Oil and Gas Economic Impact Analysis

Colorado Energy Research Institute
Report 2007-1
Colorado School of Mines
Golden, Colorado 80401

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Preface and Acknowledgements

As directed in CRS 23-41-114, the Colorado Energy Research Institute (CERI) has completed a comprehensive economic analysis of the economic impact of the oil and gas industry in Colorado. A copy of the executive summary of this report is enclosed, and the complete report is available for download at the CERI website: http://www.ceri-mines.org.

A large team of people was engaged in this big study, and we owe them our most sincere thanks. First and foremost, my thanks to the authors and their assistants: Lisa A. McDonald, Holly Wise Bender, Eric Hurley and Sheri Donnelly at Booz Allen Hamilton and David 'Tex' Taylor at the University of Wyoming. Second, a number of formal and informal reviewers added great insights, relevant data and critical evaluations along the way. These include Edward Balistreri and Jeremy Boak, Colorado School of Mines; Brian Macke, State of Colorado – Department of Natural Resources; Bruce Cartwright, Duff & Phelps, LLC; Owen Phillips, University of Wyoming; Greg Schnacke, Colorado Oil and Gas Association; and several representatives from the oil and gas companies with presence here in Colorado, including Don McClure at EnCana. Finally, a note of thanks is due the President of CSM, M.W. Scoggins, for his personal interest in the project and to the CSM Board of Trustees for having re-enacted CERI and enthusiastically supported the new institute's range of projects in both renewable and extractive energy research, economic analysis, and regional energy workforce development throughout Colorado.

The report's authors at Booz Allen Hamilton, the CERI/CSM staff overall, and I personally would appreciate feed-back on this report, to ensure that potential future related studies would be even more relevant to the state's executives, lawmakers, industry leaders, academics and other interested constituencies.

Sincerely,

Dag Nummedal, Director
Colorado Energy Research Institute
Golden, Colorado
June 18, 2007

Executive Summary

This project, guided by Colorado legislative directive, was designed to evaluate the economic contribution of the oil and gas industry to the State of Colorado in terms of employment, income, industry output and taxes. Booz Allen used a regional economic modeling approach to evaluate the contribution of the industry to different regions (for example, multi-county basins and the State as a whole). The approach included an extensive effort to gather site specific information needed to complete the analysis, such as capital investments, average cost to drill and complete a well, average production costs, private royalty and lease payments, and service company costs. Secondary source data were also obtained, including number of wells drilled and completed for each basin, oil and gas prices, oil and gas production, employment, *etc*. The primary and secondary data were then used in combination with a common regional economic model, IMPLAN, to estimate economic contributions. Additionally, fiscal models were developed to estimate State and local business and income tax revenues from oil and gas activities in Colorado. A glossary is provided in Appendix B for definitions of technical terms.

The IMPLAN model results indicate that there were approximately $21.0 billion in total economic contribution for drilling, completion, recompletion, and extraction activities in 2005, 90 percent (%) of which is attributed to extraction activities (See Exhibit ES 1-1). Including private mineral royalty and lease payments and extraction tax impacts, total economic contribution for all oil and gas-related activities within Colorado is $22.9 billion. This does not include large development expenditures such as new regional pipeline development or building new facilitates, nor does it include gathering and in-basin transportation investments and expenses associated with the extraction industry Oil and gas activity within the State employs approximately 71,000 people. The employment multiplier is provided in the final row of Exhibit ES 1-1, which measures the amount of additional employment generated as a result of direct employment associated with oil and gas activities. For example, for every one direct job generated as a result of oil and gas activities, there is an additional 1.67 indirect and induced jobs generated by this activity. The impacts summarized below include direct, indirect and induced economic activity.

Exhibit ES 1-1: Total Economic Contribution for Oil and Gas Activities in Colorado (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Mineral Royalty & Lease Payments	Extraction Taxes	Total Economic Contribution
Economic Contribution	$2,182,322,782	$18,774,801,959	$900,392,239	$1,060,690,054	$22,918,207,034
Employment	19,307	32,471	7,257	11,744	70,779
Labor Earnings	$1,112,434,035	$2,380,405,642	$266,516,586	$544,747,083	$4,304,103,346
Earnings per Worker	$57,619	$73,309	$36,728	$46,385	$60,811
Employment Multiplier	2.01	5.63	1.8	1.51	2.67

Oil and gas activities contribute to the economic well-being of many other industries within the State of Colorado as well. From all of the oil and gas activities in the State (including extraction taxes and mineral royalty payments), approximately 22% of the employment is specific to the oil and gas industries, followed by 14% in government, 9% in professional services, 8% in retailing,

and 7% in health care and social services. These are the major industries impacted by oil and gas activities within the State in terms of employment.

Labor earnings within the oil and gas sectors comprise 41% of total labor earnings from all oil and gas activities within the State. Other industries that benefit in terms of the total amounts paid to workers from oil and gas activities include government (11%), professional services (9%), finance and insurance (5%), and health care and social services (5%). The industries that benefit most in employment and labor earnings as indirect economic effects of the oil and gas industry are state and local governments, and professional services.

Exhibit ES 1-2 summarizes some of the economic indicators for the oil and gas industry in Colorado and compares these indicators to State totals. This study indicates that oil and gas activities within Colorado account for approximately 6.1% of the State's total industry revenues, 2.2% of employment, and 3.2% of total earnings. In general, the oil and gas activities, including private mineral royalty payments and extraction taxes generate average earnings of approximately $61,000, or 32% higher than the State average.

Exhibit ES 1-2: Comparison of Oil and Gas Industry to the State's Economy (2005$)

Economic Indicator	All Industries in Colorado	Oil and Gas Activities in Colorado	Percent of Oil and Gas to State	Source
Total Economic Contribution	$377,918,854,850	$22,918,207,034	6.1%	IMPLAN 2003
Total Employment	3,148,945	70,779	2.2%	IMPLAN 2003
Total Earnings	$136,619,914,547	$4,304,103,346	3.2%	IMPLAN 2003
Average Earnings	$46,050	$60,811	132.1%	IMPLAN 2003
Severance Tax	$152,000,670	$134,791,755	88.7%	Department of Revenue Annual Report 2005
Assessed Valuation (Taxable Production Value)[3]	$70,625,603,899	$5,055,329,000	7.2%	DOLA Annual Report 2005
Federal Mineral Royalties	$89,451,528[1]	$68,436,710[2]	76.5%	Minerals Management Service 2005
State Mineral Royalties	$43,083,957	$29,790,445	69.1%	Colorado State Land Board

[1] Does not include rent, bonuses, and other revenues.

[2] This estimate is from the Minerals Management Service (MMS), and it includes Federal Mineral Royalties from carbon dioxide, coalbed methane, condensate, gas plant products, oil, processed gas, and unprocessed gas. The Federal Minerals Royalties estimated through this study (in section 3.2.3) are $161,559,037. This is much higher than those of the MMS as the MMS does not include Federal Mineral Royalty disbursements to Indian lands.

[3] The assessed valuation figures reflect 2004 amounts, but are reported in 2005.

According to the State of Colorado, Colorado Data Book (2006), in 2005, service industry employment accounts for 39% of the Colorado economy, followed by employment in government (16%), retail trade (11%), manufacturing (7%), construction (7%), and finance, insurance and real estate (7%).

From the data provided by the industry in Colorado and secondary data obtained from the COGCC database, drilling, completion, and recompletion investments were estimated for the State of Colorado and summarized in Exhibit ES 1-3. From primary data collected from operators and service companies, overall, approximately 50% of the investments stay within the State.

Exhibit ES 1-3: Drilling, Completion, and Recompletion Investments in Colorado (2005$)

Type of Impact	Drilling and Completion (Per Well)	Drilling, Completion, and Recompletion Investments (Total)
Investments that Stay Within State	$397,167	$1,193,383,955
Investments that Move Out-of-State	$419,035	$1,201,758,517
Total Investments	$816,202	$2,395,142,471
Percent that Stays within State	49%	50%

Exhibit ES 1-4 summarizes the direct income paid to homeowners and interest owners to access private minerals and surface lands. According to this analysis, 63% of these payments stay within Colorado. Approximately $552 million is assumed to be spent within the State as a result of these payments to households and businesses.

Exhibit ES 1-4: Private Mineral Royalties and Lease Payments in Colorado (2005$)

Type of Impact	Total Annual Mineral Royalties and Lease Payments	Annual Mineral Royalties and Lease Payments per Producing Well
Payments that Stay Within State	$808,318,415	$29,119
Payments that Move Out-of-State	$468,205,765	$16,867
Total Payments	$1,276,524,180	$45,986
Total Assumed to be Spent in the State	$552,408,641	$19,900

This study also addressed the economic contribution of five multi-county basins within the State that comprise the majority of oil and gas production within Colorado. Exhibit ES 1-5 summarizes the results from this analysis. These figures comprise the direct, indirect and induced impacts from drilling, completion, recompletion, and extraction activities. The final row highlights the additional economic activity generated through payments for access to private mineral royalties and leases. Other capital investments such as pipeline construction and other oil and gas infrastructure are not included in these figures.

Exhibit ES 1-5: Total Economic Contribution of Oil and Gas Drilling, Completion, Recompletion and Extraction for All Basins (2005$)

Type of Economic Contribution	Piceance	Northern DJ	Eastern DJ	Raton	San Juan & Paradox
Total Revenues	$3,409,000,000	$3,075,000,000	$332,000,000	$805,000,000	$3,959,000,000
Employment	6,694	7,013	594	1,160	1,227
Labor Earnings	$398,000,000	$450,000,000	$36,000,000	$68,000,000	$66,000,000
Earnings per Worker	$59,600	$64,200	$59,800	$58,100	$53,607
Private Mineral Royalties and Payments (Total Economic Activity)	$71,000,000	$73,000,000	$19,000,000	$34,000,000	ND

ND=Non Disclosure

Although the study has captured the majority of the production in the State, the extraction and drilling and completion impacts for all the basins are less than those of the State. The differences between the drilling and completion impacts for the basins and the State are due to the investments made out of the basin but within the State; these investments are captured in the State model but not included in the basin models. The differences between the total extraction impacts for the basins and the State impacts are much more significant. This difference is due to the fact that the value of the oil and gas extraction industry in Colorado comprises not only the value of the oil and gas produced in the State, but the industry also supports extraction in other areas surrounding Colorado. This is exemplified by the fact that the greater Denver area hosts many regional headquarter offices in the Rocky Mountain Region. This Denver-area extraction management and administrative support to other states is included in the State model, but not in the basin models; only the value of oil and gas production is included in the basin models. The part of the extraction industry is a significant driver of extraction economic activity in Colorado, and therefore are included in the State model, creating additional revenues for the State.

There are considerable fiscal contributions to Federal, State, and local governments that occur as a result of oil and gas drilling and completion capital investments, oil and gas production, and private mineral royalty payments in Colorado. To gain an understanding of the fiscal and economic effects to the State, Booz Allen analyzed tax revenues for drilling, completion, and recompletion investments and extraction activities. Estimates of business taxes, taxes based on production value, and income taxes are estimated for the State utilizing models developed by Booz Allen and Duff and Phelps (2007) and IMPLAN results. Exhibit ES 1-6 summarizes the extraction tax revenue paid by the oil and gas industry to State and local governments. Property taxes were estimated by Duff and Phelps (2007).

Exhibit ES 1-6: State and Local Government Revenue as a Result of Oil and Gas Extraction Activities (2005$)

Government Revenue	Property Taxes on Production and Equipment	Severance Taxes	Federal Royalties*	State Royalties
Tax Revenue	$315,053,860	$134,049,755	$161,559,037	$29,790,445
Total Tax Revenue	*$640,453,097*			

*This is an estimate of Federal Mineral Royalties from extraction distributed to Colorado. This estimate includes Federal Mineral Royalty disbursements to Native American nations within Colorado.

Additional business taxes for the State were also estimated through IMPLAN impacts from extraction revenues not directly associated with production values, drilling, completion, and recompletion activities, and payments to private mineral royalty owners. These taxes are estimated through IMPLAN, resulting in total tax payments to local and State governments. Direct business taxes are estimates of those taxes paid directly by the oil and gas industry. Therefore, the extraction industry pays approximately $679 million to State and local governments, which includes severance taxes, production-based property taxes, Federal and State royalties, motor vehicle licenses, and other taxes. The indirect and induced taxes are generated by the oil and gas activities but not directly paid by the oil and gas industries. In total, oil and gas activities generate $752.9 million in total business taxes, as shown in Exhibit ES 1-7.

Exhibit ES 1-7: Business Taxes Paid to State and Local Governments (2005$)

Business Taxes	Extraction		Drilling, Completion, and Recompletion Activities[1]	Private Royalties[1]	Total Business Taxes Paid to State and Local Governments
	Colorado Production and Equipment[3]	Extraction Industry Support of Operations in Other States[1 2]			
Direct	$640,453,097	$30,523,043	$8,210,826		$679,186,966
Indirect	$11,255,567	$8,231,926	$918,232		$20,405,725
Induced	$21,318,001	$6,497,433	$4,614,745	$20,907,305	$53,337,484
Total	*$673,026,665*	*$45,252,402*	*$13,743,803*	*$20,907,305*	*$752,930,175*

[1] These taxes include motor vehicle licenses, other taxes, and state and local non-taxes as defined in 3.1 and estimated by IMPLAN. These taxes do *not* include sales, property, severance taxes or other taxes such as corporate income taxes, dividend taxes, social insurance taxes, and household income and personal taxes.

[2] These are taxes derived from the portion of the extraction industry that is not directly associated with oil and gas production: the Colorado extraction industry that supports operations in areas outside of Colorado.

[3] These business tax payments are based on the analysis provided in 3.1. The direct business tax is the amount paid by the extraction industry to State and local governments. The indirect and induced tax payments are taxes estimated though IMPLAN as a result of this indirect and induced economic activity.

Personal income taxes were also estimated by a model developed by Booz Allen. Total personal income tax paid by workers affected by the oil and gas industry in Colorado during 2005 is summarized in Exhibit ES 1-8.

Exhibit ES 1-8: Personal Income Taxes Paid to State Government (2005$)

	Drilling, Completion and Recompletion	Extraction	Government	Private Royalties	Total Personal Income Taxes Paid
Direct	$24,102,087	$27,921,384			$52,023,471
Indirect	$2,911,075	$20,388,401	$10,736,339		$34,035,815
Induced	$7,954,120	$16,015,956		$7,543,190	$31,513,266
Total	*$34,967,282*	*$64,325,741*	*$10,736,339*	*$7,543,190*	*$117,572,552*

According to these estimates, the oil and gas industry contributed to the generation of over $117 million in personal income tax in the State, of which workers directly associated with the industry paid approximately $52 million. The total amount of personal taxes paid, $117.6 million, accounts for approximately three percent of total personal income tax liability in Colorado during 2005.

Overall, there are significant tax contributions from oil and gas activities in Colorado, summarized in Exhibit ES 1-9. The oil and gas industries pay an estimated $679 million in tax revenues from extraction activities and people employed by oil and gas industries pay approximately $52 million, for a total of $731 million. In addition, the oil and gas activities in Colorado generate additional tax revenues for indirect industries and households. This generated economic activity contributes an additional $73.7 million in business taxes and $65.5 million in personal income taxes. Total business and income taxes generated by the industry in Colorado is $752.9 million and $117.6 million, respectively. These State and local taxes do not include sales taxes, corporate income taxes, and other personal taxes, which could not be accurately estimated. Federal taxes were not estimated due to the scope of the study, which focused on State fiscal contributions from Colorado oil and gas activities.

Exhibit ES 1-9: Business and Personal Income Taxes Paid to State and Local Governments (2005$)

	Business Taxes	Personal Income Taxes	Total Business and Income Taxes Paid
Direct	$679,186,966	$52,023,471	$731,210,437
Indirect	*$20,405,725*	$34,035,815	$54,441,540
Induced	*$53,337,484*	$31,513,266	$84,850,750
Total	*$752,930,175*	*$117,572,552*	*$870,502,727*

The oil and gas industry in Colorado contributes significantly to the Colorado economy, with approximately $22.9 billion in economic output or 6.1% of the economy. Additionally, oil and gas activities contribute to 2.2% of the employment in the State with $4.3 billion in labor earnings annually. The average annual earnings per worker for these activities are approximately $61,000, which is 32% higher than the State average. Oil and gas activities generate over $753 million in business tax revenue (not including sales and corporate income taxes) to State and local governments. These activities also generate $117 million in personal income taxes paid to State government.

1. Introduction

This report describes the results of a three-phase study to evaluate the economic contribution associated with the oil and gas industry in Colorado. This project was driven by the State Legislature, Senate Bill 05-666, which requires the Colorado Energy Research Institute (CERI) to study the economic impacts of the oil and gas industry on counties, communities, regions, and the State of Colorado (see Appendix C). The motivation for this study stems from the fact that the full economic contribution of the oil and natural gas industries is not fully understood in Colorado. While existing input-output (IO) models provide a foundation for estimating relative impacts and contributions of the industry, these models, built with national production functions, are not specific to local conditions that can significantly affect oil and gas operations. This study customizes input-output models for the State and multi-county basin regions within the State and also develops a Fiscal Model to estimate the economic contribution of the oil and gas industry in Colorado.

This report summarizes the final results of the Oil and Gas Economic Impact Analysis. Section 2 presents a discussion of the methods and approach used to collect primary and secondary data and to utilize that data to customize a common regional economic model. In Section 3, the results of the estimated economic contribution of the oil and gas industry by specific basins and for the State are discussed. Section 4 provides a summary of the Fiscal Model and Analysis, and Section 5 discusses overall conclusions and considerations. Appendix A provides a list of acronyms and Appendix B provides a glossary of terms used in this document.

1.1 Objectives of the Project

This project was designed to meet three objectives:

- To validate and customize a regional economic model with local industry data and to specify the model for Colorado operations in selected multi-county regions as well as for the State
- To utilize the newly specified model to estimate the current economic contribution of the industry in the State (e.g., multi-county basins and state)
- To develop a Fiscal Model to determine the oil and gas contribution to State and local government entities

1.2 Colorado Oil and Gas Industry

In 2003, Colorado ranked 16th nationally in terms of the number of producing crude oil wells and 11th for production. For natural gas, Colorado ranked 5th in terms of the number of wells drilled, and 7th in terms of production (Independent Petroleum Association of America, July, 2005). According to the Colorado Oil and Gas Conservation Commission (COGCC), in 2005, there are 27,700 wells producing crude oil, natural gas, and coalbed methane (CBM) as summarized in Exhibit 1-1. Thirty percent (%) of Colorado counties have at least 200 wells. Weld County has the most wells (10,000) followed by Rio Blanco (2,000) and La Plata (2,000). According to the U.S. Bureau of Economic Analysis, in 2005, mining operations (which include oil and gas industries) were estimated to generate nearly 27,000 direct jobs of which 12,852 were thought to be dedicated to the extraction sector.

Exhibit 1-1: Drilling and Production by Basin in Colorado, 2005

Basin	Wells Drilled 2005*	Wells in Production**	Total Production (Mcfe)	Production per well (Mcfe / well)
Eastern DJ	545	2,869	35,216,906	12,275
Northern DJ	756	13,613	269,747,890	19,815
Piceance	810	5,159	346,543,603	67,173
San Juan and Paradox	88	2,852	482,359,402	169,130
Raton	317	2,019	88,655,454	43,911
Rest of State	54	1,247	46,380,680	37,194
TOTAL	2,570	27,759	1,268,903,935	45,711

* Includes COGCC wells drilled in 2005 supplemented with information provided by operators.

** Wells with well status (according to COGCC) as "Producing" and any well with status of "Shut in" with 2005 production greater than zero.

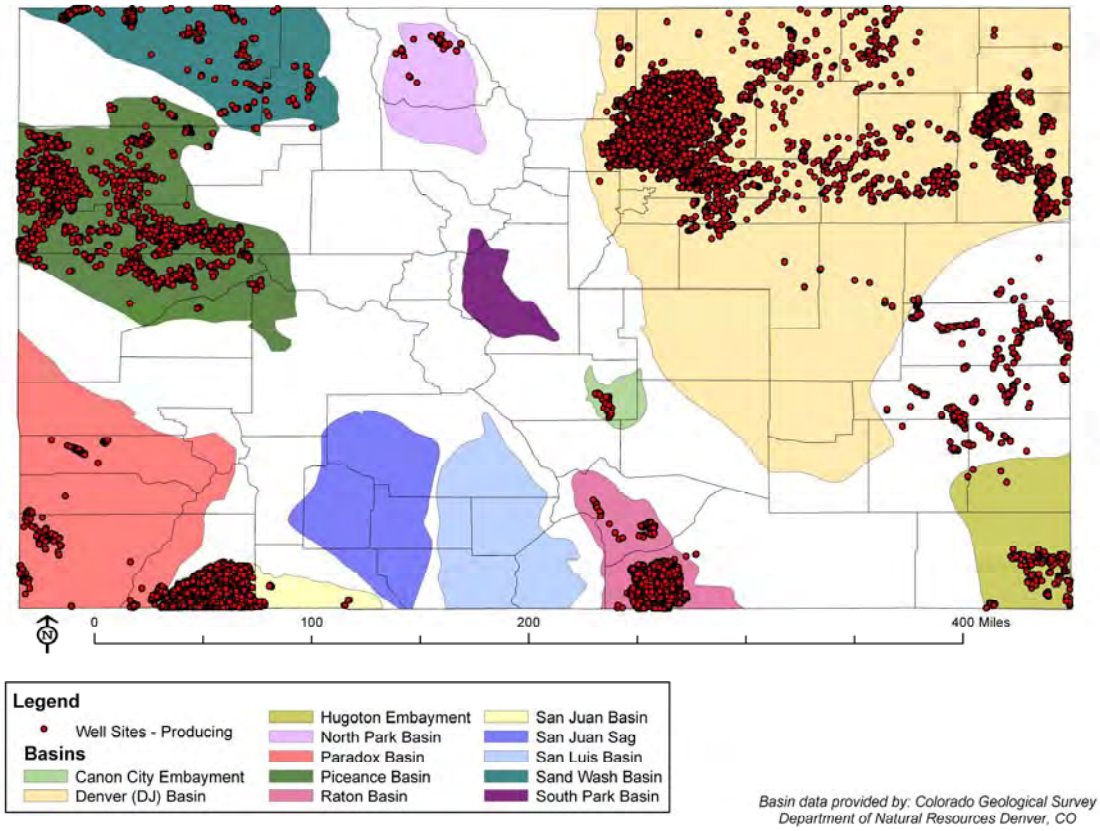
Oil and gas production amounts were obtained from the COGCC database. However, production figures are also available through the Colorado Department of Local Affairs and the Colorado Department of Revenue. There are some variations among the figures; the Department of Local Affairs database provides for 14 million more barrels of oil produced than the COGCC database. As a result, the State Auditor is investigating these database production discrepancies. Regardless, there is not one standard source for this information.

Oil and gas reserves and production in Colorado are located throughout the State (Longman, 2001):

> Production can be thought of as occurring in all four corners of Colorado, "wrapped around" a mountainous area of Precambrian igneous and metamorphic rocks in the center of the state where there is essentially no oil and gas production. To the north, the productive areas include the *Sand Wash* and *Piceance Creek* basins on the western part of the state, and the northern *Denver (or DJ)* basin in the east. In the southern part of Colorado, production is found in the *Paradox* and *San Juan* basins to the southwest, and the *southern Denver* basin and *Las Animas Arch* area to the southeast.

According to COGCC, there were 4,363 Applications for Permits-to-Drill (APD) approved for 2005. This represents a 50% increase of the previous record high of 2,917 in 2004 and a 94% increase over the 2,249 APDs approved in 2003. In 2005, the most active county in terms of APD was Garfield (in the Piceance basin), followed by Weld (DJ Basin), Yuma (DJ), and Las Animas (Raton). Exhibit 1-2 illustrates the location of producing wells within the nine identified oil and gas basins in Colorado. A number of the oil and gas basins are described below for a broad understanding of the major basins across the State.

Exhibit 1-2: Producing Wells in Colorado, 2004



Denver-Julesburg Basin – The oldest most developed basin within the State is the Denver-Julesburg (DJ) basin located in northeastern Colorado. Some believe that development within the Wattenberg Field, located just north of Denver, may be the most significant oil and gas development in the State over the last 35 years. The basin continues to be an important producer of both oil and natural gas.

Piceance Basin – The Piceance Basin is an important oil shale reserve located in Northwestern Colorado. The basin has numerous oil and gas seeps that were initially spotted by early explorers of the Rocky Mountains. The Pennsylvanian Weber Sandstone is the oldest developed and most prolific oil reservoir in the State (including the very large Rangely Field). Additionally, conservative estimates rate the Piceance Basin's potential natural gas reserve at 31 trillion cubic feet, the largest gas discovery in the Rocky Mountain region.

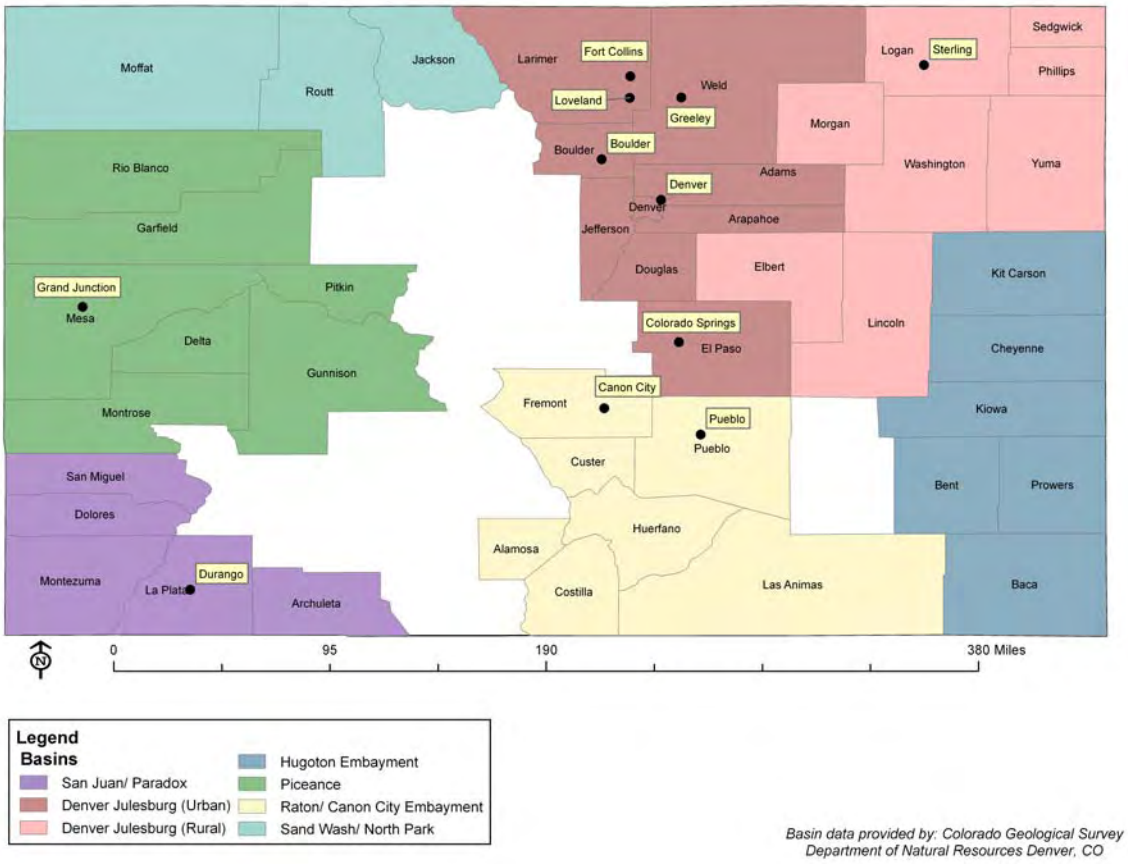
Raton Basin – Activities within the Raton basin are primarily focused on the development and production of CBM resources. A total of 2,749 linear miles were surveyed for hydrocarbon seeps using a truck-mounted infrared spectroscopy detection device. Sixty seven separate seeps were found, and these were confined to an area within the Raton Formation coal outcrop and a shallow subcrop.

San Juan Basin – CBM development conditions exist in the San Juan Basin as well; this basin measures approximately 6,700 square miles. The San Juan Basin exists in both Colorado and New Mexico and is one of the leading producers of CBM gas in the world.

Paradox Basin – The Paradox Basin is an important oil producing region of Colorado, Utah and Arizona. However, most of the basin's production exists outside of Colorado.

The economic and fiscal contributions of the oil and gas industry were initially studied across the important basins within the State as described above. The basin boundaries were used to identify economic study areas that included multi-county basins. This includes seven specific multi-county basins as shown in Exhibit 1-3. As the data collection process evolved, two of the basins (Hugoton and Sand Wash/North Park) were not analyzed due to a lack of information collected in these areas. However, they were included in the State model, which estimated the oil and gas economic contribution for Colorado as a whole.

Exhibit 1-3: Economic Study Areas Associated with Different Oil and Gas Basins in Colorado

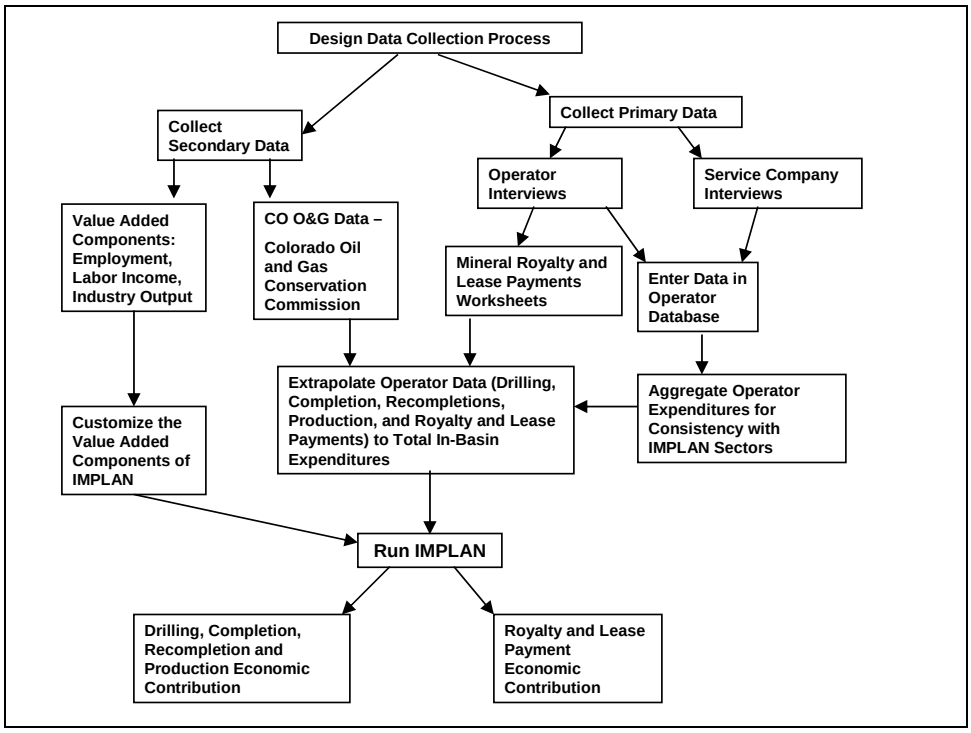


1.3 Regional Economic Modeling

Booz Allen utilized a regional economic modeling approach, outlined in Exhibit 1-4, to evaluate the economic contribution of the oil and gas industry to the State of Colorado. This approach included an extensive data collection effort to identify site-specific information needed to complete the economic contribution analysis. Data collected included capital investments, average cost to drill and complete a well, average production costs, royalty and lease payments, service company allocations, and basin and state purchase coefficients (SPCs). Secondary data were also obtained and included such things as number of wells drilled and completed for each basin, oil and gas prices, oil and gas production,

employment, etc. The primary and secondary data were then used in combination with a common regional economic model to estimate economic contributions as described below.

Exhibit 1-4: Economic Contribution Analysis Flow Chart



1.3.1 Regional Economic Model

IO modeling is a systematic method used to describe production and consumption sectors within a particular economy through a series of linkages among industries, households, and government. Booz Allen utilized the IMPLAN® economic impact model data and software system as the basic regional economic model (IO) for this analysis. IMPLAN provides certain advantages in that study area data can be upgraded using local data and conditions to more accurately represent the industry economic profiles, providing more accurate multipliers. In addition, IMPLAN gives the user full access to the model for added flexibility, allowing numerous manipulations to be made at any time during the analysis.

For this analysis, Booz Allen obtained the latest existing data sets and structural matrices (2003) from the Minnesota IMPLAN Group (MIG) for use with the IMPLAN Software Version 2.0. The data sets included all counties within Colorado, which allowed different IO models to be developed for each economic study area. Once these models were developed, specific value-added parameters, regional purchase coefficients (RPCs), and production functions were evaluated for relevancy to oil and gas activities. Through this review, Booz Allen determined that value-added components and trade flow data would need to be modified for the basin and state IO models. The following sections describe the approach used to modify these aspects of the models. In addition, Booz Allen developed some site-specific factors that represent local expenditures that were utilized for the analysis. The methodology

for deriving these basin factors from the information collected is described in Section 2.3 and the direct investments and revenues are identified in Section 3.0.

1.3.2 Methodology for Adjusting Model and Value Added Components

One of the first steps in customizing the IMPLAN models involved the modification of the industry specific data and value-added components reported in the basin and state models. The value-added components are shown in Appendix D. For three sectors in IMPLAN that represent oil and gas activities, adjustments were made to the three components listed below and the data and information sources used to make those adjustments for each of the relevant sectors are described in the sections below.

- Total Industry Output
- Earnings
- Employment
- Value Added

An important part of modifying the Value Added components involves specifying the costs of production. The following section describes how this figure was determined.

1.3.2.1 Costs of Production

There is considerable variation in the costs of production depending on a number of factors, including the depth of the well, type of reserves, types of pump involved, and where production is occurring within the lifecycle of the well. Generally, there are three types of costs associated with production as it is defined in the extraction sector: lifting costs; in-basin gathering, processing and treatment; and in-basin transportation costs. For the purposes of this modeling effort, these costs should exclude labor, administrative, finding and development, overhead, and taxes. Many of these costs have already been accounted for as separate components in the model. Further, these costs require adjustment for reporting in 2003 dollars. Due to differing corporate financial and accounting reporting systems, the various cost components are not always nor easily identifiable. As a result, there is considerable uncertainty surrounding these costs, and as such, a sensitivity analysis on the economic impacts as a result of varying this cost is performed in Section 2.4.

To determine the costs of production, as defined specifically for the purpose of this project, three types of analysis were performed. First, primary data was collected from operators. Nine operators provided information, representing 36, 70, and 66 percent of oil, natural gas and CBM production in the State, respectively, resulting in a cost estimate weighted by production of $0.68/mcfe. Most of these companies were not able to provide information about the components of these costs, likely a result of reporting and the proprietary nature of this information. Second, the Energy Information Agency provides operational costs on production in the Rocky Mountains. These costs are provided by the number of wells, type of well, and depth of wells. This information was mapped to the specific basins of operation in Colorado, depending on production types and depths. Furthermore, labor costs were removed from the EIA costs, resulting in $0.55/mcfe estimate of lifting costs. For the most part, gathering, processing and in-basin transportation are not included in these estimates. Third, Duff and Phelps (2007) provided an analysis of 29 public companies that operate in Colorado. Larger corporations were not included since their costs were national or international in nature and would not provide a regional cost estimate. These production costs were typically only lifting costs, and did not include gathering and transportation costs, although some of the costs included production taxes. This resulted in an estimate of $1.26/mcfe weighted by company production (Duff and Phelps, 2007).

As a result of the above analysis, this model uses a midpoint cost of production of $0.90/mcfe, which is assumed to capture only lifting costs, and not in-basin gathering, processing, treatment, or transportation. As previously noted, general and administrative, overhead, labor, taxes, and finding and development costs are also assumed not to be included in this estimate. This is a 2005 cost that is deflated to 2003 dollars to be consistent with the IMPLAN modeling effort. Therefore, the economic contribution of the extraction sector is assumed to capture only wellhead lifting expenditures and not other extraction investments associated with gathering and in-basin transportation. This production cost assumption was used to allocate value added to intermediate payments.

According to industry representatives, all costs associated with the development and extraction of oil and natural gas within Colorado have increased considerably between 2005 and 2006. These additional costs would provide an even greater economic contribution by the extraction sector.

1.3.2.2 Oil and Gas Extraction (Sector 19)

Total Industry Output - The extraction sector was based on 2005 COGCC data on oil and gas production quantities by county in Colorado. These quantities were converted to dollar amounts using the 2005 Colorado Index Prices from COCGG's website. The index prices for calendar year 2005 were $59.93 per barrel (Bbl) for oil and $7.39 per thousand cubic feet (Mcf) for natural gas. These prices were converted to 2003 dollars to be consistent with the IMPLAN model resulting in a price of $49.33 per Bbl for oil and $6.76 per Mcf for natural gas. The deflators used for the conversion were sector specific estimates obtained from the IMPLAN database. The deflated prices were then used to estimate total industry output by county in Colorado. Since Sector 19 also includes natural gas liquids, the total industry output for the sector was increased by 3.2% of the value of natural gas production to account for natural gas liquids production. This estimate was based on information from the Mineral Management Service's website on 2005 Federal Mineral Royalty Revenues for natural gas liquids in Colorado.

Earnings - Component estimates of value added for the extraction sector were based on 2003-2004 Bureau of Labor Statistics (BLS) county data for the extraction sector in Colorado (North American Industry Classification System [NAICS] code 211). Information on the number of extraction jobs and the earnings associated with these jobs in 2003-2004 (primarily 2004) was obtained from the BLS website for Colorado counties. Non-disclosed employment and earnings were allocated based on total value of production. From this information, average earnings per job were estimated for the extraction sector in each county. Average earnings per job were adjusted to include benefits based on the 2004 national ratio of wage and salary accruals to compensation of employees for the oil and gas extraction. This ratio was obtained from the August 2005 Survey of Current Business.

Employment – As based on the State of Colorado's severance tax data, extraction employment by county was used to adjust extraction employment. This employment data was multiplied by the benefits-adjusted average earnings per job from BLS to estimated total earnings for the extraction sector. Finally, total earnings from extraction were adjusted to 2003 dollars. Total earnings were then allocated between employee compensation and proprietor income based on the ratio between the two in IMPLAN.

Total Value Added - Total Value Added for the extraction sector was the residual of total industry output minus the cost of production (excluding labor and indirect business taxes). The cost of production is $0.90 per Mcf equivalent (Mcfe), which is assumed to include only lifting costs as described in section 1.3.2.1. This production cost is a conservative figure and may be higher than

estimated here; if this is the case, more economic impact would be run through the model (and less allocated to value added), resulting in higher economic impacts of the extraction sector. An analysis is provided in Section 2.4 that shows the sensitivity of the model results to a change in these production costs. Other property income and indirect business taxes were estimated as the residual of total value added minus employee compensation and proprietor income. This residual amount was allocated between the two components based on the ratio from IMPLAN.

1.3.2.3 Drilling Oil and Gas Wells (Sector 27)

Employment and Earnings - Component estimates of value added for the drilling sector was based on 2003-2004 BLS county data for the drilling sector in Colorado (NAICS code 213111). Information on the number of drilling jobs and the earnings associated with these jobs in 2003-2004 (primarily 2004) was obtained from the BLS website for Colorado counties. Non-disclosed employment and earnings were allocated based on approved well permits data from the COGCC website. BLS estimates of drilling sector employment were adjusted to include self-employed individuals based on the ratio of total employment to wage and salary employment from the Bureau of Economic Analysis for mining support services in Colorado in 2004. BLS estimates of labor earnings were adjusted to include benefits based on the 2004 national ratio of wage and salary accruals to compensation of employees for the mining support activities. This ratio was obtained from the August 2005 Survey of Current Business. The adjusted BLS estimates of employment and labor earnings were then used to estimate total earnings for the drilling sector. Finally, total earnings from drilling were adjusted to 2003 dollars. Total earnings were then allocated between employee compensation and proprietor income based on the ratio between the two in IMPLAN.

Total Industry Output – Total industry output was based on output per employee estimates from the 2002 Economic Census for the mining sector in Colorado (which includes oil and gas). This ratio ($126,086 per employee) was multiplied by the adjusted employment estimates to estimate total industry output. Total value added for drilling was estimated based on the ratio of total value added to total industry output from IMPLAN. Other property income and indirect business taxes were then estimated as the residual of total value added minus employee compensation and proprietor income. This residual amount was allocated between the two components based on the ratio from IMPLAN.

1.3.2.4 Support Activities for Oil and Gas Operations (Sector 28)

Employment and Earnings - Component estimates of value added for the support sector was based on 2003-2004 BLS county data for the support sector in Colorado (NAICS code 213111). Information on the number of support jobs and the earnings associated with these jobs in 2003-2004 (primarily 2004) was obtained from the BLS website for Colorado counties. Non-disclosed employment and earnings were allocated based on approved well permits data from the COGCC website. BLS estimates of support sector employment were adjusted to include self-employed individuals based on the ratio of total employment to wage and salary employment from the Bureau of Economic Analysis for mining support services in Colorado in 2004. BLS estimates of labor earnings were adjusted to include benefits based on the 2004 national ratio of wage and salary accruals to compensation of employees for the mining support activities. This ratio was obtained from the August 2005 Survey of Current Business. The adjusted BLS estimates of employment and labor earnings were then used to estimate total earnings for the support sector. Finally, total earnings from support services were adjusted to 2003 dollars. The total was then allocated between employee compensation and proprietor income based on the ratio between the two in IMPLAN.

Total Industry Output – Total industry output was based on output per employee estimates from the 2002 Economic Census for oil and gas support services in Colorado. This ratio ($118,410 per employee) was multiplied by the adjusted employment estimates to estimate total industry output. Total value added for support services was estimated based on the ratio of total value added to total industry output from IMPLAN. Other property income and indirect business taxes were estimated as the residual of total value added minus employee compensation and proprietor income. This residual amount was allocated between the two components based on the ratio from IMPLAN.

1.3.3 Trade Flows Data

Version 2.0 of IMPLAN utilizes Regional Purchase Coefficients (RPCs) to represent the proportion of intermediate demands and final demands for a specific commodity that will be satisfied by local production. They are derived from a calculation encompassing production, consumption, total imports, foreign imports, and domestic imports. RPCs represent the proportion of the total supply of a good or service used to fulfill the demands of a region that is supplied by the region to itself. RPCs can be critical to the accuracy of the model.

The new version of IMPLAN *not yet released* incorporates a new approach to measuring RPCs: the IMPLAN National Trade Flows Model. This new approach utilizes a doubly-constrained gravity model using IMPLAN's county-level estimates of commodity demand and supply. In general terms, the import and export flows between regions are thought to be proportional to the "mass," "attractiveness," or "size" of an economy and inversely proportional to the "distance" or cost of moving goods and services between them. There are three main databases used in the Trade Flows Model: the Oak Ridge National Laboratory county-to-county distances by mode of transportation, the Commodity Flows Survey ton-miles data by commodity, and the IMPLAN commodity supply and demand by county. As such, the Trade Flows RPCs have been shown to reveal much more accurate economic movement between counties and regions than the RPCs embedded in IMPLAN Version 2.

Although the new version of IMPLAN was not available, Booz Allen was able to obtain the new Trade Flows Microsoft Access Databases from MIG and imported them into the basin and state models developed for this analysis. After each basin or state Study area value added components were adjusted, the respective gravity-fed trade flow data was inputted and the multipliers were recalculated.

1.3.4 Data and Information Collection

Under the data collection task, Booz Allen identified a representative sample of oil and gas industry representatives to interview. The sampling procedure was discussed in the initial kick-off meeting with CERI representatives, and industry and trade association contacts. It was concluded that because there are approximately 20 oil and gas companies executing over 90% of the work in Colorado, data collection would focus on the largest operators with the hope of collecting significant amount of data and information without interviewing an exhaustive number of industry contacts. The basis for this selection ensured a broad geographic distribution that included all oil and gas basins within Colorado as determined in the kick-off meeting.

The data collection effort was expanded early in the project to include service companies or vendors. This change was necessitated due to the fact that service companies are a major source of the oil and gas development and production services throughout the State. During this phase, Booz Allen contacted over 80 oil and gas operating companies, service companies, and other oil and gas representatives. Throughout the data collection process, Booz Allen generally received positive responses from industry contacts on the study, though response time due to their busy schedules hampered the primary data collection process.

Both operators and service companies were contacted initially with a phone call, and then with an email which described the project in more detail. Once the correct point of contact was located within the company, Booz Allen ensured that they received a "Data Request Document," (see Appendix E) understood the requirements, and could provide the information within the time frame required. Often there were three (and sometimes more) points of contact within each company (e.g., drilling and completion, production, and mineral royalties). Generally, standard reporting forms such as Authority for Expenditure (AFE) for drilling and completion and Lease Operating Expenses (LOE) for production expenses were requested from the operator for an average well within the various basins of operation. Once information was received from the operators, interviews were scheduled to clarify and obtain additional information needed for the study.

Since the actual costs of the various services for drilling, completion, and production can be obtained from operators, interviews with service companies were focused on the breakdown of the revenue received from the operator (the operator's cost) by labor, materials/equipment, overhead, administration, and margin. For each of these breakdown areas, Booz Allen gathered the percentage of revenues earned within the basin, within-the-state, and out-of-state.

1.3.5 Operator Data Collection

Booz Allen staff contacted a total of 28 operating companies who have operations located in Colorado. Of these 28 operators, four declined to take part in the study while another ten either were unable to provide information within the time period allocated or did not respond to numerous requests for information. Upon conclusion of this phase, information was received from 14 operators which accounts for 45.7, 78.0, and 76.4% of the oil, natural gas, and CBM production in the State, respectively. This resulted in a response rate of approximately 50%, with half of the operators providing information for the customization of the model and determination of the economic contribution of the industry to Colorado. This response rate seems reasonable considering the fairly onerous request for information.

Booz Allen received very little information from operators in the Hugoton, Southeastern and the Sand Wash Basins. However, these basins do not currently account for a significant amount of exploration and production (9% of oil and 2% for gas for Hugoton; 2% for oil and 3% for gas for Sand Wash/North Park). Therefore, the data collection effort focused on the other five basins within the State. Overall expenditure impacts for these areas were included in the State impact model, analyzed in Section 3.3 of this report.

The Raton and San Juan and Paradox basins account for 99% of the CBM production in the State. For Raton Basin, information was collected from two operators that comprise approximately 93% of the CBM production in this area. For San Juan and Paradox basins, information from four operators was collected, comprising 74% of CBM production. One operator in the San Juan and Paradox basins required certain stipulations in terms of reporting data in this report. Due to these confidentiality measures, the drilling, completion, and recompletion expenditures for both Raton and San Juan and Paradox basins are extrapolated together to provide an average cost per well for both basins. Additionally, mineral royalty and lease payment expenditures were not reported for the San Juan and Paradox Basins due to disclosure issues.

The Northern DJ and Piceance Basins account for 82% (53% Northern DJ and 29% Piceance) of Colorado's oil production and 77% of Colorado's conventional natural gas. In Northern DJ, which encompasses Weld County, information from six operators was captured, comprising approximately 71% of the oil production and 83% of the conventional gas production. For Piceance Basin, Booz Allen collected information from 5 operators comprising 15% of the oil production and 89% of the

conventional gas production. Information from 4 operators in the Eastern DJ Basin was collected, comprising 11 and 31% of the basin's oil and conventional gas, respectively.

Exhibit 1-5 provides the percentage of production that the 14 operators account for within the five basins of analysis, and within the State in total.

Exhibit 1-5: Percentage of Basin Production Accounted For By Operators Who Participated in Data Collection Efforts

Multi-County Basin	Oil	Gas	CBM
Northern DJ	71.2	82.8	NA
Eastern DJ	10.9	30.8	NA
Piceance	14.5	88.8	NA
San Juan and Paradox	NA	63.9	73.5
Raton	NA	99.4	93.1
State	45.7	78.0	76.4

1.3.6 Types of Information Collected

This section describes the types of information collected on operator expenditures for exploration, development, and production of oil, natural gas, and CBM. As indicated previously, it was determined that most operators contracted much of their well drilling, completion, and re-completion work to service companies. Therefore, additional efforts were initiated to collect data from service company representatives, which are described in Section 2.2.2.

Operator expenditures were separated into three categories:

- Drilling, completion, and recompletion expenditures
- Production expenditures
- Mineral and override royalty payments, lease and bonus payments, and surface land damages.

Information was also obtained on the names and location of vendors utilized, the expenditures that were incurred in house, the locations of field, district, and headquarter offices, and to separate the materials and equipment expenses from the mostly labor-based expenses.

To simplify the data collection effort and the impact on each company, Booz Allen requested an example AFE document for drilling and completing a well for each basin where exploration and development occurs. These forms were requested for a typical well in each basin of operation for 2005. We also requested additional information, which was usually conveyed verbally in follow-up interviews, on expenditures, clarifying whether they were labor, overhead, materials/equipment, or margin. Further, additional information was also requested on the largest expenses, the names of service companies utilized and their locations, and other pertinent information. All operators were able to provide us drilling and completion information; the majority of operators were able to furnish recompletion information as well.

Recompletions occur throughout Colorado to improve well production, before choosing the costly alternative of drilling a new well. Therefore, the corresponding cost categories for recompletion operations are similar to those for well completion and incurred to revitalize production in an aging well.

Booz Allen collected operator's information on the number of wells recompleted in 2005 or other information relevant to expenditures spent in 2005 on recompletion. From our data collection, it is apparent that recompletion costs are significant in mature basins (e.g., DJ) and less common in developing basins.

The drilling, completion, and recompletion costs were grouped into categories that were consistent across operators and which mapped to the relevant sectors in IMPLAN. A sample of the cost categories are shown below in Exhibit 1-6.

Exhibit 1-6: Major Well Drilling & Completion Cost Categories

Drilling	Completion and Recompletion
Main Drill Contract	Stimulation and Cementing (main contract)
Earthwork	Earthwork
Services (e.g., insurance, permitting)	Tube & Pressure inspectors
Supervision (labor)	Water & Transport
Well Logging	Complete Workover Equipment (Rig & Unit)
Overhead	Casing & Tubing (surface and production)
Miscellaneous	Tanks & Equipment
	Downhole Equipment
	Roustabout
	Labor (Supervision, Administration)
	Overhead

In this way, Booz Allen was able to group Drilling, Completion, and Recompletion expenditures into four IMPLAN sectors: Drilling, Support Activities for Oil and Gas Industries, Construction, and Wholesale Trade. This process is further described in Section 1.3.10.

Information was also requested on production costs, which is often found on the LOE form. However, since it was not possible to collect consistent data on these costs, total industry output from the extraction sector was used to estimate this economic contribution (see Appendix D), which is consistent with other IO models.

Booz Allen also requested information on private mineral royalties, override royalties, payments for leases and bonuses, and surface land damages. Specific information requested on these expenditures and investments are shown in Appendix E. Approximately, ten operators were able to provide information on these types of mineral royalty and lease expenditures. The numbers of operators that were able to provide information in each of the basins are summarized in Exhibit 1-7.

Exhibit 1-7: Mineral Royalty and Lease Payment Operator Data Collection

Basin	Number of Operators Providing Mineral Royalty and Lease Payment Data
Raton	2
San Juan and Paradox	1
Piceance	3
Northern DJ	4
Eastern DJ	3

1.3.7 Service Company Data Collection

Since many of the oil and gas operators within Colorado contract drilling and completion activities, a number of oil and gas service companies across various basins were contacted to assess the types and locations of expenditures (within the basin, within the state, or out-of-state). This section will focus on the approach and type of information that was collected from service companies across basins. Additional information is provided in Appendix F.

1.3.8 Service Company Approach

During interviews with Booz Allen staff for this project, operators provided information on the total expenditures incurred for services rendered as well as the names of the particular vendors and service companies regularly utilized in 2005. Booz Allen interviewed some of the larger service companies to obtain an understanding of what and where these operator expenditures and vendor revenue were allocated. Since the expenditures by operators are revenues for the service companies, the interviews with service companies targeted both the allocation of expenses among labor, materials, administrative, and margin, and where the allocation occurred. The service company information collection was focused on two general issues: whether the service was primarily labor or materials based (or provide information on materials and labor percentages for the service); and the origination of the service or material (e.g., local, in-state, or out-of-state). Once these service company allocations were determined, they were averaged to estimate the in-basin, within state (out-of-basin), and out-of-state percentages for the related contracted vendor expenditures.

Vendors were targeted that provided services and materials that accounted for the highest percentage of total costs incurred by operators. Examples of these services are:

- Main drilling (turnkey) contract
- Well completion stimulation and cementing
- Well head equipment (tubulars and casing)
- Well recompletion, refracturing, and stimulation
- Well servicing and maintenance costs.

The interviews with service companies focused on the following categories and their related portion of total costs:

- Labor
- Materials, supplies, and equipment
- Overhead and administrative costs
- Margin.

For each of the above categories, information was also obtained on the percentage of allocations that were incurred in-basin, in-state (out-of-basin), and out-of-state. This process allowed us to obtain a general breakdown of the operator's expenditure (and corresponding service company allocation) within the basin, within the state, and out-of- state. Taxes are not included as part of the drilling, completion, and recompletion expenditures, but are specifically assessed in the fiscal analysis.

In general, materials and supplies for drilling, completion, and recompletion such as tubing, casing, flow lines, and other well head equipment were typically purchased through wholesalers who purchase

them from outside Colorado, in states that manufacture these types of products. Therefore, the percentages for in-basin and in-state materials (such as casing and tubing) are typically low. Also, the location of service company offices and corporate headquarters played a role in determining how labor and administrative allocations are incurred within basin, within the state or out-of state. During interviews with drilling and completion, stimulation and cementing companies, it was noted that the labor force utilized by these companies are often "flex" crews (in some basins more than others). Flex crews are laborers who travel to well sites for one or two week rotations, but generally do not live in the local area. Therefore, Booz Allen gathered specific labor allocations from drilling and completion stimulation/cementing companies to ensure that the labor expenditure's allocations were accurately portrayed.

During interviews with vendors and service companies, the Booz Allen team determined that drilling and completion cost allocations were often different from some of the general production cost allocations; a large percentage of production costs are a local expenditure, which can be very different from the drilling and completion location allocations in some basins.

The following example will show how the service company allocations were determined for both the labor-materials-administrative-margin breakdown and the location of the expenditure. This example will also explain how the information was utilized from service company interviews and applied to operator expenditures for the related services in the database. Exhibit 1-8 below shows a summary of data from a service company collected during an interview. This drilling company operates in the Piceance Basin with a local field office in Rifle, a regional office in Denver, and corporate headquarters in Texas. This company provides a turnkey, main drilling contract service to the oil and gas operators throughout a specific basin.

Exhibit 1-8: Example Drilling Company Location Allocation

X Drilling Company (Piceance) – Main Drill Contract				
Local Field Office/Denver Regional Office/Corporate HQ in TX				
Category	Percent of Total Allocation (of total revenue received)	Location Breakdown (Percent of revenue amount for each category)		
		In-Basin	In-State (out-of-Basin)	Out-of-State
Labor	31	85	9	6
Materials/Supplies	42	63	7	30
Overhead/Admin	2.5	20	80	0
Margin	24.5	5	20	75
Total Cost Breakdown (Percent of total revenue received)		54.5	12.5	33

Booz Allen received the labor, materials, and overhead/administrative categories and their corresponding allocations during interviews with service companies. Through interviews with service companies, profit was assumed to move to the location of the corporate headquarters, although some service companies reported that a small percentage did stay at the regional office (in this case 20%) and an even smaller percent of margin remained at the location of the field office (in this case 5%). This was consistent with idea that partners and managers may receive a share of profits and the company could pay out bonuses to employees.

After collecting data from service company interviews, the next step was to determine the allocation profile for other companies in the basin providing similar services. Three location profiles were applied for each service company allocation:

1) Local Field Office, Regional Office in Denver, and Corporate Headquarters out-of-state
2) Local Field Office, Regional and Corporate Headquarters located out-of-state
3) No Local Field Office, Denver Regional Office, and Corporate Headquarters out-of-state.

There are some allocations that have variations from one of the three profiles, which were adjusted accordingly. For example, one company indicated that their regional office in Denver was only four people and the personnel employed there were mainly overhead (marketing and sales). In this case, the overhead percentage moving to the Denver area was reduced since the first profile above accounts for a larger regional office. Therefore, although we only had three base profiles (above), there was still flexibility to adjust them based on the information provided by service companies.

Information obtained in the interviews from similar companies was used to extrapolate for companies providing similar services and with similar office locations. For services on which data was not collected, such as smaller expense items (e.g., legal, surveying, etc.,) secondary information was collected on whether the company was typically either more labor-based or more material-based and on the location of the offices. Then, data from similar service company allocations and locations for those allocations were applied to new service companies.

1.3.9 Service Company Interviews

Interviews with vendors and service companies for the Northern DJ, Piceance, Raton, San Juan and Paradox, and Eastern DJ Basins included three drilling companies, one stimulation and cementing company (for completions and recompletions), eight well head equipment companies, and one well servicing and maintenance company. Most of these companies operate in multiple basins and Booz Allen received the different profiles for each of the basins where possible. In addition, over 20 additional service companies or vendors were contacted to request participation in the study. They did not participate due to either time constraints or personal preference. Since the sample size is relatively small and all interviewed service companies required that company information remain confidential, allocations are reported on an aggregate basis.

Information from three drilling companies was obtained, representing drilling companies in all basins of analysis for the study. When operators used other drilling companies than those interviewed, Booz Allen researched the particular company through the internet, primarily identifying office locations. This allowed a more accurate estimate of expenditure allocation and location profile. Information was readily available on the number and location of drill rigs operating across the State, allowing a better understanding of service company operations and locations.

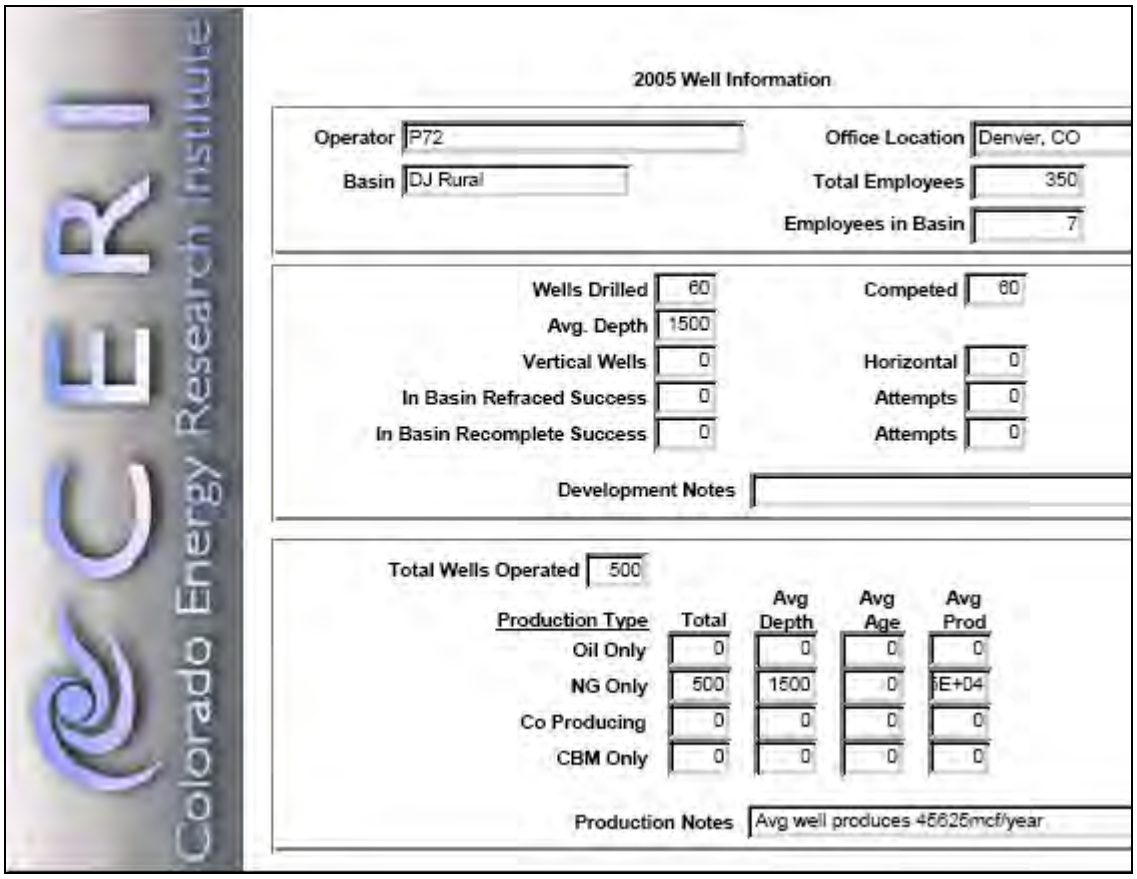
Although four stimulation and cementing service companies operating in Colorado were contacted, information was received from only one company. However, this company operated in three basins allowing a broader understanding of the regional operators across the State. Booz Allen was successful in interviewing and receiving information from major distributors of casing, tubing, flowlines, and well head equipment. Many of the companies provide services to all basins analyzed in this study. Most of these expenditures were materials-based, but did contain, in some cases, small labor components for delivering and setting up equipment.

1.3.10 Database Creation Process

Booz Allen developed a Microsoft Access database to incorporate both the operator and service company (vendor) data. This standard reporting process allowed the team to incorporate and maintain data integrity and easily perform data queries to aggregate and manipulate the data to map to the IMPLAN sectors. The database has expenditure categories that mirror those in AFE and LOE forms, as most operators provided these general types of categories. These expenditure categories were aggregated and mapped to the relevant IMPLAN sectors, providing percentages for in-basin, in-state (out-of-basin) and out-of state expenditures.

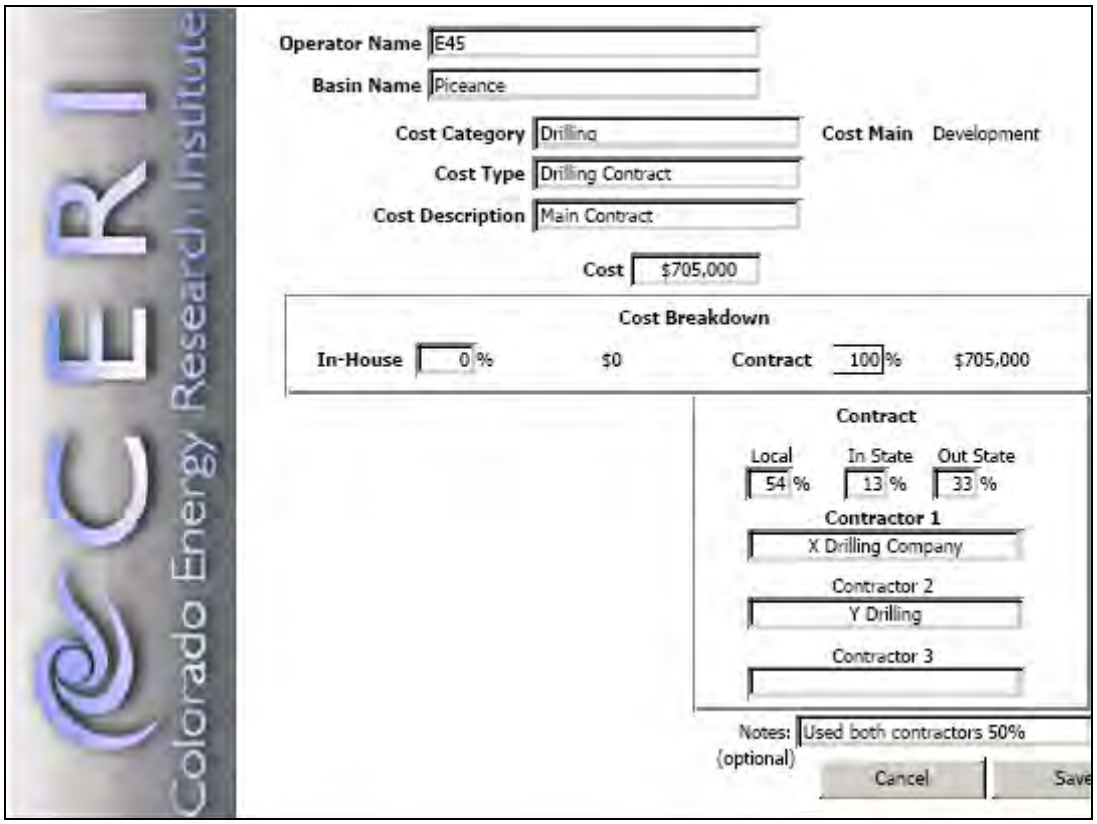
The database was developed with two forms on which primary data was entered: “Operator Well Information” form; and “Cost” form. The Operator Well Information form is illustrated in Exhibit 1-9 was used to enter general well development and production information for an operator in a particular basin (or multiple basins). Generally this information was gathered directly from operating companies, but occasionally we used secondary sources (primarily COGCC database) to fill in the gaps that were not known by the operator.

Exhibit 1-9: Database "Well Information" Form Example



The second "Cost" form, as shown in Exhibit 1-10, was primarily where expenditures were entered into the database. These cost categories were broken down for drilling, completion, recompletion and restimulating, and production expenditures. Each of these major categories was then further disaggregated. For example, completion comprised of: casing/tubing, equipment, roustabouts, stimulation and cementing, other services, and fuel. The expenditures for the operators were then entered into the relevant expenditure category. If the service was contracted to a vendor, then the corresponding service company location allocation was applied to the contracted cost. If the expenditure was incurred in-house for the operator, then the operator provided a percentage breakdown (or general idea) of where the expenditure was incurred for that expenditure. This way, both operator and service company information was entered into the Microsoft Access database.

Exhibit 1-10: Database "Cost" Form Example



After entering all operator expenditure and service company location allocation data for a particular basin, queries were developed that aggregated the operators' total expenditures by whether they were within the basin of analysis, within the state (and out-of-basin), or out-of-state for each associated IMPLAN sector. The query returned a total expenditure per well for an operator in a particular basin.

The queries aggregated the expenditure categories to map various expenditures to the relevant sectors within the IMPLAN model. For example, the activity of *drilling* was broken into four categories for estimating the economic contribution in the IMPLAN model:

- Drilling Sector (#27) – includes all expenditures related directly to drilling a well (e.g., drill rig rental, mobilization, and anything related directly to the actual drilling of the well
- Construction Sector (#39) – includes all necessary expenditures to prep and reclaim a well site location (e.g., earthwork, road and pit construction, re-vegetation)
- Support Activities for the Oil and Gas Industry (Sector #28) – includes:
    - Engineering & Geology
    - Open Hole Logging
    - Drilling Water
- Wholesale Trade Sector (#390) – includes equipment and goods that are purchased through a wholesale distributor. An example from our study is surface casing.

Completion and recompletion activities were all assigned to either Support Activities for the Oil and Gas Industry (Sector #28) or to Wholesale Trade (#390) for the IMPLAN model.

Exhibit 1-11 shows an example of a query for the drilling sector in the Northern DJ basin. The data produced by this query was then used to extrapolate to total basin expenditures, which will be explained in the following section.

Exhibit 1-11: Example Database Query for Drilling in Northern DJ Basin

Basin Name	Operator ID	Total Cost	In-Basin Total	In-State Total	Out-State Total	Wells Drilled	Vert. Wells	Horiz. Wells	Avg Well Depth
N. DJ	A27	$250,000	$150,000	$9,000	$91,000	20	45	0	0
N. DJ	B16	$100,000	$77,050	$1,659	$4,148	90	0	0	7,980
N. DJ	G45	$145,000	$102,250	$2,250	$38,000	100	15	0	7,500
N. DJ	P72	$100,000	$90,993	$2,602	$6,505	300	0	0	7,500
N. DJ	T66	$165,000	$162,360	$0	$2,640	4	0	0	5,500

1.3.11 Secondary Source Data Collection

Throughout this study, Booz Allen collected data from secondary sources to supplement the data received directly from oil and gas operators and service companies. In Exhibit 1-12, the secondary source items are listed by source, information received, and the details of the information. The source used most often during the study was the COGCC's 2005 database, which provided information on the number of wells drilled and 2005 annual production by well. Booz Allen utilized different queries to determine wells drilled by operator and by basin in 2005 and average and median well depths. For production information, the database included by well (API number) the production amounts for oil and gas. Using the gas type field and the formulas COGCC had developed, the portion of gas production was attributed to natural gas, CBM, or other gas was determined. Booz Allen staff further analyzed this data to obtain total production by operator, by basin, and by production type.

Exhibit 1-12: Secondary Source Data List

Source	Data Received	Data Details
COGCC Database: Well Completion	2005 Colorado Oil and Gas Wells Drilled	- # Drilled by Basin & Operator (used "td_date" (total depth date) to query for 2005 wells drilled
		- Average & Median Depths
COGCC Database: Production Data	2005 Colorado Oil & Gas Production	- By Operator, by Basin, by type (Oil, Natural Gas, and CBM determined from "gas type" field)
		- Production by type, by county for Value Added Component for Oil Extraction Sector
Bureau of Economic Analysis	Ratio of total employment to wage and salary employment	- Mining support services
BLS	2003-2004 Job Numbers & associated earnings for Colorado	- Oil & Gas Extraction industry (by county) - Oil & Gas Drilling sector (by county) - Support Activities for Oil & Gas (by county)
Department of Energy (DOE): Energy Information Agency (EIA)	Data for oil and gas operating costs	- Data for costs of oil and gas extraction - Data for costs of oil and gas drilling sector
Mineral Management Service's	2005 Federal Mineral Royalty Revenues	- Natural Gas Liquids output estimate
August 2005 Survey of Current Business	National ratio of wage and salary accruals to compensation	- For the oil and gas extraction - For mining support activities (used for drilling sector)

Exhibit 1-13 shows information that was derived from the COGCC database. The majority of the data in the exhibit comes from the database, but in this case, the information was supplemented with primary source data received during interviews with operators. Typically, the number of wells drilled provided by the operator were higher than those reported by COGCC, likely due to a lag in reporting. Therefore, it is possible that the numbers summarized in Exhibit 1-13 are slightly less than actual 2005 wells drilled in Colorado.

Exhibit 1-13: Wells Drilled by Multi-County Basin

Basin	Total 2005 Wells Drilled[1]
Eastern Denver Julesburg	545
Northern Denver Julesburg	756
San Juan & Paradox	88
Piceance	810
Raton & Canyon City Embayment	317
Rest of the State	54
TOTAL	2,570

[1] Used date the well reached total depth to determine wells drilled in 2005 COGCC database and supplemented with primary data from interviewed companies.

In conducting the economic analyses, numerous secondary sources were used in addition to the data received and/or derived from the COGCC database. Most of the additional secondary sources listed in the above exhibit assisted Booz Allen in developing and adjusting the economic parameters for IMPLAN. This included: number of jobs, job earnings, oil & gas costs, ratios of wage and salary to

compensation. The use of each of these secondary sources is described in more detail in Section 3 of this report.

1.4 Methodology for Extrapolation to Basin Investments

This section addresses the methods for taking the primary data that was collected from the operators and secondary sources to extrapolate it to the basin and state. This includes investments for drilling, completion, and recompletion, mineral royalties and lease expenditures, and wholesale trade. The methods used to estimate and apply both basin and SPCs are discussed in this section as well.

1.4.1 Drilling, Completion, and Recompletion Extrapolation

From the database that was created to house drilling, completion, and recompletion investment information, multiple categories were combined to map into relevant sectors for the model analysis in IMPLAN.

The IMPLAN sectors for drilling, completion, and recompletion investments were determined to be:

- Drilling: Sector 26, Drilling
- Drilling: Sector 27, Support Activities for Oil and Gas Industries
- Drilling: Sector 39, Construction and Earthwork
- Drilling: Sector 390, Wholesale Trade
- Completion: Sector 27, Support Activities for Oil and Gas Industries
- Completion: Sector 390, Wholesale Trade
- Recompletion: Sector 27, Support Activities for Oil and Gas Industries
- Recompletion: Sector 390, Wholesale Trade.

Total development investments per basin were aggregated into one of the above categories with queries from the database. Since information was inputted on where the costs were incurred by both operators and service companies, this allowed an estimate from each operator of the “in-basin”, “in-state,” and “out-of-state” costs for each of the IMPLAN sector categories. Information obtained from service companies and vendors allowed appropriate percentages of local expenditures to be estimated and applied for each type of service or material needed for drilling operations. This resulted in a total estimated expenditure for each itemized cost that occurred in the basin of interest, occurred outside the basin but within Colorado, and occurred outside of Colorado. Section 3 provides greater detail on the various sectors in IMPLAN and the model implementation.

Once the in-basin investments for each of the operators were aggregated to the various expenditures relevant to the IMPLAN sectors, the investments were then applied to all wells drilled within the basin to determine total basin-wide expenditures, out-of-basin but in-state expenditures, out-of-state expenditures, and total expenditures. The total number of wells drilled as well as the depth of the various wells were obtained from the COGCC database. After comparing the secondary source data from the 2005 COGCC database to the primary data received from the oil and gas operators, it was determined that there were some differences between the two. This was true mainly for number of wells drilled in a given basin. Usually, the primary data received from operators was slightly higher than what was reported from the COGCC database, likely due to a lag in filing completion reports. Where possible, the COGCC database number of wells drilled for a given operator were replaced with the number reported by the operator. For example, if information obtained from the COGCC database

reported 100 wells drilled in a given basin and Company X drilled 20 wells, but in reality, Company X drilled 25 wells, then during the extrapolation, Booz Allen used 25 wells for Company X, and the total wells drilled for the basin would increase to 125. This change was only done for data received and verified by operators interviewed by Booz Allen.

This extrapolation process was implemented by mapping operator information about drilling and completing at various depths to the well depth distribution of the basin in total as reported by COGCC on their website. For example, in the Northern DJ Basin, all but one of the operators reported costs for wells drilled between 7,000 and 8,000 feet, and one operator reported drilling to well depths below 7,000 feet. Since there are multiple operators that operate wells deeper than 7,000 feet in the DJ Basin, a weighted average of the operator costs was calculated for each operator, based on the number of wells they reported drilling in 2005 as a percentage of the total wells on which data was collected. This weighted average for each basin was then applied to the percentage of total basin wells drilled to these similar depths. Similarly, the operator reporting costs based on wells drilled at less than 7,000 feet was extrapolated to the percent of total basin wells relevant to these depths. In this way, the individual operator costs were mapped to:

1) The number of wells drilled for each operator as a percent of drilled wells reported; and

2) The total basin drilled depths.

Average investment expenditures based on well depth and number of wells drilled was used to estimate total basin costs for each of the IMPLAN sectors identified above. Earthwork and site construction expenditures for drilling was extrapolated to the basin totals according only to the number of wells drilled by each of the operators as a percent of the reported total wells drilled. All other sectors were extrapolated based on operator costs as they related to comparable well depths.

Although information was available from the COGCC database on recompleted wells, the various queries needed to pull the information created uncertainty in the accuracy of the numbers. Information was collected, where possible, from operators on both the number of recompletions and the total costs of recompletion in each basin. Since all operators were not able to provide costs for each recompletion or restimulating, the total amount spent on recompletion and restimulating were estimated for each operator and then was divided by the operators' total production in the basin. In this way, a unit cost of recompletion per unit of production was estimated. The in-basin, in-state, and out-of-state allocations were applied as indicated by the operators or relevant vendors. If this information was not available, the breakdowns among the sectors were applied from completion information within the basin. Subsequently, the recompletion expenditures per Mcfe were averaged for all operators and then extrapolated across the basin for the expenditure for all production in the basin, in-state, and out-of state.

1.4.2 Mineral Royalties and Lease Payments Extrapolation

As part of the data collection effort, operators across Colorado were asked about their expenditures and payments to gain access to both minerals and surface lands from private mineral owners. Information was obtained on a number of expenditures, including:

- Royalties to private mineral owners;
- Override royalties;
- Payments for leases and bonuses, and
- Payments for surface land damages.

Additionally, information was collected if possible from operators about the location of the recipients of mineral and override royalties and the percentage of wells or production that comprised private mineral ownership.

For both mineral and override royalties, operators were asked about the percentage of operating wells in the basin receiving these royalties, and the average royalty rate typically applied to the value of production. Average 2005 prices were utilized from the COGCC database to determine the value of production. These were determined to be $53.93 per Bbl of oil and $7.39 per Mcf for gas (2005$). Company and basin-wide production was also determined from the COGCC database. For the purposes of the extrapolation, Bbls of oil were converted into Mcfe by multiplying by a factor of six.

For each operator, a royalty value per Mcfe was determined for privately-owned mineral production, averaged over the number of operators, and multiplied by total basin production to determine a total payment for mineral and override royalties. Operators also provided general information about the locations of the recipients of these payments. Information about whether the payments were staying with local households or companies or moving to other operators located in Denver or out-of state was obtained. These percentages were applied to the mineral and override royalties to obtain in-basin, in-state, and out-of-state expenditures.

Information was also collected on surface land damages, including the percentage of wells drilled in 2005 where this payment applied, and average payment per well drilled. It was assumed that these payments to surface land owners stay within the basin, since these are typically households. These payments were calculated for the number of wells drilled for the operator in the basin and averaged on a per well basis. These per well expenses were averaged across all operator data, and then multiplied by the number of wells drilled in the basin in 2005.

Information was also collected, where possible on the amounts of payments for leases and bonuses for access to privately-owned minerals. After pretesting this request with select operators, it was determined that the best way to obtain this information was to ask operators to provide this number in total for these types of payments within each basin of operation. These payments were calculated on a per Mcfe basis for each operator and averaged over all of the operator data, and multiplied by total basin production to determine the total expenditures for leases and payments. The percentages obtained for local basin, within-state, and out-of-state for the royalties were applied to the lease payments and bonuses.

Once the in-basin totals were calculated for surface land damages, private royalties, and lease payments and bonuses, they were aggregated to yield a total in-basin expenditure for mineral royalties, lease payments, and surface land damages. To ascertain how much of this payment was spent within the multi-county basin, it was necessary to determine the disposable income or amount spent (versus being saved or paid to the government) for each basin and for the State overall. IMPLAN provides an Aggregate Social Accounting Matrix (SAM) report that identifies a matrix delineating the relationships among industries in total, commodities, value added components, households, Federal and State institutions, capital, and foreign and domestic trade. The percentage of household expenditures spent on commodities, foreign, and domestic trade provides an estimate of the disposable income in the area. These percentages were applied to the in-basin mineral and override royalties and lease payments.

1.4.3 Basin and State Purchase Coefficients

For the basins of analysis and the State overall, Booz Allen created specific terms or concepts to analyze the expenditures. The first is Basin Purchase Coefficient (BPC), which refers to the

percentage of total expenditures that stay local or are incurred within the basin. These expenditures are analyzed in IMPLAN models to determine local economic contribution that are occurring 100% within the local multi-county basin. For the State model, the State Purchasing Coefficient (SPC) is defined to be the percentage of the total expenditures incurred within the State. The remaining percentage moves out of the State. Again, these SPCs were run through the State IMPLAN model as 100% local, within the State.

1.4.4 Wholesale Trade IMPLAN Sector

The activities of oil and gas drilling and completion require a considerable amount of material and equipment purchases from wholesale trade industries in Colorado. As indicated in the service company section, in general, these industries acquire considerable equipment and materials from outside of Colorado. These 'retail' sectors are treated differently in IMPLAN and typically have to be 'margined' to determine the warehouse mark-up of the merchandise. Through the assessment of the vendors supplying this equipment and materials in the service company database, Booz Allen has utilized primary data to estimate appropriate margins for these wholesale trade industries. In this way, the margins as a percentage of total expenditures have been determined through the database process, and it has not been necessary to utilize IMPLAN's margins.

2. Economic Contribution

Through the approach outlined in the previous section, the in-basin impacts for drilling, completion, and recompletion, mineral royalty and lease payments, and extraction were calculated and run through IMPLAN such that all of the direct impact was incurred in the multi-county basin. Other capital investments, such as for pipelines or other major infrastructure, were not included in this analysis.[1] The new Trade Flows RPCs are utilized in the indirect and induced impacts that occur from this initial expenditure in the local economy. The results therefore yield direct, indirect, and induced economic contribution of these activities, which are defined in the following section.

For each basin, the county IMPLAN models were combined and constructed to create five multi-county models. For each multi-county basin model, multipliers were created in the model utilizing only the household institutions. This analysis allowed the Booz Allen Team to run fiscal impacts calculated from the oil and gas economic activity. This differs from the State model, which had multipliers created for the household and state and local government institutions. The Fiscal Model section will identify how the State tax revenues were extracted from the IMPLAN model analysis.

This section will initially describe how the direct economic contribution is run through the IMPLAN models. This is followed by the basin results, which include the direct economic contribution as well as the results of the economic contribution analysis from IMPLAN. Finally, the State model is described, analyzed, and results are summarized.

2.1 Types of Economic Impacts

Changes to purchases of goods and services for final consumption (final demand change) drives IO models. Each industry that produces goods and services generates demands for other goods and services. When the oil and gas industries purchase services, such as construction, drilling contract, stimulating, additional economic activity is generated. ***Multipliers*** describe these iterations (IMPLAN Manual, 2003). Multipliers can be described through the following definitions.

- Direct effects are the changes in the industries to which a final demand change is made. In this case, we have direct impacts from extraction, support activities for oil and gas activities, drilling industries, wholesale trade, and construction.
- Indirect effects are the changes in *inter-industry* purchases as they respond to the new demands of the directly affected industries. The direct change creates increases in economic activity for additional businesses that support these direct industries (i.e., geological services, trucking, power generation, etc.).
- Induced effects are the increases in *household* income expenditures generated by the direct and indirect effects (e.g., food and beverage stores, motor vehicle dealers, etc.).

A type SAM multiplier, as modeled by IMPLAN, is estimated as the sum of the direct, indirect and induced effects, divided by the direct effect. It shows the amount of additional economic activity generated by the direct economic stimulus. Therefore, multipliers closer to one indicate very little additional activity generated, and larger multipliers indicate more indirect and induced economic activity.

[1] Although pipeline investment was not included, flowline costs per well were included. This includes the costs of purchasing and installing flowlines from the well head to the pipeline.

For drilling and completion activities, the oil and gas industry is purchasing from a number of industries to drill, complete and recomplete wells – these are the direct effects. For the extraction industry, most of the oil and gas production is consumed outside the State of Colorado; this allows the modeling of total industry sales as the direct effect.

2.2 Analyzing Direct Impacts through IMPLAN Model Sectors

The economic contribution of drilling, completion, and recompletion activities were estimated using the modified IMPLAN model for each basin and the State. Drilling and completion capital investments support many industries across Colorado. These operator expenditures or capital investments become revenue or sales for the recipient industries providing these services (e.g., drilling, stimulating and cementing, construction, etc.). The analysis commenced with the categorization of drilling, completion, and recompletion capital investments into appropriate IMPLAN sectors, as summarized in Exhibit 2-1.

Exhibit 2-1: IMPLAN Sectors for Direct Capital Investments for Drilling, Completion, and Recompletion Activities

Type of Expenditure	Title of Sector	IMPLAN Sector Number
Drilling	Drilling Sector	26
	Construction	39
	Support Industries for Oil and Gas Activities	27
	Wholesale Trade	390
Completion	Support Industries for Oil and Gas Activities	27
	Wholesale Trade	390
Recompletion	Support Industries for Oil and Gas Activities	27
	Wholesale Trade	390

The extrapolated 2005 in-basin investments were deflated to 2003 dollars, then run as direct impacts through the multi-county models, while the extrapolated State expenditures were also deflated and run as direct impacts through the State model. Because the estimated investments were both in-basin (for the basin models) and in-state (for the state model), they were run through IMPLAN as if they were 100% local. The results of the IMPLAN model were then reinflated to 2005 dollars utilizing the inflation/deflation ratios provided by IMPLAN. The direct in-basin expenditures are therefore the same as the direct impacts in the results section; these numbers may differ only slightly due to the deflating and inflating process.

To run the extrapolated in-basin expenditures for mineral royalties and lease payments, it was necessary to import the correct household sector. We utilized the 'income per household' for the multi-county basins and imported the related sector in IMPLAN. For example, the average income per household in Northern DJ is approximately $88,000. Therefore, the $75,000 to $100,000 household sector was imported into IMPLAN to run the analysis. These direct impacts were deflated to 2003 dollars to be consistent with the IMPLAN model; the IMPLAN results were then reinflated with IMPLAN inflation factors to report the impacts in 2005 dollars.

The economic contribution of oil and gas production was analyzed directly through one of the IMPLAN sectors (Sector 19) because it is a self-contained sector which includes all economic activity associated with oil and gas extraction. This differs from the approach used for drilling, completion, and recompletion since these activities involve a number of different sectors in the IMPLAN model

including the drilling of oil and gas wells (Sector 27) but also other sectors such as support activities for oil and gas operations (Sector 28) and earthwork (Sector 39). Thus, there is no one sector for oil and gas drilling, completion, and recompletion. The oil and gas industry also differs in that extraction represents an annual operating expense while drilling, completion, and recompletion are more of a one-time capital investment. Inconsistencies in the data collected from operators precluded modifying the production function for oil and gas extraction to make it more specific to Colorado.

The economic contribution of production is based on total industry sales for the oil and gas extraction sector, which was derived from COGCC data on 2005 quantities of oil and gas production in Colorado and Colorado indexed 2005 oil and gas prices (see Appendix C for values). To be consistent with the IMPLAN model, the 2005 oil and gas prices were converted to 2003 dollars. An estimate of the production costs ($0.90/Mcfe for lifting costs) was used to allocate total industry sales between the value-added component and intermediate payments for the extraction sector. The derivation and explanation of this production cost is provided in Section 1.3.2.1.

The contribution of the extraction sector was assumed to be set at 100% local, as all of the production is occurring in Colorado. Additionally, this analysis assumes that most of the oil and gas produced in Colorado is consumed outside the State.

2.3 Basin Results

This section will summarize both the direct expenditures estimates and the IMPLAN economic contribution results for all five of the basins.

2.3.1 Piceance Basin

2.3.1.1 Direct Economic Contribution

The Piceance Basin has the most expensive overall investments for drilling and completing wells in the State. In general, our analysis of investment data indicates that on average a well in the Piceance Basin costs approximately $1.6 million to drill and complete (compared with $550,000 in Northern DJ and $611,000 in southern Colorado). The operators and service companies indicated that this was due to the types of formations in this area, which require a greater and more intensive stimulation as well as mountainous topography which requires more construction and location access expenditures. This area also has deeper wells, which contribute to the higher costs of drilling and completing wells; the average depth of wells drilled (810) in 2005 is approximately 8,200 feet. Exhibit 2-2 summarizes the direct investments associated with drilling, completion, and recompletion activities in the Piceance basin. The in-basin expenditures were run through the IMPLAN model and represent the direct economic impact.

Exhibit 2-2: Piceance Basin Drilling, Completion, and Recompletion Capital Investments (2005$)

Investment Location	Drilling and Completion	Drilling and Completion Investment Per Well Drilled	Recompletion	Total Drilling, Completion, and Recompletion
In-Basin Investment	$350,202,481	$432,349	$3,740,922	$353,943,403
In-State Investment (excludes basin expenditure)	$200,456,241	$247,477	$2,998,820	$203,455,061
Out-of-State Investment	$722,645,833	$892,155	$8,467,258	$731,113,091
Total Investment	$1,273,304,555	$1,571,981	$15,207,000	$1,288,511,555
BPC	28%		25%	27%
SPC	43%		44%	43%

In general, approximately 27% of drilling, completion, and recompletion investments remain within the multi-county basin, while 43% stay either in the basin or within the State. The SPC is lower for Piceance Basin than for other basins in the State. This is likely due to drilling and support vendors located in Vernal, UT allowing expenditures to be paid to out-of-state companies. Additionally, many of the drilling and support companies are employing temporary and flex crews that are located both within the State, but also out-of-state, in locations such as New Mexico. Therefore, the in-basin allocations (Appendix F) were lower for this basin, contributing to smaller BPC and SPC for drilling, completion, and recompletion.

Overall, recompletion investments are approximately $15 million (compared to $191 million in the Northern DJ Basin). This is much lower than others basins indicating that this is a relatively new basin and new wells are being drilled rather than older wells being restimulated.

Exhibit 2-3 displays the mineral royalties and lease payments in the Piceance Basin. In general, 20% of the mineral and override royalties and lease payments stay within this basin. Otherwise, these payments are made to individuals, other operators and companies with mineral ownership or interest located in the Denver area (20%) or out-of-state (60%). There were 5,159 producing wells in the Piceance basin in 2005 with an average expenditure that stays in the Piceance basin of approximately $16,000 per well. Total expenditures per well for mineral and override royalties and lease payments are $80,000 per year.

Exhibit 2-3: Piceance Basin Mineral Royalties and Lease Payments (2005$)

Payment Location	Payment	Payment per Producing Well
In-Basin Payment	$83,754,806	$16,235
In-Basin Disposable Income (66%)	$58,628,364	$11,364
In-State Payment (Out-of-Basin)	$82,928,883	$16,075
Out-of-State Payment	$248,786,648	$48,224
Total Payments	$415,470,336	$80,533
BPC	20%	
SPC	40%	
Disposable Income BPC (after DI taken out)	14%	

Appendix F provides specific information on the allocations for service companies and vendors utilized within the Piceance Basin. In general, the Piceance Basin has lower in- basin expenditures and larger in-state (out-of-basin) expenditures since most of the oil and gas service companies operating in the Piceance Basin are supported by large regional offices in the Denver metro area. Additionally, the in-basin investments are lower since some of the larger service companies providing services such as stimulating and cementing indicated that they bring in temporary (two weeks on, two weeks off) workers since it is difficult to fill positions in this area, which reduces the in-basin location allocation (see Appendix F). The Piceance area is also serviced by vendors in the Vernal, UT area, which increases the amount of investments that move out-of-state.

Interviews with wholesale and retail vendors providing materials and equipment to the oil and gas industry, such as casing and tubing, indicated that these specialty items are manufactured elsewhere and imported. This creates a larger out-of-state allocation for tangible items for drilling, completion, and recompletion activities of between 60 and 95%. These percentages are similar across all basins in Colorado. Most of these tangible items are manufactured elsewhere, imported, and sold to operators within Colorado. Therefore, the local economic activity encompasses only the mark-up applied to the items as well as the local and regional offices located within the basins or State.

Direct impacts for production activities were determined by total industry revenues in the Piceance basin; these were determined to be $2,788,185,740 in 2005 dollars. These are industry revenues as a result of production in the Piceance Basin.

2.3.1.2 Economic Contribution Results

In total, there is approximately $3.1 billion in direct revenues from oil and gas activities in the Piceance Basin and $263M in additional economic activity for a total of $3.4 billion in industry revenue for these activities. Extraction activities comprise 86% of this revenue. Exhibit 2-4 summarizes the total revenues for the Piceance Basin from oil and gas activity. Capital investments for drilling, completion, and recompletion activities and total extraction revenues were estimated as the direct effects. Indirect and induced economic activity was estimated by the IMPLAN model.

Exhibit 2-4: Total Revenues for Oil and Gas Activities in Piceance Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Oil and Gas Contribution
Direct	$353,943,368	$2,788,185,740	$3,142,129,108
Indirect	$34,973,416	$69,922,486	$104,895,903
Induced	$80,574,908	$81,795,612	$162,370,521
Total Direct, Indirect, and Induced Impacts	$469,491,702	$2,939,903,979	$3,409,395,681
Multiplier	1.33	1.05	1.09
Percent of Total Impact	14%	86%	100%

Direct industries impacted by the investments and extraction contribution are shown in Exhibit 2.1 and also include the Extraction Sector. According to the IMPLAN analysis, indirect industries positively impacted by oil and gas activities include:

- Management of companies and enterprises
- Custom computer programming services
- Legal services

- Real estate
- Power generation
- Architectural and engineering services
- Scientific research and development
- Truck transportation.

Induced economic activity is generated through households spending their money within the economy. The types of industries benefiting from oil and gas activity resulting from induced activity in the Piceance Basin include:

- Offices of physicians, dentists and other health care
- Food services and drinking places
- Real estate
- Hospitals
- Motor vehicle and parts dealers
- Food and beverage stores
- Insurance carriers
- General merchandise stores.

The industries benefiting either indirectly or through induced spending are similar across all basins in the State. For this reason, these industries will not be shown in the other basin sections of the report.

In total, the Piceance Basin generates approximately 4,092 direct jobs, which includes service companies, construction, wholesale trade, and drilling companies. There are an additional 2,574 jobs supported by this oil and gas activity, for a total of 6,694 jobs in the multi-county study area. Of the total jobs, 63% are attributed to drilling, completion, and recompletion activities. Employment contribution is summarized in Exhibit 2-5.

Exhibit 2-5: Employment Impacts for Oil and Gas Activities in Piceance Basin

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Oil and Gas Contribution
Direct	2,969	1,123	4,092
Indirect	26	480	805
Induced	908	861	1,769
Total Direct, Indirect, and Induced Impacts	4,230	2,464	6,694
Multiplier	1.42	2.19	1.64
Percent of Total Impact	63%	37%	100%

Total labor earnings for direct and additional economic activity related to the oil and gas activities in the Piceance Basin is approximately $399 million, 51% of which is from drilling, completion, and recompletion activities. Exhibit 2-6 summarizes the labor earnings from oil and gas activities within the Piceance Basin.

Exhibit 2-6: Earnings for Oil and Gas Activities in Piceance Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Earnings
Direct	$162,040,745	$140,320,226	$302,360,971
Indirect	$13,677,756	$26,815,087	$40,492,844
Induced	$27,800,367	$28,202,858	$56,003,225
Total Direct, Indirect, and Induced Impacts	$203,518,868	$195,338,171	$398,857,039
Multiplier	1.26	1.39	1.32
Percent of Total Impact	51%	49%	100%

Exhibit 2-7 shows that the earnings per worker in the industries that directly support oil and gas activities were $74,000 for the year in 2005. On average, all labor earnings that both directly and indirectly support this activity are approximately $60,000.

Exhibit 2-7: Earnings per Worker per Year for Oil and Gas Activities in Piceance Basin for 2005 (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Average Oil and Gas Earnings per Worker
Direct	$54,572	$124,951	$73,885
Indirect	$42,021	$55,911	$50,295
Induced	$30,621	$32,752	$31,658
Average Earnings per Worker	$48,115	$79,287	$59,589

In-basin direct payments to households for access to private minerals and lands in the multi-county Piceance Basin were $56 million, which generated $11.9 million in additional economic activity for a total of $71 million in economic activity. Labor earnings were approximately $15 million in total, while earnings per worker on average were $31,000 per year. Overall these private mineral and lease payments support 477 people in the Piceance area.

Exhibit 2-8: Economic Impacts of Mineral Royalties and Lease Payments in the Piceance Basin (2005$)

Type of Impact	Total Economic Impact	Employment	Labor Earnings	Labor Earnings Per Worker Per Year
Total Economic Impact	$71,094,550	477	$14,791,382	$30,996

While the Piceance Basin has considerable drilling, completion, and recompletion investments, a considerable amount of this economic activity leaks out of basin (73%) and out-of state (57%). This is attributable to supporting vendors located in Denver and Vernal, UT as well as labor pools supporting these activities from both out-of-basin and out-of-state. The Piceance Basin has the highest overall payments for minerals and surface access of approximately $80 million within the basin. On a per-producing-well basis, however, Raton Basin has higher payments.

2.3.2 Northern DJ Basin

2.3.2.1 Direct Economic Contribution

From the primary data collected from the interviews with both operators and service companies in the Northern DJ basin, it was determined that average cost to drill and complete a well was approximately $553,603, of which 64% of the expenditure remained within the multi-county basin. The COGCC database indicates that 756 wells were drilled in the Northern DJ Basin with an average depth of 7,543 feet. There is less drilling occurring in the Northern DJ Basin as compared to other areas of the State but considerably more restimulating of the formations as this is often more economical than drilling new wells. The formations in the DJ are unique in that restimulating current producing wells can recover nearly as much production as drilling a new well. As a result, recompleting and restimulating activities account for approximately 32% of the in-basin investments for drilling, completing, and recompleting activities. More information from the primary data collection is shown in Exhibit 2-9. The in-basin investments were run through the IMPLAN model and represent the direct economic impact.

Exhibit 2-9: Northern DJ Basin Drilling, Completion, and Recompletion Investments (2005$)

Investment Location	Drilling and Completion	Drilling and Completion Investment Per Well Drilled	Recompletion	Total Drilling, Completion, and Recompletion
In-basin Investment	$264,402,493	$349,739	$126,754,565	$391,157,058
In-State Investment (excludes basin expenditure)	$3,255,272	$4,306	$0	$3,255,272
Out-of-State Investment	$150,866,096	$199,558	$64,347,446	$215,213,542
Total Investment	$418,523,861	$553,603	$191,102,011	$609,625,872
BPC	63%		66%	64%
SPC	64%		66%	65%

With an overall BPC of 64% and a SPC of 65%, a greater number of expenditures are remaining within the basin compared to others areas. This is due to the fact that the Northern DJ Basin includes the Denver metropolitan area and therefore most of the drilling and completion purchases from the Denver area are within the basin.

The mineral royalties and lease payment information indicates that on average, 26% of the payments for access to private minerals and leases stay within the basin, while 65% stay within the basin and State. This equates to a payment of approximately $5,635 per producing well remaining within the basin, but a total payment of almost $21,975 per producing well (Exhibit 2-10). According to the COGCC database, there were 13,612 producing wells in the Northern DJ Basin. The total in-basin payment of $76,701,805 of which $50.6 million is assumed to be spent locally was run through IMPLAN as the direct effect.

Exhibit 2-10: Northern DJ Mineral Royalties and Lease Payments (2005$)

Payment Location	Payment	Payment per Number of Producing Wells
In-Basin Payment	$76,701,805	$5,635
In-Basin Disposable Income Payment	*$50,623,191*	$3,719
In-State Payment (out of basin)	$118,628,502	$8,715
Out-of-State Payment	$103,799,940	$7,626
Total Payments	$299,130,247	$21,975
BPC	*26%*	
SPC	*65%*	
Disposable Income BPC (after DI taken out)	*17%*	

Specific service company and vendor location allocations for various services and equipment and materials provided to oil and gas operators in the Northern DJ Basin are shown in Appendix F. Interviews with service companies and vendors within the Northern DJ basin indicate that many of the labor-based services, including drilling are supported by companies headquartered in Denver or with large regional offices in Denver. Therefore, the in-basin percentages for the drilling companies and labor-based services such as stimulation and cementing range from 69 to 90% for in-basin expenditures. Very few drilling and completion capital investments are allocated as in-state and out-of-basin since this basin incorporates the greater Denver area. However, interviews with vendors supplying casing, tubing and other smaller tangible items and materials in the Northern DJ Basin suggest that quite of significant portion of these materials is purchased from out-of-state (from 60 to 95%). This is similar across all of the basins in Colorado.

Direct impacts for production activities were determined by total industry revenues in the Northern DJ Basin; these were determined to be $2.219 billion in 2005 dollars. These are industry revenues as a result of production in the Northern DJ basin.

2.3.2.2 Economic Contribution Results

Total revenues for the oil and gas activities analyzed in this study are approximately $3.1 billion. The bulk of this impact is from extraction activities (79%). Capital investments for drilling, completion, and recompletion activities and total extraction revenues were estimated as the direct effects. Indirect and induced economic activity was estimated by the IMPLAN model. The total revenues for oil and gas activities in the DJ Basin are summarized in Exhibit 2-11.

Exhibit 2-11: Total Revenues for Oil and Gas Activities in Northern DJ Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Oil and Gas Contribution
Direct	$391,156,977	$2,219,026,231	$2,610,183,207
Indirect	$67,763,579	$152,813,952	$220,577,532
Induced	$185,175,372	$59,322,537	$244,497,909
Total Direct, Indirect, and Induced Impacts	$644,095,928	$2,431,162,720	$3,075,258,648
Multiplier	1.65	1.10	1.18
Percent of Total Impact	21%	79%	100%

Direct industries impacted by the investments and extraction revenues are shown in Exhibit 2.1 and also include the Extraction Sector. According to the IMPLAN analysis, the indirect and induced economic activity in the Northern DJ basin benefits many of the same industries as those identified in the Piceance Basin results section.

In the Northern DJ Basin, oil and gas activities directly employ 3,500 people, with an additional 3,500 supported through indirect and induced activity (Exhibit 2-12). Seventy-six percent of this employment is created from drilling, completion, and recompletion activities.

Exhibit 2-12: Employment Impacts for Oil and Gas Activities in Northern DJ Basin

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Oil and Gas Contribution
Direct	3,146	359	3,505
Indirect	432	791	1,223
Induced	1760	525	2,285
Total Direct, Indirect, and Induced Impacts	5,338	1675	7,013
Multiplier	1.70	4.67	2.00
Percent of Total Impact	76%	24%	100%

Total labor earnings for direct and additional economic activity related to the oil and gas activities in the Northern DJ basin is approximately $450 million, the majority of which (76%) is attributed to production activities. Labor earnings in the Northern DJ Basin are summarized in Exhibit 2-13.

Exhibit 2-13: Earnings for Oil and Gas Activities in Northern DJ Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Earnings
Direct	$249,776,667	$34,099,901	$283,876,569
Indirect	$27,708,517	$54,090,645	$81,799,161
Induced	$64,108,733	$20,537,892	$84,646,625
Total Direct, Indirect, and Induced Impacts	$341,593,917	$108,728,438	$450,322,355
Multiplier	1.37	3.19	1.59
Percent of Total Impact	76%	24%	100%

Exhibit 2-14 shows that the earnings per worker in the industries directly supporting oil and gas activities were approximately $81,000 annually in 2005. On average, all labor earnings per worker that both directly and indirectly support this activity were $64,000. These averages were slightly higher than labor earnings in the Piceance Basin.

Exhibit 2-14: Earnings per Worker for Oil and Gas Activities in Northern DJ Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Oil and Gas Contribution
Direct	$79,395	$94,986	$80,992
Indirect	$64,140	$68,383	$66,884
Induced	$36,425	$39,120	$37,044
Average Earnings per Worker	$63,993	$64,913	$64,213

In-basin direct payments to households for access to private minerals and lands in the multi-county Northern DJ Basin were $51 million, which generated $23 million in additional economic activity for a total of $73 million in economic activity. Labor earnings were approximately $20 million in total, while earnings per worker on average were $37,000 per year. Overall these private mineral and lease payments support 534 people in the Northern DJ area.

Exhibit 2-15: Economic Contribution of Mineral Royalties and Lease Payments for Northern DJ Basin (2005$)

	Economic Activity	Employment	Labor Earnings	Labor Earnings Per Worker Per Year
Total Economic Impact	$73,431,875	534	$19,577,402	$36,669

The Northern DJ Basin has considerably higher in-basin and lower in-state capital investments for drilling and completion than other basins in the State since the Denver metro area that supports a considerable amount of oil and gas activities is located within the Northern DJ Basin. Drilling, completion, and recompletion expenditures account for 21% of total revenues yet 76% of the employment in the Northern DJ Basin. Labor earnings and earnings per worker are slightly higher than those of the Piceance Basin, with 76% of the earnings in Northern DJ basin from drilling, completion, and recompletion activities.

The Northern DJ Basin has the highest recompletion investments of all the basins, approximately $191 million in total investments, compared to $15 million in Piceance, $1.7 million in Eastern DJ, and $14 million in Raton. Additionally, 65% of mineral royalties stay within the Northern DJ Basin and State, with a total of $77 million (26%) paid to households and companies within the basin.

2.3.3 Eastern DJ Basin

2.3.3.1 Direct Economic Contribution

There were 545 wells drilled in 2005 with an average depth of 2,700 feet in Eastern DJ basin. The average depths of these wells in this part of the DJ Basin are much shallower than those in the Northern DJ Basin (an average of 7,500 feet). As a result, these wells are much less expensive to drill and complete, with an average total cost of $183,000 per well (Exhibit 2-16). The total in-basin capital investments for drilling, completion, and recompletion are approximately $32M, approximately 31% of total drilling and completion investments. Twenty-five percent of these expenditures are paid to companies in the Denver area that support oil and gas activities, for a total of 56% staying within the State. The in-basin capital investments were run through the IMPLAN model and represent the direct economic impacts.

Exhibit 2-16: Eastern DJ Basin Drilling, Completion, and Recompletion Capital Investments (2005$)

Investment Location	Drilling and Completion	Drilling and Completion Investment Per Well	Recompletion	Total Drilling, Completion, and Recompletion
In-basin Investment	$31,067,239	$57,004	$488,724	$31,555,963
In-State Investment (excludes basin investment)	$25,195,014	$46,229	$736,224	$25,931,238
Out-of-State Investment	$43,422,802	$79,675	$430,232	$43,853,034
Total Investment	$99,685,055	$182,908	$1,655,180	$101,340,235
BPC	31%		30%	31%
SPC	56%		74%	57%

In the Eastern DJ Basin, mineral and override royalties and payments are more apt to be paid to local households for access to minerals -- approximately 80% (Exhibit 2-17). No royalties and lease payments move to the Denver area; as a result the BPC and the SPC are the same. Since the number of producing wells in Eastern DJ basin is 2,869, the average payment per well per year that stays local is $8,623.

Exhibit 2-17: Eastern DJ Basin Mineral Royalties and Lease Payments (2005$)

Payment Location	Payment	Payment per Number of Producing Wells
In-Basin Payment	$24,740,100	$8,623.25
In-Basin Disposable Income (66%)	$17,565,471	$6,122.51
In-State Payment (out of basin)	0	$0.00
Out-of-State Payment	$6,011,079	$2,095.18
Total Payments	$30,751,179	$10,718.43
BPC	80%	
SPC	80%	
Disposable Income BPC (after DI taken out)	57%	

Appendix F provides specific information on the allocations for service companies and vendors utilized within the Eastern DJ Basin. In general, the Eastern DJ Basin has relatively high in-basin and moderate in-state (out-of-basin) investments as most of the oil and gas service companies operate out of offices in the eastern part of Colorado, but also utilize companies that have large (or larger) regional offices in the Denver metro area. A considerable number of drilling companies utilized by operators in this basin have offices in the Eastern DJ Basin, although many have corporate HQs outside the State. Therefore, the in-basin allocation was determined to range from 55 to 68%. Similarly, many of the service companies that provide general labor-based services were located within the Eastern DJ Basin, therefore 80 to 90% of expenditures were allocated as in-basin.

Location allocations for vendors providing materials and equipment for drilling and completion activities, including casing and tubing, were similar to those profiles used in other basins, with a large portion of materials purchases coming from out-of-state (from 60 to 90%). However, in the Eastern DJ Basin there is a higher in-state (out-of-basin) expenditure as a result of the Denver area support.

Stimulating and cementing services, which comprise a large portion of completion expenditures, had a smaller in-basin labor component as a large percentage of the support comes from the Denver area.

Direct impacts for production activities were determined by total industry revenues in the Eastern DJ Basin; these were determined to be $286 million in 2005 dollars. These are industry revenues as a result of production in the Eastern DJ Basin.

2.3.3.2 Economic Contribution Results

In the Eastern DJ Basin, there is approximately $318 million in direct revenues from oil and gas activities, with $13.9 million in additional economic activity, for total revenues of $332 million (Exhibit 2-18). Extraction activities comprise 89% of this economic output. Capital investments for drilling, completion, and recompletion activities and total extraction revenues were estimated as the direct effects. Indirect and induced economic activity was estimated by the IMPLAN model.

Exhibit 2-18: Total Revenues for Oil and Gas Activities in Eastern DJ Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Oil and Gas Contribution
Direct	$31,555,956	$286,111,575	$317,667,530
Indirect	$1,596,161	$2,928,332	$4,524,493
Induced	$4,233,394	$5,220,283	$9,453,677
Total Direct, Indirect, and Induced Impacts	$37,385,511	$294,260,190	$331,645,700
Multiplier	1.18	1.03	1.04
Percent of Total Impact	11%	89%	100%

Employment in the Eastern DJ Basin is considerably lower than the other basins, with approximately 594 people employed for direct oil and gas activities as well as industries and households supported by the oil and gas industries (Exhibit 2-19). Fifty-nine percent of this total employment is attributed to drilling, completion, and recompletion activities.

Exhibit 2-19: Employment Impacts for Oil and Gas Activities in Eastern DJ Basin

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Oil and Gas Contribution
Direct	277	163	440
Indirect	18	22	41
Induced	52	60	112
Total Direct, Indirect, and Induced Impacts	348	246	594
Multiplier	1.26	1.51	1.35
Percent of Total Impact	59%	41%	100%

Labor earnings in total are approximately $35.5 million for the Eastern DJ Basin and are fairly evenly attributed to both drilling and extraction activities (Exhibit 2-20).

Exhibit 2-20: Earnings for Oil and Gas Activities in Eastern DJ Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Earnings
Direct	$14,583,808	$16,648,886	$31,232,694
Indirect	$557,528	$916,701	$1,474,230
Induced	$1,257,531	$1,556,136	$2,813,666
Total Direct, Indirect, and Induced Impacts	$16,398,865	$19,121,723	$35,520,589
Multiplier	1.12	1.15	1.14
Percent of Total Impact	46%	54%	100%

The average earnings per worker in the Eastern DJ Basin were estimated to be approximately $70,000 for direct jobs and $60,000 for all jobs. Exhibit 2-21 summarizes the earnings per worker per year.

Exhibit 2-21: Earnings per Worker for Oil and Gas Activities in Eastern DJ Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Average Earnings per Worker
Direct	$52,611	$102,140	$70,951
Indirect	$30,300	$41,293	$36,311
Induced	$24,183	$25,764	$25,033
Average Earnings per Worker	$47,123	$77,825	$59,829

In-basin direct payments to households for access to private minerals and lands in the multi-county Eastern DJ basin were $17.6 million, which generated $1.3 million in additional economic activity for a total of $18.8 million in economic activity. Labor earnings were approximately $2.2 million in total, while earnings per worker on average were $24,000 per year. Overall these private mineral and lease payments support 91 people in the Eastern DJ area.

Exhibit 2-22: Economic Contribution of Mineral Royalties and Lease Payments for Eastern DJ Basin (2005$)

	Economic Activity	Employment	Labor Earnings	Labor Earnings Per Worker Per Year
Total Economic Impact	$18,840,896	91	$2,227,964	$24,376

The Eastern DJ Basin generally has shallower wells that are less expensive to drill and complete. Additionally, most of the mineral royalty and lease payments are staying local in Eastern DJ basin with an average payment per producing well of $8,600 per year. However, these payments are lower than those in other basins in the State both in total and per well, due primarily to the lower production in Eastern DJ Basin. In general, the economic contribution of the Eastern DJ Basin is less than others basins in the State, as this basin has less overall production and lower investments for drilling and completing wells than other basins in the State.

2.3.4 Raton and San Juan and Paradox Basins

The method used to estimate direct investments in the San Juan and Paradox and Raton Basins was different from other basins due to disclosure issues. Six operators were interviewed from both basins. All operator drilling, completion, and recompletion investments were combined together and mapped to the well depths and number of wells reported to have been drilled and completed in both of the basins. Once the average investment per well was calculated through the extrapolation process (using both basins), it was applied to the total number of wells drilled in each of the basins (88 wells in San Juan and Paradox and 317 in Raton) to determine the basin-wide investments for Raton and San Juan and Paradox.

Recompletion information from three operators in both basins was used to determine the average investment for completions per Mcfe, which was then multiplied by the total production in each basin to determine a total basin-wide investment for recompletion. Both recompletion capital investments and mineral royalty and lease payments could not be disclosed in the San Juan and Paradox Basin due to disclosure issues. Direct investments for recompletion (and drilling and completion) as well as for mineral royalties and leases are estimated for the Raton Basin since this information did not have constraining stipulations and could be disclosed.

Raton Basin is supported through offices and activities in Trinidad (within basin) and Denver, while San Juan and Paradox oil and gas operations are primarily supported from the Farmington, NM area. As explained above, these basins were extrapolated together resulting in the same BPC and SPC for both Basins. However, in reality the BPC and SPC for the Raton Basin are likely higher than reported here and the BPC and SPC for San Juan and Paradox Basin are likely lower.

2.3.4.1 Raton Basin Economic Contribution

In Raton Basin, there were 317 wells drilled in 2005, and a total of 2,019 producing wells. In Raton Basin, our extrapolation process determined that in-basin capital investments for drilling, completion, and recompletion were $71 million for this basin, considerably lower than both Piceance and Northern DJ Basins (Exhibit 2-23). The extrapolation process from both the Raton and San Juan and Paradox Basins indicated that in general 34% of these investments stayed within the basin, and 49% remained within the Basin and State. In reality the in-basin and in-state investments for the Raton Basin are most likely higher than the percentages reported here. This is due to the San Juan and Paradox Basin location allocations, which are much lower for in-basin and in-state as a considerable portion of drilling and completion support comes from Farmington, NM. In contrast, the Raton Basin, in general, has considerably more support from local field offices (Trinidad, CO) and support from regional Colorado offices than occurs in the San Juan and Paradox Basin. Since both basins' drilling and completion investments were extrapolated together, these location allocations were averaged across both basins. This process likely brought down the actual BPCs and SPCs for Raton Basin and increased the BPCs and SPCs for the San Juan and Paradox Basin. The in-basin investments were run through the IMPLAN model and represent the direct economic impact.

Exhibit 2-23: Ration Basin Drilling, Completion, and Recompletion Capital Investments (2005$)

Investment Location	Drilling and Completion	Drilling and Completion Investment Per Well	Recompletion	Total Drilling, Completion, and Recompletion
In-basin Investment	$67,503,077	$212,943	$3,285,076	$70,788,153
In-State Investment (excludes basin investment)	$26,725,496	$84,308	$2,406,977	$29,132,473
Out-of-State Investment	$99,597,744	$314,188	$7,881,445	$107,479,189
Total Investment	$193,826,317	$611,439	$13,573,498	$207,399,815
BPC	35%		24%	34%
SPC	49%		42%	48%

Mineral and override royalties and lease payments are estimated to be approximately $42.6 million to local households (Exhibit 2-24). In total, these payments are lower than those of the Piceance and Northern DJ Basins, but are higher when considering the expenditure per producing well. Households in the Raton Basin are assumed to spend 66% of their income; therefore, approximately $31 million was assumed to be spent in the local economy by households in the multi-county basin.

Exhibit 2-24: Raton Basin Mineral Royalties and Lease Payments (2005$)

Payment Location	Payments	Payment Expenditure per Number of Producing Wells
In-Basin Payment	$42,583,661	$21,091.46
In-Basin Disposable Income (66%)	$31,086,073	$15,396.77
In-State Expenditure (out of basin)	$25,431,862	$12,596.27
Out-of-State Expenditure	$16,517,799	$8,181.18
Total Expenditures	$84,533,322	$41,868.91
BPC	50%	
SPC	80%	
Disposable Income BPC (after DI taken out)	37%	

Appendix F provides specific information on the allocations for service companies and vendors utilized within the Raton Basin. In general, the Raton Basin has relatively lower in-basin allocations for drilling and completion expenditures than other basins within the State (except the San Juan and Paradox basin) and moderate in-state (out-of-basin) allocations since most of the oil and gas service companies operate out of a local office in the Trinidad area, and many are supported from large (or larger) regional offices in the Denver metro area. Booz Allen determined that some of the operators in the Raton Basin were supported, though infrequently, by companies from the Farmington, NM area.

In general, the location allocations for vendors providing equipment and materials for service companies are similar to the profiles used for those in other Colorado basins. However, in the Raton Basin, there were slightly higher in-state (out-of-basin) expenditures, representing Denver area support for material purchases and services. Casing and tubing allocations for the Raton Basin were also similar to those in other basins with a large out-of-state component as these materials are imported to Colorado. In the Raton Basin, the location allocations for drilling companies, and other general labor-based services were fairly low for the in-state (out-of-basin allocations) since much of this labor was utilized from local Trinidad labor pools. Stimulation and cementing services were

provided generally by large companies with regional offices in the Denver area and headquarter offices out-of-state. Therefore, in-basin allocations were lower, with a higher proportion moving out-of-state.

Direct impacts for production activities were determined by total industry revenues in the Raton Basin; these were determined to be $702,398,800 in 2005 dollars. These are industry revenues as a result of production in the Raton Basin.

2.3.4.2 Raton Basin Economic Contribution Results

In the Raton Basin, there is approximately $773 million in direct revenues from oil and gas activities, with $32 million in additional economic activity for total revenues of approximately $805 million (Exhibit 2-25). Extraction activities comprise 89% of this economic output. Capital investments for drilling, completion, and recompletion activities and total extraction revenues were estimated as direct effects. Indirect and induced economic activity was estimated by the IMPLAN model.

Exhibit 2-25: Total Revenues for Oil and Gas Activities in Raton Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Oil and Gas Contribution
Direct	$70,787,813	$702,398,835	$773,186,648
Indirect	$3,757,717	$8,202,009	$11,959,726
Induced	$11,900,314	$8,211,154	$20,111,468
Total Direct, Indirect, and Induced Impacts	$86,445,844	$718,811,999	$805,257,842
Multiplier	1.22	1.02	1.04
Percent of Total Impact	11%	89%	100%

In total, the Raton Basin contributes approximately 830 direct jobs, which includes service companies, construction, wholesale trade, and drilling companies. There are an additional 331 jobs supported by this oil and gas activity, for a total of 1,160 jobs (Exhibit 2-26). Of the total jobs, 69% are attributed to drilling, completion, and recompletion activities.

Exhibit 2-26: Employment Impacts for Oil and Gas Activities in Raton Basin

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Oil and Gas Contribution
Direct	618	212	830
Indirect	40	57	97
Induced	142	92	234
Total Direct, Indirect, and Induced Impacts	800	360	1,160
Multiplier	1.30	1.70	1.40
Percent of Total Impact	69%	31%	100%

Total labor earnings for direct and additional economic activity related to the oil and gas activities in the Raton Basin was approximately $68 million in 2005, the majority of which (60%) is attributed to drilling, completion, and recompletion activities (Exhibit 2-27).

Exhibit 2-27: Earnings for Oil and Gas Activities in Raton Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Earnings
Direct	$35,468,460	$21,677,984	$57,146,444
Indirect	$1,286,804	$2,514,416	$3,801,219
Induced	$3,890,943	$2,681,416	$6,572,360
Total Direct, Indirect, and Induced Impacts	$40,646,207	$26,873,816	$67,520,023
Multiplier	1.15	1.24	1.18
Percent of Total Impact	60%	40%	100%

Annual earnings per worker for oil and gas activities in the Raton Basin are approximately $69,000, and overall with the additional economic activity generated by these activities, the earnings per worker are $58,000 per year (Exhibit 2-28).

Exhibit 2-28: Earnings per Worker for Oil and Gas Activities in Raton Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Average Earnings per Worker
Direct	$57,430	$102,255	$68,884
Indirect	$31,931	$44,503	$39,269
Induced	$27,343	$29,241	$28,087
Average Earnings Per Worker	$50,795	$74,608	$58,187

In-basin direct payments to households for access to private minerals and lands in the multi-county Raton Basin were $31 million, which generated $2.8 million in additional economic activity for a total of $34 million in economic activity (Exhibit 2-29). Labor earnings were approximately $4.8 million in total, while earnings per worker on average were $27,500 per year. Overall these private mineral and lease payments support 176 people in the Raton Basin.

Exhibit 2-29: Economic Contribution of Mineral Royalties and Lease Payments for Raton Basin (2005$)

	Economic Activity	Employment	Labor Earnings	Labor Earnings Per Worker Per Year
Total Economic Impact	$33,946,481	176	$4,839,481	$27,560

In general, the primary data collected from operators in San Juan and Paradox and Raton Basins indicate that in general approximately 34% and 48% of drilling, completion, and recompletion revenues and private mineral and lease payments stay within the basin and the State, respectively. In reality, these percentages are likely higher in the Raton Basin compared with the San Juan and Paradox data, which has significantly lower in-basin and in-state percentages.

Overall, total revenue from oil and gas activities for the Raton Basin is less than that of the Piceance, Northern DJ and San Juan and Paradox Basins. The employment and labor income is about the same as those in San Juan and Paradox Basin, although still significantly lower than Piceance and the Northern DJ Basins. As indicated earlier, the Raton economic contribution, employment, and labor income are likely higher than reported here due to significant leakages in San Juan and Paradox

Basin to New Mexico. Since the two basins were extrapolated together, the location allocations for in-basin expenditures were reduced due to the averaging of the extrapolation process.

2.3.4.3 San Juan and Paradox Basin Direct Economic Contribution

Reporting on primary data collected for the San Juan and Paradox Basin was restricted due to disclosure issues with operators that were interviewed. As a result, information related to recompletions and mineral and override royalties and lease payments could not be disclosed in this report for this basin. However, aggregate numbers are included in the State-wide analysis. Overall impressions and insights regarding these issues will be made on a qualitative basis.

Total drilling, completion, and recompletion capital investments were determined to be approximately $128 million, with an average cost to drill and complete of $611,000 per well, which is consistent with the extrapolation process for the Raton and San Juan and Paradox Basin. On average, the depth of the wells drilled in 2005 in the San Juan and Paradox basin is 4,500 feet. Since the average depth is deeper in the San Juan and Paradox Basin that the wells in Raton, it is likely that the total expenditure costs are higher in the San Juan and Paradox Basin. However, there are significantly more leakages to New Mexico for the San Juan and Paradox Basin compared with the Raton Basin, indicating that these expenditures are likely lower than indicated here. The extrapolation process averaged costs across both basin costs. There were only 88 wells drilled in the San Juan and Paradox Basins in 2005; therefore this expenditure is less overall compared to those in the Raton Basin. Due to disclosure constraints, only the aggregated investments for drilling, completion, and recompletion are reported. The in-basin investment of $36.6 million, 29% of total investments, was run through the IMPLAN model and represents the direct economic impact.

Exhibit 2-30: San Juan and Paradox Basin Drilling, Completion, and Recompletion Capital Investments (2005$)

Investment Location	Total Drilling, Completion, and Recompletion
In-basin Investment	$36,612,571
In-State Investment (excludes basin expenditure)	$20,515,026
Out-of-State Investment	$70,530,197
Total Investment	$127,657,794
BPC	29%
SPC	45%

Although the mineral and override royalties and lease payments cannot be disclosed quantitatively, these payments to local households and business are considerable. San Juan and Paradox basin has the highest overall Mcfe production in the State. Since these mineral access payments are primarily based upon the value of production, these payments are greatest for this basin. There are 2,852 producing wells in the basin.

Interviews with both operators and service companies that support drilling and completion in the San Juan and Paradox basin indicate that in general most of these companies are located in Farmington and labor is also typically coming from out-of-state. Only the earthwork and construction companies are generally located within the basin. Therefore, the in-basin and in-state allocations are very low for this basin.

Direct impacts for production activities were determined by total industry revenues in the San Juan and Paradox Basin; these were determined to be $702,398,800 in 2005 dollars. These numbers represent industry revenues as a result of production in the San Juan and Paradox Basin.

2.3.4.4 San Juan and Paradox Basin Economic Contribution Results

The total revenues from the San Juan and Paradox Basin are higher than those of other basins. In total, total revenues from oil and gas activities are approximately $4.0 billion for this basin, 99% of which is due to extraction activities. This is due to the fact that there were only 88 wells drilled in this area in 2005 and most of the drilling and completion expenditures leaked to New Mexico. As stated in the previous section, direct capital investments for drilling, completion, and recompletion, and total revenues for oil and gas production were estimated as the direct effect. Indirect and induced economic activity was estimated by the IMPLAN model.

Exhibit 2-31: Total Revenues for Oil and Gas Activities in San Juan and Paradox Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Oil and Gas Contribution
Direct	$36,612,572	$3,831,466,124	$3,868,078,696
Indirect	$1,842,482	$66,244,817	$68,087,299
Induced	$6,101,298	$16,970,481	$23,071,779
Total Direct, Indirect, and Induced Impacts	$44,556,351	$3,914,681,422	$3,959,237,773
Multiplier	1.22	1.02	1.02
Percent of Total Impact	1%	99%	100%

Employment impacts for oil and gas activities are lower in this area since they influenced by the low amount of drilling and completion which is more labor-based than are extraction activities. In total, there are 1,227 jobs within the San Juan and Paradox Basin associated with drilling, completion, recompletion and extraction activities (Exhibit 2-32).

Exhibit 2-32: Employment Impacts for Oil and Gas Activities in San Juan and Paradox Basin

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Oil and Gas Contribution
Direct	312	186	498
Indirect	21	455	476
Induced	71	183	254
Total Direct, Indirect, and Induced Impacts	403	824	1,227
Multiplier	1.29	4.43	2.47
Percent of Total Impact	33%	67%	100%

Labor earnings in total for both direct and additional economic activity from oil and gas activities are $66 million, which is lower than earnings in other basins due to lower amount of local employment in this area (Exhibit 2-33).

Exhibit 2-33: Earnings for Oil and Gas Activities in San Juan and Paradox Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Total Earnings
Direct	$14,720,432	$22,743,895	$37,464,327
Indirect	$667,471	$20,038,343	$20,705,814
Induced	$2,008,518	$5,586,582	$7,595,100
Total Direct, Indirect, and Induced Impacts	$17,396,421	$48,368,820	$65,765,241
Multiplier	1.18	2.13	1.76
Percent of Total Impact	26%	74%	100%

Labor earnings per worker are significant in this area, as there are fewer workers with considerable production. Therefore, the earnings per worker for the direct activities associated with oil and gas are approximately $75,000 per year. If all jobs generated by oil and gas activity are included, the earnings per worker drop to approximately $54,000 annually.

Exhibit 2-34: Earnings per Worker for Oil and Gas Activities in San Juan and Paradox Basin (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Average Earnings per Worker
Direct	$47,257	$122,279	$75,305
Indirect	$31,936	$44,069	$43,536
Induced	$28,449	$30,511	$29,937
Average Earnings Per Worker	$43,167	$58,714	$53,607

Most of the economic contribution from the San Juan and Paradox Basin is derived from the considerable extraction activities in this basin. There were fewer wells drilled in this area, and most of these drilling and completion investments were purchased from vendors from outside Colorado. For this reason, employment impacts are lower, yet total revenues from extraction are considerable. Mineral and override royalties are also significant in this area as a result of the considerable production, although these numbers could not be disclosed due to an agreement signed with operators.

2.3.5 Economic Contribution of Remaining Oil and Gas Activity across the State

To determine the overall direct economic contribution of the State, it was necessary to include additional oil and gas investment and activity of the remaining areas not included in the five basins. To measure the additional development activity for the remaining wells drilled and completed in State that were not accounted for in the basin analysis, two additional study areas were created. These two areas generally included wells located in: 1) the Sand Wash and North Park Basins in the north central part of the State; and 2) the Hugoton Basin in southeastern Colorado.

Average drilling, completion, and recompletion investments were mapped from basins near these areas on a per well basis. For instance, the Piceance drilling and completion expenditures per well were applied to those wells in the Sand Wash and North Park area, and the Eastern DJ Basin values were applied to those wells in and near the Hugoton basin. The COGCC database provided the number of wells drilled in these additional basins.

To determine the total royalties and lease payments for the additional wells and production located in the two study areas, a total payment per unit of production was determined for both in-basin and in-state mineral royalty and lease payments for all the basins. Each basin's private royalty expenditures were divided by the basin production (Mcfe) to determine a per Mcfe payment for private mineral royalties and leases. Again, the Piceance Basin private mineral royalty and lease payments per Mcfe were applied to the remaining production in the Sand Wash and North Park area, and the Eastern DJ Basin mineral royalty and lease payments per Mcfe were applied to the production in the Hugoton area in the southeastern part of the State. This process was applied to both in-basin, in-state, and out-of-state mineral royalties and lease payments. These investments and royalty payments are included in the direct economic contribution for the State in Section 2.4.1.

2.3.6 Economic Contribution Comparison of the Basins

Exhibit 2-35 summarizes the results from the economic contribution of the multi-county basins across the State of Colorado. This figure comprises the direct, indirect and induced impacts from drilling, completion, recompletion, and extraction activities. The final row highlights the additional economic activity generated through payments for access to private mineral royalties and leases.

Exhibit 2-35: Total Economic Contribution of Oil and Gas Drilling, Completion, Recompletion and Extraction for All Basins (2005$)

Type of Economic Contribution	Piceance	Northern DJ	Eastern DJ	Raton	San Juan & Paradox
Total Revenues	$3,409,000,000	$3,075,000,000	$332,000,000	$805,000,000	$3,959,000,000
Employment	6,694	7,013	594	1,160	1,227
Labor Earnings	$398,000,000	$450,000,000	$36,000,000	$68,000,000	$66,000,000
Earnings per Worker	$59,600	$64,200	$59,800	$58,100	$53,607
Private Mineral Royalties and Payments (Total Economic Activity)	$71,000,000	$73,000,000	$19,000,000	$34,000,000	ND

ND=Non Disclosure

2.4 State Model

For the State model, Booz Allen utilized the existing basin capital investments for drilling, completion, and recompletion, and private mineral royalties and lease payments and extrapolated those expenditures or investments to other areas of the State that were not captured to account for the remaining wells drilled and production, as discussed in Section 2.3.5. Total capital investments in 2005 in Colorado were estimated using existing data and assumptions. These direct impacts were run through the modified IMPLAN model to estimate full economic contribution of the oil and gas industry to the State of Colorado.

2.4.1 Direct Economic Contribution

All basin expenditures were aggregated across the relevant drilling, completion, and recompletion IMPLAN sectors to determine overall in-state capital investment for drilling, completion, and recompletion. These numbers include all in-basin impacts and in-state impacts. Total capital investment for drilling, completion, and recompletion were also captured allowing a determination of SPC.

From the five basins and the two study areas, which comprise all the drilling, completion, and recompletion investments within the State, the primary data collection and analysis indicated that overall approximately 50% of these capital investments move outside of Colorado. This is primarily due to a large amount of materials and equipment that come from out-of-state, including cement, casing, tubing and other materials.

The information that the Booz Allen team collected from operators across five basins indicate that the average cost to drill and complete a well is $816,000 in Colorado. Total estimated expenditures for 2005 are summarized in Exhibit 2-36. The within-state capital investments were run through the IMPLAN model as direct effects. As such they were deflated to 2003 dollars to be consistent with the IMPLAN model, and then reinflated to report the results in 2005 dollars. Because of this process, there are slight variations between the in-state investments in Exhibit 2-36 and the direct impacts shown in Exhibit 2-38.

Exhibit 2-36: Drilling, Completion, and Recompletion Investments for Colorado (2005$)

Type of Impact	Drilling and Completion (Per Well)	Drilling, Completion, and Recompletion Investments (Total)
Investments that Stay within the State	$397,168	$1,193,383,955
Investments that Move Outside the State	$419,035	$1,201,758,517
Total Investments	$816,208	$2,395,142,471
Percent that Stays within the State	49%	50%

To determine the amount of royalty payments that were spent within the State, it was necessary to derive the disposable income from the relevant IMPLAN models (for each basin and the State) from the Aggregate SAM. Royalty payments within each basin were multiplied by the basin disposable income percentage to determine the amount spent locally. Similarly, the royalty payments estimated to stay within the State were multiplied by the State disposable income rate of 67%, determined from the Colorado Model Aggregate SAM. The disposable income calculated for the Piceance Basin was applied to the Sand Wash and North Park mineral royalty payments (70%) and the Eastern DJ Basin Disposable Income was applied to the payments in the Hugoton basin area (71%).

Overall, there is a fair amount of income paid to homeowners and interest owners to access private minerals and surface lands (Exhibit 2-37). This is in the form of private mineral royalties, surface land damages, lease payments and bonuses, and override royalties. Sixty-three percent of these payments stay within Colorado, in general. Overall, the average disposal income for the State is 68%, indicating that in general 68% of these payments are spent within the state's economy. Average private mineral royalty and lease payments per producing well that remain local are $29,000, with 68% of that amount spent within the State (i.e., $20,000).

Exhibit 2-37: Colorado Private Mineral Royalties and Lease Payments

Type of Impact	Total Mineral Royalties and Lease Payments (2005$)	Total Mineral Royalties and Lease Payments per Producing Well (2005$)
Within State Payments	$808,318,415	$29,119
Out of State Payments	$468,205,765	$16,867
Total Payments	$1,276,524,180	$45,986
State Purchase Coefficient (SPC)	63%	
Total Assumed to be Spent in the State (Average Disposable income is 68%)	$552,408,641	$19,900
Effective Basin Percentage (after disposable income is accounted for)	43%	

In the Colorado State model, total industry revenues were used to estimate economic contribution of the extraction industry. Industry revenues for the extraction sector was expanded to include not only the value of oil and gas production in Colorado, but also the Colorado extraction industry's administrative and management support of operations outside Colorado. This was done in order to recognize the fact that the Metro-Denver Area is a regional center for oil and gas extraction in the Rocky Mountain area. The additional industry revenues for the sector were based on BLS employment estimates of employment, adjusted for self-employment, minus the State of Colorado severance tax extraction employment estimates that were used in the production calculations for the regional models. This net employment estimate was multiplied by the revenue per employee estimates for the extraction industry from the 2002 Economic Census for oil and gas extraction in Colorado. This revenue per employee estimate was converted to 2003$ using IMPLAN deflators. For consistency, self-employment adjusted BLS extraction employment estimates were also used in the Colorado State model rather than the severance tax employment.

The total industry output is shown in Appendix C; it was determined to be $14,062,110,000 in 2003 dollars and $15,373,340,000 in 2005 dollars. Of this 2005 total extraction revenues, $10,212,329,819 was determined to be extraction revenues associated with Colorado production, and $5,161,010,181 was estimated to be industry support (i.e., management and administrative services and expertise) for extraction in other states.

The rest of the value-added components were estimated in the same manner as the regional models, which are described in section 1.3.2. Since the production cost used to allocate the value-added components is assumed to capture only lifting costs, the economic impacts from the extraction figures only measure the expenses and investments as encompassed in lifting the oil and gas out of the ground. Including additional production costs for gathering and in-basin transportation would increase the economic impacts (see Section 2.4.3). The value-added components for the drilling and support sectors were also estimated using the same procedure as implemented for the multi-basin models.

2.4.2 Colorado Economic Contribution Analysis

The IMPLAN model results indicate that that there is less than $22 billion in total industry revenues for drilling, completion, recompletion and extraction activities in 2005, 90% of which is attributed to extraction activities (Exhibit 2-38). This does not include large development expenditures captured in drilling, completion, and recompletion activities such as new regional pipeline development, building new facilitates to accommodate seasonal workers, etc. These revenue figures do not include private

mineral lease and royalty payments and extraction taxes, which are included at the end of this section. For this reason, there are likely additional capital investments not captured within this analysis from this type of development activity.

Exhibit 2-38: Total Revenues for Oil and Gas Activities in Colorado (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction
Direct	$1,193,350,509	$15,373,337,313
Indirect	$236,874,991	$2,490,270,590
Induced	$752,097,282	$1,610,975,199
Total	$2,182,322,782	$19,474,583,101
Multiplier	1.83	1.27

The results indicate that the drilling, completion, recompletion and extraction industries supports approximately 53,000 individuals either directly through oil and gas activities or through additional economic activity generated through this direct stimulus to the economy (Exhibit 3-39). There are additional economic contributions from the private mineral and lease payments and from fiscal stimulus, described at the end of this section. Again, these figures do not include employment generated by other capital investments.

Exhibit 2-39: Employment Impacts for Oil and Gas Activity in Colorado

Type of Impact	Drilling, Completion, and Recompletion	Extraction
Direct	9,616	5,985
Indirect	1,828	12,383
Induced	7,863	15,313
Total	19,307	33,681
Multiplier	2.01	5.63

Exhibit 2-40 demonstrates the labor earnings associated with oil and gas activities for the State of Colorado. Overall, there is $3.6 billion in labor earnings for oil and gas activities for direct, indirect, and induced economic activities. This is primarily associated with extraction (69%), though drilling activities account for a considerable percentage (31%).

Exhibit 2-40: Earnings for Oil and Gas Activities in Colorado (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction
Direct	$724,741,867	$1,036,601,274
Indirect	$94,557,073	$826,277,602
Induced	$293,135,095	$606,250,110
Total	$1,112,434,035	$2,469,128,986
Multiplier	1.53	2.38

Exhibit 2-41 summarizes earnings per worker for oil and gas activities; activities directly associated with oil and gas industries indicate earnings per worker of approximately $113,000. If induced and

indirect labor earnings are factored in, the annual earnings per worker are estimated to be $67,500 for 2005.

Exhibit 2-41: Earnings per Worker for Oil and Gas Activities in Colorado (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Average
Direct	$75,365	$173,200	$112,896
Indirect	$51,736	$66,728	$64,800
Induced	$37,283	$39,590	$38,807
Total	$57,619	$73,309	$67,592

Disposable income to households for access to private minerals and lands in the State was estimated to be $552.4 million, which generated $348 million in additional economic activity for a total of $900.4 million in economic activity as summarized in Exhibit 2-42. Labor earnings were approximately $266.5 million in total, while earnings per worker on average were $36,700 per year. Overall these private mineral and lease payments support 7,257 people in the State.

Exhibit 2-42: Economic Contribution of Mineral Royalties and Lease Payments for Colorado (2005$)

	Economic Activity	Employment	Labor Earnings	Labor Earnings Per Worker Per Year
Total Economic Impact	$900,392,239	7,257	$266,516,586	$36,728

Although the extraction taxes are derived, examined, and explained in Section 3, they are also included here in the economic contribution analysis for the State Model. These extraction taxes include property taxes, state severance taxes, and Federal and State royalties. Exhibit 2-43 summarizes the total economic contribution of these extraction taxes, which includes the direct impact of $560.4 million in extraction tax payments and $367.7 million in indirect and induced impacts of these payments rolling over in the economy, benefiting households and indirect industries.

Exhibit 2-43: Economic Contribution of Extraction Taxes in Colorado (2005$)

	Economic Activity	Employment	Labor Earnings	Labor Earnings Per Worker Per Year
Total Economic Impact	$1,060,690,054	11,744	$544,747,083	$46,385

Aggregating over all of the economic impacts from drilling, completion, and recompletion capital investments, extraction revenues, private mineral royalties and lease payments, and extraction taxes, there is considerable economic contribution from these combined activities. To avoid double counting these impacts, direct private mineral royalty payments ($552.4 million) were removed from the extraction revenues, since these payments to households and industries would be embedded in these extraction revenues. This allows an aggregation across economic impacts to determine total economic contribution of the industry. Since the indirect business taxes were zeroed out for the extraction sector, this type of adjustment was not necessary for the extraction tax revenue. The overall economic contribution of oil and gas activities in Colorado in 2005 is summarized in Exhibit 2-44. As compared to the extraction impacts summarized previously, the extraction figures in Exhibit 2-24 are slightly lower due to the private mineral royalties adjustment.

Exhibit 2-44: Total Economic Contribution for Oil and Gas Activities in Colorado (2005$)

Type of Impact	Drilling, Completion, and Recompletion	Extraction	Mineral Royalty & Lease Payments	Extraction Taxes	Total Economic Contribution
Economic Contribution	$2,182,322,782	$18,774,801,959	$900,392,239	$1,060,690,054	$22,918,207,034
Employment	19,307	32,471	7,257	11,744	70,779
Labor Earnings	$1,112,434,035	$2,380,405,642	$266,516,586	$544,747,083	$4,304,103,346
Earnings per Worker	$56,619	$73,309	$36,728	$46,385	$60,811
Employment Multiplier	2.01	5.63	1.8	1.51	2.67

Although the study has captured the majority of the production in the State, the extraction and drilling and completion impacts for all the basins are less than those of the State. The differences between the drilling and completion impacts for the basins and the State are due to the investments made out of the basin but within the State; these investments are captured in the State model but not included in the basin models. The differences between the total extraction impacts for the basins and the State impacts are much more significant. This difference is due to the fact that the value of the oil and gas extraction industry in Colorado comprises not only the value of the oil and gas produced in the State, but the extraction industry in Colorado also provides management, administrative support and expertise to operations outside of Colorado, likely in the Rocky Mountain Region (*e.g.*, there are many regional headquarter offices in Denver). This Denver-area extraction management and administrative support to other states is included in the State model, but not in the basin models; only the value of oil and gas production is included in the basin models. The extraction support of other states is a significant driver of extraction economic activity in Colorado, and therefore is included in the State model, creating additional revenues for the State.

2.4.3 Economic Contribution Sensitivity to Changing the Cost of Production

As discussed in Section 1.3.2.1, the costs of production are highly variable and accounting and financial reporting systems often create difficulties in their estimation. The cost of production is a model assumption that allocates value added to intermediate payments within the IMPLAN model. To determine how sensitive this assumption is to the results of the model, a sensitive analysis was run on increasing the production cost from $0.90/mcfe to $1.26/mcfe. As summarized in Exhibit 2-45, with a 40% increase in production costs, the extraction industry economic contribution, labor earnings and employment results increase between 2 to 8 percent, while the overall results for all oil and gas activities increase by 1.9 to 3.7 percent. The largest change occurred with labor which increased by 8 percent. It is believed the reason labor is more sensitive than the other variables is changes in production costs affect secondary employment. Since secondary employment in this case tends to be lower paying than primary employment the change has a greater proportional effect on employment than on labor earnings and output. In addition it is likely that secondary employment is more labor intensive. Although increasing the production cost does increase the estimated economic impacts, the results are not highly sensitive to this change.

Exhibit 2-45: Model Sensitivity to a Change in Production Costs (2005$)

	Production Cost = $0.90/mcfe	Production Cost = $1.26/mcfe	Percent Increase
Extraction Sector			
Total Economic Contribution	$19,474,580,034	$19,918,471,545	2.3%
Total Employment	33,681	36,384	8.0%
Total Labor Earnings	$2,469,128,599	$2,622,487,706	6.2%
All Oil and Gas Activities			
Total Economic Contribution	$22,918,207,032.90	$23,346,228,878	1.9%
Total Employment	70,778	73,397	3.7%
Total Labor Earnings	$4,304,103,345	$4,451,980,239	3.4%

2.4.4 Economic Contribution of Indirect Industries

Oil and gas activities contribute to the economic well-being of many other industries within the State of Colorado. Exhibit 2-46 ummarizes the industries that benefit through employment and labor earnings from the oil and gas activities within the State in 2005. From all of the oil and gas-related activities in the State (including extraction taxes and mineral royalty payments), approximately 22% of the employment is specific to the oil and gas industries (which is encompassed within the Mining sector), followed by 14% in government, 9% in professional services, 8% in retailing, and 7% in health care and social services (Exhibit 2-46). These are the major industries impacted by oil and gas activities within the State in terms of employment.

Exhibit 2-46: Industries Impacted by Oil and Gas Activities (2005$)

IMPLAN Sector	Oil and Gas State Employment	% of Oil and Gas Employment	Oil and Gas Labor Earnings	Percent of Oil and Gas Labor Earnings
Mining	15,304	21.6%	$1,780,797,349	41.2%
Government	9,701	13.7%	$478,298,955	11.1%
Professional Service	5,996	8.5%	$393,463,844	9.1%
Retailing	5,722	8.1%	$161,108,038	3.7%
Health Care & Social Services	5,184	7.3%	$217,582,076	5.0%
Accommodations/Food Service	3,954	5.6%	$66,816,213	1.5%
Finance & Insurance	3,764	5.3%	$219,348,217	5.1%
Other Service	3,719	5.3%	$100,048,194	2.3%
Administration	3,316	4.7%	$94,156,049	2.2%
Wholesale	2,658	3.8%	$176,926,354	4.1%
Real Estate	2,235	3.2%	$108,934,360	2.5%
Transportation/Warehousing	2,094	3.0%	$102,418,558	2.4%
Management	1,587	2.2%	$133,586,351	3.1%
Arts/Entertainment/Recreation	1,396	2.0%	$29,947,656	0.7%
Construction	1,067	1.5%	$54,005,310	1.2%
Manufacturing	984	1.4%	$55,147,713	1.3%
Information	882	1.2%	$95,948,681	2.2%
Education Services	768	1.1%	$19,180,746	0.4%
Utilities	249	0.4%	$32,397,289	0.7%
Ag/For/Fish/Hunt	199	0.3%	$4,635,164	0.1%
Total	70,779	100.0%	$4,324,747,118	100.0%

Labor earnings within the oil and gas sectors comprise 41% of total labor earnings from all oil and gas activities within the State. Other industries that benefit in terms of the total amounts paid to workers from oil and gas activities include government (11%), professional services (9%), finance and insurance (5%), and health care and social services (5%). In terms of both employment and labor earnings, the top indirect industries that benefit economically from oil and gas activities in the State are state and local government and professional services, among many others.

2.4.5 Relative Importance of Oil and Gas Industries in the State of Colorado

Exhibit 2-46 summarizes some of the economic indicators for the oil and gas industry in Colorado and compares these indicators to State totals. Oil and gas activities within the State account for 6% of the State's total industry revenues, 2.2% of employment, and 3.2% of total earnings. In general, the oil and gas activities, including private mineral royalty payments and extraction taxes, generate average earnings that are significantly higher than the State average, $61,000 or 32% higher than the State average. However, considering only those sectors directly impacted by drilling, completion, and extraction activities, the average earnings are $113,000 annually (see Exhibit 2-41). Including induced and indirect impacts for capital expenditures and extraction, the average earnings fall to $61,000.

Exhibit 2-47: Comparison of Oil and Gas Industry to the State's Economy (2005$)

Economic Indicator	All Industries in Colorado	Oil and Gas Activities in Colorado	Percent of Oil and Gas to State	Source
Total Economic Contribution	$377,918,854,850	$22,918,207,034	6.1%	IMPLAN 2003
Total Employment	3,148,945	70,779	2.2%	IMPLAN 2003
Total Earnings	$136,619,914,547	$4,304,103,346	3.2%	IMPLAN 2003
Average Earnings	$46,050	$60,811	132.1%	IMPLAN 2003
Severance Tax	$152,000,670	$134,791,755	88.7%	Department of Revenue Annual Report 2005
Assessed Valuation (Taxable Production Value)[3]	$70,625,603,899	$5,055,329,000	7.2%	DOLA Annual Report 2005
Federal Mineral Royalties	$89,451,528[1]	$68,436,710[2]	76.5%	Minerals Management Service 2005
State Mineral Royalties	$43,083,957	$29,790,445	69.1%	Colorado State Land Board

[1] Does not include rent, bonuses, and other revenues.

[2] This estimate is from the Minerals Management Service (MMS), and it includes Federal Mineral Royalties from carbon dioxide, coalbed methane, condensate, gas plant products, oil, processed gas, and unprocessed gas. The Federal Minerals Royalties estimated through this study (in section 3.2.3) are $161,559,037. This estimate is higher than that of the MMS as the MMS does not include Federal Mineral Royalty disbursements to Indian lands.

[3] The assessed valuation figures reflect 2004 amounts, but are reported in 2005.

Severance taxes from oil and gas activities comprise 89% of all severance taxes collected by the State. Oil and gas taxable valuation from production activities accounts for 7.2% of all taxable value within the State. Oil and gas revenues provide for 77% of all Federal mineral royalties dispersed to the State and 69% of all State mineral royalties. The oil and gas industry is a vital Colorado industry that contributes significant revenue to State, local, and Federal governments, with considerably higher per worker wages than the State average. In comparison, the State of Colorado, Colorado Data Book (2006), in 2005, estimates the following portion of industry employment: service industry employment accounts for 39% of the Colorado economy, followed by employment in government (16%), retail trade (11%), manufacturing (7%), construction (7%), and finance, insurance and real estate (7%).

2.4.6 Oil and Gas Industry Compared to the Travel Industry in Colorado

The travel industry in Colorado is another integral part of the State's economy. Therefore, comparing the economic indicators of the travel industry[2] and the oil and gas industry can highlight similarities and differences among the two. Exhibit 2-48 summarizes some of the major economic indicators for

[2] Dean Runyan Associates defines the travel industry as: "All overnight travel that occurs in Colorado is included in the scope of this analysis. Overnight trips in Colorado by Colorado residents, other U.S residents and foreign visitors are included. In general, the terms "traveler" and "visitor" are used interchangeably in this report. Both represent a person who is traveling in the State of Colorado, away from his or her home, on a trip as defined above. The purpose of such travel can be for business, pleasure, shopping, to attend meetings, or for personal, medical or educational purposes."

both the oil and gas and travel industries in Colorado. The travel industry comprises approximately 5.1% of the workforce in Colorado.

Exhibit 2-48: Economic Comparison of Oil and Gas and Travel Industry[3] in Colorado (2005$)

Economic Indicator	Travel Industry[1]	Oil and Gas Activities	Ratio of Oil and Gas Industry to Travel Industry
Direct Revenue Impacts	$8,559,836,297	$17,207,134,985	201.0%
Total Employment	162,381	70,779	43.6%
Total Earnings	$5,027,803,992	$4,304,103,346	85.6%
Average Earnings	$30,963	$60,811	196.4%
Employment Multiplier	1.55	2.60	168.0%
Earnings Multiplier	1.93	1.92	99.5%

[1] Source: Dean Runyan Associates, Economic Impact of Travel on Colorado 1996-2003, 2003. All values were inflated to 2005$.

Activities related to the oil and gas industry generate more than twice as many direct industry revenues as those generated by the travel industry, although the travel industry comprises over twice as many jobs as the oil and gas industry. Labor earnings for the travel industry are slightly higher than those of the oil and gas industry, yet the average earnings per worker for the oil and gas industry are almost twice those for the travel industry. Direct business taxes[4] that were collected from the oil and gas industry are slightly higher than those collected from the travel industry.

The earnings multiplier for both industries are 1.9, indicating that with every dollar paid to workers, there is an additional $0.90 of economic activity (i.e., workers spending their money in the economy and supporting other businesses and households). The employment multiplier is much higher for the oil and gas industry; for every job directly created by the oil and gas industry, there are 1.6 additional jobs created in other industries and sectors. The travel industry is a more labor-intensive industry with lower average earnings than the oil and gas industry.

[4] Direct business taxes include excise taxes, property taxes, fees, licenses, sales taxes, and other taxes paid by businesses to state and local governments. These taxes occur during the normal operation of business, but do not include taxes on profit and income.

3. Fiscal Analysis

Fiscal contributions to Federal, State, and local governments occur as a result of oil and gas drilling and completion capital investments, oil and gas production, and private mineral royalty payments in Colorado. To gain an understanding of the fiscal and economic effects to the State, Booz Allen analyzed tax revenue impacts for drilling, completion, and recompletion investments and extraction activities. Estimates of business taxes, taxes based on production value, and income taxes are estimated for the State utilizing IMPLAN results and models developed by Booz Allen and Duff and Phelps (2007).

3.1 Derivation of the Business Taxes

To estimate business tax revenue received by State and local governments from oil and gas activities, Booz Allen used the IMPLAN SAM. The business tax contributions are summarized in the Tax IMPACT Report in IMPLAN. These taxes estimated by IMPLAN include motor vehicle licenses, other taxes (i.e., business licenses, documentary and stamp taxes), state and local non-taxes (i.e., rents and royalties, special assessments, fines, settlements and donations), sales taxes, property taxes, and severance taxes (Olson, 1999). Since severance and property taxes were being estimated independently from the IMPLAN model, these taxes were removed from the analysis. In addition, sales taxes were also removed since there are multiple considerations in their estimation. There is a general exemption for sales taxes for equipment used directly in the manufacturing process, for which much of the oil and gas extraction and processing equipment qualifies. The exemption is expanded to include all equipment related to the manufacturing process in an enterprise zone. Some, but not all, oil and gas production is located in enterprise zones. Thus, it is difficult to accurately estimate these fiscal contributions. The business taxes estimated through IMPLAN[5] are derived from the US Bureau of Economic Analysis (BEA), National Income and Product Accounts.

Business taxes were estimated through IMPLAN for:

- Drilling, completion, and recompletion capital investments
- Private mineral royalties payments, and
- Extraction that is not associated directly with production amounts.

For the purposes of the fiscal analysis, extraction output was separated into two figures as consistent with the analysis in Section 2.4.1: 1) $10,212,329,819 are extraction revenues associated with Colorado production; and 2) $5,161,010,181 are extraction sales of Colorado services and expertise to oil and gas industries in other states (reported in 2005$), Since business taxes associated with the value of production are estimated independently of IMPLAN (see the discussion in the next paragraph), the analysis in this section focuses on the tax contribution of the extraction output that is not directly associated with production amounts (i.e., $5.2 billion). The business taxes associated with this extraction revenue are estimated through IMPLAN and summarized in the results section.

Additionally, Booz Allen compiled estimates of extraction tax revenues and developed a model to estimate Federal royalties. Duff and Phelps also developed a model to estimate property taxes.

[5] IMPLAN defines these business taxes as "indirect business taxes."

The following types of tax revenue were estimated from oil and gas production and assessed valuation:

- Property taxes based on production and equipment values
- State severance tax
- Federal mineral royalties that are allocated to Colorado
- State royalties.

These tax revenues are further discussed below.

3.1.1 Property Taxes of Oil and Gas Production

Property valuation includes leaseholds and lands producing oil and gas assessed by county assessors (DOLA, 2006). Oil and gas production and related producing equipment in Colorado is a major source of tax revenue for government entities. For instance, the assessed value of oil and gas property was $4.9 billion and $7.1 billion for 2005 and 2006, respectively. Of all property and production assessed by the state and local governments, oil and gas operations accounted for approximately 7.2% and 9.6% of assessed value in the State during 2005 and 2006, respectively (DOLA, 2006, pg. 23). Over 95% of that value is concentrated within ten counties including Rio Blanco County, which have over 70% of taxable property value categorized under the oil and gas class. This is significant since the Taxpayer Bill of Rights (TABOR) Act prohibits a mill levy increase without voter approval, which "…can subject the tax base of certain local governments to the volatility inherent to the oil and gas class." (DOLA, 2006, pg. 24).

Duff and Phelps (2007) developed a model to estimate the property tax revenue for the State. Property tax revenue associated with oil and gas production and equipment was estimated based on mill levy rates and a percentage of the sale price obtained for the product at the wellhead, "the point of valuation", in the previous year. Mill levy rates were determined for each county based on the percentage of county revenues to the total amount of assessed valuation for each county, which was obtained from the Colorado Department of Taxation. Since property tax liabilities are based on previous year's production figures (2005), it was determined that 2006 property taxes would be estimated and deflated to 2005 dollars for consistency with the rest of the report, which is focused on 2005 production figures. The assessed valuation for production and equipment was obtained from the Department of Revenues Annual Report (2006). The county property tax estimates were then aggregated to obtain an estimate for the State.

3.1.2 State Mineral Severance Taxes

Colorado severance tax is a tax imposed upon nonrenewable natural resources that are removed from the earth. Half of severance taxes collected on mineral production (including oil and gas) go to counties and municipalities via the Energy and Mineral Impact Program, Government Severance Tax Fund. Of this, 15% goes directly to counties and municipalities on the basis of the residence of severance taxpayer employees according to Section 39-29-110(1) in the State Revised Statutes. The other half of severance tax revenue goes to the Department of Natural Resources, which distributes it to water protection and development projects and natural resource programs. The 2005 severance tax liability was obtained from the Department of Revenue Annual Report (2006). According to DOLA's *Forecasting Colorado State Severance Tax,* the severance tax rate ranges from 2 to 5% of production value. This is due to the graduated nature

that tax rates are applied to production levels. Therefore, small production amounts are taxed at a lower level than large production amounts.

3.1.3 Federal Mineral Royalties

Oil and gas production occurring on Federally-administered public lands is assessed a Federal mineral royalty. Production is assessed at 12.5% of value after allowable deductions. The Federal government returns approximately 50% of the total royalties collected to the state where the oil and gas production occurred. In Colorado, the distribution of the Federal royalties is based on a formula promulgated by Colorado State Statute (CRS 34-63-102), which requires the distribution of these funds to school districts and political subdivisions economically or socially impacted by the development or construction and processing of the Federal oil and gas resources. The State allows a percentage of these Federal royalties to be distributed to the county of origin, the State School Fund, DOLA, and Colorado Water Conservation Board. In addition, towns and local school districts may benefit from Federal royalty payments for counties that receive more than $200,000 dollars and Federal mineral lease and royalty revenue in excess of $10.7 million. Funds from counties that receive Federal royalty revenues over $1.2 million are distributed to cities and counties on the basis of employee residence reports. Therefore, local government entities could receive a percentage of Federal royalty payments generated from oil and gas production within each basin.

Oil and gas production on Federally-administered public lands was estimated by matching 2005 COGCC oil and gas well production data with geospacial layers of Federally-administered public lands in Colorado. The estimated oil and gas production values were then generated using the average oil and gas prices obtained from COGCC. The reported Federal royalty is 12.5% of the estimated production value, of which 50% is disbursed back to the State. No adjustments to royalty disbursements for oil and gas production from Indian Tribal lands were made because these disbursements are assumed to remain within the State.[6] Therefore, the impacts from Federal royalties may be overestimated if Indian Tribe payments leak out of the State.

3.1.4 State Royalties (State Land Board)

Oil and gas production occurring on State-administrated public lands is also assessed a State mineral royalty of 12.5%. However, only a portion of an acre of oil and gas production land is administrated by the State. In other words, only the portion of the acre of land administered by the State is taxed a state mineral royalty payment. These royalty payments are distributed to public primary schools through the School Finance Act to school districts on a per-pupil basis (Colorado State Land Board, 2006). Therefore, local public schools will receive a percentage of State royalty payments generated from oil and gas production within each basin. State mineral royalty revenue data for the year 2005 was obtained from the Colorado State Land Board, Royalty Accounting Department (Colorado State Land Board, 2006).

[6] The Mineral Management Service does not include royalty disbursements to Indian lands in its state Federal Royalty disbursement estimates. For this reason, these estimates are smaller than those estimated through this analysis.

3.2 Derivation of Income Taxes

Economic activity generated by the oil and gas industry leads to significant tax revenues associated with income taxes collected by the State. This includes personal income taxes paid by individuals employed by the industry and those individuals that benefit from the additional economic activity associated with oil and gas activities. Additionally, business entities must pay corporate income taxes to the State.

The Colorado Department of Revenue reported annual income taxes received for 2005 in the *2006 Colorado Department of Revenue Annual Report.* A summary is provided in Exhibit 3-1.

Exhibit 3-1: Total Income Taxes Collected for Income Tax Year 2005

Colorado Income Tax Categories	Total Income Collected (2005)
Individual	$3,738,994,787
Corporate	$315,834,496
Fiduciary	$31,740,701
Total	*$4,086,569,985*

Upon further review it was determined that the State corporate income taxes cannot be specifically estimated with any confidence at this time due to difficulties in estimating corporate profits. This includes accounting for certain types of tax credits and deductions provided to the industry which are specific to individual companies. For instance, depletion allowances for depreciation of reserves complicate the estimation of corporate taxes paid on average for the industry. It is acknowledged that the industry does contribute to corporate income taxes at a rate of 4.6% of their allocated Colorado taxable income. However, the overall tax revenues received by the State for 2005 as reported by the Department of Revenue suggest that overall, personal state income taxes are much more significant in terms of contribution compared to corporate income taxes (91% versus 8%, respectively). Therefore, it is likely that the contribution made by the industry will be more significant in terms of personal income taxes paid by employees than corporate income taxes. As such an estimate of the personal income taxes attributed to economic activity associated with the oil and gas industry is estimated in this report.

Personal income taxes generated by economic activity associated with oil and gas industry in Colorado were estimated with information on average earnings and total employment estimated with the IMPLAN model, average taxes paid by Colorado residents, and other information regarding adjusted gross income. The methodology is described below.

First, the total number of employees and average earnings by industry sector were taken from the IMPLAN runs for the Colorado State model and are summarized in Exhibit 3-2 and Exhibit 3-3.

Exhibit 3-2: Average Earnings per Worker for Industries Impacted by Oil and Gas Activities (2003$)

	Drilling	Extraction	State and Local Governments	Private Mineral Royalties
Direct	$73,931	$158,426		
Indirect	$50,751	$61,036	$48,977	
Induced	$36,573	$36,213		$35,297

Exhibit 3-3: Estimated Employment Due to Oil and Gas Activities in Colorado (2005)

	Drilling, Completion and Recompletion	Extraction	State and Local Government	Private Mineral Royalties	Total
Direct	9,616	5,770			15,386
Indirect	1,828	11,938	10,329		24,095
Induced	7,863	14,763		7,257	29,883
Total	19,307	32,471	10,329	7,257	69,364

Due to the fact that income tax rates are applied to adjusted taxable income instead of gross earnings, an adjustment was made to average earnings as follows. Wages as a percentage of adjusted gross income for income classes in Colorado was obtained from the Department of Revenue as summarized in Exhibit 3-4. For income categories of interest for this study, wages account for approximately ninety percent of adjusted gross income.

Exhibit 3-4: Wages as a Percentage of Adjusted Gross Income in Colorado (Income Tax Year 2003)

Adjusted Gross Income Classes	Wages as a Percentage of Adjusted Gross Income By Income Class
$35,001 to $50,000	89.4
$50,001 to $75,000	90.3
$75,001 to $100,000	92.4
$100,000 to $250,000	92.1

Source: Colorado Tax Statistics, 2003, Table 13C

These percentages were applied to average earnings as estimated with the IMPLAN model in order to determine the appropriate income category for each employee type. In addition the percentages were applied to the average income taxes paid per Colorado taxpayer in 2003. This

adjustment was needed to account for the fact that income taxes are paid on adjusted gross income which for most tax payers is larger than earnings. The result is an estimate of the average Colorado income taxes applied to earnings of workers impacted by the oil and gas industry. These average tax amounts are shown in Exhibit 3-5.

Exhibit 3-5: Estimated Average Income Taxes Paid by Individuals Workers by Income Class

Adjusted Gross Income Classes	Average Estimated Income Taxes Per Worker
$35,001 to $50,000	$992
$50,001 to $75,000	$1,562
$75,001 to $100,000	$2,459
$100,000 to $250,000	$4,426

These average tax liabilities were then applied to the number of workers per income class. The result is an estimate of the total personal income tax paid by workers affected by the oil and gas industry in Colorado during 2005. The results are summarized in Exhibit 3-8.

3.3 State Tax Results

3.3.1 Business Taxes

Business taxes include taxes based on the value of production, business taxes as estimated through the IMPLAN models, and property taxes on land and equipment. The extraction taxes were estimated independently of IMPLAN. However, the IMPLAN models were then used to estimate the additional indirect and induced business taxes associated with these extraction tax payments. The methods to derive these taxes are further described in Section 3.2.

Tax payments to State and local governments associated with extraction are summarized in Exhibit 3-6. The oil and gas industry pays approximately $640.5 million in extraction taxes.

Exhibit 3-6: Total State and Local Government Revenue as a Result of Oil and Gas Production Values (2005$)

Government Revenue	Property Taxes on Production and Equipment	Severance Taxes	Federal Royalties*	State Royalties
Tax Revenue	$315,053,860	$134,049,755	$161,559,037	$29,790,445
Total Tax Revenue	*$640,453,097*			

*This is an estimate of Federal Mineral Royalties from extraction distributed to Colorado. This estimate includes Federal Mineral Royalty disbursements to Native American nations within Colorado.

Additionally, business taxes for the State were also estimated through IMPLAN impacts from extraction revenues not directly associated with production values, drilling, completion, and recompletion activities, and payments to private mineral royalty owners (Exhibit 3-7). These taxes result in direct, indirect, and induced tax payments to local and State governments. Direct business taxes are estimates of those taxes paid directly by the oil and gas industry. Therefore, the extraction industry pays approximately $679 million to State and local governments, which includes severance taxes, production-based property taxes, Federal (allocated to the State) and State mineral royalties, motor vehicle licenses, and other taxes. The indirect and induced taxes are generated by the oil and gas activities but not directly paid by the oil and gas industries. In total, oil and gas activities generate $752.9 million in total business taxes.

Exhibit 3-7: Business Taxes Paid to State and Local Governments (2005$)

Business Taxes	Extraction		Drilling, Completion, and Recompletion Activities[1]	Private Royalties[1]	Total Business Taxes Paid to State and Local Governments
	Production and Equipment[3]	Export Sales[1,2]			
Direct	$640,453,097	$30,523,043	$8,210,826		$679,186,966
Indirect	$11,255,567	$8,231,926	$918,232		$20,405,725
Induced	$21,318,001	$6,497,433	$4,614,745	$20,907,305	$53,337,484
Total	*$673,026,665*	*$45,252,402*	*$13,743,803*	*$20,907,305*	*$752,930,175*

[1] These taxes include motor vehicle licenses, other taxes, and state and local non-taxes as defined in Section 3.1 and estimated by IMPLAN. These taxes do *not* include sales, property, severance taxes or other taxes such as corporate income taxes, dividend taxes, social insurance taxes, and household income and personal taxes.

[2] Export Sales represents the portion of the extraction industry that is not directly associated with oil and gas production: the Colorado extraction industry that supports operations in areas outside of Colorado.

[3] These business tax payments are based on the analysis provided in Section 3.1. The direct business tax is the amount paid by the extraction industry to State and local governments. The indirect and induced tax payments are taxes estimated though IMPLAN as a result of this indirect and induced economic activity.

3.3.2 Income Taxes

Through the methodology described in Section 3.2, the average tax liabilities were applied to the number of workers per income class. The result is an estimate of the total personal income tax paid by workers affected by the oil and gas industry in Colorado during 2005 as shown in Exhibit 3-8.

Exhibit 3-8: Personal Income Taxes Paid to State Government (2005$)

	Drilling, Completion and Recompletion	Extraction	Government	Private Royalties	Total Personal Income Taxes Paid
Direct	$24,102,087	$27,921,384			$52,023,471
Indirect	$2,911,075	$20,388,401	$10,736,339		$34,035,815
Induced	$7,954,120	$16,015,956		$7,543,190	$31,513,266
Total	*$34,967,282*	*$64,325,741*	*$10,736,339*	*$7,543,190*	*$117,572,552*

According to these estimates, the oil and gas industry contributed to the generation of over $117 million in personal income tax in the State, of which workers directly associated with the industry paid approximately $52 million. The total amount of personal taxes paid, $117.6 million, accounts for approximately three percent of total personal income tax liability in Colorado during 2005.

3.3.3 Additional Economic Contribution From Extraction Tax Payments

The estimated production-based taxes ($640.5 million) were run through the State and local government non-education institution in IMPLAN to generate the fiscal contribution in terms of employment and income from oil and gas extraction tax payments in the State. The value added business taxes for the IMPLAN oil and gas extraction sector (Sector 19) were zeroed out to avoid IMPLAN from double counting fiscal revenue impacts from state and local government institutions from oil and gas extraction. These direct tax payments by the oil and gas sector generate an additional $420.2 million in economic activity for a total of $1.06 billion in total economic contribution from extraction taxes. The total employment and income effects from oil and gas extraction tax payments to state and local governments were estimated to generate 11,744 indirect jobs and $544.7 million in labor income.

3.3.4 Conclusions

Overall, there are significant tax contributions from oil and gas activities in Colorado. The oil and gas industries pay an estimated $679 million in revenues from extraction activities and people employed by oil and gas industries pay approximately $52 million, for a total of $731 million. In addition, the oil and gas activities in Colorado generate additional tax revenues for indirect industries and households. This generated economic activity contributes an additional $73.7 million in business taxes and $54.5 million in personal income taxes. Exhibit 3-9 summarizes this total tax contribution.

Exhibit 3-9: Business and Personal Income Taxes Paid to State and Local Governments (2005$)

	Business Taxes	Personal Income Taxes	Total Business and Income Taxes Paid
Direct	$679,186,966	$52,023,471	$731,210,437
Indirect	*$20,405,725*	$34,035,815	$54,441,540
Induced	*$53,337,484*	$31,513,266	$84,850,750
Total	*$752,930,175*	*$117,572,552*	*$870,502,727*

These State and local taxes do not include sales taxes, corporate income taxes, and other personal taxes, which could not be accurately estimated. Additionally, the oil and gas industry also pays considerable Federal taxes, such as excise taxes and corporate income taxes, and employees pay Federal personal income tax and social insurance taxes. These Federal taxes were not estimated due to the scope of the study, which focused on State fiscal contributions from Colorado oil and gas activities.

4. Conclusions and Future Considerations

This study focused on evaluating the economic and fiscal contribution of the oil and gas industry to different regional basins and the State as a whole in 2005. The analysis evaluated economic contribution parameters including: total industry revenues, employment earnings, average earnings, and tax revenue. The overall contribution to the State and regional areas is significant and varied. For instance, according to this analysis, the oil and gas industry accounted for 6% of the total industry revenues for the state, 2.2% of annual employment and 3.2% of total earnings. The industry continues to provide high-paying jobs to individuals throughout the state as measured by the average earnings per worker which were 32% of average earnings for all workers in Colorado. Oil and gas operations also generate significant revenues to State and local government entities including $753 million in total business taxes (not including sales taxes), $134 million in severance taxes, $161 million in Federal mineral royalties, and $118 million in personal income taxes.

The purpose of this study was two fold: to estimate the economic and fiscal contribution of the oil and gas industry and to validate and customize a regional economic model that can be used to estimate economic contribution of the industry on an annual basis. Both objectives were accomplished during this project. The economic and fiscal contributions for 2005 are discussed above. In addition, a customized IMPLAN model was developed for each of the major basins in Colorado and the State of Colorado as a whole. All these models can be used with readily-available secondary data to estimate future economic contributions. Booz Allen also evaluated the fiscal contribution of the industry and that knowledge can be used with other models to estimate this impact in the future.

To determine the full economic and fiscal contribution of the oil and gas industry, additional research in the following areas should be conducted:

- Further data collection is needed to gather cost information relevant to some basins within the state. This includes oil development and production within the Sand Wash and North Park Basins in north-central Colorado and the Hugoton Basin in the southeastern portion of the state.
- Additional data is needed to refine cost estimates associated with recompletion and production expenditures.
- Further analysis is needed to understand the BPCs for the San Juan and Paradox and Raton Basins.
- The analysis should be expanded to look at other indirect industries that directly or indirectly support the oil and gas industry including additional development activities, processing and refining, and transportation sectors.
- Oil and gas activities in Colorado have continued to increase at a considerable rate, which has likely increased their economic contribution within Colorado (e.g., increases in production, production costs, oil and gas prices, etc.). Updating this model and information to better understand the relative importance of this industry in Colorado should be a future endeavor.

Additionally, it is possible that future research could evaluate ways to utilize the results to develop policies to enhance the economic contribution of the industry (e.g., attract important support activities, reduce economic leakages to other states).

Appendix A: Acronyms

AFE	Authority for Expenditure
APD	Applications for Permits to Drill
B	Billion
Bbl	Barrel
BLS	Bureau of Labor Statistics
BPC	Basin Purchase Coefficient
CBM	Coalbed Methane
CERI	Colorado Energy Research Institute
COGCC	Colorado Oil & Gas Conservation Commission
DJ	Denver-Julesberg
DOE	Department of Energy
EIA	Energy Information Agency
IMPLAN	Impact Analysis for Planning
IO	Input-Output
LOE	Lease Operating Expenses
NAICS	North American Industry Classification System
M	Million
Mcf	Thousand cubic feet
Mcfe	Million cubic feet equivalent
MIG	Minnesota IMPLAN Group
RPC	Regional Purchase Coefficient
SAM	Social accounting matrix
SPC	State Purchase Coefficient

Appendix B: Glossary

Basin Purchase Coefficient	The percentage of total investment that stays local or are incurred within the multi-county basin.
Direct Impact	The set of expenditures or revenues as a result of activity in the geographic location of the basin, which are run through the IMPLAN model as the direct effect.
Disposable Income	The amount of income left to an individual after taxes have been paid available for spending and personal savings. It is also known as take-home pay.
Employment	The work in which one is engaged; an occupation by which a person earns income. The percentage or number of people gainfully employed.
Final Demands	Consist of purchases of goods and services for final consumption as opposed to an intermediate purchase where the good will be further remanufactured.
IMPLAN	A software program that estimates input-output (IO) models using data and assumptions to generate social accounts and multipliers for various scenarios and economics impacts.
In-Basin Investment	These are operator's expenditures or investments that are incurred and remain within the multi-county basin. These in-basin capital investments and expenditures are run as direct effects in the IMPLAN model (see Investment definition).
Indirect Business Taxes	Includes property taxes, and other taxes such as sales and excise taxes, but excludes taxes on profit and income.
Indirect Impact	The inter-industry impact of IO analysis that measures the economic activity associated with the directly impacted industries selling and purchasing goods and services to/from other industries.
Induced Impact	The effects of increased consumer spending resulting from direct and indirect income changes.
Industries	The collection of businesses in an economy within a given region purchasing good and services and paying workers.
Inflation/Deflation	The rate at which the general level of prices for goods and services is rising or falling, causing purchasing power to fall or rise. Inflation/deflation rates can be applied to create an assessment of constant dollars across different time periods.
In-State Investment	These are operator's expenditures or investments that are incurred or paid outside of the basin region, but within the State.
Investment	An asset or item that is purchased with the intent of generating income or future appreciation. The purchase of goods that are not consumed today but are used to create future wealth.
Input-Output (IO) Analysis	An economic model that allows the assessment of change in overall economic activity as a result of some corresponding change in one or several activities.
Labor Earnings	*R*epresents all forms of employment earnings. In IO analysis, it is the sum of employee compensation and proprietor income (income from self-employed people).
Margins	Represents the difference between producer and purchaser prices in a retail environment.
Multi-County Basin	An oil and gas basin that spans across multiple counties.
Multiplier	A factor that quantifies the change in total economic activity as compared to the injection of capital investments or revenues which originally fueled the growth. The SAM multiplier is estimated as a sum of the direct, indirect, and induced effects, divided by the direct effect.
Out-of-State Investment	Capital investments that are either made outside or move outside the State of Colorado.

Production Function	The relationship between the output of a good and the inputs required to produce that good for any given industry.
Revenues	The amount of money that an entity receives during a given time period. The "top line" or "gross income" figure from which costs are subtracted to determine net income. In this report, the Booz Allen team utilized operator expenditures to estimate recipient industries' revenues.
Regional Purchase Coefficients (RPC)	Ratios representing the portion of regional production used to satisfy local demand.
Social Accounting Matrices (SAMs)	A set of regional economic accounts which describe transfers between institutions, as well as value added components.
State Purchase Coefficients	The percentage of the total investments or expenditures that remain or are incurred within the State, which also includes investments within the multi-county basin.
Value-Added Components	Payments made by industry to workers, which also includes interest, profits and indirect business taxes. In IMPLAN, value added components consist of employee compensation, proprietary income, other property type income, and indirect business taxes.

Appendix C: Guiding Legislation

In the 2005 legislative session, Senate Bill 05-066 allocated funds for various projects to be conducted by the CERI at the Colorado School of Mines. This included research on the economic impact and contribution of the energy industries, specifically oil and gas, on the State as well as on counties and municipalities within the State. To view the legislation, please refer to the following website:

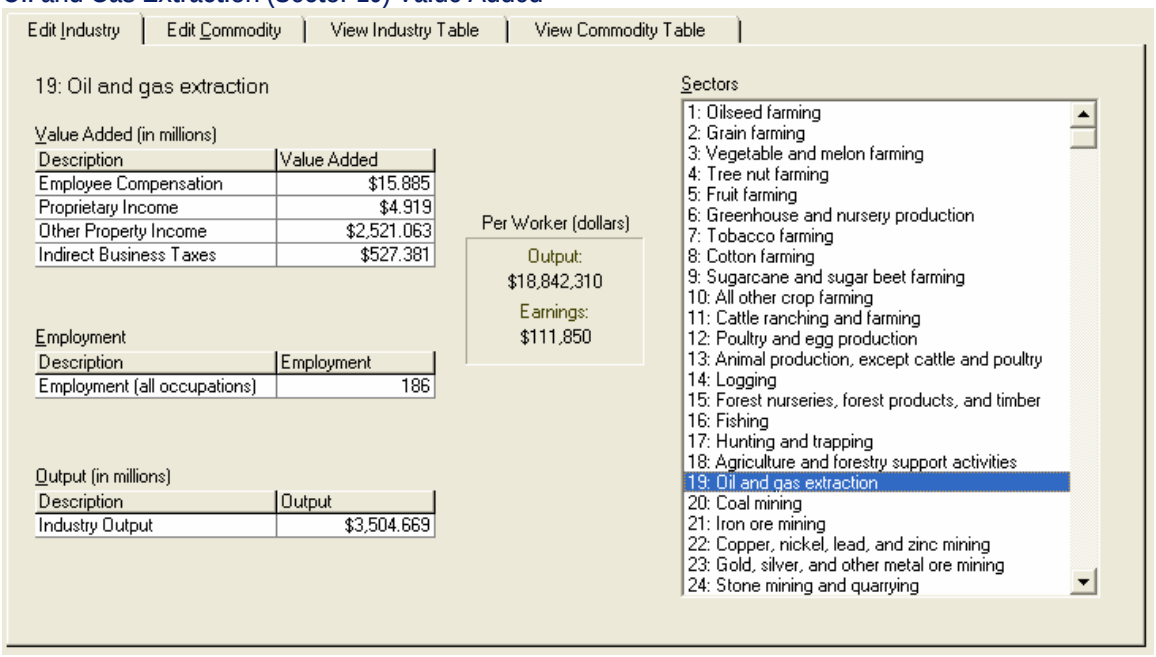
http://www.leg.state.co.us/clics2005a/csl.nsf/fsbillcont3/6CD2C34A3552E57A87256F72000194F5?open&file=066_enr.pdf

Appendix D: IMPLAN Sector 19, 27, & 28 Value Added (2003$)

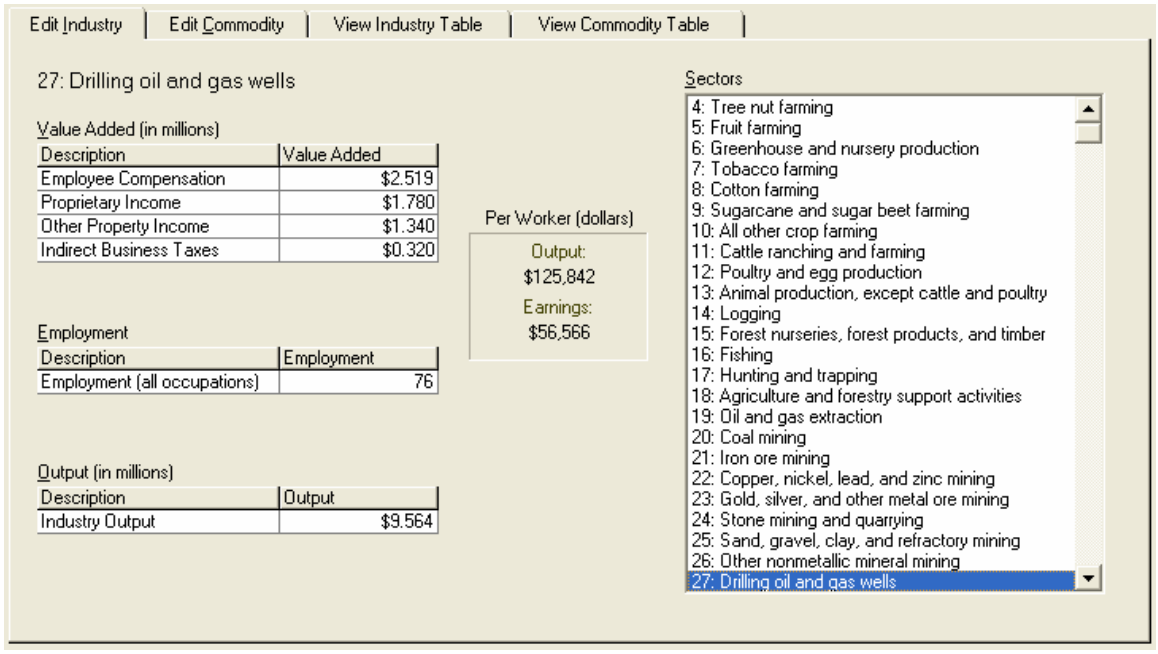
D.1 Basin Value Added Screen Shots

D.1.1 San Juan & Paradox Basin

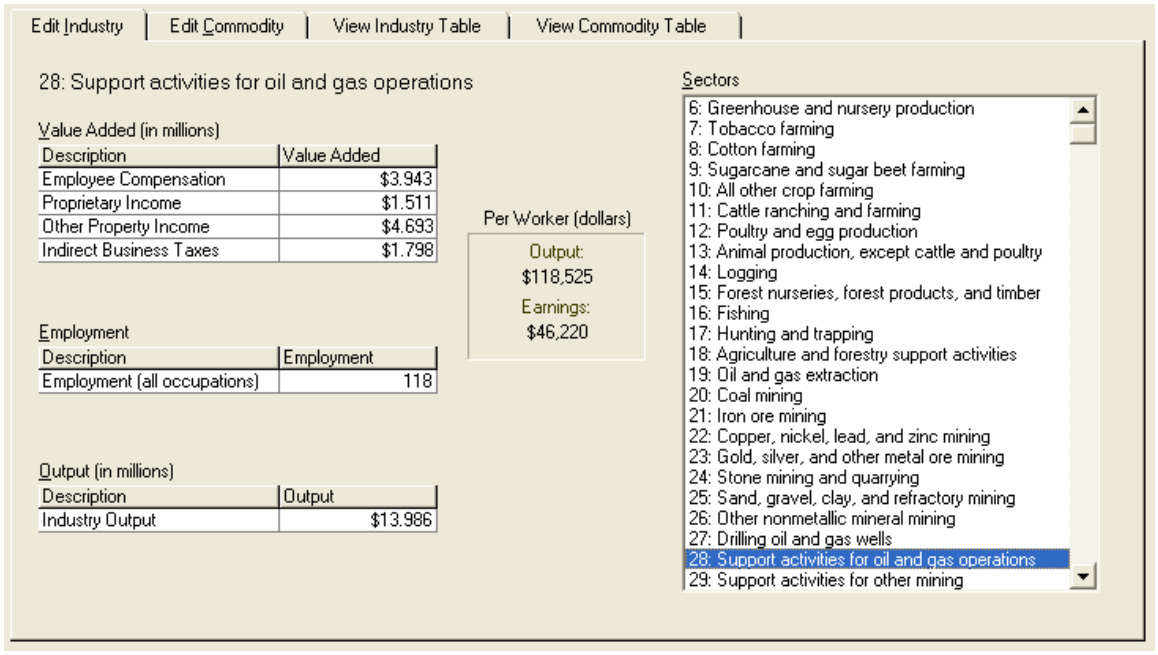
Oil and Gas Extraction (Sector 19) Value Added



Drilling Oil and Gas Wells (sector 27) Value Added

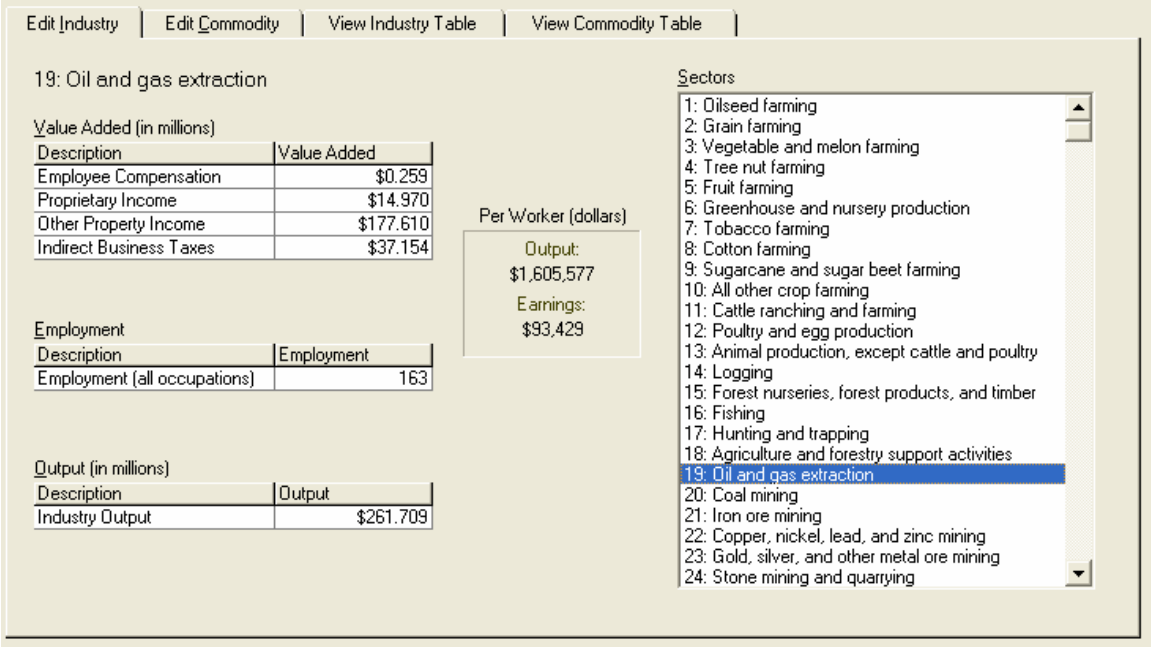


Support Activities for Oil and Gas Operations

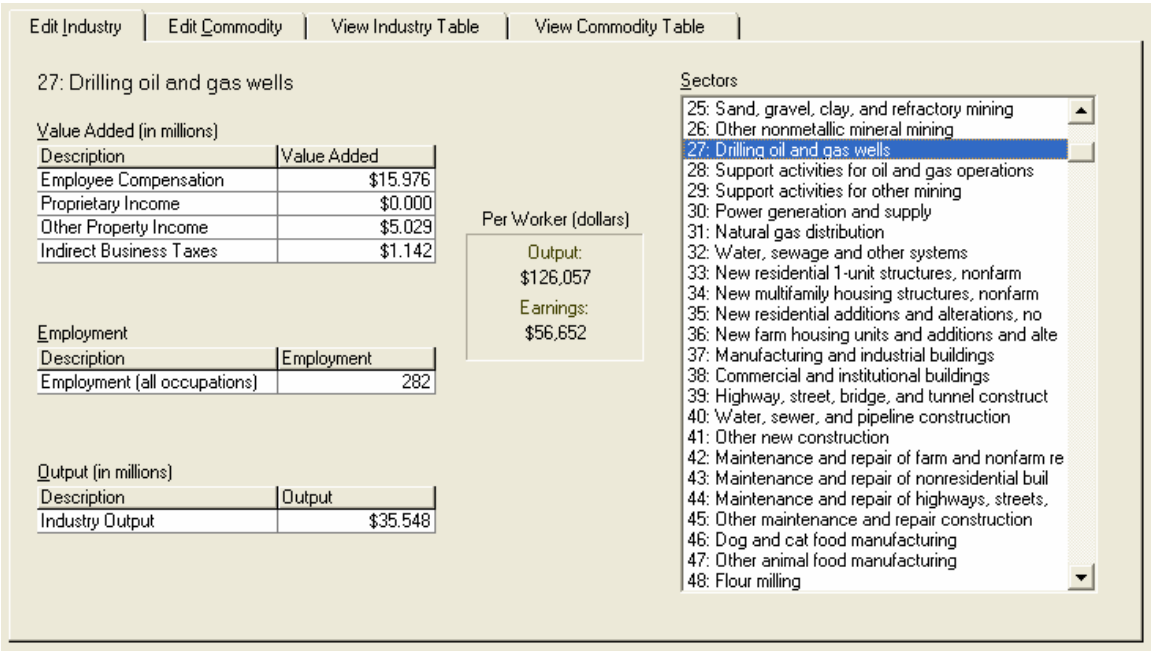


D.1.2 Eastern DJ Basin

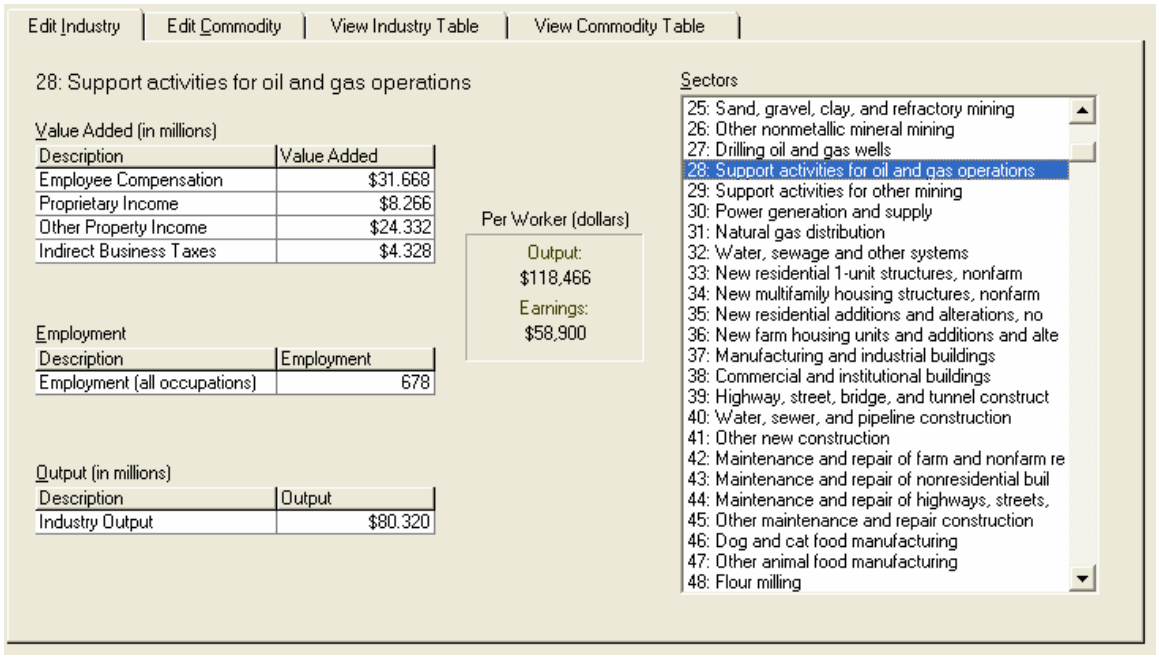
Oil and Gas Extraction



Drilling Oil and Gas Wells

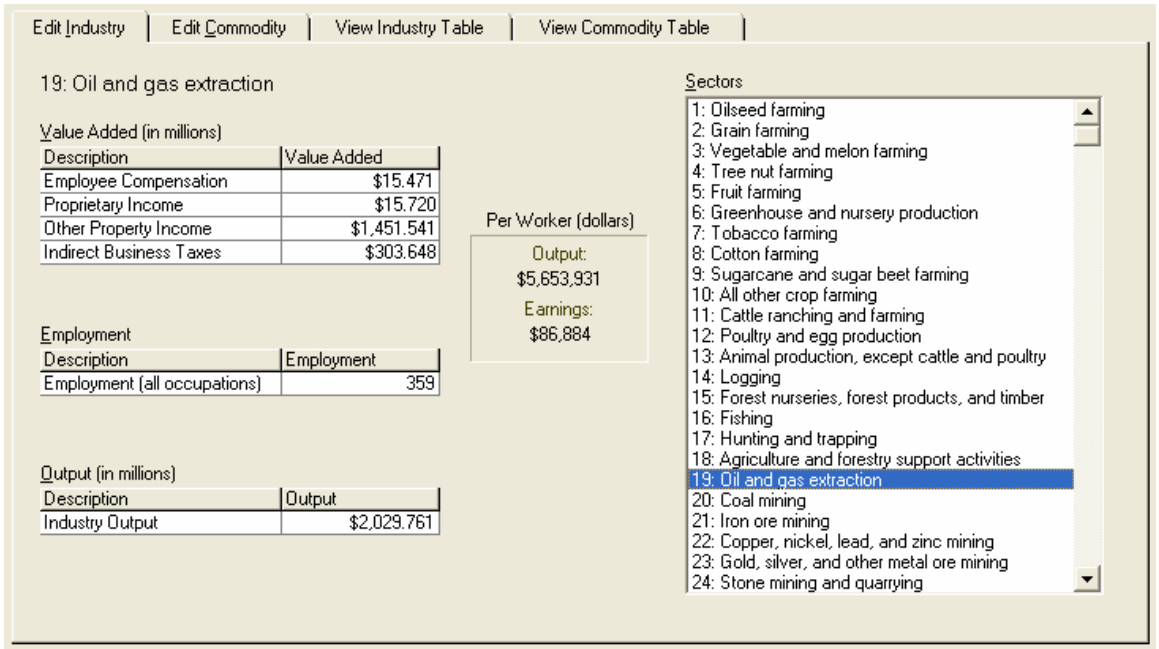


Support Activities for Oil and Gas Operations

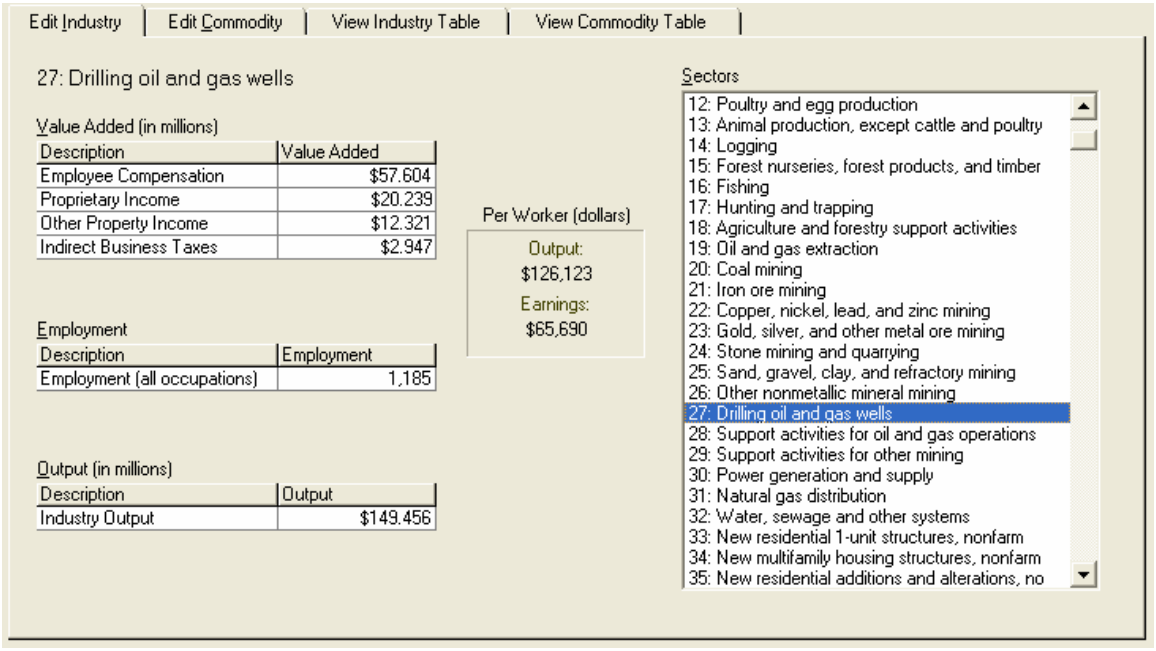


D.1.3 Northern DJ Basin

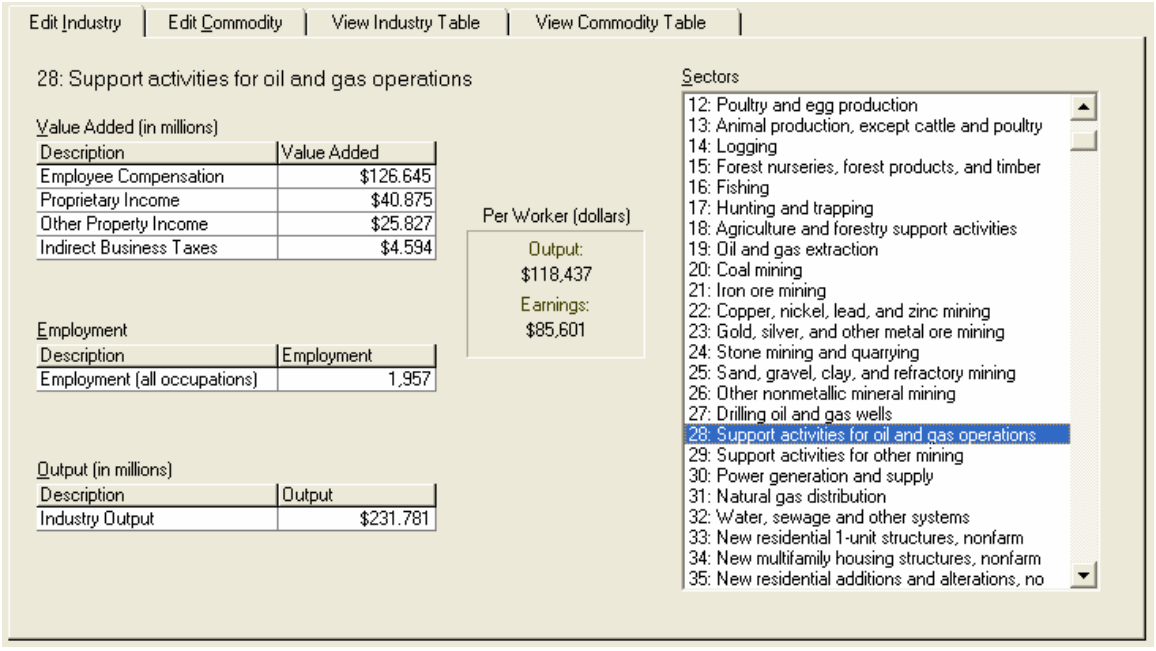
Oil and Gas Extraction (Sector 19) Value Added



Drilling Oil and Gas Wells (sector 27) Value Added

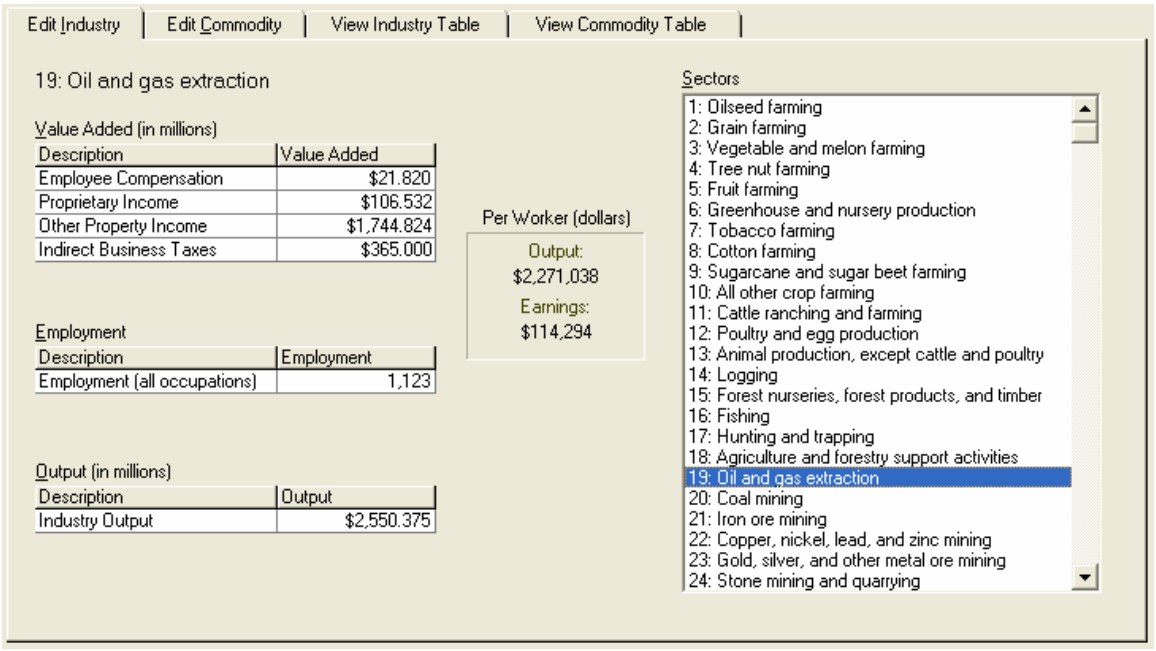


Support Activities for Oil and Gas Operations

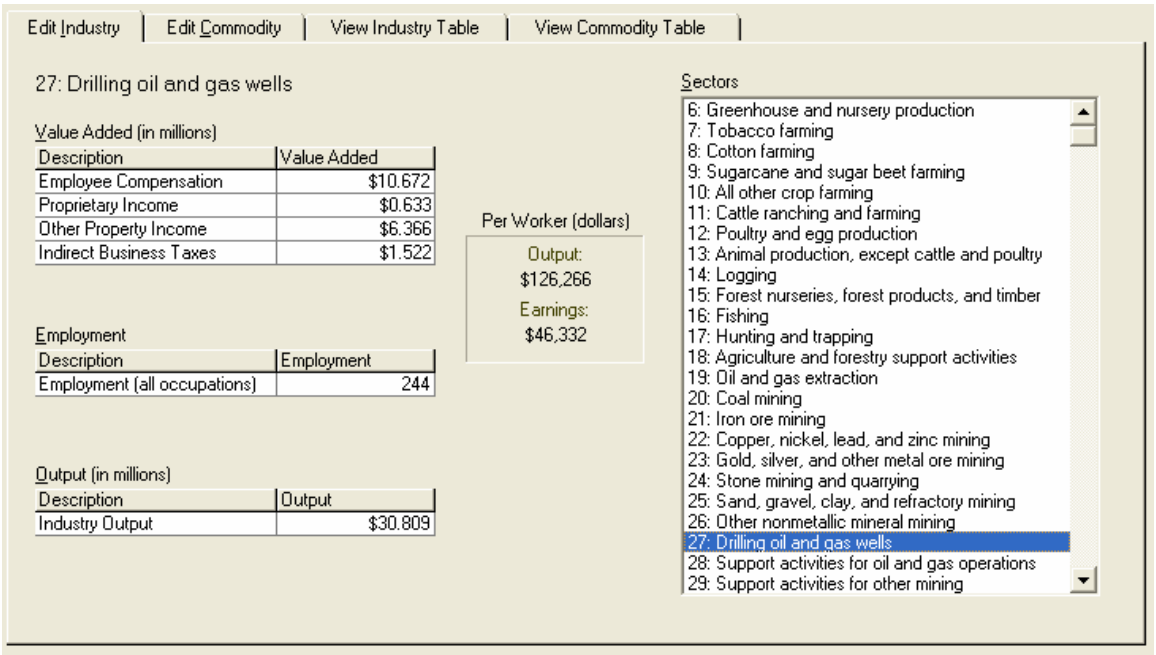


D.1.4 Piceance Basin

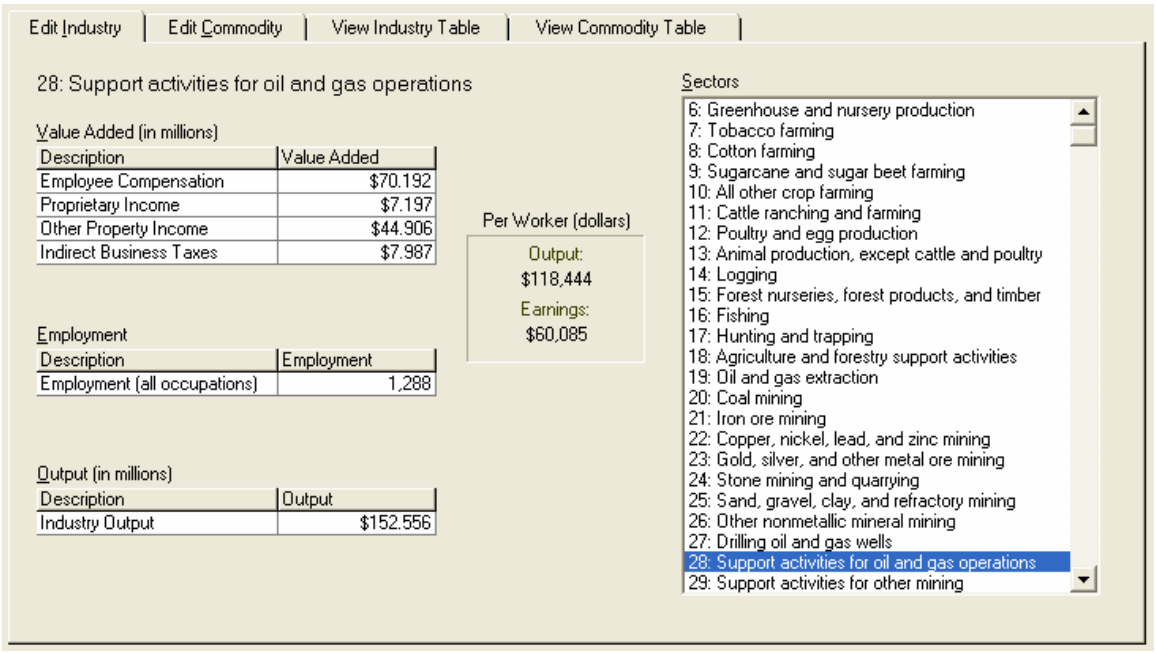
Oil and Gas Extraction



Drilling Oil and Gas Wells

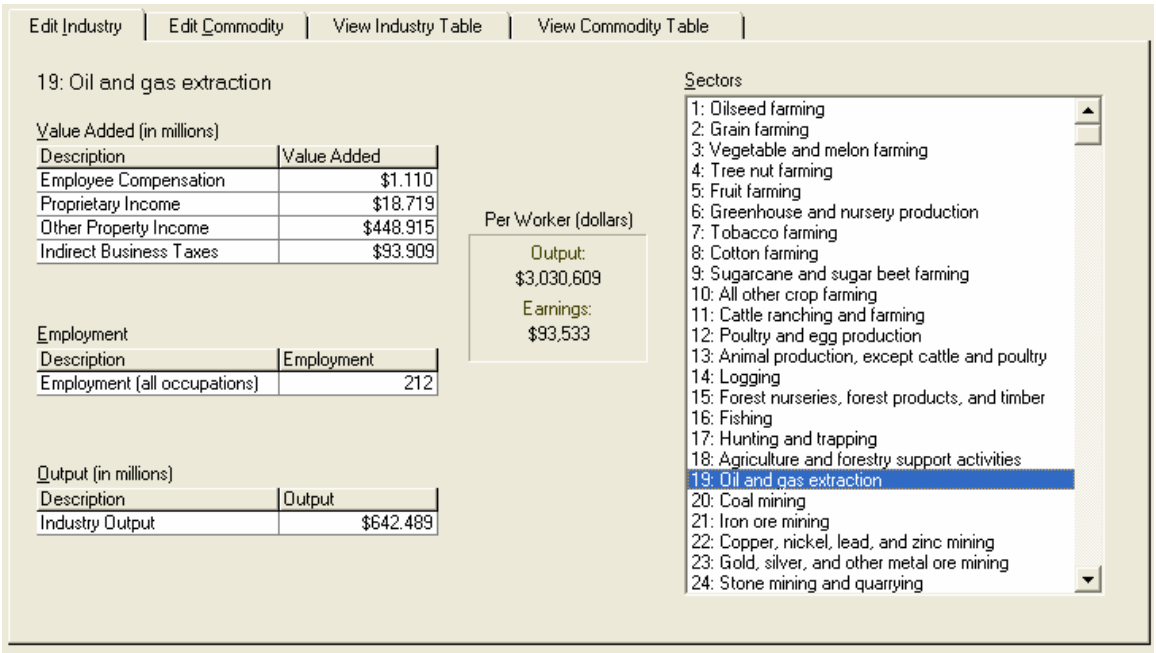


Support Activities for Oil and Gas Operations

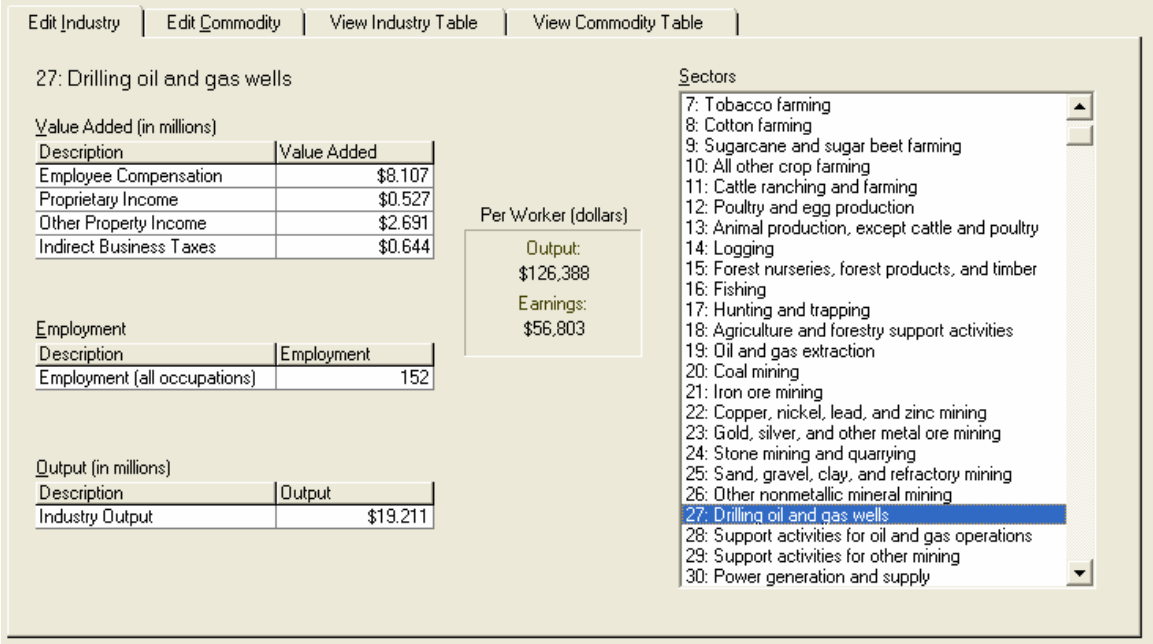


D.1.5 Raton and Canyon City Basin

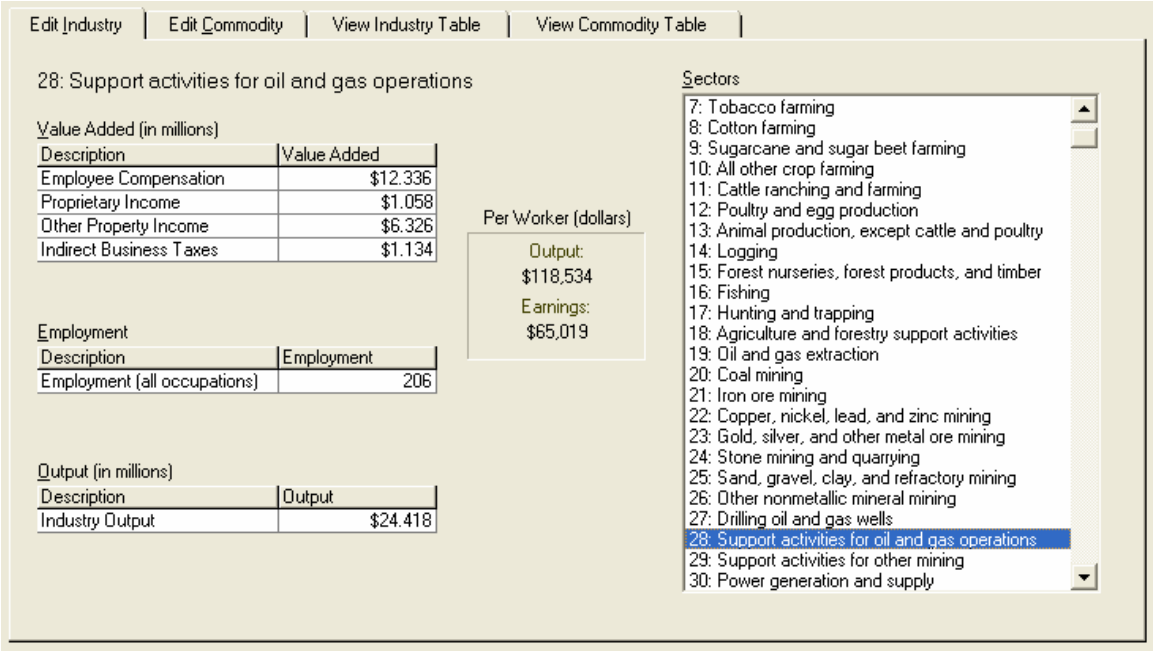
Oil and Gas Extraction



Drilling Oil and Gas Wells

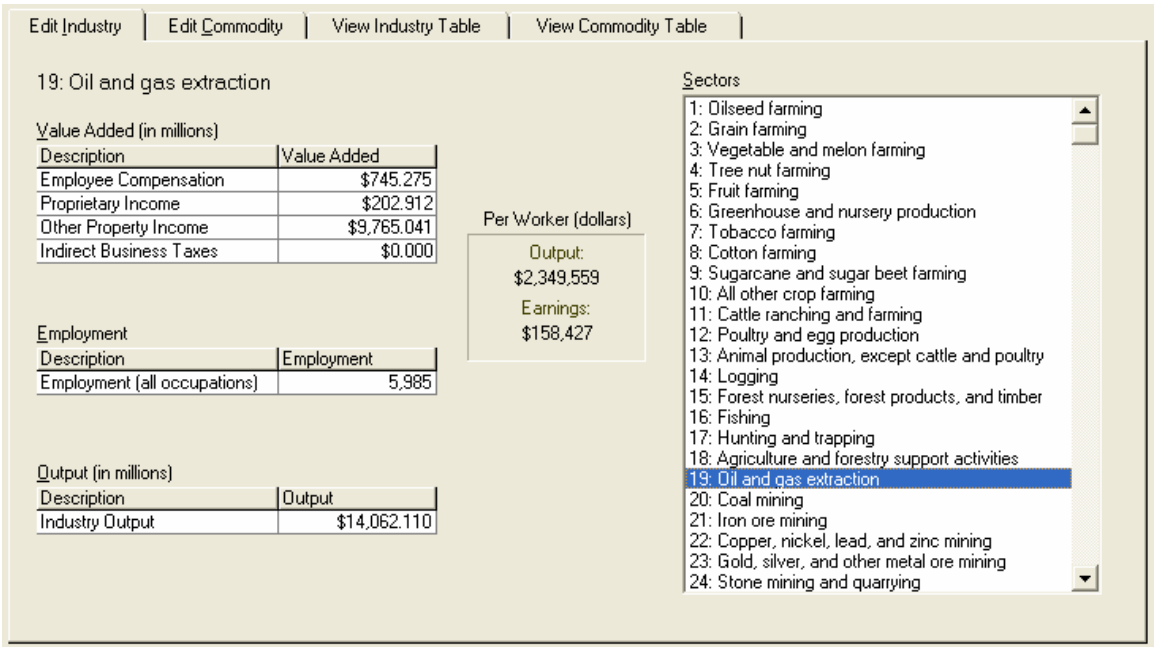


Support Activities for Oil and Gas Operations

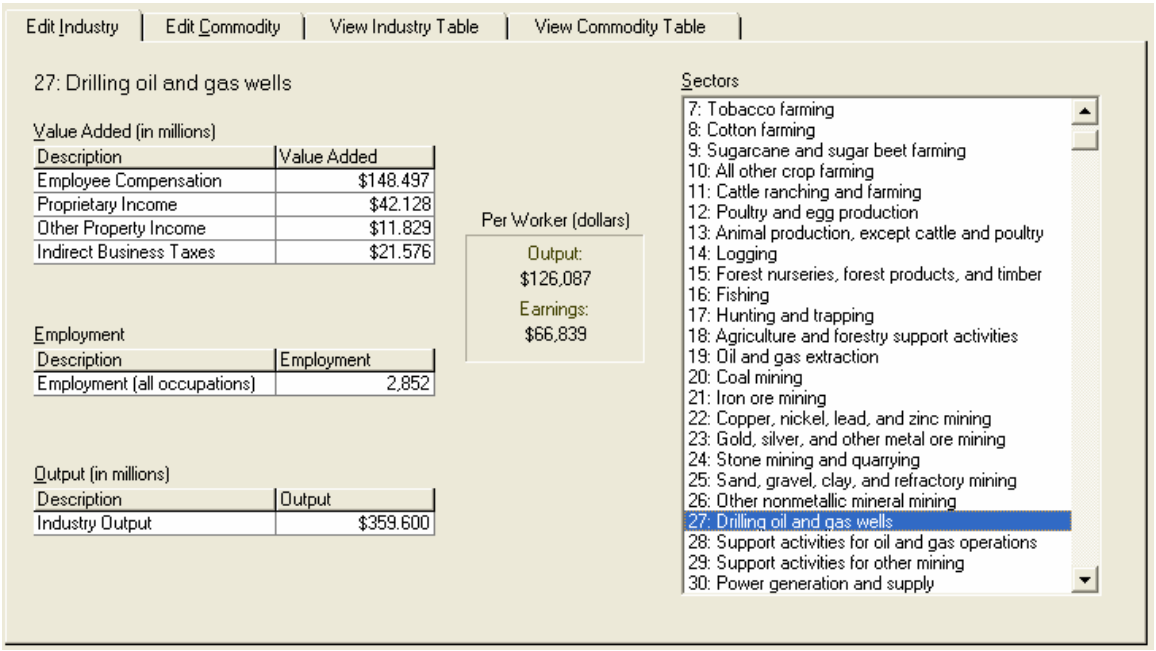


D.2 State Value Added Screen Shots

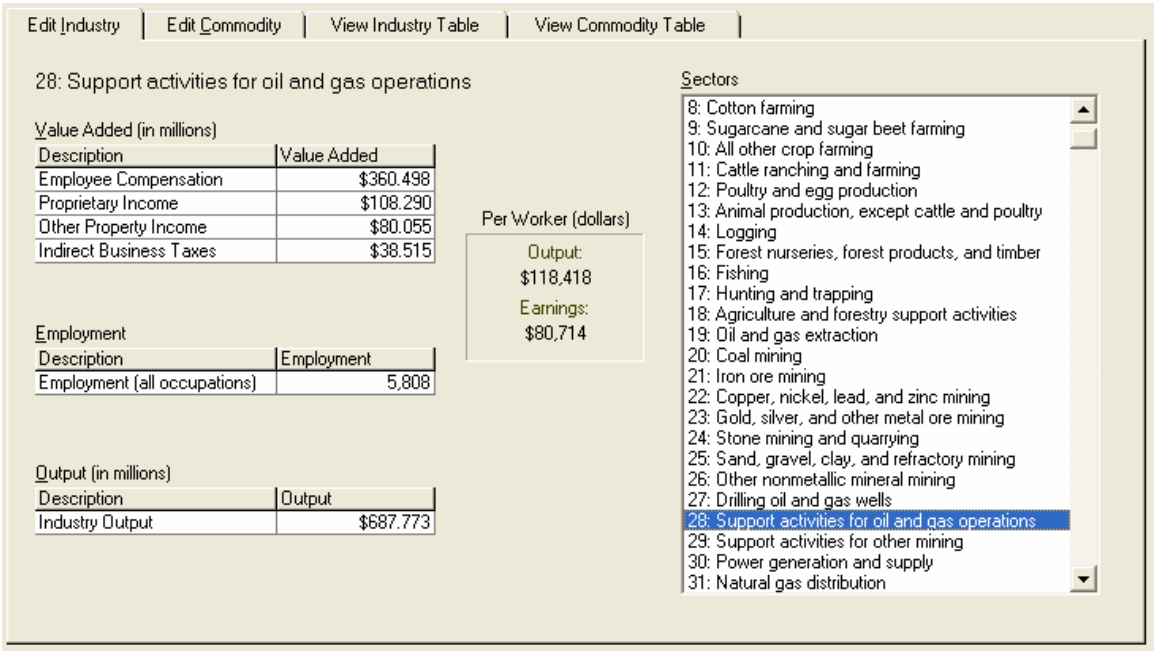
Oil and Gas Extraction (Sector 19) Value Added



Drilling Oil and Gas Wells (sector 27) Value Added



Support Activities for Oil and Gas Operations



Appendix E: Colorado Oil and Gas Operators Data Collection

A number of documents were created to facilitate communication with the industry contacts. This includes:

- A letter of introduction to the project (Exhibit E-1)
- Confidentiality Measures (Exhibit E-2)

Once these documents were finalized, they were pretested with two operators. This ensured that our data requests were in a format consistent with industry reporting methods.

Booz Allen met with the Colorado Oil and Gas Association (COGA) representatives to obtain an initial list of industry contacts. The contacts were prioritized and contacted by phone. A follow-up email was then sent to each contact with additional project information. The letter of introduction, shown in Exhibit E-1 was designed to provide general information regarding the project. This letter of introduction was sent to all contacts and some general information regarding the types of information that was needed from operators. This included: drilling, completion, and recompletion expenditures (AFE forms); production expenditures (often obtained through LOE forms); and private mineral and override royalties, lease Payments, surface Damages – payments for access to the minerals and surface lands.

Once the appropriate contact was made at the company, the data request document (Exhibit E-3) was sent to this contact. The document provided industry contacts with more specific information on the expenditure data required for the project. After sending this information, a call was made to make sure the requests were understood and to obtain a timeframe in which the company would be able to furnish the information. Booz Allen also forwarded a copy of the Confidentiality Measures that were put in place to ensure that the industry information is handled with care, statistics and impacts are reported in aggregate, and other measures were taken to protect the proprietary nature of the information. Calls were made weekly to follow up with industry contacts to insure deadlines were met. Oftentimes, additional contacts were made within the company to obtain information on vendor names and locations.

Exhibit E-1: Example Letter of Introduction

Booz | Allen | Hamilton

Booz Allen Hamilton Inc.
Suite 840
5299 DTC Boulevard
Greenwood Village, CO 80111-3362

Tel 1-303-694-4159
Fax 1-303-694-7367

www.boozallen.com

June 1, 2006

Dear Oil and Gas Industry Contact:

In recent years, there has been a considerable increase in oil and gas activity in Colorado. As a result, the state legislature is funding a study to investigate and quantify the economic contribution of these industries to the State. The Colorado Energy Research Institute of the Colorado School of Mines has contracted Booz Allen Hamilton to analyze the direct and indirect economic and fiscal contributions of the Colorado oil and gas industry to local regions and to the State of Colorado.

As part of this study, it is necessary to customize the economic parameters of the model we use. It is vital that your company participate in this data collection process to ensure the accuracy of the oil and gas economic contribution to the local basins and State. Generally, the data we are collecting includes expenditures related to the *development and production* of oil, conventional gas, and coalbed methane including labor costs and costs in various basins across the State, if applicable.

Your participation in this study will be entirely confidential. The study will only report aggregate data from responses to the interviews. Study areas will be identified and aggregated to protect proprietary industry information. Drs. Lisa McDonald and Holly Bender, associates with Booz Allen Hamilton, or one of their representatives will follow up with you to arrange a convenient time for a discussion and interview. A “data request sheet” is attached that specifies the type of information that we will be requesting from your company. We would very much appreciate your participation in this effort.

Sincerely,

Holly Bender, PhD and Lisa McDonald, PhD

Associates

Exhibit E-2: CERI Economic Contribution Study Confidentiality Measures

- No specific company names will be mentioned in any report or correspondence with the CERI or other third parties interested in this study.
- The purpose of this study is to better understand the relationships between relevant industries that directly or indirectly support oil and gas development in the State. In order to accomplish this task, the project team is collecting basin specific expenditure data on drilling, completing and operating wells in Colorado as well as average itemized expenditures, labor and material expense breakdowns, and location of services and materials being purchased. This information will be used to modify and customize the IMPLAN model. IMPLAN is a regional economic model that estimates additional economic activities, in terms of employment and income, generated from a primary activity (oil and gas development). Models such as IMPLAN are based on national averages that often times do not properly consider these important relationships and thus are not accurate in their estimate of total economic contribution.

  The updates to the model will consist of modifications of coefficients that represent expenditure relationships between relevant industries. These coefficients are embedded in Microsoft Access Database files within the software program. As such, there is no requirement to report any specific company costs, contactor information or other proprietary information to be released as part of this study. However, the study may report on general trends or differences in industry operations that can impact expenditures and investments across basins.
- The economic contribution will be estimated using the modified IMPLAN model and will be reported in terms of total employment, income, and tax revenue (estimated with a separate fiscal model) generated by the industry to the State of Colorado.
- Average expenditures for well development and production for both labor and materials expenses within basins will be used in combination with publicly available data (e.g., number of wells, production levels) to estimate economic contribution. Only aggregated direct expenditures for these activities to estimate impacts will be reported as part of a final report.
- Upon receipt, all company information will be held and stored behind the Booz Allen protected firewall. No specific company data will be released behind the firewall. The data will only be shared with Booz Allen team members needed to conduct the analysis.
- Booz Allen would appreciate the involvement of interested industry contacts to review a Draft Report before it is delivered to the CERI for publication.
- The Final Report will be shared and distributed to all operators and service companies that participate in the study.

Exhibit E- 3: Data Request Document

Booz Allen Hamilton (Booz Allen) is requesting information from your company regarding oil and gas development and production expenditures. We are very cognizant of the sensitive nature of this information and insure that no specific cost information for any individual company will be revealed. For instance, ALL costs, fees, and payments WILL BE AGGREGATED across the industries and reported only in aggregate to protect the proprietary nature of this information. *However, in order to accurately estimate the true ECONOMIC CONTRIBUTION of the industry to regional areas and the State of Colorado we need to have accurate information on the average costs incurred by companies within specific basins. This is the number one goal of this effort.*

After a couple of initial interviews with industry contacts in Colorado, we have tried to simplify the industry data collection efforts. The same types of information are required as explained and distributed earlier, we only hope that the approach outlined below will require less time and effort from your company. We appreciate any help you can provide in facilitating this information collection effort.

Booz Allen is specifically interested in obtaining the following information from your company:

- Cost information per well for oil, conventional gas or CBM gas *development*
- Cost information per well for oil, conventional gas, or CBM gas *production*
- Specific fee and payment information for mineral and surface owners, overrides, and value of leases and bonuses

In order for this study to be accurate, we are trying to map whether the major inputs and costs are originating within the basin, outside the basin, or outside of Colorado. It is important that we capture to where the expenditures are being paid.

To facilitate this information collection process, it is necessary to contact and collect information from Team Leads for the various basins of operation as well as a Land Group contact. The information needed for each is outlined below.

If cost documentation is not available from your company, we would like to interview (for about an hour) someone within your company who has knowledge about both development and production costs as well as land access fees and payments. We require only ESTIMATES of these costs to customize our model, and your subjective knowledge related verbally about your company's expenses is better than no information at all.

<u>For the Team Lead in Each Basin of Operation for Each Type of Resource</u>

In order to simplify the data collection effort and the impact on each company, we would like to request an example AFE document for drilling and completing a well and any information on LOEs for production expenses. If possible, these documents should be for a *typical well* in *each* basin where you operate (*each for oil, conventional gas and CBM*) for 2005. We would like estimates of the percentage of your company's drilling, completion, and production costs that are specifically labor, taxes, overhead, and other indirect expenses.

Once these forms or cost documents are obtained, we would like to contact you to obtain more information on the largest expenses, the names of service companies utilized and their locations, and other pertinent information. We would also like to obtain information on the LOE costs and how they vary over the life of a producing well.

If these costs cannot be captured per well, *we are willing to work with whatever type of reporting units or methods you can provide.* If a LOE per well or Mcf/Bbl is not available, and production costs are captured on a lease basis, we would need to obtain additional information on the lease, number of wells, production, etc., such that these costs can be calculated either per well or per Bbl or Mcf.

For the Land Group (or Division Order) for Each Basin of Operation and Each Type of Resource

On average across each basin of operation, we would like to obtain the following information for 2005:

- The percentage of wells with private mineral ownership
- Average production fee (for example, percentage of value) paid to private mineral owners
- Percentage of wells that are split estates where surface land damages are paid to private surface owners
- The average surface land damage payment paid (for example, $/well) in the basin
- The total amount paid to surface owners for surface land damages in the basin
- Average dollar value of leases and bonuses for minerals in 2005
- The number or percentage of wells in the basin where an override payment is made
- The average override fee (for example, percentage of production value)
- The typical type of company, person, or entity receiving those payments (i.e., local households, companies), and the location of the entity

Appendix F: Vendor and Service Company Allocations

F.1 Piceance Basin

Exhibit F-4-1 summarizes the location allocations used for drilling contract expenditures. Most of the drilling companies that were interviewed had local field offices and major regional offices in Denver.

Exhibit F-4-1: Drilling Contract Company Location Allocation for Piceance Basin (Percentages)

Location	Local Office Large Regional Office in Denver Out-of-State HQs	Local Field Office Most Support From Out-of-State	No Field Office Denver Office & Out-of-State HQ
In-Basin	54	20	20
Out-of-Basin/In-State	13	7	47
Out-of-State	33	73	33

Exhibit F-4-2: and F-3 display service company allocations used for general labor services and material/equipment supplies, respectively for the Piceance Basin. The percentage of local expenditures as shown in Exhibit F-4-2: for general labor-based services were estimated with information obtained from interviews with operators and service companies, including oil field services (e.g., water hauling) and administrative (e.g., legal services). Most of these services were provided by local field offices in Grand Junction and the Rifle area, or supported by the Denver Metro regional offices. In general, equipment and materials allocation for service companies is similar to the profile used for those in the Northern DJ basin. However, in the Piceance Basin a higher in-state (out-of-basin) expenditure ratio was used to represent Denver area support as reported by Piceance Basin operators.

Exhibit F-4-2: General Labor Services Location Allocations for Piceance Basin (Percentages)

Location	Local Field Office Large Admin In-State Out-of-State HQs	Local Field Office & Out-of-State HQ No Other CO Office
In-Basin	70	75
Out-of-Basin/In-State	15	10
Out-of-State	15	15

Exhibit F-4-3: General Tangible Equipment and Materials Location Allocations for Piceance Basin (Percentages)

Location	Local Office Small Denver Office Out-of-State HQs	Local Field Office & HQ
In-Basin	20	30
Out-of-Basin/In-State	5	10
Out-of-State	75	60

The following two exhibits show the service company location allocations for two of the major support industries for completing a well in the Piceance Basin. Stimulation and cementing services, shown in Exhibit F-4-4 are the largest expenses for completing an oil or gas well. Stimulation and cementing are largely labor-based services requiring some materials. In the Piceance Basin, these services comprise a relatively lower in-basin labor component, since a larger percentage of labor support comes from the Denver area and other areas outside of the basin, but within Colorado. As indicated in Exhibit F-4-5 casing and tubing expenditures for the Piceance Basin are similar to those in the Northern DJ Basin with a large out-of-state component as these materials are mainly imported to Colorado. The small percentage out of basin, in-state allocation is attributed to overhead for the distributors in Denver.

Exhibit F-4-4: Stimulation and Cementing Location Allocations for Piceance Basin (Percentages)

Location	Local Field Office Regional Office In-State HQ Out-of-State	Local Field Office Regional Office & HQ Out-of-State
In-Basin	25	25
Out-of-Basin/In-State	21	12
Out-of-State	54	63

Exhibit F-4-5: Casing and Tubing Expenditure Allocation for Piceance Basin (Percentage)

Location	No Local Office Small Denver Office Out-of-State HQs	No Local Office Larger Denver Office Out-of-State HQ
In-Basin	0	0
Out-of-Basin/In-State	5	10
Out-of-State	95	90

F.2 Northern DJ Basin

This section reports on many of the location profiles used to distribute service company allocations for the Northern DJ basin. Exhibit F-4-6 summarizes the service company location allocations that were used for drilling contract expenditures. Most of the drilling companies interviewed had local field offices and major regional offices in Denver. Since the Northern DJ basin incorporates Denver where many regional and a considerable number of headquarters offices are located, much of the allocations are in basin, while very little goes within state (out-of basin).

Exhibit F-4-6: Drilling Contract Company Location Allocations for Northern DJ (Percentages)

Location	Local Office Large Regional Denver Office Out-of-State HQs	Local Field Office Local HQ
In-Basin	82	93
Out-of-Basin/In-State	2	2
Out-of-State	16	5

Exhibit F-4-7: and Exhibit F-8 summarize expenditure allocations used for general labor-based services and vendors providing tangible equipment and materials, respectively. As explained in the Section 2, the tangible equipment and materials allocations were applied to expenditures that did not include casing and tubing, and are typically lower cost items (such as pumps). Interviews indicated that in general 80% of the general labor-based services were supported from the Denver Metro area, while the remaining 20% was attributed to margin and administration moving to headquarter offices out-of-state.

Exhibit F-4-7: General Labor-Based Services Location Allocations for Northern DJ (Percentages)

Location	Local Office Large Regional Denver Office Out-of-State HQs	Local Field Office Local HQ
In-Basin	80	90
Out-of-Basin/In-State	0	0
Out-of-State	20	10

Exhibit F-4-8: General Tangible Equipment and Materials Location Allocations for Northern DJ (Percentages)

Location	Local Office Out-of-State HQs	Local Field Office Local HQ
In-Basin	25	40
Out-of-Basin/In-State	0	0
Out-of-State	75	60

Most materials needed in the drilling, completion, and recompletion of wells in Northern DJ typically come from out-of-state, which is typical of materials needed for completion activities across the State. The location allocations for casing and tubing show this type of large out-of-basin component. However, smaller cost items did generally come from within the basin. Exhibit F-8 shows the percentages applied to companies that provide materials and equipment, aside from casing and tubing, which include supply smaller scale equipment and materials for drilling, completion, and recompletion activities.

The following two exhibits summarize the service company location allocations for two of the major support industries for completing a well. Stimulation & cementing services, shown in Exhibit F-4-9 comprise a considerable portion of expenditures for completing an oil or gas well in Colorado. Stimulation and cementing services in Northern DJ basin are largely labor-based services with a significant in-basin labor component. As indicated in Exhibit F-4-10, casing and tubing expenditures are largely imported to Colorado, as is typical for casing and tubing in all the basins. The small percentage within the basin is attributed to the overhead for the distributors in Denver.

Exhibit F-4-9: Stimulation and Cementing Location Allocations for Northern DJ (Percentages)

Location	Local Office Out-of-State HQs	Local Field Office Local HQ
In-Basin	69	93
Out-of-Basin/In-State	0	2
Out-of-State	31	5

Exhibit F-4-10: Casing and Tubing Location Allocations for Northern DJ (Percentages)

Location	Local Office Out-of-State HQs	Local Field Office Local HQ
In-Basin	5	10
Out-of-Basin/In-State	0	0
Out-of-State	95	90

F.3 Eastern DJ Basin

This section reports on the location profiles used to specify service company allocations for the Eastern DJ Basin. In general, the Eastern DJ Basin has relatively high in-basin expenditures and moderate in-state (out of basin) expenditures as most of the oil and gas service companies operate out of offices in the Eastern part of Colorado, but also utilize companies that have large regional offices in the Denver metro area.

Exhibit F-4-11 summarizes the location allocations used for drilling contract expenditures. From interviews with oil and gas operators in the Eastern DJ Basin, it was determined that a fair number of drilling companies utilized by operators in this basin have offices in Eastern DJ basin, although many have corporate HQs outside the State. Therefore, the in-basin allocations for drilling contract ranges from 55 to 68%.

Exhibit F-4-11: Drilling Contract Company Location Allocation for Eastern DJ Basin (Percentages)

Location	Local Office Large Local Regional Office Out-of-State HQs	Local Office Large Regional Denver Office Out-of-State HQs
In-Basin	68	55
Out-of-Basin/In-State	17	25
Out-of-State	15	20

Exhibit F-4-12 and Exhibit F-4-13 depict service company allocations used for general labor-based services and for vendors providing tangible equipment and materials for oil and gas activities in the Eastern DJ Basin, respectively. In Exhibit F-4-12 the general labor-based service allocations were obtained from interviews with a number of different types of labor-based companies (i.e., water hauling, mud logging, drilling supervision, etc.,) supporting drilling and completion, most of which were supported from local offices. In Exhibit F-4-13, the equipment and materials allocation for service companies is similar to the profile used in the Northern DJ

basin. However, in the Eastern DJ Basin there is a higher in-state (out-of-basin) expenditure as a result of the Denver area support, as indicated by interviews with service companies in the Eastern DJ Basin.

Exhibit F-4-12: General Labor-Based Services Location Allocation for Eastern DJ Basin (Percentages)

Location	Local Field Office Large Admin In-State Out-of-State HQs	Local Field Office Out-of-State HQ No Other CO Offices
In-Basin	80	90
Out-of-Basin/In-State	10	5
Out-of-State	10	5

Exhibit F-4-13: Tangible Equipment and Materials Location Allocations for Eastern DJ Basin (Percentages)

Location	Local Office Small Denver Office Out-of-State HQs	Local Field Office Local HQ,
In-Basin	15	25
Out-of-Basin/In-State	20	10
Out-of-State	65	60

The following two exhibits summarize service company location allocations for two of the major support industries for well completions in the Eastern DJ Basin. Stimulation and cementing services in Eastern DJ basin, shown in Exhibit F-4-14 are primarily labor-based services that have a lower in-basin labor component as a large percentage of the support for these types of services comes from the Denver area. As indicated in Exhibit F-4-15, casing and tubing expenditures for the Eastern DJ Basin are similar to those of the Northern DJ Basin with a large out-of-state component as these materials are imported to Colorado. The small percentage of out-of- basin, but in-state, is attributed to the overhead for the distributors in Denver.

Exhibit F-4-14: Stimulation and Cementing Location Allocations for Eastern DJ Basin (Percentages)

Location	Local Field Office Regional Office HQ in-State	No Local Field Office Regional Office in-State HQ Out-of-State
In-Basin	22	6
Out-of-Basin/In-State	54	29
Out-of-State	24	65

Exhibit F-4-15: Casing and Tubing Location Allocations for Eastern DJ Basin (Percentages)

Location	Local Office No Denver Office Out-of-State HQs	No Local Office Larger Denver Office Out-of-State HQ
In-Basin	10	0
Out-of-Basin/In-State	0	10
Out-of-State	90	90

F.4 Raton Basin

This section will report on many of the location profiles for service company and vendor allocations for the Raton Basin. In general, the Raton Basin has relatively lower in-basin allocations and moderate in-state (out-of-basin) allocations since most of the oil and gas service companies and vendors are located and supported from large (or larger) regional offices in the Denver metro area and some are located out-of-state. From interviews with service companies and operators, Booz Allen did find that services in the Raton Basin were supported by some companies from Farmington, NM and a drilling company from Missouri. However, many of the labor-based services are supported locally through offices in Trinidad.

Exhibit F-4-16 summarizes the location allocations used for drilling contract expenditures. There were some out-of-state drilling companies servicing the Raton Basin, which increases the out-of-state allocations. Therefore, the in-basin allocations were lower for the drilling companies in Raton basin than for drilling companies operating in the DJ and Piceance Basins. The out-of-basin allocations for this type of service were estimated to range from 30 to 48%.

Exhibit F-4-16: Drilling Contract Company Location Allocations in Raton Basin (Percentages)

Location	Local Office No Denver Regional Office Out-of-State HQs	Local Office Large Regional Office in Denver Out-of-State HQs
In-Basin	45	60
Out-of-Basin/In-State	5	10
Out-of-State	50	30

Exhibit F-4-17 and Exhibit F-4-18 depict the service company allocations used for general labor-based services and vendors providing tangible equipment and materials (not including tubing and casing) for the Raton Basin, respectively. In Exhibit F-4-17 the general labor-based service allocations were obtained from interviews with a number of different types of labor-based companies (e.g., water hauling) supporting drilling and completion, most of which were supported from local and Denver offices. In general, the location allocation for vendors providing equipment and materials for service companies is similar to the profiles used for these vendors in other Colorado basins. However, in the Raton Basin we have included a higher in-state (out-of-basin) expenditure to represent Denver area support for material purchases and services, as consistent with interviews with these types of vendors in the Raton Basin.

Exhibit F-4-17: Labor-Based Services Location Allocations for Raton Basin (Percentages)

Location	Local Field Office Large Admin In-State Out-of-State HQs	Local Field Office Out-of-State HQ No Other CO Office
In-Basin	65	75
Out-of-Basin/In-State	15	10
Out-of-State	20	15

Exhibit F-4-18: Tangible Equipment and Materials Location Allocations for Raton Basin (Percentages)

Location	Local Office Small Denver Office Out-of-State HQs	Local Field Office Local HQ
In-Basin	20	30
Out-of-Basin/In-State	5	10
Out-of-State	75	60

The following two exhibits display service company location allocations for two of the major support industries for well completions in the Raton Basin. Stimulation and cementing services, shown in Exhibit F-4-19 are primarily labor-based services with a relatively lower in-basin (out-of-state) component than those in other basins, as labor was often utilized from the Denver area or from Farmington, NM. As indicated in Exhibit F-4-20, casing and tubing allocations for the Raton Basin are similar to those in other basins with a large out-of-state component as these materials are imported to Colorado. The small allocation to out-of-basin and in-state is attributed to the overhead for the distributors in the greater Denver area.

Exhibit F-4-19: Stimulation and Cementing Location Allocations for Raton Basin (Percentages)

Location	Local Field Office Regional Office HQ In-State	No Local Field Office Regional Office In-State HQ Out-of-State
In-Basin	35	10
Out-of-Basin/In-State	13	10
Out-of-State	52	80

Exhibit F-4-20: Casing and Tubing Expenditure Location Allocations for Raton Basin (Percentages)

Location	No Local Office Small Denver Office Out-of-State HQs	No Local Office Larger Denver Office Out-of-State HQ
In-Basin	0	0
Out-of-Basin/In-State	5	10
Out-of-State	95	90

F.5 San Juan and Paradox Basins

This section will report on the location profiles for service company and vendor allocations in the San Juan and Paradox Basin. In general, the San Juan and Paradox Basin has an extremely low in-basin allocation and even smaller in-state (out-of-basin) allocation, since most of the service companies and vendors operate out of offices in Farmington, NM. Exhibit F-4-21 summarizes the location allocations used for drilling contract expenditures, as indicated by interviews with both operators and service companies. As noted, there are considerable leakages from this basin to New Mexico.

Exhibit F-4-21: Drilling Contract Company Location Allocations for San Juan and Paradox Basin (Percentages)

Location	No Local Office Regional Office Out-of-State Out-of-State HQs	Small Local Field Office Regional Office Out-of-State Out-of-State HQs
In-Basin	10	15
Out-of-Basin/In-State	10	15
Out-of-State	80	70

Exhibit F-4-22 and Exhibit F-4-23 show the service company location allocations utilized for general labor-based services and for vendors providing tangible equipment and materials (not including casing and tubing) for the San Juan and Paradox Basin, respectively. In Exhibit F-4-22, the general labor-based service allocations were obtained from interviews with operators and a number of different types of labor-based companies supporting drilling and completion, resulting again a considerable out-of-state component. The location allocation for vendors providing equipment and materials also comprises a considerable out-of-state component and is similar to the profiles used in other basins. However, in the San Juan Basin we have included a slightly higher in-state (out-of-basin) expenditure to represent Denver area support for material purchases, as reported by interviews with operators and service companies in the San Juan and Paradox Basin.

Exhibit F-4-22: Labor-Based Services Location Allocations for San Juan and Paradox Basin (Percentages)

Location	Local Field Office Regional and HQs Out-of-State	No Local Field Office Out-of-State HQ No Other CO Office
In-Basin	25	15
Out-of-Basin/In-State	5	5
Out-of-State	70	80

Exhibit F-4-23: Tangible Equipment and Materials Location Allocations for San Juan and Paradox Basin (Percentages)

Location	Local Office Out-of-State HQs	Most Support from Out-of-State
In-Basin	30	10
Out-of-Basin/In-State	5	5
Out-of-State	65	85

The following two exhibits summarize service company location allocations for two of the major support industries for well completions in the San Juan and Paradox Basin. In the San Juan and Paradox basin, stimulation and cementing services, shown in Exhibit F-4-24, are primarily labor-based services that comprise a fairly low in-state and in-basin location allocation as the labor pool general resides in Farmington, NM. As indicated in Exhibit F-4-25:, casing and tubing location allocations for the San Juan and Paradox Basin are similar to most other basins in Colorado with a significant out-of-state component since these materials are imported to Colorado.

Exhibit F-4-24: Stimulation and Cementing Location Allocations for San Juan and Paradox Basin (Percentages)

Location	Out-of-State Field Office Small Regional Office in Denver HQ Out-of-State
In-Basin	10
Out-of-Basin/In-State	10
Out-of-State	80

Exhibit F-4-25: Casing and Tubing Location Allocations for San Juan and Paradox Basin (Percentages)

Location	All Supported From Out-of-State	Purchased Through Denver-Based Distributor Office
In-Basin	0	0
Out-of-Basin/In-State	0	10
Out-of-State	100	90

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