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The Economic Impact of Los Alamos National Laboratory on North-Central New Mexico and the State of New Mexico Fiscal Year 1995

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PREFACE

The Albuquerque Operations Office (AL) of the U.S. Department of Energy (DOE) is charged with managing laboratories, production plants, and energy programs in several locations throughout the United States, including New Mexico. Due to the significance of DOE activities in New Mexico, selected economic impact studies have been completed annually since the early 1980s. The types of activities that DOE/AL oversees are, for the most part, an outgrowth of atomic research that started in New Mexico in the 1940s. In New Mexico, activity that was once confined to "the Hill" (Los Alamos National Laboratory), northwest of Santa Fe, has become two national laboratories, a biomedical and environmental research institute; a national waste repository, a national remedial action project, and several energy research and conservation programs.

The economic impact on New Mexico has grown over the years to a point where these activities provide tens of thousands of jobs and contribute billions of dollars to the state's economy. Therefore, it is appropriate that a report be provided periodically to the citizens of New Mexico describing the impact of DOE on the state. This report details activities for federal Fiscal Year 1995.

DISCLAIMER

ACKNOWLEDGMENTS

As is the case with studies of this type, many more people contribute to the effort than just the listed authors. The detailed information needed for the economic modeling and expenditure analysis could not have been obtained without the support of several individuals. Moreover, there are some who contribute but their contributions are not always acknowledged—to those individuals, we apologize.

The employment data by economic sector used in the regional model was obtained from the New Mexico Department of Labor (NMSOL). Larry Blackwell, Chief, Economic Research and Analysis Bureau, NMDOL, made certain we obtained the detailed, but unpublished, data needed for our research. Steve Pazand, Unit Supervisor, Actuarial Research, NMDOL also assisted the study team in obtaining the appropriate data. Importantly, this state government department has cooperated fully with our research efforts for several years and should be commended for their continuing efforts to participate in regional economic studies.

Janet M. Smith, Staff Accountant, Albuquerque Financial Service Center, Department of Energy (DOE) Albuquerque Operations Office, contacted all the DOE agencies to obtain expenditure information for this study. We thank the LANL budget officials who provided budget and expenditure data in a timely fashion, specifically Newby Ellington and Randy Hodges. Also, we thank John Mott, LANL, who provided summarized achievements information.

Tommie Nielsen, Reports Layout Typist, Department of Agricultural Economics and Agricultural Business, New Mexico State University, typed several drafts, the final report, and assured that study information was transmitted among the authors.

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INTRODUCTION

Los Alamos National Laboratory is a multidisciplinary, multiprogram laboratory with a mission to enhance national military and economic security through science and technology. Its mission is to reduce the nuclear danger through stewardship of the nation's nuclear stockpile and through its nonproliferation and verification activities. An important secondary mission is to promote U.S. industrial competitiveness by working with U.S. companies in technology transfer and technology development partnerships. Los Alamos has provided technical assistance to over 70 small New Mexico businesses enabling economic development activities in the region and state.

For several years, the U.S. Department of Energy (DOE) Albuquerque Operations Office (AL) and New Mexico State University (NMSU) have maintained an inter-industry, input-output model that has the capability to assess the effect on an economy of developments initiated from outside the economy (exogenous changes on New Mexico)--federal LANL monies that flow into a region or state. This model will be used to assess economic, personal income, and employment impacts of LANL on north-central New Mexico (a three-county region consisting of Los Alamos, Santa Fe, and Rio Arriba Counties) and the state of New Mexico (Figure 1).

The results of the econometric input-output (I/O) model for FY 1994 are not directly comparable to results of the DOE/NMSU I/O model for LANL for FY 1992 as a new I/O model was developed to estimate economic impacts for FY 1995. The current model is based on new technical information released by the Bureau of Economic Research (BEA), U.S. Department of Commerce. The base year for the FY 1994 I/O model is 1987. The economic sectors were restructured for the FY 1994 model to reflect economic activity in the state of New Mexico better. In FY 1992 the base year for

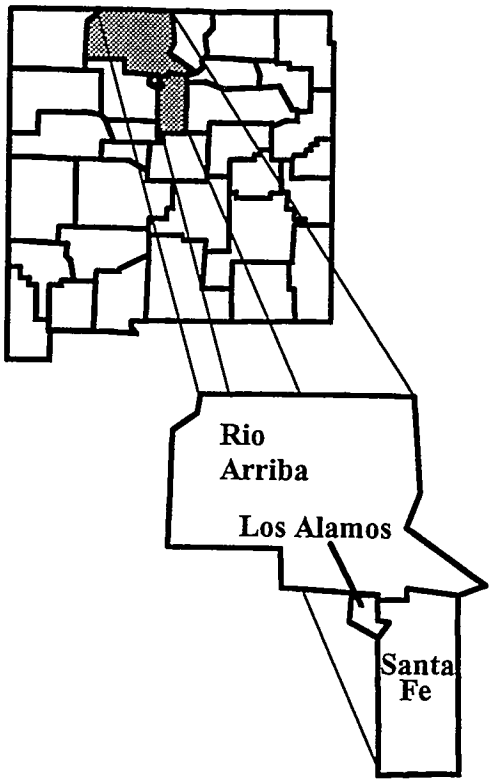


Figure 1. Los Alamos National Laboratory Three County North-Central New Mexico Region.

the National I/O model was 1982 for measuring the LANL economic impacts (Lansford et. al., 1993). Further revised details about the input-output model can be found in "The Economic Impact of the Department of Energy on the State of New Mexico - FY 1994" report by Lansford, et al.

For this report, the reference period is FY 1995 (October 1, 1994, through September 30, 1995) and includes two major impact analyses: the impact of LANL activities on north-central New Mexico and the economic impacts of LANL on the state of New Mexico. Total impact represents both direct and indirect respending by business, including induced effects (respending by households). The standard multipliers used in determining impacts result from the inter-industry, input-output models developed for the three-county region and the state of New Mexico.

PROFILE OF LOS ALAMOS NATIONAL LABORATORY

History

Los Alamos National Laboratory was established in 1943 as Project Y of the Manhattan Engineering District with the specific responsibility of developing the first nuclear weapon. It became a multi-discipline, multiprogram laboratory applying its capabilities to national needs, defense and civilian issues during the cold-war era.

Background

The Laboratory is located in Los Alamos County, New Mexico. The county covers 110 square miles and had a 1994 population of 18,521 (Bureau of the Census, 1994). The Laboratory is operated by the University of California for the U.S. Department of Energy under Contract W-7406-ENG-36, and is an affirmative action/equal opportunity employer.

Los Alamos is also involved in partnerships and collaborations with other federal agencies, universities, and industry. Working with a broad spectrum of partners reflects the fact that the Los Alamos National Laboratory is a national laboratory.

In FY 1995, the Laboratory had 8,558 University of California employees; 1,533 of whom had a doctorate and 3,303 of whom had at least one technical degree. The operating budget was approximately $1.2 billion.

Administrative, research, and maintenance facilities occupy more than 7.8 million square feet of building space, with 2.3 percent being leased (off site). The 34 technical areas are scattered over 43 square miles and occupy about 39 percent of the total county area.

Mission and Capabilities

The Laboratory's central mission is reducing the global nuclear danger, which involves five areas: Stockpile Stewardship, Stockpile Support, Nuclear Materials Management, Non Proliferation and Counter Proliferation, and Environmental Stewardship. A distinguishing feature of the Laboratory is its work in nuclear science. It is responsible for maintaining the safety and operability of the physics package of the nuclear weapons. Los Alamos also applies its expertise to key conventional defense and civilian issues that are synergistic with the central mission and capabilities.

Los Alamos provides technical assistance to the weapons complex and provides support to such areas as energy and environmental technologies. It also emphasizes basic research that sustains existing programs and the DOE research mission, work for other federal agencies, and work with U.S. industry.

The Laboratory's technical capabilities are clustered into eight major areas called core technical competencies. The core competencies are characterized by those that emphasize a scientific approach and those that emphasize scientific foundations:

Scientific Approach

- Complex experimentation and measurement
- Theory, modeling, and high-performance computing
- Analysis and Assessment

Scientific Foundations

- Nuclear weapons, science, and technology
- Earth and environmental systems

- Nuclear and advanced materials
- Bioscience and biotechnology
- Nuclear science, plasmas, and beams

Major Facilities

- *TA-55 Plutonium Facility.* The nation's only full-service operating plutonium facility. Weapons stockpile stewardship, pit surveillance and dismantlement, actinide research, NASA fuel projects, nuclear waste management and treatment.
- *Laboratory Data Communication Center (LDCC) plus Advanced Computing Laboratory (ACL).* Laboratory's central computing facility plus state-of-the-art ACL for advances in high-performance computing.
- *Neutron Science Center (LANSCE): National user-facility.* Includes the Lujan Neutron Scattering Center, the Weapons Neutron Research facility, one of the world's most powerful proton linear accelerator, and the proton storage ring. LANSCE supports advanced materials science, nuclear science, partical beam technology, nuclear weapons science, bioscience, and chemistry.
- *Chemistry & Metallurgy Research Facility (CMR).* Plutonium metallurgy, advanced chemical diagnostics, nuclear and radiochemistry.
- *Materials Science Laboratory (MSL).* Materials R&D center and user facility, experiments in high-temperature superconductivity, materials modifications and analysis, using ion beams and lasers.
- *Health Research Laboratory (HRL).* Center for Human Genome Studies, biological research, molecular biology, biochemistry, genetics.

Achievements

- Developed first nuclear weapons (1945).
- Demonstrated the ignition of thermonuclear fuel (1951).
- Tested first thermonuclear weapon (1952).
- Designed the majority of the weapons in the nuclear stockpile and the first flash x-ray radiographic facility (1963) and holds responsibility for stewardship of the weapons.
- VELA satellite verification of atmospheric test-ban treaty (1963).
- Major contributions to the development of large scale computers and computation and to nuclear reactor design:

  MANIAC II computer (1956), IBM's STRETCH (1961), Cray computer (1976), Thinking Machines Corp. CM-2 (1989-90), Monte-Carlo method (1947) and the S_n discrete ordinates method (1953) for solving radiation transport computations, the particle-in-cell method of numerical fluid dynamics (1957), computer codes to analyze reactor safety (1979). Achievement of criticality: uranium solution-fueled reactor (1944);

  First plutonium-fueled reactor (1946); "Lady Godiva" critical assembly (1953); KIWI reactor (1960); and Phoebus reactor (1965); for nuclear-powered rocket program, and operation of UHTREX reactor (1969).
- Major contributions in fundamental science, including:

  Detection of neutrino (1956), first demonstration of thermonuclear plasma in laboratory fusion studies (1958), use of high intensity LAMPF proton accelerator for nuclear studies (1972), discovery of heavy-fermion superconductor (1982).
- Recent Contributions:

  Detection of single fluorescent molecules, first flow cytometer for sorting single biological cells, discovery of the human telomere, complete sequencing of chromosome 16, measurements of neutrino mass and observation of neutrino oscillations, computer simulation of earth's magnetic field that predicts reversal of the field, computer modeling of global ocean

temperatures, detection of ionic pulsed-pairs of radio impulses by a detection instrument aboard a satellite, and new milestones in high temperature superconductivity and materials processing.

Future Prospects

Los Alamos will continue its role in science-based stockpile stewardship. Although defense is expected to decrease; there may be an increase in the role in non-proliferation and counterproliferation. The Laboratory has been tentatively assigned, in the Stockpile Stewardship and Management Program Programmatic Impact Statement, as the preferred location to manufacture nuclear weapon pits on a small scale. It has also been named as the project office for activities relating to the accelerator-production of tritium.

ECONOMIC IMPACTS OF LANL ON NORTH-CENTRAL NEW MEXICO, FY 1995

Funding

Throughout this chapter, funding to or expenditures by major on-site contractors or LANL will be referred to as "activities by LANL" for simplicity. The total LANL funding (operating and capital budget) in north-central New Mexico in FY 1995 was $1.2 billion (Table 1). LANL regional (Los Alamos, Santa Fe, and Rio Arriba Counties) expenditures were $704 million in FY 1995 for salaries and wages, trade and services, capital equipment, and construction. University of California operating expenditures accounted for about 86 percent of the total north-central New Mexico expenditures; Johnson Controls funding accounted for 10 percent; and Protection Technologies accounted for 4 percent.

LANL Expenditure Patterns

Total LANL regional expenditures (the initial respending of the total operating and capital budget) amounted to $704 million or about 59 percent of the total budget in FY 1995 (Table 1). The five economic sectors accounting for the majority of LANL regional expenditures for FY 1995 were households ($573 million), other business services ($28 million), engineering services ($23 million), wholesale trade ($17 million), and retail trade ($13 million). These sectors combined accounted for just under 93 percent of total LANL regional expenditures (Table 1).

LANL expenditures by major sectors in north-central New Mexico for FY 1995 were personnel, (including benefits) ($573 million), services ($70 million), trade ($30 million), government ($11 million), manufacturing ($9 million), other sectors ($8 million), and construction ($4 million) (Table 2). By far the largest LANL expenditure in north-central New Mexico was labor, 81 percent of the total regional expenditures. In FY 1995, 10 percent of the LANL expenditures went for services, 4 percent for trade, 1.6 percent for government, 1.3 percent for manufacturing, 1.1 percent for other sectors, 1 percent for transportation communication and utilities, and less then one percent for construction (Figure 2).

Employment

LANL is managed and operated by the University of California with approximately 8,113 employees in the three-county region in FY 1995 (Table 3). Johnson Controls had 1,524 full-time employees in FY 1995 and Protection Technologies had 439 employees. Subcontractors averaged 2,000 employees. The total number of jobs (all types of personnel) region-wide paid by the federal government or by contracts directly associated with LANL averaged 10,076 for FY 1995.

Measuring the LANL Economic Impact on North-Central New Mexico

The analysis of the DOE/New Mexico economic impact on north-central New Mexico employed an economic model that incorporates buying and selling linkages among regional industries. This analysis measures the impact generated by LANL and contractors expending money in the three north-central counties (Los Alamos, Santa Fe, and Rio Arriba) of New Mexico.

Several useful products of the I/O modeling technique are multipliers. Three multipliers (the first related to general economic activity, the second to

Table 1. LANL Expenditures (in Dollars) in North-Central New Mexico by Sector and Total Operating Budget, FY 1995.

Sector	University of California	Protection Technologies	Johnson Controls	Total Expenditures by LANL in North-Central New Mexico
1. Livestock & Livestock Products				0
2. Other Agricultural Products				0
3. Forestry & Fishery Products				0
4. Agriculture, Forestry & Fishery Services	300			300
5. Mining, Crude Petroleum & Natural Gas	190,420			190,420
6. Construction	3,584,915			3,584,915
7. Ordnance & Chemical Manufacturing	31,648			31,648
8. Food & Kindred Products Man.	2,007			2,007
9. Textiles Products & Apparel Manufacturing	4,963			4,963
10. Lumber & Wood Products Man.	31,240			31,240
11. Paper & Publishing Manufacturing	48,581			48,581
12. Petroleum Refining & Products Manufacturing				0
13. Glass, Stone & Clay Products Man.	103,475			103,475
14. Primary & Fabricated Metals Man.	832,080			832,080
15. Computer, Office & Service Equipment Man.				0
16. Electrical Equipment Manufacturing	5,063,617			5,063,617
17. Scientific Instruments Man.	1,099,955			1,099,955
18. All Other Manufacturing	1,855,494			1,855,494
19. Motor Freight Transportation & Warehousing	50,880	17,591		68,471
20. All Other Transportation	40,325	135,094		175,419
21. Communication	873,099		642,774	1,515,873
22. Electric & Gas Utilities	196,357		4,175,184	4,371,541
23. Water & Other Utilities			26,119	26,119
24. Wholesale Trade	17,356,778			17,356,778
25. Retail Trade	12,800,069			12,800,069
26. Finance, Insurance & Real Estate	1,222,817	74,205	406,043	1,703,065
27. Hotel Restaurant & Other Personal Services	352,909		82,750	435,659
28. Data Processing & Computer Services	4,826,943		126,465	4,953,408
29. Management & Consulting Services	5,819,372	97,909		5,917,281
30. Engineering, Architecture & Surveying Services	23,270,068			23,270,068
31. Other Business Services	27,967,235	198,762		28,165,997
32. Automobile & Other Repair Services	168,441		2,477,044	2,645,485
33. Amusement, Recreation & Video Services	2,030			2,030
34. Health, Education & Social Services	1,788,566		2,429,372	4,217,938
35. Government Services	183,951		4,525,147	4,709,098
36. Local Government		271,166	2,192,146	2,463,312
37. State Government		1,276,075	2,575,461	3,851,536
38. Los Alamos National Laboratory (a)				
39. Households	420,667,267	22,732,981	54,382,000	572,616,456
Total North-Central Regional Expenditures	530,435,802	24,803,783	74,040,505	704,114,298
Total Operating and Capital Budget	1,184,883,810	(b)	(b)	1,184,883,810

a. Any transfer of money for services or products between specified activites is counted only in the activity of the last receiving agency.
b. Total Operating and Capital Budget for Johnson Control & Protection Technology--Los Alamos is included in the LANL budget.

income, and the third to employment) provide information needed to estimate LANL's impact. The activity multiplier identifies the extent to which an activity such as LANL relies directly and indirectly on the regional economy to provide it with the materials, services, and labor it requires to conduct its activities, and the extent to which respending by businesses and industries occurs in the region. Income and employment multipliers make possible the identification of not only the direct impacts of an activity on income and jobs but also the indirect (business) and induced (households) effects.

Economic Impact of LANL

The flow diagram (Figure 3) charts the movement of monies spent by LANL. Expenditures for salaries and purchases go to households, regional businesses, and other regions (outside the three-

Table 2. Los Alamos National Laboratory Expenditures in North-Central New Mexico by Major Sector, FY 1995.

Sectors		FY-1995 thousands of dollars	(%)
I. Personnel			
	Salaries & Wages	452,594	64.3%
	Benefits	12,022	17.0%
	Total	572,616	81.3%
II. Construction		3,585	0.5%
III. Manufacturing		9,073	1.3%
IV. Trade		30,157	4.3%
V. Service		69,608	9.9%
VI. Government			
A.	Local Government	2,463	0.3%
B.	State Government	3,852	0.5%
C.	Government Services	4,709	0.7%
	Total	11,024	1.6%
VI. Other Sectors			
A.	Agriculture	0	0.0%(a)
B.	Mining	190	0.0%(a)
C.	T.C.U.(b)	6,157	0.8%
D.	F.I.R.E(c)	1,703	0.2%
	Total	8,051	1.1%
TOTAL EXPENDITURES		704,114	100.0%

*Totals may not add due to rounding.

a. Less than 1/10 of one percent

b. Transportation, Communications and Utilities

c. Finance, Insurance and Real Estate

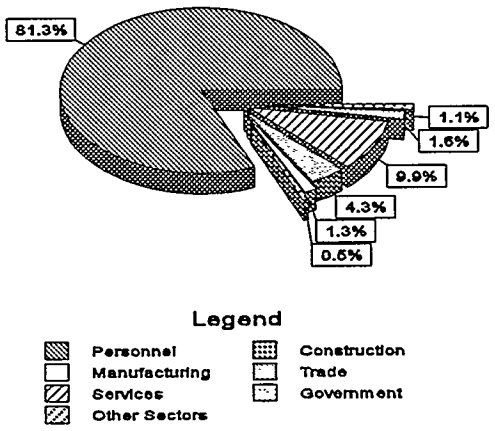


Figure 2. LANL Expenditures in North-Central New Mexico by Major Sector, FY 1995.

county region of New Mexico). This injection of money affects economic activity directly: the effect equals the amount funded for LANL efforts in north-central New Mexico ($1.2 billion).

Households and businesses affected by LANL respend much of the money they receive in the three-county region, thus creating indirect (business) and induced (household) effects. In turn, businesses buy from other local firms and pay salaries to their employees, starting another round of spending. Every movement of money around the circle causes additional indirect (and induced) effects. However, some funds leak outside the region when purchases are made elsewhere and are not available for further local spending. Thus, indirect effects become smaller and smaller as continued respending occurs.

The initial spending by LANL generates substantial first-round impacts on households (net) and businesses ($503 and $121 million, respectively for FY 1995) in the three-county north-central region (Figure 3). This initial spending will provide government $11 million in new revenues (mainly state and local government taxes and fees). However, a large portion of the initial spending ($481 million) and transfer payments, including fringe benefits costs to labor ($46 million), flow out-of-state through leakages.

Respending by regional businesses and purchases by households and state and local government

Table 3. LANL Funding, Region Expenditures and Employment by Major Entity in North Central New Mexico, FY 1995.

Entity	New Mexico Funding	Regional Expend-itures	New Mexico Regional Employment
	---millions of dollars---		(jobs)
Univ. of California (LANL)	1,184.8	530.4	8,113
Johnson Controls (LANL)	(a)	74.0	1,524
PT-LA	(a)	24.8	439
Total	1,184.8	629.3	10,076

*Total may not add due to rounding.

a. Total Operating and Capital Budget for Johnson Control & Protection Technology--Los Alamos is included in the LANL budget.

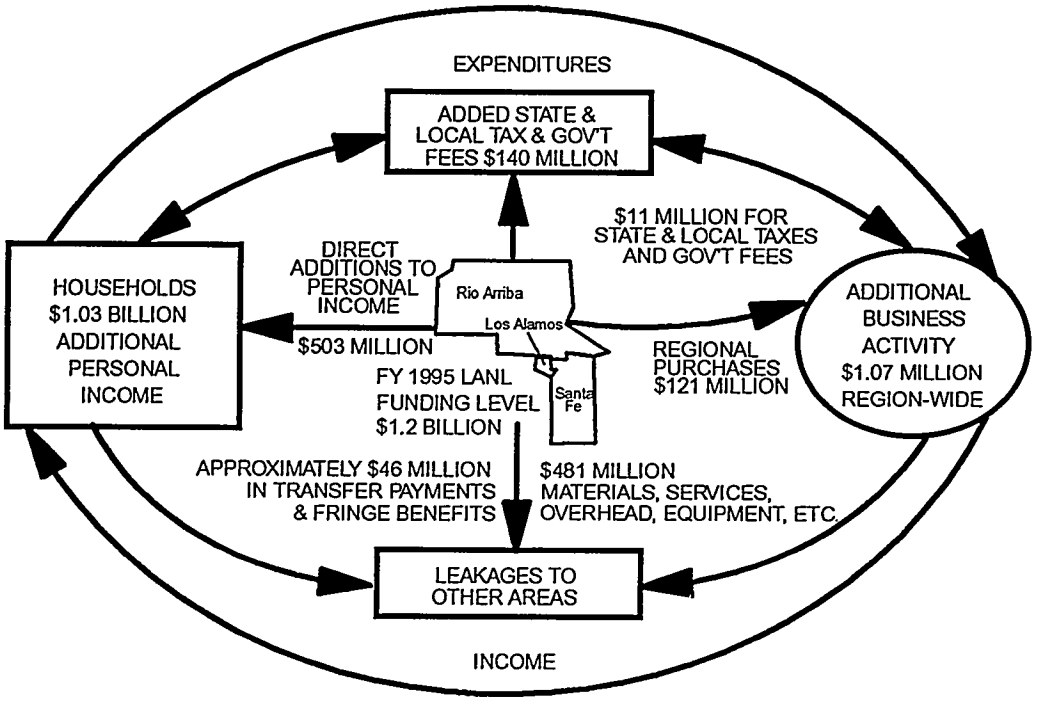
eventually bring the total private business impact to about $965 million. Also, respending activity will continue to add to personal income and government revenues so that total personal income will increase to $1.07 million, and state and local government tax revenues and government fees will expand $140 million as a result of direct, indirect, and induced effects.

Overall Impact

Using LANL's funding for its total operating and capital budget of $1.2 billion, econometric modeling techniques were used to calculate the effects of this funding. As Table 4 indicates, the total increase in economic activity in New Mexico was $3.4 billion from the initial infusion of $1.2 billion. The economic activity multiplier measures the volume of activity generated among various sectors of a region as a result of a $1 exogenous change in a sector. For example, the economic activity multiplier for LANL for FY 1995 was 2.89. This indicates that for every $1 spent by LANL and its major on-site New Mexico contractors, another $1.89 was generated for a total impact of $2.89 in FY 1995.

No official figure exists for total economic activity in the three-county north-central region; however, for the purposes of this study total economic activity in the three-county region is estimated at $11.35 billion for 1995 (Table 4). Applying the regional economic activity multiplier of 2.89 to the $1.2 billion directly added to the regional economy results in the $3.4 billion estimated total impact in FY 1995. This total impact of $3.4 billion generated by LANL is about 30 percent of the estimated $11.35 billion total economic activity in the region. Table 4 gives the direct, indirect, induced, and total economic activity impact of LANL on the region.

Table 11 in the Appendix gives LANL indirect economic impacts on private and public sectors for FY 1995. The retail trade sector received the greater volume of indirect private and public economic



TOTAL REGION-WIDE ECONOMIC IMPACT - $3.4 BILLION

Figure 3. Los Alamos National Laboratory Economic Impact on North-Central New Mexico, FY 1995.

Table 4. Los Alamos National Laboratory Regional Influence on North-Central New Mexico's Economy, FY 1995.

Economic Measure	LANL	Total Region	LANL as a % of the Region
	billions of dollars		%
Economic Activity			
Direct Expenditures	1.18		
Indirect and Induced (a)	2.24		
Total	3.42	11.35	30.1
Economic Activity Multiplier	2.89		
Personal Income			
Gross Labor	0.57		
Net Wages and Salaries	0.53		
Indirect and Induced (a)	0.50		
Total	1.03	3.56	28.9
Personal Income Multiplier	1.95		
	-----number of employees-----		
Employment			
Direct	10,076		
Indirect and Induced (a)	17,206		
Total	27,282	85,721(b)	31.8
Employment Multiplier	2.71		

(a) Based on the results of the econometric model.
(b) New Mexico Department of Labor, Economic Research and Analysis Bureau, Table C, 1995.

impacts, about 19 percent of the total estimated indirect impacts. Other sectors with large indirect economic impacts include finance, insurance and real estate (FIRE) (17 percent), electric and gas utilities (6 percent), hotel, restaurant, and other personal services (6 percent), and health, education, and social services (6 percent).

Impact on Income

Personal income is money that goes to individuals that will be respent for purchases such as groceries, automobiles and gasoline, mortgage payments, medical, new shoes, taxes and savings. Most personal income consists of wages and salaries, although payments received as interest, rent, dividends, and social security benefits (payments to individuals) also count as personal income. Some of the fringe benefits and wages paid to employees are not counted in the current income stream (i.e., social security payments by employers and employees). In FY 1995, labor payments of $573 million resulted in an estimated $503 million in net additional personal income to the region.

Income multipliers measure the indirect and induced effects from new income generated from payment to labor by LANL. The income multiplier was 1.95 for FY 1995 (Table 4). Applying the income multiplier of 1.95 to the direct net personal income figure of $503 million yields a total impact of $1.03 billion for income in the region resulting from LANL activity. This multiplier indicates that for every $1 of personal income from LANL for labor, another $0.95 is generated through indirect and induced effects, for a total impact on personal income of $1.03 billion.

In FY 1995, total personal income in north-central New Mexico was estimated at $3.56 billion (Table 4). LANL activities in the north-central New Mexico region accounted for about 29 percent of total regional personal income in 1995.

Impact on Employment

Beside this dollars-and-cents impact, LANL affects region-wide employment. In addition to the average of 10,076 mainly full-time jobs created by LANL in FY 1995, other jobs are supported by the resulting needs for goods and services and respending by individuals and businesses. Firms filling those needs have their own employees and in turn, spend money with other firms who must also hire people. In addition, each individual employee needs goods and services and helps support other jobs such as waitresses, mechanics, clerks, lawyers, and nurses.

The employment multipliers measure the number of indirect and induced jobs supported, on the average, by LANL. The regional employment multiplier for LANL was estimated to be 2.71 in FY 1995 (Table 4). This indicates that for every 100 jobs created by LANL, another 171 jobs were supported in FY 1995, translating to a total impact of 27,282 jobs. These 27,282 jobs created or supported by LANL accounted for about 32 percent of total employment in the region in FY 1995 (Table 4).

Table 11 in the Appendix gives the LANL indirect employment impact on private and public sectors for FY 1995. The more labor-intensive sectors received the greater indirect employment impact. The retail trade sector had the largest indirect impact of about 29 percent. Other sectors with a large indirect employment impact include FIRE (11 percent), hotel, restaurant and other personal services (10 percent), health, education and social services (8 percent), and other business services (5 percent).

CONCLUSIONS

In summary, LANL operations in north-central New Mexico have a significant and positive influence on the economy of north-central New Mexico. The funding for LANL in north-central New Mexico was about $1.2 billion in FY 1995, yielding a total economic impact of over $3.4 billion or about 30 percent of the total economic activity in the region.

Total personal income impact was $1.03 billion in FY 1995 or 29 percent of personal income derived in the three counties. The employment multiplier was 2.71 for the region, meaning that the 10,076 average employment level of FY 1995 supported a total impact of 27,282. In effect, one of nearly every 3 jobs in the region was created or supported by LANL. Approximately 78 percent of the jobs created indirectly by LANL in the region occurred in the trade and services sectors.

ECONOMIC IMPACTS OF LANL ON THE STATE OF NEW MEXICO, FY 1995

Funding

Throughout this chapter, funding to or expenditures by major on-site contractors or LANL offices will be referred to as activities by LANL for simplicity. The state-wide total funding (operating and capital budget) for LANL for FY 1995 was $1.2 billion (Table 5). LANL expenditures were $875 million in FY 1995 for salaries and wages, trade and services, capital equipment, and construction. University of California expenditures accounted for 87 percent of the total New Mexico expenditures; Johnson Controls funding accounted for 10 percent; and Protection Technologies accounted for 3 percent. The largest contractor supporting the LANL project in the state of New Mexico was Johnson Controls.

LANL Expenditure Patterns

Total LANL in-state expenditures (the initial respending of the total operating and capital budget) amounted to about 74 percent of the total budget in FY 1995 (Table 5). Johnson Controls total in-state expenditures in New Mexico were $86 million. Actual LANL in-state expenditures were $875 million in FY 1995 for salaries and wages, trade and services, capital equipment, and construction (Table 5).

Out-of-state purchases and salaries for those living elsewhere amounted to $308 million. In addition, approximately $48 million for transfer payments and some fringe benefit costs for in-state labor costs leaked directly out of state. The six economic sectors accounting for the majority of LANL in-state expenditures for FY 1995 were households ($609 million), retail trade ($56 million),wholesale trade ($51 million), other business services ($37 million), and engineering, architecture, and surveying ($28 million). These sectors combined accounted for 89 percent of total in-state LANL expenditures in FY 1995.

LANL expenditures by major sectors in New Mexico for FY 1995 were personnel including benefits ($609 million), trade ($107 million), services ($101 million), government ($15 million), manufacturing ($13 million), construction ($8 million), and other sectors ($23 million) (Table 6). By far the largest expenditure by LANL in the state of New Mexico was labor ($609 million), which is nearly 70 percent of the state-wide expenditure (Table 6), or 51 percent of the total operating and capital budget for FY 1995 . Salaries and wages (without benefit costs) accounted for 56 percent of the total in-state expenditures. In FY 1995, about 12 percent of LANL expenditures went for trade, 12 percent to services, 2 percent to transportation, communication, and utilities, 2 percent for manufacturing, 2 percent went to government, and about 1 percent for construction and the other sectors (Figure 4).

Table 5. LANL Expenditures (in Dollars) in New Mexico by Sector and Total Operating Budget, FY 1995.

Sector	University of California	Johnson Controls	Protection Technologies	Total Expenditures by LANL in New Mexico
1. Livestock & Livestock Products				0
2. Other Agricultural Products				0
3. Forestry & Fishery Products				0
4. Agriculture, Forestry & Fishery Services	4,908			4,908
5. Mining, Crude Petroleum & Natural Gas	1,305,950			1,305,950
6. Construction	8,229,776			8,229,776
7. Ordnance & Chemical Man.	59,680			59,680
8. Food & Kindred Products Man.	49,303			49,303
9. Textiles Products & Apparel Man.	25,411			25,411
10. Lumber & Wood Products Man.	271,124			271,124
11. Paper & Publishing Man.	278,408			278,408
12. Petroleum Refining & Products Man.	1,348			1,348
13. Glass, Stone & Clay Products Man.	123,725			123,725
14. Primary & Fabricated Metals Man.	2,660,253			2,660,253
15. Computer, Office & Service Equipment Man.				0
16. Electrical Equipment Man.	5,643,642			5,643,642
17. Scientific Instruments Man.	1,274,838			1,274,838
18. All Other Man.	2,521,249			2,521,249
19. Motor Freight Transportation & Warehousing	63,100		17,591	80,691
20. All Other Transportation	356,268		135,094	491,362
21. Communication	1,642,629	642,774		2,285,423
22. Electric & Gas Utilities	12,540,869	4,175,184		16,716,053
23. Water & Other Utilities	11,729	26,119		37,848
24. Wholesale Trade	50,861,030			50,861,030
25. Retail Trade	56,179,678			56,179,678
26. Finance, Insurance & Real Estate	1,222,617	406,043	74,205	1,702,865
27. Hotel Restaurant & Other Personal Services	434,388	82,750		517,138
28. Data Processing & Computer Services	12,067,885	126,465		12,194,350
29. Management & Consulting Services	13,261,861		97,909	13,359,770
30. Engineering, Architecture & Surveying Services	28,018,355			28,018,355
31. Other Business Services	36,418,278		198,762	36,617,040
32. Automobile & Other Repair Services	816,001	2,477,044		3,293,045
33. Amusement, Recreation & Video Services	7,196			7,196
34. Health, Education & Social Services	4,641,559	2,429,372		7,070,931
35. Government Services	2,714,634	4,525,147		7,239,781
36. Local Government	403,070	2,192,146	271,166	2,866,382
37. State Government	940,496	2,575,461	1,276,075	4,792,032
38. Los Alamos National Laboratory (a)				
39. Households	518,418,004	66,320,029	23,873,985	608,612,018
Total New Mexico Expenditures	763,469,282	85,978,534	25,944,787	875,392,603
Total Operating and Capital Budget	1,184,883,810	(b)	(b)	1,184,883,810

a. Any transfer of money for services or products between specified activites is counted only in the activity of the last receiving agency.

b. Total Operating and Capital Budget for Johnson Control & Protection Technology--Los Alamos is included in the LANL budget.

Employment

LANL is managed and operated by the University of California, with approximately 8,558 full-time employees state-wide in FY 1995. Johnson Controls had 1,524 full-time employees in FY 1995, and Protection Technologies had 439 employees each (Table 7). The total number of jobs (all types of personnel) state-wide paid by the federal government or by contracts directly associated with LANL averaged 10,521 for FY 1995.

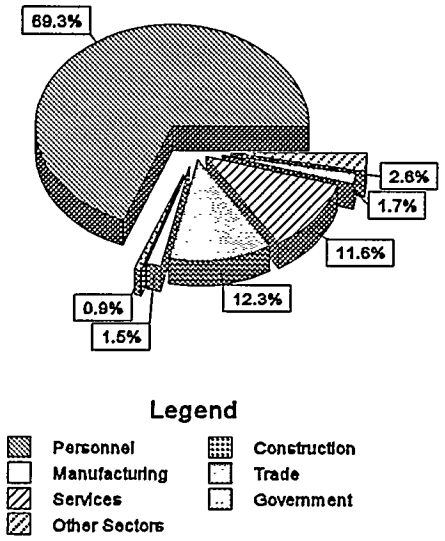


Figure 4. LANL Expenditures in New Mexico by Major Sector, FY 1995.

Measuring LANL's Economic Impact on New Mexico

The analysis of DOE/New Mexico economic impact on New Mexico employed an economic model that incorporates buying and selling linkages among regional industries. This analysis measures the impact generated by LANL, the DOE/AL contractor expending money in the state. As previously stated, the term DOE/New Mexico is used to describe all these entities.

Several useful products of the I/O modeling technique are multipliers. Three multipliers—the first related to general economic activity, the second to income, and the third to employment—provide the information needed to estimate LANL's impact. The activity multiplier identifies the extent to which an activity such as LANL relies directly and indirectly on the state's economy to provide the materials, services, and labor it requires to conduct its activities, and the extent to which respending by businesses and industries occurs in the state. Income and employment multipliers make it possible to identify not only the direct impacts of an activity on income and jobs, but also the indirect (business) and induced (households) effects.

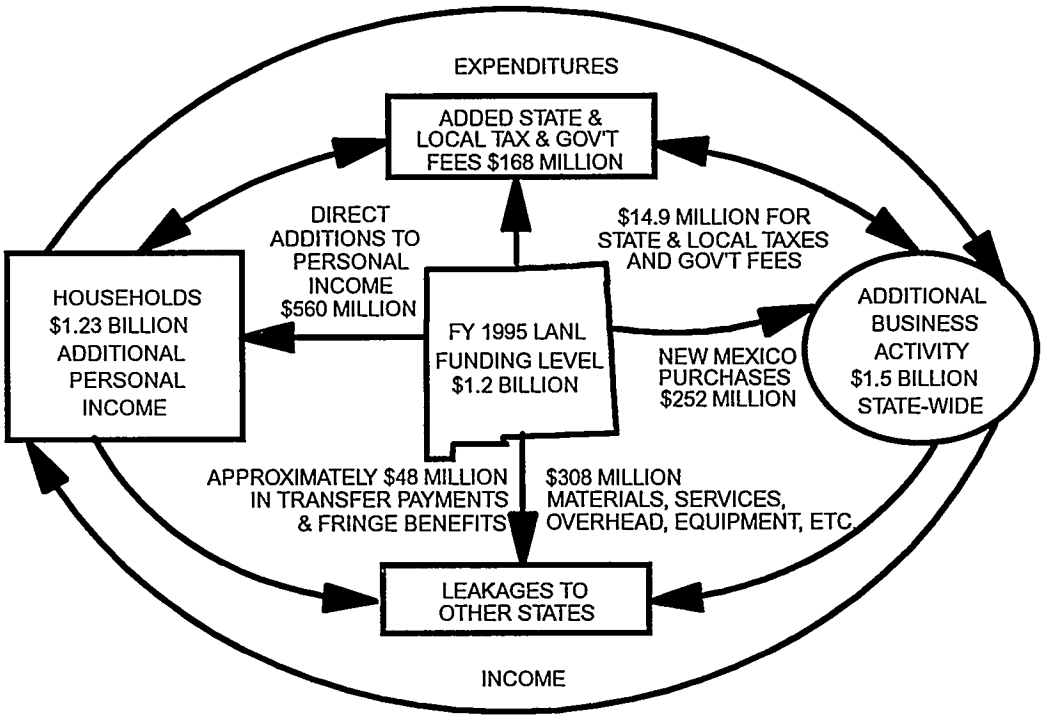
Table 6. LANL Expenditures in New Mexico by Major Sector, FY 1995.

Sectors	FY-1995 thousands of dollars	(%)
I. Personal		
Salaries & Wages	486,890	55.6%
Benefits	121,722	13.9%
Total	608,612	69.5%
II. Construction	8,230	0.9%
III. Manufacturing	12,909	1.5%
IV. Trade	107,041	12.2%
V. Service	101,078	11.5%
VI. Government		
A. Local Government	2,866	0.3%
B. State Government	4,792	0.5%
C. Government Services	7,240	0.8%
Total	14,898	1.7%
VI. Other Sectors		
A. Agriculture	5	0.0%(a)
B. Mining	1,306	0.1%
C. T.C.U.(b)	19,611	2.2%
D. F.I.R.E(c)	1,703	0.2%
Total	22,627	2.6%
TOTAL EXPENDITURES	875,393	100.0%

*Totals may not add due rounding.
a. Less than 1/10 of one percent
b. Transportation, Communications and Utilities
c. Finance, Insurance and Real Estate

Table 7. LANL Funding, Instate Expenditures and Employment by Major Entity in New Mexico, FY 1995.

Entity	New Mexico Funding	Instate Expend-itures	New Mexico Employment
	—millions of dollars—		(jobs)
Univ. of California (LANL)	1,184.9	763.5	8,558
Johnson Controls (LANL)	(b)	856.0	1,524
Protective Technologies	(b)	25.9	439
Total	1,184.9	875.4	10,521



TOTAL STATE-WIDE ECONOMIC IMPACT - $4.09 BILLION

Figure 5. Los Alamos National Laboratory Economic Impact on the State of New Mexico, FY 1995.

Eonomic Impact of LANL

The flow diagram (Figure 5) charts the movement of monies spent by LANL. Expenditures for salaries and purchases go to households, state-wide businesses, and other regions (outside the state of New Mexico). This injection of money affects economic activity directly, that is, the effect equals the amount allocated to LANL ($1.2 billion).

Households and businesses affected by LANL respend much of the money they receive in the state, thus creating indirect (business) and induced (household) effects. In turn, businesses buy from other local firms and pay salaries to their employees, starting another round of spending. Every movement of money around the circle causes additional indirect (and induced) effects. However, some funds leak outside the region (state) when purchases are made elsewhere and are not available for further local spending. Thus, the indirect effects become smaller and smaller as continued respending occurs.

Initial spending by LANL generates substantial first-round impacts on households (net) and businesses: $560 and $252 million, respectively for FY 1995 (Figure 5). This initial spending will give government $15 million in new revenues (mainly state and local government taxes and fees); however, a large portion of the initial spending ($308 million, plus $48 million in transfer payments and some fringe benefit costs) flows out of state through leakages.

Respending by in-state businesses and purchases by households and state and local governments eventually bring the total private business impact to $1.5 billion. Also, respending activity will continue to add to personal income and government revenues so that the total personal income effect will increase to $1.2 billion, and state and local government tax revenues and government fees will expand $168 million as a result of direct, indirect, and induced impacts.

Overall Impact

No official figure exists for total economic activity in the state; however, for this study, a 1995 estimate of $84.6 billion is used (Table 8). While LANL is an important economic factor in north-central New Mexico, the economic impacts are important but less significant when measured on a state-wide basis. LANL directly added $1.2 billion to the total state economy in FY 1995. The estimated indirect (and induced) impact of $2.91 billion brings the total impact to $4.09 billion or about 5 percent of the estimated $84.6 billion state-wide total activity in 1995.

The estimated $4.10 billion total economic impact in New Mexico from the initial infusion of $1.2 billion is derived from I/O modeling techniques employed in the study. The modeling process produces estimated impacts from which multipliers can be determined. The economic activity multipliers are used to measure the volume of activity generated among various sectors of a region as a result of a $1 exogenous change in a sector.

For example, the economic activity multiplier for LANL for FY 1995 was 3.45. This indicates that for every $1 spent by LANL or its major on-site contractors, another $2.45 was generated, for a total impact of $3.45 in FY 1995. Table 8 gives the direct, indirect, induced, and total economic activity impact of LANL on the state.

Appendix Table 12 gives LANL indirect economic impacts on private and public sectors for FY 1995. The retail trade sector received the greatest volume of indirect economic impacts, about 19 percent of the total estimated public and private sector volume of indirect impacts. Other sectors with large indirect impacts were FIRE (15 percent), wholesale trade (6 percent), other business services (6 percent), hotel, restaurant and other personal services (6 percent), and electric and gas utilities (5 percent).

Impact on Income

Personal income is money that goes to individuals to be respent for items such as groceries, automobiles and gasoline, mortgage payments, medical, new shoes, taxes, and savings. Most personal income consists of wages and salaries, although payments received as interest, rent, dividends, and social security benefits (payments to individuals) also count as personal income. Some of the fringe benefits and wages paid to employees are not counted in the current income stream (i.e., social security payments by employers and employees). In FY 1995, labor payments of $609 million resulted in an estimated $560 million in net additional personal income.

Income multipliers measure the indirect and induced effects of new income generated from payment to labor by LANL. The income multiplier was 2.19 for FY 1995 (Table 8). Application of the income multiplier of 2.19 to the direct net personal income figure of $560 million yields a total impact of $1.23 billion for income resulting from LANL activity. This multiplier indicates that for every $1 of personal income from LANL for labor, another $1.19 is generated through indirect and induced effects, for a total impact on personal income of $1.23 billion.

In FY 1995, total personal income in New Mexico was estimated at $30.4 billion (Table 8). LANL activities in the New Mexico accounted for slightly over 4 percent of total personal income in 1995.

Impact on Employment

Beside this dollars-and-cents impact, LANL affects state-wide employment. In addition to the average of 10,521 mainly full-time jobs created by LANL in FY 1995, other jobs are supported by needs for goods and services and respending by individuals and businesses. Firms filling those needs have their own employees and in turn, spend money with other firms who must also hire people. Additionally, each individual employee demand goods and services and therefore supports other jobs such as waitresses, mechanics, clerks, lawyers, and nurses.

Employment multipliers measure the number of indirect and induced jobs supported, on the average, by LANL. The employment multiplier for LANL was estimated to be 3.23 in FY 1995 (Table 8). This indicates that for every 100 jobs created by LANL, another 223 jobs were supported in FY 1995, a total impact of 33,961 jobs. The total impact of 33,961 jobs created or supported by LANL accounted for

Table 8. LANL Influence on New Mexico's Economy, FY 1995.

Economic Measure	LANL	Total State	LANL as a % of the State
	billions of dollars		%
Economic Activity			
Direct Expenditures	1.18		
Indirect and Induced (a)	2.91		
Total	4.09	84.6	4.8
Economic Activity Multiplier	3.45		
Personal Income			
Gross Labor	0.61		
Net Wages and Salaries	0.56		
Indirect and Induced (a)	0.66		
Total	1.22	30.4(b)	4.0
Personal Income Multiplier	2.19		
	----number of employees----		
Employment			
Direct	10,521		
Indirect and Induced	23,440		
Total	33,961	738,400(c)	4.6
Employment Multiplier	3.23		

(a) Based on the results of the econometric model.
(b) Less than 1/10 of one percent
(c) Totals may not add due to rounding.

4.6 percent of total employment in the state in FY 1995 (see Table 8).

Table 12 in the Appendix gives LANL indirect employment impact on the private and public sectors for FY 1995. The more labor-intensive sectors received the greater indirect employment impact. The retail trade sector had the largest indirect impact, about 29 percent of the indirect impact. Other sectors with a large indirect employment impact include lodging and personal services (11 percent), FIRE (10 percent), and health and social services (8 percent).

CONCLUSIONS

In summary, LANL operations in New Mexico have a significant and positive influence on the economy of New Mexico. The funding for LANL in New Mexico, about $1.2 billion in FY 1995, supported a total economic impact of $4.1 billion or slightly less then 5 percent of total economic activity in the state.

Total personal income impacts were over $1.2 billion in FY 1995 or 4 percent of personal income derived in New Mexico. The employment multiplier was 3.23 for the state, meaning that the 10,521 average employment level in FY 1995 supported a total impact of 33,961. In effect, one of nearly every 20 jobs in the state was created or supported by LANL. Approximately 80 percent of the jobs created indirectly by LANL in the region occurred in the trade and services sectors.

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APPENDIX

Table 9. LANL North-Central New Mexico I/O Model Direct Coefficients, FY 1995.

Sector	Direct Coefficients
1. Livestock & Livestock Products	0.000000
2. Other Agricultural Products	0.000000
3. Forestry & Fishery Products	0.000000
4. Agric., Forestry & Fishery Services	0.000000
5. Mining, Crude Petroleum & Natural Gas	0.000161
6. Construction	0.003026
7. Ordnance & Chemical Manufacturing	0.000027
8. Food & Kindred Products Manufacturing	0.000002
9. Textiles Products & Apparel Manufacturing	0.000004
10. Lumber & Wood Products Manufacturing	0.000026
11. Paper & Publishing Manufacturing	0.000041
12. Petroleum Refining & Products Manufacturing	0.000000
13. Glass, Stone & Clay Products Manufacturing	0.000087
14. Primary & Fabricated Metals Manufacturing	0.000702
15. Computer, Office & Service Equipment Manufacturing	0.000000
16. Electrical Equipment Manufacturing	0.004274
17. Scientific Instruments Manufacturing	0.000928
18. All Other Manufacturing	0.001566
19. Motor Freight Transportation & Warehousing	0.000058
20. All Other Transportation	0.000148
21. Communication	0.001279
22. Electric & Gas Utilities	0.003689
23. Water & Other Utilities	0.000022
24. Wholesale Trade	0.014649
25. Retail Trade	0.010803
26. Finance, Insurance & Real Estate	0.001437
27. Hotel Restaurant & Other Personal Services	0.000368
28. Data Processing & Computer Services	0.004181
29. Management & Consulting Services	0.004994
30. Engineering, Architecture & Surveying Services	0.019639
31. Other Business Services	0.023771
32. Automobile & Other Repair Services	0.002233
33. Amusement, Recreation & Video Services	0.000002
34. Health, Education & Social Services	0.003560
35. Government Services	0.003974
36. Local Government	0.002079
37. State Government	0.003251
38. LANL	0.000000
39. Households	0.483268
Total New Mexico Expenditures	0.594248
Total Operating and Capital Budget	1.000000

a. Any transfer of money for services or products between specified activites is counted only in the activity of the last receiving agency.

Table 10. LANL State-wide I/O Model Direct Coefficients, FY 1995.

Sector	Direct Coefficients
1. Livestock & Livestock Products	0.000000
2. Other Agricultural Products	0.000000
3. Forestry & Fishery Products	0.000000
4. Agric., Forestry & Fishery Services	0.000004
5. Mining, Crude Petroleum & Natural Gas	0.001102
6. Construction	0.006946
7. Ordnance & Chemical Manufacturing	0.000050
8. Food & Kindred Products Manufacturing	0.000042
9. Textiles Products & Apparel Manufacturing	0.000021
10. Lumber & Wood Products Manufacturing	0.000229
11. Paper & Publishing Manufacturing	0.000235
12. Petroleum Refining & Products Manufacturing	0.000001
13. Glass, Stone & Clay Products Manufacturing	0.000104
14. Primary & Fabricated Metals Manufacturing	0.002245
15. Computer, Office & Service Equipment Manufacturing	0.000000
16. Electrical Equipment Manufacturing	0.004763
17. Scientific Instruments Manufacturing	0.001076
18. All Other Manufacturing	0.002128
19. Motor Freight Transportation & Warehousing	0.000068
20. All Other Transportation	0.000416
21. Communication	0.001929
22. Electric & Gas Utilities	0.014108
23. Water & Other Utilities	0.000032
24. Wholesale Trade	0.042925
25. Retail Trade	0.047414
26. Finance, Insurance & Real Estate	0.001437
27. Hotel Restaurant & Other Personal Services	0.000436
28. Data Processing & Computer Services	0.010185
29. Management & Consulting Services	0.011275
30. Engineering, Architecture & Surveying Services	0.023646
31. Other Business Services	0.030903
32. Automobile & Other Repair Services	0.002779
33. Amusement, Recreation & Video Services	0.000006
34. Health, Education & Social Services	0.005968
35. Government Services	0.006110
36. Local Government	0.002419
37. State Government	0.004044
38. LANL	0.000000
39. Households	0.513647
Total New Mexico Expenditures	0.738695
Total Operating and Capital Budget	1.000000

a. Any transfer of money for services or products between specified activites is counted only in the activity of the last receiving agency.

Table 11. Los Alamos National Laboratory, Central New Mexico, FY 1995, Indirect Volume Employment Impacts by Subsector.

Sector	Volume ($000)	Employment Jobs	%
1. Livestock & Livestock Products	4,924	14.2	0.1
2. Other Agricultural Products	6,675	40.3	0.2
3. Forestry & Fishery Products	350	1.4	0.0
4. Agric., Forestry & Fishery Services	1,097	36.9	0.2
5. Mining, Crude Petroleum & Natural Gas	4,338	17.3	0.1
6. Construction	23,794	280.0	1.6
7. Ordnance & Chemical Manufacturing	361	2.8	0.0
8. Food & Kindred Products	22,198	125.6	0.7
9. Textiles Products & Apparel	5,655	70.5	0.4
10. Lumber & Wood Products	567	6.8	0.0
11. Paper & Publishing	9,579	136.6	0.8
12. Petroleum Refining & Products	17,583	13.5	0.1
13. Glass, Stone & Clay Products	1,056	12.4	0.1
14. Primary & Fabricated Metals	2,632	24.4	0.1
15. Computer, Office & Service Equipment Manufacturing	9,964	85.2	0.5
16. Electrical Equipment Manufacturing	6,342	54.2	0.3
17. Scientific Instruments Manufacturing	2,221	16.9	0.1
18. All Other Manufacturing	4,837	52.4	0.3
19. Motor Freight Transportation & Warehousing	8,172	102.4	0.6
20. All Other Transportation	10,361	158.7	0.9
21. Communication	36,161	359.3	2.1
22. Electric & Gas Utilities	57,922	116.3	0.7
23. Water & Other Utilities	6,277	82.8	0.5
24. Wholesale Trade	43,577	579.8	3.4
25. Retail Trade	227,527	4914.5	28.6
26. Finance, Insurance & Real Estate	201,652	1903.4	11.1
27. Hotel Restaurant & Other Personal Services	67,105	1791.4	10.4
28. Data Processing & Computer Services	18,232	225.2	1.3
29. Management & Consulting Services	7,738	70.5	0.4
30. Engineering, Architecture & Surveying Services	24,737	237.0	1.4
31. Other Business Services	80,603	899.2	5.2
32. Automobile & Other Repair Services	55,502	588.9	3.4
33. Amusement, Recreation & Video Services	29,436	733.7	4.3
34. Health, Education & Social Services	69,181	1448.1	8.4
TOTAL Private Sector	1,068,356	15202.4	88.4
35. Government Services	20,326	280.5	1.6
36. Local Government	44,079	656.9	3.8
37. State Government	75,595	1065.8	6.2
TOTAL Public Sector	140,000	2003.1	11.6
TOTAL Private and Public Sectors	1,208,356	17205.5	100.0

Detail may not add due to rounding.

Table 12. Los Alamos National Laboratory, State of New Mexico, FY 1995, Indirect Volume Employment Impacts by Subsector.

Sector	Volume ($000)	Jobs	Employment %
1. Livestock & Livestock Products	8,127	23.4	0.1
2. Other Agricultural Products	8,950	54.0	0.2
3. Forestry & Fishery Products	448	1.8	0.0
4. Agric., Forestry & Fishery Services	2,427	81.5	0.3
5. Mining, Crude Petroleum & Natural Gas	33,706	134.3	0.6
6. Construction	33,999	400.0	1.7
7. Ordnance & Chemical Manufacturing	2,657	20.4	0.1
8. Food & Kindred Products	34,250	193.8	0.8
9. Textiles Products & Apparel	5,880	73.3	0.3
10. Lumber & Wood Products	880	10.6	0.0
11. Paper & Publishing	8,654	123.4	0.5
12. Petroleum Refining & Products	31,177	23.9	0.1
13. Glass, Stone & Clay Products	2,139	25.1	0.1
14. Primary & Fabricated Metals	6,975	64.5	0.3
15. Computer, Office & Service Equipment Manufacturing	12,060	103.1	0.4
16. Electrical Equipment Manufacturing	12,146	103.9	0.4
17. Scientific Instruments Manufacturing	2,515	19.1	0.1
18. All Other Manufacturing	8,419	91.2	0.4
19. Motor Freight Transportation & Warehousing	12,012	150.5	0.6
20. All Other Transportation	20,939	320.7	1.4
21. Communication	39,408	391.6	1.7
22. Electric & Gas Utilities	88,132	176.9	0.8
23. Water & Other Utilities	7,720	101.8	0.4
24. Wholesale Trade	100,513	1337.3	5.7
25. Retail Trade	315,265	6809.6	29.1
26. Finance, Insurance & Real Estate	250,422	2363.7	10.1
27. Hotel Restaurant & Other Personal Services	93,729	2502.2	10.7
28. Data Processing & Computer Services	24,651	304.5	1.3
29. Management & Consulting Services	27,530	251.0	1.1
30. Engineering, Architecture & Surveying Services	29,858	286.0	1.2
31. Other Business Services	90,339	1007.8	4.3
32. Automobile & Other Repair Services	68,483	726.7	3.1
33. Amusement, Recreation & Video Services	34,358	856.4	3.7
34. Health, Education & Social Services	84,901	1777.1	7.6
TOTAL Private Sector	1503669	20911.2	89.2
35. Government Services	25,877	357.1	1.5
36. Local Government	54,210	807.9	3.4
37. State Government	96,771	1364.3	5.8
TOTAL Public Sector	176859	2529.3	10.8
TOTAL Private and Public Sectors	1,680,527	23440.1	100.0

Detail may not add due to rounding.