

# **SABINE-NECHES ESTUARY:**

*ECONOMIC IMPACT OF RECREATIONAL  
ACTIVITY AND COMMERCIAL FISHING*

A REPORT TO  
TEXAS WATER DEVELOPMENT BOARD

BY

DEPARTMENT OF RECREATION AND PARKS  
DEPARTMENT OF AGRICULTURAL ECONOMICS

AUGUST, 1987

TEXAS AGRICULTURAL EXPERIMENT STATION  
TEXAS A&M UNIVERSITY SYSTEM

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BY

DANIEL R. FESENMAIER  
SEOHO UM  
WESLEY S. ROEHL  
ALLAN S. MILLS

TEOFILO OZUNA, JR.  
LONNIE L. JONES  
RAMON GUAJARDO Q.

For: Visitation and Direct  
Expenditure Estimation

For: Input-Output Models  
Total Impact Estimation

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## Sabine-Neches Estuary: Economic Impact of Recreational Activity and Commercial Fishing

### Summary

The quantification of sport fishing, other recreational activity, and commercial fishing along with the estimation of the economic impacts of these activities on the local and state economies has been carried out in this study. The methodology employed in doing so has involved the use of various statistical survey instruments, published statistical series on commercial fishing, and the development and construction of state and regional input-output models. The economic impacts for this study have focused on the contribution of these three economic activities to the economies of the local region and the state in the form of output, employment, income, and state and local tax revenues.

Sport fishing, like other recreational activity and commercial fishing, exerts an effect upon the economies of the local region where these activities occur and upon the entire state. These effects can be classified as to direct and indirect business impacts. Direct business impacts include expenditures for goods and services (transportation, food, lodging, equipment rental, fees and related fishing expenses) purchased by sport fishermen, other recreational activity participants, and commercial fishermen. Indirect business impacts are the dollar value of goods and services produced to supply the businesses which make direct sales to these three groups of participants. Still other indirect impacts include wages, salaries and other forms of income to employees, owners and stockholders.

Total economic output impacts from sport fishing, other recreational activity, and commercial fishing (both inshore and offshore) in the Sabine-

Neches estuary amounted to \$32.8 million and \$66.3 million for the region and state, respectively. Of these totals, sport fishing contributed the largest impact with \$18.3 million or 56 percent for the region and \$36.8 million or 56 percent for the state. Direct sport fishing expenditures in the Sabine-Neches estuary of \$11.1 million were also greater than those for other recreational activity of \$5.0 million. In contrast, other recreational activity participants spent more outside the local region (\$600 thousand) than did sport fishermen (\$500 thousand).

Over 25 percent of the direct expenditures by sport fishermen and other recreational activity participants in the Sabine-Neches estuary region resulted in increased personal income for regional households directly affected by the sport fishing and other recreational activity industry. Statewide, the income impacts amounted to over \$9.9 million for sport fishing and over \$4.8 million for other recreational activity. Sport fishing and other recreational activity expenditures not only generate additional personal income but they also create additional employment opportunities both within the region and elsewhere in Texas. The estimated total employment impacts to the state economy were 619 and 311 full-time job equivalents for sport fishing and other recreational activity, respectively.

Increased economic activity due to gross dollar flows from the sport fishing and other recreational activity industry also impact positively the revenues to state and local governments. The total state tax revenues amounted to \$501 thousand for sport fishing and \$244 thousand for other recreational activity statewide. Likewise, local tax revenues from sport fishing and other recreational activity were of \$887 thousand and \$433 thousand, respectively. Most of these tax revenues, whether local or state, were generated within the Sabine-Neches estuary region.

Estimates were also made of the inshore-offshore commercial fish landings associated with the Sabine-Neches estuary region. The three year (1984, 1985, 1986) average inshore annual commercial finfish and shellfish contributions were estimated at 694.6 thousand pounds with an ex-vessel value of \$249 thousand. Inshore and offshore landings together, however, amounted to about \$3.5 million with direct employment of 25 full-time job equivalents and direct personal income of \$803 thousand.

SABINE-NECHES ESTUARY:  
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Introduction

This study has been conducted as part of the Texas Water Development Board's on-going efforts to evaluate hydrological, biological, chemical and economic factors as they relate to the freshwater inflow needs of the six estuaries along the Texas Gulf Coast. Outdoor recreation, sport fishing in particular, has been long recognized to exert significant economic impacts on local economies of the Texas Gulf Coast region. The primary focus of this study was to evaluate the economic impact of the estuarine-dependent fisheries resource; sport fishing and commercial fishing. However, since sport fishing is generally enjoyed as part of a complex of recreation activities, six other activities were included in the study. These are pleasure boating, hunting, camping, swimming, picknicking and sightseeing.

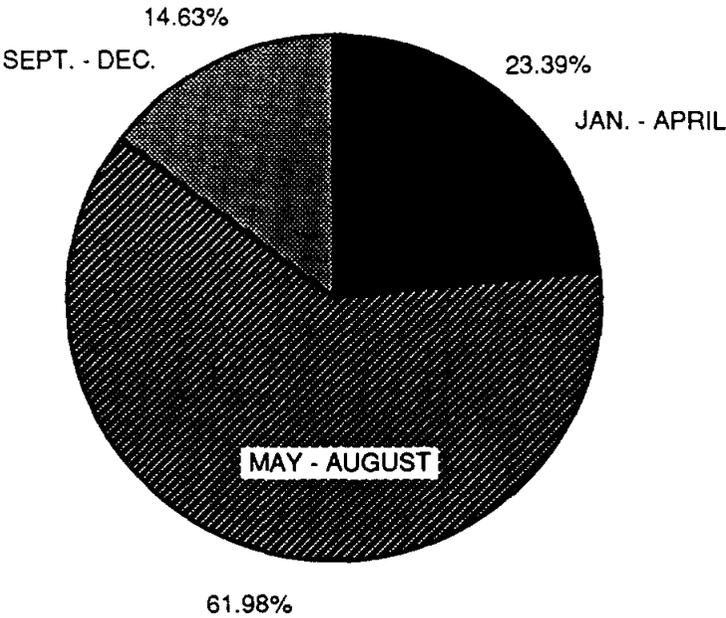
Visitation Patterns

The results of the study indicate that there were approximately 380,000 visits to the Sabine-Neches estuary during calendar year of 1986; and of these visits, 65.9 percent were made by those households involved in sport fishing.\* As shown in Chart 1, there is substantial seasonal variation; approximately 23 percent of these visits occurred from January through April, 1986; whereas 62 percent of the total occurred during the summer months (May through August); finally, 15 percent occurred between September 1 and December 31, 1986.

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\*The methods and procedures for developing the participation and expenditure estimates are presented in Appendix A.

**CHART 1: SEASONAL VISITATION**

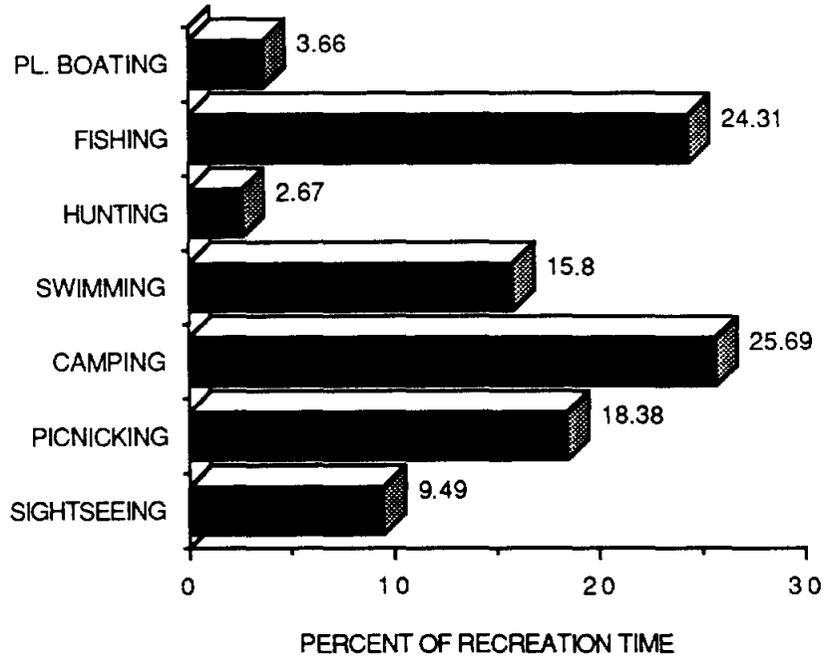


As part of the mail survey, information was collected concerning each household's current county of residence, the distance required to travel to each of the places visited along the Sabine-Neches estuary, as well as the number of years members of the household had been visiting each place. The survey results indicate that Texas' households travel, on average, 108 miles to reach their destinations located along the Sabine-Neches estuary. This relatively short travel distance is reflected by the counties in which these visitors reside. Jefferson county was overwhelmingly the largest source for visitors; 47.0 percent of the visitors to the Sabine-Neches estuary were from Jefferson County; 13.8 percent of the visitors were from Orange County and 9.9 percent were from nearby Harris County. Interestingly, only 37.7 percent of those survey indicated they had first visited places along the Sabine-Neches estuary within the past six years (since 1980); another 24.4 percent started visiting this area of the Texas Coast between 1970 and 1980; finally, 37.7 percent of those survey indicated that they have been visiting the same place for over 16 years.

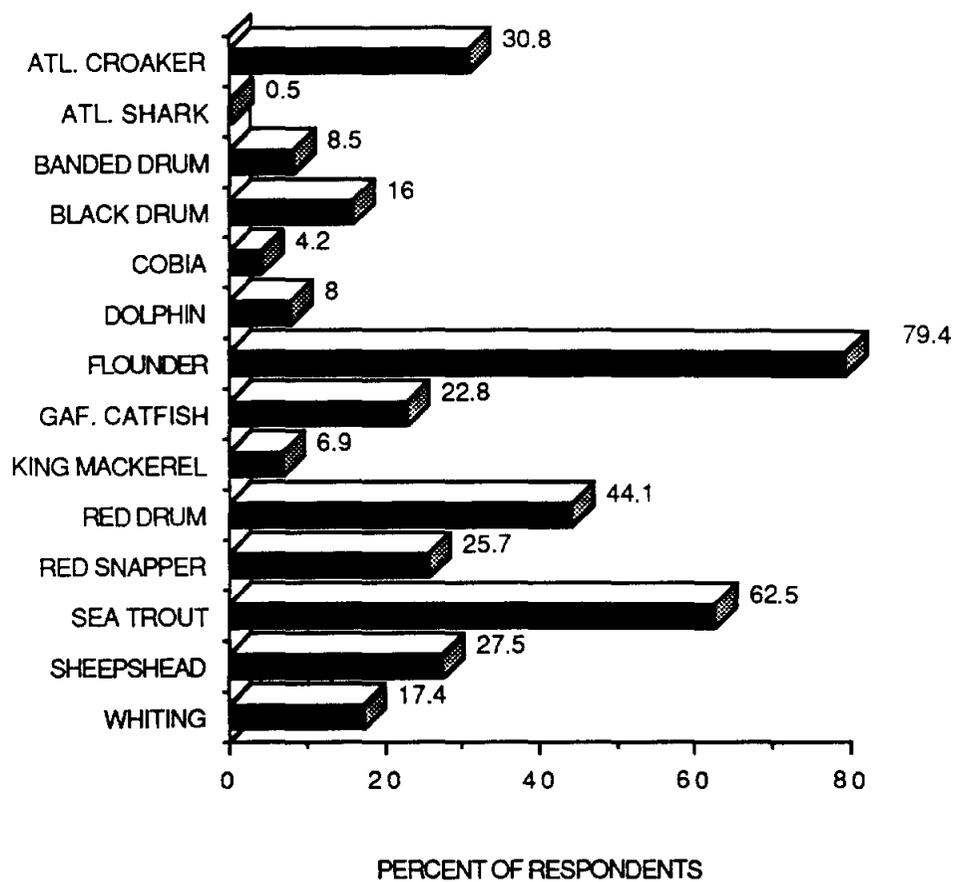
One of the important assumptions guiding the study was that a trip to the Texas Coast involved a number of recreation activities. The results of the study support this assumption; for the Sabine-Neches estuary, camping and sport fishing account for 50 percent of the time allocated to recreation activity (25.7% and 24.3%, respectively). As one might expect, picnicking (18.4% of the time) and swimming (15.8%) were also popular activities (see Chart 2).

As indicated previously, a primary focus of this study was on the economic importance of sport fishing to communities along the Texas Gulf Coast. For those fishing in the Sabine-Neches estuary, Flounder was caught most often, followed by Sea Trout and Red Drum. Chart 3 presents a list identifying the popularity of fish caught in this estuary. As part of the survey, fisherman were asked to evaluate the overall quality of the Texas Gulf Coast in the

**CHART 2:  
RELATIVE POPULARITY OF RECREATION ACTIVITY**



**CHART 3: POPULARITY OF SELECTED FISH**



vicinity of the place(s) they went fishing. 11.2 percent of those surveyed indicated that this area was excellent for fishing; 47.2 percent and 35.5 percent thought the area was fair or good for fishing while only 6.3 percent indicated that places along the Sabine-Neches estuary were poor to very poor.

#### Direct Expenditures

During the survey, respondents were asked to indicate their expenditures while on a "typical" or "average" trip to each particular place along the Sabine-Neches estuary. Specifically, respondents were asked to estimate their total expenditures for seven types of goods and services: (1) overnight lodging (2) transportation (3) grocery store purchases (4) restaurants and other eating establishments (5) rental of recreation equipment (6) entrance, participation, and guided tour fees and (7) fishing-related items including bait and boat fuel. Based upon the estimation procedures discussed in Appendix A, the results of the study were used to estimate the total expenditures by Texans visiting places along the Sabine-Neches estuary. As can be seen in Table 1, visitors spent approximately \$16,140,628 during 1986. Of this total, 68.9 percent (\$11,115,519) was spent by sport fisherman. Food costs accounted for a substantial portion of expenditures by fisherman; \$3,399,914 was spent on grocery store purchases and an additional \$1,313,220 was spent in restaurants. Transportation expenditures were also high at \$3,014,471. Interestingly, for those visitors not fishing, transportation expenditures constituted the largest share of their trip-related cost.

**Table 1. Visitor Expenditures in the Sabine-Neches Estuary\***

Category	"Fishing" Household Expenditures	"Nonfishing" Household Expenditures	Total
Lodging	\$ 1,229,457	\$ 690,393	\$ 1,919,850
Transportation*	3,014,471	1,586,773	4,601,244
Restaurant	1,313,220	1,099,547	2,412,767
Grocery	3,399,914	1,125,525	4,525,439
Rental	390,056	178,104	568,160
Fees	598,516	344,767	943,283
Fishing-related items	1,169,885	-----	1,169,885
<b>Total</b>	<b>\$ 11,115,519</b>	<b>\$ 5,025,109</b>	<b>\$16,140,628</b>

\*For those households living outside the Sabine-Neches region, transportation costs were reduced by 50 percent to provide a better estimate of "true" costs.

**Economic Impact Analyses**

Sport fishing and other recreational activities provide economic impacts or benefits to the economies of the local region where these activities occur and throughout the entire state. These economic impacts can be classified into direct and secondary impacts. Direct impacts are the direct sales of goods and services to recreationists and sport fishermen. For this study, the actual expenditures by recreationist and sport fishermen for goods and services constitute the direct or initial business impacts on the local economy and the state. These include expenditures with local restaurants, hotels and motels, grocery stores, bait shops and other recreational and sport fishing related businesses.

Direct expenditures associated with sport fishing and other recreational activities have a multiplying effect or impact on the economy of the local region and the state in the form of secondary or indirect impacts. Secondary impacts arise because local and non-local businesses produce and sell inputs to eating and drinking establishments, hotels and motels, piers and guides, bait shops, and other recreational and sport fishing related businesses in order that they may serve their customers.

The total business effects or impacts of the sale of goods and services to recreationists and sport fishermen upon the local and state economies include both the direct and secondary impacts resulting from direct sport fishing and other recreational expenditures. This total impact in turn provides other economic benefits in the form of employment and wages, salaries, rents, profits and governmental revenues of which a portion is spent on goods and services. In this study, input-output analysis is used to estimate the total economic impact, both local and statewide, arising from fishing and other recreational expenditures.

Since economic impacts were estimated separately for the Sabine-Neches estuary region and the state, it was necessary that both a regional and statewide input-output model be developed. State impacts are estimated using the 1986 Texas Input-Output Model developed specifically for this study. Likewise, regional impacts are estimated using the 1986 Sabine-Neches three county regional input-output model also developed for purposes of this study. The methods and procedures for developing these models are presented in Appendix B.

#### Sport Fishing Economic Impact Analysis.

The results of the surveys conducted for this study were used to estimate

the total expenditures by sport fishermen on the six types of goods and services presented earlier. These estimated expenditures are presented in Table 1 by type of expenditure and between sport fishing and other recreational activities.

To estimate the total economic impacts of sport fishing, expenditures by sport fishermen were multiplied by their respective Type II multipliers obtained from the 1986 Texas Input-Output Model and the Sabine-Neches Input-Output Model. The results of these calculations are summarized and presented in Table 2. As indicated in the table, regional sport fishing expenditures (output) in the Sabine-Neches estuary region were over \$11 million in 1986. Statewide expenditures that occurred as a result of recreational fishing in the Sabine-Neches estuary amounted to \$11.6 million. The difference between regional and state direct expenditures is the estimated transportation expenditures made by fishermen from outside the Sabine-Neches region. As can be observed, most direct expenditures (96 percent) accrue to the region. However, when the indirect and induced impacts are added to the direct impacts to obtain the regional total impact of over \$18 million, this figure accounts for less than half (49 percent) of the gross output impacts statewide (\$36.8 million). This difference reflects economic linkages between the Sabine-Neches recreational fishing industry and product input suppliers throughout Texas.

The regional and statewide input-output models developed for this study enabled the estimation of employment impacts of recreational fishing within the Sabine-Neches estuary region and within the state. The input-output analysis estimated a total of 376 full time job equivalents directly related to sport fishing in the Sabine-Neches estuary region during 1986. Statewide, an additional 52 full time job equivalents were estimated to be directly related to the expenditures of sport fishermen. Taking account of the indirect

and induced impacts along with the direct impacts, the total employment impact on the Sabine-Neches region was 422 jobs and 619 jobs in the state economy (Table 2).

Table 2. Direct and Total Economic Impact From Sport Fishing Expenditures, Sabine-Neches Estuary, 1986

	Direct		Total	
	<u>Regional</u>	<u>State</u>	<u>Regional</u>	<u>State</u>
Output (million \$)	11.1	11.6	18.3	36.8
Employment (man-years)	376	428	422	619
Income (million \$)	2.9	4.3	3.7	9.9
State Tax Revenues (million \$)	a	0.55	0.48	0.50
Local Tax Returns (million \$)	a	0.15	0.85	0.89

a. Local data were insufficient to estimate local tax effects.

Sport fishing expenditures in the Sabine-Neches region not only created employment but also generated personal income to households both within the region and elsewhere in Texas. As shown in Table 2, about \$2.9 million and \$4.3 million of personal income was created directly for households within the region and state, respectively, by sport fishing expenditures within the Sabine-Neches region. Moreover, total personal income impacts from sport fishing in the region amounted to \$3.7 million within the region and \$9.9 million within the state.

Increased economic activity due to gross dollar flows from the sport fishing industry also impact positively the revenues to state and local

governments. About \$481 thousand of the total statewide state tax revenues, which amounted to \$501 thousand, were collected in the local region.

As shown in Table 2, direct state tax revenues paid by the sport fishing industry were \$550 thousand. Table 3 also shows that the total tax revenue impacts for local jurisdictions were concentrated within the Sabine-Neches estuary region where an estimated \$852 thousand resulted from direct, indirect, and induced sport fishing expenditures. Additionally, local governments outside the Sabine-Neches estuary region collected an estimated \$35 thousand in taxes on travel expenditures by sport fishermen for a total impact on local governments of \$887 thousand statewide in 1986.

#### Other Recreational Activity Economic Impacts

Table 3 presents 1986 expenditures and related economic impacts from all recreational activity other than sport fishing in the Sabine-Neches estuary region. As with recreational fishing, regional and statewide economic impacts of other recreational activity expenditures were estimated using the regional and state input-output models. It is estimated that in 1986 Sabine-Neches non-fishing recreational participants spent just over \$5 million within the Sabine-Neches estuary region and a total of about \$5.6 million in the state. These expenditures generated total economic impacts of about \$8.3 and \$18 million within the region and state, respectively (Table 3).

Other economic benefits from recreational activity other than fishing, including local and statewide employment, personal income and state and local tax revenues were estimated as shown in Table 3. Hence, it is estimated that a total of 158 jobs were directly related to other recreational activity in the Sabine-Neches estuary region. The analysis also estimated that an additional 60 jobs were generated throughout the state because of other Sabine-Neches

recreational activity. Table 3 also shows the impacts accruing to household income due to other recreational activity expenditures in the region. Regional income impacts amounted to about \$1.3 million of direct income and \$1.7 million of total income. Direct state income impacts were about \$2.1 million and total state income effects amounted to \$4.8 million.

State and local tax revenue impacts from other recreational activity for the Sabine-Neches estuary region are also presented in Table 3. Local tax revenue for all categories are greater than state tax revenue. Ninety percent of the total state tax revenue is generated within the region. Total state tax revenues amounted to \$244 thousand while total local tax revenue was estimated at \$433 thousand. Local tax jurisdictions elsewhere in the state also received an estimated \$45 thousand in tax revenues from the travel expenditures of non-fishing recreationist to the Sabine-Neches region.

**Table 3. Direct and Total Economic Impact From Other Recreational Activity Expenditures, Sabine-Neches Estuary, 1986**

	Direct		Total	
	<u>Regional</u>	<u>State</u>	<u>Regional</u>	<u>State</u>
Output (million \$)	5.0	5.6	8.3	18.0
Employment (man-years)	158	218	178	311
Income (million \$)	1.3	2.1	1.7	4.8
State Tax Revenues (million \$)	a	0.03	0.22	0.24
Local Tax Returns (million \$)	a	0.07	0.39	0.43

a. Local data were insufficient to estimate local tax effects.

Combined Economic Impacts from Sport Fishing and Other Recreational Activity

The combined impacts from both sport fishing and other recreational activity for the Sabine-Neches estuary in 1986 are presented in Table 4. Total state output was more than twice that of total regional output. The total employment impacts show that 65 percent of the jobs were generated locally while the other 35 percent were generated throughout the State. Both sport fishing and other recreational activity expenditures in the Sabine-Neches region resulted in increased household personal incomes of about \$5.4 million for this region. In addition, household income generated outside the region was about \$9.4 million bringing the total state personal income impact to \$14.8 million from Sabine-Neches recreational and fishing activities in 1986.

Table 4. Direct and Total Economic Impact From Sport Fishing and Other Recreational Activity Expenditures, Sabine-Neches Estuary, 1986

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	Direct		Total	
	<u>Regional</u>	<u>State</u>	<u>Regional</u>	<u>State</u>
Output (million \$)	16.1	17.2	26.6	54.8
Employment (man-year)	533	646	600	930
Income (million \$)	4.1	6.4	5.4	14.8
State Tax Revenues (million \$)	a	0.08	0.70	0.74
Local Tax Revenues (million \$)	a	0.22	1.2	1.3

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a. Local data were insufficient to estimate local tax effects.

Most of the state and local tax revenues were generated within the region. Total state tax revenues amounted to an estimated \$745 thousand, of

which \$699 thousand was collected within the region. Local tax jurisdictions within the region received \$1.2 million in revenues while those outside the region received an additional \$100 thousand for a total statewide tax impact on local jurisdiction of 1.3 million in 1986.

#### Economic Impact of Commercial Fishing

The analysis of the commercial fishing industry in the Sabine-Neches estuary region was carried out using data available from the Texas Parks and Wildlife Department (TPWD) in conjunction with the regional and state input-output models developed for this study. The annual TPWD data consists of detailed information on the value and volume of both inshore (bay system) and offshore commercial finfish and shellfish landings. Since offshore landings are reported only as a total for the state of Texas, it was necessary to allocate these landings to the different bay systems of the Texas Gulf Coast based on a weighting scheme developed for previous fisheries resource studies conducted by the Texas Water Development Board.

Given that the Sabine Lake bay system corresponds with the Sabine-Neches estuary, for purposes of estimating direct and total economic impacts, the value of commercial fish landings in the Sabine Lake bay system were chosen to represent Sabine-Neches estuary commercial fishing industry direct value of output. In addition, since commercial fish landings may vary significantly from year to year, an average of landings in 1984, 1985 and 1986 were computed to represent a typical current year. This procedure reduces the influence of annual variations. Hence, while reference is made to 1986 commercial fish landings, the values are, in fact, an average of the most recent three years.

The average annual inshore commercial fish landings (finfish and shellfish) for the Sabine-Neches estuary were reported to be 694.6 thousand

pounds with an ex-vessel value of \$249 thousand for the 1984 through 1986 period. Of this, blue crab made up almost 95 percent of the total value of landings, while white shrimp and flounder account for most of the remaining value. The combined inshore and offshore ex-vessel value of landings for this same time period was about \$3.5 million. This difference in the offshore-inshore value of landings suggests the importance of offshore landings supported by the Sabine-Neches estuary.

The regional and statewide total economic impacts resulting from commercial fish catch attributed to the Sabine-Neches estuary were estimated using the 1986 Sabine-Neches Input-Output Model and the 1986 Texas Input-Output Model. These impacts, including total business activity, employment, personal income and state and local tax revenue estimates are presented in Table 5.

**Table 5. Direct and Total Economic Impact of Commercial Fishing in the Sabine-Neches Estuary, 1986**

	<u>Landings</u>		<u>Total Impacts</u>			
	<u>Inshore</u>	<u>Inshore - Offshore</u>	<u>Inshore Region</u>	<u>Inshore State</u>	<u>Inshore-Offshore Region</u>	<u>Inshore-Offshore State</u>
Output (million \$)	0.25	3.5	0.44	0.82	6.2	11.5
Employment (man-years)	16	221	17	18	234	251
Income (million \$)	0.06	0.80	0.08	0.21	1.1	2.9
State Tax Rev. (million \$)	0.001	0.02	a	0.01	a	0.16
Local Tax Rev. (million \$)	0.002	0.02	a	0.02	a	0.24

a. Local data were insufficient to estimate local tax effects.

Total value of the inshore catch was \$249 thousand, direct employment in the inshore fisheries industry was 16 fulltime job equivalents and personal income paid to households by the inshore fishing industry was \$57 thousand. In addition, the commercial fishing industry paid \$1000 directly in state taxes and \$2000 in local taxes (Table 5). Gross Texas business resulting from inshore commercial fishing, processing, and marketing fish attributed to the Sabine-Neches estuary in 1986 was estimated at \$819 thousand, of which \$439 thousand was business within the estuary region. This regional inshore industry also supported a total of 17 fulltime equivalent jobs and created personal income amounting to \$206 thousand throughout the state. Also generated by this industry was statewide state taxes paid of \$11 thousand and local taxes of \$17 thousand to local jurisdictions throughout Texas.

The total value of offshore and inshore landings was reported to be about \$3.5 million. Direct employment associated with this output was estimated at 221 fulltime job equivalents. Personal income paid to households by the inshore and offshore fishing industry was \$803 thousand. The combined inshore and offshore state tax revenues from this industry was estimated at \$17 thousand, while the local tax revenues were estimated to be \$24 thousand (Table 5).

Gross Texas business resulting from inshore and offshore commercial fishing, processing, and marketing fish attributed to the Sabine-Neches estuary in 1986 was estimated at \$11.5 million of which almost \$6.2 million was business within the estuary region. The combined inshore and offshore regional commercial fishing industry also supported a total of 251 fulltime equivalent jobs and generated personal income of nearly \$2.9 million throughout the state. Also, generated by this commercial fishing industry were

statewide local tax revenue of \$155 thousand and local taxes of \$242 thousand to local jurisdictions throughout the state.

## Bibliography

### Direct Expenditures

Dean, Gillian, Malcolm Getz, Larry Nelson and John Siegfried. 1978. The Local Economic Impact of State Parks. Journal of Leisure Research, 10(2): 98-112.

Garrison, Charles B. 1974. A Case Study of the Local Economic Impact of Reservoir Recreation. Journal of Leisure Research, 6(1): 7-19.

Lieber, Stanley R. and David J. Allton. 1983. "Visitor Expenditures and the Economic Impact of Public Recreation Facilities in Illinois." In Recreation Planning and Management, (ed.) Stanley R. Lieber and Daniel R. Fesenmaier. State College, PA: Venture Publishing. 36-54.

Liu, Juanita and Turgut Var. 1983. The Economic Impact of Tourism in Metropolitan Victoria, B.C. Journal of Travel Research, 22(2): 8-15.

Millerd, Frank W. and David W. Fischer. 1979. "The Local Economic Impact of Outdoor Recreation Facilities." In Land and Leisure (2nd edition), (ed.) Carlton S. Van Doren, George B. Priddle and John F. Lewis. Chicago: Maaroufe Press. 244-258.

Pearce, Douglas G. 1981. Estimating Visitor Expenditures. Tourism Management, 7(1): 240-252.

Rose, Warren. 1981. The Measurement and Economic Importance of Tourism in Galveston, Texas: A Case Study. Journal of Travel Research, 19(4): 3-11.

### Input-Output Models

American Hospital Association. American Hospital Association Guide to the Health Care Field, 1982. Chicago, Illinois.

Bureau of Economic Geology, The University of Texas at Austin. The Mineral Industry of Texas in 1982. Austin, Texas. 1984.

Council of Economic Advisers. Economic Indicators. U.S. Government Printing Office, Washington, D.C. 1987.

Edison Electric Institute. Statistical Year Book of the Electric Utility Industry for 1982. New York. 1982.

Energy Information Administration. Coal Production, 1982. Washington, D.C. 1983.

Energy Information Administration. Natural Gas Annual, 1982. Washington, D.C. 1983.

Robert Morris Associates. Annual Statement Studies, '82. Philadelphia. 1982.

Texas Agricultural Extension Service. Texas Agriculture 1986. An Economic Review. College Station, Texas. 1987.

Texas Crop and Livestock Reporting Service, Texas Department of Agriculture. Texas Agricultural Cash Receipts and Price Statistics. Vols. 1981, 1982, 1983, 1984, and 1985. Austin, Texas.

Texas Crop and Livestock Reporting Service, Texas Department of Agriculture. Texas Agricultural Cash Receipts, Prices Received and Paid by Farmers. Vols. 1981, 1982, and 1983. Austin, Texas.

Texas Crop and Livestock Reporting Service, Texas Department of Agriculture. Texas County Statistics. Vols. 1981, 1982, and 1983. Austin, Texas.

Texas Crop and Livestock Reporting Service, Texas Department of Agriculture. Texas Field Crop Statistics. Vols. 1981, 1982, and 1983. Austin, Texas.

Texas Crop and Livestock Reporting Service, Texas Department of Agriculture. Texas Field Crop Statistics. Vols. 1981, 1982, and 1983. Austin, Texas.

Texas Crop and Livestock Reporting Service, Texas Department of Agriculture. Texas Livestock, Dairy, and Poultry Statistics. Vols. 1982, 1983, 1984, and 1985.

Texas Crop and Livestock Reporting Service, Texas Department of Agriculture. Texas Small Grains Statistics. Vols. 1981, 1982, and 1983. Austin, Texas.

Texas Crop and Livestock Reporting Service, Texas Department of Agriculture. 1866-1984, Texas Historic Crop Statistics. Austin, Texas. 1985.

Texas Comptroller of Public Accounts, Economic Analysis Center. Fiscal Notes. Austin, Texas. Dec. 1986.

Texas Department of Water Resources. The Texas Input-Output Model, 1979. Austin, Texas. 1983.

Texas Parks and Wildlife Department, Coastal Fisheries Branch. Computer Printout of Texas Landings by Species, by Bay and Gulf. (preliminary data for 1986). Austin, Texas.

Texas Parks and Wildlife Department, Coastal Fisheries Branch. Trends in Commercial Fishery Landings, 1977-1985. Austin, Texas. 1986.

The Railroad Commission of Texas. Annual Report of the Oil and Gas Division-1982 and 1983. Austin, Texas.

The Railroad Commission of Texas, Transportation Division. Memo on Railroad Revenues and Expenses for 1982. Austin, Texas. 1984.

Office of the Comptroller, State of Texas. Annual Report of the Comptroller of Public Accounts. Austin, Texas. 1979.

U.S. Army Corps of Engineers. News Release. Public Affairs Office. Galveston, Texas. 1982.

U.S. Bureau of the Census. 1982 Census of Construction Industries. U.S. Government Printing Office, Washington, D.C.

U.S. Bureau of the Census. 1982 Census of Manufacturing: Texas. U.S. Government Printing Office, Washington, D.C.

U.S. Bureau of the Census. 1982 Census of Mineral Industries. U.S. Government Printing Office, Washington, D.C.

U.S. Bureau of the Census. 1982 Census of Services Industries. U.S. Government Printing Office, Washington, D.C.

U.S. Bureau of the Census. 1982 Census of Wholesale Trade and Retail Trade. U.S. Government Printing Office, Washington, D.C.

U.S. Bureau of the Census. Compendium of Government Finances 1982. U.S. Government Printing Office, Washington, D.C.

U.S. Bureau of the Census. County Business Patterns, 1982 and 1983. U.S. Government Printing Office, Washington, D.C.

U.S. Bureau of the Census. Government Finances in 1982. U.S. Government Printing Office, Washington, D.C.

U.S. Department of Commerce, Bureau of the Census. Annual Survey of Manufactures. U.S. Government Printing Office, Washington, D.C. 1981 through 1986.

U.S. Department of Commerce, Bureau of the Census. Federal Expenditures by State for Fiscal Year, 1986. U.S. Government Printing Office, Washington, D.C. 1986.

U.S. Department of Commerce, Bureau of Economic Analysis. "Survey of Current Business". Washington, D.C., various monthly issues of 1982, 1983, 1986, and 1987.

U.S. Department of Labor, Bureau of Labor Statistics. Time Series for Input-Output Industries. Washington, D.C. 1096.

U.S. Department of the Interior. 1980 National survey of Fishing, Hunting, and Wildlife-Associated Recreation. Washington, D.C. 1982.

U.S. Department of Transportation, Federal Aviation Administration. Airport Activity Statistics of Certified Route Air Carriers. Washington, D.C. 1982.

U.S. Office of Management and Budget. Standard Industrial Classification Manual, 1972. U.S. Government Printing Office, Washington, D.C.

U.S. Treasury Department, Internal Revenue Service. Statistics of Income-1982, Individual Income Tax Returns.

U.S. Treasury Department, Internal Revenue Service. Statistic of Income for 1982, Corporation Income Tax Returns. U.S. Government Printing Office, Washington, D.C.

### Sampling

Cannon, John C. 1987. "Issues in Sampling and Sample Design - A Managerial Perspective," In Travel, Tourism and Hospitality Research, (ed.) J.R. Brent Ritchie and Charles R. Goeldner. New York: John Wiley & Sons. 101-117.

Dikeman, Neil J., Jr. 1983. "Research and Data Collection," In Recreation Planning and Management, (ed.) Stanley R. Lieber and Daniel R. Fesenmaier. State College, PA: Venture Publishing. 216-228.

Dillman, Don A. 1978. Mail and Telephone Surveys. New York: John Wiley & Sons.

Ferber, Robert, Paul Sheatsley, Anthony Turner and Joseph Waksberg. 1980. What is a Survey? Washington, D.C.: American Statistical Association.

Snedcor, George W. and William G. Cochran. 1980. Statistical Methods (7th edition). Ames, IW: Iowa State University Press. (Chapter 21, Sample Surveys.)

### Travel Demand Models

Archer, Brian H. 1980. Forecasting Demand: Quantitative and Intuitive Techniques. International Journal of Tourism Management, 1(1): 5-12.

Archer, Brian H. 1976. Demand Forecasting in Tourism. Bangor Occasional Papers in Economics, Number 9. Bangor, U.K.: University of Wales Press.

Baxter, Mike J. and Gordon O. Ewing. 1986. A Framework for the Exploratory Development of Spatial Interaction Models: A Recreation Travel Example. Journal of Leisure Research, 18(4): 320-336.

Beaman, Jay, Y. Kim and Steve Smith. 1979. The Effect of Recreation Supply on Participation. Leisure Sciences, 2(4): 463-479.

Ben-Akiva, Moshe and Steven R. Lerman. 1985. Discrete Choice Analysis. Cambridge, MA: The MIT Press.

Fesenmaier, Daniel R. and Stanley R. Lieber. 1987. Outdoor Recreation Expenditures and the Effects of Spatial Structure. Leisure Sciences, 9(1): 27-40.

Fesenmaier, Daniel R. 1985. Modeling Variation in Destination Patronage for Outdoor Recreation Activity. Journal of Travel Research, 24(2): 17-23.

Getz, Donald. 1986. Models in Tourism Planning. Tourism Management, 7(1): 21-32.

Hensher, David A. and Lester W. Johnson. 1981. Applied Discrete-Choice Modeling. New York: John Wiley & Sons.

Levine, Ralph L. and John E. Hunter. 1983. Regression Methodology: Correlation, Meta-Analysis, Confidence Intervals, and Reliability. Journal of Leisure Research, 15(4): 323-343.

Maddala, G.S. 1983. Limited-Dependent and Qualitative Variables in Econometrics. Cambridge: Cambridge University Press.

Montgomery, Douglas C. and Elizabeth A. Peck. 1982. Introduction to Linear Regression Analysis. New York: John Wiley & Sons.

Snedcor, George W. and William G. Cochran. 1980. Statistical Methods (7th edition). Ames, IW: Iowa State University Press. (Chapter 9, Regression)

Appendix A

Participation and Expenditure  
Estimation Methodology

### Description of Database

There are a number of approaches one might take in developing estimates of economic impact. In this study a particular approach is adopted which attempts to generate reliable estimates of expenditure levels while minimizing the cost of data collection and analysis. The study design takes advantage of recent advances in geographical, marketing, and transportation research indicating that people's travel patterns tend to be consistent and repetitive over time. That is, people tend to consistently visit places with which they are familiar while visiting "new" places very infrequently. In addition, because people tend to repeatedly visit the same place, they also can provide reliable information concerning the time and money spent at these places. The questionnaire used in this study focused upon the place (s) chosen for recreational outings. For each place identified, information was obtained which described a "typical" or "usual" trip to that place. This emphasis on the places (s) visited offers a number of methodological benefits including improved reliability of estimated expenditure levels and increased stability of the estimates against "unique" events that may effect travel patterns in the short term.

Data collection involved a two step strategy which incorporated the best aspects of both telephone and mail survey formats. In the first stage, information was obtained from a randomly drawn sample of Texans concerning their travel to the Texas Gulf Coast in order to develop weighting factors that can be used to estimate expenditures for the entire state population. A telephone survey was used in this step as a "filter" with which to identify those Texas households having traveled to the Texas Gulf Coast during 1986. The telephone format was adopted because it is relatively efficient in terms of cost per response and because personal communication affords greater

control over the quantity and quality of the responses.

The telephone survey first asked the respondent whether or not any member of the household visited the Texas Gulf Coast during 1986; a second question focused the respondent's attention onto travel to the Texas Coast for recreation-related purposes. Socioeconomic information was also gathered in order to incorporate into the estimation procedure differences between households that visited and those that did not visit the Texas Coast during 1986. Lastly, each respondent that indicated they had traveled to the Coast was informed of the need for additional information and asked if he/she would respond to a follow-up mail questionnaire. This telephone interview process required between two to three minutes of contact time.

Having agreed to complete a more indepth follow-up survey, a questionnaire was mailed to the household. The respondent was first asked to identify the place visited (along the Texas Gulf Coast) most often and then asked to estimate the time and money spent, the daily hours of participation in each of seven recreation activities as well as an evaluation of the quality of that place for the specific activities considered. Similar questions were asked for the place visited second most often and, with an abridged set of questions, for the place visited third most often. Finally, a series of attitude/evaluation questions were asked concerning the quality of respondents' experiences with particular emphasis on sport fishing.

In order to reduce recall error, the study utilized a "two phase" strategy. A fall survey was conducted which focused on trips made between January 1, 1986 and August 30, 1986. A spring survey was conducted to obtain information concerning travel to the Texas Gulf Coast from September 1, 1986 to December 31, 1986.

The sampling strategy of Texas households was designed to efficiently obtain information describing travel to the Texas Gulf Coast. First, it recognized that there are significant differences in travel patterns among Texans. Previous studies conducted for the Texas Department of Parks and Wildlife indicated that over fifty percent of those households living near the Coast (within 100 miles) regularly visit coastal areas. This contrasts sharply with those households living in El Paso and Amarillo where less than five percent travel to the Coast during any given year. Based upon the results of these previous studies, twelve state regions were identified to reflect the sharp behavioral differences throughout Texas. For each of the respective regions, households were randomly sampled from a panel of names provided by National List, Inc. (a subsidiary of Dun and Bradstreet, Inc.). The list was comprised of a large random sample of those households who own telephones in the state Texas.

Sample sizes for each region were determined with three goals in mind. First, the total number of households contacted should generate as large as possible the number of "completed" surveys for each estuary. Second, a minimum number of completed questionnaires must be generated in each region in order to allow adequate regional analysis and to guarantee sufficient variation within the data. This minimum was established at 100 completed questionnaires. With these first two goals in mind and using the results of previous studies for estimates, those regions where a "high" proportion of households visited the Texas Coast were targeted to generate a relatively large sample of households. Those regions showing low participation in Texas Gulf Coast related activities, on the other hand, were allocated only that number of households needed to generate the "minimum" number of completed surveys. This "step" or "targeted" sampling strategy improved substantially

the efficiency of the population based survey and guaranteed the variability and regional representation required for accurate and reliable statewide expenditures.

The results of the survey are presented in Table A1. For the fall telephone survey, 37,000 telephone numbers of Texas households were obtained and dialed; of these, 30,909 (83.5%) were contacted and resulted in 21,305 completed interviews (68.9%). 9,493 households either refused to participate or terminated the interview while in progress. Completion of the fall telephone phase took ten weeks and required, in total, 57,331 telephone calls.

**Table A1. Results of Fall and Spring Survey**

	Fall	Spring
Sample Size of Telephone Survey (Households)	37,000	16,678
# of Completed Telephone Surveys	21,305	9,486
# of Mailed Surveys	6,152	1,275
# of Returned Surveys	3,516	702
# of Completed Mail Surveys	2,711	513
Response Rate	(57.1%)	(55.1%)

Written questionnaires were mailed to all households (6152) that indicated they had visited the Texas Gulf Coast between January 1, 1986 and August 31, 1986. To improve response rate of the mail surveys, two follow-up surveys were

administered. As a result of this effort, 3516 questionnaires were returned (57.1%). However, 805 of these mail questionnaires were non-usable because they had not been completed correctly. Therefore, 2,711 completed mail interviews were generated by the fall survey effort.

In the second wave (the spring survey), the same procedures were employed to obtain information concerning travel to the Texas Gulf Coast between September 1, 1986 and December 31, 1986. Table 1 presents the results of this survey effort. 16,678 telephone numbers of Texas households were again obtained from National List, Inc. Of these, 12,766 households (76.5%) were contacted, resulting in 9,486 interviewed (56.9%). Follow-up mail surveys were sent to 1,275 households and resulted in 702 returned questionnaires. However, 189 of these questionnaires were deleted because they had not been completed correctly.

#### Recreation Visitation and Expenditure Estimation Procedures

Total visitation and resulting expenditures were estimated following a two phase process. The first phase focused on estimating the total number of households that visited the Sabine-Neches estuary during 1986. As defined by the Texas Water Development Board, the Sabine-Neches estuarine system includes Sabine Lake, Sabine Pass and surrounding wetlands. As further defined by the TWDB, the economic area around the Sabine-Neches estuary includes Hardin, Jefferson and Orange Counties. The second phase estimated the total number of trips and the total dollars spent for transportation, food (restaurant and groceries), equipment rental, guide fees and bait and boat fuel by those households visiting this area along the Texas Gulf Coast. Based upon the results of these two stages, total visitation and expenditure estimates were

developed using the following equations:

$$THN_i = POP_i * P1_i * PN_i \quad (1)$$

$$THF_i = POP_i * P1_i * PF_i \quad (2)$$

where:

$THN_i$  - the total number of households residing in region i that visited but did not fish at the Sabine-Neches estuary;

$THF_i$  - the total number of households residing in region i that went fishing at the Sabine-Neches estuary;

$POP_i$  - the population of households in region i;

$P1_i$  - the proportion of households from region i that visited the Texas Gulf Coast during 1986;

$PN_i$  - the proportion of households from region i that traveled to the Texas Gulf Coast and visited (but did not fish at) places located along the Sabine-Neches estuary;

$PF_i$  - the proportion of households from region i that traveled to the Texas Gulf Coast and went fishing at the Sabine-Neches estuary.

$$TTN_i = THN_i * TRN_i \quad (3)$$

$$TTF_i = THF_i * TRF_i \quad (4)$$

where:

$TTN_i$  - the total number of trips by "nonfishing" households residing in region i to the Sabine-Neches estuary;

$TTF_i$  - the total number of trips by fishing households residing in region i to the Sabine-Neches estuary;

$THN_i$  - same as before;

$THF_i$  - same as before;

$TRN_i$  - the mean number of trips per "nonfishing" household taken to the Sabine-Neches estuary from region i;

$TRF_i$  - the mean number of trips per "fishing" household taken to the Sabine-Neches estuary from region i;

$$TEN_k = \sum_i TTN_i * EXPN_{ik} \quad (5)$$

$$TEF_k = \sum_i TTF_i * EXPF_{ik} \quad (6)$$

where:

$TEN_k$  = the total expenditures by "nonfishing" households that visited the Sabine-Neches estuary for expenditure category k;

$TEF_k$  = the total expenditures by "fishing" households that visited the Sabine-Neches estuary for expenditure category k;

$TTN_i$  = same as before;

$TTF_i$  = same as before;

$EXPN_{ik}$  = the mean expenditure per trip in category k by "nonfishing" households that reside in region i and visit the Sabine-Neches estuary;

$EXPF_{ik}$  = the mean expenditure per trip in category k by "fishing" households that reside in region i and fish in the Sabine-Neches estuary;

$$TEN = \sum_k TEN_k \quad (7)$$

$$TEF = \sum_k TEF_k \quad (8)$$

where:

$TEN$  = the total expenditure level by "nonfishing" households that visited the Sabine-Neches estuary;

$TEF$  = the total expenditure level by households that fished in the Sabine-Neches estuary;

$TEN_k$  = the same as before;

$TEF_k$  = the same as before;

$$TE = TEN + TEF \quad (9)$$

where:

$TE$  = the total expenditure level by Texas residents that visited places along the Sabine-Neches estuary;

$TEN$  = same as before;

$TEF$  = same as before.

In the initial phase of the estimation procedure, households throughout the State were assigned to one of seven regions based upon their county of residence. Six of the regions corresponded to the six estuary "economic" regions developed by the Texas Water Development Board and the seventh region included all "non-estuary" counties. This regionalization process was necessary since visitation behavior including expenditure levels were likely to differ substantially for those households staying close to home (i.e., those who live near to the Coast) as compared to households that must travel farther to visit the Texas Gulf Coast. Based upon this regional distinction, data from the telephone interviews was used to calculate the proportion of households within each area that visited the Texas Gulf Coast during calendar year 1986. Data from the follow-up mail survey was then used to calculate the proportion of those households (given that they have traveled to the Coast) that visited places located along the Sabine-Neches estuary. The total number of households visiting the estuary during 1986 was estimated by multiplying the respective proportions by the total number of households residing within each region (see equation 1). The total number of sport fisherman visiting the Sabine-Neches estuary was estimated following the same procedure and is summarized in equation 2.

The second phase of procedure focused on developing accurate and reliable estimates of the total number of trips households throughout Texas made to the Sabine-Neches estuary as well as the total dollars expended during these trips. Estimates of the total visitation and expenditure levels were developed for "fishing" and "nonfishing" households residing in each of the seven regions and traveling to the Sabine-Neches estuary following equations 3-6. As part of this stage in the estimation procedure, statistical analyses were conducted to test for regional differences in visitation and expenditure levels. These analyses



confirmed prior expectations that visitation and expenditures vary substantially across Texas. Finally, estimates of the total dollars expended in the Sabine-Neches estuary were calculated using equations 7-9 where the estimated total expenditure per category was summed across categories and then summed for "fishing" and "nonfishing" households.

**Appendix B**  
**Input-Output Methodology**

## Appendix B

### Input-Output Methodology

#### Input-Output Methodology

Both the 1986 Texas Input-Output Model and the Sabine-Neches Input-Output Model developed for this study are of the Leontief structure. As such these models may be expressed in matrix form as:

$$X = (I-A)^{-1} Y \quad (1)$$

where:

- X - a vector of each sector's total value of output
- I - an identity matrix
- A - a matrix of direct requirement coefficients
- Y - a vector of final demand

The X vector in this equation contains the dollar value for each sector that measures that sector's total value of output. The A matrix contains direct requirements coefficients which reflect the degree of interaction among sectors within the regional economy. Each column of this matrix shows the dollar value of purchases made from each sector of the economy per dollar of output by another sector. The Y vector contains values for each sector that measures that sector's total sales to final demand. It is from this model that the final demand, employment and income multipliers, both Type I and Type II, were estimated. A distinct advantage of this input-output technique over other methods is that it provides estimates of both direct and indirect effects of changes in the economy.

State Input-Output Model Development. In this study, a procedure was designed to update the 1979 Texas Input-Output Model to 1986 by a non-survey technique. This procedure involved; (1) setting up the definitional structure

of the 1986 input-output sectors and then aggregation of the 1979 Texas Input-Output Model into these sectors, (2) the construction of state control totals and price indices for each sector, and (3) the development of microcomputer programs to perform the non-survey updating technique and complete the input-output analysis.

The 1986 Texas Input-Output Model was defined as having forty-one sectors. This model contains 34 processing sectors, seven final demand sectors, and seven final payment sectors. It was into this definitional structure that the 1979 Texas Input-Output Model was aggregated. Sector control totals for the 1986 Texas Input-Output Model were first obtained from secondary data for the year 1982. These control totals were then adjusted to 1986 by using wage data from the Texas Employment Commission. Various checks were performed to ascertain the accuracy of each of the 1986 sector control totals estimated. The 1986 price indices for each of the sectors were also obtained from published secondary sources. The methodology employed in constructing the 1986 vector of price indices was essentially the same as that used by the Texas Department of Water Resources in the updating of the Texas Input-Output Model from 1972 to 1979. All price indices in this study use 1979 as a base.

The final step involved in developing the 1986 Texas Input-Output Model was the modification and adoption of the fortran programs designed to update an input-output model and to complete the input-output analysis. The updating procedure first uses the price indices to price adjust the 1979 transaction table and then uses the control totals along with a modified interactive RAS technique to update and near-balance the 1979 transaction table. The program then uses a balancing routine to completely balance the new 1986 input-output

transaction table. Once the 1986 input-output transaction table is formed, the procedure constructs the direct requirements; direct and indirect requirements; and direct, indirect, and induced requirements tables, and the necessary multipliers tables (Types I and II) that are used in this study. The 1986 Texas Input-Output Model developed for this study is available from the Texas Water Development Board.

Regional Input-Output Model Development. Having constructed the 1986 Texas Input-Output Model and its subsequent multipliers, this model is then used to create the Sabine-Neches Estuary Input-Output Model. To estimate this model regional control totals were first constructed using wage data from the Texas Employment Commission and the 1986 state control totals. These regional control totals were then used in conjunction with the location quotient technique to estimate the Sabine-Neches Estuary Input-Output Model. This computerized location quotient program provided the necessary Type II input-output tables and Type II final demand, income, and employment multipliers used to calculate the total regional impacts. Direct requirement coefficients, interdependence coefficients and all multipliers developed for this study are presented in the tables of this appendix. The complete 1986 Sabine-Neches Estuary Region Input-Output Model is available from the Texas Water Development Board.

Direct Requirements Coefficients for the  
Sabine-Neches Estuary Region, 1986

```

*****
*   Sector 1 *   Sector 2 *   Sector 3 *   Sector 4 *   Sector 5
*****
1 Irrigated Agri      .00026341      .00020306      .00125252      .00000103      .00000119
2 Dryland Agri       .00001363      .00163562      .00440470      .00000844      .00001012
3 Lvestock & Pdt     .00000000      .00000000      .00039293      .00006322      .00000044
4 Agri Services      .03264883      .03575982      .01262540      .01030769      .00006382
5 Forestry           .00000000      .00000000      .00000000      .00000000      .16930090
6 Fisheries          .00000000      .00000000      .00000101      .00000000      .00000000
7 Petro & NL,NGL     .00000000      .00000000      .00000000      .00003320      .00000000
8 Other Mining       .00000000      .00000000      .00000000      .00000000      .00003866
9 Construction       .00274543      .00327751      .00072189      .01376482      .00644477
10 Food & Kindred    .00000000      .00000000      .00792663      .00009660      .00002006
11 Text & Apparel    .00000000      .00000000      .00000002      .00000085      .00000000
12 Lum & Pap Pdt     .00294418      .00013373      .00211892      .00004982      .13112590
13 Print & Publih    .00000000      .00000000      .00000430      .00039073      .00000000
14 Chemicals         .05954107      .06930304      .00689888      .14085680      .00076990
15 Petro Refining    .03765839      .06544629      .01064910      .03281003      .00014621
16 Rub Leath Plas    .00252634      .00035440      .00012439      .00020998      .00003120
17 Glas Ston Clay    .00000000      .00000000      .00000186      .00003831      .00000761
18 Prim Metal Pdt    .00011720      .00030365      .00000908      .00000000      .00000000
19 Fab Metal Pdt     .00029916      .00032943      .00048106      .00018215      .00008426
20 Non-Elec Mach     .00028460      .00033987      .00008272      .00170013      .00000337
21 Elec Machinery    .00002063      .00005428      .00001967      .00002863      .00002672
22 Transpor Equip    .00332012      .00396375      .00061954      .00105872      .00000000
23 Instruments       .00000000      .00000000      .00000000      .00000000      .00000000
24 Misc Manufactu    .00000374      .00000420      .00000316      .00001059      .00000181
25 Transportation    .00503802      .00513482      .01031209      .00877829      .05606225
26 Communications    .00066608      .00072481      .00083532      .00250403      .00192098
27 Utilities         .10337690      .00239340      .00814386      .03599604      .00174243
28 Wholesale Trde    .00188458      .00251101      .00523448      .00863541      .01121762
29 Eat&Drink Estb    .00000000      .00000000      .00008118      .00031315      .00004627
30 Other Ret Trde    .01994399      .02692473      .02351255      .01097046      .01082206
31 F.I.R.E.          .01993512      .01891724      .01649976      .01499403      .00094375
32 Health Service    .00000000      .00000000      .00000000      .00000000      .00000000
33 Educ Services     .00108701      .00113764      .00085138      .00037348      .00001392
34 Other Services    .00309484      .00017696      .00054073      .00991083      .00975615
35 Households        .18773620      .23630690      .15722910      .17897530      .09465017

```

Direct Requirements, Cont'd.

	* Sector 6	* Sector 7	* Sector 8	* Sector 9	* Sector 10
1 Irrigated Agri	.00000309	.00000000	.00000000	.00000000	.00056998
2 Dryland Agri	.00002569	.00000000	.00000000	.00000011	.00171475
3 Lvestock & Pdt	.00000121	.00000000	.00000000	.00000000	.00043699
4 Agri Services	.00016170	.00000000	.00000000	.00166507	.00000000
5 Forestry	.00000000	.00000000	.00000000	.00000000	.00010046
6 Fisheries	.00085803	.00000000	.00000000	.00000000	.00349206
7 Petro & NL,NGL	.00002942	.02617142	.00000000	.00000006	.00093367
8 Other Mining	.00000000	.00005000	.00021507	.00314844	.00003241
9 Construction	.01466137	.00088612	.00304340	.00126129	.00130233
10 Food & Kindred	.00158580	.00000441	.00001906	.00000060	.01068327
11 Text & Apparel	.00007656	.00000039	.00000214	.00000615	.00002070
12 Lum & Pap Pdts	.00985612	.00028947	.00026738	.01612656	.02615528
13 Print & Publih	.00000000	.00018496	.00005862	.00019751	.00068765
14 Chemicals	.00114260	.00220896	.02352327	.00481593	.00484567
15 Petro Refining	.11774530	.00941689	.02985810	.02304116	.01034541
16 Rub Leath Plas	.00002923	.00002126	.00296487	.00188296	.00123421
17 Glas Ston Clay	.00000000	.00005745	.00099767	.00999138	.00234769
18 Prim Metal Pdt	.00009602	.00004343	.00579540	.02147336	.00075357
19 Fab Metal Pdts	.00005317	.00018297	.00245969	.02918498	.01555977
20 Non-Elec Mach	.00001668	.00089082	.00700699	.00141078	.00017126
21 Elec Machinery	.00001558	.00065242	.00156988	.00172193	.00007505
22 Transpor Equip	.03343449	.00004950	.00391793	.00074512	.00007097
23 Instruments	.00000000	.00000982	.00000000	.00040336	.00005915
24 Misc Manufactu	.00000360	.00000103	.00000000	.00003681	.00005808
25 Transportation	.01097951	.00706460	.03575197	.01147321	.01662647
26 Communications	.00163387	.00186732	.00199137	.00389535	.00758420
27 Utilities	.00304186	.00811944	.03253104	.00379013	.01971389
28 Wholesale Trde	.00631394	.00104691	.00075965	.00332189	.00418187
29 Eat&Drink Estb	.00053289	.00044316	.00000000	.00039591	.00498862
30 Other Ret Trde	.00998012	.00146514	.00369238	.00540373	.00532650
31 F.I.R.E.	.03320915	.01117787	.02346129	.02171700	.00578495
32 Health Service	.00000000	.00009553	.00000000	.00000316	.00010235
33 Educ Services	.00038110	.00450298	.00274424	.00037209	.00030256
34 Other Services	.00671281	.00908246	.01352136	.03191229	.00704753
35 Households	.22937720	.22118080	.20167130	.22374600	.09490931

Direct Requirements, Cont'd.

	* Sector 11 *	Sector 12 *	Sector 13 *	Sector 14 *	Sector 15
1 Irrigated Agri	.00029352	.00001078	.00001600	.00002080	.00000010
2 Dryland Agri	.00042656	.00003846	.00005707	.00007438	.00000034
3 Lvestock & Pdt	.00000732	.00000692	.00001024	.00001323	.00000006
4 Agri Services	.00000000	.00000000	.00000000	.00000022	.00000000
5 Forestry	.00003450	.05756395	.00027948	.00039572	.00000166
6 Fisheries	.00001015	.00005450	.00008127	.00010508	.00000048
7 Petro & NL,NGL	.00032946	.00173913	.00257380	.00861111	.03768877
8 Other Mining	.00001280	.00009087	.00009060	.00057298	.00004830
9 Construction	.00043399	.00482238	.00201863	.00828275	.00532116
10 Food & Kindred	.00001646	.00009016	.00013353	.00018188	.00000138
11 Text & Apparel	.00031702	.00001345	.00000668	.00000272	.00000074
12 Lum & Pap Pdts	.00881377	.08910014	.05973571	.00561634	.00336272
13 Print & Publih	.00135907	.00026988	.01420348	.00039315	.00010876
14 Chemicals	.00381800	.02438916	.01353726	.16051660	.05827928
15 Petro Refining	.00319998	.00753515	.01353216	.11241410	.11106620
16 Rub Leath Plas	.00024331	.00286100	.00057731	.00121575	.00011480
17 Glas Ston Clay	.00001929	.00007761	.00010779	.00015604	.00003362
18 Prim Metal Pdt	.00310184	.00354402	.00173148	.00502802	.00189274
19 Fab Metal Pdts	.00238914	.00165721	.00155043	.00230077	.00327496
20 Non-Elec Mach	.00026163	.00130845	.00074671	.00071708	.00020880
21 Elec Machinery	.00006304	.00010166	.00016215	.00020409	.00021624
22 Transpor Equip	.00003392	.00006265	.00013743	.00018799	.00002502
23 Instruments	.00001011	.00004120	.00097632	.00015288	.00010769
24 Misc Manufactu	.00033234	.00000899	.00029170	.00002666	.00000205
25 Transportation	.01327827	.02271142	.01792498	.02097035	.03571086
26 Communications	.00324191	.00346843	.00853573	.00251100	.00093057
27 Utilities	.02820500	.04240694	.01937359	.08853389	.03160474
28 Wholesale Trde	.00144342	.00657107	.00283743	.00398926	.00298996
29 Eat&Drink Estb	.00062908	.00032251	.00104599	.00032214	.00005328
30 Other Ret Trde	.00076681	.01008937	.00345690	.00396696	.00021100
31 F.I.R.E.	.01840257	.00866147	.00709657	.00663390	.00905687
32 Health Service	.00001349	.00000649	.00001263	.00003372	.00000981
33 Educ Services	.00074175	.00006058	.00023906	.00043682	.00117611
34 Other Services	.00713215	.00355491	.01005684	.00551976	.00614058
35 Households	.25556100	.15795620	.22975530	.06781748	.03525858

Direct Requirements, Cont'd.

```

*****
* Sector 16 * Sector 17 * Sector 18 * Sector 19 * Sector 20
*****
1 Irrigated Agri .00000257 .00000297 .00000959 .00000776 .00000625
2 Dryland Agri .00048330 .00001070 .00003429 .00002774 .00002218
3 Lvestock & Pdt .00000170 .00000189 .00000612 .00000498 .00000435
4 Agri Services .00000000 .00000000 .00000000 .00000000 .00000000
5 Forestry .00004548 .00005195 .00016716 .00013528 .00012276
6 Fisheries .00001197 .00001510 .00004861 .00003891 .00003131
7 Petro & NL,NGL .00050473 .00047757 .00153623 .00125110 .00100317
8 Other Mining .00001748 .00923034 .00205038 .00004904 .00003778
9 Construction .00190352 .00102568 .00442130 .00252235 .00193189
10 Food & Kindred .00040593 .00008784 .00010072 .00011744 .00005514
11 Text & Apparel .00002392 .00000050 .00000218 .00000226 .00001695
12 Lum & Pap Pdts .00940914 .01950479 .00234545 .00465919 .00408458
13 Print & Publih .00048347 .00020005 .00019976 .00064302 .00039358
14 Chemicals .15596740 .00417098 .01261641 .01473251 .00509615
15 Petro Refining .00371277 .00367666 .01371703 .00834831 .00707416
16 Rub Leath Plas .00778412 .00090931 .00076424 .00273009 .00800966
17 Glas Ston Clay .00002163 .00900338 .00029070 .00069890 .00046780
18 Prim Metal Pdt .00090595 .00096078 .06805368 .04267374 .03406757
19 Fab Metal Pdts .00120113 .00046216 .00228443 .02462030 .02064340
20 Non-Elec Mach .00119159 .00033645 .00055277 .00095019 .00393419
21 Elec Machinery .00008711 .00002926 .00049063 .00057659 .00235897
22 Transpor Equip .00001822 .00008407 .00008201 .00083264 .00024886
23 Instruments .00001009 .00000683 .00003761 .00005944 .00100337
24 Misc Manufactu .00003042 .00001561 .00003993 .00004457 .00004639
25 Transportation .02598173 .08722020 .03044311 .02852628 .01401289
26 Communications .00393512 .00395862 .00211033 .00476316 .00453556
27 Utilities .03762924 .09636603 .09034866 .03352166 .01687758
28 Wholesale Trde .00339309 .00324751 .00409848 .00499471 .00572017
29 Eat&Drink Estb .00029535 .00027921 .00016394 .00071575 .00070716
30 Other Ret Trde .00633964 .00429933 .02743790 .00328369 .00433736
31 F.I.R.E. .00790369 .01152255 .00761413 .00985217 .01226878
32 Health Service .00001009 .00004497 .00005746 .00002810 .00004365
33 Educ Services .00021996 .00079563 .00026034 .00038437 .00028656
34 Other Services .00454064 .00991856 .01048044 .00718902 .00765689
35 Households .18217400 .15717630 .15036960 .21442670 .23013990

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Direct Requirements, Cont'd.

	* Sector 21 *	* Sector 22 *	* Sector 23 *	* Sector 24 *	* Sector 25
1 Irrigated Agri	.00000587	.00000414	.00000609	.00000262	.00000000
2 Dryland Agri	.00002105	.00001472	.00002227	.00001001	.00000000
3 Lvestock & Pdt	.00000374	.00000265	.00000418	.00000180	.00000000
4 Agri Services	.00000000	.00000000	.00000666	.00000000	.00000000
5 Forestry	.00010213	.00007253	.00010798	.00004928	.00000000
6 Fisheries	.00002979	.00002067	.00003148	.00001416	.00000000
7 Petro & NL,NGL	.00099285	.00066848	.00105571	.00047371	.00006060
8 Other Mining	.00003838	.00002556	.00003673	.00001595	.00005265
9 Construction	.00093315	.00205799	.00148871	.00073212	.00227263
10 Food & Kindred	.00005267	.00004548	.00044879	.00003434	.00003774
11 Text & Apparel	.00000120	.00000543	.00000102	.00008945	.00000107
12 Lum & Pap Pdt	.00368342	.01035399	.00523307	.03869868	.00208094
13 Print & Publih	.00062836	.00122988	.00133307	.00284437	.00038950
14 Chemicals	.01158199	.01444459	.00917241	.05554325	.00149839
15 Petro Refining	.00457867	.00502262	.00712799	.00424435	.07704464
16 Rub Leath Plas	.00520169	.00378708	.00504605	.01652685	.00252746
17 Glas Ston Clay	.00012163	.00090543	.00172645	.00106485	.00015374
18 Prim Metal Pdt	.01257036	.01568821	.02303130	.00968574	.00080988
19 Fab Metal Pdt	.00345109	.01763127	.00704159	.01217746	.00126212
20 Non-Elec Mach	.00063066	.00106273	.00456280	.00072953	.00040136
21 Elec Machinery	.01167191	.00228788	.00067519	.00424739	.00078377
22 Transpor Equip	.00143266	.01449393	.00003400	.00456580	.01208518
23 Instruments	.00041974	.00026694	.01274609	.00468919	.00054464
24 Misc Manufactu	.00005993	.00004240	.00035990	.00021816	.00000616
25 Transportation	.00650768	.01765325	.02544197	.01120522	.03356349
26 Communications	.00714455	.00328798	.00735745	.00553775	.01549149
27 Utilities	.01331129	.01701690	.03666909	.01676781	.01999214
28 Wholesale Trde	.00333885	.00478198	.00377276	.00478878	.00295077
29 Eat&Drink Estb	.00015674	.00013552	.00206143	.00036254	.00056008
30 Other Ret Trde	.00385733	.00372321	.00202383	.00434581	.00378909
31 F.I.R.E.	.01022778	.00460937	.01293339	.01085028	.03300789
32 Health Service	.00002688	.00002378	.00079668	.00000000	.00000052
33 Educ Services	.00025287	.00038554	.00053507	.00054096	.00074209
34 Other Services	.00729499	.00747846	.01460740	.01039283	.01156315
35 Households	.28362260	.20486160	.20288520	.25342080	.26516150

Direct Requirements, Cont'd.

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*****
*   Sector 26 *   Sector 27 *   Sector 28 *   Sector 29 *   Sector 30
*****
1 Irrigated Agri      .00000000      .00000000      .00000576      .00041980      .00008161
2 Dryland Agri       .00000000      .00000000      .00002063      .00000097      .00000000
3 Lvestock & Pdt     .00000000      .00000000      .00000060      .00006536      .00000005
4 Agri Services      .00000000      .00000000      .00000323      .00000000      .00000000
5 Forestry           .00000000      .00000000      .00010015      .00000000      .00000000
6 Fisheries          .00000000      .00000000      .00002915      .00006979      .00000025
7 Petro & NL,NGL     .00000000      .04500268      .00124539      .00000362      .00001696
8 Other Mining       .00000000      .00117303      .00003371      .00000000      .00000006
9 Construction       .00027122      .00115337      .00279628      .00117048      .00063822
10 Food & Kindred    .00000000      .00000000      .00005231      .01653008      .00017642
11 Text & Apparel    .00000044      .00000195      .00000326      .00000310      .00000888
12 Lum & Pap Pdt     .01066788      .00794723      .00267457      .00349727      .00129455
13 Print & Publih    .00620331      .00049656      .00226142      .00445187      .00893656
14 Chemicals         .00013950      .00272018      .00442134      .00039929      .00028213
15 Petro Refining    .01199047      .00541332      .01600232      .00313711      .01131074
16 Rub Leath Plas    .00007921      .00016262      .00169811      .00007722      .00013925
17 Glas Ston Clay    .00004091      .00052437      .00006606      .00000704      .00000145
18 Prim Metal Pdt    .00014070      .00023987      .00083502      .00000175      .00000752
19 Fab Metal Pdt     .00008823      .00315144      .00098466      .00086681      .00007350
20 Non-Elec Mach     .00004204      .00004979      .00026888      .00106844      .00011351
21 Elec Machinery    .00192200      .00013394      .00014704      .00034415      .00045796
22 Transpor Equip    .00030136      .00005098      .00078920      .00051751      .00219356
23 Instruments       .00003526      .00012432      .00004581      .00000000      .00000000
24 Misc Manufactu    .00000282      .00000224      .00004366      .00019292      .00005974
25 Transportation    .00448619      .00317463      .02213020      .00273353      .00416211
26 Communications    .01000015      .00243397      .01707122      .00874580      .01555395
27 Utilities         .01885703      .16174810      .04109908      .03824475      .02413139
28 Wholesale Trde    .00030446      .00089336      .00223047      .00468433      .00609575
29 Eat&Drink Estb    .00070471      .00000000      .00293213      .00017502      .00081628
30 Other Ret Trde    .00006121      .00195930      .00639103      .00548426      .02450682
31 F. I. R. E.       .02068903      .01245559      .03231637      .02931107      .03418462
32 Health Service    .00001972      .00000000      .00002753      .00000532      .00011238
33 Educ Services     .00532088      .00368058      .00097381      .00033219      .00070676
34 Other Services    .00762478      .00779779      .01437820      .02362392      .01169394
35 Households        .21992180      .09599926      .27237280      .22354870      .24728050

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Direct Requirements, Cont'd.

	* Sector 31 *	* Sector 32 *	* Sector 33 *	* Sector 34 *	Households
1 Irrigated Agri	.00000000	.00000000	.00000000	.00000000	.00001632
2 Dryland Agri	.00000000	.00000000	.00000000	.00000000	.00011674
3 Lvestock & Pdt	.00000000	.00000017	.00000000	.00000002	.00000311
4 Agri Services	.00000000	.00000000	.00000000	.00000000	.00000000
5 Forestry	.00000000	.00000000	.00000000	.00000000	.00000000
6 Fisheries	.00000000	.00000000	.00000000	.00000000	.00005944
7 Petro & NL,NGL	.00005305	.00000000	.00000000	.00000000	.00014115
8 Other Mining	.00000000	.00000000	.00000000	.00000059	.00000000
9 Construction	.00531733	.00098859	.00072668	.00275070	.00119751
10 Food & Kindred	.00001789	.00052911	.00387188	.00049012	.00690846
11 Text & Apparel	.00000072	.00000622	.00000212	.00001256	.00005383
12 Lum & Pap Pdts	.00227525	.00208413	.01086280	.00260471	.00180517
13 Print & Publih	.00194988	.00136961	.00233800	.00393355	.00122205
14 Chemicals	.00025176	.00617367	.00433987	.00711581	.00349167
15 Petro Refining	.00079362	.00196303	.00357552	.01351199	.03702909
16 Rub Leath Plas	.00002227	.00044114	.00066586	.00477470	.00135823
17 Glas Ston Clay	.00010056	.00003012	.00005560	.00007947	.00011405
18 Prim Metal Pdt	.00003162	.00004087	.00028562	.00113433	.00034274
19 Fab Metal Pdts	.00019408	.00098034	.00134655	.00717946	.00053874
20 Non-Elec Mach	.00000369	.00010665	.00031674	.00128901	.00002115
21 Elec Machinery	.00005032	.00042236	.00083402	.00055526	.00011575
22 Transpor Equip	.00000819	.00032060	.00011929	.00322135	.00680002
23 Instruments	.00000000	.00283575	.00584969	.00265988	.00017832
24 Misc Manufactu	.00001661	.00006016	.00009199	.00021157	.00002760
25 Transportation	.00124524	.00872939	.00306928	.01049153	.01932241
26 Communications	.01542200	.01232991	.00783983	.01817519	.00652153
27 Utilities	.02128300	.04039472	.04077891	.02601294	.03270740
28 Wholesale Trde	.00064986	.00402115	.00113301	.00342019	.00822715
29 Eat&Drink Estb	.00090239	.00243755	.00020562	.00235989	.01920691
30 Other Ret Trde	.00012053	.00285362	.00152573	.00394980	.05711323
31 F.I.R.E.	.06408869	.03481051	.01770821	.02948830	.03250780
32 Health Service	.00058556	.01514533	.00015997	.00090141	.03369484
33 Educ Services	.00138446	.00062898	.00005118	.00057681	.00247339
34 Other Services	.01855723	.02435325	.01000094	.01873374	.02083033
35 Households	.27496880	.32612110	.44776700	.31162610	.04497153

Interdependence Coefficients for the  
Sabine-Neches Estuary Region

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*****
* Sector 1 * Sector 2 * Sector 3 * Sector 4 * Sector 5
*****
1 Irrigated Agri 1.00027600 .00021880 .00126842 .00001517 .00001225
2 Dryland Agri .00005800 1.00168800 .00445659 .00005759 .00004843
3 Lvestock & Pdt .00000542 .00000612 1.00039900 .00006844 .00000359
4 Agri Services .03300897 .03621069 .01296791 1.01044600 .00009685
5 Forestry .00050587 .00025027 .00028090 .00034074 1.21605700
6 Fisheries .00003367 .00003884 .00004942 .00004299 .00002993
7 Petro & NL,NGL .01054527 .00666708 .00237589 .00829715 .00252439
8 Other Mining .00025380 .00013019 .00004872 .00026175 .00014167
9 Construction .00519896 .00598666 .00178266 .01661693 .00961124
10 Food & Kindred .00205348 .00237941 .00957820 .00208871 .00161491
11 Text & Apparel .00001630 .00001851 .00001228 .00001666 .00001470
12 Lum & Pap Pdts .00668035 .00289099 .00391236 .00364445 .17668690
13 Print & Publih .00105948 .00115369 .00081239 .00138750 .00086070
14 Chemicals .08428434 .09830738 .01423047 .17708990 .00955204
15 Petro Refining .06946395 .10412220 .02615623 .07486392 .02040046
16 Rub Leath Plas .00326493 .00113248 .00059191 .00108661 .00123921
17 Glas Ston Clay .00020404 .00016068 .00009515 .00033254 .00018726
18 Prim Metal Pdt .00126373 .00161144 .00043183 .00192417 .00131702
19 Fab Metal Pdts .00187276 .00173304 .00119011 .00213423 .00136878
20 Non-Elec Mach .00051149 .00057615 .00017541 .00197596 .00035154
21 Elec Machinery .00020148 .00024264 .00012244 .00024213 .00022553
22 Transpor Equip .00568102 .00668823 .00245439 .00338331 .00262629
23 Instruments .00018498 .00018265 .00011007 .00020957 .00018526
24 Misc Manufactu .00002369 .00002599 .00001690 .00003377 .00001994
25 Transportation .01721239 .01934231 .01738289 .02282214 .08120807
26 Communications .00535094 .00565654 .00423145 .00724322 .00735525
27 Utilities .15216800 .03649248 .02533335 .08045942 .02736673
28 Wholesale Trde .00568254 .00680105 .00773939 .01246938 .01732201
29 Eat&Drink Estb .00547051 .00633703 .00429874 .00562343 .00438645
30 Other Ret Trde .03794985 .04758186 .03713787 .02820194 .02844709
31 F.I.R.E. .03837827 .03820669 .02914567 .03261982 .01687085
32 Health Service .00940185 .01091543 .00720219 .00902735 .00724259
33 Educ Services .00265305 .00243030 .00164826 .00168955 .00087376
34 Other Services .01373067 .01129318 .00744034 .02047506 .02024048
35 Households .27346410 .31772550 .20959750 .26237710 .21066330
TOT INT COEF 1.78811400 1.77520500 1.43467700 1.78956900 1.86715200

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Interdependence Coefficients, Cont'd.

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*****
*   Sector 6 * Sector 7 * Sector 8 * Sector 9 * Sector 10
*****
1 Irrigated Agri      .00001657   .00000990   .00001085   .00001243   .00058570
2 Dryland Agri       .00007255   .00003700   .00004169   .00004593   .00176114
3 Lvestock & Pdt     .00000483   .00000229   .00000279   .00000323   .00044388
4 Agri Services      .00019493   .00000467   .00000965   .00168944   .00009317
5 Forestry           .00097800   .00013076   .00021309   .00142677   .00227048
6 Fisheries           1.00089600   .00002525   .00002943   .00003282   .00355026
7 Petro & NL,NGL     .00757883   1.02918900   .00542244   .00353998   .00382575
8 Other Mining        .00011539   .00009623   1.00035500   .00335692   .00012376
9 Construction       .01668645   .00175255   .00458151   1.00284300   .00226150
10 Food & Kindred    .00395264   .00207575   .00211150   .00233591   1.01199700
11 Text & Apparel     .00009512   .00001603   .00001849   .00002458   .00003025
12 Lum & Pap Pdts    .01391523   .00181721   .00275605   .02030244   .03085777
13 Print & Publih    .00106079   .00094741   .00096455   .00127060   .00129391
14 Chemicals         .01518394   .00631703   .03490143   .01349926   .01031091
15 Petro Refining     .15206120   .02555430   .05552467   .04552533   .02346228
16 Rub Leath Plas    .00091597   .00059262   .00381394   .00287610   .00178020
17 Glas Ston Clay    .00028776   .00014129   .00116090   .01022547   .00248440
18 Prim Metal Pdt    .00186159   .00046556   .00742528   .02518051   .00202228
19 Fab Metal Pdts    .00234799   .00086992   .00389499   .03110947   .01677064
20 Non-Elec Mach     .00021349   .00099085   .00718259   .00164345   .00030358
21 Elec Machinery    .00028763   .00078786   .00178632   .00193923   .00019374
22 Transpor Equip    .03661800   .00226059   .00664383   .00347554   .00162729
23 Instruments       .00020415   .00018708   .00022377   .00065520   .00017072
24 Misc Manufactu    .00002551   .00001747   .00002030   .00006375   .00007137
25 Transportation    .02608510   .01501426   .04726481   .02477048   .02393046
26 Communications    .00671861   .00544612   .00674161   .00909091   .01046584
27 Utilities         .03032823   .02615057   .06212424   .03170937   .03758483
28 Wholesale Trde    .01029703   .00384951   .00407271   .00712303   .00627499
29 Eat&Drink Estb    .00682716   .00591126   .00558284   .00665592   .00802500
30 Other Ret Trde    .02964346   .01812382   .02118411   .02546380   .01515126
31 F.I.R.E.          .05304767   .02530880   .04097546   .04037893   .01572212
32 Health Service    .01082481   .00959190   .00960428   .01070984   .00517474
33 Educ Services     .00169557   .00556128   .00395075   .00155747   .00100186
34 Other Services    .01817040   .01734476   .02335509   .04269296   .01264996
35 Households        .31473130   .27641130   .27917130   .31083820   .14743510
TOT INT COEF        1.76394300  1.48300200  1.64312300  1.68406800  1.40170800

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Interdependence Coefficients, Cont'd.

	* Sector 11 *	* Sector 12 *	* Sector 13 *	* Sector 14 *	* Sector 15
1 Irrigated Agri	.00030534	.00002279	.00002899	.00003141	.00000557
2 Dryland Agri	.00047074	.00008147	.00010397	.00011223	.00002049
3 Lvestock & Pdt	.00001009	.00001030	.00001375	.00001745	.00000204
4 Agri Services	.00002983	.00002080	.00001130	.00002531	.00001338
5 Forestry	.00086349	.07702269	.00516005	.00131137	.00046577
6 Fisheries	.00004015	.00008757	.00011684	.00014252	.00001885
7 Petro & NL,NGL	.00379631	.00707789	.00668795	.02380114	.04786759
8 Other Mining	.00009824	.00025491	.00019159	.00092988	.00021010
9 Construction	.00150631	.00710097	.00358375	.01164936	.00734886
10 Food & Kindred	.00237990	.00196733	.00244990	.00137333	.00077586
11 Text & Apparel	1.00033500	.00002949	.00002531	.00001273	.00000715
12 Lum & Pap Pds	.01175269	1.11119000	.06933305	.01057336	.00609299
13 Print & Publih	.00225515	.00116976	1.01535800	.00111630	.00056041
14 Chemicals	.00869059	.03705220	.02322866	1.20515400	.08103780
15 Petro Refining	.02140219	.02977165	.03602925	.16451230	1.14522200
16 Rub Leath Plas	.00093350	.00385731	.00150085	.00201075	.00063596
17 Glas Ston Clay	.00012481	.00025891	.00024251	.00043222	.00019187
18 Prim Metal Pdt	.00390288	.00507899	.00286562	.00760517	.00334559
19 Fab Metal Pds	.00325488	.00299474	.00269413	.00460506	.00475613
20 Non-Elec Mach	.00036126	.00158227	.00096575	.00102979	.00041792
21 Elec Machinery	.00019661	.00027893	.00033641	.00043976	.00040303
22 Transpor Equip	.00263197	.00241990	.00279646	.00187389	.00140333
23 Instruments	.00018517	.00020746	.00119193	.00034614	.00025172
24 Misc Manufactu	.00035103	.00002702	.00031607	.00004487	.00001328
25 Transportation	.02260569	.03906202	.03007627	.03751702	.04760909
26 Communications	.00749219	.00816103	.01324764	.00644812	.00384660
27 Utilities	.05310553	.07652120	.04777981	.14491750	.06008887
28 Wholesale Trde	.00472965	.01107401	.00667161	.00724834	.00508189
29 Eat&Drink Estb	.00690158	.00534798	.00719810	.00349142	.00215682
30 Other Ret Trde	.02010912	.02786659	.02310446	.01496900	.00718348
31 F.I.R.E.	.03505695	.02491335	.02421460	.02129837	.01969132
32 Health Service	.01091361	.00857448	.01059758	.00530168	.00347748
33 Educ Services	.00191916	.00121184	.00144504	.00187492	.00217845
34 Other Services	.01664677	.01339182	.02003859	.01446362	.01233369
35 Households	.31739610	.24940680	.30820310	.15277560	.10035550
TOT INT COEF	1.56275500	1.75509600	1.66780900	1.84945600	1.56507100

Interdependence Coefficients, Cont'd.

	* Sector 16 *	* Sector 17 *	* Sector 18 *	* Sector 19 *	* Sector 20
1 Irrigated Agri	.00001694	.00001270	.00002170	.00001994	.00001843
2 Dryland Agri	.00053861	.00004642	.00007106	.00007293	.00006981
3 Lvestock & Pdt	.00000667	.00000426	.00000885	.00000820	.00000740
4 Agri Services	.00002800	.00000635	.00001354	.00001025	.00000876
5 Forestry	.00111354	.00177128	.00061216	.00072474	.00063755
6 Fisheries	.00005824	.00004033	.00007658	.00007198	.00006332
7 Petro & NL,NGL	.00789565	.00801560	.00953052	.00596717	.00442731
8 Other Mining	.00025417	.00950407	.00240120	.00026606	.00019746
9 Construction	.00460688	.00240858	.00598160	.00401525	.00323237
10 Food & Kindred	.00240236	.00196042	.00189738	.00233290	.00233489
11 Text & Apparel	.00003988	.00001543	.00001661	.00001947	.00003470
12 Lum & Pap Pdts	.01389975	.02454164	.00553008	.00770479	.00676301
13 Print & Publih	.00140572	.00108444	.00126001	.00157847	.00132991
14 Chemicals	.19291110	.01035589	.02114496	.02376235	.01271195
15 Petro Refining	.04486327	.02704109	.03535501	.03090408	.02681992
16 Rub Leath Plas	1.00874100	.00180855	.00150698	.00358630	.00887671
17 Glas Ston Clay	.00019941	1.00925600	.00050418	.00087567	.00061672
18 Prim Metal Pdt	.00268835	.00177521	1.07384000	.04763387	.03825149
19 Fab Metal Pdts	.00273971	.00172797	.00378158	1.02638100	.02220186
20 Non-Elec Mach	.00145537	.00056416	.00074025	.00112653	1.00410400
21 Elec Machinery	.00028538	.00025182	.00071120	.00078390	.00256681
22 Transpor Equip	.00248950	.00321329	.00247061	.00355306	.00283137
23 Instruments	.00020622	.00022600	.00022674	.00024785	.00119490
24 Misc Manufactu	.00005194	.00003309	.00006129	.00006612	.00006800
25 Transportation	.03992151	.09978438	.04226566	.04091693	.02535735
26 Communications	.00856980	.00925350	.00682866	.00945423	.00902313
27 Utilities	.08302582	.13572380	.13433880	.06669054	.04469724
28 Wholesale Trde	.00716056	.00642056	.00737004	.00856577	.00922594
29 Eat&Drink Estb	.00557926	.00530585	.00497296	.00660977	.00676967
30 Other Ret Trde	.02353906	.02040378	.04507941	.02286476	.02409297
31 F.I.R.E.	.02470800	.02980856	.02447183	.02710718	.02906553
32 Health Service	.00902950	.00863470	.00827295	.01016906	.01049900
33 Educ Services	.00150670	.00222941	.00163148	.00162496	.00144085
34 Other Services	.01443572	.01981449	.02038909	.01737571	.01755773
35 Households	.26244890	.24982810	.23875630	.29518480	.30433260
TOT INT COEF	1.76882300	1.69287200	1.70214200	1.66827600	1.62143100

Interdependence Coefficients, Cont'd.

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*   Sector 21 * Sector 22 * Sector 23 * Sector 24 * Sector 25
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1 Irrigated Agri .00001909 .00001501 .00001804 .00001751 .00001315
2 Dryland Agri .00007276 .00005652 .00006600 .00007228 .00004963
3 Lvestock & Pdt .00000699 .00000548 .00000731 .00000610 .00000309
4 Agri Services .00000705 .00000825 .00001469 .00000823 .00000918
5 Forestry .00057456 .00105910 .00072665 .00329373 .00036891
6 Fisheries .00006479 .00005034 .00006280 .00005714 .00003366
7 Petro & NL,NGL .00413632 .00394080 .00554715 .00512163 .00683255
8 Other Mining .00013876 .00015272 .00021115 .00017690 .00014855
9 Construction .00215335 .00328851 .00280129 .00277207 .00407496
10 Food & Kindred .00267016 .00207991 .00259110 .00261123 .00268333
11 Text & Apparel .00002135 .00002140 .00001758 .00011025 .00002149
12 Lum & Pap Pds .00627098 .01370530 .00832366 .04600010 .00516935
13 Print & Publih .00164091 .00208068 .00228663 .00396511 .00156692
14 Chemicals .01944141 .02279963 .01688007 .07592948 .01271792
15 Petro Refining .02560228 .02433685 .02739716 .03338146 .10919670
16 Rub Leath Plas .00605191 .00461091 .00594464 .01771108 .00344182
17 Glas Ston Clay .00024003 .00105694 .00190320 .00123466 .00031226
18 Prim Metal Pdt .01440002 .01857070 .02610965 .01232232 .00195338
19 Fab Metal Pds .00448519 .01924265 .00845011 .01384235 .00281709
20 Non-Elec Mach .00075901 .00122679 .00478668 .00100710 .00056122
21 Elec Machinery 1.01196600 .00250190 .00087803 .00449963 .00103955
22 Transpor Equip .00426408 1.01708400 .00259092 .00750613 .01547219
23 Instruments .00061261 .00043990 1.01311600 .00496676 .00078480
24 Misc Manufactu .00008167 .00006187 .00038584 1.00024500 .00002930
25 Transportation .01724219 .02812874 .03655347 .02545029 1.04803800
26 Communications .01175099 .00733534 .01200540 .01077939 .02122070
27 Utilities .03947899 .04226074 .06703794 .05298068 .05036021
28 Wholesale Trde .00706221 .00801450 .00709130 .00913190 .00700724
29 Eat&Drink Estb .00712109 .00556443 .00770578 .00721476 .00763047
30 Other Ret Trde .02565686 .02115298 .02011335 .02641130 .02551158
31 F.I.R.E. .02797239 .01944739 .02971653 .03005331 .05466368
32 Health Service .01212212 .00938365 .01047540 .01177436 .01219581
33 Educ Services .00150142 .00142407 .00174393 .00187360 .00225535
34 Other Services .01774723 .01631049 .02441625 .02171022 .02360680
35 Households .35234060 .27257420 .28085240 .34264740 .35464200
TOT INT COEF 1.62567800 1.56999300 1.62882800 1.77688600 1.77643300

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Interdependence Coefficients, Cont'd.

	* Sector 26 *	* Sector 27 *	* Sector 28 *	* Sector 29 *	* Sector 30
1 Irrigated Agri	.00001015	.00000622	.00002015	.00044045	.00009555
2 Dryland Agri	.00003794	.00002313	.00006996	.00006980	.00004425
3 Lvestock & Pdt	.00000245	.00000150	.00000384	.00007517	.00000291
4 Agri Services	.00000393	.00000467	.00001362	.00002190	.00000790
5 Forestry	.00097396	.00080959	.00052794	.00047203	.00029828
6 Fisheries	.00002639	.00001629	.00006299	.00015560	.00003122
7 Petro & NL,NGL	.00306807	.05649130	.00634070	.00388000	.00362386
8 Other Mining	.00006015	.00143849	.00014889	.00009182	.00007307
9 Construction	.00125381	.00210803	.00418728	.00226175	.00181324
10 Food & Kindred	.00209055	.00125109	.00275405	.01890171	.00260059
11 Text & Apparel	.00001634	.00001197	.00002377	.00002050	.00002758
12 Lum & Pap Pdts	.01396775	.01160564	.00575052	.00669209	.00418556
13 Print & Publih	.00711779	.00114266	.00349895	.00553130	.01031933
14 Chemicals	.00448819	.00685676	.01107189	.00445090	.00495000
15 Petro Refining	.02815715	.01743621	.03931347	.01951784	.03017291
16 Rub Leath Plas	.00067970	.00061471	.00252607	.00079897	.00082987
17 Glas Ston Clay	.00012784	.00069983	.00022020	.00016161	.00011017
18 Prim Metal Pdt	.00060039	.00082716	.00157992	.00056009	.00051051
19 Fab Metal Pdts	.00081561	.00436385	.00215472	.00210915	.00097341
20 Non-Elec Mach	.00013440	.00019272	.00039847	.00118241	.00021465
21 Elec Machinery	.00207181	.00028215	.00034975	.00049463	.00063423
22 Transpor Equip	.00249609	.00142755	.00386078	.00289355	.00483480
23 Instruments	.00022114	.00028251	.00027352	.00021040	.00019513
24 Misc Manufactu	.00002116	.00001462	.00006752	.00021629	.00008377
25 Transportation	.01275504	.00961314	.03349620	.01148753	.01369668
26 Communications	1.01383500	.00551191	.02262447	.01344267	.02071867
27 Utilities	.03979137	1.20513000	.07238126	.06432081	.04948819
28 Wholesale Trde	.00320251	.00294617	1.00604300	.00784918	.00956666
29 Eat&Drink Estb	.00620735	.00332975	.01003612	1.00613700	.00728732
30 Other Ret Trde	.01689942	.01261581	.02823760	.02356669	1.04466700
31 F.I.R.E.	.03558069	.02489545	.05327686	.04650301	.05333432
32 Health Service	.00956816	.00570767	.01229762	.01012710	.01125630
33 Educ Services	.00637493	.00522931	.00248142	.00154710	.00200918
34 Other Services	.01609235	.01508988	.02605173	.03330530	.02218362
35 Households	.27788770	.16572480	.35680930	.29394880	.32392350
TOT INT COEF	1.50663700	1.56370200	1.70895500	1.58344500	1.62476500

Interdependence Coefficients, Cont'd.

	* Sector 31 *	* Sector 32 *	* Sector 33 *	* Sector 34 *	* Households
1 Irrigated Agri	.00001272	.00001633	.00002126	.00001590	.00003867
2 Dryland Agri	.00004748	.00005788	.00007961	.00005806	.00014989
3 Lvestock & Pdt	.00000295	.00000409	.00000622	.00000390	.00000891
4 Agri Services	.00001334	.00000687	.00000765	.00000988	.00001095
5 Forestry	.00034570	.00036649	.00106735	.00042383	.00031413
6 Fisheries	.00003234	.00004110	.00006349	.00004025	.00010068
7 Petro & NL,NGL	.00308522	.00464996	.00514903	.00438822	.00502102
8 Other Mining	.00008469	.00010972	.00011710	.00010268	.00009056
9 Construction	.00661263	.00243997	.00228979	.00423537	.00241985
10 Food & Kindred	.00267660	.00370448	.00790122	.00351293	.00837757
11 Text & Apparel	.00002100	.00003034	.00003269	.00003564	.00006317
12 Lum & Pap Pdts	.00492210	.00514702	.01524785	.00591478	.00439482
13 Print & Publih	.00314717	.00273670	.00380433	.00528956	.00256462
14 Chemicals	.00419687	.01244850	.01148021	.01523650	.01017008
15 Petro Refining	.01906971	.02537085	.03172176	.03812918	.05363509
16 Rub Leath Plas	.00076935	.00139161	.00176317	.00574982	.00191893
17 Glas Ston Clay	.00026116	.00018120	.00023529	.00024528	.00023426
18 Prim Metal Pdt	.00059171	.00076234	.00121708	.00239451	.00100373
19 Fab Metal Pdts	.00121763	.00221360	.00269791	.00863221	.00174188
20 Non-Elec Mach	.00010822	.00025449	.00048097	.00145486	.00016830
21 Elec Machinery	.00021861	.00062676	.00104411	.00077977	.00030915
22 Transpor Equip	.00277272	.00370706	.00425241	.00652686	.00847729
23 Instruments	.00022162	.00318220	.00619058	.00294646	.00045359
24 Misc Manufactu	.00004033	.00009032	.00012391	.00024018	.00005262
25 Transportation	.01072495	.02070254	.01766343	.02291792	.02722515
26 Communications	.02090289	.01861584	.01439785	.02406945	.01154819
27 Utilities	.04690779	.07464708	.07934628	.05732732	.05706003
28 Wholesale Trde	.00423089	.00839449	.00654134	.00767666	.01067359
29 Eat&Drink Estb	.00799304	.01083224	.01083485	.01033697	.02221664
30 Other Ret Trde	.02151727	.02833565	.03398199	.02836974	.06748664
31 F.I.R.E.	1.08550200	.05858220	.04386887	.05173618	.04835303
32 Health Service	.01284682	1.02982000	.01864510	.01468326	.03896224
33 Educ Services	.00276709	.00227476	1.00196400	.00213949	.00337765
34 Other Services	.03010819	.03785130	.02537609	1.03140900	.02914471
35 Households	.35568390	.41984880	.53842380	.40041010	1.13684400
TOT INT COEF	1.64965700	1.77944500	1.88803900	1.75744300	1.55461200

**TYPE II FINAL DEMAND AND OUTPUT MULTIPLIERS  
FOR THE SABINE-NECHES ESTUARY REGION**

	MULTIPLIER (Final Demand)	DIAGONAL COEFFICIENT	MULTIPLIER (Output)
1 Irrigated Agri	1.788114	1.000276	1.787621
2 Dryland Agri	1.775205	1.001688	1.772213
3 Lvestock & Pdt	1.434677	1.000399	1.434105
4 Agri Services	1.789569	1.010446	1.771068
5 Forestry	1.867152	1.216057	1.535415
6 Fisheries	1.763943	1.000896	1.762365
7 Petro & NL,NGL	1.483002	1.029189	1.440942
8 Other Mining	1.643123	1.000355	1.642539
9 Construction	1.684068	1.002843	1.679294
10 Food & Kindred	1.401708	1.011997	1.385091
11 Text & Apparel	1.562755	1.000335	1.562231
12 Lum & Pap Pdts	1.755096	1.111190	1.579475
13 Print & Publih	1.667809	1.015358	1.642582
14 Chemicals	1.849456	1.205154	1.534622
15 Petro Refining	1.565071	1.145222	1.366609
16 Rub Leath Plas	1.768823	1.008741	1.753495
17 Glas Ston Clay	1.692872	1.009256	1.677346
18 Prim Metal Pdt	1.702142	1.073840	1.585098
19 Fab Metal Pdts	1.668276	1.026381	1.625397
20 Non-Elec Mach	1.621431	1.004104	1.614803
21 Elec Machinery	1.625678	1.011966	1.606454
22 Transpor Equip	1.569993	1.017084	1.543621
23 Instruments	1.628828	1.013116	1.607741
24 Misc Manufactu	1.776886	1.000245	1.776450
25 Transportation	1.776433	1.048038	1.695008
26 Communications	1.506637	1.013835	1.486078
27 Utilities	1.563702	1.205130	1.297539
28 Wholesale Trde	1.708955	1.006043	1.698689
29 Eat&Drink Estb	1.583445	1.006137	1.573787
30 Other Ret Trde	1.624765	1.044667	1.555294
31 F.I.R.E.	1.649657	1.085502	1.519718
32 Health Service	1.779445	1.029820	1.727918
33 Educ Services	1.888039	1.001964	1.884338
34 Other Services	1.757443	1.031409	1.703924
35 Households	1.554612	1.136844	1.367480

**TYPE II INCOME MULTIPLIERS  
FOR THE SABINE-NECHES ESTUARY REGION**

	DIR EFFECT (Per \$1.00)	TOT EFFECT (F DEMAND)	MULTIPLIER (F DEMAND)	TOT EFFECT (OUTPUT)	MULTIPLIER (OUTPUT)
1 Irrigated Agri	.187736	.273464	1.456640	.273389	1.456238
2 Dryland Agri	.236307	.317726	1.344546	.317190	1.342280
3 Lvestock & Pdt	.157229	.209598	1.333071	.209514	1.332539
4 Agri Services	.178975	.262377	1.465996	.259665	1.450840
5 Forestry	.094650	.210663	2.225705	.173235	1.830263
6 Fisheries	.229377	.314731	1.372113	.314450	1.370885
7 Petro & NL,NGL	.221181	.276411	1.249708	.268572	1.214265
8 Other Mining	.201671	.279171	1.384289	.279072	1.383797
9 Construction	.223746	.310838	1.389246	.309957	1.385307
10 Food & Kindred	.094909	.147435	1.553432	.145687	1.535016
11 Text & Apparel	.255561	.317396	1.241958	.317290	1.241542
12 Lum & Pap Pdts	.157956	.249407	1.578962	.224450	1.420965
13 Print & Publih	.229755	.308203	1.341440	.303541	1.321150
14 Chemicals	.067817	.152776	2.252747	.126769	1.869261
15 Petro Refining	.035259	.100356	2.846273	.087630	2.485347
16 Rub Leath Plas	.182174	.262449	1.440650	.260175	1.428165
17 Glas Ston Clay	.157176	.249828	1.589477	.247537	1.574899
18 Prim Metal Pdt	.150370	.238756	1.587796	.222339	1.478614
19 Fab Metal Pdts	.214427	.295185	1.376623	.287598	1.341240
20 Non-Elec Mach	.230140	.304333	1.322381	.303089	1.316975
21 Elec Machinery	.283623	.352341	1.242287	.348174	1.227597
22 Transpor Equip	.204862	.272574	1.330528	.267996	1.308179
23 Instruments	.202885	.280852	1.384293	.277216	1.366372
24 Misc Manufactu	.253421	.342647	1.352089	.342563	1.351757
25 Transportation	.265161	.354642	1.337457	.338387	1.276153
26 Communications	.219922	.277888	1.263575	.274096	1.246332
27 Utilities	.095999	.165725	1.726313	.137516	1.432470
28 Wholesale Trde	.272373	.356809	1.310004	.354666	1.302135
29 Eat&Drink Estb	.223549	.293949	1.314921	.292156	1.306900
30 Other Ret Trde	.247280	.323924	1.309944	.310073	1.253934
31 F.I.R.E.	.274969	.355684	1.293543	.327668	1.191654
32 Health Service	.326121	.419849	1.287402	.407691	1.250123
33 Educ Services	.447767	.538424	1.202464	.537368	1.200107
34 Other Services	.311626	.400410	1.284905	.388217	1.245777

**TYPE II EMPLOYMENT MULTIPLIERS  
FOR THE SABINE-NECHES ESTUARY REGION**

	D EFFECT PER MIL \$	T EFFECT F DEMAND	MULTIPLI F DEMAND	T EFFECT OUTPUT	MULTIPLI OUTPUT	NUMBER OF EMPLOYEES
1 Irrigated Agri	13.561	17.768	1.310	17.763	1.310	31.
2 Dryland Agri	2.070	6.341	3.063	6.330	3.058	15.
3 Lvestock & Pdt	5.338	8.268	1.549	8.265	1.548	3.
4 Agri Services	9.127	13.145	1.440	13.009	1.425	84.
5 Forestry	1.236	6.091	4.930	5.009	4.054	184.
6 Fisheries	63.233	67.009	1.060	66.949	1.059	221.
7 Petro & NL,NGL	6.174	8.732	1.414	8.484	1.374	2608.
8 Other Mining	5.659	9.002	1.591	8.999	1.590	52.
9 Construction	6.983	11.331	1.623	11.299	1.618	6914.
10 Food & Kindred	5.622	8.358	1.487	8.259	1.469	510.
11 Text & Apparel	24.113	26.884	1.115	26.875	1.115	36.
12 Lum & Pap Pdts	7.534	11.617	1.542	10.455	1.388	2099.
13 Print & PUBLH	15.803	19.553	1.237	19.258	1.219	795.
14 Chemicals	2.910	6.420	2.206	5.327	1.831	8228.
15 Petro Refining	.936	3.355	3.584	2.930	3.129	8337.
16 Rub Leath Plas	7.413	10.990	1.482	10.895	1.470	399.
17 Glas Ston Clay	12.593	16.316	1.296	16.167	1.284	319.
18 Prim Metal Pdt	3.646	8.017	2.199	7.465	2.047	831.
19 Fab Metal Pdts	9.033	12.519	1.386	12.198	1.350	1385.
20 Non-Elec Mach	7.409	10.774	1.454	10.730	1.448	805.
21 Elec Machinery	7.924	11.113	1.402	10.982	1.386	433.
22 Transpor Equip	3.709	6.751	1.820	6.638	1.790	897.
23 Instruments	12.206	15.767	1.292	15.563	1.275	358.
24 Misc Manufactu	11.614	15.791	1.360	15.787	1.359	57.
25 Transportation	5.090	8.893	1.747	8.486	1.667	3222.
26 Communications	9.820	12.527	1.276	12.356	1.258	2010.
27 Utilities	3.246	6.157	1.897	5.109	1.574	3511.
28 Wholesale Trde	21.923	25.829	1.178	25.674	1.171	5493.
29 Eat&Drink Estb	18.308	21.899	1.196	21.765	1.189	6818.
30 Other Ret Trde	38.085	42.302	1.111	40.493	1.063	19599.
31 F.I.R.E.	6.765	10.391	1.536	9.573	1.415	4912.
32 Health Service	30.772	35.533	1.155	34.504	1.121	8194.
33 Educ Services	33.378	37.643	1.128	37.569	1.126	1458.
34 Other Services	28.244	32.484	1.150	31.494	1.115	12918.

TOTAL EMPLOYMENT - 103736.