Appendix V

Economic Impact Analysis Methodology

APPENDIX V
ECONOMIC IMPACT ANALYSIS METHODOLOGY

INTRODUCTION

This appendix describes the methods and data that underlie the economic impact modeling analysis. Input-output models such as the Impact Analysis for Planning (IMPLAN) model, an economic impact analysis model, provide a quantitative representation of the production relationships between individual economic sectors. Thus, the economic modeling analysis uses information about physical production quantities and the prices and costs for goods and services. The inputs required to run the IMPLAN model are described in the following narrative and tables. The resulting estimates from the IMPLAN model, by alternative, are in **Chapter 4**, Environmental Consequences, **Section 4.19**, Socioeconomics and Environmental Justice. The first portion of the following information describes general aspects of the IMPLAN model and how it was used to estimate economic impacts. The remaining sections provide additional detailed data used in the analysis for livestock grazing, recreation, and oil and gas.

THE IMPLAN MODEL

IMPLAN is a regional economic model that provides a mathematical accounting of the flow of money, goods, and services through a region's economy. The model provides estimates of how a specific economic activity translates into jobs and income for the region. It includes the ripple effect (also called the multiplier effect) of changes in economic sectors that may not be directly impacted by management actions, but are linked to industries that are directly impacted. In IMPLAN, these ripple effects are termed indirect impacts (for changes in industries that sell inputs to the industries that are directly impacted) and induced impacts (for changes in household spending as household income increases or decreases due to the changes in production).

This analysis used IMPLAN 2011; prior to running the model, cost and price data were converted to a consistent dollar year (2010) using sector-specific

adjustment factors from the IMPLAN model. The values in this appendix are expressed in year 2010 dollars.

The current IMPLAN model has 440 economic sectors, of which 309 are represented in the socioeconomic study area counties. This analysis involved direct changes in economic activity for 27 IMPLAN economic sectors, as well as changes in all other related sectors due to the ripple effect. The IMPLAN production coefficients were modified to reflect the interaction of producing sectors in the socioeconomic study area. As a result, the calibrated model does a better job of generating multipliers and the subsequent impacts that reflect the interaction between and among the sectors in the socioeconomic study area compared to a model using unadjusted national coefficients. Key variables used in the IMPLAN model were filled in using data specific to the socioeconomic study area, including employment estimates, labor earnings, and total industry output.

The trade data available in the current version of IMPLAN (Version 3.0) make it possible to do multi-region analysis to track how an impact on any of the IMPLAN sectors in the study area affects production in any of the sectors in any other region of the US. For this analysis, this feature allowed the estimation of how an impact in the primary study area disperses into the secondary study area, and how these effects in the secondary study area create additional local effects in the primary study area. As a result, it was possible to estimate not only the jobs and income generation in the primary study area, but to also estimate how the economic activity in the primary study area affected jobs and income generation in the secondary study area.

LIVESTOCK GRAZING

Economic impacts from changes to livestock grazing are a function of the amount of forage available and the economic value of forage.

Forage availability was measured in Animal Unit Months (AUMs), with one AUM defined as the amount of forage needed to feed one cow, one horse, or five sheep for one month. Data on forage availability were obtained from BLM's Rangeland Administration System (BLM 2012) and from the Forest Service's INFRA range module (Forest Service 2013). Two types of AUM measures were used: Active AUMs and Billed AUMs. Active AUMs measure the amount of forage from land available for grazing. The Forest Service designates this measure "permitted" AUMs. Billed AUMs measure the amount of forage for which the BLM and Forest Service bill annually (i.e., the amount of forage that ranchers actually use, which is typically less than the amount of forage available). The Forest Service uses the designation "authorized" AUMs. Billed AUMs may be less than active AUMs for various reasons. BLM may require non-use of a portion of the active AUMs granted for conservation and protection of habitat or for improvement of land health conditions. On the other hand, the permittee may choose to reduce the amount of AUMs after land treatments or fire

rehabilitation projects or for business reasons[1] (BLM 2014a; 2014b). .Data for 2011 were used for active AUMs, except for active AUMs on the Humboldt-Toiyabe National Forest, for which 2012 data were used. Data for 2000 to 2011 were used to develop a 12-year average for billed AUMs. Data capture AUMs for entire allotments when those allotments intersect with GRSG habitat.

Forage availability was estimated for all alternatives. Alternatives A, B, D, E, and the Proposed Plan used the current data for active AUMs in GRSG habitat. Alternative C discounted the current data to remove 100 percent of active AUMs in GRSG habitat. Alternative F discounted the current data to remove 62.5 percent of active AUMs in GRSG habitat.[2] The analysis estimated 2,250,950 active AUMs in GRSG habitat in the socioeconomic study area, including 278,253 in the Humboldt-Toiyabe National Forest, 181,471 in the California BLM planning area, and 1,791,226 in the Nevada BLM planning area. This information was used to calculate the total active AUMs that would be available for grazing under each alternative in GRSG habitat. The results of these calculations are presented in **Table V-1**, below.

Table V-1
Estimated Active Annual Animal Unit Months in GRSG habitat by Alternative for the Study Area

Agency	Initial	Alternatives A, B, D, E, and Proposed Plan	Alternative C	Alternative F
		Active		
Forest Service	278,253	278,253	0	104,345
California BLM	181,471	181,471	0	68,052
Nevada BLM	1,791,226	1,791,226	0	671,710
Socioeconomic Study Area	2,250,950	2,250,950	0	844,106

Sources: Calculated based on **Appendix S**, Livestock Grazing.

Table V-2 shows AUM reductions, calculated as the difference between the initial billed AUMs and reduced billed AUMs under each alternative, for two scenarios, a high impact scenario and a low impact scenario. AUMs are distinguished between those allocated to sheep, and those allocated to cattle and other animals, to allow different valuation of forage, as explained further below.

[1] Livestock operators often value the amount of AUMs permitted by BLM, whether they intend to bill the total amount active or not. This results from the view that the AUMs permitted add value to their operations (e.g., when applying for credit with banks).

[2] Under Alternative F, 25 percent of the area in GRSG habitat must be rested each year. Of the remaining 75 percent, 50 percent must be set aside. Thus, the total area available for forage in GRSG habitat is reduced by 62.5 percent.

Table V-2
Estimated Reduction in Annual Animal Unit Months by Alternative and Livestock Type

Agency	High Impact Scenario			Low Impact Scenario		
	Alternatives A, B, D, E, Proposed Plan	Alternative C	Alternative F	Alternatives A, B, D, E, Proposed Plan	Alternative C	Alternative F
Total						
Forest Service	0	-467,786	-280,203	0	-236,414	-132,069
California BLM	0	-241,710	-144,319	0	-113,321	-45,269
Nevada BLM	0	-2,201,200	-1,315,428	0	-1,053,720	-382,010
Socioeconomic Study Area	0	-2,910,696	-1,739,950	0	-1,403,455	-559,349
Cattle and Other						
Forest Service	0	-427,517	-255,035	0	-196,146	-109,574
California BLM	0	-237,231	-141,520	0	-108,842	-43,480
Nevada BLM	0	-2,120,257	-1,264,839	0	-972,777	-352,666
Socioeconomic Study Area	0	-2,785,006	-1,661,394	0	-1,277,765	-505,719
Sheep						
Forest Service	0	-40,269	-25,168	0	-40,269	-22,495
California BLM	0	-4,479	-2,799	0	-4,479	-1,789
Nevada BLM	0	-80,943	-50,589	0	-80,943	-29,345
Socioeconomic Study Area	0	-125,690	-78,556	0	-125,690	-53,629

Sources: Calculated based on data from **Appendix S**, Livestock Grazing.

For the low impact scenario, the analysis assumed that ranchers would continue to use as many of the initial billed AUMs as possible. If active AUMs were not reduced beyond the initial amount of billed AUMs, ranchers would continue to use the initial billed AUMs, resulting in no impact. If active AUMs were reduced beyond the initial amount of billed AUMs, ranchers would use all of the reduced active AUMs. Thus, when the number of reduced active AUMs was less than number of the initial billed AUMs, the analysis used the number of reduced active AUMs as the number of reduced billed AUMs under each alternative. Otherwise, the analysis assumed no change in the number of billed AUMs.

For the high impact scenario, the analysis assumed that ranchers would choose to maintain a constant ratio of active to billed AUMs so any reduction to active AUMs would result in a proportional reduction to billed AUMs. Thus, the analysis applied the current ratio of active to billed AUMs to the calculated number of reduced active AUMS under each alternative to calculate the corresponding number of reduced billed AUMs under each alternative.

In addition, the high impact scenario considered the possibility that the loss of AUMs on public lands could lead to the loss of AUMs on state and private lands as well. This would be the case if livestock operations have no reasonable alternative to seasonal grazing on public lands. Livestock grazing on federal lands is often done during the spring and summer seasons, with other feeding alternatives (hay) being used during fall and winter. If there are no grazing alternatives to federal lands during spring and summer, farmers may need to reduce their operations and the resulting loss of output, jobs, and earnings would be larger than currently estimated. Torell et al. (2014) provides estimates of the potential impacts to a model ranch in Nevada of seasonal closures of federal lands for cattle grazing. These estimates show the total number of AUMs lost for each AUM lost on BLM lands under various scenarios. These scenarios range from a 25 percent reduction in BLM AUMs to a complete elimination of AUMs on BLM lands with the livestock operation going out of business. The estimates are based on an economic model that assumes farmers respond to the loss of availability of federal lands for grazing in several ways to maximize their profits (gross margins), including reducing the size of their operations. Based on the Torell et al. (2014) estimates, BLM and Forest Service assumed that for each BLM AUM lost under Alternative C, an additional 1.18 AUMs would be lost for a total of 2.18 AUMs lost (mid-point between the scenarios of 100 percent loss of BLM AUMs with and without closure of operations). Under Alternative F, 1.08 additional AUMs would be lost for each reduction of BLM AUMs (mid-point of scenarios of loss of 50 percent of AUMs on BLM lands and scenario of loss of 75 percent of AUMs on BLM lands). These AUM adjustment factors are based on a model Nevada ranch that relies on a total of approximately 8,200 AUMs, of which 3,700 AUMs (30%) are linked to federal land. These estimates were applied only to cattle AUMs, because no similar estimate was available for sheep.

The economic value of forage is estimated based on the value of production associated with the forage. Values for cattle and sheep are estimated separately, with the value of forage for other animals considered equivalent to the value for cattle. Due to price fluctuations, average per-AUM values for cattle and sheep are based on the 2002 to 2011 average value of production estimates from the US Department of Agriculture, Economic Research Service (2012). The value for cattle is $50.37 per AUM, and the value for sheep is $57.20 per AUM in the socioeconomic study area (in 2010 dollars). Including indirect and induced impacts, the value of one AUM in the socioeconomic study area for cattle is $101.14 and for sheep is $124.91 (in 2010 dollars). **Table V-3**, shows the economic impact assumptions for cattle and sheep. The direct economic impact is the estimated change in livestock output per AUM; IMPLAN generates the indirect and induced impacts.

Table V-3
Assumptions for Analysis of Impacts on Output for Livestock Grazing

Economic Impact	Cattle	Sheep
Direct Economic Impact ($/AUM)	$50.37	$57.20
Indirect Economic Impact ($/AUM)[1]	$42.50	$56.27
Induced Economic Impact ($/AUM)[2]	$8.26	$11.45
Total Economic Impact ($/AUM)	$101.14	$124.91
Multiplier (Total Impact/Direct Impact)	2.01	2.18

Note: All dollar values are in 2010 dollars.
[1]Indirect impacts reflect increased demand in sectors that directly or indirectly provide supplies to the livestock industry.
[2]Induced impacts reflect increased demand in the consumer and government sectors.

Table V-4, provides a summary of the employment impacts that would result, according to IMPLAN, based on unit changes in livestock AUMs.

Table V-4
Assumptions for Analysis of Employment Impacts for Livestock Grazing

Employment Impact	Cattle	Sheep
Direct Employment (Jobs/ AUM	0.000559	0.000980
Indirect Employment (Jobs/AUM)	0.000435	0.000708
Induced Employment (Jobs/AUM)	0.000072	0.000099
Total Employment (Jobs/AUM)	0.001065	0.001787
Multiplier (Total Impact/Direct Impact)	1.91	1.82
Average Earnings per Job (2010 dollars)	$35,239	$21,672

Note: Direct, indirect, and induced employment impacts and average earnings per job are calculated using IMPLAN.

Output, labor, and earning impacts summarized in **Table 4-24** in the economic impact section of the FEIS are presented as lower and upper bound impacts. Estimates of lower bound impacts are equal to the 'low impact scenario' reductions in AUMs in **Table V-2** multiplied by impact coefficients in **Tables V-3** and **V-4**; calculations are performed for cattle and sheep separately and then added together. Estimates of upperbound impacts are equal to 'high impact scenario' reductions in AUMs in **Table V-2**, and multiplied by coefficients in **Tables V-3** and **V-4** in a similar manner; however, 'high impact scenario' AUM reductions for cattle are multiplied by the Torell production adjustment factors (i.e., 2.18 for Alternative C and 2.08 for Alternative F) as described earlier (Torell adjustment factors are not available for sheep).

The IMPLAN sectors used to model an exogenous change in demand for livestock grazing were the following (IMPLAN sector numbers are shown in brackets): grain farming (2), all other crop farming (10), support activities for agriculture and forestry (19), residential structures maintenance and repairs (40), wholesale trade (319), truck transportation (335), banking (354), real

estate (360), accounting (368), veterinary services (379), equipment repair and maintenance (417), and labor income (NA). Cattle grazing used the following additional sector: cattle ranching and farming (11). Sheep grazing used the following additional sectors: animal production except cattle and poultry and eggs (14) and retail-food and beverages (324).

GEOTHERMAL EXPLORATION AND DEVELOPMENT

Economic impacts from geothermal exploration and development are a function of construction and operation expenditures for geothermal electricity development, including drilling wells (exploratory, production, and injection), constructing power plants, and operating facilities. In the Reasonably Foreseeable Development scenario for geothermal development, BLM developed a scenario to serve as a basis for analyzing impacts resulting from future leasing and development of federal geothermal resources within the decision area over the next 20 years.

To estimate economic activity associated with geothermal development, BLM first used the National Renewable Energy Laboratory's Jobs and Economic Development Impact (JEDI) model (NREL 2012) to determine approximate capital and operating costs associated with a representative power plant. The assumptions used a 28.8 MW nameplate capacity (based on current average plant capacity in the area) and typical conditions for the planning area: a resource at about 310 degrees Fahrenheit at a depth of 5,500 feet; binary cycle; and 1.13 production wells per injection well (BLM 2014e). BLM used standard assumptions from the National Renewable Energy Laboratory for the local share of construction and operating expenses that would be spent within the state of Nevada, as an approximation for the study area (local spending assumptions were available at the state level but not the county level). BLM then used IMPLAN, calibrated to the specific region of the socioeconomic study area, to calculate indirect and induced impacts associated with a given direct expenditure. **Table V-5** shows the resulting assumptions for construction and operation of an individual power plant.

Table V-6 provides a summary of employment impacts according to IMPLAN results, based on construction and operation of an individual power plant.

Output, labor, and earning impacts summarized in **Table 4-27** in the economic impact section of the FEIS are presented for construction and operations of geothermal power plants. Impacts during construction are equal to the average number of plants built per year multiplied by impact coefficients in **Tables V-5** and **V-6**. Estimates of impacts during operations assume only a share of the wells drilled produce and about half of the production wells are producing by year 10. Impacts are estimated by multiplying the number of plamts in operation by the coefficients in **Tables V-5** and **V-6**.

Table V-5
Assumptions for Analysis of Impacts on Output for Geothermal Exploration and Development

Economic Impact (millions of 2010 dollars)	Traditional Hydrothermal Plant
Construction	
Direct Economic Impact[1]	$78.8
Indirect Economic Impact[2]	$6.9
Induced Economic Impact[3]	$17.3
Total Economic Impact	$102.9
Multiplier (total impact/direct impact)	1.31
Operation	
Direct Economic Impact[1]	$1.7
Indirect Economic Impact[2]	$0.0
Induced Economic Impact[3]	$0.9
Total Economic Impact	$2.6
Multiplier (total impact/direct impact)	1.56

Notes: Details may not add to total due to rounding.
[1]Direct economic impact is the average expenditure per plant, assuming an average nameplate capacity of 28.8 MW.
[2]Indirect impacts from IMPLAN reflect increased demand in sectors that directly or indirectly provide support for the geothermal exploration and development industry.
[3]Induced impacts from IMPLAN reflect increased demand in the consumer and government sectors (e.g., employee wages).

Table V-6
Assumptions for Employment Impact Analysis for Geothermal Exploration and Development Activities

Employment Impact (number of jobs per plant)	Traditional Hydrothermal Plant
Construction	
Direct Employment	457.1
Indirect Employment	58.9
Induced Employment	144.1
Total Employment	660.1
Multiplier (Total Impact/Direct Impact)	1.44
Average Earnings per Job (2010 dollars)	$57,107
Operation	
Direct Employment	13.2
Indirect Employment	0.0
Induced Employment	7.8
Total Employment	21.0
Multiplier (Total Impact/Direct Impact)	1.59
Average Earnings per Job (2011 dollars)	$94,220

Note: Direct, indirect, and induced employment impact and average earnings per job are calculated using IMPLAN, as described in the text.

The IMPLAN sectors used to model an exogenous change in demand for geothermal development were the following (IMPLAN sector numbers are shown in brackets): drilling oil and gas wells (28), support activities for oil and gas operations (29), construction of new manufacturing structures (35), nonresidential maintenance and repair (39), wholesale trade (319), retail – food and beverages (324), truck transportation (335), commercial and industrial equipment leasing (365), architectural and engineering services (369), environmental and consulting services (375), miscellaneous professional/scientific/technical services (380), and labor income change (NA).

OIL AND GAS

The economic impact of oil and gas reflects drilling, completion, and production activities. The number of wells expected to be developed, and how BLM developed its assumptions, is discussed in **Chapter 4**, Environmental Consequences, **Section 4.12**, Minerals – Fluid. BLM assumed a completion rate ranging from 10 percent to 75 percent, as well as production per well completed of 1,000,000 barrels over the lifetime of the well. **Table V-7** provides the resulting estimated numbers of wells and production that were used for the economic analysis.

Table V-7
Oil and Gas Wells and Production

	Oil Wells Expected to be Drilled			Oil Wells Expected to be Producing		
Alternative	Existing Leases	New Leases	Total	Existing Leases	New Leases	Total
A	75	25	100	36	5	41
B	52	20	72	24	4	28
C	30	18	48	13	3	16
D	35	19	54	15	4	19
E	64	21	85	30	4	34
F	30	18	48	13	3	16
Proposed Plan	59	19	78	12	4	16

Source: BLM (2014d). The BLM's analysis also indicates that there would be some gas production, which would be used on location or vented to the atmosphere (BLM 2014d). Because the gas may simply be vented without being used productively, the economic analysis does not factor in the potential to sell it.

The costs of drilling and completing wells and producing oil and gas also are relevant for the economic impact analysis. Starting with the estimate of $3.25 million for drilling and completion of one well (BLM 2014d), the estimate was adjusted from 2012 to 2010 dollars using price indices from IMPLAN, then the percentage of local spending and breakouts into drilling and completion costs were estimated based on IMPLAN factors and costs for wells in other parts of the Great Basin. The price for oil from Utah was used since the Energy

Information Administration does not provide a price for Nevada; the price and cost per barrel of oil were based on EIA 2010 and 2013. IMPLAN was then used to generate output, employment, and earnings multipliers per unit. Impacts were estimated by multiplying per-unit impact estimates by the number of wells drilled and completed, and number of barrels of oil produced. **Table V-8** provides a summary of the per-unit values used for output, employment, and earnings in the study area. A separate analysis was done for a five-county area where development of oil and gas would be expected to be concentrated. This five-county area includes Elko, Eureka, White Pine, Nye and Lincoln Counties. **Table V-9** provides a summary of the per-unit values used for output, employment, and earnings in the five-county area. Overall, a considerable share of the wells expected to be drilled and to be producing on existing leases are in the Elko-Noble area. The Elko-Noble project is a large project for the area and its success rate (55%) is expected to be higher than other parts of the planning area (20%).

Table V-8
Assumptions for Analysis of Output, Earnings, and Employment for Oil and Gas, Study Area

Economic Impact[1]	Drilling (per well)	Completion (per well)	Production (per MBO)
Direct output	$1,357,100	$994,335	$79,724
Indirect output	$257,013	$180,167	$10,937
Induced output	$478,418	$381,268	$5,373
Total output	$2,092,531	$1,555,770	$96,034
Multiplier[2]	1.54	1.56	1.20
Direct earnings	$717,311	$580,892	$4,405
Indirect earnings	$102,923	$73,455	$4,761
Induced earnings	$161,781	$128,959	$1,818
Total earnings	$982,015	$783,306	$10,984
Multiplier	1.37	1.35	2.49
Direct employment	8.1	6.7	0.060660
Indirect employment	2.0	1.5	0.074855
Induced employment	4.0	3.2	0.045061
Total employment	14.1	11.4	0.180576
Multiplier	1.74	1.70	2.98
Average earnings per job	$69,646	$68,711	$60,825

Sources: BLM 2014d, EIA 2010, EIA 2013, and the IMPLAN model, as described in the text.
MBO = thousands of barrels of oil
[1] All dollar figures are in 2010 dollars.
[2] Multiplier is calculated as total impact divided by direct impact.

Table V-9
Assumptions for Analysis of Output, Earnings, and Employment for Oil and Gas, Five County Area

Economic Impact[1]	Drilling (per well)	Completion (per well)	Production (per MBO)
Direct output	$961,435	$615,050	$79,724
Indirect output	$81,992	$51,106	$6,918
Induced output	$181,562	$129,989	$2,609
Total output	$1,224,989	$796,145	89,251
Multiplier[2]	1.27	1.29	1.12
Direct earnings	$513,448	$371,396	$4,499
Indirect earnings	$29,223	$18,185	$3,285
Induced earnings	$50,708	$36,304	$728
Total earnings	$593,379	$425,885	$8,512
Multiplier	1.16	1.15	1.89
Direct employment	6.0	4.1	0.060660
Indirect employment	0.7	0.5	0.049931
Induced employment	1.6	1.2	0.022613
Total employment	8.3	5.8	0.133203
Multiplier	1.38	1.41	2.20
Average earnings per job	$71,491	$73,428	$63,899

Sources: BLM 2014d, EIA 2010, EIA 2013, and the IMPLAN model, as described in the text.
MBO = thousands of barrels of oil
[1] All dollar figures are in 2010 dollars.
[2] Multiplier is calculated as total impact divided by direct impact.

Output, labor, and earning impacts summarized in **Tables 4-25** and **4-26** in the economic impact section of the FEIS are presented for drilling and completion and for operations of oil and gas wells. Impacts during drilling and completion are equal to the average wells drilled per year multiplied by impact coefficients in **Tables V-8** and **V-9**. Estimates of impacts during operations assume only a share of the wells drilled are completed and enter production, and about half of the production wells are producing by year 10. Impacts are estimated by multiplying the number of wells producing by the coefficients in **Tables V-8** and **V-19**.

The IMPLAN sectors used to model an exogenous change in demand for oil and gas well drilling were the following (IMPLAN sector numbers are shown in brackets): drilling oil and gas wells (28), support activities for oil and gas operations (29), construction of new manufacturing structures (35), construction of other new structures (36), wholesale trade (319), truck transportation (335), telecommunications (351), commercial and industrial equipment leasing (365), and architectural and engineering services (369). In the gas of oil and gas production, the sector used was oil and gas extraction (35).

WIND ENERGY

The economic impact of wind energy development reflects local expenditures made during construction and operations. BLM and Forest Service estimated impacts of current applications for wind energy development in three areas: a)

the study area as a whole; b) Elko and White Pine Counties; and c) Washoe and Lassen Counties. The number of MW expected to be developed under current management would be 980 MW in Elko and White Pine Counties and 151 MW in Washoe and Lassen Counties, for a total of 1,131 MW. **Table V-10** provides a summary of the per-unit values used for output, employment, and earnings.

Table V-10
Assumptions for Analysis of Output, Earnings, and Employment for Wind Energy Development

Economic Impact[1]	Study Area (per MW)		Elko and White Pine Counties (per MW)		Washoe/Lassen Counties (per MW)	
	Constr.	Operat.	Constr.	Operat.	Const.	Operat.
Direct output	$306,713	$14,761	$306,713	$14,761	$306,713	$14,761
Indirect output	$58,166	$345	$36,934	$206	$49,676	$348
Induced output	$74,560	$5,969	$43,320	$3,744	$79,866	$6,498
Total output	$439,440	$21,075	$386,967	$18,711	$436,255	$21,607
Multiplier[2]	1.43	1.43	1.26	1.27	1.42	1.46
Direct earnings	$131,147	$10,148	$128,268	$10,067	$131,209	$10,205
Indirect earnings	$21,346	$131	$13,252	$78	$20,127	$147
Induced earnings	$25,191	$2,017	$13,445	$1,162	$29,189	$2,375
Total earnings	$177,684	$12,296	$154,965	$11,307	$180,525	$12,727
Multiplier	1.35	1.21	1.21	1.12	1.38	1.25
Direct employment	1.646	0.153	1.691	0.162	1.640	0.149
Indirect employment	0.414	0.003	0.276	0.002	0.383	0.003
Induced employment	0.610	0.049	0.380	0.032	0.648	0.053
Total employment	2.670	0.205	2.347	0.196	2.671	0.205
Multiplier	1.62	1.34	1.39	1.21	1.63	1.37
Average earnings per job	$66,546	$59,864	$66,025	$57,688	$67,585	$61,962

Sources: IMPLAN model, as described in the text.

[1] All dollar figures are in 2010 dollars.

[2] Multiplier is calculated as total impact divided by direct impact.

Output, labor, and earning impacts summarized in **Table 4-28** in the economic impact section of the FEIS are presented for construction and operations of wind energy projects. Impacts during construction are equal to the average MW

of construction multiplied by impact coefficients in **Table V-10**. Estimates of impacts during operations assume half of the MW are installed and in production by year 10. Impacts are estimated by multiplying the number of MW being produced by the coefficients in **Table V-10**.

The IMPLAN sectors used to model an exogenous change in demand for wind energy development were the following (IMPLAN sector numbers are shown in brackets): sand and gravel mining (26), ready-mix concrete manufacturing (161), wholesale trade (319), retail-building materials and garden supply (323), hotels and motels (411), food services and drinking places (413), and labor income change (NA). In the case of wind energy operations, the IMPLAN sectors used were the following: electrical power (31), nonresidential maintenance and power (39), wholesale trade (319), retail – motor vehicle and parts (320), retail – building materials and garden supply (323), retail – gasoline stations (326), other state and local government enterprises (432), labor income change (NA), state and local government – non-educational (NA), and state and local government – educational (NA). Unlike other sectors modeled in IMPLAN for this EIS, the state and local government sector was included when modeling wind energy operations following the NREL JEDI model on which the model for this EIS was based.

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