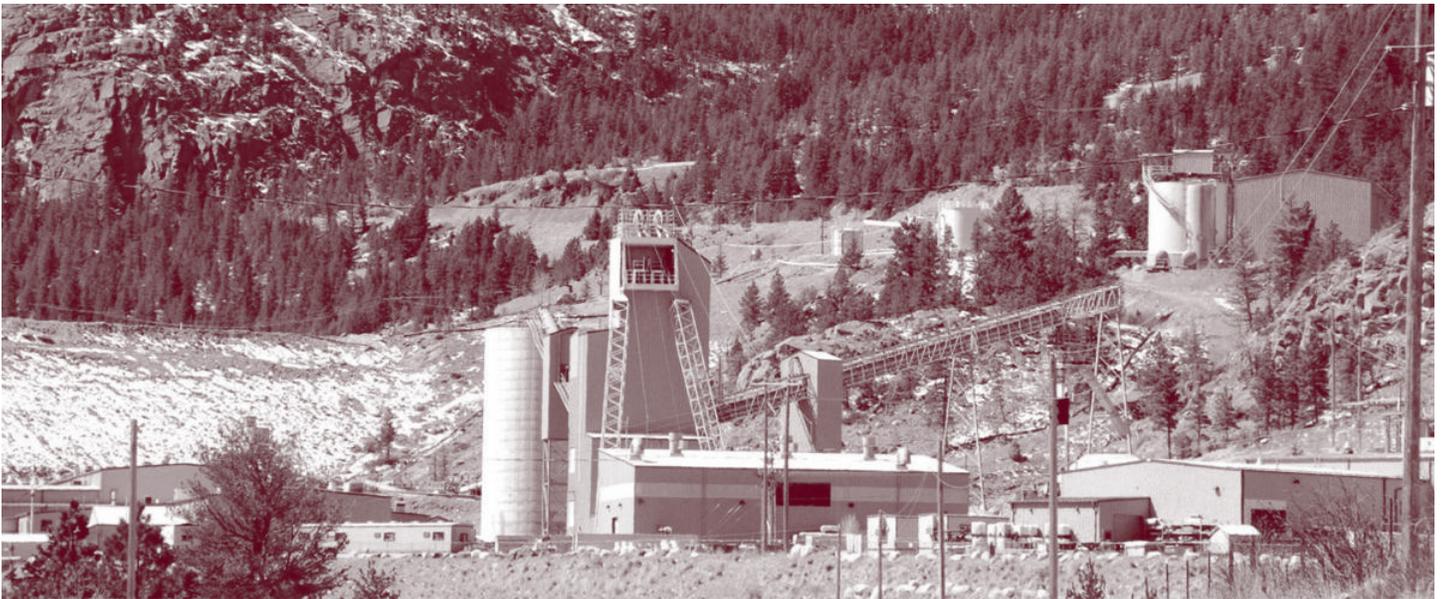




**BUREAU OF BUSINESS AND
ECONOMIC RESEARCH**
UNIVERSITY OF MONTANA



THE ECONOMIC CONTRIBUTION OF MONTANA'S HARDROCK MINING INDUSTRY

EXECUTIVE SUMMARY
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The Economic Contribution of Montana's Hardrock Mining Industry: Executive Summary

What would the economy of the state of Montana look like if the eight largest hardrock mines – producing copper, palladium, gold, talc, cement and other products and materials – did not exist? The communities in which those facilities are located – the businesses, the households and governments whose economic fortunes are closely tied with the success of Montana's mines – already understand the importance of the hardrock mining industry to their own prosperity. It is perhaps less apparent – but no less important – to the population of the state as a whole.

This study is intended to provide information to shed light on this question. Using comprehensive information gathered from the state's eight largest mining facilities on the breadth and scale of their operations, as well as the activities of the dozens of exploration projects underway throughout the state, we construct a picture of what economic activity across the state would look like if those operations did not exist. Such a picture removes not just the mining activities themselves, but the transportation, energy, engineering, and other activities that are closely linked to mining production, as well as the spending and activity in the economy as a whole that are induced by the considerable spending of mining companies and their employees.

We also consider the future changes that can be expected to occur in the state economy should three proposed new mines be successfully developed and brought into operation: the Rock Creek, Montanore, and Black Butte Copper mines. We use projected levels of investment, employment, wages and vendor purchases to identify and estimate the changes in employment, income, output, population and state revenues that can be expected to occur in this scenario.

Our analysis is quite detailed, but the answers to the basic research questions are quite simple. The Montana hardrock mining industry is an important source of prosperity and value to Montana households, businesses and governments. Not just in the mining communities, but throughout the state. The state's eight largest hardrock mining, talc mining and cement materials facilities together with the ongoing exploration activities, ultimately produce a state economy that:

- has 12,304 more permanent, year-round jobs with average annual earnings of \$86,030 per job,
- produces an additional \$2.7 billion dollar each year in economic output,
- sees Montana households receive \$1.1 billion more per year in income, including \$1 billion in after-tax income available for spending in their local communities,
- helps state government realize almost \$200 million in additional tax and non-tax revenue per year, and
- supports a population that is larger by 20,293 people, including 4,933 more school-aged children,

in comparison to an economy where those activities were not present.



These economic contributions are well in excess of the employment, production, and tax receipts produced by the industry directly, and reflect (i) the extensive linkages that exist between Montana’s mines and the rest of the economy, (ii) the high value-added nature of hardrock mining and the resultant high levels of capital expenditure and worker wages, and (iii) the outsized contributions of natural resource industries in general, and the hardrock mining industry in particular, to Montana state government’s revenue mix.

The Economic Impact of Mining in Montana Impacts Summary

Category		Units	Impacts
Total Employment	Text	Jobs	12,304
Personal Income		\$ Millions	1,154.5
Disposable Pers. Income		\$ Millions	1,005.3
Selected State Revenues		\$ Millions	199.4
Output		\$ Millions	2,721
Population		People	20,293

It is important to note that these sizable contributions doubtless underestimate by a large factor the full economic benefits that Montana households, businesses and governments ultimately derive from the hardrock mining industry. This is because this analysis does not take into account the unique and irreplaceable value of the products hardrock mines deliver, making possible countless modern goods and services purchased by consumers, businesses and others. We do not, for example, consider how the palladium mined by Sibanye-Stillwater helps improve public health by reducing engine emissions through its use in catalytic converters, how copper mined by Montana Resources helps power the myriad of electronic machines and devices that improve our lives, or how the gold mined by Barrick finds its way into high tech medical and electronic devices.

The importance of these economic contributions is also magnified because of the specific places and communities where the production takes place. In larger cities with more diversified economies, the fortunes of individual industries can be offset in part by opportunities in other sectors of the economy. High paying mining jobs would be difficult to replace in almost any circumstance, but the comparative lack of opportunities in some of the smaller towns and rural communities where current activities take place makes them especially important.

A second finding of this report concerns the changes in economic activity that would be expected to take place if three new mines – Rock Creek, Montanore and Black Butte – were fully developed and became operational. Compared to an economy where no new development takes place, we estimate that a state economy with new development brought online in year 2020 as described would:

- have an addition 3,531 jobs in a wide spectrum of industries and occupations by the year 2025,
- realize an addition \$228.6 million in annual personal income within five years of operation,
- produce \$450 million more each year in economic output, and
- add more than \$35 million each year to state government revenues by year 2025.



The development of new mines produces a different pattern of economic impacts as the projects proceed through the development, construction, and operations phases, and some of the changes – especially those relating to population movements – take more time to manifest themselves. But the basic story concerning how these new mines could be expected to contribute to the economy of the individual regions as well as the state as a whole is unchanged – they would add significantly to the size of the economic pie.

The Economic Impact of Proposed New Mines in Montana Impacts Summary

Category	Units	Impacts by Year		
		2020	2025	2030
Total Employment	Jobs	3,257	3,531	3,102
Personal Income	\$ Millions	186.1	228.6	227.0
Disposable Pers. Income	\$ Millions	159.9	196.6	195.7
Selected State Revenues	\$ Millions	25.9	37.5	38.9
Output	\$ Millions	407.8	450.3	460.8
Population	People	886	3,233	3,775

Research Method

These findings are based on an analysis of the hardrock mining industry’s economic contributions conducted by the University of Montana’s Bureau of Business and Economic Research (BBER). As detailed in the body of the report, the analysis makes use of the BBER’s policy analysis model of the Montana economy, leased from Regional Economic Models, Inc. (REMI), which has been designed and calibrated expressly for this purpose. The REMI model (www.remi.com) has been thoroughly documented, tested, and evaluated in dozens of peer-reviewed research journals, and the BBER’s adaptation of the model for this study follows the state-of-the-art practices in conducting policy research.

The model was used to create a “without mining” scenario for the Montana economy – a level of economic activity that would be observed if mining (either existing or proposed new mines) did not exist. This is not a shutdown scenario. Rather, it is a level of employment, income, investment, production and population that would be observed if mining activities were not present. The “without mining” economy removes (i) the mining jobs, wages, production, vendor purchases, and taxes paid that are directly associated with the mines themselves, (ii) the transportation and contractor activities that are not a part of the mines but would not take place in the absence of mining activity, and (iii) the seemingly unrelated activities in the rest of the economy that would nonetheless be affected by the reduced spending of businesses, households and governments in response to declines in their income, sales, and tax revenues reflecting the absence of mine and mine-related activity.

The difference between this “without mining” economy and the actual economy – which contains all of the operations of the state’s current mining and exploration activities – represents the economic contribution of the industry as a whole.

The Economic Contribution of Existing Mines: Employment Impacts

A more detailed examination of the economic contribution of Montana’s existing mines yields important insights concerning the breadth and magnitude of its impacts on the economy. Many of the more than 12,000 jobs that exist in state economy because of the mining industry today are found in the mining industry itself, as one would expect. As shown in the table on the next page, there are 2,849 jobs in the mining industry which are present in the economy due to the exploration and production activities of hardrock mining. This is about 23 percent of the total number of jobs supported by the industry.

Perhaps more surprising are the employment impacts shown in the table for other industries across the state. These impacts come about because of the loss of income, revenues and sales. Retail sales employment, construction employment, and even health care employment would be lower today if the hardrock mining industry did not exist.

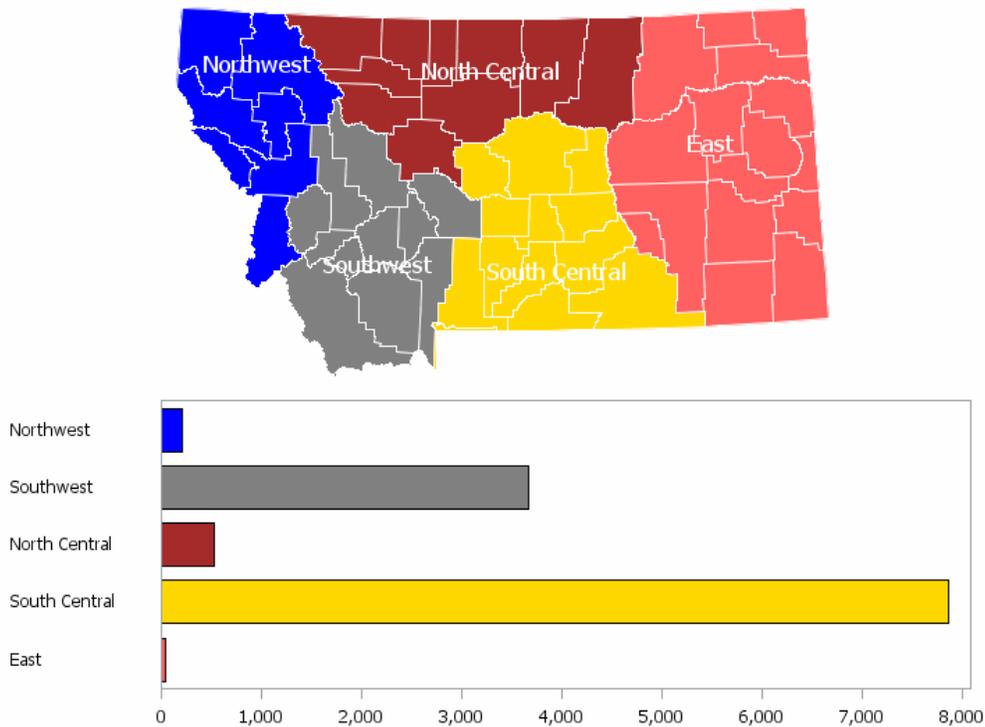
The Economic Impact of Mining in Montana Employment Impacts

Industry	Jobs
Mining	2,849
Construction	860
Manufacturing	275
Wholesale Trade	310
Retail Trade	1,607
Transportation and Warehousing	95
Professional and Technical Services	824
Administrative and Waste Services	291
Health Care and Social Assistance	878
Arts, Entertainment, and Recreation	117
Accommodation and Food Services	866
Other Services, except Public Administration	440
Other Private	798
Government	2,095
TOTAL	12,304

Of particular note is the presence of 2,095 jobs in government that comes about because of hardrock mining. While some regulatory jobs at all levels of government are associated with industry activities, the preponderance of these jobs come about because of (1) the outsized tax contributions of the hardrock mining industry which support a diverse array of state and local government jobs and services, and (2) the demands of the population that exists in the state today because of mining, especially the demand on local public schools from the presence of nearly 5,000 more school-aged children in Montana today that would be present if the hardrock mining did not exist.

The employment footprint supported by the hardrock mining industry varies across the regions of the state, as shown on the map on the following page. The south central portion of the state, home to some of the most important mining facilities as well as the city of Billings, the largest retail and wholesale distribution center in the state, has the largest number of jobs which owe their existence to the hardrock mining industry. Southwest Montana also has a significant share of the more than 12,000 jobs ultimately supported by hardrock mining. Employment impacts of mining are smaller, yet still important, in other regions of the state.

The Economic Impacts of Mining in Montana Employment Impacts by Region



The Economic Contribution of Existing Mines: Personal Income and Compensation Impacts

A state economy with the hardrock mining industry is an economy with more income – both for households and businesses. Personal income – the income received by Montana households – is higher by more than \$1.1 billion per year statewide. That amount is higher than the total personal income of all but 8 of Montana’s 56 counties. The income received by Montana households because of the presence of the mining industry in the state is roughly equivalent to the total income of Lake County in the northwestern region of the state. The spending power of that income, of which over \$1.0 billion is disposable, after-tax income, is one reason why the impacts of mining extend to most segments of the state economy.

The largest share of the income that is ultimately supported by the hardrock mining industry in Montana is earnings – income derived from employment, as shown in the table on the following page.



Earnings is, of course, associated with the jobs supported by the mining industry’s operations described above. But it also includes increased hours, higher wages and more revenue for existing payroll jobs and business proprietors. There are also portions of property income – from sources such as rent, dividends and royalties – that come about because of mining operations. This so-called unearned income, which also includes transfer payments from government programs, is higher in a more populous, more prosperous economy that includes hardrock metal mining.

The Economic Impact of Mining in Montana Personal Income Impacts (\$ millions)

Category	Impact
Total Earnings by Place of Work	1,058.5
Total Wage and Salary Disbursements	781.7
Supplements to Wages and Salaries	213.8
Employer contributions for employee pension and insurance funds	134.9
Employer contributions for government social insurance	78.8
Proprietors' income with inventory valuation and capital consumption adjustments	63.0
Less: Contributions for government social insurance	150.1
Employee and self-employed contributions for government social insurance	71.3
Employer contributions for government social insurance	78.8
Plus: Adjustment for residence	-10.6
Gross In	10.9
Gross Out	21.4
Equals: Net earnings by place of residence	897.8
Plus: Property Income	129.4
Dividends	39.4
Interest	67.2
Rent	22.7
Plus: Personal Current Transfer Receipts	127.3
Equals: Personal Income	1,154.5
Less: Personal Current Taxes	149.2
Equals: Disposable Personal Income	1,005.3



These income contributions recur each year. The spending supported by this income supports permanent jobs in the state economy, as well as the sustainment of many important governmental services.

A closer examination of the contribution of hardrock mining to worker earnings yields more insights concerning the impacts of mining on the prosperity of Montana households. As shown in the table on the following page, the \$1.058 billion of recurring, annual earnings paid to Montana workers that occurs because of the presence of hardrock mining operations in the economy consists of three pieces. The largest is wages and salaries, paid to payroll employees, amounting to about \$782 million per year. A second piece, other labor income, consists of employer-paid worker benefits, including the cash value of pension contributions made in those workers names by their employers. Earnings is defined as compensation – wages and benefits – plus business proprietor income. The latter are business owner income for sole proprietors, partnerships, self-employed and other non-corporate establishments.

The Economic Impact of Mining in Montana Compensation Impacts

Category	Units	Impact
Wages and Salaries	\$ Millions	781.7
Compensation	\$ Millions	995.5
Earnings	\$ Millions	1058.5
Earnings per Job, New Jobs	\$ Dollars	\$86,030

All three of these components contribute to some degree to the total earnings in the state economy that is due to hardrock mining. When this earnings contribution is considered on a per job basis, we see that the average earnings for each of the more than 12,000 jobs in the economy that are ultimately supported by hardrock mining is more than \$86,000 per year. This is approximately double the size of the average earnings for all jobs in the state for 2016 as reported by the U.S. Bureau of Economic Analysis (\$43,654).

What is even more impressive concerning this result is that while it does reflect the fact that mining jobs pay substantially in excess of average earnings, those jobs only make up about 23 percent of the total jobs in the state that are supported by the hardrock mining industry. A substantial number of jobs included in the total of 12,304 that represents the employment impact of existing operations includes substantial numbers of jobs in industries such as retail trade, accommodations, and other services, which are more likely to be part time and/or pay less than the overall state average. This underscores the fact that part of the earnings supported by mining is increased earnings for those who already have jobs – e.g., jobs that might continue to exist, albeit with lower pay, if mining were not present in the state economy.

The Economic Contribution of Existing Mines: Output Impacts

Montana households are not the only economic actors that have gained both in terms of numbers and in terms of prosperity because of hardrock mining. Montana businesses have also realized higher sales and revenues than would have occurred if hardrock mining were not part of the economy.

One way of measuring this is the output, or gross receipts, of Montana business and non-business organizations. In this instance, the definition of this economic concept used by REMI and reported here differs slightly from what is standard in national income accounting. Output as presented below is gross receipts for all industries with two exceptions – retail and wholesale trade, where instead it is total markup which is shown. This results in a lower total shown below than would be the case if gross receipts were used for all industries consistently.

The table below reveals that businesses and non-business organization realize a considerable amount of sales volume because of the presence of hardrock mining in the state economy. For all industries as a whole, gross receipts are \$2.7 billion higher each year than they would be if mining were not present in the state. As was the case for employment impacts, output impacts are spread across a wide range of industries, as shown in the table on the next page. Unlike jobs, however, output impacts are much more heavily concentrated in the mining and manufacturing industries that are where hardrock mining’s direct sales impacts show up in the results (ore concentrators are considered to be manufacturing in the national industry classification guidelines).

The Economic Impact of Mining in Montana Output Impacts, \$ Millions

Category	Impact
Mining	1847.1
Construction	78.8
Manufacturing	73.1
Wholesale Trade	62.2
Retail Trade	106.6
Transportation and Warehousing	7.4
Professional and Technical Services	85.0
Administrative and Waste Services	18.4
Health Care and Social Assistance	70.1
Arts, Entertainment, and Recreation	2.6
Accommodation and Food Services	30.7
Other Services, except Public Administration	19.2
Other Private	171.7
Government	147.8
TOTAL	2720.7



As a capital intensive, high value-added industry, the mining industry captures a larger share of the overall output impacts than its labor share would otherwise suggest. The size of its output share is also accentuated by the unique treatment of retail and wholesale trade output in the REMI model – if gross rather than net revenues were used for these two industries (as it is for every other industry on the table above) doubtless their output impacts would be significantly higher.

The Economic Contribution of Existing Mines: State and Local Revenue Impacts

Natural resource industries, especially hardrock metal mines, have special importance for state and local tax revenues. Not including the taxes levied on workers, which are the same as other employers, the hardrock facilities analyzed in this study pay:

- | | |
|---|----------------------------------|
| 1. Metal Mines Tax | 5. State Lands Royalties |
| 2. Resource Indemnity and Groundwater Taxes | 6. Property Tax – Net Proceeds |
| 3. Cement and Gypsum Taxes | 7. Property Tax – Gross Proceeds |
| 4. State Lands Fees | 8. Property Tax – Other |
| | 9. Corporation Income Tax |

With the major exception of property taxes, these taxes are remitted to state government. In fiscal year 2018, tax revenues from the taxes listed above (omitting the Corporation Tax) totaled \$44.8 million.

As significant as these tax revenues are, they are only a portion of the contribution that is ultimately made by hardrock mining to state and local government revenues. Not only would a “without mining” economy lose the resource-specific revenues listed above, but with lower employment, production, population and sales, other tax and non-tax revenues would be significantly different from today.

The Economic Impact of Mining in Montana State Revenue Impacts, \$ Millions

Category	Impact
Intergovernmental Revenue	48.3
Selective Sales Tax	26.1
License Taxes	6.9
Individual Income Tax	30.6
Corporate Income Tax	11.0
Other Taxes	15.1
Current Charges	16.4
Miscellaneous General Revenue	14.5
Utility Revenue	1.6
Liquor Store Revenue	2.5
Insurance Trust Revenue	26.4
TOTAL	199.4

The operations of Montana hardrock mines ultimately support \$199.4 million in state tax and non-tax revenues each year, as shown in the table above. The table details the revenue impacts for the categories used by the Census of Governments. Many, but not all, of these revenues are directed to the state’s General Fund. The largest revenue impacts come from intergovernmental revenue – primarily from the Federal Government – which is everything from grants-in-aid to support for education. Others revenue categories have dedicated uses, such as highways, health care, or insurance trust funds. These revenue impacts come about because of the higher population, higher wages, and increases in other economic activity measures that occur in a “with mining” economy compared to an economy where hardrock mining activities did not take place.

Economic Contribution of Existing Mines: Population Impacts

Finally we note that the economic opportunity and prosperity that is supported by the operations and exploration activities of the hardrock mining industry also supports a population of workers, retirees and their families and dependents across the state. If those operations and activities were not present in the state economy, those opportunities would not occur and some fraction of those people would not be in the state. This has important implications for local businesses and governments, most importantly K-12 public schools.

The Economic Impact of Mining in Montana Population Impacts

Age Cohort	Population Impact
Ages 0-14	5,379
Ages 15-24	2,421
Ages 25-64	11,492
Ages 65+	1,001
TOTAL	20,293

We estimate that the population of the state is 20,293 higher today because of the presence of hardrock mining activities in the state. Reflecting the continued presence of the industry in the state, that population consists of working aged people, children, and those at retirement age, and shown in the table above. This population purchases goods and services from local businesses, places demands on local and state governments, and pays taxes of all forms. This population includes more than 4,900 school-aged children.

The Economic Impact of New Mine Development

A second important finding of this study is that the successful development and operation of three new hardrock metal mines in Montana – the Rock Creek, Montanore, and Black Butte mines – would add significantly to the state economy in terms of jobs, income, output and population, compared to what would be expected if the facilities were not developed. While much of the detail of this overall finding bears a strong resemblance to the outcome of the analysis for existing mines, this second finding differs in at least one important aspect. Namely, it is a prospective, future-oriented analysis.

Using its policy analysis model, BBER projected two futures for the state economy. The first was a status quo projection, using baseline assumptions for the drivers of economic growth. A second projection was made that was identical in every respect, except that it added the construction and the operations of the three new mines, with full operation assumed to commence in the year 2020. Operational assumptions – employment, production and compensation – were as reported by the companies.



As was the case for the analysis of the economic contribution of existing mines, this analysis traces the direct, indirect, and induced spending the state economy that would result from new mine development, and thus includes all of the impacts throughout the economy that occur as wages, sales revenues and government revenues that are received are, in part, spent again in the state.

The analysis thus not only serves as a way of understanding how these new projects would impact the future trajectory of the state economy, but it also represents a quantification of the economic benefits of the projects to the state as a whole.

The Economic Impact of New Mine Development: Employment Impacts

The new mines would ultimately add between about 3,100 and 3,500 net new jobs in the state economy in the first decade of their full operation. In addition to the mining, government, and other jobs that would be added to the economy, there is a substantial impact on construction jobs, as shown on the table on the next page. These occur because of the new demand ultimately created by the mining operations, causing capital spending to increase as businesses expand.

The Economic Impact of Proposed New Mines in Montana Employment Impacts

Industry	Jobs Impact by Year		
	2020	2025	2030
Mining	931	885	888
Construction	572	641	357
Manufacturing	47	39	26
Wholesale Trade	43	45	40
Retail Trade	358	394	354
Transportation and Warehousing	28	18	11
Professional and Technical Services	106	165	175
Administrative and Waste Services	62	64	57
Health Care and Social Assistance	176	175	167
Arts, Entertainment, and Recreation	30	22	18
Accommodation and Food Services	133	158	151
Other Services, except Public Administration	137	113	93
Other Private	164	158	132
Government	471	654	632
TOTAL	3,257	3,531	3,102

The Economic Impact of New Mine Development: Output Impacts

Economic output, defined as gross receipts of Montana businesses and non-business organizations, see a significant increase due to new mining development, growing by between \$400 and \$460 million over the years 2020-2030. These increases are largest in the mining industry itself.

The Economic Impact of Proposed New Mines in Montana Output Impacts, \$ Millions

Category	Impacts by Year		
	2020	2025	2030
Mining	248.3	255.0	287.4
Construction	37.8	47.0	28.8
Manufacturing	4.9	4.4	3.2
Wholesale Trade	6.9	8.2	8.1
Retail Trade	17.6	22.3	22.6
Transportation and Warehousing	2.0	1.0	0.3
Professional and Technical Services	8.2	13.9	15.7
Administrative and Waste Services	3.5	4.0	4.0
Health Care and Social Assistance	12.0	13.1	13.3
Arts, Entertainment, and Recreation	0.9	0.6	0.5
Accommodation and Food Services	4.3	5.1	5.0
Other Services, except Public Administration	4.6	4.2	3.7
Other Private	26.2	27.1	23.5
Government	30.5	44.3	44.8
TOTAL	407.8	450.3	460.8

The Economic Impact of New Mine Development: Compensation Impacts

The compensation impacts reveal the relatively high impact that high paying jobs in mining industries produce. By the year 2030 the 3,102 net jobs created because of the operations of the new mines jointly produce an additional \$217.4 million in annual earnings. This averages more than \$70,000 per year for each new jobs created (all dollar figures are expressed in terms of 2018 purchasing power).

The Economic Impact of Proposed New Mines in Montana Compensation Impacts

Category	Units	Impacts by Year		
		2020	2025	2030
Wages and Salaries	\$ Millions	145.4	164.1	153.6
Compensation	\$ Millions	180.4	208.5	197.3
Earnings	\$ Millions	210.3	237.7	217.4
Earnings per Job, New Jobs	\$ Dollars	\$64,548	\$67,318	\$70,098

Summary and Conclusion

The hardrock mining industry in Montana is an important source of jobs, income, sales revenue and tax revenue for Montana workers, households, businesses and governments. The eight largest producers of metals, talc, and concrete products today ultimately support more than 12,000 jobs statewide with average annual earnings of over \$86,030. Many of those jobs are in smaller towns and rural communities with few, if any, opportunities in other industries for those workers and their families. Additionally, if three mines currently under consideration – the Rock Creek, Montanore, and Black Butte mines – were to be successfully developed and operated, the economy would stand to gain more than 3,000 jobs and \$450 million per year in personal income.

The question of how mining activities can sustainably support the jobs, income flows and revenues detailed in this report has not been directly addressed in this discussion. But it underpins all of the finding of this report. Simply put, Montana’s raw materials have tremendous value in the global marketplace. The process of finding, extracting, and processing those materials, and ultimately turning them into the wide spectrum of products that improve our lives is a chain of events that begins here, and in some cases, ends up all around the world.