.276	.913
8/81-10/81	0	0	96	.338	13	.087	32	.184	.609
10/81-1/82	0	0	96	.507	13	.130	32	.276	.913
1/82-3/82	0	0	112	.394	13	.087	32	.184	.665
3/82-5/82	0	0	112	.394	13	.087	32	.184	.665
5/82-6/82	0	0	128	.225	13	.043	32	.092	.360
6/82-7/82	0	0	128	.225	13	.043	32	.092	.360
7/82-10/82	0	0	160	.844	13	.130	32	.276	1.250
10/82-12/82	0	0	160	.563	13	.087	32	.184	.834
TOTAL		6.176		11.257		3.120		6.624	27.177

*Expenditures are given in millions of dollars.

Figure 248. Expenditures/ Scenario III in Region VI

Time Period	Drilling Contractors		Helicopters		Boats		Well Logging		Diving		Cement		Mud		Oil Field Equipment Supply		Pipeline Laying		Total
	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.I	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	Emp.	Exp.*	
6/76-9/76	60	.579	4	.042	32	.169	10	.036	11	.097	12	.096	13	.131	32	.276	0	0	1.426
9/76-12/76	60	.579	4	.042	64	.338	10	.036	11	.097	12	.096	13	.131	32	.276	0	0	1.595
12/76-3/77	60	.579	8	.084	96	.507	10	.036	22	.194	12	.096	13	.131	32	.276	0	0	1.903
3/77-6/77	60	.579	8	.084	96	.507	10	.036	22	.194	12	.096	13	.131	32	.276	0	0	1.903
6/77-8/77	60	.386	8	.056	96	.338	10	.024	22	.129	12	.064	13	.087	32	.184	0	0	1.268
8/77-9/77	120	.386	8	.028	112	.197	10	.012	22	.065	12	.032	13	.044	32	.092	0	0	.856
9/77-12/77	120	1.158	8	.084	112	.591	10	.036	22	.194	12	.096	13	.131	32	.276	0	0	2.566
12/77-2/78	120	.772	8	.056	112	.394	10	.024	22	.129	12	.064	13	.087	32	.184	0	0	1.710
2/78-3/78	120	.386	8	.028	112	.197	10	.012	22	.065	12	.032	13	.044	32	.092	0	0	.856
3/78-5/78	60	.386	8	.056	112	.394	10	.024	22	.129	12	.064	13	.087	32	.184	0	0	1.324
5/78-6/78	60	.193	8	.028	112	.197	10	.012	22	.065	12	.032	13	.044	32	.092	0	0	.663
6/78-8/78	60	.386	8	.056	112	.394	10	.024	22	.129	12	.064	13	.087	32	.184	0	0	1.324
8/78-11/78	60	.579	8	.084	112	.591	10	.036	22	.194	12	.096	13	.131	32	.276	0	0	1.987
11/78-2/79	60	.579	8	.084	112	.591	10	.036	22	.194	12	.096	13	.131	32	.276	0	0	1.987
2/79-5/79	60	.579	8	.084	112	.591	10	.036	22	.194	12	.096	13	.131	32	.276	160	5.120	7.107
5/79-8/79	60	.579	8	.084	112	.591	10	.036	22	.194	12	.096	13	.131	32	.276	160	5.120	7.107
8/79-12/79	0	0	8	.111	112	.788	10	.048	22	.258	12	.128	13	.175	32	.368	160	6.827	8.703
12/79-6/80	56	1.081	8	.167	112	1.182	10	.072	22	.387	12	.192	13	.262	32	.552	160	10.240	14.135
6/80-1/81	56	1.261	12	.292	112	1.378	10	.084	22	.451	12	.224	13	.306	32	.644	0	0	4.640
1/81-2/81	72	.232	12	.042	112	.197	10	.012	22	.065	12	.032	13	.044	32	.092	0	0	.716
2/81-5/81	72	.695	28	.292	112	.591	10	.036	22	.194	12	.096	13	.131	32	.276	0	0	2.311
5/81-8/81	128	1.235	36	.375	144	.760	10	.036	22	.194	12	.096	13	.131	32	.276	0	0	3.103
8/81-10/81	128	.824	40	.278	160	.563	10	.024	22	.129	12	.064	13	.087	32	.184	0	0	2.153
10/81-1/82	144	1.390	40	.417	160	.844	10	.036	22	.194	12	.096	13	.131	32	.276	0	0	3.384
1/82-3/82	160	1.029	48	.334	176	.619	20	.048	22	.129	24	.128	13	.087	32	.184	0	0	2.558
3/82-5/82	160	1.029	48	.334	176	.619	20	.048	22	.129	24	.128	13	.087	32	.184	0	0	2.558
5/82-6/82	160	.515	56	.195	208	.366	20	.024	22	.065	24	.064	26	.087	64	.184	0	0	1.500
6/82-7/82	192	.618	56	.195	208	.366	20	.024	22	.065	24	.064	26	.087	64	.184	0	0	1.603
7/82-10/82	192	1.854	60	.626	224	1.182	20	.072	22	.194	24	.192	26	.262	64	.552	0	0	4.934
10/82-12/82	192	1.236	60	.417	224	.788	20	.048	22	.129	24	.128	26	.175	64	.368	0	0	3.289
		21.684		5.055		16.830		1.068		4.846		2.848		3.711		7.820		27.307	91.169

*Expenditures are given in millions of dollars.

The total expenditures over time during Scenario III can be analyzed in several ways. Figure 249 contains totals by study site, by time period, and by activity.

Thus, it can be seen that expenditures in Region IV will total $27,392,000; $27,177,000 in Region V; and $91,169,000 in Region VI, for a total of $145,783,000.

Figure 249

Total Expenditures of Scenario III

ACTIVITY

Time Period	Drilling Contractors Region IV	Drilling Contractors Region V	Drilling Contractors Region VI	Helicopter Services Region IV	Helicopter Services Region V	Helicopter Services Region VI	Boat Services Region IV	Boat Services Region V	Boat Services Region VI	Well Logging Region IV	Well Logging Region V	Well Logging Region VI	Diving Services Region IV	Diving Services Region V	Diving Services Region VI	Cement Region IV	Cement Region V	Cement Region VI	Mud IV	Mud V	Mud VI	Oil Field Equipment Supply IV	Oil Field Equipment Supply V	Oil Field Equipment Supply VI	Pipeline Laying IV	Pipeline Laying V	Pipeline Laying VI	Sub-Total
6/76-9/76	0	0	.579	0	0	.042	0	.085	.169	0	0	.036	0	0	.097	0	0	.096	0	0	.131	0	0	.276	0	0	0	1.511
9/76-12/76	0	.579	.579	.042	0	.042	0	.169	.338	0	0	.036	0	0	.097	0	0	.096	0	0	.131	0	0	.276	0	0	0	2.385
12/76-3/77	.579	.579	.579	.042	0	.084	0	.253	.507	.082	0	.036	0	0	.194	.107	0	.096	0	.130	.131	0	.276	.276	0	0	0	3.951
3/77-6/77	.579	.579	.579	.042	0	.084	0	.253	.507	.082	0	.036	0	0	.194	.107	0	.096	0	.130	.131	0	.276	.276	0	0	0	3.951
6/77-8/77	.386	.386	.386	.028	0	.056	0	.169	.338	.055	0	.024	0	0	.129	.071	0	.064	0	.087	.087	0	.184	.184	0	0	0	2.634
8/77-9/77	.193	.193	.386	.028	0	.028	0	.141	.197	.027	0	.012	0	0	.065	.036	0	.032	0	.043	.044	0	.092	.092	0	0	0	1.609
9/77-12/77	.579	.579	1.158	.084	0	.084	0	.422	.591	.082	0	.036	0	0	.194	.107	0	.096	0	.130	.131	0	.276	.276	0	0	0	4.825
12/77-2/78	.386	.386	.772	.056	0	.056	0	.281	.394	.055	0	.024	0	0	.129	.071	0	.064	0	.087	.087	0	.184	.184	0	0	0	3.216
2/78-3/78	.193	.193	.386	.028	0	.028	0	.141	.197	.027	0	.012	0	0	.065	.036	0	.032	0	.043	.044	0	.092	.092	0	0	0	1.609
3/78-5/78	.386	.386	.386	.056	0	.056	0	.281	.394	.055	0	.024	0	0	.129	.071	0	.064	0	.087	.087	0	.184	.184	0	0	0	2.830
5/78-6/78	.193	.193	.193	.028	0	.028	0	.141	.197	.027	0	.012	0	0	.065	.036	0	.032	0	.043	.044	0	.092	.092	0	0	0	1.416
6/78-8/78	.386	.386	.386	.056	0	.056	0	.281	.394	.055	0	.024	0	0	.129	.071	0	.064	0	.087	.087	0	.184	.184	0	0	0	2.830
8/78-11/78	.579	.579	.579	.084	0	.084	0	.422	.591	.082	0	.036	0	0	.194	.107	0	.096	0	.130	.131	0	.276	.276	0	0	0	4.246
11/78-2/79	.579	.579	.579	.084	0	.084	0	.422	.591	.082	0	.036	0	0	.194	.107	0	.096	0	.130	.131	0	.276	.276	0	0	0	4.246
2/79-5/79	0	.579	.579	.084	0	.084	0	.422	.591	.082	0	.036	0	0	.194	.107	0	.096	0	.130	.131	0	.276	.276	0	0	5.120	8.787
5/79-8/79	0	0	.579	.084	0	.084	0	.422	.591	.082	0	.036	0	0	.194	.107	0	.096	0	.130	.131	0	.276	.276	0	0	5.120	8.208
8/79-12/79	0	0	0	.111	0	.111	0	.563	.788	.109	0	.048	0	0	.258	.143	0	.128	0	.173	.175	0	.368	.368	0	0	6.827	10.170
12/79-6/80	0	0	1.081	.167	0	.167	0	.844	1.182	.164	0	.072	0	0	.387	.214	0	.192	0	.260	.262	0	.552	.552	0	0	10.240	16.336
6/80-1/81	1.261	0	1.261	.292	0	.292	0	.985	1.378	.191	0	.084	0	0	.451	.250	0	.224	0	.303	.306	0	.644	.644	0	0	0	8.566
1/81-2/81	.180	0	.232	.042	0	.042	0	.141	.197	.027	0	.012	0	0	.065	.036	0	.032	0	.043	.044	0	.092	.092	0	0	0	1.277
2/81-5/81	.695	0	.695	.209	0	.292	0	.422	.591	.082	0	.036	0	0	.194	.107	0	.096	0	.130	.131	0	.276	.276	0	0	0	4.232
5/81-8/81	.695	0	1.235	.250	0	.375	0	.507	.760	.082	0	.036	0	0	.194	.107	0	.096	.131	.130	.131	.276	.276	.276	0	0	0	5.557
8/81-10/81	.824	0	.824	.222	0	.278	.113	.338	.563	.055	0	.024	0	0	.129	.071	0	.064	.087	.087	.087	.184	.184	.184	0	0	0	4.318
10/81-1/82	1.235	0	1.390	.334	0	.417	.169	.507	.844	.082	0	.036	0	0	.194	.107	0	.096	.131	.130	.131	.276	.276	.276	0	0	0	6.631
1/82-3/82	.824	0	1.029	.250	0	.334	.169	.394	.619	.055	0	.048	0	0	.129	.071	0	.128	.087	.087	.087	.184	.184	.184	0	0	0	4.863
3/82-5/82	.926	0	1.029	.250	0	.334	.169	.394	.619	.055	0	.048	0	0	.129	.071	0	.128	.087	.087	.087	.184	.184	.184	0	0	0	4.965
5/82-6/82	.463	0	.515	.139	0	.195	.084	.225	.366	.027	0	.024	0	0	.065	.036	0	.064	.044	.043	.087	.092	.092	.184	0	0	0	2.745
6/82-7/82	.463	0	.618	.139	0	.195	.084	.225	.366	.027	0	.024	0	0	.065	.036	0	.064	.044	.043	.087	.092	.092	.184	0	0	0	2.848
7/82-10/82	1.390	0	1.854	.501	0	.626	.253	.844	1.182	.082	0	.072	0	0	.194	.107	0	.192	.131	.130	.262	.276	.276	.552	0	0	0	8.924
10/82-12/82	1.029	0	1.236	.334	0	.417	.169	.563	.788	.055	0	.048	0	0	.129	.071	0	.128	.087	.087	.175	.184	.184	.368	0	0	0	6.052
SUB-TOTAL	15.003	6.176	21.684	4.066	0	5.055	1.210	11.257	16.830	1.968	0	1.068	0	0	4.846	2.568	0	2.848	.829	3.120	3.711	1.748	6.624	7.820	0	0	27.307	
TOTAL	42.863			9.121			29.297			3.036			4.846			5.416			7.660			16.192			27.307			145.738
GRAND TOTAL													145.738															

Note: Expenditures are given in millions of dollars.

9. PRIMARY AND INDIRECT PERSONAL INCOME

Personal income, both primary and indirect,generated by the three phases of Scenario III were, once again, calculated by using personal income coefficients of the OCSOG Model (see Appendix E). Those are revealed in Figure 250.

Figure 250

Personal Income Coefficients of the OCS Model

	Coefficients (Dollars/Per Employee/Per Year)		
Primary Activity	Region IV	Region V	Region VI
Drilling Contractors	13,685	21,316	22,461
Helicopter Service	15,870	NA	24,880
Boat Service	11,138	11,138	11,474
Well Logging	10,228	NA	7,200
Diving	NA	NA	24,236
Cement	16,010	NA	26,503
Mud	19,714	15,890	32,564
Oil Field Equipment Supply	13,716	21,752	23,125
Pipeline Laying	NA	NA	56,816

(Note: NA = Not Applicable in Scenario III)

The personal income coefficients displayed in Figure 250 were used to calculate the personal incomes shown in Figure 251.

Figure 251

Personal Income/Scenario III

Time Period	Region IV	Region V	Region VI	Total
6/76-9/76	0	$ 44,552	$ 908,578	$ 953,130
9/76-12/76	$ 15,870	408,844	1,000,370	1,425,084
12/76-3/77	294,745	679,055	1,183,691	2,157,491
3/77-6/77	294,745	679,055	1,183,691	2,157,491
6/77-8/77	196,497	452,703	789,126	1,438,326
8/77-9/77	103,538	256,052	522,169	881,759
9/77-12/77	310,615	768,159	1,566,502	2,645,276
12/77-2/78	207,077	512,106	1,044,333	1,763,516
2/78-3/78	103,538	256,052	522,169	881,759
3/78-5/78	207,077	512,106	819,723	1,538,906
5/78-6/78	103,538	256,052	409,864	769,454
6/78-8/78	207,077	512,106	819,723	1,538,906
8/78-11/78	310,615	768,159	1,229,587	2,308,361
11/78-2/79	310,615	768,159	1,229,587	2,308,361
2/79-5/79	105,340	768,159	3,502,227	4,375,726
5/79-8/79	105,340	448,419	3,502,227	4,055,986
8/79-12/79	140,453	597,891	4,220,418	4,958,762
12/79-6/80	210,680	896,837	6,959,532	8,067,049
6/80-1/81	729,866	1,046,309	2,874,682	4,650,857
1/81-2/81	104,266	149,472	440,618	694,356
2/81-5/81	399,280	448,419	1,421,370	2,269,069
5/81-8/81	588,949	492,971	1,877,376	2,959,296
8/81-10/81	600,923	328,647	1,298,767	2,228,337
10/81-1/82	901,383	492,971	2,037,996	3,432,350
1/82-3/82	641,204	358,348	1,547,336	2,546,888
3/82-5/82	677,697	358,348	1,547,336	2,583,381
5/82-6/82	344,138	194,024	917,797	1,455,959
6/82-7/82	344,138	194,024	977,693	1,515,855
7/82-10/82	1,064,155	671,179	3,003,854	4,739,188
10/82-12/82	745,930	447,452	2,002,570	3,195,952
Total	$ 10,369,289	$14,766.630	$ 51,360,912	
Grand Total		$ 76,496,831		

10. STATE TAX REVENUE

Primary State Tax Revenue

The direct tax payments to the State government in each affected study site from the exploration, development and production phases of Scenario III are calculated by using the direct State tax payment coefficients of the OCSOG Model (see Appendix E). Figure 252 displays those coefficients.

Figure 252

State Tax Payment Coefficients of OCSOG Model

Primary Activity	State Tax Payment Coefficient ($ Million Annually Per Employee)		
	Region IV	Region V	Region VI
Drilling Contractors	.000038	.000038	.000033
Helicopter Service	.000333	NA	.000333
Boat Service	.000210	.000210	.000204
Well Logging	.000318	NA	.000144
Diving	NA	NA	.000135
Cement	.000333	NA	.000370
Mud	.000400	.000400	.000400
Oilfield Equipment Supply	.000344	.000344	.000346
Pipeline Laying	NA	NA	.003522

(Note: NA = Not Applicable in Scenario III)

Using those coefficients, primary State tax payments were derived for each affected study site over time; they are displayed in Figure 253.

Indirect State Tax Revenue

Indirect tax payments generated by the exploration, development, and production phases of Scenario III, were, like direct tax payments, calculated by using the indirect tax payment coefficients of the OCSOG Model (see Appendix E). Indirect State tax coefficients are shown in Figure 254.

Figure 253

Primary State Tax Payments/Scenario III

Time Period	Region IV	Region V	Region III	Total
6/76-9/76	0	$ 840	$ 8,369	$ 9,209
9/76-12/76	$ 333	2,250	10,001	12,584
12/76-3/77	2,697	7,142	12,338	22,177
3/77-6/77	2,697	7,142	12,338	22,177
6/77-8/77	1,798	4,762	8,225	14,785
8/77-9/77	1,010	2,940	4,550	8,500
9/77-12/77	3,030	8,822	13,649	25,501
12/77-2/78	2,020	5,882	9,099	17,001
2/78-3/78	1,010	2,940	4,550	8,500
3/78-5/78	2,020	5,882	8,769	16,671
5/78-6/78	1,010	2,940	4,385	8,335
6/78-8/78	2,020	5,882	8,769	16,671
8/78-11/78	3,030	8,822	13,154	25,006
11/78-2/79	3,030	8,822	13,154	25,006
2/79-5/79	2,460	8,822	154,034	165,316
5/79-8/79	2,460	8,252	154,034	164,746
8/79-12/79	3,280	11,002	204,718	219,000
12/79-6/80	4,920	16,504	308,001	329,425
6/80-1/81	7,758	19,254	31,392	58,404
1/81-2/81	1,108	2,750	4,529	8,387
2/81-5/81	4,143	8,252	14,918	27,313
5/81-8/81	8,528	9,092	17,678	35,298
8/81-10/81	7,605	6,062	12,551	26,218
10/81-1/82	11,406	9,092	18,959	39,457
1/82-3/82	8,387	6,622	14,695	29,704
3/82-5/82	8,488	6,622	14,695	29,805
5/82-6/82	4,354	3,590	9,470	17,414
6/82-7/82	4,354	3,590	9,558	17,502
7/82-10/82	13,730	12,452	29,822	56,004
10/82-12/82	9,255	8,302	19,881	37,438
TOTAL	$127,941	$215,328	$1,150,285	
GRAND TOTAL		$1,493,554		

Figure 254

Indirect State Tax Coefficients of OCSOG Model

Primary Activity	Coefficients (Dollars/Per Employee/Per Year) Region IV	Region V	Region VI
Drilling Contractors	165	250	180
Helicopter Service	112	NA	185
Boat Service	72	72	87
Well Logging	137	NA	102
Diving	NA	NA	92
Cement	148	NA	201
Mud	158	43	277
Oil Field Equipment Supply	103	248	198
Pipeline Laying	NA	NA	1036

(Note: NA = Not Applicable in Scenario III)

The indirect state tax coefficients in Figure 254 were used to calculate the indirect state tax payments shown in Figure 255.

Total State Tax Revenue

Aggregated primary and indirect tax payments to the State government can be calculated by adding the payments displayed in Figure 253 to the indirect tax payments of the same time periods. The result is presented in Figure 256, Aggregated State Tax Payments/Scenario III.

It must be noted that the tax payments for any given time period in Figure 256 represent only the amount of tax dollars accruing to the affected unit or units of government during that time period. They do not indicate that the affected unit or units of government actually collect that amount of tax revenue during that particular time period. Indeed, in many cases there may be a significant time lag between the time that taxes accrue to a unit of government and the time at which that unit of government actually collects those taxes. Thus, we see only tax accruals in Figure 256; the actual time and amount of tax payments will be further analyzed in succeeding chapters.

Figure 255

Indirect State Tax Payments/Scenario II

Time Period	Region IV	Region V	Region VI	Total
6/76-9/76	0	$ 288	$ 7,176	$ 7,464
9/76-12/76	$ 112	4,326	7,872	12,310
12/76-3/77	3,374	6,738	9,006	19,118
3/77-6/77	3,374	6,738	9,006	19,118
6/77-8/77	2,249	4,492	6,004	12,745
8/77-9/77	1,162	2,438	4,018	7,618
9/77-12/77	3,486	7,314	12,054	22,854
12/77-2/78	2,323	4,876	8,036	15,235
2/78-3/78	1,162	2,438	4,018	7,618
3/78-5/78	2,323	4,876	6,236	13,435
5/78-6/78	1,162	2,438	3,118	6,718
6/78-8/78	2,323	4,876	6,236	13,435
8/78-11/78	3,486	7,314	9,354	20,154
11/78-2/79	3,486	7,314	9,354	20,154
2/79-5/79	1,011	7,314	50,794	59,119
5/79-8/79	1,011	3,564	50,794	55,369
8/79-12/79	1,348	4,751	64,125	70,224
12/79-6/80	2,021	7,128	101,229	110,378
6/80-1/81	8,009	8,315	21,839	38,163
1/81-2/81	1,144	1,188	3,360	5,692
2/81-5/81	4,317	3,564	10,819	18,700
5/81-8/81	5,767	3,852	14,405	24,024
8/81-10/81	5,916	2,568	9,958	18,442
10/81-1/82	8,877	3,852	15,658	28,387
1/82-3/82	6,183	2,760	11,969	20,912
3/82-5/82	6,623	2,760	11,969	21,352
5/82-6/82	3,349	1,476	7,168	11,993
6/82-7/82	3,349	1,476	7,648	12,493
7/82-10/82	10,273	5,004	23,478	38,755
10/82-12/82	7,287	3,336	15,651	26,274
Total	$ 106,507	$ 129,374	$ 522,352	
Grand Total		$ 758,233		

Figure 256

Aggregated State Tax Payments/Scenario III

Time Period	Region IV	Region V	Region VI	Total
6/76-9/76	0	$ 1,128	$ 15,545	$ 16,673
9/76-12/76	$ 445	6,576	17,873	24,894
12/76-3/77	6,071	13,880	21,344	41,295
3/77-6/77	6,071	13,880	21,344	41,295
6/77-8/77	4,047	9,254	14,229	27,530
8/77-9/77	2,172	5,378	8,568	16,118
9/77-12/77	6,516	16,136	25,703	48,355
12/77-2/78	4,343	10,758	17,135	32,236
2/78-3/78	2,172	5,378	8,568	16,118
3/78-5/78	4,343	10,758	15,005	30,106
5/78-6/78	2,172	5,378	7,503	15,053
6/78-8/78	4,343	10,758	15,005	30,106
8/78-11/78	6,516	16,136	22,508	45,160
11/78 2/79	6,516	16,136	22,508	45,160
2/79-5/79	3,471	16,136	204,828	224,435
5/79-8/79	3,471	11,816	204,828	220,115
8/79-12/79	4,628	15,753	268,843	289,224
12/79-6/80	6,941	23,632	409,230	439,803
6/80-1/81	15,767	27,569	53,231	96,567
1/81-2/81	2,252	3,938	7,889	14,079
2/81-5/81	8,460	11,816	25,737	46,013
5/81-8/81	14,295	12,944	32,083	59,322
8/81-10/81	13,521	8,630	22,509	44,660
10/81-1/82	20,283	12,944	34,617	67,844
1/82-3/82	14,570	9,382	26,664	50,616
3/82-5/82	15,111	9,382	26,664	51,157
5/82-6/82	7,703	5,066	16,638	29,407
6/82-7/82	7,703	5,066	17,206	29,995
7/82-10/82	24,003	17,456	53,300	94,759
10/82-12/82	16,542	11,638	35,532	63,712
TOTAL	$234,448	$344,702	$1,672,637	
GRAND TOTAL		$2,251,787		

11. LOCAL TAX REVENUE

Primary Local Tax Revenue

The direct tax payments to local governments in each affected study site from the exploration, development and production activities of Scenario III are calculated by using the direct local tax payment coefficients of the OCSOG Model (Appendix E). Figure 257 displays those coefficients.

Figure 257

Local Tax Payment Coefficients of OCSOG Model

Primary Activity	Region IV	Region V	Region VI
Drilling Contractors	.000038	.000038	.000033
Helicopter Service	.002333	NA	.002444
Boat Service	.000210	.000210	.000204
Well Logging	.000182	NA	.000086
Diving	NA	NA	.000101
Cement	.000167	NA	.000185
Mud	.000200	.000200	.000200
Oilfield Equipment Supply	.000260	.000258	.000259
Pipeline Laying	NA	NA	.001000

(Note: NA = Not Applicable in Scenario III)

Using those coefficients, primary local tax payments were derived for each affected study site over time; they are displayed in Figure 258.

Indirect Local Tax Revenue

Indirect tax payments generated by the exploration, development, and production phases of Scenario III were, like direct tax payments, calculated by using the indirect tax payment coefficients of the OCSOG Model (Appendix E). Indirect local tax payment coefficients are shown in Figure 259.

Figure 258

Primary Local Tax Payments/Scenario III

Time Period	Region IV	Region V	Region VI	Total
6/76-9/76	0	$ 840	$ 8,341	$ 9,181
9/76-12/76	$ 2,333	2,250	9,973	14,556
12/76-3/77	3,859	5,804	14,327	23,990
3/77-6/77	3,859	5,804	14,327	23,990
6/77-8/77	2,572	3,869	9,550	15,991
8/77-9/77	2,064	2,495	5,213	9,772
9/77-12/77	6,192	7,484	15,638	29,314
12/77-2/78	4,128	4,989	10,694	19,811
2/78-3/78	2,064	2,495	5,213	9,772
3/78-5/78	4,128	4,989	10,364	19,481
5/78-6/78	2,064	2,495	5,048	9,607
6/78-8/78	4,128	4,989	10,364	19,481
8/78-11/78	6,192	7,484	15,143	28,819
11/78-2/79	6,192	7,484	15,143	28,819
2/79-5/79	5,622	7,484	55,143	68,249
5/79-8/79	5,622	6,914	55,143	67,679
8/79-12/79	7,495	9,219	72,864	89,578
12/79-6/80	11,244	13,828	110,075	135,147
6/80-1/81	19,803	16,133	40,907	76,843
1/81-2/81	2,829	2,305	5,896	11,030
2/81-5/81	13,305	6,914	27,462	47,681
5/81-8/81	18,368	7,754	34,444	60,566
8/81-10/81	16,831	5,169	25,134	47,134
10/81-1/82	25,246	7,754	37,836	70,836
1/82-3/82	18,946	5,729	29,627	54,302
3/82-5/82	19,047	5,729	29,627	54,403
5/82-6/82	10,302	3,145	17,893	31,340
6/82-7/82	10,302	3,145	17,981	31,428
7/82-10/82	35,570	11,114	56,838	103,522
10/82-12/82	23,814	7,409	38,509	69,732
TOTAL	$294,121	$183,216	$804,717	
GRAND TOTAL		$1,282,054		

Figure 259

Indirect Local Tax Coefficients of OCSOG Model

Primary Activity	Coefficients (Dollars/Per Employee/Per Year) Region IV	Region V	Region VI
Drilling Contractors	151	217	180
Helicopter Service	273	NA	207
Boat Service	88	88	71
Well Logging	105	NA	71
Diving	100	NA	211
Cement	100	NA	143
Mud	97	44	169
Oil Field Equipment Supply	67	163	127
Pipeline Laying	NA	NA	573

(Note: NA = Not Applicable in Scenario III)

The indirect local tax coefficients shown in Figure 259 were used to calculate the local tax payments shown in Figure 260.

Total Local Tax Revenue

Aggregated primary and indirect tax payments to the local governments can be calculated by adding the payments displayed in Figure 258 to the indirect tax payments of the same time periods. The result is presented in Figure 261, Aggregated Local Tax Payments/Scenario III.

It must be noted that the tax payments for any given time period in Figure 261 represent only the amount of tax dollars accruing to the affected unit or units of government during that time period. Indeed, in many cases there may be a significant time lag between the time that taxes accrue to a unit of government and the time at which that unit of government actually collects those taxes. Thus, we see only tax accruals in Figure 261; the actual time and amount of tax payments will be further analyzed in succeeding chapters.

Figure 260

Indirect Tax Payments to Local Governments/Scenario III

Time Period	Region IV	Region V	Region VI	Total
6/76-9/76	0	$ 352	$ 6,277	$ 6,579
9/76-12/76	$ 273	3,959	6,705	11,027
12/76-3/77	3,101	5,758	8,151	17,010
3/77-6/77	3,101	5,758	8,151	17,010
6/77-8/77	2,067	3,838	5,433	11,338
8/77-9/77	1,125	2,155	3,712	6,992
9/77-12/77	3,374	6,462	11,135	20,971
12/77-2/78	2,249	4,307	7,422	13,978
2/78-3/78	1,125	2,155	3,712	6,992
3/78-5/78	2,249	4,307	5,622	12,178
5/78-6/78	1,125	2,155	2,812	6,092
6/78-8/78	2,249	4,307	5,622	12,178
8/78-11/78	3,374	6,462	8,435	18,271
11/78-2/79	3,374	6,462	8,435	18,271
2/79-5/79	1,109	6,462	31,355	38,926
5/79-8/79	1,109	3,207	31,355	35,671
8/79-12/79	1,478	4,277	38,206	43,961
12/79-6/80	2,217	6,414	62,349	70,980
6/80-1/81	8,157	7,484	20,744	36,385
1/81-2/81	1,166	1,070	3,061	5,297
2/81-5/81	4,646	3,207	10,010	17,863
5/81-8/81	5,770	3,559	13,512	22,841
8/81-10/81	6,088	2,372	9,334	17,794
10/81-1/82	9,134	3,559	14,723	27,416
1/82-3/82	6,505	2,607	11,165	20,277
3/82-5/82	6,908	2,607	11,165	20,680
5/82-6/82	3,546	1,422	6,431	11,399
6/82-7/82	3,546	1,422	6,911	11,879
7/82-10/82	11,182	4,967	21,226	37,375
10/82-12/82	7,857	3,311	14,151	25,319
Total	$ 109,204	$ 116,384	$ 397,362	
GRAND TOTAL		$ 622,950		

Figure 261

Aggregated Local Tax Payments/Scenario III

Time Period	Region IV	Region V	Region VI	Total
6/76-9/76	0	$ 1,192	$ 14,568	$ 15,760
9/76-12/76	$ 2,606	$ 6,209	16,768	25,583
12/76-3/77	6,960	11,562	22,478	41,000
3/77-6/77	6,960	11,562	22,478	41,000
6/77-8/77	4,639	7,707	14,983	27,329
8/77-9/77	3,189	4,650	8,925	16,764
9/77-12/77	9,566	13,946	26,773	50,285
12/77-2/78	6,377	9,296	18,116	33,789
2/78-3/78	3,189	4,650	8,925	16,764
3/78-5/78	6,377	9,296	15,986	31,659
5/78-6/78	3,189	4,650	7,860	15,699
6/78-8/78	6,377	9,296	15,986	31,659
8/78-11/78	9,566	13,946	23,578	47,090
11/78-2/79	9,566	13,946	23,578	47,090
2/79-5/79	6,731	13,946	86,498	107,175
5/79-8/79	6,731	10,121	86,498	103,350
8/79-12/79	8,973	13,496	111,070	133,539
12/79-6/80	13,461	20,242	172,424	206,127
6/80-1/1/	27,960	23,617	61,651	113,228
1/81-2/81	3,995	3,375	8,957	16,327
2/81-5/81	17,951	10,121	37,472	65,544
5/81-8/81	24,138	11,313	47,956	83,407
8/81-10/81	22,919	7,541	34,468	64,923
10/81-1/82	34,380	11,313	52,559	98,252
1/82-3/82	25,451	8,336	40,792	74,579
3/82-5/82	25,955	8,336	40,792	75,083
5/82-6/82	13,848	4,567	24,324	42,739
6/82-7/82	13,848	4,567	24,892	43,307
7/82-10/82	46,752	16,081	78,064	140,897
10/82-12/82	31,671	10,720	52,660	95,051
TOTAL	$403,325	$299,600	$1,202,079	
GRAND TOTAL		$1,905,004		

12. DOMESTIC AND MUNICIPAL WATER REQUIREMENTS

The computation of domestic and municipal water requirements over time in Scenario II follows the approach described in Part B of this Volume. The coefficient of residential and municipal water demand used is 120 gallons per person per day and subsumes water use in households, beautification, street cleaning, etc.

Figure 262 presents total new domestic and municipal water requirements in Scenario III over time for each affected region.

Figure 262

Total New Domestic and Municipal Water Requirements
(acre-feet)

Time Period	Region IV	Region V	Region VI
6/76- 9/76	0	1.06	12.0
9/76-12/76	.36	6.36	14.15
12/76- 3/77	5.47	10.47	17.37
3/77- 6/77	5.63	10.57	17.37
6/77- 8/77	3.76	7.05	11.58
8/77- 9/77	1.88	3.82	7.1
9/77-12/77	5.83	12.63	23.43
12/77- 2/78	3.89	8.42	15.62
2/78- 3/78	1.94	4.21	7.81
3/78- 5/78	3.89	8.42	15.62
5/78- 6/78	1.94	4.21	7.81
6/78- 8/78	3.89	8.42	15.62
8/78-11/78	5.89	12.69	23.43
11/78- 2/79	5.89	12.69	23.43
2/79- 5/79	5.89	12.69	31.16
5/79- 8/79	5.89	12.69	31.22
8/79-12/79	7.87	16.93	41.63
12/79- 6/80	11.8	25.39	83.26
6/80- 1/81	26.29	29.62	97.13
1/81- 2/81	3.76	4.23	13.88
2/81- 5/81	12.89	12.69	41.63
5/81- 8/81	15.31	12.69	41.63
8/81-10/81	17.06	8.46	27.75
10/81- 1/82	26.22	12.69	41.63
1/82- 3/82	20.22	8.46	27.75
8/82- 5/82	18.67	8.46	27.75
5/82- 6/82	9.49	4.23	14.35
6/82- 7/82	9.55	4.23	14.88
7/82-10/82	30.26	13.89	50.64
10/82-12/82	20.53	9.26	33.76
TOTAL	291.96	307.63	832.39

13. RESIDENTIAL LAND REQUIREMENTS

New residential land requirements in Scenario III were derived as described in Part B of this Volume. Figure 263 presents new occupancy trends in Region IV, V, and VI expressed as the percent of new occupants residing in apartment (more than 4 families) units, single family dwelling units, and mobile home units. The difference in proportions of new occupancy in Region VI between the Scenario II and this Scenario III analysis represents the effect of adding current characteristics of Aransas Pass into the evaluation. (In Scenario II, only Corpus Christi and Ingleside were included in the Region VI estimate.)

Figure 263

Current Locational Trends in New Occupancy

	Apartment Units	Single Family Units	Mobile Home Units
Region IV	47%	24%	29%
Region V	20%	65%	15%
Region VI	36%	48%	16%

Figure 264 presents acreage requirements per housing unit type. These coefficients were derived for Scenario III as described in Part B of this Volume, and subsume fractions of on-site parking space, open space, and access roads (where appropriate) as well as the area for the dwelling unit itself.

Figure 264

Acreage Requirements for Housing Unit Types

	Apartment Units	Single Family Units	Mobile Home Units
Acreage per unit	.05	.18	.10

New residential land requirements were derived by multiplying the number of new housing units postulated in Scenario III in each region over time by the respective percentage values in Figure 263. The resulting

number of housing units as apartment, single family, and mobile home dwellings are then multiplied by their respective average land requirements as shown in Figure 264. Figure 265 presents the calculated resulting number of new residential land requirements in Scenario III for each affected region.

The residential land requirements shown in Figure 265 are not additions to the total land requirements shown in Figure 230. Rather, the amounts shown in Figure 265 represent only the residential land portion of the amounts shown in Figure 230.

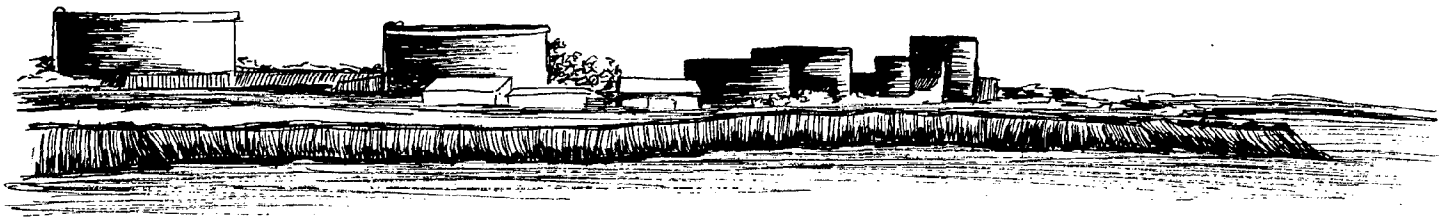


Figure 265

Residential Land Requirements

Time Period	Region IV	Region V	Region VI
6/76- 9/76	0	0.6	5.5
9/76-12/76	0.1	3.4	6.5
12/76- 3/77	2.0	5.7	7.9
3/77- 6/77	2.0	5.7	7.9
6/77- 8/77	2.0	5.7	7.9
8/77- 9/77	2.0	6.2	9.8
9/77-12-77	2.1	6.8	10.7
12/77- 2/78	2.1	6.8	10.7
2/78- 3/78	2.1	6.8	10.7
3/78- 5/78	2.1	6.8	10.7
5/78- 6/78	2.1	6.8	10.7
6/78- 8/78	2.1	6.8	10.7
8/78-11/78	2.1	6.8	10.7
11/78- 2/79	2.1	6.8	10.7
2/79- 5/79	2.1	6.8	14.2
5/79- 8/79	2.1	6.8	14.3
8/79-12/79	2.1	6.8	14.3
12/79- 6/80	2.1	6.8	19.0
6/80- 1/81	4.1	6.8	19.0
1/81- 2/81	4.1	6.8	19.0
2/81- 5/81	4.7	6.8	19.0
5/81- 8/81	5.6	6.8	19.0
8/81-10/81	9.3	6.8	19.0
10/81- 1/82	9.6	6.8	19.0
1/82- 3/82	9.9	6.8	19.0
3/82- 5/82	10.1	6.8	19.0
5/82- 6/82	10.3	6.8	19.7
6/82- 7/82	10.4	6.8	20.5
7/82-10/82	11.0	7.5	23.1
10/82-12/82	11.2	7.5	23.1

14. ECONOMIC IMPACT ANALYSIS

Introduction

Part B contains an extensive discussion of the process by which economic/fiscal impact was analyzed. The analysis in this chapter was performed in accordance with that process. In short, infrastructural costs, tax revenues, and net fiscal impact are analyzed below.

Infrastructural Costs

As Part B explained, the key to understanding infrastructural costs to units of government affected by Scenario III activities is contained in the per capita service costs of those units of government as they are currently constituted. Using the procedure outlined in Part B, the information contained in Figure 266 was derived.

Figure 266 summarizes per capita expenditures for each region in Scenario III.

When that data is applied to the projected increases in population over time associated with Scenario III, Figure 267 (for Region VI), 268 (for Region V), and 269 (for Region VI) result. Each figure shows the costs to local, county, and State governments in columns C, D, and H, respectively. These cost estimates were derived by multiplying the population figure in column B by the appropriate per capita annual service cost in Figure 266, adjusted to correspond with the length of the time period in column A. The cost to local governments is calculated inclusive of county government expenditures.

Fiscal Impact

Cost data alone present an incomplete picture of the two-sided fiscal impact, they must be subtracted from the corresponding tax revenues to show the net gains or losses to government treasuries from OCS development. This was also done in Figures 267, 268 and 269; columns F and J reveal the resulting tax revenue surplus or deficit for local and State governments, respectively. The parentheses indicate deficits. The process by which the fiscal impact is determined is distilled to a form readily usable by local officials in Part B.

Figure 266

Government Expenditures/Scenario III

STUDY SITE

	Region IV (Matagorda, Jackson, Victoria & Calhoun Counties)	Region V (Aransas and Refugio Counties)	Region VI (San Patricio and Nueces Counties)
1. Population (1972 Est.)	113,700	19,500	297,900
2. Local Gov't. Expenditures	$37,712,000	$5,845,000	$98,239,000
3. Local Gov't. Per Capita Expenditures	$ 332	$ 300	$ 330
4. County Expenditures (included in Item #2.	$9,735,000	$1,793,000	$8,553,000
5. County Gov't. Per Capita Expenditures (included in Item #3)	$ 86	$ 92	$ 29
6. State Gov't. Expenditures	$28,218,000	$3,659,000	$ 60,356,000
7. State Gov't. Per Capita Expenditures	$ 248	$ 188	$ 203

Figure 267. Fiscal Impact/Region IV/Scenario III

A[1]	B[2]	C	D[3]	E[4]	F	G[5]	H	I[6]	J	K[5]
Time Period	Population	Cost to Local Governments (Pop.x$332 Annually)	Cost to County Governments (Pop.x $86 Annually)	Local Tax Revenue	Local Tax Revenue Surplus or Deficit	Present Value of Local Tax Revenue Surplus or Deficit	Cost to State Government (Pop.x$248 Annually)	State Tax Revenue	State Tax Revenue Surplus or Deficit	Present Value of State Tax Revenue Surplus or Deficit
6/76-9/76	0	0	0	0	0	0	0	0	0	0
9/76-12/76	11	913	237	2,606	$ 1,693	$ 1,644	682	$ 445	($ 237)	($ 230)
12/76-3/77	165	13,695	3,548	6,960	(6,735)	(6,447)	10,230	6,071	(4,159)	(3,981)
3/77-6/77	170	14,110	3,655	6,960	(7,150)	(6,745)	10,540	6,071	(4,469)	(4,216)
6/77-8/77	170	9,407	2,437	4,639	(4,768)	(4,455)	7,027	4,047	(2,980)	(2,784)
8/77-9/77	170	4,703	1,218	3,189	(1,514)	(1,408)	3,513	2,172	(1,341)	(1,247)
9/77-12/77	176	14,608	3,784	9,566	(5,042)	(4,620)	10,912	6,516	(4,396)	(4,028)
12/77-2/78	176	9,739	2,523	6,377	(3,362)	(3,051)	7,275	4,343	(2,932)	(2,661)
2/78-3/78	176	4,869	1,261	3,189	(1,680)	(1,517)	3,637	2,172	(1,465)	(1,323)
3/78-5/78	176	9,739	2,523	6,377	(3,362)	(3,007)	7,275	4,343	(2,932)	(2,622)
5/78-6/78	176	4,869	1,261	3,189	(1,680)	(1,495)	3,637	2,172	(1,465)	(1,304)
6/78-8/78	176	9,739	2,523	6,377	(3,362)	(2,963)	7,275	4,343	(2,932)	(2,584)
8/78-11/78	178	14,774	3,827	9,566	(5,208)	(4,524)	11,036	6,516	(4,520)	(3,926)
11/78-2/79	178	14,774	3,827	9,566	(5,208)	(4,459)	11,036	6,516	(4,520)	(3,870)
2/79-5/79	178	14,774	3,827	6,731	(8,043)	(6,786)	11,036	3,471	(7,565)	(6,383)
5/79-8/79	178	14,774	3,827	6,731	(8,043)	(6,688)	11,036	3,471	(7,565)	(6,290)
8/79-12/79	178	19,699	5,103	8,973	(10,726)	(8,747)	14,715	4,628	(10,087)	(8,226)
12/79-6/80	178	29,548	7,654	13,461	(16,087)	(12,742)	22,072	6,941	(15,131)	(11,985)
6/80-1/81	340	65,847	17,057	27,960	(37,887)	(29,007)	49,187	15,767	(33,420)	(25,587)
1/81-2/81	340	9,407	2,437	3,995	(5,412)	(4,123)	7,027	2,252	(4,775)	(3,638)
2/81-5/81	389	32,287	8,364	17,951	(14,336)	(10,765)	24,118	8,460	(15,658)	(11,758)
5/81-8/81	462	38,346	9,933	24,138	(14,208)	(10,514)	28,644	14,295	(14,349)	(10,619)
8/81-10/81	772	42,717	11,065	22,919	(19,798)	(14,510)	31,909	13,521	(18,388)	(13,476)
10/81-1/82	791	65,653	17,007	34,380	(31,273)	(22,588)	49,042	20,283	(28,759)	(20,772)
1/82-3/82	915	50,630	13,115	25,451	(25,179)	(18,011)	37,820	14,570	(23,250)	(16,631)
3/82-5/82	845	46,757	12,112	25,955	(20,802)	(14,736)	34,927	15,111	(19,816)	(14,038)
5/82-6/82	859	23,766	6,156	13,848	(9,918)	(6,992)	17,753	7,703	(10,050)	(7,085)
6/82-7/82	864	23,904	6,192	13,848	(10,056)	(7,055)	17,856	7,703	(10,153)	(7,123)
7/82-10/82	913	75,779	19,630	46,752	(29,027)	(20,069)	56,606	24,003	(32,603)	(22,542)
10/82-12/82	929	51,405	13,316	31,671	(19,734)	(13,512)	38,399	$ 16,542	(21,857)	(14,966)
TOTAL*		$731,232	$189,419	$403,325	($327,907)	($249,892)	$546,222	$234,448	($311,774)	($235,895)

1. Taken from Figure 3.
2. Taken from Figure 242.
3. The figures in Column D are included in the corresponding figures of Column C.
4. Taken from Figure 261.
5. Assumes an interest rate of 6 percent.
6. Taken from Figure 256.

*Entries may not total due to rounding.

Figure 268. Fiscal Impact/Region V/Scenario III

A [1]	B [2]	C	D [3]	E [4]	F	G [5]	H	I [6]	J	K [5]
Time Period	Population	Cost to Local Governments (Pop.x$ 300 Annually)	Cost to County Governments (Pop.x $ 92 Annually)	Local Tax Revenue	Local Tax Revenue Surplus or Deficit	Present Value of Local Tax Revenue Surplus or Deficit	Cost to State Government (Pop.x$188 Annually	State Tax Revenue	State Tax Revenue Surplus or Deficit	Present Value of State Tax Revenue Surplus or Deficit
6/76-9/76	32	2,400	736	1,192	(1,208)	(1,191)	1,504	$ 1,128	(376)	(371)
9/76-12/76	192	14,400	14,416	6,209	(8,191)	(7,956)	9,024	6,576	(2,448)	(2,378)
12/76-3/77	316	23,700	37,268	11,562	(12,138)	(11,619)	14,852	13,880	(972)	(930)
3/77-6/77	319	23,925	37,337	11,562	(12,363)	(11,663)	14,993	13,880	(1,113)	(1,050)
6/77-8/77	319	15,950	34,891	7,707	(8,243)	(7,701)	9,995	9,254	(741)	(692)
8/77-9/77	346	8,650	32,653	4,650	(4,000)	(3,719)	5,421	5,378	(43)	(40)
9/77-12/77	381	28,575	38,763	13,946	(14,629)	(13,405)	17,907	16,136	(1,771)	(1,623)
12/77-2/78	381	19,050	35,842	9,296	(9,754)	(8,851)	11,938	10,758	(1,180)	(1,071)
2/78-3/78	381	9,525	32,921	4,650	(4,875)	(4,402)	5,969	5,378	(591)	(534)
3/78-5/78	381	19,050	35,842	9,296	(9,754)	(8,723)	11,938	10,758	(1,180)	(1,055)
5/78-6/78	381	9,525	2,921	4,650	(4,875)	(4,339)	5,969	5,378	(591)	(526)
6/78-8/78	381	19,050	5,842	9,296	(9,754)	(8,597)	11,938	10,758	(1,180)	(1,040)
8/78-11/78	383	28,725	8,809	13,946	(14,779)	(12,838)	18,001	16,136	(1,865)	(1,620)
11/78-2/79	383	28,725	8,809	13,946	(14,779)	(12,652)	18,001	16,136	(1,865)	(1,597)
2/79-5/79	383	28,725	8,809	13,946	(14,779)	(12,469)	18,001	16,136	(1,865)	(1,574)
5/79-8/79	383	28,725	8,809	10,121	(18,604)	(15,469)	18,001	11,816	(6,185)	(5,143)
8/79-12/79	383	38,300	11,745	13,496	(24,804)	(20,228)	24,001	15,753	(8,248)	(6,726)
12/79-6/80	383	57,450	17,618	20,242	(37,208)	(29,472)	36,002	23,632	(12,370)	(9,798)
6/80-1/81	383	67,025	20,554	23,617	(43,408)	(33,234)	42,002	27,569	(14,433)	(11,050)
1/81-2/81	383	9,575	2,936	3,375	(6,200)	(4,724)	6,000	3,938	(2,062)	(1,571)
2/81-5/81	383	28,725	8,809	10,121	(18,604)	(13,970)	18,001	11,816	(6,185)	(4,644)
5/81-8/81	383	28,725	8,809	11,313	(17,412)	(12,886)	18,001	12,944	(5,057)	(3,742)
8/81-10/81	383	19,150	5,873	7,541	(11,609)	(8,508)	12,001	8,630	(3,371)	(2,471)
10/81-1/82	383	28,725	8,809	11,313	(17,412)	(12,576)	18,001	12,944	(5,057)	(3,653)
1/82-3/82	383	19,150	5,873	8,336	(10,814)	(7,735)	12,001	9,382	(2,619)	(1,873)
3/82-5/82	383	19,150	5,873	8,336	(10,814)	(7,661)	12,001	9,382	(2,619)	(1,855)
5/82-6/82	383	9,575	2,936	4,567	(5,008)	(3,548)	6,000	5,066	(934)	(658)
6/82-7/82	383	9,575	2,936	4,567	(5,008)	(3,513)	6,000	5,066	(934)	(655)
7/82-10/82	419	31,425	9,637	16,081	(15,344)	(10,609)	19,693	17,456	(2,237)	(1,547)
10/82-12/82	419	20,950	6,425	10,720	(10,230)	(7,005)	13,129	11,638	(1,491)	(1,021)
TOTAL*		$696,200	$213,501	$299,600	($396,600)	($321,263)	$436,285	$344,702	($91,583)	($72,508)

1. Taken from Figure 3.
2. Taken from Figure 242.
3. The figures in Column D are included in the corresponding figures of Column C.
4. Taken from Figure 261.
5. Assumes an interest rate of 6 percent.
6 Taken from Figure 256.

*Entries may not total due to rounding.

Figure 269. Fiscal Impact/Region VI/Scenario III

A [1]	B [2]	C	D [3]	E [4]	F	G [5]	H	I [6]	J	K [5]
Time Period	Population	Cost to Local Governments (Pop.x$330 Annually)	Cost to County Governments (Pop.x $29 Annually)	Local Tax Revenue	Local Tax Revenue Surplus or Deficit	Present Value of Local Tax Revenue Surplus or Deficit	Cost to State Government (Pop.x$203 Annually	State Tax Revenue	State Tax Revenue Surplus or Deficit	Present Value of State Tax Revenue Surplus or Deficit
6/76-9/76	362	29,865	2,625	14,568	(15,297)	(15,076)	18,372	15,545	(2,827)	(2,786)
9/76-12/76	427	35,228	3,096	16,768	(18,460)	(17,930)	21,670	17,873	(3,797)	(3,688)
12/76-3/77	524	43,230	3,799	22,478	(20,752)	(19,865)	26,593	21,344	(5,249)	(5,025)
3/77-6/77	524	43,230	3,799	22,478	(20,752)	(19,577)	26,593	21,334	(5,249)	(4,952)
6/77-8/77	524	28,820	2,533	14,983	(13,837)	(12,928)	17,729	14,229	(3,500)	(3,270)
8/77-9/77	643	17,683	1,544	8,925	(8,758)	(8,143)	10,877	8,568	(2,309)	(2,147)
9/77-12/77	707	58,328	5,126	26,773	(31,555)	(28,916)	35,880	25,703	(10,177)	(9,325)
12/77-2/78	707	38,885	3,417	18,116	(20,769)	(18,847)	23,920	17,135	(6,785)	(6,157)
2/78-3/78	707	19,443	1,709	8,925	(10,518)	(9,498)	11,960	8,568	(3,392)	(3,063)
3/78-5/78	707	38,885	3,417	15,986	(22,899)	(20,479)	23,920	15,005	(8,915)	(7,973)
5/78-6/78	707	19,443	1,709	7,860	(11,583)	(10,309)	11,960	7,503	(4,457)	(3,967)
6/78-8/78	707	38,885	3,417	15,986	(22,899)	(20,183)	23,920	15,005	(8,915)	(7,858)
8/78-11/78	707	58,328	5,126	23,578	(34,750)	(30,186)	35,880	22,508	(13,372)	(11,616)
11/78-2/79	707	58,328	5,126	23,578	(34,750)	(29,749)	35,880	22,508	(13,372)	(11,448)
2/79-5/79	940	77,550	6,815	86,498	8,948	7,549	47,705	204,828	157,123	132,566
5/79-8/79	942	77,715	6,830	86,498	8,783	7,303	47,807	204,828	157,021	130,564
8/79-12/79	942	103,620	9,106	111,070	7,450	6,076	63,742	268,843	205,101	167,262
12/79-6/80	1,256	207,240	18,212	172,424	(34,816)	(27,578)	127,484	409,230	281,746	223,169
6/80-1/81	1,256	241,780	21,247	61,651	(180,129)	(137,911)	148,731	53,231	(95,500)	(73,117)
1/81-2/81	1,256	34,540	3,035	8,957	(25,583)	(19,492)	21,247	7,889	(13,358)	(10,178)
2/81-5/81	1,256	103,620	9,106	37,472	(66,148)	(49,670)	63,742	25,737	(38,005)	(28,538)
5/81-8/81	1,256	103,620	9,106	47,956	(55,664)	(41,193)	63,742	32,083	(31,659)	(23,429)
8/81-10/81	1,256	69,080	6,071	34,468	(34,612)	(25,367)	42,495	22,509	(19,986)	(14,647)
10/81-1/82	1,256	103,620	9,106	52,559	(51,061)	(26,881)	63,742	34,617	(29,125)	(21,037)
1-82-3/82	1,256	69,080	6,071	40,792	(28,288)	(20,235)	42,495	26,664	(15,831)	(11,324)
3/82-5/82	1,256	69,080	6,071	40,792	(28,288)	(20,039)	42,495	26,664	(15,831)	(11,215)
5/82-6/82	1,299	35,723	3,139	24,324	(11,399)	(8,036)	21,975	16,638	(5,337)	(3,762)
6/82-7/82	1,347	27,043	3,255	24,892	(12,151)	(8,524)	22,787	17,206	(5,581)	(3,915)
7/82-10/82	1,528	126,060	11,078	78,064	(47,996)	(33,184)	77,546	53,300	(24,246)	(16,754)
10/82-12/82	1,528	84,040	7,385	52,660	(31,380)	(21,486)	51,697	35,532	(16,165)	(11,068)
TOTAL *		$2,071,992	$182,086	$1,202,079	($869,913)	($690,354)	$1,274,586	$1,672,637	$398,051	$341,292

1. Taken from Figure 3.
2. Taken from Figure 242.
3. The figures in Column D are included in the corresponding figures of Column C.
4. Taken from Figure 261.
5. Assumes an interest rate of 6 percent.
6. Taken from Figure 256.

*Entries may not add to totals due to rounding.

Because the revenues flow over a time span of 6½ years, the surpluses or deficits are discounted to present value and presented in column G for the local governments, and column K for the state government. An interest rate of six percent was used; its choice is explained in Part B.

The existence and size of the expected deficits on both the local and state levels is the most salient feature of Figures 267, 268, and 269. The fiscal impact is partly a function of population; it is lower in Region V where the increase in population is expected to be lower, and greatest in Region VI where the increase in population is expected to be greatest.

Even the State incurs deficits in two regions due to fairly high per capita expenditure levels. The aggregated State revenues are presented in Figure 270.

Figures 267 through 270 are helpful in that they describe the dollar amounts of surpluses or deficits experienced by local or state governments in each affected study site of Scenario III based on the postulated activities of Scenario III. Nevertheless, understanding of the data might be enhanced by a presentation of the percentage of projected costs which are covered by projected revenues over time in each affected study site. Figures 271, 272, 273, (for Regions IV, V, and VI, respectively), and 274 (combined State revenues) show such information.

A review of these figures reveals similar revenue/cost ratio curves between regions, even though actual dollar deficits differ among study sites and between the State and local governments within any one site. These dollar differences are due primarily to the following reasons:

1. Each affected study site has a different set of postulated OCS-related activities, time periods during which those activities take place, and number of workers involved in those activities over time.

2. Each activity has its own tax multipliers for tax payments (direct and indirect) to local governments and for tax payments (direct and indirect) to State government.

3. Each affected study site has a different per capita cost for local government services and for State government services.

As a result, the net fiscal impact of each activity in terms of tax revenue surplus or deficit per employee per year, presented in Figure 275 for the local governments and in Figure 276 for the State government, varies for each region and unit of government. Its derivation is discussed in Part B.

Only two activities, helicopter services and pipeline laying, are identified in Figure 275 as providing for each employee sufficient tax revenues to more than cover the added costs incurred by the local governments. The employment resulting from each is small, and neither occurs in Region V. Consequently, their positive effect on local treasuries is more than offset by the negative impact of the remaining activities, and continuous deficits occur.

Figure 270

Total State Tax Revenue
(Scenario III)

Time Period[1]	Combined[2] State Revenues	Combined[3] State Costs	Combined Tax[4] Revenue Surplus or Deficit	Present Value of[5] Combined Tax Revenue Surplus or Deficit
6/76-9/76	$ 16,673	$ 19,876	($ 3,203)	($ 3,157)
9/76-12/76	24,894	31,376	(6,482)	(6,296)
12/76-3/77	41,295	51,675	(10,380)	(9,936)
3/77-6/77	41,295	52,126	(10,831)	(10,218)
6/77-8/77	27,530	34,751	(7,221)	(6,746)
8/77-9/77	16,118	19,811	(3,693)	(3,434)
9/77-12/77	48,355	64,699	(16,344)	(14,976)
12/77-2/78	32,236	43,133	(10,897)	(9,889)
2/78-3/78	16,118	21,566	(5,448)	(4,920)
3/78-5/78	30,106	43,133	(13,027)	(11,650)
5/78-6/78	15,053	21,566	(6,513)	(5,797)
6/78-8/78	30,106	43,133	(13,027)	(11,482)
8/78-11/78	45,160	64,917	(19,757)	(17,162)
11/78-2/79	45,160	64,917	(19,757)	(16,915)
2/79-5/79	224,435	76,742	147,693	124,609
5/79-8/79	220,115	76,844	143,271	119,131
8/79-12/79	289,224	102,458	186,766	152,310
12/79-6/80	439,803	185,558	254,245	201,386
6/80-1/81	96,567	239,920	(143,353)	(109,754)
1/81-2/81	14,079	34,274	(20,195)	(15,387)
2/81-5/81	46,013	105,861	(59,848)	(44,940)
5/81-8/81	59,322	110,387	(51,065)	(37,790)
8/81-10/81	44,660	86,405	(41,745)	(30,594)
10/81-1/82	67,844	130,785	(62,941)	(45,462)
1/82-3/82	50,616	92,316	(41,700)	(29,828)
3/82-5/82	51,157	89,423	(38,266)	(27,108)
5/82-6/82	29,407	45,728	(16,321)	(11,505)
6/82-7/82	29,975	46,643	(16,668)	(11,693)
7/82-10/82	94,759	153,845	(59,086)	(40,853)
10/82-12/82	63,712	103,225	(39,513)	(27,055)
TOTAL *	$2,251,787	$2,257,093	($ 5,306)	$ 32,889

1. Taken from Figure 3.
2. Addition of Columns I from Figures 267, 268, and 269 for each time period.
3. Addition of Columns H from Figures 267, 268, and 269 for each time period.
4. Addition of Columns J from Figures 267, 268, and 269 for each time period.
5. Addition of Columns K from Figures 267, 268, and 269 for each time period.

*Entries may not total due to rounding.

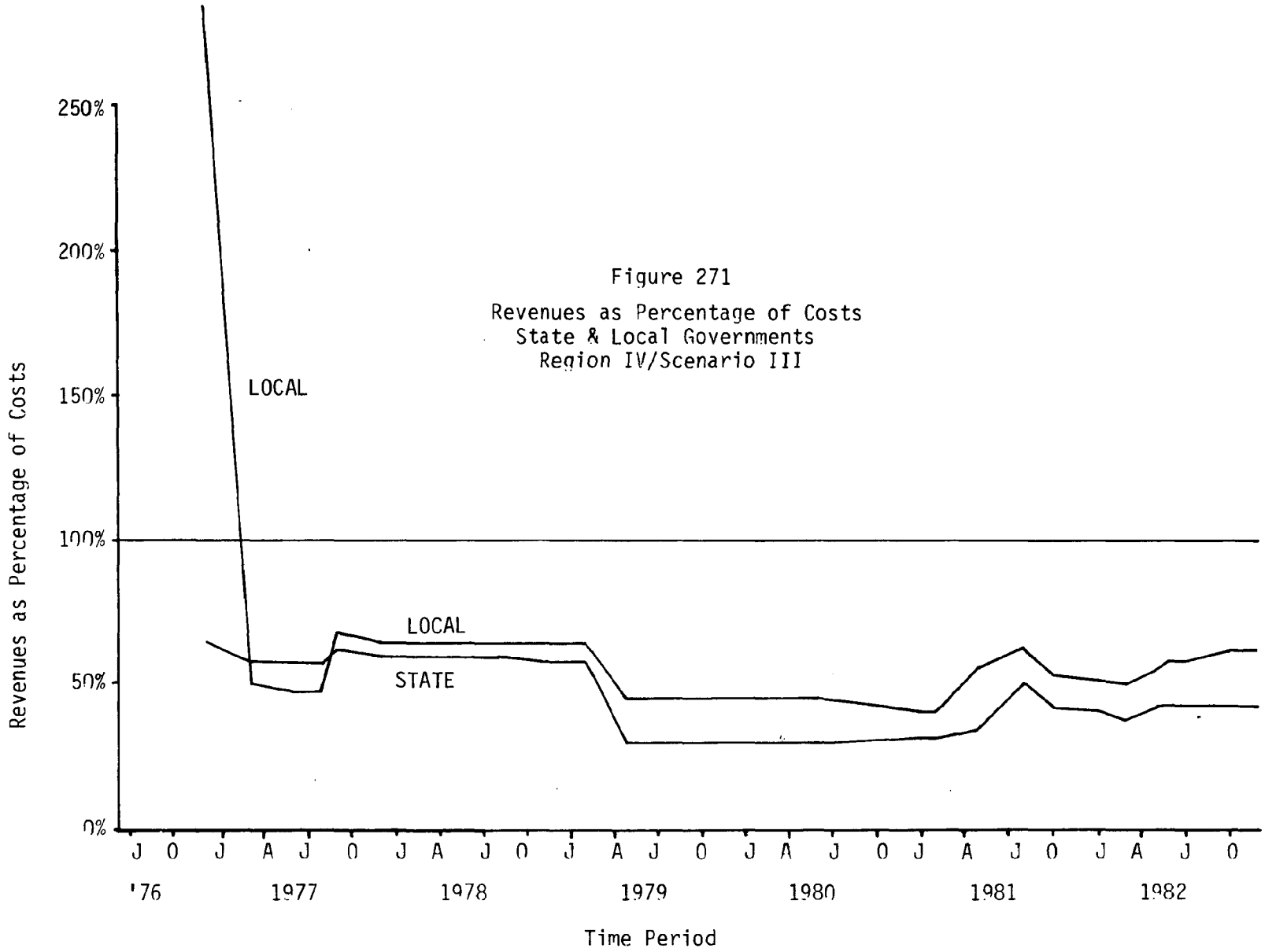


Figure 271

Revenues as Percentage of Costs
State & Local Governments
Region IV/Scenario III

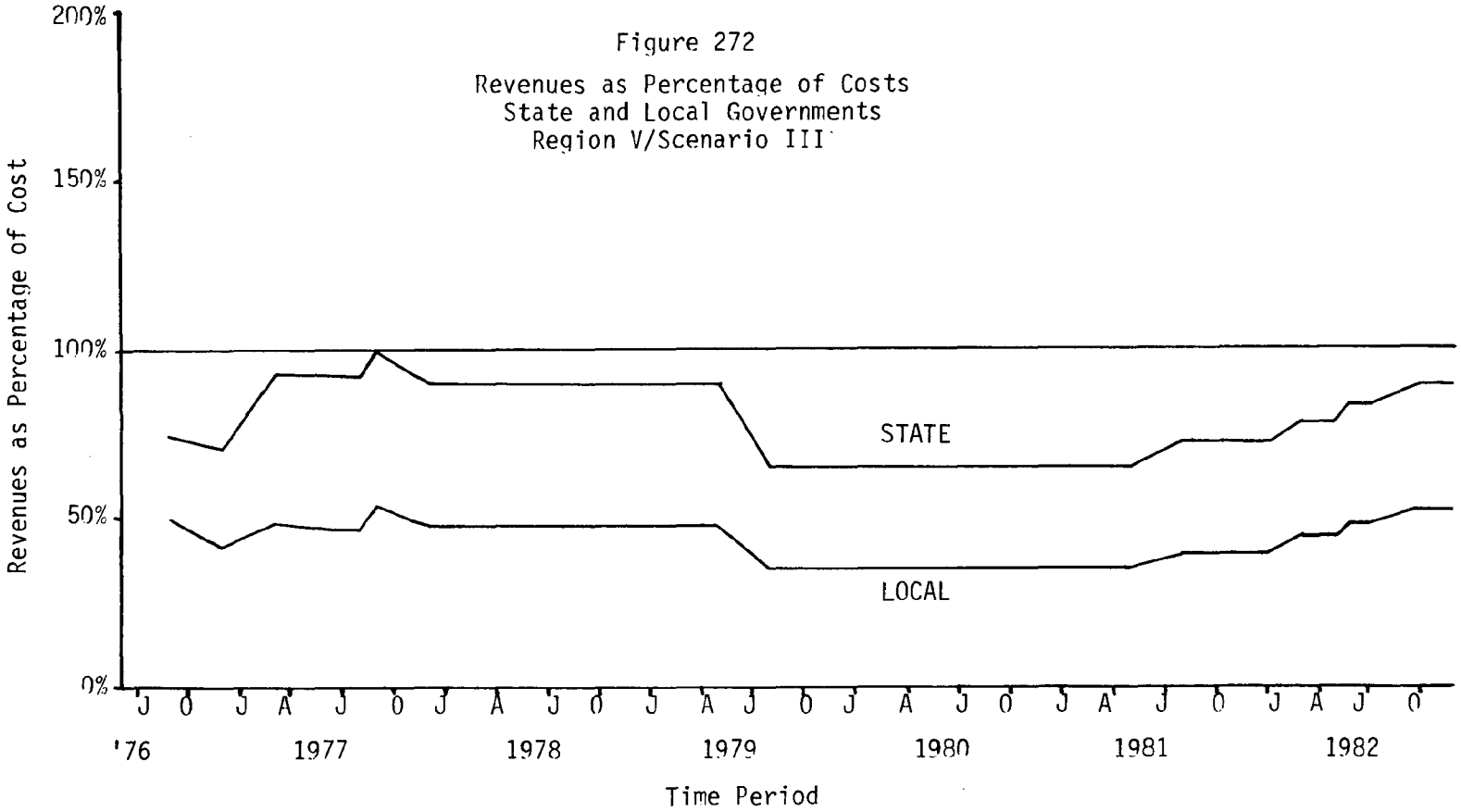


Figure 272
Revenues as Percentage of Costs
State and Local Governments
Region V/Scenario III
200%
150%
100%
50%
0%
Revenues as Percentage of Cost
STATE
LOCAL
J O J A J O J A J O J A J O J A J O J A J O J A J O
'76
1977
1978
1979
1980
1981
1982
Time Period

Figure 273

Revenues As Percentage Of Costs
State and Local Governments
Region VI/Scenario III

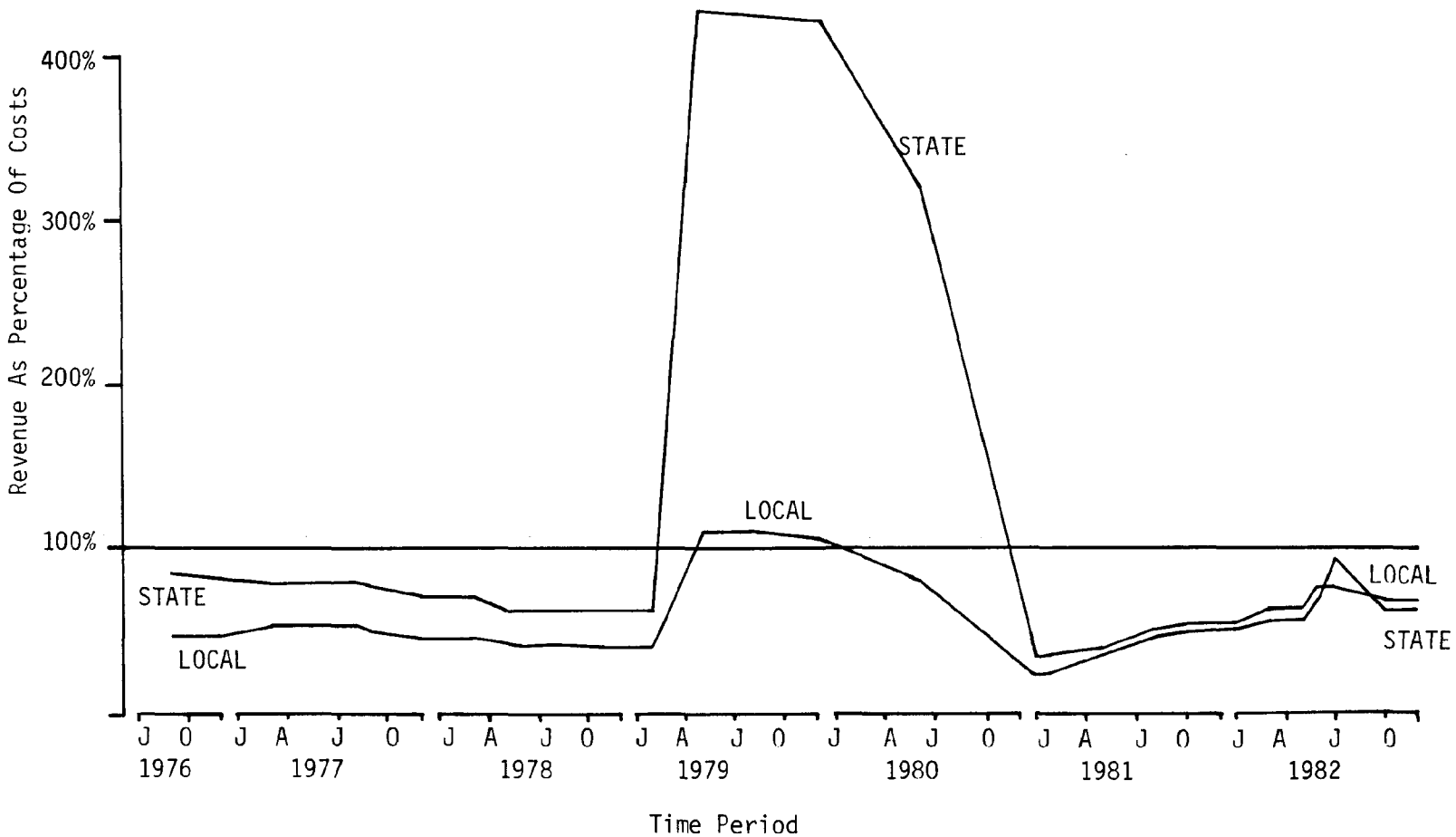


Figure 274

Revenues As Percentage Of Costs
State Government Combined For All Regions
Scenario III

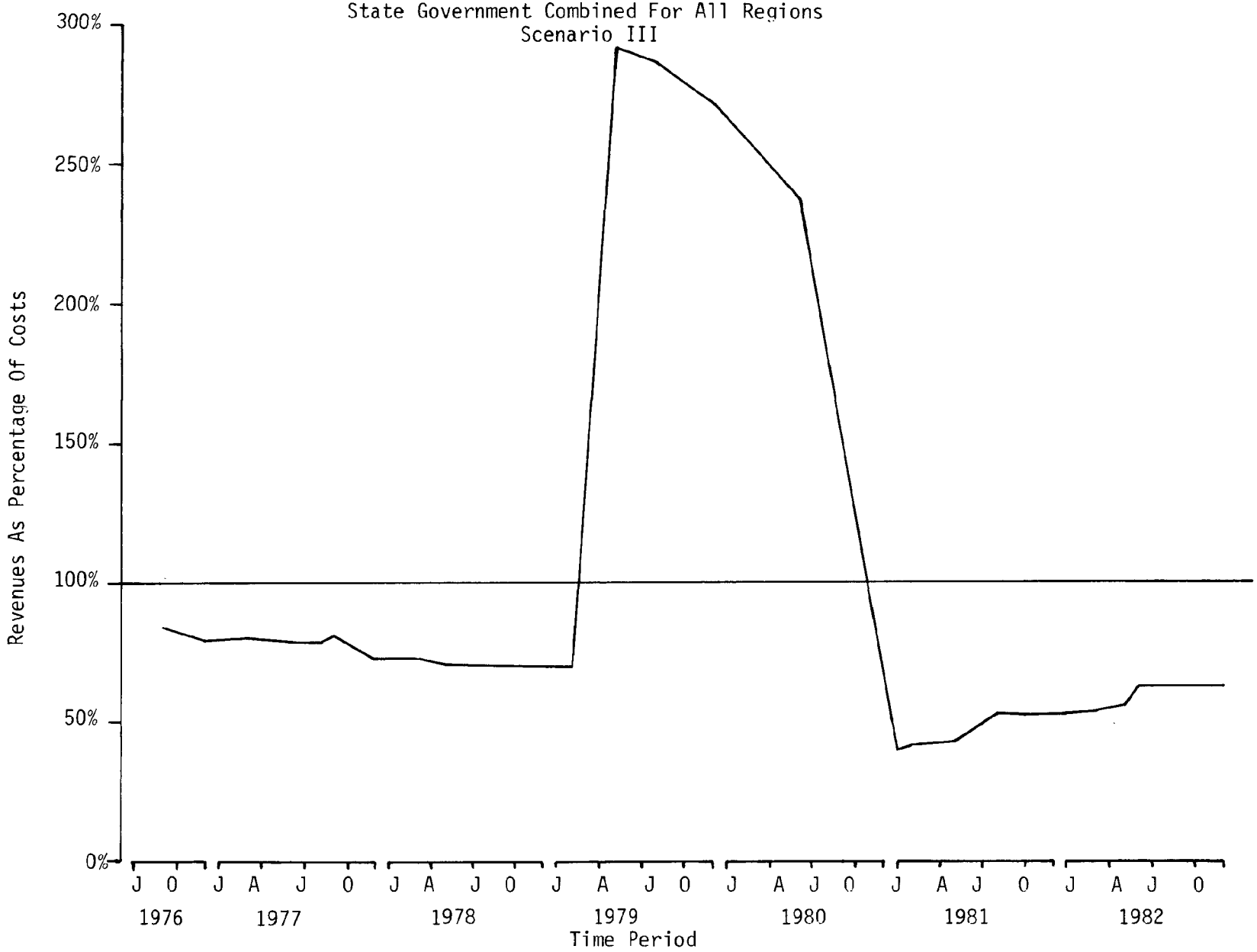


Figure 275

Fiscal Impact of Exploration, Development and Production Activities
Local Governments/Scenario III

Dollars Per Employee Per Year

A	B			C			D		
	Total Tax Multipliers [1]			Government Cost [2]			Tax Revenue Surplus or Deficit [3]		
Activity	Region IV	Region V	Region VI	Region IV	Region V	Region VI	Region IV	Region V	Region VI
Exploratory Rigs	189	255	213	359	324	446	(170)	(77)	(233)
Dockside Support	189	255	213	359	324	446	(170)	(77)	(233)
Development Drilling	189	NA [4]	213	359	NA	356	(170)	NA	(143)
Production Operation	189	NA	213	583	NA	446	(394)	NA	(233)
Onshore Support	189	NA	213	448	NA	446	(259)	NA	(233)
Operations Bases	189	NA	213	583	NA	446	(394)	NA	(233)
Administrative Bases	189	NA	213	583	NA	490	(394)	NA	(277)
Helicopters	2,606	NA	2,651	672	NA	624	1,934	NA	2,027
Boats	298	298	275	627	567	624	(329)	(269)	(349)
Well Logging	287	NA	157	538	NA	446	(251)	NA	(289)
Diving	NA	NA	312	NA	NA	535	NA	NA	(223)
Cement	267	NA	328	627	NA	535	(360)	NA	(207)
Mud	297	244	369	448	567	446	(151)	(323)	(77)
Oilfield Equipment	327	421	386	448	486	446	(121)	(65)	(60)
Pipeline Laying	NA	NA	1,573	NA	NA	446	NA	NA	1,127

1. Derived by adding the indirect tax multipliers in Figure 259 and the direct tax multipliers in Figure 257.

2. Calculated by multiplying the new resident employees as a percentage of employed (taken from Figure 240) by the increase in population per resident employee (assumed to be 2.7) by per capita government cost in Figure 266).

3. The net fiscal effect per employee per year is determined by subtracting Columns C from Columns B.

4. NA = not applicable in Scenario III.

Figure 276

Fiscal Imapct of Exploration, Development and Production Activities
State Government/Scenario III

Dollars Per Employee Per Year

A	B Total Tax Multipliers [1]			C Government Cost [2]			D Tax Revenue Surplus or Deficit [3]			
Activity	Region IV	Region V	Region VI	Region IV	Region V	Region VI	Region IV	Region V	Region VI	Combined[4]
Exploratory Rigs	203	288	213	268	203	274	(65)	85	(61)	(41)
Dockside Support	203	288	213	268	203	274	(65)	85	(61)	(41)
Development Drilling	203	NA [5]	213	268	NA	219	(65)	NA	(6)	(71)
Production Operation	203	NA	213	435	NA	274	(232)	NA	(61)	(293)
Onshore Support	203	NA	213	335	NA	274	(132)	NA	(61)	(193)
Operations Bases	203	NA	213	435	NA	274	(232)	NA	(61)	(293)
Administrative Bases	203	NA	213	435	NA	301	(232)	NA	(88)	(320)
Helicopters	445	NA	518	502	NA	384	(57)	NA	134	77
Boats	282	282	291	469	335	384	(187)	(73)	(93)	(353)
Well Logging	455	NA	246	402	NA	274	53	NA	(28)	25
Diving	NA	NA	227	NA	NA	329	NA	NA	(102)	(102)
Cement	481	NA	571	469	NA	329	12	NA	242	254
Mud	558	443	677	335	335	274	223	88	403	714
Oilfield Equipment	447	592	544	335	304	274	112	288	270	670
Pipeline Laying	NA	NA	4,558	NA	NA	274	NA	NA	4,284	4,284

1. Derived by adding the indirect tax multipliers in Figure 245 and the direct tax multipliers in Figure 252.

2. Calculated by multiplying the new resident employees as a percentage of employed (taken from Figure 240) by the increase in population per resident employee (assumed to be 2.7) by per capita government cost in Figure 266).

3. The net fiscal effect per employee per year is determined by subtracting Columns C from Columns B.

4. The total equals the addition of impacts from Regions IV, V, and VI.

5. NA = not applicable in Scenario III.

The fiscal effects of the activities are not much more favorable to the State government, as Figure 276 shows. When the impact of each activity is aggregated for all regions, six provide the State with a revenue surplus. Revenues increase sharply in Region VI due to pipeline laying during 1979 and 1980. This activity channels $4,284 per employee per year into the State treasury. However, it is not postulated to occur in the other two regions, where continuous deficits occur. During the remaining time periods in Region VI, and during the entire period in Region IV and V, revenues often do not cover government costs.

Summary

Analysis of available data enable these conclusions to be drawn concerning the fiscal impact of OCS development upon State and local governments:

1. Each affected region in Scenario III has different postulated OCS-related activities, time periods during which they take place, and number of involved workers over time. These factors, when combined with varying tax multipliers and per capita service costs for each government unit, imply that no two governmental units will experience exactly the same fiscal effects. The dollar amounts consequently differ, although the revenue/cost ratio curves for Regions IV and V especially are similarly shaped.

2. The OCS-related activities were analyzed to determine their fiscal impact in terms of tax revenue surplus or deficit per employee per year. Primarily because local government costs per capita are at least thirty percent more than State costs per capita, there are more deficit activities on the local level than on the State level.

3. OCS development does not help local governments in the three study sites financially. Rather, it results in a widening dollar gap between added costs and revenues which will have to be met by decreased services, increased taxes, or federal impact aid, if the deficit were to cause the total budget to have a deficit.

15. ENVIRONMENTAL IMPACT ANALYSIS

General Environmental Impact Evaluation

This chapter, in accordance with the study methodology (Appendix A), describes the environmental effects likely to result from OCS activities in Scenario III. The categories of study included here are land, solid waste generation, water use and water quality, and air quality, which are procedurally described in the section "Environmental Impact Assessment" (Part B).

I. General Environmental Description

A. Climate

The climate of the Scenario III affected coastal regions is transitional between the humid, subtropical area to the north (described in Chapter 15, Part C) and the semi-arid area to the south and southwest (see Chapter 15, Part D). Figure 277 presents three general climatic parameters: normal annual precipitation and normal mean annual temperature (1941-1970 averages), and a typical wind current frequency diagram for an offshore 1° square quadrant. Toward the southern end of the Scenario III study regions, rainfall is characteristically erratic throughout the year. During the past 20 years there have been two major wet-dry cycles. Previous to 1955, wet and dry periods were not so marked nor were the periods so long.

The general inverse trend in precipitation and temperature across the regions results in a gradation of net deficit rainfall, following runoff and evapotranspiration, from 4 to 18 inches per year (north to south, respectively). Furthermore, to the north in the Matagorda Bay area, there is an average long-term expectency of 6½ years of drought conditions out of 10 years, while to the south in the Corpus Christi Bay area there is an average expectancy of 8 'drought' years out of 10 (Water For Preservation of Bays and Estuaries, 1967).

Like other areas of the Texas coastal zone, there is a high probability of tropical storms landing on this part of the coast, especially in August and September. Estimates of the likelihood of such a disaster in any year range from 12 to 16 percent, increasing in likelihood across the three regions (IV, V, and VI) to the north. There is a 7 percent chance of a tropical storm of such strength to be designated as a hurricane, and a 3 to 4 percent chance of a severe hurricane landing in these regions (Gulf Coast Program Research Report #1, 1976).

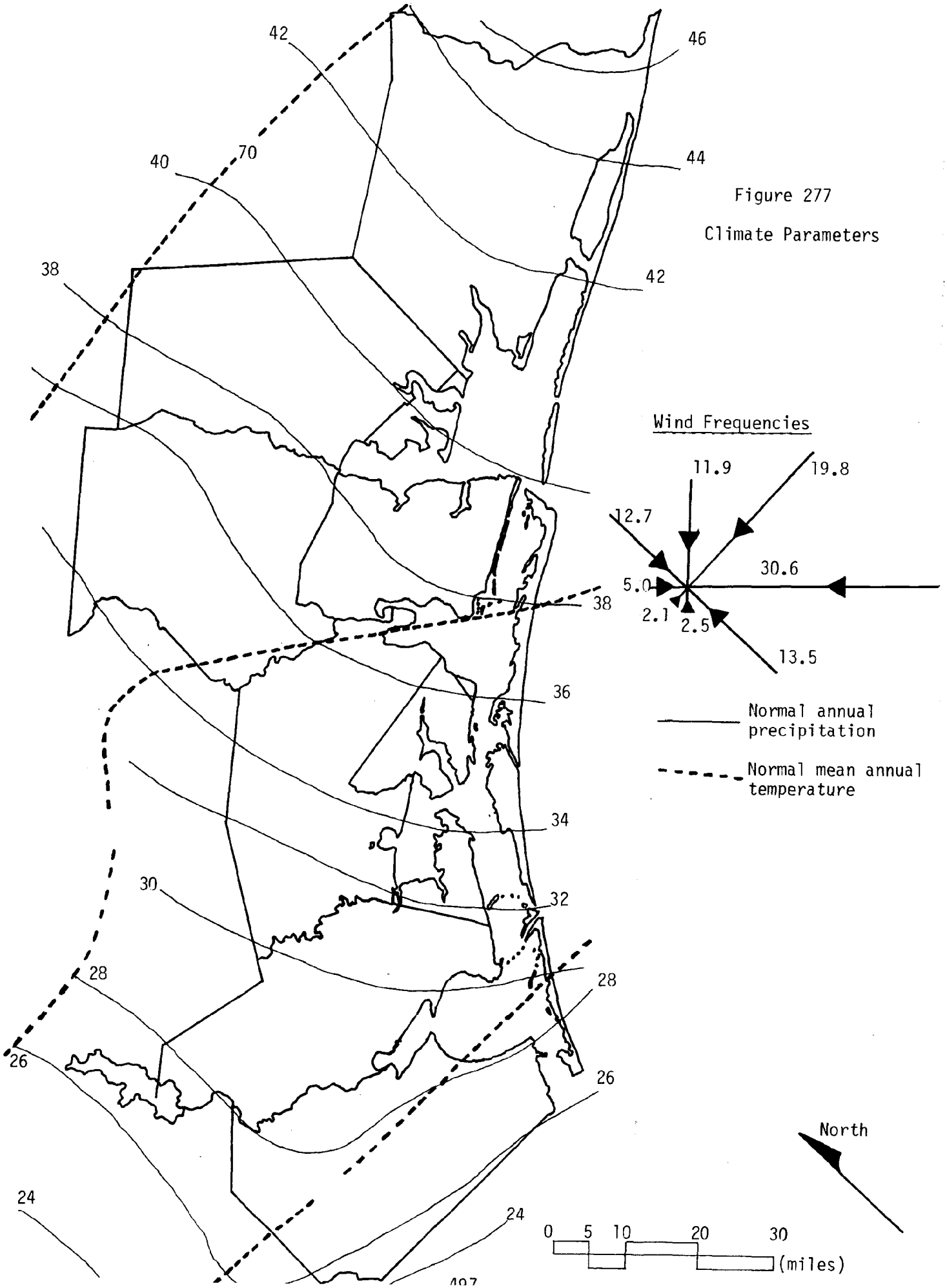


Figure 277

Climate Parameters

B. Water

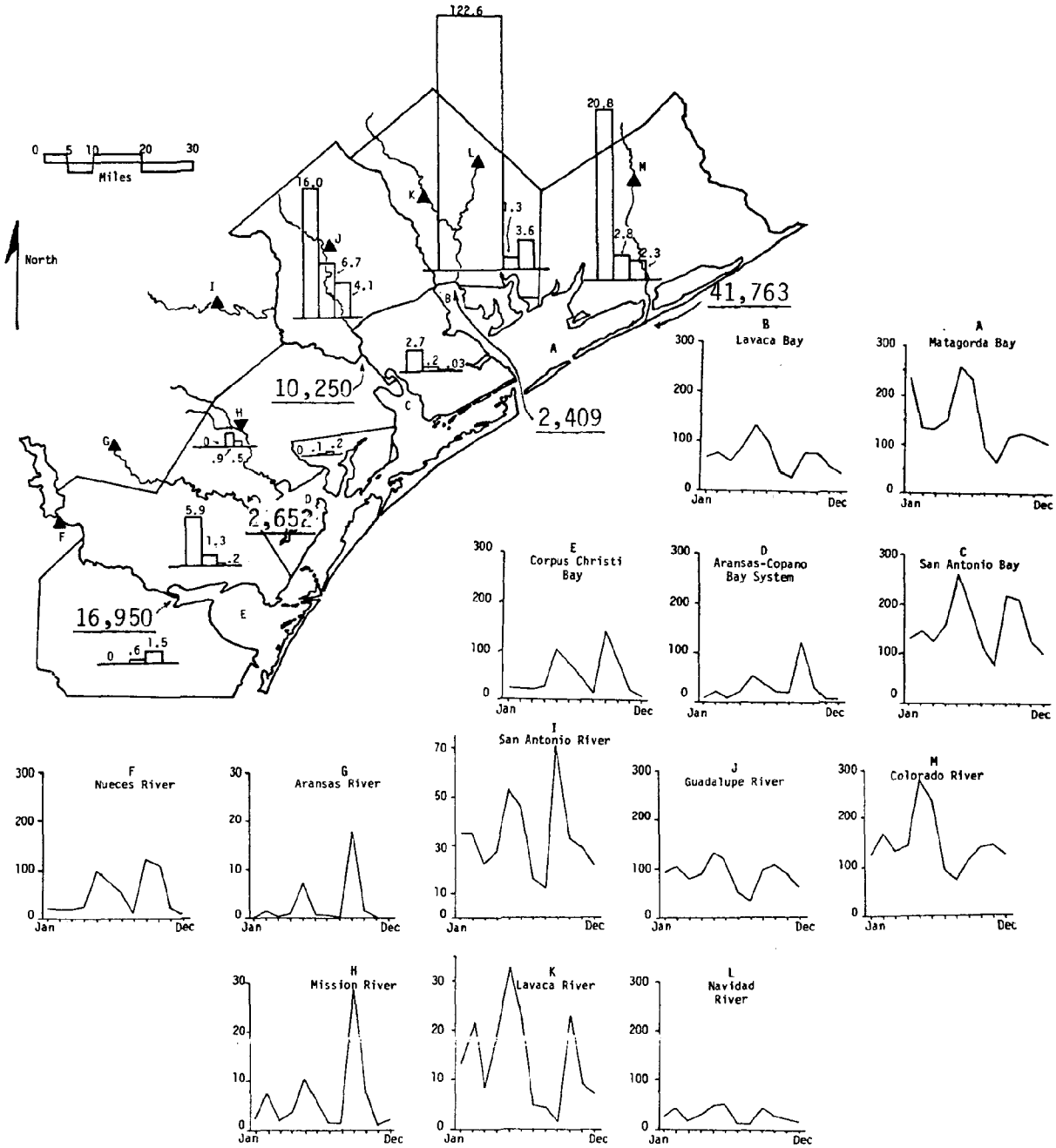
Of the six major river systems crossing the Scenario III regions, only the Colorado extends far inland. The drainage area of each river system, as estimated at their estuarine mouth, is presented in Figure 278. Although only one major reservoir impoundment currently exists near the coast (Corpus Christi Lake), as many as 10 reservoirs are now proposed or under construction. The flow volume of the rivers and the rate of inflow to their respective bay systems are also presented in Figure 278.

The Gulf Coastal Aquifer, composed of Pleistocene alluvial sands, is the major source of fresh groundwater in the regions. Toward the coast, however, the strata comprising the aquifer increase in dip and decrease in thickness. Some of the coastal counties fresh groundwater resources may be limited by the extent of natural salt-water encroachment. In addition to the major Gulf Coastal Aquifer, minor water table aquifers provide limited quantities of slightly to moderately saline groundwater. These perched aquifers are less than 50 feet thick and include Blackjack and Lamar Peninsulas in Aransas County and the seaward edge of mainland Calhoun County (which are relict Pleistocene barrier islands) as well as the modern offshore barrier islands. The major use of groundwater, as seen in Figure 278, is for irrigation of rice fields; the minor perched water table aquifers mainly supply livestock needs.

Four of the rivers have been designated as 'water quality segments' (see Figure 279), including Caney Creek above tidal influence in Region IV; its designation is based on noncompliant levels of dissolved oxygen, which fall below the standard for this stream segment. Also included are the San Antonio River bordering Regions IV and V, based on violations of Water Quality Board dissolved oxygen standard; and the Aransas River bordering Regions V and VI, based upon violated pH and dissolved oxygen standards. Finally, the Corpus Christi Inner Harbor has violated pH levels (too high), primarily resulting from industrial cooling water discharge.

Figure 279 also locates general areas which are experiencing noticeable extents of subsidence. The major areas in Jackson and Matagorda Counties are likely associated with large-scale groundwater withdrawal in these areas (see Figure 278) as well as, in part, with the withdrawals to the northeast (see Chapter 15, Part C). The subsidence area to the west of Nueces Bay is more related to oil extraction than groundwater pumpage, as mentioned in Chapter 15, Part D. Other problems related to large groundwater withdrawals (see Chapter 15, Part C) include, for coastal areas, salt-water encroachment, and well water level decline. The Texas Water Development Board has recommended that future major groundwater production in Matagorda

Figure 278. Water Resources

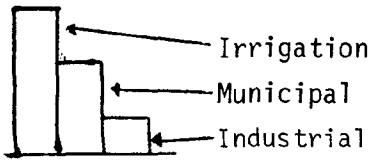


LEGEND

Graphs A-E, Mean monthly inflow (1950-1969) in thousands of acre-feet.

F-L, Mean monthly stream flow (1950-1969) in thousands of acre-feet.

10,250 - Areal extent of drainage basins at estuarine mouth (square miles)



Self-supplied groundwater by county, as labeled below. All units in thousands of acre-feet; area of histogram is proportional to total volume withdrawn. (1974 data, T.W.D.B.)

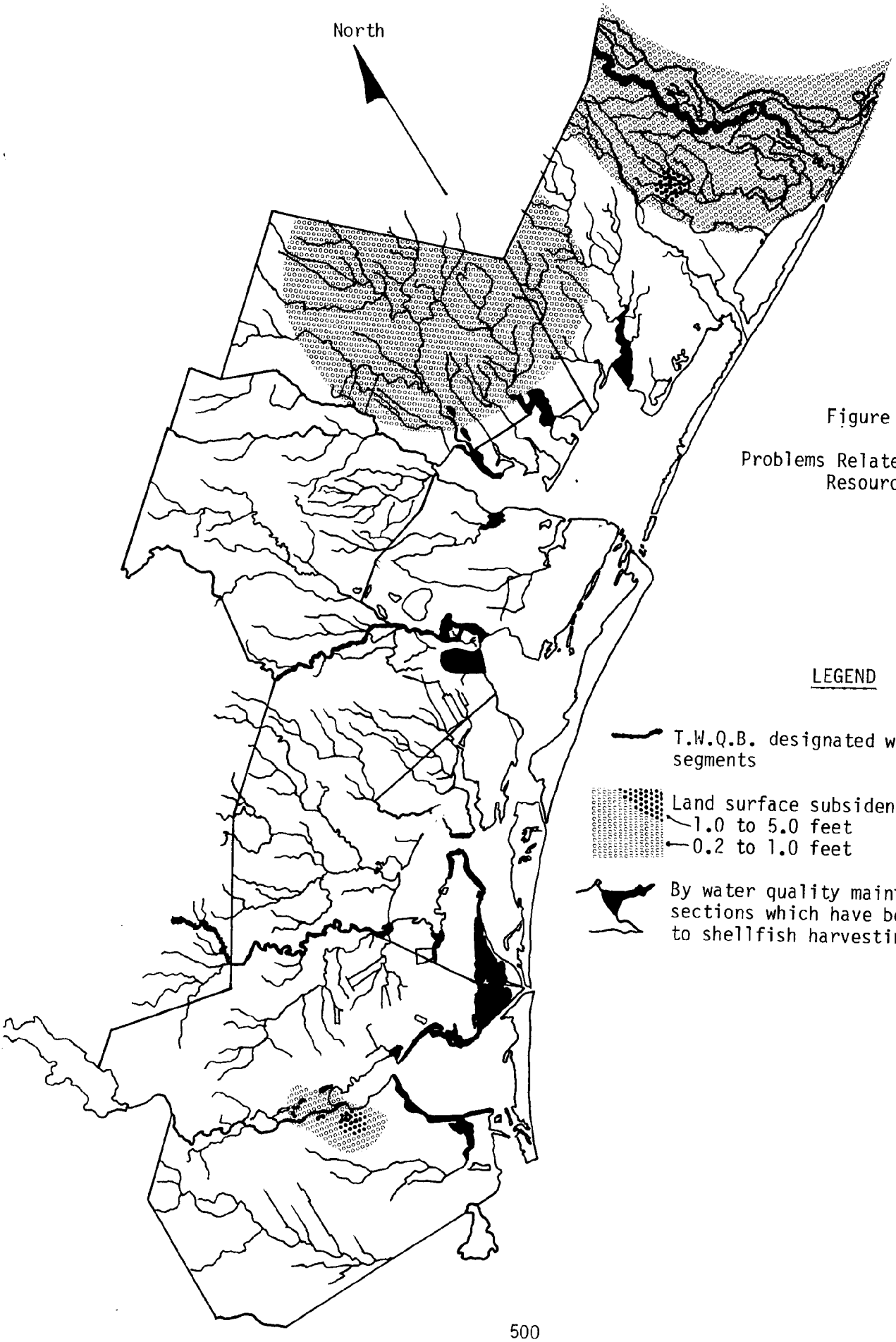


Figure 279

Problems Related to Water Resources

LEGEND

T.W.Q.B. designated water quality segments

Land surface subsidence:
1.0 to 5.0 feet
0.2 to 1.0 feet

By water quality maintenance sections which have been closed to shellfish harvesting.

County be limited as far inland as 15 miles, to minimize possible salt-water contamination. In the area bordering Jackson and Matagorda Counties, well water levels have shown the greatest amount of decline - more than 50 feet in the last 25 years (Groundwater Resources of Matagorda County, Groundwater Resources of Jackson County).

The present shape of the coastal bays represents the results of relative sea-level rise since the last glacial episode, the drowning of coastal river valleys, and the sedimentary filling of the drowned estuaries. Corpus Christi Bay and Matagorda Bay are two of the largest and deepest bays in the Texas coastal wetlands (Figure 280). Smaller passes across the barrier islands (not shown in Figure 280) have a tendency towards natural filling. Although oyster reefs are not as extensive in these regions' bays as in Galveston Bay, they effectively decrease water circulation in Espiritu Santo Bay and Copano Bay. Overall circulation in the bay complex, as shown in Figure 280, is dependent upon wind patterns, maintained Gulf passes, bay bathymetry, and flow obstructions such as oyster reefs.

Figure 281 illustrates patterns of extreme low and extreme high surface salinity in the bays. Extremes in salinity may often be found within the more enclosed, restricted bays or lagoons when weather patterns hold steady for long periods of time. As a parameter affecting wetlands biota, often a more stable salinity range is more important than any given salinity value. Favorable areas for the occurrence of finfish and shrimp and waterfowl are shown in Figure 282.

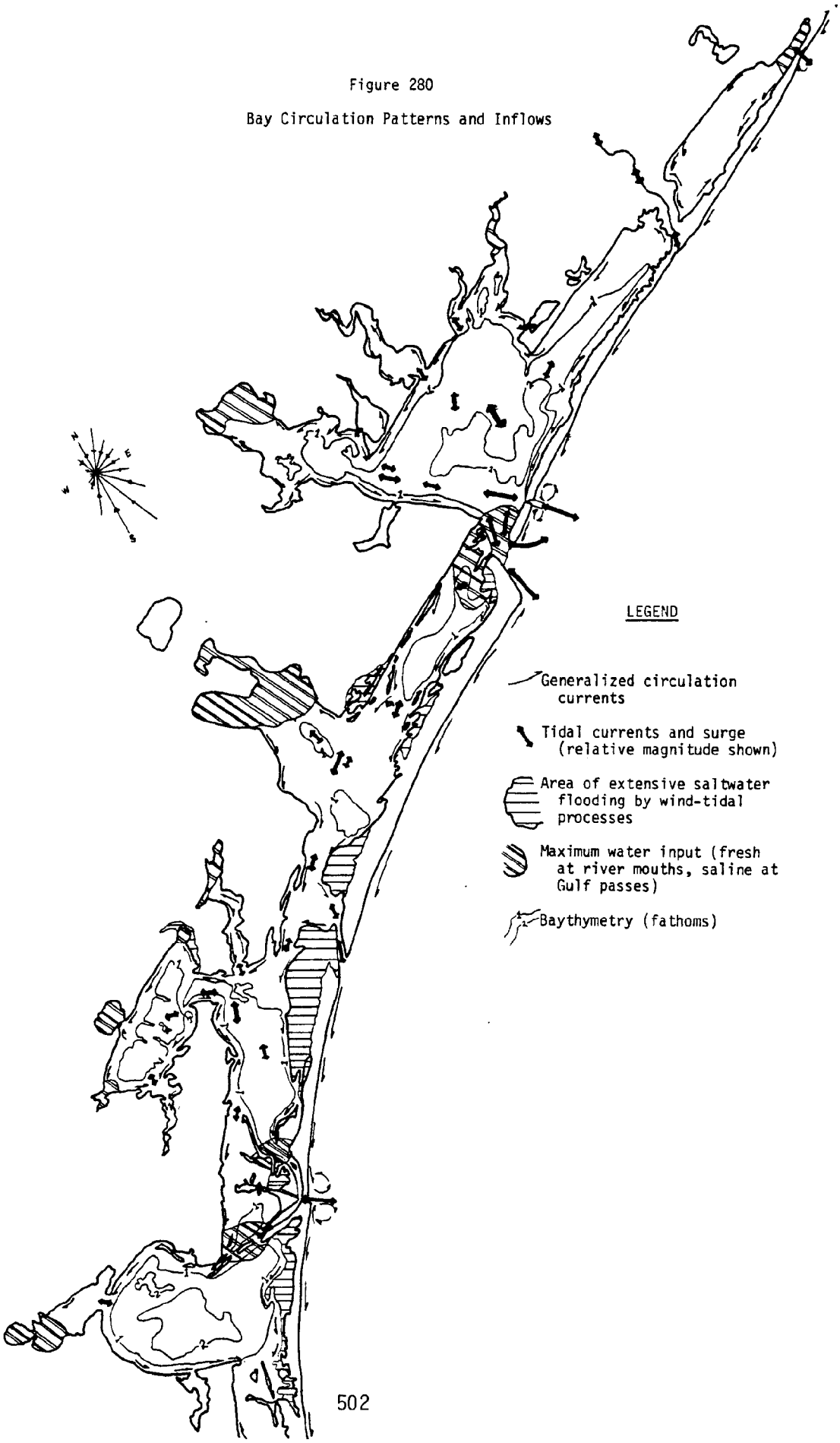
C. Land

The topography of the Scenario III study regions is characteristically a flat plain, with a gently seaward slope on the order of 2½ to 4 feet per mile. The maximum inland elevation is about 200 feet. Seventy-five percent of Region IV, 66% of Region V, and 57% of Region VI lies less than 60 feet above sea level.

Two main physical processes have dominated the Pleistocene development of the three regions of Scenario III, and thus the first 100-300 feet of subsurface sediment. Fluvial deltaic sedimentation was associated with the several rivers' channels and interdistributary depositional environments, as the rivers meandered across the ancient coastal plain. Shoreline processes left relict barrier island sand deposits now incorporated at the edge of the mainland from south of Corpus Christi Bay to Matagorda Bay, and in recent times have developed the modern barrier islands about six miles

Figure 280

Bay Circulation Patterns and Inflows



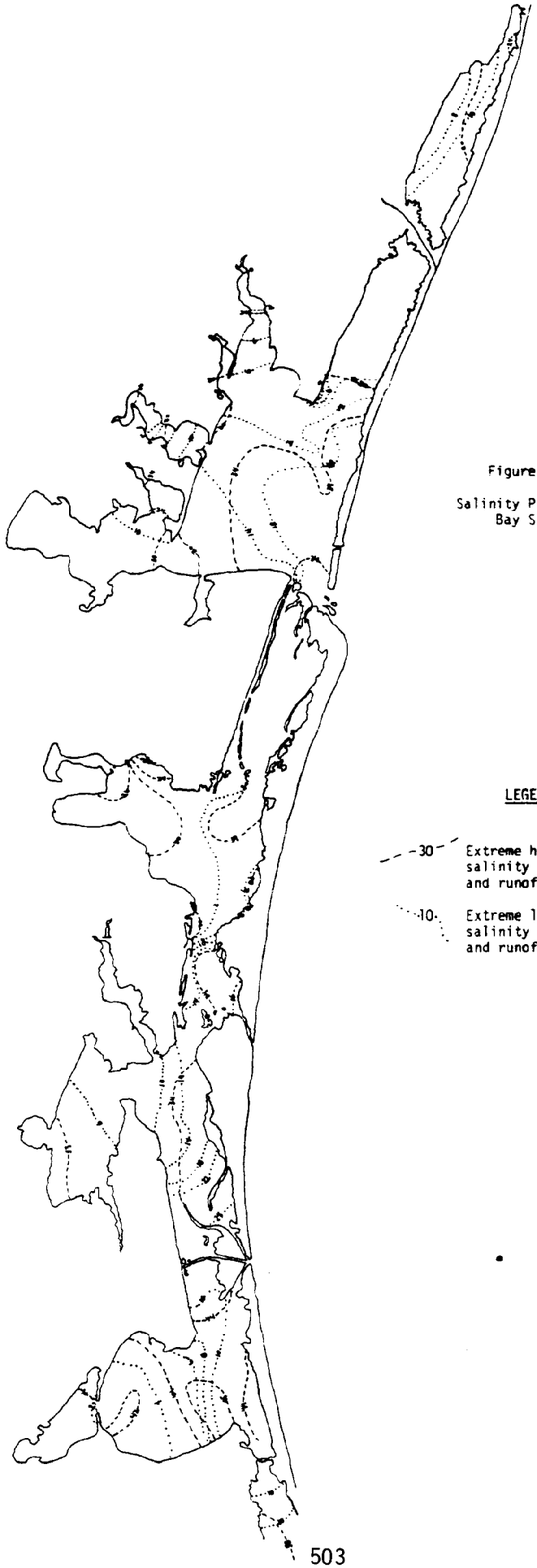


Figure 281

Salinity Patterns of Bay Systems

LEGEND

30 Extreme high surface salinity (low rainfall and runoff)

10 Extreme low surface salinity (high rainfall and runoff)

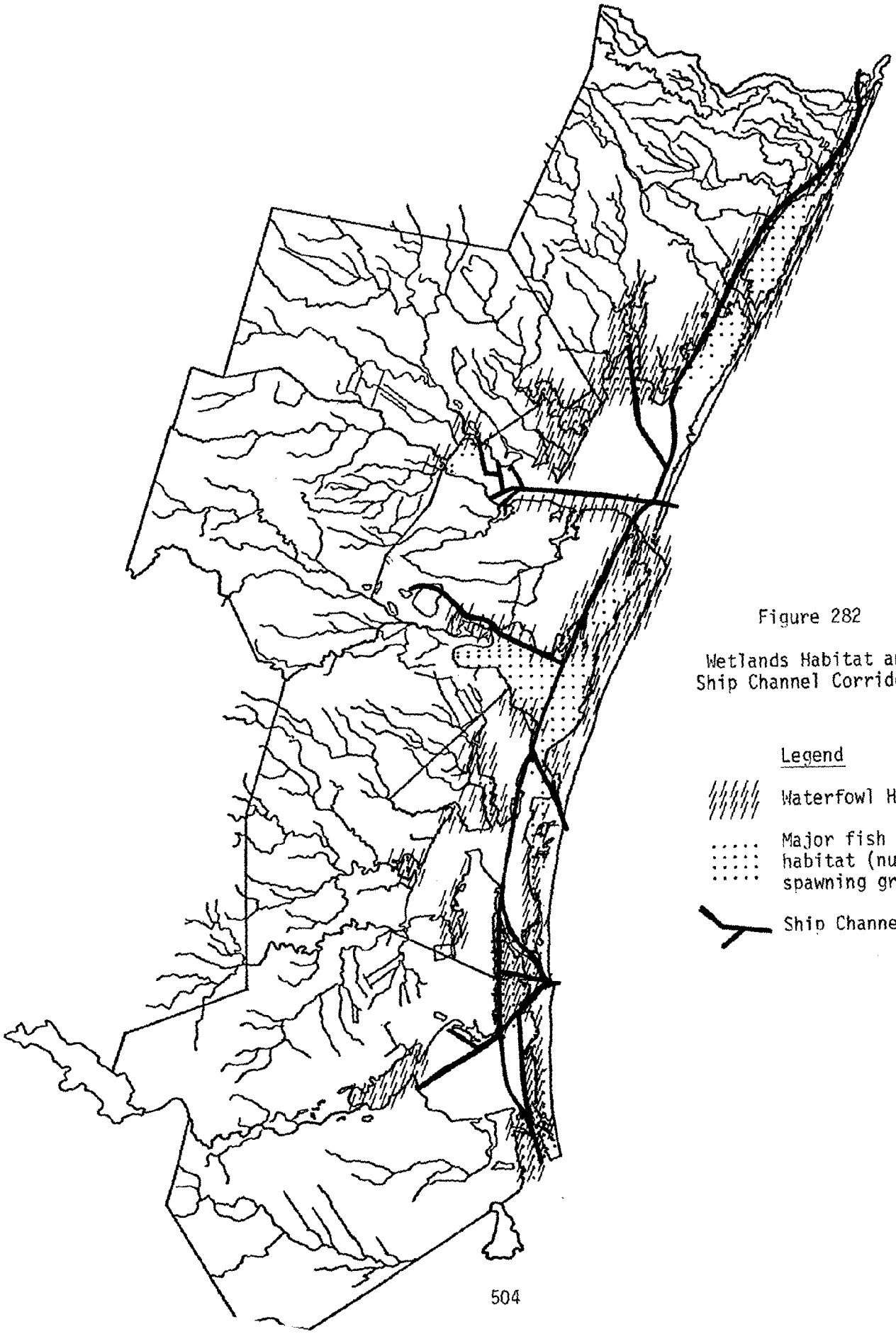


Figure 282

Wetlands Habitat and
Ship Channel Corridors

Legend

Waterfowl Habitat

Major fish or shrimp habitat (nursery and spawning grounds)

Ship Channel Corridors

offshore from the mainland. To the extent that these different geological environments have resulted in different sediments, the physical properties of the substrates may vary. Figure 283 lists those substrate units found in Regions IV, V, and VI, their physical properties, and their suitability to alternate human uses, as defined by the Texas Bureau of Economic Geology.

Figure 284 lists current acreage estimates of ten categories of land use in the three Scenario III regions. Figure 285 presents a land development inventory of selected portions of the three Scenario III regions, as described in the section "Environmental Impact Assessment," Part B. The total "other" land in Figure 285 is allocated into agricultural, range-pasture, woodland-timber, recreation, and marsh land usage.

Mainland shoreline patterns vary within the regions from low-lying marshes and grassflats to upland coastal prairie. Corpus Christi is the only major urban-industrial development along this stretch of the coastline. Most of the northwest shore of Aransas and Redfish Bays are well developed with the cities of Aransas Pass, Rockport, and Fulton. Around Copano Bay are scattered permanent houses, hunting and fishing camps, and farm buildings. The Aransas National Wildlife Refuge occupies Blackjack Peninsula. The shore of the San Antonio Bay complex is not, for the most part, developed. The north and northeast shores are low lying and not completely suitable for permanent structures.

Most of the perimeter of Matagorda Bay is sparsely populated marshland used for grazing, except at Port O'Connor and other small communities on the western shore. The western shore generally has sand and shell beach areas which are used for recreation if public access is available. Farm and ranchland border a large portion of Tres Palacios Bay. The bay shore of the town of Palacios is protected by a concrete seawall. The southeast shore of Lavaca Bay is low, undeveloped land. The remainder of the shore is made up of banks and bluffs to 25 feet high, except at river and creek mouth areas. The City of Port Lavaca is the largest populated area on the bay, with most of its shoreline protected against erosion. Point Comfort, across the bay from Port Lavaca, contains an aluminum plant and other industrial-urban developments.

Major deep draft port facilities exist at Corpus Christi and Harbor Island. In Region VI, there are 72 piers, wharves, and docks at the Port of Corpus Christi, 57 percent of which are privately owned. The public facilities are located in the main harbor at Corpus Christi. Ports at Ingleside, Harbor Island, and La Quinta are operated by private industries. There is more than 7,000 feet of docking space. Other port facilities in the Scenario III study regions include Gulf Intracoastal Waterway offchannel sites at Port O'Connor, Rockport, and Aransas Pass, as well as at Victoria, Port Lavaca on the Matagorda Ship Channel, and at Palacios (see Appendix H).

Figure 283

Evaluation of the natural suitability of physical properties groups for various coastal activities and land uses, Bay City-Freeport map area, Texas.*

Suitability is evaluated on the basis of natural properties and may be improved by special engineering and construction methods. Significant properties considered as positive criteria for evaluating land use suitability (+ = satisfactory; – = unsatisfactory; 0 = possible problems).

(1) Road construction: Earthen structures and fill material–low shrink-swell potential, low compressibility, and low plasticity.
(2) Road construction: Base material–low compressibility, low shrink-swell potential, and high shear strength.
(3) Road construction: Grade material–low compressibility, low shrink-swell potential, and high shear strength.
(4) Fill material: Topsoil–loam or sandy/silty clay composition.
(5) Fill material: General, below topsoil–silty/sandy clay composition with low to moderate shrink-swell potential.
(6) Foundation: Heavy–high load-bearing strength, low shrink-swell potential, and good drainage.
(7) Foundation: Light–low shrink-swell potential.
(8) Underground installations: Low shrink-swell potential, high load-bearing strength, and good drainage.
(9) Buried cables and pipes: Low shrink-swell potential and low corrosivity.
(10) Excavatability: Ease of digging with conventional machinery.
(11) Waste disposal: Septic systems–moderate permeability, low to moderate shrink-swell potential, and good subsurface drainage.
(12) Waste disposal: Solid waste–low permeability and good surface drainage.
(13) Waste disposal: Unlined liquid-waste retention ponds–low permeability.
(14) Water storage: Earthen dams and dikes–low permeability, moderate shear strength, and moderate compressibility.
(15) Water storage: Unlined reservoirs or ponds above ground-water level–low permeability.
(16) Water storage: Reservoirs or ponds supplied by ground water–high permeability.

GENERAL PHYSICAL PROPERTIES	PRINCIPAL ENVIRONMENTAL GEOLOGIC MAP UNIT	Coastal Activities and Land Uses															
		Road Construction			Fill Material		Foundation					Waste Disposal			Water Storage		
		(1) Earthen structures and fill material	(2) Base material	(3) Grade material	(4) Topsoil	(5) General, below topsoil	(6) Heavy	(7) Light	(8) Underground installations	(9) Buried cables and pipes	(10) Excavatability	(11) Septic systems	(12) Solid waste	(13) Unlined liquid-waste retention ponds	(14) Earthen dams and dikes	(15) Unlined reservoirs or ponds above ground-water level	(16) Reservoirs or ponds supplied by ground water
Group I Dominantly clay and mud, low permeability, high water-holding capacity, high compressibility, high to very high shrink-swell potential, poor drainage, level to depressed relief, low shear strength, high plasticity, high to very high acidity, high corrosivity	Interdistributary muds, abandoned channel-fill muds, overbank fluvial muds, mud-filled coastal lakes and tidal creeks, mud veneer over reworked delta facies	–	–	–	0	–	–	0	–	–	+	–	+	+	0	+	–
Group II Dominantly sand, high to very high permeability, low water-holding capacity, low compressibility, low shrink-swell potential, good drainage, low ridge and depressed relief, high shear strength, low plasticity	Beach, beach ridges, low fore-island dunes, vegetated shell ramp and barrier flat, wash-over fan, point bars, and wind-tidal flats	+	+	+	0	+	+	+	+	+	+	0	–	–	–	–	+
Group III Dominantly clayey sand and silt, moderate permeability, drainage, and water-holding capacity, low to moderate compressibility and shrink-swell potential, level relief with local mounds and ridges, high shear strength	Meanderbelt sands, levee, crevasse splay, and distributary sands, and Pleistocene fluvial, distributary, and delta-front sands	+	+	+	+	+	0	+	0	+	+	+	0	0	+	0	0
Group IV Coastal marsh, fresh to brackish, very low permeability, high water-holding capacity, very poor drainage, depressed relief, low shear strength, high plasticity, high organic content, subject to salt-water flooding, high to very high corrosivity	Fresh to brackish marsh, marsh-filled abandoned coastal lakes and tidal creeks	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Group V Inland swamp and marsh, permanently high water table, very low permeability, high water-holding capacity, very poor drainage, very poor load-bearing strength, high organic content, subject to frequent flooding, very high acidity	Swamp, inland marsh, and marsh-filled channels	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Group VI Salt marsh, permanently high water table, very low permeability, high water-holding capacity, very poor drainage, very poor load-bearing strength, very high corrosivity, subject to frequent tidal inundations	Salt marsh	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Group VII Made land and spoil, properties highly variable, mixed mud, silt, and sand, reworked spoil commonly sandy and moderately sorted with properties similar to those of Group III	Subaerial spoil heaps or mounds, subaerial reworked spoil, subaqueous spoil, made land	HIGHLY VARIABLE: USE WITH CAUTION															

(from: Environmental Geologic Atlas, Texas Coastal Zone, University of Texas Bureau of Economic Geology)

Figure 284

Current Land Use (Acres) in Scenario III Affected Study Sites

	Use	Region IV	Region V	Region VI
1.	Residential-Urban, Commercial, Residential Development	14,342	8,640	27,264
2.	Industrial, Railyards, Docks	2,304	640	6,080
3.	Undeveloped, Greenbelts, Cemeteries, Undifferentiated Land	3,072	64	2,816
4.	Parks and Recreation	960	640	7,232
5.	Sewage Disposal	1,020	165	1,260
6.	Solid Waste	410	207	547
7.	Airfields	4,343	662	2,758
8.	Artificial Reservoirs	8,864	0	4,544
9.	Agriculture, Cultivated Land and Orchard	454,400	87,936	520,320
10.	Range-pasture, Uncultivated	875,072	464,448	161,280
TOTAL		1,364,787	563,402	734,101

Figure 285

Regional Land Development Inventory
(acres)

Region IV Totals (Bay City, Victoria, Port Lavaca, Port O'Conner)

	Group III	Group II	Group I	Made Land	Unsuitable	Total
Industrial	235	10	351	99	0	695
Residential-commercial	2,463	160	2,893	-	0	5,516
Other land	4,372	50	8,380	-	349	13,151
Total	7,070	220	11,624	99	0	19,013

Agriculture*	Range-pasture	Woodland-timber	Recreation	Marsh	Other
7,859 (59%)	4,185 (32%)	0	629 (5%)	379 (3%)	99 (1%)

Prone to hurricane surge-tide flooding

*(Cropland and rangeland in Victoria area are pooled together within agriculture category.)

Region V Totals (Rockport)

	Group III	Group II	Group I	Made Land	Unsuitable	Total
Industrial	0	60	0	0	0	60
Residential-commercial	0	1,046	0	224	0	1,270
Other land	0	897	0	373	0	1,270
Total	0	2,003	0	597	0	2,600

Agriculture	Range-pasture	Woodland-timber	Recreation	Marsh	Other
0	523 (41%)	299 (24%)	224 (18%)	149 (12%)	75 (6%)

Prone to hurricane surge-tide flooding 1,893 (73%)

Region VI Totals (Corpus Christi, Ingleside, Aransas Pass, Harbor Island)

	Group III	Group II	Group I	Made Land	Unsuitable	Total
Industrial	1,419	564	1,419	2,083	552	6,007
Residential-commercial	8,469	4,783	9,964	0	0	23,216
Other land	18,732	17,336	30,889	1,295	2,292	70,544
Total	29,094	22,683	42,746	3,378	2,844	100,745

Agriculture	Range-pasture	Woodland-timber	Recreation	Marsh	Other
33,678 (48%)	18,532 (26%)	5,878 (8%)	3,787 (5%)	2,292 (3%)	6,377 (9%)

Prone to hurricane surge-tide flooding 13,152 (13%)

D. Waste Residuals

1. Solid Wastes

Figure 286 presents estimated solid waste generation by county in municipal, agricultural, and industrial activities. Municipal wastes are presented on a wet basis; on a dry basis they are assumed to be 75% combustible and 25% inert. Residential wastes include household garbage, lawn clippings, and miscellaneous furniture, appliances, etc. Commercial wastes include refuse from stores, markets, offices, schools, airports, etc. Also included in the municipal waste total are demolition and construction wastes and other wastes (street cleaning, treatment plant residues, dead animals, etc.). Agricultural wastes are presented on a dry weight basis and include estimates of livestock manure and field and crop waste. Industrial wastes are assumed to be 62% combustible and 38% inert and include heavy and light manufacturing wastes, food processing wastes, chemical and petroleum industry wastes, and other smaller categories where appropriate.

The values of Figure 286 represent basically one pattern of population size, type and extent of industrial activity, and agricultural base. Variations certainly exist. In all three regions agricultural wastes exceed municipal wastes, which are in turn larger than industrial wastes generated. Whereas Region V produces the smallest net volume, agricultural wastes are proportionately much greater than industrial wastes. The agricultural:municipal:industrial waste ratios are, in Region IV-17:4:1, in Region V-101:13:1, and in Region VI-14:5:1.

The optimum conditions for sanitary landfill solid waste disposal in the Texas coastal area requires the dominantly mud and clay substrates of group I (Figure 283) with low permeability, high water holding capacity, poor drainage, low to depressed topographic relief, and away from active fluvial processes (Evaluation of Sanitary Landfill Sites, B.E.G., 1972). The percentage of operating sites meeting these criteria are, in Region IV-38%, in Region V-50%, and in Region VI-40%. Landfill operations under other conditions require more engineering maintenance and monitoring to minimize contamination of the locale's hydraulogic system. It will be seen elsewhere (Identification of Significant Issues) that there is sufficient disposal acreage currently available to suitably meet the waste volume demands of the Scenario III areas. The need for new solid waste disposal acreage for Port O'Connor is a special issue, related to the closing of Port O'Connor's open dump.

Figure 286

Estimates of Solid Waste Generation
(million pounds per year)

	1. Residential	2. Commercial	3. Total Municipal	4. Total Agricultural	5. Manufacturing	6. Total Industrial	GRAND TOTAL (3+4+6)
Matagorda	25.4	20.43	58.21	329.69	5.7	5.7	393.6
Jackson	11.8	8.4	25.04	273.67	0.77	0.77	299.48
Victoria	48.9	44.7	121.3	320.0	29.4	29.4	470.7
Calhoun	16.2	14.05	39.64	158.0	26.0	26.0	223.64
Refugio	8.64	6.33	18.63	267.98	0.22	0.22	286.83
Aransas	8.1	5.95	17.47	10.58	2.53	2.53	30.58
San Patricio	43.0	60.5	142.35	979.6	19.0	19.0	1,140.95
Nueces	217.0	303.0	715.7	1,224.82	173.4	173.4	2,113.92

2. Water Effluents

The total amount of wastewater and effluent loadings discharged by county gives an idea of the pollution potential of the drainage basins. Figure 287 presents such information for domestic and industrial wastewater discharges, based on actual reported discharge surveys by the Texas Water Development Board and the Texas Water Quality Board. Not included in the compilation are non-point sources, including agricultural runoff and groundwater outflow. Also not included are estimates of effluent sewage production for those areas not on regional water treatment systems. As was seen previously, there is not extensive stream pollution in the three regions, although there are several designated water quality segments (see Figure 279).

Figure 287

Wastewater Effluent Estimates by County

				Industrial Waste			Number of
	B.O.D.	T.S.S.	FLOW	B.O.D.	T.S.S.	Flow	Discharges
Matagorda	205	199	1.8	110	444	1.3	5
Jackson	81	185	0.5	-	-	-	3
Victoria	1,405	2,299	6.1	184	3,614	87	12
Calhoun	242	217	1.1	1,069	24,690	223	11
Refugio	78	255	0.4	-	-	-	3
Aransas	116	154	0.6	-	-	-	2
San Patricio	466	1,344	2.3	26	8	0.2	7
Nueces	2,185	6,537	23.6	8,260	17,571	250.1	28

B.O.D. - pounds/day
T.S.S. - pounds/day
Flow - cubic feet per second

3. Air Emissions

The comprehensiveness of atmospheric emissions data is basically poor. The emissions data presented in Figure 288 is self-reported by industry. Non-point source (or mobile) automobile emissions are not included. There are negligible levels of emissions of sulfur oxides in several counties.

Figure 288

Industrial Air Emissions Inventory
(thousand tons/year)

County	NOx	SOx	HC	CO	Particulates
Matagorda	17.2	-	12.1	-	-
Jackson	-	-	-	-	0.1
Victoria	4.6	-	1.7	2.3	0.5
Calhoun	77.4	-	49.9	-	7.8
Refugio	0.6	-	0.7	-	-
Aransas	0.3	-	13.7	152.2	0.3
San Patricio	84.3	0.8	2.6	0.8	2.9
Nueces	30.0	7.0	36.9	210.9	9.6

Figure 289 presents an estimated combined emissions source inventory for the entire Texas Coastal Zone. Gaseous emissions (NO_x, SO_x, HC, CO) account for 98 percent by weight of total emissions. Carbon monoxide is the highest single air pollutant, followed by hydrocarbons. Over 70% of CO emissions and roughly 50% of hydrocarbon emissions are due to automobiles. Industrial chemicals and petroleum refining account for over 84 percent of industrial processing emissions. Municipal incineration accounts for about 60 percent of the particulate and SO_x emissions in the solid waste disposal category. Aircraft emissions account for about 66% of particulate emissions in the transportation category.

Figure 289

Combined Emission Source Inventory

Emissions due to:	NOx	SOx	HC	CO	Particulates
Fuel Combustion	38%	0.1%	10.1%	-	11.2%
Industrial Processing	23%	95%	36.8%	28%	27.1%
Solid Waste Disposal	.6%	.7%	1.7%	1%	40.5%
Transportation	38%	4.2%	15.3%	71.2%	18.4%

(From: Waste Management in the Texas Coastal Zone p. IV - 24)

It is difficult to accurately estimate current air quality impacts of non-point sources such as autos. However, two reports present estimates which may aid in setting such a perspective. An estimate of automobile emissions for Corpus Christi's downtown and industrial zone areas includes, in thousands of pounds per year, 177.3 - particulates, 1,679 - NO_x, 42.9 - SO_x, 1,185 - HC, and 11,850 - CO (Water Needs and Residuals Management). In the 18-county Corpus Christi Air Quality Maintenance Area, an estimated 74.97 million pounds of hydrocarbon emissions per year results from automobiles, compared to 4.8 times that amount for industries located in the same area (Texas Gulf Coast Program Research Report #1). Automobiles play a small but statistically significant role in atmospheric emissions, particularly of hydrocarbons and carbon monoxide.

The distribution of air quality monitoring stations across the Scenario III regions is insufficient to comprehensively describe ambient air quality. Only the Corpus Christi area seems to have serious air quality problems and frequent violations of standards. Studies have shown that the ozone levels related to photochemical atmospheric reactions have exceeded national standards in the Corpus Christi area including Nueces County. Also, particulate concentration and hydrocarbon emissions show probable or frequent violations of standards. Figure 195 presents an isopleth map of SO_2 concentration in the Corpus Christi area resulting from estimated low-level, non-point sources. The pattern represents transportation and industrial density and dominent wind disperson potential. It may be expected that other pollutant concentrations may follow a similar pattern.

Finally, the Corpus Christi S.M.S.A. has been designated as an air quality maintenance area by the E.P.A. Thus, there is a high priority requirement in this area for the reduction of photochemical oxidants and particulate matter to meet ambient air quality standards. Ultimately, stringent regulations may have a direct affect on the rate and form of urban and industrial growth in this region.

II. Impact Evaluation

A. Land

Land requirements over time in the Scenario III study regions are presented in Figure 290. In Regions IV and V, the first three months of the Scenario time span show land demand at slow rates of 1 and 7 acres per month. Subsequently demand accelerates to 29 and 37 acres per month, respectively. In Regions IV and V, following a 20-month

Figure 290

Scenario III Land Requirements

Time Period	LAND (acres) PRIMARY Regions IV	V	VI	INDIRECT* Regions IV	V	VI	RESIDENTIAL Regions IV	V	VI	TOTAL Regions IV	V	VI	DOCKING SPACE (feet) IV	V	VI
6/76- 9/76	0	0	20.5	0	20.4	70.5	0	0.6	5.5	0	21	96.5	0	300	300
9/76-12/76	0	1.5	20.5	2.9	160.6	84.5	0.1	3.4	6.5	3	165.5	111.5	300	300	600
12/76- 3/77	10.5	11	21	76	227.3	104.1	2	5.7	7.9	88.5	244	133	300	600	900
3/77- 6/77	10.5	11	21	76	227.3	104.1	2	5.7	7.9	88.5	244	133	300	600	900
6/77- 8/77	10.5	11	21	76	227.3	104.1	2	5.7	7.9	88.5	244	133	300	600	900
8/77- 9/77	10.5	11	22.5	79	268.8	152.2	2	6.2	9.8	91.5	286	184.5	600	600	1,200
9/77-12/77	10.5	11	22.5	78.9	268.2	151.3	2	6.8	10.7	91.5	286	184.5	600	600	1,200
12/77- 2/78	10.5	11	22.5	78.9	268.2	151.3	2.1	6.8	10.7	91.5	286	184.5	600	600	1,200
2/78- 3/78	10.5	11	22.5	78.9	268.2	151.3	2.1	6.8	10.7	91.5	286	184.5	600	600	1,200
3/78- 5/78	10.5	11	21	78.9	268.2	109.3	2.1	6.8	10.7	91.5	286	141	300	600	900
5/78- 6/78	10.5	11	21	78.9	268.2	109.3	2.1	6.8	10.7	91.5	286	141	300	600	900
6/78- 8/78	10.5	11	21	78.9	268.2	109.3	2.1	6.8	10.7	91.5	286	141	300	600	900
8/78-11/78	10.5	11	21	78.9	268.2	109.3	2.1	6.8	10.7	91.5	286	141	300	600	900
11/78- 2/79	10.5	11	21	78.9	268.2	109.3	2.1	6.8	10.7	91.5	286	141	300	600	900
2/79- 5/79	9	11	21	10.9	268.2	142.8	2.1	6.8	14.2	22	286	178	300	300	800
5/79- 8/79	9	9.5	21	10.9	146.2	179.7	2.1	6.8	14.3	22	162.5	215	0	300	700
8/79-12/79	9	9.5	19.5	10.9	146.2	136.7	2.1	6.8	14.3	22	162.5	170.5	0	0	400
12/79- 6/80	10	9.5	77	9.9	146.2	148.0	2.1	6.8	19	22	162.5	244	0	200	1,000
6/80- 1/81	67.5	9.5	78	69.9	146.2	75	4.1	6.8	19	141.5	162.5	172	0	600	1,000
1/81- 2/81	67.5	9.5	78	69.9	146.2	83	4.1	6.8	19	141.5	162.5	180	0	600	1,000
2/81- 5/81	69.5	9.5	82	98.3	146.2	94	4.7	6.8	19	172.5	162.5	195	200	1,200	1,800
5/81- 8/81	80	9.5	139.5	122.4	167.2	129	5.6	6.8	19	208	183.5	287.5	200	1,400	2,400
8/81-10/81	137.5	9.5	140.5	207.7	167.2	137	9.3	6.8	19	354.5	183.5	296.5	600	1,600	2,600
10/81-1/8	137.5	9.5	140.5	207.4	167.2	145	9.6	6.8	19	354.5	183.5	304.5	600	1,600	2,600
1/82- 3/82	138.5	9.5	151.5	220.1	188.2	171	9.9	6.8	19	368.5	204.5	341.5	800	1,800	3,000
3/82- 5/82	138.5	9.5	151.5	231.9	188.2	171	10.1	6.8	19	380.5	204.5	341.5	800	1,800	3,000
5/82- 6/82	139.5	9.5	163	246.7	208.2	198.3	10.3	6.8	19.7	396.5	224.5	381	1,000	2,000	3,400
6/82- 7/82	139.5	9.5	163	246.6	208.2	211.5	10.4	6.8	20.5	396.5	224.5	395	1,000	2,000	3,400
7/82-10/82	141.5	9.5	164	250.0	249.5	225.9	11.0	7.5	23.1	402.5	266.5	413	1,000	2,600	3,600
10/82-12/82	141.5	9.5	164	261.8	249.5	225.9	11.2	7.5	23.1	414.5	266.5	413	1,000	2,600	3,600

*Total indirect land minus residential land

period of no increased demand, total land required markedly drops to a fourth and half of previous levels in each respective region. After another 20-month lull period, total required land again gradually increases in these two regions at rates of 14 and 6 acres per month to the final maximum level of demand (Figure 291).

The pattern of total land demand rate in Region VI is somewhat different. After an immediate 3-month demand of 32 acres per month, decreasing to 6 acres per month for the following 6 months, the pattern of total demand markedly fluctuates with periods on the order of one to 1½ years for the next 5 years of the Scenario time span. Through this period of fluctuating demand, the average net demand can be seen to gradually increase. In the final two years of the Scenario, total land more consistently increases at a rate of 11 acres per month (Figure 291).

These patterns basically differ from those of the previously described Scenarios I and II, in which continuous brief increases are separated by longer periods seeing no further development. In those two Scenarios, it may be recalled, indirect land dominates the picture of total land requirements. This is also the case in Scenario III, except that the proportion of indirect land is 2 to 4 times greater than in the previous Scenarios, and that indirect land here shows such fluctuations, rather than the stable increases seen previously. As this Scenario III pattern of land demand rate appears somewhat novel in terms of all considered Scenarios, and because of the possibility of exacerbated land use impacts due to fluctuating rates of net demand, this pattern will be subsequently further evaluated in 'Special Environmental Issue Analysis'.

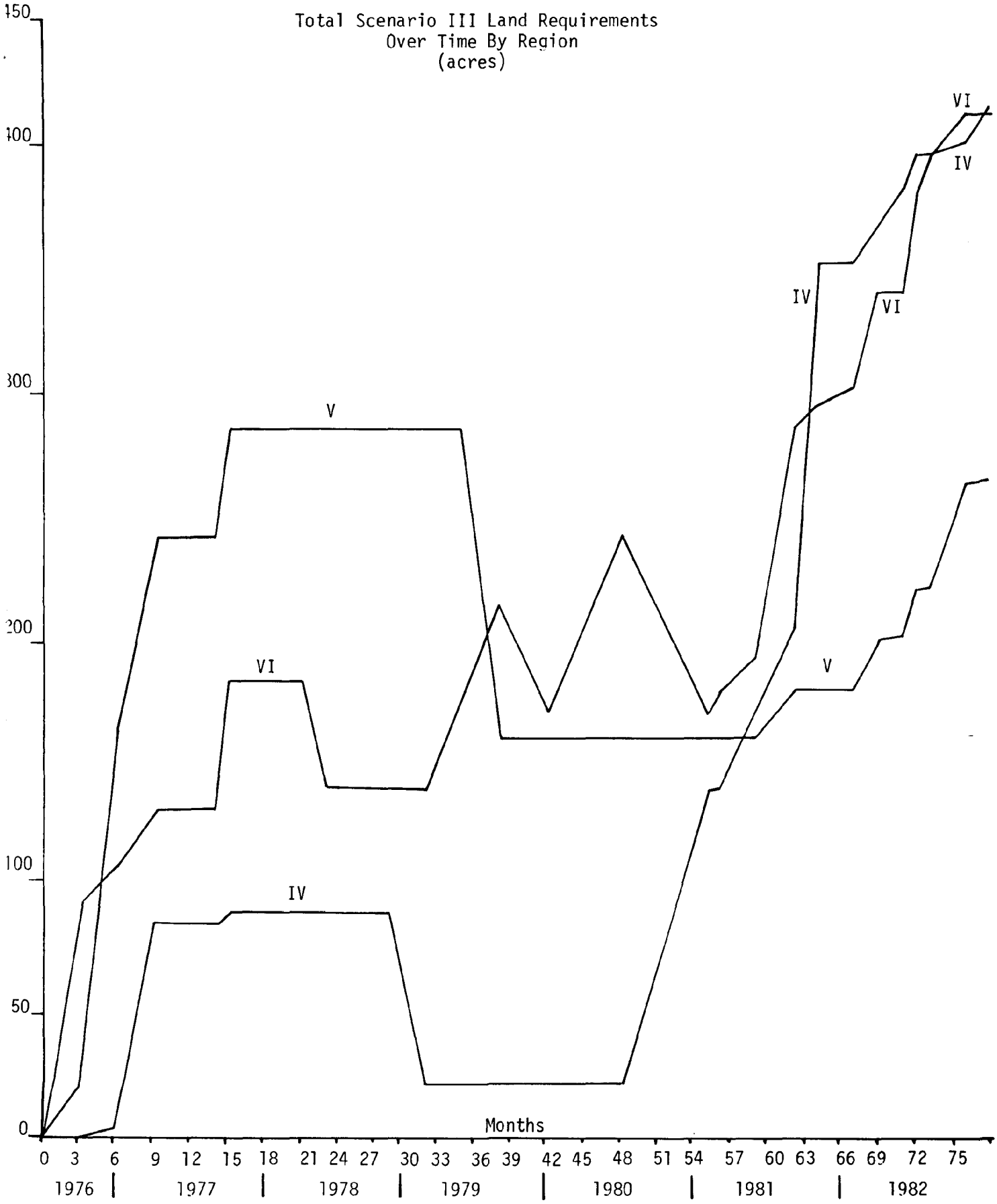
The following three sections evaluate the regions' ability to satisfy the net requirement of direct, residential, and indirect land in Scenario III.

1. Direct Land Requirements

As described in the section, "Environmental Impact Assessment," Part B of this report, the substrate group most suitable for most direct OCS land uses is group III, group II, or reclaimed land made suitable (see Figure 283). There are three conditions under which all or part of the direct land requirements may be met on suitable substrates: (1) there may be open, undeveloped tracts zoned for industrial use; (2) there may be vacant albeit developed facilities available for lease or sale; or (3) existing companies may have 'buffer land' about current plant sites and into which they may expand. Figure 285 presents a baseline regional land development

Figure 291

Total Scenario III Land Requirements
Over Time By Region
(acres)



inventory by substrate group for the communties to which a sub-allocation of requirements was previously made.

If all direct land requirements, given Scenario III postulations, can be met within currently designated industrial areas in a manner as described above, then in Region IV it is seen that the final and maximum land requirement is 41% of such suitable industrial land areas inventoried in the cities to which a sub-allocation of requirements has been made. Furthermore, the final requirement (141.5 acres) is 6% of all industrial land in Region IV, irrespective of location and suitability, and more than 3% of suitable land now in uses 'other' than industrial-residential (see Figures 284 and 285). This perspective on proportional increases in industrial land usage in Region IV suggests that there may be possible important impacts; therefore this will be discussed in greater detail in 'Special Environmental Issue Analysis'.

If all direct land requirements allocated to Region V can be met in a manner as described above, the final and maximum land demand (9.5 acres) is 16% of such suitable land as has been inventoried, 0.7% of 'other' suitable land (see Figure 285), and only 1.4% of total industrial land in the region. Although the region is mostly rural and not intensively developed, it has had a history of onshore oil and gas development. Furthermore, although the Corpus Christi area to the south dominates the area's concentration of oil field-related companies, such enterprises do exist in Region V. Therefore, because the net direct land demand is less than 10 acres, it may be reasonably assumed that no significant industrial land use impacts will occur in Region V due to Scenario III activities.

In Region VI, which includes the Corpus Christi area, the final maximum demand is for 164 acres, which is only 4 percent of available and suitable land if the demand is met as described above. It may be assumed that this direct land requirement will not in itself pose environmental problems.

The maximum required docking space in Scenario III is 1000 feet in Region IV, 2600 feet in Region V, and 3600 feet in Region VI. It should be noted that this is the maximum footage required; the amount in use at any time must be considerably less. The proportionate impact of these docking requirements upon current facilities depends upon the residence time that OCS-involved vessels are in port, the intensity of current use of available port facilities, and the available water frontage which is already owned and developable by harbor authorities in each region. All three regions have historically depended upon their port activities for a significant share of their regional income, and it may be assumed that OCS docking needs will not pose any immediate environmental impacts.

2. Residential Land Requirements

It is assumed that all residential land requirements will be met within the municipalities inventoried in Figure 285, as described in the section of Part B, 'Environmental Impact Assessment.' The substrate needs for suitable residential development, i.e., development with minimal foundation problems, are less restricted than for industrial development as there is generally less loading force superimposed on building foundations.

The residential land development demand resulting from Scenario III is a very small proportion of currently available and suitable residential land (0.2% in Region IV, 0.7% in Region V, 0.1% in Region VI). However, as will be seen subsequently in 'Identification of Issues', there are housing problems in Bay City and Port O'Connor (Region IV), and in Aransas Pass (Region VI). These problems in Port O'Connor and Aransas Pass appear to be more related to supply of finished dwelling units than to developable real estate. Possible secondary environmental affects related to residential land development in these communities will be further discussed later in 'Special Environmental Issue Analysis'.

3. Indirect Land Requirements

The final and maximum indirect land requirements in Regions IV, V, and VI are 261.8 acres, 249.5 acres, and 225 acres, respectively (Figure 290). These requirements include unspecified amounts of land for industrial and commercial uses, vacant or undeveloped land, parks and recreation areas, sewage and solid waste disposal sites, airfields, and artificial reservoirs. In short, all of the indirect land use categories listed in Chapter 5 of this Part, except for residential land, are included.

As previously mentioned, net indirect land requirements fluctuate markedly in all three Scenario III regions. The amount of indirect land does not increase proportionately with direct land needs, as the former is calibrated to net direct OCS Scenario employment. Direct, or primary, activities do not proportionately relate land use and employment. The possibility of exacerbated land use impacts due to such fluctuating rates of net indirect land will be further evaluated in 'Special Environmental Issue Analysis'.

Treated as a unit, the indirect land uses have different substrate requirements, as described in Figure 16 of Part B, yet most require or prefer properties of Groups I and III (see also Figure 283). A visual comparison of the maximum indirect land requirements with the amount of 'other' land in each region characterized by these

two suitability classes (Figure 285) indicates that there is ample land to meet the requirements in Regions V and VI. In Region IV, indirect land requires 2% of the inventoried suitable 'other' land, which may exacerbate the impacts already described for direct and residential land needs.

To the extent that a major portion of the indirect land in Region IV is industrially comprised, the previously described direct land impacts would be increased.

Parks and recreational facilities in several of the Scenario III affected communities are noted to be below standards used to identify special issues in the section 'Significant Infrastructural Issues' (see Chapters 17 and 18, Part E). A portion of the indirect land requirements may be assumed to be given to making up this deficit.

It will be seen later that solid waste disposal acreage required for direct and indirect OCS-related solid waste generation is 1.6% of indirect land in Region IV, in Region V - 3.8%, and in Region VI - 1.6%. It will be seen, however that these disposal acreage requirements need not be assumed to involve important impacts on currently available disposal sites, except perhaps in the case of Port O'Connor.

B. Solid Waste Generation

Direct OCS related industries may be grouped into four categories on the basis of similarity of solid waste production: (1) offshore rig and platform activities; (2) dockside support for rigs and platforms; (3) operations and administrative bases, well-logging and diving services, and oil field equipment suppliers; and (4) cement and mud supply companies.

Waste materials produced by offshore activities, including galley, paper, glass, metal, and other wastes, have been estimated to be 4.5 pounds per worker per day (BLM OCS lease sale #40). In the last year of the Scenario time span, maximum offshore employment occurs during development drilling and production operations. In this year, using the above coefficient, 199.12 thousand pounds of solid waste would be produced. By OCS Order #7, such solid waste materials must be transported to shore for disposal, and it is assumed that such onshore removal will occur in the regional proportion of onshore support for platforms, as postulated for Scenario III. Therefore, Region IV and Region VI would each receive 50% of this amount (see Figure 224), or 99.56 thousand pounds. As will be seen later, this generated offshore waste will add another 3.4% and 1.4% to generated onshore indirect industrial and municipal wastes in Regions IV and VI, respectively.

Waste production by the other three direct OCS activities listed above is not quantified, but is treated here to give a perspective of the type of waste which each may produce. It is expected that the amount of waste those three categories produce will not be significant.

Operations and administrative bases, well logging and diving services, and oil field suppliers may be expected to mainly generate waste comparable to commercial activities - paper, packaging, and miscellaneous. Dockside support activity wastes would include the solid wastes brought ashore from rigs and platforms, discarded equipment, and barreled spent lubricants. Cement and mud companies, besides having paper wastes, would also have drilling mud and lime wastes. Most of such waste would probably be treated on-site.

Figure 292 presents solid waste generation over time in Scenario III by indirect industrial and domestic, municipal, and commercial sources. The values were derived using coefficients by employment and new population as described in the section 'Environmental Impact Assessment', Part B of this report. The maximum annual waste generation thus postulated is 2,939.1 thousand pounds in Region IV, in Region V - 1,788.5 thousand pounds, and 6,891.1 thousand pounds in Region VI. Together with wastes brought ashore, these solid waste levels represent an estimated increase of 1%, 4.6%, and 0.7% over current levels in Regions IV, V, and VI respectively. There appears to be no basic change in the domestic/industrial ratio of generated wastes given Scenario III activities; rather, the domestic waste proportion relatively decreases. Shown below is the Scenario III domestic/industrial waste ratio and the historical ratio, for each affected region.

Region	Scenario III	Historical
IV	4.7	4.0
V	1.6	13.0
VI	1.03	5.0

The previously mentioned increases in solid waste generation may be misleading as an average over the whole of each region. Two other factors need to be considered: whether there are current deficits in suitable disposal site acreage, and where solid waste disposal may tend to be greatest. As mentioned in the environmental description of the Scenario III regions, only 38%, 50%, and 40% of the solid waste disposal sites in Regions IV, V, and VI, respectively, currently meet the criteria of best substrate suitability. Furthermore, it will be seen in Chapter 17 that solid waste disposal is an issue in Port O'Connor. This community must close its open dump and join a sanitary landfill enterprise roughly 35 miles away. Finally, the Scenario III

Figure 292

Solid Waste Generation in Scenario III

Time Period	Region IV			Region V			Region VI		
	Ind.	Dom.	Total	Ind.	Dom.	Total	Ind.	Dom.	Total
6/76- 9/76	0	0	0	7.5	23.0	30.5	146.4	260.6	406
9/76-12/76	3.8	7.9	11.7	82.6	128.2	220.8	165.1	307.4	472.5
12/76- 3/77	45.0	118.8	163.8	127.6	227.5	355.1	191.4	377.3	568.7
3/77- 6/77	56.3	122.4	178.7	131.4	229.7	361.1	187.7	377.3	565
6/77- 8/77	22.5	81.6	104.1	57.5	153.1	210.6	85.1	251.5	336.6
8/77- 9/77	3.8	40.8	44.6	15.0	83.0	98	27.5	154.3	181.8
9/77-12/77	48.8	126.7	175.5	142.6	274.3	416.9	262.7	509.0	771.7
12/77- 2/78	25.0	84.5	109.5	65.1	182.9	248	117.6	339.4	457
2/78- 3/78	7.5	42.2	49.7	17.5	91.4	108.9	30.0	169.7	199.7
3/78- 5/78	25.0	84.5	109.5	65.1	182.9	248	85.1	339.4	424.5
5/78- 6/78	3.8	42.2	46	15.0	91.4	106.4	20.0	169.7	189.7
6/78- 8/78	25.0	84.5	109.5	65.1	182.9	248	90.1	339.4	429.5
8/78-11/78	56.3	128.2	184.5	146.4	275.8	422.2	198.9	509.0	707.9
11/78- 2/79	48.8	128.2	177	142.6	275.8	418.4	195.2	509.0	704.2
2/79- 5/79	18.8	128.2	147	146.4	275.8	422.2	668.0	676.8	1,344.8
5/79- 8/79	11.3	128.2	139.5	75.1	275.8	350.9	671.8	678.2	1,350
8/79-12/79	25.0	170.9	195.9	140.1	367.7	507.8	1,065.9	904.3	1,970.2
12/79- 6/80	60.0	256.3	316.3	307.7	551.5	859.2	2,657.1	1,808.6	4,465.7
6/80- 1/81	290.0	571.2	861.2	429.1	643.4	1,072.5	1,059.6	2,110.1	3,169.7
1/81- 2/81	7.5	81.6	89.1	10.1	91.9	102	25.0	301.4	326.4
2/81- 5/81	71.3	280.1	351.4	78.8	275.8	354.6	228.9	904.3	1,133.2
5/81- 8/81	82.6	332.6	415.2	82.6	275.8	358.4	307.7	904.3	1,212
8/81-10/81	57.5	370.6	428.1	37.5	183.8	221.3	142.6	602.9	745.5
10/81- 1/82	142.6	569.5	712.1	86.3	275.8	362.1	337.8	904.3	1,242.1
1/82- 3/82	62.6	391.2	453.8	40.0	183.8	223.8	170.1	602.9	773
3/82- 5/82	65.1	405.6	470.7	42.5	183.8	226.3	175.1	602.9	778
5/82- 6/82	13.8	206.2	220	10.0	91.9	101.9	48.8	311.8	360.6
6/82- 7/82	18.8	207.4	226.2	12.5	91.9	104.4	55.0	323.3	378.3
7/82-10/82	150.1	657.4	807.5	112.6	301.7	414.3	491.6	1,100.2	1,591.8
10/82-12/82	77.6	445.9	523.5	52.5	100.6	153.1	220.2	733.4	953.6

Ind. - Indirect Industrial

Dom. - Domestic and Municipal, Commercial

Units - Thousands of pounds

sub-allocation of requirements (see Figure 225) postulates that Port O'Connor will be the sole point of onshore support for platforms in Region IV. If this is actually the case, Port O'Connor's solid waste disposal facilities may be required to handle as much as 99 thousand pounds of waste brought ashore in the year of maximum activity, given the Scenario III postulation. While such a development could pose significant infrastructural problems, the extent of environmental impact would depend upon the suitability of the disposal site, its operations practices, and upon the extent to which more land would be required than currently planned.

C. Water

Total water requirements over time in each region of Scenario III are presented in Figure 293 (see Chapters 6 and 12). Over the 6½-year Scenario time span, these water requirements average 57.82 acre-feet annually (af/a) in Region IV, 53.53 af/a in Region V, and 144.89 af/a in Region VI. The maximum, annual water requirements are, in the same units and respective order, 146.49, 74.91, and 211.48. The maximum monthly requirement is 14.54 acre-feet in Region IV, 5.49 in Region V, and 19.28 acre-feet in Region VI.

In all three regions, these water requirements may be met in part by groundwater supplies, either self-supplied or imported. However, it has been seen that withdrawal is, in some areas, exceeding effective recharge and that some areas do not actually have very extensive or good quality groundwater. Alternatively, part of the Scenario water requirements may be met by surface water.

Water For Preservation of Bays and Estuaries, a 1967 publication of the Texas Water Development Board, points out the need for conserving fresh water flow in regulating salinity in the regions' coastal bays and estuaries. However, except for the driest years, it appears reasonable to assume that the water requirement expressed in Scenario III would not significantly commit surface water away from the coastal water bodies. Nor would it appear that the requirements would add significantly to groundwater withdrawals and related environmental problems.

Figure 294 presents the volume of return wastewater flows over time for each Scenario III region, based on coefficients presented in 'Environmental Impact Assessment', Part B of this report. The maximum average return flow, calibrated to cubic feet per second for comparison with Figure 287, is 0.11 cfs in Region IV, 0.07 cfs in Region V, and 0.17 cfs in Region VI. In comparison to current regional return flow (Figure 287), the Scenario III return flows are

Figure 293

Scenario III Water Requirements
(acre-feet)

Time Period	Region IV	Region V	Region VI
6/76- 9/76	0	1.06	15.2
9/76-12/76	0.36	10.14	17.35
12/76- 3/77	9.25	14.25	20.57
3/77- 6/77	9.41	14.35	20.57
6/77- 8/77	6.28	9.57	13.71
8/77- 9/77	3.14	5.08	9.23
9/77-12/77	9.61	16.41	29.82
12/77- 2/78	6.41	10.94	18.96
2/78- 3/78	3.2	5.47	9.94
3/78- 5/78	6.41	10.94	17.75
5/78- 6/78	3.2	5.47	8.88
6/78- 8/78	5.49	10.94	16.69
8/78-11/78	9.67	16.47	25.56
11/78- 2/79	9.67	16.47	26.63
2/79- 5/79	5.89	16.47	34.36
5/79- 8/79	5.89	12.69	34.42
8/79-12/79	7.87	16.93	0
12/79- 6/80	11.8	25.39	89.41
6/80- 1/81	34.74	29.62	104.3
1/81- 2/81	4.51	4.32	15.07
2/81- 5/81	17.15	12.69	45.19
5/81- 8/81	19.57	12.69	48.26
8/81-10/81	22.31	8.46	32.17
10/81- 1/82	32.72	12.69	48.75
1/82- 3/82	22.34	8.46	32.79
3/82- 5/82	23.43	8.46	31.9
5/82- 6/82	11.87	4.23	16.88
6/82- 7/82	11.47	4.23	17.28
7/82-10/82	37.4	13.89	57.83
10/82-12/82	29.07	9.26	38.55
TOTAL	375.84	347.93	941.79

Figure 294

Total Wastewater Return Flow
(includes indirect industrial and
municipal - units in acre-feet)

Time Period	Region IV	Region V	Region VI
6/76- 9/76	0	.61	7.52
9/76-12/76	.21	4.43	8.77
12/76- 3/77	3.91	6.81	10.66
3/77- 6/77	4.0	6.87	10.66
6/77- 8/77	2.78	4.6	7.10
8/77- 9/77	1.34	2.47	4.5
9/77-12/77	4.12	8.07	14.73
12/77- 2/78	2.76	5.38	9.81
2/78- 3/78	1.38	2.69	4.91
3/78- 5/78	2.76	5.38	9.81
5/78- 6/78	1.38	2.69	4.72
6/78- 8/78	2.76	5.38	9.44
8/78-11/78	4.16	8.10	14.15
11/78- 2/79	4.16	8.10	14.15
2/79- 5/79	3.42	8.10	18.63
5/79- 8/79	3.42	7.36	18.67
8/79-12/79	4.56	9.82	24.14
12/79- 6/80	6.84	14.73	49.34
6/80- 1/81	16.87	17.18	57.55
1/81- 2/81	2.41	2.51	8.28
2/81- 5/81	8.37	7.36	24.82
5/81- 8/81	9.77	7.36	25.34
8/81-10/81	10.95	4.91	16.9
10/81- 1/82	16.8	7.36	25.49
1/82- 3/82	11.34	4.91	17.1
3/82- 5/82	12.02	4.91	17.1
5/82- 6/82	6.1	2.45	8.82
6/82- 7/82	6.14	2.45	9.2
7/82-10/82	19.34	8.06	31.17
10/82-12/82	13.23	5.37	20.78

negligible in Regions IV and VI, being less than one-tenth of one percent of current levels. In Region V, the Scenario maximum return flow is 1.05% of current flow rate. A similar pattern exists when Scenario return flows are compared to total return flow within each region to water quality segments: 0.05% in Region IV, 6.2% in Region V, and .36% in Region VI. The City of Aransas Pass, which straddles the Aransas-San Patricio County line, is currently operating a sewage treatment plant in which the contact stabilization facility is hydraulically overloaded due to excessive wastewater generation. The City is under order to seek a solution to the problem.

It therefore appears that return flow levels from indirect industrial and municipal or domestic activity may be a potential problem in Region V. This issue will be subsequently discussed further in 'Special Environmental Issue Analysis'.

Associated with return flows are wastewater effluent loadings. The derivation of effluent generation coefficients used in this study is presented in Part B. Figure 295 presents the total levels of wastewater loadings over time as postulated for Scenario III. Only point source effluents are considered, as these are what may be ascribed to indirect industrial or municipal activities.

The presence of oxygen demanding wastes in stream and bay waters results in a decrease of available dissolved oxygen for fish and aquatic invertebrates and plants. The effect of suspended solids (sediments) is to decrease biotic filter feeding efficiency and to decrease the amount of sunlight available to aquatic plants, decreasing plant respiration and oxygen production.

The maximum average daily production of B.O.D. effluents is 493.3 pounds in Region IV, 594.3 pounds in Region V and 4,036.7 pounds in Region VI. The maximum average daily production of T.S.S. is, in the same units and respective order, 441.7, 483.3, and 3,189.4. Indirect industrial activity accounts for 1.4 to 3.6 times the effluent loadings which domestic wastewater contains.

In Region IV, the maximum B.O.D. loading in Scenario III is 2.3% of current levels, and T.S.S. is 0.4% of current levels. In Region V, the B.O.D. Scenario loading is greater than 50% of current levels, and T.S.S. is 32% of current levels. In 'Special Environmental Issue Analysis', the relationship of this impact to current water quality problems and facility needs in Region V will be discussed. Finally, in Region VI, B.O.D. loadings postulated in Scenario III are seen to be 5% of current loadings, and T.S.S. is 3.7% of current suspended solids loadings in that region. Therefore, wastewater effluent loading in Region VI may also potentially pose an impact of some magnitude, and is discussed further below.

Figure 295

Wastewater Effluent Loadings
(1,000's of pounds)

Time Period	Region IV		Region V		Region VI	
	BOD	TSS	BOD	TSS	BOD	TSS
6/76- 9/76	0	0	1.1	2.0	43.4	35.6
9/76-12/76	1.2	0.9	24.3	19.9	49.3	40.6
12/76- 3/77	14.2	11.9	37.8	31.3	57.6	47.5
3/77- 6/77	17.2	14.3	38.9	31.8	56.6	54.0
6/77- 8/77	7.5	6.5	18.2	15.2	27.3	23.2
8/77- 9/77	1.9	1.7	5.7	5.0	10.4	9.4
9/77-12/77	15.3	12.9	42.7	35.3	78.8	65.0
12/77- 2/78	8.3	7.0	20.7	17.5	37.7	31.9
2/78- 3/78	2.8	2.6	6.4	5.8	11.4	10.2
3/78- 5/78	8.3	7.0	20.7	17.5	29.2	17.0
5/78- 6/78	1.9	1.8	5.8	5.2	8.8	8.2
6/78- 8/78	8.3	7.0	20.7	17.5	30.5	26.4
8/78-11/78	17.3	14.4	43.8	36.0	62.3	52.3
11/78- 2/79	15.3	12.9	42.8	35.3	61.3	51.5
2/79- 5/79	7.6	6.9	43.8	36.0	187.4	149.9
5/79- 8/79	5.6	5.4	25.3	21.8	188.3	150.7
8/79-12/79	10.1	9.2	44.1	37.1	295.2	234.7
12/79- 6/80	21.0	18.3	91.4	75.1	726.6	574.1
6/80- 1/81	86.9	71.8	124.8	101.5	319.2	263.7
1/81- 2/81	3.6	3.5	4.6	4.3	12.9	12.5
2/81- 5/81	24.4	21.2	26.3	22.7	78.5	68.2
5/81- 8/81	28.5	24.7	27.3	23.4	98.9	83.9
8/81-10/81	22.8	20.7	18.5	12.1	49.7	43.5
10/81- 1/82	49.0	42.6	28.3	24.2	106.7	89.8
1/82- 3/82	24.5	32.2	9.1	12.6	56.9	49.0
3/82- 5/82	25.4	23.0	14.9	13.1	58.2	50.0
5/82- 6/82	8.0	7.9	4.6	4.3	19.2	17.5
6/82- 7/82	9.3	8.9	5.2	4.8	21.0	19.1
7/82-10/82	52.9	46.3	35.6	29.9	150.7	125.4
10/82-12/82	29.6	26.5	17.9	15.5	72.6	62.1

D. Air Quality

Air emissions over time in Scenario III as a result of indirect industrial, municipal-residential, and transportation activity are presented in Figure 296. Direct OCS-related air emissions are not included in Figure 296, but would include dockside support power equipment exhaust, helicopter and boat exhaust where these vehicles cross over the regions to offshore rigs and platforms, and minor emissions from the heating of operations and administrative bases and from other service and supply company offices.

In the year of maximum production of air emissions in Region IV, total particulate and gaseous components amount to 140 and 2,404.8 thousand pounds. When compared to an inventory of self-reporting industrial air emissions (Figure 288), it is seen that Scenario III emissions represent about seven to eight tenths of one percent of current Region IV emissions. Sulfur oxide and carbon monoxide emissions account for the greatest proportionate increases over their respective base level loadings. Fifty-six percent of the Scenario carbon monoxide emissions are from vehicle exhaust.

In Region V during the year of maximum Scenario III air emissions, total particulate and gaseous emissions (79.9 and 1,717.8 thousand pounds respectively) present an increase over base-level atmospheric loadings of 13.3% and 0.5%, respectively. Nitrous oxides and sulfur oxides represent the greatest proportionate impact of the gaseous emissions. Region V currently has negligible SO_x emissions. About 79% of the NO_x loadings and about 99% of the SO_x loadings in the Scenario are attributable to indirect industrial activity generated by Scenario postulations.

In Region VI during the year of maximum air emissions, total particulate and gaseous emissions (309.09 and 7,389.8 thousand pounds, respectively) present an increase over base-level atmospheric loadings of 1.3 and 0.22 percent. Of the gaseous emissions, SO_x and hydrocarbon (HC) components represent the greatest proportionate impact. Roughly 76% of HC loadings are due to indirect industrial activity, and another 23 percent are due to vehicle exhaust.

The proportionate increases presented above compare total postulated Scenario III emissions - including indirect industrial, stationary municipal/domestic, and vehicle exhaust components - against self-reported industrial base-level emissions. As mentioned previously in the environmental description, automobiles play a small but statistically significant role in atmospheric emissions, particularly of hydrocarbons and carbon monoxide which act in producing various photochemical oxidants such as ozone. However, if vehicle emissions were included in the base level inventory, the Scenario's

Figure 296

OCS Air Emissions/Scenario III
(indirect industrial, residential, municipal, and transportation)

Time Period	Particulates			Gaseous			NO_x			SO_x			HC			CO		
	IV	V	VI	IV	V	VI	IV	V	VI	IV	V	VI	IV	V	VI	IV	V	VI
6/76- 9/76	0	1.5	18.3	0	26.8	385.1	0	3.8	63.1	0	2.6	49.5	0	4.9	76.1	0	15.6	196.4
9/76-12/76	.5	9.9	21.3	10.8	210.8	444.3	1.7	35.1	72.0	1.3	27.8	55.9	2.1	42.0	87.4	5.8	105.7	229.4
12/76- 3/77	7.5	16.0	25.3	146.6	335.9	530.1	21.5	55.0	84.5	15.3	43.1	64.7	27.5	66.4	103.4	82.3	171.3	277.4
3/77- 6/77	8.1	16.2	25.3	164.3	342.5	525.1	25.5	56.4	83.7	19.1	44.4	63.9	31.6	67.9	102.6	88.1	173.9	276.6
6/77- 8/77	4.9	9.8	15.7	89.5	188.3	296.7	12.0	27.6	42.2	7.7	19.6	29.0	16.1	35.3	54.8	53.7	105.9	170.8
8/77- 9/77	2.1	4.7	8.7	34.7	80.5	149.2	3.5	9.6	17.7	1.4	5.2	9.6	5.6	13.7	25.4	24.4	52.0	96.6
9/77-12/77	8.1	18.8	34.9	157.4	390.1	721.3	23.3	62.7	115.6	16.6	48.3	88.9	29.6	76.4	141.0	88.0	202.9	375.9
12/77- 2/78	5.1	11.4	21.2	95.0	220.0	404.1	13.0	31.8	57.9	8.6	22.2	40.0	17.2	40.9	74.8	56.0	125.3	231.4
2/78- 3/78	2.4	5.2	9.6	40.8	90.0	163.7	4.8	10.9	19.4	2.6	6.1	10.4	6.9	15.5	27.8	26.4	57.6	106.2
3/78- 5/78	5.1	11.4	20.1	95.0	220.0	360.7	13.0	31.8	47.1	8.6	22.2	29.2	17.2	40.9	64.0	56.0	125.3	220.6
5/78- 6/78	2.2	5.1	9.2	35.8	86.6	150.4	3.6	10.9	16.0	1.4	6.1	7.1	5.7	15.5	24.5	25.2	57.6	102.8
6/78- 8/78	5.1	11.4	20.2	95.0	220.0	367.4	13.0	31.8	48.7	8.6	22.2	30.8	17.2	40.9	65.6	56.0	125.3	222.2
8/78-11/78	8.4	19.1	32.6	168.5	396.2	636.2	25.8	64.0	94.3	19.1	49.5	67.6	32.2	77.7	119.7	91.4	205.0	354.6
11/78- 2/79	8.2	18.9	32.4	158.5	391.2	631.2	23.3	62.8	93.1	16.6	48.3	66.4	29.7	76.5	118.5	88.9	203.8	353.4
2/79- 5/79	7.1	19.1	57.8	118.4	396.2	1,383.9	13.3	64.0	259.9	6.6	49.5	223.9	19.7	77.7	276.1	78.9	205.0	511.0
5/79- 8/79	6.8	16.5	58.1	108.4	301.1	1,390.0	10.8	40.2	261.2	4.1	25.7	225.6	17.2	53.9	295.1	76.4	181.2	608.0
8/79-12/79	9.4	24.4	83.5	157.9	454.7	2,080.1	17.8	66.9	405.0	8.8	47.6	357.6	26.3	85.3	450.2	105.1	254.9	867.3
12/79- 6/80	15.0	38.7	186.0	266.9	812.2	4,860.8	34.1	132.9	985.2	20.6	104.0	890.2	46.9	160.5	1,075.5	165.1	414.9	1,909.8
6/80- 1/81	39.0	47.6	143.6	701.6	1,041.0	2,950.5	127.7	178.4	469.3	97.7	144.6	358.5	156.2	210.5	574.6	419.8	507.3	1,548.0
1/81- 2/81	4.4	5.0	16.0	69.5	80.3	253.1	7.0	8.4	25.0	2.7	3.5	9.2	11.1	12.9	40.0	48.7	55.4	179.1
2/81- 5/81	16.6	16.6	53.4	299.2	306.1	964.2	39.2	41.5	126.0	24.5	27.0	78.6	53.2	55.2	171.2	182.4	182.5	588.3
5/81- 8/81	19.6	16.8	56.3	352.5	311.1	1,069.3	45.8	42.7	152.3	28.3	28.2	104.9	62.4	56.4	195.5	215.8	183.7	614.6
8/81-10/81	20.6	10.6	35.2	346.7	184.0	629.5	39.6	22.6	80.8	20.1	13.0	49.1	58.1	31.8	110.9	229.0	116.6	388.9
10/81- 1/82	33.6	16.9	57.4	605.2	316.1	1,109.4	78.9	44.0	162.3	49.0	29.5	114.9	107.4	57.7	207.5	370.1	185.0	624.6
1/82- 3/82	21.9	10.6	36.2	368.5	187.4	665.1	42.4	23.5	89.9	21.9	13.9	58.2	62.0	32.7	120.0	232.4	117.5	398.0
3/82- 5/82	22.6	10.7	36.4	382.3	190.7	672.8	44.0	24.3	91.6	22.7	14.9	59.9	64.3	33.5	121.7	251.4	118.3	399.7
5/82- 6/82	10.8	5.0	17.4	168.5	80.3	292.3	15.9	8.4	33.4	5.1	3.5	17.1	26.2	12.9	49.0	121.3	55.4	192.8
6/82- 7/82	11.1	5.1	18.2	176.1	83.7	309.0	17.7	9.3	36.2	6.8	4.4	19.2	28.1	13.8	52.3	123.7	56.3	201.5
7/82-10/82	37.3	19.2	72.4	679.3	369.9	1,457.2	86.3	54.1	224.4	51.7	38.3	164.7	119.1	69.2	197.8	422.4	208.3	347.0
10/82-12/82	25.1	12.0	44.6	428.4	216.7	828.1	50.4	21.9	113.7	25.3	18.0	75.2	72.7	38.6	150.4	278.4	131.4	488.7

All valves in thousands of pounds

proportionate increases would probably not be decreased to the extent that the apparent impacts previously mentioned would not actually occur.

Thus, in terms of the potentially important impacts of air pollutant emissions in Region IV, SO_x and CO loadings may be important; in Region V, particulate, NO_x, and SO_x loadings may represent serious increases over current levels; and in Region VI, SO_x and hydrocarbon loadings may be important. These possible impacts will be discussed further in the following section.

Special Environmental Issue Analysis

In the 'General Environmental Impact Evaluation' it was seen that the main onshore effects of the postulated Scenario III activities may be increased demand for industrial land in Region IV; possible secondary effects of residential land development in certain communities of Region IV and V; possible land use impacts due to fluctuating demand for 'indirect' land in all three regions; land use and environmental impacts of solid waste disposal sites in Calhoun County of Region IV; possibly important increases in return flow wastewater volume in Region V and increased effluent loadings in Regions V, and VI; and increased atmospheric emissions of certain particulate and gaseous components in all three regions. In this section, the importance of these potential impacts will be further analyzed. Also, secondary effects of immediate environmental impacts will be discussed. Finally, the possible affects of Scenario III activities on biological conditions of the three regions will be presented.

It will be recalled that the Scenario III direct and residential land requirements in Region IV represent a net urban intensification of 2.6%. The direct OCS land needs would represent a 20% increase of industrial area within the communties to which direct activities have been sub-allocated (see Figure 225), and 6% of all industrial land in Region IV, irrespective of the suitability of substrates for constructing foundations. Furthermore, it is reasonable to expect that different communities would experience greater shares of direct OCS land development in such a situation as postulated in Scenario III, and thus greater impact. Port O'Connor is certainly attractive as a location for onshore support and supply operations, yet appears to possess certain sensitivities to large scale development. (For a review of Port O'Connor, see Chapter 17). Bay City has in the last 5 years undergone a boom industrial expansion. It may be that there are not existing available facilities which may be given over to Scenario operations. Further industrial plant development may add to current growth problems.

In addition to the communities to which direct OCS requirements in Region IV have been sub-allocated, the cities of Matagorda, Palacios, Point Comfort, and Cuero may attract some of such development, thus spreading possible impact more evenly throughout the region and diminishing net land use impacts.

In summary, intensification of industrial land development for OCS needs in Region IV may range towards 6 percent. OCS land development in Region IV would also involve a land use conversion of as much as 3.2% of suitably defined substrates currently non-urban residential-industrial. Agricultural cropland, rangeland, and pasture would be the most impacted land-use activities in such a conversion. Further studies may be desired to investigate possible related affects on tax roles, historical values, and also of post-Scenario operations levels and phase-out impacts.

As previously mentioned, indirect land requirements fluctuate in all three regions (see Figure 290). The fluctuation is indicated by the association between indirect land and indirect employment (see Chapter 5 for the derivation of indirect land requirements). The latter also fluctuates in all regions of Scenario III. Whereas the net amount of indirect land may not pose land development patterns, the fluctuation through time in reaching the final, peak requirement may be a source of problems. However, it has been maintained throughout this study that fluctuations in activities, and hence in employment and land requirements, would not indicate that employees and land demands go away, but rather that they would be given over to non-Scenario oil and gas activities, in part onshore and in part offshore. Therefore, true fluctuations in indirect land demand must be seen as appreciably less than what appears to be the case in considering Scenario III in isolation from probable concurrent non-Scenario activities.

It may be recalled that solid waste generation in Region IV, given Scenario III postulations, represents a 1% increase over current levels. Also, the estimated disposal site acreage for such waste is only 2.6% of current, suitable solid waste disposal site acreage in the region. However, as will be seen in Chapter 17, solid waste disposal is an infrastructural issue in Port O'Connor and, jurisdictionally, in Calhoun County. Therefore, although the average magnitude of impact over the four-county region is negligible, locally there may be more serious problems. Besides requiring more disposal site acreage than is currently planned, environmental impacts could include groundwater pollution, increased run-off, and, potentially, health hazards - depending of course upon the operations practices and physical location of the disposal site.

Secondary environmental effects of land development for direct, indirect, and residential uses may be expected to mainly involve alteration of groundcover and surface drainage patterns. (see Figure 14, Part B). The

development processes include excavation, surface paving, construction, and landscaping. The magnitude and importance of such secondary impacts would depend upon the physical characteristics of development sites, the intensity and distribution of development, and the physical design of the new construction.

There are three principal physiographic areas which are suitable for such development in Region IV: low-lying coastal land, upland coastal plain, and wooded river and stream valley slopes. Forty-eight percent of Region IV is less than 30 feet above sea level and 75% is less than 60 feet in elevation. It may be recalled that there is a 7 percent chance of a hurricane landing on this portion of the Gulf Coast in any year. Therefore, all coastal development is prone to hurricane related wind and flood damage. Residential or industrial construction along stream banks could increase local erosion. Efforts at erosion control could result in additional peak discharge and greater flooding. The effect of surface paving in low-lying areas may result in sheet water flooding of wide areal extent, as the stream gradients in the lower coastal area are insufficient to handle storm rainwater runoff if much of the water cannot percolate into the ground. Much of the upland coastal plain is underlain by impermeable mud and silt. During land development, rainwater runoff would easily erode large volumes of unstabilized or unprotected soil.

It is not possible to quantify the magnitude of such secondary effects without assuming an arbitrary distribution of the OCS land requirements to the different physiographic areas. It may be sufficient to point out these possible problems for further study should such construction permits be sought by developers. Finally, it may be recalled that total land development as a result of Scenario III requirements is probably less than a 6 percent increase in development over the 6½ years of the scenario time span, which is well within current rates of land development. It should also be noted that, typically, once such development occurs, the affected area seldom is returned to its original, undeveloped condition. Fixation of development may affect the number of options for future planning.

As was seen in the general impact evaluation, wastewater return flow volume may present a more than one percent increase over current levels in Region V, with a major impact of increased effluent loadings. In this region are several cities whose water treatment facilities are adequate with no population growth and other cities whose facilities are inadequate with B.O.D., T.S.S., and pH levels exceeding their water control orders (Water Quality Management Plan for the Nueces River Basin). In addition, smaller communities in Aransas county bordering Copano and Aransas Bays have no public water treatment system, but rather depend upon septic tanks. As previously mentioned, the relict barrier island sand upon which these communities are located has a porous soil and a shallow water table aquifer, conditions leading to possibly serious groundwater pollution. Oxygen demanding wastes and suspended solids generation in Region VI were also seen to present increases over current levels.

Current water quality problems in Region V and VI were described in 'General Environmental Description/Scenario III'. Included in these regions are 4 water quality segments with State Abatement Priority Rankings of 10, 19, 54, and 63. Of these, only the Aransas River above tidal influence (segment 2004) is suitable for contact recreation, yet all are suitable for propogation of fish. Only the San Antonio River, in some stretches, is suitable as a domestic water supply.

It is, therefore, reasonable to assume that wastewater effluent loadings on the scale postulated in Scenario III for Regions V and VI would represent an important impact upon regional water quality. Such impacts could be felt at the same time that efforts, under State and federal measures, are being made to improve water quality. However, it is not expected that water quality will limit or restrict location of OCS-related companies or personnel.

Air quality impact is another area which may be considered as an important environmental change given Scenario III activities. The abatement of air quality impact is a difficult problem involving costly equipment, technical conversions and changes in way of life. A significant portion of air emissions both in Scenario III postulations and in the present case is from non-point sources auto or truck transportation. An effective decrease in air pollution requires added anti-pollution devices in vehicles, acceptance of mass transit alternatives to reduce the number of vehicle miles driven, and more refined fuels. Also required are efficient and implementable transportation plans to reduce traffic conjestion in thoroughfares and around large parking lots' exits, as more carbon monoxide per gallon of fuel is emitted at low edle speeds endemic to stalled traffic flow.

It is difficult to link the magnitude of air emissions to the importance of possible air quality impacts. In all three regions, Scenario-related SO_x emissions are felt to be important as the regions have not historically had great atmospheric loadings of this pollutant. However, it is not assumed that the postulated Scenario-related SO_x emissions will result in violation of SO_x standards (560-800 yg/m^3 averaged over 30 minutes). Nor can the increased emissions of carbon monoxide and nitrous oxides in Regions IV and V, respectively, be assured to cause significant deterioration of ambient air quality as indicated by these parameters. The postulated 2 percent increase of hydrocarbon emissions in Region VI can, with more confidence, be assumed to be important, as hydrocarbons currently play a role in violating photo-chemical oxident levels (see Figure 101, Part C) in the Corpus Christi metropolitan area. In order to better understand the impacts of current and projected development in the Scenario III coastal area, a more extensive air quality monitoring network will have to be implemented.

Figure 297 presents groupings of geographical areas of particular concern and the bases of concern about the natural areas, as nominated by

Texas Parks and Wildlife Department. The reader is referred to Part B for a discussion of the technique used in developing the clusters shown in Fiugre 297 and for a description of the general use of such clusters. Four major groups of natural areas may be distinguished in Figure 297. Several natural areas, while not strongly clustered with these 4 groups, show some degree of association to various natural areas groupings. Other natural areas appear to be unique and present no association with any of the groups.

The four natural areas groups, as shown in Figure 297, are: (A) productive coastal habitat - spawning and nursery grounds, freshwater input, waterfowl and bird-watching area; (B) productive and unique coastal habitat - spawning and nursery grounds, endangered species, fish-eating birds and waterfowl, bird-watching areas; (C) scarce and fragile coastal resources of oyster reefs and waterfowl; and (D) water exchange passes of substantial recreational value. Groups A and B are quite similar coastal nursery areas of high productivity, differing essentially on bases of uniqueness of occurance, dominance of grassflats, endangered species and fish-eating bird rookeries (Group B), and in the importance of freshwater input (Group A). To the extent that these two groups are similar, they will be treated together below; their different features will be evaluated separately.

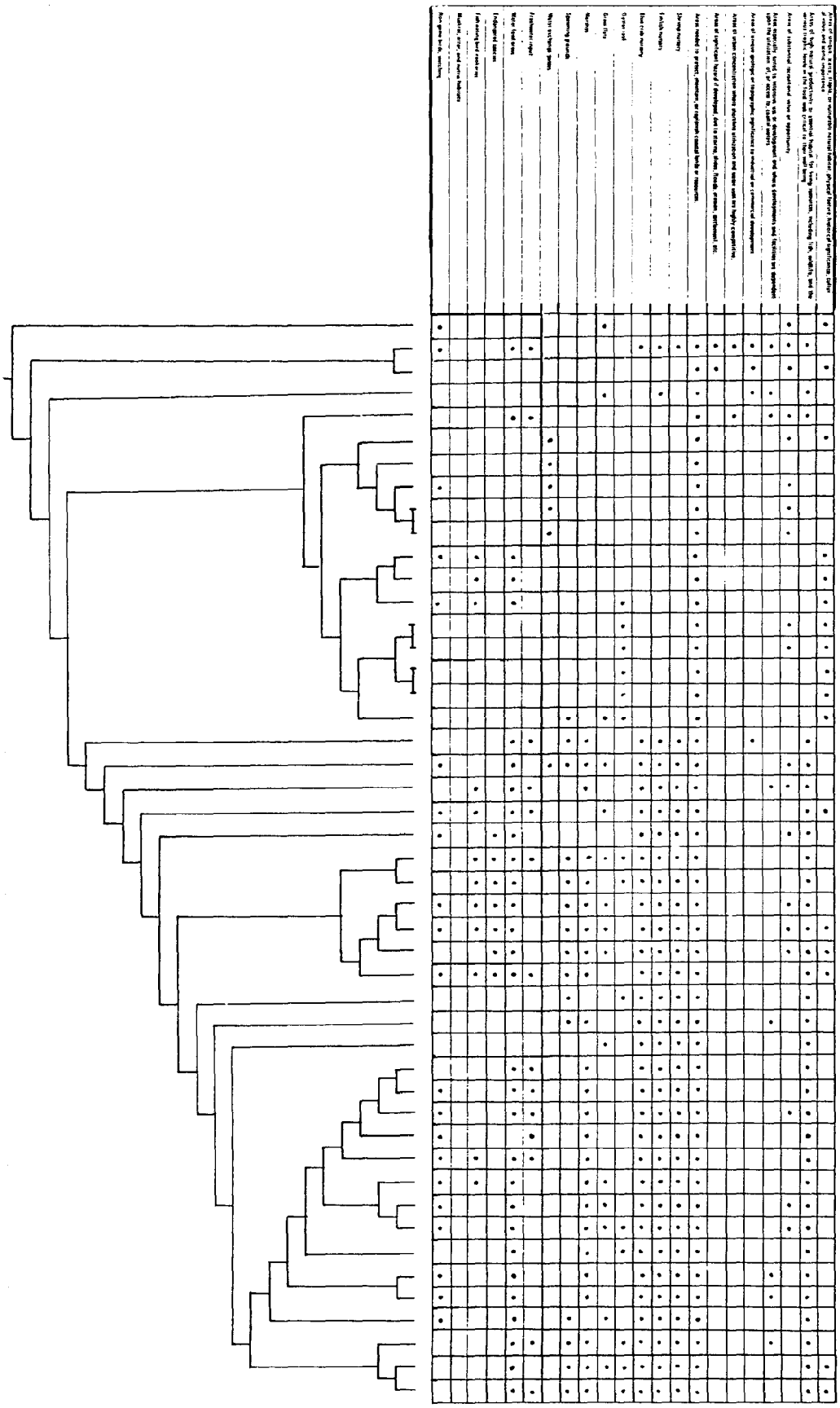
The 'Environmental Impact Matrix' shows an array of possible sources of impact upon these natural areas. The remainder of this section will be given to describing those Scenario activities which may generally be expected to affect the natural areas members of each group recognized above, using the 'Impact Matrix' as a reference guide as described in Part B of this report, 'Environmental Impact Assessment.' It would be tenuous to make any statement about the extent that Scenario events may further extend current problems. Therefore, it will be sufficient to describe the complexities of possible impact of such Scenario developments irrespective of current conditions or present activities.

The OCS-related activities of Scenario III which may influence the environmental quality of the natural areas included in Groups A and B (coastal marshes and grassflats of high productivity) are shoreline development by or for piers and marinas, etc., and by residential subdivisions; pollution by wastewater effluent loadings and surface runoff from on-land development; and pipeline installation and associated dredging or spoil emplacement. Such activities also take place currently without the activities designated under Scenario III, and vary in intensity across the three regions.

The construction activities of shoreline development often entail filling and dredging different areas of shallow water or low relief grassflats and marshes in order to increase developable area, to increase access to the development, and even to reduce local health problems related

Figure 297

Analysis of Critical Habitats



Dendrogram of Similarity

Justification as an Area of Particular Concern

Critical Habitats

to insect infestation. This reduction of net acreage has a direct impact upon the net productivity of the ecological system. However, it is very difficult to assess how much acreage is needed as a composite to maintain high productivity, and which parts of the physical habitat are most productive or most necessary to the whole system.

The importance of such activities to the nominated areas of particular concern (APC) included in Groups A and B depends upon (1) the actual location of development relative to a given APC and (2) the magnitude of development. For example, while the area west of Pass Cavallo and Espiritu Santo Bay are two APC's in Region IV, actual development would more likely take place along the G.I.W.W. at Port O'Connor, separated from these APC's by Blackberry Island (see Chapter 17 for a description of industrial development in this area). Therefore, impact upon these important areas from direct OCS activities might be slight.

Pollution of bay waters may decrease the quality of habitat for fish, shrimp, and blue crabs which spawn and nurse their young in these coastal grassflats and marshes. The possibility that discharged effluents, generated by direct and indirect OCS-related activities, may add to deterioration of these systems has already been discussed. The biological results of such deteriorated conditions could include decreased productivity, although local extinction would probably not result from pollution at such a level as here postulated. Impacts on shrimp populations would not be felt immediately, yet could affect net Gulf catch of these migrating crustaceans. Impacts on fish populations may more readily be felt by sport fishermen.

Included in Group A are natural areas characterized by the importance of freshwater input in regulating salinity in brackish water marshes. However, the magnitude of freshwater use from surface supplies is not assumed to be large enough to significantly reduce such input to the ecological system. Scenario III activities in this regard appear to fall in line with present trends in increased water use, and add to that trend, yet cannot be stated as an important component.

It is postulated that a pipeline from OCS Strike Area 16 will be brought ashore in Nueces County (see Part A, 'Scenario Descriptions'). Depending upon the selected right-of-way, this pipeline may cross a barrier island and grassflats of some importance. Figure 15 in Part B of this report presents an expanded impact matrix of pipeline installation. The installation of pipelines in shallow water often involves jet-sled dredging which may suspend toxic metals and generally increase turbidity. The activities may to an unknown extend disturb the project areas' faunal inhabitants, primarily waterfowl and small mammals, but this effect is probably short-term. Finally, the return of the project area to its original condition may often be complicated by aspects of vegetative

succession and by the tendency for opportunistic species to colonize the area more efficiently than native flora. A Study of Selected Coastal Zone Ecosystems in Relation to Gas Pipelining Activities presents a documented analysis of such problems. Choosing right-of-ways for pipelines involve similar problems as selecting alternate marsh locations for shoreline development. The Bureau of Economic Geology is currently conducting a baseline inventory of biologic, geologic, and hydrologic characteristics of coastal submerged lands in Texas for the General Land Office. Such information will be of use in future planning efforts.

Other natural areas in Group B include sites of habitation of endangered species. Endangered species occuring in the area of Scenario III onshore activities include the Brown Pelican, Whooping Crane, the Wood and White Faced Ibis, Audobon's Carcara, American Osprey, Western Snowy Plover, Attwater's Prairie Chicken, Southern Bald Eagle, and Peregrine Falcon. There are a number of national, State and private wildlife reserves, refuges, and sanctuaries in Regions IV, V, and VI. Any specific proposed action may need to specially consider possible affects on these species' habitats.

Group C is dominated by oyster reefs in Corpus Christi, Matagorda, San Antonio, Copano, and Aransas Bay areas. These vulnerable areas are currently diminishing under stress from shell dredging and large-scale harvesting. In some areas the oyster beds have been polluted (see Figure 279). However, of the postulated Scenario activities, only water pollution may be reasonably associated with any immediate impact on the oyster communities - and such impact is difficult to definitively assess.

The final group (D) is dominated by natural areas of Gulf-bay water exchange passes of substantial recreational value, especially for sport fishing. As such, this group is less of an important biological habitat than it is an area useable by human interest. Impacts from Scenario III activities upon these areas would involve more social impacts than environmental problems, to the extent that part of the increased population also uses the recreational sites and thereby adds an increment of crowding.

Finally, Matagorda, St. Joseph's, and Mustang Island and Matagorda Peninsula form an important and sensitive natural coastal barrier to Gulf storms. While not a part of any of the previously defined groups, the islands and their dune fields stand out as important by themselves. They act to take the brunt of wind and wave energy associated with the landing of tropical cyclones and hurricanes. The barrier islands are more likely to be affected by indirect activities associated with OCS development than by direct onshore activities. Impacts may be due to the crossing of pipelines coming ashore, excessive negative disruption by recreational vehicles and large numbers of vacationers, and by subdivision development. Any development on the barrier islands may expect the possibility of destruction during hurricanes, either by wind, flooding, or by erosion of

the unstable sandy foundation substate near washover channels. The removal of vegetation destabilizing the active/stabilized dune equilibria increases the likelihood of the formation of such washover channels.

Environmental Impact Assessment Summary

In the final analysis, the principal categories of environmental effect for the total affected area of Scenario III include:

- an important intensification of land development and land use conversion especially for direct and indirect OCS-related onshore industrial activities in Region IV;

- further or engendered air quality problems in all three regions, with different pollutants being significant in the different regions;

- further water quality problems in Regions V and VI with increased wastewater effluent loadings;

- possible solid waste disposal problems in Calhoun County of Region IV; and

- a possible important conversion and disruption of coastal wetland habitats depending upon the magnitude and geographic scale of activities' influences.

Figure 298 presents the OCS Environmental Impact Matrix with environmental effects indicated as were found to be important in Scenario III. That other "effect boxes" in the matrix are not checked does not mean that there would be no impact, but rather that the effects of the postulated levels of activity in Scenario III cannot be reasonably considered to be of such magnitude as to be important at this level and orientation of analysis.

Figure 298

ENVIRONMENTAL IMPACT

SCENARIO III

AXIS I: CHARACTERISTICS AND CONDITIONS OF THE ENVIRONMENT			AXIS II. OCS-RELATED ACTIONS WHICH MAY CAUSE ENVIRONMENTAL IMPACT																												
			A. STAGING AREA		B. OFFSHORE OPERATIONS				C. TRANSPORT							D. PROCESSING & STORAGE							E. INDUCED ACTIVITIES					F. OTHER OR COMMON				
			a. Industrial Sites & Buildings, Yards	b. Piers, Seawalls, Bulkheads, & Marinas	a. Platform Siting	b. Subsea Completions	c. Formation Water Discharge	d. Drill Cutting Disposal	a. Pipeline Installation	b. Channel & Harbor Dredging	c. Spoil Emplacement	d. Trucking	e. Shipping	f. Aircraft	g. River & Canal Traffic	a. Petrochemical Industry	b. Oil Refining	c. Petroleum and Product Storage	d. Energy Generation	e. Stabilization & Oxidation Ponds	f. Stack Exhaust Emissions	g. Industrial Water Discharge	a. Urbanization	b. Auto Traffic	c. Solid Waste Disposal	d. Residential-Municipal Wastewater Treatment	e. Subdivision Development	a. Oil Spills	b. Surface Water Diversion	c. Ground Water Withdrawal	d. Surface Paving	e. Highways & Bridges
A. PHYSICAL & CHEMICAL CHARACTERISTICS	1. Water Quality	a. Surface								/	/				/				/									/				
		b. Ground																		/					/	/				/		
		c. [redacted] Bay		/			/	/	/	/			/		/							/					/	/			/	
	2. Air	a. Air Quality										/		/		/	/		/					/	/			/				
	3. Processes	a. Flooding		/						/	/												/				/				/	/
		b. Erosion, Deposition		/						/	/																/				/	/
		c. Subsidence																												/		
		d. Surface Faulting																												/		
		e. Freshwater Inflows to Bays								/												/							/			
		f. Bay - Gulf Water exchange & Circulation		/					/	/	/																					
B. BIOLOGICAL CONDITIONS	1. Habitat	a. Woodlands																	/								/					/
		b. Savannah-Prairie	[redacted]											/									/		[redacted]		/				/	/
		c. Grassflats	/	[redacted]					[redacted]		/				/			/					/					/			/	/
		d. Marsh	/	[redacted]					[redacted]		/				/			/					/				[redacted]		/			/
		e. Benthic (Ocean, Bay) Substrate				/		/	[redacted]	/	/																	/				
	2. Unique or Sensitive	a. Marine Food Web			/		/	/	/	/	/																	/				
		b. Fishing Bank			/	/	/	/	/	/																		/				
		c. Coral Bank			/	/	/	/	/																			/				
		d. Oyster Reef							/	/	/															/		/				
		e. Spawning and Nursery Grounds		/					/	/	/											/				/		/				
		f. Bird Rookeries		/					/		/				/								/	/			/	/			/	/
		g. Waterfowl Areas		/					/		/												/					/			/	
		h. Endangered Species							/		/	/		/							/	/	/					/				/
		i. Barrier Islands							[redacted]		/													/	/	/					/	/
C. CULTURAL FACTORS	1. Human Utilization	a. Industrial	/																				/									/
		b. Residential	/																				/	/	/	/	/				/	/
		c. Cropland	[redacted]													/	/	/	/	/			/		/	/	/				/	/
		d. Rangeland-Pasture	[redacted]													/	/	/	/	/			/		[redacted]	/	/				/	/
		e. Wilderness or Open Area	/	/																			/				/	/				/
		f. Soil Quality Contamination									/									/		/				/	/	/				
		g. Commercial Fishing		/	/	/			/				/															/				
	2. Human Interest	a. Game Areas										/		/									/	/				/				/
		b. Sport Fishing		/	/	/		/	/		/		/													[redacted]		/				
		c. Gulf Beaches		/					/															/				/				
		d. Formal Parks	/																		/		/	/								/
		e. Urban or Rural Natural Areas	/	/																			/	/	/	/	/				/	/
		f. Wildlife Refuge							/		/		/	/							/		/	/				/				
		g. Historical and Archeological	/	/	/	/		/			/												/								/	/

16. SOCIAL IMPACT ANALYSIS

In accordance with the Study Methodology (Appendix A), an analysis of the general social effects likely to result from OCS activities has been made for Region IV, V and VI, the affected study sites of Scenario III.

A general social impact assessment for each affected region (Region IV, Region V and Region VI) of Scenario III follows.

I. Region IV - Calhoun, Jackson, Matagorda and Victoria Counties

A. Existing Social Characteristics

Region IV, the Calhoun/Jackson/Matagorda/Victoria Counties area, has not experienced many of the problems associated with major urban-industrial expansion but has the potential for long-term growth. It has significant agricultural, mineral and manufacturing production. Its population increased by over 37% between 1950 and 1960 but by only 9.4% between 1960 and 1970. The population is expected to rise 27% by 1990. Over 35% of the population is rural. Net migration between 1960 and 1970 was - 7.0%.

Forty-seven percent of the population's wage earners make between $3,000 - $10,000 annually while over 18% are below the poverty level. Of the area's residents 25 years of age or older, thirty-seven percent have less than nine years of education. Median school years completed is 11.4, 10.0, 10.6 and 11.2 in Calhoun, Jackson, Matagorda and Victoria counties, respectively. As of July, 1975, Calhoun county had a relatively high unemployment rate of 10.1%, the rate of unemployment in the other counties of Region IV ranged between 4.3% and 6.1%.

In 1974, 14.3% of this area's total labor force was employed in manufacturing. Its production of gas well gas is 3.5% of the State's total; casinghead production is 3.1% of the States total. There are no refineries in the area but there are 17 gas plants with a combined maximum daily capacity that is 4.6% of the State's total.

The fishing industry in this region, excluding catches brought in from the Gulf, accounts for 28.7% of the States total poundage and 32.6% of its dollar value. Commercial fishing is a basic industry in Calhoun County.

Total value of crop and livestock production in Region IV accounts for 2% of the States total. Jackson county is one of the

leading rice growing counties in the area; Victoria County is one of the leading cattle counties in Texas. Sixty percent of Victoria County's annual income is based on agriculture and livestock, and 50% of Jackson County's annual income is based on agriculture.

B. Impact on Demographic Factors

Region IV's projected 1980 population is expected to be increased by a maximum of 0.7% as a result of population growth associated with Scenario III activities, and population density by a maximum of .72% (see Figure 299). These percentage increases are high in comparison to the other regions surveyed in the course of this study, but are minimal in comparison to Region IV's current population growth pattern. Thus, OCS related population growth associated with Scenario III activities in Region IV will not likely create significant social impacts.

Moreover, although it is virtually impossible to predict social impacts on such groups as families, church groups, school groups, ethnic groups and formal associations, Region IV's Scenario III-related population increases are small enough that it is highly improbable that these groups will be socially affected.

D. Impact on Services to People

The analysis of infrastructural issues has isolated recreational facilities as a potentially significant infrastructural issue associated with Scenario III activities in Bay City. Recreational facilities and educational services have been flagged as such issues in Victoria; recreational facilities in Port Lavaca; and incorporation, sewage treatment and collection, solid waste disposal, and traffic patterns in Port O'Connor. Port O'Connor, in comparison to the other affected coastal study sites, is somewhat unique in terms of its existing characteristics and potential OCS-related impacts; thus, it has been analyzed separately in Part F of Volume II.

The possibility of social impacts resulting from disruptions in public services depends upon the degree to which these deficiencies become noticeable. Much of Region IV's land area is sparsely developed, and, therefore, has a substantial potential for recreational development. This land availability makes possible the use of natural areas for recreation. Water-based recreation also has the capabilities for expansion. These factors, coupled with the relatively small amount of activity projected for Scenario III in

Figure 299

Selected Impact Statistics/Region IV/Scenario III

Population/1980 Projection	132,158
Maximum OCS-Related Population	929
% Change; OCS-Related	.70%
Total Population: 1980 Projection + Maximum OCS-Related Population	133,087
Density of Population: 1980, Projected	38.6
Density of Population: 1980, Projected + OCS-Related	38.9
% Increase: OCS-Related	.78%
Maximum OCS-Related Resident Employment	204
Current Unemployment (Sept. 75)	2,774
% of Currently Unemployed to be Hired	7.4%
Total, Projected, OCS-Related Personal Income	$10,369,289
Current, Total, Annual Personal Income (1973) x 7 years (Life of Scenario I)	$3,262,000,000
% Increase: OCS-Related	.32%
Total, Projected, OCS-Related Expenditures	$27,392,000
Current, Total, Annual Expenditures (1973) x 7 years (Life of Scenario I)	$10,617,838,000
% Increase: OCS-Related	.26%

Region IV, makes the possibility of adverse social affects due to a lack of recreational facilities highly unlikely. Also the shortage of educational facilities in Victoria will probably not be a source of social impact since the projected number of new students associated with Scenario III, for the region as a whole, is slight.

D. Impact of Land Use and Environmental Factors

Chapter 15 contains an extensive discussion of potentially significant environmental and land use issues in Region IV. Specifically, those issues are: increased demand for industrial land, possible secondary effects of land development, fluctuating demand for "indirect land", solid waste disposal in Calhoun County, and atmospheric emissions.

The resultant social impacts of any land use or environmental effects are difficult to project. It is reasonable to assume, however, that to the extent that environmental degradation becomes noticeable, that land use demands result in increased land prices, that land use conversions or environmental effects harm the existing economic sectors (agriculture, tourism, fishing, and others), dissatisfaction on the part of existing residents could result.

Port O'Connor (Calhoun County) is somewhat unique among impacted coastal sites; sociocultural impacts on that village are analyzed separately in Part F.

E. Impact of Housing Factors

The availability of housing units was flagged as a potentially significant infrastructural issue in Bay City and Port O'Connor. Port O'Connor, as was noted above, is somewhat unique in terms of its existing characteristics and potential OCS-related impacts, and is analyzed separately in Part F. The analysis of infrastructural issues pointed out that industrial expansion in Bay City has caused the demand for housing to exceed the city's capability to provide adequate housing; consequently, there is a significant sprawl of mobile homes around the city. This situation will only worsen with the onset of Scenario III activities in the area. It is thus reasonable to assume that this lack of available housing will probably be a source of social impact in the area and possibly create a feeling of dissatisfaction among the existing residents. As would seem to follow, the

quality of mobile home sites and the density of housing will most likely be impacted due to this unavailability of housing units.

The other affected study sites of Region IV appear to have a sufficient number of available housing units to accommodate the projected new population associated with Scenario III activities.

F. Impact of Employment Factors

In Region IV, maximum resident employment associated with Scenario III activities is projected to be 204. If these residents are drawn from the current unemployment pool, the unemployment level will be reduced by 7.4% (see Figure 299). The percentage is somewhat larger than in the other coastal regions surveyed in this study, but probably not large enough to engender any social impacts.

Additionally, Scenario III activities over the 6½ year period are projected to generate a total personal income of $10,369,289: a .32% increase in total personal income over the 6½ years, based on the 1973 annual personal income level. Similarly, the total projected OCS-related business expenditures in Region IV over the 6½ year period of Scenario III activities is $27,392,000: a .26% increase over the 6½ year period, based on the 1973 level of $10,617,838,000 (see Figure 299). In all probability these percentages will be less since the annual region totals will most likely be higher than the 1973 level.

The onshore production of oil and gas has been very important to the economy of this region, thus, it is reasonable to assume that no new industrial sectors or job categories will be established as a result of Scenario III activities. It is also reasonable to assume that Scenario III activities will probably not affect the employment of women and minorities over and above the current trend of such employment. Thus, no social impacts are expected in these regards.

G. Impact on Traditional Values

Since Region IV's income, expenditures, employment levels and other factors have created such slight impacts, there is no reason to believe that the individual's perception of quality of life in the community, and of traditional values will be significantly impacted by Scenario III activities.

II. Region V: Aransas and Refugio Counties

A. Existing Social Characteristics

Region V, the area encompassing Aransas and Refugio counties, is a significant tourist and recreation center. The population of this region increased by only 2.3% between 1960 and 1970 and is projected to increase by 20% by 1990. Its population per square mile in 1970 was 17.5; 50.7% of the population is rural. Net migration between 1960 and 1970 was -9.5%. Over 51% of the working force earns between $3,000 - $10,000 annually while 18% of the families are below the poverty level. A relatively high percentage (37.7%) of the area's over-25 population have less than nine years education. The median number of school years completed in Aransas county is 11.3%; in Refugio county it is 10.1%. In July, 1975, the rate of unemployment was 4.3% in Aransas County and 4.7% in Refugio county.

Region V has a very low percentage (6.9%) of its labor force employed in manufacturing. Its production of crude oil is 3.1% of the State's total. In 1973, the total dollar value of mineral production was more than the area's retail sales, manufacturing value, and value of agricultural output. There are no refineries in the region, but seven gas plants are located there.

B. Impact on Demographic Factors

Population growth in Region V has been small: between 1960 and 1970 there was only a 2.3% increase in population; a 5.4% increase was projected between 1970-1975. Scenario III activities in Region V are projected to increase this region's population by a maximum of 2.1% and population density by 2.1% (see Figure 300). These percentage increases are substantial in comparison to its normal growth rate; thus, it is likely that population growth associated with Scenario III activities may be a source of social impact in this region.

Although it is virtually impossible to predict social impacts on such groups as family, church groups, school groups, ethnic groups, and formal associations, the fact that over 50% of the population is rural and that there is going to be a relatively large population increase raises the possibility of community changes which may engender social impacts on the part of the existing residents.

Figure 300

Selected Impact Statistics/Region V/Scenario III

Population/1980 Projection	20,373
Maximum OCS-Related Population	419
% Change; OCS-Related	2.1%
Total Population: 1980 Projection + Maximum OCS-Related Population	20,792
Density of Population: 1980, Projected	19.4
Density of Population: 1980, Projected + OCS-Related	19.8
% Increase: OCS-Related	2.1%
Maximum OCS-Related Resident Employment	84
Current Unemployment (Sept. 75)	369
% of Currently Unemployed to be Hired	22.8%
Total, Projected, OCS-Related Personal Income	$14,776,630
Current, Total, Annual Personal Income (1973) x 7 years (Life of Scenario I)	$532,000,000
% Increase: OCS-Related	2.8%
Total, Projected, OCS-Related Expenditures	$27,177,000
Current, Total, Annual Expenditures (1973) x 7 years (Life of Scenario I)	$2,306,563,000
% Increase: OCS-Related	1.2%

C. Impact on Services to People

Educational service has been isolated as a potentially significant infrastructural issue in the City of Rockport as a result of Scenario III activities. Social impacts could arise if crowding of school system facilities becomes noticeable, creating dissatisfaction on the part of the existing residents. Since the number of new students associated with Scenario III activities is relatively small, the possibility of social impacts due to this shortage in Region V is unlikely.

D. Impact on Land Use and Environmental Factors

Chapter 15 noted that secondary effects of residential land development, fluctuating demand for land, increases in return flow wastewater volume and effluent loadings, and atmospheric emissions are potentially significant land use/environmental effects in Region V.

While it has been noted elsewhere that the resultant social impacts of such environmental or land use effects are difficult to isolate, it is reasonable to assume that social tensions could result if existing economic sectors (particularly tourism and fishing) suffer or if land use demands lead to inflated land prices.

E. Impact of Housing Factors

In the analysis of infrastructural issues in Rockport, housing availability was not flagged as a potentially significant infrastructural issue as a result of Scenario III activities. However, it should be noted that 48 housing units have been projected to be required for the first eighteen months of Scenario III activities; and, although housing supply in the recent past in Region V has been equal to demand, there is a good possibility that during these first months of Scenario III activities there may not be a sufficient number of housing units to accommodate existing needs plus the projected new population due to Scenario III activities. Thus, not only would this unavailability of housing units likely be a source of special impact, but land and housing prices could possibly significantly rise - creating social impact. Likewise, the number and quality of mobile homes, and the density of housing could be significantly impacted as a result of Scenario III activities.

F. Impact of Employment Factors

The maximum resident employment in Region V associated with Scenario III activities is projected to be 84 employees. Assuming that these employees will be drawn from the current unemployment pool, the current unemployment level will be reduced by 22.8% (see Figure 300).

Region V, in the past, has had very little industrial development and limited experience with OCS-related activities. Consequently, new industrial sectors as well as job categories will be established to accommodate Scenario III activities. As would be expected, there will likely be an in-migration of more experienced personnel from outside this region since the area has not required a large number of the types of personnel demanded by OCS development.

The number of new residents to be employed by Scenario III activities in Region V is considerably larger than the number of existing residents to be employed. Also, since these existing residents have had such limited OCS experience, it seems likely that those employed would be selected from the skilled unemployed workers in the area and from personnel in other parts of the region who change jobs. So, in reality, the current unemployment pool in Region V may not be as significantly impacted as is shown in Figure 300.

Scenario III activities over the seven-year period are projected to produce a total income of $14,776,630: a 2.8% increase over the seven-year total personal income, based on the 1973 level (see Figure 300). The economy of this region, in the past, has been based on tourist trade and commercial fishing; and personal income levels on the whole have been low. Thus, with the establishment of new industries due to Scenario III activities, it does not seem surprising that personal income levels will be affected by almost 3%. Unfortunately, the new residents, rather than the existing residents, will most likely benefit the greatest from these activities.

Similarly, the total projected OCS expenditures of Scenario III in Region V are $27,177,000, total expenditures over the 6½ years, based on the 1973 annual expenditure level, is $2,306,563,000. Thus, expenditures will be increased 1.2% due to Scenario III activities (see Figure 300). In reality, these personal income and expenditure percentages will probably be less since the annual regional totals will most likely be higher than the 1973 level.

With the institution of new industrial sectors and new job categories in Region V as a result of Scenario III, it seems likely that social impacts will be involved. Not only will there be

increased activity but also competition for jobs. The latter may create resentment on the part of the existing residents whose inexperience may cause them to be passed over for the more experienced worker.

Although the current unemployment level may be slightly impacted by Scenario III activities in Region V, there is no reason to believe, however, that the employment trends for minorities and women will be significantly impacted due to Scenario III activities over and above the current trends of such employment.

G. Impact on Traditional Values

Scenario III activities in Region V may significantly alter the individuals perception of quality of life in the community or of other traditional amenities. As has been shown on the preceding pages, Region V may be significantly impacted by population growth, increased incomes, the introduction of new industrial sectors and job categories and other factors due to Scenario III. This broadening of the economic base may bring not only positive and negative reactions among the affected residents, but also may change their image of the community.

III. Region VI: San Patricio and Nueces Counties

A. Existing Social Characteristics

San Patricio and Nueces Counties, comprising Region VI, are economically and socially diverse. Not only is this a populous, industrialized area with an active port system, it is a significant agricultural, fishing and mineral producing area as well. Its population increased by 32.4% between 1950 and 1960 but by only 6.8% between 1960 and 1970. The region is predominantly urban with 46.8% of the population being of Spanish heritage. Net migration between 1960 and 1970 was -13.1%.

Over 43% of this region's employed earn between $3,000 and $10,000 annually while 18.4% earn below the poverty level. Nearly 35% of the area's over-25 population has had less than nine years of education. The median number of school years completed in San Patricio County is 10.0; in Nueces County it is 11.8. The rate of unemployment as of July 1975 was 8.6% in San Patricio County and 8.1% in Nueces County.

Although only 10% of this area's labor force is employed in manufacturing, annual manufacturing value is more than the value of agricultural and mineral production combined. Region VI produced 3.7% of the State's total gas well gas and 6.1% of its condensate. Additionally, the combined maximum daily capacity of the six refineries in the Corpus Christi area is 12.2% of the State's total; 3.2% of the nation's. Further, this area has 18 gas plants with a combined maximum daily capacity being 5.6% of the State's total.

B. Impact on Demographic Factors

The projected population growth associated with Scenario III activities is minimal in comparison to Region VI's current rate of growth; thus, no related impacts are expected. This region's 1980 projected population will be increased by a maximum of .46% due to Scenario III activities; population density will be increased by a maximum of .38% (see Figure 301).

Additionally, although impacts on families, church groups, ethnic groups, school groups and formal associations are virtually impossible to predict, the increase in this region's population due to Scenario III activities would probably not be substantial enough to produce social impacts.

C. Impact on Services to People

In the analysis of infrastructural issues, educational services was isolated as a potentially significant issue in Corpus Christi. In Aransas Pass, sewage treatment, recreational facilities and educational services were isolated as such issues.

The severity of social impacts of potential shortages of such government services, as mentioned above, depends largely upon the degree to which crowding of these facilities become noticeable. When they do become noticeable, it is not unlikely for the affected residents to demand an expansion of these services. The number of new students in Corpus Christi associated with Scenario III activities is probably not substantial enough to create any significant social impacts.

The strain on sewage treatment in Aransas Pass has already been observed, and measures are being taken to correct the problem. Thus, it seems improbable that the increase in population associated with

Figure 301

Selected Impact Statistics/Region VI/Scenario III

Population/1980 Projection	330,805
Maximum OCS-Related Population	1,528
% Change; OCS-Related	.46%
Total Population: 1980 Projection + Maximum OCS-Related Population	332,333
Density of Population: 1980, Projected	212
Density of Population: 1980, Projected + OCS-Related	212.8
% Increase: OCS-Related	.38%
Maximum OCS-Related Resident Employment	381
Current Unemployment (Sept. 75)	8,996
% of Currently Unemployed to be Hired	4.2%
Total, Projected, OCS-Related Personal Income	$51,360,912
Current, Total, Annual Personal Income (1973) x 7 years (Life of Scenario I)	$8,043,000,000
% Increase: OCS-Related	.64%
Total, Projected, OCS-Related Expenditures	$91,169,000
Current, Total, Annual Expenditures (1973) x 7 years (Life of Scenario I)	$19,934,677,000
% Increase: OCS-Related	.46%

Scenario III will cause further impacts over and above what is currently being experienced. Additionally, recreational facilities and educational services in Aransas Pass will probably not be significantly impacted by Scenario III activities.

D. Impact of Land Use and Environmental Factors

This study's Environmental Impact Assessment concludes that Region VI could experience further air quality deterioration and water pollution as a result of Scenario III activities. The social impacts of such environmental issues, however, is much less obvious and more difficult to assess. It is reasonable to assume that the residents of this region have, for a period of time, lived in an area where air and water quality, from time to time, in certain sites do not meet State and federal standards. It can thus be concluded that the social impacts of environmental degradation directly attributable to Scenario III activities will most likely not be significant.

E. Impact of Housing Factors

Although the availability of housing units was flagged as a potentially significant infrastructural issue in Aransas Pass, it will most likely not be regarded as a source of social impact in Region VI as a result of Scenario III activities since Corpus Christi and Ingleside have available housing units. Likewise, no significant impacts in regard to land or housing prices, the number and quality of mobile home sites, or the density of housing in general is foreseen.

F. Impact of Employment Factors

In Region VI, the maximum number of existing residents who will be employed as a result of Scenario III activities is projected to be 381 (see Figure 301). Assuming that these resident employees will be chosen from the existing unemployment pool and that none will be currently employed persons who change jobs, the percentage of currently unemployed to be hired during Scenario III activities in Region VI is 4.2% (see Figure 301), a relatively minor decline in unemployed residents.

Similarly, Scenario III activities in Region VI over the 6½ year period are projected to generate a total personal income of $51,360,912: a .64% increase in total personal income in Region VI over the 6½ year life of Scenario III, based on the 1973 personal

income level (see Figure 301). Furthermore, the total projected OCS-related business expenditures of Scenario III in Region VI over the 6½ years is $91,169,000. This figure represents a .46% increase over the 6½ year total expenditures in Region VI, based on the 1973 level (see Figure 301). In reality, the personal income percentage and the expenditure percentage will likely be less since the annual regional totals will likely be higher than the 1973 level.

Since the Corpus Christi area has been involved in the oil industry for a considerable length of time, it is reasonable to assume that no new jobs, categories or industrial sectors will be established as a result of Scenario III activities in Region VI. Finally, since the effect on the unemployment level is expected to be relatively minor, Scenario III activities will more than likely have no substantial impacts on the employment of women or minorities over and above the current trends of such employment in Region VI.

G. Impact on Traditional Values

The preceding analysis has shown that in Region VI, income, employment, expenditures, housing, and other factors have engendered such minimal impacts; and will be dispersed over such a sizeable population base that there is no reason to suspect that the individual's perception of quality of life in the community, or of other traditional amenities will be significantly altered by Scenario III activities.

Special Social Issue Analysis

As required by the study methodology (Appendix A), the 'General Social Impact Evaluation' isolated special social issues which are to be analyzed further in the 'Special Social Issue Analysis'.

The General Social Impact Evaluation of Region IV pointed out that Bay City is experiencing a housing shortage, thus, it was isolated as a potentially significant social issue associated with Scenario III activities. The housing shortage will probably become worse with the arrival of new residents associated with Scenario III activities. But the fact that the city is currently taking positive measures to remedy the situation may lighten the social impact of increased population associated with Scenario III. Thus, although there will likely be social impacts involved with the lack of available housing units, it is reasonable to assume that these

impacts will not be over and above what is currently being felt by the existing residents. It should be noted that the new residents could probably live in the surrounding areas until the housing problem in Bay City was solved.

Port O'Connor, in many ways, is unique among specific impacted sites of Region IV and is analyzed further in Part F.

In Region V, the substantial population growth associated with Scenario III was isolated as a potentially significant social issue. Although the region appears relatively stable, population growth has been slow and the tremendous influx of new residents during the first eighteen months of Scenario III activities may put an unforeseen strain on its public services and housing availability. The existing residents may resent this competition for available services brought about by the arrival of the new residents associated with Scenario III activities.

The introduction of new industry and job sectors due to Scenario III activities may also be a source of social impact. This change in the economic mix in the region may have socially significant effects. Further, with this industrial growth comes the probable change of the individual's perception of the community and of traditional values. However, the inconveniences due to increased activities associated with Scenario III may not be substantial and longlasting enough to outweigh the Scenario's positive effects such as increased job opportunities, housing and civic improvements; and more economic opportunity and diversification.

In Region VI, no potentially significant social issues arising from Scenario III activities were isolated. If any social effects were engendered from these activities, they would be spread over such a large population and sizable industrial sector that individual effects would be slight, thus social impacts small.

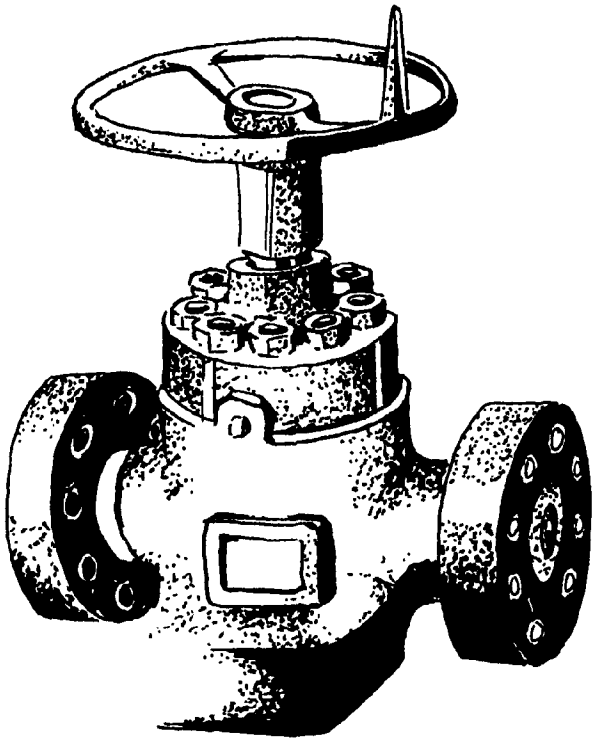
Social Impact Assessment Summary

The 'General Social Impact Evaluation' discussed the general social effects likely to result from OCS activities in each affected study site in Scenario III; these effects, their magnitude, and possible induced social impacts were anlayzed further in the 'Special Social Issue Analysis'.

Although the preceding analyses indicated that, in general, Region IV and VI were not likely to experience any potentially sigificant social impacts as a result of Scenario III activities, that is not to imply, however, that absolutely no social impacts are likely ever to occur due to these activities. Policymakers should be attentative to the fact that OCS-

related social impacts not postulated in Scenario III could arise (see also Part F). For example, the City of Victoria could experience urban growth at a much faster rate than expected; such that not only would its public services be strained, but that there would also be crowding and a general dissatisfaction on the part of the existing residents. Therefore, although no significant social impacts are projected for either Region IV or Region VI, it would be a mistake to conclude that no such impact could ever occur.

In Region V, policymakers should not only be attuned to the social impacts resulting from greater population growth, but also to other subsequent impacts which may arise from such growth.



17. IMPACT ON REGION IV: MATAGORDA, JACKSON, CALHOUN, AND VICTORIA COUNTIES

Summary of Requirements

A summary of the impacts of Scenario III activities on any of the three affected study sites is most easily undertaken by reviewing the requirements placed on that site by such activities. Figure 302 provides such a review for Region IV, the Matagorda, Jackson, Calhoun, and Victoria Counties area. In Figure 302, all requirements are given over time; that is, in each relevant Scenario III time period. Land requirements are categorized primary, indirect, residential, and total; water requirements are given for primary and indirect activities, domestic and municipal use, and total water requirements. Employment requirements are broken down in two ways: direct and indirect; and resident, new resident and commuter. Thus, the figures in the total employment column are equal to the sum of the corresponding figures in the direct and indirect columns, or to the sum of corresponding figures in the resident, new resident, and commuter columns. New population, new housing units, and new students data is also provided. Column totals are provided only for water requirements data. These are the only figures which can be cumulated. In the cases of land, employment, population, housing units and students each column entry is the total requirement of that time period (shown in the first and last columns) and is not an addition to the requirement of the previous time period; thus, no column total is provided.

Significant Infrastructural Issues

Part B includes a detailed discussion of the manner in which the significant infrastructural issues raised by Scenario III activities were identified in each affected study site of Scenario III. (The reader is urged to review that section of Part B.) In short, a significant infrastructural issue was identified when the OCS-generated demand on an infrastructural service (water, sewage, police protection, etc.) could potentially supercede a unit of government's capacity to provide that service. For example, if every city in an affected study site is currently experiencing maximum or near-maximum demand on sewage treatment facilities, any increase in population brought about by an OCS scenario will make sewage treatment a significant issue.

Any list of services provided by a unit of government would, of course, be lengthy. To survey each and every one to determine if it could

Figure 302

SUMMARY OF REQUIREMENTS/SCENARIO III

REGION IV

Time Period	LAND REQUIREMENTS (Acres)					WATER REQUIREMENTS (Acre Feet)				EMPLOYMENT									Time Period
	Primary	Indirect *	Residential	Total	Docking Space (feet)	Primary	Indirect	Domestic & Municipal	Total	Primary	Indirect	Total	Resident	New Resident	Commuter	New Population	New Housing Units	New Students	
6/76- 9/76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6/76- 9/76
9/76-12/76	0	2.9	0.1	3	300	0	0	.36	.36	4	1	5	1	4	0	11	4	3	9/76-12/76
12/76- 3/77	10.5	76.0	2.0	88.5	300	1.38	2.40	5.47	9.25	121	12	133	34	61	38	165	56	42	12/76- 3/77
3/77- 6/77	10.5	76.0	2.0	88.5	300	1.38	2.40	5.63	9.41	121	15	136	35	63	38	170	59	43	3/77- 6/77
6/77- 8/77	10.5	76.0	2.0	88.5	300	.92	1.60	3.76	6.28	121	9	130	29	63	38	170	59	43	6/77- 8/77
3/77- 9/77	10.5	79.0	2.0	91.5	600	.46	.80	1.88	3.14	125	3	128	27	63	38	170	59	43	8/77- 9/77
9/77-12/77	10.5	78.9	2.0	91.5	600	1.38	2.40	5.83	9.61	125	13	138	35	65	38	176	60	44	9/77-12/77
12/77- 2/78	10.5	78.9	2.1	91.5	600	.92	1.60	3.89	6.41	125	10	135	32	65	38	176	60	44	12/77- 2/78
2/78- 3/78	10.5	78.9	2.1	91.5	600	.46	.80	1.94	3.2	125	6	131	28	65	38	176	60	44	2/78- 3/78
3/78- 5/78	10.5	78.9	2.1	91.5	300	.92	1.60	3.89	6.41	125	10	135	32	65	38	176	60	44	3/78- 5/78
5/78- 6/78	10.5	78.9	2.1	91.5	300	.46	.80	1.94	3.2	125	3	128	30	65	38	176	60	44	5/78- 6/78
6/79- 8/78	10.5	78.9	2.1	91.5	300	0	1.60	3.89	5.49	125	10	135	32	65	38	176	60	44	6/78- 8/78
8/78-11/78	10.5	78.9	2.1	91.5	300	1.38	2.40	5.89	9.67	125	15	140	36	66	38	178	61	45	8/78-11/78
11/78- 2/79	10.5	78.9	2.1	91.5	300	1.38	2.40	5.89	9.67	125	13	138	34	66	38	178	61	45	11/78- 2/79
2/79- 5/79	9	10.9	2.1	22	300	0	0	5.89	5.89	30	5	35	0	66	0	178	61	45	2/79- 5/79
5/79- 8/79	9	10.9	2.1	22	0	0	0	5.89	5.89	30	3	33	0	66	0	178	61	45	5/79- 8/79
8/79-12/79	9	10.9	2.1	22	0	0	0	7.87	7.87	30	5	35	0	66	0	178	61	45	8/79-12/79
12/79- 6/80	10	9.9	2.1	22	0	0	0	11.8	11.8	30	8	38	0	66	0	178	61	45	12/79- 6/80
6/80- 1/81	67.5	69.9	4.1	141.5	0	3.22	5.23	26.29	34.74	193	33	226	79	126	21	340	116	86	6/80- 1/81
1/81- 2/81	67.5	69.9	4.1	141.5	0	0	.75	3.76	4.51	193	6	199	52	126	21	340	116	86	1/81- 2/81
2/81- 5/81	69.5	98.3	4.7	172.5	200	1.38	2.88	12.89	17.15	235	19	254	86	144	24	389	132	98	2/81- 5/81
5/81- 8/81	80	122.4	5.6	208	200	1.38	2.88	15.31	19.57	284	22	306	111	171	24	462	157	116	5/81- 8/81
8/81-10/81	137.5	207.7	9.3	354.5	600	1.84	3.41	17.06	22.31	483	23	506	175	286	45	772	262	195	8/81-10/81
10/81- 1/82	137.5	207.4	9.6	354.5	600	1.38	5.12	26.22	32.72	483	38	521	183	293	45	791	269	199	10/81- 1/82
1/82- 3/82	138.5	220.1	9.9	368.5	800	.92	3.41	18.01	22.34	503	25	528	181	302	45	815	277	205	1/82- 3/82
3/82- 5/82	138.5	231.9	10.1	380.5	800	.92	3.84	18.67	23.43	519	26	545	187	313	45	845	287	213	3/82- 5/82
5/82- 6/82	139.5	246.7	10.3	396.5	1000	.46	1.92	9.49	11.87	541	11	552	186	318	48	859	292	216	5/82- 6/82
6/82- 7/82	139.5	246.6	10.4	396.5	1000	0	1.92	9.55	11.47	541	15	556	188	320	48	864	294	218	6/82- 7/82
7/82-10/82	141.5	250.0	11.0	402.5	1000	1.38	5.76	30.26	37.4	549	40	589	203	338	48	913	310	230	7/82-10/82
10/82-12/82	141.5	261.8	11.2	414.5	1000	0	4.27	20.53	29.07	565	31	596	204	344	48	929	316	234	10/82-12/82
						23.9	62.19	289.75	375.84										

*Total indirect land minus residential land

be a significant issue would have been an undertaking of immense proportion. Thus, only the major infrastructural issues were surveyed here. They are:

1. Administrative/Financial Capabilities;
2. Housing;
3. Water Demand;
4. Sewage Collection and Treatment;
5. Solid Waste Collection and Disposal;
6. Crime Prevention;
7. Fire Protection;
8. Recreational Facilities;
9. Health Facilities; and
10. Educational Services.

For each of those ten candidate issues, one or more indicators of a government's ability to handle that issue were established. Next, standard measures for the indicators were used as a basis of comparison with a government's current or future capacity to deal with that issue. Finally, the units of government within an affected study site were analyzed in terms of their current capacity to meet the standard measures for each indicator for the purpose of identifying significant infrastructural issues.

The local governments of Region IV which were analyzed in the manner described above are the City of Bay City, the City of Victoria, the City of Port Lavaca, and Port O'Connor. (It will be recalled that it was postulated that these localities would fill the bulk of Scenario III requirements in Region IV.)

Port O'Connor in Region IV is an unincorporated community of about 1200 permanent residents. Its government is effectively the Calhoun County Commissioners Court. As Port O'Connor is unincorporated, unlike the other communities analyzed in this study, the procedure for identifying special issues (see Part B) is inapplicable. Therefore, the subsequent analysis of special issues in Port O'Connor is based upon on-site discussions with Port O'Connor Chamber of Commerce Officials, oilfield company managers, the Calhoun County Sheriff's Department deputy assigned to Port O'Connor, and the Calhoun County Building Inspector. (Because of the uniqueness of Port O'Connor among affected coastal communities, it has been analyzed separately in Part F of this Volume. While that analysis deals largely with sociocultural impacts, infrastructural impacts are, to some degree, also addressed. The reader is referred to that Part.)

In the following paragraphs, the history and activities of the OCS oilfield companies in Port O'Connor is reviewed. Then follows a categorical descripion of the character of issues facing Port O'Connor, as identified through the interviews.

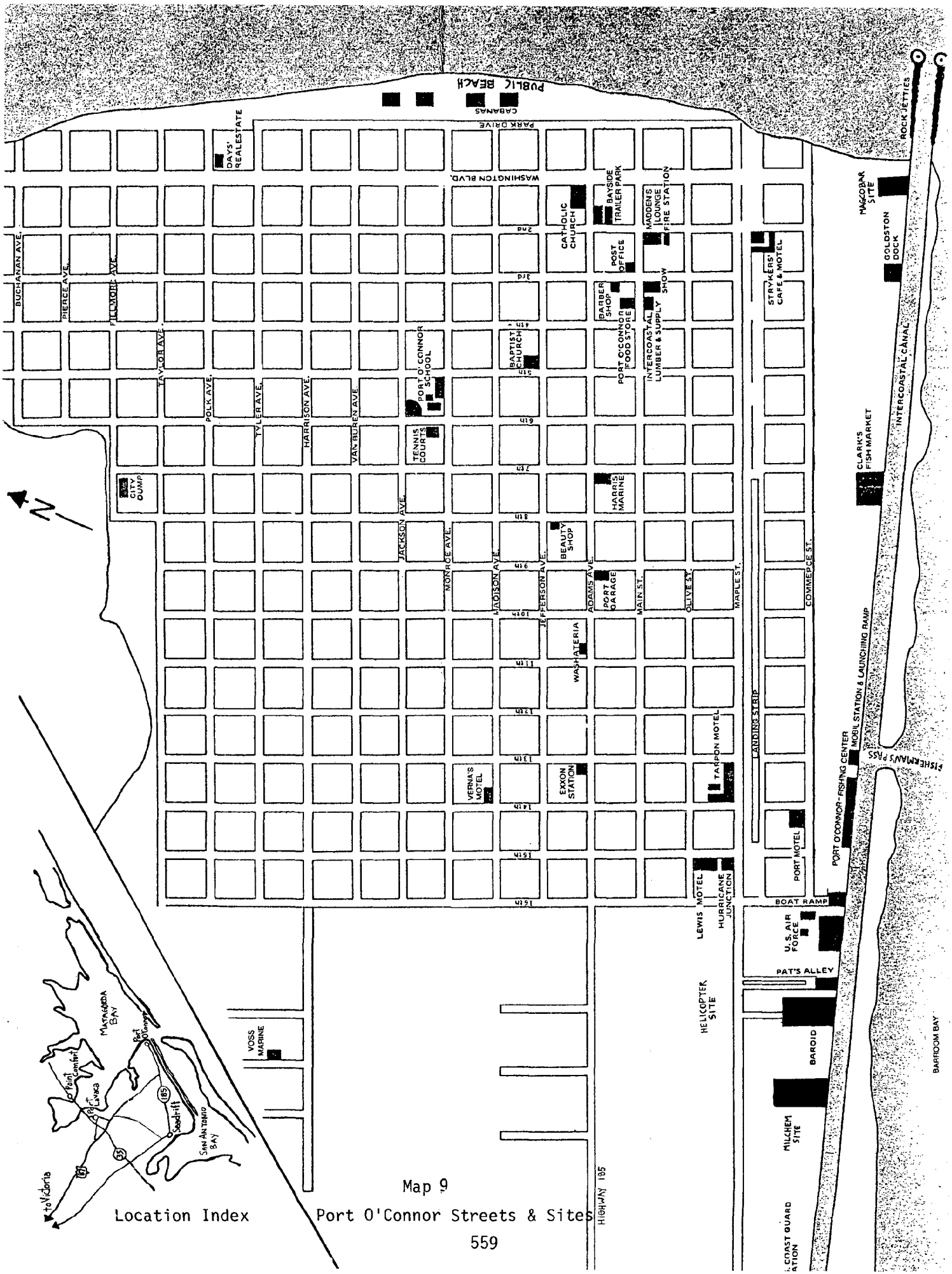
Port O'Connor has three main commercial business sectors: tourism and sport fishing, commercial fishing and shrimping, and the oilfield supply business. The latter bears a direct economic impact of one third of Port O'Connor's cash flow, although a much larger proportion flows through the town from outside the region, onto the company boats, and offshore to the rigs. The three oilfield companies in Port O'Connor are Magcobar, Baroid, and Milchem (see Map 9 for their plant locations). All three supply mud to exploratory drilling operations in the State and Federal portions of the Gulf of Mexico, as well as within Matagorda Bay. Other nearby mud supply company branches are located at Port Lavaca, Bay City, Freeport, Rockport, Ingleside, and Corpus Christi.

Figure 303 shows the status of offshore activity near Port O'Connor. There are currently 58 active Federal leases which may be serviced and supplied from Port O'Connor (including tracts in Brazos, Brazos South Addition, Matagorda, and Mustang Island East Addition blocks). In 42 of these leased tracts, or 72%, the exploration to production sequence has not begun. Nine percent may expire in 1979 if activity is not begun before then, and another 60 percent might expire in 1980. Therefore, it is reasonable to assume that the owners of these tracts, rather than letting the tracts revert to the Federal Government, will increase efforts to develop the potential oil and gas reserves in the area within the next two to three years. This was confirmed by the managers of the mud supply companies in Port O'Connor, who generally expect a 300 to 400 percent increase in their activity offshore in the next two to five years.

The three companies have already experienced increased activity in Port O'Connor. Magcobar operations in Port O'Connor indicated that since this firm began operations in 1971, plant employment has increased from 3 to 13 employees. Magcobar has the largest gross revenue of the three companies in Port O'Connor. Baroid operations likewise indicated a 5 to 14 employee increase since their establishment in Port O'Connor 2½ years ago. Baroid has the second largest gross revenue, which increased more than 450% in the past year. Milchem indicated an increase from 3 to 8 employees, and expects a maximum of 16 employees two years hence. The increased employment has generally been met by oilfield workers relocating from out-of-state (New Jersey, Michigan, and Oklahoma were mentioned as sources) as well as from the Houston/Galveston and Beaumont areas.

In addition to increased employment, the three companies expect that increased plant site acreage may be needed. Magcobar may expand their plant site to the northeast (see Map 9) by filling in low-lying land inside of the breakwater. Baroid has no room for lateral expansion or for increased docking space at their current site. Milchem appears to have ample lateral room to expand along the intracoastal waterway.

The 130 to 200-foot crew and supply boats which operate out of Port O'Connor have as much as 16-foot drafts. Yet at low tide, the intracoastal



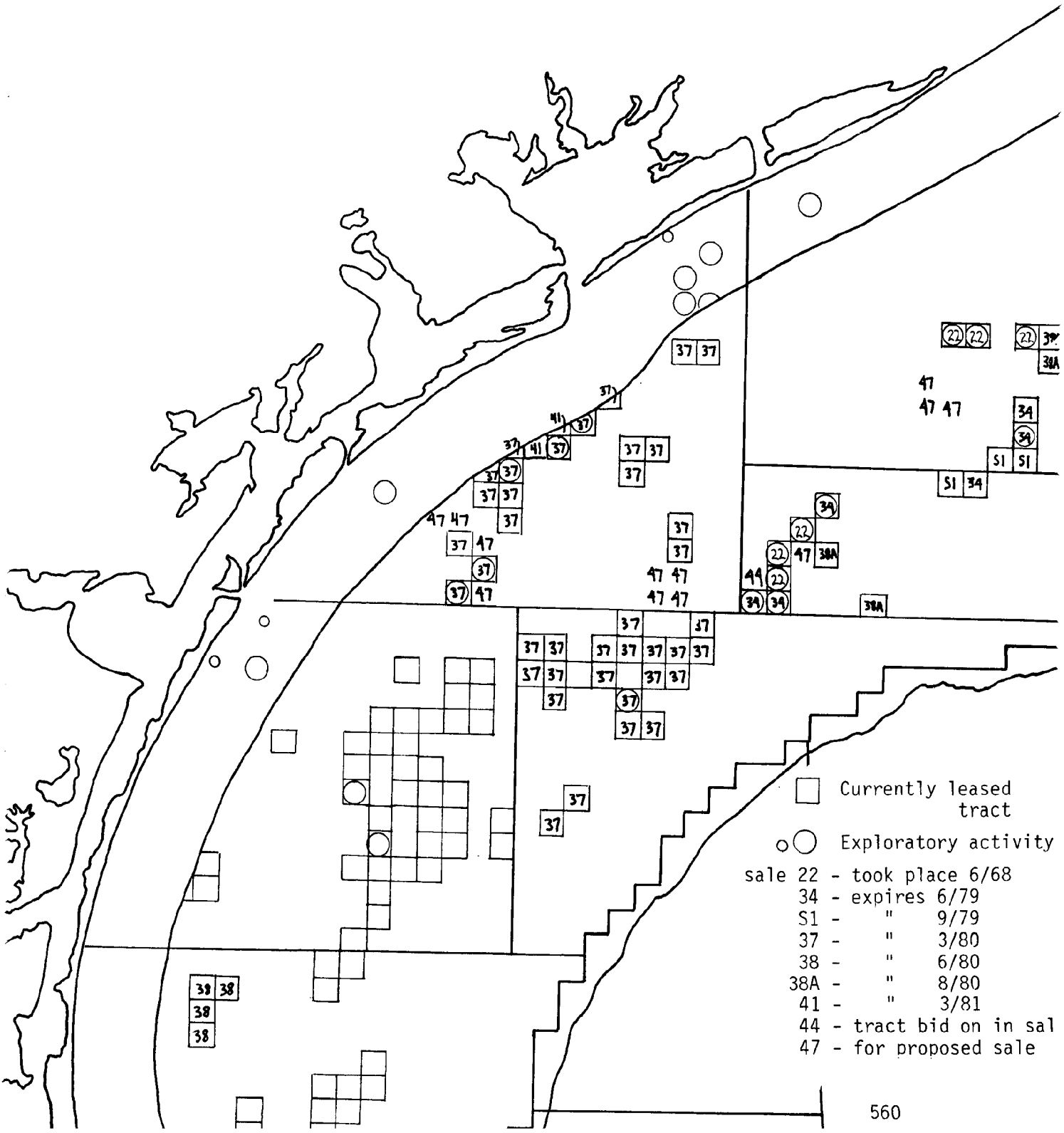
Location Index

Map 9

Port O'Connor Streets & Sites

Figure 303

Offshore Activity Near Port O'Connor



waterway depth is only 12 feet, although the docking berths themselves may extend to a 30-35 foot depth. While there is an expectation that the U.S. Army Corps of Engineers may increase the depth of the waterway, none of the managers appeared certain that such plans would soon be implemented.

It was reported that when offshore rig crew shifts change at Port O'Connor, as many as 200 autos may jam the plant sites, bringing the new shift and or taking away the past shift. Baroid has plans to move their helicopter site, which is leased to Petroleum Helicopter, Inc., further inland (see Map 9) and to convert the present site to a parking area.

Most of the special issues voiced in the interviews with the Calhoun County Building Inspector, the President of the Port O'Connor Chamber of Commerce, and with another member of the Chamber of Commerce, appear to, at least in part, stem from Port O'Connor's non-incorporation as a city. Port O'Connor has no direct financing authority as a rural area, and is dependent upon County financing and County politics. Port O'Connor also has no control over the quality and type of physical growth which occurs in the community, as the County governing body has no such authority.

This lack of ordinance power allows substandard housing construction, construction of marina wet storage boat stalls with no protective fire-walls, and does not allow the community any authoritative voice over a possible conversion to OCS-related industrial plant sites of the remaining frontage along the waterway.

The central issue facing Port O'Connor is certainly their lack of a sewage system. All houses are on septic tank systems. Many of the older systems are overloaded. New installations are inspected under State county-enabling legislation for adequacy in septic tank size and drain field area for minimizing pollution and health hazards. Measures are currently being taken to propose to the State Legislature the establishment of a municipal utilities district (M.U.D.) which would have the funding and authority to construct a sewage collection and treatment system. The construction of this system would, of course, be costly and complicated by the fact that the Port O'Connor area is flat - between 6 and 10 feet above sea level on sandy, permeable soils with a water table within three feet of the surface. An initial expense of $8,000 is expected for the engineering design of the system.

Solid waste disposal in Port O'Connor involves the use of an open dump, which will soon be closed. Port O'Connor must then join a County sanitary landfill operation located roughly 35 miles away from Port O'Connor and requiring capital expenditures for collection vehicles.

Fresh water is supplied by the Guadalupe-Blanco River Authority (GBRA), from their Port Lavaca water treatment plant. There is a 100,000

gallon overhead storage tank in Port O'Connor with a maximum supply rate of 250 gallons per minute. Under tentative plans for the sewage treatment system, Port O'Connor's municipal utilities district would continue to buy water from GBRA, although the M.U.D. would own and operate their own sewage treatment plant and water distribution system.

Port O'Connor has an elementary school with a projected 1977-1978 enrollment of 140 in grades K-8 with a very low student/teacher ratio. Students in grades 9-12 (numbering 53) are bused to Port Lavaca. There was no special issue voiced concerning their school system. Port O'Connor is part of the Calhoun County Independent School District.

There are about 835 residences in Port O'Connor. Roughly 20 to 30 percent are mobile homes; the remainder are single family dwellings. About 400 of the single family residences are weekend or vacation homes, including at least one in the $250,000 range. There is a severe housing problem in Port O'Connor, as expressed by both mud company officials trying to find residences for their employees and by the Chamber of Commerce representatives. The problem does not involve available land of which there is plenty, but rather the lack of development of the land for quality dwelling units. It was expressed that many of the houses and trailers are not fit to live in. Summer rental prices are typically $100 per week. In the off-tourist season, rentals may be $100 to $150 per month for small units. What is needed, it was said, is someone with money and vision to take the initiative to construct suitable housing. The only current restriction on housing construction is under the Federal flood insurance program which requires living quarters to be above the height of hurricane surge flooding. It is expected that after the next hurricane, mobile homes will be prohibited from Port O'Connor. It appears that this housing problem ranks with the sewage system as a key issue in Port O'Connor.

Another problem facing Port O'Connor is transportation. The Calhoun County Transportation Plan identifies State Highway 185 leading into town as part of a 10-year plan to upgrade and widen the transportation facility. Large tractor trailers carrying drillpipe and heavy trucks carrying mud into the mud companies' plant sites exact a toll on the streets within Port O'Connor. Two areas are especially noticeable: one where the trucks turn off Adams Street to the Magcobar site (see Map 9) and the other along Commerce Street. At the former, the trucks cannot execute the narrow turn without dropping of the road with a consequent destruction of the intersection's shoulder. At the second area, the trucks must pull off the road to make way for any auto; here, too, the shoulder bears evidence of deep rutting. The community officials did not know what steps would be taken to improve traffic patterns when increased OCS activity results in added truck usage of the local streets.

A second transportation problem is in the aerial sector. The landing strip located in Map 9 is a privately owned facility with a shell bed

which, although of adequate length to handle aircraft (twin-engine prop planes), has no navigation control. Furthermore, the approach pattern of airplanes conflicts with that of the helicopters using their adjacent site. A near-miss was reported involving a helicopter take-off and an airplane landing a few years ago. There are current discussions among pilots and among local, State, and Federal aviation officials to seek a solution to the problem. It may be noted that the Port O'Connor airstrip has 5 times the level of usage as does the Calhoun County airfield in Port Lavaca.

Another issue related to Port O'Connor's non-incorporation is the lack of a local, full-time police force. A deputy of the Calhoun County Sheriff's department, a Port O'Connor resident, suggests that Port O'Connor could use a permanent force of 3 police officers under present conditions. (By the standard measure used in this section for incorporated cities' crime prevention, Port O'Connor would require a minimum of two police officers, not including the added need during summer months.) However, Port O'Connor's police force actually consists of this deputy, when he is assigned to Port O'Connor and while he is at home or nearby. However, crime prevention does not appear to be a special issue in Port O'Connor, as the crime rate is low.

Finally, there is a sensitive environmental awareness among Port O'Connor residents of the importance of the areas' grassflats and marshes as natural resource areas. An estimated 2/3 of the community ultimately depends upon the marshes' continued productivity. Port O'Connor's tourist industry centers around sport fishing which directly utilizes the marshes and grassflats. The commercial shrimp fishery depends upon the successful spawning and rearing of young fish and shrimp for good harvests in the Gulf of Mexico. There is concern whether an oil spill in Matagorda Bay or in the waterway could be effectively contained.

None of the Region IV incorporated cities included in this analysis appear to have administrative/financial problems. Bay City has no outstanding general obligation bonds and has a low ratio of assessment (30%) and tax rate ($1.30 on $100 value). Similarly, the city appears well-suited in such areas as water supply, solid waste collection and disposal, sewage treatment, fire protection, health facilities, and police protection.

In approximately the past 5 years, a boom industrial expansion in Bay City has, in part, created some infrastructural tensions. Demand for housing has exceeded capacity to provide adequate housing. There is a significant sprawl of mobile homes in and around Bay City. The city has annexed much surrounding land and needs to extend public facilities to these areas. Sewage treatment plants are operating below capacity, with a recent increase in facilities. Recreational facilities are below the state average standard employed in this study to identify special issues. Therefore, in Bay City, housing and recreational facilities have been flagged as special issues.

The City of Victoria appears infrastructurally well-equipped in providing services specifically included in this analysis such as housing, water, sewage treatment and solid waste disposal, police protection, fire prevention, health services, and educational services, such that these factors cannot be considered special issues.

The City of Port Lavaca, in terms of the standard measures of this study, also appears well-suited in the areas of housing, water supply, sewage treatment, solid waste disposal site acreage, fire protection, and health facilities. Port Lavaca barely meets the per capita standard for police officers (0.99), but as the county seat also houses the County Sheriff's Department, crime prevention has not been flagged as a special issue. Port Lavaca is below the State average in number of parks and total park acreage; therefore, recreational facilities is considered a special issue although water-based recreation may supplant part of the local recreational demand.

Thus, the significant infrastructural issues expected to face the impacted communities of Region IV are shown in Figure 304.

Figure 304
Significant Infrastructural Issues/Scenario III/Region IV

1.	Bay City	Housing Recreational Facilities
2.	Victoria	Recreational Facilities Educational Services
3.	Port Lavaca	Recreational Facilities
4.	Port O'Connor	Incorporation Sewage Collection and Treatment Housing Solid Waste Disposal Traffic Patterns

Infrastructural Impacts Associated With Significant Infrastructural Issues

Unlike the analysis of impacts on operating costs, which involve the addition of new residents to current infrastructural systems which have the capacity to absorb more demands, the analysis of significant infrastruc-

tural issues raises the possibility that large-scale, capital expenditures may be required to provide the additional needed services. (Operating costs were analyzed in Chapter 14 and are summarized below.)

It is not clear, however, that because a study site reveals, for example, a need for expanded health services when the infrastructural capacity indicators of this study are applied, that the affected study site will undertake the construction of a new hospital or the expansion of an existing one or any other large-scale capital investment. Between that kind of large capital investment (which would significantly affect the fiscal analysis contained in Chapter 14 and in the Summary below) and a decision to "make do" with existing facilities, there exists an infinite number of short-term, non-capital-intensive solutions. A discussion of some of the solutions is contained in the Executive Summary.

The environmental and social impacts of these significant infrastructural issues were analyzed in Chapters 15 and 16, respectively, and are also summarized below.

Summary of Fiscal, Environmental, and Social Impacts

I. Fiscal

The analysis of fiscal impacts (see Chapter 14) revealed that over the 6½ year life of Scenario III, local governments in Region IV will incur a total cost of $731,232 due to Scenario III activities; during the same period they will accrue $403,325 in tax revenues from Scenario III-related activities. The total deficit over the 6½ year period, then, will be $327,907. Chapter 14 also noted that very seldom during the life of Scenario III will local tax revenues associated with Scenario III cover more than 70% of incurred costs associated with Scenario I in Region I. At times, that percentage drops as low as 42%.

II. Environmental

Chapter 15, Environmental Impact Analysis, isolated the following as potentially significant environmental issues for Region IV:

A. Increased demand for industrial land, land use conversions, and possible secondary effects of residential land development.

B. Solid waste disposal in Calhoun County.

C. Air emissions.

III. Social

A. The social impacts associated with increasing demand for public service and housing (see Chapter 16).

B. Potentially significant social impacts of several types in Port O'Connor. The potential for the development of sociocultural impacts and for observing and ameliorating them at an early stage is somewhat unique in Port O'Connor; it is analyzed separately in Part F of this Volume.

18. IMPACT ON REGION V: ARANSAS AND REFUGIO COUNTIES

Summary of Requirements

A summary of the impacts of Scenario III activities on any of the three affected study sites is most easily undertaken by reviewing the requirements placed on that site by such activities. Figure 305 provides such a review of Region V, the Aransas and Refugio Counties area. In Figure 305, all requirements are given over time; that is, in each relevant Scenario III time period. Land requirements are categorized primary, indirect, residential, and total; water requirements are given for primary and indirect activities, domestic and municipal use, and total water requirements. Employment requirements are broken down in two ways: direct and indirect; and resident, new resident and commuter. Thus, the figures in the total employment column are equal to the sum of the corresponding figures in the direct and indirect columns, or to the sum of corresponding figures in the resident, new resident, and commuter columns. New population, new housing units, and new students data is also provided. Column totals are provided only for water requirements data. These are the only figures which can be cumulated. In the cases of land, employment, population, housing units and students, each column entry is the total requirement of that time period (shown in the first and last columns) and is not an addition to the requirement of the previous time period; thus, no column total is provided.

Significant Infrastructural Issues

Part B includes a detailed discussion of the manner in which the significant infrastructural issues raised by Scenario III activities were identified in each affected study site of Scenario III. (The reader is urged to review that section of Part B.) In short, a significant infrastructural issue was identified when the OCS-generated demand on an infrastructural service (water, sewage, police protection, etc.) could potentially supercede a unit of government's capacity to provide that service. For example, if every city in affected study site is currently experiencing maximum or near-maximum demand on sewage treatment facilities, any increase in population brought about by an OCS scenario will make sewage treatment a significant issue.

Any list of services provided by a unit of government would, of course, be lengthy. To survey each and every one to determine if it could be a significant issue would have been an undertaking of immense proportion. Thus, only the major infrastructural issues were surveyed here. They are:

Figure 305

SUMMARY OF REQUIREMENTS/SCENARIO III

REGION V

Time Period	LAND REQUIREMENTS (Acres)				Docking Space (feet)	WATER REQUIREMENTS (Acre Feet)				EMPLOYMENT						New Population	Housing Units	New Students	Time Period
	Primary	Indirect *	Residential	Total		Primary	Indirect	Domestic & Municipal	Total	Primary	Indirect	Total	Resident	New Resident	Commuter				
6/76- 9/76	0	20.4	0.6	21	300	0	0	1.06	1.06	16	2	18	6	12	0	32	11	8	6/76- 9/76
9/76-12/76	1.5	160.6	3.4	165.5	300	1.38	2.40	6.36	10.14	127	22	149	45	71	33	192	65	48	9/76-12/76
12/76- 3/77	11	227.3	5.7	244	600	1.38	2.40	10.47	14.25	188	34	222	72	117	33	316	107	80	12/76- 3/77
3/77- 6/77	11	227.3	5.7	244	600	1.38	2.40	10.57	14.35	188	35	223	72	118	33	319	108	80	3/77- 6/77
6/77- 8/77	11	227.3	5.7	244	600	.92	1.60	7.05	9.57	188	23	211	60	118	33	319	108	80	6/77- 8/77
8/77- 9/77	11	268.8	6.2	286	600	.46	.80	3.82	5.08	220	12	232	71	128	33	346	118	87	8/77- 9/77
9/77-12/77	11	268.2	6.8	286	600	1.38	2.40	12.63	16.41	220	38	258	84	141	33	381	130	96	9/77-12/77
12/77- 2/78	11	268.2	6.8	286	600	.92	1.60	8.42	10.94	220	26	246	72	141	33	381	130	96	12/77- 2/78
2/78- 3/78	11	268.2	6.8	286	600	.46	.80	4.21	5.47	220	14	234	60	141	33	381	130	96	2/78- 3/78
3/78- 5/78	11	268.2	6.8	286	600	.92	1.60	8.42	10.94	220	26	246	72	141	33	381	130	96	3/78- 5/78
5/78- 6/78	11	268.2	6.8	286	600	.46	.80	4.21	5.47	220	12	232	58	141	33	381	130	96	5/78- 6/78
6/78- 8/78	11	268.2	6.8	286	600	.92	1.60	8.42	10.94	220	26	246	72	141	33	381	130	96	6/78- 8/78
8/78-11/78	11	268.2	6.8	286	600	1.38	2.40	12.69	16.47	220	39	259	84	142	33	383	130	97	8/78-11/78
11/78- 2/79	11	268.2	6.8	286	600	1.38	2.40	12.69	16.47	220	38	258	83	142	33	383	130	97	11/78- 2/79
2/79- 5/79	11	268.2	6.8	286	300	1.38	2.40	12.69	16.47	220	39	259	84	142	33	383	130	97	2/79- 5/79
5/79- 8/79	9.5	146.2	6.8	162.5	300	0	0	12.69	12.69	125	20	145	3	142	0	383	130	97	5/79- 8/79
8/79-12/79	9.5	146.2	6.8	162.5	0	0	0	16.93	16.93	125	28	153	11	142	0	383	130	97	8/79-12/79
12/79- 6/80	9.5	146.2	6.8	162.5	200	0	0	25.39	25.39	125	41	166	24	142	0	383	130	97	12/79- 6/80
6/80- 1/81	9.5	146.2	6.8	162.5	600	0	0	29.62	29.62	125	49	174	32	142	0	383	130	97	6/80- 1/81
1/81- 2/81	9.5	146.2	6.8	162.5	600	0	0	4.32	4.32	125	8	133	0	142	0	383	130	97	1/81- 2/81
2/81- 5/81	9.5	146.2	6.8	162.5	1200	0	0	12.69	12.69	125	21	146	4	142	0	383	130	97	2/81- 5/81
5/81- 8/81	9.5	167.2	6.8	183.5	1400	0	0	12.69	12.69	141	22	163	21	142	0	383	130	97	5/81- 8/81
8/81-10/81	9.5	167.2	6.8	183.5	1600	0	0	8.46	8.46	141	15	156	14	142	0	383	130	97	8/81-10/81
10/81- 1/82	9.5	167.2	6.8	183.5	1600	0	0	12.69	12.69	141	23	164	22	142	0	383	130	97	10/81- 1/82
1/82- 3/82	9.5	188.2	6.8	204.5	1800	0	0	8.46	8.46	157	16	173	31	142	0	383	130	97	1/82- 3/82
3/82- 5/82	9.5	188.2	6.8	204.5	1800	0	0	8.46	8.46	157	17	174	32	142	0	383	130	97	3/82- 5/82
5/82- 6/82	9.5	208.2	6.8	224.5	2000	0	0	4.23	4.23	173	8	181	39	142	0	383	130	97	5/82- 6/82
6/82- 7/82	9.5	208.2	6.8	224.5	2000	0	0	4.23	4.23	173	10	183	41	142	0	383	130	97	6/82- 7/82
7/82-10/82	9.5	249.5	7.5	266.5	2600	0	0	13.89	13.69	205	30	235	80	155	0	419	142	106	7/82-10/82
10/82-12/82	9.5	249.5	7.5	266.5	2600	0	0	9.26	9.26	205	21	226	71	155	0	419	142	106	10/82-12/82
						14.7	25.60	307.63	347.93										

*Total indirect land minus residential land

1. Administrative/Financial Capabilities;
2. Housing;
3. Water Demand;
4. Sewage Collection and Treatment;
5. Solid Waste Collection and Disposal;
6. Crime Prevention;
7. Fire Protection;
8. Recreational Facilities;
9. Health Facilities; and
10. Educational Services.

For each of those ten candidate issues, one or more indicators of a government's ability to handle that issue were established. Next, standard measures for the indicators were used as a basis of comparison with a government's current or future capacity to deal with that issue. Finally, the units of government within an affected study site were analyzed in terms of their current capacity to meet the standard measures for each indicator for the purpose of identifying significant infrastructural issues.

The City of Rockport is the only community analyzed in Region V, Aransas and Refugio Counties. (It will be recalled that it was postulated that this city would fill the bulk of the Scenario III requirements of Region V.)

In terms of administrative/financial capabilities, Rockport's assessed valuation/general obligatory bond ratio and ratio of assessment are well within the standard limits used in this study to isolate special issues. While the tax rate is equal to the maximum allowable by State law for cities of its size (less that 5,000 residents), the tax rate is still lower than surrounding cities. A low ratio of assessment allows graduation upward to increase taxes if necessary. Other indicators of water supply, sewage treatment, solid waste disposal, fire prevention, recreational facilities, and housing do not appear to be special issues. While the number of police officers per capita is close to the standard measure, it is not seen as a special issue. Although there is no hospital or medical clinic in Rockport, the number of physicians is 2.7 times greater than the standard. Most communities of Rockport's size cannot support a local hospital. If the population of Rockport is added to that of Aransas Pass, it is seen that the number of hospital beds per capita population at the Aransas Pass hospital (10 miles from Rockport) is close to the standard for this indicator's measure. Therefore, health facilities are not flagged as a special issue in Rockport. Only educational services,as indicated by a high student/teacher ratio (16.5) is flagged as a special issue.

Infrastructural Impacts Associated With Significant Infrastructural Issues

Unlike the analysis of impacts on operating costs, which involve the addition of new residents to current infrastructural systems which have the capacity to absorb more demands, the analysis of significant infrastructural issues raises the possibility that large-scale, capital expenditures may be required to provide the additional needed services. (Operating costs were analyzed in Chapter 14 and are summarized below.)

It is not clear, however, that because a study site reveals, for example, a need for expanded health services when the infrastructural capacity indicators of this study are applied, that the affected study site will undertake the construction of a new hospital or the expansion of an existing one or any other large-scale capital investment. Between that kind of large capital investment (which would significantly affect the fiscal analysis contained in Chapter 14 and in the Summary below) and a decision to "make do" with existing facilities, there exists an infinite number of short-term, non-capital-intensive solutions. A discussion of some of these solutions is contained in the Executive Summary.

The environmental and social impacts of these significant infrastructural issues were analyzed in Chapters 15 and 16, respectively, and are also summarized below.

Summary of Fiscal, Environmental, and Social Impacts

I. Fiscal

The analysis of fiscal impacts (see Chapter 14) revealed that over the 6½ year life of Scenario III, local governments in Region V will incur a total cost of $696,200 due to Scenario III activities; during the same period they will accrue $299,600 in tax revenues from Scenario III-related activities. The total deficit over the 6½ year period, then, will be $396,600. Chapter 14 also noted that at no time during the life of Scenario III will local tax revenues associated with Scenario III cover more than 60% of incurred costs associated with Scenario III in Region V. At times, that percentage drops to less than 40%.

II. Environmental

The Environmental Impact Analysis (Chapter 15) isolated the following environmental issues as potentially significant in Region V:

A. Secondary effects of residential land development and land use conversions.

B. Increased return flow wastewater volume and effluent loadings.

C. Atmospheric Emissions.

III. Social

Chapter 16 isolated rapid population growth, competition for housing and land, potential shortages of public services, and a changing economic structure as potential sources of social effects which could result in a significant change of life styles for existing residents.

19. IMPACT ON REGION VI: SAN PATRICIO AND NUECES COUNTIES

Summary of Requirements

A summary of the impacts of Scenario III activities is most easily undertaken by reviewing the requirements placed on that site by such activities. Figure 306 provides such a review for Region VI, the San Patricio and Nueces Counties area. In Figure 306, all requirements are given over time; that is, in each relevant Scenario III time period. Land requirements are categorized primary, indirect, residential, and total; water requirements are given for primary and indirect activities, domestic and municipal use, and total water requirements. Employment requirements are broken down in two ways: direct and indirect; and resident, new resident and commuter. Thus, the figures in the total employment column are equal to the sum of the corresponding figures in the direct and indirect columns, or to the sum of corresponding figures in the resident, new resident, and commuter columns. New Population, new housing units, and new students data is also provided. Column totals are provided only for water requirements data. These are the only figures which can be cumulated. In the cases of land, employment, population, housing units and students, each column entry is the total requirement of that time period (shown in the first and last columns) and is not an addition to the requirement of the previous time period; thus, no column total is provided.

Significant Infrastructural Issues

Part B includes a detailed discussion of the manner in which the significant infrastructural issues raised by Scenario III activities were identified in each affected study site of Scenario III. (The reader is urged to review that section of Part B.) In short, a significant infrastructural issue was identified when the OCS-generated demand on an infrastructural service (water, sewage, police protection, etc.) could potentially supercede a unit of government's capacity to provide that service. For example, if every city in any affected study site is currently experiencing maximum or near-maximum demand on sewage treatment facilities, any increase in population brought about by an OCS scenario will make sewage treatment a significant issue.

Any list of services provided by a unit of government would, of course, be lengthy. To survey each and every one to determine if it could be a significant issue would have been an undertaking of immense proportion. Thus, only the major infrastructural issues were surveyed here. They are:

Figure 306

SUMMARY OF REQUIREMENTS/SCENARIO III

REGION VI

Time Period	LAND REQUIREMENTS (Acres) Primary	Indirect *	Residential	Total	Docking Space (feet)	WATER REQUIREMENTS (Acre Feet) Primary	Indirect	Domestic & Municipal	Total	EMPLOYMENT Primary	Indirect	Total	Resident	New Resident	Commuter	New Population	New Housing Units	New Students	Time Period
6/76- 9/76	20.5	70.5	5.5	96.5	300	1.38	1.82	12.0	15.2	209	39	248	95	134	19	362	123	91	6/76- 9/76
9/76-12/76	20.5	84.5	6.5	111.5	600	1.38	1.82	14.15	17.35	241	44	285	108	158	19	427	145	108	9/76-12/76
12/76- 3/77	21	104.1	7.9	133	900	1.38	1.82	17.37	20.57	288	51	339	126	194	19	524	178	132	12/76- 3/77
3/77- 6/77	21	104.1	7.9	133	900	1.38	1.82	17.37	20.57	288	50	338	125	194	19	524	178	132	3/77- 6/77
6/77- 8/77	21	104.1	7.9	133	900	.92	1.21	11.58	13.71	288	34	322	109	194	19	524	178	132	6/77- 8/77
8/77- 9/77	22.5	152.2	9.8	184.5	1200	.92	1.21	7.1	9.23	399	22	421	145	238	38	643	219	162	8/77- 9/77
9/77-12/77	22.5	151.3	10.7	184.5	1200	2.76	3.63	23.43	29.82	399	70	469	169	262	38	707	240	178	9/77-12/77
12/77- 2/78	22.5	151.3	10.7	184.5	1200	.92	2.42	15.62	18.96	399	47	446	146	262	38	707	240	178	12/77- 2/78
2/78- 3/78	22.5	151.3	10.7	184.5	1200	.92	1.21	7.81	9.94	399	24	423	123	262	38	707	240	178	2/78- 3/78
3/78- 5/78	21	109.3	10.7	141	900	.92	1.21	15.62	17.75	304	34	338	57	262	19	707	240	178	3/78- 5/78
5/78- 6/78	21	109.3	10.7	141	900	.46	.61	7.81	8.88	304	16	320	39	262	19	707	240	178	5/78- 6/78
6/78- 8/78	21	109.3	10.7	141	900	.92	1.21	15.62	16.69	304	36	340	59	262	19	707	240	178	6/78- 8/78
8/78-11/78	21	109.3	10.7	141	900	1.38	1.82	23.43	25.56	304	53	357	76	262	19	707	240	178	8/78-11/78
11/78- 2/79	21	109.3	10.7	141	900	1.38	1.82	23.43	26.63	304	52	356	75	262	19	707	240	178	11/78- 2/79
2/79- 5/79	21	142.8	14.2	178	900	1.38	1.82	31.16	34.36	464	178	642	243	348	51	940	320	237	2/79- 5/79
5/79- 8/79	21	179.7	14.3	215	700	1.38	1.82	31.22	34.42	464	179	643	243	349	51	942	320	237	5/79- 8/79
8/79-12/79	19.5	136.7	14.3	170.5	400	0	0	41.63	0	369	213	582	201	349	32	942	320	237	8/79-12/79
12/79- 6/80	77	148.0	19.0	244	1000	2.76	3.39	83.26	89.41	528	354	882	371	465	46	1,256	427	317	12/79- 6/80
6/80- 1/81	78	75.0	19.0	172	1000	3.22	3.95	97.13	104.3	372	121	492	14	465	14	1,256	427	317	6/80- 1/81
1/81- 2/81	78	83.0	19.0	180	1000	.46	.73	13.88	15.07	388	20	408	0	465	0	1,256	427	317	1/81- 2/81
2/81- 5/81	82	94.0	19.0	195	1800	1.38	2.18	41.63	45.19	422	61	483	2	465	16	1,256	427	317	2/81- 5/81
5/81- 8/81	139.5	129.0	19.0	287.5	2400	2.76	3.87	41.63	48.26	621	82	703	209	465	29	1,256	427	317	5/81- 8/81
8/81-10/81	140.5	137.0	19.0	296.5	2500	1.84	2.58	27.75	32.17	641	57	698	204	465	29	1,256	427	317	8/81-10/81
10/81- 1/82	140.5	145.0	19.0	304.5	2500	2.76	4.36	41.63	48.75	657	90	747	253	465	29	1,256	427	317	10/81- 1/82
1/82- 3/82	151.5	171.0	19.0	341.5	3000	1.84	3.23	27.75	32.79	737	68	805	309	465	31	1,256	427	317	1/82- 3/82
3/82- 5/82	151.5	171.0	19.0	341.5	3000	.92	3.23	27.75	31.9	737	70	807	311	465	31	1,256	427	317	3/82- 5/82
5/82- 6/82	163	198.3	19.7	381	3400	.92	1.61	14.35	16.88	822	39	861	349	481	31	1,299	442	327	5/82- 6/82
6/82- 7/82	163	211.5	20.5	395	3400	.46	1.94	14.88	17.28	854	44	898	368	499	31	1,347	458	339	6/82- 7/82
7/82-10/82	164	225.9	23.1	413	3600	1.38	5.81	50.64	57.83	892	131	1,023	424	566	33	1,528	520	385	7/82-10/82
10/82-12/82	164	225.9	23.1	413	3600	.92	3.87	33.76	38.55	892	88	980	381	566	33	1,528	520	385	10/82-12/82
						41.4	68.02	832.39	941.79										

*Total indirect land minus residential land

1. Administrative/Financial Capabilities;
2. Housing;
3. Water Demand;
4. Sewage Collection and Treatment;
5. Solid Waste Collection and Disposal;
6. Crime Prevention;
7. Fire Protection;
8. Recreational Facilities;
9. Health Facilities; and
10. Educational Services.

For each of those ten candidate issues, one or more indicators of a government's ability to handle that issue were established. Next, standard measures for the indicators were used as a basis of comparison with a government's current or future capacity to deal with that issue. Finally, the units of government within an affected study site were analyzed in terms of their current capacity to meet the standard measures for each indicator for the purpose of identifying significant infrastructural issues.

The local governments of Region VI which were analyzed in the manner described above are the City of Corpus Christi, the City of Ingleside, and the City of Aransas Pass. (Most requirements of Scenario III in Region VI, it will be recalled, are expected to be filled in these localities.)

The Cities of Corpus Christi and Ingleside, in Region VI, were studied in Scenario II. The reader is referred to Chapter 17 in Part D of this report for a discussion of infrastructural issues in these cities. The special issues isolated there include only educational services in Corpus Christi. In Ingleside, no special issues were identified.

The City of Aransas Pass is added to the analysis of infrastructural issues in Region VI with the Scenario III direct OCS sub-allocation of requirements. Administrative/financial capabilities in Aransas Pass do not appear to be a special issue, with a ratio of assessed valuation to general obligatory bonds (19.4) well above the standard measure employed in this study (see Part B). There is no special issue seen for other indicators of water supply, solid waste disposal, crime prevention, fire protection, and health facilities.

However, other indicators may be considered as special issues. Sewage treatment plant usage exceeds capacity, either because of water infiltration or excess sewage generation. The city has until December, 1979 to reach a solution to the problem. Total recreational park acreage is below the standard for towns (population 2,500 to 9,999) while number of parks is just equal to the standard employed in this study. In addition, the student/teacher ratio (18.1) may indicate that educational services are a special issue. Finally, a housing shortage is evident, especially for rental units, as building supply does not meet demand.

Therefore, the significant infrastructural issues expected to face the impacted cities of Region VI are shown in Figure 307.

Figure 307

Significant Infrastructural Issues/Scenario III/Region VI

1.	Corpus Christi	Educational Services
2.	Ingleside	None Identified
3.	Aransas Pass	Housing Sewage Treatment Recreational Facilities Educational Services

Infrastructural Impacts Associated With Significant Infrastructural Issues

Unlike the analysis of impacts on operating costs, which involve the addition of new residents to current infrastructural systems which have the capacity to absorb more demands, the analysis of significant infrastructural issues raises the possibility that large-scale, capital expenditures may be required to provide the additional needed services. (Operating costs were analyzed in Chapter 14 and are summarized below.)

It is not clear, however, that because a study site reveals, for example, a need for expanded health services when the infrastructural capacity indicators of this study are applied, that the affected study site will undertake the construction of a new hospital or the expansion of an existing one or any other large-scale capital investment. Between that kind of large capital investment (which would significantly affect the fiscal analysis contained in Chapter 14 and in the Summary below) and a decision to "make do" with existing facilities, there exists an infinite number of short-term, non-capital-intensive solutions. A discussion of some of the solutions is contained in the Executive Summary.

The environmental and social impacts of these significant infrastructural issues were analyzed in Chapters 15 and 16, respectively, and are also summarized below.

Summary of Fiscal, Environmental, and Social Impacts

I. Fiscal

The analysis of fiscal impacts (see Chapter 14) revealed that over the 6½ year life of Scenario III, local governments in Region VI will incur a total cost of $2,071,992 due to Scenario III activities; during the same period they will accrue $1,202,079 in tax revenues from Scenario III-related activities. The total deficit over the 6½ year period, then, will be $869,913. Chapter 14 further revealed that occasionally during the life of Scenario III will local tax revenues associated with Scenario III cover more than 100% of incurred costs associated with Scenario III in Region VI. At times, that percentage drops to less than 30%.

II. Environmental

Chapter 15, Environmental Impact Analysis, isolated air and water quality as potentially significant environmental issues for Region VI. (See also Chapters 15 and 17 of Part D.)

III. Social

No potentially significant social issues for Region VI were isolated in Chapter 16, Social Impact Analysis.

PART F

OCS DEVELOPMENT: A SOCIOCULTURAL PORTRAIT OF A SMALL COMMUNITY

A SOCIOCULTURAL PORTRAIT OF SMALL COMMUNITY

Introduction

This study attempts to further answer the question raised in Volume II: "given the impacts on systems (economic, demographic, infrastructural, or environmental), what can be said of the impacts on people?" (pg. 65). It is recognized that residents in small towns will experience the impacts of offshore oil and gas development differently than persons who reside in large urban centers. Individuals living in small cities or towns will be more aware of increasing diversity as a result of development, and in many cases their communities will be less prepared and less able to deal with the consequences of growth. While the organizational and institutional structures of some of these communities may be strained, the existence of a governmental structure does allow a community to have a voice in decisions involving future growth. However, what of the small, isolated community which has no local governmental structure?

Port O'Connor is a small, unincorporated community on the Texas coast. In many ways Port O'Connor has all the characteristics of a potential "boom town." This study does not suggest that Port O'Connor will experience a boom, but that the community is growing rapidly relative to its size. The population has at least doubled during the last eight to ten years and is now estimated at 1,100 persons. This growth is the result of a number of factors including an increase in the number of tourists, resident retirees, and oil support personnel in the community. The native residents speak of the change in their lives - the traffic, the overused septic tanks, the strangers, the rising land prices, and the construction.

The question of incorporation is the major issue facing this community. For a number of reasons discussed in detail in this section, the majority of the residents oppose incorporation. Their attitudes toward this issue are indicative of their attitudes toward their lives and their community. They resent the idea of increased government and local taxes. Many actively oppose the growth of their community and the changes in their life that result from growth. The majority of the residents want to go back "to the good old days", and they see incorporation as propelling them in the opposite direction. The importance of this issue in the future of Port O'Connor can not be overlooked; the mere fact that it is an issue in the community is a manifestation of its growth.

Port O'Connor was chosen for study because of its size and its location. The community's small size allowed on-site study in a reasonable time period; its location makes it a likely candidate for further OCS development. Its unincorporated status, however, makes it difficult to learn much about Port O'Connor without on-site research.

Port O'Connor offered an opportunity to use a more qualitative approach to investigate the possible impacts of development on a community. This study is not a prediction that development will occur in this particular community, but it does examine various options available to Port O'Connor. Both the degree and direction of growth will depend on the decisions made by residents as well as non-residents. However, by observing the residents and talking with them it is possible to generally discern how they feel about growth, what they perceive their options to be, and what their decisions will likely be.

A large portion of the time involved in this study was spent learning about Port O'Connor, and a considerable portion of this paper describes the people in this community and their perceptions of their life. As such, this study is a short-term ethnography that hopefully establishes a baseline for further discussions of the effects of growth and change on the social and economic lives of individuals.

While this study might be described as the first step in the social impact assessment process, it differs in an important respect. Some social impact assessment studies that involve on-site research have been based on the knowledge that growth will occur in the area due to a specific project (e.g. Thompson, Blevins, Ellis - 1975). Others have known the general area being considered for the location of a specific project, thus being forced to discuss the effects more generally. (e.g. Lopreato, Meriwether, Ramsey). Many researchers began their studies after a specific project had resulted in a "boom" (e.g. Blevins, Thompson, Ellis - 1974). In all cases, the underlying assumption was that growth would occur in a particular area due to a specific project. Since this study cannot make this assumption with such certainty, it may be argued that this study extends beyond the framework of traditional social impact assessment.

Methodology

Ethnographic studies depend heavily on qualitative methodologies. The primary goal is to produce a descriptive study which is holistic in nature. Ethnographic study seeks to present both the subjective viewpoint of an individual, organization or community as well as the viewpoint of the researcher.

"The two approaches which have served as the mainstays of qualitative methods" are participant observation and interviewing (Bogdon and Taylor-1975), and both approaches were used extensively in this study. The participant observation approach allows a researcher to become immersed in the lives of the people - to eat with them, joke with them, and talk with them of their concerns and experiences. Interviewing, which in this case was relatively unstructured, allows a researcher to discover particular individuals' reactions to specific topics.

The primary researcher spent approximately 18 days in the community. Four other members of the research team visited Port O'Connor for an average of one and one-half days each. Interviews were conducted with a variety of people including those from various occupational and age groups, those who had lived in the community for varying amounts of time, and those who are best described as community leaders. Topics discussed varied slightly in the individual interviews, but generally included personal life histories as well as attitudes toward the community and growth. Available time did not allow for the use of questionnaires; however, a number of secondary data sources were utilized. A more detailed discussion of the methodological perspectives and tools employed in this study can be found in Appendix I.

Description of Port O'Connor

I. History

The American Townsite Company had high hopes for a small settlement on the coast of Texas around the turn of the century. Rail service had been extended to Alligator's Head located on the southeast corner of the O'Connor Ranch. The company renamed the community Port O'Connor in honor of Thomas O'Connor. A company brochure on the new township boasts of the beauty and convenience of Port O'Connor and of the fine facilities. Business lots, bay front lots, and farm tracts were offered for sale. The town was described as both a popular resort and a rich farming area. In 1919 a hurricane destroyed the flourishing town with its $18,000 "Pleasure" pavilion, its fine hotel, its two banks, and its numerous stores and houses.

The town was rebuilt, but slowly. In 1942 and 1945 Port O'Connor was partially destroyed by two more hurricanes. During World War II, the Air Force nationalized Matagorda Island for use as a base and gunnery range and compensated the original owners. Port O'Connor, thus, became the home of Air Force personnel and their families. Once again, the town began to grow, and once again a hurricane intruded.

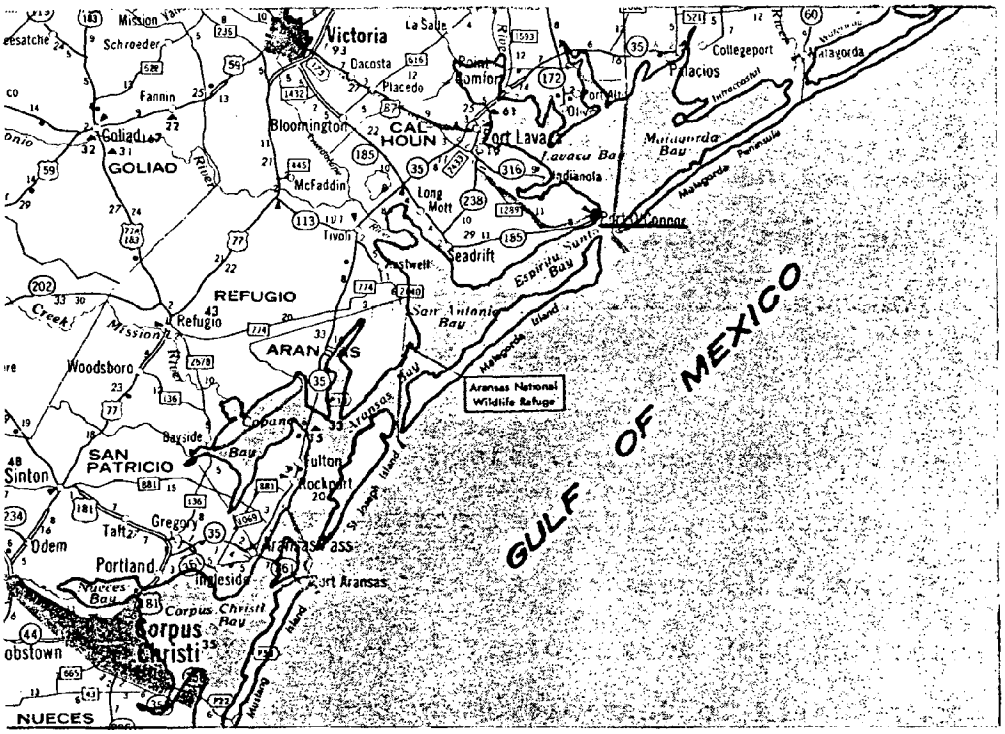
In September of 1961, Hurricane Carla destroyed 90% of Port O'Connor. Many of the residents remember the storm and cite it as an important point in the current spurt in tourism. Although it does not appear that the growth began immediately after the hurricane, the attention drawn to the town because of the storm was undoubtedly a component in the resurgence of the tourist industry. Sports fishermen came to launch their boats into the Gulf and often returned to buy land and build vacation homes. Others became permanent residents either upon retirement or to escape the bustle of larger cities. The long-time residents were apparently unconcerned in the beginning, but as the number of tourists has increased, problems have developed.

II. Geography

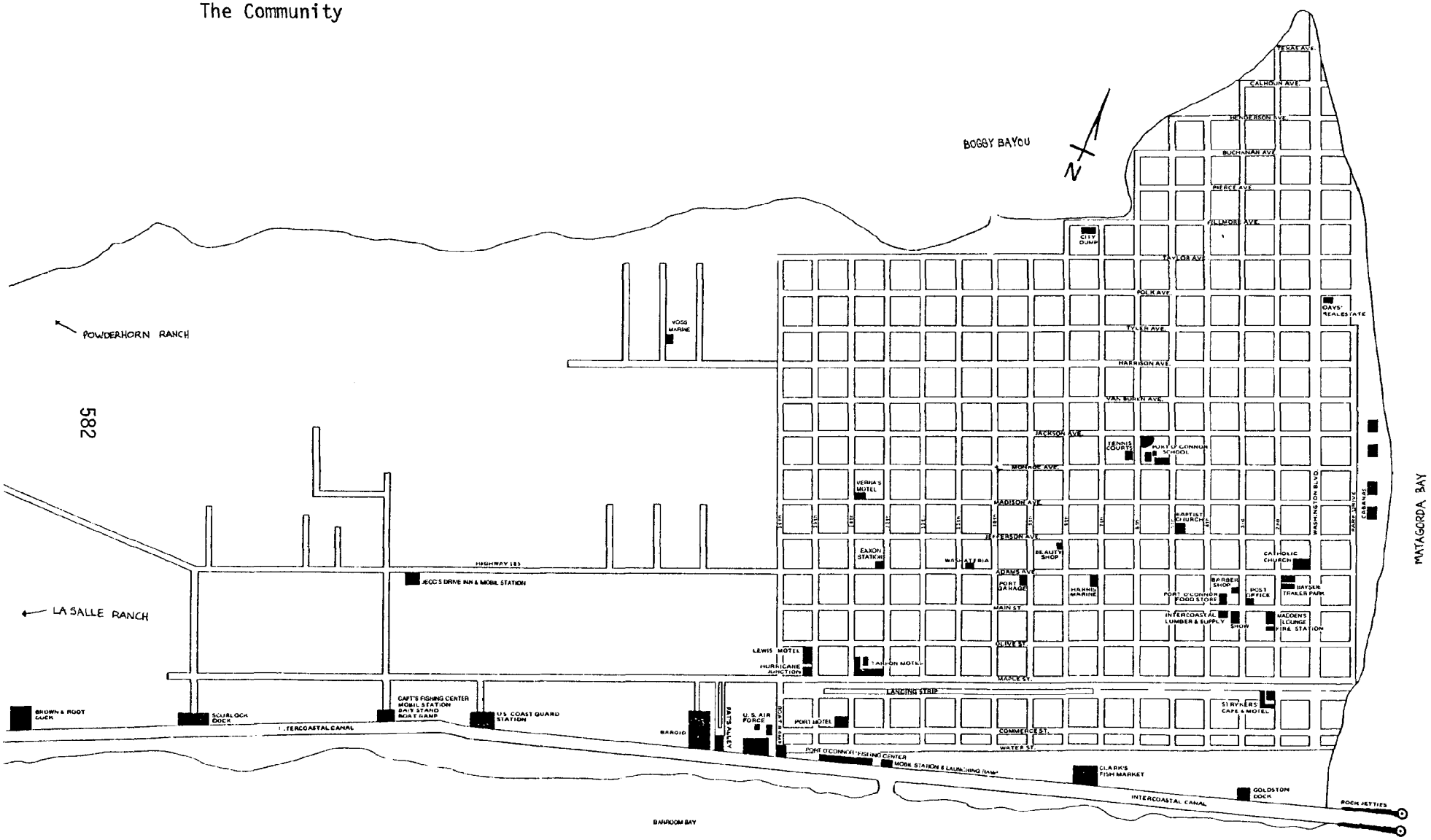
Port O'Connor's location makes it attractive to industry as well as tourists. Located on the eastern tip of Calhoun County, twenty-eight miles from Port Lavaca, Port O'Connor occupies an interesting geographical position. Halfway between Freeport and Corpus Christi, the community is surrounded on three sides by the intercoastal canal and bays. It is within three miles of Pass Cavallo, a natural pass to the Gulf of Mexico.

Map 10

Map of the Vicinity



Map 11
The Community



(Source: Port O'Connor Chamber of Commerce Brochure)

Two large ranches border the fourth side of the community as shown in Map II. Though it might be difficult for a newcomer to identify downtown Port O'Connor, the residents designate this as the area near the Post Office. The community has no real neighborhoods, and commercial enterprises are often located next door to housing units. In general, though, the canal front land is the sight of the industrial docks and the marinas serving sports fishermen. However, there are also a number of expensive homes owned by vacationers on the canal, and most of the motels are in this area. Vacation homes that range from very expensive to moderately priced are found along the bay front. Throughout the rest of the area, mobile homes are quite common.

III. Demography

Accurate demographic data on this type of community is not readily available. Port O'Connor was an enumeration district in the 1970 Census; some of this Census information has been compiled in Figure 308. The accuracy of this data may be questioned. For instance, the Census lists 255 housing units as vacant year round. However, it seems likely that these houses belong to summer/weekend residents and were erroneously listed as vacant year round. The Census also lists 84 children between the ages of 5 and 15 in Port O'Connor in 1970, yet the enrollment in the local school was 134 as of February, 1970. Since the school serves only local residents, this discrepancy may indicate a low census count for the population as a whole. While the Census Bureau emphasizes the sampling and non-sampling variability of its data, particularly in data for very small areas, the Port O'Connor data appears to represent a rather extreme case.

Figure 309 lists various information collected or observed about the community in March and April of 1977. The population and housing count are approximations. The population figure is based on observation and discussions with the local postmaster and county building inspector. An actual housing count was taken, but the settlement patterns make it difficult to promise 100% accuracy. The remaining information was obtained from county agencies.

It is interesting to note that the enrollment in the Port O'Connor school was 133 students in February of 1977 as compared to an enrollment of 134 students in February of 1970. Thus, the overall population and housing growth has not been paralleled by increased school enrollment. Two factors may be important in explaining this disparity. First, probably 40% to 50% of the residences in Port O'Connor are owned by individuals who use them only during the summer or on weekends. Second, many of the full-time residents who have recently moved to the community no longer have school-aged children at home.

Figure 308

Selected 1970 Census Data Relevant to Port O'Connor

Population	450

Count of Persons By: Sex and Age

Age	Male	Female
0- 2	14	11
3- 4	5	38
5	5	5
6	15	5
7- 9	19	19
10-13	0	5
14	0	0
15	6	5
16	6	0
17	4	0
18	0	10
19	0	0
20	5	0
21	18	10
22-24	12	18
25-34	46	24
35-44	44	32
45-54	23	24
55-59	5	0
60-61	0	0
62-64	0	5
65-74	0	7
75 yrs and older	0	5

Count of Persons By: Household Relationship	
Head of Family	125
Primary Individual	28
Relative of Head	297
Nonrelative of Head	0
Inmate in Institution	0
Others in Group Quarters	0
Housing Units	407
Occupied and Vacant Year Round Housing Units By:	
Tenure/Vacancy Status Occupied	
Owner or Being Bought	81
Cooperative or Condominium	0
Rented for Cash Rent	57
Occupied Without Payment of Cash Rent	5
Vacant Year-Round	
For Rent	0
For Sale Only	9
All other	255

Figure 309

Demographic Information on Port O'Connor in 1977

Approximate population	1,100
Housing	
Homes	557
Mobile homes	210
Permanent Campers	210
Homes under construction	12
Calhoun County Independent School District Count, Feb., 1977	
Students enrolled in Port O'Connor School (K-8)	133
Students from Port O'Connor bused to Calhoun High School (Port Lavaca)	53
Department of Public Welfare (Port Lavaca) Feb., 1977	
Port O'Connor residents in DPW nursing homes	0
Port O'Connor residents receiving food stamps	12
Port O'Connor residents receiving AFDC	3
Port O'Connor residents receiving protective services	1
Port O'Connor residents receiving ABD	0

The possible discrepancies in the Census data make it difficult to accurately determine the exact degree of population and housing growth. Although there are a considerable number of new homes in the community, residents and employees of oil service companies expressed concern over the lack of available housing. Many of the older homes are of poor quality and few dwellings are available for long-terms renting or leasing. The problem is not a lack of available land, but rather the scarcity of homes that are built for sale or lease purposes.

Another significant characteristics, which is discussed further in this section, is the small number of residents who utilize Department of Public Welfare services (see Figure 309). There are probably a considerable number of families who, though eligible, have not sought public assistance. The low utilization of Public Welfare services is paralleled by the residents' low utilization of Texas Department of Mental Health and Mental Retardation services as shown in Figure 310. The fact that residents do not utilize these services is probably a reflection of their attitudes toward governmental services in general.

Figure 310

Residents' Use of MHMR Services

	72	73	74	75	76
Admissions to State Hospitals					
Austin	0	0	0	0	1
San Antonio	0	4	4	0	1
Admission to State Schools					
Corpus Christi	0	1	0	0	0
Travis State	0	0	1	0	0
Admission to Gulf Bend Community Center	2	4	3	9	6

IV. Public Services

The public services locally available are minimal. There is a volunteer fire department and a local school. There are no doctors, and the nearest hospital is located in Port Lavaca. The roads and garbage dump are maintained by the county. A county deputy sheriff moved to the community two years ago and is assigned part-time to Port O'Connor. Although the local Chamber of Commerce and the Port O'Connor Businessmen's Association have organized a number of public projects, the community depends on the county for many of its services.

The community receives its electricity from a cooperative and its water from the Guadalupe-Blanco River Authority. There is no sewer system in Port O'Connor and problems have developed with the septic tank systems. After a year of heavy rain, many of the septic tanks overflowed this winter. The county government cannot supply sewer service to the community. A bill, H. B. 2151, has been introduced in the 1977 session of the Texas Legislature which would establish a municipal utilities district (MUD) in Port O'Connor, thus allowing them to construct a sewer system. The Chamber of Commerce sponsored an election to determine the board of directors for the MUD in February, 1977.

There are a limited number of formal communication systems in the community. Port O'Connor has no local newspaper, although the Port Lavaca, Victoria, Houston, and Corpus Christi papers are delivered daily. A private cable television station operates locally and broadcasts music, weather information, and community announcements.

Port O'Connor has two churches. The Baptist church has a new minister, but the Catholic church does not have a resident priest. The churches sponsor weekly activities.

V. Commercial Activities

The tempo of life is slow in Port O'Connor on a February day. The Post Office experiences a flurry of activity at ten o'clock when the mail arrives. The motels and marinas are empty and traffic on the streets is minimal. Occassionally large trucks rumble down the narrow roads and helicopters pass overhead. By no stretch of the imagination does Port O'Connor "bustle" - at least, not on a winter's day.

However, the residents describe the change which comes with the summer. On weekend mornings, cars and boat trailers may be lined up a quarter of a mile waiting for a launch space; ten private planes may be parked on the dirt airstrip. Tempers often flare. Novices drag their boats up the cement launch, having forgotten to unhook them from their trailers. Needless to say, most of the residents have their tourist story.

Tourism is a seasonal activity in Port O'Connor which begins in the spring, reaches a peak in the summer, and tapers off in the fall. Some of the tourists own houses or trailers in the community; others bring their own campers or stay in the motels. The tourist industry here centers around sports fishing. This industry is a major source of revenue for a number of the local commercial enterprises including the grocery stores, restaurants, marinas, motels, and construction companies (see Figure 311). However, a majority of the residents derive their major income from commercial fishing activities.

Commercial fishing, particularly shrimping, is also a seasonal activities. The gulf shrimping seasons are regulated by the Texas Department of Parks and Wildlife. Usually gulf shrimping is allowed year round with the exception of 45 to 60 day period in May or June. This closed season allows young shrimp to grow to legal size and thus, varies yearly with the shrimp's life-cycle. There are two bay shrimping seasons, May 15 through July 15 and August 15 through December 15.

Some shrimpers work on construction crews during the off-seasons; a few find industrial employment. Many use this time to repair and repaint their boats. Although oystering is another alternative, few choose this because of the potential damage to their boats. According to shrimpers who were interviewed, a good bay shrimper makes around $15,000 a year after boat expenses, but they are quick to point out that it depends on the year and the shrimp.

Shrimping is difficult work and during the seasons can be a seven-days-a-week, twelve-hours-a-day job. Bay boats, small boats which shrimp in the bays, require at least a two-person crew - one to steer the boat and one to cull the shrimp. Boat owners often rely on their families, particularly wives and sons, for help. When a crew is hired, the profit is divided equally, with the boat counted as a partner.

Fishing boats which shrimp in the open gulf require a larger crew - usually 4 to 6 persons. These large boats often stay out for two or three weeks. They represent substantial capital investments with initial purchase prices of $100,000 to $150,000, as compared to bay boats which cost approximately $20,000. The number of bay shrimping boats far exceeds the number of gulf boats.

Operating shrimp boats also requires a constant outlay of revenue for oil, diesel fuel, and ice. In fact, the bay shrimper's gross income is often halved by these operating expenses. The owner of the fishhouse extends credit for these supplies to many of the boat owners and then buys their catch, deducting these expenses. The price paid for a pound of shrimp varies with the type of shrimp as well as the supply and demand.

Port O'Connor has only a few commercial enterprises and the major ones are listed in Figure 311 below. Most of these enterprises have three to five employees with the exception of the fish house and oil and gas companies, which employ considerably more. Many of the businesses are owned and operated by families.

The full-time residents tend to buy most of their food and gas in Port Lavaca because of the greater selection and the somewhat lower prices. The stores and restaurants, as well as the recreation-oriented enterprises, depend on the tourists for a large portion of their business. Port O'Connor has no fast food restaurants, although one may be established in the near future. There are no supermarkets and no clothing stores. One of the construction companies is fairly new, and another is associated with the lumber supply company.

The present oil and gas activity has been described in Volume II, Part E. To review briefly, the oilfield companies supply mud to exploratory and development drilling operations in the gulf. The three mud supply companies have expanded over the last six years from a total of 8 employees to a total of 35 employees. These companies expect continued expansion during the next few years as offshore exploration of active oil leases increases.

The boat service company operates crew and supply boats. When the offshore crews change shifts, automobiles may crowd the streets of the community for an hour or two; occasionally bad weather will force a crew, waiting for transport to the rigs, to remain overnight in a local motel. However, while most of the mud company personnel are residents, few of the rig and crew boat personnel live in Port O'Connor.

Figure 311

Commercial Enterprises

Grocery Stores	2
Restaurants/bars	6
"Package" Store	1
Marinas (Sports Fishing)	2
Motels	5
Movie Theatre	1
Pleasure Boat Dealership	1
Beauty Shop	1
Barber Shop	1
Lumber Supply Company	1
Gas Stations[1]	2
Oilfield Companies (mud)	3
Helicopter Service	1
Boat Service	1
Construction Companies	3
Boat Construction Companies[2]	1
Wholesale/Retail Fishhouse and Commercial Fishing Docks	1

[1] One is associated with a grocery store.
[2] Small enterprise which builds bay boat hulls.

VI. The Groups

Small, isolated communities, whether in Africa, Europe, or South Texas, share at least one common feature - the importance of the family in social life. The family unit is not only the focal point of social activity, but also the basis of many economic pursuits. Port O'Connor typifies this model. Until recently, the community was basically composed of a group of extended families, and while the number of families may be growing, the cohesiveness of the familial unit does not appear to have changed greatly. This is probably an important indication of the kind of people who have moved to the community during the last few years and the ability of the community to absorb their numbers. Port O'Connor is still a very personal place - people know each other. In fact, people appear to know a considerable amount about each other, however accurate that knowledge may be.

Individuals who live in Port O'Connor tend to distinguish residents by two means: occupation and length of residence. There are shrimpers, merchants, and retirees; and there are natives, residents and newcomers.

Natives are persons who were born in the community; residents are persons who have lived in the community at least 7 to 10 years; newcomers are persons who have moved to the community over the last 7 to 10 years. It swhould be noted that natives and residents seldom distinguished between tourists who own summer/weekend homes in the community and those who just visit the community. Retired newcomers did tend to distinguish between these two tourists groups.

The persons catagorized as residents probably comprise the largest group since they include both the spouses of natives and the members of resident families. Most of the natives and at least one-half of the residents are involved in shrimping activities. Approximately one-half of the merchants are newcomers. Approximately three of the merchants are natives and many of the rest are new comers.

To the outside observer, the inmigrant population who reside permanently in the community appears to consist of two major groups: the urban migrants and OCS personnel. While the long-time residences speak of "no longer knowing everyone in town", it seems that some of the recent inmigrants actually spent their childhood in Port O'Connor. They have returned with their spouse and/or children after living in other areas for a number of years. They give various reasons for their return: employment, distaste for city life, and in the case of some women, divorce. Implicit is the idea that they are returning to a place where they know people and to their families.

Another segment of the urban migrant population is composed of families who discovered Port O'Connor on a vacation. Most raised their children in a large city, and the household now consists of only the husband and the wife. Some have retired; others have bought or started businesses. In general, these inmigrants form a social subgroup of their own and interact on a public rather than private level with the long-time residents. (This group overlaps with the local category mentioned earlier - "retirees".)

There is one other small segment of the urban migrant population which must be noted. This segment consists of families whose major source of income is derived from commercial fishing activities. These families generally own small bay boats and have moved to Port O'Connor from another coastal community, often to escape growth there.

At least 8 to 10 of the 35 mud company employees are natives or long-time residents while the remainder of the employees are newcomers. Most of these mud company personnel live in the community. However, they represent only one-half to one-third of the total number of OCS personnel in the area. The helicopter and crew boat personnel reside in the community only when they are on-duty. The rig personnel commute from as far away Louisiana and Oklahoma. However, since this study focuses on the residents of Port O'Connor, these OCS commuters were not interviewed in depth.

Having spoken of the residents of the community and the inmigrant population, some mention of the outmigrant population must be made. A number of individuals do leave the community. Although there was not sufficient time to locate and interview these individuals, a number of residents spoke of grown children who lived elsewhere. Often these individuals had attended college or married non-residents.

While the people of Port O'Connor share a strong sense of family, they tend to be individualists. Of course, the environment may heighten this perception somewhat since people not only know one another well but also their numbers are small. Yet one has only to talk to shrimpers about the challenge of the sea and the lure of the life - "Once it is in your blood, it is hard to get out" - to be aware of their independent spirit. In many cases, they have other occupational skills but prefer to shrimp because they are their own bosses. This independent spirit is a component in their opposition to incorporating and to expanding local services.

VII. Community Attitudes Toward Growth

Attitudes vary among individuals and among groups even in a small community. It is generally accepted that individuals in a small community environment tend to share a common value system. Long-time residents and natives of Port O'Connor seem to have similar attitudes on questions relating to their community and growth. However, there are definite interest groups in the town, such as the commercial fishermen, the retirees, and the merchants, and attitudes may vary among these groups. Therefore, where attitudinal differences betweens the major groups were detected they are noted in the following discussion.

When residents were asked their opinion of what makes Port O'Connor a community, their replies generally involved one of the following: the extended family network, the individualistic nature of the residents, and the hurricanes. The two latter replies probably require some explanation. Hurricanes encourage community cohesion, because they threaten everyone. Residents who lived in the community sixteen years ago recall helping each other rebuild after Hurricane Carla, and everyone is aware that another may intrude some summer or fall day. It is interesting to note that individuals generally do not speak of the "threat" posed by tourism or industry in relation to community cohesion.

Though the concepts of individualism and community cohesion appear to be somewhat contradictory, they are not mutually exclusive. The personal atmosphere that exists in Port O'Connor creates the sense of an individualistic community. Individuals know each other, and many live there because they like being known. They share a desire to live in a community

distinguished by its small size and lack of governmental structure. While family members depend on each other, this individualism includes a strong sense of independence. Certainly, individuals depend on friends and neighbors, but most natives and shrimpers speak strongly against the idea of depending on a governmental structure for services.

The shrimpers and the natives, some of whom are shrimpers tend to share many attitudes and both groups tend to oppose incorporation. (When asked what he thought about the possibility of incorporation, one shrimper said straightforwardly - "It stinks.") They feel there is no need to incorporate and no reason to incur the cost of local government. Not only do they not want to pay for a city, but they also do not want the additional red-tape. The natives and shrimpers display what might best be described as rugged individualism. They are disdainful of governmental services and resentful of governmental interference in their lives.

Implicit in this groups' attitude is their fear that their community is being taken over by outsiders, particularly sports fishermen. The commercial fishermen resent the greater economic and wider political power of the sports fishermen, and the interests of these two groups do tend to conflict. (For instance, shrimpers claim sports fishermen have been instrumental in promoting legislation which restricts the areas open to commercial fishermen.) Both sports fish and certain species of shrimp spawn and mature in the bays, and some shrimpers fish commercially during the off-seasons. Both sports fishermen and commercial fishermen claim the other side is damaging the ecosystem.

The shrimpers fear that sports fishermen are not only taking over their bays but also their community. Many of the tourists, the new merchants who cater to them, and the retirees are sports fishermen. These individuals are labelled by the natives and shrimpers as the source of growth; they have promoted and required the expansion of local services. However, the natives and shrimpers definitely seem to resent the weekend/summer tourists more than the local sports fishermen who are merchants and retirees. Perhaps this is related to the distinction made between residents and outsiders. The shrimpers and natives may feel they are in a better position to control the desires and behavior of other residents of the community than they are to control the desires and behavior of outsiders.

The natives' and shrimpers' desire to preserve their small community is shared by the retirees. The retirees also resent the intrusion of the tourists, particularly those who do not own homes in the community. While many retirees discovered Port O'Connor as tourists, they moved to the community because of its size and its quaint nature. They escaped the city, and are not fond of the idea that it might follow them. However, they are more accustomed to formal political structures; and although they oppose growth, they see incorporation as a mechanism for directing it.

Merchants, particularly those who are newcomers, seem to quietly support incorporation because of perceived advantages. They are often from

cities and are accustomed to local taxes and public services. etc.) It is interesting to note that all of the MUD directors elected by the community were merchants, and three were newcomers to the community. Four of these directors own or manage enterprises directly related to tourism while the fifth owns the commercial fishhouse. Not only did the natives' and shrimpers' not express an interest in election to this office, but they also described these merchants as more capable of dealing with the red-tape involved in the creation of the MUD. Their lack of interest may be a combination of a number of factors including: apathy, capability, and desire. While feelings of apathy and lack of capability are definetely components, the natives and shrimpers lack of desire to creat any type of local governmental structure is probably the most important component in their non-participation. Although the septic tank problem necessitated the creation of the MUD, they see it as having no further jurisdictional power. While they do not openly oppose it, they have no desire to run it.

Given the natives and shrimpers negative attitudes toward growth and tourism, it is interesting that few spoke of growth in relation to OCS activity. In fact, shrimpers and natives discussed OCS activity only when questioned directly. Disregarding OCS personnel, less than ten community residents spoke of the potential for increased OCS activity. A number of factors may combine to explain the residents perceptions regarding OCS. First, the number of new residents associated with OCS has been small in comparison to the number of tourists. Second, many feel the lack of local services prevents industrial expansion. Third, OCS support activity requires dock space along the canal and there is little vanant space available. (Actually, there is a good deal of vacant space, but the residents seem to discount the possibility that the owners of the large ranch, which fronts on the canal, will sell their property.) Fourth, industrial development has provided jobs and has not conflicted with the interest of the commercial fishermen.

The conclusion that the majority of this community's members dislike increased tourism and support increased industry might be drawn. However, it might also be argued that they have not felt the impact of OCS development. (Two individuals who spoke of increased OCS activity added "But this will never be a Morgan City".) Many members of the community resent growth and they see tourism as the present culprit. Given rapid growth due to OCS activity, it is possible their present opinion will be revised.

Possible Future Growth and Its Impacts

I. Perspectives on the Process of Growth

The amount of literature on growth and change is enormous and no attempt will be made to review the literature in this section. However, a

theoretical perspective is implicit in this discussion which outlines the options available to the community. For this reason, some of this studies' assumptions about change and growth will be presented.

Change is a constant process in social and cultural systems. Growth is a relative form of change which also implies increase. Applebaum offers three distinctions that are useful in terms of understanding this view of change: the magnitude of change, the time span of change, and the effects on the changing unit (1970). The magnitude of change refers to the scale of change as reflected in the characteristics, proportion, susceptibility, and degree of alteration of the affected unit; in other words, large-scale as opposed to small-scale change. "The length of the period over which change occurs" is defined as the time span of change. Using Parsons' definitions of process versus structural change (1966), Applebaum's third distinction involves the effect on the changing unit. Some processes serve to maintain a system; other processes result in structural change in a system.

Rapid growth, then, could be defined as large-scale change (relative to the system) which occurs over a short period of time and involves structural changes in a system. Rapid growth generally has different impacts on individuals (Shields, 1975; Wallace, 1970) and on communities (Wolf, 1974) than slower, sustained growth. Boom towns experience a form of rapid growth, but the two are not necessarily synonymous. Economic prosperity for many of the residents of a community is usually implied in the use of the term "boom town".

The list of possible negative impacts of growth on a community expands daily. Theserange from infrastructural impacts to environmental impacts. Crime, divorce, land prices, and pollution all tend to increase. Community cohesion, control by long-time residents, and available housing all tend to decrease. Carnes and Friesema discuss the possible negative and positive impacts of urbanization on the individual, the family, and the community (1975). Potential positive impacts include an increase in the long-time residents perception of personal freedom, in the roles available to individuals, in the number of groups and in the number of local facilities.

Although Port O'Connor appears to be growing rather rapidly, the residents have not experienced many of the impacts associated with rapid growth. The concept of absorptive capacity of a community may help to explain the lack of significant impacts. This concept of absorptive capacity is discussed in Volume II, Part A in relation to significant infrastructural issues. "A significant infrastructural issue was identified when the OCS-generated demand on an infrastructural service (water, sewage, police protection, etc.) could potentially supercede a unit of government's current capacity to provide that service" (pg. 46). For instance, if a city's sewage treatment facility is currently experiencing maximum or near-maximum utilization, then a population increase will place stress on the facility. The system is not capable of absorbing the increased demand without further investment and sewage treatment can be labelled a significant issue.

The methodology described in Part A of Volume 2 involved the use of the indicator or indicators of a government's ability to handle a candidate issue. Once the candidate issues and indicators were established, standard measures were derived from state agencies and law. These standard measures for the indicators were used to compare a government's current and future capacity to deal with that issue.

This methodology proved effective for identifying significant infrastructural issues. Unfortunately, establishment of sociocultural indicators, not to mention standard measures, has proved difficult. A definitive methodology and system simply does not exist at the present time. However, the concept of absorption capacity is valuable in explaining the sociocultural system vis-a-vis growth.

Just as a community has a sociocultural structure or social organization, individuals who live in a community have related structures in their minds. It is the difference in social organization and the perspective of the members of community which allows us to distinguish a peasant from a president and a rural person from an urban individual. Note carefully that no value judgement is implied in this distinction - rural persons and urban persons are simply different in certain ways as are the communities in which they live.

When a rural community, such as Port O'Connor, grows rapidly, certain structural transformations occur in the social organization of the community. These structural tranformations are mirrored by the restructuring of long-time residents' perceptions and lives. As the population of the community grows, the long-time residents are faced with an increasing number of people, whose lives and interests may be significantly different. Thus, the long-term residents ability to absorb these changes is a function of the extent and degree of diversity.

Growth, which occurs gradually over a period of time and which does not dramatically change the structure of a system, allows the community to absorb the increase. To use Applebaum's distinction the magnitude of change is such that the degree of alteration in the affected unit is slight. The life-styles of the newcomers to Port O'Connor have not differed radically enough to visibly alter the life-styles of long-time residents. While the creation of a MUD may alter the structure of the community, long-time residents seem to prefer this alternative to the extensive restructuring that incorporation would imply. However, the creation of the MUD is probably an important clue to the current system's increasing inability to absorb growth.

II. OCS Activity and Growth

There are certain physical changes in the community as a result of OCS activity - the helicopter pads, the crew boat and service docks, and the three mud companies. The OCS activity has apparently not conflicted with commercial fishing activity. It has not resulted in an significant increase in school enrollment, crime, or environmental problems. It has provided employment for local residents and has provided economic rewards for some of the merchants. In short, the perceived demographic, environmental, and infrastructural impacts have been few and the economic impacts positive. At the present time, any significant impacts of OCS development on the people of Port O'Connor and its sociocultural structure are simply not discernable.

As mentioned previously, the long-time residents of Port O'Connor feel their community is being threatened by tourism but not by industrial development. Tourism is certainly the more visible and more disruptive of the two activities at the present time. The community has not been forced to absorb a significant number of new residents as a result of OCS development. While tourism may be the immediate problem, increased industrial development is probably a long-range source of community growth. In addition to the degree of growth resulting from OCS activity, the extent to which OCS personnel's life-styles differ from those of the residents may be an important factor in the residents' perception, positive or negative, of these individuals and this activity.

III. Alternatives

Ideally, Port O'Connor has two fundamental alternatives: to allow growth to continue or to halt growth. Future growth can result from increased tourism, increased industry, or a combination of the two. Realistically, it is doubtful that residents can halt growth without a local governmental structure.

Elizabeth Colson has pointed out the importance of asking "What it is members of a society want to organize to achieve - for this defines what exactly they think society is all about, as well as what are the evils they see in their present situation" (1974). Evidently, the long-time residents of Port O'Connor fear growth and added complexity in their lives. A local government represents the antithesis of what they want to organize to achieve. However rational their decision, one can question its effectiveness. By opposing incorporation, the residents may ultimately be encouraging the growth of their community. Even if it is assumed that lack of local services will inhibit industrial expansion, then an increase in tourism may be inevitable.

Incorporation, though, will not solve all the problems and will certainly create a new type of problem. There are two basic types of local governmental structure: "reactive" systems and "anticipatory" systems. The former tend to function only in reaction to specific stimuli which is often the result of decisions made outside a community. Anticipatory systems tend to direct change rather than being directed by it. Given the general attitudes of the long-time residents, incorporation would probably take the form a reactive local government.

Most of the residents of Port O'Connor perceive few options in terms of the form of a local city government can take. A number of shrimpers and natives spoke of a nearby city of approximately the small size as Port O'Connor, and the fiscal problems it has encountered since incorporation. They do not want Port O'Connor to be dependent on federal grants as they perceive this city to be. Perhaps, if a wider range of options were presented to the resident of Port O'Connor then their negative reactions to incorporation would change.

While incorporation is the prominent issue in relation to the growth of Port O'Connor, there are a number of secondary issues. The lack of local services and adequate housing has been mentioned; however, there is no shortage of land for expansion within the community since only about one-half of the land is now occupied by structures. Land prices have increased greatly over the last few years as have construction costs. Although crime is almost non-existent at the present time, the possibility of increase is apparent, especially as familial social controls are disrupted (Carnes and Freisema, 1975).

A couple of the native residents spoke of their plans to leave Port O'Connor for smaller communities. This raises the interesting issues of native migration and local leadership. With increased growth, many of the natives may leave the community and those that remain may have their desires superseded by the desires of new residents. Recall the fact that MUD directors elected by the community were merchants and only two of these individuals could be considered long-time residents. Not only did the old-time residents not express an interest in election to this office but they also feel these merchants are more capable of dealing with the red-tape involved in the creation of a MUD. This attitude leads to the new residents' assumption of the leadership roles, and their interests do not always overlap the interests of the long-time residents.

There is little doubt that growth has begun to affect the quality of life in the community, although the effects are only minimal at the present time. While employment opportunities have increased, the number of competing commercial enterprises has grown; and the local family businesses face the possibility that large-scale enterprises will establish outlets in the community. New homes are expensive to buy and difficult to rent. Residents feel they can no longer leave their doors unlocked and allow their young children to roam about the community. There is a sense of the community

growing more impersonal, and there are always strangers on the streets. Shrimpers feel their bays are being invaded by sports fishermen and their life styles threatened. "The good old days" are ending for the residents of Port O'Connor.

Conclusions

There are seven major conclusions which can be drawn from this study of Port O'Connor.

1. The residents of Port O'Connor tend to be unaware of the possibility of growth due to OCS activity.

2. Few residents of Port O'Connor tend to express or be aware of the potential environmental problems that may result from future OCS development. (A number of residents did express concern over the need for a seawall along the bay to halt erosion, but this need is not directly connected with OCS activity.)

3. Port O'Connor lacks many types of public services, and many residents oppose any expansion of current services.

4. The residents of Port O'Connor oppose growth which is the result of a temporary increase in population more strongly than they oppose growth which is the result of an increase in the permanent resident population. Thus, the geographic loyalty of inmigrants is an important factor in the residents' assessment of their impact on the community.

5. Although residents do express a concern over the growing impersonalization in the community, the full-time residents, who are newcomers, have, thus far, been absorbed by the community. These newcomers' life styles have not conflicted dramatically with those of long-time residents, but these newcomers tend to have formed a social sub-group of their own. Most of these newcomers share the long-time residents' desire to see Port O'Connor remain relatively small.

6. The lack of a local political structure severly limits the community's ability to direct future growth. If the community does choose to incorporate, then the "character" of the local government, reactive or to anticipatory, will be an important variable in determining the direction of future growth.

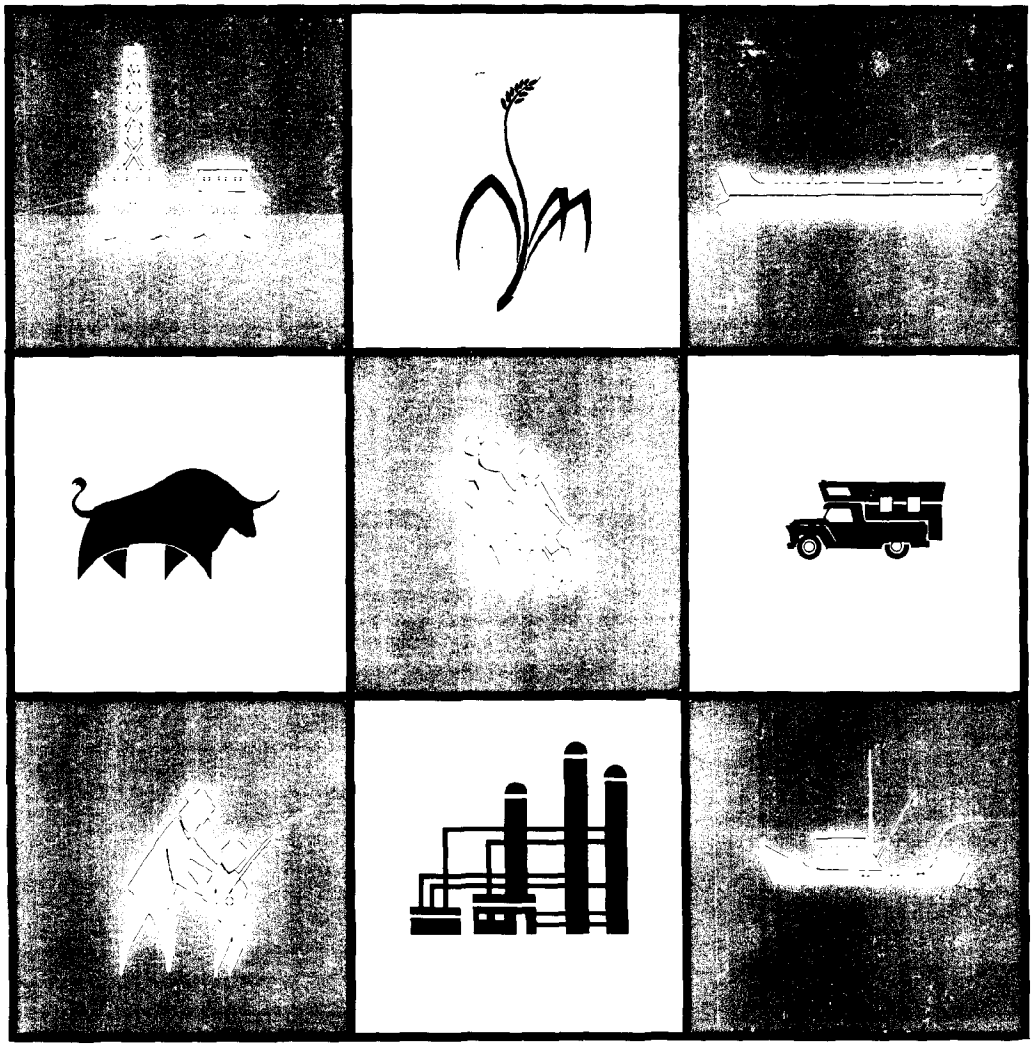
7. Regardless of the community's decision on the issue of incorporation, there is a need for technical assistance, both financial

and informational, to aid the community in ameliorating the possible negative impacts which result from the process of rapid growth. The various forms of local government should be discussed with the residents of the community.

Though Port O'Connor is at a rather unique stage in the process of growth, the issues facing its residents are indicative of the issues facing other small communities that will experience growth due to the development of natural resources. Tending to look at the short-term, immediate consequences of growth, the community pays little attention to long-term issues. Individuals everywhere have a tendency to adopt a present tense perspective of their lives rather than a long range outlook. In most cases, we all treat the symptoms of our disease as opposed to the actual cause of the disease.

Perhaps futuristic forecasting should best be left to psychics, especially as "the art of forecasting is in its infancy in all sciences" (Thompson, Blevins, Ellis - 1975); yet we have learned a considerable amount about the effects of growth and change on the lives of individuals. We have become concerned with "the quality of life," and this concern has encouraged the development of various mechanisms to ameliorate certain negative impacts of growth. While Port O'Connor may not experience all of these negative impacts, it lacks the community skills necessary to deal with the short-term problems and the long-term planning. Though we may know various means of aiding this community during the growth process, supplying this information to the community involves another whole set of problems. How do you help a community which has no local governmental structure and whose residents dislike outside interference?

Port O'Connor may allow us to confront these questions as well as many others. This study has only attempted to portray Port O'Connor as it exists during early 1977. The emphasis has been on describing the community, not on predicting future growth. Hopefully, continuing study of the community will allow investigation into the processes of growth and change. Having established a baseline portrait of this community, future research will allow other factors to be investigated including: the OCS personnel and the summer residents' perception of the community and the reasons for outmigration by long-time residents. Of course, the long-time residents may achieve their goal of halting growth, in which case the community's strategies will be of interest to other small communities sharing a similar goal. Whatever happens to the community in the future, as stated in the Chamber of Commerce Brochure, the residents are convinced that "Port O'Connor has proved that no matter what, it is here to stay."



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