

**The Economic Impact of
Los Alamos National Laboratory
on North-Central New Mexico and the
State of New Mexico Fiscal Year 1998**

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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 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 1998.

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 (NMDOL). Steve Pazand, Unit Supervisor, Actuarial Research, NMDOL made certain we obtained the detailed, but unpublished data needed for our research. Larry Blackwell, Chief, Economic Research and Analysis Bureau, 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.

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INTRODUCTION

As a multidisciplinary, multiprogram laboratory, Los Alamos National Laboratory (LANL) is a key national resource for developing and integrating leading-edge science and technology to solve national and global security problems. The Laboratory's mission is to enhance global security by ensuring the safety and reliability of the U.S. nuclear weapons stockpile; reducing threats to U.S. security with a focus on weapons of mass destruction; cleaning up the legacy of the Cold War; and providing technical solutions to energy, environment, infrastructure, and health security problems. LANL promotes U.S. industrial competitiveness by working with U.S. companies in technology transfer and technology development partnerships. LANL is involved in partnerships and collaborations with other federal agencies, with industry (including New Mexico businesses), and with universities worldwide.

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 (I/O) 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). Caution should be exercised when comparing economic impacts between fiscal years prior to this report. The I/O model was rebased for FY 1998. The fringe benefits coefficients have been updated for the FY 1996 and FY 1997 economic impacts analysis. Prior to FY 1993 two different I/O base models were used to estimate the impacts. New technical information was released by the Bureau of Economic Analysis (BEA), U.S. Department of Commerce in 1991 and in 1994 and was incorporated in FY 1991, FY 1993, and FY 1994 I/O models. Also in 1993, the state and local tax coefficients and expenditure patterns were updated from a 1986 study for the FY 1992 report.

Further details about the I/O model can be found in "The Economic Impact of the Department of Energy on the State of New Mexico - FY 1998" report by Lansford, et al. (1999).

For this report, the reference period is FY 1998 (October 1, 1997, through September 30, 1998) and includes two major impact analysis: the impact of LANL activities on North-Central New

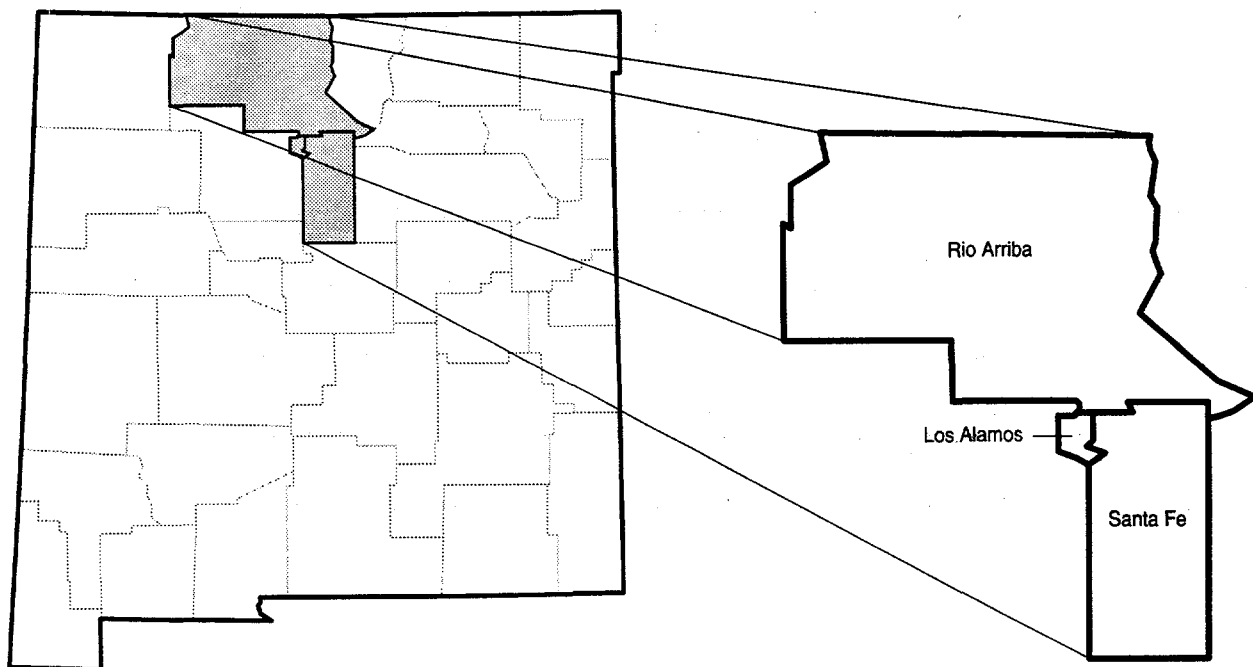


Figure 1. LANL Three County North-Central New Mexico Region.

Mexico and the economic impacts of LANL on the state of New Mexico. Total impact represents both direct and indirect responding by business, including induced effects (responding by households). The standard multipliers used in determining impacts result from the inter-industry, I/O models developed for the three-county region and the state of New Mexico.

PROFILE OF LOS ALAMOS NATIONAL LABORATORY

History

LANL was established in 1943 as the Wartime Project Y of the Manhattan Engineering District with responsibility for developing the first nuclear weapon. During the cold-war era, Los Alamos became a multidiscipline, multiprogram Laboratory applying capabilities from its original weapons mission to national security and civilian security needs. In this post cold-war era, the Laboratory continues its scientific role in national security as a steward of the enduring stockpile. It applies scientific capabilities to the reduction of threats from weapons of mass destruction and to civilian security threats.

Background

The Laboratory is located in Los Alamos County, New Mexico. The county covers 110 square miles and had a 1997 population of 18,275 (Bureau of the Census, 1997). 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.

During 1998, the Laboratory had approximately 8,931 University of California employees, by headcount, (including full-time, part-time, paid and unpaid affiliate, visiting, and casual status) and an additional 1,800 contract employees, vendors, members of the protective guard force, and contractor personnel.

The 1998 operating budget was \$1.3 billion. Principal activities are as follows: Defense Programs 53 percent, Nonproliferation and National Security 9 percent, Materials Disposition 12 percent, Environmental Restoration and Waste Management 12 percent, Energy Research 5 percent, Nuclear Energy 1 percent, Energy Efficiency and

Renewable Energy 1 percent, other DOE 2 percent, and Work for Others 15 percent.

Administrative, research, and maintenance facilities occupy more than 5.1 million occupiable square feet of the available 8 million gross square feet of building space, of which 2.3 percent is leased in the community. The 34 technical areas are scattered over about 43 square miles (27,800 acres). These technical areas occupy about 39 percent of the total county area.

Because of topographical, environmental, operational, and buffering constraints, only about 30 percent of the 27,800 acres of DOE land is developable. The facilities, including buildings, infrastructure, and capital equipment, have an estimated replacement cost of \$4.2 billion.

LANL is involved in partnerships and collaborations with other federal agencies, with industry, and with over 230 universities worldwide. In addition, the Laboratory is committed to helping diversify the regional economy and enhance educational opportunities.

The Laboratory, DOE, and the Los Alamos Economic Development Corporation (LAEDC), with support from the county of Los Alamos, is pursuing the development of a research and development park. The park is proposed to be developed on about 44 acres of land directly north of the Laboratory's main area. This land and park are intended to provide a physical location for private industry to develop facilities that will allow and foster scientific and technological exchange between private industry and the Laboratory.

Mission and Capabilities

The Laboratory's core mission is to enhance global security by ensuring safety and confidence in the U.S. nuclear weapons stockpile, by developing technical solutions to reduce the threat of weapons of mass destruction, and by improving the environmental and nuclear materials legacy of the cold war.

In addition, the Laboratory applies its scientific and engineering capabilities to assist the nation in addressing energy, environment, infrastructure, and biological security problems. For example, the high-performance computing capability and related competencies address national problems as

wide-ranging as epidemics, global warming, traffic patterns, and forest fires.

The Laboratory's strength derives from its ability to solve extremely complex problems that require the integration of an array of disciplines and capabilities with highly specialized facilities and unique operations expertise.

LANL supports DOE complex wide initiatives in all four of DOE's business areas: National Security, Science and Technology, Energy Resources, and Environmental Quality. In addition, it performs work for other federal agencies, and works with U.S. industry that is synergistic with its core mission.

Major Nuclear Facilities

Plutonium Facility—the Nation's only full-service operating plutonium facility.

Weapons Engineering Tritium Facility—state-of-the-art tritium research and development facility.

Critical Experiments Facility—national resource for critical-assembly training and nuclear data measurements.

Chemistry and Metallurgy Research Facility—facilities for plutonium metallurgy, advanced chemical diagnostics, and nuclear and radio-chemistry.

Major Experimental Facilities

Neutron Science Center—national user facility includes one of the world's most powerful proton linear accelerators and the proton storage ring.

Materials Science Laboratory—specialized laboratory that provides experiments in high-temperature superconductivity, materials modification, and materials analysis.

Dual-Axis Radiographic Hydrotest Facility—premier three-dimensional hydrotest center; expected to begin operations in 1999.

National High Magnetic Field Laboratory—unique facility that will produce 100-tesla magnetic fields for periods lasting up to 10 milliseconds (1000 times longer than anywhere else in the world).

Major Research Facilities

Advanced Computing Laboratory—new facility to provide resources for advances in high-performance computing; Strategic Computing Complex—TeraOp

computing and simulation (construction begins in 1999).

Health Research Laboratory—contains the *Center for Human Genome Studies*, biological research, molecular biology, biochemistry, and genetics.

Achievements

- Developed first nuclear weapons (1945);
- Demonstrated the ignition of thermonuclear fuel (1951);
- Tested first thermonuclear weapon (1952);
- Designed the majority of weapons in the nuclear stockpile and the first flash x-ray radiographic facility (1963) and holds responsibility for stewardship of the weapons;
- Developed VELA Satellite for verification of atmospheric test-ban treaty (1963); and
- 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);

Blue Mountain standard speed test ran at 1.6 teraOps. (1998);

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, 1995 Nobel Prize in physics), 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).

- Recently:

Detection of single fluorescent molecules, first flow cytometer for sorting single biological cells, discovery of the human telomere, complete sequencing of chromosome 16, measurement of neutrino mass, computer modeling of global ocean temperatures. Detection of ionic pulsed-pairs of radio impulses by an instrument aboard a satellite, new milestones in high temperature superconductivity and materials processing, Advanced Recovery and Integrated Extraction System (ARIES) for Plutonium, characterization of the earth's changing magnetic field and the spin-rate of the earth's core, detection of lunar ice, and detection of evidence for a super-massive black hole.

Future Prospects

Los Alamos will continue its roles in science-based stockpile stewardship and in nonproliferation and counter-proliferation. The Laboratory has been designated as the preferred location to manufacture nuclear weapon pits on a small scale. High performance computing, with its associated capabilities, is expected to address additional complex civilian security problems.

ECONOMIC IMPACTS OF LANL ON NORTH-CENTRAL NEW MEXICO, FY 1998

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 1998 was over \$1.3 billion (Table 1). LANL regional (Los Alamos, Santa Fe, and Rio Arriba Counties) expenditures were \$773 million in FY 1998 for salaries and wages, trade and services, capital equipment, and construction. University of California operating budget accounted for about 91 percent of the total North-Central New Mexico budget; Johnson Controls funding accounted for 7

percent; and Protection Technology accounted for about 2 percent.

LANL Expenditure Patterns

Total LANL regional expenditures (the initial respending of the total operating and capital budget) amounted to about \$773 million or about 58 percent of the total budget in FY 1998 (Table 1). The eight economic sectors accounting for the majority of LANL regional expenditures for FY 1998 were: households (\$576 million), engineering services (\$42 million), retail trade (\$41 million), data processing and computer services (\$23 million), wholesale trade (\$23 million), other business services (\$15 million), management and consulting services (\$12 million), and construction (\$10 million). These sectors combined accounted for about 96 percent of total LANL regional expenditures (Table 1).

LANL expenditures by major sectors in North-Central New Mexico for FY 1998 were: personnel (including benefits) (\$576 million), services (\$100 million), trade (\$63 million), construction (\$10 million), government (\$9 million) manufacturing (\$8 million), and other sectors (\$6 million) (Table 2). By far the largest LANL expenditure in North-Central New Mexico was labor, 75 percent of the total regional expenditures. In FY 1998, 13 percent of the LANL expenditures went for services, 8 percent for trade, and one percent each for other sectors, government, construction and manufacturing (Figure 2).

Employment

LANL is managed and operated by the University of California with approximately 7,923 employees in the three-county region in FY 1998 (Table 3). Johnson Controls had 1,381 full-time employees in FY 1998 and Protection Technology had 453 employees. The total number of jobs (all types of personnel) regionwide directly associated with LANL averaged 9,757 for FY 1998. Sub-contractors averaged 1,834 employees.

Measuring the LANL Economic Impact on North-Central New Mexico

The analysis of the LANL's economic impact on North-Central New Mexico employed an economic model that incorporates buying and selling linkages among regional industries. This

Table 1. LANL Expenditures (in dollars) in North-Central NM by Sector and Operating Budget, FY 1998.

Sector	University of California (a)	Johnson Controls, Inc.	Protection Technology Los Alamos (b)	Total
1. Livestock & Livestock Products				0
2. Other Agricultural Products				0
3. Forestry & Fishery Products				0
4. Agriculture, Forestry & Fishery Services	6,843			6,843
5. Mining, Crude Petroleum & Natural Gas	11,909			11,909
6. Construction	10,234,104			10,234,104
7. Ordnance & Chemical Manufacturing	274,075			274,075
8. Food & Kindred Products Manufacturing				0
9. Textiles Products & Apparel Manufacturing	31,937			31,937
10. Lumber & Wood Products Manufacturing	21,005			21,005
11. Paper & Publishing Manufacturing	19,614			19,614
12. Petroleum Refining & Products Manufacturing				0
13. Glass, Stone & Clay Products Manufacturing	35,187			35,187
14. Primary & Fabricated Metals Manufacturing	3,347,190			3,347,190
15. Computer, Office & Service Equipment Manufacturing	1,833,054			1,833,054
16. Electrical Equipment Manufacturing	2,276,724			2,276,724
17. Scientific Instruments Manufacturing				0
18. All Other Manufacturing				0
19. Motor Freight Transportation & Warehousing	815			815
20. All Other Transportation	23,923			23,923
21. Communication	40,104	810,692		850,796
22. Electric & Gas Utilities	17,000	2,802,953		2,819,953
23. Water & Other Utilities		19,759		19,759
24. Wholesale Trade	22,552,838			22,552,838
25. Retail Trade	40,927,388			40,927,388
26. Finance, Insurance & Real Estate	1,374,736	439,951		1,814,687
27. Hotel Restaurant & Other Personal Services	734,732	80,545		815,277
28. Data Processing & Computer Services	22,973,477	239,318		23,212,795
29. Management & Consulting Services	12,168,603			12,168,603
30. Engineering, Architecture & Surveying Services	42,265,195			42,265,195
31. Other Business Services	14,631,908			14,631,908
32. Automobile & Other Repair Services	667,927	2,248,112		2,916,039
33. Amusement, Recreation & Video Services	64,500			64,500
34. Health, Education & Social Services	2,513,743	1,836,142		4,349,885
35. Government Services	8,143,709			8,143,709
36. Local Government		336,003		336,003
37. State Government		464,004		464,004
38. Los Alamos National Laboratory (c)				0
39. Households	490,566,508	63,467,504	22,042,451.00	576,076,463
Total Regional Expenditures	677,758,748	72,744,983	22,042,451	772,546,182
Total Operating and Capital Budget	1,206,486,093	90,353,696	30,609,219	1,327,449,008
Number of Employees	7,923	1,381	453	9,757

a. The LANL Total Operating and Capital Budget has been adjusted to account for contracts to Johnson Controls, Inc., Protection Technology - Los Alamos and other NM DOE management & operating contracts.

b. Expenditures by PT-LA with the exception salaries and wages are included in LANL's Total Operating and Capital Budget.

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

Table 2. LANL Expenditures in North-Central New Mexico by Major Sector, FY 1998.

Sector	thousands of dollars	Percent
I. Personnel		
A. Salaries & Wages	488,265	63.2
B. Benefits	87,811	11.4
Total	576,076	74.6
II. Construction	10,234	1.3
II. Manufacturing	7,839	1.0
IV. Trade	63,480	8.2
V. Services	100,424	13.0
II. Government		
A. Local Government	336	0.0
B. State Government	464	0.1
C. Government Services	8,144	1.1
Total	8,944	1.2
VII. Other Sectors		
A. Agriculture	7	0.0
B. Mining	12	0.0
C. T.C.U.(a)	3,715	0.5
D. F.I.R.E.(b)	1,815	0.2
Total	5,549	0.7
TOTAL EXPENDITURES	772,546	100.0

*Totals may not add due to rounding

a. Transportation, Communications, and Utilities

b. Finance, Insurance and Real Estate

analysis measures the impact generated by LANL and contractors expending money in the three North-Central counties (Los Alamos, Sante 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 first related to general economic activity, the second to 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 that it

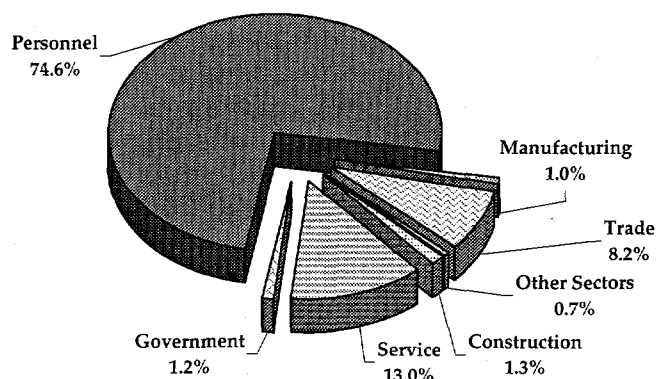
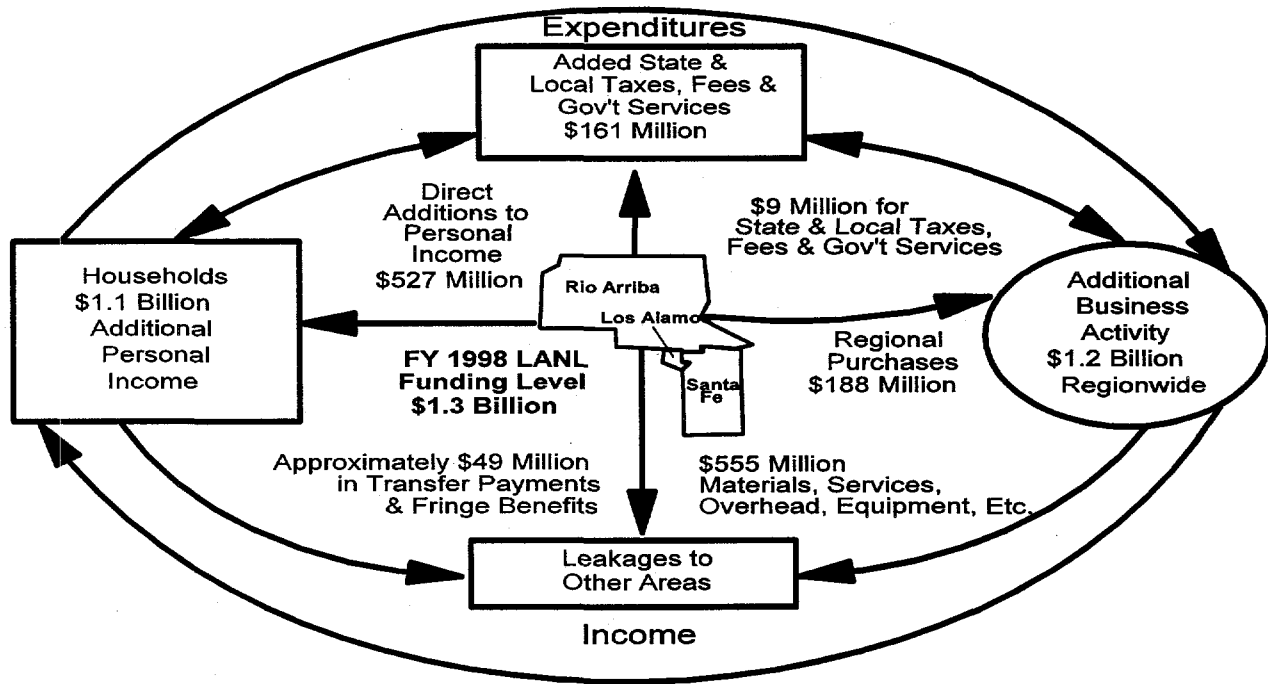


Figure 2. LANL Expenditures in North-Central New Mexico by Major Sector, FY 1998.

Table 3. LANL Funding, In-Region Expenditures, and Employment in New Mexico, FY 1998.

Entity	New Mexico Funding	Regional Expenditures	Regional Employment
	millions of dollars		number
University of California	1,206.5	677.8	7,923
Johnson Controls	90.4	72.7	1,381
PT-LA	30.6	22.0	453
Total	1,327.4	772.5	9,757

requires to conduct its activities, and the extent to which responding by businesses and industries occurs in the region. Income and employment



Total Regional Economic Impact - \$3.8 Billion

Figure 3. LANL Economic Impact on North-Central New Mexico, FY 1998.

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-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 (\$1.3 billion).

Households and businesses affected by LANL spend 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 (\$527 and \$188 million, respectively for FY 1998) in the three-county North-Central region (Figure 3). This initial spending will provide government with \$9 million in new revenues (mainly state and local government taxes, fees, and services). However, a large portion of the initial spending (\$555 million) and transfer payments, including fringe benefits costs to labor (\$49 million), flow out of state through leakages.

Respending by regional businesses and purchases by households and state and local government eventually brings the total private business impact to about \$1.2 billion. Also, respending activity will continue to add to personal income and government revenues so that total personal income will increase to \$1.1 billion, and state and local government tax revenues and government fees will expend \$161 million as a result of direct, indirect, and induced effects.

**Table 4. LANL Regional Influence on North-Central New Mexico's Economy,
FY 1998.**

Economic Measure	LANL	Total Region	LANL as % of Region
-billions of dollars-			
<u>Economic Activity</u>			
Direct Expenditures	1.33		
Indirect and Induced (a)	<u>2.50</u>		
Total Economic Activity	3.83	12.9	29.7
Economic Activity Multiplier	2.88		
<u>Personal Income</u>			
Gross Labor Costs	0.57		
Net Wage and Salaries	0.53		
Indirect and Induced (a)	<u>0.58</u>		
Total Personal Income	1.11	4.2 ^(a)	26.4
Personal Income Multiplier	2.10		
-- number of employees --			
<u>Employment</u>			
Direct	9,757		
Indirect and Induced (a)	<u>17,931</u>		
Total Employment	27,688	93,669 ^(b)	29.6
Employment Multiplier	2.84		

a. BEA May 1999

b. New Mexico Department of Labor, Table C, March 1999.

Overall Impact

Using LANL's funding for its total operating and capital budget of \$1.3 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 \$3.8 billion from the initial infusion of \$1.3 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 1998 was 2.88. This indicates that for every \$1 spent by LANL and its major on-site New Mexico contractors, another \$1.88 was generated in the region for a total impact of \$2.88 in FY 1998.

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 \$12.9 billion for 1998 (Table 4).

Applying the regional economic activity multiplier of 2.88 to the \$1.2 billion directly added to the regional economy results in the \$3.8 billion estimated total impact in FY 1998. This total impact of \$3.8 billion generated by LANL is about 30 percent of the estimated \$12.9 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 1998. The retail trade sector received the greater volume of indirect private and public economic impacts, about 20 percent of the total estimated indirect impacts. Other sectors with large indirect economic impacts include: finance, insurance and real estate (FIRE) (16 percent); hotel, restaurant, and other personal services (6 percent); state government (6 percent); health, education, and social services (5 percent); other business services (5 percent); electric and gas utilities (4 percent); and wholesale trade (4 percent).

Impact on Income

Personal income is money that goes to individuals that will be spent for purchases such as groceries, automobiles and gasoline, mortgage payments, medical, clothing and 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 1998, labor payments of \$576 million resulted in an estimated \$527 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 2.10 for FY 1998 (Table 4). This multiplier indicates that for every \$1 of personal income from LANL for labor, another \$1.10 is generated through indirect and induced effects, for a total impact on personal income of \$1.11 billion.

Applying the income multiplier of 2.10 to the direct net personal income figure of \$527 million yields a total impact of \$1.11 billion for income in the region resulting from LANL activity.

In FY 1998, total personal income in North-Central New Mexico was estimated at just over \$4.0 billion (Table 4). LANL activities in the North-Central New Mexico region accounted for about 26 percent of total regional personal income in 1998.

Impact on Employment

Beside this dollars-and-cents impact, LANL affects regionwide employment. In addition to the average of 9,757 jobs created by LANL in FY 1998, other jobs are supported by the resulting needs for goods and services, and responding 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 2.84 in FY 1998 (Table 4). This indicates that for every 100 jobs created by LANL, another 184 jobs were supported in the region during FY 1998. This translated into 27,688 jobs created or supported by LANL or about 30 percent of total employment in the region in FY 1998 (Table 4).

Table 11 in the Appendix gives the LANL indirect employment impact on private and public sectors for FY 1998. The more labor-intensive sectors received the greater indirect employment impact. The retail trade sector had the largest indirect impact of about 31 percent. Other sectors with a large indirect employment impact include: hotel, restaurant and other personal services (12 percent); FIRE (10 percent); health, education and social services (8 percent); state government (6 percent); wholesale trade (4 percent), and other business services (4 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 total funding for LANL in North-Central New Mexico was \$1.3 billion in FY 1998, yielding a total economic impact of about \$3.8 billion or about 30 percent of the total economic activity in the region. Total personal income impact was \$1.11 billion in FY 1998 or about 26 percent of personal income derived in the three counties. The employment multiplier was 2.84 for the region, meaning that the 9,757 average employment level of FY 1998 supported a total impact of 27,688. In effect, nearly one of every three jobs in the region was created or supported by LANL. Approximately 80 percent of the jobs created indirectly by LANL in the region occurred in the trade, FIRE and services sectors.

ECONOMIC IMPACTS OF LANL ON THE STATE OF NEW MEXICO, FY 1998

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 statewide total funding (operating and capital budget) for LANL for FY 1998 was over \$1.3 billion (Table 5). LANL's New Mexico expenditures were just under \$1.0 billion (\$962 million) in FY 1998 for salaries and wages, trade and services, capital equipment, and construction. The University of California budget accounted for 90 percent of the total New Mexico expenditures; Johnson Controls funding accounted for 7 percent; and Protection Technology accounted for about 2 percent. The largest contractor supporting LANL in the state of New Mexico was Johnson Controls.

LANL Expenditure Patterns

Total LANL instate expenditures (the initial respending of the total operating and capital budget) amounted to about 72 percent of the total budget in FY 1998 (Table 5). Johnson Controls' total instate expenditures in New Mexico were \$90 million. In total, LANL instate expenditures were nearly \$1.0 billion in FY 1998 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 \$365 million. In addition, approximately \$53 million for transfer payments and some fringe benefit costs for instate labor costs leaked directly out of state.

The nine economic sectors accounting for the majority of LANL instate expenditures for FY 1998 were: households (\$628 million), retail trade (\$69 million), wholesale trade (\$59 million), engineering, architecture, and surveying (\$49 million), data processing and computer services (\$34 million), electric and gas utilities (\$24 million), other business services (\$22 million), construction (\$20 million), and management and consulting (\$14 million). These sectors combined accounted for over 95 percent of total instate LANL expenditures in FY 1998.

LANL expenditures by major sectors in New Mexico for FY 1998 were: personnel including benefits (\$628 million), services (\$130 million), trade (\$128 million), other sectors (\$29 million), construction (\$20 million), manufacturing (\$15 million) and government (\$11 million) (Table 6). By far the largest expenditure by LANL in the state of New Mexico was labor (\$628 million), which is over 65 percent of the statewide expenditures (Table 6), or 47 percent of the total operating and capital budget for FY 1998. Salaries and wages (without benefit costs) accounted for almost 53 percent of the total instate expenditures. In FY 1998, 13 percent of LANL expenditures went for services, 13 percent to trade, 3 percent to other sectors and utilities, 2 percent for construction, 2 percent for manufacturing, and 1 percent went to government (Figure 4).

Employment

LANL is managed and operated by the University of California, with approximately 8,931 full-time employees statewide in FY 1998. Johnson Controls had 1,381 full-time employees in FY 1998, and Protection Technology had 453 employees (Table 7). The total number of jobs (all types of personnel) statewide paid by the federal government or by contracts directly associated with LANL averaged 10,765 for FY 1998.

Table 5. LANL Expenditures (in dollars) in New Mexico by Sector and Operating Budget, Contractors, FY 1998.

Sector	University of California ^(a)	Johnson Controls, Inc.	Protection Technology Los Alamos ^(b)	Total
1. Livestock & Livestock Products				
2. Other Agricultural Products	80,000			80,000
3. Forestry & Fishery Products				
4. Agriculture, Forestry & Fishery Services	6,843			6,843
5. Mining, Crude Petroleum & Natural Gas	664,409			664,409
6. Construction	20,333,745			20,333,745
7. Ordnance & Chemical Manufacturing	339,500			339,500
8. Food & Kindred Products Manufacturing	169,442			169,442
9. Textiles Products & Apparel Manufacturing	49,868			49,868
10. Lumber & Wood Products Manufacturing	567,967			567,967
11. Paper & Publishing Manufacturing	91,248			91,248
12. Petroleum Refining & Products Manufacturing	310,206			310,206
13. Glass, Stone & Clay Products Manufacturing	54,747			54,747
14. Primary & Fabricated Metals Manufacturing	8,122,518			8,122,518
15. Computer, Office & Service Equipment Manufacturing	2,950,340			2,950,340
16. Electrical Equipment Manufacturing	2,541,132			2,541,132
17. Scientific Instruments Manufacturing	96,106			96,106
18. All Other Manufacturing	119,568			119,568
19. Motor Freight Transportation & Warehousing	815			815
20. All Other Transportation	65,860			65,860
21. Communication	1,911,885	810,692		2,722,577
22. Electric & Gas Utilities	21,233,460	2,802,953		24,036,413
23. Water & Other Utilities	9,525	19,759		29,284
24. Wholesale Trade	59,232,520			59,232,520
25. Retail Trade	68,813,746			68,813,746
26. Finance, Insurance & Real Estate	1,374,736	439,951		1,814,687
27. Hotel Restaurant & Other Personal Services	800,797	80,545		881,342
28. Data Processing & Computer Services	33,714,951	239,318		33,954,269
29. Management & Consulting Services	14,471,482			14,471,482
30. Engineering, Architecture & Surveying Services	48,732,854			48,732,854
31. Other Business Services	21,572,966			21,572,966
32. Automobile & Other Repair Services	1,414,145	2,248,112		3,662,257
33. Amusement, Recreation & Video Services	312,252			312,252
34. Health, Education & Social Services	4,757,588	1,836,142		6,593,730
35. Government Services	8,559,837			8,559,837
36. Local Government	387,159	336,003		723,162
37. State Government	903,371	464,004		1,367,375
38. Los Alamos National Laboratory ^(c)				
39. Households	542,695,238	63,467,504	22,042,451	628,205,193
Total New Mexico Expenditures	867,462,826	72,744,983	22,042,451	962,250,260
Total Operating and Capital Budget	1,206,486,093	90,353,696	30,609,219	1,327,449,008
Number of Employees	8,931	1,381	453	10,765

- a. The LANL Total Operating and Capital Budget has been adjusted to account for contracts to Johnson Controls, Inc., Protection Technology - Los Alamos and other NM DOE management & operating contracts.
- b. Expenditures by PT-LA with the exception salaries and wages are included in LANL's Total Operating and Capital Budget.
- c. Any transfer of money for services or products between specified activities is counted only in the activity of the last receiving agency.

Table 6. LANL Expenditures in New Mexico by Major Sector, FY 1998.

Sector	thousands of dollars	Percent
I. Personnel		
A. Salaries & Wages	508,969	52.9
B. Benefits	119,236	12.4
Total	628,205	65.3
II Construction	20,334	2.1
II Manufacturing	15,413	1.6
IV Trade	128,046	13.3
V. Services	130,181	13.3
VI. Government		
A. Local Government	723	0.1
B. State Government	1,367	0.1
C. Government Services	8,560	0.9
Total	10,650	1.1
VII. Other Sectors		
A. Agriculture	87	0.0
B. Mining	664	0.1
C. T.C.U.(a)	26,855	2.8
D. F.I.R.E.(b)	1,815	0.2
Total	29,421	3.1
TOTAL EXPENDITURES	962,250	100.0

*Totals may not add due to rounding

a. Transportation, Communication and Utilities

b. Finance, Insurance and Real Estate

Measuring LANL's Economic Impact on New Mexico

The analysis of LANL's 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 LANL 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 that it requires to conduct activities, and the extent to which responding by businesses and industries occurs in the state. Income and

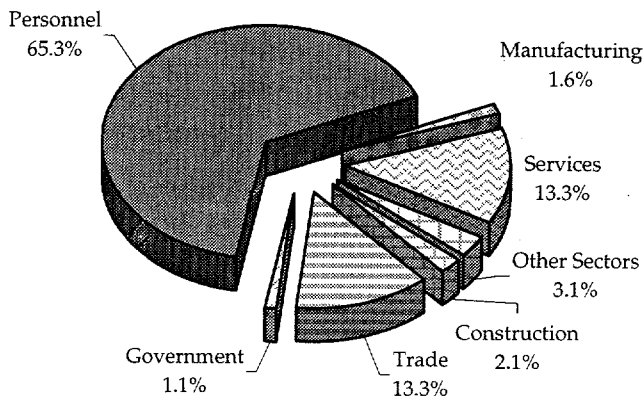


Figure 4. LANL Expenditures in New Mexico by Major Sector, FY 1998.

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.

Economic Impact of LANL

The flow diagram (Figure 5) charts the movement of monies spent by LANL. Expenditures for salaries and purchases go to households, statewide 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 (\$1.3 billion).

Households and businesses affected by LANL spend 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, \$575 and \$323 million, respectively for FY 1998 (Figure 5). This initial spending will give government \$11 million in new revenues (mainly state and local government taxes, fees, and services); however, a large portion of the initial spending (\$365 million, plus \$53 million in transfer payments and some fringe benefits costs) flows out of state through leakages.

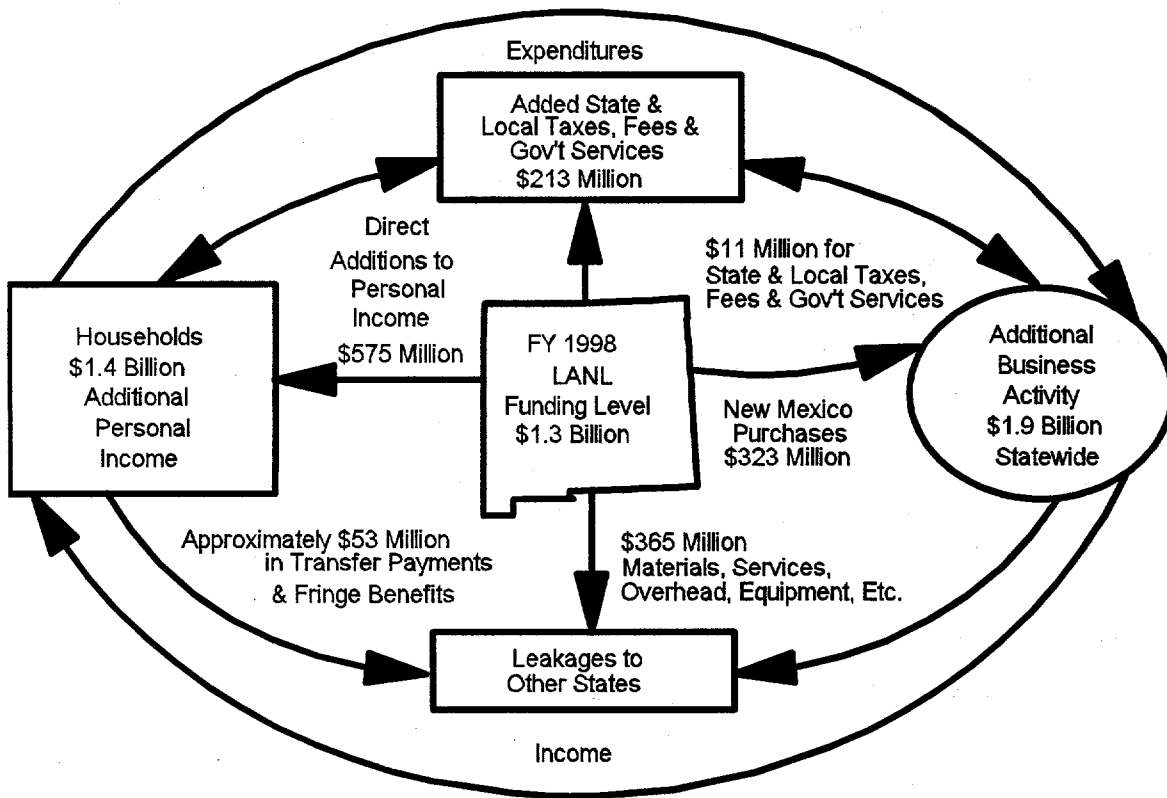
Table 7. LANL Funding, Instate Expenditures, and Employment in New Mexico, FY 1998.

Entity	New Mexico Funding	Instate Expenditures	New Mexico Employment
	-- millions of dollars --		jobs
University of California (LANL)	1,206.5	867.5	8,931
Johnson Controls (LANL)	90.4	72.7	1,381
PT-LA	30.6	22.0	453
Total	1,327.4	962.2	10,765

Respending by instate businesses and purchases by households and state and local governments eventually bring the total private business impact to \$1.9 billion. Also, respending activity will continue to add to personal income and government revenues so that the total personal income effect will increase to over \$1.4 billion, and state and local government tax revenues and government fees will expand to almost \$213 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 1998 estimate of \$96.5 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 statewide basis. LANL directly added more



Total Statewide Economic Impact - \$4.9 Billion

Figure 5. LANL Economic Impact on the State of New Mexico, FY 1998.

than \$1.3 billion to the total state economy in FY 1998. The estimated indirect (and induced) impact of more than \$3.5 billion brings the total impact to \$4.9 billion, about 5 percent of the estimated \$96.5 billion statewide total activity in 1998.

The estimated \$4.9 billion total economic impact in New Mexico from the initial infusion of \$1.3 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 1998 was 3.66. This indicates that for every \$1 spent by LANL or its major on-site contractors, another \$2.66 was generated, for a total impact of \$3.66 in FY 1998. 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 1998. The retail trade sector received the greatest volume of indirect economic impacts, about 17 percent of the total estimated public and private sector volume of indirect impacts. Other sectors with large indirect impacts were FIRE (14 percent), hotel, restaurant and other personal services, wholesale trade, other business services, electric and gas utilities, and health, education and social services (all about 5 percent each).

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, clothing and 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.

Table 8. LANL State Influence on New Mexico's Economy, FY 1998.

Economic Measure	LANL	Total State	LANL as % of State
----billions of dollars----			
<u>Economic Activity</u>			
Director Expenditures	1.33		
Indirect and Induced (a)	<u>3.54</u>		
Total Economic Activity	4.86	96.5	5.0
Economic Activity Multiplier	3.66		
<u>Personal Income</u>			
Gross Labor Costs	0.63		
Net Wage and Salaries	0.57		
Indirect and Induced (a)	<u>0.83</u>		
Total Personal Income	1.40	34.8 ^(a)	4.0
Personal Income Multiplier	2.44		
- - number of employees- -			
<u>Employment</u>			
Direct	10,765		
Indirect and Induced (a)	<u>25,629</u>		
Total Employment	36,394	831,052 ^(b)	4.4
Employment Multiplier	3.38		

a. BEA May 1999

b. New Mexico Department of Labor, Table C, March 1999.

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 1998, labor payments of \$628 million resulted in an estimated \$575 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 2.44 for FY 1998 (Table 8).

Application of the income multiplier of 2.44 to the direct net personal income figure of \$575 million yields a total impact of slightly over \$1.4 billion for income resulting from LANL activity. This multiplier indicates that for every \$1 of personal income from LANL for labor, another \$1.44 is generated through indirect and induced effects.

In FY 1998, total personal income in New Mexico was estimated at \$34.8 billion (Table 8). LANL activities in New Mexico accounted for about 4 percent of total personal income in 1998.

Impact on Employment

Beside this dollars-and-cents impact, LANL affects statewide employment. In addition to the average of 10,765 mainly full-time jobs created by LANL in FY 1998, other jobs are supported by needs for goods and services and responding 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 demands 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 3.38 in FY 1998 (Table 8). This indicates that for every 100 jobs created by LANL, another 238 jobs were supported in FY 1998. Considering the multiplier effect, 10,765 jobs translates into a total impact of 36,394 jobs created or supported by LANL or over 4 percent of total employment in the state in FY 1998 (see Table 8).

Table 12 in the Appendix gives LANL indirect employment impact on the private and public sectors for FY 1998. 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: hotel, restaurant, and personal services (11 percent); FIRE (9 percent); health education and social services (7 percent); wholesale trade (6 percent); and other business services (4 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, slightly over \$1.3 billion in FY 1998, supported a total economic impact of \$4.9

billion or about 5 percent of total economic activity in the state.

Total personal income impacts were over \$1.4 billion in FY 1998 or about 4 percent of personal income derived in New Mexico. The employment multiplier was 3.38 for the state, meaning that the 10,765 average employment level in FY 1998 supported a total impact of 36,394. In effect, about one of every 23 jobs in the state was created or supported by LANL. Approximately 76 percent of the jobs created indirectly by LANL in the region occurred in the trade, FIRE, and services sectors.

REFERENCES

- Adcock, Larry. "Effective Tax Rates for New Mexico, 1986." Los Alamos National Laboratory. Unpublished manuscript, Los Alamos, New Mexico.
- Adcock, L.D., T.M. Cohen, R.R. Lansford, D.J. Post, and S.L. Runyon, 1992. "The Social and Economic Impacts of the Department of Energy on the State of New Mexico, FY 1991." U.S. DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.
- Adcock, L.D., and R.R. Lansford, 1991. "The Social and Economic Impacts of the Department of Energy on the State of New Mexico, FY 1990." U.S. DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.
- Adcock, L.D., and R.R. Lansford, 1990. "The Social and Economic Impacts of the Department of Energy on the State of New Mexico, FY 1989." U.S. DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.
- Adcock, L.D., R.R. Lansford, and A. Turpin, 1989. "The Social and Economic Impact of the Department of Energy on the State of New Mexico, FY 1988." U.S. DOE Albuquerque, Albuquerque Operations Office, Report No. APD-89-2, Albuquerque, New Mexico.
- Adcock, Larry and Larry Waldman, "A Non-Survey Technique for Constructing a Direct Requirements Regional Input-Output Table." Proceedings 1975 Conference of the Association for University and Business Research, Virginia, edited at Arizona State University, Tempe, Arizona.
- Carruthers, Garrey, K. Mitchell, and Thomas Williams, 1972. "An Inter-industry Model of the Economy of North-Central New Mexico," Agricultural Experiment Station Research Report 237, New Mexico State University, Las Cruces, New Mexico.
- Cohen, T.M., L.D. Adcock, and R.R. Lansford, 1992. "The Economic Impact of Los Alamos National Laboratory and Sandia National Laboratories on the State of New Mexico FY 1990." Agricultural Experiment Station, Technical Report 7, New Mexico State University, Las Cruces, New Mexico.
- Lansford, R.R., L.D. Adcock, S. Ben-David, L.M. Gentry, and J. Temple, 1999. "The Social and Economic Impacts of the Department of Energy on the State of New Mexico, FY 1998." U.S. DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.
- Lansford, R.R., L.D. Adcock, S. Ben-David L. M. Gentry, T.G. Nielsen, J. Schultz, and J. Temple, 1997. "The Social and Economic Impacts of the Department of Energy on the State of New Mexico, FY 1996." U.S. DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.
- Lansford, R.R., L.D. Adcock, S. Ben-David L. M. Gentry, T.G. Nielsen, J. Schultz, and J. Temple, 1997. "The Economic Impact of Los Alamos National Laboratory on North-Central New Mexico, FY 1996." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1997. "The Economic Impact of the Department of Energy on the State of New Mexico, FY 1996." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1997. "The Economic Impact of Los Alamos National Laboratory on North-Central New Mexico, FY 1996." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, NM.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1997. "The Economic Impact of Los Alamos National Laboratory on North-Central New Mexico, FY 1996." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.

- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1996. "The Economic Impact of the Department of Energy on the State of New Mexico, FY 1995." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1996. "The Economic Impact of Los Alamos National Laboratory on North-Central New Mexico, FY 1995." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1995. "The Economic Impact of the Department of Energy on the State of New Mexico, FY 1994." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1995. "The Economic Impact of Los Alamos National Laboratory on North-Central New Mexico, FY 1994." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1994. "The Economic Impact of the Department of Energy on the State of New Mexico, FY 1993." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.
- Lansford, R.R., L.D. Adcock, S. Ben-David, and S.L. Runyon, 1993. "The Economic Impact of the Department of Energy on the State of New Mexico FY 1992." U.S. DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico..
- Lansford, R.R., L.D. Adcock, L.M. Gentry and S. Ben-David, 1993. "The Economic Impact of Los Alamos National Laboratory on North-Central New Mexico, FY 1994." US DOE Albuquerque, Albuquerque Operations Office, Albuquerque, New Mexico.
- Lansford, R.R., J.A. Diemer, E.M. Jaramillo, A Turpin, D. Williams, V. Devers, and L. Adcock, 1988. "The Social and Economic Impact of the Department of Energy on the State of New Mexico, FY 1987," Special Report 79, Agricultural Experiment Station, New Mexico State University, Las Cruces, New Mexico.
- Morris, Donald, Larry Adcock, Steven Booth, 1986. "Los Alamos National Laboratory: A Regional Economic Impact Study," Los Alamos National Laboratory Report LA-UR-3206, Los Alamos, New Mexico.
- New Mexico Department of Labor, April 1989. "New Mexico Labor Market, Annual Planning Report," Bureau of Economic Research and Analysis, University of New Mexico, Albuquerque, New Mexico.
- New Mexico Department of Labor, January 1991. "Covered Employment and Wages," Quarterly Report, Quarter 1989 and First Quarter 1990; Economic Research and Analysis Bureau, Albuquerque, New Mexico.
- New Mexico Department of Labor, April 1993. "Table A," Economic Research and Analysis Bureau, Albuquerque, New Mexico.
- New Mexico Department of Labor. "Report of Employment, Wages, and Contributions (Es-202)," Economic Research and Analysis Bureau, Albuquerque, New Mexico; unpublished information.
- Runyon, Shannon L, 1993. Effective Tax Rates for New Mexico by Economic Sector, M.S. thesis, New Mexico State University, Las Cruces, New Mexico.
- Sunwest Financial Services, Inc., 1992, "New Mexico Progress, Economic Review of 1991," in draft; Sunwest Financial Services, Inc. P.O. Box 25500, Albuquerque, New Mexico.
- Turpin, Annette, Larry Adcock, and Donna Williams, 1987. "The Economic Impact of the United States Department of Energy on the State of New Mexico Fiscal Years 1985 and 1986," Los Alamos National Laboratory Miscellaneous Report, Los Alamos, New Mexico.
- U.S. Department of Commerce, April 1, 1997. "New Mexico Population by Race and Ethnicity 1997," Bureau of the Census, PL-94-171, Washington, D.C.

U.S. Department of Agriculture, 1997.
"Agricultural Statistics 1996," U.S.
Government Printing Office, Washington
D.C.

U.S. Department of Agriculture, 1998, "New
Mexico Agricultural Statistics, 1997," New
Mexico Agricultural Statistics Service, Las
Cruces, New Mexico.

U.S. Department of Agriculture, 1997, "New
Mexico Agricultural Statistics, 1996," New
Mexico Agricultural Statistics Service, Las
Cruces, New Mexico.

U.S. Department of Commerce, July 1991,
"Benchmark Input-Output Accounts for the
U.S. Economy, 1987," Survey of Current
Business, Washington, D.C.

U.S. Department of Commerce, 1986. "County
Business Patterns of 1984, New Mexico,"
Bureau of the Census,
CBP-84-33. Washington, D.C.

APPENDIX

Table 9. LANL Central New Mexico I/O Model Direct Coefficients, FY 1998

Sector	Direct Coefficients
1. Livestock & Livestock Products	0.000000
2. Other Agricultural Products	0.000000
3. Forestry & Fishery Products	0.000000
4. Agriculture, Forestry & Fishery Services	0.000005
5. Mining, Crude Petroleum & Natural Gas	0.000009
6. Construction	0.007710
7. Ordnance & Chemical Manufacturing	0.000206
8. Food & Kindred Products Manufacturing	0.000000
9. Textiles Products & Apparel Manufacturing	0.000024
10. Lumber & Wood Products Manufacturing	0.000016
11. Paper & Publishing Manufacturing	0.000015
12. Petroleum Refining & Products Manufacturing	0.000000
13. Glass, Stone & Clay Products Manufacturing	0.000027
14. Primary & Fabricated Metals Manufacturing	0.002522
15. Computer, Office & Service Equipment Manufacturing	0.001381
16. Electrical Equipment Manufacturing	0.001715
17. Scientific Instruments Manufacturing	0.000000
18. All Other Manufacturing	0.000000
19. Motor Freight Transportation & Warehousing	0.000001
20. All Other Transportation	0.000018
21. Communication	0.000641
22. Electric & Gas Utilities	0.002124
23. Water & Other Utilities	0.000015
24. Wholesale Trade	0.016990
25. Retail Trade	0.030832
26. Finance, Insurance & Real Estate	0.001367
27. Hotel Restaurant & Other Personal Services	0.000614
28. Data Processing & Computer Services	0.017487
29. Management & Consulting Services	0.009167
30. Engineering, Architecture & Surveying Services	0.031839
31. Other Business Services	0.011023
32. Automobile & Other Repair Services	0.002197
33. Amusement, Recreation & Video Services	0.000049
34. Health, Education & Social Services	0.003277
35. Government Services	0.006135
36. Local Government	0.000253
37. State Government	0.000350
38. Los Alamos National Laboratory	0.000000
39. Households	0.433973
Total New Mexico Expenditures	0.581978
Total Operating and Capital Budget	1.000000

Table 10. LANL Statewide I/O Model Direct Coefficients, FY 1998

Sector	Direct Coefficients
1. Livestock & Livestock Products	0.000000
2. Other Agricultural Products	0.000000
3. Forestry & Fishery Products	0.000060
4. Agriculture, Forestry & Fishery Services	0.000000
5. Mining, Crude Petroleum & Natural Gas	0.000005
6. Construction	0.000501
7. Ordnance & Chemical Manufacturing	0.015318
8. Food & Kindred Products Manufacturing	0.000256
9. Textiles Products & Apparel Manufacturing	0.000128
10. Lumber & Wood Products Manufacturing	0.000038
11. Paper & Publishing Manufacturing	0.000428
12. Petroleum Refining & Products Manufacturing	0.000069
13. Glass, Stone & Clay Products Manufacturing	0.000234
14. Primary & Fabricated Metals Manufacturing	0.000041
15. Computer, Office & Service Equipment Manufacturing	0.006119
16. Electrical Equipment Manufacturing	0.002223
17. Scientific Instruments Manufacturing	0.001914
18. All Other Manufacturing	0.000072
19. Motor Freight Transportation & Warehousing	0.000090
20. All Other Transportation	0.000001
21. Communication	0.000050
22. Electric & Gas Utilities	0.002051
23. Water & Other Utilities	0.018107
24. Wholesale Trade	0.000022
25. Retail Trade	0.044621
26. Finance, Insurance & Real Estate	0.051839
27. Hotel Restaurant & Other Personal Services	0.001367
28. Data Processing & Computer Services	0.000664
29. Management & Consulting Services	0.025579
30. Engineering, Architecture & Surveying Services	0.010902
31. Other Business Services	0.036712
32. Automobile & Other Repair Services	0.016251
33. Amusement, Recreation & Video Services	0.002759
34. Health, Education & Social Services	0.000235
35. Government Services	0.004967
36. Local Government	0.000545
37. State Government	0.001030
38. Los Alamos National Laboratory	0.000000
39. Households	0.473242
Total New Mexico Expenditures	0.724887
Total Operating and Capital Budget	1.000000

Table 11. Indirect Volume and Employment Impacts by Sector, LANL, North-Central New Mexico, FY 1998

Sector	Volume		Employment	
	(\$000)	%	Jobs	%
1. Livestock and Livestock Products	4111.	0.3	11.	0.1
2. Other Agricultural Products	7177.	0.5	40.	0.2
3. Forestry and Fishery Products	385.	0.0	2.	0.0
4. Agricultural, Forestry, and Fishery Services	1725.	0.1	36.	0.2
5. Mining, Crude Petroleum, and Natural Gas	2866.	0.2	10.	0.1
6. Construction	52445.	3.8	591.	3.3
7. Ordnance and Chemical Manufacturing	520.	0.0	3.	0.0
8. Food and Kindred Products Manufacturing	25969.	1.9	131.	0.7
9. Textile Products and Apparel Manufacturing	5665.	0.4	61.	0.3
10. Lumber and Wood Products Manufacturing	1501.	0.1	16.	0.1
11. Paper and Publishing Manufacturing	6130.	0.4	70.	0.4
12. Petroleum Refining and Products Manufacturing	18986.	1.4	13.	0.1
13. Glass, Stone and Clay Products Manufacturing	2014.	0.1	20.	0.1
14. Primary and Fabricated Metals Manufacturing	5180.	0.4	45.	0.3
15. Computer, Office and Service Equipment Mfg.	12592.	0.9	74.	0.4
16. Electrical Equipment Manufacturing	3737.	0.3	19.	0.1
17. Scientific Instruments Manufacturing	809.	0.1	5.	0.0
18. All Other Manufacturing	2669.	0.2	28.	0.2
19. Motor Freight Transportation and Warehousing	5113.	0.4	70.	0.4
20. All Other Transportation	10013.	0.7	121.	0.7
21. Communication	30403.	2.2	259.	1.4
22. Electric and Gas Utilities	50737.	3.6	72.	0.4
23. Water and Other Utilities	8275.	0.6	38.	0.2
24. Wholesale Trade	59483.	4.3	688.	3.8
25. Retail Trade	275831.	19.8	5603.	31.2
26. Finance, Insurance and Real Estate	224557.	16.1	1735.	9.7
27. Hotel Restaurant and Other Personal Services	77813.	5.6	2216.	12.4
28. Data Processing and Computer Services	35966.	2.6	322.	1.8
29. Management and Consulting Services	26984.	1.9	167.	0.9
30. Engineering, Architecture and Surveying Services	51985.	3.7	428.	2.4
31. Other Business Services	70242.	5.0	691.	3.9
32. Automobile and Other Repair Services	50372.	3.6	466.	2.6
33. Amusement, Recreation and Video Services	27660.	2.0	577.	3.2
34. Health, Education and Social Services	74836.	5.4	1385.	7.7
TOTAL Private Sector	1234748.	88.5	16011.	89.3
35. Government Services	24996.	1.8	270.	1.5
36. Local Government	49973.	3.6	658.	3.7
37. State Government	85733.	6.1	992.	5.5
TOTAL Public Sector	160701.	11.5	1920.	10.7
TOTAL Private and Public Sectors	1395450.	100.0	17931.	100.0

Totals may not add due to rounding

Table 12. Indirect Volume and Employment Impacts by Sector, LANL, State Of New Mexico, FY 1998

Sector	Volume		Employment	
	(\$000)	%	Jobs	%
1. Livestock and Livestock Products	9048.	0.4	24.	0.1
2. Other Agricultural Products	10536.	0.5	59.	0.2
3. Forestry and Fishery Products	500.	0.0	2.	0.0
4. Agricultural, Forestry, and Fishery Services	2033.	0.1	42.	0.2
5. Mining, Crude Petroleum, and Natural Gas	55222.	2.6	188.	0.7
6. Construction	78892.	3.7	890.	3.5
7. Ordnance and Chemical Manufacturing	3386.	0.2	20.	0.1
8. Food and Kindred Products Manufacturing	39059.	1.8	197.	0.8
9. Textile Products and Apparel Manufacturing	7187.	0.3	77.	0.3
10. Lumber and Wood Products Manufacturing	3416.	0.2	36.	0.1
11. Paper and Publishing Manufacturing	10742.	0.5	122.	0.5
12. Petroleum Refining and Products Manufacturing	41482.	1.9	28.	0.1
13. Glass, Stone and Clay Products Manufacturing	5529.	0.3	54.	0.2
14. Primary and Fabricated Metals Manufacturing	15699.	0.7	137.	0.5
15. Computer, Office and Service Equipment Mfg.	44897.	2.1	264.	1.0
16. Electrical Equipment Manufacturing	21172.	1.0	108.	0.4
17. Scientific Instruments Manufacturing	1977.	0.1	12.	0.0
18. All Other Manufacturing	7140.	0.3	76.	0.3
19. Motor Freight Transportation and Warehousing	16298.	0.8	222.	0.9
20. All Other Transportation	24797.	1.2	299.	1.2
21. Communication	49631.	2.3	423.	1.7
22. Electric and Gas Utilities	104682.	4.9	149.	0.6
23. Water and Other Utilities	11212.	0.5	52.	0.2
24. Wholesale Trade	128043.	6.0	1480.	5.8
25. Retail Trade	367322.	17.2	7462.	29.1
26. Finance, Insurance and Real Estate	294312.	13.8	2273.	8.9
27. Hotel Restaurant and Other Personal Services	99692.	4.7	2839.	11.1
28. Data Processing and Computer Services	53689.	2.5	481.	1.9
29. Management and Consulting Services	34628.	1.6	214.	0.8
30. Engineering, Architecture and Surveying Services	62909.	2.9	518.	2.0
31. Other Business Services	108293.	5.1	1065.	4.2
32. Automobile and Other Repair Services	73982.	3.5	685.	2.7
33. Amusement, Recreation and Video Services	38822.	1.8	810.	3.2
34. Health, Education and Social Services	95978.	4.5	1776.	6.9
TOTAL Private Sector	1922205.	90.0	23082.	90.1
35. Government Services	29949.	1.4	323.	1.3
36. Local Government	65418.	3.1	862.	3.4
37. State Government	117733.	5.5	1362.	5.3
TOTAL Public Sector	213100.	10.0	2547.	9.9
TOTAL Private and Public Sectors	2135305.	100.0	25629.	100.0

Totals may not add due to rounding