Appendix W

Economic Impact Analysis Methodology

APPENDIX W
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 the Social and Economic Impacts (Including Environmental Justice) section of **Chapter 4**. 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, oil and gas, coal and wind energy.

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). Because IMPLAN incorporates regional trade data, it is able to separate the economic impact received by a specific region from the impact that is felt beyond the selected geographic area. The estimates reported below for output, employment and earnings reflect only the share supported in the primary and secondary study areas.

This analysis used IMPLAN 2011. This means that parameters such as productivity and trade data reflect estimates for the study area released in the 2011 IMPLAN version. These parameters typically do not meaningfully change from one year to another and would likely not

be substantially affected by more recent growth trends in employment or output in specific sectors. Prior to running the model, cost and price data were converted to a consistent dollar year (2011) using sector-specific adjustment factors from the IMPLAN model. Unless stated otherwise, the values in this appendix are expressed in year 2011 dollars.

The current IMPLAN model has 440 economic sectors, of which 331 are represented in the Primary and 384 are represented in the Secondary Socioeconomic Study Area counties. This analysis involved direct changes in economic activity for 38 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 Primary and Secondary Socioeconomic Study Areas. 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 Primary and Secondary Socioeconomic Study Areas compared to a model using unadjusted national coefficients.

Key variables used in the IMPLAN model were filled in using data specific to the Primary and Secondary Socioeconomic Study Areas, including employment estimates, labor earnings, and total industry output. This data was used to estimate labor productivity and earnings per job. As explained above, recent growth trends in employment and output in specific sectors in the study area would not likely affect these parameters.

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.

In addition to analyzing impacts in the primary and secondary study area, the BLM and Forest Service analyzed impacts to smaller regions, where socioeconomic impacts associated with oil and gas, wind energy and coal would likely be concentrated. No similar analysis was done for livestock grazing, given the relatively disperse socioeconomic impacts of alternatives through effects on livestock grazing.

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 a cow, one horse, or five sheep for one month. For Forest Service data, measurements in AUMs were also obtained. Data were obtained from the BLM's Rangeland Administration System (BLM 2012a) 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

that the BLM and Forest Service bill for annually. The Forest Service uses the designation "authorized" AUMs. Impacts were estimated for the range between billed and active AUMs.

Data for Alternatives A, B, D, and E, and the Proposed Plan were for 2011. Estimates of Active and Billed AUMs under Alternative C1 were obtained by using GIS to remove AUMs intersecting with sage-grouse habitat. In doing so, all allotments containing sage grouse habitat were considered closed for grazing (and not just the portion with sage grouse habitat). Estimates for Active and Billed AUMs for Alternative C2 assume 60 percent of the AUMs made unavailable under Alternative C1 are made unavailable under Alternative C2. the Social and Economic Impacts (Including Environmental Justice) section of **Chapter 4** discusses the possibility of Billed AUMs not being reduced in proportion to reductions in Active AUMs under Alternatives C1 and C2.

Table W.1, below, shows estimated Animal Unit Months by management unit under each Alternative. Data for National Forests corresponds only to AUMs in the portion of those National Forests within the study area and with sage-grouse habitat.

Table W.1
Estimated Annual Animal Unit Months on Federal Lands, 2011

	Active			Billed		
	Alternative A, B, D, and E, Proposed Plan	Alternative C1	Alternative C2	Alternative A, B, D, and E, Proposed Plan	Alternative C1	Alternative C2
Cedar City FO	139,816	66,229	110,381	88,432	37,828	68,190
Fillmore FO	256,674	229,493	245,802	152,760	128,418	143,023
GSENM	76,816	74,896	76,048	38,464	36,950	37,858
Kanab FO	18,686	9,695	15,090	9,189	3,933	7,086
Moab FO	89,648	89,648	89,648	46,957	46,957	46,957
Price FO	100,375	87,530	95,237	51,434	45,111	48,905
Richfield FO	98,462	83,032	92,290	66,371	55,209	61,906
Salt Lake FO	176,398	78,370	137,187	137,686	57,011	105,416
Vernal FO	127,839	36,150	91,163	65,457	15,652	45,535
Sawtooth NF	12,348	0	7,409	12,348	0	7,409
Dixie NF	38,843	0	23,306	38,843	0	23,306
Fishlake NF	69,707	0	41,824	69,707	0	41,824
Manti-Lasal NF	55,561	0	33,337	55,561	0	33,337
Uinta-Wasatch-Cache NF	44,441	0	26,665	44,441	0	26,665
Ashley NF	43,329	0	25,997	43,329	0	25,997
Total	1,348,943	755,043	1,111,383	920,979	427,069	723,414

Sources: Calculated based on data from BLM 2012a and Forest Service 2013. Billed AUMs for Forest Service were assumed equal to active AUMs.

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, and other grazing animals are considered of negligible commercial value.

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 $51.19 per AUM, and the value for sheep is $58.01 per AUM in the Primary Socioeconomic Study Area (in 2011 dollars). Including indirect and induced impacts, the value of one AUM in the Primary Socioeconomic Study Area for cattle is $102.12 and for sheep is $127.11 (in 2011 dollars). **Table W.2** 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 W.2
Assumptions for Analysis of Impacts on Output for Livestock Grazing

Economic Impact	Primary Study Area	Primary and Secondary Study Area
Cattle		
Direct Economic Impact ($/AUM)	$51.19	$51.19
Indirect Economic Impact ($/AUM)[1]	$44.22	$49.39
Induced Economic Impact ($/AUM)[2]	$6.71	$9.08
Total Economic Impact ($/AUM)	$102.12	$109.66
Multiplier (Total Impact/Direct Impact)	1.99	2.14
Sheep		
Direct Economic Impact ($/AUM)	$58.01	$58.01
Indirect Economic Impact ($/AUM)[1]	$59.85	$67.76
Induced Economic Impact ($/AUM)[2]	$9.25	$12.53
Total Economic Impact ($/AUM)	$127.11	$138.30
Multiplier (Total Impact/Direct Impact)	2.19	2.38

Note: All dollar values are in 2011 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 W.3 provides a summary of the employment impacts that would result, according to IMPLAN, based on unit changes in livestock AUMs.

The IMPLAN sectors used to model and 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), retail-food and beverages (324).

Table W.3
Assumptions for Analysis of Employment Impacts for Livestock Grazing

Employment Impact	Primary Study Area	Primary and Secondary Study Area
Cattle		
Direct Employment (Jobs/1,000 AUMs)	0.559	0.559
Indirect Employment (Jobs/1,000 AUMs)	0.456	0.486
Induced Employment (Jobs/1,000 AUMs)	0.067	0.087
Total Employment (Jobs/1,000 AUMs)	1.081	1.132
Multiplier (Total Impact/Direct Impact)	1.93	2.03
Average Earnings per Job (2011 dollars)	$36,738	$36,738
Sheep		
Direct Employment (Jobs/1,000 AUMs)	0.980	0.980
Indirect Employment (Jobs/1,000 AUMs)	0.760	0.801
Induced Employment (Jobs/1,000 AUMs)	0.087	0.110
Total Employment (Jobs/1,000 AUMs)	1.827	1.891
Multiplier (Total Impact/Direct Impact)	1.86	1.93
Average Earnings per Job (2011 dollars)	$15,408	$15,408

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

OIL AND GAS

The economic impact of oil and gas reflects drilling, completion, and production activities. Estimation of drilling, completion, and production activities was done for a 15-year period (2014 to 2028). **Appendix R**, Oil and Gas Reasonably Foreseeable Development Scenario for Greater Sage-Grouse Occupied Habitat in Utah Sub-Region, provides a complete description of the assumptions and methodology used in developing these estimates.

The number of wells drilled and the number of wells completed under the No Action Alternative (Alternative A) were based on the average number of wells expected to be drilled or completed per year in each BLM field office's current Reasonable Foreseeable Development Scenario. Completion rates ranged from 10 percent in most counties to 85 percent for oil wells in Carbon and Duchesne counties and for gas wells in Uintah County. Drilling and completion numbers were estimated for federal surface, as well as for all surface ownership.

The BLM oil and gas specialists estimated the share of oil and gas that would intersect with GRSG habitat using GIS. The number of wells completed or drilled that would be affected by each alternative is the number that intersects with GRSG habitat, as appropriate for each alternative:

- Alternative A – Existing areas would be available for fluid mineral leasing
- Alternative B – some GRSG occupied habitat would be designated as PHMA and would be closed to new fluid mineral leasing
- Alternative C – All GRSG occupied habitat would be designated as PHMA and would be closed to new fluid mineral leasing

- Alternative D – Some GRSG occupied habitat would be designated as PHMA but would not be closed to new leasing. Rather, NSO, with waivers, exceptions, and modifications, would be placed within 4 miles of an occupied lek in PHMA. NSO with waivers, exceptions, and modifications applies within 1 mile of leks in GHMA.
- Alternative E – Based on the State of Utah's *Conservation Plan for Greater Sage-grouse in Utah*, minor constraints would be placed on management areas.
- Proposed Plan – Some GRSG occupied habitat would be designated as PHMA and subject to NSO restrictions with no waivers, exceptions, or modifications. The remainder of the priority habitat would be subject to NSO restrictions with one exception. Oil and gas development in GHMA would be open but subject to net conservation gain requirements and other conservation measures.

Both wells in new leases and wells in existing leases were considered to be affected by GRSG management (see **Appendix R** for details). In addition, the BLM assumed that leases on state and private lands would be affected similarly to federal lands, if large areas of contiguous BLM-administered land are closed to new oil and gas leasing.

Table W.4 presents the total number of wells drilled and completed in the Primary Socioeconomic Study Area for each alternative, relative to Alternative A.

Table W.4
Oil and Gas Well Numbers in New and Existing Leases Over 15 Years, Relative to Alternative A

Item	Federal, State, and Fee Surface	Federal Surface		State and Fee Surface
		New Leases	Existing Leases	
Alternative B – Wells Drilled	-329	-115	-165	-49
Alternative B – Wells Completed	-242	-93	-126	-23
Alternative C – Wells Drilled	-858	-270	-494	-94
Alternative C – Wells Completed	-670	-217	-397	-56
Alternative D – Wells Drilled	-223	-40	-165	-18
Alternative D – Wells Completed	-166	-31	-126	-9
Alternative E – Wells Drilled	0	0	0	0
Alternative E – Wells Completed	0	0	0	0
Proposed Plan – Wells Drilled	-228	-44	-165	-19
Proposed Plan – Wells Completed	-167	-34	-126	-6

Sources: Elaborated by BLM staff based on field office Reasonable Foreseeable Development Scenarios and available information

The production per well was assumed based on the typical production of existing wells in the area, or 1,471 million cubic feet per gas well and 200 thousand barrels of oil per oil well over a 20 year well life. Each well was assumed to have a 20-year life and 75 percent of its lifetime production would be reached during the 15-year period. The production that would be affected by each alternative is proportional to the share of wells affected by GRSG habitat, as appropriate for each alternative. Reductions in drilled and completed wells relative to

Alternative A correspond to approximately 7 percent under alternative D and the Proposed Plan, 10 percent under Alternative B, and 27 percent under Alternative C, with no reduction under Alternative E. **Table W.5** presents the projected quantity of oil and gas over the 15-year forecast period on federal surface and on federal, state, and fee surface.

Table W.5
Projected Oil and Gas Production in New and Existing Leases Relative to Alternative A, 15-Year Period

Item	Federal, State, and Fee Surface	Federal Surface	State and Fee Surface
Alternative B – Gas (MMCF)	-113,083	-101,628	-11,455
Alternative B – Oil (MBO)	-2,775	-2,580	-195
Alternative C – Gas (MMCF)	-302,842	-277,417	-25,425
Alternative C – Oil (MBO)	-9,075	-8,366	-709
Alternative D – Gas (MMCF)	-77,228	-72,791	-4,436
Alternative D – Oil (MBO)	-1,950	-1,909	-41
Alternative E – Gas (MMCF)	0	0	0
Alternative E – Oil (MBO)	0	0	0
Proposed Plan – Gas (MMCF)	-78,882	-75,183	-3,699
Proposed Plan – Oil (MBO)	-1,800	-1,827	27

Source: Elaborated by BLM staff based on field office Reasonable Foreseeable Development Scenarios and available information.
MMCF = million cubic feet; MBO = thousand barrels

The costs of drilling and completing wells and producing oil and gas also are relevant for the economic impact analysis. Cost of completion or drilling per well were assumed to sum to $3,250,000 for vertical wells under Alternatives A and E, wells not on federal lands, and wells on federal lands not in priority sage grouse habitat. This is a mid-point in the $1,500,000 to $5,000,000 range typical for the region (BLM 2013a). Directional wells were assumed to be approximately 5 percent more expensive to drill per foot and similarly costly to complete, and horizontal wells were assumed to be 30 percent more expensive to drill per foot and similarly costly to complete. Vertical wells were assumed to be 43 percent of total wells, directional wells were assumed to be 55 percent of total wells and horizontal wells were assumed to be 2 percent of total wells.

For Alternatives B, C, D, and the Proposed Plan, wells drilled in priority habitat on federal lands were assumed to have increased costs. These increased costs would affect both wells on existing leases and new wells. The increased costs would be a consequence of increased directional drilling, from 55 percent of total wells to 75 percent of total wells, and horizontal drilling, from 2 percent of total wells to 5 percent of total wells. In addition, increased costs would derive from required design features identified in Appendix J and off-location mitigation requirements. In Alternatives A and E, the average cost of drilling and completing a well was estimated to be $3,371,400. In Alternatives B, C, D, and the Proposed Plan, the average cost for drilling and completing a well was estimated to be $4, 498,000. This increase in costs translates in increases local expenditures per well and, therefore, increased outcome, employment and earnings impacts per well.

The increased costs of drilling in priority habitat was assumed to impact the number of wells drilled under existing leases in Alternatives B, C, D, and the Proposed Plan.[1] Because the reduction in the number of wells drilled in existing leases was assumed to be proportional to the increase in drilling costs under Alternatives B, C, D, and the Proposed Plan. These reductions are already reflected in the number of wells drilled and completed under each alternative, relative to Alternative A, shown in **Table W.4**.

IMPLAN was used to generate output, employment, and earnings multipliers per million dollars of expenditures. These multipliers were then applied to the estimated expenditures with drilling and completion by alternative to obtain the resulting impacts. A summary of the costs of drilling and completion and impacts per well used for the economic analysis is shown in **Table W.6** and **Table W.7**. Assumptions are shown for the Primary Study Area, the Primary and Secondary Study Area and for a Three-County Area consisting of Duchesne, Carbon and Uintah counties. As explained in the Social and Economic Impacts (Including Environmental Justice) section of **Chapter 4**, these three counties are expected to bear a considerable share of the economic impacts associated with the effects of management alternatives on oil and gas development. The analysis of the three-county area assumed all parameters would be the same as those used for the broader analysis of the impacts on the primary and secondary areas (e.g., sectors affected by oil and gas related expenditures, labor productivity, etc.) except that all direct expenditures previously assumed to occur in the primary study area would now only occur in the three-county area.

Table W.6
Assumptions for Analysis of Economic Impacts for Oil and Gas Well Drilling and Completion, Alternatives A and E and Wells not on Federal Lands in Priority Habitat in Alternatives B, C, and D, and Proposed Plan

Economic Impact	Primary Study Area	Primary and Secondary Study Area	Three-County Area
Drilling Impacts			
Total Drilling Costs[1]	$1,640,290	$1,640,290	$1,640,290
Total Local Drilling Costs[2]	$1,439,222	$1,439,222	$1,439,222
Local Direct Impact ($/well)	$1,439,222	$1,439,222	$1,439,222
Local Indirect Impact ($/well)	$299,375	$479,317	$236,831
Local Induced Impact ($/well)	$320,223	$434,455	$286,130
Local Total Impact ($/well)[3]	$2,058,819	$2,352,993	$1,962,183
Multiplier (total impact/direct impact)	1.43	1.63	1.36
Completion Impacts			
Total Completion Costs[1]	$1,731,110	$1,731,110	$1,731,110
Total Local Completion Costs[2]	$1,052,633	$1,052,633	$1,052,633
Local Direct Impact ($/well)	$1,052,633	$1,052,633	$1,052,633
Local Indirect Impact ($/well)	$253,164	$390,856	$195,471
Local Induced Impact ($/well)	$240,337	$325,751	$210,663

[1] Alternatives B, C, D, and the Proposed Plan were assumed to require increased costs of drilling equally, relative to Alternative A.

Table W.6
Assumptions for Analysis of Economic Impacts for Oil and Gas Well Drilling and Completion, Alternatives A and E and Wells not on Federal Lands in Priority Habitat in Alternatives B, C, and D, and Proposed Plan

Economic Impact	Primary Study Area	Primary and Secondary Study Area	Three-County Area
Local Total Impact ($/well)[3]	$1,546,134	$1,769,240	$1,458,766
Multiplier (total impact/direct impact)	1.47	1.68	1.39

Source: Drilling and completion costs (the first row in each part of the table) were based on the mid-point of a range provided by BLM staff (BLM 2013a), $3,250,000 per well for vertical wells. Costs for directional and horizontal wells were adjusted, as explained in the text. Remaining data is from IMPLAN, as described in the text.
[1]Coalbed natural gas wells were assumed to be included in the estimate of the average cost of vertical wells. Coalbed natural gas well costs would correspond to the lower end of the range provided by BLM (2013).
[2]The local cost shares correspond to the percent of total drilling or completion costs that would be spent on goods and services purchased from the local economy and were assumed based on regional experience.
[3]Total impacts estimated using IMPLAN include direct, indirect, and induced impacts.

Table W.7
Assumptions for Analysis of Economic Impacts for Oil and Gas Well Drilling and Completion, Wells on Federal Lands in Priority Habitat in Alternatives B, C, and D, and Proposed Plan

Economic Impact	Primary Study Area	Primary and Secondary Study Area	Three-County Area
Drilling Impacts			
Total Drilling Costs[1]	$2,188,416	$2,188,416	$2,188,416
Total Local Drilling Costs[2]	$1,920,157	$1,920,157	$1,920,157
Local Direct Impact ($/well)	$1,920,157	$1,920,157	$1,920,157
Local Indirect Impact ($/well)	$399,415	$639,487	$315,971
Local Induced Impact ($/well)	$427,230	$579,634	$381,745
Local Total Impact ($/well)[3]	$2,746,803	$3,139,279	$2,617,873
Multiplier (total impact/direct impact)	1.43	1.63	1.36
Completion Impacts			
Total Completion Costs[1]	$2,309,584	$2,309,584	$2,309,584
Total Local Completion Costs[2]	$1,404,385	$1,404,385	$1,404,385
Local Direct Impact ($/well)	$1,404,385	$1,404,385	$1,404,385
Local Indirect Impact ($/well)	$337,762	$521,466	$260,790
Local Induced Impact ($/well)	$320,649	$434,605	$281,059
Local Total Impact ($/well)[3]	$2,062,797	$2,360,456	$1,946,233
Multiplier (total impact/direct impact)	1.47	1.68	1.39

Source: Drilling and completion costs (the first row in each part of the table) were based on the mid-point of a range provided by BLM staff (BLM 2013a), $3,250,000 per well for vertical wells. Costs for directional and horizontal wells were adjusted, as explained in the text. Remaining data is from IMPLAN, as described in the text.
[1]Coalbed natural gas wells were assumed to be included in the estimate of the average cost of vertical wells. Coalbed natural gas well costs would correspond to the lower end of the range provided by BLM (2013).
[2]The local cost shares correspond to the percent of total drilling or completion costs that would be spent on goods and services purchased from the local economy and were assumed based on regional experience.
[3]Total impacts estimated using IMPLAN include direct, indirect, and induced impacts.

Table W.8 provides the assumptions used to determine the economic impact associated with the production of oil and gas. For the analysis, the BLM estimated a nonlabor production cost (for gas) of $4.23 per thousand cubic feet and $82.53 per barrel of oil, in year 2011 dollars, based on data from the Energy Information Administration for the Rocky Mountain Region (Energy Information Administration 2013).

The forecasted number of wells and production used for estimating employment impacts is the same as for estimating impacts on labor earnings and output. The direct and total employment impacts attributable to drilling and completion are shown in **Table W.9** and **Table W.10**.

Table W.11 shows the direct and total employment impacts associated with production.

The analysis of potential changes in tax revenues is based on tax rates of 12.5 percent of taxable value for federal mineral royalties and 5 percent of taxable value for state severance taxes: Utah severance tax rates are 5 percent for value above a minimum, so 5 percent is an upper bound (University of Utah 2010). Taxable value was assumed to be 87.5 percent of value of sales based on a report for neighboring Colorado.[2] **Table W.12** shows tax collections for the annual average production under each alternative in the primary study area.

Table W.8
Assumptions for Analysis of Economic Impacts on Output for Oil and Gas Production

Economic Impact	Primary Study Area	Primary and Secondary Study Area	Three-County Area
Oil Production (per thousand barrels)			
Direct Economic Impact[1]	$82,530[2]	$82,530	$82,530
Indirect Economic Impact[4]	$8,309	$12,123	$5,760
Induced Economic Impact[5]	$2,924	$4,573	$2,190
Total Economic Impact	$93,763	$99,226	$90,480
Multiplier (total impact/direct impact)	1.14	1.20	1.10
Gas Production (per million cubic feet)			
Direct Economic Impact[1]	$4,230[3]	$4,230	$4,230
Indirect Economic Impact[4]	$425	$621	$295
Induced Economic Impact[5]	$149	$234	$112
Total Economic Impact	$4,805	$5.085	$4,637
Multiplier (total impact/direct impact)	1.14	1.20	1.10

Note: All dollar values are in year 2011 dollars.
[1]Direct economic impact is the market value of output.
[2]Based on an oil price of $82.53 per barrel, which is the 2011 Utah Crude Oil First Purchase Price reported by the US Energy Information Administration (EIA 2013).
[3]Based on a gas price of $4,23 per thousand cubic feet, which is the 2010 Utah Natural Gas Wellhead Price reported by the US Energy Information Administration (EIA 2013).
[4]Indirect impacts from IMPLAN reflect increased demand in sectors that directly or indirectly provide supplies to the oil and gas industry.
[5]Induced impacts from IMPLAN reflect increased demand in the consumer sectors.

[2] This was based on information available for the State of Colorado from the Colorado Oil and Gas Association (Colorado Oil and Gas Association 2011). Valuation for Utah may be slightly above or below this number.

Table W.9
Assumptions for Employment Impact Analysis for Oil and Gas Well Drilling and Completion, Alternatives A and E, and Wells not on Federal Lands in Priority Habitat in Alternatives B, C, and D, and Proposed Plan[1]

Employment Impact	Primary Study Area	Primary and Secondary Study Area	Three-County Area
Drilling Impacts			
Direct Employment (jobs/well)	8.3	8.3	8.2
Indirect Employment (jobs/well)	2.6	3.5	1.9
Induced Employment (jobs/well)	3.1	3.9	2.7
Total Employment Impact (jobs/well)	14.0	15.8	12.8
Multiplier (Total Impact/Direct Impact)	1.69	1.90	1.56
Average Earnings per Job (2011 dollars)	$51,377	$51,337	$56,543
Completion Impacts			
Direct Employment (jobs/well)	6.5	6.5	6.5
Indirect Employment (jobs/well)	2.2	2.9	1.6
Induced Employment (jobs/well)	2.3	2.9	2.0
Total Employment Impact (jobs/well)	11.0	12.3	10.1
Multiplier (Total Impact/Direct Impact)	1.68	1.89	1.54
Average Earnings per Job (2011 dollars)	$49,031	$49,108	$52,704

Note: Direct and total employment impact and average earnings per job are calculated using IMPLAN.
[1]Each job corresponds to a part-time or full-time employment position during a one year period.

Table W.10
Assumptions for Employment Impact Analysis for Oil and Gas Well Drilling and Completion, Wells on Federal Lands in Priority Habitat in Alternatives B, C, and D, and Proposed Plan[1]

Employment Impact	Primary Study Area	Primary and Secondary Study Area	Three-County Area
Drilling Impacts			
Direct Employment (jobs/well)	11.1	11.1	10.9
Indirect Employment (jobs/well)	3.5	4.7	2.5
Induced Employment (jobs/well)	4.2	5.3	3.6
Total Employment Impact (jobs/well)	18.7	21.0	17.0
Multiplier (Total Impact/Direct Impact)	1.69	1.90	1.56
Average Earnings per Job (2011 dollars)	$51,377	$51,337	$56,543
Completion Impacts			
Direct Employment (jobs/well)	8.7	8.7	8.7
Indirect Employment (jobs/well)	2.9	3.9	2.1
Induced Employment (jobs/well)	3.0	3.9	2.6

Table W.10
Assumptions for Employment Impact Analysis for Oil and Gas Well Drilling and Completion, Wells on Federal Lands in Priority Habitat in Alternatives B, C, and D, and Proposed Plan[1]

Employment Impact	Primary Study Area	Primary and Secondary Study Area	Three-County Area
Total Employment Impact (jobs/well)	14.7	16.5	13.4
Multiplier (Total Impact/Direct Impact)	1.68	1.89	1.54
Average Earnings per Job (2011 dollars)	$49,031	$49,108	$52,704

Note: Direct and total employment impact and average earnings per job are calculated using IMPLAN.
[1] Each job corresponds to a part-time or full-time employment position during a one year period.

Table W.11
Assumptions for Employment Impact Analysis for Oil and Gas Production

Employment Impact (annual number of jobs per thousand barrels or million cubic feet)	Primary Study Area	Primary and Secondary Study Area	Three-County Area
Oil Production (per thousand barrels)			
Direct Employment	0.028968	0.028968	0.029051
Indirect Employment	0.067014	0.087647	0.036808
Induced Employment	0.027978	0.040935	0.020302
Total Employment	0.123960	0.157550	0.086161
Multiplier (Total Impact/Direct Impact)	4.28	5.44	2.97
Average Earnings per Job (2011 dollars)	$52,485	$52,242	$63,800
Gas Production (per million cubic feet)			
Direct Employment	0.001485	0.001485	0.001489
Indirect Employment	0.003435	0.004492	0.001887
Induced Employment	0.001434	0.002098	0.001041
Total Employment	0.006353	0.008075	0.004416
Multiplier (Total Impact/Direct Impact)	4.28	5.44	2.97
Average Earnings per Job (2011 dollars)	$52,485	$52,242	$63,800

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

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), architectural and engineering services (369). In the gas of oil and gas production, the sector used was oil and gas extraction (20).

Table W.12
Tax Collections from Oil (MBO) and Gas (MMCF) Production Relative to Alternative A, 15 Year Period, 2011 $

	Alternative B		Alternative C		Alternative D		Alternative E		Proposed Plan	
	Gas	Oil	Gas	Gas	Gas	Oil	Gas	Oil	Gas	Oil
Total production	-113,083	-2,775	-302,842	-9,075	-77,227	-1,950	0	0	-77,227	-1,950
Prices	$4,230	$82,530	$4,230	$82,530	$4,230	$82,530	$4,230	$82,530	$4,230	$82,530
Assessed valuation	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%	87.5%
Assessed value	-$418,548,454	-$200,393,156	-$1,120,893,953	-$655,339,781	-$285,836,434	-$140,816,813	$0	$0	-$285,836,434	-$140,816,813
Federal royalties rate	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%	12.5%
Federal royalty tax	-$47,018,829	-$23,288,934	-$128,348,709	-$75,526,556	-$33,677,211	-$17,241,033	$0	$0	-$34,783,885	-$16,491,815
State severance rate	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
State severance tax	-$20,927,423	-$10,019,658	-$56,044,698	-$32,766,989	-$14,291,822	-$7,040,841	$0	$0	-$14,291,822	-$7,040,841
Total taxes	-$67,946,252	-$33,308,592	-$184,393,407	-$108,293,545	-$47,969,033	-$24,281,873	$0	$0	-$49,075,707	-$23,532,656

Source: Production volumes elaborated by BLM staff based on field office Reasonable Foreseeable Development Scenarios and available information. Prices are from Energy Information Administration (2013). Assessed valuation percentage is based on information available for Colorado (Colorado Oil and Gas Association 2011).
MMCF = million cubic feet; MBO = thousand barrels

COAL

The economic impact of coal production is estimated based on the volume of coal produced and the sales price of coal. BLM projected coal production in Utah to 2028 based on information from the US Energy Information Administration (EIA) and the Utah Geological Survey (BLM 2013b; Utah Geological Survey et al. 2010). These projections incorporate expected future trends of related prices and quantities (e.g. the price of gas). Although these projections include coal from San Juan County, which is not part of the Study Area for this EIS, the coal from San Juan would not be affected by the choice of alternatives and therefore does not affect the comparison of alternatives. For the estimation of the impacts of the alternatives on coal production, the following assumptions were made, based on information in various documents:

- 77 percent of all production is from federal mineral lands (BLM 2013b)
- New coal leases would be required for underground coal production from 2017 onwards
- BLM made the assumption for analysis purposes only that no new underground leasing would occur in priority habitat (for Alternative B) or occupied habitat (for Alternative C). The idea that closing GRSG habitat to new leases would effectively preclude underground coal mining represents a worst-case scenario because nothing in this alternative would preclude leasing of underground materials.
- For the Proposed Plan, the BLM assumed that underground leasing would occur in the Alton coal field, assuming also that this would reduce the recovery rate in this area from 90 percent to 45 percent. The BLM also assumed that lek buffers under the Proposed Plan would have additional restrictive effects on coal mining.
- The Alton coal field would generate 1,840,000 tons of coal per year starting in 2016 from surface coal mining, under Alternatives A, D and E (BLM 2011) and 792,200 tons of coal per year under the Proposed Plan. For analytical purposes only, this coal is assumed to be produced entirely from federal lands. BLM assumed that no production would occur from the Alton coal field in Alternatives B and C, based on it being a surface mine. To the extent that some underground mining of the deposit could still occur, accessed through surrounding non-Federal lands, this assumption of no production under Alternatives B and C may overstate the actual impacts of those alternatives.
- On National Forest System lands, the SUFCO Mine and Horn Mountain make up the majority of the known recoverable coal resources in PHMA.The PHMA overlying the SUFCO Mine has been partially undermined and should not be impacted by future mining or the Proposed Plan. The Horn Mountain area has three known active leks, two of which overlie areas that could be mined in the future. Under the Proposed Plan, precluding surface disturbance in PHMA could limit coal produced from Horn Mountain if it is ever leased and developed, however, there are is no proposed mining in the Horn Mountain area.

The estimated annual average volume of coal produced on federal lands under each alternative is presented in **Table W.13** below. The average production from surface mining in **Table W.13** includes two years (2014 and 2015) where no federal coal production from the Alton field mines is expected (explaining why surface coal production shown in **Table W.13** is lower than the average annual production expected starting 2016).

Table W.13
Estimated Annual Average Coal Production on Federal Lands in Utah (tons), 2014-2028

	Underground	Surface	Total
Alternative A	15,291,616	1,594,667	16,886,283
Alternative B	13,150,790	0	13,150,790
Alternative C	12,080,377	0	12,080,377
Alternative D	15,291,616	1,594,667	16,886,283
Alternative E	15,291,616	1,594,667	16,886,283
Proposed Plan	15,291,616	686,504	15,978,120

Source: BLM 2013b

Estimates of the impacts of coal production were developed using IMPLAN and assuming a price for underground coal of $33.80 per ton, which is the EIA's 2011 coal price estimate for Utah (EIA 2013), and a price of $23.86 per ton for surface coal. The price for surface coal is estimated as the average between the price for underground coal for Utah and the price of surface mining in Wyoming's Powder River Basin (used as a reference). The basis for this is the fact that the Alton mine coal is expected to have 10,000 BTU per pound (BLM 2011). Surface coal mined from the Powder River Basin in Wyoming contains about 8,800 BTU per pound and has an average price of $13.56 per ton. The EIA estimates the price of underground coal in Utah to be $33.80 per ton based on 11,700 BTU per pound of coal. The simple average in prices would approximate the expected BTU for the coal from the Alton mine.

Table W.14 and **Table W.15** show the multipliers for output and employment, respectively, estimated for coal. Assumptions are shown for the Primary Study Area, the Primary and Secondary Study Area and for an Eight-County Area consisting of Carbon, Emery, Sanpete, and Kane, as well as counties that could be expected to provide construction inputs, materials, transportation services and other supplies, and that are located within the primary or secondary study area. These include Sevier, Paiute, Garfield and Millard. Utah County was also considered but was not included, because it would disproportionately impact the results, given its large population and economy relative to the other counties. As explained in the Social and Economic Impacts (Including Environmental Justice) section of **Chapter 4**, these eight counties are expected to bear a considerable share of the economic impacts associated with the effects of management alternatives on coal development and production.

Table W.14
Assumptions for Analysis of Impacts on Output for Coal

Economic Impact	Primary Study Area	Primary and Secondary Study Area	Eight-County Area
Underground			
Direct Economic Impact ($/MT)	$33,800	$33,800	$33,800
Indirect Economic Impact ($/MT)[1]	$8,147	$15,218	$7,799
Induced Economic Impact ($/MT)[2]	$5,305	$8,258	$4,601
Total Economic Impact ($/MT)	$47,251	$57,276	$46,200
Multiplier (Total Impact/Direct Impact)	1.40	1.69	1.37
Surface			
Direct Economic Impact ($/MT)	$23,680	$23,680	$23,680
Indirect Economic Impact ($/MT)[1]	$5,149	$7,886	$3,911
Induced Economic Impact ($/MT)[2]	$3,018	$4,357	$2,494
Total Economic Impact ($/MT)	$31,847	$35,923	$30,085
Multiplier (Total Impact/Direct Impact)	1.34	1.52	1.27

Source: IMPLAN; Note: All dollar values are in 2011 dollars.
[1]Indirect impacts reflect increased demand in sectors that directly or indirectly provide supplies to the coal industry.
[2]Induced impacts reflect increased demand in the consumer and government sectors.
MT= metric tonne

Table W.15
Assumptions for Analysis of Impacts on Employment for Coal[3]

Employment Impact	Primary Study Area	Primary and Secondary Study Area	Eight-County Area
Underground			
Direct Employment (jobs/MT)	0.089502	0.089502	0.089502
Indirect Employment (jobs/MT)[1]	0.048266	0.079295	0.039952
Induced Employment (jobs/MT)[2]	0.050768	0.073988	0.042250
Total Employment Impact (jobs/MT)	0.188536	0.242785	0.171704
Multiplier (Total Impact/Direct Impact)	2.11	2.71	1.92
Average Earnings per Job (2011 dollars)	$63,113	$61,601	$67,879
Surface			
Direct Employment (jobs/MT)	0.044862	0.044862	0.044862
Indirect Employment (jobs/MT)[1]	0.026481	0.038363	0.025405
Induced Employment (jobs/MT)[2]	0.028898	0.039331	0.022899
Total Employment Impact (jobs/MT)	0.100241	0.122556	0.093166
Multiplier (Total Impact/Direct Impact)	2.23	2.73	2.08
Average Earnings per Job (2011 dollars)	$65,666	$63,715	$69,416

Source: IMPLAN; Note: All dollar values are in 2011 dollars.
[1]Indirect impacts reflect increased demand in sectors that directly or indirectly provide supplies to the coal industry. "For example, the U.S. coal mining industry has a multiplier of 3.6, meaning that, for every ten direct jobs, an additional 26 jobs are supported in the United States through indirect and induced economic activity." by Ernst & Young http://www.nma.org/pdf/coal_export_report.pdf
[2]Induced impacts reflect increased demand in the consumer and government sectors.
[3] Each job corresponds to a part-time or full-time employment position during a one year period.
MT = metric tonne

The IMPLAN sector used to model an exogenous change in demand for coal was coal mining (21).

The employment impacts for the Alton LBA would be in Kane and Garfield counties where nearly all of the mine employees live and where the large majority of domestic, trucking, and mine supply/support services are provided. Based on a 3.6 multiplier[3], the projected mine on-site employment of 160 represents 576 jobs or some 17.7 percent of the jobs in the two counties or the equivalent Salt County employment of some 87,700 jobs. (http://quickfacts.census.gov/qfd/states/49/49025.html, http://quickfacts.census.gov/qfd/states/49/49017.html, and http://quickfacts.census.gov/qfd/states/49/49035.html)

Potential changes in tax revenues associated to Federal mineral royalties are estimated based on a 12.5 percent royalty rate for surface coal and 8 percent royalty rate for underground coal (BLM). The value of coal output under each alternative was estimated as discussed above. **Table W.16** shows royalties collections for the estimated production under each alternative.

WIND ENERGY

The economic impact of wind energy depends on the expenditures made with installation and operations of wind farms. Expenditures made in the Primary Study Area were estimated based on the amount of electricity (nameplate capacity in megawatts, MW[4]) projected under each alternative, and the installation and operations costs per MW.

BLM projected 17,328 acres of reasonably foreseeable wind development in the Hamlin and Bald Hills Sage-Grouse population areas, under Alternative A. Using Utah's Milford Wind Corridor Project as a baseline, BLM estimated that this would correspond to approximately 210 MW of installed capacity. The same installed capacity would be projected under Alternative E. Based on GIS analysis, 121 MW would be potentially installed under Alternatives B, C, and D, and the Proposed Plan.

Installation and operations costs per MW were obtained from default values for the State of Utah used by the Jobs and Economic Development Impact (JEDI) model. The JEDI model for wind energy was developed by the National Renewable Energy Laboratory and default values for construction and operation costs per MW were determined based on extensive interviews with power generation project developers, state tax representatives, and others in the appropriate industries (NREL 2012). Default values were based on projects of 100 MW (50 turbines of 2,000 kilowatts each) and were estimated to be, in 2008 dollars,, $2,000 per kilowatt for installed project costs and $20 per kilowatt for operations and maintenance costs.

[3]"For example, the U.S. coal mining industry has a multiplier of 3.6, meaning that, for every ten direct jobs, an additional 26 jobs are supported in the United States through indirect and induced economic activity." by Ernst & Young http://www.nma.org/pdf/coal_export_report.pdf

[4] Megawatt = one thousand kilowatts

Table W.16
Estimated Average Annual Coal Royalties in Primary Study Area, 2014-2028

	Alternatives A, D and E			Alternative B			Alternative C			Proposed Plan		
	Underground	Surface	Total	Underground	Surface	Total	Underground	Surface	Total	Underground	Surface	Total
Mtons	15,292	1,595	16,886	13,151	0	13,151	12,080	0	12,080	15,292	687	15,978
Output (2011 $000)	$516,857	$37,762	$554,618	$444,497	$0	$444,497	$408,317	$0	$408,317	$516,857	$16,256	$533,113
Royalties (%)	8.0%	12.5%		8.0%	12.5%		8.0%	12.5%		8.0%	12.5%	
Royalties (2011 $000)	$41,349	$4,720	$46,069	$35,560	$0	$35,560	$32,665	$0	$32,665	$41,349	$2,032	$43,381

Table W.17 and **Table W.18** below show the estimated multipliers for output and employment during installation and operations. Assumptions are shown for the Primary Study Area, the Primary and Secondary Study Area and for a Two-County Area consisting of Millard and Beaver counties. As explained in the Social and Economic Impacts (Including Environmental Justice) section of **Chapter 4**, these two counties are expected to bear a considerable share of the economic impacts associated with the effects of management alternatives on wind energy development and production.

Table W.17
Assumptions for Analysis of Impacts on Output for Wind Energy

Economic Impact	Primary Study Area	Primary and Secondary Study Area	Two-County Area
Installation			
Direct Economic Impact ($/MW)	$303,774	$303,774	$303,774
Indirect Economic Impact ($/MW)[1]	$53,862	$94,884	$30,900
Induced Economic Impact ($/MW)[2]	$46,892	$67,484	$33,776
Total Economic Impact ($/MW)	$404,527	$466,142	$368,450
Multiplier (Total Impact/Direct Impact)	1.33	1.53	1.21
Operations			
Direct Economic Impact ($/MW)	$17,176	$17,176	$17,176
Indirect Economic Impact ($/MW)[1]	$572	$845	$384
Induced Economic Impact ($/MW)[2]	$5,390	$6,664	$3,883
Total Economic Impact ($/MW)	$23,138	$24,685	$21,442
Multiplier (Total Impact/Direct Impact)	1.35	1.44	1.25

Source: IMPLAN. Note: All dollar values are in 2011 dollars.
[1]Indirect impacts reflect increased demand in sectors that directly or indirectly provide supplies to the installation and operations of wind farms.
[2]Induced impacts reflect increased demand in the consumer and government sectors.

Table W.18
Assumptions for Analysis of Impacts on Employment for Wind Energy[4]

Employment Impact	Primary Study Area	Primary and Secondary Study Area	Two-County Area
Installation			
Direct Employment (jobs/MW)	1.77	1.77	1.77
Indirect Employment (jobs/MW)[1]	0.37	0.57	0.22
Induced Employment (jobs/MW)[2]	0.45	0.61	0.31
Total Employment Impact (jobs/MW)	2.58	2.94	2.30
Multiplier (Total Impact/Direct Impact)	1.46	1.67	1.30
Average Earnings per Job (2011 dollars)	$40,834	$42,141	$40,177
Operations			
Direct Employment (jobs/MW)	0.24	0.24	0.24
Indirect Employment (jobs/MW)[1]	0.01	0.01	0.00[3]
Induced Employment (jobs/MW)[2]	0.05	0.06	0.04
Total Employment Impact (jobs/MW)	0.29	0.30	0.28

Table W.18
Assumptions for Analysis of Impacts on Employment for Wind Energy[4]

Employment Impact	Primary Study Area	Primary and Secondary Study Area	Two-County Area
Multiplier (Total Impact/Direct Impact)	1.24	1.28	1.17
Average Earnings per Job (2011 dollars)	$41,985	$42,157	$42,037

Source: IMPLAN. Note: All dollar values are in 2011 dollars.
[1]Indirect impacts reflect increased demand in sectors that directly or indirectly provide supplies to the installation and operations of wind farms.
[2]Induced impacts reflect increased demand in the consumer and government sectors.
[3]0.004
[4]Each job corresponds to a part-time or full-time employment position during a one year period.

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), 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), 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.

REFERENCES

BLM (United States Department of the Interior, Bureau of Land Management). 2011. Alton Coal Tract Lease by Application Draft Environmental Impact Statement. Internet Web site: http://www.blm.gov/ut/st/en/prog/energy/coal/alton_coal_project/alton_coal_eis.html.

_____. 2012a. Data from BLM Rangeland Administration System.

_____. 2012b. Coal Operations. Available at: http://www.blm.gov/wo/st/en/prog/energy/coal_and_non-energy.html

_____. 2013a. Fluid Minerals data provided by Julie Suhr Pierce (BLM) and Michael McKinley (BLM fluid minerals specialist) in personal communication with Josh Sidon (BLM), April 26.

_____. 2013b. Coal projections provided by Julie Suhr Pierce, in consultation with BLM minerals specialist, in personal communication with Josh Sidon (BLM), May 3.

Colorado Oil and Gas Association. 2011. COGA/Colorado Oil & Gas Industry Tax Whitepaper. Denver, CO. Available at: http://www.coga.org/pdfs_policy/Oil%20&%20Gas%20Industry%20Tax%20White%20Paper.pdf

EIS (US Department of Energy, Energy Information Administration). 2013. Coal. Department of Energy. Internet Web site: http://www.eia.gov/coal/

NREL (National Renewable Energy Laboratory). 2012. Methodology. JEDI, Jobs and Economic Development Impact Models. Internet Web site: http://www.nrel.gov/analysis/jedi/methodology.html

University of Utah. 2010. Fiscal Policy and Utah's Oil and Gas Industry. Utah Economic and Business Review. V. 70, N. 3. Bureau of Economic and Business Research. Internet Web site: http://www.bebr.utah.edu/Documents/uebr/UEBR2010/UEBR2010no3.pdf

US Department of Agriculture Economic Research Service. 2012. Commodity Costs and Returns. Online at http://www.ers.usda.gov/data-products/commodity-costs-and-returns.aspx#.VEWSMpldVBM, accessed August 2012.

US Forest Service (United States Department of Agriculture, Forest Service). 2013. Routt National Forest Permitted and Authorized AUMs. Data provided by Dustin Bambrough (Forest Service) to Alex Uriarte, 04/01/2013

Utah Geological Survey; Bureau of Economic and Business Research (BEBR) and University of Utah. 2010. The Structure and Economic Impact of Utah's Coal Industry.

This page intentionally left blank.