

## **Appendix C**

### **Socioeconomics Technical Appendix**

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## **Socioeconomics Technical Appendix**

This technical appendix describes the methodology, key data and assumptions used for the socioeconomic impact analysis for the EIS. The appendix first discusses the impact analysis approach from the new natural gas well construction and their subsequent long-term operations. The appendix also shows the approach used to estimate the related revenue impacts on the county governments and region's economy from the wells' future natural gas production. The potential for related economic impacts on also is addressed in this Technical Appendix.

The technical appendix also describes the methodology, key data and assumptions used for the IMPLAN analysis used to estimate the direct, indirect and induced impacts on the region's economy from the spending and revenue impacts of the future new well construction, their operations and their revenue impacts on the county governments. Analysis results for Alternative 1 are included in the discussion to assist in explaining the analysis approach. Well construction and future natural gas production are based on the project assumptions discussed in Section 2.2.7.

Unless stated otherwise, the analysis is performed in 2014 dollars. It is assumed that full development of the leases will occur over the 20-year time period of 2017 to 2036.

### **New Well Construction and Production Operations**

Projecting future natural gas construction activity and subsequent production levels are central to the evaluation of the EIS alternatives future socioeconomic impacts. County level analysis of the EIS Alternatives impacts requires identification of the future natural gas development activity on a county basis.

The following sections discuss the socioeconomic analysis's key components. The approach and key assumptions used for the socioeconomic analysis also are presented below.

### **Existing Well Operations**

There are 75 existing directional wells currently in production. Under Alternatives 1 through 4 these wells are expected to continue to operate for the rest of their useful operating life. Since the existing well production is part of the existing conditions for the Alternative 1 (No Action), only new well production is analyzed in the socioeconomic impact analysis for Alternatives 1 through 4.

Consequently, existing well production is only evaluated under Alternative 5, which would cancel all well leases and close all 75 existing wells. Under Alternative 5, the existing wells closure would result in a direct economic loss from the future natural production from the 75 existing wells.

These wells began producing between 2002 and 2012. For the purposes of the socioeconomic impact analysis the wells are conservatively assumed to have the weighted average start date of 2007. As these wells are anticipated to have a 20-year production lifespan, they are expected, on average, to continue production through 2026. The total estimated annual future production of the 75 wells is estimated to be 4.5 billion cubic feet (Bcf).

### **Future Well Development Locations**

The specific locations of the future well development sites will be selected by the lessee are therefore currently unknown. Therefore, the socioeconomic analysis allocated future well locations based on the proportion of each lease's developable acreage within each county. For example, if 20 percent of a

lessee's land is located in Pitkin County, the analysis attributed 20 percent of that leases' future well development sites to Pitkin County.

In cases where a parcel is predominantly (i.e., 90 percent or more) within a single county, all future well development has been attributed to that county. Additionally, 116 leased acres are located in Gunnison County. However, since none of the individual leases have more than 7 percent of its acreage within Gunnison County, for purposes of the socioeconomic analysis it is assumed that no drilling would occur in Gunnison County.

### New Well Construction

The socioeconomic analysis assumes all wells will be viable as long-term production wells. It also is assumed that future well development will occur at a constant rate over the 20-year analysis period. For example, under Alternative 1, a total of 416 wells would be developed over the future 20-year analysis period. Therefore, approximately 21 new wells will be constructed each year between 2017 and 2036. **Table C-1** shows Alternative 1 future new well construction, producing wells and their total natural gas production on an annual basis.

**Table C-1 Well Count and Natural Gas Production (2017-2036) – Alternative 1**

Year	New Directional Wells	New Horizontal Wells	Producing Directional Wells	Producing Horizontal Wells	Natural Gas Production (Bcf)
2017	19.9	0.9	19.9	0.9	1.5
2018	19.9	0.9	39.8	1.8	3.0
2019	19.9	0.9	59.8	2.7	4.4
2020	19.9	0.9	79.7	3.6	5.9
2021	19.9	0.9	99.6	4.5	7.4
2022	19.9	0.9	119.5	5.4	8.9
2023	19.9	0.9	139.4	6.3	10.4
2024	19.9	0.9	159.4	7.2	11.9
2025	19.9	0.9	179.3	8.1	13.3
2026	19.9	0.9	199.2	9.0	14.8
2027	19.9	0.9	219.1	9.9	16.3
2028	19.9	0.9	239.0	10.8	17.8
2029	19.9	0.9	259.0	11.7	19.3
2030	19.9	0.9	278.9	12.6	20.8
2031	19.9	0.9	298.8	13.5	22.2
2032	19.9	0.9	318.7	14.4	23.7
2033	19.9	0.9	338.6	15.3	25.2
2034	19.9	0.9	358.6	16.2	26.7
2035	19.9	0.9	378.5	17.1	28.2
2036	19.9	0.9	398.4	18.0	29.7
Total	398.4	18.0	398.4	18.0	311.5
Average	19.9	0.9	209.2	9.5	15.6

The future new well development under Alternative 2 would be very similar to that under Alternative 1. Slightly fewer new wells would be constructed under Alternatives 3 and 4. No new well construction would occur under Alternative 5.

**Future Total Natural Gas Projection**

Directional and horizontal wells are expected to produce 1.2 Bcf and 6.4 Bcf of natural gas, respectively, over their 20-year operational lifespans. The wells are expected to operate at a steady production rate. As a result, each directional well is expected to produce 60 million cubic feet of natural gas annually. Each horizontal well is expected to produce 320 million cubic feet of natural gas annually.

**Table C-2** shows the projected total natural gas production for the region and on a county basis by alternative. These values represent the total production over the 20-year analysis period by calculating the number of production wells operating each year (see **Table C-1** above for Alternative 1) and multiplying them by their respective annual production rate.

**Table C-2 Natural Gas Production by County (2017-2036)**

Location	Natural Gas Production (Bcf) (2017-36)				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Four-county Region	311.5	311.5	309.6	288.9	-45.0
Garfield	85.1	85.1	87.8	81.8	-8.6
Mesa	203.9	203.9	199.6	199.7	-35.4
Pitkin	16.2	16.2	15.9	0.7	0.0
Rio Blanco	6.3	6.3	6.3	6.3	0.0

**Estimated Average Cost of Natural Gas Development and Production**

Well Construction

Development of a typical directional natural gas well is expected to employ 55 direct workers working 12-hour shifts for an average of 11 days (BBC Research 2014). This corresponds to a total of 3.5 full time equivalents (FTEs) for 1 year assuming 8-hour shifts. The total cost of new well construction (including all necessary labor, equipment and materials) is estimated to be approximately \$1.8 million (BBC Research 2014).

Construction of a new horizontal well is estimated to take three times as long as a directional well, and therefore is expected to cost approximately three times as much to develop (WPX 2014). Therefore, construction of a new horizontal well is estimated to be \$5.5 million and expected to require a total of 10.5 FTEs of labor.

Note that while the proposed stipulations may reduce the extent of some leases future development, no major additional development costs are expected to be associated with complying with the proposed stipulations and/or the well-site relocations.

Road Construction

Wells may be located in remote areas that will require new road construction for the well to be developed. Other wells may be located near existing roads and therefore would require little in the way of new road construction for site access. For the socioeconomic impact analysis it is estimated that on average one mile of new road construction will be required for each new well pad development and that

each well pad can support an average of seven wells (**USFS 2010a**). Consequently, on average each new well will require 0.14 mile of new road construction.

Road construction cost estimates for the region vary greatly. The Corridor Analysis Report performed for the East Divide Access Route in Pitkin County determined that a previously county maintained gravel road might be upgraded for \$21,000 per mile. The upgrade cost for a minimally maintained natural surface road could cost between \$429,000 and \$2.5 million per mile, depending on the grade, horizontal alignment and other issues (SGM 2012).

For the socioeconomic analysis the average cost of future road construction within the WRNF is estimated to be \$1.1 million per mile for minimally maintained natural surfaces. Therefore each well would require an average of \$157,000 of road construction. Each \$92,000 of labor construction spending is expected to generate 0.64 FTEs of direct and indirect labor (ARRA 2009). It also is estimated that 40 percent of the road construction cost will be for labor. As a result road construction for each well is expected to require \$63,000 in labor spending which would create 0.4 direct and indirect jobs.

#### Natural Gas Production Operations and Maintenance Cost

Once well construction is complete employees will be required to both operate and maintain the wells during their 20-year production lifespan. Recent analysis has estimated that 1,000 directional producing wells will have a total annual operating cost of \$35 million and require 200 FTEs of labor (BBC Research 2014). A horizontal well produces more than five times as much natural gas as a directional well and costs three times as much to construction. Therefore, the socioeconomic analysis averaged the two values for an operating cost factor of four times the operating cost for a directional well. Based on this assumption, 1,000 horizontal producing wells are expected to have an annual operating cost of \$140 million and require 800 FTEs. This direct employment estimate includes not only the required onsite labor but also the necessary management and support.

This translates to 0.2 FTEs per directional well and 0.8 FTEs per horizontal well. About 70 percent of these jobs are directly related to the on-site natural gas production with the remaining 30 percent associated with management, support and downstream activities.

#### Total Natural Gas New Construction, Operating, and Production Cost and Employment

**Table C-3** shows the total well construction and operating costs for Alternative 1. The projected direct employment also is shown. These cost estimates are used by the IMPLAN analysis to estimate indirect and induced employment and economic output impacts to the regional economy.

#### **Future Government Revenues from Natural Gas Activity**

Government revenues generated from oil and gas activities that occur within its jurisdiction will depend on well production quantities. For counties with significant oil and gas extraction activity, oil- and gas-related tax revenue can represent a major percentage of general fund expenses. In 2012 Garfield County received oil and gas related revenues equal to approximately 35 percent of its general fund expenses (Garfield County 2012).

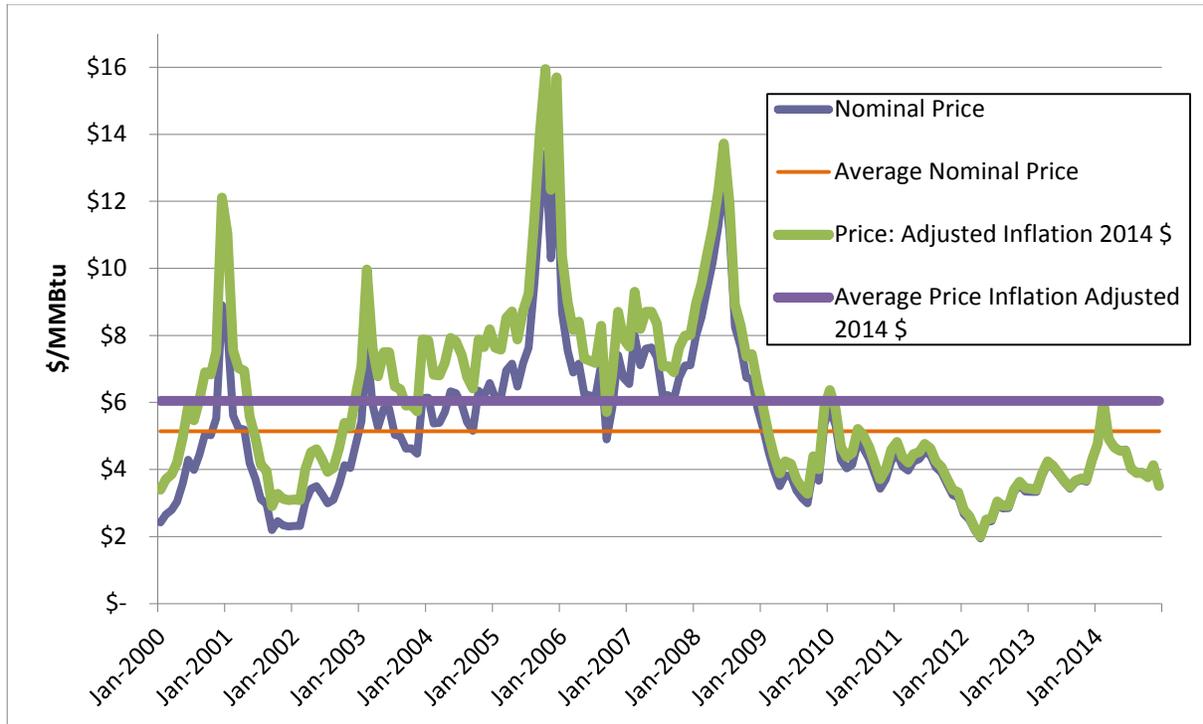
**Table C-3 Future Construction and Operating Costs and Employment (2017-2036) – Alternative 1 (\$ Millions)**

Year	New Well Development Cost				Production Cost				Total Cost	
	Well Construction		Road Construction		Operations		Support			
	Costs	Employment	Costs	Employment	Costs	Employment	Costs	Employment	Costs	Employment
2017	\$41.7	79.0	\$3.3	9.2	\$0.6	3.3	\$0.2	1.4	\$45.8	92.9
2018	\$41.7	79.0	\$3.3	9.2	\$1.2	6.6	\$0.5	2.8	\$46.6	97.6
2019	\$41.7	79.0	\$3.3	9.2	\$1.7	9.9	\$0.7	4.2	\$47.4	102.3
2020	\$41.7	79.0	\$3.3	9.2	\$2.3	13.2	\$1.0	5.6	\$48.2	107.0
2021	\$41.7	79.0	\$3.3	9.2	\$2.9	16.5	\$1.2	7.0	\$49.1	111.7
2022	\$41.7	79.0	\$3.3	9.2	\$3.5	19.8	\$1.5	8.4	\$49.9	116.4
2023	\$41.7	79.0	\$3.3	9.2	\$4.0	23.1	\$1.7	9.8	\$50.7	121.1
2024	\$41.7	79.0	\$3.3	9.2	\$4.6	26.4	\$2.0	11.2	\$51.5	125.8
2025	\$41.7	79.0	\$3.3	9.2	\$5.2	29.7	\$2.2	12.6	\$52.3	130.5
2026	\$41.7	79.0	\$3.3	9.2	\$5.8	33.0	\$2.5	14.0	\$53.2	135.2
2027	\$41.7	79.0	\$3.3	9.2	\$6.4	36.3	\$2.7	15.4	\$54.0	139.9
2028	\$41.7	79.0	\$3.3	9.2	\$6.9	39.6	\$2.9	16.8	\$54.8	144.6
2029	\$41.7	79.0	\$3.3	9.2	\$7.5	42.9	\$3.2	18.2	\$55.6	149.3
2030	\$41.7	79.0	\$3.3	9.2	\$8.1	46.2	\$3.4	19.6	\$56.5	154.0
2031	\$41.7	79.0	\$3.3	9.2	\$8.7	49.5	\$3.7	21.0	\$57.3	158.7
2032	\$41.7	79.0	\$3.3	9.2	\$9.2	52.8	\$3.9	22.4	\$58.1	163.4
2033	\$41.7	79.0	\$3.3	9.2	\$9.8	56.1	\$4.2	23.9	\$58.9	168.1
2034	\$41.7	79.0	\$3.3	9.2	\$10.4	59.4	\$4.4	25.3	\$59.8	172.8
2035	\$41.7	79.0	\$3.3	9.2	\$11.0	62.7	\$4.7	26.7	\$60.6	177.5
2036	\$41.7	79.0	\$3.3	9.2	\$11.6	66.0	\$4.9	28.1	\$61.4	182.3
Total (2017-2036)	\$833.3	1,579.1	\$65.4	184.4	\$23.1	693.2	\$9.8	294.6	\$1,071.6	2,751.3
Annual Average	\$41.7	79.0	\$3.3	9.2	\$23.7	34.7	\$10.1	14.7	\$53.6	137.6

County revenues from natural gas production are expected to support existing job positions and potentially add new jobs. The socioeconomic analysis conservatively assumes that 50 percent of the future new natural gas revenues may be saved in an “Oil and Gas Mitigation Fund” or an “Emergency Reserve Fund.” In which case, during most years when these funds are held in reserve, these contingency funds will have no spending impact on the regional economy. County governments are expected to predominantly use the remaining revenues for capital expenditures (7.5 percent on road construction; 12.5 percent on public building maintenance and repair; and 15 percent on other local government activities (e.g., community development, airports and water). Only 15 percent of the natural gas revenues are expected to be used to pay county government staff salaries.

**Natural Gas Prices**

As seen in **Figure C-1**, there has been significant volatility in natural gas prices nationally since 2000. As a result of nationwide production increases and other factors, natural gas prices peaked at nearly \$13/MMBtu in 2008. However, since then natural gas prices have decreased dramatically (EIA 2015). Between 2000 and 2014, the Henry Hub average nominal natural gas price was \$5.17/MMBtu. Adjusted for inflation, between 2000 and 2014 natural gas prices averaged approximately \$6.05 in 2014 dollars (U.S. Inflation Calculator 2015).



Source: EIA 2014.

**Figure C-1 Henry Hub Natural Gas Prices**

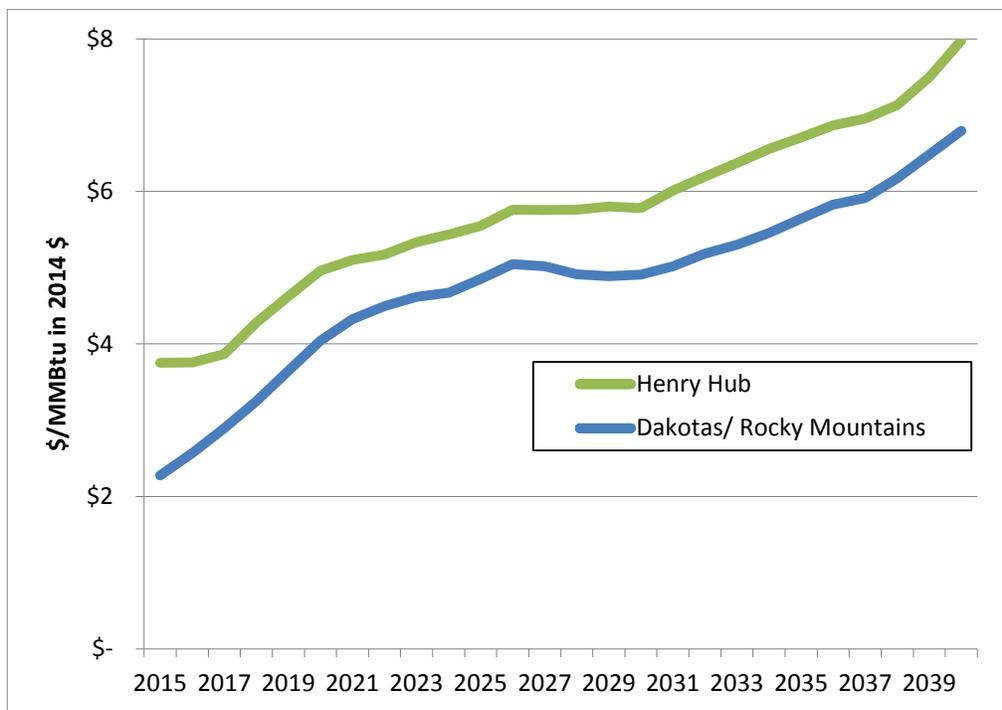
Past Colorado wellhead prices have not consistently correlated with Henry Hub prices due primarily to fluctuations in both natural gas supply conditions and transportation costs. The Leeds 2013 report (citing the Colorado Geological Survey) reported an average of price of \$2.87 per thousand cubic feet (Mcf) in Colorado in 2012, with oil priced at \$87.33 per barrel, and CO<sub>2</sub> at \$0.86 per Mcf. These values were used for the total sales revenue estimates shown in **Table C-4**.

**Table C-4 Natural Gas Sales (2012) (\$ Millions)**

Area	Natural Gas Sales	Oil Sales	CO <sub>2</sub> Sales	Total Sales	Natural Gas Sales (%)
Colorado	\$4,764.5	\$4,252.3	\$377.5	\$9,394.3	51
Four-county Region	\$2,384.6	\$673.7	\$0	\$3,058.3	78
Garfield County	\$1,987.7	\$245.0	\$0	\$2,232.6	89
Mesa County	\$129.4	\$5.6	\$0	\$135.0	96
Pitkin County	\$0	\$0	\$0	\$0	0
Rio Blanco County	\$267.5	\$423.1	\$0	\$690.7	39

Source: **Calculations; COGCC 2015a,b,c; Leeds 2013.**

Recent expansion of Colorado’s natural gas pipeline system has resulted in greater consistency with Henry Hub prices. However, Colorado’s natural gas prices are expected to continue to vary in the future (EIA 2015). As shown in **Figure C-2**, natural gas prices in the Dakotas/Rocky Mountains are forecasted to increase in real terms through 2040 with a projected average price between 2017 and 2036 of \$4.70/MMBtu in 2014 dollars (EIA 2014).



Source: EIA 2014.

**Figure C-2 EIA Natural Gas Price Projections (2015-2040)**

**Table C-5** shows the inflation adjusted projected future price for natural gas based on U.S. Department of Energy Information Administration projections for the Dakotas/Rocky Mountains region (EIA 2014).

**Table C-5 Future Natural Gas Price Projections in Rocky Mountains (\$2014)**

Year	Natural Gas Price \$/Mcf <sup>1</sup>
<b>2014</b>	\$2.61
<b>2015</b>	\$2.28
<b>2016</b>	\$2.57
2017	\$2.89
2018	\$3.25
2019	\$3.65
2020	\$4.04
2021	\$4.32
2022	\$4.50
2023	\$4.62
2024	\$4.67
2025	\$4.85
2026	\$5.05
2027	\$5.02
2028	\$4.91
2029	\$4.89
2030	\$4.91
2031	\$5.02
2032	\$5.18
2033	\$5.30
2034	<b>\$5.45</b>
2035	<b>\$5.64</b>
2036	<b>\$5.83</b>

<sup>1</sup> Future price projections adjusted for inflation from 2013 to 2014 values by 1.62%.using the CPI-U.

Source: EIA 2014.

As new natural gas wells are constructed each year over the 20-year time period, natural gas production from the leases is projected to increase substantially and consequently natural gas revenue payments to the region's County governments also will be expected to increase.

**Table C-6** projects the sales value of Alternative 1 total future natural gas production on annual basis over the 20-year analysis period. The annual sales revenue estimates are based on the expected schedule of well construction (**Table C-3**), well production assumptions (60 and 320 Mcf/yr of natural gas for directional and horizontal wells, respectively), and future expected natural gas price prices (**Table C-5**).

**Table C-7** shows the projected value of total future natural gas production under Alternative 1 for each county in the region. Under all the alternatives, the majority of the future natural gas production (or loss) would occur from natural gas development in Mesa County.

**Table C-6 Projected Natural Gas Production and Revenues (2017-36) - Alternative 1**

Year	Natural Gas Production (Bcf)	Natural Gas Sales (\$ Millions)
2017	1.5	4.3
2018	3.0	9.6
2019	4.4	16.2
2020	5.9	24.0
2021	7.4	32.1
2022	8.9	40.0
2023	10.4	47.9
2024	11.9	55.4
2025	13.3	64.7
2026	14.8	74.9
2027	16.3	81.9
2028	17.8	87.4
2029	19.3	94.2
2030	20.8	101.9
2031	22.2	111.6
2032	23.7	123.0
2033	25.2	133.7
2034	26.7	145.6
2035	28.2	159.1
2036	29.7	172.9
Total	311.5	1,580.4
Average Annual (2017-36)	15.6	79.0

**Table C-7 Total Future Natural Gas Sales by County (2017-2036)**

Location	Total Natural Gas Sales (2017-36)				
	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5
Four-county Region	\$1,580.4	\$1,580.8	\$1,570.9	\$1,465.7	-\$183.4
Garfield	\$431.6	\$431.9	\$445.5	\$415.3	-\$35.3
Mesa	\$1,034.8	\$1,034.8	\$1,012.6	\$1,013.2	-\$148.1
Pitkin	\$82.2	\$82.2	\$80.8	\$3.5	\$0
Rio Blanco	\$32.0	\$32.0	\$32.0	\$32.0	\$0

Note: Total may not sum exactly due to rounding.

### Federal Mineral Lease Revenues

The Federal Government collects royalties, rents and bonus payments from non-renewable resource production occurring on federal lands. Together these fees and royalties constitute the federal mineral lease (FML) revenues paid to the federal government for mineral extraction on federal lands. Total FML payments statewide in Colorado are typically equal to approximately 12.5 percent of the mineral production value.

Nearly half (49 percent) of these revenues are redistributed to the state from where the mineral leases production occurred, which is equivalent to 6.13 percent of the mineral production value. Colorado retains the majority of these revenues (60 percent) and distributes the remaining 40 percent to its county and local governments either through direct distributions (20 percent of the state FML revenues) or through its grant assistance program (20 percent of the state FML revenues). Together these distributions equates to 2.45 percent of the total value of production. The direct distribution is based upon where the resource was extracted.

**Table C-8** provides the 2012 revenues that both the region and each individual county directly received from the Federal Mineral Leasing Program for both oil and gas. The estimated total distribution to local municipalities and school districts also are shown.

**Table C-8 Federal Mineral Lease Revenues for Four County Region (2012)**

Area	FML Revenues (\$ Millions)
Colorado	72.4
Four County Region	8.8
Garfield County	3.8
Mesa County	1.9
Pitkin County	0.0
Rio Blanco County	3.1
Local Communities <sup>1</sup>	3.5

<sup>1</sup> Includes nearby school and special districts as well as the communities of Parachute, Rifle, Silt, New Castle, Glenwood Springs, Carbondale, and De Beque. Local communities FML revenues are included within county totals.

Source: Leeds 2014a.

This analysis assumed that future FML revenues for the region's counties and local communities would continue to be 2.45 percent of total natural gas sales value. For the purposes of the analysis, the economic impacts to local governments are recognized and aggregated at the county level. The socioeconomic analysis primarily focuses on the county government revenues changes. Due the number and complexity of the sub-county jurisdictions, the specific revenue impacts to smaller municipalities are not estimated.

### Property Taxes

The counties assess annual property taxes on three separate types of properties (land, improvements, and the extracted minerals). The federal government does not pay any county or city property taxes on the land they own and improvements they construct. Instead the federal government generally pays "Payments in Lieu of Taxes" (PILT) to local governments to help offset their losses in property taxes. Future PILT are not expected to changes as a result of future well development and therefore are not further analyzed.

However, local counties and cities obtain property tax revenue from non-federal improvements and the minerals extracted on these lands (Sean McCourt 2015). The counties collect these property taxes on behalf of the local agencies based on mill levies set by the counties, cities, towns, special districts and school districts and then distributes them according to the agencies. **Table C-9** shows the total natural gas related properties tax revenues received in 2012 by the region’s counties and local communities. The average property tax percentages on natural gas production also were estimated based on its corresponding natural gas production values. These values were estimated based on the percentage of natural gas sales to total mineral extraction revenues.

**Table C-9 Estimated Property Tax Rates (2012)**

Area	Property Tax on Natural Gas Production (\$ Millions)	Production Value Percentage
Four County Region (ex. local agencies) <sup>1</sup>	43.8	1.84
Garfield County	34.5	1.74
Mesa County	6.3	4.89
Pitkin County <sup>2</sup>	0.0	1.10
Rio Blanco County	2.9	1.10
Local Communities <sup>3</sup>	49.9	0.93

<sup>1</sup> Regional total only includes county governments.

<sup>2</sup> Pitkin County currently has no natural gas production. Pitkin’s future property tax rate is assumed to be the same as Rio Blanco County.

<sup>3</sup> Includes nearby school and special districts as well as all cities and towns in the region. However, cities and towns accounted for only \$105,000 combined.

Source: Leeds 2014a.

### Severance Tax

In 2012, 71 percent of Colorado’s natural gas sales were taxed for severance compared with only 19 percent of the state’s oil production. As a result, natural gas production generated 81 percent of the state’s total severance tax revenues. These values were used to determine the amount of severance produced by natural gas and compared it to natural gas sales in the state. If a particular well development is assessed a property tax levy greater than 58 mills, then it will incur no severance tax (consequently wells in Mesa County are expected to result in no future severance tax revenues).

Colorado distributes fifty percent of its collected severance tax revenues through its local impact fund. The local impact fund distributes thirty percent (or 15 percent of total severance tax revenues) directly to county and local agencies and the other 70 percent (or 25 percent of total severance tax revenues) are distributed as competitively awarded grant projects.

A county may receive severance tax revenues even if wells in the county did not generate any severance tax revenue. **Table C-10** shows the estimated natural gas severance taxes directly distributed to each county as well as local communities. In addition, severance tax also funds a state-wide grant program. Allocation is determined for specific projects basis on both need and on a competitive basis. Consequently, the extent that any future severance tax revenue increases from the Alternatives will result in increased grant program awards for the local communities cannot be projected. Therefore, only direct distribution severance revenues are attributed by the socioeconomic analysis.

**Table C-10 Estimated Severance Tax Revenues and Rates (2012)**

Area	Severance Tax Direct Distribution from Natural Gas Production	Production Value Percentage
Colorado	\$60.7	1.80
Four County Region <sup>1</sup>	\$3.7	0.11
Garfield County	\$1.7	0.05
Mesa County	\$1.5	0.04
Pitkin County	\$0.0	0.01
Rio Blanco County	\$0.5	0.01
Local Communities <sup>2</sup>	\$1.3	0.04

<sup>1</sup> Regional total only includes county governments.

<sup>2</sup> Includes nearby school and special districts as well as the communities of Parachute, Rifle, Silt, New Castle, Glenwood Springs, Carbondale and De Beque.

Source: Leeds 2014b.

**Table C-10** shows the calculated percentages to be used in the analysis based on natural gas sales in Garfield, Pitkin and Rio Blanco Counties. The estimated total severance tax revenues distributed to local municipalities and school districts also are shown. Although the analysis did not include the estimated future local severance tax revenues in its IMPLAN analysis estimating the indirect and induced economic impacts, if these revenues are obtained in the future they may be expected to result in induced and indirect of a similar type and proportional magnitude as those determined for the county severance tax revenues.

**Colorado Oil and Gas Conservation Commission (COGCC) Taxes**

Oil and gas companies are required to pay COGCC a conservation levy (currently 0.07 percent of sales less qualified exemptions) for commission expenses and to contribute to its Environmental Response fund. COGCC tax revenues in 2012 were \$4.7 million and down from \$7.1 Million in 2011 (Leeds 2013). However these revenues do not directly impact the county or local governments and were therefore are not considered further in the socioeconomic analysis.

**Total County Governmental Revenues from Natural Gas Production**

The future natural gas related revenue from future development of the EIS alternatives are estimated based on the estimated future natural gas production increases (shown in **Table C-1** and **C-2**) and the tax specific average percentage rates. Over the 20-year study period, the combined total of all natural gas related revenues are expected to result in an estimated \$98.8 million in additional revenues for the local governments within the Four County Region. **Table C-11** shows the future total tax revenues for each county based on the estimated future sales from the natural gas operations.

**Table C-11 Total Projected Natural Gas Revenues for Counties (2017-36) - Alternative 1 (\$ Millions)**

Area	Total Natural Gas Revenues	FML Revenues	Property Taxes	Severance
Four County Region <sup>1</sup>	\$98.8	\$38.7	\$59.4	\$0.7
Garfield County	\$18.4	\$10.6	\$7.5	\$0.3
Mesa County	\$76.2	\$25.4	\$50.6	\$0.2
Pitkin County	\$3.0	\$2.0	\$0.9	\$0.1
Rio Blanco County	\$1.2	\$0.8	\$0.4	\$0.1
Local Communities <sup>2</sup>	\$14.9	\$0.0	\$14.7	\$0.2

<sup>1</sup> Regional total only includes county governments.

<sup>2</sup> Includes nearby school and special districts as well as the communities of Parachute, Rifle, Silt, New Castle, Glenwood Springs, Carbondale, and De Beque. FML revenues are accounted for at the county level.

### **Cancellation of Existing Leases**

**Some or all of the leases may be canceled at the BLM's or by the lessee request as a result of the new stipulations. Should the lessee not accept the new lease stipulations on a producing lease, it may be necessary for the BLM to request judicial action to cancel the lease. The federal government will only be responsible for repayment of the federal share of the refund to the lessee. Should a lease be cancelled by the BLM, the federal government would expect to provide the full refund amount to the potentially affected lessees and the State of Colorado's share of the refund would most likely be deducted from future disbursements to the State, per 30 USC 1721a. Ultimately, approximately 51 percent of the refund would come from the federal government, and 49 percent would be withheld from future federal mineral revenue payments to the State of Colorado Department of Local Affairs (DOLA 2015). The state's formula for allocation of future disbursements to local governments is unknown; however, while a percentage of these funds was distributed to the counties, in accordance with similar circumstances for the Roan Plateau lease cancellation per the Roan Plateau Settlement Agreement, it is expected that the counties (and any other local agencies) would not be required to repay any of their past revenues from the cancelled leases.**

If an Alternative (e.g., Alternative 4) cancels part of a lease, the BLM would refund any bonus bids and lease payments associated with the specific acreage loss. Each lease pad typically requires at most 10 acres of developable area. Depending on the stipulations and site conditions, a specific lease location may not be to support development of a lease pad. Therefore, as a conservative assumption, all leases with less than 100 acres of remaining unencumbered land areas are assumed to be completely canceled and all of its bonus bids and lease payments will be refunded.

Alternatives 2, 3, and 4 are expected to result in some future reductions (compared to Alternative 1) in the natural gas production of some of their lease parcels. However, the reductions are expected to be relatively limited and it is assumed that no refunds payments by BLM would be required.

### **IMPLAN Analysis**

Impact Analysis for PLANning (IMPLAN) is the Input-Output model used to evaluate economic effects of each EIS Alternative. The IMPLAN model was originally developed by the U.S. Department of Agriculture Forest Service to assist in land and resource management planning, but its role has expanded to serve clients in federal, state, and local governments, universities, as well as the private sector. IMPLAN is an accepted and widely used regional economic modeling tool that can measure the effect of projects or policies on local economic conditions. The IMPLAN model can estimate changes in

regional output, income, value added, and employment. Accordingly, the model is used to estimate regional output and employment effects, which are the focus of this analysis.

IMPLAN provides estimates of direct, indirect and induced economic impacts based on future changes in spending with the region. IMPLAN can analyze both the initial spending change (i.e., direct spending) and its subsequent indirect economic effects resulting from income transfers to supplier businesses and induced economic effects from employee (of both the direct and supplier business's) spending of their wages.

IMPLAN also can estimate the economic impacts on a sector by sector basis so that the magnitude of employment and output changes can be estimate not only on total overall countywide (or regional) basis but also for a specific business sector (or set of sectors). IMPLAN generally can analyze up to 536 sectors – although in many cases, and particularly in more rural counties, many business sectors may not be active in the economy.

Output represents the value of industry production. In IMPLAN these are annual production estimates expressed in producer prices. For manufacturers this would be sales plus/minus change in inventory. For service sectors production output is represented by sales. For retail and wholesale trade, output corresponds to gross margin (i.e., net of the goods' input cost) and not gross sales.

The 2013 IMPLAN dataset for Garfield, Mesa, Pitkin, and Rio Blanco counties were used to develop both the combined regional-level and individual County models used by the socioeconomic analysis to estimate the direct, indirect and induced impacts from the projected spending future changes under the EIS Alternatives. IMPLAN is an annual model and therefore all model inputs were converted into average annual values (undiscounted) based on a straight-line extrapolation of the future spending effects between 2017 and 2036. In addition, all effect estimates have been normalized into 2014 dollar terms so that no price (i.e., inflation) effects are reflected in the economic or cost impact calculations. In the case of this analysis, the direct impacts calculated by IMPLAN were not utilized in the final estimation of employment and economic activity impacts. These impacts were based off of research conducted by BBC that provided locally estimated employment, construction and operation costs of the oil wells. It was felt that these estimates provided a better approximation of the direct impacts of the well construction and natural gas production.

Overall spending is expected to occur in four separate industries. Construction is expected to occur in both the "37-Drilling Oil and Gas Wells" and "56-Construction of New Highways and Streets" industries with employment and spending expected to remain constant through the analysis period. Production is expected to occur in "21-Extraction of Natural Gas Liquids" and "38-Support Activities for Oil and Gas Operations" industries, and is expected to gradually increase as more wells begin to produce.

### **Well Construction and Natural Gas Production**

Future well and road construction will result in substantial capital spending. Construction costs will include payments to construction labor, as well as procurement of construction-related goods and services. Similarly, the subsequent developed wells will incur annual operating and maintenance (O&M) costs associated with their natural gas production that also will add new economic activity to the region's economy.

The regional economic effects from well and road construction will be temporary, coinciding with the construction period. Future lease development and well construction activity could vary over the 20-year timeframe. However, for this analysis, future well and road construction activity have been allocated proportionately over the 20-year period in order to provide estimates of average annual economic effects attributed to well construction for future lease development under each EIS Alternative. Future O&M spending will increase in the region as the newly constructed wells begin steady production.

To the extent that this construction and operations spending occurs locally, future lease development will generate regional economic effects. However, based on the relatively small size of the local counties' economies and the specialized nature of many of the construction inputs, it is anticipated that substantial portion of the well construction expenditures would be for equipment and materials that would need to be imported into the region. In which cases, the portion of the construction spending for wells would have less of an economic effect on local and regional economies than if they were larger economies that were able to supply a higher percentage of the required equipment and materials.

The IMPLAN analysis evaluates payments to labor separately from spending on equipment and materials. The IMPLAN analysis allocated total construction spending across these three expense categories: labor (20 percent for well construction and 40 percent for road construction); equipment (40 percent for well construction and 30 percent for road construction) and materials (including input services) (40 percent for well construction and 30 percent for road construction). For operations spending, it was assumed that labor cost would account for the majority (60 percent) of the annual production related cost with the remainder split evenly between equipment (20 percent), and materials (20 percent).

#### Labor Sourcing

As a result of the region's past history of natural gas development and its current labor supply conditions, future construction labor sourcing for wells is assumed to be an 80 percent labor local resident and 20 percent non-local employment. Non-local workers would likely consist of both specialized skill employees and less skilled general laborers that would be needed for specific tasks or on a short-notice/short-term basis (BLM 2015). For road construction it is expected that all employment needs would be met locally. Future labor needs for the operations of the producing wells are expected to be possible by employing local residents.

Some of these workers (especially the more skilled workers) may be interested and willing to relocate to the area - particularly given the federal leases' 20-year development rights. If the actual proportion of transient workers is less than the 20 percent assumed by the impact analysis, the magnitude of the direct, indirect, and induced effects may be expected to be proportionally increased as a greater portion of the project's labor expenditures would instead be spent within the region.

For the purposes of the socioeconomic analysis of the potential population growth-related impacts (e.g., housing and public services demand) it is assumed that all non-local workers might represent the development-related transient labor attracted to the region. However, given the projected steady long-term construction that might encourage the transient workers permanent relocation to the region, the regional labor income effect was based on the full total construction labor spending.<sup>1</sup> These labor payments are modeled in IMPLAN as a labor income change (5001-Employee Compensation).

#### Equipment and Materials Sourcing

The IMPLAN analysis also noted the extent to which purchases of major equipment would likely need to be imported from outside the region. For other equipment and materials, the extent to which spending would occur in the local area is based on trade data in the IMPLAN model.

Only a minor proportion (10 percent) of the well development-related equipment or material purchases are expected to originate within the region. The majority of the local economic effect will likely result from in region value added from assembly or final manufacturing of equipment and materials. On-site consumption of natural gas would also account for a major proportion of development-related

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<sup>1</sup> A limited portion of the labor cost may consist of wages to staff working off-site (e.g., upper managers, accounting and other support staff) and located outside the region. However, no adjustment was made to the construction labor income since their proportion is unknown and expected to be minor compared to the on-site employment.

construction spending in the region. Consequently, a 10/90 local/non-local purchasing ratio for both well equipment and wells materials is conservatively assumed to ensure that the economic impacts to the regional from future well construction are not overestimated (BLM 2015).

**Impact Findings**

The above spending change estimates and cost factors were incorporated into the four county regional IMPLAN model. The socioeconomic impact analysis also modeled and analyzed each county individually. The results below are a combination of the direct employment impacts based on the BBC Research estimates and the IMPLAN estimated indirect and induced impacts. The IMPLAN estimated jobs were converted into FTE terms using a sector-based conversion factor. The combined four county region results are slightly higher the sum of the four counties modeled individually as the combined four county region model also includes the spending transactions between the counties.

**Tables C-12 to C-14** shows the expected labor impacts from the projected future well construction and natural gas production operations for the Alternatives 1, 4, and 5.

**Table C-12 Total Employment and Revenue Impacts Generated from Natural Gas Development and Operation (2017-36) - Alternative 1 (\$ Millions)**

Impact Type	County				Four County Region
	Garfield	Mesa	Pitkin	Rio Blanco	
<b>Employment (FTEs)</b>					
Direct	814.0	1,721.0	155.0	60.0	2,751.0
Indirect	118.8	345.1	9.3	9.6	592.8
Induced	260.0	884.0	29.6	9.6	1,240.2
Total (2017-36)	1,192.8	2,950.1	193.9	79.2	4,584.0
<b>Income (Millions \$)</b>					
Labor Income	\$83.1	\$192.8	\$16.4	\$5.6	\$309.1
Value Added	\$49.9	\$139.2	\$7.4	\$3.0	\$217.4
Output	\$277.8	\$642.5	\$42.7	\$19.6	\$1,021.3

Source: BBC 2012; IMPLAN 2015.

**Table C-13 Total Employment and Revenue Impacts Generated from Natural Gas Development and Operation (2017-36) - Alternative 4 (\$ Millions)**

Impact Type	County				Four County Region
	Garfield	Mesa	Pitkin	Rio Blanco	
<b>Employment (FTEs)</b>					
Direct	776.0	1,698.0	7.0	60.0	2,542.0
Indirect	113.3	362.1	0.4	9.6	547.7
Induced	247.5	716.7	9.3	9.6	1,145.8
Total (2017-36)	1,136.8	2,776.9	16.7	79.2	4,235.5
<b>Income (Millions \$)</b>					
Labor Income	\$79.1	\$190.2	\$1.1	\$5.6	\$285.6
Value Added	\$47.5	\$146.0	\$1.2	\$3.0	\$201.6
Output	\$264.6	\$601.9	\$3.2	\$19.6	\$943.5

Source: BBC 2012; IMPLAN 2015.

**Table C-14 Total Employment and Revenue Impacts Generated from Natural Gas Development and Operation (2017-26) - Alternative 5 (\$ Millions)**

Impact Type	County				Four County Region
	Garfield	Mesa	Pitkin	Rio Blanco	
<b>Employment (FTEs)</b>					
Direct	-32.0	-118.0	0	0	-150.0
Indirect	-4.7	-18.4	0	0	-24.6
Induced	-12.2	-76.6	0	0	-83.4
Total (2017-26)	-49	-213	0	0	-258.0
<b>Income (Millions \$)</b>					
Labor Income	-\$3.9	-\$16.7	\$0.0	\$0.0	-\$21.1
Value Added	-\$2.3	-\$9.9	\$0.0	\$0.0	-\$12.1
Output	-\$10.8	-\$43.1	\$0.0	\$0.0	-\$53.6

<sup>1</sup> No new well construction would occur. All 75 existing wells would be abandoned despite an average of 10 years of remaining production potential. Values shown are only for the 2017-26 loss in natural gas production for these existing wells.

Source: IMPLAN 2015; BBC 2012.

**Government Revenue Payments from Natural Gas Production**

Future county revenues were projected based on WRNF’s increased future natural gas production. The additional county revenues are expected to support government programs and capital improvement projects. The revenue payments will likely not only directly maintain county agency staff but also will potentially generate new jobs. Based on the Garfield County’s 2012 Financial Report, the IMPLAN analysis conservatively assumed that 50 percent of the revenue would be retained as “Reserve Funds.” The remainder was assumed would be used for capital projects or services: road construction (7.5 percent); public building maintenance and repair (12.5 percent); other local government services (e.g., community development, airports and water) (15 percent); and county or program staff salaries (15 percent).

Tables C-15 to C-17 shows the expected economic impacts from the projected future county revenues under the Alternatives 1, 4, and 5.

**Table C-15 Total County Government Revenue Impacts (2017-36) – Alternative 1 (\$ Millions)**

Impact Type	County				Four County Region
	Garfield	Mesa	Pitkin	Rio Blanco	
<b>Employment (FTEs)</b>					
Direct	63.7	257.0	8.6	3.8	332.3
Indirect	16.2	88.0	2.4	0.3	121.6
Induced	18.7	125.9	2.0	0.5	146.2
Total (2017-36)	98.6	470.9	13.0	4.6	600.1
<b>Income (Millions \$)</b>					
Labor Income	\$4.4	\$27.4	\$1.1	\$0.3	\$36.9
Value Added	\$5.0	\$37.4	\$1.3	\$0.4	\$49.6
Output	\$9.2	\$68.8	\$2.3	\$0.6	\$89.8

Source: BBC 2012; IMPLAN 2015.

**Table C-16 Total County Government Revenue Impacts (2017-36) – Alternative 4 (\$ Millions)**

Impact Type	County				Four County Region
	Garfield	Mesa	Pitkin	Rio Blanco	
<b>Employment (FTEs)</b>					
Direct	62.4	251.6	0.5	3.8	<b>318.4</b>
Indirect	15.8	86.1	0.2	0.3	115.2
Induced	18.3	123.3	0.1	0.4	138.6
Total (2017-36)	96.6	461.0	0.8	4.6	<b>572.2</b>
<b>Income (Millions \$)</b>					
Labor Income	\$4.3	\$26.8	\$0.1	\$0.3	\$34.9
Value Added	\$4.8	\$36.6	\$0.1	\$0.4	\$47.0
Output	\$9.0	\$67.3	\$0.1	\$0.6	\$85.1

Source: BBC 2012; IMPLAN 2015.

**Table C-17 Total County Government Revenue Impacts (2017-26) - Alternative 5 (\$ Millions)**

Impact Type	County				Four County Region
	Garfield	Mesa	Pitkin	Rio Blanco	
<b>Employment (FTEs)</b>					
Direct	-5.3	-36.7	0	0	-41.7
Indirect	-1.3	-12.6	0	0	-15.3
Induced	-1.5	-18.0	0	0	-18.4
Total (2017-26)	-8.1	-67.3	0	0	-75.3
<b>Income (Millions \$)</b>					
Labor Income	-\$0.5	-\$3.9	\$0.0	\$0.0	-\$4.6
Value Added	-\$0.7	-\$5.3	\$0.0	\$0.0	-\$6.2
Output	-\$1.2	-\$9.8	\$0.0	\$0.0	-\$11.3

<sup>1</sup> No new well construction; 75 wells abandoned with an average of 10 years of remaining production potential. Values shown are only for the 2017-27 loss in natural gas production by existing wells.

Source: BBC 2012; IMPLAN 2015.