

**THE ECONOMY OF NORTHWESTERN  
COLORADO  
DESCRIPTION AND ANALYSIS**

**By**

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**COLORADO WATER RESOURCES**



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Fort Collins, Colorado**

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Fort Collins, Colorado

Norman A. Evans, Director

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## CHAPTER 1

### INTRODUCTION

#### INTRODUCTION

Recent concern with the adequacy of existing energy supplies to satisfy rapidly expanding requirements has led to plans for increasing production from existing sources and for developing new sources. Two resources, coal and oil-bearing shale, are available for rather extensive development in Colorado. The perceived impacts of coal and oil extraction will likely vary depending on the accounting stance or perspective taken, i.e., national, state, or regional. They may include both economic and non-economic effects. While it would be a worthwhile endeavor to consider the wide range of perspectives and impacts resulting from rapid energy resource developments, time and financial constraints, as well as a concern with the impacts on a particular regional economy, limit the scope of this inquiry to the regional perspective and to an assessment of the economic impacts.

Thus, the thrust of this report is to provide a description and analysis of a regional economy within the state of Colorado. The intent of the researchers is to provide policy makers with specific information contributing to the decision-making and planning processes and to provide a planning tool having the capability of analyzing a number of alternative development scenarios in the study region.

#### The Region Under Study

Nine counties in northwestern Colorado, plus the Somerset coal area of Gunnison County make up the study area.<sup>1</sup> These counties comprise all of Colorado State Planning Region II and parts of regions X and XII. The region consists of a varied geography and climate and is bounded by mountain ranges to the east and south and the states of Utah and Wyoming to the west and north.

The land area contained in the region consists of approximately 22,752 square miles and is some 22 percent of the state total. The Federal Government owns 14,674 square miles or 64.5 percent of the region's total land area.<sup>2</sup> Federal ownership is represented in three national monuments, four national forests, and holdings of the Bureau of Land Management and the Bureau of Reclamation. Land holdings of the U. S. Forest Service and the Bureau of Land Management generated Federal income of \$20.4 million in fiscal 1974.<sup>3</sup> In addition, Bureau of Reclamation power activities contributed \$4.6 million for interest and repayment transfers to the Federal Government.<sup>4</sup>

The region's 1974 population is estimated at 152,680 inhabitants with an adjusted gross income of some \$590 million. As a percentage of the state totals in these categories, the region's population is approximately six percent of the total while personal adjusted gross income is some 5.5 percent.

On balance, the region is a net exporting region (where exports are defined in terms of deliveries of goods and services outside the region's boundaries). Net exports are estimated at \$43.6 million. The major exporting activities are the extractive industries and recreation-oriented activities. A significant percentage of the state's total production of extractive goods comes from the Northwest Colorado region. Some 7.4 percent of the value of agricultural output in the state is produced in the region; 19.1 percent of the value of lead and zinc ores; 100 percent of the state's iron ore; 41 percent of the uranium and vanadium ores; 60.3 percent of the state's crude oil; and 37.5 percent of the state's natural gas production. The region's coal output is 85.5 percent of the total Colorado tonnage. Colorado's oil shale deposits are all in the study area.<sup>6</sup>

The relative abundance of amenity resources has encouraged outdoor recreation activities of all kinds. Major ski areas are found in Vail, Steamboat



Springs and in Pitkin County. Big game hunting is an important activity with 59.8 percent and 53.9 percent, respectively, of the state's 1974 total deer and elk harvest occurring in the region. Water based recreation is also a major outlet for outdoor recreation.

The regional economy is also characterized by a continually expanding base in the "light" industries sector. Firms in this segment of the economy produce largely for export markets. Significant export activity also occurs in the transportation, electric power, trade and a number of service sectors. However, except for a limited number of food products and certain petroleum products, the economy imports nearly all finished consumer products, heavy industry products, and ingredient materials such as cement and lumber.

#### STATEMENT OF THE PROBLEM

The natural resource base in the region, while relatively abundant in terms of the capability to satisfy local demands, is nonetheless the focal point for regional and extra-regional economic conflict. Ownership of the large deposits of exploitable resources is vested largely with the Federal Government and corporations headquartered out of state. Water use is governed by state water law, interstate compacts, and international treaty. Thus, from a regional perspective, policies affecting the disposition of the regional resource base are largely determined outside of the region. From this same perspective, there is a need to develop a detailed description of the economy as it presently exists and an analytical framework which is capable of assessing the direct and indirect consequences of alternative scenarios for resource exploitation proposed by the public and private sectors of the economy. This description and analysis constitutes the major thrust of the research reported here.

### The Model Used

A tool particularly adapted to these questions is the comprehensive inter-industry production model developed by W. W. Leontief. The strength of this model (often termed the input-output model) lies in its capability not only to describe the interdependence existing among sectors of an economy but also in the capacity to demonstrate, sector by sector, the total consequences of any number of development scenarios. The model is thus both descriptive and analytical. The descriptive components are accommodated through the collection of extensive primary data, from firms within the region, and subsequent tabulation of the data in a form consistent with the interindustry framework. The analytical phase consists of the impact analysis, development of the various multipliers, and consistent forecasting under alternative resource development scenarios.

### Outline of the Report

The remainder of the report consists of a description of the method of the study which is contained in Chapter 2; the analysis of the regional economy, which is the concern of Chapter 3; extensions of the basic model to include an analysis of water use in the economy and the impacts of alternative growth scenarios in the final demands for underground and surface mined coal and electric power, which are contained in Chapter 4.

In addition to the main text of the report, there are several appendices. These contain the input-output tables, the sector identification used in the analysis, and a rather detailed critique of the data sources used in constructing the model. The reader interested only in the results of the model will perhaps not find this critique to be of much interest. However, it is the authors' hope

that the model will be updated and used by the contracting agency and if this is the case, the appendix should be valuable aid for further work.

Under separate cover are the Executive Summary and the Technical Report which describes the mathematical formation of the model and presents a simple example showing how the model operates.

NOTES

1. Delta, Eagle, Garfield, Mesa, Moffat, Montrose, Pitkin, Rio Blanco, and Routt, and the Somerset coal area of Gunnison County.
2. Colorado State Planning Division, Colorado Year Book, 1962-62, pp. 492-509.
3. In house reports of the U. S. Forest Service and U. S. Bureau of Land Management. Some 37.5 percent or \$7.6 million were returned to the state. These monies are, of course, exclusive of oil shale lease monies amounting to \$65.6 million.
4. In-house reports of the Bureau of Reclamation.
5. Colorado State Planning Office and Colorado Department of Revenue, Annual Report, Fiscal Year Ending June 30, 1975.
6. Colorado Department of Agriculture, Colorado Crop and Livestock Reporting Service, Colorado Agricultural Statistics - 1976, July, 1976. Colorado Department of Natural Resources, Division of Mines, A Summary of Mineral Industry Activities in Colorado - 1974, May, 1975. Colorado Department of Natural Resources, Division of Mines, Coal - 1974, April, 1975.

## CHAPTER 2

### THE METHODOLOGY OF THE STUDY

#### INTRODUCTION

The national energy situation has focused an increasing attention on the coal, oil shale, uranium, and oil and gas reserves in Northwestern Colorado. As evidence of this fact are prototype leases of federal oil shale lands, the Anvil Points experiments, private research and development plans for oil shale by Colony Development Operation, Occidental Oil Shale, Inc., and the Union Oil Company of California. Additional evidence is found in the increased production of coal from existing operations, proposals for additional leases on federal coal lands, the Hayden power plant on line and another undergoing construction, increased uranium exploration activities of the past two years, and increases in crude petroleum and natural gas production.<sup>1</sup>

These activities have generally been viewed as isolated from, or independent of, the remainder of the economic environment. In those cases where an impact statement has been filed<sup>2</sup> more concern has been given to physical impacts than to social and economic impacts.<sup>3</sup> As a result the total consequences of such developments have not been thoroughly analyzed.<sup>4</sup> While we do not propose to perform an ex-post evaluation of the impacts of existing developments, a major product of this research is the provision of the analytical capability for assessing the regional impacts of continued developments.

The interindustry model identifies the interdependent structure of an economy. No producing sector is autonomous (independent of the other sectors); rather, each sector interacts with other sectors (industrial, commercial, labor, government) through the purchase of goods and services and the sale of outputs.

Structural interdependence means, quite simply, that the activities in one sector have impacts on others. The identification of the nature and magnitude of this interdependence is one of the most useful results of the interindustry model.

The model is driven by what are termed final demands.<sup>5</sup> Final demands (as opposed to intermediate demands) reflect the demand for goods and services in final form. Thus, final demand sectors use or consume a finished good. Intermediate demands, on the other hand, reflect the demand for goods and services which are processed before becoming available for final consumption. Thus, changes in final demands result in changes in the processing (or intermediate) sectors of the economy. The primary purpose of the interindustry model is to trace these impacts throughout the economy. Tracing these direct and indirect impacts allows the derivation of the multiplier impacts on production, income, employment or water use, and also allows the use of the model in providing consistent forecasts of economic activity.<sup>6</sup>

### Procedures Followed

The discussion of procedures followed in conducting the research may be conveniently condensed into several categories including: the definition of the region; delineation of economic sectors; the data collection effort; selection of the base year; and data processing. Each is discussed, as briefly as possible, in the following pages.

### The Definition of the Region

Northwestern Colorado, for purposes of this study, was defined as nine counties including Delta, Eagle, Garfield, Mesa, Moffat, Montrose, Pitkin, Rio Blanco, and Routt.<sup>7</sup> Special economic and geographical considerations also led

to the inclusion of the Somerset coal region in Gunnison County.<sup>8</sup> While some geographical barriers do exist, e.g., Douglas Pass, the region appears to be a relatively homogenous trade area with Mesa County, especially the Grand Junction area, serving as a hub for reciprocal economic activity in the region.<sup>9</sup>

This regional definition does impose some limitations on the complete consideration of mining activities in Western Colorado. First, the uranium and vanadium ores of the Colorado Plateau are not represented simply because San Miguel County, Colorado and Grand County, Utah, are excluded. The model should be expanded to include these areas if a study of these particular economic sectors is deemed desirable.<sup>10</sup> This delineation also fails to account for the lead and zinc activities in Ouray and San Juan Counties. Two considerations led to these exclusions. First, the primary concern with mining activities focuses on coal production and development in shale oil activities of the nine counties comprising the region. The other counties are not heavily involved in these activities. Second, in view of the market instabilities in uranium, lead, and zinc, a decision was made to treat economic activity in the counties containing these sectors exogenously. This omits some known and rather large disequilibrium problems from the model. Third, Utah oil shale lands, Federal Tracts U-a and U-b, and the independent operations of Western Oil Shale Corporation, are not included in the region. These were excluded for two reasons. First, the status of oil shale activity is confined, at present, largely to research and development. Because of this, the oil shale sector is included in the final demands portion of the model. As long as this is the case, it makes no difference, analytically, whether a firm in Colorado is selling its output to the Colorado oil shale sector or selling to export markets. On the revenue side, sales by the oil shale sector are treated as export sales. Thus, nothing is lost by excluding the Utah lands.<sup>11</sup> Secondly, the costs of securing

detailed information regarding economic activity in Eastern Utah, solely to include the Utah oil shale tracts, would far outweigh the benefits likely to emerge.<sup>12</sup>

### The Sector Delineations

The interindustry model requires the separation of the economy into various economic entities or "sectors." Total output, by interindustry accounting procedures, is the aggregate value of all sales or purchases that take place, i.e., the total sales or purchases during a year. This total output must be divided up into sectors in order to assess the interindustry structural dependence that prevails. The model structures economic activity into two major components, suppliers (or sellers) and purchasers (or users). Each of these is further subdivided according to the following scheme: Suppliers include: 1) intermediate or processing suppliers who are producers who must purchase inputs to be processed into outputs which they sell to final users or as inputs to other processors; and 2) primary suppliers whose output is not directly dependent on purchased inputs. This latter category includes non-local suppliers (or imports). Purchasers include: 1) intermediate or processing purchasers who buy the outputs of suppliers for use as inputs for further processing; and 2) final purchasers who buy the outputs of suppliers in their final form and for final use. This latter category includes purchases by non-local users (or sales to exports). The level of demand by final purchasers, and its composition, are determined outside the processing sector. Production to meet the exogenously determined final demands generates intermediate purchases and sales. Primary suppliers and final purchasers may or may not be one and the same. However, in the interindustry model, their activities are treated as if they were completely independent of one another.



In summary, the two major divisions of suppliers are the intermediate suppliers, which we call the processing sector, and the primary suppliers, which we call the final payments sector. (The suppliers are conventionally shown along the left hand border of an interindustry table.) The two major divisions of the purchasers are the intermediate purchasers, which we label as the processing sector (just as with the intermediate suppliers) and the final purchasers which we label final demand. (The purchasers are conventionally shown along the top of an interindustry or input-output table.) It is within this general framework that a further sector disaggregation must be accomplished.<sup>13, 14, 15</sup>

The ideal sector delineation would allow unique recognition of industries or producer groups which provide a homogenous good or service. This ideal is very difficult to achieve because of the large amounts of time and finances required for detailed disaggregation, disclosure problems, and lack of data. Any of these factors or a combination of them lead to a violation of the homogenous product ideal.<sup>16</sup>

Sector selection, in addition to dependence upon financing, time, and data availability, is determined to a large extent by the objectives of the study. Research objectives can often be achieved without detailed disaggregation in all sectors. Since our purpose here is largely to determine the impacts of coal and oil shale development and other sectors such as agriculture and manufacturing, economic sectors such as trade and services do not require detailed disaggregation. The final delineation of the sectoring plan adopted for this study is shown in Table 2-1. A discussion of certain individual sectors and their construction follows. The reader who is not interested in specific sectoring problems may proceed to Chapter 3 without loss of continuity in reading.

TABLE 2-1

BRIEF SECTOR IDENTIFICATION, NORTHWESTERN  
COLORADO INTERINDUSTRY STUDY

Sector Number	Sector Description	1972 SIC Codes
Processing Sectors		
1.	Fruit Agriculture	01 (part)
2.	Irrigated Agriculture other than Fruit	01 (part)
3.	Dryland Agriculture	01 (part)
4.	Dairy Farms	02 (part)
5.	Livestock other than Dairy Farms	02 (part)
6.	Agricultural Services; Forestry	07,08
7.	Metal Mining; Related Services	10
8.	Coal Mining - Underground; Related Services	12 (part)
9.	Coal Mining - Surface; Related Services	12 (part)
10.	Oil and Gas Extraction; Related Services	13
11.	Nonmetal Mining; Related Services	14
12.	Construction	15, 16, 17
13.	Food and Kindred Products Manufacturers	20
14.	Lumber; Wood Products Manufacturers	24
15.	Printing and Publishing; Paper and Allied Products Manufacturers	26, 27
16.	Stone, Glass, Clay Product Manufacturers	32
17.	Fabricated Metals; Non-electrical Machinery Manufacturers	34, 35
18.	Electrical Machinery and Equipment; Transportation Equipment; Electronic Instruments and Components Manufacturers	37, 37, 38
19.	All Other Manufacturers, Textiles, Apparel, Furniture, Chemicals, Petroleum, Rubber, Leather, Primary Metals, Miscellaneous	22, 23, 25, 28, 29, 30, 31, 33, 39
20.	Transportation	40, 41, 42, 45, 46, 47
21.	U. S. Postal Service	43
22.	Communication	48
23.	Electricity; Natural Gas Utilities	491, 492, 493
24.	Water, Sewerage, Trash Removal Services	494, 495, 496, 497
25.	Wholesale Trade	50, 51

TABLE 2-1 Continued

Sector Number	Sector Description	1972 SIC codes
Processing Sectors - Cont.		
26.	Automobile Dealers; Gasoline Service Stations	55
27.	Eating and Drinking Establishments; Hotels, Motels, Other Lodging	58, 70
28.	All Other Retail Trade Building Materials, General Merchandise, Food Stores, Apparel and Accessory, Furniture and Furnishings and Equipment, Miscellaneous	52, 53, 54, 56, 57, 59
29.	Finance	60, 61, 62, 67
30.	Insurance; Real Estate	63, 64, 65, 66
31.	Health Services	80
32.	All Other Services, Personal Business, Automotive Repair, Miscellaneous Repair, Motion Pictures, Amusement and Recreation, Legal, Museums, Membership Organizations, Miscellaneous	72, 73, 75, 76, 78, 79, 81, 84, 86, 89
33.	(Reserved in computer program to subtotal processing sector values.)	
Final Demand Sectors		
34.	Households	-
35.	Education	82
36.	Social Services	83
37.	Local and County Government Roads and Bridges	-
38.	Local and County Governments	91, 92, 93, 94, 95, 96
39.	Local and County Government Tax Accounts	-
40.	State of Colorado	91, 92, 93, 94, 95, 96, 97
41.	Federal Government	91, 92, 93, 94, 95, 96, 97
42.	Oil Shale Research and Development	-
43.	Economic Investment	-
44.	Transfer Account	-
45.	Exports to Colorado other than the Northwest	-
46.	Exports to the Rest of the World	-

TABLE 2-1 Continued

Sector Number	Sector Description	1972 SIC Codes
Final Payment Sectors		
34.	Households	-
35.	Education	82
36.	Social Services	83
37.	Local and County Government Roads and Bridges	-
38.	Local and County Government	91, 92, 93, 94, 95, 96
39.	Local and County Government Tax Accounts	-
40.	State of Colorado	91, 92, 93, 94, 95, 96, 97
41.	Federal Government	91, 92, 93, 94, 95, 96, 97
42.	Profits, Rents, Losses	-
43.	Depreciation; Net Inventory Depletion	-
44.	Transfer Account	-
45.	Imports from Colorado other than the Northwest	-
46.	Imports from the Rest of the World	-

The index of fruit production,<sup>17</sup> base 1967, shows that from 1960 through 1975 the range of output index values was between 80 and 553. Given this variability in output, a decision was made to keep fruit production separate from all other agriculture. Further, because it was anticipated that the Northwestern Colorado interindustry model could be used in conjunction with certain types of water studies, agriculture was further divided into dryland and irrigated sectors. Good information was secured on the operation of dairy farms so that sector was kept separate from all other livestock if for no other reason than non-dairy livestock producers suffered tremendous economic losses in 1974. Forestry does not contribute significantly to the Northwestern Colorado economy; in fact the value of forestry output does not exceed several hundred thousand dollars. Accordingly, placing forestry with agricultural services does not materially affect the coefficients of this classification.

Metal mining was taken as a separate class but no attempt was made to isolate the respective metals because of disclosure problems. The division of coal production was based on technological differences between underground and surface mining. Oil shale was removed from oil and natural gas production so that oil shale activities could be treated in the exogenous portion of the interindustry model. Nonmetal mining was allowed to stand by itself.

Preliminary examination of secondary sources suggested that construction activities in Northwestern Colorado did not exceed \$53 million; later stages of the research produced a value for total gross output that exceeded \$208 million.<sup>18</sup> Based on the \$53 million figure a decision was made to collect information treating all construction as one sector.<sup>19</sup> It was the authors' contention that payroll, interindustry transactions, and imports would account for a relatively large amount of the total gross outlay in this sector and only a much smaller volume of dollars would be left to make regional input purchases. The \$208

million figure is perhaps large enough to warrant disaggregation in construction but because interviews had been conducted with all construction aggregated, the final model also shows all construction aggregated.

In the manufacturing sectors, food processing, lumber and wood products, and stone, clay, glass, and concrete products could be presented separately because there was clearly no problem in meeting the disclosure requirements. Total gross output of paper and allied products manufacturing is quite negligible in Northwestern Colorado so scheduling it with printing and publication does not materially affect the coefficients of this delineation. Fabricated metals and machinery, except electrical, were placed together because multiple products are produced by several firms in the region, i.e., firms produce for both classifications. Likewise, multiple product lines warrant combining electrical and electronic machinery, equipment, and supplies, transportation equipment, and measuring, analyzing, and controlling instruments. All other manufacturing industries were categorized together because of disclosure problems; the industries involved include textile mill products, apparel and other finished products made from fabrics, furniture and fixtures, chemicals and allied products, petroleum refining, rubber and miscellaneous plastics products, leather products, primary metals, and miscellaneous manufacturing.

Northwestern Colorado is served by one railroad and several airlines; neither type of transportation data could have been published separately in the model without violating confidentiality. Accordingly, all transportation was classified together. Because of the public nature of the United States Postal Service this sector was kept separate without concern for disclosure requirements. Originally the sectoring scheme called for telephone and telegraph communication to be kept separate from broadcasting; later information demonstrated that this could not be done; thus all communication appears

together. Electricity and natural gas utilities were taken together because the Public Service Company of Colorado handles both; ex post it is seen that this need not have been a concern and the two could have been separated. Examination of the financial statements of various municipal governments and water and sanitation districts brought the conclusion that water, sewerage, and trash removal appear in the Northwestern Colorado interindustry model as one sector.

Examination of Robert Morris Associates' Annual Statement Studies<sup>20</sup> suggested that to arrive at any meaningful coefficients for the trade sectors a rather exhaustive and detailed study of the trade sectors would have to be conducted. Considering the time and financial constraint imposed on the research such a detailed study could not be justified. Concern for the possibility of analyzing tourist activities warranted an isolation of automobile dealers, gasoline service stations, and eating and drinking places;<sup>21</sup> otherwise all wholesale activities are combined as are all other retail trade sectors. All other retail includes building materials, general merchandise, food, apparel, furniture and equipment, and miscellaneous retail stores.

Analogous to the case presented for delineation of the trade sectors, the purpose of the study does not warrant extensive delineation of the finance, insurance, and real estate and service sectors. Thus, finance is taken as a sector, insurance and real estate are combined, and with certain exceptions, all services are combined. The exceptions in services are health, education, and social services. The latter delineation is explained below.

Great concern has been voiced over the impacts of energy resource development on the public sectors in the Northwestern Colorado economy. Thus the research procedure warranted a rather extensive search through the financial statements of all levels of government. Government enterprises, e.g., electricity, water treatment, health services,<sup>22</sup> are treated endogenously along with

their counterparts in the private sectors. Activities such as education, social services, and road and bridge operations that are financed almost totally by public tax dollars are kept separate but treated exogenously. Each of these activities is balanced, respective row with respective column, i.e., total gross output equals total gross outlay, to facilitate moving them to the endogenous portion of the model should that be desired. Local and county government activities not elsewhere classified are aggregated into one exogenous sector and balanced row with column. These "not elsewhere classified" activities include general legislative, judicial, and administrative functions, public safety, public health programs, and community recreation and cultural activities.

The local and county government tax sector is employed as an accounting device. With the exception of building permit fees, franchise taxes, local and county liquor license fees, charges for services, intergovernmental transfers, and fines and forfeitures, all revenues (basically property and sales taxes, though also general occupation license fees) accruing to local and county government entities are shown as being paid to this account (sector). In turn the account distributes the tax monies to the appropriate agencies.<sup>23</sup>

Another accounting device employed in the Northwestern Colorado inter-industry model is the transfer sector. This accounting device allows for two unique and distinctive characteristics that are not found in other regional interindustry studies. First, the assumption that transfer payments cancel in the net is dropped. Second, the model handles financial balances in such a manner as to give rise to a definition of regional income more analogous to the definition of national income. There are several reasons for this. (The reader is referred to the gross flows in Appendix B-1 for the positioning of the transfer sector and the relative magnitudes of its row and column values. A schedule explaining the components of various cells in the transfer sector



row and column appears in Appendix D.)

First, insurance premiums were divided so that a value equal to loss experiences (\$32,513,839) was separated from other revenues (\$35,289,995). This value equal to loss experiences was then prorated among the various sectors in accordance with their premium payments and directly charged into the transfer row.<sup>24</sup> The transfer column in turn is shown as making the claim payments to the various sectors, construction (\$1,463,176), automobile dealers and gasoline service stations (\$1,104,696), retail trade n.e.c. (\$356,220), insurance and real estate (\$154,012), health medical care services (\$10,853,557), services n.e.c. (\$8,086,510), households (\$6,459,332), imports from Colorado other than the Northwestern region (\$496,546), and imports from the rest of the world (\$3,539,790).

The \$35,289,995 of other insurance revenues, were further divided to reflect the amount that stayed in the Northwestern Colorado economy (\$12,105,283)<sup>25</sup> and the amount that was a financial surplus (\$23,184,712) and hence left the region.<sup>26</sup> The \$12,105,283 was allocated among the various regional sectors and the \$23,184,712 was charged to the transfer row; the transfer column in turn charged the insurance financial surplus to the imports from Colorado other than the Northwestern region account.<sup>27</sup>

Second, as mentioned in Chapter I,<sup>28</sup> the state of Colorado and the Federal Government both generated revenues in Northwestern Colorado that exceeded the value of their expenditures in the region. These financial surpluses<sup>29</sup> are shown as outlays by the respective sectors to the transfer account row. The transfer column then shows the state of Colorado's financial surplus as an import from Colorado other than the Northwestern region; the Federal Government surplus is shown as an import from the rest of the world.

Third, transfer payments to households are handled through the transfer

account.<sup>30</sup> Taxes collected in the region are always shown as being paid to the respective government accounts, i.e., local and county tax accounts, state of Colorado, or Federal Government. Any inter-governmental transfer is shown as a sale by the recipient and a purchase by the grantor.<sup>31</sup> In turn, the account that grants the transfer payment(s) to the household sector is shown as making a purchase from the transfer account row in the amount of the transfer payment(s).<sup>32</sup> The transfer account column then makes the payment to the household account.

Fourth, financial capital finds its way into the Northwestern Colorado region by means other than local financial institutions.<sup>33</sup> When interest payments are made on this outside finance<sup>34</sup> the dollars involved leave the region; a lower bound estimate for this phenomenon was \$4,307,020. To account for this the total gross output of the regional financial institutions was increased by \$4,307,020 so that all interest payments in the region could be shown as being made to the finance sector. The finance sector then charged the transfer row with the amount of the increase and the transfer column charged the same to the imports from Colorado other than the Northwestern region account.

Fifth, payments (\$1,107,017) for a pension plan in the communications sector were charged against the transfer account row.<sup>35</sup> The transfer account column in turn treated this money by charging the imports from Colorado other than the Northwestern region account.

Finally, the transfer account was used to close profits, interest, rents, and the like into the household sector. To accomplish this the transfer account column shows a \$243,746,090 credit at the intersection with the profit sector while the same amount is charged at the intersection with the household row.

As indicated earlier,<sup>36</sup> the State Home and the Veterans Administration

Hospital were placed with health and medical care in the endogenous portion of the model. The accounting employed to accomplish this was to have the health and medical care sector sell \$4,586,366 of its output to the state of Colorado and \$3,665,272 to the Federal Government. United States Bureau of Reclamation power activity, the Postal Service, Production Credit Associations, and Federal Land Bank Associations are the other accounts that were removed from the Federal Government sector.<sup>37</sup> No other accounts were removed from the Colorado sector.

Where enterprise accounting was employed, the profit sector includes after tax profits, charges to reserves for bad debts, capital loss amortization, and outlays for rents and royalties.<sup>38</sup> Where government fund accounting was employed, the profit sector includes surplus of current revenues over current<sup>39</sup> expenditures,<sup>40</sup> the value of capital expenditures appropriated out of current revenues, contributions to bond indenture sinking funds out of current revenues, net charges out of current revenues to any other reserve fund (e.g., contingency funds), and rent payments. The profit sector is shown exporting \$100,683,163). Of this amount, \$84,544,359 represents the flow of dollars to support the oil shale research and development sector; the balance, \$16,138,804, represents the estimate of dividend income flowing into the region from the outside world.

The depreciation sector includes both depreciation and net inventory depletions. Inventory depletions are, relatively speaking, insignificant<sup>41</sup> and are placed with depreciation charges. Similarly, the net inventory accumulation values were incorporated in the investment sector.<sup>42</sup>

With the exception of the intersection of the household row and the transfer column<sup>43</sup> and the household on household cell the household row represents wages and salaries paid subject to withholding. In the absence of an

adequate source for domestic employment earnings 644 employees<sup>44</sup> are assumed to be full time equivalents at \$2.50 an hour for 2,000 hours.

### Questionnaire Design and Use

Previous experience with questionnaires employed to obtain primary information for interindustry models suggested that a questionnaire, as such, should not be used in the pursuit of the Northwestern Colorado research. The reason behind this is that no firm accounts for expenditure and revenue patterns on an SIC basis, the language ultimately employed in an interindustry model. Rather, a firm's books are designed around process or product activities. The use of a questionnaire, either by mail or by interview, presupposes adequate translation from a firm's accounting language into SIC codes. The typical entrepreneur or manager does not ordinarily work with SIC descriptions, a rather precise and technical language.

Accordingly, a determination was made to conduct all interviews in a basic accounting language tailored to the individual firms involved and for the researcher to make the translation to SIC classification. Thus, the questionnaire form which appears in Appendix E represents the format for the final translation by the researcher. A large majority of the primary data were originally collected in field notes that described the detail behind profit and loss statements for the firms interviewed.

Not all interviews could, however, be conducted as planned. It was found, for example, that some firms would have to refer for legal advice while others did not want to reveal information in the form desired. Even though it was established that the research should not solicit primary data through the mail, it was necessary to design a questionnaire for use both as an interview focal point and as an item that could be left with an interviewed

firm.

The questionnaire was designed to fit three sheets of paper. A cover sheet was used to briefly explain the nature of the research and to solicit information on the nature of the firm's product lines, the number of employees, water use, and level of capacity utilization. Outlay patterns, both of a cash flow and a non-cash flow nature, were the concern of the second sheet; information on sales distribution was solicited on the third. Both sales and outlay patterns were disaggregated by Northwestern Colorado interindustry study sector descriptions and regionalized according to (a) Northwestern Colorado, (b) Colorado other than the Northwestern region, and (c) activity outside Colorado. A question on water use was included to provide information on sector-by-sector water withdrawals. The level of production capacity utilization question was used to provide general background information.

#### Selection of the Base Year

Other than a consumer price index for the Denver metropolitan area<sup>45</sup> there is no price index constructed specifically for Colorado. This effectively removes one criterion (relatively stable prices) from consideration when selecting a base year for Colorado economic studies. The 1974 base was selected for the following two reasons.

Interviewing for the Northwestern Colorado interindustry study commenced in February of 1975. Calendar 1974 was the most recently completed accounting cycle for most firms; it was anticipated that the information from this cycle would be, qualitatively speaking, foremost in the command of the interviewees. Also, activities of relatively new firms were automatically incorporated in the primary data base by soliciting what was then the most current information; this was rather critical for the food processing and electronics manufacturing

sectors.

### Conduct of the Survey

Interview schedules were arranged by telephone between three days and a week in advance. Every effort was made to gain an interview with the person who would have immediate authority to release information. The length of time spent on an individual interview varied from firm to firm: several were concluded in less than an hour; some took place over several days. The interviews for the Northwestern Colorado interindustry model were conducted over a fifteen month period.

### Processing the Data

Information gathered on the outlay and sales patterns for any given enterprise was tabulated to conform to the sector delineations and regional descriptions as defined by the questionnaire form. Care was exercised at this step to assure a balance between outlays and sales. Any anomalies were checked and corrected before proceeding further.

The next step was to aggregate questionnaire forms within a sector and to expand the information to represent gross flows. An iterative process was used to accomplish this so that the relative composition of a given sector delineated for the Northwestern Colorado interindustry model would be more truly reflected.<sup>46</sup> The final iteration produced gross flow patterns for the respective sectors delineated in the model.<sup>47</sup> The gross flows identified in this manner provide the border totals for the initial transactions statement.

Reconciling discrepancies in any given transaction cell is to be expected; only if the research yielded perfect knowledge about outlays and sales would this be avoided. A discrepancy can emanate from one of several sources or a

combination thereof. The sales or purchases of one industry to or from another industry can be misrepresented, or the total gross output value for individual sectors can be in error. In the former case other rows and columns are affected by the error. In the latter, there is an aggregate distribution error in both outlays and sales for that sector. Each discrepancy is examined individually and reconciled on a case-by-case basis. Fortunately, in the Northwestern Colorado interindustry model, the sources of relatively large discrepancies were isolated and remedied through additional examination. Small discrepancies were reconciled by using imports from and exports to the world other than Colorado as residual accounts.

NOTES

1. Colorado Department of Natural Resources, Division of Mines, A Summary of Mineral Industry Activities in Colorado - 1974 (May 1974); and Colorado Department of Natural Resources, Division of Mines, Coal 1974 (April 1974); and Colorado Department of Natural Resources, Division of Mines, State Coal Mine Inspection, Monthly Report; and Colorado Department of Natural Resources, Oil and Gas Conservation Commission, Oil and Gas Statistics 1974 (1974); and Colorado-Ute Electric Association, Inc., Annual Report to the Colorado Public Utilities Commission - 1974; and Colorado School of Mines Mineral Industries Bulletin, March 1975; and U. S. Department of the Interior, Bureau of Mines, Subcommittee to Expedite Energy Development. Also, U. S. Environmental Protection Agency, Socio-economic Impacts of Natural Resource Development Committee, "A Listing of Proposed, Planned or Under Construction Energy Projects in Federal Region VIII" (a joint report prepared for the Committee on Energy and Environment of the Denver Federal Executive Board and the Mountain Plains Federal Regional Council, August 1975), (Xerox reproduction.); and U. S. Energy Research and Development Administration, Uranium Exploration Expenditures in 1974 and Plans for 1975-76 (Grand Junction, Colorado: U. S. Energy and Research Development Administration, April 1975).
2. Colony Development Operation, Atlantic Richfield, Operator, An Environmental Impact Analysis for a Shale Oil Complex at Parachute Creek Colorado, 3 volumes and 17 appendices (Denver, Colorado: 1974); and Colorado-Ute Electric Association, Inc., Basalt-Aspen 115 KV Transmission Line: Applicant's Environmental Analysis (Montrose, Colorado: June 1974); and U. S. Department of Agriculture, Rural Electrification Administration, Final Environmental Statement - Hayden Station Unit 2 (Washington, D.C.: January 1972); and U. S. Department of Agriculture, Rural Electrification Administration, Final Environmental Statement - 230 KV Transmission Tap Line to Steamboat Springs and Substation (Washington, D.C.: October 1973); and U. S. Department of Agriculture, Rural Electrification Administration, Final Environmental Statement - Yampa Project (Washington, D.C.: July 1974); and U. S. Department of the Interior, Bureau of Land Management, Draft Northwest Colorado Coal Environmental Statement, 4 volumes and 4 appendices (June 1976); and U. S. Department of the Interior, Bureau of Land Management, Final Environmental Impact Statement, Proposed Federal Coal Leasing Programs (Washington, D.C.: Government Printing Office, 1975); and U. S. Department of the Interior, Office of the Secretary, Final Environmental Statement for the Prototype Oil Shale Leasing Program, 6 volumes (Washington, D.C.: Government Printing Office, 1973); and VTN Colorado, Inc., Environmental Impact Assessment for the Proposed Colowyo Mine, Colowyo Coal Company (Denver, Colorado, for W. R. Grace and Co., December 1975). (Commercial reproduction.)
3. Environmental Impact Assessment Project of the Institute of Ecology, A Scientific and Policy Review of the Final Environmental Impact Statement for the Prototype Oil Shale Leasing Program of the Department of the Interior. Edited by Katherine Fletcher and Malcolm F. Baldwin (Washington, Environmental Impact Assessment Project, 1973). Researcher's



4. Colorado General Assembly, Final Report of the Committee on Oil Shale, Coal, and Related Minerals, Legislative Council Research Publication No. 208, often referred to as the Michael L. Strang Committee Report (December 1974); and Colorado Office of the Governor, Oil Shale Planning and Coordination, Impact: An Assessment of the Impact of Oil Shale Development - Colorado Planning and Management Region 11, 5 volumes, often referred to as the Donald A. Rapp Report (December 1974); and U. S. Department of the Interior, Oil Shale Environmental Advisory Panel, First Annual Report (Denver, Colorado: U. S. Department of the Interior, June 1975).
5. See Technical Report for a solution to the interindustry equations.
6. The projections are consistent but the underlying assumption in the model of fixed production coefficients qualify the results unless some dynamic adjustment of technology is explicitly involved.
7. 1974 estimated population 151,600: Colorado State Planning Office.
8. Somerset is just within the western Gunnison County boundary and is on State Highway 133. Highway 133 cuts through the northwest corner of Gunnison County and provides a link between Pitkin and Delta Counties. Under only very limited conditions is it possible to access any other part of Gunnison County from Somerset. Coal production in this region has its immediate impacts on Somerset itself and Paonia and Delta in Delta County. See Jean Bailey, et al., Local Citizens' Participation in Coal Development: A Descriptive Process in the North Fork Valley (Denver, Colorado: Foundation for Urban and Neighborhood Development, March 1975).
9. 1974 estimated population 59,000: Colorado State Planning Office.
10. Uranium was bringing approximately \$8.00 a pound in 1974; by mid-year 1976, the Nuclear Exchange price was approaching \$40.00. Also, in 1975 General Electric announced plans for a buying station at Naturita. Whether General Electric mills the ore in the region or elsewhere remains to be resolved.
11. This is especially true when one examines the economic base of western Utah and observes that manufacturing, industrial services, and so forth are virtually non-existent. Actually, something is gained by excluding the Utah lands; an analyst can use the model within the framework of Colorado land use laws, water law, tax law, and other such institutional parameters.
12. Preliminary investigation demonstrated that as many hours would have to be spent in the Denver area collecting information (corporate and government offices) as was spent in Northwestern Colorado. Analogously, to collect detailed information about eastern Utah would have necessitated a considerable time expenditure in Salt Lake City; the opportunity cost of doing this was judged to be too great.
13. Evaluation of the secondary data sources is the topic of Appendix C.

14. Executive Office of the President, Office of Management and Budget, Standard Industrial Classification Manual - 1972 (Washington, D. C.: Government Printing Office, 1972).
15. All manufacturing sectors: University of Colorado, Bureau of Business Research, Directory of Colorado Manufacturers, 1974. Mining: Colorado Department of Natural Resources, Division of Mines, A Summary of Minerals, Industry Activities in Colorado, 1974, also Coal, 1974. Petroleum and natural gas extraction: Colorado Department of Natural Resources, Oil and Gas Conservation Commission, Oil and Gas Statistics, 1974. Western Oil Reporter, Rocky Mountain Petroleum Directory, 1974. Transportation and public utilities: Reports on file with Colorado Public Utilities Commission and Colorado State Auditor. Private and non-profit public institutional health medical care services: U. S. Department of Health, Education, and Welfare, Social Security Administration, Directory - Medicare Providers and Suppliers of Services (Washington, D. C.: Government Printing Office, 1974). Primary and secondary wood products, wholesale lumber dealers, and planing mills: Colorado State University, Colorado State Forest Service, Colorado Forest Products Directory - 1973. General and otherwise: Yellow Pages of various phone directories. Newspaper clippings file.
16. Information obtained from the Colorado Department of Labor and Employment cannot be published unless there are at least three firms in a given sector and no two firms account for more than 80 percent of the total employment. Ethical considerations also dictate that the operations of any single enterprise can never be divulged.
17. Colorado Department of Agriculture, Crop and Livestock Reporting Service, Colorado Agricultural Statistics - 1976, p. 3.
18. For a comment on this see Appendix C, p. 12.
19. Three two-digit SIC levels are involved, 15, 16, and 17. Respectively these encompass building construction-general constructors, construction other than building-general constructors, and special trade contractors.
20. Robert Morris Associates, Annual Statement Studies - 1974 (Philadelphia, Pennsylvania, 1974).
21. Eating and drinking establishments, a retail trade activity, were combined with lodging facilities, a service sector, because of their complementary nature from the standpoint of a traveler. Admittedly, when the decision was made to do this no thought was given to the coefficients that would result when the trade portion of the sector was margined and the service sector was not.
22. Though the State Home and the Veterans Administration Hospital are in the grants, as opposed to the market, economy they are both treated here in an endogenous sector.

23. Thus the entries in the row for the local and county government tax sector show the amounts of local sales and property taxes paid by each respective sector in the Northwestern Colorado economy. In turn, the entries in the local and county government tax column show the relative distribution of local sales and property taxes for health, education, social services, roads and bridges operation and maintenance, other general government activities, and otherwise unallocated bond indenture sinking funds.
24. Thus the \$32,513,839 loss experience is not part of the total gross output of the insurance and real estate sector.
25. Basically commissions and administrative and promotional expenses.
26. Financial surplus is defined here analogous to the definition employed when describing the surplus of Colorado and Federal Government revenues generated in the region over and above the level of expenditures made. Essentially what occurs when a premium payment is made to an insurance company (with the exception of a health maintenance organization in Mesa County there are no insurance companies in Northwestern Colorado), part of the premium is effectively returned to the region via commissions and claim payments; the remaining part of the premium dollar effectively leaves Northwestern Colorado and is used to operate district offices, add to reserves, and other such things. When dollars leave Northwestern Colorado, the interindustry model treats such dollars as an import, be it an import from Colorado other than the Northwestern region or an import from the rest of the world.
27. Granted, a certain portion of this balance left Colorado but because of the nature of accounting requirements imposed by the Colorado Department of Regulatory Agencies, Division of Insurance, the dollars in the insurance financial surplus were treated as flowing to Colorado other than the Northwestern region.
28. Page 2.
29. \$34,717,632 for the State of Colorado and \$71,739,542 for the Federal Government.
30. At the county level these transfer payments are monies distributed by the various departments of social services. The state of Colorado transfer payments are confined largely to unemployment compensation insurance claims and distribution of funds from the Public Employees Retirement Association account. Federal Government transfer payments include bonus payments under the food stamp program, direct payments to households under the social security program, such as disability, retirement, and survivor benefits, railroad retirement benefits, black lung benefits, veterans and military pensions, federal employee retirement benefits, medicare payments, and payments to farm operators under the agricultural stabilization and conservation program and the sugar program.

31. For example, the State of Colorado gives the respective county departments of social services certain monies to use for both administrative and grant purposes. Thus the social services account is shown as selling \$6,334,849 worth of its services to the State of Colorado.
32. Respectively for the accounts social services, State of Colorado, and Federal Government these charges are \$6,302,427, \$6,213,372, and \$75,158,074.
33. An example would be the sale of bonds in an open market by a school district.
34. With the exception of finance by the Federal Government; see page 15, footnote 37.
35. Ordinarily, ethical considerations would preclude isolating the outlay of a single firm in this manner. In this instance, the dollars were estimated by using information in the firm's annual report to the Colorado Public Utilities Commission. Because the report is open for public inspection, and because the dollars were estimated, it is not felt that any privilege of information principle has been violated.
36. Page 11, footnote 22.
37. Payments to the Federal Government by the electricity and natural gas sector appear abnormally high because of this. Instead of showing interest paid by the Bureau (\$3,026,332) as going to the finance sector it was shown as being paid to the Federal Government. Likewise, repayment by the Bureau (\$1,544,961) was not charged to the profit sector but rather went to the Federal Government. Other interest payments by the electricity and natural gas sector to the Federal Government were estimated to be \$472,391 and were handled in the same way as Bureau of Reclamation interest payments. Also, to avoid showing a credit balance in the profit row cell for the Postal Service, the postal sector is shown selling its \$2,343,250 loss to the Federal Government. Note that this causes the total gross output of the postal sector to be defined in terms of an expense level instead of postal receipts.
38. Except in the case where rents (e.g., agricultural land leases) and royalties (e.g., oil and gas) were paid to the Colorado and Federal Governments. In these instances the amounts are shown as being paid directly to the respective governments.
39. Current in the sense that it occurred in 1974.
40. An exception to this is in the Colorado and Federal Government sectors; see the explanation of the transfer sector, Appendix D.
41. Insignificant with the exception of the livestock sector which had an estimated net depletion of \$9,667,518 in 1974. When the livestock normalized model was arranged this net depletion value was assumed to be zero.
42. A schedule of the values of net inventory depletions and accumulations appears in Appendix D.

43. See explanation of the transfer account Appendix D.
44. U. S. Department of Commerce, Bureau of the Census, Census of Population, 1970: General Social and Economic Characteristics, Final Report, Colorado, PC(1)-C7, Washington, D.C.: Government Printing Office, Table 123.
45. Denver Metropolitan Area Consumer Price Index, Denver, Colorado: University of Denver, College of Business Administration, Quarterly.
46. For example: There were three two-digit SIC classifications incorporated in the sector delineation for construction. Accordingly the questionnaire forms were first aggregated on the basis of the two-digit categories. Regional payroll data from the Colorado Department of Labor and Employment was then aggregated on the same basis. The payroll values on the aggregated questionnaire forms represented a given proportion of the regional payroll in each respective SIC classification; based on this ratio the information on the aggregated two-digit level questionnaire sheets was blown up to represent the total pattern for the two-digit delineation. Subsequently the computed totals at the two-digit level were aggregated to represent the construction sector in the Northwestern Colorado inter-industry model.
47. The gross flow patterns were arrived at in either one of two ways. First there was a method that used payroll data (described in the preceding footnote) when an adequate total gross output value had not been identified. The second method distributed gross flows within the bounds of a total gross output value based on the relative allocation of the flows identified on initially aggregated questionnaire forms.

## CHAPTER 3

### ANALYSIS OF THE NORTHWESTERN COLORADO ECONOMY

#### INTRODUCTION

The results of the descriptive analysis of the Northwestern Colorado economy are presented in this chapter. It should be noted at the outset that the results presented here are obtained from the model incorporating a normalized livestock sector. This sector, in 1974, suffered severe financial losses and, as a result, is not representative of the norm for livestock activity in the region. To avoid imposing this distortion on the analysis, we have normalized the sector.

The discussion contained in the chapter includes: the description of the economy; an analysis of the nature and magnitude of economic interdependence among processing sectors; the various business activity and income multipliers; and an analysis of employment in the region.

The description and analysis of the economy hinges on three major components of the interindustry model. These are: the gross flows or transactions table; the table of direct production requirements; and the table of direct plus indirect production requirements. These tables are discussed and interpreted in turn. Because of the size of the tables, they are presented in Appendix B, Tables B-1, B-2, B-3, and B-4.

#### The Transactions Table

The first essential component of any interindustry study is the collection and tabulation of data which serve to describe the flows of commodities from each supplying sector to each purchasing sector. These flows are typically expressed in terms of the dollar value of transactions occurring in a specific period of time, normally one year. The information is arrayed in tabular form

with the suppliers (selling sectors) listed at the left of the table and the purchasing sectors listed at the top. The information in this table, termed the transactions table, does two things simultaneously: it identifies the estimated dollar value of sales by each sector to each of the other sectors, (thus, the distribution of each sector's output) and it identifies the purchases of ingredients of production by each sector from each of the other sectors (the distribution of purchases). In essence, the material contained in the transactions table represents a double-entry system of bookkeeping in which every sale is simultaneously described as a purchase. Thus, the system deliberately double counts. The transactions table for the Northwestern Economy is found in Appendix B, Table B-1. A description of the sector identification labels used throughout Appendix B and in the tables of this chapter is presented in Appendix A.

The rows and columns of Table B-1 which are numbered 1-32 identify the processing, or intermediate demand, sectors. Row and column 33 represent subtotals of activities within the processing sector. This portion of the table describes, in dollar terms, the flow of goods and services necessary to satisfy intermediate demands. Final demands, i.e., demands for goods and services that will not be further processed within the region, are identified in columns 34-38, 40-43, 45 and 46. Rows 34-38, 40-43, 45 and 46 identify the final payments sector. Final payments include, then, taxes, wages, profits, rents, losses, net inventory depletions, and payments for goods and services imported from outside the region. The rows and columns numbered 39 and 44 (the local and county government tax account and the transfer account) are accounting devices as described in Chapter 2. The last row and column of Table B-1 contain, respectively, total outlay (purchases) and total output (sales) for each sector of the regional economy.

The distribution of total output of each sector, according to the sectors in which the output is sold, may be readily discerned by reading across the rows of Table B-1. The bill of purchases by each sector is found by reading down any column of the table. These column entries show the allocation of purchases by cost component.

For example, consider sector 2, irrigated agriculture. Reading across row 2 of Table B-1 shows that the total output of irrigated agriculture was distributed in the following way: \$9,717 worth of output was sold to dryland agriculture; \$2,270,025 to dairy agriculture; \$6,852,437 to livestock, \$42,537 to agricultural services; and \$4,389,517 to food and kindred products. Total sales by irrigated agriculture to the processing sector of the economy thus amounted to \$13,564,233. The remaining sales were to the final demand sectors consisting of households, \$201,913; net inventory accumulation, \$2,708,952; exports to Colorado, \$3,375,468; and exports to the rest of the world, \$6,514,141. Total sales to final demand thus amounted to \$12,800,474. The total gross output of the irrigated agriculture sector is the sum of these individual sales or \$26,364,707.

The distribution of purchases by irrigated agriculture, by cost category, are shown in column 2 of Table B-1. Purchases by irrigated agriculture from livestock were estimated at \$213,337; from the agricultural services sector, \$1,268,896; from repair and maintenance construction, \$55,000; from printing and publishing, \$3,522; from fabricated metals, \$38,314; from other manufacturers, \$157,614; from transportation, \$154,674; from U. S. Postal Service, \$7,547; from communication, \$60,126; from electricity and natural gas utilities, \$255,318; from water, sewer, and trash removal services, \$716,738; from gasoline and automobile dealers, \$1,644,542; from other trade, \$27,314; from finance, \$1,732,762; from insurance and real estate, \$403,744; from services



not elsewhere classified, \$686,064. The total purchases from the processing sector are thus estimated at \$7,565,886 for 1974. Final payments made by irrigated agriculture were estimated at \$18,798,821. These payments were distributed as follows: wages subject to withholding, \$1,687,441; local and county tax accounts, \$892,498; taxes and charges of the State of Colorado, \$154,540; taxes and charges of the Federal Government, \$72,342; profits, including imputed wages for farm operators and their families, \$10,320,212; depreciation, \$1,821,805; insurance loss pool (transfer account), \$145,512; imports from Colorado, \$721,163; imports from the rest of the world, \$2,983,308. Total purchases thus amount to \$26,364,707 and, as required by the accounting format, equal the value of output.

Other information can be obtained directly from the transactions table. The household row, with the exception of the sale by households to the transfer account represents wages paid subject to withholding. This row shows household income. The leading contributors to household income are: construction, with payments to labor of \$43.8 million; education, \$34.8 million, trade not elsewhere classified, \$34.5 million; services not elsewhere classified, \$26.8 million; and health services, \$23.1 million. Similarly, sector by sector contributions to taxes may be directly obtained from Table B-1. Consider row 39. The five sectors showing the greatest dollar outlay for local and county taxes are: households, \$16.7 million; trade not elsewhere classified, \$5.5 million; petroleum and gas extraction, \$3.8 million; livestock, \$3.1 million; and exports to the rest of the world, \$3.0 million.

Estimates of gross regional income and gross regional product may be obtained from the final payments and final demands portion of the table. Gross regional product is defined as the sum of deliveries to final demand, net of imports. (In the Northwestern Colorado model, however, local and county gov-

ernment tax account monies distributed to final demand and the transfer account values are excluded to avoid double counting.) Gross regional product for Northwestern Colorado for 1974 is estimated at \$1.47 billion. Gross regional income (which must equal gross regional product) is computed as the sum of final payments less imports. Again, the local and county tax account and the transfer account must be excluded to avoid double counting.

While these items, obtained directly from the transactions table, are useful as initial indicators of the relative importance of each sector in the regional economy, the important question of interdependence is not addressed. In order to do so, it is first necessary to isolate the direct production relationships existing in the economy.

#### Direct Production Requirements

The direct production requirements, or coefficients, represent the second major component of the interindustry analysis. These direct requirements are presented in Appendix B, Table B-2. Computation of the direct production requirements is quite simple, given the transactions table and requires only that each column entry of Table B-1 be divided by the respective column total. The resulting coefficients describe the direct purchases necessary from each supplier (at the left of the table) in order for the purchasing sector (at the head of the column) to produce one dollar's worth of output. The coefficients, then, are interpreted as the direct requirements per dollar of output produced by each sector.

As an example consider the surface coal mining sector, sector 9 (column 9 of Table B-2). For every dollar's worth of output produced by surface coal mines in the region, \$.0903 worth of inputs are required from the surface coal

mining and related services sector; \$.0115 from construction; \$.00005 from printing and publishing; \$.0118 from fabricated metals; \$.0011 from manufacturers not elsewhere classified and so on down the column. It is obvious from the table that far and away the largest direct purchases made by the surface coal mining sector are those for labor services, with a direct outlay of nearly 16 cents per each dollar of output produced, and imports from outside the region, with a coefficient of .4155 for all imports. This says that a dollar's worth of production in surface coal requires imports valued at 42 cents. Each column of Table B-2 is interpreted in this manner.

These direct impacts identify only a portion of the total economic impacts that would accompany a change in final demands for the output of a given sector. There are additional, or indirect, impacts which can be quite important. Assessment of all direct and indirect impacts of these exogenous (final demand) changes is made possible through the third analytical component of interindustry analysis. This component is the table of direct plus indirect production requirements.

#### Direct Plus Indirect Impacts

The concept of interdependence can be fairly easily established with a brief example. Suppose that the export demand for coal production increases. There will be immediate, or direct, responses of the following type. Coal production will have to increase. In order for coal production to increase, inputs must be obtained from sectors such as transportation, utilities for power, and labor. These are direct impacts. As transportation and utilities increase their output to meet the increasing requirements in the coal sector, their own requirements for productive ingredients increase, e.g., services, labor, petroleum and natural gas, and coal. The chain of events goes on. The

total impacts are readily estimated through the input-output framework and are presented in Table B-3 of Appendix B.

Before proceeding to a discussion of the table, a few comments regarding the treatment of households are in order. Households may be treated as either a part of the processing sector of the economy or as a part of the final demand component. In the first instance, households are treated in precisely the same manner as any other production sector. The estimate of the direct and indirect production impacts of a change in final demand include the induced production impacts which derive from increased household incomes and increased consumption. In the latter, with households a component in final demand, the induced impacts of successive rounds of consumer spending are omitted. For purposes of this report, the discussion of economic interdependencies and the subsequent business and income multiplier analysis is based upon the model which includes households both as a member of the processing sector of the economy and as a final demand sector.

The direct plus indirect coefficients presented in Table B-3 are interpreted as the production required or generated in all sectors of the economy in order to sustain the delivery of one dollar's worth of output to final demand by any single sector. It should be carefully noted that these coefficients reflect production generated per dollar of final demand as opposed to requirements per dollar of output. This, of course, reflects the fact that the model is driven by changes in final demand.

For purposes of interpretation, consider the surface coal mining sector of Table B-3. Suppose that the export demand for surface mined coal increases by one million dollars. What is the estimated impact that this increase will have on the entire Northwestern Colorado economy? The answer to this question may be obtained directly by reading down column nine of the table and summing the individual sector impacts. Thus, the increase of \$1,000,000 in the final

demand for surface mined coal generates a total direct plus indirect production valued at \$600 in irrigated agriculture ( $\$1,000,000 \times .0006$ ); \$400 in dairy agriculture; \$200 in livestock; \$200 in agricultural services; \$900 in underground coal mining; \$1.1 million in surface mined coal; and so on down the column. Any column of this table is interpreted in this same manner. The sum of the entries in column 9 show the total production generated locally as a result of the increase in fixed demands for surface mined coal. Thus, the total business activity generated per dollar increase in final demand for strip mined coal is \$1.604 or, in our example assuming a one million dollar increase, \$1.6 million worth of business activity results. These column sums are one of the various multipliers concepts which are derived from input-output analysis.

### Business Multipliers

The column sums of the direct plus indirect requirements table are termed business activity ( or production) multipliers. They identify the total value of production in the region which results from a dollar's worth of output delivered to final demand. Table 3-1 presents the business multipliers. These estimates indicate that the greatest business activity generated per dollar of delivery to final demand is in the U. S. Postal Service. The business multiplier for this sector is 2.436 which indicates that, as the final demand for Postal Services increases by one dollar a total production of \$2.44 is generated in the Northwestern Colorado economy. Other sectors of the economy which have relatively large business multipliers are: construction, 2.319; electricity and natural gas utilities, 2.231; fruit agriculture, 2.159; food processing, 2.135; livestock, 2.118; gasoline service stations and automobile dealers, 2.096; water, sewage, and trash removal services, 2.067; and dairy agriculture, 2.031. These sectors show the greatest degree of interdependence with other

TABLE 3-1

NORTHWESTERN COLORADO INTERINDUSTRY STUDY BUSINESS  
ACTIVITY MULTIPLIERS, BY SECTOR, 1974

(in dollars of business activity generated in Northwestern  
Colorado per dollar delivered to final demand)

Sector	Business Multiplier I	Business Multiplier II
1. FRUIT AG	1.657	2.159
2. IRRIG AG	1.351	1.589
3. DRYLAND AG	1.450	1.660
4. DAIRY AG	1.778	2.031
5. LIVESTOCK	1.801	2.118
6. AG SER, FOR	1.116	1.467
7. METAL MIN	1.341	1.889
8. COAL UNDER	1.322	1.953
9. COAL STRIP	1.240	1.604
10. PET-NAT GS	1.207	1.341
11. NONMET MIN	1.362	1.604
12. CONSTRUCTN	1.688	2.319
13. FOOD PROC	1.695	2.135
14. WOOD PROD	1.376	1.894
15. PRINT-PUB	1.237	1.959
16. CONCRETE	1.174	1.573
17. FAB METALS	1.200	1.869
18. ELECTRONIC	1.081	1.766
19. MFG NEC	1.116	1.375
20. TRANSPORT	1.077	1.614
21. POSTAL SER	1.050	2.436
22. COMMUNICAT	1.144	1.783
23. ELEC-GS UT	1.681	2.231
24. WATER-SAN	1.457	2.067
25. WHOLESALE	1.225	1.712
26. RES-AUT DCR	1.257	2.096
27. EAT-DR-LOD	1.279	1.922
28. TRADE NEC	1.246	1.907
29. FINANCE	1.079	1.351
30. BUS-R EST	1.271	1.670
31. MEDICAL	1.132	1.825
32. SERVIC NEC	1.168	1.735

sectors of the regional economy. At the margin, these sectors generate the greatest business activity per dollar of output delivered to final demand. The phrase, "at the margin," is important as a qualification in the use of these multipliers. It implies a word of caution concerning the implications of the multipliers. The Postal Service in 1974 had total final demand deliveries of \$5,419,584. Thus a 10 percent increase in final demand, i.e., an increase of \$541,958, would result in a total business activity of \$1,320,210 in the regional economy. This same 10 percent increase in the final demand for the output of the livestock sector, an increase of \$6,209,730 yields a total business activity of \$13,152,208 in the regional economy. This is, of course, because of the absolute magnitude of final demands for the livestock sector's output. In using the business multipliers, the argument thus should be stated in terms of the impacts of an equal increase in final demands. That is, for an equal increase (in dollar terms) in final demands, the Postal Service will generate more business activity in the local economy than will any other sector. The first column of Table 3-1 are the business multipliers with households in final demand.

#### Income Multipliers

Other multiplier effects can also be estimated from the interindustry model. For example, there are income multipliers which relate to changes in income paid to the household sector. The following discussion presents what are termed the Type I and Type II income multipliers.

The Type I and Type II income multipliers are estimated as ratios: Type I is the ratio of direct plus indirect income to the direct income paid households; Type II is the ratio of direct plus indirect plus induced income to direct income. Thus, while the business activity multipliers are related to changes in sales to final demand, the income multipliers are related to changes

TABLE 3-2

NORTHWESTERN COLORADO INTERINDUSTRY STUDY  
 TYPE I AND TYPE II INCOME MULTIPLIERS, BY SECTOR, 1974  
 (in dollars of income generated in Northwestern Colorado  
 per dollar of direct income paid to households)

Sector	Income Multipliers	
	Type I	Type II
1. FRUIT AG	1.834	2.141
2. IRRIG AG	2.098	2.449
3. DRYLAND AG	3.423	3.996
4. DAIRY AG	3.121	3.644
5. LIVESTOCK	2.501	2.921
6. AG SER, FOR	1.151	1.344
7. METAL MIN	1.345	1.570
8. COAL UNDER	1.302	1.520
9. COAL STRIP	1.305	1.523
10. PET-NAT GS	1.718	2.006
11. NONMET MIN	2.030	2.371
12. CONSTRUCTN	1.690	1.974
13. FOOD PROC	1.467	1.713
14. WOOD PROD	1.368	1.598
15. PRINT-PUB	1.173	1.370
16. CONCRETE	1.184	1.383
17. FAB METALS	1.139	1.329
18. ELECTRONIC	1.074	1.254
19. MFG NEC	1.230	1.437
20. TRANSPORT	1.072	1.251
21. POSTAL SER	1.016	1.187
22. COMMUNICAT	1.076	1.257
23. ELEC-GS UT	1.503	1.755
24. WATER-SAN	1.336	1.560
25. WHOLESALE	1.256	1.466
26. GS-AUT DLR	1.158	1.352
27. EAT-DR-LOD	1.202	1.403
28. TRADE NEC	1.202	1.403
29. FINANCE	1.175	1.372
30. INS-R EST	1.403	1.638
31. MEDICAL	1.106	1.291
32. SERVIC NEC	1.148	1.340



in income paid to the household sector. The Type I multiplier describes the direct plus indirect income increases emanating from an additional dollar of direct income paid to households. The Type II multiplier takes into account not only the direct plus indirect changes in income, but also the induced income increases generated by additional consumer spending. Accordingly, the Type II income multiplier identifies the direct plus indirect plus induced income generated by an additional dollar of income paid directly to households.

Attention is drawn to the comparatively higher income multiplier values estimated for the agricultural, livestock, and nonmetallic mining sectors. The reason for these relatively high values is straightforward. The Northwestern Colorado interindustry study allocated proprietorship and partnership net incomes to the profit account. As a result, labor inputs (household account) for agriculture, livestock, and nonmetallic mining are somewhat understated because these sectors are characterized by a relatively high incidence of proprietorship and partnership enterprises with relatively little hired help. By understating the value (contribution) of labor inputs for these sectors, the value (contribution) of other inputs, relative to labor, became larger. And with direct income being the denominator of the Type I and Type II income multiplier ratios, the respective multiplier estimates for these sectors are of the relatively high magnitude observed. By contrast, the relatively high multiplier values for petroleum and natural gas extraction, construction, and electricity and natural gas utilities exist because these sectors exhibit greater interdependence in the Northwestern Colorado economy.

### Employment Analysis

Direct employment requirements as is the case with direct business activity and direct income payments, are, by themselves, of limited use for assessing the impacts of various changes in economic activity in Northwestern Colorado. This limitation arises because direct requirements differ from total requirements, the difference being indirect requirements that emanate from sectoral interdependence. The interindustry model provides a framework within which both direct and indirect employment requirements can be addressed. Basic to the analysis are data on employment levels in the respective sectors and the table of direct plus indirect requirements per dollar of output delivered to final demand.

Before proceeding with the analysis some discussion on the table of direct and indirect requirements per dollar of delivery to final demand is warranted. When the household sector is included as a processing sector in the interindustry model it becomes simply another producer. To treat households in this manner is consistent within the interindustry framework, but it imposes a rather critical assumption on household purchase patterns. Specifically, household purchases are expressed as a linear function of income; the marginal and the average propensities to consume are assumed to be one and the same. To change this limiting assumption the household sector has to be treated as a part of final demand.

Treating the household sector in this manner removes the assumption that household purchases are a linear function of income. Specifically, because the interindustry model is a final demand driven model, treating the household sector as any other producing sector implies the level of employment was dependent only on the level of government expenditures, investment expenditures, and exports. By treating households exogenously this assumption is expanded to

include a dependency on the level of household expenditures. Thus, Appendix Table B-4 presents direct and indirect requirements per dollar of delivery to final demand, households exogenous, which are used in the employment analysis for Northwestern Colorado. The estimated employment levels and corresponding employment coefficients (expressed as the number of employees per dollar of total gross output) used in the analysis are presented in Table 3-3.

To assess the total employment impacts of exogenous changes in final demand the respective tables of direct and indirect requirements per dollar of delivery to final demand, households exogenous, was pre-multiplied by a diagonal matrix of direct labor use requirements (where the elements of the diagonal were the employment coefficients shown in Table 3-3). Summing down the respective columns of the resulting matrix yielded the estimates of the direct and indirect labor requirements per dollar delivered to final demand. Table 3-4 presents the estimates.

The interpretation of the entries in Table 3-4 is demonstrated by an example from the surface coal mining sector. As the final demand for the output of the surface mining of coal expands by \$1, there will be a direct expansion of employment in that sector as well as those sectors responsible for supplying production ingredients to the surface mining of coal sector. The sectors supplying ingredients to the surface mining of coal sector will in turn require production ingredients from others and this will further expand indirect employment impacts; and so forth. The magnitude of the direct and indirect employment impacts, \$.000014, shows the total employment generated in the entire Northwestern Colorado economy as this single sector, surface mining of coal, increases, by \$1, its deliveries to final demand. That is to

TABLE 3- 3

NORTHWESTERN COLORADO INTERINDUSTRY STUDY  
 TOTAL EMPLOYMENT AND EMPLOYMENT COEFFICIENTS, BY SECTOR, 1974  
 (in number of workers in Northwestern Colorado and workers  
 per dollar of output)

Sector	Total Employment	Workers per Dollar Total Output
1. FRUIT AG )	5,388	.000042 normalized .000053 loss
2. IRRIG AG )		
3. DRYLAND AG )		
4. DAIRY AG )		
5. LIVESTOCK )		
6. AG SER, FOR	296	.000037
7. METAL MIN	839	.000020
8. COAL UNDER	<u>815</u>	.000019
9. COAL STRIP	210	.000010
10. PET-NAT GS	724	.000004
11. NONMET MIN	35	.000006
12. CONSTRUCTN	3,992	.000019
13. FOOD PROC	886	.000025
14. WOOD PROD	410	.000031
15. PRINT-PUB	306	.000050
16. CONCRETE	289	.000022
17. FAB METALS	235	.000035
18. ELECTRONIC	1,386	.000062
19. MFG NEC	377	.000015
20. TRANSPORT	1,270	.000022
21. POSTAL SER	362	.000051
22. COMMUNICAT	936	.000034
23. ELEC-GS UT	1,009	.000016
24. WATER-SAN	355	.000031
25. WHOLESALE	1,307	.000026
26. GS-AUT DLR	1,799	.000056
27. EAT-DR-LOD	6,311	.000090
28. TRADE NEC	5,788	.000052
29. FINANCE	1,060	.000016
30. INS-R EST	1,346	.000023
31. MEDICAL	3,622	.000055
32. SERVIC NEC	3,771	.000039
33. HOUSEHOLDS	644	NA
34. EDUCATION	4,283	NA
35. SOCIAL SER	116	NA
36. LOCAL RD	747	NA
37. LOCAL GV NEC	1,236	NA
38. STATE GV	989	NA
39. FEDERAL GV	734	NA
40. SHALE R+D	262	NA
41. EXP-COLO	143	NA
<b>TOTAL</b>	<b>54,318</b>	

TABLE 3-4

NORTHWESTERN COLORADO INTERINDUSTRY STUDY  
 DIRECT PLUS INDIRECT LABOR REQUIREMENTS PER DOLLAR  
 DELIVERED TO FINAL DEMAND, BY SECTOR, 1974

(in workers per dollar)

Sector	Direct Plus Indirect Labor Requirement Per Dollar of Final Demand
1. FRUIT AG	.000061
2. IRRIG AG	.000051
3. DRYLAND AG	.000053
4. DAIRY AG	.000069
5. LIVESTOCK	.000068
6. AG SER, FOR	.000041
7. METAL MIN	.000028
8. COAL UNDER	.000026
9. COAL STRIP	.000014
10. PET-NAT GS	.000007
11. NONMET MIN	.000015
12. CONSTRUCTN	.000034
13. FOOD PROC	.000050
14. WOOD PROD	.000042
15. PRINT-PUB	.000057
16. CONCRETE	.000027
17. FAB METALS	.000039
18. ELECTRONIC	.000065
19. MFG NEC	.000018
20. TRANSPORT	.000024
21. POSTAL SER	.000053
22. COMMUNICAT	.000037
23. ELEC-GS UT	.000025
24. WATER-SAN	.000042
25. WHOLESALE	.000032
26. GS-AUT DLR	.000063
27. EAT-DR-LOD	.000097
28. TRADE NEC	.000059
29. FINANCE	.000018
30. INS-R EST	.000031
31. MEDICAL	.000060
32. SERVIC NEC	.000044

say that an increase of \$1 million dollars in the final demands, e.g., exports to the Front Range or out of state, for surface mined coal would result in an estimated additional employment of 14 persons in Northwestern Colorado. All remaining entries in Table 3-4 have analogous interpretations for their respective sectors. Thus, the leading sectors in terms of direct and indirect employment generation in the Northwestern Colorado economy are eating and drinking establishments and lodging facilities, dairy agriculture, livestock production, electronics, fruit agriculture, gasoline service stations and automobile dealers, and health and medical care facilities.

This concludes the basic interindustry analysis of the Northwestern Colorado region. The following chapter describes certain extensions of the model to forecasting and natural resource requirements.

## CHAPTER 4

### EXTENSIONS OF THE BASIC ANALYSIS: REGIONAL WATER REQUIREMENTS AND ANALYSIS OF A GROWTH SCENARIO

#### Introduction

The previous chapter presented what may be appropriately called the results of traditional applications of the Leontief interindustry model. In addition to the descriptive analysis and the attendant development of various multipliers, application of the model has been extended to other questions. The I-O technique, because of the detailed analysis of interdependence among economic sectors, is readily adaptable to an examination of, for example, natural resource use associated with economic activity in the region. It is also acknowledged as a reasonable aid in the forecasting process and, given projections of changes in final demands, provides consistent estimates of associated employment, income, and output. It is our intent in this chapter to demonstrate the usefulness of the technique in both regards.

We proceed, first, with an examination of water withdrawal and consumptive use in the regional economy. Subsequent to the water use analysis, we demonstrate the use of the tool as a forecasting aid by examining the impacts of changes in the final demand for coal output, both surface and underground. Both of these extensions may be readily expanded to include other resource impacts, e.g., water and air quality impacts and land use, and growth in other sectoral final demands, providing adequate data are available.

### Water Use Analysis

The water use analysis requires data pertaining to water withdrawals and consumptive use on a sector by sector basis. It is further required that these data be related to economic activity on a per dollar sales basis. These data, particularly for consumptive use, are difficult to obtain on a sector-by-sector basis and for a rather small regional economy. The problem for northwestern Colorado is narrowed somewhat simply because the most intensive water use is found in the agricultural sectors. Nonagricultural water use is thus quite small in relation to water use in agriculture.

Water withdrawal and consumption data for irrigated agriculture and fruit production were computed from several sources. The USDA-SCS, Special Projects Division, Denver, Colorado, has published Annual Irrigation Water Use Coefficients, 1975 National Water Assessment. This report provides, for each state, a subregional breakdown of gross diversion requirements and net depletions by crop. These estimates are in terms of acre-feet per acre of irrigated crop. We have used these requirements per acre and the estimated 1974 irrigated acreage for each crop as stated in the 1976 Colorado Agricultural Statistics<sup>1</sup> in order to obtain the total estimated withdrawal and consumptive use of water in irrigated agriculture. The totals were then divided by the estimated total value of output in order to obtain water use per dollar of output.

Water use in the manufacturing sectors was estimated from the four digit SIC water use data presented in the U.S. Census of Manufacturers, Water Use in Manufacturing, 1972. These data were weighted by employment share in the four digit SIC listings for the regional economy and then converted to withdrawal and consumptive use requirements per dollar of output in each sector. Water use in the mining sectors was estimated from personal interview and questionnaire responses.



Table 4-1 presents the withdrawal and consumptive use coefficients per dollar of output for each of the processing sectors of the regional economy. These estimates may vary depending upon sources of information, particularly within certain manufacturing sectors. However, alternative water use estimates may be employed quickly and inexpensively within the analytical framework and thus disagreement with the coefficients does not pose a serious shortcoming of the analysis. In addition, water use in irrigated agriculture and related sectors constitutes far and away the largest pressure on the region's water supply. The detailed estimates of diversion and consumption per crop and per irrigated acre appear to be as accurate as any estimates currently available. Thus, discrepancies in the minor water using sectors will have very little impact on aggregate water use in the region. Table 4-2 presents the estimated withdrawals and consumptive use for each of the processing sectors of the regional economy in acre-feet. The combined agricultural sectors account for some 95 percent of total withdrawals and 98 percent of consumptive use in the region. For the region as a whole, consumptive use represents 38 percent of total withdrawals.

It should be noted that the estimates presented in Tables 4-1 and 4-2 do not include water use in the final demand/final payments sectors. In order to assess total water use it is necessary to have some indication of requirements in the final demand sectors, e.g., households, governments, education, etc. Aggregated data generally show depletions for irrigation as a separate category of water use and a second category consisting of municipal and industrial and domestic water use. Since industrial (manufacturing) water use has been disaggregated above, as has agricultural use, the final demand use of water may be computed as a residual if estimates of total withdrawal and consumption are available. One possibility is to determine the per capita withdrawal

TABLE 4-1

ESTIMATED WITHDRAWAL AND CONSUMPTIVE USE REQUIREMENTS  
BY SECTOR, NORTHWESTERN COLORADO, 1974

(in gallons per dollar of output)

Sector	Withdrawal	Consumptive Use
1. FRUIT AG	2,409.0	383.0
2. IRRIG AG	24,790.0	9,798.0
3. DRYLAND AG	0.0	0.0
4. DAIRY AG	16.0	16.0
5. LIVESTOCK	30.0	30.0
6. AG SER, FOR	8.0	.8
7. METAL MIN	108.0	32.4
8. COAL UNDER	1.0	0.0
9. COAL STRIP	11.0	1.0
10. PET-NAT GS	27.0	6.2
11. NONMET MIN	137.0	4.8
12. CONSTRUCTN	4.0	.4
13. FOOD PROC	6.0	.4
14. WOOD PROD	27.0	6.2
15. PRINT-PUB	2.0	.2
16. CONCRETE	52.0	13.0
17. FAB METALS	7.0	1.7
18. ELECTRONIC	2.0	.4
19. MFG NEC	20.0	2.6
20. TRANSPORT	2.0	.1
21. POSTAL SER	1.0	.1
22. COMMUNICAT	2.3	.2
23. ELEC-GS UT	267.0	13.4
24. WATER-SAN	0.0	0.0
25. WHOLESALE	2.3	.2
26. GS-AUT DLR	2.3	.2
27. EAT-DR-LOD	7.0	2.1
28. TRADE NEC	4.0	.4
29. FINANCE	2.3	.2
30. INS-R EST	8.0	.8
31. MEDICAL	5.1	.5
32. SERVIC NEC	2.3	.2

TABLE 4-2  
 TOTAL WATER USE, BY SECTOR, PROCESSING  
 SECTORS OF NORTHWESTERN COLORADO, 1974  
 (in acre-feet)

Sector	Withdrawal	Consumptive Use
1. FRUIT AG	61,708	9,811
2. IRRIG AG	2,005,767	792,759
3. DRYLAND AG	--	--
4. DAIRY AG	251	251
5. LIVESTOCK	7,450	7,450
6. AG SER, FOR	195	20
7. METAL MIN	13,731	4,119
8. COAL UNDER	130	--
9. COAL STRIP	738	74
10. PET-NAT GS	16,214	3,723
11. NONMET MIN	2,458	86
12. CONSTRUCTN	2,553	255
13. FOOD PROC	651	43
14. WOOD PROD	1,111	255
15. PRINT-PUB	38	4
16. CONCRETE	2,060	515
17. FAB METALS	146	35
18. ELECTRONIC	137	27
19. MFG NEC	1,497	195
20. TRANSPORT	362	18
21. POSTAL SER	22	2
22. COMMUNICAT	192	17
23. ELEC-GS UT	50,673	2,543
24. WATER-SAN	--	--
25. WHOLESALE	352	31
26. GS-AUT DLR	227	20
27. EAT-DR-LOD	1,499	450
28. TRADE NEC	1,367	137
29. FINANCE	481	42
30. INS-R EST	1,440	144
31. MEDICAL	1,023	100
32. SERVIC NEC	678	59
TOTAL	2,175,151	823,185

and consumptive use and then, given the population of the region, determine total water use. Subtracting the sum of the processing sector use from this total would give an estimate of water use in the final demand sectors. The estimated per capita withdrawal of publically supplied water for the state of Colorado is 197 gallons per day.<sup>2</sup> This figure, multiplied by the estimated population of the region in 1974 (152,686) yields an estimated withdrawal of 33,693 acre-feet of publically supplied water for domestic, industrial and municipal purposes.<sup>3</sup> Subtracting the estimated processing sector withdrawals (sectors 12-22 and 24-32) from this total yields 17,662 acre-feet, a residual attributed to households, governments, education, and other final demands sectors. This residual suggests a per capita withdrawal of 103 gallons per day. Thus, total estimated withdrawals in the regional economy are estimated to be 2,192,813 acre-feet. Consumptive use of publically supplied water is roughly 25 percent of the total withdrawals for domestic, industrial and municipal uses.<sup>4</sup> This represents a daily per capita consumption of 49 gallons and an estimated total of 8,380 acre-feet in the regional economy. The estimated consumptive use in sectors 12-22 and 24-32 is subtracted from this total to obtain the estimated consumptive use in households, governments, and other final demand sectors. This residual amounts to 6,031 acre-feet or 35 gallons per capita per day. Total consumptive use in the regional economy, estimated for 1974, thus amounts to 829,216 acre-feet.

These estimates of total withdrawal and total consumptive use of water are interesting from a purely descriptive point of view. However, the model allows also the analysis of direct and indirect water use which parallels the previous discussion of direct and indirect production. The purpose of such analysis is to isolate the effect of economic interdependence on water requirements. The specific question to be addressed is that of determining the likely impact of expanding final demand in any or all processing sectors on the regional water

requirements. The key element in the assessment is the derivation of the direct plus indirect water requirements per dollar of output delivered to final demand.

The procedure is really quite simple once the direct water requirements and the table of direct plus indirect production requirements have been obtained. The matrix of direct and indirect production coefficients is pre-multiplied by a diagonal matrix consisting of the direct water requirements along the diagonal and zeros elsewhere. The columns of the resulting matrix are summed in order to obtain the direct plus indirect water requirements per dollar of output delivered to final demand by each sector. These requirements for the northwest Colorado economy are shown in Table 4-3. The importance of considering indirect as well as direct water requirements in the planning perspective can be readily seen by comparing Table 4-1 and Table 4-3. Consider, for example, the direct withdrawal and consumptive use requirements for livestock and dairy in Table 4-1. These direct requirements are rather small, respectively 30 and 16 gallons for each dollar of output. However, as the final demand for the output of the livestock sector expands by one dollar there is a total direct plus indirect water requirement of 2,802 gallons (withdrawal) and 1,128 gallons (consumptive) generated throughout the economy. Similarly, in the dairy sector a one dollar increase in the final demand for dairy products generates a total direct plus indirect water requirement of 11,059 gallons (withdrawal) and 4,378 gallons (consumptive) throughout the economy. The indirect impacts, because of the significant interdependencies between these sectors and irrigated agriculture, are far more important than the direct requirements. Applying only the direct water requirements to assumed increases in deliveries to final demand can obviously result in an understatement of water use.

TABLE 4-3

DIRECT PLUS INDIRECT WATER REQUIREMENTS  
NORTHWESTERN COLORADO, 1974

(in gallons per dollar of output delivered to final demand)

Sector	Withdrawal	Consumptive Use
1. FRUIT AG	2,459.91	400.61
2. IRRIG AG	24,824.70	9,810.02
3. DRYLAND AG	54.08	19.46
4. DAIRY AG	11,059.15	4,377.96
5. LIVESTOCK	2,802.53	1,127.69
6. AG SER, FOR	145.34	53.59
7. METAL MIN	134.24	37.79
8. COAL UNDER	7.06	.39
9. COAL STRIP	22.85	1.82
10. PET-NAT GS	39.16	7.26
11. NONMET MIN	145.45	5.36
12. CONSTRUCTN	15.34	1.71
13. FOOD PROC	5,000.82	1,969.67
14. WOOD PROD	54.72	13.58
15. PRINT-PUB	6.45	.49
16. CONCRETE	60.26	13.40
17. FAB METALS	11.86	2.02
18. ELECTRONIC	4.53	.55
19. MFG NEC	28.29	3.07
20. TRANSPORT	2.97	.18
21. POSTAL SER	3.49	.25
22. COMMUNICAT	4.37	.33
23. ELEC-GS UT	344.17	18.40
24. WATER-SAN	9.08	.54
25. WHOLESALE	5.99	.44
26. GS-AUT DLR	7.17	.49
27. EAT-DR-LOD	17.44	2.70
28. TRADE NEC	10.06	.76
29. FINANCE	4.22	.32
30. INS-R EST	12.36	1.13
31. MEDICAL	17.66	4.62
32. SERVIC NEC	12.13	.95

### Coal Growth Scenarios

The second extension of the basic model employs two alternative sets of estimated growth in final demands for surface and underground coal mining. The purpose of this analysis is to assess the impacts of growth in these two sectors on regional output, income, employment and water use. The analysis demonstrates very clearly the use of the input-output model as a tool for consistent forecasting.<sup>5</sup>

The projected deliveries by the two coal sectors to export markets within Colorado (but outside the region) and to markets outside the state are shown in Table 4-4. There are two sets of estimates, which represent conservative and speculative projections, for each sector. Table 4-5 identifies the impacts of these growth scenarios on the economic variables: output, employment, income, and water use.

The estimates presented in Table 4-5 are to be interpreted in the following manner. First, consider the total output change under the scenario for underground coal. As the final demand expands to the level projected for 1980 a series of production impacts is generated throughout the economy. This occurs because of the interdependence existing between the underground coal sectors and other sectors of the economy. As these impacts work themselves out the total additional value of production of \$153.12 million is generated. This is not the additional value of underground coal production but the additional value of production generated in all sectors of the economy in order to satisfy the increased final demand for underground coal. As the 1985 final demand projection is realized, there is an additional \$167.01 million worth of output generated in the economy over the 1974 levels. Thus, there is a change of \$13,886,288 worth of output between the 1980 and 1985 levels. The remaining economic variables of Table 4-5 are interpreted in the same manner.

TABLE 4-4

PROJECTED VALUE OF UNDERGROUND AND SURFACE COAL DELIVERIES  
TO EXPORT MARKETS, NORTHWEST COLORADO ECONOMY

(in dollars)\*

Year	<u>Underground Coal</u>			
	<u>Conservative</u>		<u>Speculative</u>	
	<u>Colorado</u>	<u>Out-of-state</u>	<u>Colorado</u>	<u>Out-of-state</u>
1980	14,544,000	138,345,760	16,160,000	138,345,760
1985	14,544,000	148,849,760	16,160,000	148,849,760
1990	17,776,000	150,465,760	17,776,000	247,425,760

Year	<u>Surface Coal</u>			
	<u>Conservative</u>		<u>Speculative</u>	
	<u>Colorado</u>	<u>Out-of-state</u>	<u>Colorado</u>	<u>Out-of-state</u>
1980	31,108,000	23,433,768	31,108,000	46,842,250
1985	31,385,750	29,266,518	31,385,750	46,939,750
1990	27,219,500	29,266,518	27,219,500	46,939,750

SOURCE: BLM, USDI, Draft Northwest Colorado Coal EIS, June 1976. BLM in house reports.

\* Underground coal is priced at \$16.16 per ton. Surface coal is priced at \$5.56 per ton.





It will be noted that there are two estimates of changes in household income payments presented in Table 4-5. The income change I is the direct plus indirect income change generated by changing final demands. Income change II includes also the induced impacts of increased household spending.

A third scenario was also included in the analysis of altering the deliveries of coal to final demand. It is known that electric power generation (included in sector 23) is a large coal consumer and is also expected to expand quite rapidly over the period 1974-1980. There are estimates of the expected coal requirements by electric power generation to the year 1980 and from these, it is possible to calculate the projected increase in final demand for electric power output. The projected change in electric power final demand between 1974 and 1980 is \$263.74 million. The estimated impact of this final demand increase translates into an additional output, over 1974 levels, valued at \$443.35 million; a type I income change of \$108.63 million; a type II income change of \$126.84 million; additional employment of 6,594 workers and; increased consumptive use of water amounting to 10,846 acre-feet. Since the projected purchase of coal by the electric power sector consists solely of purchases of strip mined coal, these estimates should be added to the 1980 conservative and speculative estimates for surface coal in order to assess the total impacts of the combined increases in coal deliveries to final demand and electric power deliveries to final demand. This combined impact could result in a conservative and speculative set of changes as shown in Table 4-6.

TABLE 4-6

ESTIMATED CHANGES IN SELECTED VARIABLES 1974-1980  
ASSOCIATED WITH PROJECTED COAL AND ELECTRIC  
POWER SECTOR DELIVERIES TO FINAL DEMAND<sup>1</sup>

	<u>Conservative</u>	<u>Speculative</u>
Total Output Change <sup>2</sup>	\$644,661,683	\$675,824,542
Total Income Change I <sup>3</sup>	169,546,613	175,483,710
Total Income Change II <sup>3</sup>	197,950,843	204,879,977
Total Employment Change <sup>4</sup>	10,149	10,519
Total Water Use Change <sup>5</sup>	11,203	11,335

1. These changes are changes throughout the entire economy resulting from changes in deliveries to final demand (exports) by the two coal sectors.
2. These are dollar values.
3. These are changes in dollar value of payments to households. Change I reflects direct and indirect income; change II reflects direct, indirect and induced income change.
4. Units are numbers of workers.
5. Units are acre-feet of water consumed.

## NOTES

1. The exceptions are fruit agriculture and irrigated pasture. Data on acreages in fruit production and irrigated pasture were obtained from 1974 Census of Agriculture Preliminary Reports and from unpublished sources.
2. C. Richard Murray and E. Bodette Reeves, U.S. Geological Survey, Circular 676, Estimated Use of Water in the United States in 1970, Washington, D.C., 1972.
3. Excludes withdrawals for mining activities, electric power generation, and agriculture.
4. Murray and Reeves, op. cit.
5. It was the original intent of the authors to include an actual oil shale producing sector, along with coal production sectors, in the model. However, at the time of the data collection effort, oil shale operations consisted of research and development, a final demand activity. Recent indications are that actual production activity on a limited scale will be undertaken. Thus, it may be possible at an early future date to shift the oil shale sector into the processing sector of the model.

## APPENDICES

### Appendix:

A - Sector Identification, Northwestern Colorado Interindustry Study

B - Input-Output Tables for the Northwestern Colorado Interindustry Study:

Northwestern Colorado Gross Flows Table

Northwestern Colorado Direct Requirements Per Dollar of Output

Northwestern Colorado Direct and Indirect Requirements Per Dollar of  
Output Delivered to Final Demand (Households in Processing Sector)

Northwestern Colorado Direct and Indirect Requirements Per Dollar of  
Output Delivered to Final Demand (Households in Final Demands).

C - Critique of Data Sources

D - Components of Transfer, Depreciation, and Investment Accounts

Components of Transfer Account Row

Components of Transfer Account Column

Components of Depreciation Account Row

Components of Investment Account Column

E - Survey Form Used for the Northwestern Colorado Interindustry Model

F - Bibliography

APPENDIX A

SECTOR IDENTIFICATION, NORTHWESTERN COLORADO INTERINDUSTRY STUDY

<u>Sector Number</u>	<u>Appendix Title</u>	<u>Sector Description</u>	<u>1972 SIC Codes</u>
<b>Processing Sectors</b>			
1.	FRUIT AG	Fruit Agriculture	01 (part)
2.	IRRIG AG	Irrigated Agriculture other than Fruit	01 (part)
3.	DRYLAND AG	Dryland Agriculture	01 (part)
4.	DAIRY AG	Dairy Farms	02 (part)
5.	LIVESTOCK	Livestock other than Dairy Farms	02 (part)
6.	AG SER, FOR	Agricultural Services; Forestry	07,08
7.	METAL MIN	Metal Mining; Related Services	10
8.	COAL UNDER	Coal Mining - Underground; Related Services	12 (part)
9.	COAL STRIP	Coal Mining - Surface; Related Services	12 (part)
10.	PET-NAT GS	Oil and Gas Extraction; Related Services	13
11.	NONMET MIN	Nonmetal Mining; Related Services	14
12.	CONSTRUCTN	Construction	15,16,17
13.	FOOD PROC	Food and Kindred Products Manufacturers	20
14.	WOOD PROD	Lumber; Wood Products Manufacturers	24
15.	PRINT-PUB	Printing and Publishing; Paper and Allied Products Manufacturers	26,27
16.	CONCRETE	Stone, Glass, Clay Products Manufacturers	32
17.	FAB METALS	Fabricated Metals; Non-electrical Machinery Manufacturers	34,35
18.	ELECTRONIC	Electrical Machinery and Equipment; Transportation Equipment; Electronic Instruments and Components Manufacturers	36,37,38

## APPENDIX A--Continued

<u>Sector Number</u>	<u>Appendix Title</u>	<u>Sector Description</u>	<u>1972 SIC Codes</u>
19.	MFG NEC	All Other Manufacturers, Textiles, Apparel, Furniture, Chemicals, Petroleum, Rubber, Leather, Primary Metals, Miscellaneous	22,23,25,28,29,30,31,33,39
20.	TRANSPORT	Transportation	40,41,42,45,46,47
21.	POSTAL SER	U. S. Postal Service	43
22.	COMMUNICAT	Communication	48
23.	ELEC-GS UT	Electricity; Natural Gas Utilities	491,492,493
24.	WATER-SAN	Water, Sewerage, Trash Removal Services	494,495,496,497
25.	WHOLESALE	Wholesale Trade	50,51
26.	GS-AUT DLR	Automobile Dealers; Gasoline Service Stations	55
27.	EAT-DR-LOD	Eating and Drinking Establishments; Hotels, Motels; Other Lodging	58,70
28.	TRADE NEC	All Other Retail Trade, Building Materials, General Merchandise, Food Stores, Apparel and Accessory, Furniture and Furnishings and Equipment, Miscellaneous	52,53,54,56,57,59
29.	FINANCE	Finance	60,61,62,67
30.	INS-R EST	Insurance; Real Estate	63,64,65,66
31.	MEDICAL	Health Services	80
32.	SERVIC NEC	All Other Services, Personal, Business, Automotive Repair, Miscellaneous Repair, Motion Pictures, Amusement and Recreation, Legal, Museums, Membership Organizations, Miscellaneous	72,73,75,76,78,49,81,84,86,89
33.	SUBTOTAL	Subtotal of Processing Sector	-

## APPENDIX A—Continued

<u>Sector Number</u>	<u>Appendix Title</u>	<u>Sector Description</u>	<u>1972 SIC Codes</u>
<b>Final Demand Sectors</b>			
34.	HOUSEHOLDS	Households	-
35.	EDUCATION	Education	82
36.	SOCIAL SER	Social Services	83
37.	LOCAL ROAD	Local and County Government Roads and Bridges	-
38.	LOC GV NEC	Local and County Government	91,92,93,94,95, 96
39.	LOC GV TAX	Local and County Government Tax Accounts	-
40.	STATE GV	State of Colorado	91,92,93,94,95, 96,97
41.	FEDERAL GV	Federal Government	91,92,93,94,95, 96,97
42.	SHALE R+D	Oil Shale Research and Development	-
43.	INVESTMENT	Economic Investment; Net Inventory Accumulation	-
44.	TRANSFERS	Transfer Account	-
45.	EXP-COLO	Exports to Colorado other than the Northwest	-
46.	EXP-WORLD	Exports to the Rest of the World	-
47.	TOTAL	Total all Sectors	-
<b>Final Payment Sectors</b>			
34.	HOUSEHOLDS	Households	-
35.	EDUCATION	Education	82
36.	SOCIAL SER	Social Services	83
37.	LOCAL ROAD	Local and County Government Roads and Bridges	-
38.	LOC GV NEC	Local and County Government	91,92,93,94,95, 96
39.	LOC GV TAX	Local and County Government Tax Accounts	-



## APPENDIX A--Continued

<u>Sector Number</u>	<u>Appendix Title</u>	<u>Sector Description</u>	<u>1972 SIC Codes</u>
40.	STATE GV	State of Colorado	91,92,93,94,95, 96,97
41.	FEDERAL GV	Federal Government	91,92,93,94,95, 96,97
42.	PROFITS	Profits, Rents, Losses	-
43.	DEPRECC	Depreciation; Net Inventory Depletion	-
44.	TRANSFERS	Transfer Account	-
45.	IMP-COLO	Imports from Colorado other than the Northwest	-
46.	IMP-WORLD	Imports from the Rest of the World	-
47.	TOTAL	Total all Sectors	-

APPENDIX B

NORTHWESTERN COLORADO INTERINDUSTRY MODEL

LIVESTOCK SECTOR NORMALIZED - 1974

- B-1 NORTHWESTERN COLORADO GROSS FLOWS TABLE, LIVESTOCK SECTOR NORMALIZED, 1974, DOLLARS
- B-2 NORTHWESTERN COLORADO DIRECT REQUIREMENTS PER DOLLAR OF OUTPUT, LIVESTOCK SECTOR NORMALIZED
- B-3 NORTHWESTERN COLORADO DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR DELIVERS TO FINAL DEMAND, LIVESTOCK SECTOR NORMALIZED (Households in Processing Sector)
- B-4 NORTHWESTERN COLORADO DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR DELIVERED TO FINAL DEMAND, LIVESTOCK SECTOR NORMALIZED (Households in Final Demand)

APPENDIX B-1  
NORTHWESTERN COLORADO GROSS FLOWS TABLE, LIVESTOCK SECTOR NORMALIZED, 1974, DOLLARS

	1	2	3	4	5	6	7	8	9	10
	FRUIT AG	IRRIG AG	DRYLAND AG	DAIRY AG	LIVESTOCK	AG SER.FOR	METAL MIN	COAL UNDER	COAL STRIP	PET-NAT GS
1	FRUIT AG	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
2	IRRIG AG	-0-	917.	2278025.	6852437.	42537.	-0-	-0-	-0-	-0-
3	DRYLAND AG	-0-	-0-	-0-	782105.	-0-	-0-	-0-	-0-	-0-
4	DAIRY AG	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
5	LIVESTOCK	213337.	48980.	16174303.	-0-	-0-	-0-	-0-	-0-	-0-
6	AG SER.FOR	1248096.	318370.	1528467.	-0-	-0-	-0-	-0-	-0-	-0-
7	METAL MIN	-0-	-0-	-0-	-0-	-0-	4873010.	-0-	-0-	-0-
8	COAL UNDER	-0-	-0-	-0-	-0-	-0-	15151.	3697400.	1933637.	-0-
9	COAL STRIP	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
10	PET-NAT GS	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	14734540.
11	MCMET MIN	-0-	-0-	-0-	-0-	-0-	46469.	143060.	-0-	7617.
12	CCNSTRUCIN	-0-	-0-	-0-	-0-	-0-	28088.	267960.	251879.	1054491.
13	FCCO PROC	-0-	-0-	5109.	400976.	-0-	1418500.	154877.	-0-	132295.
14	WCOO PROD	-0-	-0-	-0-	1646200.	-0-	1093.	-0-	-0-	149593.
15	FKINT-PUB	3522.	-0-	-0-	4451.	-0-	1566.	19361.	1826.	-0-
16	CONCRETE	-0-	-0-	-0-	-0-	-0-	349305.	212185.	-0-	-0-
17	FAF METALS	-0-	7253.	-0-	6454.	-0-	-0-	298752.	611322.	-0-
18	ELECTRNIC	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
19	PFG MEC	19734.	180134.	11151.	402362.	35461.	36992.	16712.	23775.	167452.
20	TRANSCRT	424320.	336.	-0-	154599.	16670.	2304665.	402810.	983421.	2946121.
21	FOSTAL SER	253.	500.	400.	13500.	3201.	3733.	2134.	3010.	7771.
22	CCOMUNICAT	2703.	54011.	1590.	163370.	30070.	59070.	52475.	15469.	112790.
23	ELEC-US UT	58040.	81016.	67952.	88980.	84935.	949210.	471175.	582512.	4930231.
24	WATER-SAN	9260.	-0-	1060.	600942.	5197.	12555.	29595.	11232.	58777.
25	WOLESALE	110500.	394803.	19726.	3520412.	192542.	70900.	141151.	106481.	2511400.
26	GS-AUT OILM	-0-	36898.	1675.	111501.	32487.	9005.	23883.	16226.	162570.
27	FAT-DR-LOD	-0-	-0-	-0-	-0-	4446.	-0-	-0-	9289.	46293.
28	TRADE NEC	-0-	39073.	1384.	263631.	4889.	17393.	9564.	1390.	351867.
29	FINANCE	719717.	1438592.	233491.	7373782.	58776.	15430.	-0-	-0-	1259510.
30	INS-R EST	141046.	339547.	2302.	1092524.	43066.	491366.	903378.	173224.	384524.
31	MEDICAL	-0-	-0-	-0-	-0-	-0-	4229.	34334.	18919.	-0-
32	SERVIC NEC	196192.	450101.	318526.	2005092.	178854.	78892.	83984.	73278.	2807592.
33	SUBTOTAL	4872429.	3372015.	3036655.	44335466.	736462.	10010466.	11088586.	4014720.	31630796.
34	HOUSEHCLDS	1288497.	303709.	233491.	5770908.	1368176.	9506060.	11591920.	3439300.	2562115.
35	EDUCATION	-0-	-0-	-0-	-0-	-0-	-0-	-0-	2034.	-0-
36	SOCIAL SER	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
37	LOCAL ROAD	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
38	LCC GV NEC	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
39	LCC GV TAX	556625.	892498.	519299.	3049515.	20762.	390698.	267463.	217090.	3772651.
40	STATE GV	17449.	154540.	36760.	664965.	44702.	148797.	204447.	206144.	5632776.
41	FEDERAL GV	72342.	18223.	14004.	566633.	391570.	2555234.	3540251.	2039472.	41601229.
42	INCEFTS	330444.	145984.	1213034.	12906962.	808710.	5337040.	2667147.	1417552.	68954359.
43	TRFEC	235611.	1907829.	374506.	4869137.	303626.	3002424.	2556281.	1283731.	6074743.
44	TRANSFERS	16380.	145512.	124052.	352403.	37768.	457291.	569225.	157501.	122570.
45	IMP-COLO	43410.	104017.	61744.	1647233.	3649801.	3902951.	1760170.	5161089.	25214015.
46	IMP-WORLD	474337.	2981106.	749693.	6734708.	591543.	5309111.	8131376.	3922827.	11085579.
47	TOTAL	8146927.	26364707.	47866789.	80923210.	7943210.	41428264.	42381874.	21811540.	195677741.

APPENDIX B-1--Continued

NORTHWESTERN COLORADO GROSS FLOWS TABLE, LIVESTOCK SECTOR NORMALIZED, 1974, DOLLARS

	11	12	13	14	15	16	17	18	19	20
	NONMET MIN	CONSTRUCTN	FOOD PROC	WOOD PROD	PRINT-PUB	CONCRETE	FAB METALS	ELECTRONIC	MFG MEC	TRANSPORT
1 FRUIT AG	-0-	-0-	289585	-0-	-0-	-0-	-0-	-0-	-0-	-0-
2 IRRIG AG	-0-	-0-	4389517	-0-	-0-	-0-	-0-	-0-	-0-	-0-
3 DRYLAND AG	-0-	2231	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
4 DAIRY AG	-0-	-0-	4964808	-0-	-0-	-0-	-0-	-0-	-0-	-0-
5 LIVESTOCK	-0-	-0-	2381728	-0-	-0-	-0-	-0-	-0-	-0-	-0-
6 AG SER-FOR	-0-	-0-	5873	1673605	-0-	-0-	-0-	-0-	-0-	-0-
7 METAL FIN	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	1488	-0-
8 COAL UNDER	-0-	-0-	4116	-0-	-0-	-0-	-0-	-0-	-0-	-0-
9 COAL STRIP	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
10 PET-NAT GS	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
11 NONMET MIN	66740	4246852	87888	587746	39898	451684	382797	85184	-0-	27888
12 CONSTRUCTN	1335	85332711	114688	156854	-0-	67321	-0-	-0-	-0-	-0-
13 FOOD PROC	2069	-0-	18432	2833	1906	2786	4837	1887	2223	2888
14 WOOD PROD	-0-	991168	1432	156854	-0-	16184	3755	-0-	-0-	49979
15 PRINT-PUB	66740	79578	9061	2833	1906	16184	-0-	-0-	-0-	2088
16 CONCRETE	66740	8168461	-0-	-0-	-0-	-0-	-0-	-0-	316882	1888
17 FAB METALS	66740	521418	33234	8654	-0-	-0-	-0-	-0-	-0-	1888
18 ELECTRONIC	66740	-0-	-0-	152254	-0-	-0-	-0-	-0-	-0-	1888
19 MFG MEC	66740	515112	38729	1118	36538	186123	2095	17278	29138	22858
20 TRANSPORT	66740	1793828	53729	272873	68918	184317	387171	187582	615444	663888
21 FOSTAL SER	66740	9891	5720	2187	43296	4434	4576	29888	2982	14162
22 COMMUNICAT	66740	495876	142796	18231	78784	74471	28994	189385	48979	195122
23 ELEC-GS UT	66740	176869	58894	294931	47126	82887	78464	12984	551681	43667
24 WATER-SAN	66740	180122	53481	2661	3481	9151	3687	18632	1717	1617
25 WHOLESALE	66740	946485	288851	187545	11434	86188	17238	8988	247663	79885
26 GS-AUT OLN	66740	588118	37682	1888	3325	183834	2834	16775	7981	21885
27 FAT-DR-LOU	66740	13731	29812	385	6885	6388	-0-	-0-	239	17143
28 TRADE MEC	66740	4826378	68361	1458	15315	154153	272	156354	28895	284879
29 FINANCE	66740	257429	387827	248781	258654	211259	98483	37343	88188	34788
30 IN-R EST	66740	1575598	78795	47387	28884	76417	5949	178599	131296	448818
31 MEDICAL	66740	58525	4111	355	-0-	-0-	-0-	-0-	1938	3888
32 SERVICE NEC	66740	188417	218273	445433	584529	141597	125187	313293	12842	158876
33 SUCROTAL	66740	1717882	15689633	4817618	1228285	1787491	1822739	1468218	2288376	3849711
34 HOUSEHOLDS	66740	392536	5988826	2861612	2138399	2448899	2253155	7988321	2858892	16629633
35 EDUCATION	66740	-0-	3971	2129	-0-	-0-	8875	18884	-0-	1888
36 SOCIAL SER	66740	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
37 LOCAL ROAD	66740	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
38 LCC GV NEC	66740	148746	-0-	-0-	-0-	-0-	-0-	-0-	-0-	24563
39 LCC GV TAX	66740	18812	338721	65322	51975	114852	11767	88881	455356	1196192
40 STATE GV	66740	78896	138432	59513	81152	131918	19228	114888	72874	2252544
41 FEDERAL GV	66740	638200	1548962	798656	184517	748758	171253	1452159	793849	2598182
42 PROFITS	66740	1813883	1743746	781861	521329	143889	62526	1386624	1348847	5166628
43 DIRECT	66740	2882594	1883560	699941	647329	527996	173873	526995	1828842	2977886
44 TRANSFERS	66740	15393	78758	44187	27812	71119	37886	168687	185347	358888
45 INT-CCLO	66740	31523	3585321	2887372	251759	4182794	528888	1392588	1342175	15672822
46 INT-WORLO	66740	66288	5368966	2883896	1088896	1471687	1948456	766288	14148748	4282237
47 TOTAL	66740	5945477	288882112	1341281	6137173	12988873	6798236	22258839	24388698	58918878

APPENDIX B-1--Continued  
NORTHWESTERN COLORADO GROSS FLOWS TABLE, LIVESTOCK SECTOR NORMALIZED, 1974, DOLLARS

	21	22	23	24	25	26	27	28	29	30
	POSTAL SER	COMMUNICAT	ELEC-GS UT	WATER-SAN	WHOLESALE	GS-AUT ULR	EAT-DR-LOD	TRADE MEC	FINANCE	I&S-R EST
1 FRUIT AG	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
2 FRIG AG	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
3 ORFLAND AG	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
4 DAIRY AG	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
5 LIVESTOCK	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
6 AG SER, FOR	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
7 METAL FIN	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
8 COAL UNDER	-0-	-0-	750005.	-0-	-0-	-0-	-0-	-0-	-0-	-0-
9 COAL STRIP	-0-	-0-	3951619.	-0-	-0-	-0-	-0-	-0-	-0-	-0-
10 PET-NAT GS	-0-	-0-	9004441.	-0-	-0-	-0-	-0-	65973.	-0-	-0-
11 MONNET MIN	-0-	-0-	-0-	1322.	-0-	-0-	-0-	-0-	-0-	-0-
12 CCASTRUCTN	13000.	10236.	41400.	96840.	454500.	111986.	1220797.	497450.	44107.	2515769.
13 FCID PROC	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
14 MCOO PROD	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
15 PRINT-PUB	-0-	64500.	37334.	7171.	72400.	356476.	147675.	1552600.	305050.	687493.
16 CCAGGTE	-0-	-0-	4061.	-0-	-0-	-0-	-0-	-0-	-0-	-0-
17 FAF PETALS	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
18 ELECTRONIC	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
19 MFG NEC	36713.	72453.	70566.	22606.	302012.	125515.	0593.	250197.	0466.	170135.
20 TRANSPORT	32500.	5036.	134066.	1236.	4166000.	2700600.	311400.	6130351.	35030.	94017.
21 POSTAL SER	-0-	37013.	47217.	14052.	59175.	40720.	55115.	230954.	234401.	74971.
22 COMMUNICAT	25420.	124123.	337967.	29193.	509990.	512245.	2129340.	3234075.	924954.	003067.
23 ELEC-GS UT	43380.	107950.	12401001.	216392.	350914.	328564.	1013337.	1507790.	257748.	345060.
24 WATER-SAN	2500.	7004.	9920.	300445.	16005.	69120.	211600.	192933.	16057.	44090.
25 WHOLESALE	10774.	22436.	70333.	101430.	170734.	303650.	1556314.	358333.	10216.	404633.
26 GS-AUT DLK	35645.	70344.	71210.	21940.	91773.	91773.	0343.	329179.	020.	172950.
27 EAT-DR-LOD	-0-	6404.	33735.	3500.	115232.	10667.	-0-	35766.	20900.	545009.
28 TRADE NEC	1069.	14561.	20409.	75064.	42427.	31025.	541556.	103543.	35055.	174057.
29 FINANCE	-0-	2635017.	1412301.	2549460.	1476483.	034407.	4200176.	1735437.	67021.	576097.
30 I&S-R EST	-0-	96657.	256412.	100203.	276357.	405260.	977262.	3164624.	199162.	2136900.
31 MEDICAL	-0-	-0-	1144.	-0-	45450.	-0-	-0-	-0-	-0-	-0-
32 SERVICE MEC	70000.	212753.	439400.	660620.	1147053.	1045210.	2204774.	3411997.	2597000.	3320206.
33 SUEVITIAL	279201.	3456093.	30034529.	4377594.	9650229.	7076042.	15446670.	22002944.	4454963.	12003910.
34 FUSEHOLDS	5449501.	9124365.	12741514.	2916711.	10930031.	13171596.	21043350.	34520906.	0095564.	5415505.
35 EDUCATION	-0-	-0-	-0-	1406.	0391.	-0-	-0-	-0-	-0-	-0-
36 SOCIAL SER	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-	-0-
37 LOCAL ROAD	-0-	-0-	-0-	40002.	-0-	-0-	-0-	-0-	-0-	-0-
38 LCC GV MEC	-0-	179610.	700911.	506425.	-0-	-0-	20017.	-0-	-0-	-0-
39 LCC GV TAX	-0-	1520470.	1069070.	-0-	023527.	796420.	1200210.	5543523.	104077.	720226.
40 STABLE GV	-0-	303562.	243975.	1275.	505172.	120500.	105103.	554612.	377012.	09194.
41 FERTILE GV	491499.	1976290.	6503453.	373109.	4790149.	1796759.	2694592.	5017360.	4076114.	1400761.
42 FRCILLS	224250.	3301643.	2110915.	600460.	15330645.	5007015.	14960050.	31461663.	9921052.	4595455.
43 OFFREC	91000.	1603009.	3774362.	1101693.	1636975.	1025070.	4145170.	3900013.	446253.	1210437.
44 TRANSFERS	-0-	1273075.	230494.	90501.	257196.	451627.	909402.	1660091.	32100104.	23310310.
45 IPI-COLO	399007.	2104560.	1349410.	453015.	073307.	617497.	3107943.	1996204.	3031561.	3102202.
46 IPI-WORLD	149742.	208105.	1990156.	606000.	5112707.	1357077.	5932335.	3000794.	3001400.	2716020.
47 TOTAL	7745000.	27260410.	61044597.	11330914.	44913603.	1127194.	64762350.	111346610.	64170500.	52652416.

APPENDIX B-1--Continued

NORTHWESTERN COLORADO GROSS FLOWS TABLE, LIVESTOCK SECTOR NORMALIZED, 1974, DOLLARS

	31	32	33	34	35	36	37	38	39	40
	MEDICAL	SERVIC MEC	SUBTOTAL	HOUSEHOLDS	EDUCATION	SOCIAL SER	LOCAL ROAD	LOC GV NEC	LOC GV TAX	STATE GV
1	FRUIT AG	-0-	249585	327012	-0-	-0-	-0-	-0-	-0-	-0-
2	IRRIG AG	-0-	13564233	201913	-0-	-0-	-0-	-0-	-0-	-0-
3	DRYLAND AG	-0-	784416	-0-	-0-	-0-	-0-	-0-	-0-	-0-
4	CARIY AG	-0-	4964000	145216	-0-	-0-	-0-	-0-	-0-	-0-
5	LIVESTOCK	7653	10825913	-0-	-0-	-0-	-0-	-0-	-0-	10326
6	AG SER-FOR	-0-	7603447	237150	-0-	-0-	-0-	1444	-0-	3446
7	METAL PIN	-0-	4073014	-0-	-0-	-0-	-0-	-0-	-0-	-0-
8	COAL UNDER	-0-	4408200	833217	16536	-0-	-0-	-0-	-0-	-0-
9	COAL STRIP	-0-	5991229	-0-	-0-	-0-	-0-	-0-	-0-	-0-
10	PET-MAT GS	-0-	24618009	-0-	-0-	-0-	-0-	-0-	-0-	-0-
11	ACRNET MIN	-0-	4927742	419736	-0-	-0-	289762	2070	-0-	205421
12	CONSTRUCTN	180771	74285759	3977808	20060	-0-	236250	120294	-0-	14406520
13	FCCO PROC	122375	2021330	7610602	394640	-0-	-0-	17196	-0-	16740
14	WCOD PROD	-0-	2063764	83409	-0-	-0-	-0-	-0-	-0-	8018
15	FRINE-PUB	309050	4212091	851783	16152	3432	6025	95602	-0-	11025
16	CCCAFETE	-0-	420212	574099	-0-	-0-	14339	0206	-0-	457991
17	FAE PETALS	-0-	2679955	-0-	-0-	-0-	82297	15223	-0-	3310
18	ELECTRONIC	-0-	223002	-0-	-0-	-0-	-0-	-0-	-0-	-0-
19	PFC MEC	78342	3327734	4131215	64060	6230	39069	59547	-0-	115693
20	TRANSPORT	70072	30701430	4746786	87500	5366	4857	20036	-0-	95300
21	POSTAL SER	12251	1645416	2746009	28794	12203	1430	104260	-0-	17940
22	COMMUNICAT	415109	11200034	1410247	50409	13696	17399	160395	-0-	66733
23	ELIC-GE UT	10017	29493103	12000556	981369	10703	333645	106400	-0-	170203
24	HAIR-SAN	70035	2060070	5174104	357	357	10139	147137	2526659	3374
25	WOLESALE	296662	15290010	11224322	277341	2026	652309	79204	-0-	254503
26	GS-AUT DLR	76062	2740251	1059593	62972	6057	30709	52436	-0-	112325
27	EAI-DR-LOD	690	125490	21593415	14077	-0-	1239	3502	-0-	7095
28	TRAGUE REC	241343	7717939	87210269	144343	6002	15026	101423	-0-	150097
29	FINANCE	45300	1404537	26267646	1764070	-0-	202744	511200	-0-	-0-
30	INS-R EST	009455	32174553	21070275	704139	-0-	100735	240032	-0-	191900
31	MEDICAL	2230331	2440344	33255600	23503	42690	212067	212067	642050	12343394
32	SERVIC MEC	1101314	31975710	24120014	300969	17300	90499	699350	-0-	1056111
33	SUEICATL	7144294	376209174	303303006	5300172	141305	2057203	2045334	3319517	25717257
34	FOUSEHCLDS	21079591	309220044	3220000	34035063	757621	5327700	9695500	-0-	11046491
35	EDUCATION	-0-	17220	3001934	127530	-0-	242	4116	21003362	24957135
36	SOCIAL SER	-0-	0	-0-	18563	920	-0-	6006	1236059	6334089
37	LOCAL ROAD	-0-	40002	141549	-0-	-0-	102693	-0-	4650515	6647116
38	LOC GV NEC	-0-	1740300	1093822	54233	40753	245635	504516	14040566	1206653
39	LOC GV TAX	500216	20045940	16747066	-0-	-0-	-0-	-0-	-0-	-0-
40	STATE GV	440663	13693307	40125431	3016765	-0-	40	262260	-0-	1104151
41	FEDERAL GV	1360814	90717059	85427763	12900	43722	309511	411200	-0-	290305
42	FRUITTS	24772216	14402484	251260364	4550609	297163	243907	6079055	3673151	3340402
43	DEPREC	1200554	59834350	-0-	-0-	-0-	-0-	-0-	-0-	-0-
44	TRANSFERS	027703	66331697	20497700	659316	6315732	93750	221906	-0-	40931004
45	IFI-CULO	2454037	127156656	65766917	1937022	6901	641259	737942	-0-	2215525
46	IFI-WORLD	3003521	159505231	162271604	2890344	18550	1425341	1271102	-0-	1544705
47	TOTAL	65370001	1491901160	728110444	54325477	7622040	12717521	22640055	49651170	127511753

APPENDIX B-1--Continued  
NORTHWESTERN COLORADO GROSS FLOWS TABLE, LIVESTOCK SECTOR NORMALIZED, 1974, DOLLARS

	41	42	43	44	45	46	47
	FEDERAL GV	SHALE R+D	INVESTMENT	TRANSFERS	EXP-COLO	EXP-WORLD	TOTAL
1 FRUIT AG	-0-	-0-	-0-	-0-	2020170	5781432	8346927
2 IRREG AG	-0-	-0-	2700952	-0-	3375468	6514441	26364287
3 ORLAND AG	-0-	-0-	-0-	-0-	202605	7799180	8786289
4 DAIRY AG	-0-	-0-	-0-	-0-	-0-	-0-	5189210
5 LIVESTCK	-0-	-0-	-0-	-0-	59115303	2971668	88923218
6 AG SER+FOR	-0-	-0-	67206	-0-	18437	12808	7943218
7 METAL MIN	-0-	-0-	13784908	-0-	2314454	20535088	41428284
8 COAL UNDER	-0-	-0-	-0-	-0-	7613837	29458824	42381874
9 CCAL STRIP	-0-	-0-	191312	-0-	14838173	848826	21861548
10 PET-NAT GS	-0-	-0-	682920	-0-	-0-	170365832	195677741
11 ACN+PET MIN	-0-	-0-	28733	-0-	-0-	-0-	9845472
12 CONSTRUCTN	673679	3623488	189198054	1463176	-0-	-0-	288882112
13 FCCD PROC	-0-	4927	246389	-0-	12488822	11779242	35379888
14 WOOD PROD	-0-	7332	2423873	-0-	2666588	5388437	13412821
15 FRINT-PUB	1659	13953	-0-	-0-	38876	885715	6137173
16 CONCRETE	194346	12867	2748959	-0-	543124	91778	12985873
17 FAB METALS	-0-	771356	-0-	-0-	1128586	2125581	6798236
18 ELECTRONIC	-0-	142534	815228	-0-	563302	20584773	22258839
19 IFC NEC	49185	127897	352971	-0-	3844563	12231926	24385698
20 TRANSPGRT	2191849	44155	-0-	-0-	15331489	5623334	58818678
21 POSTAL SER	2343250	5500	-0-	-0-	43884	88820	7885880
22 COMMUNICAT	65439	81354	-0-	-0-	316129	936577	27268416
23 ELEG-GS UT	247489	43844	-0-	-0-	7668487	9893310	61842597
24 WATER-SAN	166694	37419	281816	-0-	-0-	-0-	11338999
25 WHEELSALR	251569	62227	11976160	-0-	3418396	6422450	49919589
26 GS-AUT DLR	47753	83891	6939918	1104698	1153267	1292960	32227188
27 EAT-DR-LDD	55694	7564	-0-	-0-	15431476	31243763	69762358
28 TRADE NEC	71675	48092	2694210	356220	4331742	8401188	11346618
29 FINANCE	2874381	-0-	-0-	-0-	458287	3925699	68178588
30 IAS-R EST	12833	1197792	9884482	154012	1414705	5907688	58652916
31 MEDICAL	3669272	8053	10853557	18853557	1177926	584825	65378889
32 SERVICE NEG	834842	365536	188162	8886518	15845882	13188743	98865912
33 SUBTOTAL	18745829	6658981	165842133	22818171	178550486	364741552	1491981188
34 HOUSEHCLDS	18284382	4585892	-0-	337879295	1377396	-0-	1728138444
35 EDUCATION	2752474	-0-	-0-	-0-	944815	546881	54325477
36 SOCIAL SER	18812	-0-	-0-	-0-	-0-	14749	7622846
37 LCCD ROAD	1348484	-0-	-0-	-0-	7162	-0-	12717521
38 LCC GV NEC	2978278	-0-	-0-	-0-	16555	38744	22848855
39 LCC GV TAX	-0-	78956	-0-	-0-	1752424	3827984	49853170
40 STATE GV	58342378	15142	1689115	-0-	5618886	127511753	127511753
41 FEDERAL GV	1904576	66183677	-0-	-0-	3809714	257896866	197995425
42 PROFITS	18322820	75075	-0-	-216817528	-0-	100683163	197995425
43 CEFREC	-0-	-0-	-0-	-0-	-0-	-0-	58834358
44 TRANSFERS	148897616	53183	-0-	-0-	207439	283035197	283035197
45 IPI-COLO	1933312	2161682	8512316	63875927	4592412	9012247	288491588
46 IPI-ACHLD	1764093	4821771	39358675	75279332	1393124	2521268	489293633
47 TOTAL	257856266	84544353	214714743	281035197	204246067	532189547	6071257285







APPENDIX B-2--Continued

NORTHWESTERN COLORADO DIRECT REQUIREMENTS PER DOLLAR OF OUTPUT, LIVESTOCK SECTOR NORMALIZED

	21	22	23	24	25	26	27	28	29	30
1	POSTAL SER	COMMUNICAT	ELEC-GS UT	WATER-SAN	WHOLESALE	GS-AUT OLR	EAT-DR-LOD	TRADE MEC	FINANCE	IMS-R EST
2	FRUIT AG	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	IRRIG AG	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	ORYLAND AG	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	DATRY AG	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	LIVESTOCK	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	AG SER,FOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	METAL FIN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	CCAL UNDER	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	CCAL STRIP	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	PET-WAT GS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	NCMNET MIN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	CONSTRUCTN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	WCCD PROD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	PRINT-FUB	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	CCNGRETE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	FAE PETALS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	ELECTRCHIC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	MFG NEC	0.00162	0.01141	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	TRANSPORT	0.00487	0.02170	0.00109	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	FCSTAL SER	0.00000	0.00214	0.00109	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	COMMUNICAT	0.00361	0.01307	0.00264	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	ELEC-GS UT	0.00613	0.00553	0.00466	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	WATER-SAN	0.00353	0.00257	0.00160	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	MCHLSALE	0.01521	0.00823	0.00293	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
26	GS-AUT OLR	0.00000	0.00350	0.00152	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	EAT-DR-LOD	0.00000	0.00235	0.00045	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
28	TRADE MEC	0.00191	0.00534	0.00330	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	IMS-R EST	0.00000	0.00690	0.00347	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
30	MEDICAL	0.00000	0.00346	0.00146	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
31	SERVIC MEC	0.11009	0.00000	0.00010	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
32	HOUSEHOLDS	0.76910	0.07004	0.07106	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
33	EDUCATION	0.00000	0.34711	0.20031	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
34	SOCIAL SER	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
35	LCCAL ROAD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
36	LCC GV NEC	0.00000	0.00650	0.00267	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
37	LCC GV TAX	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
38	STATE GV	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
39	FEDERAL GV	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
40	PRCFTS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
41	DEFREC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
42	TRANSFERS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
43	TRF-COLO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
44	TRF-WORLU	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
45		0.02135	0.07614	0.03210	0.05345	0.04211	0.00504	0.02769	0.05630	0.04632

APPENDIX B-2--Continued

NORTHWESTERN COLORADO DIRECT REQUIREMENTS PER DOLLAR OF OUTPUT, LIVESTOCK SECTOR NORMALIZED

	31	32	33	34	35	36	37	38	39	40
	MEDICAL	SERVIC NEC	HOUSEHOLDS	EDUCATION	SOCIAL SER	LOCAL ROAD	LOC CV MEC	LOC CV TAX	STATE CV	FEDERAL CV
1	FRUIT AG	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
2	IRRIQ AG	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
3	CRYLANC AG	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
4	DAIRY AC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
5	LIVESTOCK	0.00117	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
6	AG SER FOR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
7	METAL MIN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
8	COAL UNDER	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
9	COAL STRIP	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
10	PEI-NAT GS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
11	MCAMET MIN	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
12	CCS TRUCTN	0.02765	0.02962	0.00576	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
13	FCLO PROC	0.01872	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
14	MCOO PROD	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
15	FRINT-PUB	0.00339	0.04058	0.00170	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
16	CCNGFETE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
17	FAB PETALS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
18	ELECTRONIC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
19	MFG NEC	0.01190	0.00953	0.00574	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
20	TRANSPRT	0.01072	0.07653	0.06519	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
21	FCSTAL SER	0.04601	0.01273	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
22	CCPMUNICAT	0.06351	0.07635	0.01477	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
23	ELEC-GS UT	0.00721	0.13684	0.17714	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
24	WATER-SAN	0.01194	0.01527	0.00718	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
25	WHOLESALE	0.04508	0.15082	0.15415	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
26	CS-AUT DLR	0.00116	0.00925	0.02956	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
27	EAT-DR-LOD	0.00011	0.01396	0.02657	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
28	TRADE NEC	0.00192	0.00236	0.11703	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
29	FINANCE	0.06566	0.11763	0.36075	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
30	INS-R EST	0.13006	0.11113	0.30047	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
31	MEDICAL	0.34241	0.00000	0.45822	0.00433	0.00000	0.00000	0.00000	0.00000	0.00000
32	SERVIC NEC	0.10071	0.43123	0.33138	0.00197	0.00000	0.00000	0.00000	0.00000	0.00000
33	HOUSEHOLDS	0.53060	0.27803	0.04422	0.64229	0.99300	0.41632	0.00000	0.00000	0.00000
34	EDUCATION	0.00000	0.00252	0.00413	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
35	SOCIAL SER	0.00000	0.00000	0.00194	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
36	LCCAL ROAD	0.00000	0.00000	0.00152	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
37	LCC GV NEC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
38	LCC GV TAX	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
39	STATE GV	0.06131	0.03153	0.05107	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
40	FEDERAL GV	0.20017	0.30911	0.11734	0.00239	0.00576	0.00000	0.00000	0.00000	0.00000
41	PROFITS	0.37053	0.15064	0.36449	0.00376	0.38963	0.30114	0.73976	0.01057	0.063209
42	LEPNEC	0.10365	0.41487	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
43	TRANSFERS	0.12663	0.00430	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
44	IPF-CGLO	0.45189	0.06019	0.00322	0.012663	0.02057	0.009720	0.00000	0.00000	0.00000
45	IPF-MCRLD	0.45953	0.254484	0.22058	0.05315	0.00916	0.05423	0.00000	0.00000	0.00000

APPENDIX B-2---Continued

NORTHWESTERN COLORADO DIRECT REQUIREMENTS PER DOLLAR OF OUTPUT, LIVESTOCK SECTOR NORMALIZED

	41	42	43	44	45
	SHALE S+D	INVESTMENT	TRANSFERS	EXP-COLO	EXP-WORLD
1	0.00000	0.00000	0.00000	0.00000	0.00000
2	0.00000	0.00000	0.00000	0.00000	0.00000
3	0.00000	0.00000	0.00000	0.00000	0.00000
4	0.00000	0.00000	0.00000	0.00000	0.00000
5	0.00000	0.00000	0.00000	0.00000	0.00000
6	0.00000	0.00000	0.00000	0.00000	0.00000
7	0.00000	0.00000	0.00000	0.00000	0.00000
8	0.00000	0.00000	0.00000	0.00000	0.00000
9	0.00000	0.00000	0.00000	0.00000	0.00000
10	0.00000	0.00000	0.00000	0.00000	0.00000
11	0.00000	0.00000	0.00000	0.00000	0.00000
12	0.00000	0.00000	0.00000	0.00000	0.00000
13	0.00000	0.00000	0.00000	0.00000	0.00000
14	0.00000	0.00000	0.00000	0.00000	0.00000
15	0.00000	0.00000	0.00000	0.00000	0.00000
16	0.00000	0.00000	0.00000	0.00000	0.00000
17	0.00000	0.00000	0.00000	0.00000	0.00000
18	0.00000	0.00000	0.00000	0.00000	0.00000
19	0.00000	0.00000	0.00000	0.00000	0.00000
20	0.00000	0.00000	0.00000	0.00000	0.00000
21	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000
23	0.00000	0.00000	0.00000	0.00000	0.00000
24	0.00000	0.00000	0.00000	0.00000	0.00000
25	0.00000	0.00000	0.00000	0.00000	0.00000
26	0.00000	0.00000	0.00000	0.00000	0.00000
27	0.00000	0.00000	0.00000	0.00000	0.00000
28	0.00000	0.00000	0.00000	0.00000	0.00000
29	0.00000	0.00000	0.00000	0.00000	0.00000
30	0.00000	0.00000	0.00000	0.00000	0.00000
31	0.00000	0.00000	0.00000	0.00000	0.00000
32	0.00000	0.00000	0.00000	0.00000	0.00000
33	0.00000	0.00000	0.00000	0.00000	0.00000
34	0.00000	0.00000	0.00000	0.00000	0.00000
35	0.00000	0.00000	0.00000	0.00000	0.00000
36	0.00000	0.00000	0.00000	0.00000	0.00000
37	0.00000	0.00000	0.00000	0.00000	0.00000
38	0.00000	0.00000	0.00000	0.00000	0.00000
39	0.00000	0.00000	0.00000	0.00000	0.00000
40	0.00000	0.00000	0.00000	0.00000	0.00000
41	0.00000	0.00000	0.00000	0.00000	0.00000
42	0.00000	0.00000	0.00000	0.00000	0.00000
43	0.00000	0.00000	0.00000	0.00000	0.00000
44	0.00000	0.00000	0.00000	0.00000	0.00000
45	0.00000	0.00000	0.00000	0.00000	0.00000

APPENDIX B-3  
 NORTHWESTERN COLORADO DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR DELIVERED TO FINAL DEMAND  
 LIVESTOCK SECTOR NORMALIZED  
 (Households in Processing Sector)

	1	2	3	4	5	6	7	8	9	10
	FRUIT AG	IRRIG AG	DRYLAND AG	DAIRY AG	LIVESTOCK	AG SER,FOR	METAL MIN	COAL UNDER	COAL STRIP	PET-NAT GS
1	1.0002	.0001	.0001	.0001	.0003	.0001	.0002	.0002	.0001	.0000
2	.0026	1.0015	.0023	.4455	.1117	.0059	.0009	.0010	.0006	.0002
3	.0000	.0001	1.0001	.0000	.0121	.0000	.0000	.0010	.0000	.0000
4	.0006	.0003	.0003	1.0004	.0000	.0004	.0006	.0007	.0004	.0002
5	.0003	.0103	.0071	.0000	1.2534	.0003	.0003	.0004	.0002	.0001
6	.3245	.0405	.0366	.0416	.0290	1.0004	.0052	.0000	.0002	.0000
7	.0000	.0000	.0000	.0000	.0000	.0000	1.1333	.0000	.0000	.0000
8	.0007	.0005	.0004	.0006	.0006	.0006	.0015	1.0965	.0009	.0006
9	.0010	.0014	.0014	.0022	.0020	.0015	.0020	.0020	1.1024	.0026
10	.0043	.0035	.0034	.0053	.0050	.0037	.0077	.0049	.0077	.0079
11	.0004	.0003	.0004	.0002	.0006	.0002	.0010	.0044	.0007	.0003
12	.0066	.0000	.0140	.0055	.0172	.0041	.0100	.0102	.0234	.0106
13	.0036	.0019	.0017	.0029	.0205	.0025	.0039	.0045	.0026	.0010
14	.0001	.0001	.0001	.0001	.0001	.0001	.0394	.0042	.0002	.0000
15	.0020	.0019	.0026	.0019	.0025	.0004	.0000	.0023	.0014	.0015
16	.0006	.0005	.0007	.0004	.0009	.0002	.0000	.0017	.0011	.0005
17	.0002	.0017	.0012	.0009	.0015	.0002	.0000	.0057	.0132	.0035
18	.0000	.0000	.0000	.0000	.0000	.0000	.0005	.0001	.0000	.0000
19	.0000	.0001	.0133	.0067	.0107	.0061	.0039	.0040	.0031	.0010
20	.1102	.0360	.0009	.0104	.0147	.0096	.0727	.1352	.0320	.0203
21	.0022	.0016	.0016	.0015	.0020	.0016	.0019	.0021	.0014	.0006
22	.0126	.0090	.0135	.0001	.0116	.0110	.0122	.0136	.0079	.0030
23	.0247	.0203	.0195	.0305	.0207	.0212	.0440	.0204	.0444	.0376
24	.0141	.0297	.0015	.0144	.0161	.0020	.0033	.0042	.0026	.0011
25	.0200	.0607	.0007	.0379	.0005	.0296	.0097	.0123	.0104	.0161
26	.0100	.0104	.0006	.0070	.0095	.0105	.0103	.0123	.0075	.0035
27	.0106	.0052	.0049	.0054	.0069	.0077	.0111	.0129	.0079	.0030
28	.0416	.0211	.0225	.0222	.0300	.0291	.0440	.0510	.0279	.0131
29	.1090	.0049	.1761	.0901	.1410	.0213	.0205	.0222	.0135	.0132
30	.0341	.0241	.0479	.0161	.0301	.0153	.0200	.0420	.0191	.0064
31	.0157	.0075	.0066	.0079	.0099	.0110	.0103	.0206	.0119	.0042
32	.0570	.0440	.0730	.0920	.0576	.0370	.0240	.0204	.0100	.0100
33	.3306	.1560	.1301	.1665	.2003	.2312	.3603	.4157	.2397	.0000

APPENDIX B-3--Continued  
 NORTHWESTERN COLORADO DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR DELIVERED TO FINAL DEMAND  
 LIVESTOCK SECTOR NORMALIZED  
 (Households in Processing Sector)

	11	12	13	14	15	16	17	18	19	20
	NONMET MIN	CONSTRUCTN	FOOD PROC	WOOD PROD	PRINT-PUB	CONCRETE	FAB METALS	ELECTRONIC	MFG MEC	TRANSPORT
1	FRUIT AG	.0001	.0002	.0006	.0002	.0001	.0002	.0002	.0001	.0002
2	IRRIG AG	.0004	.0010	.0004	.0015	.0007	.0011	.0011	.0004	.0009
3	ORLAND AG	.0000	.0000	.0009	.0000	.0000	.0000	.0000	.0000	.0000
4	DAIRY AG	.0003	.0007	.1454	.0006	.0000	.0000	.0000	.0003	.0006
5	LIVESTCK	.0002	.0004	.0092	.0003	.0002	.0004	.0004	.0002	.0007
6	AG SER-FOR	.0002	.0012	.0174	.1266	.0002	.0004	.0003	.0001	.0003
7	PETAL FIN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	COAL UNDER	.0007	.0007	.0010	.0010	.0006	.0009	.0000	.0007	.0006
9	COAL STRIP	.0020	.0012	.0026	.0019	.0013	.0019	.0015	.0024	.0009
10	PET-NAT GS	.0050	.0020	.0064	.0071	.0030	.0046	.0036	.0059	.0021
11	NONMET MIN	1.0007	.0322	.0030	.0018	.0045	.0018	.0006	.0002	.0004
12	CCASRUCTM	1.4667	1.4667	.0116	.0703	.0167	.0710	.0123	.0030	.0030
13	FCCD PROD	.0017	.0045	1.0357	.0037	.0052	.0040	.0049	.0019	.0001
14	HCCD PROD	.0004	.0071	.0001	.0012	.0001	.0010	.0001	.0001	.0001
15	FRINT-PUB	.0033	.0033	.0022	.0023	.0026	.0029	.0024	.0011	.0024
16	CONCRETE	.0012	.0500	.0007	.0031	1.0020	.0032	.0009	.0014	.0014
17	FAB PETALS	.0090	.0046	.0016	.0009	.0004	1.0004	.0000	.0002	.0002
18	ELECTRONIC	.0114	.0005	.0030	.0117	.0000	.0030	1.0000	.0000	.0000
19	PFG MEC	.0022	.0072	.0057	.0034	.0103	.0020	.0040	.0026	.0065
20	TRANSPORT	.0050	.0240	.0269	.0301	.0226	.0525	.0143	.0307	1.0192
21	POSTAL SER	.0023	.0023	.0019	.0022	.0097	.0029	.0155	.0010	.0020
22	COMMUNICAT	.0110	.0167	.0141	.0123	.0274	.0159	.0176	.0049	.0134
23	ELEC-GS UT	.0207	.0163	.0369	.0409	.0175	.0266	.0209	.0040	.0119
24	WATER-SAN	.0017	.0037	.0066	.0032	.0046	.0042	.0042	.0015	.0029
25	WHOLESALE	.0104	.0150	.0300	.0189	.0126	.0117	.0093	.0006	.0006
26	GS-AUT DLR	.0049	.0153	.0106	.0101	.0125	.0125	.0130	.0031	.0133
27	EAT-DR-LOU	.0005	.0155	.0059	.0107	.0007	.0136	.0130	.0053	.0111
28	TRADE NEC	.0210	.0799	.0085	.0436	.0444	.0546	.0622	.0210	.0402
29	FINANCE	.1030	.0204	.0560	.0302	.0346	.0376	.0240	.0140	.0189
30	INS-R EST	.1320	.0332	.0190	.0193	.0250	.0275	.0261	.0120	.0221
31	PELICAL	.0076	.0201	.0139	.0162	.0124	.0209	.0213	.0002	.0160
32	SERVIC NEC	.0307	.0392	.0430	.0502	.0202	.0443	.0301	.0160	.0453
33	HOUSEHOLDS	.1592	.4154	.2099	.3400	.4757	.4406	.4500	.1703	.3532

APPENDIX B-3--Continued  
 NORTHWESTERN COLORADO DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR DELIVERED TO FINAL DEMAND  
 LIVESTOCK SECTOR NORMALIZED  
 (Households in Processing Sector)

	21	22	23	24	25	26	27	28	29	30
	POSTAL SER	COMMUNICAT	ELEC-GS UT	WATER-SAN	WHOLESALE	GS-AUT DLR	EAT-DR-LOO	TRADE NEG	FINANCE	INS-R EST
1	FRUIT AG	.0005	.0002	.0002	.0002	.0003	.0002	.0002	.0001	.0001
2	IRRIE AG	.0023	.0010	.0009	.0008	.0014	.0010	.0011	.0004	.0007
3	ORYLAND AG	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
4	DAIRY AG	.0016	.0007	.0006	.0006	.0010	.0007	.0006	.0003	.0005
5	LIVESTOCK	.0009	.0004	.0003	.0004	.0005	.0004	.0004	.0002	.0002
6	AG SFR-FDR	.0006	.0003	.0003	.0002	.0004	.0003	.0003	.0001	.0000
7	METAL MIN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	COAL UNDER	.0016	.0008	.0174	.0007	.0011	.0012	.0010	.0004	.0006
9	CCAL STRIP	.0025	.0013	.0094	.0020	.0022	.0033	.0029	.0000	.0013
10	PET-WAT GS	.0059	.0031	.2199	.0060	.0052	.0001	.0054	.0019	.0030
11	HEMMET MIN	.0009	.0004	.0005	.0006	.0007	.0010	.0006	.0002	.0017
12	CCNSTRUCTN	.0149	.0070	.0102	.0200	.0141	.0330	.0140	.0030	.0695
13	FCCD PROC	.0099	.0048	.0039	.0044	.0060	.0046	.0047	.0019	.0029
14	ACCD PROD	.0002	.0001	.0003	.0002	.0001	.0002	.0001	.0000	.0004
15	FRINT-PUB	.0042	.0049	.0029	.0044	.0142	.0090	.0167	.0067	.0139
16	CCONCRETE	.0013	.0006	.0008	.0011	.0011	.0016	.0010	.0003	.0029
17	FAB PETALS	.0004	.0002	.0020	.0003	.0003	.0003	.0003	.0001	.0004
18	ELECTRONIC	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
19	PFC NEG	.0115	.0056	.0044	.0052	.0043	.0036	.0059	.0015	.0054
20	TRANSPORT	.0220	.0009	.0100	.0111	.0922	.0160	.0656	.0045	.0095
21	POSTAL SER	1.0044	.0030	.0029	.0031	.0045	.0032	.0045	.0044	.0029
22	COMMUNICAT	.0203	1.0169	.0175	.0217	.0323	.0439	.0424	.0131	.0230
23	ELEC-GS UT	.0343	1.2720	.0175	.0194	.0303	.0467	.0312	.0100	.0175
24	WATER-SAN	.0077	.0037	.0033	.0394	.0060	.0067	.0054	.0010	.0031
25	WHOLESALE	.0190	.0091	.0121	.0257	.0209	.0015	.0125	.0042	.0139
26	GS-AUT DLR	.0294	.0139	.0135	.0146	1.0102	.0119	.0151	.0050	.0105
27	EAT-DR-LOO	.0277	.0131	.0110	.0122	.0174	1.0132	.0139	.0060	.0179
28	TRADE NEG	.1112	.0519	.0451	.0410	.0693	.0604	1.0540	.0220	.0372
29	FINANCE	.0452	.1104	.0502	.0479	.0576	.0084	.0423	1.0115	.0276
30	INS-R EST	.0351	.0203	.0213	.0271	.0304	.0324	.0476	.0105	1.0500
31	MEDICAL	.0432	.0199	.0172	.0190	.0262	.0201	.0206	.0005	.0125
32	SERVIC NEG	.0564	.0333	.0322	.0447	.0674	.0597	.0597	.0005	.0702
33	HOUSEHOLDS	.9127	.4206	.3615	.4013	.5520	.4233	.4351	.1791	.2629

APPENDIX B-3--Continued  
 NORTHWESTERN COLORADO DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR DELIVERED TO FINAL DEMAND  
 LIVESTOCK SECTOR NORMALIZED  
 (Households in Processing Sector)

	31	32	33
	MEDICAL	SERVIC NEC	HOUSEHOLDS
1	FRUIT AG	.0003	.0002
2	FRIG AG	.0015	.0009
3	ORLANC AG	.0000	.0000
4	DAIRY AG	.0011	.0006
5	LIVESTOCK	.0000	.0011
6	AG SER, FOR	.0004	.0003
7	METAL PIM	0.0000	0.0000
8	CCAL UNDER	.0000	.0019
9	CCAL STRIP	.0015	.0021
10	PET-NAT GS	.0035	.0050
11	ACKPET MIN	.0005	.0011
12	CONSTRUCTN	.0115	.0109
13	FOOD PROC	.0070	.0041
14	ACCD PROD	.0001	.0001
15	PRINT-FIB	.0057	.0064
16	CONCRETE	.0000	.0007
17	FAP PETALS	.0002	.0017
18	ELECTRONIC	.0000	.0000
19	MFG NEC	.0046	.0039
20	TRANSPORT	.1110	.0177
21	POSTAL SER	.0071	.0033
22	COMMUNICAT	.0196	.0191
23	ELEC-GS UT	.0201	.0295
24	WATER-SAM	.0050	.0047
25	WHOLESALE	.0139	.0232
26	CS-AUT DLR	.0136	.0112
27	EAT-DR-LOD	.0140	.0129
28	TRADE NEC	.0597	.0564
29	FINANCE	.0314	.0333
30	IAS-R EST	.0326	.0271
31	MEDICAL	1.0570	.0177
32	SERVIC NEC	.0440	1.0666
33	HOUSEHOLDS	.4560	.1736



APPENDIX B-4  
 NORTHWESTERN COLORADO DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR DELIVERED TO FINAL DEMAND  
 LIVESTOCK SECTOR NORMALIZED  
 (Households in Final Demand)

	1	2	3	4	5	6	7	8	9	10
	FRUIT AG	IRRIG AG	DRYLAND AG	DAIRY AG	LIVESTOCK	AG SER.FOR	METAL MIN	COAL UNDER	COAL STRIP	PET-NAT GS
1	FRUIT AG	1.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
2	IRRIG AG	.0017	1.0012	.0000	.0000	.0000	.0000	.0000	.0000	.0000
3	DRYLAND AG	.0000	.0001	1.0001	.0000	.0000	.0000	.0000	.0000	.0000
4	DAIRY AG	.0000	.0000	.0000	1.0002	.0000	.0000	.0000	.0000	.0000
5	LIVESTOCK	.0000	.0000	.0000	.0000	1.0000	.0000	.0000	.0000	.0000
6	AG SER.FOR	.3243	.0484	.0365	.0296	1.0000	.0000	.0000	.0000	.0000
7	METAL MIN	0.0000	0.0000	0.0000	0.0000	0.0000	1.1333	0.0000	0.0000	0.0000
8	COAL UNDER	.0002	.0002	.0002	.0003	.0002	.0009	1.0958	.0005	.0005
9	COAL STRIP	.0011	.0011	.0011	.0016	.0018	.0024	1.1019	.0019	.0025
10	PET-NAT GS	.0026	.0027	.0027	.0039	.0025	.0060	.0065	.0065	1.0075
11	CONCRETE	.0001	.0001	.0001	.0004	.0000	.0014	.0040	.0004	.0002
12	CONSTRUCN	.0023	.0060	.0130	.0033	.0010	.0052	.0127	.0202	.0034
13	FCCO PROC	.0000	.0002	.0001	.0011	.0000	.0000	.0000	.0000	.0000
14	MCCO PROD	.0000	.0000	.0001	.0000	.0000	.0000	.0001	.0001	.0000
15	PRINT-FUD	.0013	.0012	.0020	.0016	.0009	.0004	.0005	.0003	.0011
16	CONCRETE	.0002	.0002	.0005	.0006	.0000	.0003	.0014	.0000	.0004
17	FAE PETALS	.0002	.0017	.0012	.0009	.0001	.0007	.0056	.0132	.0035
18	ELECTRONIC	.0000	.0000	.0000	.0000	.0000	.0005	.0001	.0000	.0000
19	HFG NEC	.0045	.0071	.0124	.0056	.0046	.0015	.0011	.0015	.0012
20	TRANSPRT	.1039	.0131	.0063	.0072	.0002	.0659	.1213	.0274	.0106
21	POSTAL SER	.0007	.0008	.0009	.0007	.0006	.0026	.0002	.0002	.0002
22	COMMUNICAT	.0038	.0048	.0098	.0037	.0048	.0014	.0025	.0015	.0014
23	ELEC-GS UT	.0153	.0159	.0156	.0257	.0146	.0345	.0165	.0375	.0311
24	WATER-SAN	.0115	.0204	.0004	.0130	.0009	.0045	.0009	.0006	.0003
25	WHOLESALE	.0226	.0657	.0041	.0348	.0253	.0029	.0045	.0059	.0144
26	CS-AUT ULR	.0020	.0062	.0049	.0033	.0044	.0007	.0013	.0011	.0012
27	EAT-OR-LOD	.0006	.0005	.0007	.0004	.0007	.0007	.0003	.0007	.0004
28	TRADE NEC	.0014	.0020	.0050	.0020	.0010	.0011	.0013	.0007	.0024
29	FINANCE	.0938	.0774	.1695	.0821	.0192	.0031	.0020	.0020	.0009
30	INS-R EST	.0215	.0101	.0427	.0222	.0065	.0154	.0262	.0100	.0031
31	MEDICAL	.0000	.0001	.0001	.0000	.0000	.0012	.0009	.0006	.0000
32	SERVIC NEC	.0414	.0372	.0663	.0647	.0258	.0074	.0083	.0064	.0148

APPENDIX B-4--Continued  
 NORTHWESTERN COLORADO DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR DELIVERED TO FINAL DEMAND  
 LIVESTOCK SECTOR NORMALIZED  
 (Households in Final Demand)

	11	12	13	14	15	16	17	18	19	20
	NONMET MIN	CONSTRUCTN	FOOD PROC	WOOD PROD	PRINT-PUB	CONCRETE	FAB METALS	ELECTRONIC	MFG NEC	TRANSPORT
1	FLLT AG	.0000	.0004	.0000	.0000	.0000	.0000	.0000	.0000	.0000
2	IRRIQ AG	.0000	.2001	.0007	.0000	.0000	.0000	.0000	.0000	.0000
3	DRYLANC AG	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
4	DAIRY AG	.0000	.1449	.0000	.0000	.0000	.0000	.0000	.0000	.0000
5	LIVESTCK	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
6	AG SER.FOR	.0000	.0172	.1263	.0000	.0000	.0001	.0000	.0000	.0000
7	METAL PTN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	COAL UNDER	.0003	.0001	.0005	.0004	.0002	.0001	.0001	.0001	.0000
9	COAL STRIP	.0017	.0003	.0020	.0022	.0007	.0010	.0006	.0001	.0000
10	PET-NAT GS	.0042	.0000	.0054	.0021	.0017	.0024	.0014	.0020	.0003
11	NONMET MIN	1.0006	.0310	.0027	.0014	.0352	.0034	.0001	.0001	.0001
12	CONSTRUCTN	.0259	1.4613	.0078	.0005	.0094	.0000	.0064	.0016	.0015
13	FCGO PROC	.0000	.0000	1.0025	.0000	.0000	.0000	.0000	.0000	.0000
14	WCGO PROD	.0004	.0071	.0001	1.0121	.0003	.0009	.0000	.0000	.0000
15	PRINT-PUB	.0026	.0015	.0009	.0008	.0014	.0010	.0004	.0003	.0009
16	CONCRETE	.0010	.0075	.0003	.0026	1.0016	.0026	.0003	.0001	.0009
17	FAB METALS	.0008	.0045	.0015	.0000	.0005	1.0003	.0001	.0001	.0001
18	ELECTRONIC	.0114	.0004	.0000	.0000	.0004	.0000	1.0000	.0000	.0000
19	PFC NEC	.0011	.0044	.0011	.0000	.0006	.0008	.0010	.0000	.0001
20	TRANSPORT	.0020	.0170	.0236	.0136	.0171	.0472	.0050	.0015	.0041
21	FUSTAL SER	.0016	.0003	.0006	.0006	.0006	.0008	.0134	.0002	.0003
22	COMMUNICAT	.0068	.0056	.0064	.0032	.0072	.0041	.0056	.0024	.0040
23	ELEC-GS UT	.1242	.0044	.0206	.0147	.0100	.0006	.0001	.0001	.0010
24	WATER-SAN	.0004	.0000	.0003	.0004	.0008	.0006	.0006	.0001	.0001
25	WHOLESALE	.0074	.0000	.0245	.0125	.0076	.0035	.0009	.0106	.0020
26	GS-AUT DLR	.0006	.0043	.0029	.0011	.0003	.0008	.0010	.0006	.0039
27	EAT-DR-LDD	.0037	.0029	.0011	.0004	.0000	.0003	.0001	.0001	.0004
28	TRADE NEC	.0025	.0294	.0022	.0022	.0125	.0019	.0074	.0012	.0053
29	FINANCE	.0053	.0004	.0420	.0217	.0219	.0163	.0031	.0057	.0010
30	INS-R EST	.1200	.0004	.0007	.0063	.0117	.0100	.0090	.0063	.0006
31	MEDICAL	.0000	.0004	.0002	.0001	.0000	.0000	.0000	.0001	.0001
32	SERVIC NEC	.0310	.0191	.0290	.0417	.0155	.0230	.0162	.0070	.0202

APPENDIX B-4--Continued  
 NORTHWESTERN COLORADO DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR DELIVERED TO FINAL DEMAND  
 LIVESTOCK SECTOR NORMALIZED  
 (Households in Final Demand)

	21	22	23	24	25	26	27	28	29	38
	POSTAL SER	COMMUNICAT	ELEC-GS UT	WATER-SAN	WHOLESALE	GS-AUT DLR	EAT-DF-LOD	TRADE NEC	FINANCE	INS-R EST
1	FRUIT AG	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
2	IRRIG AG	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
3	DAYLAND AG	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
4	DAIRY AG	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
5	LIVESTOCK	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
6	AG SER-FOR	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
7	METAL MIN	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
8	COAL UNDER	.0001	.0168	.0004	.0001	.0002	.0005	.0002	.0001	.0001
9	COAL STRIP	.0006	.0006	.0020	.0007	.0010	.0024	.0020	.0004	.0007
10	PET-NAT GS	.0014	.2101	.0010	.0016	.0025	.0006	.0032	.0010	.0017
11	NONPET MIN	.0001	.0002	.0004	.0003	.0002	.0006	.0002	.0000	.0014
12	CCNSTRUCTN	.0029	.0054	.0147	.0142	.0068	.0274	.0091	.0015	.0660
13	FCCO PROC	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
14	WCCC PROD	.0000	.0000	.0001	.0001	.0000	.0001	.0000	.0000	.0003
15	PRINT-PUB	.0001	.0013	.0027	.0020	.0118	.0031	.0148	.0059	.0126
16	CCNCFETE	.0001	.0003	.0006	.0006	.0003	.0002	.0004	.0001	.0026
17	FAF METALS	.0001	.0019	.0002	.0002	.0002	.0002	.0002	.0000	.0004
18	ELECTRNIC	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
19	FFG NEC	.0053	.0019	.0025	.0002	.0046	.0007	.0030	.0003	.0037
20	TRANSPORT	.0056	.0111	.0035	.0061	.0069	.0000	.0573	.0012	.0046
21	PCSTAL SER	1.0000	.0018	.0023	.0016	.0019	.0012	.0024	.0016	.0016
22	COMMUNICAT	.0039	.0070	.0060	.0132	.0176	.0326	.0300	.0083	.0160
23	ELEC-GS UT	.0002	1.2617	.0280	.0103	.0145	.0346	.0100	.0057	.0100
24	WATER-SAN	.0004	.0004	1.0357	.0005	.0023	.0033	.0019	.0003	.0010
25	WGCLESBLE	.0019	.0053	.0102	1.0044	.0106	.0235	.0044	.0009	.0009
26	GS-AUT DLR	.0051	.0019	.0024	.0060	1.0035	.0006	.0035	.0003	.0003
27	EAT-CR-LOU	.0000	.0009	.0007	.0025	.0006	1.0004	.0000	.0005	.0009
28	TRADE NEC	.0004	.0012	.0002	.0020	.0021	.0000	1.0020	.0000	.0053
29	FINANCE	.0011	.0320	.2364	.0324	.0309	.0679	.0213	1.0029	.0149
30	INS-R EST	.0004	.0074	.0119	.0074	.0174	.0163	.0310	.0037	1.0400
31	MEDICAL	.0000	.0001	.0000	.0010	.0000	.0000	.0000	.0000	.0000
32	SERVIC NEC	.0122	.0147	.0756	.0292	.0406	.0392	.0386	.0410	.0655

APPENDIX B-4--Continued  
 NORTHWESTERN COLORADO DIRECT AND INDIRECT REQUIREMENTS PER DOLLAR DELIVERED TO FINAL DEMAND  
 LIVESTOCK SECTOR NORMALIZED  
 (Households in Final Demand)

	31	32
	MEDICAL	SERVIC NEC
1	FRUIT AG	.0000
2	IRRIG AG	.0004
3	ORLAND AG	.0000
4	DAIRY AG	.0000
5	LIVESTCK	.0003
6	AG SER, FOR	.0000
7	METAL PIN	0.0000
8	COAL UNDER	.0001
9	COAL STRIP	.0005
10	PET-MAT GS	.0012
11	MCNET MIN	.0001
12	CCSTRUCIN	.0055
13	FCCD PROC	.0020
14	MCCD PROC	.0000
15	PRINT-PUB	.0037
16	CCCRETE	.0002
17	FAE METALS	.0001
18	ELECTRONIC	.0000
19	PFG NEC	.0015
20	TRANSPRT	.0024
21	FCSTAL SER	.0049
22	CCMUNICAT	.0074
23	ELEC-GS UT	.0071
24	WATER-SAM	.0014
25	WHCLESAL	.0053
26	GS-AUT DLK	.0014
27	EAT-DR-LOH	.0002
28	TRADE NEC	.0043
29	FINANCE	.0094
30	IFS-R EST	.0153
31	PECCAL	1.0355
32	SERVIC NEC	.0220
		1.0485

## APPENDIX C

### CRITIQUE OF DATA SOURCES

#### Introduction

Data gathered for the Northwestern Colorado interindustry study were secured from a wide variety of primary and secondary sources. As previously explained, data from secondary sources were basically used to provide tentative estimates of total gross output levels for the respective sectors delineated in the study. As the study progressed it was discovered that particular secondary sources could not be used for such estimation purposes. The reasons for this are quite specific and vary depending on the source. Primary data were used extensively to estimate the gross flows matrix; they were also used to estimate a level of total gross output for several of the sectors. Thus, the purpose of this section is to criticize the various data sources and specifically explain how the data and any attending problems were handled in the study. The discussion commences with an overview of the primary sources. Following this, the section is divided by SIC division descriptions with each containing an identification of relevant data sources, comment on the adequacy of the data for the Northwestern Colorado interindustry study, and mention of how the data were handled.

Following the discussion is a complete listing, in bibliographic form, of data sources cited. Reference numbers in the text of this section refer to the sequence numbers of this list, not the bibliography

entries at the conclusion of the report. Following each entry is an abbreviated annotation in brackets. The SIC numbers in the annotation indicate that data pertinent to that respective SIC classification are contained in the source cited; a verbal description is used when SIC numbers are not appropriate.

#### Primary Sources

Data from primary sources can be classified into two categories: first, information obtained directly from economic producers, and second, information obtained from the files of government agencies, trade associations, and others who receive report forms from economic producers. As indicated previously, data obtained directly from economic producers were secured through the interview process; a mail questionnaire was not employed in the Northwestern Colorado inter-industry study.

Table C-1 lists interviewing rates for each sector. The rates refer to the percentage of total employment accounted for. In select instances a rate is given for the percentage of total gross output accounted for; in these cases, data were largely secured from filed or published financial statements and supplemented when necessary by select interviews. Interview rates are not listed for the agricultural and livestock sectors; data identifying gross flows for these sectors were largely secured from the Cooperative Extension Service, Department of Economics, Colorado State University. Specifically, the Extension Service data pertained to estimated costs of producing particular crops and animals, not the aggregate expense levels of individual farm

TABLE C-1

## INTERVIEW RATES, NORTHWESTERN COLORADO INTERINDUSTRY STUDY

Sector	Percentage of Total Employment Accounted For	Percentage of Total Gross Output Accounted For*
1. FRUIT AG	**	-
2. IRRIG AG	**	-
3. DRYLAND AG	**	-
4. DAIRY AG	**	-
5. LIVESTOCK	**	-
6. AG SER, FOR	8.446	-
7. METAL MIN	82.956	-
8. COAL UNDER	76.442	-
9. COAL STRIP	48.571	-
10. PET-NAT GS	3.867	-
11. NONMET MIN	37.143	-
12. CONSTRUCTN	10.621	-
13. FOOD PROC	82.054	-
14. WOOD PROD	53.171	-
15. PRINT-PUB	29.412	-
16. CONCRETE	39.100	-
17. FAB METALS	70.213	-
18. ELECTRONIC	69.553	-
19. MFG NEC	63.130	-
20. TRANSPORT	56.063	-
21. POSTAL SER	-	94.726
22. COMMUNICAT	72.222	-
23. ELEC-GS UT	65.114	-
24. WATER-SAN	40.563	-
25. WHOLESALE	3.673	-
26. GS-AUT DLR	.945	-
27. EAT-DR-LOD	.206	-
28. TRADE NEC	1.071	-
29. FINANCE	-	62.208
30. INS-R EST	-	10.725
31. MEDICAL	44.368	-
32. SERVIC NEC	.345	-
33. EDUCATION	43.473	-
34. SOCIAL SER	59.483	-
35. LOCAL ROAD	21.151	-
36. LOC GV NEC	30.920	-
37. LOC GV TAX	-	100.000
38. STATE GV	-	100.000
39. FEDERAL GV	71.117	-
40. SHALE R+D	80.534	-

\*In these cases, data were largely secured from filed or published financial statements and supplemented when necessary by select interviews.

\*\*Information pertinent to these sectors was obtained from the Cooperative Extension Service, Department of Economics, Colorado State University.

operators. A description of the sector identification labels used in Table C-1 is found in Appendix A.

Examination of the interview rates in Table C-1 shows relatively high rates for the extractive sectors with the exception of petroleum and gas. John Peterson and Oded Rudawsky of the Colorado School of Mines had just completed a rather extensive study of minerals and energy in Colorado about the time the research for this inquiry was commencing (40). Because some sixty percent of Colorado's crude production and nearly thirty-eight percent of the state's natural gas extraction occurs in Northwestern Colorado, the decision was made to use the basic findings of Pederson and Rudawsky and limit the interviewing for this sector. The limited interviewing that did occur was highly selective and for the express purpose of securing information necessary for the modification of published results of the Pederson and Rudawsky study.

Relatively high interview rates are also observed in the manufacturing, utilities, finance, and medical care sectors as well as the tax supported sectors, education, social services, local and county roads and bridges, local and county governments, the State of Colorado, and the Federal Government. Relatively moderate rates appear for agricultural services, construction, and insurance and real estate. Low rates are observed for the remaining trade and service sectors. As explained previously, the purpose of the Northwestern Colorado study did not warrant extensive delineation of sectors such as trade, services, finance, and insurance and real estate. Further, the study was conducted under a financial and time constraint. Thus, when the interviews were conducted it was decided to place more emphasis on certain sectors and



less on others. It is contended that no significant inaccuracies in the model result from this procedure since, in most cases, purchases from and sales to these sectors may be obtained from intensive examination of other sectors. For example, by concentrating on utilities it was comparatively easy to determine the kilowatt hours of electricity used by the trade sectors; the cost of securing this same information from the trade sectors could not be justified. What has been sacrificed is the convenience of a double check which would be provided by intensive interviews in both sectors.

Special comment on the data secured from the Colorado Department of Labor and Employment is warranted (10). Employment and wage information contained in the reports of each employer in the state is placed on reels of computer tape for processing by the Department. The Colorado Manpower Review (9) publishes a summary of this data for the state and the Denver-Boulder Labor Market Area; detailed information for individual counties does not ordinarily get published. Accordingly, the information pertinent to employment and earnings in Northwestern Colorado had to be obtained directly from the Colorado Department of Labor and Employment. The computer tapes released for use in the Northwestern Colorado inter-industry study covered the reports of calendar years 1972 and 1973 and the first three quarters of 1974. This presented some difficulty because the Northwestern Colorado study was designed to cover calendar year 1974. Further, the Colorado Department of Labor and Employment uses 1967 SIC descriptions at the four-digit level to classify firms; the Northwestern Colorado study used 1972 SIC codes. Still other difficulties were presented by what appeared to be obvious misclassification of firms (this is especially true at the four-digit level) and keypunch errors, not to

mention a change in report procedure between 1973 and 1974. The ramifications of this latter can be shown by an example from SIC 4213, trucking except local. In calendar 1973, SIC 4213 firms in the nine counties covered by this study were reported as having paid less than \$100,000 in wages; in the first three quarters of 1974 the corresponding wage payments are shown as being nearly \$2.6 million. The point is, considerable effort was required to modify Colorado Department of Labor and Employment data before it could be used. These adjustments were made on a case-by-case basis and did not follow a specific formula.

Serious difficulties were not encountered with the information secured from the files and inhouse reports of other government agencies, trade associations, and other organizations (5,7,19,22,23,24,25,29,31, 38,44,68, and 77). The data were not always in the form requested but were sufficiently detailed so that, with slight modifications, they were quite useful. Specific comment on these data and others follows in the respective SIC divisions.

#### Agriculture and Forestry

Before proceeding, a comment on the sector delineation of agriculture and livestock will facilitate an understanding of why certain data, though readily available, was not considered for inclusion in the Northwest Colorado study. As indicated previously, the design of the Northwestern Colorado model anticipated possible future use for water studies. Accordingly, irrigated crops were treated separately from dryland. Also, pecuniary losses suffered by livestock producers warranted treating livestock separately. Explicitly then, these sectors are delineated on a product basis, not an enterprise basis. Thus,

documents, such as the Federal Census of Agriculture (49), which report on an enterprise basis were not directly considered in the study.

Of all economic sectors in Northwest Colorado, agriculture has the most current and detailed data. The most versatile document in terms of securing individual crop data on an individual county basis is the Colorado Agricultural Statistics publication (1). Issued annually by the Colorado Department of Agriculture, it separates dry production from irrigated, publishes detail on major state crops, and identifies the production levels in respective counties. Specific limitations are nonetheless inherent in the tabular presentations. For example, crops are reported on a production and market value basis; and there is a difference between market value and market receipts. The implication of this is not too severe for crops when virtually all production is marketed; this is not the case with hay, however, the major crop in Northwestern Colorado. Total gross output in the Northwestern Colorado model is defined in terms of market receipts; so an adjustment of the value of the hay crop, as reported in Colorado Agricultural Statistics, was made. Specifically, the ratio of hay marketings reported in the 1969 Federal Census of Agriculture to the 1969 market value of hay reported in Colorado Agricultural Statistics was applied to the latter's 1974 report.

The Colorado Agricultural Statistics also has a tendency to aggregate certain "minor" crops not only across crop lines but also county lines. For example, potatoes are identified for Morgan, Weld, and the respective counties in the San Luis Valley; one value is then reported for the rest of the state. Hence, while potatoe production is not important in Northwestern Colorado, precise documentation of that fact is not possible because of aggregated reporting for crops.

Fruit production, on the other hand, is extremely important in select counties in Northwestern Colorado; yet the production of individual fruit crops is reported at the state level in the Colorado Agricultural Statistics. Publications such as Colorado Fruit Tree Survey (3) and Colorado Peach Tree Survey (4) were used in this instance to prorate the state production. Further, there were some upward price adjustments made based on information secured while interviewing packers.

Other particular adjustments were not attempted on the irrigated and dry agricultural output as reported by Colorado Agricultural Statistics. The publication is not well enough documented to determine whether or not an adjustment is warranted. Further, all production indices available are for the entire state and are highly aggregated (2).

Procedures employed to secure and report information are not documented in Colorado Agricultural Statistics. A regional analyst must be concerned with the quality of data but really has no basis for judgment without supporting documentation. For example, onion production is reported in Colorado Agricultural Statistics for the Western Slope (no county delineation); the Bureau of Reclamation also reports onion production in the annual publication of Water and Land Resource Accomplishments for farms served by the Grand Valley and Uncompahgre projects (71) and (72). The Bureau's report suggests there is a definite element of randomness involved, i.e., both acreage planted and production yields vary over time. By contrast, the acreages reported by Colorado Agricultural Statistics are rather consistent. It should also be mentioned that in certain years the Bureau's publication reports considerably more acreage for farms served by the above two projects

than the state publication does for the entire Western Slope; and for the counties involved, the authors suggest that it makes a considerable difference in the aggregate value of marketings.

Data on the value of marketings of livestock is reported in Colorado Agricultural Statistics for final marketings only. Further, the data are reported at the state level. Thus, not only are interfarm transactions not reported, but the relative value of individual county output cannot be directly determined. Thus, the value of the total gross output of the livestock sector in the Northwestern Colorado interindustry study was determined from information secured from the Cooperative Extension Service, Department of Economics, Colorado State University.

As indicated when discussing interview rates in this chapter, determination of the gross flows for agriculture and livestock production was highly dependent on information secured from the Cooperative Extension Service. This was supplemented with data published in Cost of Producing Crops in the Irrigated Southwest (82) and information supplied by the Northwest Colorado Agri-Business Association (38) and Tri River Agri-Business Farm Management Association (44). Government payments to the agricultural sectors were determined from the Agricultural Stabilization and Conservation Service, Annual Report - Colorado (45).

Data on the employment of labor in the agricultural sectors is not readily available from published sources. The estimate of the dollars paid for wages in each of the sectors was based on the Cooperative Extension Service information. The number of people employed in agriculture in Northwestern Colorado as identified in the 1970 Census of

Population (59) was taken as a proxy value to obtain an employment coefficient. Some coefficient value was required by the computer program that was used to manipulate data for the employment analysis portion of this study. Thus, the employment coefficient is the same for all agricultural sectors.

The aggregate value for agricultural services was estimated by using the Cooperative Extension Service information and checked for consistency by interview. The Colorado Forest Products Directory (27) does not identify any great number of firms in the forestry sector of the Northwestern Colorado economy. Thus, the total gross output estimate for the forestry sector was made based on information secured in one interview.

In summary, adequate data do appear to exist for the agricultural sectors of the Northwestern Colorado economy. However, particular concern is noted for the high level of aggregation in some cases, a lack of published interfarm transaction values for livestock, and lack of good data on employment. Also, it appears that there is a general lack of documentation, a deficiency which must be overcome in order to judge the quality of the data.

### Mining

Publications by the Federal Government were not considered for inclusion in the mining division of the Northwestern Colorado inter-industry study. At the national level, and sometimes the state level, information pertaining to mining production quantities and values can be secured. Because of the characteristically small number of operators, information on specific minerals in specific counties is

rarely published. Examples of Federal publications for which this is largely true are: Census of Minerals Industries (58); Minerals Yearbook (70); Statistical Data of the Uranium Industry (75); and Uranium Exploration Expenditures and Plans (76).

State of Colorado documents were relied upon quite extensively, but not without reservation. The most comprehensive, yet the most limiting, state document is A Summary of Mineral Industry Activities in Colorado (13). This publication lists production by mineral value and by county. Listing by mineral value has several very specific limitations. For some outputs the unit price is not always given; thus quantity calculation becomes difficult, if not nearly impossible. Where unit price is given it is always applied to all production; thus, for example, the market value for metallurgical coal is published as being equal to the market value for other types of coal. The unit price for ores refers to a refined market value; thus when ore is subject to reduction away from the county in which it was mined, the value accruing to the mining county is overstated. One last criticism is leveled at the practice in the publication of adding nearly \$50 million to the value of state mineral production and footnoting it as minerals mined out of, but refined in, the state; no indication is given as to what the minerals are or where they are refined.

Data are available monthly in the Monthly Report (15) and annually in Coal (14) on the production of coal. Tonnage values, labor employed, and days worked are reported for every coal mine in the state. Barrels of oil pumped, cubic feet of gas produced, and the volume of injections are published for every well in the state in Oil and Gas Statistics (17).

Thus, the researcher is left with the task of determining a unit value when information on coal, oil, and gas is secured from these sources.

As indicated in the comments on interview rates (Table C-1) earlier in this chapter, the Pederson and Rudawsky study, "The Role of Minerals and Energy in the Colorado Economy," was used as a data source in the mining division, especially as it related to oil and gas production. A publication that complemented Oil and Gas Statistics when identifying potential interviewees for the oil and gas sector was the Rocky Mountain Petroleum Directory (81).

In the final analysis, the total gross output values used in the mining division of the Northwestern Colorado interindustry study were estimated based on information gained by interviewing. Federal publications fail to publish sufficient information at the county level and state publications leave much to be desired with respect to unit pricing. Furthermore, state documents do not necessarily identify the economic production that takes place in some counties.

#### Construction

Mention of originally underestimating the total gross output for the construction sector is made previously; how total gross output was finally determined for the Northwestern Colorado interindustry study is explained in Footnote 46 of Chapter II (page 25). The original underestimation emanated from insufficient data. Specifically, publications such as the Census of Construction Industries (50) and (51) and the Construction Review (65) aggregate on the state level and hence are inadequate for estimation of activities in individual counties. The publication, Construction Reports - Housing Authorized by Building



Permits and Public Contracts (63), though county specific, fails to account for all construction. Further, the reference accounts for permits and contracts authorized during a given period. In a relatively small county there is not necessarily sufficient volume to either avoid "lumpy" reporting or maintenance of the assumption that level of work in a given period is equal to the dollar value of the authorizations. Finally, the Construction Reports do not suggest how much of the job is involved with various types of contractors so that an estimate of value of intersector transactions can be made. In conclusion, the authors saw no alternative but to estimate total gross output for the construction sector from primary data.

#### Manufacturing

The 1972 Census of Manufacturers (57) published detail for the electric and electronic machinery, equipment, and supplies (SIC 36) sector in Mesa County; this accounts for about one-fifth the total manufacturing activity in that county. No other detail was published for Mesa County or for any of the other counties in Northwestern Colorado. County Business Patterns (64) is fairly complete in a broad sense but still quite restrictive in what detail is published. Disclosure requirements preclude publishing critical information and result in a high degree of aggregation. Even in those sectors where the data are published, limitations are imposed because seasonal variations (e.g., as in food processing) are not reflected in the first quarter reporting. Finally, County Business Patterns still employs 1967 SIC code definitions. As a result, neither of these publications were of much use for the Northwestern Colorado interindustry study. In fact,

levels of output for the manufacturing sectors in the Northwestern Colorado economy had to be estimated from primary data.

The Directory of Colorado Manufacturers (79), published annually by the Bureau of Economic and Business Research (University of Colorado), was used extensively in the determination of which manufacturers to interview. The publication identifies firms by four-digit SIC classification, location, and employment range. Key personalities are also identified. Some information in the Directory of Colorado Manufacturers is quite dated, but the document is nonetheless an invaluable reference.

Before interviewing a given owner or manager, an attempt was always made to gain a "feel" for the type of firm that was involved. For example, secondary research was done on what the output per worker might be and what might be expected in terms of value added. A publication quite often referred to for answers to these types of questions was the Annual Survey of Manufacturers (48). Though the information contained therein was not directly used in the Northwestern Colorado study it did provide for an ongoing consistency check. Specifically, the document contains, on a four-digit SIC basis, ratios pertaining to inputs and outputs of the manufacturing sectors of the national economy.

In summary, detailed secondary data do not exist for manufacturing activities in Northwestern Colorado. Aggregate levels of economic activity for individual sectors must be determined from primary data and checked for consistency by observing secondary data.

Transportation, Communications, Electric,  
Gas, and Sanitary Services

Secondary data for the transportation, communications, electric, gas, and sanitary services sectors is quite available and generally speaking, of fairly good quality. Despite this, almost none of it was used in the Northwestern Colorado study. The reasons for this are largely in the nature of the filing system at the Colorado Public Utilities Commission (PUC) (23) and methods employed prior to seeking an interview with any given firm. Specifically, before any single interview was conducted an attempt was made to learn as much as possible about the firm in question. This meant that for firms in the public utilities sectors the research started with an examination of the reports filed with the PUC. The PUC reports were readily accessible so they were also used to estimate levels of total gross output where applicable. For those cases in which the PUC does not have jurisdiction, because municipal owned enterprises are involved, estimates were made based on information filed with the Colorado State Auditor (24). Bureau of Reclamation power activities were estimated based on interview. Despite the above mentioned relatively high incidence of direct information, secondary data sources still merit comment.

The Interstate Commerce Commission publishes materials pertaining to various forms of transportation on a regional basis: examples are Transport Statistics in the United States: Pipelines (36) and Transport Statistics in the United States: Motor Carriers (37). These types of documents were not really helpful in the Northwestern Colorado study because their use necessitates a significant amount of prorating. A

similar argument holds for documents published by the Federal Aviation Administration. As a result, the best alternative was to estimate the level of economic activity in the transportation sector from PUC reports and information gained in interviews.

United States Postal Service (U.S.P.S.) revenues were determined by examining postal receipt schedules for each post office in Northwestern Colorado. Since Congress created the independent U.S.P.S., postal receipts for individual post offices are no longer published. Accordingly, this information was obtained directly from the Sectional Center Facility (SCF) managers (77). The SCF manager in Grand Junction was interviewed to gain information on the expense patterns for the U.S.P.S. Despite the accuracy of this information, it is suggested that the regional accounting perspective can lead to an erroneous conclusion about the U.S.P.S. specifically, in earlier discussion, it was explained that the postal sector's total gross output was defined in terms of an expense level rather than a revenue level. The reason for doing this is that the imputed postal revenue for Northwestern Colorado is higher than the actual revenue but it is not known by how much higher. For example, Mountain Bell mails statements to Grand Junction customers from Denver; the actual revenue for the U.S.P.S. is identified with the Denver Post Office, yet a portion of the expenses connected with the handling of those statements is absorbed by the Grand Junction Post Office. Thus, a portion of the actual Denver revenue imputes to Grand Junction.

Information on rural telephone systems can be obtained from the Annual Statistical Report: Rural Telephone Borrowers (47). Territorial integrity for rural systems in Northwestern Colorado is such that the

information is straightforward and does not have to be allocated. Mountain Bell's activities, on the other hand, had to be estimated by prorating the various revenues and charges identified in their annual report to the Colorado PUC. This was greatly facilitated by having additional information supplied directly by the company. Radio and television activities were estimated by prorating data contained in the Federal Communications Commission's Annual Report (30). Specifically, the data identified revenue for stations outside the metropolitan area. The basis for allocation was the volume of retail sales as identified in the Annual Report (21) of the Colorado Department of Revenue.

Published secondary data were of limited use for estimating electric and gas revenues. For example, examination of Annual Statistical Report: Rural Electric Borrowers (46) does not reveal that Moon Lake Electric Association (Utah) has significant operations in Northwestern Colorado. Information contained in Statistics of Publicly Owned Electric Utilities in the United States (34) is reported on a company basis and Northwestern Colorado is only part of the territory of the Public Service Company of Colorado. Statistics of Publicly Owned Electric Utilities in the United States (35) does not identify all the municipal operations in Northwestern Colorado. Finally, the Bureau of Reclamation's power activities cannot be reasonably estimated by using the information contained in Water and Land Resource Accomplishments: Summary Report (72). Thus, the estimation of total gross output for the electricity and natural gas sector was determined by the information obtained from PUC reports, the State Auditor, and interviews.

The water, sewerage, and sanitary services sector is characterized by a high incidence of special tax districts. Complete information on

the activities of these districts is not published anywhere. Thus the audit reports filed with the Colorado State Auditor were examined in detail to secure information for this sector. For those instances where private enterprise is involved, the information was obtained at the PUC office.

In summary, though considerable information is published for the transportation, communications, electric, gas, and sanitary services sectors, problems associated with excessive aggregation, territorial integrity, and incomplete reporting precluded use of the information in the Northwestern Colorado interindustry study.

#### Trade - Wholesale and Retail

As indicated previously, examination of Robert Morris Associates' Annual Statement Studies (42) suggested that to arrive at any meaningful coefficients for the trade sectors a rather exhaustive and detailed study of the trade sectors would have been warranted. Considering the time and financial constraint imposed on the research such a detailed study could not be justified. Accordingly, very little primary data were secured for the trade sectors in the Northwestern Colorado interindustry study.

Secondary data sources used to estimate the levels of total gross output included the Census of Wholesale Trade (62), The Census of Retail Trade (60), and the Colorado Department of Revenue's Annual Report (21). Both Census publications referred to calendar year 1972, used 1972 SIC classifications, and needed updating to reflect 1974 conditions. Difficulties encountered in this activity emanated from the Colorado Department of Labor and Employment data being classified

by 1967 SIC codes and the lack of price indices for Colorado. The Department of Revenue report is classified by 1967 SIC descriptions and pertains to a fiscal year. Other problems associated with the use of the Department of Revenue report stem from the failure to identify the ratio of tax exempt sales at the county level and what appears to be a rather significant understatement of the volume of wholesale activities. The total gross output values were thus estimated as follows. Mean values were calculated for each trade sector using two annual reports of the Colorado Department of Revenue; the state exemption ratio for each respective sector was used to increase reported county retail sales; output values were shifted to conform to 1972 SIC descriptions by using ratios describing the relationship between Colorado labor data for 1972 and the wholesale and retail census for 1972.

Select interviews were used to gain information relative to what values should be used for regional flows and margining of the trade sectors. Further, information contained in publications such as "Economic Impact of Alternative Energy Supply Policies in Colorado" (26) and "An Interindustry Analysis of the Colorado River Basin in 1960 with Projections to 1980 and 2010" (78) was used to routinely check for consistency. Given these limitations, caution must be expressed in regard to the accuracy of the coefficients in the trade sector. It is recommended that an in-depth study of this sector, employing primary data collection techniques, be undertaken in the near future.

#### Finance, Insurance and Real Estate

Secondary data on the activities of commercial banks is contained in Sheshunoff and Company's The Banks of Colorado (43). This is a

privately printed industry publication that shows the balance sheet and income statement for each bank in the state. A source such as Bank Operating Statistics (32), published by the Federal Deposit Insurance Corporation, aggregates information by region; none of these regions correspond to the delineation of Northwestern Colorado. Accordingly, the Sheshunoff data was used to identify the level of economic activity for commercial banks.

Savings and Loan Association data are published in Combined Financial Statements - Member Savings and Loan Associations of the Federal Home Loan Bank System (33). Association activities are identified by state total, metropolitan area, and the area outside the metropolitan area. Thus, to estimate total gross output for savings and loan associations, the activity outside the metropolitan area was prorated to Northwestern Colorado by using the personal adjusted gross income figures reported in the Colorado Department of Revenue's Annual Report (21). Information pertaining to the activities of the Federal Credit Banks' operations was gained from filed reports (31).

Insurance activities were estimated from information gained largely from interview. The Colorado Division of Insurance publishes the Insurance Industry in Colorado: Statistical Report (20). This document identifies, on a company basis and a line basis, premiums earned and losses incurred. As a first approximation the difference between premiums and losses was prorated by population to estimate Northwestern Colorado insurance activity. This first approximation was then modified based on information gained in interviews.

Real estate activities were estimated by first obtaining the value of documentary fees paid in each of the nine counties (29). From the



documentary fees paid an estimate was made of the transaction values involved and a six percent commission was allowed on the same. The estimated commissions were used in turn as the approximation for the total gross output of the real estate sector.

In summary, direct information pertaining to finance, insurance, and real estate does not exist in published form for Northwestern Colorado. Estimates must be made using a combination of published secondary data and information gained from primary sources.

### Services

Data sources for services are grouped into three categories for discussion purposes. The first part of the discussion will focus on data sources pertinent to the health and medical care field; the second pertains to data sources for the education sector; and final portion comments on data sources for all other services.

Information pertaining to institutional health care was secured directly from the providers of the services. These providers include the Veterans Administration Hospital, the State Home, private and public hospitals, and nursing homes. Contact with the nursing homes was facilitated by an interview with the Colorado Health Care Association (25). A partial list of hospitals and nursing homes in the region is contained in the Directory - Medicare Providers and Suppliers of Services (66).

The value of services provided by physicians, dentists, optometrists, and others was estimated by using secondary information. For a first approximation, information contained in "National Health Expenditures" (28) was adjusted by using the index values published in

Medicare: Health Insurance for the Aged - Geographical Index of Reimbursement by State and County (67). The resulting figure was then adjusted based on information gained in interviews and secured from the Colorado State Department of Health (7), the Colorado Department of Social Services (22), and the Social Security Administration (68).

With the exception of information on junior colleges, data are readily available for education activities in Northwestern Colorado. Data pertaining to junior colleges and Mesa College were secured directly from the respective institutions. The Colorado Commission on Higher Education (CCHE) (5) provided information on other institutions of higher education in Northwestern Colorado. Revenues and Expenditures: Colorado School Districts (6), published annually by the Colorado Department of Education, was used to identify the level of total gross output for public schools. This document is rather comprehensive and identifies revenues and expenditures for each school district in the state. Data secured from the CCHE and the Department of Education's revenue and expenditure report were supplemented with information gained in interviews. Because of the high quality data described above, the Bureau of the Census data contained in Finances of School Districts (55) were not used in the Northwestern Colorado inter-industry study.

The information contained in Census of Selected Service Industries (61) was used as a first approximation of the total gross output for all other services. Colorado Department of Labor and Employment data were used to update the census data to an approximation of 1974 conditions. Concomitantly, the data that pertained to dental laboratories in this publication were removed to the health and medical care sector.

Membership organizations, museums, research services, accounting services, and miscellaneous services not elsewhere classified are not included in the Census of Selected Service Industries. Accordingly, the following approximations were arbitrarily made. Approximately 266 people are employed by membership organizations and receive about \$950,000; the payroll value was multiplied by three to approximate the total economic activity of this sector. Museum activities were identified in the financial statements of the various governments and were allowed to remain there. Research and accounting services account for approximately 198 employees and an annual payroll of \$1,413,901. The productivity rates observed for law offices in the Census of Selected Service Industries were applied to this payroll value.

As with the trade sectors, very little primary information was collected for the services not elsewhere classified sector. Accordingly, given this limitation, caution is expressed with regard to the accuracy of the coefficients in this sector in the Northwestern Colorado inter-industry study. Further, it is recommended that an in-depth study of the sector be conducted employing primary data collection techniques.

#### Public Administration

Rather extensive information on local and county government activities is contained in the Bureau of Census publications, Compendium of Government Finances (52), Finances of County Governments (53), Finances of Municipalities and Township Governments (54), and Compendium of Public Employment (56). Two considerations precluded the use of these documents in the Northwestern Colorado interindustry study. First, the desire to have even more detailed data to facilitate the separation

of local and county government enterprises. Second, preliminary investigation suggested that the dollar increase in a number of local and county government budgets was rather significant between 1972 and 1974.

Secondary data published by the state were used extensively during the preliminary stages of the research but were later replaced with primary data. The Local Government Financial Compendium (11) does not list expenditures and revenues for communities under 1,000 people. Further, the publication does not account for special tax districts. The Division of Property Taxation's Annual Report to the Governor and the Legislature (12) identifies valuations, levies, and property tax revenues for every local tax authority. The Colorado Department of Revenue's Annual Report (21) contains information sufficient to estimate local sales tax collections. Though each publication contains good quality data, the Northwestern Colorado study eventually used the files of the State Auditor. The audit reports filed here are more complete, more detailed, and more extensive in coverage than the state publications.

Data pertaining to the total expenditures of the State of Colorado were secured directly from the Colorado Department of Planning and Budget (19). A recent executive order had caused all state budgets to be regionalized according to the various planning regions in the state. Though the planning regions do not conform to the delineation of the Northwestern Colorado interindustry study, the budget regionalization greatly facilitated the search for data on state expenditures. Information on tax payments to the State of Colorado is contained in the Department of Revenue's Annual Report (21). An estimation of revenues

from hunting and fishing licenses was made based on information in Colorado Big Game Harvest (16). Revenue generated because of activities on state lands was estimated by using the State Board of Land Commissioners' Summary of Transactions (18).

Following the collection of the above data, interviews were arranged with the agencies that made significant expenditures in behalf of the State of Colorado. Scheduling the expense patterns of the Colorado Department of Highways was greatly facilitated by the use of Colorado's Annual Highway Report (8). In summary, the data secured on the State of Colorado pecuniary activities in Northwestern Colorado were not difficult to obtain and are rather comprehensive.

Revenues accruing to the Federal Government account were largely estimated by prorating from a Colorado base. The Treasury publication, Combined Statement of Receipts, Expenditures and Balances of the United States Government for the Fiscal Year Ended June 30, 1975 (73), identified revenue by state and by category. Thus the figure published for Colorado was adjusted by using information in the Colorado Department of Revenues' Annual Report (21) and the Treasury's Statistics of Income 1969, Zip Code Area Data from Individual Income Tax Returns (74). This first approximation was then adjusted by using information gained from the Forest Service, the Bureau of Land Management, the Bureau of Reclamation, and the publication Public Land Statistics (69).

For a first approximation of Federal expenditures, data were secured from Federal Outlays in Colorado (39). This publication shows estimates for Federal outlays by agency and by county. Many of the estimates are prorated by using standardized criteria. Thus, the research for the Northwestern Colorado interindustry study sought to

estimate Federal expenditures independently. Some documents, such as the Veterans Administration's Annual Report (80) and the Railroad Retirement Board's Annual Report (41), were examined and the data so secured prorated to Northwestern Colorado. This practice was too limiting so more direct information was obtained. Specifically, the major agencies were contacted: these include the Social Security Administration, the Bureau of Reclamation, the Bureau of Land Management, the Geological Survey, the Forest Service, and the Energy Research and Development Administration. The Veterans Administration Hospital and the United States Postal Service, as mentioned earlier, were also contacted.

In summary, the data on Federal Government revenues are approximations derived largely from state totals. The data pertaining to Federal expenditures are largely estimations based on information gained in interviews.

Households were not interviewed for the Northwestern Colorado study. Further, the data pertaining to household income and expenses are a direct result of the estimations made for the income and expenses of the other sectors in the study.

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APPENDIX D

COMPONENTS OF TRANSFER, DEPRECIATION, AND INVESTMENT ACCOUNTS

- D-1 COMPONENTS OF TRANSFER ACCOUNT ROW
- D-2 COMPONENTS OF TRANSFER ACCOUNT COLUMN
- D-3 COMPONENTS OF DEPRECIATION ACCOUNT ROW
- D-4 COMPONENTS OF INVESTMENT ACCOUNT COLUMN

## APPENDIX D-1

## COMPONENTS OF TRANSFER ACCOUNT ROW

<u>Column Headed</u>	<u>Dollars Charged</u> <u>Transfer Account</u>	<u>Explanation</u>
1. FRUIT AG	36,380	insurance loss pool
2. IRRIG AG	145,512	insurance loss pool
3. DRYLAND AG	124,852	insurance loss pool
4. DAIRY AG	2,217	insurance loss pool
5. LIVESTOCK	352,403	insurance loss pool
6. AG SER, FOR	37,768	insurance loss pool
7. METAL MIN	457,297	insurance loss pool
8. COAL UNDER	569,225	insurance loss pool
9. COAL STRIP	157,501	insurance loss pool
10. PET-NAT GS	122,578	insurance loss pool
11. NONMET MIN	35,393	insurance loss pool
12. CONSTRMGTN	1,466,344	insurance loss pool
13. FOOD PROC	70,750	insurance loss pool
14. WOOD PROD	44,107	insurance loss pool
15. PRIN-PUB	27,812	insurance loss pool
16. CONCRETE	71,119	insurance loss pool
17. FAB METALS	37,006	insurance loss pool
18. ELECTRONIC	160,607	insurance loss pool
19. MFG NEC	115,347	insurance loss pool
20. TRANSPORT	350,870	insurance loss pool
22. COMMUNICAT	166,858	insurance loss pool
	1,107,017	pension plan
23. ELEC-GS UT	238,494	insurance loss pool
24. WATER-SAN	90,501	insurance loss pool
25. WHOLESALE	257,196	insurance loss pool
26. GS-AUT DLR	451,622	insurance loss pool
27. EAT-DR-LOD	909,502	insurance loss pool
28. TRADE NEC	1,668,591	insurance loss pool
29. FINANCE	64,522	insurance loss pool
	32,035,582	interest payments
30. INS-R EST	133,606	insurance loss pool
	23,184,712	insurance financial surplus
31. MEDICAL	827,783	insurance loss pool
32. SERVIC NEC	810,623	insurance loss pool
34. HOUSEHOLDS	20,497,708	insurance loss pool
35. EDUCATION	655,316	insurance loss pool
36. SOCIAL SER	13,305	insurance loss pool
	6,302,427	transfer monies for households
37. LOCAL RD	93,750	insurance loss pool
38. LOC GV NEC	221,996	insurance loss pool
40. STATE GV	6,213,372	transfer monies for households
	34,717,632	Colorado financial surplus
41. FEDERAL GV	75,158,074	transfer monies for households
	71,739,542	Federal financial surplus
42. SHALE R&D	53,183	insurance loss pool
45. EXP-COLO	829,756	insurance loss pool
46. EXP-WORLD	207,439	insurance loss pool
	<u>283,035,197</u>	TOTAL



## APPENDIX D-2

## COMPONENTS OF TRANSFER ACCOUNT COLUMN

<u>Row Headed</u>	<u>Dollars From Transfer Account</u>	<u>Explanation</u>
12. CONSTRUCTION	1,463,176	insurance loss pool
26. GS-AUT DLR	1,104,696	insurance loss pool
28. TRADE NEC	356,220	insurance loss pool
30. INS-R EST	154,012	insurance loss pool
31. MEDICAL	10,853,557	insurance loss pool
32. SERVIC NEC	8,086,510	insurance loss pool
34. HOUSEHOLDS	6,459,332	insurance loss pool
	6,302,427	social service transfer payments
	6,213,372	State transfer payments
	75,158,074	Federal transfer payments
	243,746,090	close profits, rent, interest, and dividends into households
42. PROFITS	-243,746,090	close profits, rent, interest, and dividends into households
	27,728,562	interest paid by finance
45. IMP-COLO	1,170,017	communication pension plan
	4,307,020	interest paid to out of region concerns
	23,184,712	insurance financial surplus
	34,717,632	Colorado financial surplus
	496,546	insurance loss pool
46. IMP-OUT	71,739,542	federal financial surplus
	<u>3,539,790</u>	insurance loss pool
	283,035,197	TOTAL

## APPENDIX D-3

## COMPONENTS OF DEPRECIATION ACCOUNT ROW

<u>Column Headed</u>	<u>Dollars Charged Depreciation Account</u>	<u>Dollars that are Depreciation</u>	<u>Dollars that are Net Inventory Depletion</u>
1. FRUIT AG	235,611	235,611	-
2. IRRIG AG	1,821,805	1,821,805	-
3. DRYLAND AG	1,907,829	1,107,757	800,072
4. DAIRY AG	374,506	374,506	-
5. LIVESTOCK	4,869,137	4,869,137	*
6. AG SER, FOR	303,626	303,626	-
7. METAL MIN	3,002,424	2,908,117	94,037
8. COAL UNDER	2,556,281	2,556,281	-
9. COAL STRIP	1,283,731	1,283,731	-
10. PET-NAT GS	6,074,743	6,074,743	-
11. NONMET MIN	367,113	266,991	100,122
12. CONSTRUCTN	2,862,594	2,862,594	-
13. FOOD PROC	1,003,560	1,003,560	-
14. WOOD PROD	699,941	699,941	-
15. PRINT-PUB	647,329	647,329	-
16. CONCRETE	527,396	527,396	-
17. FAB METALS	173,873	147,165	26,708
18. ELECTRONIC	526,995	526,995	-
19. MFG NEC	1,028,042	1,023,717	4,325
20. TRANSPORT	2,977,096	2,977,096	-
21. POSTAL SER	91,000	91,000	-
22. COMMUNICAT	3,681,009	3,681,009	-
23. ELEC-GS UT	3,774,362	3,765,180	9,182
24. WATER-SAN	1,301,693	1,250,683	51,010
25. WHOLESALE	1,636,975	1,636,975	-
26. GS-AUT DLR	1,025,076	1,025,076	-
27. EAT-DR-LOD	4,145,778	4,094,758	51,020
28. TRADE NEC	3,900,013	3,900,013	-
29. FINANCE	446,253	446,253	-
30. INS-R EST	1,210,437	1,210,437	-
31. MEDICAL	1,200,554	1,200,554	-
32. SERVIC NEC	4,177,576	4,177,576	-
33. SUBTOTAL	59,834,358	58,697,612	1,136,746*

\*In the Livestock loss model, net inventory depletion was estimated to be \$9,667,518. In the Livestock normalized model net inventory depletion was assumed to be zero. The depreciation charges are the same for both models.

## APPENDIX D-4

## COMPONENTS OF INVESTMENT ACCOUNT COLUMN

<u>Row Headed</u>	<u>Dollars Charged Investment Account</u>	<u>Dollars that are Investment</u>	<u>Dollars that are Net Inventory Accumulation</u>
2. IRRIG AG*	2,708,952	-	2,708,952
6. AG SER, FOR	67,286	-	67,286
7. METAL MIN	13,704,988	-	13,704,988
9. COAL STRIP	191,312	-	191,312
10. PET-NAT GS	692,920	-	692,920
11. NONMET MIN	20,733	-	20,733
12. CONSTRUCTN	109,195,054	109,195,054	-
13. FOOD PROC	246,309	-	246,309
14. WOOD PROD	2,423,673	2,217,909	205,764
16. CONCRETE	2,748,959	2,626,619	122,340
18. ELECTRONIC	815,228	-	815,228
19. MFG NEC	352,971	352,971	-
24. WATER-SAN	201,816	201,816	-
25. WHOLESALE*	11,976,160	11,010,340	965,820
26. GS-AUT DLR	6,935,918	6,488,840	447,078
28. TRADE NEC	2,694,210	1,769,154	925,056
30. INS-R EST	9,884,482	9,884,482	-
32. SERVIC NEC	181,162	-	181,162
33. SUBTOTAL*	165,042,133	143,747,185	21,294,948
40. STATE GV	1,809,615	1,809,615	-
45. IMP-COLO*	8,512,316	7,494,775	1,017,541
46. IMP-WORLD*	39,350,679	35,520,367	3,830,312
47. TOTAL	214,714,743	188,571,942	26,142,801

\*Figures are for the livestock normalized model; livestock loss model figures are below.

2. IRRIG AG	3,663,197	-	3,663,197
25. WHOLESALE	12,315,809	11,010,340	1,305,469
33. SUBTOTAL	166,336,027	143,747,185	22,588,842
45. IMP-COLO	8,657,467	7,494,775	1,162,692
46. IMP-WORLD	39,951,942	35,520,367	4,431,575
47. TOTAL	216,755,051	188,571,942	28,183,109

APPENDIX E

SURVEY FORM USED FOR NORTHWESTERN COLORADO INTERINDUSTRY STUDY

COLORADO  
STATE UNIVERSITY  
PORT COLLINS  
COLORADO  
80521

Department of Economics

## QUESTIONNAIRE

## North-West Colorado Inter-industry Analysis

This questionnaire is designed to enable you to provide us, in as simple a form as possible, a detailed account of your firm's purchases and sales in 1974. The specific focus of the analysis is the component of that activity occurring in the nine county N.W. Colorado region comprised of Delta, Eagle, Garfield, Mesa, Moffat, Montrose, Pitkin, Rio Blanco and Routt counties.

This information will be handled in strictest confidence. Your responses will be aggregated with those of other firms in your sector, eliminating the possibility that any single firm's responses will be identifiable.

Please note:

1. We are particularly interested in obtaining data which are a reasonable representation of your firm's current operation. Data for a fiscal or calendar year 1974 or later are preferred. In the event that data are not available in this form, please use any consecutive twelve months since 1973 (please indicate).
2. You may indicate sales and purchases in dollar amounts or percentages.
3. When exact data are not available, please use estimates. If it is not possible to provide information for certain questions, please indicate.

Name of Firm: \_\_\_\_\_

What is your major product(s) or service(s)? If convenient, list the appropriate SIC classification(s). \_\_\_\_\_

What was the total number of employees you had at any one time in 1974?

Full Time: \_\_\_\_\_ Part Time: \_\_\_\_\_

Please indicate the value of your establishment's sales in 1974. TOTAL SALES:

\$ \_\_\_\_\_

Please indicate the value of your establishment's purchases in 1974.

TOTAL PURCHASES: \$ \_\_\_\_\_

Please indicate the value of your establishment's net inventory change in 1974. (This may be a positive or negative figure.) NET INVENTORY CHANGE: \$ \_\_\_\_\_

At what level of output capacity did your establishment operate during 1974?

LEVEL OF CAPACITY UTILIZATION: % \_\_\_\_\_

What is your estimate of your establishment's total water use for all phases of your operation? (Note: please use any convenient unit of measurement; e.g., gallons per day, 1000 gallons per day, acre feet per year, etc.)

TOTAL WATER INTAKE: \_\_\_\_\_



## PURCHASES ANALYSIS

SUPPLY SOURCE; SECTORS FROM WHICH YOU PURCHASE	PURCHASES IN N.W. COLORADO COUNTIES \$ or % of Total	PURCHASES FROM OTHER COLORADO COUNTIES \$ or % of Total	PURCHASES OUTSIDE COLORADO \$ or % of Total
1. IRRIGATED AGRICULTURE			
2. DRYLAND AGRICULTURE			
3. LIVESTOCK; RELATED PRODUCTS (dairy and poultry products; honey; animal specialties; etc.)			
4. AGRICULTURAL SERVICES (veterinary, custom forestry, field work, etc.)			
5. METAL MINING; RELATED SERVICES			
6. COAL MINING; RELATED SERVICES			
7. OIL AND GAS EXTRACTION; RELATED SERVICES			
8. SHALE OIL EXTRACTION; RELATED SERVICES			
9. NON-METALLIC MINING; RELATED SERVICES			
10. ALL CONSTRUCTION			
11. FOOD AND KINDRED PRODUCTS (processed foods for human and animal consumption)			
12. LUMBER; WOOD PRODUCTS (loggers, sawmills, cabinet shops, miscellaneous wood products manufacturers)			
13. PRINTING AND PUBLISHING; PAPER AND ALLIED PRODUCTS (includes newspaper advertising, etc.)			
14. CHEMICALS; PETROLEUM REFINERS; RUBBER MANUFACTURERS			
15. STONE, GLASS, CLAY PRODUCT MANUFACTURERS			
16. FABRICATED METALS; NON-ELECTRICAL MACHINERY MANUFACTURERS			
17. ELECTRICAL MACHINERY AND EQUIPMENT; TRANSPORTATION EQUIPMENT; ELECTRONIC INSTRUMENTS AND COMPONENTS MANUFACTURING			
18. ALL OTHER MANUFACTURERS (Jewelry, precious metals, musical instruments, sporting goods, etc.)			
19. TRANSPORTATION: AIRLINES, BUS LINES, RAILROADS, TRUCK LINES, AMBULANCES, U.P.S., R.E.A., etc.			
20. U. S. POSTAL SERVICE (postage, mail box rental, etc.)			
21. COMMUNICATION: RADIO, TELEVISION, TELEPHONE, TELEGRAPH (includes media advertising, cable subscriptions, etc.)			
22. ELECTRICITY; NATURAL GAS (Utilities)			
23. WATER, SEWERAGE, TRASH REMOVAL SERVICES (Utilities)			
24. WHOLESALE TRADE (wholesaling intermediaries)			
25. AUTOMOBILE DEALERS; GASOLINE SERVICE STATIONS			
26. EATING AND DRINKING ESTABLISHMENTS; HOTELS, MOTELS, OTHER LODGING			
27. RETAIL - NOT ELSEWHERE LISTED			
28. FINANCE (interest payments; payments on outstanding principal)			
29. INSURANCE PREMIUMS--LIFE, ACCIDENT, HEALTH, MEDICAL, FIRE, CASUALTY, SURETY, TITLE; PENSION, HEALTH, AND WELFARE FUNDS (non-government)			
30. REAL ESTATE (value of real estate purchased, commissions, and measurement fees)			
31. HEALTH SERVICES (medical, dental, hospitals, laboratories, other patient care facilities)			
32. EDUCATIONAL SERVICES (primary, secondary, post-secondary, technical, professional)			
33. SOCIAL SERVICES AGENCIES			
34. ALL OTHER SERVICES (legal, personal, data processing, equipment leasing, recreation, etc.)			
35. LOCAL AND COUNTY GOVERNMENTS (taxes, permits, licenses)			
36. STATE GOVERNMENT (taxes, permits, license fees)			
37. FEDERAL GOVERNMENT (taxes, permits, license fees, employer FICA, unemployment insurance)			
38. HOUSEHOLDS (payments subject to withholding)			
39. RENTS; DIVIDEND PAYMENTS; RETAINED EARNINGS; BAD DEBTS			
40. DEPRECIATION EXPENSE			

## SALES ANALYSIS

DEMAND SOURCE: SECTORS TO WHICH YOU SELL	SALES IN S.W. COLORADO COUNTIES \$ or % of Total	SALES TO OTHER COLORADO COUNTIES \$ or % of Total	SALES OUTSIDE COLORADO \$ or % of Total
1. IRRIGATED AGRICULTURE			
2. DEWATERED AGRICULTURE			
3. LIVESTOCK; RELATED PRODUCTS (dairy and poultry producers; bee keepers; animal breeders; etc.)			
4. AGRICULTURAL SERVICES (veterinarians, custom field work operators, etc.); FORESTRY			
5. METAL MINING; RELATED SERVICE OPERATORS			
6. COAL MINING; RELATED SERVICE OPERATORS			
7. OIL AND GAS EXTRACTION; RELATED SERVICE OPERATORS			
8. SHALE OIL EXTRACTION; RELATED SERVICE OPERATORS			
9. NON-METALLIC MINING; RELATED SERVICE OPERATORS			
10. ALL CONSTRUCTION			
11. FOOD AND KINDRED PRODUCTS (processors of foods for human or animal consumption)			
12. LUMBER; WOOD PRODUCTS (loggers, sawmills, cabinet shops, miscellaneous wood manufacturers)			
13. PRINTERS AND PUBLISHERS; PAPER AND ALLIED PRODUCTS (includes newspaper advertising, etc.)			
14. CHEMICALS; PETROLEUM REFINERS; RUBBER MANUFACTURERS			
15. STONE; GLASS; CLAY PRODUCT MANUFACTURERS			
16. FABRICATED METALS; NON-ELECTRICAL MACHINERY MANUFACTURERS			
17. ELECTRICAL MACHINERY AND EQUIPMENT; TRANSPORTATION EQUIPMENT; ELECTRONIC INSTRUMENTS AND COMPONENTS MANUFACTURERS			
18. ALL OTHER MANUFACTURERS (jewelry, precious metals, medical instruments, sporting goods, etc.)			
19. TRANSPORTATION; AIRLINES; BUS LINES, RAILROADS; TRUCK LINES; AMBULANCES; U.P.S.; R.E.A.; etc.			
20. U. S. POSTAL SERVICE			
21. COMMUNICATION; RADIO, TELEVISION, TELEPHONE, TELEGRAPH			
22. ELECTRICITY; NATURAL GAS COMPANIES			
23. WATER, SEWERAGE, TRASH REMOVAL SERVICE ENTERPRISES			
24. WHOLESALE TRADE (wholesaling intermediaries)			
25. AUTOMOBILE DEALERS; GASOLINE SERVICE STATIONS			
26. EATING AND DRINKING ESTABLISHMENTS; HOTELS; MOTELS; OTHER LODGING			
27. RETAILERS - NOT ELSEWHERE LISTED			
28. FINANCE INSTITUTIONS (banks, trust companies, credit agencies, brokers, etc.)			
29. INSURANCE (companies, agents, brokers)			
30. REAL ESTATE (owners, lessors, buyers, sellers, agents, developers)			
31. HEALTH SERVICE ESTABLISHMENTS (medical, dental, hospitals, laboratories, other patient care facilities)			
32. EDUCATIONAL INSTITUTIONS (primary, secondary, post-secondary, technical, professional)			
33. SOCIAL SERVICES AGENCIES			
34. ALL OTHER SERVICE ESTABLISHMENTS (legal, personal, data processing, equipment leasing, recreation, etc.)			
35. LOCAL AND COUNTY GOVERNMENTS			
36. STATE GOVERNMENT			
37. FEDERAL GOVERNMENT			
38. HOUSEHOLDS (direct sales for private consumption)			

## APPENDIX F

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